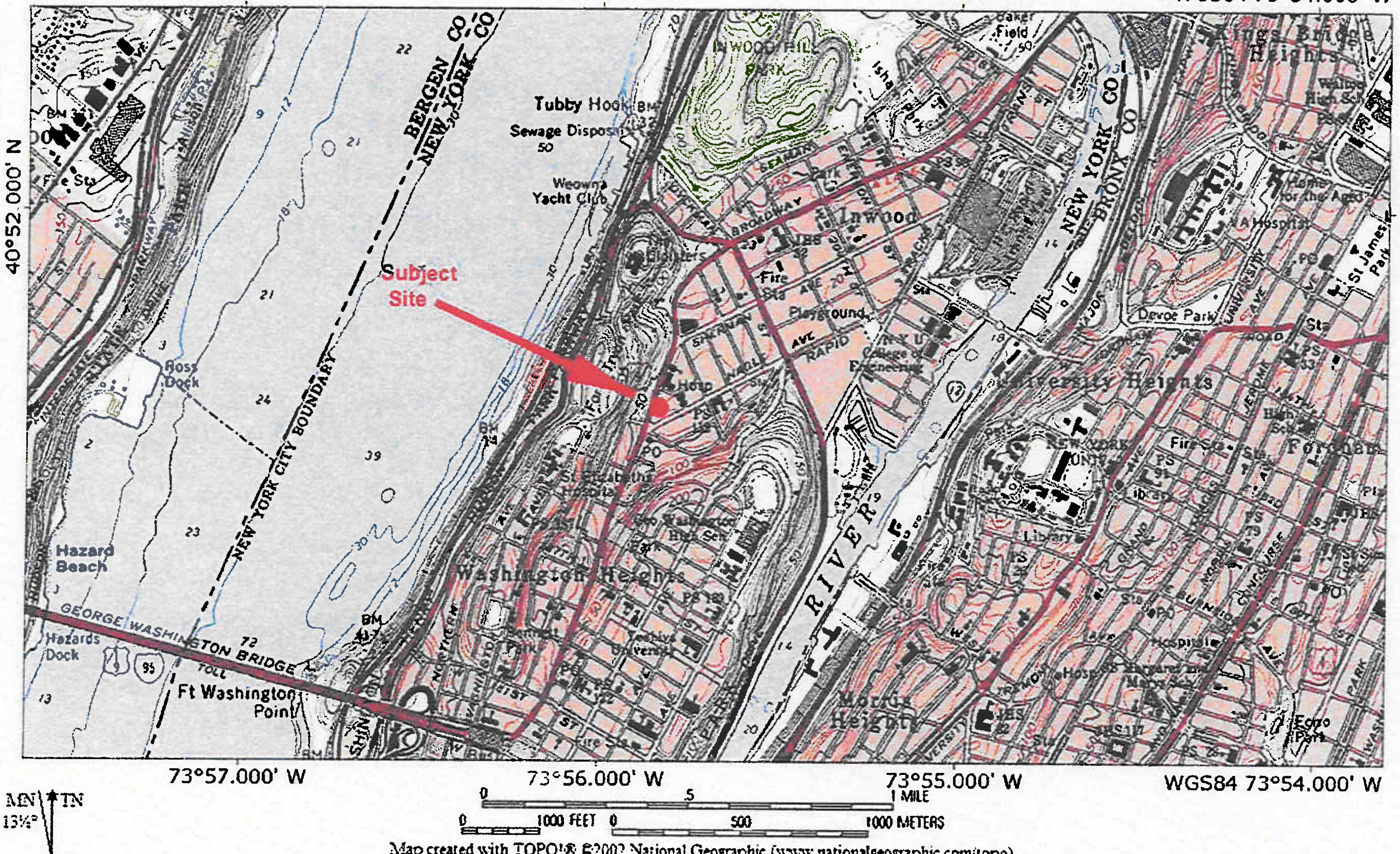
APPENDIX – A

FIGURES

TOPO! map printed on 02/12/07 from "Northeast.tpo" and "Untitled.tpg"



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Tel: 212-809-1110 Fax: 212-809-1779 info@askasr.com

SWM

Figure - 1
USGS Site Location Map
4566 Broadway Ave
New York, New York

09/05/06

North

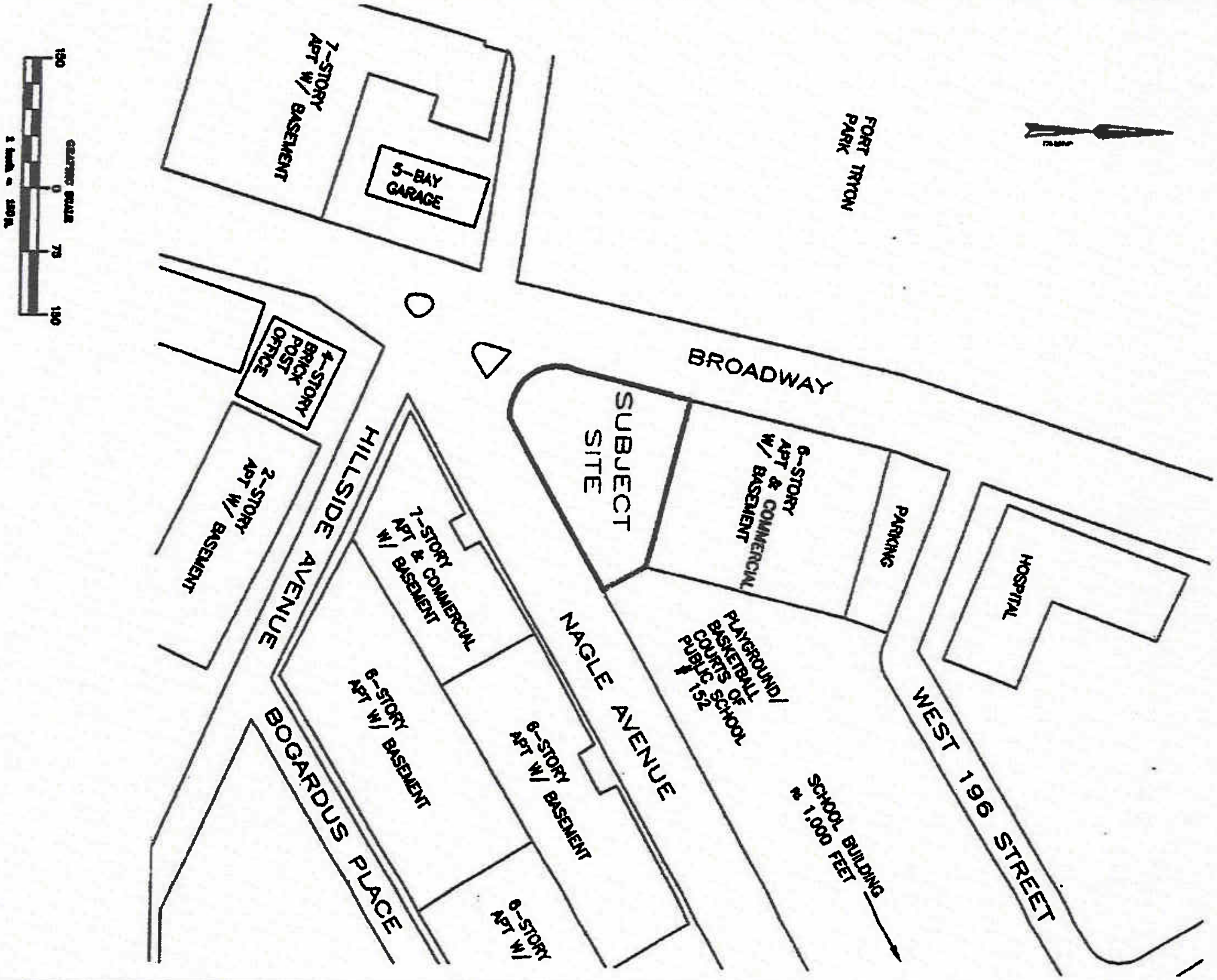

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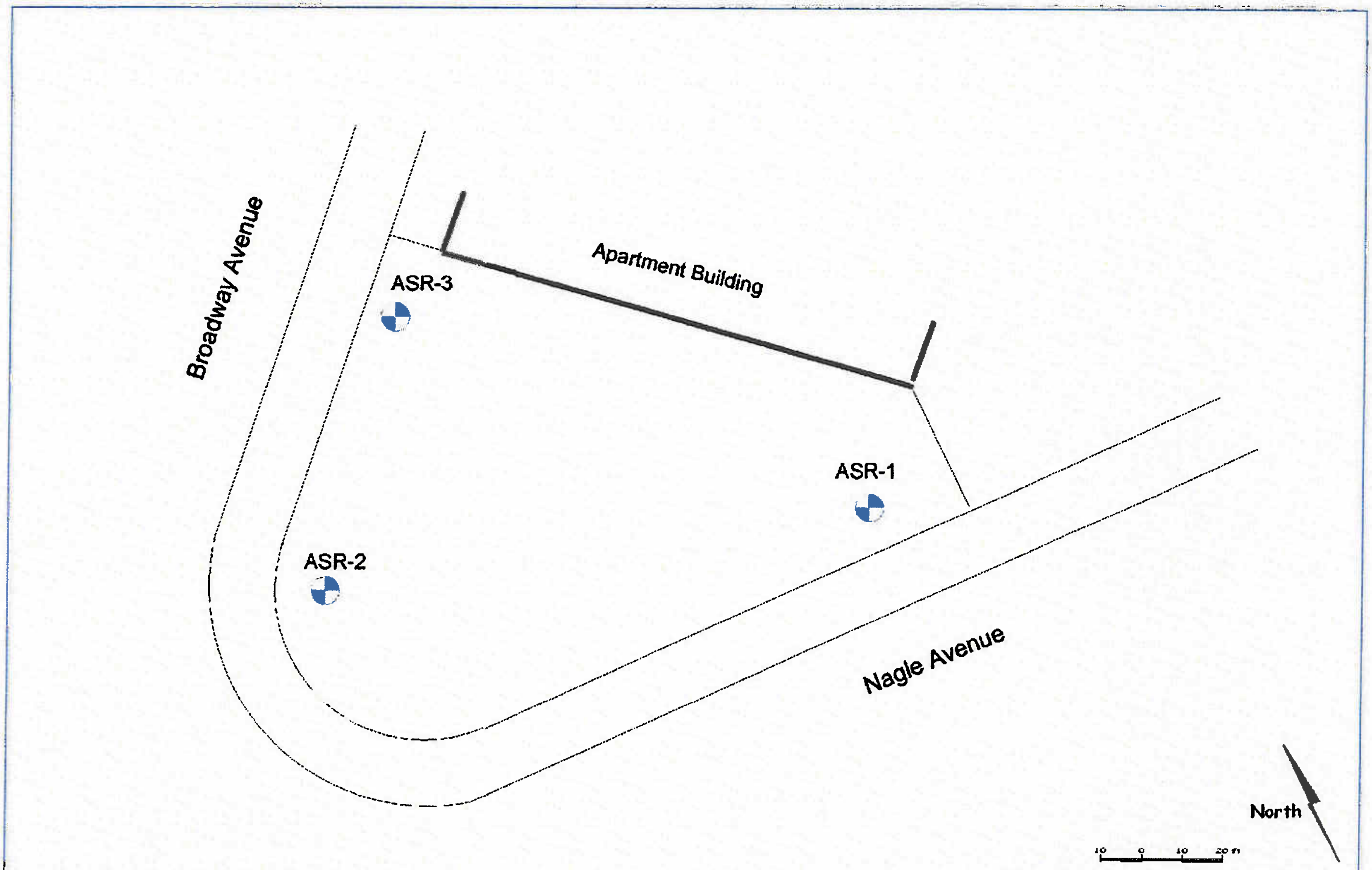
Figure - 2
Surrounding Land Use Map

CPT 2/22/06

4566 Broadway (at Nagel)
New York, NY 10040



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SWM

Figure 3
Groundwater Monitoring
Well Location Map
February 2007

MW-1 Location of existing well and number

4566 Broadway Avenue
New York, New York

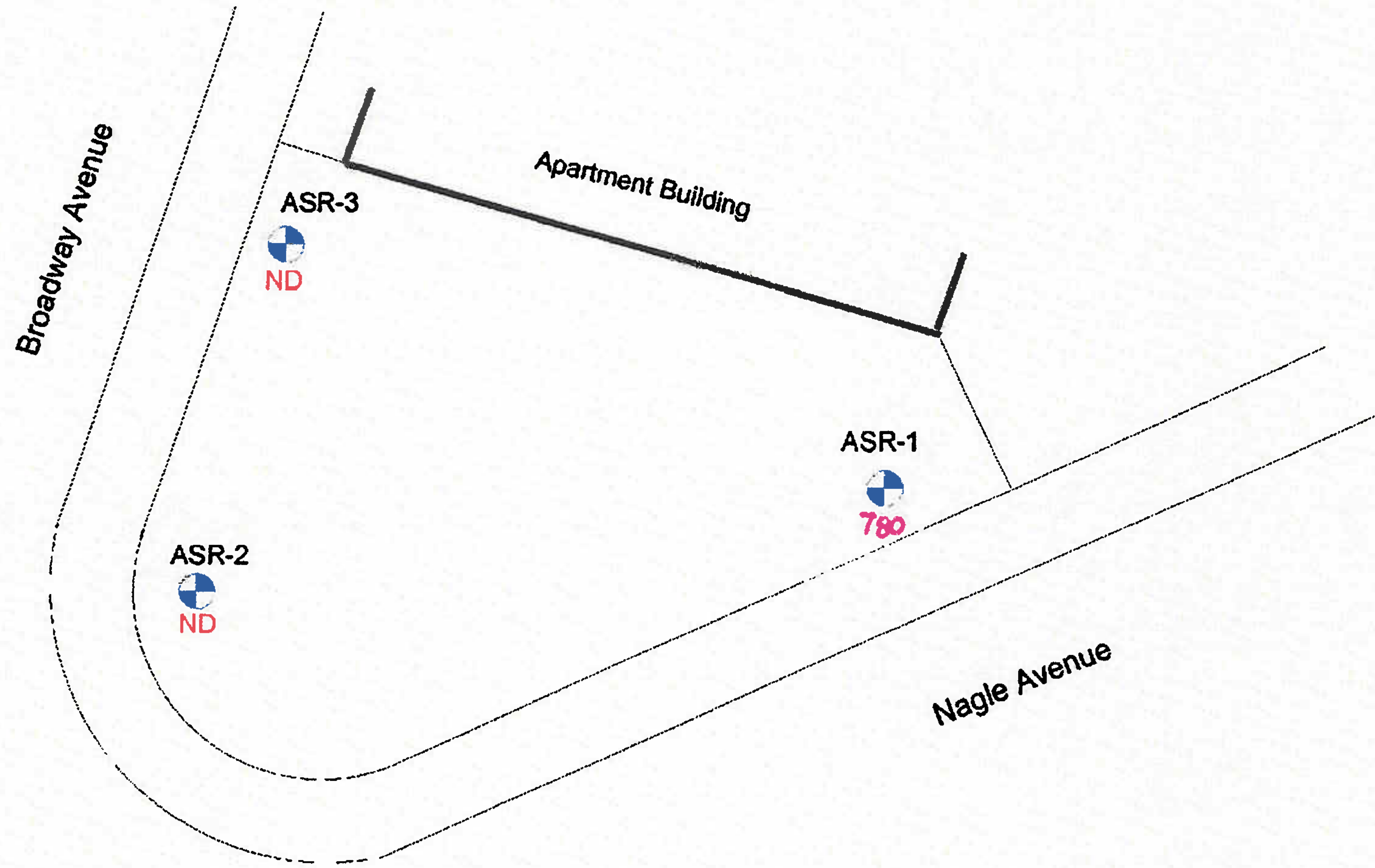

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Fig.4 - Groundwater Results Map
November 2006
4566 Broadway Avenue
New York, New York

ASR-1 Location of existing well and number
780 VOCs in Groundwater Sample (ppb)
ND Not Detected

North

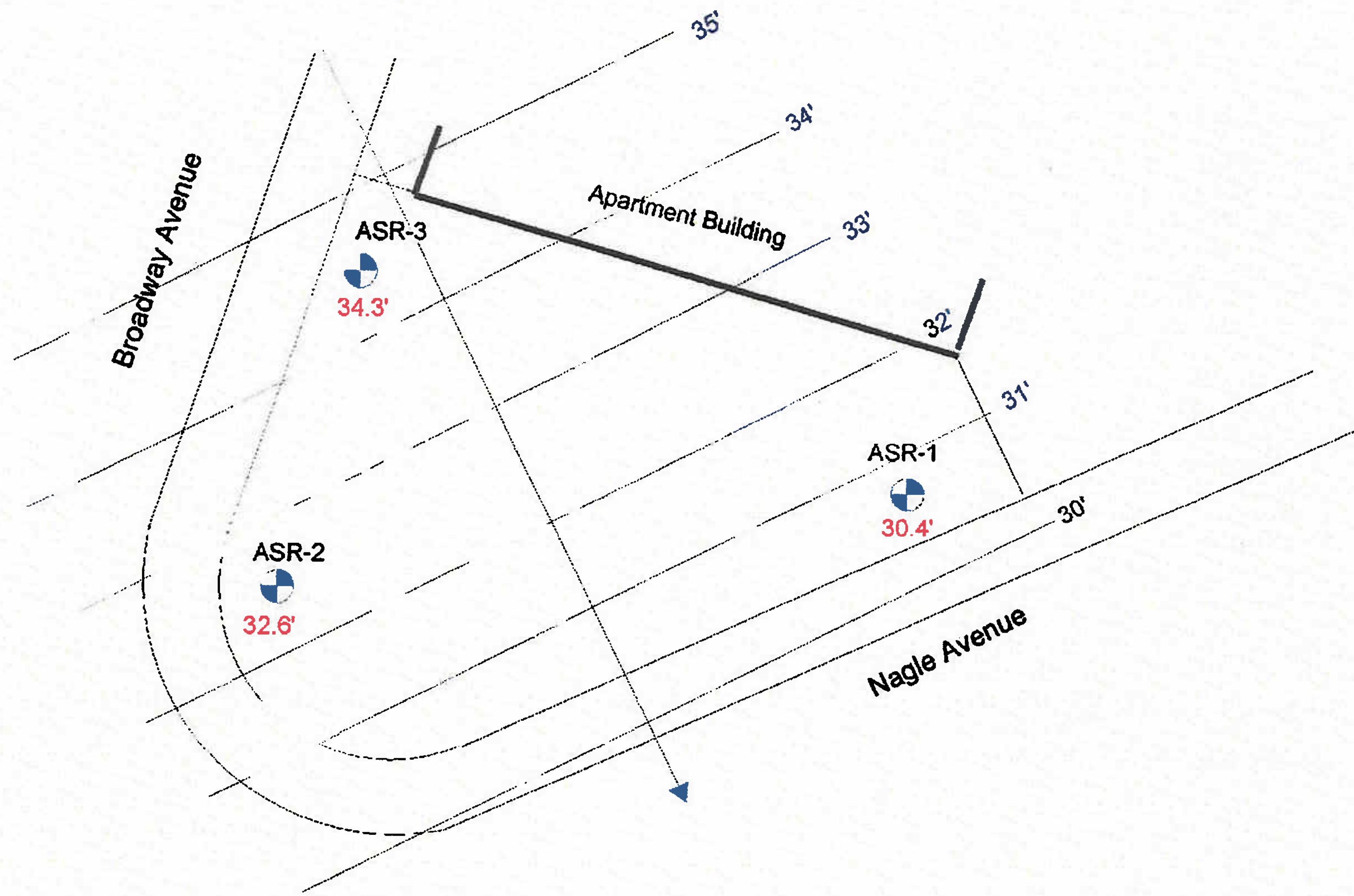

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Fig. 5 - Groundwater Gradient Map
November 2006
4566 Broadway Avenue
New York, New York

ASR-1 Existing Well and Number
34.3' Groundwater Elevation
Groundwater Flow Direction

North

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Fig. 6 - Proposed Well Location Map
June 2007

4566 Broadway Avenue
New York, New York

SWM

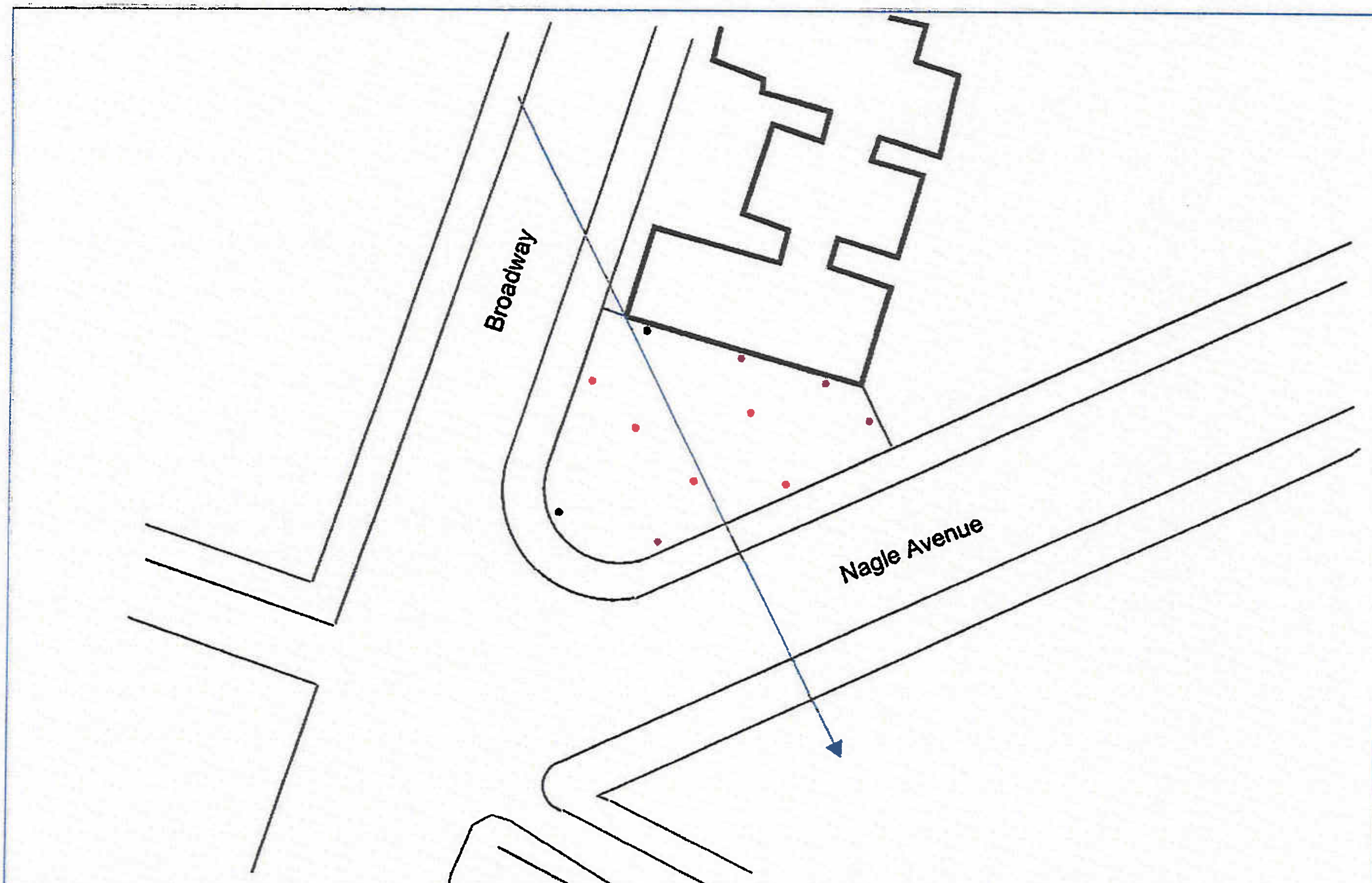

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Fig. 7 - Soil Vapor Sampling Plan Map
June 2007
4566 Broadway Avenue
New York, New York

SWM

● Soil Vapor Sampling Point

Groundwater flow direction

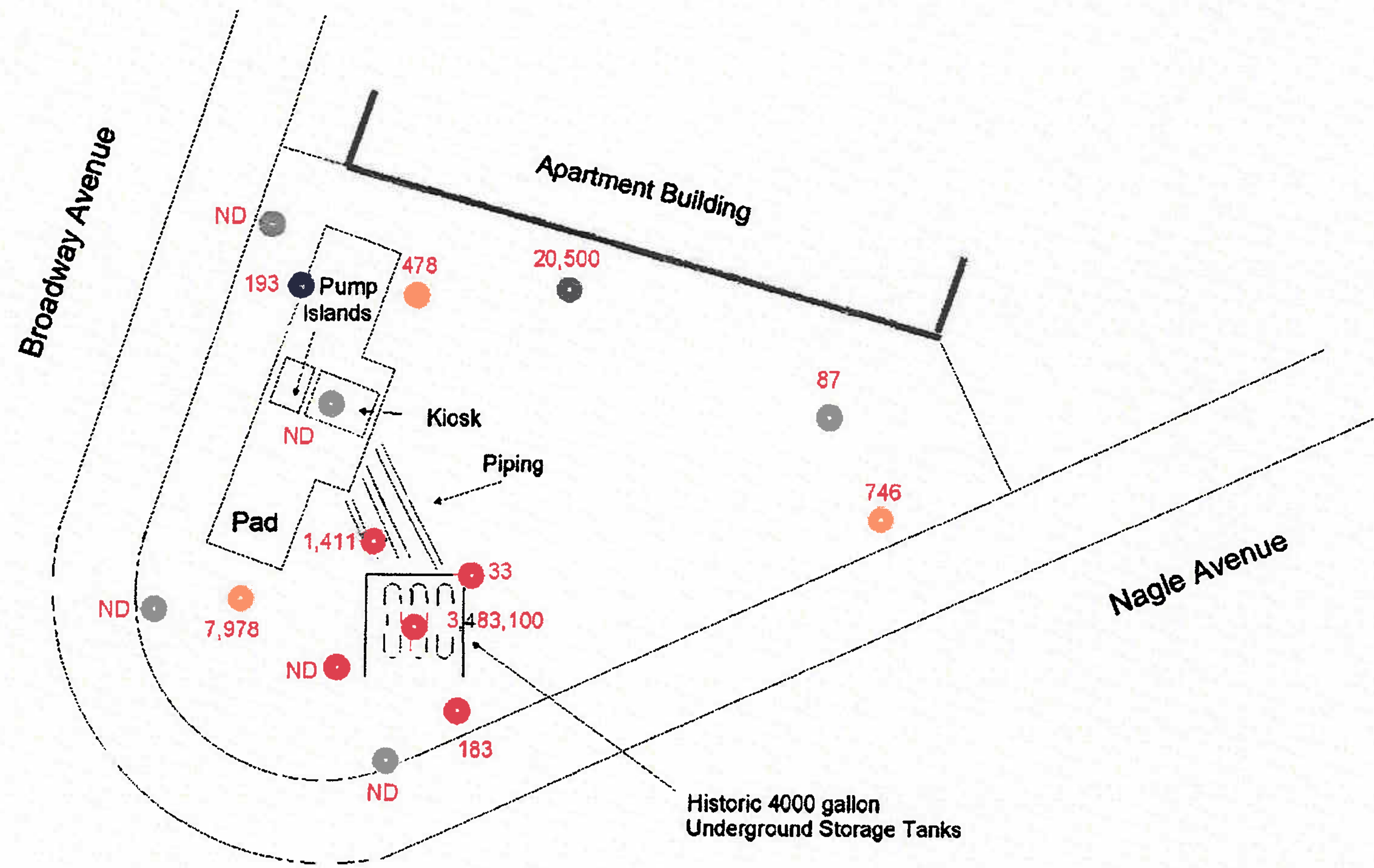

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Figure 8- Soil Sampling Data Map
January 2002 - October 2006
4566 Broadway Avenue
New York, New York

Borehole soil sample from 01/09/2002
Endpoint soil sample from 10/19/2005
Borehole soil sample from 10/2006
123 **Total VOCs in soil** (PPM)

North

Appendix – B

Haley & Aldrich Observation Well Installation Report

GEOTECHNICAL ENGINEERING REPORT
PROPOSED MIXED USE DEVELOPMENT
4566 BROADWAY
NEW YORK, NEW YORK

by

Haley & Aldrich, Inc.
East Hartford, Connecticut

for

4566 Broadway, LLC
New York, New York

File No. 33637-000
10 November 2006

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10 November 2006
File No. 33637-000

4566 Broadway, LLC
364 Maspeth Avenue
Brooklyn, New York 11211

Attention: Mr. Marcello Porcelli

Subject: Proposed Mixed Use Development
4566 Broadway
New York, New York

Ladies and Gentlemen:

This report presents the results of our subsurface investigations and geotechnical engineering recommendations for the proposed mixed use development at 4566 Broadway, in New York, New York. Our work was performed in accordance with the Client-Consultant Agreement dated 22 September 2006, and our amendment letter to you dated 6 October 2006, as authorized.

In summary, we recommend the building be supported on end-bearing pile foundations founded on sound bedrock (Material Class 3-65 minimum) with a structural lowest level floor slab designed to resist hydrostatic uplift pressure. The basement walls and lowest floor slab should be waterproofed. Premium costs will be associated with temporary excavation support, construction dewatering, rock excavation, and possibly protection of the adjacent building. Recommendations for additional explorations to assist with premium cost assessments and project bidding are also provided.

We appreciate the opportunity to work with you on this challenging project. Please call if you would like to discuss any aspect of this report or the project.

Sincerely yours,
HALEY & ALDRICH, INC.

Timothy Crowl, P.E.
Senior Engineer

John T. Difini, P.E.
Vice President

Enclosures

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TABLE OF CONTENTS

		Page
LIST OF FIGURES		iii
1.	**INTRODUCTION**	**1**
1.1	General	1
1.2	Purpose and Scope	1
1.3	Elevation Datum	1
1.4	Limitations	1
2.	**SITE CONDITIONS AND PROPOSED DEVELOPMENT**	**2**
2.1	Site Conditions	2
2.2	Proposed Construction	2
3.	**FIELD AND LABORATORY INVESTIGATIONS**	**3**
3.1	Subsurface Explorations	3
3.2	Laboratory Testing	3
4.	**SUBSURFACE CONDITIONS**	**4**
4.1	Soil and Bedrock Conditions	4
4.2	Groundwater Conditions	5
5.	**GEOTECHNICAL ENGINEERING RECOMMENDATIONS**	**6**
5.1	Foundation Design Criteria	6
5.2	Lowest Floor Slab	8
5.3	Groundwater and Waterproofing	8
5.4	Lateral Earth Pressures	9
5.5	Seismic Design	9
5.6	Resistance to Lateral Loads	10
6.	**CONSTRUCTION CONSIDERATIONS**	**11**
6.1	General	11
6.2	Excavation	11
6.3	Bedrock Excavation	11
6.4	Dewatering	11
6.5	Temporary Excavation Support	12
6.6	Pile Installation and Obstructions	12
6.7	Preparation and Protection of Bearing Surfaces	13
6.8	Backfill Materials	14
6.8.1	Compacted Granular Fill	14
6.8.2	Crushed Stone	14
6.8.3	Common Fill	14
6.8.4	Geotextile	15
6.9	Compaction	15
6.10	Protection of the Adjacent Building	16

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TABLE OF CONTENTS
(continued)

		Page
6.11	Environmental Considerations	16
6.12	Assessment of Anticipated Foundation Premium Costs	16
6.13	Additional Explorations	17
6.14	Construction Monitoring	17

TABLES
FIGURES
APPENDIX A Logs of Test Borings
APPENDIX B Observation Well Installation and Monitoring Reports
APPENDIX C Geotechnical Laboratory Test Results
APPENDIX D Haley & Aldrich Preliminary Geotechnical Assessment Letter, dated 31 October 2006

LIST OF FIGURES

Figure No.	Title
1	Project Locus
2	Subsurface Exploration Plan

1. INTRODUCTION

1.1 General

This report provides our geotechnical engineering recommendations for the proposed mixed use development at 4566 Broadway, New York, New York. The site location is shown on the Project Locus, Figure 1. The developer is 4566 Broadway, LLC, Brooklyn, New York. The architect is Ismael Layva Architects, PC, New York, New York. The structural engineer is DeSimone Consulting Engineers, PLLC, New York, New York. Advanced Site Restoration, New York, New York, is providing environmental services.

1.2 Purpose and Scope

This investigation was undertaken to obtain information on subsurface soil, rock, and groundwater conditions and to provide recommendations for foundation design for the proposed building. The scope of geotechnical engineering services included:

- visiting the site to observe existing conditions;
- reviewing existing information on subsurface soil and rock conditions and groundwater levels;
- planning and monitoring a subsurface exploration program;
- making assessments of anticipated foundation construction costs;
- performing geotechnical engineering analyses; and
- preparing this geotechnical engineering report

1.3 Elevation Datum

Elevations in this report are in feet and refer to the Borough of Manhattan Highway Datum, Ref. BM #1645A, Elev. = 36.686, reported to be 2.75 ft. above mean sea level at Sandy Hook.

1.4 Limitations

This report has been prepared for exclusive application by the project team to the geotechnical aspects of the 4566 Broadway project. In the event that changes in the nature, design, or location of structures are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing. The analyses and recommendations submitted in this report are based in part upon data obtained from referenced explorations. The nature and extent of variations between the explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

The planned construction will be supported on or in the soil, and below-grade structures will penetrate the design groundwater level for the project. Any recommendations presented in this report for foundation and floor drainage, moisture protection, and waterproofing address only the conventional geotechnical engineering related aspects of design and construction and are not intended to provide an environment that would prohibit infestation of mold or other biological pollutants. Our work scope did not include the development of criteria or procedures to minimize the risk of mold or other biological pollutant infestations in or near any structure.

2. SITE CONDITIONS AND PROPOSED DEVELOPMENT

2.1 Site Conditions

The site is a triangular parcel of land located at the intersection of Broadway and Nagle Avenue, as shown on Figure 2. The site is currently an active, at-grade parking lot. The ground surface is paved, generally sloping from about El. 34 at the northern corner of the site along Broadway to El. 30 along Nagle Avenue. The site was formerly occupied by a gas station, including associated underground storage tanks.

A small below-grade space (dimensions not known) exists in the approximate north area of the planned tower (approximately 27 ft off the north property line). This space extends about 5 to 6 ft below grade. Access to this space is through an approximately 3 ft by 4 ft opening at ground surface, which is covered by a metal plate.

An existing six-story residential building abuts the north side of the site. The building is reported to have a one-level basement. 4566 Broadway, LLC, has been unable to obtain drawings indicating foundation type and lowest floor level of the existing building.

2.2 Proposed Construction

The site is slated to be re-developed into a mixed use style development. The building will occupy the entire footprint of the parcel, and will consist of a 15-story tower at the approximate center of the site and a 5-story low rise extending from the tower to the perimeter of the site. A one-level basement is planned beneath the entire structure, with the finished floor assumed to be at about El. 22.

Based on preliminary design information provided by DeSimone, the building will be of steel frame construction. Column loads in the tower are anticipated to range between about 325 kips and 550 kips, except in the core where column loads will increase to up to 825 kips. In the low-rise portion, column loads of up to 200 kips are anticipated.

3. FIELD AND LABORATORY INVESTIGATIONS

3.1 Subsurface Explorations

A total of nine test borings, designated HA-1 through HA-9, were drilled by Craig Test Borings, Inc., Mays Landing, New Jersey, between 29 September and 16 October 2006. The borings were advanced to depths ranging from 30 to 105 ft. below ground surface. Flush-joint casing was advanced to depths of 15 to 20 ft., with drilling mud used to stabilize boreholes for remaining depths below casing. Soil samples were taken at maximum 5-ft. intervals using split-spoon samplers. The test borings were terminated after coring bedrock, with the exception of HA-1 which was terminated in decomposed bedrock at a depth of 105 ft. Rock was cored using wireline equipment.

Observation wells were installed in completed borings HA-2 and HA-6, and in a borehole advanced immediately adjacent to HA-1 (one at each approximate corner of the site).

Haley & Aldrich monitored the explorations and prepared boring logs. The boring locations were determined by Haley & Aldrich by taping from site features, and ground surface elevations were estimated based on contours shown on Figure 2. Approximate locations of test borings relative to existing site features are shown on Figure 2, and logs of test borings are provided in Appendix A. Observation well installation and monitoring reports are provided in Appendix B.

3.2 Laboratory Testing

Three grain size analyses were performed on representative soil samples to confirm visual classifications and evaluate engineering properties. The tests were performed in general conformance with ASTM standards. Results of grain size analyses are provided in Appendix C.

4. SUBSURFACE CONDITIONS

4.1 Soil and Bedrock Conditions

A generalized soil and rock sequence encountered at the test borings, in the order of increasing depth below ground surface, is given below. Not all strata were encountered at each exploration. Refer to test boring logs provided in Appendix A for additional information regarding subsurface conditions.

- **Fill** – Fill covers the site. The fill typically consists of very loose to medium dense silty coarse to fine or medium to fine SAND, trace to some gravel; or sandy coarse to fine GRAVEL, little to some silt. Asphalt, concrete, brick, glass, and wood are present in the fill. A boulder was encountered in fill HA-7 and a large concrete piece was encountered at HA-9. Portions of the fill are contaminated, and petrochemical and other odors were occasionally noted. Fill thicknesses encountered at the explorations range between about 12 and 23 ft.

- **Alluvial Deposits** – Alluvial soils consisting of very loose silty fine SAND and silty coarse to fine SAND, trace fine gravel, or very soft ORGANIC SILT were encountered at borings HA-1, HA-3, and HA-9. These materials were encountered in thicknesses ranging from 3 to 9.5 ft.

- **Glaciofluvial Deposits** – Loose to medium dense coarse to fine or medium to fine SAND, with varying amounts of gravel and silt. Layers of SILT, clayey SILT, and varved SAND and CLAY are occasionally present. Several boulders were encountered in these deposits. Glaciofluvial deposits were encountered at seven of the borings, ranging in thicknesses between 8 and 28 ft.

- **Bedrock** – Bedrock varies from INWOOD MARBLE in about the southern third of the site to MANHATTAN SCHIST over the northern two-thirds and east end of the site.

  The degree of weathering in the bedrock is highly variable. The upper 5 to 15 ft. thickness of bedrock is typically decomposed. However, much greater thicknesses of decomposed bedrock were encountered at HA-1 (greater than 66 ft.) and HA-9 (46 ft.). The top of decomposed bedrock was encountered at depths ranging between 14 ft. (near the Nagle Avenue and Broadway intersection) and 45 ft. (near the northeast corner of the site), which corresponds to about El. 20 to El. -15. Based on SPT N-values, decomposed bedrock typically ranges from loose to very dense, with relatively hard layers encountered in some portions.

  Bedrock classified as Material Class 4-65 or better was encountered at depths ranging between 19 and 66 ft. below ground surface, which corresponds to about El. -35 to El. 14. Such bedrock was not encountered at HA-1, which was terminated in decomposed bedrock at a depth of 105 ft. (about El. -71).

4.2 Groundwater Conditions

Groundwater levels recorded in observation wells installed by Haley & Aldrich range between about 8.2 and 10.9 ft. below ground surface, which corresponds to about El. 22 to El. 24.4. Refer to Appendix C for observation well installation and monitoring reports.

Groundwater levels will fluctuate with season, precipitation, and nearby construction activity, and should be anticipated to vary both during and following construction.

5. GEOTECHNICAL ENGINEERING RECOMMENDATIONS

5.1 Foundation Design Criteria

The fill and alluvial deposit are relatively loose or soft, and are not suitable for foundation support. In addition, there is potential for excessive differential settlement with soil-bearing foundations due to variability in bearing conditions (rock versus soil support) across the footprint. Consequently, use of mat foundations or spread footings is not considered practical.

We recommend the building be supported on driven pile foundations across most of the footprint, with drilled mini-piles in close proximity to the adjacent building to the north as noted below. Based on discussions with the project structural engineer, we recommend an allowable pile design capacity of 80 tons for the following pile types:

- Steel H-pile, HP12x74 – End-bearing steel H-piles driven to refusal (10 blows for ½-in. or less penetration) on bedrock (Material Class 4-65 minimum). The above-noted design capacity includes a 1/8-in. allowance of sacrificial steel due the potential for pile corrosion.

  Reinforced points should be used in areas where the bedrock surface slopes steeply to help seat piles on the bedrock. However, it should be anticipated that some piles may "walk" during installation due to the steeply sloping bedrock surface. It may be necessary to install piles with a slight batter to limit walking (say 20 vertical to 1 horizontal).

  To reduce the potential for damage to the adjacent building along the northern property line, driven piles should not be installed within 25 ft. of the property line in that area. This recommendation could possibly be revised after additional information regarding basement level and foundation support for the existing building is obtained.

  Piles should be driven using a hammer with a minimum rated energy as needed to achieve the pile design capacity at the specified blowcount for the subsurface conditions at the site. It is anticipated that Grade 50 steel will be required due to stresses during driving. The contractor should be made responsible for selection of a pile hammer that will achieve the minimum required pile capacity without generating excessive driving stresses in the piles.

  The minimum pile spacing should be 30 in.

  Prior to installation of production piles, a minimum of 10 test/indicator piles should be installed. The pile driving analyzer (PDA) should be used during installation of these test/indicator piles to evaluate hammer performance, pile driving stresses, and ultimate pile capacity. The design pile capacity should be verified by static load testing of two selected piles to two times the design capacity (160 tons) as required by the Building Code of the City of New York. The test/indicator pile program would also enable the contractor to refine pile lengths across the site, which will vary significantly.

  Production piles should be installed using the same equipment as was used during test pile installation.

Full displacement pile types (e.g., pre-stressed, precast concrete [PPC] and concrete-filled steel pipe) are not recommended at this time as they can result in significant ground and adjacent building settlement during driving. Additional information on the adjacent building foundations would be required to assess the feasibility of full-displacement piles.

- Drilled Mini-piles – Drilled mini-piles are recommended to support the building at locations within 25 ft. of the northern property line (adjacent to the existing building) in lieu of the above-noted driven H-piles. Also, mini-piles could be required in areas where steeply sloping bedrock prevents suitable seating ("take-up") of driven piles. The purpose of the mini-piles near the existing building is to limit potential vibration-induced settlements of this building that could result from pile driving. It may be feasible to use driven H-piles at these mini-pile locations if the adjacent building is determined to be supported on deep foundations.

Drilled mini-piles should be advanced into Material Class 4-65 bedrock or better with a nominal 8 in. outside diameter, and should be constructed of cement grout with a steel core bar. Pile capacity should be developed by frictional strength between the grout and sound bedrock. At a minimum, permanent steel casing should be provided through the fill and alluvial soils. Deeper casing may be warranted for seismic design purposes. Recommended design criteria are as follow:

- The maximum allowable stress in the grout should be 33 percent of the 28-day grout unconfined compressive strength, not exceeding 1,600 lbs per sq. in. (psi).
- The maximum allowable stress in the steel core and casing should be 40 percent of the minimum specified yield strength, not exceeding 24 ksi.
- The reinforcing steel should be designed to carry at least 40 percent of the design compression load where the pile has no permanent casing, including within the rock socket.
- The minimum grout thickness surrounding the core steel should be 1 in.
- The maximum allowable frictional resistance between the cement bedrock and sound bedrock is 60 psi.
- Piles should be designed to accommodate seismic loading conditions in accordance with the Building Code.
- The minimum pile spacing should be 24 in.
- Drilled mini-piles are typically designed by a specialty contractor to satisfy the requirements of a performance-based specification. Therefore, the pile diameter and length will vary depending on the contractor's design and equipment. For bidding purposes, we suggest the drawings indicate an 8-in. nominal diameter pile with a single No. 18 threaded steel bar (60 ksi steel) over the full length of the pile.

- The design pile capacity should be verified by static load testing two piles in accordance with the Building Code.

At some locations, including near HA-2, HA-5, and HA-7, the depth to Material Class 4-65 bedrock below the lowest floor level is relatively shallow. Consequently, pile lengths in some areas will likely be less than 10 ft. Depending on the pile cap depth, Material Class 3-65 and/or 4-65 bedrock could be present at or within a few feet of the bottom of pile cap. Where this occurs, it will be more practical to support the building on spread footings bearing on Material Class 3-65 or 4-65 bedrock. Footings on such bedrock (classified as 4-65 or better in accordance with the Building Code) may be sized for a net allowable bearing pressure of 8 tons per sq. ft. (tsf). Test borings are recommended at column locations in areas of shallow bedrock to better define the top of Material Class 3-65 and/or 4-65 bedrock and determine the limits of rock-supported footings. It should be noted that piles less than 10 ft. long must be braced against lateral movement. Drilled mini-piles could be used in lieu of driven piles in areas where driven piles would be relatively short.

Total settlements of pile foundations and spread footings designed as recommended above are anticipated to be ¾ in. or less, with differential settlements between adjacent columns of ½ in. or less.

The bottoms of exterior pile caps, grade beams, and rock-supported footings should extend a minimum of 4 ft. below the lowest adjacent ground surface exposed to freezing.

Driven piles will not provide significant resistance to uplift forces due to relatively loose soils across much of the site and short pile lengths where bedrock is shallow. As such, use of permanent tie-down anchors grouted into bedrock or mini-piles may be required to resist uplift forces. Further analysis and supplemental recommendations may be required once uplift loads are known.

5.2 Lowest Floor Slab

The lowest floor should be designed as a structural slab supported on end-bearing piles. The floor will be below groundwater level, and should be waterproofed and designed to resist hydrostatic uplift. We recommend that the structural engineer evaluate the possibility of using intermediate piles (driven or drilled) between columns to optimize the floor slab design. Recommendations for pile uplift capacities or rock anchor design will be provided if uplift resistance is required.

A 12-in. thick crushed stone working surface (½ in. sized crushed stone) should be placed beneath the lowest floor slab to protect subgrade soils from disturbance or softening during construction, to aid in installation of waterproofing, and to assist with temporary construction dewatering. Recommended details for the working surface are provided in the Construction Considerations section of this report.

5.3 Groundwater and Waterproofing

We recommend a Design Groundwater Level (DGL) at El. 27. This groundwater level should be used to calculate hydrostatic uplift forces and lateral water pressures acting on the structure and for waterproofing considerations.

The lowest floor slab and exterior walls should be waterproofed. Waterproofing should consist of commercially-available sheet or sprayed membrane waterproofing. Waterproofing for the lowest slab should be placed on a crushed stone working surface where the surface is covered with a heavy geotextile (e.g., 10-oz/sy needle-punched, non-woven fabric) to reduce the likelihood of damaging the waterproofing by the angular crushed stone. Some waterproofing designers may prefer placement of a concrete mudmat over the crushed stone. We recommend that the waterproofing designer, the waterproofing installation contractor, and the waterproofing manufacturer confirm the appropriate working surface approach.

Waterproofing for the foundation walls should be installed on the exterior side of the walls, including any walls constructed with one-sided forms if needed. Careful attention should be provided to the details of the waterproofing, to accommodate construction procedures and limit the potential for localized leaks through the system. The waterproofing should be continuous beneath the lowest floor slab and up the exterior of the foundation walls to the ground surface, without interruption.

Construction joints in foundation walls and the lowest floor slab, and the foundation wall-floor slab joints, should be provided with continuous flexible dumbbell-type or equivalent waterstops.

5.4 Lateral Earth Pressures

Design foundation walls that are braced at the top for the following "at-rest" earth pressures (where H is the height of soil in feet against the wall above the basement floor level):

- Static: 60 pcf equivalent fluid unit weight above the DGL
  95 pcf equivalent fluid unit weight below the DGL
- Seismic: 5.4 H^2 lbs. per l.f. of wall, (total force to be distributed as an inverse triangle over the height of the wall).
- Surcharge: (if any) 0.5 times the vertical surcharge load (psf), uniformly distributed over the height of the wall.

For seismic loading conditions, walls should be designed to resist static plus seismic earth pressures. Surcharge loading does not need to be considered for seismic design unless the surcharge will be applied over an extended time.

5.5 Seismic Design

Based on the Building Code of the City of New York, as amended on 31 December 2002, seismic design recommendations are as follow:

- The site S Type is S_3, which corresponds to an S Factor of 1.5.
- The Seismic Zone Factor, Z, is 0.15.

An evaluation of liquefaction susceptibility of soils was performed for a design earthquake with a 10 percent probability of being exceeded in 50 years. Ground motions for this analysis were estimated based on Interpolated Probabilistic Ground Motion Data (2002) published by USGS. The evaluation considered the fines content of soils, which has a significant impact on liquefaction susceptibility. Based on the results of this evaluation, the subsurface soils are not considered to be susceptible to liquefaction.

5.6 Resistance to Lateral Loads

Lateral loads may be resisted by a combination of passive pressure on pile caps and grade beams and pile lateral load capacity. It may also be feasible to resist lateral loads by passive resistance on foundation walls depending on building framing and load transfer characteristics and strain compatibility between wall and pile cap/ grade beam elements. For initial design purposes, we recommend that passive resistance on foundation walls be disregarded.

The static net (passive minus active) lateral resistance on pile caps and grade beams can be calculated using an equivalent fluid unit weight of 80 pcf. This value assumes that backfill within 5 ft laterally against pile caps and grade beams is systematically compacted in lifts, and that the backfill is submerged. The top of the assumed passive zone should be 6 in. below the top of the adjacent soil or backfill surface. If the horizontal distance between nearby pile caps or grade beams is less than twice the height of the subject structural element, the passive pressure should be discounted proportionately to the distance (full pressure at twice the height away) to accommodate interaction of the elements.. The above values can be increased by 33 percent to calculate resistance to transient (wind and seismic) loads.

Estimating the lateral capacity of piles on this site is extremely complicated given the highly variable soil and bedrock conditions. Lateral capacity of a pile in bending depends on the strength and density of the soil in contact with the pile (highly variable on this site), the depth of the top of the pile below finished grade, the spacing of the pile in the pile group, the relative fixity of the pile at the pile cap, the allowable stress in the pile, and the amount of allowable deflection. Such complicated analyses would not be required if the structure is designed to resist lateral loads through the previously discussed passive resistance mode. Additional information from and coordination with the structural engineer would be required to complete these supplemental analyses.

6. CONSTRUCTION CONSIDERATIONS

6.1 General

This section provides comments related to foundation construction, earthwork, and other geotechnical aspects of the project. It will aid those responsible for preparation of contract plans and specifications and those involved with construction monitoring. Contractors must evaluate potential construction problems based on their own knowledge and experience in the area and based on similar projects, taking into account their own proposed construction methods and procedures.

6.2 Excavation

The proposed development will require excavation into soil (existing fill, alluvial soils, and Glaciofluvial soils) and possibly some bedrock to construct the basement, pile caps, grade beams, foundations, utilities, and other improvements. Given the historic site use, we anticipate that remnants of previously existing structures including slabs, foundation elements, utilities, and other buried structures and obstructions will be encountered during construction.

We anticipate that excavations can be made with conventional powered equipment. Hoe-ramming or similar techniques may be needed to remove bedrock, concrete structures, and other large obstructions. Cut slopes should typically be maintained no steeper than 1.5H:1V. Shallower inclinations may be required locally to meet OSHA requirements. Excavations should be conducted in accordance with OSHA requirements

6.3 Bedrock Excavation

Localized bedrock excavation may be required at some pile caps, grade beams, and footings. Although some excavation may be feasible by hoe-ramming, blasting will likely be required for efficient rock removal in excavations extending more than about 2 ft. below the "non-weathered" bedrock surface.

Controlled blasting methods are recommended to control vibrations and fly rock, and to reduce overbreak below the structure and beyond the excavation perimeter. Line drilling is recommended in areas when excavating bedrock adjacent to temporary excavation support systems founded on top of the rock. Rock dowels could be required locally to provide temporary stability of rock cuts, if any, where joint and fracture orientations in the bedrock are unfavorable relative to the excavation face.

6.4 Dewatering

It is anticipated that excavation for the lowest floor level will extend up to about 4 ft. below groundwater, and excavations for pile caps and grade beams are anticipated to extend up to about 10 ft. below groundwater. Deeper excavations may be required to remove obstructions encountered below pile caps.

Temporary construction dewatering will be critical as soils at and below the excavation bottom typically have a relatively high silt content and are susceptible to disturbance by inadequate dewatering and construction activities. Unsuitable groundwater control may also result in instability of temporary excavation support systems due to reduced toe support, and increased ground settlements outside the excavation. It is anticipated that dewatering will likely need to be accomplished using a network of deep gravity wells (and possibly a vacuum extraction system) within the excavation. The contractor should monitor the performance of the dewatering system using a network of piezometers inside the excavation and observation wells outside the excavation.

6.5 Temporary Excavation Support

A temporary excavation support system will be required to construct the below-grade space. It is anticipated that interlocking steel sheet piling with one brace level will be feasible in areas where bedrock is deep enough for sufficient toe embedment below the excavation bottom. A second brace level will likely be required in the shallow bedrock areas where toe embedment is limited.

As discussed in the previous section, specialized wall types, such as a secant pile wall, could be required to support the excavation adjacent to the existing six-story building rather than steel sheet piling. A secant pile wall socketed into bedrock or other wall type could also be required in the vicinity of HA-2 and HA-7 where bedrock is shallow, and excavation will extend below or close to the top of bedrock.

It is understood that the proposed basement level may extend to the property line. If so, excavation support systems will be installed beyond the site limits (on the street sides of the site), and temporary easements will be required. Also, depending on the proximity of the basement to the adjacent six-story building, use of one-sided forms may be required to construct the basement wall in that area. Wall construction in this manner will also result in some premium cost, and more complicated waterproofing details.

Bracing systems may be internal (corner and cross lot braces), external (tiebacks grouted into bedrock) or a combination of both. Internal braces and wales will need to be removed during backfilling of foundation walls. Temporary easements will likely be required for tiebacks as they will extend beyond the property line. Tiebacks should be de-tensioned during the basement construction process.

All excavation, lateral support, bracing and backfilling must be performed in accordance with OSHA and all other applicable regulatory requirements. The contractor should be required to monitor vertical and lateral movements of the temporary excavation system on a regular basis during construction. Additionally, the contractor should monitor ground settlements and any settlement sensitive utilities within a lateral distance of one times the excavation depth behind the wall.

Further evaluation of suitable temporary excavation support systems should be made once information regarding foundations for the adjacent six-story building is available. Information regarding adjacent underground utilities should also be reviewed to evaluate the potential for damage caused by sheeting installation.

6.6 Pile Installation and Obstructions

Based on the top of bedrock elevations encountered at the borings, pile lengths will vary significantly and pile tips are anticipated to extend from about El. 14 to below El. -70. The contractor should confirm estimated pile lengths during test pile installation. As noted previously, test boring HA-1 was discontinued in decomposed bedrock at a depth of 105 ft. Total pile lengths in this area are uncertain, and additional borings advanced to sound bedrock would help to better define anticipated pile lengths. Alternately, the test pile program could be used to estimate pile lengths. However, this would likely be a more expensive approach.

The test borings encountered refusal in fill and Glaciofluvial Deposits at several locations. The fill contains boulders, concrete, and other materials that can be obstructions to pile driving. Cobbles and boulders are also present in Glaciofluvial Deposits. Pre-excavation, pre-drilling, spudding or other means may be necessary to remove obstructions. Hard driving should be anticipated at some locations in soil and decomposed bedrock.

Steel H-piles are typically designed with the strong-axis oriented in a specific direction to resist lateral loads. Pile driving equipment should be configured to permit installation at required orientations.

It is anticipated that piles may be driven from an intermediate excavation level that is slightly above groundwater, with excavation to final subgrades made after pile installation is completed. Estimated costs for pile foundations should consider the potential for extended cutoff lengths as a result of this approach.

6.7 Preparation and Protection of Bearing Surfaces

The excavation subgrade for the lowest floor slab will consist of fill, alluvial soils, and glaciofluvial deposits, which frequently have a relatively high fines content. These soils are sensitive to disturbance, particularly in the presence of water, freezing temperatures and construction equipment traffic. During excavation and foundation construction operations, precautions must be taken to minimize disturbance of the subgrade soils. The following measures are recommended:

- Final excavation should be made using smooth-bladed equipment to reduce disturbance of underlying soils.
- Final excavation to the slab subgrade should be made only when placement of the crushed stone layer can be performed immediately after completing excavation.
- Movement of construction equipment directly over the exposed subgrades should be minimized.

A subgrade protection/drainage system should be placed over the prepared floor slab subgrade to protect the soils from softening and disturbance, provide a working surface during below-grade construction, and facilitate temporary drainage from beneath the floor slab. The system should consist of the following:

- Geotextile filter fabric placed directly on the prepared subgrade
- A 12-in. thick layer of ½-in. crushed stone placed on the geotextile filter. The stone layer will serve as a working surface during construction of pile caps, grade beams, and the lowest floor slab.

  The crushed stone layer will also allow drainage and elimination of hydrostatic pressure on the underside of the lowest floor slab until sufficient structure dead weight has been achieved. Provisions should be made to enable drainage of water from the crushed stone layer until temporary pressure relief is no longer required.

6.8 Backfill Materials

6.8.1 Compacted Granular Fill

Compacted granular fill should be used to backfill pile caps and grade beams. In areas where compaction of these materials is difficult due to wet subgrades, crushed stone may be used to backfill pile caps and grade beams as described in the following section.

Place and compact fill in maximum 9-in. thick lifts with a suitable vibratory roller. In confined areas, use maximum 6-in. thick lifts. Compaction equipment in confined areas may consist of hand-guided vibratory equipment or mechanical tampers. Vibration may cause instability of the underlying subgrade soils. In the event instability during compaction is observed, we recommend that compaction be conducted by static rolling and the lift size be reduced as necessary to meet specified compaction requirements.

Off-site granular fill should consist of sandy gravel or gravelly sand, free of organic material, snow, ice, frozen soil, or other deleterious and unsuitable material, and be well-graded within the following limits:

U.S. Standard Sieve Size	Percent Finer by Weight
6 in. [1]	100
No. 4	30 – 80
No. 40	10 – 50
No. 200	0 – 8

[1] use a maximum 3 in. size for fill placed within 12 in. of concrete slabs, walls, and grade beams.

6.8.2 Crushed Stone

Crushed stone should be used for the working surface at the floor slab subgrade, and to backfill pile caps and grade beams in areas where subgrades are wet. This material should consist of ½-in. size crushed stone satisfying the requirements of NYSDOT Standard Specifications, Item 703-02, No. 1. Crushed stone should be placed in maximum 12-in. thick lifts, and compacted with at least four coverages using heavy vibratory compaction equipment.

6.8.3 Common Fill

Common fill may be used to backfill pile caps and grade beams, and to backfill basement walls. Common fill should consist of soils complying with ASTM D2487 soil classification group SM with 80% by weight passing the No. 40 sieve and between 20% and 40% by weight passing the No. 200 sieve. The maximum particle size should be 3 in.

Fill that will be excavated during construction is potentially contaminated, and it is anticipated that these materials will be disposed off-site. Natural soils encountered during excavation will be below groundwater, and will likely be too wet for re-use as common fill. Additionally, there will likely be limited space for stockpiling excavated soils on-site. Therefore, it is likely that common fill will need to be imported.

The surfaces of intermediate lifts of common fill will be easily softened due to exposure to precipitation and surface runoff and could be susceptible to disturbance from construction activities, including compaction. Disturbed soil will need to be removed prior to placing additional fill.

6.8.4 Geotextile

Filtration-type geotextile is recommended for the following applications:

- Provide a continuous layer of 8 oz /sy needle-punched, non-woven geotextile between the crushed stone working surface below the slab and the underlying subgrade soils. The purpose of this fabric is to limit migration of fine-grained soils into the crushed stone layer, limit the pushing of crushed stone into the underlying soft soils, and to provide some nominal additional stability to the working surface.

- Provide a continuous layer of 10 oz /sy needle-punched, non-woven geotextile between the crushed stone working surface below the slab and the waterproofing layer. The purpose of this fabric is to protect the waterproofing layer from the angular crushed stone. This approach should be confirmed with the waterproofing designer, waterproofing contractor, and waterproofing manufacturer.

6.9 Compaction

Recommended compaction requirements are as follows:

Location	Minimum Compaction Requirements
Adjacent to pile caps and grade beams	95% (inside building) 92 % (outside building)
Beneath floor slabs	95%
Parking, roadways and sidewalks	92% up to 3 ft. below finished grade 95% within 3 ft. of finished grade
Landscaped areas	90%

Minimum compaction requirements refer to percentages of the maximum dry density determined in accordance with ASTM D1557C.

6.10 Protection of the Adjacent Building

Information regarding the foundation type and lowest floor level for the adjacent six-story building was not available at the time of this report. Such information will be critical for selecting appropriate measures to protect this building, determining foundation type for the new building on this side of the site, and selecting an appropriate temporary excavation support system on this side of the site.

Measures required to protect the building will vary depending on the type of foundation system on which it is supported and the depth of its basement. Shallow footing foundations bearing on relatively loose soils could potentially settle due to construction vibrations during sheetpile installation and foundation pile driving, or lateral movement of temporary excavation support.

If the building is supported on shallow foundations, protective measures such as underpinning, compaction grouting, use of a "stiffer" temporary excavation support system (e.g., a secant pile wall), or the use of drilled mini-piles for new foundations located within about 25 ft of the northern property line may be required. These measures will result in significant premium costs and schedule impacts. As such, it is important that this issue be resolved during design. If continued attempts to obtain foundation drawings for the existing building are unsuccessful, a test pit should be performed along the property line to expose the building foundations.

We also recommend that settlement and vibration monitoring programs be established for the adjacent building and other structures or buildings located within about 150 ft of the pile driving activities that are considered "sensitive" to movement and vibration. Consideration should also be given to conducting pre-construction condition surveys to these buildings (interior and exterior). Details of the monitoring should be established and background data collected before pile driving begins.

Finally, we recommend that the project establish a contingency allowance to repair cosmetic damages (e.g., re-pointing of bricks, patching sidewalks and roads, filling cracks in walls and slabs, possibly re-hanging misaligned doors and windows) that may occur over the construction period.

6.11 Environmental Considerations

Fill excavated during construction will likely be contaminated. Groundwater collected by the dewatering system may also be contaminated. Disposal of excavated soil and treatment and discharge of collected groundwater should be completed in accordance with the requirements of the Brownfields Remediation Plan which will be prepared by others based on the results of a separate environmental investigation and coordination with NYSDEC.

6.12 Assessment of Anticipated Foundation Premium Costs

As part of our work, we made an assessment of anticipated foundation construction costs for the project (assuming a one-level basement and driven end bearing piles with structural lowest slab foundation system). To understand the premium costs associated with building on the 4566 Broadway site, the assessment was completed for conditions encountered on this site, and for a hypothetical "typical" urban site. The typical site is defined as a site with suitable bearing soils at the foundation level and groundwater below the excavation level. The results of this assessment were summarized in a letter dated 31 October 2006. A copy of this letter is provided in Appendix D.

6.13 Additional Explorations

We recommend that the project team consider conducting the following additional explorations during the design-phase of the project:

- Test borings in the shallow bedrock areas (i.e., areas where footings may be feasible) to assess pile versus footing foundations at these locations. This would be conducted once the structural engineer has finalized column locations.

- Test borings in the deep bedrock area (i.e., local to boring HA-1) to assess depth to Material Class 4-65 bedrock and assist with preparation of foundation piling cost estimates and bidding.

- Test pit(s) adjacent to the adjacent building to investigate the foundation type, depth and configuration for this building. This information is a critical driver of premium cost items including foundation type for the new building (i.e., driven piles versus drilled mini-piles) and temporary excavation support systems on this side of the excavation.

6.14 Construction Monitoring

The recommendations contained in this report are based on known and predictable behavior of properly engineered and constructed foundations and other facilities. It is recommended that Haley & Aldrich be retained to observe the geotechnical aspects of construction including:

- installation of temporary excavation support and dewatering systems;

- pile installation, including load testing;

- preparation of bearing surfaces for soil supported foundation elements (e.g., footings);

- controlled blasting; and

- placement and compaction of structural fill.

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APPENDIX A

Logs of Test Borings

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-1(OW)

Project	Proposed Mixed Use Development New York, New York
Client	4566 Broadway LLC
Contractor	Craig Test Borings, Inc.

File No.	33637-000
Sheet No.	1 of 5
Start	October 3, 2006
Finish	October 4, 2006
Driller	D. Cook
H&A Rep.	M. Pascal
Elevation	34.30
Datum	Manhattan Highway
Location	See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HW	S	NX	Rig Make & Model: CME 75
Inside Diameter (in.)	4	1 3/8	2	Bit Type: Roller Bit
Hammer Weight (lb.)	140	140	-	Drill Mud: Polymer
Hammer Fall (in.)	30	30	-	Casing: Driven to 20 ft
				Hoist/Hammer: Winch / Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Toughness	Plasticity	Strength
0	30 16 16 15	S1 20	0.0 2.0	NO WELL INSTALLED		SM	Medium dense brown silty coarse to fine SAND, trace gravel, with asphalt fragments, strong petrochemical odor (11-65)	-	5	5	20	40	30	-	-	-	-
	10 7 24 12	S2 4	2.0 4.0			SM	Dense brown silty coarse to fine SAND, some coarse to fine gravel, with glass fragments (11-65)	5	20	5	20	25	25	-	-	-	-
5	7 7 4 4	S3 6	4.0 6.0			SM	Similar to S12, except medium dense (11-65)	10	10	5	25	25	25	-	-	-	-
	6 3 5 6	S4 6	6.0 8.0			SM	Loose brown to red-brown gravelly coarse to fine SAND, little silt (11-65)	10	15	15	25	20	15	-	-	-	-
	8 40 56 13	S5 8	8.0 10.0			GM	Very dense brown to gray sandy coarse to fine GRAVEL, some silt (11-65)	25	15	5	15	15	25	-	-	-	-
10	1 2 1 woh	S6 3	10.0 12.0			SM	Very loose brown silty medium to fine SAND, strong chemical odor, wet (11-65)	-	-	-	30	50	20	-	-	-	-
	woh woh 2 2	S7 12	12.0 14.0		21.3 13.0	SP-SM	Very loose brown medium to fine SAND, little silt with red brick fragments, strong odor, black staining (11-65)	-	-	-	30	60	10	-	-	-	-
							-FILL-										
15	1 1 2 3	S8 12	15.0 17.0			SM	Very loose green-brown silty fine SAND, specs of organics (8-65)	-	-	-	-	60	40	-	-	-	-
							-ALLUVIAL DEPOSITS-										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
	See Observation Well Report				

Sample Identification

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (lin. ft.)	95.0
Rock Cored (lin. ft.)	10.0
Samples	17S,2C

Boring No. HA-1(OW)

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Toughness: L-Low, M-Medium, H-High; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1] SPT = Sampler blows per 6 in. [2] Maximum particle size (in.) is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

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TEST BORING REPORT

HALEY & ALDRICH

Boring No. HA-1(OW)
File No. 33637-000
Sheet No. 2 of 5

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	8 1 1 woh	S9 4	20.0 22.0			SM	Very loose gray fine silty SAND (8-65)	-	-	-	-	80	20	-	-	-	-
					12.8 21.5	PT	Very soft dark brown ORGANIC SILT, slight organic odor (11-65)	-	-	-	-	-	100	-	-	-	-
					11.8 22.5		-ALLUVIAL DEPOSITS-										
25	8 7 7 100/3	S10 10	25.0 26.8			SP-SM	Medium dense orange-brown medium to fine SAND (7-65)	-	-	-	30	60	10	-	-	-	-
					7.8		-GLACIOFLUVIAL DEPOSITS-										
					26.5	SM	Medium dense silty medium to fine SAND with mica schist rock fragments (7-65)	-	-	-	20	40	40	-	-	-	-
		C1	29.0 34.0		5.3 29.0		Pieces of mica SCHIST with silty coarse to fine SAND, little coarse to fine gravel (probable weathered boulder) REC = 16 in./27%; RQD = 11 in./18% Drill Rates (min/ft) = 3,2,3,3,2										
30																	
		C2	34.0 39.0				Hard highly weathered gray and light brown coarse grained (INWOOD) MARBLE. Low angle joint, rough, undulating, discolored, tight, open (probable weathered boulder) REC = 7 in./12%; RQD = 4 in./7% Drill Rates (min/ft) = 1,1,1,1,1										
35																	
					-4.7 39.0		-GLACIOFLUVIAL DEPOSITS-										
40	1/24	S11 1	40.0 42.0			ML	Very loose orange-brown sandy SILT (10-65)	-	-	-	10	20	70	-	-	-	-
45	2 3 4 5	S12 8	45.0 47.0		-10.7 45.0	CL	Medium stiff orange-brown and white CLAY, little sand (9-65)	-	-	-	-	10	90	-	-	-	-
							-DECOMPOSED BEDROCK-										

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-1(OW)

TEST BORING REPORT

HALEY & ALDRICH

Boring No. HA-1(OW)
File No. 33637-000

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50	2 5 9 6	S13 12	50.0 52.0			CL	Similar to S12, except stiff (9-65)	-	-	-	-	10	90	-	-	-	-
55	1 4 7 5	S14 18	55.0 57.0			CL	Similar to S13 (9-65)	-	-	-	-	10	90	-	-	-	-
60	1 2 5 9	S15 16	60.0 62.0			CL	Medium stiff orange-brown and white CLAY, little sand (9-65)	-	-	-	-	10	90	-	-	-	-
65	6 6 15 25	S16 12	65.0 67.0			GM	Medium dense orange-brown silty coarse to fine GRAVEL, some coarse to fine sand (6-65)	20	30	5	15	10	20	-	-	-	-
70							Note: Roller bit advanced to 80.0 ft										
							-DECOMPOSED BEDROCK-										
75																	

[1] SPT = Sampler blows per 6 in. [2] Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-1(OW)
File No. 33637-000
Sheet No. 4 of 5

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
							-DECOMPOSED BEDROCK-										
80	9 8 10 12	S17 4	80.0 82.0			ML	Stiff orange-brown and white SILT (10-65)	-	-	-	-	-	100	-	-	-	-
85							Note: Roller bit advanced to 105 ft										
90																	
95																	
100																	
							-DECOMPOSED BEDROCK-										

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-1(OW)

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-1(OW)
File No. 33637-000

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
105					-70.7 105.0		-DECOMPOSED BEDROCK- Bottom of exploration at 105.0 ft Note: Installed observation well in borehole subsequently advanced adjacent to HA-1. Refer to Groundwater Observation Well Installation Report for details										

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

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HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-2(OW)

Project: Proposed Mixed Use Development New York, New York
Client: 4566 Broadway LLC
Contractor: Craig Test Borings, Inc.

File No. 33637-000
Sheet No. 1 of 3
Start: October 3, 2006
Finish: October 3, 2006
Driller: D. Cook
H&A Rep.: M. Pascal
Elevation: 32.60
Datum: Manhattan Highway
Location: See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HW	S	NX	Rig Make & Model: CME 75
Inside Diameter (in.)	4	1 3/8	2	Bit Type: Roller Bit
Hammer Weight (lb.)	140	140	-	Drill Mud: Polymer
Hammer Fall (in.)	30	30	-	Casing: Driven to 15 ft; Hoist/Hammer: Winch / Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0					32.1 / 0.5		2 in. Asphalt, 6 in. Concrete										
	8 3	S1	1.0 2.0			SP	Medium dense gray coarse to fine SAND, trace silt with crushed concrete (11-65)	-	-	40	35	20	5	-	-	-	-
	4 4 6 3	S2 6	2.0 4.0			SP	Similar to S1, except little coarse gravel (11-65)	10	-	30	35	20	5	-	-	-	-
5	wor 1 2 2	S3 1	4.0 6.0			SM	Very loose brown silty coarse to fine SAND, little coarse gravel (11-65)	10	-	10	30	20	30	-	-	-	-
	9 20 20 8	S4 2	6.0 8.0			SM	Dense dark brown silty coarse to fine SAND, little fine gravel, with miscellaneous fill particles (11-65)	-	10	10	30	20	30	-	-	-	-
	1 2 3 2	S5 6	8.0 10.0			SM	Loose brown silty coarse to fine SAND, little fine gravel, moist to wet (11-65)	-	20	10	20	20	30	-	-	-	-
10	2 2 4 6	S6 4	10.0 12.0			SM	Similar to S5 (11-65)	-	10	10	30	20	30	-	-	-	-
							-FILL-										
	9 7 8 11	S7 12	12.0 14.0		20.1 / 12.5	SM	Medium dense orange-brown silty coarse to fine SAND, little fine gravel (7-65)	-	10	5	20	45	20	-	-	-	-
15	4 5 3 4	S8 8	15.0 17.0			SM	Loose green-brown silty coarse to fine SAND with mica rock fragments (7-65)	-	10	5	20	45	20	-	-	-	-
							-GLACIOFLUVIAL DEPOSITS-										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
	See Observation Well Report				

Sample Identification
- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary
- Overburden (lin. ft.) 24.0
- Rock Cored (lin. ft.) 10.0
- Samples 9S,2C

Boring No. HA-2(OW)

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None. Toughness: L-Low, M-Medium, H-High. Plasticity: N-Nonplastic, L-Low, M-Medium, H-High. Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (in.) is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

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TEST BORING REPORT

Boring No. HA-2(OW)
File No. 33637-000
Sheet No. 2 of 3

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	38 63 69 100	S9	20.0 22.0		12.6 20.0	SP	Very dense light brown coarse to fine SAND, little coarse to fine gravel, trace silt (6-65). Note: Advanced roller bit to 24.0 ft and began coring	10	5	10	30	40	5	-	-	-	-
							-DECOMPOSED BEDROCK-										
25							SEE CORE BORING REPORT FOR ROCK DETAILS										
30																	

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-2(OW)

USCS_TB4 USCSLIB4.GLB USCS_TBS.GDT G:\33637 - 4566 BROADWAY\000\DATABASES\2008-1004-GINTS 33637000TB+C.GPJ Nov 10, 08

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CORE BORING REPORT

Boring No. HA-2(OW)
File No. 33637-000

Depth (ft)	Drilling Rate Min./ft	Run No.	Depth (ft)	Recovery/RQD in.	Recovery/RQD %	Weathering	Well Diagram	Elev./Depth (ft)	Visual Description and Remarks
									SEE TEST BORING REPORT FOR OVERBURDEN DETAILS
	5.0	C1	24.0 29.0	57 30	95 50			8.6 24.0	Soft, slightly to moderately weathered, light brown to gray, medium grained INWOOD MARBLE. Moderately dipping joint set close to moderate, rough, planar, discolored to decomposed, open. Moderately dipping joint rough, undulating, discolored, open. Low angle joint set moderate, rough, undulating, discolored, open (4-65)
25	5.0								
	5.0								
	5.0								
	5.0								
		C2	29.0 34.0	48 19	80 32				Soft to medium, slightly weathered, light brown, medium grained INWOOD MARBLE. Moderately dipping joint set close to moderate, rough, planar, discolored to decomposed, open. Moderately dipping joint rough undulating, discolored, open. Low angle joint set very close to moderate, rough, undulating, discolored, open. High angle joint rough, undulating, discolored, tight (3-65)
30									
								-1.4 34.0	-BEDROCK- Bottom of exploration at 34.0 ft
									Note: Installed observation well in compelted borehole. Refer to Groundwater Observation Well Installation Report for details

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-3

Project	Proposed Mixed Use Development New York, New York
Client	4566 Broadway LLC
Contractor	Craig Test Borings, Inc.

File No.	33637-000
Sheet No.	1 of 3
Start	October 2, 2006
Finish	October 2, 2006
Driller	D. Cook
H&A Rep.	M. Pascal
Elevation	34.00
Datum	Manhattan Highway
Location	See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HW	S	NX	Rig Make & Model: CME 75
Inside Diameter (in.)	4	1 3/8	2	Bit Type: Roller Bit
Hammer Weight (lb.)	140	140	-	Drill Mud: Polymer/Bentonite
Hammer Fall (in.)	30	30	-	Casing: Driven to 20 ft
				Hoist/Hammer: Winch / Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0	37 12 7 5	S1 6	0.0 2.0	NO WELL INSTALLED		SM	Medium dense orange-brown silty coarse to fine SAND, trace fine gravel, with miscellaneous fill particles (11-65)	-	5	5	20	25	45	-	-	-	-
	5 3 3 4	S2 6	2.0 4.0			SM	Loose dark brown silty medium to fine SAND, trace fine gravel with mica fill particles (11-65)	-	5	5	20	40	30	-	-	-	-
5	2 1 2 6	S3 6	4.0 6.0			SM	Very loose brown silty medium to fine SAND, trace fine gravel with schist fragments (11-65)	-	5	5	20	40	30	-	-	-	-
	3 1 2 4	S4 6	6.0 8.0			SM	Very loose brown silty coarse to fine SAND, trace fine gravel, with asphalt fragments (11-65)	-	5	5	20	40	30	-	-	-	-
	1 1 1 1	S5 6	8.0 10.0			SP-SM	Very loose brown coarse to fine SAND, little silt, little gravel with asphalt fragments (11-65)	-	10	10	20	50	10	-	-	-	-
10	23 10 6 5	S6 4	10.0 12.0			GP-GM	Medium dense gray sandy coarse to fine GRAVEL, little silt, wet (11-65)	20	40	5	10	15	10	-	-	-	-
	4 7 6 18	S7 12	12.0 14.0			GP-GM	Medium dense brown sandy coarse to fine GRAVEL, little silt, with red brick pieces, slight organic odor (11-65)	20	30	10	15	15	10	-	-	-	-
15	40 13 12 7	S8 4	15.0 17.0			SM	Very dense brown silty coarse to fine SAND, little fine gravel (11-65)	-	10	5	20	45	20	-	-	-	-
					18.0 16.0		-FILL-										
							-ALLUVIAL DEPOSITS-										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (lin. ft.)	37.0
Rock Cored (lin. ft.)	20.0
Samples	13S,4C

Boring No. HA-3

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Toughness: L-Low, M-Medium, H-High; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (in.) is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-3
File No. 33637-000

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	100/3	S9 3	20.0 20.5		13.5 20.5	GP-GM	Very dense gray sandy fine GRAVEL, little silt, schist fragments (6-65)	-	45	10	15	20	10	-	-	-	-
		C1	20.5 25.5				-ALLUVIAL DEPOSITS-										
							Hard, highly weathered, gray and gray-green, medium grained, MANHATTAN SCHIST. Foliation moderate angle. Low angle joint, rough, undulating, discolored, open (boulder) REC = 17 in./28%; RQD = 17 in./28% Drill Rates (min/ft) = 2,3,1,0.5,0.5										
25					8.5		-WEATHERED BOULDER-										
	13 19 27 38	S10 14	25.5 27.5		25.5	SP-SM	Dense brown coarse to fine SAND, little silt, trace coarse gravel (7-65)	5	-	5	30	50	10	-	-	-	-
30	20 42 51 55	S11 14	30.0 32.0			SP	Very dense red-brown medium to fine SAND, little gravel, trace silt (7-65)	5	5	-	35	50	5	-	-	-	-
35					-1.0		-GLACIOFLUVIAL DEPOSITS-										
	20 35 48 100/5	S12 12	35.0 37.0		35.0	SM	Very dense brown to green silty medium to fine SAND, some coarse to fine gravel (6-65)	10	15	-	15	30	30	-	-	-	-
40	100/2	S13 2	40.0 40.2			SM	Similar to S13 (6-65)	10	15	-	15	30	30	-	-	-	-
							-DECOMPOSED BEDROCK-										
							SEE CORE BORING REPORT FOR ROCK DETAILS										
45																	

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-3

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CORE BORING REPORT

Boring No. HA-3
File No. 33637-000
Sheet No. 3 of 3

Depth (ft)	Drilling Rate Min./ft	Run No.	Depth (ft)	Recovery/RQD in.	Recovery/RQD %	Weathering	Well Diagram	Elev./Depth (ft)	Visual Description and Remarks
									SEE TEST BORING REPORT FOR OVERBURDEN DETAILS
		C2	42.0 47.0	60 57	100 95		NO WELL INSTALLED	-8.0 42.0	Hard, slightly weathered, gray, yellow and light brown, medium grained INWOOD MARBLE. Low angle joint set moderate, rough, undulating, discolored,open. High angle joint rough, planar, discolored, tight. Moderate angle joint rough, undulating, discolored, open (2-65)
45									
		C3	47.0 52.0	16 0	27 0				Medium hard, highly weathered brown and gray-green medium grained MANHATTAN SCHIST. Joints not apparent. Possible fault zone (3-65)
50									
		C4	52.0 57.0	57 74	95 57				Hard, slightly to moderately weathered, gray, green-gray and brown, medium grained MANHATTAN SCHIST. Foliation high angle. Low angle joint set very close to close, rough, undulating, discolored to decomposed, open. Moderate angle joint set moderate rough, undulating, discolored, open (2-65)
55									-BEDROCK-
								-23.0 57.0	Bottom of exploration at 57.0 ft

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-4

Project	Proposed Mixed Use Development New York, New York
Client	4566 Broadway LLC
Contractor	Craig Test Borings, Inc.

File No.	33637-000
Sheet No.	1 of 4
Start	September 29, 2006
Finish	September 29, 2006
Driller	D. Cook
H&A Rep.	M. Pascal
Elevation	32.00
Datum	Manhattan Highway
Location	See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HW	S	NX	Rig Make & Model: CME 75
Inside Diameter (in.)	4	1 3/8	2	Bit Type: Roller Bit
Hammer Weight (lb.)	140	140	-	Drill Mud: Bentonite
Hammer Fall (in.)	30	30	-	Casing: Driven to 20 ft
				Hoist/Hammer: Winch / Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0	15 19 14 15	S1 10	0.0 2.0	NO WELL INSTALLED		SM	Medium dense dark brown silty medium to fine SAND, little coarse gravel, with wood and glass fragments (11-65)	10	-	-	30	30	30	-	-	-	-
	8 7 5 4	S2 8	2.0 4.0			SM	Medium dense brown silty coarse to fine SAND, little coarse to fine gravel, with asphalt and wood fragments (11-65)	5	5	5	25	30	30	-	-	-	-
5	5 6 4 3	S3 6	4.0 6.0			SM	Loose brown and green silty medium to fine SAND, little coarse to fine gravel, with red-brick particles, slight organic odor (11-65)	5	10	-	15	30	40	-	-	-	-
	3 10 15 14	S4 6	6.0 8.0			SM	Medium dense brown silty coarse to fine SAND, coarse to fine gravel, with red-brick particles, rock shavings, slight odor (11-65)	10	10	10	20	20	30	-	-	-	-
	8 4 4 6	S5 12	8.0 10.0			SM	Loose brown silty medium to fine SAND, little fine gravel, with glass, strong petrochemical odor (11-65)	-	10	-	20	50	20	-	-	-	-
10	woh woh 1 1	S6 5	10.0 12.0			SM	Very loose brown medium to fine SAND, little silt, strong odor, wet (11-65)	-	-	-	20	65	15	-	-	-	-
					20.0 12.0		-FILL-										
15	3 4 3 2	S7 6	15.0 17.0			SP-SM	Loose brown medium to fine SAND, little silt, trace fine gravel, wet (8-65)	-	5	-	20	65	10	-	-	-	-
							-GLACIOFLUVIAL DEPOSITS-										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (lin. ft.)	55.0
Rock Cored (lin. ft.)	10.0
Samples	14S,2C

Boring No. HA-4

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Toughness: L-Low, M-Medium, H-High; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1] SPT = Sampler blows per 6 in. [2] Maximum particle size (in.) is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

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TEST BORING REPORT

Boring No. HA-4
File No. 33637-000
Sheet No. 2 of 4

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	2 3 3 3	S8 6	20.0 22.0			SM	Loose dark brown medium to fine SAND, little silt (8-65)	-	-	-	10	75	15	-	-	-	-
25	9 11 11 8	S9 12	25.0 27.0			SP-SM	Medium dense red-brown medium to fine SAND, little silt (8-65)	-	-	-	15	75	10	-	-	-	-
					4.5 27.5												
30	3 4 8 1	S10 12	30.0 32.0			SP-SM	-GLACIOFLUVIAL DEPOSITS- Medium dense varved red-brown medium to fine SAND and CLAY, little silt (7-65)	-	-	5	30	55	10	-	-	-	-
35	8 2 3 5	S11 12	35.0 37.0			SP-SM	Loose varved light brown coarse to fine SAND and CLAY, little silt (7-65)	-	-	10	15	65	10	-	-	-	-
							-GLACIOFLUVIAL DEPOSITS-										
40	7 10 13 15	S12	40.0 42.0		-8.0 40.0	ML	Medium dense yellow-brown SILT with some sand seams (10-65)	-	-	-	10	10	80	-	-	-	-
45	14 18 100/3	S13 12	45.0 47.0			SM	Very dense red-brown silty coarse to fine SAND, little coarse to fine gravel (6-65) -DECOMPOSED BEDROCK-	10	10	10	15	25	30	-	-	-	-

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-4

TEST BORING REPORT

HALEY & ALDRICH

Boring No. HA-4
File No. 33637-000
Sheet No. 3 of 4

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50	100/4	S14 4	50.0 50.3			SP-SM	Very dense brown coarse to fine SAND, little silt, little fine gravel (7-65)	-	10	5	15	60	10	-	-	-	-
							Note: Advanced roller bit to 55.0 ft and began coring										
55							-DECOMPOSED BEDROCK-										
							SEE CORE BORING REPORT FOR ROCK DETAILS										
60																	
65																	

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil Identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

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CORE BORING REPORT

Boring No. HA-4
File No. 33637-000

Depth (ft)	Drilling Rate Min./ft	Run No.	Depth (ft)	Recovery/RQD in.	Recovery/RQD %	Weath-ering	Well Dia-gram	Elev./ Depth (ft)	Visual Description and Remarks
									SEE TEST BORING REPORT FOR OVERBURDEN DETAILS
55	3.0	C1	55.0 60.0	11 11	18 18		NO WELL INSTALLED	-23.0 55.0	Medium to hard, highly weathered, gray and light brown medium grained INWOOD MARBLE. Low angle joint, rough, undulating, discolored, open (2-65)
	3.0								
	3.0								
	3.0								
	3.0								
60	3.0	C2	60.0 65.0	44 34	73 56				Medium to hard, moderately weathered, gray and light brown medium grained INWOOD MARBLE. Low angle joint set very close to moderate, rough, undulating, discolored, open. High angle joint set very close, rough, undulating, discolored, tight to open. Moderate angle joint rough, planar, discolored, open (2-65)
	2.0								
	2.0								
	2.0								
	2.0								-BEDROCK-
65								-33.0 65.0	Bottom of exploration at 65.0 ft

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-5

Project	Proposed Mixed Use Development New York, New York	File No.	33637-000
Client	4566 Broadway LLC	Sheet No.	1 of 3
Contractor	Craig Test Borings, Inc.	Start	September 29, 2006
		Finish	October 2, 2006
		Driller	D. Cook
		H&A Rep.	M. Pascal
		Elevation	31.00
		Datum	Manhattan Highway
		Location	See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HW	S	NX	Rig Make & Model: CME 75
Inside Diameter (in.)	4	1 3/8	2	Bit Type: Roller Bit
Hammer Weight (lb.)	140	140	-	Drill Mud: Polymer
Hammer Fall (in.)	30	30	-	Casing: Driven to 15 ft
				Hoist/Hammer: Winch / Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Toughness	Plasticity	Strength
0	8 10 8 12	S1 12	0.0 2.0	NO WELL INSTALLED		SM	Medium dense brown silty coarse to fine SAND, trace fine gravel, with red brick fragments (11-65)	-	5	5	20	30	40	-	-	-	-
	10 25 12 12	S2 8	2.0 4.0			SM	Dense brown silty coarse to fine SAND, little coarse to fine gravel with rock fragments (11-65)	10	10	5	20	20	35	-	-	-	-
5	7 7 6 8	S3 3	4.0 6.0			SM	Similar to S2, except medium dense, petrochemical odor (11-65)	5	10	10	20	25	30	-	-	-	-
	5 7 7 11	S4 12	6.0 8.0			SM	Medium dense dark brown silty coarse to fine SAND, trace fine gravel, with rock fragments (11-65)	-	5	10	30	25	30	-	-	-	-
	7 10 11 16	S5 12	8.0 10.0			SM	Medium dense brown silty coarse to fine SAND, little gravel, strong petrochemical odor, free product, moist (11-65)	10	10	10	20	20	30	-	-	-	-
10	9 11 10 10	S6 4	10.0 12.0			GM	Medium dense brown sandy coarse to fine GRAVEL, little silt, wet (11-65)	20	25	5	10	20	20	-	-	-	-
					19.0 12.0		-FILL-										
15	7 8 5 5	S7 8	15.0 17.0			SP-SM	Medium dense yellow-brown coarse to fine SAND, little silt, wet (8-65) Note: Advanced roller bit to 20.0 ft and began coring	-	-	5	10	75	10	-	-	-	-
							-GLACIOFLUVIAL DEPOSITS-										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

- Overburden (lin. ft.) 20.0
- Rock Cored (lin. ft.) 10.0
- Samples 8S,2C

Boring No. HA-5

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Toughness: L-Low, M-Medium, H-High; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (in.) is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-5
File No. 33637-000
Sheet No. 2 of 3

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20							-GLACIOFLUVIAL DEPOSITS-										
							SEE CORE BORING REPORT FOR ROCK DETAILS										
25																	
30																	

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-5

USCS_TB4 USCSLIB4.GLB USCS_TB5.GDT G:\33637 - 4566 BROADWAY\000\DATABASES\2005-1004-GINTS 33637000TB+C.GPJ Nov 10, 05

HALEY & ALDRICH

CORE BORING REPORT

Boring No. HA-5
File No. 33637-000

Depth (ft)	Drilling Rate Min./ft	Run No.	Depth (ft)	Recovery/RQD in.	Recovery/RQD %	Weath-ering	Well Dia-gram	Elev./Depth (ft)	Visual Description and Remarks
									SEE TEST BORING REPORT FOR OVERBURDEN DETAILS
20	6.0	C1	20.0 25.0	58 58	97 97		NO WELL INSTALLED	11.0 20.0	Hard, slightly weathered, gray and light brown, medium grained INWOOD MARBLE. Moderate angle joint set moderate, rough, undulating, discolored, open. Low angle joint, rough, undulating, discolored, open (2-65)
	4.0								
	5.0								
	4.0								
	4.0								
25	3.0	C2	25.0 30.0	58 45	97 75				Similar to C1, except low angle joint set close to moderate, rough, undulating, discolored, open. Moderate angle joint set moderate, rough, undulating, discolored, tight to open. Moderate angle joint rough, planar, discolored, open. High angle joint rough, undulating, discolored, open (2-65)
	3.0								
	4.0								
	4.0								
	3.0								-BEDROCK-
30								1.0 30.0	Bottom of exploration at 30.0 ft

H+A_CORE+WELL4 USCSLIB4.GLB USCS_TBS.GDT G:\33637 - 4568 BROADWAY\000\DATABASES\2006-1004-GINTS 3363700TB+C.GPJ Nov 10, 06

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-6(OW)

Project	Proposed Mixed Use Development New York, New York
Client	4566 Broadway LLC
Contractor	Craig Test Borings, Inc.

File No.	33637-000
Sheet No.	1 of 4
Start	October 4, 2006
Finish	October 4, 2006
Driller	D. Cook
H&A Rep.	M. Pascal
Elevation	30.40
Datum	Manhattan Highway
Location	See Plan

	Casing	Sampler	Barrel
Type	HW	S	NX
Inside Diameter (in.)	4	1 3/8	2
Hammer Weight (lb.)	140	140	-
Hammer Fall (in.)	30	30	-

Drilling Equipment and Procedures

Rig Make & Model: CME 75
Bit Type: Roller Bit
Drill Mud: Polymer
Casing: Driven to 20 ft
Hoist/Hammer: Winch / Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0	6 15 6 8	S1 12	0.0 2.0			SP	Medium dense brown medium to fine SAND, little coarse gravel, trace silt, with pockets of silty sand (11-65)	10	-	-	30	55	5	-	-	-	-
	5 4 3 15	S2 12	2.0 4.0			SM	Loose brown silty medium to fine SAND (11-65)	-	-	-	20	35	45	-	-	-	-
5	6 4 2 1	S3 3	4.0 6.0			SM	Similar to S2, moist (11-65)	-	-	-	25	30	45	-	-	-	-
	2 2 2 60	S4 2	6.0 8.0			SM	Similar to S2, with rock fragments in tip of spoon (11-65)	-	-	-	20	35	45	-	-	-	-
	4 7 6 8	S5 6	8.0 10.0			SM	Medium dense brown to gray silty coarse to fine SAND, some coarse to fine gravel, (gravel in tip wet) (11-65)	10	15	10	15	25	25	-	-	-	-
10	3 7 9 7	S6 2	10.0 12.0														
	6 4 3 4	S7 4	12.0 14.0			GP-GM	Medium dense gray sandy coarse to fine GRAVEL, strong petrochemical odor (11-65)	15	25	10	25	15	10	-	-	-	-
15	9 3 2 1	S8 12	15.0 17.0			SP-SM	Loose gray medium to fine SAND and SILT, strong odor (11-65)	-	-	-	20	70	10	-	-	-	-
					13.4 17.0		-FILL-										
							-GLACIOFLUVIAL DEPOSITS-										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
	See Observation Well Report				

Sample Identification

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (lin. ft.) 54.0
Rock Cored (lin. ft.) 10.0
Samples 14S,2C

Boring No. HA-6(OW)

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Toughness: L-Low, M-Medium, H-High; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1] SPT = Sampler blows per 6 in. [2] Maximum particle size (in.) is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

HALEY & ALDRICH

Boring No. HA-6(OW)
File No. 33637-000
Sheet No. 2 of 4

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	3 3 3 3	S9 12	20.0 22.0			SP-SM	Loose gray fine SAND, little silt (8-65)	-	-	-	20	70	10	-	-	-	-
25	6 9 9 10	S10 12	25.0 27.0			SP-SM	Medium dense red-brown coarse to fine SAND, little silt, with pockets of silty sand (7-65)	-	-	30	40	20	10	-	-	-	-
30	5 7 8 7	S11 12	30.0 32.0			ML	Medium dense red-brown SILT (10-65)	-	-	-	-	25	75	-	-	-	-
35	1 1 5 5	S12 12	35.0 37.0			ML	Loose light brown red-brown SILT (10-65)	-	-	-	-	25	75	-	-	-	-
40	3 2 5 5	S13 13	40.0 42.0			ML	Medium stiff varved clayey SILT and fine sand (10-65)	-	-	-	10	20	70	-	-	-	-
					-14.6		-GLACIOFLUVIAL DEPOSITS-										
45	13 20 15 13	S14 10	45.0 47.0		45.0	SM	Dense brown to gray silty coarse to fine SAND, little fine gravel (7-65)	-	10	10	25	35	20	-	-	-	-
							-DECOMPOSED BEDROCK-										

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-6(OW)

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-6(OW)
File No. 33637-000
Sheet No. 3 of 4

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50	28 100/5	S15 9	50.0 51.0			SM	Very dense brown to gray silty coarse to fine SAND, little fine gravel (7-65)	-	10	10	25	35	20	-	-	-	-
							-DECOMPOSED BEDROCK-										
55							SEE CORE BORING REPORT FOR ROCK DETAILS										
60																	

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-6(OW)

USCS_TB4 USCSLIB4.GLB USCS_TB5.GDT G:\33637 - 4566 BROADWAY\000\DATABASES\2005-1004-GINT\5 33637000TB+C.GPJ Nov 10, 05

HALEY & ALDRICH

CORE BORING REPORT

Boring No. HA-6(OW)
File No. 33637-000
Sheet No. 4 of 4

Depth (ft)	Drilling Rate Min./ft	Run No.	Depth (ft)	Recovery/RQD In.	Recovery/RQD %	Weathering	Well Diagram	Elev./ Depth (ft)	Visual Description and Remarks
									SEE TEST BORING REPORT FOR OVERBURDEN DETAILS
	4.0	C1	54.0 59.0	58 58	97 97			-23.6 54.0	Hard, slightly weathered, gray, gray-green and light brown, medium to coarse grained MANHATTAN SCHIST. Foliation is high angle. Low angle joint set, moderate to wide, rough, undulating, discolored, open. Moderate angle joint, rough, undulating, discolored,open. Second moderate angle joint is rough, undulating, discolored, open (1-65) Note: Installed observation well in completed borehole. Refer to Groundwater Observation Well Installation Report for details
55	4.0								
	4.0								
	4.0								
	4.0								
	4.0	C2	59.0 64.0	60 47	100 78				Similar to C1 (1-65)
60	4.0								
	4.0								
	3.0								
	3.0							-33.6 64.0	-BEDROCK- Bottom of exploration at 64.0 ft
									Note: Installed observation well in compelted borehole. Refer to Groundwater Observation Well Installation Report for details

H+A_CORE+WELL4 USCSLIB4.GLB USCS_TB5.GDT G:\33637 - 4566 BROADWAY\000\DATABASES\2006-1004-GINT5 33637000TB+C.GPJ Nov 10, 06

TEST BORING REPORT

HALEY & ALDRICH

Boring No. HA-7

Project	Proposed Mixed Use Development New York, New York
Client	4566 Broadway LLC
Contractor	Craig Test Borings, Inc.

File No.	33637-000
Sheet No.	1 of 3
Start	October 12, 2006
Finish	October 12, 2006
Driller	D. Cook
H&A Rep.	A. Granger
Elevation	34.00
Datum	Manhattan Highway
Location	See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HW	S	NX	Rig Make & Model: CME 75
Inside Diameter (in.)	4	1 3/8	2	Bit Type: Roller Bit
Hammer Weight (lb.)	140	140	-	Drill Mud: Bentonite
Hammer Fall (in.)	30	30	-	Casing: Driven to 15 ft
				Hoist/Hammer: Winch / Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0	65 45 6 14	S1 12	0.0 2.0	NO WELL INSTALLED		SM	Very dense brown and gray silty coarse to fine SAND, little cores to fine gravel, with concrete fragments (11-65)	5	10	5	20	30	30	-	-	-	-
	8 6 1 3	S2 4	2.0 4.0			SM	Loose brown and gray silty coarse to fine SAND, trace fine gravel (11-65)	-	5	10	20	35	30	-	-	-	-
5	23 4 3 30	S3 6	4.0 6.0			SM	Loose brown and gray silty coarse to fine SAND, little coarse to fine gravel, with concrete fragments (11-65)	5	5	5	20	40	25	-	-	-	-
	11 4 3 3	S4 10	6.0 8.0			SM	Loose dark brown and brown silty coarse to fine SAND, trace vine gravel, with brick fragments, wet (11-65)	-	5	15	15	35	30	-	-	-	-
	3 2 2 3	S5 12	8.0 10.0			SM	Very loose brown silty coarse to fine SAND, with glass particles (11-65)	-	-	5	15	35	45	-	-	-	-
10	1 2 100/4	S6 4	10.0 11.3			SM	Very dense brown silty coarse to fine SAND, trace coarse gravel (11-65) Note: Refusal at 11.3 ft. Advanced roller bit through boulder from 11.3 to 14.0 ft -FILL-	5	-	5	20	30	40	-	-	-	-
15	28 64 100/5	S7 15	14.0 15.4		20.0 14.0	SP-SM	Very dense tan, light brown and red-brown medium to fine SAND, little silt, trace fine gravel (7-65) (possible weathered rock)	-	5	-	30	55	10	-	-	-	-
	~~100/3~~	~~S8~~ 3	~~16.0~~ 16.3			SM	Very dense tan to brown coarse to fine SAND, little silt (7-65) -DECOMPOSED BEDROCK-	-	-	15	40	30	15	-	-	-	-
					15.0												

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (lin. ft.)	20.0
Rock Cored (lin. ft.)	10.0
Samples	8S,2C

Boring No. HA-7

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (in.) is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-7
File No. 33637-000
Sheet No. 2 of 3

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
					19.0		-DECOMPOSED BEDROCK-										
20							SEE CORE BORING REPORT FOR ROCK DETAILS										
25																	
30																	

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.
NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-7

HALEY & ALDRICH

CORE BORING REPORT

Boring No. HA-7
File No. 33637-000

Depth (ft)	Drilling Rate Min./ft	Run No.	Depth (ft)	Recovery/RQD in.	Recovery/RQD %	Weathering	Well Diagram	Elev./Depth (ft)	Visual Description and Remarks
20									SEE TEST BORING REPORT FOR OVERBURDEN DETAILS
	3.0 2.0 1.0 1.5 1.0	C1	20.0 25.0	45 30	75 50		NO WELL INSTALLED	14.0 20.0	Soft to medium, slightly to moderately weathered, light brown to gray, medium grained INWOOD MARBLE. Moderate angle joint set moderate, rough, planar, discolored to decomposed, open. Moderate angle joint rough undulating, discolored, tight. low angle joint set close to moderate, rough, undulating, discolored, open (4-65)
25	2.0 1.0 1.0 1.5 1.0	C2	25.0 30.0	59 43	98 72				Medium, slightly weathered, gray and light brown, medium grained INWOOD MARBLE. High angle joint set, very close, rough, undulating, discolored, tight to open. Moderate angle joint set, moderate, rough, planar, discolored, right to open., Low angle joint set, moderate, rough, undulating, discolored, open (3-65)
									-BEDROCK-
30								4.0 30.0	Bottom of exploration at 30.0 ft

H+A_CORE+WELL4 USCSLIB4.GLB USCS_TBS.GDT G:\33637 - 4566 BROADWAY\000\DATABASES\2008-1004-GINTS 33637000TB+C.GPJ Nov 10, 08

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-8

Project	Proposed Mixed Use Development New York, New York
Client	4566 Broadway LLC
Contractor	Craig Test Borings, Inc.

File No.	33637-000
Sheet No.	1 of 4
Start	October 13, 2006
Finish	October 16, 2006
Driller	D. Cook
H&A Rep.	A. Granger
Elevation	32.80
Datum	Manhattan Highway
Location	See Plan

	Casing	Sampler	Barrel
Type	HW	S	NX
Inside Diameter (in.)	4	1 3/8	2
Hammer Weight (lb.)	140	140	-
Hammer Fall (in.)	30	30	-

Drilling Equipment and Procedures

- Rig Make & Model: CME 75
- Bit Type: Roller Bit
- Drill Mud: Bentonite
- Casing: Driven to 15 ft
- Hoist/Hammer: Winch / Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0	12 13 14 12	S1 7	0.0 2.0	NO WELL INSTALLED		SM	Medium dense brown and gray silty coarse to fine SANd, trace fine gravel, with concrete fragments (11-65)	5	-	10	20	35	30	-	-	-	-
	17 14 13 11	S2 8	2.0 4.0			GM	Medium dense gray and brown silty coarse to fine GRAVEL, some coarse to fine sand, with concrete fragments (11-65)	30	10	10	10	15	25	-	-	-	-
5	6 3 4 3	S3 7	4.0 6.0			SM	Loose brown and gray, silty coarse to fine SAND, little coarse to fine gravel, with concrete fragments (11-65)	5	10	10	20	25	30	-	-	-	-
	26 94 19 6	S4 2	6.0 8.0			SM	Very dense brown coarse to fine SAND, little coarse to fine gravel (11-65)	5	5	15	20	40	15	-	-	-	-
	8 11 16 14	S5 4	8.0 10.0			SM	Medium dense brown silty coarse to fine SAND, little fine gravel, dry to moist (11-65)	-	10	5	15	50	20	-	-	-	-
10	2 1 2 1	S6 9	10.0 12.0			SM	Very loose dark brown silty coarse to fine SANd, trace fine gravel, with brick fragments, wet (11-65)	-	5	15	15	30	35	-	-	-	-
	2 1 1 1	S7 0	12.0 14.0				No recovery										
15	3 3 4 3	S8 1	14.0 16.0			SM	Loose dark brown silty coarse to fine SAND, some coarse gravel (11-65)	30	-	10	10	20	30	-	-	-	-
	3 4 4 4	S9 20	16.0 18.0			SM	Loose dark brown to brown silty coarse to fine SAND, little coarse to fine gravel (11-65)	5	10	5	10	30	40	-	-	-	

-FILL-

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (lin. ft.)	50.0
Rock Cored (lin. ft.)	10.0
Samples	15S,2C

Boring No. HA-8

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Toughness: L-Low, M-Medium, H-High; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (in.) is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

USCS_TB4 USCSLIB4.GLB USCS_TBS.GDT G:\33637 - 4566 BROADWAY\000\DATABASES\2006-1004-GINT5 33637000TB4-C.GPJ Nov 10, 06

TEST BORING REPORT

HALEY & ALDRICH

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	woh/18 2	S10 17	20.0 22.0			SM	Very loose dark brown to black silty medium to fine SAND, high organic odor (11-65)	-	-	-	10	65	25	-	-	-	-
					9.8 23.0		-FILL-										
25	6 7 8 10	S11 10	25.0 27.0			SM	Medium dense brown silty coarse to fine SAND with 1/4 in. silt seam (7-65)	-	-	5	10	55	30	-	-	-	-
30	4 6 5 6	S12 14	30.0 32.0			SM	Medium dense brown coarse to fine SAND (7-65)	-	-	15	25	40	20	-	-	-	-
35	5 6 6 5	S13 20	35.0 37.0			SM	Similar to S12 with 1/2 in. red-brown silt seam (7-65)	-	-	10	25	40	25	-	-	-	-
40	8 10 18 44	S14 18	40.0 42.0			SM	Medium dense brown silty coarse to fine SAND with mica fragments (7-65)	-	-	5	15	50	30	-	-	-	-
					-10.2 43.0		-GLACIOFLUVIAL DEPOSITS-										
45	13 14 8 8	S15 8	45.0 47.0			SM	Medium dense brown silty coarse to fine SAND, little coarse to fine gravel (7-65)	5	5	10	25	35	20	-	-	-	-
							-DECOMPOSED BEDROCK-										

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
					-15.2 48.0		-DECOMPOSED BEDROCK-										
50							SEE CORE BORING REPORT FOR ROCK DETAILS										
55																	
60																	

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

CORE BORING REPORT

Depth (ft)	Drilling Rate Min./ft	Run No.	Depth (ft)	Recovery/RQD in.	Recovery/RQD %	Weath-ering	Well Dia-gram	Elev./Depth (ft)	Visual Description and Remarks
50									SEE TEST BORING REPORT FOR OVERBURDEN DETAILS
	2.5	C1	50.0 55.0	56 56	93 93				Hard, slightly weathered, gray, gray-green and light brown medium to coarse grained MANHATTAN SCHIST. Foliation moderate angle along joint plane. Moderate angle joint set close to wide, rough, undulating, discolored to decomposed, tight to open (1-65)
	3.5								
	6.0								
	4.5								
	4.0								
55	3.5	C2	55.0 60.0	60 47	100 78				Similar to C1. Low angle joint set close to wide, rough, undulating, discolored, open. High angle joint set very close, rough, undulating, discolored, tight. moderate angle joint set. Moderate, rough, undulating, discolored to decomposed, open (1-65)
	6.5								
	5.5								
	5.0								
	4.5								
60							NO WELL INSTALLED	-27.2 60.0	-BEDROCK- Bottom of exploration at 60.0 ft

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-9

Project	Proposed Mixed Use Development New York, New York
Client	4566 Broadway LLC
Contractor	Craig Test Borings, Inc.

File No.	33637-000
Sheet No.	1 of 4
Start	October 12, 2006
Finish	October 13, 2006
Driller	D. Cook
H&A Rep.	A. Granger
Elevation	30.90
Datum	Manhattan Highway
Location	See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HW	S	NX	Rig Make & Model: CME 75
Inside Diameter (in.)	4	1 3/8	2	Bit Type: Roller Bit
Hammer Weight (lb.)	140	140	-	Drill Mud: Bentonite
Hammer Fall (in.)	30	30	-	Casing: Driven to 20 ft
				Hoist/Hammer: Winch / Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0	35 28 62 100/3	S1 9	0.0 1.8	NO WELL INSTALLED		SM	Very dense brown and gray, silty coarse to fine SAND, little coarse to fine gravel, with brick particles and concrete fragments (11-65)	5	5	20	15	25	30	-	-	-	-
							Note: Advanced roller bit through concrete from 1.75 to 5.0 ft										
5	5 7 3 4	S2 8	5.0 7.0			SM	Loose brown silty coarse to fine SAND, little coarse to fine gravel, with concrete fragments (11-65)	5	10	15	20	25	25	-	-	-	-
	5 6 3 3	S3 4	7.0 9.0			SM	Loose light brown coarse to fine SAND, little silt, trace fine gravel, with brick and concrete fragments, wet (11-65)	-	5	30	20	30	15	-	-	-	-
10	2 4 4 3	S4 3	9.0 11.0			SM	Similar to S3, except little coarse to fine gravel (11-65)	10	5	25	20	25	15	-	-	-	-
	6 7 9 13	S5 4	11.0 13.0			GM	Medium dense dark brown sandy coarse to fine GRAVEL, little silt (11-65)	50	10	-	5	20	15	-	-	-	-
							Note: Coarse gravel/rock fragments are mica schist and marble										
	4 14 25 5	S6 3	13.0 15.0			SM	Dense dark brown silty coarse to fine SAND, some coarse to fine gravel, with brick fragments (11-65)	20	10	5	15	30	20	-	-	-	-
15	2 2 1 2	S7 3	15.0 17.0			SM	Very loose dark brown to black silty coarse to fine SAND, little coarse to fine gravel (11-65)	10	5	15	20	30	20	-	-	-	-
					13.9		-FILL-										
	1 2 1 1	S8 10	17.0 19.0		17.0	SM	Very loose dark brown to brown silty coarse to fine SAND, trace fine gravel (7-65)	-	5	10	20	25	40	-	-	-	-
							-ALLUVIAL DEPOSITS-										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (lin. ft.)	70.0
Rock Cored (lin. ft.)	10.0
Samples	17S,2C

Boring No. HA-9

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Toughness: L-Low, M-Medium, H-High; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1] SPT = Sampler blows per 6 in. [2] Maximum particle size (in.) is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20					10.9		-ALLUVIAL DEPOSITS-										
	100/1	S9 0	20.0 20.1		20.0		No recovery Note: Advanced roller bit through boulder from 20.1 to 24.0 ft										
					6.9 24.0												
25	5 31 100/5	S10 12	25.0 26.4			SM	Very dense gray and brown silty coarse to fine SAND (7-65) Note: Drill action indicates gravel and/or cobbles	-	-	20	25	30	25	-	-	-	-
30	10 21 25 26	S11 17	30.0 32.0			SM	Dense brown and red-brown silty medium to fine SAND (8-65)	-	-	-	15	50	35	-	-	-	-
35	5 7 9 12	S12 20	35.0 37.0			SM	Medium dense yellow-brown silty medium to fine SAND (8-65)	-	-	-	5	75	20	-	-	-	-
40	7 24 20 21	S13 12	40.0 42.0			SM	Dense yellow-brown to gray-green silty coarse to fine SAND (8-65)	-	-	5	5	70	20	-	-	-	-
45	37 42 52 57	S14 22	45.0 47.0			SM	Similar to S13, except very dense (8-65)	-	-	5	5	70	20	-	-	-	-
							-DECOMPOSED BEDROCK-										

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-9
File No. 33637-000

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50	22 23 20 16	S15 14	50.0 52.0			SM	Dense dark brown, red-brown and gray-green silty medium to fine SAND (8-65)	-	-	-	5	65	30	-	-	-	-
55	7 13 18 20	S16 19	55.0 57.0			SM	Similar to S15 (8-65)	-	-	-	10	60	30	-	-	-	-
60	35 47 60 62	S17 20	60.0 62.0			SM	Very dense red-brown, gray-green and white (quartz) silty coarse to fine SAND, trace fine gravel (7-65)	-	5	10	15	45	25	-	-	-	-
65					-35.1 66.0		-DECOMPOSED BEDROCK- Note: Advanced roller bit to 70.0 ft and began coring										
70							SEE CORE BORING REPORT FOR ROCK DETAILS										
75																	

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-9

HALEY & ALDRICH

CORE BORING REPORT

Boring No. HA-9
File No. 33637-000

Depth (ft)	Drilling Rate Min./ft	Run No.	Depth (ft)	Recovery/RQD In.	Recovery/RQD %	Weathering	Well Diagram	Elev./ Depth (ft)	Visual Description and Remarks
70									SEE TEST BORING REPORT FOR OVERBURDEN DETAILS
	5.0	C1	70.0 75.0	58 50	97 83			-39.1 70.0	Hard, slightly weathered, gray, gray-green and light brown medium to coarse grained MANHATTAN SCHIST. Foliation is high angle. Moderately dipping joint, rough, undulating, discolored, tight. Second moderately dipping joint rough, undulating, discolored, tight. Low angle joint set, moderate to wide rough, undulating, discolored open (1-65)
	4.5								
	5.5								
	5.0								
	5.0								
75	6.0	C2	75.0 80.0	60 58	100 97				Similar to C1. Low angle joint set very close to wide, rough, undulating, discolored, open (1-65)
	5.5								
	5.0								
	5.5								
	5.0						NO WELL INSTALLED		
80								-49.1 80.0	-BEDROCK-
									Bottom of exploration at 80.0 ft

APPENDIX B

Observation Well Installation and Monitoring Reports

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No.	HA-1(OW)
Boring No.	HA-1(OW)

PROJECT	Proposed Mixed Use Development	H&A FILE NO.	33637-000
LOCATION	New York, NY	PROJECT MGR.	T. Crowl
CLIENT	4566 Broadway, LLC	FIELD REP.	A. Granger
CONTRACTOR	Craig Test Boring Co. Inc	DATE INSTALLED	10/16/2006
DRILLER	Dave Cook	WATER LEVEL	10.03

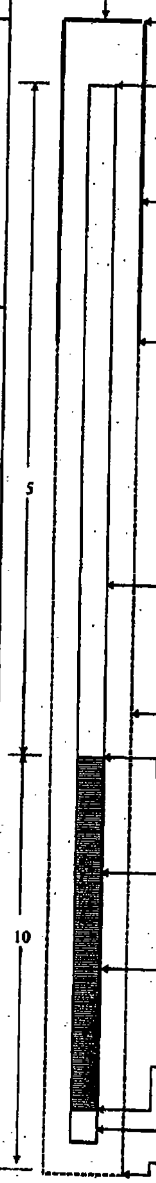
Ground El. 34.3 ft
El. Datum Manhattan Highway

Location NE corner of parking lot

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
	G.S
No samples collected	Concrete
	2.0
	Filter Sand
	3.0
	Bentonite Pellets
	4.0
	Filter Sand
	15

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock	Roadway Box	
Height/Depth of top of guard pipe/roadway box above/below ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.25	ft
Type of protective casing:	Steel Roadway Box	
Length	0.5	ft
Inside Diameter	6.0	in
Depth of bottom of guard pipe/roadway box	0.5	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	2.0
Bentonite Pellets	3.0	1.0

Type of riser pipe:	Sch 40 PVC Solid Riser	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	# 1 Filter Sand & Bentonite Pellets	
Diameter of borehole	8.0	in
Depth to top of well screen	5.0	ft
Type of screen	Sch 40 PVC Well Screen	
Screen gauge or size of openings	0.010	in
Diameter of screen	2.0	in
Type of backfill around screen	#1 Filter Sand	
Depth of bottom of well screen	15.0	ft
Bottom of Silt trap	-	ft
Depth of bottom of borehole	15.0	ft

(Not to Scale)

5 ft + 10 ft + - ft = 15 ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

GROUNDWATER MONITORING REPORT

OW/PZ NUMBER: HA-1(OW)

Page 1 of 1

PROJECT: Proposed Mixed Use Development
LOCATION: New York, NY
CLIENT: 4566 Broadway, LLC
CONTRACTOR: Craig Test Boring Co., Inc.
ELEVATION OF REFERENCE POINT: 34.0
DESCRIPTION OF REFERENCE POINT: ☐ PVC ☑ Roadway / Casing ☐ Ground Surface ☐ Other:

H&A FILE NO.: 33637-000
PROJECT MGR.: T. Crowl
FIELD REP.: A. Granger
DATE: 10/16/2006

Date	Time	Elapsed Time (days)	Depth to Water from Reference Point	Elevation of Water	Remarks	Read By
10/16/2006	8:45	--	10.7	23.3	Initial Reading	AG
10/16/2006	12:00	--	10.0	24.0		AG

Form #3170

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No.	HA-2(OW)
Boring No.	HA-2(OW)

PROJECT	Proposed Mixed Use Development	H&A FILE NO.	33637-000
LOCATION	New York, NY	PROJECT MGR.	T. Crowl
CLIENT	4566 Broadway, LLC	FIELD REP.	M. Pascal
CONTRACTOR	Craig Test Boring Co. Inc	DATE INSTALLED	10/3/2006
DRILLER	Dave Cook	WATER LEVEL	

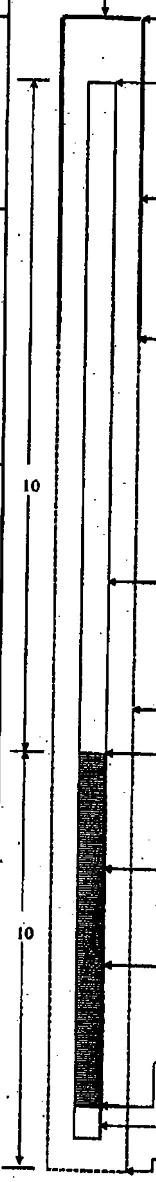
Ground El. 32.6 ft
El. Datum Manhattan Highway

Location SW corner of parking lot

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
	G.S
	Concrete
	1.0
See Log For Details	
	4.0
	Bentonite Pellets
	5.0
	Filter Sand
	20

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	Roadway Box
Height/Depth of top of guard pipe/roadway box above/below ground surface	0.0 ft
Depth of top of riser pipe below ground surface	0.25 ft
Type of protective casing:	Steel Roadway Box
Length	0.5 ft
Inside Diameter	6.0 in
Depth of bottom of roadway box	0.5 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0	1.0
Bentonite Pellets	4.0	1.0

Type of riser pipe:	Sch 40 PVC Solid Riser
Inside diameter of riser pipe	2.0 in
Type of backfill around riser	#1 Filter Sand & Bentonite Pellets
Diameter of borehole	4.0 in
Depth to top of well screen	10.0 ft
Type of screen	Sch 40 PVC Well Screen
Screen gauge or size of openings	0.010 in
Diameter of screen	2.0 in
Type of backfill around screen	# 1 Filter Sand
Depth of bottom of well screen	20.0 ft
Bottom of Silt trap	- ft
Depth of bottom of borehole	20.0 ft

10 ft + 10 ft + - ft = 20 ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

GROUNDWATER MONITORING REPORT

OW/PZ NUMBER: **HA-2(OW)**

Page 1 of 1

PROJECT Proposed Mixed Use Development
LOCATION New York, NY
CLIENT 4566 Broadway, LLC
CONTRACTOR Craig Test Boring Co., Inc.
ELEVATION OF REFERENCE POINT 32.4
DESCRIPTION OF REFERENCE POINT ☐ PVC ☑ Roadway / Casing ☐ Ground Surface ☐ Other:

H&A FILE NO. 33637-000
PROJECT MGR. T. Crowl
FIELD REP. A. Granger
DATE 10/13/2006

Date	Time	Elapsed Time (days)	Depth to Water from Reference Point	Elevation of Water	Remarks	Read By
10/13/2006	13:55	10	8.0	24.4		AG
10/16/2006	12:08	13	8.1	24.3		AG

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No. HA-6(OW)
Boring No. HA-6(OW)

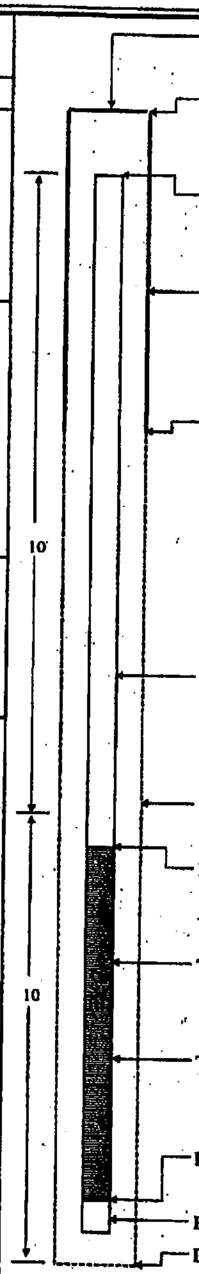
PROJECT	Proposed Mixed Use Development	H&A FILE NO.	33637-000
LOCATION	New York, NY	PROJECT MGR.	T. Crowl
CLIENT	4566 Broadway, LLC	FIELD REP.	M. Pascal
CONTRACTOR	Craig Test Boring Co. Inc	DATE INSTALLED	10/4/2006
DRILLER	Dave Cook	WATER LEVEL	

Ground El. 30.4 ft
El. Datum Manahattan Highway
Location SE corner of parling lot

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
See Log For Details	G.S
	Concrete
	1.0
	4.0
	Bentonite Pellets
	5.0
	Filter Sand
	20

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock	Roadway Box
Height/Depth of top of guard pipe/roadway box above/below ground surface	0.0 ft
Depth of top of riser pipe below ground surface	0.2 ft
Type of protective casing:	Steel Roadway Box
Length	0.5 ft
Inside Diameter	6.0 in
Depth of bottom of guard pipe/roadway box	0.5 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0	1.0
Bentonite Pellets	4.0	1.0

Type of riser pipe:	Sch 40 PVC Solid Riser
Inside diameter of riser pipe	2.0 in
Type of backfill around riser	# 1 Filter Sand & Bentonite Pellets
Diameter of borehole	4.0 in
Depth to top of well screen	10.0 ft
Type of screen	Sch 40 PVC Well Screen
Screen gauge or size of openings	0.010 in
Diameter of screen	2.0 in
Type of backfill around screen	# 1 Filter Sand
Depth of bottom of well screen	20.0 ft
Bottom of Silt trap	- ft
Depth of bottom of borehole	20.0 ft

(Not to Scale)

10 ft (Riser Pay Length (L1)) + 10 ft (Length of screen (L2)) + - ft (Length of silt trap (L3)) = 20 ft (Pay length)

COMMENTS:

Form # 3010

HALEY & ALDRICH

GROUNDWATER MONITORING REPORT

OW/PZ NUMBER: HA-6(OW)

PROJECT: Proposed Mixed Use Development
LOCATION: New York, NY
CLIENT: 4566 Broadway, LLC
CONTRACTOR: Craig Test Boring Co., Inc.
ELEVATION OF REFERENCE POINT: 30.2
DESCRIPTION OF REFERENCE POINT: ☐ PVC ☑ Roadway / Casing ☐ Ground Surface ☐ Other:

H&A FILE NO.: 33637-000
PROJECT MGR.: T. Crowl
FIELD REP.: A. Granger
DATE: 10/12/2006

Date	Time	Elapsed Time (days)	Depth to Water from Reference Point	Elevation of Water	Remarks	Read By
10/12/2006	7:10	8	8.2	22.0		AG
10/13/2006	13:50	9	8.2	22.0		AG
10/16/2006	12:05	10	8.2	22.0		AG

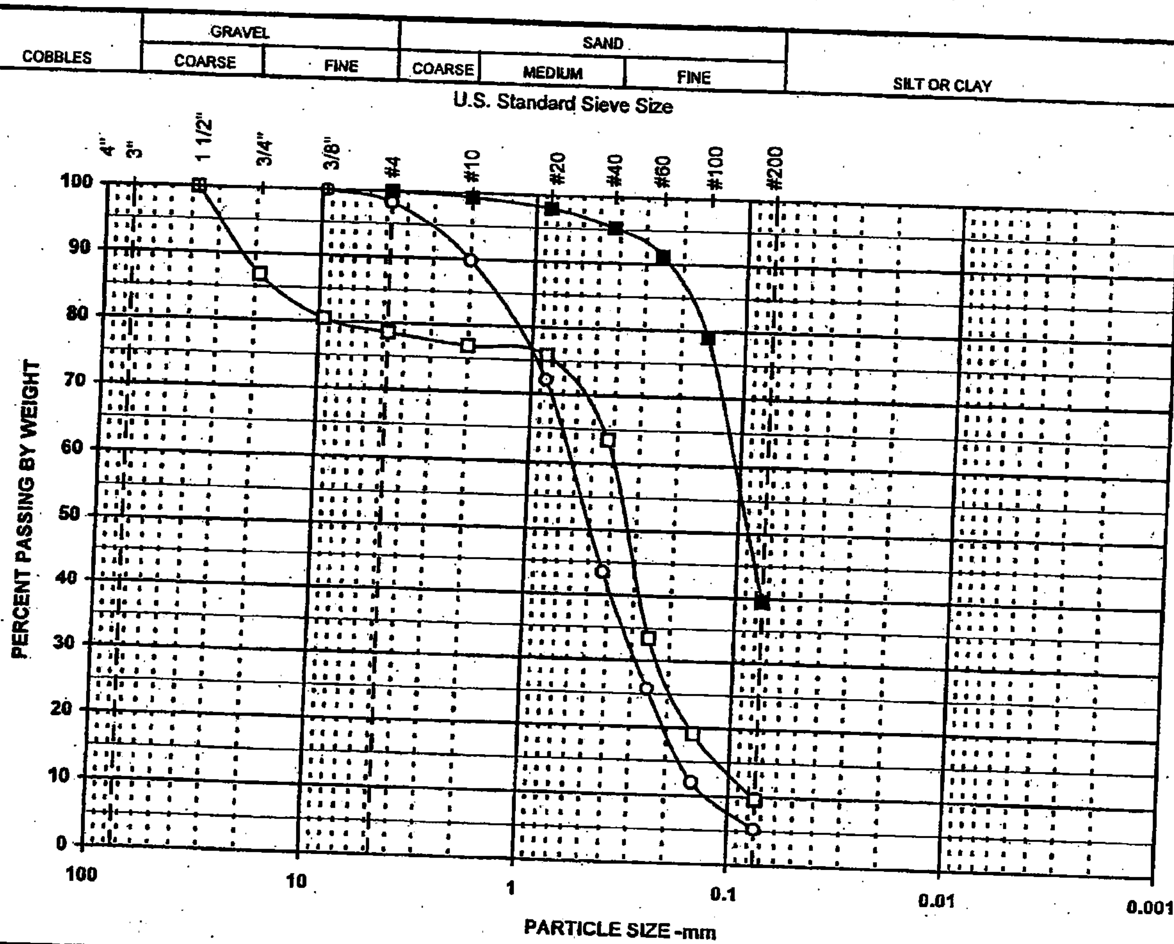
APPENDIX C

Laboratory Test Results

H&A #333637
Proposed Mixed Use
LABORATORY TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS			REMARKS
			WATER CONTENT (%)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	
HA-3	S-11	30-32	9.4	SP-SM	9.7	
HA-4	S-8	20-22	28.9	SM	39.6	
HA-8	S-12	30-32	20.0	SP-SM	5.4	

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



SYMBOL	DESCRIPTION AND REMARKS
□	brown c-f SAND, some gravel, trace silt.
■	gray silty f. SAND, trace m. sand.
○	brown c-f SAND, trace f. gravel, silt.

Symbol	□	■	○
Boring	HA-3	HA-4	HA-8
Sample	S-11	S-8	S-12
Spec			
Depth	30-32	20-22	30-32
% +3"			
% Gravel	21.4		1.7
% SAND	68.9	60.4	92.9
% FINES	9.7	39.6	5.4
% -2μ			
Cc	1.6		1.0
Cu	5.2		5.3
LL			
PL			
PI			
USCS	SP-SM	SM	SP-SM
w (%)	9.4	28.9	20.0

Particle Size (Sieve #)	PERCENT FINER □	■	○
4"			
3"			
1 1/2"	100.0		
3/4"	86.8		
3/8"	80.5		100.0
4	78.6	100.0	98.3
10	77.0	99.4	89.8
20	75.8	97.9	72.2
40	63.5	95.2	43.6
60	33.4	91.2	25.8
100	19.1	79.2	12.1
200	9.7	39.6	5.4

PARTICLE SIZE DISTRIBUTION
H&A #33637- Proposed Mixed Use

Project No.		
31737788-31	November 2006	Figure

Geotesting Services, Inc.

siev1a.xls 11/10/2006

APPENDIX D

Haley & Aldrich Preliminary Geotechnical Assessment Letter, dated 31 October 2006

Haley & Aldrich of New York
62 William St
3rd Floor
New York, NY 10005 1520

Tel: 212 785 8200
Fax: 212 [illegible]44 [illegible]301
HaleyAldrich.com

HALEY & ALDRICH

31 October 2006
File No. 33637-000

4566 Broadway LLC
c/o LargaVista Companies
364 Maspeth Avenue
Brooklyn, New York 11211

Attention: Mr. Adam Good
Executive Vice President

Subject: Preliminary Geotechnical Assessment
Proposed Mixed Use Development
4566 Broadway
Manhattan, New York

Ladies and Gentlemen:

This letter summarizes the results of our preliminary geotechnical assessment of the subject site, and includes estimated foundation construction costs for the planned development. This assessment is based on the recently completed test boring program at the site. The information herein was discussed during conference calls with the project team on 18 and 30 October 2006.

EXISTING CONDITIONS

The site is a triangular parcel of land located at the intersection of Broadway and Nagle Avenue. An existing 6-story residential building abuts the north side of the site. This existing building is reported to have a one-level basement.

The site is currently an active, at-grade parking lot. Historically, the site was occupied by a gas station, including associated underground storage tanks. Grades vary slightly across the site, generally sloping a few feet from east to west.

PROPOSED CONSTRUCTION

The site is slated to be re-developed into a mixed use style development. The building, which is planned to occupy the entire footprint of the parcel, will consist of a 15-story tower at the approximate center of the site and a 5-story low rise extending from the central tower to the perimeter of the site. The building will be of steel frame construction with column loads ranging from about 325 kips to 550 kips in the tower, and up to 200 kips in the low rise.

A one-level basement is planned over the full building footprint (i.e., roughly 15,500 s.f.). Finished floor will be approximately 10 ft below existing site grade (i.e., excavation to construct the basement will extend about 15 ft below existing grade at the deepest point).

SUBSURFACE CONDITIONS

Haley & Aldrich conducted a subsurface exploration program at the subject site to obtain information on soils, bedrock, and groundwater levels for building foundation design. The program consisted of 9 test borings drilled to depths ranging from 30 to 105 ft. Bedrock was cored in each boring, where applicable. The test borings were drilled by Craig Test Borings, Inc. during the period 29 September through 16 October 2006.

Subsurface conditions typically consisted of 12 to 23 ft of FILL soil over about 8 to 28 ft of loose to dense medium to fine SAND with varying amounts of silt and coarse sand over bedrock. Glacial Till was occasionally present over bedrock. Some boulders were encountered in the Glacial Till.

The type and condition of and depth to the bedrock varied significantly across the site. Bedrock varied from INWOOD MARBLE in the general southern third of the site to MANHATTAN SCHIST over the northern two-thirds and east end of the site. Depth to geologic bedrock ranged from about 14 ft near the Nagle Avenue and Broadway intersection to about 45 ft near the northeast corner of the site. The degree of weathering of the bedrock surface was highly variable. For example, one boring along the Broadway side of the site contained in excess of 66 ft of decomposed rock (i.e., bedrock suitable for end bearing pile foundations was not encountered within 105 ft of ground surface at this location).

Observation wells were installed in three completed test borings (one at each approximate corner of the site). Depths to water measured over the duration of the drilling program ranged from about 8 to 10 ft below ground surface.

PRELIMINARY GEOTECHNICAL ASSESSMENT

Site and subsurface conditions that are anticipated to impact foundation design and construction and result in premium costs include the following:

- Thick existing fill soils that in their current state are not suitable for foundation support;
- Contamination in the fill and groundwater;
- Sand deposits with varying silt content and localized loose zones below the groundwater;
- Periodic boulders in the Glacial Till, and hard layers within the decomposed bedrock;
- Highly variable condition of the bedrock surface (i.e., thick zones of weathered bedrock overlying "sound" bedrock, where "sound" bedrock is generally described as bedrock suitable for end-bearing support of foundation piles);
- Highly variable depth to "sound" bedrock for support of end bearing foundation piles (i.e., ranges from about 19 ft to in excess of 105 ft);
- Variable thickness layers of compressible soils and weathered bedrock; and

- Proximity of the adjacent building to the site (i.e., this building is located on the property line in some areas).

Based on these conditions, we anticipate that premium costs will be incurred relative to the following geotechnical aspects of the below-grade construction:

- Building Foundation Systems – Conventional shallow footing type foundations are not feasible for the planned building. We anticipate that the foundation system will consist of foundation piles (likely steel H-piles with reinforced points) driven to end bearing in the "sound" bedrock and a structural lowest floor slab. The basement walls and slab will require waterproofing as well.

- Temporary Excavation Support – A temporary excavation support system will be required to construct the below-grade space. The system is anticipated to consist of interlocking steel sheet piling with one brace level. A second brace level will likely be required in the shallow bedrock areas given the limited toe embedment in this area. Additionally, specialized wall types (e.g., a secant pile wall) may be required in the shallow bedrock areas and on the abutting building side of the site.

- Temporary Construction Dewatering – Temporary construction dewatering will be critical on this project given the excavation will extend about 7 ft below the groundwater, and the presence of silty sand soils below the groundwater. Typically, construction dewatering is conducted using trenches routing water to sump pits. However, we anticipate that the dewatering system on this site will likely require deep gravity wells (and possibly a vacuum extraction system) to maintain bottom stability during construction and provide toe stability for temporary excavation support systems.

- Bedrock Excavation – Localized bedrock excavation may be required. Although some excavation may be feasible by hoe ramming, controlled blasting techniques would likely be required for excavations extending more than a couple of feet below the "non-weathered" bedrock surface.

- Protection of Abutting Building – Mitigation measures required for protecting the adjacent building will be directly impacted by the type of foundation system on which it is supported and the location and depth of its basement. If this building is supported on shallow footing foundations, such measures could include underpinning, a "stiffer" temporary excavation support system (e.g., a secant pile wall), and/or the use of drilled mini-piles for new foundations located within 20 to 30 ft of the existing building. This aspect of the project requires further investigation.

A summary of estimated foundation construction costs is provided on the attached table. This table summarizes those costs that would be anticipated for a hypothetical "typical" urban site, and for the 4566 Broadway site. The difference between the costs represents the premium cost anticipated to develop the 4566 Broadway site over the typical site.

Please feel free to call should you like to discuss any aspect of this letter or the project.

Sincerely yours,
HALEY & ALDRICH OF NEW YORK

Timothy Crowl
Senior Engineer

John T. Difini
Vice President

Attachment: Table

c: Mr. Mark Muller (4566 Broadway, LLC)
Mr. Ron Hayes (4566 Broadway, LLC)
Mr. Manish Chadha (Ismael Leyva Architects, PC)
Mr. Jim Bonanno (DeSimone Consulting Engineers, PLLC)
Mr. Steve Muller (ASR)

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PROPOSED MIXED USE DEVELOPMENT
4566 BROADWAY
MANHATTAN, NEW YORK

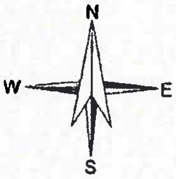
Haley & Aldrich, Inc.
31-Oct-06

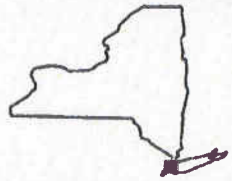
Foundation Element/ Construction Consideration	Range in Estimated Total Cost Typical Site			Range in Estimated Total Cost 4566 Broadway Site			Range in Estimated Premium Cost		
Foundation Elements (Base)									
Spread Footings	$110,000	to	$140,000	$0	to	$0	-$110,000	to	-$140,000
Foundation Piling	$0	to	$0	$585,000	to	$650,000	$585,000	to	$650,000
Pile Caps	$0	to	$0	$90,000	to	$115,000	$90,000	to	$115,000
Dampproofing Foundation Walls	$15,000	to	$30,000	$0	to	$0	-$15,000	to	-$30,000
Waterproofing Foundation Walls and Slab (with mudmat)	$0	to	$0	$160,000	to	$225,000	$160,000	to	$225,000
Lowest Level Floor Slab	$55,000	to	$80,000	$390,000	to	$470,000	$335,000	to	$390,000
Foundation Walls	N.A.	to	N.A.	N.A.	to	N.A.	N.A.	to	N.A.
Foundation Perimter Drain	$7,000	to	$10,000	$0	to	$0	-$7,000	to	-$10,000
Backfill Foundation Walls	N.A.	to	N.A.	N.A.	to	N.A.	N.A.	to	N.A.
Subtotal - Foundation Elements	**$187,000**	**to**	**$260,000**	**$1,225,000**	**to**	**$1,460,000**	**$1,038,000**	**to**	**$1,200,000**
Construction Considerations (Base)									
Temporary Excavation Support System	$200,000	to	$245,000	$515,000	to	$625,000	$315,000	to	$380,000
Excavation	N.A.	to	N.A.	N.A.	to	N.A.	N.A.	to	N.A.
Temporary Construction Dewatering	$0	to	$0	$200,000	to	$400,000	$200,000	to	$400,000
Pile Load Test (four)	$0	to	$0	$100,000	to	$160,000	$100,000	to	$160,000
Subtotal - Construction Considerations	**$200,000**	**to**	**$245,000**	**$815,000**	**to**	**$1,185,000**	**$615,000**	**to**	**$940,000**
Subtotals - Base	**$387,000**	**to**	**$505,000**	**$2,040,000**	**to**	**$2,645,000**	**$1,653,000**	**to**	**$2,140,000**
Contingency Allowances for Consideration									
Premium for Temporary Excavation Support System Upgrade	$0	to	$0	$510,000	to	$765,000	$510,000	to	$765,000
Premium for Drilled Mini-piles along Building	$0	to	$0	$220,000	to	$330,000	$220,000	to	$330,000
Reinforced Points on Piles	$0	to	$0	$40,000	to	$50,000	$40,000	to	$50,000
Obstructions	$0	to	$0	$25,000	to	$50,000	$25,000	to	$50,000
Geotechnical Instrumentation	$0	to	$0	$25,000	to	$50,000	$25,000	to	$50,000
General Conditions Allowance	$0	to	$0	$500,000	to	$600,000	$500,000	to	$600,000
Subtotals	**$0**	**to**	**$0**	**$1,320,000**	**to**	**$1,845,000**	**$1,320,000**	**to**	**$1,845,000**
TOTALS	**$387,000**	**to**	**$505,000**	**$3,360,000**	**to**	**$4,490,000**	**$2,973,000**	**to**	**$3,985,000**

Notes:

1. Proposed tower includes 15 floors plus a roof with steel-frame construction (column loads ranging from 325 to 825 kips with typical 13 to 18 ft column spacing).
2. Proposed low-rise includes 5 floors plus a roof with steel-frame construction (column loads up to 200 kips with typical 15 ft column spacing).
3. Proposed development includes one basement level over entire building footprint with finished floor 10 ft below site grade (i.e., 15 ft excavation depth at deepest point).
4. Typical site defined as urban site with suitable bearing soils at design foundation level and groundwater below excavation level.
5. N.A. denotes that element or consideration common to both typical and 4566 Broadway sites. Therefore, estimated costs should be similar (i.e., little to no premium cost).
6. Foundation systems: footings and slab-on-grade (5-in. thick) for typical site; and end bearing piles and structural slab (12-in. thick) for 4566 Broadway site.
7. Pile foundations assumed to be 80-ton design capacity steel H-piles (HP12x74) driven to end bearing on rock (45 ft average length). Reinforced points on half of the piles. Average pile length assumes piles driven from 5 ft below existing grade. Assume pre-drilling for piles and piles to resist hydrostatic uplift on low-rise slab are not required.
8. Temporary excavation support: cantilevered soldier pile and lagging wall for typical site; and steel sheeting with one brace level (tiebacks) plus a second brace level in shallow rock areas for 4566 Broadway site. Assumes pre-trenching along excavation support wall is not required.
9. Contigency allowance for temporary excavation support includes upgrading wall along existing building and in shallow rock areas (roughly one-half of the site perimeter) to a secant pile wall.
10. Assume costs for bedrock excavation (via controlled blasting) offset by elimination of piles where rock is encountered at or above the bottom of pile cap.
11. Temporary construction dewatering consists of a network of deep gravity wells, and a dewatering duration of 9 months.
12. Contingency allowance for drilled mini-piles along building-side of site (first two column bays into site, 50 piles estimated) recommended for protective purposes.
13. Estimates and foundation systems pending completion of engineering analyses, and determination of adjacent building foundations.

SITE COORDINATES: 40°51'36.67"N 73°55'53.71"W





U.S.G.S. QUADRANGLE: CENTRAL PARK, NEW YORK

HALEY & ALDRICH

PROPOSED MIXED USE DEVELOPMENT
4556 BROADWAY
MANHATTAN, NEW YORK

PROJECT LOCUS

SCALE: 1:24000
NOVEMBER 2008

FIGURE 1

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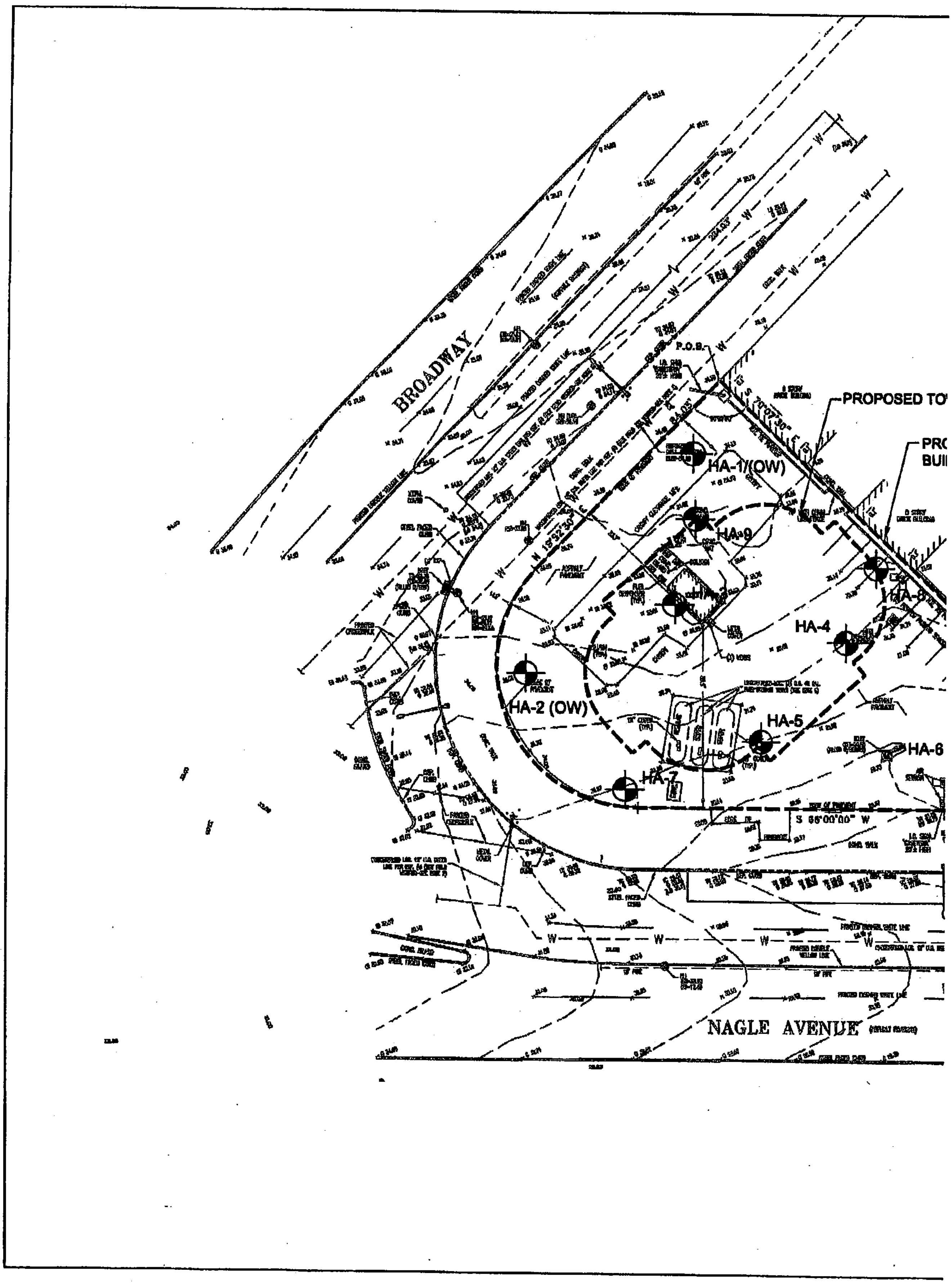

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