CULVERT GEOTECHNICAL REPORT

IL Route 56 at IL Route 53

IDOT D-91-612-11, Contract No 60P75

SN 022-C006

DuPage County, Illinois

Prepared for:

Mr. John P. O'Neill, P.E.
Bollinger, Lach and Associates, Inc.
333 Pierce Road, Suite 200
Itasca, IL. 60143

Prepared by:

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GSI Job No. 12195

December, 2013
Revised August, 2021

Geo Services, Inc.
Geotechnical, Environmental and Civil Engineering
An MBE - DBE Firm

December 18, 2013
Revised: August 20, 2021

Bollinger, Lach and Associates, Inc.
333 Pierce Road, Suite 200
Itasca, IL 60143

Attn: Mr. John P. O'Neill, P.E.

GSI Project 12195

Re: Structure Geotechnical Report
IL Route 56 at IL Route 53
Culvert SN 022-C006
FAP 870, PTB 161-006
IDOT Project No. D-91-612-11, Contract No. 60P75
DuPage County, IL

Dear Mr. John P. O'Neill:

The following report presents the geotechnical analysis and recommendations for IL Route 56 Culvert located along IL Route 56 between Arboretum Road to Briarcliff Road, and along IL Route 53 between Arboretum Road to IL Route 53 in DuPage County, Illinois. A total of two (2) culvert soil borings (CB-13 and CB-19) were completed for this project. Copies of the boring logs, along with a boring location diagram, are included in this report.

If there are any questions with regard to the information submitted in this report, or if we can be of further assistance to you in any way, please do not hesitate to contact us.

Very truly yours,

GEO SERVICES, INC.

Sean Kirwan, E.I.T.
Assistant Project Engineer

Andrew J. Ptak, P.E.
Principal Engineer

enc.

SECTION 01: INTRODUCTION

This report presents the results of the geotechnical investigation for the proposed culvert along IL Route 56 between Arboretum Road to IL Route 53 in DuPage County, Illinois (IDOT Job No. D-91-612-11). Geo Services, Inc. (GSI) selected the boring locations in cooperation with Bollinger, Lach and Associates, Inc. (BLA). The soil boring locations were laid out by GSI personnel using a mapping grade Trimble GPS unit. The elevations of each boring were interpolated from the topographic maps provided by BLA. The results of the two borings (CB-13 and CB-19) completed by GSI, along with a site location map, soil boring location diagrams, and laboratory test results are included with this report.

The proposed culvert (SN 022-C006) will cross IL Route 56 roadway at approximate Station 173+00. The culvert will be a single cell 4'x4' box culvert with an approximated length of 171 feet. The culvert box will have upstream invert elevations of 681.53 and a downstream invert elevation of 680.70.

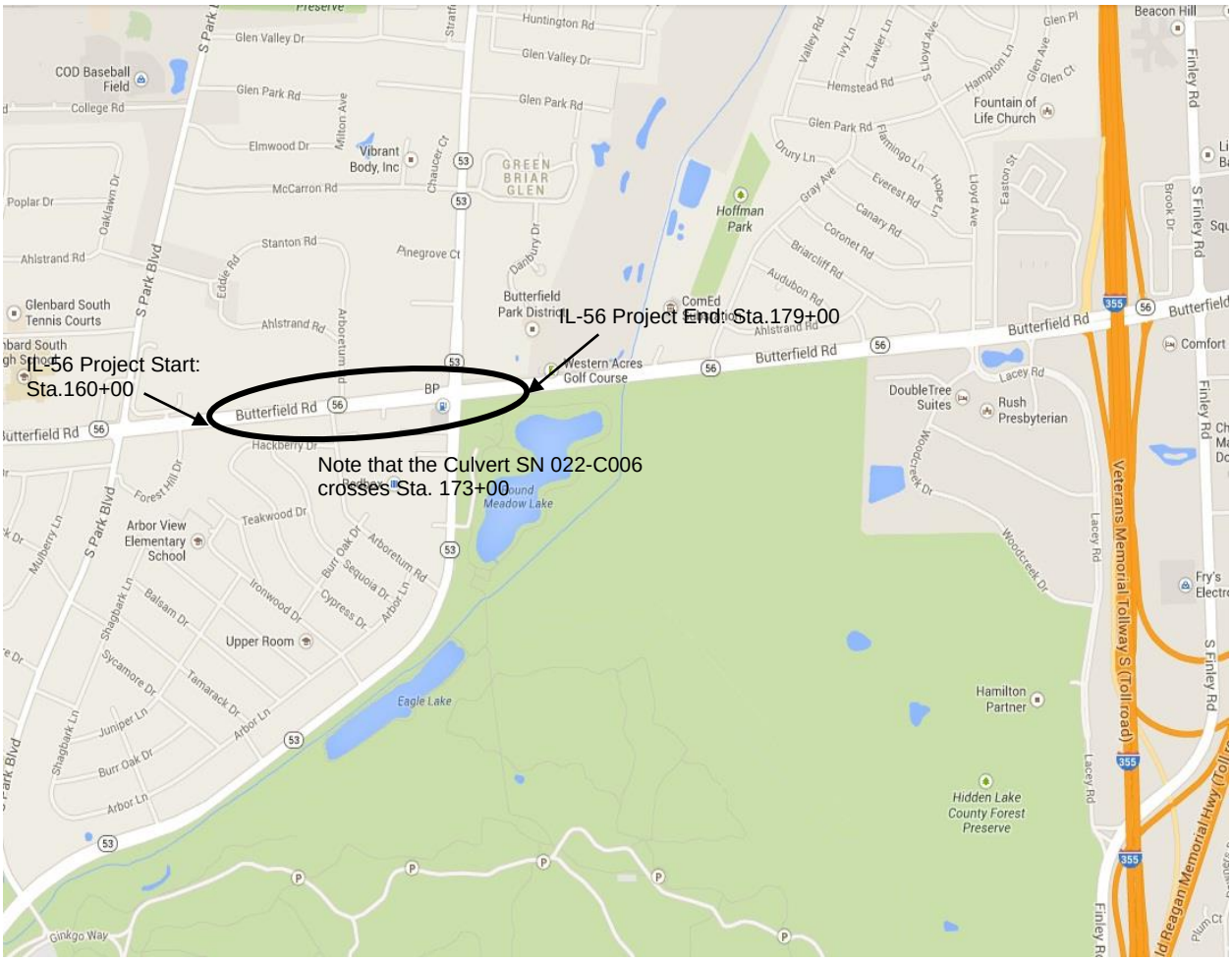
The following page shows the location map of the project site.

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

PLANS FOR PROPOSED

IDOT Job No. D-91-612-11, Contract 60P75
IL Route 56 at IL Route 53
Proposed Culvert SN 022-C006
DuPage County, IL.

GEO SERVICES JOB NO.12195



SECTION 02: CLIMATIC CONDITIONS

According to the USDA/NRCS Soil Survey of DuPage County, Illinois, the climate within the area of this project site falls within the temperate humid, continental range and is characterized by cold conditions in the winter and warm conditions in the summer. The winter average daily temperature is 25º F and the average daily minimum temperature is 17º F. The summer average temperature is 71º F and the summer average daily maximum temperature is 81º F. The total annual precipitation for this area is 35.8" with approximately 63% falling between April and September. The average seasonal snowfall for this area is 38.7".

Local Climatatological Data, as measured at O'Hare International Airport (ORD), for the three (3) month period prior to and during drilling, including total precipitation, average temperature and snowfall are summarized below:

Table 1 – Climate Conditions

MONTH-Yr	ppt (inches)		Temp (˚F)		Snow (inches)	
	Total	Departure From Norm	Average Temp.	Departure From Norm	Total	Monthly Norm
July 13	2.22	-1.48	73.2	-0.8	0.0	0.0
Aug-13	1.69	-3.21	73.0	0.6	0.0	0.0
Sept-13	2.57	-0.64	67.2	2.6	0.0	0.0
borings performed 09/30 to 10/09/13						

Total precipitation during the three months preceding drilling was below normal and temperatures were higher than normal during this period. The climatic conditions encountered prior to drilling operations suggest that the soils should be drier than normal moisture levels.

SECTION 03: GEOLOGY

According to the 1971 ISGS Circular #460: Summary of the Geology of the Chicago Area/ISGS Geologic Materials to a Depth of 20' – Du Page County, the project corridor is located in an area where the surficial soils to the east of the East Branch of the DuPage River are categorized as belonging to the Wadsworth Till Member of the Wedron Formation which were deposited during Woodfordian Substage of the Wisconsinan glaciation between 12,500 to 22,000 years ago and generally consist of gray clayey and silty clay tills. The soils on either side of the river consist of Cahokia Alluvium soils overlying soils belonging to the Batavia Member of the Henry Formation and the surficial soils away from the river bank area generally consist of Batavia Member deposits. Cahokia Alluviums consist of recent flood plain deposits of silt, sand

and gravel which can be organic and Batavia Member soils generally consist of sands and gravels deposited in outwash plains.

The ISGS Circular C542 15 Meter Stack Map confirms that surficial soils in the vicinity of the project corridor are as noted above and that bedrock is in excess of 50.0-ft below ground surface. A review of ISGS on-line well records and glacial drift thickness maps confirms that bedrock is encountered within a depth range of 50.0' to 100.0' below ground in the western portion of the project corridor and within 100’ to 200’ of the surface along the eastern portion of the site.

According to the 1984 ISGS Berg Circular #532: “Potential for Contamination of Shallow Aquifers in Illinois, the far western portion of the project corridor and the eastern half of the site are located in an E Zone and the area on either side of the river are located in an AX Zone. AX Zones are defined as an area with alluvium stream deposits of gravel, sand, silt and clay and E Zones are areas with in excess of 50-ft of relatively impermeable silty or clayey tills with no evidence of interbedded granular layers.

The Wetland Inventory database reviewed on-line at the US Fish & Wildlife Service website identified several nearby wetland areas that are summarized as follows:

- The areas on the north and south sides of Butterfield Road where it crosses the East Branch of the Du Page River are identified as 79.7 and 10.4 acre Palustrine System/Emergent Class wetlands respectively that are located in a Seasonally Flooded Water Regime and are noted to be partially drained/ditched. Located immediately adjacent to the southwest corner of the northern wetland is an approximately 0.4 acre Palustrine System/Unconsolidated Bottom Class wetland that is located in an Intermittently Exposed Water Regime that is noted to be excavated.

- Located on the west side of Illinois Route 53 at the south end of the project corridor is a 2.4 acre Palustrine System/Emergent Class wetland that is in a Temporary Flooded Water Regime.

The USDA Natural Resources Conservation Service Soil Survey database indicates that surficial soils in the vicinity of the project corridor are various silt loams and silty clay loams. None of these soils are overly organic (0.75 to 5.5%) and potential frost action ranges from moderate to high.

According to readily available ISGS sources, there are no documented coal mining operations in near vicinity to the project site and seismic activity is noted to be very low.

The available geologic information indicates that the subgrade soils along the eastern half and the far western portion of the project corridor should generally consist of clay tills and the remainder of the soils closer to the Eastern Branch of the Du Page River should consist of variable silts, sand and gravel deposits overlying clays.

SECTION 04: SUBSURFACE INVESTIGATION PROCEDURES

The borings were performed during the months of September and October, 2013 with a truck-mounted drilling rig equipped with an automatic hammer, and were advanced by means of hollow stem augers. Majority of the borings were drilled near or within the proposed culvert alignment with the exception of boring CB-14, which was drilled at near shoulders due to underground utility lines close to the proposed culvert location. Representative soil samples were obtained employing split spoon sampling procedures in accordance with AASHTO Method T-206. Samples obtained in the field were returned to our laboratory for further examination and testing.

Split spoon sampling involves driving a 2.0-inch outside diameter split-barrel sampler into the soil with a 140-pound weight falling freely through a distance of 30 inches. Blow counts are recorded at 6" intervals and the blow counts are shown on the boring logs. The number of blows required to advance the sampler the last 12 inches is termed the Standard Penetration Resistance (N). The N value is an indication of the relative density of the soil.

SECTION 05: LAB TESTING PROGRAM

The test procedures were performed in accordance with test procedures discussed in the IDOT Geotechnical Manual. All split-spoon samples obtained from the drilling operation were visually classified in the field. Cohesive samples were tested for unconfined compressive strength using an IDOT modified RIMAC test device and/or calibrated penetrometer in the field.

The soil testing program included performing water content, density and either unconfined compression and/or calibrated penetrometer tests on the cohesive samples recovered. These tests were performed upon representative portions of the samples obtained in the field. The results of the above testing, along with a visual classification of the material based upon both the Illinois textural classification and the AASHTO Soil Classification System, are indicated on the boring logs.

In addition to the regular lab testing program, Atterberg Limits (AASHTO T-89/90), and Particle Size Analysis (AASHTO T-88) or Grain Size Analysis (AASHTO T-311) tests were performed on select samples from the borings. The tests were performed upon representative portions of the samples obtained in the field. The lab testing results are attached in the Appendix D of this report.

SECTION 06: SOIL CONDITIONS

Boring logs can be found in Appendix C. The stratification lines shown on the boring logs represent the approximate boundary between soil types, and the actual transition may be gradual.

Surface conditions consist of topsoil at boring CB-13, and 12 inches of crushed asphalt and stone at boring CB-19. Boring CB-19 was performed off the proposed culvert location at approximately 30 feet offset going north due to drill-rig inaccessibility and existing underground utilities within the proposed boring location.

Below the surface materials, clay loam fill to clay soils were encountered at varying depths at approximately 15 to 33 feet below ground level. Underneath the cohesive material were interstratified soils that include strata of sandy loam, sand and gravel to boring termination of approximately 40 feet below ground. Moisture contents of the stiff to very stiff clay soils were typically in the low-teens to mid-twenties range. Granular soils had moisture contents that were typically in the low to mid-teens range.

SECTION 07: GROUND WATER CONDITIONS

All of the culvert soil borings taken for this investigation encountered groundwater at depths ranging from 16 to 25 feet during drilling, and 18 to 22 feet after the completion of drilling. Where borings extended deep enough to encounter the gray colored soils that typically represent a saturated condition and therefore the estimated long term water level, the depth of the color change was generally in the range of 18 to 28 feet below existing ground surface (EL. 660 to 670). Fluctuations in the amount of water accumulated and in the hydrostatic water table can be anticipated depending upon variations in precipitation and surface runoff.

SECTION 08: ANALYSIS AND RECOMMENDATIONS

Culvert Foundation and Wingwalls Recommendations

As mentioned previously in the Section 01 portion of this report, the estimated invert elevations for the culvert ends based on the plan drawings provided by BLA are listed in Table 2 next page.

Table 2- Estimated Invert Elevations for Proposed Culverts

Culvert Location	Corresponding Borings	Estimated Invert Elevations (feet)	
		Upstream End	Downstream End
Culvert SN 022-C006 at approximate Sta. 173+00	CB-13 and CB-19	681.53	680.70

Based on the results of the borings, it is our opinion that either precast or cast-in-place culverts can be used. The results of the borings indicate that majority of the subgrade consists of very stiff to hard clay soils and should be capable of providing support for the proposed culverts. However, portions of the soils within the culvert alignment were medium stiff clay soils, and undercuts in this area should be expected prior to new culvert placement as summarized in Table 3 below. The undercuts presented in Table 3 below are also valid for the wingwalls.

Table 3- Remedial Treatment Recommendations

Location (Station Limits)	Boring	Boring Elevation (feet)	Estimated Invert Elevation (feet)	Subgrade Condition	Remedial Treatment Approx. Depth (ft)[1]	Recommended Remedial Treatment
Sta.173+00 thru Sta.174+00	CB-13	683.0	680.0	Dark Brown to Black Stiff Clay Loam Fill (mc=27%, q_u=1.5 tsf)	1.0	Undercut to approx. EL. 679 and replace with approved structural fill material or bedding stone.

Note: 1. Undercuts should extend 2 feet beyond the outside edges of the culvert. Geotechnical Engineer or soils inspector to verify if undercuts are necessary in in field.

Based on the anticipated IL Route 56 fill heights above the proposed culvert, proposed culvert heights and the length of the proposed culverts, the horizontal cantilever wingwalls are feasible for design. However, if the wingwalls are going to be longer than 14 feet, vertical cantilever wingwalls such as L-type, T-type, and soldier pile wingwalls may be feasible for the wingwall structure design. Tabulated soil parameters for the soldier pile wingwall design are shown in Table 4 of this report. Any wingwall design other than horizontal or vertical cantilever walls need to have a Geotechnical Design Memorandum in the Design Phase per Table 7.4.1-1 from IDOT Geotechnical Manual Chapter 7.

The proposed culverts and the associated wingwalls can be designed using a factored soil bearing resistance of 3,000 pounds per square foot (psf). The factored soil bearing resistance is based on the data provided in the boring logs and also based from the culvert dimensions and invert elevations shown in the plans provided by BLA.

If any unsuitable soils are present, the soils should be undercut to the depth encountered. The overexcavated areas should be backfilled to design grade with Rockfill caped with CA-7 gradation crushed aggregate to backfill any undercuts as specified in the IDOT Culvert Manual. This should be verified in the field by the geotechnical engineer. During excavation, any unsuitable or organic material should be removed and be replaced with suitable fill material. If undercuts are recommended during the field evaluation of subgrade soils, it is recommended that a non-woven, geotechnical fabric be placed at the bottom of the undercut and the sidewalls to prevent migration of the native sand and gravel soils into the backfilled materials. The geotechnical fabric should meet the requirements of Article 210, Fabric for Ground Stabilization, of the SSRBC.

Any undercutting should be performed in such a manner as to minimize disturbance to the undercut subgrade. Heavy equipment traffic directly on the subgrade should be minimized. The actual extent of any undercut should be determined in the field at the time of construction by the geotechnical engineer.

Structural fill placed below the invert should consist of Rockfill caped with CA-7 gradation crushed aggregate. The fill should be placed and compacted in lifts not exceeding 8 inches in loose thickness. The fill materials should be placed during weather conditions and at moisture contents that permit the recommended degree of compaction to be obtained.

Total settlement of footings situated on approved natural soils or properly compacted structural fill is estimated to be 1/2 inch or less. To provide adequate frost protection, we recommend that footing foundations be situated at a minimum depth of 4 feet below final grade. For the evaluation of the resistance to sliding, per NAVFAQ Design Manual 7.02, we recommend using a friction factor (ultimate condition) of 0.60 for cast-in-place concrete on granular base. For LFRD based design for sliding, a resistance factor of 0.80 should be used for design.

The following Table 4 contains our recommended lateral soil parameters to be used for design.

Table 4 – Lateral Soil Properties

Material (elevation, feet)	Unit Weight (pcf)	Drained Friction Angle (°)	Undrained Cohesion (psf)	Lateral Modulus of Subgrade Reaction (pci)	Strain
Clay/ Clay Loam Fill (top to 674)	125	28	1,500	500	0.006
Stiff to Hard Clay/ Clay Loam (674 to 667)	125	30	2,500	800	0.005
Medium Dense to Very Dense Loam, Silt and Sand (667 to 655)	125	30	-	150	-
Medium Dense to Very Dense Sand, Gravel, and Fractured Rock (655 to 642)	125	32	-	250	-

Notes: 1. Values recommended for use in design from L-pile Software Manual

For the design of yielding walls, it is recommended that a lateral active earth pressure of 40 psf per foot of depth be used above the water table assuming a free-draining granular backfill is utilized. For cohesive soils, a lateral active earth pressure of 55 psf per foot should be used. For non-yielding walls with granular backfill, a lateral at-rest pressure of 50 psf per foot should be used, assuming proper drainage. For cohesive soils, a lateral at-rest pressure of 65 psf per foot should be used. Allowances should be made for any surcharge loads adjacent to the retaining structure. Drainage should be provided behind the wall or the wall designed for the full hydrostatic head.

SECTION 09: GENERAL QUALIFICATIONS

The analysis and recommendations presented in this report are based upon the data obtained from the soil borings performed at the indicated locations and from any other information discussed in this report. This report does not reflect any variations that may occur between borings or across the site. In addition, the soils samples cannot be relied on to accurately reflect the strata variations that usually exist between sampling locations. The nature and extent of such variations may not become evident until construction. If variations appear evident, it will be necessary to reevaluate the recommendations of the report. In addition, it is recommended that Geo Services Inc. be retained to perform construction observation and thereby provide a complete professional geotechnical engineering service through the observational method.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No other warranties, either expressed or implied, are intended or made. In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing by the geotechnical engineer. Also note that Geo Services Inc. is not responsible for any claims, damages, or liability associated with any other party's interpretation of this report's subsurface data or reuse of the report's subsurface data or engineering analyses without the express written authorization of Geo Services Inc.

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APPENDIX A

GENERAL NOTES

GENERAL NOTES

CLASSIFICATION

American Association of State Highway & Transportation Officials (AASHTO) System used for soil classification.

Cohesionless Soils

Relative Density	No. of Blows per foot N
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	Over 50

Cohesive Soils

Consistency	Unconfined Compressive Strength - qu (tsf)
Very Soft	Less than 0.25
Soft	0.25 - 0.5
Medium Stiff	0.5 - 1.0
Stiff	1.0 - 2.0
Very Stiff	2.0 - 4.0
Hard	Over 4.0

TERMINOLOGY

Streaks are considered to be paper thick. **Lenses** are considered to be less than 2 inches thick. **Layers** are considered to be less than 6 inches thick. **Stratum** are considered to be greater than 6 inches thick.

DRILLING AND SAMPLING SYMBOLS

SS:	Split Spoon 1-3/8" I.D., 2" O.D.	HS:	Housel Sampler
ST:	Shelby Tube 2" O.D., except where noted	WS:	Wash Sample
AS:	Auger Sample	FT:	Fish Tail
DB:	Diamond Bit - NX: BX: AX	RB:	Rock Bit
CB:	Carboloy Bit - NX: BX: AX	WO:	Wash Out
OS:	Osterberg Sampler		

Standard "N" Penetration: Blows per foot of a 140 lb. hammer falling 30" on a 2" O.D. Split Spoon

WATER LEVEL MEASUREMENT SYMBOLS

WL:	Water	WD:	While Drilling
WCI:	Wet Cave In	BCR:	Before Casing Removal
DCI:	Dry Cave In	ACR:	After Casing Removal
WS:	While sampling	AB:	After Boring

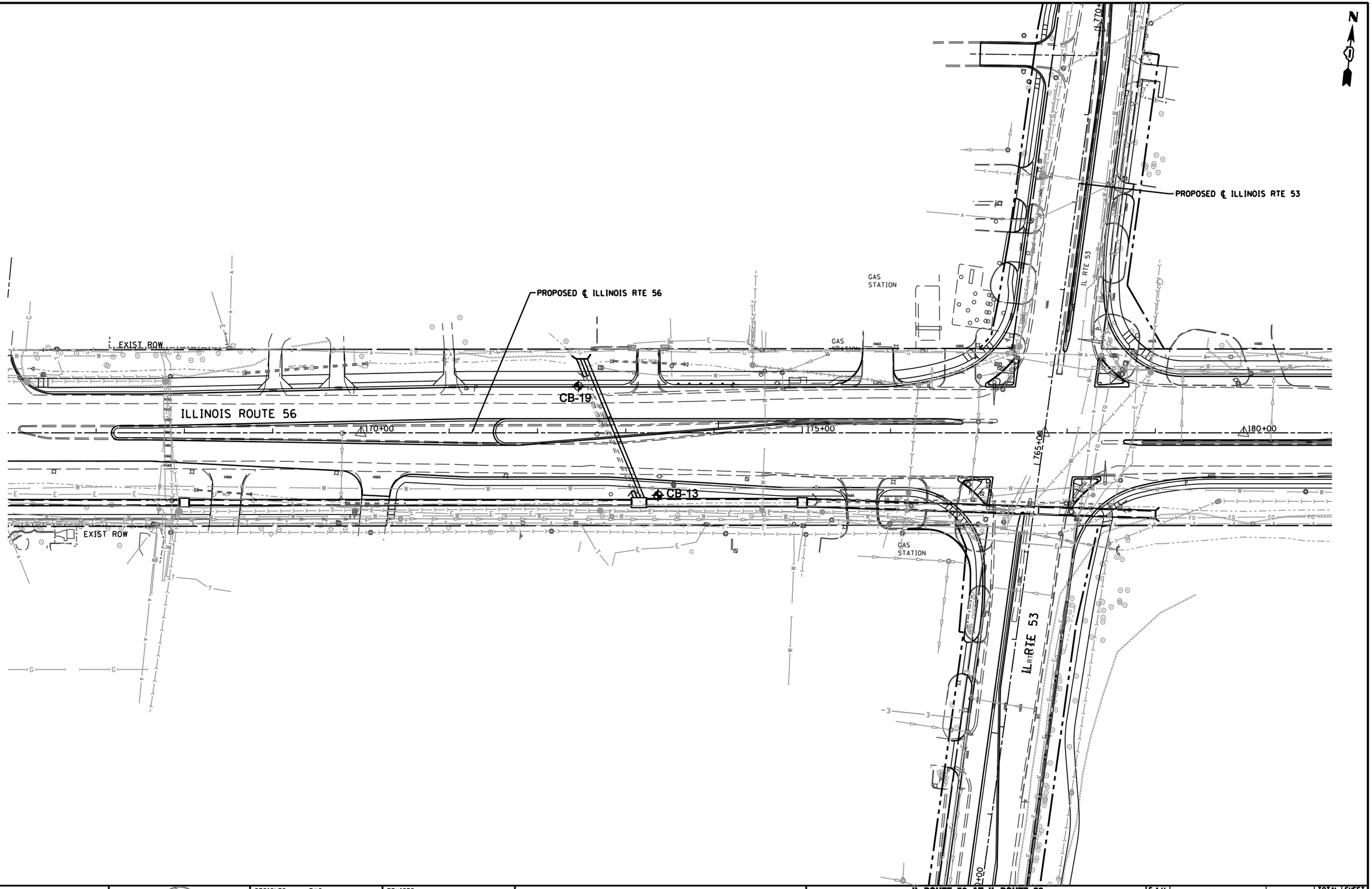
Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable ground water levels. In impervious soils, the accurate determination of ground water elevations is not possible in even several days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

APPENDIX B

SOIL BORING PLAN

PLAN		BY	DATE
NOTE BOOK	SURVEYED		
NO.	PLOTTED		
	ALIGNMENT CHECKED		
	RT. OF WAY CHECKED		
	CADD FILE NAME		

PROFILE		BY	DATE
NOTE BOOK	SURVEYED		
NO.	PLOTTED		
	GRADES CHECKED		
	BLM. NOTED		
	STRUCTURE NOTATNS CHKD		



DESIGNED -	RWC	REVISED -	
DRAWN -	RWC	REVISED -	
CHECKED -	AJP	REVISED -	
DATE -	12/13/2013	REVISED -	

Bollinger, Lach & Associates, Inc.
ITASCA, ILLINOIS

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Ambriz Court, Suite 204
Naperville, Illinois 60565
(630) 355-2938

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IL ROUTE 56 AT IL ROUTE 53
CULVERT SN 022-C006
SOIL BORING PLAN

SCALE: 1"=50' | SHEET NO. 1 OF 1 SHEETS | STA. 166+00 TO STA 181+00

F.A.U RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
365	634X-N-3	DuPAGE	1	1
		CONTRACT NO. 60P75		
	ILLINOIS	FED. AID PROJECT		

APPENDIX C

SOIL BORING LOGS

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

GSI Job No. 12195

SOIL BORING LOG

Date 10/3/13

ROUTE F.A.P. RTE. 365 **DESCRIPTION** IL Route 56 at IL Route 53 Culverts, IDOT Project No. D-91-612-11, Contract No. 60P75 **LOGGED BY** NW

SECTION 634X-N-3 **LOCATION** SE 1/4, **SEC.** 26, **TWP.** T39N, **RNG.** R10E, 3rd **PM**

COUNTY DuPage **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Diedrich Automatic

STRUCT. NO. SN 022-C005, SN 022-C006
Station Sta. 173+14.64 to Sta. 179+00, Sta. 175+00

BORING NO. CB-13
Station 173+36
Offset 70.60ft Right
Ground Surface Elev. 683.00 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 667.0 ft ▼
Upon Completion 665.0 ft ▽
After ____ **Hrs.** ____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				6.0" TOPSOIL-black
				682.50
			16	CLAY LOAM-dark brown to black-stiff (Fill)
	3			
	4	1.5	27	
	4	P		
				680.00
				CLAY-brown-medium stiff to stiff
	2			
	2	1.5	27	
-5	3	B		
	2			
	2	0.7	23	
	2	B		
				675.00
				CLAY LOAM-brown & gray-very stiff to hard
	3			
	6	3.8	16	
-10	7	P		
				becoming gray @ -10.5'
				672.00
	3			LOAM-brown-hard
	9	4.5	11	
	14	P		
				670.50
				CLAY LOAM-brown & gray-very stiff to hard
	3			
	6	5.3	17	
-15	8	B		
				667.50
▼				SAND with GRAVEL-brown-loose to medium dense
	2			
	3		23	
	6			
▽				
	3			
	4		12	
-20	6			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				SAND with GRAVEL-brown-loose to medium dense *(continued)*
	2			
	3		13	
	5			
	2			
	2		18	
-25	3			
	3			
	5		9	
	9			
				655.00
	5			SANDY LOAM-gray-medium dense
	5		18	
-30	15			
				652.50
	5			SAND & GRAVEL-gray-medium dense
	21		11	
	27			
				650.00
	9			SANDY CLAY LOAM with GRAVEL-gray-medium dense to very dense
	9		9	
-35	11			
	20			
	36		8	
	42			
	46			
	50/5"		7	End Of Boring @ -40.0'. Boring backfilled with cuttings.
				643.00
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, from 137 (Rev. 8-99)

Z:\PROJECTS\2012\12195 BLA, IL-56 OVER DUPAGE RIVER PTB 161-006\12195 BORING LOGS\12195_LOG.GPJ 12/18/13

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

GSI Job No. 12195

SOIL BORING LOG

Date 10/9/13

ROUTE F.A.P. RTE. 365 **DESCRIPTION** IL Route 56 at IL Route 53 Culverts, IDOT Project No. D-91-612-11, Contract No. 60P75 **LOGGED BY** NW

SECTION 634X-N-3 **LOCATION** SE 1/4, **SEC.** 26, **TWP.** T39N, **RNG.** R10E, 3rd **PM**

COUNTY DuPage **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Diedrich Automatic

STRUCT. NO. SN 022-C006
Station Sta. 173+00

BORING NO. CB-19
Station 172+46
Offset 52.90ft Left
Ground Surface Elev. 688.00 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 663.0 ft ▼
Upon Completion 666.0 ft ▽
After ____ **Hrs.** ____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				12.0" CRUSHED ASPHALT & STONE
			4	687.00
	4			CLAY LOAM-stiff to very stiff (Fill)
	4	3.0	22	
	6	P		
	2			
	3	1.5	15	
-5	6	P		
	2			
	2	1.3	22	
	3	P		
	3			
	4	3.0	11	
-10	5	P		
	5			
	6	4.5	15	
	7	P		
				674.50
	9			LOAM-brown-stiff
	6	1.8	13	
-15	6	P		
				672.50
	4			SILTY SAND & GRAVEL-brown
	6		14	
	7			
				670.00
	3			CLAY to CLAY LOAM-gray-stiff
	4	1.0	14	
-20	5	B		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				CLAY to CLAY LOAM-gray-stiff *(continued)*
	3			
▽	6	1.1	16	
	7	B		
	3			
	4	1.5	22	
▼-25	5	B		
	3			
	4	1.2	21	
	5	B		
	3			
	4	1.3	12	
-30	7	B		
	4			
	5	1.2	16	
	7	B		
				655.00
	6			SAND with GRAVEL-gray-medium dense
	8		8	
-35	9			
				652.50
	12			GRAVEL with SAND-gray-dense
	13		4	
	17			
				650.00
	8			SILTY SAND with GRAVEL-gray-medium dense
	5		16	End Of Boring @ -40.0'. Boring backfilled with cuttings.
-40	8			648.00

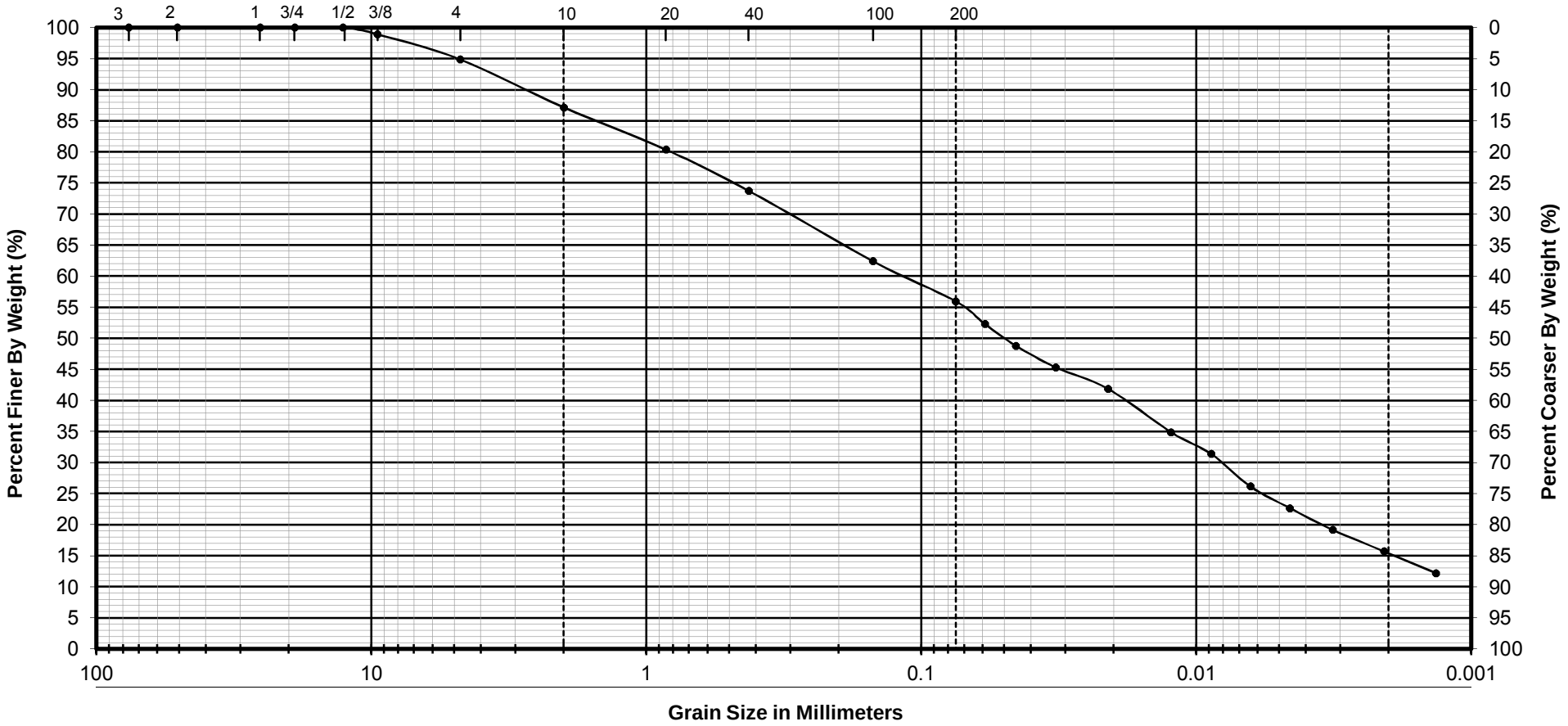
Z:\PROJECTS\2012\12195 BLA, IL-56 OVER DUPAGE RIVER PTB 161-006\12195 BORING LOGS\12195_LOG.GPJ 12/18/13

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, from 137 (Rev. 8-99)

APPENDIX D

LAB DATA



GRAVEL	SAND		SILT	CLAY
	COARSE	FINE		

Boring No.	CB-13	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	6			
Depth	11.0'-12.5'	LOAM		IL-56 / Route 53
Liquid Limit	22	A-4		IDOT P-91-439-01
Plastic Limit	15	brown		DuPage County, Illinois
Plasticity Index	7	Group Index	1	
Test By	CC	% Gravel	12.8	
Date	10/17/13	% Sand	31.2	
Reviewed By	RR	% Silt	40.3	
Job No	12195	% Clay	15.7	

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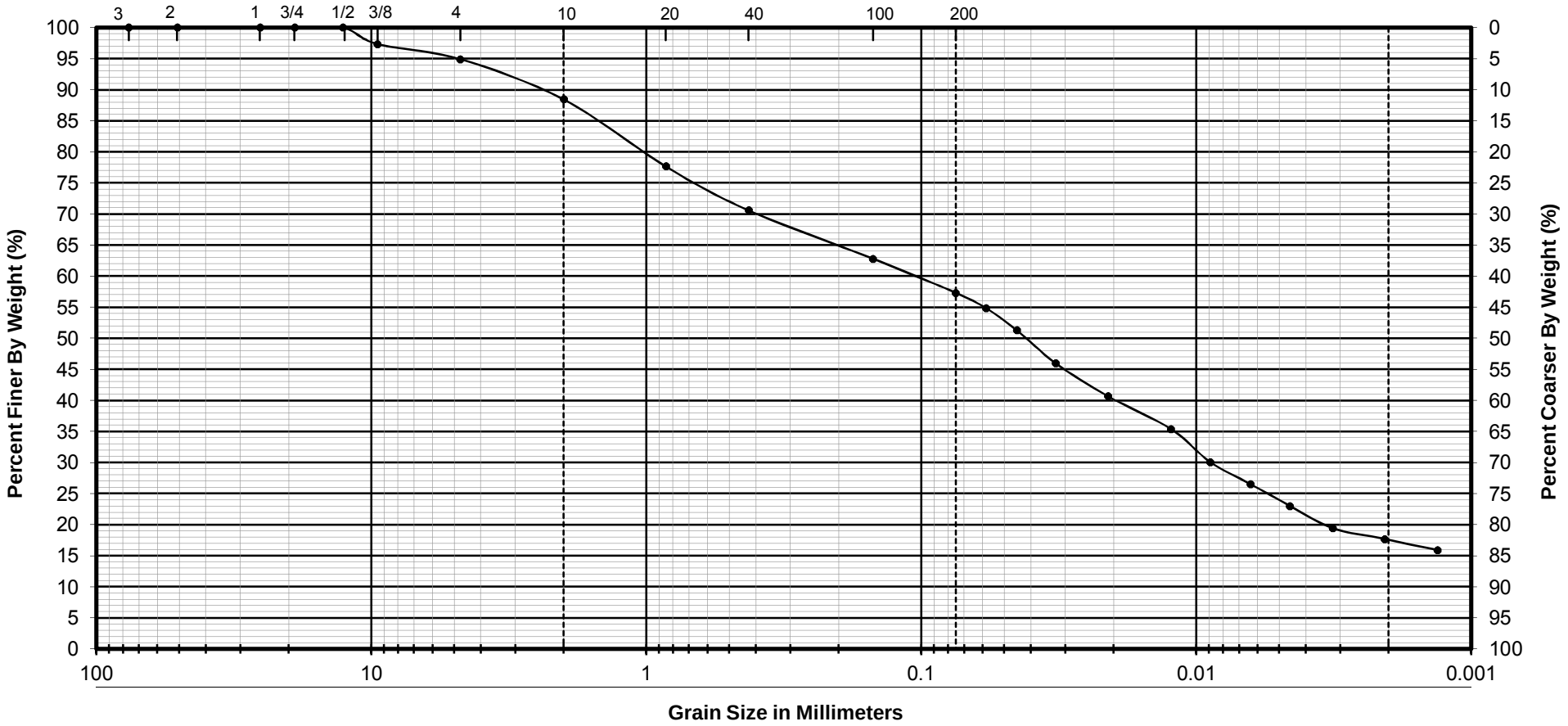
Phone 847-253-3845 • Fax 847-253-0482



GRAVEL	SAND		SILT	CLAY
	COARSE	FINE		

Boring No.	CB-19	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	7			
Depth	13.5'-15.0'	LOAM		IL-56 / Route 53
Liquid Limit	27	A-4		IDOT P-91-439-01
Plastic Limit	17	brown		DuPage County, Illinois
Plasticity Index	10	Group Index	3	
Test By	CC	% Gravel	11.6	
Date	10/17/13	% Sand	31.1	
Reviewed By	RR	% Silt	39.6	
Job No	12195	% Clay	17.7	

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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

AASHTO T89/T90

Project Name IL-56 / Route 53 IDOT Project No. P-91-439-01 Job No 12195

Location DuPage County, Illinois Date 10/21/13

Client Bollinger, Lach and Associates, Inc.

Boring No.	CB-13	CB-19						
Sample No.	6	7						
Depth	13.5'-15.0'	11.0'-12.5'						
LIQUID LIMIT (LL)	22	27						
PLASTIC LIMIT (PL)	15	17						
PLASTICITY INDEX (PI)	7	10						

Tested by TOB/CC