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STRUCTURAL GEOTECHNICAL EXPLORATION REPORT # 2
FOR
CANTILEVER SIGN STRUCTURES

PTB 199 Item 16 (D-91-078-21)
Smart Corridor Implementation Plan to IL 56 (Butterfield Rd.)
From York Rd. (Station 2012+60) on the West end to Cicero Avenue (IL-50) (Station 2510+30) on the East End
62N39
PROJECT NUMBER 2022-1264-01G

Prepared For

AMES Engineering, Inc.
6330 Belmont Rd., Suite 4B
Downers Grove, IL 60516

23856 W. Andrew Rd., Unit 103, Plainfield, L 60585, Phone: (630) 780-5201, Fax: (630) 429-9099

NST NASHnal SOIL TESTING

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Mr. Ahsan Siddiqi **Date: 8-31-23R**
AMES Engineering, Inc.
6330 Belmont Rd., Suite 4B
Downers Grove, IL 60516

RE: Structural Geotechnical Exploration Report # 2 for
Cantilever Sign Structures
PTB 199 Item 16 (D-91-078-21)-Contract 62N39
Smart Corridor Implementation Plan to IL 56 (Butterfield Rd.)
From York Road (Station 2012+60) on the West end to Cicero Ave. (IL 50) (Station 2510+30) on the East End.

Dear Mr. Siddiqi:

NASHnal Soil Testing, LLC (NST) has completed the Section 2 of Geotechnical Exploration & Engineering services for the above referenced project. The scope of our services was outlined in the Geotechnical Scope of Work on PTB 199-Item 16.

We have enjoyed working with you on this phase of the project. Should you have any questions or if we can be of further assistance, please do not hesitate to contact us.

Sincerely,
NASHnal Soil Testing, LLC

Umar T. Ahmad, PE
Registered Professional Engineer, Illinois
Registration # 062-055148

UMAR T. AHMAD 062-055148 REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

Expires 11/30/2023

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Structural Geotechnical Exploration Report # 2 for
Cantilever Sign Structures
PTB 199 Item 16 (D-91-078-21)
Smart Corridor Implementation Plan to IL 56 (Butterfield Rd.)
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Contract 62N39

PROJECT NUMBER 2022-1264-01G

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INTRODUCTION

Our scope of this Phase II project for the Improvements to the smart Corridor is to provide geotechnical exploration services for the traffic signs improvements at two locations (Lot 401- & Lot 402) at Downers Grove and Hillside respectively.

At the time of our site visit, the topography of the site was relatively sloping towards the east with the maximum elevation difference of about 52 feet between our borings. Elevations of borings are marked on the boring logs as collected from the GPS coordinates and google earth.

To evaluate the subsurface soil profile, the client requested to drill two (2) soil borings extending to a depth 60 feet each below the existing grade (BEG) for the traffic signs. These borings were located at Station 2016+00.00-60'Rt at Lot 401 in Downers Grove and at station 2102+56.00-32 L at Lot 402 in Hillside.

Based upon our findings in this subsurface investigation, we believe that there are no major limiting geotechnical concerns for the traffic signs.

SCOPE OF SERVICES

The purpose of this report is to describe the soil and groundwater conditions encountered in our geotechnical exploration, review and evaluate these conditions with respect to the proposed project and present our recommendations for feasible methods for foundation support and earthwork design and construction. Our scope of services for this project, as outlined in our proposal, is limited to the following elements.

1. Our scope of work for this phase of drilling was to drill two (2) soil boring extending to a depth of 60 feet below the existing grade (BEG) for the traffic signs at Station 2016+00.00-60' R at Lot 401 in Downers Grove and at station 2102+56.00-32' L at Lot 402 in Hillside.

2. Laboratory testing of selected samples for index classification and strength purposes and visual/manual classification of all recovered samples.

3. Development of Geotechnical recommendations, and preparation of this report presenting our findings, evaluations, and recommendations.

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FIELD EXPLORATION PROCEDURES

A total of two (2) borings were drilled to a depth of 60 feet below the existing grade (BEG) for the traffic signs at the locations marked by the client. The drilled soil boring locations are shown on the enclosed Plates 2A & 2B (Boring Location Diagram). The client specified the number, depth, and the location of the borings.

The borings were drilled with a truck mounted CME drill rig, using hollow stem augers to advance the borehole. The soil sampling was performed in accordance with the split-barrel procedure (ASTM: D 1586) with an automatic hammer, and in-situ undisturbed samples were retrieved using a split spoon sampler. The crew prepared field logs noting the drilling and sampling methods along with Standard Penetration Test values (N-values, “blows per foot”), observed groundwater levels, and preliminary soil classifications. Representative samples of the recovered soils were placed in sealed jars to reduce moisture loss before being submitted to our laboratory for examination, testing, and final classification by a Geotechnical Engineer.

If present, groundwater levels in the boreholes were measured during and after drilling. The levels of any encountered water are noted on the respective logs. The observed groundwater levels are discussed under the “Groundwater Conditions” section of this report. The drill crew backfilled the boreholes with soil cuttings after completing the groundwater measurements.

LABORATORY TESTING AND CLASSIFICATION

A Geotechnical Engineer initiated the laboratory classification program by examining each sample to determine the major and minor components, while also noting the color, degree of saturation, and lenses or seams found in the samples. The Engineer directed that selected samples be tested for moisture content and unconfined compressive strength (by hand penetrometer). The test results are shown on the respective logs in the Appendix.

The Geotechnical Engineer visually/manually classified the soils based on texture and plasticity in accordance with the Unified Soil Classification System (USCS). The capital letters in parentheses following the written soil descriptions on the boring logs are estimated group symbols based on this system. A chart describing the properties of the groups under this system is also included in the Appendix. After the classification, the Geotechnical Engineer grouped the soils by type into the strata shown on the boring logs. The stratification lines shown are approximate, *in situ*, as the transition between soil types may be abrupt or gradual in both the horizontal and vertical directions.

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 encountered in the area of the proposed signs. The lab testing program included Moisture Content (AASHTO T-265), Atterberg Limits (AASHTO T-89/90), and Dry Unit Weight. The laboratory tests were performed in accordance with test procedures outlined in the IDOT Geotechnical Manual, and per ASTM and AASHTO requirements. Based on the laboratory test results, the soils encountered were classified according to the AASHTO and the Illinois Division of Highways (IDH) classification systems. The results of the laboratory testing program are shown along with the field test results in the **Soil Boring Logs** and in the **Laboratory Test Results.**

Soil samples will be retained for ninety (90) days after the date of this report. Please notify us if there is a desire to have the samples retained beyond this period; otherwise, the samples will be discarded.

SITE CONDITIONS

Topography/Surface Features

At the time of our site visit, the topography of the site was relatively sloping towards the east with the maximum elevation difference of about 52 feet between our borings. Elevations of borings are marked on the boring logs as collected from the GPS coordinates and google earth.

Soil Conditions

The soils encountered are shown on the borehole log in the Appendix of this report. The soil characteristics have been established only at the specific boring locations and under the environmental conditions at the time of our field exploration. Variations in the soil stratigraphy, compressive strength of the soil, and moisture content were encountered; and additional variations probably exist between and around the borings. The nature and extent of these variations would not become evident until exposed by construction excavation.

In general, underlying the surficial asphalt/concrete and stone fill soils, the site is predominately formed of stiff to hard lean clay, sand seams, and very stiff sandy clay. The soil profile described below is a generalized description of the conditions encountered at the boring location. The borehole log should be referred to for more specific information.

DMS at Lot 401-Downers Grove, Station 2016+00-60' RT:

In boring B-7, approximately 6 inches of asphalt (AS) and 6 inches of crushed concrete (CONC) were noted at the surface followed by brown LEAN CLAY FILL (A-6 FILL) to an approximate depth of 3.5 feet below BEG. Underlying the brown LEAN CLAY FILL (A-6 FILL), very stiff to hard, brown, and gray mottled LEAN CLAY (A-6) was encountered to an approximate depth of 11.0 feet BEG followed by hard to very stiff, gray LEAN CLAY (A-6) to an approximate depth of 48.5 feet BEG. Underlying the gray LEAN CLAY (A-6), medium dense crushed GRAVL (A-1-a) was encountered to an approximate depth of 53.5 feet BEG followed by dense SAND (A-3) to the boring termination depth of 60 feet BEG. No free groundwater was encountered during or after drilling.

DMS at Lot 402-Hillside, Station 2102+56.00-32' Left:

In boring B-8, approximately 3 inches of asphalt and concrete (AS/CON) was noted at the surface followed by a very stiff, dark brown LEAN CLAY TOPSOIL FILL (A-6-FILL) to an approximate depth of 3.5 feet below BEG. Underlying the dark brown LEAN CLAY TOPSOIL FILL (A-6-FILL), soft, brown and gray mottled LEAN CLAY (A-6) was encountered to an approximate depth of 6.0 feet BEG followed by very stiff, brown LEAN CLAY (A-6) to an approximate depth of 8.5 feet BEG. Underlying the brown LEAN CLAY (A-6), hard, brown, and gray LEAN CLAY (A-6) was encountered to an approximate depth of 11.0 feet BEG followed by soft to hard, gray LEAN CLAY (A-6) to an approximate depth of 23.5 feet BEG. Underlying the gray LEAN CLAY (A-6), wet, very dense, gray SANDY GRAVEL (A-1-a) was encountered to an approximate depth of 33.5 BEG followed by, very stiff to hard, gray LEAN CLAY (A-6) was encountered to an approximate depth of 48.5 BEG. Underlying the gray LEAN CLAY (A-6), extremely dense, wet, gray GRAVELLY SAND (A-1-b) to the boring termination depth of 60 feet BEG. Free groundwater was encountered at 6 feet BEG during drilling. No free groundwater was after drilling.

The soft to hard consistency of lean clay was exhibited with the values of 0.25 ton per square foot (tsf) to 7.01 tsf when tested by calibrated pocket penetrometer resistance (PPR) and calibrated RiMac Soil Tester. Natural moisture content in lean clayey soils was tested to be ranging from 9.5 to 27.1 percent.

Groundwater Conditions

Groundwater level observations were made during and upon completion of drilling. Free groundwater was encountered at 6 feet BEG during drilling at B-8. No groundwater was encountered after drilling at all borings.

It should be noted that groundwater levels are subject to seasonal and long-term variations in response to climatic conditions and man-made influences. Groundwater levels particularly in less permeable cohesive soils (clay) like those found at the site occasionally, may not have had adequate time to stabilize prior to backfilling the boreholes. The hydrostatic groundwater level and any perched water levels will vary in elevation seasonally and annually depending on local amounts of precipitation, evaporation, surface-runoff, infiltration, and land use. If detailed information about the groundwater levels is required, we recommend installing piezometers or monitoring wells to permit long-term observation of the groundwater levels and the fluctuations in these levels.

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Brown and gray coloration is typically an indication of a semi-permanent groundwater table. The brown and gray coloration of clay soils is indicative of oxidation whereas the gray coloration is indicative of a lack of oxidation which tends to occur below the lowest level of groundwater.

REVIEW AND RECOMMENDATIONS

Discussion

Based upon our analysis of the soil conditions, limited geotechnical laboratory analysis, and the available project information, the following recommendations were developed. If the project characteristics are changed from those assumed herein, our recommendations should be reviewed to see whether any modifications are needed. The soil conditions that were found will permit the use of this area for the proposed construction with recommended upgrading of the existing soils where needed.

Seismic Parameters

The seismic exposure for the site is analyzed per the IDOT Geotechnical Manual, IDOT Bridge Design Manual, and Specifications.

The Seismic Soil Site Class was determined per the requirements of All Geotechnical Manual Users (AGMU) Memo 9.1, Design Guide for Seismic Site Class Determination, and the "Seismic Site Class Determination" Excel spreadsheet provided by IDOT. A global Site Class Definition was determined for this project, and was found to be Soil Site Class C. The Seismic Performance Zone (SPZ) was determined using Figure 2.3.10-3 in the IDOT Bridge Manual and was found to be Seismic Performance Zone 1.

The AASHTO Seismic Design Parameters program was used to determine the peak ground acceleration coefficient (PGA), and the short (S_{DS}) and long (S_{D1}) period design spectral acceleration coefficients for each of the proposed structures. For this section of the project, the S_{DS} and the S_{D1} were determined using AASHTO Guide Specifications as shown in Table 2. Given the site location and materials encountered, the potential for liquefaction is minimal.

Seismic Parameters

Building Code Reference	PGA	SDS	SD1
AASHTO Guide for LRFD Seismic Bridge Design	0.058g	0.127g	0.069g

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Soil Parameters

The Geotechnical Engineer determined the geotechnical parameters to be used for the project design based on the results of field and laboratory test data on individual boring logs as well as our experience. Unit weights, friction angles and shear strength parameters were estimated using corrected standard penetration test (SPT) results using published correlations for N values for the fill and cohesionless soils and in-situ and laboratory test results for cohesive soils. The SPT values were corrected for hammer efficiency. The hammer efficiency correction factor considers the use of a safety hammer system, generally estimated to be 60% efficient. Thus, correlations should be based upon what is currently termed as N60 data. The efficiency of the automatic hammer used for this exploration was estimated to be approximately 100% based on previous efficiency testing of the drill rigs equipped with such equipment. The correction for hammer efficiency is a direct ratio of relative efficiencies as follows:

$$N60 = N * (91/60)$$

* Where the N value is the field recorded blow counts.

Site Preparation

Prior to any construction, soils within the proposed sign foundations (if found unsuitable) should be upgraded/undercut to carry the design loads. All existing topsoil and/or any other unsuitable fill materials should be removed below the footings. Voids created in doing this should be backfilled with select compacted granular fill. All existing utilities/structures (if encountered) should also be properly removed, and trenches should be backfilled with compacted granular fill.

The exposed, naturally occurring subgrade soil should be observed and tested by a Geotechnical Engineer or an experienced Materials Technician from an engineering office to identify the unsuitable soils if present. The subgrade soil should be carefully observed, and any unsuitable or unstable materials should be removed from the pavement subgrade areas. If perched water is encountered or if rain or snowfall occurs, dewatering may be required in these areas when exposed or if subjected to any other form of water infiltration that would saturate the area.

To backfill the over-excavated areas if any under the foundation, we recommend using imported granular material meeting the gradation requirements of IDOT CA-6. Clayey soils can also be used as backfill; however, it is difficult to compact clayey soils in the narrow trenches to achieve the project specifications.

Granular fill meeting IDT CA-6 gradation requirements should be placed in 8 to 10-inch loose lifts and compacted to at least 95% of the maximum Modified Proctor dry density (ASTM: D 1557). If used, clayey materials should be placed in 6 to 8-inch loose lifts and compacted to at least 95% of the maximum Modified Proctor dry density (ASTM: D 1557) or 98% of the maximum Standard Proctor dry density (ASTM: D 698). Please refer to the notes in the report Appendix concerning placement of compacted fill soils.

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Sign Foundation Support

It is our understanding that two (2) cantilever traffic sign structures will be installed at two locations within the project limit. It is understood that all the proposed foundation designs will adhere to the requirements of the OSC-S-9 of the IDOT Sign Structure Manual. The foundation diameters range from 36 to 42 inches, and the depths range from 17 to 33.5 feet. The geotechnical criteria for use of the standard foundation details specify that the foundation shaft length and diameter should be designed based the mast arm length, cantilever length/weight, soil composition and average strength. The criteria for the application of the standard detail states that the foundations only apply to sites which have cohesive soils along the length of the shaft with an average unconfined compressive strength (Qu) greater than 1.25 tsf. If the soils encountered during drilling the foundation excavation fail to meet the requirement of the standard details, the district geotechnical engineer should be contacted to determine if a revised foundation design will be required.

Based on the soil exploration and testing program, asphalt and crushed aggregate material was found within the upper 1 foot of soil in both borings within the frost penetration depth. The lateral resistance of the upper 3.5 feet of soils in the frost penetration zone should be neglected in design. Due to the presence of predominately high strength cohesive soils within the borings, the foundation standards should still be applied for each traffic sign location.

Many references can be found in the IDOT Sign Manual that require Dynamic Message Sign (DMS) boards to be a Type III-A span type or alternative sign structures. It is the designer's responsibility to ensure that the restrictions for the sign type are met. If the sign panel and/or sign structure type are changed in the future, the designer should provide this information to the geotechnical design lead to determine if any changes to the structure foundation will be required.

The soils information shown in boring logs should be used to verify foundations for each traffic sign (Lot 401-Downers Grove/B-7 & LOT 402-Hillside/B-8). Soils must be visually inspected at each location to match those identified in the boring logs; if different soils are encountered during construction the engineer must be notified to provide revised parameters. Both borings contain predominately cohesive material with intermittent layers of lean and sandy materials.

Based on the soils encountered in the borings, and the information in the IDOT Sign Manual, the foundations for the sign structures may be designed using the standard details. If a special design is required, the design soil parameters for each of the traffic sign locations should reference the Boring B-7 for Lot 401-Downers Grove sign structure & Boring B-8 for Lot 402-Hillside sign structure. If the soils encountered during the foundation excavation fail to meet the requirements of the standard detail, then the District Geotechnical Engineer should be contacted to determine if a revised foundation design is required.

Drilled shafts for the proposed traffic sign structure are normally loaded laterally by wind forces and cantilever load. The ability of the shaft to resist these loads is dependent on the size of the shaft diameter and the passive pressures that develop in the soils along the shaft. Lateral loads on the drilled shafts should be analyzed for the maximum moments and lateral deflections. Software such as L-Pile and COM624 are normally used to determine the required shaft depth to resist the lateral loads, and the actual maximum moment and the anticipated shaft deflection. If the shaft deflection is excessive or if the embedment is inadequate to provide support, the shaft embedment could be increased to help address these issues. The shaft diameter should be increased if the deflection or the maximum moment is higher than the shaft designed resistance.

CONSTRUCTION CONSIDERATIONS

All work performed for the proposed project should conform to the requirements in the IDOT Standard Specifications for Road and Bridge Construction. Any variation from the IDOT manuals requirements should be approved by the design engineer.

The Drilled Shaft (Caisson) Construction:

The drilled shaft (caisson) construction should be completed in accordance with IDOT Standard Specification for Road and Bridge Construction, drilled shaft Section 516. The temporary casing construction method should be applied where sandy, lean or granular material is present within the proposed shaft depth. The temporary casing may be required to prevent caving or excessive deformation of the hole, especially in the areas where silt is encountered. Drilled shaft construction with the use of a temporary casing should be completed in accordance with article 516.06 (c) in the IDOT Standard Specification for Road and Bridge Construction.

Temporary casing is not anticipated due to the nature of lean clay encountered at 401-Downers Grove or Lot 402-Hillside sign foundations; however, contractor is advised to carry at least 15 feet of temporary casing during construction of both sign foundations. A permanent casing covering the entire shaft length is recommended for both foundations.

It is recommended that the concrete be ready on site as the caisson excavation is completed, so that the concrete can be placed immediately after completing the excavation. This diminishes the potential of water buildup in the bottom of the shaft if encountered. Bottom cleanliness of the drilled shaft excavation should be observed from the ground surface with the use of flood light or down-hole camera. Workers should not enter the shaft to manually clean the base of the shaft due to safety reasons.

Groundwater

Based on the conditions found in the borings, groundwater is expected during the excavation for the caisson foundation or during the soil improvement process at B-8 (402-Hillside) location. Any water, if encountered, should be removed from the caisson's bottom prior to placing any concrete.

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The placement method of concrete for the caisson should be based on the amount of water present at the base of the shaft just prior to placing the concrete. Concrete can be placed using the free fall method, provided less than 2 inches of water is present at the base of the shaft at the time the concrete is being placed. If more than 2 inches of water is present, a tremie should be used to displace the water to the surface for removal.

Structural fill should not be placed in standing water or on wet or disturbed soils. Placing fill, asphalt, or concrete into standing water or over disturbed soil can trap softened soil under the structure and lead to excessive post-construction settlement/cracking & rutting, even if the softened zone is only a few inches thick.

Equipment Selection/Soil Disturbance

The soil types at this site, particularly the lean clays when they are saturated or during freeze/thaw conditions, could be disturbed by construction equipment. It is the contractor's responsibility to choose equipment and work procedures, which will not unduly disturb the subgrade soils in the construction and landscaped areas. The contractor should also route construction traffic away from areas of planned pavement and slabs, to minimize soil disturbance.

If the equipment that is chosen causes rutting or pumping of the soils, it is the contractor's responsibility to switch to other types of equipment. The responsibility to properly select construction equipment to avoid disturbing soils on the site lies solely with the contractor. A note to this effect should be included in the project specifications.

Winter Construction

If the construction of this project begins or extends into the winter, the contractors must take special precautions. Only unfrozen fill and backfill should be used, and contractors may charge extra for importing unfrozen soil or keeping stockpiles of backfill from freezing. Clay soils will be especially difficult to work with under cold wet and/or freezing conditions. Placement of fill and/or asphalt/concrete must not be permitted on frozen soil, and the bearing soils or subgrade should not be allowed to freeze after the concrete is placed. All footing excavations should be protected from freezing conditions and maintained free of ponded water before asphalt/concrete placement. The footings should be cast as soon as possible after excavation is prepared and backfilled as soon as possible after the concrete has attained its strength.

Construction Safety

All excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P "Excavations and Trenches." This document states that excavation safety is solely the responsibility of the contractor; the determination of SAFE slopes for excavation and trenches is to be made by the contractor's "competent person." Reference to this OSHA requirement should be included in the job specifications. The temporary excavation slopes greater than 5 feet in depth should conform to OSHA regulations. In general, such slopes should not be steeper than 1.5 horizontal to 1 vertical (OSHA Soil Type C), unless shoring is used.

The responsibility to provide safe working conditions on this site for earthwork, construction, or any associated operations, is not borne in any manner by NASHnal Soil Testing, LLC.

Field Observation and Testing

Proper observation and testing during the construction phase of this project is an integral part of our recommendations. On-site observation during site preparation, fill placement, compaction, and footing construction, should be done by qualified personnel from IDOT/ IDOT representative or **OUR** office. Exposed soils in excavations for backfill should be tested by means of hand auguring, and with a Dynamic Cone Penetrometer (DCP) in sandy soils or a Static Cone Penetrometer (SCP) in clayey soils. Soils from the bottom of caisson should be inspected and tested by IDOT approved methods on site such as by using RiMac.

The proposed fill materials should be submitted to an IDOT approved lab for Proctor compaction tests, and tests to check compliance with our recommendations and project specifications. A representative number of field density tests should be taken in compacted fill to aid in judging its suitability. The building materials should be tested in accordance with the project specifications. We would be pleased to provide the testing services for this project.

GENERAL QUALIFICATIONS

This report has been prepared based on the soil and groundwater conditions found in our borings and on the design data that you have related to us. This report is intended solely for this project at the specific locations identified in the Introduction and Scope of Services. If there are any changes in size, scope, elevation, structural loads, location, use or nature of the structure from those discussed in the introduction of this report, or if our understanding of the project is incorrect or incomplete, we should be given the opportunity to review or modify our recommendations. If changes are made in the design and we are not given the opportunity to review these changes relative to our recommendations and to respond in writing, or we are not provided the opportunity to confirm the soil conditions are as expressed in this report during the construction of this project, our recommendations will not be considered valid. No specific efforts were performed to determine the thickness of the topsoil layer, the topsoil thickness given in our logs is an estimate. If the true thickness of topsoil is required, we recommend that numerous detailed hand augur probes be performed throughout this parcel.

For this geotechnical exploration, we drilled two (2) soil borings the specified areas. Variations in the subsurface conditions may be found during construction, and it is probable that additional variations exist on the site that cannot be determined from our boring or the site reconnaissance. These variations, which could include greater or shallower depths of unsuitable soils than found at our borings, would not become apparent until the excavation is started. No warranty, express or implied, is presented in this report with respect to the soil and groundwater conditions on this site.

STANDARD OF CARE

The recommendations and opinions contained in this report are based on our interpretation of the subsurface conditions and represent our professional judgment. These judgments were determined in accordance with currently accepted engineering practices at this time and location, by professionals working under similar time and budget constraints. No other warranty is implied or intended.

Prepared by:

Umar T. Ahmad, PE
Registered Professional Engineer, Illinois
Registration # 062-055148 - Expires 11/30/2023

UMAR T. AHMAD
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PROFESSIONAL
ENGINEER
OF
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APPENDIX

SITE LOCATION DIAGRAM (Plate No. 1)

BORING LOCATION DIAGRAMS (Plates No. 2A & 2B)

BORING LOGS (Plate No. 3 to 6)

ATTERBERG LIMITS

KEY TO TEST DATA

CLASSIFICATION OF SOILS

NOTES ON PLACEMENT OF COMPACTED FILL

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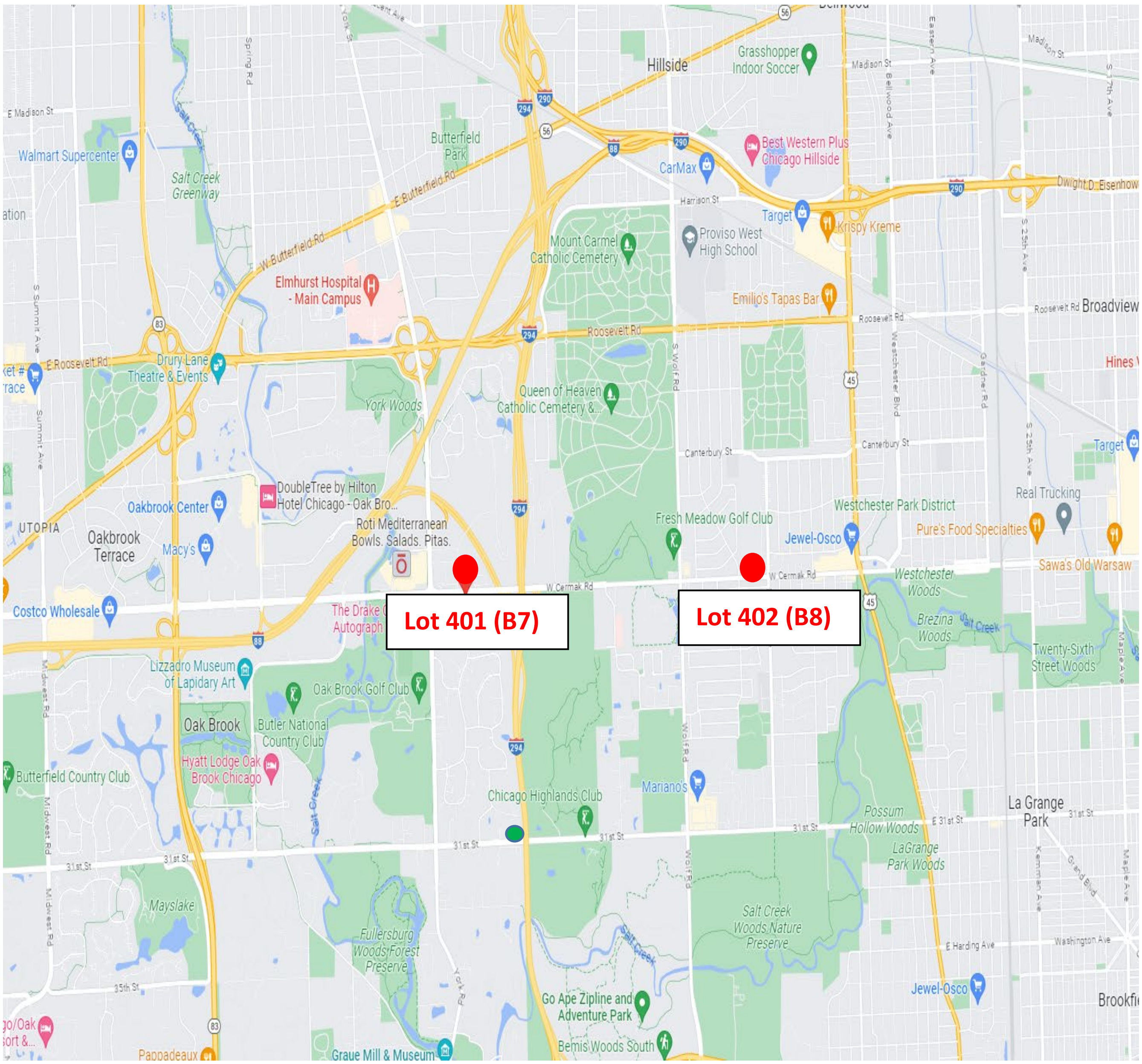
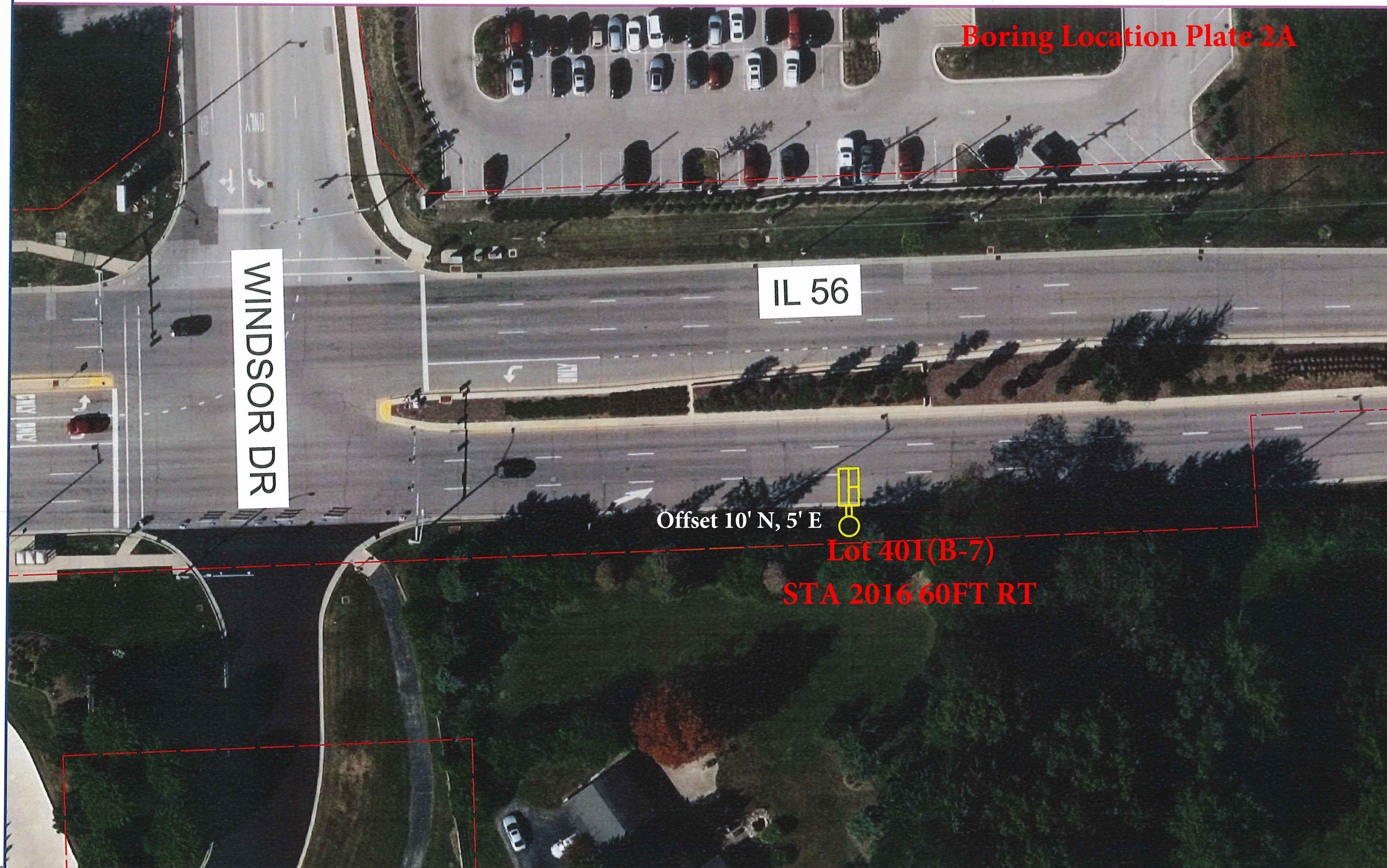


2022-1264-01G

Plate No. 1

PTB 199 Item 16 (D-91-078-21)
Smart Corridor Implementation Plan to IL 56
From IL 59 to IL-50 (Cicero Ave.)
Site Location Diagram for B7 & B8



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	DRAWN -	REVISED -		
PLOT SCALE = $SCALE$	CHECKED -	REVISED -		
PLOT DATE = $DATE$	DATE -	REVISED -		SCALE: SHEET OF 1 SHEETS STA. TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
ROUTE	Section			1
		CONTRACT NO.		
	ILLINOIS	FED. AID PROJECT		

MODEL: $MODELNAME$
FILE NAME: $FILE$

Long Section Number

STA 2016 60FT RT

MODEL: $MODELNAME$
FILE NAME: $FILES$

USER NAME = $USER$	DESIGNED -	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	IL 56 FROM IL 59 TO IL 50 DMS LOCATION 7	F.A.#### RTE. ####	SECTION Section	COUNTY
	DRAWN -	REVISED -					TOTAL SHEETS
PLOT SCALE = $SCALE$	CHECKED -	REVISED -		SCALE: SHEET OF SHEETS STA. TO STA.		CONTRACT NO. ####	SHEET NO. DMS 7
PLOT DATE = $DATE$	DATE -	REVISED -			ILLINOIS	FED. AID PROJECT	

Long Section Number

STA 2102+56 32 FT LT

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BOREHOLE LOG

Number	B-8
Plate # 5	
Client	IDOT
Location	Location 402@ Hillside, STA 2102+56-32' LT (41.8484333, -87.8936861)
Job Number	2022-1264-01T (D-91-078-21)
Drill Rig Type	Geoprobe 7822 DT
Sampler Type	Split Spoon (SS)
Boring Location	See Plate 2-Offset 10' South
Boring Elevation (ft)	639.00
Date:	3/28/2023

Sample # /RUN #	Sampling Method	Rimac Qu (tsf)	Sample Recovery (in)/%	Moisture Content (%)	SPT Values (Blows/6 in)	Depth (ft)	Graphic	Soil Description	Elevation (ft)
						0.5	AS	**6 Inches of Asphalt**	638.50
						1.0	CONC	**6 Inches of Concrete**	638.00
						1.5			637.50
1	SS	2.00	4	23.9	2,2,2	2.0		**Dark Brown Lean Clay Topsoil FILL (A-6-l**	637.00
						2.5	A-6 FILL	Trace Sand and Gravel	636.50
						3.0		Very Stiff	636.00
						3.5			635.50
						4.0			635.00
2	SS	0.25	12	27.1	1,1,2	4.5		**Brown and Gray mottled Lean Clay(A-6)**	634.50
						5.0	A-5	with Clay, Soft	634.00
						5.5		**Unit Weight 96.2 pcf**	633.50
						6.0		**WL-WD**	633.00
						6.5			632.50
3	SS	3.51	14	22.5	4,6,6	7.0		**Brown Lean Clay (A-6)**	632.00
						7.5	A6	Trace Sand and Gravel, Very Stiff	631.50
						8.0		**Unit Weight 109.3 pcf**	631.00
						8.5			630.50
						9.0			630.00
4	SS	7.01	20	19.3	5,7,11	9.5		**Brown and Gray Lean Clay (A-6)**	629.50
						10.0	A-6	Trace Sand and Gravel, Hard	629.00
						10.5		**Unit Weight 106.2 pcf**	628.50
						11.0			628.00
						11.5		**Gray Lean Clay (A-6)**	627.50
5	SS	0.25	4	26.1	5,5,6	12.0		Trace Sand and Gravel , Soft	627.00
						12.5		Wet	626.50
						13.0			626.00
						13.5			625.50
						14.0			625.00
6	SS	4.12	20	16.6	4,6,8	14.5		Hard	624.50
						15.0		**Unit Weight 120.1 pcf**	624.00
						15.5			623.50
						16.0			623.00
						16.5			622.50
7	SS	2.89	12	13.0	2,6,6	17.0		Hard	622.00
						17.5	A-6	**Unit Weight 123.4 pcf**	621.50
						18.0			621.00
						18.5			620.50
						19.0			620.00
8	SS	2.50	12	13.9	3,6,8	19.5		Very Stiff	619.50
						20.0		**Unit Weight 133.0 pcf**	619.00
						20.5			618.50
						21.0			618.00
						21.5			617.50
9	SS	6.60	10	17.3	6,9,14	22.0		Hard	617.00
						22.5		**Unit Weight 119.1 pcf**	616.50
						23.0			616.00
						23.5			615.50
						24.0			615.00
10	SS	N/A	2	23.3	9,12,38	24.5		**Gray Sandy Gravel (A-1-a)**	614.50
						25.0		Trace Clay	614.00
						25.5		Wet, Very Dense	613.50
						26.0			613.00
						26.5			612.50
11	SS	N/A	2	26.5	9,10,15	27.0	A-1-a		612.00
						27.5		Saturated	611.50
						28.0		Medium Dense	611.00
						28.5			610.50
						29.0			610.00
12	SS	N/A	3	25	11,20,17	29.5		Wet	609.50
						30.0		Dense	609.00

End of Boring 60'

Water Level While Drilling : 6'

Water Level After Drilling : Dry

Cave In Depth : None

Note: Soil group symbol and group name are determined based on visual classification. Plasticity index and liquid limit were estimated using ASTM D2488 due to insufficient material availability

BOREHOLE LOG

NST NASHnal SOIL TESTING

23856 W. Andrew Rd., Unit 103, Plainfield

Number	B-8
	Plate # 6
Client	IDOT
Location	Location 402@ Hillside, STA 2102+56-32' LT (41.8484333, -87.8936861)
Job Number	2022-1264-01T (D-91-078-21)
Drill Rig Type	Geoprobe 7822 DT
Sampler Type	Split Spoon (SS)
Boring Location	See Plate 2-Offset 10' South
Boring Elevation (ft)	639.00 **Date:** 3/28/2023

Sample # /RUN #	Sampling Method	Rimac Qu (tsf)	Sample Recovery (in)/%	Moisture Content (%)	SPT Values (Blows/6 in)	Depth (ft)	Sample Depth	Graphic	Soil Description	Elevation (ft)
						30.5			**Gray Sandy Gravel (A-1-a)**	608.50
						31.0			Wet	608.00
						31.5				607.50
						32.0		A-1-a		607.00
						32.5				606.50
						33.0				606.00
						33.5				605.50
						34.0				605.00
13	SS	3.92	14	20.1	8,7,7	34.5			**Gray Lean Clay (A-6)**	604.50
						35.0			Trace Sand and Gravel, Very Stiff	604.00
						35.5			**Unit Weight 114.6 pcf**	603.50
						36.0				603.00
						36.5				602.50
						37.0				602.00
						37.5				601.50
						38.0				601.00
						38.5				600.50
14	SS	5.36	20	17.2	4,7,11	39.0				600.00
						39.5			**Gray LeanClay (A-6)**	599.50
						40.0			Trace Clay, Hard	599.00
						40.5			Wet	598.50
						41.0		A-6		598.00
						41.5				597.50
						42.0				597.00
						42.5				596.50
						43.0				596.00
						43.5				595.50
						44.0				595.00
15	SS	4.25	24	14.8	7,6,17	44.5			Hard	594.50
						45.0				594.00
						45.5				593.50
						46.0				593.00
						46.5				592.50
						47.0				592.00
						47.5				591.50
						48.0				591.00
						48.5				590.50
						49.0				590.00
16	SS	N/A	21	N/A	50+	49.5			**Gray Gravelly Sand (A-1-b)**	589.50
						50.0			Extreamly Dense	589.00
						50.5			Wet	588.50
						51.0				588.00
						51.5				587.50
						52.0				587.00
						52.5				586.50
						53.0				586.00
						53.5				585.50
						54.0				585.00
17	SS	N/A	12	N/A	32,14,42	54.5		A-1-b	Extreamly Dense	584.50
						55.0			Wet	584.00
						55.5				583.50
						56.0				583.00
						56.5				582.50
						57.0				582.00
						57.5				581.50
						58.0				581.00
						58.5				580.50
						59.0				580.00
18	SS	N/A	2	N/A	50+	59.5			Extreamly Dense	579.50
						60.0			Wet	579.00

End of Boring 60'
Water Level While Drilling : 6'
Water Level After Drilling : Dry
Cave In Depth : None
Note: Soil group symbol and group name are determined based on visual classification. Plasticity index and liquid limit were estimated using ASTM D2488 due to insufficient material availability

NST NASHnal SOIL TESTING

23856 W. Andrew Rd., Unit 103, Plainfield

BOREHOLE LOG

Number **B-7**

Plate # 3

Client	IDOT
Location	Location 401@ Downers Grove, STA 2016+00-60' RT (41.8473222,-87.9253917)
Job Number	2022-1264-01T (D-91-078-21)
Drill Rig Type	Geoprobe 7822 DT
Sampler Type	Split Spoon (SS)
Boring Location	See Plate 2-Offset 10' N, 5, E
Boring Elevation (ft)	691.00 **Date:** 3/27/2023

Sample # /RUN #	Sampling Method	Rimac Qu (tsf)	Sample Recovery (in)/%	Moisture Content (%)	SPT Values (Blows/6 in)	Depth (ft)	Graphic	Soil Description	Elevation (ft)
						0.5	AS	**6 Inches of Asphalt**	690.50
						1.0	CONC	**6 Inches of Concrete**	690.00
						1.5		**Brown Lean Clay Fill (A-6 FILL)**	689.50
1	SS	4.50	6	11.2	9,6,6	2.0		Trace Sand and Crushed Concrete	689.00
						2.5	A-6 FILL	Hard	688.50
						3.0			688.00
						3.5			687.50
						4.0		**Brown and Gray Mottled Lean Clay (A-6L)**	687.00
2	SS	3.09	10	21.3	3,3,6	4.5		Trace Sand and Gravel, Very Stiff	686.50
						5.0		**Unit Weight 112.2 pcf**	686.00
						5.5			685.50
						6.0			684.50
						6.5			#REF!
3	SS	7.01	14	17.2	7,10,14	7.0		Hard	684.00
						7.5	A-6	**Unit Weight 114.0 pcf**	683.50
						8.0			683.00
						8.5			682.50
						9.0			682.00
4	SS	5.98	20	17.8	6,8,11	9.5		Hard	681.50
						10.0		**Unit Weight 111.9 pcf**	681.00
						10.5			680.50
						11.0			680.00
						11.5			679.50
5	SS	4.33	14	17.6	4,5,8	12.0		**Gray Lean Clay (A-6)**	679.00
						12.5		Trace Sand and Gravel, Hard	678.50
						13.0		**Unit Weight 122.8 pcf**	678.00
						13.5			677.50
						14.0			677.00
6	SS	3.30	14	18.6	3,4,7	14.5		Very Stiff	676.50
						15.0		**Unit Weight 116.9 pcf**	676.00
						15.5			675.50
						16.0			675.00
						16.5			674.50
7	SS	2.68	20	19.0	3,4,6	17.0		Very Stiff	674.00
						17.5		**Unit Weight 119.2 pcf**	673.50
						18.0			673.00
						18.5			672.50
						19.0			672.00
8	SS	2.06	12	17.7	3,4,6	19.5		Very Stiff	671.50
						20.0		**Unit Weight 120.0 pcf**	671.00
						20.5	A-6		670.50
						21.0			670.00
						21.5			669.50
9	SS	2.68	22	19.8	3,5,6	22.0		Very Stiff	669.00
						22.5		**Unit Weight 118.7 pcf**	668.50
						23.0			668.00
						23.5			667.50
						24.0			667.00
10	SS	1.00	5	23.6	3,5,6	24.5		**Gray Lean Clay (CL)**	666.50
						25.0		Trace Sand and Gravel, Stiff , Wet	666.00
						25.5		**Unit Weight 115.5 pcf**	665.50
						26.0			665.00
						26.5			664.50
11	SS	2.89	22	21.0	3,4,6	27.0		Very Stiff	664.00
						27.5		**Unit Weight 111.7 pcf**	663.50
						28.0			663.00
						28.5			662.50
						29.0			662.00
12	SS	3.09	20	20.8	3,4,6	29.5		Very Stiff	661.50
						30.0		**Unit Weight 114.7 pcf**	661.00

End of Boring 60'

Water Level While Drilling : Dry

Water Level After Drilling : Dry

Cave In Depth : None

Note: Soil group symbol and group name are determined based on visual classification. Plasticity index and liquid limit were estimated using ASTM D2488 due to insufficient material availability

NASHnal SOIL TESTING

23856 W. Andrew Rd., Unit 103, Plainfield

BOREHOLE LOG

Number	B-7
Plate # 4	
Client	IDOT
Location	Location 401@ Downers Grove, STA 2016+00-60' RT (41.8473222,-87.9253917)
Job Number	2022-1264-01T (D-91-078-21)
Drill Rig Type	Geoprobe 7822 DT
Sampler Type	Split Spoon (SS)
Boring Location	See Plate 2-Offset 10'N 5' E
Boring Elevation (ft)	691.00
Date:	9/9/2022

Sample # /RUN #	Sampling Method	Rimac Qu (tsf)	Sample Recovery (in)/%	Moisture Content (%)	SPT Values (Blows/6 in)	Depth (ft)	Graphic	Soil Description	Elevation (ft)
						30.5			660.50
						31.0			660.00
						31.5			659.50
						32.0			659.00
						32.5			658.50
						33.0			658.00
						33.5			657.50
						34.0			657.00
13	SS	3.09	14	18.9	4,5,7	34.5		**Gray Lean Clay (A-6)**	656.50
						35.0		Trace Sand and Gravel, Very Stiff	656.00
						35.5		**Unit Weight 112.9 pcf**	655.50
						36.0			655.00
						36.5			654.50
						37.0			654.00
						37.5			653.50
						38.0			653.00
						38.5			652.50
14	SS	3.09	14	20.1	4,6,6	39.0			652.00
						39.5	A-6	Very Stiff	651.50
						40.0		**Unit Weight 115.3 pcf**	651.00
						40.5			650.50
						41.0			650.00
						41.5			649.50
						42.0			649.00
						42.5			648.50
						43.0			648.00
						43.5			647.50
						44.0			647.00
15	SS	2.50	8	9.5	4,6,6	44.5		Vey Stiff	646.50
						45.0		**Unit Weight 117.6 pcf**	646.00
						45.5			645.50
						46.0			645.00
						46.5			644.50
						47.0			644.00
						47.5			643.50
						48.0			643.00
						48.5			642.50
						49.0			642.00
16	SS	N/A	10	14.0	11,12,16	49.5		**Crushed Gravel (A-1-b)**	641.50
						50.0		No Recovery	641.00
						50.5		Medium Dense	640.50
						51.0	A-1-a		640.00
						51.5			639.50
						52.0			639.00
						52.5			638.50
						53.0			638.00
						53.5			637.50
						54.0			637.00
17	SS	N/A	14	18.7	18,20,21	54.5		**Gray Sand (A-3)**	636.50
						55.0		Trace Silt, Dense	636.00
						55.5			635.50
						56.0			635.00
						56.5			634.50
						57.0	A-3		634.00
						57.5			633.50
						58.0			633.00
						58.5			632.50
						59.0			632.00
18	SS	N/A	6	11.8	30,16,17	59.5		Dense	631.50
						60.0			631.00

End of Boring 60'

Water Level While Drilling : Dry

Water Level After Drilling : Dry

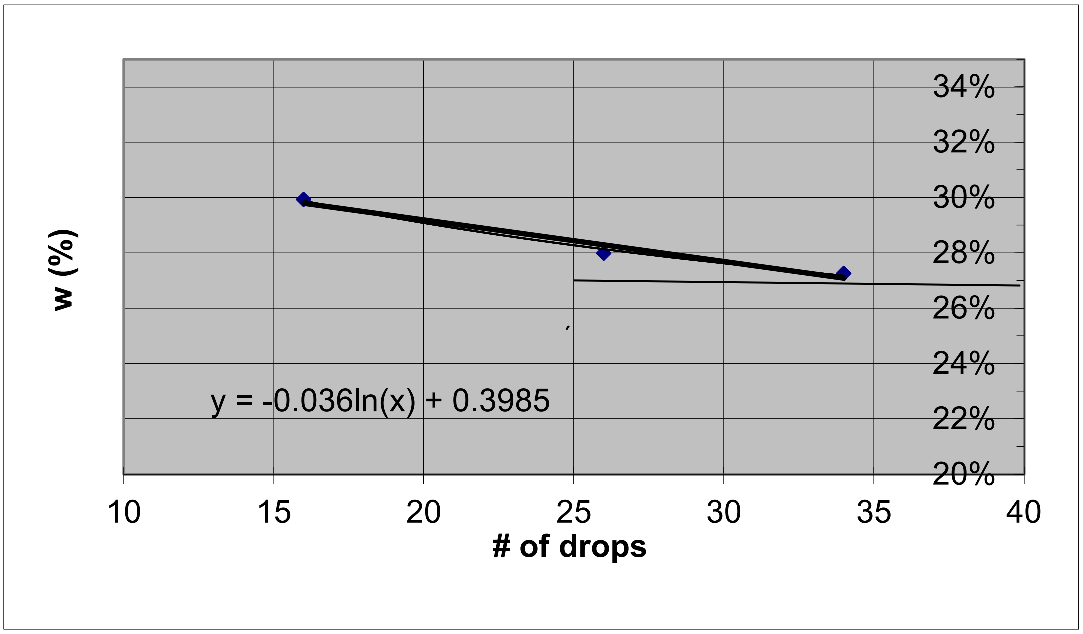
Cave In Depth : None

Note: Soil group symbol and group name are determined based on visual classification. Plasticity index and liquid limit were estimated using ASTM D2488 due to insufficient material availability

ATTERBERG LIMITS (ASTM D 4318-2017; E2018)

Date Tested: 4/11/2023
Project: PTB-199-16 Smart Corridor Implementation Plan to IL 56
Description of Soil: Gray Lean Clay (CL)
Sample# S-10 (23.5'-25')

# of drops =	26	34	16	
container No.	1	2	3	
container Wt	11.064	11.518	11.228	g
container + wet sample =	24.489	26.573	25.215	g
container + dry sample =	21.553	23.348	21.993	g
dry sample (Mdry) =	10.489	11.830	10.765	g
Water content (w) =	28.0%	27.3%	29.9%	%



LL = 28.3%

container No.	P441	P003
container Wt	11.351	11.206
container + wet sample =	20.904	20.828
container + dry sample =	19.588	19.493
dry sample (Mdry) =	8.237	8.287
Water content (w) =	16.0%	16.1%

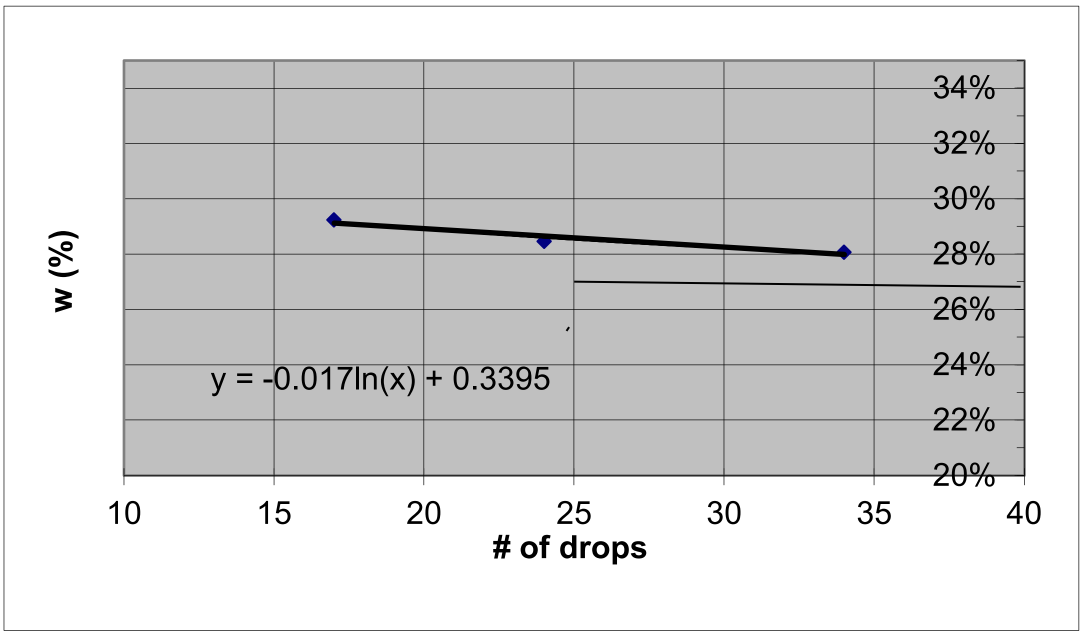
Average
PL = 16.0%

PI = LL - PL = 12.2%

ATTERBERG LIMITS (ASTM D 4318-2017; E2018)

Date Tested: 4/11/2023
Project: PTB-199-16 Smart Corridor Implementation Plan to IL 56
Description of Soil: Brown and Gray Mottled Lean Clay (CL)
Sample# S-2 (3.5'-5')

# of drops =	24	34	17	
container No.	1	2	3	
container Wt	11.145	10.010	11.435	g
container + wet sample =	26.066	26.249	29.125	g
container + dry sample =	22.760	22.690	25.123	g
dry sample (Mdry) =	11.615	12.680	13.688	g
Water content (w) =	28.5%	28.1%	29.2%	%



LL = 28.5%

container No.	P51D	P778
container Wt	10.996	11.291
container + wet sample =	20.418	22.022
container + dry sample =	18.882	20.254
dry sample (Mdry) =	7.886	8.963
Water content (w) =	19.5%	19.7%

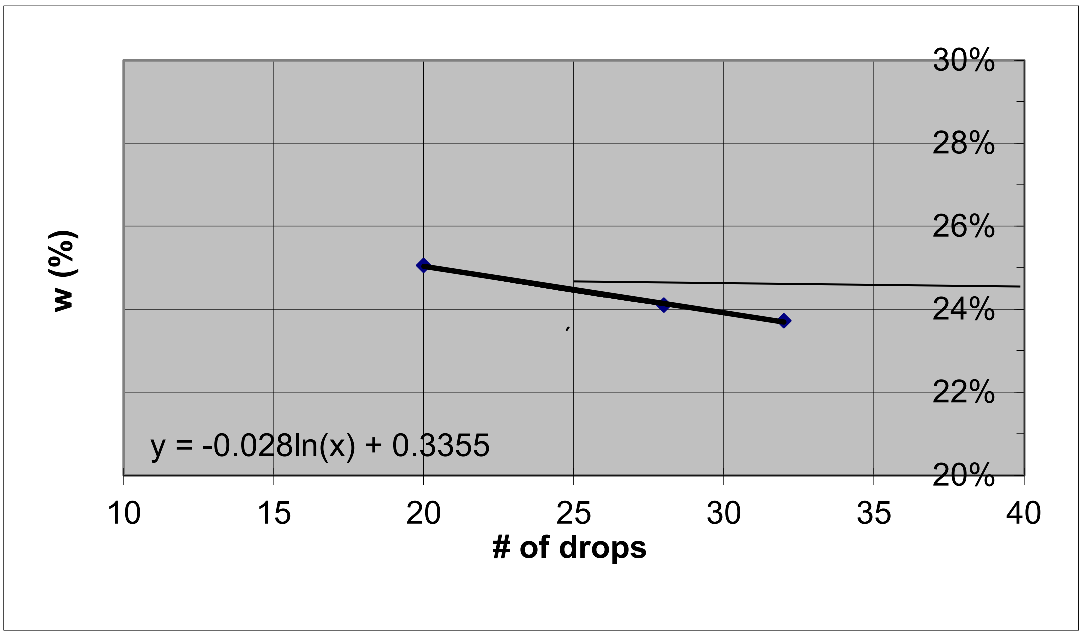
Average
PL = 19.6%

PI = LL - PL = 8.9%

ATTERBERG LIMITS (ASTM D 4318-2017; E2018)

Date Tested: 4/11/2023
Project: PTB-199-16 Smart Corridor Implementation Plan to IL 56
Description of Soil: Gray Lean Clay (CL)
Sample# S-13 (33.5'-35')

# of drops =	32	28	20	
container No.	1	2	3	
container Wt	11.246	11.259	11.155	g
container + wet sample =	27.477	27.632	24.692	g
container + dry sample =	24.365	24.453	21.980	g
dry sample (Mdry) =	13.119	13.194	10.825	g
Water content (w) =	23.7%	24.1%	25.1%	%



LL = 24.4%

container No.	P26	P17
container Wt	11.330	11.240
container + wet sample =	22.354	21.278
container + dry sample =	20.825	19.874
dry sample (Mdry) =	9.495	8.634
Water content (w) =	16.1%	16.3%

Average
PL = 16.2%

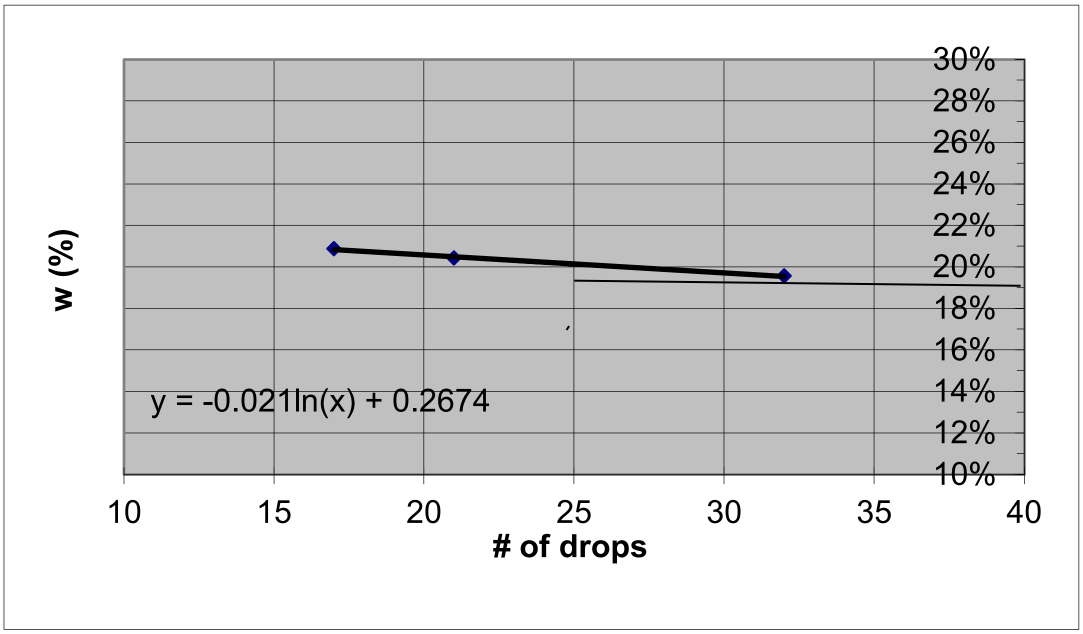
PI = LL - PL = 8.2%

ATTERBERG LIMITS (ASTM D 4318-2017; E2018)

NASHnal SOIL TESTING

Date Tested: 4/11/2023
Project: PTB-199-16 Smart Corridor Implementation Plan to IL 56
Description of Soil: Gray Silty Clay (CL-ML)
Sample# S-14 (38.5'-40')

# of drops =	32	21	17	
container No.	1	2	3	
container Wt	11.262	11.216	11.187	g
container + wet sample =	26.932	27.007	25.617	g
container + dry sample =	24.368	24.328	23.125	g
dry sample (Mdry) =	13.106	13.112	11.938	g
Water content (w) =	19.6%	20.4%	20.9%	%



LL = 20.0%

container No.	P117	P60
container Wt	10.892	11.199
container + wet sample =	21.210	22.248
container + dry sample =	19.857	20.810
dry sample (Mdry) =	8.965	9.611
Water content (w) =	15.1%	15.0%

Average
PL = 15.0%

PI = LL - PL = 5.0%

NST NASHnal SOIL TESTING

KEY TO TEST DATA

DRILLING & SAMPLING SYMBOLS:

SL = SS with Liner
SS = Split Spoon — 1%" I.D., 2" O.D., unless otherwise noted
ST = Shelby Tube — 2" O.D., unless otherwise noted
PA = Power Auger
DB = Diamond Bit — NX: BX: AX
AS = Auger Sample
JS = Jar Sample
VS = Vane Shear

ST = 3" Shelby Tube
HS = Hollow Stem Auger
WS = Wash Sample
FT = Fish Trail
RB = Rock Bit
BS = Bulk Sample
PM = Pressuremeter test—in situ

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

WATER TABLE MEASUREMENT SYMBOLS

WL = Water Level
WCI = Cave In
DCI = Dry Cave In
WS = While Sampling
WD = While Drilling
BC = Before Casing Removal
ACR = After Casing Removal
AB = After Boring

Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable ground water levels. In impervious soils, the accurate determination of ground water elevations is not possible even after several days observation, and additional evidence of ground water elevations must be sought.

GRADATION DESCRIPTION & TERMINOLOGY

Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are described as: clays or clayey silts if they are cohesive, and silts if they are non-cohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their strength or consistency, and their plasticity.

Major Component Of Sample	Size Range	Descriptive Term(s) (Of Components Also Present in Sample)	Percent of Dry Weight
Boulders	Over 8 in. (200mm)	Trace	1 — 9 .
Cobbles	8 in. to 3 in. (200mm to 75mm)	Little	10 — 19
Gravel	3 in. to #4 sieve (75mm to 2mm)	Some	20 — 34
Sand	#4 to #200 sieve (2mm to .074mm)	And	35 — 50
Silt	Passing #200 sieve (0.074mm to 0.005mm)		
Clay	Smaller than 0.005mm		

CONSISTENCY OF COHESIVE SOILS

Unconfined Comp. Strength, Qu, tsf	Consistency
<0.25 —	Very Soft
0.25— 0.49	Soft
0.50 — 0.99	Medium (Firm)
1.00— 1.99	Stiff
2.00 — 3.99	Very Stiff
4.00 — 8.00	Hard
>8.00	Very Hard

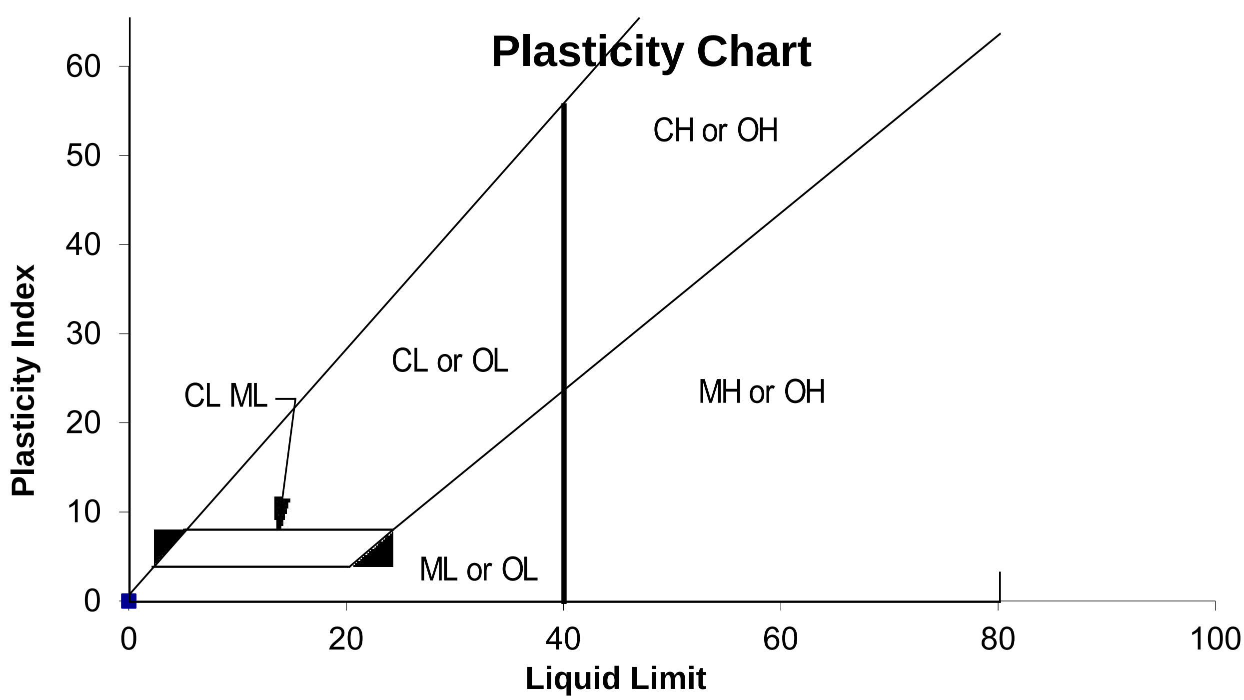
RELATIVE DENSITY OF GRANULAR SOILS

N — Blows/ft.	Relative Density
0 — 3	Very Loose
4 — 9	Loose
10 — 29	Medium Dense
30 — 49	Dense
50 — 80	Very Dense
80 +	Extremely Dense

NST NASHnal SOIL TESTING

UNIFIED SOIL CLASSIFICATION CHART

CRITERIA FOR ASSIGNING GROUP NAMES & GROUP SYMBOLS USING LABORATORY TEST RESULTS				Soil Classification: Group Symbol	Soil Classification: Group Name
COURSE-GRAINED SOILS More than 50% retained on #200 Sieve	GRAVELS More than 50% of course fractions are retained on #4 sieve	CLEAN GRAVELS Less than 5% fines	Cu ≤ 4 and 1 ≤ Cc ≤ 3	GW	Well Graded Gravel
			Cu < 4 and/or 1 > Cc > 3	GP	Poorly Graded Gravel
		GRAVELS With more than 12% fines	Fines classify as ML or MH	GM	Silty Gravel
			Fines classify as CL or CH	GC	Clayey Gravel
	SANDS 50% or more of course fractions passes #4 sieve	CLEAN SANDS Less than 5% fines	Cu ≤ 6 and 1 ≤ Cc ≤ 3	SW	Well Graded Sand
			Cu < 6 and/or 1 > Cc > 3	SP	Poorly Graded Sand
		SANDS With more than 12% fines	Fines classify as ML or MH	SM	Silty Sand
			Fines classify as CL or CH	SC	Clayey Sand
FINE-GRAINED SOILS 50% or More Passed the #200 Sieve	SILTS & CLAYS Liquid Limit Lower than 50%	Inorganic	PI > 7 and plots on or above "A" line	CL	Non to Low Plasticity Clay
			PI < 4 and plots below "A" line	ML	Silt
		Organic	$\frac{\text{Liquid Limit (Oven Dried)}}{\text{Liquid Limit (Not Dried)}} < 0.75$	OL	Organic Clay or Silt
	SILTS & CLAYS Liquid Limit 50% or Higher	Inorganic	PI plots on or above "A" line	CH	Highly Plastic Clay
			PI plots below "A" line	MH	Elastic Silt
		Organic	$\frac{\text{Liquid Limit (Oven Dried)}}{\text{Liquid Limit (Not Dried)}} < 0.75$	OH	Organic Clay or Silt
Highly Organic Soils		Primarily organic material, darker and with organic odor		PT	Peat



NOTES ON PLACEMENT OF COMPACTED FILL SOIL

GENERAL

The placement of compacted fill for support of foundations, floor slabs, pavements, or earth structures should be carried out by an experienced excavator with the proper equipment. The excavator must be prepared to adapt his procedures, equipment, and materials to the type of project, to weather conditions, and the structural requirements of the architect and engineer. Methods and materials used in summer may not be applicable in winter; fill used in dry excavations may not be suitable in wet excavations or during periods of precipitation; proposed fill soil may require wetting or drying for proper placement and compaction. Conditions may also vary during the course of a project or in different areas of the site. These needs should be addressed in the project drawings and specifications.

EXCAVATION/BACKFILL BELOW THE WATER TABLE

It is common to have to excavate and replace unsuitable soils below the water table for site correction. As a general rule of prudent construction technique, we recommend that excavation/backfill below the water table not be permitted, unless the excavation is dewatered. Numerous problems can develop when this procedure is attempted without dewatering.

- Inability of the equipment operators and soil technicians to observe that all unsuitable soil/materials have been removed from the base of the excavation.
- Inability to observe and measure that proper lateral oversizing is provided.
- Inability to prevent or correct sloughing of excavation sidewalls, which can result in unsuitable soils trapped within the select backfill.
- Inability of the contractor to adequately and uniformly compact the backfill.
- Possibility of disturbance of the suitable soils at the base of the excavation.

The dewatering methods, normally chosen at the contractor's option, should follow prudent construction practice. Excavations in clay can often be dewatered with sump pits and pumps; this technique would not be applicable for excavation extending into permeable granular soil, especially for depths significantly below the water table. Dewatering granular soils should normally be done with well points or wells. When dewatering is needed, we strongly recommend that the procedures be discussed at pre-bid or pre-construction meetings. The architect and engineer should review the dewatering technique chosen by the contractor before construction starts; it should not be left until excavation is under way.

The selection of proper backfill materials is important when working in dewatered excavations. Even with dewatering, the base is usually wet and the contractor must be careful not to disturb the base. We recommend that the first lifts of backfill be a clean medium to course grain sand with less than 5% passing the #200 sieve. The use of silty sand, clayey sand, or cohesive/semi-cohesive soils is not recommended for such situations. The excavator should be required to submit samples of the proposed material(s) he plans to use as backfill before the fill is hauled to the site, so that it can be tested for suitability.

WINTER EARTHWORK CONSTRUCTION

Winter earthwork presents its own range of problems, which must be overcome; the situation may be complicated by the need for dewatering discussed above.

During freezing conditions, the fill used must not be frozen when delivered to the site. It also must not be allowed to freeze during or after compaction. Since the ability to work the soil while keeping it from freezing depends in part on the soil type, the specifications should require the contractor to submit a sample of his proposed fill before construction starts, for laboratory testing. If the soil engineer and structural engineer determine that it is not suitable, it should be rejected. In general, silty sand, clayey sand, and cohesive/semi-cohesive soils should not be used as fill under freezing conditions. All frozen soil of any type should be rejected for use as compacted fill.

It is important that compacted fill be protected from freezing after it is placed. The excavator should be required to submit a plan for protecting the soil. The plan should include details on the type and amount of material (straw, blankets, extra loose fill, topsoil, etc.) proposed for use as frost protection. The need to protect the soil from freezing is ongoing throughout construction and applies both before and after concrete is placed, until backfilling for final frost protection is completed. Foundations placed on frozen soil can experience heaving and significant settlement, rotation, or other movement as the soil thaws. Such movement can also occur if the soil is allowed to freeze after the concrete is placed and then allowed to thaw. The higher the percentage of fines (clay and silt, P-200 material) in the fill, the more critical is the need for protection from freezing.