Geotechnical Subsurface Investigation

PBCC Project Number: 05275

Palmer Elementary School Annex
5031 N. Kenneth Avenue
Chicago, Illinois 60630

Prepared for:

Public Building Commission of Chicago

Geotechnical Consultant:
GSG Consultants, Inc.

November 20th, 2018

GSG Consultants, Inc.
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November 20th, 2018

Mr. Miguel Fernandez
Public Building Commission of Chicago
50 West Washington Street, Room 200
Chicago, IL 60602

Geotechnical Subsurface Investigation
PBCC Project Number: 05275
Palmer Elementary School Annex
5031 N. Kenneth Avenue
Chicago, Illinois 60630

Dear Mr. Fernandez:

Attached is a copy of the Geotechnical Subsurface Investigation for the above referenced project. The report provides a brief description of the site investigation, site conditions and foundation recommendations. The site investigation included advancing a total of six (6) borings to depths from 15 to 50 feet and two (2) in-situ infiltration tests.

Should you have any questions or require additional information, please call us at 630-994-2600.

Sincerely,

Dawn Edgell.

Matthew J. Chipko, P.E.
Project Engineer

Dawn Edgell, P.E.
Senior Project Engineer

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Geotechnical Subsurface Investigation
Palmer Elementary School Annex
5031 N. Kenneth Avenue
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1.0 INTRODUCTION

The Public Building Commission of Chicago (PBCC) retained GSG Consultants, Inc. (GSG) to perform a subsurface exploration and geotechnical analysis, and provide recommendations for the proposed additions at Palmer Elementary School. The site is located at 5031 N. Kenneth Avenue in Chicago, Illinois **(Site Location Plan – Exhibit 1)**.

1.1 Project Information

Based on plans provided by PBCC, the proposed project will include the construction of a new 2-story, 11 classroom annex linked to the existing school building. PBCC provided preliminary design plans for the new building annex that shows the layout of the proposed improvements. The proposed structure will be connected to the northeast corner of the existing school, where the existing parking lot is currently located. Structural plans of the existing and proposed structure were not provided.

A new parking lot and playground will also be constructed on the site to replace the existing parking and playground equipment that will be impacted by the construction of the new annex. The existing modular units in these areas will be demolished.

1.2 Purpose and Scope of Services

The objective of this study was to explore and characterize the subsurface soil conditions in order to provide recommendations regarding the suitability of the subsurface soil to support the proposed building addition, playground equipment and parking lot at the site. The scope of this study includes the following:

1. Perform site reconnaissance and advance six (6) soil borings to depths ranging from 15 to 50 feet
2. Complete two (2) infiltration tests in accordance with the City of Chicago Stormwater Manual for stormwater management design.
3. Perform the geotechnical laboratory testing program on selected representative soil samples obtained during the field investigation to evaluate relevant engineering parameters of the subsurface soils.

4. Perform engineering analysis and evaluation of the data collected during the field study investigation and laboratory testing.
5. Provide recommendations for foundation and pavement design parameters, and associated construction activities.

2.0 SITE SUBSURFACE EXPLORATION PROGRAM

This section describes the subsurface exploration program and laboratory testing program completed as part of this project.

2.1 Subsurface Exploration Program

The subsurface soil investigation was conducted on November 12th, 2018 and included advancing six (6) soil borings to depths ranging from 15 to 50 feet for the proposed annex, and two (2) in-situ infiltration tests for the proposed parking lot and playground. The proposed soil boring and infiltration test locations were chosen by PBCC, and were offset as necessary due to underground utilities and field conditions. Elevations of the boring locations were determined by GSG using internet resources. The Boring Location Plan attached shows the locations of the soil borings (**Boring Location Plan – Exhibit 2**). **Table 1** presents a list of the boring locations completed.

Table 1 – Summary of Subsurface Exploration Borings

Boring ID	Latitude	Longitude	Depth (feet)	Existing Ground Elevation (feet CCD)
B-1	41.973250° N	-87.738761° W	50	30.1
B-2	41.973389° N	-87.738385° W	50	30.1
B-3	41.973169° N	-87.738372° W	30	30.1
B-4	41.972828° N	-87.738408° W	15	29.1
B-5	41.972069° N	-87.738597° W	15	30.1
B-6	41.972223° N	-87.738994° W	15	30.1

The soil borings were drilled using truck mounted, Mobile B-57 and Geoprobe 7822DT drill rigs equipped with 3 ¼-inch and 2 ¼-inch I.D. hollow stem augers, respectively. GSG performed the field exploration activities using standard penetration test procedures in accordance with ASTM D1586-99, “Penetration Test and Split-barrel Sampling of Soil.” In this procedure, a 2 inch O.D. split-spoon sampler is driven 18 inches into undisturbed soil using a 30 inch drop of a 140-pound hammer. The number of hammer drops (Blow Counts) is recorded at six inch intervals for each sample collected. The number of blows to advance the sampler 12 inches is called the standard penetration test (SPT). The SPT values are shown on the **Soil Boring Logs (Appendix A)**. Representative samples of the cohesive soils were also obtained using a relatively undisturbed Shelby tube in accordance with ASTM D1587, "Standard Practice for Thin-Walled Tube Sampling of Soils".

Representative soil samples were obtained at 2.5-foot intervals to a depth of 15 feet, and 5-foot intervals thereafter through to the termination depths. GSG's field representative visually classified the soils according to the Unified Soil Classification System (ASTM 2487), performed pocket penetrometer on all native cohesive soil samples to estimate their unconfined compressive strength, and obtained relatively undisturbed samples of the subsurface soil for laboratory testing. The results of the pocket penetrometer tests are shown on the boring logs. Representative soil samples were collected from each sample interval, placed in jars and returned to the laboratory for further testing and evaluation. Soil boring holes were back-filled with soil cuttings after the borings were completed and patched with fast-set concrete where applicable.

2.2 Laboratory Testing Program

All samples were inspected in the laboratory to verify the field classifications. A laboratory testing program was undertaken to characterize and determine engineering properties of the subsurface soils.

The following laboratory tests were performed on representative soil samples:

- Moisture Content - ASTM D2216
- Atterberg Limits - ASTM D4318
- Unconfined Compressive Strength – ASTM D 216

The laboratory tests were performed in accordance with test procedures per ASTM requirements. Based on the laboratory test results, the soils encountered were classified according to the United Soil Classification System (USCS). The results of the laboratory testing program are shown on the **Soil Boring Logs (Appendix A)**.

2.3 Subsurface Soil Conditions

The soil boring logs provide specific conditions encountered at each boring location, including detailed soil descriptions, stratifications, penetration resistance, location of the samples, and laboratory test data. The stratification shown on the boring logs represents the conditions only at the actual borings locations, and represents the approximate boundary between subsurface materials; however, the actual transition may be gradual. The general soil descriptions for the attached soil borings are presented below.

Building Annex - Soil Borings B-1 through B-3

At the ground surface, the borings encountered 2 inches of asphalt and 6 to 7 inches of aggregate base course, underlain by black clay to a depth of 2 feet below grade. Under the surficial layers, the borings encountered stiff to hard, brown and gray silty clay to depths of 9 to 9.5 feet and stiff to hard, gray silty clay to the boring termination depths of 30 and 50 feet. Borings B-1 and B-2 were terminated in hard, gray silty clay, while boring B-3 was terminated in very stiff, gray silty clay. The black clay had unconfined compressive strengths ranging from 1.5 to 2.0 tsf. The brown and gray silty clay had unconfined compressive strengths ranging from 1.67 to 3.33 tsf while the gray clay had unconfined compressive strengths ranging from 1.87 to 6.87 tsf.

Parking Lot and Playground - Soil Borings B-4 through B-6

At the ground surface, boring B-4 encountered 4 inches of asphalt, while borings B-5 and B-6 encountered 6 to 8 inches of topsoil. Under the topsoil, boring B-5 encountered 16 inches of black and brown sandy fill. Under the surficial layers, the borings encountered black, brown and gray silty clay to depths of 9 to 15 feet below grade. Underlying the black, brown, and gray silty clay, borings B-4 and B-6 encountered stiff to very stiff, gray silty clay to the boring termination depth of 15 feet while boring B-5 was terminated in stiff brown and gray silty clay. Boring B-6 also noted a layer of soft, brown and gray silty clay from a depth of 4 feet to 6 feet below grade, with an unconfined compressive strength of 0.42 tsf. The black, brown, and gray silty clay had unconfined compressive strengths ranging from 0.42 to 4.0 tsf and the gray silty clay had unconfined compressive strengths ranging from 1.04 to 2.5 tsf.

2.4 Groundwater Conditions

Water level measurements were made at each location when evidence of free groundwater was detected on the drill rods or in the samples. The boreholes were also checked for free water immediately after auger removal and before filling the open boreholes with soil cuttings. Water was not encountered while drilling in any of the borings. No water was encountered immediately after the completion of drilling in any of the borings.

Based on the color change of the material from brown to gray, it is assumed the long-term water table is approximately 9 to 9.5 feet below grade which should be used for design. Long term observations in cased borings or piezometers would be necessary to more accurately evaluate groundwater conditions at the site. However, it should be noted that fluctuations in groundwater level may occur due to variations in rainfall, other climatic conditions, or other factors not evident at the time measurements were made and reported herein.

2.5 Infiltration Parameters

GSG conducted single-ring infiltrometer testing to measure the in-situ infiltration rate of the soils below the existing court yard around the modular buildings. The infiltration testing locations were performed in the vicinity of boring B-6 as shown on the **Boring Location Plan – Exhibit 2**. **Table 2** provides a summary of the soil types observed at each test location, the depth of the infiltration tests, and measured field permeability results for each location. It should be noted that the test immediately adjacent to boring B-6 could not be completed, however, the soil types encountered at the base of that test location were consistent with those encountered in test location 2 and the soil borings.

Table 2: Infiltration Test Summary

Infiltration Test #	Boring	Depth Below Existing Grade (feet)	Soil Type Tested	Permeability (in/hr)
IW-1	B-6	1.5	Brown Silty Clay	n/a
IW-2	B-6	1.5	Brown Silty Clay	0.0

GSG assessed the infiltration rates based on the soils encountered at each test location for the subgrade soils and recommend an infiltration rate of 0.00 inches per hour be used for design within the silty clay soils.

Based on the presence of predominantly silty clay across the entire site, minimal infiltration of storm water may be anticipated within the upper soils. For the soils 1.5 feet below the ground surface, infiltration rates were less than the minimum permeability rate of 0.5 inches per hour required by the City of Chicago Stormwater Manual for infiltration best management practices (BMPs) eligibility. Surface and are therefore not eligible for implementation of BMPs. Surface and subsurface drainage of the artificial turf should be provided to prevent standing water from developing on the surface or within the base course. Standing water could cause softening of the subgrade and deterioration of the pavement. GSG recommends the subgrade should be prepared in accordance with the Construction Considerations section of this report.

3.0 GEOTECHNICAL ANALYSES AND RECOMMENDATIONS

This section provides GSG's geotechnical analysis and recommendations for the design of the proposed project based on the results of the field exploration and laboratory testing. Based on information provided by PBCC, the proposed building addition will consist of a two-story structure with no basement. The addition will be located on the northeast end of the existing school. Interior and exterior column loads were provided to GSG and are anticipated to be a maximum of 261 and 205 kips, respectively. These loads are only the column loadings from the second floor and roof, and do not include any wall foundation loads.

Based on the subsurface conditions encountered and the design information provided by the structural engineer, it is recommended that the proposed addition be supported on shallow spread footings bearing on native soils. Recommendations for shallow spread footings are presented below.

3.1 Shallow Foundations

Based on the results of the subsurface investigation and the design information provided, the proposed building addition could be supported upon conventional shallow spread and continuous footing foundation system, bearing on the native stiff to very stiff silty clay encountered below the surficial materials or new engineered fill. The shallow foundations should be designed for net allowable bearing capacity of 3,000 psf. The minimum depth of the foundation bearing grade should be 3.5 feet below the final exterior grade to alleviate the effects of frost.

The above bearing capacity is based on an allowable total settlement less than one inch and an allowable differential settlement of approximately ½ inch. If any of the assumptions or design loading information above is not correct or has been changed, GSG should be contacted to re-evaluate the foundation design recommendations.

Spread footings should have a minimum plan dimension of 4 feet and should be at least 12 inches thick. Continuous footings should have a minimum width of 2 feet and should be at least 10 inches thick. The actual footing thickness and reinforcement should be determined by a structural analysis of the individual footings with chosen plan dimensions.

For construction of proposed foundations adjacent to existing building foundations, it is recommended that the proposed footing be offset laterally, away from the existing footing, such that a 45-degree line extending down from the proposed footing will not intersect with the existing foundations. The existing and proposed footings should be spaced a minimum of 1 footing width apart. The existing footings should be reviewed for any other lateral loads by a structural engineer.

If the native clay soils at the base of the excavation become disturbed, the exposed subgrade should be compacted prior to placing structural fill. The lateral limit of engineered structural fill placed beneath the footing should extend a minimum 1 foot beyond the outside edges of the footing and from that point outward laterally 1 foot for every 2 feet of fill thickness below the footing. The granular structural fill should be placed and compacted in accordance with the Construction Considerations Section 4.0 of this report.

3.2 Lateral Load Resistance for Shallow Foundations

Resistance to lateral loads can be provided by a combination of friction at the foundation base and slab-on-grade, and by passive resistance acting against the vertical faces of foundation elements. A coefficient of friction of 0.35 may be used for footings. For the floor slab, a coefficient of friction of 0.35 may be used between the floor slab and subgrade. For passive resistance, an equivalent fluid pressure of 275 pounds per cubic foot (pcf) acting against the footing may be used. Passive resistance in the upper one foot of soil should be neglected unless the area is covered by concrete or pavement. The friction and passive resistance may be used concurrently provided the passive resistance is reduced by 50%.

3.3 Floor Slab and Pavement Area Recommendations

3.3.1 Slab-on-Grade Design

Floor slab-on-grade should be structurally independent of the rest of the foundation system and should be designed based on the anticipated use and loading. Concrete floor slabs should be supported on a layer of compacted granular fill consisting of a minimum of 8 inches of CA-6 stone placed upon a minimum of 4 inches of free draining stone such as IDOT CA-7. The free draining stone will act as a capillary cutoff layer and may reduce the potential for soil moisture migrating upwards toward the slab, and thus will provide drainage and minimize dampness in the floor slab.

Where the existing soils are to remain in place, they should be over excavated and additional 12 inches below the bottom of the proposed floor slab subbase. The over excavation should be backfilled with CA-6 gradation crushed stone. The fill materials present at the exposed subgrade level should be evaluated during construction, and any unsuitable material should be removed in accordance with the Construction Considerations section of this report. Prior to the placement of any granular fill, the subgrade should also be prepared in accordance with the procedures outlined in the Construction Considerations section of this report.

The slab-on-grade should be designed using a coefficient of vertical subgrade reaction (modulus of subgrade reaction) of 100 pounds per cubic inch (pci) based on Terzaghi's recommended values, which are based on a 1 foot by 1 foot square plate resting granular on medium dense sand soils. The above value is based on the slab being supported upon structural fill materials.

3.3.2 Parking Lot Design

For any paved areas where vehicular traffic will be light to moderate, GSG recommends supporting the pavement on a minimum 8 inches of granular fill consistent with IDOT CA-6 gradation. The pavement for the parking lot could be designed using the Illinois Department of Transportation's pavement design procedures using an assumed CBR/IBR value of 3. It is recommended that the minimum pavement section should consist of 1.5 inches of bituminous surface course and 2.0 inches of binder course.

For pavement areas that may experience heavier loads, such as those from buses, delivery trucks, or garbage trucks, it is recommended that the minimum pavement section should consist of 2.5-inches of surface course and 3.5-inches of binder course over 12-inches of granular base course. As an alternative, the pavement section may consist of a 6-inch layer of concrete, reinforced with welded wire fabric, over a 6-inch lift of granular base course.

Based on the proposed grading for the parking areas, existing soils are anticipated to be left in place below the proposed new pavements. Additional observation and testing of the native materials will be necessary. Any significant organic materials should be removed and replaced with new engineered fill. The remaining native materials should be evaluated during construction according to the recommendations provided in Section 4.1 Site and Subgrade Preparation.

Prior to placing any base course stone, the subgrade soil should first be prepared in accordance with the Construction Considerations section of this report. Granular backfill should be placed in 8-inch maximum thickness lifts, and should be compacted with the use of a vibratory smooth drum compactor to 95% of the material's standard dry density (ASTM D-698) and finally proof rolled.

Based on the existing soil conditions consisting predominantly of low permeable clay soils, and the results of the in-situ infiltration tests, little to no infiltration of stormwater is anticipated. Therefore, surface and subsurface drainage of the pavement section should be provided to prevent standing water from developing on the pavement or within the base course. Standing water will cause softening of the subgrade and deterioration of the pavement. The subgrade should be prepared in accordance with the Construction Considerations section of this report.

4.0 CONSTRUCTION CONSIDERATIONS

4.1 Site and Subgrade Preparation

GSG recommends removing all existing pavements, concrete, vegetation, trees, topsoil, root mats, and any soft or unsuitable/deleterious materials from the proposed building addition and parking lot areas. It is anticipated that the existing modular units will be demolished for the new parking lot and playground. Any existing foundations should be removed where they will interfere with new construction and backfilled with new structural fill. After any unsuitable material is removed from the site, the exposed subgrade soils should be evaluated, and any unsuitable/deleterious material should be removed.

It is recommended that any underground utility lines that will be impacted by the proposed building footprint should also be completely removed from beneath the proposed structures. Existing utility lines that are to be abandoned should be removed to the property line and should be plugged with a minimum of 2 feet of cement grout. All excavations resulting from foundation and underground utilities removal activities should be cleaned of loose and disturbed materials, including all previously-placed backfill, and backfilled with suitable fill materials.

Suitable structural fill materials shall be of a nature that will compact and develop stability satisfactory to the geotechnical engineer. It is recommended that structural fill generally consist of crushed limestone or recycled concrete consistent with IDOT CA-6 gradation. Materials to be used as structural fill shall be inorganic, free of waste and debris, and shall not contain frozen material or any material which, by decay or otherwise, might cause settlement. Structural fill shall be placed in lifts not to exceed 8 inches in loose thickness, and should be compacted to a minimum of 95% of the material's modified proctor maximum dry density obtained according to the ASTM D1557 method.

No foundation concrete or structural fill should be placed upon wet or frozen subgrade soils. Rainfall and runoff can soften soils and affect the load bearing capacity of the soils. All water entering the foundation excavation should be removed prior to placement backfill materials above the footings.

4.2 Site Excavations

If water seepage occurs during footing excavation or where wet conditions are encountered such that the water cannot be removed with conventional sumping, GSG recommends placing open grade stone similar to IDOT CA-7 to stabilize the bottom of the excavation. The CA-7 stone should be placed in 12-inch lifts to 12 inches above the water table, and should be compacted with the use of a heavy smooth drum roller or heavy vibratory plate compactor until stable. The remaining portion of the excavation beneath the footings should be backfilled using approved structural fill consisting of granular materials such as IDOT CA-6.

All excavations should be conducted in accordance with applicable federal, state, and local safety regulations, including, but not limited to the Occupational Safety and Health Administration (OSHA) excavation safety standards – Standard 29CFR, Part 1926, Subpart P. For this site, the previously disturbed stiff to very stiff silty clay is classified as OSHA Type A soil and can have a maximum excavation slope of 3/4H:1V. Excavations into granular backfill materials may be completed based on OSHA Type B soils. Excavations near existing structures and underground utilities should be performed with extreme care to avoid undermining existing structures. Any excavations adjacent to existing structures (i.e. existing foundations) should be sloped away from the existing structures in accordance with the OSHA type soil requirements to prevent sloughing of existing soils and undermining the foundations. Excavations should not extend immediately below the adjacent existing foundations unless underpinning or other support is installed. The contractor will be responsible to provide a safe excavation during the construction activities of the project.

4.3 Approved Fill Material and Placement

Reuse of onsite native materials can be considered provided the materials meet the following soil properties. These on-site soils are not considered expansive. A shrinkage factor of 15% should be used for earthwork calculations.

Suitable structural fill should have the following soil properties:

1. A maximum dry density greater than 100 pounds per cubic foot (pcf) when determined in accordance with ASTM D1557, Modified Proctor.
2. Shall not contain organic material in excess of 3% when tested in accordance with ASTM D2974.
3. Suitable fine-gained soils include materials that comply with ASTM D 2487 soil classification group CL.
4. Suitable coarse-grained soils include materials that comply with ASTM-D2487 soil classification groups GW, GP, GM, SW, SP and SC.

5. Should not contain deleterious material, should be within ±4% of optimum moisture content, and have a maximum particle size of three inches.
6. Shall consist of a locally available material.

Suitable structural fill materials shall be of a nature that will compact and develop stability satisfactory to the geotechnical engineer. Structural fill is recommended beneath buildings and other similar structures or equipment sensitive to settlement. It is recommended that structural fill generally consist of crushed limestone or recycled concrete consistent with IDOT CA-6 gradation. Materials to be used as structural fill shall be inorganic, free of waste and debris, and shall not contain frozen material or any material which, by decay or otherwise, might cause settlement. Structural fill shall be placed in lifts not to exceed 8 inches in loose thickness, and should be compacted to a minimum of 95% of the material's modified proctor maximum dry density obtained according to the ASTM D1557 method.

Although undercuts and backfilling are not anticipated, any excavations may be backfilled with open graded stone consistent with IDOT CA-1 gradation, to a depth 12 to 18 inches below the proposed footings. CA-1 shall be placed in lifts not to exceed 12 inches in loose thickness, and compacted with excavation equipment. The remaining 12 to 18 inches below the base of the footings may be backfilled with crushed stone consistent with IDOT gradation CA-6 or CA-7, compacted to a minimum of 95% of the material's modified proctor maximum dry density obtained according to the ASTM D1557 method. **Figure 1** illustrates the structural fill placement below the footings.

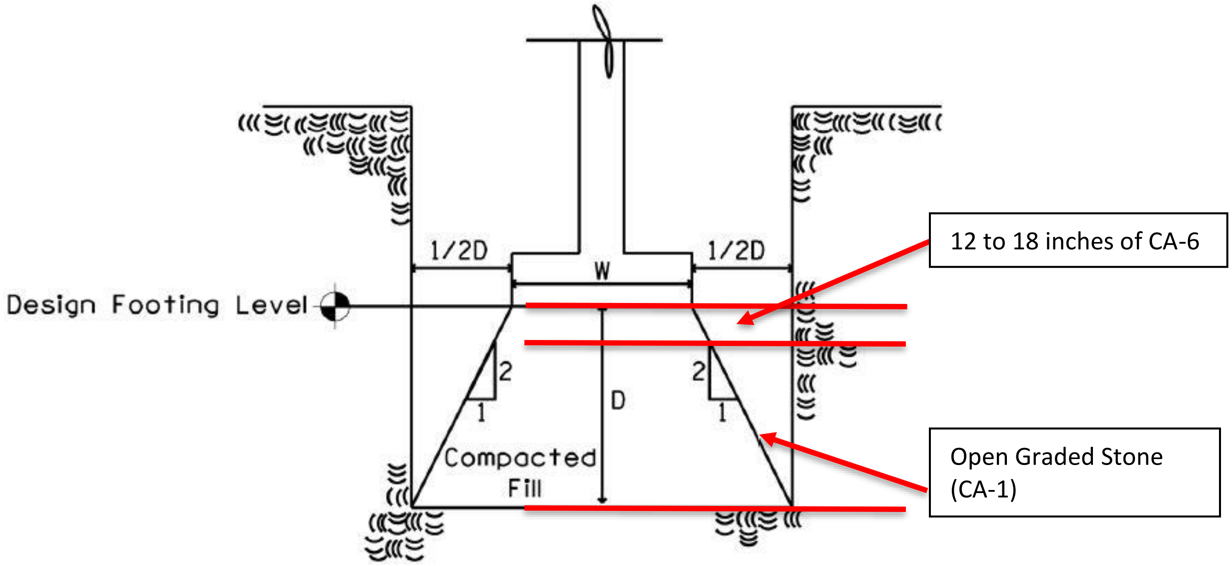


Figure 1: Structural Fill Placement Below Footing

Materials unsatisfactory for use as a structural include soils classified as silt or organic silt (ML, MH, PT, OL, and OH) in the Unified Classification System (ASTM D2847). Soils with these classifications may be used for general purpose landscaping or in areas where fill will not support structures and uncontrolled settlement is acceptable. Topsoil material shall be relatively free from large roots, sticks, weeds, brush, stones larger than 1 inch in diameter, and other litter or waste products. It shall be a loamy mixture having at least 90% passing the no. 10 sieve.

Frozen materials should not be used and fill materials should not be placed on frozen subgrade. If fill is to be placed during cool, wet seasons, the use of granular fill may be necessary since weather conditions will make compaction of cohesive soils more difficult.

5.0 LIMITATIONS

GSG has prepared this report in accordance with generally accepted geotechnical engineering practices to aid in the evaluation of the site subsurface soils. No other warranty, expressed or implied, is made. The scope of this report is limited to the specific project and location described herein, and our description of this project represents our understanding of the project. The geotechnical engineering analysis presented herein was developed based on the information obtained during the subsurface investigation. It should be noted that the borehole data reflects the subsurface conditions only at the specific locations at the particular time designated on the logs, and that soil and groundwater conditions could vary widely throughout the site. The nature and extent of any variation in the borings may not become evident until subsurface exposure, during construction activities. If variations do appear, it may become necessary to re-evaluate the recommendations of this report. It is recommended that all field construction activities be inspected by GSG's geotechnical engineer to verify the type and strength of soil materials present at the site and their conformance with the geotechnical recommendations in this report.

EXHIBITS

SITE PLAN
BORING LOCATION MAP

GSG CONSULTANTS, INC.
623 Cooper Court • Schaumburg, IL 60173
Tel: 630.994.2600 • Fax: 312.733.5612

DRAWN BY:	MC
CHECKED BY:	DE
DATE:	11/19/2018
SCALE:	AS NOTED

EXHIBIT 1 SITE LOCATION MAP
PALMER ELEMENTARY SCHOOL ANNEX
5031 N. KENNETH AVENUE
CHICAGO, ILLINOIS 60630

GSG CONSULTANTS, INC.
ENGINEERS • SCIENTISTS • CONSTRUCTION MANAGERS
623 Cooper Court • Schaumburg, IL 60173
Tel: 630.994.2600 • Fax: 312.733.5612

DRAWN BY:	MC
CHECKED BY:	DE
DATE:	11/19/2018
SCALE:	N.T.S.

CITY OF CHICAGO INCORPORATED 4th MARCH 1837

EXHIBIT 2 BORING LOCATION PLAN
PALMER ELEMENTARY SCHOOL ANNEX
5031 N. KENNETH AVENUE
CHICAGO, ILLINOIS 60630

APPENDIX A

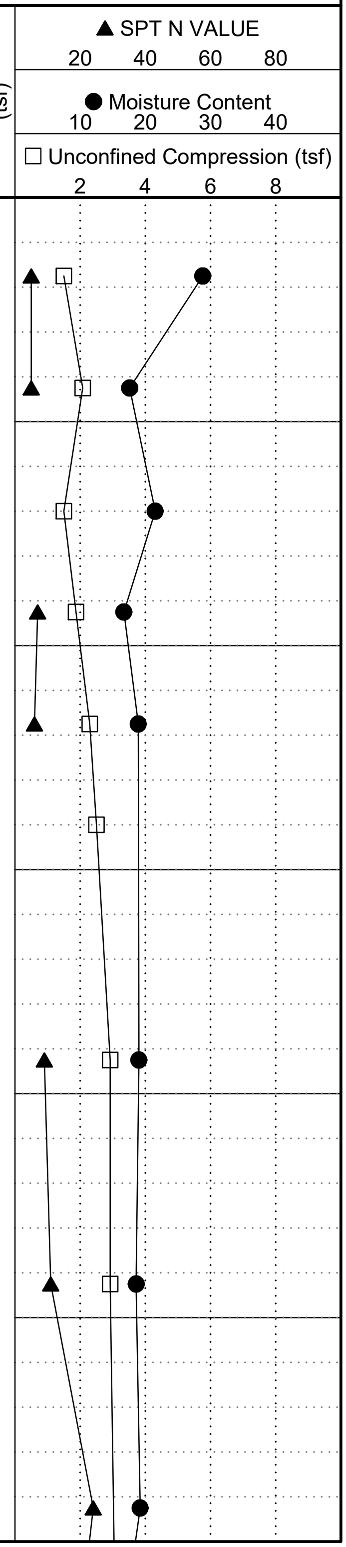
SOIL BORING LOGS

GSG CONSULTANTS
623 COOPER COURT
SCHAUMBURG IL/60173
Telephone: 630.994.2600

BORING NUMBER B-1

CLIENT Public Building Commission of Chicago
PROJECT NAME Palmer Elementary School Annex
PROJECT NUMBER 05275
PROJECT LOCATION 5031 N Kenneth Ave
DATE STARTED 11/12/18 **COMPLETED** 11/12/18
GROUND ELEVATION 30.10 ft CCD **HOLE SIZE** 3 1/4
DRILLING CONTRACTOR GSG Drilling
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING --- N/A
LOGGED BY TK **CHECKED BY** MC
AT END OF DRILLING --- N/A
NOTES Elevations determined from Google Earth
AFTER DRILLING --- N/A

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	UNCONFINED COMPRESSION (tsf)
0	2 inches of Asphalt				
	CLAY (CL) - Black - Stiff - Very Moist				
	SILTY CLAY, trace gravel (CL/ML) - Brown and Gray - Stiff to Very Stiff - Moist	SS	39	2-2-3 (5)	1.5
5		SS	44	2-3-2 (5)	2.08
		ST	79		1.50
10	SILTY CLAY, trace gravel (CL/ML) - Gray - Stiff to Very Stiff - Moist	SS	78	3-3-4 (7)	1.87
		SS	72	3-3-3 (6)	2.29
15		ST	83		2.5
20		SS	100	3-4-5 (9)	2.92
25		SS	100	4-4-7 (11)	2.92
30	Noted: cobbles at 28.5 ft	SS	6	9-14-10 (24)	



(Continued Next Page)

GSG CONSULTANTS
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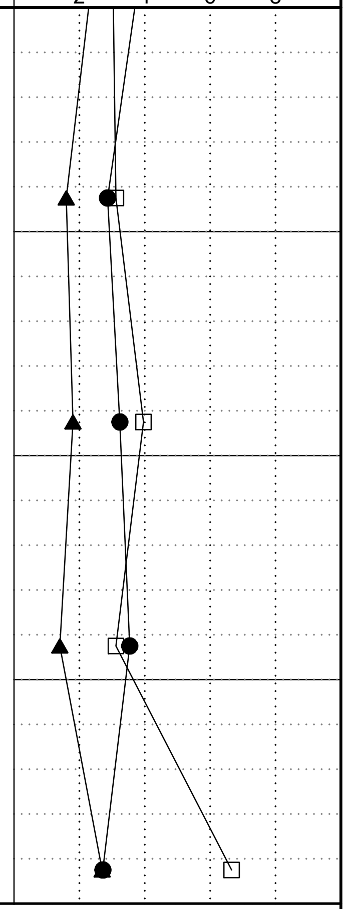
Telephone: 630.994.2600

BORING NUMBER B-1

CLIENT Public Building Commission of Chicago
PROJECT NAME Palmer Elementary School Annex
PROJECT NUMBER 05275
PROJECT LOCATION 5031 N Kenneth Ave

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	UNCONFINED COMPRESSION (tsf)
30		SILTY CLAY, trace gravel (CL/ML) - Gray - Stiff to Very Stiff - Moist *(continued)*				
35			SS	67	4-7-9 (16)	3.12
40			SS	94	4-7-11 (18)	3.96
45			SS	100	3-6-8 (14)	3.12
50		SILTY CLAY, trace gravel (CL/ML) - Gray - Hard - Moist	SS	100	7-11-16 (27)	6.66

▲ SPT N VALUE: 20 40 60 80
● Moisture Content: 10 20 30 40
□ Unconfined Compression (tsf): 2 4 6 8



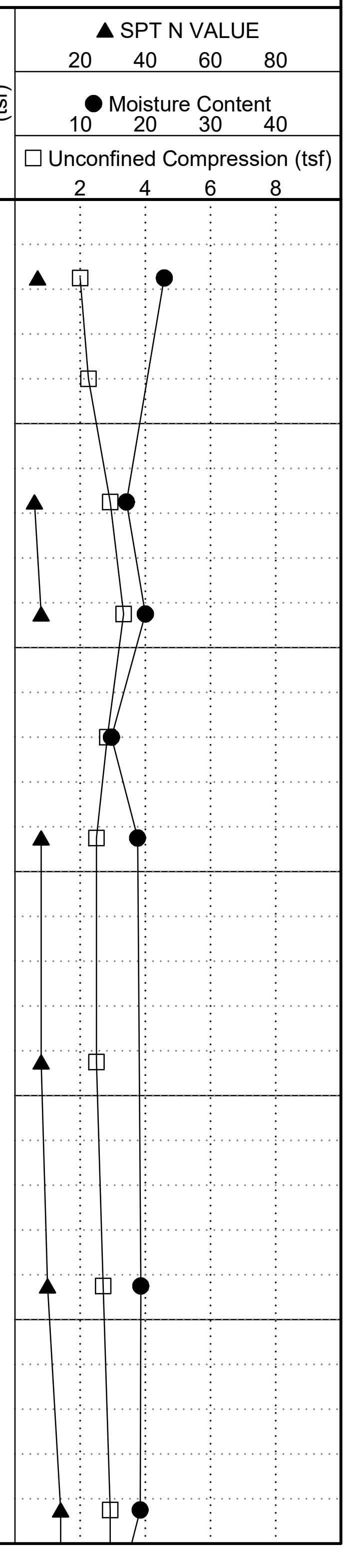
Bottom of borehole at 50.0 feet.

GSG CONSULTANTS
623 COOPER COURT
SCHAUMBURG IL/60173
Telephone: 630.994.2600

BORING NUMBER B-2

CLIENT Public Building Commission of Chicago
PROJECT NAME Palmer Elementary School Annex
PROJECT NUMBER 05275
PROJECT LOCATION 5031 N Kenneth Ave
DATE STARTED 11/12/18 **COMPLETED** 11/12/18
GROUND ELEVATION 30.10 ft CCD **HOLE SIZE** 3 1/4
DRILLING CONTRACTOR GSG Drilling
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING --- N/A
LOGGED BY TK **CHECKED BY** MC
AT END OF DRILLING --- N/A
NOTES Elevations determined from Google Earth
AFTER DRILLING --- N/A

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	UNCONFINED COMPRESSION (tsf)
0	2 inches of Asphalt				
	6 inches of Aggregate Subbase				
	CLAY (CL) - Black - Very Stiff - Moist	SS	44	3-3-4 (7)	2.0
	SILTY CLAY, trace gravel (CL/ML) - Brown and Gray - Very Stiff - Moist	ST	92		2.25
5		SS	78	3-3-3 (6)	2.92
		SS	83	3-4-4 (8)	3.33
10	SILTY CLAY, trace gravel (CL/ML) - Gray - Very Stiff - Moist	ST	92		2.83
		SS	94	3-4-4 (8)	2.50
15					
20		SS	100	2-3-5 (8)	2.50
25		SS	100	2-4-6 (10)	2.71
30		SS	100	4-6-8 (14)	2.92



(Continued Next Page)

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SCHAUMBURG IL/60173
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BORING NUMBER B-2

CLIENT Public Building Commission of Chicago

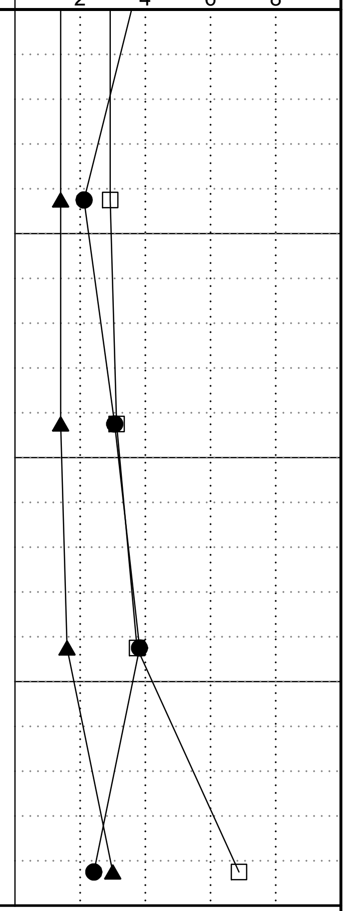
PROJECT NAME Palmer Elementary School Annex

PROJECT NUMBER 05275

PROJECT LOCATION 5031 N Kenneth Ave

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	UNCONFINED COMPRESSION (tsf)
30		SILTY CLAY, trace gravel (CL/ML) - Gray - Very Stiff - Moist *(continued)*				
35			SS	83	5-6-8 (14)	2.92
40			SS	100	3-6-8 (14)	3.12
45			SS	56	7-8-8 (16)	3.75
50		SILTY CLAY, trace gravel (CL/ML) - Gray - Hard - Moist	SS	83	10-13-17 (30)	6.87

▲ SPT N VALUE: 20 40 60 80
● Moisture Content: 10 20 30 40
□ Unconfined Compression (tsf): 2 4 6 8



Bottom of borehole at 50.0 feet.

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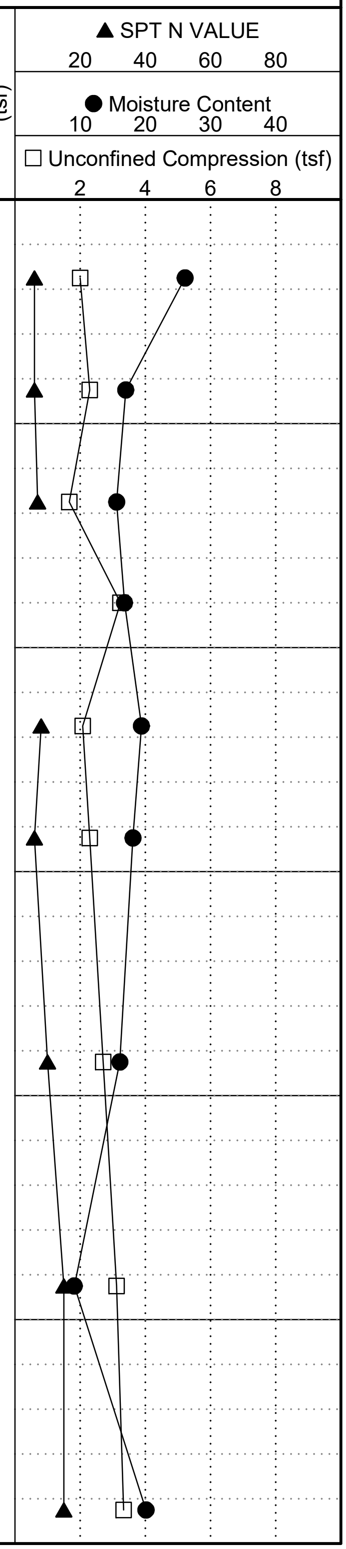
BORING NUMBER B-3

CLIENT Public Building Commission of Chicago
PROJECT NAME Palmer Elementary School Annex
PROJECT NUMBER 05275
PROJECT LOCATION 5031 N Kenneth Ave
DATE STARTED 11/12/18 **COMPLETED** 11/12/18
GROUND ELEVATION 30.10 ft CCD **HOLE SIZE** 3 1/4
DRILLING CONTRACTOR GSG Drilling
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING --- N/A
LOGGED BY TK **CHECKED BY** MC
AT END OF DRILLING --- N/A
NOTES Elevations determined from Google Earth
AFTER DRILLING --- N/A

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	UNCONFINED COMPRESSION (tsf)
0	2 inches of Asphalt 7 inches of Aggregate Subbase CLAY (CL) - Black - Very Stiff - Very Moist	SS	28	4-3-3 (6)	2.0
	SILTY CLAY, trace gravel (CL/ML) - Brown and Gray - Stiff to Very Stiff - Moist	SS	67	3-3-3 (6)	2.29
5		SS	61	2-3-4 (7)	1.67
		ST	50		3.24
10	SILTY CLAY, trace gravel (CL/ML) - Gray - Very Stiff - Moist	SS	78	3-4-4 (8)	2.08
		SS	67	3-3-3 (6)	2.29
15					
20		SS	100	2-4-6 (10)	2.71
25		SS	67	6-7-8 (15)	3.12
30		SS	83	4-6-9 (15)	3.33



Bottom of borehole at 30.0 feet.

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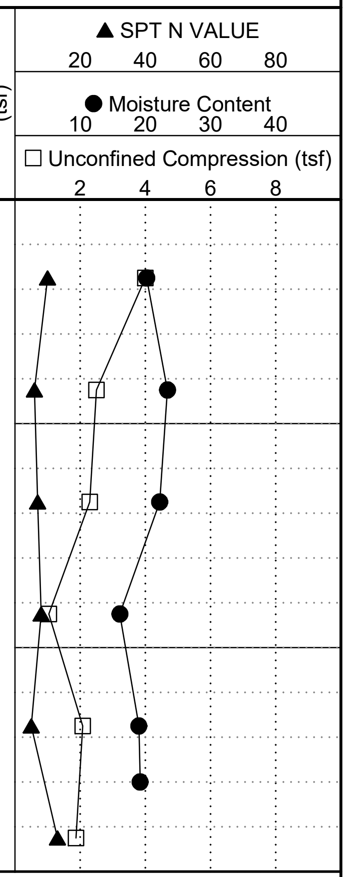
BORING NUMBER B-4

CLIENT Public Building Commission of Chicago
PROJECT NAME Palmer Elementary School Annex
PROJECT NUMBER 05275
PROJECT LOCATION 5031 N Kenneth Ave
DATE STARTED 11/12/18 **COMPLETED** 11/12/18
GROUND ELEVATION 29.10 ft CCD **HOLE SIZE** 2 1/4
DRILLING CONTRACTOR GSG Drilling
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING --- N/A
LOGGED BY TK **CHECKED BY** MC
AT END OF DRILLING --- N/A
NOTES Elevations determined from Google Earth
AFTER DRILLING --- N/A

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	UNCONFINED COMPRESSION (tsf)
0	4 inches of Asphalt				
	SILTY CLAY, trace gravel (CL/ML) - Brown and Gray - Very Stiff to Hard - Moist	SS	33	3-4-6 (10)	4.0
5		SS	78	3-3-3 (6)	2.50
		SS	89	2-3-4 (7)	2.29
10	SILTY CLAY, trace gravel (CL/ML) - Gray - Stiff to Very Stiff - Moist	SS	100	4-4-4 (8)	1.04
		SS	100	2-2-3 (5)	2.08
15		SS	100	3-5-8 (13)	1.87



Bottom of borehole at 15.0 feet.

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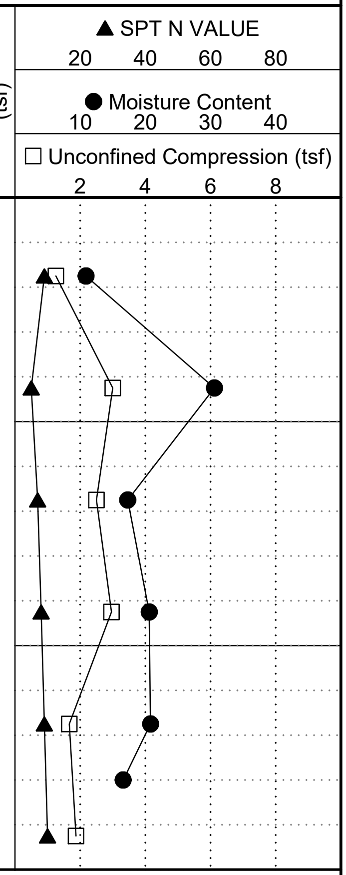
BORING NUMBER B-5

CLIENT Public Building Commission of Chicago
PROJECT NAME Palmer Elementary School Annex
PROJECT NUMBER 05275
PROJECT LOCATION 5031 N Kenneth Ave
DATE STARTED 11/12/18 **COMPLETED** 11/12/18
GROUND ELEVATION 30.10 ft CCD **HOLE SIZE** 2 1/4
DRILLING CONTRACTOR GSG Drilling
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING --- N/A
LOGGED BY TK **CHECKED BY** MC
AT END OF DRILLING --- N/A
NOTES Elevations determined from Google Earth
AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	UNCONFINED COMPRESSION (tsf)
0		8 inches of Topsoil 16 inches of Aggregate Subbase				
		SILTY CLAY, trace gravel (CL/ML) - Brown - Stiff - Moist	SS	67	3-6-3 (9)	1.25
5		SILTY CLAY, trace organics (CL/ML) - Black - Very Stiff - Very Moist	SS	33	2-2-3 (5)	3.0
		SILTY CLAY, trace gravel (CL/ML) - Brown and Gray - Stiff to Very Stiff - Moist	SS	89	2-3-4 (7)	2.50
10			SS	89	2-4-4 (8)	2.96
			SS	100	3-4-5 (9)	1.67
15			SS	100	4-4-6 (10)	1.87



Bottom of borehole at 15.0 feet.

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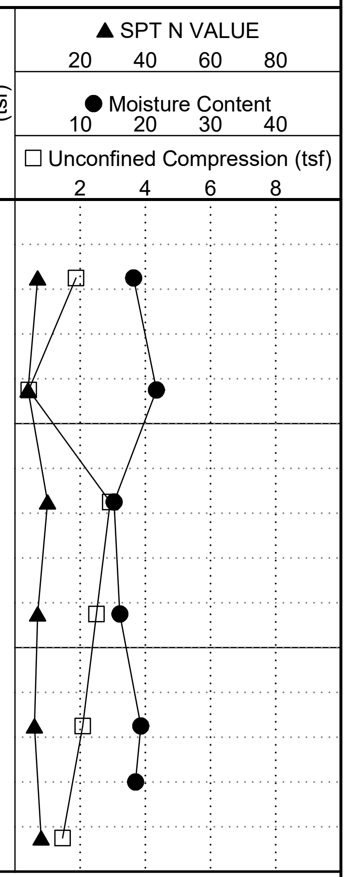
BORING NUMBER B-6

CLIENT Public Building Commission of Chicago
PROJECT NAME Palmer Elementary School Annex
PROJECT NUMBER 05275
PROJECT LOCATION 5031 N Kenneth Ave
DATE STARTED 11/12/18 **COMPLETED** 11/12/18
GROUND ELEVATION 30.10 ft CCD **HOLE SIZE** 2 1/4
DRILLING CONTRACTOR GSG Drilling
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING --- N/A
LOGGED BY TK **CHECKED BY** MC
AT END OF DRILLING --- N/A
NOTES Elevations determined from Google Earth
AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	UNCONFINED COMPRESSION (tsf)
0		6 inches of Topsoil				
		SILTY CLAY (CL/ML) - Black and Brown - Stiff - Moist	SS	56	2-3-4 (7)	1.87
5		SILTY CLAY (CL/ML) - Brown and Gray - Soft - Moist	SS	78	1-2-2 (4)	0.42
		SILTY CLAY (CL/ML) - Brown - Very Stiff - Moist	SS	89	2-4-6 (10)	2.92
10		SILTY CLAY (CL/ML) - Gray - Stiff to Very Stiff - Moist	SS	89	3-3-4 (7)	2.50
			SS	100	2-2-4 (6)	2.08
15			SS	100	2-3-5 (8)	1.46

Bottom of borehole at 15.0 feet.



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Unified Soil Classification

Soil Classification is based on the Unified Soil Classification System and ASTM Designations D-2487 and D-2488. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: clays, if they are plastic, and silts if they are slightly Plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the basis of their relative in-place density and fine grained soils on the basis of their consistency. Example: Lean clay with sand, trace gravel, stiff (CL); silty sand, trace gravel, medium dense (SM).

Drilling & Sampling Symbols

SS : Split Spoon
ST : Thin-Walled Tube
HA: Hand Auger
AU: Auger Sample
HS: Hand Sample

Water Level (ft)
▽ While Drilling
▽ After Drilling
▼ 24-hour

Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch OD split spoon, except where noted.

Major Divisions			Group Symbols	Typical Names
Coarse Grained Soils (More than Half of material is larger than No. 200 sieve size)	**Gravels** (More than hall of coarse fraction is larger than No. 4 sieve size)	**Clean Gravels** (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
		Gravels with fines (Appreciable amount of fines)	GM d / u	Silty gravels, gravel-sand-clay mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (More than hall of coarse fraction is smaller than No. 4 sieve size)	**Clean Sands** (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands, gravelly sands, little or no fines
		Sands with fines (Appreciable amount of fines)	SM d / u	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine Grained Soils (More than half of material is smaller than No. 200 sieve size)	**Silts and Clays** (liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or claye fine sands or clayey silts with slight plasticity
			CL	Inorganic clay of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays (liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
	Highly Organic Soils		Pt	Peat and other highly organic soils

Consistency of Cohesive Soil

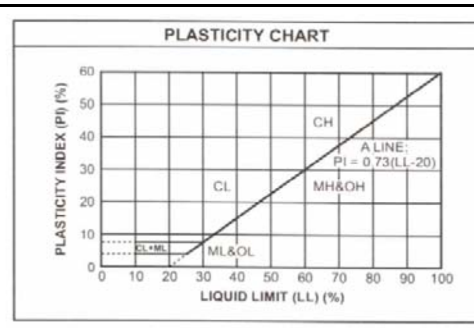
Unconfined Compressive strength, Qu, tsf	N-Blows/ft.	Consistency
< 0.25	Below 2	< Very Soft
0.25 - 0.50	2-4	- Soft
0.50 - 1.0	4-8	- Medium Stiff
1.0 - 2.0	8-15	- Stiff
2.0 - 4.0	15-30	- Very Stiff
4.0 - 8.0	30-50	- Hard
> - 8.0	> 50	- Very Hard

Relative Density of Coarse-Grained Soils

N-Blows/ft.	Relative Density
0-3	Very Loose
4-10	Loose
11-29	Medium Dense
30-49	Dense
50-80	Very Dense
>80	Extremely Dense

Description Term(s) of Components Present in Sample

Trace < 10%	Little 10-19%
Some 20-34%	And 35-50%



APPENDIX B

LABORATORY

TEST RESULTS

623 Cooper Court • Schaumburg, IL 60173
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Integrity | Quality | Reliability

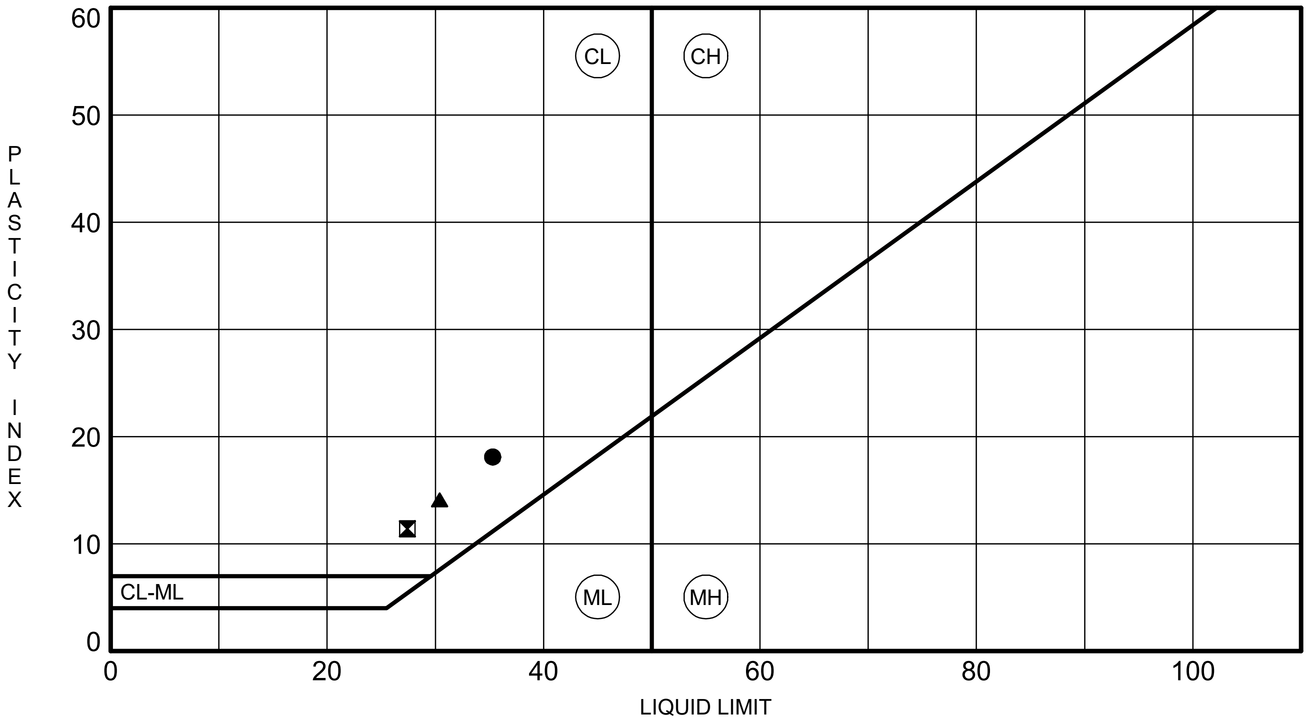
ATTERBERG LIMITS' RESULTS

CLIENT Public Building Commission of Chicago

PROJECT NAME Palmer Elementary School Annex

PROJECT NUMBER 05275

PROJECT LOCATION 5031 N Kenneth Ave



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-1**	**11.0**	**35**	**17**	**18**		
⊠	**B-2**	**6.0**	**27**	**16**	**11**		
▲	**B-3**	**6.0**	**30**	**16**	**14**		