



Stantec Consulting Services Inc.
10200 Alliance Road, Suite 300, Cincinnati OH 45242

February 16, 2023
File: 175538119

Attention: Jeff Hipp, PE
Ohio Department of Transportation, District 6
400 East William Street
Delaware, Ohio 43015

**Reference: Geotechnical Data Report
FAY-435 Improvements (PID No. 117955)
Fayette County, Ohio**

Dear Mr. Hipp,

Stantec Consulting Services Inc. (Stantec) has completed the geotechnical exploration for the FAY-435 Improvement project located in Jeffersonville, Ohio. The Ohio Department of Transportation (ODOT) is planning to widen portions of SR 435 as well as the exit ramps from IR 71 onto SR 435 near Jeffersonville, Ohio. Stantec was contracted to perform soil borings and soil laboratory testing for the project. Stantec performed seventeen soil borings along areas of proposed widening, with approximate locations shown on the plan sheet in Appendix A. Three additional borings (B-001-1-22, B-002-1-22, and B-003-1-22) along the exit ramp from US 35 to SR 435 are also part of this project and were completed prior to the exploration for this phase. The subsurface information obtained from these borings are included with the following results discussion.

The borings were advanced in accordance with the ODOT Specifications for Geotechnical Explorations (SGE). The borings were performed with either a track or truck-mounted CME 45 drill rig using 3¼ inch inside diameter hollow stem augers to advance the borings through soil. Standard Penetration Test (SPT) sampling was performed at 2.5-foot or continuous intervals until specified depths. The energy ratio (ER) of each automatic hammer and drill rod measurements are shown on the boring logs provided in Appendix B.

The borings were drilled in areas of planned widening to depths ranging from 6.0 to 7.5 feet. Two of the borings (B-001-1-22 and B-007-0-22) were advanced at locations of proposed signals and taken to depths of 26.5 feet. The latitudes and longitudes for the borings were recorded using smartphone GPS functions. Surface elevations for the borings were estimated using topographic data supplied by Google Earth.

The soil samples were returned to a geotechnical laboratory for visual classification and water content testing. Engineering classification testing was performed on samples reflecting each of the main soil horizons and to provide data for subgrade analysis. The engineering classification tests conducted on the samples were sieve and hydrometer analysis (ASTM D 422) and Atterberg limits (ASTM D 4318). The samples were classified according to the ODOT classification method. Sulfate content testing was performed on one sample from each boring in accordance with the ODOT Supplement 1122. Groundwater was observed in B-001-1-22 while drilling at a depth of 24 feet but was not observed in the other borings. Bedrock was not encountered in the borings. Boring logs showing approximate locations and elevations determined as described previously are included in Appendix B.

Reference: Geotechnical Data Report. FAY-435 Improvements (PID No. 117955)

The surface material encountered consisted of 2 to 5 inches of topsoil for borings completed off the road surface or 11 to 18 inches of asphalt pavement in road surface borings and pavement cores. Below the surface materials, cohesive soils classifying as sandy silt (A-4a), silt and clay (A-6a), silty clay (A-6b), and/or clay (A-7-6) were encountered in each of the borings. These soils were described as soft to hard with SPT N_{60} values ranging from 4 to over 50 blows per foot and pocket penetrometer readings ranging from 0.5 tons per square foot (tsf) to over 4.5 tsf. Moisture contents varied from 6 to 34 percent with an average of 17 percent. Liquid limit values varied from 20 to 57 with an average of 34, and plastic limit values varied from 13 to 27 with an average of 18. The sulfate contents of samples of this material ranged from under 100 to over 8,000 parts per million (ppm).

Sandy and gravelly soils with cohesive fines classifying as gravel and stone fragments with sand and silt (A-2-4) and gravel and stone fragments with sand, silt, and clay (A-2-6) were also encountered in four of the borings. These soils were described as loose to medium dense with SPT N_{60} values ranging from 9 to 18 blows per foot and pocket penetrometer readings ranging from 2 tsf to over 4.5 tsf. Moisture contents varied from 14 to 18 percent with an average of 16 percent. Liquid limit values varied from 27 to 32 with an average of 29, and plastic limit values varied from 16 to 20 with an average of 18. One sulfate test was completed in this material, resulting in a sulfate content of less than 100 ppm.

Additionally, non-cohesive soils classifying as gravel and stone fragments (A-1-a) and gravel and stone fragments with sand (A-1-b) were found in five of the borings. These soils were described as loose to very dense with SPT N_{60} values ranging from 6 to 53 blows per foot. Moisture contents varied from 4 to 12 percent with an average of 6 percent. Sulfate contents of samples from this material ranged from under 100 to over 2,700 ppm.

The ODOT Geotechnical Design Manual (GDM) outlines a procedure for estimating the method and limits of subgrade treatment that will be required to stabilize pavement subgrade prior to construction of the pavement section. The procedure is based upon the results of the borings, field testing, and laboratory testing. A subgrade analysis was completed in accordance with GDM. The subgrade analysis spreadsheet is provided in Appendix C. It was assumed that the proposed subgrade elevations were equal to the boring surface elevations (zero cut or fill). An average N_{60L} of 11 was calculated from the data obtained from the borings. A design CBR of 7 for pavement design was determined based on the subgrade analysis. Roughly half of the borings would require subgrade stabilization according to the subgrade analysis. The analysis indicates the following options for global subgrade stabilization:

- Excavate and replace (Item 204) to a depth of 12 inches with a geotextile.
- Chemical stabilization (Item 206) to a depth of 14 inches with cement.

It is recommended that cement stabilization be the primary subgrade stabilization treatment. For locations where equipment for cement stabilization cannot be used, the "excavate and replace" option with Item 204 Granular Material Type B is recommended. The "excavate and replace" option is also recommended along the ramp from US 35 to SR 435 due to high sulfate content at the surface. Excavations for unstable

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subgrades should extend 18 inches beyond the edge of the surface of the pavement, and Item 204 Geotextile Fabric should be placed underneath the granular material.

Regards,

Stantec Consulting Services Inc.



James Samples EI
Project Engineer in Training

Phone: (513) 842-8204
James.Samples@stantec.com

Appendices: Appendix A – Boring Location Map
Appendix B – Boring Logs
Appendix C – GB1 Analysis

cc: Andrew Holloway – District 6 Transportation Engineer

Eric Kistner PE
Geotechnical Project Manager

Phone: (513) 842-8213
Eric.Kistner@stantec.com

**APPENDIX A
BORING LOCATION MAPS**

Boring Location Map

Western portion of site showing B-001-0-22 through B-007-0-22.

Legend

○ Boring Location

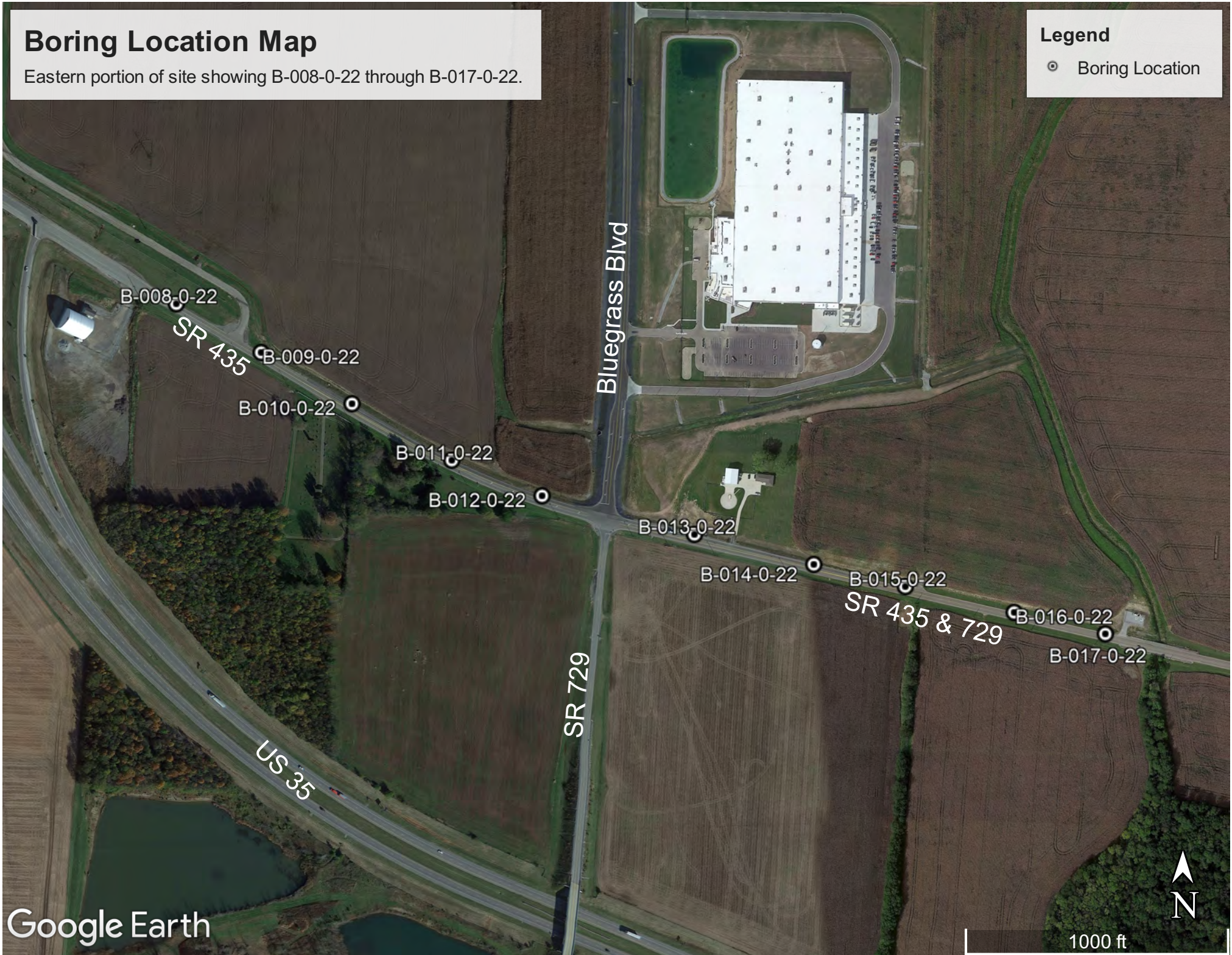


Boring Location Map

Eastern portion of site showing B-008-0-22 through B-017-0-22.

Legend

○ Boring Location





B-001-1-22
Sample Boring

B-002-1-22
7.5' Subgrade
Boring

X-002-0-22 / X-002-1-22
Pvmt. Cores (Shoulder and Driving Lane)

X-003-0-22
Pvmt. Core (Shoulder)

B-003-1-22
Pvmt. Core & 7.5' Subgrade
Boring (Driving Lane)

SLM73

Boring and pavement core
locations are approximate.

APPENDIX B BORING LOGS

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 2/16/23 14:57 - U:\1755381\10\TECHNICAL_PRODUCTION\FIELD_DATA\FAY-435\BORINGS\FAY-435 BORINGS.GPJ

PROJECT: <u>FAY-435-00.00</u>	DRILLING FIRM / OPERATOR: <u>STANTEC / DC</u>	DRILL RIG: <u>CME 45C#3 (812)</u>	STATION / OFFSET: <u>TBD</u>	EXPLORATION ID: <u>B-003-0-22</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>STANTEC / JP</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>NB IR71 TO SR435</u>	
PID: <u>117955</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>4.25" HSA</u>	CALIBRATION DATE: <u>4/24/18</u>	ELEVATION: <u>1054.0 (MSL)</u> EOB: <u>6.0 ft.</u>	PAGE: <u>1 OF 1</u>
START: <u>1/4/23</u> END: <u>1/4/23</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>88.4</u>	LAT / LONG: <u>39.618264, -83.608053</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
DARK BROWN, TOPSOIL , 3 INCHES	1054.0		4																
LOOSE, LIGHT BROWN, GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT , LITTLE CLAY, DAMP TO MOIST	1053.8	1	5	15	39	SS-1	4.00	53	14	9	13	11	28	18	10	18	A-2-4 (0)	100	<< << <<
	1051.0	2	4	12	33	SS-2	4.50	53	14	9	13	11	28	18	10	17	A-2-4 (0)	-	<< << <<
STIFF, LIGHT BROWN, SILTY CLAY , SOME GRAVEL, LITTLE SAND, DAMP TO MOIST		3	3																<< << <<
		4	4	12	39	SS-3	4.50	24	10	9	28	29	36	18	18	19	A-6b (8)	-	<< << <<
		5	3																<< << <<
	1048.0	6	4	13	17	SS-4	4.00	24	10	9	28	29	36	18	18	18	A-6b (8)	-	<< << <<
		EOB	5																<< << <<

NOTES: COORDINATES AND ELEVATIONS ARE ESTIMATED. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 2/16/23 14:57 - U:\1755381\9\TECHNICAL_PRODUCTION\FIELD_DATA\FAY-435\BORINGS\FAY-435 BORINGS.GPJ

PROJECT: <u>FAY-435-00.00</u>	DRILLING FIRM / OPERATOR: <u>STANTEC / DC</u>	DRILL RIG: <u>CME 45C#3 (812)</u>	STATION / OFFSET: <u>TBD</u>	EXPLORATION ID: <u>B-007-0-22</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>STANTEC / JP</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>SR 435</u>	
PID: <u>117955</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>4.25" HSA</u>	CALIBRATION DATE: <u>4/24/18</u>	ELEVATION: <u>1078.0 (MSL)</u> EOB: <u>26.5 ft.</u>	PAGE: <u>1 OF 1</u>
START: <u>1/4/23</u> END: <u>1/4/23</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>88.4</u>	LAT / LONG: <u>39.615134, -83.598740</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				SO4 ppm	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI	WC			ODOT CLASS (GI)
BLACK, ASPHALT, 13 INCHES	1078.0																		
VERY STIFF TO HARD, BROWN TO DARK GRAY, SILTY CLAY, LITTLE GRAVEL, SOME SAND, DAMP TO MOIST	1076.9	1	3																
		2	2	7	39	SS-1	1.00	-	-	-	-	-	-	-	11	A-6b (V)	980		
		3	7	7	25	SS-2	4.50	11	6	18	41	24	33	16	17	16	A-6b (9)	-	
		4	4	8	29	SS-3	4.50	18	10	15	38	19	31	15	16	19	A-6b (7)	-	
		5	7	9	32	SS-4	4.50	-	-	-	-	-	-	-	-	13	A-6b (V)	-	
		6	9	12	37	SS-5	4.50	-	-	-	-	-	-	-	-	9	A-6b (V)	-	
		7	12	13															
		8	12	13															
		9																	
HARD, BROWN, SANDY SILT, SOME GRAVEL, LITTLE CLAY, DAMP	1068.0	10	12	38	67	SS-6	4.50	25	11	12	37	15	23	14	9	9	A-4a (3)	-	
		11	12	14															
		12																	
		13	30	45	109	11	SS-7	-	-	-	-	-	-	-	-	9	A-4a (V)	-	
		14	29																
		15	10	20	53	11	SS-8	-	-	-	-	-	-	-	-	10	A-4a (V)	-	
		16	16																
		17																	
		18	4	8	35	22	SS-9	-	-	-	-	-	-	-	-	9	A-4a (V)	-	
STIFF TO VERY STIFF, BROWN, CLAY, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE SAND, "AND" SILT, DAMP TO MOIST	1058.0	20	3	16	89	SS-10	4.00	20	8	12	42	18	48	26	22	23	A-7-6 (11)	-	
		21	4	7															
		22																	
		23	2	4	12	100	SS-11	1.50	4	2	6	48	40	51	18	33	29	A-7-6 (18)	-
		24	4	4															
		25																	
		26	3	5	15	100	SS-12	2.00	-	-	-	-	-	-	-	14	A-7-6 (V)	-	
		26	5	5															
		1051.5																	

NOTES: COORDINATES AND ELEVATIONS ARE ESTIMATED. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 2/16/23 14:57 - U:\1755381\19\TECHNICAL_PRODUCTION\FIELD_DATA\FAY-435\BORINGS\FAY-435.BORINGS.GPJ

PROJECT: <u>FAY-435-00.00</u>	DRILLING FIRM / OPERATOR: <u>STANTEC / DC</u>	DRILL RIG: <u>CME 45C#3 (812)</u>	STATION / OFFSET: <u>TBD</u>	EXPLORATION ID <u>B-008-0-22</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>STANTEC / JP</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>SR 435</u>	PAGE 1 OF 1
PID: <u>117955</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>4.25" HSA</u>	CALIBRATION DATE: <u>4/24/18</u>	ELEVATION: <u>1061.0 (MSL)</u> EOB: <u>6.0 ft.</u>	
START: <u>1/5/23</u> END: <u>1/5/23</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>88.4</u>	LAT / LONG: <u>39.612464, -83.592468</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL			
								GR	CS	FS	SI	CL	LL	PL	PI								
DARK BROWN, TOPSOIL , 3 INCHES	1061.0		4																				
MEDIUM DENSE, BROWN TO DARK GRAY, GRAVEL AND STONE FRAGMENTS WITH SAND, SILT, AND CLAY , MOIST	1060.8	1	5	18	100	SS-1	4.00	42	16	10	20	12	27	16	11	18	A-2-6 (0)	-					
STIFF, BROWN TO DARK GRAY, SANDY SILT , TRACE GRAVEL, SOME CLAY, MOIST	1059.5	2	3	10	56	SS-2	3.50	-	-	-	-	-	-	-	-	24	A-4a (V)	620					
		3	4	13	39	SS-3	3.00	-	-	-	-	-	-	-	-	21	A-4a (V)	-					
		4	4	13	67	SS-4	3.00	9	8	21	37	25	23	15	8	17	A-4a (5)	-					
	1055.0	5	3																				
		6	6																				
		EOB																					

NOTES: COORDINATES AND ELEVATIONS ARE ESTIMATED. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 2/16/23 14:57 - U:\1755381\19\TECHNICAL_PRODUCTION\FIELD_DATA\FAY-435\BORINGS\FAY-435 BORINGS.GPJ

PROJECT: <u>FAY-435-00.00</u>	DRILLING FIRM / OPERATOR: <u>STANTEC / DC</u>	DRILL RIG: <u>CME 45C#3 (812)</u>	STATION / OFFSET: <u>TBD</u>	EXPLORATION ID <u>B-009-0-22</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>STANTEC / JP</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>SR 435</u>	PAGE 1 OF 1
PID: <u>117955</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>4.25" HSA</u>	CALIBRATION DATE: <u>4/24/18</u>	ELEVATION: <u>1058.0 (MSL)</u> EOB: <u>6.0 ft.</u>	
START: <u>1/5/23</u> END: <u>1/5/23</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>88.4</u>	LAT / LONG: <u>39.611966, -83.591319</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL		
								GR	CS	FS	SI	CL	LL	PL	PI						
DARK BROWN, TOPSOIL , 4 INCHES STIFF, BROWN TO DARK GRAY, SILTY CLAY , SOME GRAVEL, SOME SAND, DAMP TO MOIST	1058.0																				
	1057.7	1	3	5	13	78	SS-1	3.50	33	17	10	22	18	38	19	19	6	A-6b (3)	-	<< >>	
STIFF, BROWN TO DARK GRAY, CLAY , TRACE GRAVEL, TRACE SAND, "AND" SILT, MOIST	1055.0	2	4	4	12	67	SS-2	3.50	-	-	-	-	-	-	-	-	26	A-6a (V)	320	<< >>	
		3	5	5	15	100	SS-3	2.50	1	3	7	45	44	47	22	25	27	A-7-6 (15)	-	<< >>	
	1052.0	4	6	5	15	89	SS-4	2.50	-	-	-	-	-	-	-	-	27	A-7-6 (V)	-	<< >>	
		5	5	5																	<< >>
		6																			<< >>
		EOB																			<< >>

NOTES: COORDINATES AND ELEVATIONS ARE ESTIMATED. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 2/16/23 14:58 - U:\175538119\TECHNICAL_PRODUTION\FIELD_DATA\FAY-435\BORINGS\FAY-435 BORINGS.GPJ

PROJECT: <u>FAY-435-00.00</u>	DRILLING FIRM / OPERATOR: <u>STANTEC / DC</u>	DRILL RIG: <u>CME 45C#3 (812)</u>	STATION / OFFSET: <u>TBD</u>	EXPLORATION ID <u>B-010-0-22</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>STANTEC / JP</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>SR 435</u>	PAGE 1 OF 1
PID: <u>117955</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>4.25" HSA</u>	CALIBRATION DATE: <u>4/24/18</u>	ELEVATION: <u>1053.0 (MSL)</u> EOB: <u>7.5 ft.</u>	
START: <u>1/5/23</u> END: <u>1/5/23</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>88.4</u>	LAT / LONG: <u>39.611442, -83.590088</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
BLACK, ASPHALT, 18 INCHES	1053.0																		
VERY DENSE, BROWNISH GRAY, GRAVEL AND STONE FRAGMENTS WITH SAND, LITTLE SILT, TRACE CLAY, DRY	1051.5	1																	
		2	24	53	67	SS-1	-	51	23	10	10	6	NP	NP	NP	5	A-1-b (0)	-	
		3	16																
MEDIUM STIFF TO STIFF, DARK BROWN, SILTY CLAY, SOME GRAVEL, LITTLE SAND, MOIST	1048.5	4	3	7	61	SS-2	2.50	-	-	-	-	-	-	-	-	25	A-6b (V)	130	
		5	2																
	1045.5	6	3	9	33	SS-3	2.50	28	7	9	30	26	38	19	19	26	A-6b (8)	-	
		7	3	9	11	SS-4	-	28	7	9	30	26	38	19	19	30	A-6b (8)	-	
		EOB	3																

NOTES: COORDINATES AND ELEVATIONS ARE ESTIMATED. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 2/16/23 14:58 - U:\1755381\9\TECHNICAL_PROD\PRODUCTION\FIELD_DATA\FAY-435\BORINGS\FAY-435 BORINGS.GPJ

PROJECT: <u>FAY-435-00.00</u>	DRILLING FIRM / OPERATOR: <u>STANTEC / DC</u>	DRILL RIG: <u>CME 45C#3 (812)</u>	STATION / OFFSET: <u>TBD</u>	EXPLORATION ID <u>B-011-0-22</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>STANTEC / JP</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>SR 435</u>	PAGE 1 OF 1
PID: <u>117955</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>4.25" HSA</u>	CALIBRATION DATE: <u>4/24/18</u>	ELEVATION: <u>1050.0 (MSL)</u> EOB: <u>7.5 ft.</u>	
START: <u>1/5/23</u> END: <u>1/5/23</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>88.4</u>	LAT / LONG: <u>39.610864, -83.588737</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
BLACK, ASPHALT , 18 INCHES	1050.0																		
DENSE, BROWNISH GRAY, GRAVEL AND STONE FRAGMENTS , SOME SAND, TRACE SILT, TRACE CLAY, LOOSER WITH DEPTH, DAMP	1048.5	1																	
		2	19	50	100	SS-1	-	56	20	10	9	5	NP	NP	NP	5	A-1-a (0)	-	
		3	20																
		4	14																
	1045.5	5	6	7	33	SS-2	-	-	-	-	-	-	-	-	-	4	A-1-a (V)	2700	
		6	2																
		7	3																
STIFF, BROWN, SANDY SILT , LITTLE GRAVEL, SOME CLAY, DAMP TO MOIST		8	3	12	72	SS-3	3.00	-	-	-	-	-	-	-	-	20	A-4a (V)	-	
		9	4																
		10	4																
	1042.5	11	3	9	78	SS-4	3.00	15	11	16	33	25	24	16	8	15	A-4a (5)	-	
		12	3																
		13	3																
		14	3																
		15	3																
		16	3																
		17	3																
		18	3																
		19	3																
		20	3																
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STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 2/16/23 14:58 - U:\175538119\TECHNICAL_PROD\PRODUCTION\FIELD_DATA\FAY-435\BORINGS\FAY-435 BORINGS.GPJ

PROJECT: <u>FAY-435-00.00</u>	DRILLING FIRM / OPERATOR: <u>STANTEC / DC</u>	DRILL RIG: <u>CME 45C#3 (812)</u>	STATION / OFFSET: <u>TBD</u>	EXPLORATION ID <u>B-012-0-22</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>STANTEC / JP</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>SR 435</u>	PAGE 1 OF 1
PID: <u>117955</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>4.25" HSA</u>	CALIBRATION DATE: <u>4/24/18</u>	ELEVATION: <u>1048.0 (MSL)</u> EOB: <u>7.5 ft.</u>	
START: <u>1/5/23</u> END: <u>1/5/23</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>88.4</u>	LAT / LONG: <u>39.610503, -83.587516</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
BLACK, ASPHALT , 18 INCHES	1048.0																		
DENSE, BROWNISH GRAY, GRAVEL AND STONE FRAGMENTS , SOME SAND, TRACE SILT, TRACE CLAY, LOOSER WITH DEPTH, DAMP	1046.5	1	21	31	100	SS-1	-	52	24	10	9	5	NP	NP	NP	6	A-1-a (0)	-	
STIFF, BROWN, SANDY SILT , LITTLE GRAVEL, SOME CLAY, MOIST	1043.5	2	13	7	28	SS-2	-	-	-	-	-	-	-	-	-	7	A-1-a (V)	2500	
		3	4	2															
		4	3	2															
		5	4	13	56	SS-3	2.00	-	-	-	-	-	-	-	-	15	A-4a (V)	-	
		6	4	5															
		7	4	12	89	SS-4	2.00	15	12	15	34	24	24	14	10	19	A-4a (5)	-	
	1040.5	EOB	4	4															

NOTES: COORDINATES AND ELEVATIONS ARE ESTIMATED. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 2/16/23 14:58 - U:\1755381\9\TECHNICAL_PRODUCTION\FIELD_DATA\FAY-435\BORINGS\FAY-435 BORINGS.GPJ

PROJECT: <u>FAY-435-00.00</u>	DRILLING FIRM / OPERATOR: <u>STANTEC / DC</u>	DRILL RIG: <u>CME 45C#3 (812)</u>	STATION / OFFSET: <u>TBD</u>	EXPLORATION ID <u>B-013-0-22</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>STANTEC / JP</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>SR 435 & 729</u>	PAGE 1 OF 1
PID: <u>117955</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>4.25" HSA</u>	CALIBRATION DATE: <u>4/24/18</u>	ELEVATION: <u>1051.0 (MSL)</u> EOB: <u>6.0 ft.</u>	
START: <u>1/5/23</u> END: <u>1/5/23</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>88.4</u>	LAT / LONG: <u>39.610115, -83.585458</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
DARK BROWN, TOPSOIL , 2 INCHES LOOSE TO MEDIUM DENSE, BROWNISH GRAY, GRAVEL AND STONE FRAGMENTS , SOME SAND, TRACE SILT, TRACE CLAY, DRY	1051.0		4																
	1048.0	1	6	15	56	SS-1	-	68	13	7	7	5	NP	NP	NP	6	A-1-a (0)	-	↖ ↗
STIFF, BROWN, SILT AND CLAY , SOME GRAVEL, SOME SAND, DAMP	1048.0	2	3	6	28	SS-2	-	-	-	-	-	-	-	-	-	4	A-1-a (V)	100	↖ ↗
	1045.0	3	3	10	67	SS-3	3.00	20	11	15	33	21	27	16	11	11	A-6a (4)	-	↖ ↗
	1045.0	4	3	18	61	SS-4	4.50	-	-	-	-	-	-	-	-	12	A-6a (V)	-	↖ ↗
		5	5																
		6	6																
		EOB	6																

NOTES: COORDINATES AND ELEVATIONS ARE ESTIMATED. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 2/16/23 14:58 - U:\1755381\9\TECHNICAL_PRODUCTION\FIELD_DATA\FAY-435\BORINGS\FAY-435 BORINGS.GPJ

PROJECT: <u>FAY-435-00.00</u>		DRILLING FIRM / OPERATOR: <u>STANTEC / DC</u>		DRILL RIG: <u>CME 45C#3 (812)</u>		STATION / OFFSET: <u>TBD</u>		EXPLORATION ID <u>B-014-0-22</u>	
TYPE: <u>SUBGRADE</u>		SAMPLING FIRM / LOGGER: <u>STANTEC / JP</u>		HAMMER: <u>CME AUTOMATIC</u>		ALIGNMENT: <u>SR 435 & 729</u>		PAGE 1 OF 1	
PID: <u>117955</u> SFN: <u>N/A</u>		DRILLING METHOD: <u>4.25" HSA</u>		CALIBRATION DATE: <u>4/24/18</u>		ELEVATION: <u>1048.0 (MSL)</u> EOB: <u>6.0 ft.</u>			
START: <u>1/5/23</u> END: <u>1/5/23</u>		SAMPLING METHOD: <u>SPT</u>		ENERGY RATIO (%): <u>88.4</u>		LAT / LONG: <u>39.609814, -83.583846</u>			

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
DARK BROWN, TOPSOIL , 2 INCHES	1048.0		2																
MEDIUM DENSE, BROWNISH GRAY, GRAVEL AND STONE FRAGMENTS , SOME SAND, TRACE SILT, TRACE CLAY, DRY	1047.8	1	5 11	24	61	SS-1	-	65	15	8	8	4	NP	NP	NP	7	A-1-a (0)	-	
		2	6 3	22	44	SS-2	-	-	-	-	-	-	-	-	-	12	A-1-a (V)	100	
	1045.0	3	5 3	15	89	SS-3	3.50	17	14	15	32	22	22	15	7	13	A-4a (4)	-	
STIFF TO VERY STIFF, BROWN, SANDY SILT , LITTLE GRAVEL, SOME CLAY, DAMP		4	7 3																
		5	7 8	19	67	SS-4	3.50	-	-	-	-	-	-	-	-	14	A-4a (V)	-	
	1042.0	6																	
		EOB																	

NOTES: COORDINATES AND ELEVATIONS ARE ESTIMATED. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.
ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 2/16/23 14:58 - U:\1755381\10\TECHNICAL_PRODUCTION\FIELD_DATA\FAY-435\BORINGS\FAY-435 BORINGS.GPJ

PROJECT: <u>FAY-435-00.00</u>		DRILLING FIRM / OPERATOR: <u>STANTEC / DC</u>		DRILL RIG: <u>CME 45C#3 (812)</u>		STATION / OFFSET: <u>TBD</u>		EXPLORATION ID <u>B-016-0-22</u>	
TYPE: <u>SUBGRADE</u>		SAMPLING FIRM / LOGGER: <u>STANTEC / JP</u>		HAMMER: <u>CME AUTOMATIC</u>		ALIGNMENT: <u>SR 435 & 729</u>		PAGE 1 OF 1	
PID: <u>117955</u> SFN: <u>N/A</u>		DRILLING METHOD: <u>4.25" HSA</u>		CALIBRATION DATE: <u>4/24/18</u>		ELEVATION: <u>1045.0 (MSL)</u> EOB: <u>6.0 ft.</u>			
START: <u>1/4/23</u> END: <u>1/4/23</u>		SAMPLING METHOD: <u>SPT</u>		ENERGY RATIO (%): <u>88.4</u>		LAT / LONG: <u>39.609333, -83.581140</u>			

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
DARK BROWN, TOPSOIL , 4 INCHES	1045.0																		
MEDIUM DENSE, BROWN, GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT , TRACE CLAY, DAMP	1044.7 1043.5	1	4	13	67	SS-1	2.00	52	20	8	12	8	30	20	10	15	A-2-4 (0)	-	↖ ↗
STIFF TO VERY STIFF, BROWN, SILT AND CLAY , SOME GRAVEL, SOME SAND, DAMP TO MOIST		2	4	10	44	SS-2	1.50	-	-	-	-	-	-	-	-	8	A-6a (V)	100	↖ ↗
		3	3																↖ ↗
	1040.5	4	6	19	33	SS-3	0.50	28	16	12	24	20	30	16	14	20	A-6a (3)	-	↖ ↗
VERY STIFF, BROWN, SANDY SILT , SOME GRAVEL, SOME CLAY, MOIST	1039.0	5	5	27	56	SS-4	2.00	24	12	14	29	21	24	15	9	17	A-4a (3)	-	↖ ↗
		6	9																↖ ↗
		EOB																	

NOTES: COORDINATES AND ELEVATIONS ARE ESTIMATED. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 2/16/23 14:58 - U:\1755381\10\TECHNICAL_PRODUCTION\FIELD_DATA\FAY-435\BORINGS\FAY-435 BORINGS.GPJ

PROJECT: <u>FAY-435-00.00</u>	DRILLING FIRM / OPERATOR: <u>STANTEC / DC</u>	DRILL RIG: <u>CME 45C#3 (812)</u>	STATION / OFFSET: <u>TBD</u>	EXPLORATION ID <u>B-017-0-22</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>STANTEC / JP</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>SR 435 & 729</u>	PAGE 1 OF 1
PID: <u>117955</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>4.25" HSA</u>	CALIBRATION DATE: <u>4/24/18</u>	ELEVATION: <u>1043.0 (MSL)</u> EOB: <u>6.0 ft.</u>	
START: <u>1/4/23</u> END: <u>1/4/23</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>88.4</u>	LAT / LONG: <u>39.609118, -83.579909</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL		
								GR	CS	FS	SI	CL	LL	PL	PI						
DARK BROWN, TOPSOIL , 3 INCHES STIFF TO VERY STIFF, BROWN, SILTY CLAY , TRACE GRAVEL, LITTLE SAND, DAMP TO MOIST	1043.0																				
	1042.8	1	4	12	61	SS-1	4.50	-	-	-	-	-	-	-	-	-	16	A-6b (V)	100	[Pattern]	
		2	3	5	15	89	SS-2	4.00	11	8	13	37	31	36	18	18	21	A-6b (10)	-	[Pattern]	
		3	5	5	18	100	SS-3	4.00	-	-	-	-	-	-	-	-	-	18	A-6b (V)	-	[Pattern]
STIFF, BROWN, CLAY , TRACE GRAVEL, LITTLE SAND, SOME SILT, MOIST	1038.5	4	6	18	100	SS-3	4.00	-	-	-	-	-	-	-	-	-	-	18	A-6b (V)	-	[Pattern]
	1037.0	5	4	13	100	SS-4	4.00	13	3	13	34	37	46	21	25	34	A-7-6 (14)	-	[Pattern]		
		6	5																		[Pattern]
EOB																					

NOTES: COORDINATES AND ELEVATIONS ARE ESTIMATED. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT. - 2/16/23 14:59 - U:\175538119\TECHNICAL_PRODUCTION\FIELD_DATA\FAY-435\BORINGS\FAY-35 RAMP BORINGS.GPJ

PROJECT: <u>FAY-35-04.67</u>	DRILLING FIRM / OPERATOR: <u>STANTEC / DC</u>	DRILL RIG: <u>CME 45#2T (814)</u>	STATION / OFFSET: <u>TBD</u>	EXPLORATION ID: <u>B-001-1-22</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>STANTEC / JS</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>NB US35 RAMP TO SR435</u>	
PID: <u>117955</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>3.75" HSA</u>	CALIBRATION DATE: <u>3/16/21</u>	ELEVATION: <u>1074.0 (MSL)</u> EOB: <u>26.5 ft.</u>	PAGE: <u>1 OF 1</u>
START: <u>11/29/22</u> END: <u>11/29/22</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>90*</u>	LAT / LONG: <u>39.613188, -83.594538</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				SO4 ppm	HOLE SEALED	
								GR	CS	FS	SI	CL	LL	PL	PI	WC			ODOT CLASS (GI)
DARK BROWN, TOPSOIL , 5 INCHES VERY STIFF TO HARD, BROWN, SILT AND CLAY , SOME GRAVEL, LITTLE SAND, DAMP TO MOIST	1074.0		4																
	1073.6	1	5	20	83	SS-1	3.50	29	8	9	29	25	30	18	12	9	A-6a (5)	-	
VERY STIFF TO HARD, LIGHT BROWN TO GRAY, SANDY SILT , LITTLE TO SOME GRAVEL, SOME CLAY, DAMP TO MOIST	1071.0	2	2	74	67	SS-2	4.50	-	-	-	-	-	-	-	-	18	A-6a (V)	2500	
		3	16	62	100	SS-3	4.50	14	12	15	36	23	20	14	6	8	A-4a (5)	-	
		4	20	62	100	SS-3	4.50	14	12	15	36	23	20	14	6	8	A-4a (5)	-	
		5	9	38	100	SS-4	4.50	-	-	-	-	-	-	-	-	8	A-4a (V)	-	
		6	11	38	100	SS-4	4.50	-	-	-	-	-	-	-	-	8	A-4a (V)	-	
		7																	
		8	10	68	6	SS-5	4.50	-	-	-	-	-	-	-	-	8	A-4a (V)	-	
		9	22	68	6	SS-5	4.50	-	-	-	-	-	-	-	-	8	A-4a (V)	-	
		10	23	68	6	SS-5	4.50	-	-	-	-	-	-	-	-	8	A-4a (V)	-	
		11	5	30	100	SS-6	3.50	23	11	13	32	21	21	15	6	10	A-4a (4)	-	
VERY STIFF TO HARD, GRAY, CLAY , TRACE GRAVEL, TRACE SAND, "AND" SILT, DAMP TO MOIST	1056.5	12																	
		13	7	39	0	SS-7	-	-	-	-	-	-	-	-	-	-	A-4a (V)	-	
		14	9	39	0	SS-7	-	-	-	-	-	-	-	-	-	-	A-4a (V)	-	
		15	17	39	78	SS-8	3.00	-	-	-	-	-	-	-	-	24	A-4a (V)	-	
		16	12	29	78	SS-8	3.00	-	-	-	-	-	-	-	-	24	A-4a (V)	-	
		17	7	20	94	SS-9	2.50	5	1	6	42	46	51	26	25	26	A-7-6 (16)	-	
		18	6	20	94	SS-9	2.50	5	1	6	42	46	51	26	25	26	A-7-6 (16)	-	
STIFF TO VERY STIFF, BROWNISH GRAY, SANDY SILT , LITTLE GRAVEL, LITTLE TO SOME CLAY, DAMP TO MOIST	1051.5	19	12	30	28	SS-10	4.50	-	-	-	-	-	-	-	17	A-7-6 (V)	-		
		20	13	30	28	SS-10	4.50	-	-	-	-	-	-	-	17	A-7-6 (V)	-		
		21	7	30	28	SS-10	4.50	-	-	-	-	-	-	-	17	A-7-6 (V)	-		
		22																	
STIFF TO VERY STIFF, BROWNISH GRAY, SANDY SILT , LITTLE GRAVEL, LITTLE TO SOME CLAY, DAMP TO MOIST	1050.0	23	2	11	89	SS-11	2.50	14	11	15	40	20	23	17	6	16	A-4a (5)	-	
		24	3	11	89	SS-11	2.50	14	11	15	40	20	23	17	6	16	A-4a (5)	-	
		25	4	11	89	SS-11	2.50	14	11	15	40	20	23	17	6	16	A-4a (5)	-	
		26	7	30	100	SS-12	4.00	-	-	-	-	-	-	-	-	14	A-4a (V)	-	
	1047.5	26	9	30	100	SS-12	4.00	-	-	-	-	-	-	-	14	A-4a (V)	-		

NOTES: COORDINATES AND ELEVATIONS ARE ESTIMATED.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 2/16/23 14:59 - U:\1755381\9\TECHNICAL_PRODUCTION\FIELD_DATA\FAY-435\BORINGS\FAY-35 RAMP BORINGS.GPJ

PROJECT: <u>FAY-35-04.67</u>	DRILLING FIRM / OPERATOR: <u>STANTEC / DC</u>	DRILL RIG: <u>CME 45#2T (814)</u>	STATION / OFFSET: <u>TBD</u>	EXPLORATION ID <u>B-002-1-22</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>STANTEC / JS</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>NB US35 RAMP TO SR435</u>	
PID: <u>117955</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>3.75" HSA</u>	CALIBRATION DATE: <u>3/16/21</u>	ELEVATION: <u>1069.0 (MSL)</u> EOB: <u>6.0 ft.</u>	PAGE 1 OF 1
START: <u>11/29/22</u> END: <u>11/29/22</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>90*</u>	LAT / LONG: <u>39.612472, -83.594571</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				WC	ODOT CLASS (GI)	SO4 ppm	HOLE SEALED	
								GR	CS	FS	SI	CL	LL	PL	PI						
DARK BROWN, TOPSOIL , 3 INCHES STIFF TO VERY STIFF, BROWN, SILT AND CLAY , SOME GRAVEL, SOME SAND, DAMP	1069.0		2																		
	1068.8	1	3	12	56	SS-1	3.00	22	11	12	31	24	32	21	11	15	A-6a (4)	-			
HARD, BROWNISH GRAY, SANDY SILT , LITTLE GRAVEL, SOME CLAY, DAMP	1066.0	2	15	75	89	SS-2	4.50	-	-	-	-	-	-	-	-	9	A-6a (V)	8000			
		3	50																		
		4	24	102	0	SS-3	-	-	-	-	-	-	-	-	-	9	A-4a (V)	-			
		5	32																		
	1063.0	6	22	50	67	SS-4	4.50	11	8	15	37	29	24	16	8	-	A-4a (6)	-			
		EOB	15																		
			18																		

NOTES: COORDINATES AND ELEVATIONS ARE ESTIMATED. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 2/16/23 14:59 - U:\175538119\TECHNICAL_PRODUCTION\FIELD_DATA\FAY-435\BORINGS\FAY-35 RAMP BORINGS.GPJ

PROJECT: <u>FAY-35-04.67</u>	DRILLING FIRM / OPERATOR: <u>STANTEC / DC</u>	DRILL RIG: <u>CME 45#2T (814)</u>	STATION / OFFSET: <u>TBD</u>	EXPLORATION ID: <u>B-003-1-22</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>STANTEC / JS</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>NB US35 RAMP TO SR435</u>	
PID: <u>117955</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>3.75" HSA</u>	CALIBRATION DATE: <u>3/16/21</u>	ELEVATION: <u>1062.0 (MSL)</u> EOB: <u>7.0 ft.</u>	PAGE: <u>1 OF 1</u>
START: <u>11/29/22</u> END: <u>11/29/22</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>90*</u>	LAT / LONG: <u>39.610453, -83.594085</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				SO4 ppm	HOLE SEALED	
								GR	CS	FS	SI	CL	LL	PL	PI	WC			ODOT CLASS (GI)
PAVEMENT AND BASE, 12 INCHES ASPHALT, 1 INCH GRANULAR BASE	1062.0																		
VERY STIFF TO HARD, ORANGISH BROWN, SILT AND CLAY , SOME GRAVEL, SOME SAND, DAMP	1061.0	1																	
		2	12	36	83	SS-1	4.50	23	11	14	28	24	26	17	9	9	A-4a (3)	-	
STIFF TO VERY STIFF, BROWNISH GRAY TO GRAY, CLAY , TRACE GRAVEL, TRACE SILT, SOME SILT, DAMP	1058.0	3	7	30	78	SS-2	2.00	-	-	-	-	-	-	-	-	12	A-4a (V)	100	
		4	9	11															
	1055.0	5	2	14	61	SS-3	3.00	-	-	-	-	-	-	-	-	19	A-7-6 (V)	-	
		6	4	5															
		EOB	2	17	67	SS-4	3.50	7	2	8	34	49	47	27	20	17	A-7-6 (13)	-	
				7															

NOTES: COORDINATES AND ELEVATIONS ARE ESTIMATED. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

APPENDIX C

GB1 ANALYSIS

OHIO DEPARTMENT OF TRANSPORTATION**OFFICE OF GEOTECHNICAL ENGINEERING****PLAN SUBGRADES****Geotechnical Design Manual Section 600**

Instructions: Enter data in the shaded cells only.

(Enter state route number, project description, county, consultant's name, prepared by name, and date prepared. This information will be transferred to all other sheets. The date prepared must be entered in the appropriate cell on this sheet to remove these instructions prior to printing.)

**FAY-435 Widening
117955**

Widening and improvements of SR 435 from the exit ramps of IR 71 east to Bluegrass Blvd.

Stantec

Prepared By: James Samples
Date prepared: Tuesday, February 14, 2023

James Samples
10200 Alliance Road
Suite 300
Cincinnati, OH 45242
(513)842-8204
james.samples@stantec.com

NO. OF BORINGS: 20

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-001-1-22	US35				CME 45 Track Rig	92	1074.0	1074.0	0.0
2	B-002-1-22	US35				CME 45 Track Rig	92	1069.0	1069.0	0.0
3	B-003-1-22	US35				CME 45 Track Rig	92	1062.0	1062.0	0.0
4	B-001-0-22	IR71				CME 45 Truck Rig	88	1053.0	1053.0	0.0
5	B-002-0-22	IR71				CME 45 Truck Rig	88	1062.0	1062.0	0.0
6	B-003-0-22	IR71				CME 45 Truck Rig	88	1054.0	1054.0	0.0
7	B-004-0-22	IR71				CME 45 Truck Rig	88	1053.0	1053.0	0.0
8	B-005-0-22	SR435				CME 45 Truck Rig	88	1056.0	1056.0	0.0
9	B-006-0-22	SR435				CME 45 Truck Rig	88	1064.0	1064.0	0.0
10	B-007-0-22	SR435				CME 45 Truck Rig	88	1078.0	1078.0	0.0
11	B-008-0-22	SR435				CME 45 Truck Rig	88	1061.0	1061.0	0.0
12	B-009-0-22	SR435				CME 45 Truck Rig	88	1058.0	1058.0	0.0
13	B-010-0-22	SR435				CME 45 Truck Rig	88	1053.0	1053.0	0.0
14	B-011-0-22	SR435				CME 45 Truck Rig	88	1050.0	1050.0	0.0
15	B-012-0-22	SR435				CME 45 Truck Rig	88	1048.0	1048.0	0.0
16	B-013-0-22	SR435				CME 45 Truck Rig	88	1051.0	1051.0	0.0
17	B-014-0-22	SR435				CME 45 Truck Rig	88	1048.0	1048.0	0.0
18	B-015-0-22	SR435				CME 45 Truck Rig	88	1046.0	1046.0	0.0
19	B-016-0-22	SR435				CME 45 Truck Rig	88	1045.0	1045.0	0.0
20	B-017-0-22	SR435				CME 45 Truck Rig	88	1043.0	1043.0	0.0

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics					Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)		
			From	To	From	To	N ₆₀	N _{60L}		LL	PL	PI	% Silt	% Clay	P200	M _c	M _{OPT}	Class		GI	Unsuitable	Unstable	Unsuitable		Unstable	
1	B 001-1 22	SS-1	0.0	1.5	0.0	1.5	20	20	3.5	30	18	12	29	25	54	9	14	A-6a	5	2500						
		SS-2	1.5	3.0	1.5	3.0	74		4.5								18	14	A-6a		10		Mc			
		SS-3	3.0	4.5	3.0	4.5	62		4.5	20	14	6	36	23	59	8	10	A-4a	5							
		SS-4	4.5	6.0	4.5	6.0	38		4.5							8	10	A-4a	8							
2	B 002-1 22	SS-1	0.0	1.5	0.0	1.5	12	12	3	32	21	11	31	24	55	15	16	A-6a	4	8000						
		SS-2	1.5	3.0	1.5	3.0	75		4.5							9	14	A-6a	10							
		SS-3	3.0	4.5	3.0	4.5	102									9	10	A-4a	8							
		SS-4	4.5	6.0	4.5	6.0	50		4.5	24	16	8	37	29	66		11	A-4a	6							
3	B 003-1 22	SS-1	1.0	2.5	1.0	2.5	36	14	4.5	26	17	9	28	24	52	9	12	A-4a	3	100						
		SS-2	2.5	4.0	2.5	4.0	30		2							12	10	A-4a	8							
		SS-3	4.0	5.5	4.0	5.5	14		3							19	18	A-7-6	16							
		SS-4	5.5	7.0	5.5	7.0	17		3.5	47	27	20	34	49	83	17	24	A-7-6								
4	B 001-0 22	SS-1	0.0	1.5	0.0	1.5	43	16	4.5	36	24	12	26	17	43	10	19	A-6a	2	100						
		SS-2	1.5	3.0	1.5	3.0	49		3							14	14	A-6a	10							
		SS-3	3.0	4.5	3.0	4.5	29		4.5	57	24	33	44	42	86	25	21	A-7-6	19							
		SS-4	4.5	6.0	4.5	6.0	16		4							25	18	A-7-6	16							
5	B 002-0 22	SS-1	0.0	1.5	0.0	1.5	9	9	4.5							16	18	A-7-6	16	100		N ₆₀		12"		
		SS-2	1.5	3.0	1.5	3.0	16		4	43	21	22	46	33	79	22	18	A-7-6	13			Mc				
		SS-3	3.0	4.5	3.0	4.5	19		4							27	10	A-4a	8							
		SS-4	4.5	6.0	4.5	6.0	13		4	23	15	8	32	26	58	16	10	A-4a	5							
6	B 003-0 22	SS-1	0.0	1.5	0.0	1.5	15	12	4	28	18	10	13	11	24	18	10	A-2-4	0	100		Mc				
		SS-2	1.5	3.0	1.5	3.0	12		4.5	28	18	10	13	11	24	17	10	A-2-4	0			N ₆₀ & Mc				
		SS-3	3.0	4.5	3.0	4.5	12		4.5	36	18	18	28	29	57	19	16	A-6b	8							
		SS-4	4.5	6.0	4.5	6.0	13		4	36	18	18	28	29	57	18	16	A-6b	8							
7	B 004-0 22	SS-1	0.0	1.5	0.0	1.5	16	16	2							19	16	A-6b	16	100		Mc				
		SS-2	1.5	3.0	1.5	3.0	18		4.5	38	20	18	46	38	84	18	16	A-6b	11							
		SS-3	3.0	4.5	3.0	4.5	28		4.5	55	22	33	44	46	90	30	19	A-7-6	19							
		SS-4	4.5	6.0	4.5	6.0	28		4.5							27	18	A-7-6	16							
8	B 005-0 22	SS-1	0.0	1.5	0.0	1.5	15	10	4.5	23	15	8	30	22	52	12	10	A-4a	3	780						
		SS-2	1.5	3.0	1.5	3.0	13		3							14	10	A-4a	8			N ₆₀ & Mc				
		SS-3	3.0	4.5	3.0	4.5	18		3							18	10	A-4a	8							
		SS-4	4.5	6.0	4.5	6.0	10		2	20	18	2	27	12	39	14	13	A-4a	1							
9	B 006-0 22	SS-1	0.0	1.5	0.0	1.5	4	4	3							18	14	A-6a	10	100			N ₆₀ & Mc		24"	
		SS-2	1.5	3.0	1.5	3.0	32			24	13	11	30	20	50	10	14	A-6a	3							
		SS-3	3.0	4.5	3.0	4.5	34		4.5	22	14	8	25	19	44	12	10	A-4a	2							
		SS-4	4.5	6.0	4.5	6.0	32		4.5							9	10	A-4a	8							

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics					Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)		
			From	To	From	To	N ₆₀	N _{60L}		LL	PL	PI	% Silt	% Clay	P200	M _c	M _{OPT}	Class		GI	Unsuitable	Unstable	Unsuitable		Unstable	
10	B 007-0 22	SS-1	1.1	2.6	1.1	2.6	7	7	1						11	16	A-6b	16	980		HP					
		SS-2	2.6	4.1	2.6	4.1	25		4.5	33	16	17	41	24	65	16	16	A-6b	9							
		SS-3	4.1	5.6	4.1	5.6	29		4.5	31	15	16	38	19	57	19	16	A-6b	7							
		SS-4	5.6	7.1	5.6	7.1	32		4.5							13	16	A-6b								
11	B 008-0 22	SS-1	0.0	1.5	0.0	1.5	18	10	4	27	16	11	20	12	32	18	10	A-2-6	0			Mc				
		SS-2	1.5	3.0	1.5	3.0	10		3.5							24	10	A-4a	8	620		N ₆₀ & Mc				
		SS-3	3.0	4.5	3.0	4.5	13		3							21	10	A-4a	8							
		SS-4	4.5	6.0	4.5	6.0	13		3	23	15	8	37	25	62	17	10	A-4a	5							
12	B 009-0 22	SS-1	0.0	1.5	0.0	1.5	13	12	3.5	38	19	19	22	18	40	6	16	A-6b	3							
		SS-2	1.5	3.0	1.5	3.0	12		3.5							26	14	A-6a	10	320		N ₆₀ & Mc				
		SS-3	3.0	4.5	3.0	4.5	15		2.5	47	22	25	45	44	89	27	19	A-7-6	15							
		SS-4	4.5	6.0	4.5	6.0	15		2.5							27	18	A-7-6	16							
13	B 010-0 22	SS-1	1.5	3.0	1.5	3.0	53	7		NP	NP	NP	10	6	16	5	6	A-1-b	0							
		SS-2	3.0	4.5	3.0	4.5	7		2.5							25	16	A-6b	16	130						
		SS-3	4.5	6.0	4.5	6.0	9		2.5	38	19	19	30	26	56	26	16	A-6b	8							
		SS-4	6.0	7.5	6.0	7.5	9			38	19	19	30	26	56	30	16	A-6b								
14	B 011-0 22	SS-1	1.5	3.0	1.5	3.0	50	7		NP	NP	NP	9	5	14	5	6	A-1-a	0							
		SS-2	3.0	4.5	3.0	4.5	7									4	6	A-1-a	0	2700						
		SS-3	4.5	6.0	4.5	6.0	12		3							20	10	A-4a	8							
		SS-4	6.0	7.5	6.0	7.5	9		3	24	16	8	33	25	58	15	11	A-4a								
15	B 012-0 22	SS-1	1.5	3.0	1.5	3.0	31	7		NP	NP	NP	9	5	14	6	6	A-1-a	0							
		SS-2	3.0	4.5	3.0	4.5	7									7	6	A-1-a	0	2500						
		SS-3	4.5	6.0	4.5	6.0	13		2							15	10	A-4a	8							
		SS-4	6.0	7.5	6.0	7.5	12		2	24	14	10	34	24	58	19	10	A-4a								
16	B 013-0 22	SS-1	0.0	1.5	0.0	1.5	15	6		NP	NP	NP	7	5	12	6	6	A-1-a	0							
		SS-2	1.5	3.0	1.5	3.0	6									4	6	A-1-a	0	100						
		SS-3	3.0	4.5	3.0	4.5	10		3	27	16	11	33	21	54	11	14	A-6a	4							
		SS-4	4.5	6.0	4.5	6.0	18		4.5							12	14	A-6a	10							
17	B 014-0 22	SS-1	0.0	1.5	0.0	1.5	24	15		NP	NP	NP	8	4	12	7	6	A-1-a	0							
		SS-2	1.5	3.0	1.5	3.0	22									12	6	A-1-a	0	100						
		SS-3	3.0	4.5	3.0	4.5	15		3.5	22	15	7	32	22	54	13	10	A-4a	4							
		SS-4	4.5	6.0	4.5	6.0	19		3.5							14	10	A-4a	8							
18	B 015-0 22	SS-1	0.0	1.5	0.0	1.5	9	9	4	32	19	13	21	13	34	14	10	A-2-6	1			N ₆₀ & Mc		12"		
		SS-2	1.5	3.0	1.5	3.0	10		3.5							16	18	A-7-6	16	100		N ₆₀				
		SS-3	3.0	4.5	3.0	4.5	9		2.5							22	18	A-7-6	16							
		SS-4	4.5	6.0	4.5	6.0	12		3	52	20	32	42	41	83	29	18	A-7-6	18							

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics					Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)		
			From	To	From	To	N ₆₀	N _{60L}		LL	PL	PI	% Silt	% Clay	P200	M _c	M _{OPT}	Class		GI	Unsuitable	Unstable	Unsuitable		Unstable	
19	B 016-0 22	SS-1	0.0	1.5	0.0	1.5	13	10	2	30	20	10	12	8	20	15	10	A-2-4	0			N ₆₀ & M _c	12"			
		SS-2	1.5	3.0	1.5	3.0	10		1.5							8	14	A-6a	10	100		HP				
		SS-3	3.0	4.5	3.0	4.5	19		0.5	30	16	14	24	20	44	20	14	A-6a	3							
		SS-4	4.5	6.0	4.5	6.0	27		2	24	15	9	29	21	50	17	10	A-4a	3							
20	B 017-0 22	SS-1	0.0	1.5	0.0	1.5	12	12	4.5							16	16	A-6b	16	100						
		SS-2	1.5	3.0	1.5	3.0	15		4	36	18	18	37	31	68	21	16	A-6b	10			Mc				
		SS-3	3.0	4.5	3.0	4.5	18		4							18	16	A-6b	16							
		SS-4	4.5	6.0	4.5	6.0	13		4	46	21	25	34	37	71	34	18	A-7-6	14							

PID: 117955

County-Route-Section: FAY-435 Widening

No. of Borings: 20

Geotechnical Consultant: Stantec

Prepared By: James Samples

Date prepared: 2/14/2023

Chemical Stabilization Options		
320	Rubblize & Roll	No
206	Cement Stabilization	Option
	Lime Stabilization	No
206	Depth	14"

Excavate and Replace Stabilization Options	
Global Geotextile Average(N60L): Override(HP):	12" 12"
Global Geogrid Average(N60L): Override(HP):	0" 0"

Design CBR	7
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% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	1%	$HP \leq 0.5$	1%
$N_{60} < 12$	21%	$0.5 < HP \leq 1$	1%
$12 \leq N_{60} < 15$	23%	$1 < HP \leq 2$	10%
$N_{60} \geq 20$	33%	$HP > 2$	73%
M+	16%		
Rock	0%		
Unsuitable	0%		

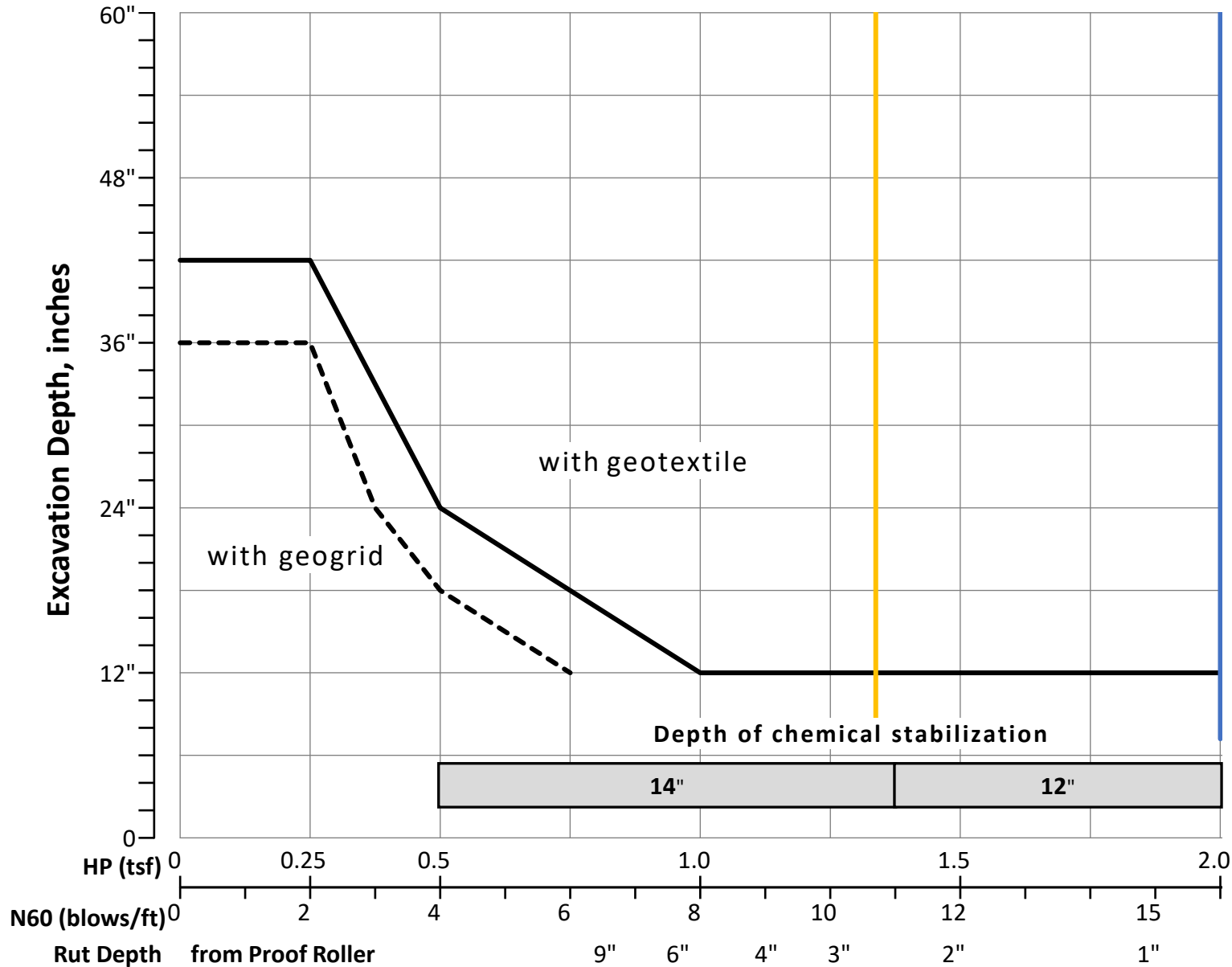
Excavate and Replace at Surface	
Average	0"
Maximum	0"
Minimum	0"

% Proposed Subgrade Surface	
Unstable & Unsuitable	46%
Unstable	46%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	22	11	3.48	33	18	15	29	23	52	16	13	8
Maximum	102	20	4.50	57	27	33	46	49	90	34	24	19
Minimum	4	4	0.50	20	13	2	7	4	12	4	6	0

Classification Counts by Sample																			
ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	8	1	3	0	2	0	0	0	24	0	0	13	15	0	14	0	0	80
Percent	0%	10%	1%	4%	0%	3%	0%	0%	0%	30%	0%	0%	16%	19%	0%	18%	0%	0%	100%
% Rock Granular Cohesive	0%	48%										53%							100%
Surface Class Count	0	6	1	3	0	2	0	0	0	5	0	0	10	7	0	3	0	0	37
Surface Class Percent	0%	16%	3%	8%	0%	5%	0%	0%	0%	14%	0%	0%	27%	19%	0%	8%	0%	0%	100%

Fig. 600-1 – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
3.48	2.00	<input checked="" type="checkbox"/> HP
10.75	6.00	<input type="checkbox"/> N60L

Average HP —
Average N_{60L} —