Construction & Geotechnical Material Testing, Inc.

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January 31, 2022

Ms. Athi Toufexis, AIA, ALEP, LEED-AP
StudioGC Architecture + Interiors
223 W. Jackson Boulevard, Suite 1200
Chicago, Illinois 60606

CGMT Project No. 22G0124

Reference: ***Report of Pavement Exploration and Evaluation, Proposed Parking Lot Improvements, 3925 W. Lunt Avenue, Lincolnwood, Illinois 60712***

Dear Mr. Toufexis:

CGMT, Inc. has completed the subsurface exploration and geotechnical engineering analyses for the Proposed Parking Lot Improvements project located at 3925 W. Lunt Avenue in Lincolnwood, Illinois. This report describes the subsurface exploration procedures, laboratory testing, and geotechnical recommendations for project construction. A Boring Location Plan is included in the Appendix of this report along with the Boring Logs performed for the exploration.

We appreciate this opportunity to be of service to the StudioGC Architecture + Interiors during the design phase of this project. If you have any questions with regard to the information and recommendations presented in this report, or if we can be of further assistance to you in any way during the planning or construction of this project, please do not hesitate to contact us.

Respectfully,

CONSTRUCTION AND GEOTECHNICAL MATERIAL TESTING, INC.

Pratik Patel, P.E.
Vice President

3pc: Encl.

REPORT OF

SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING SERVICES

PROPOSED PARKING LOT IMPROVEMENTS
3925 W. LUNT AVENUE
LINCOLNWOOD, ILLINOIS 60712

CGMT PROJECT NO. 22G0124

FOR

STUDIOGC ARCHITECTURE + INTERIORS
CHICAGO, ILLINOIS

JANURARY 31, 2022

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EXECUTIVE SUMMARY

Construction & Geotechnical Material Testing, Inc. (CGMT) has completed your subsurface exploration and geotechnical engineering project. The subsurface conditions encountered during our exploration and CGMT's conclusions and recommendations are summarized below. This summary should not be considered apart from the entire text of the report with all the qualifications and considerations mentioned herein. Details of our conclusions and recommendations are discussed in the following sections and in the Appendix of this report.

The project site is located along 3925 W. Lunt Avenue in Lincolnwood, Illinois A total of five (5) pavement cores and soil borings, C-1 through C-5 were performed for this project. The pavement thicknesses and subsurface conditions encountered at the pavement cores and borings performed at the site can be summarized as follows:

Approximately 3 to 4 5/8 inches of asphalt pavement underlain by approximately 9 to 23 inches of aggregate base course (apparent CS 02) were encountered at the ground surface in the pavement cores C-1 and C-2. Approximately 3 1/2 to 3 3/4 inches of asphalt pavement underlain by approximately 8 to 11 inches of aggregate base course (apparent IDOT CaA6) were encountered at the ground surface in the pavement cores C-3 through C-5. The surface materials were underlain by natural, brown and gray very stiff to hard silty clay soils that extended to the soil boring termination depth of approximately 5 feet below the existing grade in the soil boring C-1. The surface materials were underlain by dark brown firm to stiff sand clay fill soils that extended to depths of approximately 3½ feet below the existing grade in the soil borings C-2 and C-4. The surface materials were underlain by brown and gray stiff silty clay soils that extended to a depth of approximately 2 feet below the existing grade in the soil boring C-3. The surface materials were underlain by brown stiff silty clay fill soils that extended to a depth of approximately 2 feet below the existing grade in the soil boring C-5. The sandy clay fill soils were underlain by natural, brown and gray very stiff silty clay soils that extended to the soil boring termination depths of approximately 5 feet below the existing grade in the soil borings C-2 and C-4. The silty clay soils were underlain by natural, brown loose sand soils that extended to a depth of approximately 2½ feet below the existing grade in the soil boring C-3. The silty clay fill soils were underlain by natural, brown and gray stiff to very stiff silty clay soils that extended to the soil boring termination depth of approximately 5 feet below the existing grade in the soil boring C-5. The sand soils were underlain by natural, brown and gray stiff silty clay soils that extended to the soil boring termination depth of approximately 5 feet below the existing grade in the soil boring C-3.

Subgrade preparation for complete reconstruction should be initiated by removing the existing asphalt pavement, along with the underlying base course. Any topsoil and/or soft layers encountered immediately below the base course, should also be stripped from the pavement subgrade at this time. Based on the boring field and laboratory and test data, the immediate subgrade soils encountered in the soil boring C-4 may be unsuitable for continued support of pavements. As such, CGMT recommended soils near those borings may require remediation. Additional unstable areas may be exposed during construction operations. The actual need for the recommended treatment should be determined in the field at the time of construction based on guidelines presented in the IDOT Geotechnical Engineer Manual under the direction of a licensed geotechnical engineer. All potentially unstable soils should be tested with a cone penetrometer and treated in accordance with Article 301.04 of the IDOT Standard Specifications for Road and Bridge Construction and the undercut guidelines in the IDOT Subgrade Stability Manual.

Following the removal of the existing pavement section and removal of any visibly unsuitable materials, such as utility trench fill, the exposed soil subgrade should be closely observed and proofrolled. The proofrolling should be performed using a fully loaded tandem axle dump truck or other equipment providing an equivalent subgrade loading. A minimum gross weight of 25 tons is recommended for the proofrolling equipment.

For the design and construction of exterior pavements, we recommend that the existing pavement section and unsuitable materials be removed before construction of new pavements and that new pavements will be supported by stable and approved subgrades consisting of silty clay fill soils or on new engineered fill.

Assuming the pavement subgrade will consist predominantly of the cohesive soils and new fill prepared in accordance with the recommendations given in this report, an estimated IBR value of 3 could be used in proportioning a flexible pavement section. Similarly, an estimated modulus of subgrade reaction value equal to 100 pounds per cubic inch could be used for design of rigid concrete pavement sections. A Subgrade Stability Rating (SSR) rating of (Poor) should be used for pavement design. Concrete pavements should be air-entrained Portland cement concrete with a minimum compressive strength of 4,000 psi and a minimum flexural strength of 650 psi. Concrete strength requirements are outlined in article 1020.04 of the Standard Specifications for Road and Bridge Construction, effective April 1, 2016.

We recommend that the utility excavations, preparation of subgrades, and pavement construction be monitored full-time by a CGMT geotechnical engineer or his representative to verify that the exposed subgrade materials will be suitable for the pavement support.

Report Prepared By:

Blake Sloan

Blake A. Sloan
Staff Engineer

Report Reviewed By:

Nicholas Wolff

Nicholas P. Wolff, P.E.
Geotechnical Engineer

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PROJECT OVERVIEW

Introduction

This report presents the results of our subsurface exploration and engineering services for the Proposed Parking Lot Improvements located at 3925 W. Lunt Avenue in Lincolnwood, Illinois. A General Location Plan included in the Appendix of this report, shows the approximate location of this project.

Project Description

ITEM	DESCRIPTION
Site Layout	See Boring Location Diagram in the Appendix
Proposed Construction	Based on the information provided to us, StudioGC Architecture + Interiors is proposing to rehabilitate the pavement located at 3925 W. Lunt Avenue in Lincolnwood, Illinois
Grading and Existing Site Considerations	Site grading including cuts and fills are anticipated to be less than 1 foot will be needed to develop the final site grades across the site.

Scope of Work

The conclusions and recommendations contained in this report are based on the soil borings performed in the vicinity of the proposed pavement areas, and associated laboratory testing of selected soil samples. The scope of the subsurface exploration included the following.

Number of Pavement Cores and Soil Borings	Depth (feet)
5	5

The results of the soil borings, along with a Boring Location Plan showing the approximate locations where the borings were performed, are included in the Appendix of this report. Once the samples were returned to our laboratory, we laboratory tests on selected representative soil samples from the borings to evaluate pertinent engineering properties, and, we analyzed the field and laboratory data to develop appropriate engineering recommendations.

The purpose of this report is to provide information and geotechnical engineering recommendations with regard to:

- Subsurface Soil and Groundwater Conditions
- Site Preparation and Earthwork
- Pavement Design and Construction

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EXPLORATION RESULTS

Site Description

ITEM	DESCRIPTION
Project Locations	The project site is located at 3925 W. Lunt Avenue in Lincolnwood, Illinois
Existing Site Improvements	At the time of our exploration, the existing pavement was relatively in poor condition with many cracks in longitudinal, transverse, and random orientations. Areas of alligator cracking were also present throughout the existing pavement. In our opinion, the pavement appeared to be near the end of its useful life.

Surface Conditions

A total of five (5) pavement cores, C-1 through C-5, were performed for this project. The pavement conditions and thicknesses are summarized in the table below:

Pavement Core	Location	Total Depth of Pavement	Pavement Components	Comments
C-1	3925 W. Lunt Avenue	13 5/8 in.	1 7/8" Asphalt	Surface Coarse, Little Voids, Good Bond
			2 3/4" Asphalt	Binder Coarse, Little Voids
			9" Base Course	Apparent IDOT CS 2
C-2	3925 W. Lunt Avenue	26 in.	1 3/8" Asphalt	Surface Coarse, Little Voids, Good Bond
			1 5/8" Asphalt	Binder Coarse, Little Voids
			23" Base Course	Apparent IDOT CS 2
C-3	3925 W. Lunt Avenue	11 3/4 in.	1 1/4" Asphalt	Surface Coarse, Trace Voids, Good Bond
			2 1/2" Asphalt	Binder Coarse, Little Voids
			8" Base Course	Apparent IDOT CA 6
C-4	3925 W. Lunt Avenue	14 1/2 in.	2" Asphalt	Surface Coarse, Little Voids, Good Bond
			1 1/2" Asphalt	Binder Coarse, Little Voids
			11" Base Course	Apparent IDOT CA 6
C-5	3925 W. Lunt Avenue	13 1/2 in.	1 1/2" Asphalt	Surface Coarse, Some Voids, Good Bond
			2" Asphalt	Binder Coarse, Little Voids
			10" Base Course	Apparent IDOT CA 6

Soil Conditions

A total of five (5) soil borings, C-1 through C-5 were performed for this project. The subsurface conditions encountered at the soil borings performed at the site can be summarized as follows:

The surface materials were underlain by natural, brown and gray very stiff to hard silty clay soils that extended to the soil boring termination depth of approximately 5 feet below the existing grade in the soil boring C-1. The surface materials were underlain by dark brown firm to stiff sand clay fill soils that extended to depths of approximately 3½ feet below the existing grade in the soil borings C-2 and C-4. The surface materials were underlain by brown and gray stiff silty clay soils that extended to a depth of approximately 2 feet below the existing grade in the soil boring C-3. The surface materials were underlain by brown stiff silty clay fill soils that extended to a depth of approximately 2 feet below the existing grade in the soil boring C-5. The sandy clay fill soils were underlain by natural, brown and gray very stiff silty clay soils that extended to the soil boring termination depths of approximately 5 feet below the existing grade in the soil borings C-2 and C-4. The silty clay soils were underlain by natural, brown loose sand soils that extended to a depth of approximately 2½ feet below the existing grade in the soil boring C-3. The silty clay fill soils were underlain by natural, brown and gray stiff to very stiff silty clay soils that extended to the soil boring termination depth of approximately 5 feet below the existing grade in the soil boring C-5. The sand soils were underlain by natural, brown and gray stiff silty clay soils that extended to the soil boring termination depth of approximately 5 feet below the existing grade in the soil boring C-3.

SOILS	SOIL CHARACTERISTICS
Fill: Cohesive Soils	4 to 7 blows per foot Unconfined Compressive Strengths: 0.5 to 1.5 tsf; Firm to Stiff Moisture Contents: 20.3 to 24.6 percent
Silty Clay Soils	6 to 16 blows per foot Unconfined Compressive Strengths: 1.0 to 4.5+ tsf; Stiff to Hard Moisture Contents: 17.1 to 21.6 percent
Sand Soils	9 blows per foot; Loose Moisture Contents: 12.1 percent

The specific soil types observed at the borings are noted on the boring logs, enclosed in the Appendix.

Groundwater Observations

Observations for groundwater were made during sampling and upon completion of the drilling operations at the boring locations. In auger drilling operations, water is not introduced into the boreholes, and the groundwater position can often be obtained by observing water flowing into or out of the boreholes. Furthermore, visual observation of the soil samples retrieved during the auger drilling exploration can often be used in evaluating the groundwater conditions. Groundwater levels were observed during drilling and immediately the completion of drilling. Groundwater measurements are summarized in the table below.

Groundwater Summary

LOCATION	GROUNDWATER LEVELS (FEET)	
	DURING DRILLING	IMMEDIATELY AFTER COMPLETION
Soil Borings C-1 through C-5	None	None

Glacial till soils in the Midwest frequently oxidize from gray to brown above the level at which the soil remains saturated. The seasonal high water table is often interpreted to be near this zone of color change. Based on the results of this exploration, the season high water table may be located at depths greater than those explored, but perched groundwater may be present.

More definitive evidence of prevailing groundwater levels could be obtained through the use of groundwater monitoring wells, which CGMT could install and monitor if requested.

It should be noted that the groundwater level can vary based on precipitation, evaporation, surface run-off and other factors not immediately apparent at the time of this exploration. Surface water runoff will be a factor during general construction, and steps should be taken during construction to control surface water runoff and to remove any water that may accumulate in the proposed excavations as well as floor slab and pavement areas. Precipitation generally varies seasonally. To assist in anticipating groundwater fluctuations changes throughout the year, average monthly precipitation is provided in the table below. Average precipitation levels were obtained from wunderground.com.

Seasonal Precipitation

Month	January	February	March	April	May	June	July	August	September	October	November	December	Total
Normal Precipitation (inches)	0.77	0.64	0.97	1.40	2.84	4.70	2.38	1.37	0.91	6.71	0.83	1.84	25.36

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ANALYSIS AND RECOMMENDATIONS

Overview

The following recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered. If there are any changes to the project characteristics or if different subsurface conditions are encountered during construction, CGMT should be consulted so that the recommendations of this report can be reviewed. The pavement rehabilitation methods that could be considered would include:

- Complete Reconstruction of aggregate base and pavement
- Partial Reconstruction

Based on the observed condition of the pavements which include severe longitudinal, transverse, and alligator cracking, at the boring locations, a partial reconstruction program or a milling and overlay program will probably be best suited in most areas. A complete reconstruction of aggregate base and pavement program would likely be the most expensive alternate but would provide higher confidence of the subgrade and subbase materials would likely be best suited.

Complete reconstruction would consist of removing the entire existing pavement section down to the soil subgrade. It is possible that undercutting may be necessary when subgrade soils consisting of high moisture and/or organic soils are exposed following removal of the asphalt pavement layers.

Subgrade Preparation Recommendations for Complete Reconstruction

Subgrade preparation for complete reconstruction should be initiated by removing the existing asphalt pavement, along with the underlying base course. Any topsoil and/or soft layers encountered immediately below the base course, should also be stripped from the pavement subgrade at this time. Based on the boring field and laboratory and test data, the immediate subgrade soils encountered in the soil boring C-4 may be unsuitable for continued support of pavements. As such, CGMT recommended soils near those borings may require remediation. Additional unstable areas may be exposed during construction operations. The actual need for the recommended treatment should be determined in the field at the time of construction based on guidelines presented in the IDOT Geotechnical Engineer Manual under the direction of a licensed geotechnical engineer. All potentially unstable soils should be tested with a cone penetrometer and treated in accordance with Article 301.04 of the IDOT Standard Specifications for Road and Bridge Construction and the undercut guidelines in the IDOT Subgrade Stability Manual.

We recommend that the project geotechnical engineer or his representative should be on site to monitor stripping and site preparation operations and observe that unsuitable soils have been satisfactorily removed and to observe proofrolling.

After removal of unsuitable/deleterious materials and stripping to the desired grade, and prior to fill placement, we recommend the stripped/exposed subgrades be observed by an experienced geotechnical engineer or his authorized representative at the time of construction in order to aid in identifying localized soft/loose or unsuitable materials which should be removed. Proofrolling using a loaded dump truck having a gross weight of at least 25 tons, may be used at this time to aid in identifying localized soft or unsuitable material which should be removed. If poorer soil conditions (very soft, clay loam soils are sensitive to moisture changes and some softening/disturbance of the exposed soils should be expected following periods of precipitation. If any remediation is required at time of construction, it may include undercutting and placement of a stabilization stone such as IDOT gradation CA-1 or PGE materials or approved fill material.

Proofrolling will aid in providing a firm base for compaction of new fill or subbase materials and in delineating soft or unstable subgrade conditions. Soft or unstable subgrades identified by proofrolling should be scarified in-place, moisture conditioned as necessary, and recompacted as recommended below. If adequate stability cannot be achieved through scarification and recompaction, or project schedules or weather conditions do not allow scarification and recompaction, the unstable material should be undercut and replaced with suitable engineered fill. Although the borings did not suggest that extensive areas of undercutting would be required, subgrade conditions between borings and core holes could vary and some contingency for undercutting should be provided in the contract documents.

If improvements are needed, the aggregate subgrade improvement, as discussed in the IDOT District One Special Provision 303, shall be installed. The special provision requires a gradation CS 01 for a minimum thickness of 12 inches. The upper 3 inches of the improved subgrade shall be composed of a material that will have a maximum particle size of 1½ inches.

Based on the boring information, CGMT anticipates that the aggregate subgrade improvement will be required at the locations noted in the table below, but may also be needed at other locations where the exposed soils consist of unsuitable or unstable soils as determined by the CGMT's on-site representative.

Anticipated Areas Requiring Subgrade Improvement

Location	Material	Depth
Soil Boring C-4	Sandy Clay, Trace Gravel, dark brown, firm (CL FILL) - Low Strength Soils	1 to 2½ feet

Where required undercuts are less than about 1 foot in depth, IDOT Gradation CA-6 granular fill materials or stockpiled granular base material should be used to backfill the undercut. Where undercuts exceed about 1 foot, consideration could be given to backfilling the undercuts with an approved coarse crushed stone. However, these coarser materials should be "choked off" with a minimum 6-inch thickness of CA-6. The use of geotextile or geogrid materials to separate and reinforce the engineered fill could also be considered. Geotextiles can often provide some savings by reducing the required depths of cut and subsequent fill volumes. If undercut depths excess about 1.5 to 2 feet, consideration should be given to using geotextiles.

We should note that the use of granular soils as undercut backfill can create localized areas for water to collect below pavements, which can contribute to subgrade saturation, pumping and frost heave. If conditions warrant such undercuts and granular backfill, it may also be necessary to provide an outlet, such as a gravel filled trench extended to a catch basin or sewer trench backfill, to drain the zone of granular fill.

Some of the near surface soils encountered in the borings had somewhat high moisture contents, and sand or silt layers will likely be encountered near the ground surface. These soil types could be encountered in isolated to relatively broad areas during grading. Instability and disturbance of these soil types could occur during construction, particularly if wetted by surface water or seepage. These soils may exhibit a relatively firm/stable condition upon initial exposure at the subgrade level. However, repetitive construction traffic and/or wetting will deteriorate the strength of these soils. It is likely that portions of the pavement subgrades could become unstable during proofrolling and construction operations and some means of subgrade stabilization may be required to facilitate construction.

Representatives of CGMT should be present on an on-going basis to perform observations and testing during the preparation of the pavement areas.

Subgrade Preparation Recommendations for Partial Reconstruction

Site preparation for a partial pavement reconstruction would involve the primary steps outlined above, with the exception of removing only a portion of the existing aggregate base course. The amount of base course to be removed would be dependent upon the pavement section thickness used to reconstruct the pavement (see previous section of report).

Any aggregate base course which is disturbed during the removal process should be recompacted. After excavating to grade and recompacting as necessary, the proofrolling and undercutting procedures outlined earlier should be performed.

Engineered Fill

Where new fill material is required for backfill or to otherwise reach the design subgrade elevation beneath pavements, we recommend that engineered fill be used. Any soil placed as engineered fill should be an approved material, free of organic matter or debris, be a non-frost susceptible soil, and have a liquid limit and plasticity index less than 40 and 15, respectively. The project geotechnical engineer should be consulted to determine the suitability of off-site/on-site materials for use as engineered fill, prior to use or placement. Fill materials containing large voids are more susceptible to future movement that may become unstable resulting in excessive and variable settlement.

Fill should be placed in lifts not exceeding 8 inches in loose thickness, moisture conditioned to within 2 percent of the optimum moisture content and compacted to at least 95 percent of the maximum dry density obtained in accordance with ASTM Specification D 1557, Modified Proctor Method. Fill placed below footing base elevations should be compacted to at least 95 percent of the material's modified Proctor maximum dry density (ASTM D 1557). Engineered fill placed to support foundations should extend 1 foot beyond the outside edges of the footings and from that point outward laterally 1 foot for every 2 feet of fill thickness below the footings. Laboratory proctor tests should be performed on fill materials to determine the maximum dry density and optimum moisture content. A shrinkage factor of 15 percent can be assumed for estimating earthwork quantities for bidding purposes.

We recommend suitable silty clays used to raise the grade or backfill undercuts should be compacted with a sheepsfoot roller. Granular engineered fill should be compacted with a smooth drum roller or adequate heavy vibratory plate. Moisture control during earthwork operations, including the use of disking or appropriate drying equipment and techniques, should be expected.

In-place density tests should be performed with a minimum of 1 test per 2,000 square feet of fill area for each lift of fill placed. We recommend that the placement of engineered fill be monitored full-time by CGMT representative and in-place density tests should be performed to verify the adequacy of the compaction for each lift of fill placed.

Pavements

We anticipate the new pavement will be of asphaltic concrete or Portland cement concrete. We expect that the proposed parking lot will generally be utilized for light duty traffic, and the driveways and loading and unloading areas be utilized for light to medium duty traffic. Heavy traffic loads would be anticipated for areas near any dumpsters where garbage trucks would often cross. We recommend the pavement subjected to light traffic be underlain by a minimum of 8 inches of base course granular material, similar to Illinois Department of Transportation gradation CA-6.

Assuming the pavement subgrade will consist predominantly of the existing cohesive fill soils and/or new fill prepared in accordance with the recommendations given in this report, an estimated IBR value of 3 could be used in proportioning a flexible pavement section. Similarly, an estimated modulus of subgrade reaction value equal to 100 pounds per cubic inch could be used for design of rigid concrete pavement sections. A Subgrade Stability Rating (SSR) rating of (Poor) should be used for pavement design. Concrete pavements should be air-entrained Portland cement concrete with a minimum compressive strength of 4,000 psi and a minimum flexural strength of 650 psi. Concrete strength requirements are outlined in article 1020.04 of the Standard Specifications for Road and Bridge Construction, effective April 1, 2016.

Some typical pavement sections used in this region of the country are given below which could be considered for preliminary estimating purposes. Other sections can also be considered. These sections assume a low volume of light vehicle loads (automobiles, vans, pickups, etc.). They should also be considered minimum thicknesses, and, as such, periodic maintenance should be anticipated. Final design sections should consider details such as final grades, traffic loadings, traffic volumes, the desired design life and any local, county or city codes. If you wish, we would be pleased to perform a detailed pavement section design using AASHTO or Asphalt Institute procedures when this information is available. It should also be noted that these sections do not consider if the binder course will be subject to construction vehicle traffic for an extended period of time. Some distress to the binder course and aggregate base could occur, if this is the case.

	Light Duty (Parking Lots)	Heavy Duty ** (Drives)	Frequent Truck Traffic
Portland Cement Concrete	5 inches	6 inches	7 inches
Full Depth Asphalt	5.5 inches	7 inches	10 inches
Combined Section:			
Asphalt	3 inches	4 inches	4.5 inches
Crushed Stone Base Course	8 inches	10 inches	16 inches

* All materials should meet the current Illinois Department of Transportation Standard Specifications for Road and Bridge Construction requirements.

** In areas of anticipated heavy traffic, delivery trucks, or concentrated loads, a minimum concrete thickness of 7 inches is recommended but should be evaluated further when loading conditions are known.

Final design sections should consider details such as final grades, traffic loadings, traffic volumes, the desired design life and any local, county or city codes. If you wish, we would be pleased to perform a detailed pavement section design using AASHTO or Asphalt Institute procedures when this information is available. Minimum design requirements for hot-mix asphalt (HMA) shall follow Article 1030.05 of the Standard Specifications for Road and Bridge Construction, effective April 1, 2016. During asphalt pavement construction, the wearing and leveling course should be compacted to a minimum of 93 percent of the theoretical density value. Prior to placing the granular material, the pavement subgrade soil should be properly compacted, proofrolled, and free of standing water, mud, and frozen soil.

Consideration should also be given to placing a geotextile fabric at the base of the new pavement section as a separation layer and to reduce the potential for premature degradation of the new pavements.

An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should reduce the possibility of the subgrade materials becoming saturated over a long period of time. We would be pleased to be of further assistance to you in the design of the project pavements by providing additional recommendations during construction of the project.

Periodic maintenance of pavements should be anticipated. The subgrade parameters provided in this report consider that significant changes in the subgrade moisture content do not occur. To reduce the potential for changes in subgrade moisture, all paved areas should be sloped to provide rapid drainage of surface water and to drain water away from the pavement edges. Water that is allowed to pond on or adjacent to the pavement can saturate and soften the subgrade soils and subsequently accelerate pavement deterioration.

Granular base or subbase materials directly below pavement sections can also collect infiltrated surface water and soften the subgrade as well as increase the effects of frost action, both of which can be detrimental to pavements. For these reasons, where granular materials are used over a cohesive soil subgrade or where the groundwater level is within 3.5 feet of finished pavement subgrade, we recommend that consideration be given to using pavement underdrains hydraulically connected to the granular base or subbase to improve the pavement performance and extend its service life. Underdrains should be installed at 300 to 500 feet intervals and at low points in the pavement profile. Pipe underdrains shall be installed according to Check Sheet #19 of the Supplemental Specifications and Recurring Special Provisions, effective January 1, 2015.

General Construction Considerations

We recommend that the subgrade preparation and pavement construction be monitored by a CGMT geotechnical engineer or his representative. Methods of verification and identification such as proofrolling and hand auger probe holes will be necessary to further evaluate the subgrade soils and identify unsuitable soils. We would be pleased to provide these services.

We recommend adequate surface and subsurface drainage be considered in the design and construction of pavements. Where standing water develops, either on pavement surfaces or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavements can be expected. Adequate drainage should reduce the possibility of the subgrade materials becoming saturated over a long period of time. To reduce water infiltration to the pavement section and within the base course layer resulting in softening of the subgrade and deterioration of the pavements, we recommend the timely repair or sealing of joints and cracks in pavement.

All unsuitable materials should be removed and replaced with environmentally clean, inorganic fill and free of debris or harmful matter. Unsuitable materials removed from the project site should be disposed of in accordance with all applicable federal, state, and local regulations.

The contractor should avoid stockpiling excavated materials immediately adjacent to the excavation walls. We recommend that stockpile materials be kept back from the excavation a minimum distance equal to the excavation depth to avoid surcharging the excavation walls. If this is impractical due to space constraints, the excavation walls should be retained with bracing designed for the anticipated surcharge loading.

Excavations should comply with the requirements of OSHA 29CFR, Part 1926, Subpart P, "Excavations" and its appendices, as well as other applicable codes. This document states that the contractor is solely responsible for the design and construction of stable, temporary excavations. The excavations should not only be in accordance with current OSHA excavation and trench safety standards but also with applicable local, state, and federal regulations. The contractor should shore, slope or bench the excavation sides when appropriate. In no case should excavations extend below the level of adjacent structures, utilities or pavements, unless underpinning or other adequate support is provided. Site safety is the sole responsibility of the contractor, who shall also be responsible for the means, methods and sequencing of construction operations.

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EXPLORATION PROCEDURES

Subsurface Exploration Procedures

The soil borings were located in the field by a CGMT Field Engineer based on the proposed boring site plan provided to us. As required by the State of Illinois, the driller notified Illinois One-Call System, JULIE, to verify underground utilities in the vicinity of the project site prior to drilling operations.

The soil borings were performed with a truck-mounted rotary-type auger drill rig, which utilized continuous hollow stem augers to advance the boreholes. Prior to soil boring operations, pavement cores were obtained with a diamond impregnated core barrel. Representative soil samples were obtained at 2½ foot intervals for the first 10 feet and 5 foot intervals thereafter by means of conventional split-barrel sampling procedures. In this procedure, a 2-inch O.D., split-barrel sampler is driven into the soil a distance of 18 inches by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler through a 12-inch interval, after initial setting of 6 inches, is termed the Standard Penetration Test (SPT) or N-value and is indicated for each sample on the boring logs. The SPT value can be used as a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, it also indicates the consistency of cohesive soils. This indication is qualitative, since many factors can significantly affect the standard penetration resistance value and prevent a direct correlation between drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies. The drill rig utilized an automatic trip hammer to drive the sampler.

The drill crew maintained a field log of the soils encountered in the borings. After recovery, each geotechnical soil sample was removed from the sampler and visually classified. Representative portions of each soil sample were then sealed in jars and brought to our laboratory in Elk Grove Village, Illinois for further visual examination and laboratory testing. After completion of the drilling operations, the boreholes were backfilled with auger cuttings to the existing ground surface.

Laboratory Testing Program

The pavement cores were measured in our laboratory and the thickness and composition of the existing pavement components were documented. Other traits, such as, amount of voids or delaminated layers were also noted. Representative soil samples were selected and tested in our laboratory to check field classifications and to determine pertinent engineering properties. Representative soil samples were selected and tested in our laboratory to check field classifications and to determine pertinent engineering properties. The laboratory testing program included visual classifications and unconfined compressive strength and moisture content determinations.

An experienced geotechnical engineer classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the coring logs. A brief explanation of the Unified System is included with this report. The geotechnical engineer grouped the various soil types into the major zones noted on the coring logs. The stratification lines designating the interfaces between earth materials on the coring logs and profiles are approximate; in situ, the transitions may be gradual.

The soil samples will be retained in our laboratory for a period of 60 days, after which, they will be discarded unless other instructions are received as to their disposal.

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CLOSING

We recommend that the construction activities be monitored by CGMT to provide the necessary overview and to check the suitability of the subgrade soils for supporting the pavements. Once final loads become available, CGMT must be contacted to review the recommendations presented herein.

This report has been prepared in order to aid in the evaluation of this property and to assist the architect and/or engineer in the design of this project. The scope is limited to the specific project and locations described herein and our description of the project represents our understanding of the significant aspects relative to soil and pavement characteristics. In the event that any change in the nature or location of the proposed construction outlined in this report are planned, we should be informed so that the changes can be reviewed and the conclusions of this report modified or approved in writing by the geotechnical engineer. It is recommended that all construction operations dealing with earthwork and pavements be reviewed by an experienced geotechnical engineer to provide information on which to base a decision as to whether the design requirements are fulfilled in the actual construction. If you wish, we would welcome the opportunity to provide field construction services for you during construction.

The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings and tests performed at the locations as indicated on the Coring Location Plan and other information referenced in this report. This report does not reflect any variations, which may occur between the pavement cores and borings. In the performance of the subsurface exploration, specific information is obtained at specific locations at specific times. However, it is a well-known fact that variations in soil conditions exist on most sites between pavement core and boring locations and also such situations as groundwater levels vary from time to time. The nature and extent of variations may not become evident until the course of construction. If variations then appear evident, after performing on-site observations during the construction period and noting characteristics and variations, a reevaluation of the recommendations for this report will be necessary.

APPENDIX

Vicinity Map

Pavement Core Location Diagram

Boring Log(s)

Core Picture(s)

Unified Soil Classification System

Reference Notes for Boring Logs

VICINITY MAP

CGMT Project No. 22G0124
Proposed Parking Lot Improvements
3925 W. Lunt Avenue, Lincolnwood,
DuPage County, Illinois 60712

Drawing Not To Scale

N

LEGEND

- Approximate Pavement Core and Soil Boring Location

Pavement Core & Soil Boring Location Diagram	
Proposed Parking Lot Improvements	
3925 W. Lunt Avenue Lincolnwood, Illinois 60712	
Project Manager	Project Number
N. Wolff	22G0124
Date	Sheet Number
1/31/2022	Fig. 1

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Soil Boring Prepared for:
Ms. Athi Toufexis, AIA, ALEP, LEED-AP
StudioGC Architecture + Interiors
223 W. Jackson Boulevard, Suite 1200
Chicago, Illinois 60606

Boring No.: C-1
Date: Monday, January 17, 2022
Project: Paving Improvements Replacement
3925 W. Lunt Avenue, Lincolnwood, IL 60712
Project No.: 22G0124
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 4 5/8" of Asphalt Pavement Approximately 9" of Aggregate Base Course					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Silty Clay, Trace Sand and Gravel, brown and gray, very stiff to hard (CL)	SS-1 1.0' - 2.5' 17" Recovery	2 6 7	17.8	3.0	
	2.0							
	3.0							
	4.0			SS-2 3.5' - 5.0' 15" Recovery	6 7 9	17.1	4.5+	
	5.0		END of BORING at 5 Feet					
	6.0							
	7.0							
	8.0							
	9.0							
	10.0							
	11.0							
	12.0							
	13.0							
	14.0							
	15.0							
	16.0							
	17.0							
	18.0							
	19.0							
	20.0							

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: C-2
Date: Monday, January 17, 2022
Project: Paving Improvements Replacement
3925 W. Lunt Avenue, Lincolnwood, IL 60712
Project No.: 22G0124
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Sheet 1 of 1

Soil Boring Prepared for:
Ms. Athi Toufexis, AIA, ALEP, LEED-AP
StudioGC Architecture + Interiors
223 W. Jackson Boulevard, Suite 1200
Chicago, Illinois 60606

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 3" of Asphalt Pavement Approximately 23" of Aggregate Base Course					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0			SS-1 1.0' - 2.5' 14" Recovery	3 2 2	20.3	1.0	
	2.0		Sandy Clay, Trace Gravel, dark brown, stiff (CL FILL)					
	3.0							
	4.0		Silty Clay, Trace Sand and Gravel, brown and gray, very stiff (CL)	SS-2 3.5' - 5.0' 16" Recovery	2 2 4	21.6	2.5	
	5.0		END of BORING at 5 Feet					
	6.0							
	7.0							
	8.0							
	9.0							
	10.0							
	11.0							
	12.0							
	13.0							
	14.0							
	15.0							
	16.0							
	17.0							
	18.0							
	19.0							
	20.0							

Drilling Contractor:	CGMT, Inc.	**Water Level (Ft.)**	
Drilling Method:	3¼" O.D. H.S.A. Split Spoon Sampling	**During Drilling:**	None
Drilling Equipment:	CME-45C Truck Mounted Drill Rig	**Immediately After Drilling:**	None
	REVIEWED BY: NPW		

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Soil Boring Prepared for:
Ms. Athi Toufexis, AIA, ALEP, LEED-AP
StudioGC Architecture + Interiors
223 W. Jackson Boulevard, Suite 1200
Chicago, Illinois 60606

Boring No.: C-3
Date: Monday, January 17, 2022
Project: Paving Improvements Replacement
3925 W. Lunt Avenue, Lincolnwood, IL 60712
Project No.: 22G0124
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 3 3/4" of Asphalt Pavement Approximately 8" of Aggregate Base Course					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Silty Clay, Trace Sand and Gravel, brown and gray, stiff (CL)	SS-1 1.0' - 2.5' 14" Recovery	4 4	17.6	1.25	
	2.0		Sand, Trace Gravel, brown, loose (SP)		5	12.1	-	
	3.0		Silty Clay, Trace Sand and Gravel, brown and gray, stiff (CL)					
	4.0			SS-2 3.5' - 5.0' 18" Recovery	3 4 4	19.9	1.0	
	5.0		END of BORING at 5 Feet					
	6.0							
	7.0							
	8.0							
	9.0							
	10.0							
	11.0							
	12.0							
	13.0							
	14.0							
	15.0							
	16.0							
	17.0							
	18.0							
	19.0							
	20.0							

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Soil Boring Prepared for:
Ms. Athi Toufexis, AIA, ALEP, LEED-AP
StudioGC Architecture + Interiors
223 W. Jackson Boulevard, Suite 1200
Chicago, Illinois 60606

Boring No.: C-4
Date: Monday, January 17, 2022
Project: Paving Improvements Replacement
3925 W. Lunt Avenue, Lincolnwood, IL 60712
Project No.: 22G0124
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 3 1/2" of Asphalt Pavement Approximately 11" of Aggregate Base Course					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Sandy Clay, Trace Gravel, dark brown, firm (CL FILL)	SS-1 1.0' - 2.5' 14" Recovery	2 3 3	24.6	0.5	Dry Density: 1.0' - 2.5' = 93.6 lbs/ft^3
	2.0							
	3.0							
	4.0		Silty Clay, Trace Sand and Gravel, brown and gray, very stiff (CL)	SS-2 3.5' - 5.0' 16" Recovery	2 4 5	19.1	3.0	
	5.0		END of BORING at 5 Feet					
	6.0							
	7.0							
	8.0							
	9.0							
	10.0							
	11.0							
	12.0							
	13.0							
	14.0							
	15.0							
	16.0							
	17.0							
	18.0							
	19.0							
	20.0							

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Soil Boring Prepared for:
Ms. Athi Toufexis, AIA, ALEP, LEED-AP
StudioGC Architecture + Interiors
223 W. Jackson Boulevard, Suite 1200
Chicago, Illinois 60606

Boring No.: C-5
Date: Monday, January 17, 2022
Project: Paving Improvements Replacement
3925 W. Lunt Avenue, Lincolnwood, IL 60712
Project No.: 22G0124
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

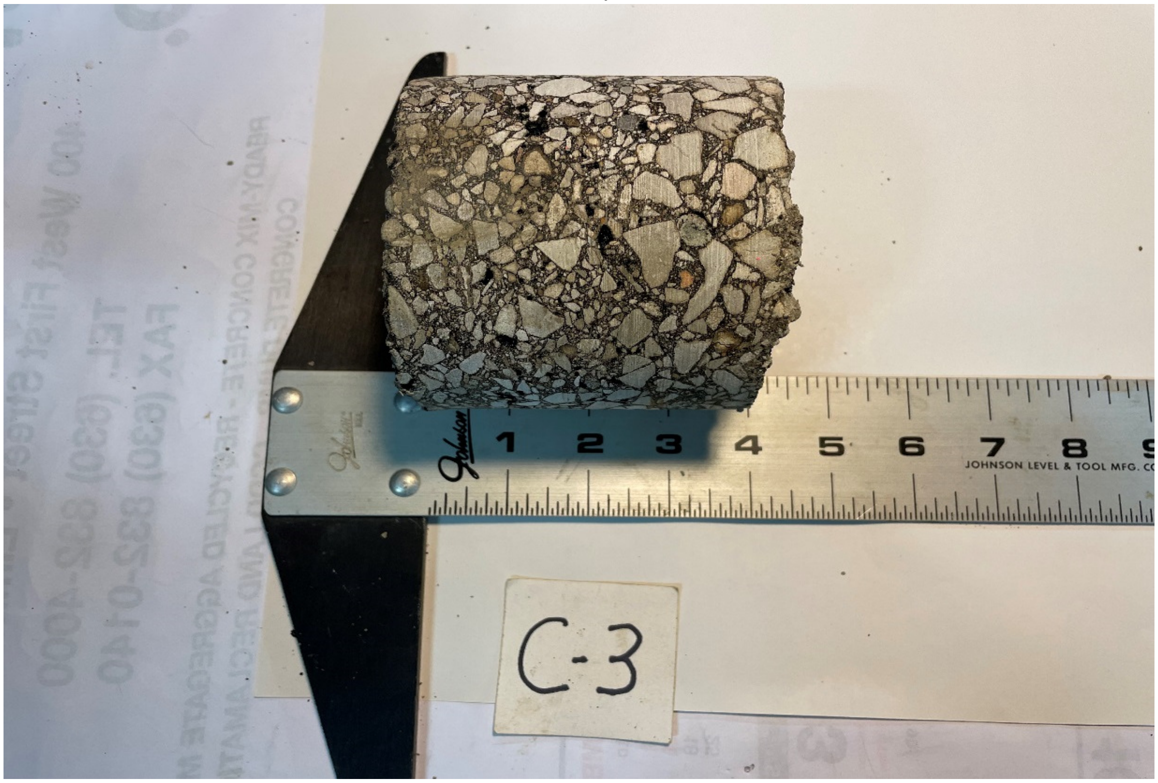
Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 3 1/2" of Asphalt Pavement Approximately 10" of Aggregate Base Course					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Silty Clay, Trace Sand and Gravel, brown, stiff (CL FILL)	SS-1 1.0' - 2.5' 16" Recovery	2 4 3	20.9 17.1	1.5 1.5	
	2.0		Silty Clay, Trace Sand and Gravel, brown and gray, stiff to very stiff (CL)					
	3.0							
	4.0			SS-2 3.5' - 5.0' 17" Recovery	3 4 5	19.9	2.5	
	5.0		END of BORING at 5 Feet					
	6.0							
	7.0							
	8.0							
	9.0							
	10.0							
	11.0							
	12.0							
	13.0							
	14.0							
	15.0							
	16.0							
	17.0							
	18.0							
	19.0							
	20.0							

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

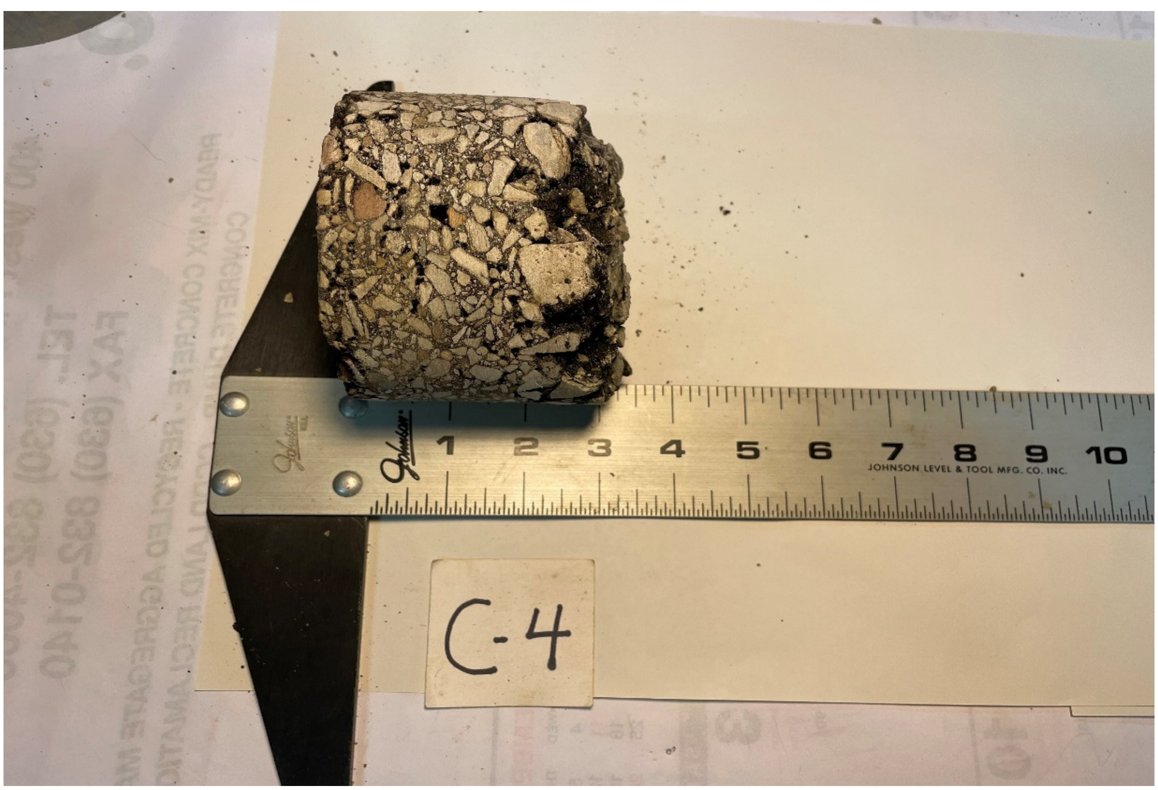
Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Pavement Core-1: 3925 W. Lunt Avenue

Pavement Core-2: 3925 W. Lunt Avenue



Pavement Core-3: 3925 W. Lunt Avenue



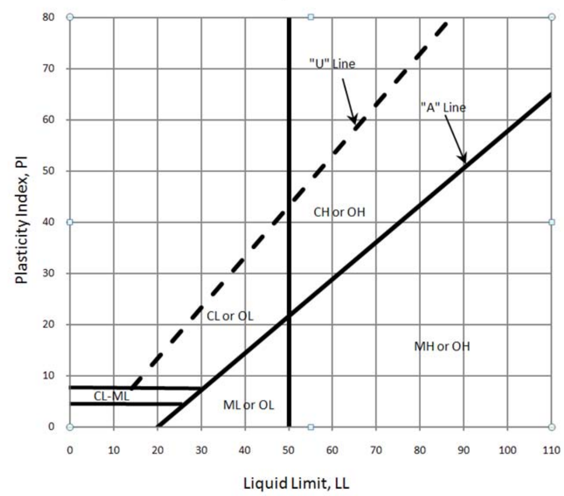
Pavement Core-4: 3925 W. Lunt Avenue

CONSTRUCTION & GEOTECHNICAL MATERIAL TESTING, INC.

Pavement Core-5: 3925 W. Lunt Avenue

UNITED SOIL CLASSIFICATION SYSTEM
(ASTM D-2487)

Major Division		Group Symbol	Typical Names		Classification Criteria
Coarse-grained soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines: Less than 5% pass No. 200 sieve: GW, GP, SW, SP; More than 12% pass No. 200 sieve: GM, GC, SM, SC; 5% to 12% pass No. 200 sieve: Borderline classification requiring use of dual symbol	$C_u = D_{60}/D_{10}$ greater than 4 $C_z = (D_{30})^2/(D_{10} X D_{60})$ between 1 & 3
		GP	Poorly graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW
		GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits plot below "A" line or plasticity index less than 4
		GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits plot above "A" line and plasticity index greater than 7
	Sands More than 50% of coarse fraction passes No. 4 sieve	SW	Well-graded sands and gravelly sands, little or no fines		$C_u = D_{60}/D_{10}$ greater than 6 $C_z = (D_{30})^2/(D_{10} X D_{60})$ between 1 & 3
		SP	Poorly graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW
		SM	Silty sands, sand-silt mixtures		Atterberg limits plot below "A" line or plasticity index less than 4
		SC	Clayey sands, sand-clay mixtures		Atterberg limits plot above "A" line and plasticity index greater than 7
Fine-grained soils 50% or more passing No. 200 sieve	Silts and Clays Liquid limit 50% or less	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	Note: U-line represents approximate upper limit of LL and PI combinations natural soils (empirically determined). ASTM D-2487	
		CL	Inorganic clays 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 sands or silts, elastic silts		
		CH	Inorganic clays of high plasticity, fat clays		
		OH	Organic clays of medium to high plasticity		
Highly organic soils		Pt	Peat, muck and other highly organic soils		Fibrous organic matter; will char, burn or glow



Plasticity chart for the classification of fine-grained soils. Tests made on fraction finer than No. 40 sieve

Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder

UNIFIED SOIL CLASSIFICATION SYSTEM

REFERENCE NOTES FOR BORING LOGS

I. Drilling and Sampling Symbols:

SS – Split Spoon Sampler
ST – Shelby Tube Sampler
RC – Rock Core: NX, BX, AX
PM – Pressuremeter
DC – Dutch Cone Penetrometer

RB – Rock Bit Drilling
BS – Bulk Sample of Drilling
PA – Power Auger (no sample)
HSA – Hollow Stem Auger
WS – Wash Sample

Standard Penetration (Blows/Ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2 inch O.D. split spoon sampler, as specified in ASTM D-1586. The blow count is commonly referred to as the N-value.

II. Correlation of Penetration Resistances to Soil Properties:

Relative Density-Sands, Silts

SPT – N	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 49	Dense
50 – 80	Very Dense

Consistency of Cohesive Soils

Unconfined Compressive Strength, Qp, tsf	Consistency
under 0.25	Very Soft
0.25 – 0.49	Soft
0.50 – 0.99	Firm
1.00 – 1.99	Stiff
2.00 – 3.99	Very Stiff
4.00 – 8.00	Hard
over 8.00	Very Hard

III Unified Soil Classification Symbols:

GP – Poorly Graded Gravel
GW – Well Graded Gravel
GM – Silty Gravel
GC – Clayey Gravel
SP – Poorly Graded Sand
SW – Well Graded Sand
SM – Silty Sand
SC – Clayey Sand

ML – Low Plasticity Silt
MH – High Plasticity Silt
CL – Low Plasticity Clay
CH – High Plasticity Clay
OL – Low Plasticity Organic
OH – High Plasticity Organic
CL-ML – Dual Classification (Typical)

IV. Water Level Measurement Symbol:

WL – Water Level
WS – While Sampling
WD – While Drilling

BCR – Before Casing Removal
ACR – After Casing Removal
WCI – Wet Cave In
DCI – Dry Cave In

The water levels are those water levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clays and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.