

**INSPECTION OF BORINGS FOR
MANHATTAN WEST NORTH EAST TOWER
375 9TH AVENUE
NEW YORK, NEW YORK**

Section BC 1704.7.4 of the city of New York Building Code includes a requirement for boring inspection. Mses. Roberto Reale and Jerry Chan of the staff of Mueser Rutledge Consulting Engineers inspected all borings for which logs are submitted herewith. To the best of the undersigned's knowledge and belief, the inspection meets the requirements of Section BC 1704.7.4.



David R. Good
N. Y. P. E: 066684-1

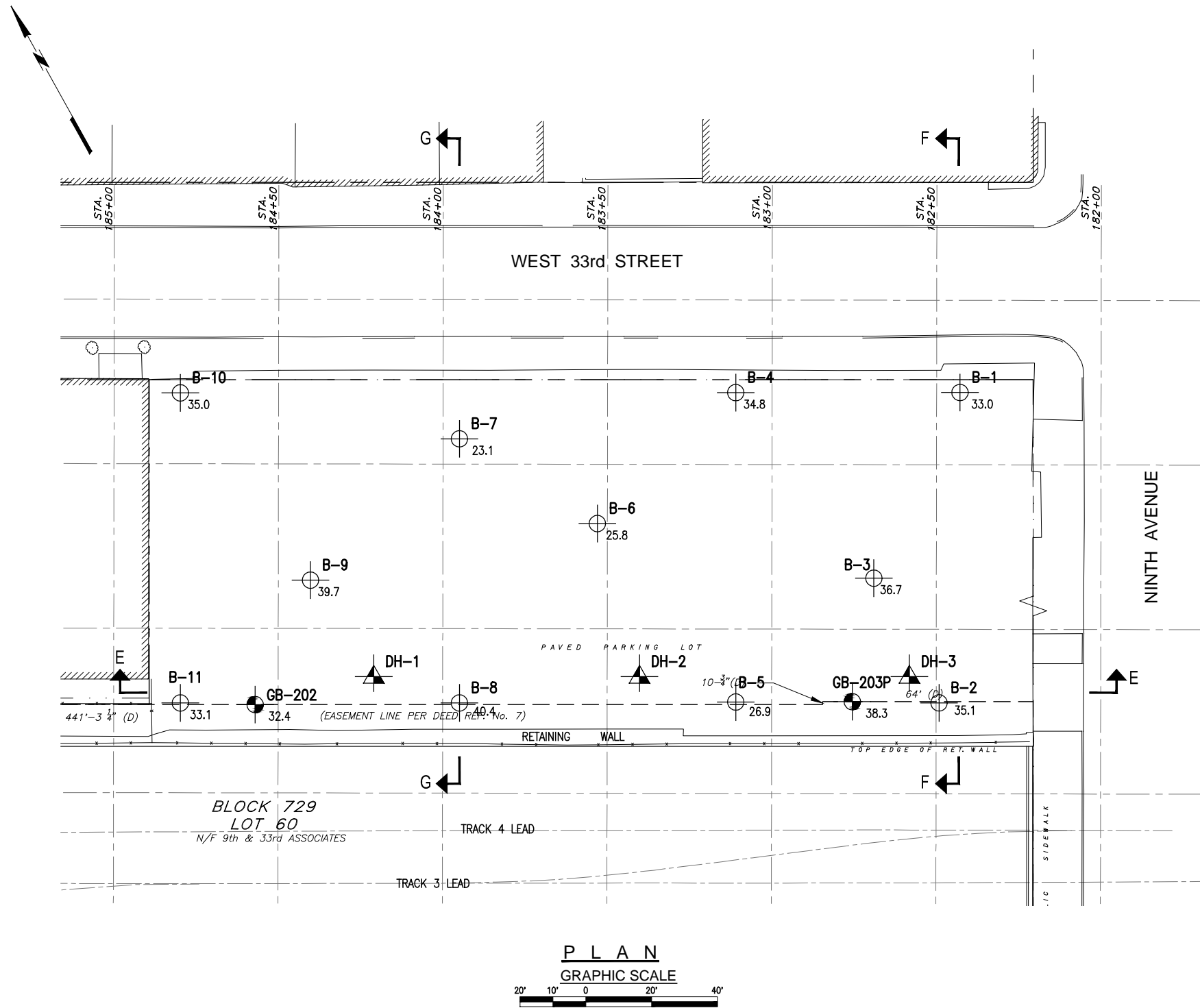
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David R. Good

MANHATTAN WEST NORTH EAST TOWER
375 9TH AVENUE
NEW YORK, NEW YORK
MRCE FILE NO . 9560D

STRATUM	DESCRIPTION	BUILDING CODE CLASS OF MATERIAL
F1	FILL	7
S	SAND	3b
DR	DECOMPOSED ROCK	1d
R	BEDROCK	1a, 1b, 1c

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NOTES:

1. BASE PLAN FROM TOPOGRAPHIC MAP AT STREET LEVEL, SHEET NO. 2 OF 5 DATED 06-04-07 PROVIDED BY MEDINA CONSULTANTS.
2. ELEVATIONS ARE SHOWN IN FEET AND REFER TO BOROUGH PRESIDENT OF MANHATTAN DATUM, WHICH IS 2.75 FEET ABOVE M.S.L. AT SANDY HOOK, NJ 1929. TO CONVERT TO NAVD88, ADD APPROXIMATELY 1.7 FEET.
3. BORING ELEVATIONS WERE ESTIMATED BY MRCE BASED ON EXISTING SURVEY PLAN.
4. TEST PIT LOCATIONS NOT SHOWN.
5. FOR GEOLOGIC SECTIONS, SEE DRAWINGS GS-5 TO GS-7.

LEGEND:

- BORING MADE BY OTHERS FOR LAZARD REALTY 1986-1988
- ELEVATION OF TOP OF STRATUM R. (TYP.) (BPMO)
- BORING MADE BY WGI DRILLING UNDER THE INSPECTION OF MRCE IN SEPT. 2005 AND BETWEEN DEC 2007 AND MARCH 2008.
- APPROXIMATE LOCATION OF HAGAR-RICHTER TELEVIEWER PROBE COMPLETED AUGUST 2013.

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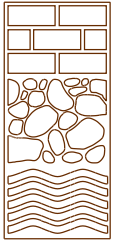
REV.	DATE	BY	DESCRIPTION	
MANHATTAN WEST—NORTH EAST TOWER				
NEW YORK			NEW YORK	
BROOKFIELD PROPERTIES				
NEW YORK			NEW YORK	
MUESER RUTLEDGE CONSULTING ENGINEERS				
14 PENN PLAZA — 225 W. 34TH STREET, NY, NY 10122				
SCALE GRAPHIC	MADE BY: E.C. CH'KD BY: A.E.P.	DATE: 10—30—2014 DATE: 10—30—2014	FILE NUMBER 9560	DRAWING NUMBER
BORING LOCATION PLAN				B—1

**GEOTECHNICAL DATA REPORT
MANHATTAN WEST
NE TOWER**

**Brookfield Properties
250 Vesey Street
New York, NY 10281**

**Mueser Rutledge Consulting Engineers
14 Penn Plaza - 225 West 34th Street
New York, NY 10122**

December 17, 2014



Mueser Rutledge Consulting Engineers

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Associates

Joseph N. Courtade
**Director of Finance
and Administration**

Martha J. Huguet
Director of Marketing

December 17, 2014

Brookfield Properties
Three World Financial Center
200 Vesey Street, 11th Floor
New York, NY 10281-1021

Attention: Mr. Henry Caso

Re: Subsurface Investigation Data Report
Manhattan West North East Tower
New York, New York
MRCE File No. 9560

Gentlemen:

At your request, we have conducted a subsurface investigation for northeast tower of the Manhattan West development project, located immediately west of Ninth Avenue and north of the Amtrak Rail cut.

This data report summarizes previous and current investigations and describes subsurface conditions on site.

EXHIBITS

Plate No. 1	Site Location Plan
Sheet 2 of 5	Site Survey Plan
Plate No. 2	Viele Map: 1865
Plate No. 3	Manhattan Atlas: 1891
Plate No. 4	Manhattan Atlas: 1899
Drawing No. B-1	Boring Location Plan
Drawing No. GS-5	Geologic Section E-E
Drawing No. GS-6	Geologic Section F-F
Drawing No. GS-7	Geologic Section G-G
Drawing No. C-2	Contour Plan – Top of Stratum R at Terra Firma
Plate No. 5	Plot of RQD vs Elevation
Drawing No. R-1	Stereonet Reference Drawing
Drawing No. GS-R	Geotechnical Reference Standards
Drawing No. RC-1	Rock Core Classification Criteria

Appendix A	MRCE Boring Logs
Appendix B	Boring Logs By Others
Appendix D	Selected Photographs of Rock Core
Appendix F	Orientation of Rock Joints

Foundation Engineering Since 1910

SITE AND PROJECT DESCRIPTION

The northeast tower site is located between the Amtrak rail cut and 33rd street, immediately west of 9th Avenue and east of the existing loft building as shown on Plate No. 1. Site grades and boundaries are shown on Sheet 2 of 5, the site survey plan. The site is bounded by 33rd Street to the north, Ninth Avenue to the east, the Amtrak rail cut to the south, and the existing Loft building to the west.

The site was formed on an at-grade parking lot at 33rd street. The at-grade portion of the site accessed from 33rd street is east of the "Loft Building", a 12-story structure, which will remain. The site has a total footing area of 50,600 square feet.

The proposed project is a high-rise commercial tower with a surrounding podium structure. The rail cut deck overbuild is complete.

All elevations in the text of this report reference the NAVD 88 Datum. All exhibits in this report reference the Borough President of Manhattan (BPM) datum, which is 2.75 ft above Mean Sea Level at Sandy Hook, N.J. To convert BPM elevations to NAV 88 elevations, add approximately 1.7 feet.

Sidewalk grades at 33rd street generally slope up from Elev. +45 at Ninth Avenue to Elev. + 48 at the west end of the site (Loft building). On Ninth Avenue, the sidewalk is generally level at about Elev +45.

Adjacent Structures. A 12-story structure, known as the "Loft Building" is situated on the 33rd Street side of the site as shown on Sheet 2 of 5, the site survey plan. That building has one basement and is founded on bedrock, as observed by test pit and excavations made for the railroad overbuild deck foundations. The loft building has a footprint area of approximately 12,600 square feet and is set back about 15 feet from the north retaining wall.

Retaining Walls. The remaining (lower portion) of the existing Amtrak retaining wall running along the south side of the site is approximately 25 feet high. The retaining wall was constructed when the rock cut was made around 1908. The original retaining wall drawings are available for review. In summary, the walls were constructed as thick concrete retaining walls, pinned to the cut rock face by rock bolts, spaced approximately every six feet along the retaining wall. Drainage channels were framed on the back side of the wall also approximately every six feet on center. The vertical line of rock bolts are typically positioned mid-way between drainage chases.

Local Geology. The project area is located on the Manhattan Prong, which is at the southern tip of the New England Uplands. It is composed of ancient, durable, highly folded and metamorphosed crystalline rock. The bedrock at the site was historically known as the Manhattan Schist, but is currently mapped as the Hartland Formation. The Hartland is typically a gneissic schist with layers of schistose gneiss, granofels, mica schist and hornblende schist. The formation has frequent intrusions of granite and granitic pegmatite.

The project location has an unusually large amount of hornblende schist. The hornblende schist is concentrated along a band that runs from the northwest corner of the site diagonally to the southeast corner of the site. The overall trend of the hornblende schist is roughly N-S, in a band up to 100 feet

wide. Pegmatite and granite are scattered across the entire site. Borings usually encountered pegmatite thicknesses less than 5 feet.

Prior to early development, the area that is now midtown Manhattan consisted of low hills and meadowlands dissected by occasional streams. These features are shown on the 1865 Viele map on Plate No. 2. That map shows the site to have been predominantly meadow with occasional rock outcroppings. The original bedrock surface has since been altered by construction of buildings and for the 1908 rail cut.

SITE HISTORY

We researched the 1891 atlas to identify former structures at the site. Plate No. 3 shows the site area usage as of 1891 and Plate No 4 the site area usage as of 1899. 1899 is the latest dated drawing available in our files that precedes the rock cut for the railroad.

The 1891 Atlas indicates that the site was mainly occupied by residential buildings with small backyards. No basements are indicated on the map, however shallow basements likely existed. The 1899 Atlas shows that the former site buildings had been demolished by 1899, likely in anticipation of the rock cut.

SUBSURFACE INVESTIGATIONS

Investigations by Others. A subsurface investigation was performed between October 1986 and July 1988 by Testwell Craig Test Boring Company for Lazard Reality. Locations of the borings (B-1 to B-11) are shown on Drawing No. B-1. Logs for those borings are attached in Appendix B. Permission to use those borings to fulfill the New York City building code requirement for number of borings was obtained from the department of building (DOB).

Investigations by MRCE. Between March 13, 2008 and March 14, 2008, MRCE performed a supplemental investigation consisting of two borings designated GB-202 and GB-203P, drilled by Warren George, Inc. The borings were performed in the former parking lot area with locations shown on Drawing No. B-1.

Borings were made using one truck-mounted drill rig using rotary techniques. Representative soil samples were obtained with a 2-inch O.D. (1-3/8 inch I.D.) split-spoon sampler driven with a manual 140-pound hammer free falling 30 inches to obtain the Standard Penetration Test (SPT) resistance, also termed N-value, expressed in blows per foot. The SPT N-value is an indication of the density of the material sampled. Where soils were too dense for the sampler to penetrate a full 12 inches, or where gravel, cobbles or boulders were encountered, the sampler was driven until 100 blows were administered and the actual penetration of the sampler was measured and recorded. Recovered split-spoon soil samples were placed in jars and were delivered along with the rock core to our Soil Mechanics laboratory in Manhattan for verification of field classifications. Individual descriptions of soil and rock samples are provided on boring logs attached in Appendix B. The terminology used in MRCE soil descriptions is provided on Drawing No. GS-R. Rock core classification terminology and criteria used on the boring logs are shown on Drawing No. RC-1.

Descriptions of recovered rock cores, core recoveries and Rock Quality Designations (RQDs) are provided on the boring logs. Rock recovery is the length of core recovered divided by the length of the core run expressed as a percentage. RQD is the sum of the length of core fragments recovered four inches or greater between natural breaks divided by the length of the core run expressed as a

percentage. RQD is a measure of the relative frequency of jointing or natural fracturing of the bedrock. Selected samples of rock core from the gneissic schist and hornblende schist formations were sent out for strength testing, as described later herein.

Oriented rock coring was performed on Boring Nos. GB-202 and GB-203P. Oriented rock core is similar to normal rock coring, except that the core barrel continuously striates the side of the rock core with carbide tipped scribe blades as it is cored. The scribe blades are located at the tip of the inner core barrel that contains three blades on one side and a single scribe located directly opposite the center of the other three scribes. The striations are established along predetermined compass direction relative to the position of the drill rig. That allows the absolute orientation of the jointing planes to be known, allowing strike, dip direction, and dip angle of joints and foliation planes to be determined in the laboratory.

One observation well was installed in Boring GB-203P to monitor ground water within the site. The well is contained within the PVC casing installed to clear the boring location and may be accessed for future readings. Upon completion, GB-202 was tremie-grouted. PVC casings surrounding the piezometer in GB-203P were left in place and covered with a steel plate to allow access for future water level readings.

Three holes were also drilled by airtrack in September 2013 for logging by Televiwer at the request of MRCE. Televiwer logging was performed by Hager-Richter Geoscience, Inc. The televiwer holes were drilled from about the elevation of the bottom of the cap beam to depths ranging from 40 to 51 feet. The televiwer holes were drilled fully in bedrock, performed to characterize the quality of bedrock to depths below the deepest intended footing foundation. The Televiwer report is attached as Appendix H.

SUBSURFACE CONDITIONS

General site subsurface conditions consist of a granular fill layer typically overlying a natural sand layer, underlain by bedrock. Occasionally a discontinuous layer of decomposed rock was encountered above the bedrock. Our interpretation of the subsurface strata is shown on individual boring logs. The subsurface material stratification at the site is illustrated on Geologic Sections E-E to G-G presented on Drawings No. GS-5 to GS-7. Geologic section orientation is shown in plan on Drawing B-1.

General descriptions of the materials encountered are summarized below in order of their occurrence with depth:

Stratum F1 - Fill (NYC Class 7) A granular fill layer that ranges from seven to 15 feet in thickness was encountered. Stratum F1 consists of loose to compact black, gray and red fine to coarse sand, some to trace silt, clay, mica, gravel rock fragment, trace of brick fragments. Remnant foundations and slabs can be anticipated to be found in this Stratum.

Stratum S-Sand (NYC Class 3b) Stratum S consists of medium compact to compact, medium to fine silty sand, with some coarse to fine red-brown gravel.

Stratum DR - Decomposed Rock (NYC Class 1d) A thin layer of decomposed rock overlies the bedrock in locations. The decomposed rock ranged from 0.2 to 1 foot thick in the borings, but a deeper trough was noted during excavation for the deck foundations.

Stratum R - Bedrock (NYC Class 1a to 1c) Gneissic schist and hornblende schist are the two dominant rock types at the site. The gneissic schist is typically a medium hard to hard slightly weathered to unweathered gray gneissic schist, trace pegmatite, schistose gneiss, mica schist, jointed to moderately jointed, with iron stained and occasionally weathered joints. The hornblende schist is generally a hard to medium hard unweathered to slightly weathered gray to black hornblende schist, jointed to moderately jointed, with mineral coated, iron stained and occasionally weathered joints.

In addition to the gneissic and hornblende schist, pegmatite is also found. Intrusions of granite and pegmatite are scattered throughout the rock mass.

Recoveries of all rock types ranged between 84% and 100% averaging about 98%. Rock quality designation (RQD) ranged between 50% and 100%, averaging 90%. RQD versus elevation is plotted on Plate No. 5. Top of rock elevations range from Elev. +32 to Elev. +38 (Drawing C-2). Photographs of selected rock core are provided in Appendix D.

Oriented rock coring was performed in all of the borings. The orientation of the rock joints from oriented cores are presented as stereographic projections in Appendix F.

Drawing No. R-1 provides an explanation of the stereonet construction. A plot of joint discontinuities in rock core is shown on Plate No. 6. Across the site the joints in all rock types do not follow a distinct preferred trend. In general, joints in the pegmatite and granite tend to have a random orientation with a dip ranging from 0° to 60°. Virtually all of the joints in the hornblende schist cross the foliation with dips ranging from 0° to 40°, with many less than 10°. Foliation in the hornblende schist was fairly steep, with a dip angle typically 50° to 90°. Joint surfaces were frequently mineral-coated, often with pyrite. Joints in the gneissic schist and schistose gneiss also showed no preferred direction. The rock was often poorly to moderately foliated and joints parallel to foliation tended to occur in the well foliated rock. Orientation of the foliation was variable and inconsistent across the site, but the dip angles tended to range from 25° to 60°. Joints crossing the foliation generally had a dip angle that ranged from 0° to 40°. Individual polar plots of joint discontinuities for each boring are provided in Appendix G.

Petrography was not performed on the rock from the site, so the exact minerals and their percentages have not been determined. In general, the gneissic schist consists primarily of quartz, feldspar and mica in varying amounts, with trace amounts of garnet. Where the rock was described as a schistose gneiss less mica was present. The hornblende schist is composed predominantly of hornblende, with varying amounts of feldspar and quartz. The pegmatite and granite contain varying amounts of quartz and feldspar, with modest to small amounts of mica.

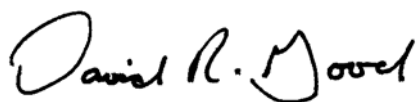
The Mohs hardness values for these minerals are as follows: quartz (7), feldspar (6), mica (2 to 3), garnet (6.5 to 7.5), and hornblende (5 to 6). The Mohs scale measures the relative hardness of materials on a scale of 1 to 10. For context, on that hardness scale talc has a value of 1, diamond has a value of 10, a knife blade equals to 5.5 and a steel file 6.5.

Groundwater. Groundwater level was observed to be to be at about Elev. -3 in the observation well installed in Boring GB-203P. The measured groundwater level is depressed below high tide, indicating nearby pumping (probably by Amtrak in the track base).

Very truly yours,

MUESER RUTLEDGE CONSULTING ENGINEERS

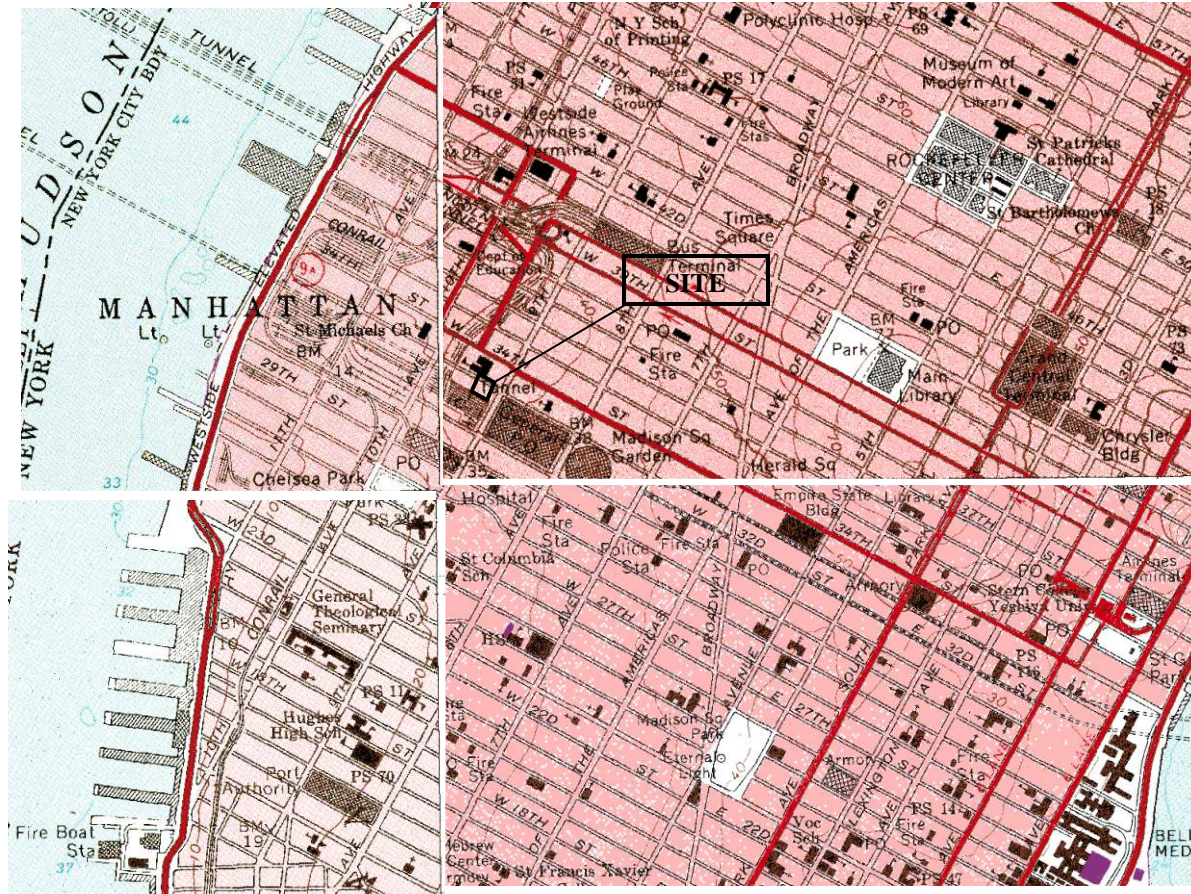
By: 
Alexandra E. Patrone

By: 
David R. Good, Partner

Attachment

F:\95\9560\9560D - NE Tower\Geotech Report\

EXHIBITS



SOURCE: U.S. Geological Survey Quadrangle Maps

MANHATTAN WEST – NORTHEAST TOWER

NEW YORK

NEW YORK

BROOKFIELD PROPERTIES

NEW YORK

NEW YORK

MUESER RUTLEDGE CONSULTING ENGINEERS

225 WEST 34TH STREET, NEW YORK, NY 10122

SCALE
NTS

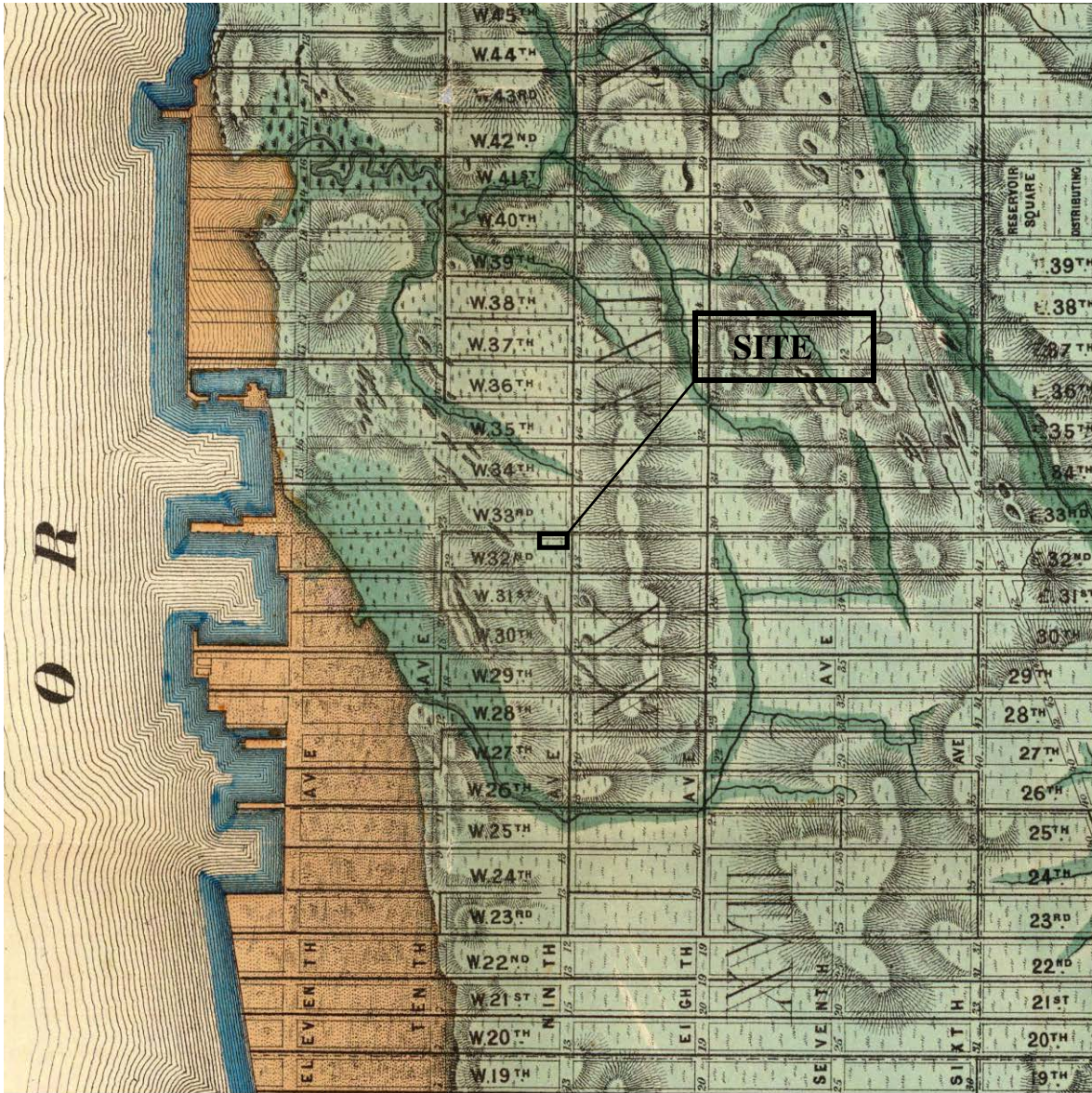
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DATE: 11/03/14

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SITE LOCATION PLAN

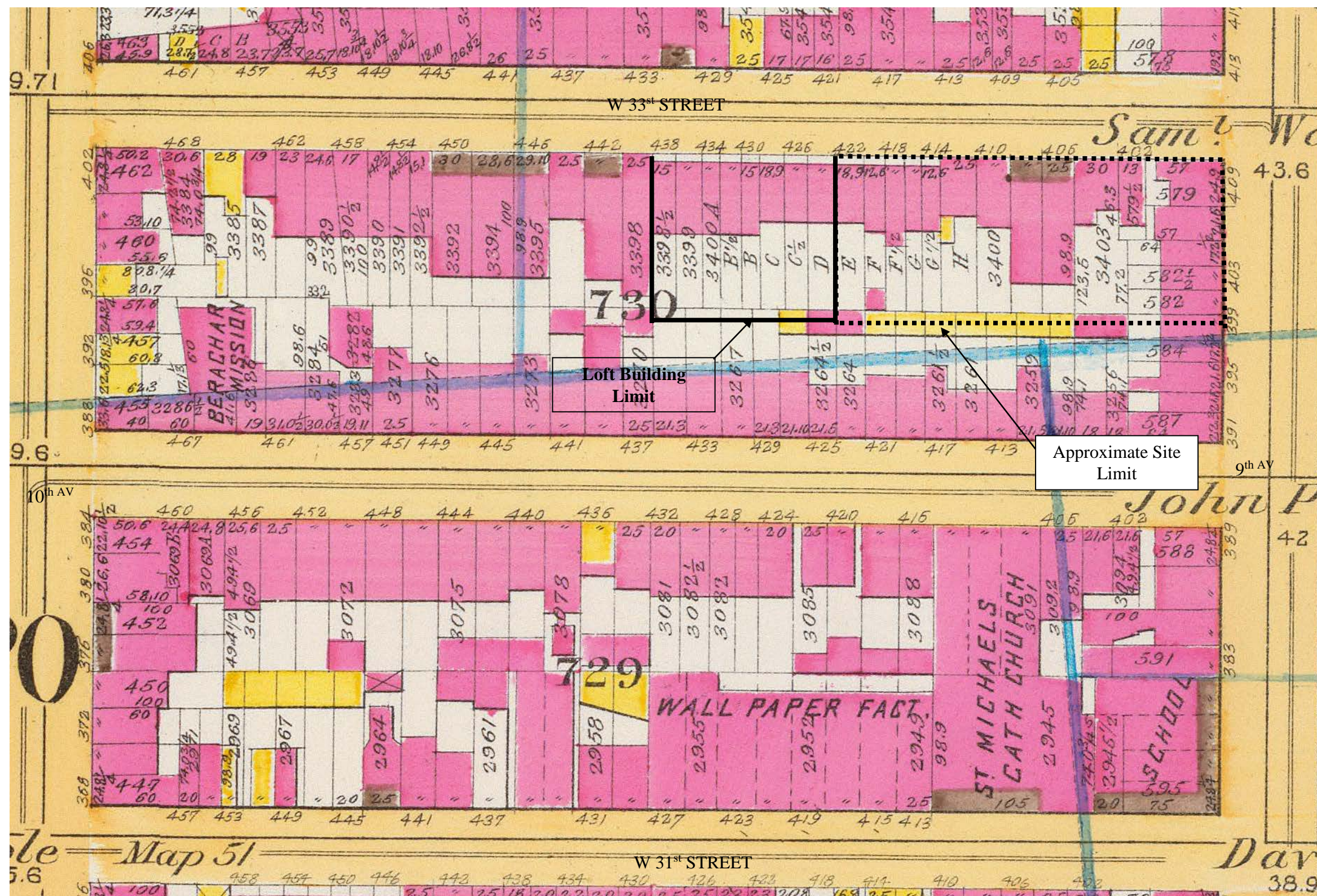
PLATE NO.
1



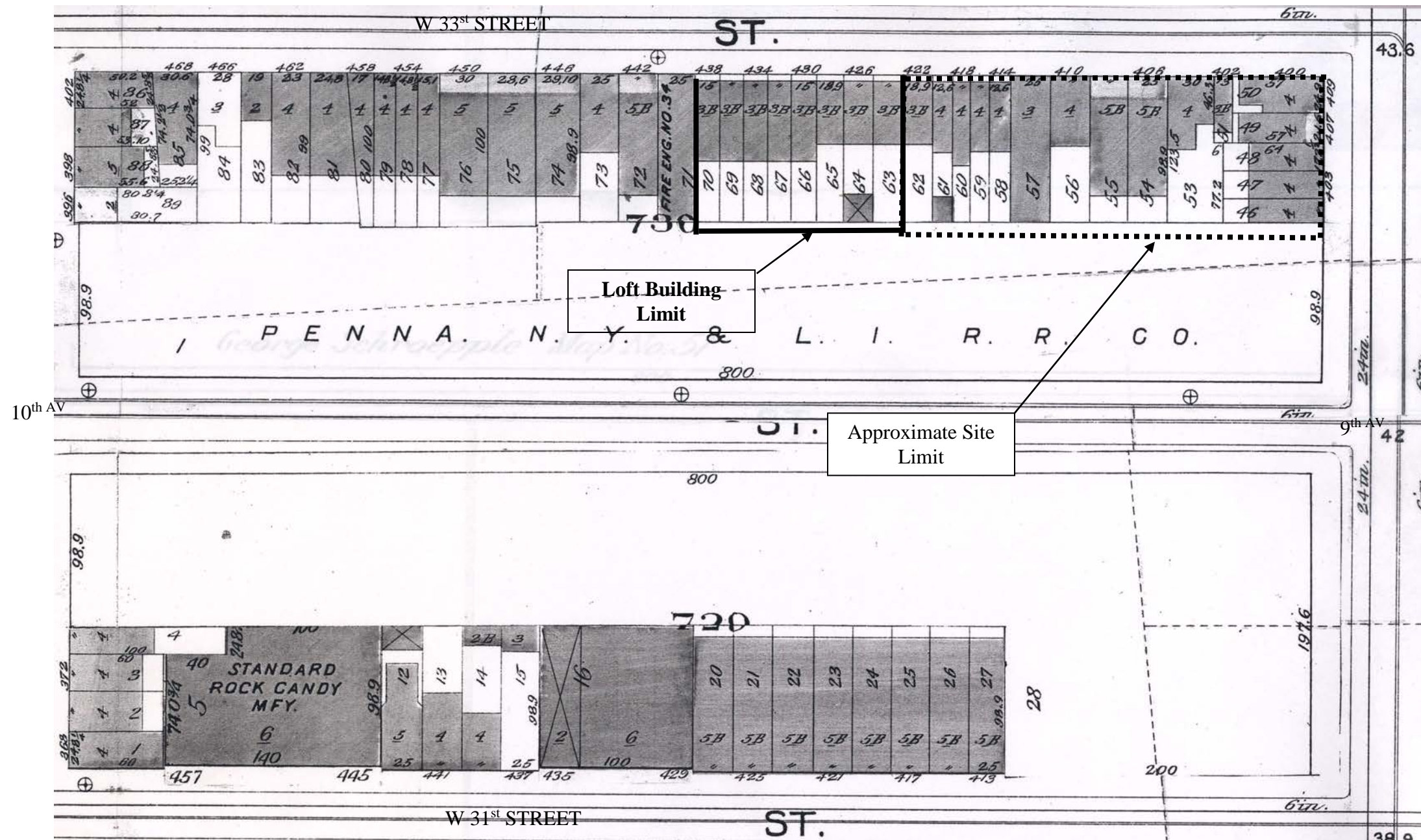
SOURCE:

Topographical Atlas of the City of New York
By Egbert L. Viele, dated 1865

MANHATTAN WEST – NORTHEAST TOWER			
NEW YORK		NEW YORK	
BROOKFIELD PROPERTIES			
NEW YORK		NEW YORK	
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225 WEST 34 TH STREET, NEW YORK, NY 10122			
SCALE NTS	MADE BY: AEP CH'KD BY: DRG	DATE: 10/31/14 DATE: 10/31/14	FILE NO. 9560
1865 VIELE MAP			PLATE NO. 2

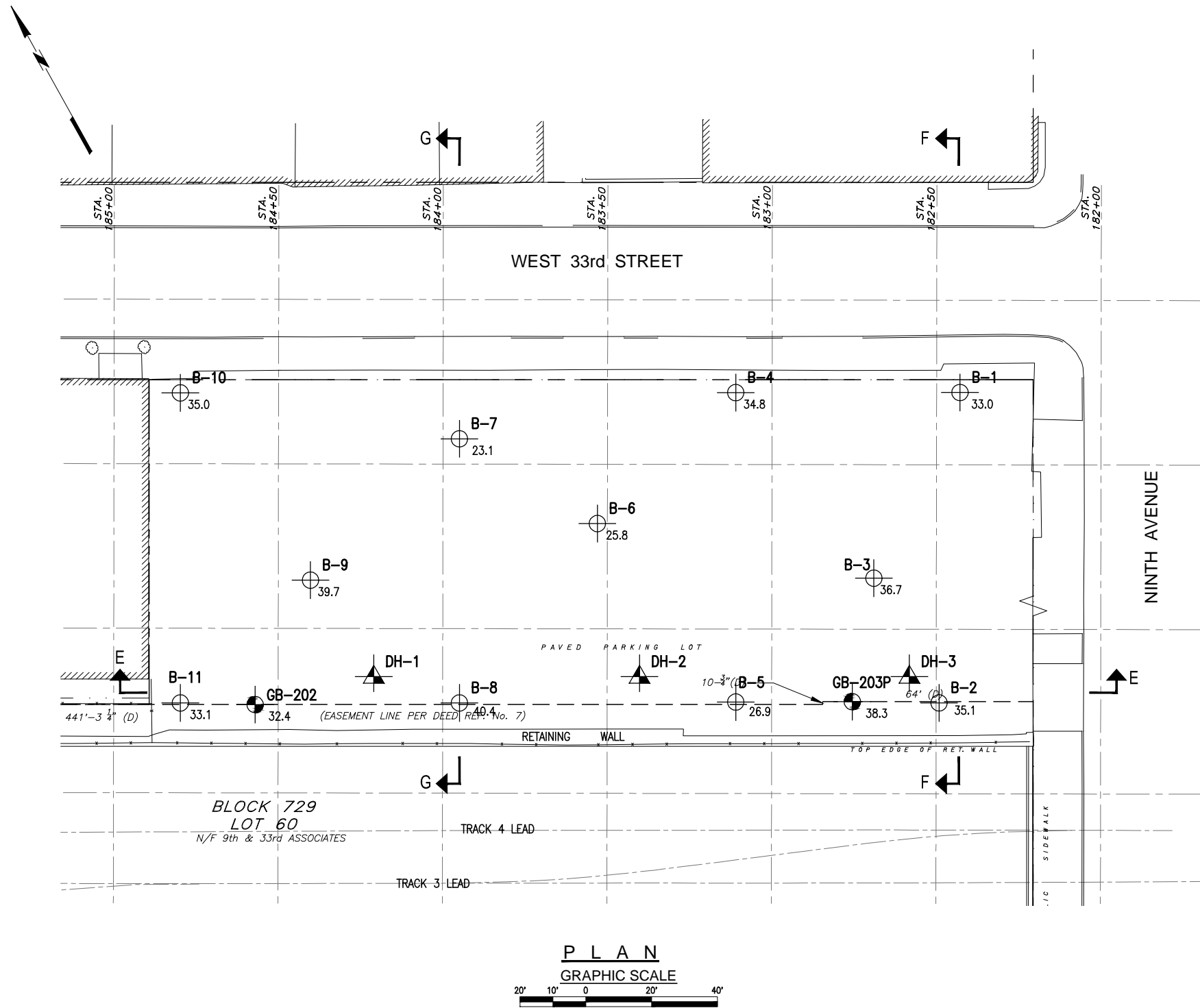


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NEW YORK		NEW YORK	
BROOKFIELD PROPERTIES			
NEW YORK		NEW YORK	
MUESER RUTLEDGE CONSULTING ENGINEERS			
225 W. 34 th Street • New York, NY 10122			
SCALE: NTS	MADE BY: AEP CH'KD BY: DRG	DATE: 10/31/14 DATE: 10/31/14	FILE NO. 9560
1891 MANHATTAN ATLAS			PLATE NO. 3



MANHATTAN WEST – NORTHEAST TOWER			
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SCALE 1"=80'	MADE BY: AEP CH'KD BY: DRG	DATE: 10/31/14 DATE: 10/31/14	FILE NO. 9560
1899 MANHATTAN ATLAS			PLATE NO. 4

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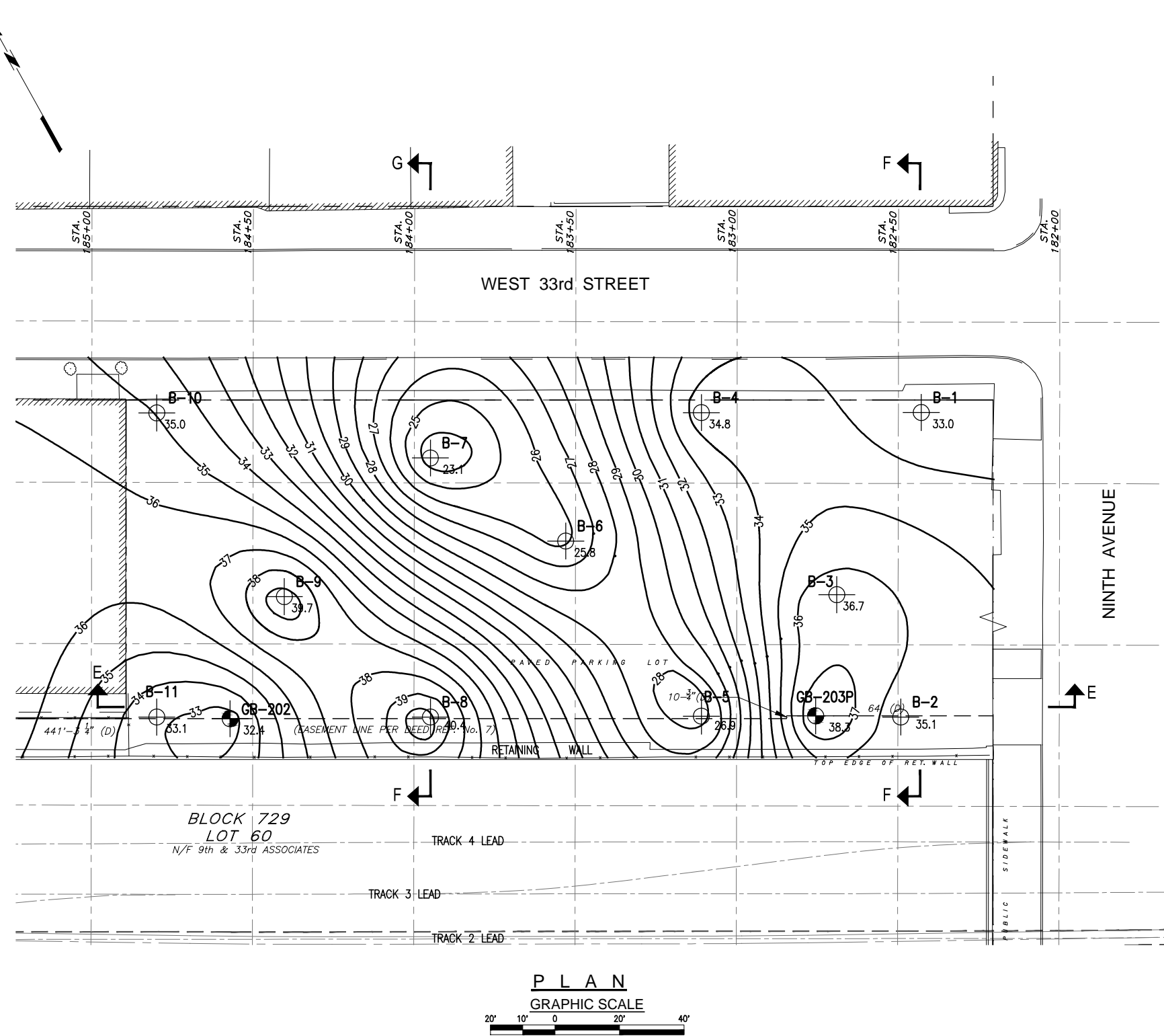
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NEW YORK			NEW YORK	
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SCALE GRAPHIC		MADE BY: E.C. CH'KD BY: A.E.P.		DATE: 10-30-2014 DATE: 10-30-2014
				FILE NUMBER 9560
BORING LOCATION PLAN				DRAWING NUMBER B-1

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NOTES:

1. FOR PLAN NOTES, SEE DRAWING B-1.
2. ELEVATIONS OF TOP OF ROCK (STRATUM R) ARE SHOWN AT THE BORING LOCATIONS. SURFACE ELEVATION OF ROCK BETWEEN BORINGS WILL VARY.
3. ELEVATIONS REFERENCE BOROUGH PRESIDENT OF MANHATTAN (BPM) DATUM. TO CONVERT TO NAVD88, ADD APPROXIMATELY 1.7 FEET.
4. CONTOURS ARE BASED ON INFORMATION FROM BORINGS ONLY.

LEGEND:

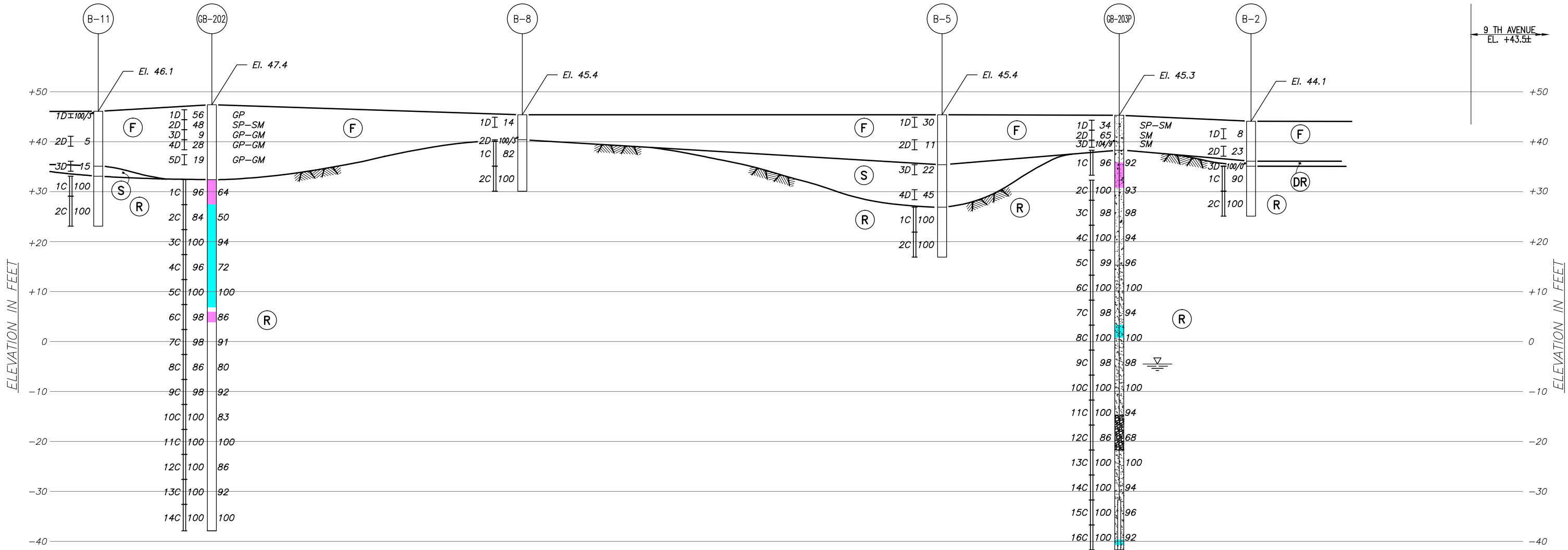
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- ELEVATION OF TOP OF STRATUM R. (TYP.) (BPM D)

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14 PENN PLAZA — 225 W. 34TH STREET, NY, NY 10122			
SCALE GRAPHIC	MADE BY: E.C. CH'KD BY: A.E.P.	DATE: 10—30—2014 DATE: 10—30—2014	FILE NUMBER 9560
CONTOUR PLAN — TOP OF STRATUM R AT TERRA FIRMA			DRAWING NUMBER C—2

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G:\DWG\95\9560\MANHATTAN WEST-NORTH EAST TOWER\GS-5.dwg



SECTION E-E
GRAPHIC SCALE
10' 5' 0 10' 20'

GENERAL STRATA DESCRIPTION

- (F) - **FILL** LOOSE TO COMPACT BLACK AND GRAY, OCCASIONALLY RED FINE TO COARSE SAND WITH SOME TRACE OF SILT, CLAY, MICA, GRAVEL AND ROCK FRAGMENTS, BRICK.
- (S) - **SAND** MEDIUM COMPACT TO COMPACT, MEDIUM TO FINE SILTY SAND WITH SOME COARSE TO FINE RED-BROWN GRAVEL .
- (DR) - **DECOMPOSED ROCK** GRAY MICACEOUS FINE TO MEDIUM SAND, SOME SILT AND ROCK FRAGMENTS.
- (R) - **ROCK** MEDIUM HARD TO HARD, SLIGHTLY WEATHERED TO UN-WEATHERED, GRAY GNEISS, GNEISSIC SCHIST AND HORNBLENDE SCHIST, TRACE PEGMATITE, MODERATELY JOINTED TO JOINTED WITH SOME IRON STAINED JOINTS AND MINERAL COATED JOINTS.

LEGEND:

- INDICATES PEGMATITE OR GRANITE
- INDICATES HORNBLENDE SCHIST
- NON-SHADED ROCK INDICATES GNEISSIC SCHIST OR SCHISTOSE GNEISS

NOTES:

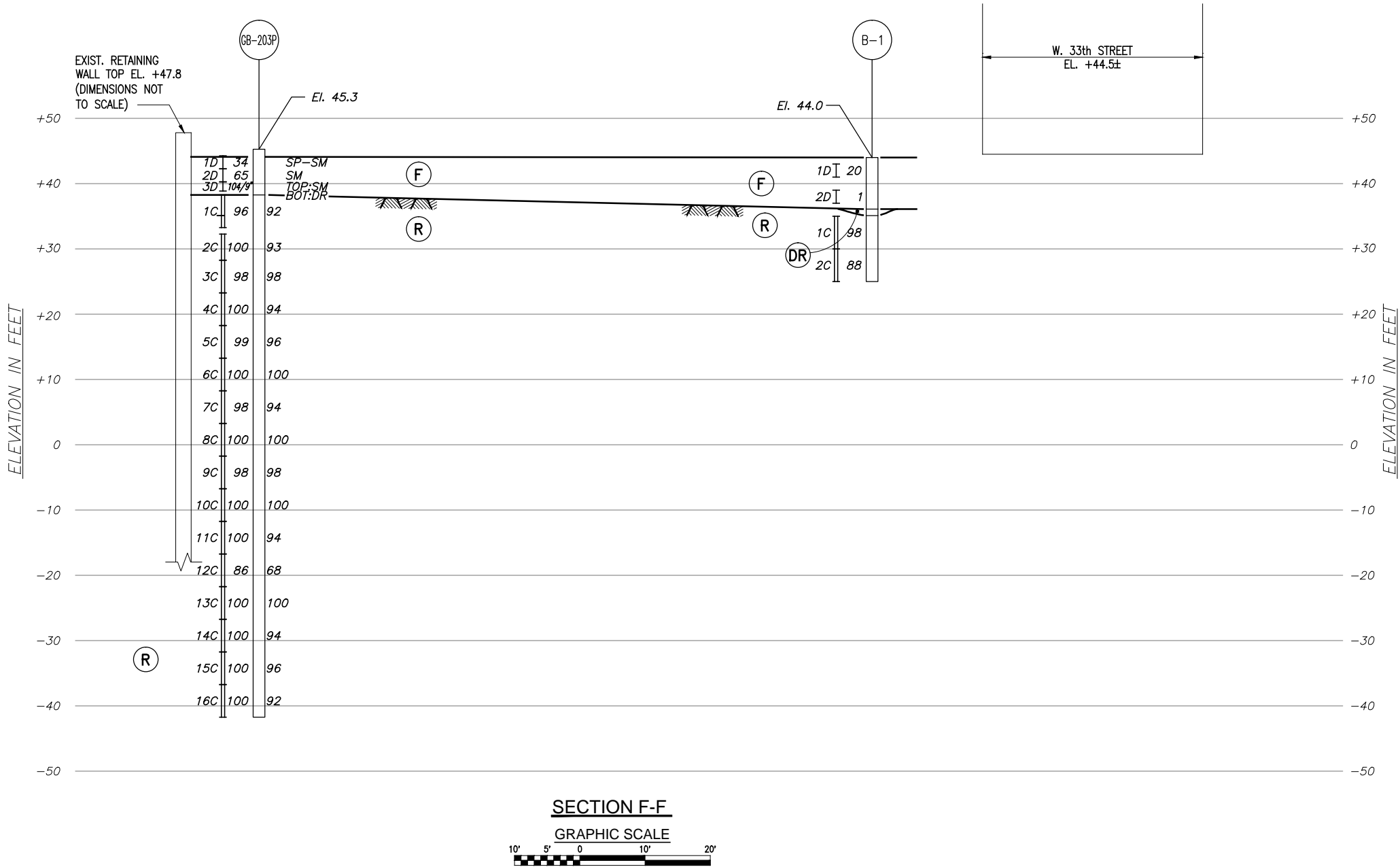
- FOR GENERAL NOTES AND BORING AND SECTIONS LOCATIONS SEE DRAWING NO. B-1.
- BORINGS ILLUSTRATED ON GEOLOGIC SECTIONS ARE IN SOME CASES PROJECTED ON THE SECTION AND/OR OFFSET FOR CLARITY. STRATIFICATIONS SHOWN ON SECTIONS ARE NECESSARY INTERPOLATIONS BETWEEN AND BEYOND BORINGS AND MAY NOT REPRESENT THE ACTUAL SUBSURFACE CONDITIONS.
- ELEVATIONS REFERENCE BOROUGH PRESIDENT OF MANHATTAN (BPM) DATUM. TO CONVERT TO NAVD88, ADD APPROXIMATELY 1.7 FEET.

WARNING: IT IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER ANY ITEM ON THESE PLANS IN ANY WAY. IF ALTERATIONS TO THESE PLANS ARE MADE, THE ALTERATIONS SHALL BE MADE IN ACCORDANCE WITH ARTICLE 145 - SECTION 7209.2 OF THE NEW YORK STATE EDUCATION LAW.

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REV.	DATE	BY	DESCRIPTION
MANHATTAN WEST-NORTH EAST TOWER			
NEW YORK			NEW YORK
BROOKFIELD PROPERTIES			
NEW YORK			NEW YORK
MUESER RUTLEDGE CONSULTING ENGINEERS			
14 PENN PLAZA - 225 W. 34TH STREET, NY, NY 10122			
SCALE GRAPHIC	MADE BY: E.C. CH'KD BY: A.E.P.	DATE: 10-30-2014 DATE: 10-30-2014	FILE NUMBER 9560
GEOLOGIC SECTION E-E			DRAWING NUMBER GS-5

Printed by: Alexandra Patrone
Printed on: Thursday, Dec 18, 2014 - 09:57:04 AM
Last saved by: apatrone on Thursday, Dec 18, 2014 - 9:56:24 AM
G:\DWG\95\9560\MANHATTAN WEST-NORTH EAST TOWER\GS-6.dwg



- NOTES:**
1. FOR GENERAL NOTES AND BORING AND SECTIONS LOCATIONS SEE DRAWING NO. B-1.
 2. BORINGS ILLUSTRATED ON GEOLOGIC SECTIONS ARE IN SOME CASES PROJECTED ON THE SECTION AND/OR OFFSET FOR CLARITY. STRATIFICATIONS SHOWN ON SECTIONS ARE NECESSARY INTERPOLATIONS BETWEEN AND BEYOND BORINGS AND MAY NOT REPRESENT THE ACTUAL SUBSURFACE CONDITIONS.
 3. ELEVATIONS REFERENCE BOROUGH PRESIDENT OF MANHATTAN (BPM) DATUM. TO CONVERT TO NAVD88, ADD APPROXIMATELY 1.7 FEET.

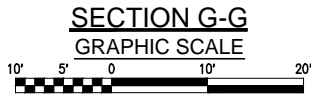
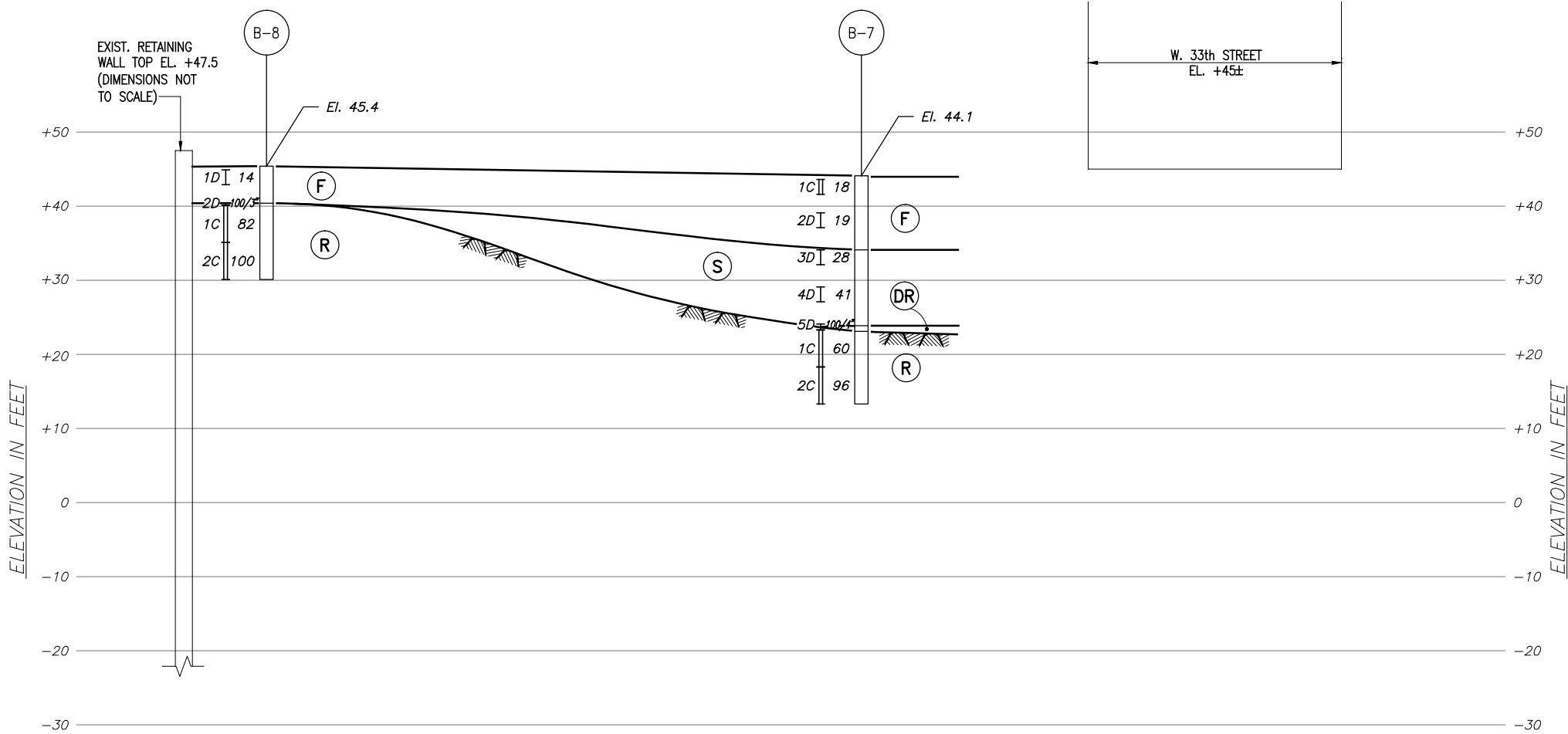
GENERAL STRATA DESCRIPTION

- (F) - **FILL** LOOSE TO COMPACT BLACK AND GRAY, OCCASIONALLY RED FINE TO COARSE SAND WITH SOME TO TRACE OF SILT, CLAY, MICA, GRAVEL AND ROCK FRAGMENTS, BRICK.
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REV.	DATE	BY	DESCRIPTION	
MANHATTAN WEST—NORTH EAST TOWER				
NEW YORK			NEW YORK	
BROOKFIELD PROPERTIES				
NEW YORK			NEW YORK	
MUESER RUTLEDGE CONSULTING ENGINEERS				
14 PENN PLAZA — 225 W. 34TH STREET, NY, NY 10122				
SCALE GRAPHIC	MADE BY: E.C. CH'KD BY: A.E.P.		DATE: 10-30-2014 DATE: 10-30-2014	FILE NUMBER 9560
GEOLOGIC SECTION F—F				DRAWING NUMBER GS-6



GENERAL STRATA DESCRIPTION

- (F) - **FILL** LOOSE TO COMPACT BLACK AND GRAY, OCCASIONALLY RED FINE TO COARSE SAND WITH SOME TRACE OF SILT, CLAY, MICA, GRAVEL AND ROCK FRAGMENTS, BRICK.
- (DR) - **DECOMPOSED ROCK** GRAY MICACEOUS FINE TO MEDIUM SAND, SOME SILT AND ROCK FRAGMENTS.
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NOTES:

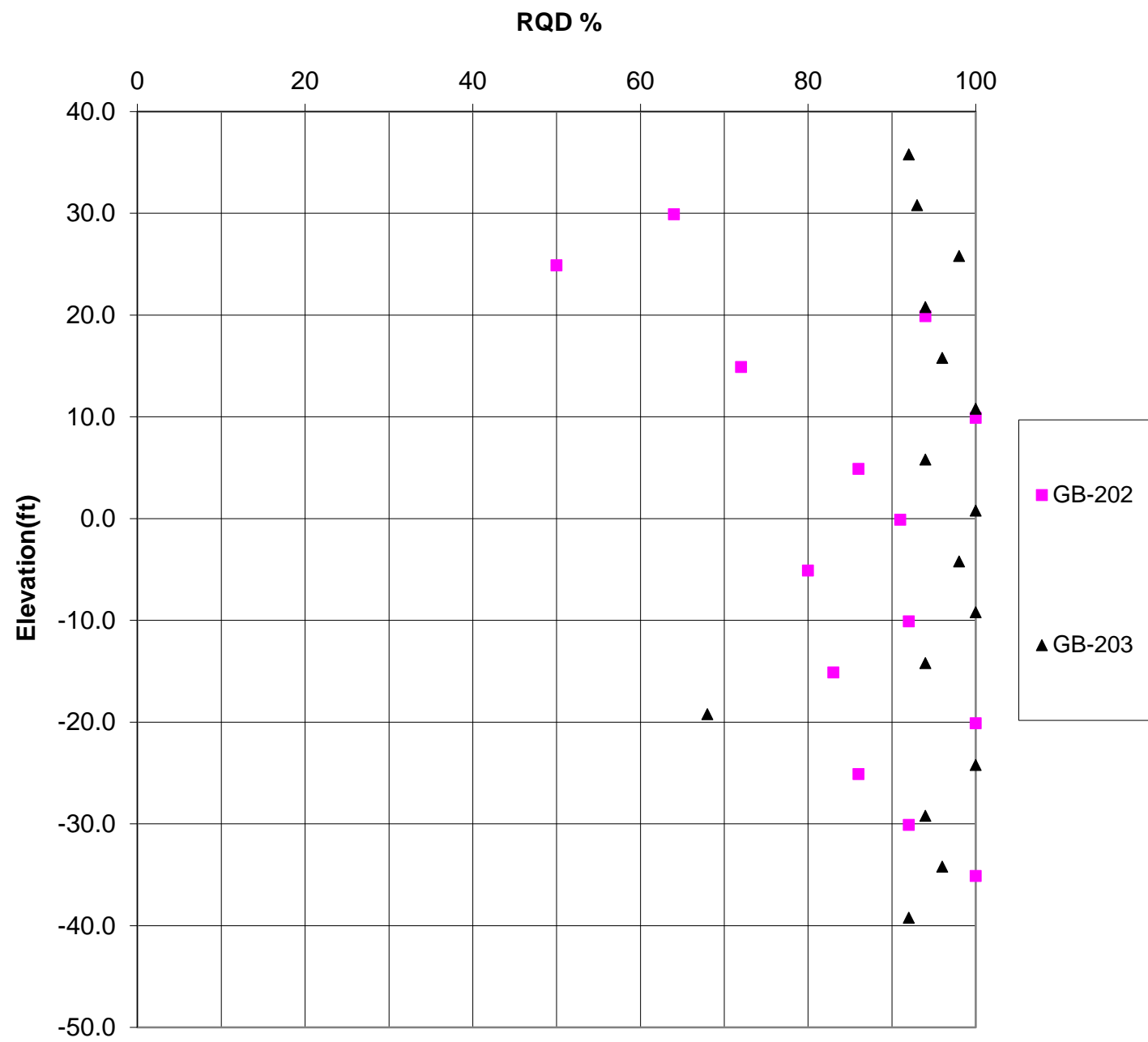
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REV.	DATE	BY	DESCRIPTION	
9th AVENUE DEVELOPMENT				
NEW YORK			NEW YORK	
BROOKFIELD PROPERTIES				
NEW YORK			NEW YORK	
MUESER RUTLEDGE CONSULTING ENGINEERS				
14 PENN PLAZA – 225 W. 34TH STREET, NY, NY 10122				
SCALE GRAPHIC	MADE BY: E.C. CH'KD BY: A.E.P.		DATE: 10–30–2014 DATE: 10–30–2014	FILE NUMBER 9560
GEOLOGIC SECTION G–G				DRAWING NUMBER GS–7

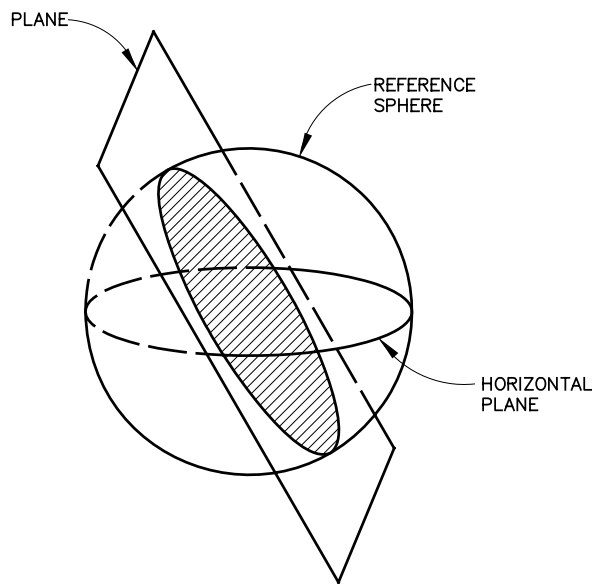
RQD vs Elevation



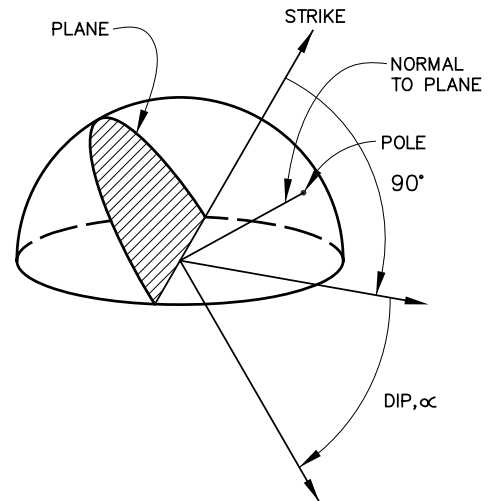
NOTE:

1. ELEVATIONS REFER TO BOROUGH PRESIDENT OF MANHATTAN (BPM) DATUM. TO CONVERT TO NAVD88, ADD APPROXIMATELY 1.7 FEET.

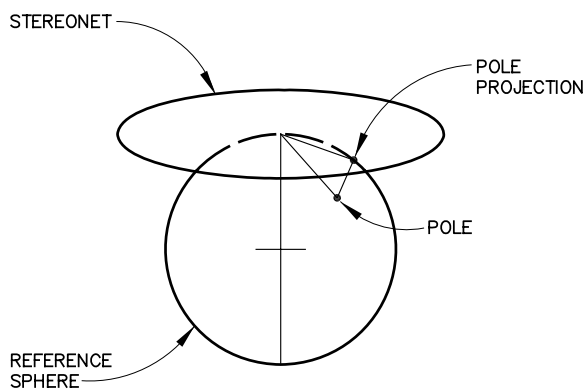
<div>MANHATTAN WEST – NORTHEAST TOWER</div> <div>NEW YORKNEW YORK</div>			
<div>BROOKFIELD PROPERTIES</div> <div>NEW YORKNEW YORK</div>			
<div>MUESER RUTLEDGE CONSULTING ENGINEERS</div> <div>225 W. 34th Street • New York, NY 10122</div>			
<div>SCALE:</div> <div>NTS</div>	<div>MADE BY: AEP</div> <div>CH'KD BY:DRG</div>	<div>DATE: 10/31/2014</div> <div>DATE: 10/31/2014</div>	<div>FILE NO.</div> <div>9560</div>
<div>ROCK QUALITY DESIGNATION (RQD) vs</div> <div>ELEVATION</div>			<div>PLATE NO.</div> <div>5</div>



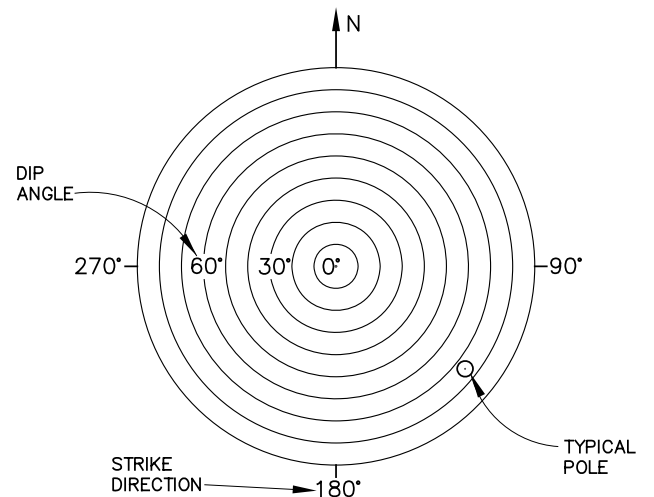
(A) TYPICAL PLANE AND REFERENCE SPHERE



(B) INTERSECTION OF NORMAL TO PLANE AND UPPER HEMISPHERE LOCATES POLE



(C) PROJECTION OF POLE ONTO EQUAL AREA, UPPER HEMISPHERE STERONE



(D) TYPICAL EQUAL AREA STERONE

NOTE:

- FIGURES (A), (B), AND (C) SHOW PROJECTION OF POLE LOCATION ON UPPER HEMISPHERE EQUAL AREA STERONE. TYPICAL NET SHOWN IN FIGURE (D) IS GRAPHED TO ALLOW PLOTTING OF POLE PROJECTION DIRECTLY USING STRIKE AND DIP ANGLES.



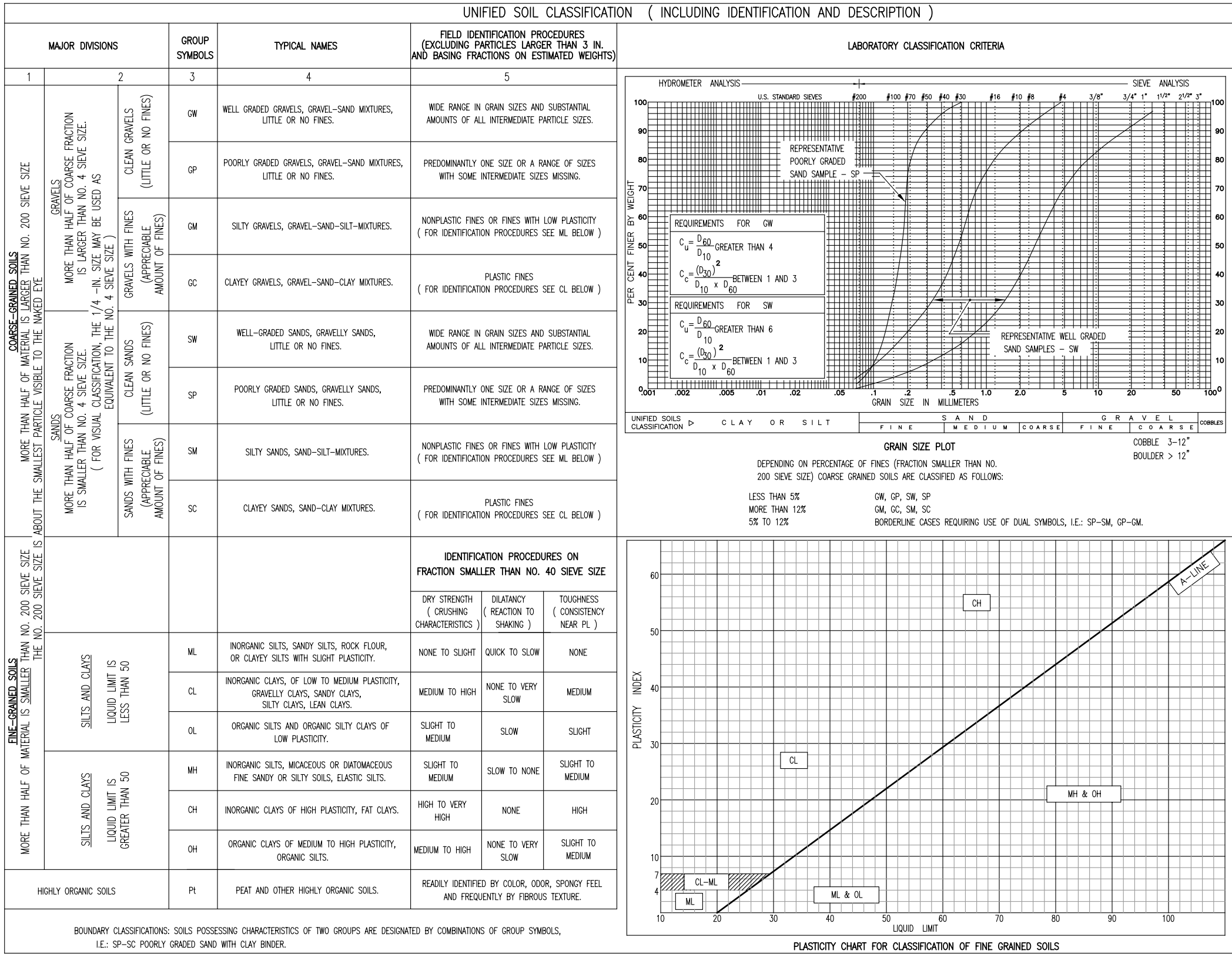
MUESER RUTLEDGE CONSULTING ENGINEERS

225 WEST 34th STREET – 14 PENN PLAZA
NEW YORK, NY 10122

STEREONET REFERENCE DRAWING

DRAWING NO.

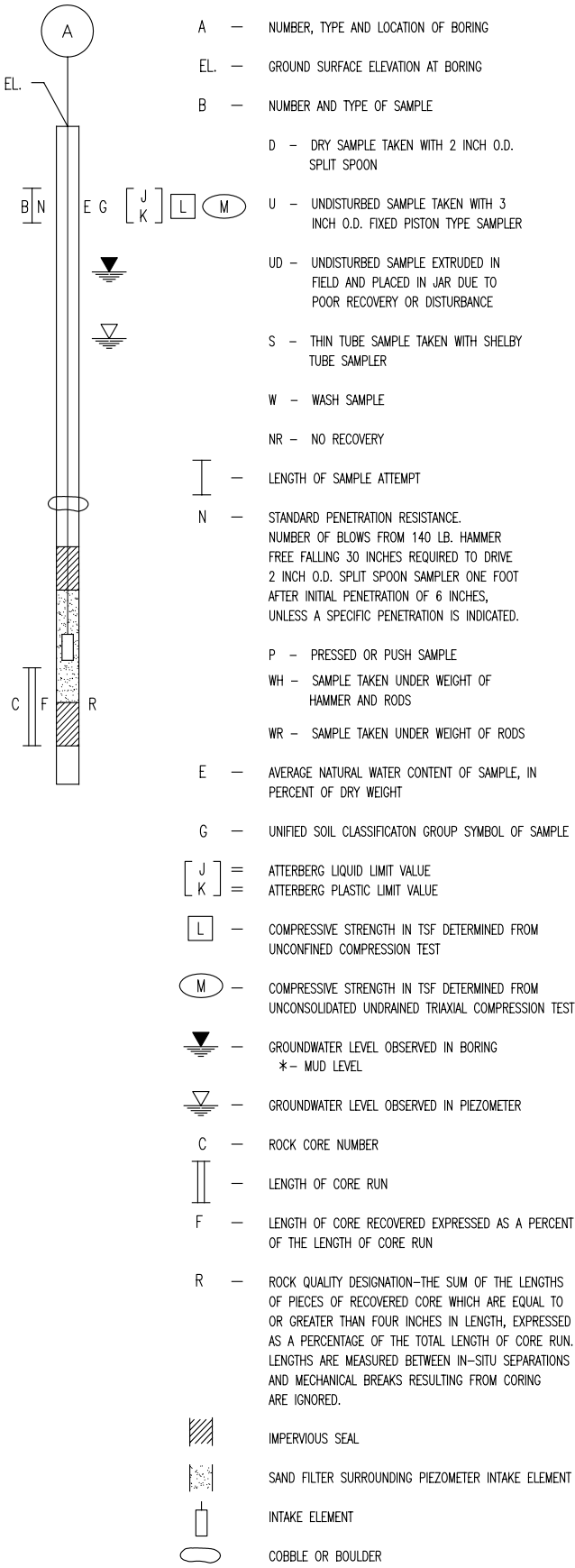
R-1

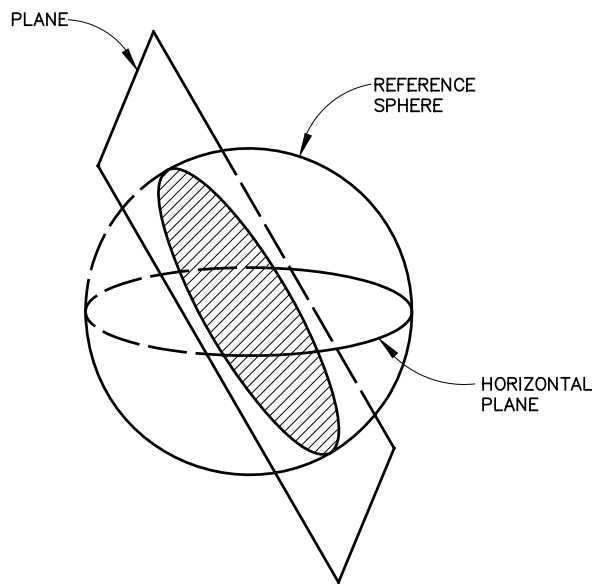


TERMINOLOGY USED IN MRCE SOIL DESCRIPTIONS

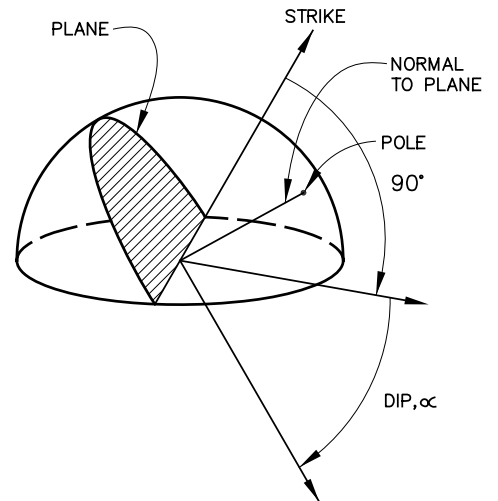
DEGREE OF COMPACTION FOR NON-PLASTIC SOIL		CONSISTENCY OF CLAY AND CLAYEY SILT ⁺			DESCRIPTION OF CONSTITUENT PERCENTAGES AS USED IN SOIL SAMPLE CLASSIFICATIONS
DEGREE OF COMPACTION	BLOWS* PER FOOT	CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TSF)	IDENTIFICATION CHARACTERISTICS	
LOOSE	0 TO 10	SOFT	LESS THAN 0.5	EASILY REMOLDED WITH SLIGHT FINGER PRESSURE	1% TO 12% - "TRACE" 13% TO 30% - "SOME" 31% TO 49% - ADJECTIVE FORM OF SOIL GROUP (EG. SANDY) EQUAL AMOUNT - "AND" (EG. SAND AND GRAVEL)
MEDIUM COMPACT	11 TO 29	MEDIUM	0.5 TO 1.0	REQUIRES SUBSTANTIAL PRESSURE FOR REMOLDING	
COMPACT	30 TO 50	STIFF	1.0 TO 4.0	DIFFICULT TO REMOLD WITH FINGERS	
VERY COMPACT	GREATER THAN 50	HARD	GREATER THAN 4.0	CANNOT BE REMOLDED WITH FINGERS	
* STANDARD PENETRATION RESISTANCE USING 140 LB. HAMMER FREE FALLING 30 INCHES TO DRIVE A 2 INCH O.D. SPLIT-SPOON SAMPLER.		+ NONPLASTIC SILTS ARE DESCRIBED USING DEGREE OF COMPACTION AS PRESENTED FOR NON-PLASTIC SOIL.			

BORING LEGEND

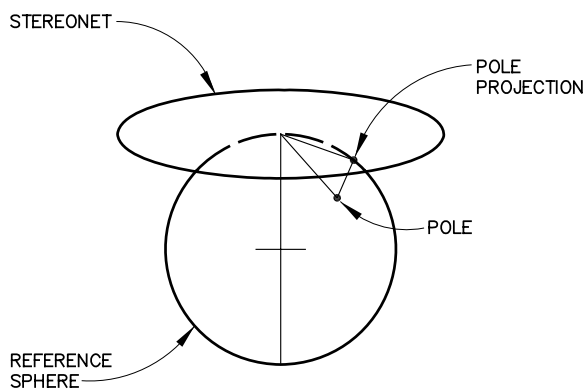




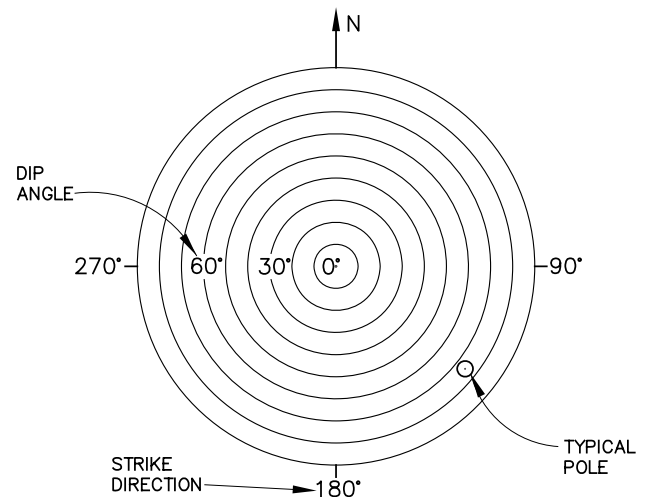
(A) TYPICAL PLANE AND REFERENCE SPHERE



(B) INTERSECTION OF NORMAL TO PLANE AND UPPER HEMISPHERE LOCATES POLE



(C) PROJECTION OF POLE ONTO EQUAL AREA, UPPER HEMISPHERE STEREO NET



(D) TYPICAL EQUAL AREA STEREO NET AND POLE

NOTE:

- FIGURES (A), (B), AND (C) SHOW PROJECTION OF POLE LOCATION ON UPPER HEMISPHERE EQUAL AREA STEREO NET. TYPICAL NET SHOWN IN FIGURE (D) IS GRAPHED TO ALLOW PLOTTING OF POLE PROJECTION DIRECTLY USING STRIKE AND DIP ANGLES.



MUESER RUTLEDGE CONSULTING ENGINEERS

225 WEST 34th STREET – 14 PENN PLAZA
NEW YORK, NY 10122

STEREONET REFERENCE DRAWING

DRAWING NO.

R-1

APPENDIX A

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: 9TH AVENUE DEVELOPMENT
LOCATION: NEW YORK, NEW YORK

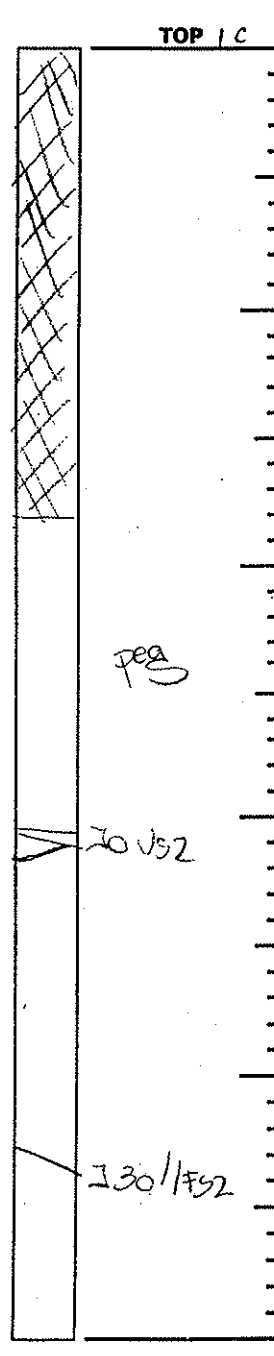
BORING NO. GB-202
SHEET 1 OF 7
FILE NO. 9560
SURFACE ELEV. 47.4 +/-
RES. ENGR. ROBERTO REALE

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING	REMARKS
	NO.	DEPTH	BLOWS/6"				BLOWS	
01:00							DRILLED	
03-13-08	1D	1.0	33-27	Red & yellow fine to medium sand, some gravel (Fill) (GP)			AHEAD	
Thursday		3.0	29-21				4"	
Clear	2D	3.0	34-21	Red & gray fine to medium sand, some brick, gravel (Fill) (SP-SM)				
30°F		5.0	27-18			5		
	3D	5.0	5-6	Gray gravel & bricks, some silt, trace coarse sand (Fill) (GP-GM)				Poor recovery.
		7.0	3-3					
	4D	7.0	5-9	Bricks & gravel, trace coarse sand, silt (Fill) (GP-GM)				
		9.0	19-16		F1			
						10		
	5D	10.0	6-7	Do 4D (Fill) (GP-GM)				
		12.0	12-8					Rig facing North 3 scratches on East side.
						15	▼	
	1C	15.0	REC=96%	Medium hard slightly weathered gray granite, broken to jointed, weathered joints			6*	*Coring time in minutes per foot.
		20.0	RQD=64%				5*	
							6*	
							6*	
						20	5*	
	2C	20.0	REC=84%	Top 0.8': Do 1C			5*	
		25.0	RQD=50%	Bot: Intermediate black homblende schist, broken to closely jointed, weathered joints			6*	
							6*	
							5*	
07:00						25	6*	No wash return from 25' to 40'.
08:15	3C	25.0	REC=100%	Hard slightly weathered to unweathered black homblende schist, jointed, mineral coated joints			2*	
03-13-08		30.0	RQD=94%				3*	
Thursday							2*	Core barrel was blocked at 29'.
Cloudy							4*	
40°F						30	4*	Core barrel was blocked at 30.5'.
	4C	30.0	REC=96%	Medium hard slightly weathered black homblende schist, jointed, trace broken, weathered joints & mineral coated joints			5*	
		35.0	RQD=72%				4*	
							5*	
					R		5*	
						35	5*	
	5C	35.0	REC=100%	Hard unweathered black homblende schist, moderately jointed, mineral coated joints			4*	
		40.0	RQD=100%				4*	
							5*	
							5*	
						40	5*	No wash return from 40' to 50'.
	6C	40.0	REC=98%	Top 0.5': Do 5C			6*	
		45.0	RQD=86%	Bot 4.3': Medium hard slightly weathered gray gneissic schist & pegmatite, jointed to closely jointed, iron stained joints			6*	
							8*	
							6*	
						45	7*	
	7C	45.0	REC=98%	Hard slightly weathered to unweathered gray gneissic schist, trace pegmatite, jointed, iron stained joints			5*	
		50.0	RQD=91%				5*	
							6*	
							6*	
						50	6*	No wash return from 50' to 60'.
	8C	50.0	REC=86%	Hard slightly weathered to unweathered gray gneissic schist, moderately jointed, FeJts				
		55.0	RQD=80%					

RES. ENGR. RRFAF JCh

LOCATION NEW YORK, NY

Run No.	REC / RQD
1C	96 / 64



- ☐ Empty Space

SCALE: 1 division = 0.1 feet

NOTES

MUESER RUTLEDGE CONSULTING ENGINEERS ROCK CORE SKETCH

BORING NO. GB-202
SHEET 4 OF 7
FILE NO. 9560
SURFACE ELEV. 17.4±
RES. ENGR. J. Chan

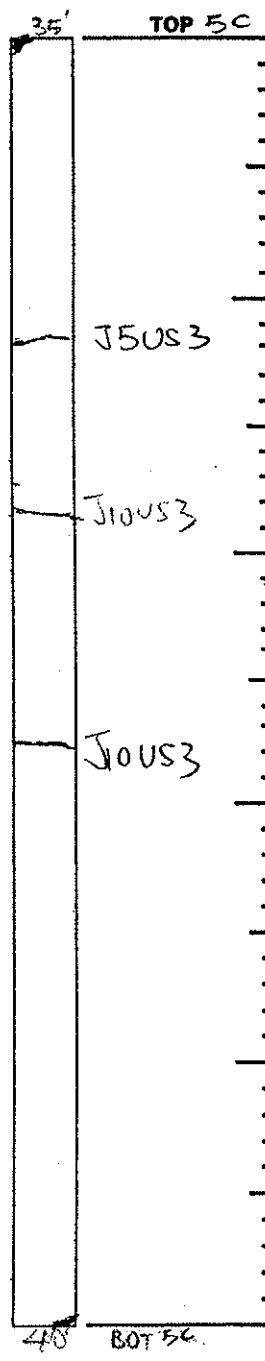
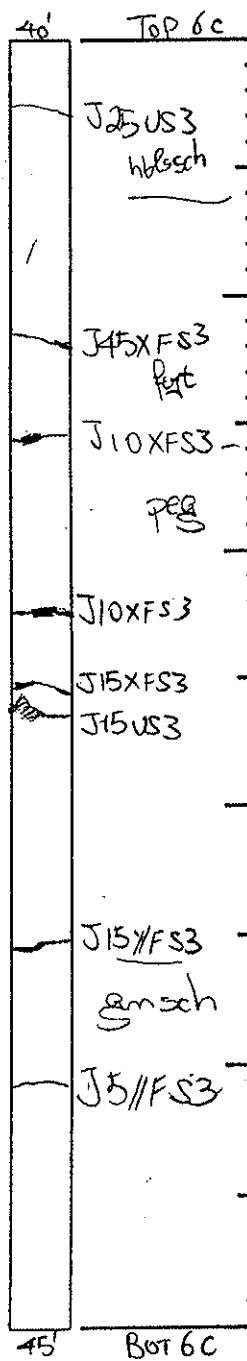
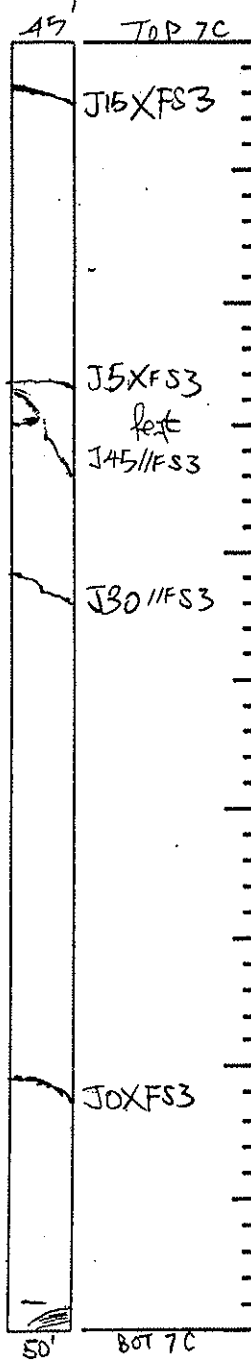
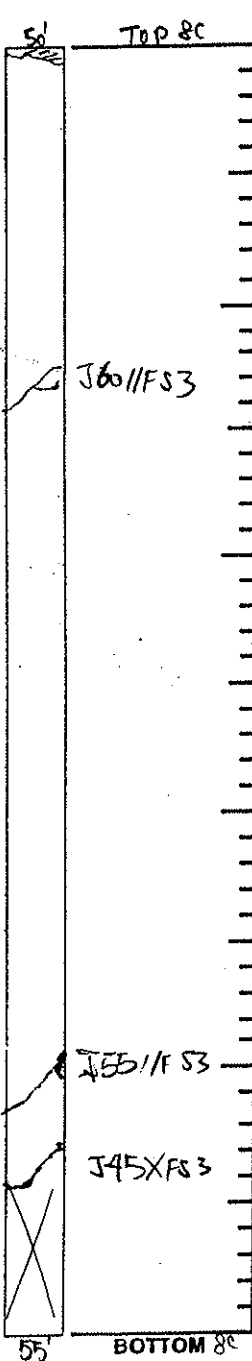
PROJECT 9th Av Development
LOCATION NY, NY

Run No.	REC / RQD
8C	86/80

Run No.	REC / RQD
7C	98/91

Run No.	REC / RQD
6C	98/86

Run No.	REC / RQD
5C	100/100



ROCK CORE SKETCH LEGEND	
JOINTING	
J	- Joint
MB	- Mechanical Break
✕	- Angle w/ Horizontal
//	- Parallel
X	- Crossing
F	- Foliation
S	- Stratification
U	- Unfoliated or Unstratified
SURFACE	
C	- Curved
I	- Irregular
S	- Straight
CONDITION	
1	- Slick
2	- Smooth
3	- Rough
SKETCH SYMBOLS	
	Joint
	Healed Joint
	Broken
	Part of Core Not Recovered
	Cavities or Vugs in Core
	Clay
	Sand
	Empty Space

SCALE: 1 division = 0.1 feet

NOTES

MUESER RUTLEDGE CONSULTING ENGINEERS ROCK CORE SKETCH

BORING NO. GB-202
SHEET 5 OF 7
FILE NO. 9560
SURFACE ELEV. 47.4+
RES. ENGR. J. Chan

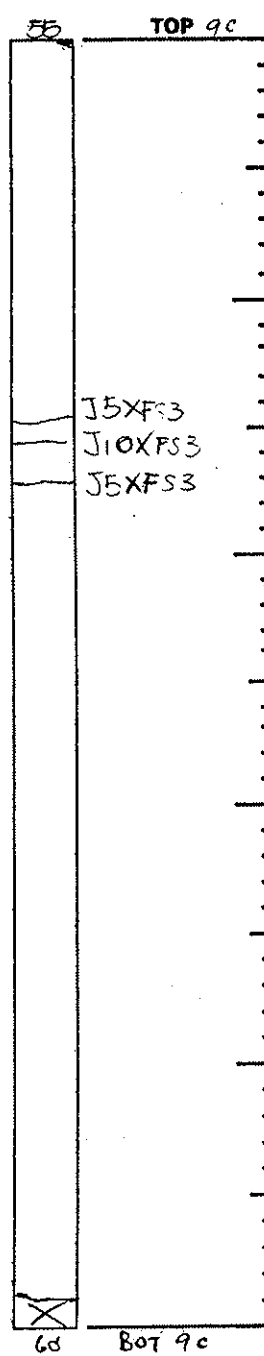
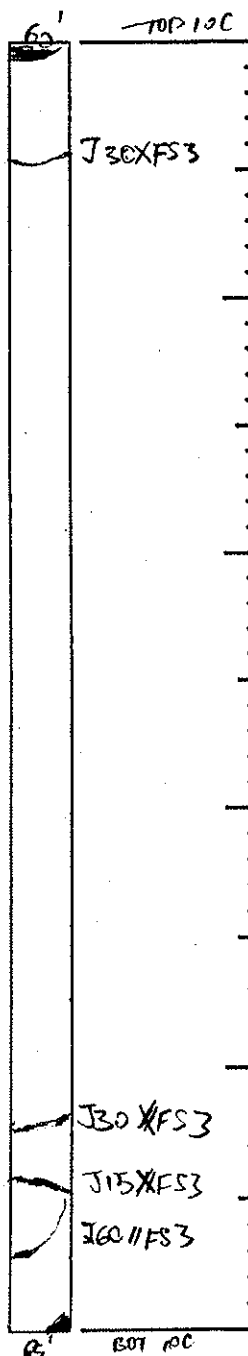
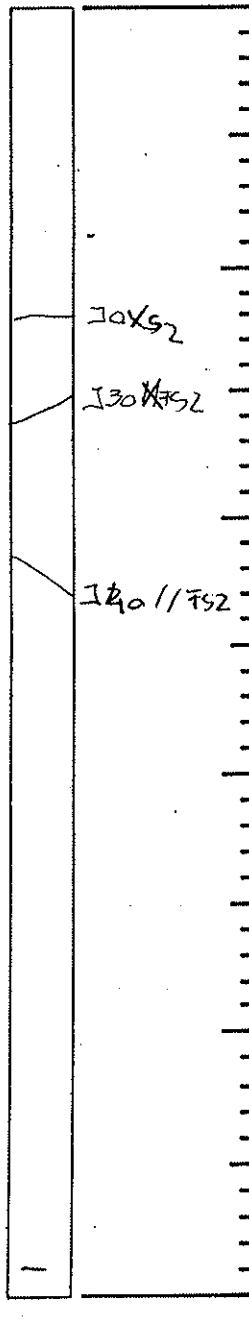
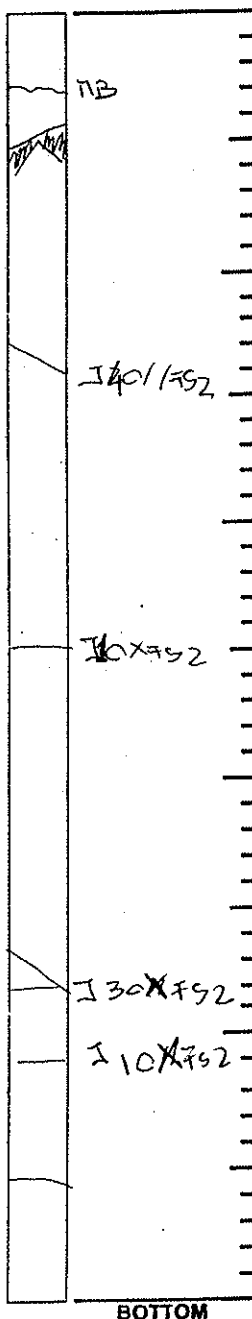
PROJECT 9th Av. Development
LOCATION NY, NY

Run No.	REC / RQD
12C	100/86

Run No.	REC / RQD
11C	100/100

Run No.	REC / RQD
10C	100/83

Run No.	REC / RQD
9C	98/92



ROCK CORE SKETCH LEGEND	
JOINTING	
J	- Joint
MB	- Mechanical Break
∠	- Angle w/ Horizontal
//	- Parallel
X	- Crossing
F	- Foliation
S	- Stratification
U	- Unfoliated or Unstratified
SURFACE	
C	- Curved
I	- Irregular
S	- Straight
CONDITION	
1	- Slick
2	- Smooth
3	- Rough
SKETCH SYMBOLS	
	Joint
	Healed Joint
	Broken
	Part of Core Not Recovered
	Cavities or Vugs in Core
	Clay
	Sand
	Empty Space

NOTES _____

**MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE SKETCH**

BORING NO. GB-202

SHEET 6 **OF** 7

FILE NO. 2560

SURFACE ELEV. 47.4±

RES. ENGR. RREALE

PROJECT 9th Avenue Dev.

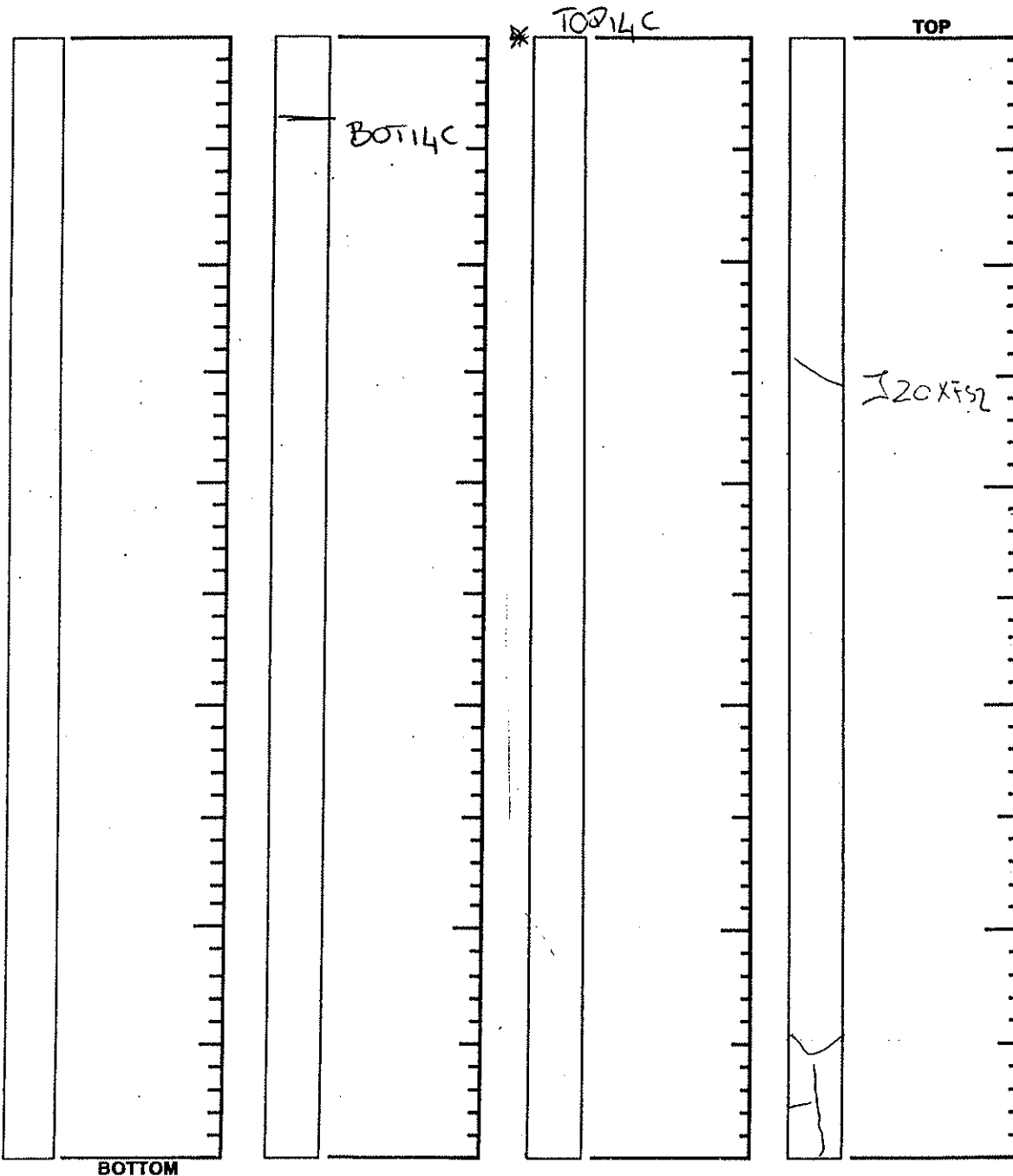
LOCATION NEW YORK, NY

Run No.	REC / RQD

Run No.	REC / RQD

Run No.	REC / RQD
14C	100/100

Run No.	REC / RQD
13C	100/92



ROCK CORE SKETCH LEGEND	
JOINTING	
J	- Joint
MB	- Mechanical Break
X	- Angle w/ Horizontal
//	- Parallel
X	- Crossing
F	- Foliation
S	- Stratification
U	- Unfoliated or Unstratified
SURFACE	
C	- Curved
I	- Irregular
S	- Straight
CONDITION	
1	- Slick
2	- Smooth
3	- Rough
SKETCH SYMBOLS	
	Joint
	Healed Joint
	Broken
	Part of Core Not Recovered
	Cavities or Vugs in Core
	Clay
	Sand
	Empty Space

SCALE: 1 division = 0.1 feet

NOTES * 1 MASSIVE PIECE DRILLER BROKE THE BOTTOM
TO FIX IN THE BOX

MUESER RUTLEDGE CONSULTING ENGINEERS

PROJECT 9TH AVENUE DEVELOPMENT	BORING NO. GB-202
LOCATION NEW YORK, NEW YORK	SHEET 7 OF 7
BORING LOCATION SEE BORING LOCATION PLAN	FILE NO. 9560
	SURFACE ELEV. 47.4 +/-
	DATUM BOROUGH PRESIDENT OF MANHATTAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
TRUCK <input checked="" type="checkbox"/>	DURING CORING	DIA., IN. 4	DEPTH, FT. FROM	0 TO 15
SKID <input type="checkbox"/>	MECHANICAL	DIA., IN.	DEPTH, FT. FROM	TO
BARGE <input type="checkbox"/>	HYDRAULIC <input checked="" type="checkbox"/>	DIA., IN.	DEPTH, FT. FROM	TO
OTHER <input type="checkbox"/>	OTHER	DIA., IN.	DEPTH, FT. FROM	TO

TYPE AND SIZE OF:	DRILLING MUD USED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
D-SAMPLER 2" O. D. SPLIT SPOON	DIAMETER OF ROTARY BIT, IN.
U-SAMPLER	TYPE OF DRILLING MUD
S-SAMPLER	
CORE BARREL NX DOUBLE TUBE	AUGER USED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
CORE BIT NX DIAMOND BIT	TYPE AND DIAMETER, IN.
DRILL RODS NWJ	
	CASING HAMMER, LBS. 140 AVERAGE FALL, IN. 30
	SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO WATER LEVEL OBSERVATIONS MADE.

PIEZOMETER INSTALLED ☐ YES ☒ NO **SKETCH SHOWN ON** _____

STANDPIPE:	TYPE	ID, IN.	LENGTH, FT.	TOP ELEV.
INTAKE ELEMENT:	TYPE	OD, IN.	LENGTH, FT.	TIP ELEV.
FILTER:	MATERIAL	OD, IN.	LENGTH, FT.	BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	15	NO. OF 3" SHELBY TUBE SAMPLES	70
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER: ORIENTED ROCK CORING	

BORING CONTRACTOR WARREN GEORGE INC.	
DRILLER CARLOS MALDONADO	HELPERS BEN SCOTT
REMARKS BOREHOLE GROUTED UPON COMPLETION. (ORIENTED CORE).	
RESIDENT ENGINEER ROBERTO REALE	DATE 03-13-08
CLASSIFICATION CHECK: CHERYL J. MOSS	TYPING CHECK: AERY RYUNG JOO

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: 9TH AVENUE DEVELOPMENT
LOCATION: NEW YORK, NEW YORK

BORING NO. GB-203P
SHEET 1 OF 8
FILE NO. 9560
SURFACE ELEV. 45.3 +/-
RES. ENGR. R. REALE/J. CHAN

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
05:00							DRILLED	
03-14-08	1D	1.0	22-21	Gray black & yellow fine to coarse sand, some gravel, brick (Fill) (SP-SM)	F1		AHEAD	
Friday		3.0	13-15				4"	
Cloudy	2D	3.0	13-20	Black fine to coarse sand, some silt, bricks, trace clay (Fill) (SM)		5	↓	
35°F		5.0	45-32					
	3D	5.0	5-4	Top 2": Fine to medium sand, some silt (Fill)(SM)		7		
		6.4	100/3"	Bot 2": Fine to coarse sand, tr silt, mica (Fill)(DR)				
	1C	7.0	REC=96%	Top 2.8': Hard slightly weathered gray gneissic schist, trace pegmatite, jointed, iron stained joints				
		12.0	RQD=92%	Bot 2.2': Medium hard slightly weathered light gray granite, jointed		10		
								Light gray wash from 12' to 14'.
							4*	No wash return at 14'.
07:15	2C	13.0	REC=100%	Top 1.7': Medium hard slightly weathered gray to light gray pegmatite, closely jointed to WJts	R		4*	*Coring time in minutes per foot.
03-14-08		17.0	RQD=93%	Bot 3.3': Hard slightly weathered gray gneissic schist, jointed, weathered joints		15	5*	
Friday							4*	
Partly							5*	
Cloudy	3C	17.0	REC=98%	Hard slightly weathered to unweathered gray gneissic schist, jointed, iron stained joints & weathered joints			5*	
40°F		22.0	RQD=98%			20	4*	Rig facing North 3 scratches on East side 132° bearing.
							4*	
							4*	
	4C	22.0	REC=100%	Hard unweathered black to dark gray gneissic schist, jointed			5*	
		27.0	RQD=94%				5*	
						25	4*	
							4*	
							4*	
	5C	27.0	REC=99%	Hard unweathered black to gray gneissic schist, jointed, trace weathered joints			4*	
		32.0	RQD=96%				4*	
						30	4*	
							4*	
							4*	
	6C	32.0	REC=100%	Hard unweathered black to dark gray gneissic schist, trace pegmatite, moderately jointed			3*	
		37.0	RQD=100%				4*	
						35	4*	
							4*	
							4*	
	7C	37.0	REC=98%	Hard unweathered black to dark gray gneissic schist, jointed, trace weathered joints			4*	
		42.0	RQD=94%				4*	
						40	4*	Wash return from 40' to 42'.
							3*	Light gray wash at 40'.
	8C	42.0	REC=100%	Hard unweathered black to dark gray hornblende schist, trace pegmatite, gneissic schist, moderately jointed to jointed			4*	
		47.0	RQD=100%				4*	
						45	4*	
							4*	
							5*	No wash return at 47'.
	9C	47.0	REC=98%	Hard unweathered black to dark gray gneissic schist, blocky			5*	
		52.0	REC=98%				5*	
						50	4*	
							5*	
							4*	

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: 9TH AVENUE DEVELOPMENT
LOCATION: NEW YORK, NEW YORK

BORING NO. GB-203P
SHEET 2 OF 8
FILE NO. 9560
SURFACE ELEV. 45.3 +/-
RES. ENGR. J. CHAN/S. K. SHETTY/R. REALE

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	CASING		REMARKS
	NO.	DEPTH	BLOWS/6"			DEPTH	BLOWS	
Cont'd							4*	
03-14-08							4*	
Friday	10C	52.0	REC=100%	Hard unweathered black to dark gray gneissic schist, some schistose gneiss, jointed, weathered joints			4*	
Partly		57.0	RQD=100%				4*	
Cloudy						55	4*	
40°F							5*	
							4*	
	11C	57.0	REC=100%	Hard slightly weathered to unweathered black to dark gray gneissic schist, jointed, iron stained joints			4*	
		62.0	RQD=94%				4*	
						60	3*	
							4*	
							4*	
	12C	62.0	REC=86%	Medium hard slightly weathered to moderately weathered black to dark gray gneissic schist with weathered zones, jointed to closely jointed, weathered joints				
		67.0	RQD=68%					
05:00						65		Wash return at 63.5'; light gray color.
03-14-08					R			
Friday	13C	67.0	REC=100%	Hard gray gneissic schist, moderately jointed			6*	
Cloudy		72.0	RQD=100%				6*	
40°F						70	5*	
							6*	
							6*	
	14C	72.0	REC=100%	Hard unweathered gray gneissic schist, moderately jointed			6*	
		77.0	RQD=94%				5*	
						75	4*	
							5*	
							6*	
07:00							6*	
03-14-08							6*	
Friday	15C	77.0	REC=100%	Hard unweathered gray gneissic schist, moderately jointed			6*	
Cloudy		82.0	RQD=96%				4*	
40°F					80	5*		
						6*		
						6*		
	16C	82.0	REC=100%	Hard unweathered gray gneissic schist, trace hornblende schist, pegmatite, jointed to moderately jointed		7*		
		87.0	RQD=92%			6*		
					85	8*		
						6*		
						7*	End of Boring at 87'.	
12:00								

**MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE SKETCH**

BORING NO. GB-203 P

SHEET 3 OF 8

FILE NO. 9560

SURFACE ELEV. 45.3

RES. ENGR. JCHAN

PROJECT 9th Avenue Dev

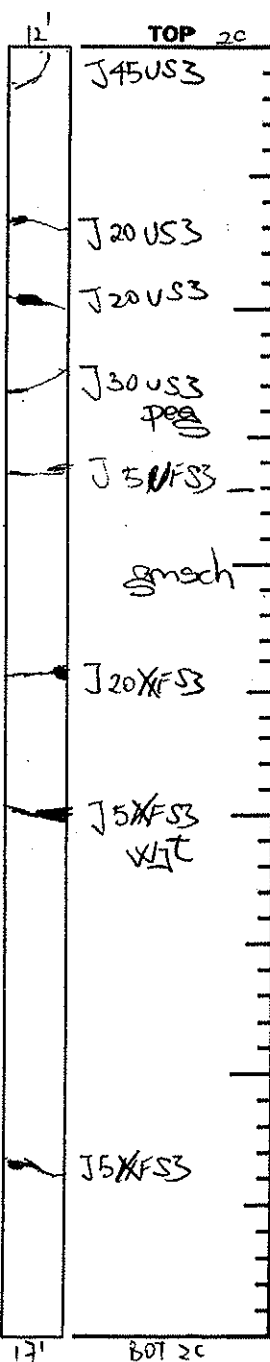
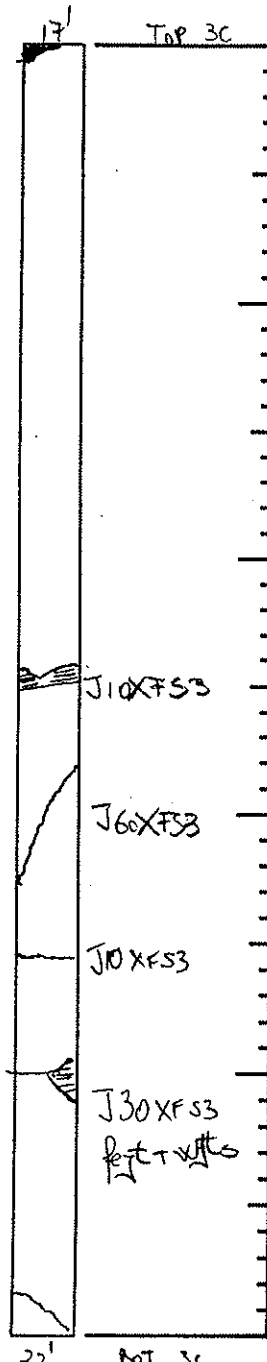
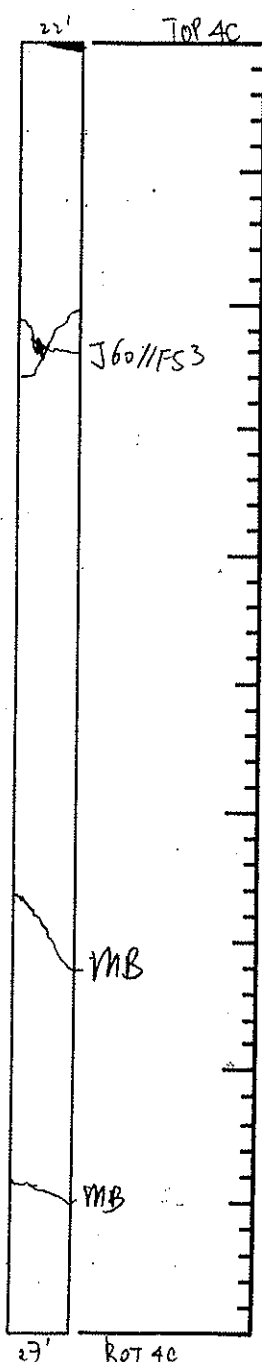
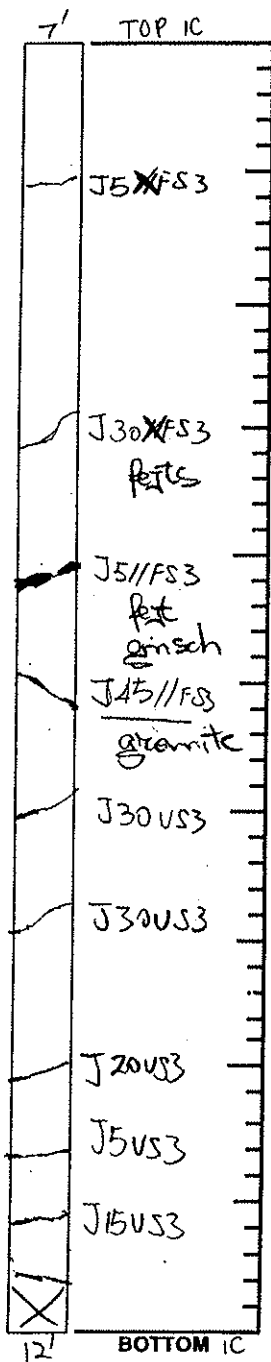
LOCATION NEW YORK, NY

Run No.	REC / RQD
1C	96/92

Run No.	REC / RQD
4C	100/94

Run No.	REC / RQD
3C	98/98

Run No.	REC / RQD
2C	100/93



ROCK CORE SKETCH LEGEND	
JOINTING	
J	- Joint
MB	- Mechanical Break
X	- Angle w/ Horizontal
//	- Parallel
X	- Crossing
F	- Foliation
S	- Stratification
U	- Unfoliated or Unstratified
SURFACE	
C	- Curved
I	- Irregular
S	- Straight
CONDITION	
1	- Slick
2	- Smooth
3	- Rough
SKETCH SYMBOLS	
	Joint
	Healed Joint
	Broken
	Part of Core Not Recovered
	Cavities or Vugs in Core
	Clay
	Sand
	Empty Space

NOTES 4C AND 2C, 3C, 4C IN DIFFERENT BOXES

MUESER RUTLEDGE CONSULTING ENGINEERS ROCK CORE SKETCH

BORING NO. GB-203 P

SHEET 4 OF 8

FILE NO. 9560

SURFACE ELEV. 45.31

RES. ENGR. J. Chan

PROJECT 9th Av. Dev

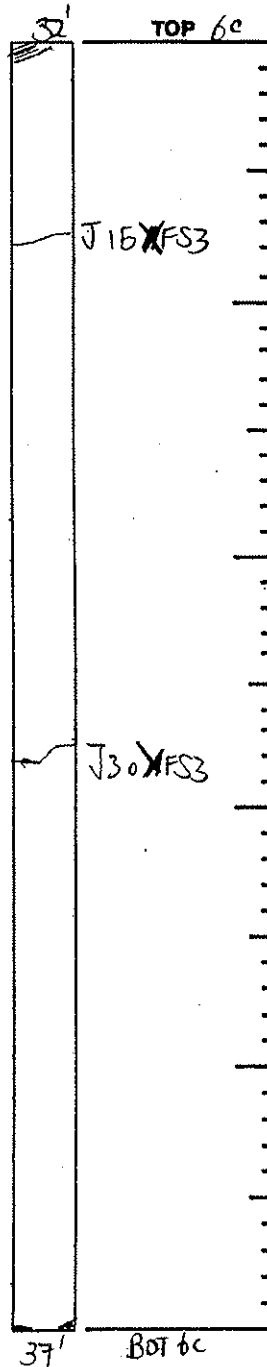
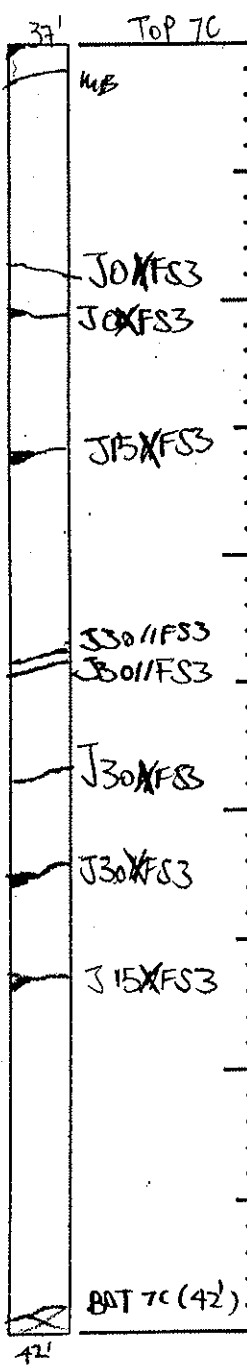
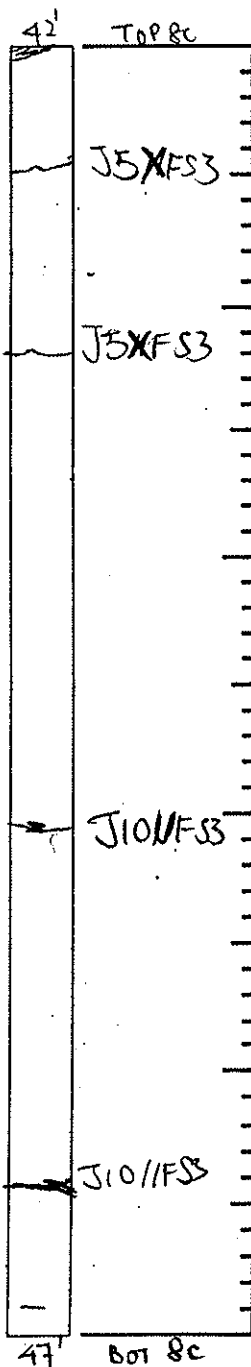
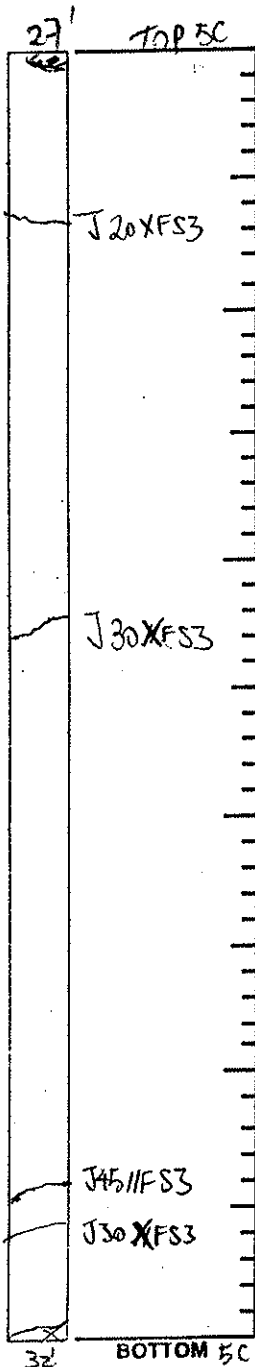
LOCATION NY, NY

Run No.	REC / RQD
5C	99/96

Run No.	REC / RQD
8C	100/100

Run No.	REC / RQD
7C	98/94

Run No.	REC / RQD
6C	100/100



ROCK CORE SKETCH LEGEND	
JOINTING	
J	- Joint
MB	- Mechanical Break
K	- Angle w/ Horizontal
//	- Parallel
X	- Crossing
F	- Foliation
S	- Stratification
U	- Unfoliated or Unstratified
SURFACE	
C	- Curved
I	- Irregular
S	- Straight
CONDITION	
1	- Slick
2	- Smooth
3	- Rough
SKETCH SYMBOLS	
	Joint
	Healed Joint
	Broken
	Part of Core Not Recovered
	Cavities or Vugs in Core
	Clay
	Sand
	Empty Space

SCALE: 1 division = 0.1 feet

NOTES 5C AND 6C 7C 8C IN DIFFERENT BOXES
partly foliated

**MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE SKETCH**

BORING NO. GB-203P

SHEET 5 OF 8

FILE NO. 956

SURFACE ELEV. 15.3±

RES. ENGR. J. Chen

PROJECT 9th Av. Dev.

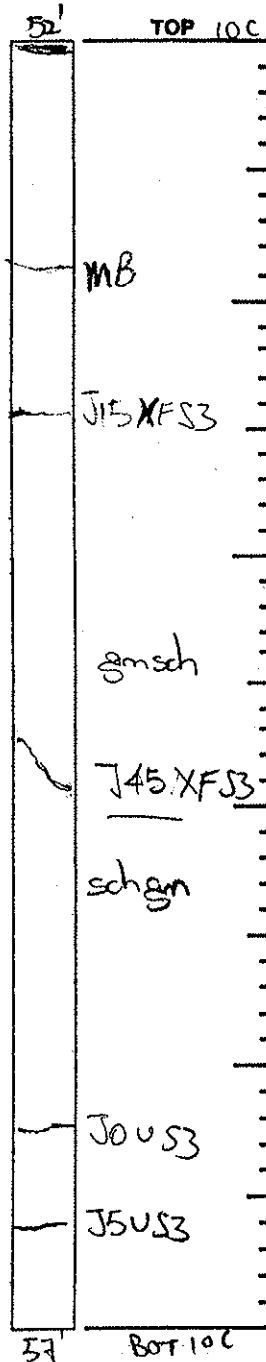
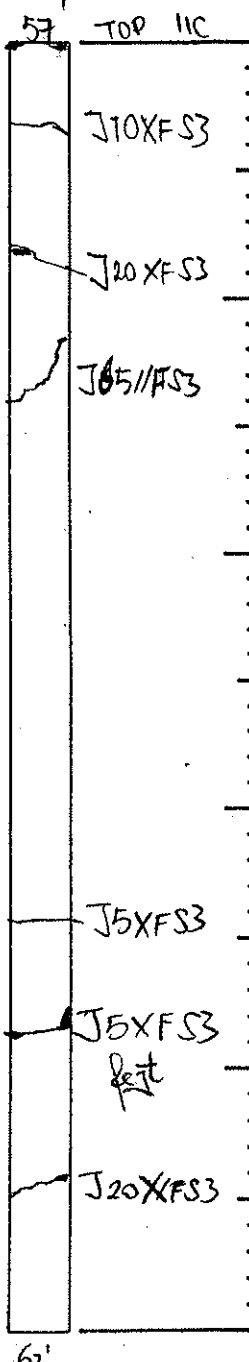
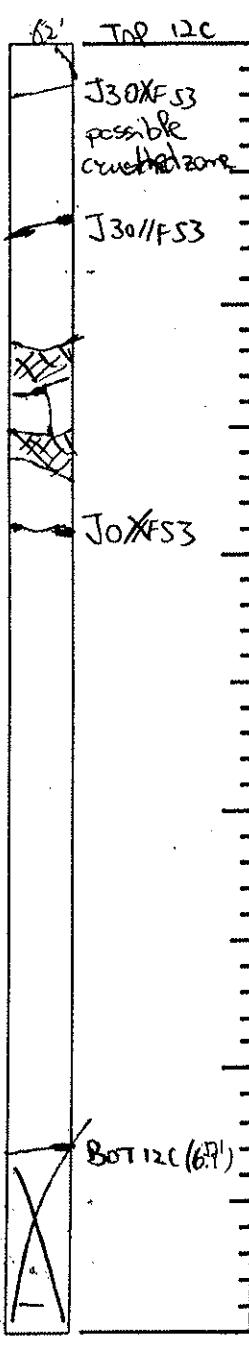
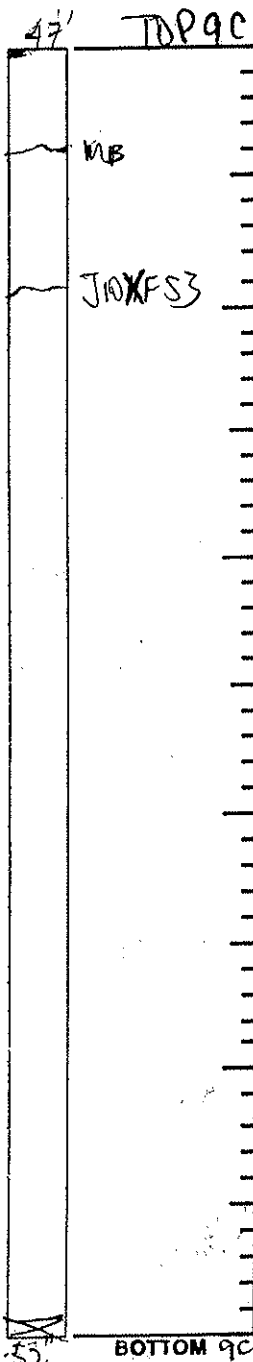
LOCATION NY, NY

Run No.	REC / RQD
9C	98/98

Run No.	REC / RQD
12C	86/88

Run No.	REC / RQD
11C	100/94

Run No.	REC / RQD
10C	100/100



ROCK CORE SKETCH LEGEND	
JOINTING	
J	- Joint
MB	- Mechanical Break
*	- Angle w/ Horizontal
//	- Parallel
X	- Crossing
F	- Foliation
S	- Stratification
U	- Unfoliated or Unstratified
SURFACE	
C	- Curved
I	- Irregular
S	- Straight
CONDITION	
1	- Slick
2	- Smooth
3	- Rough
SKETCH SYMBOLS	
	Joint
	Healed Joint
	Broken
	Part of Core Not Recovered
	Cavities or Vugs in Core
	Clay
	Sand
	Empty Space

SCALE: 1 division = 0.1 feet

NOTES 9C AND 10C, 11C, 12C IN DIFFERENT BOXES
partly foliated

NOTES 13C AND 14C, 15C, 16C IN DIFFERENT BOXES

PROJECT 9th Avenue PIEZOMETER NO. GB-203P
LOCATION NEW YORK, NY
PIEZOMETER LOCATION _____ DATE OF INSTALLATION 3/14/08
☐ SEE SKETCH ON BACK RES. ENG. RZEALE

 Sand
  Bentonite
 Gravel
  Grout

GROUND SURFACE ELEV. 45.34

PIEZOMETER NO. GB-203P

MUESER RUTLEDGE CONSULTING ENGINEERS

PROJECT <u>9TH AVENUE DEVELOPMENT</u>	BORING NO. <u>GB-203P</u>
LOCATION <u>NEW YORK, NEW YORK</u>	SHEET <u>8</u> OF <u>8</u>
BORING LOCATION <u>SEE BORING LOCATION PLAN</u>	FILE NO. <u>9560</u>
	SURFACE ELEV. <u>45.3 +/-</u>
	DATUM <u>BOROUGH PRESIDENT OF MANHATTAN</u>

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	
TRUCK <u>X</u>	DURING CORING	DIA., IN. <u>4</u>			DEPTH, FT. FROM <u>0</u> TO <u>5</u>
SKID	MECHANICAL	DIA., IN.			DEPTH, FT. FROM TO
BARGE	HYDRAULIC <u>X</u>	DIA., IN.			DEPTH, FT. FROM TO
OTHER	OTHER	DIA., IN.			DEPTH, FT. FROM TO

TYPE AND SIZE OF:

D-SAMPLER 2" O. D. SPLIT SPOON

U-SAMPLER _____

S-SAMPLER _____

CORE BARREL NX DOUBLE TUBE

CORE BIT NX DIAMOND BIT

DRILL RODS NWJ

DRILLING MUD USED ☐ YES ☒ NO

DIAMETER OF ROTARY BIT, IN. 3-7/8, 2-7/8

TYPE OF DRILLING MUD _____

AUGER USED ☐ YES ☒ NO

TYPE AND DIAMETER, IN. _____

CASING HAMMER, LBS. _____ AVERAGE FALL, IN. _____

SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO WATER LEVEL OBSERVATIONS MADE.

PIEZOMETER INSTALLED ☐ YES ☒ NO **SKETCH SHOWN ON** _____

STANDPIPE:	TYPE	ID, IN.	LENGTH, FT.	TOP ELEV.	
INTAKE ELEMENT:	TYPE	OD, IN.	LENGTH, FT.	TIP ELEV.	
FILTER:	MATERIAL	OD, IN.	LENGTH, FT.	BOT. ELEV.	

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	<u>7</u>	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER: ORIENTED ROCK CORING	<u>80</u>

BORING CONTRACTOR WARREN GEORGE INC.

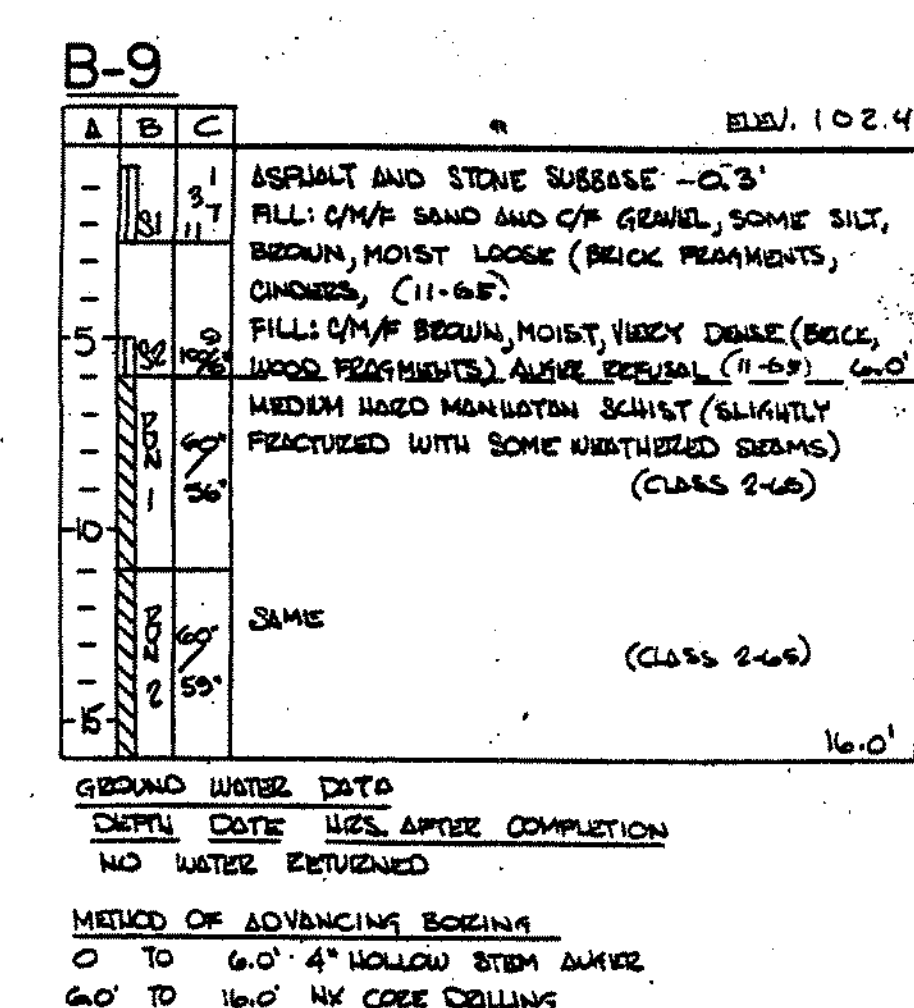
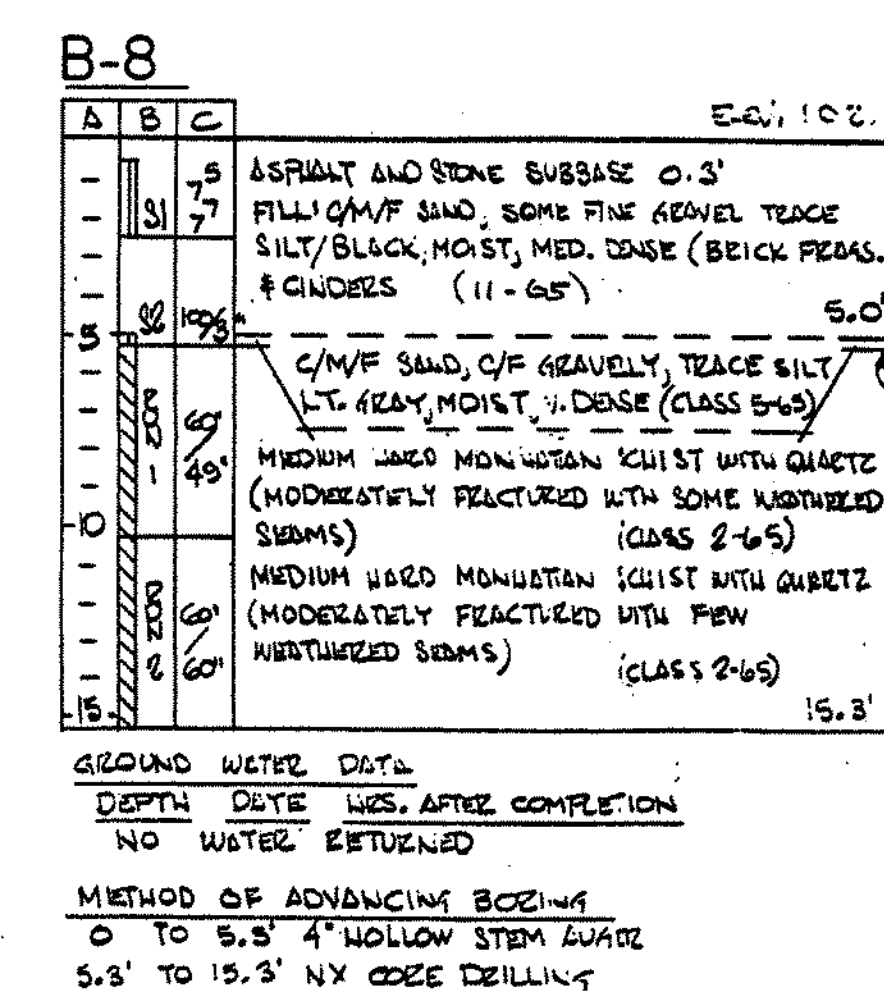
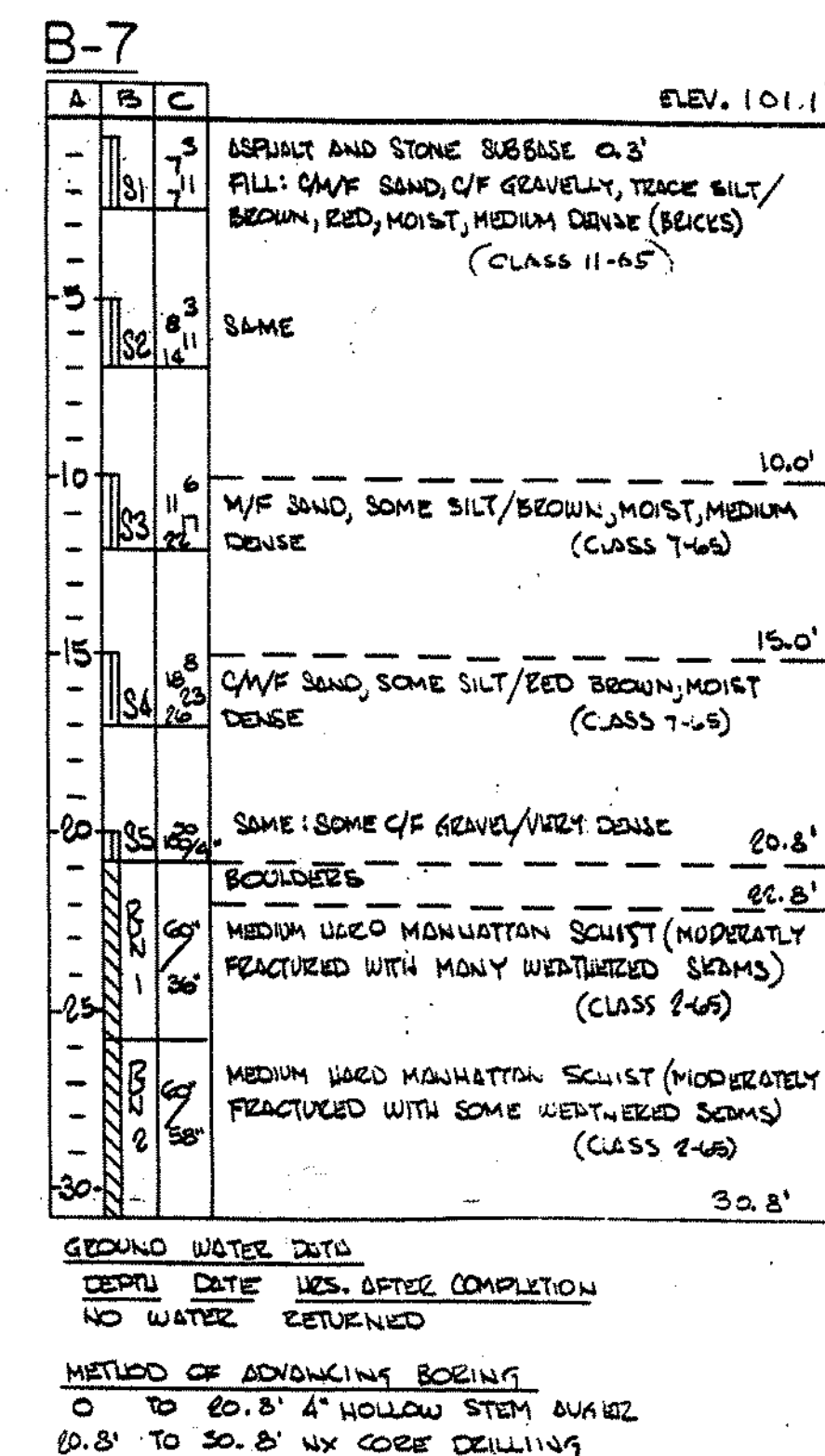
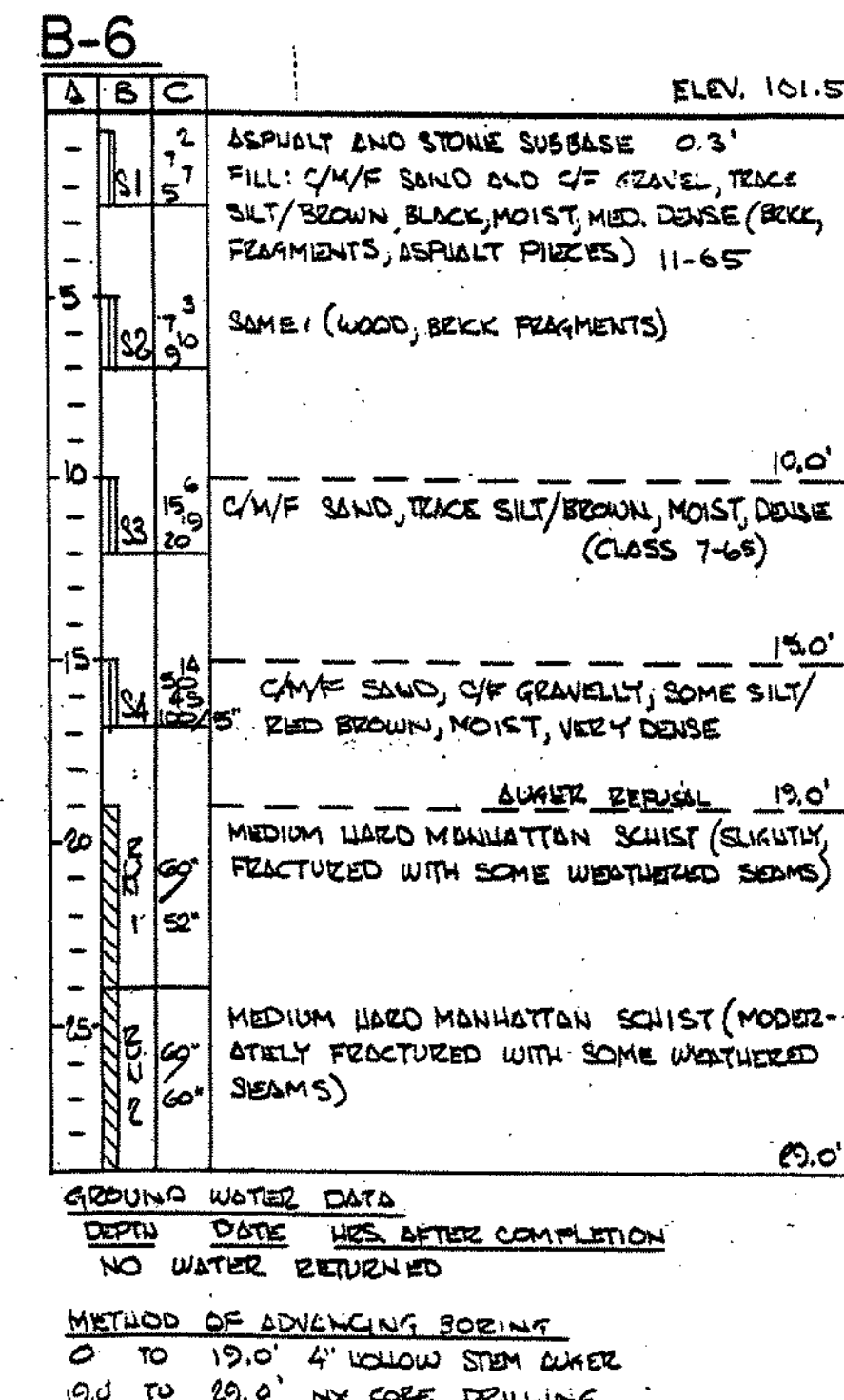
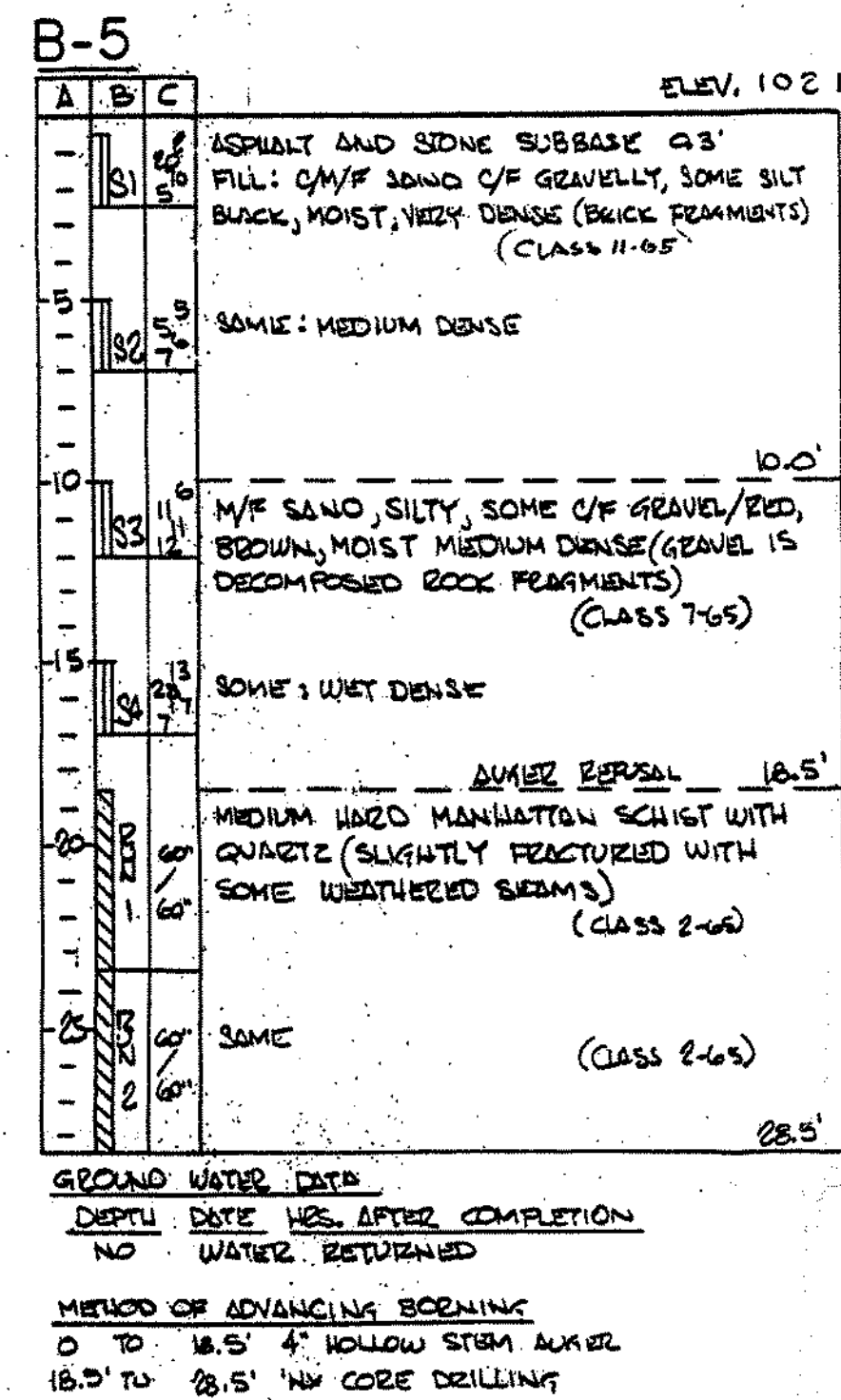
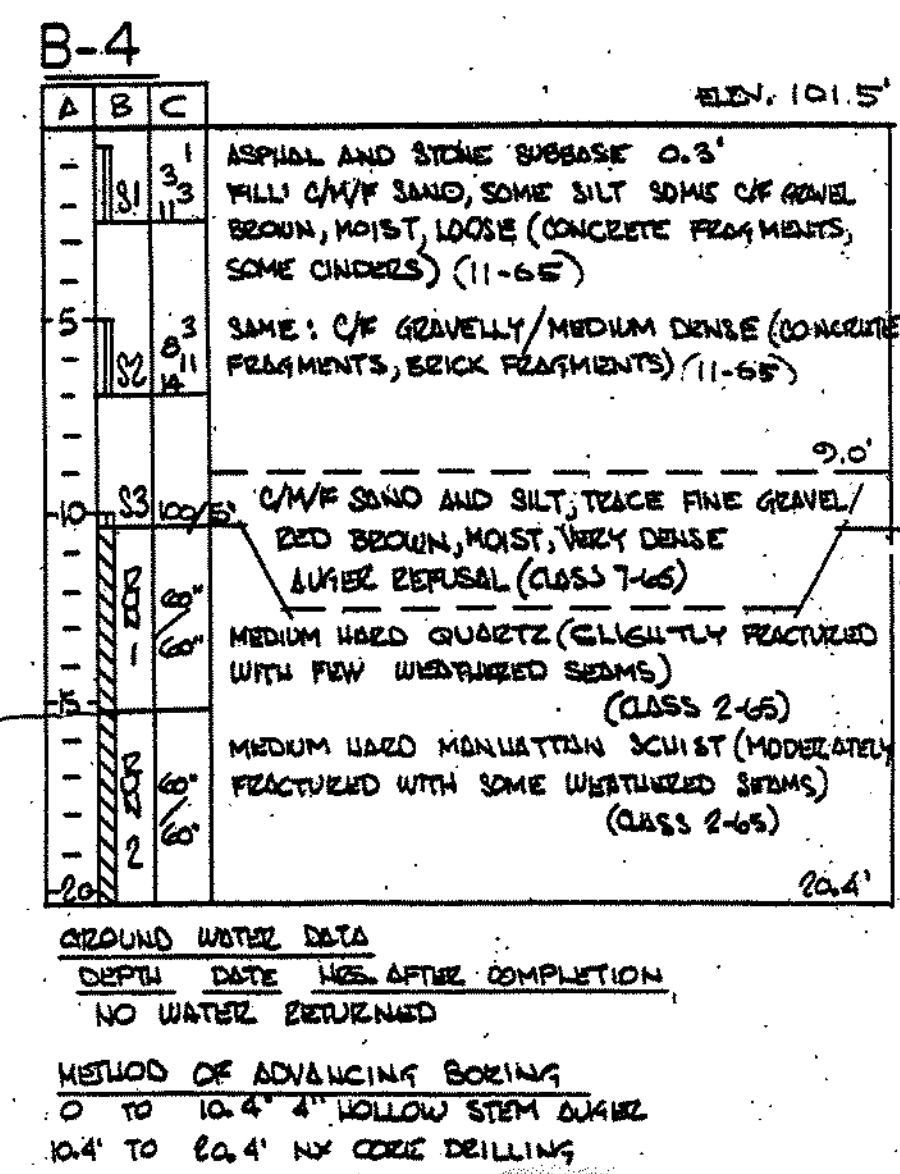
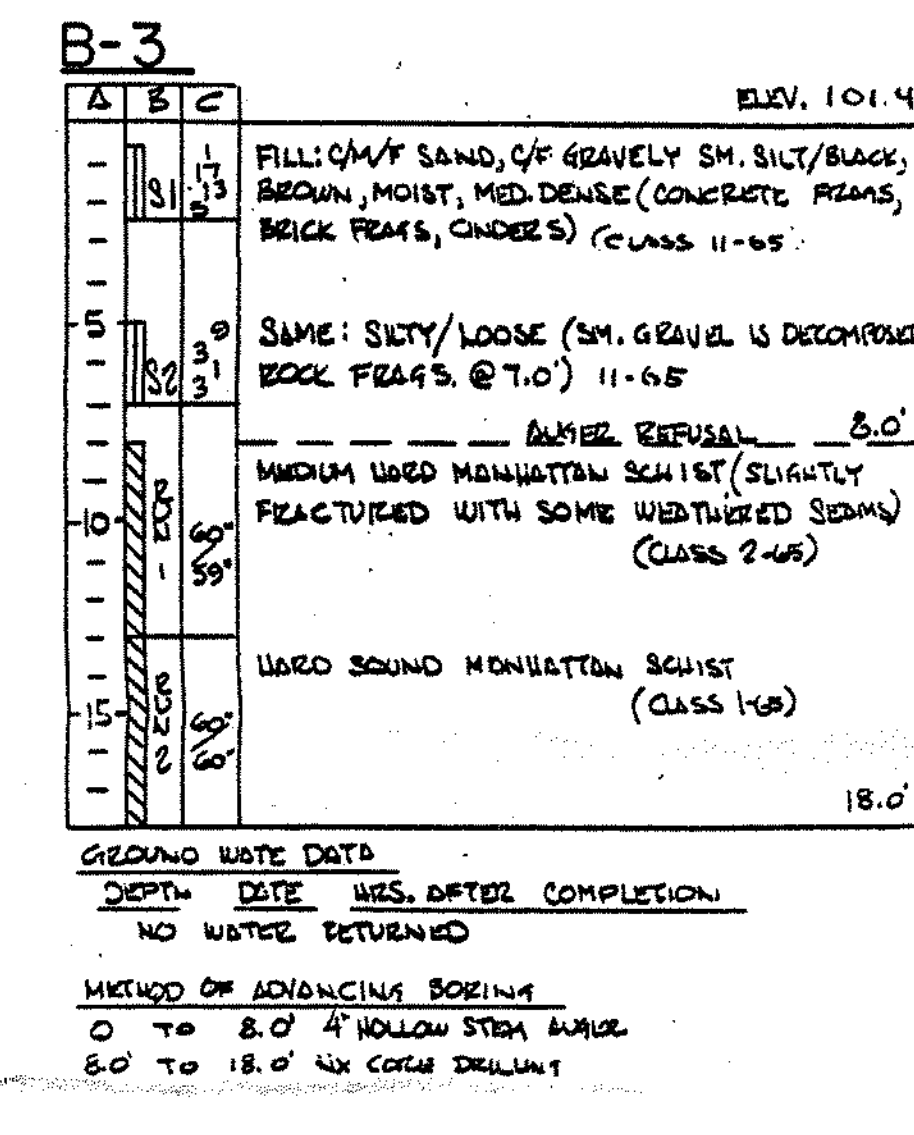
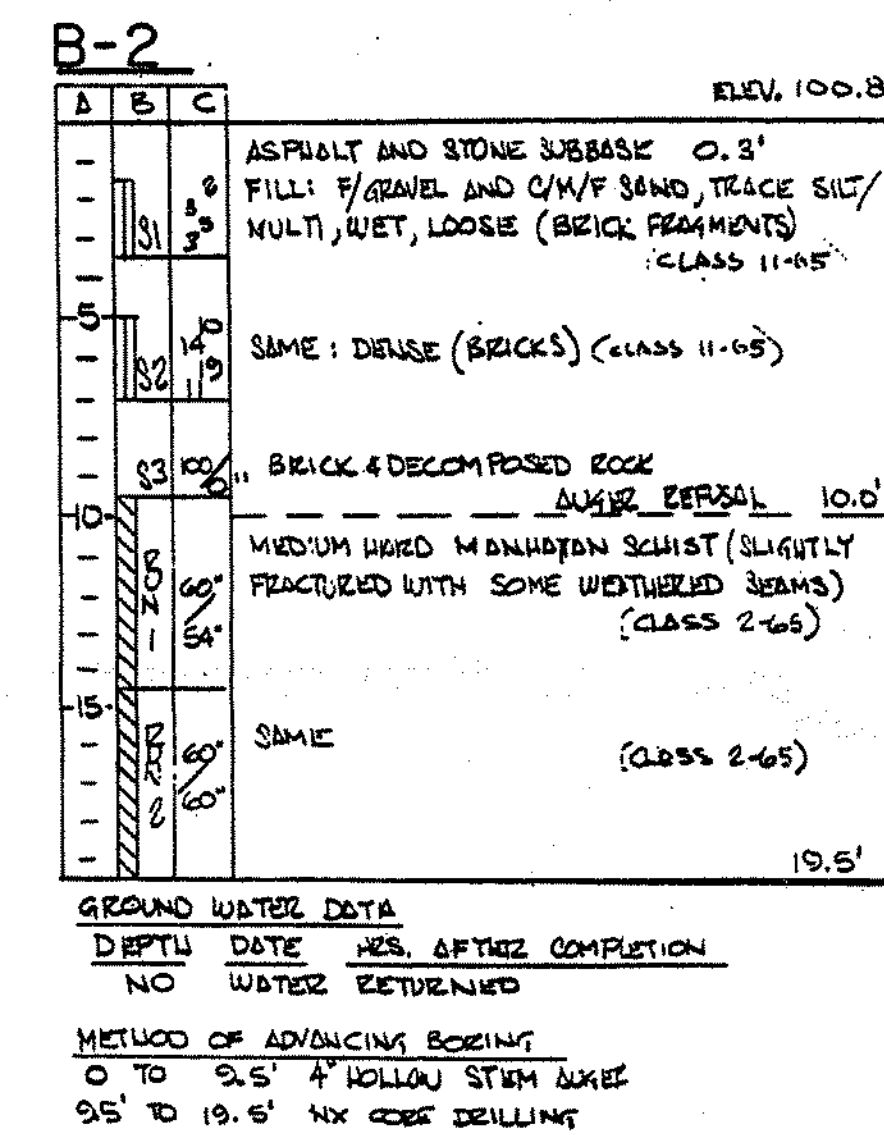
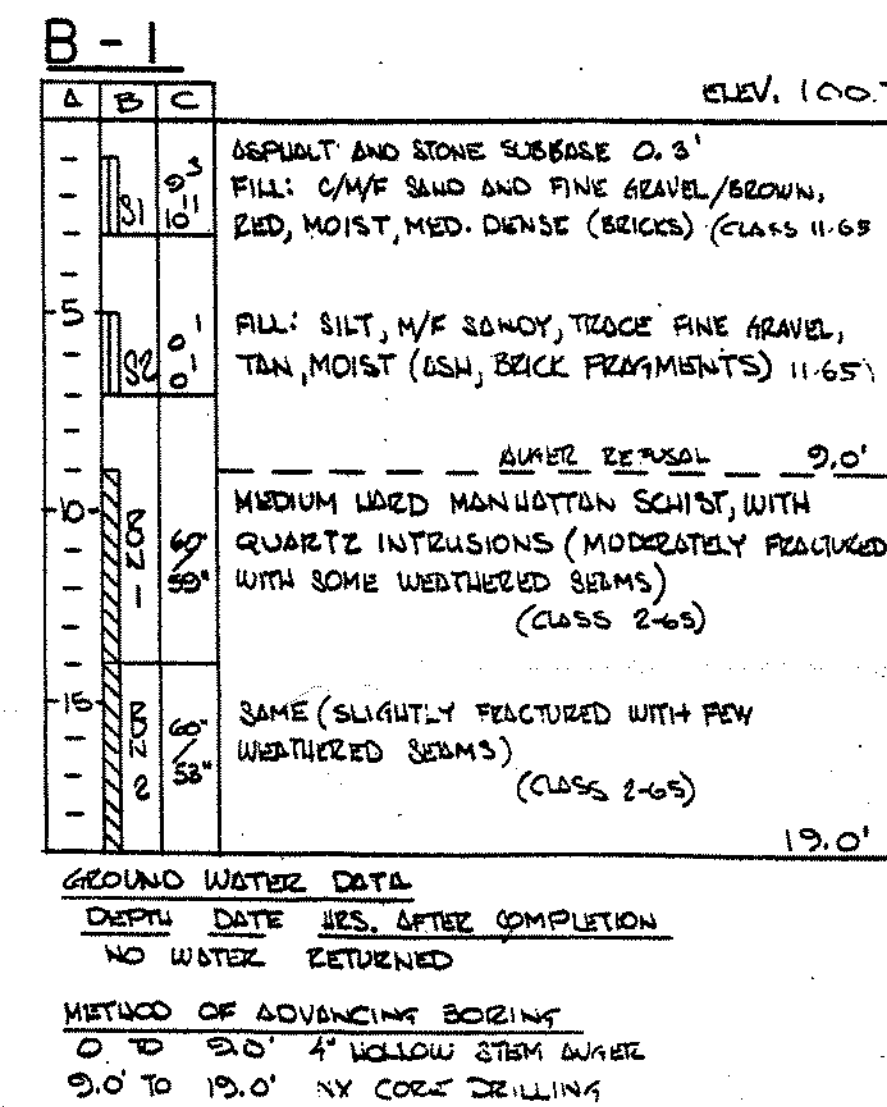
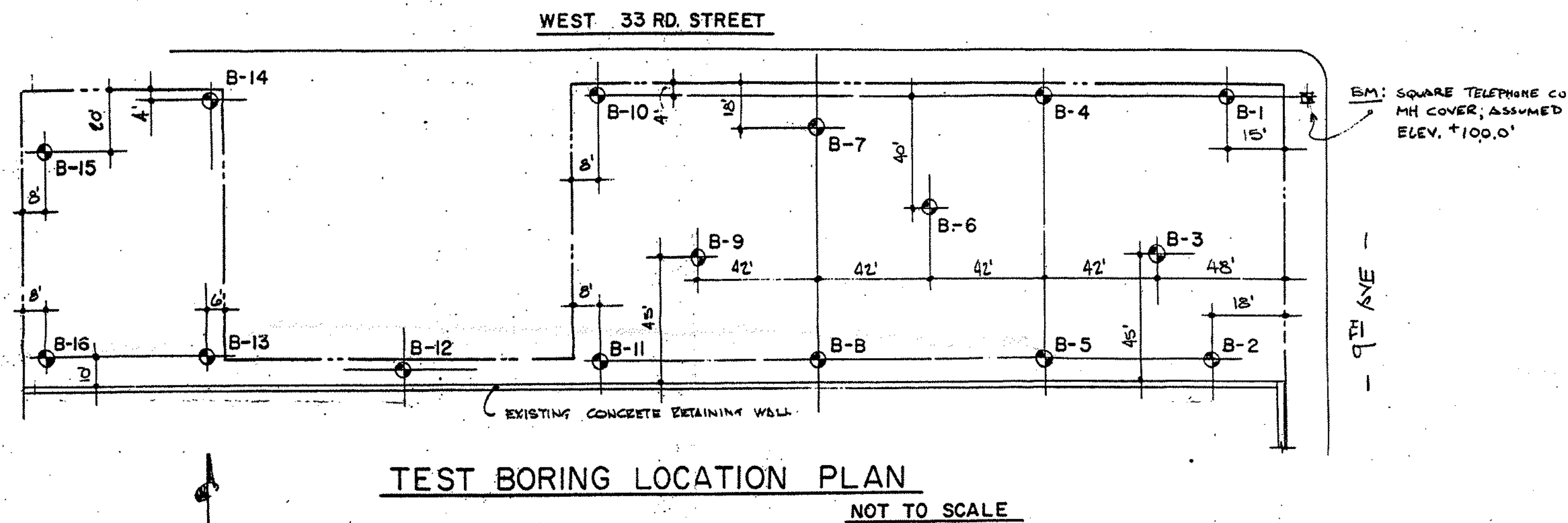
DRILLER CARLOS MALDONADO **HELPERS** BEN SCOTT

REMARKS PIEZOMETER INSTALLED. (ORIENTED CORE).

RESIDENT ENGINEER ROBERTO REALE/JERRY CHAN/S. K. SHETTY **DATE** 03-14-08

CLASSIFICATION CHECK: CHERYL J. MOSS **TYPING CHECK:** ROBERTO REALE

APPENDIX B



BORING NOTES

- ✦ BORING LOCATION
- || SPLIT SPOON SAMPLE
- || CORE DRILLING
- COL. A = DEPTH OF BORING IN FEET (1" = 5'-0")
- COL. B = SAMPLE NUMBER
- COL. C = STANDARD PENETRATION RESISTANCE PER 6" (140# HAMMER, 30" DROP)
- 60' LENGTH OF CORE DRILLED
- 60' LENGTH OF CORE RECOVERED



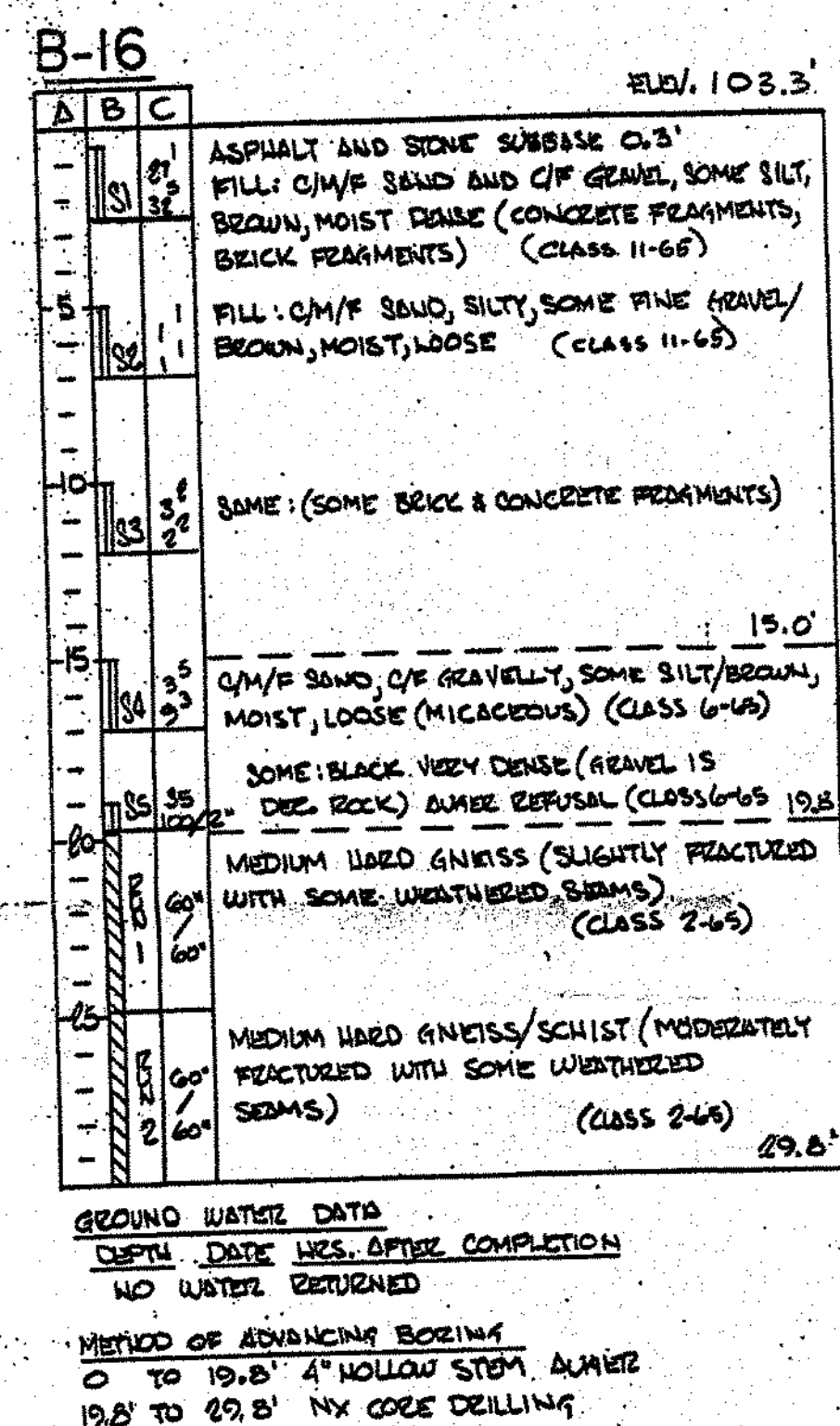
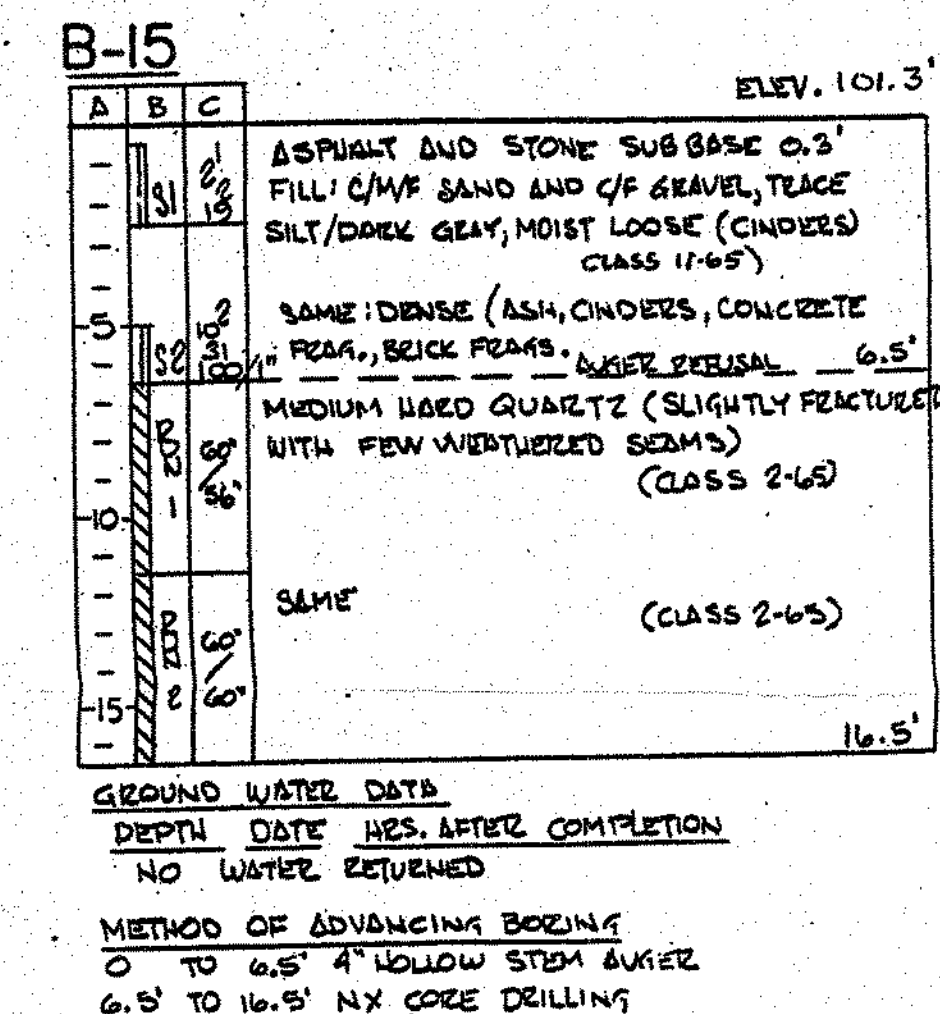
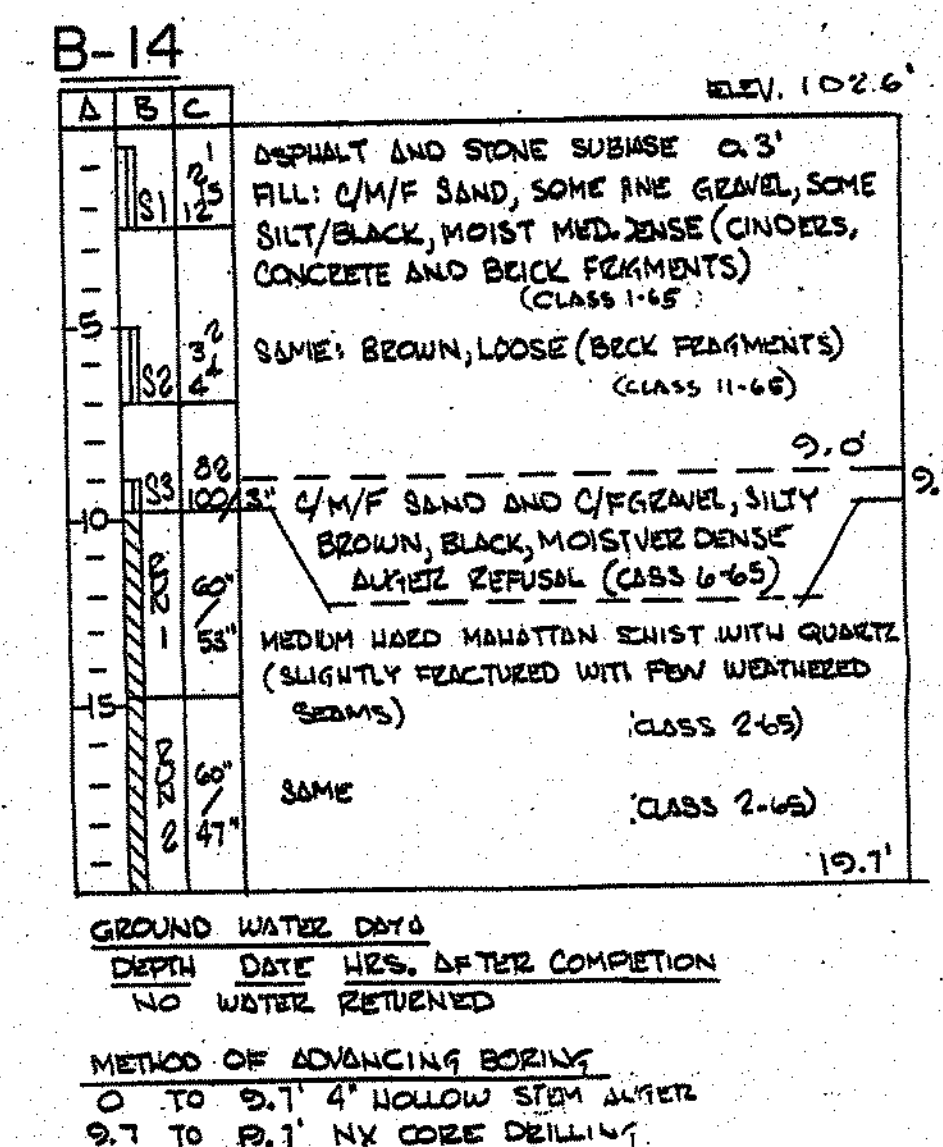
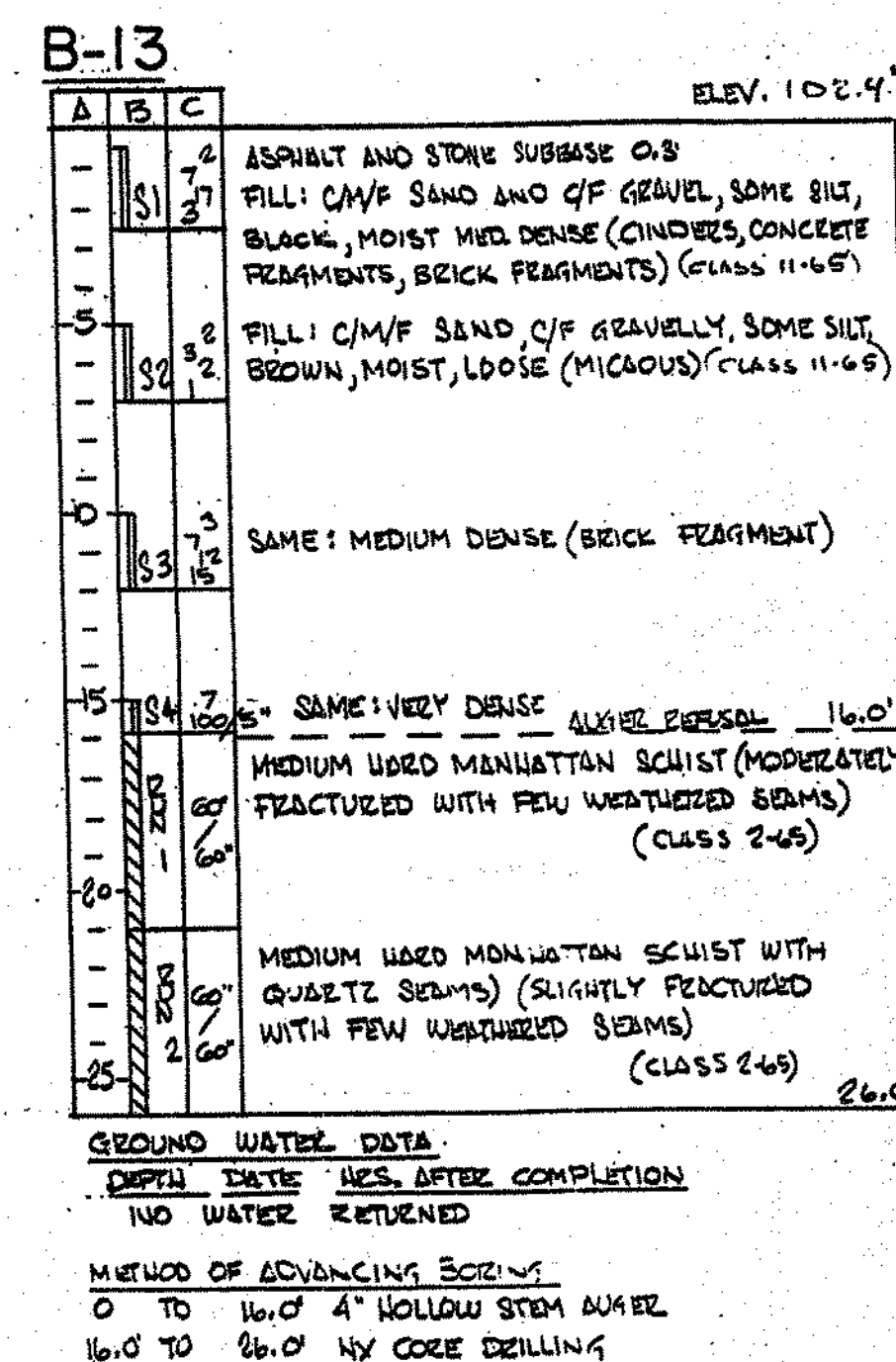
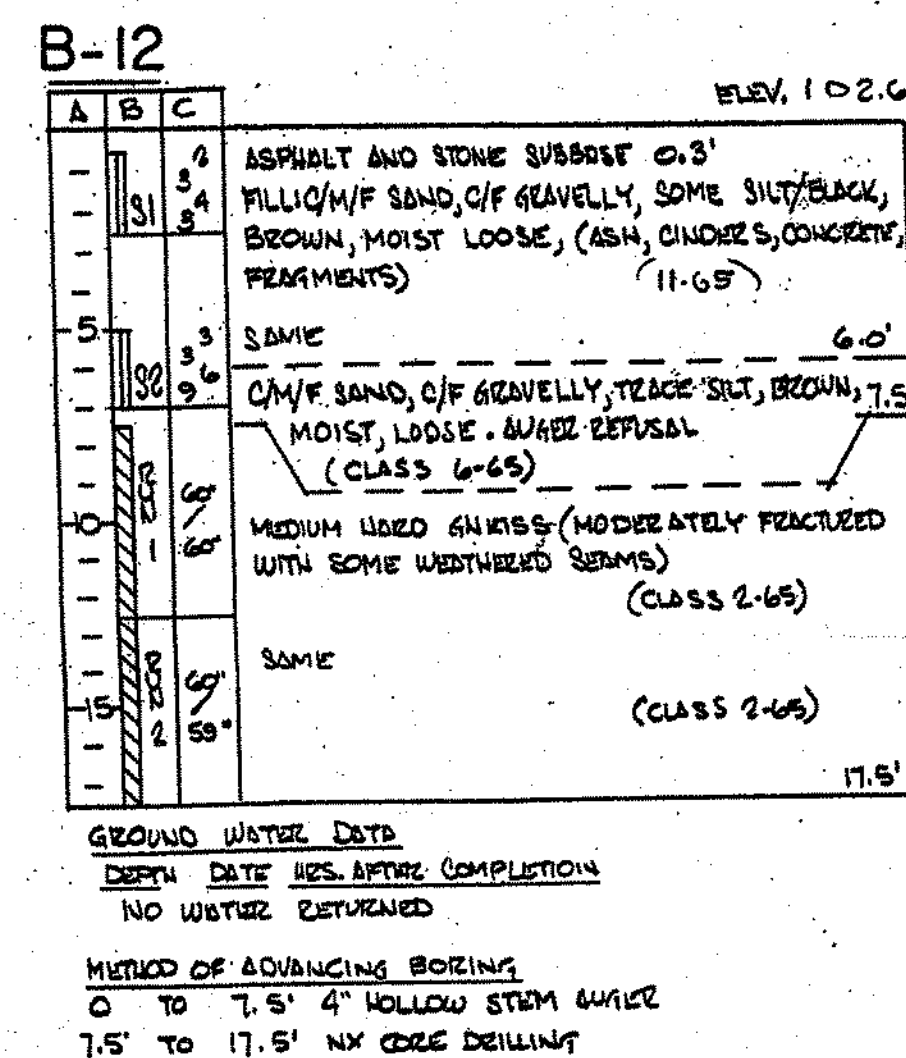
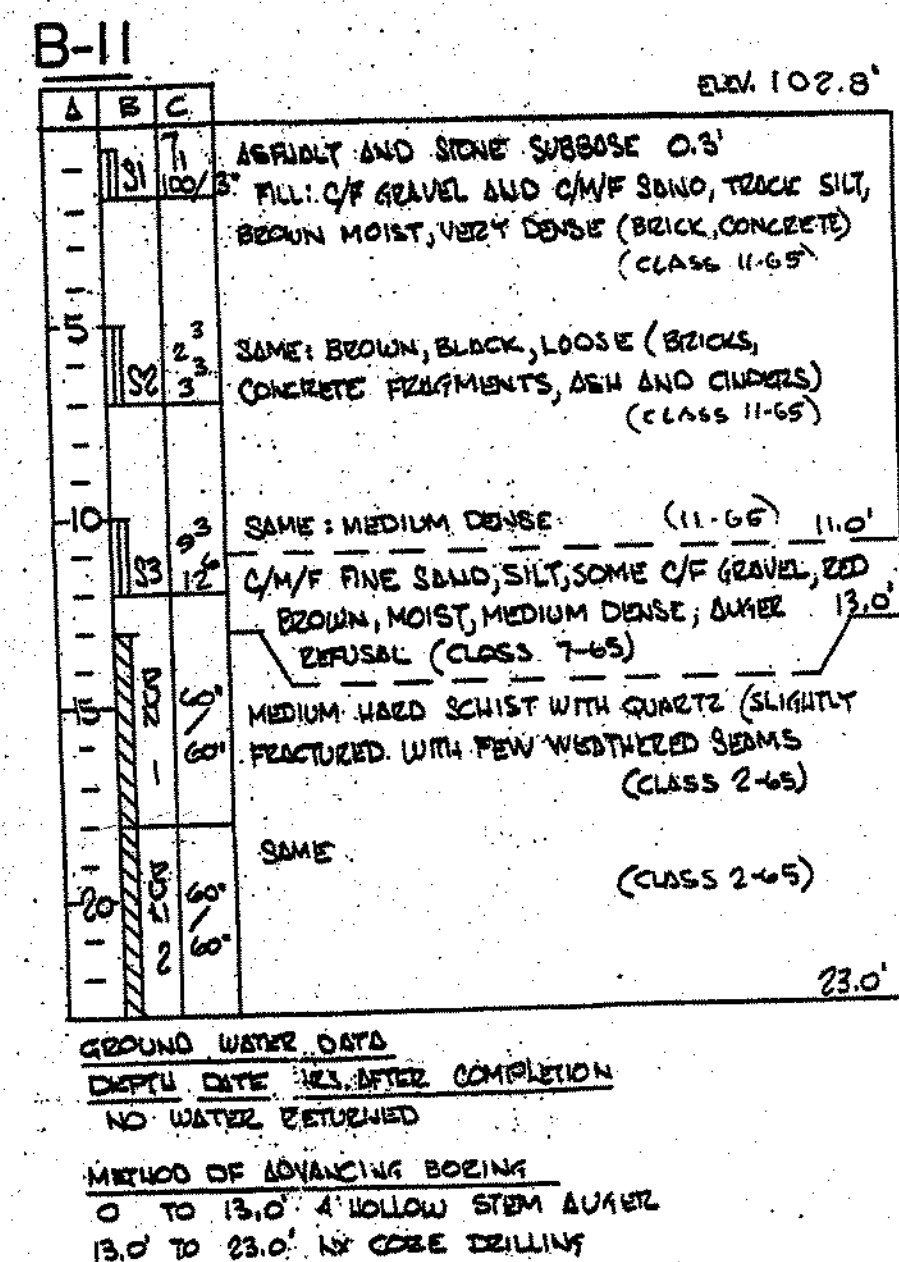
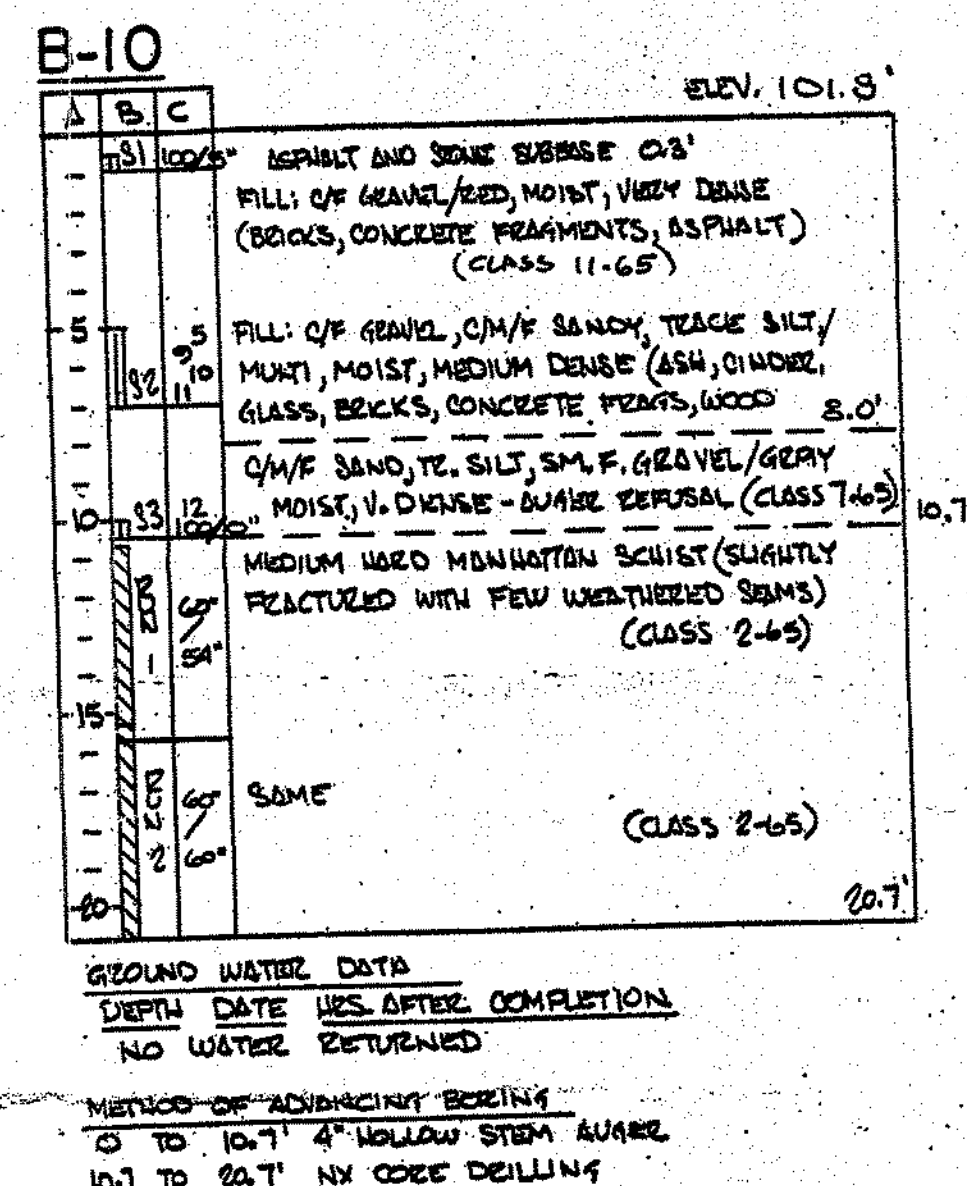
TESTWELL CRAIG TEST BORING CO., INC.
SOUTH JERSEY DIVISION
P.O. BOX J, MAYS LANDING, N.J., 08330

CLIENT: LAZARD REALTY CORP

PROJECT: NINTH AVE. & WEST 33RD ST., NYC

DATE	LAB. NO.	SCALE	DWG. BY	DWG. NO.
10-20-86	2341	NOTES	N.P.C.	102



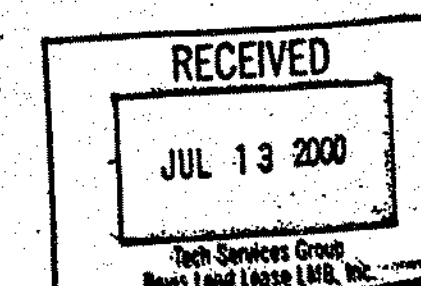


TESTWELL CRAIG TEST BORING CO., INC.
SOUTH JERSEY DIVISION
P.O. BOX 4, MAYS LANDING, N.J. 08330

CLIENT: LAZARD REALTY

PROJECT: 9TH AVE & W. 33RD, NYC

DATE: 10-20-80 LAB. NO.: 2341 SCALE: NOTED DWG. BY: N.P.C. DWG. NO.: 2 of 2



APPENDIX D



Top of Box

Bottom of Box

MANHATTAN WEST
NORTHEAST TOWER

NEW YORK

NEW YORK

Boring No. GB-202: Runs 9C to 12C

MUESER RUTLEDGE CONSULTING ENGINEERS
225 W. 34th Street, New York, NY 10122

MRCE No. 9560

Sheet 1 of 2



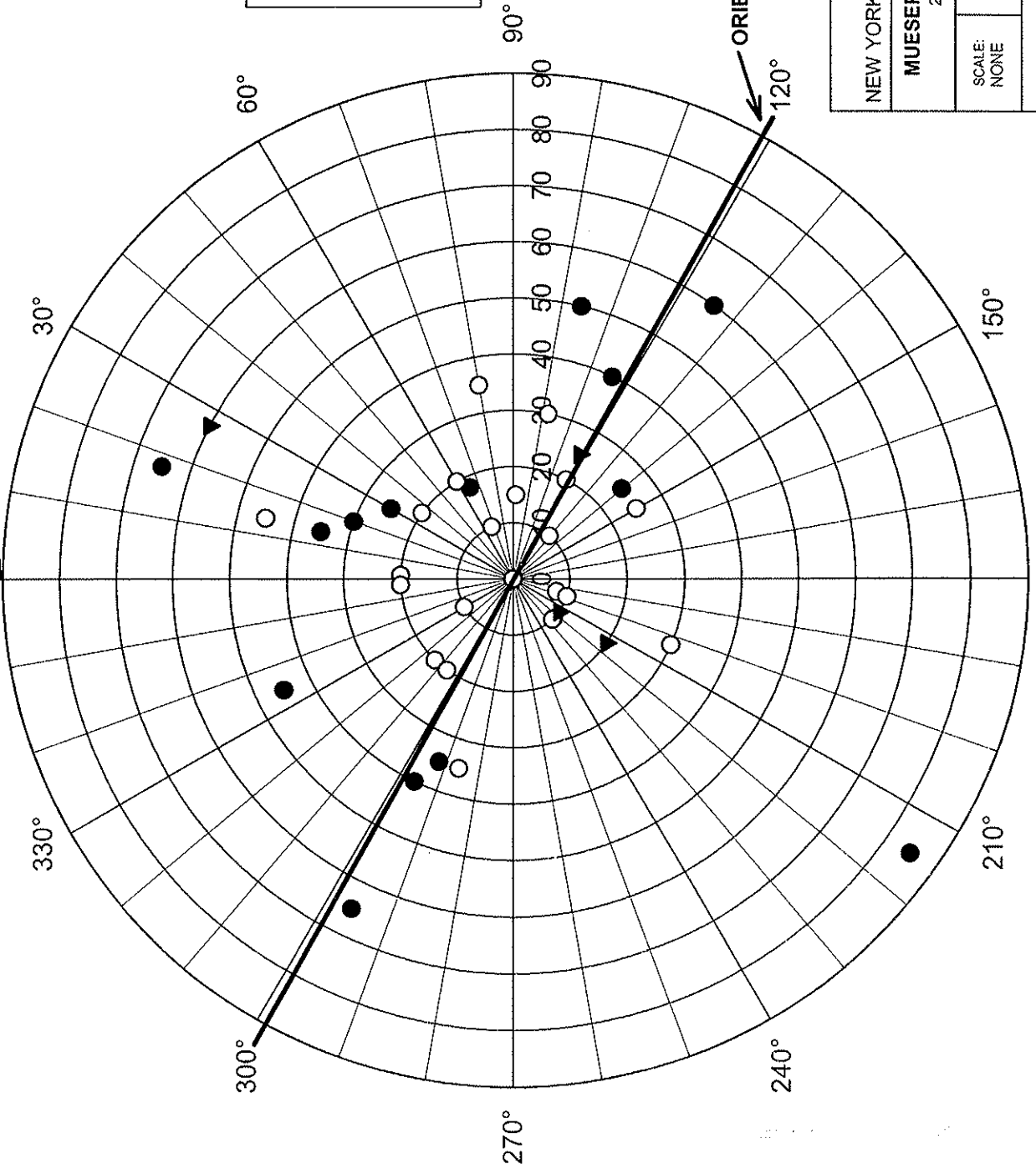
Top of Box

Bottom of Box

MANHATTAN WEST NORTHEAST TOWER NEW YORKNEW YORK	Boring No. GB-203: Runs 2C to 5C	MUESER RUTLEDGE CONSULTING ENGINEERS 225 W. 34th Street, New York, NY 10122	
		MRCE No. 9560	Sheet 2 of 2

APPENDIX F

TRUE NORTH

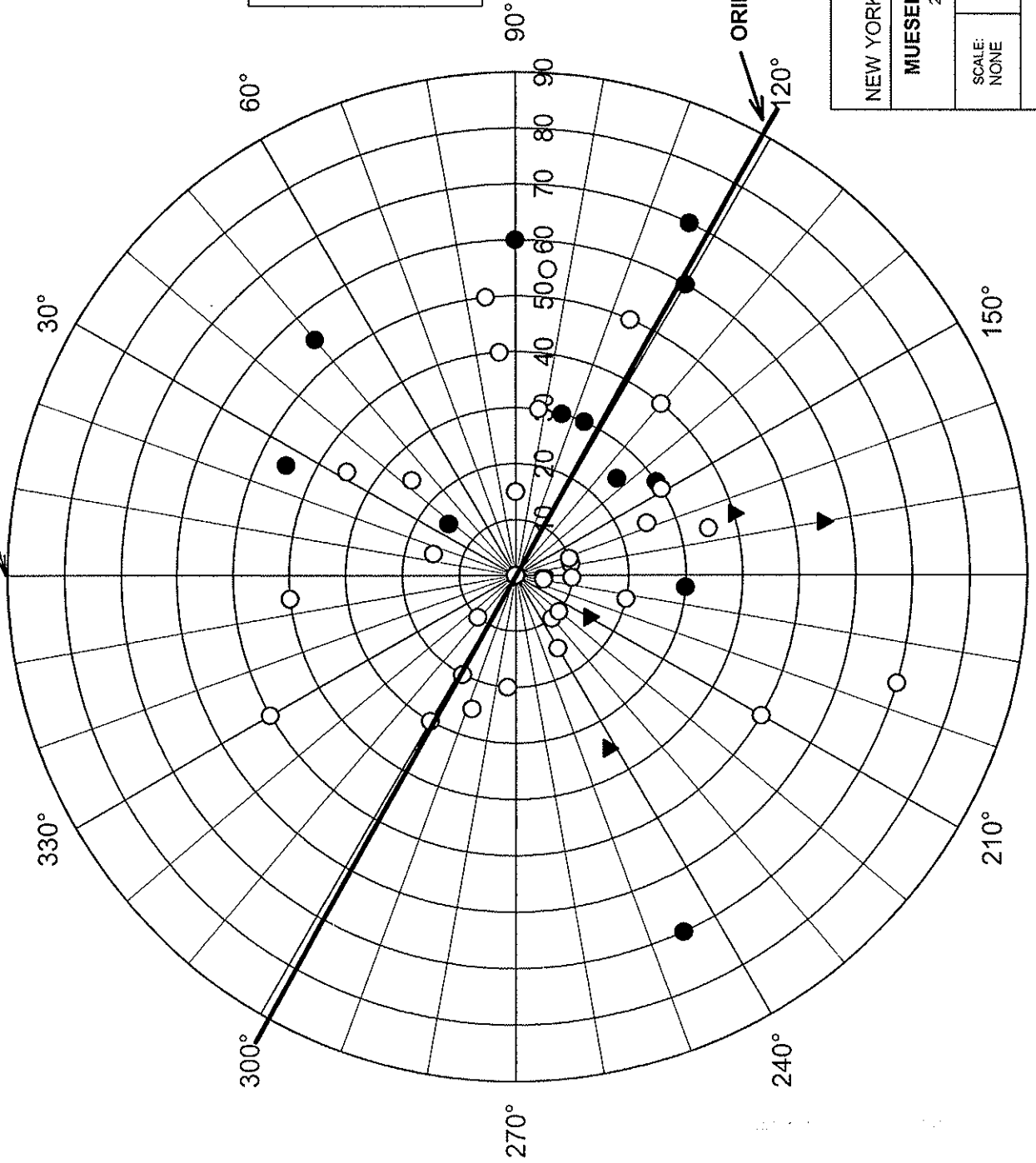


LEGEND FOR JOINT ORIENTATION

- JOINT PLANES
CROSSING FOLIATION
- JOINT PLANES
PARALLEL TO FOLIATION
- ▼ JOINT PLANES IN
UNFOLIATED ROCK

NEW YORK		9TH AVENUE DEVELOPMENT		NEW YORK	
MUESER RUTLEDGE CONSULTING ENGINEERS					
225 WEST 34TH ST., NEW YORK, NY 10122					
SCALE: NONE	MADE BY: CJM CHKD BY: JMT	DATE: 4/21/08 DATE: 4/22/08	FILE NO. 9560	POLAR PLOT OF PLANAR JOINT DISCONTINUITIES BORING GB-202	
				PLATE NO. P-7	

TRUE NORTH



LEGEND FOR JOINT ORIENTATION

- JOINT PLANES
- CROSSING FOLIATION
- JOINT PLANES
- ▶ PARALLEL TO FOLIATION
- ▶ JOINT PLANES IN UNFOLIATED ROCK

NEW YORK		9TH AVENUE DEVELOPMENT		NEW YORK	
MUESER RUTLEDGE CONSULTING ENGINEERS					
225 WEST 34TH ST., NEW YORK, NY 10122					
SCALE: NONE	MADE BY: CJM CHKD BY: JMT	DATE: 4/21/08 DATE: 4/22/08	FILE NO. 9560	PLATE NO. P-8	
POLAR PLOT OF PLANAR JOINT DISCONTINUITIES			BORING GB-203P		

APPENDIX G

VARIABLE HEAD PERMEABILITY TEST

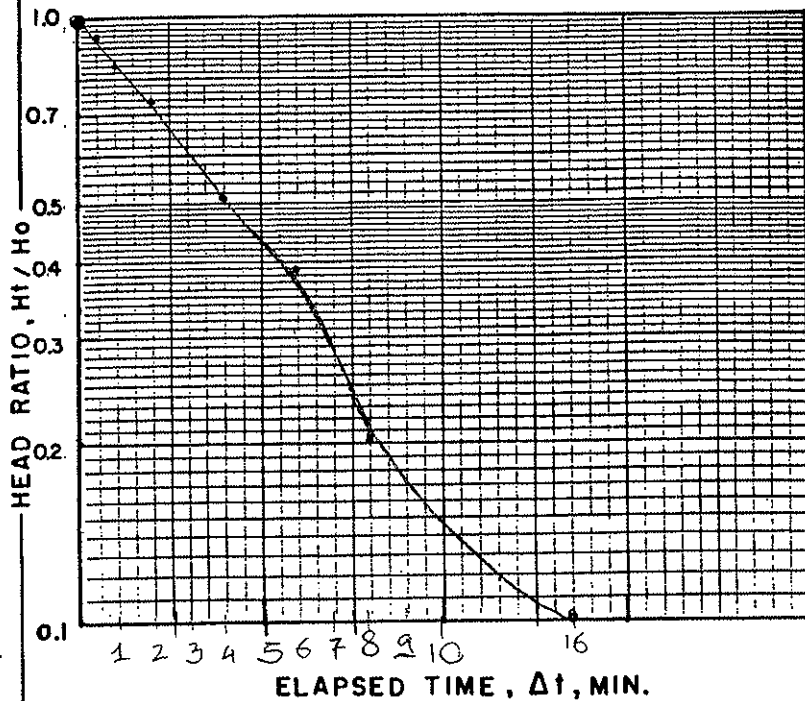
☐ BOREHOLE OR ☒ PIEZOMETER NO. G-3-2034

TEST NO. _____

PROJECT 2th Avenue Development RES.ENG. RR

LOCATION NEW YORK, NY CALC. BY DR DATE 5/2/08

PIEZOMETER LOCATION SEE BLD GB-203D CH'KD BY DATE 7/1



INTAKE POINT

depth to bottom, ft = 87'

depth to top, ft = 771

length, $ft = \frac{101}{100} = L$

diameter, in = 1.25, ft = 0.104 = 2R

STANDPIPE / RISER

diameter, in = 1.25, ft = 0.104 = 2r

depth of casing, ft=_____

depth to which stand-
pipe was bailed, ft = _____ = Z

[illegible]

PIEZOMETER NO. GB-203P

APPENDIX H

HAGER-RICHTER GEOSCIENCE, INC.

CONSULTANTS IN GEOLOGY AND GEOPHYSICS

846 MAIN STREET

FORDS, NEW JERSEY 08863

TELEPHONE (732) 661-0555

FAX (732) 661-0123

BOREHOLE GEOPHYSICAL LOGGING RESULTS MANHATTAN WEST 9TH AVENUE & 33RD STREET MANHATTAN, NEW YORK

Prepared by:

Hager-Richter Geoscience, Inc.
846 Main Street
Fords, New Jersey 08863

File 13RG69
September, 2013






Tadpole	Structure Category (Symbol Color)	Description
	Fracture Rank 1 (Light Blue)	Minor Fracture - not distinct and may not be continuous around the borehole
	Fracture Rank 2 (Blue)	Intermediate Fracture - distinct and continuous around the borehole with little or no apparent aperture
	Fracture Rank 3 (Light Green)	Intermediate Fracture - distinct and continuous around the borehole with some apparent aperture
	Fracture Rank 4 (Red)	Major Fracture - distinct with continuous apparent aperture around the borehole
	Foliation or Vein (Orange)	Planar geologic feature interpreted as foliation or a vein

Figure 1. Key to bedrock structure categories.

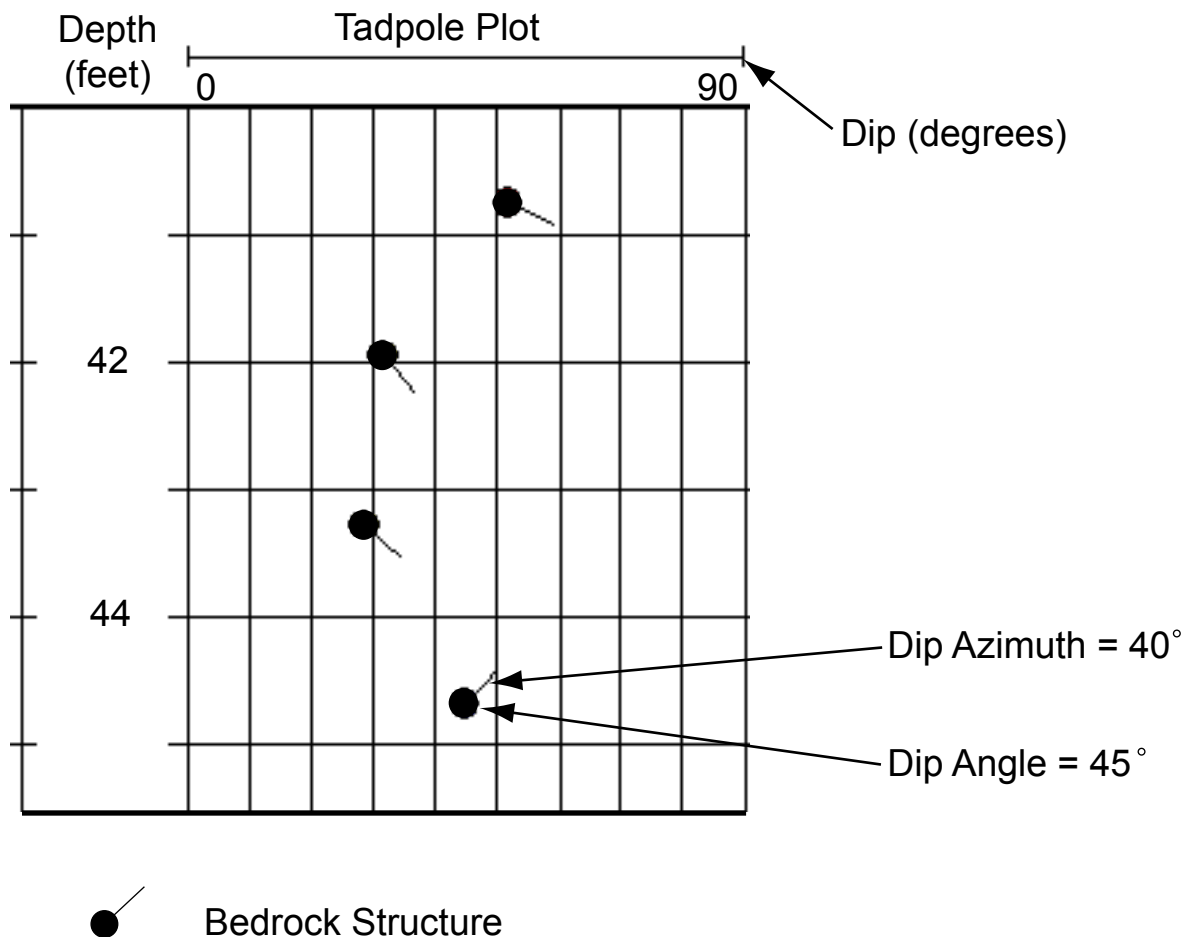


Figure 2. Tadpole plot explanation. The orientation of the bedrock structures is graphically displayed by a tadpole consisting of a circle, the head, and a line, the tail. The position of the head, left to right on the tadpole plot, gives the dip angle of the structure. The left side of the track indicates a dip angle of 0°, and the right side of the track indicates a dip angle of 90° from horizontal. The orientation of the tail gives the dip azimuth of the structure and can be read like a compass. The tail pointing directly up is 0°, north.

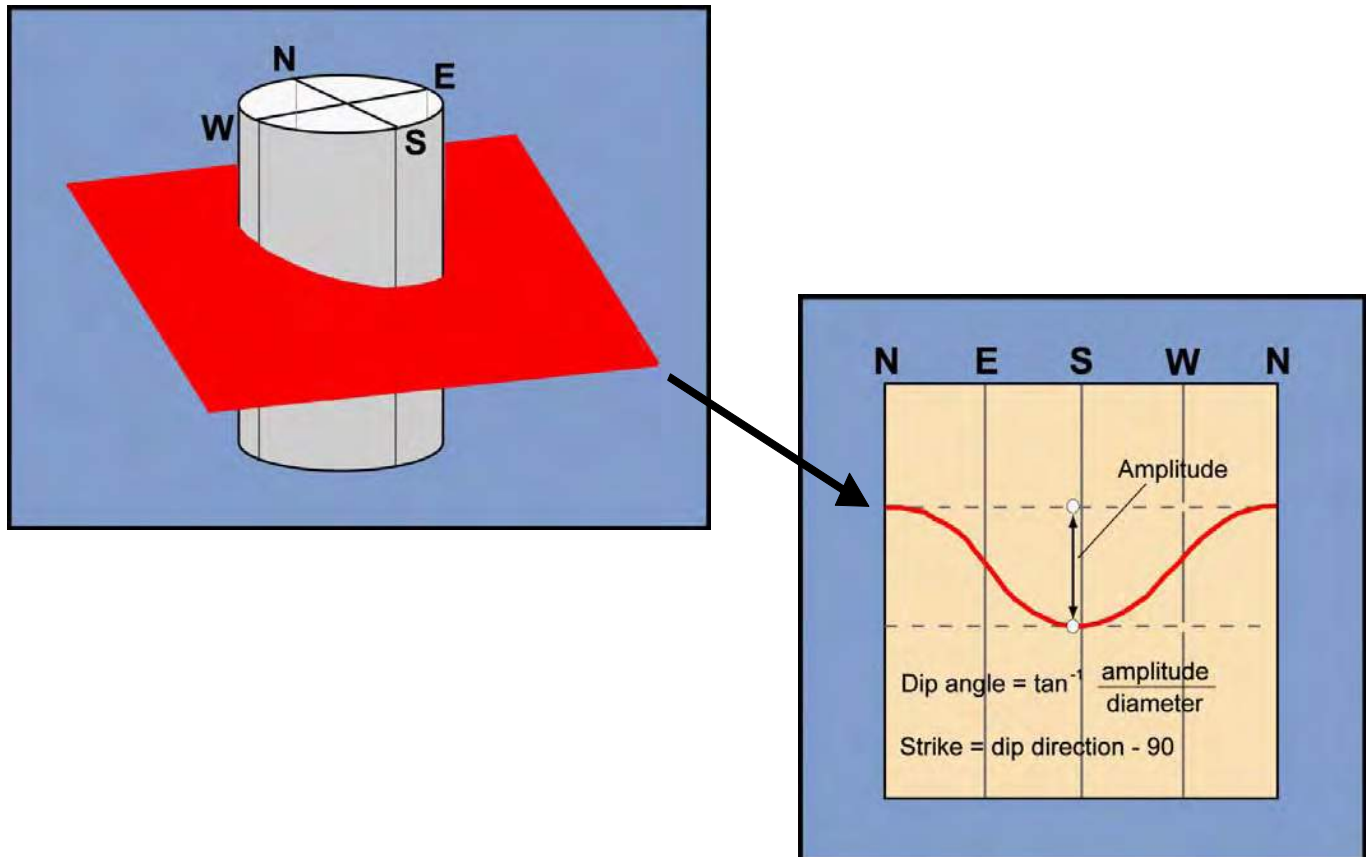


Figure 3. Televiewer Explanation Figure. The image on the left depicts a planar structure in red, such as a fracture or bedding plane, intersected by a borehole. The image on the right depicts the same structure unwrapped as it would be displayed in an optical televiewer (OTV) or acoustic televiewer (ATV) log.

Figure modified from: Garfield, R.L., Day-Lewis, F.D., Gray, M.B., Johnson, C.D., Williams, J.H. and Day-Lewis, A.D.F., 2003, Fractured-Rock Aquifer Characterization within a Regional Geologic Context: Results from the Bucknell University Hydrogeophysics Test Site, GSA Northeastern Section, 38th Annual Meeting, Paper No. 25-19.

HAGER-RICHTER GEOSCIENCE, INC.

846 Main Street
Fords, NJ 08863
Phone: 732-661-0555
Fax: 732-661-0123

DH-1 - BOREHOLE GEOPHYSICAL LOGS

DATE LOGGED:

August 26, 2013

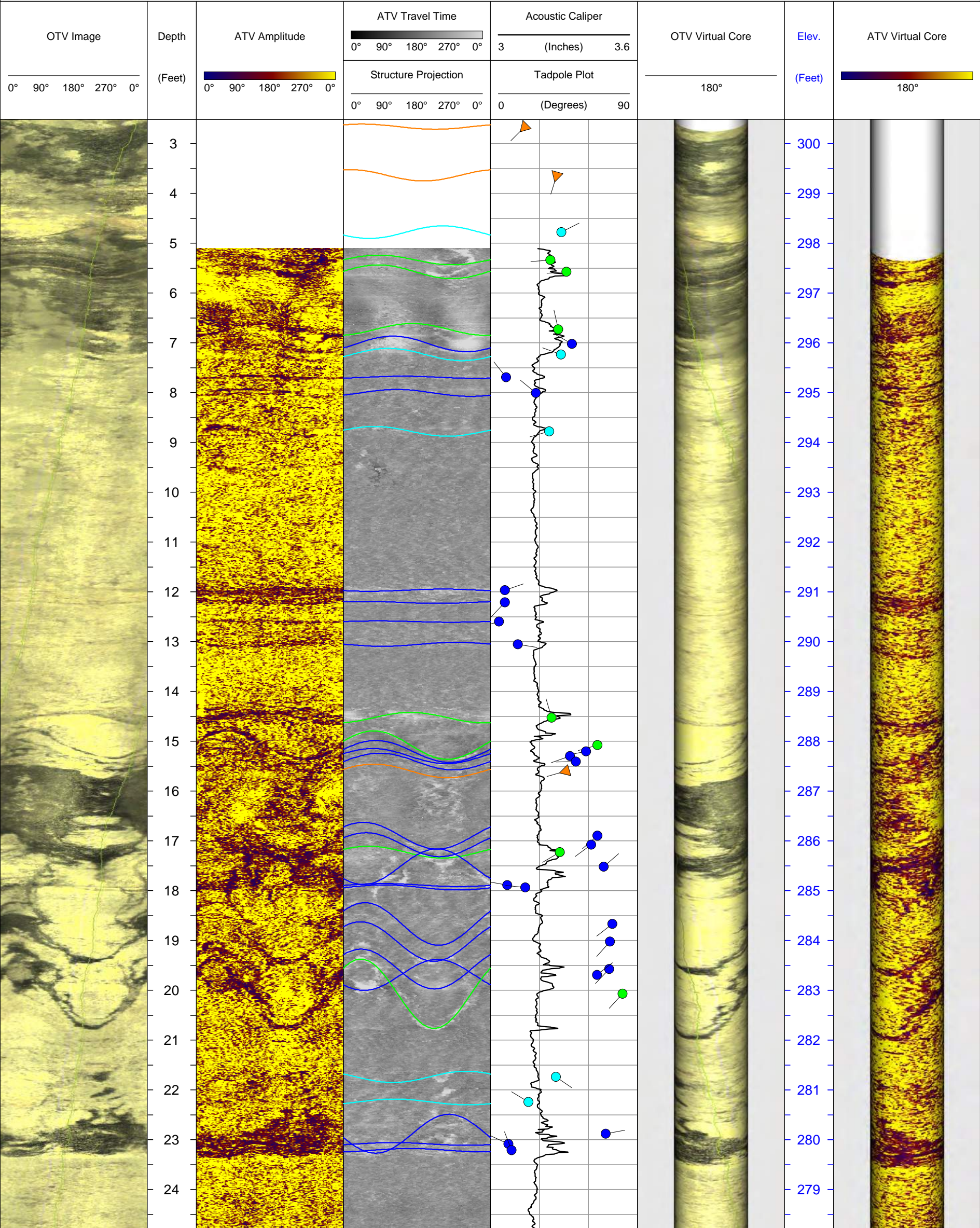
CLIENT: Mueser Rutledge Consulting Engineers
PROJECT: Manhattan West - Borehole Geophysical Logging
LOCATION: 9th Avenue & 33rd Street, Manhattan, New York
LOGGING GEOPHYSICIST(S): Nick DeCristofaro & Mikko Aarnio
CLIENT REP(S) ON-SITE: Michael McMaster

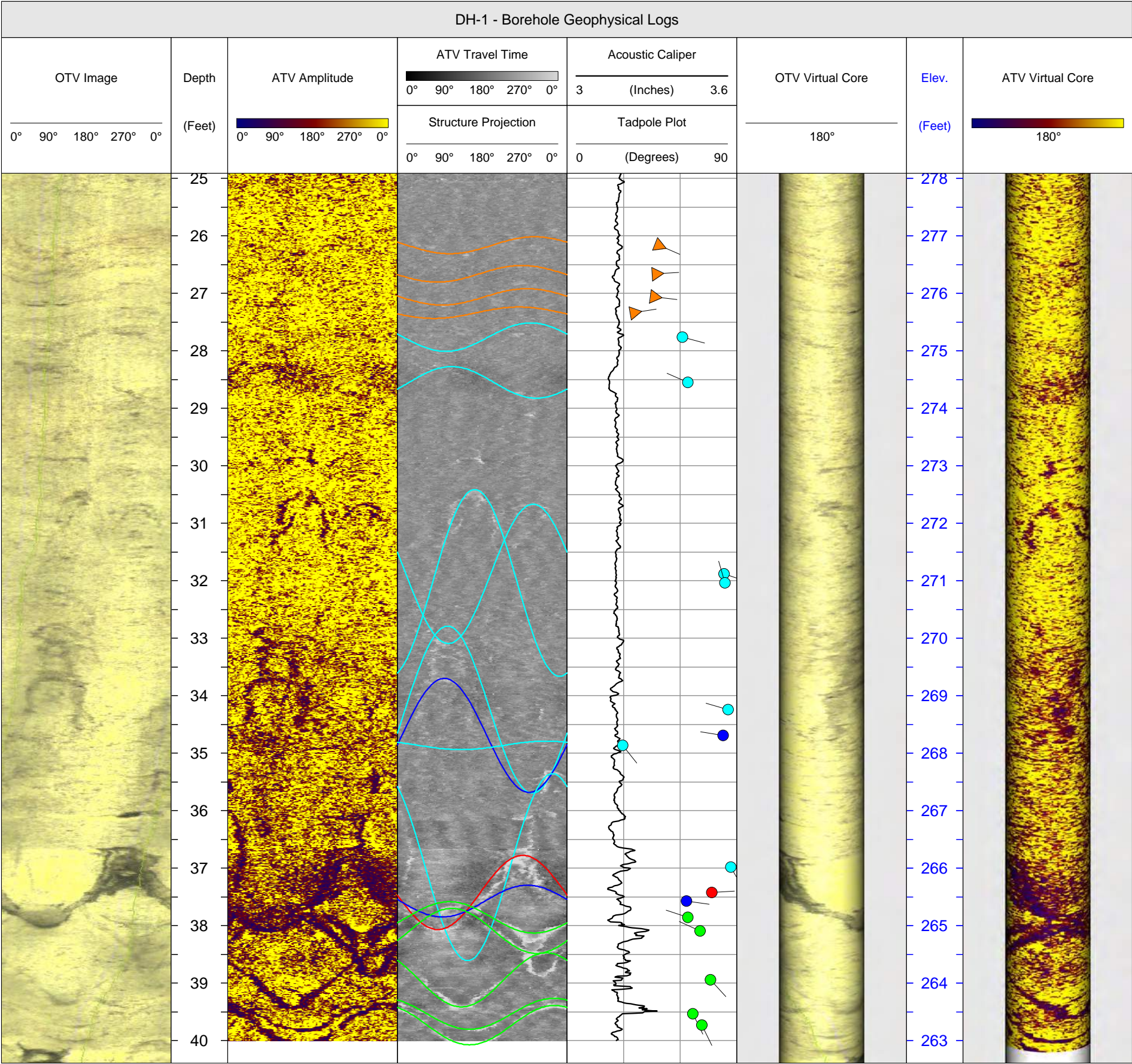
HAGER-RICHTER FILE:	13RG69
LOG DATUM:	Ground Surface (Surface Elevation = 303 Feet)
ORIENTATION REFERENCE:	NYC Grid North (Magnetic Declination = 42° West)
BOREHOLE DIAMETER:	3 Inches
LOGS PROCESSED BY:	Robert Garfield

STRUCTURE LEGEND

 Fracture Rank 1
 Fracture Rank 2
 Fracture Rank 3
 Fracture Rank 4
 Foliation / Vein

DH-1 - Borehole Geophysical Logs





HAGER-RICHTER GEOSCIENCE, INC.

846 Main Street
Fords, NJ 08863
Phone: 732-661-0555
Fax: 732-661-0123

DH-2 - BOREHOLE GEOPHYSICAL LOGS

DATE LOGGED:

August 26, 2013

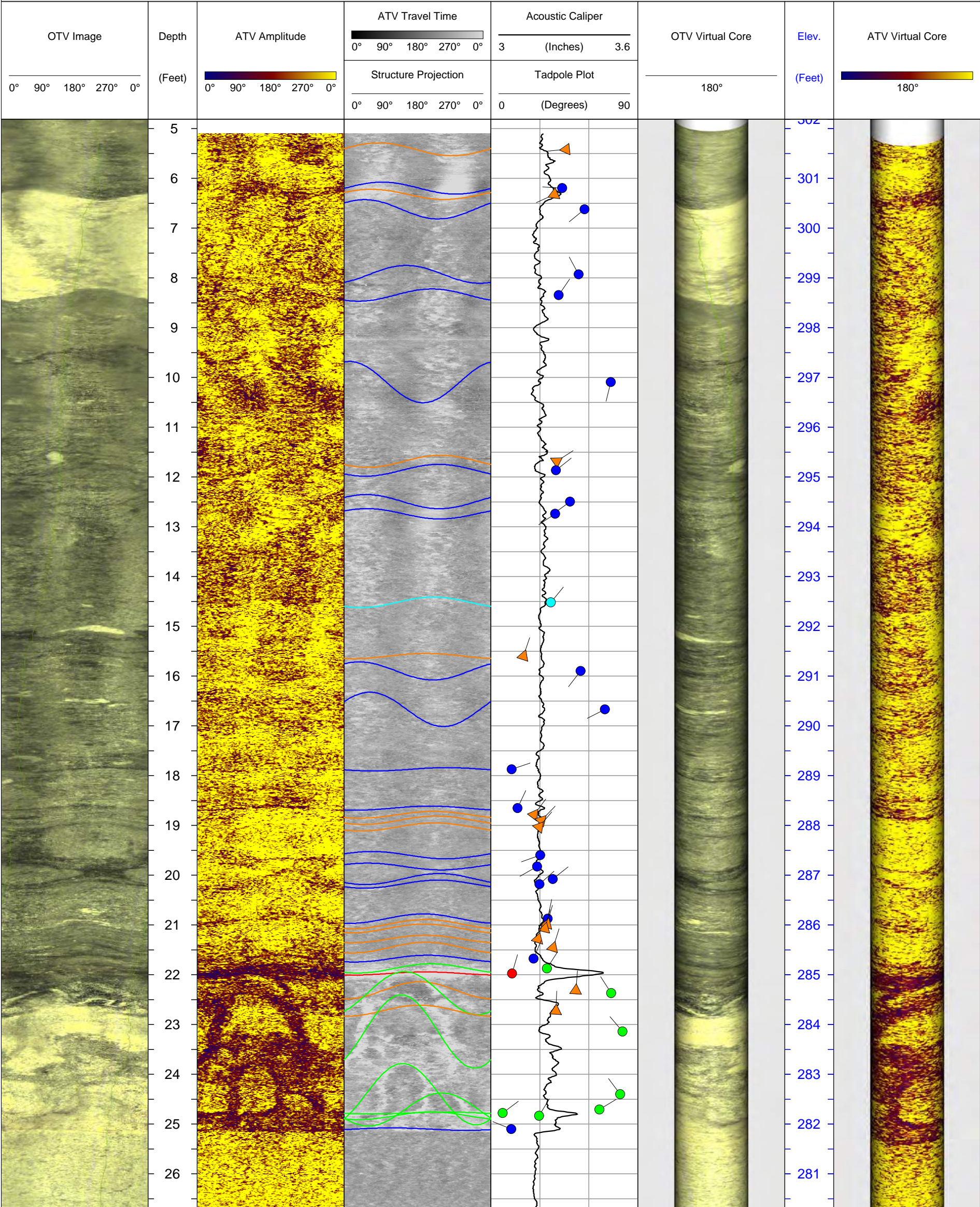
CLIENT: Mueser Rutledge Consulting Engineers
PROJECT: Manhattan West - Borehole Geophysical Logging
LOCATION: 9th Avenue & 33rd Street, Manhattan, New York
LOGGING GEOPHYSICIST(S): Nick DeCristofaro & Mikko Aarnio
CLIENT REP(S) ON-SITE: Michael McMaster

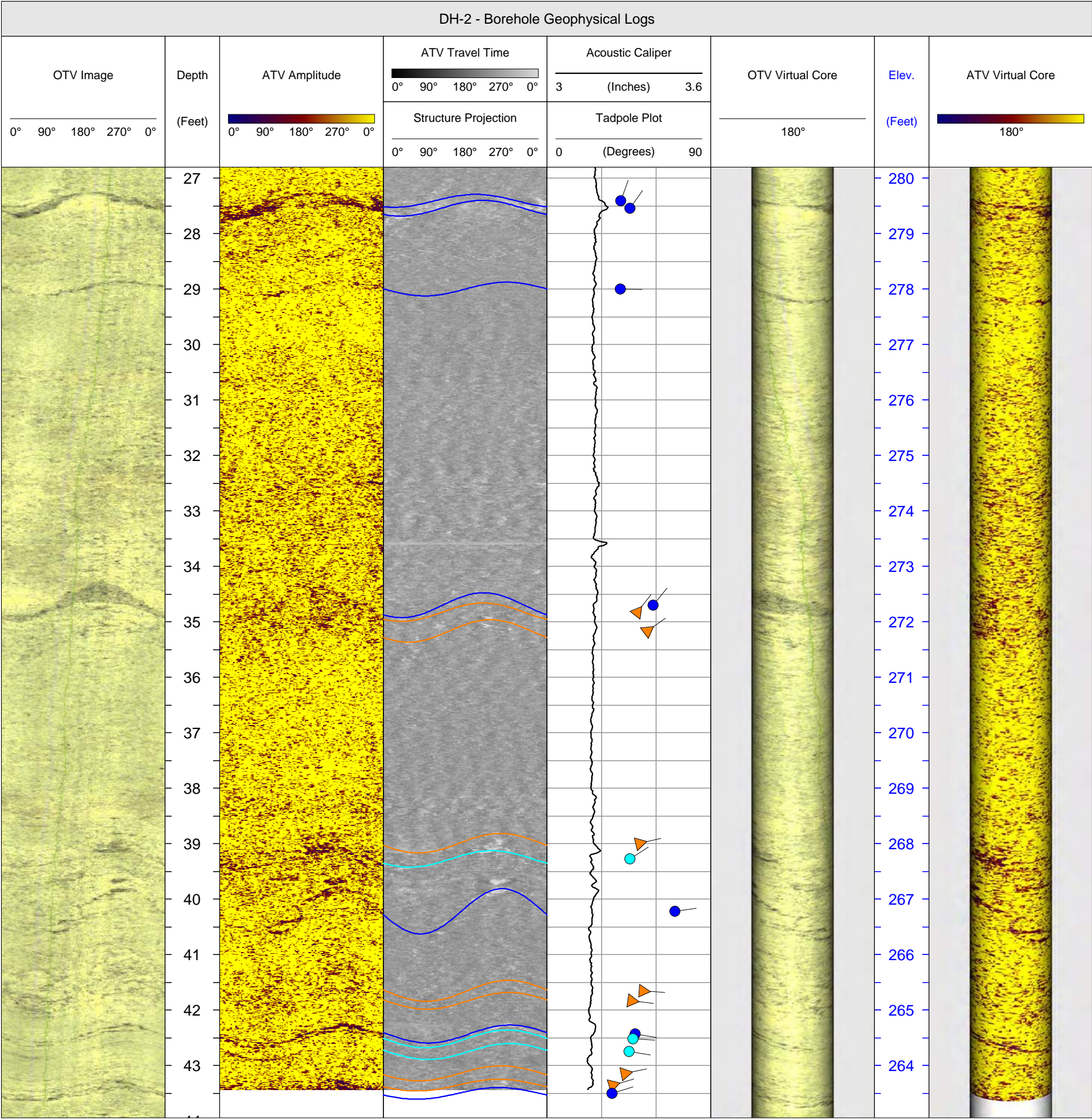
HAGER-RICHTER FILE:	13RG69
LOG DATUM:	Ground Surface (Surface Elevation = 307 Feet)
ORIENTATION REFERENCE:	NYC Grid North (Magnetic Declination = 42° West)
BOREHOLE DIAMETER:	3 Inches
LOGS PROCESSED BY:	Robert Garfield

STRUCTURE LEGEND

 Fracture Rank 1
 Fracture Rank 2
 Fracture Rank 3
 Fracture Rank 4
 Foliation / Vein

DH-2 - Borehole Geophysical Logs





HAGER-RICHTER GEOSCIENCE, INC.

846 Main Street
Fords, NJ 08863
Phone: 732-661-0555
Fax: 732-661-0123

DH-3 - BOREHOLE GEOPHYSICAL LOGS

DATE LOGGED:

August 26, 2013

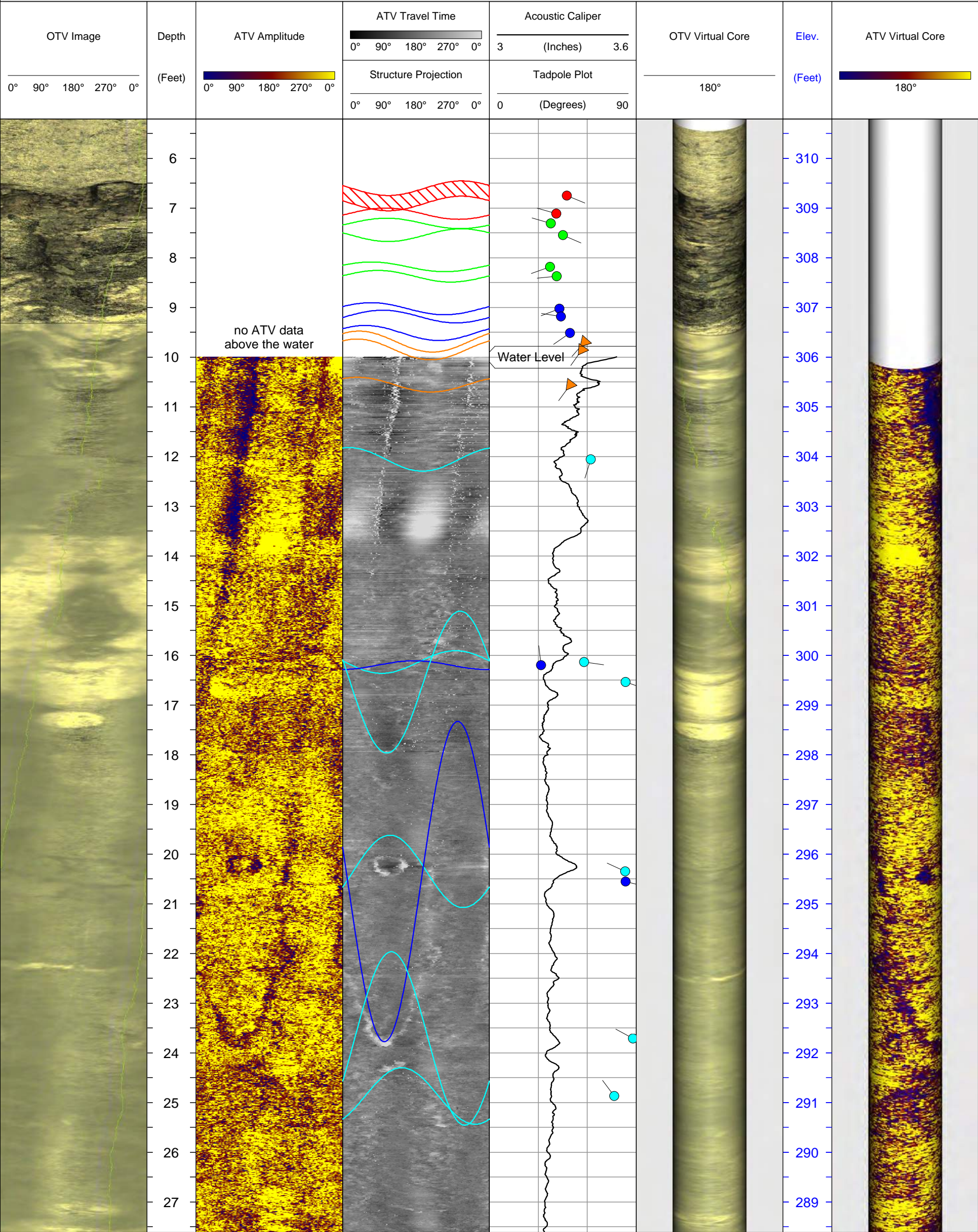
CLIENT: Mueser Rutledge Consulting Engineers
PROJECT: Manhattan West - Borehole Geophysical Logging
LOCATION: 9th Avenue & 33rd Street, Manhattan, New York
LOGGING GEOPHYSICIST(S): Nick DeCristofaro & Mikko Aarnio
CLIENT REP(S) ON-SITE: Michael McMaster

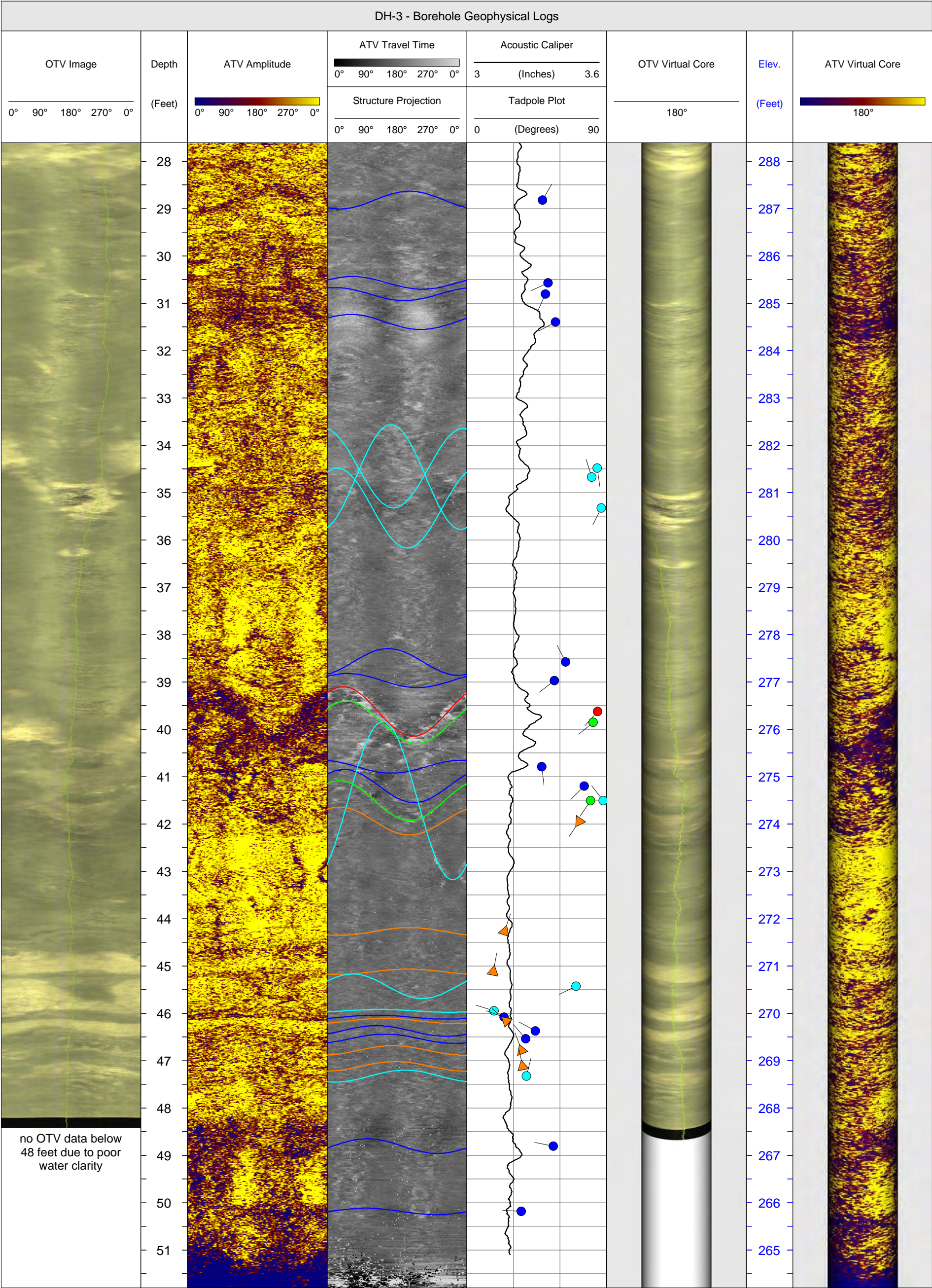
HAGER-RICHTER FILE:	13RG69
LOG DATUM:	Ground Surface (Surface Elevation = 316 Feet)
ORIENTATION REFERENCE:	NYC Grid North (Magnetic Declination = 42° West)
BOREHOLE DIAMETER:	3 Inches
LOGS PROCESSED BY:	Robert Garfield

STRUCTURE LEGEND



DH-3 - Borehole Geophysical Logs





846 Main Street
Fords, NJ 08863
Phone: 732-661-0555
Fax: 732-661-0123

DATE(S) LOGGED: August 26, 2013

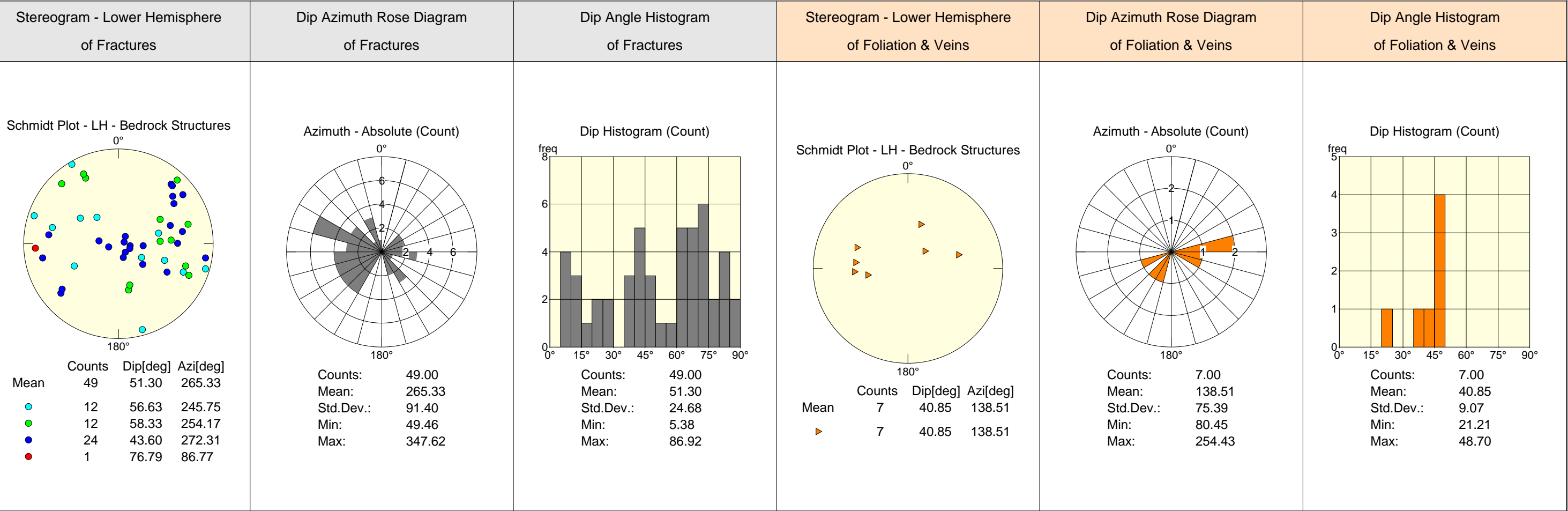
H-R FILE: 13RG69

ORIENTATION REFERENCE: NYC Grid North (Magnetic Declination = 42° West)

LOGS PROCESSED BY: Robert Garfield

STRUCTURE LEGEND

● Fracture Rank 1 ● Fracture Rank 2 ● Fracture Rank 3 ● Fracture Rank 4 ▲ Foliation / Vein



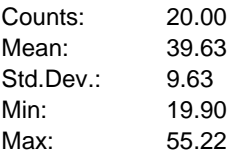
846 Main Street
Fords, NJ 08863
Phone: 732-661-0555
Fax: 732-661-0123

DATE(S) LOGGED: August 26, 2013

H-R FILE: 13RG69
ORIENTATION REFERENCE: NYC Grid North (Magnetic Declination = 42° West)
LOGS PROCESSED BY: Robert Garfield

● Fracture Rank 1 ● Fracture Rank 2 ● Fracture Rank 3 ● Fracture Rank 4 ▲ Foliation / Vein

Dip Angle Histogram of Foliation & Veins



846 Main Street
Fords, NJ 08863
Phone: 732-661-0555
Fax: 732-661-0123

DATE(S) LOGGED: August 26, 2013

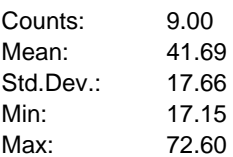
H-R FILE: 13RG69

ORIENTATION REFERENCE: NYC Grid North (Magnetic Declination = 42° West)

LOGS PROCESSED BY: Robert Garfield

● Fracture Rank 1 ● Fracture Rank 2 ● Fracture Rank 3 ● Fracture Rank 4 ▲ Foliation / Vein

Dip Angle Histogram of Foliation & Veins



HAGER-RICHTER GEOSCIENCE, INC.	
DH-1 - TABLE OF BEDROCK STRUCTURES	
CLIENT	Mueser Rutledge Consulting Engineerins
PROJECT	Manhattan West - Borehole Geophysical Logging
LOCATION	9th Avenue & 33rd Street, Manhattan, New Yrok
H-R FILE	13RG69
DATE(S) LOGGED	August 26, 2013
LOG DATUM	Ground Surface
GROUND SURFACE ELEV.	303 Feet
ORIENTATION REFERENCE	NYC Grid North (Magnetic Declination = 42° West)
DIP ANGLE	Measured from Horizontal

DH-1 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Elevation (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
2.7	300.3	225	21	Foliation / Vein
3.6	299.4	196	40	Foliation / Vein
4.8	298.2	63	44	Fracture Rank 1
5.3	297.7	267	37	Fracture Rank 3
5.6	297.4	266	47	Fracture Rank 3
6.7	296.3	348	41	Fracture Rank 3
7.0	296.0	301	50	Fracture Rank 2
7.2	295.8	290	43	Fracture Rank 1
7.7	295.3	322	10	Fracture Rank 2
8.0	295.0	310	28	Fracture Rank 2
8.8	294.2	255	36	Fracture Rank 1
12.0	291.0	71	9	Fracture Rank 2
12.2	290.8	224	9	Fracture Rank 2
12.6	290.4	254	5	Fracture Rank 2
13.1	289.9	98	17	Fracture Rank 2
14.5	288.5	344	37	Fracture Rank 3
15.1	287.9	254	65	Fracture Rank 3
15.2	287.8	259	59	Fracture Rank 2
15.3	287.7	251	49	Fracture Rank 2
15.4	287.6	270	52	Fracture Rank 2
15.6	287.4	254	46	Foliation / Vein
16.9	286.1	229	65	Fracture Rank 2
17.1	285.9	234	62	Fracture Rank 2
17.2	285.8	240	42	Fracture Rank 3
17.5	285.5	49	69	Fracture Rank 2
17.9	285.1	281	10	Fracture Rank 2
17.9	285.1	275	21	Fracture Rank 2
18.7	284.3	233	75	Fracture Rank 2
19.0	284.0	221	73	Fracture Rank 2
19.6	283.4	223	73	Fracture Rank 2
19.7	283.3	51	65	Fracture Rank 2
20.1	282.9	223	81	Fracture Rank 3
21.7	281.3	124	40	Fracture Rank 1
22.2	280.8	301	23	Fracture Rank 1

DH-1 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Elevation (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
22.9	280.1	79	71	Fracture Rank 2
23.1	279.9	294	11	Fracture Rank 2
23.2	279.8	340	13	Fracture Rank 2
26.2	276.8	113	49	Foliation / Vein
26.7	276.3	86	47	Foliation / Vein
27.1	275.9	97	46	Foliation / Vein
27.3	275.7	80	35	Foliation / Vein
27.8	275.2	104	61	Fracture Rank 1
28.6	274.5	294	64	Fracture Rank 1
31.9	271.1	108	83	Fracture Rank 1
32.0	271.0	344	84	Fracture Rank 1
34.2	268.8	286	85	Fracture Rank 1
34.7	268.3	279	83	Fracture Rank 2
34.9	268.1	141	30	Fracture Rank 1
37.0	266.0	150	87	Fracture Rank 1
37.4	265.6	87	77	Fracture Rank 4
37.6	265.4	98	63	Fracture Rank 2
37.9	265.2	289	64	Fracture Rank 3
38.1	264.9	294	71	Fracture Rank 3
38.9	264.1	137	76	Fracture Rank 3
39.5	263.5	153	67	Fracture Rank 3
39.7	263.3	153	71	Fracture Rank 3

HAGER-RICHTER GEOSCIENCE, INC.	
DH-2 - TABLE OF BEDROCK STRUCTURES	
CLIENT	Mueser Rutledge Consulting Engineerins
PROJECT	Manhattan West - Borehole Geophysical Logging
LOCATION	9th Avenue & 33rd Street, Manhattan, New Yrok
H-R FILE	13RG69
DATE(S) LOGGED	August 26, 2013
LOG DATUM	Ground Surface
GROUND SURFACE ELEV.	307 Feet
ORIENTATION REFERENCE	NYC Grid North (Magnetic Declination = 42° West)
DIP ANGLE	Measured from Horizontal

DH-2 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Elevation (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
5.4	301.6	265	46	Foliation / Vein
6.2	300.8	273	44	Fracture Rank 2
6.3	300.7	246	39	Foliation / Vein
6.6	300.4	231	57	Fracture Rank 2
7.9	299.1	331	54	Fracture Rank 2
8.3	298.7	34	41	Fracture Rank 2
10.1	296.9	194	74	Fracture Rank 2
11.7	295.3	57	40	Foliation / Vein
11.9	295.1	52	40	Fracture Rank 2
12.5	294.5	234	49	Fracture Rank 2
12.7	294.3	237	39	Fracture Rank 2
14.5	292.5	39	37	Fracture Rank 1
15.6	291.4	19	20	Foliation / Vein
15.9	291.1	218	55	Fracture Rank 2
16.7	290.3	244	70	Fracture Rank 2
17.9	289.1	71	13	Fracture Rank 2
18.7	288.4	25	16	Fracture Rank 2
18.8	288.2	37	26	Foliation / Vein
18.9	288.1	44	31	Foliation / Vein
19.0	288.0	40	30	Foliation / Vein
19.6	287.4	250	30	Fracture Rank 2
19.8	287.2	240	28	Fracture Rank 2
20.1	286.9	51	38	Fracture Rank 2
20.2	286.8	48	30	Fracture Rank 2
20.9	286.1	12	35	Fracture Rank 2
21.0	286.0	17	34	Foliation / Vein
21.1	285.9	15	33	Foliation / Vein
21.3	285.7	16	29	Foliation / Vein
21.5	285.6	18	38	Foliation / Vein
21.7	285.3	23	26	Fracture Rank 2
21.9	285.1	32	34	Fracture Rank 3
22.0	285.0	16	13	Fracture Rank 4
22.3	284.7	5	52	Foliation / Vein
22.4	284.6	328	74	Fracture Rank 3

DH-2 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Elevation (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
22.7	284.3	3	40	Foliation / Vein
23.1	283.9	320	81	Fracture Rank 3
24.4	282.6	323	79	Fracture Rank 3
24.7	282.3	59	66	Fracture Rank 3
24.8	282.2	54	7	Fracture Rank 3
24.8	282.2	31	30	Fracture Rank 3
25.1	281.9	292	12	Fracture Rank 2
27.4	279.6	20	40	Fracture Rank 2
27.5	279.5	36	46	Fracture Rank 2
29.0	278.0	91	40	Fracture Rank 2
34.7	272.3	39	58	Fracture Rank 2
34.8	272.2	38	50	Foliation / Vein
35.2	271.8	54	55	Foliation / Vein
39.0	268.0	77	51	Foliation / Vein
39.3	267.7	57	46	Fracture Rank 1
40.2	266.8	81	70	Fracture Rank 2
41.7	265.4	94	53	Foliation / Vein
41.8	265.2	97	47	Foliation / Vein
42.4	264.6	99	49	Fracture Rank 2
42.5	264.5	93	47	Fracture Rank 1
42.8	264.3	99	45	Fracture Rank 1
43.1	263.9	78	43	Foliation / Vein
43.4	263.7	73	36	Foliation / Vein
43.5	263.5	73	36	Fracture Rank 2

HAGER-RICHTER GEOSCIENCE, INC.	
DH-3 - TABLE OF BEDROCK STRUCTURES	
CLIENT	Mueser Rutledge Consulting Engineerins
PROJECT	Manhattan West - Borehole Geophysical Logging
LOCATION	9th Avenue & 33rd Street, Manhattan, New Yrok
H-R FILE	13RG69
DATE(S) LOGGED	August 26, 2013
LOG DATUM	Ground Surface
GROUND SURFACE ELEV.	316 Feet
ORIENTATION REFERENCE	NYC Grid North (Magnetic Declination = 42° West)
DIP ANGLE	Measured from Horizontal

DH-3 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Elevation (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
6.8	309.2	112	48	Fracture Rank 4
7.1	308.9	286	41	Fracture Rank 4
7.3	308.7	286	38	Fracture Rank 3
7.6	308.5	113	45	Fracture Rank 3
8.2	307.8	250	37	Fracture Rank 3
8.4	307.6	265	41	Fracture Rank 3
9.0	307.0	250	43	Fracture Rank 2
9.2	306.8	279	44	Fracture Rank 2
9.5	306.5	235	49	Fracture Rank 2
9.7	306.3	221	59	Foliation / Vein
9.8	306.2	215	57	Foliation / Vein
10.6	305.5	217	50	Foliation / Vein
12.1	303.9	197	62	Fracture Rank 1
16.1	299.9	98	58	Fracture Rank 1
16.2	299.8	353	32	Fracture Rank 2
16.5	299.5	109	84	Fracture Rank 1
20.4	295.7	295	83	Fracture Rank 1
20.6	295.4	103	83	Fracture Rank 2
23.7	292.3	299	88	Fracture Rank 1
24.9	291.1	324	77	Fracture Rank 1
28.8	287.2	30	49	Fracture Rank 2
30.6	285.4	245	52	Fracture Rank 2
30.8	285.2	204	51	Fracture Rank 2
31.4	284.6	242	57	Fracture Rank 2
34.5	281.5	172	84	Fracture Rank 1
34.7	281.3	344	80	Fracture Rank 1
35.3	280.7	207	87	Fracture Rank 1
38.6	277.4	333	64	Fracture Rank 2
39.0	277.0	233	56	Fracture Rank 2
39.6	276.4	222	84	Fracture Rank 4
39.9	276.2	231	81	Fracture Rank 3
40.8	275.2	173	48	Fracture Rank 2
41.2	274.8	226	76	Fracture Rank 2
41.5	274.5	323	88	Fracture Rank 1

DH-3 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Elevation (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
41.5	274.5	214	80	Fracture Rank 3
41.9	274.1	214	73	Foliation / Vein
44.3	271.7	19	24	Foliation / Vein
45.1	270.9	11	17	Foliation / Vein
45.4	270.6	244	70	Fracture Rank 1
46.0	270.1	288	18	Fracture Rank 1
46.1	269.9	290	24	Fracture Rank 2
46.2	269.8	312	25	Foliation / Vein
46.4	269.6	299	44	Fracture Rank 2
46.5	269.5	319	38	Fracture Rank 2
46.8	269.2	340	35	Foliation / Vein
47.1	268.9	347	36	Foliation / Vein
47.3	268.7	14	38	Fracture Rank 1
48.8	267.2	281	56	Fracture Rank 2
50.2	265.8	274	35	Fracture Rank 2