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PLANNING SERVICES



## Geotechnical Investigation and Design Report

*Barry Kindrat*

**Type of Document:**

Report

**Project Name:**

Proposed Re-Zoning of 1876 and 1890 Bancroft Drive  
Sudbury, Ontario

**Project Number:**

SUD-21017389-A0

**Prepared By:**

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**Date Submitted:**

2021-09-28

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Further to our Proposal No. 21/135/GP\_rev, dated August 19, 2021 and your subsequent authorization to proceed, EXP Services Inc. (EXP) has completed the field investigation and geotechnical engineering evaluation for the proposed re-zoning at 1876 and 1890 Bancroft Drive in Sudbury, Ontario. Our comments and recommendations, based on the results of the field investigation and our understanding of the project scope, are provided in this report.

## 1. Introduction

It is understood by EXP that a multi-unit residential development is proposed at 1876 and 1890 Bancroft Drive in Sudbury, Ontario. For the development, re-zoning of the subject properties is required from R1-5, low density residential to R3, medium density residential. As part of the re-zoning process, Conservation Sudbury has indicated in a letter dated June 29, 2021 (copy provided to EXP) that “mapped wetlands” are present at the rear (north) of the subject properties, which are often associated with unstable, organic soils. As such, Conservation Sudbury indicated that a geotechnical investigation is required to establish the soil composition and determine the presence of organic (unstable) soils, along with acceptable mitigation measured.

EXP has completed a geotechnical investigation at the rear of the subject properties at the identified “mapped wetland” areas in order to satisfy Conservation Sudbury’s requirements. The results of our investigation are included herein.

## 2. Field Investigation

The field investigation for this project consisted of the advancement of four (4) sampled test pits at the sites, at accessible locations within the areas identified as potential wetland. The test pits were completed on September 15, 2021 at the locations shown on Dwg. No. A-1 included in Appendix A.

Each test pit was advanced to the depths shown on the attached test pits logs, Figs. B-2 to B-5 in Appendix B, using a rubber tire backhoe. Grab samples were obtained at each general change in stratigraphy. The retained samples were logged in the field and then carefully packaged and transported to our Sudbury laboratory for detailed examination and testing. The test pits were backfilled with excavated soils, which were compacted in place as best as possible using the bucket of the backhoe.

The advancement of the test pits was supervised on a full-time basis by a geotechnical representative from EXP.

The test pit locations and elevations were surveyed in the field using a handheld GPS. The locations and elevations should be considered accurate only to the degree implied by the method used.

## 3. Laboratory Testing

A geotechnical laboratory testing program was performed on representative soil samples and consisted of moisture content tests and grain size analyses. The laboratory test results are summarized on the test pit logs in Appendix B, with detailed results included in Appendix C.

## 4. Subsurface Conditions

Details of the soils encountered during the field investigation are summarized on the attached logs in Appendix B. The logs include textural descriptions of the subsoil and indicate the soil boundaries inferred from non-continuous sampling and observations during the field investigation. These boundaries reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. When reading this report, the explanatory notes and definitions provided in Figures B-1A and B-1B in Appendix B should be referenced.

In general, the test pits encountered a thin layer of topsoil/organics overlying native cohesionless soils.

Topsoil/organics was encountered at the surface of each test pit and ranged in thickness from 75 to 150 mm. Measured moisture contents within the topsoil ranged from 18.4 to 226.1%.

Underlying the topsoil/organics was native sand. The sand extended to 0.6 to 2.0 m depth. At Test Pit TP-2, the sand extended to the test pit termination depth of 2.0 m. The sand was brown to grey in colour, moist, and contained trace to some silt and trace to some organics. Measured moisture contents within the sand ranged from 17.5 to 69.9%.

Underlying the sand at TP-1, TP-3, and TP-4 was native sandy silt that extended to the test pit termination depths of 1.5 to 3.0 m. The sandy silt was brown to grey in colour, and moist to wet. Measured moisture contents within the sandy silt ranged from 27.1 to 36.0%.

Groundwater was not encountered within the test pits upon completion.

## 5. Discussion

Based on the completed test pits, the soil composition at the rear of the subject properties consists of a thin layer of topsoil/organics overlying native cohesionless soils consisting of sand to sandy silt. As such, other than the thin layer of topsoil/organics, unstable soils do not appear to be present at the rear (north) of the subject properties.

Development of the properties for the proposed multi-unit residential dwellings are anticipated to be relatively straight forward as there were no unstable soils encountered. It is assumed that the encountered 75 to 150 mm of topsoil/organics will be stripped from any development locations (buildings locations, pavement areas, etc.) as is typical construction practice. The encountered cohesionless soils are suitable to support the proposed development and no mitigation measures would be required.

## 6. Limitations

A subsurface investigation is a limited sampling of a site. Should any conditions at the site be encountered that differ from those reported at the test locations, we require that we be notified immediately in order to allow reassessment of our recommendations.

Virtually no scope of work, no matter how exhaustive, can identify all contaminants or all conditions above or below ground. For example, conditions elsewhere on the property may differ from those encountered, and conditions may change with time. Therefore, no warranty is provided that the entire site condition is represented by those identified at specific test hole locations.

This report in no way reflects any on-site environmental considerations.

## 7. Closure

We trust that these comments provide you with sufficient information to proceed with design. Should you have any questions, please do not hesitate to contact this office.

Yours truly,

EXP Services Inc.

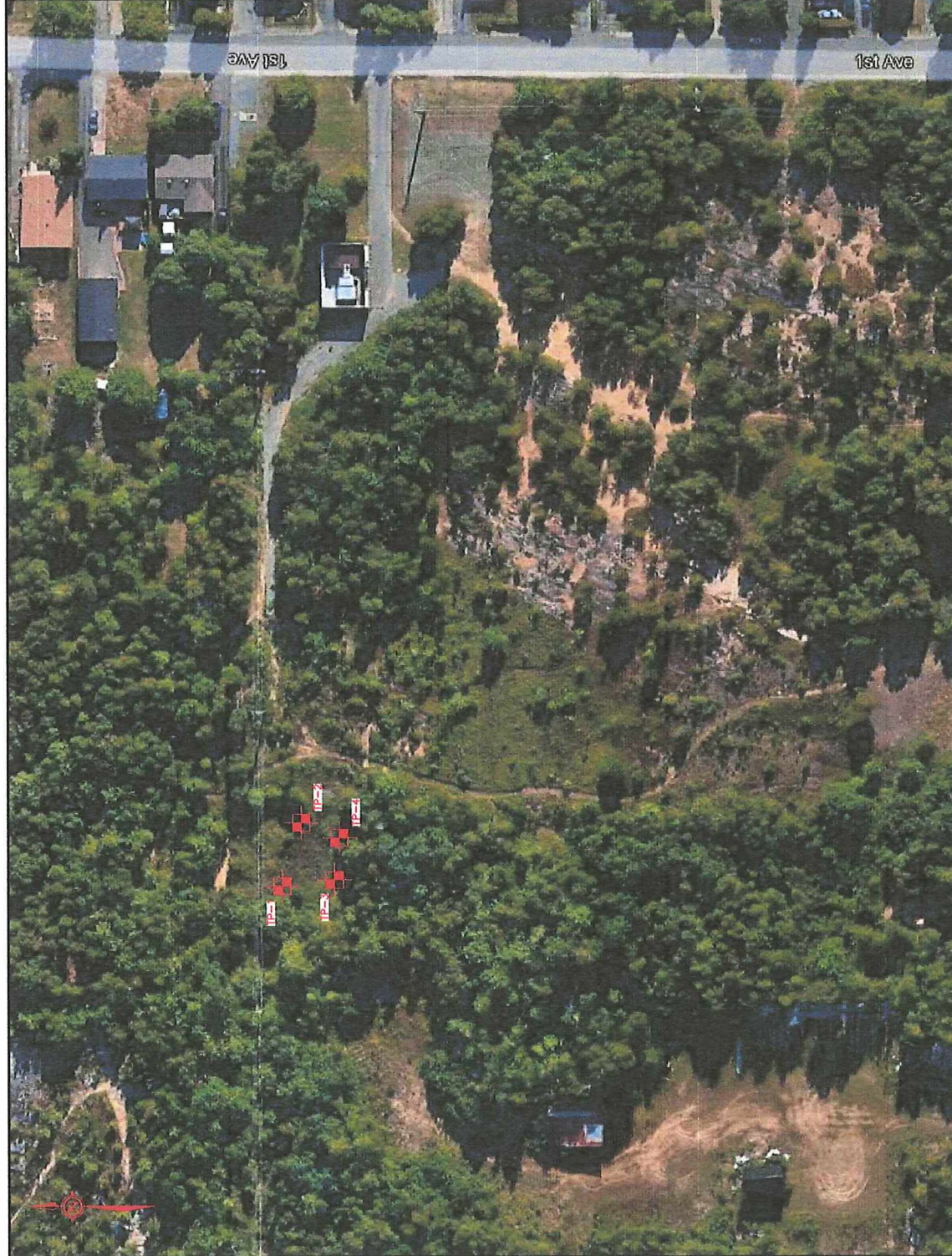


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## Appendix A – Drawing



KEYPLAN - N.T.S.

LEGEND

EXP TEST PIT



NOTES

- 1) The boundaries and soil types have been established only at Test Hole locations. Between Test Holes, they are assumed and may be subject to considerable error.
- 2) Do not use Test Hole elevations for design purposes.
- 3) Soil samples will be retained in storage for 3 months and then destroyed unless client advises that an extended time period is required.
- 4) Quantities should not be established from the information provided at the Test Hole locations.
- 5) This drawing forms part of the report, project number as shown, and should be used only in conjunction with this report.

TITLE		TEST PIT LOCATION PLAN	
DATE	SCALE	DATE	DWG. NO.
SEPT 2021	NTS		A-1

CLIENT	BARRY KINDRAT
PROJECT	PROPOSED RE-ZONING OF 1876 AND 1890 BANCROFT DRIVE, SUDBURY, ON.
PROJECT NO.	SUD-21017389-A0

REVISIONS		DATE
No.	DESCRIPTION	

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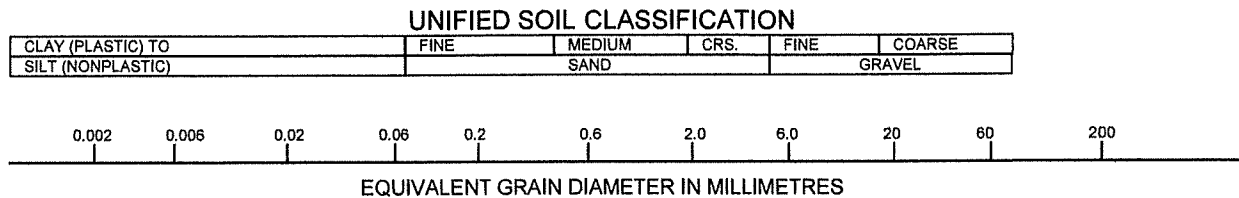
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## Appendix B – Test Pit Logs



## Notes on Sample Descriptions

- All sample descriptions included in this report follow the International Society for Soil Mechanics and Foundation Engineering (ISSMFE), as outlined in the Canadian Foundation Engineering Manual. Note, however, that behavioral properties (i.e. plasticity, permeability) take precedence over particle gradation when classifying soil. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.



**ISSMFE SOIL CLASSIFICATION**

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		

- Fill:** Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.
- Till:** The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (75 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

## Notes On Soil Descriptions

4. The following table gives a description of the soil based on particle sizes. With the exception of those samples where grain size analyses have been performed, all samples are classified visually. The accuracy of visual examination is not sufficient to differentiate between this classification system or exact grain size.

Soil Classification		Terminology	Proportion
Clay and Silt	<0.060 mm	"trace" (e.g. Trace sand)	1% to 10%
Sand	0.060 to 2.0 mm	"some" (e.g. Some sand)	10% to 20%
Gravel	2.0 to 75 mm	adjective (e.g. sandy, silty)	20% to 35%
Cobbles	75 to 200 mm	"and" (e.g. and sand)	35% to 50%
Boulders	>200 mm		

The compactness of Cohesionless soils and the consistency of the cohesive soils are defined by the following:

Cohesionless Soil		Cohesive Soil		
Compactness	Standard Penetration Resistance "N" Blows / 0.3 m	Consistency	Undrained Shear Strength (kPa)	Standard Penetration Resistance "N" Blows / 0.3 m
Very Loose	0 to 4	Very soft	<12	<2
Loose	4 to 10	Soft	12 to 25	2 to 4
Compact	10 to 30	Firm	25 to 50	4 to 8
Dense	30 to 50	Stiff	50 to 100	8 to 15
Very Dense	Over 50	Very Stiff	100 to 200	15 to 30
		Hard	>200	>30

### 5. ROCK CORING

Where rock drilling was carried out, the term RQD (Rock Quality Designation) is used. The RQD is an indirect measure of the number of fractures and soundness of the rock mass. It is obtained from the rock cores by summing the length of the core covered, counting only those pieces of sound core that are 100 mm or more length. The RQD value is expressed as a percentage and is the ratio of the summed core lengths to the total length of core run. The classification based on the RQD value is given below.

RQD Classification	RQD (%)
Very Poor Quality	<25
Poor Quality	25 to 50
Fair Quality	50 to 75
Good Quality	75 to 90
Excellent Quality	90 to 100

$$\text{Recovery Designation \% Recovery} = \frac{\text{Length of Core Per Run}}{\text{Total Length of Run}} \times 100$$

# Log of Test Pit TP-1

Project No. SUD-21017389-A0

Figure No. B-2

Project: Proposed Rezoning of 1876 and 1890 Bancroft Drive

Sheet No. 1 of 1

Location: Sudbury, Ontario

Date Excavated: September 15, 2021

Excavator Type: Backhoe

Datum: Geodetic (hand-held GPS)

Grab Sample   
 Penetrometer   
 Field Vane Test

Combustible Vapour Reading   
 Natural Moisture   
 Plastic and Liquid Limit   
 Undrained Triaxial at % Strain at Failure

SYMBOL	Soil Description	ELEV. m	DEPTH m	N Value				Combustible Vapour Reading (ppm)			SAMPLES	Sample Number
				20	40	60	80	25	50	75		
				Shear Strength kPa				Natural Moisture Content % Atterberg Limits (% Dry Weight)				
	<b>TOPSOIL/ORGANICS</b> (~ 75 mm thick) <b>SAND</b> , some silt, brown, moist	272.00 271.9	0	50	100							GS1
			1						X			GS2
	<b>SANDY SILT</b> , grey, moist to wet	270.0	2							X		GS3
	TEST PIT TERMINATED AT ~ 3.0 m DEPTH	269.0	3									

TESTPIT (GEO) SUD-21017389-A0 - BANCROFT RE-ZONING.GPJ NEW.GDT 9/29/21



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Test Pit data requires interpretation assistance from EXP before use by others.

See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	Dry	

# Log of Test Pit TP-2

Project No. SUD-21017389-A0 Figure No. B-3  
 Project: Proposed Rezoning of 1876 and 1890 Bancroft Drive Sheet No. 1 of 1  
 Location: Sudbury, Ontario

Date Excavated: September 15, 2021  
 Excavator Type: Backhoe  
 Datum: Geodetic (hand-held GPS)

Grab Sample  
 Penetrometer  
 Field Vane Test  
 Combustible Vapour Reading  
 Natural Moisture  
 Plastic and Liquid Limit  
 Undrained Triaxial at % Strain at Failure

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value				Combustible Vapour Reading (ppm)			SAMPLES	Sample Number
					20	40	60	80	25	50	75		
					Shear Strength kPa				Natural Moisture Content % Atterberg Limits (% Dry Weight)				
		<b>TOPSOIL/ORGANICS</b> (~ 150 mm thick)	272.00	0									
		<b>SAND</b> , trace to some silt, trace organics, grey, moist to wet	271.9									<input checked="" type="checkbox"/>	GS1
												<input checked="" type="checkbox"/>	GS2
		<b>TEST PIT TERMINATED AT</b> ~ 1.5 m DEPTH	270.5										

TESTPIT (GEO) SUD-21017389-A0 - BANCROFT RE-ZONING.GPJ NEW.GDT 9/29/21


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Test Pit data requires interpretation assistance from EXP before use by others.  
  
 See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	Dry	

# Log of Test Pit TP-3

Project No. SUD-21017389-A0

Figure No. B-4

Project: Proposed Rezoning of 1876 and 1890 Bancroft Drive

Sheet No. 1 of 1

Location: Sudbury, Ontario

Date Excavated: September 15, 2021

Excavator Type: Backhoe

Datum: Geodetic (hand-held GPS)

Grab Sample   
 Penetrometer   
 Field Vane Test

Combustible Vapour Reading   
 Natural Moisture   
 Plastic and Liquid Limit   
 Undrained Triaxial at % Strain at Failure

G L W	Soil Description	ELEV. m	DEPTH m	N Value				Combustible Vapour Reading (ppm)			S A M P L E S	Sample Number
				20	40	60	80	25	50	75		
	<b>TOPSOIL/ORGANICS</b> (~ 75 mm thick)	272.00 271.9	0									GS1
	<b>SAND</b> , trace to some silt, brown, moist											GS2
	<b>SANDY SILT</b> , brown, moist to wet	271.2										GS3
	TEST PIT TERMINATED AT ~ 1.5 m DEPTH	270.5										

TESTPIT (GEO) SUD-21017389-A0 - BANCROFT RE-ZONING.GPJ NEW.GDT 9/29/21

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

Test Pit data requires interpretation assistance from EXP before use by others.  
 See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	Dry	

# Log of Test Pit TP-4

Project No. SUD-21017389-A0 Figure No. B-5  
 Project: Proposed Rezoning of 1876 and 1890 Bancroft Drive Sheet No. 1 of 1  
 Location: Sudbury, Ontario

Date Excavated: September 15, 2021  
 Excavator Type: Backhoe  
 Datum: Geodetic (hand-held GPS)

Grab Sample  Penetrometer  Field Vane Test 	Combustible Vapour Reading <input type="checkbox"/> Natural Moisture <input checked="" type="checkbox"/> Plastic and Liquid Limit  Undrained Triaxial at % Strain at Failure <input checked="" type="checkbox"/>
--	--

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH m	N Value				Combustible Vapour Reading (ppm)			SAMPLES	Sample Number	
					20	40	60	80	25	50	75			
					Shear Strength kPa				Natural Moisture Content % Atterberg Limits (% Dry Weight)					
		TOPSOIL (~ 100 mm thick)	272.00	0										
		SAND, trace to some silt, trace to some organics, brown, moist	271.9								X			GS1
			271.4									69.9	X	GS2
		SANDY SILT, grey, moist to wet		1									X	GS3
			270.0	2										
		TEST PIT TERMINATED AT ~ 2.0 m DEPTH												

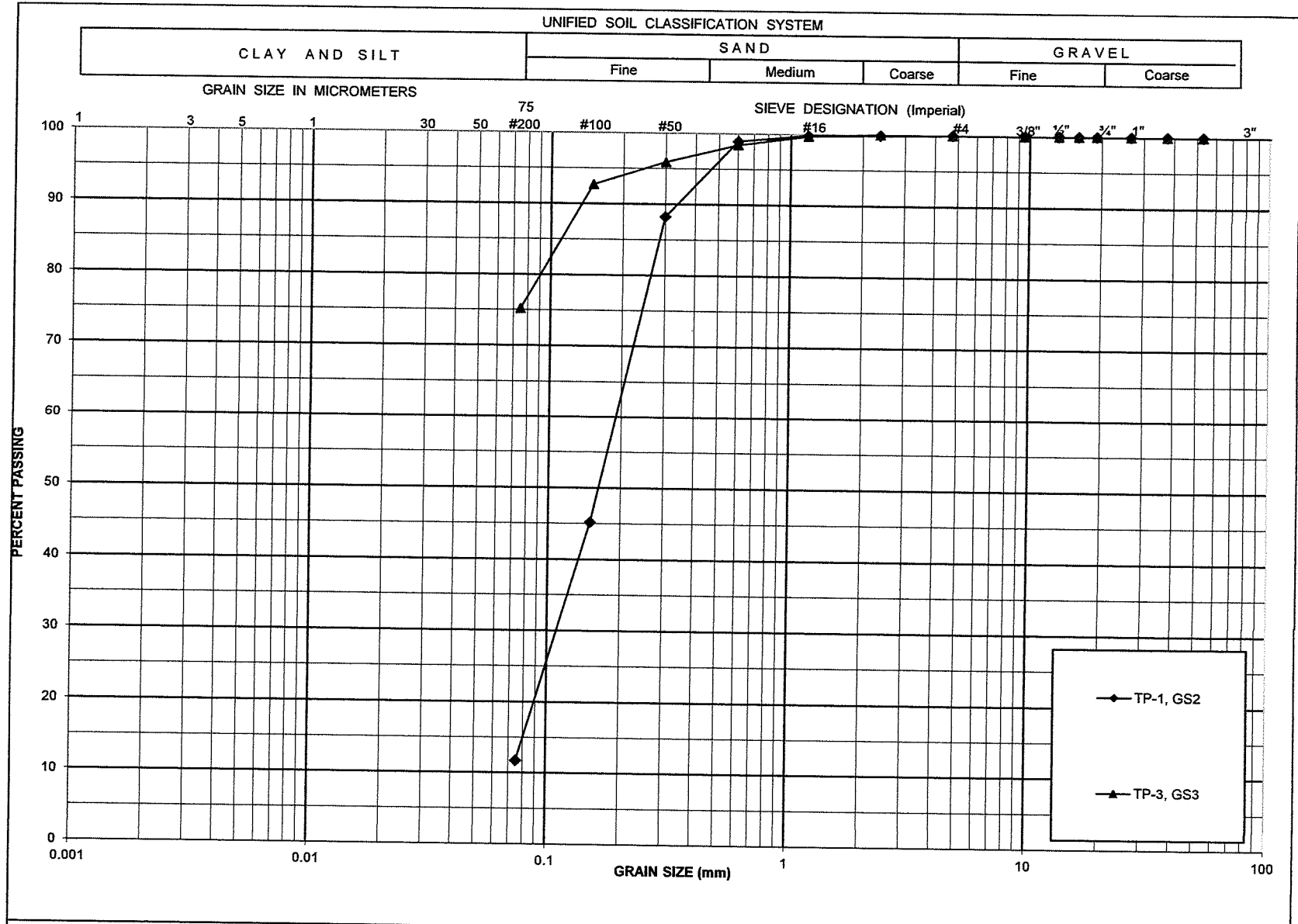
TESTPIT (GEO) SUD-21017389-A0 - BANCROFT RE-ZONING.GPJ NEW.GDT 9/29/21

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Test Pit data requires interpretation assistance from EXP before use by others.  
  
 See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	Dry	

## Appendix C – Laboratory Testing



**GRAIN SIZE DISTRIBUTION**  
*Proposed Re-Zoning of 1876 and 1890 Bancroft Dr.*  
*Sudbury, Ontario*

FIGURE: C-1  
 PROJECT No.: SUD-21017389-A0  
 DATE: September 2021