ENGINEERING INVESTIGATION & ANALYSIS GEOTECHNICAL & STRUCTURAL ASSESSMENT REPORT

10 SYLVAN ROAD
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 10 Sylvan Road 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 44 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 10 Sylvan Road in Fairfield, New Jersey. The property consists of a two-story timber-framed raised ranch-style house with an approximately 1,150 square foot footprint. The house is situated atop concrete masonry unit (CMU) foundation walls on cast-in-place concrete foundations. The house does not contain an underground level – the lower level of the house consists of a ground-level garage adjacent to a ground-level living space. The timber frame of the residential structure is covered with a wood shingle siding throughout the second-floor exterior. The ground level contains a stucco coating covering the exterior face of the CMU foundation walls throughout the building perimeter. The property also contains a raised timber deck adjacent to the rear wall of the house and matching the elevation of the second floor.

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 Pompton – Urban land. The subsurface composition is typically sand and loamy sands from 8 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 of B-1, in which Sand was encountered followed by a layer of Silt. Present only in B-2 was an upper layer of Silt, followed by Sand and finally a lower Silt layer. Groundwater was encountered in the borings at approximately 1.3 to 2.7 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 (West Wall of Building) to a depth of 44 inches below the ground surface. The test pit was dug using shovels to prevent any damage to the existing building foundations. The exterior edge of the building’s foundation wall 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 pit, 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 31, 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: 4-6’, 20-22’, 25-27’ B-2: 2-4’, 4-6’, 20-22’
Sieve Analysis	ASTM D422	1	B-2: 2-4’
Atterberg Limits	ASTM D4318	3	B-1: 25-27’ B-2: 4-6’, 20-22’
Percent Fines	ASTM D1140	2	B-1: 4-6’, 20-22’

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 test pit competed along the west wall of the building was prematurely terminated at 14” below the ground surface (bgs), due to the presence of groundwater. Using a metal rod, the top of concrete was encountered at 44 inches bgs. The high groundwater table within the test pit prevented measurement of the foundation wall footing dimensions.

Surface Cover

The surface cover for borings B-1 and B-2 consisted of grass cover and topsoil, approximately 5 inches thick.

Stratum 1: Upper Silt & Sand (ML, SM)

Beneath the surface cover, a soil layer was encountered consisting of light brown or brown Silt and mostly fine Sand. In boring B-1, this layer consisted predominantly of Sand, while in boring B-2, the Silt content outweighed the Sand material. This layer was encountered immediately underlying the surface cover and extended to 5.33 feet bgs in boring B-1 and to 4.75 feet bgs in boring B-2.

The SPT N-values in this layer ranged from 2 to 6 blows per foot (bpf), which is indicative of very loose to loose soil material. The SPT N-values for Stratum 1 are summarized in the tables below.

Table 6.0-1: SPT N-Values for Stratum 1

Soil Boring Location	USCS Group Symbol	Depth Below Ground Surface	SPT N-Values
B-1	SM	0.42-5.33’	2-6
B-2	ML	0.42-4.75’	2-4

Stratum 2: Clay & Sand (CL, SC)

Beneath the Silty soil layer (Stratum 1) in both borings, a thin soil layer was encountered consisting of grey to brown Clay and mostly fine Sand. This layer varied in content of differing soil material, but was nearly an even mixture of Clay and Sand throughout the layer's depth. This Clayey layer was encountered at 5.33 feet bgs in boring B-1 and at 4.75 feet bgs in boring B-2, and extended to 6 feet bgs in both borings.

The SPT N-values in this layer are estimated between 8 and 13 bpf, which is indicative of stiff Clay and loose to medium-dense granular soils. The SPT N-values for Stratum 2 are summarized in the tables below.

Table 6.0-2: SPT N-Values for Stratum 2

Soil Boring Location	USCS Group Symbol	Depth Below Ground Surface	SPT N-Values
B-1	SC	5.33-6'	4/6"
B-2	CL SC	4.75-5.33' 5.33-6'	10 6/6"

<u>Stratum 3: Lower Sand (SP-SM, SM)</u>

Beneath the Clayey soil layer (Stratum 2) in both borings, a soil layer was encountered consisting of brown to grey coarse-to-fine grained Sand with varying amounts of Silt and traces of fine Gravel. This Lower Sand layer was encountered at 6 feet bgs in both borings and extended to approximately 18.5 feet bgs in boring B-1 and 21 feet bgs in boring B-2.

The SPT N-values in this layer typically decreased with depth and ranged from 4 to 19 blows per foot (bpf), which is indicative of loose to medium-dense Sand. The SPT N-values for Stratum 3 are summarized in the tables below.

Table 6.0-3: Loose SPT N-Values for Stratum 3

Soil Boring Location	USCS Group Symbol	Depth Below Ground Surface	SPT N-Values
B-1	SM	13.5-18.5'	7
B-2	SM	13.5-21'	4-8

Table 6.0-4: Medium-Dense SPT N-Values for Stratum 3

Soil Boring Location	USCS Group Symbol	Depth Below Ground Surface	SPT N-Values
B-1	SP-SM, SM	6-13.5'	12-19
B-2	SP-SM	6-13.5'	12-19

Stratum 4: Lower Silt & Clay (ML, CL-ML)

Beneath the granular material of Stratum 3 in both borings, a soil layer was encountered consisting of grey Silt with varying amounts of Clay and fine Sand. This lower cohesive layer was encountered at approximately 18.5 feet bgs in boring B-1 and 21 feet bgs in boring B-2. Both borings were terminated within this layer at 27 feet bgs.

The SPT N-values in this layer ranged from 3 to 11 blows per foot (bpf), which is indicative of loose to medium Silt or stiff Clay soils. The SPT N-values for Stratum 4 are summarized in the tables below.

Table 6.0-5: Loose/Stiff SPT N-Values for Stratum 4

Soil Boring Location	USCS Group Symbol	Depth Below Ground Surface	SPT N-Values
B-1	ML	18.5-23.5’	5
B-2	ML CL-ML	21-23.5’ 23.5-27’	3 8

Table 6.0-6: Medium/Stiff SPT N-Values for Stratum 4

Soil Boring Location	USCS Group Symbol	Depth Below Ground Surface	SPT N-Values
B-1	CL-ML	23.5-27’	11

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 lies approximately between 1.3 and 2.7 feet bgs. Saturated soils were encountered in B-1 at 1.3 feet bgs at 10:50 AM and in B-2 at 2.7 feet bgs at 11:55 AM. 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 ≤ 10]	$\gamma = 120$ $\gamma' = 58$	30°	0	0.33	3.00	2,500	150
Native Silt (ML) Medium [10 ≤ SPT N ≤ 30]	$\gamma = 115$ $\gamma' = 53$	28°	400	0.36	2.77	2,000*	100
Native Silt (ML) Loose [SPT N < 10]	$\gamma = 90$ $\gamma' = 28$	26°	150	0.39	2.56	1,500*	75
Native Clay Material (CL) Stiff [8 < SPT N ≤ 30]	$\gamma = 110$ $\gamma' = 48$	-	1,500	-	-	2,000*	100

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, $K_o = 1 – \text{Sin}\ \phi'$.

8.0 STRUCTURAL INSPECTION

The following sections present the results of the structural inspection of the residential building at 10 Sylvan Road 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 garage and ground level 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 building at 10 Sylvan Road sits atop CMU foundation walls that make up the exterior perimeter of the building's ground level. The timber frame and subfloor of the house is supported by timber joists and girders spanning the CMU foundation walls.

The garage area of the building, measuring 25'-2" long x 20'-8" wide, encompasses the east portion of the ground level. The garage contains CMU (8x8x18 block) foundation walls around the full perimeter of the area, typically ranging between 82" and 84" in height from floor to top of wall. In the front wall of the garage, the CMU blocks have been removed above a glass window and have been replaced with timber framing. Two garage doors are located along the east wall of the garage, both measuring 8'-3" wide. The framing of the second floor above could not be observed, due to the presence of a stucco-covered sheetrock ceiling throughout the space. A girder was visible beneath the ceiling, spanning the garage from east to west (side to side of house), but this structural member was also covered in a stucco coating. The girder measured 6” wide x 9.25” deep, suggesting a composition of (3) connected nominal 2x10 timber members. The girder is supported throughout its span, between the edge foundation walls, by (2) 4” diameter steel post columns that extend into the ground below the concrete floor slab. The longest clear span of the girder measured 7’-3” at each end between the steel post column and the CMU walls. The concrete floor of the garage was not evenly graded, as the distance from floor to ceiling varied in this area between 7’-1” and 7’-2”.

Approximately 14” above the garage floor, in the front interior of the house, an entrance vestibule connects the exterior front entrance platform to the interior of the ground level. This vestibule appears to be made up of a combination of brick and concrete, and the floor surface is covered in tile flooring.

The remainder of the ground level, located west of the entrance vestibule and approximately 18” below the vestibule floor, consists of furnished living space. This space contains timber-framed partition walls that separate the area into a bathroom, bedroom, living room, and laundry room. Similar to the garage, this area contains CMU perimeter foundation walls that appear to extend to the full height of the floor up to the ceiling (CMU blocks are likely removed above windows, similar to the garage). The concrete slab on grade in this area is covered with tile throughout, and measured approximately 7’-7” to the painted sheetrock ceiling. Beneath the stairs leading to the second floor of the house, a boiler room was observed that did not contain a sheetrock ceiling. From this room, the subfloor of the second floor was observed to consist of nominal 2x8 timber members, spaced 16” on center, running from front to rear of the house. These joists are supported by a girder that appeared to consist of (3) nominal 2x10 timber members spanning the full width of the ground-level living space from the west wall of the garage to the west exterior wall of the building. Though they could not be observed behind the finished sheetrock walls of the ground level, column supports are expected to be in place along the length of the girder to provide the necessary support for the building’s loads.

A test pit excavation conducted along the west wall of the building was prematurely terminated at 14” bgs due to the presence of the groundwater table at that depth. Using a metal rod, the top of the concrete footing was encountered at 44” bgs, but due to groundwater obstructions the footing dimensions could not be measured. 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.

8.2 Existing Equipment

Various pieces of equipment and machinery were observed on the ground level of the house, in both the garage and the boiler room. In the garage, a gas meter was observed in the northwest corner (elevated 44" above the floor) and an electrical panel and internet modem are mounted next to the northern garage door in the northeast corner (elevated 42" above the floor). Along the west wall, a small water well pressure tank and water pump were observed near the center of the garage. The tank was situated on the floor surface, while the pump was elevated 12" above the floor on a plastic crate. Multiple PVC and metal pipes were also observed within the garage extending up into the second floor of the house.

In the boiler room, located under the stairs to the second floor, a boiler and hot water heater were observed. The boiler was raised 7" above the concrete floor with brick and stone blocks, while the hot water heater was raised 4" above the floor on concrete blocks/pavers. Next to the hot water heater, a water filter tank was observed on the floor surface. Also in the boiler room, a CMU exhaust chimney connects to the exhaust pipelines of the hot water heater and boiler, extending up through the roof of the house. Outside the boiler room, in the laundry room of the ground-level living space, separate washer and dryer units were observed situated on the floor surface.

Outside the building, on the roof, multiple solar panels cover much of the south and east areas of the roof surface. The roof panels connect to an inverter/electrical box mounted to the east exterior wall of the house (north of the garage doors). All air conditioning for the house appears to come from window units installed along the second floor.

8.3 Site Observations

The building at 10 Sylvan Road appears to have originally been a single-story house, and has since been raised on relatively new CMU foundation walls.

Within the garage area multiple cracks were also seen throughout the concrete floor of the garage, and the floor surface was slightly uneven throughout the space.

A section of the garage ceiling, in the southwest corner of the space, appeared to have been previously damaged or removed. The area has been repaired with plywood and new sheetrock without a stucco coating.

An approximately 16” overhang was observed on the second floor in the front of the house, above the ground-level garage area only. This is a cantilever overhang, as there is no additional support for the overhanging area of the second-floor joists.

A triangular-shaped timber deck has been constructed along the rear of the house, encompassing the west half of the rear wall. The deck is elevated to match the elevation of the house’s second floor. Support for the timber subfloor of the deck consist of 4x4 timber posts along the rear wall of the house and a 12” square CMU block column supporting the southern tip of the deck. A set of timber stairs provide access from the rear deck to the backyard ground surface.

8.4 Elevation Requirements

The FEMA 100-year flood elevation at 10 Sylvan Road 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. Therefore, the new first floor elevation must be at El. +177 or higher to meet the requirements set forth in the program.

The current second-floor elevation at the Site is estimated at El. +176.6, with the ground-level living space below at El. +168.42. To achieve the elevation requirements for the second floor, the existing building would need to be raised at least 0.4 feet. Maintaining the existing habitable area of the house would require raising the building at least 8.2 feet, along with construction of a new first floor beneath the existing timber-framed second floor of the building.

8.5 Recommendations for Building Elevation

Matrix recommends that the existing foundation system of the residential building at 10 Sylvan Road be kept in place, and a new timber floor built above, to achieve the required design flood elevation. The existing CMU foundation walls are expected to provide sufficient support for the additional height of the newly raised building. 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 shallow concrete strip footings at the Site.

In accordance with NFIP requirements, it is required that the existing ground-level of the house be filled in to match the lowest adjacent exterior grade following raising. The ground-level space beneath the newly raised building can be used for storage at the resident's discretion. Raising the house by the minimum 0.4 feet will result in a loss of habitable area for the residence, as the existing ground level will be partially filled in and can no longer be used for living space (floor below the design flood elevation). To maintain the existing habitable square footage, it is recommended that the timber-framed second floor of the house be raised off the existing CMU foundation walls by at least 8.2 feet. A new story of timber-framed floor and walls will then be built atop the foundation walls to connect the newly raised second floor to the existing foundation walls of the building.

The most feasible method of elevation for the building consists of jacking up the timber-framed portion of the residential structure (second floor) from below using steel beams and jack posts. The building will then sit atop temporary cribbing while the new first floor timber joists, girders, and bearing walls are constructed atop the CMU foundation walls and connected to the bottom of the existing perimeter timber walls of the second floor. Prior to construction of the new first floor, the front CMU wall of the ground level, which is currently not at the same height as the other foundation walls, will require additional courses of block to achieve uniform top-of-wall elevation throughout the building. It is also recommended that the existing windows throughout the CMU walls of the building be removed, and the openings replaced with CMU block. Additional vertical reinforcement would need to be installed in ungrouted masonry cells to properly transfer loads through these areas of new CMU block, and horizontal ladder reinforcement should be installed at a minimum of every other course.

All furniture, fixtures, and service machinery/equipment within the ground level will require removal prior to raising of the house and must be elevated 3 feet above the BFE. The existing equipment in the boiler room and garage (hot water heater, boiler, electrical panel, gas meter, and water well tank and pump), and the ground-level bathroom fixtures (toilet and sink) will need to be relocated onto the new first floor or the raised second floor following elevation of the building. Also, the solar panel equipment located on the east exterior wall of the building will require raising 3 feet above the BFE.

The garage doors located along the east wall of the house will need to be removed prior to raising the house, then replaced at the ground level once the house is elevated and the new first floor is constructed. The existing CMU exhaust chimney located within the interior of the house will also require extending during raising of the house to keep the top of the chimney above the roof level. Additionally, the rear timber deck is anticipated to require raising to match the new ingress/egress at heights of the main structure. This would require replacement or extension of the timber support posts and CMU column.

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.

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 8.0 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.

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 10 Sylvan Road 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. 10 Sylvan Road (Front of Building)

Photo 2. 10 Sylvan Road (Rear of Building)

Photo 3. Garage Entrance Door & CMU Foundation Walls (Looking North)

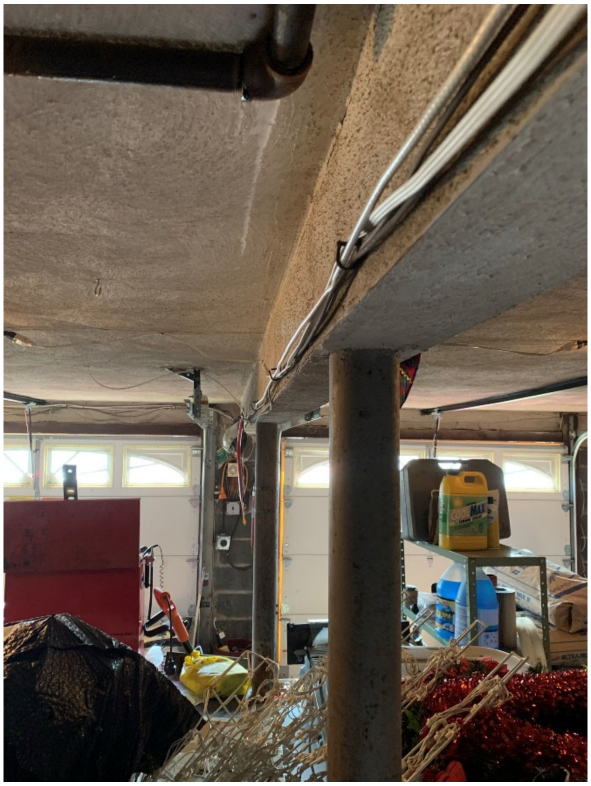


Photo 4. Garage Girder & Steel Post Columns (Looking East)

Photo 5. CMU Wall Along Front Wall of Garage, Timber Frame Wall Above Window

Photo 6. Water Well Pressure Tank & Pump, West Wall of Garage

Photo 7. Front Entrance Vestibule (Looking Northeast)

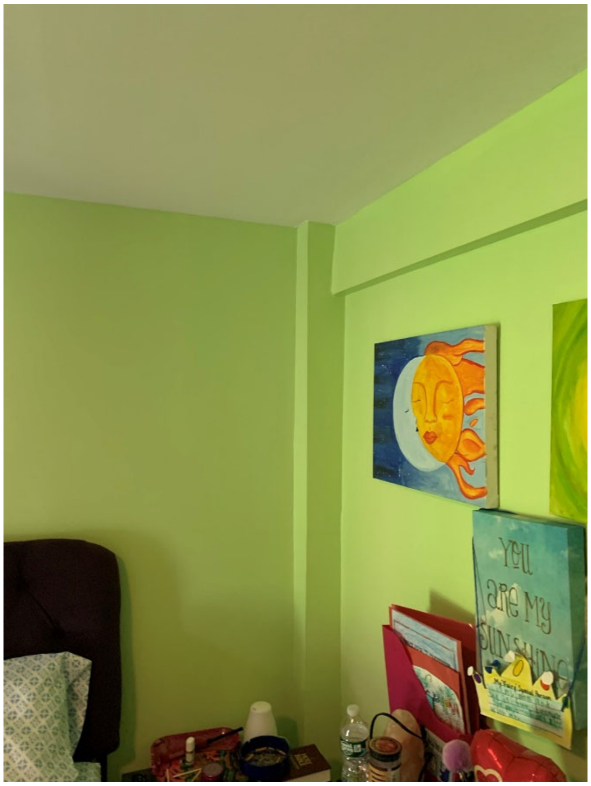


Photo 8. Ground Level Living Space with Girder & Column (Looking Northwest)

Photo 9. Boiler Room Beneath Stairs to Second Floor (Looking Southeast)

Photo 10. Boiler in Boiler Room (Looking North)

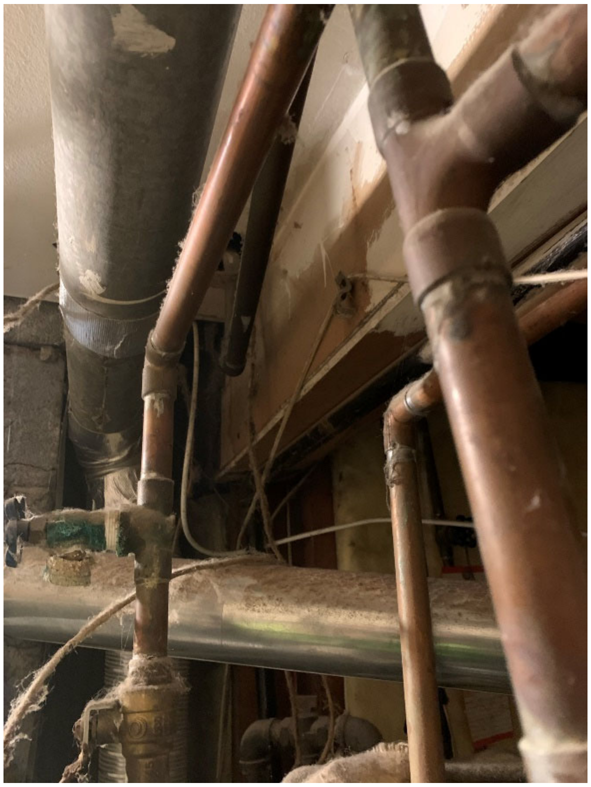


Photo 11. Timber Girder Above Boiler Room (Looking Northwest)

Photo 12. Solar Panel Equipment on East Exterior Wall of House

Photo 13. Second-Floor Overhang Over Garage Front Wall

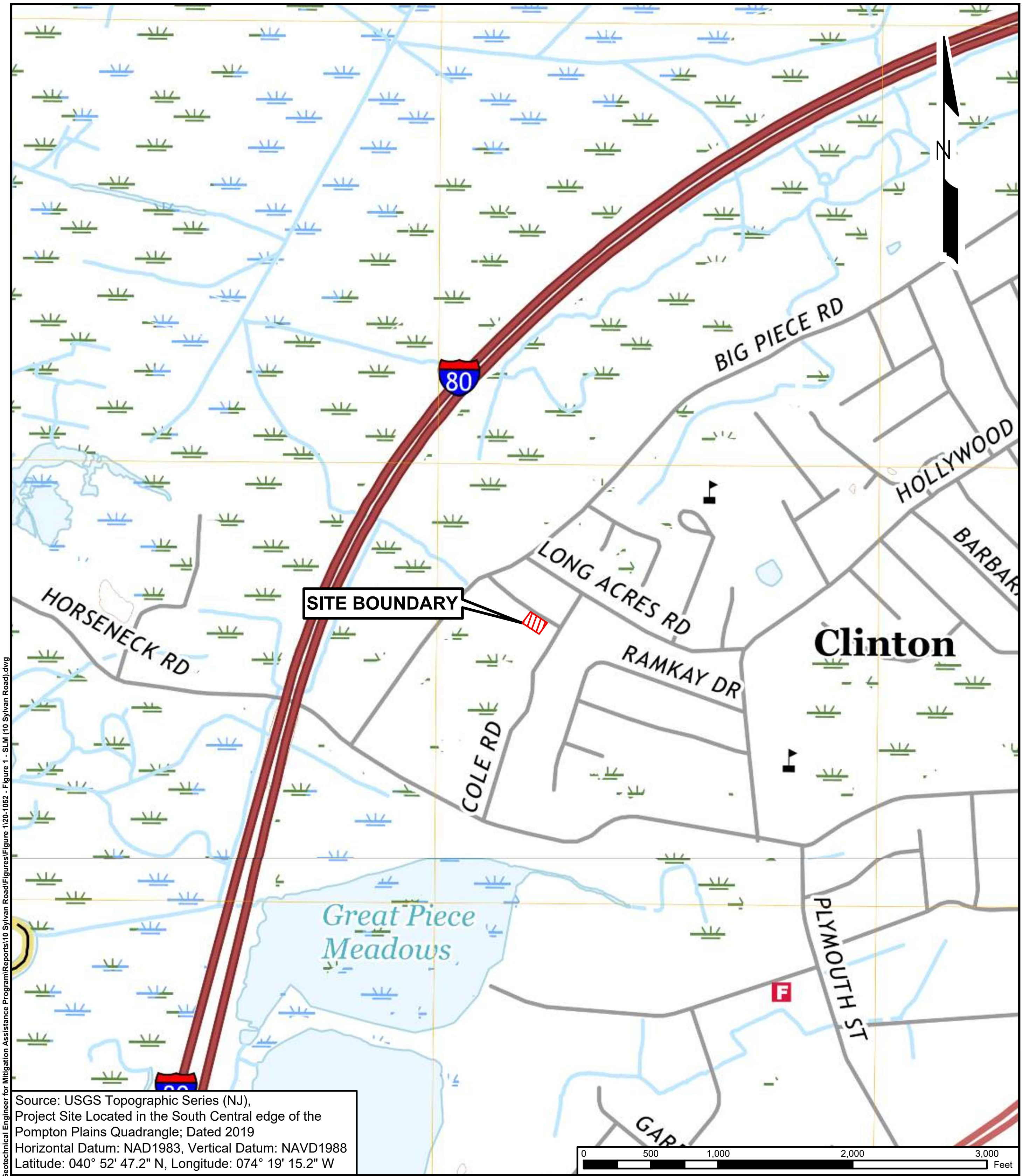
Photo 14. Rear Timber Deck Frame & Columns

Test Pit Photos

Photo 15. Test Pit TP-1 Location (Southwest Corner of Building – Ground Level Living Space)

Photo 16. Test Pit TP-1 Conditions

FIGURES



Source: USGS Topographic Series (NJ),
Project Site Located in the South Central edge of the
Pompton Plains Quadrangle; Dated 2019
Horizontal Datum: NAD1983, Vertical Datum: NAVD1988
Latitude: 040° 52' 47.2" N, Longitude: 074° 19' 15.2" W

SITE LOCATION MAP

MATRIXNEWORLD
Engineering Progress

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Florham Park, New Jersey 07932
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NJ DEPARTMENT OF COMMUNITY AFFAIRS
GEOTECHNICAL AND STRUCTURAL ASSESSMENT REPORT
10 SYLVAN ROAD
FAIRFIELD, NEW JERSEY 07004

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

© MATRIXNEWORLD\F:\2020\20-1052 NJDCA Geotechnical Engineer for Mitigation Assistance Program\Reports\10 Sylvan Road\Figures\Figure 1\20-1052 - Figure 1 - SLM (10 Sylvan Road).dwg

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 31, 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
TP-# ⌖	TEST PIT LOCATION

NO.	DESCRIPTION	DATE:	BY:	APR:

REVISIONS

DESIGNED BY: WB

REVIEWED BY: MS

RELEASED BY: MS

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AS-DRILLED BORING LOCATION PLAN

NJDCA GEOTECHNICAL ENGINEER
FOR MITIGATION ASSISTANCE PROGRAM

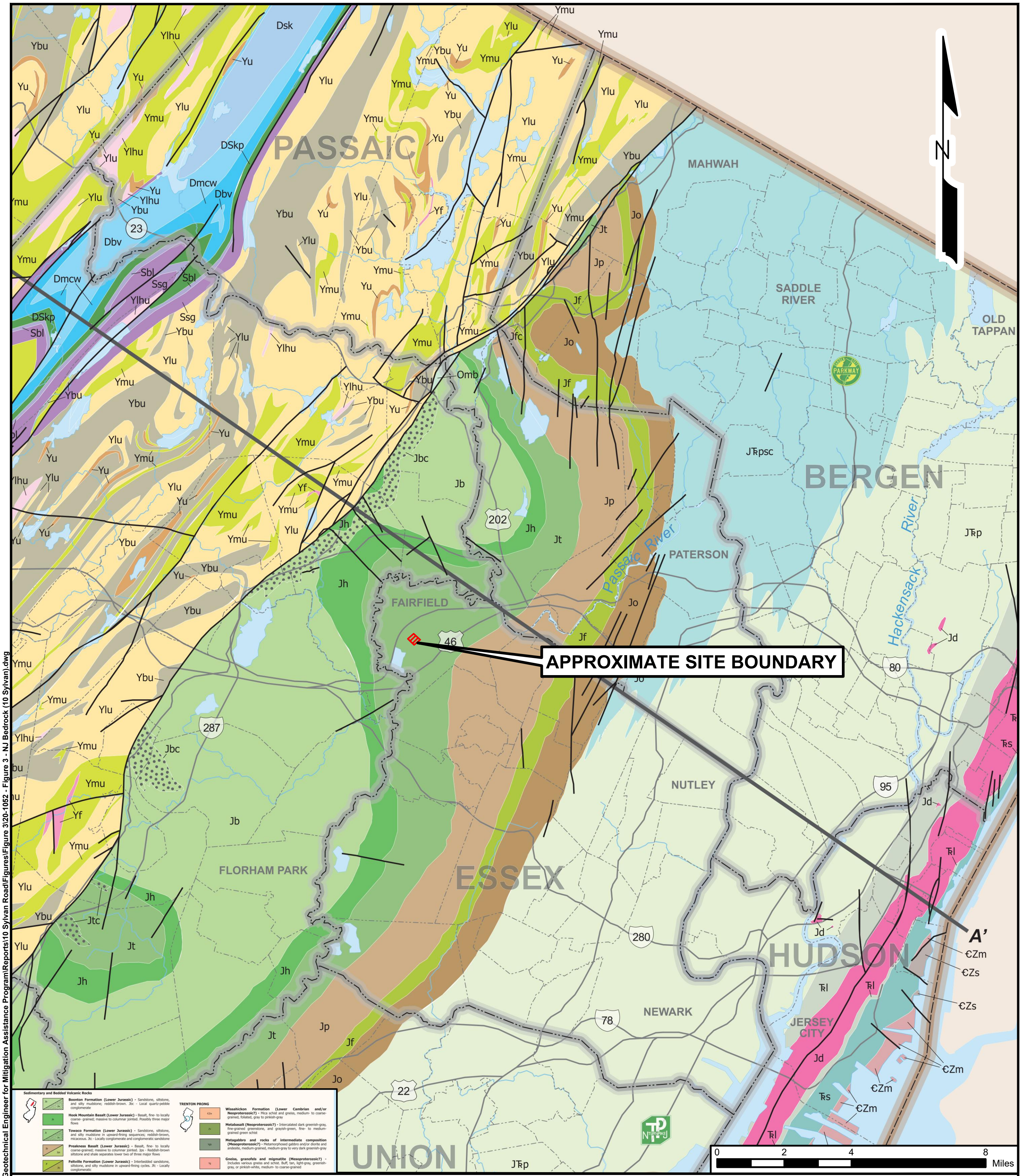
10 SYLVAN RAOD
FAIRFIELD, NJ 07004

PROJECT NUMBER: 20-1052

SCALE: AS NOTED

DATE: SEPTEMBER 2021

2



BEDROCK GEOLOGY LOCATION MAP

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10 SYLVAN ROAD
FAIRFIELD, NEW JERSEY 07004

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

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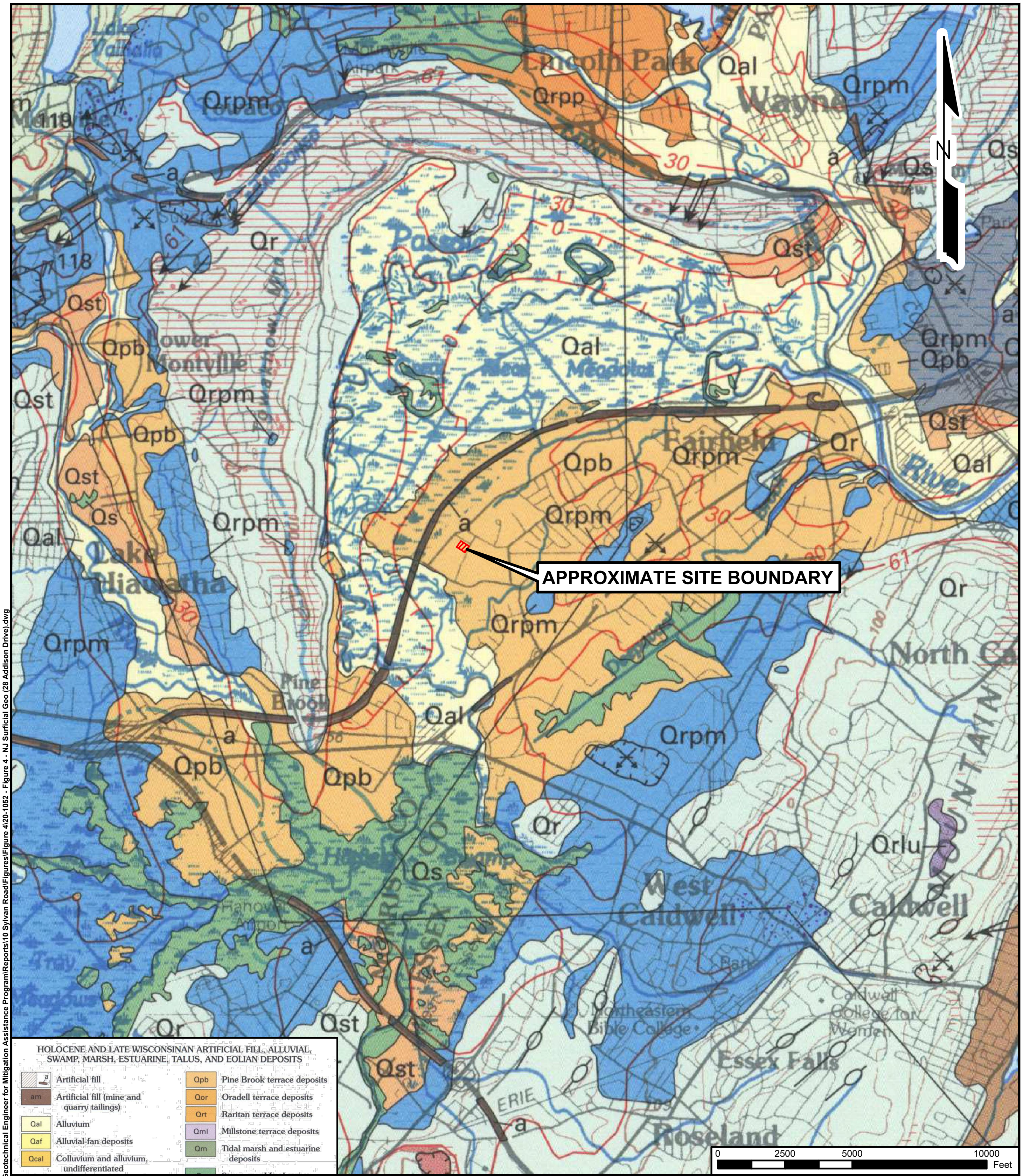

SURFICIAL GEOLOGY LOCATION MAP

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10 SYLVAN ROAD
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: **8/31/21**
PROJECT LOCATION: **Fairfield, NJ** BORING LOCATION: **10 Sylvan Road, East 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"**	**8/31/21**	**10:50 am**	**1.3**	**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"-2-5 (58%)		5" Grass/Topsoil S-1: Brown mf* SAND, little Silt, trace fine Gravel, wet (SM)	
▼		S-2	SS	2-4	5-3-3-4 (75%)		S-2: Brown to Grey fine SAND, some Silt, trace fine Gravel, wet (SM)	
5	PUSH MUD	S-3	SS	4-6	1-1-4-4 (100%)		S-3A (Top 16"): Same as Above, trace gaseous odor, wet (SM) S-3B (Bottom 8"): Grey fine SAND and Silty Clay, wet (SC) WC: 21.3%, Fines: 42.1%	Pass No 200
		S-4	SS	6-8	4-5-7-8 (100%)		S-4: Grey-Brown cm*f SAND, little Clayey Silt, trace fine Gravel, wet (SP-SM)	
		S-5	SS	8-10	8-7-7-8 (100%)		S-5: Grey-Brown to Brown cm*f SAND, trace Silt, trace fine Gravel, wet (SP-SM)	
10		S-6	SS	10-12	11-9-10-10 (100%)		S-6: Grey/Brown mf SAND, little Silt, trace fine Gravel, wet (SM)	
15		S-7	SS	15-17	3-3-4-5 (58%)		S-7: Grey-Brown fine SAND, some Silt, wet (SM)	
20		S-8	SS	20-22	3-3-2-2 (54%)		S-8: Grey Clayey SILT, some fine Sand, wet (ML) WC: 27.9%, Fines: 70.1%	Pass No 200
25		S-9	SS	25-27	7-6-5-6 (75%)		S-9: Grey Clayey SILT & CLAY, trace fine Sand, wet (CL-ML) WC: 26.0%, LL: 21, PL: 17, PI: 4	Atterberg Limits
	MUD						Bottom of Borehole @ 27 ft.	

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: **8/31/21**
PROJECT LOCATION: **Fairfield, NJ** BORING LOCATION: **10 Sylvan Road, West 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"**	**8/31/21**	**11:55 am**	**2.7**	**N/A**
FJ Steel	**4"**			**SS**	**1 3/8"**						

Depth Feet (Elev.)	CASING	SAMPLE				Graphic Symbol	Description Of Material	Laboratory Tests
	Blows/ Foot	No.	Type	Depth Feet	Blows/6" (REC. %) [RQD %]			
	PUSH	S-1	SS	0-2	2/12"-2-2 (58%)		5" Grass/Topsoil S-1: Light Brown SILT and fine Sand, moist (ML)	
▼		S-2	SS	2-4	2-2-2-1 (63%)		S-2: Same as Above, wet (ML) WC: 23.6%, Gravel: 0.0%, Sand: 36.3%, Fines: 63.7%	Sieve
5	PUSH MUD	S-3	SS	4-6	2-3-7-6 (100%)		S-3A (Top 9"): Same as Above, wet (ML) S-3B (Middle 7"): Grey/Brown Silty CLAY and fine Sand, wet (CL) WC: 26.9%, LL: 45, PL: 14, PI: 31 S-3C (Bottom 8"): Grey mf* SAND, some Silty Clay, wet (SC)	Atterberg Limits
		S-4	SS	6-8	5-6-7-7 (100%)		S-4: Grey-Brown mf SAND, little Silt, wet (SP-SM)	
		S-5	SS	8-10	5-5-7-9 (100%)		S-5: Grey-Brown to Brown cm*f SAND, trace Silt, trace fine Gravel, wet (SP-SM)	
10		S-6	SS	10-12	12-8-11-9 (100%)		S-6: Same as Above, wet (SP-SM)	
15		S-7	SS	15-17	5-4-4-6 (54%)		S-7: Grey fine SAND, some Silt, wet (SM)	
20		S-8	SS	20-22	2-2-2-1 (100%)		S-8A (Top 12"): Same as Above with pockets of Clayey Silt [1" to 2" thick], wet (SM) S-8B (Bottom 12"): Grey-Brown Clayey SILT, trace fine Sand, wet (ML) WC: 26.5%, LL: 21, PL: 18, PI: 3	Atterberg Limits
25		S-9	SS	25-27	4-4-4-3 (100%)		S-9: Grey SILT & CLAY, trace fine Sand, wet (CL-ML)	
	MUD						Bottom of Borehole @ 27 ft.	

BORING NO.: **B-2**

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: **11:10:00 AM**

TEST PIT LOCATION: **10 Sylvan Road (West Wall - Ground Level)** DATUM: **NAVD88** TIME FINISHED: **11:25:00 AM**

CONTRACTOR: **Boring Brothers, Inc.** GROUNDWATER LEVEL (IN): **14**

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

Depth Inches (Elev)	No.	Depth Inches	Graphic Symbol	Description Of Material	Laboratory Tests
		0-5		Topsoil, Mulch Cover	
5 10 15 20 25 30 35 40		5-44		Brown SILT and fine Sand (ML) Groundwater table encountered at 14" bgs - test pit could not be advanced further.	
				Metal rod used to determine depth of concrete wall footing. Top of concrete encountered at 44" bgs (30" below water surface). Width and thickness of concrete could not be measured due to presence of groundwater. Bottom of Test pit @ 44 in. Test Pit Backfilled.	

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

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

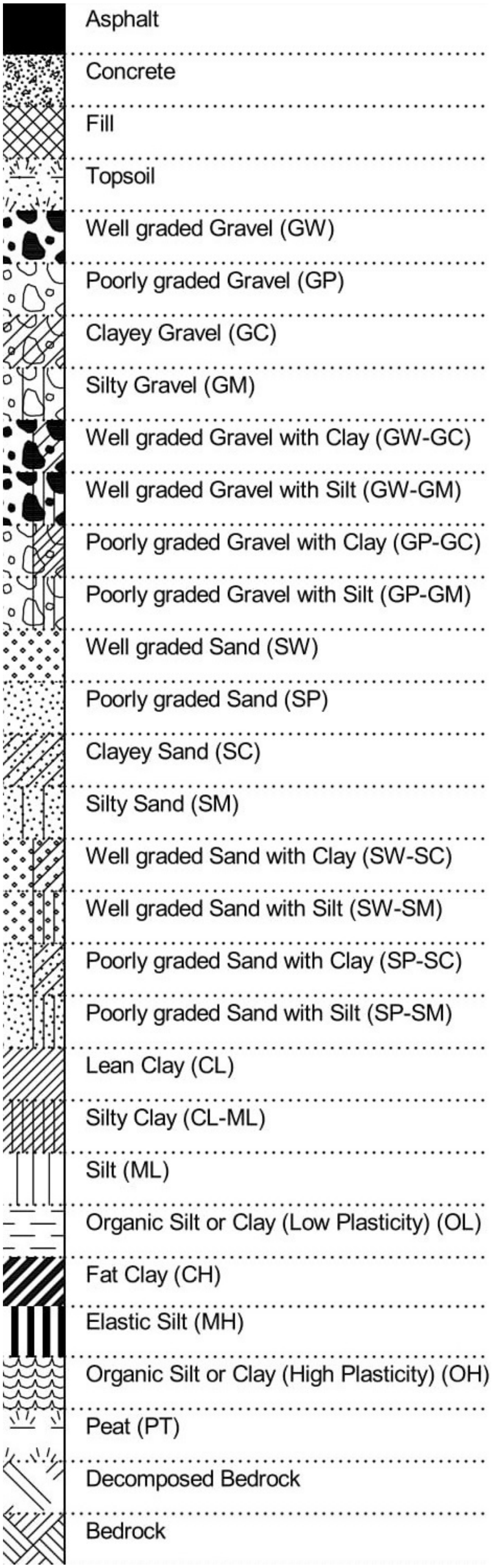
PL = Plastic Limit

LL = Liquid Limit

PI = Plasticity Index

OC = Organic Content

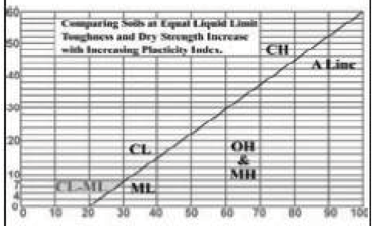
LOG GRAPHICAL LEGEND



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	
Fine-grained Soils More than half of material is smaller than No. 200 sieve size.					Identification Procedure on Fraction Smaller than No. 40 Sieve Size.							
					Dry Strength (Crushing Characteristics)	Dilatancy (Reaction to shaking)	Toughness (Consistency near PL)					
	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		Plasticity Index	**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							

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” 29th 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

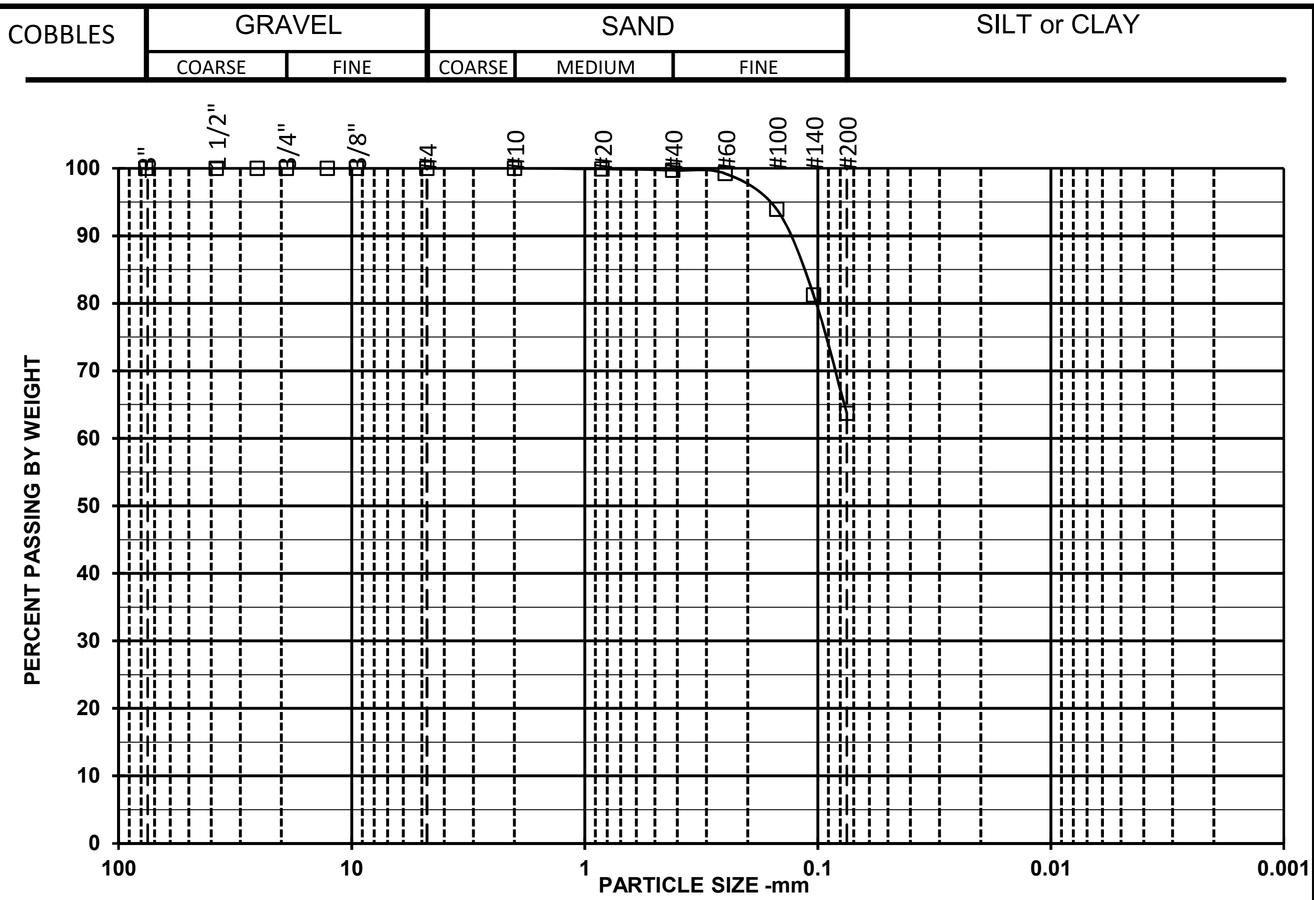
APPENDIX C

GEOTECHNICAL LABORATORY TESTING RESULTS

Matrix New World Engineering, P.C. #20-1052-020
NJDCA MAP 10 Sylvan Road
LABORATORY TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS						REMARKS / TEST ID
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	
B-1	S-3B	4-6	21.3				SC	42.1	
B-1	S-8	20-22	27.9				ML	70.1	
B-1	S-9	25-27	26.0	21	17	4	CL-ML		
B-2	S-2	2-4	23.6				ML	63.7	
B-2	S-3B	4-6	26.9	45	14	31	CL		
B-2	S-8B	20-22	26.5	21	18	3	ML		

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



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

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
☐	23.6				ML		Brown, Sandy silt	09/10/21
◇								
○								

Matrix New World Engineering, P.C. #20-1052-020

TerraSense #21005327A

NJDCA MAP
10 Sylvan Road

Symbol	☐	◇	○
Boring	B-2		
Sample	S-2		
Depth	2-4		
% +3"	0		
% Gravel	0		
% SAND	36.3		
%C SAND	0		
%M SAND	0.3		
%F SAND	36		
% FINES	63.7		
D_{100} (mm)	4.75		
D_{60} (mm)			
D_{30} (mm)			
D_{10} (mm)			
Cc			
Cu			

Sieve Size/ID #	Percent Finer Data		
6"	100.0		
4"	100.0		
3"	100.0		
1 1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.7		
#60	99.2		
#100	93.9		
#140	81.2		
#200	63.7		
5μ m			
2μ m			
1μ m			

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.
10 Sylvan Road

Company NAIC Number:

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

A3. Property Description (Lot and Block Numbers, Tax Parcel Number, Legal Description, etc.)
Block 5402, Lot 11

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

A5. Latitude/Longitude: Lat. N40°52'47" Long. W74°19'15" 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 1A

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

a) Square footage of crawlspace or enclosure(s) 541.00 sq ft

b) Number of permanent flood openings in the crawlspace or enclosure(s) within 1.0 foot above adjacent grade 0

c) Total net area of flood openings in A8.b ______ sq in

d) Engineered flood openings? ☐ Yes ☒ No

A9. For a building with an attached garage:

a) Square footage of attached garage 492.00 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 0.00 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)
34013C0014	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

ELEVATION CERTIFICATE

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

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.
10 Sylvan Road

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)	168.4	☒ feet	☐ meters
b) Top of the next higher floor	169.9	☒ feet	☐ meters
c) Bottom of the lowest horizontal structural member (V Zones only)	N/A	☐ feet	☐ meters
d) Attached garage (top of slab)	168.7	☒ feet	☐ meters
e) Lowest elevation of machinery or equipment servicing the building (Describe type of equipment and location in Comments)	168.8	☒ feet	☐ meters
f) Lowest adjacent (finished) grade next to building (LAG)	167.7	☒ feet	☐ meters
g) Highest adjacent (finished) grade next to building (HAG)	168.6	☒ feet	☐ meters
h) Lowest adjacent grade at lowest elevation of deck or stairs, including structural support	168.2	☒ 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 was at Elev=168.8'(NAVD88)

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

ELEVATION CERTIFICATE

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. 10 Sylvan Road	Policy Number:
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

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

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.
10 Sylvan Road

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.

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

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. 10 Sylvan Road	Policy Number:
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

ELEVATION CERTIFICATE

BUILDING PHOTOGRAPHS

Continuation Page

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

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.
10 Sylvan Road

Policy Number:

City	State	ZIP Code
Town of Fairfield	New Jersey	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