Exhibit C-2

EMPIRE GEO SERVICES, INC.
A SUBSIDIARY OF SJB SERVICES, INC.

☒ CORPORATE/ BUFFALO OFFICE
5167 South Park Avenue
Hamburg, NY 14075
Phone: (716) 649-8110
Fax: (716) 649-8051

☐ ALBANY OFFICE
PO Box 2199
Ballston Spa, NY 12020

5 Knabner Road
Mechanicville, NY 12118
Phone: (518) 899-7491
(518) 899-7496

☐ CORTLAND OFFICE
60 Miller Street
Cortland, NY 13045
Phone: (607) 758-7182
Fax: (607) 758-7188

☐ ROCHESTER OFFICE
535 Summit Point Drive
Henrietta, NY 14467
Phone: (585) 359-2730
Fax: (585) 359-9668

Final Geotechnical Evaluation Report for Former Buffalo Memorial Auditorium Site Proposed Buffalo Canal Side Development Buffalo, New York

Prepared For:

Erie Canal Harbor Development Corporation

c/o C&S Companies
90 Broadway Street
Buffalo, New York, 14203

Prepared By:

Empire Geo-Services, Inc.
5167 South Park Avenue
Hamburg, New York, 14075

STATE OF NEW YORK
JOHN JOSEPH DANZER
No. 065989
LICENSED PROFESSIONAL ENGINEER

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1.00 INTRODUCTION

1.10 GENERAL

This final report presents a comprehensive summary of the subsurface explorations and geotechnical engineering evaluations, completed by Empire Geo-Services, Inc. (Empire), for the proposed Buffalo Canal Side Development planned at the former Buffalo Memorial Auditorium (Auditorium) site, in downtown Buffalo, New York. The approximate location of the project site is shown on Figure 1.

This final report includes additional subsurface information from the test borings recently completed in the south portion of the site, along with laboratory test data, and presents additional geotechnical evaluations, considerations and recommendations made since the issuance of our preliminary geotechnical report on July 14, 2009.

C&S Companies, on behalf of the Erie Canal Harbor Development Corporation (ECHDC), retained Empire to complete the subsurface exploration program and provide geotechnical engineering recommendations for the proposed project. This work was completed in general accordance with our April 28, 2009 proposal, and the subsequent authorized modifications, as presented in our supplemental services proposal dated September 11, 2009.

The subsurface exploration program consisted of the following, which serve as a basis for our geotechnical evaluation and recommendations presented herein:

- Completion of test borings at fourteen locations (designated as B-1 through B-14) throughout the former Buffalo Memorial Auditorium site;

- Installation of groundwater observation wells within four (4) of the completed test borings (i.e. at locations B-1, B-4, B-7A and B-10);

- Measuring and recording the groundwater levels in the observation wells on several occasions during our study;

- Excavation of two (2) test pits in the bottom of the lower bowl area, at the north end, of the former auditorium;

- Coring and investigation of the upper slab component of the existing Sub-Basement floor system;

- Extraction of two (2) existing piles to evaluate their condition with regard to potential corrosion and re-use within the existing sub-basement foundation structure;

- Laboratory testing of representative recovered soil samples and bedrock core samples to help characterize the soils and their index properties, as well as develop appropriate engineering parameters; and

- Review of historical test boring information from the site, dating back to 1901 through 1939, prior to the construction of the Auditorium.

SJB Services, Inc. (SJB), our affiliated drilling and testing company completed the recent test borings and installed the groundwater observation wells. In addition, SJB completed geotechnical laboratory testing on the selected soil and bedrock samples. Demco, Inc., the Auditorium demolition contractor, excavated the two test pits, which were observed and documented by Empire.

Based on the findings from the exploration program, as well as our review of the historic data, Empire prepared this report, which summarizes the subsurface conditions, and presents geotechnical considerations and recommendations for planning the design and construction of the proposed Buffalo Canal Side Development on the site.

1.20 SITE DESCRIPTION

The proposed Buffalo Canal Side Development will be located within the limits of the former Auditorium site. As shown on Figure 2, this includes approximately 5.2 acres bound by Commercial Street and Pearl Street to the west, Lower Terrace to the north, Main Street to the east, and Marine Drive to the south.

The site currently consists of a rough graded site following demolition of the Auditorium, which is surrounded by a chain link fence. The basement level or lower bowl floor within the former Auditorium was reportedly at elevation (El.) 580.2 feet and has been graded following removal of the floor system to about El. 579 feet. A sub-basement area exists within the southwest portion of the site, which extends approximately 15 feet below the basement level floor, or approximately El. 565 feet. A portion of the sub-basement walls and the entire floor system currently remain in-place and are planned to be incorporated into the Buffalo Canal Side Development plan. The former Auditorium structure was supported on driven piles, end bearing on bedrock.

The area between the former Auditorium basement or bowl area, and the roadways surrounding the site, has be graded to slope up to the adjacent sidewalks and roadways. The upper ground surface along the roadways drops in elevation from north to south, with surface elevations ranging from about El. 600 feet at the north end of the site to about El. 586 feet at the south end of the site.

As shown on Figure 2, the former Erie Canal / commercial slip extended from the Buffalo River (near the current Naval and Military Park) to the west side of the site and connected with a northwest to southeast aligned former canal. The "Hamburg Drain", which is an approximate 16 feet wide by 13 feet deep trunk sewer, is located within this former canal area. The top of the Hamburg Drain is reportedly at approximate elevation 575 feet.

1.30 PROJECT DESCRIPTION

The proposed Buffalo Canal Side Development is currently in the conceptual design phase, therefore, estimated structural loads and final design details were not available to Empire prior to preparation of this report. The facility, however, is expected to consist of a three level parking ramp and multi-story commercial structure at the north end of the site, and several interconnected building structures within the south portion of the project site. A series of canals or surface pools will bisect the site. The lower level floor elevation for the proposed parking ramp and buildings is expected to be near El. 580 feet, which is about 6 to 20 feet below the adjacent site grades at the surrounding roadways. Ground floor construction is currently planned as slab-on-grade.

Due to the known fill soils, the relatively shallow groundwater conditions, and the relatively loose soil conditions in this part of Downtown Buffalo, it is anticipated that the proposed development will be supported on a deep foundation system end bearing on bedrock. A conceptual site plan showing the currently proposed development is presented on Figure 3.

2.00 SUBSURFACE EXPLORATION

The subsurface exploration program was completed by SJB Services, Inc. (SJB), Empire's affiliated drilling company, during two phases. The first phase was completed during June, 2009 and the second phase was completed during September and October, 2009. The combined phases of the subsurface exploration program consisted of 14 test borings and the installation of four groundwater observation wells. In addition, two test pit explorations were made by Demco, Inc. on July 10, 2009. The test borings are designated B-1 through B-14 and the groundwater observation wells are identified by the test borings in which they were installed (i.e. observation wells B-1, B-4, B-7A, and B-14). The test pits are designated as TP-1 and TP-2. The approximate exploration and groundwater observation well locations are shown on Figure 2.

The test boring locations were initially selected by Empire and C&S, at mutually agreed upon locations. SJB then staked the test borings in the field using tape measurements referenced to existing site features. Following completion of the drilling, Foit Albert Associates obtained the "as-drilled" locations of the test borings and monitoring wells, and determined the ground surface elevations. This data was then provided to Empire for inclusion with this report. The two test pit locations were plotted on Figure 2 based on tape measurements made from existing site features. The ground surface elevations at the test pit locations were estimated to be 580.2 feet (i.e. floor of the former Auditorium).

The test borings were made using a Central Mine Equipment (CME) model 550X, all terrain tire mounted drill rig, and a CME model 85 truck mounted drill rig. All the test borings were advanced using hollow stem auger and split spoon sampling techniques. Split spoon samples and Standard Penetration Tests (SPTs) were taken continuously from the ground surface to a depth of 14 to 56 feet and in intervals of five feet or less below the zone of continuous sampling. The split spoon sampling and SPTs were completed in general accordance with *ASTM D 1586 - "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils"*.

With the exception of test borings B-3, B-3A, and B-7 the test borings were advanced through the overburden until encountering auger refusal conditions (presumed top of bedrock), which was encountered at depths ranging from about 35.7 feet (B-9) to 60.6 feet (B-3B). Following auger refusal within test borings B-2, B-5, B-8, B-11, and B-14, approximately 4.8 feet to 7.0 feet bedrock was cored in general accordance with *ASTM D 2113 – "Standard Practice for Rock core Drilling and Sampling of Rock for Site Investigation"*.

During the first phase of the investigation, test boring B-3 encountered auger refusal conditions on an obstruction at a depth of 19.7 feet. A new test boring, identified as B-3A was drilled about 15 feet west of test boring B-3 and was advanced to a depth of 18.1 feet, where auger refusal conditions were encountered again. The refusal material within test boring B-3A was cored and determined to consist of an approximate 2 feet thick sandstone block, possibly related to a former structure. The soil beneath the obstruction was sampled by driving continuous split-spoons to a depth of 28.5 feet. The test boring was terminated after the side walls collapsed at a depth of 21.7 feet. During the second phase of the investigation, test boring B-3B was completed about 15 feet north of test boring B-3A. Test boring B-3B was advanced to the presumed top of bedrock without encountering the shallower refusal conditions identified within test borings B-3 and B-3A.

Similar to test boring B-3, the first attempt to complete test boring B-7 encountered auger refusal conditions at a depth of about 12.9 feet. A second test boring, identified as B-7A, was completed about 10 feet south of test boring B-7. At the revised location, the test boring was advanced to the top of the presumed bedrock without encountering the shallower refusal conditions identified within test boring B-7.

A Geologist from SJB prepared the test boring logs based on visual observation of the recovered soil and bedrock samples and a review of the driller's field notes. The soil samples were described based on visual/manual estimation of the grain size distribution, along with characteristics such as color, relative density, consistency, moisture, etc. The recovered rock core samples were also described, including characteristics such as color, rock type, hardness, weathering, bedding thickness, core recovery and rock quality designation (RQD). The test boring logs are presented in Appendix A, along with general information and a key of terms and symbols used to prepare the logs.

The groundwater observation wells installed in completed test borings B-1, B-4, B-7A, and B-10, consisted of a 2-inch diameter PVC well screen and riser pipe with a sand filter, bentonite seal and soil backfill. The wells were completed with a protective surface casing. Additional details regarding the construction of the observation wells are shown on the Monitoring Well Completion Records presented following their respective test boring logs in Appendix A.

The test pits were made by Demco, Inc. using a Caterpillar 330C, track type excavator, with a 32 inch wide bucket. The test pits were excavated to a depth ranging from about 8 feet to 9 feet, where the test pit sidewalls began to collapse due to groundwater infiltration. The soils encountered within the test pits were observed and logged by a Geologist from SJB Services, Inc. (SJB). The test pit logs are included in Appendix B.

3.00 LABORATORY TESTING

Several of the collected soil and bedrock samples were tested in SJB's geotechnical testing laboratory to confirm soil classifications, provide soil index properties, and assist with estimating soil and bedrock engineering properties. In addition, several soil samples were tested by SJB and Paradigm Environmental Services, Inc. (Paradigm) to evaluate their potential corrosiveness to steel and concrete.

3.10 GEOTECHNICAL LABORATORY TESTING

The geotechnical laboratory testing completed on some of the collected soil and bedrock samples included the following tests.

- Natural moisture content in accordance with *ASTM D 2216 – "Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass"*.
- Grain size analyses (sieve analyses only) in accordance with *ASTM C136– "Standard Test Method for Particle-Size Analysis of Soils"*.
- Liquid Limit, Plastic Limit, and Plasticity Index of Soil in accordance with *ASTM D 4318 – "Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils"*.
- Unconfined compressive strength in accordance with *ASTM D2938- "Standard Test Method for Unconfined Compressive Strength of Intact Rock Core Specimens"*.

The following matrix summarizes the soil and bedrock samples tested and the tests performed. The geotechnical laboratory test data is presented in Appendix C and is discussed in Section 5.30 and 5.40 of this report.

Summary of Geotechnical Laboratory Testing Completed					
Test Boring	Sample Depth (ft. bgs)	Moisture Content	Grain Size Analysis	Liquid Limit / Plastic Limit / Plasticity Index	Unconfined Compressive Strength
B-2	32 to 34		X		
B-2	46 to 48		X		
B-5	20 to 22		X		
B-5	38 to 40		X		
B-7A	14 to 16	X		X	
B-9	10 to 12	X		X	
B-10	28 to 30		X		
B-12	16 to 18		X		
B-14	12 to 14		X		
B-14	25 to 27		X		
B-2	58				X
B-5	54.5				X
B-5	57.5				X
B-5	60				X
B-8	43				X
B-11	42				X

Notes:
1. ft. bgs = feet below ground surface.

3.20 ANALYTICAL LABORATORY TESTING

The laboratory testing completed on some of the collected fill soil samples to evaluate their potential corrosiveness to steel and concrete included the following tests.

- Resistivity, redox, pH, and sulfides according to procedures established by the Ductile Iron Pipe Research Association (DIPRA).
- Chloride ion and sulfate ion in accordance with Analytical Methods SW 9056 and EPA 300.

The following matrix summarizes the soil samples tested and tests performed. The analytical laboratory test data is presented in Appendix D and is discussed in Section 5.20 of this report.

Summary of Analytical Laboratory Testing Completed				
Test Boring or Test Pit	Sample Depth (ft. bgs)	DIPRA Test	Sulfates	Chlorides
B-1	16 to 24		X	X
B-2	6 to 12	X		
B-3	4 to 8	X		
B-4	2 to 6		X	X
B-5	2 to 8	X		
TP-1	Near Surface		X	X
TP-2	2 to 3		X	X
B-7	8 to 10		X	X
B-9	2 to 8	X		
B-10	6 to 8		X	X
B-14	2 to 4	X		

Notes:
1. ft. bgs = feet below ground surface.

4.00 EXISTING SUBSURFACE DATA

Two drawings were provided by C&S which present the results from previously completed test borings within the area of the project site. The first drawing is a November 23, 1938 drawing titled "Plot Plan – Showing Existing Bldgs. – R.R. Siding – Test Borings". This drawing shows the location of 14 test borings (borings A through P with borings I and O omitted), and a generalized soil and presumed bedrock profile. The test boring data were reportedly obtained from the City of Buffalo Sewer Authority records from 1901, 1912, 1925, and 1936. The drawing also shows the location of 14 proposed test borings (numbers 1 through 14).

The second drawing is dated February, 1939 and is identified as "Sheet No. X-2". This drawing shows the location of 14 test borings, designated as Hole #1 through Hole #14, and provides a general soil and groundwater elevation profile as well as presumed top of bedrock elevations. The test borings were reportedly completed by Riley Engineering and Drilling Company.

The generalized soil profiles included a soil description at intervals of about 5 feet. The transition depth from fill soils to indigenous soils was estimated as the midpoint between the last fill soil sample and the first indigenous soil sample. Standard Penetration Test "N" values were not reported on the generalized soil profiles. Information pertaining to the subsurface conditions obtained from these drawings is discussed in Section 5.00 of this report and is summarized on Table 1.

The elevations included on the drawings are referenced to the City of Buffalo Datum. The conversion from the City of Buffalo Datum to the United States Geologic Survey Datum (NGVD29) was made by adding 575.453 feet to the City of Buffalo Datum elevation. The City of Buffalo Datum Elevation, equal to 0.00 feet, is reported to be near the mean water level of Lake Erie

5.00 SUBSURFACE CONDITIONS

5.10 GENERAL

Based on the 14 recently completed test borings, and our review of the existing subsurface data, the general subsurface stratigraphy at the project site consists of fill soils at the surface which typically extended down to an elevation between 570 and 575 feet. Test borings completed within the apparent limits of the former canals had fill soils extending down to about elevation 560 feet. Beneath the fill layer, the indigenous soils consisted predominately of silty sands. Exceptions include the southern portion of the site, where a stratum of silty clay and clayey silt soils were encountered beneath the fill layer, prior to encountering the sand soils. In addition, peat/organic soils were encountered at test boring B-8 within the 25 to 27 feet deep sample. Limestone bedrock was encountered at an approximate elevation ranging from 537 feet to 546 feet.

The soil stratigraphy encountered and the groundwater conditions observed are described in more detail in the following sections and on the test boring logs in Appendix A. Table 1 presents a summary of the depths and elevation to the bottom of the fill soils and to the top of bedrock.

5.20 FILL SOILS

Fill soils were encountered beneath the surface conditions (i.e. sidewalks) or directly at the surface. The fill soils within the limits of the project site typically extended down to an elevation between 570 and 575 feet. Exceptions include test borings B-1, B-10, B-11, Hole #4, #5, #12, and borings F and J, where the fill soils extended down to an elevation between 555 feet and 564 feet. Based on the 1938 and 1939 mapping, these eight test borings appear to have been completed within the limits of the former canals. The depth to the bottom of the fill layer along with the corresponding elevation at each test boring location is presented on Table 1.

The nature of the fill soils varied widely with location and depth. Within the recently completed test borings, the fill typically consisted of reworked silty sands and gravels with varying amounts of brick fragments, ash, cinders, concrete fragments, organics, and wood. Zones of fill consisting predominately bricks, with a thickness ranging from about 2 to 6 feet, were also encountered within several of the test borings. In addition, within test borings B-1, B-5, B-9, and B-10, a portion of the fill soils, with a thickness ranging from about 6 to 15 feet, consisted of reworked sandy and silty clay soils with varying amounts of intermixed fill type materials (i.e. brick fragments, ash, etc.). Silty clay fill soils, with a thickness less than 3 feet were also observed sporadically within test boring B-2. The Standard Penetration Test (SPT) "N" values obtained within the fill soils ranged from 2 to greater than 50, but were typically less than 12. The variable nature of the fill soils, coupled with the variable SPT "N" values, are an indication the fill was likely installed in an uncontrolled manner.

The fill soils encountered within the circa early 1900 test borings also had a variable description, and are described as: clay fill; sand and cinders; silt fill; river mud; mixed fill; sand with organic matter; cinders; brick with ashes and dirt; brick and ashes; clay, sand and wood; timbers; and soft clay with pieces of brick.

As noted, several composite soil samples collected from the fill layer were tested for resistivity, redox, pH, and sulfides according to procedures established by the Ductile Iron Pipe Research Association (DIPRA). Several fill soil samples were also tested for chloride ion and sulfate ion. This analytical laboratory test data is included in Appendix D and is summarized in the following tables.

Summary of DIPRA Test Results

Test Boring	Sample Depth (feet bgs)	Resistivity (ohm-cm)	Redox (mv)	ph	Sulfides	Moisture (%)	Total DIPRA Points
B-2	6 to 12	1,900	35.6	7.5	Trace	8.5	12
B-3	4 to 8	3,200	-12.2	7.3	Trace	9.2	8
B-5	2 to 8	6,400	-35.8	8.1	Trace	9.0	8
B-9	2 to 8	1,100	-109	8.0	Negative	8.6	16
B-14	2 to 4	2,300	-45.3	7.8	Negative	9.2	8

Based on the DIPRA publication "American National Standard for Polyethylene Encasement for Ductile Iron Pipe Systems", if the total DIPRA points exceed 10, the soil is considered corrosive to ductile iron pipe, and protection against exterior corrosion should be provided.

Summary of Chloride and Sulfate Test Results			
Test Boring	Sample Depth (feet bgs)	Chloride (ug/g)	Sulfate (ug/g)
B-1	16 to 24	244	722
B-4	2 to 6	20	297
Test Pit #1	Near Surface	non detect (< 20)	179
Test Pit #2	2 to 3	non detect (< 20)	150
B-7	8 to 10	19.3	non detect (<50)
B-10	6 to 8	398	non detect (<50)

Based on the sulfate concentrations, these soils are considered to have a negligible potential for sulfate exposure. However, the water soluble sulfate concentration of the soil sample collected from test boring B-1 is near the upper limit of the range considered to be negligible.

5.30 INDIGENOUS SOILS

Beneath the fill soils, the indigenous soils typically consisted of silty sands with varying amounts of gravel, extending to the top of bedrock. Exceptions include a thin veneer of silty clay soils encountered beneath the fill layer within test borings B-2 and B-3A. In addition, thicker zones of silty clay and clayey silt soils (i.e. about 2 feet to 10 feet thick) were encountered within the southern portion of the site, at the recently completed test borings B-7, B-8, B-9, B-10, and B-14, along with the circa 1939 borings #7, #8, #9, #13, and #14. These silty clay and clayey silt soils generally extended from the bottom of the fill layer to approximate elevation 560 to 565 feet. Within test boring B-8, the soil sample collected at a depth of 25 to 27 feet (approximate elevation 560 feet) consisted of peat. Trace amounts of wood were also noted within test boring B-7A near elevation 560 feet.

The silty sand soils are classified as a SM and SP group soil using the Unified Soil Classification System (USCS). The SPT "N" values obtained within the granular sand soils ranged from "weight of hammer" (i.e. only the weight of the hammer and rods required to advance the sample spoon) to 40, with an average about 12, indicating the soils have a variable relative density of "very loose" to "compact", but are typically "firm". When drilling within the sand soils, "running sands" (i.e. flow of sands into the augers after removing the center plug) were often encountered, generally beneath elevation 560 feet. The geotechnical laboratory testing completed on collected samples of the sand soils, as summarized in the table below, indicate the soils typically consists of about 70 to 95 percent sand size particles, with the remaining portions consisting of gravel, silt, or clay size particles. The percentage of silt and clay size particles was typically less than 10 percent. The soil sample from test boring B-14 at 12 to 14 feet consisted of a sandy clayey silt.

The cohesive silty clay and clayey silt soils, encountered within some of the test borings, are classified as a CL and ML group soil using the USCS. The SPT "N" values obtained within these soils ranged from "weight of hammer" to 12, indicating the cohesive soils have a "very soft" to "stiff" consistency. The geotechnical laboratory testing completed on collected samples of the silty clay and clayey silt soils, as summarized in the table below, indicate the soils have a plasticity index of 4 to 10, correlating to a low to medium degree of plasticity.

Summary of Geotechnical Laboratory Test Results

Test Boring	Sample Depth (ft. bgs)	Moisture Content (%)	Particle Size Analysis			LL / PL / PI
			Gravel (%)	Sand (%)	Silt & Clay (%)	
B-2	32 to 34		17.6	71.8	10.6	
B-2	46 to 48		15.6	73.2	11.2	
B-5	20 to 22		0.0	91.2	8.8	
B-5	38 to 40		0.0	95.4	4.6	
B-7A	14 to 16	24.8				28 / 18 / 10
B-9	10 to 12	27.9				22 / 18 / 4
B-10	28 to 30		0	56.4	43.6	
B-12	16 to 18		15.2	76.0	8.8	
B-14	12 to 14		0	26.2	73.8	
B-14	25 to 27		0	94.9	5.1	

Notes:

1. ft. bgs = feet below ground surface.
2. LL = liquid limit, PL = Plastic Limit, PI = Plasticity Index.
3. Blank space indicates testing was not completed.

5.40 BEDROCK

As discussed above, auger refusal (presumed bedrock) was encountered at each of the 14 recently completed test borings. Rock coring completed within test borings B-2, B-5, B-8, B-11, and B-14 confirmed the refusal conditions consisted of bedrock. The top of bedrock was also identified on the generalized soil profiles included on the 1938 and 1939 drawings. The depths to the top of bedrock at the test boring locations, along with the corresponding elevations are summarized on Table 1.

Based on the findings from the recently completed 14 test borings, a top of bedrock contour plan was developed and is included as Figure 4. As shown on Figure 4, the top of bedrock slopes downward from approximate elevation 546 feet within the western portion of the project site to elevation 537 feet within the northeastern portion of the project site. These top of bedrock contours generally coincide with the top of bedrock encountered within the circa early 1900 test borings. Exceptions include test borings A, B, C, and N, where the top of bedrock was about 2.5 feet to 4 feet higher or lower than the surrounding test borings.

The bedrock core recovered from test borings B-2, B-5, B-8, B-11, and B-14 consisted of gray, hard to very hard, weathered to sound, laminated to thickly bedded Limestone bedrock. Occasional fossils, styorites, and chert nodules were noted within the bedrock. The core recoveries ranged from 47% to 100%. Rock quality designation (RQD) values ranged between 18% and 94%, indicating the recovered rock cores have a variable rock mass quality of very poor to excellent. Rock coring was not performed at the remaining boring locations, therefore, the exact nature of the refusal material encountered at these locations was not determined (i.e. bedrock or possibly a cobble/boulder obstruction), although it appears in general that it is bedrock.

The geotechnical laboratory testing completed on selected samples of the recovered bedrock core, as summarized in the table below, indicates the bedrock has an unconfined compressive strength of 9,460 psi to 19,630 psi, with an average of about 15,675 psi.

Unconfined Compressive Strength of Bedrock Core Samples		
Test Boring	Sample Depth (ft. bgs)	Unconfined Compressive Strength (psi)
B-2	58	16,560
B-5	54.5	19,630
B-5	57.5	9,460
B-5	60	12,130
B-8	43	17,850
B-11	42	18,430

5.50 GROUNDWATER CONDITIONS

Water level measurements were made in some of the test borings at the completion of overburden drilling and sampling and are noted on the test boring logs included in Appendix A. It is noted that these measurements may not have provided sufficient time for the groundwater to accumulate and/or stabilize in the bore holes within the time period that had elapsed from the completion of drilling operations and the time of measurement.

Groundwater observation wells were installed in completed test borings B-1, B-4, B-7A, and B-10. Empire visited the site to record the water level in the wells on several occasions between the date of installation and October 16, 2009. The water level depth measurements and corresponding elevations are summarized on Table 2.

Based on the water level data, the groundwater elevation at the northern end of the project site generally fluctuates between elevation 574.5 feet and 575.0 feet. At the south end of the site, the normal groundwater elevation is expected to fluctuate between elevation 572.0 and 573.0 feet. However, the groundwater elevation at the south end of the site was noted to fluctuate up to approximate elevation 574.5 feet during a recent high lake level event. On October 7, 2009, high sustained winds from the south – southwest caused a surge in the Lake Erie water levels. As shown on Table 2 and the graph following Table 2, the water level within the southern most observation wells (B-7 and B-10) increased from about elevation 572.8 feet on October 6, 2009 to elevation 574.5 feet on October 7, 2009. An increase in water level within the northern observation wells (B-1 and B-4) was also observed, but to a lesser degree. Within observation wells B-1 and B-4 the water level increased from about elevation 574.7 feet on October 6, 2009 to elevation 574.9 feet on October 7, 2009.

It is possible some perched groundwater may be encountered in the upper more permeable fill soils. Perched groundwater conditions can be particularly more prevalent during and following heavy or extended periods of precipitation and during seasonally wet periods. Groundwater was observed flowing from the fill soils, around the pile cap, at test pit exploration TP-2. It should be expected that perched and permanent groundwater conditions will vary with changes in soil conditions, precipitation and seasonal conditions and will be influenced by fluctuations in the level of the nearby Buffalo River and Lake Erie.

6.00 GEOTECHNICAL EVALUATION, CONSIDERATIONS, AND RECOMMENDATIONS

6.10 GENERAL GEOTECHNICAL CONSIDERATIONS

Based on our analysis of the subsurface conditions disclosed by the explorations and groundwater observation wells, the following general considerations and recommendations are provided to assist with planning the design and construction of the foundations for the proposed Buffalo Canal Side Development. More detailed considerations and recommendations are presented in the subsequent sections of this report.

Given the variable composition and extensive thicknesses of the fill soils, along with the generally very loose to firm relative density of the indigenous sand soils, as well as considering the potential structure loads, the use of spread foundations to support the various proposed structures is not considered a viable option. Accordingly, it is recommended that the proposed buildings, parking structure and ancillary structures should be supported using a deep foundation system bearing on or within the Limestone bedrock. Limestone bedrock was encountered at elevations ranging from approximate El. 546 feet within the west portion of the site to El. 537 feet within the northeast portion of the site. An approximate top of bedrock contour plan has been developed based on the apparent bedrock elevations encountered in the recent test borings, and is presented as Figure 4.

A deep foundation system consisting of driven piles (i.e. H-piles or pipe piles), or possibly drilled piers, end bearing on bedrock, appear to be the most appropriate deep foundation options to consider. The groundwater conditions and the non-plastic silty fine sand layers present beneath the groundwater table will pose difficulties with drilled pier installation and will require the use of temporary casing and/or drilling slurry to stabilize the pier excavations. As noted on the test boring logs, running sands were encountered within several of the test borings. Therefore, it appears driven H-piles or pipe piles would be better suited from a constructability standpoint. The planned locations of the new deep foundations must consider the locations of the existing piles and structures, which will remain in place.

The existing fill is expected to contain occasional inclusions or zones of rubble, possible boulder size obstructions, as well as existing pile caps, which may cause some difficulties with deep foundation installation. Accordingly, the Contractor must be prepared to potentially encounter and handle such conditions.

If necessary, drilled pier foundations could be considered for locations, which require resistance of high uplift loads. In such cases, it may be possible to use a combination of drilled piers where high uplift resistance is required, with the remaining portions of the structure supported on driven piles. Socketting the drilled piers into the bedrock to gain additional uplift capacity could also be considered, however, due to the hard nature of the limestone bedrock, socketting the drilled piers below the bedrock surface is expected to be difficult, time consuming and costly. As an alternative, smaller diameter rock anchors socketted into the bedrock could also be considered where higher uplift resistance is required.

Some existing piles from the former Auditorium, specifically in the sub-basement area, are planned to be re-used to support some of the new structures. As part of the subsurface exploration program, two (2) existing piles were extracted to evaluate their condition with regard to potential corrosion and re-use. The results of this evaluation, along with recommendations regarding their capacity are presented below in Section 6.20.

The presence of significant amounts of existing fill on the site will need to be considered with regard to the design and construction of slab-on-grade type floor construction. It is common practice to recommend that the existing uncontrolled fill type soils be removed and replaced with a properly controlled and compacted engineered fill beneath the slab-on-grade construction. However, due to the substantial amounts of existing fill encountered, it will not be economically or technically practical to remove the fill in its entirety, for the floor construction.

Accordingly, ECHDC and the designer can consider removing a portion of the existing fill and provide some additional Structural Fill/Subbase Stone beneath the slab-on-grade construction. There are some uncertainties with this approach, such as the potential for some long-term differential settlement, which may occur with leaving potentially undetected unsuitable soils in-place.

If the ECHDC and the designer are willing to accept these risks, then we recommend the following be implemented as minimum requirements for constructing the slabs-on-grade over the existing fill soils.

- The existing fill subgrades should be thoroughly compacted, proof rolled, evaluated and prepared in accordance with our recommendations in Section 6.120.5
- All existing structures (i.e. pile caps, foundation walls, footings, etc.) within the limits of the slab-on-grade construction, should be removed to a depth of at least 15-inches from the bottom of the proposed slab-on-grade.
- The slabs-on-grade should be constructed over a minimum 15-inch thick layer of Structural Fill/Subbase Stone.
- Any deleterious materials, such as voided rubble, wood, organics, soft soils, etc., which are present within the fill soils at the bottom of the subgrade excavation, should be further undercut, removed and replaced with additional Structural Fill/Subbase Stone material.
- A suitable stabilization/separation geotextile, such as Mirafi 500X, should be placed between the existing fill subgrade and the overlying Structural Fill/Subbase Stone layer for the slab-on-grade construction.

As an alternative to a slab-on-grade floor, consideration could be given to using a structural floor slab supported by grade beams and the deep foundation system. Although potentially more costly, the structural floor will generally eliminate the settlement risks associated with constructing a slab-on-grade floor over the fill soils.

Due to the variable constituents which make up the fill, as well as considering any potential odors, which the fill may emit, a moisture/vapor barrier system should be placed beneath interior ground slab construction.

In addition to the foundation and site preparation considerations, it will also be necessary to consider the groundwater conditions present on the site. Based on the water levels observed in the groundwater observation wells, at the time of our study, groundwater was typically present between El. 572 feet and 575 feet, depending on the location within the site. It is recommended the below grade parking structure and basement area structural foundation elements (i.e. pile caps, grade beams, elevator pit, structures, etc.) be constructed as high as possible to minimize or eliminate intrusion into the permanent groundwater table.

Excavations to construct the proposed project are expected to range between 5 and 25 feet below the surrounding ground surface. Accordingly, it will be necessary to protect the existing, nearby foundations, streets, and underground utilities against potential undermining and lateral instability during excavation and construction of the proposed project.

Based on the subsurface conditions encountered, the proposed site should be classified as Seismic Site Class "D" in accordance with the criteria on Table 1615.1.1 in the Building Code of New York State. Therefore, seismic design may be based on this classification.

6.20 RE-USE OF EXISTING PILES

As previously stated, the existing piles, within the existing sub-basement foundation structure, are planned to be incorporated into the development plan. As part of our evaluation, two (2) existing piles located in the south portion of the site were extracted to evaluate their condition with regard to potential corrosion and to develop appropriate capacities associated with their re-use.

Studies indicate that pile corrosion can occur in non-protected piles, generally within the zone at or just above the existing water table, and within the fluctuation zone of the groundwater table. Existing fill materials containing constituents such as ash, cinders, slag and metals or other potentially corrosive materials can also enhance such corrosion. These studies have also found that the pile sections below a non-saline or freshwater groundwater table are generally not susceptible to corrosion, provided they are embedded within non-corrosive type soils.

The sub-basement floor level is at approximate El. 565 feet, which is about 10 feet below the site groundwater table of about El. 575 feet. Accordingly, the pile foundations supporting the sub-basement structure are sufficiently submerged below the water table and are assumed to be embedded in native soils, and therefore, less susceptible to potential corrosion than the non sub-basement piles.

On September 1st, 2009, two existing piles, from outside the sub-basement area were extracted and observed by Empire for indications of possible corrosion and diminished integrity. The locations of the two piles extracted are shown on Figures 1 and 1A presented in Appendix E. Photographs of the extracted piles are also presented in Appendix E.

The two piles extracted were measured and determined to each have a depth of 8-inches, a flange width of 8.125-inches, and a length of 35.4 feet from the exposed top of pile (following removal of the pile cap) to the pile tip. Caliper thickness measurements of the flange and web were taken on one of the piles and were found to average about 0.451 inches. Based on these measurements the piles extracted correspond to an HP8 x 36 pile section, which is in agreement with the information presented on the 1939 design drawings for the City of Buffalo, Municipal Auditorium at the corresponding pile cap location. Excerpts of these drawings are also presented in Appendix E.

Both of the extracted piles were found to be clad with an apparent corrosion protection coating material. Empire observed each of the piles and found no indications of significant corrosion or section loss. This includes the flange edges, where possible corrosion would most likely begin to occur. Based on these observations, we would rate the extracted piles as being in good to very good condition, given their approximate current 70-year life.

The 1939 design drawings for the City of Buffalo, Municipal Auditorium indicate that four (4) different pile sections were used within the sub-basement area, including an H8 x 36, an H10 x 44, an H12 x 53 and an H14 x 73. Based on historical information of structural steels used in the 1939 era (Appendix E), the steel grade used for buildings was typically A9 steel, which is reported to have a yield strength in the range of about 33 kips per square inch (ksi). Foundation design drawings provided to Empire, specifically Drawings S1, S2 and S3, do not note the steel grade or the allowable pile capacities used for design, although this information could be presented within other portions of the original design documents.

In lieu of not having actual steel grade and allowable design capacity information, the allowable axial compressive capacities of the existing sub-basement piles can be evaluated using the following criteria. We would recommend the design maximum allowable axial compressive capacity of the existing sub-basement piles not exceed 25% of the presumed pile yield strength of 33 ksi (i.e. 8.25 ksi) times the cross sectional area of the pile. We also recommend that a 5% reduction in the cross sectional area be considered to account for any possible corrosion / section loss over the continued life of the pile. Using these criteria, the recommended maximum allowable design capacity of the existing pile sections would be as follows:

Pile Section	Allowable Axial Compressive Capacity per Pile
H8 x 36	41 tons
H10 x 44	48 tons
H12 x 53	60 tons
H14 x 73	84 tons

A pile load testing program (i.e. dynamic pile testing) could be implemented as part of the project final design, to test the capacity of selected representative piles, which are accessible outside of the sub-basement area. If this is done, it may be possible to increase the allowable capacity for design beyond the capacities recommended above. A dynamic testing program, however, will require retaining the services of a pile driving contractor (i.e. mobilization of an appropriate pile driving rig to re-strike the test piles), along with the services of an appropriate pile testing agency.

6.30 DESIGN RECOMMENDATIONS FOR NEW DRIVEN PILE FOUNDATIONS

The Limestone bedrock should provide a suitable bearing stratum for a driven pile foundation system. H-piles or pipe piles driven to refusal on the bedrock will derive their capacity predominately through end bearing.

An H-pile, driven to absolute refusal on the bedrock, may be designed for an allowable axial capacity equal to 33% of the pile yield strength or 16.5 kips per square inch (ksi), whichever is less, times the cross sectional area of the pile. We recommend that a 10% reduction in the cross sectional area be considered to account for potential corrosion and section loss over the pile life. Alternatively, the piles could be coated with a suitable bitumastic coating to help limit potential corrosion within the embedment zone from the top of the pile to at least 10 feet below the permanent groundwater table (i.e. to El. 565 feet). In this case the 10% area reduction to account for potential pile section loss, would not be necessary.

Based on the above criteria, an HP12 x 53 section (Grade 50 steel), with a cross sectional area of 15.5 in^2, would provide an allowable axial capacity of about 115 tons per pile, when accounting for the 10% section loss. The piles, however, should be driven and tested for an ultimate capacity of 256 tons to account for the above reduction, assuming an HP 12 x 53 is used.

A lighter or heavier pile section could also be used to obtain a different allowable axial capacity, using the same criteria outlined above. The following table summarizes the allowable axial compressive capacity and required ultimate test capacity for various pile sections based on the above design criteria. These capacities assume the use of Grade 50 Steel, as well as account for the 10% section loss.

Pile Section	Allowable Axial Compressive Capacity per H-Pile	Required Ultimate Test Capacity
HP 10 x 42	92 tons	205 tons
HP 12 x 53	115 tons	256 tons
HP 14 x 73	158 tons	353 tons

The ultimate load test capacities presented above assume a Factor of Safety of 2.0 as required by the Building Code of New York State.

Pipe piles should have a wall thickness of at least 0.25 inches and may be driven open ended or with a closed end, as determined appropriate by the pile driving contractor. If a closed end pipe pile is used, a flat steel plate, at least 0.50 inches thick, should be welded to the pile to form the closed end. Following driving and acceptance, the annulus of the pipe pile should be filled with concrete having a 28-day compressive strength (f’c) of 4,000 psi or greater.

A pipe pile, driven to refusal on the bedrock, may be designed for an allowable axial capacity equal to 33% of the pile yield strength or 16.5 kips per square inch (ksi), whichever is less, times the cross sectional area of the pipe pile. As with the H-piles, a 10% reduction in the cross sectional area or a bitumastic coating should also be considered to account for potential corrosion / section loss over the pile life.

The following table summarizes the allowable axial compressive capacity and required ultimate test capacity for various pipe pile sections based on the above design criteria. These capacities assume the use of Grade 50 Steel. Other pipe pile sections could also be used, based on current product availability, to obtain different allowable axial capacities, provided the same design criteria outlined above is used.

Pipe Pile Section	Allowable Axial Compressive Capacity per Pipe Pile	Required Ultimate Test Capacity
12.750” O.D. Pipe Pile (0.375” Wall Thickness)	108 tons	240 tons
10.750” O.D. Pipe Pile (0.365” Wall Thickness)	88 tons	196 tons
9.625” O.D. Pipe Pile (0.352” Wall Thickness)	76 tons	169 tons
7.000” O.D. Pipe Pile (0.317” Wall Thickness)	49 tons	110 tons

The ultimate load test capacities presented above assume a Factor of Safety of 2.0 as required by the Building Code of New York State, as well as consider the section reduction for potential corrosion loss.

Driven pile foundations end bearing on the bedrock are expected to undergo insignificant total settlement, when designed and constructed in accordance with our recommendations. Driven piles should be spaced a minimum of 3 pile widths apart, or three feet, whichever is greater. At this spacing, no group reduction factor is considered necessary. All exterior pile caps and grade beams for driven pile foundations should be embedded a minimum of 4 feet below final exterior grades for frost protection.

A preliminary evaluation was made of the estimated uplift capacity resistance of a driven piles bearing on the Limestone bedrock. Based on these preliminary analyses, we suggest that an allowable uplift capacity (i.e. side shear resistance) of 150 pounds per square foot of pile surface area embedded below the pile cap or grade beam be utilized. The box perimeter of H-pile sections should be used in calculating the uplift resistance of H-piles.

At least 2 to 3 random piles of each driven pile type used, or no less than a total of 6 piles, should be dynamically tested in accordance with *ASTM D 4945 – “Standard Test Method for High Strain Dynamic Testing of Piles”* to confirm that the pile capacity has been obtained with an adequate factor of safety (i.e. Factor of Safety of 2.0 or greater as required by the Building Code of New York State). For driven piles subject to uplift loads, at least 1 pile should be tested in accordance with *ASTM D 3689 – “Standard Test Method for Individual Piles Under Static*

Axial Tensile Load" to confirm the that the uplift capacity has been obtained with an adequate factor of safety (i.e. Factor of Safety of 2.0 or greater).

6.40 LATERAL LOAD CAPACITY OF DRIVEN H-PILES

As part of the design development Timothy Haahs & Associates, Inc. (Parking Ramp Consultant) had selected driven. HP12x53 piles, end bearing on the limestone bedrock, as the foundation design scheme to support the proposed parking ramp structure. As part of this design development, Empire completed an evaluation of the estimated pile deflection characteristics under various lateral loads applied to the top of the pile. This was done using the computer program "All-Pile", Version 7.12K developed by Civil Tech Software. The subsurface profile developed for the analysis included:

- Fill soils from the proposed finished floor elevation of 580 feet down to elevation 570 feet;
- "Loose" silty sand soils to elevation 560 feet;
- "Firm" silty sand soils to the top of bedrock at elevation 544 feet; and
- Groundwater conditions at elevation 575 feet.

The pile configuration provided by Timothy Haahs & Associates, Inc. for this analysis included: a single, vertical, HP12x53 pile, with a top of pile at El. 575 feet or El. 578 feet. No moments were applied to the top of the pile, however, a vertical axial load of 230 kips was used in the analysis. The pile was evaluated in a free head and a fixed head condition.

The following tables provide the lateral force (applied to the strong axis of the pile) that will result in an approximate ¼ inch and ½ inch deflection for the proposed pile at the two different elevations. The pile deflection curves for the top of pile at both El. 575 feet and El. 578 feet are included in Appendix F.

Top of Pile at Elevation 575 Feet			
Free Head Condition		Fixed Head Condition	
Lateral Force Resulting in ¼ inch Deflection	Lateral Force Resulting in ½ inch Deflection	Lateral Force Resulting in ¼ inch Deflection	Lateral Force Resulting in ½ inch Deflection
10 kips	21 kips	26 kips	52 kips

Top of Pile at Elevation 578 Feet			
Free Head Condition		Fixed Head Condition	
Lateral Force Resulting in ¼ inch Deflection	Lateral Force Resulting in ½ inch Deflection	Lateral Force Resulting in ¼ inch Deflection	Lateral Force Resulting in ½ inch Deflection
6 kips	13 kips	17 kips	34 kips

Depending on the spacing between piles within a group, the total lateral capacity of an individual pile may not be fully developed. This will need to be considered during the final design process. Empire can provide additional analyses after a pile layout has been developed. In addition, Empire can also evaluate other pile sections if necessary.

The lateral analysis summarized above is only applicable for the proposed parking ramp planned at the north end of the project site, using the HP 12 x 53 pile section. As previously stated, there are several portions of the site with relatively thicker zones of fill soils, particularly within the limits of the former canals. These thicker zones of fill soils would likely provide less lateral resistance to the piles. Accordingly, it is recommended that additional lateral analyses be performed on a case specific basis as the design is finalized and the actual pile sections are selected.

6.50 PRELIMINARY DESIGN RECOMMENDATIONS FOR DRILLED PIERS

As stated in Section 6.10, the use of drilled pier foundations may be a consideration where additional uplift resistance and/or additional lateral resistance is required. The following design recommendations are provided for preliminary consideration. If drilled piers appear to be a viable foundation option, Empire can provide additional design and construction recommendations as appropriate.

As with driven piles, drilled pier foundations bearing on the bedrock will derive their capacity predominately through end bearing. Accordingly, we recommend that the side shear resistance within the overburden, be neglected in designing the drilled pier foundation for axial compressive capacity.

Drilled pier foundations end bearing on suitable Limestone bedrock, can be sized for an allowable end bearing pressure of 45 tons per square foot (tsf). For uplift capacity, we suggest that an allowable uplift capacity (i.e. side shear resistance) of 180 pounds per square foot of drilled pier surface area embedded below the pile cap or grade beam be utilized within soil.

Drilled pier foundations should have a minimum diameter of 30-inches. The drilled piers should be seated a nominal 2 to 3 inches into the bedrock surface (i.e. extend to drilled pier auger refusal) to insure that the piers are bearing on competent bedrock. Drilled piers constructed on suitable bedrock bearing grades in accordance with our recommendations should undergo insignificant total settlement.

6.60 DESIGN RECOMMENDATIONS FOR ROCK ANCHORS

As stated above uplift forces can be resisted by the use of rock anchors grouted into the Limestone bedrock. In addition, rock anchors can also be incorporated into the shoring system design to provide lateral restraint.

The Post Tensioning Institute (PTI) - "Recommendations for Prestressed Rock and Soil Anchors" can be referenced with regard to providing design criteria and installation requirements for Rock Anchors. It is general practice to develop a performance specification, with the desired capacity and locations, and then have a Specialty Contractor design the rock anchors.

Based on the PTI guidelines, an anchor spacing of at least 4 to 5 feet is recommended between anchors and the anchors can be installed at various angles. We recommend a minimum anchor diameter of 3 inches and a minimum effective bond length of at least 5 feet be used in the design of the rock anchors. The anchor hole should be over-bored approximately 1 foot. In addition the bond length for the first 5 feet into the bedrock surface should be neglected. Therefore, a rock anchor designed for an effective bond length of 10 feet should be embedded a minimum of 16 feet into the Limestone bedrock.

An ultimate bond strength of about 250 psi between the Limestone bedrock and the grout can be used for preliminary design of the rock anchors. Accordingly, a 3-inch diameter rock anchor with 10 feet of effective bond length in the Limestone bedrock would provide an ultimate capacity of about 140 tons.

At least the first three anchors installed should be performance tested and all remaining rock anchors should be proof tested. Installation and testing of the rock anchors should be in accordance with NYSDOT Standard Specification Item No. 17203.174101M and Item No. 17203.174102M, respectively.

6.70 SLAB-ON-GRADE FLOOR CONSTRUCTION

As discussed in Section 6.10, where the floor system is constructed as a slab-on-grade over the existing fill, or directly on loose indigenous sand soils, it is recommended that a minimum of 15-inches of Subbase Stone, as described in Appendix H, be placed beneath the slab-on-grade construction.

In areas where more than 12-inches of compacted Suitable Granular Fill, or other approved subgrade backfill materials, are placed over the existing fill or indigenous soil subgrades, then it is recommended that a minimum of 6-inches of Subbase Stone, be placed beneath the slab-on-grade construction for lightly loaded floor slabs. A minimum of 10-inches of Subbase Stone should be placed over the Suitable Granular Fill subgrade in areas of heavier floor loading or where concrete slabs will be subject to vehicle loads.

A suitable stabilization/separation geotextile, such as Mirafi 500X, should be placed over the existing fill or indigenous soil subgrades prior to placement of the Suitable Granular Fill. A second geotextile would not be necessary where Subbase Stone is placed over Suitable Granular Fill.

For exterior slabs, subgrade underdrains should be provided to allow drainage of the Subbase Stone course to help minimize the potential for frost action. The underdrains should drain to a suitable storm sewer or other drainage relief point.

Floor slabs constructed as a slab-on-grade may be designed using a modulus of subgrade reaction of 150 pounds per cubic inch at the top of the Subbase Stone layer. It is recommended that the slab-on-grade be constructed such that it floats on the subbase and subgrades and is not structurally connected to, or resting directly on, perimeter walls or column footings in order to limit differential settlement effects. A suitable moisture/vapor barrier is recommended beneath the slab-on-grade, to reduce the potential for dampness and limit potential odors from the fill entering the building. In addition, it is recommended that the below grade walls, above the permanent groundwater table be damp proofed.

As an alternative to a slab-on-grade floor, consideration could be given to using a structural floor slab supported by grade beams and the deep foundation system. If the floors are structurally supported by the deep foundation system, it is recommended a minimum of 6 to 8-inches of Subbase Stone material be placed beneath the structural slab to provide a suitable working surface to construct the slabs.

6.80 SUB-BASEMENT FLOOR SLAB CORING INVESTIGATION

As part of the design development, a coring investigation of the upper slab component of the Sub-Basement floor system was completed. The purpose of this investigation was to confirm the thickness of the upper slab component of the sub-basement floor system and to confirm if the cells formed by the grade beams, above the lower reinforced pressure slab, were filled with soil (i.e. confirming that the upper slab was designed as a slab-on-grade over the grade beams and soil fill), as depicted on the 1939 design drawings for the City of Buffalo, Municipal Auditorium.

On August 27th, 2009, Empire performed a total of three (3) 4-inch diameter floor slab cores at two locations within the sub-basement area. These investigation locations are designated as C-1 and C-2 and were established in the northwest portion and southeast portion of the sub-basement, between the grade beam locations shown on the sub-basement design drawings. The approximate locations of the cores are shown on Figure 1 in Appendix G.

At core location C-1, an initial core designated as C-1A was made through the upper floor slab (about 5¼ -inches thick), and then encountered concrete beneath the slab concrete. It was initially thought that this underlying concrete was possibly a grade beam, so the core location was moved about 3 feet and the core was re-performed, and designated as core C-1. At this new location, concrete was again encountered beneath the upper slab concrete. An approximate 9-inch section of the underlying concrete was obtained at this location. Similar conditions were also encountered at core location C-2, with concrete being encountered beneath the floor slab concrete. Photographs of the recovered concrete cores are also presented in Appendix G.

The following information was gleaned from the recovered cores and our field observations:

1. The upper concrete floor slab was found to vary between 5 and 5 ½-inches in thickness at the core locations, which are as follows:

    - C-1A: 5 ¼-inches
    - C-1: 5-inches
    - C-2: 5 ½ -inches

2. There was no evidence of reinforcement (i.e. reinforcing steel or wire mesh) present in the recovered floor slab cores, although we cannot say for certain

that no reinforcing was used for this upper slab without further investigation.

3. The underlying concrete appears to be a fill concrete, placed in lieu of the soil fill that was originally called out on the design drawings. This apparent fill concrete contains a higher proportion of fine aggregate than the upper slab concrete. The cores were not advanced through the fill concrete, due concern with possibly penetrating into the underlying pressure slab.

Empire did not perform any compressive strength tests on the recovered concrete core samples.

6.90 BASEMENT AND DEPRESSED STRUCTURE WALL DESIGN

As previously stated, permanent groundwater conditions are typically present between El. 572 and El. 575 feet, depending location within the site. For design purposes, however, the permanent groundwater conditions should be assumed at El. 578 feet or the 100-year flood elevation, whichever is higher.

Accordingly, any basement or depressed structures, which would be situated below the design permanent groundwater elevation, should be designed to resist full hydrostatic pressures acting the walls and bottom slab, as well as be properly waterproofed.

Where the basement or depressed structure is situated above the design permanent groundwater elevation, a foundation drainage system, as discussed below, should be incorporated, to relieve hydrostatic pressures from developing against the structure walls and bottom, due to the potential presence of upper perched groundwater zones. In this case it is recommended the below grade walls and floors be damp proofed where suitable foundation drainage is provided.

Below grade basement and depressed structure walls, should be designed to resist “at rest” lateral earth pressures generated by the earth backfill and any temporary or permanent surcharge loads, based on the following soil parameters. In addition, full hydrostatic pressures should also be included, as applicable. These parameters are based on the wall backfill beyond the foundation drainage system, consisting of Suitable Granular Fill or Structural Fill, as described in Appendix H.

Recommended Soil Parameters for Below Grade Wall Design

- Coefficient of At-Rest Lateral Earth Pressure – 0.50
- Coefficient of Passive Lateral Earth Pressure – 3.00
- Angle of Internal Friction – 30 Degrees
- Total Unit Weight of Soil – 125pcf
- Surcharge Load Coefficient – 0.50

Perimeter foundation wall and underslab foundation drains, to intercept perched groundwater and relieve potential hydrostatic pressures, should be provided where the structure is situated above the design permanent groundwater elevation. The foundation drainage system must be properly designed, installed and maintained for long-term performance and should include such features as clean-outs to properly maintain the system. The foundation drainage system should drain to a sump and pump system. The foundation drain pipes should be set at a minimum depth of 1.0 foot below the structure floor grade.

The foundation drainage system should include a geotextile, selected considering drainage and filtration, installed around drainage stone surrounding a slotted under-drain pipe. The drainage stone should be sized in accordance with the pipe slotting or perforations. A crushed aggregate conforming to NYSDOT Standard Specifications Section 703-02, Size Designation No. 1 (½-inch washed gravel or stone) is generally acceptable for slotted under-drain pipe. The foundation drainage stone and surrounding geotextile, along the walls, should extend above the drainpipe a minimum of 2 feet.

A pervious granular backfill (soil type drainage media) or a suitable geosynthetic drainage composite (i.e. “Grace Hydroduct”, “Miradrain”, “Delta MS” or other suitable equivalent) should be placed against the foundation wall, above the drainage system, to allow infiltration to the drainage system. Concrete Sand, which meets the minimum requirements of NYSDOT Standard Specifications Section 703-07 (100 percent passing 3/8 inch sieve to maximum of 3 percent passing a No. 200 sieve), is generally acceptable as pervious granular backfill.

The soil type drainage media against the wall should be a nominal 2 feet in width. The drainage media against the wall should extend to about 1 to 2 feet below the finished grade surface, where it may be capped off with the foundation backfill material.

6.100 EXCAVATION SHORING

The design and construction of the proposed buildings, parking structure and ancillary structures in relation to the adjacent existing roadways, utilities and existing substructures should be carefully planned. Proper sloping/benching and/or temporary shoring of the excavation sidewalls, along with underpinning/bracing of the existing structures and utilities will be required where the excavation extends below these structures. In addition, the existing adjacent roadways and surface structures (i.e. sidewalks, utilities, etc.) must also be protected from potential excavation slope instability, soil relaxation and undermining. Braced or tied backed tight sheet piling, soldier pile and lagging type wall systems, a soilcrete curtain wall (i.e. jet grouting) or compaction grouting could be considered to protect these structures.

Excavations must be adequately sloped back and/or properly supported (i.e. sheeted, shored, braced, shielded etc.) in accordance with OSHA requirements as a minimum. Based on the test boring information, it would appear that the overall soil conditions encountered would be generally classified as Type C soil in accordance with OSHA criteria.

Based on the OSHA Type C soil criteria, unsupported excavations less than 20 feet deep would need to be sloped backed to at least a 1.5 H (min) to 1 V slope. It is noted, however, that any slopes which encounter perched or permanent groundwater conditions, or unsuitable fill soils (i.e. topsoil, wood, organics, etc), can be expected to be unstable using this criteria, and therefore may require flatter slopes in conjunction with proper dewatering in order to maintain stable and safe conditions. The contractor should confirm the OSHA soil classification and excavation requirements at the time of construction based on actual location and soil and groundwater conditions present. The contractor shall be solely responsible for all excavation safety, including the design of all excavation support systems.

Generally it is expected that properly braced or tied back tight steel sheeting or soldier piles and lagging and/or soilcrete curtain wall will be necessary to protect existing structures, utilities and roadways from potential detrimental soil movement/undermining where the excavations extends below these existing structures or foundations. The use of a cantilevered sheet piling excavation support system (un-braced tight sheeting) will not be sufficient to prevent soil relaxation/stress relief (i.e. soil deformation) beneath adjacent structures, utilities and roadways, and therefore, should not be permitted in this case. Rock anchors, as discussed above in Section 6.60, can be incorporated into the shoring system design to provide additional lateral restraint.

It is recommended that excavation support systems (i.e., tight sheeting, shoring and bracing, soilcrete, etc.), be properly designed by a Professional Engineer licensed in the State of New York and experienced in the design of earth support systems. The design requirements should consider the subsurface and groundwater conditions, the potential for undercutting subgrades, the structures that must be protected, construction sequence, lateral earth pressures, hydrostatic conditions, bottom stability and any surcharge effects, as well as the construction staging logistics.

Excavation support systems should be designed for a factor of safety equal to or greater than 1.5 for lateral stability. “At-rest”, “active” and “passive” earth pressures can be computed based on the following parameters, which have been generalized from the test borings.

Existing Fill Soils and Indigenous Silty Clay Soils:

- Coefficient of Active Earth Pressure – 0.39
- Coefficient of At-Rest Earth Pressure – 0.56
- Coefficient of Passive Earth Pressure – 2.56
- Angle of Internal Friction – 26 Degrees
- Estimated Interface Friction Coefficient with Steel – 0.20
- Moist Unit Weight of Soil – 110 pcf (Above El. 578 feet)
- Submerged Unit Weight of Soil – 50 pcf (Below El. 578 feet)

Indigenous Silty Sand Soils:

- Coefficient of Active Earth Pressure – 0.33
- Coefficient of At-Rest Earth Pressure – 0.50
- Coefficient of Passive Earth Pressure – 3.00
- Angle of Internal Friction – 30 Degrees
- Estimated Interface Friction Coefficient with Steel – 0.25
- Submerged Unit Weight of Soil – 60 pcf (Below El. 578 feet)

It is recommended that pre-construction, during construction and post construction surveys be taken on the adjacent existing structures, utilities and roadways to confirm that construction of the excavation support systems does not adversely affect the integrity of these structures. In addition, it is recommended that an appropriate vibration monitoring program be implemented during driving and removal of sheeting/soldier piles, immediately adjacent to existing structures, utilities and roadways. The removal of sheet piling which is installed immediately adjacent existing structures, utilities and roadways may cause settlement.

Therefore, in this case, the removal of the sheet piling following construction is not recommended.

6.110 SEISMIC DESIGN CONSIDERATIONS

Based on the subsurface conditions encountered at the project site, the upper 100 feet of the site can be classified as Seismic Site Class "D" in accordance with Table 1615.1.1 of the Building Code of New York State (dated August 2007).

The spectral accelerations for the project site were obtained by Empire from the United States Geological Survey (USGS) web site (www.earthquake.usgs.gov). These accelerations are based on 2003 NEHRP mapping, as published in the Building Code of NYS, dated August 2007, and were obtained by using the Zip Code 14202 for the downtown Buffalo, New York area.

The maximum spectral response accelerations in the downtown Buffalo, New York area (Zip Code 14202) for the Seismic Site Class "D" classifications are as follows:

- Short Period Response (S_{MS}) - 0.437g
- 1 Second Period Response (S_{M1}) - 0.139g

The corresponding maximum five percent damped design spectral response accelerations (S_{DS} and S_{D1}) are as follows:

- S_{DS} - 0.291g
- S_{D1} - 0.093g

6.120 SITE PREPARATION AND CONSTRUCTION CONSIDERATIONS

6.120.1 Construction Dewatering

Based on the water levels observed in the monitoring observation wells, it appears that the permanent groundwater table was present at elevations in the range of about El. 572 feet to 575 feet at the time of the subsurface exploration. The permanent groundwater conditions are most likely influenced by the nearby Buffalo River and Erie Lake, and can be expected to fluctuate with changes in the levels of these water bodies, as well as with precipitation and seasonal events. It is also possible some perched groundwater may be encountered in the upper fill soils.

Depending on the design elevation of the various basement and ground level floors, it is possible that groundwater conditions may be encountered during construction in the structure excavations (i.e. for pile cap and grade beam construction).

The impacts of groundwater on the structure design and construction will be dependent on the design depths of the various components. Silty clay and clayey silt soils, which are present at some locations and depths are not expected to yield vast quantities of water, however, more substantial seepage can be expected from the more granular and non-plastic soils. The more granular and non-plastic soils will also be susceptible to rapid subgrade and excavation side wall instability, if not properly dewatered. We note that substantial amounts of groundwater could be encountered where existing fill extends below the groundwater surface.

Accordingly, it is recommended the below grade parking structure and basement area structural foundation elements (i.e. pile caps, grade beams, elevator pit, structures, etc.) be constructed as high as possible to minimize or eliminate intrusion into the permanent groundwater table.

It may be necessary to place a crushed stone working mat/drainage layer over the bottom of the below grade parking structure / basement excavations to protect the subgrade soils and to provide a suitable working surface on which to construct the building foundation elements and floor slabs (i.e. for pile installation, excavation spoil removal, and concrete placement. The working mat/drainage layer will also help with construction dewatering efforts (control of any higher perched or trapped groundwater seepage) and can be incorporated to provide permanent under-slab drainage.

Provided that the excavations do not extend more than a foot or two below the permanent groundwater table, it is anticipated that sump and pump methods of dewatering in conjunction a working mat/drainage layer, as necessary, will generally be sufficient to control perched or trapped groundwater such that construction of the building foundation elements and basement level floor slabs can proceed in the dry. For deeper excavations which must extend below the permanent water table, more substantial methods of dewatering such as deep sumps, deep wells and/or vacuum well points are expected to be necessary.

6.120.2 Driven Pile Construction and Testing

The H-piles or pipe piles should be driven to absolute refusal, into the Limestone bedrock, using a pile hammer having a suitable energy rating. The pile driving criteria should be confirmed by the contractor through the use of the wave equation, based on the actual pile, pile hammer and cushions that will be used, to determine the final driving criteria and that adequate stresses can be developed in the pile to confirm its capacity through dynamic testing and to determine that the pile will not be overstressed during driving. Pile stresses should not exceed 85% of the pile yield stress. Plumbness of the piles should be maintained within 1% of the total length. Any misaligned or damage piles should be replaced.

Absolute refusal should be defined as when about 5 blows have been recorded for less than ¼ inch of pile penetration and the pile reaches the anticipated bedrock elevation. At least 6 random piles should be dynamically tested in accordance with *ASTM D 4945 – "Standard Test Method for High Strain Dynamic Testing of Piles"* to confirm the driving criteria and to evaluate that the pile capacity has been obtained with an adequate factor of safety (i.e. Factor of Safety of 2.0 or greater). The dynamic testing should also include piles which are suspect of not having been seated on bedrock.

A qualified individual should observe all pile driving and should prepare an individual pile driving report for each pile installed. The report should include, pile number and location, hammer and cushion types, pile size and material, installed length, blows per foot, unusual conditions encountered during driving, top of pile elevation following driving and notes on any necessary re-striking. Installed piles should be monitored for potential heaving during installation of adjacent piles. Any piles that heave should be re-driven and reseated as appropriate.

6.120.3 Drilled Pier Foundation Construction

Drilled pier foundation construction is expected to encounter permanent groundwater conditions. The high groundwater conditions and the non-plastic silty fine sand layers present beneath the groundwater table will pose difficulties with drilled pier installation and are expected to require the use of temporary casing and/or drilling slurry to stabilize the pier excavations.

Dewatering of drilled pier excavations will also be necessary in order to properly construct the pier structure in the dry. Alternatively, procedures for constructing the drilled piers below groundwater, can also be implemented. However, there is less control during construction in-the-wet, and therefore, there may be greater risk associated with this construction procedure. If this method is used, the hole must be stabilized with a temporary casing or proper drilling slurry and the concrete must be placed in a manner that displaces the slurry/water from the hole, such as using a tremie. It is recommended that drilled piers which are constructed in-the-wet be constructed only by contractors qualified and experienced in such construction methods.

It is possible that some rubble or boulders may be encountered in the existing fill soils. Therefore, the contractor should expect to possibly encounter some obstructions and should be prepared to handle such conditions.

Initially, the excavation should extend to the proposed bedrock bearing grade. Loose soil or bedrock should be removed from the bearing surface. The final bearing surface should be level or near level. Plumbness of the pier should be maintained within 1% of the total length. Casing removal during concrete placement should proceed in a manner that prevents or reduces to the extent possible, surrounding soil and water from protruding into the space that will be occupied by concrete. In all cases drilled pier construction should be monitored by qualified geotechnical personnel

6.120.4 Excavation and Backfilling

Excavations for grade beam and pile cap construction, as well as other structure excavations, should be performed using a method, which reduces disturbance to the subgrade soils, such as a backhoe equipped with a smooth blade bucket. If any soils containing organics, voided demolition debris/rubble, or otherwise deleterious soil material are encountered, they should be removed and replaced with compacted Structural Fill or Suitable Granular Fill, as recommended in Appendix H. Any ridges or loose soil left by machine excavation should also be manually trimmed and removed prior to constructing the grade beams.

Subgrades for grade beam, pile cap and structure construction should be protected from precipitation and surface water. Water should not be allowed to accumulate on the soil subgrades and the subgrades should not be allowed to freeze, either prior to or after construction of foundations. If subgrades are not protected and degrade, they must be undercut/removed accordingly.

Grade beam and pile cap excavations should be backfilled as soon as possible and prior to construction of the superstructure. It is recommended that excavations within the building, slab and pavement areas be backfilled with a properly compacted Structural Fill or Suitable Granular Fill material, as recommended in Appendix H.

6.120.5 Subgrade Preparation for Slab-on-Grade and Pavement Construction

All existing surface structures, slabs, organic soils, etc., and any other deleterious materials within the proposed slab-on-grade and pavement areas should be removed. In addition, existing pile caps and concrete structures directly beneath the floor slabs should be cut out and removed to a nominal depth of at least 15-inches below the bottom of the proposed floor slabs or pavement courses.

Following removal of the existing structure floor slabs, pile caps, surface structures, etc. and excavation to proposed subgrades, the exposed fill soil subgrades should be thoroughly compacted/densified and then proof rolled.

It is recommended that the exposed fill soil subgrade surface be compacted to a minimum of 95 percent of it's maximum dry density, as determined by the modified Proctor moisture-density relationship (ASTM D 1557). This will require sampling of exposed subgrade soils, prior to commencing this work, and performing laboratory moisture-density relationship testing (ASTM D 1557) on the representative soils to establish proper control densities for the subgrade compaction.

Following completion of the subgrade compaction, the compacted subgrades should be proof-rolled to determine if any soft or unstable conditions exist in the subgrade. The proof-rolling should be performed just prior to overlying Subbase Stone placement using a smooth steel drum roller weighing at least 10 tons, which is operated in the "static", non-vibratory mode. The roller should complete at least two passes over the exposed subgrades.

The subgrade proof-rolling procedure should be observed and evaluated by qualified geotechnical personnel. Any areas, which appear wet, loose, soft, unstable or otherwise contain unsuitable materials or exhibit unsuitable conditions, should be undercut. Over excavation, which may be required as the result of the subgrade inspection and/or proof-rolling, should be performed based on evaluation of the conditions and guidance provided by qualified geotechnical personnel. Resulting over-excavations should be backfilled with a controlled Structural Fill or Suitable Granular Fill as described in Appendix H, or other suitable engineered type fill material.

A separation/stabilization geotextile (i.e. Mirafi 500X or suitable equivalent), should be placed over the final subgrade prior to placing the Subbase Stone course.

The recommended Subbase Stone course thicknesses beneath the slab-on-grade construction, in some cases, may not be sufficient for carrying heavy construction vehicle loads. In addition, undercutting of the subbase stone surface and replacement with new subbase stone material may be necessary if the subbase becomes contaminated with soil from the foundation construction activities.

Therefore, it may be desirable for the Contractor to temporarily increase the Subbase Stone thickness in certain areas to provide a suitable working surface to stage the construction, carry construction vehicle loads and protect the underlying subgrades. This will be particularly important if construction proceeds during wet periods. The additional temporary subbase stone material could then be removed and the subbase layer re-graded in preparation for the actual floor or slab construction. This additional temporary subbase material could then be re-used where determined to be appropriate.

During construction the contractor should take precautions to limit construction traffic over the subgrades for foundation, slab on grade and pavement construction. Any subgrades, including existing soil subgrades or fill subgrades, which become damaged, rutted or unstable should be undercut and repaired as necessary prior to placement of the Subbase Stone courses. Utility trenches located within slab and pavement areas should be backfilled with controlled Structural Fill.

7.00 CONCLUDING REMARKS

This report was prepared to assist in design and construction of the proposed Buffalo Canal Side Development planned at the former Buffalo Memorial Auditorium site, in downtown Buffalo, New York. The report has been prepared for the exclusive use of C&S Companies, the Erie Canal Harbor Development Corporation, and other members of the design team, for specific application to this site and this project only.

The recommendations were prepared based on Empire Geo-Services, Inc.'s understanding of the proposed project, as described herein, and through the application of generally accepted soil and foundation engineering practices. No warranties, expressed or implied are made by the conclusions, opinions, recommendations or services provided.

Empire Geo-Services, Inc. should be informed of any changes to the planned construction so that it may be determined if any changes to the recommendations presented in this report are necessary. Empire Geo-Services, Inc. should also be retained to review final plans and specifications, and to monitor the earthwork and foundation construction, to verify that the recommendations were properly interpreted and implemented. Additional information regarding the use and interpretation of this report is presented in Appendix I.

If you have any questions or wish to discuss this information, please do not hesitate to contact our office at any time. Thank you for considering Empire Geo-Services, Inc. for this work.

Sincerely,

EMPIRE GEO-SERVICES, INC.

John J. Danzer, P.E.
Senior Geotechnical Engineer

Thomas R. Seider, P.E.
Senior Geotechnical Engineer

TABLES

TABLE 1

SUMMARY OF SUBSURFACE CONDITIONS

FORMER BUFFALO MEMORIAL AUDITORIUM SITE,
PROPOSED BUFFALO CANAL SIDE DEVELOPMENT
BUFFALO, NEW YORK

Test Boring	Ground Surface Elevation		Bottom of Fill Soils		Top of Bedrock		Groundwater Conditions	
	City of Buffalo Datum	USGS Datum	Depth (feet bgs)	Bottom Elevation (feet)	Depth (feet bgs)	Elevation (feet)	Approximate Depth (feet bgs)	Approximate Elevation (feet)
SJB Test Borings (2009)								
B-1	12.8	588.3	24.0	564.3	44.0	544.3		
B-2	22.3	597.8	21.0	576.8	57.0	540.8		
B-3	23.5	599.0	>19.7	<579.3	N.E.	N.E.		
B-3A	24.1	599.6	26.0	573.6	N.E.	N.E.		
B-3B	24.0	599.5	24.5	575.0	60.6	538.9		
B-4	19.2	594.7	23.0	571.7	58.0	536.7		
B-5	14.8	590.3	15.0	575.3	53.5	536.8		
B-6	10.4	585.9	13.5	572.4	47.7	538.2		
B-7	9.5	585.0	>12.9	<572.1	N.E.	N.E.	Refer to Table 2 Summary of Groundwater Elevations	
B-7A	9.5	585.0	14.0	571.0	44.5	540.5		
B-8	9.8	585.3	9.0	576.3	42.5	542.8		
B-9	3.0	578.5	9.5	569.0	35.7	542.8		
B-10	9.6	585.1	24.0	561.1	40.5	544.6		
B-11	10.6	586.1	28.0	558.1	41.5	544.6		
B-12	3.3	578.8	6.5	572.3	39.4	539.4		
B-13	4.2	579.7	5.0	574.7	41.4	538.3		
B-14	3.6	579.1	8.0	571.1	37.6	541.5		
Riley Engineering and Drilling Company Test Borings (1939)								
# 1	16.12	591.57	17.9	573.7	54.7	536.9	21.4	570.2
# 2	15.48	590.93	17.3	573.6	53.8	537.1	19.5	571.4
# 3	13.37	588.82	16.7	572.1	49.2	539.6	15.1	573.7
# 4	12.79	588.24	25.9	562.3	47.2	541.0	15	573.2
# 5	9.55	585.00	25.3	559.7	43.3	541.7	12	573.0
# 6	11.56	587.01	12.7	574.3	45.6	541.4	14.6	572.4
# 7	9.34	584.79	11.5	573.3	42.4	542.4	12.1	572.7
# 8	2.75	578.20	7.5	570.7	34.4	543.8	5.1	573.1
# 9	8.82	584.27	8.6	575.7	40.2	544.1	12.4	571.9
# 10	13.55	589.00	16.1	572.9	44.2	544.8	15	574.0
# 11	14.06	589.51	16.1	573.4	46.4	543.1	16.5	573.0
# 12	11.84	587.29	27.6	559.7	42.3	545.0	14.1	573.2
# 13	10.48	585.93	11.5	574.4	40.7	545.2	13.9	572.0
# 14	8.98	584.43	12.1	572.3	38.6	545.8	9.5	574.9
Test Boring Data from November 23, 1938 Drawing "Plot Plan - Showing Existing Buildings - RR Siding - Test Borings"								
A-B	22.54	597.99	2.2	595.8	54.7	543.3	N.R.	N.R.
C	20.45	595.90	N.R.	N.R.	52.4	543.5	N.R.	N.R.
D	14.19	589.64	6.4	583.2	48.1	541.5	N.R.	N.R.
E	10.45	585.90	N.R.	N.R.	45.0	540.9	N.R.	N.R.
F	1.80	577.25	22.6	554.7	31.3	546.0	N.R.	N.R.
G	13.08	588.53	15.2	573.3	46.9	541.6	N.R.	N.R.
H	2.16	577.61	8.9	568.7	36.2	541.4	N.R.	N.R.
J	10.00	585.45	23.8	561.7	44.4	541.1	N.R.	N.R.
K	2.80	578.25	6.8	571.5	36.8	541.5	N.R.	N.R.
L	1.33	576.78	3.1	573.7	35.3	541.5	N.R.	N.R.
M	2.04	577.49	7.3	570.2	34.5	543.0	N.R.	N.R.
N	0.88	576.33	6.6	569.7	34.4	541.9	N.R.	N.R.
P	1.06	576.51	6.1	570.4	27.6	548.9	N.R.	N.R.

Notes:
1) All depths and elevations are approximate based on test boring logs.
2) N.R. = Not Recorded.
3) N.E. = Not Encountered.
4) Conversion of City of Buffalo Datum to USGS NGVD 1929: City of Buffalo + 575.453
5) Soil at test boring B-3A, from 26 feet to the bottom of the test boring at 28.5 feet noted as "possible fill"
6) Test borings not completed by SJB were sampled at intervals of 5 feet or greater. Accordingly, the depth to the bottom of the fill soils should be considered approximate.

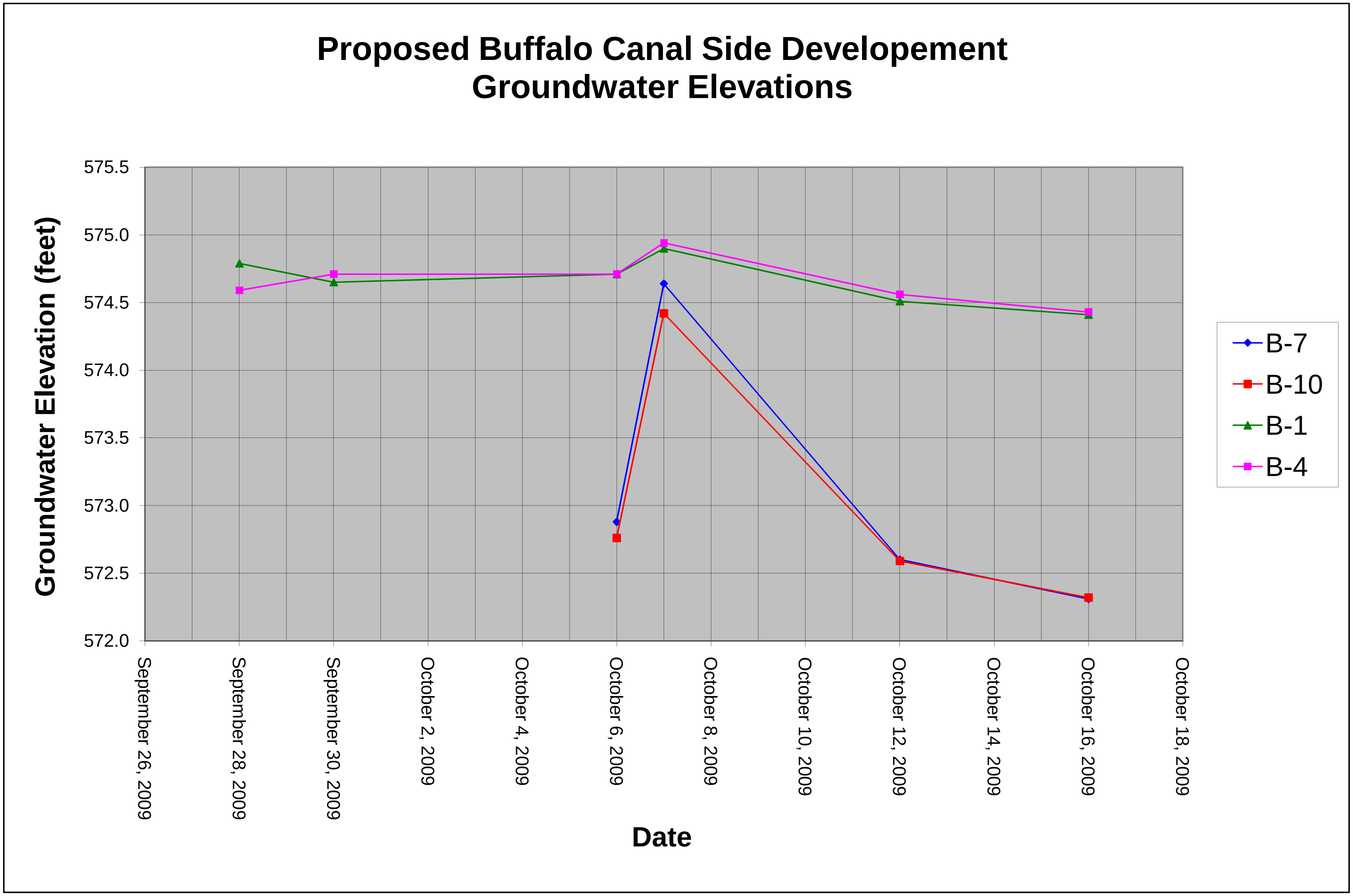
Empire Geo-Services, Inc.
5167 South Park Avenue
Hamburg, New York 14075

TABLE 2

SUMMARY OF GROUNDWATER ELEVATIONS

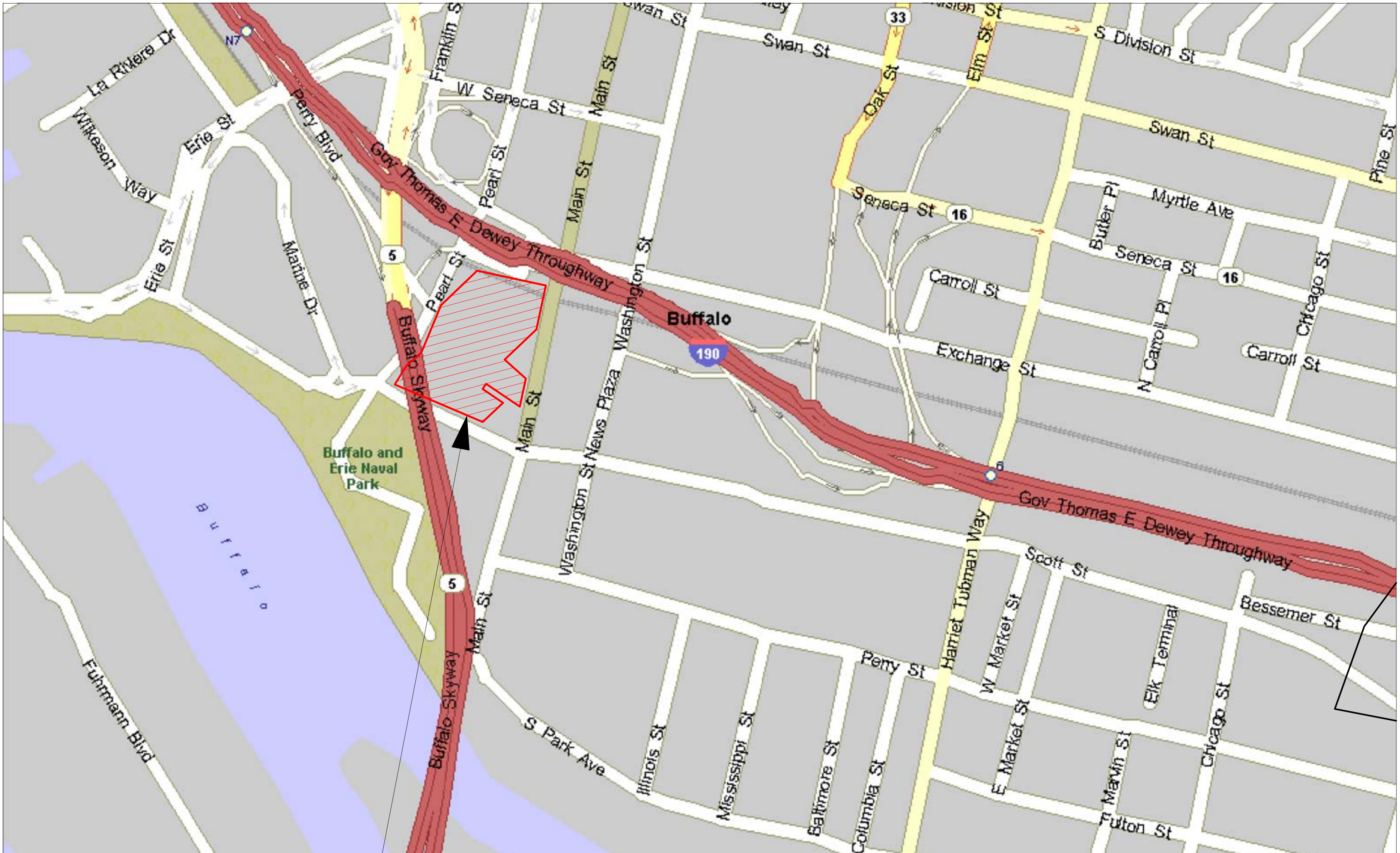
FORMER BUFFALO MEMORIAL AUDITORIUM SITE, PROPOSED BUFFALO CANAL SIDE DEVELOPMENT BUFFALO, NEW YORK

Observation Well	Ground Surface Elevation (feet)	Top of PVC Riser Elevation (feet)	Date	Groundwater Depth / Elevation			Remarks
				Depth from Riser (feet)	Elevation (feet)	Depth Below Ground Surface (feet)	
B-1	588.3	588.01	6/26/2009	13.37	574.6	13.7	Approx. 30 minutes after well installation.
			7/7/2009	13.35	574.7	13.6	
			7/10/2009	13.42	574.6	13.7	
			9/28/2009	13.22	574.8	13.5	
			9/30/2009	13.36	574.7	13.7	
			10/6/2009	13.30	574.7	13.6	
			10/7/2009	13.11	574.9	13.4	High sustained winds from the southwest.
			10/12/2009	13.50	574.5	13.8	
			10/16/2009	13.60	574.4	13.9	
B-4	594.7	597.01	6/25/2009	20.88	576.1	18.6	Approx. 30 minutes after well installation.
			6/26/2009	19.85	577.2	17.5	
			7/7/2009	22.30	574.7	20.0	Removed approx. 2 gallons of water following measurement.
			7/10/2009	22.36	574.7	20.1	
			9/28/2009	22.42	574.6	20.1	
			9/30/2009	22.30	574.7	20.0	
			10/6/2009	22.30	574.7	20.0	
			10/7/2009	22.07	574.9	19.8	High sustained winds from the southwest.
			10/12/2009	22.45	574.6	20.1	
			10/16/2009	22.58	574.4	20.3	
B-7A	585.0	587.28	10/6/2009	14.40	572.9	12.1	
			10/7/2009	12.64	574.6	10.4	High sustained winds from the southwest.
			10/12/2009	14.68	572.6	12.4	Removed approx. 10 gallons of water following measurement.
			10/16/2009	14.97	572.3	12.7	
B-10	585.1	586.96	10/6/2009	14.20	572.8	12.3	
			10/7/2009	12.54	574.4	10.7	High sustained winds from the southwest.
			10/12/2009	14.37	572.6	12.5	Removed approx. 10 gallons of water following measurement.
			10/16/2009	14.64	572.3	12.8	



Empire Geo-Services, Inc.
5167 Soiuth Park Avenue
Hamburg, New York 14075

FIGURES



APPROXIMATE SITE LOCATION

N

NOTE:
SITE LOCATION PLAN DEVELOPED FROM MICROSOFT STREETS & TRIPS 2006

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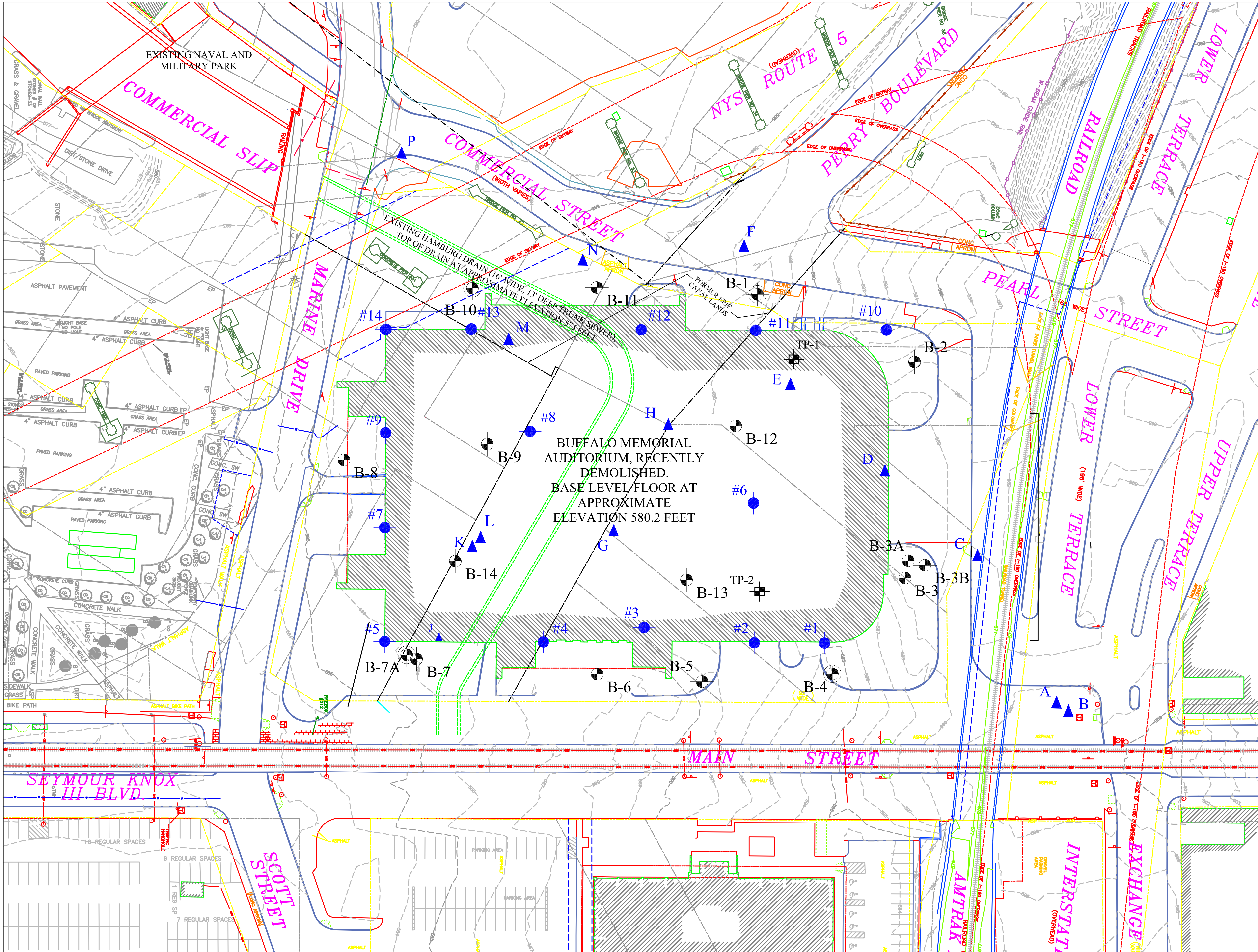
FORMER BUFFALO MEMORIAL AUDITORIUM SITE
PROPOSED BUFFALO CANAL SIDE DEVELOPMENT
BUFFALO, NEW YORK

SITE LOCATION PLAN

DR BY: TJF	SCALE: NTS	PROJ NO.: BE-09-094
CHKD BY: TRS	DATE: 10/15/09	FIGURE NO: 1



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SUBSURFACE LOCATION PLAN

FORMER BUFFALO MEMORIAL AUDITORIUM SITE
PROPOSED BUFFALO CANAL SIDE DEVELOPMENT
BUFFALO, NEW YORK

SCALE: AS SHOWN	PROJ NO.:BE-09-094
DR. BY: TJF	FIGURE NO.: 2
CK BY: TRS	DATE: 10/15/09

N

80 0 80
SCALE FEET

LEGEND:

TP-1 INDICATES APPROXIMATE TEST PIT LOCATION AND DESIGNATION COMPLETED BY DEMCO, INC. ON JULY 10, 2009

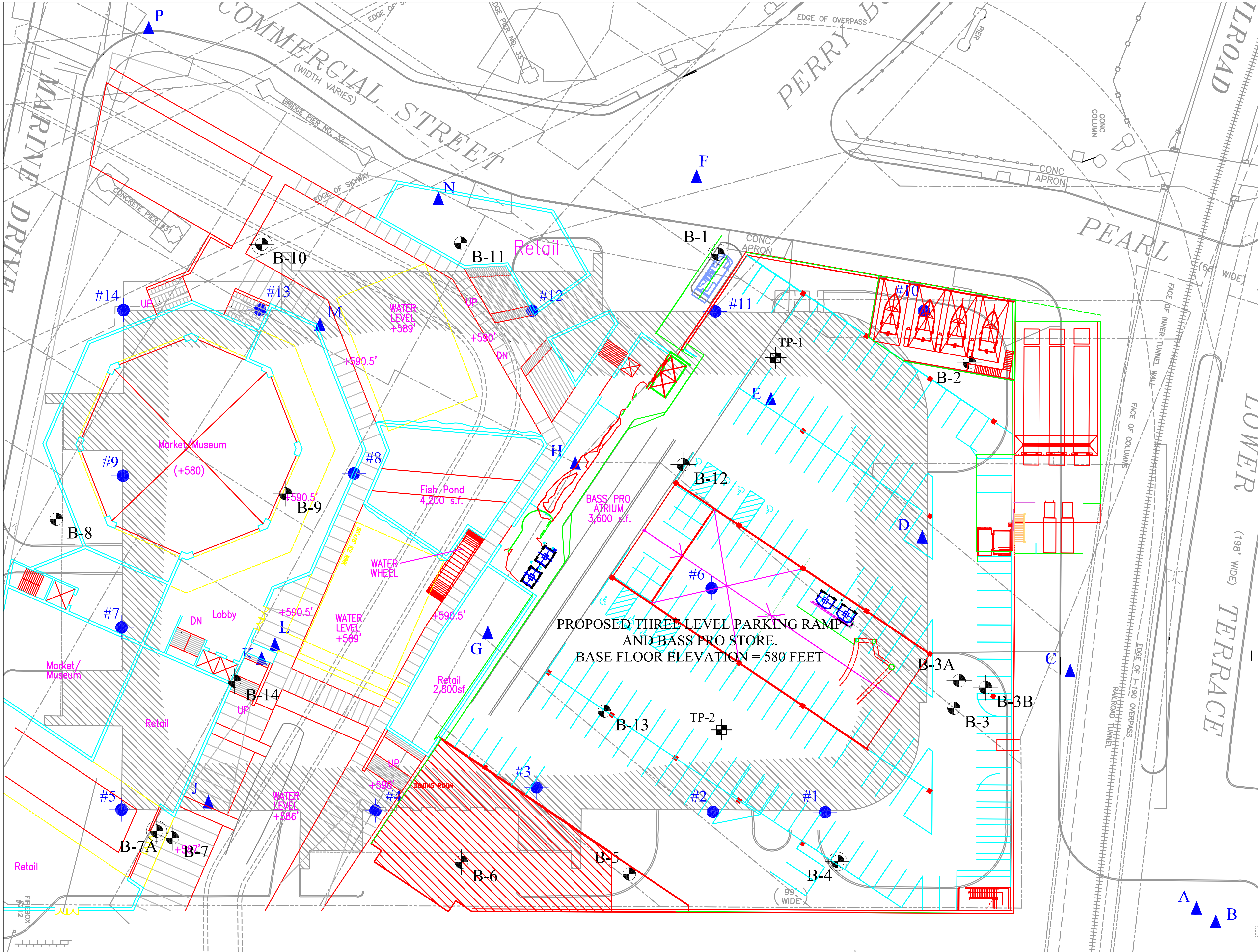
B-2 INDICATES APPROXIMATE TEST BORING LOCATION AND DESIGNATION COMPLETED BY SJB SERVICES, INC. DURING 2009

B-1 INDICATES APPROXIMATE TEST BORING LOCATION AND DESIGNATION COMPLETED WITH A GROUNDWATER OBSERVATION WELL COMPLETED BY SJB SERVICES, INC. DURING 2009.

#1 INDICATES APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING COMPLETED BY RILEY ENGINEERING AND DRILLING COMPANY, CIRCA 1939.

A INDICATES APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING COMPLETED CRICA 1901 TO 1936.

NOTE:
FIGURE WAS DEVELOPED FROM:
TOPOGRAPHIC SURVEY PREPARED BY FOIT-ALBERT ASSOCIATES;
NOVEMBER 23, 1938 DRAWING TITLED "PLOT PLAN - SHOWING EXISTING BLDGS. - R.R. SIDING - TEST BORINGS";
AND FEBRUARY 1939 "SHEET NO. X-2", PROVIDED BY C&S COMPANIES.



EMPIRE GEO SERVICES INC
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PROPOSED DEVELOPMENT PLAN

FORMER BUFFALO MEMORIAL AUDITORIUM SITE
PROPOSED BUFFALO CANAL SIDE DEVELOPMENT
BUFFALO, NEW YORK

SCALE: AS SHOWN	PROJ NO.:BE-09-094
DR. BY: TJF	FIGURE NO.: 3
CK BY: TRS	DATE: 10/15/09

N

SCALE 50 0 50 FEET

LEGEND:

TP-1 — INDICATES APPROXIMATE TEST PIT LOCATION AND DESIGNATION COMPLETED BY DEMCO, INC. ON JULY 10, 2009

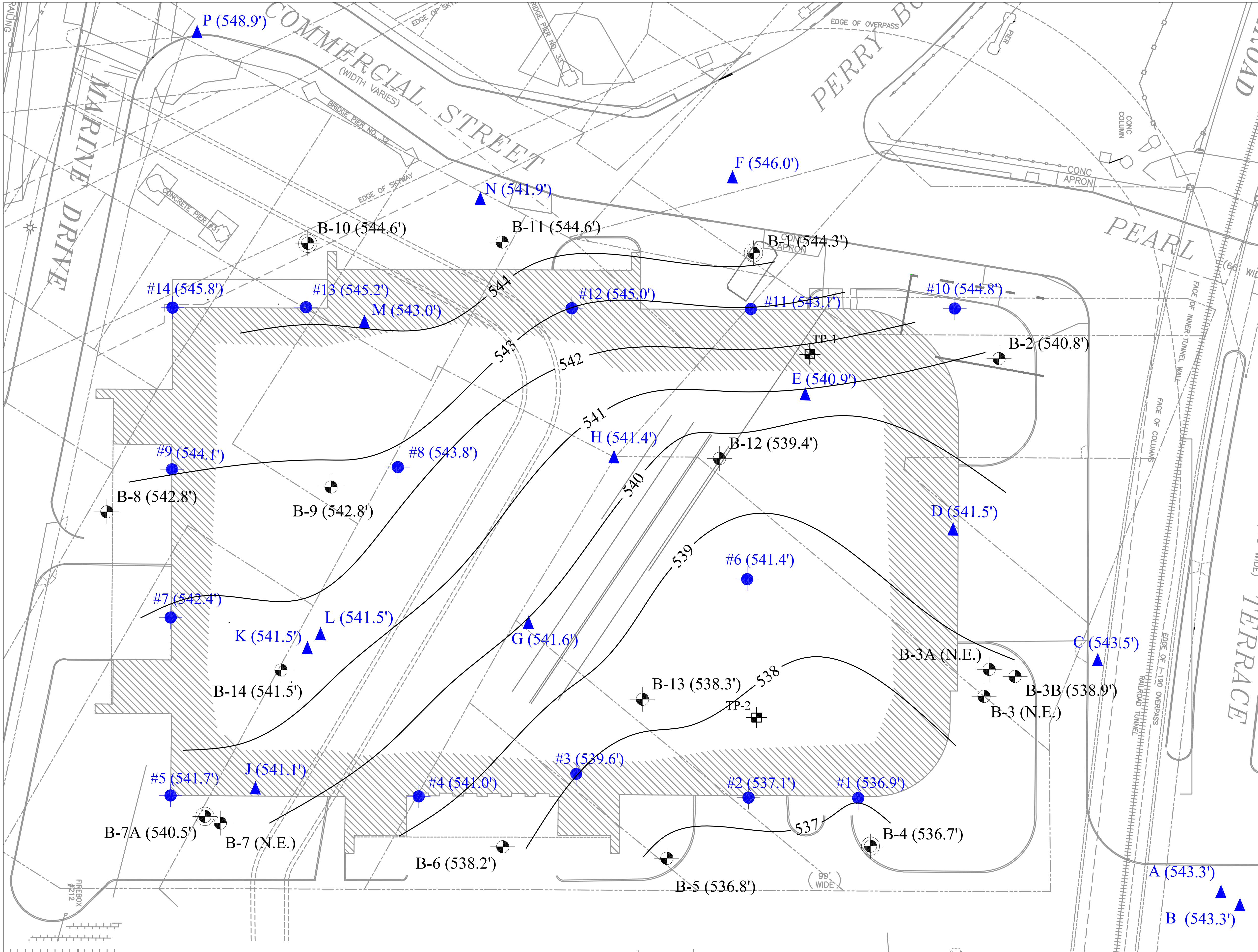
B-2 — INDICATES APPROXIMATE TEST BORING LOCATION AND DESIGNATION COMPLETED BY SJB SERVICES, INC. DURING 2009

B-1 — INDICATES APPROXIMATE TEST BORING LOCATION AND DESIGNATION COMPLETED WITH A GROUNDWATER OBSERVATION WELL COMPLETED BY SJB SERVICES, INC. DURING 2009.

#1 — INDICATES APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING COMPLETED BY RILEY ENGINEERING AND DRILLING COMPANY, CIRCA 1939.

A — INDICATES APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING COMPLETED CRICA 1901 TO 1936.

NOTE:
FIGURE WAS DEVELOPED FROM: TOPOGRAPHIC SURVEY PREPARED BY FOIT-ALBERT ASSOCIATES; NOVEMBER 23, 1938 DRAWING TITLED "PLOT PLAN - SHOWING EXISTING BLDGS. - R.R. SIDING - TEST BORINGS"; FEBRUARY 1939 "SHEET NO. X-2", AND CONCEPT PLANS PREPARED BY EHRENKRANTZ, ECKSTUT, & KUHN ARCHITECTS, PROVIDED BY C&S COMPANIES;



EMPIRE GEO SERVICES INC
a subsidiary of SJB Services, Inc.

APPROXIMATE TOP OF BEDROCK CONTOUR PLAN

FORMER BUFFALO MEMORIAL AUDITORIUM SITE
PROPOSED BUFFALO CANAL SIDE DEVELOPMENT
BUFFALO, NEW YORK

SCALE: AS SHOWN	PROJ NO.:BE-09-094
DR. BY: TJF	FIGURE NO.: 4
CK BY: TRS	DATE: 10/30/09

N

50 0 50
SCALE FEET

LEGEND:

- TP-1 — INDICATES APPROXIMATE TEST PIT LOCATION AND DESIGNATION COMPLETED BY DEMCO, INC. ON JULY 10, 2009.
- B-2 — INDICATES APPROXIMATE TEST BORING LOCATION AND DESIGNATION COMPLETED BY SJB SERVICES, INC. DURING JUNE 2009.
- B-1 — INDICATES APPROXIMATE TEST BORING LOCATION AND DESIGNATION COMPLETED WITH A GROUNDWATER OBSERVATION WELL COMPLETED BY SJB SERVICES, INC. DURING 2009.
- #1 — INDICATES APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING COMPLETED BY RILEY ENGINEERING AND DRILLING COMPANY, CIRCA 1939.
- A — INDICATES APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING COMPLETED CRICA 1901 TO 1936.
- (544.0') — INDICATES APPROXIMATE TOP OF BEDROCK ELEVATION.
- 544 — INDICATES APPROXIMATE TOP OF BEDROCK ELEVATION CONTOUR (FEET).

NOTE:

1) FIGURE WAS DEVELOPED FROM: TOPOGRAPHIC SURVEY PREPARED BY FOIT-ALBERT ASSOCIATES; NOVEMBER 23, 1938 DRAWING TITLED "PLOT PLAN - SHOWING EXISTING BLDGS. - R.R. SIDING - TEST BORINGS"; FEBRUARY 1939 "SHEET NO. X-2", AND CONCEPT PLANS PREPARED BY EHRENKRANTZ, ECKSTUT, & KUHN ARCHITECTS, PROVIDED BY C&S COMPANIES.
2) TOP OF BEDROCK CONTOURS BASED ON TEST BORINGS COMPLETED BY SJB SERVICES, INC. DURING 2009.
3) TOP OF BEDROCK CONTOURS ASSUME A UNIFORM SLOPE BETWEEN DATA POINTS.

APPENDIX A

TEST BORING LOGS AND MONITORING WELL COMPLETION RECORDS

DATE

STARTED

FINISHED

SHEET OF

SJB SERVICES, INC.
SUBSURFACE LOG

PROJ. No.

HOLE No.

SURF. ELEV.

G.W. DEPTH

PROJECT

LOCATION

DEPTH (ft)	SAMPLES	SAMPLE No.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	BLOWS ON CASING C	SOIL OR ROCK CLASSIFICATION	NOTES
0		1	3	3	4	8	7	10	3" TOPSOIL	Groundwater at 10' upon completion, and 5' 24 hrs. after completion
								15	Brown SILT, some Sand, trace clay, ML (Moist-Loose)	
								50/.5		
5									Gray SHALE, medium hard, weathered, thin bedded, some fractures	Run#1, 2.5'-5.0' 95% Recovery 50% RQD

(1) (2) (3) (4) (5) (6) (7) *(numbered features explained on reverse)* (8) (9) (10)

TABLE I

Symbol	Sample
	Split Spoon Sample
	Shelby Tube Sample
	Geoprobe Macro-Core
	Auger or Test Pit Sample
	Rock Core

TABLE II

Identification of soil type is made on basis of an estimate of particle sizes, and in the case of fine grained soils also on basis of plasticity.

Soil Type	Soil Particle Size	
Boulder	>12"	
Cobble	3" - 12"	
Gravel - Coarse	3" - 3/4"	Coarse Grained (Granular)
- Fine	3/4" - #4	
Sand - Coarse	#4 - #10	
- Medium	#10 - #40	
- Fine	#40 - #200	
Silt - Non Plastic (Granular)	<#200	Fine Grained
Clay - Plastic (Cohesive)		

TABLE III

The following terms are used in classifying soils consisting of mixtures of two or more soil types. The estimate is based on weight of total sample.

Term	Percent of Total Sample
"and"	35 - 50
"some"	20 - 35
"little"	10 - 20
"trace"	less than 10

(When sampling gravelly soils with a standard split spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter.)

TABLE IV

The relative compactness or consistency is described in accordance with the following terms:

Granular Soils Term	Blows per Foot, N	Cohesive Soils Term	Blows per Foot, N
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Firm	10 - 30	Medium	4 - 8
Compact	30 - 50	Stiff	8 - 15
Very Compact	>50	Very Stiff	15 - 30
		Hard	>30

(Large particles in the soils will often significantly influence the blows per foot recorded during the penetration test)

TABLE V

Term	Meaning
Varved	Horizontal uniform layers or seams of soil(s).
Layer	Soil deposit more than 6" thick.
Seam	Soil deposit less than 6" thick.
Parting	Soil deposit less than 1/8" thick.
Laminated	Irregular, horizontal and angled seams and partings of soil(s).

TABLE VI

Rock Classification Term		Meaning
Hardness	- Soft	Scratched by fingernail
	- Medium Hard	Scratched easily by penknife
	- Hard	Scratched with difficulty by penknife
	- Very Hard	Cannot be scratched by penknife
Weathering	- Very Weathered	Judged from the relative amounts of disintegration, iron staining, core recovery, clay seams, etc.
	- Weathered	
	- Sound	

Rock Classification Term		Meaning	
Bedding	- Laminated	(<1")	Natural breaks in Rock Layers
	- Thin Bedded	(1" - 4")	
	- Bedded	(4" - 12")	
	- Thick Bedded	(12" - 36")	
	- Massive	(>36")	

(Fracturing refers to natural breaks in the rock oriented at some angle to the rock layers)

GENERAL INFORMATION & KEY TO SUBSURFACE LOGS

The Subsurface Logs attached to this report present the observations and mechanical data collected by the driller at the site, supplemented by classification of the material removed from the borings as determined through visual identification by technicians in the laboratory. It is cautioned that the materials removed from the borings represent only a fraction of the total volume of the deposits at the site and may not necessarily be representative of the subsurface conditions between adjacent borings or between the sampled intervals. The data presented on the Subsurface Logs together with the recovered samples provide a basis for evaluating the character of the subsurface conditions relative to the project. The evaluation must consider all the recorded details and their significance relative to each other. Often analyses of standard boring data indicate the need for additional testing or sampling procedures to more accurately evaluate the subsurface conditions. Any evaluation of the contents of this report and recovered samples must be performed by qualified professionals. The following information defines some of the procedures and terms used on the Subsurface Logs to describe the conditions encountered, consistent with the numbered identifiers shown on the Key opposite this page.

1. The figures in the Depth column define the scale of the Subsurface Log.

2. The Samples column shows, graphically, the depth range from which a sample was recovered. See Table I for descriptions of the symbols used to represent the various types of samples.

3. The Sample No. is used for identification on sample containers and/or Laboratory Test Reports.

4. Blows on Sampler - shows the results of the "Penetration Test", recording the number of blows required to drive a split spoon sampler into the soil. The number of blows required for each six inches is recorded. The first 6 inches of penetration is considered a seating drive. The number of blows required for the second and third 6 inches of penetration is termed the penetration resistance, N.

5. Blows on Casing - Shows the number of blows required to advance the casing a distance of 12 inches. The casing size, hammer weight, and length of drop are noted at the bottom of the Subsurface Log. If the casing is advanced by means other than driving, the method of advancement will be indicated in the Notes column or under the Method of Investigation at the bottom of the Subsurface Log. Alternatively, sample recovery may be shown in this column, or other data consistent with the column heading.

6. All recovered soil samples are reviewed in the laboratory by an engineering technician, geologist or geotechnical engineer, unless noted otherwise. Visual descriptions are made on the basis of a combination of the driller's field descriptions and noted observations together with the sample as received in the laboratory. The method of visual classification is based primarily on the Unified Soil Classification System (ASTM D 2487) with regard to the particle size and plasticity (See Table No. II), and the Unified Soil Classification System group symbols for the soil types are sometimes included with the soil classification. Additionally, the relative portion, by weight, of two or more soil types is described for granular soils in accordance with "Suggested Methods of Test for Identification of Soils" by D.M. Burmister, ASTM Special Technical Publication 479, June 1970. (See Table No. III). Description of the relative soil density or consistency is based upon the penetration records as defined in Table No. IV. The description of the soil moisture is based upon the relative wetness of the soil as recovered and is described as dry, moist, wet and saturated. Water introduced into the boring either naturally or during drilling may have affected the moisture condition of the recovered sample. Special terms are used as required to describe soil deposition in greater detail; several such terms are listed in Table V. When sampling gravelly soils with a standard two inch diameter split spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter. The presence of boulders and large gravel is sometimes, but not necessarily, detected by an evaluation of the casing and sampler blows or through the "action" of the drill rig as reported by the driller.

7. Rock description is based on review of the recovered rock core and the driller's notes. Frequently used rock classification terms are included in Table VI.

8. The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Solid stratification lines delineate apparent changes in soil type, based upon review of recovered soil samples and the driller's notes. Dashed lines convey a lesser degree of certainty with respect to either a change in soil type or where such change may occur.

9. Miscellaneous observations and procedures noted by the driller are shown in this column, including water level observations. It is important to realize the reliability of the water level observations depends upon the soil type (water does not readily stabilize in a hole through fine grained soils), and that any drill water used to advance the boring may have influenced the observations. The ground water level will fluctuate seasonally, typically. One or more perched or trapped water levels may exist in the ground seasonally. All the available readings should be evaluated. If definite conclusions cannot be made, it is often prudent to examine the conditions more thoroughly through test pit excavations or groundwater observation wells.

10. The length of core run is defined as the length of penetration of the core barrel. Core recovery is the length of core recovered divided by the core run. The RQD (Rock Quality Designation) is the total length of pieces of NX core exceeding 4 inches divided by the core run. The size core barrel used is also noted in the Method of Investigation at the bottom of the Subsurface Log.

SJB SERVICES, INC.
SUBSURFACE LOG

DATE
START: 6/26/2009
FINISH: 6/26/2009
SHEET: 1 OF 2

HOLE NO.: B-1
SURF. ELEV: 588.3'
G.W. DEPTH: See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT
LOCATION: FORMER MEMORIAL AUDITORIUM SITE, BUFFALO, NEW YORK
PROJ. NO.: BE-09-094

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	-	12				CONCRETE SIDEWALK	PID= Photoionization
		7	9		16	1.0	Black to Brown f-c SAND, some fine Gravel, little	Detector
	2	11	12				Silt, tr. cinders, tr. brick (moist, FILL)	BG= Background,
		7	14		19	1.0	Becomes Brown, contains little f-c Gravel, tr. silt	measured in parts per
5	3	-	-					million
		-	-		-	-		Driller noted obstruction
	4	3	2				Red- Brown Mottled Grey Silty CLAY, tr. brick,	at 4'- 6'. No sample taken.
		3	2		5	BG	occasional f-c Sand laminations (moist, FILL)	Pea- gravel noted at 4'.
	5	5	4				Becomes Brown to Dark Grey, contains little f-c	
10		7	2		11	BG	Sand, little Cinders, some Concrete fragments	
	6	1	1					
		2	2		3	BG	Contains tr. wood, tr. cinders, tr. concrete	
	7	3	3				Becomes Black, contains some Wood	Poor Recovery Sample #7
		2	2		5	1.3		Cresol odor noted on
15	8	3	1					Sample #7
		4	4		5	-		No Recovery Sample #8
	9	2	4				Contains little f-c Sand, little Wood, tr. glass,	
		3	4		7	BG	tr. brick	
	10	1	1					No Recovery Sample #10
20		1	1		2	-		
	11	1	1				Black f-m SAND, little fine Gravel, little Silt, tr. wood	
		2	1		3	BG	(moist- wet, FILL)	
	12	2	1				Contains tr. gravel, tr. metal, occasional Organic	Slight sheen on Sample
		3	3		4	BG	matter (wet)	#12
25	13	1	8				Yellow- Brown f-m SAND, some Silt (wet, firm, SM)	
		5	5		13	BG		
	14	1	4				Becomes Brown f-c SAND, tr. gravel, tr. silt	
		5	5		9	BG	(loose, SP- SM)	
	15	3	6					
30		11	12		17	BG	(firm)	
	16	1	6				Becomes Yellow- Brown f-m SAND, tr. gravel, tr. silt	Driller noted significant
		4	15		10	BG		running sands. Begin
								sampling at 5' intervals to
								limit running sands.
35								
	17	6	9				Becomes Light Brown, contains little Silt	
		10	15		19	BG		
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: D. MATTHIES

DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION: ASTM D-1586 USING HOLLOW STEM AUGERS

SJB SERVICES, INC.
SUBSURFACE LOG

DATE
START 6/26/2009
FINISH 6/26/2009
SHEET 2 OF 2

HOLE NO. B-1
SURF. ELEV 588.3'
G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT
PROJ. NO.: BE-09-094
LOCATION: FORMER MEMORIAL AUDITORIUM SITE
BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	18	2	3				Becomes Brown f-c SAND, tr. silt	
		3	5		6	BG		
45							Boring Complete with Auger Refusal at 44.0'	Free Standing Water Measured at 21.1' at Boring Completion 2" PVC groundwater observation well installed in completed test boring. Refer to installation log for details.
50								
55								
60								
65								
70								
75								
80								

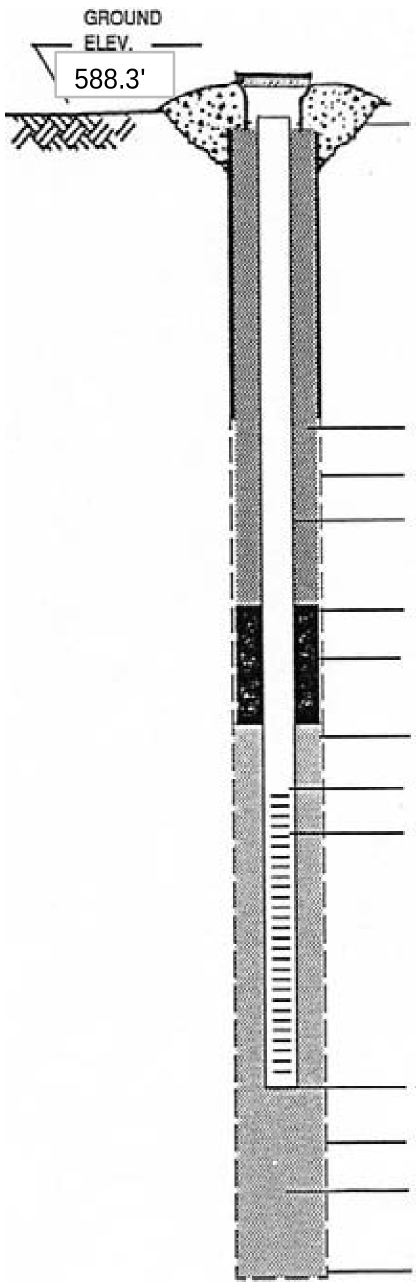
N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: D. MATTHIES DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

MONITORING WELL COMPLETION RECORD

PROJECT: Buffalo Canal Side Development	
PROJECT NUMBER: BE-09-094	DRILLING METHOD: ASTM D-1586
WELL NUMBER: B-1	GEOLOGIST: -
DRILLER: D. Matthies	INSTALLATION DATE(S): 6/26/2009



TYPE OF SURFACE SEAL: Concrete
ELEV./ TOP OF RISER PIPE: 588.01'

TYPE OF BACKFILL: Auger Cuttings
BOREHOLE DIAMETER: 8"+/-
I.D. OF RISER PIPE: 2.0"
TYPE OF RISER PIPE: PVC

DEPTH OF SEAL: 21.5'
TYPE OF SEAL: Bentonite

DEPTH OF SAND PACK: 24.0'
DEPTH OF TOP OF SCREEN: 33.8'

TYPE OF SCREEN: PVC
SLOT SIZE X LENGTH: 0.10x10.0'
I.D. OF SCREEN: 2.0"
TYPE OF SAND PACK: "O" Filter Sand

DEPTH BOTTOM OF SCREEN: 43.8'

DEPTH BOTTOM OF SAND PACK: 44.0'
TYPE OF BACKFILL BELOW OBSERVATION WELL: "O" Filter Sand
ELEVATION/ DEPTH OF HOLE: 44.0'

DATE			
START	6/22/2009	**SJB SERVICES, INC.**	HOLE NO. B-2
FINISH	6/23/2009	**SUBSURFACE LOG**	SURF. ELEV 597.8'
SHEET	1 OF 2		G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT LOCATION: FORMER MEMORIAL AUDITORIUM SITE

PROJ. NO.: BE-09-094 BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	5	3				Black f-c SAND, little f-c Gravel, little Silt, little	PID= Photoionization
		6	6		9	BG	Brick fragments, tr. slag, tr. cinders (moist, FILL)	Detector
	2	3	4					BG= Background,
		7	7		11	BG	Brown Silty CLAY, tr. cinders, tr. ash, occasional	measured in parts per
5	3	50/0.4			REF	BG	topsoil seams (moist, FILL)	million
								Poor Recovery Sample #3
	4	15	5				Brown to Grey f-c SAND, little fine Gravel, tr. roots,	
		4	3		9	BG	occasional Brick fragments (moist, FILL)	
	5	6	8					Poor Recovery Sample #5
10		5	10		13	BG		
	6	4	4				Grey to Brown Silty CLAY, tr. sand, tr. brick, tr. wood	Poor Recovery Sample #6
		8	11		12	BG	(moist, FILL)	
	7	8	16				Orange Brick fragments and Concrete fragments	REF= Sample Spoon
		13	14		29	BG	(moist, FILL)	Refusal
15	8	2	2					
		3	4		5	BG	Brown f-c SAND, little f-c Gravel, little Brick fragments,	
	9	3	4				tr. cinders, tr. slag (moist, FILL)	Poor Recovery Sample #9
		6	4		10	1.7	Orange Brick fragments, tr. tar (moist, FILL)	Slight creosol odor Sample
	10	3	1					#9
20		1	1		2	BG	Brown to Grey f-c SAND, little Silt, little Cinders,	
	11	3	1				tr. ash (moist- wet, FILL)	
		1	2		2	BG	Brown f-c SAND, little fine Gravel	
	12	2	5				(moist- wet, v. loose, SP)	
		4	3		9	BG	Becomes Grey f-m SAND, contains little Silt (SM)	
25	13	8	8				Grey Silty CLAY, little fine Sand, occasional f-m	
		6	7		14	BG	Sand seams (moist- wet, stiff, CL)	
	14	6	5				Grey f-m SAND, little Silt (moist- wet, firm, SM)	No Recovery Sample #14
		4	5		9	-	(loose)	
	15	2	2					No Recovery Sample #15
30		2	3		4	-		
	16	1	2				Becomes Brown to Grey f-c SAND, tr. gravel, tr. silt	
		5	7		7	BG	(wet, SP)	
	17	5	9				Becomes Brown	
		7	10		16	BG	(firm)	
35	18	11	8					
		8	10		16	BG		
	19	11	8					
		9	10		17	BG		
	20	1	3				Becomes Brown f-m SAND, contains little Silt (SM)	
40		7	8		10	BG		

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: D. MATTHIES DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE	
START	6/22/2009
FINISH	6/23/2009
SHEET	2 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-2
SURF. ELEV 597.8'
G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT
LOCATION: FORMER MEMORIAL AUDITORIUM SITE
BUFFALO, NEW YORK
PROJ. NO.: BE-09-094

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	21	1	4					
		5	8		9	BG	(loose)	
	22	6	5				Contains some Silt (firm)	
		7	9		12	BG		
45	23	9	6				Becomes Brown to Grey f-c SAND, tr. gravel, tr. silt	
		6	7		12	BG	(SP)	
	24	11	9				Becomes Brown, contains little fine Gravel	
		9	7		18	BG		
	25	4	2				Contains little f-c Gravel, little Silt, tr. clay (SM)	
50		10	35		12	BG		Driller augered to 57' to prepare boring for rock coring.
	26	14	35	50/0.3	REF	BG	(v. compact)	
	27	3	20				Brown to Grey f-c GRAVEL, some f-c Sand, tr. silt	
		20	24		40	BG	(wet, compact, GP- GM)	
55	28	5	4				Brown to Grey f-c SAND, tr. silt, occasional Silty Clay	
		6	6		10	BG	seams (wet, firm, SM- SC)	
							Grey LIMESTONE, weathered to sound, hard to very hard, thin bedded to bedded, frequent horizontal mechanical breaks, frequent horizontal fractures, occasional vertical fractures, occasional fossils, frequent styorites	Run #1: 57.0'- 62.0' REC= 47% RQD= 18%
60								
							Boring Complete at 62.0'	No Free Standing Water Measurement Made at Boring Completion
65								
70								REF= Sample Spoon Refusal
75								
80								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: D. MATTHIES DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE START 6/23/2009 FINISH 6/23/2009 SHEET 1 OF 1	**SJB SERVICES, INC.** **SUBSURFACE LOG**	HOLE NO. B-3 SURF. ELEV 599.0' G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT LOCATION: FORMER MEMORIAL AUDITORIUM SITE
PROJ. NO.: BE-09-094 BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	2	3				Dark Grey SILT, some f-c Sand, tr. gravel, tr. clay,	PID= Photoionization
		2	4		5	BG	tr. cinders (moist, FILL)	Detector
	2	3	5				Becomes Brown, contains tr. brick, tr. ash	BG= Background,
		7	7		12	BG		measured in parts per
5	3	4	4				Contains occasional f-c Sand laminations	million
		4	3		8	BG		
	4	4	4				Contains occasional f-c Sand seams, occasional	
		4	9		8	BG	Clayey Silt seams	
	5	3	4				Contains occasional f-c Sand and Concrete	
10		5	8		9	BG	fragments	
	6	2	3				Contains tr. wood	
		4	6		7	BG		
	7	7	9				Becomes Dark Grey, contains little Brick fragments,	Poor Recovery Sample #7
		8	9		17	BG	frequent f-m Sand seams	
15	8	2	3					
		2	4		5	BG	Becomes f-c GRAVEL, some Brick fragments,	
	9	3	3				little Silty Clay, little f-c Sand (moist, FILL)	No Recovery Sample #9
		3	4		6	BG		
	10	3	5				Brown Silty CLAY, little f-c Sand, tr. brick, tr. wood,	Poor Recovery Sample #10
20		8	50/0.2		13	BG	tr. cinders (moist, FILL)	
							Boring Complete with Auger Refusal at 19.7'	No Free Standing Water Measurement Made at Boring Completion
25								
30								
35								
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: D. MATTHIES DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE	**SJB SERVICES, INC.** **SUBSURFACE LOG**	HOLE NO. B-3A
START 6/23/2009		SURF. ELEV 599.6'
FINISH 6/23/2009		G.W. DEPTH See Notes
SHEET 1 OF 1		

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT LOCATION: FORMER MEMORIAL AUDITORIUM SITE
PROJ. NO.: BE-09-094 BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	3	5				Brown SILT, little f-c Sand, tr. roots (moist, FILL)	PID= Photoionization
		5	5		10	BG	Brown to Grey f-c SAND, some fine Gravel, little Silt	Detector
	2	6	7				(moist, FILL)	BG= Background,
		11	8		18	BG	Grey Concrete fragments, tr. silt (moist, FILL)	measured in parts per
5	3	7	6					million
		5	6		11	BG		Poor Recovery Sample #3
	4	6	3				Brown f-m SAND, some Silt, tr. gravel, tr. cinders	
		4	4		7	BG	(moist, FILL)	
	5	3	2				Brown SILT, some f-m Sand, tr. cinders, tr. brick	
10		2	4		4	BG	(moist, FILL)	
	6	3	2				Contains little f-c Gravel, tr. clay	
		5	5		7	BG		
	7	4	4				Contains tr. gravel, tr. ash, tr. wood, frequent f-c	
		2	3		6	BG	Sand seams	
15	8	4	5				Brown f-c GRAVEL, some f-c Sand, little Brick	
		18	15		23	BG	fragments, occasional Silty Clay laminations	
	9	7	8				(moist, FILL)	
		9	7		17	BG	Orange Brick fragments	Auger Refusal at 18.8'
	10	5	50/0.3		REF	BG	Brown f-m SAND, some Silt. tr. clay, tr. brick,	Run #1: 18.8'- 22.8'
20							little fine Gravel (moist, FILL)	Driller noted obstruction was
							Contains little Silt, tr. wood	approximately 2' thick.
							Light Brown- Tan SANDSTONE	REC= 0.45'
	11	3	3				Grey f-m SAND, little Clayey Silt, tr. wood	
		2	3		5	BG	(moist, FILL)	
25	12	6	2				Becomes Black	No water in boring prior
		6	7		8	BG		to coring.
	13	4	4				Grey Silty CLAY, some f-c Sand, tr. gravel	Water level after coring
		3	6		7	BG	(moist, medium, possible FILL)	was 16.7'.
30								Free Standing Water
							Boring Complete at 28.5' After Sidewalls Collapsed at 21.7'	Measured at 18.4'
								at Boring Completion
35								REF= Sample Spoon Refusal
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: D. MATTHIES DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE	**SJB SERVICES, INC.**	HOLE NO. B-3B
START 10/6/2009	**SUBSURFACE LOG**	SURF. ELEV 599.5
FINISH 10/7/2009		G.W. DEPTH See Notes
SHEET 1 OF 2		

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT LOCATION: FORMER MEMORIAL AUDITORIUM SITE
PROJ. NO.: BE-09-094A BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
							Auger to 20' with out sampling-	PID= Photoionization
		A	U	G	E	R	See logs for B-3 and B-3A	Detector, measured in
								parts per million.
								BG= Background
5								
10								
15								
20								
	1	7	5				Dark Grey- Brown f-m SAND, tr. cinders, tr. wood,	
		5	5		10	BG	tr. brick (moist, FILL)	
	2	3	5					
		7	7		12	BG	(moist- wet seam at 23')	
25	3	2	2					
		1	3		3	BG	Grey Silty CLAY and f-c Sand, tr. gravel	
	4	4	6				(moist, soft, CL)	
		11	7		17	BG	Brown- Grey f-c SAND, little Silty Clay, tr. gravel	
	5	WOH	1				(wet, firm, SW- SC)	WOH= Weight of Hammer
30		4	6		5	BG	Contains f-m Sand, tr. silt (loose, SP)	and Rods
	6	1	6					
		6	7		12	BG	(firm)	
	7	7	6					
		6	9		12	BG		
35								
	8	4	10					
		13	17		23	BG		
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: N. HINTZ DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE
START 10/6/2009
FINISH 10/7/2009
SHEET 2 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-3B
SURF. ELEV 599.5
G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT
PROJ. NO.: BE-09-094A
LOCATION: FORMER MEMORIAL AUDITORIUM SITE
BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	9	5	3				Becomes Tan- Brown (loose)	Driller added water to
		5	6		8	BG		boring to limit
								"running sands".
45								
	10	3	7					
		11	10		18	BG	(firm)	
50								
	11	3	5					
		6	11		11	BG		
55								
	12	4	4					
		7	9		11	BG		REF= Sample Spoon Refusal
60								No Recovery Sample #13
	13	50/0.2			REF			
							Boring Complete with Auger Refusal at 60.6'	Free Standing Water Measured at 28.8' at Boring Completion
65								
70								
75								
80								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: N. HINTZ DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE			
START	6/24/2009	**SJB SERVICES, INC.**	HOLE NO. B-4
FINISH	6/25/2009	**SUBSURFACE LOG**	SURF. ELEV 594.7'
SHEET	1 OF 2		G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT LOCATION: FORMER MEMORIAL AUDITORIUM SITE
PROJ. NO.: BE-09-094 BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	6	5				Dark Brown SILT, some f-c Sand, tr. gravel, tr. brick	PID= Photoionization
		4	7		9	BG	(moist, FILL)	Detector
	2	6	8				Brown f-c SAND, some Silt, tr. brick, tr. slag, tr. tar	BG= Background,
		7	7		15	BG	(moist, FILL)	measured in parts per
5	3	8	6				Contains little Slag, little Brick fragments	million
		7	8		13	BG		
	4	6	7				Grey to Brown f-c GRAVEL, some f-c Sand, little Silt,	
		4	4		11	BG	little Brick fragments, tr. concrete fragments	
	5	2	4				(moist, FILL)	
10		6	7		10	BG	Dark Brown f-c SAND, little Silt, tr. gravel, tr. brick,	
	6	1	3				tr. slag (moist, FILL)	
		2	7		5	BG	Becomes Brown, contains and Clayey Silt, tr. concrete	
	7	10	5				Dark Brown to Brown coarse GRAVEL, some f-c Sand	Poor Recovery Sample #7
		11	5		16	BG	little Silty Clay, tr. concrete, tr. cinders (moist, FILL)	
15	8	9	6				Orange Brick fragments, some f-c Gravel, tr. silt	
		5	14		11	BG	(moist, FILL)	
	9	23	25				Contains tr. gravel, occasional Concrete seams	
		23	34		48	BG		
	10	18	50/0.4		REF	BG	Grey f-c GRAVEL, little Wood, tr. brick (moist, FILL)	REF= Sample Spoon
20								Refusal
	11	12	3				Contains little Brick fragments	Poor Recovery Sample
		5	6		8	BG		#11
	12	3	3					No Recovery Sample #12
		2	3		5	BG		
25	13	6	6				Brown f-c SAND, tr. silt (wet, firm, SP)	Poor Recovery Sample
		4	3		10	BG		#13
	14	3	5				Contains tr. gravel	
		8	9		13	BG		
	15	1	1					Slight running sands
30		2	4		3	BG	(v. loose)	Sample #15
	16	1	3				Becomes Brown f-m SAND, little Silt (wet, firm, SM)	
		8	10		11	BG		
	17	4	7					
		8	9		15	BG		Driller noted 6' of running
35	18	3	7				Becomes Brown f-c SAND, tr. silt (wet, firm, SP)	sands at 36'.
		8	8		15	BG		Begin sampling at 5'
								intervals to limit running
								sands.
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: D. MATTHIES DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE		
START	6/24/2009	
FINISH	6/25/2009	
SHEET	2 OF 2	

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-4
SURF. ELEV 594.7'
G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT LOCATION: FORMER MEMORIAL AUDITORIUM SITE
PROJ. NO.: BE-09-094 BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	19	1	6					
		9	9		15			
45	20	3	4				Becomes Brown f-m SAND, little Silt (wet, firm, SM)	
		11	7		15			
50	21	3	6				Becomes Brown f-c SAND, tr. silt (wet, firm, SP)	
		12	11		18			
55	22	6	19				Becomes Brown f-m SAND, some Silt (wet, compact, SM)	
		18	10		37			
60							Boring Complete with Auger Refusal at 58.0'	Free Standing Water Measured at 25.2' at Boring Completion 2" PVC groundwater observation well installed at boring completion. Refer to installation log for details.
65								
70								
75								
80								

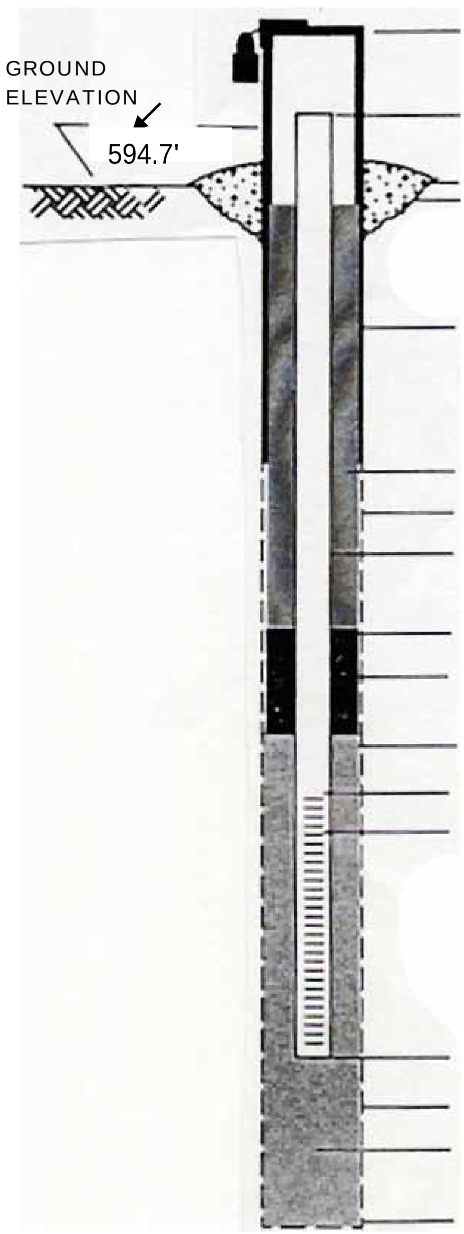
N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: D. MATTHIES DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

MONITORING WELL COMPLETION RECORD

PROJECT: Buffalo Canal Side Development	
PROJECT NUMBER: BE-09-094	DRILLING METHOD: ASTM D-1586
WELL NUMBER: B-4	GEOLOGIST: -
DRILLER: D. Matthies	INSTALLATION DATE(S): 6/25/2009



ELEVATION/ TOP OF RISER PIPE:	597.01'
STICK- UP/ TOP OF RISER PIPE:	2.4'
TYPE OF SURFACE SEAL:	Concrete
I.D. OF SURFACE CASING:	3" Square
TYPE OF SURFACE CASING:	Steel
TYPE OF BACKFILL:	Auger Cuttings
BOREHOLE DIAMETER:	8"+/-
I.D. OF RISER PIPE:	2.0"
TYPE OF RISER PIPE:	PVC
DEPTH OF SEAL:	25.5'
TYPE OF SEAL:	Bentonite
DEPTH OF SAND PACK:	28.0'
DEPTH TOP OF SCREEN:	36.1'
TYPE OF SCREEN:	PVC
SLOT SIZE X LENGTH:	0.10x20.0'
I.D. OF SCREEN:	2.0"
TYPE OF SAND PACK:	"O" Filter Sand
DEPTH BOTTOM OF SCREEN:	56.1'
DEPTH BOTTOM OF SAND PACK:	58.0'
TYPE OF BACKFILL BELOW OBSERVATION WELL:	"O" Filter Sand
ELEVATION/ DEPTH OF HOLE:	58.0'

DATE	
START	6/24/2009
FINISH	6/24/2009
SHEET	1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO.	B-5
SURF. ELEV	590.3'
G.W. DEPTH	See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT LOCATION: FORMER MEMORIAL AUDITORIUM SITE
PROJ. NO.: BE-09-094 BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	4	3				Dark Brown SILT, some f-m Sand, tr. gravel	PID= Photoionization
		3	4		6	BG	(moist, FILL)	Detector
	2	6	8				Contains little Ash	BG= Background,
		7	7		15	BG		measured in parts per
5	3	4	3					million
		1	1		4	BG	Brown f-m SAND, little fine Gravel, tr. silt (moist, FILL)	
	4	4	4				Contains some Clayey Silt, little f-c Gravel	
		5	6		9	BG		
	5	1	4				Grey Silty CLAY, some f-c Sand, tr. gravel	
10		1	2		5	BG	(moist, FILL)	
	6	1	1				Becomes Brown, contains little fine Gravel, tr. wood	
		7	2		8	BG		
	7	3	2					No Recovery Sample #7
		2	2		4	BG		
15	8	2	1					
		3	2		4	BG	Brown f-m SAND, little fine Gravel, little Silt	
	9	3	3				(moist- wet, loose, SM)	
		5	5		8	BG	Contains tr. gravel	
	10	1	1					No Recovery Sample #10
20		1	3		2	-	(v. loose)	
	11	1	1				Becomes Grey f-m Sand, tr. silt (wet, SP)	
		1	2		2	BG		
	12	2	3				Becomes Grey to Brown, contains little Silt (loose, SM)	
		4	4		7	BG		
25	13	1	1				Becomes Brown (v. loose)	
		2	4		3	BG		
	14	1	3				Becomes f-c SAND, contains tr. gravel (loose)	
		4	5		7	BG		
	15	1	2					
30		5	6		7	BG		
	16	2	4					
		7	7		11	BG	(firm)	
	17	8	7					
		9	9		16	BG		
35	18	4	4				Becomes Brown f-m SAND, some Silt (wet, SM)	Poor Recovery Sample
		10	14		14	BG		#18
	19	1	3				Becomes Brown f-c SAND, tr. silt	
		9	7		12	BG	(wet, SP)	
	20	1	1					Possible running sands
40		1	2		2	BG	(v. loose)	Sample #20

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: D. MATTHIES DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE			
START	6/24/2009	**SJB SERVICES, INC.**	HOLE NO. B-5
FINISH	6/24/2009	**SUBSURFACE LOG**	SURF. ELEV 590.3'
SHEET	2 OF 2		G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT LOCATION: FORMER MEMORIAL AUDITORIUM SITE
PROJ. NO.: BE-09-094 BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	21	4	5				(firm)	PID= Photoionization Detector
		6	8		11	BG		
	22	1	4				Becomes Brown f-m SAND, little Silt (wet, loose, SM)	BG= Background, measured in parts per million
		5	5		9	BG		
45	23	2	4				Becomes Brown f-c SAND, little Silt (wet, firm)	
		10	5		14	BG		
								Driller noted significant amounts of running sands. Begin sampling at 5' intervals to limit the running sands.
50								
	24	4	5				Becomes Brown f-m SAND, some Silt	
		17	25		22	BG	(wet, firm)	Free Standing Water Measured at 24.1' at Auger Refusal
55							Grey LIMESTONE, hard to very hard, weathered to sound, thin bedded to bedded, occasional horizontal fractures, occasional horizontal mechanical breaks, occasional vertical fractures, occasional vertical mechanical breaks, contains occasional Chert nodules	Run #1 53.5'- 56.5' REC= 62% RQD= 40%
60							Becomes slightly weathered to sound 57' Contains occasional angular breaks	Run #2 56.5'- 60.5' REC= 84% RQD= 69%
							Boring Complete at 60.5'	Free Standing Water Measured at 15.6' Before 2nd Run
65								Free Standing Water Measured at 14.7' After Coring
70								
75								
80								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: D. MATTHIES DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

SJB SERVICES, INC.
SUBSURFACE LOG

DATE
START 10/1/2009
FINISH 10/2/2009
SHEET 1 OF 2

HOLE NO. B-6
SURF. ELEV 585.9
G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT
LOCATION: FORMER MEMORIAL AUDITORIUM SITE, BUFFALO, NEW YORK
PROJ. NO.: BE-09-094A

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	9	11				Brown f-c GRAVEL, some f-c Sand, little Silt	PID= Photoionization
		12	11		23	BG	(moist, FILL)	Detector, measured in
	2	6	7					parts per million.
		4	2		11	BG		BG= Background
5	3	7	6					
		12	13		18	BG		Poor Recovery Sample #1
	4	43	50/0.3		REF	BG		
								Sample #3 rock fragments
	5	12	9				Contains tr. asphalt and brick fragments	in shoe of spoon.
10		7	4		16	BG		
	6	3	1				Contains Dark Brown f-m Sand, some Clayey Silt,	REF= Sample Spoon
		2	1		3	BG	tr. wood, tr. cinders	Refusal
	7	3	7					
		4	3		11	BG	- - - - - - - - - -	
15	8	1	1				Brown- Grey f-m SAND, some Clayey Silt,	
		2	5		3	BG	tr. gravel (wet, loose, SP- SM)	
	9	7	6				Becomes Brown, contains tr. silt (firm, SP)	
		5	3		11	BG		
	10	WOH	1					WOH= Weight of Hammer
20		3	4		4	BG	(loose)	and Rods
	11	2	1					
		3	4		4	BG		
	12	6	9					
		8	9		17	BG	(firm)	
25								
	13	WOH	2					Encountered "running
		3	3		5	BG	(loose)	sands" from approximately
								25' to bottom of borehole.
30								
	14	4	8				Contains tr. gravel	
		10	10		18	BG	(firm)	
35								
	15	13	16					
		22	22		38	BG	(compact)	
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: N. HINTZ

DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE		**SJB SERVICES, INC.**	HOLE NO. B-6
START	10/1/2009	**SUBSURFACE LOG**	SURF. ELEV 585.9
FINISH	10/2/2009		G.W. DEPTH See Notes
SHEET	2 OF 2		

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT — LOCATION: FORMER MEMORIAL AUDITORIUM SITE
PROJ. NO.: BE-09-094A — BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	16	4	10					
		15	17		25	BG	(firm)	
45								
	17	3	9					
		10	10		19	BG		
							Boring Complete with Auger Refusal at 47.7'	Free Standing Water Measured at 14.5' at Boring Completion
50								
55								
60								
65								
70								
75								
80								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW — CLASSIFIED BY: Geologist

DRILLER: N. HINTZ — DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION: ASTM D-1586 USING HOLLOW STEM AUGERS

DATE
START 10/1/2009
FINISH 10/1/2009
SHEET 1 OF 1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-7
SURF. ELEV 585.0
G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT
LOCATION: FORMER MEMORIAL AUDITORIUM SITE, BUFFALO, NEW YORK
PROJ. NO.: BE-09-094A

DEPTH FT.	SMPL NO.	0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	9	5				Dark Brown f-c SAND, little- some Clayey Silt,	PID= Photoionization
		7	8		12	BG	tr. cinders, tr. brick, tr. concrete (moist, FILL)	Detector, measured in
	2	6	6					parts per million.
		5	6		11	BG	Contains Red Brick and Fire Brick fragments	BG= Background
5	3	3	2					
		2	1		4	BG		Poor Recovery Sample
	4	6	6					#'s 2, 3, 4, 6, 7
		5	4		11	BG		
	5	3	2				Contains little Silt	
10		2	3		4	BG		
	6	4	4				Contains some Clayey Silt	
		50/0.1			REF	BG		REF= Sample Spoon
	7	50/0.4			REF	BG	Contains Crushed Stone fragments	Refusal
15							Boring Complete with Auger Refusal at 12.9'	No Free Standing Water
								Encountered at Boring
								Completion
								Moved 10' south for
20								test boring B-7A
25								
30								
35								
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: N. HINTZ

DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE
START 10/1/2009
FINISH 10/1/2009
SHEET 1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-7A
SURF. ELEV 585.0
G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT
LOCATION: FORMER MEMORIAL AUDITORIUM SITE, BUFFALO, NEW YORK
PROJ. NO.: BE-09-094A

DEPTH FT.	SMPL NO.	0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
							Auger to 12' before sampling-	PID= Photoionization
		A	U	G	E	R	See log B-7 for details	Detector, measured in
								parts per million.
								BG= Background
5								
								Test boring B-7 was
								located approximately
								10' north of B-7A.
10								
	1	4	3				Dark Grey Clayey SILT, tr. sand, tr. wood	
		3	4		6	BG	(moist, FILL)	
15	2	3	3				Grey and Olive Silty CLAY, tr. sand	
		3	4		6	BG	(moist, medium, CL)	
	3	5	4					
		4	3		8	BG	Contains wet Sandy Silt seam at 17.5'- 19.0'	
	4	WOH/1.0						WOH= Weight of Hammer
20		2	3		2	BG	Grey Clayey SILT, some fine Sand	and Rods
	5	WOH	1				(moist- wet, v. soft, ML)	
		3	5		4	BG	Contains wet Sandy Silt seam 20'- 21'	
							Becomes Dark Grey- Brown, contains tr. wood	
							(soft)	
25								
	6	4	6					Encountered "running
		7	11		13	BG	Brown- Grey f-c SAND, little- some Clayey Silt,	sands" while augering
							tr. gravel (wet, firm, SW- SM)	to 30'.
								Added water to augers
30								to offset running sands.
	7	2	3				Becomes Brown, contains f-m Sand, tr. silt	
		4	8		7	BG	(loose, SP)	
35								
	8	1	1					
		2	7		3	BG	(v. loose)	
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW   CLASSIFIED BY: Geologist

DRILLER: N. HINTZ   DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE			
START	10/1/2009	HOLE NO.	B-7A
FINISH	10/1/2009	SURF. ELEV	585.0
SHEET	2 OF 2	G.W. DEPTH	See Notes

SJB SERVICES, INC.
SUBSURFACE LOG

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT
LOCATION: FORMER MEMORIAL AUDITORIUM SITE, BUFFALO, NEW YORK
PROJ. NO.: BE-09-094A

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	9	7	11				Contains occasional Grey Clayey Silt seams (firm)	
		16	19		27	BG		
45							Boring Complete with Auger Refusal at 44.5'	Free Standing Water Measured at 14.8' Below Top of PVC Riser Pipe on 10/2/09 2" PVC groundwater observation well installed at boring completion. Refer to installation log for details.
50								
55								
60								
65								
70								
75								
80								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

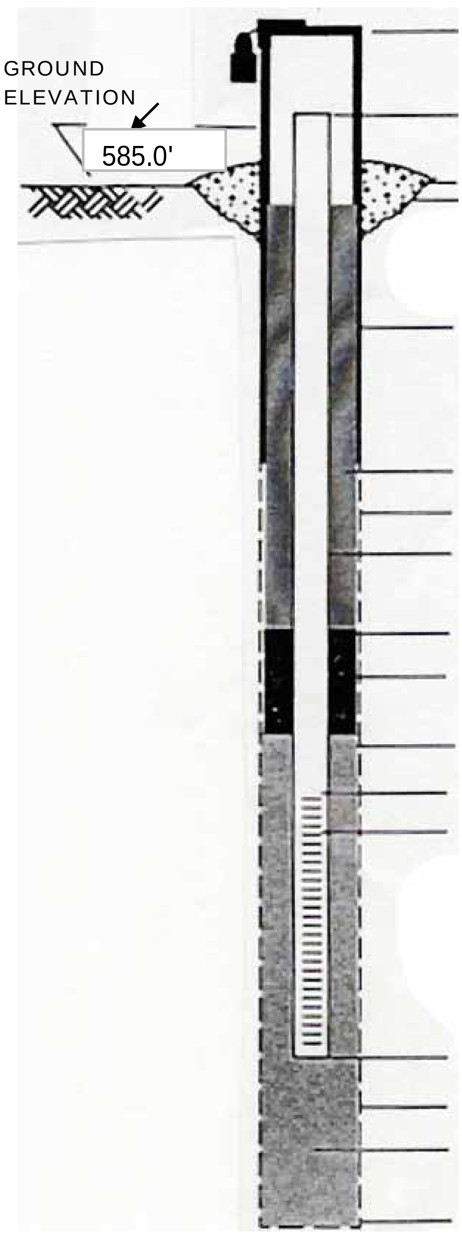
DRILLER: N. HINTZ

DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION: ASTM D-1586 USING HOLLOW STEM AUGERS

MONITORING WELL COMPLETION RECORD

PROJECT: Buffalo Canal Side Development	
PROJECT NUMBER: BE-09-094A	DRILLING METHOD: ASTM D-1586
WELL NUMBER: B-7A	GEOLOGIST: -
DRILLER: N. Hintz	INSTALLATION DATE(S): 10/1/2009



ELEVATION/ TOP OF RISER PIPE:	587.28'
STICK- UP/ TOP OF RISER PIPE:	2.3'
TYPE OF SURFACE SEAL:	Concrete
I.D. OF SURFACE CASING:	4" Square
TYPE OF SURFACE CASING:	Steel
TYPE OF BACKFILL:	Auger Cuttings
BOREHOLE DIAMETER:	8" Nominal
I.D. OF RISER PIPE:	2.0"
TYPE OF RISER PIPE:	PVC
DEPTH OF SEAL:	20.0'
TYPE OF SEAL:	Bentonite
DEPTH OF SAND PACK:	22.0'
DEPTH TOP OF SCREEN:	34.2'
TYPE OF SCREEN:	PVC
SLOT SIZE X LENGTH:	0.010"x10.0'
I.D. OF SCREEN:	2.0"
TYPE OF SAND PACK:	"O" Filter Sand
DEPTH BOTTOM OF SCREEN:	44.2'
DEPTH BOTTOM OF SAND PACK:	44.5'
TYPE OF BACKFILL BELOW OBSERVATION WELL:	"O" Filter Sand
ELEVATION/ DEPTH OF HOLE:	44.5'

DATE
START 9/28/2009
FINISH 9/28/2009
SHEET 1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-8
SURF. ELEV 585.3'
G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT
LOCATION: FORMER MEMORIAL AUDITORIUM SITE, BUFFALO, NEW YORK
PROJ. NO.: BE-09-094A

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	14	14				Brown to Grey f-c SAND, little fine Gravel, tr. cinders,	PID= Photoionization
		11	10		25	BG	tr. slag, occasional Silty Clay seams (moist, FILL)	Detector, measured in
	2	10	13				Brown Clayey SILT, some fine Sand, tr. brick	parts per million.
		25	30		38	BG	(moist, FILL)	BG= Background
5	3	22	19				Brown Clayey SILT, little Organics, tr. sand	
		20	9		39	BG	(moist, hard, possible FILL)	Collect 0-9' for
	4	10	7					analytical testing.
		7	6		14	BG	(stiff)	
	5	4	7					
10		8	8		15	BG	Brown f-c GRAVEL and f-c Sand, tr. silt	
	6	8	7				(moist, firm, GP)	
		9	8		16	BG	Grey f-c SAND, little fine Gravel, little Silt	
	7	2	3				(moist- wet, firm, SM)	
		2	2		5	BG	(loose)	
15	8	1	2				Grey Clayey SILT, tr. sand, tr. organics	
		4	4		6	BG	(moist, medium, ML)	
	9	3	5					
		7	8		12	BG	(stiff)	
	10	WOH	1				Contains some fine Sand (moist- wet, soft)	WOH= Weight of Hammer
20		1	2		2	BG		and Rods
25								
	11	WOH	2				Brown PEAT (moist, medium, PT)	
		3	3		5	BG		
30								
	12	WOH	3				Grey f-m SAND, tr. silt (wet, loose, SP)	
		2	2		5	BG		
35								
	13	3	3				Becomes Brown fine Sand, tr. silt	
		3	3		6	BG		
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW   CLASSIFIED BY: Geologist

DRILLER: R. STEINER   DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE

START 9/28/2009

FINISH 9/28/2009

SHEET 2 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-8

SURF. ELEV 585.3'

G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT LOCATION: FORMER MEMORIAL AUDITORIUM SITE

PROJ. NO.: BE-09-094A BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	14	6	7				Contains tr. gravel, occasional f-c Sand seams	
		11	50/0.3		18	BG		
45							Grey LIMESTONE, hard to very hard, slightly weathered to sound, laminated to bedded, occasional horizontal fractures, occasional horizontal mechanic breaks, contains occasional Styolites	Run #1 42.5'- 47.5' REC= 86% RQD= 72%
50							Boring Complete at 47.5'	Free Standing Water Measured at 27.6' Before Coring Free Standing Water Measured at 11.3' After Coring
55								
60								
65								
70								
75								
80								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: R. STEINER DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE	
START	10/5/2009
FINISH	10/5/2009
SHEET	1 OF 1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-9
SURF. ELEV 578.5
G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT LOCATION: FORMER MEMORIAL AUDITORIUM SITE
PROJ. NO.: BE-09-094A BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	1	2				Brown Silty CLAY, some f-c Sand, little f-m Gravel,	PID= Photoionization
		17	6		19	BG	tr. brick, tr. cinders (moist, FILL)	Detector, measured in
	2	10	9					parts per million.
		12	13		21	BG		BG= Background
5	3	11	12				Contains little f-m Sand, tr. gravel	
		7	5		19	BG		Poor Recovery Sample
	4	7	8					#'s 1, 2 ,3 ,4
		10	10		18	BG		
	5	5	4				Contains seam of Black Cinders 8.8'- 9.4'	
10		7	5		11	BG		
	6	3	4				Grey Silty CLAY, tr. sand (moist, stiff, CL)	
		6	5		10	BG		
	7	4	3				Brown- Grey Clayey SILT, some fine Sand	
		3	3		6	BG	(moist- wet, medium, ML)	
15	8	2	2				Contains wet Silty Sand seam 12'-13'	
		4	15		6	BG	Becomes Dark Brown, contains little fine Sand	
	9	2	3				Grey- Brown f-m SAND, tr. silt, tr. gravel	
		2	4		5	BG	(wet, loose, SP)	
	10	1	5					
20		6	5		11	BG	(firm)	
	11	5	6					
		11	10		17	BG		
25								
	12	WOH	3					"Running Sands"
		5	5		8	BG	(loose)	encountered between
								25' and 30' to bottom of
								boring.
30								WOH= Weight of Hammer
	13	6	3				Becomes Tan- Brown	and Rods
		2	10		5	BG		
								REF= Sample Spoon
								Refusal
35								
	14	5	50/0.2		REF	BG	Red- Brown Silty CLAY, tr. sand, tr. gravel	Silty Clay Till at 35.5'- 35.7'
							(moist, CL)	
								Free Standing Water
							Boring Complete with Auger Refusal at 35.7'	Recorded at 21.4' at
40								Boring Completion

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: N. HINTZ DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE		SJB SERVICES, INC. SUBSURFACE LOG	HOLE NO.	B-10
START	9/29/2009		SURF. ELEV	585.1'
FINISH	9/30/2009		G.W. DEPTH	See Notes
SHEET	1 OF 2			

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT LOCATION: FORMER MEMORIAL AUDITORIUM SITE
PROJ. NO.: BE-09-094A BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	7	9				Brown SILT, some f-c Gravel, some f-c Sand,	PID= Photoionization
		10	12		19	1.7	tr. cinders (moist, FILL)	Detector, measured in
	2	6	6				Brown Silty CLAY, little fine gravel sized Cinders,	parts per million.
		5	6		11	3.0	tr. sand, contains occasional seams of brick fragments	BG= Background
5	3	3	4				(moist, FILL)	
		6	6		10	3.1	Contains occasional f-c Sand laminations, tr. wood,	Collect Sample 0-8' for
	4	6	6				tr. gravel, tr. brick fragments	analytical testing.
		7	8		13	BG	Becomes Grey, contains some f-c Sand	
	5	4	3				Brown SILT, some f-c Sand, tr. brick (moist, FILL)	Poor Recovery Sample #5
10		4	6		7	BG		
	6	2	4				Brown f-m SAND, some Silt, tr. clay, tr. wood	
		2	1		6	BG	(moist, FILL)	
	7	4	2					No Recovery Sample #7
		5	3		7	-		
15	8	2	5				Red BRICK fragments, some Silty Clay	Poor Recovery Sample #8
		2	2		7	BG	(wet, FILL)	
	9	3	3				Black SLAG (moist, FILL)	
		7	4		10	BG		
	10	2	2					No Recovery Sample #10
20		2	2		4	-		
	11	1	1				Black SILT, tr. sand, tr. clay, tr. organics	
		1	2		2	BG	(moist, v. loose, possible FILL)	
	12	1	2					
		2	2		4	BG		
25	13	WOH	WOH				Grey Clayey SILT, tr. sand (moist- wet, v. soft, ML)	WOH= Weight of Hammer
		WOH	WOH		WOH	3.0		and Rods
	14	2	5				Brown to Grey Fine SAND, some Silt (wet, firm, SM)	
		6	9		11	BG		
	15	4	6				Becomes Brown	
30		7	7		13	BG		
35								
	16	3	6				Becomes f-m Sand, contains little Silt	
		9	14		15	BG		
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: R. STEINER/ N. HINTZ DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE		
START	9/29/2009	
FINISH	9/30/2009	
SHEET	2 OF 2	

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-10
SURF. ELEV 585.1'
G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT
LOCATION: FORMER MEMORIAL AUDITORIUM SITE, BUFFALO, NEW YORK
PROJ. NO.: BE-09-094A

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	17	8	50/0.1		REF	BG	(v. compact)	
							Boring Complete with Auger Refusal at 40.5'	Free Standing Water Measured at 23.0' at Boring Completion
45								2" PVC groundwater observation well installed at boring completion. Refer to installation log for details.
50								
55								Free Standing Water Measured at 12.2' After Well Installation
								REF= Sample Spoon Refusal
60								
65								
70								
75								
80								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

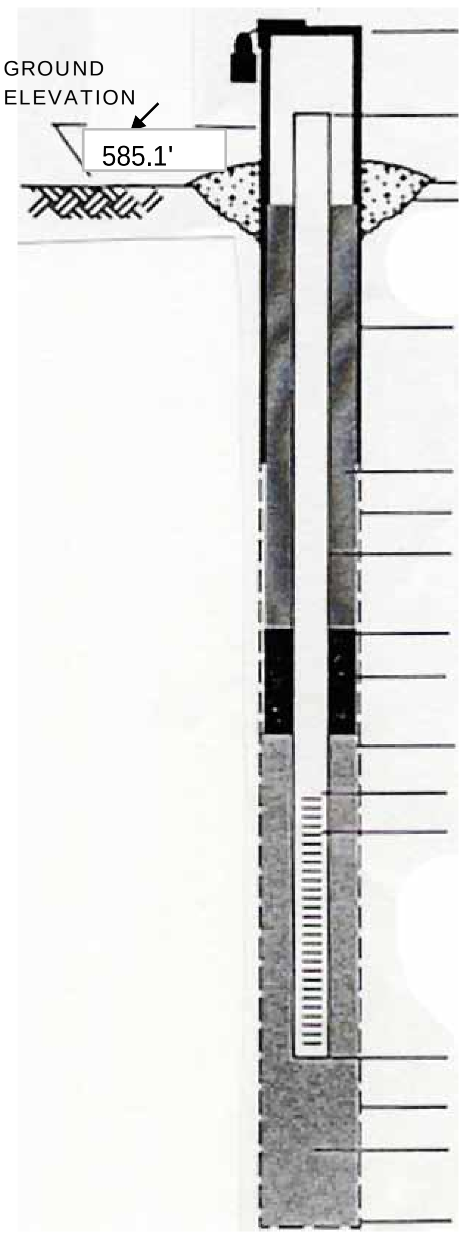
DRILLER: R. STEINER/ N. HINTZ

DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

MONITORING WELL COMPLETION RECORD

PROJECT: Buffalo Canal Side Development	
PROJECT NUMBER: BE-09-094A	DRILLING METHOD: ASTM D-1586
WELL NUMBER: B-10	GEOLOGIST: -
DRILLER: R. Steiner/ N. Hintz	INSTALLATION DATE(S):



ELEVATION/ TOP OF RISER PIPE: 586.96'

STICK- UP/ TOP OF RISER PIPE: 1.9'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4" Square

TYPE OF SURFACE CASING: Steel

TYPE OF BACKFILL: Auger Cuttings

BOREHOLE DIAMETER: 8" Nominal

I.D. OF RISER PIPE: 2.0"

TYPE OF RISER PIPE: PVC

DEPTH OF SEAL: 18.0'

TYPE OF SEAL: Bentonite

DEPTH OF SAND PACK: 20.0'

DEPTH TOP OF SCREEN: 30.2'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 0.010"x10.0'

I.D. OF SCREEN: 2.0"

TYPE OF SAND PACK: "O" Filter Sand

DEPTH BOTTOM OF SCREEN: 40.2'

DEPTH BOTTOM OF SAND PACK: 40.5'

TYPE OF BACKFILL BELOW OBSERVATION WELL: "O" Filter Sand

ELEVATION/ DEPTH OF HOLE: 40.5'

DATE	
START	9/29/2009
FINISH	9/29/2009
SHEET	1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-11
SURF. ELEV 586.1'
G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT LOCATION: FORMER MEMORIAL AUDITORIUM SITE
PROJ. NO.: BE-09-094A BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	6	9	11	20		CONCRETE (0.5')	PID= Photoionization
						BG	Light Brown to Brown f-m SAND, tr. silt (moist, FILL)	Detector, measured in
	2	5	6				Becomes Light Brown, contains tr. gravel, tr. concrete	parts per million.
		5	4		11	BG		BG= Background
5	3	3	3					
		3	3		6	BG		Collect Sample 0-8' for
	4	2	2				Brown Silty CLAY, little f-c Sand, little brick fragments,	analytical testing.
		12	8		14	BG	tr. organics (moist, FILL)	
	5	WOH	3					Poor Recovery Sample #1
10		5	8		8	BG	Contains tr. sand, tr. cinders, occasional f-c Sand	
	6	2	5				seams	Poor Recovery Sample #6
		6	8		11	BG	Brown Fine SAND, some Silt, little coarse Gravel,	
	7	2	3				tr. brick, occasional Silt seams (moist, FILL)	WOH= Weight of Hammer
		2	3		5	BG	Contains tr. cinders	and Rods
15	8	WOH	3				Becomes f-c Sand, little fine Gravel, little Silt,	
		3	2		6	2.1	little Brick, tr. wood, occasional Silty Clay seams	
	9	24	50				Black SILT, little f-c Sand, tr. glass, tr. organics,	
		4	3		54	17.4	occasional Silty Clay seams (moist- wet, FILL)	
	10	3	8					
20		2	2		10	4.5		
	11	1	50/0.2		REF	4.1	Contains some fine Sand, tr. gravel	REF= Sample Spoon
								Refusal
	12	3	5				Black f-c GRAVEL, some f-c Sand, little Silty Clay,	
		3	1		8	14.5	tr. organics (wet, FILL)	
25	13	1	3					No Recovery Sample #13
		7	14		10	-		
	14	19	10					No Recovery Sample #14-
		11	10		21	-		wood in shoe
	15	14	16				Brown to Grey f-m SAND, tr. silt (wet, firm, SP)	
30		12	10		28	BG		
	16	1	4				Becomes Brown (loose)	
		3	6		7	BG		
	17	2	4					
		9	10		13	BG	(firm)	
35	18	5	7					
		9	9		16	BG		
	19	19	22					
		22	27		44	BG	(compact)	
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: R. STEINER DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE
START 9/29/2009
FINISH 9/29/2009
SHEET 2 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-11
SURF. ELEV 586.1'
G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT
LOCATION: FORMER MEMORIAL AUDITORIUM SITE, BUFFALO, NEW YORK
PROJ. NO.: BE-09-094A

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	20	4	11	50/0.0	REF	BG		
45							Dark Grey to Grey LIMESTONE, hard to very hard, slightly weathered to sound, thinly bedded to thickly bedded, occasional horizontal fractures, occasional horizontal mechanical breaks, contains few Styolites, few Chert nodules	Run #1 41.5'- 46.5' REC= 96% RQD= 76%
50							Boring Complete at 46.5'	Free Standing Water Encountered at 14.5' After Coring REF= Sample Spoon Refusal
55								
60								
65								
70								
75								
80								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW   CLASSIFIED BY: Geologist

DRILLER: R. STEINER   DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE	
START	10/2/2009
FINISH	10/2/2009
SHEET	1 OF 1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-12
SURF. ELEV 578.8'
G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT
LOCATION: FORMER MEMORIAL AUDITORIUM SITE, BUFFALO, NEW YORK
PROJ. NO.: BE-09-094A

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	WOH	4				Brown f-c SAND and Silty Clay, little f-c Gravel,	PID= Photoionization
		2	1		6	BG	tr. brick fragments (moist, FILL)	Detector, measured in
	2	3	2				Contains tr. crushed stone	parts per million.
		1	1		3	BG		BG= Background
5	3	5	8					
		6	6		14	BG		WOH= Weight of Hammer
	4	22	13				------------------------------	and Rods
		9	7		22	BG	Grey- Brown f-m SAND, tr. silt (wet, firm, SP)	
	5	8	2				Contains tr.- little Silt	
10		2	2		4	BG	(loose, SP- SM)	
	6	3	1					
		1	1		2	BG	(v. loose)	
	7	1	2					
		2	2		4	BG		
15	8	13	17					
		4	3		21	BG	Contains f-c Sand, tr. gravel, tr. silt (firm, SW)	"Running sands"
	9	3	5					encountered between
		6	8		11	BG		15'- 20' to bottom of
								boring.
20								
	10	4	4					
		4	4		8	BG	(loose)	
25								
	11	3	4				Contains Tan- Brown f-m Sand, tr. silt (SP)	
		5	4		9	BG		
30								
	12	5	5					
		13	11		18	BG	(firm)	
35								
	13	WOH	2					
		9	13		11	BG		Free Standing Water
							Difficult augering 37'- 39'	Measured at 16.2' at
								Boring Completion
40							Boring Complete with Auger Refusal at 39.4'	

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: N. HINTZ

DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE
START 9/30/2009
FINISH 9/30/2009
SHEET 1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-13
SURF. ELEV 579.7'
G.W. DEPTH See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT
LOCATION: FORMER MEMORIAL AUDITORIUM SITE, BUFFALO, NEW YORK
PROJ. NO.: BE-09-094A

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	4	5				Brown f-c GRAVEL, some f-c Sand, tr. silt	PID= Photoionization
		7	5		12	BG	(moist, FILL)	Detector, measured in
	2	9	3				Brown f-c SAND, some Silt, little fine Gravel, tr. clay,	parts per million.
		2	2		5	BG	tr. brick fragments, tr. cinders, tr. glass	BG= Background
5	3	2	1				(moist, FILL)	
		3	2		4	BG	Dark Brown to Grey SILT, tr. clay, tr. organics	
	4	5	7				(moist, soft, possible FILL)	
		4	3		11	BG	Grey Clayey SILT, tr. sand, contains occasional	
	5	WOH	WOH				Sand partings (moist, stiff)	WOH= Weight of Hammer
10		1	2		1	BG	Brown to Grey Fine SAND, little Silt	and Rods
	6	2	3				(moist- wet, firm, SM)	
		3	4		6	BG		
	7	5	6					
		5	4		11	BG		
15								
20								
	8	1	1				Becomes Brown f-c Sand, little fine Gravel, tr. silt	
		7	7		8	BG	(wet, loose, SP)	
25								
	9	6	7				Contains little f-c Gravel (firm)	
		9	11		16	BG		
30								
	10	3	3				Becomes f-m Sand, tr. gravel, tr. silt (loose)	
		5	7		8	BG		
35								
	11	8	10				Becomes Fine Sand, some Silt (firm)	
		7	12		17	BG		
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW   CLASSIFIED BY: Geologist

DRILLER: N. HINTZ   DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE		**SJB SERVICES, INC.**	HOLE NO. B-13
START	9/30/2009	**SUBSURFACE LOG**	SURF. ELEV 579.7'
FINISH	9/30/2009		G.W. DEPTH See Notes
SHEET	2 OF 2		

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT LOCATION: FORMER MEMORIAL AUDITORIUM SITE
PROJ. NO.: BE-09-094A BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	12	4	8	50/0.0	REF	BG	Becomes f-m Sand, tr. silt (v. compact)	
							Boring Complete with Auger Refusal at 41.4'	Free Standing Water Measured at 10.6' at Boring Completion
45								REF= Sample Spoon Refusal
50								
55								
60								
65								
70								
75								
80								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: N. HINTZ DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE		**SJB SERVICES, INC.**	HOLE NO. B-14
START	10/5/2009	**SUBSURFACE LOG**	SURF. ELEV 579.1
FINISH	10/6/2009		G.W. DEPTH See Notes
SHEET	1 OF 2		

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT LOCATION: FORMER MEMORIAL AUDITORIUM SITE
PROJ. NO.: BE-09-094A BUFFALO, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
	1	6	7				Black f-c SAND, some Cinders, little Silty Clay,	PID= Photoionization
		6	7		13	BG	tr. gravel, tr. brick fragments, tr. wood (moist, FILL)	Detector, measured in
	2	5	8					parts per million.
		8	6		16	BG	Becomes Grey, contains some Silty Clay,	BG= Background
5	3	2	1				tr. cinders	
		3	1		4	BG		Poor Recovery Sample #3
	4	3	3				Dark Grey Clayey SILT, tr. sand (moist- wet, FILL)	
		3	2		6	BG		
	5	WOH/2.0					Grey Silty CLAY, tr. sand, tr. wood	WOH= Weight of Hammer
10					WOH	BG	(moist- wet, v. soft, CL)	and Rods
	6	WOH/2.0						
					WOH	BG		
	7	WOH/2.0					Grey f-m SAND and Silt (wet, v. loose, SP- SM)	
					WOH	BG	Grey- Brown Clayey SILT, some f-m Sand	
15	8	WOH	1				(moist- wet, v. soft, ML)	
		2	5		3	BG		
	9	5	11				Brown- Grey f-m SAND, tr. silt (wet, firm, SP)	
		10	10		21	BG		
20								
	10	WOH	3					"Running sands"
		5	7		8	BG	(loose)	encountered from
								approximately 20' to
								boring completion.
25								
	11	WOH	3					
		3	2		6	BG		
30								
	12	1	6					
		9	8		15	BG	(firm)	
35								
	13	9	10					
		11	13		21	BG		NQ '2' Size Rock Core
								Run 1: 37.6'- 42.4'
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: N. HINTZ DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE		
START	10/5/2009	
FINISH	10/6/2009	
SHEET	2 OF 2	

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO.	B-14
SURF. ELEV	579.1'
G.W. DEPTH	See Notes

PROJECT: BUFFALO CANAL SIDE DEVELOPMENT
LOCATION: FORMER MEMORIAL AUDITORIUM SITE, BUFFALO, NEW YORK
PROJ. NO.: BE-09-094A

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID	SOIL OR ROCK CLASSIFICATION	NOTES
							Grey LIMESTONE Rock, weathered to sound, hard, bedded, occasional chert inclusions, occasional styolites, occasional fractures	REC.: 100% RQD: 94%
45							Boring Complete at 42.4'	Free Standing Water Measured at 7.0' After Coring
50								
55								
60								
65								
70								
75								
80								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW   CLASSIFIED BY: Geologist

DRILLER: N. HINTZ   DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

APPENDIX B

TEST PIT LOGS

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
Phone: (716) 649-8110
Fax: (716) 649-8051

SJB SERVICES, INC.

TEST PIT FIELD LOG

		DATE	10-Jul-09
PROJECT	Buffalo Canal Side Development	LOCATION	Buffalo, NY
CLIENT	C&S Companies	TEST PIT NO.	TP-1
CONTRACTOR	DEMCO, Inc.	PROJECT NO.	BE-09-094
FIELD REP	S. Bochenek	WEATHER / TEMP	Sunny, 50s
EXCAVATION EQUIP	Track Excavator	OPERATOR	D. Raiser
GROUND ELEV	580.2'	MAKE/ MODEL	CAT 330C
TIME STARTED	0726	CAPACITY	3/4 CY
TIME FINISHED	0817	REACH	~22 FT

DEPTH	SOIL DESCRIPTION	EXCAV EFFORT	REMARK NO.
	CONCRETE (0.4')	E	
1'	Grey f-c gravel sized SLAG, some f-c Sand, tr. brick, tr. concrete, tr. silt (moist, FILL)	E	
2'	Light Brown f-c SAND, tr. slag, tr. brick (moist, FILL) Becomes Brown, contains tr. concrete	E	
3'	Black SILT, tr. sand, tr. organics (moist, FILL/ possible Topsoil)	E	
4'	Light Brown to Grey Fine SAND, little Silt, tr. gravel, tr. organics, tr. clay silt partings (moist- wet, SM)	E	
5'		E	
6'		E	
7'	water entering excavation	E	
8'	Test Pit Complete at 8.0'		
9'			
10			
11'			
12'			
13'			
14'			

Remarks:

Slag varies in composition.

Test pit collapsing due to water infiltration.

Free standing water at 6.0' at test pit completion.

ABREVIATIONS	
F - FINE	F/M - FINE TO MEDIUM
C - COARSE	F/C-FINE/COARSE
GR - GRAY	M - MEDIUM
BN - BROWN	V-VERY
YEL-YELLOW	

PROP USED	
TRACE (TR.)	0-10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 -35%
AND	35 - 50%

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
Phone: (716) 649-8110
Fax: (716) 649-8051

SJB SERVICES, INC.

TEST PIT FIELD LOG

		DATE	10-Jul-09
PROJECT	Buffalo Canal Side Development	LOCATION	Buffalo, NY
CLIENT	C&S Companies	TEST PIT NO.	TP-2
CONTRACTOR	DEMCO, Inc.	PROJECT NO.	BE-09-094
FIELD REP	S. Bochenek	WEATHER / TEMP	Sunny, 50s
EXCAVATION EQUIP	Track Excavator	OPERATOR	D. Raiser
GROUND ELEV	580.2'	MAKE/ MODEL	CAT 330C
TIME STARTED	0830	CAPACITY	3/4 CY
TIME FINISHED	0907	REACH	~22' FT

DEPTH	SOIL DESCRIPTION	EXCAV EFFORT	REMARK NO.
	CONCRETE (0.45')	E	
1'	Grey f-c gravel sized SLAG, some f-c Sand, little f-c gravel sized		
1.5'	Concrete, tr. silt (moist, FILL)	E	
2'	Grey f-c SAND, some Ash, some f-c Gravel, tr. concrete		
	(moist, FILL)	E	
3'			
		E	
4'	Brown f-m SAND, some Silt, tr. concrete, tr. brick, tr. gravel,		
4.5'	tr. clay (moist, FILL)	E	
5'	Brown to Grey Fine SAND, little Silt (moist- wet, SM)		
		E	
6'			
		E	
7'	Groundwater entering excavation, from around pile cap.		
		E	
8'	Contains some Silt		
		E	
9'			
	Test Pit Complete at 9.0'		
10			
11'			
12'			
13'			
14'			

Remarks:
Slag varies in composition.
Test pit collapsing due to water infiltration.
Free standing water at 7.5' at test pit completion.

ABREVIATIONS		PROP USED	
F - FINE	F/M - FINE TO MEDIUM	TRACE (TR.)	0-10%
C - COARSE	F/C-FINE/COARSE	LITTLE (LI.)	10 - 20%
GR - GRAY	M - MEDIUM	SOME (SO.)	20 -35%
BN - BROWN	V-VERY	AND	35 - 50%
YEL-YELLOW			

APPENDIX C

GEOTECHNICAL LABORATORY TEST RESULTS

SJB SERVICES, INC.

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
Phone: (716) 649-8110
Fax: (716) 649-8051

Laboratory Test Report

PROJECT: **Buffalo Canal Side Development**

CLIENT: **Erie Canal Harbor Development Corp.**

DATE: **July 9, 2009**

PROJECT NO.: BE-09-094
REPORT NO.: LTR-1

SAMPLE INFORMATION:
Sample Nos. 09-999 through 09-1002 were collected by a SJB Services, Inc. Drill Crew and received at our laboratory on July 9, 2009. Samples are described as rock core specimens obtained from various borings at the site. Samples were chosen for testing by Tom Seider, representing Empire-Geo Services, Inc.

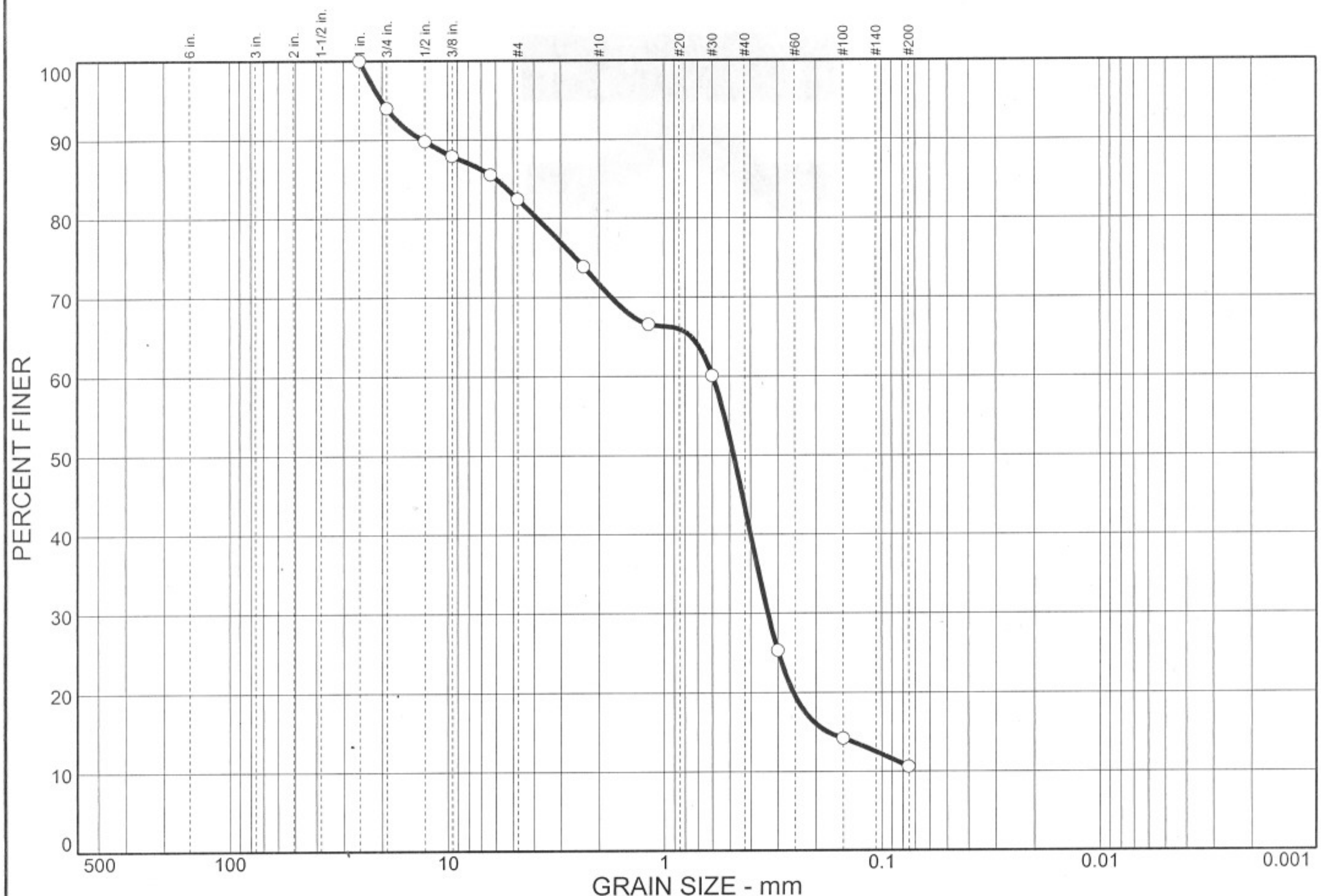
ASTM D-2938: Unconfined Compressive Strength of Intact Rock Core Specimens

Sample Number	Sample Location	Sample Diameter inches	Sample Length inches	Maximum Load lbs.	Unconfined Compressive Strength psi
09-999	B-2: 58.0’	1.97	3.34	50480	16,560
09-1000	B-5: 54.5’	1.95	4.03	58610	19,630
09-1001	B-5: 57.5’	1.98	4.16	29125	9,460
09-1002	B-5: 60.0’	1.98	4.16	37345	12,130

SJB Services, Inc.

Paul Gregorczyk
Laboratory Manager

ASTM C-136: Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	17.6	71.8	10.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	94.0		
.5 in.	89.8		
.375 in.	87.9		
.25 in.	85.5		
#4	82.4		
#8	73.9		
#16	66.6		
#30	60.1		
#50	25.3		
#100	14.2		
#200	10.6		

* (no specification provided)

Soil Description

B-2, S-17: 32' - 34'

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 6.01 D_{60}= 0.598 D_{50}= 0.479
D_{30}= 0.333 D_{15}= 0.176 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

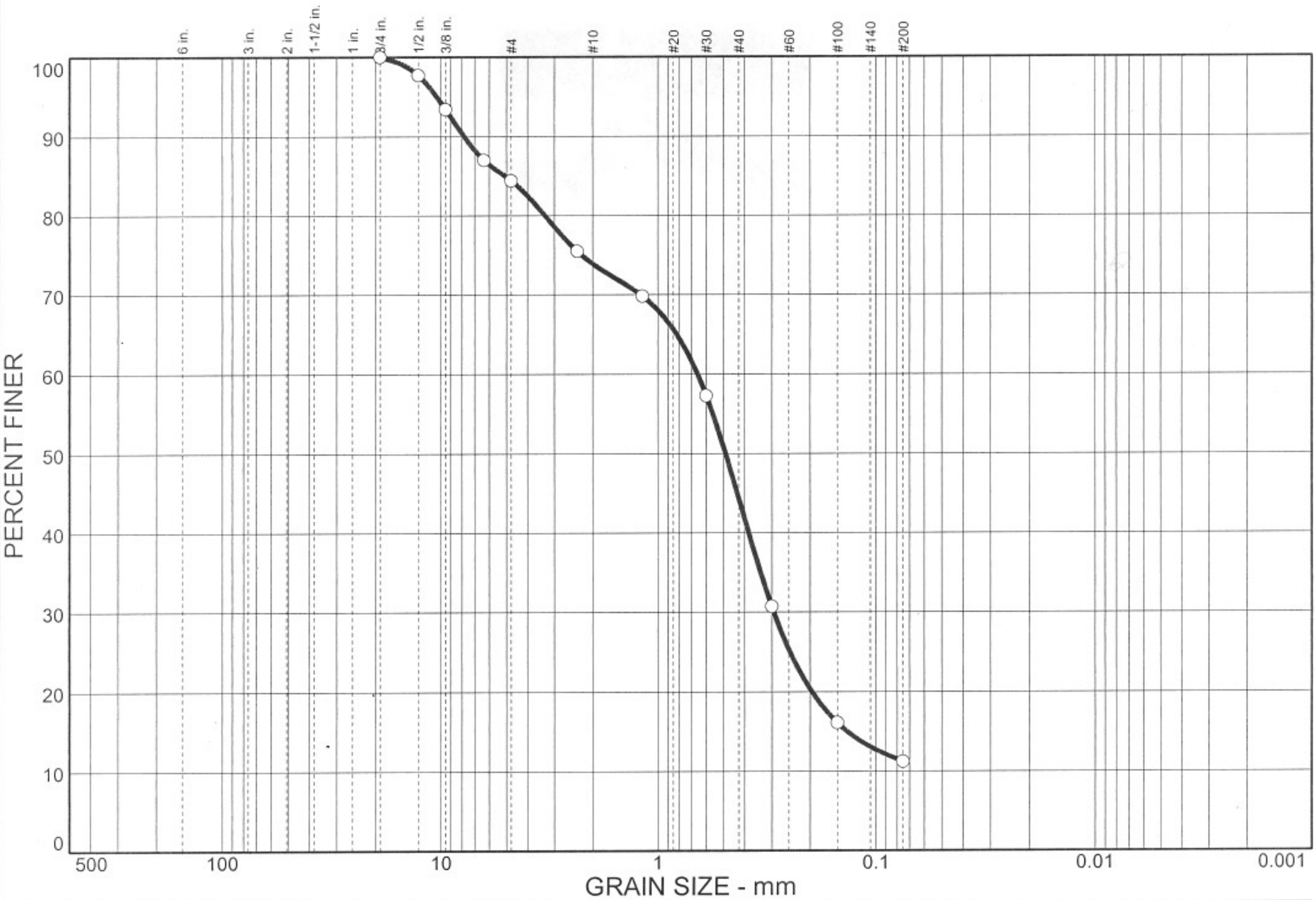
LTR-2
SAMPLE NUMBER: 09-1042

Sample No.: S-17 **Source of Sample:** B-2 **Date:** 7/20/09
Location: B-2, S-17: 32' - 34' **Elev./Depth:** 32' - 34'

SJB SERVICES, INC.

Client: ERIE CANAL HARBOR DEVELOPMENT
Project: BUFFALO CANAL SIDE DEVELOPMENT
Project No: BE-09-094

ASTM C-136: Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	15.6	73.2	11.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	97.7		
.375 in.	93.4		
.25 in.	87.0		
#4	84.4		
#8	75.5		
#16	69.8		
#30	57.3		
#50	30.7		
#100	16.1		
#200	11.2		

* (no specification provided)

Soil Description

B-2, S-24: 46' - 48'

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.08 D_{60}= 0.658 D_{50}= 0.490
D_{30}= 0.294 D_{15}= 0.135 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

LTR-2
SAMPLE NUMBER: 09-1043

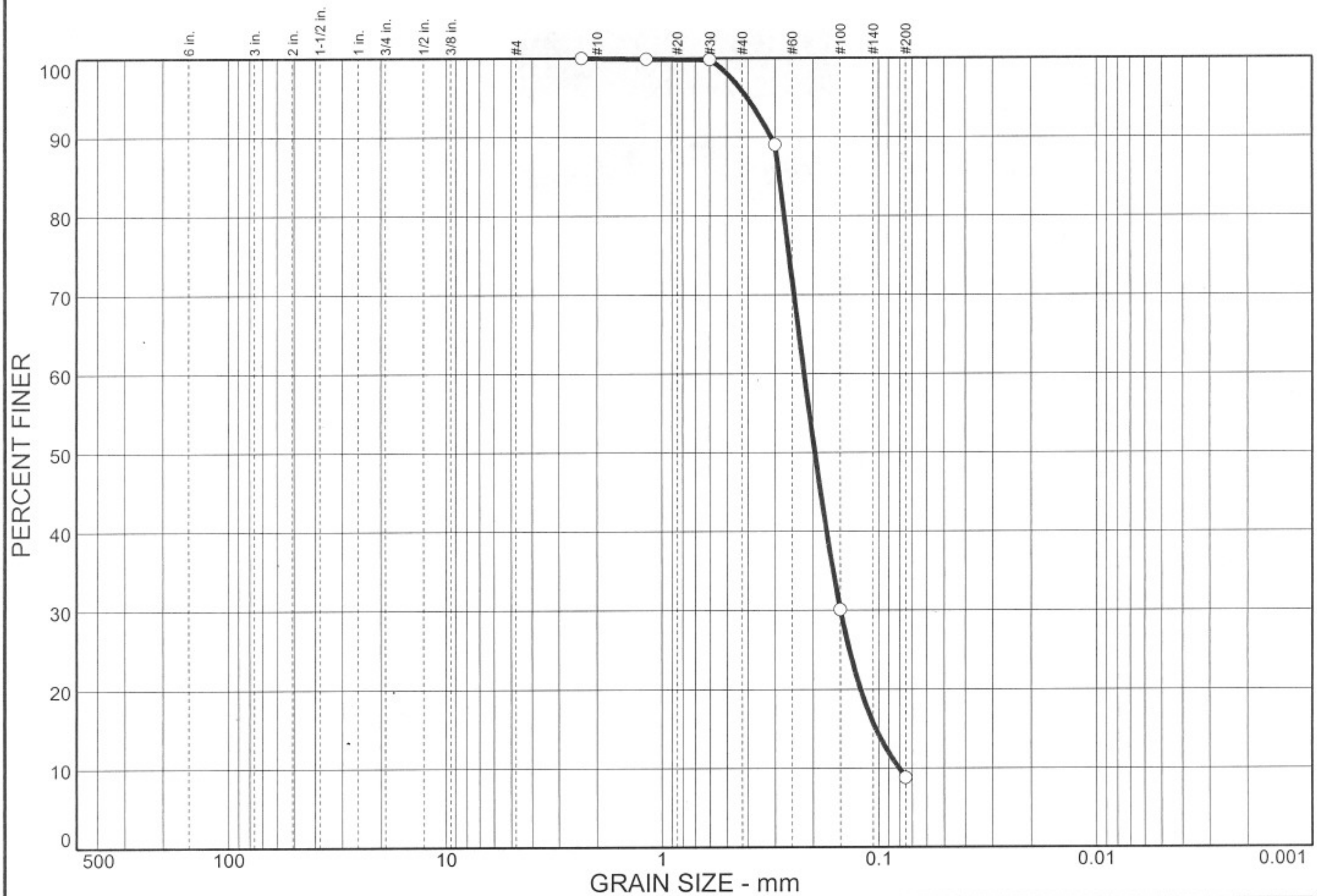
Sample No.: S-24 **Source of Sample:** B-2 **Date:** 7/20/09
Location: B-2, S-24: 46' - 48' **Elev./Depth:** 46' - 48'

SJB SERVICES, INC.

Client: ERIE CANAL HARBOR DEVELOPMENT
Project: BUFFALO CANAL SIDE DEVELOPMENT

Project No: BE-09-094

ASTM C-136: Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	91.2	8.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#8	100.0		
#16	99.9		
#30	99.8		
#50	89.0		
#100	30.1		
#200	8.8		

* (no specification provided)

Soil Description

B-5, S-11: 20' - 22'

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.288 D_{60}= 0.220 D_{50}= 0.197
D_{30}= 0.150 D_{15}= 0.103 D_{10}= 0.0806
C_u= 2.74 C_c= 1.26

Classification

USCS= AASHTO=

Remarks

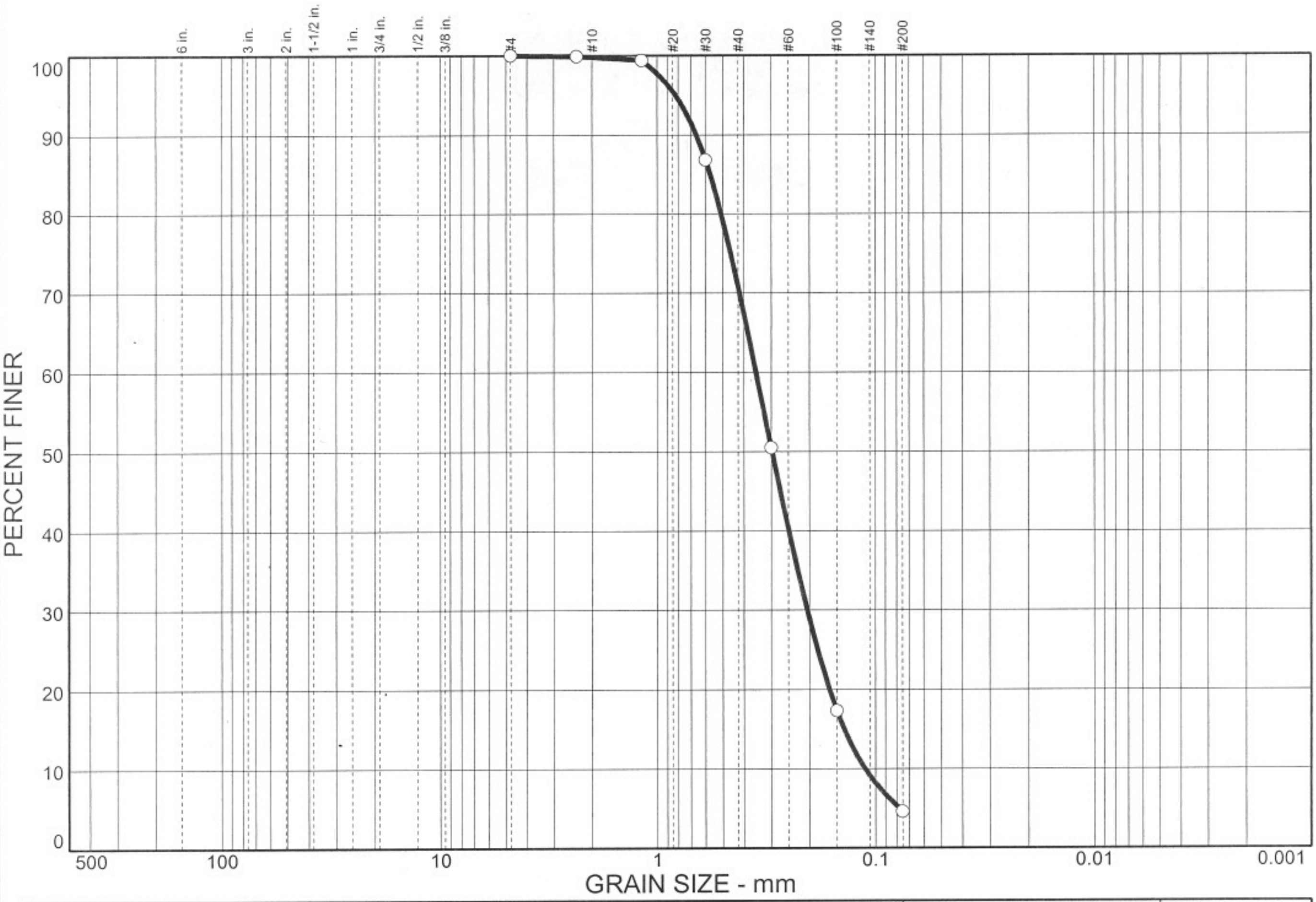
LTR-2
SAMPLE NUMBER: 09-1044

Sample No.: S-11 **Source of Sample:** B-5 **Date:** 7/20/09
Location: B-5, S-11: 20' - 22' **Elev./Depth:** 20' - 22'

SJB SERVICES, INC.

Client: ERIE CANAL HARBOR DEVELOPMENT
Project: BUFFALO CANAL SIDE DEVELOPMENT
Project No: BE-09-094

ASTM C-136: Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	95.4	4.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.9		
#16	99.4		
#30	86.8		
#50	50.5		
#100	17.3		
#200	4.6		

* (no specification provided)

Soil Description

B-5, S-20: 38' - 40'

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.572 D_{60}= 0.353 D_{50}= 0.297
D_{30}= 0.205 D_{15}= 0.139 D_{10}= 0.111
C_u= 3.16 C_c= 1.07

Classification

USCS= AASHTO=

Remarks

LTR-2
SAMPLE NUMBER: 09-1045

Sample No.: S-20 **Source of Sample:** B-5 **Date:** 7/20/09
Location: B-5, S-20: 38' - 40' **Elev./Depth:** 38' - 40'

SJB SERVICES, INC.

Client: ERIE CANAL HARBOR DEVELOPMENT
Project: BUFFALO CANAL SIDE DEVELOPMENT
Project No: BE-09-094

SJB SERVICES, INC.

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
Phone: (716) 649-8110
Fax: (716) 649-8051

Laboratory Test Report

PROJECT: **Buffalo Canal Side Development**

CLIENT: **Erie Canal Harbor Development**

DATE: **October 30, 2009**

PROJECT NO.: BE-09-094
REPORT NO.: LTR-3

Attached are the results of laboratory testing conducted on various samples from the above referenced project. Mr. Tom Seider, representing Empire –Geo Services, Inc, chose samples contained in this report.

The testing conducted was as follows:

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil & Rock

ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

ASTM C-136: Sieve Analysis of Fine and Coarse Aggregates

ASTM D-2938: Unconfined Compressive Strength of Intact Rock Core Specimens

Samples were received at the SJB Services, Inc. laboratory on October 15, 2009 where they were processed for testing.

If the reviewer should have any questions concerning this report, please do not hesitate to contact our office at any time.

SJB Services, Inc.

Paul Gregorczyk
Laboratory Manager

SJB SERVICES, INC.

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
Phone: (716) 649-8110
Fax: (716) 649-8051

Laboratory Test Report

PROJECT: **Buffalo Canal Side Development**

CLIENT: **Erie Canal Harbor Development**

DATE: **October 30, 2009**

PROJECT NO.: BE-09-094
REPORT NO.: LTR-3

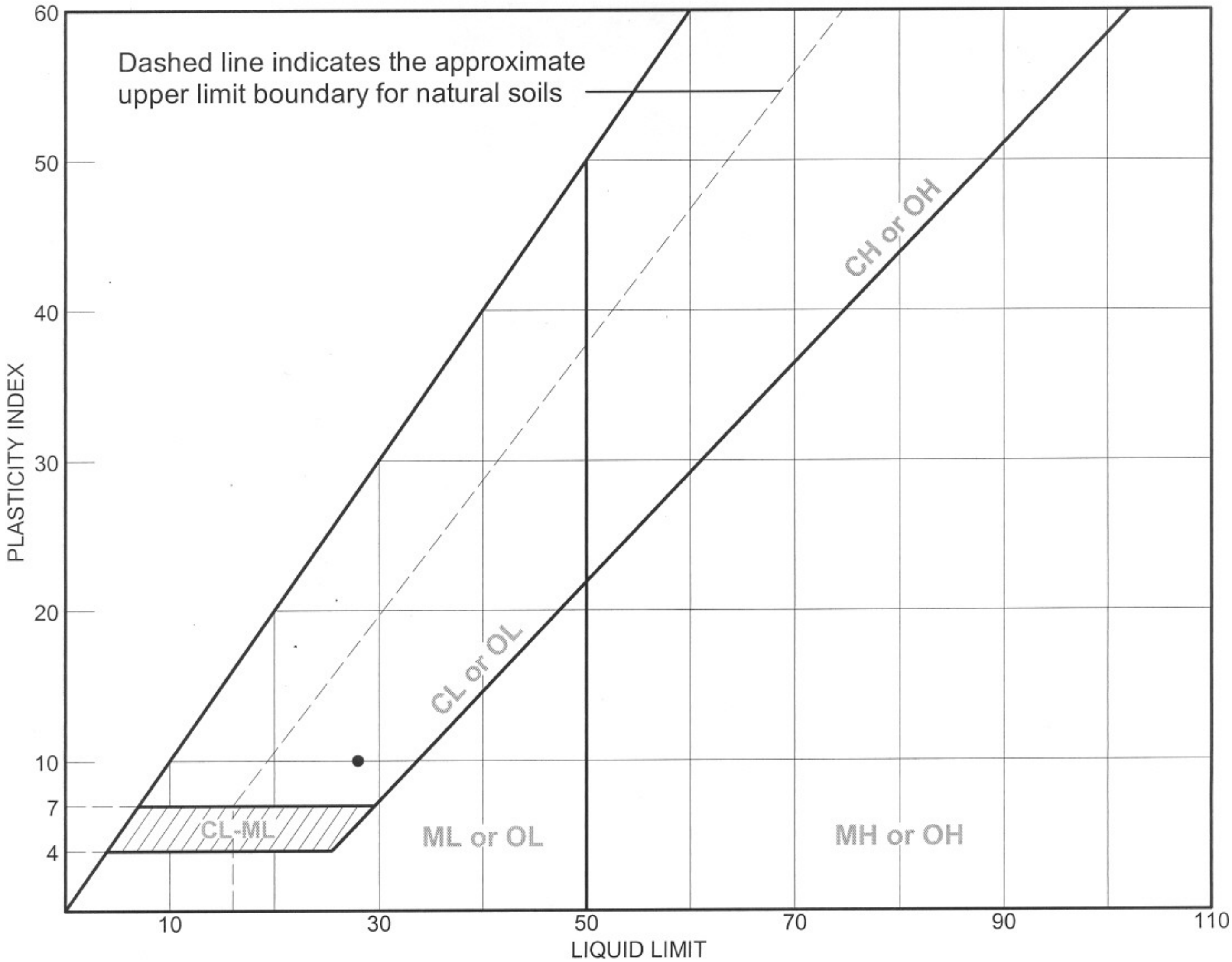
ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil &Rock
ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

Sample Number	Sample Location	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index
09-1380	B-7A, S-2: 14' – 16'	24.8 %	28	18	10
09-1381	B-9, S-6: 10' – 12'	27.9 %	22	18	4

ASTM D-2938: Unconfined Compressive Strength of Intact Rock Core Specimens

Sample Number	Rock Core Location	Core Length Inches	Core Diameter inches	Maximum Load lbs.	Unconfined Compressive Strength psi
09-1386	B-8: 43'	4.13	1.98	54950	17,850
09-1387	B-11: 42'	4.15	1.97	56170	18,430

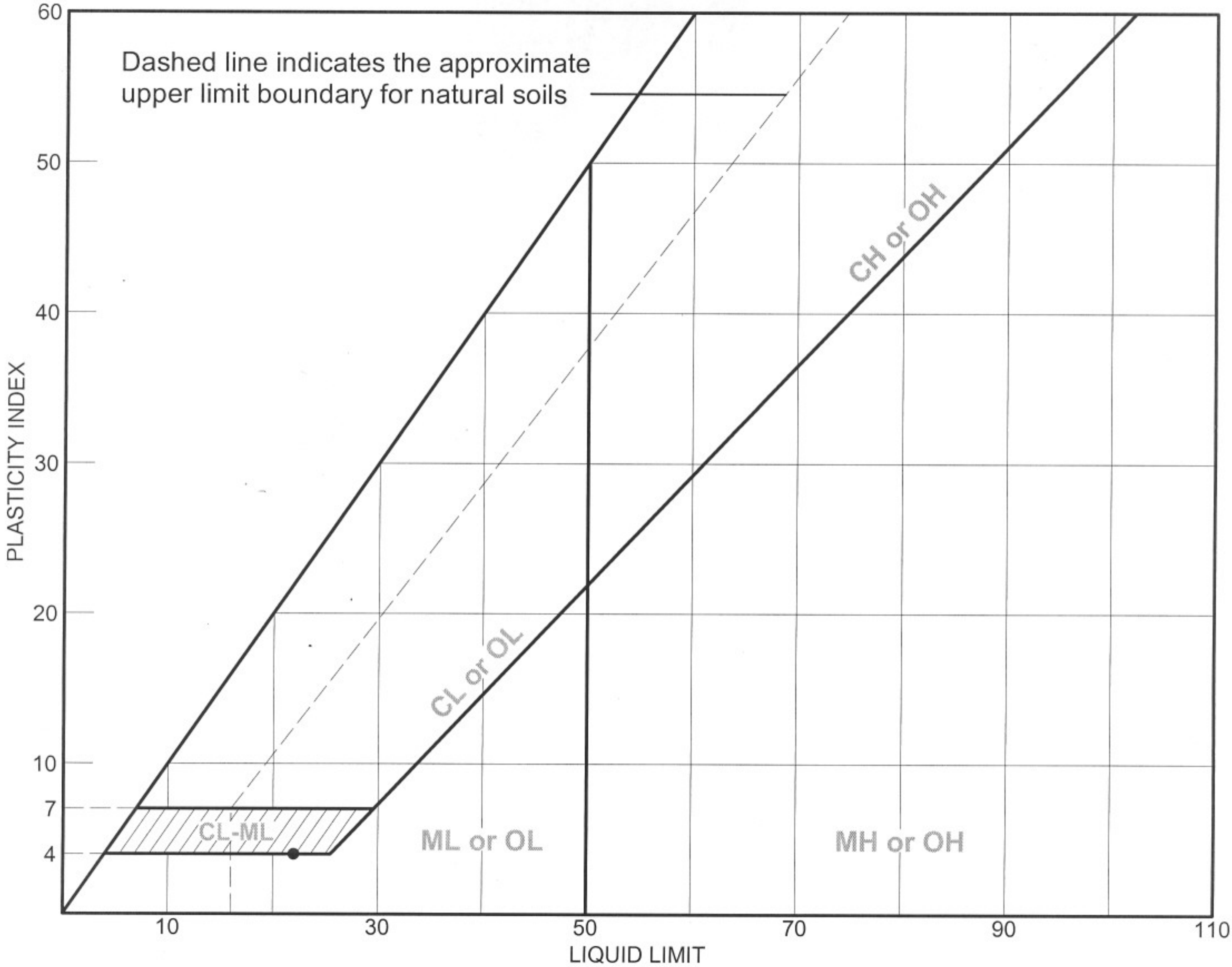
LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-7A	S-2	14' - 16'	24.8 %	18	28	10	

LIQUID AND PLASTIC LIMITS TEST REPORT **SJB SERVICES, INC.**	**Client:** ERIE CANAL HARBOR DEVELOPMENT **Project:** BUFFALO CANAL SIDE DEVELOPMENT **Project No.:** BE-09-094

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-9	S-6	10' - 12'	27.9 %	18	22	4	

LIQUID AND PLASTIC LIMITS TEST REPORT

SJB SERVICES, INC.

Client: ERIE CANAL HARBOR DEVELOPMENT

Project: BUFFALO CANAL SIDE DEVELOPMENT

Project No.: BE-09-094

Western New York Office
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Phone: (716) 649-8110
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Laboratory Test Report

PROJECT: **Buffalo Canal Side Development**

CLIENT: **Erie Canal Harbor Development**

DATE: **October 30, 2009**

PROJECT NO.: BE-09-094
REPORT NO.: LTR-3

SAMPLE NUMBER: 09-1382
SAMPLE LOCATION: B-10, S-15: 28' – 30'

ASTM C-136: Sieve Analysis of Fine and Coarse Aggregates

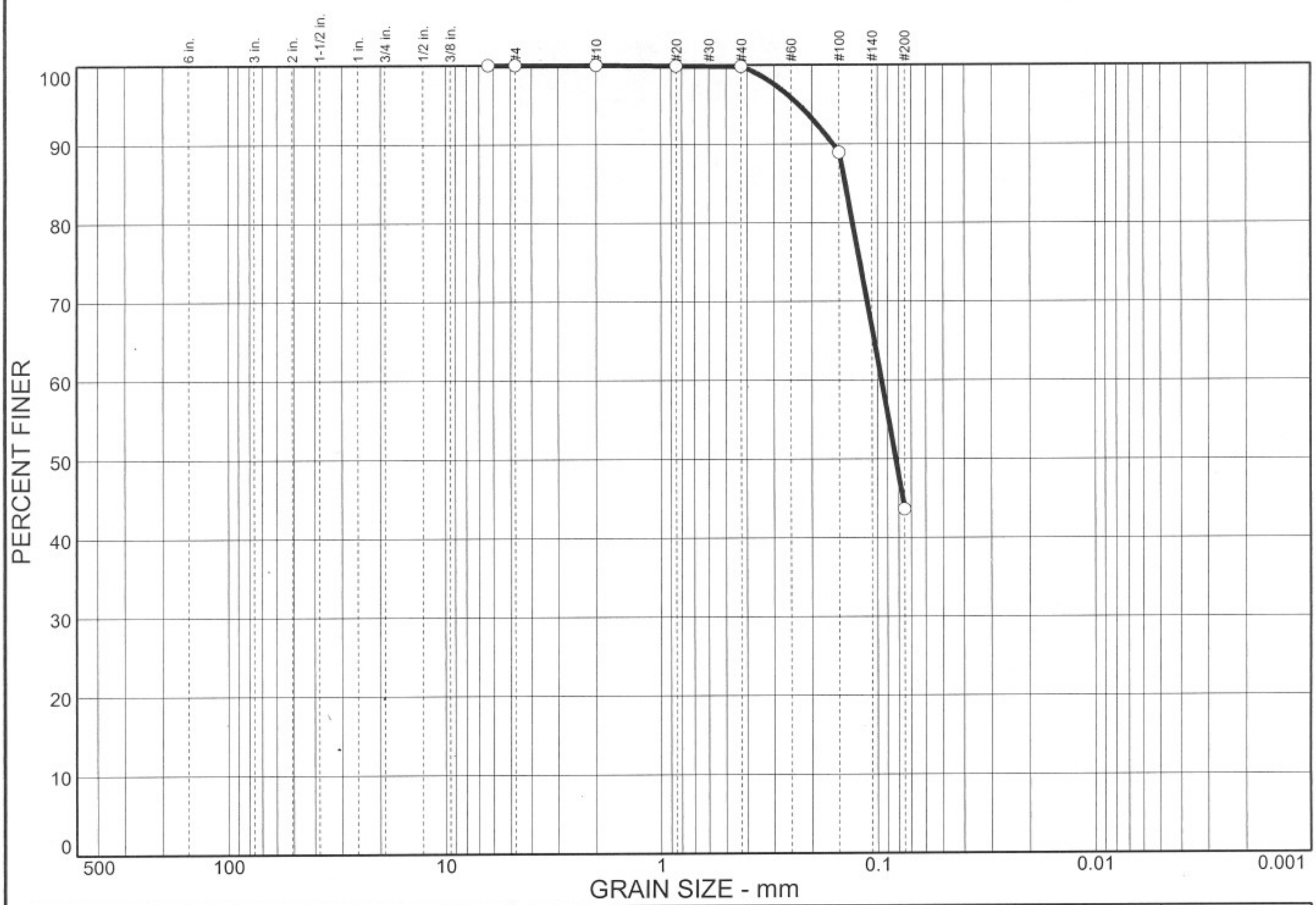
Sieve *Size*	***Percent Passing***
¼"	100.0
#4	100.0
#10	100.0
#20	99.9
#40	99.8
#100	88.9
#200	43.6

SAMPLE NUMBER: 09-1383
SAMPLE LOCATION: B-12, S-9: 16' – 18'

ASTM C-136: Sieve Analysis of Fine and Coarse Aggregates

Sieve *Size*	***Percent Passing***
1"	100.0
¾"	92.5
½"	92.5
⅜"	90.2
¼"	87.2
#4	84.8
#10	73.9
#20	60.0
#40	41.2
#100	13.5
#200	8.8

ASTM C-136: Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	56.4	43.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.8		
#100	88.9		
#200	43.6		

* (no specification provided)

Soil Description

B-10, S-15: 28' - 30'

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.141 D_{60}= 0.0960 D_{50}= 0.0826
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

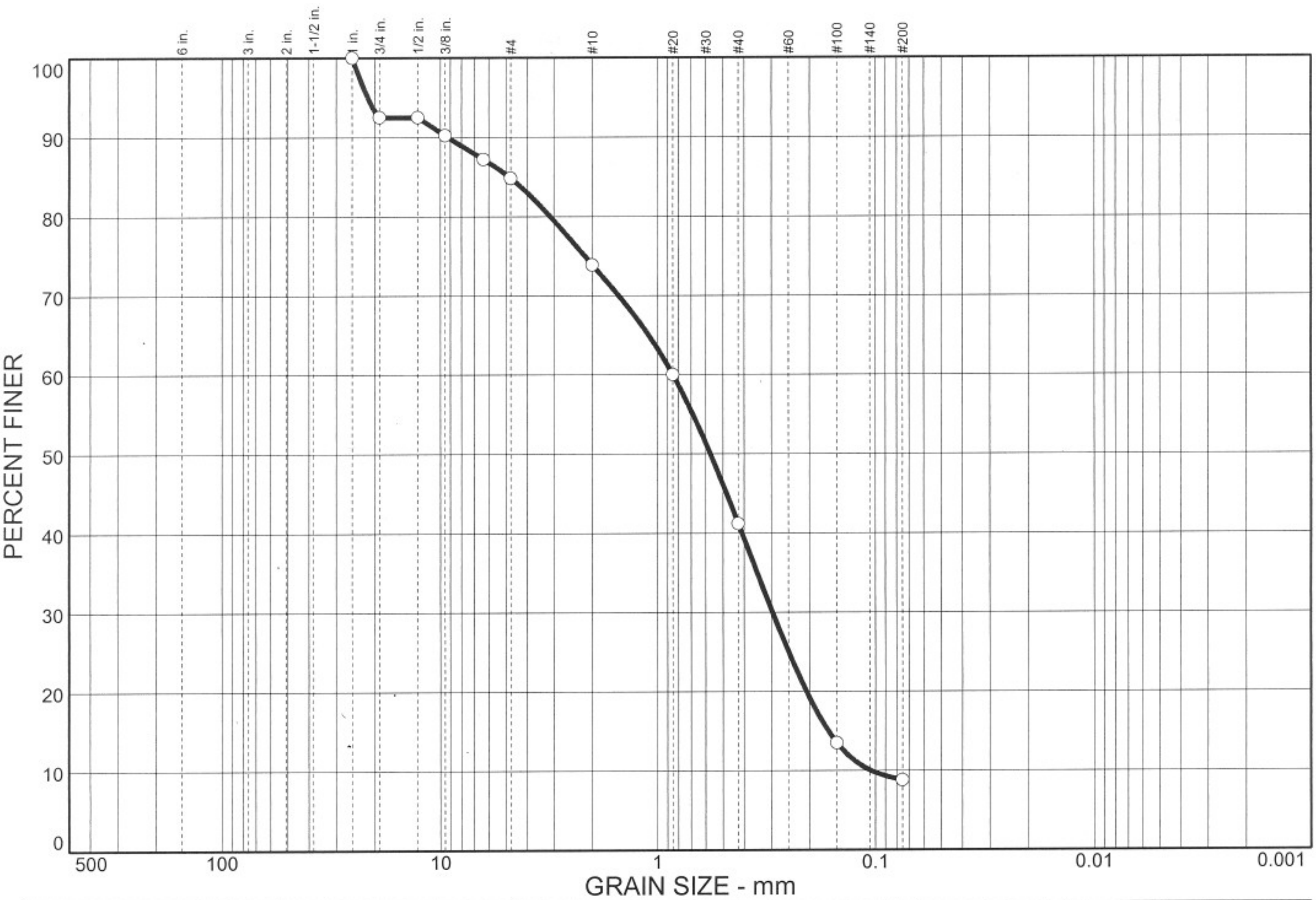
SAMPLE NUMBER: 09-1382

Sample No.: S-15 **Source of Sample:** B-10 **Date:** 10/30/09
Location: B-10, S-15: 28' - 30' **Elev./Depth:** 28' - 30'

SJB SERVICES, INC.

Client: ERIE CANAL HARBOR DEVELOPMENT
Project: BUFFALO CANAL SIDE DEVELOPMENT
Project No: BE-09-094

ASTM C-136: Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	15.2	76.0	8.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	92.5		
.5 in.	92.5		
.375 in.	90.2		
.25 in.	87.2		
#4	84.8		
#10	73.9		
#20	60.0		
#40	41.2		
#100	13.5		
#200	8.8		

* (no specification provided)

Soil Description

B-12, S-9: 16' - 18'

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.85 D_{60}= 0.850 D_{50}= 0.572
D_{30}= 0.296 D_{15}= 0.164 D_{10}= 0.105
C_u= 8.11 C_c= 0.98

Classification

USCS= AASHTO=

Remarks

SAMPLE NUMBER: 09-1383

Sample No.: S-9 **Source of Sample:** B-12 **Date:** 10/30/09
Location: B-12, S-9: 16' - 18' **Elev./Depth:** 16' - 18'

SJB SERVICES, INC.

Client: ERIE CANAL HARBOR DEVELOPMENT
Project: BUFFALO CANAL SIDE DEVELOPMENT
Project No: BE-09-094

SJB SERVICES, INC.

Western New York Office
5167 South Park Avenue
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Phone: (716) 649-8110
Fax: (716) 649-8051

Laboratory Test Report

PROJECT: **Buffalo Canal Side Development**

CLIENT: **Erie Canal Harbor Development**

DATE: **October 30, 2009**

PROJECT NO.: BE-09-094
REPORT NO.: LTR-3

SAMPLE NUMBER: 09-1384
SAMPLE LOCATION: B-14, S-7: 12' – 14'

ASTM C-136: Sieve Analysis of Fine and Coarse Aggregates

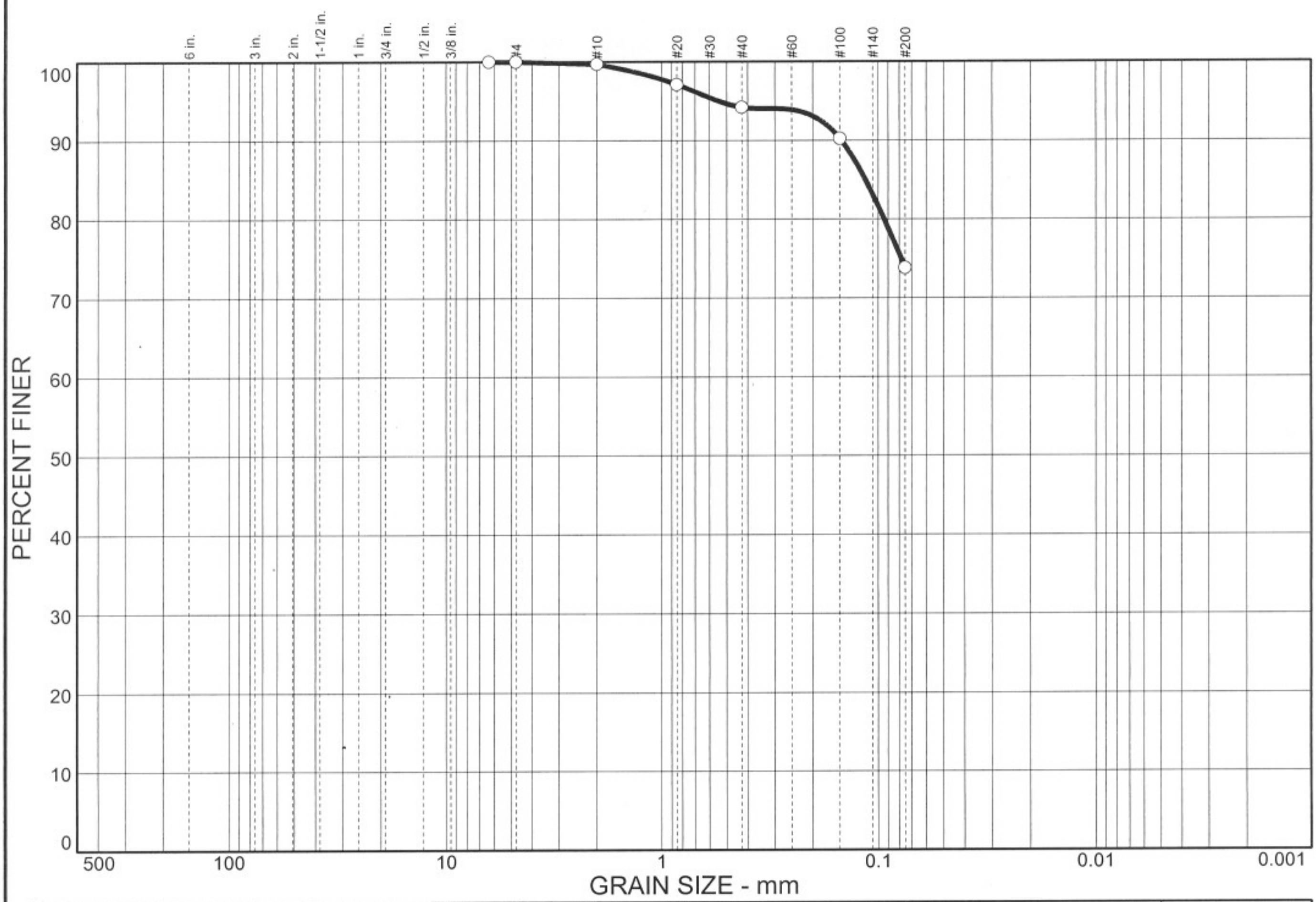
Sieve *Size*	*Percent Passing*
¼"	100.0
#4	100.0
#10	99.7
#20	97.1
#40	94.2
#100	90.2
#200	73.8

SAMPLE NUMBER: 09-1385
SAMPLE LOCATION: B-14, S-11: 25' – 27'

ASTM C-136: Sieve Analysis of Fine and Coarse Aggregates

Sieve *Size*	*Percent Passing*
¼"	100.0
#4	100.0
#10	99.7
#20	97.9
#40	68.0
#100	10.4
#200	5.1

ASTM C-136: Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	26.2	73.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	100.0		
#10	99.7		
#20	97.1		
#40	94.2		
#100	90.2		
#200	73.8		

* (no specification provided)

Soil Description

B-14, S-7: 12' - 14'

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.115 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

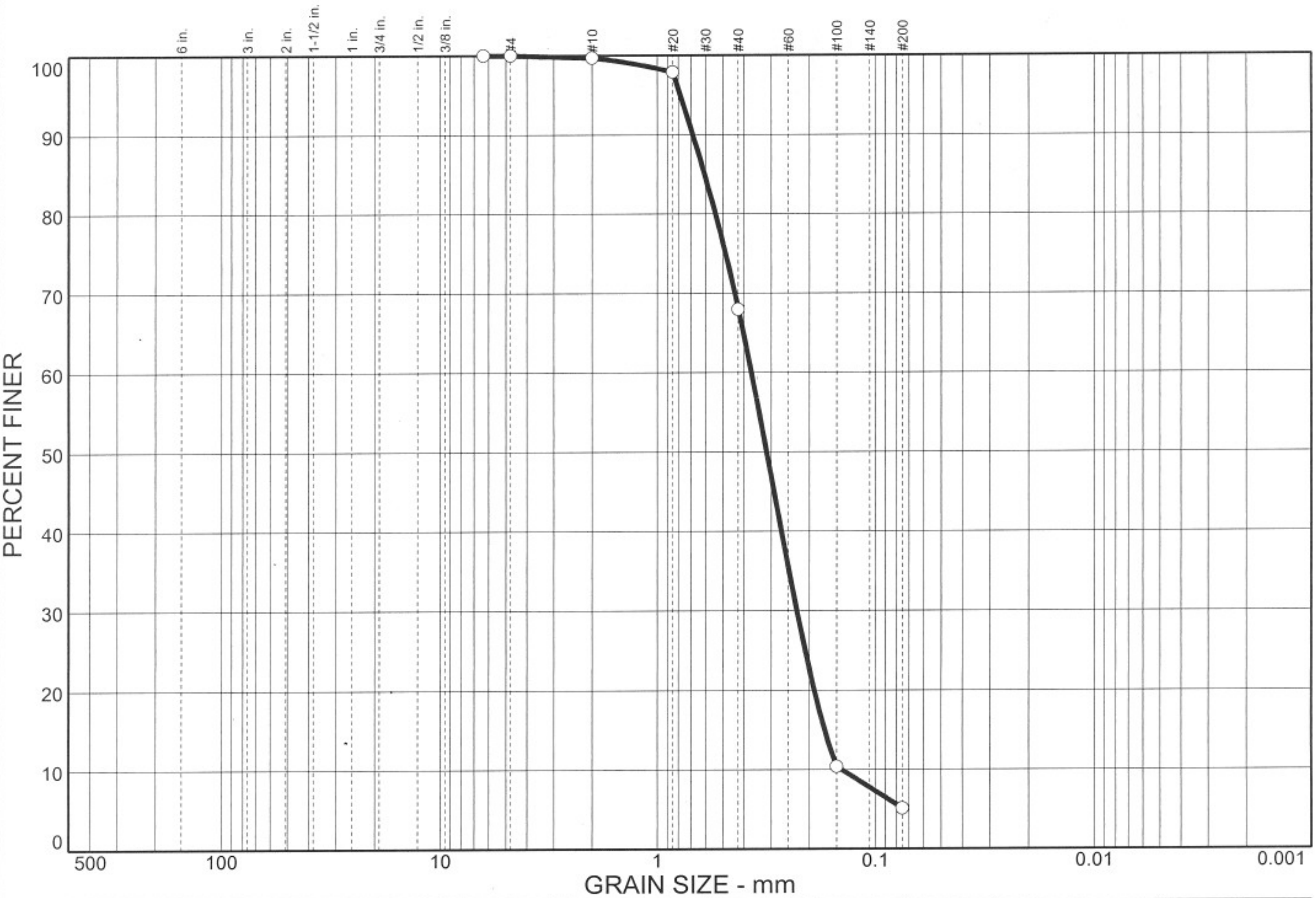
SAMPLE NUMBER: 09-1384

Sample No.: S-7 **Source of Sample:** B-14 **Date:** 10/30/09
Location: B-14, S-7: 12' - 14' **Elev./Depth:** 12' - 14'

SJB SERVICES, INC.

Client: ERIE CANAL HARBOR DEVELOPMENT
Project: BUFFALO CANAL SIDE DEVELOPMENT
Project No: BE-09-094

ASTM C-136: Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	94.9	5.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	100.0		
#10	99.7		
#20	97.9		
#40	68.0		
#100	10.4		
#200	5.1		

* (no specification provided)

Soil Description

B-14, S-11: 25' - 27'

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.608 D_{60}= 0.370 D_{50}= 0.315
D_{30}= 0.229 D_{15}= 0.170 D_{10}= 0.142
C_u= 2.60 C_c= 0.99

Classification

USCS= AASHTO=

Remarks

SAMPLE NUMBER: 09-1385

Sample No.: S-11 **Source of Sample:** B-14 **Date:** 10/30/09
Location: B-14, S-11: 25' - 27' **Elev./Depth:** 25' - 27'

SJB SERVICES, INC.

Client: ERIE CANAL HARBOR DEVELOPMENT
Project: BUFFALO CANAL SIDE DEVELOPMENT
Project No: BE-09-094

APPENDIX D

ANALYTICAL LABORATORY TEST RESULTS

Rochester Office
535 Summit Point Drive
Henrietta, NY 14467

LABORATORY D.I.P.R.A. TESTS

Project: Buffalo Canal Side Development

Project Number: BE-09-094

Town /City: Buffalo NY

Date: 7-28-2009

Client: Erie Canal Harbor Development Corporation
Technician: William Gilmore

Summary of Laboratory Analysis Soil

Lab ID:	Location:	Resistivity (Ohm-cm)	Redox (mv)	PH	Sulfides (+,T,-)	% Moisture Content (wet, moist, dry)	TOTAL POINTS
		Points	*Points*	*Points*	*Points*	*Points*	
09-334	B-2/S-4 to S-6	1,900	35.6	7.50	T	Moist (8.5%)	12
	Depth = 6' –12'	5	4	0	2	1	
09-335	B-3/S3 to S-4	3,200	-12.2	7.27	T	Moist (9.2%)	8
	Depth = 4'-8'	0	5	0	2	1	
09-336	B-5/S-2 to S-4	6,400	-35.8	8.12	T	Moist (9.0%)	8
	Depth = 2'-8'	0	5	0	2	1	

Per the Ductile Iron Pipe Research Association (DIPRA), point totals 10 or greater should be considered for Cathodic Protection.

Rochester Office
535 Summit Point Drive
Henrietta, NY 14467

LABORATORY D.I.P.R.A. TESTS

Project: Buffalo Canal Side Development

Project Number: BE-09-094

Town /City: Buffalo N.Y.

Date: 10-27-2009

Client: C&S Engineers / Erie Canal Harbor Development Corp.
Technician: William Gilmore

Summary of Laboratory Analysis Soil

Lab ID:	Location:	Resistivity (Ohm-cm)	Redox (mv)	PH	Sulfides (+,T,-)	% Moisture Content (wet, moist, dry)	TOTAL POINTS
		Points	*Points*	*Points*	*Points*	*Points*	
09-478	Boring #14, Samples 1 & 2 Depth = 0' – 4'	2,300	-45.3	7.8	-	Moist (9.2%)	**8**
		2	5	0	0	1	
09-479	Boring #9, Samples 2 - 4 DEPTH = 2'-8'	1,100	-109	7.95	-	Moist (8.6%)	**16**
		10	5	0	0	1	

Per the Ductile Iron Pipe Research Association (DIPRA), point totals 10 or greater should be considered for Cathodic Protection.

PARADIGM
ENVIRONMENTAL SERVICES, INC.

Analytical Report Cover Page

Empire Geo-Services, Inc.

For Lab Project # 09-2498
Issued July 22, 2009
This report contains a total of 3 pages

The reported results relate only to the samples as they have been received by the laboratory.

Any noncompliant QC parameters having impact on the data are flagged or documented on the final report.

All soil/sludge samples have been reported on a dry weight basis, unless qualified "reported as received". Other solids are reported as received.

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The Chain of Custody provides additional information, including compliance with sample condition requirements upon receipt. Sample condition requirements are defined under the 2003 NELAC Standard, sections 5.5.8.3.1 and 5.5.8.3.2.

NYSDOH ELAP does not certify for all parameters. Paradigm Environmental Services or the indicated subcontracted laboratory does hold certification for all analytes where certification is offered by ELAP unless otherwise specified.

Data qualifiers are used, when necessary, to provide additional information about the data. This information may be communicated as a flag or as text at the bottom of the report. Please refer to the following list of frequently used data flags and their meaning:

"ND" = analyzed for but not detected.
"E" = Result has been estimated, calibration limit exceeded.
"D" = Duplicate results outside QC limits. May indicate a non-homogenous matrix.
"M" = Matrix spike recoveries outside QC limits. Matrix bias indicated.
"B" = Method blank contained trace levels of analyte. Refer to included method blank report.

179 Lake Avenue · Rochester, NY 14608 · (585) 647-2530 · Fax (585) 647-3311 · ELAP ID# 10958

PARADIGM
ENVIRONMENTAL SERVICES, INC.
179 Lake Avenue Rochester New York 14608 (585) 647-2530 FAX (585) 647-3311

Client: Empire Geo-Services, Inc.

Client Job Site: N/A

Client Job No.: BE-09-094

Analytical Method: SW 9056

Lab Project No.: 09-2498

Sample Type: Soil

Date Sampled: 6/24-7/10/2009
Date Received: 7/13/2009
Date Analyzed: 7/20/2009

Laboratory Report of Analysis

Sample ID	Field Location	Chloride (ug/g)	Sulfate (ug/g)
7945	Test Pit #2, 2' -3'	ND<20.0	150
7946	B-1, 16'-18' / 20'-22' / 22'-24'	244	722
7947	Test Pit #1, Surface	ND<20.0	179
7948	B-4, 2'-4' / 4'-6'	20.0	297

ELAP ID.No.: 10709

Comments: ND denotes Non Detect.

Approved By Technical Director: Val McMullen for BH
Bruce Hoogesteger

This report is part of a multipage document and should only be evaluated in its entirety. The Chain of Custody provides additional sample information, including compliance with the sample condition requirements upon receipt.

PARADIGM ENVIRONMENTAL SERVICES, INC.

CHAIN OF CUSTODY

179 Lake Avenue
Rochester, NY 14608
(716) 647-2530 * (800) 724-1997

PROJECT NAME/SITE NAME:

REPORT TO:	INVOICE TO:	
COMPANY: EMPIRE GEO-SERVICES, INC.	COMPANY: Same	LAB PROJECT #: 09-2498 / CLIENT PROJECT #: BE-09-094
ADDRESS: 5167 SOUTH PARK AVENUE	ADDRESS:	
CITY: HAMBURG STATE: NY ZIP: 14075	CITY: STATE: ZIP:	TURNAROUND TIME: (WORKING DAYS)
PHONE: 716-649-8110 FAX: 716-649-8051	PHONE: FAX:	STD: ☐1 ☐2 ☐3 ☒5 OTHER ☐
ATTN: TOM SEIDER	ATTN:	
COMMENTS:		

REQUESTED ANALYSIS

	DATE	TIME	COMPOSITE	GRAB	SAMPLE LOCATION/FIELD ID	MATRIX	NUMBER CONTAINERS	CHLORIDE 10:1	SULFATE 10:1	REMARKS	PARADIGM LAB SAMPLE NUMBER
1	7/10/09	—	X		TEST PIT #2, 2'~3'	SOIL	1	X	X		7945
2	6/26/09	—	X		B-1, 16'-18' / 20'-22' / 22'-24'	SOIL	3	X	X	COMPOSITE IN LAB	7946
3	7/10/09	—	X		TEST PIT #1, SURFACE	SOIL	1	X	X		7947
4	6/24/09	—	X		B-4, 2'-4' / 4'-6'	SOIL	2	X	X	COMPOSITE IN LAB	7948
5											
6					* "extra" jars not comped –					B1, 16'-18'/20'-22'/22'-24'	
7					only what ~~was~~ was (ee em 7/13)					comped 3 to one	
8					sent to Adk was					at lab. B-4 2'-4'/4'-6	
9					comped. Em 7/13					comped two to	
10										one at lab *	

Em 7/13.

LAB USE ONLY

SAMPLE CONDITION: Check box if acceptable or note deviation:

CONTAINER TYPE: ☐ #7945, 7947 rec'd in plastic – transferred to glass at lab.

PRESERVATIONS: ☐ NA

HOLDING TIME: ☒ (ee EAH 7/13) ~~Sulfate past HT for B-1 and B-4~~

TEMPERATURE: ☐ 22°C iced on 7/13

Sampled By: [signature]	Date/Time: 7/13/09 15:57	Relinquished By:	Date/Time:	Total Cost:
Relinquished By: [signature]	Date/Time: 7/13/09 15:57	Received By:	Date/Time:	
Received By: Emily [signature]	Date/Time: 7/13/09 1840	Received @ Lab By:	Date/Time:	P.I.F.

PARADIGM
ENVIRONMENTAL SERVICES, INC.

Analytical Report Cover Page

Empire Geo-Services, Inc.

For Lab Project # 09-3830
Issued October 22, 2009
This report contains a total of 4 pages

The reported results relate only to the samples as they have been received by the laboratory.

Any noncompliant QC parameters having impact on the data are flagged or documented on the final report.

All soil/sludge samples have been reported on a dry weight basis, unless qualified "reported as received". Other solids are reported as received.

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The Chain of Custody provides additional information, including compliance with sample condition requirements upon receipt. Sample condition requirements are defined under the 2003 NELAC Standard, sections 5.5.8.3.1 and 5.5.8.3.2.

NYSDOH ELAP does not certify for all parameters. Paradigm Environmental Services or the indicated subcontracted laboratory does hold certification for all analytes where certification is offered by ELAP unless otherwise specified.

Data qualifiers are used, when necessary, to provide additional information about the data. This information may be communicated as a flag or as text at the bottom of the report. Please refer to the following list of frequently used data flags and their meaning:

"ND" = analyzed for but not detected.
"E" = Result has been estimated, calibration limit exceeded.
"D" = Duplicate results outside QC limits. May indicate a non-homogenous matrix.
"M" = Matrix spike recoveries outside QC limits. Matrix bias indicated.
"B" = Method blank contained trace levels of analyte. Refer to included method blank report.

PARADIGM
ENVIRONMENTAL SERVICES, INC.
179 Lake Avenue Rochester New York 14608 (585) 647-2530 FAX (585) 647-3311

LABORATORY REPORT OF ANALYSIS

Client: Empire Geo-Services, Inc.

Client Job Site: N/A

Client Job No.: BE-09-094

Field Location: B-7, 8'-10'

Lab Project No.: 09-3830
Lab Sample No.: 11748

Sample Type: Soil

Date Sampled: 10/1/2009
Date Received: 10/19/2009

Parameter	Date Analyzed	Analytical Method	Results (mg/kg)
Chloride	10/16/2009	EPA 300	19.3
Sulfate	10/16/2009	EPA 300	ND<50.0

ELAP ID.No.: 11179

Comments: ND denotes Non Detect.

Approved By: ______________________________
Bruce Hoogesteger, Technical Director

This report is part of a multipage document and should only be evaluated in its entirety. The Chain of Custody provides additional sample information, including compliance with the sample condition requirements upon receipt.

PARADIGM
ENVIRONMENTAL SERVICES, INC.
179 Lake Avenue Rochester New York 14608 (585) 647-2530 FAX (585) 647-3311

LABORATORY REPORT OF ANALYSIS

Client: Empire Geo-Services, Inc.

Client Job Site: N/A

Client Job No.: BE-09-094

Field Location: B-10, 6'-8'

Lab Project No.: 09-3830
Lab Sample No.: 11749

Sample Type: Soil

Date Sampled: 9/29/2009
Date Received: 10/19/2009

Parameter	Date Analyzed	Analytical Method	Results (mg/kg)
Chloride	10/16/2009	EPA 300	398
Sulfate	10/16/2009	EPA 300	ND<500

ELAP ID.No.: 11179

Comments: ND denotes Non Detect.

Approved By: ______________________
Bruce Hoogesteger, Technical Director

This report is part of a multipage document and should only be evaluated in its entirety. The Chain of Custody provides additional sample information, including compliance with the sample condition requirements upon receipt.

PARADIGM ENVIRONMENTAL SERVICES, INC.

179 Lake Avenue

Rochester, NY 14608

(716) 647-2530 * (800) 724-1997

CHAIN OF CUSTODY

4

REPORT TO:		INVOICE TO:	
COMPANY:	EMPIRE GEO-SERVICES, INC.	COMPANY:	Same
ADDRESS:	5167 SOUTH PARK AVENUE	ADDRESS:	
CITY: HAMBURG	STATE: NY ZIP: 14075	CITY:	STATE: ZIP:
PHONE: (716) 649-8110	FAX: (716) 649-8051	PHONE:	FAX:
ATTN:	TOM SEIDER	ATTN:	

LAB PROJECT #: 09-3830

CLIENT PROJECT #: BE-09-094

TURNAROUND TIME: (WORKING DAYS) ☐ 1 ☐ 2 ☐ 3 ☐ 5 STD ☐ OTHER

PROJECT NAME/SITE NAME:

COMMENTS:

REQUESTED ANALYSIS

	DATE	TIME	COMPOSITE	GRAB	SAMPLE LOCATION/FIELD ID	MATRIX	NUMBER CONTAINERS	CHLORIDE 10d	SULFATE 10d									REMARKS	PARADIGM LAB SAMPLE NUMBER
1	10/01/2009	—		X	B-7, 8'-10'	SOIL	1	X	X										11748
2	9/29/2009	—		X	B-10, 6'-8'	SOIL	1	X	X										11749
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

LAB USE ONLY

SAMPLE CONDITION: Check box if acceptable or note deviation: CONTAINER TYPE: ☐ PRESERVATIONS: ☐ HOLDING TIME: ☐ TEMPERATURE: ☐

unknown - samples given directly to sub lab

Sampled By: SJB SERVICES, INC.	Date/Time:	Relinquished By:	Date/Time:
Relinquished By: [signature]	Date/Time: ~~10/14/09~~ 10/15/09	Received By:	Date/Time:
Received By: [signature]	Date/Time: 10/15/09	Received @ Lab By: Elizabeth A. Honch	Date/Time: 10/19/09 1130

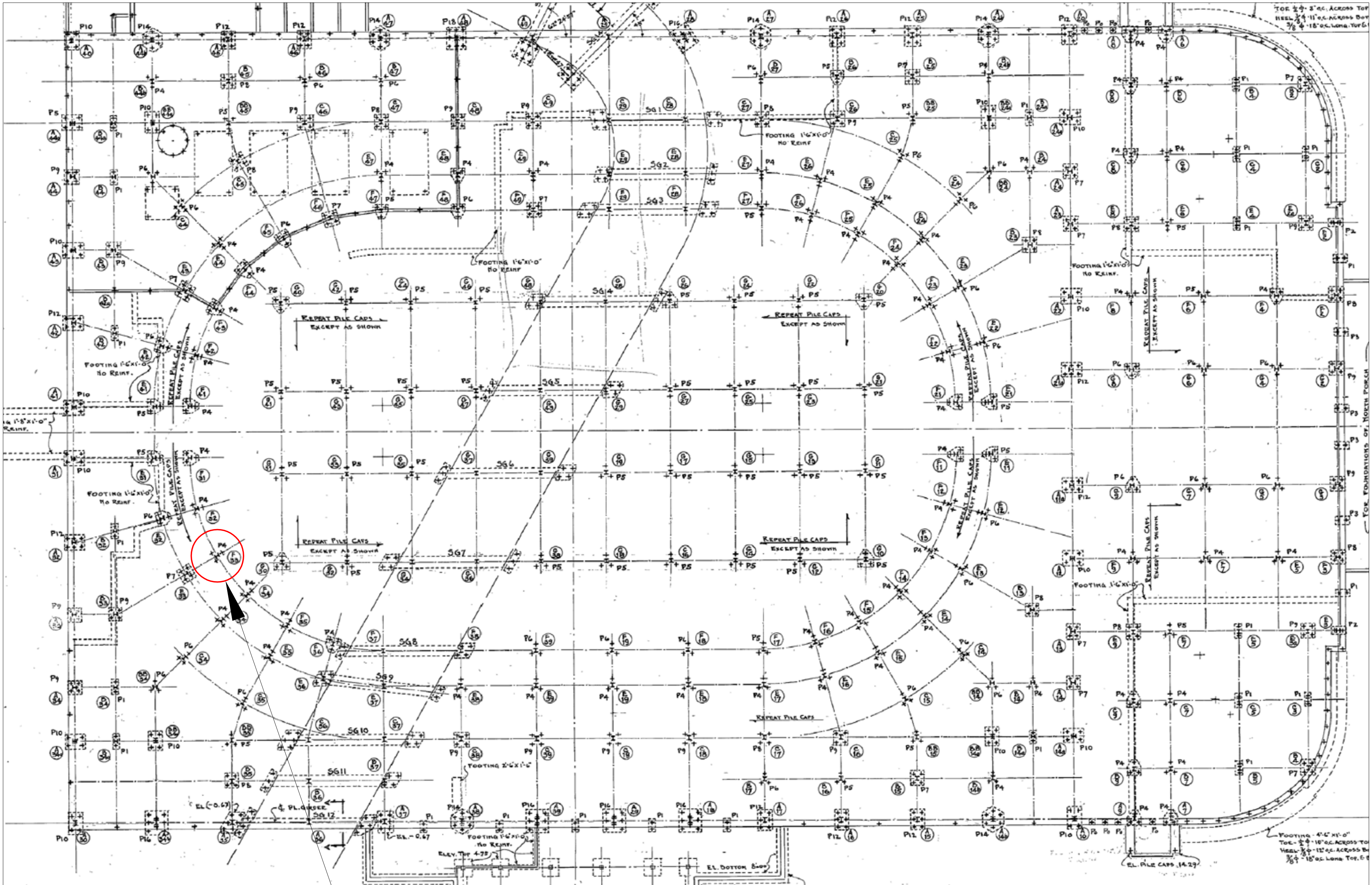
Total Cost:

P.I.F.

APPENDIX E

PILE EXTRACTION LOCATIONS, PHOTOGRAPHS AND HISTORICAL INFORMATION

EXTRACTED PILE LOCATIONS



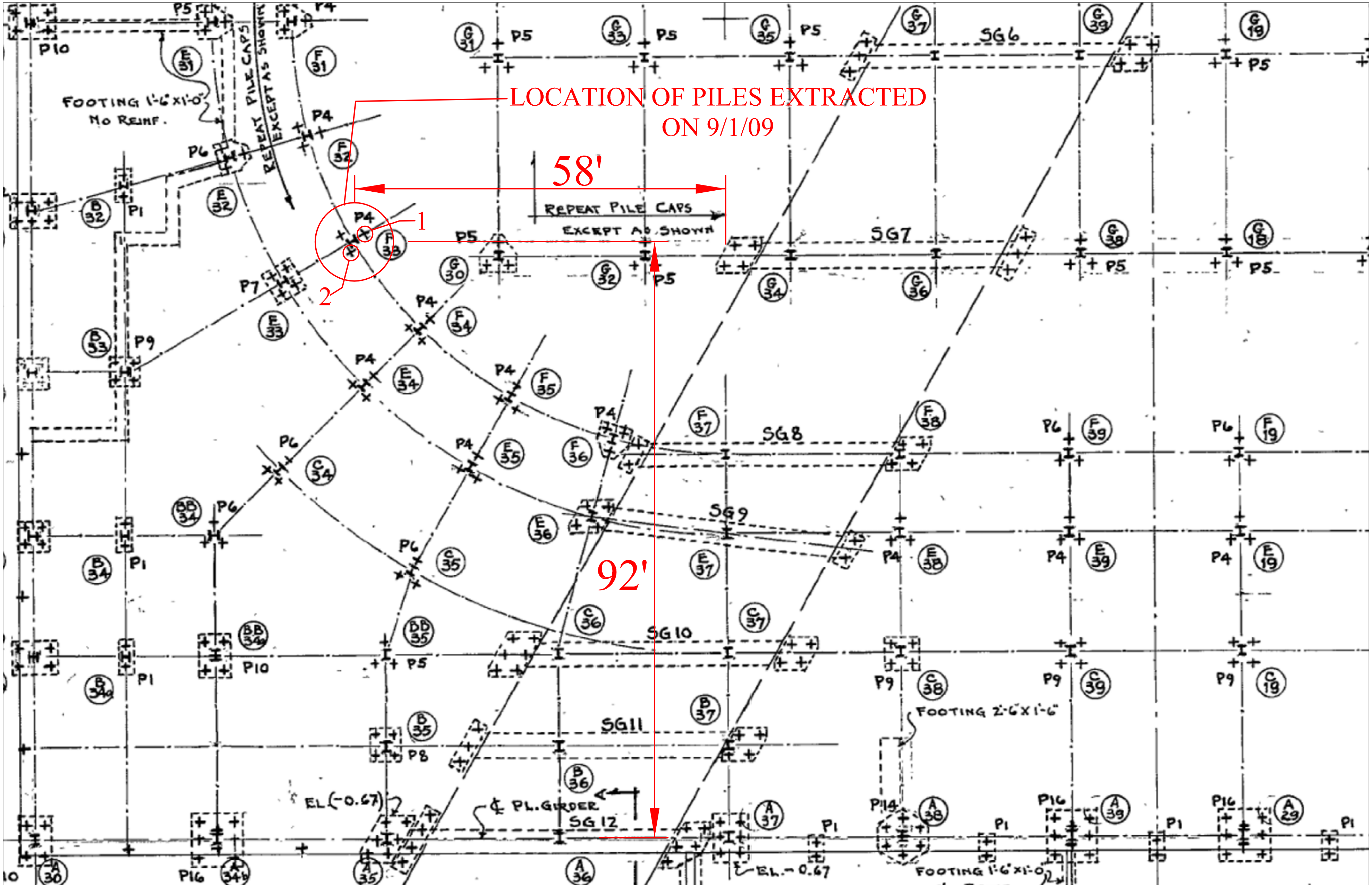
LOCATION OF PILES EXTRACTED
ON SEPTEMBER 1, 2009

EMPIRE GEO SERVICES INC
a subsidiary of SJB Services, Inc.

FORMER BUFFALO MEMORIAL AUDITORIUM SITE
PROPOSED BUFFALO CANAL SIDE DEVELOPMENT
BUFFALO, NEW YORK

EXTRACTED PILE LOCATION PLAN

DR. BY: TJF	SCALE: NTS	PROJ NO.: BE-09-094
CK BY: JJD	DATE: 09/02/09	FIGURE NO.: 1



EMPIRE GEO SERVICES INC
a subsidiary of SJB Services, Inc.

FORMER BUFFALO MEMORIAL AUDITORIUM SITE
PROPOSED BUFFALO CANAL SIDE DEVELOPMENT
BUFFALO, NEW YORK

EXTRACTED PILE LOCATION PLAN

DR. BY: TJF	SCALE: NTS	PROJ NO.: BE-09-094
CK BY: JJD	DATE: 09/01/09	FIGURE NO.: 1A

EXTRACTED PILE PHOTOGRAPHS

Photo Taken 9/1/09
Project No. BE-09-094

Empire Geo-Services, Inc.
5167 South Park Avenue
Hamburg, New York 14075

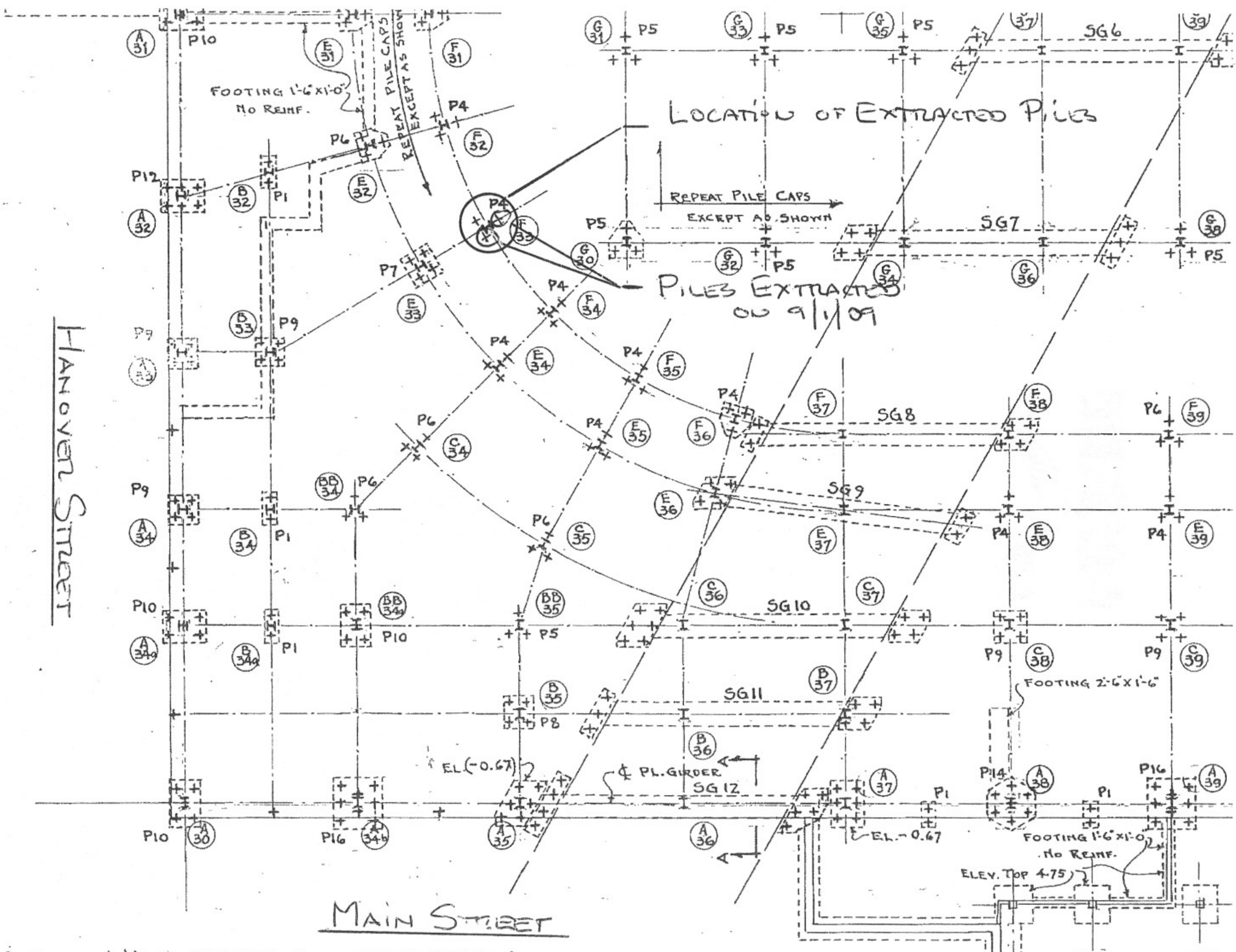
Photo Taken 9/1/09
Project No. BE-09-094

Empire Geo-Services, Inc.
5167 South Park Avenue
Hamburg, New York 14075

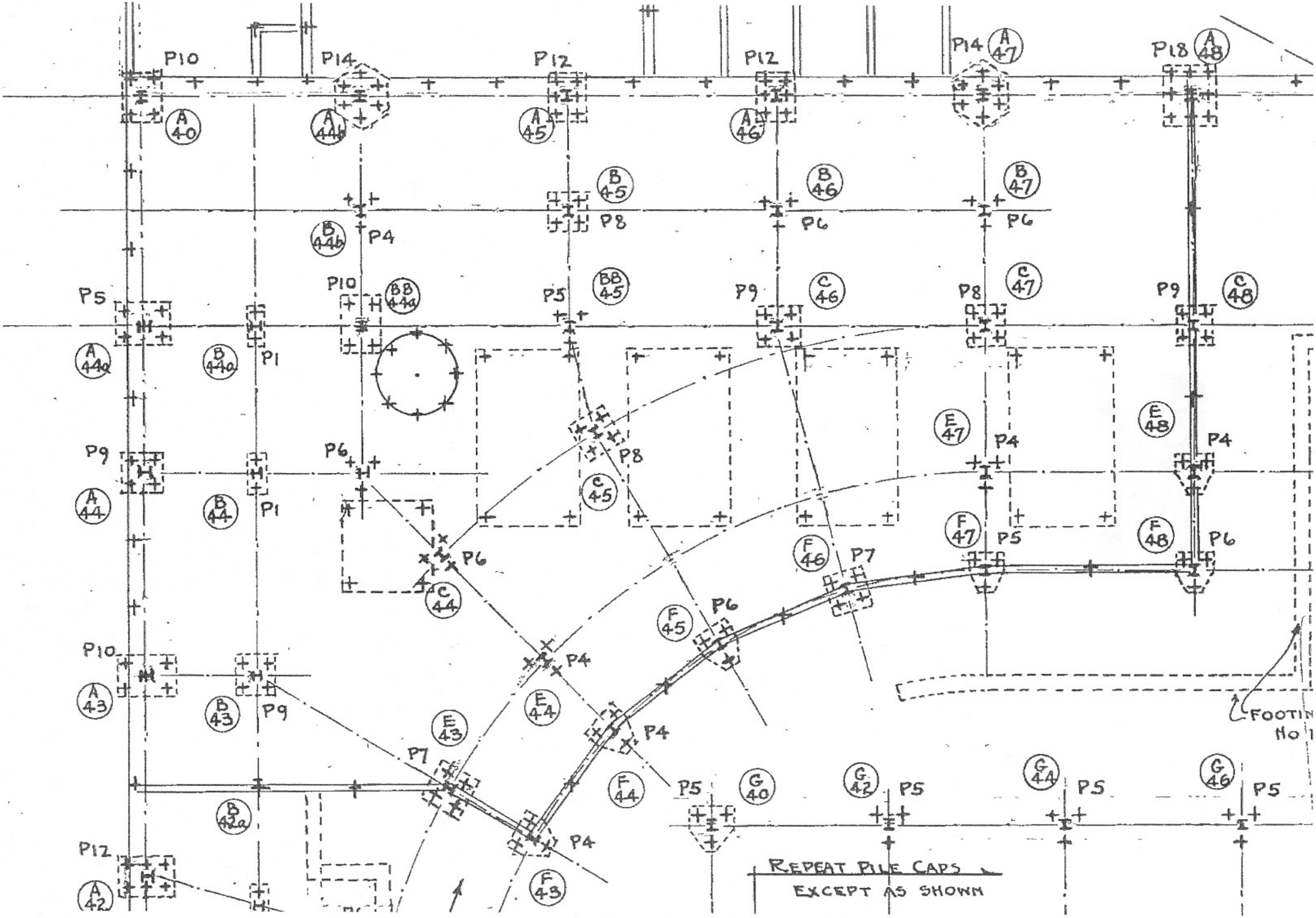
Photo Taken 9/1/09
Project No. BE-09-094

Empire Geo-Services, Inc.
5167 South Park Avenue
Hamburg, New York 14075

EXCERPTED 1939 DESIGN INFORMATION AND HP PILE SECTION DETAILS



EXTRACTED PILE LOCATION

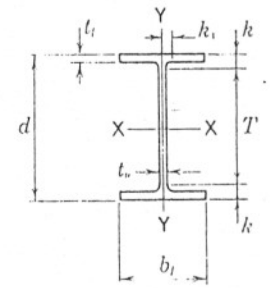


SUB-BASEMENT AREA PILES

SCHEDULE OF H-PILE FOUNDATIONS

MARK	H-PILES No.	H-PILES SECTION	H-PILES BEARING PL	REINFORCING BAND A No. Bars	REINFORCING BAND A EA. BAND	REINFORCING BAND B No. Bars	REINFORCING BAND B EA. BAND	ANCHOR BOLTS No.	ANCHOR BOLTS SIZE	"C"	"D"	"H"	REMARKS
P0	1	8H36	12"x11"x1"	—	—			—					2 DOWELS - 3/4φ x 3'-0"
P1	2	8H36	12x11x1"	1	2-1"□	—		2			—		
P1a	do	do	do	do	do	—		2		—		do	SUBSTITUTE 2 DOWELS 3/4φ x 3'-0 FOR ANCHOR BOLTS UNDER WALLS
P2	2	10H44	13x12x1	1	2-1"□	—		2					
P3	2	12H53	14x14x1	1	2-1"□	—							2 DOWELS - 3/4φ x 3'-0"
P4	3	8H36	12x11x1"	3	2-1"φ	—		2			—		
P4a	do	do	do	do	do	—		2		—			
P5	3	10H44	13x12x1	3	2-1"φ	—		2					
P6	3	12H53	14x14x1	3	2-1"φ	—		2					
P7	4	10H44	13x12x1	2	6-7/8φ	—		2					
P8	4	12H53	14x14x1	2	6-7/8φ	—		2					
P9	4	14H73	16x16x1	2	6-7/8φ	—		2					
P10	5	14H73	16x16x1	2	5-1"□	—							
P12	6	14H73	16x16x1	1	12-1"□	3	1 BD - 2-3/4φ; 2 " - 4-3/4φ						
P14	7	14H73	16x16x1	3	3-1"□	—							
P16	8	14H73	16x16x1	4	2-7/8φ	4	2-7/8φ						
P18	9	14H73	16x16x1	2	5-1"□	4	2-1"□						

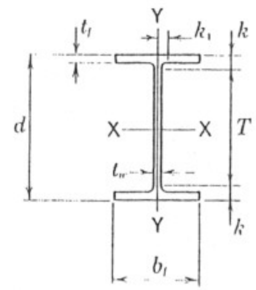
SCHEDULE OF PILE FOUNDATIONS



HP SHAPES
Dimensions

Designation	Area A	Depth d		Web Thickness t_w		$\frac{t_w}{2}$	Flange Width b_f		Flange Thickness t_f		Distance T	Distance k	Distance k_1
	In.^{2}	In.		In.		In.	In.		In.		In.	In.	In.
HP 14x117	34.4	14.21	14 1/4	0.805	13/16	7/16	14.885	14 7/8	0.805	13/16	11 1/4	1 1/2	1 1/16
x102	30.0	14.01	14	0.705	11/16	3/8	14.785	14 3/4	0.705	11/16	11 1/4	1 3/8	1
x 89	26.1	13.83	13 7/8	0.615	5/8	5/16	14.695	14 3/4	0.615	5/8	11 1/4	1 5/16	15/16
x 73	21.4	13.61	13 5/8	0.505	1/2	1/4	14.585	14 5/8	0.505	1/2	11 1/4	1 3/16	7/8
HP 13x100	29.4	13.15	13 1/8	0.765	3/4	3/8	13.205	13 1/4	0.765	3/4	10 1/4	1 7/16	1
x 87	25.5	12.95	13	0.665	11/16	3/8	13.105	13 1/8	0.665	11/16	10 1/4	1 3/8	15/16
x 73	21.6	12.75	12 3/4	0.565	9/16	5/16	13.005	13	0.565	9/16	10 1/4	1 1/4	15/16
x 60	17.5	12.54	12 1/2	0.460	7/16	1/4	12.900	12 7/8	0.460	7/16	10 1/4	1 1/8	7/8
HP 12x 84	24.6	12.28	12 1/4	0.685	11/16	3/8	12.295	12 1/4	0.685	11/16	9 1/2	1 3/8	1
x 74	21.8	12.13	12 1/8	0.605	5/8	5/16	12.215	12 1/4	0.610	5/8	9 1/2	1 5/16	15/16
x 63	18.4	11.94	12	0.515	1/2	1/4	12.125	12 1/8	0.515	1/2	9 1/2	1 1/4	7/8
x 53	15.5	11.78	11 3/4	0.435	7/16	1/4	12.045	12	0.435	7/16	9 1/2	1 1/8	7/8
HP 10x 57	16.8	9.99	10	0.565	9/16	5/16	10.225	10 1/4	0.565	9/16	7 5/8	1 3/16	13/16
x 42	12.4	9.70	9 3/4	0.415	7/16	1/4	10.075	10 1/8	0.420	7/16	7 5/8	1 1/16	3/4
HP 8x 36	10.6	8.02	8	0.445	7/16	1/4	8.155	8 1/8	0.445	7/16	6 1/8	15/16	5/8

HP SHAPES
Properties



Nominal Wt. per Ft.	Compact Section Criteria $\frac{b_f}{2t_f}$	F_y'	$\frac{d}{t_w}$	F_y'''	r_T	$\frac{d}{A_f}$	Axis X-X I	Axis X-X S	Axis X-X r	Axis Y-Y I	Axis Y-Y S	Axis Y-Y r	Torsional constant J	Plastic Modulus Z_x	Plastic Modulus Z_y
Lb.		Ksi		Ksi	In.		In.^{4}	In.^{3}	In.	In.^{4}	In.^{3}	In.	In.^{4}	In.^{3}	In.^{3}
117	9.2	49.4	17.7	—	4.00	1.19	1220	172	5.96	443	59.5	3.59	8.02	194	91.4
102	10.5	38.4	19.9	—	3.97	1.34	1050	150	5.92	380	51.4	3.56	5.40	169	78.8
89	11.9	29.6	22.5	—	3.94	1.53	904	131	5.88	326	44.3	3.53	3.60	146	67.7
73	14.4	20.3	27.0	—	3.90	1.85	729	107	5.84	261	35.8	3.49	2.01	118	54.6
100	8.6	56.7	17.2	—	3.54	1.30	886	135	5.49	294	44.5	3.16	6.25	153	68.6
87	9.9	43.5	19.5	—	3.51	1.49	755	117	5.45	250	38.1	3.13	4.12	131	58.5
73	11.5	31.9	22.6	—	3.47	1.74	630	98.8	5.40	207	31.9	3.10	2.54	110	48.8
60	14.0	21.5	27.3	—	3.43	2.11	503	80.3	5.36	165	25.5	3.07	1.39	89.0	39.0
84	9.0	52.5	17.9	—	3.29	1.46	650	106	5.14	213	34.6	2.94	4.24	120	53.2
74	10.0	42.1	20.0	—	3.26	1.63	569	93.8	5.11	186	30.4	2.92	2.98	105	46.6
63	11.8	30.5	23.2	—	3.23	1.91	472	79.1	5.06	153	25.3	2.88	1.83	88.3	38.7
53	13.8	22.0	27.1	—	3.20	2.25	393	66.8	5.03	127	21.1	2.86	1.12	74.0	32.2
57	9.0	51.6	17.7	—	2.74	1.73	294	58.8	4.18	101	19.7	2.45	1.97	66.5	30.3
42	12.0	29.4	23.4	—	2.69	2.29	210	43.4	4.13	71.7	14.2	2.41	0.81	48.3	21.8
36	9.2	50.3	18.0	—	2.18	2.21	119	29.8	3.36	40.3	9.88	1.95	0.77	33.6	15.2

HISTORICAL LISTING OF STRUCTURAL STEELS

Historical Listing of Selected Structural Steels

CSA Standards

Designation	Date Published	Yield Strength		Tensile Strength (F_u)	
		ksi	MPa	ksi	MPa
A16	1924	½ F_u	½ F_u	55 - 65	380 - 450
S39	1935	30	210	55 - 65	380 - 450
S40	1935	33	230	60 - 72	410 - 500
G40.4	1950	33	230	60 - 72	410 - 500
G40.5	1950	33	230	60 - 72	410 - 500
G40.6	1950	45 [1]	310	80 - 95	550 - 650
G40.8	1960	40 [3]	280	65 - 85	450 - 590
G40.12	1964 *	44 [2]	300	65	450
G40.21	1973 **	Replaced all previous Standards, see CISC Handbook			

* Introduced in May 1962 by the Algoma Steel Corporation as "Algoma 44"
** In May 1997, grade 350W became the only grade for W and HP shapes produced by Algoma Steel Inc.
[1] Silicon steel
[2] Yield reduces when thickness exceeds 1½ inches (40 mm).
[3] Yield reduces when thickness exceeds ⅝ inches (16 mm).

Rivet Steel

Designation	Date Published	Yield Strength		Tensile Strength (F_u)	
		ksi	MPa	ksi	MPa
G40.2	1950	28	190	52 - 62	360 - 430

ASTM Specifications

Designation	Date Published	Yield Strength		Tensile Strength (F_u)	
		ksi	MPa	ksi	MPa
A7 (bridges) A9 (buildings)	1914*	½ F_u	½ F_u	55 - 65	380 - 450
	1924	½ $F_u \geq 30$	½ $F_u \geq 210$	55 - 65	380 - 450
	1934	½ $F_u \geq 33$	½ $F_u \geq 230$	60 - 72	410 - 500
A373	1954	32	220	58 - 75	400 - 520
A242	1955	50 [1]	350	70 [1]	480
A36	1960	36	250	60 - 80	410 - 550
A440	1959	50 [1]	350	70 [1]	480
A441	1960	50 [1]	350	70 [1]	480
A572 grade 50	1966	50	345	65	450
A588	1968	50 [1]	345	70 [1]	485
A992	1998	50 min. to 65 max.	345 min. to 450 max.	65	450

[1] Reduces with increasing thickness
* Between 1900 and 1909, medium steel in A7 and A9 had a tensile strength 5 ksi higher than that adopted in 1914.

Reference: Handbook of Steel Construction, 8th Edition, CISC, 2004.

APPENDIX F

DRIVEN H-PILE LATERAL LOAD ANALYSES

Pile Deflection Curves
Top of Pile at Elevation 575 feet

FOUNDATION PROFILE & SOIL CONDITIONS

Non-displacement pile: H pile or open-ended pipe. Little soil is displaced. Friction is less than displacement pile. Effective area is used.

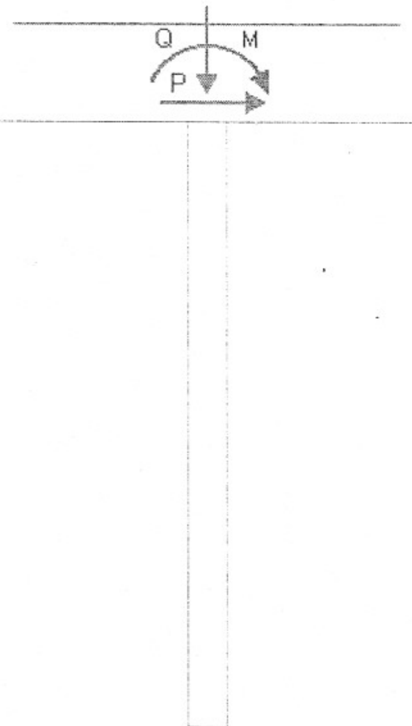
Depth from Ground-ft: 0, 10, 20, 30, 40, 50, 60

Elevation from Ground-ft: 580, 570, 560, 550, 540, 530, 520

FOUNDATION PROPERTIES

Depth	Width-in	A'-in2	Per.-in	I'-in4	E -kp/i2	W -kp/f
0.0	12.0	15.5	47.7	393.0	29000	0.05
		Steel (smooth)				

31.0



SOIL PROPERTIES

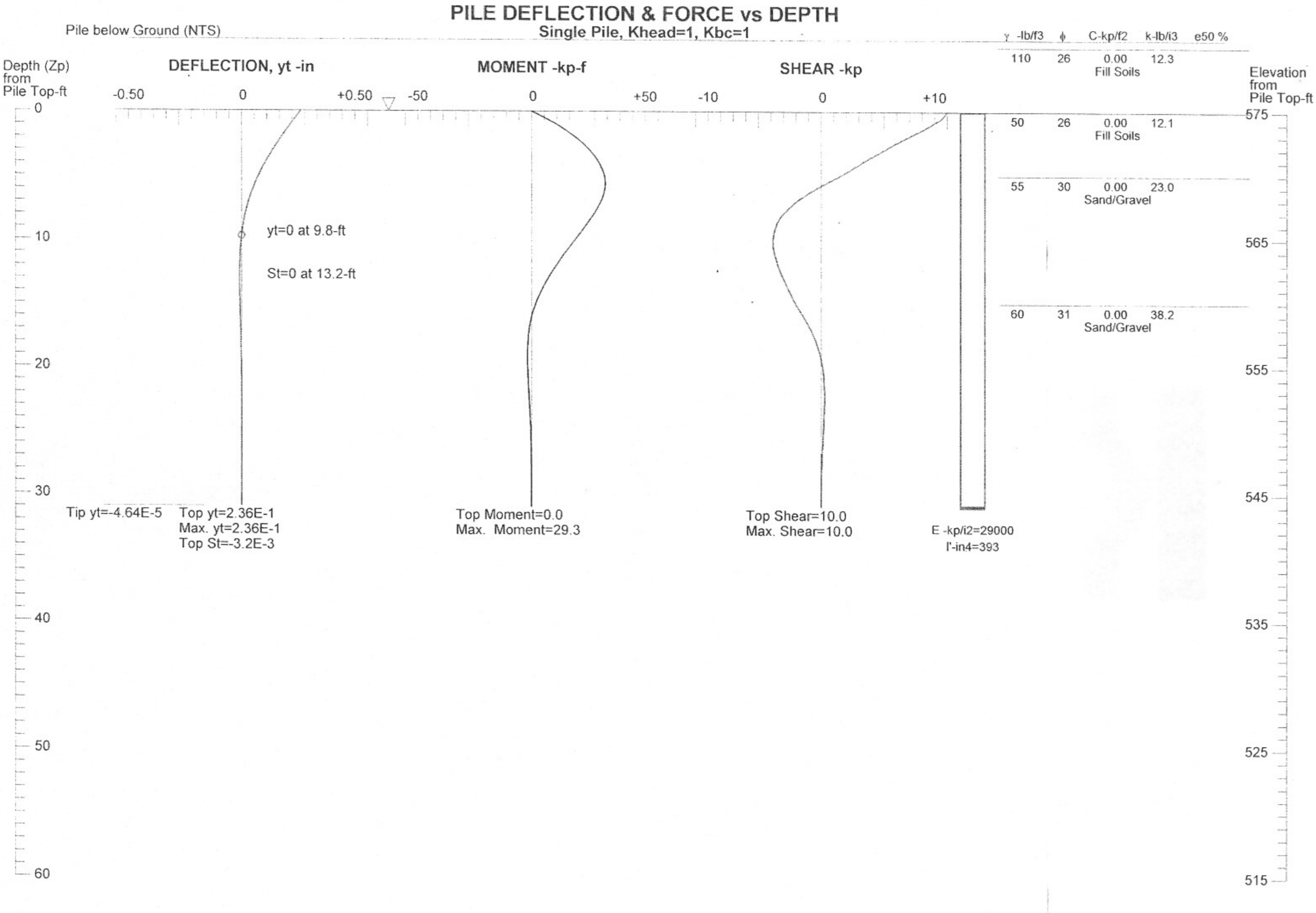
Depth	γ -lb/f3	ϕ	C-kp/f2	k-lb/i3	e50 %	Nspt
0.0	110	26	0.00	12.3		5
			Fill Soils			
5.0	50	26	0.00	12.1		5
			Fill Soils			
10.0	55	30	0.00	23.0		8
			Sand/Gravel			
20.0	60	31	0.00	38.2		12
			Sand/Gravel			
36.0	110	26	500	2956.0	0.03	60
			Crystalline limestones			

Batter Angle=0 (Pile diameter not to scale) Surface Angle=0

CivilTech Software

Buffalo Canal Side Development - Parking Ramp
HP 12x53 - Top at 575'

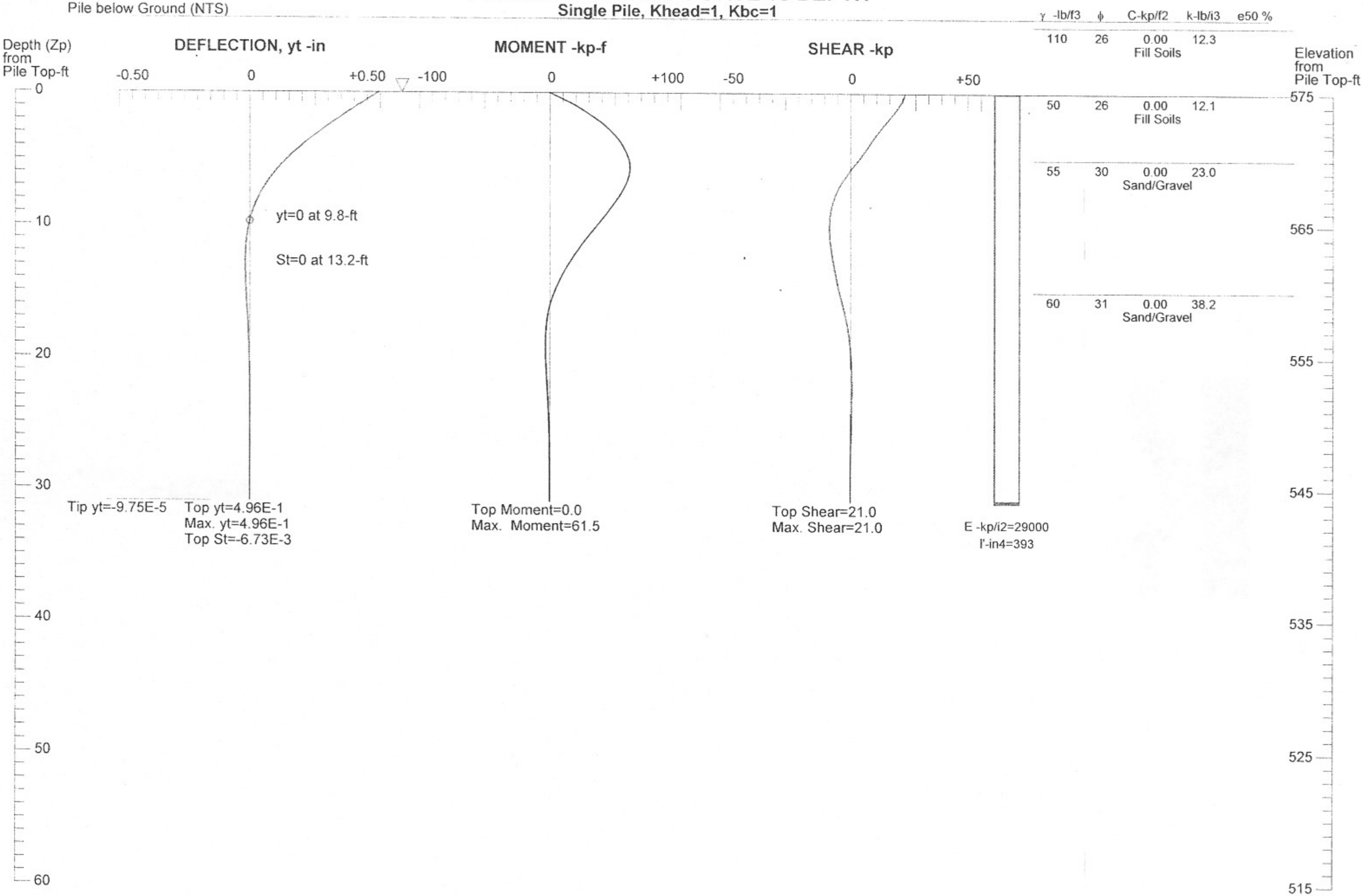
Figure 1



CivilTech Software

Buffalo Canal Side Development - Parking Ramp
HP 12x53 - Top at 575' - Free Head
Figure 2

PILE DEFLECTION & FORCE vs DEPTH

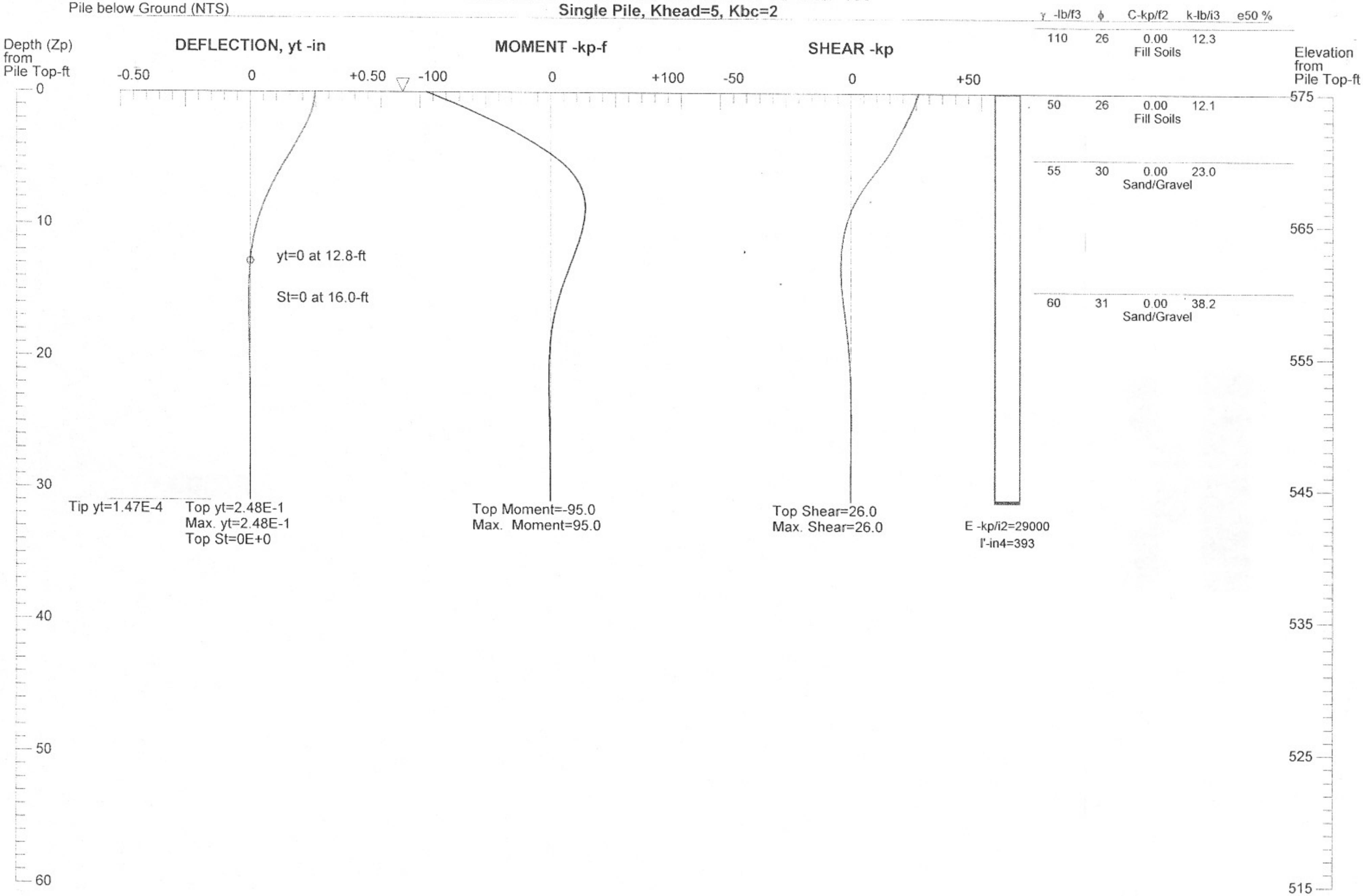


CivilTech Software

Buffalo Canal Side Development - Parking Ramp
HP 12x53 - Top at 575' - Free Head

Figure 2

PILE DEFLECTION & FORCE vs DEPTH



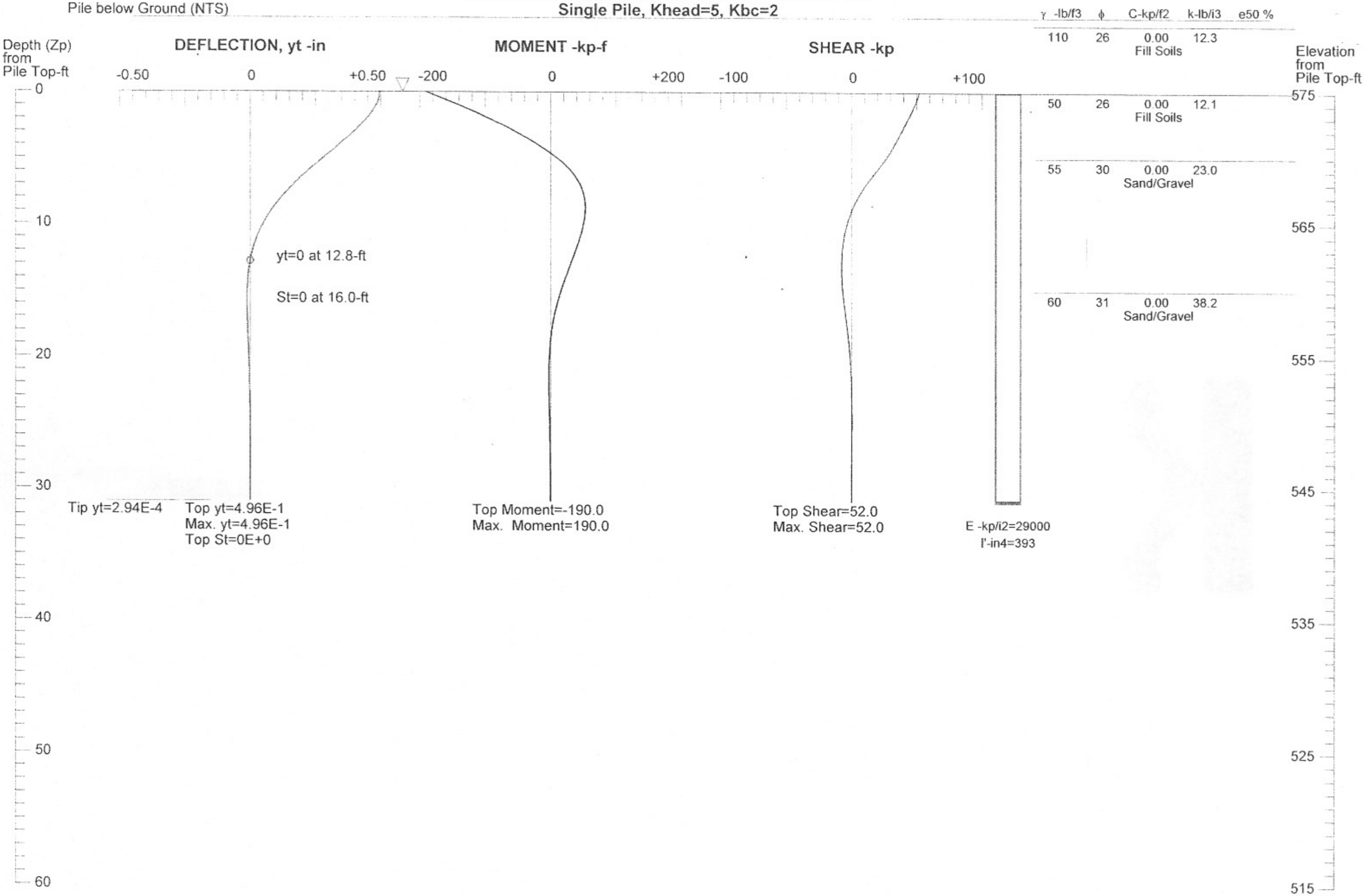
CivilTech Software

Buffalo Canal Side Development - Parking Ramp
HP 12x53 - Top at 575' - Fixed Head

Figure 2

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=5, Kbc=2



CivilTech Software

Buffalo Canal Side Development - Parking Ramp

HP 12x53 - Top at 575' - Fixed Head Figure 2

Pile Deflection Curves
Top of Pile at Elevation 578 feet

FOUNDATION PROFILE & SOIL CONDITIONS

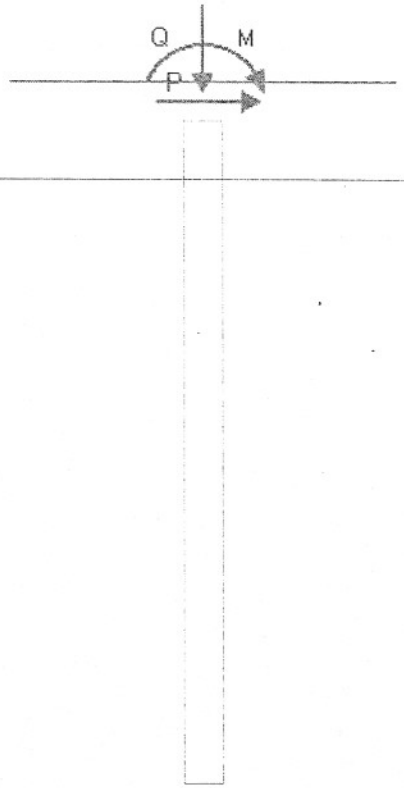
Non-displacement pile: H pile or open-ended pipe. Little soil is displaced. Friction is less than displacement pile. Effective area is used.

FOUNDATION PROPERTIES

Depth	Width-in	A'-in2	Per.-in	I'-in4	E -kp/i2	W -kp/f
0.0	12.0	15.5	47.7	393.0	29000	0.05

Steel (smooth)

Pile bottom depth: 34.0



SOIL PROPERTIES

Depth	γ -lb/f3	ϕ	C-kp/f2	k-lb/i3	e50 %	Nspt
0.0	110	26	0.00	12.3		5
Fill Soils						
5.0	50	26	0.00	12.1		5
Fill Soils						
10.0	55	30	0.00	23.0		8
Sand/Gravel						
20.0	60	31	0.00	38.2		12
Sand/Gravel						
36.0	110	26	500	2956.0	0.03	60
Crystalline limestones						

Depth from Ground-ft: 0, 10, 20, 30, 40, 50, 60

Elevation from Ground-ft: 580, 570, 560, 550, 540, 530, 520

Batter Angle=0 (Pile diameter not to scale) Surface Angle=0

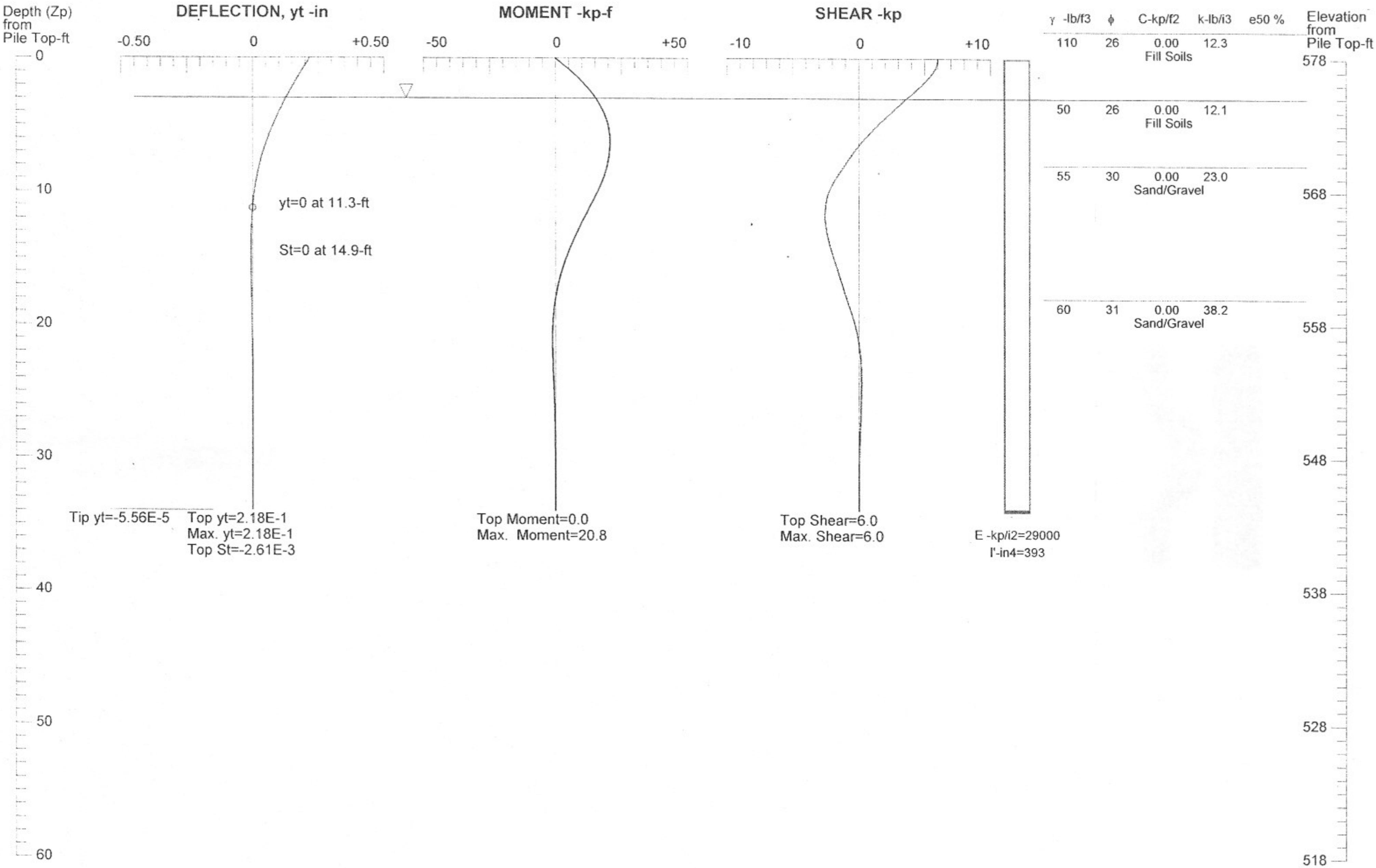
CivilTech Software

Buffalo Canal Side Development - Parking Ramp
HP 12x53 - Top at 578'

Figure 1

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=1, Kbc=1



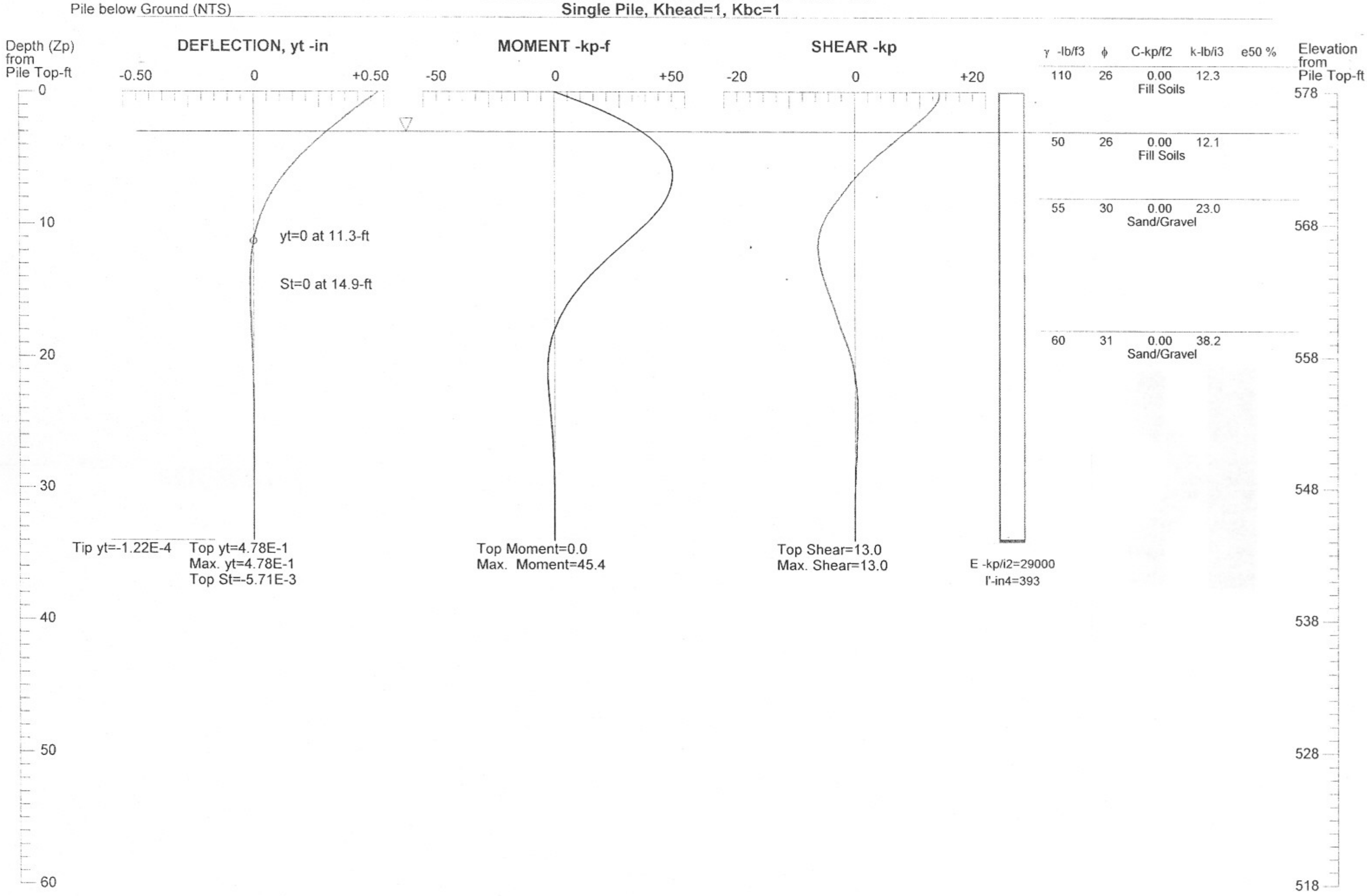
CivilTech Software

Buffalo Canal Side Development - Parking Ramp
HP 12x53 - Top at 578' - Free Head

Figure 2

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=1, Kbc=1

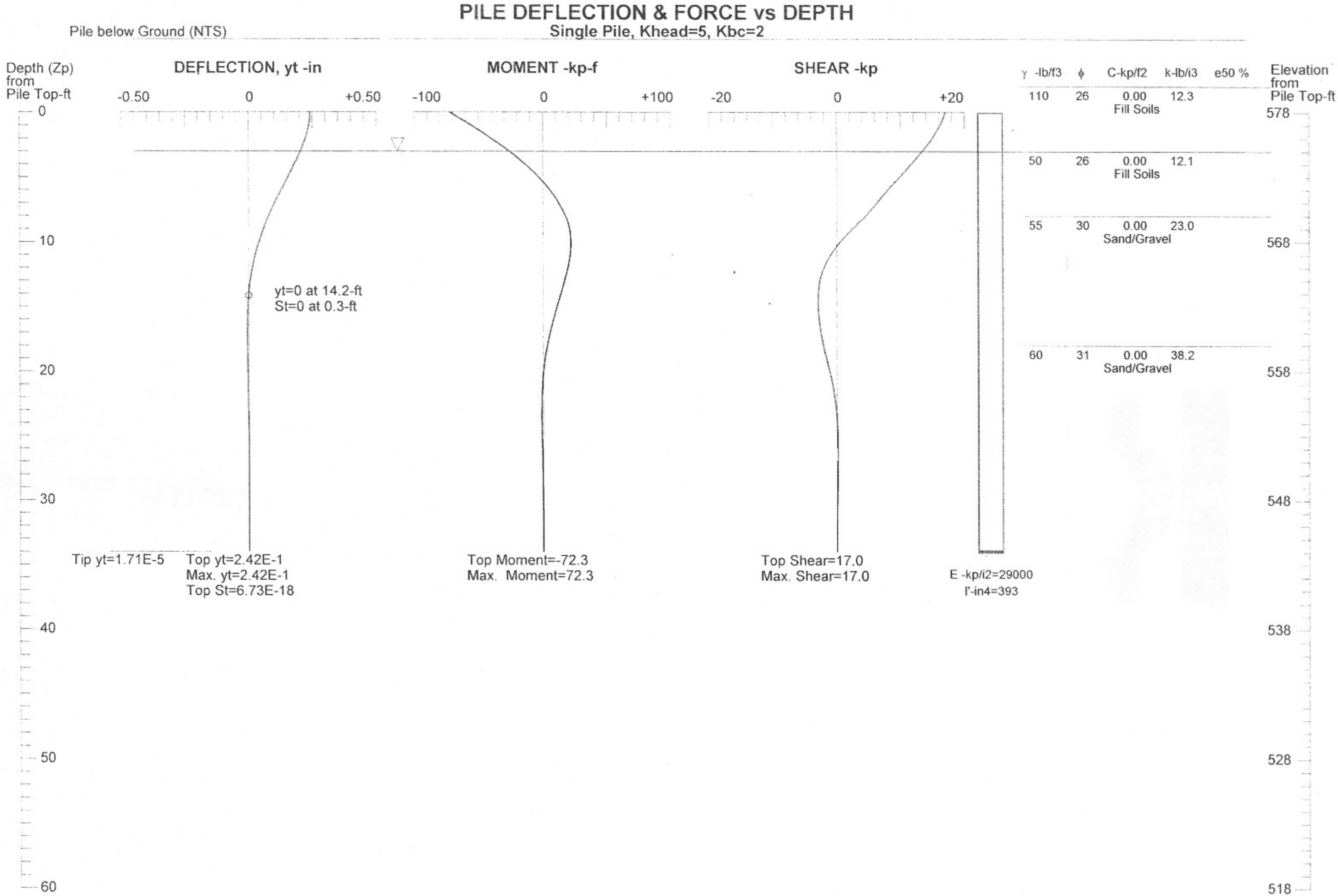


CivilTech Software

Buffalo Canal Side Development - Parking Ramp

HP 12x53 - Top at 578' - Free Head

Figure 2



CivilTech Software

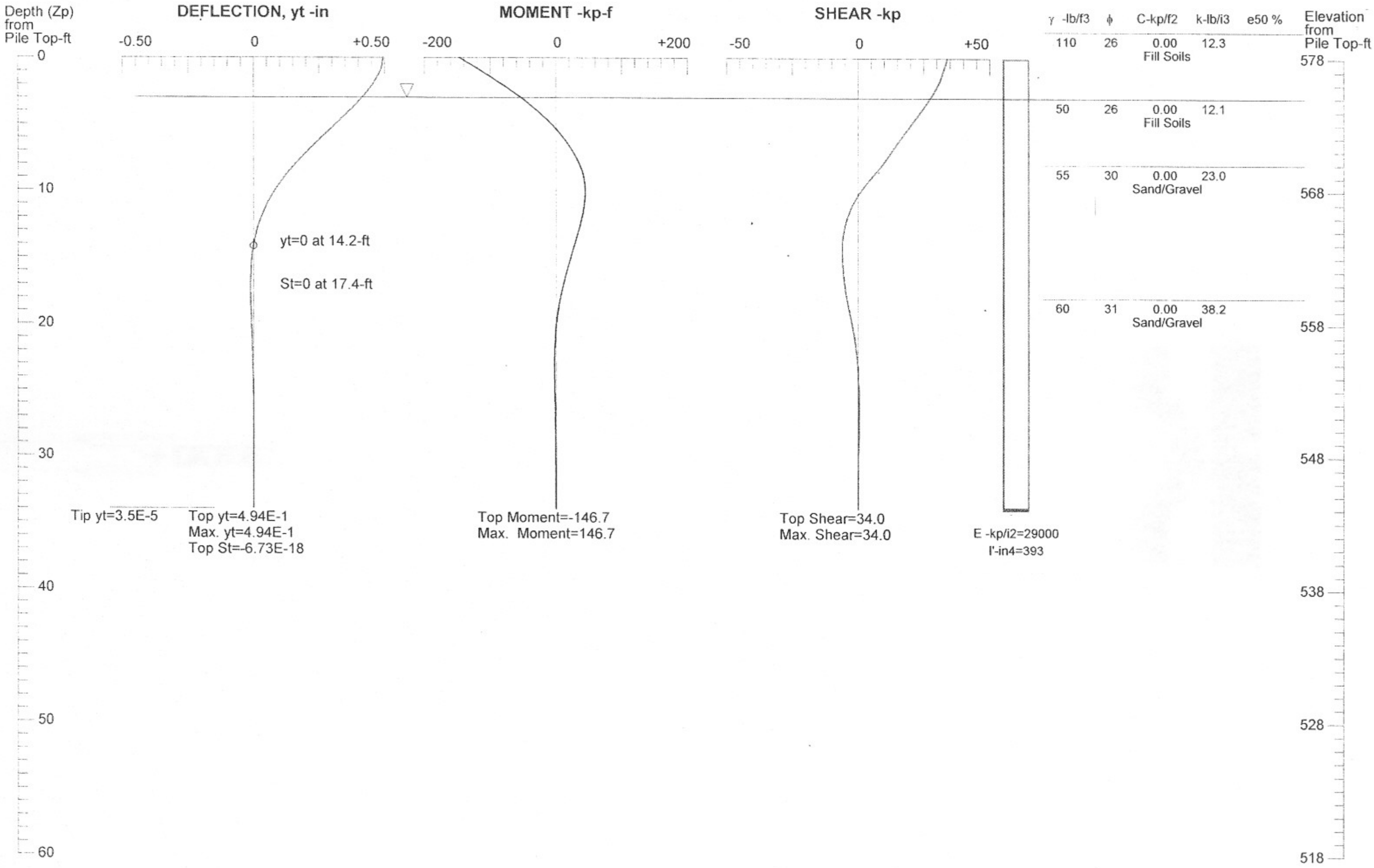
Buffalo Canal Side Development - Parking Ramp
HP 12x53 - Top at 578' - Fixed Head

Figure 2

PILE DEFLECTION & FORCE vs DEPTH

Pile below Ground (NTS)

Single Pile, Khead=5, Kbc=2



CivilTech Software

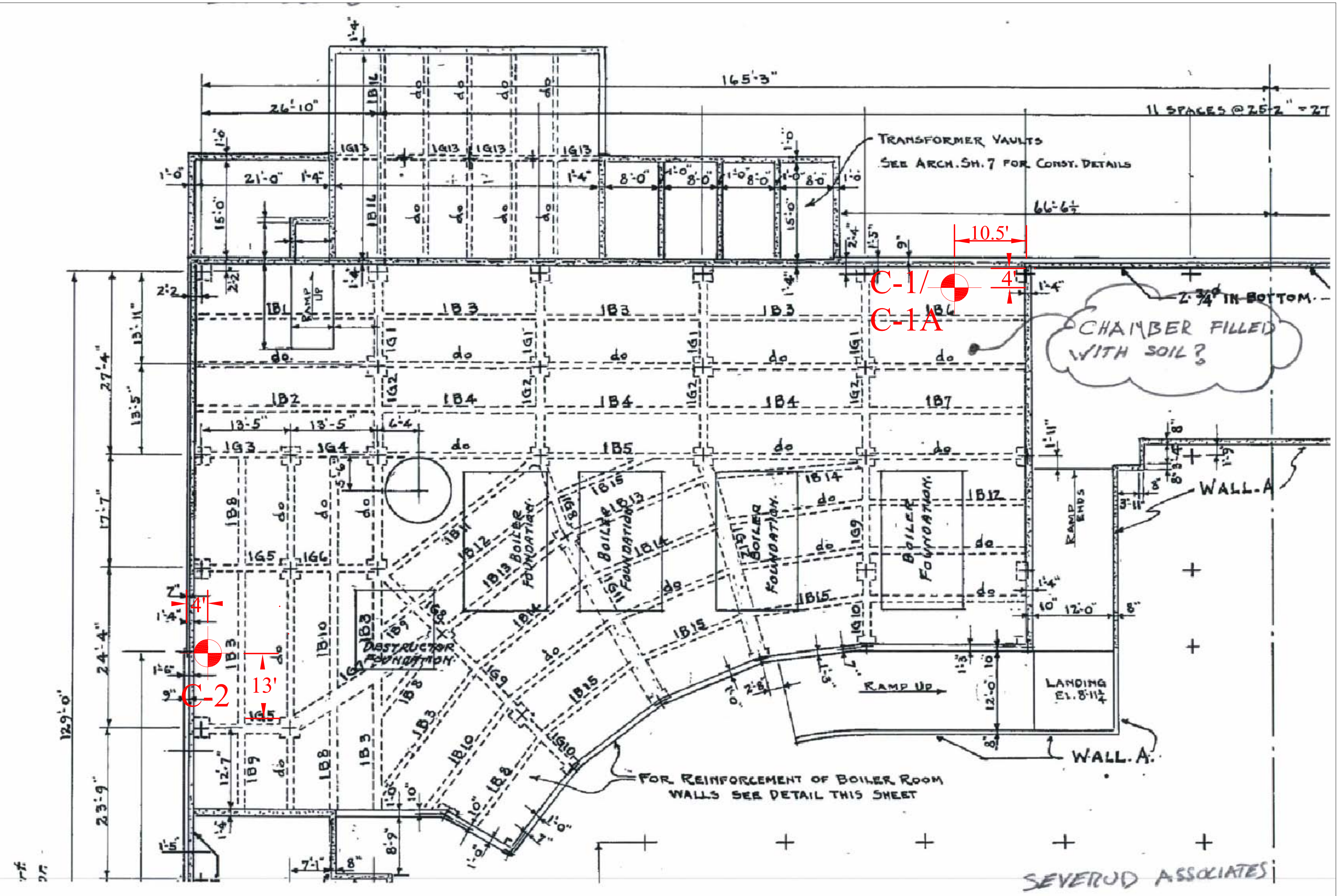
Buffalo Canal Side Development - Parking Ramp

HP 12x53 - Top at 578' - Fixed Head

Figure 2

APPENDIX G

SUB-BASEMENT FLOOR SLAB CORES LOCATIONS AND PHOTOGRAPHS



LEGEND:

C-1 INDICATES APPROXIMATE LOCATION AND DESIGNATION OF SLAB CORE COMPLETED ON AUGUST 27, 2009

EMPIRE GEO SERVICES INC
a subsidiary of SJB Services, Inc.

FORMER BUFFALO MEMORIAL AUDITORIUM SITE
PROPOSED BUFFALO CANAL SIDE DEVELOPMENT
BUFFALO, NEW YORK

SUB-BASEMENT AREA
SLAB CORE LOCATIONS

DR. BY: TJF	SCALE: NTS	PROJ NO.: BE-09-094
CK BY: JJD	DATE: 09/02/09	FIGURE NO.: 1

SEPTEMBER 4, 2009
FILE: BE-09-094

EMPIRE GEO-SERVICES, INC.
5167 SOUTH PARK AVENUE
HAMBURG, NEW YORK 14075


BUFFALO AUDITORIUM SITE
SUB-BASEMENT FLOOR SLAB CORE
CORE C-1
TOP SLAB ←
FILL CONCRETE →

EMPIRE GEO-SERVICES, INC.
5167 SOUTH PARK AVENUE
HAMBURG, NEW YORK 14075

APPENDIX H

FILL MATERIAL AND EARTHWORK RECOMMENDATIONS

APPENDIX H

FILL MATERIAL AND EARTHWORK RECOMMENDATIONS

I. Material Recommendations

A. Structural Fill

Structural Fill should consist of a crusher run stone, which is free of clay, organics and friable or deleterious particles. As a minimum, the Structural Fill material should meet the requirements of New York State Department of Transportation, Standard Specifications, Item 304.12 M – Type 2 Subbase, with the following gradation requirements.

Sieve Size Distribution	Percent Finer by Weight
2 inch	100
¼ inch	25-60
No. 40	5-40
No. 200	0-10

B. Subbase Stone

The subbase stone course placed as the aggregate course beneath slab on grade and construction should conform to the same material requirements as Structural Fill as stated above.

C. Suitable Granular Fill

Suitable soil material, classified as GW, GP, GM, SW, SP and SM soils using the Unified Soil Classification System (ASTM D-2487) and having no more than 85-percent by weight material passing the No. 4 sieve, no more than 20 percent by weight material passing the No. 200 sieve, and which is generally free of particles greater than 6 inches, will be acceptable as Suitable Granular Fill. It should also be free of topsoil, asphalt, concrete rubble, wood, debris, clay and other deleterious materials.

Suitable Granular Fill can be used as foundation backfill and as subgrade fill to raise site grades beneath slab-on-grade construction. Material meeting the requirements of New York State Department of Transportation, Standard Specifications, Item 203.07M – Select Granular Fill is acceptable for use as Suitable Granular Fill.

II. Placement and Compaction Requirements

All controlled fill placed beneath foundations, slab-on-grade construction and beneath utilities should be compacted to a minimum of 95 percent of the maximum dry density as measured by the modified Proctor test (ASTM D1557). Fill placed in non-loaded grass areas can be compacted to a minimum of 90 percent of the maximum dry density (ASTM D1557).

Placement of fill should not exceed a maximum loose lift thickness of 6 to 9 inches with the exception of subbase courses beneath slab on grade and pavement construction, which can be placed in a lift not exceeding 12 inches. The loose lift thickness, however, should be reduced in conjunction with the compaction equipment used so that the required density is attained.

Fill should have a moisture content within two percent of the optimum moisture content prior to compaction. Subgrades should be properly drained and protected from moisture and frost. Placement of fill on frozen subgrades is not acceptable. It is recommended that all fill placement and compaction be monitored and tested by a representative of Empire Geo-Services, Inc.

III. Quality Assurance Testing

The following minimum laboratory and field quality assurance testing frequencies are recommended to confirm fill material quality and post placement and compaction conditions. These minimum frequencies are based on generally uniform material properties and placement conditions. Should material properties vary or conditions at the time of placement vary (i.e. moisture content, placement and compaction, procedures or equipment, etc.) Then additional testing is recommended. Additional testing, which may be necessary, should be determined by qualified geotechnical personnel, based on evaluation of the actual fill material and construction conditions.

A. Laboratory Testing of Material Properties

- Moisture content (ASTM D-2216) - 1 test per 4,000 cubic yards or no less than 2 tests per each material type.
- Grain Size Analysis (ASTM D-422) - 1 test per 4,000 cubic yards or no less than 2 tests per each material type.
- Liquid and Plastic Limits (ASTM D-4318) 1 test per 4,000 cubic yards or no less than 2 tests per each material type. Liquid and Plastic Limit testing is necessary only if appropriate, based on material composition (i.e. clayey or silty soils).

- Modified Proctor Moisture Density Relationship (ASTM D-1557) 1 test per 4000 cubic yards or no less than 1 test per each material type. A maximum/minimum density relationship (ASTM D-4253 and ASTM D-4254) may be an appropriate substitute for ASTM D-1557 depending on material gradation.

B. Field In-Place Moisture/Density Testing (ASTM D-3017 and ASTM D-2922)

- Backfilling along trenches and foundation walls - 1 test per 50 lineal feet per lift.
- Backfilling Isolated Excavations (i.e. column foundations, manholes, etc.) 1 test per lift.
- Filling in open areas for slab-on-grade construction - 1 test per 2500 square feet per lift.

APPENDIX I

GEOTECHNICAL REPORT LIMITATIONS

GEOTECHNICAL REPORT LIMITATIONS

Empire Geo-Services, Inc. (Empire) has endeavored to meet the generally accepted standard of care for the services completed, and in doing so is obliged to advise the geotechnical report user of our report limitations. Empire believes that providing information about the report preparation and limitations is essential to help the user reduce geotechnical-related delays, cost over-runs, and other problems that can develop during the design and construction process. Empire would be pleased to answer any questions regarding the following limitations and use of our report to assist the user in assessing risks and planning for site development and construction.

PROJECT SPECIFIC FACTORS: The conclusions and recommendations provided in our geotechnical report were prepared based on project specific factors described in the report, such as size, loading, and intended use of structures; general configuration of structures, roadways, and parking lots; existing and proposed site grading; and any other pertinent project information. Changes to the project details may alter the factors considered in development of the report conclusions and recommendations. *Accordingly, Empire cannot accept responsibility for problems which may develop if we are not consulted regarding any changes to the project specific factors that were assumed during the report preparation.*

SUBSURFACE CONDITIONS: The site exploration investigated subsurface conditions only at discrete test locations. Empire has used judgement to infer subsurface conditions between the discrete test locations, and on this basis the conclusions and recommendations in our geotechnical report were developed. It should be understood that the overall subsurface conditions inferred by Empire may vary from those revealed during construction, and these variations may impact on the assumptions made in developing the report conclusions and recommendations. *For this reason, Empire should be retained during construction to confirm that conditions are as expected, and to refine our conclusions and recommendations in the event that conditions are encountered that were not disclosed during the site exploration program.*

USE OF GEOTECHNICAL REPORT: Unless indicated otherwise, our geotechnical report has been prepared for the use of our client for specific application to the site and project conditions described in the report. *Without consulting with Empire, our geotechnical report should not be applied by any party to other sites or for any uses other than those originally intended.*

CHANGES IN SITE CONDITIONS: Surface and subsurface conditions are subject to change at a project site subsequent to preparation of the geotechnical report. Changes may include, but are not limited to, floods, earthquakes, groundwater fluctuations, and construction activities at the site and/or adjoining properties. *Empire should be informed of any such changes to determine if additional investigative and/or evaluation work is warranted.*

MISINTERPRETATION OF REPORT: The conclusions and recommendations contained in our geotechnical report are subject to misinterpretation. *To limit this possibility, Empire should review project plans and specifications relative to geotechnical issues to confirm that the recommendations contained in our report have been properly interpreted and applied.*

Subsurface exploration logs and other report data are also subject to misinterpretation by others if they are separated from the geotechnical report. This often occurs when copies of logs are given to contractors during the bid preparation process. *To minimize the potential for misinterpretation, the subsurface logs should not be separated from our geotechnical report and the use of excerpted or incomplete portions of the report should be avoided.*

OTHER LIMITATIONS: Geotechnical engineering is less exact than other design disciplines, as it is based partly on judgement and opinion. For this reason, our geotechnical report may include clauses that identify the limits of Empire's responsibility, or that may describe other limitations specific to a project. These clauses are intended to help all parties recognize their responsibilities and to assist them in assessing risks and decision making. Empire would be pleased to discuss these clauses and to answer any questions that may arise.