R E P O R T

GEOTECHNICAL EVALUATION

VA MEDICAL CENTER
423 EAST 23^RD STREET
NEW YORK, NEW YORK

EMERGENCY GENERATOR BUILDING AND FUEL STORAGE TANKS

Prepared for:
Department of Veterans Affairs
Office of Construction and Facilities Management
8380 Colesville Road, Suite 420
Silver Spring, Maryland 20910
Contract No. VA101F-13-D0002

June 5, 2014

Prepared by:

URS

1255 Broad Street, Suite 201
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Project No: 11071440

TABLE OF CONTENTS

List of Figures

List of Appendices

This report provides geotechnical recommendations for the design and construction of the proposed emergency generator building and underground fuel storage tanks at the Veterans Affairs Medical Center (VAMC) building at 423 East 23rd Street in Manhattan, New York. The geotechnical evaluations and recommendations presented herein are in general accordance with the 2012 International Building Code (Code) and the United States Department of Veterans Affairs Seismic Design Requirements, dated August 2013.

The proposed development is located to the west of existing hospital building 4 and building 5, within the area of the existing parking lot at the northeast corner of the hospital campus. At this location, one geotechnical boring was drilled to a depth of 140 ft. The subsurface conditions encountered generally consist of fill (Stratum 1), overlying soft clay (Stratum 2), overlying medium dense sand (Stratum 3), overlying medium stiff clay (Stratum 4), overlying dense sand (Stratum 5), overlying hard clay (Stratum 6), overlying weathered and decomposed bedrock (Stratum 7), overlying bedrock (Stratum 8), at about 124 ft below grade. Groundwater is estimated to be about 4 ft below grade, which corresponds to an approximate elevation of el. +0 feet[1].

The recommended seismic site classification is Site Class E. If the proposed building is in Risk Category IV, the Seismic Design Category (SDC) is D. Liquefaction is unlikely.

Recommendations are given in the report for 40-ton micro-piles. Remnant foundation elements of historic buildings that had occupied the site prior to construction of the hospital building are likely present below grade. We assume the remnant foundation walls and slabs will not be removed prior to new foundation construction and recommend that the contract documents include provisions for pre-drilling to clear obstructions that may impede the satisfactory installation of the new foundation.

The remainder of this report includes additional information related to the subsurface conditions and foundation design recommendations and additional recommendations regarding excavation considerations, temporary groundwater control, micro-pile installation and load testing, backfill and compaction requirements, pre-construction condition documentation and monitoring, and construction inspection and monitoring.

[1] Elevations are referenced to Borough President of Manhattan Datum, which is 2.75 feet above the National Geodetic Vertical Datum (Mean sea level. at Sandy Hook, NJ 1929). [BPMD = USGS – 2.75]

1.1 GENERAL

This report provides geotechnical recommendations for the design and construction of a new generator building and two underground fuel storage tanks at the Veterans Affairs Medical Center (VAMC) located at 423 East 23rd Street in Manhattan, New York. The geotechnical evaluations and recommendations presented herein are in general accordance with the 2012 International Building Code (Code) and the United States Department of Veterans Affairs Seismic Design Requirements, dated August 2013. Authorization to proceed was obtained in the form of an agreement between Department of Veterans Affairs Office of Construction and Facilities Management and URS Corporation – New York (URS).

All elevations presented herein are referenced to the Borough President of Manhattan Datum (BPMD) which is 2.75 feet above the National Geodetic Vertical Datum (Mean sea level. at Sandy Hook, NJ 1929).

1.2 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The project site is located at 423 East 23rd Street in Manhattan, New York and is referenced as Block 955, Lot No.5. The total lot size is about 280,000 ft^2 and is currently occupied by the Veterans Affairs Medical Center. The site is bounded to the west by First Avenue, to the north by East 25th Street, to the east by Asser Levy Place, and to the south by East 23rd Street. A site location plan is presented as Figure 1.

The proposed development is located to the west of existing hospital building 4 and building 5, within the area of the existing parking lot at the northeast corner of the hospital campus. The proposed development involves the construction of a new generator building consisting of a new platform about 3,400 square-feet raised about 14.5 ft above the existing parking lot. The development also involves the construction of two new 25,000 gallon underground storage tanks for the storage of fuel oil. The bottom of the tanks will be about 15 ft below the existing parking lot. Proposed elevations are estimated and are to be finalized by the architect. Structural foundation loads were not finalized at the time of writing this report.

1.3 HISTORIC BUILDING INFORMATION AND GEOTECHNICAL DATA

URS reviewed the following documents with information relating to the historic site conditions prior to construction of the existing medical center, and information relating to past and current projects performed at the existing medical center:

- Alfred Hopkins & Associates – Veterans Administration Hospital – Topographic Survey Boring & Drill Hole Plan, dated 20 October 1950
- Alfred Hopkins & Associates – Veterans Administration Hospital – Foundation Plan North East, dated 1 December 1950
- Russo & Sonder, PC – Hellmuth, Obata & Kassabaum, PC – Dwg 5B-1 – Boring Data – Part I, dated 25 July 1985

- Russo & Sonder, PC – Hellmuth, Obata & Kassabaum, PC – Dwg 5B-2 – Boring Data – Part II, dated 25 July 1985
- Soil Solutions, Inc. – submittal dated 12 May 2010 – includes partial geotechnical report by Medina Consultants for new emergency generator
- HDR Engineering – Report of Geotechnical Evaluation for Proposed Floodwall Project – Revision 2, dated December 2013

The historic topographic plan shows the site was previously occupied by several brick buildings. The historic documents and geotechnical reports suggest that the remnant foundations of the former buildings are still present below the existing parking lot.

The historic building plans for the hospital indicate the existing VAMC building is supported by a deep foundation system of piles interconnected by reinforced concrete pile caps and grade beams. The type and capacity of the existing piles is not known.

1.4 OBJECTIVES AND SCOPE OF SERVICES

The objectives of this investigation were to evaluate the subsurface conditions in the vicinity of the proposed emergency generator building and fuel storage tanks and to provide geotechnical recommendations for the design and construction of the new structures. The following scope of services was performed to achieve these objectives:

- Retained a subcontractor to perform one test boring;
- Provided full-time special inspection of the test boring operation;
- Performed engineering evaluations and prepared this report that includes the following:
  a) A description of the subsurface investigation performed for this project;
  b) A plan drawing showing the locations of the as-drilled test boring;
  c) An overview of general site and geologic conditions;
  d) The results of engineering evaluations and recommendations regarding the foundation design, including:
     - Foundation type, estimated capacity, bearing elevation, and settlement estimate;
     - Evaluation of drilled mini-pile foundations, including estimated pile lengths, and capacities;
     - Requirements for pile load testing;
     - Seismic site class and liquefaction potential;
  e) A discussion regarding construction related issues, including:
     - Excavation and temporary support of excavation considerations;
     - Temporary groundwater control;

- Micro-pile load test and installation inspection requirements;
- Backfill and compaction requirements;
- Pre-construction survey;
- Construction monitoring recommendations;

f) Appendices that include test boring log.

1.5 REPORT ORGANIZATION

This report is divided into five sections. Following this section is a description of the subsurface investigation methods and results in Section 2. Section 3 summarizes the engineering evaluations and our recommendations. Construction considerations are addressed in Section 4. The limitations of this study are discussed in Section 5. Figures are provided at the end of the text. The boring log and laboratory test results are included in the appendices.

2.1 GENERAL

The subsurface investigation included a test boring program to identify soil, rock, and groundwater conditions in the vicinity of the proposed generator building and fuel tanks. Details of the subsurface investigation are presented in the following sections.

2.2 SUBSURFACE INVESTIGATION

2.2.1 Test Boring Program

One test boring, designated URS-1, was drilled to a depth of 140 ft between May 7 and May 9, 2014, within the existing parking lot at the northeast corner of the campus. The boring was inspected on a full-time basis by a URS Geotechnical Engineer, under the direction of Mr. Jamie Rodger, P.E. The test boring location is presented in Figure 2.

The test boring was performed by Aquifer Drilling and Testing, Inc. of Mineola, New York using a CME-55 truck mounted drill rig. The boring was advanced using the mud rotary technique with tricone roller bits having diameters of 2-7/8 in, 3-7/8 in and 5-7/8 in. Soil samples were obtained using a 2-inch O.D. split-spoon sampler in accordance with American Society for Testing and Materials (ASTM) Standard Specification D1586 – Standard Penetration Test (SPT). The SPT consists of driving a 2-in O.D. split-spoon for a depth of 24 inches with repeated blows of a 140-lb hammer free-falling 30 inches. The standard penetration or N-value is defined as the number of blows required to drive the sampler for a 12 in interval after an initial 6 inches of penetration. The split-spoon sampler was advanced using a safety hammer. The soil samples obtained from the borings were visually classified by the URS field inspector using the Unified Soil Classification System. The recovered split-spoon samples were placed in properly labeled jars.

Rock coring was performed using a five-foot long NX (3 in O.D.) core barrel. The top of rock was estimated based on the drilling operations (e.g., excessive rig chatter, difficult penetration) and practical spoon refusal as indicated by blow counts greater than 100 for a 6-inch interval on the split spoon sampler. Rock coring was performed to verify the presence of rock (instead of encountering a boulder) and to assess its relative quality, as indicated by Core Recovery[2] and the Rock Quality Designation (RQD)[3].

A groundwater observation well was not installed and groundwater measurements were not taken.

The test boring log is included in Appendix A.

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[2] The Core Recovery is defined as the ratio (expressed as a percent) of the total length of recovered core to the length cored.

[3] The Rock Quality Designation (RQD) is defined as the ratio (expressed as a percentage) of the total length of recovered core samples having a length of at least 4 in to the total length of core.

2.2.2 Laboratory Testing

Laboratory testing was conducted on one representative soil sample to determine physical index and engineering properties and to confirm field classification. One unconfined compression strength test and one Atterberg Limits test were performed. The laboratory test results are included in Appendix B.

2.3 GENERALIZED SUBSURFACE CONDITIONS

The generalized strata descriptions provided below are based on our interpretation of the results of the subsurface investigation.

Stratum 1 – Fill: The upper portion of this is stratum generally consists of sand with varying amounts of gravel, silt, brick and porcelain. The lower portion of this stratum generally consists of sandy silt with some clay. N-values of this stratum were measured between 1 and 3 bpf. The thickness of this stratum is approximately 13 ft.

Stratum 2 – Soft Clay (CH): This stratum was encountered below Stratum 1 and generally consists of dark gray clay with trace silt and occasional shells. N-values of this stratum were measured between 1 and 2 bpf. The thickness of this stratum is approximately 10 ft.

Stratum 3 – Medium Dense Sand (SM): This stratum was encountered below Stratum 2 and generally consists of dark gray coarse to fine sand with varying amounts of silt and gravel and occasional clay lenses. N-values of this stratum were measured between 14 and 23 bpf. The thickness of this stratum is approximately 15 ft.

Stratum 4 – Medium Stiff Clay (CH): This stratum was encountered below Stratum 3 and generally consists of red-brown clay with trace fine sand, varying amounts of silt and some layers and partings of fine sand. N-values of this stratum were measured between 6 and 9 bpf. The thickness of this stratum is approximately 23 ft.

Stratum 5 – Dense Sand (SM): This stratum was encountered below Stratum 4 and generally consists of gray coarse to fine sand with varying amounts of gravel and silt. It also contained occasional clay seams and possibly boulders. N-values of this stratum were measured from 37 to over 100 bpf, consistent with a dense to very dense material. The thickness of this stratum is approximately 33 ft.

Stratum 6 – Hard Clay (CH): This stratum was encountered below Stratum 5 and generally consists of yellow, red, tan and gray clay with traces of sand and silt. N-values of this stratum were measured between 28 and 61 bpf. The thickness of this stratum is approximately 20 ft.

Stratum 7 – Weathered and decomposed bedrock: This stratum was encountered below Stratum 6 and generally consists of blue-green-gray silt or clay with varying amounts of rock fragments and sand. N-values of this stratum were measured to be in excess of 100 bpf. The thickness of this stratum is approximately 10 ft.

Stratum 8 – Bedrock: This stratum was encountered below Stratum 7 at about 124 ft below grade and typically consists of moderately hard, slightly to moderately weathered blue-gray gneissic schist that is closely to extremely closely fractured. Three five-foot-long core runs were retrieved. Core recovery was measured to be between 82% and 100% and RQD was determined to vary from 50% to 60%. The boring was terminated at 140 feet below grade.

2.4 GROUNDWATER LEVEL

Groundwater readings were measured during the HDR Engineering, Inc. investigation of December 2013 at an approximate elevation of between +0 and +2. Since groundwater measurements were not taken over an extended period of time, the stated groundwater levels do not adequately reflect seasonal or other time dependent variations that may occur.

3.1 GENERAL

This section presents engineering evaluations and recommendations for the design of the foundations and below grade structures. The evaluations and recommendations are based on the results of the subsurface investigation, our experience on other projects, and the information we have been provided to date on the design requirements for the proposed structure.

3.2 SEISMIC CONSIDERATIONS

Based on the soil profile, the recommended seismic site classification is Site Class E. Therefore, if the Risk Category is IV, the Seismic Design Category is "D". The appropriate Risk Category should be determined by the Architect or Structural Engineer.

Earthquake induced soil liquefaction is unlikely.

3.3 FOUNDATION RECOMMENDATIONS

The soils of the uppermost strata (Stratum 1 and Stratum 2), which extend to approximately 24 ft below grade, generally consist of fill, soft clay, and loose sandy silt. The soils at the site are not suitable for supporting a shallow foundation system; therefore, we recommend a deep foundation system be constructed to support the new structures. Given the proximity of the existing hospital buildings to remain operational during construction, driven piles are not recommended as vibrations and noise may be excessive. In addition, driven piles are not recommended because of the likely presence of remnant foundation elements that could result in many piles being damaged, unacceptably out of plumb, and/or unacceptably offset.

The bottom of the proposed pile caps supporting the generator buildings are about eight feet below existing grade. The fuel oil tanks are proposed to be supported on a pile supported reinforced slab. The top of the slab is about 15 feet below existing grade.

It is recommended that the foundation for the new structures be supported on drilled-in micro-pile foundations, grouted into the soils of Stratum 3, Stratum 4 and Stratum 5 – between 25 ft and 80 ft below grade. The micro-piles should be drilled and permanently cased through the soils of Stratum 1 and Stratum 2 to reduce the potential for collapse of the drill hole or necking of the grout-ground socket.

The final design of the micro-pile is often performed by the contractor, because some contractors have their preferred design methods and materials to suit their construction capabilities. However, for the purpose of preparing design drawings and evaluating costs, the following preliminary micro-pile sizes and capacities can be used:

Maximum Allowable Compression Capacity (tons)	Steel Casing Outside Diameter (in) (see note 1)	Steel Casing Thickness (in)	Number and Size of Reinforcing Bars (see note 1)	Minimum Bond Zone Length (ft) (see note 2)	Maximum Allowable Uplift Capacity (tons)
40	9.625	0.545	1 - #10	55	20
40	13.375	0.515	1 - #10	45	18

Notes:

1. The estimated micro-pile capacities are based on steel casing and reinforcing bar minimum yield strengths of 50 ksi and 75 ksi, respectively. The casing shall be permanently installed through the soils of Stratum 1 and Stratum 2, to a depth of approximately 25 ft below grade. The reinforcing steel shall be installed through the cased and uncased portions of the micro-pile. The connection of the reinforcement to the pile cap shall be designed by others.
2. The bond zone length is based on the bond zone having a minimum diameter of 8 inches for the 9.625 inch micro-pile and a minimum bond zone diameter of 12 inches for the 13.375 inch micro-pile. The expected bearing strata are a combination of the soils of Stratum 3, Stratum 4 and Stratum 5.
3. A minimum of one axial load test will be required to substantiate the micro-pile capacity and to meet Code requirements. The design of the load test assembly will be the responsibility of the micro-pile contractor.
4. The concrete/grout compression strength should be 5,000 psi.
5. The minimum center-to-center micro-pile spacing shall be 24 inches.

The basic allowable lateral load per pile is 1 ton without performing additional lateral pile analyses or lateral load tests. If more than 1 ton of lateral capacity is needed, it is recommended that lateral pile analyses or load tests be performed to determine if the selected pile(s) can resist the lateral loads.

4.1 GENERAL

This section presents a discussion and recommendations regarding special geotechnical aspects of the proposed construction which should be addressed in the project specifications and contract documents.

We understand construction work for other contracts within the campus will be taking place at different times in the vicinity of the proposed generator structures. We recommend VAMC consider the sequence of the proposed construction work in order to minimize potential conflicts of schedule and tasks.

We recommend VAMC consult with local specialist foundation contractors experienced with the construction of deep foundations to discuss schedule and task logistics. The contractor should be aware that remnant foundation elements of the former historic buildings may be encountered during foundation installation. The contractor should have equipment and expertise in drilling through natural and manmade obstructions.

4.2 EXCAVATION CONSIDERATIONS

Excavation of up to about nine feet below existing grade will be required for construction of the pile caps for the generator building. Excavation of up to about 20 feet will be required for construction of the fuel storage tanks.

The excavation support systems will likely involve a soldier pile and lagging system. The soldier piles will likely be required to be drilled into the ground, since pile driving may not be practical as discussed in a preceding section of this report. The use of a driven sheet pile system may not be practical given the potential for the presence of significant obstructions within the fill.

The deeper excavations for the fuel storage tanks will likely require at least one level of external bracing to stabilize the support of excavation system. The external bracing will likely be drilled tie-back anchors socketed within competent soil. Internal braces may not be practical as they will impede the installation of the storage tank.

The contractor should carefully consider the proximity and presence of existing buildings and their foundations and existing below grade structures in the design of his support of excavation system. The support of excavation system should not affect the performance of the existing buildings and infrastructure. Conflicts with existing foundation elements should be evaluated.

The design and construction of any slopes and/or temporary excavation support systems should be the responsibility of a licensed New York Professional Engineer. All excavations and temporary support systems should conform to pertinent OSHA and local safety regulations.

4.3 TEMPORARY GROUNDWATER CONTROL

The groundwater table should be maintained at a depth of approximately at least 2 feet below the bottom of excavations to preserve the excavation bottoms for construction activities. The dewatering system must be designed by the foundation contractor and groundwater must be discharged in accordance with New York City Department of Environmental Protection (DEP) and New York State Department of Environmental Conservation (DEC) regulations.

4.4 MICRO-PILE INSTALLATION AND TESTING

Micro-piles should be installed by a contractor with experience on similar projects. The contract specifications should require that the proposed contractor submit a construction procedure to the Engineer for review and approval prior to beginning work. It is the responsibility of the contractor to use an installation method that will not cause damage to the existing building foundation or adjacent structures. The use of air or undereamers to advance the casing through the overburden and/or remnant foundation elements may cause damage to existing or adjacent structures if the air cannot be contained in the casing. Control of the air will depend on the driller's equipment, procedures, and experience. If the driller cannot control the air, they will have to switch to another method, which typically consists of using water with no air. The use of water to advance the casing may be much slower than using air; therefore, this should be taken into consideration when obtaining pricing from the contractor.

All aspects of the micro-pile installation should be inspected on a full time basis. The use of air during advancement of the casing should be closely monitored by the special inspector.

We recommend installing index piles that are the same in every aspect to production micro-piles at the start of the pile drilling operations. The recommended number of index piles is about 5% to 10% of the total number of piles required. Index piles allow for estimating pile lengths, identifying unusual drilling conditions and the need for pre-drilling. The index piles should be installed under the full-time Special Inspection of a URS engineer. The index piles may be used as production piles if properly installed and accepted by the geotechnical engineer.

Pile load tests are necessary to substantiate the proposed micro-pile capacities, to verify the pile construction methods and to satisfy Code requirements. A minimum of one axial load test is required by Code to substantiate the micro-pile capacity. The design of the load test assembly will be the responsibility of the pile contractor's engineer. The compression load tests should be performed in accordance with ASTM D1143 Standard Loading Procedure and Code requirements.

Remnant foundation elements are present within the site. We assume the remnant foundation walls and slabs will not be removed prior to new foundation construction, and we recommend that the contract documents include provision for pre-drilling to clear obstructions that may impede the satisfactory installation of the new foundation.

4.5 BACKFILL AND COMPACTION REQUIREMENTS

Select backfill or structural backfill should be granular soils free of cinder, brick, asphalt, ash, and other unsuitable materials. Such material should not contain any boulders or cobbles larger than about 4 inches across and should have a fine content (material passing the No. 200 sieve) less than 15 percent. It is recommended that structural backfill or select backfill beneath the proposed building foundations be compacted to a minimum of 95% of the maximum dry density, as determined by ASTM D1557-88, Method C. All backfill should be placed in lifts not exceeding 8 inches in loose thickness. If requested by the special inspector, the subgrade underneath the backfill should be satisfactorily proof-rolled prior to the placement of backfill. Backfill placed beneath slabs-on-grade, behind below-grade walls, and underneath sidewalks should be compacted to a minimum of 90% of the maximum dry density. Backfill placed in landscaped areas should be compacted to a minimum of 85% of the maximum dry density.

Backfill around the fuel storage tanks should be performed in accordance with the tank manufacturer's specifications.

4.6 PRE-CONSTRUCTION DOCUMENTATION REPORT AND MONITORING

A pre-construction documentation report of selected sections of the existing VAMC building should be performed for the protection of VAMC in the event of a future damage claim. The report should include detailed documentation and photographs of the existing condition of the structures. Based on the survey results, a monitoring program should be developed for the purpose of checking the performance of the adjacent structures or utilities and for monitoring construction procedures. This monitoring program should include, at a minimum, recommendations for the location of survey points to monitor vertical and horizontal movements, locations for crack gauges, and locations for monitoring vibrations during key construction activities. The monitoring program should also include threshold levels for allowable movements and vibrations, and the procedures to be implemented if the threshold levels are exceeded during construction.

4.7 CONSTRUCTION MONITORING

It is recommended that a geotechnical engineer, familiar with the subsurface conditions and foundation design criteria, review the foundation contractors' procedures and provide inspection services during excavation and foundation construction. Geotechnical related inspection services should include:

- Review and approval of contractor submittals related to foundation construction;
- Observation and documentation of all phases of excavation and foundation construction;
- Full time special inspection of micro-piles;
- Monitoring of subgrade preparation and structural fill placement and compaction;
- Special inspection of underpinning and support of excavation (if required);
- Monitoring of vibrations and review of monitoring data.

Professional judgments were necessary in relation to determining stratigraphy and soil properties from the subsurface investigations. Such judgments were based partly on the evaluation of the technical information gathered, and partly on our experience with similar projects. If further investigation reveals differences in the subsurface conditions and/or groundwater level, or if the proposed building elevations or design are different from those indicated herein, it is recommended that we be given the opportunity to review this new information and modify our recommendations, if deemed appropriate.

The results presented in this report are applicable only to the present study, and should not be used for any other purpose without our review and consent. This study has been conducted in accordance with the standard of care commonly used as state-of-the-practice in the profession. No other warranties are either expressed or implied.

FIGURES

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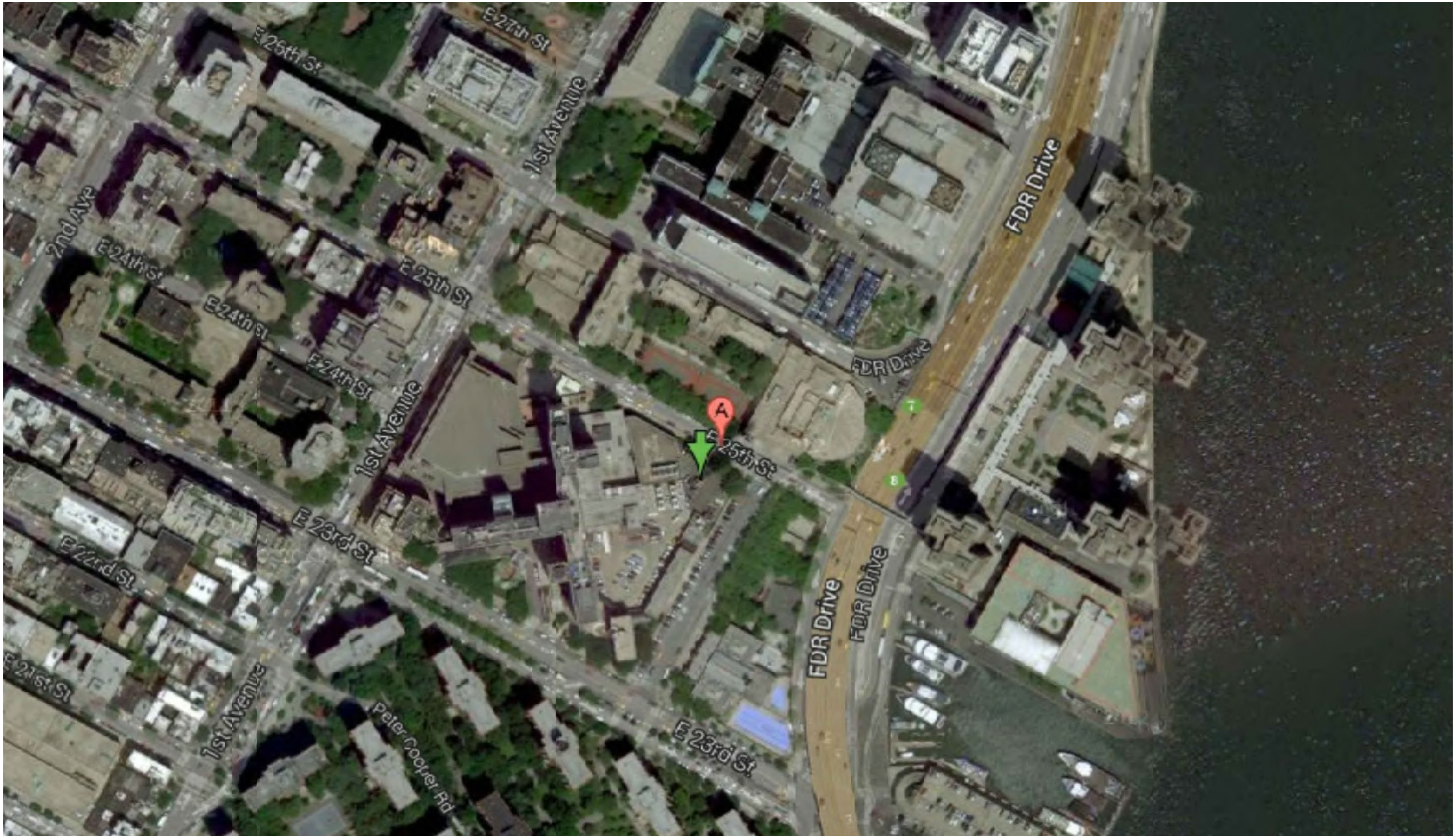


DESIGNED BY:			
DRAWN BY:			
APPROVED BY:	NO.	DATE	EXPLANATION
	REVISIONS		

CONSULTANT I.D.

URS

1255 Broad Street, Suite 201
Clifton, New Jersey

CLIENT:

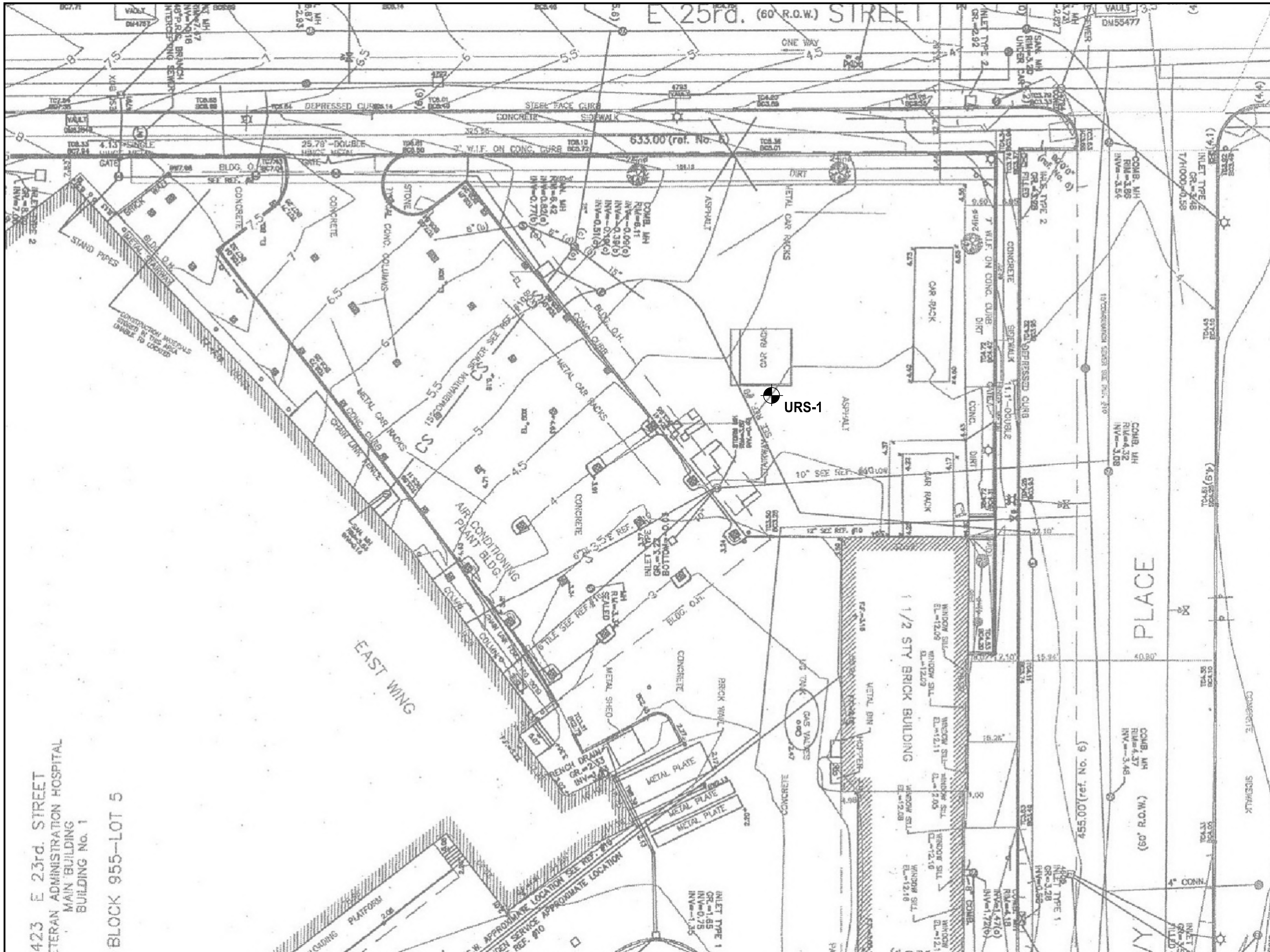
DEPARTMENT OF VETERANS AFFAIRS
OFFICE OF CONSTRUCTION AND
FACILITIES MANAGEMENT
8380 COLESVILLE ROAD, SUITE 420
SILVER SPRING, MARYLAND 20910

TITLE:

SITE LOCATION PLAN
VETERANS AFFAIRS MEDICAL CENTER
423 EAST 23RD STREET
NEW YORK, NEW YORK

11071440

SCALE	DATE
1"=200'	5/20/2014
FIGURE NO. 1	SHEET NO. –



NOTES:

1. BASE MAP BASED ON A SURVEY PERFORMED BY MAITRA ASSOCIATES, P.C., OF MAITRA, N.Y. ON NOVEMBER, 2008.
2. ALL ELEVATIONS SHOWN REFER TO THE BOROUGH PRESIDENT MANHATTAN DATUM (BPMD) WHICH IS 2.75 FT ABOVE THE U.S. COAST AND GEODETIC SURVEY DATUM (MEAN SEA LEVEL, SANDY HOOK).
3. GEOTECHNICAL TEST BORINGS DRILLED MAY 7, 2014 THROUGH MAY 9, 2014 BY AQUIFER DRILLING AND TESTING, INC. OF MINEOLA, NEW YORK.

LEGEND

URS-1 GEOTECHNICAL BORING – NUMBER AND LOCATION

DESIGNED BY:

DRAWN BY:

APPROVED BY:

NO.	DATE	EXPLANATION

REVISIONS

CONSULTANT I.D.

URS

1255 Broad Street, Suite 201
Clifton, New Jersey

CLIENT:

DEPARTMENT OF VETERANS AFFAIRS
OFFICE OF CONSTRUCTION AND FACILITIES MANAGEMENT
8380 COLESVILLE ROAD, SUITE 420
SILVER SPRING, MARYLAND 20910

TITLE:

BORING LOCATION PLAN
VETERANS AFFAIRS MEDICAL CENTER
423 EAST 23RD STREET
NEW YORK, NEW YORK

PROJECT NO. 11071440

SCALE 1"=30'

DATE 5/20/2014

FIGURE NO. 2

SHEET NO. –

APPENDIX A
TEST BORING LOG

Project: VA Medical Center Project Location: New York, NY Project Number: 11071440	**Log of Boring URS-1** Sheet 1 of 5

Date(s) Drilled	5/7/14 - 5/9/14	Logged By	J. Tooker	Approximate Surface Elevation (feet)	+4 MBP Datum
Drilling Method	Mud Rotary	Drilling Contractor	ADT	Coordinates	North: East:
Casing Size/Type	4" I.D. Steel (15'); 3" I.D. Steel (125')	Drill Rig Operator	Chris Chaillou	Total Depth Drilled (feet) 140.0	Rock Depth (feet) 124.0
Drill Rig Type	CME-55 Truck Rig	Drill Bit Size/Type	5 7/8", 3 7/8", 2 7/8" Tricone Roller Bits	Sampler Type(s)	2" O.D. Split Spoon
Groundwater Level and Date Measured		Hammer Wt/Drop 140 lb/30" (safety)	Casing Hammer Wt/Drop N/A	Core Barrel Size/Type	NX (3" O.D.)
Boring Location and Comments	See boring location plan			No. of Samples	Dist.: 26 Undist.: 1 Core (ft): 15

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								~12" Asphalt Pavement (several layers)					5 7/8" roller bit through 12" asphalt
	S-1	N/A						Brown c-f SAND, trace m-f gravel, trace silt, brick (fill) [7]					Hand augered to 5' BGS
	S-2	N/A						Gray c-f SAND, some silt, some clay, brick, porcelan (fill) [7]					
5	S-3	0.9	4 1 1 3					Brown sandy SILT, some clay (ML) [7] (possible fill)					Wet sampler - S-3
	S-4	1.1	2 1 2 2					Same as above (ML) [7] (possible fill)					Wet sampler - S-4
													Driller installed 10' of 4" casing (1' stickup), 3 7/8" roller bit to 10' BGS
10	S-5	0.1	WOR WOR 1 3					Same as above (ML) [7] (possible fill)					
	S-6	0.9	1 WOH 1 3					TOP 5": Same as above (ML) [7] (possible fill) BOTTOM 6": Brown silty CLAY, trace m-f sand (CL) [6]					
													Driller added 5' casing, roller bit to 15' BGS
15	S-7	1.9	4 1 1 1					Dark gray CLAY, trace silt (CH) [6]					
	U-1	2.0	PUSH					Dark gray CLAY, trace silt, trace shells (CH) [6]					Undisturbed sample 17'-19' BGS
													Roller bit to 20' BGS
20	S-8	2.0	WOH WOH 1 3					Same as above (CH) [6]					
													Roller bit to 25' BGS
25													

Project: VA Medical Center	Log of Boring URS-1
Project Location: New York, NY	Sheet 2 of 5
Project Number: 11071440	

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
25	S-9	1.4	3 9 14 18					Dark gray c-f SAND, some silt (SM) [3b] 2 clay lenses in sample approximately 1" long					
													Driller added bentonite to drilling fluid. Roller bit to 30' BGS
30	S-10	1.8	15 10 7 12					Dark gray c-f SAND, some c-f gravel, trace silt (SW) [3b]					
													Roller bit to 35' BGS
35	S-11	0.2	9 6 8 9					Same as above (SW) [3b]					Gravel lodged in sampler tip (S-11)
													Roller bit to 40' BGS
40	S-12	1.8	4 3 3 6					Red-Brown CLAY, trace silt, trace fine sand (CL) [4c]					
													Roller bit to 45' BGS
45	S-13	1.5	4 4 5 6					Red-Brown silty fine sand (SM) [6]					
													Roller bit to 50' BGS
50	S-14	2.0	3 2 4 4					Red-Brown CLAY, some silt, trace fine sand (CL) [4c] 1/8" to 1" partings of fine sand					
													Roller bit to 55' BGS

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
55	S-15	2.0	3 3 3 5					Red-Brown CLAY, trace silt (CH) [4c]					
													Roller bit to 60' BGS
60	S-16	1.4	16 36 14 12					TOP 5": Same as above (CH) except [4a] BOTTOM 12": Gray c-f SAND, some m-f gravel, trace silt (SW) [3a]					
													Roller bit to 65' BGS
65	S-17	0.0	37 17 21 20					No Recovery					Rock Fragment lodged in sampler tip (S-17)
													Roller bit to 70' BGS Drilling concluded with roller bit to 70' BGS on 5/7
70	S-18	1.4	14 17 20 32					Gray silty c-f SAND, trace m-f gravel (SM) [3a] (decomposed rock - possible boulder)					Drilling resumed with S-18 at 70' BGS on 5/8
													Roller bit to 75' BGS - significant drill rig chatter from 70' to 75' BGS
75	S-19	0.3	100/4"					Gray-brown c-f SAND, some c-f gravel, some silt (SM) [3a]					
													Roller bit to 80' BGS - slight drill rig chatter and slow drilling for most of drilling to 80' BGS
80	S-20	1.4	66 72 100/6"					Gray c-f SAND, some CLAY, trace m-f gravel, trace silt (SC) [3a] occasional clay seams of up to 1" long					
													Roller bit to 85' BGS - occasional drill rig chatter and generally

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
													slow drilling for most of drilling to 85' BGS
85	S-21	1.8	95 100/5"					Gray c-f SAND, some CLAY, some m-f gravel, trace silt (SC) [3a] one clay seam ~1" long					
													Roller bit to 90' BGS - occasional drill rig chatter and generally slow drilling for most of drilling to 90' BGS
90	S-22	0.4	100/5"					Gray silty fine SAND (SM) [3a]					
													Roller bit to 95' BGS - drill rig chatter and very slow drilling for most of drilling to 95' BGS
95	S-23	1.6	21 12 16 25					Yellow CLAY, trace c-f sand, trace silt (decomposed rock) (CH) [4b]					
													Roller bit to 100' BGS - smooth, fast drilling from 95' to 100' BGS
100	S-24	2.0	16 19 25 38					Red CLAY, trace fine sand, trace silt (CH) [4a]					
													Roller bit to 105' BGS - smooth, fast drilling from 95' to 100' BGS
105	S-25	2.0	19 25 36 45					Same as above except mostly tan, some red, some white, some green (CH) [4a]					
													Roller bit to 110' BGS - slightly slower drilling to 110' BGS
110	S-26	1.8	19 21 28 34					Same as above except mostly red, some tan, some gray (CH) [4a]					
													Roller bit to 115' BGS -

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
													smooth, fast drilling to 115' BGS Drilling concluded with roller bit to 115' BGS on 5/8
115	S-27	1.5	18 39 69 100/6"					Blue-green-gray SILT (ML) [1d] (decomposed rock)					Drilling resumed with S-27 at 115' BGS on 5/9 Hammer bouncing for last 1" of S-27 Roller bit to 120' BGS - slow drilling from 117.5' to 120' BGS
120	S-28	0.2	100/2"					Blue-green-gray CLAY, some c-f rock fragments, trace c-f sand (CL) [1d] (weathered rock)					Roller bit to 123' BGS - very slow drilling
													Driller installed 125' of 3" casing (1' stickup) 2 7/8" roller bit to 125' BGS to clear 3" casing for coring. Water only, no drilling mud.
125				R-1	82	50		Gneissic SCHIST, blue-gray, medium to coarse grained, foliated, slightly to moderately weathered, moderately hard, closely to extremely closely fractured [1c]					R-1: Light beige to white fluid return. Core times (minutes for each 1' increment): 2.5, 2.25, 1.75, 2.25, 2.75
130				R-2	93	57		Same as above except [1b] white, hard quartz at bottom 4" of sample					R-2: White to blue-white to green-white fluid return. Core times: 2.25, 2.5, 2.5, 2.25, 2.0
135				R-3	100	60		Same as above [1b] white, hard quartz at top 6" of sample and from 11" to 14" from top of sample					R-3: Light brown fluid return. Core times: 1.5, 1.75, 3, 2, 1.75
140								End of boring URS-1 at 140' below ground surface					

APPENDIX B
LABORATORY TESTING RESULTS

URS Corporation #11071440
VA Medical Center
LABORATORY TESTING DATA SUMMARY

BORING	SAMPLE	DEPTH	IDENTIFICATION TESTS							STRENGTH			REMARKS
NO.	NO.		WATER CONTENT	LIQUID LIMIT	PLASTIC LIMIT	PLAS. INDEX	USCS SYMB. (1)	TOTAL UNIT WEIGHT	DRY UNIT WEIGHT	Type Test	PEAK DEVIATOR STRESS	AXIAL STRAIN @ PEAK STRESS	
		(ft)	(%)	(-)	(-)	(-)		(pcf)	(pcf)		(tsf)	(%)	
URS-1	U-1	17-19						100.3					
URS-1	U-1	17.65	62.6										
URS-1	U-1	18.2	67.3										
URS-1	U-1	18.75	60.9										
URS-1	U-1D	19.0	65.9	72	31	41	OH	99.9	60.2	UC	0.7	4.1	UC-URS1

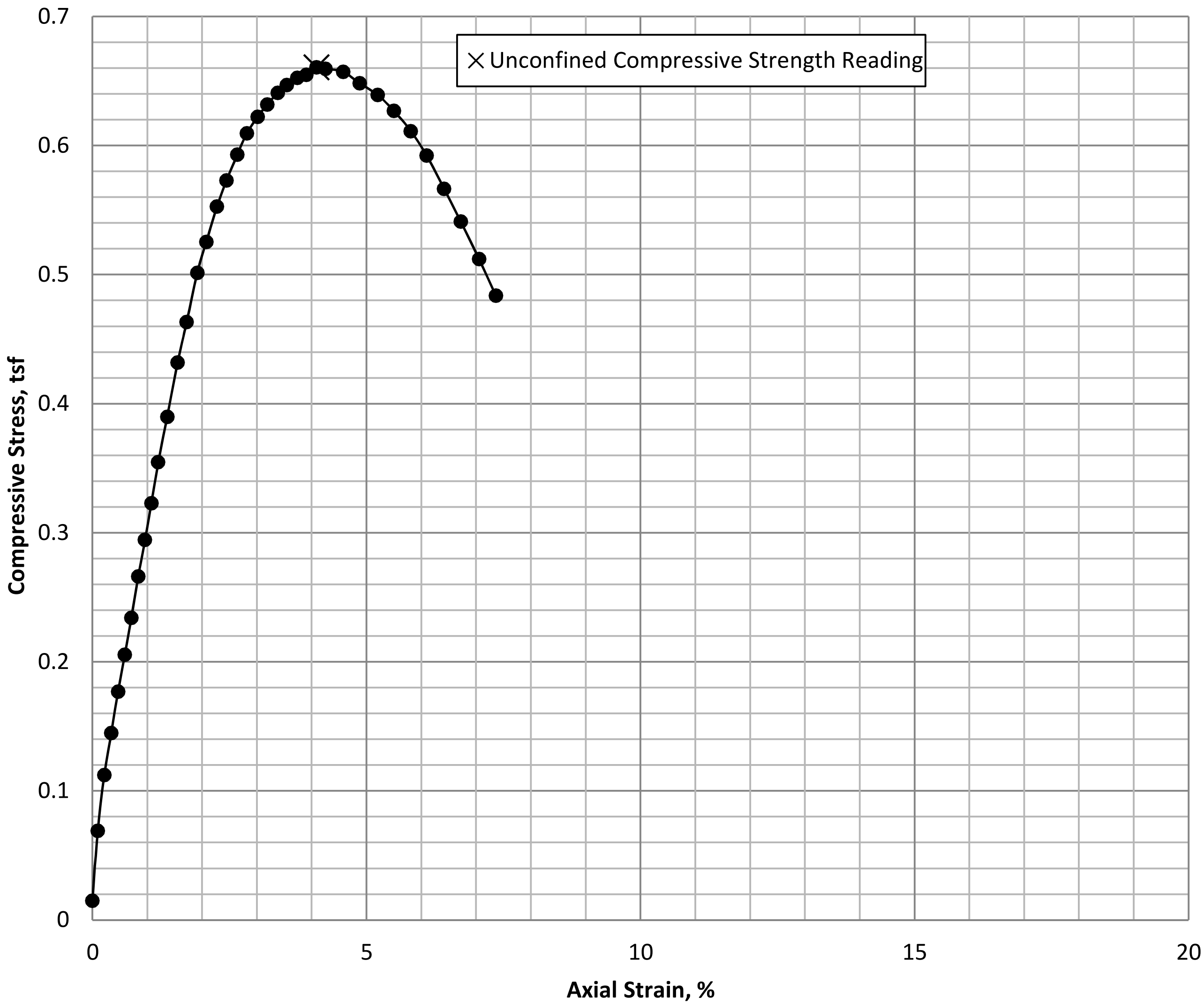
Note: (1) USCS symbol based on visual observation and Atterberg limits reported.

Prepared by: JR
Reviewed by: GET
Date: 5/29/2014

TerraSense, LLC
45H Commerce Way
Totowa, NJ 07512

Project No.: T11071440
File: Indx1.xls

UNCONFINED COMPRESSIVE STRENGTH TEST, ASTM METHOD D2166



Specimen and Material Property Information

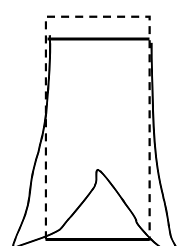
Sample Type: Intact tube sample

Description and/or Classification: OH, dark gray Organic CLAY with shell fragments

	Water (1) Content (%)	Wet Unit Weight (pcf)	Dry Unit (1) Weight (pcf)	Void(2) Ratio (-)	Saturation(2) (%)	Length (inch)	Diameter (inch)	L/D (-)	LL (-)	PI (-)	Specific (2) Gravity (-)
Initial	65.9	99.9	60.2	1.75	100.0	5.998	2.854	2.1	72	41	2.65

Failure Summary

UC Compressive Strength, q_u (tsf)	UC Shear Strength, s_u (tsf)	Strain to to Peak (%)	Strain Rate (%/min)
0.66	0.33	4.1	0.73



FAILURE SKETCH

Remarks and Notes:

(1) Water Content determined after shear from partial specimen.

(2) Assumed specific gravity

Tested by: DT
Reviewed by: GET

Test Date: 5/19/2014
Review Date: 5/29/2014

URS Corporation Project # 11071440	**VA Medical Center**	**UNCONFINED COMPRESSION TEST**
TerraSense, LLC Project # T11071440		**Boring: URS-1 Sample: U-1** **Section: D Depth: 19 ft.**