# PHASE IA ARCHAEOLOGICAL SURVEY
# 253 RICHMOND VALLEY ROAD
# STATEN ISLAND, NEW YORK
**LPC #36566_FSO_DNP_08232022**

***Prepared For:***

**Langan Engineering, Environmental, Surveying,**
**Landscape Architecture, and Geology, DPC**
**21 Penn Plaza**
**360 West 31st Street, 8th Floor**
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***For Submittal To:***

**New York City Landmarks Preservation Commission**
**1 Centre Street, 9N**
**New York, NY 10007**

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ARCHAEOLOGY & HISTORIC RESOURCE SERVICES

**December 2022**

**ABSTRACT**

Archaeology & Historic Resource Services, LLC (AHRS) was retained by Langan Engineering, Environmental, Surveying, Landscape Architecture, and Geology, DPC to perform a Phase IA Archaeological Survey to assist with a NYC Landmarks Preservation Commission (LPC) review for the City Environmental Quality Review (CEQR) correspondence letter dated 8/15/2022. The NYC LPC indicated that the project site located at 253 Richmond Valley Road, Staten Island, NY is in an archeologically sensitive area. The proposed development is a 181,888 sq. ft. one-story warehouse/distribution facility with accessory loading and parking area. The proposed warehouse would be constructed as slab-on-grade and the depth of excavation is anticipated to be 10 feet to construct underground utilities.

An online search of the New York State CRIS identified two known precontact, eight known historic and three known multi component archaeological sites within a half-mile radius of the Project Site. There are a total of eight archaeological surveys that have been conducted within a quarter-mile of the Project Site. Furthermore, according to the CRIS, the entire Project Site is located in an archaeologically sensitive area.

Archaeology

The archaeological-APE is relatively flat and was historically surrounded by open lands and woods which would have provided indigenous peoples with different resources. The Mill Creek is located to the south of the archaeological-APE which would have provided a constant water source. In addition, the Arthur Kill is located to the west of the archaeological-APE and would have been a major avenue of trade and provided additional resources. The area was most likely forested until cleared for farming in the 19th century. However, the soils in the southern portion of the archaeological-APE have been modified in the recent past from development activity to build a parking area.

A record search confirmed that archaeological work has been conducted within a half mile radius of the archaeological-APE and two prehistoric and three multi component archaeological sites have been recorded in this radius. The presence of known precontact archaeological sites in the vicinity of the archaeological-APE is most likely based on the proximity to a water source, other resources and an avenue of transportation for indigenous peoples.

The topography, distance from water, other identified resources in the area and number of previously identified precontact archaeological sites within a one-mile radius of the archaeological-APE would have been able to support at least seasonal settlement and temporary encampments. Therefore, we conclude that there is a high sensitivity for precontact archaeological materials and features within the undisturbed northern portion of the archaeological-APE and a low sensitivity for precontact archaeological materials and features within the southern portion of the archaeological-APE that contained the parking lot.

Online research of the NYS CRIS and the NYC LPC's cultural resource management reports revealed that there eight historic and three multi component archaeological sites within a one quarter mile radius of the archaeological-APE. Historic maps and atlases revealed that the area surrounding the archaeological-APE has been occupied since the mid-19th century. However, no buildings have been built within the archaeological-APE as revealed by the historic map review. Based on the available information, as documented above, we conclude that there is a low to no sensitivity for historic archaeological materials within the archaeological-APE.

Based on the above archaeological sensitivity assessment for the archaeological-APE, AHRS recommends phase IB archaeological testing for the areas of undisturbed soils in the northern portion of the archaeological-APE.

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## 1.0 INTRODUCTION

Archaeology & Historic Resource Services, LLC (AHRS) was retained by Langan Engineering, Environmental, Surveying, Landscape Architecture, and Geology, DPC to perform a Phase IA Archaeological Survey to assist with a NYC Landmarks Preservation Commission (LPC) review for the City Environmental Quality Review (CEQR) correspondence letter dated 8/15/2022. The NYC LPC indicated that the project site located at 253 Richmond Valley Road, Staten Island, NY is in an archeologically sensitive area. The proposed development is a 181,888 sq. ft. one-story warehouse/distribution facility with accessory loading and parking area. The proposed warehouse would be constructed as slab-on-grade and the depth of excavation is anticipated to be 10 feet to construct underground utilities.

All work for the survey was performed in accordance with the *Secretary of the Interior Standards and Guidelines for Archaeology and Historic Preservation 1983*; the New York State Historic Preservation Act of 1980, the *New York City Landmarks Preservation Commission (LPC) Guidelines for Archaeological Work in New York City* (2018), the New York SHPO's guidelines and the New York SHPO's *Phase I Archaeological Report Format Requirements* (2005). All work was conducted by or under the supervision of AHRS archaeologists who meet or exceed the Secretary of the Interior's Professional Qualifications Standards criteria outlined in 48 FR 44738-9.

### 1.1 Site and Project Description

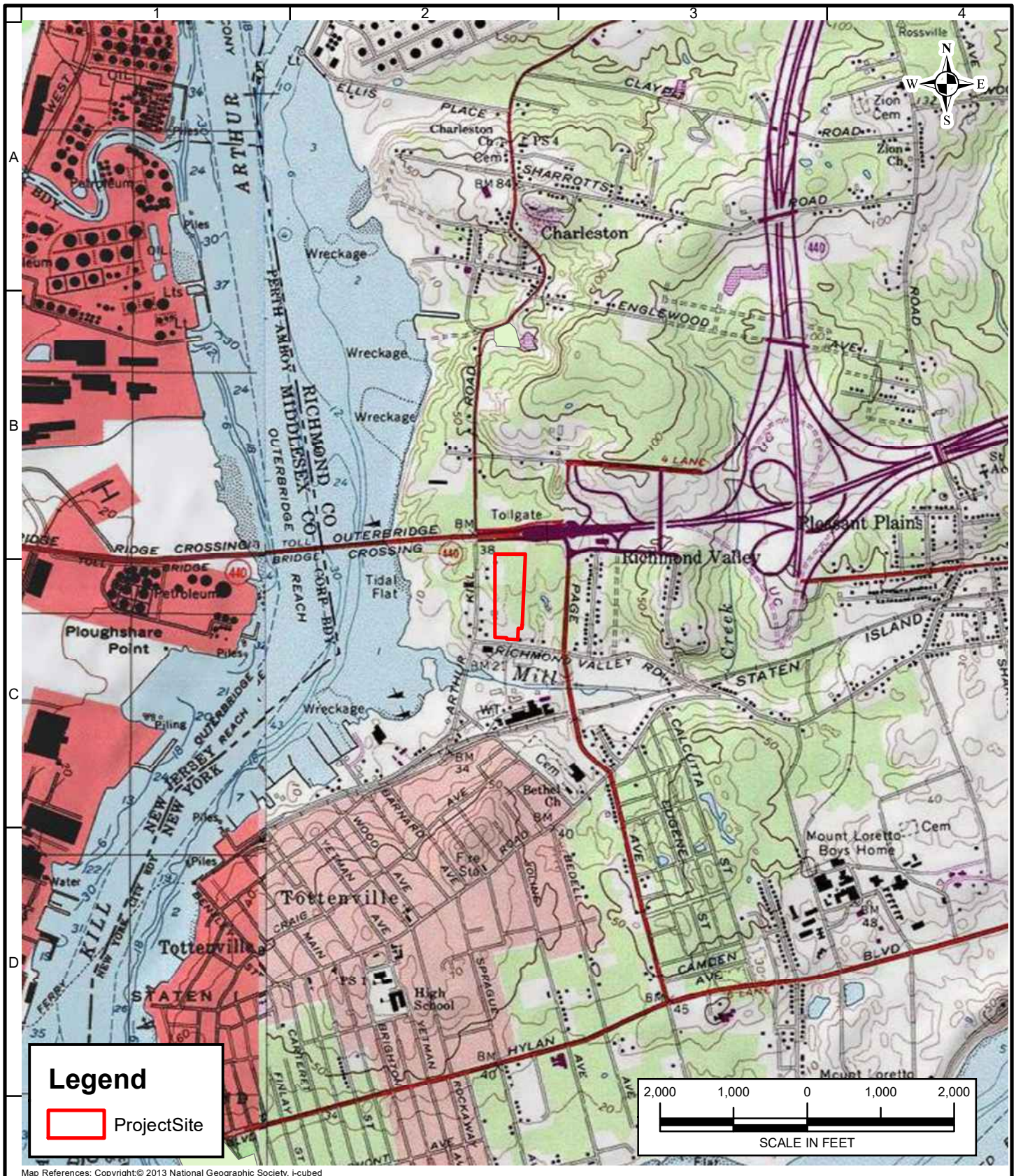
The Project Site is an approximate 434,729 sq ft lot located at 253 Richmond Valley Road, Staten Island, NY. It is also known as Block 7584, Lot 4. It is bounded by a parking lot to the north, undeveloped land to the north and central east, a developed area to the southeast, Richmond Valley Road to the south and various developed lots to the west.

The proposed development is a 181,888 sq. ft. one-story warehouse/distribution facility with accessory loading and parking areas and associated utilities. The proposed warehouse would be constructed as slab-on-grade and the depth of excavation is anticipated to be up to 10 feet to construct underground utilities.

### 1.2 Area of Potential Effect

The APE is defined in 36 CFR 800.16(d) as: "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking."

The Area of Potential Effect (APE) includes locations that may be potentially impacted by the construction or that may experience effects once construction is completed. Included in the APE are all locations where the project may result in ground disturbance, areas that the elements of the project may be visible and where the activity may result in changes to traffic patterns, land use and public access, etc. Project effects on historic resources can include both physical effects

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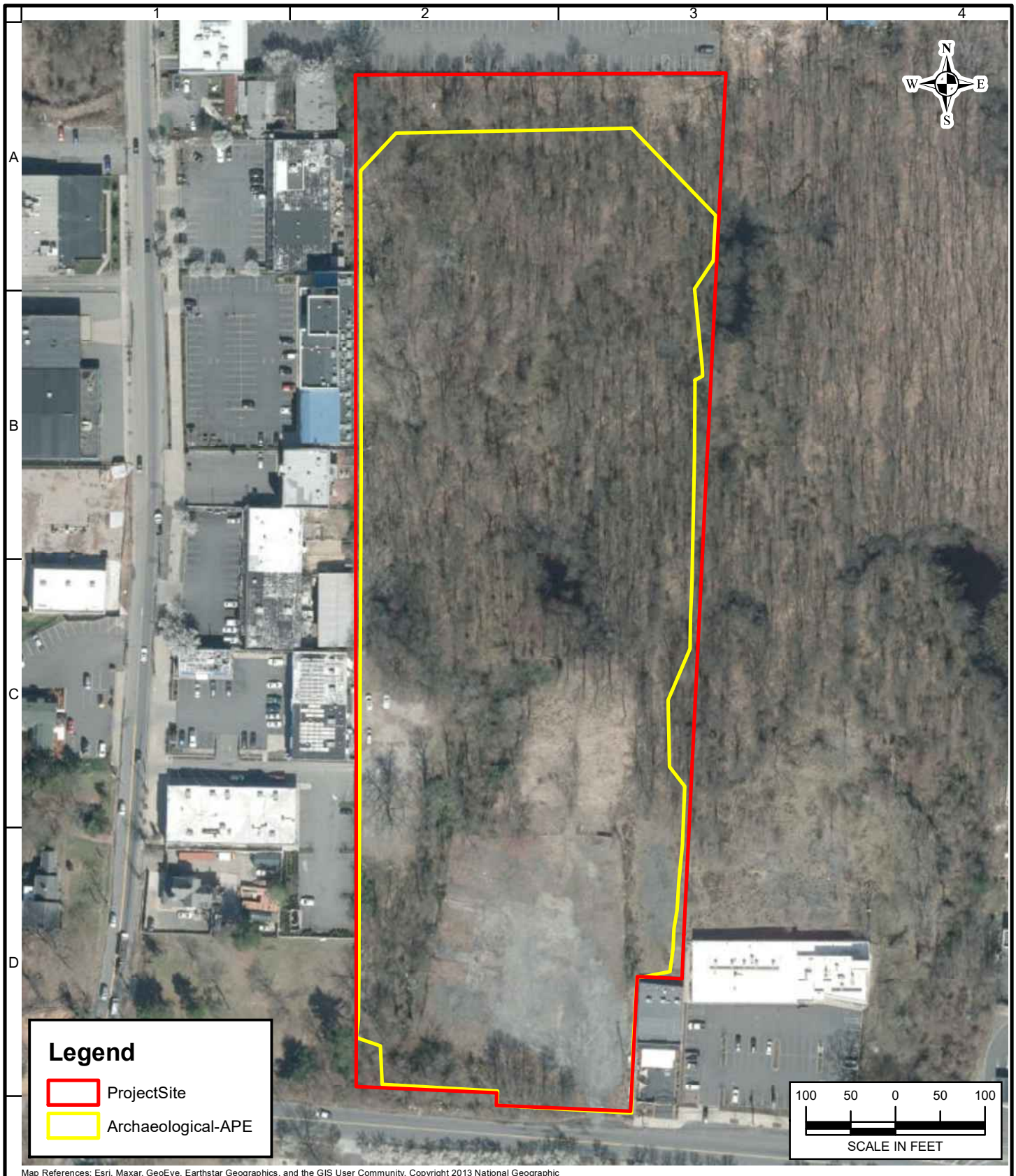
| AHRS ARCHAEOLOGY & HISTORIC RESOURCE SERVICES<br>605 Twin Arch Road<br>Rock Tavern, New York 12575<br>T: 845-725-7694<br>www.ahrservices.com | Project<br>**253 RICHMOND VALLEY ROAD**<br>BLOCK 7584, LOT 4<br>STATEN ISLAND<br>RICHMOND COUNTY NEW YORK | Drawing Title<br>**USGS MAP** | Project No. 202209-NY-0042<br>Date 10/21/2022<br>Scale See Above<br>Drawn By MAA<br>Figure 1 |




Map References: Esri, Maxar, GeoEye, Earthstar Geographics, and the GIS User Community, Copyright 2013 National Geographic

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Project
**253 RICHMOND VALLEY ROAD**
BLOCK 7584, LOT 4
STATEN ISLAND
RICHMOND COUNTY NEW YORK

Drawing Title
**AERIAL PHOTOGRAPH**

| | |
|---|---|
| Project No. | 202209-NY-0042 |
| Date | 10/21/2022 |
| Scale | See Above |
| Drawn By | MAA |
| Figure | 2 |

and contextual effects.

Physical effects can include physical destruction, demolition, damage or alteration of a historic resource. Contextual effects can include isolation of a property from its surrounding environment; the introduction of visual or audible elements that are out of character with the property or that alter its setting and context; or, elimination of publicly accessible views to the resource.

Archaeological

An APE was delineated for archaeology as part of this Phase IA Archaeological Survey. The archaeological-APE encompasses any locations where project activities have the potential to disturb soils through activities such as excavation or grading. The archaeological-APE was defined where ground-disturbing activities are proposed such as grading and excavation (Figure 2) and encompasses the majority of the 9.98-acre project site.

## 2.0 RESEARCH GOALS AND DESIGN

This section presents a general overview of the research design for cultural resource assessments in the State of New York. Sections 5 and 6 present detailed methodologies for the archaeological and architectural assessments for this specific project.

### 2.1 Archaeology

The preliminary Phase IA archaeological survey begins with identifying the areas where project activities have the potential to affect archaeological sites through below-ground disturbance, referred to as the archaeological-APE as described in section 1.2. After defining the APE, documentary research is conducted to determine which locations could have been used during precontact (Native American) or historic times. The research assists in identifying areas where intact archaeological evidence, foundations, structural remains, Native American artifacts or activity areas might be present. A site visit or reconnaissance is then conducted to observe the existing conditions and determine the extent to which the original topography is still present and the effects that landscape alterations may have had on potential archaeological resources. Archaeologically sensitive areas based on topographic features, vegetation and soils are noted as well as any disturbances that would compromise archaeological resources. The result of the site visit is to determine whether archaeological testing is necessary and, if so, to develop an appropriate testing strategy.

Phase IB subsurface archaeological testing (Phase I level) is then conducted in archaeologically sensitive locations and elsewhere in the archaeological-APE to identify whether potentially significant archaeological resources are present. The presence of a potentially significant Native American or historic period site requires a subsequent survey (Phase II level) to evaluate the significance or importance of the identified site, unless the site can be avoided. Usually, an archaeological site has to have the potential to yield important new information in history or prehistory to be considered significant (National Register of Historic Places Criterion D). Evaluations for significance are dependent upon the quality of archaeological data retrieved from the ground, the integrity or intactness of the deposits, prior research activities in the region and the development of historic or prehistoric contexts that identify gaps in archaeological research, that further work at the site might address.

## 3.0 ENVIRONMENTAL SETTINGS

This chapter briefly describes the ecological characteristics of the site and the region including physiography, geology, and soils of the region.

### 3.1 Topography

Existing topography of the property is roughly flat with some hummocks. The site has a gently slope down from the north to the south. The northern portion of the Project Site is wooded and overgrown with a paved parking lot in the southern portion of the Project Site. The Project site is surrounded by undeveloped land, developments, commercial buildings and roads.

### 3.2 Physiography and Geology

Staten Island is the southernmost part of both the city and state of New York. It is the third largest of the NYC boroughs, with a total area of approximately 150 km2. Staten Island Serpentinite, which underlies the "highlands" of Staten Island, is situated between the Newark Basin to the west, and the coastal plain to the east.

### 3.3 Soils

The 2022 Natural Resources Conservation Service (NRCS) Web Soil Survey of Richmond County indicates multiple soil types at the Project Site (Figure 3). The following soils are represented:

- Boonton-Haledon complex (BHBu), 0 to 8 percent slopes – Landforms commonly associated with this soil type are ground moraines. The down-slope shape is convex and the across-slope shape is linear. The parent material is Red coarse-loamy basal till derived from sedimentary rock. The natural drainage is classified as well drained. This type of soil is classified as farmland of statewide importance.

- Haledon-Hasbrouck complex (HHA), 0 to 3 percent slopes – Landforms commonly associated with this soil type are ground moraines. The down-slope shape is convex and the across slope shape is linear. The parent material is Red coarse-loamy basal till derived from sedimentary rock. The natural drainage is classified as somewhat poorly drained. This type of soil is classified as not prime farmland.

- Urban Land-Greenbelt complex (UGB), 3 to 8 percent slopes – Landforms commonly associated with this soil type are summit and talf. The down-slope shape is linear and the across-slope shape is linear. The parent material is Asphalt over human-transported material. The natural drainage is classified as well drained. This type of soil is not classified as prime farmland.


Map References: Esri, Maxar, GeoEye, Earthstar Geographics, etc and GIS User Community and Contributing counties, NYS Office of Info Tech Ser. GIS Program Office and NYS Dept of Tax and Finance's Office of Real Property Tax Ser.

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Project
**253 RICHMOND VALLEY ROAD**
BLOCK 7584, LOT 4
STATEN ISLAND
RICHMOND COUNTY NEW YORK

Drawing Title
**SOILS MAP**

Project No. 202209-NY-0042
Date 10/21/2022
Scale See Above
Drawn By MAA
Figure 3

- Urban Land-Greenbelt complex (UGBI), 3 to 8 percent slopes – Landforms commonly associated with this soil type are summit and talf. The down-slope shape is linear and the across-slope shape is linear. The parent material is Asphalt over human-transported material. The natural drainage is classified as well drained. This type of soil is not classified as prime farmland.

- Urban land, till substratum (UtA), 0 to 3 percent slopes – Landforms commonly associated with this soil type are summit and talf. The down-slope shape is linear and the across-slope shape is linear. The parent material is Asphalt over human-transported material. This type of soil is classified as prime farmland.

### 3.4 Climate

Staten Island gets precipitation, on average, 117 days per year. Precipitation consists of rain, sleet, or hail that falls to the ground. The Island averages about 47.1 inches of rain and 25.4 inches of snow per year. May, June, and September are the most pleasant months in Staten Island, while January and February are least comfortable months. On average, Staten Island gets 206 sunny days per year.

### 3.5 Flora and Fauna

Floral and faunal conditions contribute to the soil formation and its quality and contribute to the overall ecological conditions of the area. Ecological conditions, in turn, stimulate human activity. Vegetation also has an effect on erosion by limiting the runoff rate and increasing the available water capacity. Overall, all these ecological conditions impact the possibility for human adaptations within the ecosystem by limiting or encouraging past and present activities.

Intensive historic development and dense population of Richmond County has irrevocably altered the environment and ecosystem of the Project Site. Environmental reconstructions, such as the comprehensive reconstruction produced by the Wildlife Conservation Society's Mannahatta project, demonstrate that human groups living in the Hudson estuary would have been able to support themselves in the past either through hunting, foraging or subsistence farming (Sanderson 2009).

The animal species currently thriving in Richmond County are well adapted to the urban landscape. Prior to development, Richmond County supported a thriving and diverse ecosystem combining salt and freshwater marshes, beaches and forested areas. Habitat diversity contributed to a diverse food base for prehistoric people. Species that contributed to the diet of the Lenape people who lived in the area at the point of European Contact include jack-in-the-pulpits, hickory, chestnuts, goosefoot, common persimmons, wild berry plants (e.g., strawberry, hackberry, blackberry, blueberry, cranberry), Jerusalem artichokes, cattails and wild grapes. In addition, a number of plant fibers were exploited for craft production or building trades, including Indian Hemp, Tulip trees, milkweed, elm, and American basswood (Sanderson 2009).

Terrestrial mammals contributed to the indigenous subsistence patterns by providing a variety of biologically and economically significant items such as meat, furs, hide, marrow, bones, and antler. In this context, information on animal species and their distribution within the ecosystem contribute significantly to comprehensive interpretations of the archaeological record. The Lenape were known to hunt white-tailed deer for meat, hides and antlers, as well as black bears as a source of grease for cooking and ointments. The Hudson River and the proximity of the coast also provided access to both marine and freshwater resources, including various fish species (e.g., shad, herring, cod, weakfish, bluefish, sturgeon), shellfish (e.g., blue mussels, lobsters, crabs), bivalves (e.g., oysters and clams), waterfowl (e.g., ducks, geese), amphibians (frogs, turtles) and water snakes (Sanderson 2009).

Temperature, sea level changes and industrial development substantially changed the environment of Richmond County during the Holocene. Environmental reconstructions of past conditions support the assumption that human groups could have found favorable ecological and climatic conditions within the Project Area in the distant past (Sanderson 2009).

This brief discussion of the ecological and physiographic conditions presently existing in Richmond County suggests that human groups could have lived in the surrounding area of the archaeological-APE. They would have been able to support themselves either through foraging or subsistence farming. Except for temperature, there is no evidence that those ecological conditions drastically changed over the past several thousand years and, therefore, it is possible to assume that human groups could have found favorable ecological and climatic conditions within the limit of disturbance in the past.

## 4.0 BACKGROUND RESEARCH

Background research was conducted to locate previously identified cultural resources and to evaluate the archaeological sensitivity for previously unidentified cultural resources within an appropriate context within the archaeological-APE. Research was conducted on the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) Cultural Resource Information System (CRIS) online to identify known architectural and archaeological resources (sites) on or adjacent to the archaeological-APE. In addition, a review of previously conducted cultural resources surveys in the archaeological-APE were also conducted on both CRIS and the LPC archaeological report library. Research was conducted on Google Books, the Staten Island Historical Society, the NYC Public Library online collection, Historic Aerials website and the David Rumsey Online Cartography Collection.

### 4.1 Archaeology

An online search of the CRIS identified two known precontact, eight known historic and three known multi component archaeological sites within a half-mile radius of the Project Site (Table 1). In addition, there are a total of eight archaeological surveys that have been conducted within a quarter-mile of the Project Site. Furthermore, according to the CRIS, the entire Project Site is located in an archaeologically buffer (sensitive) area.

**Table 1 –** Known individual archaeological sites within half-mile of the archaeological-APE.

| Site # | Pre-Contact/ Historic | Site Name | Proximity to APE (feet) - Direction | Period | Description |
|---|---|---|---|---|---|
| 8501.000026 | Pre-Contact | NASSAU PLACE SITE(PREH) | 1,070 feet southwest | | Undetermined |
| 8501.002627 | Historic | V-196 WOOD CAR FLOAT | 1,340 feet southwest | form missing | Not Eligible |
| 8501.002628 | Historic | V-208 WOOD CAR FLOAT | 2,430 feet southwest | form missing | Not Eligible |
| 8501.002652 | Historic | V-242 WOOD HOPPER BARGE | 2,907 feet southwest | form missing | Not Eligible |
| 8501.002678 | Historic | V-215 FLOATING DRYDOCK | 2,490 feet southwest | form missing | Not Eligible |
| 8501.002651 | Historic | V-238 WOOD HOPPER BARGE | 2,520 feet southwest | form missing | Not Eligible |
| 8501.002609 | Historic | V-219 BARREL-BOW CANAL BARGE MARY & MELVIN | 2,530 feet southwest | form missing | Eligible |
| 8501.002659 | Historic | V-252 COVERED BARGE | 2,540 feet southwest | form missing | Not Eligible |
| 8501.002608 | Historic | V-214 SCOW-SHAPED CANAL BARGE | 2,550 feet southwest | form missing | Not Eligible |

| Site # | Pre-Contact/ Historic | Site Name | Proximity to APE (feet) - Direction | Period | Description |
|---|---|---|---|---|---|
| 8501.004064 | Multi component | Arthur Kill Road at Mill Creek site | 690 feet northwest | | Not Eligible |
| 8501.003697 | Multi component | Dissosway Totten Starr Site | 1,450 feet northwest | | Eligible |
| 8501.003358 | Pre-contact | Catbriar | 1,550 feet northwest | Woodland | Eligible |
| 8501.003696 | Multi component | Area 1 West Site | 1,830 feet northwest | Pre-contact/ 17th to 19th c. | Undetermined |

Site 8501.000026 (Nassau Place Site) is a Precontact archaeological site identified by Arnold Pickman and Rebecca Yamin as part of the Oakwood Beach Water Pollution Control Phase I Cultural Resource Report in October 1984. The pre contact site is located approximately 1,070 feet southwest of the Project Site. The site was identified through the excavation of borings. The artifacts are simply described as "buried evidence". No other artifacts or features were identified. No other information is included on the site form.

Site 8501.002627 (V-196 Wood Car Float) is a historic archaeological resource which has been identified approximately 1,340 feet southwest of the Project Site. This site is recorded on the NY CRIS system; however, the site form is not available within the CRIS system and no other information could be obtained about this resource.

Site 8501.002628 (V-208 Wood Car Float) is a historic archaeological resource which has been identified approximately 2,430 feet southwest of the Project Site. This site is recorded on the NY CRIS system; however, the site form is not available within the CRIS system and no other information could be obtained about this resource.

Site 8501.002652 (V-242 Wood Hopper Barge) is a historic archaeological resource which has been identified approximately 2,490 feet southwest of the Project Site. This site is recorded on the NY CRIS system; however, the site form is not available within the CRIS system and no other information could be obtained about this resource.

Site 8501.002678 (V-215 Floating Drydock) is a historic archaeological resource which has been identified approximately 2,490 feet southwest of the Project Site. This site is recorded on the NY CRIS system; however, the site form is not available within the CRIS system and no other information could be obtained about this resource.

Site 8501.002651 (V-238 Wood Hopper Barge) is a historic archaeological resource which has been identified approximately 2,520 feet southwest of the Project Site. This site is recorded on the

NY CRIS system; however, the site form is not available within the CRIS system and no other information could be obtained about this resource.

Site 8501.002609 (V-219 Barrel-Bow Canal Barge Mary & Melvin) is a historic archaeological resource which has been identified approximately 2,530 feet southwest of the Project Site. This site is recorded on the NY CRIS system; however, the site form is not available within the CRIS system and no other information could be obtained about this resource.

Site 8501.002659 (V-252 Covered Barge) is a historic archaeological resource which has been identified approximately 2,540 feet southwest of the Project Site. This site is recorded on the NY CRIS system; however, the site form is not available within the CRIS system and no other information could be obtained about this resource.

Site 8501.002608 (V-214 Scow-Shaped Canal Barge) is a historic archaeological resource which has been identified approximately 2,550 feet southwest of the Project Site. This site is recorded on the NY CRIS system; however, the site form is not available within the CRIS system and no other information could be obtained about this resource.

Site 8501.004064 (Arthur Kill Road at Mill Creek site) is a multi component archaeological site identified by D. W. Hanning as part of a Phase I Archaeological survey conducted by HPI in 2020. The historic site is located approximately 690 feet northwest of the Project Site. This site is located on a wooded upland with good drainage and moderate slope. Two brick lined privies were identified during excavations. Historic finds from within the features and scattered around the site included whiteware, ironstone, redware, stoneware, nails, window glass, brick, mortar, vessel glass fragments and whole machine-made bottles and faunal materials. Diagnostic glass bottles were dated to the early 20$^{th}$ century.

Site 8501.003697 (Dissosway Totten Starr Site) is a multi component site identified by William Sandy as part of a Phase I Archaeological survey conducted by Greenhouse Consultants in December 2016. The multi component site is located approximately 1,450 feet northwest of the Project Site. This site is located on a wooded upland with previous cultivation and erosion with good drainage and gentle slope. Precontact finds included fire cracked rock, chert flakes and bifacial fragments found in and below the plow zone. Historic finds included creamware, delftware, ironstone, pearlware, porcelain, redware, stoneware, yellowware, nails, window glass, brick, mortar, vessel glass and faunal materials. No features from any time period were identified. The site had been previously disturbed by road and parking lot construction in the 1920s.

Site 8501.003358 (Catbriar) is a Precontact archaeological site identified by William Sandy as part of a Phase I Archaeological survey conducted by Greenhouse Consultants in October 2008. The pre contact site is located approximately 1,550 feet northwest of the Project Site. This site is located on a wooded upland with good drainage and moderate slope. This site is approximately 4,900 square meters in size. Artifacts recovered include argillite, chert, chalcedony, and jasper flakes and debitage, fire cracked rock found in a hearth feature, a chopper, clam and oyster shell,

and pottery fragments with sand temper, cordmarked, fabric impressed, incised and punctate decorations. The pottery is indicative of a woodland period habitation.

Site 8501.003696 (Area 1 West Site) is a multi component site identified by William Sandy as part of a Phase I Archaeological survey conducted by Greenhouse Consultants in October 2014. The multi component site is located approximately 1,830 feet northwest of the Project Site. This site is located on a wooded upland with good drainage and moderate slope. The precontact artifacts recovered include chert, chalcedony, and jasper biface fragments, flakes and debitage, and fire cracked rock. No precontact features were identified. Historic artifacts include clay smoking pipe fragments, North Devon ware, creamware, delftware, pearlware, jackfield, redware, slipware, salt glaze stoneware, yellowware, olive green glass and faunal remains. The historic ceramics are dated to the 18th and early 19th centuries with some outlier artifacts dating to the 17th century.

There are a total of eight archaeological surveys that have been conducted within a mile of the Project Site.

The first survey (87SR54180) is titled *Phase IA Cultural Resource Investigation, Chateau Du Bois Development, Staten Island, New York* by Louis Berger & Associates, Inc in October 1987. This survey is located approximately 376 feet east of the Project Site. This survey was conducted as a part of the CEQA process in preparation for a housing development. The survey included a site file search, a historic map review, a site visit and a sensitivity assessment for the project area. At least twenty precontact archaeological sites are recorded within a two-mile radius of the Project Site. Additionally, the map review indicated that numerous buildings and structures had been built within the Project Site in the 19th century. The Project Site was evaluated to have high sensitivity for precontact and historic archaeological resources. The report concluded that the surrounding project area has a high sensitivity for precontact archaeological resources. Additional Phase IB work was recommended.

The second survey 87SR54181) is titled *Phase IB Archaeological Survey of the Chateau Du Bois Development, Staten Island, New York* by Greenhouse Consultants Inc in December 1987. This survey is located approximately 525 feet east from the Project Site. This survey was conducted as a part of the CEQA process in preparation for a housing development and is a follow up to the above survey. The project was for an approximately 14.5-acre survey area. The survey included a shovel test pit survey and follow up artifact analysis. A total of 35 STPs were excavated. Large portions of the Project Site were disturbed from bulldozing and landscaping. The center of the Project Site was unexcavated due to wetland soils. One chert flake and 49 historic artifacts consisting of ceramics, glass and building material were identified in the plow zone context. The ceramics ranged in date from the 18th to 20th centuries. No significant grouping of artifacts was identified. No archaeological sites were identified in the project area, and no further work was recommended.

The third survey (90SR52538) is titled *Stage I Cultural Resource Investigation, Gateway Cathedral, Staten Island, New York by* Louis Berger & Associates, Inc in May 1990. This survey is located approximately 1,279 feet east from the Project Site. This survey was conducted as a part of the

CEQA process in preparation for a business development. The Project Site for this survey was 22 acres in size. The survey included a site file search, a historic map review, a site visit with auger tests and a sensitivity assessment for the project area followed by a surface collection survey, shovel test pit (STP) survey and artifact analysis. At least twenty precontact archaeological sites are recorded within a two-mile radius of the Project Site. Additionally, the map review indicated that numerous buildings and structures had been built within the Project Site in the 19th century. The site visit identified scatters of historic artifacts within the northern 14 acres of the Project Site and impromptu auger tests confirmed the presence of historic artifact deposits though no features were identified. The Stage IB portion of the survey consisted of STPs and surface collection. A Total of 174 STPs were excavated in a 50 ft interval pattern and subsequent radial testing. A total of 345 historic artifacts were recovered during the survey, 85% of these were recovered during surface collection from areas which had significant disturbance. The artifacts consisting of ceramics, glass and building material were identified in the plow zone context. The ceramics ranged in date from the 18th to 20th centuries. No significant grouping of artifacts was identified. No archaeological sites were identified in the project area, and no further work was recommended.

The fourth survey (20SR00612) is titled *Phase IA Archaeological Documentary Study, Arthur Kill Road Storage, Block 7983, Lot 100, Staten Island, Richmond County, New York And Phase IB Archaeological Testing Program, Arthur Kill Road Storage, Block 7983, Lot 100, Staten Island, Richmond County, New York* by Historic Perspectives, Inc. in November 2020. This survey is located approximately 699 feet southwest from the Project Site. This survey was conducted as a part of the CEQA process and wetland permit in preparation for a storage facility development. The Project Site for this survey was 8.6 acres in size. The survey included a site file search, a historic map review, a site visit and a sensitivity assessment for the project area followed by a surface collection survey, shovel test pit survey and artifact analysis. The Phase IA determined that the Project Site had a high sensitivity for both precontact and historic archaeological resources. In addition, HPI recommended that the entire project site be thoroughly inspected for the presence of a grist mill complex from the 18th century and any resources photographed. A total of 23 STPs were excavated within areas of high probability for archaeological resources. The survey identified concentrations of precontact and historic artifacts as well as a brick shaft feature. HPI recommended additional work within the Project Site including Phase II investigation of the identified site and supplemental Phase II investigations in areas within the Project Site if areas of disturbance were to be modified by future construction plans.

The fifth survey (21SR00470) is titled *Phase II Archaeological Testing Program Arthur Kill Road Storage Block 7983, Lot 100 Staten Island, Richmond County, New York by* Historic Perspectives, Inc. in November 2021. This survey is located approximately 636 feet southwest from the Project Site. The project was the follow up Phase II investigation for the above survey. This survey was investigating precontact artifact scatters and historic features located during the previous survey. The survey consisted of additional STP surveying to further refine site boundaries, Test unit excavations and machine trenching other areas where significant disturbance had deposited soils over the artifact bearing layers. The precontact artifacts were determined to be in disturbed contexts and no additional precontact artifacts were found. The trench excavation identified two

brick lined cisterns filled with domestic refuse and ash from the early to mid-20th century. No further work was recommended.

The sixth survey (06SR56284) is titled *Phase IB Archaeological Survey, Proposed Bank Branch, Lots 1 and 3, Block 7580, Borough of Staten Island, Richmond County, New York* CRCG in March 2006. This survey is located approximately 527 feet west from the Project Site. This survey was conducted as a part of the State Environmental Quality Review Act (SEQRA) for the 1-acre proposed construction of a new bank branch. An initial background research review was conducted including a site file search, a historic map review and a sensitivity assessment for the project area. The investigation included site reconnaissance, pedestrian survey and STP excavations. The background research determined that the area had a high sensitivity to precontact archaeological resources. No historic structures were identified on maps of the project area and a low sensitivity to historic archaeological resources was determined. A pedestrian (initial walkover) survey was conducted of the project area. The STP survey consisted of 19 STPs excavated in areas where soil accumulation allowed for excavation. No significant archaeological materials were identified and other further work was recommended.

The seventh survey (15SR00585) is titled *Phase 1 Archaeological and Historical Survey Waterfront Commons Block 7620, Lot 1 Block 7632, Lots 1, 6, 50, 150 And 151 Richmond County, Staten Island, New York* by Greenhouse Consultants Inc in June 2015. This survey is located approximately 544 feet west from the Project Site. This survey was conducted as a part of the State Environmental Quality Review Act (SEQRA) and USACE permit for the 33.5-acre proposed housing development. An initial background research review was conducted including a site file search, a historic map review and a sensitivity assessment for the project area. The investigation included site reconnaissance, pedestrian survey and STP excavations. The background research determined that the area had a high sensitivity to precontact archaeological resources. Historic structures were identified on maps of the project area and a high sensitivity to historic archaeological resources was determined. The STP survey consisted of 274 STPs excavated in areas where soils surveys indicated deep natural soils and historic maps indicated potential historic buildings. Backhoe trenches were excavated in areas where natural soils could not be reached by hand excavation. Artifacts recovered include argillite, chert, chalcedony, and jasper flakes and debitage, fire cracked rock found in a hearth feature, a chopper, clam and oyster shell, and pottery fragments with sand temper, cordmarked, fabric impressed, incised and punctate decorations. The pottery is indicative of a woodland period habitation. Historic artifacts include clay smoking pipe fragments, North Devon ware, creamware, delftware, pearlware, jackfield, redware, slipware, salt glaze stoneware, yellowware, olive green glass and faunal remains. The historic ceramics are dated to the 18th and early 19th centuries with some outlier artifacts dating to the 17th century. The Catbriar Site, The Area 4 Site, the Area 5 Site and the Area 1 West Site were registered after this survey. Extensive supplemental Phase I and additional Phase II investigations were recommended throughout the Project Site.

The eighth survey (17SR00174) is titled *Supplemental Phase 1b And Phase 2 Archaeological And Historical Investigations Of Riverside Galleria (Formerly Waterfront Commons) Block 7620, Lot 1 Block 7632, Lots 1, 6, 50, 150, And 151 And Richmond Valley Road Extension, Lots 100 And 110*

*Richmond County, Staten Island, New York by* Greenhouse Consultants Inc in January 2017. This survey is located approximately 544 feet west from the Project Site. This survey was conducted as a part of the State Environmental Quality Review Act (SEQRA) and USACE permit for the 33.5-acre proposed housing development and is the follow up to the above survey. This survey consisted of specialized investigations of identified archaeological sites within the Project Site. The Area 1 Site and Catbriar Sites were investigated for precontact archaeological deposits, the Area 4 and 5 Sites were investigated for historical industrial archaeological deposits associated with the mills and related industries along the creek. Supplemental Phase IB field work was conducted in additional areas to determine the extent of other archaeological deposits and site boundaries. Shovel testing, excavation units and backhoe trenching were utilized to investigate the sites. The investigation results determined the The Catbriar Site is a large, significant Precontact Site. It produced stone tools, flakes, fire-cracked rock, and Native American pottery. No temporally diagnostic lithic artifacts were found; ceramics are thought to date to the Middle Woodland, Late Woodland, and possibly Historic Contact. A hearth feature and areas with shell middens were also found. The historic and industrial archaeological deposits were also considered to be significant as they proved to contain significant amounts of diagnostic artifacts and could be associated to the surrounding industrial archaeological sites and relate to the occupation by the Dissosway, Starr, and Totten households, and possibly others. The archaeological deposits qualify under Criterion B, in that they are associated with the lives of persons significant in the history of the Tottenville area. They also relate to Criterion D. Phase III Data Recovery was recommended for the Project Site.

## 4.2 Known Historic Architecture

Research conducted on the CRIS website, identified 10 buildings within 1320 feet (0.25 miles) of the limit of disturbance for listing, eligible or not eligible on the State (SRHP) or National Register of Historic Places (NRHP). Table 5 below names the buildings and their determination for listing on the S/NRHP.

**Table 2 –** Historic properties within 1320 feet (0.25 miles) the archaeological-APE.

| USN | Name | Location | Distance/Direction from Limit of Disturbance (feet) | Status |
|---|---|---|---|---|
| 8501.0013 | RES - 4850 ARTHUR KILL RD | - 4850 ARTHUR KILL RD | 988 feet north | Not Eligible - Demolished |
| 8501.001276 | Former residence / construction office | 233 RICHMOND VALLEY RD | 289 feet east | Not Eligible - Demolished |
| 8501.004086 | Commercial building | 236 Richmond Valley Rd 10309 | 295 feet southeast | Not Eligible |
| 8501.004085 | Commercial building | 286 Richmond Valley Rd 10309 | 327 feet southwest | Not Eligible |
| 8501.004227 | Arthur Kill Road Bridge BIN: 2249820 | Arthur kill Road 10307 | 794 feet southwest | Not Eligible |
| 8501.004178 | Concrete pad and Transformers - | 1 Nassau Pl 10307 | 1,179 feet southwest | Not Eligible |

| USN | Name | Location | Distance/Direction from Limit of Disturbance (feet) | Status |
|---|---|---|---|---|
| 8501.001277 | Residence (demolished 2007) | 291 RICHMOND VALLEY RD | 312 feet west | Not Eligible - Demolished |
| 8501.001275 | RES - 217 RICHMOND VALLEY RD | 217 RICHMOND VALLEY RD | 442 feet west | Not Eligible - Demolished |
| 8501.001274 | RE - 169 RICHMOND VALLEY RD | 169 RICHMOND VALLEY RD | 885 feet west | Undetermined |
| 8501.001301 | Cole House | 4927 ARTHUR KILL RD | 589 feet northwest | Not Eligible |

## 4.3 Prehistoric Context

Since the late Pleistocene, humans have occupied all areas of the continental United States adapting to its regionally diverse ecosystems. Only the past 500 years are historically documented; most of the past 13,000 years can be recorded only through the study of Precontact archaeological sites. The prehistoric period is commonly divided into five major chronological sub periods; Paleo, Archaic, Transitional, Woodland and Contact. The Archaic and Woodland Periods are further broken down into early, middle and late.

The earliest period, when the first people crossed the Beringian Gap between Asia and America, commenced around 13,000 years before present (B.P.) and continued until approximately 10,000 B.P. This is a period that saw dramatic changes in the environment (e.g. Pielou 1992), climate (e.g. Delcourt and Delcourt 1985) and animal species available for exploitation (e.g. Martin and Klein 1984). Considerable attention has been devoted to the Paleo-Indian life ways (e.g. Anderson 1990; Frison and Todd 1986; Haynes 1966; Tankersley and Isaac 1990).

Paleo-Indian Period (13,000 B.P. to 10,000 B.P.)

The Paleo-Indian period began around 13,000 B.P. and continued to ca. 10,000 B.P., coinciding with the end of the Pleistocene and the beginning of the Holocene. The earliest documented inhabitants of the continental U.S. crossed from Asia sometime before 13,000 B.P. and rapidly colonized all of North and South America.

Archaeological research in various parts of the U.S. has documented numbers of surface finds of the fluted points diagnostic of this period. Far fewer Paleo-Indian sites with subsurface cultural materials have been documented. Recent analysis of Paleo-Indian tool assemblages has established chronologically significant tool types to identify three temporal subdivisions of the Paleo-Indian time period (Anderson 1990; Tankersley and Isaac 1990).

Despite a refinement of the chronology, the temporal range and spatial distribution of these point types is poorly understood. Some inferences may be drawn, however, from the frequent isolated finds and paucity of large Paleo-Indian sites in the Southeast.
Paleo-Indian occupation in New York area is no better known than in other parts of the country. Occupation of New York appears to have begun at around 11,000 years B.P, a few thousand years after the first humans appeared on the North American continent. The earliest evidence of occupation in the New York area are the Clovis and other fluted points and several small possible camp-sites (like Davis and Port Mobil, NY). Among the best known are sites such as Potts in north-central NY and the West Athens and Kings Road sites located west of the Hudson River in Greene County. These sites recovered points in the 1960's.

The West Athens Hill site is a quarry-workshop-habitation site and the largest known Paleo-Indian site in New York State (Ritchie and Funk, 1973 and Ritchie, 1980). More than 1,400 artifacts and most of the debitage are dateable to the Clovis tradition. It contained 24 fluted points (in various states) and 200 bifacially worked pieces, 96 end scrappers, 220 side scrappers and knives and a large number of retouched flakes (Lozny at.al, 2007). The West Athens Hill site is the only known quarry workshop found up to that time.

The Kings Road site is a small site with 351 artifacts including 7 fragments of 7 fluted points, 47 end scrappers, 67 side scrappers, 43 flake knives, 19 biface tools and 150 other items (Ritchie and Funk, 1973 and Ritchie, 1980). The most interesting part of this site is the high percentage (10%) of imported flints from the west, south and north of the New York area (Ritchie and Funk, 1973 and Ritchie, 1980).

The Port Mobil site is a multi-component site with Paleo-Indian phase. Paleo-Indian phase artifacts include two fluted points, three broken fluted points, fifteen end scrapers, seven side scrapers, two spokeshave scrapers, nine flakes knives and two graving tools were chipped from tan or yellow jasper, possibly from the Hardystone Jasper region of eastern Pennsylvania and New York Normanskill flint (Richie 1980). Located on Staten Island, New York, this site suggests a scattered, highly mobile population in bands of approximately 20 individuals, who ranged across a vast area necessary to support lifeways organized around the hunting of migratory game (Ritchie 1980).

In general, fluted points were found in certain locations in New York which are close to permanent source of water, like swamps or lakes and sometimes slightly elevated. The distribution of points is primarily limited to the valleys of big rivers and their tributaries. The Orange County, which includes the project area, was pointed out many years ago by William Ritchie as an ideal place to look for evidence of the Paleoindian subsistence, as the region contains numerous sites with Pleistocene fauna and also locations of fluted points (Ritchie 1994).

Although few sites have been thoroughly excavated and reported, some information on Paleo-Indian life ways is available. Anderson (1990) has suggested two models of Paleo-Indian settlement patterns, one appropriate to the Northern Tundra-Spruce Parkland zone and one to the Southern Boreal-Deciduous forest zone.

Anderson's model of Southeastern Paleo-Indians suggests that they were generalized foragers, exploiting the diverse plant and animal resources of the Boreal-Deciduous forests. As a result of this foraging strategy, the dense accumulation of animal bone and lithic materials that characterize sites in the Western plains (e.g. Olson-Chubbuck, Colby) and some of the Northeastern sites (e.g. Delbert, Vail, Bull Brook) is absent. According to Anderson, southeastern Paleo-Indian occupations are characterized by light lithic scatters, with some functional diversity in the tool assemblage. Although Anderson's model of Paleo-Indian period settlement is reasonable, several large Paleo-Indian sites or site clusters have been documented in the Southeast (e.g., Adams site, Big Bone Lick, Pine Tree, Quad, Thunderbird, Well Creek Crater); yet, almost none have been intensively excavated (Daniel and Wisenbaker 1987; Sanders 1986, 1983). Current excavation at the Thunderbird site in Virginia may provide more detailed information on Paleo-Indian life ways in the Boreal-Deciduous Forest zone.

Paleo-Indian subsistence strategy was based on foraging. This type of subsistence includes the hunting of wild animals as well as the gathering of wild plants. The archaeological record confirms hunting activities, including hunting of big game, while gathering is not well documented for this period. The settlement distribution pattern of Paleo-Indian sites from Pennsylvania and elsewhere strongly suggests that indigenous people preferred well-drained, elevated locales in close proximity to a stable source of water. Such adaptation derives from the strategy of utilizing the ecosystem according to certain patterns. In addition to occupying lower terraces and sometimes flooded areas, other types of Paleo-Indian sites have been located near outcropping sources of chert (quarry sites), or in rock shelters (probably seasonal habitations), etc.

The Paleo-Indian settlement patterns cannot be fully recognized due to the adverse impact to these sites, which were caused by the environmental change by the end of Pleistocene and the beginning of Holocene. As a consequence, the warmer climate during the Holocene period led to the retreat of glaciers and rise of sea levels, which covered many areas previously utilized by humans. This climatic transition also contributed to the change of the ecosystem, especially the distribution of faunal and floral elements. These changes subsequently encouraged new designs in the pattern of human migrations and alterations in the subsistence pattern characteristic for a new prehistoric period — the Archaic Period, ca. 10,000 to 3,700 B.P. Compared to the Paleo-Indian period, a new type of culture developed, containing a greater variety of implements, especially used to process diverse foodstuffs (scrapers, knives, expedient tools, grinding stones and the development of the earliest pottery).

Archaic Period (10,000 B.P. to 3,700 B.P.)

The Archaic period is divided into three sub periods, characterized by different cultural adaptation and typical tool-kits. These are briefly summarized below.

Early Archaic (10,000 B.P. to 8,000 B.P.)

The Early Archaic Period is distinguished from the preceding Paleo-Indian Period primarily on the basis of projectile point styles. These include the widespread Kirk and LeCroy points. Early Archaic

bifaces, in contrast with Paleo-Indian projectile points, are unfluted and usually have a well-defined haft element (see Justice 1987).

Very little is known of this early period of human settlement in the Americas, although some general inferences may be drawn. The widespread occurrence of similar point types over much of North America suggests that social groups were highly mobile and probably maintained a fluid social organization, as many modern hunters and gatherers do. Given their mobility, these groups probably created very ephemeral sites, with little midden accumulation and only light scatters of lithic and bone debris. Highly mobile societies are unlikely to invest time and energy in the creation of permanent storage facilities. Consequently, storage pits and houses from this period are unknown. It should be noted, however, that such archaeologically visible remains are known from the European and Eurasian Paleolithic period. Problems of identification and the rapid environmental changes associated with the European colonization of North America compound the difficulties of locating ephemeral sites in upland and alluvial settings.

Very few tool types, other than bifaces, are known for this period, although research in the Far Northeast and Southeast has identified a variety of expediently prepared tools (Petersen 1991; Starbuck and Bolian 1980; Tankersley 1990). Although the lack of ground stone tools in this period is frequently taken as an indication that Early Archaic people exploited few plant resources, it is more than likely that they did use plant foods, but did not expend much energy in the preparation of the tools to exploit them. Ground stone tools are a hallmark of the Middle and Late Archaic and probably reflect not a change in resource use per se, but a more intensive and less mobile adaptation to a region. Chapman (1977) for example documented the presence of basket fibers in an Early Archaic context, suggesting that knowledge and use of plant fibers was certainly a characteristic of the Early Archaic.

Few sites that date to this period have been excavated. Consequently, information about this period must be inferred from general models of hunters and gatherers or from the small number of sites that are reported. In both cases, such models have serious biases (cf. Jefferies 1990, for discussion on the Archaic Period in the Southeastern U.S.).

A cultural horizon that characterizes most of the Archaic period in New York and greater Northeast was identified as the Laurentian tradition. It is interesting to notice certain cultural unification identifiable within this horizon. This observation led some (for instance Ritchie) to suggest that the Laurentian might be the time when new indigenous social structure and political system emerged — tribal societies. One of the examples of the material evidence of such a claim could be the western New York phenomenon identified as the Lamoka culture with the subsequent Brewerton and Meadowood horizon linking the Archaic with the Early Woodland times. The sites Lamoka Lake, Geneva, Woodchuck Hill and at Frontenac Island in Cayuga Lake are representative sites of Lamoka phase in New York. The large Lamoka Lake site is the only sizeable site from this time period. The evidence from the Ward's Point site suggests either an extended period of use or more likely the reuse of a known site over several years. Several hearth-centered workshops have been identified at the site including tool making, cooking and hide-working.

In summary, the early Archaic is a poorly known period. Native Americans in the mid-continent must have had to adapt to a variety of local ecozones, which may have changed rapidly, sometimes within a generation, as a result of the Hypsithermal. During the Early Archaic Period new types of projectile points appeared which were smaller in size and in greater variety. The new styles include corner-notched points, stemmed points and bifurcate base points (Justice 1987). Such technological change probably indicates cultural transition manifested in diversified adaptation strategies that people must have followed during that time. New climatic conditions created more options in terms of exploiting diverse ecosystems and subsequently designing appropriate mobility patterns. A greater diversity in decision-making contributed to creation of diversified tool assemblages. Some researchers suggested however, that such technological change might not necessarily indicate a significant cultural change (e.g. Gardner 1974). The variety of tools, they argue, implies a technological rather than economic shift.

Middle Archaic (8,000 B.P. to 5,000 B.P.)

Although this sub period is somewhat longer than the Early Archaic and spans an important period of climatic and environmental change, archaeological investigations indicate that cultural adaptations did not differ markedly from the preceding period. More sites dating to the Middle Archaic have been identified than in the preceding period, although many are not thoroughly documented.

One of the most significant changes occurring sometime after 8,000 B.P. is the development of regional projectile point styles. In addition, a variety of ground stone tools were made for the first time, indicating a greater investment of time and energy in the manufacture of tools for the exploitation of plants. Such investments may be associated with an overall decrease in mobility, or a change in the rate of movement, or the distance between camps. Earlier Archaic hunters probably manufactured only a small portion of their tool assemblage from stone. Middle Archaic hunters created a greater variety of tools, although most were geared to the exploitation of plants.

Although some Middle Archaic sites are as ephemeral as those of the Early Archaic, others contain deep midden deposits with large and diverse assemblages. The presence of burials at some of these sites might be an indication of long term or repeated use of these site localities. Brown and Vierra (1983) have addressed these issues for sites in Illinois.

An important innovation in the Middle archaic was the use of shellfish in the diet. The Hudson River at this time was a rich estuary and the salinity was such that it could support large numbers of shellfish. The Dogan Point site is the earliest evidence for use of shellfish in the Middle Archaic dating between the Middle and Late Archaic periods (6,900 to 4,400 years B.P.). This site is one of the few identified in the New York dating to this time period. It is possible that many of the sites were flooded with the rise of sea levels to their modern position, or just as likely these important sites were destroyed during the development of the city itself. (Ritchie and Funk, 1973 and Ritchie, 1980).

Although the Middle Archaic differs in its stone tool assemblage, little information is available to determine if major differences exist in the life ways of Early and Middle Archaic Native Americans.

Late Archaic (5,000 B.P. to 3,700 B.P.)

Unlike the preceding sub-periods, the Late Archaic is a better-known period of Eastern Woodlands prehistory. In part this is a reflection of the greater preservation of artifacts and features and a larger number of sites, with more substantial deposits. The sites are diverse in their setting, artifact assemblages and probable function. Late Archaic societies continued on the same cultural trajectories identified in the Middle Archaic: greater regionalization, an increase in overall population and population densities in the river valleys. Other changes, however, represent innovations in technology, subsistence activities and social organization. Studies of projectile points document an increase in regional forms, perhaps representing stylistic innovations associated with stronger inter-societal boundaries.

Various authors (e.g., Jefferies 1990) have suggested that Late Archaic settlements were larger and occupied for longer periods of time than Middle Archaic settlements. The implication of such changes is that the subsistence regime may also have been significantly different.

The use of cultivars and 'encouraged' vascular plants is documented for many sites occupied during this period (e.g. Chomko and Crawford 1978; Watson 1985) although a variety of nuts formed an important component of the diet. The exploitation of such plants, which can be stored for later consumption, probably reduced the need to exploit geographically extensive resource territories and resulted in the more intensive utilization of smaller areas. One consequence of such a change in subsistence strategy is the creation of archaeologically visible sites, many with a greater degree of alteration (i.e., pit features, hearths, house floors) and built up of thicker midden deposits. Such sites are more likely to be occupied over greater periods of time and to be revisited over many years. Localization of cultural behaviors also frequently resulted in a greater incidence of interment in a confined locality. More people died and were buried at a specific location: Late Archaic burial populations are much better known and frequently larger, than Middle or Early Archaic burial populations for this reason. Human skeletal remains from this period form one of the most important sources of information on how Native American populations lived and died.

The excavation or surface collection of an archaeological assemblage provides information on raw material use, tool production and use and subsistence activities. The collection of additional information on the spatial relationships among artifacts and cultural features has enormously increased our understanding of the internal organization of archaic communities, their use of space and the identification of specific activity loci within the community (e.g. Whallon 1974). For these reasons, the investigation of surface and subsurface cultural remains, even in plowed fields, offer opportunities to collect information relevant to a number of research issues.

By the Late Archaic, coastal and shoreline areas provided shellfish, small game, fish, salt hay and tuberous grasses, making larger more permanent settlements possible. Semi-nomadic life is still

indicated, but wandering occurred within well-defined territorial limits, with seasonal movements between camps near exploitable resources. A dietary shift to shellfish in coastal New York near the end of the Archaic suggests a scarcity of large game and a change from the early Archaic inland adaptation of forest hunting. Coastal sites show a principal reliance upon shellfish, especially oysters, hard- and soft-shell clams and bay scallops, which were readily available in the waters of the East River and Long Island Sound. In contrast to conditions during the Paleo-Indian, Early and Middle Archaic, "by Late Archaic times sea level was so close to present levels that its subsequent small rise has failed to obliterate much of what remains on Long Island from that period" (Gwynne 1982).

Around 3,700 years B.P., the landscape was very similar to modern times. At this point a culture known as the Orient emerged in the New York area. This group is known for their complex funerary rituals and use of steatite (soapstone) bowls. The Throg's Neck Site is the best-known site in Long Island for this time period. Two hilltop cemeteries face the water and several habitation sites surround these cemeteries. The burials represent in-the-flesh burials, fleshed cremations and cremations of defleshed bone. The burials included several grave goods including broken steatite containers, fire-making kits, 'cosmetic' stones (used for their pigments), red ochre, woodworking kits, spear points and knives. This period appears to mark the beginning of distinct cemeteries and could be a sign of intense social changes, likely due to the drastic environmental change which occurred during the Late Archaic. (Ritchie and Funk, 1973 and Ritchie, 1980).

Transitional Period (3,700 B.P. to 3,000 B.P.)

Soapstone vessels is one of the characteristics distinguishes the Transitional period (ca 3,700-3,000 B.P.) from the Late Archaic. Even though relatively small mobile bands continued seasonal migration patterns and exploited local resources, some of the raw materials of the stone vessels and projectile points were sourced as far south as Virginia (Hohman 2004a; Versaggi and Knapp 2000). Broad-bladed and fishtailed points replacing the narrow-stemmed or side-notched projectile points is the second characteristics that distinguished the Transitional period. Transitional base camps are generally located near river or coastal areas with small special-purpose camps and processing locations located inland and upland (Ritchie and Funk 1973).

Woodland Period (3,000 B.P. to 400 B.P.)

The Woodland period, like the preceding Archaic is divided into three sub periods, although a greater number of cultural phases and spatially discrete societies are recognized. The major distinctions between the Woodland and Archaic periods are the development of ceramic technology and the use of ceramic vessels as part of everyday life. Coinciding with this is the development of complex, hierarchical societies in many parts of the Eastern Woodlands. Such societies appear to have developed after the adoption of a small number of native plants as cultivars. A reliance on these crops and the development of storage techniques enabled Native American populations to inhabit more restricted territories than hunters and gatherers.

The evolution of Woodland society from relatively noncomplex foragers to hierarchically organized chiefdoms is one of the major research foci of North American archaeology. Only a brief overview of the major characteristics of these three sub-periods is presented here.

Early and Middle Woodland (3,000 B.P. to 1,500 B.P.)

The Woodland period is marked in the Ohio and Mississippi valleys by extensive societies who built large earthworks, sedentary cities and extensive roadways, over which vast trade networks formed. During this period the people occupying present-day New York were no different than the people located elsewhere in the country and the trend appears to be away from the small, highly mobile camps toward more sedentary camps. Though some researchers have dismissed the tidewater communities in New York as marginal due to the absence of complex societies and hierarchical organization, many still argue that the area was nonetheless culturally rich and incredibly significant (Ritchie and Funk, 1973 and Ritchie, 1980).

Most notably, these early and middle Woodland periods are marked by the adoption of ceramic making technology by Native Americans and the use of cultivars as a major component of the diet (Cowan 1985; Watson 1985). They are considered here as a unit because the chronological division between them is the subject of debate and because activities such as mound building are associated with both periods.

Though agriculture had an effect on the life ways and settlement patterns of Woodland societies in Pennsylvania, New Jersey and New York, cultural change was not very dramatic as for example in the Ohio River Valley (e.g. the Hopewell tradition). The tidewater area of New York is often seen as being the most culturally marginal environment of all. However, the presence of goods which are not native to the region indicates that these people were either traveling or trading with peoples around Trenton and Southeastern Pennsylvania (Ritchie and Funk, 1973 and Ritchie, 1980).

Sites of this time period tend to be relatively small and to have been occupied by a small group of people for a relatively short period of time. One of the major distinctions between Early Woodland society and Late Archaic society is a change in the social organization from a less complex to a more complex social system. Evidence for such changes can be documented by analysis of the mortuary program. Small numbers of individuals were buried in large well-built log tombs within burial mounds, while others were buried in adjacent areas or in caves. Artifacts found with these individuals are interpreted as evidence of differences in social status within society.

Although the primary habitation sites tend to be small homesteads which are removed from neighboring sites, occasionally archaeologists have documented large special purpose sites. These sites range from specialized settlements to sacred enclosures. Recent investigation of caves and rock shelters has documented intense utilization of these localities during this period.

Trends towards greater sedentism and subsistence specialization begun during the Terminal Archaic continued and were accompanied by experimentation with cultigens. The earliest ceramics are named the Mercey Creek and Ware Plain types and consist of flat-bottomed, straight-sided vessels with lugs or handles. The Vinette I type with characteristic conical bases, coarse grit tempered paste and cord marks in the interior and exterior walls have followed these two types (Kraft 1975; Williams and Thomas 1982). Meadowood projectile points are typical of this time period.

During the Middle Woodland period (ca. 2000 to 1300 B.P.) decorated pottery replaced coarse tempered vessels. The usual decorative motifs include net impressions and the unusual zoned geometrical patterns from the Abbott Farm. Among projectile points Rossville, Fox Creek and Jack's Reef Pentagonal dominate the assemblage. Other tools include pestles, hammer stones, anvil stones, net sinkers, etc. (Ritchie and Funk, 1973 and Ritchie, 1980).

Late Woodland (1,500 B.P. to 400 B.P.)

The activities that mark the Early and Middle Woodland period such as the extensive trade and construction of large burial mounds are not apparent during the Late Woodland. Habitations tend to be larger and agglomerated into circular villages in contrast with the preceding periods. Ceramics associated with these occupations tend to lack decoration and appear to be utilitarian in function rather than associated with any particular ritual. Information on plant and animal food resources is available from numerous sites and indicates a reliance on cultivated foods, although hunted and gathered resources comprised an important component of the diet.

The largest sites are usually located on major rivers and probably represent permanently occupied base camps. Smaller sites are abundant along tributaries and near natural springs. These sites probably functioned as temporary or seasonal camps. An economic system based on horticulture was well established during this time period, although foraging and fishing persisted as the major subsistence activities. Hickory nuts, acorns, butternuts and blueberries remained important wild foodstuffs and the gathering of freshwater foods like mussels found on sites along the Upper Delaware (Kinsey at al. 1972; Kraft and Mournier 1982b) contributed significantly to the daily diet.

Southern New York does not appear to have been caught in the agricultural revolution that swept much of the rest of the country. While no one knows exactly why this is so, there is no lack of speculation as to the reasoning. It could have been that the environment in which these people were living was so rich that large settlements and agriculture were not necessary (Ritchie and Funk, 1973 and Ritchie, 1980).

The local Native American group that inhabited the project area was considered to be the Manhattas, whose name inspired the Europeans in naming Manhattan Island (Armbruster 1918). The Manhattas were a part of the Algonquian speaking Lenape (Delaware) tribe (Bolton 1922). The archaeological record shows that early Native American inhabitants of the area exploited the

coastal resources of the area. Many of the Native American remains or sites found within the City of New York were shell middens (Kraft 1986).

Available evidence suggests that subsistence and occupation among Native American groups in the area was seasonal and that they practiced a hunting and gathering economy that utilized the abundance of water resources in the area (Ceci 1977, 1982). During the summer months when resources were more abundant, groups would merge into large camps that would then split during the other seasons when resources were more scare to occupy smaller hunting, fishing, or plant procurement locations. Agriculture became predominant during the Late Woodland period (1,000 A.D. – European Contact) (Ceci 1979-1980). By the time of European settlement in the early seventeenth century, Native Americans kept fields in which they grew corn, beans and squash, along with some other domesticated plants (Truex 1982).

At the time of European contact, it is estimated that as many as fifteen thousand Native Americans inhabited the New York City area (Burrows and Wallace 1999). Fairly soon after the arrival of the Europeans a majority of the Native American population was decimated by a combination of war and disease (Burrows and Wallace 1999; Ritchie 1958; Levin 1980).

### 4.4 Staten Island (Richmond County) History

Created in 1683, Staten Island (Richmond County) is one of the original 10 counties of New York Colony. The county was named after the Duke of Richmond, brother of James, Duke of York, the colony's proprietor (Moss 2005). Richmond County has been coterminous with Staten Island, a triangular island on the west side of New York Bay, roughly 14 miles north to south, and 7 miles east to west (Moss 2005). The island contains the southernmost point in New York State. In 1898, the four town and five village governments had been disbanded to form the Borough of New York City and the smallest in population. In 1975, it was renamed the Borough of Staten Island (Moss 2005).

In 1630, the Dutch West India Company granted Michael Pauw a patent on Staten Island, however he never took possession of it. Captain David Pietersz de Vries established the first settlement in January 1639, at the Watering Place (now Tompkinsville), maned after the spring where outbound ships took on fresh water. The settlement was wiped out in 1641 when settlers accused the Indians of stealing their pigs and the dispute became escalated. Cornelius Melyn established a new settlement in 1642 but abandoned it a year later amid renewed warfare (Moss 2005). Indians destroyed a third settlement during the Peach War of 1655. In 1661, the Dutch established a permanent settlement at Oude Dorp (now South Beach). In 1670 the Indians finally sold the island to the English, marking the transaction by handing over soil and twigs from every type of tree growing on Staten Island except, according to legend, the ash and hickory trees. They retained rights to those trees for basketry (Moss 2005).

In 1698 the population of Staten Island numbered 727 which included about 70 slaves. By 1776 the number approximated 3,000, 10% being slaves. Slavery was typical of the province, with human property engaged in farming and domestic tasks but not in large scale plantation

agriculture (Moss 2005). Benjamin Perine was born into slavery in December 1796. He died there in October 1900 and was the Island's last living connection to slavery. By 1890, Staten Island's population had reached 51,693, only 2% were black. In the mid-19th century, the island was attracting immigrants. Most were German, Irish and English. By the 1880's the number of immigrants including Italians began a steady increase with growing industrialization (Moss 2005).

The earliest regular ferry across the narrows to Long Island began in 1713; regular ferry service between the north *shore* and Manhattan also began in the early 18th century. Cornelius Vanderbilt, born on the island in 1794, began ferrying passengers to New York City while he was still in his teens (Moss 2005). In 1886 the ferry began running from St. George to Whitehall Street in Manhattan. The city took over the operation of Staten Island ferries in 1905. The Staten Island Ferry between St. George and Whitehall Street has been free since 1997 (Moss 2005).

In 1816 Governor Daniel D. Tompkins, organized the Richmond Turnpike Company to shorten travel between New York and Philadelphia; the road is now Victory Boulevard. The company also bought the steam ferry Nautilus, operating between Tompkinsville and Whitehall Street beginning 1817 (Moss 2005). In 1860 Staten Island Rapid Transit (SIRT) began running from Vanderbilt's Landing known as Clifton to Tottenville; in 1883 was linked to with the Baltimore and Ohio Railroad, known as B&O, which inaugurated freight and passenger connections to New Jersey over the Arthur Kill in 1889.

Most residents engaged in agriculture or fishing, particularly oystering. In 1900, 290 farms, covering 11,724 acres were some of the many farms raised produced or the New York City market. By 1900 the water around Staten Island yielded about 200,000 bushels per year, however the city closed the Arthur Kill shellfish grounds in 1917 due to pollution (Moss 2005).

Until the mid-19th Staten Island was predominantly Protestant. There were also Dutch Reformed and Episcopal congregations. Beyond those, there were also Presbyterian, Moravian, Baptist, Methodist, and Unitarian churches. The first Catholic parish was founded in 1839 and the first Lutheran congregation was founded in 1852 (Moss 2005). By 1900 there were 10 Catholic churches, and 25 more opened by the late 1920s. The first Jewish body was organized at Tompkinsville in 1888 (Moss 2005).

Staten Island remains an Italian American flavor, but demographics change as new immigrants discover the place. The people of Staten Island have made efforts to preserve historic neighborhoods, old homes and any open space. The Preservation League of Staten Island and the Friends of Pine Oak Woods are gaining ground in the race with developers, though landmark designations and rezoning come too late to preserve what is left of old Staten Island (Moss 2005).

## 4.6 Land Use History of the APE

A review of historic maps, atlases and aerial photographs facilitated the compilation of a land use history for the Project Site. AHRS reviewed historical maps, atlases and Sanborn maps depicting the site and surroundings from 1872, 1887, 1900, 1917 and 1938 (Figures 4 through 8), aerial photographs from 1951, 1972, 1996, 2016 and 2019 (Figures 9 through 13 and 2).

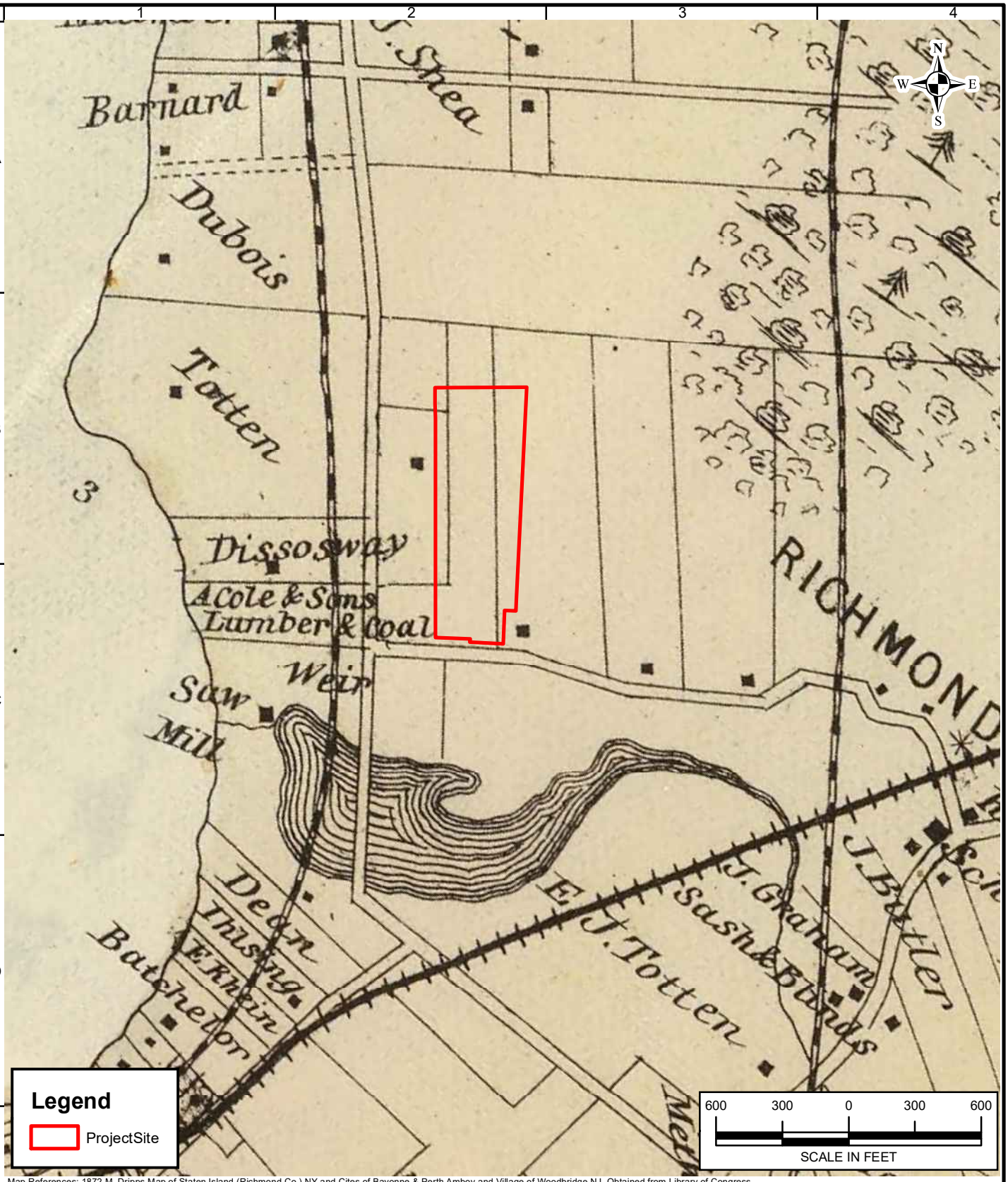
The *1872 M. Dripps Map of Staten Island (Richmond Co.) NY and Cites of Bayonne & Perth Amboy and Village of Woodbridge NJ* (Figure 4) depicts the Project Site as open land. The Project Site is comprised of portions of 4 depicted lots. There are two unlabeled buildings depicted on the map adjacent to the Project Site, one to the west and one to the southeast. Roads are depicted adjacent to the west of the Project Site. There is a wooded area depicted approximately 500 feet east of the Project Site. Low density housing surrounds the Project Site in all directions. A railroad is depicted to the south. The Arthur Kill is located approximately 1,000 ft to the west of the Project Site. A waterway with a mill pond for a saw mill is depicted south of the Project Site flowing west towards the Arthur Kill.

The *1887 JB Beers Atlas of Staten Island, Section C Southern SI.* (Figure 5) depicts the Project Site similar to the 1872 map. The Project Site is now comprised of a single lot labeled "A. Cole 25A " most likely indicating 25 acres in size. No buildings are depicted in the Project Site. Richmond Valley Road is depicted in its same orientation along the southern boundary of the Project Site. Additional buildings and homes are present around the Project Site and development is increasing in the area. The waterway to the south is now named Mill Pond and industrial development has increased around the shores of the pond and the Arthur kill. The Staten Island Railroad is still present south of the Project Site.

The 1900 USGS Topographic Map (Figure 6) depicts the general topography and development of the Project Site. The Project Site is depicted as open land which slopes down from the north to south. There are numerous buildings around the Project Site but no buildings are depicted on the Project Site. The waterway to the south, labeled Mill Creek, is better delineated with a wetland surrounding it. The roads and railways are still depicted in their previous orientations.

The 1917 Sanborn Fire Insurance Map from Staten Island Borough of Richmond, Richmond County, New York (Figure 7) depicts the Project Site as open land. The Project Site is surrounded to the west and south by properties with dwellings and other buildings constructed on them. Richmond Valley Road is depicted adjacent to the south and Arthur Kill Road is depicted approximately 200 ft to the west.

The 1938 Sanborn Fire Insurance Map from Staten Island Borough of Richmond, Richmond County, New York (Figure 8) depicts the Project Site similar to the 1917 map. No buildings or structures are depicted on the Project Site, however, the map has subdivided the Project Site into numerous planned lots and roads for residential housing. These streets are named "Plaza Ave" "Botany Place" "Julie Place" "Sewel Ave" and "Jalmore Place". These streets are all labeled as "Unopened". The surrounding area is depicted identical to the 1917 map.




Map References: 1872 M. Dripps Map of Staten Island (Richmond Co.) NY and Cites of Bayonne & Perth Amboy and Village of Woodbridge NJ. Obtained from Library of Congress.

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Drawing Title
**1872 M. DRIPPS MAP OF RICHMOND CTY NEW YORK**

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| Drawn By | MAA |

Figure
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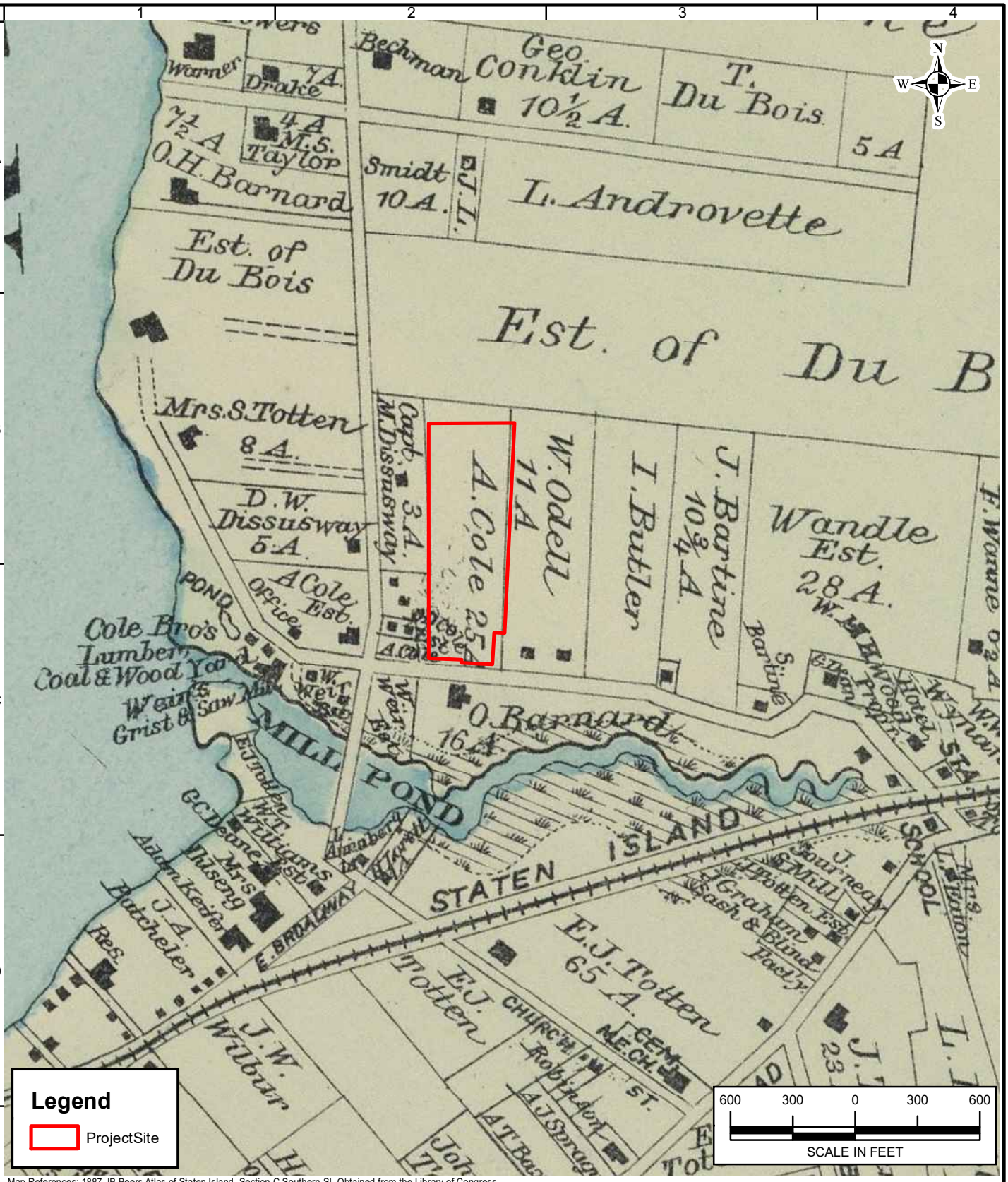


Map References: 1887 JB Beers Atlas of Staten Island, Section C Southern SI. Obtained from the Library of Congress.


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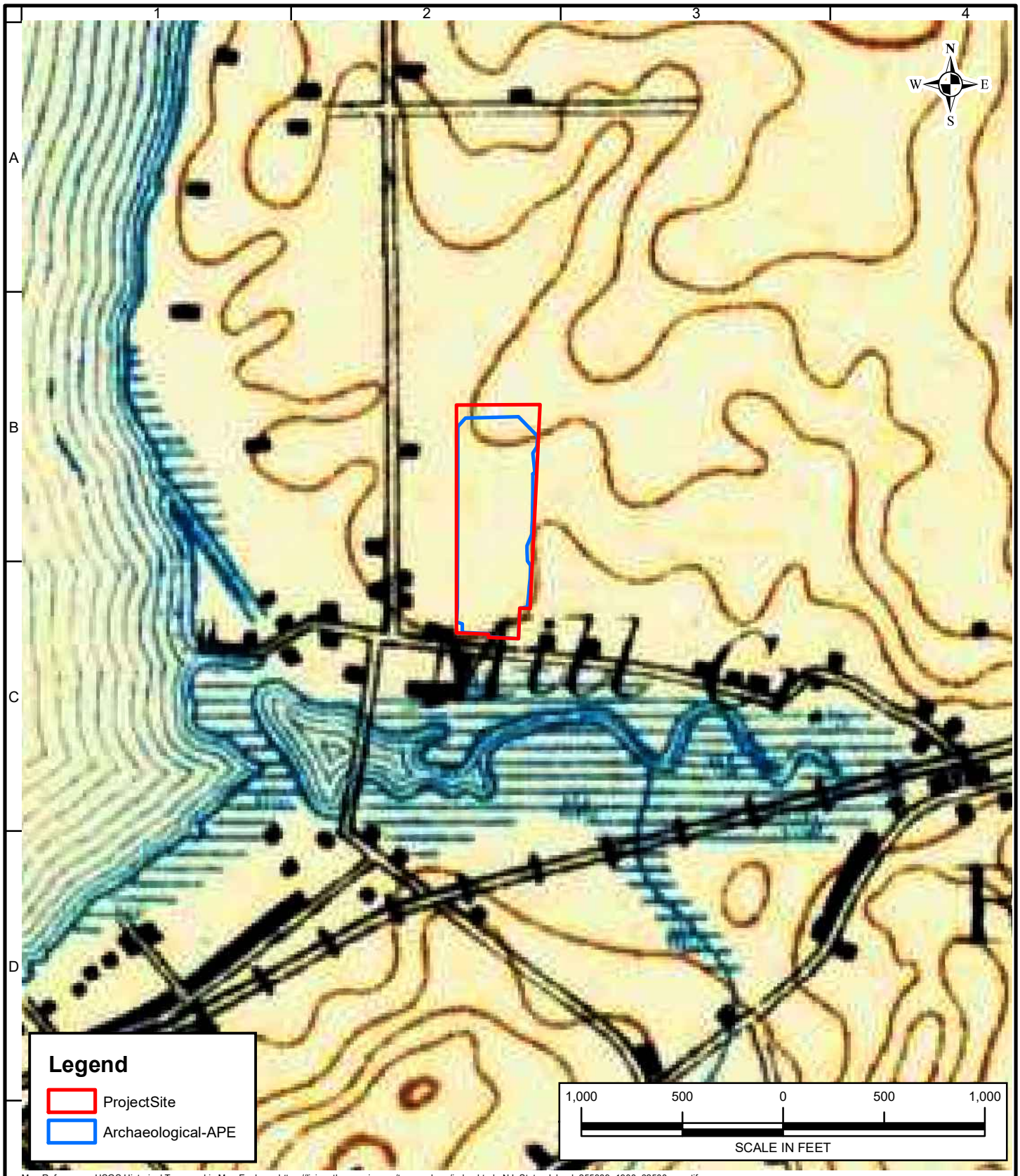
| Scale | See Above |
| Drawn By | MAA |
| Figure | 5 |




Map References: USGS Historical Topographic Map Explorer, https://livingatlas.arcgis.com/topoexplorer/index.html, NJ_Staten Island_255389_1900_62500_geo.tif

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**1900 USGS TOPOGRAPHIC MAP**

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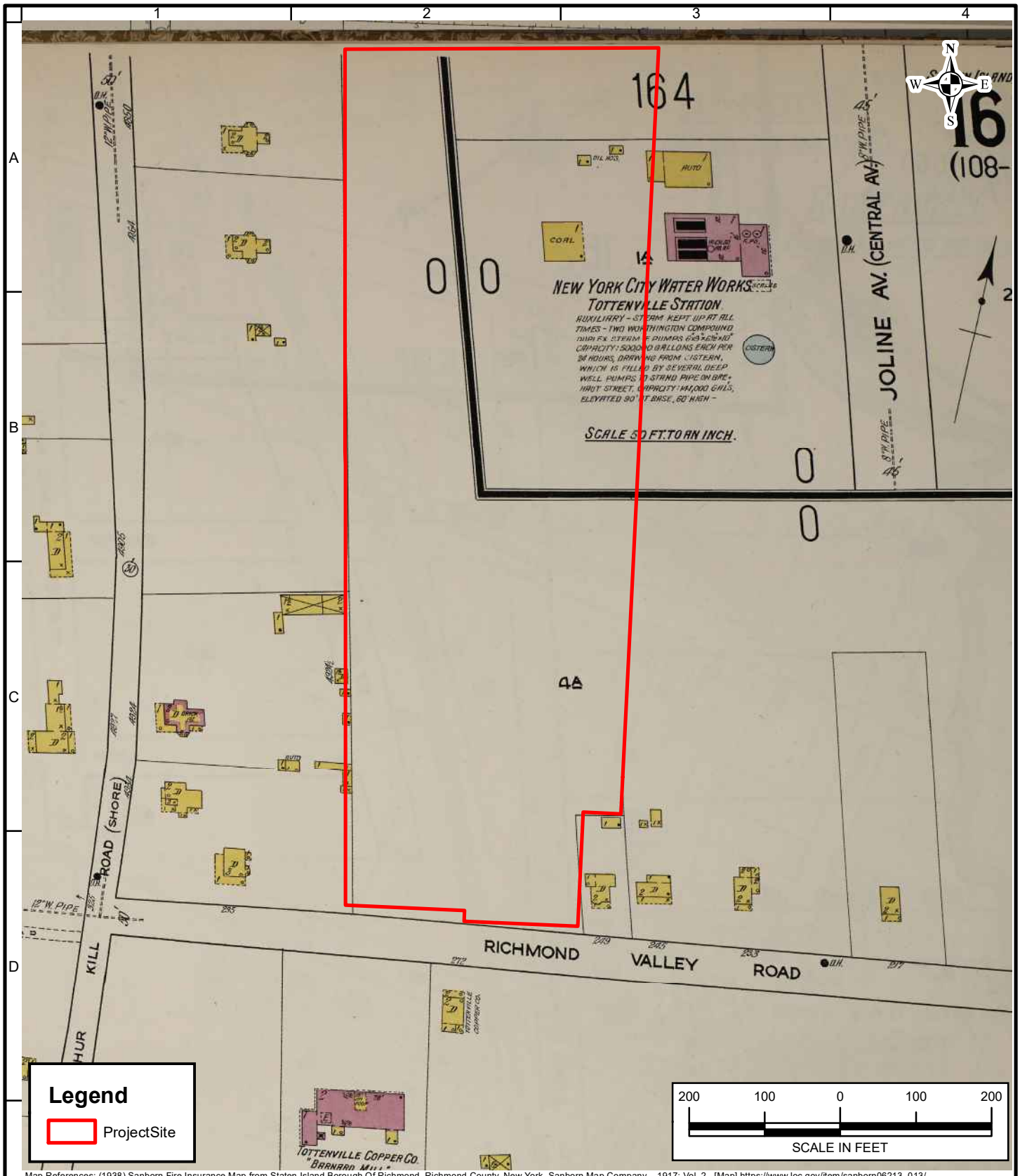
| Figure | 6 |




Map References: (1938) Sanborn Fire Insurance Map from Staten Island Borough Of Richmond, Richmond County, New York. Sanborn Map Company, - 1917: Vol. 2,. [Map] https://www.loc.gov/item/sanborn06213_013/.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**1917 SANBORN MAP**

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| Figure | 7 |


Map References: (1938) Sanborn Fire Insurance Map from Staten Island Borough Of Richmond, Richmond County, New York. Sanborn Map Company, - Apr 1938: Vol. 4,. [Map] https://www.loc.gov/item/sanborn06213_013/.

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**1938 SANBORN MAP**

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| Figure | 8 |

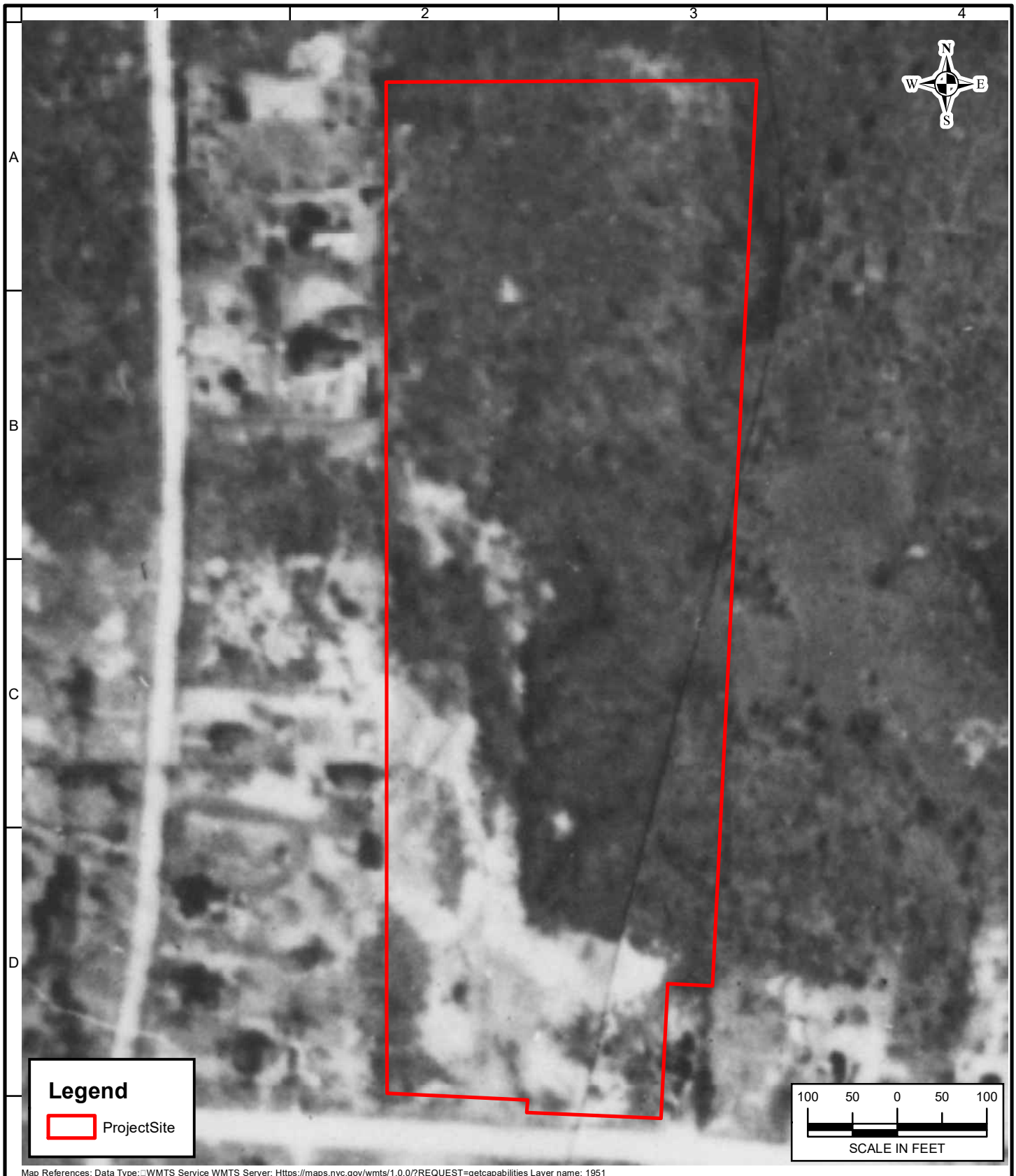
The 1951 Aerial Photograph (Figure 9) depicts the Project Site as mostly an undeveloped property. The northeastern half of the Project Site is wooded while the southwestern half is cleared. The western border of the Project Site abuts a number of mixed-use properties but no buildings are within the Project Site. Richmond Valley Road is depicted adjacent to the south and Arthur Kill Road is depicted approximately 200 ft to the west.

The 1972 Aerial Photograph (Figures 10) depicts the Project Site similar to the 1951 aerial photograph. The division between the wooded area and the clear area of the Project Site are roughly the same as seen in the 1951 photograph, with the northeast being wooded and the southwest being clear. The surrounding buildings are unchanged. Richmond Valley Road is depicted adjacent to the south and Arthur Kill Road is depicted approximately 200 ft to the west.

The 1996 Aerial Photograph (Figure 11) depicts the Project Site similar to the 1972 aerial photograph. The majority of the Project Site has now been allowed to regrow into an undeveloped wooded area. Industrial developments have been built adjacent to the northeast, southeast and southwest. These developments are now utilizing the Project Site for informal dumping/storage and parking activities. Dirt roads enter the Project Site from the east and scrap and waste are visible through the trees. The two southern industrial developments are using the southeastern corner of the Project Site as a parking lot for trailers and vehicles. The surrounding area has become dominated by industrial developments as residential housing has been demolished. Richmond Valley Road is depicted adjacent to the south and Arthur Kill Road is depicted approximately 200 ft to the west.

The 2006 Aerial Photograph (Figure 12) depicts the Project Site similar to the 1996 aerial photograph. The parking lot in the southern portion of the Project Site is now paved and connect the lot with the industrial development to the east of the Project Site in the south. The remainder of the Project Site is still wooded. The industrial developments to the west of the Project Site have increased in size and frequency. Richmond Valley Road is depicted adjacent to the south and Arthur Kill Road is depicted approximately 200 ft to the west.

The 2016 Aerial Photograph (Figure 13) depicts the Project Site similar to the 2006 aerial photograph and depicts the site in its current state. The paved parking lot in the south of the Project Site has been expanded and additional vehicles are being stored and parked around the paved lot. Vehicles from both the southwestern and southeastern industrial lots are being stored in these lots. The remainder of the Project Site is still wooded and has continues to reforest. The industrial developments to the west of the Project Site have expanded in frequency. Richmond Valley Road is depicted adjacent to the south and Arthur Kill Road is depicted approximately 200 ft to the west. The 2019 Aerial Photograph (Figure 2) is identical to the 2016 aerial photograph for the landuse.




Map References: Data Type:□WMTS Service WMTS Server: Https://maps.nyc.gov/wmts/1.0.0/?REQUEST=getcapabilities Layer name: 1951

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**1951 AERIAL PHOTOGRAPH**

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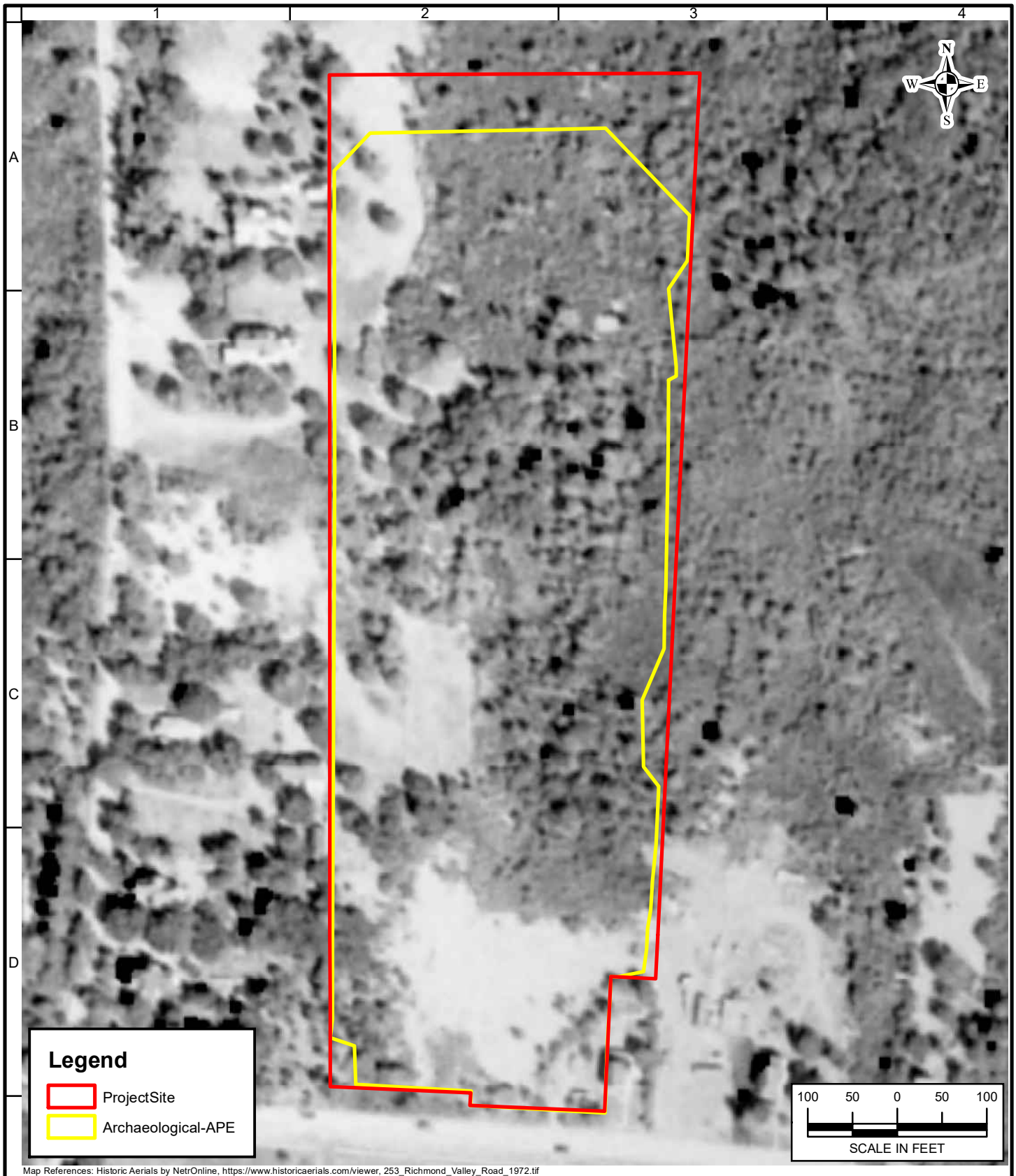
| Figure | 9 |




Map References: Historic Aerials by NetrOnline, https://www.historicaerials.com/viewer, 253_Richmond_Valley_Road_1972.tif

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**1972 AERIAL PHOTOGRAPH**

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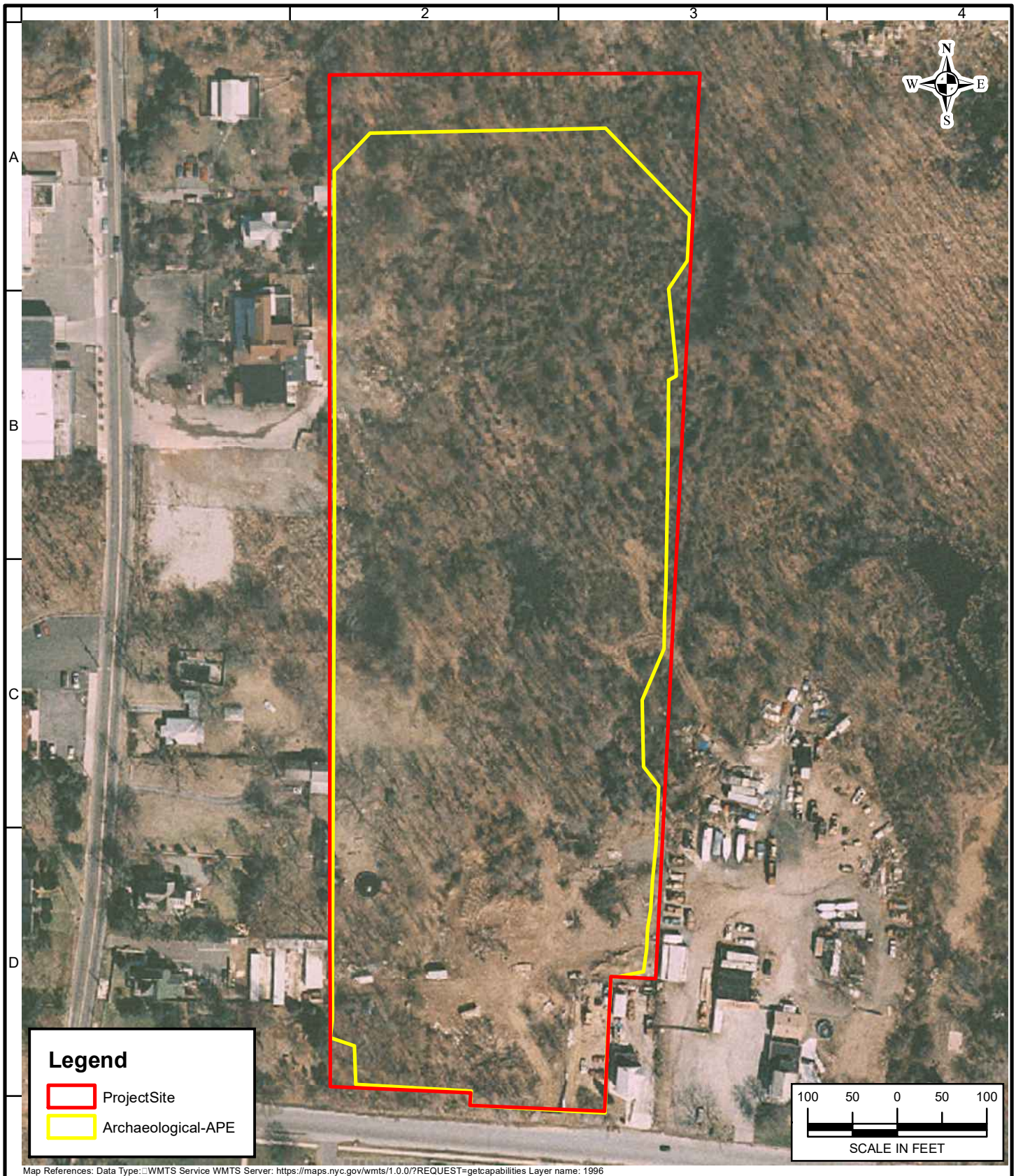


Map References: Data Type: WMTS Service WMTS Server: https://maps.nyc.gov/wmts/1.0.0/?REQUEST=getcapabilities Layer name: 1996

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**1996 AERIAL PHOTOGRAPH**

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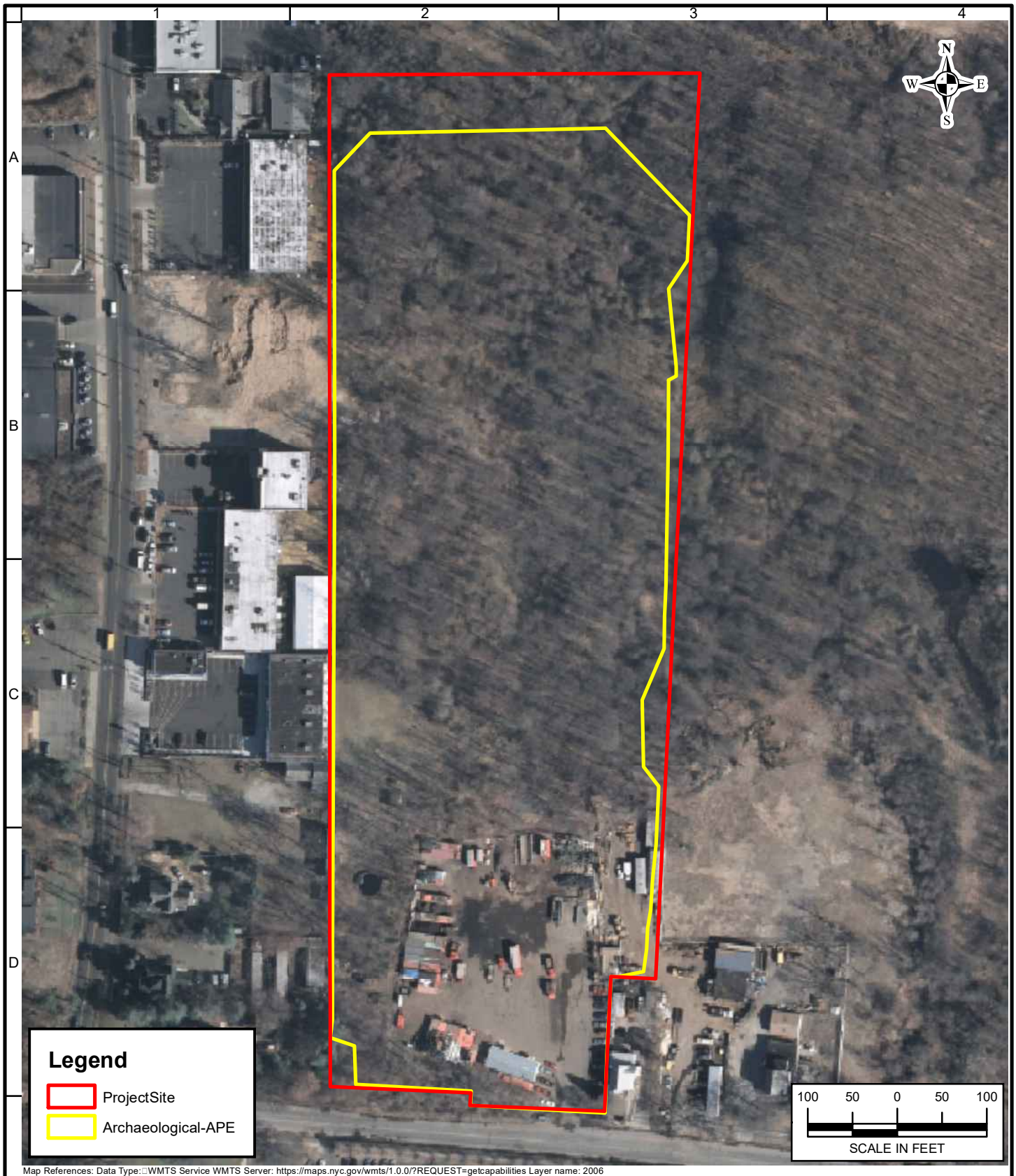


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**2006 AERIAL PHOTOGRAPH**

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| Figure | 12 |


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**2016 AERIAL PHOTOGRAPH**

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| Figure | 13 |

## 4.7 Geotechnical Report

A geotechnical study of the Project site was conducted by Whitestone Associates Engineering & Geology NY, PLLC (2022). The subsurface exploration included drilling 41 soil test borings, excavating 10 soil profile pits and six test pits, conducting 10 in-situ infiltration tests, and collecting soil samples for laboratory analysis.

The borings and excavations encountered top soils ranging from 6 inches to 36 inches in depth in the wooded areas of the Project Site. These top soils are loose course loamy material. In the paved area of the Project Site, 6 inches of asphalt was above 6 to 19 inches of fill. In the southeast corner of the Project Site around the paved area, additional fill was identified in Boring B-8 and Soil Profile Pit 5. This fill is comprised of a mix of sand, silt, clay, and gravel and is 24 to 48 inches in depth. Glacial subsoils were identified underneath the top soils and fills across the entire Project Site. These natural glacial deposits were investigated to a maximum depth of 27 feet below ground surface.

## 5.0 ARCHAEOLOGICAL SURVEY

This section discusses the research design, methodology, site visit and archaeological sensitivity of the archaeological-APE.

### 5.1 Research Design and Methodology

The research design for the Phase IA Archaeological survey included background research and a site visit. The background research was conducted before the site visit to determine the presence of any known cultural resources and to assess the potential for the archaeological-APE to contain undocumented cultural resources. All information was analyzed to determine whether archaeological testing would be necessary within the archaeological-APE.

### 5.2 Site Visit

The site visit was conducted by Nicholas Zeitlin on November 2, 2022. Photographs 1 through 4 depict the current conditions of the archaeological-APE. The southern portion of the archaeological-APE is a paved parking lot. The lot is in disrepair and overgrown. The northern portion of the archaeological-APE is wooded with dirt tracks running throughout the area creating surface disturbances. A photo location map is provided with all photograph locations depicted (Figure 14). This site visit combined with the background research was used to determine if archaeological testing would be recommended within the archaeological-APE.

**Photograph 1 –** View of parking area along Richmond Valley Road, facing north.

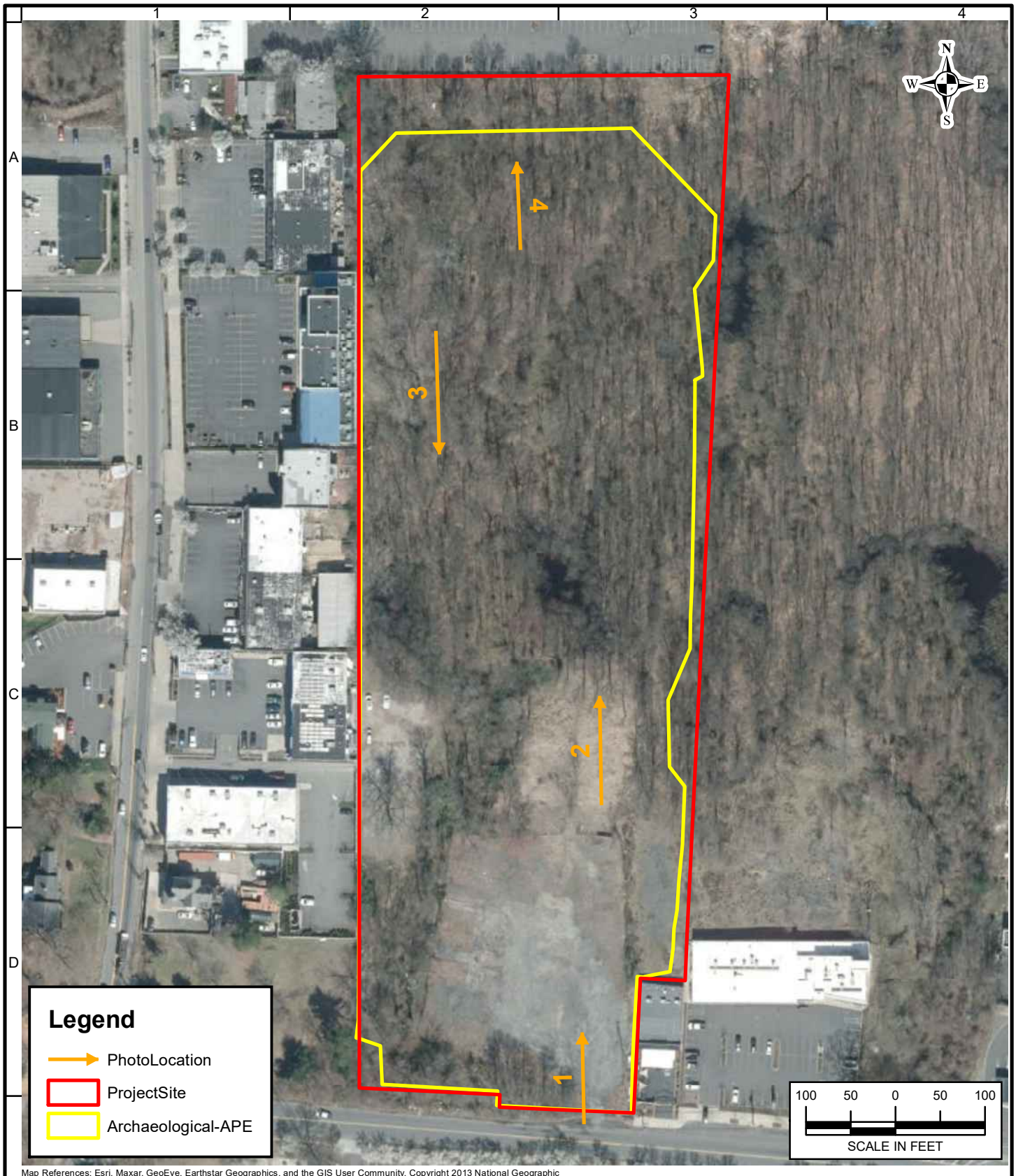
**Photograph 2 –** View of central area of the archaeological-APE facing north.

**Photograph 3 –** View of central area of archaeological-APE, facing south.

**Photograph 4 –** View of northern area of archaeological-APE, facing north.

### 5.3 Buildings over 50 Years Adjacent to the Archaeological-APE

There are no buildings over 50 years of age adjacent to the archaeological-APE




Map References: Esri, Maxar, GeoEye, Earthstar Geographics, and the GIS User Community, Copyright 2013 National Geographic

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## 5.4 Assessment of Archaeological Resource Sensitivity

The assessment of archaeological resource sensitivity is based on:

- The potential for archaeological sites to exist in a given area; and
- The sensitivity of that area to contain intact cultural resources.

In areas where no sites have been documented the potential presence of precontact resources is based primarily on environmental setting such as topography, proximity to water, other resources and soil quality. The potential for historic resources is usually determined through the analysis of historic sources especially cartographic materials. The presence of roads, canals or railroads documented on historic maps usually increases the potential for historic sites.

The archaeological potential for the archaeological-APE relies on a combination of the known archaeological sites and previous archaeological surveys in the vicinity, the comparison of historic maps and aerial photographs, previous ground disturbance, topographic conditions and observations made during the site visit.

Online research of the New York State CRIS and the NYC LPC's cultural resource management reports identified two known precontact, eight known historic and three known multi component archaeological sites within a half-mile radius of the Project Site. In addition, there are a total of eight archaeological surveys that have been conducted within a quarter-mile of the Project Site. Furthermore, according to the CRIS, the entire Project Site is located in an archaeologically sensitive area.

Prehistoric Archaeological Sensitivity

The prehistoric archaeological sensitivity of an archaeological-APE is generally evaluated based on the presence of level or elevated areas with proximity to watercourses and other resources, the presence of well-drained soils, lack of previous ground disturbance and proximity to previously identified prehistoric archaeological sites. The archaeological-APE is relatively flat and was historically surrounded by open lands and woods which would have provided indigenous peoples with resources. The Mill Creek located to the south of the archaeological-APE. In addition, the Arthur Kill is located to the west of the archaeological-APE. Both would have provided various resources and the Arthur Kill would have been a major avenue of trade.

The area was most likely forested until cleared for farming and industry in the 19$^{th}$ century. However, the soils in the southern portion of the archaeological-APE are now urban fills that have been modified in the recent past for the paved parking area as identified by the fill layers in the geotechnical investigation. The archaeological-APE has been utilized for residential and farming property since the mid-19$^{th}$ century and a commercial parking property since the mid-20$^{th}$ century. Additionally, the archaeological-APE has been surrounded by commercial and infrastructure development in the mid-20$^{th}$ century which has further modified the landscape.

A record search confirmed that substantial archaeological work has been conducted within a mile radius of the archaeological-APE with eleven prehistoric archaeological sites having been recorded in this radius. The presence of known prehistoric archaeological sites in the vicinity of the archaeological-APE is most likely based on the proximity to Mill Creek which would have provided numerous resources and an avenue of transportation to indigenous peoples.

The topography, well drained soils, distance from water, other identified resources in the area and number of previously identified precontact archaeological sites within a one-mile radius the archaeological-APE would have been able to support at least seasonal settlement and temporary encampments. Therefore, we conclude that there is a high sensitivity for precontact archaeological materials and features within the undisturbed northern portion of the archaeological-APE and a low sensitivity for precontact archaeological materials and features within the southern portion of the archaeological-APE that contained the parking lot.

Historic Archaeological Sensitivity

Overall sensitivity to historic sites is a measure of the potential for intact cultural resources to be present within the archaeological-APE. The potential presence of historic archaeological resources within an APE must also be weighed against ground-disturbing activities that might destroy the site's contextual integrity. As with prehistoric archaeological resources, a site's historic cultural resource sensitivity is derived by ascertaining the probable location of a potentially significant historic sites and comparing that location with documented ground disturbances.

Online research of the NYS CRIS and the NYC LPC's cultural resource management reports revealed that there are eight historic and three multi component archaeological sites within a one quarter mile radius of the archaeological-APE. Historic maps and atlases revealed that the area surrounding the archaeological-APE has been occupied since the mid-19th century. However, no buildings have been built within the archaeological-APE as revealed by the historic map review. Based on the available information, as documented above, we conclude that there is a low to no sensitivity for historic archaeological materials within the archaeological-APE.

## 7.0 CONCLUSIONS AND RECOMMENDATIONS

Archaeology & Historic Resource Services, LLC (AHRS) was retained by Langan Engineering, Environmental, Surveying, Landscape Architecture, and Geology, DPC to perform a Phase IA Archaeological Survey to assist with a NYC LPC review for the CEQR correspondence letter dated 8/15/2022. The proposed development is a 181,888 sq. ft. one-story warehouse/distribution facility with accessory loading and parking area. The proposed warehouse would be constructed as slab-on-grade and the depth of excavation is anticipated to be 10 feet to contrast underground utilities.

An online search of the New York State CRIS identified two known precontact, eight known historic and three known multi component archaeological sites within a half-mile radius of the Project Site. There are a total of eight archaeological surveys that have been conducted within a quarter-mile of the Project Site. Furthermore, according to the CRIS, the entire Project Site is located in an archaeologically sensitive area.

*Archaeology*

The archaeological-APE is relatively flat and was historically surrounded by open lands and woods which would have provided indigenous peoples with different resources. The Mill Creek is located to the south of the archaeological-APE which would have provided a constant water source. In addition, the Arthur Kill is located to the west of the archaeological-APE and would have been a major avenue of trade and provided additional resources. The area was most likely forested until cleared for farming in the 19$^{th}$ century. However, the soils in the southern portion of the archaeological-APE have been modified in the recent past from development activity to build a parking area.

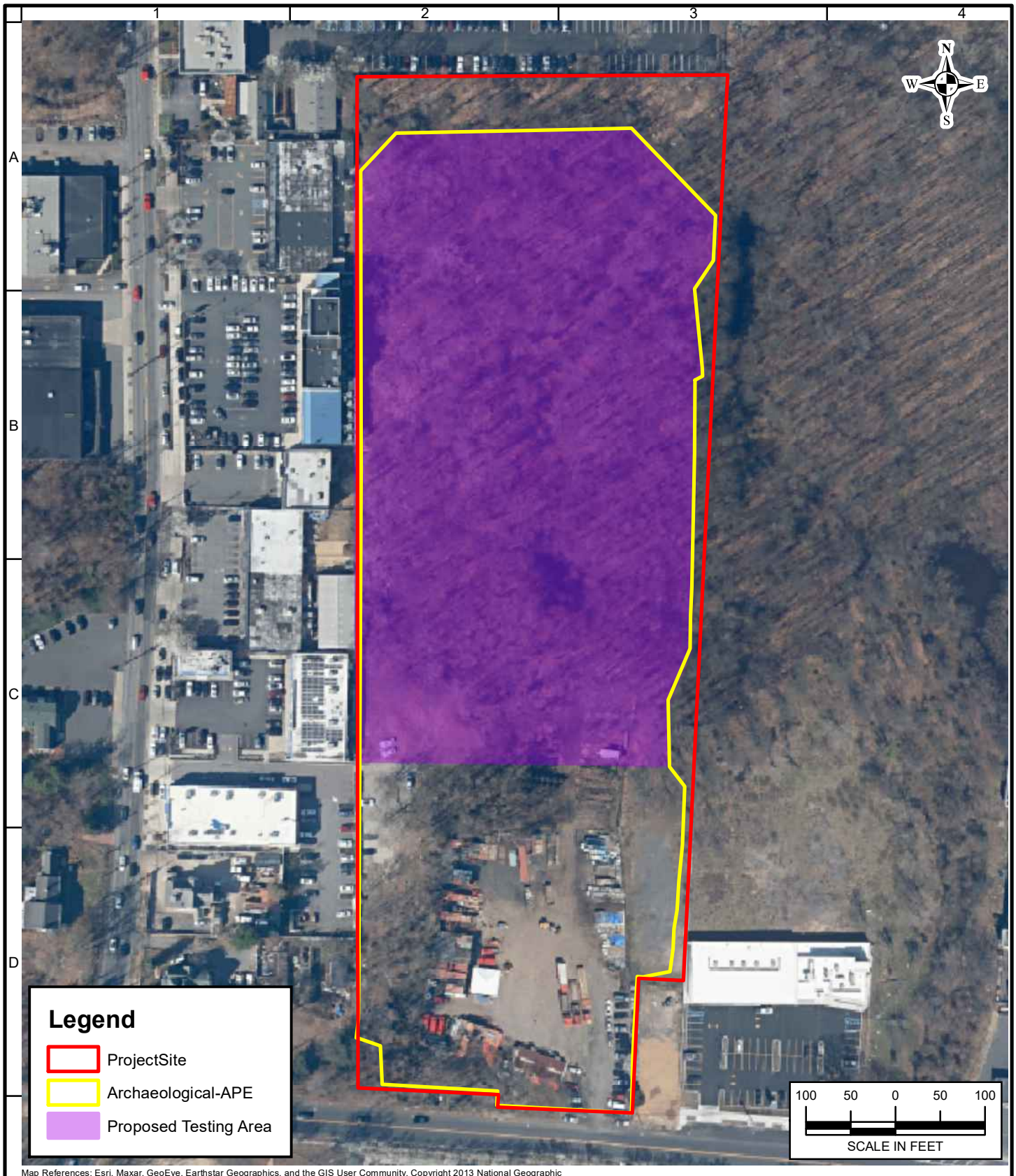
A record search confirmed that archaeological work has been conducted within a half mile radius of the archaeological-APE and two prehistoric and three multi component archaeological sites have been recorded in this radius. The presence of known precontact archaeological sites in the vicinity of the archaeological-APE is most likely based on the proximity to a water source, other resources and an avenue of transportation for indigenous peoples.

The topography, distance from water, other identified resources in the area and number of previously identified precontact archaeological sites within a one-mile radius the archaeological-APE would have been able to support at least seasonal settlement and temporary encampments. Therefore, we conclude that there is a high sensitivity for precontact archaeological materials and features within the undisturbed northern portion of the archaeological-APE and a low sensitivity for precontact archaeological materials and features within the southern portion of the archaeological-APE that contained the parking lot.

Online research of the NYS CRIS and the NYC LPC's cultural resource management reports revealed that there eight historic and three multi component archaeological sites within a one quarter mile radius of the archaeological-APE. Historic maps and atlases revealed that the area

surrounding the archaeological-APE has been occupied since the mid-19th century. However, no buildings have been built within the archaeological-APE as revealed by the historic map review. Based on the available information, as documented above, we conclude that there is a low to no sensitivity for historic archaeological materials within the archaeological-APE.

Based on the above archaeological sensitivity assessment for the archaeological-APE, AHRS recommends phase IB archaeological testing for the areas of undisturbed soils in the northern portion of the archaeological-APE (Figure 15).




Map References: Esri, Maxar, GeoEye, Earthstar Geographics, and the GIS User Community, Copyright 2013 National Geographic

AHRS
ARCHAEOLOGY & HISTORIC RESOURCE SERVICES
605 Twin Arch Road
Rock Tavern, New York 12575
T: 845-725-7694
www.ahrservices.com

Project
**253 RICHMOND VALLEY ROAD**
BLOCK 7584, LOT 4
STATEN ISLAND
RICHMOND COUNTY NEW YORK

Drawing Title
**PROPOSED TESTING AREA**

Project No. 202209-NY-0042
Date 12/18/2022
Scale See Above
Drawn By MAA
Figure 15

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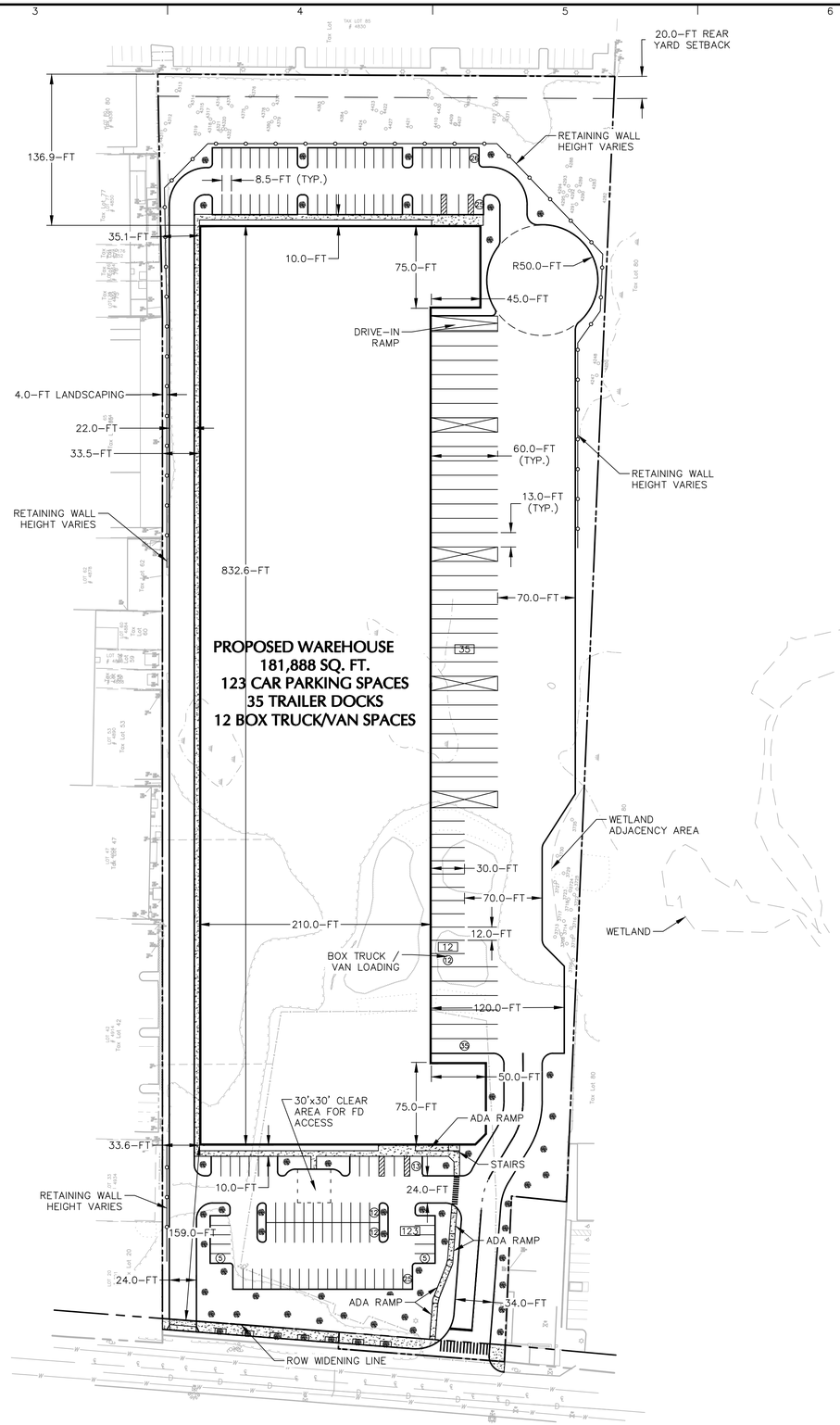
# APPENDIX A

# CONCEPT PLAN




| Required Parking | | | | | | |
|---|---|---|---|---|---|---|
| Zoning District | Footprint (SQ. FT.) | Permitted FAR | Proposed FAR | Warehouse (1 space per 2,000 SQ. FT.) | Provided Car Parking | Permitted Car Parking |
| M1-1 | 181,888 | 1.00 | 0.45 | 91 | 123 | 30 |

60 0 20 40 60
SCALE: 1 INCH = 60 FEET

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| Date | Description | No. |
|---|---|---|
| Revisions | | |

Signature Date


LANGAN
Langan Engineering and Environmental Services, Inc.
300 Kimball Drive
Parsippany, NJ 07054
973.560.4900 973.560.4901 www.langan.com


Project
JDA/RICHMOND VALLEY RD/STATEN ISLAND NY
STATEN ISLAND
RICHMOND COUNTY NEW YORK

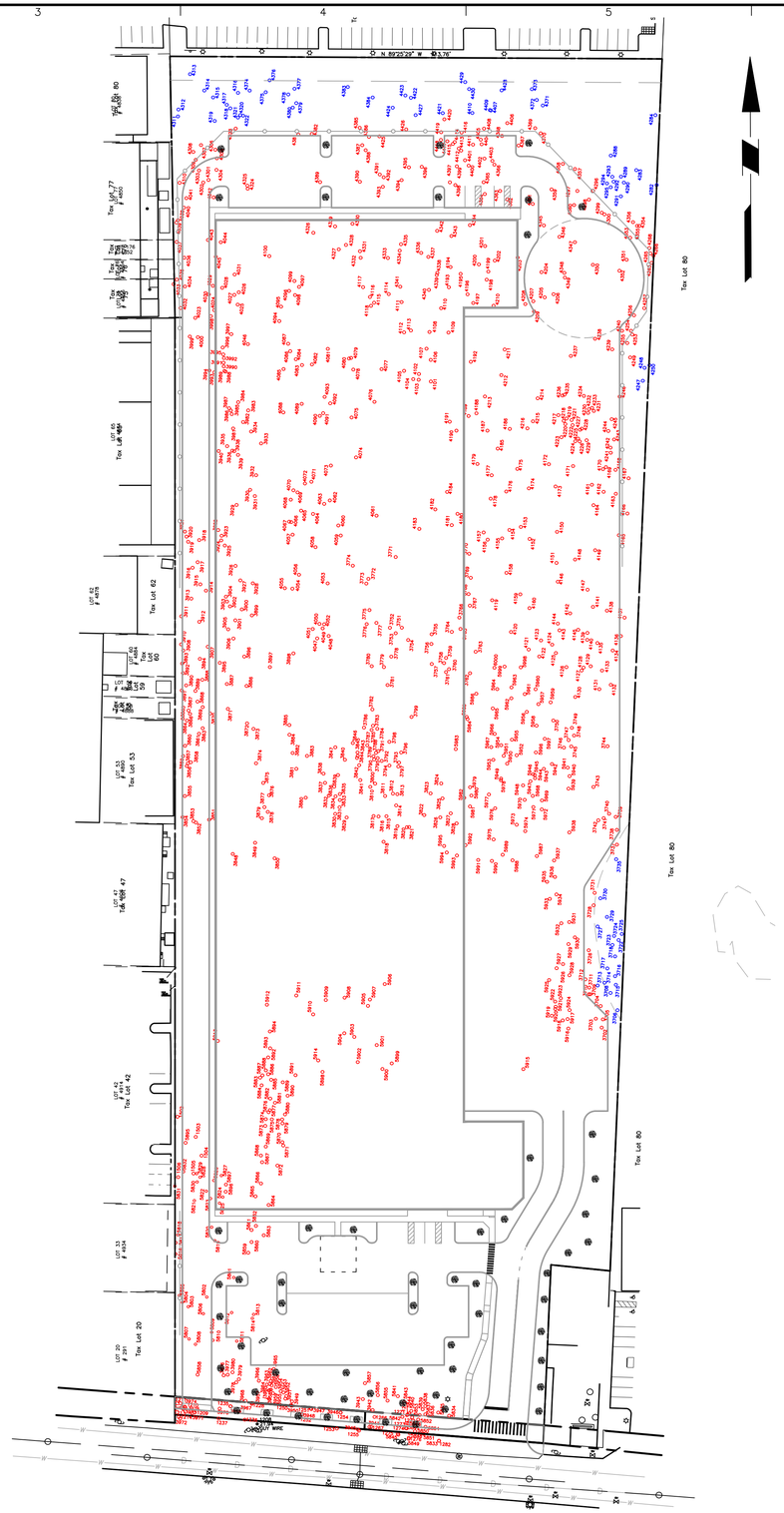
Drawing Title
SITE PLAN

| Project No. | Drawing No. |
|---|---|
| 100954501 | CS101 |
| Date: 06/03/2022 | |
| Drawn By: AL | |
| Checked By: EG | Sheet 1 of 4 |

LANGAN
Project No. 001234501

## LIST OF TREES TO REMAIN

| NUMBER | SIZE | NOTES | CREDITS |
|---|---|---|---|
| 3703 | 12" | REMAIN | 2 |
| 3706 | 24" | REMAIN | 5 |
| 3708 | 8" | REMAIN | 1 |
| 3713 | 6",8" | REMAIN | 1, 1 |
| 3714 | 16" | REMAIN | 3 |
| 3715 | 16" | REMAIN | 3 |
| 3716 | 12" | REMAIN | 2 |
| 3717 | 12" | REMAIN | 2 |
| 3718 | 8",12" | REMAIN | 1, 2 |
| 3722 | 16" | REMAIN | 3 |
| 3723 | 16" | REMAIN | 3 |
| 3724 | 8" | REMAIN | 1 |
| 3725 | (2)12" | REMAIN | 2, 2 |
| 3727 | 24" | REMAIN | 5 |
| 3729 | 12" | REMAIN | 2 |
| 3730 | 8" | REMAIN | 1 |
| 3735 | 8" | REMAIN | 1 |
| 4247 | 16" | REMAIN | 3 |
| 4248 | 8",16" | REMAIN | 1, 3 |
| 4250 | 8" | REMAIN | 1 |
| 4282 | 16" | REMAIN | 3 |
| 4283 | 8",16" | REMAIN | 1, 3 |
| 4284 | 12" | REMAIN | 2 |
| 4288 | 16" | REMAIN | 3 |
| 4289 | 6" | REMAIN | 1 |
| 4290 | 12" | REMAIN | 2 |
| 4291 | 16",20" | REMAIN | 3, 4 |
| 4292 | 12" | REMAIN | 2 |
| 4293 | 8" | REMAIN | 1 |
| 4294 | 12" | REMAIN | 2 |
| 4295 | 6" | REMAIN | 1 |
| 4311 | 16" | REMAIN | 3 |
| 4312 | 20" | REMAIN | 4 |
| 4313 | 36" | REMAIN | 8 |
| 4314 | 8" | REMAIN | 1 |
| 4315 | 10" | REMAIN | 2 |
| 4316 | 12" | REMAIN | 2 |
| 4317 | 6" | REMAIN | 1 |
| 4318 | 6" | REMAIN | 1 |
| 4319 | 12" | REMAIN | 2 |
| 4320 | 12" | REMAIN | 2 |
| 4321 | 10" | REMAIN | 2 |
| 4322 | 12" | REMAIN | 2 |
| 4371 | (2)8" | REMAIN | 2 |
| 4372 | 16" | REMAIN | 3 |
| 4373 | 12" | REMAIN | 2 |
| 4374 | 6" | REMAIN | 1 |
| 4375 | 12" | REMAIN | 2 |
| 4376 | 12" | REMAIN | 2 |
| 4377 | 12" | REMAIN | 2 |
| 4378 | 8" | REMAIN | 1 |
| 4379 | 16" | REMAIN | 3 |
| 4380 | 24" | REMAIN | 5 |
| 4383 | 30" | REMAIN | 7 |
| 4384 | 6" | REMAIN | 1 |
| 4407 | 8" | REMAIN | 1 |
| 4409 | 8" | REMAIN | 1 |
| 4410 | 24" | REMAIN | 5 |
| 4421 | 24" | REMAIN | 5 |
| 4422 | 16" | REMAIN | 3 |
| 4423 | 6" | REMAIN | 1 |
| 4424 | 12" | REMAIN | 2 |
| 4427 | 24" | REMAIN | 5 |
| 4428 | 12" | REMAIN | 2 |
| 4429 | 20" | REMAIN | 4 |
| 4430 | 20" | REMAIN | 4 |
| | | | 171 |




## LEGEND

- ≥6" TREE TO BE REMOVED
- ≥6" TREE TO REMAIN

## ON-SITE TREE SUMMARY

| | |
|---|---|
| TOTAL NUMBER OF EXISTING TREES | 892 |
| EXISTING TREES TO BE REMOVED | 826 |
| EXISTING TREES TO REMAIN | 66 |
| EXISTING TREE CREDITS TO REMAIN | 171 |
| PROPOSED ONSITE TREES | 52 |

PURSUANT TO ZR 107-322(b) AND 107-483(a), ONE TREE, OF THREE INCH CALIPER OR MORE, PRE-EXISTING OR NEWLY PLANTED, SHALL BE PROVIDED FOR EACH FOUR PARKING SPACES.

TREES REQUIRED:
123 PARKING STALLS / 4 = 31 TREES REQUIRED

TOTAL PROPOSED TREES AND TREES CREDITS = 223

## OFF-SITE TREE SUMMARY

STREET TREE REQUIRED FOR EVERY 25 FEET OF LOT FRONTAGE.

| | |
|---|---|
| LOT FRONTAGE | 311 FEET |
| STREET TREES REQUIRED | 12 |
| STREET TREES PROVIDED | 7 |

60 0 20 40 60
SCALE: 1 INCH = 60 FEET

**WARNING:** IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, LAND SURVEYOR OR GEOLOGIST, TO ALTER THIS ITEM IN ANY WAY.

| Date | Description | No. |
|---|---|---|
| Revisions | | |

Signature Date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JDA/RICHMOND VALLEY RD/STATEN ISLAND NY
STATEN ISLAND
RICHMOND COUNTY NEW YORK

Drawing Title
SITE PLAN-
TREE REMOVAL SKETCH

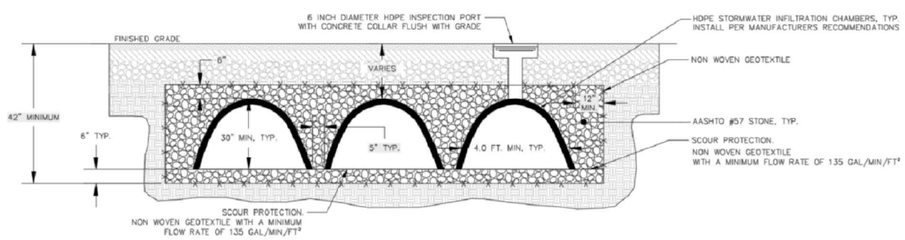
| | |
|---|---|
| Project No. 100954501 | Drawing No. CS102 |
| Date 06/03/2022 | |
| Drawn By JV | |
| Checked By EG | Sheet 2 of 4 |

LANGAN
Project No. 001234501

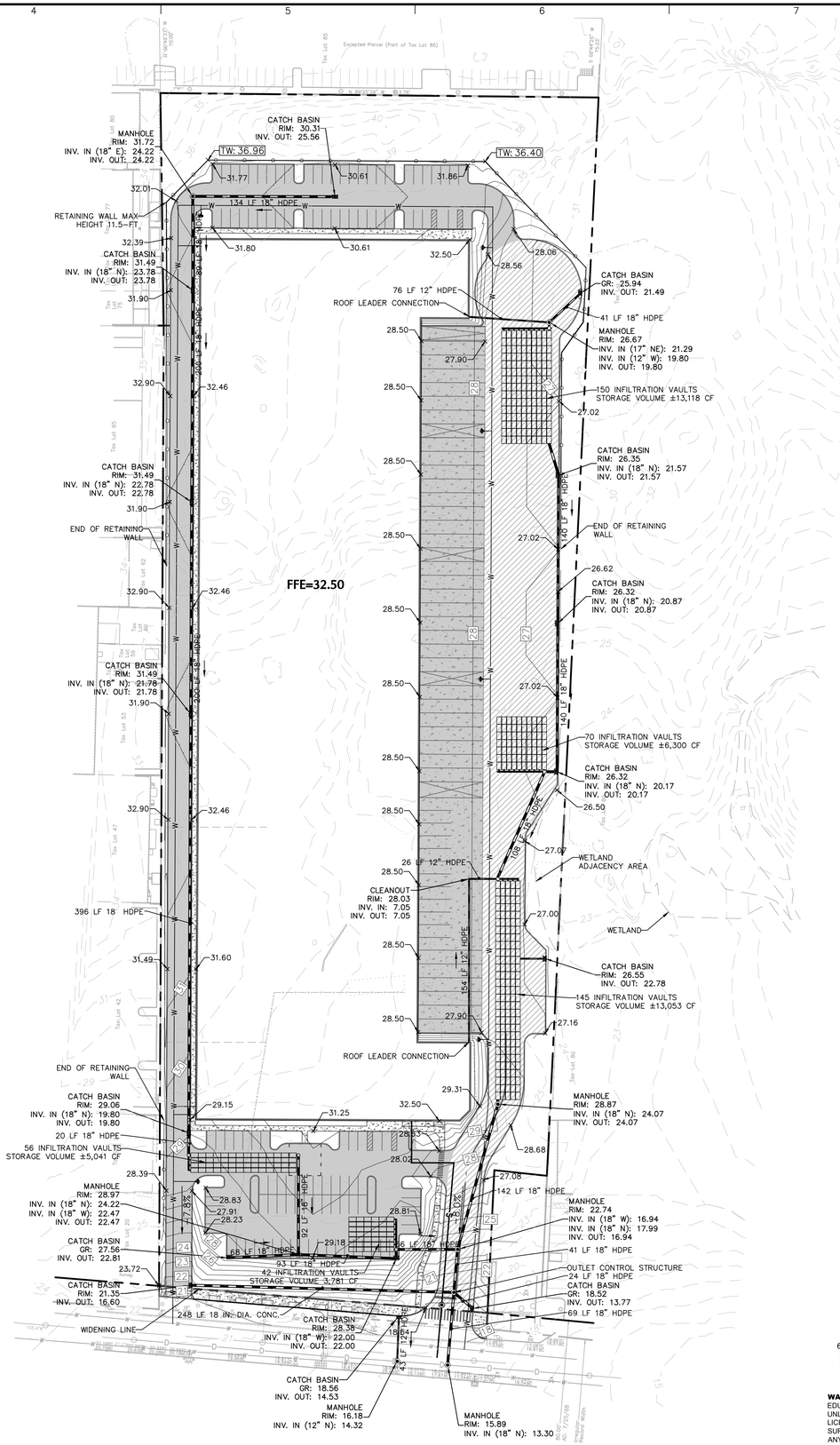
## LEGEND

- HEAVY-DUTY CONCRETE
- HEAVY-DUTY ASPHALT
- CONCRETE SIDEWALK
- ASPHALT PAVEMENT
- CATCH BASIN
- STORM DRAIN

| INFILTATION BREAKDOWN | | |
|---|---|---|
| VAULT DIMENSIONS | | |
| | LENGTH | 85.4 INCH |
| | WIDTH | 51 INCH |
| | HEIGHT | 30 INCH |
| TOTAL NUMBER OF VAULTS | | 463 |
| VOLUME GAIN FROM INFILTRATION = AREA OF VAULTS* 0.5 INCH RAINFALL | | |
| VOLUME GAIN FROM INFILTATION | | 7001.9104 CF |
| VOLUME STONE | | 1,759 CU.YD |
| VOLUME OF EXCAVATION | | 2,547 CU.YD |
| **TOTAL STORAGE VOLUME** | | **41,681 CF** |
| DETENTION VOLUME REQUIRED | | 40,508 CF |




**STORMWATER DETENTION VAULT DETAIL**




60 0 20 40 60
SCALE: 1 INCH = 60 FEET

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| Date | Description | No. |
|---|---|---|

Revisions

Signature Date


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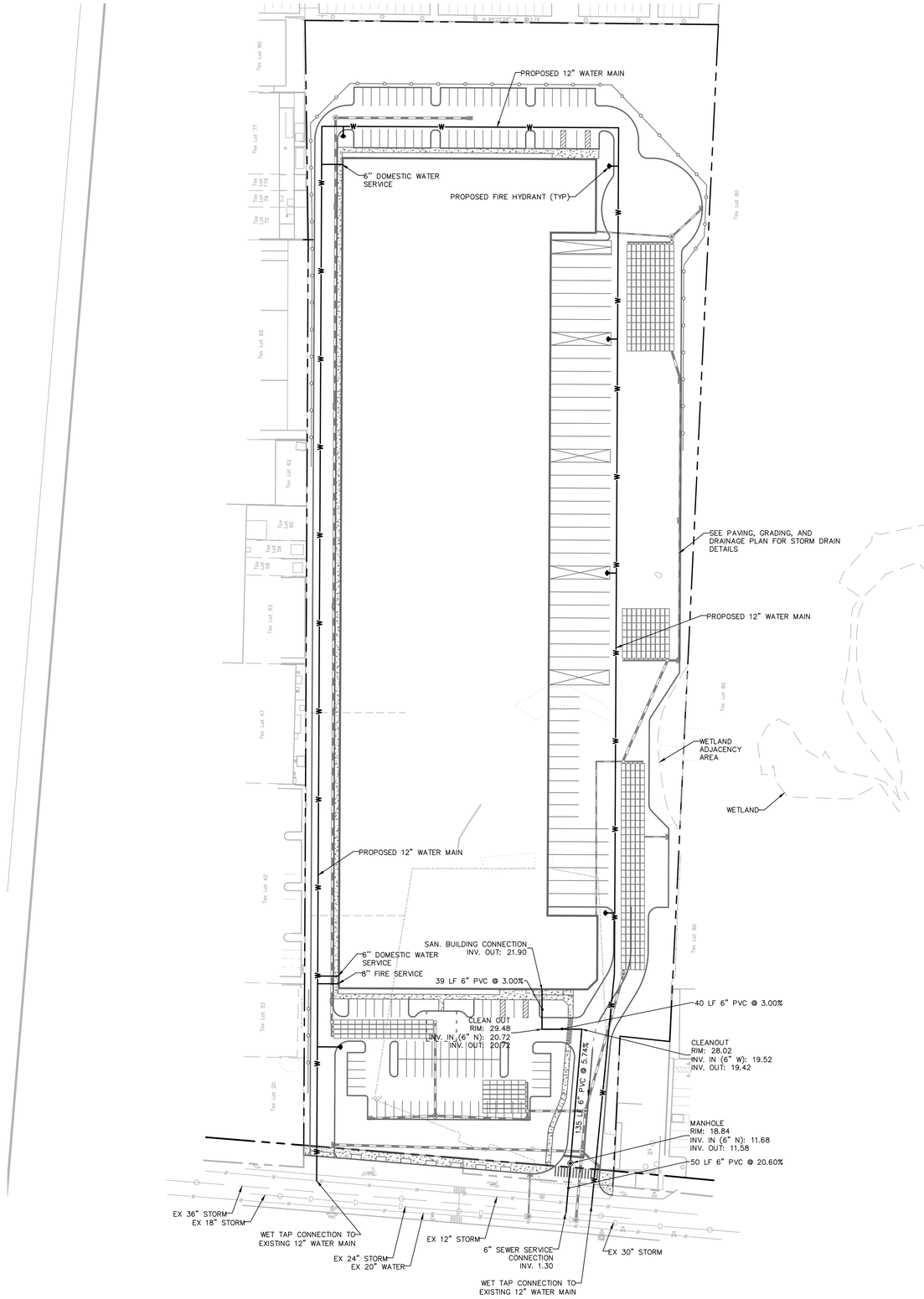
Project
# JDA/RICHMOND VALLEY RD/STATEN ISLAND NY
STATEN ISLAND
RICHMOND COUNTY NEW YORK

Drawing Title
# PAVING, GRADING, AND DRAINAGE PLAN

| Project No. | Drawing No. |
|---|---|
| 100954501 | CG101 |
| Date: 06/03/2022 | |
| Drawn By: AL | |
| Checked By: EG | Sheet 3 of 4 |

LANGAN
Project No. 001234501

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SCALE: 1 INCH = 60 FEET

**WARNING:** IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, LAND SURVEYOR OR GEOLOGIST, TO ALTER THIS ITEM IN ANY WAY.

| Date | Description | No. |
|---|---|---|

Revisions

Signature Date


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Project
JDA/RICHMOND VALLEY RD/STATEN ISLAND NY
STATEN ISLAND
RICHMOND COUNTY NEW YORK

Drawing Title
UTILITY PLAN

| Project No. | Drawing No. |
|---|---|
| 100954501 | CU101 |
| Date: 06/03/2022 | |
| Drawn By: AL | |
| Checked By: EG | Sheet 4 of 4 |

LANGAN
Project No. 001234501

# APPENDIX B

# GEOTECHNICAL REPORT

30 INDEPENDENCE BOULEVARD
SUITE 250
WARREN, NJ 07059
908.668.7777
whitestoneassoc.com

# REPORT OF GEOTECHNICAL INVESTIGATION

## PROPOSED WAREHOUSE
## RICHMOND VALLEY ROAD
## STATEN ISLAND, RICHMOND COUNTY, NEW YORK

***Prepared for:***

**JOHNSON DEVELOPMENT ASSOCIATES, INC.**
**551 West Lancaster Avenue**
**Suite 202**
**Haverford, Pennsylvania 19041**

***Prepared by:***

**WHITESTONE ASSOCIATES ENGINEERING & GEOLOGY NY, PLLC**
**30 Independence Boulevard, Suite 250**
**Warren, New Jersey 07059**

**Mudar Khantamr, P.E.**
**Associate**

**Laurence W. Keller, P.E.**
**Vice President**

**Whitestone Project No.: GJ2219649.Y00**
**November 15, 2022**

WHITESTONE

30 INDEPENDENCE BOULEVARD
SUITE 250
WARREN, NJ 07059
908.668.7777
whitestoneassoc.com

November 15, 2022

*via email*

**JOHNSON DEVELOPMENT ASSOCIATES, INC.**
551 West Lancaster Avenue
Suite 202
Haverford, Pennsylvania 19041

Attention: Mr. Kenneth Kubitschek
Real Estate Manager, Industrial Division

**Regarding: REPORT OF GEOTECHNICAL INVESTIGATION**
**PROPOSED WAREHOUSE**
**RICHMOND VALLEY ROAD**
**STATEN ISLAND, RICHMOND COUNTY, NEW YORK**
**WHITESTONE PROJECT NO.: GJ2219649.Y00**

Dear Mr. Kubitschek:

Whitestone Associates Engineering & Geology NY, PLLC (Whitestone) is pleased to submit the attached *Report of Geotechnical Investigation* for the above-referenced project. The attached report presents the results of Whitestone's soils exploration efforts and presents recommendations for design of the proposed structural foundations, floor slabs, pavements, and related earthwork associated with the proposed development.

Whitestone's Geotechnical Division appreciates the opportunity to be of continued service to Johnson Development Associates, Inc (JDA). Please note that Whitestone has the capability to conduct the additional geotechnical engineering services recommended herein.

Please contact us at (908) 668-7777 with any questions regarding the enclosed report.

Sincerely,

**WHITESTONE**

Mudar Khantamr, P.E.
Associate

Laurence W. Keller, P.E.
Vice President

TJ/ri L:\Job Folders\2022\2219649GJ\Reports and Submittals\19649.Y00 ROGI.docx
Enclosures
Copy: Tripp Bailey, Johnson Development Associates, Inc.
Mark Robinson, Johnson Development Associates, Inc.
David Kane, Johnson Development Associates, Inc.
Miguel Villarreal, Johnson Development Associates, Inc.

# REPORT OF GEOTECHNICAL INVESTIGATION
## PROPOSED WAREHOUSE
## Richmond Valley Road
## Staten Island, Richmond County, New York

### TABLE OF CONTENTS

# REPORT OF GEOTECHNICAL INVESTIGATION
## PROPOSED WAREHOUSE
## Richmond Valley Road
## Staten Island, Richmond County, New York

### TABLE OF CONTENTS

### FIGURES



### APPENDICES

# SECTION 1.0
# Summary of Findings

Whitestone has conducted an exploration and evaluation of the subsurface conditions at the site of the proposed warehouse to be located on Richmond Valley Road in Staten Island, Richmond County, New York. The site of the proposed construction is shown on the *Test Location Plan* included as Figure 1.

At the time of Whitestone's investigation, the subject site consisted of an unoccupied moderately- to heavily-wooded parcel with an asphalt covered parking lot located within the southern portion of the site. The existing pavement appeared to be in poor condition with areas of significant distress and cracking. Based on information provided by Johnson Development Associates, Inc. (JDA), including the June 3, 2022 *Civil Plans* prepared by Langan Engineering and Environmental Services, Inc. (Langan), the subject site has grade changes of approximately 19 feet.

Based on the aforementioned *Civil Plans*, the proposed development is anticipated to include constructing an approximately 181,888-square feet (footprint) warehouse including 35 trailer docks, 12 box truck/van spaces, an approximately 1,150 linear feet long cut retaining wall with a maximum height of seven feet, five stormwater management (SWM) infiltration vaults, and associated pavements, landscaping, and utilities. The proposed building is not anticipated to include a basement/cellar. Based on proposed grading, the northwestern and southeastern corners of the proposed building pad will require up to 6.5 feet of cut and 5.5 feet of fill placement to achieve grades, respectively. The northern portion of the proposed pavement and retaining wall will require up to eight feet of cut to achieve design elevations.

The subsurface exploration included conducting a reconnaissance of the project site, drilling 41 soil test borings, excavating 10 soil profile pits and six test pits, conducting 10 in-situ infiltration tests, and collecting soil samples for laboratory analyses. The data from this exploration was analyzed by Whitestone in light of the project information provided by JDA.

A summary of Whitestone's findings is presented in the following:

- **Subsurface Conditions:** The subsurface tests were conducted within existing grass-covered areas or existing paved areas across the subject site. Beneath the surface cover and/or at the surface, several subsurface tests encountered existing fill to depths ranging from approximately two feet below ground surface (fbgs) to four fbgs. The existing fill generally consisted of a combination of sand, silt, clay, and gravel. Underlying the surface cover and/or existing fill, the subsurface tests encountered natural glacial deposits generally consisting of mixtures of sand, silt, clay, and gravel. Specifically, the natural soils encountered consisted of poorly graded sand with varying amounts of silt and clay (USCS: SP, SP-SM, SM, and SC), silt (USCS: ML), and lean clay (USCS CL and CL-ML) with variable amounts of sand, silt, and gravel. The subsurface tests were terminated within the glacial deposits at depths ranging from approximately 10 fbgs to 27

fbgs. Static groundwater was encountered within half of the subsurface tests at variable depths ranging from approximately four fbgs to 18 fbgs. Indications of seasonal high groundwater were encountered within approximately half of the soil profile pits at the depths indicated in Section 5.12. Additionally, Whitestone installed two temporary piezometers and monitored static groundwater levels within two soil borings B-6 and B-41 over a period of six days. Static groundwater levels within the temporary piezometers varied between approximately nine fbgs and 20 fbgs.

Recommendations developed upon consideration of these results are summarized below and presented in greater detail in the following report.

- **Ground Improvement:** The upper soils were encountered in a loose/soft relative density and consistency and should be improved upon via compaction effort using a minimum 10-ton roller prior to placement of any new fill.

- **Foundations:** Following surficial compaction of the upper site soils, Whitestone recommends supporting the proposed structures on conventional spread and continuous wall footings designed to bear within the improved and approved site soils and/or on properly placed and compacted structural fill. Foundations bearing within these materials may be designed using a maximum allowable net bearing pressure of 3,000 pounds per square foot (psf). In addition, all footing excavation bottoms should be compacted in-place in the presence of a geotechnical engineer to densify sporadic loose/soft zones and disturbed soils resulting from the excavation.

- **Floor Slabs and Pavements:** Whitestone anticipates that the underlying improved and approved on-site soils and/or controlled structural fill will be suitable for support of the proposed floor slabs and pavements provided these materials are properly evaluated, placed, and proofrolled as recommended herein. Any areas that become softened or disturbed as a result of wetting and/or repeated exposure to construction traffic should be removed and replaced with compacted structural fill. The upper 12 inches of all subgrades should be recompacted in-place under the observation of the owner's geotechnical engineer due to the presence of loose/soft materials. Areas of overexcavation of existing fill should be anticipated if exposed to precipitation and due to the inherent variability of the existing fill.

- **Soil Reusability:** Whitestone anticipates that the majority of the on-site soils above the groundwater table will be suitable for selective reuse as structural fill/backfill material provided that soil moisture contents are controlled within two percent of optimum moisture level and deleterious materials are segregated where encountered. The on-site soils will require moisture conditioning, including aerating and drying to achieve proper compaction. Immediate reuse of the above referenced on-site soil should not be anticipated. Imported soils may be required to expedite earthwork operations, especially if the construction schedule, weather conditions, or the site area restricts moisture control operations, such as air drying the soil. Materials that are or become exceedingly wet will require discing and aerating. The stripped topsoil should not be used as general structural fill or backfill. Construction schedules and budgets should account for wet soils and soil exchange with imported soils or in-situ stabilization to expedite schedules.

More detailed design criteria and construction recommendations for proposed foundations, slabs, pavements, and earthwork are discussed in the following report.

# SECTION 2.0
# Introduction

## 2.1 AUTHORIZATION

Mr. Kenneth Kubitschek with JDA issued authorization to Whitestone to conduct the geotechnical investigation and SWM area evaluation at this site relevant to the proposed site development. The above services were conducted in general accordance with Whitestone's August 19, 2022 revised proposal to JDA.

## 2.2 PURPOSE

The purpose of this subsurface exploration and analysis was to:

- ascertain the various soil profile components at test locations;
- estimate the engineering characteristics of the proposed foundation bearing and subgrade materials;
- provide geotechnical criteria for use by the design engineers in preparing the foundation, floor slab, SWM, and pavement design;
- provide recommendations for required earthwork and subgrade preparation;
- record groundwater and estimated seasonal high groundwater levels (where encountered) at the time of the investigation and discuss the potential impact on the proposed construction; and
- recommend additional investigation and/or analysis (if warranted).

## 2.3 SCOPE

The scope of the exploration and analysis included the subsurface exploration, field testing and sampling, laboratory analyses, and a geotechnical engineering analysis and evaluation of the subsurface materials. This *Report of Geotechnical Investigation* is limited to addressing the site conditions related to the physical support of the proposed construction. Any references to suspicious odors, materials, or conditions are provided strictly for the client's information.

### 2.3.1 Field Exploration

The field exploration of the project site was conducted by means of 41 soil test borings (identified as B-1 through B-41) advanced with an all-terrain vehicle (ATV)-mounted drill rig using hollow stem augers and

split-spoon sampling techniques, and six test pits (identified as TP-1 through TP-6) and 10 soil profile pits (identified as SPP-1 through SPP-10) conducted with a track-mounted excavator. The subsurface tests were backfilled with excavated soils generated from the investigation. The locations of the subsurface tests are shown on the *Test Location Plan* included as Figure 1. The test locations and termination depths are summarized in the following table.

| TEST LOCATION/TERMINATION DEPTH SUMMARY TABLE | | |
|---|---|---|
| **Proposed Construction** | **Test No.** | **Termination Depth (fbgs)** |
| Building | B-1 through B-41, TP-5, and TP-6 | 10 to 27 |
| Pavements, Retaining Wall and SWM Areas | SPP-1 through SPP-10, TP-1 through TP-4 | 11 to 12 |

The subsurface tests were conducted in the presence of Whitestone personnel who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The test locations were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

Soil borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D 1586. The Standard Penetration Resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations.

Groundwater level observations, where encountered, were recorded during and immediately following the completion of the testing operations within the soil borings and test excavations. Seasonal variations, temperature effects, and recent rainfall conditions may influence the levels of the groundwater, and the observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitoring wells may not be representative of true groundwater levels.

### 2.3.3 Laboratory Program

In addition to the field investigation, a laboratory program was conducted to determine additional, pertinent engineering characteristics of representative samples of on-site soils. The laboratory program was conducted in general accordance with applicable ASTM standard test methods and included physical/textural testing of representative samples of various strata.

**Physical/Textural Analyses:** Representative samples of the various strata encountered were subjected to a laboratory program that included Atterberg limits determination (ASTM D-4318), moisture content determinations (ASTM D-2216), and washed gradation analyses (ASTM D-422) in order to conduct supplementary engineering soil classifications in general accordance with ASTM D-2487. The soil strata tested were classified by the Unified Soil Classification System (USCS) and results of the laboratory testing are summarized in the following table. Quantitative test results are provided in Appendix B.

| PHYSICAL/TEXTURAL ANALYSES SUMMARY | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Boring** | **Sample** | **Depth (fbgs)** | **% Passing No. 200 Sieve** | **Moisture Content (%)** | **Liquid Limit** | **Plastic Index** | **USCS Classification** |
| B-2 | S-4 | 6.0 - 8.0 | 11.4 | 22.7 | NP | NP | SP-SM |
| B-8 | S-5 | 8.0 - 10.0 | 36.4 | 11.8 | 24 | 8 | SC |
| B-11 | S-3 | 4.0 - 6.0 | 75.5 | 20.1 | 33 | 12 | CL |
| B-17 | S-4 | 6.0 - 8.0 | 20.5 | 13.9 | NP | NP | SM |
| B-32 | S-2 | 2.0 - 4.0 | 30.2 | 4.7 | NP | NP | SM |

Notes: NP = Non-Plastic

The engineering classifications are useful when considered in conjunction with the additional site data to estimate properties of the soil types encountered and to predict the soil's behavior under construction and service loads.

# SECTION 3.0
# Site Description

## 3.1 LOCATION AND DESCRIPTION

The approximately 9.98-acre subject property is located on Richmond Valley Road in Staten Island, Richmond County, New York. The site is bound to the north by commercial development followed by South Bridge Street, to the south by Richmond Valley Road followed by commercial development, to the west by commercial development followed by Arthur Kill Road, and to the east by a moderately-wooded lot followed by Page Avenue. The site of the proposed construction is shown on the *Test Location Plan* included as Figure 1.

## 3.2 EXISTING CONDITIONS

**Surface Cover/Development:** At the time of Whitestone's investigation, the subject site consisted of an unoccupied moderately- to heavily-wooded parcel with an asphalt covered parking lot located within the southern portion of the site. The existing pavement appeared to be in poor condition with areas of significant distress and cracking.

**Topography:** Based on existing topography indicated on the aforementioned *Civil Plans* prepared by Langan, the subject site has a grade change of approximately 19 feet.

**Utilities:** At the time of Whitestone's subsurface field investigation, utilities were not observed at the subject site by Whitestone but may be present. The utility information contained in this report is presented for general discussion only and is not intended for construction purposes.

**Site Drainage:** Surface runoff generally consists of sheet flow across the existing ground surface and generally appeared to flow in an southerly direction.

## 3.3 SITE GEOLOGY

The subject site is situated within the Coastal Plain Geomorphic Province of New York. Specifically, the site is within the Raritan Formation that generally is underlain by marine and alluvial deposits of clay, silt, sand, and gravel deposited during the late Cretaceous age. Surficial materials typically include glacial deposits associated with the Wisconsinan Advance, which ended approximately 10,000 years ago. Overburden materials also include man-made fill associated with current and past development of the subject site.

## 3.4 PROPOSED CONSTRUCTION

Based on the aforementioned *Civil Plans* prepared by Langan, the proposed development is anticipated to include constructing an approximately 181,888-square feet (footprint) warehouse including 35 trailer docks, 12 box truck/van spaces, an approximately 1,150 linear feet long cut retaining wall with a maximum height of seven feet, five SWM infiltration vaults, and associated pavements, landscaping, and utilities. The proposed building is not anticipated to include a basement/cellar.

Based on proposed grading, the northwestern and southeastern corners of the proposed building pad will require up to 6.5 feet of cut and 5.5 feet of fill placement to achieve grades, respectively. The northern portion of the proposed pavement and retaining wall will require up to eight feet of cut to achieve design elevations.

Detailed structural information was not available at the time of this report. Based on experience with similar projects, maximum loading is expected to be less than the following:

- column loads - 250 kips;
- wall loads - 6.0 kips/linear foot; and
- floor slabs - 250 pounds per square foot (psf) to 500 psf.

The above-referenced structural loads were assumed based upon Whitestone's previous experience with similar facilities and should be confirmed by the structural engineer. The scope of Whitestone's investigation and the professional advice contained in this report were generated based on the project details noted herein. Any revisions or additions to the design details enumerated in this report should be brought to the attention of Whitestone for additional evaluation as warranted.

# SECTION 4.0
# Subsurface Conditions

Details of the subsurface materials encountered are presented on the *Records of Subsurface Exploration* presented in Appendix A of this report. The subsurface soil conditions encountered in the subsurface tests consisted of the following generalized strata in order of increasing depth.

## 4.1 SUBSURFACE SOIL CONDITIONS

**Surface Cover:** The subsurface tests were conducted within either existing grass-covered areas or existing paved areas. The subsurface tests conducted within the existing grass-covered areas encountered approximately six inches to 36 inches of topsoil at the surface. The subsurface tests conducted within existing paved areas encountered approximately five inches to six inches of asphaltic concrete underlain by approximately six inches to 19 inches of granular subbase. Two subsurface tests identified as B-8 and SPP-5 encountered existing fill at the surface as detailed below

**Existing Fill (NYC Class 7):** Beneath the surface cover and/or at the surface, several subsurface tests encountered existing fill to depths ranging from approximately two fbgs to four fbgs. The existing fill generally consisted of a combination of sand, silt, clay, and gravel. SPT N-values within coarse-grained portions of this stratum ranged between 11 blows per foot (bpf) and refusal (refusal defined as greater than 50 blows per six-inch advancement of the split-spoon sampler).

**Glacial Deposits (NYC Classes 3a, 3b, 4a, 4b, 4c, 5a & 5b):** Beneath the surface cover and/or existing fill, the subsurface tests encountered natural glacial deposits generally consisting of mixtures of sand, silt, clay, and gravel. Specifically, the natural soils encountered consisted of poorly graded sand with varying amounts of silt and clay (USCS: SP, SP-SM, SM, and SC), silt (USCS: ML), and lean clay (USCS CL and CL-ML) with variable amounts of sand, silt, and gravel. The subsurface tests were terminated within the glacial deposits at depths ranging from approximately 10 fbgs to 27 fbgs.

SPT N-values within coarse-grained portions of this stratum ranged between two blows per foot (bpf) and 37 bpf, generally indicating a very loose to dense relative density and averaging approximately 12 bpf. Pocket penetrometer testing conducted on the cohesive portions of the glacial soils resulted in unconfined compressive strength values ranging between approximately less than 0.5 ton per square foot (tsf) and over 4.5 tsf, generally indicating medium stiff to hard consistencies, with majority encountered in a stiff to very stiff consistency.

## 4.2 GROUNDWATER

Static groundwater was encountered within half of the subsurface tests at variable depths ranging from approximately four fbgs to 18 fbgs. Indications of seasonal high groundwater were encountered within approximately half of the soil profile pits at the depths indicated in Section 5.12. Additionally, Whitestone installed two temporary piezometers and monitored static groundwater levels at two soil borings identified as B-6 and B-41 over a period of six days. Static groundwater levels within the temporary piezometers varied between approximately nine fbgs and 20 fbgs. Static groundwater conditions likely will fluctuate seasonally and following periods of precipitation.

# SECTION 5.0
# Conclusions and Recommendations

## 5.1 GENERAL

The results of the subsurface investigation and engineering evaluation indicate that the improved and approved site soils and/or controlled structural fill materials are suitable for support of conventional shallow foundations, floor slab, and pavements subject to ground improvement via compaction effort, construction phase evaluation, and proper subgrade preparation as described herein. Due to the relatively loose/soft existing conditions within the upper site soils, in-place compaction of the foundation subgrades should be anticipated prior to structural support.

The on-site soils consist of granular soils with appreciable amounts of fines and fine-grained soils that have poor workability. Segregation, processing, and moisture control will be critical to the successful reuse of on-site soil and existing fill as well as stockpile and subgrade protection.

## 5.2 SITE PREPARATION AND EARTHWORK

**Surface Cover Stripping:** Prior to stripping operations, all utilities should be identified and secured. Pavements, vegetation, trees, topsoil, and organic matter should be removed from within and at least 10 feet beyond the limits of the proposed building footprint as well as any other area that will require controlled structural fill placement. Tree and/or brush removal should include the removal of stumps and root material. All stripping and earthwork activities operations should be conducted in a manner consistent with good erosion and sediment control practices.

**Ground Improvement/Proofrolling:** Prior to placing any fill, backfill or subbase materials to raise or restore grades to design subgrade elevations, due to the relatively loose/soft existing conditions within the upper site soils, the exposed soils should be compacted to at least 95 percent of the maximum dry density as determined by Modified proctor analysis (ASTM D 1557) with a minimum of three passes in two perpendicular directions of a minimum 20 ton, vibratory smooth drum roller. The surface should be proofrolled with a loaded tandem axle truck in the presence of the geotechnical engineer to help identify soft or loose pockets which may require additional compaction effort or removal and replacement or further investigation. Proofrolling should be conducted after a suitable period of dry weather to avoid degrading an otherwise stable subgrade. Any fill or backfill should be placed and compacted in accordance with Section 5.3.

**Weather Performance Criteria:** Because portions of the site soils are moderately to highly moisture sensitive and may soften when exposed to water, every effort must be made to maintain drainage of

surface water runoff away from construction areas by grading and limiting the exposure of excavations and prepared subgrades to rainfall. Accordingly, excavation and fill placement procedures should be conducted during favorable weather conditions. Overexcavation of saturated soils and replacement with controlled structural fill per Section 5.3 of this report may be required prior to resuming work on disturbed subgrade soils.

**Subgrade Protection and Inspection:** Portions of the encountered site soils are moderately to highly moisture sensitive and will degrade if exposed to inclement weather, freeze-thaw cycles, or repeated construction traffic. However, if properly protected and maintained as recommended herein, the site soils will provide adequate support for the proposed construction. The site contractors should employ appropriate means and methods to protect the subgrade including, but not limited to the following:

- leaving existing pavements in-place as long as practical to help minimum subgrade exposure to inclement weather;
- sealing exposed subgrade soils on a daily basis with a smooth drum roller operated in static mode;
- regrading the site as needed to maintain positive drainage away from open earthwork construction areas and to prevent standing water;
- removing wet surficial soils and ruts immediately; and
- limiting exposure to construction traffic especially following inclement weather and subgrade thawing.

**Slab and Pavement Subgrade Stabilization and Inspection:** Subgrade soils that are exposed to inclement weather and heavy construction traffic may degrade and require either extensive drying time or overexcavation and replacement in order to provide a suitable subgrade. Overexcavation of unstable soils within slab and pavement areas typically should be limited to approximately 1.5 feet below planned subgrade unless directed otherwise by the owner's geotechnical engineer, provided that a reinforcing geogrid approved by the owner's geotechnical engineer is used. Alternatively, unstable materials may be completely overexcavated and either aerated and recompacted or replaced with imported structural fill per Section 5.3. However, this option is likely least economical. Geogrids typically are economical when proposed undercut depths exceed approximately 16 inches. The geogrid should be placed directly on the exposed subgrade and backfill should consist of a well-graded gravel and sand blend. The services of the geotechnical engineer should be retained to inspect soil conditions during construction and to provide specific recommendations for stabilizing subgrades. Additionally, a geotechnical engineer should be retained to verify the suitability of prepared foundation and floor slab subgrades for support of design loads.

## 5.3 STRUCTURAL FILL AND BACKFILL

**Imported Fill Material:** Any imported material placed as structural fill or backfill to raise elevations or restore design grades should consist of clean, relatively well graded sand or gravel with a maximum particle size of three inches and five percent to 15 percent of material finer than a #200 sieve. Alternatively, inorganic soil types including silty and clayey sands and gravels with higher percentage of fine material and silts and clays with a liquid limit less than 40 and a plasticity index less than 20 may be considered subject to the owner's approval, provided that the required moisture content and compaction controls are met. The material should be free of clay lumps, organics and deleterious material.

**On-Site Materials:** Based on the conditions disclosed by the test locations, Whitestone anticipates that the majority of the on-site soils above the groundwater table will be suitable for selective reuse as structural fill/backfill material provided that soil moisture contents are controlled within two percent of optimum moisture level and deleterious materials are segregated where encountered. Immediate soil reuse should not be anticipated due to moisture sensitivity of the on-site soil, especially if construction occurs in early spring or following inclement weather. The stripped topsoil should not be used as general structural fill or backfill. Reuse of the existing fill will be contingent on careful inspection in the field by the owner's geotechnical engineer by visual observation and test pit excavations conducted during construction in accordance with Sections 5.2, 5.3, and 5.11 of this report.

The site soils contain appreciable amounts of clay and silt that are extremely moisture sensitive. The reuse of these fine-grained soils typically is possible only during ideal weather conditions. Reuse of these soils may require mixing with a granular material, extensive moisture conditioning, and/or drying to facilitate their reuse, workability, and compaction in fill areas. These materials will become increasingly difficult to reuse and compact if they become wetted beyond the optimum moisture content. Materials that become exceedingly wet will likely require discing and aerating. Alternatively, imported fill materials may be used to attain the desired grades and expedite earthwork operations during wet weather periods. It should be the contractor's responsibility to cover stockpiled soils, seal subgrades, and provide proper surface drainage during forecasted wet weather.

**Submerged Fill:** Where necessary, up to two feet of an open-graded, crushed, three-quarter inch stone may be placed in the wet to provide a working mat, expedite dewatering efforts and enable subsequent placement of structural fill or backfill in the dry. Prior to placing submerged fill materials, free water and disturbed materials should be removed to the extent recommended by the geotechnical engineer. A separation geotextile, such as Mirafi 140N or equivalent, should be placed at the base and sides of the overexcavation to separate the stone from underlying and adjacent soils. The fabric also should be placed on top of the stone prior to subsequent fill placement if fill soils with a substantial amount of fines are to be used to restore grade.

**Demolition Material:** Demolition material, free of environmental restrictions, may be used as fill material provided the material is properly segregated and processed as recommended herein. Concrete masonry materials should be crushed to a well graded blend with a maximum size of three inches in diameter. Deleterious building materials such as wood, insulation, metal, shingles, etc. should not be used as structural fill material. Milled or recycled asphalt pavement (RAP) may be re-used as granular base for pavements provided that the RAP particle size meets New York State Department of Transportation (NYSDOT) standard specifications for granular base and no more than 50% of the pavement granular base contains RAP.

**Compaction and Placement Requirements:** All fill and backfill should be placed in maximum eight-inch loose lifts and compacted to 95 percent of the maximum dry density within two percent of the optimum moisture content as determined by ASTM D 1557 (Modified Proctor) unless otherwise recommended in subsequent sections of this report. Whitestone recommends using a vibratory drum roller to compact the on-site soils or a small hand-held vibratory compactor within excavations.

**Structural Fill Testing:** A sample of the imported fill material and on-site materials to be re-used should be submitted to the geotechnical engineer for analysis and approval prior to use. The placement of all fill and backfill should be monitored by a qualified engineering technician to ensure that the specified material and lift thicknesses are properly installed. A sufficient number of in-place density tests (methods ASTM D 6938 or ASTM D 1556) should be conducted on each lift to ensure that the specified compaction is achieved throughout the height of the fill or backfill.

## 5.4 GROUNDWATER CONTROL

Static groundwater was encountered within half of the subsurface tests at variable depths ranging from approximately four fbgs to 18 fbgs. Additionally, Whitestone installed two temporary piezometers and monitored static groundwater levels at two soil borings identified as B-6 and B-41. Static groundwater levels within the temporary piezometers varied between approximately nine fbgs and 20 fbgs. Based on anticipated redevelopment grades, Whitestone anticipates that static groundwater will be deeper than proposed site excavations and permanent groundwater measures are not anticipated to be required. However, trapped/perched groundwater may be expected to be encountered within the existing fill, at the natural soil/existing fill interface, and within the finer-grained layers of the natural site soils, especially following precipitation events. As such, construction phase dewatering of trapped/perched water through the use of gravity fed sump pumps should be anticipated during excavation activities for this site.

Whitestone anticipates that dewatering typically would include numerous sump pumps along the excavation perimeter and/or deep well points to lower the groundwater level.

Because the subsurface soils will soften when exposed to water, every effort must be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations to rainfall. Overexcavation of saturated soils and replacement with controlled structural fill and/or one foot to two feet of open graded gravel (such as 3/4-inch clean crushed stone) may be required prior to resuming work on disturbed subgrade soils.

## 5.5 FOUNDATIONS

**Shallow Foundation Design Criteria:** Whitestone recommends supporting the proposed structures on conventional spread and continuous wall footings designed to bear within the improved and approved site soils and/or on properly placed and compacted structural fill provided these materials are properly evaluated, placed and compacted in accordance with Sections 5.2, 5.3, and 5.11 of this report. The upper site soils were relatively loose/soft and will require improvement prior to foundation support, where encountered at or below proposed foundation bearing elevations. Foundations bearing within these materials may be designed to impart a maximum allowable net bearing pressure of 3,000 psf, under the observation of the owner's geotechnical engineer with specific knowledge of the site subsurface conditions and design assumptions.

All footing bottoms should be improved by in-trench compaction in the presence of the geotechnical engineer. Regardless of loading conditions, proposed foundations should be sized no less than minimum dimensions of 24 inches for continuous wall footings and 36 inches for isolated column footings.

Below-grade footings and footings subject to overturning should be designed so that the maximum toe pressure due to the combined effect of vertical loads and overturning moment does not exceed the recommended maximum allowable net bearing pressure. In addition, positive contact pressure should be maintained throughout the base of the footings such that no uplift or tension exists between the base of the footings and the supporting soil. Uplift loads should be resisted by the weight of the concrete. Side friction should be neglected when proportioning the footings so that lateral resistance should be provided by friction resistance at the base of the footings. A coefficient of friction against sliding of 0.35 is recommended for use in the design of the foundations bearing within the existing site soils or imported structural fill soils.

**Foundation Inspection:** Whitestone recommends that the suitability of the bearing soils along and below the footing bottoms be verified by a geotechnical engineer prior to placing concrete for the footings. Where areas of unsuitable materials are encountered in footing excavations, overexcavation and recompaction or replacement may be necessary to provide a suitable footing subgrade in accordance with Sections 5.2 and 5.3. Any overexcavation to be restored with structural fill will need to extend at least one foot laterally beyond footing edges for each vertical foot of overexcavation. Lateral overexcavation can be reduced if the grade is restored with lean concrete or approved flowable fill. The bottom of overexcavation should be compacted with vibrating plates or plate tampers ("jumping jacks") to compact locally disturbed materials.

**Settlement:** Whitestone estimates post construction settlements of proposed building foundations to be approximately one inch if the recommendations outlined in this report are properly implemented. Differential settlement of building foundations should be less than one-half inch.

**Frost Coverage:** Footings subject to frost action should be placed at least 48 inches below adjacent exterior grades or the depth required by local building codes to provide protection from frost penetration. Interior footings not subject to frost action may be placed at a minimum depth of 18 inches below the slab subgrade.

## 5.6 FLOOR SLAB

Whitestone anticipates that the improved and approved on-site soils and/or controlled structural fill will be suitable for support of the proposed floor slab provided these materials are properly evaluated, recompacted and proofrolled in accordance with Sections 5.2, 5.3, and 5.11 of this report during favorable weather conditions. The upper 12 inches of floor slab subgrade should be improved by in-place compaction with a minimum 20-ton drum roller and/or overexcavation and replacement/recompaction of the natural site soils prior to structural support due to the relatively loose existing density/soft consistency of portions of the site soils. Areas of overexcavation of existing fill should be anticipated if exposed to precipitation and due to the inherent variability of the existing fill.

Any areas that become softened or disturbed as a result of wetting and/or repeated exposure to construction traffic should be removed and replaced with compacted structural backfill. The properly prepared on-site soils are expected to yield a minimum subgrade modulus (k) of 150 psi/in.

A minimum four-inch layer of coarse aggregate, such as AASHTO #57 stone, dense graded aggregate, or equal, should be installed below ground-supported floor slabs to provide a capillary break. An impervious membrane also should be provided as a moisture vapor barrier beneath all floor slabs.

## 5.7 PAVEMENT DESIGN CRITERIA

**General:** Whitestone anticipates that improved and approved on-site soils and/or compacted structural fill and/or backfill placed to raise or restore design elevations are expected to be suitable for support of the proposed pavements provided these materials are properly evaluated, compacted, and proofrolled in accordance with Sections 5.2, 5.3, and 5.11 of this report during favorable weather conditions. Areas of in-place compaction and/or overexcavation and replacement/recompaction of the natural site soils should be anticipated prior to structural support due to the relatively loose existing density/soft consistency of the upper site natural soils and the inherent variability of the existing fill.

**Design Criteria:** A California Bearing Ratio value of 4.0 has been assigned to the properly prepared subgrade soils for pavement design purposes. This value was correlated with pertinent soil support values and assumed traffic loads to prepare flexible and rigid pavement designs per the AASHTO *Guide for the Design of Pavement Structures*.

Detailed traffic data has not been provided. The daily traffic estimates Whitestone utilized in the preliminary pavement section designs are based on the number of loading docks and spaces provided on the *Civil Plans*. The actual traffic data should be provided to Whitestone to confirm these assumptions.

The following preliminary design criteria and traffic loads were considered:

*Standard Duty Pavement* - Design life of 20 years, based on 18-kip equivalent single axle loads (ESAL) with a maximum load of 35,000 ESAL.

*Heavy Duty Pavement* - Design life of 20 years, based on 18-kip ESAL with a maximum load of 800,000 ESAL.

**Pavement Sections:** The recommended flexible pavement sections are presented below in tabular format:

| **FLEXIBLE PAVEMENT SECTIONS** | | | |
|---|---|---|---|
| **Layer** | **Material** | **Standard Duty Thickness (Inches)** | **Heavy Duty Thickness (Inches)** |
| Asphalt Surface | NYSDOT Type 7 or 7F Top | 1.5 | 2.5 |
| Asphalt Base | NYSDOT Type 3 Binder | 2.5 | 3.5 |
| Granular Subbase | NYSDOT Type 2 Subbase | 6.0 | 9.0 |

A rigid concrete pavement should be used to provide suitable support at areas of high traffic or severe turns (such as at loading areas and ingress/egress areas). The recommended rigid pavement is presented below in tabular format:

| **RIGID PAVEMENT SECTIONS** | | | |
|---|---|---|---|
| **Layer** | **Material** | **Standard Duty Thickness (Inches)** | **Heavy Duty Thickness (Inches)** |
| Surface | 4,000 psi air-entrained concrete | 5.0[1] | 8.0[1] |
| Base | NYSDOT Type 2 Subbase | 6.0 | 10.0 |

Note[1]: The outer edges of concrete pavements are susceptible to damage as trucks move from rigid pavement to adjacent flexible pavement. Therefore, the thickness at the outer two feet of the rigid concrete pavement should be 12 inches.

**Additional Design Considerations:** The pavement section thickness designs presented in this report are based on the design parameters detailed herein and are contingent on proper construction, inspection, and maintenance. Additional thickness may be required by local code. The designs are contingent on achieving the minimum soil support value in the field. To accomplish this requirement, all subgrade soil and supporting fill or backfill must be placed, compacted, and evaluated in accordance with Sections 5.2, 5.3, and 5.11 of this report. Proper drainage must be provided for the pavement structure including appropriate grading and surface water control.

The performance of the pavement also will depend on the quality of materials and workmanship. Whitestone recommends that NYSDOT standards for materials, workmanship, and maintenance be applied to this site. Project specifications should include verifying that the installed asphaltic concrete material composition is within tolerance for the specified materials and that the percentage of air voids of the installed pavement is within specified ranges for the respective materials. All rigid concrete pavements should be suitably air-entrained, jointed, and reinforced.

## 5.8 RETAINING WALLS/LATERAL EARTH PRESSURES

**General:** The proposed development will include a site retaining wall. While the design of the retaining structures are beyond Whitestone's current scope of work, Whitestone would be pleased to assist with the calculation of lateral earth pressures based on the soil parameters presented herein during the structural design phase when final grading and wall geometries are available.

**Lateral Earth Pressure:** Temporary retaining structures and/or permanent retaining/below-grade walls may be required to resist lateral earth pressures. Proposed retaining/below-grade walls must be capable of withstanding active and at-rest earth pressures. Retaining/below-grade walls free to rotate generally can be designed to resist active earth pressures.

Retaining/below-grade walls corners and restrained walls need to be designed to resist at-rest earth pressures. Such structures should be properly designed by the Owner's engineer. The following soil parameters apply to the encountered subsurface strata and imported granular materials and may be used for design of the any proposed temporary and permanent retaining structures.

| LATERAL EARTH PRESSURE PARAMETERS | | |
|---|---|---|
| **Parameter** | **Granular Site Soils** | **Imported Fill Materials** |
| Moist Density ($\gamma_{moist}$) | 135 pcf | 140 pcf |
| Internal Friction Angle ($\varphi$) | 26° | 30° |
| Active Earth Pressure Coefficient ($K_a$) | 0.39 | 0.33 |
| Passive Earth Pressure Coefficient ($K_p$) | 2.56 | 3.00 |
| At-Rest Earth Pressure Coefficient ($K_o$) | 0.56 | 0.50 |

Lateral earth pressure will depend on the backfill slope angle and the wall batter angle. A sloped backfill will add surcharge load and affect the angle of the resultant force. The effect of other surcharges will also need to be included in earth pressure calculations, including the loads imposed by adjacent structures and traffic. The effects of proposed sloped backfill surface grades, and proposed slopes beyond the toe of the retaining structure, if applicable, must be considered when calculating resultant forces to be resisted by the retaining structure. A coefficient of friction of 0.35 against sliding can be used for concrete on the existing site soils. Retaining/below-grade wall footings should be designed so that the combined effect of vertical and horizontal resultants and overturning moment does not exceed the maximum soil bearing capacity provided in Section 5.5.

**Backfill Criteria:** Whitestone recommends that granular soils be used to backfill behind the proposed below-grade walls. The granular backfill materials should consist of clean, relatively well graded sand or gravel with a maximum particle size of three inches and five percent to 15 percent of material finer than a #200 sieve. The material should be free of clay lumps, organics, and deleterious material. Portions of the on-site soils encountered consisted of poorly graded sand (USCS: SP and SP-SM) and are anticipated to be suitable for retaining wall backfill. The site soils with an appreciable amount of fines (USCS: SM and SC) may not be suitable for retaining/below-grade wall backfill unless approved by the wall designer. Clayey and/or silty soils should not be used as retaining wall backfill. Accordingly, imported granular soils may be required. The maximum densities in the table above should not be exceeded to avoid creating excessive lateral pressure on the walls during compaction operations.

Whitestone recommends that backfill directly behind any walls be compacted with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within a zone of influence measured at a 45-degree angle from the base of the walls during backfilling to avoid developing excessive temporary or long-term lateral soil pressures.

**Wall Drainage:** Positive gravity drainage of the backfill should be provided at the base of the retaining/below-grade walls by a series of perforated pipes surrounded by at least 18 inches of clean crushed stone that discharges into a stormwater sewer or daylights to appropriate site surface drainage. Whitestone recommends that a two-foot wide zone of clean crushed stone or washed sand, separated from the backfill by a filter fabric, be constructed adjacent to the back of the wall. This zone should prevent the buildup of hydrostatic pressures and pressures from freezing moisture in the backfill above the groundwater level. The vertical drain should be tied into the gravity drainage system (perforated pipe) installed at the base of the wall. Alternatively, retaining/below-grade walls may include weep holes instead of a drain tied to the site drainage system. Where wall drainage is not provided, the wall should be designed to withstand full hydrostatic pressure.

Whitestone should be notified if any other retaining structures or design considerations requiring lateral earth pressure estimations are proposed. Specific recommendations for temporary retaining structures are beyond Whitestone's scope of work.

## 5.9 SEISMIC AND LIQUEFACTION CONSIDERATIONS

The soils encountered during this investigation are most consistent with a Site Class D defined by the *2022 New York State Building Code*. Based on the seismic zone and soil profile, liquefaction considerations are not expected to have a substantial impact on design.

## 5.10 EXCAVATIONS

The soils encountered during this investigation within anticipated excavation depths are, at least, consistent with Type C Soil Conditions as defined by 29 CFR Part 1926 (OSHA) which require a maximum unbraced excavation angle of 1.5:1 (horizontal:vertical). Actual conditions encountered during construction should be evaluated by a competent person (as defined by OSHA) to ensure that safe excavation methods and/or shoring and bracing requirements are implemented.

## 5.11 SUPPLEMENTAL POST INVESTIGATION SERVICES

**Construction Monitoring and Testing**: The owner's geotechnical engineer with specific knowledge of the subsurface conditions and design recommendations should conduct inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be conducted to verify that the existing surface cover materials are properly removed, suitable materials are used for controlled fill and that they are properly placed and compacted over suitable subgrade soils. The improvement of loose/soft soils and proofrolling of all subgrades prior to foundation, floor slab, and pavement support should be witnessed and documented by the owner's geotechnical engineer.

## 5.12 SWM AREA EVALUATION

**General:** Soil profile pits SPP-1 through SPP-10 were conducted within accessible areas of the anticipated SWM facility locations provided by Langan. The soil profile pits conducted within the above areas were terminated at depths ranging from approximately 11 fbgs to 12 fbgs.

**Estimated Seasonal High Groundwater Levels:** The methods used in determining the seasonal high groundwater level include evaluating the soil morphology within a test excavation and identifying irregular spots or blotches of different colors or minerals unlike that of the surrounding soil (mottles). A summary of the estimated seasonal high groundwater observations, where encountered, as well as infiltration test results are included in the following table.

| INFILTRATION TEST SUMMARY | | | | | |
|---|---|---|---|---|---|
| **Profile Pit #** | **Surface Elevation (feet*)** | **ESHGW (fbgs/feet*)** | **USDA Classification @ Test** | **Infiltration Test** | |
| | | | | **Depth (fbgs/feet*)** | **Rate (in/hour)** |
| SPP-1 | 24.0 | 9.0 / 15.0 | Sandy Clay Loam | 5.0 / 19.0 | 0.0 |
| SPP-2 | 25.0 | 8.0 / 17.0 | Sandy Clay Loam | 5.0 / 20.0 | 0.0 |
| SPP-3 | 27.0 | 7.0 / 20.0 | Sandy Clay Loam | 5.0 / 22.0 | 0.0 |
| SPP-4 | 26.0 | 4.0 / 22.0 | Sandy Clay Loam | 2.0 / 24.0 | 0.0 |
| SPP-5 | 26.0 | 9.0 / 17.0 | Sandy Clay | 5.0 / 21.0 | 0.0 |
| SPP-6 | 25.0 | Not Encountered | Sandy Clay Loam | 5.0 / 20.0 | 0.0 |
| SPP-7 | 25.0 | Not Encountered | Clay | 5.0 / 20.0 | 0.0 |
| SPP-8 | 25.0 | Not Encountered | Sandy Clay Loam | 5.0 / 20.0 | 0.0 |
| SPP-9 | 32.0 | Not Encountered | Silt Loam | 5.0 / 27.0 | 0.5 |
| SPP-10 | 32.0 | Not Encountered | Sandy Clay Loam | 6.0 / 26.0 | 0.0 |

* datum not specified

**Soil Infiltration Rates:** Falling head infiltration tests were conducted within the proposed SWM areas at profile pit SPP-1 through SPP-10. The tests resulted in infiltration rates ranging from 0.0 inches per hour (iph) to 0.5 iph. Detailed infiltration test results are provided in Appendix C, Soil Profile Pit Logs are included in Appendix A.

# SECTION 6.0
# General Comments

Supplemental recommendations may be required upon finalization of construction plans or if significant changes are made in the characteristics or location of the proposed structures. Soil bearing conditions should be checked at the appropriate time for consistency with those conditions encountered during Whitestone's geotechnical investigation.

The possibility exists that conditions between borings and test pits may differ from those at specific test locations, and conditions may not be as anticipated by the designers or contractors. In addition, the construction process may alter soil and rock conditions. Therefore, experienced geotechnical personnel should observe and document the construction procedures used and the conditions encountered.

The recommendations presented herein should be utilized by a qualified engineer in preparing the project plans and specifications. The engineer should consider these recommendations as minimum physical standards which may be superseded by local and regional building codes and structural considerations. These recommendations are prepared for the sole use of Johnson Development Associates, Inc. for the specific project detailed and should not be used by any third party. These recommendations are relevant to the design phase and should not be substituted for construction specifications.

Whitestone assumes that a qualified contractor will be employed to conduct the construction work, and that the contractor will be required to exercise care to ensure all excavations are conducted in accordance with applicable regulations and good practice. Particular attention should be paid to avoiding damaging or undermining adjacent properties and maintaining slope stability.

Whitestone recommends that the services of the geotechnical engineer be engaged to test and evaluate the soils in the footing excavations prior to concreting in order to determine that the soils will support the bearing capacities. Monitoring and testing also should be conducted to verify that suitable materials are used for controlled fills and that they are properly placed and compacted over suitable subgrade soils.

The exploration and analysis of the foundation conditions reported herein are considered sufficient in detail and scope to form a reasonable basis for the foundation design. The recommendations submitted for the proposed construction are based on the available soil information and the preliminary design details furnished by Johnson Development Associates, Inc. If deviations from the noted subsurface conditions are encountered during construction, they should be brought to the attention of the geotechnical engineer.

*The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been promulgated after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology. No other warranties are implied or expressed.*

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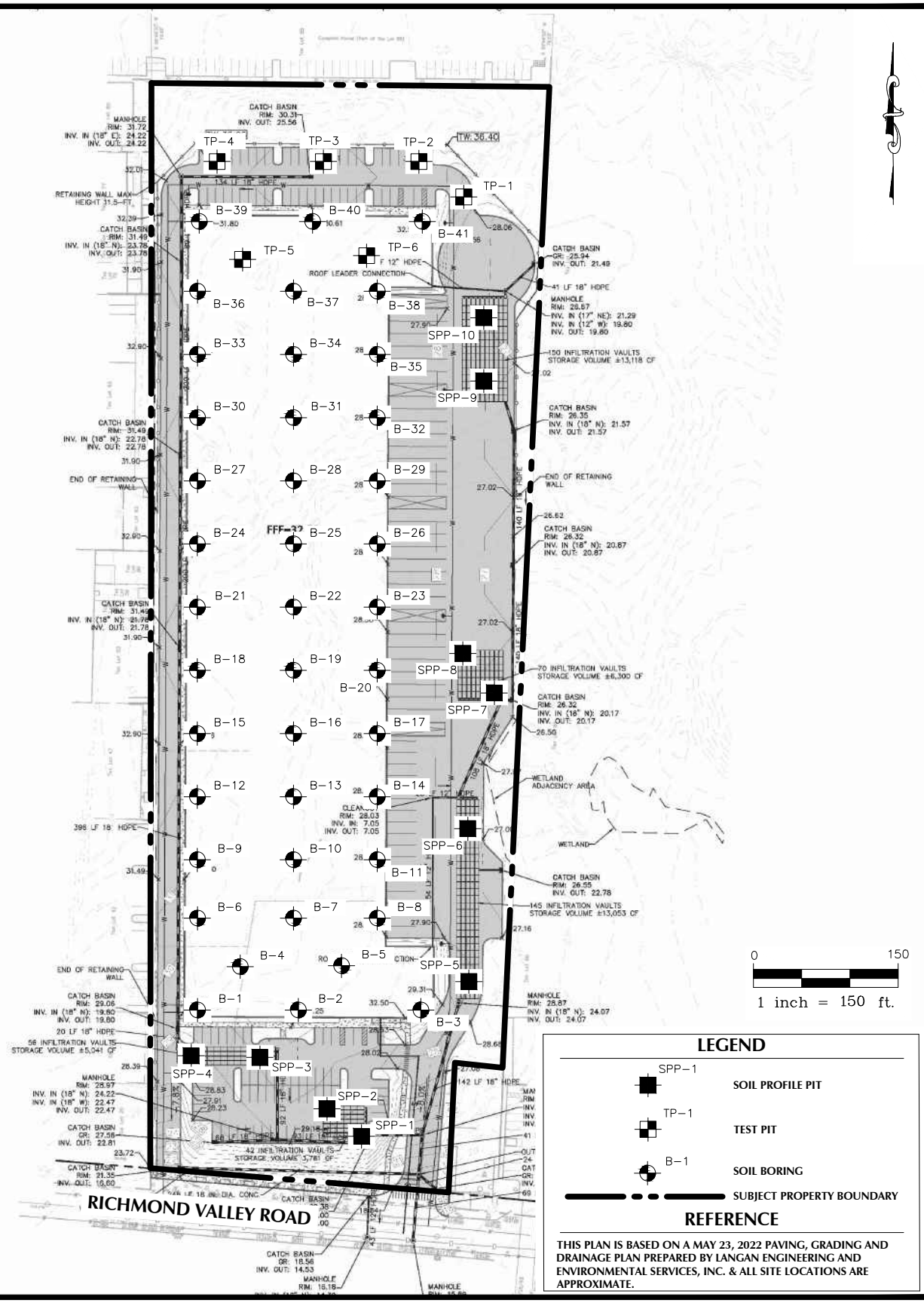
# FIGURE 1
# Test Location Plan




## LEGEND

- SPP-1 — SOIL PROFILE PIT
- TP-1 — TEST PIT
- B-1 — SOIL BORING
- SUBJECT PROPERTY BOUNDARY

## REFERENCE

THIS PLAN IS BASED ON A MAY 23, 2022 PAVING, GRADING AND DRAINAGE PLAN PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC. & ALL SITE LOCATIONS ARE APPROXIMATE.

| | |
|---|---|
| PROJECT #: | GJ2219649.Y00 |
| DESIGNED BY: | GR |
| PROJ. MGR.: | MK |
| DATE: | 11/8/22 |
| FIGURE: | 1 |
| SCALE: | 1" = 150' |

DRAWING TITLE: **TEST LOCATION PLAN**

CLIENT: **JOHNSON DEVELOPMENT ASSOCIATES, INC.**

PROJECT:
PROPOSED WAREHOUSE
RICHMOND VALLEY ROAD
STATEN ISLAND, RICHMOND COUNTY, NY


WHITESTONE
*An Employee-Owned Company*
30 INDEPENDENCE BOULEVARD, SUITE 250, WARREN, NJ 07059
908.668.7777 WHITESTONEASSOC.COM

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# APPENDIX A
# Records of Subsurface Exploration

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# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-1



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 27.0 feet | **Date Started:** | 10/18/2022 |
| **Termination Depth:** | 27.0 feet bgs | **Date Completed:** | 10/18/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|
| **During:** | 7.0 \| 20.0 | | |
| **At Completion:** | --- \| --- | **At Completion:** | --- \| --- |
| **24 Hours:** | NE \| --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | | | | |
| | | | | | | 0.5 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | X | 1 - 2 - 1 - 2 | 18 | 3 | | GLACIAL DEPOSITS | | Brown Poorly Graded Sand, Moist, Very Loose (SP) (NYC Class 3b) | |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | X | 2 - 2 - 3 - 5 | 18 | 5 | | | | Brown Silty Sand, Moist, Loose (SM) (NYC Class 3b) | |
| | | | | | | 4.0 | | | | |
| 4 - 6 | S-3 | X | 2 - 4 - 3 - 2 | 15 | 7 | 5.0 | | | Brown Poorly Graded Sand, Moist, Loose (SP) (NYC Class 3b) | |
| | | | | | | 6.0 | | | | |
| 6 - 8 | S-4 | X | 5 - 8 - 7 - 8 | 22 | 15 | | | | Brown Clayey Sand, Very Moist, Medium Dense (SC) (NYC Class 3b) | |
| | | | | | | 8.0 | | | | |
| 8 - 10 | S-5 | X | 7 - 5 - 7 - 8 | 24 | 12 | | | | As Above, Wet (SC) (NYC Class 3b) | |
| | | | | | | 10.0 | | | | |
| 10 - 12 | S-6 | X | 2 - 2 - 5 - 6 | 24 | 7 | | | | As Above, Loose (SC) (NYC Class 3b) | |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | X | 20 - 16 - 17 - 21 | 6 | 33 | | | | As Above, Dense (SC) (NYC Class 3b) | |
| | | | | | | 20.0 | | | | |
| 20 - 22 | S-8 | X | 18 - 20 - 18 - 18 | 4 | 38 | | | | Brown Lean Clay, Moist, Stiff (CL) (NYC Class 4b) | Qu = 1.0 tsf |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-1(2)



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | Water Depth \| Elevation (feet bgs) \| (feet) | Cave-In Depth \| Elevation (feet bgs) \| (feet) |
|---|---|---|---|---|---|
| **Surface Elevation:** | ± 27.0 feet | **Date Started:** | 10/18/2022 | | |
| **Termination Depth:** | 27.0 feet bgs | **Date Completed:** | 10/18/2022 | | |
| **Proposed Location:** | Building | **Logged By:** | MO | **During:** 7.0 \| 20.0 | |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG | **At Completion:** --- \| --- | **At Completion:** --- \| --- |
| | | **Equipment:** | AMS-Tracked | **24 Hours:** NE \| --- | **24 Hours:** NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 25.0 | | | | |
| 25 - 27 | S-9 | X | 18 - 32 - 17 - 12 | 21 | 49 | | GLACIAL DEPOSITS | | As Above, Brown Sandy Lean Clay, Very Moist to Wet, Medium Stiff (CL) (NYC Class 4c) | Qu = 0.75 tsf |
| | | | | | | 27.0 | | | Boring Log B-1 Terminated at a Depth of 27.0 Feet Below Ground Surface | |
| | | | | | | 30.0 | | | | |
| | | | | | | 35.0 | | | | |
| | | | | | | 40.0 | | | | |
| | | | | | | 45.0 | | | | |
| | | | | | | 50.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-2

Page 1 of 1

| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | Water Depth \| Elevation (feet bgs) \| (feet) | Cave-In Depth \| Elevation (feet bgs) \| (feet) |
|---|---|---|---|---|---|
| **Surface Elevation:** | ± 28.0 feet | **Date Started:** | 10/25/2022 | | |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/25/2022 | | |
| **Proposed Location:** | Building | **Logged By:** | MO | **During:** 7.0 \| 21.0 | |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG | **At Completion:** NE \| --- | **At Completion:** 16.0 \| 12.0 |
| | | **Equipment:** | AMS-Tracked | **24 Hours:** NE \| --- | **24 Hours:** NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | | | | |
| | | | | | | 0.5 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 12 - 7 - 5 - 14 | 18 | 12 | | FILL | | Brown Silty Clay with Fine Gravel, Moist (FILL) (NYC Class 7) | |
| | | | | | | 2.0 | GLACIAL DEPOSITS | | | |
| 2 - 4 | S-2 | | 19 - 12 - 14 - 16 | 18 | 26 | | | | Brown Poorly Graded Sand, Moist, Medium Dense (SP) (NYC Class 3b) | |
| | | | | | | 4.0 | | | | |
| 4 - 6 | S-3 | | 9 - 6 - 7 - 4 | 24 | 13 | 5.0 | | | Brown Silty Sand, Very Moist, Medium Dense (SM) (NYC Class 3b) | |
| 6 - 8 | S-4 | | 3 - 3 - 1 - 1 | 24 | 4 | | | | Brown Poorly Graded Sand with Silt, Moist, Very Loose (SP-SM) (NYC Class 3b) | |
| | | | | | | 8.0 | | | | |
| 8 - 10 | S-5 | | 3 - 3 - 5 - 5 | 24 | 8 | | | | Gray/Brown Sandy Lean Clay,Wet, Stiff (CL) (NYC Class 4b) | Qu = 1.25 tsf |
| | | | | | | 10.0 | | | | |
| | | | | | | | | | | |
| | | | | | | 13.0 | | | | |
| 13 - 15 | S-6 | | 3 - 4 - 5 - 6 | 24 | 9 | | | | Brown Silty Clay with Gravel, Wet, Stiff (CL-ML) (NYC Class 4a) | Qu = 1.5 tsf |
| | | | | | | 15.0 | | | | |
| | | | | | | | | | | |
| 18 - 20 | S-7 | | 10 - 17 - 18 - 19 | 6 | 35 | | | | As Above, Hard (CL-ML) (NYC Class 4a) | |
| | | | | | | 20.0 | | | | |
| | | | | | | | | | Boring Log B-2 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-3



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 27.0 feet | **Date Started:** | 10/25/2022 |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/25/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | 6.0 | 21.0 | | |
| **At Completion:** | NE | --- | **At Completion:** | 12.0 \| 15.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | | | | |
| | | | | | | 0.5 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 30 - 17 - 11 - 17 | 18 | 28 | | FILL | | Dark Brown Silty Clay with Gravel (FILL) (NYC Class 7) | |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | 19 - 19 - 17 - 16 | 18 | 36 | | GLACIAL DEPOSITS | | Brown Poorly Graded Sand, Moist, Dense (SP) (NYC Class 3a) | |
| | | | | | | 4.0 | | | | |
| 4 - 6 | S-3 | | 8 - 8 - 7 - 6 | 18 | 15 | 5.0 | | | Light Brown Silty Sand, Wet, Medium Dense (SM) (NYC Class 3b) | |
| | | | | | | 6.0 | | | | |
| 6 - 8 | S-4 | | WOH - 1 - 1 - 2 | 24 | 2 | | | | Yellow /Brown Sandy Lean Clay, Wet, Soft (CL) (NYC Class 4c) | |
| | | | | | | 8.0 | | | | |
| 8 - 10 | S-5 | | 5 - 7 - 6 - 6 | 24 | 13 | | | | Brown Silty Clay with Gravel, Wet, Very Stiff (CL-ML) (NYC Class 4b) | Qu = 2.25 tsf |
| | | | | | | 10.0 | | | | |
| 13 - 15 | S-6 | | 4 - 3 - 4 - 7 | 12 | 7 | | | | As Above, Stiff (CL-ML) (NYC Class 4b) | Qu = 2.0 tsf |
| | | | | | | 15.0 | | | | |
| 18 - 20 | S-7 | | 8 - 8 - 10 - 12 | NR | 18 | | | | No Recovery, Presumed as above (CL) (NYC Class 4b) | |
| | | | | | | 20.0 | | | | |
| | | | | | | | | | Boring Log B-3 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-4

Page 1 of 1

| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 29.0 feet | **Date Started:** | 10/25/2022 |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/25/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | --- | --- | | |
| **At Completion:** | --- | --- | **At Completion:** | 16.0 \| 13.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | | | | |
| 0 - 2 | S-1 | | 7 - 9 - 6 - 4 | 6 | 15 | | PAVEMENT | | 6" Asphalt<br>18" Subbase | |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | 4 - 4 - 5 - 5 | 10 | 9 | | GLACIAL DEPOSITS | | Brown Poorly Graded Sand, Moist, Loose (SP) (NYC Class 3b) | |
| | | | | | | 4.0 | | | | |
| 4 - 6 | S-3 | | 4 - 4 - 7 - 5 | 18 | 11 | 5.0 | | | Brown Silty Sand, Moist, Medium Dense (SM) (NYC Class 3b) | |
| | | | | | | 6.0 | | | | |
| 6 - 8 | S-4 | | 6 - 7 - 11 - 14 | 24 | 18 | | | | Brown Lean Clay, Moist, Very Stiff (CL) (NYC Class 4b) | Qu = 3.25 tsf |
| 8 - 10 | S-5 | | 12 - 30 - 17 - 18 | 18 | 47 | | | | As Above with Fine Gravel, Hard (CL) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 10.0 | | | | |
| | | | | | | 13.0 | | | | |
| 13 - 15 | S-6 | | 13 - 9 - 10 - 12 | 6 | 19 | | | | Brown Silty Clay with Gravel, Moist, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 15.0 | | | | |
| 18 - 20 | S-7 | | 6 - 8 - 8 - 10 | 5 | 16 | | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 20.0 | | | | |
| | | | | | | | | | Boring Log B-4 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-5

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 28.0 feet | **Date Started:** | 10/25/2022 |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/25/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | NE | --- | | |
| **At Completion:** | NE | --- | **At Completion:** | 13.0 \| 15.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | PAVEMENT | | 6" Asphalt | |
| 0 - 2 | S-1 | | 4 - 6 - 2 - 2 | 18 | 8 | | FILL | | Brown Silt with Fine Gravel, Moist (FILL) (NYC Class 7) | Qu = >4.0 tsf |
| | | | | | | 2.0 | GLACIAL DEPOSITS | | | |
| 2 - 4 | S-2 | | 2 - 3 - 2 - 4 | 18 | 5 | | | | Light Poorly Graded Brown Sand, Moist, Loose (SP) (NYC Class 3b) | |
| | | | | | | 4.0 | | | | |
| 4 - 6 | S-3 | | 3 - 3 - 4 - 2 | 24 | 7 | 5.0 | | | Brown Silty Sand, Moist, Loose (SM) (NYC Class 3b) | |
| | | | | | | 6.0 | | | | |
| 6 - 8 | S-4 | | 3 - 3 - 3 - 5 | 24 | 6 | | | | Brown/Gray Clay, Moist, Medium Stiff (CL) (NYC Class 4c) | Qu = 0.75 tsf |
| 8 - 10 | S-5 | | 3 - 3 - 4 - 4 | 18 | 7 | | | | As Above, Stiff (CL) (NYC Class 4b) | Qu = 1.5 tsf |
| | | | | | | 10.0 | | | | |
| 13 - 15 | S-6 | | 4 - 5 - 7 - 10 | 24 | 12 | | | | As Above, Very Stiff (CL) (NYC Class 4b) | Qu = 3.5 tsf |
| | | | | | | 15.0 | | | | |
| | | | | | | 18.0 | | | | |
| 18 - 20 | S-7 | | 6 - 7 - 7 - 10 | 6 | 14 | | | | Brown Clayey Sand, Moist, Medium Dense (SC) (NYC Class 3b) | |
| | | | | | | 20.0 | | | | |
| | | | | | | | | | Boring Log B-5 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-6

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 30.0 feet | **Date Started:** | 10/18/2022 |
| **Termination Depth:** | 22.0 feet bgs | **Date Completed:** | 10/18/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | 7.0 | 23.0 | | |
| **At Completion:** | --- | --- | **At Completion:** | --- \| --- |
| **24 Hours:** | NE | --- | **24 Hours:** | --- \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | | | | |
| | | | | | | 0.5 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 9 - 4 - 2 - 2 | 12 | 6 | | GLACIAL DEPOSITS | | Brown Sandy Silt, Moist, Soft (ML) (NYC Class 5b) | Qu = 0.5 tsf |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | 2 - 2 - 2 - 2 | 18 | 4 | | | | Brown Poorly Graded Sand, Moist, Very Loose (SP) (NYC Class 3b) | |
| 4 - 6 | S-3 | | 6 - 3 - 4 - 5 | 12 | 7 | 5.0 | | | As Above, Loose (SP) (NYC Class 3b) | |
| | | | | | | 6.0 | | | | |
| 6 - 8 | S-4 | | 3 - 2 - 3 - 3 | 22 | 5 | | | | Brown Silty Sand, Wet, Loose (SM) (NYC Class 3b) | |
| | | | | | | 8.0 | | | | |
| 8 - 10 | S-5 | | 3 - 5 - 2 - 7 | 22 | 7 | | | | Brown Lean Clay with Gravel, Wet, Medium Stiff (CL) (NYC Class 4c) | Qu = 1.5 tsf |
| | | | | | | 10.0 | | | | |
| 10 - 12 | S-6 | | 6 - 5 - 7 - 7 | 24 | 12 | | | | As Above, Stiff (CL) (NYC Class 4b) | Qu = 2.25 tsf |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | | 5 - 6 - 11 - 15 | 21 | 17 | | | | As Above, Very Stiff (CL) (NYC Class 4b) | Qu = 3.75 tsf |
| | | | | | | 20.0 | | | | |
| 20 - 22 | S-8 | | 26 - 29 - 36 - 50 | 2 | 65 | | | | As Above, Hard (CL) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 22.0 | | | | |
| | | | | | | | | | Boring Log B-6 Terminated at a Depth of 22.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-7

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 30.0 feet | **Date Started:** | 10/25/2022 |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/25/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | NE | --- | | |
| **At Completion:** | NE | --- | **At Completion:** | 17.0 \| 13.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | | | | |
| 0 - 2 | S-1 | | 7 - 7 - 4 - 3 | 6 | 11 | | PAVEMENT | | 6" Asphalt<br>18" Subbase | |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | 5 - 5 - 5 - 6 | 18 | 10 | | GLACIAL DEPOSITS | | Brown Poorly Graded Sand, Moist, Medium Dense (SP) (NYC Class 3b) | |
| | | | | | | 4.0 | | | | |
| 4 - 6 | S-3 | | 4 - 3 - 48 - 8 | 14 | 51 | 5.0 | | | Brown/Gray Sandy Clay, Moist, Stiff (CL) (NYC Class 4b) | Qu = 2.25 tsf |
| 6 - 8 | S-4 | | 8 - 11 - 15 - 14 | 24 | 26 | | | | As Above, Hard (CL) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 8.0 | | | | |
| 8 - 10 | S-5 | | 10 - 15 - 15 - 14 | 24 | 30 | | | | As Above, Brown with Gravel, Stiff (CL) (NYC Class 4b) | Qu = 2.25 tsf |
| | | | | | | 10.0 | | | | |
| | | | | | | 13.0 | | | | |
| 13 - 15 | S-6 | | 5 - 15 - 15 - 17 | 24 | 30 | | | | Brown Silty Clay with Fine Gravel, Moist, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 15.0 | | | | |
| 18 - 20 | S-7 | | 19 - 30 - 36 - 30 | 12 | 66 | | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 20.0 | | | | |
| | | | | | | | | | Boring Log B-7 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-8

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 28.0 feet | **Date Started:** | 10/24/2022 |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/24/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | 13.0 | --- | | |
| **At Completion:** | NE | --- | **At Completion:** | 18.0 \| 10.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | | | | |
| 0 - 2 | S-1 | | 8 - 13 - 9 - 6 | 14 | 22 | | FILL | | Dark Brown Silty Clay with Gravel, Moist (FILL) (NYC Class 7) | RCA |
| 2 - 4 | S-2 | | 8 - 6 - 4 - 4 | 10 | 10 | 3.0 | | | As Above (FILL) (NYC Class 7) | |
| 4 - 6 | S-3 | | 2 - 3 - 7 - 7 | 24 | 10 | 5.0 | GLACIAL DEPOSITS | | Brown Silty Clay, Very Moist, Medium Stiff (CL-ML) (NYC Class 4c) | Qu = 1.5 tsf |
| 6 - 8 | S-4 | | 6 - 9 - 13 - 9 | 24 | 22 | | | | As Above, Stiff (CL-ML) (NYC Class 4b) | Qu = 2.0 tsf |
| 8 - 10 | S-5 | | 6 - 6 - 6 - 8 | 24 | 12 | 10.0 | | | Brown Clayey Sand, Moist, Medium Dense (SC) (NYC Class 3b) | Qu = 2.0 tsf |
| | | | | | | | | | | |
| 13 - 15 | S-6 | | 4 - 6 - 7 - 10 | 22 | 13 | 15.0 | | | Brown Silty Clay, Wet, Medium Stiff (CL-ML) (NYC Class 4c) | Qu = 1.0 tsf |
| | | | | | | | | | | |
| 18 - 20 | S-7 | | 7 - 5 - 6 - 9 | 24 | 11 | 20.0 | | | As Above (CL-ML) (NYC Class 4c) | Qu = 2.0 tsf |
| | | | | | | | | | Boring Log B-8 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-9

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± NS feet | **Date Started:** | 10/18/2022 |
| **Termination Depth:** | 22.0 feet bgs | **Date Completed:** | 10/18/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth (feet bgs) \| Elevation (feet) | | Cave-In Depth (feet bgs) \| Elevation (feet) | |
|---|---|---|---|
| **During:** | 7.0 \| --- | | |
| **At Completion:** | --- \| --- | **At Completion:** | --- \| --- |
| **24 Hours:** | --- \| --- | **24 Hours:** | --- \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | | | | |
| | | | | | | 0.5 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | X | 9 - 4 - 2 - 2 | 16 | 6 | | GLACIAL DEPOSITS | | Brown Poorly Graded Sand with Gravel, Moist, Loose (SP) (NYC Class 3b) | |
| 2 - 4 | S-2 | X | 3 - 4 - 4 - 4 | 20 | 8 | | | | As Above (SP) (NYC Class 3b) | |
| 4 - 6 | S-3 | X | 2 - 4 - 3 - 3 | 18 | 7 | 5.0 | | | As Above (SP) (NYC Class 3b) | |
| 6 - 8 | S-4 | X | 4 - 4 - 5 - 3 | 24 | 9 | | | | As Above, Wet (SP) (NYC Class 3b) | |
| | | | | | | 8.0 | | | | |
| 8 - 10 | S-5 | X | WOH 24 | 24 | <2 | | | | Dark Gray Clayey Sand, Wet, Very Loose (SC) (NYC Class 3b) | Weight of Hammer |
| | | | | | | 10.0 | | | | |
| 10 - 12 | S-6 | X | 3 - 4 - 7 - 8 | 24 | 11 | | | | As Above, Medium Dense (SC) (NYC Class 3b) | |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | X | 8 - 9 - 8 - 9 | 24 | 17 | | | | Brown Lean Clay, Wet, Medium Stiff (CL) (NYC Class 4c) | Qu = 1.0 tsf |
| | | | | | | 20.0 | | | | |
| 20 - 22 | S-8 | X | 8 - 9 - 11 - 8 | 16 | 20 | | | | As Above with Gravel, Hard (CL) (NYC Class 4a) | Qu = 4.0 tsf |
| | | | | | | 22.0 | | | Boring Log B-9 Terminated at a Depth of 22.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-10



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | Water Depth \| Elevation (feet bgs) \| (feet) | Cave-In Depth \| Elevation (feet bgs) \| (feet) |
|---|---|---|---|---|---|
| **Surface Elevation:** | ± 31.0 feet | **Date Started:** | 10/24/2022 | | |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/24/2022 | | |
| **Proposed Location:** | Building | **Logged By:** | MO | **During:** --- \| --- | |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG | **At Completion:** --- \| --- | **At Completion:** 17.0 \| 14.0 |
| | | **Equipment:** | AMS-Tracked | **24 Hours:** NE \| --- | **24 Hours:** NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 1 - 2 - 1 - 2 | 15 | 3 | | GLACIAL DEPOSITS | | Brown Poorly Graded Sand, Moist, Very Loose (SP) (NYC Class 3b) | |
| 2 - 4 | S-2 | | 3 - 4 - 5 - 6 | 15 | 9 | 4.0 | | | As Above, Loose (SP) (NYC Class 3b) | |
| 4 - 6 | S-3 | | 4 - 6 - 5 - 5 | 19 | 11 | 5.0 6.0 | | | Light Brown Silty Clay, Moist, Medium Stiff (CL-ML) (NYC Class 4c) | Qu = 1.75 tsf |
| 6 - 8 | S-4 | | 5 - 7 - 7 - 10 | 13 | 14 | 8.0 | | | Light Brown Silty Sand, Moist, Medium Dense (SM) (NYC Class 3b) | |
| 8 - 10 | S-5 | | 5 - 6 - 7 - 8 | 24 | 13 | 10.0 | | | Brown Sandy Silt, Moist, Medium Stiff (ML) (NYC Class 4c) | Qu = 0.75 tsf |
| 13 - 15 | S-6 | | 8 - 13 - 17 - 21 | 20 | 30 | 15.0 | | | As Above, with Gravel, Very Stiff (ML) (NYC Class 4b) | Qu = 3.5 tsf |
| 18 - 20 | S-7 | | 6 - 13 - 17 - 23 | 24 | 30 | 20.0 | | | As Above, Hard (ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 25.0 | | | Boring Log B-10 Terminated at a Depth of 20.0 Feet Below Ground Surface | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-11

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 29.0 feet | **Date Started:** | 10/24/2022 |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/24/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | --- | --- | | |
| **At Completion:** | --- | --- | **At Completion:** | 16.0 \| 13.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | | | | |
| 0 - 2 | S-1 | | 5 - 3 - 2 - 1 | 13 | 5 | | TOPSOIL | | 36" Topsoil | |
| 2 - 4 | S-2 | | 5 - 4 - 3 - 3 | 4 | 7 | 3.0 | GLACIAL DEPOSITS | | | |
| 4 - 6 | S-3 | | 5 - 6 - 6 - 7 | - | 12 | 5.0 | | | Brown/Gray Lean Clay with Sand, Moist, Very Stiff (CL-ML) (NYC Class 4b) | Qu = 3.25 tsf |
| 6 - 8 | S-4 | | 9 - 13 - 17 - 12 | 20 | 30 | 8.0 | | | As Above, Hard (CL) (NYC Class 4a) | Qu = >4.0 tsf |
| 8 - 10 | S-5 | | 11 - 14 - 15 - 19 | 24 | 29 | 10.0 | | | Brown Clayey Sand, Moist, Medium Dense (SC) (NYC Class 3b) | |
| | | | | | | 13.0 | | | | |
| 13 - 15 | S-6 | | 4 - 5 - 7 - 7 | 18 | 12 | 15.0 | | | Brown Lean Clay with Fine Gravel, Moist, Stiff (CL) (NYC Class 4b) | Qu = 2.5 tsf |
| | | | | | | | | | | |
| 18 - 20 | S-7 | | 2 - 4 - 2 - 2 | 12 | 6 | 20.0 | | | As Above, Medium Stiff (CL) (NYC Class 4c) | Qu = 1.25 tsf |
| | | | | | | | | | Boring Log B-11 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-12



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 32.0 feet | **Date Started:** | 10/18/2022 |
| **Termination Depth:** | 22.0 feet bgs | **Date Completed:** | 10/18/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|
| **During:** | 6.0 \| 26.0 | | |
| **At Completion:** | --- \| --- | **At Completion:** | --- \| --- |
| **24 Hours:** | NE \| --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 7 - 4 - 4 - 4 | - | 8 | | GLACIAL DEPOSITS | | Brown, Poorly Graded Sand, Moist, Loose (SP) (NYC Class 3b) | |
| 2 - 4 | S-2 | | 5 - 3 - 5 - 5 | 4 | 8 | | | | As Above (SP) (NYC Class 3b) | |
| | | | | | | 4.0 | | | | |
| 4 - 6 | S-3 | | 4 - 4 - 5 - 5 | 24 | 9 | 5.0 | | | Light Brown Silty Sand, Wet, Loose (SM) (NYC Class 3b) | |
| 6 - 8 | S-4 | | 6 - 6 - 2 - 1 | 24 | 8 | | | | As Above (SM) (NYC Class 3b) | |
| | | | | | | 8.0 | | | | |
| 8 - 10 | S-5 | | 2 - 3 - 5 - 7 | | 8 | | | | Dark Gray Sandy Lean Clay, Wet, Stiff (CL) (NYC Class 4b) | Qu = 2.5 tsf |
| | | | | | | 10.0 | | | | |
| 10 - 12 | S-6 | | 2 - 4 - 5 - 8 | 24 | 9 | | | | As Above, with Gravel, Medium Stiff (CL) (NYC Class 4c) | Qu = 1.0 tsf |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | | 7 - 6 - 10 - 10 | 20 | 16 | | | | As Above, Brown, Very Stiff (CL) (NYC Class 4b) | Qu = 3.5 tsf |
| | | | | | | 20.0 | | | | |
| 20 - 22 | S-8 | | 7 - 6 - 9 - 16 | 24 | 15 | 22.0 | | | As Above, Hard (CL) (NYC Class 4a) | Qu = 4.5 tsf |
| | | | | | | | | | Boring Log B-12 Terminated at a Depth of 22.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-13

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | Water Depth \| Elevation (feet bgs) \| (feet) | Cave-In Depth \| Elevation (feet bgs) \| (feet) |
|---|---|---|---|---|---|
| **Surface Elevation:** | ± 31.0 feet | **Date Started:** | 10/24/2022 | | |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/24/2022 | | |
| **Proposed Location:** | Building | **Logged By:** | MO | **During:** 8.0 \| 23.0 | |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG | **At Completion:** NE \| --- | **At Completion:** 16.0 \| 15.0 |
| | | **Equipment:** | AMS-Tracked | **24 Hours:** NE \| --- | **24 Hours:** NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 2 - 2 - 6 - 3 | 14 | 8 | | GLACIAL DEPOSITS | | Dark Brown Silty Clay, Moist, Medium Stiff (CL-ML) (NYC Class 4c) | With Roots |
| 2 - 4 | S-2 | | 3 - 4 - 7 - 5 | 6 | 11 | | | | As Above, Stiff (CL-ML) (NYC Class 4b) | |
| 4 - 6 | S-3 | | 4 - 1 - 1 - 3 | NR | 2 | 5.0 | | | No Recovery, Presumed as Above, Soft (CL-ML) (NYC Class 4c) | |
| 6 - 8 | S-4 | | 9 - 11 - 13 - 16 | 24 | 24 | 6.0 | | | As Above, Very Stiff (CL-ML) (NYC Class 4b) | Qu = 3.5 tsf |
| 8 - 10 | S-5 | | 9 - 11 - 11 - 12 | 24 | 22 | 8.0 | | | Light Brown Silty Sand with Fine Gravel, Wet, Medium Dense (SM) (NYC Class 3b) | |
| | | | | | | 10.0 | | | | |
| | | | | | | 13.0 | | | | |
| 13 - 15 | S-6 | | 3 - 3 - 4 - 5 | 15 | 7 | | | | Light Brown Silty Clay with Fine Gravel, Wet, Medium Stiff (CL-ML) (NYC Class 4c) | Qu = 1.75 tsf |
| | | | | | | 15.0 | | | | |
| 18 - 20 | S-7 | | 3 - 3 - 14 - 13 | 24 | 17 | | | | As Above, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 20.0 | | | Boring Log B-13 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-14



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 29.0 feet | **Date Started:** | 10/24/2022 |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/24/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|
| **During:** | --- \| --- | | |
| **At Completion:** | --- \| --- | **At Completion:** | 16.0 \| 13.0 |
| **24 Hours:** | NE \| --- | **24 Hours:** | NE \| --- |

| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | DEPTH (feet) | STRATA | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 0.0 | | | |
| 0 - 2 | S-1 | X | 3 - 4 - 3 - 4 | 24 | 7 | | TOPSOIL | 24" Topsoil | |
| | | | | | | 2.0 | | | |
| 2 - 4 | S-2 | X | 3 - 3 - 3 - 3 | 13 | 6 | | GLACIAL DEPOSITS | Dark Brown/Gray Silty Clay, Moist, Medium Stiff (CL-ML) (NYC Class 4c) | Qu = 1.25 tsf |
| | | | | | | 4.0 | | | |
| 4 - 6 | S-3 | X | 1 - WOH - WOH - 3 | 15 | <2 | 5.0 | | As Above, Very Moist, Very Soft (CL-ML) (NYC Class 4c) | Qu = 0.5 tsf |
| | | | | | | 6.0 | | | |
| 6 - 8 | S-4 | X | 6 - 8 - 11 - 13 | 15 | 19 | | | Light Brown Silty Sand, Moist, Medium Dense (SM) (NYC Class 3b) | |
| 8 - 10 | S-5 | X | 8 - 11 - 11 - 11 | 24 | 22 | | | As Above (SM) (NYC Class 3b) | |
| | | | | | | 10.0 | | | |
| | | | | | | 13.0 | | | |
| 13 - 15 | S-6 | X | 4 - 7 - 7 - 10 | 24 | 14 | | | Brown Silty Clay with Fine Gravel, Very Moist, Very Stff (CL-ML) (NYC Class 4b) | Qu = 3.25 tsf |
| | | | | | | 15.0 | | | |
| | | | | | | 18.0 | | | |
| 18 - 20 | S-7 | X | 8 - 10 - 11 - 13 | 20 | 21 | | | Brown Poorly Graded Sand, Moist, Medium Dense (SP) (NYC Class 3b) | |
| | | | | | | 20.0 | | | |
| | | | | | | | | Boring Log B-14 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-15

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 32.0 feet | **Date Started:** | 10/19/2022 |
| **Termination Depth:** | 21.0 feet bgs | **Date Completed:** | 10/19/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | --- | --- | | |
| **At Completion:** | --- | --- | **At Completion:** | 16.8 \| 15.2 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 11 - 6 - 4 - 4 | 18 | 10 | | GLACIAL DEPOSITS | | Light Brown Poorly Graded Sand, Moist, Medium Dense (SP) (NYC Class 3b) | |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | 4 - 4 - 8 - 8 | 24 | 12 | | | | Light Brown Silt, Moist, Hard (ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 4 - 6 | S-3 | | 15 - 11 - 13 - 9 | 24 | 24 | 5.0 | | | As Above with Gravel (ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 6 - 8 | S-4 | | 8 - 9 - 8 - 8 | 24 | 17 | | | | As Above (ML) (NYC Class 4a) | |
| | | | | | | 8.0 | | | | |
| 8 - 10 | S-5 | | 6 - 9 - 11 - 13 | 16 | 20 | | | | Brown Lean Clay with Gravel, Moist, Hard (CL) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 10.0 | | | | |
| 10 - 12 | S-6 | | 8 - 10 - 11 - 13 | 21 | 21 | | | | As Above (CL) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | | 9 - 4 - 2 - 8 | 24 | 6 | | | | As Above (CL) (NYC Class 4a) | Qu = 4.25 tsf |
| | | | | | | | | | | |
| 19 - 21 | S-8 | | 43 - 34 - 23 - 9 | 6 | 57 | 20.0 | | | As Above (CL) (NYC Class 4a) | |
| | | | | | | 21.0 | | | Boring Log B-15 Terminated at a Depth of 21.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-16



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 31.0 feet | **Date Started:** | 10/24/2022 | | **Water Depth \| Elevation (feet bgs) \| (feet)** | | **Cave-In Depth \| Elevation (feet bgs) \| (feet)** |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/24/2022 | | | | |
| **Proposed Location:** | Building | **Logged By:** | MO | **During:** | 10.0 \| 21.0 | | |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG | **At Completion:** | NE \| --- | **At Completion:** | --- \| --- |
| | | **Equipment:** | AMS-Tracked | **24 Hours:** | NE \| --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 2 - 2 - 1 - 2 | 12 | 3 | | GLACIAL DEPOSITS | | Dark Brown Silt, Moist, Soft (ML) (NYC Class 5b) | |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | 2 - 4 - 3 - 2 | 6 | 7 | | | | Brown Silty Clay with Gravel, Very Moist, Stiff (CL-ML) (NYC Class 4b) | Qu = 2.0 tsf |
| 4 - 6 | S-3 | | 2 - 4 - 7 - 8 | 18 | 11 | 5.0 | | | As Above, Very Stiff (CL-ML) (NYC Class 4b) | Qu = 3.5 tsf |
| 6 - 8 | S-4 | | 6 - 5 - 8 - 12 | 20 | 13 | | | | As Above, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 8 - 10 | S-5 | | 9 - 16 - 14 - 21 | 24 | 30 | | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 10.0 ▽ | | | | |
| | | | | | | 13.0 | | | | |
| 13 - 15 | S-6 | | 24 - 24 - 14 - 9 | 12 | 38 | | | | Brown Silty Clay with Gravel, Moist, Soft (CL-ML) (NYC Class 4c) | Qu = 0.5 tsf |
| | | | | | | 15.0 | | | | |
| 18 - 20 | S-7 | | 11 - 10 - 12 - 19 | NR | 22 | | | | No Recovery, Presumed As Above (CL-ML) (NYC Class 4c) | |
| | | | | | | 20.0 | | | | |
| | | | | | | | | | Boring Log B-16 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-17

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 29.0 feet | **Date Started:** | 10/24/2022 |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/24/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| | Water Depth (feet bgs) | Elevation (feet) | Cave-In Depth (feet bgs) | Elevation (feet) |
|---|---|---|---|---|
| **During:** | 10.0 | 19.0 | | |
| **At Completion:** | NE | --- | **At Completion:** | 16.0 / 13.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE / --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | |
| | | | | | | 0.0 | TOPSOIL | 6" Topsoil | |
| 0 - 2 | S-1 | | 3 - 1 - 3 - 2 | 16 | 4 | | GLACIAL DEPOSITS | Dark Brown Silt, Moist, Soft (ML) (NYC Class 5b) | |
| | | | | | | 2.0 | | | |
| 2 - 4 | S-2 | | 1 - 1 - 2 - 1 | 20 | 3 | | | Gray/Brown Silty Clay, Wet, Soft (CL-ML) (NYC Class 4c) | |
| | | | | | | 4.0 | | | |
| 4 - 6 | S-3 | | 2 - 3 - 5 - 9 | 19 | 8 | 5.0 | | Brown Silty Sand, Wet, Loose (SM) (NYC Class 3b) | |
| 6 - 8 | S-4 | | 8 - 12 - 9 - 11 | 16 | 21 | | | As Above with Gravel, Medium Dense (SM) (NYC Class 3b) | |
| | | | | | | 8.0 | | | |
| 8 - 10 | S-5 | | 6 - 6 - 8 - 12 | 24 | 14 | | | Brown Silty Clay, Wet, Very Stiff (CL-ML) (NYC Class 4b) | Qu = 3.5 tsf |
| | | | | | | 10.0 | | | |
| 13 - 15 | S-6 | | 3 - 7 - 8 - 10 | 18 | 15 | | | Brown Silty Clay with Gravel (CL-ML) (NYC Class 4b) | Qu = 3.5 tsf |
| | | | | | | 15.0 | | | |
| 18 - 20 | S-7 | | 5 - 8 - 17 - 18 | - | 25 | | | As Above (CL-ML) (NYC Class 4b) | Qu = 3.5 tsf |
| | | | | | | 20.0 | | | |
| | | | | | | | | Boring Log B-17 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-18

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 31.0 feet | **Date Started:** | 10/18/2022 |
| **Termination Depth:** | 22.0 feet bgs | **Date Completed:** | 10/18/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | | |
|---|---|---|---|---|---|
| **During:** | 7.0 | 24.0 | | | |
| **At Completion:** | --- | --- | **At Completion:** | 17.1 | 13.9 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE | --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 2 - 1 - 1 - 1 | 14 | 2 | | GLACIAL DEPOSITS | | Dark Brown, Silty Sand, Moist, Very Loose (SM) (NYC Class 3b) | |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | 2 - 5 - 7 - 8 | 24 | 12 | | | | Pale Brown Poorly Graded Sand, Moist, Medium Dense (SP) (NYC Class 3b) | |
| | | | | | | 4.0 | | | | |
| 4 - 6 | S-3 | | 5 - 6 - 6 - 2 | 24 | 12 | 5.0 | | | Light Brown Silty Sand, Moist, Medium Dense (SM) (NYC Class 3b) | |
| | | | | | | 6.0 | | | | |
| 6 - 8 | S-4 | | 4 - 6 - 8 - 8 | 24 | 12 | | | | Brown Lean Clay, Moist, Medium Stiff (CL) (NYC Class 4c) | Qu = 1.0 tsf |
| 8 - 10 | S-5 | | 4 - 4 - 5 - 9 | 24 | 9 | | | | As Above, Wet (CL) (NYC Class 4c) | Qu = 1.5 tsf |
| | | | | | | 10.0 | | | | |
| 10 - 12 | S-6 | | 8 - 8 - 7 - 9 | 24 | 15 | | | | As Above with Gravel, Stiff (CL) (NYC Class 4b) | Qu = 2.5 tsf |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | | 4 - 5 - 9 - 8 | 22 | 14 | | | | As Above (CL) (NYC Class 4b) | Qu = 3.0 tsf |
| | | | | | | 20.0 | | | | |
| 20 - 22 | S-8 | | 6 - 7 - 7 - 8 | 4 | 14 | | | | As Above (CL) (NYC Class 4b) | |
| | | | | | | 22.0 | | | | |
| | | | | | | | | | Boring Log B-18 Terminated at a Depth of 22.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-19

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 31.0 feet | **Date Started:** | 10/24/2022 |
| **Termination Depth:** | 18.2 feet bgs | **Date Completed:** | 10/24/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| | Water Depth (feet bgs) | Elevation (feet) | Cave-In Depth (feet bgs) | Elevation (feet) |
|---|---|---|---|---|
| **During:** | NE | --- | | |
| **At Completion:** | NE | --- | **At Completion:** | 5.0 / 26.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE / --- |

| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | DEPTH (feet) | STRATA | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 0.0 | TOPSOIL | 6" Topsoil | |
| 0 - 2 | S-1 | X | 1 - 4 - 5 - 11 | 20 | 9 | | GLACIAL DEPOSITS | Light Brown Sandy Silt, Slightly Moist, Stiff (ML) (NYC Class 5b) | |
| 2 - 4 | S-2 | X | 9 - 13 - 14 - 20 | 18 | 27 | 2.0 | | As Above, Very Stiff (ML) (NYC Class 5b) | |
| 4 - 6 | S-3 | X | 15 - 17 - 13 - 12 | 23 | 30 | 4.0 | | Brown Silty Clay, Moist, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 6 - 8 | S-4 | X | 9 - 15 - 14 - 13 | 20 | 29 | 5.0 | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 8 - 10 | S-5 | X | 3 - 2 - 7 - 15 | 5 | 9 | | | As Above with Gravel, Medium Stiff (CL-ML) (NYC Class 4c) | Qu = 1.0 tsf |
| | | | | | | 10.0 | | | |
| 13 - 15 | S-6 | X | 23 - 30 - 36 - 40 | 20 | 66 | | | As Above, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 15.0 | | | |
| | | | | | | 18.0 | | Clayey Gravel, Moist, Very Dense (GC) | |
| 18 - 18.2 | S-7 | X | 50/2" | 1 | 50/2" | 18.2 | | Boring Log B-19 Terminated at a Depth of 18.2 Feet Below Ground Surface Due to Spoon Refusal | Spoon Refusal @ 18.2 fbgs |
| | | | | | | 20.0 | | | |
| | | | | | | 25.0 | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-20

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 28.0 feet | **Date Started:** | 10/25/2022 | **Water Depth \| Elevation (feet bgs) \| (feet)** | | **Cave-In Depth \| Elevation (feet bgs) \| (feet)** | |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/25/2022 | | | | |
| **Proposed Location:** | Building | **Logged By:** | MO | **During:** | NE \| --- | | |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG | **At Completion:** | NE \| --- | **At Completion:** | 17.0 \| 11.0 |
| | | **Equipment:** | AMS-Tracked | **24 Hours:** | NE \| --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 1 - 2 - 4 - 3 | 15 | 6 | | GLACIAL DEPOSITS | | Light Gray Silt, Slightly Moist, Medium Stiff (ML) (NYC Class 4c) | |
| 2 - 4 | S-2 | | 4 - 8 - 9 - 13 | 15 | 17 | | | | As Above, Very Stiff (ML) (NYC Class 4b) | |
| 4 - 6 | S-3 | | 12 - 15 - 18 - 15 | 24 | 33 | 5.0 | | | As Above, with Gravel, Hard (ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 6 - 8 | S-4 | | 8 - 12 - 15 - 14 | 20 | 27 | | | | As Above (ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 8 - 10 | S-5 | | 8 - 9 - 13 - 14 | 11 | 22 | | | | As Above, Light Gray, Very Stiff (ML) (NYC Class 4b) | |
| | | | | | | 10.0 | | | | |
| | | | | | | 13.0 | | | | |
| 13 - 15 | S-6 | | 11 - 4 - 13 - 12 | 24 | 17 | | | | Brown Silty Clay with Fine Gravel, Moist, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 15.0 | | | | |
| 18 - 20 | S-7 | | 15 - 10 - 11 - 14 | 24 | 21 | | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 20.0 | | | Boring Log B-20 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-21

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 33.0 feet | **Date Started:** | 10/19/2022 |
| **Termination Depth:** | 22.0 feet bgs | **Date Completed:** | 10/19/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | 6.0 | 22.0 | | |
| **At Completion:** | --- | --- | **At Completion:** | --- \| --- |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 1 - 1 - 1 - 1 | 18 | 2 | | GLACIAL DEPOSITS | | Light Brown Clayey Sand, Moist, Very Loose (SC) (NYC Class 3b) | |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | WHO 24" | 16 | <2 | | | | Gray Sandy Clay, Moist, Very Stiff (CL) (NYC Class 4b) | Weight of Hammer |
| | | | | | | 4.0 | | | | |
| 4 - 6 | S-3 | | 5 - 5 - 3 - 3 | 22 | 8 | 5.0 | | | Gray Poorly Graded Sand, Wet, Loose (SP) (NYC Class 3b) | |
| | | | | | | 6.0 | | | | |
| 6 - 8 | S-4 | | 2 - 2 - 4 - 4 | 24 | 6 | | | | Gray Lean Clay with Gravel, Wet, Medium Stiff (CL) (NYC Class 4c) | |
| | | | | | | 8.0 | | | | |
| 8 - 10 | S-5 | | 1 - 1 - 2 - 1 | 24 | 3 | | | | Gray Poorly Graded Sand, Wet, Very Loose (SP) (NYC Class 3b) | |
| | | | | | | 10.0 | | | | |
| 10 - 12 | S-6 | | 2 - 3 - 8 - 7 | 24 | 11 | | | | Brown Sandy Lean Clay, Wet, Soft (CL) (NYC Class 4c) | Qu = 0.5 tsf |
| | | | | | | | | | | |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | | 5 - 7 - 6 - 8 | 16 | 13 | | | | As Above, Medium Stiff (CL) (NYC Class 4c) | Qu = 1.75 tsf |
| | | | | | | | | | | |
| | | | | | | 20.0 | | | | |
| 20 - 22 | S-8 | | 7 - 5 - 7 - 6 | 24 | 12 | | | | As Above, with Gravel, Very Stiff (CL) (NYC Class 4b) | Qu = 3.5 tsf |
| | | | | | | 22.0 | | | | |
| | | | | | | | | | Boring Log B-21 Terminated at a Depth of 22.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-22

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 31.0 feet | **Date Started:** | 10/24/2022 |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/24/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|
| **During:** | NE \| --- | | |
| **At Completion:** | NE \| --- | **At Completion:** | --- \| --- |
| **24 Hours:** | NE \| --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | WOH - WOH - 3 - 2 | 18 | <4 | | GLACIAL DEPOSITS | | Gray Silty Clay with Gravel, Moist, Very Soft (CL-ML) (NYC Class 4c) | |
| 2 - 4 | S-2 | | 2 - 4 - 6 - 5 | 18 | 6 | | | | As Above, Medium Stiff (CL-ML) (NYC Class 4c) | Qu = 1.5 tsf |
| 4 - 6 | S-3 | | 6 - 7 - 7 - 7 | 20 | 14 | 5.0 | | | As Above, Brown, Stiff (CL-ML) (NYC Class 4b) | Qu = 2.25 tsf |
| 6 - 8 | S-4 | | 5 - 7 - 9 - 11 | 24 | 16 | | | | As Above, Very Moist (CL-ML) (NYC Class 4b) | Qu = 2.5 tsf |
| 8 - 10 | S-5 | | 6 - 8 - 8 - 9 | 22 | 16 | | | | As Above with Gravel, Very Stiff (CL-ML) (NYC Class 4b) | Qu = 3.5 tsf |
| | | | | | | 10.0 | | | | |
| 13 - 15 | S-6 | | 6 - 8 - 5 - 6 | 18 | 13 | | | | As Above, Medium Stiff (CL-ML) (NYC Class 4c) | Qu = 1.5 tsf |
| | | | | | | 15.0 | | | | |
| 18 - 20 | S-7 | | 8 - 9 - 11 - 9 | 4 | 20 | | | | As Above (CL-ML) (NYC Class 4c) | Qu = 1.0 tsf |
| | | | | | | 20.0 | | | Boring Log B-22 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-23

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 27.0 feet | **Date Started:** | 10/25/2022 |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/25/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | NE | --- | | |
| **At Completion:** | NE | --- | **At Completion:** | 18.0 \| 9.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | WOH - WOH - 1 - 5 | 18 | <2 | | GLACIAL DEPOSITS | | Light Brown Silty Clay, Moist, Soft (CL-ML) (NYC Class 4c) | Qu = 2.0 tsf |
| 2 - 4 | S-2 | | 10 - 12 - 23 - 20 | 23 | 25 | | | | As Above, with Gravel, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 4 - 6 | S-3 | | 16 - 16 - 17 - 14 | 24 | 33 | 5.0 | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 6 - 8 | S-4 | | 14 - 15 - 15 - 14 | 20 | 30 | | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 8 - 10 | S-5 | | 10 - 10 - 10 - 24 | 22 | 20 | | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 10.0 | | | | |
| 13 - 15 | S-6 | | 12 - 15 - 16 - 16 | - | 31 | | | | As Above, Light Brown, Very Stiff (CL-ML) (NYC Class 4b) | Qu = 3.75 tsf |
| | | | | | | 15.0 | | | | |
| 18 - 20 | S-7 | | 23 - 14 - 15 - 16 | 15 | 29 | | | | As Above, Brown (CL-ML) (NYC Class 4b) | Qu = 3.75 tsf |
| | | | | | | 20.0 | | | Boring Log B-23 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-24

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 33.0 feet | **Date Started:** | 10/19/2022 |
| **Termination Depth:** | 16.9 feet bgs | **Date Completed:** | 10/19/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | NE | --- | | |
| **At Completion:** | NE | --- | **At Completion:** | --- \| --- |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 2 - 2 - 2 - 4 | 24 | 4 | | GLACIAL DEPOSITS | | Light Brown Silty Sand with Gravel, Moist, Very Loose (SM) (NYC Class 3b) | |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | 4 - 8 - 15 - 18 | 20 | 23 | | | | Light Brown Silt, Moist, Hard (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| 4 - 6 | S-3 | | 17 - 16 - 21 - 32 | 24 | 37 | 5.0 | | | As Above, Stiff (ML) (NYC Class 5a) | Qu = 2.5 tsf |
| 6 - 8 | S-4 | | 18 - 24 - 22 - 19 | 18 | 46 | | | | As Above, Hard (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| 8 - 10 | S-5 | | 32 - 18 - 28 - 26 | 24 | 46 | | | | As Above (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| | | | | | | 10.0 | | | | |
| 10 - 12 | S-6 | | 10 - 11 - 14 - 12 | 24 | 25 | | | | As Above (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| | | | | | | 15.0 | | | | |
| 15 - 16.9 | S-7 | | 26 - 39 - 16 - 50/5" | 22 | 55 | 16.9 | | | As Above (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| | | | | | | | | | Boring Log B-24 Terminated at a Depth of 16.9 Feet Below Ground Surface Due to Auger Refusal | |
| | | | | | | 20.0 | | | | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-25

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 31.0 feet | **Date Started:** | 10/21/2022 |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/21/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | --- | --- | | |
| **At Completion:** | --- | --- | **At Completion:** | 14.8 \| 16.2 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 2 - 2 - 2 - 2 | 14 | 4 | | GLACIAL DEPOSITS | | Light Gray Silty Clay with Gravel, Moist, Stiff (CL-ML) (NYC Class 4b) | Qu = 2.5 tsf |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | 5 - 9 - 14 - 18 | 20 | 23 | | | | Brown Silt with Gravel, Moist, Hard (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| | | | | | | 4.0 | | | | |
| 4 - 6 | S-3 | | 12 - 12 - 13 - 10 | 14 | 25 | 5.0 | | | Brown Silty Clay, Slightly Moist, Stiff (CL-ML) (NYC Class 4b) | Qu = 2.5 tsf |
| | | | | | | 6.0 | | | | |
| 6 - 8 | S-4 | | 8 - 10 - 12 - 11 | 23 | 22 | | | | Brown Silt, Slightly Moist, Hard (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| | | | | | | 8.0 | | | | |
| 8 - 10 | S-5 | | 7 - 7 - 10 - 13 | 22 | 17 | | | | Brown Silty Clay with Gravel, Moist, Very Stiff (CL-ML) (NYC Class 4b) | Qu = 3.25 tsf |
| | | | | | | 10.0 | | | | |
| 13 - 15 | S-6 | | 2 - 4 - 5 - 8 | 24 | 9 | | | | Brown Silty Clay with Gravel, Wet, Medium Stiff (CL-ML) (NYC Class 4c) | Qu = 1.5 tsf |
| | | | | | | 15.0 | | | | |
| 18 - 20 | S-7 | | 4 - 8 - 8 - 9 | - | 16 | | | | As Above (CL-ML) (NYC Class 4c) | Qu = 1.5 tsf |
| | | | | | | 20.0 | | | Boring Log B-25 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-26

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | Water Depth \| Elevation (feet bgs) \| (feet) | Cave-In Depth \| Elevation (feet bgs) \| (feet) |
|---|---|---|---|---|---|
| **Surface Elevation:** | ± 27.0 feet | **Date Started:** | 10/25/2022 | | |
| **Termination Depth:** | 18.2 feet bgs | **Date Completed:** | 10/25/2022 | | |
| **Proposed Location:** | Building | **Logged By:** | MO | **During:** --- \| --- | |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG | **At Completion:** --- \| --- | **At Completion:** --- \| --- |
| | | **Equipment:** | AMS-Tracked | **24 Hours:** NE \| --- | **24 Hours:** NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | 14 | Rec. (in.) | 16 | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 2 - 2 - 5 - 5 | - | 7 | | GLACIAL DEPOSITS | | Light Brown/Gray Sandy Clay with Gravel, Slightly Moist, Loose (SC) (NYC Class 3b) | Trace Wood |
| 2 - 4 | S-2 | | 6 - 11 - 14 - 16 | - | 25 | 4.0 | | | As Above (SC) (NYC Class 3b) | Qu = >4.0 tsf |
| 4 - 6 | S-3 | | 14 - 27 - 23 - 17 | 20 | 50 | 5.0 | | | Brown Silty Clay with Gravel, Slightly Moist, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 6 - 7.3 | S-4 | | 12 - 23 - 50/3" | 9 | 50/3" | | | | As Above (CL-ML) (NYC Class 4a) | Spoon Refusal @ 7.3 fbgs |
| 8 - 10 | S-5 | | 5 - 6 - 9 - 10 | 24 | 15 | 10.0 | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 13 - 15 | S-6 | | 30 - 14 - 14 - 10 | 10 | 28 | 15.0 | | | As Above (CL-ML) (NYC Class 4a) | |
| 18 - 18.2 | S-7 | | 50/2" | 2 | 50/2" | 18.2 | | | As Above (CL-ML) (NYC Class 4a) | |
| | | | | | | | | | Boring Log B-26 Terminated at a Depth of 18.2 Feet Below Ground Surface Due to Spoon Refusal | Spoon Refusal @ 18.2 fbgs |
| | | | | | | 20.0 | | | | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-27

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 38.0 feet | **Date Started:** | 10/19/2022 |
| **Termination Depth:** | 22.0 feet bgs | **Date Completed:** | 10/19/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| | Water Depth (feet bgs) | Elevation (feet) | Cave-In Depth (feet bgs) | Elevation (feet) |
|---|---|---|---|---|
| **During:** | --- | --- | | |
| **At Completion:** | --- | --- | **At Completion:** | 17.0 / 21.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE / --- |

| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | Depth (feet) | STRATA | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 0.0 | TOPSOIL | 6" Topsoil | |
| 0 - 2 | S-1 | | 1 - 2 - 1 - 6 | 18 | 3 | | GLACIAL DEPOSITS | Light Brown Silt, Moist, Medium Stiff (ML) (NYC Class 5b) | Qu = 1.0 tsf |
| 2 - 4 | S-2 | | 6 - 10 - 10 - 11 | 22 | 20 | 2.0 | | Brown Lean Clay with Gravel, Moist, Hard (CL) (NYC Class 4a) | Qu = >4.0 tsf |
| 4 - 6 | S-3 | | 12 - 11 - 12 - 9 | 24 | 23 | 4.0 | | Light Brown Silt with Gravel, Moist, Hard (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| 6 - 8 | S-4 | | 12 - 9 - 10 - 9 | 24 | 19 | 5.0 | | As Above (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| 8 - 10 | S-5 | | 5 - 6 - 9 - 10 | 24 | 15 | | | As Above (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| 10 - 12 | S-6 | | 7 - 9 - 9 - 9 | 24 | 18 | 10.0 | | Brown Lean Clay with Gravel, Moist, Stiff (CL) (NYC Class 4b) | Qu = 2.5 tsf |
| | | | | | | 15.0 | | | |
| 15 - 17 | S-7 | | 3 - 3 - 3 - 4 | 21 | 6 | | | As Above, Very Moist, Medium Stiff (CL) (NYC Class 4c) | Qu = 1.5 tsf |
| | | | | | | 20.0 | | | |
| 20 - 22 | S-8 | | 27 - 13 - 8 - 8 | 24 | 21 | 22.0 | | As Above (CL) (NYC Class 4c) | Qu = 1.25 tsf |
| | | | | | | 25.0 | | Boring Log B-27 Terminated at a Depth of 22.0 Feet Below Ground Surface | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-28

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 34.0 feet | **Date Started:** | 10/21/2022 |
| **Termination Depth:** | 22.0 feet bgs | **Date Completed:** | 10/21/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | 18.0 | 16.0 | | |
| **At Completion:** | --- | --- | **At Completion:** | 16.5 \| 17.5 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 2 - 8 - 6 - 6 | 20 | 14 | | GLACIAL DEPOSITS | | Light Brown Silty Sand, Moist, Medium Dense (SM) (NYC Class 3b) | |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | 6 - 9 - 9 - 10 | 22 | 18 | | | | Light Gray Silty Clay, Moist, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 4 - 6 | S-3 | | 11 - 11 - 13 - 11 | 24 | 24 | 5.0 | | | As Above with Gravel (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 6 - 8 | S-4 | | 11 - 11 - 11 - 10 | 23 | 22 | | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 8 - 10 | S-5 | | 6 - 5 - 7 - 8 | 24 | 12 | | | | As Above (CL-ML) (NYC Class 4a) | Qu = 4.0 tsf |
| | | | | | | 10.0 | | | | |
| 10 - 12 | S-6 | | 14 - 18 - 14 - 9 | 24 | 32 | | | | As Above, Very Stiff (CL-ML) (NYC Class 4b) | Qu = 3.0 tsf |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | | 8 - 9 - 9 - 10 | 3 | 18 | | | | As Above, Stiff (CL-ML) (NYC Class 4b) | Qu = 2.25 tsf |
| | | | | | | 20.0 | | | | |
| 20 - 22 | S-8 | | 6 - 7 - 15 - 8 | 16 | 22 | | | | Brown Silty Sand with Gravel, Wet, Medium Dense (SM) (NYC Class 3b) | |
| | | | | | | 22.0 | | | Boring Log B-28 Terminated at a Depth of 22.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-29

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | Water Depth \| Elevation (feet bgs) \| (feet) | Cave-In Depth \| Elevation (feet bgs) \| (feet) |
|---|---|---|---|---|---|
| **Surface Elevation:** | ± 30.0 feet | **Date Started:** | 10/25/2022 | | |
| **Termination Depth:** | 13.4 feet bgs | **Date Completed:** | 10/25/2022 | | |
| **Proposed Location:** | Building | **Logged By:** | MO | **During:** --- \| --- | |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG | **At Completion:** --- \| --- | **At Completion:** --- \| --- |
| | | **Equipment:** | AMS-Tracked | **24 Hours:** NE \| --- | **24 Hours:** NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 2 - 3 - 3 - 5 | 18 | 6 | | GLACIAL DEPOSITS | | Brown, Silty Clay with Fine Gravel, Moist, Very Stiff (CL-ML) (NYC Class 4b) | Qu = 3.0 tsf |
| 2 - 4 | S-2 | | 9 - 12 - 17 - 23 | - | 29 | | | | As Above, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 4 - 6 | S-3 | | 25 - 24 - 24 - 23 | 24 | 48 | 5.0 | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 6 - 8 | S-4 | | 25 - 30 - 27 - 22 | 18 | 57 | | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 8 - 10 | S-5 | | 19 - 17 - 20 - 20 | 24 | 37 | | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 10.0 | | | | |
| 13 - 13.4 | S-6 | | 50/5" | 4 | 50/5" | 13.4 | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 15.0 | | | Boring Log B-29 Terminated at a Depth of 13.4 Feet Below Ground Surface Due to Refusal | |
| | | | | | | 20.0 | | | | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-30

Page 1 of 1

| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 37.0 feet | **Date Started:** | 10/19/2022 |
| **Termination Depth:** | 22.0 feet bgs | **Date Completed:** | 10/19/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | 10.0 | 27.0 | | |
| **At Completion:** | --- | --- | **At Completion:** | 17.0 \| 10.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 2 - 2 - 6 - 8 | 22 | 8 | | GLACIAL DEPOSITS | | Brown Silty Sand with Gravel, Moist, Loose (SM) (NYC Class 3b) | Qu = 4.0 tsf |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | 9 - 8 - 6 - 5 | 22 | 14 | | | | Brown Poorly Graded Sand, Slightly Moist, Medium Dense (SP) (NYC Class 3b) | |
| 4 - 6 | S-3 | | 6 - 6 - 7 - 7 | 21 | 13 | 5.0 | | | As Above (SP) (NYC Class 3b) | |
| 6 - 8 | S-4 | | 4 - 5 - 5 - 5 | 20 | 10 | | | | As Above (SP) (NYC Class 3b) | |
| | | | | | | 10.0 ▽ | | | | |
| 10 - 12 | S-5 | | 3 - 3 - 2 - 3 | 24 | 5 | | | | Brown Silty Sand, Wet, Loose (SM) (NYC Class 3b) | |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-6 | | 2 - 2 - 3 - 3 | 24 | 5 | | | | As Above (SM) (NYC Class 3b) | |
| | | | | | | 20.0 | | | | |
| 20 - 22 | S-7 | | 4 - 3 - 4 - 6 | 24 | 7 | | | | Brown/Gray Lean Clay, Wet, Medium Stiff (CL) (NYC Class 4b) | Qu = 1.5 tsf |
| | | | | | | 22.0 | | | | |
| | | | | | | | | | Boring Log B-30 Terminated at a Depth of 22.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-31

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 34.0 feet | **Date Started:** | 10/21/2022 |
| **Termination Depth:** | 21.3 feet bgs | **Date Completed:** | 10/21/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | 8.0 | 26.0 | | |
| **At Completion:** | NE | --- | **At Completion:** | 16.0 \| 8.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | --- \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | W O H - 1 - 2 - 2 | 15 | 3 | 2.0 | GLACIAL DEPOSITS | | Light Brown, Silty Clay, Moist, Medium Stiff (CL-ML) (NYC Class 4c) | Qu = 1.25 tsf |
| 2 - 4 | S-2 | | 6 - 9 - 12 - 13 | 23 | 21 | 4.0 | | | Brown Silt with Gravel, Moist, Very Stiff (ML) (NYC Class 5b) | Qu = 3.5 tsf |
| 4 - 6 | S-3 | | 8 - 8 - 10 - 11 | 23 | 18 | 5.0<br>6.0 | | | Brown Silty Clay, Moist, Stiff (CL-ML) (NYC Class 4b) | Qu = 2.75 tsf |
| 6 - 8 | S-4 | | 6 - 8 - 10 - 9 | 20 | 18 | | | | Brown Silty Sand with Gravel, Wet, Medium Dense (SM) (NYC Class 3b) | |
| 8 - 10 | S-5 | | 5 - 4 - 4 - 11 | 23 | 8 | 10.0 | | | As Above, Loose (SM) (NYC Class 3b) | |
| 10 - 12 | S-6 | | 4 - 7 - 7 - 7 | 24 | 14 | | | | As Above (SM) (NYC Class 3b) | |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | | 5 - 5 - 6 - 7 | 24 | 11 | | | | Gray Sandy Lean Clay with Gravel, Wet, Very Stiff (CL) (NYC Class 4b) | Qu = 3.5 tsf |
| | | | | | | 20.0 | | | | |
| 20 - 21.3 | S-8 | | 13 - 18 - 50/3" | 15 | 50/3" | 21.3 | | | Brown Silty Clay with Gravel, Wet, Hard (CL-ML) (NYC Class 4a) | |
| | | | | | | | | | Boring Log B-31 Terminated at a Depth of 21.3 Feet Below Ground Surface Due to Spoon Refusal | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-32



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 34.0 feet | **Date Started:** | 10/25/2022 |
| **Termination Depth:** | 20.0 feet bgs | **Date Completed:** | 10/25/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | NE | --- | | |
| **At Completion:** | NE | --- | **At Completion:** | 17.0 \| 17.0 |
| **24 Hours:** | --- | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | W O H - 1 - 2 - 3 | 18 | 3 | | GLACIAL DEPOSITS | | Light Brown Silt with Fine Gravel, Slightly Moist, Soft (ML) (NYC Class 5b) | |
| 2 - 4 | S-2 | | 11 - 15 - 19 - 20 | 16 | 34 | | | | Light Brown Silty Sand, Moist, Dense (SM) (NYC Class 3a) | Qu = 2.5 tsf |
| 4 - 6 | S-3 | | 20 - 20 - 20 - 17 | 24 | 40 | 5.0 | | | Light Brown Silt with Gravel, Moist, Hard (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| 6 - 8 | S-4 | | 17 - 19 - 23 - 19 | 15 | 42 | | | | As Above (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| 8 - 10 | S-5 | | 15 - 14 - 15 - 17 | 14 | 29 | | | | As Above Stiff (ML) (NYC Class 5b) | Qu = 2.5 tsf |
| | | | | | | 10.0 | | | | |
| | | | | | | 13.0 | | | | |
| 13 - 15 | S-6 | | 9 - 12 - 10 - 12 | 24 | 22 | | | | Brown Silty Clay with Fine Gravel, Very Moist, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 15.0 | | | | |
| | | | | | | 18.0 | | | | |
| 18 - 20 | S-7 | | 25 - 20 - 17 - 29 | - | 37 | | | | Brown Silty Sand with Gravel, Moist, Dense (SM) (NYC Class 3a) | |
| | | | | | | 20.0 | | | Boring Log B-32 Terminated at a Depth of 20.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-33

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 37.0 feet | **Date Started:** | 10/19/2022 |
| **Termination Depth:** | 22.0 feet bgs | **Date Completed:** | 10/19/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|
| **During:** | --- \| --- | | |
| **At Completion:** | --- \| --- | **At Completion:** | 16.0 \| 21.0 |
| **24 Hours:** | NE \| --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 3 - 3 - 4 - 3 | 23 | 7 | | GLACIAL DEPOSITS | | Brown Silt, Slightly Moist, Hard (ML) (NYC Class 5a) | Qu = 4.0 tsf |
| 2 - 4 | S-2 | | 6 - 10 - 11 - 12 | 24 | 21 | | | | As Above (ML) (NYC Class 5a) | |
| | | | | | | 4.0 | | | | |
| 4 - 6 | S-3 | | 6 - 10 - 7 - 11 | 21 | 17 | 5.0 | | | Brown Poorly Graded Sand, Slightly Moist, Medium Dense (SP) (NYC Class 3b) | |
| | | | | | | 6.0 | | | | |
| 6 - 8 | S-4 | | 9 - 11 - 9 - 7 | 24 | 20 | | | | Brown Silty Sand, Slightly Moist, Medium Dense (SM) (NYC Class 3b) | |
| | | | | | | 8.0 | | | | |
| 8 - 10 | S-5 | | 4 - 3 - 5 - 7 | 24 | 8 | | | | Brown/Gray Silty Clay, Moist, Medium Stiff (CL-ML) (NYC Class 4c) | Qu = 1.0 tsf |
| | | | | | | 10.0 | | | | |
| 10 - 12 | S-6 | | 4 - 5 - 7 - 7 | 24 | 12 | | | | As Above, Very Stiff (CL-ML) (NYC Class 4b) | Qu = 3.5 tsf |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | | 6 - 6 - 4 - 8 | 8 | 10 | | | | As Above (CL-ML) (NYC Class 4b) | |
| | | | | | | 20.0 | | | | |
| 20 - 22 | S-8 | | 8 - 10 - 11 - 11 | 6 | 21 | | | | Gray Lean Clay with Gravel, Moist, Hard (CL) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 22.0 | | | | |
| | | | | | | | | | Boring Log B-33 Terminated at a Depth of 22.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-34



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 36.0 feet | **Date Started:** | 10/21/2022 |
| **Termination Depth:** | 22.0 feet bgs | **Date Completed:** | 10/21/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| | Water Depth (feet bgs) | Elevation (feet) | Cave-In Depth (feet bgs) | Elevation (feet) |
|---|---|---|---|---|
| **During:** | NE | --- | | |
| **At Completion:** | NE | --- | **At Completion:** | 17.5 / 18.5 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE / --- |

| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | DEPTH (feet) | STRATA | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 0.0 | TOPSOIL | 6" Topsoil | |
| 0 - 2 | S-1 | | WOH - 2 - 2 - 2 | 22 | 4 | 2.0 | GLACIAL DEPOSITS | Brown Silty Clay, Moist, Stiff (CL-ML) (NYC Class 4b) | Qu = 2.0 tsf |
| 2 - 4 | S-2 | | 7 - 10 - 10 - 10 | 21 | 20 | | | Light Brown Sandy Silt, Slightly Moist, Stiff (ML) (NYC Class 5b) | Qu = 2.25 tsf |
| 4 - 6 | S-3 | | 7 - 7 - 8 - 7 | 20 | 15 | 5.0 | | Light Gray Silt, Slightly Moist, Very Stiff (ML) (NYC Class 5b) | Qu = 2.75 tsf |
| 6 - 8 | S-4 | | 7 - 6 - 4 - 6 | 22 | 10 | 6.0 | | Brown Clayey Sand, Moist, Medium Dense (SC) (NYC Class 3b) | |
| 8 - 10 | S-5 | | 2 - 2 - 4 - 3 | 15 | 6 | 8.0 | | Brown Silty Clay, Moist, Very Stiff (CL-ML) (NYC Class 4b) | Qu = 3.25 tsf |
| 10 - 12 | S-6 | | 4 - 9 - 11 - 8 | 20 | 20 | 10.0 | | Brown Silty Sand with Gravel, Moist, Medium Dense (SM) (NYC Class 3b) | |
| 15 - 17 | S-7 | | 6 - 7 - 11 - 12 | 1 | 18 | 15.0 | | Brown Silty Sand with Gravel, Moist, Medium Dense (SM) (NYC Class 3b) | |
| 20 - 22 | S-8 | | 9 - 10 - 12 - 13 | NR | 22 | 20.0 | | No Recovery, Presumed As Above (SM) (NYC Class 3b) | |
| | | | | | | 22.0 | | Boring Log B-34 Terminated at a Depth of 22.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-35



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 34.0 feet | **Date Started:** | 10/25/2022 |
| **Termination Depth:** | 10.0 feet bgs | **Date Completed:** | 10/25/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|
| **During:** | --- \| --- | | |
| **At Completion:** | --- \| --- | **At Completion:** | --- \| --- |
| **24 Hours:** | NE \| --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 2 - 3 - 5 - 9 | 15 | 8 | 2.0 | GLACIAL DEPOSITS | | Brown Sandy Silt with Fine Gravel, Slightly Moist, Very Stiff (ML) (NYC Class 5b) | Qu = 3.5 tsf |
| 2 - 4 | S-2 | | 10 - 12 - 14 - 25 | 18 | 26 | | | | Light Brown Silty Clay with Fine Gravel, Moist, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 4 - 6 | S-3 | | 21 - 23 - 20 - 21 | 20 | 43 | 5.0 | | | As Above, Brown (CL-ML) (NYC Class 4a) | |
| 6 - 8 | S-4 | | 24 - 24 - 25 - 17 | 19 | 49 | | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 8 - 10 | S-5 | | 17 - 16 - 18 - 14 | 24 | 34 | 10.0 | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 15.0 | | | Boring Log B-35 Terminated at a Depth of 10.0 Feet Below Ground Surface | |
| | | | | | | 20.0 | | | | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-36



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 37.0 feet | **Date Started:** | 10/20/2022 |
| **Termination Depth:** | 22.0 feet bgs | **Date Completed:** | 10/20/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | NE | --- | | |
| **At Completion:** | NE | --- | **At Completion:** | 17.0 \| 20.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 2 - 1 - 2 - 6 | 14 | 3 | | GLACIAL DEPOSITS | | Light Brown Silt, Slightly Moist, Soft (ML) (NYC Class 5b) | Qu = 0.75 tsf |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | 10 - 13 - 12 - 13 | 23 | 25 | | | | Light Brown Silty Sand, Slightly Moist, Medium Dense (SM) (NYC Class 3b) | |
| | | | | | | 4.0 | | | | |
| 4 - 6 | S-3 | | 13 - 14 - 13 - 9 | 24 | 27 | 5.0 | | | Light Brown Silt, Slightly Moist, Stiff (ML) (NYC Class 5b) | Qu = 2.75 tsf |
| | | | | | | 6.0 | | | | |
| 6 - 8 | S-4 | | 4 - 6 - 8 - 6 | 16 | 14 | | | | Light Brown Silty Sand, Slightly Moist, Medium Dense (SM) (NYC Class 3b) | |
| 8 - 10 | S-5 | | 5 - 5 - 3 - 7 | 22 | 8 | | | | As Above, Very Moist, Loose (SM) (NYC Class 3b) | |
| | | | | | | 10.0 | | | | |
| 10 - 12 | S-6 | | 11 - 12 - 6 - 7 | 18 | 18 | | | | Brown Lean Clay, Very Moist, Medium Stiff (CL) (NYC Class 4c) | Qu = 1.75 tsf |
| | | | | | | | | | | |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | | 9 - 10 - 10 - 6 | 22 | 20 | | | | Brown Silty Clay with Gravel, Very Moist, Medium Stiff (CL-ML) (NYC Class 4c) | Qu = 1.75 tsf |
| | | | | | | | | | | |
| | | | | | | 20.0 | | | | |
| 20 - 22 | S-8 | | 9 - 9 - 10 - 11 | 1 | 19 | | | | As Above (CL-ML) (NYC Class 4c) | |
| | | | | | | 22.0 | | | | |
| | | | | | | | | | Boring Log B-36 Terminated at a Depth of 22.0 Feet Below Ground Surface | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-37

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 36.0 feet | **Date Started:** | 10/21/2022 |
| **Termination Depth:** | 22.0 feet bgs | **Date Completed:** | 10/21/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | NE | --- | | |
| **At Completion:** | NE | --- | **At Completion:** | 16.5 \| 19.5 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 2 - 2 - 3 - 4 | 15 | 5 | | GLACIAL DEPOSITS | | Light Brown Silt, Slightly Moist, Stiff (ML) (NYC Class 4b) | Qu = 3.0 tsf |
| 2 - 4 | S-2 | | 6 - 10 - 16 - 18 | 15 | 26 | 4.0 | | | As Above with Gravel, Hard (ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 4 - 6 | S-3 | | 13 - 10 - 11 - 11 | 24 | 21 | 5.0 | | | Brown Silty Clay, Slightly Moist, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 6 - 8 | S-4 | | 7 - 8 - 8 - 8 | 15 | 16 | 8.0 | | | As Above (CL-ML) (NYC Class 4a) | |
| 8 - 10 | S-5 | | 6 - 11 - 10 - 11 | 6 | 21 | | | | Brown Silt with Gravel, Slightly Moist, Medium Stiff (ML) (NYC Class 5b) | Qu = 1.0 tsf |
| 10 - 12 | S-6 | | 7 - 7 - 7 - 8 | 24 | 14 | 10.0 | | | Brown Silty Clay with Gravel, Moist, Stiff (CL-ML) (NYC Class 4b) | Qu = 2.5 tsf |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | | 6 - 8 - 10 - 11 | 20 | 18 | | | | As Above (CL-ML) (NYC Class 4b) | Qu = 2.5 tsf |
| | | | | | | 20.0 | | | | |
| 20 - 22 | S-8 | | 6 - 6 - 16 - 16 | - | 22 | 22.0 | | | As Above, Very Stiff (CL-ML) (NYC Class 4b) | Qu = 3.5 tsf |
| | | | | | | 25.0 | | | Boring Log B-37 Terminated at a Depth of 22.0 Feet Below Ground Surface | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-38

Page 1 of 1

| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 34.0 feet | **Date Started:** | 10/25/2022 |
| **Termination Depth:** | 10.0 feet bgs | **Date Completed:** | 10/25/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|
| **During:** | --- \| --- | | |
| **At Completion:** | --- \| --- | **At Completion:** | --- \| --- |
| **24 Hours:** | NE \| --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 5 - 4 - 6 - 6 | 10 | 10 | | GLACIAL DEPOSITS | | Light Brown, Silty Clay, Moist, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 2 - 4 | S-2 | | 13 - 15 - 17 - 20 | 24 | 32 | | | | As Above, Slightly Moist (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 4 - 6 | S-3 | | 13 - 16 - 18 - 20 | 24 | 34 | 5.0 | | | As Above with Gravel (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 6 - 8 | S-4 | | 15 - 20 - 16 - 17 | 16 | 36 | | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 8 - 10 | S-5 | | 10 - 10 - 15 - 11 | 24 | 25 | | | | As Above (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 10.0 | | | Boring Log B-38 Terminated at a Depth of 10.0 Feet Below Ground Surface | |
| | | | | | | 15.0 | | | | |
| | | | | | | 20.0 | | | | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-39



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 38.0 feet | **Date Started:** | 10/20/2022 |
| **Termination Depth:** | 27.0 feet bgs | **Date Completed:** | 10/20/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | 19.0 | 19.0 | | |
| **At Completion:** | 10.4 | 27.6 | **At Completion:** | 17.0 \| 21.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 2 - 2 - 4 - 7 | 18 | 6 | | GLACIAL DEPOSITS | | Light Brown Silt, Slightly Moist, Stiff (ML) (NYC Class 5b) | Qu = 2.5 tsf |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | 9 - 13 - 13 - 14 | 18 | 26 | | | | Light Brown Silty Sand, Slightly Moist, Medium Dense (SM) (NYC Class 3b) | |
| | | | | | | 4.0 | | | | |
| 4 - 6 | S-3 | | 13 - 12 - 11 - 9 | 24 | 23 | 5.0 | | | Brown Sandy Silt, Slightly Moist, Stiff (ML) (NYC Class 5b) | Qu = 2.25 tsf |
| 6 - 8 | S-4 | | 9 - 7 - 6 - 7 | 18 | 13 | | | | As Above, Moist, Soft (ML) (NYC Class 5b) | Qu = 0.75 tsf |
| | | | | | | 8.0 | | | | |
| 8 - 10 | S-5 | | 15 - 12 - 15 - 16 | 24 | 27 | | | | Brown Poorly Graded Sand with Gravel, Moist, Medium Dense (SP) (NYC Class 3b) | |
| | | | | | | 10.0 | | | | |
| 10 - 12 | S-6 | | 8 - 7 - 7 - 6 | 10 | 14 | | | | Brown Silt with Gravel, Moist, Hard (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| | | | | | | | | | | |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | | 7 - 6 - 7 - 21 | NR | 13 | | | | No Recovery, Presumed As Above (ML) (NYC Class 5a) | |
| | | | | | | | | | | |
| | | | | | | 20.0 | | | | |
| 20 - 22 | S-8 | | 11 - 6 - 9 - 11 | 18 | 15 | | | | Brown Sandy Silt with Gravel, Wet, Stiff (ML) (NYC Class 5b) | Qu = 2.25 tsf |
| | | | | | | | | | | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-39(2)



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 38.0 feet | **Date Started:** | 10/20/2022 |
| **Termination Depth:** | 27.0 feet bgs | **Date Completed:** | 10/20/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|
| **During:** | 19.0 \| 19.0 | | |
| **At Completion:** | 10.4 \| 27.6 | **At Completion:** | 17.0 \| 21.0 |
| **24 Hours:** | NE \| --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 25.0 | | | | |
| 25 - 27 | S-9 | X | 7 - 9 - 10 - 13 | 2 | 19 | | GLACIAL DEPOSITS | | Brown Silty Clay, Wet, Very Stiff (CL-ML) (NYC Class 4b) | |
| | | | | | | 27.0 | | | Boring Log B-39 Terminated at a Depth of 27.0 Feet Below Ground Surface | |
| | | | | | | 30.0 | | | | |
| | | | | | | 35.0 | | | | |
| | | | | | | 40.0 | | | | |
| | | | | | | 45.0 | | | | |
| | | | | | | 50.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-40

Page 1 of 1

| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 36.0 feet | **Date Started:** | 10/20/2022 |
| **Termination Depth:** | 22.0 feet bgs | **Date Completed:** | 10/20/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | NE | --- | | |
| **At Completion:** | NE | --- | **At Completion:** | 18.0 \| --- |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 1 - 3 - 3 - 5 | 15 | 6 | | GLACIAL DEPOSITS | | Light Brown Silty Clay, Moist, Stiff (CL-ML) (NYC Class 4b) | Qu = 2.0 tsf |
| 2 - 4 | S-2 | | 9 - 13 - 12 - 11 | 23 | 25 | 4.0 | | | As Above, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 4 - 6 | S-3 | | 11 - 12 - 12 - 10 | 24 | 24 | 5.0 | | | Light Brown Silt, Slightly Moist, Hard (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| 6 - 8 | S-4 | | 9 - 9 - 9 - 15 | 23 | 18 | 8,0 | | | As Above (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| 8 - 10 | S-5 | | 16 - 14 - 13 - 13 | 24 | 27 | | | | Brown Silty Clay with Gravel, Moist, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| 10 - 12 | S-6 | | 10 - 14 - 14 - 10 | 15 | 28 | 10.0 | | | As Above (CL-ML) (NYC Class 4a) | |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | | 12 - 19 - 19 - 25 | 0 | 38 | | | | No Recovery, Presumed as Above (CL-ML) (NYC Class 4a) | |
| | | | | | | 20.0 | | | | |
| 20 - 22 | S-8 | | 7 - 12 - 14 - 18 | 2 | 26 | 22.0 | | | Brown Silty Clay, Moist, Very Stiff (CL-ML) (NYC Class 4b) | |
| | | | | | | 25.0 | | | Boring Log B-40 Terminated at a Depth of 22.0 Feet Below Ground Surface | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-41



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 34.0 feet | **Date Started:** | 10/20/2022 |
| **Termination Depth:** | 27.0 feet bgs | **Date Completed:** | 10/20/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| Water Depth \| Elevation (feet bgs) \| (feet) | | | Cave-In Depth \| Elevation (feet bgs) \| (feet) | |
|---|---|---|---|---|
| **During:** | 15.0 | 19.0 | | |
| **At Completion:** | --- | --- | **At Completion:** | 21.0 \| 13.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE \| --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 0.0 | TOPSOIL | | 6" Topsoil | |
| 0 - 2 | S-1 | | 2 - 7 - 9 - 11 | 5 | 16 | | GLACIAL DEPOSITS | | Brown, Sandy Silt, Moist, Very Stiff (ML) (NYC Class 5b) | |
| | | | | | | 2.0 | | | | |
| 2 - 4 | S-2 | | 18 - 14 - 12 - 12 | | 26 | | | | As Above, Hard (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| 4 - 6 | S-3 | | 11 - 11 - 10 - 11 | 20 | 21 | 5.0 | | | As Above (ML) (NYC Class 5a) | Qu = >4.0 tsf |
| 6 - 8 | S-4 | | 2 - 3 - 10 - 11 | 14 | 13 | | | | As Above, Meidum Stiff (ML) (NYC Class 5b) | Qu = 1.25 tsf |
| | | | | | | 8.0 | | | | |
| 8 - 10 | S-5 | | 11 - 8 - 7 - 8 | 14 | 15 | | | | Brown Silty Sand, Moist, Medium Dense (SM) (NYC Class 3b) | |
| | | | | | | 10.0 | | | | |
| 10 - 12 | S-6 | | 6 - 4 - 7 - 7 | 20 | 11 | | | | As Above, with Gravel (SM) (NYC Class 3b) | |
| | | | | | | 15.0 | | | | |
| 15 - 17 | S-7 | | 4 - 4 - 7 - 6 | 14 | 11 | | | | Brown Silty Clay with Gravel, Wet, Very Siff (CL-ML) (NYC Class 4b) | Qu = 3.5 tsf |
| | | | | | | 20.0 | | | | |
| 20 - 22 | S-8 | | 13 - 8 - 9 - 10 | NR | 17 | | | | No Recovery, Presumed As Above (CL-ML) (NYC Class 4b) | |
| | | | | | | 25.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Boring No.:** B-41(2)



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 34.0 feet | **Date Started:** | 10/20/2022 |
| **Termination Depth:** | 27.0 feet bgs | **Date Completed:** | 10/20/2022 |
| **Proposed Location:** | Building | **Logged By:** | MO |
| **Drill / Test Method:** | HSA / SPT | **Contractor:** | ECG |
| | | **Equipment:** | AMS-Tracked |

| | Water Depth (feet bgs) | Elevation (feet) | Cave-In Depth (feet bgs) | Elevation (feet) |
|---|---|---|---|---|
| **During:** | 15.0 | 19.0 | | |
| **At Completion:** | --- | --- | **At Completion:** | 21.0 / 13.0 |
| **24 Hours:** | NE | --- | **24 Hours:** | NE / --- |

| SAMPLE INFORMATION | | | | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (feet) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | | | | |
| | | | | | | 25.0 | | | | |
| 25 - 27 | S-9 | | 7 - 7 - 9 - 12 | 24 | 16 | | GLACIAL DEPOSITS | | As Above, Brown Silty Clay, Wet, Hard (CL-ML) (NYC Class 4a) | Qu = >4.0 tsf |
| | | | | | | 27.0 | | | Boring Log B-41 Terminated at a Depth of 27.0 Feet Below Ground Surface | |
| | | | | | | 30.0 | | | | |
| | | | | | | 35.0 | | | | |
| | | | | | | 40.0 | | | | |
| | | | | | | 45.0 | | | | |
| | | | | | | 50.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Soil Profile Pit No.:** SPP-1



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 24.0 feet | **Date Started:** | 10/19/2022 | | **Water Depth (feet bgs)** | **Elevation (feet)** | **Estimated Seasonal High Groundwater Depth (feet bgs)** / **Elevation (feet)** |
| **Termination Depth:** | 11.0 feet bgs | **Date Completed:** | 10/19/2022 | | | | |
| **Proposed Location:** | SWM | **Logged By:** | MO | **During:** | 9.0 | 15.0 | |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | **At Completion:** | 9.5 | 14.5 | **At Completion:** 9.0 / 15.0 |
| **Test Method:** | Visual Observation | **Rig Type:** | Case 580 | **24 Hours:** | 9.5 | 14.5 | |

| SAMPLE INFORMATION | | | DEPTH | HORIZON | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|
| Depth (feet) | Number | Type | feet | | | |
| | | | 0.0 | | | |
| | | | 0 - 1.8 | PAVEMENT | 6" Asphalt<br>15" Subbase | |
| | | | 1.8 | | | |
| | | | 1.8 - 6 | GLACIAL DEPOSITS | Light Brown (5YR 5/8) SANDY CLAY LOAM; No Gravel; Moist; Moderate, Blocky Structure; No Roots | |
| | | | 6 - 11 | | Brown (5YR 4/8) CLAY; 20% Gravel; Moist; Blocky Structure; Hard; No Roots | |
| | | | 9.0 | | As Above, Wet | |
| | | | 11.0 | | Soil Profile Pit SPP-1 Terminated at a Depth of 11.0 Feet Below Ground Surface | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Soil Profile Pit No.:** SPP-2



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 25.0 feet | **Date Started:** | 10/19/2022 | | **Water Depth (feet bgs)** | **Elevation (feet)** | **Estimated Seasonal High Groundwater Depth (feet bgs)** / **Elevation (feet)** |
| **Termination Depth:** | 11.0 feet bgs | **Date Completed:** | 10/19/2022 | | | | |
| **Proposed Location:** | SWM | **Logged By:** | MO | **During:** | 8.0 | 17.0 | |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | **At Completion:** | 8.5 | 16.5 | **At Completion:** 8.0 / 17.0 |
| **Test Method:** | Visual Observation | **Rig Type:** | Case 580 | **24 Hours:** | 8.5 | 16.5 | |

| SAMPLE INFORMATION | | | DEPTH | HORIZON | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|
| Depth (feet) | Number | Type | feet | | | |
| | | | 0.0 | | | |
| | | | 0 - 1.7 | PAVEMENT | 6" Asphalt<br>14" Subbase | |
| | | | 1.0 | | | |
| | | | 1.7 | | | |
| | | | 1.7 - 6 | GLACIAL DEPOSITS | Light Brown (5YR 5/8) SANDY CLAY LOAM; No Gravel; Moist; Moderate, Blocky Structure; No Roots | |
| | | | 2.0 | | | |
| | | | 3.0 | | | |
| | | | 4.0 | | | |
| | | | 5.0 | | | |
| | | | 6.0 | | | |
| | | | 6 - 11 | | Brown (5YR 4/8) CLAY; 20% Gravel; Moist; Blocky Structure; Hard; No Roots | |
| | | | 7.0 | | | |
| | | | 8.0 ▼ | | As Above, Wet | |
| | | | ▽ | | | |
| | | | 9.0 | | | |
| | | | 10.0 | | | |
| | | | 11.0 | | | |
| | | | 12.0 | | Soil Profile Pit SPP-2 Terminated at a Depth of 11.0 Feet Below Ground Surface | |
| | | | 13.0 | | | |
| | | | 14.0 | | | |
| | | | 15.0 | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Soil Profile Pit No.:** SPP-3



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | Water Depth (feet bgs) \| Elevation (feet) | | Estimated Seasonal High Groundwater Depth (feet bgs) \| Elevation (feet) | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 27.0 feet | **Date Started:** | 10/19/2022 | **During:** | 7.5 \| 19.5 | | |
| **Termination Depth:** | 12.0 feet bgs | **Date Completed:** | 10/19/2022 | **At Completion:** | 8.0 \| 19.0 | **At Completion:** | 7.0 \| 20.0 |
| **Proposed Location:** | SWM | **Logged By:** | MO | **24 Hours:** | 8.0 \| 19.0 | | |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | | | | |
| **Test Method:** | Visual Observation | **Rig Type:** | Case 580 | | | | |

| SAMPLE INFORMATION | | | DEPTH | | HORIZON | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|
| Depth (feet) | Number | Type | feet | | | | |
| | | | 0.0 | | | | |
| | | | | 0 - 2 | PAVEMENT | 5" Asphalt<br>19" Subbase | |
| | | | 1.0 | | | | |
| | | | 2.0 | | | | |
| | | | | 2 - 7 | GLACIAL DEPOSITS | Light Brown (5YR 5/8) SANDY CLAY LOAM; No Gravel; Moist Grading to Wet; Moderate, Blocky/Granular Structure; No Root | |
| | | | 3.0 | | | | |
| | | | 4.0 | | | | |
| | | | 5.0 | | | | |
| | | | 6.0 | | | | |
| | | | 7.0 | | | | |
| | | | | 7 - 12 | | Brown (5YR 4/8) CLAY; 5% Gravel, 15% Cobbles; Very Moist to Wet; Blocky Structure; Hard; No Roots; | |
| | | | 8.0 | | | | |
| | | | 9.0 | | | | |
| | | | 10.0 | | | | |
| | | | 11.0 | | | | |
| | | | 12.0 | | | | |
| | | | | | | Soil Profile Pit SPP-3 Terminated at a Depth of 12.0 Feet Below Ground Surface | |
| | | | 13.0 | | | | |
| | | | 14.0 | | | | |
| | | | 15.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Soil Profile Pit No.:** SPP-4



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |
| **Surface Elevation:** | ± 26.0 feet | **Date Started:** | 10/19/2022 |
| **Termination Depth:** | 11.0 feet bgs | **Date Completed:** | 10/19/2022 |
| **Proposed Location:** | SWM | **Logged By:** | MO |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC |
| **Test Method:** | Visual Observation | **Rig Type:** | Case 580 |

| Water Depth (feet bgs) \| Elevation (feet) | | |
|---|---|---|
| **During:** | 4.0 | 22.0 |
| **At Completion:** | 4.0 | 22.0 |
| **24 Hours:** | 4.0 | 22.0 |

**Estimated Seasonal High Groundwater Depth \| Elevation (feet bgs) \| (feet)**

**At Completion:** 4.0 | 22.0

| SAMPLE INFORMATION | | | DEPTH | | HORIZON | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|
| Depth (feet) | Number | Type | feet | | | | |
| | | | 0.0 | | | | |
| | | | | 0 - 1 | PAVEMENT | 6" Asphalt<br>6" Subbase | |
| | | | 1.0 | | | | |
| | | | | 1 - 7 | GLACIAL DEPOSITS | Light Brown (5YR 5/8) SANDY CLAY LOAM; No Gravel; Moist; Moderate, Blocky Structure; Roots on Top 1' | |
| | | | 2.0 | | | | |
| | | | 3.0 | | | | |
| | | | | 4.0 | | As Above, Wet | |
| | | | 4.0 ▼ ▽ | | | | |
| | | | 5.0 | | | | |
| | | | 6.0 | | | | |
| | | | 7.0 | | | | |
| | | | | 7 - 11 | | Brown (5YR 4/8) CLAY; 10% Gravel, 10% Cobbles; Wet; Blocky Structure; Hard; No Roots | |
| | | | 8.0 | | | | |
| | | | 9.0 | | | | |
| | | | 10.0 | | | | |
| | | | 11.0 | | | | |
| | | | | | | Soil Profile Pit SPP-4 Terminated at a Depth of 11.0 Feet Below Ground Surface | |
| | | | 12.0 | | | | |
| | | | 13.0 | | | | |
| | | | 14.0 | | | | |
| | | | 15.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Soil Profile Pit No.:** SPP-5



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 26.0 feet | **Date Started:** | 10/18/2022 | | **Water Depth (feet bgs)** | **Elevation (feet)** | **Estimated Seasonal High Groundwater Depth (feet bgs)** / **Elevation (feet)** |
| **Termination Depth:** | 12.0 feet bgs | **Date Completed:** | 10/18/2022 | **During:** | 9.0 | 17.0 | |
| **Proposed Location:** | SWM | **Logged By:** | MO | **At Completion:** | 10.0 | 16.0 | **At Completion:** 9.0 / 17.0 |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | **24 Hours:** | NE | --- | |
| **Test Method:** | Visual Observation | **Rig Type:** | Case 580 | | | | |

| SAMPLE INFORMATION | | | DEPTH | | HORIZON | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|
| Depth (feet) | Number | Type | feet | | | | |
| | | | 0.0 | | | | |
| | | | | 0 - 2.5 | FILL | Brown (5YR 4/6) LOAM; 40% Gravel; Moist; Moderate, Blocky Structure; No Roots | |
| | | | 1.0 | | | | |
| | | | 2.0 | | | | |
| | | | | 2.5 - 4 | | As Above, 5% Gravel | |
| | | | 3.0 | | | | |
| | | | 4.0 | | | | |
| | | | | 4 - 6 | GLACIAL DEPOSITS | Gray (5YR 5/2) SANDY CLAY; No Gravel; Moist Grading to Wet; Moderate, Blocky Structure; No Roots | |
| | | | 5.0 | | | | |
| | | | 6.0 | | | | |
| | | | | 6 - 12 | | Reddish-Brown (5YR 5/8) SANDY LOAM; 10% Gravel; Moist, Moderate, Blocky Structure; No Roots | |
| | | | 7.0 | | | | |
| | | | 8.0 | | | | |
| | | | | | | As Above, Wet | |
| | | | 9.0 ▼ | | | | |
| | | | 10.0 ▽ | | | | |
| | | | 11.0 | | | | |
| | | | 12.0 | | | | |
| | | | | | | Soil Profile Pit SPP-5 Terminated at a Depth of 12.0 Feet Below Ground Surface | |
| | | | 13.0 | | | | |
| | | | 14.0 | | | | |
| | | | 15.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Soil Profile Pit No.:** SPP-6



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 25.0 feet | **Date Started:** | 10/18/2022 | **Water Depth (feet bgs) \| Elevation (feet)** | | | **Estimated Seasonal High Groundwater Depth (feet bgs) \| Elevation (feet)** |
| **Termination Depth:** | 11.0 feet bgs | **Date Completed:** | 10/18/2022 | | | | |
| **Proposed Location:** | SWM | **Logged By:** | MO | **During:** | NE | --- | |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | **At Completion:** | NE | --- | **At Completion:** NE \| --- |
| **Test Method:** | Visual Observation | **Rig Type:** | Case 580 | **24 Hours:** | NE | --- | |

| SAMPLE INFORMATION | | | DEPTH | | HORIZON | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|
| Depth (feet) | Number | Type | feet | | | | |
| | | | 0.0 | | | | |
| | | | | 0 - 1 | TOPSOIL | 12" Topsoil | |
| | | | 1.0 | | | | |
| | | | | 1 - 11 | GLACIAL DEPOSITS | Light Brown (5YR 5/6) SANDY CLAY LOAM; 10% Gravel, 10% Cobbles, 10% Boulders; Slightly Moist; Blocky Structure; Cemented; Hard; Roots on Top 1' | |
| | | | 2.0 | | | | |
| | | | 3.0 | | | | |
| | | | 4.0 | | | | |
| | | | 5.0 | | | | |
| | | | 6.0 | | | | |
| | | | 7.0 | | | | |
| | | | 8.0 | | | | |
| | | | 9.0 | | | | |
| | | | 10.0 | | | | |
| | | | 11.0 | | | | |
| | | | | | | Soil Profile Pit SPP-6 Terminated at a Depth of 11.0 Feet Below Ground Surface Due to Refusal | |
| | | | 12.0 | | | | |
| | | | 13.0 | | | | |
| | | | 14.0 | | | | |
| | | | 15.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Soil Profile Pit No.:** SPP-7



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 25.0 feet | **Date Started:** | 10/18/2022 | **Water Depth (feet bgs) \| Elevation (feet)** | | | **Estimated Seasonal High Groundwater Depth (feet bgs) \| Elevation (feet)** |
| **Termination Depth:** | 11.0 feet bgs | **Date Completed:** | 10/18/2022 | | | | |
| **Proposed Location:** | SWM | **Logged By:** | MO | **During:** | NE | --- | |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | **At Completion:** | NE | --- | **At Completion:** NE \| --- |
| **Test Method:** | Visual Observation | **Rig Type:** | Case 580 | **24 Hours:** | NE | --- | |

| SAMPLE INFORMATION | | | DEPTH | | HORIZON | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|
| Depth (feet) | Number | Type | feet | | | | |
| | | | 0.0 | | | | |
| | | | | 0 - 1 | TOPSOIL | 12" Topsoil | |
| | | | 1.0 | | | | |
| | | | | 1 - 4 | GLACIAL DEPOSITS | Light Brown (5YR 6/8) SANDY CLAY LOAM; 15% Gravel, 5% Cobbles; Slightly Moist; Blocky Structure; Hard; Roots on Top 2'; No Mottling | |
| | | | 2.0 | | | | |
| | | | 3.0 | | | | |
| | | | 4.0 | | | | |
| | | | | 4 - 11 | | As Above; 10% Gravel, 10% Cobbles; Blocky/Flaky Structure | |
| | | | 5.0 | | | | |
| | | | 6.0 | | | | |
| | | | 7.0 | | | | |
| | | | 8.0 | | | | |
| | | | 9.0 | | | | |
| | | | 10.0 | | | | |
| | | | 11.0 | | | | |
| | | | | | | Soil Profile Pit SPP-7 Terminated at a Depth of 11.0 Feet Below Ground Surface Due to Refusal on Boulder | |
| | | | 12.0 | | | | |
| | | | 13.0 | | | | |
| | | | 14.0 | | | | |
| | | | 15.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Soil Profile Pit No.:** SPP-8



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 25.0 feet | **Date Started:** | 10/18/2022 | **Water Depth (feet bgs) \| Elevation (feet)** | | | **Estimated Seasonal High Groundwater Depth (feet bgs) \| Elevation (feet)** |
| **Termination Depth:** | 12.0 feet bgs | **Date Completed:** | 10/18/2022 | | | | |
| **Proposed Location:** | SWM | **Logged By:** | MO | **During:** | NE \| --- | ▼ | |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | **At Completion:** | NE \| --- | ▽ | **At Completion:** NE \| --- |
| **Test Method:** | Visual Observation | **Rig Type:** | Case 580 | **24 Hours:** | NE \| --- | ▼ | |

| SAMPLE INFORMATION | | | DEPTH | | HORIZON | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|
| Depth (feet) | Number | Type | feet | | | | |
| | | | 0.0 | | | | |
| | | | | 0 - 1 | TOPSOIL | 12" Topsoil | |
| | | | 1.0 | | | | |
| | | | | 1 - 3 | GLACIAL DEPOSITS | Brown (5YR 5/8) LOAM; 10% Gravel; Slightly Moist; Moderate, Granular/Blocky Structure; Roots on Top 1' | |
| | | | 2.0 | | | | |
| | | | 3.0 | | | | |
| | | | | 3 - 7 | | Light Brown (5YR 5/6) SANDY CLAY LOAM; 10% Gravel, 10% Cobbles; Blocky Structure; Hard; No Roots | |
| | | | 4.0 | | | | |
| | | | 5.0 | | | | |
| | | | 6.0 | | | | |
| | | | 7.0 | | | | |
| | | | | 7 - 12 | | Brown (5YR 4/8) LOAM; 10% Gravel, 10% Cobbles, 10% Boulders; Blocky Structure; Hard; No Roots | |
| | | | 8.0 | | | | |
| | | | 9.0 | | | | |
| | | | 10.0 | | | | |
| | | | 11.0 | | | | |
| | | | 12.0 | | | | |
| | | | | | | Soil Profile Pit SPP-8 Terminated at a Depth of 12.0 Feet Below Ground Surface | |
| | | | 13.0 | | | | |
| | | | 14.0 | | | | |
| | | | 15.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Soil Profile Pit No.:** SPP-9



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 32.0 feet | **Date Started:** | 10/18/2022 | | **Water Depth (feet bgs) \| Elevation (feet)** | | **Estimated Seasonal High Groundwater Depth (feet bgs) \| Elevation (feet)** |
| **Termination Depth:** | 11.0 feet bgs | **Date Completed:** | 10/18/2022 | | | | |
| **Proposed Location:** | SWM | **Logged By:** | MO | **During:** | NE \| --- | | |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | **At Completion:** | NE \| --- | | **At Completion:** NE \| --- |
| **Test Method:** | Visual Observation | **Rig Type:** | Case 580 | **24 Hours:** | NE \| --- | | |

| SAMPLE INFORMATION | | | DEPTH | | HORIZON | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|
| Depth (feet) | Number | Type | feet | | | | |
| | | | 0.0 | | | | |
| | | | | 0 - 1 | TOPSOIL | 12" Topsoil | |
| | | | 1.0 | | | | |
| | | | | 1 - 2.5 | GLACIAL DEPOSITS | Light Brown (5YR 5/6) SANDY LOAM; 10% Gravel; Slightly Moist; Granular/Blocky Structure; Hard; Roots on Top 1' | |
| | | | 2.0 | | | | |
| | | | | 2.5 - 5 | | Light Brown (5YR 6/6) SANDY LOAM; 15% Gravel, 10% Cobbles; Slightly Moist; Granular/Blocky Structure; Hard; No Roots | |
| | | | 3.0 | | | | |
| | | | 4.0 | | | | |
| | | | 5.0 | | | | |
| | | | | 5 - 11 | | Brown (5YR 4/8) SILT LOAM; 10% Gravel, 10% Cobble, 10% Boulders; Slightly Moist; Granular/Blocky Structure; Hard; No Roots | |
| | | | 6.0 | | | | |
| | | | 7.0 | | | | |
| | | | 8.0 | | | | |
| | | | 9.0 | | | | |
| | | | 10.0 | | | | |
| | | | 11.0 | | | | |
| | | | | | | Soil Profile Pit SPP-9 Terminated at a Depth of 11.0 Feet Below Ground Surface | |
| | | | 12.0 | | | | |
| | | | 13.0 | | | | |
| | | | 14.0 | | | | |
| | | | 15.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Soil Profile Pit No.:** SPP-10



| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road; Staten Island, Richmond County, NY | **Client:** | Johnson Development Associates, Inc. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 32.0 feet | **Date Started:** | 10/18/2022 | | **Water Depth (feet bgs) \| Elevation (feet)** | | **Estimated Seasonal High Groundwater Depth (feet bgs) \| Elevation (feet)** |
| **Termination Depth:** | 12.0 feet bgs | **Date Completed:** | 10/18/2022 | | | | |
| **Proposed Location:** | SWM | **Logged By:** | MO | **During:** | NE \| --- | | |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | **At Completion:** | NE \| --- | **At Completion:** | NE \| --- |
| **Test Method:** | Visual Observation | **Rig Type:** | Case 580 | **24 Hours:** | NE \| --- | | |

| SAMPLE INFORMATION | | | DEPTH | | HORIZON | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|
| Depth (feet) | Number | Type | feet | | | | |
| | | | 0.0 | | | | |
| | | | | 0 - 1 | TOPSOIL | 12" Topsoil | |
| | | | 1.0 | | | | |
| | | | | 1 - 12 | GLACIAL DEPOSITS | Light Brown (5YR 6/8) SANDY CLAY LOAM; 10% Gravel, 10% Cobbles; Slightly Moist; Granular/Blocky Structure; Hard; Roots to Top 1' | |
| | | | 2.0 | | | | |
| | | | 3.0 | | | | |
| | | | 4.0 | | | | |
| | | | 5.0 | | | | |
| | | | 6.0 | | | | |
| | | | 7.0 | | | | |
| | | | 8.0 | | | | |
| | | | 9.0 | | | | |
| | | | 10.0 | | | | |
| | | | 11.0 | | | | |
| | | | 12.0 | | | | |
| | | | | | | Soil Profile Pit SPP-10 Terminated at a Depth of 12.0 Feet Below Ground Surface | |
| | | | 13.0 | | | | |
| | | | 14.0 | | | | |
| | | | 15.0 | | | | |

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Test Pit No.:** TP-1

Page 1 of 1

| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road, Staten Island, Ricmond County, New York | **Client:** | Johnson Development Associates |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 35.0 feet | **Date Started:** | 10/17/2022 | **Water Depth (feet bgs) \| Elevation (feet)** | | **Cave-In Depth (feet bgs) \| Elevation (feet)** | |
| **Termination Depth:** | 11.5 feet bgs | **Date Completed:** | 10/17/2022 | | | | |
| **Proposed Location:** | Pavement | **Logged By:** | MO | **During:** | 11.0 \| --- | | |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | **At Completion:** | 11.0 \| --- | **At Completion:** | NE \| --- |
| **Test Method:** | Visual Observation | **Rig Type:** | CASE 580 | **24 Hours:** | NE \| --- | | |

| SAMPLE INFORMATION | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|
| Depth (ft.) | Number | Type | (feet) | | | | |
| | | | 0.0 | | | | |
| | | | | TOPSOIL | | 6" Topsoil | |
| | | | 0.5 | GLACIAL DEPOSITS | | Light Brown Silty Sand, Moist (SM) (NYC Class 3b) | |
| | | | 4.5 | | | | |
| | | | 5.0 | | | As Above, with Gravel & Cobbles (SM) (NYC Class 3b) | |
| | | | 7.5 | | | | |
| | | | 10.0 | | | | |
| | | | 11.5 | | | As Above, Wet (SM) | |
| | | | | | | Test Pit Log TP-1 Terminated at a Depth of 11.5 Feet Below Ground Surface | |
| | | | 15.0 | | | | |

NOTES: bgs = below ground surface, DNC = Did Not Cave, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Test Pit No.:** TP-2

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road, Staten Island, Ricmond County, New York | **Client:** | Johnson Development Associates |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 37.0 feet | **Date Started:** | 10/17/2022 | **Water Depth (feet bgs) \| Elevation (feet)** | | **Cave-In Depth (feet bgs) \| Elevation (feet)** | |
| **Termination Depth:** | 12.0 feet bgs | **Date Completed:** | 10/17/2022 | | | | |
| **Proposed Location:** | Pavement | **Logged By:** | MO | **During:** | NE \| --- | | |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | **At Completion:** | NE \| --- | **At Completion:** | NE \| --- |
| **Test Method:** | Visual Observation | **Rig Type:** | CASE 580 | **24 Hours:** | NE \| --- | | |

| SAMPLE INFORMATION | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|
| Depth (ft.) | Number | Type | (feet) | | | | |
| | | | 0.0 | | | | |
| | | | | TOPSOIL | | 12" Topsoil | |
| | | | 1.0 | | | | |
| | | | | GLACIAL DEPOSITS | | Light Brown Clayey Sand, Moist (SC) (NYC Class 3b) | |
| | | | 5.0 | | | | |
| | | | 6.0 | | | As Above, with Gravel & Cobbles (SC) (NYC Class 3b) | |
| | | | 10.0 | | | | |
| | | | 12.0 | | | | |
| | | | | | | Test Pit Log TP-2 Terminated at a Depth of 12.0 Feet Below Ground Surface | |
| | | | 15.0 | | | | |

NOTES: bgs = below ground surface, DNC = Did Not Cave, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Test Pit No.:** TP-3

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road, Staten Island, Ricmond County, New York | **Client:** | Johnson Development Associates |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 38.0 feet | **Date Started:** | 10/17/2022 | | **Water Depth (feet bgs) \| Elevation (feet)** | **Cave-In Depth (feet bgs) \| Elevation (feet)** | |
| **Termination Depth:** | 11.5 feet bgs | **Date Completed:** | 10/17/2022 | | | | |
| **Proposed Location:** | Pavement | **Logged By:** | MO | **During:** | NE \| --- | | |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | **At Completion:** | NE \| --- | **At Completion:** | NE \| --- |
| **Test Method:** | Visual Observation | **Rig Type:** | CASE 580 | **24 Hours:** | NE \| --- | | |

| SAMPLE INFORMATION | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|
| Depth (ft.) | Number | Type | (feet) | | | | |
| | | | 0.0 | TOPSOIL | | 12" Topsoil | |
| | | | 1.0 | GLACIAL DEPOSITS | | Light Brown Sandy Lean Clay, Moist (CL) (NYC Class 4c) | |
| | | | 5.0 | | | | |
| | | | 8.0 | | | As Above, Light Brown, with Gravel (CL) (NYC Class 4c) | |
| | | | 10.0 | | | | |
| | | | | | | Test Pit Log TP-3 Terminated at a Depth of 11.5 Feet Below Ground Surface | |
| | | | 15.0 | | | | |

NOTES: bgs = below ground surface, DNC = Did Not Cave, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Test Pit No.:** TP-4

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| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road, Staten Island, Ricmond County, New York | **Client:** | Johnson Development Associates |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 41.0 feet | **Date Started:** | 10/17/2022 | **Water Depth (feet bgs) \| Elevation (feet)** | | **Cave-In Depth (feet bgs) \| Elevation (feet)** | |
| **Termination Depth:** | 11.5 feet bgs | **Date Completed:** | 10/17/2022 | | | | |
| **Proposed Location:** | Pavement | **Logged By:** | MO | **During:** | NE \| --- | | |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | **At Completion:** | NE \| --- | **At Completion:** | NE \| --- |
| **Test Method:** | Visual Observation | **Rig Type:** | CASE 580 | **24 Hours:** | NE \| --- | | |

| SAMPLE INFORMATION | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|
| Depth (ft.) | Number | Type | (feet) | | | | |
| | | | 0.0 | | | | |
| | | | | TOPSOIL | | 6" Topsoil | |
| | | | 0.5 | GLACIAL DEPOSITS | | Light Brown Sandy Lean Clay, Moist (CL) (NYC Class 4b) | |
| | | | 5.0 | | | | |
| | | | 8.0 | | | As Above, Reddish-Brown (CL) (NYC Class 4b) | |
| | | | 10.0 | | | | |
| | | | 11.5 | | | | |
| | | | | | | Test Pit Log TP-4 Terminated at a Depth of 11.5 Feet Below Ground Surface | |
| | | | 15.0 | | | | |

NOTES: bgs = below ground surface, DNC = Did Not Cave, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Test Pit No.:** TP-5

Page 1 of 1

| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road, Staten Island, Ricmond County, New York | **Client:** | Johnson Development Associates |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 37.0 feet | **Date Started:** | 10/17/2022 | **Water Depth (feet bgs) \| Elevation (feet)** | | **Cave-In Depth (feet bgs) \| Elevation (feet)** | |
| **Termination Depth:** | 11.5 feet bgs | **Date Completed:** | 10/17/2022 | | | | |
| **Proposed Location:** | Building | **Logged By:** | MO | **During:** | NE \| --- | | |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | **At Completion:** | NE \| --- | **At Completion:** | NE \| --- |
| **Test Method:** | Visual Observation | **Rig Type:** | CASE 580 | **24 Hours:** | NE \| --- | | |

| SAMPLE INFORMATION | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|
| Depth (ft.) | Number | Type | (feet) | | | | |
| | | | 0.0 | | | | |
| | | | | TOPSOIL | | 6" Topsoil | |
| | | | 0.5 | GLACIAL DEPOSITS | | Light Brown Sandy Lean Clay, Moist (CL) (NYC Class 4b) | |
| | | | 5.0 | | | | |
| | | | 6.0 | | | As Above, with Gravel (CL) (NYC Class 4b) | |
| | | | 9.0 | | | As Above, Brown (CL) (NYC Class 4b) | |
| | | | 10.0 | | | | |
| | | | 11.5 | | | | |
| | | | | | | Test Pit Log TP-5 Terminated at a Depth of 11.5 Feet Below Ground Surface | |
| | | | 15.0 | | | | |

NOTES: bgs = below ground surface, DNC = Did Not Cave, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# RECORD OF SUBSURFACE EXPLORATION

**Test Pit No.:** TP-6

Page 1 of 1

| | | | |
|---|---|---|---|
| **Project:** | Proposed Warehouse | **WAI Project No.:** | GJ2219649.Y00 |
| **Location:** | Richmond Valley Road, Staten Island, Ricmond County, New York | **Client:** | Johnson Development Associates |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Surface Elevation:** | ± 35.0 feet | **Date Started:** | 10/17/2022 | **Water Depth (feet bgs) \| Elevation (feet)** | | **Cave-In Depth (feet bgs) \| Elevation (feet)** | |
| **Termination Depth:** | 11.5 feet bgs | **Date Completed:** | 10/17/2022 | | | | |
| **Proposed Location:** | Building | **Logged By:** | MO | **During:** | NE \| --- | | |
| **Excavating Method:** | Test Pit Excavation | **Contractor:** | MC | **At Completion:** | NE \| --- | **At Completion:** | NE \| --- |
| **Test Method:** | Visual Observation | **Rig Type:** | CASE 580 | **24 Hours:** | NE \| --- | | |

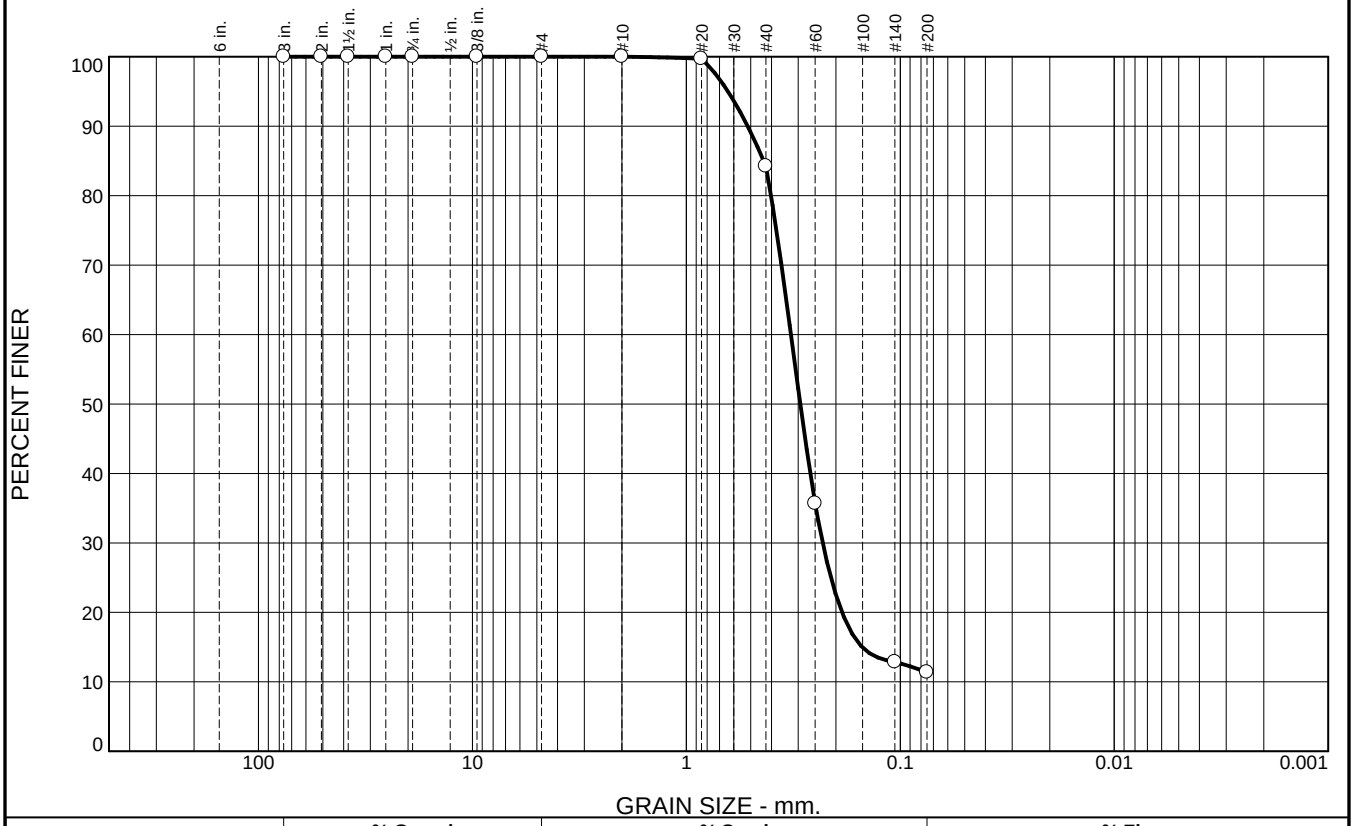
| SAMPLE INFORMATION | | | DEPTH | STRATA | | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
|---|---|---|---|---|---|---|---|
| Depth (ft.) | Number | Type | (feet) | | | | |
| | | | 0.0 | | | | |
| | | | 0.5 | TOPSOIL | | 6" Topsoil | |
| | | | | GLACIAL DEPOSITS | | Light Brown Sandy Lean Clay, Moist (CL) (NYC Class 4b) | |
| | | | 5.0 | | | | |
| | | | 6.5 | | | As Above, with Gravel (CL) (NYC Class 4b) | |
| | | | 10.0 | | | | |
| | | | | | | Test Pit Log TP-6 Terminated at a Depth of 11.5 Feet Below Ground Surface | |
| | | | 15.0 | | | | |

NOTES: bgs = below ground surface, DNC = Did Not Cave, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

# APPENDIX B
# Laboratory Test Results

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 15.8 | 72.8 | 11.4 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 2 | 100.0 | | |
| 1.5 | 100.0 | | |
| 1 | 100.0 | | |
| .75 | 100.0 | | |
| .375 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 99.7 | | |
| #40 | 84.2 | | |
| #60 | 35.7 | | |
| #140 | 12.8 | | |
| #200 | 11.4 | | |

* (no specification provided)

**Material Description**

Poorly Graded Sand with Silt

**Atterberg Limits**

PL= NP LL= NP PI= NP

**Coefficients**

$D_{90}$= 0.5171 $D_{85}$= 0.4354 $D_{60}$= 0.3245
$D_{50}$= 0.2935 $D_{30}$= 0.2306 $D_{15}$= 0.1508
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SP-SM AASHTO= A-2-4(0)

**Remarks**

$W_n$ = 22.7 %

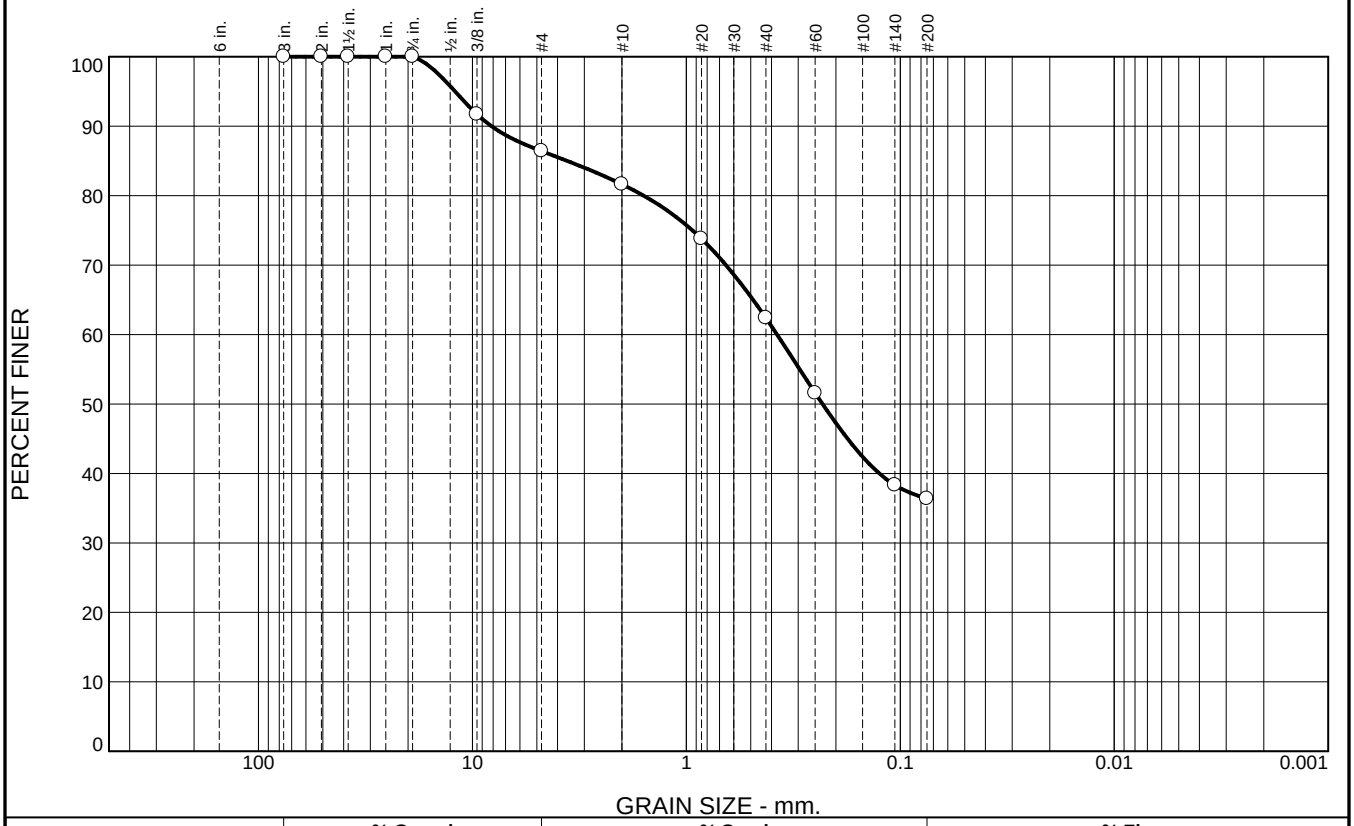
**Source of Sample:** B-2 **Depth:** 6.0' - 8.0'
**Sample Number:** S-4

**Date:** 11/11/2022

**WHITESTONE ASSOCIATES, INC.**
**Warren, New Jersey**

**Client:** Johnson Development Associates, Inc.
**Project:** Proposed Warehouse
Richmond Valley Road, Staten Island, Richmond County, NY
**Project No:** GJ2219649.Y00 **Figure**

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 13.6 | 4.8 | 19.2 | 26.0 | 36.4 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 2 | 100.0 | | |
| 1.5 | 100.0 | | |
| 1 | 100.0 | | |
| .75 | 100.0 | | |
| .375 | 91.7 | | |
| #4 | 86.4 | | |
| #10 | 81.6 | | |
| #20 | 73.8 | | |
| #40 | 62.4 | | |
| #60 | 51.6 | | |
| #140 | 38.3 | | |
| #200 | 36.4 | | |

* (no specification provided)

**Material Description**

Clayey Sand

**Atterberg Limits**

PL= 16 LL= 24 PI= 8

**Coefficients**

$D_{90}$= 8.1549 $D_{85}$= 3.6107 $D_{60}$= 0.3769
$D_{50}$= 0.2310 $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SC AASHTO= A-4(0)

**Remarks**

$W_n$ = 11.8 %

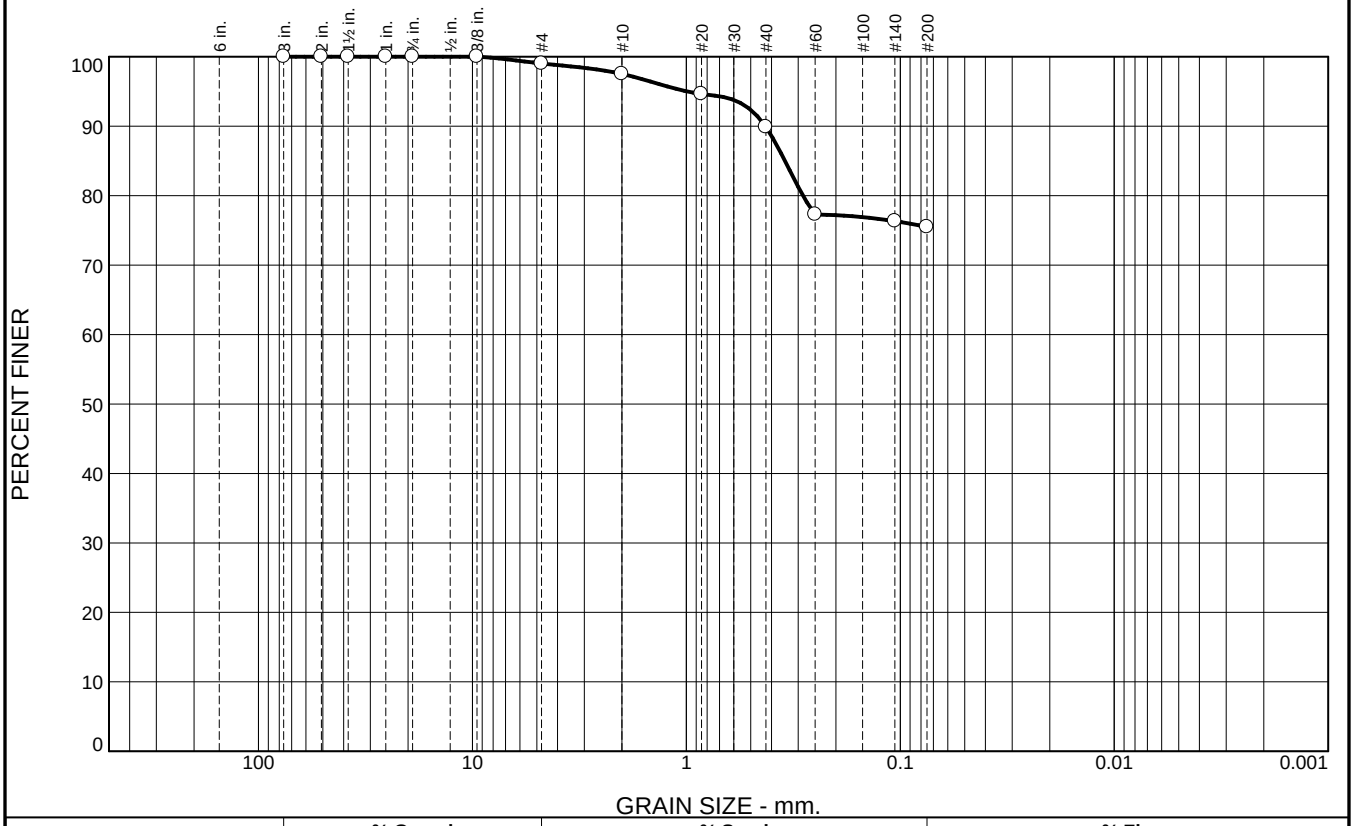
**Source of Sample:** B-8 **Depth:** 8.0' - 10.0'
**Sample Number:** S-5

**Date:** 11/11/2022

**WHITESTONE ASSOCIATES, INC.**
**Warren, New Jersey**

**Client:** Johnson Development Associates, Inc.
**Project:** Proposed Warehouse
Richmond Valley Road, Staten Island, Richmond County, NY
**Project No:** GJ2219649.Y00 **Figure**

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 1.0 | 1.5 | 7.6 | 14.4 | 75.5 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 2 | 100.0 | | |
| 1.5 | 100.0 | | |
| 1 | 100.0 | | |
| .75 | 100.0 | | |
| .375 | 100.0 | | |
| #4 | 99.0 | | |
| #10 | 97.5 | | |
| #20 | 94.6 | | |
| #40 | 89.9 | | |
| #60 | 77.3 | | |
| #140 | 76.3 | | |
| #200 | 75.5 | | |

* (no specification provided)

**Material Description**

Lean Clay with Sand

**Atterberg Limits**

PL= 21 LL= 33 PI= 12

**Coefficients**

$D_{90}$= 0.4275 $D_{85}$= 0.3461 $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= CL AASHTO= A-6(8)

**Remarks**

$W_n$ = 20.1 %

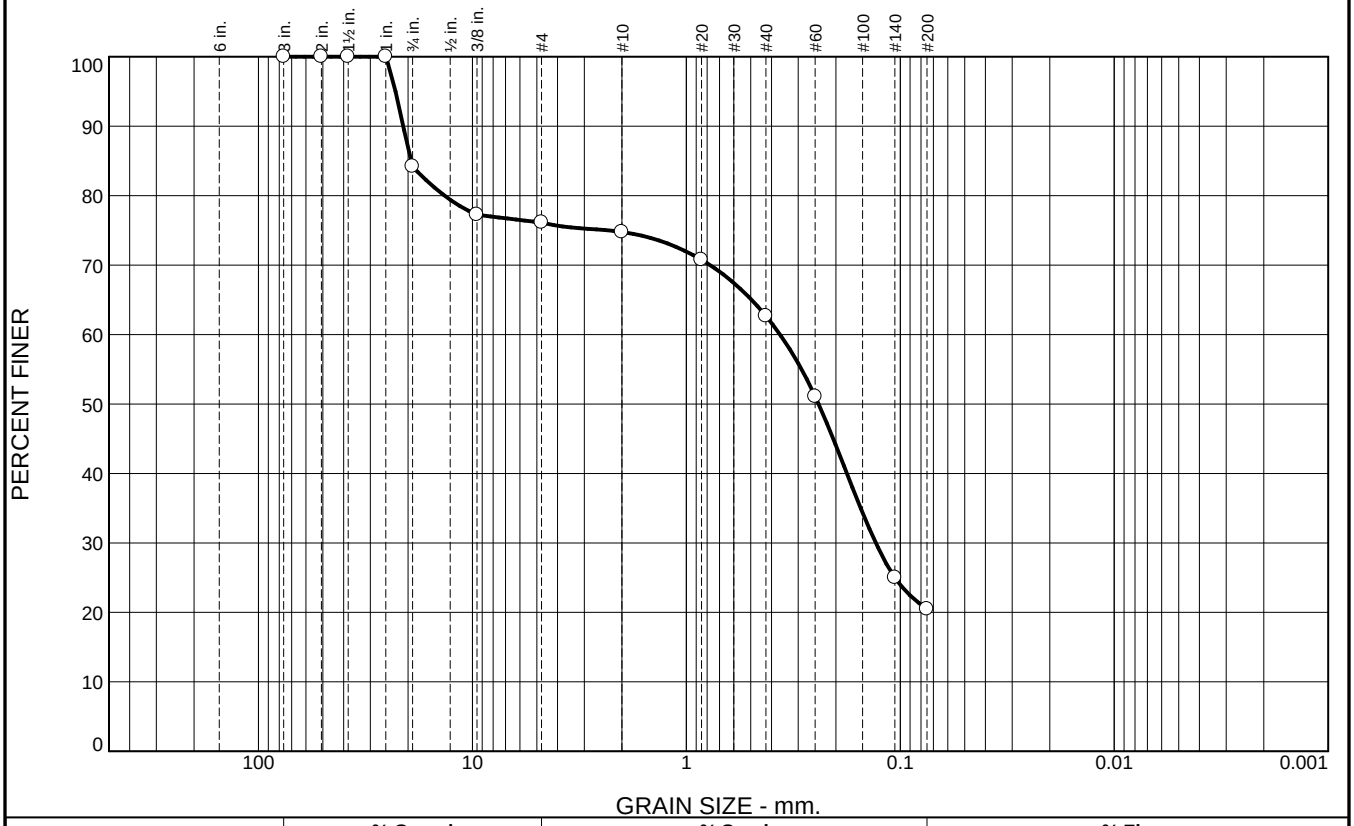
**Source of Sample:** B-11 **Depth:** 4.0' - 6.0'
**Sample Number:** S-3

**Date:** 11/11/2022

**WHITESTONE ASSOCIATES, INC.**
**Warren, New Jersey**

**Client:** Johnson Development Associates, Inc.
**Project:** Proposed Warehouse
Richmond Valley Road, Staten Island, Richmond County, NY
**Project No:** GJ2219649.Y00 **Figure**

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 15.8 | 8.1 | 1.3 | 12.1 | 42.2 | 20.5 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 2 | 100.0 | | |
| 1.5 | 100.0 | | |
| 1 | 100.0 | | |
| .75 | 84.2 | | |
| .375 | 77.2 | | |
| #4 | 76.1 | | |
| #10 | 74.8 | | |
| #20 | 70.8 | | |
| #40 | 62.7 | | |
| #60 | 51.1 | | |
| #140 | 25.0 | | |
| #200 | 20.5 | | |

* (no specification provided)

**Material Description**

Silty Sand with Gravel

**Atterberg Limits**

PL= NP LL= NP PI= NP

**Coefficients**

$D_{90}$= 21.0648 $D_{85}$= 19.3491 $D_{60}$= 0.3650
$D_{50}$= 0.2410 $D_{30}$= 0.1302 $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SM AASHTO= A-2-4(0)

**Remarks**

$W_n$ = 13.9 %

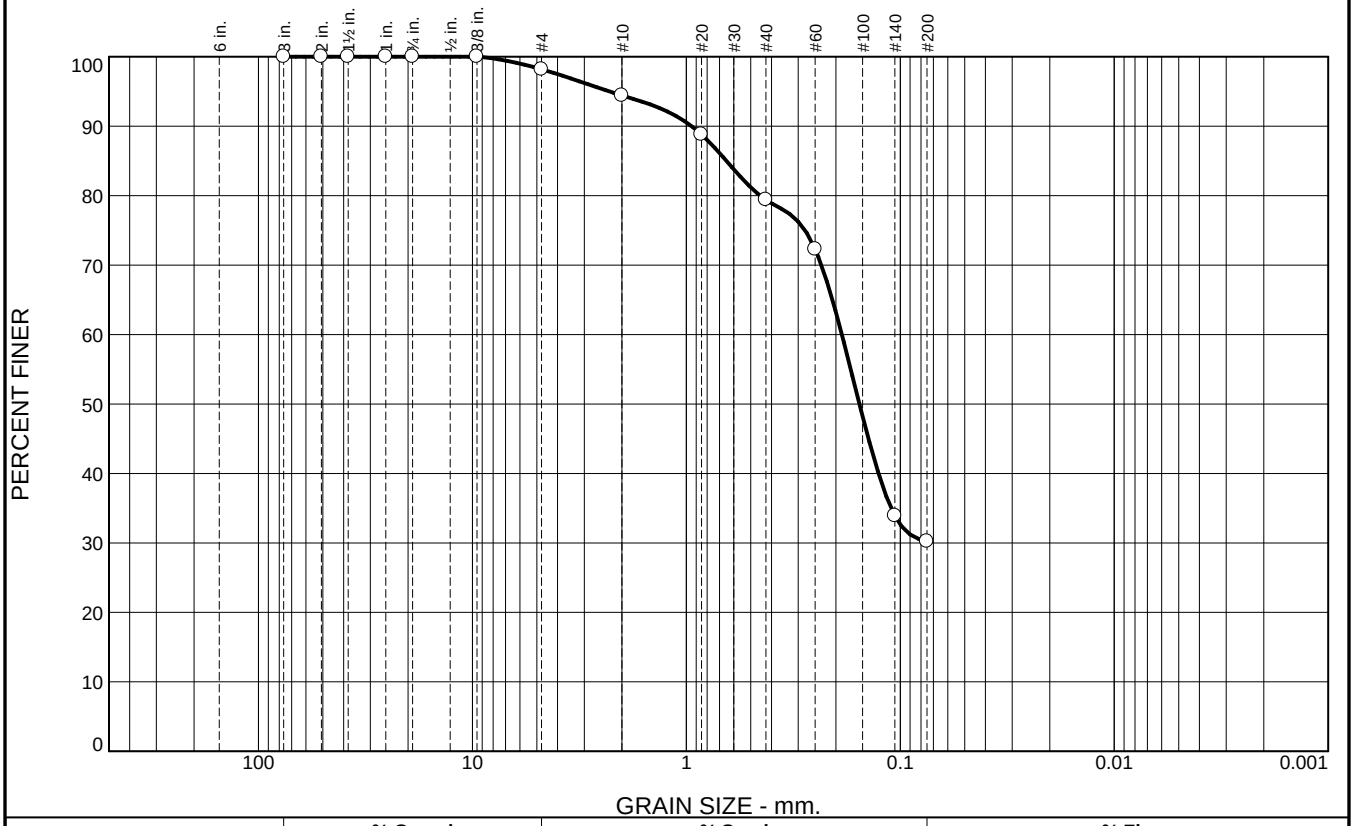
**Source of Sample:** B-17 **Depth:** 6.0' - 8.0'
**Sample Number:** S-4

**Date:** 11/11/2022

**WHITESTONE ASSOCIATES, INC.**
**Warren, New Jersey**

**Client:** Johnson Development Associates, Inc.
**Project:** Proposed Warehouse
Richmond Valley Road, Staten Island, Richmond County, NY
**Project No:** GJ2219649.Y00 **Figure**

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 1.8 | 3.8 | 15.0 | 49.2 | 30.2 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 2 | 100.0 | | |
| 1.5 | 100.0 | | |
| 1 | 100.0 | | |
| .75 | 100.0 | | |
| .375 | 100.0 | | |
| #4 | 98.2 | | |
| #10 | 94.4 | | |
| #20 | 88.8 | | |
| #40 | 79.4 | | |
| #60 | 72.3 | | |
| #140 | 33.9 | | |
| #200 | 30.2 | | |

* (no specification provided)

**Material Description**

Silty Sand

**Atterberg Limits**

PL= NP LL= NP PI= NP

**Coefficients**

$D_{90}$= 0.9460 $D_{85}$= 0.6503 $D_{60}$= 0.1877
$D_{50}$= 0.1553 $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SM AASHTO= A-2-4(0)

**Remarks**

$W_n$ = 4.7 %

**Source of Sample:** B-32 **Depth:** 2.0' - 4.0'
**Sample Number:** S-2

**Date:** 11/11/2022

**WHITESTONE ASSOCIATES, INC.**
**Warren, New Jersey**

**Client:** Johnson Development Associates, Inc.
**Project:** Proposed Warehouse
Richmond Valley Road, Staten Island, Richmond County, NY
**Project No:** GJ2219649.Y00 **Figure**

WHITESTONE

# APPENDIX C
# Infiltration Test Results

WHITESTONE

# INFILTRATION TEST

**Client:** Johnson Development Associates, Inc.

**Test Hole No.:** I-1@SPP-1

**Project:** Proposed Warehouse

**Date:** 10/19/2022

**Location:** Richmond Valley Road

**Weather:** Cloudy

Staten Island, Richmond County, NY

**Surface Elevation:** 24.0

**File No.** GJ2219649.Y00

**Test Depth (Feet):** 5.0

**Field Engineer:** MO

**Test Depth (Elevation):** 19.0

| Reading No. | Time | | Water Level Reading (inches) | | Water Level Fall (Inches) | Time Interval (Hours) | Rate of Flow (Inches/Hour) |
|---|---|---|---|---|---|---|---|
| | Start | Finish | Start | Finish | | | |
| PS | 9:22 | 1:22 | 12.0 | 12.0 | 0.0 | 4.0 | 0.0 |
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**Remarks:**

Field $i$ = 0.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE

# INFILTRATION TEST

**Client:** Johnson Development Associates, Inc.

**Test Hole No.:** I-2@SPP-2

**Project:** Proposed Warehouse

**Date:** 10/19/2022

**Location:** Richmond Valley Road

**Weather:** Cloudy

Staten Island, Richmond County, NY

**Surface Elevation:** 25.0

**File No.** GJ2219649.Y00

**Test Depth (Feet):** 5.0

**Field Engineer:** MO

**Test Depth (Elevation):** 20.0

| Reading No. | Time | | Water Level Reading (inches) | | Water Level Fall (Inches) | Time Interval (Hours) | Rate of Flow (Inches/Hour) |
|---|---|---|---|---|---|---|---|
| | Start | Finish | Start | Finish | | | |
| PS | 12:37 | 4:37 | 12.0 | 12.0 | 0.0 | 4.0 | 0.0 |
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**Remarks:**

Field $i$ = 0.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE

# INFILTRATION TEST

**Client:** Johnson Development Associates, Inc.

**Test Hole No.:** I-3@SPP-3

**Project:** Proposed Warehouse

**Date:** 10/19/2022

**Location:** Richmond Valley Road

**Weather:** Cloudy

Staten Island, Richmond County, NY

**Surface Elevation:** 27.0

**File No.** GJ2219649.Y00

**Test Depth (Feet):** 5.0

**Field Engineer:** MO

**Test Depth (Elevation):** 22.0

| Reading No. | Time | | Water Level Reading (inches) | | Water Level Fall (Inches) | Time Interval (Hours) | Rate of Flow (Inches/Hour) |
|---|---|---|---|---|---|---|---|
| | Start | Finish | Start | Finish | | | |
| PS | 10:52 | 2:52 | 12.0 | 12.0 | 0.0 | 4.0 | 0.0 |
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**Remarks:**

Field $i$ = 0.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE

# INFILTRATION TEST

**Client:** Johnson Development Associates, Inc.

**Test Hole No.:** I-4@SPP-4

**Project:** Proposed Warehouse

**Date:** 10/19/2022

**Location:** Richmond Valley Road

**Weather:** Cloudy

Staten Island, Richmond County, NY

**Surface Elevation:** 26.0

**File No.** GJ2219649.Y00

**Test Depth (Feet):** 2.0

**Field Engineer:** MO

**Test Depth (Elevation):** 24.0

| Reading No. | Time | | Water Level Reading (inches) | | Water Level Fall (Inches) | Time Interval (Hours) | Rate of Flow (Inches/Hour) |
|---|---|---|---|---|---|---|---|
| | Start | Finish | Start | Finish | | | |
| PS | 12:26 | 4:26 | 12.0 | 12.0 | 0.0 | 4.0 | 0.0 |
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**Remarks:**

Field $i$ = 0.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE

# INFILTRATION TEST

**Client:** Johnson Development Associates, Inc.

**Test Hole No.:** I-5@SPP-5

**Project:** Proposed Warehouse

**Date:** 10/18/2022

**Location:** Richmond Valley Road

**Weather:** Clear

Staten Island, Richmond County, NY

**Surface Elevation:** 26.0

**File No.** GJ2219649.Y00

**Test Depth (Feet):** 5.0

**Field Engineer:** MO

**Test Depth (Elevation):** 21.0

| Reading No. | Time | | Water Level Reading (inches) | | Water Level Fall (Inches) | Time Interval (Hours) | Rate of Flow (Inches/Hour) |
|---|---|---|---|---|---|---|---|
| | Start | Finish | Start | Finish | | | |
| PS | 10:40 | 2:40 | 12.0 | 12.00 | 0.00 | 4 | 0.00 |
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**Remarks:**

Field $i$ = 0.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE

# INFILTRATION TEST

**Client:** Johnson Development Associates, Inc.

**Test Hole No.:** I-6@SPP-6

**Project:** Proposed Warehouse

**Date:** 10/18/2022

**Location:** Richmond Valley Road

**Weather:** Clear

Staten Island, Richmond County, NY

**Surface Elevation:** 25.0

**File No.** GJ2219649.Y00

**Test Depth (Feet):** 5.0

**Field Engineer:** MO

**Test Depth (Elevation):** 20.0

| Reading No. | Time | | Water Level Reading (inches) | | Water Level Fall (Inches) | Time Interval (Hours) | Rate of Flow (Inches/Hour) |
|---|---|---|---|---|---|---|---|
| | Start | Finish | Start | Finish | | | |
| PS | 12:32 | 4:32 | 12.0 | 12.0 | 0.0 | 4.0 | 0.0 |
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**Remarks:**

Field $i$ = 0.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE

# INFILTRATION TEST

**Client:** Johnson Development Associates, Inc.

**Test Hole No.:** I-7@SPP-7

**Project:** Proposed Warehouse

**Date:** 10/18/2022

**Location:** Richmond Valley Road

**Weather:** Clear

Staten Island, Richmond County, NY

**Surface Elevation:** 25.0

**File No.** GJ2219649.Y00

**Test Depth (Feet):** 5.0

**Field Engineer:** MO

**Test Depth (Elevation):** 20.0

| Reading No. | Time | | Water Level Reading (inches) | | Water Level Fall (Inches) | Time Interval (Hours) | Rate of Flow (Inches/Hour) |
|---|---|---|---|---|---|---|---|
| | Start | Finish | Start | Finish | | | |
| PS | 10:20 | 2:20 | 12.0 | 12.00 | 0.00 | 4.0 | 0.00 |
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**Remarks:**

Field $i$ = 0.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE

# INFILTRATION TEST

**Client:** Johnson Development Associates, Inc.

**Test Hole No.:** I-8@SPP-8

**Project:** Proposed Warehouse

**Date:** 10/18/2022

**Location:** Richmond Valley Road

**Weather:** Clear

Staten Island, Richmond County, NY

**Surface Elevation:** 25.0

**File No.** GJ2219649.Y00

**Test Depth (Feet):** 5.0

**Field Engineer:** MO

**Test Depth (Elevation):** 20.0

| Reading No. | Time | | Water Level Reading (inches) | | Water Level Fall (Inches) | Time Interval (Hours) | Rate of Flow (Inches/Hour) |
|---|---|---|---|---|---|---|---|
| | Start | Finish | Start | Finish | | | |
| PS | 12:10 | 4:10 | 12.0 | 12.00 | 0.00 | 4.0 | 0.00 |
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**Remarks:**

Field $i$ = 0.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE

# INFILTRATION TEST

**Client:** Johnson Development Associates, Inc.

**Test Hole No.:** I-9@SPP-9

**Project:** Proposed Warehouse

**Date:** 10/18/2022

**Location:** Richmond Valley Road

**Weather:** Clear

Staten Island, Richmond County, NY

**Surface Elevation:** 32.0

**File No.** GJ2219649.Y00

**Test Depth (Feet):** 5.0

**Field Engineer:** MO

**Test Depth (Elevation):** 27.0

| Reading No. | Time | | Water Level Reading (inches) | | Water Level Fall (Inches) | Time Interval (Hours) | Rate of Flow (Inches/Hour) |
|---|---|---|---|---|---|---|---|
| | Start | Finish | Start | Finish | | | |
| PS | 8:30 | 12:30 | 12.0 | 10.0 | 2.0 | 4.0 | - |
| 1 | 12:30 | 1:30 | 6.0 | 5.50 | 0.50 | 1.0 | 0.5 |
| 2 | 1:30 | 2:30 | 6.0 | 5.50 | 0.50 | 1.0 | 0.5 |
| 3 | 2:30 | 3:30 | 6.0 | 5.5 | 0.50 | 1.0 | 0.5 |
| 4 | 3:30 | 4:30 | 6.0 | 5.5 | 0.50 | 1.0 | 0.5 |
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**Remarks:** Field *i* = 0.5 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE

# INFILTRATION TEST

**Client:** Johnson Development Associates, Inc.

**Test Hole No.:** I-10@SPP-10

**Project:** Proposed Warehouse

**Date:** 10/18/2022

**Location:** Richmond Valley Road

**Weather:** Clear

Staten Island, Richmond County, NY

**Surface Elevation:** 32.0

**File No.** GJ2219649.Y00

**Test Depth (Feet):** 6.0

**Field Engineer:** MO

**Test Depth (Elevation):** 26.0

| Reading No. | Time | | Water Level Reading (inches) | | Water Level Fall (Inches) | Time Interval (Hours) | Rate of Flow (Inches/Hour) |
|---|---|---|---|---|---|---|---|
| | Start | Finish | Start | Finish | | | |
| PS | 10:35 | 2:35 | 12.0 | 12.00 | 0.00 | 4.0 | 0.00 |
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**Remarks:**

Field $i$ = 0.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE

# APPENDIX D
# Supplemental Information (USCS, Terms & Symbols)

WHITESTONE

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# UNIFIED SOIL CLASSIFICATION SYSTEM

**SOIL CLASSIFICATION CHART**

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

**GRADATION***

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

**COMPACTNESS***
**Sand and/or Gravel**

RELATIVE DENSITY

LOOSE. ..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

**CONSISTENCY***
**Clay and/or Silt**

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... ..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

** VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.*

L:\Geotechnical Forms and References\Reports\USCSTRMSSYM NJ.docx

WHITESTONE

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# GEOTECHNICAL TERMS AND SYMBOLS

## SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

## SOIL PROPERTY SYMBOLS

N: Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
Qu: Unconfined compressive strength, TSF.
Qp: Penetrometer value, unconfined compressive strength, TSF.
Mc: Moisture content, %.
LL: Liquid limit, %.
PI: Plasticity index, %.
δd: Natural dry density, PCF.
▼: Apparent groundwater level at time noted after completion of boring.

## DRILLING AND SAMPLING SYMBOLS

NE: Not Encountered (Groundwater was not encountered).
SS: Split-Spoon - 1 ⅜" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
AU: Auger Sample.
OB: Diamond Bit.
CB: Carbide Bit
WS: Washed Sample.

## RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

| Term (Non-Cohesive Soils) | Standard Penetration Resistance |
|---|---|
| Very Loose | 0-4 |
| Loose | 4-10 |
| Medium Dense | 10-30 |
| Dense | 30-50 |
| Very Dense | Over 50 |

| Term (Cohesive Soils) | Qu (TSF) |
|---|---|
| Very Soft | 0 - 0.25 |
| Soft | 0.25 - 0.50 |
| Firm (Medium) | 0.50 - 1.00 |
| Stiff | 1.00 - 2.00 |
| Very Stiff | 2.00 - 4.00 |
| Hard | 4.00+ |

## PARTICLE SIZE

| | | | | | |
|---|---|---|---|---|---|
| Boulders | 8 in.+ | Coarse Sand | 5mm-0.6mm | Silt | 0.074mm-0.005mm |
| Cobbles | 8 in.-3 in. | Medium Sand | 0.6mm-0.2mm | Clay | -0.005mm |
| Gravel | 3 in.-5mm | Fine Sand | 0.2mm-0.074mm | | |



*Other Office Locations:*

CHALFONT, PA 215.712.2700 | SOUTHBOROUGH, MA 508.485.0755 | ROCKY HILL, CT 860.726.7889 | WALL, NJ 732.592.2101 | PHILADELPHIA, PA 215.848.2323 | BEDFORD, NH 603.514.2230 | TAMPA, FL 813.851.0690 | MIAMI, FL 786.783.6966

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