ENGINEERING INVESTIGATION & ANALYSIS
GEOTECHNICAL & STRUCTURAL
ASSESSMENT REPORT

47 ADDISON DRIVE
FAIRFIELD, NEW JERSEY 07004

MATRIXNEWORLD
Engineering Progress

Prepared for:

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Department of Community Affairs
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1.0 PROJECT BACKGROUND

The State of New Jersey Department of Community Affairs (DCA), Division of Disaster Recovery and Mitigation, anticipates receiving approval for grant funding through FEMA's Flood Mitigation Assistance (FMA) appropriation. This funding is provided through FMA to states and local communities to reduce or eliminate flood risk due to repetitive flood damage to buildings insured by the National Flood Insurance Program (NFIP). The DCA intends to use the funding for the State's Mitigation Assistance Program (MAP) to elevate residential properties located in a floodplain in the Township of Fairfield. The properties are to be elevated at least 3 feet above the base flood elevation (BFE). The DCA hosted a town hall meeting for homeowners in Fairfield, focused on homeowners with properties that experience Repetitive Losses or Severe Repetitive Losses.

In preparation of procuring a Design-Build firm to conduct the effort, the DCA has contracted Matrix New World Engineering, Land Surveying and Landscape Architecture, P.C. (Matrix) to conduct a geotechnical analysis, preliminary structural analysis, and elevation certificate for residences anticipated to be included in the program. It is understood that this document will serve as the basis for the development of a Request for Proposal (RFP) to procure Design-Build firms to do final structural design and perform the elevation of the properties.

2.0 PROJECT SCOPE

Matrix has completed a geotechnical and structural assessment and elevation certificate to evaluate the viability of elevating the residential building located at 47 Addison Drive in Fairfield, New Jersey (Site). Matrix provided geotechnical and structural engineering and land surveying services as a consultant to the DCA. The project location is shown on the attached Site Location Map (Figure 1).

The purpose of the engineering study was to compile comprehensive data regarding the existing building's foundations and overall structural composition and condition at the Site. The information obtained will be further utilized to determine the feasibility and proposed design of raising the existing residence 3 feet above the base flood elevation (BFE) as determined by FEMA. A team of Matrix engineers and surveyors performed the evaluation, consisting of a geotechnical soil inspection, test pits to reveal the existing building foundations, an interior inspection of the building's visible foundation walls and frame, and topographic surveying for the development of a flood elevation certificate. One test pit (TP-1) was completed to a depth of 54 inches below the ground surface (bgs) and 2 geotechnical borings (B-1 and B-2) were completed to a depth of 27 feet bgs (see Figure 2).

Matrix's geotechnical characterization of the property is based on an engineering evaluation of the subsurface conditions as indicated by the field exploration data and geotechnical laboratory test results on representative soil samples.

3.0 SITE LOCATION & PROJECT DESCRIPTION

The project site is located at 47 Addison Drive in Fairfield, New Jersey. The property consists of a two-story timber-framed split-level house with an approximately 1,630 square foot footprint. The house is situated atop concrete masonry unit (CMU) foundation walls on cast-in-place concrete foundations or on concrete slabs on grade. The substructure of the house is comprised of a finished basement and garage area. The timber frame of the residential structure is mostly covered with a wood shingle siding throughout most of its exterior, though the northeast corner and lower front portion of the building has a brick façade. The rest of the visible foundation walls contain a stucco finish on the exterior.

To assist with the geotechnical and structural evaluation, a test pit and geotechnical borings were advanced in areas around the residence to obtain information regarding the soil's structural properties and the building's existing foundation. The test pit and 2 borings were located to provide the most useful information about the subsurface conditions. Refer to Figure 2 of this report for a map of the test pit and boring locations.

4.0 GEOLOGIC SETTING

According to the USDA Soil Survey of Essex County, the site is situated atop Horseneck – Urban land. The subsurface composition is typically sandy loams from 2 to 22 inches bgs and loamy sands from 22 to 60 inches bgs.

According to the 2014 Bedrock Geologic Map of New Jersey, the Site is underlain by the Sedimentary and Bedded Volcanic Rocks Towaco Formation. Specifically, the subsurface consists of micaceous, reddish-brown sandstone, siltstone, and silty mudstone in upward-fining sequences. The Bedrock Geologic Map is shown in Figure 3.

From the Surficial Geologic Map of Northern New Jersey, compiled by and edited by Byron D. Stone, Scott D. Stanford, and Ron W. White in 2002, the natural surface material (beyond fill) is suggested to be in the Pine Brook terrace deposit, which contains sand and gravel, moderately to poorly sorted. The Surficial Geology map is shown in Figure 4.

The documented site conditions presented above are consistent with the findings from the subsurface investigation, in which Sand was encountered followed by a layer of Silty Clay. Groundwater was encountered in the borings at approximately 1.5 feet bgs and in the test pit at approximately 4.5 feet bgs. Bedrock was not encountered during this subsurface program.

5.0 SUBSURFACE FIELD PROGRAM

The subsurface investigation was completed by generally accepted practices in the Geotechnical Engineering field and consisted of the advancement of 1 test pit and 2 Standard Penetration Test (SPT) borings using mud rotary drilling methods. Matrix retained Boring Brothers, Inc., located in Egg Harbor Township, NJ, to complete the subsurface field program.

A Matrix Geotechnical Engineer provided full-time drilling oversight, soil logging, and sample collection. Matrix prepared the field test pit and boring logs, which included sample depths, SPT-N blow counts, soil recovery, and soil descriptions based on the Burmister Soil Classification System followed by the Unified Soil Classification System (USCS) letter symbol. Test pit and soil boring logs are provided in Appendix A. Classification tables and charts used to determine the soil attributes are included in Appendix B.

Upon the completion of the field program, representative samples were subjected to geotechnical laboratory analyses. Laboratory results aided in soil classification and assessing the relevant engineering properties of the stratigraphic layers which were used in developing the revised geotechnical parameters outlined herein. Geotechnical laboratory reports are included in Appendix C.

5.1 Test Pits

On August 27, 2021, Boring Brothers completed a foundation survey which included 1 test pit, TP-1 (Northeast Corner of Building-Basement), to a depth of 54 inches below the ground surface. The test pit was dug using a Kubota KX033-4 and shovel to prevent any damage to the existing building foundations. The exterior edge of the building footing was exposed to accurately measure the structure’s dimensions, as well as to analyze the conditions of the concrete foundation.

The Matrix Geotechnical Engineer also observed the subsurface soil conditions encountered within the test pits, noting the type and composition of the soils surrounding and beneath the existing footing. The test pit was backfilled with the original soils upon completion of the test pit logs. No test pit samples were collected at the site for further analysis.

5.2 SPT Borings

On August 30, 2021, Boring Brothers advanced 2 geotechnical borings with a Mobile CME 55 track-mounted drill rig using mud rotary drilling techniques.

Split spoon (SS) samples were collected in accordance with *ASTM D-1586*, *Standard Method for Penetration Test and Split-Barrel Sampling of Soils*. A standard 2-inch outer diameter split spoon, two feet in length, was used to collect the soil samples. An automatic 140-pound hammer having a 30-inch drop was used to drive the split spoon sampler. As a part of boring observation, the SPT blow counts were recorded for the 0- to 6-inch interval, the 6- to 12-inch interval, the 12- to 18-inch interval and the 18- to 24-inch interval. The SPT N-values for design purposes are reported as the sum of the SPT N values observed for the above referenced 6- to 12-inch interval and the 12- to 18-inch interval that the split spoon sampler was driven.

The Matrix Geotechnical Engineer observed the split spoon samples and collected representative samples in sealed containers for further examination. All borings were continuously sampled to 12 feet bgs and at every subsequent 5-foot interval thereafter. The 2 borings were each advanced to a depth of 27 feet bgs. The borings were backfilled with soil cuttings and bentonite hole plug (if necessary) upon completion of the borehole.

5.3 Laboratory Testing

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

Upon review of the boring logs, Matrix selected representative samples for laboratory testing. Laboratory testing of selected samples was completed by TerraSense, LLC, located in Totowa, New Jersey. The following table presents a summary of the testing program.

The results of the laboratory testing program were utilized to assist in developing geotechnical design parameters and recommendations, and are provided in Appendix C.

Table 5.3-1: Laboratory Testing Program

Test	Testing Procedure	Quantity Performed	Sample Locations and Depth Intervals
Water Content	ASTM D2216	6	B-1: 2-4’, 8-10’, 15-17’ B-2: 4-6’, 20-22’, 25-27’
Sieve Analysis	ASTM D422	1	B-1: 8-10’
Atterberg Limits	ASTM D4318	3	B-1: 15-17’ B-2: 20-22’, 25-27’
Percent Fines	ASTM D1140	1	B-2: 4-6’
Combined Sieve & Hydrometer	ASTM D422	1	B-1: 2-4’

6.0 SUBSURFACE CONDITIONS

The subsurface conditions beneath the site can be characterized by the following stratigraphy, proceeding from the surface materials downward, unless noted otherwise below. Classification tables and charts used to determine the soil attributes are included in Appendix B.

Test Pits

The top of concrete was uncovered in TP-1 at 51” bgs. The thickness of the concrete could not be measured due to groundwater seepage. Excavation was terminated at 54” bgs.

Surface Cover

The surface cover for boring B-1 and B-2 consisted of grass cover and topsoil, approximately 4 inches thick.

Stratum 1: Sand (SP-SM, SM)

Beneath the surface cover in each boring, a soil layer was encountered consisting of reddish-brown to grey coarse-to-fine-grained Sand with varying amounts of Silt and fine Gravel. This Sand layer extended from the bottom of the surface cover to approximately 13.5 feet below the ground surface (bgs) in both borings.

The SPT-N values in this layer ranged from 2 to 17 blows per foot (bpf), which is indicative of very loose to medium-dense Sand. The SPT N-values for Stratum 1 are summarized in the tables below.

Table 6.0-1: Very Loose to Loose SPT N-Values for Stratum 1

Soil Boring Location	USCS Group Symbol	Depth Below Ground Surface	SPT N-Values
B-1	SM	0-4’	3-4
B-2	SM	0-4’ 6-8’	2-5 10

Table 6.0-2: Medium-Dense SPT N-Values for Stratum 1

Soil Boring Location	USCS Group Symbol	Depth Below Ground Surface	SPT N-Values
B-1	SM, SP-SM	4-13.5’	12-17
B-2	SM SM, SP-SM	4-6’ 8-13.5’	12 15-17

Stratum 2: Clay (CL, CH)

Beneath the granular material of Stratum 1, a soil layer was encountered consisting of grey Silty Clay. This Clay layer was encountered at approximately 13.5 feet in both borings, and each boring was terminated within this Clay layer at 27 feet bgs.

The SPT-N values in this layer typically ranged from 4 to 6 blows per foot (bpf), which is indicative of medium-soft cohesive material. In boring B-2, a N-value of 16 bpf was recorded within this layer at the 15-to-17-foot sampling interval, signifying very stiff Clay. The SPT N-values for Stratum 2 are summarized in the tables below.

Table 6.0-3: Medium-Soft SPT N-Values for Stratum 2

Soil Boring Location	USCS Group Symbol	Depth Below Ground Surface	SPT N-Values
B-1	CL CH	13.5-18.5’ 18.5-27’	6 4-5
B-2	CH	18.5-27’	4-5

Table 6.0-4: Very Stiff SPT N-Values for Stratum 2

Soil Boring Location	USCS Group Symbol	Depth Below Ground Surface	SPT N-Values
B-2	CL	13.5-18.5’	16

Groundwater

Groundwater levels could not be measured during drilling in either boring, due to the use of water and drilling mud to advance the borings. Based on soil saturation levels, the groundwater table lied at approximately between 1.5 and 4.5 feet bgs during the drilling/test pit program. Saturated soils were encountered in B-1 at 1.5 feet bgs at 08:15 AM and in B-2 at 1.5 feet bgs at 9:25 AM. Groundwater was also encountered within test pit TP-1 at approximately 4.5 feet bgs. It should be noted that the groundwater levels will vary with temperature, precipitation, and other climatic factors.

7.0 GEOTECHNICAL SUBSURFACE PARAMETERS

The geotechnical design parameters in this report are derived from the field program and are based on accepted geotechnical standards and practices. At the time of the geotechnical assessment, loading conditions and the final proposed grading plans were not available. Therefore, certain assumptions were made for the recommendations provided in this report.

Table 7.0-1 summarizes the recommended geotechnical design parameters for the various soil strata encountered at the Site. The values are based on review and interpretation of the subsurface field program and laboratory test data results.

Table 1806.2 of the 2018 International Building Code provides allowable coefficients of friction to be used in the evaluation of resistance to sliding.

Table 7.0-1: Geotechnical Design Parameters

Stratum	Unit Weight	Friction Angle (Φ)	Cohesive Strength, c_u	Earth Pressure Coefficient		Net Allowable Foundation Pressure*	Lateral Bearing
				Active	Passive		
	(pcf)	(deg)	(psf)	(Ka)	(Kp)	(psf)	(psf/ft. bgs)
Native Medium-Dense to Dense Granular Soil (SP, SP-SM, SM) [SPT N > 10]	$\gamma = 125$ $\gamma' = 63$	32°	0	0.31	3.26	4,000	200
Native Loose Granular Soil (SP, SP-SM, SM) [SPT N $\leq$ 10]	$\gamma = 105$ $\gamma' = 43$	30°	0	0.33	3.00	2,500	150
Native Clay (CL) Stiff – Very Stiff [8 < SPT N $\leq$ 30]	$\gamma = 110$ $\gamma' = 48$	-	1,500	-	-	2,000*	100
Native Clay (CL) Medium-Soft [4 $\leq$ SPT N $\leq$ 8]	$\gamma = 100$ $\gamma' = 38$	-	1,000	-	-	1,500*	75

Notations: γ = moist unit weight, γ' = buoyant unit weight, and c_u = average undrained shear strength.

\+ Allowable foundation pressure is contingent upon either replacement of at least two feet of existing fill below the bottom of footing by a Controlled Fill, or upon confirmation that the field density of the existing fill material down to four feet below the bottom of footing meets 95% of the maximum dry density of the existing fill material observed in Modified Proctor Tests.

* These values are based on the 2018 International Building Code, New Jersey Edition, and adjusted for field conditions encountered. To increase the allowable foundation pressure above the values recommended in the table given above, further testing of soil will be required. In Cohesive soils, it should be noted that the shallow footing may fail under the settlement criteria before the footing pressure approaches the anticipated allowable bearing capacity. Allowable Foundation Pressure values assume the water table is below the influence depth of the foundation.

- Coefficient of earth pressure at rest may be computed using Jaky's equation, $K_o = 1 - \sin \phi'$.

8.0 STRUCTURAL INSPECTION

The following sections present the results of the structural inspection of the residential building at 47 Addison Drive in Fairfield, New Jersey. The conclusions presented herein are derived from Matrix's geotechnical and structural investigation of the existing soils and building foundations and framing configurations, along with pertinent survey data as compiled by Matrix's team of land surveyors.

Matrix conducted a subsurface investigation that included both a test pit and soil borings to obtain maximum pertinent information regarding the existing site conditions (refer to Section 6.0 of this report). The test pit performed at the site exposed the exterior portion of the building's foundation wall footings, allowing for measurement of dimensions of the structure and assessment of the construction methods utilized. Two geotechnical borings were also conducted to gain further information regarding the existing soils beneath the site.

In addition to the geotechnical investigation, Matrix also conducted a structural site inspection to observe the existing foundation walls and framing of the building. Matrix's structural engineer was granted access to the residence's basement and garage to observe the building's foundation structure. Substructure composition was recorded, including beam/girder type, building dimensions, and spacing of structural components. Structural defects, if any, were also noted during the inspection and have been included within Section 8.3.

8.1 Existing Building Foundations

The split-level building at 47 Addison Drive contains three separate foundation areas – a basement, garage, and finished living space. The entire north side of the building sits atop CMU basement foundation walls, while the timber frame of the rest of the building is situated on ground-level concrete floor slabs. The timber frame and subfloor of the house above the basement is supported by timber joists and girders spanning the CMU foundation walls.

The basement area of the building, measuring 24'-8" long x 21'-5" wide, encompasses the full area of the 1.5-floor of the building. The basement contains CMU (8x8x18 block) foundation walls measuring approximately 84.5" in height throughout the exterior walls of the room (measured from basement floor surface). Along the south wall, which is located inside the building, the height of the CMU block was only 52" – the remainder of this basement wall consisted of timber stud framing. A 4" bump out was observed on the north and west walls of the basement, located approximately 44" above the floor surface. The floor of the basement measured approximately 8’-1” below the bottom of the 1.5-floor floorboards, and the ground-level first floor of the house is approximately 55” above the basement floor. Also, a gap was observed between the basement walls and floor slab along the entire perimeter of the basement. This gap was 1” to 1.5” wide and 2” to 4” deep throughout its length.

The floor above the basement is supported by nominal 2x10 timber floor joists, spaced 16” on center, running from front to rear of the building (east to west). A set of (3) connected nominal 2x10 timber members acts as a girder for the floor joists, located approximately 13’-0” off of the front wall of the basement. The girder is supported throughout its span, between the edge foundation walls, by (2) 4” diameter steel post columns that extend beneath the concrete floor (to presumed concrete spread footings). Since the south wall of the basement is shorter than the other walls, timber studs bridge the gap between the foundation wall and bottom of the girder. The longest clear span of the girder measured 7’-4” along the northernmost span.

A test pit excavation along the east (front) wall of the basement revealed a concrete spread footing with a top approximately 51” below the exterior grade. The water table was observed at about 54” bgs, so the bottom of concrete and thickness of the footing could not be determined at the time of the excavation. Based on our findings within the test pit and from conventional foundation construction, Matrix utilized a 16” wide footing as a minimum value for analysis, but believes the actual footings for the building to likely range from 16” to 24” in width. Prior to raising the house, Matrix recommends that the contractor confirm the foundation size and bearing adequacy with multiple test pits around the building perimeter.

South of the basement, the remainder of the house appears to bear directly on a concrete slab on grade. The perimeter walls of the house in this area consist of timber stud framing that extends down to the concrete floor in the garage and ground level. The floor of the garage area is approximately 4.5” lower than the ground floor surface of the house. Within the garage, a timber girder was observed running north to south and consisting of (3) nominal 2x10 members. The girder, along with the rest of the ceiling, was covered in painted drywall and supported along its length by (2) 4” diameter steel post columns, similar to the columns in the basement. The edges of the girder extend into the perimeter walls of the garage, so the supports could not be confirmed but are expected to consist of timber posts or studs that extend down to the concrete floor slab. The longest clear span of the girder measured 6’-10” along the southernmost span. The ceiling of the garage covered the floor joists that support the second floor above, so they could not be observed or measured at the time of the inspection.

8.2 Existing Equipment

Most of the building's equipment and machinery were located in the basement, along the north foundation wall. In this space, a boiler and hot water heater were observed situated on the floor of the basement, an electrical panel was mounted 33" above the floor on the north wall, a water meter was elevated 12" above the floor in the northeast corner, and a sump pit was installed within the floor in the northeast corner. Also, along the east (front) wall of the basement, a gas meter was observed with its bottom elevated approximately 52.5" above the floor surface. Various PVC pipes and metal conduits were also observed running along the walls of the basement to feed the floors above.

The only piece of equipment observed in the garage was what appeared to be an internet modem mounted to the east wall of the room (height above floor could not be measured due to obstructions along the east wall).

Outside the building, to the north, an air conditioner unit was observed with its bottom situated directly on the exterior ground.

8.3 Site Observations

In the southwest corner of the basement, the floor joists extend 25" past the west foundation wall to create a cantilevered floor for an approximately 12-foot-wide area on the 1.5-floor of the house.

In the center of the front wall of the house, adjacent to the entrance doorway, the second floor overhangs the exterior grade in an approximately 5'4" x 9'-8" area. This area contains a ceiling, so the second-floor joists could not be observed at the time of the inspection. A decorative metal post/pedestal provides support for the cantilevered floor members in the northeast corner of the overhang area. The remainder of the floor support is provided by the perimeter timber frame walls of the house.

A couple of damaged areas were noted along the foundation walls of the basement. In the northeast corner, a vertical crack was observed originating at the top of the wall and running down the corner to nearly the floor surface of the basement. This crack decreased in width from top to bottom of the wall. Also, in the northwest corner of the basement a large opening/hole was observed in the exterior of the foundation wall. This opening appeared to originate from the exterior face of the wall and measured approximately 8" deep, which is likely the full depth of the wall. This opening could not be seen from inside the basement due to the presence of storage shelves in the northwest corner.

A concrete and stone patio surrounds the rear and southwest corner of the house in the backyard. This patio butts up against the rear wall of the house and extends approximately 16' into the backyard.

A brick chimney was observed along the north wall of the building, adjacent to basement area. The chimney dimensions could not be measured due to the presence of gates and landscaping around the structure.

8.4 Elevation Requirements

The FEMA 100-year flood elevation at 47 Addison Drive is El. +174 (NAVD88). As per the New Jersey Department of Community Affairs (DCA), and in accordance with the New Jersey Flood Hazard Area Control Act, the lowest floor of newly elevated buildings must be at least 3 feet above the base flood elevation (BFE). Therefore, the new first floor elevation must be at El. +177 or higher to meet the requirements set forth in the program.

The current 1.5-floor elevation at the Site is at El. +173.73, with the adjacent ground level floor at El. +170.06. To achieve the elevation requirements, the existing building would need to be raised at least 3.3 feet to elevate the existing 1.5-floor 3 feet above the BFE. Matrix recommends that the house be raised a minimum of 3.9 feet to allow for the creation of a ground level beneath the newly raised building.

8.5 Recommendations for Building Elevation

Matrix recommends that the existing basement foundation wall system of the residential building at 47 Addison Drive be kept and extended to achieve the required design flood elevation. The bi-level nature of the existing building will require extra construction to bring the newly raised house to living condition. The south half of the house (ground level and garage) bears on a concrete slab on grade, which cannot be easily raised with the house. In this area, new CMU walls with concrete strip footings are recommended beneath the existing timber-framed walls to provide sufficient support for the newly raised building. The existing CMU foundation walls of the basement are expected to provide sufficient support for the additional height of the newly raised building, while the new CMU walls and concrete footings for the house are to be designed with sufficient capacity to support the expected loads of the house. Based on loading estimation and analysis for the existing building, Matrix estimates that the anticipated additional dead load of the required new courses of CMU would remain under an allowable bearing capacity of 2,000 psf for the existing shallow concrete strip footings at the Site.

In accordance with NFIP requirements, it is required that the existing basement be filled in to match the lowest adjacent exterior grade following raising. By elevating the house 3.9 feet, the newly raised building will have over 7 feet of space beneath (down to existing finished grade), which is enough vertical height for a ground-floor level. This additional space beneath the raised building can be used for storage at the resident's discretion. Raising the house in this manner will result in a loss of habitable area for the residence, as the existing ground-level can no longer be used for living space (below the design flood elevation).

Alternatively, the homeowner may elect to raise the existing house an additional 2.1 feet (6.0 feet total above current elevation) and construct a new elevated timber floor in the area of the existing ground level. The additional 2.1 feet of elevation will allow for the new first-floor ceiling height to be above the required limits for habitable space as per the 2018 International Residential Code, New Jersey Edition. Raising the house in this way will preserve the original square footage of the building's habitable space while also providing a new ground level for storage. The new timber subfloor will bear directly on the new CMU foundation walls of the building, which are proposed to be located along the exterior perimeter of the building and below the existing interior garage walls. The garage area is expected to remain at ground level (no new first floor in this area), while the new timber-framed first floor is built around the garage walls. Support for the second floor is expected to remain the same as the existing support, which consists of a timber girder in the garage area supported by steel columns.

Based on observations during the interior inspection, the existing ground level consists of a hallway, laundry room, and living room. No relocation of bathroom or kitchen utilities will be required as part of the construction of a new first-floor subfloor, but the washer/dryer and associated utilities will need to be relocated to the new first floor.

The most feasible method of elevation for the building consists of jacking up the entire residential structure (except the concrete ground slabs) from below using steel beams and jack posts. The building will then sit atop temporary cribbing while the new CMU walls are built, and the existing CMU foundation walls are heightened with additional courses of masonry block units. Additional vertical reinforcement would need to be installed in ungrouted masonry cells to properly transfer loads through the new heightened wall to the existing wall, and horizontal ladder reinforcement should be installed at a minimum of every other course.

The existing steel post columns intermittently supporting the building's girders must be removed and replaced by new steel, concrete, or masonry block columns. These new columns will need to include a spread footing beneath to sufficiently support the building loads. The garage doors located along the south wall of the house will need to be removed prior to raising the house, and the opening replaced with a new timber-framed wall to match the rest of the building. The garage door will then be replaced at the ground level once the house is elevated. The existing brick chimney located along the north wall of the house will also require extending during raising of the house to keep the top of the chimney above the roof level.

The new CMU walls that are to be built within the south area of the house will require excavation into the ground to construct the concrete strip footings. Groundwater was observed approximately 1.5 feet bgs during the subsurface investigation, which is above the expected location of the concrete footings at the site. Dewatering is therefore expected to be required for this project during construction of the new foundation walls. As previously noted, the groundwater table can be impacted by seasonal variations, precipitation, and other climatic factors. Presence of groundwater at foundation depths may severely impede the constructability of footings due to possible inflow of groundwater into the open excavation. The appropriate measures to be taken for groundwater control during construction should be determined in the field at the time of excavation and are the responsibility of the Contractor.

Raising of the building should be undertaken with special attention to preserve the existing brick façade covering the timber frame in the front and northeast side of the building. If the façade is kept in place during raising, the process is liable to lead to some cracking in the existing façade. Alternatively, the brick façade can be removed prior to raising, then replaced with a similar or more flexible finish after completion of the elevation process. The materials and labor involved in exterior façade restoration of the house are not within the scope of this project.

Within the new foundation walls, permanent openings are required to allow floodwater to enter the ground level and equalize the hydrostatic pressure during a flood event. As per the 2018 International Residential Code, New Jersey Edition, the total net area of non-engineered openings must comprise at least 1 square inch for every square foot of enclosed space within the building's ground floor. This equates to approximately 11.32 square feet of total flood openings in the building's new foundation walls. Additionally, a minimum of two openings must be provided for each enclosed area of the new ground floor. These openings must be located no higher than one foot above the adjacent finished exterior grade along the building perimeter. Matrix recommends the use of engineered openings in lieu of non-engineered openings to maximize efficiency and minimize the quantity of openings required.

Additionally, any service equipment, whether outside or in the basement/garage, such as air conditioning, heat pump compressors, gas meters, electric meters, and hot water heaters, must be elevated 3 feet above the BFE. For interior elements, this may include relocation to an upper floor and thus less usable living space. For this residence, the hot water heater, boiler, electrical panel, water meter, and gas meter in the building interior would require elevating 3 feet above the BFE onto the raised first floor. The exterior air conditioning unit would also require elevating 3 feet above the BFE on a new exterior platform.

9.0 CLOSURE

This report has been prepared to assist the State of New Jersey Department of Community Affairs with the structural and geotechnical evaluation of the residential building at 47 Addison Drive in Fairfield, New Jersey. The conclusions and recommendations provided within this report were prepared based on our understanding of the project and through the application of generally accepted engineering practices. No warranties, expressed or implied, are made. Matrix should be notified of any changes to the existing building foundation system or if subsurface conditions differing from those described herein are encountered, so the impact on the geotechnical and/or structural recommendations can be evaluated.

10.0 REPRESENTATIVE SITE PHOTOS

Structural Inspection Photos

Photo 1. 47 Addison Drive (Front of Building – 2-Story Area)

Photo 2. 47 Addison Drive (Front of Building – 1.5-Story Area)

Photo 3. 47 Addison Drive (Rear of Building)

Photo 4. Basement Girders, Columns & Subfloor (Looking Northwest)

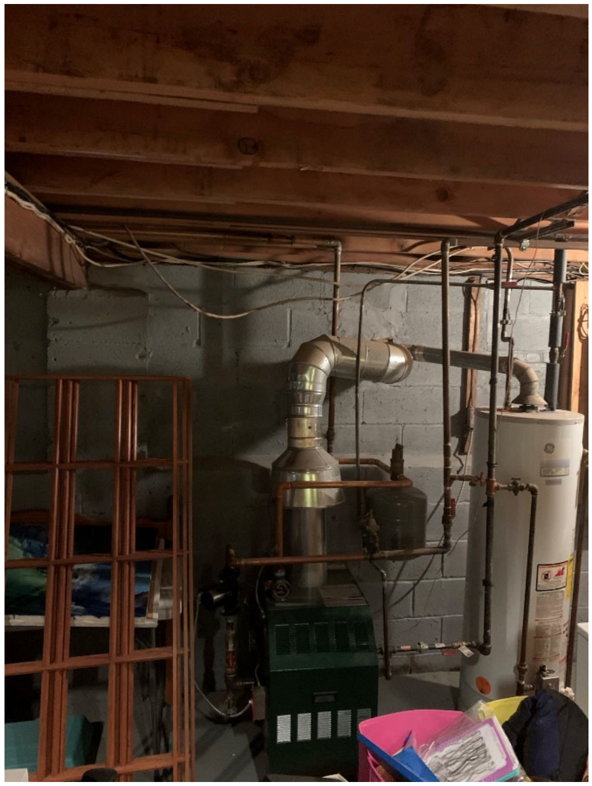


Photo 5. Basement Foundation Walls with Boiler & Hot Water Heater (Looking North)

Photo 6. Vertical Crack in Basement Wall (Northeast Corner)

Photo 7. Lowered CMU Foundation Wall in Basement (Looking South)

Photo 8. Garage Girder & Column (Looking South)

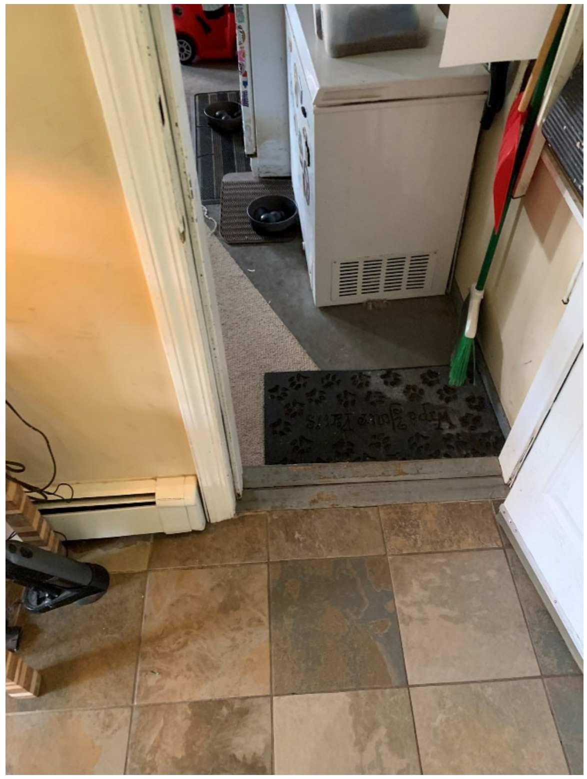


Photo 9. Concrete Ground Floors at Garage/Ground Level Interface

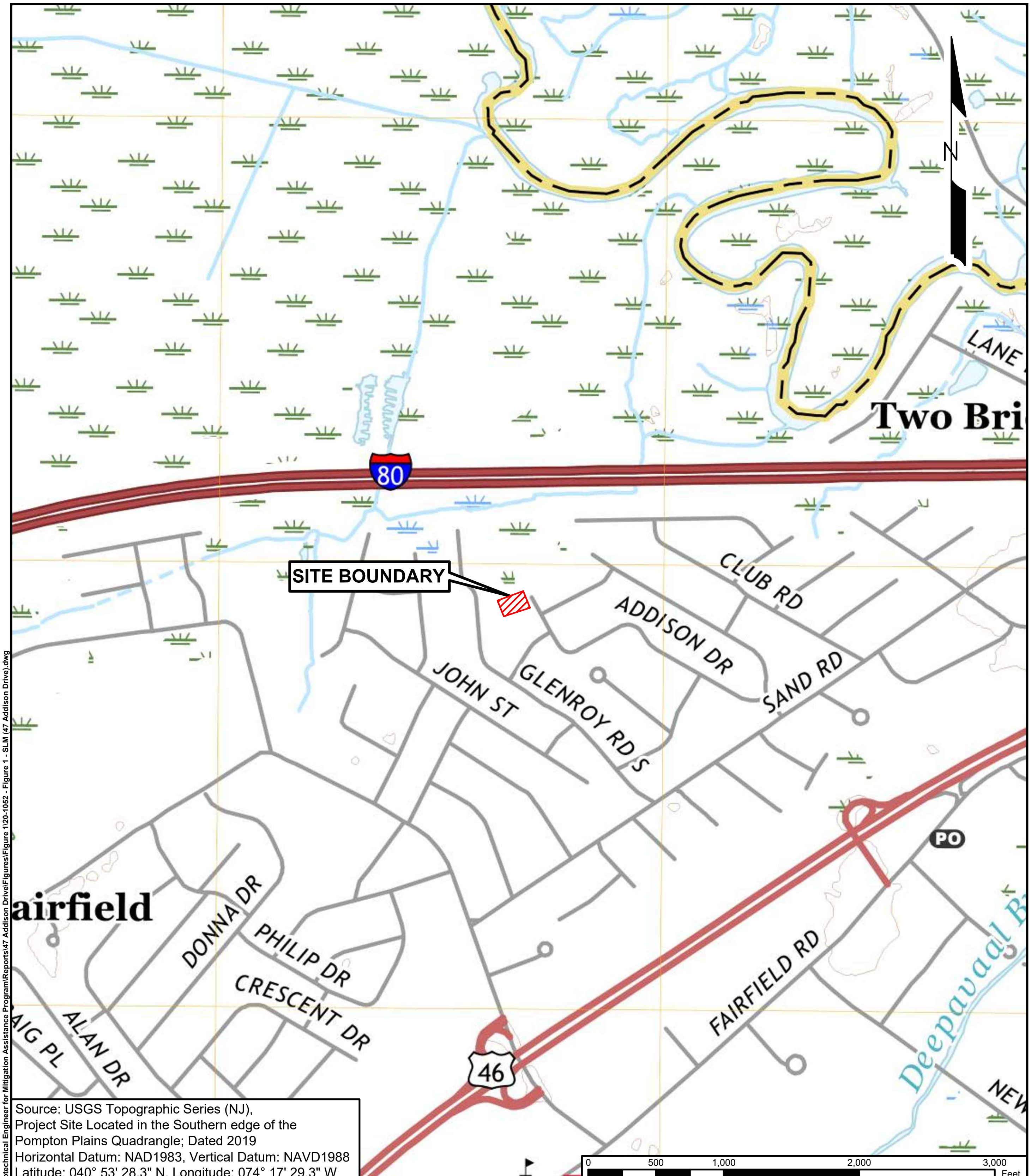
Photo 10. Hole in Basement Foundation Wall (Northwest Corner)

Test Pit Photos

Photo 11. Test Pit TP-1 Location (Front of Building – Basement)

Photo 12. Test Pit TP-1 Foundation Conditions

FIGURES



Source: USGS Topographic Series (NJ),
Project Site Located in the Southern edge of the Pompton Plains Quadrangle; Dated 2019
Horizontal Datum: NAD1983, Vertical Datum: NAVD1988
Latitude: 040° 53' 28.3" N, Longitude: 074° 17' 29.3" W

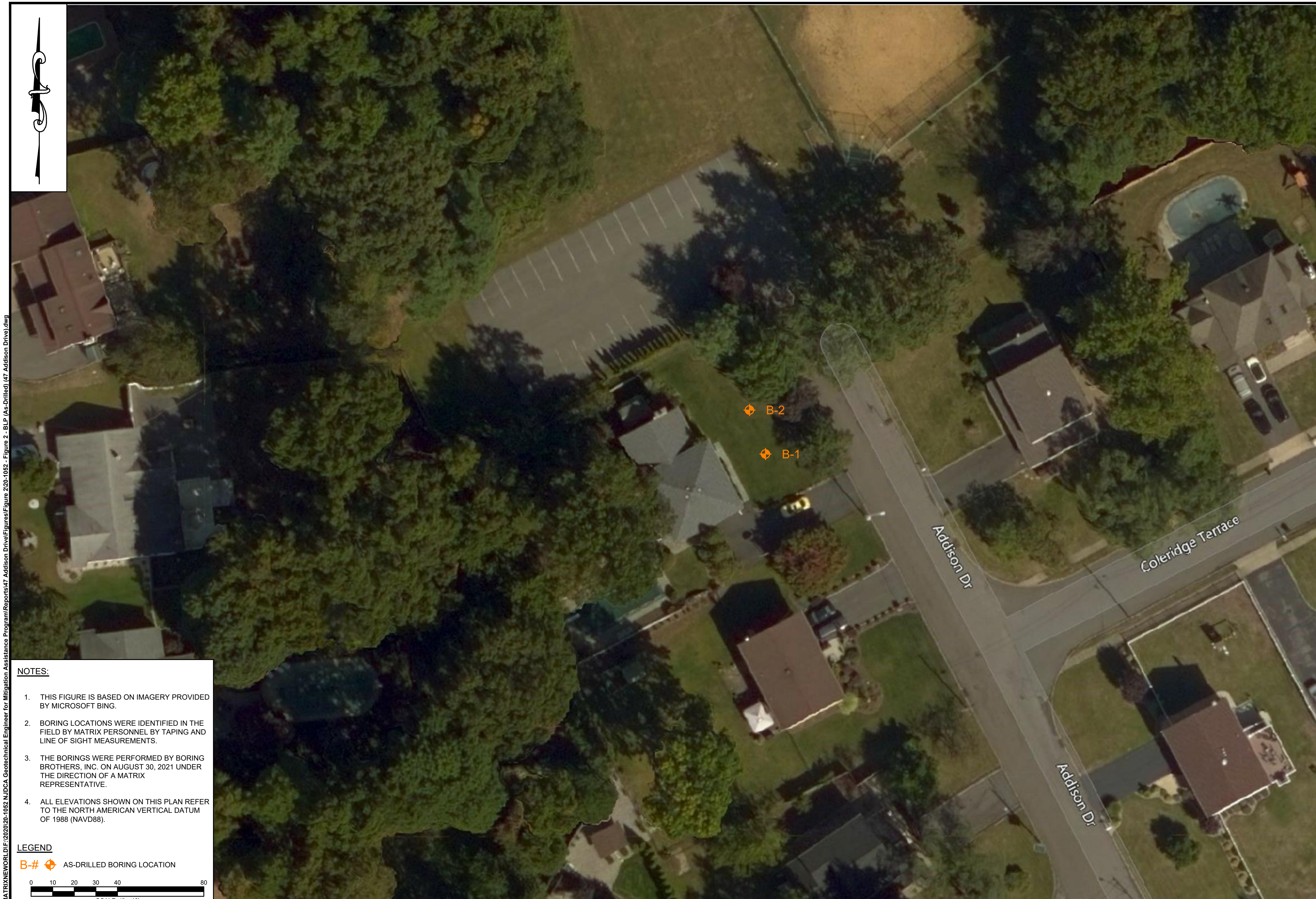
SITE LOCATION MAP

MATRIXNEWORLD
Engineering Progress

Matrix New World Engineering, Land Surveying and Landscape Architecture, P.C.
26 Columbia Turnpike
Florham Park, New Jersey 07932
WBE
Tel: 973-240-1800
Fax: 973-240-1818
www.matrixneworld.com

NJ DEPARTMENT OF COMMUNITY AFFAIRS
GEOTECHNICAL AND STRUCTURAL ASSESSMENT REPORT
47 ADDISON DRIVE
FAIRFIELD, NEW JERSEY 07004

SCALE:	PROJECT NO.:	DATE:	FIGURE NO.:
1" = 1,000'	20-1052	SEPTEMBER 2021	1



NOTES:

1. THIS FIGURE IS BASED ON IMAGERY PROVIDED BY MICROSOFT BING.
2. BORING LOCATIONS WERE IDENTIFIED IN THE FIELD BY MATRIX PERSONNEL BY TAPING AND LINE OF SIGHT MEASUREMENTS.
3. THE BORINGS WERE PERFORMED BY BORING BROTHERS, INC. ON AUGUST 30, 2021 UNDER THE DIRECTION OF A MATRIX REPRESENTATIVE.
4. ALL ELEVATIONS SHOWN ON THIS PLAN REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

LEGEND

B-# AS-DRILLED BORING LOCATION

0 10 20 30 40 80

SCALE: 1" = 40'

NO.	DESCRIPTION	DATE:	BY:	APR:

REVISIONS

DESIGNED BY: SF
REVIEWED BY: MS
RELEASED BY: MS

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AS-DRILLED BORING LOCATION PLAN

NJDCA GEOTECHNICAL ENGINEER FOR MITIGATION ASSISTANCE PROGRAM

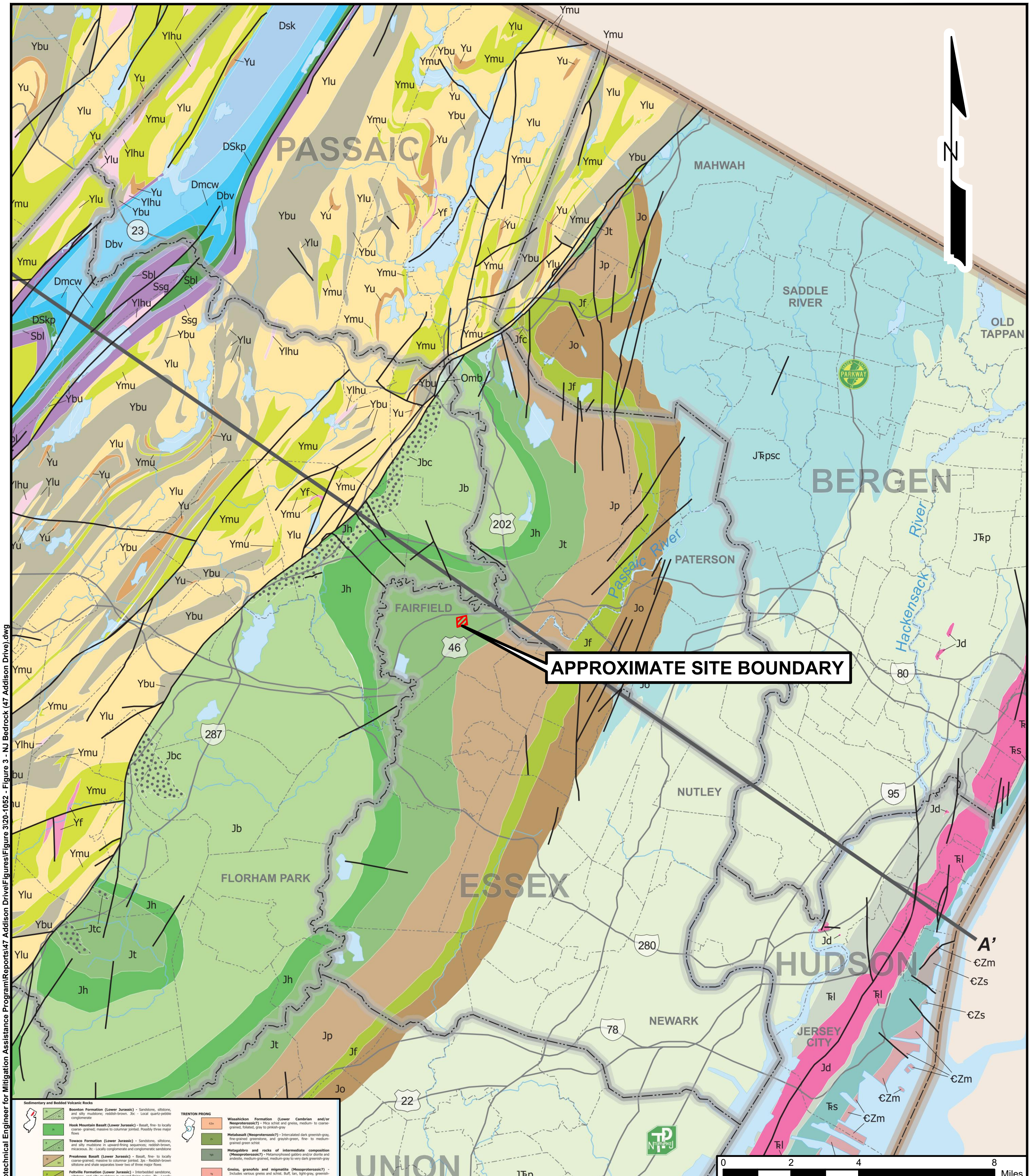
47 ADDISON DRIVE
FAIRFIELD, NJ 07004

PROJECT NUMBER: 20-1052

SCALE: AS NOTED

DATE: SEPTEMBER 2021

2



BEDROCK GEOLOGY LOCATION MAP

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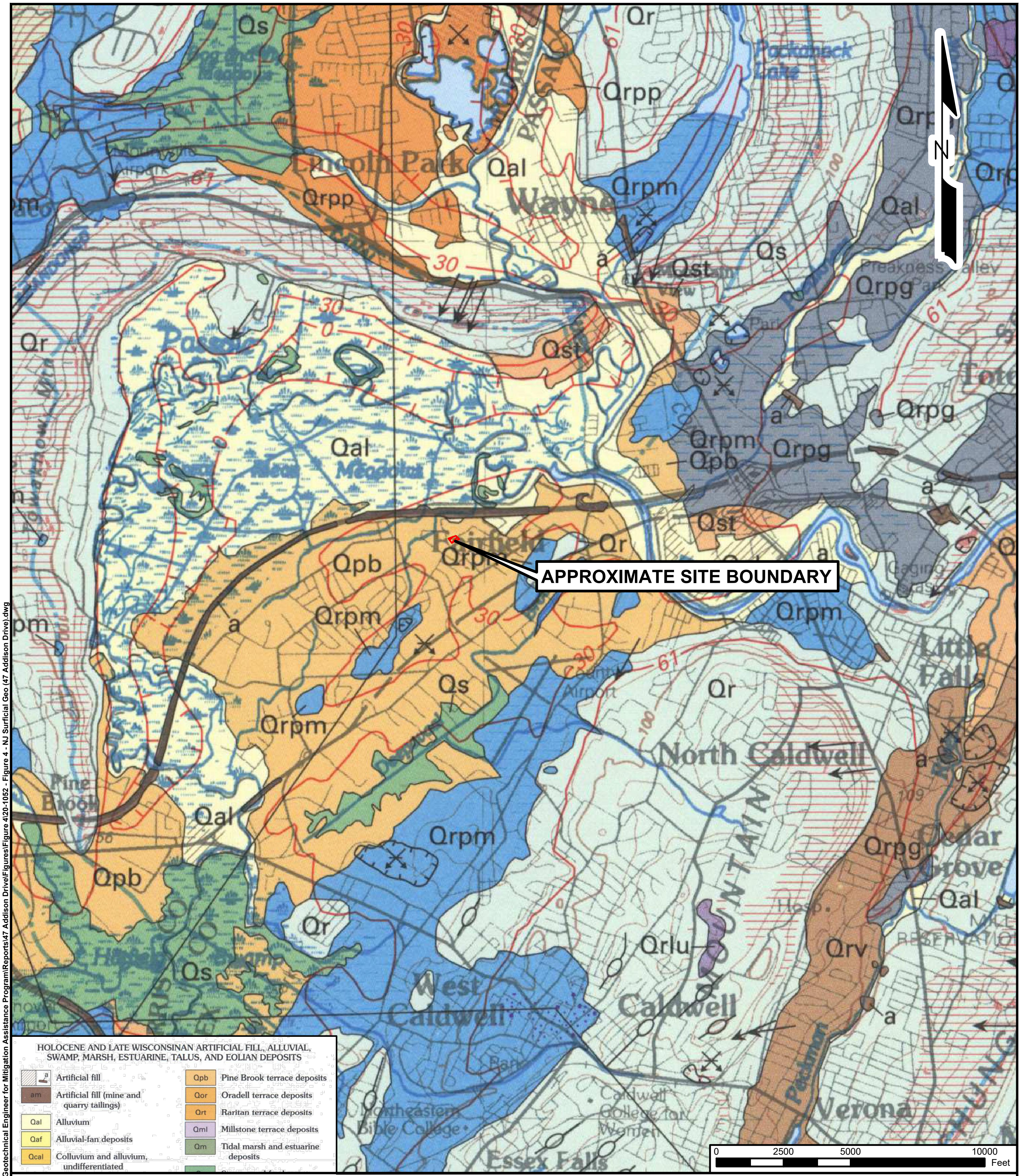
NJ DEPARTMENT OF COMMUNITY AFFAIRS
GEOTECHNICAL AND STRUCTURAL ASSESSMENT REPORT
47 ADDISON DRIVE
FAIRFIELD, NEW JERSEY 07004

SCALE:	PROJECT NO.:	DATE:	FIGURE NO.:
1" = 4 Miles	20-1052	SEPTEMBER 2021	3



SURFICIAL GEOLOGY LOCATION MAP

MATRIXNEWORLD
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NJ DEPARTMENT OF COMMUNITY AFFAIRS
GEOTECHNICAL AND STRUCTURAL ASSESSMENT REPORT
47 ADDISON DRIVE
FAIRFIELD, NEW JERSEY 07004

SCALE:	PROJECT NO.:	DATE:	FIGURE NO.:
1" = 5000'	20-1052	SEPTEMBER 2021	4

APPENDIX A

SOIL BORING & TEST PIT LOGS

MATRIXNEWORLD
Engineering Progress

BORING LOG

BORING NO.: **B-1**

SHEET **1** OF **1**

PROJECT NO.: **20-1052** PROJECT: **NJDCA Geotechnical Engineer for Mitigation Assistance Program** DATE: **8/30/21**
PROJECT LOCATION: **Fairfield, NJ** BORING LOCATION: **47 Addison Drive, South Side of Front Lawn**
DRILLING EQUIPMENT: **CME 55** ANGLE: **-90.0** DIR.: **------** ELEV.: DATUM: **NAVD88**
DRILLING CONTRACTOR: **Boring Brothers, Inc.** DRILLER: **R. Dollar** INSPECTOR: **T. Pace**

CASING and HAMMER				SAMPLER and HAMMER				GROUNDWATER LEVELS			
Type	I.D.	Weight	Drop	Type	I.D.	Weight	Drop	Date	Time	Depth	Casing Depth
Auto		**140 lbs**	**30"**	**AUTO**		**140 lbs**	**30"**	**8/30/21**	**8:15 am**	**1.5**	**N/A**
FJ Steel	**4"**			**SS**	**1 3/8"**						

Depth Feet (Elev.)	CASING Blows/ Foot	SAMPLE No.	Type	Depth Feet	Blows/6" (REC. %) [RQD %]	Description Of Material	Laboratory Tests
	5	S-1	SS	0-2	1/12"-2-1 (38%)	4" Grass/Topsoil S-1: Brown mf* SAND, some Silt, moist (SM)	
	5, 5	S-2	SS	2-4	2-2-2-5 (100%)	S-2: Light Brown fine SAND and Silt, wet (SM) WC: 16.1%, Gravel: 0.1%, Sand: 51.8%, Fines: 48.1%, <2 µm: 9%	Sieve; Hydrometer
5	10, 10	S-3	SS	4-6	6-8-9-10 (100%)	S-3A (Top 12"): Same as Above, wet (SM) S-3B (Bottom 12"): Red-Brown fine SAND, some Silt, wet (SM)	
	40, 50	S-4	SS	6-8	9-9-7-8 (100%)	S-4A (Top15"): Same as Above, wet (SM) S-4B (Bottom 9"): Grey-Brown mf SAND, little Silt, wet (SM)	
	50, 50	S-5	SS	8-10	3-6-6-9 (100%)	S-5: Grey-Brown mf* SAND, trace Silt, wet (SP-SM) WC: 20.0%, Gravel: 0.0%, Sand: 91.5%, Fines: 8.5%	Sieve
10	60 MUD	S-6	SS	10-12	5-6-6-5 (100%)	S-6: Same as Above, wet (SP-SM)	
15		S-7	SS	15-17	4-2-4-7 (50%)	S-7: Grey Silty CLAY, wet (CL) WC: 28.0%, LL: 44, PL: 21, PI: 23	Atterberg Limits
20		S-8	SS	20-22	3-2-3-3 (100%)	S-8: Same as Above, wet (CH)	
25	MUD	S-9	SS	25-27	WOH-2-2-3 (100%)	S-9: Same as Above, wet (CH)	
						Bottom of Borehole @ 27 ft.	

BORING NO.: **B-1**

MATRIXNEWORLD
Engineering Progress

BORING LOG

BORING NO.: **B-2**

SHEET **1** OF **1**

PROJECT NO.: **20-1052** PROJECT: **NJDCA Geotechnical Engineer for Mitigation Assistance Program** DATE: **8/30/21**
PROJECT LOCATION: **Fairfield, NJ** BORING LOCATION: **47 Addison Drive, North Side of Front Lawn**
DRILLING EQUIPMENT: **CME 55** ANGLE: **-90.0** DIR.: **------** ELEV.: DATUM: **NAVD88**
DRILLING CONTRACTOR: **Boring Brothers, Inc.** DRILLER: **R. Dollar** INSPECTOR: **T. Pace**

CASING and HAMMER				SAMPLER and HAMMER				GROUNDWATER LEVELS			
Type	I.D.	Weight	Drop	Type	I.D.	Weight	Drop	Date	Time	Depth	Casing Depth
Auto		**140 lbs**	**30"**	**AUTO**		**140 lbs**	**30"**	**8/30/21**	**9:25 am**	**1.5**	**N/A**
FJ Steel	**4"**			**SS**	**1 3/8"**						

Depth Feet (Elev.)	CASING Blows/ Foot	SAMPLE No.	Type	Depth Feet	Blows/6" (REC. %) [RQD %]	Graphic Symbol	Description Of Material	Laboratory Tests
	PUSH	S-1	SS	0-2	2/12"-1-1 (46%)		4" Grass/Topsoil S-1: Brown fine SAND, some Cleyey Silt, moist (SM)	
		S-2	SS	2-4	4-3-2-4 (75%)		S-2: Light to Dark Brown fine SAND, some Silt, trace coarse Gravel, trace wood, wet (SM)	
5	PUSH	S-3	SS	4-6	5-6-6-6 (88%)		S-3: Light to Red-Brown fine SAND, little Silt, wet (SM) WC: 18.0%, Fines: 18.7%	Pass No 200
	30 30	S-4	SS	6-8	5-4-6-8 (92%)		S-4: Red to Grey-Brown mf* SAND, some Silt, wet (SM)	
	40 50	S-5	SS	8-10	7-7-8-11 (100%)		S-5: Grey-Brown mf* SAND, little Silt, trace fine Gravel, wet (SM)	
10	60 MUD	S-6	SS	10-12	6-9-8-7 (100%)		S-6A (Top 19"): Same as Above, wet (SM) S-6B (Bottom 5"): Grey fine SAND, trace Silt, wet (SP-SM)	
15		S-7	SS	15-17	3-7-9-13 (83%)		S-7: Grey Silty CLAY, wet (CL)	
20		S-8	SS	20-22	2-3-2-3 (100%)		S-8: Same as Above, wet (CH) WC: 42.1%, LL: 55, PL: 26, PI: 29	Atterberg Limits
25		S-9	SS	25-27	1-2-2-2 (100%)		S-9: Same as Above, wet (CH) WC: 43.6%, LL: 54, PL: 24, PI: 30	Atterberg Limits
	MUD						Bottom of Borehole @ 27 ft.	

NEWORLD NO GROUT 20-1052 BORING LOGS.GPJ MATRIX EGS.GDT 9/20/21

MATRIXNEWORLD
Engineering Progress

TEST PIT LOG

TEST PIT NO.: **TP-1**

SHEET **1** OF **1**

PROJECT NO.: **20-1052** PROJECT: **NJDCA Geotechnical Engineer - Mitigation Assistance Program** DATE: **8/27/2021**

PROJECT LOCATION: **Fairfield, NJ** ELEV.: TIME STARTED: **8:10:00 AM**

TEST PIT LOCATION: **47 Addison Drive (Northeast Corner of Building - Basement)** DATUM: **NAVD88** TIME FINISHED: **9:15:00 AM**

CONTRACTOR: **Boring Brothers, Inc.** GROUNDWATER LEVEL (IN): **54**

EQUIPMENT: **Kubota KX033-4** OPERATOR: **Eladio Cruz** INSPECTOR: **J. Chon**

Depth Inches (Elev)	No.	Depth Inches	Graphic Symbol	Description Of Material	Laboratory Tests
		0-4		Topsoil, Mulch Cover	
5		4-54		Brown fine SAND, some Silt (SM)	
10					
15					
20					
25					
30					
35					
40					
45					
50				Top of concrete encountered at 51" bgs. Thickness of concrete could not be measured due to groundwater seepage	
▼				Groundwater table encountered at 54" bgs - water seeping into test pit excavtion. Excavation terminated at this depth. Bottom of Test pit @ 54 in. Test Pit Backfilled.	

LOG NOTATION

Sample Classifications

SS = Split Spoon

NR = No Recovery

NX = Rock Core

SH = Shelby Tube

REC = Soil Recovery

RQD = Rock Quality Designation

Sand Classifications

c = Coarse

m = Medium

f = Fine

* = Predominant Grain Size

Soil Properties

WC = Water Content

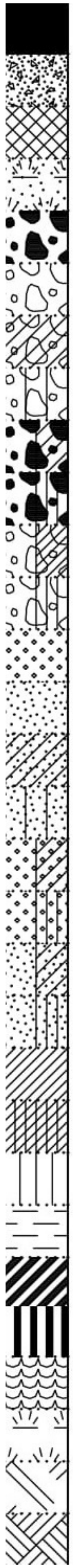
PL = Plastic Limit

LL = Liquid Limit

PI = Plasticity Index

OC = Organic Content

LOG GRAPHICAL LEGEND



- Asphalt
- Concrete
- Fill
- Topsoil
- Well graded Gravel (GW)
- Poorly graded Gravel (GP)
- Clayey Gravel (GC)
- Silty Gravel (GM)
- Well graded Gravel with Clay (GW-GC)
- Well graded Gravel with Silt (GW-GM)
- Poorly graded Gravel with Clay (GP-GC)
- Poorly graded Gravel with Silt (GP-GM)
- Well graded Sand (SW)
- Poorly graded Sand (SP)
- Clayey Sand (SC)
- Silty Sand (SM)
- Well graded Sand with Clay (SW-SC)
- Well graded Sand with Silt (SW-SM)
- Poorly graded Sand with Clay (SP-SC)
- Poorly graded Sand with Silt (SP-SM)
- Lean Clay (CL)
- Silty Clay (CL-ML)
- Silt (ML)
- Organic Silt or Clay (Low Plasticity) (OL)
- Fat Clay (CH)
- Elastic Silt (MH)
- Organic Silt or Clay (High Plasticity) (OH)
- Peat (PT)
- Decomposed Bedrock
- Bedrock

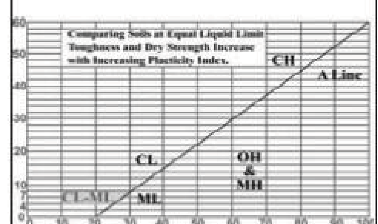
APPENDIX B

SOIL CLASSIFICATION TABLES

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	FIELD IDENTIFICATION PROCEDURES (EXCLUDING PARTICLES LARGER THAN 3 IN. AND BASING FRACTIONS ON ESTIMATED WEIGHTS)	INFORMATION REQUIRED FOR DESCRIBING SOILS	LABORATORY CLASSIFICATION CRITERIA	
1	2		3	4	5	6	7	
Coarse-grained Soils More than half of material is larger than No. 200 sieve size. The No. 200 sieve size is about the smallest visible to the naked eye.	Gravels More than half of coarse fraction is larger than No. 4 sieve size. (For visual classification, the $^1/_4$-in. size may be used as equivalent to the No. 4 sieve size.)	Clean Gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixture, little or no fines.	Wide range in grain size and substantial amounts of all intermediate particle sizes.	For undisturbed soils add information on stratification, degree of compactness, cementation, moisture condition, and drainage characteristics.	Use grain-size curve in identifying the fractions as given under field identification. Determine percentage of gravel and sand from grain-size curve. Depending on percentage of fine (fraction smaller than No. 200 sieve size) coarse-grained soils are classified as follows: Less than 5% GW, GP, SW, SP. More than 12% GM, GC, SM, SC. 5% to 12% Borderline cases requiring use of dual symbols.	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			GP	Poorly graded gravels or gravel-sand mixture, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.			Not meeting all gradation requirements for GW
		Gravels with Fines (Appreciable amount of fines)	GM	Silty gravels, gravel and silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).	Give typical name; indicate approximate percentages of sand and gravel, maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbol in parentheses.		Atterberg limits below "A" line or P1 less than 4 / Above "A" line with P1 between 4 and 7 are borderline cases requiring use of dual symbols.
			GC	Clayey gravels, gravel and clay mixtures.	Plastic fines (for identification procedures see CL below).			Atterberg limits above "A" line with P1 greater than 7
	Sands More than half of coarse fraction is smaller than No .4 sieve size.	Clean Sand (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.	Wide range in grain size and substantial amounts of all intermediate particle sizes.			$Cu = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			SP	Poorly graded sands or gravelly sands, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.	Example: Silty sand, gravelly; about 20% hard, angular gravel particles $^1/_2$-in. maximum size; rounded and subangular sand grains, coarse to fine; about 15% nonplastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM).		Not meeting all gradation requirements for SW
		Sands with Fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).			Atterberg limits above "A" line or P1 less than 4 / Limits plotting in hatched zone with P1 between 4 and 7 are borderline cases requiring use of dual symbols.
			SC	Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below).			Atterberg limits above "A" line with Pl greater than 7

MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES	Identification Procedure on Fraction Smaller than No. 40 Sieve Size. Dry Strength (Crushing Characteristics)	Dilatancy (Reaction to shaking)	Toughness (Consistency near PL)	INFORMATION REQUIRED FOR DESCRIBING SOILS	LABORATORY CLASSIFICATION CRITERIA
Fine-grained Soils More than half of material is smaller than No. 200 sieve size.	Silts and Clays Liquid limit is less than 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	None to slight	Quick to slow	None	For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded states, moisture and drainage conditions	LIQUID LIMIT PLASTICITY CHART For laboratory classification of fine-grained soils
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	Medium to high	None to very slow	Medium		
	Silts and Clays Liquid limit is greater than 50	OL	Organic silts and organic silty clays of low plasticity.	Slight to medium	Slow	Slight	Give typical name; indicate degree and character of plasticity; amount and maximum size of coarse grains; color in wet condition; odor, if any; local or geologic name and other pertinent descriptive information; and symbol in parentheses.	
		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Slight to medium	Slow to none	Slight to medium		
		CH	Inorganic clays of high plasticity, fat clays.	High to very high	None	High		
		OH	Organic clays of medium to high plasticity, organic silts.	Medium to high	None to very slow	Slight to medium	Example: Clayey silt, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (ML)	
Highly Organic Soils		Pt	Peat and other highly organic soils.	Readily identified by color, odor, spongy feel and frequently by fibrous texture				

Plasticity Index



1. Boundary classifications: Soils possessing characteristics of two groups are designed by combinations of group symbols. For example GM-GC, well-graded gravel-sand mixture with clay binder.
2. All sieve sizes on this chart are U.S. standard.
3. Adopted by Corps of Engineers and Bureau of Reclamation, January 1952.

032058C

BURMISTER SOIL IDENTIFICATION METHOD

BURMISTER SOIL IDENTIFICATION METHOD

1. SOIL MATERIAL Composition, Gradation, and Plasticity Characteristics

a) Soil Components and Soil Fractions

Sieve	3"	1"	3/8"	No. 10 2 mm	No. 30	No. 60	No. 200 0.076 mm	0.02 mm
Granular Component Fractions	GRAVEL			SAND			SILT	
	coarse	medium	fine	coarse	medium	fine	coarse	fine
Clay Soil Components							CLAY-SOIL Defined and Named on a Plasticity Basis	

b) Identifying Terms for Granular Soils
Composition and Proportion Terms for Components

Component		Proportion Terms	Defining Range of Percentages
Principal Components- GRAVEL, SAND, SILT (all Uppercase)			50% or more
Minor Components-	Gravel	and	35 to 50%
	Sand	some	20 to 35%
	Silt	little	10 to 20%
		trace	1 to 10%

Gradation Terms for Granular Soils		ORGANIC SOILS
coarse to fine	all fractions more than 10%	Plasticity Basis, as
coarse to medium	fine less than 10%	
medium to fine	coarse less than 10%	Organic SILT, H. PI
medium	coarse and fine less than 10%	
fine	coarse and medium less than 10%	Organic SILT, L. PI
PLUS or MINUS signs used to indicate upper or lower limits.		

c) Identifying Terms for CLAY SOILS. Plasticity Basis for Combined Silt and Clay Components, Expressing the Relative Dominance of Clay

Overall Plasticity	Plasticity Index	Principal Component	Minor Component
Non-Plastic	0	SILT	Silt
Slight	1 to 5	Clayey SILT	Clayey Silt
Low	5 to 10	SILT & CLAY	Silt & Clay
Medium	10 to 20	CLAY & SILT	Clay & Silt
High	20 to 40	Silty CLAY	
Very High	more than 40	CLAY	

Example: Soil 60% coarse to fine Sand, 25% medium to fine Gravel, 15% Clayey Silt and color-brown.
Identification: Br. coarse to fine SAND, some medium to fine Gravel, little Clayey Silt.

References:
1) D. M. Burmister, "Principles and Techniques of Soil Identification" 29^{th} Highway Research Board Proceedings, 1949.
2) "Identification and Classification of Soils – An appraisal and Statement of Principles", ASTM Special Technical Publication No. 113, 1951.

Field Classification of Soil Using the USCS

Apparent Density of Coarse-Grained Soils

SPT N-Value (corrected)	Apparent Density
0 - 4	Very loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
> 50	Very Dense

Consistency of Fine-Grained Soils

SPT N-Value (uncorrected)	Consistency	Compressive Strength (ksf)	Results of Manual Manipulation
< 2	Very Soft	< 0.5	Specimen (height = twice the diameter) sags under its own weight; extrudes between fingers when squeezed
3 - 4	Soft	> 0.5 - 1.0	Speciment can be pinched in to between the thumb and forefinger; remolded by light finger pressure
5 - 8	Medium stiff	> 1.0 - 2.0	Can be imprinted easily with fingers; remolded by strong finger pressure
9 - 15	Stiff	> 2.0 - 4.0	Can be imprinted with considerable pressure from fingers or indented by thumbnail
16 - 30	Very stiff	> 4.0 - 8.0	Can be barely imprinted by pressure from the fingers or indented by thumbnail
> 30	Hard	> 8.0	Cannot be imprinted by fingers or difficult to indent by thumbnail

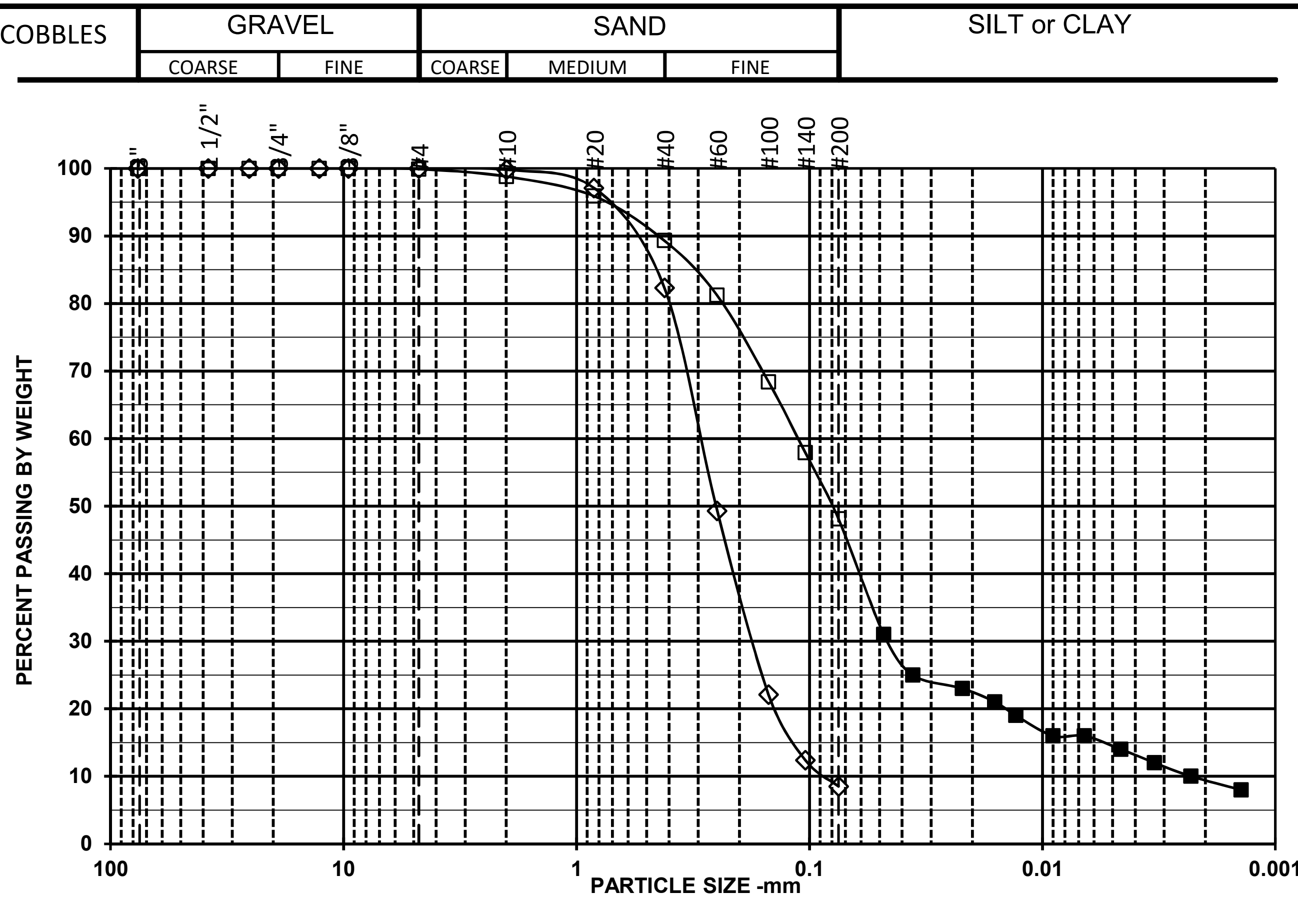
APPENDIX C

GEOTECHNICAL LABORATORY TESTING RESULTS

Matrix New World Engineering, P.C. #20-1052-019
NJDCA MAP 47 Addison Drive
LABORATORY TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS: WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDROMETER % MINUS 2 μm (%)	REMARKS / TEST ID
B-1	S-2	2-4	16.1				SM	48.1	9	
B-1	S-5	8-10	20.0				SP-SM	8.5		
B-1	S-7	15-17	28.0	44	21	23	CL			
B-2	S-3	4-6	18.0				SM	18.7		
B-2	S-8	20-22	42.1	55	26	29	CH			
B-2	S-9	25-27	43.6	54	24	30	CH			

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



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

Symbol	□	◇	○
Boring	B-1	B-1	
Sample	S-2	S-5	
Depth	2-4	8-10	
% +3"	0	0	
% Gravel	0.1	0	
% SAND	51.8	91.5	
%C SAND	1.1	0.2	
%M SAND	9.5	17.5	
%F SAND	41.2	73.8	
% FINES	48.1	8.5	
D_{100} (mm)	9.53	4.75	
D_{60} (mm)	0.112	0.295	
D_{30} (mm)	0.046	0.17	
D_{10} (mm)	0.0023	0.085	
Cc	8.2	1.2	
Cu	48.7	3.5	

Sieve Size/ID #	Percent Finer Data		
6"	100.0	100.0	
4"	100.0	100.0	
3"	100.0	100.0	
1 1/2"	100.0	100.0	
1"	100.0	100.0	
3/4"	100.0	100.0	
1/2"	100.0	100.0	
3/8"	100.0	100.0	
#4	99.9	100.0	
#10	98.8	99.8	
#20	95.9	97.1	
#40	89.3	82.3	
#60	81.2	49.3	
#100	68.4	22.1	
#140	57.9	12.4	
#200	48.1	8.5	
5μ m	15		
2μ m	9		
1μ m	7		

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	16.1				SM		Brown, Silty sand	09/09/21
◇	20.0				SP-SM		Gray, Poorly graded sand with silt	09/10/21
○								

Matrix New World Engineering, P.C. #20-1052-019

TerraSense #21005322A

NJDCA MAP
47 Addison Drive

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

TerraSense Analysis File: GrainSizeV6Rev1a15

Siev1a 9/19/2021

APPENDIX D

FEMA NFIP ELEVATION CERTIFICATE

U.S. DEPARTMENT OF HOMELAND SECURITY
Federal Emergency Management Agency
National Flood Insurance Program

OMB No. 1660-0008
Expiration Date: November 30, 2022

ELEVATION CERTIFICATE

Important: Follow the instructions on pages 1–9.

Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

SECTION A – PROPERTY INFORMATION			FOR INSURANCE COMPANY USE
A1. Building Owner's Name [redacted]			Policy Number:
A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. 47 Addison Dr			Company NAIC Number:
City Town of Fairfield	State New Jersey	ZIP Code 07004-1112	

A3. Property Description (Lot and Block Numbers, Tax Parcel Number, Legal Description, etc.)
Block 3605, Lot 6

A4. Building Use (e.g., Residential, Non-Residential, Addition, Accessory, etc.) Residential

A5. Latitude/Longitude: Lat. N40°53'28" Long. W74°17'29" Horizontal Datum: ☐ NAD 1927 ☒ NAD 1983

A6. Attach at least 2 photographs of the building if the Certificate is being used to obtain flood insurance.

A7. Building Diagram Number 4

A8. For a building with a crawlspace or enclosure(s):

a) Square footage of crawlspace or enclosure(s) 1226.00 sq ft

b) Number of permanent flood openings in the crawlspace or enclosure(s) within 1.0 foot above adjacent grade 3

c) Total net area of flood openings in A8.b N/A sq in

d) Engineered flood openings? ☐ Yes ☒ No

A9. For a building with an attached garage:

a) Square footage of attached garage 377.00 sq ft

b) Number of permanent flood openings in the attached garage within 1.0 foot above adjacent grade 0

c) Total net area of flood openings in A9.b N/A sq in

d) Engineered flood openings? ☐ Yes ☒ No

SECTION B – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

B1. NFIP Community Name & Community Number	B2. County Name	B3. State
Fairfield, Township of	Essex	New Jersey

B4. Map/Panel Number	B5. Suffix	B6. FIRM Index Date	B7. FIRM Panel Effective/ Revised Date	B8. Flood Zone(s)	B9. Base Flood Elevation(s) (Zone AO, use Base Flood Depth)
34013C0018	G	04-03-2020	04-03-2020	AE	174' (NAVD88')

B10. Indicate the source of the Base Flood Elevation (BFE) data or base flood depth entered in Item B9:
☐ FIS Profile ☒ FIRM ☐ Community Determined ☐ Other/Source:

B11. Indicate elevation datum used for BFE in Item B9: ☐ NGVD 1929 ☒ NAVD 1988 ☐ Other/Source:

B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA)? ☐ Yes ☒ No

Designation Date: ☐ CBRS ☐ OPA

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IMPORTANT: In these spaces, copy the corresponding information from Section A.

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.			FOR INSURANCE COMPANY USE
47 Addison Dr			Policy Number:
City: Town of Fairfield	State: New Jersey	ZIP Code: 07004-1112	Company NAIC Number

SECTION C – BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

C1. Building elevations are based on: ☐ Construction Drawings* ☐ Building Under Construction* ☒ Finished Construction

*A new Elevation Certificate will be required when construction of the building is complete.

C2. Elevations – Zones A1–A30, AE, AH, A (with BFE), VE, V1–V30, V (with BFE), AR, AR/A, AR/AE, AR/A1–A30, AR/AH, AR/AO. Complete Items C2.a–h below according to the building diagram specified in Item A7. In Puerto Rico only, enter meters.

Benchmark Utilized: CORS Network NGS Monuments Vertical Datum: NAVD 1988

Indicate elevation datum used for the elevations in items a) through h) below.

☐ NGVD 1929 ☒ NAVD 1988 ☐ Other/Source:

Datum used for building elevations must be the same as that used for the BFE.

Check the measurement used.

a) Top of bottom floor (including basement, crawlspace, or enclosure floor)	165.4	☒ feet	☐ meters
b) Top of the next higher floor	170.0	☒ feet	☐ meters
c) Bottom of the lowest horizontal structural member (V Zones only)	N/A	☐ feet	☐ meters
d) Attached garage (top of slab)	169.6	☒ feet	☐ meters
e) Lowest elevation of machinery or equipment servicing the building (Describe type of equipment and location in Comments)	165.4	☒ feet	☐ meters
f) Lowest adjacent (finished) grade next to building (LAG)	169.0	☒ feet	☐ meters
g) Highest adjacent (finished) grade next to building (HAG)	169.8	☒ feet	☐ meters
h) Lowest adjacent grade at lowest elevation of deck or stairs, including structural support	169.1	☒ feet	☐ meters

SECTION D – SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION

This certification is to be signed and sealed by a land surveyor, engineer, or architect authorized by law to certify elevation information. *I certify that the information on this Certificate represents my best efforts to interpret the data available. I understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001.*

Were latitude and longitude in Section A provided by a licensed land surveyor? ☒ Yes ☐ No ☐ Check here if attachments.

Certifier's Name: Frank J. Barlowski
License Number: 24GS03973500

Title: Professional Land Surveyor

Company Name: Matrix New World Engineering, Land Surveying and Architecture, P.C.

Address: 442 State Route 35, Second Floor

City: Eatontown State: New Jersey ZIP Code: 07724

Place Seal Here

Signature Date Telephone Ext.

Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

Comments (including type of equipment and location, per C2(e), if applicable)

C2(e): Base of hot water heater and boiler was located at Elev=165.4'(NAVD88)

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City Town of Fairfield	State New Jersey	ZIP Code 07004-1112	Company NAIC Number

SECTION E – BUILDING ELEVATION INFORMATION (SURVEY NOT REQUIRED) FOR ZONE AO AND ZONE A (WITHOUT BFE)

For Zones AO and A (without BFE), complete Items E1–E5. If the Certificate is intended to support a LOMA or LOMR-F request, complete Sections A, B,and C. For Items E1–E4, use natural grade, if available. Check the measurement used. In Puerto Rico only, enter meters.

E1. Provide elevation information for the following and check the appropriate boxes to show whether the elevation is above or below the highest adjacent grade (HAG) and the lowest adjacent grade (LAG).

a) Top of bottom floor (including basement, crawlspace, or enclosure) is ____________ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

b) Top of bottom floor (including basement, crawlspace, or enclosure) is ____________ ☐ feet ☐ meters ☐ above or ☐ below the LAG.

E2. For Building Diagrams 6–9 with permanent flood openings provided in Section A Items 8 and/or 9 (see pages 1–2 of Instructions), the next higher floor (elevation C2.b in the diagrams) of the building is ____________ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E3. Attached garage (top of slab) is ____________ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E4. Top of platform of machinery and/or equipment servicing the building is ____________ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E5. Zone AO only: If no flood depth number is available, is the top of the bottom floor elevated in accordance with the community's floodplain management ordinance? ☐ Yes ☐ No ☐ Unknown. The local official must certify this information in Section G.

SECTION F – PROPERTY OWNER (OR OWNER'S REPRESENTATIVE) CERTIFICATION

The property owner or owner's authorized representative who completes Sections A, B, and E for Zone A (without a FEMA-issued or community-issued BFE) or Zone AO must sign here. The statements in Sections A, B, and E are correct to the best of my knowledge.

Property Owner or Owner's Authorized Representative's Name			
Address	City	State	ZIP Code
Signature	Date	Telephone	

Comments

☐ Check here if attachments.

ELEVATION CERTIFICATE

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IMPORTANT: In these spaces, copy the corresponding information from Section A.			FOR INSURANCE COMPANY USE
Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. 47 Addison Dr			Policy Number:
City Town of Fairfield	State New Jersey	ZIP Code 07004-1112	Company NAIC Number

SECTION G – COMMUNITY INFORMATION (OPTIONAL)

The local official who is authorized by law or ordinance to administer the community's floodplain management ordinance can complete Sections A, B, C (or E), and G of this Elevation Certificate. Complete the applicable item(s) and sign below. Check the measurement used in Items G8–G10. In Puerto Rico only, enter meters.

G1. ☐ The information in Section C was taken from other documentation that has been signed and sealed by a licensed surveyor, engineer, or architect who is authorized by law to certify elevation information. (Indicate the source and date of the elevation data in the Comments area below.)

G2. ☐ A community official completed Section E for a building located in Zone A (without a FEMA-issued or community-issued BFE) or Zone AO.

G3. ☐ The following information (Items G4–G10) is provided for community floodplain management purposes.

G4. Permit Number	G5. Date Permit Issued	G6. Date Certificate of Compliance/Occupancy Issued

G7. This permit has been issued for: ☐ New Construction ☐ Substantial Improvement

G8. Elevation of as-built lowest floor (including basement) of the building: ____________ ☐ feet ☐ meters Datum ____________

G9. BFE or (in Zone AO) depth of flooding at the building site: ____________ ☐ feet ☐ meters Datum ____________

G10. Community's design flood elevation: ____________ ☐ feet ☐ meters Datum ____________

Local Official's Name	Title
Community Name	Telephone
Signature	Date

Comments (including type of equipment and location, per C2(e), if applicable)

☐ Check here if attachments.

ELEVATION CERTIFICATE

BUILDING PHOTOGRAPHS

See Instructions for Item A6.

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City Town of Fairfield	State New Jersey	ZIP Code 07004-1112	Company NAIC Number

If using the Elevation Certificate to obtain NFIP flood insurance, affix at least 2 building photographs below according to the instructions for Item A6. Identify all photographs with date taken; "Front View" and "Rear View"; and, if required, "Right Side View" and "Left Side View." When applicable, photographs must show the foundation with representative examples of the flood openings or vents, as indicated in Section A8. If submitting more photographs than will fit on this page, use the Continuation Page.

Photo One

Photo One Caption Front View

Clear Photo One

Photo Two

Photo Two Caption Rear View

Clear Photo Two

BUILDING PHOTOGRAPHS

Continuation Page

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IMPORTANT: In these spaces, copy the corresponding information from Section A.			FOR INSURANCE COMPANY USE
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City Town of Fairfield	State New Jersey	ZIP Code 07004-1112	Company NAIC Number

If submitting more photographs than will fit on the preceding page, affix the additional photographs below. Identify all photographs with: date taken; "Front View" and "Rear View"; and, if required, "Right Side View" and "Left Side View." When applicable, photographs must show the foundation with representative examples of the flood openings or vents, as indicated in Section A8.

Photo Three

Photo Three Caption Right Side View

Clear Photo Three

Photo Four

Photo Four Caption Left Side View

Clear Photo Four