CASE STUDY

iDEAL Group

BROOKLYN, NY: A NEW 8 STORY BUILDING AT 211 MCGUINNESS BLVD. WILL STAND ON STELCOR

OWNER:
Stellar Management
New York, NY

ARCHITECT:
Gene Kaufman Architect PC
New York, NY

GENERAL CONTRACTOR:
Britt Realty Construction
Brooklyn, NY

STRUCTURAL ENGINEER:
Gene Kaufman Architect PC
New York, NY

GEOTECHNICAL ENGINEER:
AECOM
New York, NY
and
Geotechnical Engineering Services, P.C.
Elmsford, New York

INSTALLER:
Champ Construction Corp.
Hempstead, NY

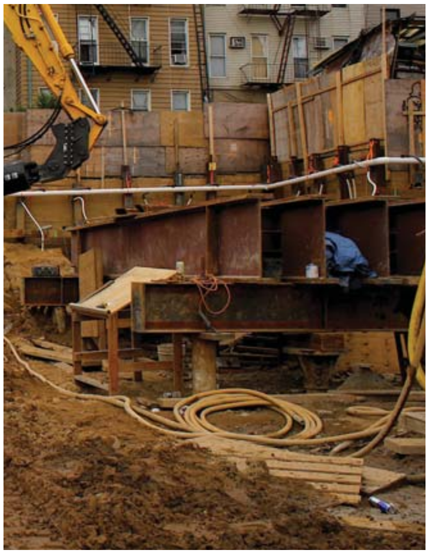
LOADS:
150 tons allowable compression
75 tons allowable tension
1 ton allowable lateral

ANTICIPATED TEST LOAD: 300 tons
ACTUAL TEST LOAD: 300 tons

SPECIFICATIONS:
7” pile shaft
.498” W.T. 80 ksi
16” corrugated grout column
18” tip or drive plate
39.8 ft. bond length
25 psi acheived bond

SOILS + EMBEDMENT DEPTH:
See soils report

STELCOR DDM ELIMINATED THE NEED FOR EXCESSIVE DEWATERING AND INCREASED INSTALL TIMES FROM AN ANTICIPATED *2 PILES PER DAY TO 10 PILES PER DAY.*



OVERVIEW:
An 8 story mixed use building designed by Gene Kaufman is currently going up at 211 McGuinness Blvd. in the Greenpoint neighborhood of Brooklyn. The anticipated install rate of the originally specified micropile was 2 piles per day. There were a total of 340 micropiles on this project.

CHALLENGE:
The greatest challenge with this project was the high water table and the significant costs that would be associated with excessive dewatering. The tops of the piles were 4’ to 6’ below the water table. Before the Stelcor DDM (Drilled-In Displacement Micropile) was introduced as an alternate, there were two options for pile installation; excessive dewatering or install the pile, excavate, and cut-off.

SOLUTION:
Using the proprietary below-grade drive tool from Ideal, the need for dewatering was eliminated. The 340 STELCOR DDM micropiles were installed to 120,000 ft. lbs. using a Digga MD160 drive motor. The piles were installed at a rate of 10 per day as opposed to the anticipated 2 piles per day with the originally specified micropile. The elimination of dewatering costs and the accelerated install times resulted in significant benefits to all parties involved.

AXIAL COMPRESSION LOAD TEST

Project Name:	211 McGuinness Blvd.	**GES Project #:**	2015030
Location:	Brooklyn, NYC, NY	**Contractor:**	Champ Construction Corp.
Pile Number:	5	**Column Number:**	NA
Type of Pile:	Stelcor	**Pile Depth:**	40 feet
Primary Measuring Device:	Dial Gauges	**Jack Serial Number:**	WB 600
Auxiliary Meas. Device:	Piano Wire and Scale	**Gauge Serial Number:**	WB 656
Design Load:	150 tons	**Begin Date/Time:**	March 15, 2016 @ 10:15 AM
Test Load:	300 tons	**End Date/Time:**	March 18, 2016 @ 12:35 PM

Jack Gage Reading	Pile Load (tons)	% of Design Load	Date	Read Time	Primary Readings (in.)			Average Displacement (in.)	Primary Displacement (in.)	Auxiliary Reading (in.)	Auxiliary Displacement (in.)	Remarks
					1	2	3					
0	0	0%	3/14/2016	10:15 AM	1.899	1.499	1.870	1.756	0.000	3.047	0.000	Initial Readings
850	30	20%	3/14/2016	10:24 AM	1.854	1.471	1.833	1.719	0.037	3.000	0.047	Beginning Load Cycle 1
850	30	20%	3/14/2016	1	1.854	1.471	1.833	1.719	0.037	3.000	0.047	
850	30	20%	3/14/2016	2	1.854	1.471	1.833	1.719	0.037	3.000	0.047	
850	30	20%	3/14/2016	4	1.854	1.471	1.833	1.719	0.037	3.000	0.047	
850	30	20%	3/14/2016	8	1.854	1.471	1.833	1.719	0.037	3.000	0.047	
850	30	20%	3/14/2016	10	1.854	1.471	1.833	1.719	0.037	3.000	0.047	
850	30	20%	3/14/2016	15	1.854	1.471	1.832	1.719	0.037	3.000	0.047	
1012	45	30%	3/14/2016	10:44 AM	1.839	1.460	1.822	1.707	0.049	2.984	0.063	
1012	45	30%	3/14/2016	1	1.839	1.460	1.822	1.707	0.049	2.984	0.063	
1012	45	30%	3/14/2016	2	1.838	1.460	1.821	1.706	0.050	2.984	0.063	
1012	45	30%	3/14/2016	4	1.838	1.460	1.821	1.706	0.050	2.984	0.063	
1012	45	30%	3/14/2016	8	1.838	1.460	1.821	1.706	0.050	2.984	0.063	
1012	45	30%	3/14/2016	10	1.838	1.460	1.821	1.706	0.050	2.984	0.063	
1012	45	30%	3/14/2016	15	1.836	1.459	1.819	1.705	0.051	2.984	0.063	
1525	60	40%	3/14/2016	11:06 AM	1.796	1.432	1.794	1.674	0.082	2.984	0.063	
1525	60	40%	3/14/2016	1	1.796	1.432	1.794	1.674	0.082	2.984	0.063	
1525	60	40%	3/14/2016	2	1.795	1.430	1.794	1.673	0.083	2.984	0.063	
1525	60	40%	3/14/2016	4	1.795	1.430	1.794	1.673	0.083	2.984	0.063	
1525	60	40%	3/14/2016	8	1.795	1.430	1.794	1.673	0.083	2.984	0.063	
1525	60	40%	3/14/2016	10	1.794	1.430	1.792	1.672	0.084	2.984	0.063	
1525	60	40%	3/14/2016	15	1.794	1.430	1.792	1.672	0.084	2.984	0.063	
1750	75	50%	3/14/2016	11:17 AM	1.765	1.421	1.787	1.658	0.098	2.922	0.125	
1750	75	50%	3/14/2016	1	1.765	1.421	1.787	1.658	0.098	2.922	0.125	
1750	75	50%	3/14/2016	2	1.765	1.420	1.786	1.657	0.099	2.922	0.125	
1750	75	50%	3/14/2016	4	1.765	1.420	1.786	1.657	0.099	2.922	0.125	
1750	75	50%	3/14/2016	8	1.764	1.420	1.786	1.657	0.099	2.922	0.125	
1750	75	50%	3/14/2016	10	1.764	1.420	1.786	1.657	0.099	2.922	0.125	
1750	75	50%	3/14/2016	15	1.764	1.420	1.786	1.657	0.099	2.922	0.125	
1750	75	50%	3/14/2016	20	1.763	1.419	1.785	1.656	0.100	2.922	0.125	
1525	60	40%	3/14/2016	11:46 AM	1.765	1.422	1.788	1.658	0.098	2.984	0.063	Unloading
1525	60	40%	3/14/2016	1	1.765	1.422	1.788	1.658	0.098	2.984	0.063	
1525	60	40%	3/14/2016	2	1.765	1.422	1.788	1.658	0.098	2.984	0.063	
1525	60	40%	3/14/2016	4	1.765	1.422	1.788	1.658	0.098	2.984	0.063	
1525	60	40%	3/14/2016	8	1.766	1.423	1.788	1.659	0.097	2.984	0.063	
1525	60	40%	3/14/2016	10	1.766	1.423	1.788	1.659	0.097	2.984	0.063	
1525	60	40%	3/14/2016	15	1.766	1.423	1.788	1.659	0.097	2.984	0.063	
1525	60	40%	3/14/2016	20	1.766	1.423	1.788	1.659	0.097	2.984	0.063	
1012	45	30%	3/14/2016	12:09 PM	1.788	1.435	1.800	1.674	0.082	2.984	0.063	
1012	45	30%	3/14/2016	1	1.788	1.435	1.800	1.674	0.082	2.984	0.063	
1012	45	30%	3/14/2016	2	1.788	1.435	1.800	1.674	0.082	2.984	0.063	
1012	45	30%	3/14/2016	4	1.788	1.435	1.800	1.674	0.082	2.984	0.063	
1012	45	30%	3/14/2016	8	1.789	1.435	1.801	1.675	0.081	2.984	0.063	
1012	45	30%	3/14/2016	10	1.789	1.435	1.801	1.675	0.081	2.984	0.063	
1012	45	30%	3/14/2016	15	1.789	1.436	1.801	1.675	0.081	2.984	0.063	
1012	45	30%	3/14/2016	20	1.789	1.436	1.802	1.676	0.080	2.984	0.063	
850	30	20%	3/14/2015	12:35 PM	1.799	1.442	1.808	1.683	0.073	3.000	0.047	
850	30	20%	3/14/2015	1	1.799	1.442	1.808	1.683	0.073	3.000	0.047	
850	30	20%	3/14/2015	2	1.799	1.442	1.808	1.683	0.073	3.000	0.047	
850	30	20%	3/14/2015	4	1.799	1.442	1.808	1.683	0.073	3.000	0.047	

Gage Reading	Load (tons)	Design Load	Date	Read Time	1	2	3	Displacement (in.)	Displacement (in.)	Reading (in.)	Displacement (in.)	Remarks
850	30	20%	3/14/2015	8	1.799	1.442	1.808	1.683	0.073	3.000	0.047	
850	30	20%	3/14/2015	10	1.799	1.442	1.808	1.683	0.073	3.000	0.047	
0	0	0%	3/14/2016	12:56 PM	1.865	1.487	1.850	1.734	0.022	3.031	0.016	
0	0	0%	3/14/2016	1	1.865	1.487	1.850	1.734	0.022	3.031	0.016	
0	0	0%	3/14/2016	2	1.865	1.487	1.850	1.734	0.022	3.031	0.016	
0	0	0%	3/14/2016	4	1.865	1.487	1.850	1.734	0.022	3.031	0.016	
0	0	0%	3/14/2016	8	1.865	1.487	1.850	1.734	0.022	3.031	0.016	
0	0	0%	3/14/2016	10	1.866	1.486	1.850	1.734	0.022	3.031	0.016	
0	0	0%	3/14/2016	15	1.866	1.486	1.850	1.734	0.022	3.031	0.016	
0	0	0%	3/14/2016	20	1.866	1.486	1.850	1.734	0.022	3.031	0.016	Load Cycle 1 Complete
850	30	20%	3/14/2016	1:18 PM	1.816	1.450	1.817	1.694	0.062	3.031	0.016	Beginning Load Cycle 2
850	30	20%	3/14/2016	1	1.816	1.450	1.817	1.694	0.062	3.031	0.016	
850	30	20%	3/14/2016	2	1.816	1.450	1.817	1.694	0.062	3.031	0.016	
850	30	20%	3/14/2016	4	1.816	1.450	1.817	1.694	0.062	3.031	0.016	
850	30	20%	3/14/2016	10	1.815	1.450	1.816	1.694	0.062	3.031	0.016	
850	30	20%	3/14/2016	20	1.815	1.450	1.816	1.694	0.062	3.031	0.016	
850	30	20%	3/14/2016	40	1.815	1.450	1.816	1.694	0.062	3.031	0.016	
850	30	20%	3/14/2016	60	1.815	1.450	1.816	1.694	0.062	3.031	0.016	
1012	45	30%	3/14/2016	2:24 PM	1.807	1.441	1.807	1.685	0.071	2.984	0.063	
1012	45	30%	3/14/2016	1	1.807	1.441	1.807	1.685	0.071	2.984	0.063	
1012	45	30%	3/14/2016	2	1.807	1.441	1.807	1.685	0.071	2.984	0.063	
1012	45	30%	3/14/2016	4	1.800	1.441	1.807	1.683	0.073	2.984	0.063	
1012	45	30%	3/14/2016	8	1.800	1.441	1.807	1.683	0.073	2.984	0.063	
1012	45	30%	3/14/2016	10	1.800	1.441	1.807	1.683	0.073	2.984	0.063	
1012	45	30%	3/14/2016	20	1.800	1.441	1.807	1.683	0.073	2.984	0.063	
1012	45	30%	3/14/2016	40	1.800	1.441	1.807	1.683	0.073	2.984	0.063	
1012	45	30%	3/14/2016	60	1.800	1.441	1.807	1.683	0.073	2.984	0.063	
1525	60	40%	3/14/2016	3:25 PM	1.772	1.424	1.790	1.662	0.094	2.969	0.078	
1525	60	40%	3/14/2016	1	1.772	1.424	1.790	1.662	0.094	2.969	0.078	
1525	60	40%	3/14/2016	2	1.772	1.424	1.790	1.662	0.094	2.969	0.078	
1525	60	40%	3/14/2016	4	1.772	1.424	1.790	1.662	0.094	2.969	0.078	
1525	60	40%	3/14/2016	8	1.771	1.424	1.790	1.662	0.094	2.969	0.078	
1525	60	40%	3/14/2016	10	1.771	1.424	1.790	1.662	0.094	2.969	0.078	
1525	60	40%	3/14/2016	20	1.770	1.423	1.790	1.661	0.095	2.969	0.078	
1525	60	40%	3/14/2016	40	1.770	1.423	1.790	1.661	0.095	2.969	0.078	
1525	60	40%	3/14/2016	60	1.770	1.423	1.790	1.661	0.095	2.969	0.078	
1750	75	50%	3/14/2016	4:32 PM	1.750	1.417	1.782	1.650	0.106	2.969	0.078	
1750	75	50%	3/14/2016	1	1.750	1.417	1.782	1.650	0.106	2.969	0.078	
1750	75	50%	3/14/2016	2	1.750	1.416	1.782	1.649	0.107	2.969	0.078	
1750	75	50%	3/14/2016	4	1.750	1.416	1.782	1.649	0.107	2.969	0.078	
1750	75	50%	3/14/2016	8	1.750	1.416	1.782	1.649	0.107	2.969	0.078	
1750	75	50%	3/14/2016	10	1.750	1.416	1.782	1.649	0.107	2.969	0.078	
1750	75	50%	3/14/2016	20	1.749	1.416	1.782	1.649	0.107	2.969	0.078	
1750	75	50%	3/14/2016	40	1.748	1.415	1.781	1.648	0.108	2.969	0.078	
1750	75	50%	3/14/2016	60	1.748	1.415	1.781	1.648	0.108	2.969	0.078	
2450	105	70%	3/14/2016	5:34 PM	1.762	1.406	1.469	1.546	0.210	2.938	0.109	
2450	105	70%	3/14/2016	1	1.762	1.406	1.469	1.546	0.210	2.938	0.109	
2450	105	70%	3/14/2016	2	1.761	1.406	1.469	1.545	0.211	2.938	0.109	
2450	105	70%	3/14/2016	4	1.761	1.406	1.469	1.545	0.211	2.938	0.109	
2450	105	70%	3/14/2016	8	1.760	1.405	1.469	1.545	0.211	2.938	0.109	
2450	105	70%	3/14/2016	10	1.760	1.405	1.468	1.544	0.212	2.938	0.109	
2450	105	70%	3/14/2016	20	1.759	1.404	1.467	1.543	0.213	2.938	0.109	
2450	105	70%	3/14/2016	40	1.757	1.403	1.466	1.542	0.214	2.938	0.109	
2450	105	70%	3/14/2016	60	1.757	1.403	1.466	1.542	0.214	2.938	0.109	
3600	150	100%	3/14/2016	6:35 PM	1.472	1.361	1.724	1.519	0.237	2.859	0.188	
3600	150	100%	3/14/2016	1	1.472	1.361	1.724	1.519	0.237	2.859	0.188	
3600	150	100%	3/14/2016	2	1.472	1.360	1.722	1.518	0.238	2.859	0.188	
3600	150	100%	3/14/2016	4	1.471	1.360	1.720	1.517	0.239	2.859	0.188	
3600	150	100%	3/14/2016	8	1.471	1.360	1.720	1.517	0.239	2.859	0.188	
3600	150	100%	3/14/2016	10	1.471	1.357	1.720	1.516	0.240	2.859	0.188	
3600	150	100%	3/14/2016	20	1.470	1.357	1.720	1.516	0.240	2.859	0.188	
3600	150	100%	3/14/2016	40	1.469	1.357	1.720	1.515	0.241	2.859	0.188	
3600	150	100%	3/14/2016	60	1.469	1.357	1.720	1.515	0.241	2.859	0.188	
3600	150	100%	3/14/2016	80	1.469	1.357	1.720	1.515	0.241	2.859	0.188	

Gage Reading	Load (tons)	Design Load	Date	Read Time	1	2	3	Displacement (in.)	Displacement (in.)	Reading (in.)	Displacement (in.)	Remarks
2450	105	70%	3/14/2016	8:00 PM	1.485	1.377	1.739	1.534	0.222	2.859	0.188	Unloading
2450	105	70%	3/14/2016	1	1.485	1.377	1.739	1.534	0.222	2.859	0.188	
2450	105	70%	3/14/2016	2	1.485	1.377	1.739	1.534	0.222	2.859	0.188	
2450	105	70%	3/14/2016	4	1.485	1.377	1.739	1.534	0.222	2.859	0.188	
2450	105	70%	3/14/2016	10	1.485	1.377	1.739	1.534	0.222	2.859	0.188	
2450	105	70%	3/14/2016	20	1.486	1.378	1.739	1.534	0.222	2.859	0.188	
1750	75	50%	3/14/2016	8:20 PM	1.538	1.401	1.760	1.566	0.190	2.969	0.078	
1750	75	50%	3/14/2016	1	1.538	1.401	1.760	1.566	0.190	2.969	0.078	
1750	75	50%	3/14/2016	2	1.538	1.401	1.760	1.566	0.190	2.969	0.078	
1750	75	50%	3/14/2016	4	1.538	1.401	1.760	1.566	0.190	2.969	0.078	
1750	75	50%	3/14/2016	10	1.540	1.402	1.760	1.567	0.189	2.969	0.078	
1750	75	50%	3/14/2016	20	1.541	1.402	1.760	1.568	0.188	2.969	0.078	
1525	60	40%	3/14/2016	8:40 PM	1.565	1.412	1.770	1.582	0.174	2.969	0.078	
1525	60	40%	3/14/2016	1	1.565	1.412	1.770	1.582	0.174	2.969	0.078	
1525	60	40%	3/14/2016	2	1.565	1.412	1.770	1.582	0.174	2.969	0.078	
1525	60	40%	3/14/2016	4	1.565	1.412	1.770	1.582	0.174	2.969	0.078	
1525	60	40%	3/14/2016	10	1.567	1.412	1.770	1.583	0.173	2.969	0.078	
1525	60	40%	3/14/2016	20	1.568	1.412	1.770	1.583	0.173	2.969	0.078	
1012	45	30%	3/14/2016	9:00 PM	1.617	1.436	1.793	1.615	0.141	2.984	0.063	
1012	45	30%	3/14/2016	1	1.617	1.436	1.793	1.615	0.141	2.984	0.063	
1012	45	30%	3/14/2016	2	1.617	1.436	1.793	1.615	0.141	2.984	0.063	
1012	45	30%	3/14/2016	4	1.617	1.436	1.793	1.615	0.141	2.984	0.063	
1012	45	30%	3/14/2016	10	1.619	1.436	1.793	1.616	0.140	2.984	0.063	
1012	45	30%	3/14/2016	20	1.620	1.436	1.794	1.617	0.139	2.984	0.063	
850	30	20	3/14/2016	9:20 PM	1.635	1.446	1.803	1.628	0.128	3.016	0.031	
850	30	20	3/14/2016	1	1.635	1.446	1.803	1.628	0.128	3.016	0.031	
850	30	20	3/14/2016	2	1.635	1.446	1.803	1.628	0.128	3.016	0.031	
850	30	20	3/14/2016	4	1.635	1.446	1.803	1.628	0.128	3.016	0.031	
850	30	20	3/14/2016	10	1.636	1.446	1.804	1.629	0.127	3.016	0.031	
850	30	20	3/14/2016	20	1.636	1.446	1.804	1.629	0.127	3.016	0.031	
0	0	0	3/14/2016	9:40 PM	1.792	1.456	1.823	1.690	0.066	3.031	0.016	
0	0	0	3/14/2016	1	1.792	1.456	1.823	1.690	0.066	3.031	0.016	
0	0	0	3/14/2016	2	1.792	1.456	1.823	1.690	0.066	3.031	0.016	
0	0	0	3/14/2016	4	1.792	1.456	1.823	1.690	0.066	3.031	0.016	
0	0	0	3/14/2016	10	1.793	1.457	1.825	1.692	0.064	3.031	0.016	
0	0	0	3/14/2016	20	1.794	1.457	1.826	1.692	0.064	3.031	0.016	Load Cycle 2 Complete
850	30	20	3/14/2016	10:00 PM	1.719	1.433	1.798	1.650	0.106	3.016	0.031	Beginning Load Cycle 3
850	30	20	3/14/2016	1	1.719	1.433	1.798	1.650	0.106	3.016	0.031	
850	30	20	3/14/2016	2	1.719	1.433	1.798	1.650	0.106	3.016	0.031	
850	30	20	3/14/2016	5	1.719	1.433	1.798	1.650	0.106	3.016	0.031	
850	30	20	3/14/2016	10	1.719	1.433	1.798	1.650	0.106	3.016	0.031	
850	30	20	3/14/2016	20	1.718	1.433	1.798	1.650	0.106	3.016	0.031	
850	30	20	3/14/2016	40	1.718	1.433	1.798	1.650	0.106	3.016	0.031	
850	30	20	3/14/2016	60	1.718	1.433	1.798	1.650	0.106	3.016	0.031	
1012	45	30	3/14/2016	11:00 PM	1.707	1.427	1.791	1.642	0.114	2.984	0.063	
1012	45	30	3/14/2016	1	1.707	1.427	1.791	1.642	0.114	2.984	0.063	
1012	45	30	3/14/2016	2	1.707	1.427	1.791	1.642	0.114	2.984	0.063	
1012	45	30	3/14/2016	5	1.707	1.427	1.791	1.642	0.114	2.984	0.063	
1012	45	30	3/14/2016	10	1.707	1.427	1.791	1.642	0.114	2.984	0.063	
1012	45	30	3/14/2016	20	1.707	1.427	1.791	1.642	0.114	2.984	0.063	
1012	45	30	3/14/2016	40	1.707	1.427	1.791	1.642	0.114	2.984	0.063	
1012	45	30	3/14/2016	60	1.706	1.426	1.790	1.641	0.115	2.984	0.063	
1525	60	40	3/15/2016	12:00 AM	1.662	1.405	1.768	1.612	0.144	2.938	0.109	
1525	60	40	3/15/2016	1	1.662	1.405	1.768	1.612	0.144	2.938	0.109	
1525	60	40	3/15/2016	2	1.662	1.405	1.768	1.612	0.144	2.938	0.109	
1525	60	40	3/15/2016	5	1.662	1.405	1.768	1.612	0.144	2.938	0.109	
1525	60	40	3/15/2016	10	1.662	1.405	1.768	1.612	0.144	2.938	0.109	
1525	60	40	3/15/2016	20	1.662	1.405	1.768	1.612	0.144	2.938	0.109	
1525	60	40	3/15/2016	40	1.661	1.404	1.767	1.611	0.145	2.938	0.109	
1525	60	40	3/15/2016	60	1.661	1.404	1.767	1.611	0.145	2.938	0.109	
1750	75	50	3/15/2016	1:00 AM	1.647	1.399	1.761	1.602	0.154	2.906	0.141	
1750	75	50	3/15/2016	1	1.647	1.399	1.761	1.602	0.154	2.906	0.141	
1750	75	50	3/15/2016	2	1.647	1.399	1.761	1.602	0.154	2.906	0.141	
1750	75	50	3/15/2016	5	1.647	1.399	1.761	1.602	0.154	2.906	0.141	

Gage Reading	Load (tons)	Design Load	Date	Read Time	1	2	3	Displacement (in.)	Displacement (in.)	Reading (in.)	Displacement (in.)	Remarks
1750	75	50	3/15/2016	10	1.647	1.399	1.761	1.602	0.154	2.906	0.141	
1750	75	50	3/15/2016	20	1.647	1.399	1.761	1.602	0.154	2.906	0.141	
1750	75	50	3/15/2016	40	1.646	1.398	1.761	1.602	0.154	2.906	0.141	
1750	75	50	3/15/2016	60	1.646	1.398	1.761	1.602	0.154	2.906	0.141	
2450	105	70	3/15/2016	2:00 AM	1.584	1.386	1.747	1.572	0.184	2.84	0.203	
2450	105	70	3/15/2016	1	1.584	1.386	1.747	1.572	0.184	2.84	0.203	
2450	105	70	3/15/2016	2	1.584	1.386	1.747	1.572	0.184	2.84	0.203	
2450	105	70	3/15/2016	5	1.584	1.386	1.747	1.572	0.184	2.84	0.203	
2450	105	70	3/15/2016	10	1.584	1.386	1.747	1.572	0.184	2.84	0.203	
2450	105	70	3/15/2016	20	1.584	1.386	1.747	1.572	0.184	2.84	0.203	
2450	105	70	3/15/2016	40	1.583	1.384	1.745	1.571	0.185	2.84	0.203	
2450	105	70	3/15/2016	60	1.583	1.384	1.745	1.571	0.185	2.84	0.203	
3600	150	100	3/15/2016	3:00 AM	1.473	1.361	1.720	1.518	0.238	2.813	0.234	
3600	150	100	3/15/2016	1	1.473	1.361	1.720	1.518	0.238	2.813	0.234	
3600	150	100	3/15/2016	2	1.473	1.361	1.720	1.518	0.238	2.813	0.234	
3600	150	100	3/15/2016	5	1.473	1.361	1.720	1.518	0.238	2.813	0.234	
3600	150	100	3/15/2016	10	1.473	1.361	1.720	1.518	0.238	2.813	0.234	
3600	150	100	3/15/2016	20	1.473	1.361	1.720	1.518	0.238	2.813	0.234	
3600	150	100	3/15/2016	40	1.472	1.359	1.719	1.517	0.239	2.813	0.234	
3600	150	100	3/15/2016	60	1.471	1.358	1.719	1.516	0.240	2.813	0.234	
4218	187.5	125	3/15/2016	4:00 AM	1.395	1.341	1.699	1.478	0.278	2.781	0.266	Hydraulic Jack is beginning to Tilt
4218	187.5	125	3/15/2016	1	1.395	1.341	1.699	1.478	0.278	2.781	0.266	
4218	187.5	125	3/15/2016	2	1.395	1.341	1.699	1.478	0.278	2.781	0.266	
4218	187.5	125	3/15/2016	4	1.395	1.341	1.699	1.478	0.278	2.781	0.266	
4218	187.5	125	3/15/2016	8	1.395	1.341	1.699	1.478	0.278	2.781	0.266	
4218	187.5	125	3/15/2016	12	1.395	1.341	1.699	1.478	0.278	2.781	0.266	
4218	187.5	125	3/15/2016	16	1.395	1.341	1.699	1.478	0.278	2.781	0.266	
4218	187.5	125	3/15/2016	20	1.395	1.341	1.699	1.478	0.278	2.781	0.266	
4218	187.5	125	3/15/2016	24	1.394	1.34	1.698	1.477	0.279	2.781	0.266	
4218	187.5	125	3/15/2016	28	1.394	1.340	1.698	1.477	0.279	2.781	0.266	
4218	187.5	125	3/15/2016	32	1.393	1.340	1.697	1.477	0.279	2.781	0.266	
4218	187.5	125	3/15/2016	36	1.393	1.339	1.697	1.476	0.280	2.781	0.266	
4218	187.5	125	3/15/2016	40	1.393	1.338	1.697	1.476	0.280	2.781	0.266	
4218	187.5	125	3/15/2016	44	1.392	1.337	1.696	1.475	0.281	2.781	0.266	
4218	187.5	125	3/15/2016	48	1.392	1.337	1.696	1.475	0.281	2.781	0.266	
4218	187.5	125	3/15/2016	52	1.391	1.337	1.694	1.474	0.282	2.781	0.266	
4218	187.5	125	3/15/2016	56	1.390	1.336	1.694	1.473	0.283	2.781	0.266	
4218	187.5	125	3/15/2016	60	1.390	1.336	1.694	1.473	0.283	2.781	0.266	
4218	187.5	125	3/15/2016	80	1.389	1.336	1.694	1.473	0.283	2.781	0.266	
4218	187.5	125	3/15/2016	100	1.389	1.336	1.694	1.473	0.283	2.781	0.266	
4218	187.5	125	3/15/2016	120	1.389	1.336	1.694	1.473	0.283	2.781	0.266	
5437	225	150	3/15/2016	6:00 AM	1.176	1.287	1.642	1.368	0.388	2.750	0.297	
5437	225	150	3/15/2016	1	1.176	1.287	1.642	1.368	0.388	2.750	0.297	
5437	225	150	3/15/2016	2	1.176	1.287	1.642	1.368	0.388	2.750	0.297	
5437	225	150	3/15/2016	5	1.175	1.287	1.641	1.368	0.388	2.750	0.297	
5437	225	150	3/15/2016	10	1.174	1.286	1.640	1.367	0.389	2.750	0.297	
5437	225	150	3/15/2016	20	1.173	1.285	1.640	1.366	0.390	2.750	0.297	
5437	225	150	3/15/2016	40	1.171	1.284	1.639	1.365	0.391	2.750	0.297	
5437	225	150	3/15/2016	60	1.169	1.282	1.637	1.363	0.393	2.750	0.297	
5437	225	150	3/15/2016	7:15 AM	1.168	1.281	1.635	1.361	0.395	2.750	0.297	
5437	225	150	3/15/2016	7:45 AM	1.165	1.281	1.635	1.360	0.396	2.750	0.297	
5437	225	150	3/15/2016	9:00 AM	1.162	1.280	1.635	1.359	0.397	2.750	0.297	
4218	187.5	125	3/15/2016	9:12 AM	1.164	1.283	1.639	1.362	0.394	2.750	0.297	Unloading
4218	187.5	125	3/15/2016	1	1.164	1.284	1.639	1.362	0.394	2.750	0.297	
4218	187.5	125	3/15/2016	2	1.164	1.284	1.639	1.362	0.394	2.750	0.297	
4218	187.5	125	3/15/2016	4	1.164	1.284	1.639	1.362	0.394	2.750	0.297	
4218	187.5	125	3/15/2016	10	1.164	1.284	1.639	1.362	0.394	2.750	0.297	
4218	187.5	125	3/15/2016	20	1.164	1.284	1.639	1.362	0.394	2.750	0.297	
3600	150	100	3/15/2016	9:34 AM	1.186	1.301	1.654	1.380	0.376	2.781	0.266	
3600	150	100	3/15/2016	1	1.186	1.301	1.654	1.380	0.376	2.781	0.266	
3600	150	100	3/15/2016	2	1.187	1.301	1.654	1.381	0.375	2.781	0.266	
3600	150	100	3/15/2016	4	1.187	1.301	1.654	1.381	0.375	2.781	0.266	
3600	150	100	3/15/2016	10	1.190	1.302	1.655	1.382	0.374	2.781	0.266	
3600	150	100	3/15/2016	20	1.192	1.302	1.655	1.383	0.373	2.781	0.266	
2450	105	70	3/15/2016	9:57 AM	1.319	1.332	1.683	1.445	0.311	2.813	0.234	
2450	105	70	3/15/2016	1	1.319	1.332	1.683	1.445	0.311	2.813	0.234	

Gage Reading	Load (tons)	Design Load	Date	Read Time	1	2	3	Displacement (in.)	Displacement (in.)	Reading (in.)	Displacement (in.)	Remarks
2450	105	70	3/15/2016	2	1.320	1.332	1.683	1.445	0.311	2.813	0.234	
2450	105	70	3/15/2016	4	1.320	1.332	1.684	1.445	0.311	2.813	0.234	
2450	105	70	3/15/2016	10	1.322	1.333	1.685	1.447	0.309	2.813	0.234	
2450	105	70	3/15/2016	20	1.325	1.334	1.686	1.448	0.308	2.813	0.234	
1750	75	50	3/15/2016	10:19 AM	1.376	1.359	1.720	1.485	0.271	2.844	0.203	
1750	75	50	3/15/2016	1	1.376	1.359	1.720	1.485	0.271	2.844	0.203	
1750	75	50	3/15/2016	2	1.377	1.359	1.720	1.485	0.271	2.844	0.203	
1750	75	50	3/15/2016	4	1.379	1.359	1.720	1.486	0.270	2.844	0.203	
1750	75	50	3/15/2016	10	1.383	1.360	1.714	1.486	0.270	2.844	0.203	
1750	75	50	3/15/2016	20	1.384	1.360	1.713	1.486	0.270	2.844	0.203	
1525	60	40	3/15/2016	10:40 AM	1.406	1.373	1.726	1.502	0.254	2.875	0.172	
1525	60	40	3/15/2016	1	1.407	1.374	1.727	1.503	0.253	2.875	0.172	
1525	60	40	3/15/2016	2	1.408	1.374	1.728	1.503	0.253	2.875	0.172	
1525	60	40	3/15/2016	4	1.408	1.374	1.728	1.503	0.253	2.875	0.172	
1525	60	40	3/15/2016	10	1.410	1.375	1.728	1.504	0.252	2.875	0.172	
1525	60	40	3/15/2016	20	1.411	1.375	1.725	1.504	0.252	2.875	0.172	
1012	45	30	3/15/2016	11:25 AM	1.457	1.400	1.748	1.535	0.221	2.906	0.141	
1012	45	30	3/15/2016	1	1.458	1.400	1.748	1.535	0.221	2.906	0.141	
1012	45	30	3/15/2016	2	1.458	1.400	1.749	1.536	0.220	2.906	0.141	
1012	45	30	3/15/2016	4	1.458	1.400	1.749	1.536	0.220	2.906	0.141	
1012	45	30	3/15/2016	10	1.460	1.400	1.750	1.537	0.219	2.906	0.141	
1012	45	30	3/15/2016	20	1.462	1.401	1.750	1.538	0.218	2.906	0.141	
850	30	20	3/15/2016	11:46 AM	1.482	1.413	1.762	1.552	0.204	2.938	0.109	
850	30	20	3/15/2016	1	1.482	1.413	1.762	1.552	0.204	2.938	0.109	
850	30	20	3/15/2016	2	1.483	1.413	1.762	1.553	0.203	2.938	0.109	
850	30	20	3/15/2016	4	1.483	1.413	1.763	1.553	0.203	2.938	0.109	
850	30	20	3/15/2016	10	1.484	1.414	1.764	1.554	0.202	2.938	0.109	
850	30	20	3/15/2016	20	1.486	1.415	1.765	1.555	0.201	2.938	0.109	
0	0	0	3/15/2016	12:07 PM	1.718	1.425	1.767	1.637	0.119	3.000	0.047	
0	0	0	3/15/2016	1	1.719	1.43	1.767	1.639	0.117	3.000	0.047	
0	0	0	3/15/2016	2	1.722	1.436	1.768	1.642	0.114	3.000	0.047	
0	0	0	3/15/2016	4	1.724	1.436	1.769	1.643	0.113	3.000	0.047	
0	0	0	3/15/2016	10	1.727	1.436	1.770	1.644	0.112	3.000	0.047	
0	0	0	3/15/2016	20	1.727	1.436	1.770	1.644	0.112	3.016	0.031	Load Cycle 3 Complete
0	0	0	3/15/2016	5:05 PM	1.731	1.436	1.770	1.646	0.110	2.375	0.000	Readjusted the Hydraulic Jack Reset Dial Gauges
850	30	20	3/15/2016	5:10 PM	1.655	1.397	1.717	1.590	0.166	2.438	0.063	Beginning Load Cycle 4
850	30	20	3/15/2016	1	1.655	1.397	1.717	1.590	0.166	2.438	0.063	
850	30	20	3/15/2016	2	1.655	1.397	1.717	1.590	0.166	2.438	0.063	
850	30	20	3/15/2016	5	1.655	1.397	1.717	1.590	0.166	2.438	0.063	
850	30	20	3/15/2016	10	1.655	1.396	1.716	1.589	0.167	2.438	0.063	
850	30	20	3/15/2016	20	1.655	1.396	1.716	1.589	0.167	2.438	0.063	
1012	45	30	3/15/2016	5:32 PM	1.642	1.387	1.705	1.578	0.178	2.469	0.094	
1012	45	30	3/15/2016	1	1.642	1.387	1.705	1.578	0.178	2.469	0.094	
1012	45	30	3/15/2016	2	1.642	1.387	1.705	1.578	0.178	2.469	0.094	
1012	45	30	3/15/2016	5	1.642	1.387	1.705	1.578	0.178	2.469	0.094	
1012	45	30	3/15/2016	10	1.641	1.388	1.705	1.578	0.178	2.469	0.094	
1012	45	30	3/15/2016	20	1.641	1.387	1.705	1.578	0.178	2.469	0.094	
1525	60	40	3/15/2016	5:53 PM	1.600	1.365	1.675	1.547	0.209	2.500	0.125	
1525	60	40	3/15/2016	1	1.600	1.365	1.675	1.547	0.209	2.500	0.125	
1525	60	40	3/15/2016	2	1.600	1.365	1.675	1.547	0.209	2.500	0.125	
1525	60	40	3/15/2016	5	1.600	1.365	1.675	1.547	0.209	2.500	0.125	
1525	60	40	3/15/2016	10	1.599	1.365	1.675	1.546	0.210	2.500	0.125	
1525	60	40	3/15/2016	20	1.598	1.365	1.675	1.546	0.210	2.500	0.125	
1750	70	50	3/15/2016	6:14 PM	1.578	1.353	1.661	1.531	0.225	2.500	0.125	
1750	70	50	3/15/2016	1	1.578	1.353	1.661	1.531	0.225	2.500	0.125	
1750	70	50	3/15/2016	2	1.578	1.353	1.661	1.531	0.225	2.500	0.125	
1750	70	50	3/15/2016	5	1.578	1.353	1.661	1.531	0.225	2.500	0.125	
1750	70	50	3/15/2016	10	1.578	1.352	1.661	1.530	0.226	2.500	0.125	
1750	70	50	3/15/2016	20	1.578	1.352	1.660	1.530	0.226	2.500	0.125	
2450	105	70	3/15/2016	6:35 PM	1.537	1.315	1.610	1.487	0.269	2.531	0.156	
2450	105	70	3/15/2016	1	1.537	1.315	1.610	1.487	0.269	2.531	0.156	
2450	105	70	3/15/2016	2	1.537	1.315	1.610	1.487	0.269	2.531	0.156	

Gage Reading	Load (tons)	Design Load	Date	Read Time	1	2	3	Displacement (in.)	Displacement (in.)	Reading (in.)	Displacement (in.)	Remarks
2450	105	70	3/15/2016	5	1.537	1.315	1.610	1.487	0.269	2.531	0.156	
2450	105	70	3/15/2016	10	1.536	1.314	1.608	1.486	0.270	2.531	0.156	
2450	105	70	3/15/2016	20	1.536	1.313	1.607	1.485	0.271	2.531	0.156	
3600	150	100	3/15/2016	7:10 PM	1.472	1.235	1.524	1.410	0.346	2.625	0.250	
3600	150	100	3/15/2016	1	1.472	1.235	1.524	1.410	0.346	2.625	0.250	
3600	150	100	3/15/2016	2	1.472	1.235	1.524	1.410	0.346	2.625	0.250	
3600	150	100	3/15/2016	5	1.472	1.235	1.524	1.410	0.346	2.625	0.250	
3600	150	100	3/15/2016	10	1.472	1.235	1.532	1.413	0.343	2.625	0.250	
3600	150	100	3/15/2016	20	1.471	1.232	1.521	1.408	0.348	2.625	0.250	
4218	187.5	125	3/15/2016	7:34 PM	1.436	1.194	1.48	1.370	0.386	2.656	0.281	
4218	187.5	125	3/15/2016	1	1.436	1.194	1.479	1.370	0.386	2.656	0.281	
4218	187.5	125	3/15/2016	2	1.435	1.194	1.479	1.369	0.387	2.656	0.281	
4218	187.5	125	3/15/2016	5	1.435	1.193	1.479	1.369	0.387	2.656	0.281	
4218	187.5	125	3/15/2016	10	1.435	1	1.478	1.368	0.388	2.656	0.281	
4218	187.5	125	3/15/2016	20	1.434	1.191	1.477	1.367	0.389	2.656	0.281	
5437	225	150	3/15/2016	8:03 PM	1.355	1.107	1.385	1.282	0.474	2.750	0.375	
5437	225	150	3/15/2016	1	1.354	1.106	1.385	1.282	0.474	2.750	0.375	
5437	225	150	3/15/2016	2	1.353	1.105	1.384	1.281	0.475	2.750	0.375	
5437	225	150	3/15/2016	5	1.352	1.104	1.383	1.280	0.476	2.750	0.375	
5437	225	150	3/15/2016	10	1.351	1.103	1.382	1.279	0.477	2.750	0.375	
5437	225	150	3/15/2016	20	0.1349	1.101	1.379	0.872	0.884	2.750	0.375	
5437	225	150	3/15/2016	40	1.348	1.1	1.378	1.275	0.481	2.750	0.375	
5437	225	150	3/15/2016	60	1.347	1.099	1.377	1.274	0.482	2.750	0.375	
5437	225	150	3/15/2016	70	1.346	1.099	1.377	1.274	0.482	2.750	0.375	
5906	262.5	175	3/15/2016	9:17 PM	1.309	1.057	1.334	1.233	0.523	2.781	0.406	
5906	262.5	175	3/15/2016	1	1.307	1.057	1.333	1.232	0.524	2.781	0.406	
5906	262.5	175	3/15/2016	2	1.306	1.056	1.333	1.232	0.524	2.781	0.406	
5906	262.5	175	3/15/2016	5	1.305	1.055	1.332	1.231	0.525	2.781	0.406	
5906	262.5	175	3/15/2016	10	1.304	1.054	1.331	1.230	0.526	2.781	0.406	
5906	262.5	175	3/15/2016	20	1.303	1.053	1.329	1.228	0.528	2.781	0.406	
5906	262.5	175	3/15/2016	40	1.301	1.051	1.327	1.226	0.530	2.781	0.406	
5906	262.5	175	3/15/2016	60	1.300	1.050	1.326	1.225	0.531	2.781	0.406	
7075	300	200	3/15/2016	10:28 PM	1.185	0.927	1.20	1.104	0.652	2.906	0.531	
7075	300	200	3/15/2016	1	1.184	0.926	1.199	1.103	0.653	2.906	0.531	
7075	300	200	3/15/2016	2	1.182	0.925	1.198	1.102	0.654	2.906	0.531	
7075	300	200	3/15/2016	5	1.181	0.924	1.198	1.101	0.655	2.906	0.531	
7075	300	200	3/15/2016	10	1.179	0.922	1.197	1.099	0.657	2.906	0.531	
7075	300	200	3/15/2016	10:41 PM	1.168	0.909	1.195	1.091	0.665	2.906	0.531	Adjusted Pressure 6900 psi-7075 psi
7075	300	200	3/15/2016	10	1.165	0.906	1.182	1.084	0.672	2.906	0.531	
7075	300	200	3/15/2016	20	1.163	0.904	1.179	1.082	0.674	2.906	0.531	
7075	300	200	3/15/2016	40	1.161	0.902	1.177	1.080	0.676	2.906	0.531	
7075	300	200	3/15/2016	60	1.16	0.901	1.175	1.079	0.677	2.906	0.531	
7075	300	200	3/16/2016	4:00 AM	1.144	0.885	1.174	1.068	0.688	2.906	0.531	
7075	300	200	3/16/2016	4:30 AM	1.141	0.882	1.157	1.060	0.696	2.906	0.531	
7075	300	200	3/16/2016	5:00 AM	1.14	0.880	1.155	1.058	0.698	2.906	0.531	
7075	300	200	3/16/2016	5:30 AM	1.139	0.880	1.154	1.058	0.698	2.906	0.531	
7075	300	200	3/16/2016	6:00AM	1.138	0.879	1.153	1.057	0.699	2.906	0.531	
7075	300	200	3/16/2016	6:30 AM	1.138	0.879	1.152	1.056	0.700	2.906	0.531	
7075	300	200	3/16/2016	7:00 AM	1.138	0.878	1.152	1.056	0.700	2.906	0.531	
7075	300	200	3/16/2016	8:00 AM	1.132	0.873	1.151	1.052	0.704	2.906	0.531	Adjusted Pressure 6900 psi-7075 psi
7075	300	200	3/16/2016	9:00 AM	1.131	0.872	1.146	1.050	0.706	2.906	0.531	
7075	300	200	3/16/2016	10:00 AM	1.131	0.872	1.145	1.049	0.707	2.906	0.531	
7075	300	200	3/16/2016	11:00 AM	1.131	0.872	1.145	1.049	0.707	2.906	0.531	
7075	300	200	3/16/2016	12:00 PM	1.131	0.872	1.145	1.049	0.707	2.906	0.531	
7075	300	200	3/16/2016	12:30 PM	1.125	0.866	1.145	1.045	0.711	2.906	0.531	Adjusted Pressure 6900 psi-7075 psi
7075	300	200	3/16/2016	1:00 PM	1.125	0.866	1.139	1.043	0.713	2.906	0.531	
7075	300	200	3/16/2016	2:00PM	1.125	0.866	1.138	1.043	0.713	2.969	0.594	
7075	300	200	3/16/2016	3:00 PM	1.125	0.866	1.138	1.043	0.713	2.969	0.594	
7075	300	200	3/16/2016	4:00 PM	1.124	0.864	1.137	1.042	0.714	2.969	0.594	
7075	300	200	3/16/2016	5:00 PM	1.123	0.863	1.135	1.040	0.716	2.969	0.594	
7075	300	200	3/16/2016	6:00 PM	1.12	0.861	1.133	1.038	0.718	2.969	0.594	
7075	300	200	3/16/2016	7:00 PM	1.119	0.86	1.132	1.037	0.719	2.969	0.594	
7075	300	200	3/16/2016	8:00 PM	1.117	0.858	1.130	1.035	0.721	2.969	0.594	
7075	300	200	3/16/2016	8:30 PM	1.117	0.857	1.130	1.035	0.721	2.969	0.594	
7075	300	200	3/16/2016	9:00 PM	1.116	0.857	1.129	1.034	0.722	2.969	0.594	
7075	300	200	3/17/2016	7:00AM	1.111	0.850	1.122	1.028	0.728	3.000	0.625	
7075	300	200	3/17/2016	7:20 AM	1.109	0.849	1.122	1.027	0.729	3.000	0.625	Adjusted Pressure 6700 psi-7075 psi
7075	300	200	3/17/2016	7:30 AM	1.109	0.849	1.122	1.027	0.729	3.000	0.625	

Gage Reading	Load (tons)	Design Load	Date	Read Time	1	2	3	Displacement (in.)	Displacement (in.)	Reading (in.)	Displacement (in.)	Remarks
7075	300	200	3/17/2016	8:00 AM	1.109	0.849	1.122	1.027	0.729	3.000	0.625	
5437	225	150	3/17/2016	8:30 AM	1.153	0.889	1.159	1.067	0.689	2.953	0.578	Unloading
5437	225	150	3/17/2016	1	1.153	0.889	1.159	1.067	0.689	2.953	0.578	
5437	225	150	3/17/2016	2	1.154	0.889	1.159	1.067	0.689	2.953	0.578	
5437	225	150	3/17/2016	5	1.154	0.889	1.159	1.067	0.689	2.953	0.578	
5437	225	150	3/17/2016	10	1.154	0.889	1.159	1.067	0.689	2.953	0.578	
5437	225	150	3/17/2016	20	1.155	0.890	1.160	1.068	0.688	2.953	0.578	
5437	225	150	3/17/2016	40	1.155	0.890	1.160	1.068	0.688	2.953	0.578	
5437	225	150	3/17/2016	60	1.155	0.890	1.160	1.068	0.688	2.953	0.578	
3600	150	100	3/17/2016	9:37 AM	1.246	0.979	1.250	1.158	0.598	2.875	0.500	
3600	150	100	3/17/2016	1	1.246	0.979	1.250	1.158	0.598	2.875	0.500	
3600	150	100	3/17/2016	2	1.247	0.979	1.250	1.159	0.597	2.875	0.500	
3600	150	100	3/17/2016	5	1.248	0.98	1.250	1.159	0.597	2.875	0.500	
3600	150	100	3/17/2016	10	1.248	0.98	1.251	1.160	0.596	2.875	0.500	
3600	150	100	3/17/2016	20	1.249	0.981	1.251	1.160	0.596	2.875	0.500	
3600	150	100	3/17/2016	40	1.249	0.982	1.252	1.161	0.595	2.875	0.500	
3600	150	100	3/17/2016	60	1.249	0.982	1.252	1.161	0.595	2.875	0.500	
1750	75	50	3/17/2016	10:41 AM	1.479	1.106	1.478	1.354	0.402	2.734	0.359	
1750	75	50	3/17/2016	1	1.479	1.106	1.478	1.354	0.402	2.734	0.359	
1750	75	50	3/17/2016	2	1.48	1.107	1.478	1.355	0.401	2.734	0.359	
1750	75	50	3/17/2016	5	1.48	1.108	1.479	1.356	0.400	2.734	0.359	
1750	75	50	3/17/2016	10	1.481	1.109	1.480	1.357	0.399	2.734	0.359	
1750	75	50	3/17/2016	20	1.482	1.109	1.481	1.357	0.399	2.734	0.359	
1750	75	50	3/17/2016	40	1.483	1.110	1.482	1.358	0.398	2.734	0.359	
1750	75	50	3/17/2016	60	1.484	1.111	1.483	1.359	0.397	2.734	0.359	
0	0	0	3/17/2016	11:51 AM	1.584	1.289	1.598	1.490	0.266	2.547	0.172	
0	0	0	3/17/2016	1	1.585	1.289	1.598	1.491	0.265	2.547	0.172	
0	0	0	3/17/2016	2	1.586	1.289	1.600	1.492	0.264	2.547	0.172	
0	0	0	3/17/2016	5	1.588	1.290	1.602	1.493	0.263	2.547	0.172	
0	0	0	3/17/2016	10	1.589	1.291	1.603	1.494	0.262	2.547	0.172	
0	0	0	3/17/2016	20	1.592	1.291	1.610	1.498	0.258	2.547	0.172	
0	0	0	3/17/2016	40	1.595	1.291	1.611	1.499	0.257	2.547	0.172	
0	0	0	3/17/2016	60	1.598	1.291	1.611	1.500	0.256	2.547	0.172	Load Cycle 4 Complete
0	0	0	3/18/2016	12:35 PM	1.622	1.300	1.611	1.511	0.245	2.547	0.172	24 Hour Rebound Reading

Test Pile Number 5

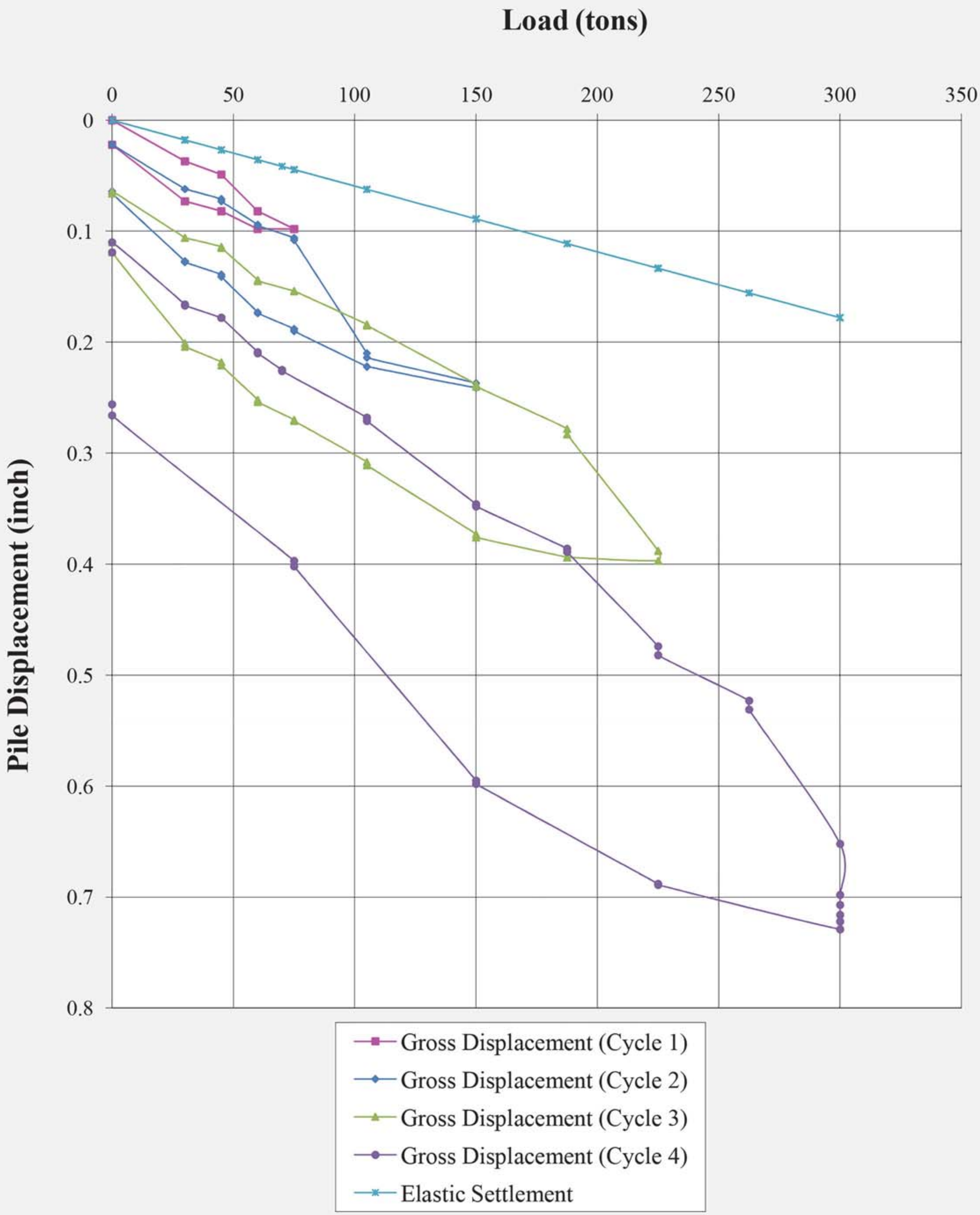
Length =	40	ft	Modulus (Steel) =	29000000	psi
Area(Steel) =	5.83	sq. in.	Modulus (Steel) =	2900000	
Area (Conc.) =	195.17	sq. in.			

PLOT DATA

Pile Load (tons)	Date	Read Time (min)	Gross Displacement (in.)	Pile Shortening (in.)	Elastic Settlement (in.)
0	3/14/2016	10:15 AM	0	0.000	0.000
30	3/14/2016	10:24 AM	0.037	0.018	0.019
45	3/14/2016	10:44 AM	0.049	0.027	0.022
60	3/14/2016	11:06 AM	0.082	0.036	0.046
75	3/14/2016	11:17 AM	0.098	0.044	0.054
60	3/14/2016	11:46 AM	0.098	0.036	0.062
45	3/14/2016	12:09 PM	0.082	0.027	0.055
30	3/14/2015	12:35 PM	0.073	0.018	0.055
0	3/14/2016	12:56 PM	0.022	0.000	0.022
30	3/14/2016	1:18 PM	0.062	0.018	0.044
30	3/14/2016	60	0.062	0.018	0.044
45	3/14/2016	2:24 PM	0.071	0.027	0.044
45	3/14/2016	60	0.073	0.027	0.046
60	3/14/2016	3:25 PM	0.094	0.036	0.058
60	3/14/2016	60	0.095	0.036	0.059
75	3/14/2016	4:32 PM	0.106	0.044	0.062
75	3/14/2016	60	0.108	0.044	0.064
105	3/14/2016	5:34 PM	0.210	0.062	0.148
105	3/14/2016	60	0.214	0.062	0.152
150	3/14/2016	6:35 PM	0.237	0.089	0.148
150	3/14/2016	80	0.241	0.089	0.152
105	3/14/2016	8:00 PM	0.222	0.062	0.160
105	3/14/2016	20	0.222	0.062	0.160
75	3/14/2016	8:20 PM	0.190	0.044	0.146
75	3/14/2016	20	0.188	0.044	0.144
60	3/14/2016	8:40 PM	0.174	0.036	0.138
60	3/14/2016	20	0.173	0.036	0.137
45	3/14/2016	9:00 PM	0.141	0.027	0.114
45	3/14/2016	20	0.139	0.027	0.112
30	3/14/2016	9:20 PM	0.128	0.018	0.110
30	3/14/2016	20	0.127	0.018	0.109
0	3/14/2016	9:40 PM	0.066	0.000	0.066

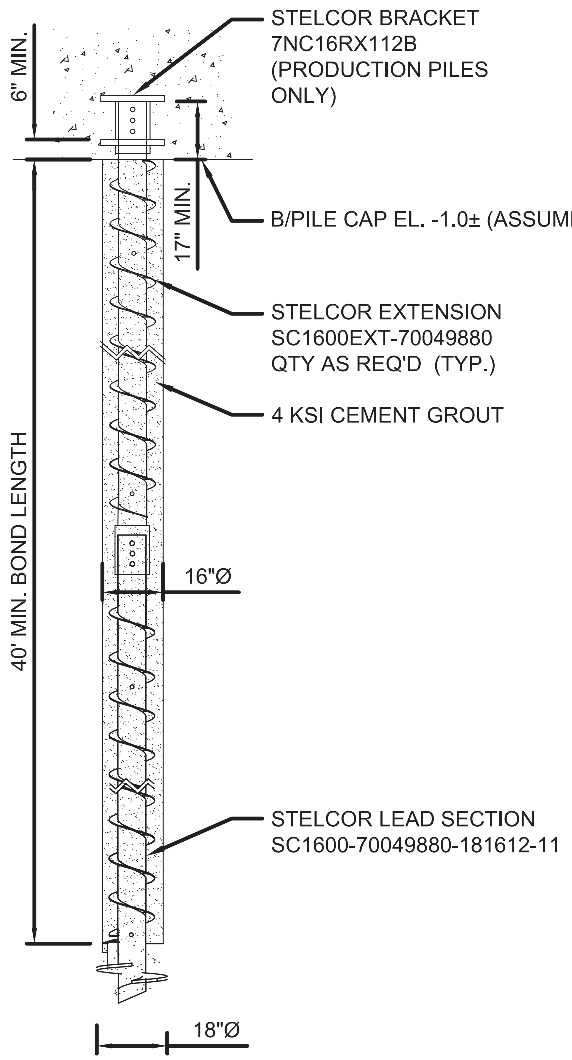
Pile Load (tons)	Date	Read Time (min)	Gross Displacement (in.)	Pile Shortening (in.)	Elastic Settlement (in.)
0	3/14/2016	20	0.064	0.000	0.064
30	3/14/2016	10:00 PM	0.106	0.018	0.088
30	3/14/2016	60	0.106	0.018	0.088
45	3/14/2016	11:00 PM	0.114	0.027	0.087
45	3/14/2016	60	0.115	0.027	0.088
60	3/15/2016	12:00 AM	0.144	0.036	0.108
60	3/15/2016	60	0.145	0.036	0.109
75	3/15/2016	1:00 AM	0.154	0.044	0.110
75	3/15/2016	60	0.154	0.044	0.110
105	3/15/2016	2:00 AM	0.184	0.062	0.122
105	3/15/2016	60	0.185	0.062	0.123
150	3/15/2016	3:00 AM	0.238	0.089	0.149
150	3/15/2016	60	0.240	0.089	0.151
187.5	3/15/2016	4:00 AM	0.278	0.111	0.167
187.5	3/15/2016	120	0.283	0.111	0.172
225	3/15/2016	6:00 AM	0.388	0.133	0.255
225	3/15/2016	9:00 AM	0.397	0.133	0.264
187.5	3/15/2016	9:12 AM	0.394	0.111	0.283
187.5	3/15/2016	20	0.394	0.111	0.283
150	3/15/2016	9:34 AM	0.376	0.089	0.287
150	3/15/2016	20	0.373	0.089	0.284
105	3/15/2016	9:57 AM	0.311	0.062	0.249
105	3/15/2016	20	0.308	0.062	0.246
75	3/15/2016	10:19 AM	0.271	0.044	0.227
75	3/15/2016	20	0.270	0.044	0.226
60	3/15/2016	10:40 AM	0.254	0.036	0.218
60	3/15/2016	20	0.252	0.036	0.216
45	3/15/2016	11:25 AM	0.221	0.027	0.194
45	3/15/2016	20	0.218	0.027	0.191
30	3/15/2016	11:46 AM	0.204	0.018	0.186
30	3/15/2016	20	0.201	0.018	0.183
0	3/15/2016	12:07 PM	0.119	0.000	0.119
0	3/15/2016	5:05 PM	0.110	0.000	0.110
30	3/15/2016	5:10 PM	0.166	0.018	0.148
30	3/15/2016	20	0.167	0.018	0.149
45	3/15/2016	5:32 PM	0.178	0.027	0.151
45	3/15/2016	20	0.178	0.027	0.151
60	3/15/2016	5:53 PM	0.209	0.036	0.173

Pile Load (tons)	Date	Read Time (min)	Gross Displacement (in.)	Pile Shortening (in.)	Elastic Settlement (in.)
60	3/15/2016	20	0.210	0.036	0.174
70	3/15/2016	6:14 PM	0.225	0.042	0.183
70	3/15/2016	20	0.226	0.042	0.184
105	3/15/2016	6:35 PM	0.268	0.062	0.206
105	3/15/2016	20	0.271	0.062	0.209
150	3/15/2016	7:10 PM	0.346	0.089	0.257
150	3/15/2016	20	0.348	0.089	0.259
187.5	3/15/2016	7:34 PM	0.386	0.111	0.275
187.5	3/15/2016	20	0.389	0.111	0.278
225	3/15/2016	8:03 PM	0.474	0.133	0.341
225	3/15/2016	70	0.482	0.133	0.349
262.5	3/15/2016	9:17 PM	0.523	0.156	0.367
262.5	3/15/2016	60	0.531	0.156	0.375
300	3/15/2016	10:28 PM	0.652	0.178	0.474
300	3/15/2016	5:00 AM	0.698	0.178	0.520
300	3/15/2016	10:00 AM	0.707	0.178	0.529
300	3/15/2016	5:00 PM	0.716	0.178	0.538
300	3/15/2016	9:00 PM	0.722	0.178	0.544
300	3/16/2016	8:00 AM	0.729	0.178	0.551
225	3/17/2016	8:30 AM	0.689	0.133	0.556
225	3/17/2016	60	0.688	0.133	0.555
150	3/17/2016	9:37 AM	0.598	0.089	0.509
150	3/17/2016	60	0.595	0.089	0.506
75	3/17/2016	10:41 AM	0.402	0.044	0.358
75	3/17/2016	60	0.397	0.044	0.353
0	3/17/2016	11:51 AM	0.266	0.000	0.266
0	3/18/2016	12:35 PM	0.256	0.000	0.256



Axial Compression Load Test - Settlement Curve: Pile 5 (150 tons)
211 McGuinness Boulevard
Brooklyn, NYC, NY

Geotechnical Engineering Services, P.C.
Elmsford, New York



PRODUCTION AND TEST MICROPILE

MICROPILE NOTES:

1. MATERIALS:
   1.1. MICROPILE SHALL BE STELCOR AS MANUFACTURED BY IDEAL CONSTRUCTION GROUP INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS..
   1.2. CEMENT GROUT SHALL BE PORTLAND CEMENT CONFORMING TO ASTM C150 TYPE I/II MIXED WITH POTABLE WATER. WATER CEMENT RATIO SHALL NOT EXCEED 0.45. THE MINIMUM COMPRESSIVE STRENGTH SHALL BE 4,000 PSI.
2. DESIGN LOADS:
   2.1. COMPRESSION: 300-KIPS (150-TON)
   2.2. TENSION: 150-KIPS (75-TON)
   2.3. LATERAL: 2-KIPS (1-TON)
3. THE BOND LENGTH OF THE PRODUCTION MICROPILES SHALL BE CONFIRMED BY THE RESULTS OF THE COMPRESSION AND/OR TENSION TESTS.

GS&S
GEOTECHNICAL SYSTEMS AND STRUCTURES PE, PLLC
3624 Dixon Rd | Mannsville, NY 13661
ph: 315 385-7577

MICROPILE DETAILS AND NOTES

211 MCGUINNESS
BROOKLYN, NY

PREPARED FOR:
THE IDEAL GROUP

1/13/2016 GS-1

STATE OF NEW YORK
JASON GEORGE SPERRY
LICENSED PROFESSIONAL ENGINEER
No. 083565

211 McGuinness

Brooklyn, NY

150 Ton Micropile Design

Project Name: 211 McGuinness Blvd, Brooklyn, NY	URS Project Number: 60400268
Submittal Description: 150 Ton Micropile Design	Submittal No. NA

✓	NO EXCEPTIONS
	EXCEPTIONS TAKEN AS NOTED
	REVISE AND RESUBMIT
	REJECTED (SEE COMMENTS)

Review is only for conformance with the design intent of the project and compliance with the information given in the Contract Documents. Contractor is responsible for performance of the work in accordance with the requirements of the Contract Documents and for all fabrication processes, means, methods, techniques, sequences and procedures of construction, coordination with the work of other contractractors and subcontractors, and verifying all dimensions and quantities. Action does not authorize changes to contract requirements unless otherwise stated in a separate letter or change order.

URS

Reviewed by: Mahdi Soudkhah	Date: 01/19/2016

For

The Ideal Group

East Rochester, New York

Prepared By:

GS&S

Geotechnical Systems and Structures PE, PLLC
Mannsville, New York

STATE OF NEW YORK · JASON GEORGE SPERRY · LICENSED PROFESSIONAL ENGINEER · No. 083565

January 13, 2016

211 McGuiness
Brooklyn, NY

Calc. By: ZSA

Micropile Design

Compression Design Load = 300K

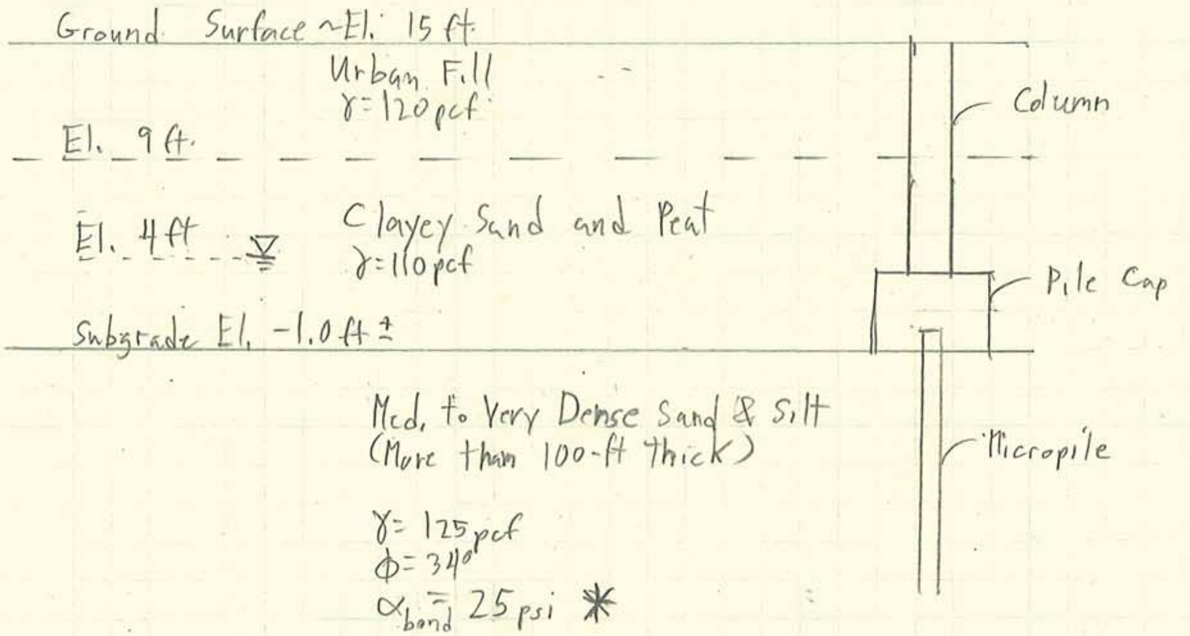
Tension Design Load = 150K

Lateral Design Load = 2K

Exts Grade El ~ 15ft

Subgrade El. ~ -1.0 at top of pile from drawing P-200.00 (7/14/16)
(Estimated Avg)

Generalized subsurface conditions based on borings B-1 through B-14 (URS 3/22/16).



Review of borings indicates Med. to Very Dense sand (N ~ 11 to > 50) for proposed bond length. Bond Value will be verified by testing.

References:

New York City Building Code 2008

AISC Steel Construction Manual, 13th Ed.

FHWA NHI-05-039 Micropile Design and Construction, (12-2005)

ACI 318 Building Code Requirements for Structural Concrete, 2008

TOPS 35502

01/13/2016

Calc . By: JGS
Chk'd By: ZSA

Stelcor Pile Design: **Production Pile**

Load and Material Strength:

Compressive Design Load:	P_C =	300	k
Tension Design Load:	P_T =	150	k
Grout Strength:	f_g =	4	ksi
Casing Yield Strength:	f_{yc} =	80	ksi

Pile Properties:

Stelcor Product:	**SC1600-70049880-181612-11**				
Casing O.D.:	d_c =	7.00	in		
Casing I.D.:	d_i =	6.00	in		
Wall Thickness:	t_w =	0.498	in		
Deformation Plate Diameter:	d_s =	16	in =	1.33	ft

Structural Capacity:

Area of Casing:	$A_c = (d_c^2 - d_i^2)\pi/4$ =	10.17	in^2	
Area of Inner Grout:	$A_{gi} = d_i^2\pi/4$ =		in^2	(neglected, conservative)
Area of Outer Grout:	$A_{go} = (d_s^2 - d_c^2)\pi/4$ =	162.58	in^2	

Compression:

Allow. Load:	$P_{all} = 0.33f_gA_g + 0.35f_y(A_c)$ =	499	k ≥	P_C =	300	k	**OK**

Tension:

Allowable Steel Stress:	$F_t = 0.35f_y$ =	28	ksi				
Allow. Load:	$P_{all} = F_tA_c$ =	285	k ≥	P_T =	150	k	**OK**

Calc . By: JGS
Chk'd By: ZSA

Stelcor Pile Design:

Geotechnical Capacity:

Ultimate Bond Strength:	α_{bond} =	25	psi =	3.60	ksf	
Bond Length:	L_b =	39.8	ft			
Factor of Safety: (Compression)	F.S. =	2.0				(w/compression test)
Factor of Safety: (Tension)	F.S. =	3.0				(w/o tension test)

Compression:

Allowable Load:	$P_{all} = [\alpha_{bond} L_b d_s \pi]/F.S.$ =	300	k	≥	P_C =	300	k	**OK**

Tension:

Allowable Load:	$P_{all} = [\alpha_{bond} L_b d_s \pi]/F.S.$ =	200	k	≥	P_T =	150	k	**OK**

Block Failure:

Cohesionless soil, not overlying weak layer, therefore block failure does not apply.

Group Effect:

Spacing, s ≥ 3d, therefore no group reduction factor. (NYCBC 1808.2.23.1.2)

Ref: NYCBC, "The City of New York Building Code", 2008

Calc . By: JGS
Chk'd By: ZSA

Stelcor Pile Design: **Test Pile Structural Capacity**

Load and Material Strength:

Compressive Design Load:	P_C =	600	k
Tensile Design Load:	P_T =	300	k
Grout Strength:	f_g =	4	ksi
Casing Yield Strength:	f_{yc} =	80	ksi

Pile Properties:

Stelcor Product:	**SC1600-70049880-181612-11**				
Casing O.D.:	d_c =	7.00	in		
Casing I.D.:	d_i =	6.00	in		
Wall Thickness:	t_w =	0.498	in		
Deformation Plate Diameter:	d_s =	16	in =	1.33	ft

Structural Capacity: (FHWA for Test Pile)

Area of Casing:	$A_c = (d_c^2 - d_i^2)\pi/4$ =	10.17	in^2	
Area of Inner Grout:	$A_{gi} = (d_i^2\pi/4)$ =		in^2	(neglected, conservative)
Area of Outer Grout:	$A_{go} = (ds^2 - d_c^2)\pi/4$ =	162.6	in^2	

Compression:

Allow. Load:	$P_{all} = 0.4f_gA_g + 0.47f_y(A_c)$ =	643	k ≥	P_C =	600	k	**OK**

(FHWA Eq. 5-1)

Tension:

Allow. Load:	$P_{all} = 0.55f_{ymin}(A_c)$ =	448	k ≥	P_T =	300	k	**OK**

(FHWA Eq. 5-2)

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Brooklyn, NY

Calc. By: ZSA

Micropile Design:

Lateral Capacity

Lateral Capacity of a single vertical pile

Flexural Capacity:

$F_b = 0.55 f_{yc} = 0.55(80ksi) = 44ksi$

$S = \frac{\pi(d_c^4 - d_i^4)}{32 d_c} = \frac{\pi((7.0in)^4 - (6.0in)^4)}{32(7.0in)} = 15.50 in^3$

$M_{all} = F_b S = \frac{(44ksi)(15.50in^3)}{12in/ft} = 56.8 k \cdot ft$

Model in AllPile, varying lateral load at pile top to determine lateral load that induces $M_{max} \approx M_{all} = 25.7 k \cdot ft$

Section Properties:

inner grout neglected (conservative)

$A_c = 10.21 in^2$ $A_g = A_{gi} + A_{go} = 28.27 in^2 + 162.58 in^2 = 190.85 in^2$

$E_s = 29000 ksi$ $E_g = w_c^{1.5} 33 \sqrt{f_c'} = \frac{(145pcf)^{1.5} 33 \sqrt{4{,}000 psi}}{1000 \#/K} = 3{,}644 ksi$

Total Section Area, $A_t = \frac{d_s^2 \pi}{4} = \frac{(16in)^2 \pi}{4} = 201.06 in^2$

Effective Net Area, $A' = A_c + \frac{E_g}{E_s} A_g = 10.21 in^2 + \frac{3{,}644ksi}{29{,}000ksi}(160.58 in^2) = 30.39 in^2$

Moment of Inertia: (set $I_{cr} = 0.35 I_g$ for cracked concrete)

Casing: $I_c = \frac{\pi(d_c^4 - d_i^4)}{64} = \frac{\pi((7.0in)^4 - (6.0in)^4)}{64} = 54.24 in^4$

neglected (conservative)

Grout: $I_g = \frac{\pi d_i^4}{64} + \frac{\pi(d_s^4 - d_c^4)}{64} = \frac{\pi}{64}((6.0in)^4 + (16in)^4 - (7.0in)^4) = 3{,}099.13 in^4$

Effective Moment of Inertia: $I' = I_c + \frac{E_g}{E_s} 0.35 I_g = 54.24 in^4 + \frac{(3{,}644ksi)}{29{,}000ksi}(0.35)(3{,}099.13 in^4)$

$I' = 190.54 in^4$ (cracked section)

Lateral Analysis: (Free head assumed (conservative))

A lateral load of 5.3K induces a moment of 56.4 k·ft ≈ M_{all}

∴ Lateral Load Capacity ≈ 53 K w/o compressive or tensile loads.

Deflection at 53K lateral load is 0.19in @ pile head

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Brooklyn, NY

Calc. By: ZA

Micropile Design

Combined Loading:

2-Kip Lateral Loading, $M_{max} = 1.4 k \cdot ft$ $\Delta_{max} = 0.004 in$

$$\frac{P_{max}}{P_{n_{11}}} + \left(\frac{8}{9}\right)\frac{M_{max}}{M_{n_{11}}} = \frac{300k}{499k} + \left(\frac{8}{9}\right)\frac{1.4k \cdot ft}{56.8k \cdot ft} = 0.62 \leq 1.0 \quad \underline{ok}$$

∴ the pile section is sufficient to resist a combined loading of 300-kip in compression and 2-kip lateral load.

Group Effects: SDC C NYCBC 1808.2.22.1.2

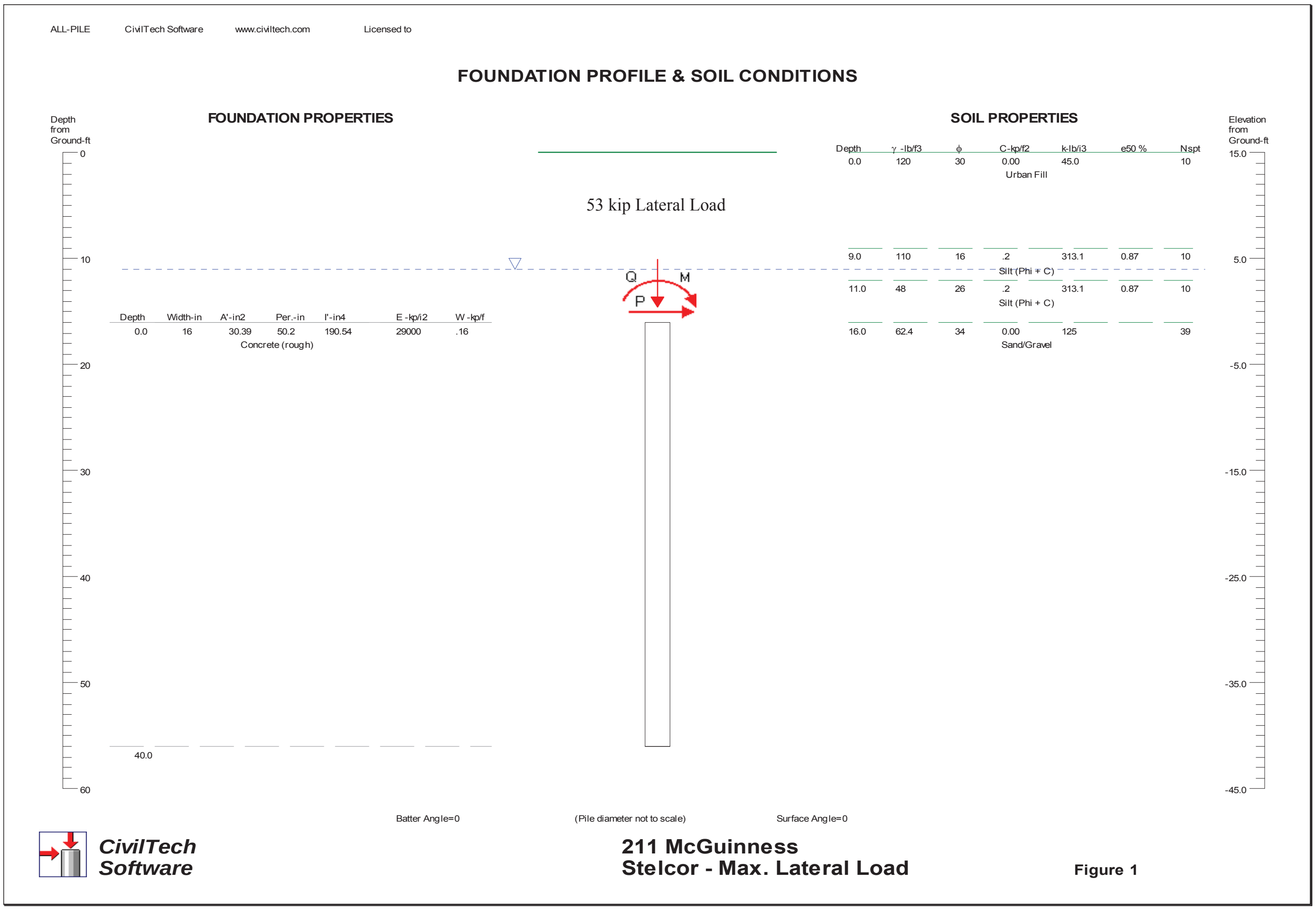
Pile spacing, $s = 4 ft = 3d$ ∴ $s \geq 3d$, no group effect for compression loads

$s = 3d < 8d$ ∴ group effect for lateral load

By inspection, 2-pile cap will control.

All pile: $\Delta_{max} = 0.006 in$, $M_{max} = 2.3 k \cdot ft$

Combined: $\frac{300k}{499k} + \left(\frac{8}{9}\right)\frac{2.3k \cdot ft}{56.8k \cdot ft} = 0.65 \leq 1.0$ ok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FOUNDATION PROFILE & SOIL CONDITIONS
Depth from Ground-ft
FOUNDATION PROPERTIES
SOIL PROPERTIES
Elevation from Ground-ft
53 kip Lateral Load
Depth Width-in A'-in2 Per.-in I'-in4 E-kp/i2 W-kp/f
0.0 16 30.39 50.2 190.54 29000 .16
Concrete (rough)
40.0
Depth γ-lb/f3 ϕ C-kp/f2 k-lb/i3 e50 % Nspt
0.0 120 30 0.00 45.0 10
Urban Fill
9.0 110 16 .2 313.1 0.87 10
Silt (Phi + C)
11.0 48 26 .2 313.1 0.87 10
Silt (Phi + C)
16.0 62.4 34 0.00 125 39
Sand/Gravel
Q M P
0 10 20 30 40 50 60
15.0 5.0 -5.0 -15.0 -25.0 -35.0 -45.0
Batter Angle=0
(Pile diameter not to scale)
Surface Angle=0
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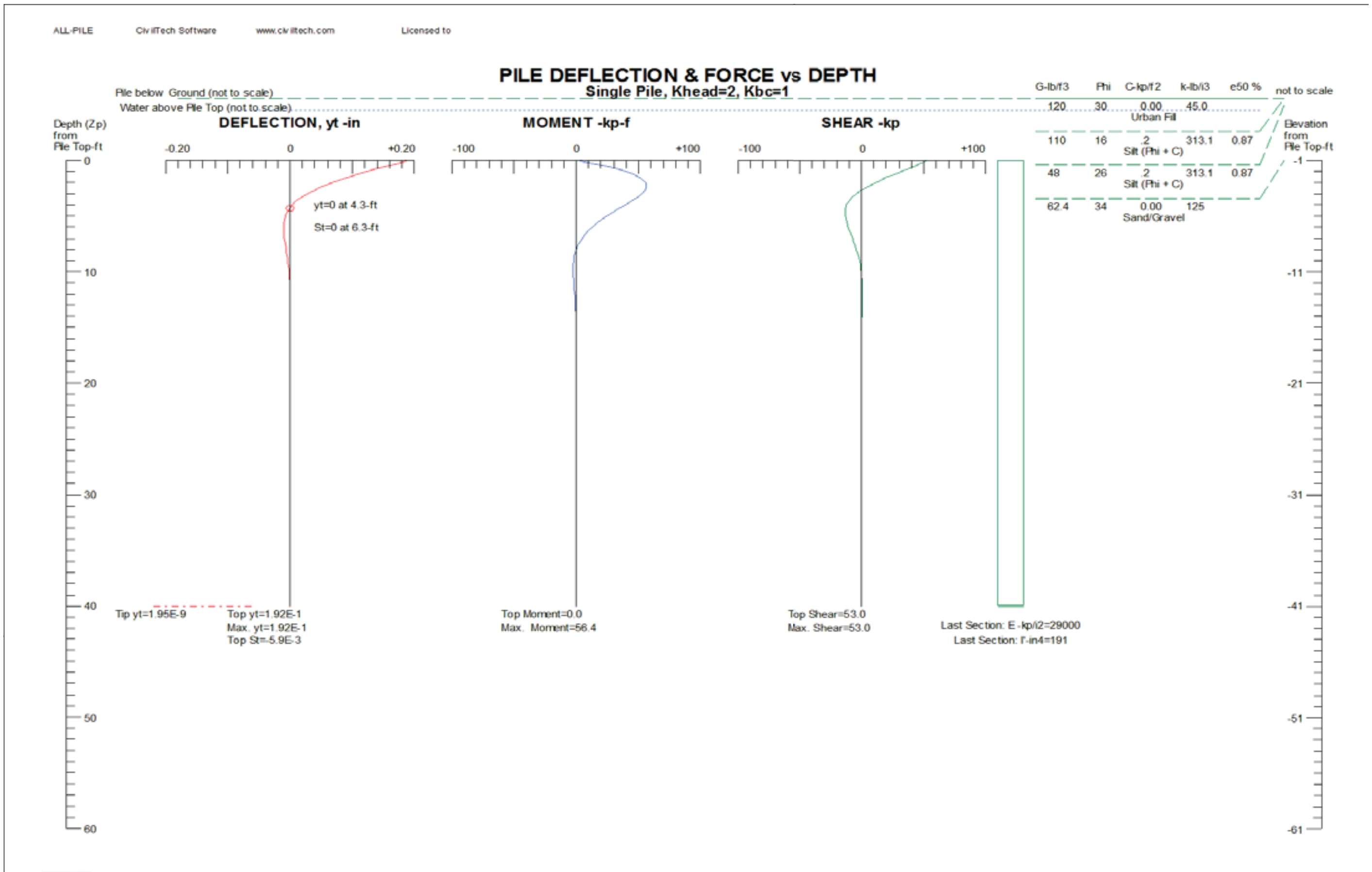
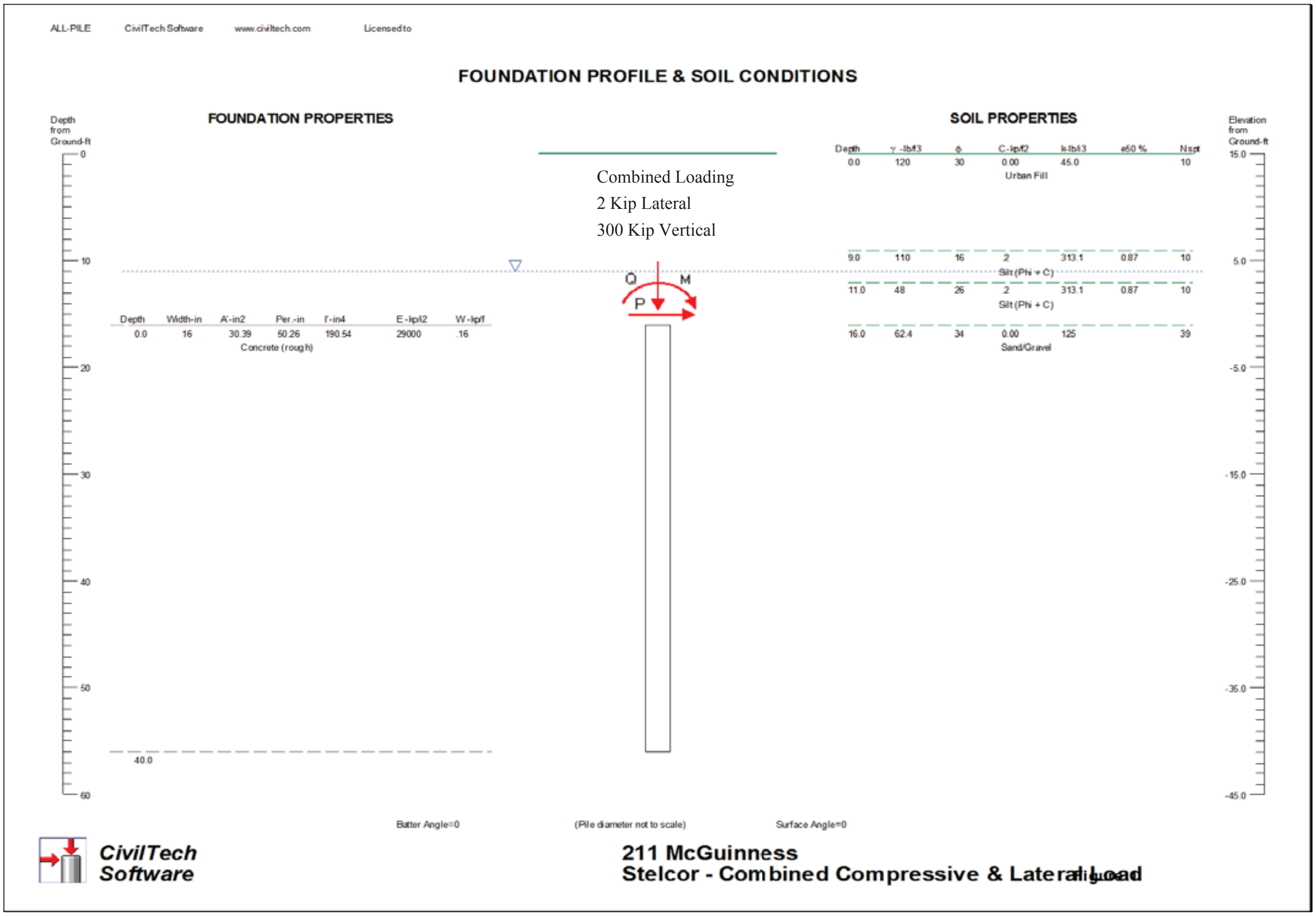
Stelcor - Max. Lateral Load
Figure 1



211 McGuinness
Stelcor - Max. Lateral Load

Figure 2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FOUNDATION PROFILE & SOIL CONDITIONS
FOUNDATION PROPERTIES
Depth from Ground-ft
0
10
20
30
40
50
60
Depth Width-in A'-in2 Per.-in I'-in4 E-kp/i2 W-kp/f
0.0 16 30.39 50.26 190.54 29000 .16
Concrete (rough)
40.0
Combined Loading
2 Kip Lateral
300 Kip Vertical
Q
M
P
SOIL PROPERTIES
Depth γ-lb/f3 ϕ C-kp/f2 k-lb/i3 e50 % Nspt
0.0 120 30 0.00 45.0 10
Urban Fill
9.0 110 16 .2 313.1 0.87 10
Silt (Phi + C)
11.0 48 26 .2 313.1 0.87 10
Silt (Phi + C)
16.0 62.4 34 0.00 125 39
Sand/Gravel
Elevation from Ground-ft
15.0
5.0
-5.0
-15.0
-25.0
-35.0
-45.0
Batter Angle=0
(Pile diameter not to scale)
Surface Angle=0
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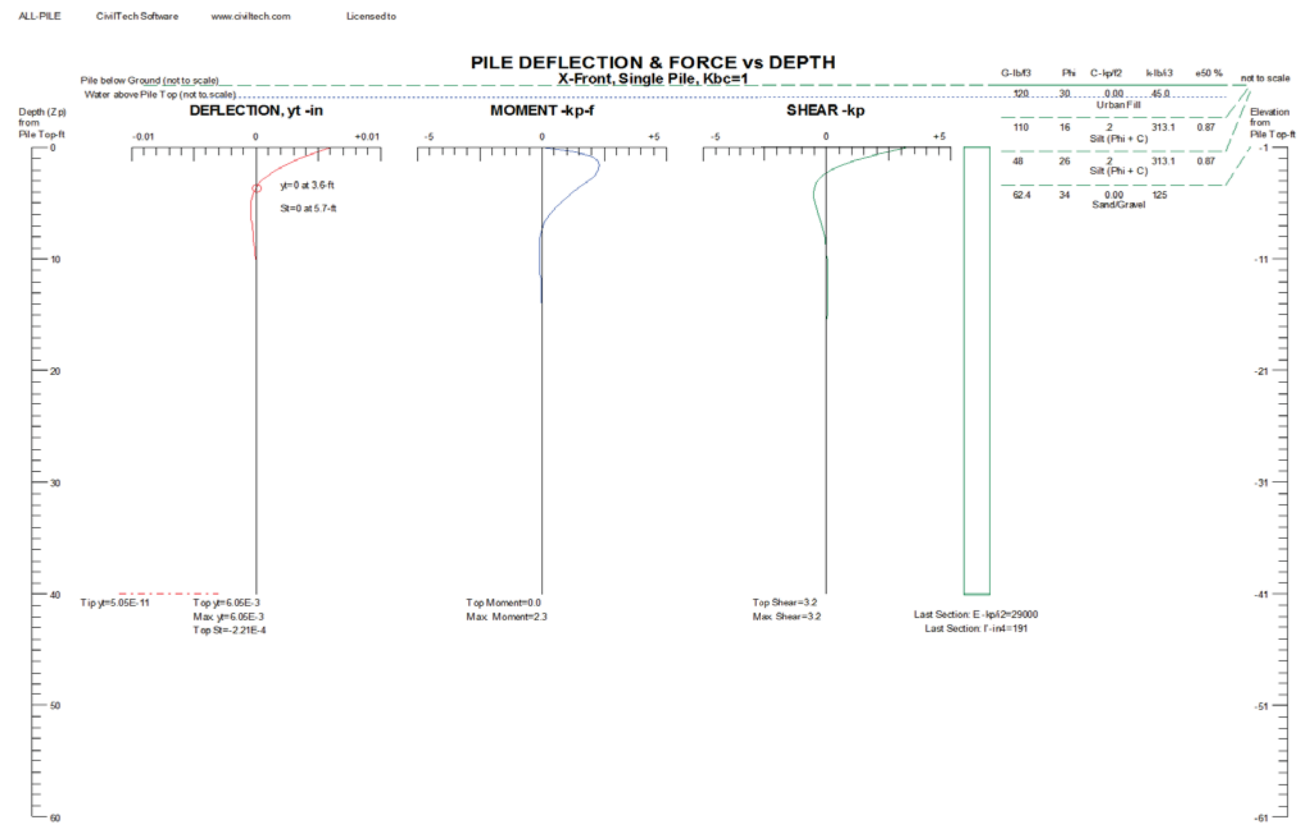
Stelcor - Combined Compressive & Lateral Load



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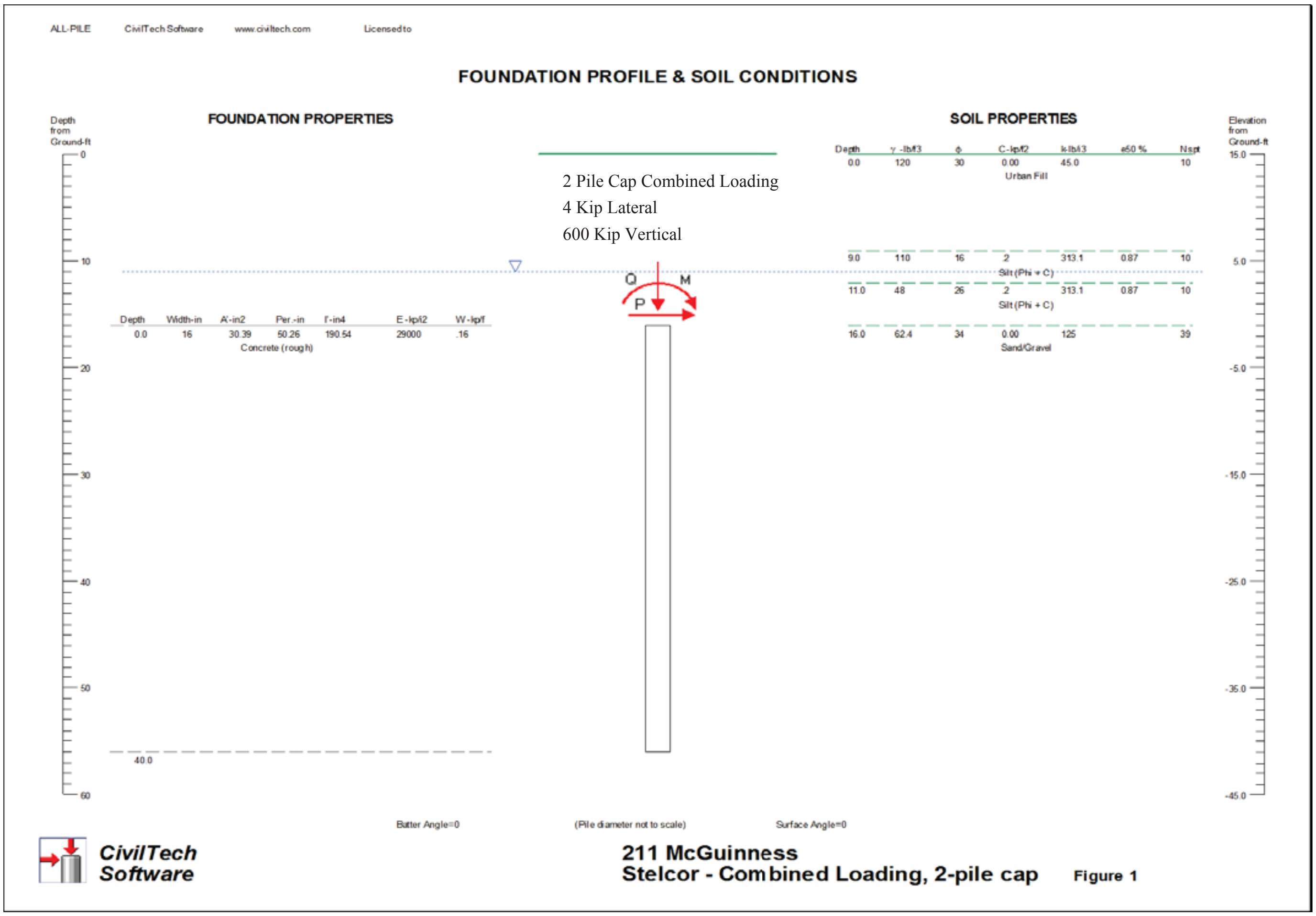
Stelcor - Combined Loading, 2-pile cap **Figure 2**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FOUNDATION PROFILE & SOIL CONDITIONS
FOUNDATION PROPERTIES
SOIL PROPERTIES
Depth from Ground-ft
Elevation from Ground-ft
2 Pile Cap Combined Loading
4 Kip Lateral
600 Kip Vertical
Depth Width-in A'-in2 Per.-in I'-in4 E-kp/i2 W-kp/f
0.0 16 30.39 50.26 190.54 29000 .16
Concrete (rough)
40.0
Depth γ-lb/f3 φ C-kp/f2 k-lb/i3 e50 % Nspt
0.0 120 30 0.00 45.0 10
Urban Fill
9.0 110 16 .2 313.1 0.87 10
Silt (Phi + C)
11.0 48 26 .2 313.1 0.87 10
Silt (Phi + C)
16.0 62.4 34 0.00 125 39
Sand/Gravel
Q M P
Batter Angle=0
(Pile diameter not to scale)
Surface Angle=0
CivilTech Software
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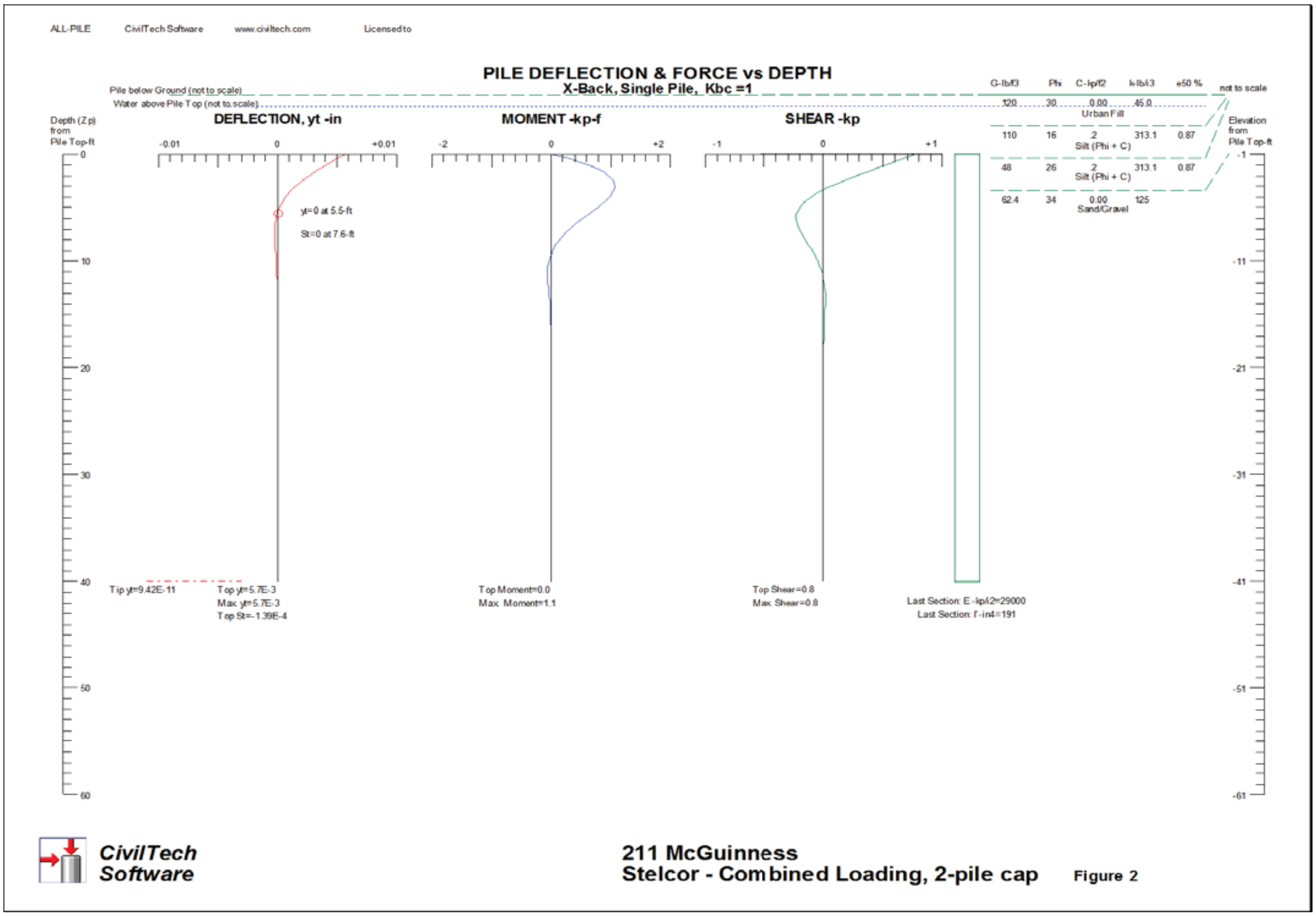
Stelcor - Combined Loading, 2-pile cap
Figure 1



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PILE DEFLECTION & FORCE vs DEPTH
X-Back, Single Pile, Kbc =1
Pile below Ground (not to scale)
Water above Pile Top (not to scale)
Depth (Zp) from Pile Top-ft
DEFLECTION, yt -in
MOMENT -kp-f
SHEAR -kp
-0.01
0
+0.01
-2
+2
-1
+1
yt=0 at 5.5-ft
St=0 at 7.6-ft
G-lb/f3
Phi
C-kp/f2
k-lb/i3
e50 %
not to scale
120 30 0.00 45.0
Urban Fill
110 16 2 313.1 0.87
Silt (Phi + C)
48 26 2 313.1 0.87
Silt (Phi + C)
62.4 34 0.00 125
Sand/Gravel
Elevation from Pile Top-ft
10
20
30
40
50
60
-1
-11
-21
-31
-41
-51
-61
Tip yt=9.42E-11
Top yt=5.7E-3
Max yt=5.7E-3
Top St=-1.39E-4
Top Moment=0.0
Max Moment=1.1
Top Shear=0.8
Max Shear=0.8
Last Section: E-kp/i2=29000
Last Section: I-in4=191
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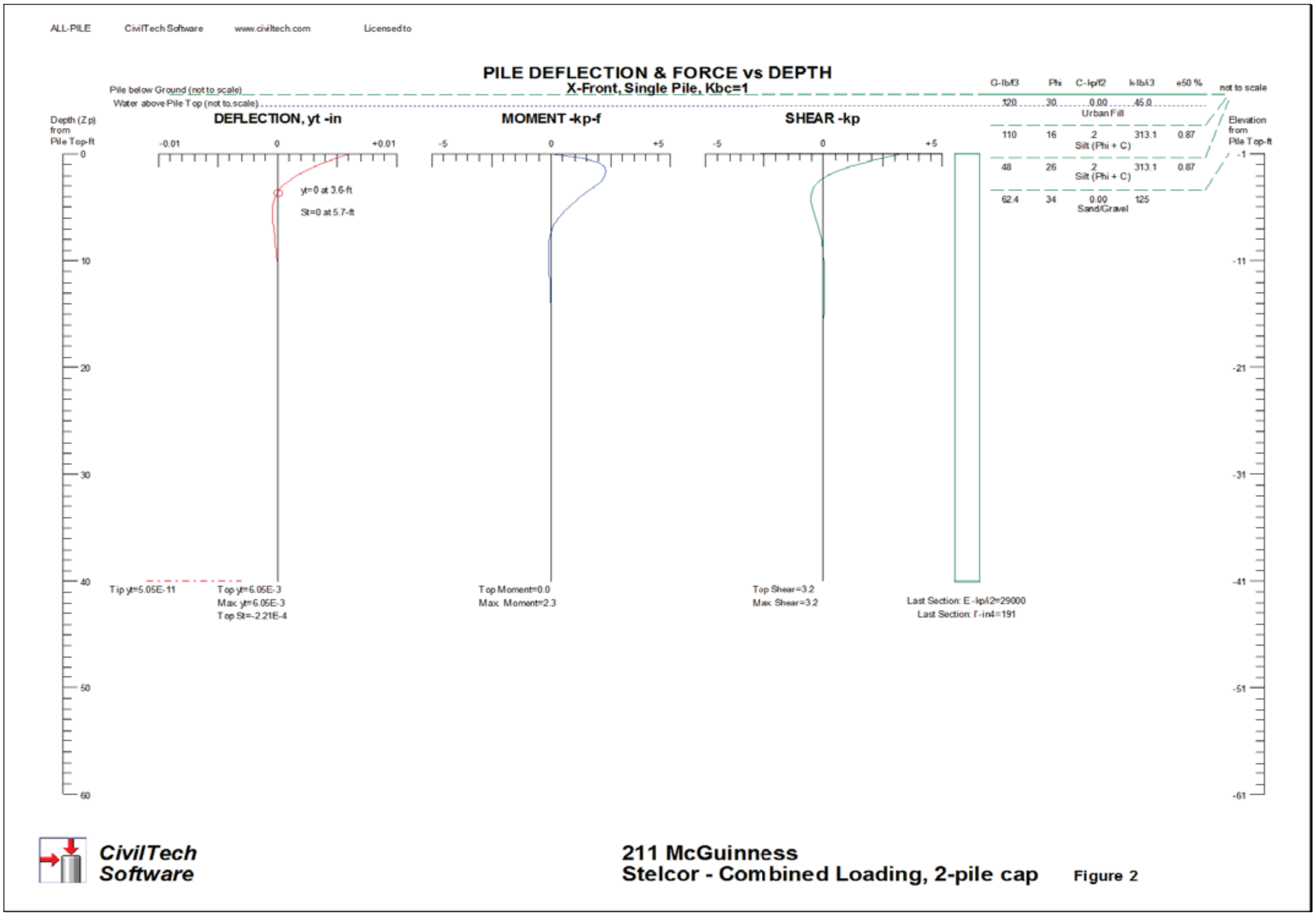
Stelcor - Combined Loading, 2-pile cap
Figure 2



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PILE DEFLECTION & FORCE vs DEPTH
X-Front, Single Pile, Kbc=1
Pile below Ground (not to scale)
Water above Pile Top (not to scale)
DEFLECTION, yt -in
MOMENT -kp-f
SHEAR -kp
Depth (Zp) from Pile Top-ft
yt=0 at 3.6-ft
St=0 at 5.7-ft
Tip yt=5.05E-11
Top yt=6.05E-3
Max yt=6.05E-3
Top St=-2.21E-4
Top Moment=0.0
Max Moment=2.3
Top Shear=3.2
Max Shear=3.2
Last Section: E-kp/i2=29000
Last Section: I-in4=191
G-lb/f3 Phi C-kp/f2 k-lb/i3 e50 %
not to scale
120 30 0.00 45.0
Urban Fill
110 16 2 313.1 0.87
Silt (Phi + C)
48 26 2 313.1 0.87
Silt (Phi + C)
62.4 34 0.00 125
Sand/Gravel
Elevation from Pile Top-ft
CivilTech Software
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Stelcor - Combined Loading, 2-pile cap
Figure 2

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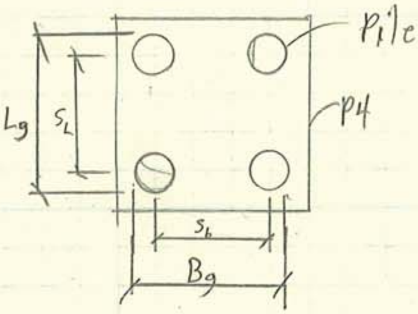
Brooklyn, NY

Calc. By: ZSK

Pile Group Uplift Capacity

Ref.: FHWA-NHI-05-039 (2005)

4-Pile Group: P4



$s = 4.0$ ft
$d_p = 1.33$

$\therefore B_g = L_g = S + d_p = 5.33$ ft

$D = 40$ ft

$A_{base} = B_g L_g = (5.33\ ft)^2 = 28$ S.F.

$A_{top} = (B_g + D/2)(L_g + D/2) = (5.33ft + 40ft/2)^2 = 642$ S.F.

Soil effective Wt: $\gamma' = \gamma_s - \gamma_w = 125pcf - 62.4pcf = 62.6pcf$

Uplift Group Capacity:

$Q_{ug} = [1/3(A_{base} + A_{top} + \sqrt{(A_{base} + A_{top})})D]\gamma'$

$Q_{ug} = [1/3(28S.F. + 642S.F. + \sqrt{(28S.F. + 642S.F.)})(40ft)]\frac{(62.6pcf)}{1000\#/k}$

$Q_{ug} = 580k$

Calculations are similar for P2, P4L, P6; see spreadsheet

3-Pile Group-Triangular - P3

Areas per CAD at 2-ft vertical intervals

$\therefore V_{n+1} = \frac{(A_n + A_{n+1})}{2} d_i, \quad d_i = 2ft$

(A_{avg})

First interval: $A_0 = 11$ S.F. $A_1 = 19$ S.F. $V_i = \frac{(11S.F. + 19S.F.)}{2} 2ft = 30$ C.F.

see Spreadsheet for remaining intervals, calculations similar for P5

Uplift Capacity, $Q_{ug} = \frac{V\gamma'}{1000\#/k}$

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Brooklyn, NY

Calc. By: ZSA
Chk'd By: JGS

Pile Group Uplift Capacity

Soil Unit Weight	125	pcf
Water Unit Weight	62.4	pcf
Effective Soil Unit Weight	62.6	pcf

Pile Cap:	**P2**	**P4**	**P4L**	**P6**
Qty of Piles:	2-pile	4-pile	4-pile	6-pile
Shape:	Strip	Square	Strip	Rectangle
Width, B_g (ft):	1.33	5.33	1.33	5.33
Length, L_g (ft):	5.33	5.33	13.33	9.33
Depth, D (ft):	40	40	40	40
Area of Base, A_{base} (SF):	7	28	18	50
Area of Top, A_{top} (SF):	540	642	711	743
Group Uplift Capacity, Q_{ug} (kips):	**476**	**580**	**631**	**685**
Per Pile	238	145	158	114
Group Vs Individual Pile (200k Uplift Capacity)	N/A	Controls	Controls	Controls

Pile Cap:		**P3**		
Qty of Piles:		3-pile		
Shape:		Triangle		
	Height (ft)	Area (SF)	Volume (CF)	
Base	0	11		
	2	19	30	2
	4	28	47	1
	6	38	66	1
	8	50	88	1
	10	64	114	1
	12	79	143	1
	14	96	175	1
	16	114	210	1
	18	134	248	1
	20	156	290	1
	22	179	335	1
	24	204	383	1
	26	230	434	1
	28	258	488	1
	30	287	545	1
	32	318	605	1
	34	350	668	1
	36	384	734	1
	38	420	804	1
Top	40	457	877	1

Total Volume, V:	7284	CF
Uplift Capacity, Q_{ug} (kips):	**456**	**kips**
Per Pile	152	kips
Group Vs Pile (200k Uplift Capacit	**Controls**	

Pile Cap:		**P5**	
Qty of Piles:		5-pile	
Shape:		Trapezoid	
	Height (ft)	Area (SF)	Volume (CF)
Base	0	23	
	2	33	56
	4	45	78
	6	59	104
	8	74	133
	10	91	165
	12	109	200
	14	129	238
	16	150	279
	18	173	323
	20	198	371
	22	224	422
	24	251	475
	26	281	532
	28	311	592
	30	344	655
	32	378	722
	34	413	791
	36	450	863
	38	489	939
Top	40	529	1018

Total Volume, V:	8956	CF
Uplift Capacity, Q_{ug} (kips):	**561**	**kips**
Per Pile	112.2	kips
Group Vs Pile (200k Uplift Capacit	Controls	

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Brooklyn, NY

Calc. By: ZS

Pile Group Uplift Capacity

*Analysis of larger pile caps will be provided as necessary under a separate cover.

Summary:

Pile Group:	Group Uplift Capacity (kips)	
P2	400k	(Individual Pile capacities control)
P3	456k	
P4	580k	
P4L	621k	
P5	561k	
P6	685k	

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Brooklyn, NY

1/13/2016

Calc . By: ZSA
Chk'd By: JGS

Pile Cap Connection

Assumptions:

Design Loads:

Axial: P_{max} = 300 kips
Uplift: N_{max} = 150 kips

Material Strength:

Concrete: Compressive Strength, f'_c = 5 ksi
Steel: ASTM A572, Gr. 55 f_y = 55 ksi

Geometry:

Cap Casing O.D., d = 8.625 in
Bearing Plate Dia., D = 12 in

Area, $A_m = d^2\pi/4$ = 58.4 in^2
Plate Area, A_1 = 91.1 in^2
Area, $A_{net} = A_1 - A_m$ = 32.7 in^2

Pile Cap (min.): Width, b_{pc} = 24 in
Length, l_{pc} = 24 in

Area, $A_2 = b_{pc} x l_{pc}$ = 576.0 in^2
Embedment, d_{pc} = 17 in

Reference:

AISC Steel Construction Manual, 13th Ed.
ACI 318-08 Building Code Requirements for Structural Concrete

Bearing on Concrete: (AISC pgs 16.1-114 to 16.1-115)

Axial:

$P_p = 0.85f'_cA_1$ = 387 kips < $0.85f'_cA_1\sqrt{(A_2/A_1)}$ = 973.5 kips => P_p = 973.5 kips
Ω_c = 2.50 (eqns J8-1 & J8-2)
P_p/Ω_c = 389.4 kips ≥ P_{max} = 300 kips **OK**

Uplift:

$P_p = 0.85f'_cA_{net}$ = 138.9 kips < $0.85f'_cA_{net}\sqrt{(A_2/A_{net})}$ = 583 kips => P_p = 583 kips
Ω_c = 2.50 (eqns J8-1 & J8-2)
P_p/Ω_c = 233.2 kips ≥ N_{max} = 150.0 kips **OK**

Uplift Pullout (Two-way Shear) of Concrete: (ACI pgs 190-191)

ϕ = 0.60 $b_o = (D+d_{pc})\pi$ = 91.11 in ≤ $2(b_{pc}+l_{pc})$ = 96 in
$\phi V_n = \phi 4(\sqrt{f'_c})b_od_{pc}$ = 262.8 kips ≥ $N_u = 1.6N_{max}$ = 240.0 kips **OK** (eqn 11-33)

Plate Thickness: (AISC pgs 14-4 to 14-6)

$m = (D-0.8d)/2$ = 2.55 in λ = 1.0
$n' = d/4$ = 2.16 in $l = max(m, \lambda n')$ = 2.55 in

Minimum Thickness, $t_{min} = l\sqrt{(3.33P_{max}/F_yA_1)}$ = 1.14 in ~ 1 1/4 in (pg 14-6 eqn)

Summary:

Bearing Plate: **1 1/4 in x 12 in diameter**

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Brooklyn, NY

Calc. By: ZSA
Chk By: JGS

Stelcor Pile Design

Coupling:

Tension Load:

(3) 1½" ϕ SAE J429 Gr. 8 thru bolts

$F_y = 130ksi$ $F_u = 150ksi$ $A_b = 1.77 in^2$ $\Omega = 2.00$

$F_{nv} = 0.4 F_u = (0.4)(150ksi) = 60ksi$

$R_n/\Omega = \frac{F_{nv} A_b}{\Omega} = \frac{(60ksi)(1.77in^2)}{2.00} \times 2 = 106.2k/bolt$ (Double Shear)

∴ $R_n/\Omega = 106.2k/bolt \times 3 = 318.6k > R_{max} = P_{max} = 150k$ ok

Bearing: $\Omega = 2.00$

7in ϕ x 0.498in Casing: $F_y = 80ksi$ $F_u = 95ksi$ $L_e = 3$ in $s = 3.75$in $d_h = 1.63$ in
8 5/8" ϕ x 0.625in Coupling: $F_y = 55ksi$ $F_u = 75ksi$ $L_e = 3$ in $s = 3.75$in $d_h = 1.63$in

Edge: $L_c = L_e - \frac{d_h}{2} = 3.0in - \frac{1.63in}{2} = 2.19in$

Casing: $R_n/\Omega = \frac{1.5 L_c t F_u}{\Omega} = \frac{1.5(2.19in)(0.498in)(95ksi)}{2.00} = 77.7k/hole$ (6 holes)

Coupling: $R_n/\Omega = 77.0k/hole$ (6 holes)

Spacing: $L_c = s - d_h = 3.75in - 1.63in = 2.12in$

casing $R_n/\Omega = \frac{1.5 L_c t F_u}{\Omega} = \frac{1.5(2.12in)(0.498in)(95ksi)}{2.0} = 75.2k/hole$ (6 holes)

coupling: $R_n/\Omega = 74.5k/hole$ (6 holes)

∴ By inspection, bolt strength controls

(4) 1¼" x 2½" Plug Welds $A = 2.79in^2$ $F_{EXX} = 100ksi$

Base Metal: (Casing) $R_n/\Omega = \frac{F_y A}{\Omega} = \frac{(80ksi)(2.79in^2)}{2.00} = 111.6k/weld$

Weld: $R_n/\Omega = \frac{0.6 F_{EXX} A}{\Omega} = \frac{0.6(100ksi)(2.79in^2)}{2.00} = 83.7k/weld$

∴ $R_n/\Omega = 83.7k/weld \times 4 = 334.8k > P_{max} = 150k$ ok

∴ Coupling is sufficient to resist tension load and tension test load

FINAL REPORT

GEOTECHNICAL EVALUATION

211 MCGUINNESS BOULEVARD
BROOKLYN, NEW YORK

Prepared for

Stellar Management
156 William Street, 10th Floor
New York, NY

March 22, 2015

Prepared by:

URS

1255 Broad Street, Suite 201
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Project No: 11100746

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This report provides geotechnical recommendations for the design and construction of a proposed 8-story building with one cellar level at 211 McGuinness Boulevard (Block 2576, Lots 20 & 23) in Brooklyn, New York. The recommendations presented herein are in general accordance with the 2008 NYC Building Code.

Based on the performance of fourteen test borings, the subsurface conditions generally consist of approximately 10 feet of Fill (Stratum 1), approximately 10 feet of Clayey Sand to Sandy Clay and Peat (Stratum 2), which is underlain by Sand with varying amounts of silt (Stratum 3) to a depth of over 100 feet. Intermediate rock (Stratum 4) was encountered at depths of approximately 111 and 141.5 feet at two borings.

Groundwater was measured, in March 2015, at a depth of approximately 9 feet, which corresponds to approximately el. +4 feet[1].

The potential for liquefaction appears unlikely. The recommended seismic site classification is Site Class "D". If the Seismic Use Group is I or II, the Seismic Design Category is "C". The appropriate Seismic Use Group should be determined by the Architect or Structural Engineer.

Based on an assumed bottom of foundation depth of 13 feet, Stratum 2 will be encountered at this depth for a large portion of the site. Bearing the building directly on this stratum may result in long term unacceptable differential settlements. The unsuitable soil could be removed and replaced or ground improvement could be performed. However, considering that a large amount of material would need to be removed or improved and that a lot of the excavated material would be below the groundwater, a shallow foundation is not practical or cost effective. Therefore, it is recommended that the building be pile supported.

It is recommended that the building be supported on a combination of driven and drilled piles. For the purpose of foundation design, it is recommended that driven piles only be allowed when they are located 20 feet, or more, from any adjacent buildings that are not pile supported or are in poor structural condition. Considering that the rock is relatively deep and the building loads are estimated to be moderate, it is recommended that the drilled piles be minipiles. The report provides information for several driven pile types having compression capacities of 30, 40, 100, and 150 tons and minipiles with compression capacities of 100 tons. Compression pile load tests will be required for the higher capacity driven piles and the minipiles.

The recommended non-flood design groundwater elevation is +6.5 feet. If the site is located within the flood zone, it is recommended that the design groundwater elevation, for this loading condition, be taken as the same elevation as the flood elevation. If the bottom of the cellar slab will be above the design groundwater elevation, the below grade walls and the slabs should be dampproofed. If the bottom of the cellar slab will be below the design groundwater elevation, the below grade walls and slab should be designed to resist groundwater pressures and be waterproofed.

If the excavations will be within the influence zone of the adjacent building foundations, underpinning, or other support measures, will be required. It is recommended that a site walk through of the adjacent structures be performed for the purpose of determining the cellar level

[1] All elevations in this report refer to NAVD88.

extents and depths and any other features that may affect the design and construction of the proposed new building. Following the site visits, it is recommended that test pits be performed to obtain information regarding the elevations, locations, and bearing grades of the existing foundations of the adjacent buildings.

The report includes additional information regarding the subsurface conditions and foundation design recommendations and additional recommendations regarding excavation considerations, underpinning, subgrade preparation, backfill and compaction requirements, pre-construction condition surveys and monitoring, and construction inspection and monitoring.

1.1 GENERAL

This report provides preliminary geotechnical recommendations for the design and construction of a proposed building at 211 McGuinness Boulevard in Brooklyn, New York (see Figure 1). The geotechnical evaluations and recommendations presented herein are in general accordance with the 2008 NYC Building Code (Code). Authorization to proceed was obtained in the form of an agreement between Stellar Management, and URS Corporation – New York (URS), dated October 13, 2014.

1.2 PROJECT UNDERSTANDING

The project site is located at 211 McGuinness Boulevard (Block 2576, Lots 20 & 23) in Brooklyn, New York. The total lot size is approximately 33,750 sq. ft. The site is currently occupied by 1 to 2-story buildings and a parking lot. The ground surface varies from approximately el. +13 to +15 feet. There are 1 to 6-story buildings along the north, west and south property lines. Information regarding the presence and depth of the adjacent building cellars was not provided to us.

Based on the drawings provided to us, it is proposed to construct a new 8-story building with one cellar level. The cellar depth has not been provided; however, for the purpose of this report, it is assumed that the floor to floor height will be 10 feet.

1.3 OBJECTIVES AND SCOPE OF SERVICES

The objectives of this investigation were to evaluate the subsurface conditions at the site and provide geotechnical recommendations for the design and construction of the proposed building. The following scope of services was performed to achieve these objectives:

- Retained a subcontractor to perform fourteen test borings;
- Provided full-time special inspection of the test boring operations;
- Performed engineering evaluations and prepared this report that includes the following:
    a) A description of the subsurface investigations performed for this project;
    b) A plan drawing showing the locations of the as-drilled test borings;
    c) An overview of general site and geologic conditions;
    d) The results of engineering evaluations and recommendations regarding the foundation design, including:
        - Foundation type, estimated capacity, bearing elevation, and settlement estimate;
        - Evaluation of foundations, including dimensions and capacities, if necessary;
        - Seismic site classification and liquefaction potential;
        - Floor slab support;

- Permanent below grade wall lateral pressures;
- Permanent groundwater control measures, if necessary;

e) Recommendations regarding construction related issues, including:
- Excavation and temporary support of excavation considerations;
- Underpinning;
- Subgrade preparation;
- Backfill and compaction requirements;
- Pre-construction condition surveys;
- Construction monitoring recommendations;

f) Appendices that include the test boring logs and laboratory testing results.

1.4 REPORT ORGANIZATION

This report is divided into five sections. Section 2 includes a description of the subsurface investigation methods and results. Section 3 summarizes the engineering evaluations and the foundation design recommendations. Construction recommendations are included in Section 4. The limitations of this study are discussed in Section 5. Figures are provided at the end of the text. The boring logs and laboratory testing results are included in the appendices.

2.1 GENERAL

The subsurface conditions were evaluated by performing test borings, laboratory tests, and taking groundwater measurements. The following sections provide information about the number, location, and procedures for the test borings and a generalized interpretation of the subsurface conditions at the site.

2.2 SUBSURFACE INVESTIGATION

2.2.1 Test Borings

Fourteen test borings, designated B-1 through B-14, were drilled at the site between December 8 and 11, 2014 and between February 25 and March 12, 2015 at the locations shown in Figure 2. Special inspection of the test borings was performed on a continuous basis by URS geotechnical engineers under the direction of Mr. Thomas Thomann, PE.

The test borings were performed by Craig Test Boring Company, Inc. of Mays Landing, New Jersey using a truck mounted drilling rig and a rubber track drill rig. All borings were performed using rotary drilling techniques with a 3-7/8 inch diameter tri-cone roller bit. Soil samples were obtained using a 2-inch O.D. split-spoon sampler in accordance with American Society for Testing and Materials (ASTM) Standard Specification D1586-Standard Penetration Test (SPT). The SPT consists of driving a 2-in O.D. split-spoon for a depth of 24 inches with repeated blows of a 140-lb hammer free-falling 30 inches. The standard penetration, or N-value, is defined as the number of blows required to drive the sampler for a 12-inch interval after an initial 6 inches of penetration. The split-spoon sampler was advanced using a safety hammer in all borings. The soil samples obtained from the borings were visually classified by the URS field inspector using the Unified Soil Classification System and the New York City Building Code designations and placed in labeled sample jars.

Rock coring was performed using a five-foot long NX (2-1/8 in. O.D.) core barrel. The top of rock was estimated based on the drilling operations (e.g., excessive rig chatter, difficult penetration) and practical spoon refusal, as indicated by blow counts greater than 100 for a 6-inch interval. Rock coring was performed to verify the presence of rock (instead of intercepting a boulder), and assess its relative quality, as indicated by Core Recovery[2] and the Rock Quality Designation (RQD)[3].

Upon completion of Boring B-3, a groundwater observation well was installed. The well was constructed of nominal 2-in diameter Schedule 40 PVC pipe with 10 ft. screen and 25 ft. riser. The annulus between the pipe and the wall of the borehole was backfilled with sand to within

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

[3] The Rock Quality Designation (RQD) is defined as the ratio (expressed as a percentage) of the total length of recovered core samples having a length of at least twice the core diameter (e.g., about 4 in for NX-core) to the total length of core.

three feet of the top of the borehole. The remainder of the annulus was backfilled with bentonite and cement. A flush-mount cap was installed at the top of the borehole.

The test boring logs are included in Appendix A.

2.2.2 Laboratory Testing

Laboratory testing was conducted on representative soil samples to determine physical index and engineering properties of the subsurface materials and to confirm field classifications. Five sieve analyses and 3 Atterberg limits tests were performed on representative soil samples obtained from the borings. The laboratory test results are included in Appendix B.

2.3 GENERALIZED SUBSURFACE CONDITIONS

The following generalized strata descriptions are based on interpretations of the subsurface investigation results:

Stratum 1 – Fill [7][4] : This stratum generally consists of sand with traces of gravel, brick and debris. The N-values ranged from 2 to 48 blows per foot (bpf), with an average of 13 bpf. The thickness of this stratum is estimated to be approximately 10 feet.

Stratum 2 – Clayey Sand to Sandy Clay and Peat [3b/4b/6]: This stratum was encountered at 10 borings and generally consists of brown fine clayey sand to sandy clay and, in 5 borings, black organic peat. The N-values ranged from 0 to 45 bpf, with an average of 13 bpf, indicative of a medium dense material; however a relatively soft layer of clay was encountered between depths of 10 and 15 feet. The thickness of this stratum is estimated to be approximately 10 feet.

Stratum 3 – Sand [3a/3b] and Silt [5a]: This stratum was encountered below Stratum 2 in all borings and generally consists of brown, dense, coarse to fine sand with trace gravel and dense silt. The N-values ranged from 8 to 100 bpf, with an average value of 40 bpf, indicative of a dense material. Based on the results of Borings B-7 and B-11, the thickness of this stratum is more than 100 feet.

Stratum 4 - Bedrock [1b/1d]: This stratum was encountered below Stratum 3 and consists of a gray gneiss/schist rock. The rock core recovery ranged from 70% to 78%, and the Rock Quality Designation (RQD) ranged from 59% to 60%, which indicates a medium hard rock. The depth to the top of at least Class 1c rock was encountered at depths of approximately 111 feet at Boring B-7 and 141.5 feet at Boring B-11. Soft rock (Class 1d) was encountered at Boring B-11 between depths of approximately 120 and 140 feet. It is also possible that rock was encountered at Boring B-12 at 100 feet; however, rock coring was not performed.

Boulders and cobbles were encountered in Boring B-1 between depths of approximately 91 to 102 feet.

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[4] Number in parenthesis indicates classification according to the New York City Building Code (2008)

2.4 GROUNDWATER LEVEL

A groundwater observation well was installed in the completed Boring B-3 on December 10, 2014. The groundwater depth on December 11 2014 was 10.5 feet, which corresponds to el. +2.5 feet. The groundwater depth on March 9, 10, and 12, 2015 was approximately 9 feet, which corresponds to approximately el. +4 feet.

The groundwater measurements were not taken over an extended period of time; therefore, the measurements do not adequately reflect seasonal or other time dependent variations that may occur.

3.1 GENERAL

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

3.2 EARTHQUAKE CONSIDERATIONS

Based on the soil profile, the SPT N-values from completed test borings, and assuming that liquefaction is unlikely, the recommended seismic site classification is Site Class "D". If the Seismic Use Group is I or II, the Seismic Design Category is "C". The appropriate Seismic Use Group should be determined by the Architect or Structural Engineer.

The Code requires that a liquefaction potential assessment be performed for non-cohesive soils located below the groundwater and to a maximum depth of 50 feet. The potential for liquefaction at the site was evaluated using the Code based liquefaction assessment diagram, which, as shown in Figure 3, indicates that liquefaction may be a concern between depths of 10 and 25 feet.

Site specific liquefaction evaluations were performed using the methods developed by I.M. Idriss and R. W. Boulanger (2004). These analyses require the peak ground surface acceleration and an earthquake magnitude to estimate the seismic shear stresses. Based on Site Class D, the calculated code specified peak ground surface acceleration is 0.15g. An earthquake magnitude of 6.0 is used in the analyses and is primarily based on historical information in the northeast. The factor of safety against liquefaction using the site specific analysis is shown in Figure 4. The Code specifies that, for Structural Occupancy Category II, the minimum acceptable factor of safety against liquefaction is 1.4. Only a few data points are less than approximately 1.4; therefore, it is considered that liquefaction is not a significant concern for this site and does not need to be considered in the foundation design.

3.3 FOUNDATION RECOMMENDATIONS

3.3.1 Columns and Walls

Based on an assumed cellar height of 10 feet and a slab and foundation thickness of approximately 3 feet, the bottom of the foundations may be at a depth of approximately 13 feet. It is likely that Stratum 2 (Clayey Sand to Sandy Clay and Peat) will be encountered at this depth for a large portion of the site. Bearing the building directly on this stratum may result in long term unacceptable differential settlements. The unsuitable soil could be removed and replaced or ground improvement could be performed. However, considering that a large amount of material would need to be removed or improved and that a lot of the excavated material would be below the groundwater, a shallow foundation is not practical or cost effective. Therefore, it is recommended that the building be pile supported.

It is recommended that the building be supported on a combination of driven and drilled piles. The vibrations from the installation of driven piles could result in unacceptable settlements and/or damage to adjacent buildings. The distance at which vibrations will become a concern depends on many factors. For the purpose of foundation design, it is recommended that driven piles only be allowed when they are located 20 feet, or more, from any adjacent buildings that are not pile supported or are in poor structural condition. Vibration and other monitoring should be performed during the driving of the test piles and the 20 foot distance should be adjusted, if necessary. Piles located within 20 feet of any adjacent buildings should be installed using drilling methods. Considering that the bedrock is very deep and the building loads are estimated to be moderate, it is recommended that the drilled piles be minipiles.

Driven Piles

Selection of the most cost effective driven pile depends on several factors included the soil conditions, the material pile costs, and the time needed to install the piles. The following provides several different pile types, that are likely to be considered by contractors, and the estimated allowable pile capacities and lengths:

Pile Type	Pile Size	Est. Allowable Pile Compression Capacity (Tons)	Est. Allowable Pile Tension Capacity (tons)	Estimated Pile Length (feet)
Timber pile	12” butt, 8” tip	30	10	50
Open-ended Steel Pipe Pile	Min. OD = 12.75" Min. Thickness= 0.5"	40	10	40
		100	45	75
	Min. OD = 16" Min. Thickness= 0.5"	150	75	75
Tapertube pile (concrete filled)	Top OD = 14" Tip OD = 10" Thickness = 0.5" Tapered Length = 15 ft	40	20	35
		100	60	45
		150	90	55

Open ended steel pipe piles should have minimum yield strength of 45 ksi. Tapertube piles should have minimum yield strength of 50 ksi. The concrete in the Tapertube piles should have a minimum compression strength of 4,000 psi. Since the project is in Seismic Design Category C, seismic steel reinforcement shall be placed in the Tapertube in accordance with Section 1810.6.4.1 of the Code.

The minimum pile spacing should be two times the pile diameter, but not less than two feet.

The Code allows for a maximum 1 ton lateral pile capacity without performing additional lateral pile analyses or lateral load tests. If higher lateral capacity is needed, it is recommended that lateral pile calculations and/or pile load tests be performed to determine if the driven piles can resist the lateral loads.

The piles will be driven through saturated clayey soils, which will produce excess pore water pressures that will decrease the pile capacity during pile driving. After pile driving, the excess pore pressures dissipate and the pile capacity increases with time. This process is known as *pile setup*. Therefore, the pile capacities, as obtained with a Pile Driving Analyzer (PDA), during initial drive and at the estimated lengths given above, may be lower than the capacity required. If this occurs, it will be necessary to stop the pile driving and allow pile setup (i.e., strength gain) to occur so that the necessary pile capacity can be achieved. The excess pore pressure dissipation rate depends on the soil type and the degree of soil disturbance. Considering the subsurface conditions at the site, it is estimated that it could take several days, or longer, for excess pore pressure dissipation to occur. The pile capacity increase is evaluated in the field by re-striking the test piles with a PDA, at various times after the initial drive.

Minipiles

Minipiles obtain their resistance through friction in soils. The installation of a minipile typically consists of drilling a steel casing to the required depth, installing the required reinforcement, placing the grout from the bottom of the hole to replace the drilling fluid, and pumping additional grout as the casing is withdrawn through the bond zone. The bond zone is the area where the pile develops its capacity.

Maximum Allowable Compression Capacity (tons)	Steel Casing OD, thickness (in)	Number and Size of Reinforcing Bars	Maximum Allowable Uplift Capacity (tons)	Minimum Casing Length (ft)	Minimum Estimated Bond Length (ft)	Estimated Total Length (ft)
100	9-5/8, 0.545	1 - #18	75	10	70	80

Minipile design notes:

1. The steel casing and reinforcing bar should have minimum yield strengths of 50 ksi and 75 ksi, respectively.
2. The grout should have minimum compression strength of 5,000 psi.
3. The center to center spacing of minipiles should be at least two times the outside diameter of the casing, but not less than 2 feet.
4. The bond length is estimated and should be adjusted based on the results of pile load tests performed prior to the installation of production piles.

The Code allows for a maximum 1 ton lateral pile capacity without performing additional lateral pile analyses or lateral load tests. If higher lateral capacity is needed, it is recommended that lateral pile calculations and/or pile load tests be performed to determine if the minipiles can resist the lateral loads.

3.3.2 Floor Slab

The subgrade material at the cellar floor slab level will likely be Stratum 2. The slab can be designed as a slab-on-grade provided certain measures are implemented if peat, or other unsuitable bearing materials, are encountered. At these locations, it is recommended that at least one foot of the unsuitable material be removed and that ¾” crushed stone be placed to the bottom of the slab level. Alternatively, the cellar floor slab could be designed as a structural slab.

At locations where unsuitable material is not encountered, the subgrade should be properly prepared, as indicated in Section 4.5, and the slab should bear on a minimum of 6 inches of ¾” crushed stone.

If the cellar floor slab is located below the design groundwater elevation, the slab should be designed to resist the groundwater pressures and be waterproofed (see Section 3.5).

3.4 LATERAL EARTH PRESSURES

The design lateral pressures for permanent below grade walls consist of static and seismic pressures that are influenced by the thickness and type of overburden material. It is recommended that the below grade walls above and below the design groundwater level be designed for a static lateral soil pressure of 45 pcf and 85 pcf, respectively. In addition, a seismic lateral soil force of $6H^2$ (lb/ft of wall), where H is the total vertical height of the wall, in feet, should be included. This force should be applied at a distance of H/3 from the top of the wall (i.e., wall pressure is an inverted triangle).

The recommended lateral pressure does not include any surcharge loads adjacent to the walls or at the ground surface. It is recommended that a uniform (i.e., rectangular) lateral pressure distribution of 0.40 times the surcharge be added to the lateral soil and rock pressure distribution. The structural engineer should determine the magnitude of the surcharge loads (i.e., live loads).

3.5 PERMANENT GROUNDWATER CONTROL

Based on the measured groundwater levels and taking into consideration that the groundwater level may fluctuate due to seasonal conditions, a non-flood design groundwater elevation of +6.5 feet is recommended. If the site is located within the flood zone, it is recommended that the design groundwater elevation, for this loading condition, be taken as the same elevation as the flood elevation.

If the bottom of the cellar slab will be above the design groundwater elevation, the below grade walls and the slabs should be dampproofed. Dampproofing should be performed at the bottom of the slab by installing a membrane, such as Grace Construction Products Florprufe, or approved equal. Dampproofing of the below grade walls should be performed with a liquid applied membrane (LAM), such as Grace Construction Products Procor, or approved equal, for 2-sided forms, or a membrane, such as Grace Construction Products Preprufe, or approved equal, for blind-sided forms.

If the bottom of the cellar slab will be below the design groundwater elevation, the below grade walls and slab should be designed to resist groundwater pressures and be waterproofed.

Waterproofing materials should be installed on the outside of the perimeter walls (Grace Construction Products Bituthene 3000 for two-sided form applications and Preprufe 160R for blind side applications, or approved equivalent) and directly beneath the cellar slab (Grace Construction Products Preprufe 300R, or equivalent). The waterproofing on the perimeter walls is typically installed to the ground surface. Waterstops should be installed at applicable locations. The installation of all waterproofing elements should be inspected on a full time basis to confirm that the waterproofing is being applied as per the manufacturer's specifications and details. It is also recommended that the project team consider the benefits of a "sandwich" slab, which consists of the pressure slab, a gravel filled layer with perforated pipes connected to a sump pit, and a wearing slab. This system minimizes penetrations through the pressure slab and provides a way to manage water that may leak from the pressure slab or at connections between the pressure slab and the foundation walls or other critical locations.

4.1 GENERAL

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

4.2 EXCAVATION CONSIDERATIONS

Local temporary soil excavations above the natural groundwater level can have cut slopes as steep as 1H:1V. Temporary soil excavations below the natural groundwater level should be no steeper than 1.5H:1V. The slopes of any excavations adjacent to the existing structures should be no steeper than 2H:1V, unless approved by the SOE engineer.

All vertical soil faces will require temporary support until the new foundations and foundation walls are constructed and the area is properly backfilled. Considering the subsurface conditions and the proposed cellar level, a feasible support system may consist of soldier piles and timber lagging with sufficient lateral restraint (e.g., anchors, rakers, bracing, etc.), as required. However, if significant peat material is present outside the footprint of the site, it may be necessary to install steel sheeting to reduce the potential for groundwater drawdown outside the site, which could result in settlement of the adjacent buildings.

Measurements of vibration levels should be made in selected adjacent structures during the installation of the support system. The maximum allowable vibration levels should be established as part of the pre-construction condition survey of the adjacent structures. Considering the proximity of the adjacent buildings, the vibrations from driving or vibrating the soldier piles or sheeting may cause damage to the adjacent buildings; therefore, it may be determined that some of the piles will need to be drilled, or sheeting may need to be pushed in, so that the vibrations are reduced. At locations where driven piles are acceptable, the continuous vibrations from a vibratory hammer could increase the potential for settlement of adjacent structures; therefore, the SOE designer should consider specifying the use of a hydraulic impact hammer for installing the soldier beams or sheeting.

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

4.3 UNDERPINNING

Underpinning, or other support (e.g, relatively stiff support walls, such as secant or tangent pile walls), will be required at locations where the new foundations will be placed within the influence zone of the adjacent building foundations. Underpinning should transfer the foundation loads from their present bearing level to a level that results in the new foundations being outside the influence zone of the existing or adjacent foundations. The underpinning designer should review all of the subsurface investigation results and adjacent building information and take this information into account to ensure that appropriate underpinning methods are selected and designed.

If the excavations will be within the influence zone of the adjacent building foundations, underpinning, or other support measures, will be required. It is recommended that additional information be obtained regarding the elevations, locations, and bearing grades of the adjacent building foundations. It is recommended that a site walk through of the adjacent structures be performed for the purpose of determining the cellar level extents and depths, and any other features (e.g., elevator pits, ejector pits, etc.) that may affect the design and construction of the proposed new building. This information should then be used to develop a test pit plan. The purposes of the test pits are to document the size, depth, and type of foundation of the adjacent buildings, as well as any below-grade encroachments that may be present. This information should then be used to develop a plan for performing construction close to the adjacent buildings.

The analysis and design of any underpinning or other building support systems should be performed by a licensed New York Professional Engineer. Underpinning operations should be inspected full time during construction by a qualified engineer.

4.4 TEMPORARY GROUNDWATER CONTROL

The need for temporary groundwater control will depend on the groundwater level at the time of construction and the proposed cellar elevation. Based on the measured groundwater depth of 9 to 10.5 feet and considering that the cellar construction will likely go below this depth, it should be anticipated that dewatering of the site with wellpoints or deep wells will be required.

Due to the soft soils encountered at the site, it is possible that groundwater drawdown outside the excavation could result in settlement of the adjacent buildings if they are not on sufficiently designed piles or shallow foundations. Therefore, the need for sheetpiles, or other groundwater cutoff measures should be considered by the support of excavation (SOE) engineer.

A NYCDEP dewatering permit will be required to temporarily discharge the groundwater into the sewer system.

4.5 DRIVEN PILES

It is recommended that a hydraulic pile driving hammer be used to install the driven piles because the stroke of the hammer can be varied thereby having some control over the potential vibrations. It may be possible to reduce the stroke at the beginning of pile driving to minimize the vibrations and when the pile is at a depth where vibrations are acceptable or the pile is close to the rock, the stroke can be increased to achieve the proper driving criteria. Vibration and settlement monitoring should be performed during the driving of the test piles and production piles. The use of vibratory hammers should not be allowed.

Prior to driving any piles, the contractor should submit the results of Wave Equation Analyses (WEAP) of the proposed pile and hammer configuration to confirm that the proposed pile driving system will obtain the necessary pile capacity without overstressing the pile.

In accordance with the Code, static axial load tests are required for timber piles with a design load greater than 30 tons and other driven piles with a design load greater than 40 tons. The code requires that two load tests be conducted for a driven pile area between 5,000 and 30,000 sf, with one additional load test for each additional 20,000 sf of driven pile area. Pile load tests will be required for each different pile type or pile capacity. The maximum test load should be maintained for a minimum of 24 hours, and in accordance with additional Code requirements.

It is recommended that a minimum of six driven test piles, for each pile type and capacity, be installed and that all driven test piles be monitored using a Pile Driving Analyzer (PDA). A PDA provides real-time information regarding pile capacity and stresses during pile driving and will assist in deciding which piles to select for static load tests and will assist in developing the pile driving criteria. The PDA testing should be included in the contractors scope and be performed by a company with sufficient PDA testing experience.

4.6 MINIPILES

Minipiles should be performed by a contractor with experience on similar projects. The contract specifications should require that the proposed contractor submit a construction procedure to the Engineer for review and approval prior to beginning the work. It is the responsibility of the contractor to use an installation method that will not cause damage to adjacent structures. The use of down-the-hole hammers, which use air, are sometimes proposed to advance the casing through the overburden, or past obstructions. This may cause damage to adjacent structures, if the air cannot be contained in the casing. Control of the air will depend on the drillers equipment, procedures, and experience. The use of down-the-hole hammers should not be allowed without discussing the proposed procedures at a field meeting with the owner, engineer, construction manager, and contractor.

In accordance with the Code, static compression load tests are required for minipiles, regardless of their capacity. The load tests are used to determine if the estimated design bond length is sufficient. Therefore, the pile load tests should be performed prior to the installation of any production piles. The Code requires that two load tests be performed for pile areas between 5,000 and 30,000 square feet. It is estimated that two minipile load tests will be required for this project. The maximum test load for the piles should be maintained for a minimum of 12 hours, and in accordance with the Code requirements.

4.7 SUBGRADE PREPARATION

Subgrade surfaces for the cellar slab should be level and cleaned of loose soil, mud, and other material (such as concrete, brick, wood, debris, etc.) that can have a negative impact on the performance of the foundation or slab. Any soft clay or peat that is present should be excavated and replaced with ¾” crushed stone. If directed by the Special Inspector, the soil subgrade should be proof-rolled with a minimum of 6 passes of a smooth drum roller with a minimum 1,500 lb. static weight and minimum centrifugal force of 4,000 lbs. or similar approved equipment. Any unstable areas which cannot be stabilized by additional compaction should be excavated to competent material and the area backfilled with compacted structural fill or ¾” stone. The proof-rolling should not be performed when the subgrade is wet, muddy, or frozen. If the foundation is constructed in the winter, the subgrade should be protected from frost action to limit possible subgrade deterioration resulting from freezing and thawing cycles. Concrete should not be poured if the subgrade is wet, muddy, or frozen.

A minimum 6-inch thick layer of compacted coarse aggregate, commonly known as ¾" gravel or crushed stone, or a "mud-slab" (i.e., 2 to 3 inches of lean concrete), should be placed on the approved subgrade so that the subgrade is properly protected from disturbance.

4.8 BACKFILL AND COMPACTION REQUIREMENTS

Select backfill or structural backfill should be granular soils free of cinder, brick, asphalt, ash, and other unsuitable materials. Such material should not contain any boulders or cobbles larger than about 4 inches across, and should have a fines content (material passing the No. 200 sieve) less than 15 percent. The subgrade underneath the backfill should be satisfactorily proofrolled prior to the placement of backfill. All backfill should be placed in lifts not exceeding 8-in. in loose thickness. Backfill placed beneath any shallow foundation elements (e.g., footings, mat) should be compacted to a minimum of 95% of the maximum dry density. Backfill placed beneath slabs-on-grade, behind below-grade walls, and underneath sidewalks should be compacted to a minimum of 90% of the maximum dry density. Backfill placed in landscaped areas should be compacted to a minimum of 85% of the maximum dry density.

4.9 PRE-CONSTRUCTION CONDITION SURVEY AND MONITORING

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

4.10 CONSTRUCTION MONITORING

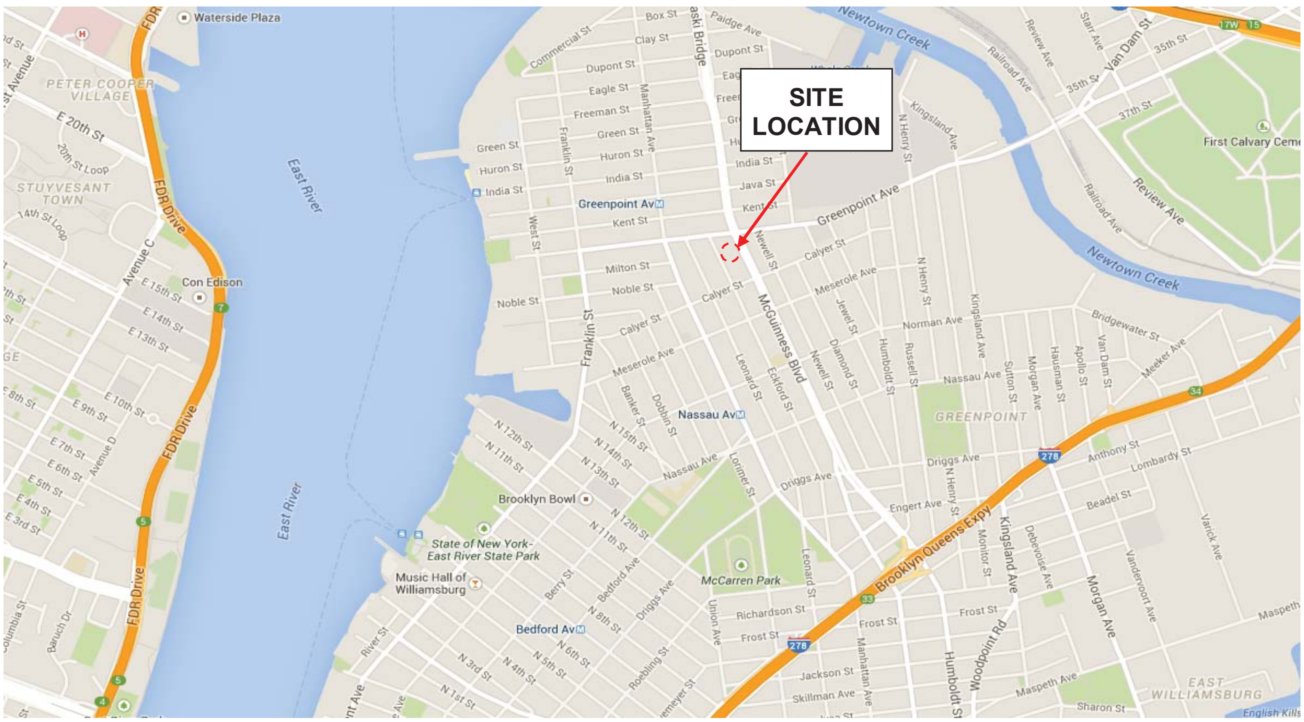
It is recommended that a geotechnical engineer familiar with the subsurface conditions and foundation design criteria, review and approve the foundation contractors procedures and provide inspection services during excavation and foundation construction. Geotechnical related inspection services should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

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

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

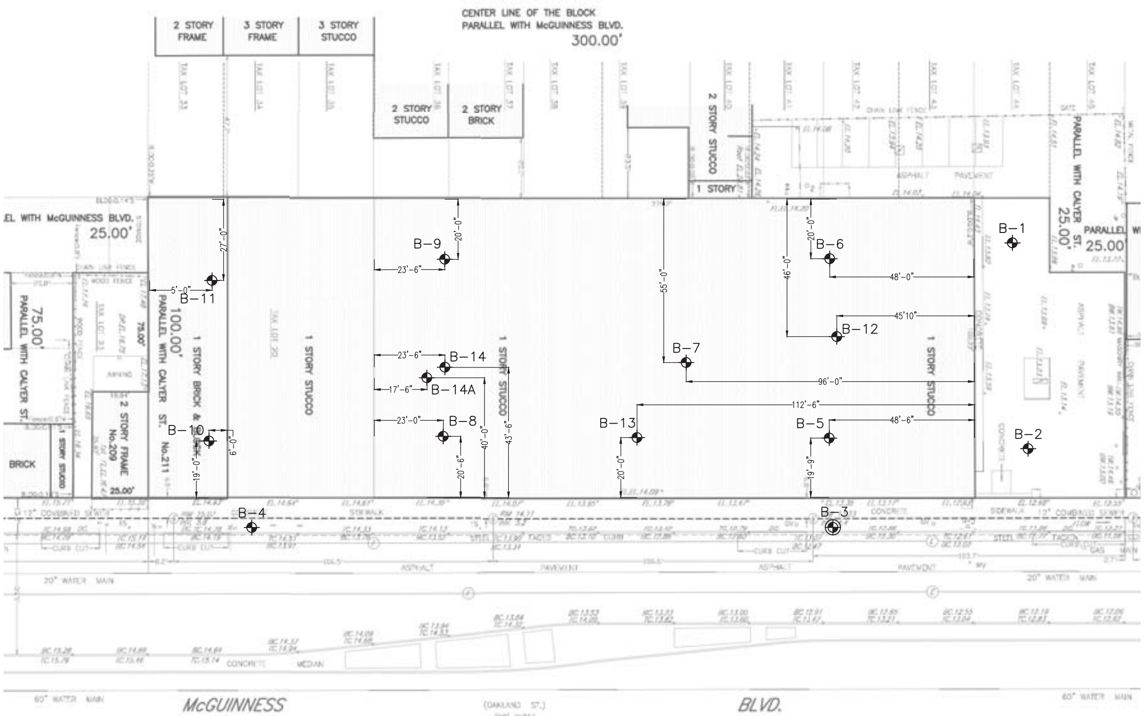
The results presented in this report are applicable only to the present study, and should not be used for any other purpose without our review and consent. This study has been conducted in accordance with the standard of care commonly used as state-of-the-practice in the profession. No other warranties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

FIGURES



SITE LOCATION PLAN 211 MCGUINNESS BLVD BROOKLYN, NY		
URS CLIFTON, NEW JERSEY		
DR. BY: RH	SCALE: NTS	PROJ: 11100746
DATE: DECEMBER 2014		FIG NO: 1

I:\Projects\11100746(211McGuinessBlvd)\Report\Figure 1 SiteLocationPlan.xls



LEGEND:

B-1 BORING NUMBER AND APPROXIMATE LOCATION

B-3 BORING NUMBER AND APPROXIMATE LOCATION WITH INSTALLED WELL

NOTES:

1. ALL ELEVATIONS SHOWN REFER TO NAVD88 DATUM.
2. SURVEY PREPARED BY AUTAR LAND SURVEYING, P.C., DATED SEPTEMBER 17, 2014.

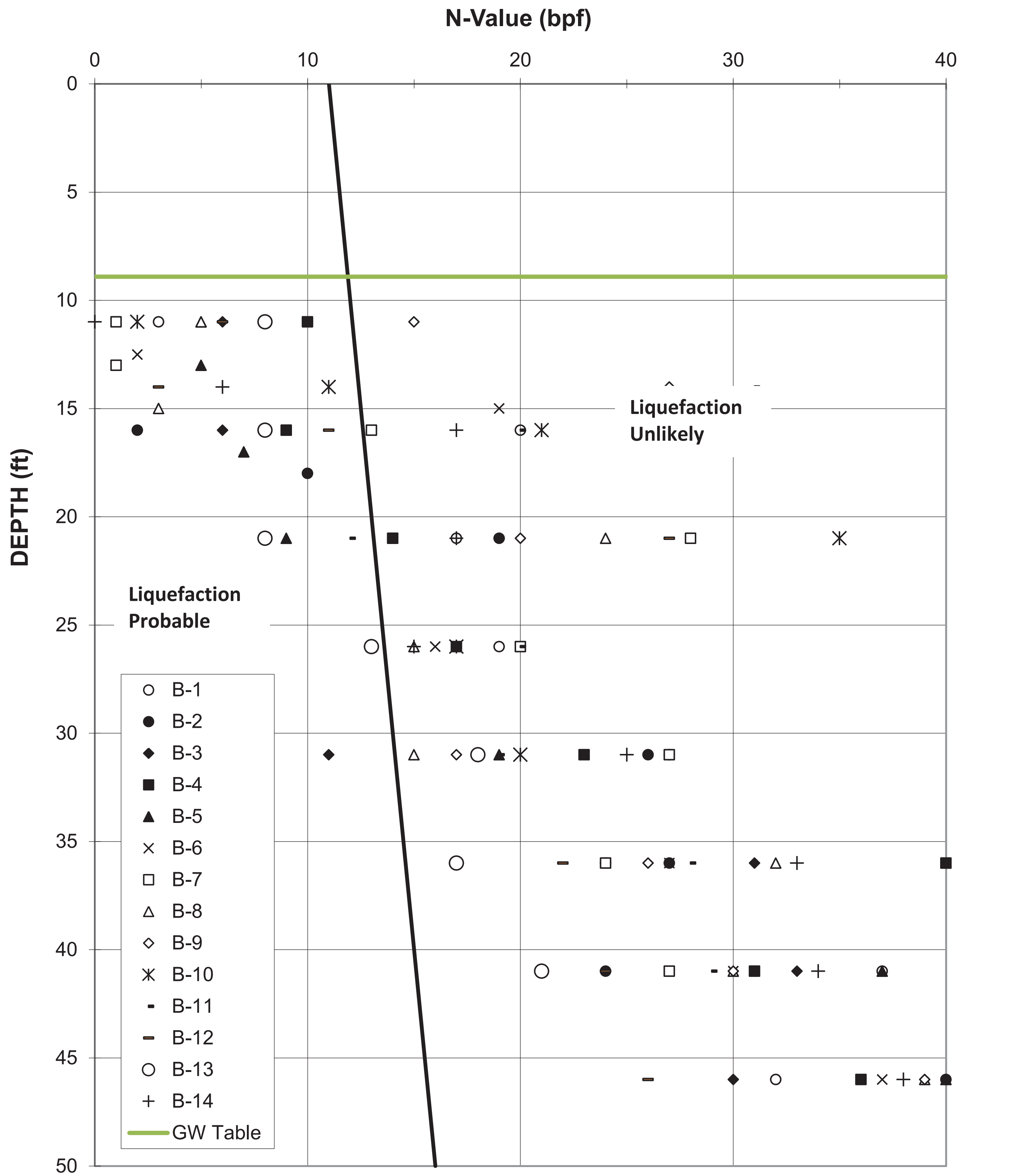
0 16 32 64

SCALE (FEET)

BORING LOCATION PLAN
211 MCGUINNESS BOULEVARD
BROOKLYN, N.Y.

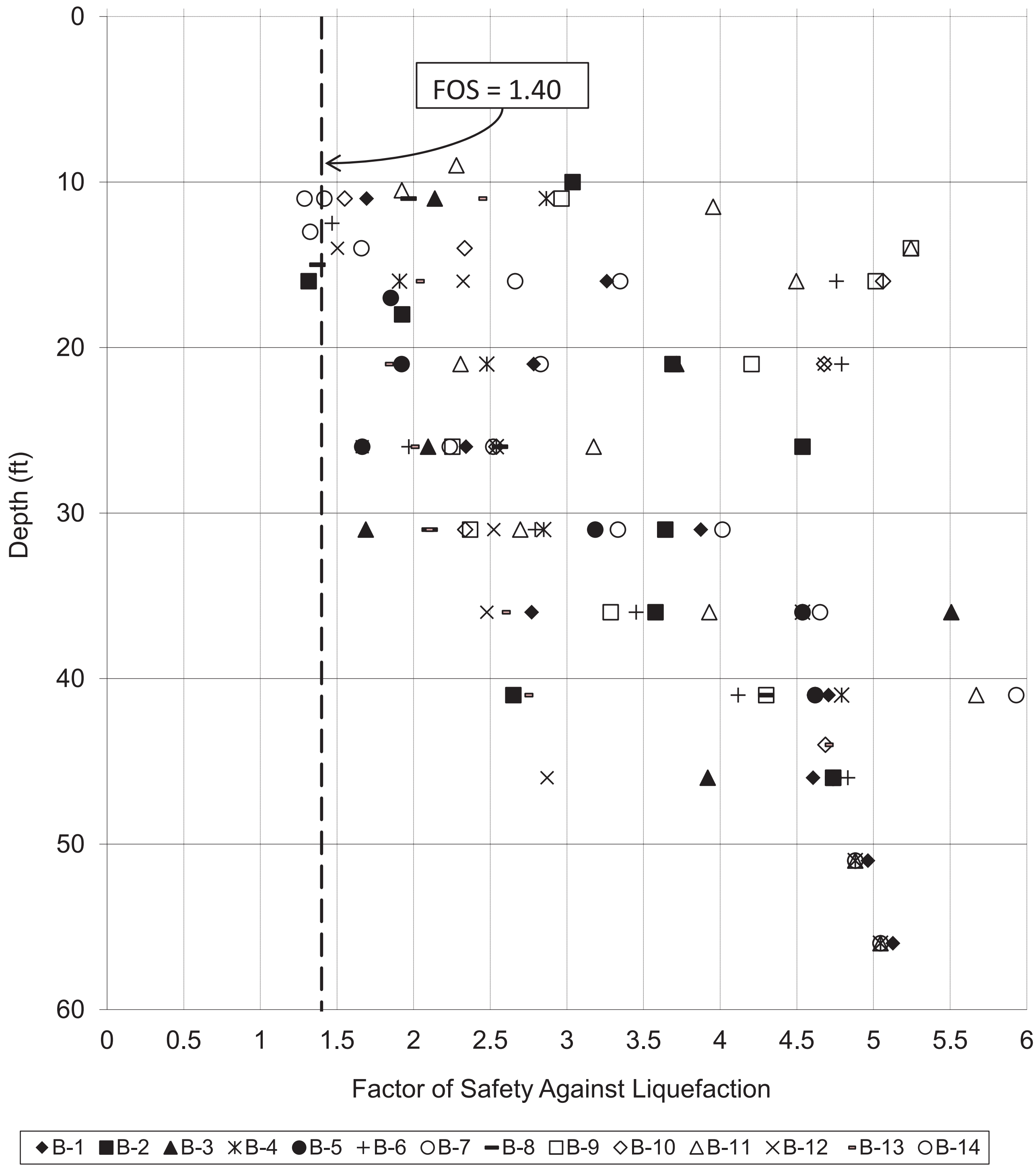
URS
CLIFTON, NEW JERSEY

DR. BY	RH	SCALE	AS SHOWN	DWG. NO.		PROJ. NO. 11100746	
CK'D. BY	TGT		DATE	DECEMBER, 2014		FIG. NO.	2



Notes:
1. Structural Occupancy Category II is assumed.

CODE BASED SOIL LIQUEFACTION POTENTIAL 211 MCGUINNESS BOULEVARD BROOKLYN, NY		
URS CLIFTON, NJ		
DR. BY: RH & KV	SCALE: As Shown	PROJ NO: 11100746
	DATE: Mar 2015	FIG NO: 3



SOIL LIQUEFACTION POTENTIAL - SITE SPECIFIC
211 MCGUINNESS BOULEVARD
BROOKLYN, NY

URS

CLIFTON, NEW JERSEY

DR. BY: KV	SCALE: As Shown	PROJ NO: 11100746
CHK'D BY:	DATE: MAR. 2015	FIG NO: 4

APPENDIX A
TEST BORING LOGS

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-1

Date(s) Drilled	12/8/14 - 12/8/14	Logged By	Robert Hoffmann	Approximate Surface Elevation (feet)	14.0
Drilling Method	Mud Rotary	Drilling Contractor	Craig Geotechnical	Coordinates	North: East:
Casing Size/Type	4" steel	Drill Rig Operator	Mike Gorski	Total Depth Drilled (feet) 102.0	Rock Depth (feet) 91.0
Drill Rig Type	CME 75	Drill Bit Size/Type	3-7/8" roller	Sampler Type(s)	2" O.D. split spoon
Groundwater Level and Date Measured		Hammer Wt/Drop 140 lb / 30" (safety)	Casing Hammer Wt/Drop 140 lb / 30" (auto)	Core Barrel Size/Type	NX
Boring Location and Comments	see boring location plan			No. of Samples	Dist.: 19 Undist.: 0 Core (ft): 10

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								3" ASPHALT					
	S-1	1.0	22 29 19 11					(FILL) Gray-Brown c-f SAND, some gravel, silt, trace asphalt, concrete [7]					
5	S-2	0.3	8 8 6 7					(FILL) Brown Silty fine SAND [7]					pushed casing to 5'
10	S-3	2.0	1 1 2 2					(CL) Brown sandy CLAY [6]			26	54	
15	S-4	1.5	6 8 12 11					(SP) Orange-Brown fine SAND, trace silt [3b]					
20	S-5	1.7	6 8 9 8					(SM) Brown m-f SAND, some silt [3b]					
25													

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-1

Depth, feet	Soil Samples: Type, Number	Recov. (ft)	Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Recov. (%)	RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
25	S-6	1.2	6 9 10 9					(SP) Brown m-f SAND, trace silt [3b]					
30	S-7	1.3	8 12 15 17					(SP) Brown m-f SAND, trace silt [3b]					rig chatter
35	S-8	1.0	11 10 14 16					(SP) Brown m-f SAND, trace silt [3b]					
40	S-9	1.2	16 17 20 24					(SP) Brown m-f SAND, trace silt [3a]			17	5	
45	S-10	1.3	11 16 16 14					(SP) Brown m-f SAND, trace silt [3a]					
50	S-11	1.5	21 23 33 35					(SP) Brown fine SAND, trace silt [3a]					

Project: 211 McGuinness Blvd Project Location: Brooklyn, NY Project Number: 11100746	Log of Boring B-1 Sheet 3 of 4

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
55	S-12	1.6	17 21 29 35					(SM) Brown fine SAND, some silt [3a]					
60	S-13	1.7	15 22 25 31					(SM) Brown fine SAND, some silt [3a]					
65	S-14	1.7	22 23 27 27					(SP) Brown fine SAND, trace silt [3a]					
70	S-15	1.5	22 22 26 26					(SP) Brown fine SAND, trace silt [3a]					
75	S-16	1.3	12 15 19 24					(SM) Brown fine SAND, some varved silt & clay [3a]					
80	S-17	1.5	12 20 21 26					(SM) Brown fine SAND, some silt, some silt lenses [3a]					

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-1

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
85	S-18	2.0	29 24 28 34					(SM) Brown fine SAND, some varved silt [3a]					
													rig chatter
90	S-19	0.4	71 65 100/3"					(SM) Gray-Reddish Brown Gravelly c-f SAND, some silt [3a]					
95				R-1	48	23		BOULDERS & COBBLES SCHIST/GNEISS, blue-gray-brown, c-f grained, subangular, slightly weathered					
100				R-2	45	25		BOULDERS & COBBLES SCHIST/GNEISS, blue-gray-brown, c-f grained, subangular, slightly weathered					
								End of Boring at 102' BGS					
105													
110													

Project: 211 McGuinness Blvd Project Location: Brooklyn, NY Project Number: 11100746	**Log of Boring B-2** Sheet 1 of 2

Date(s) Drilled	12/10/14 - 12/10/14	Logged By	Robert Hoffmann	Approximate Surface Elevation (feet)	13.0
Drilling Method	Mud Rotary	Drilling Contractor	Craig Geotechnical	Coordinates	North: East:
Casing Size/Type	4" steel	Drill Rig Operator	Mike Gorski	Total Depth Drilled (feet) 47.0	Rock Depth (feet) N/A
Drill Rig Type	CME 75	Drill Bit Size/Type	3-7/8" roller	Sampler Type(s)	2" O.D. split spoon
Groundwater Level and Date Measured		Hammer Wt/Drop 140 lb / 30" (safety)	Casing Hammer Wt/Drop 140 lb / 30" (auto)	Core Barrel Size/Type	
Boring Location and Comments	see boring location plan			No. of Samples	Dist.: 12 Undist.: 0 Core (ft): 0

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								3" ASPHALT					
	S-1	1.2	14 7 7 7					(FILL) Gray-Brown c-f SAND, some silt, brick, trace asphalt, concrete [7]					
5	S-2	0.8	3 2 1 3					(FILL) Brown m-f SAND, some clay [7]					
	S-3	0.3	2 2 2 3					(FILL) Brown m-f SAND, some clay [7]					
10	S-4	0.8	4 5 5 5					(SC) Brown Clayey m-f SAND [3b]			19	38	installed casing to 10'
15	S-5	1.8	1 1 1 1					(SP) Brown fine SAND, trace clay, silt [6]			20	37	
	S-6	1.3	2 4 6 14					Top 10": (SP) Brown fine SAND, trace clay, silt [6] Bottom 6": (SM) Brown-Gray m-f SAND, some silt [3b]					
20	S-7	1.7	6 5 14 16					(SM) Gray-Brown fine SAND, some silt, some clay lenses [3b]					
25													

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-2

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
25	S-8	NR	18 20 25 26					No Recovery					
30	S-9	1.5	11 11 15 14					(SP) Brown m-f SAND, trace gravel, silt [3b]					
35	S-10	0.8	12 14 13 15					(SP) Brown m-f SAND, trace gravel, silt [3b]					
40	S-11	1.3	8 10 14 14					(SP) Brown fine SAND, trace silt [3b]					
45	S-12	1.5	12 15 25 30					(SP) Brown fine SAND, trace silt [3a]					
47								End of Boring at 47' BGS					
50													

Project: 211 McGuinness Blvd Project Location: Brooklyn, NY Project Number: 11100746	**Log of Boring B-3** Sheet 1 of 2

Date(s) Drilled	12/10/14 - 12/10/14	Logged By	Robert Hoffmann	Approximate Surface Elevation (feet)	13.0
Drilling Method	Mud Rotary	Drilling Contractor	Craig Geotechnical	Coordinates	North: East:
Casing Size/Type	4" steel	Drill Rig Operator	Mike Gorski	Total Depth Drilled (feet)	47.0 — Rock Depth (feet) N/A
Drill Rig Type	CME 75	Drill Bit Size/Type	3-7/8" roller	Sampler Type(s)	2" O.D. split spoon
Groundwater Level and Date Measured	10.5 12/11/14	Hammer Wt/Drop	140 lb / 30" (safety) — Casing Hammer Wt/Drop 140 lb / 30" (auto)	Core Barrel Size/Type	
Boring Location and Comments	see boring location plan			No. of Samples	Dist.: 10 Undist.: 0 Core (ft): 0

Depth, feet	Soil Samples: Type, Number	Recov. (ft)	Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Recov. (%)	RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								6" CONCRETE					
	S-1	0.8	7 6 8 8					(FILL) Gray-Black-Brown c-f SAND, some silt, clay, trace asphalt, concrete [7]					
5	S-2	1.2	2 3 3 2					(FILL) Brown c-f SAND, some clay, silt [7]					
10	S-3	0.3	3 2 4 3				▼	(SC) Gray-Brown Clayey c-f SAND, trace gravel [6]					installed casing to 10' petroleum odor
15	S-4	1.5	3 3 3 4					(PT) Black PEAT, some gray silt, roots, wood fragments [6]	489	185	305		
20	S-5	1.7	6 7 12 14					(CL) Light Gray-Brown fine Sandy CLAY [4b]	41	23	27		
25													

Project: 211 McGuinness Blvd Project Location: Brooklyn, NY Project Number: 11100746	**Log of Boring B-3** Sheet 2 of 2

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
25	S-6	1.3	9 8 9 8					(SP) Brown m-f SAND, trace silt [3b]					
30	S-7	0.5	7 5 6 5					(SM) Brown m-f SAND, some silt [3b]					rig chatter
35	S-8	0.8	11 14 17 18					(SP) Brown c-f SAND, trace silt [3a]					rig chatter
40	S-9	1.2	11 16 17 18					(SP) Brown m-f SAND, trace silt [3a]					
45	S-10	1.0	14 14 16 19					(SP) Brown fine SAND, trace silt [3a]					
								End of Boring at 47' BGS					35' GW observation well installed (10' screen, 25' riser)
50													

Project: 211 McGuinness Blvd Project Location: Brooklyn, NY Project Number: 11100746	**Log of Boring B-4** Sheet 1 of 4

Date(s) Drilled	12/11/12 - 12/11/12	Logged By	Robert Hoffmann	Approximate Surface Elevation (feet)	14.50
Drilling Method	Mud Rotary	Drilling Contractor	Craig Geotechnical	Coordinates	North: East:
Casing Size/Type	4" steel	Drill Rig Operator	Mike Gorski	Total Depth Drilled (feet) 102.0	Rock Depth (feet) N/A
Drill Rig Type	CME 75	Drill Bit Size/Type	3-7/8" roller	Sampler Type(s)	2" O.D. split spoon
Groundwater Level and Date Measured		Hammer Wt/Drop 140 lb / 30" (safety)	Casing Hammer Wt/Drop 140 lb / 30" (auto)	Core Barrel Size/Type	
Boring Location and Comments	see boring location plan			No. of Samples	Dist.: 21 Undist.: 0 Core (ft): 0

Depth, feet	Soil Samples: Type, Number	Recov. (ft)	Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Recov. (%)	RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								6" CONCRETE					
	S-1	0.7	15 10 5 5					(FILL) Gray-Brown c-f SAND, some concrete, trace silt [7]					
5	S-2	0.5	13 5 4 4					(FILL) Tan CONCRETE fragments, some c-f sand, gravel, trace brick [7]					
10	S-3	1.0	6 4 6 4					(SC) Dark Brown fine SAND, some clay [3b]			19	45	installed casing to 10'
15	S-4	0.5	7 4 5 5					(SC) Brown fine SAND, some clay [6]					
20	S-5	1.7	6 5 9 9					(CL) Brown fine Sandy CLAY [4b]	36	22	22		
25													

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-4

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
25	S-6	2.0	6 7 10 12					(SM) Brown fine SAND, some silt [3b]					
30	S-7	1.5	7 10 13 14					(SP) Brown m-f SAND, trace silt [3b]					
35	S-8	1.3	16 18 22 17					(SP) Brown c-f SAND, trace gravel, silt [3a]					
40	S-9	1.6	15 15 16 18					(SP) Brown fine SAND, trace silt [3a]					
45	S-10	1.4	15 15 21 23					(SP) Brown m-f SAND, trace silt [3a]					
50	S-11	2.0	18 20 24 22					(SM) Brown fine SAND, some silt [3a]					

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-4

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
55	S-12	1.8	20 20 23 26					(SM) Brown fine SAND, some silt [3a]					
60	S-13	2.0	14 19 26 25					(SP) Brown fine SAND, trace silt [3a]					
65	S-14	1.7	21 22 25 24					(SP) Brown fine SAND, trace silt [3a]					
70	S-15	1.8	21 21 26 25					(SP) Brown fine SAND, trace silt [3a]					
75	S-16	2.0	24 26 25 27					(SP) Brown fine SAND, trace silt, trace silt lenses [3a]					
80	S-17	1.8	21 17 24 27					(SM) Brown fine SAND, some silt [3a]					

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-4

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
85	S-18	1.6	20 20 25 32					(ML) Brown fine Sandy SILT [5a]					
90	S-19	1.7	19 21 25 31					(SM) Brown fine SAND, some silt, some silt & clay lenses [3a]					
95	S-20	1.7	30 28 30 32					(SM) Brown fine SAND, some silt [3a]					
100	S-21	2.0	19 20 22 30					(SM) Brown fine SAND, some silt [3a]					
								End of Boring at 102' BGS					
105													
110													

Project: 211 McGuinness Blvd Project Location: Brooklyn, NY Project Number: 11100746	**Log of Boring B-5** Sheet 1 of 2

Date(s) Drilled	**2/25/15**	Logged By	**K. Vishnukanthan**	Approximate Surface Elevation (feet)	**14.10**
Drilling Method	**Mud Rotary**	Drilling Contractor	**Craig Geotechnical**	Coordinates	**North:** **East:**
Casing Size/Type	**4" steel**	Drill Rig Operator	**Rob Dollar**	Total Depth Drilled (feet) **47.0**	Rock Depth (feet) **N/A**
Drill Rig Type	**CME 55**	Drill Bit Size/Type	**3-7/8" Tricone roller**	Sampler Type(s)	**2" O.D. split spoon**
Groundwater Level and Date Measured		Hammer Wt/Drop **140 lb / 30" (auto)**	Casing Hammer Wt/Drop **140 lb / 30" (auto)**	Core Barrel Size/Type	**N/A**
Boring Location and Comments	**see boring location plan**			No. of Samples	**Dist.: 11 Undist.: 1 Core (ft): 0**

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								6" CONCRETE					
	S-1	1.3	20 12 5 4					Dark Gray c-f SAND, some gravel, trace concrete, trace debris [FILL] (7)					
5	S-2	0.2	4 4 5 2					Red brick fragments with gravel, trace c-f sand , trace silt [FILL] (7)					
10	S-3	0.5	4 3 2 2					Gray GRAVEL with some c-f SAND, trace glass, trace wood, trace debris [FILL] (7)					
	S-4	0.3	2 2 3 9					Dark Gray CLAY, some gravel, trace silt, trace fine sand, trace shells except 2" wood at the tip [OH] (6)					Petroleum odor
15	T-1	2.0	N/A N/A N/A N/A										Shelby tube sampling
	S-5	1.2	3 3 4 5					Top 4": Black SANDY CLAY, trace peat, trace wood fragments [OH] (6) Bot 10": Yellowish brown SANDY CLAY, trace silt [CL] (4c)					
20	S-6	1.5	3 4 5 4					Yellowish brown CLAY, trace sand [CL] (4b)					Casing to 20'
25													

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-5

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
25	S-7	1.1	5 6 7 7					Reddish brown c-f SAND, trace silt, trace gravel [SP] (3b)					
30	S-8	1.3	6 9 10 12					Brown SILTY SAND [SM] (3b)					
35	S-9	0.3	15 19 21 22					Brown c-f SAND, trace silt, trace gravel [SP] (3a)					
40	S-10	1.4	13 18 19 20					Brown c-f SAND, some silt, trace gravel [SP-SM] (3a)					
45	S-11	1.2	17 20 20 21					Brown c-f SAND, some gravel, some silt [SM] (3a)					
47								End of Boring at 47' BGS					
50													

Project: 211 McGuinness Blvd **Project Location: Brooklyn, NY** **Project Number: 11100746**	**Log of Boring B-6** Sheet 1 of 2

Date(s) Drilled	**2/26/15**	Logged By	**K. Vishnukanthan**	Approximate Surface Elevation (feet)	**14.20**
Drilling Method	**Mud Rotary**	Drilling Contractor	**Craig Geotechnical**	Coordinates	**North:** **East:**
Casing Size/Type	**4" steel**	Drill Rig Operator	**Rob Dollar**	Total Depth Drilled (feet) **47.0**	Rock Depth (feet) **N/A**
Drill Rig Type	**CME 55**	Drill Bit Size/Type	**3-7/8" Tricone roller**	Sampler Type(s)	**2" O.D. split spoon**
Groundwater Level and Date Measured		Hammer Wt/Drop **140 lb / 30" (auto)**	Casing Hammer Wt/Drop **140 lb / 30" (auto)**	Core Barrel Size/Type	**N/A**
Boring Location and Comments	**see boring location plan**			No. of Samples	**Dist.: 10 Undist.: 1 Core (ft): 0**

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
0								6" CONCRETE					
	S-1	1.8	24 9 8 13					Gray c-f SAND with gravel, crushed concrete and red brick fragments [FILL] (7)					
5	S-2	0.9	35 15 6 6					Light gray, GRAVELLY SAND with white shells [FILL] (7)					Rig chatter from 4.5' to 5.0'
10	T-1	1.4	N/A N/A N/A N/A										Dark gray wash with odor from 9.0', Possibly organic soil Shelby tube sampling
	S-3	1.7	1 1 1 2					Gray CLAY, some fine sand [CL] (6)					Pocket Penetrometer 0.25 TSF
15	S-4	1.3	10 11 8 8					Brown SILTY fine SAND, trace clay [SM] (3b)					
20	S-5	0.8	9 24 18 16					Brown SILTY fine SAND, trace gravel, trace clay [SM] (3a)					Casing to 20'
													Rig chatter from 23.0' to 23.5', Possibly gravel
25													

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-6

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
25	S-6	0.8	7 8 8 9					Reddish brown c-f SAND, trace gravel, trace silt [SP] (3b)					
30	S-7	1.3	6 11 12 8					Same as above [SP-SM] (3b)					
35	S-8	1.0	13 13 14 14					Brown c-f SAND, trace gravel, trace silt [SP] (3b)					
40	S-9	0.9	13 16 14 16					Brown c-f SAND, some gravel, trace silt [SP] (3b)					
45	S-10	1.2	18 18 19 21					Brown c-f SAND, trace gravel, some silt [SM] (3a)					
								End of Boring at 47' BGS					
50													

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-7

Date(s) Drilled	2/26/15 - 3/3/15	Logged By	K. Vishnukanthan	Approximate Surface Elevation (feet)	14.15
Drilling Method	Mud Rotary	Drilling Contractor	Craig Geotechnical	Coordinates	North: East:
Casing Size/Type	3" & 4" steel	Drill Rig Operator	Rob Dollar	Total Depth Drilled (feet) 115.0	Rock Depth (feet) 110.0
Drill Rig Type	CME 55	Drill Bit Size/Type	2-7/8" 3-7/8" Tricone roller	Sampler Type(s)	2" O.D. split spoon
Groundwater Level and Date Measured		Hammer Wt/Drop 140 lb / 30" (auto)	Casing Hammer Wt/Drop 140 lb / 30" (auto)	Core Barrel Size/Type	NX
Boring Location and Comments	see boring location plan			No. of Samples	Dist.: 24 Undist.: 0 Core (ft): 5

Depth, feet	Soil Samples: Type, Number	Recov. (ft)	Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Recov. (%)	RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								6" CONCRETE					
	S-1	1.8	20 17 20 19					Black-Gray c-f SAND, trace gravel, trace concrete, trace brick fragments [FILL] (7)					
													Slight rig chatter at 4.0'
5	S-2	1.1	2 1 2 1					Brown c-f SAND, trace silt, trace concrete, trace brick fragments [FILL] (7)					4" steel casing to 5'
10	S-3	1.7	1 WOH 1 WOH					Gray SANDY CLAY, trace silt [CL] (6)					
	S-4	1.4	WOH WOH 1 1					Same as above [CL] (6)					
15	S-5	1.5	3 6 7 12					Top 7" : Same as above Bot 9" : Reddish brown m-f SAND, some silt, trace clay [SM] (3b)					
								Reddish brown CLAYEY SAND, trace gravel, trace silt [SC] (3b)					
20	S-6	1.0	3 12 16 17										
													Rig chatter from 23.0' to 24.0'
25													

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-7

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
25	S-7	0.8	7 10 10 9					Brown c-f SAND, trace gravel, trace silt, [SP] (3b)					
30	S-8	0.5	12 15 12 13					Brown c-f SAND, some gravel, trace silt, [SP] (3b)					
													Slight rig chatter at 33.0'
35	S-9	1.2	8 12 12 14					Brown SILTY SAND, trace gravel [SM] (3b)					
40	S-10	1.3	9 14 13 15					Reddish brown SILTY fine SAND [SM] (3b)					
45	S-11	1.5	18 24 23 24					Brown m-f SAND, some silt [SM] (3a)					
50	S-12	1.4	15 21 20 20					Brown m-f SAND, trace silt [SP] (3a)					

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-7

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
55	S-13	1.4	15 21 17 19					Brown m-f SAND, some silt [SM] (3a)					
60	S-14	1.5	13 16 18 18					Brown fine SANDY SILT [SM / ML] (3a/5a)					
65	S-15	1.5	24 39 36 31					Same as above [SM / ML] (3a/5a)					
70	S-16	1.8	17 28 25 26					Brown SILTY fine SAND [SM] (3a)					
75	S-17	1.6	20 34 31 30					Brown fine SANDY SILT [ML] (5a)					
80	S-18	1.8	22 30 31 32					Same as above [ML] (5a)					

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-7

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
85	S-19	1.8	17 27 28 30					Brown SILT, trace fine sand [ML] (5a)					
90	S-20	1.8	18 23 30 31					Same as above [ML] (5a)					
95	S-21	1.3	20 24 26 25					Gray c-f SAND, some silt [SM] (3a)					
100	S-22	1.3	23 25 26 27					Gray c-f SAND, some silt [SM] (3a)					
105	S-23	1.5	28 38 44 48					Top 6": Same as above [SM] (3a) Bot 12": Gray c-f Sand, some gravel, some silt [SM] (3a)					
110	S-24	0.0	100/1"					No recovery Dark gray SCHIST with some QUARTZ, c-f grained, slightly weathered, moderately fractured, Hard rock with fractures dipping 25 to 65 degree from horizontal, trace					Hard drilling and rig chattering from 109' to 110', possibly bedrock Split spoon bouncing at 110', 3" casing to 110'

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
				R-1	70	60		vertical fracture. (Class 1b)					
115								End of Boring at 115' BGS					
120													
125													
130													
135													
140													

Project: 211 McGuinness Blvd **Project Location: Brooklyn, NY** **Project Number: 11100746**	**Log of Boring B-8** Sheet 1 of 2

Date(s) Drilled	**3/4/15**	Logged By	**K. Vishnukanthan**	Approximate Surface Elevation (feet)	**14.10**
Drilling Method	**Mud Rotary**	Drilling Contractor	**Craig Geotechnical**	Coordinates	**North: East:**
Casing Size/Type	**4" steel**	Drill Rig Operator	**Rob Dollar**	Total Depth Drilled (feet) **47.0**	Rock Depth (feet) **N/A**
Drill Rig Type	**CME 55**	Drill Bit Size/Type	**3-7/8" Tricone roller**	Sampler Type(s)	**2" O.D. split spoon**
Groundwater Level and Date Measured		Hammer Wt/Drop **140 lb / 30" (auto)**	Casing Hammer Wt/Drop **140 lb / 30" (auto)**	Core Barrel Size/Type	**N/A**
Boring Location and Comments	**see boring location plan**			No. of Samples	**Dist.: 10 Undist.: 1 Core (ft): 0**

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								6" CONCRETE					
	S-1	0.3	21 7 3 3					Gray c-f SAND, trace gravel, trace concrete, trace brick fragments [FILL] (7)					
5	S-2	0.9	1 2 3 3					Concrete and Red brick fragments [FILL] (7)					Hard drilling from 4.5' to 5.0'
10	S-3	1.0	4 2 3 4					Gray CLAY, trace sand, except 1" peat at the tip [CL] (4c)					Petroleum odor
	T-1	0.9	N/A N/A N/A N/A										Shelby tube sampling Casing to 13'
15	S-4	2.0	WOH WOH 3 4					Top 15": Light gray CLAY, trace Sand [CL] (6) Bot 9": Gray m-f SAND, trace clay, trace silt [SM] (6)					Petroleum odor
20	S-5	1.3	3 7 17 12					Brown c-f SAND, some clay, trace gravel, trace silt [SC] (3b)					
25													

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-8

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
25	S-6	1.2	5 7 8 7					Reddish brown SILTY fine SAND [SM] (3b)					
30	S-7	1.3	5 6 9 7					Brown - Gray m-f SAND, some silt [SM] (3b)					
35	S-8	1.3	14 17 15 16					Gray m-f SAND, trace silt [SP] (3a)					
40	S-9	1.4	9 13 17 14					Same as above [SP] (3a)					
45	S-10	1.3	12 19 20 19					Same as above [SP] (3a)					
								End of Boring at 47' BGS					
50													

Project: 211 McGuinness Blvd **Project Location: Brooklyn, NY** **Project Number: 11100746**	**Log of Boring B-9** Sheet 1 of 2

Date(s) Drilled	**3/3/15 - 3/4/15**	Logged By	**K. Vishnukanthan**	Approximate Surface Elevation (feet)	**14.20**
Drilling Method	**Mud Rotary**	Drilling Contractor	**Craig Geotechnical**	Coordinates	**North:** **East:**
Casing Size/Type	**4" steel**	Drill Rig Operator	**Rob Dollar**	Total Depth Drilled (feet) **47.0**	Rock Depth (feet) **N/A**
Drill Rig Type	**CME 55**	Drill Bit Size/Type	**3-7/8" Tricone roller**	Sampler Type(s)	**2" O.D. split spoon**
Groundwater Level and Date Measured		Hammer Wt/Drop **140 lb / 30" (auto)**	Casing Hammer Wt/Drop **140 lb / 30" (auto)**	Core Barrel Size/Type	**N/A**
Boring Location and Comments	**see boring location plan**			No. of Samples	**Dist.: 13 Undist.: 0 Core (ft): 0**

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								6" CONCRETE					
	S-1	1.3	37 25 4 2					Black c-f SAND, some gravel, trace silt, trace concrete and trace red brick fragments [FILL] (7)					
													Rig chattering from 4.0' to 4.5
5	S-2	0.3	5 7 4 5					Black gravelly Sand, trace brick fragments [FILL] (7)					
													Rig chattering from 7.0' to 8.0
	S-3	0.5	8 5 5 7					Red brick fragments [FILL] (7)					
10	S-4	1.0	13 10 5 6					Top 6": Same as above [FILL] (7) Bot 6": Brown, m-f SAND, some gravel, trace silt [SP] (3b)					
	S-5	1.0	5 7 20 17					Gray c-f SAND, some gravel, some silt [SM] (3b)					Casing to 13.0'
15	S-6	1.7	14 24 21 16					Dark gray / black c-f SAND, trace gravel, trace silt [SP] (3b)					
20	S-7	0.0	9 8 12 10					No recovery					
	S-8	N/A	N/A N/A N/A N/A					Brown, CLAYEY SAND [SC]					3" O.D Split spoon sampler used
25													

Project: 211 McGuinness Blvd Project Location: Brooklyn, NY Project Number: 11100746	Log of Boring B-9 Sheet 2 of 2

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
25	S-9	1.2	6 6 7 8					Reddish brown SILTY SAND [SM] (3b)					
30	S-10	1.3	6 8 9 8					Brown m-f SAND, some silt [SM] (3b)					
35	S-11	1.3	7 12 14 13					Brown - Gray c-f SAND, trace silt [SP] (3b)					
40	S-12	1.3	12 14 16 14					Gray m-f SAND, trace silt [SP] (3b)					
45	S-13	1.3	16 20 19 19					Same as above [SP] (3a)					
								End of Boring at 47' BGS					
50													

Project: 211 McGuinness Blvd	Log of Boring B-10
Project Location: Brooklyn, NY	
Project Number: 11100746	Sheet 1 of 2

Date(s) Drilled	3/12/15	Logged By	K. Vishnukanthan	Approximate Surface Elevation (feet)	14.90
Drilling Method	Mud Rotary	Drilling Contractor	Craig Geotechnical	Coordinates	North: East:
Casing Size/Type	4" steel	Drill Rig Operator	Rob Dollar	Total Depth Drilled (feet)	45.0 / Rock Depth (feet) N/A
Drill Rig Type	CME 55	Drill Bit Size/Type	3-7/8" Tricone roller	Sampler Type(s)	2" O.D. split spoon
Groundwater Level and Date Measured		Hammer Wt/Drop	140 lb / 30" (Safety) / Casing Hammer Wt/Drop 140 lb / 30" (auto)	Core Barrel Size/Type	N/A
Boring Location and Comments	see boring location plan			No. of Samples	Dist.: 11 Undist.: 0 Core (ft): 0

Depth, feet	Soil Samples: Type, Number	Recov. (ft)	Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Recov. (%)	RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								5" CONCRETE					
	S-1	1.0	7 5 4 4					Black c-f SAND, some gravel, trace silt, trace concrete [FILL] (7)					
													Slight rig chattering from 3.5' to 4.5'
5	S-2	0.8	4 4 4 3					Black c-f SAND, trace gravel, trace silt, trace debris, trace roots [FILL] (7)					
													Casing to 9.0'
10	S-3	1.8	1 1 1 1					Brown Sandy CLAY [CL] (6)					
	S-4	1.7	1 1 10 12					Same as above [CL] (6)					
								Brown m-f SAND, some silt [SM] (3b)					
15	S-5	1.2	11 9 12 11					Brown m-f SAND, some silt [SM] (3b)					
20	S-6	1.4	10 16 19 13					Same as above [SM] (3a)					
25													

Log of Boring B-10

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
25	S-7	1.3	6 5 12 16					Reddish brown m-f SAND, some silt [SM] (3b)					
30	S-8	1.2	12 10 10 10					Brown - Gray m-f SAND, trace silt [SP] (3b)					
35	S-9	1.3	23 24 26 32					Gray c-f SAND, trace gravel, trace silt [SP] (3b)					
40	S-10	1.3	20 28 37 38					Gray m-f SAND, some silt [SM] (3a)					
	S-11	1.4	16 29 35 39					Same as above [SM] (3a)					
45								End of Boring at 45' BGS					
50													

Project: 211 McGuinness Blvd Project Location: Brooklyn, NY Project Number: 11100746	Log of Boring B-11 Sheet 1 of 6

Date(s) Drilled	3/10/15 - 3/11/15	Logged By	K. Vishnukanthan	Approximate Surface Elevation (feet)	14.90
Drilling Method	Mud Rotary	Drilling Contractor	Craig Geotechnical	Coordinates	North: East:
Casing Size/Type	4" steel	Drill Rig Operator	Rob Dollar	Total Depth Drilled (feet) 146.5	Rock Depth (feet) 141.5
Drill Rig Type	CME 55	Drill Bit Size/Type	3-7/8" Tricone roller	Sampler Type(s)	2" O.D. split spoon
Groundwater Level and Date Measured		Hammer Wt/Drop 140 lb / 30" (auto)	Casing Hammer Wt/Drop 140 lb / 30" (auto)	Core Barrel Size/Type	NX
Boring Location and Comments	see boring location plan			No. of Samples	Dist.: 31 Undist.: 0 Core (ft): 5

Depth, feet	Soil Samples: Type, Number	Recov. (ft)	Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Recov. (%)	RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								5" CONCRETE					
								Crushed Concrete, trace c-f SAND [FILL] (7)					
	S-1	0.3	5 4 3 2										
													Slight rig chattering from 2.5' to 4.0'
5	S-2	0.6	2 1 2 1					Gray - brown c-f SAND, trace gravel, some silt, trace concrete, trace brick fragments [FILL] (7)					
	S-3	1.2	4 4 2 3					Brown m-f SAND, some clay [SC] (6)					Casing to 9.0'
10	S-4A	0.5	3 2					Same as above [SC] (6)					
	S-4B	0.5	8 11					Brown - Gray c-f SAND, trace gravel, trace silt [SP] (3b)					
	S-5	1.0	13 15 16 17					Brown c-f SAND, some gravel, trace silt [SP] (3a)					
15	S-6	1.0	14 11 9 7					Brown fine SAND, some silt [SM] (3b)					
													Rig chattering from 19' to 20'
20	S-7	1.1	7 5 7 7					Brown silty fine SAND [SM] (3b)					
25													

Log of Boring B-11

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
25	S-8	0.9	7 10 10 8					Brown m-f SAND, some silt [SM] (3b)					
30	S-9	1.0	8 10 9 14					Same as above [SM] (3b)					
35	S-10	1.0	13 12 16 17					Brown m-f SAND, trace silt [SP] (3b)					
40	S-11	1.3	11 13 16 17					Brown m-f SAND, some silt [SM] (3b)					
45	S-12	0.8	15 20 21 15					Light Gray m-f SAND, trace silt [SP] (3a)					
50	S-13	1.2	12 19 20 18					Gray silty fine SAND [SM] (3a)					

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-11

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
55	S-14	1.2	12 19 23 18					Same as above [SM] (3a)					
60	S-15	1.3	18 20 20 19					Same as above [SM] (3a)					
65	S-16	1.5	20 21 19 19					Gray - Brown fine SAND, some silt [SM] (3a)					
70	S-17	1.5	16 23 24 22					Same as above [SM] (3a)					
75	S-18	1.5	16 21 25 24					Gray silty fine SAND [SM] (3a)					
80	S-19	1.3	18 20 22 20					Same as above [SM] (3a)					

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-11

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
85	S-20	1.2	13 17 26 23					Same as above [SM] (3a)					
90	S-21	1.3	16 23 21 24					Gray Sandy SILT [ML] (5a)					
95	S-22	0.4	16 34 57 40					Gray c-f SAND, trace silt [SP] (3a)					
100	S-23	1.0	24 25 35 26					Gray c-f SAND, some silt [SM] (3a)					Rig chattering from 102' to 105'
105	S-24	1.5	18 25 22 19					Gray silty fine SAND [SM] (3a)					
110	S-25	1.0	13 22 29 25					Gray silty fine SAND, trace gravel [SM] (3a)					

Project: 211 McGuinness Blvd	Log of Boring B-11
Project Location: Brooklyn, NY	
Project Number: 11100746	

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
115	S-26	1.0	60 40 51 52					Gray c-f SAND, some Gray - Red- White gravel, some silt [SM] (3a) (Decomposed rock)					Rig chattering from 116' to 118'
120	S-27	2.0	14 19 32 48					Red - Brown - White, weathered Granitic Gneiss rock, c-f grained (1d)					
125	S-28	2.0	18 29 47 67					Top 1' : Same as above Bot 1' : Gray - White, weathered Gneiss rock, c-f grained (1d)					
130	S-29	2.0	21 39 50 55					Gray - White, weathered Gneiss rock, c-f grained (1d)					
135	S-30	2.0	12 18 23 21					Same as above (1d)					
140	S-31	1.0	32 95 100/2"					Greenish gray, weathered Gneiss rock, c-f grained (1d)					

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-11

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
145				R-1	78	59		Top 0.9' : Greenish gray Gneiss rock, c-f grained, moderately weathered, closely fractured Bot 3.0': Gray Gneiss rock, c-f grained, unweathered, slightly fractured hard rock					
								End of Boring at 146.5' BGS					
150													
155													
160													
165													
170													

Project: 211 McGuinness Blvd Project Location: Brooklyn, NY Project Number: 11100746	# Log of Boring B-12 Sheet 1 of 4

Date(s) Drilled	3/6/15 - 3/9/15	Logged By	K. Vishnukanthan	Approximate Surface Elevation (feet)	14.15
Drilling Method	Mud Rotary	Drilling Contractor	Craig Geotechnical	Coordinates	North: East:
Casing Size/Type	4" steel	Drill Rig Operator	Rob Dollar	Total Depth Drilled (feet)	100.2 — Rock Depth (feet) N/A
Drill Rig Type	CME 55	Drill Bit Size/Type	3-7/8" Tricone roller	Sampler Type(s)	2" O.D. split spoon
Groundwater Level and Date Measured		Hammer Wt/Drop 140 lb / 30" (auto)	Casing Hammer Wt/Drop 140 lb / 30" (auto)	Core Barrel Size/Type	N/A
Boring Location and Comments	see boring location plan			No. of Samples	Dist.: 22 Undist.: 0 Core (ft): 0

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								6" CONCRETE					
	S-1	1.3	12 8 2 4					Dark gray c-f SAND, trace gravel, trace silt, trace concrete, trace brick fragments [FILL] (7)					
													Rig chattering from 3' to 4'
5	S-2	1.0	1 4 3 4					Brown m-f SAND, some clay, trace glass fragment, trace wood [FILL] (7)					
	S-3	0.7	2 1 1 1					Gray c-f SAND, some gravel, trace clay, trace brick fragments, trace plastic fragments [FILL] (7) Dark gray, Sandy CLAY with peat, trace gravel [OH] (6)					Casing to 9.0'
10	S-4	1.0	1 4 2 3					Dark gray, Sandy CLAY with peat [OH] (6)					
	S-5	1.5	1 1 2 2					Gray - brown, clayey SAND [SC] (6)					
15	S-6	1.5	3 4 7 6					Gray - brown m-f SAND, some silt, trace clay [SM] (3b)					
													Rig chattering from 18' to 19'
20	S-7	1.0	4 7 20 18					Brown clayey SAND, some gravel [SC] (3b)					
25													

Log of Boring B-12

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
25	S-8	1.0	4 6 7 7					Reddish brown c-f SAND, trace silt [SP] (3b)					
30	S-9	0.8	5 5 13 9					Brown c-f SAND, trace gravel, some silt [SM] (3b)					Rig chattering from 32' to 33'
35	S-10	1.1	11 11 11 12					Brown c-f SAND, trace gravel, trace silt [SP] (3b)					
40	S-11	1.0	10 12 12 10					Brown - Gray c-f SAND, some fine gravel, trace silt [SP] (3b)					
45	S-12	1.0	13 15 11 12					Gray c-f SAND, trace gravel, trace silt [SP] (3b)					
50	S-13	1.4	13 26 24 20					Brown silty fine SAND [SM] (3a)					

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
55	S-14	1.3	16 19 24 23					Same as above [SM] (3a)					
60	S-15	1.5	13 16 20 19					Gray m-f SAND, some silt [SM] (3a)					
65	S-16	1.4	16 22 22 21					Same as above [SM] (3a)					
70	S-17	1.6	26 33 27 31					Brown silty fine SAND [SM] (3a)					
75	S-18	1.5	18 28 29 28					Brown silty fine SAND [SM] (3a)					
80	S-19	2.0	20 30 36 36					Brown sandy SILT [ML] (5a)					Interbeded sand and silt

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-12

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
85	S-20	1.4	18 24 27 27					Brown - Gray c-f SAND, trace silt [SP] (3a)					
90	S-21	1.6	14 22 23 26					Gray m-f SAND, some silt [SM] (3a)					
95	S-22	1.3	23 32 40 34					Gray Gravelly SAND, some silt [SM] (3a)					
100	S-23	0.0	100/2"					No recovery End of Boring at 100.2' BGS					Rig chattering from 99' to 100', Hard drilling, Split spoon bouncing, Possibly bedrock
105													
110													

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-13

Date(s) Drilled	3/12/15	Logged By	K. Vishnukanthan	Approximate Surface Elevation (feet)	14.10
Drilling Method	Mud Rotary	Drilling Contractor	Craig Geotechnical	Coordinates	North: East:
Casing Size/Type	4" steel	Drill Rig Operator	Rob Dollar	Total Depth Drilled (feet)	45.0 / Rock Depth (feet) N/A
Drill Rig Type	CME 55	Drill Bit Size/Type	3-7/8" Tricone roller	Sampler Type(s)	2" O.D. split spoon
Groundwater Level and Date Measured		Hammer Wt/Drop	140 lb / 30" (auto); Casing Hammer Wt/Drop 140 lb / 30" (auto)	Core Barrel Size/Type	N/A
Boring Location and Comments	see boring location plan			No. of Samples	Dist.: 10 Undist.: 0 Core (ft): 0

Depth, feet	Soil Samples: Type, Number	Recov. (ft)	Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Recov. (%)	RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								1.5' CONCRETE					
	S-1	0.3	4 3 2 2					Gray c-f SAND with concrete, trace gravel [FILL] (7)					Slight rig chattering from 3.5' to 4.0'
5	S-2	0.4	2 1 4 6					Black c-f SAND, trace gravel, trace brick fragments [FILL] (7)					
													Rig chattering from 9.0' to 10.0', Casing to 9.0'
10	S-3	1.5	WOH 5 3 2					Gray CLAY, trace Sand [CL] (4c)					
								Black PEAT, some gray clay [OH] (6)					
15	S-4	1.0	1 3 5 4					Gray clayey SAND [SC] (6)					
								Brown sandy CLAY [CL] (4c)					Rig chatter at 19.0'
20	S-5	1.3	4 3 5 5										
25													

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-13

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
25	S-6	1.0	5 7 6 7					Brown c-f SAND, trace gravel, some silt [SM] (3b)					
30	S-7	1.0	8 9 9 10					Brown - Gray c-f SAND, trace silt [SP] (3b)					
35	S-8	1.3	6 7 10 9					Brown silty SAND [SM] (3b)					
40	S-9	1.3	6 10 11 11					Brown m-f SAND, some silt [SM] (3b)					
	S-10	1.0	14 25 22 26					Same as above [SM] (3a)					
45								End of Boring at 45' BGS					
50													

Project: 211 McGuinness Blvd
Project Location: Brooklyn, NY
Project Number: 11100746

Log of Boring B-14

Date(s) Drilled	3/9/15 - 3/10/15	Logged By	K. Vishnukanthan	Approximate Surface Elevation (feet)	14.15
Drilling Method	Mud Rotary	Drilling Contractor	Craig Geotechnical	Coordinates	North: East:
Casing Size/Type	4" steel	Drill Rig Operator	Rob Dollar	Total Depth Drilled (feet)	100.0 — Rock Depth (feet) N/A
Drill Rig Type	CME 55	Drill Bit Size/Type	3-7/8" Tricone roller	Sampler Type(s)	2" O.D. split spoon
Groundwater Level and Date Measured		Hammer Wt/Drop	140 lb / 30" (auto) — Casing Hammer Wt/Drop 140 lb / 30" (auto)	Core Barrel Size/Type	N/A
Boring Location and Comments	see boring location plan			No. of Samples	Dist.: 22 Undist.: 0 Core (ft): 0

Depth, feet	Soil Samples: Type, Number	Recov. (ft)	Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Recov. (%)	RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								6" CONCRETE					
	S-1	1.0	6 6 8 5					Black c-f SAND with concrete, trace brick fragments [FILL] (7)					
													Rig chattering from 4.0' to 5.0'
5	S-2	0.6	3 2 2 3					Gray Gravelly SAND, trace clay, trace brick fragments, trace concrete fragments [FILL] (7)					
													Casing to 9.0'
10	S-3	0.8	WOH WOH WOH WOH					Top 10" : Yellowish brown CLAY, trace sand [CL] (6) Bot 10" : Yellowish brown Sandy CLAY [CL] (6)					
	S-4	0.0	1 3 3 3					No recovery					
15	S-5	0.9	6 7 10 15					Brown c-f SAND, some gravel, some silt [SM] (3b)					
													Rig chattering from 17.0' to 18.0'
20	S-6	0.5	8 9 8 6					Brown m-f SAND, some clay [SC] (3b)					
25													

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
25	S-7	1.0	4 7 8 8					Brown m-f SAND, some silt [SM] (3b)					
30	S-8	1.3	8 12 13 10					Brown m-f SAND, trace silt [SP] (3b)					
35	S-9	1.5	11 15 18 18					Brown c-f SAND, trace silt [SP] (3a)					
40	S-10	1.5	12 16 18 15					Same as above [SP] (3a)					
45	S-11	1.4	15 19 19 22					Brown m-f SAND, trace silt [SP] (3a)					
50	S-12	1.3	13 16 18 21					Gray fine SAND, some silt [SM] (3a)					

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
55	S-13	1.2	11 16 19 17					Gray SILTY fine SAND [SM] (3a)					
60	S-14	1.3	13 20 24 23					Gray fine SAND, some silt [SM] (3a)					
65	S-15	1.3	17 22 24 26					Same as above [SM] (3a)					
70	S-16	1.3	18 23 23 28					Same as above [SM] (3a)					
75	S-17	1.4	20 17 23 25					Brown silty SAND [SM] (3a)					
80	S-18	1.3	19 22 27 28					Brown fine sandy SILT [ML] (5a)					

Log of Boring B-14

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont.(%)	% Fines	REMARKS/ OTHER TESTS
85	S-19	1.7	16 17 29 30					Same as above [ML] (5a)					
90	S-20	1.3	15 24 22 26					Same as above [ML] (5a)					
95	S-21	1.7	15 20 21 29					Brown - Gray, Sand - Silt mixtures (Interbedded) [ML] (5a)					
	S-22	1.7	18 22 25 33					Brown fine sandy SILT [ML] (5a)					
100								End of Boring at 100' BGS					
105													
110													

Project: 211 McGuinness Blvd **Project Location: Brooklyn, NY** **Project Number: 11100746**	**Log of Boring B-14A** Sheet 1 of 1

Date(s) Drilled	**3/9/15**	Logged By	**K. Vishnukanthan**	Approximate Surface Elevation (feet)	**14.15**
Drilling Method	**Mud Rotary**	Drilling Contractor	**Craig Geotechnical**	Coordinates	**North:** **East:**
Casing Size/Type	**4" steel**	Drill Rig Operator	**Rob Dollar**	Total Depth Drilled (feet) **8.8**	Rock Depth (feet) **N/A**
Drill Rig Type	**CME 55**	Drill Bit Size/Type	**3-7/8" Tricone roller**	Sampler Type(s)	**2" O.D. split spoon**
Groundwater Level and Date Measured		Hammer Wt/Drop **140 lb / 30" (auto)**	Casing Hammer Wt/Drop **140 lb / 30" (auto)**	Core Barrel Size/Type	**N/A**
Boring Location and Comments	**see boring location plan**			No. of Samples	**Dist.: 3 Undist.: 0 Core (ft): 0**

Depth, feet	Soil Samples: Type, Number	Soil Samples: Recov. (ft)	Soil Samples: Pen. Resist. (blows/6 in)	Rock Coring: Run Number	Rock Coring: Recov. (%)	Rock Coring: RQD (%)	Graphic Log	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Water Cont. (%)	% Fines	REMARKS/ OTHER TESTS
0								6" CONCRETE					
	S-1	1.0	6 6 8 5					Black c-f SAND with concrete, trace brick fragments [FILL] (7)					
													Rig chattering from 4' to 5'
5	S-2	0.1	5 100/3"					Concrete fragments at the tip [FILL] (7)					Casing to 5.0' Slow advancement from 5.5' to 8.0'
	S-3	0.4	13 100/3"					Crushed concrete and brick fragments [FILL] (7)					
								End of Boring at 8.8' BGS					Spoon refusal encountered, possibly footing, driller decided to move the boring loaction
10													
15													
20													
25													

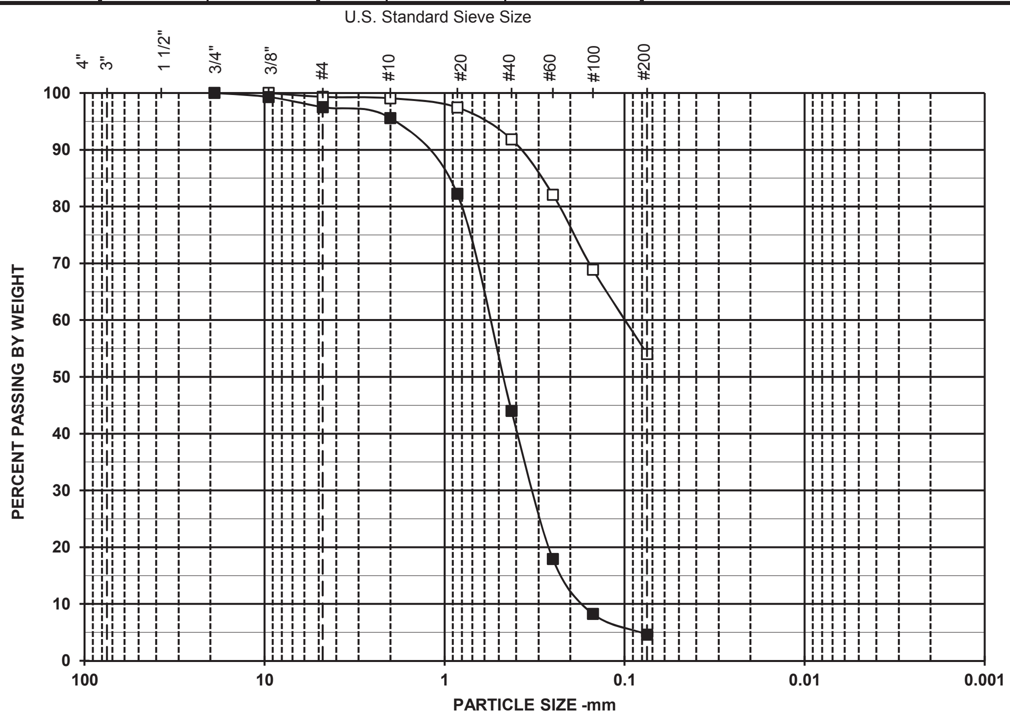
APPENDIX B
LABORATORY TESTING RESULTS

URS #11100746
211 McGuinness Blvd.
LABORATORY TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS						REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	
B-1	S-3	10-12	25.6				CL	54.0	
B-1	S-9	40-42	17.2				SP	4.6	
B-2	S-4	9-11	19.0				SC	37.7	
B-2	S-5	15-17	20.4				SC	37.3	
B-3	S-4	15-17	305.1	489	185	304	OH		
B-3	S-5	20-22	26.8	41	23	18	CL		
B-4	S-3	10-12	18.8				SC	45.4	
B-4	S-5	20-22	21.6	36	22	14	CL		

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

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



Symbol	□	■	○
Boring	B-1	B-1	
Sample	S-3	S-9	
Depth	10-12	40-42	
% +3"	0.0	0.0	
% Gravel	0.7	2.5	
% SAND	45.3	92.9	
%C SAND	0.2	1.9	
%M SAND	7.2	51.6	
%F SAND	37.8	39.4	
% FINES	54.0	4.6	
% -2μ			
D_{100} (mm)	9.50	19.00	
D_{60} (mm)	0.11	0.60	
D_{30} (mm)		0.33	
D_{10} (mm)		0.17	
Cc		1.1	
Cu		3.6	

Particle Size (Sieve #)	PERCENT FINER □	■	○
4"			
3"			
1 1/2"			
3/4"		100.0	
3/8"	100.0	99.3	
4	99.3	97.5	
10	99.1	95.6	
20	97.5	82.2	
40	91.8	44.0	
60	82.1	17.9	
100	68.9	8.2	
200	54.0	4.6	

SYMBOL	w (%)	LL	PL	PI	USCS	DESCRIPTION AND REMARKS	Date Tested
□	25.6				CL	Gray, Sandy lean clay	12/16/2014
■	17.2				SP	Brown, Poorly graded sand	12/16/2014
○							

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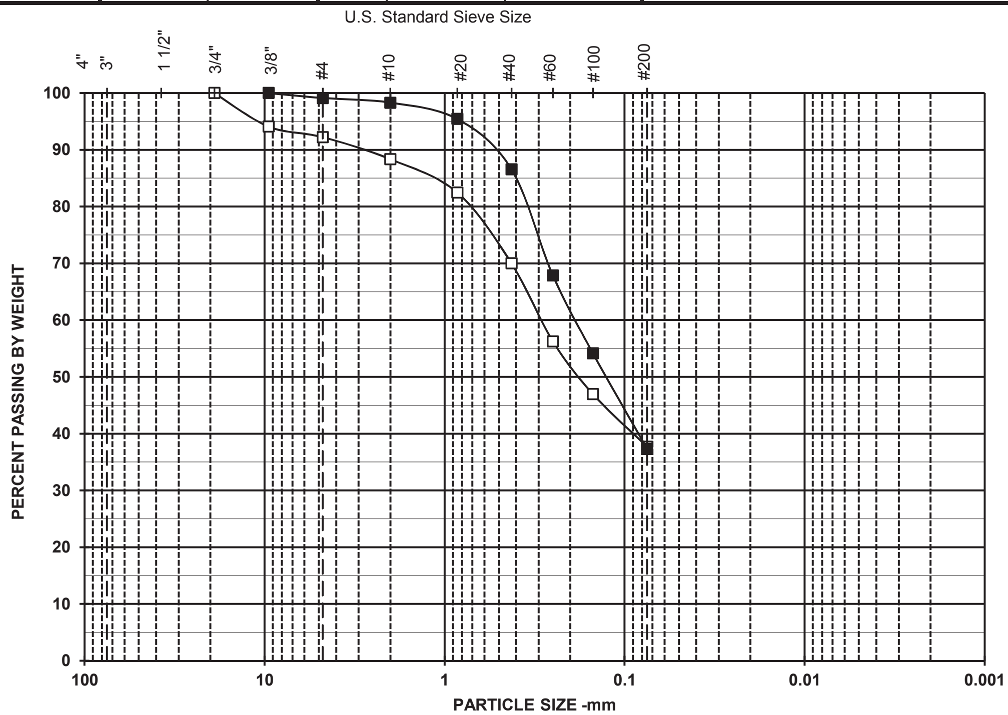
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



Symbol	□	■	○
Boring	B-2	B-2	
Sample	S-4	S-5	
Depth	9-11	15-17	
% +3"	0.0	0.0	
% Gravel	7.8	0.9	
% SAND	54.5	61.8	
%C SAND	3.9	0.8	
%M SAND	18.4	11.7	
%F SAND	32.3	49.3	
% FINES	37.7	37.3	
% -2μ			
D_{100} (mm)	19.00	9.50	
D_{60} (mm)	0.30	0.19	
D_{30} (mm)			
D_{10} (mm)			
Cc			
Cu			

Particle Size (Sieve #)	PERCENT FINER □	■	○
4"			
3"			
1 1/2"			
3/4"	100.0		
3/8"	94.1	100.0	
4	92.2	99.1	
10	88.3	98.3	
20	82.5	95.4	
40	70.0	86.6	
60	56.2	67.9	
100	47.0	54.2	
200	37.7	37.3	

SYMBOL	w (%)	LL	PL	PI	USCS	DESCRIPTION AND REMARKS	Date Tested
□	19.0				SC	Brown, Clayey sand	12/16/2014
■	20.4				SC	Brown, Clayey sand	12/16/2014
○							

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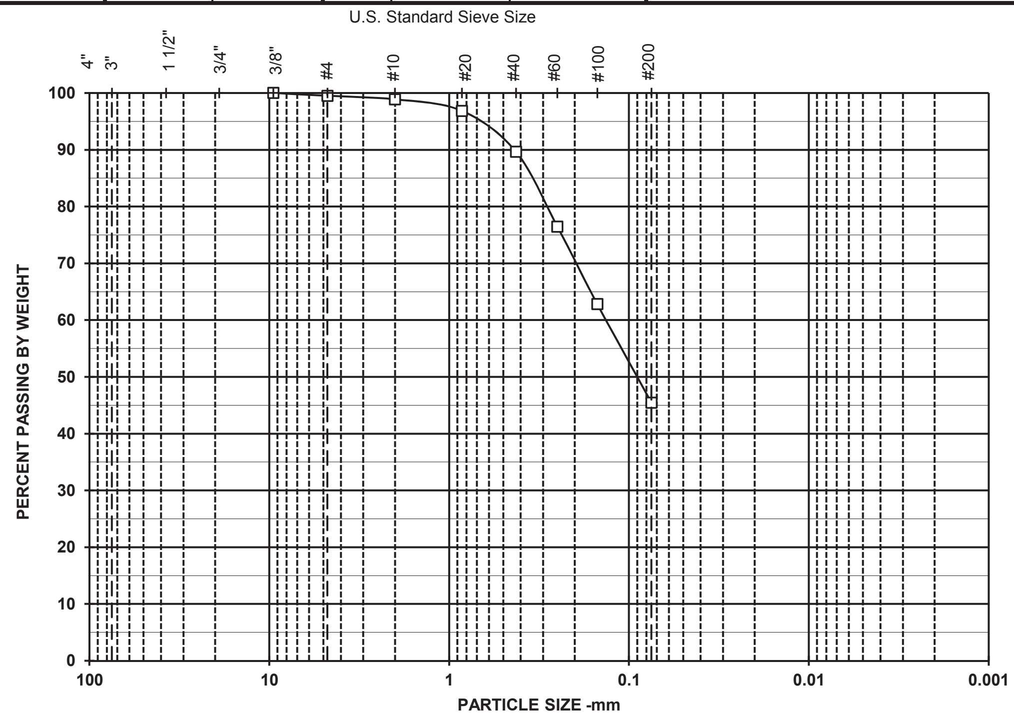
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



Symbol	□	■	○
Boring	B-4		
Sample	S-3		
Depth	10-12		
% +3"	0.0		
% Gravel	0.5		
% SAND	54.1		
%C SAND	0.6		
%M SAND	9.2		
%F SAND	44.2		
% FINES	45.4		
% -2μ			
D_{100} (mm)	9.50		
D_{60} (mm)	0.14		
D_{30} (mm)			
D_{10} (mm)			
Cc			
Cu			

Particle Size (Sieve #)	PERCENT FINER □	■	○
4"			
3"			
1 1/2"			
3/4"			
3/8"	100.0		
4	99.5		
10	98.9		
20	96.9		
40	89.7		
60	76.5		
100	62.8		
200	45.4		

SYMBOL	w (%)	LL	PL	PI	USCS	DESCRIPTION AND REMARKS	Date Tested
□	18.8				SC	Brown, Clayey sand	12/16/2014
■							
○							

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