

Subsurface Investigation Report

Enbridge Line 5 Reroute

New Canadian National Railroad Alignment

Location 1-CN, West of Curry Road, South of the CN Railroad

Location 2-CN, West of Curry Road, North of the CN Railroad

Town of Gurney, Iron County, Wisconsin

Prepared for

Enbridge Energy

Professional Certification:

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Wisconsin.



Joseph C. Butler, PE

Senior Engineer

License Number: E-43286-6

August 26, 2020



Project B2001991

Braun Intertec Corporation

August 26, 2020

Project B2001991

Mr. Adam Erickson
Enbridge Energy, Limited Partnership
Manulife Place, 10180-101 Street
Edmonton, AB T5J 3S4

Re: Subsurface Investigation
Enbridge Line 5 Reroute
New Canadian National Railroad Alignment
Location 1-CN, West of Curry Road, South of the CN Railroad
Location 2-CN, West of Curry Road, North of the CN Railroad
Town of Gurney, Iron County, Wisconsin

Dear Mr. Erickson:

We are pleased to present this Subsurface Investigation Report for the Line 5 Reroute Project at the exploration locations 1-CN and 2-CN crossing under Canadian National (CN) Railroad in Town of Gurney, Iron County, Wisconsin.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report, or if there are other services that we can provide in support of our work to date, please contact Kyle Warmuth (kwarmuth@braunintertec.com) or David Morrison (dmorrison@braunintertec.com) at 218.624.4967.

Sincerely,

BRAUN INTERTEC CORPORATION



Kyle P. Warmuth
Staff Consultant



David E. Morrison
Project Consultant



Joseph C. Butler, PE
Senior Engineer

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Descriptive Terminology of Soil

Sieve Analysis Reports: 328485, 328486, 328675, 328487, 328488, 328490

Moisture Content Report: 328485, 328486, 328675, 328487, 328488, 328490

A. Introduction

A.1. Project Description

Enbridge Energy plans to relocate Line 5 around the Bad River Indian Reservation, as part of that project, a geotechnical investigation and evaluation is being completed. We are providing subsurface investigation services as part of this effort.

This report provides a factual data obtained at Borehole Locations 1-CN and 2-CN which is located west of Curry Road, at the new proposed Canadian National (CN) Railroad alignment in the Town of Gurney, Iron County, Wisconsin.

A.2. Purpose

The purpose of our subsurface investigation is to characterize subsurface geologic conditions at the selected exploration locations.

A.3. Background Information and Reference Documents

We reviewed the following information:

- Wisconsin Geologic Map, "Soils of Wisconsin", prepared by F. D. Hole, M.T Beatty, C.J. Milfred, G.B. Lee, and A.J Klingelhoets, dated 1968.
- Aerial photos from Google Earth Pro®.

A.4. Scope of Services

We performed our scope of services for the project in accordance with our Quote to Mr. Jonathan Underland of Enbridge Energy, under the terms of the Work Order (132013839) provided by Enbridge Energy. The following list describes the geotechnical tasks completed in accordance with our authorized scope of services.

- Reviewing the background information and reference documents previously cited.

- Lake Superior Consulting selected and staked the boring locations and we cleared the exploration locations of underground utilities. The Soil Boring Location Sketch included in the Appendix shows the approximate locations of the borings.
- Performing two (2) standard penetration test (SPT) borings with coring denoted as 1-CN and 2-CN, to nominal depths of approximately 42 feet below grade.
- Performing laboratory testing on select samples as selected by Lake Superior Consulting.
- Preparing this report containing a boring location sketch, exploration logs, laboratory tests, and a summary of the geologic materials encountered.

Our scope of services did not include environmental services or testing and our geotechnical personnel performing this evaluation are not trained to provide environmental services or testing. We can provide environmental services or testing at your request.

B. Results

B.1. Geologic Overview

We based the geologic origins used in this report on the soil types, in-situ and laboratory testing, and available common knowledge of the geological history of the site. Because of the complex depositional history, geologic origins can be difficult to ascertain. We did not perform a detailed investigation of the geologic history for the site.

B.2. Geologic Materials

B.2.a. Soil Encountered

The general geologic profile of the soils encountered between the two (2) borings consisted (proceeding down from the ground surface) of 2 to 4 feet of fill materials, underlain by layers of glacial till and outwash. The soils contained in the layers consisted of silty sands, poorly graded sand, and silt to the termination depth in each boring, the encountered soils contained variable amounts of gravel. Table 1 in section B.3 contains more information on each material encountered.

B.3. Estimated Soil Properties

Estimated soil properties for each significant strata change are presented below in Table 1.

Table 1: Estimated Soil Properties

Soil Strata and Elevations (ft)	Soil Type	Blow Count per foot Range (BPF)	Dry Unit Weight Range (pcf)	Undrained Unit Weight Range (pcf)	Drained Friction Angle Range (degrees)	Undrained Friction Angle (degrees)	Undrained Cohesion Range (ksf)	Drained Cohesion Range (ksf)	Modulus of Elasticity Range* (tsf)
Upper Soils (1061 1/2 to 1017 1/2)	Silty Sand (SM)	7 - 12	96 - 98	115 - 118	28 - 30	10 - 15	0.75 – 1.0	0.4 – 1.35	40 - 84
	Poorly Graded Sand (SP)	4 - 16	88 - 111	105 - 118	30 - 34	30 - 33	0	0	28 - 115
Lower Soils (1052 to 1011 1/2)	Silt (ML)	8 - 75	94 - 114	112 - 127	28 - 36	29 - 35	0	0	32 - 324

*Sustained Young's Modulus values

B.4. Groundwater

We did not observe groundwater while advancing borings.

Project planning should anticipate seasonal and annual fluctuations of groundwater. Mud-rotary drilling techniques were used to advance the borings, hindering the ability to observe groundwater.

B.5. Laboratory Test Results

The boring logs show the results of the sieve analysis and moisture testing that were requested. The Appendix contains the results of these tests.

C. Procedures

C.1. Penetration Test Borings

The penetration test borings were drilled with a vehicle -mounted core and auger drill equipped with hollow-stem auger. We performed the borings in general accordance with ASTM D6151 taking penetration test samples at 2 1/2- or 5-foot intervals in general accordance to ASTM D1586. We collected thin-walled tube samples in general accordance with ASTM D1587 at selected depths. The boring logs show the actual sample intervals and corresponding depths. We also collected bulk samples of auger cuttings at selected locations for laboratory testing.

C.2. Exploration Logs

C.2.a. Log of Boring Sheets

The Appendix includes Log of Boring sheets for our penetration test borings. The logs identify and describe the penetrated geologic materials, and present the results of penetration resistance and other in-situ tests performed. The logs also present the results of laboratory tests performed on penetration test samples, and groundwater measurements. The Appendix also includes a Fence Diagram intended to provide a summarized cross-sectional view of the soil profile across the site.

We inferred strata boundaries from changes in the penetration test samples and the auger cuttings. Because we did not perform continuous sampling, the strata boundary depths are only approximate. The boundary depths likely vary away from the boring locations, and the boundaries themselves may occur as gradual rather than abrupt transitions.

C.2.b. Geologic Origins

We assigned geologic origins to the materials shown on the logs and referenced within this report, based on: (1) a review of the background information and reference documents cited above, (2) visual classification of the various geologic material samples retrieved during the course of our subsurface exploration, (3) penetration resistance and other in-situ testing performed for the project, (4) laboratory test results, and (5) available common knowledge of the geologic processes and environments that have impacted the site and surrounding area in the past.

C.3. Material Classification and Testing

C.3.a. Visual and Manual Classification

We visually and manually classified the geologic materials encountered based on ASTM D2488. When we performed laboratory classification tests, we used the results to classify the geologic materials in accordance with ASTM D2487. The Appendix includes a chart explaining the classification system we used.

C.3.b. Laboratory Testing

The exploration logs in the Appendix note most of the results of the laboratory tests performed on geologic material samples. The remaining laboratory test results follow the exploration logs. We performed the tests in general accordance with ASTM or AASHTO procedures.

C.4. Groundwater Measurements

The drillers checked for groundwater while advancing the penetration test borings, and again after auger withdrawal. We then filled the boreholes, as noted on the boring logs.

D. Qualifications

D.1. Variations in Subsurface Conditions

D.1.a. Material Strata

We developed our evaluation, analyses and recommendations from a limited amount of site and subsurface information. It is not standard engineering practice to retrieve material samples from exploration locations continuously with depth. Therefore, we must infer strata boundaries and thicknesses to some extent. Strata boundaries may also be gradual transitions, and project planning should expect the strata to vary in depth, elevation and thickness, away from the exploration locations.

Variations in subsurface conditions present between exploration locations may not be revealed until performing additional exploration work, or starting construction. If future activity for this project reveals any such variations, you should notify us so that we may reevaluate our recommendations. Such variations could increase construction costs, and we recommend including a contingency to accommodate them.

D.1.b. Groundwater Levels

We made groundwater measurements under the conditions reported herein and shown on the exploration logs, and interpreted in the text of this report. Note that the observation periods were relatively short, and project planning can expect groundwater levels to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, surface drainage modifications and other seasonal and annual factors.

D.2. Continuity of Professional Responsibility

D.2.a. Plan Review

We based this report on a limited amount of information, and we made a number of assumptions to help us develop our recommendations. We should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether we anticipated the design correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

D.2.b. Construction Observations and Testing

We recommend retaining us to perform the required observations and testing during construction as part of the ongoing geotechnical evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the borings and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

D.3. Use of Report

This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

D.4. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Appendix

Project Number B2001991 Geotechnical Evaluation Enbridge Line 5 Re-Route Various Locations Ashland and Iron Counties, Wisconsin					BORING: 1-CN		
					LOCATION: See attached sketch		
					LATITUDE: 46.48731	LONGITUDE: -90.48601	
DRILLER: EPC		LOGGED BY: P. Moe		START DATE: 07/30/20	END DATE: 07/30/20		
SURFACE ELEVATION: 1063.4 ft		RIG: Subcontractor	METHOD: 4 1/4" HSA	SURFACING:		WEATHER:	
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
1061.4		FILL: SILTY SAND (SM), fine to medium-grained, brown, dry		1-2-1-2 (3) 20"			
2.0		POORLY GRADED SAND (SP), fine to medium-grained, brown, moist, very loose to medium dense (GLACIAL OUTWASH)		9-2-3-3 (5) 18"			
			5	3-7-6-6 (13) 18"			
				2-4-4-4 (8) 16"		6	Test results are in the attached lab report
			10	2-2-2-2 (4) 16"			
1051.9		SANDY SILT (ML), fine to medium-grained, brown, moist, medium dense (GLACIAL TILL)		3-2-10-12 (12) 14"			Drilling method switched to mud rotary at 11 1/2 feet
11.5				10-11-13-22 (24) 14"			
			15				
1045.9		SANDY SILT with GRAVEL (ML), fine to medium-grained, brown, moist to wet, very dense (GLACIAL TILL)		20-29-41-48 (70) 18"		11	Test results are in the attached lab report
17.5			20				
				23-28-30-36 (58) 20"			
			25				
				23-25-34-36 (59) 20"			
			30				

Continued on next page

Project Number B2001991 Geotechnical Evaluation Enbridge Line 5 Re-Route Various Locations Ashland and Iron Counties, Wisconsin					BORING: 1-CN	
					LOCATION: See attached sketch	
					LATITUDE: 46.48731	LONGITUDE: -90.48601
DRILLER: EPC		LOGGED BY: P. Moe		START DATE: 07/30/20	END DATE: 07/30/20	
SURFACE ELEVATION: 1063.4 ft		RIG: Subcontractor	METHOD: 4 1/4" HSA	SURFACING:		WEATHER:

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
1030.4 33.0		SANDY SILT with GRAVEL (ML), fine to medium-grained, brown, moist to wet, very dense (GLACIAL TILL)					
		SILT (ML), fine to medium-grained, brown, moist to wet, very dense (GLACIAL TILL)	35	23-30-33-45 (63) 20"		19	Test results are in the attached lab report
			40	18-25-28-38 (53) 18"			
1021.4 42.0		END OF BORING					Water not observed while drilling.
		Boring then backfilled with cement/bentonite grout	45				
			50				
			55				
			60				

Project Number B2001991 Geotechnical Evaluation Enbridge Line 5 Re-Route Various Locations Ashland and Iron Counties, Wisconsin					BORING: 2-CN	
					LOCATION: See attached sketch	
					LATITUDE: 46.48769	LONGITUDE: -90.48604
DRILLER: EPC		LOGGED BY: P. Moe		START DATE: 07/29/20	END DATE: 07/29/20	
SURFACE ELEVATION: 1053.3 ft		RIG: Subcontractor	METHOD: 4 1/4" HSA	SURFACING:		WEATHER:

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
1049.3		FILL: SILTY SAND (SM), fine to medium-grained, brown, dry		2-3-5-5 (8) 20"			Drilling method switched to mud rotary at 6 feet Test results are in the attached lab report
4.0		SILTY SAND (SM), fine to medium-grained, brown, moist, loose (GLACIAL TILL)	5	3-6-6-6 (12) 18"		20	
			10	2-3-4-6 (7) 20"			
				4-4-4-4 (8) 18"			
1039.3		POORLY GRADED SAND (SP), fine to medium-grained, brown, moist, loose to medium dense (GLACIAL OUTWASH)	15	3-4-5-6 (9) 12"			Test results are in the attached lab report
14.0				4-4-4-8 (8) 10"		19	
				4-5-7-10 (12) 10"			
			20	7-8-8-9 (16) 12"			
			25				
				4-4-7-7 (11) 10"			
			30				

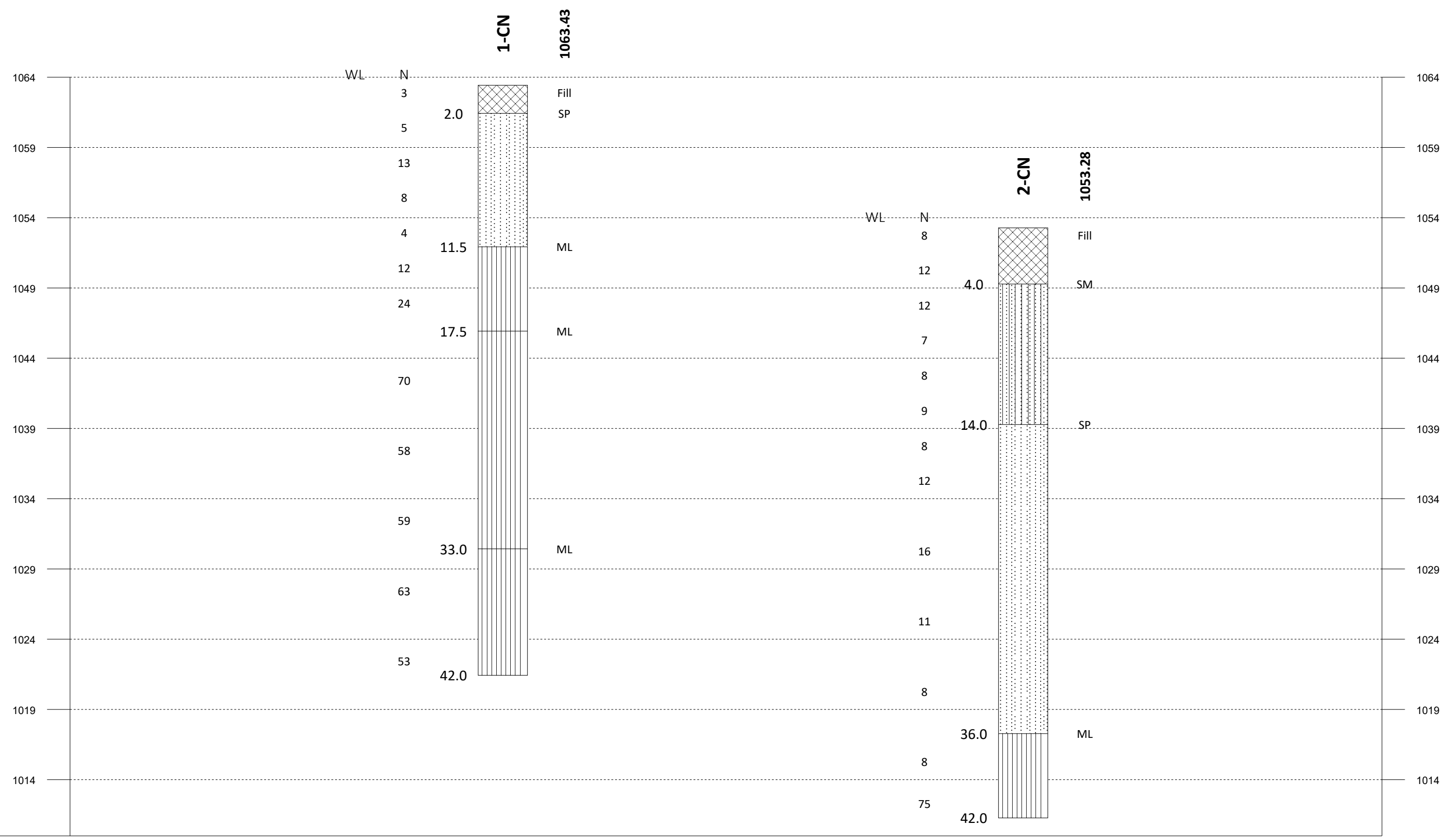
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Project Number B2001991 Geotechnical Evaluation Enbridge Line 5 Re-Route Various Locations Ashland and Iron Counties, Wisconsin					BORING: 2-CN		
					LOCATION: See attached sketch		
					LATITUDE: 46.48769	LONGITUDE: -90.48604	
DRILLER: EPC		LOGGED BY: P. Moe		START DATE: 07/29/20	END DATE: 07/29/20		
SURFACE ELEVATION: 1053.3 ft		RIG: Subcontractor	METHOD: 4 1/4" HSA	SURFACING:		WEATHER:	
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
1017.3		POORLY GRADED SAND (SP), fine to medium-grained, brown, moist, loose to medium dense (GLACIAL OUTWASH)	35	4-4-4-3 (8) 12"			Test results are in the attached lab report
36.0		SANDY SILT (ML), fine to medium-grained, brown, moist, very dense (GLACIAL TILL)	40	4-3-5-6 (8) 12"		18	
1011.3				23-34-41-45 (75) 20"			
42.0		END OF BORING					Water not observed while drilling.
		Boring then backfilled with cement/bentonite grout	45				
			50				
			55				
			60				

Legend Key

- Fill
- SP
- ML
- SM

1010.00



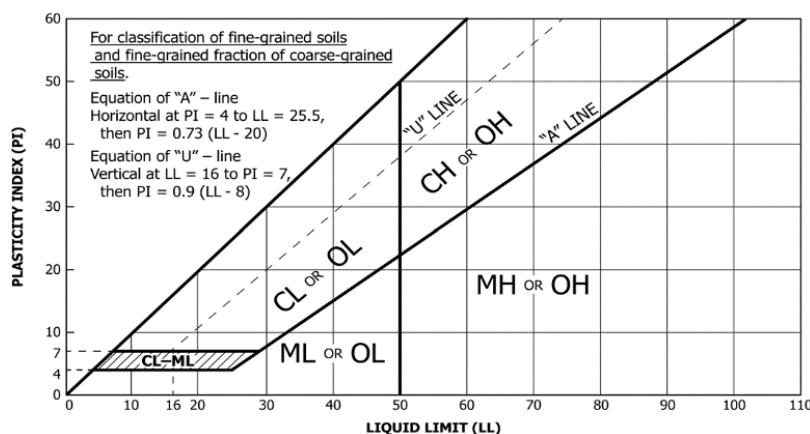
CN Alignment
Fence Diagram
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

Project ID: B2001991
Vert. Scale: 1"= 7'
Hor. Scale: NTS
Date: 08-19-2020



Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification	
				Group Symbol	Group Name ^B
Coarse-grained Soils (more than 50% retained on No. 200 sieve)	Gravels (More than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (Less than 5% fines ^C)	$C_u \geq 4$ and $1 \leq C_c \leq 3^D$	GW	Well-graded gravel ^E
			$C_u < 4$ and/or ($C_c < 1$ or $C_c > 3$) ^D	GP	Poorly graded gravel ^E
		Gravels with Fines (More than 12% fines ^C)	Fines classify as ML or MH	GM	Silty gravel ^{EFG}
			Fines Classify as CL or CH	GC	Clayey gravel ^{EFG}
	Sands (50% or more coarse fraction passes No. 4 sieve)	Clean Sands (Less than 5% fines ^H)	$C_u \geq 6$ and $1 \leq C_c \leq 3^D$	SW	Well-graded sand ^I
			$C_u < 6$ and/or ($C_c < 1$ or $C_c > 3$) ^D	SP	Poorly graded sand ^I
		Sands with Fines (More than 12% fines ^H)	Fines classify as ML or MH	SM	Silty sand ^{FGI}
			Fines classify as CL or CH	SC	Clayey sand ^{FGI}
Fine-grained Soils (50% or more passes the No. 200 sieve)	Silts and Clays (Liquid limit less than 50)	Inorganic	PI > 7 and plots on or above "A" line ^J	CL	Lean clay ^{KLM}
			PI < 4 or plots below "A" line ^J	ML	Silt ^{KLM}
		Organic	Liquid Limit – oven dried Liquid Limit – not dried <0.75	OL	Organic clay ^{KLMN} Organic silt ^{KLMQ}
	Silts and Clays (Liquid limit 50 or more)	Inorganic	PI plots on or above "A" line	CH	Fat clay ^{KLM}
			PI plots below "A" line	MH	Elastic silt ^{KLM}
		Organic	Liquid Limit – oven dried Liquid Limit – not dried <0.75	OH	Organic clay ^{KLMP} Organic silt ^{KLMQ}
Highly Organic Soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

- Based on the material passing the 3-inch (75-mm) sieve.
- If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
- Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
- $C_u = D_{60} / D_{10}$ $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
- If soil contains $\geq 15\%$ sand, add "with sand" to group name.
- If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
- If fines are organic, add "with organic fines" to group name.
- Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay
- If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.
- If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.
- If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant.
- If soil contains $\geq 30\%$ plus No. 200, predominantly sand, add "sandy" to group name.
- If soil contains $\geq 30\%$ plus No. 200 predominantly gravel, add "gravelly" to group name.
- PI ≥ 4 and plots on or above "A" line.
- PI plots on or above "A" line.
- PI plots below "A" line.



DD Dry density, pcf
WD Wet density, pcf
P200 % Passing #200 sieve

Laboratory Tests
OC Organic content, %
q_p Pocket penetrometer strength, tsf
MC Moisture content, %
q_u Unconfined compression test, tsf

LL Liquid limit
PL Plastic limit
PI Plasticity index

Particle Size Identification

Boulders..... over 12"
Cobbles..... 3" to 12"
Gravel
Coarse..... 3/4" to 3" (19.00 mm to 75.00 mm)
Fine..... No. 4 to 3/4" (4.75 mm to 19.00 mm)
Sand
Coarse..... No. 10 to No. 4 (2.00 mm to 4.75 mm)
Medium..... No. 40 to No. 10 (0.425 mm to 2.00 mm)
Fine..... No. 200 to No. 40 (0.075 mm to 0.425 mm)
Silt..... No. 200 (0.075 mm) to .005 mm
Clay..... < .005 mm

Relative Proportions^{L, M}

trace..... 0 to 5%
little..... 6 to 14%
with..... $\geq 15\%$

Inclusion Thicknesses

lens..... 0 to 1/8"
seam..... 1/8" to 1"
layer..... over 1"

Apparent Relative Density of Cohesionless Soils

Very loose 0 to 4 BPF
Loose 5 to 10 BPF
Medium dense..... 11 to 30 BPF
Dense..... 31 to 50 BPF
Very dense..... over 50 BPF

Consistency of Cohesive Soils Blows Per Foot Approximate Unconfined Compressive Strength

Very soft..... 0 to 1 BPF..... < 0.25 tsf
Soft..... 2 to 4 BPF..... 0.25 to 0.5 tsf
Medium..... 5 to 8 BPF 0.5 to 1 tsf
Stiff..... 9 to 15 BPF..... 1 to 2 tsf
Very Stiff..... 16 to 30 BPF..... 2 to 4 tsf
Hard..... over 30 BPF..... > 4 tsf

Moisture Content:

Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp but no visible water.
Wet: Visible free water, usually soil is below water table.

Drilling Notes:




Blows/N-value: Blows indicate the driving resistance recorded for each 6-inch interval. The reported N-value is the blows per foot recorded by summing the second and third interval in accordance with the Standard Penetration Test, ASTM D1586.

Partial Penetration: If the sampler could not be driven through a full 6-inch interval, the number of blows for that partial penetration is shown as #/x" (i.e. 50/2"). The N-value is reported as "REF" indicating refusal.

Recovery: Indicates the inches of sample recovered from the sampled interval. For a standard penetration test, full recovery is 18", and is 24" for a thinwall/shelby tube sample.

WOH: Indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WOR: Indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

Water Level: Indicates the water level measured by the drillers either while drilling (, at the end of drilling (, or at some time after drilling ().

4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number:	328485	Alternate ID:	1-CN 4 7'-9'
Sampling Method:	Auger Boring ASTM D1452	Depth (ft):	7-9
Boring Number:	1-CN	Sampled By:	Drill Crew
Location:	In-place		
Location Details:	Boring 1-CN Sample 4 7'-9'		
Sample Date:	07/29/2020		
Received Date:	08/07/2020	Lab:	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	08/11/2020	Tested By:	Nelson, Brennan

Laboratory Data

Sieve Size	Passing (%)	Specification
4.75 mm (No. 4)	100.0	
2 mm (No. 10)	100.0	
850 µm (No. 20)	99.8	
425 µm (No. 40)	98.1	
150 µm (No. 100)	10.9	
75 µm (No. 200)	3.9	

Sand (%)

96.1

Silt & Clay (%)

3.9

D10

0.102

D30

0.172

D60

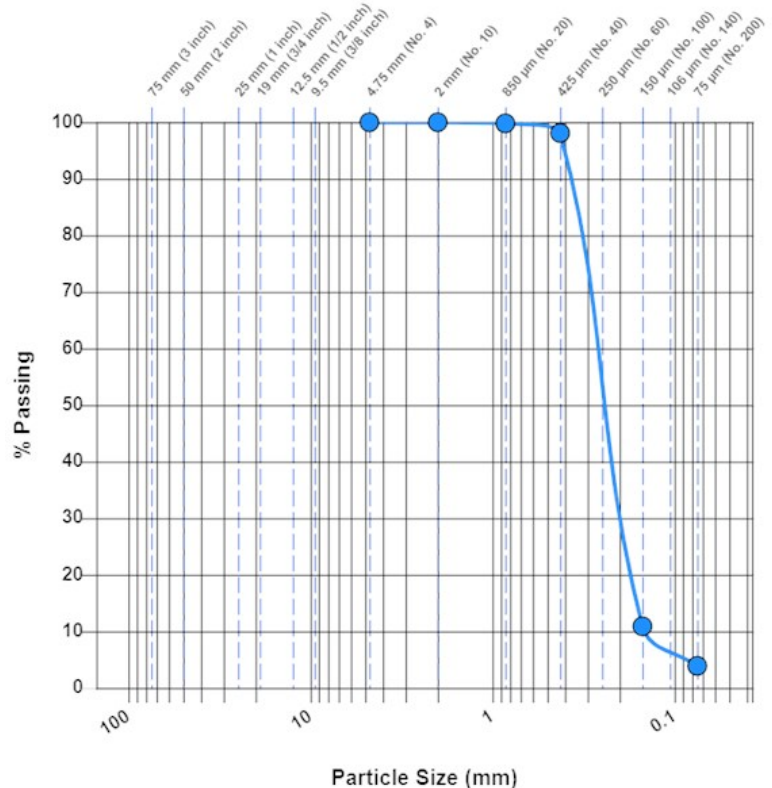
0.206

C_u

2.02

C_c

1.41



Classification: SP Poorly graded sand

Specimen Obtained: Oven Dry

Test Method: Method A (Composite Sieving)

Dispersion Apparatus: Shaking

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample is 243.9 grams.

[Signature]

4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number:	328486	Alternate ID:	1-CN 8 20'-22'
Sampling Method:	Auger Boring ASTM D1452	Depth (ft):	20-22
Boring Number:	1-CN	Sampled By:	Drill Crew
Location:	In-place		
Location Details:	Boring 1-CN Sample 8 20'-22'		
Sample Date:	07/29/2020		
Received Date:	08/07/2020	Lab:	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	08/11/2020	Tested By:	Nelson, Brennan

Laboratory Data

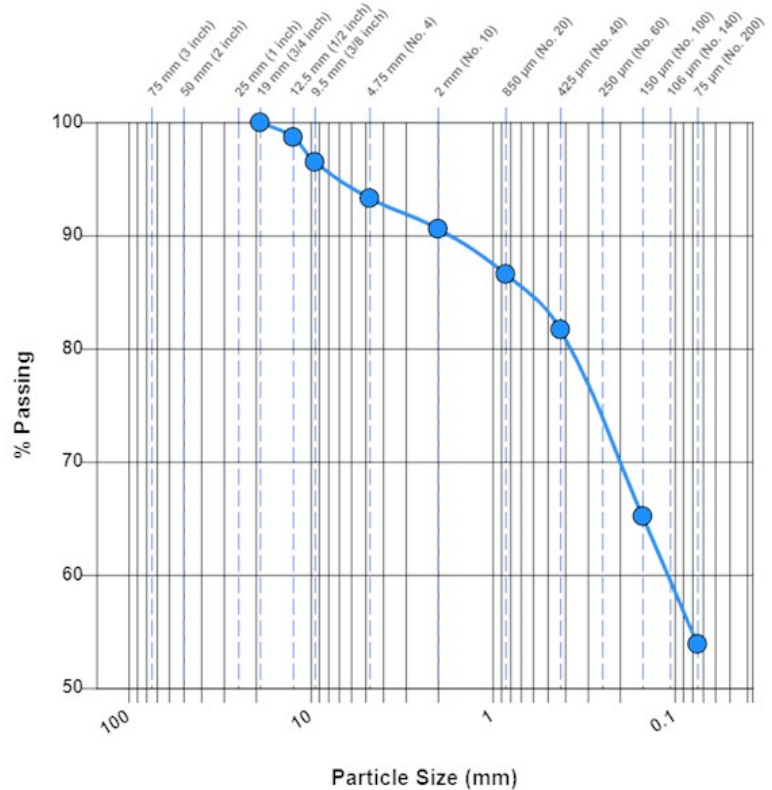
Sieve Size	Passing (%)	Specification
19 mm (3/4 inch)	100.0	
12.5 mm (1/2 inch)	98.7	
9.5 mm (3/8 inch)	96.5	
4.75 mm (No. 4)	93.3	
2 mm (No. 10)	90.6	
850 µm (No. 20)	86.6	
425 µm (No. 40)	81.7	
150 µm (No. 100)	65.2	
75 µm (No. 200)	53.9	

Gravel (%)
6.7

Sand (%)
39.4

Silt & Clay (%)
53.9

D60
0.092



Classification: ML Sandy silt

Specimen Obtained: Oven Dry

Test Method: Method A (Composite Sieving)

Dispersion Apparatus: Shaking

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample is 267.2 grams.

[Signature]

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Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number:	328675	Alternate ID:	1-CN 11 35'-37'
Sampling Method:	Auger Boring ASTM D1452	Depth (ft):	35-37
Boring Number:	1-CN	Sampled By:	Patterson, Gregg
Location:	In-place		
Location Details:	Boring 1-CN Sample 11 35'-37		
Sample Date:	07/29/2020		
Received Date:	08/11/2020	Lab:	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	08/11/2020	Tested By:	Nelson, Brennan

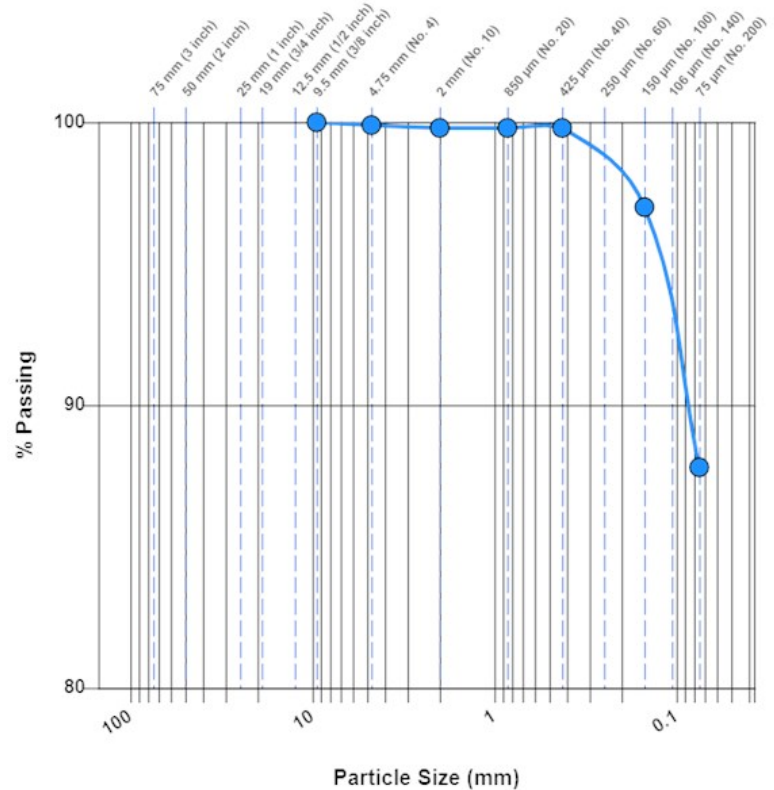
Laboratory Data

Sieve Size	Passing (%)	Specification
9.5 mm (3/8 inch)	100.0	
4.75 mm (No. 4)	99.9	
2 mm (No. 10)	99.8	
850 µm (No. 20)	99.8	
425 µm (No. 40)	99.8	
150 µm (No. 100)	97.0	
75 µm (No. 200)	87.8	

Gravel (%)
0.1

Sand (%)
12.1

Silt & Clay (%)
87.8



Classification: ML Silt

Specimen Obtained: Oven Dry

Dispersion Apparatus: Shaking

Test Method: Method A (Composite Sieving)

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample is 224.6 grams.

[Signature]

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Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

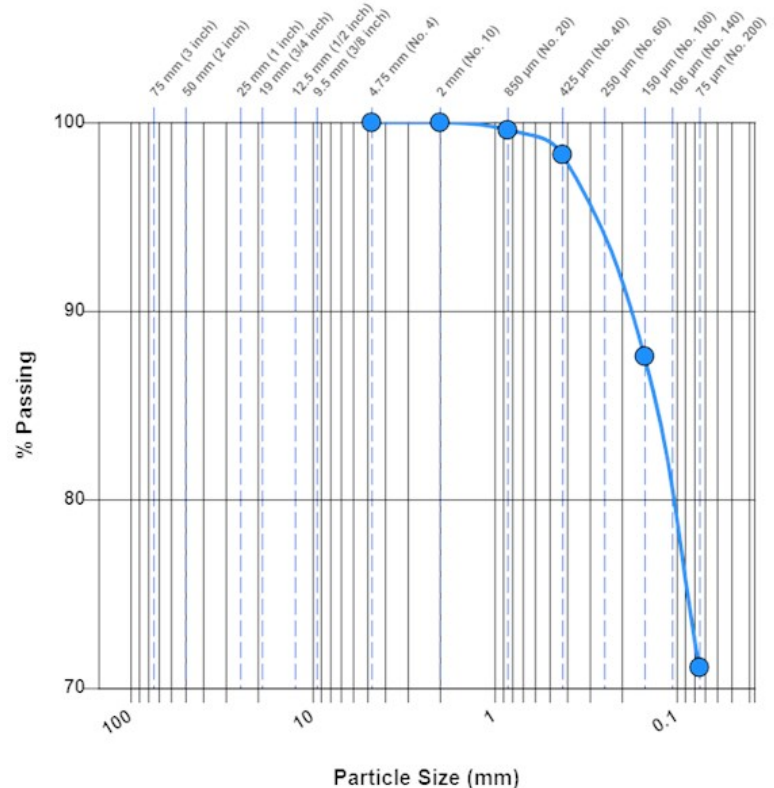
Sample Number:	328487	Alternate ID:	2-CN 4 7'-9'
Sampling Method:	Auger Boring ASTM D1452	Depth (ft):	7-9
Boring Number:	2-CN	Sampled By:	Drill Crew
Location:	In-place		
Location Details:	Boring 2-CN Sample 4 7'-9'		
Sample Date:	07/29/2020		
Received Date:	08/07/2020	Lab:	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	08/11/2020	Tested By:	Nelson, Brennan

Laboratory Data

Sieve Size	Passing (%)	Specification
4.75 mm (No. 4)	100.0	
2 mm (No. 10)	100.0	
850 µm (No. 20)	99.6	
425 µm (No. 40)	98.3	
150 µm (No. 100)	87.6	
75 µm (No. 200)	71.1	

Sand (%)
28.9

Silt & Clay (%)
71.1



Classification: SM Silty sand

Specimen Obtained: Oven Dry

Test Method: Method A (Composite Sieving)

Dispersion Apparatus: Shaking

General

Results: The test is for informational purposes.

Remarks: Total Dry Weight of sample is 203.8 grams.

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Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number:	328488	Alternate ID:	2-CN 8 17'-19'
Sampling Method:	Auger Boring ASTM D1452	Depth (ft):	17-19
Boring Number:	2-CN	Sampled By:	Drill Crew
Location:	In-place		
Location Details:	Boring 2-CN Sample 8 17'-19'		
Sample Date:	07/29/2020		
Received Date:	08/07/2020	Lab:	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	08/11/2020	Tested By:	Nelson, Brennan

Laboratory Data

Sieve Size	Passing (%)	Specification
4.75 mm (No. 4)	100.0	
2 mm (No. 10)	100.0	
850 µm (No. 20)	100.0	
425 µm (No. 40)	99.2	
150 µm (No. 100)	12.3	
75 µm (No. 200)	4.9	

Sand (%)

95.1

Silt & Clay (%)

4.9

D10

0.096

D30

0.170

D60

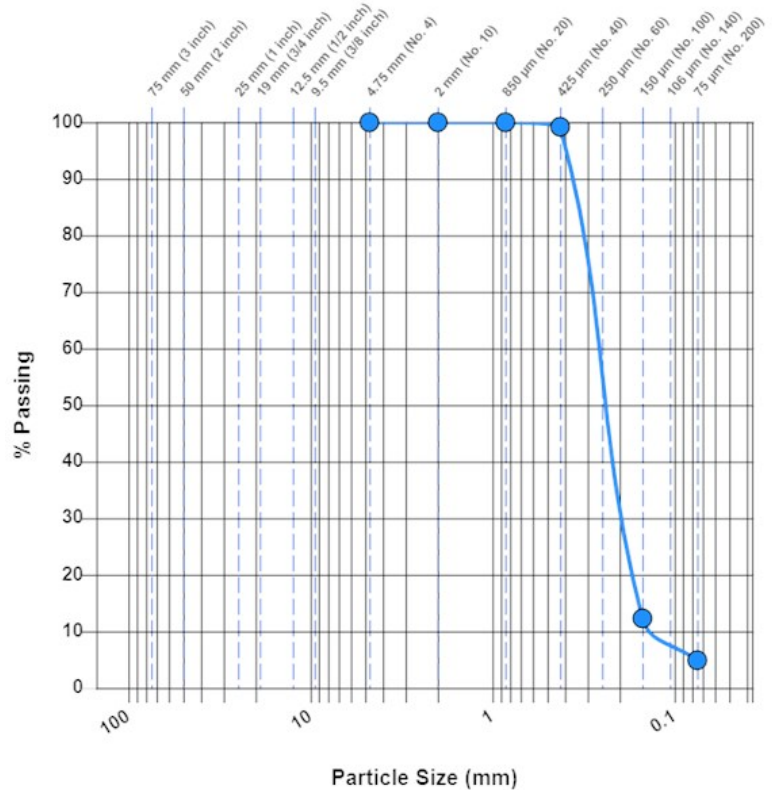
0.205

C_U

2.14

C_C

1.47



Classification: SP Poorly graded sand

Specimen Obtained: Oven Dry

Test Method: Method A (Composite Sieving)

Dispersion Apparatus: Shaking

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample is 198.0 grams.

[Signature]

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Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number:	328490	Alternate ID:	2-CN 12 37'-39'
Sampling Method:	Auger Boring ASTM D1452	Depth (ft):	37-39
Boring Number:	2-CN	Sampled By:	Drill Crew
Location:	In-place		
Location Details:	Boring 2-CN Sample 12 37'-39'		
Sample Date:	07/29/2020		
Received Date:	08/07/2020	Lab:	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	08/11/2020	Tested By:	Nelson, Brennan

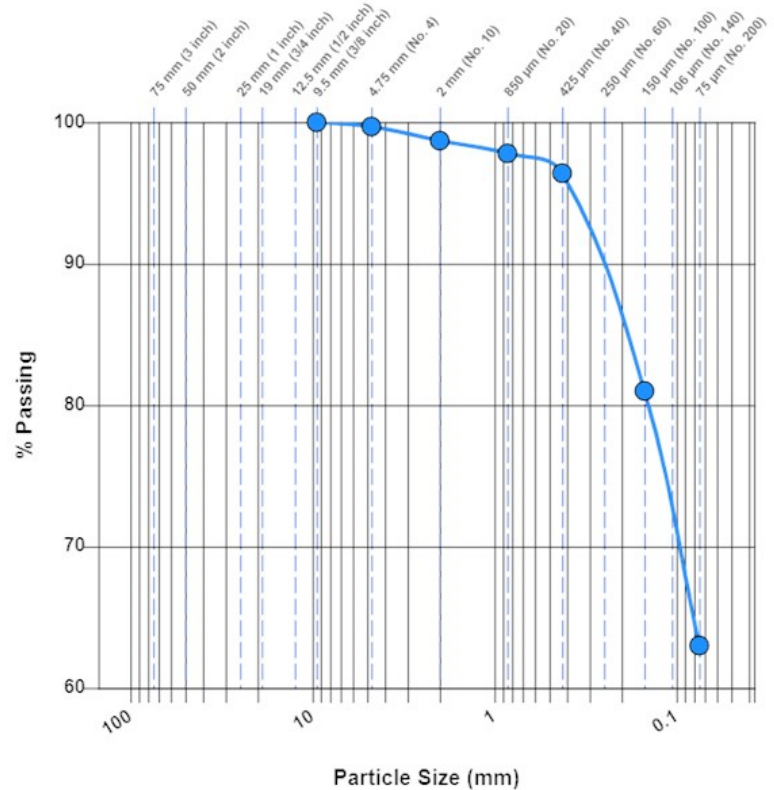
Laboratory Data

Sieve Size	Passing (%)	Specification
9.5 mm (3/8 inch)	100.0	
4.75 mm (No. 4)	99.7	
2 mm (No. 10)	98.7	
850 µm (No. 20)	97.8	
425 µm (No. 40)	96.4	
150 µm (No. 100)	81.0	
75 µm (No. 200)	63.0	

Gravel (%)
0.3

Sand (%)
36.7

Silt & Clay (%)
63.0



Classification: ML Sandy silt

Specimen Obtained: Oven Dry

Test Method: Method A (Composite Sieving)

Dispersion Apparatus: Shaking

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample is 98.0 grams.

[Signature]

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Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number: 328485 **Alternate ID:** 1-CN 4 7'-9'

Sampling Method: Auger Boring ASTM D1452 **Sampled By:** Drill Crew

Location: In-place

Location Details: Boring 1-CN Sample 4 7'-9'

Sample Date: 07/29/2020

Received Date: 08/07/2020 **Lab:** 4511 West First Street, Suite 4, Duluth, MN

Tested Date: 08/11/2020 **Tested By:** Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
1-CN	4	8.0	5.8

General

Results: The test is for informational purposes.



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B2001991
Enbridge Line 5 Re-route
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near Mellen, WI

Sample Information

Sample Number: 328486 **Alternate ID:** 1-CN 8 20'-22'
Sampling Method: Auger Boring ASTM D1452 **Sampled By:** Drill Crew
Location: In-place
Location Details: Boring 1-CN Sample 8 20'-22'
Sample Date: 07/29/2020
Received Date: 08/07/2020 **Lab:** 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 08/11/2020 **Tested By:** Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
1-CN	8	21.0	10.5

General

Results: The test is for informational purposes.



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Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number: 328675 **Alternate ID:** 1-CN 11 35'-37'
Sampling Method: Auger Boring ASTM D1452 **Sampled By:** Patterson, Gregg
Location: In-place
Location Details: Boring 1-CN Sample 11 35'-37'
Sample Date: 07/29/2020
Received Date: 08/11/2020 **Lab:** 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 08/11/2020 **Tested By:** Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
1-CN	11	36.0	18.7

General

Results: The test is for informational purposes.



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B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number: 328487 **Alternate ID:** 2-CN 4 7'-9'

Sampling Method: Auger Boring ASTM D1452 **Sampled By:** Drill Crew

Location: In-place

Location Details: Boring 2-CN Sample 4 7'-9'

Sample Date: 07/29/2020

Received Date: 08/07/2020 **Lab:** 4511 West First Street, Suite 4, Duluth, MN

Tested Date: 08/11/2020 **Tested By:** Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
2-CN	4	8.0	20.3

General

Results: The test is for informational purposes.



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Sample Information

Sample Number: 328488 **Alternate ID:** 2-CN 8 17'-19'
Sampling Method: Auger Boring ASTM D1452 **Sampled By:** Drill Crew
Location: In-place
Location Details: Boring 2-CN Sample 8 17'-19'
Sample Date: 07/29/2020
Received Date: 08/07/2020 **Lab:** 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 08/11/2020 **Tested By:** Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
2-CN	8	18.0	19.0

General

Results: The test is for informational purposes.



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Sample Information

Sample Number: 328490 **Alternate ID:** 2-CN 12 37'-39'
Sampling Method: Auger Boring ASTM D1452 **Sampled By:** Drill Crew
Location: In-place
Location Details: Boring 2-CN Sample 12 37'-39'
Sample Date: 07/29/2020
Received Date: 08/07/2020 **Lab:** 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 08/11/2020 **Tested By:** Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
2-CN	12	38.0	18.3

General

Results: The test is for informational purposes.

