FTL FLOOD
Testing Laboratories, Inc.
A Certified Woman Owned Business Enterprise

1945 EAST 87TH STREET
CHICAGO. IL 60617-2946
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17 July 2015

Mr. Drew A. Friestedt
Principal
3F Properties
1101 W. Monroe St., Ste 200
Chicago, IL 60607

Re: Geotechnical Investigation (Initial)
851 West Grand
Chicago, Illinois

Dear Mr.Friestedt

Enclosed are our results of geotechnical investigations performed between 16 June and 1 July 2015 at the above project. A total of 2 borings were performed. Results address a deep foundation option for the structure based on the information retrieved. Based on the gathered data, caissons should be designed to bear at -60 feet CCD with an allowable bearing capacity of 25,000 psf.

We would be pleased to discuss this report with you at your convenience.

Yours Very Truly,

Glen Hodson

Walter H. Flood

Walter H. Flood, P.E.

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Table of Contents

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I. Summary of Borings

The subsurface investigation consisted of two test borings taken at the locations shown on the attached sketch. The test borings were taken to a depth of approximately 95 to 98 feet using a truck mounted power auger using rotary wash techniques to auger refusal. Soil samples were taken by means of split barrel sampling procedures using a manual hammer and were taken in general accordance with ASTM D-1586 specifications.

The borings are identified as B-101and B-102. All samples were identified and sealed in the field and returned to our laboratory for further identification and testing. During the field operation the drilling crew maintained a log of drilling procedures and subsurface conditions including changes in soil stratigraphy and ground water levels.

In both of the borings, measurements of insitu shear were taken in the soft clay soils at various elevations using a Roctest Vane Shear apparatus. Results are for evaluation for sheeting, if required, and the depth that temporary liners may be required if a caisson foundation system is selected.

Pressuremeter tests were performed in both of the borings once hard consistency clay was encountered. These values are used to determine bearing capacity and probable settlement for caisson foundations.

Two additional borings are to be performed once the existing structure is demolished and equipment access is available.

II. Laboratory Testing

The laboratory testing program consisted of moisture content and hand penetrometer tests on portions of cohesive soils recovered from the borings. The unconfined compressive strength of the cohesive soil is estimated to a maximum value of four and one-half tons per square foot (TSF) by using a hand penetrometer. This measures the resistance of the sample to penetration by a small spring calibrated cylinder. Water content tests and particle size analyses were also performed on representative portions of the materials obtained. The results of all laboratory tests are indicated on the boring logs.

The retrieved soil samples were examined in our laboratory and classified on the basis of texture and plasticity in accordance with the Unified Soil Classification System (ASTM

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D2487). The soil descriptions on the boring logs are in conformance with this system and estimated group symbol according to this system is included in parenthesis following each soil description in the boring logs. Stratification lines, as indicated on the boring logs, are in some cases estimated *insitu*. The transition between soil types may be gradual.

III. Site Conditions

Zero elevation on our logs represents the existing ground surface at the time of the investigation. Each boring log has the CCD elevation of the ground surface at the time of drilling listed at the top. The site is located at 851 West Grand Av. in Chicago, IL. A sketch of the area is attached at the rear of this report. The site is currently occupied by a two story masonry structure and associated parking. Current ground elevation is estimated as +19 CCD.

IV. Soil Profile

All locations investigated were noted to be overlain by asphalt pavement. The asphalt pavement was noted to be approximately 3” to 4” in thickness and was underlain by crushed stone fill to a depth of approximately 12” below existing grade. Below this, miscellaneous fill, which consisted mainly of clay with some stone, concrete and brick, was encountered. The fill layer was noted to extend to approximately 6’ below existing grade. The standard penetration value for this layer was found to range from 4 to 19 and varied greatly depending on the material composition.

Below the fill, stiff to very stiff brown silty clay was encountered. The standard penetration value for this layer was found to range from 5 to 10. The unconfined compressive strength was noted to range from 2,500 psf and 5,000 psf. This stratum was found to extend to between +6 CCD to +6.5 CCD.

Below this and extending to approximately -19 CCD and -24 CCD, soft gray silty clay was found. The standard penetration value for this layer was found to range from 3 to 7. Unconfined compressive strength is typically less than 2,000 psf. The vane shear test results can be found on the soil logs and are summarized in Appendix C. Results should be utilized in evaluating the temporary liner length for caissons or for estimating lengths of pile.

Generally below the soft clay layer, stiff to hard gray silty clay was encountered. This material extends to approximately -57 CCD and -59 CCD. The standard penetration

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value for this layer was found to range from 5 to 36. The material has an unconfined compressive strength of 3,000 to 9,000 psf.

Hard gray clay was found below this and continues to the depth investigated (-76 CCD and -79CCD). On this site, silt or sand was not encountered above bedrock as is often found throughout Chicago. B-102 was extended to refusal. Bedrock elevation is thought to be approximately -79 CCD.

V. Ground Water

Though most borings were dry at the time they were drilled and rotary wash techniques made precise determination of the water table difficult, it is expected that a perched ground water table is present within the fill above the top of the clay crust layer, estimated at 13 CCD. Fluctuations in ground water levels may occur depending on fluctuations in precipitation, evaporation and surface run-off as well as the local consistency of the fill material and its ability to hold and transmit water. In the past, typical sump and pump operations have been adequate in the project vicinity to remove the water and make the area suitable for construction operations. Deep excavations for basements and elevator pits may need to be sheeted to limit the inflow of the water perched in the fills above the clay. This should be considered when making decisions regarding basements and water-proofing systems. Though pumps will temporarily lower the perched water level, a long term value of +8 CCD can be used for design purposes.

VI. Foundations

Specific recommendations are difficult without more knowledge of the proposed structure; however, we understand the intention is to support a 6 story residential structures at 851 W Grand. It is our understanding that there will not be basements in the proposed structure.

Pressuremeter testing was performed in hard gray silty clay from -62 CCD to -77 CCD. A summary of pressuremeter results can be found in appendix D. Utilizing the design data determined from the pressuremeter testing, a caisson design was performed. Caissons should bear in the hard silty clay at an elevation of -60 CCD. To determine the bell sizes, a bearing capacity of 25,000 psf should be used. Settlement can be calculated once final building loads are finalized. The transition in bearing strata at this elevation is gradual and an experienced caisson inspector will need to identify appropriate bearing material during caisson installation activities.

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Vane shear and potential squeeze of the clays has been considered. Data shows that little potential for squeeze of subsurface clays on the project. As such, temporary casings need only extend into the crust clay to seal off potential ingress of water.

Though there is little expected risk of encountering problems with water or caving silts based on the borings performed, auger cast piles could also be used as a deep foundation option on the project. Auger cast installation contractors should be contacted regarding constructability, load capacity and depth.

Piles could also be used as a deep foundation option on the project although due to the noise and surrounding neighborhood this may not be the best option. End-bearing piles would likely need to be advanced to hard gray clay at -60 CCD, for a total pile length exceeding 50 feet. Piles of this length would require splicing onsite and will likely greatly increase the cost of their use. Pile load tests would also likely be required.

In lieu of a deep foundation, we feel that another footing option is the use of a rammed aggregate pier system for support of the foundation system. This recommendation is based on the intended construction and the consistency of the materials present. If the use of a rammed aggregate pier system is desired for the project, the information obtained from the geotechnical investigation should be forwarded to an underground contractor for review and suggestions regarding feasibility.

Regardless of the option selected, the foundation should be installed in the presence of a qualified FTL soil technician, experienced with the site conditions, to confirm the type and consistency of the bearing material present.

VII. Slabs on Ground and Pavement

Assuming that the pavement present on the surface of the project will be removed, the miscellaneous fill encountered is generally suitable for support of slabs on grade and pavement. While not encountered during the investigation, any organic material encountered during excavation must be removed and replaced with compacted material. The subsoil should be compacted and then proofrolled using a heavy vehicle such as loaded dump truck with an axle weight exceeding 15,000 lbs. or a roller exceeding 12 tons. Soft or voided areas encountered should be removed and replaced with granular material compacted in lifts to at least 90% of an ASTM D-1557 proctor value or 75% of a relative density. A compacted drainage course of gap graded crushed material (IL CA-7 or similar) or sand at least 4” in thickness should be used below the slab on grades.

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It should be noted that the proposed structure will be located over previously demolished structures that contained basements. Backfilling of these areas should be accomplished following the recommended backfill procedures contained in this report.

VIII. Backfill

The on site fills are suitable as backfill for non-structural members and below slabs on grade and along, but not below, supported foundation walls and footings. Wood or other organics as well as large stones or boulders larger than a fist should be removed prior to placement of backfill. These materials are not acceptable and should not be used in backfill on the project.

Imported sand or clay is suitable for backfill; however, it should be noted that clay materials have a very narrow moisture range for acceptable compaction results. It may be difficult to obtain adequate compaction without significant manipulation of the material.

If a granular backfill material is selected, CA-6, CA-10, or a gap graded material such as CA-7 or CA-11 may be utilized. If a large material such as CA-1 (3”) material is utilized, proofrolling should be substituted for nuclear density testing. Regardless of the type of material used, it must be placed and compacted in lifts of 8” to 12” in thickness. There is no such thing as “self-compacting” fill. The use of gap-graded fill material should be considered from a moisture standpoint as it will likely fill with water over the long-term.

All fill should be placed in maximum loose lifts of 8” to 12” and compacted to a minimum 95% of an ASTM D-1557 maximum proctor below footings, 90% below slabs and paving, and 85% below lawn and landscaped areas. As always, fill materials must not be frozen and may never be placed on a frozen subgrade.

IX. Excavation Considerations

Foundation construction may encounter occasional obstructions. We strongly suggest pot holing prior to caisson installation.

Due to the granular nature of the miscellaneous fill present at the surface, excavations should be cut to a 1.5:1 slope to maintain stability; however, under the influence of the water table, a slope of 2:1 or more may be required. On past projects in the local area, conventional sump and pump operations have been adequate to remove the water.

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However, depending on the height of the water table at the time of excavation, the bottom elevation, and the length of time the excavation must remain open, the ease of draining and maintaining a dry construction environment may be difficult. The excavation should be kept as dry as possible prior to and during the placement of fill materials to prevent degradation of existing material.

Care must be used in placement of caissons. Potholing prior to caisson installation is advised due to the possibility of obstructions. The use of temporary casing is necessary to limit the intrusion of water from the urban fill present over the project.

For excavations and basement walls, lateral earth pressures are presented in the following table.

Material	Equivalent Fluid pressure, pcf	
	Active	Passive
Onsite Urban Fills (γ=120)	40	290
CA-6 Stone (γ=130)	29	500
CA-7 Stone (γ=105)	28	375
Modulus of Subgrade reaction (fill)	K_S=100 psi/inch	

Approximately ¼” of movement is required to mobilize the full active pressures, and over 2” of movement is required to mobilize the passive pressures. Because of this, passive pressures should rarely be used in design, as they will rarely be fully mobilized.

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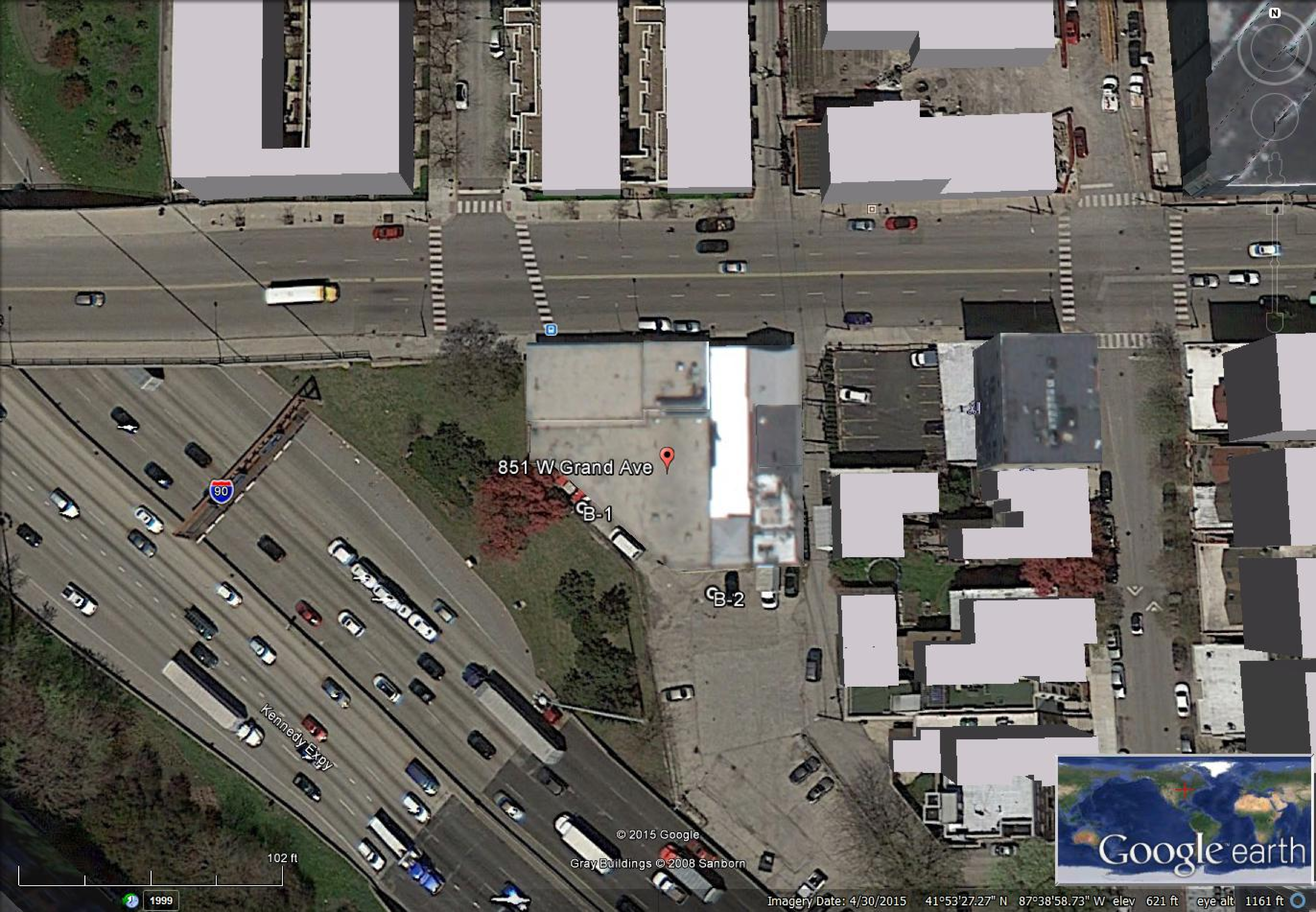
A. Boring Location Plan


N
851 W Grand Ave
B-1
B-2
90
Kennedy Expy
© 2015 Google
Gray Buildings © 2008 Sanborn
102 ft
1999
Imagery Date: 4/30/2015
41°53'27.27" N 87°38'58.73" W elev 621 ft eye alt 1161 ft
Google earth

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B. Boring Logs

FTL FLOOD
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LOG OF BORING - No. B-101

Friday, July 17, 2015

PROJECT: **851 West Grand**

CLIENT: **3F Properties**

ELEVATION OF SURFACE +19CCD

DEPTH (FT.)	SAMPLE NUMBER	SAMPLE TYPE
0.3		
1.0		
2.5	1	SS
3.5		
5.0	2	SS
6.0		
7.5	3	SS
8.5		
10.0	4	SS
13.0		
13.5		
15.0	5	SS
16.0		
18.5		
20.0	6	SS
23.5		
25.0	7	SS
26.0		
28.5		
30.0	8	SS
33.5		
35.0	9	SS
36.0		
38.0		
38.5		
40.0	10	SS
43.5		
45.0	11	SS
48.5		
50.0	12	SS
53.5		
55.0	13	SS
58.5		
60.0	14	SS
63.5		
65.0	15	SS

DESCRIPTION OF MATERIAL

Asphalt Pavement
(FILL)

Crushed Stone
(FILL)

Miscellaneous Fill (Clay, Brick and Stone)
(FILL)

Stiff to Very Stiff Gray Silty Clay
(CL-ML)

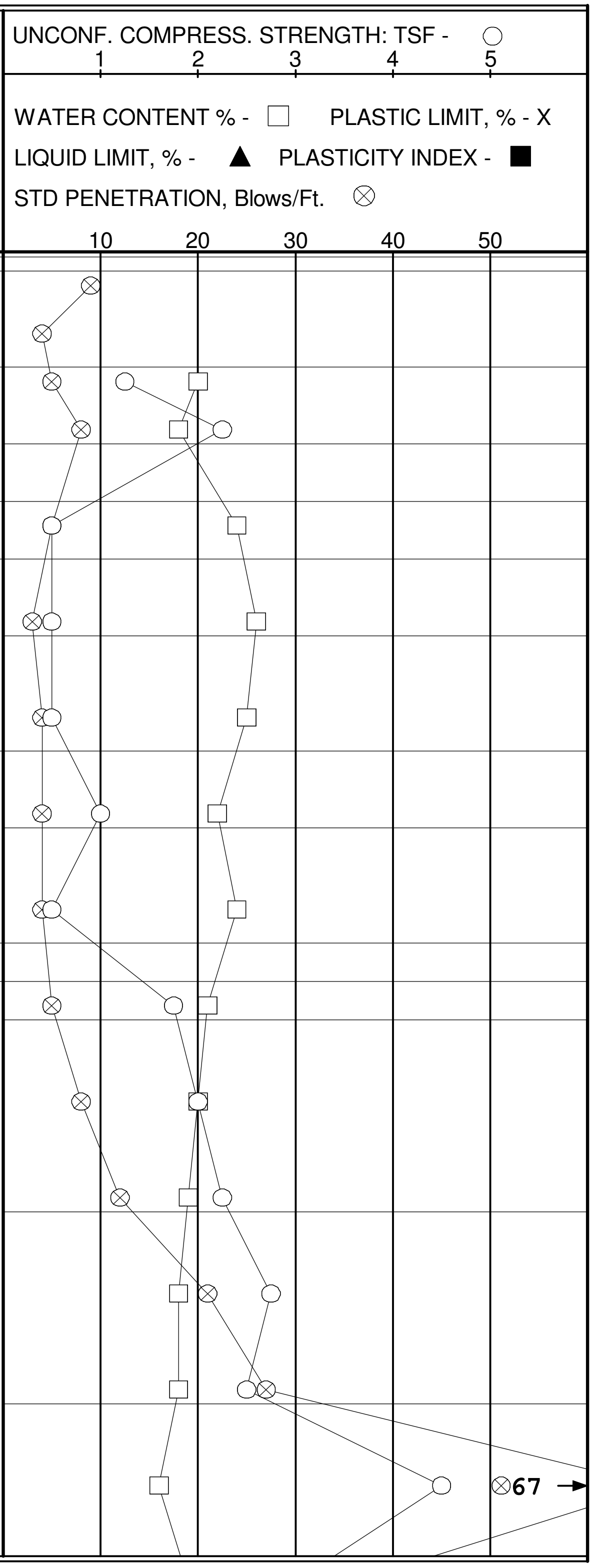
Soft Gray Silty Clay
VST: Su = 596.9 psf

VST: Su = 816.8 psf

VST: Su = 994.8 psf
(CH)

Stiff to Hard Gray Silty Clay

DRY DENSITY LBS./CU.FT.



WATER LEVEL: **Dry** FT. AT **WD** HRS.
N/A FT. AT **AC** HRS.

BORING STARTED: **16 June 2015**

BORING COMPLETED: **29 June 2015**

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LOG OF BORING - No. B-101
Friday, July 17, 2015

PROJECT: **851 West Grand**

CLIENT: **3F Properties**

ELEVATION OF SURFACE +19CCD

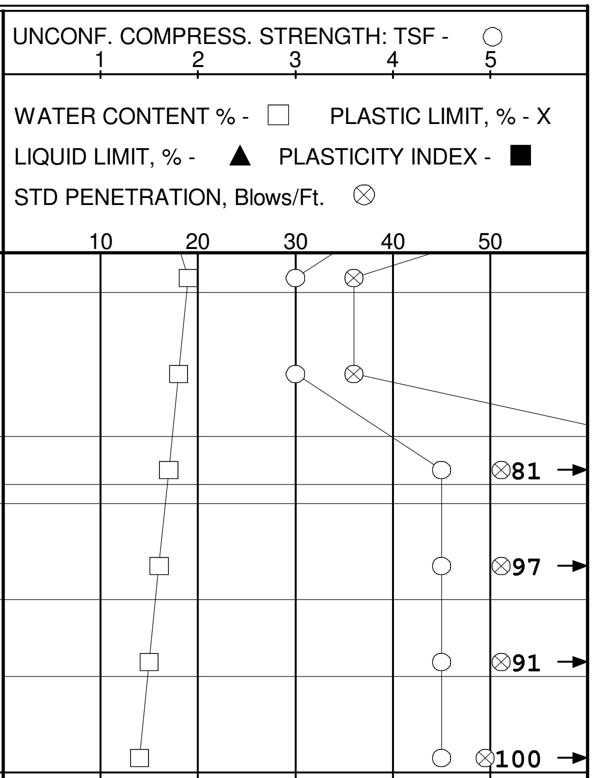
DEPTH (FT.)	SAMPLE NUMBER	SAMPLE TYPE	LENGTH/RECOV.	DESCRIPTION OF MATERIAL	DRY DENSITY LBS./CU.FT.
68.5					
70.0	16	SS	■		
73.5					
75.0	17	SS	■		
77.5				(CL-ML)	
78.5				Hard Gray Silty Clay	
80.0	18	SS	■		
81.0				PMT: Pl=54,302 psf	
83.5					
85.0	19	SS	■		
86.0				PMT Pl=68,922 psf	
88.5					
90.0	20	SS	■		
93.5					
95.0	21	SS	■	(CL-ML)	
				Boring Terminated at 95'	

UNCONF. COMPRESS. STRENGTH: TSF - ○

WATER CONTENT % - □ PLASTIC LIMIT, % - X

LIQUID LIMIT, % - ▲ PLASTICITY INDEX - ■

STD PENETRATION, Blows/Ft. ⊗



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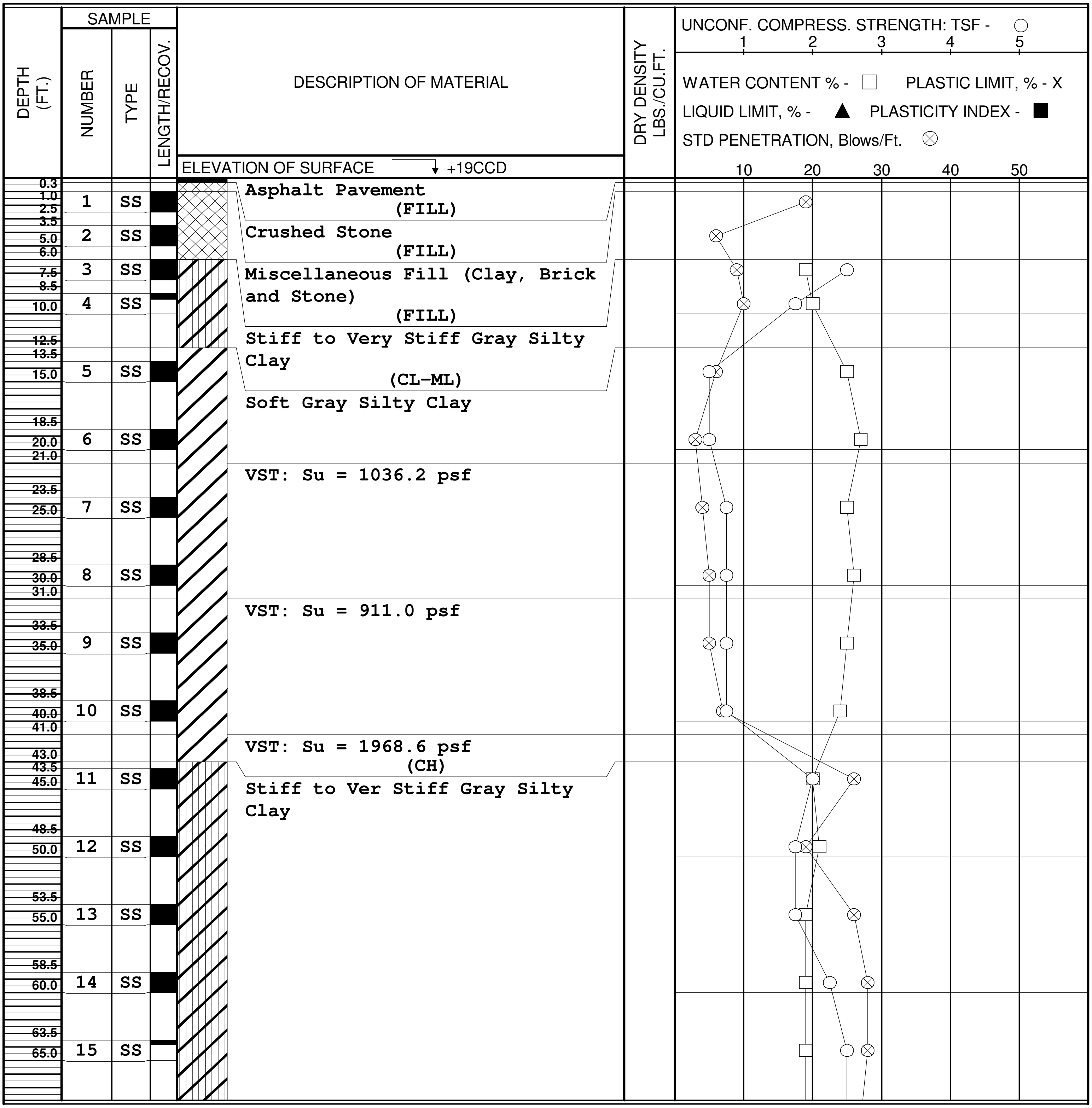
LOG OF BORING - No. B-102

Friday, July 17, 2015

PROJECT: **851 West Grand**

CLIENT: **3F Properties**



NUMBER	TYPE
1	SS
2	SS
3	SS
4	SS
5	SS
6	SS
7	SS
8	SS
9	SS
10	SS
11	SS
12	SS
13	SS
14	SS
15	SS

Asphalt Pavement
(FILL)

Crushed Stone
(FILL)

Miscellaneous Fill (Clay, Brick and Stone)
(FILL)

Stiff to Very Stiff Gray Silty Clay
(CL-ML)

Soft Gray Silty Clay

VST: Su = 1036.2 psf

VST: Su = 911.0 psf

VST: Su = 1968.6 psf
(CH)

Stiff to Ver Stiff Gray Silty Clay

WATER LEVEL: **Dry** FT. AT **WD** HRS.
N/A FT. AT **AC** HRS.

BORING STARTED: **30 June 2015**

BORING COMPLETED: **1 July 2015**

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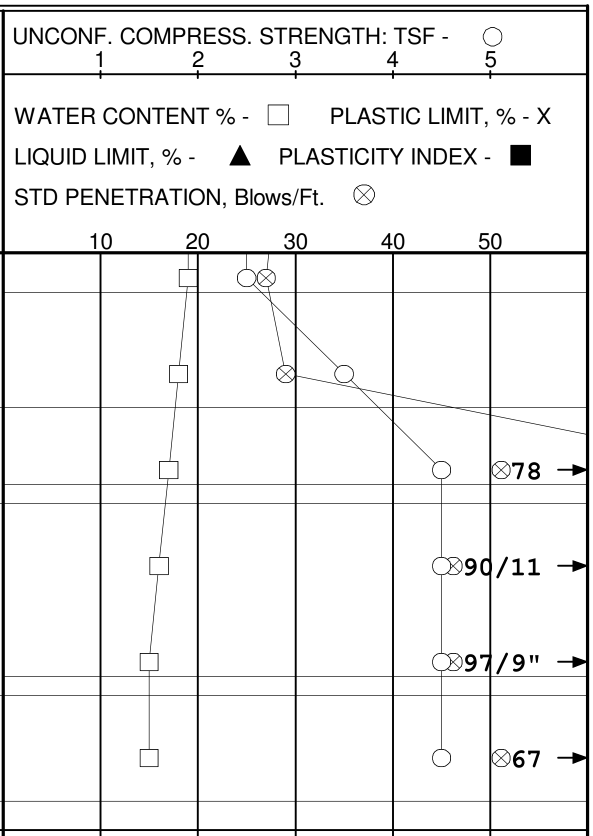
LOG OF BORING - No. B-102

Friday, July 17, 2015

PROJECT: **851 West Grand**

CLIENT: **3F Properties**

DEPTH (FT.)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE LENGTH/RECOV.	DESCRIPTION OF MATERIAL	DRY DENSITY LBS./CU.FT.
				ELEVATION OF SURFACE +19CCD	
68.5	16	SS	■		
70.0					
73.5	17	SS	■		
75.0				(CL-ML)	
76.0				Hard Gray Silty Clay	
78.5	18	SS	■		
80.0					
81.0				PMT: Pl=75,188 psf	
83.5	19	SS	■		
85.0					
88.5	20	SS	■		
90.0					
91.0				PMT Pl=76,232 psf	
93.5	21	SS	■		
95.0					
96.5				PMT Pl=58,480 psf	
98.0				(CL-ML) Boring Terminated at 98' (Auger Refusal)	



KEY TO SYMBOLS

Symbol	Description
Strata symbols	
■	Paving
▩	Fill
▥	Silty low plasticity clay
▨	High plasticity clay
Misc. Symbols	
⊗	N-Value
□	Water Content

Notes:

1. Exploratory borings were drilled on 30 June 2015 using a 4-inch diameter continuous flight power auger.

2. No free water was encountered at the time of drilling or when re-checked the following day.

3. Boring locations were taped from existing features and elevations extrapolated from the final design schematic plan.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

5. Results of tests conducted on samples recovered are reported on the logs.

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C. Vane Shear Tests

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Vane Shear Test Summary

Boring No.	Elev., Ft.	Shear, psf
	(CCD)	
B-1	+3	597
	-7	817
	-17	995
B-2	-2	1036
	-12	911
	-22	1969

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E. Pressuremeter Tests

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17 July 2015

Summary of Pressuremeter Data

Boring	Elevation, ft CCD	Po, psf	Pl, psf	Eo, psf
B-101	-62	12,500	54,302	230,343
	-67	20,900	68,922	274,991
B-102	-62	9,400	75,188	454,740
	-72	11,500	76,232	439,655
	-77.5	12,000	58,480	477,443