

October 18, 2017

File: 20454

Lac Ste. Anne County
Box 219, 4928 Langston Street
Sangudo, AB T0E 2A0

Attention: Mr. Mike Primeau, CLGM
County Manager

**LAC ST ANNE COUNTY ADMINISTRATION BUILDING
SLAB HEAVING CONCERNS**

Dear Sir,

This letter report presents the results of a supplementary geotechnical investigation carried out by Thurber Engineering Ltd. (Thurber) to assess the floor slab heaving issues that have been noted at the Lac Ste. Anne County Administration Building, in Sangudo, Alberta

This work is supplementary to our preliminary geotechnical assessment provided in our letter to Lac Ste. Anne County (LSA) dated August 28, 2017. The purpose of this investigation was to obtain geotechnical information on the current soil and groundwater conditions, and particularly to obtain information on the presence of any ponded water below the concrete slab on grade, that may be contributing to ongoing slab heaving.

Authorization to proceed with the geotechnical investigation was provide by Mr. Mike Primeau, CLGM of LSA in a telephone call dated August 30, 2017.

It is a condition of this letter that Thurber's performance of its professional services will be subject to the attached Statement of Limitations and Conditions.

1. BACKGROUND

It is understood that the Administration Building was built during 2016-17 and was recently opened during early summer 2017.

The building is founded on screw piles and concrete grade beams and has a concrete floor slab on grade that supports numerous interior non-load bearing partition walls. Slab heaving and drywall cracking has been noticed throughout the building which is symptomatic of the results of swelling of the high plastic clay material beneath the concrete floor slab.

It is understood that a thick topsoil layer was removed from underneath the building floor slab during site development and that high plastic clay fill obtained locally was placed and compacted up to about 2 m thick within the building area in 2016 by the earthworks contractor. Soil compaction was monitored by P. Machibroda and the results were referenced in pour previous report.

2. SCOPE OF WORK

Thurber's scope of work consisted of carrying out a hand augering program at nine selected locations inside the building to gather information on the existing soil and groundwater conditions beneath the existing concrete floor slab inside the building.

3. HAND AUGERING

Nine (9) hand auger test holes (TH17-1 to TH17-9) were drilled on September 21 and 22, 2017 at the locations shown on the Drawing No. 20454-1 Appendix A. The test holes locations were chosen by LSA personnel and were considered representative of the main areas where floor slab heave has been noted.

The existing concrete slab at the test holes locations was cored by Nexxt Concrete Cutting and Construction Ltd of Edmonton prior to hand augering. The test holes were then hand augered by Thurber field personnel to a depth of about 1.6 m below the top of the concrete slab. Soil and groundwater conditions were logged and grab samples were obtained during hand augering. The undrained shear strength (C_{pen} value) of cohesive samples was estimated using a pocket penetrometer.

Groundwater seepage observations in the test holes was recorded during hand augering and are noted on the test hole log. The test holes were backfilled with soil cuttings and a high strength grout mix was used to replace the slab core hole.

4. LABORATORY TESTING

Laboratory testing included visual classification and the determination of the natural water content of all soil samples. Atterberg limits test were also conducted on selected samples. The results of the laboratory testing are summarized on the attached test hole logs in Appendix B. The results of the water contents and Atterberg limits are also summarized in Table 5.1.

5. SUBSURFACE CONDITIONS

The subsurface conditions encountered at the hand auger drilled test hole locations generally consisted of a layer of gravel base course beneath the concrete slab, overlying high plastic clay.

Further descriptions of the main soil layers are provided in the following sections. A detailed description of subsurface conditions observed in the test hole locations is presented on the test hole log in Appendix A.

5.1 Concrete/Gravel Base Course

The concrete slab ranged from about 120 mm to 150 mm thick at the test holes locations.

The gravel base course below the concrete slab ranged between 120 mm and 170 mm thick. The water content in the gravel fill ranged from 2.4 percent to 6 percent, indicating that the gravel fill was dry to moist.

5.2 Clay (Possible Fill)

Clay was encountered below the gravel fill and extended to the termination depths of the hand auger test holes (1.6 m to 1.7 m). It was not possible to differentiate between clay fill (where present) and the native high plastic clay in the hand auger holes, as both materials are of similar soil type and consistency.

The clay was dark grey, silty and contained trace sand, gravel, oxides, rootlets and organics. The undrained shear strength measured by pocket penetrometer (Cpen) values taken on clay material ranged between 12 kPa to 200 kPa indicating a firm to very stiff consistency

The water content in the clay ranged from 20 percent to 43 percent. A stratigraphic cross-section showing the observed stratigraphy and moisture contents in the bore holes is presented in Figure 5.1. A summary of moisture contents versus depth for all bore holes is presented in Figures 5.2 and 5.3, in Appendix A.

It can be seen that the moisture contents of the clay varies considerably between the bore holes. For example, in TH17-5 the moisture content ranges from 20 percent at the top of the clay to 27 percent below about 1.2 m depth. Whereas, in TH17-8, the moisture content ranges from 34 percent near surface to 43 percent at a depth of 0.8 m. The majority of bore holes, however, had moisture contents ranging from about 27 to 35 percent near surface, increasing to about 33 to 38 percent at a depth of one metre and staying relatively consistent below that depth to the bottom of the holes.

The results of Atterberg limit testing on a clay sample indicated that clay is high plastic, with plastic limits ranging between 22 percent and 26 percent with an average of about 22 percent and liquid limits ranging between 67 percent and 74 percent within an average of about 71 percent. The results of Atterberg limit tests are summarized in Table 5.1 below.

The relative water content (i.e. in-situ water content minus Optimum Moisture Content is also reported on Table 5.1 based on the Optimum Moisture content of 29.6 percent reported by P. Machibroda Engineering Ltd on the field density test result sheets. As noted the values ranged between about -0.6 percent and -9.6 percent of the Optimum Moisture Contents. This value is an indication of the swelling potential of the clay, that is, clays that have moisture contents below the Optimum Moisture Content are more prone to swelling, all else being equal. It can be seen that the natural moisture contents in these tests are all below the Optimum Moisture Content indicating that the clay in these test holes has potential for further swelling.

**TABLE 5.1
SUMMARY OF ATTERBERG LIMIT TEST RESULTS**

TEST HOLE	SOIL TYPE	DEPTH (m)	NATURAL WATER CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	STANDARD PROCTOR OPTIMUM MOISTURE CONTENT (OMC)* %	RELATIVE WATER CONTENT (NATURAL MOISTURE CONTENT MINUS OPTIMUM MOISTURE CONTENT)
TH17-1	Clay(CH)	0.28	29	72	26	46	29.6	-0.6
TH17-3	Clay (CH)	0.28	29	67	22	45	29.6	-0.6
TH17-5	Clay (CH)	0.28	20	70	25	45	29.6	-9.6
TH17-7	Clay (CH)	0.27	28	74	24	50	29.6	-1.6
TH17-9	Clay (CH)	0.31	26	71	23	48	29.6	-3.6

*Standard Proctor Optimum Moisture Content as reported by P. Machibroda Engineering Ltd

5.3 Groundwater Observations

The following groundwater observations were noted during the hand auger program:

1. The gravel base course layer was noted to be dry in all bore holes and no ponding of water was noted on top of the underlying clay layer;
2. Minor groundwater seepage was noted coming in from the underlying clay in several test holes, at depths ranging from 0.5 m (TH17-6) to 1.4 m in TH17-1. Shallow seepage (i.e. around 0.5 to 0.75 m below top of slab) was encountered in TH17-3, 17-6, 17-8 and 17-9. Three of these test holes were located near to the interior courtyards (see attached site plan).
3. The majority of holes were dry at the end of drilling. Minor accumulation of groundwater seepage (i.e. was noted in TH 17-3, where seepage was noted from the clay layer at a depth of about 0.6 m below top of slab.
4. It should be noted that these are relatively short-term water level observations ant the end of drilling. All test holes were backfilled after the drilling program and hence it was not possible to obtain long-term water level readings.

6. EVALUATION AND CONCLUSIONS

Following are the main observations and conclusions:

1. The results for the field investigation has confirmed that the building floor slab is underlain by thick high plastic clay fill and native clay material that is prone to swelling when it gains access to water. It was not possible to differential between clay fill and native clay as the fill was obtained from the local clay and hence the materials are similar in appearance and composition;
2. The gravel base course was about 120 to 170 mm thick and was essentially dry. No ponding of water was noted in the gravel layer in the bore holes;
3. The underlying clay has highly variable moisture contents ranging from about 20 percent to 43 percent and generally increasing with depth. However, the majority of moisture contents fall into a range of between about 27 percent and 33 percent at the top of the clay subgrade increasing to about 33 to 38 percent at a depth of one metre below top of slab and remaining fairly constant below one metre depth.
4. As noted in our previous report of August 28, 2017, the field density test results provided by P. Machibroda indicated that that the majority of the clay fill was initially placed at moisture contents at below the Optimum Moisture Content of 29.5 percent. Based on the moisture contents recorded during this recent investigation, it would appear that the moisture contents of the upper clay have generally increased over time, which has resulted in the observed swelling.
5. There is still potential for swelling of some of the near surface clay in portions of the site, particularly where low moisture contents (i.e. below Optimum Moisture content) were observed which can lead to further swelling of the clay fill material placed beneath the concrete slab on grade.
6. The main remediation measures will be to prevent further ingress of water from outside the building, by enhanced grading and subdrainage measures around the building exterior and interior court room areas. It appears less practical to provide internal drainage below the floor slab inside the building. Moreover, no ponding of water was noted in the bore holes that would indicate the need for such internal drainage measures.

7. RECOMMENDATIONS

The following recommendations were provided in our previous report and are still considered prudent for the building. It is understood that many of these recommendations have already been implemented. Furthermore, it is understood that there have been some recent signs that the building floor slab has stabilized or possibly settled up to about 12 mm in some areas, over the summer months.

1. Re-grade the landscape around the building with generous slopes away from the building. The grades are noted to be poor on the north side of the building due to the elevation of

the adjacent concrete sidewalk, and it would be beneficial to provide a drainage swale in the grassed boulevard to provide better drainage away from the north building wall.

2. Improve the surface and subsurface drainage in the two courtyard areas inside the building, including providing a more robust subdrainage system placed below the base of the grade beams, to lower the water table and potentially drain excess water that may be currently trapped in the gravel base layer under the slabs on grade inside the buildings. The subdrains will need to be tied into a sump and removed by gravity or pumping as necessary to the drainage ditch south of the building.
3. Redirect all roof drains so that the discharge is far enough from the building exterior to prevent back flow to the building which would impact the moisture content near the building footprint.
4. Provide permanent roof drain collection system in the two courtyard areas to collect and drain all roof water and prevent ponding of water in the courtyard areas.
5. Consider removing any door aprons and rebuild them as a structural slab to prevent heave and buckling of the exterior cladding that currently rests on the slabs at some locations.
6. Leakage of underground pipes and utilities would be detrimental to future floor slab performance and any measure to identify and deal with potential leaks would also be a prudent measure.
7. It should be noted that the swelling is a long-term process and further swelling can occur which could result in further damage to the building. Implementing the above measures should reduce but not necessarily eliminate the ongoing swelling.
8. Ongoing visual monitoring of the floor slab movements should be carried out by LSA throughout the next few years. Where slab movements are noted, it may be necessary to undertake further repairs to the interior walls and slab.

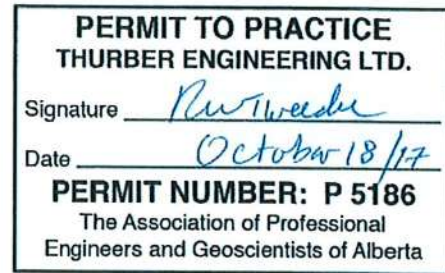
8. CLOSURE

We trust the assessment and recommendations provided herein are sufficient for your needs at this time. If questions arise, please contact the undersigned.

Yours very truly,
Thurber Engineering Ltd.
Robin Tweedie, P. Eng.
Review Principal



Pawandeep Sandher, P.Eng.
Project Engineer
/meg



Attachments

- Statement of Limitations and Conditions

APPENDIX A

- Drawing 20454-1 - Site Plan Showing Approximate Hand Auger Test Hole Location
- Figure 5.1, 5.2, 5.3
- Test Hole Logs



STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

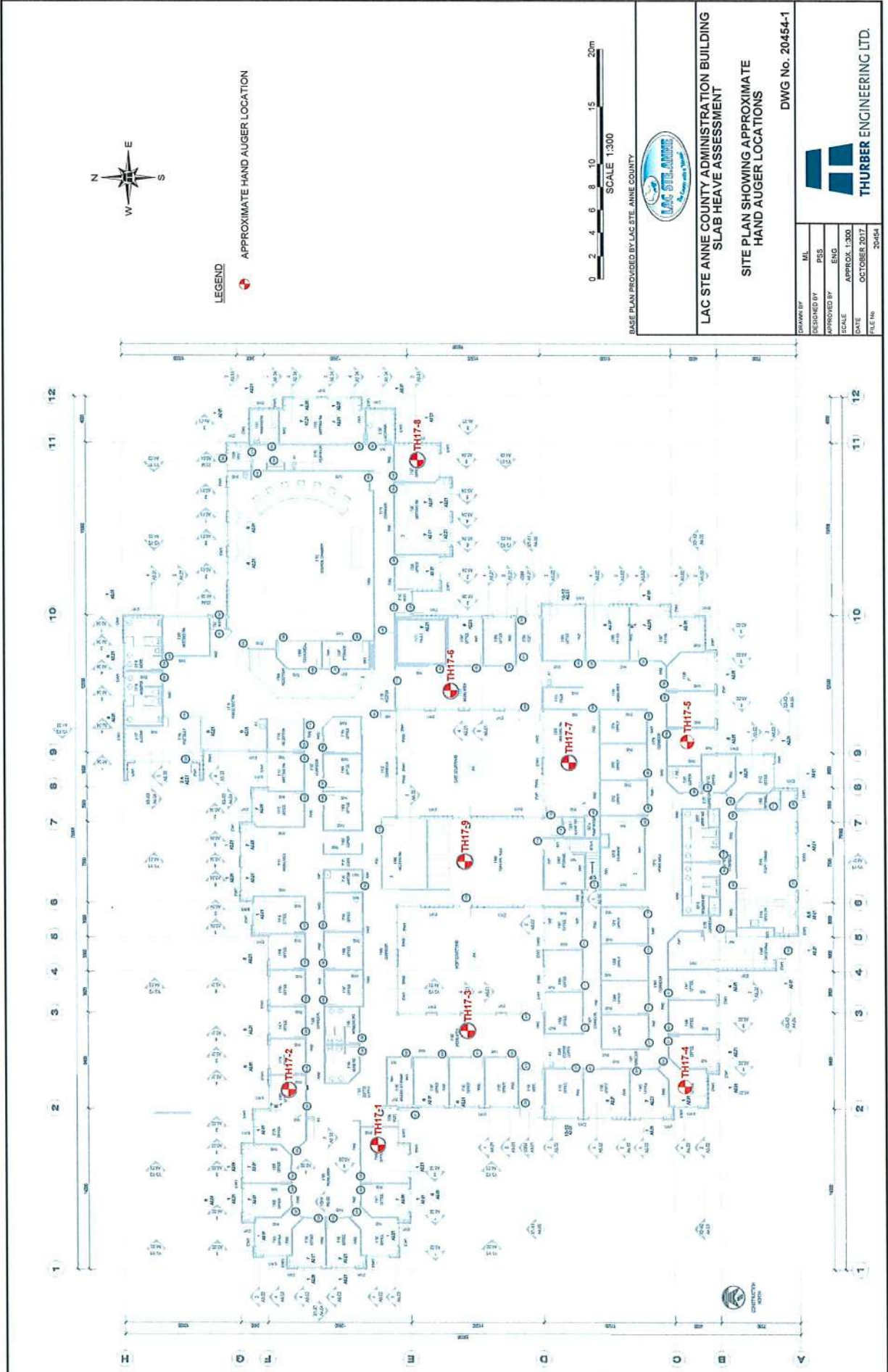
7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.



APPENDIX A

Drawing 20454-1 - Site Plan Showing Approximate Hand Auger Test Hole Location
Figure 5.1, 5.2, 5.3
Test Hole Logs



LEGEND

APPROXIMATE HAND AUGER LOCATION



BASE PLAN PROVIDED BY LAC STE ANNE COUNTY



**LAC STE ANNE COUNTY ADMINISTRATION BUILDING
SLAB HEAVE ASSESSMENT**

**SITE PLAN SHOWING APPROXIMATE
HAND AUGER LOCATIONS**

DWG No. 20454-1

DESIGNED BY	ML
DESIGNED BY	PRS
APPROVED BY	ENG
SCALE	APPROX. 1:300
DATE	OCTOBER 2017
FILE NO.	20454



THURBER ENGINEERING LTD.

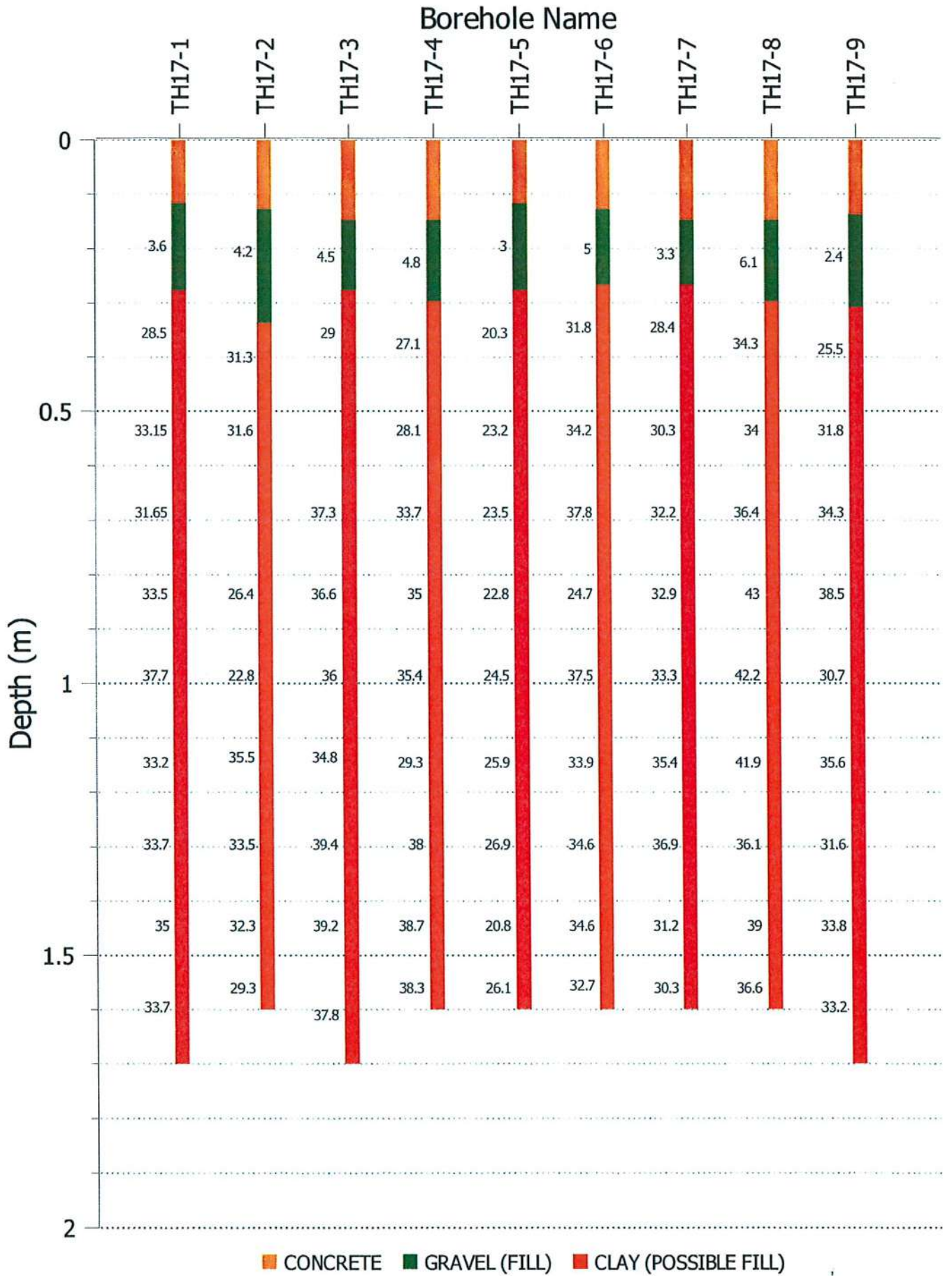
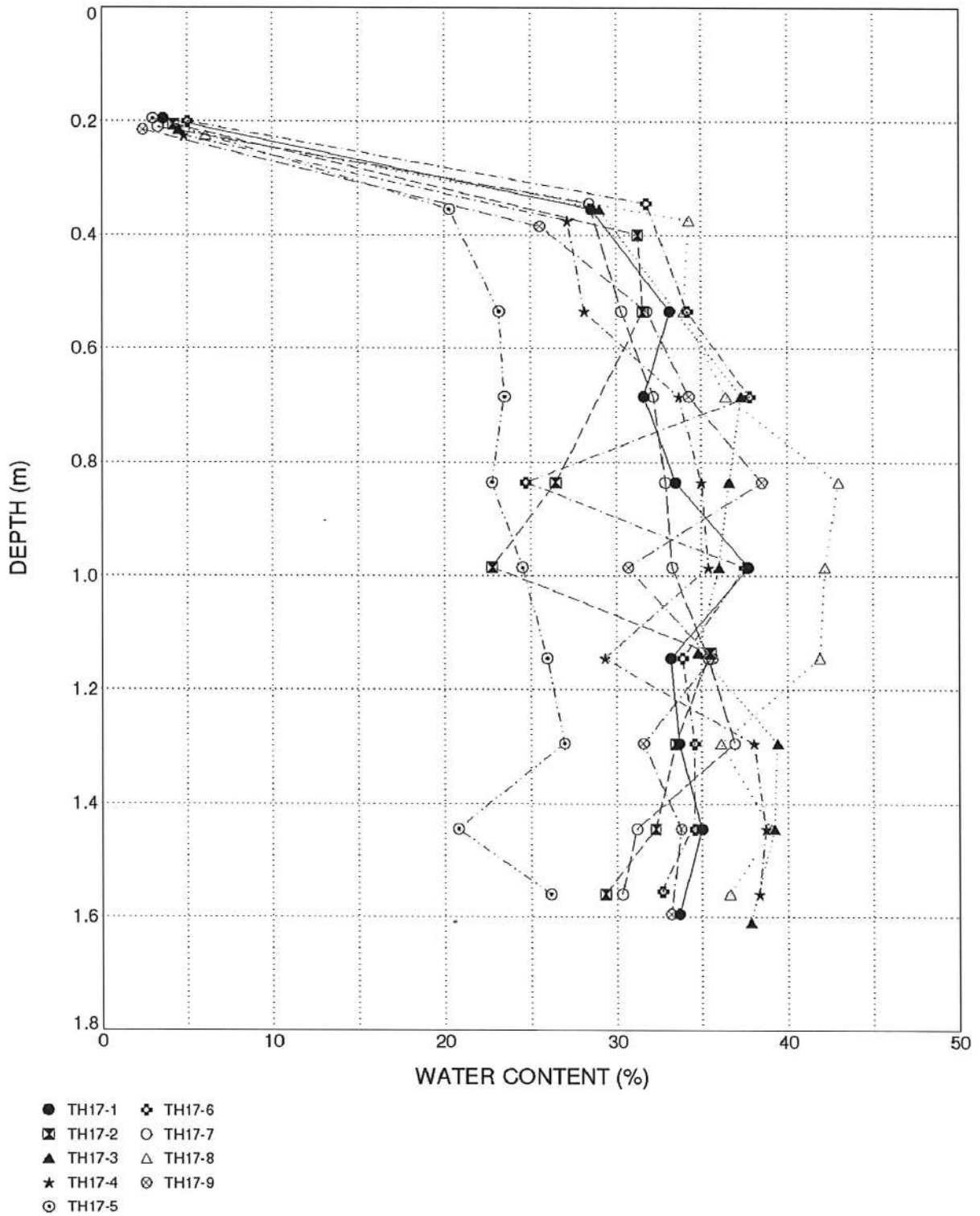


FIGURE 5.1
THURBER PROJECT # 20454



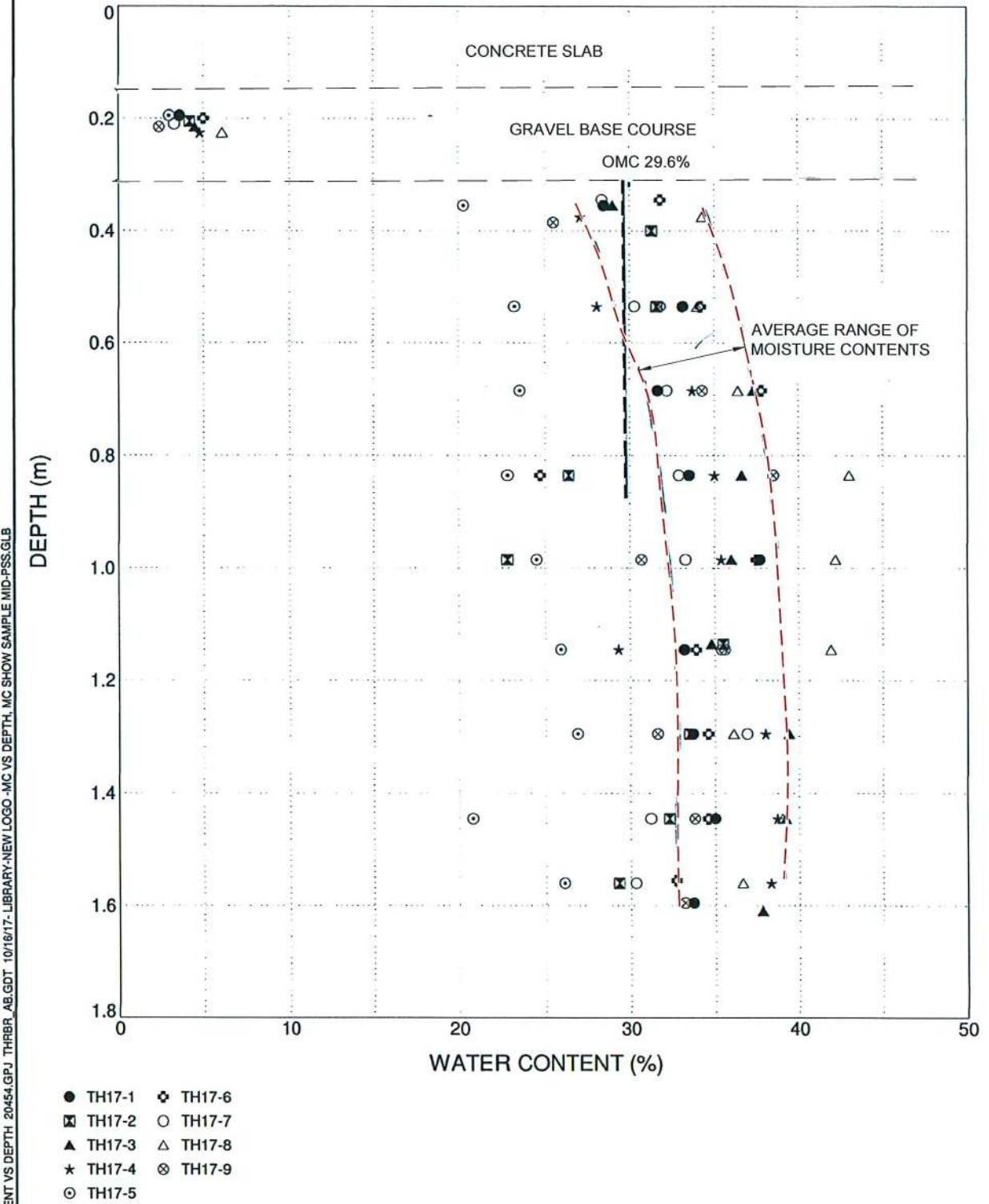
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Thurber Engineering Ltd.
EDMONTON, ALBERTA,

WATER CONTENT VS DEPTH

FIGURE 5.2
THURBER PROJECT # 20454



WATER CONTENT VS DEPTH: 20454.GPJ THRB AB.GDT 10/16/17 - LIBRARY-NEW LOGO -MC VS DEPTH.MC SHOW SAMPLE MID-PSS.GLB



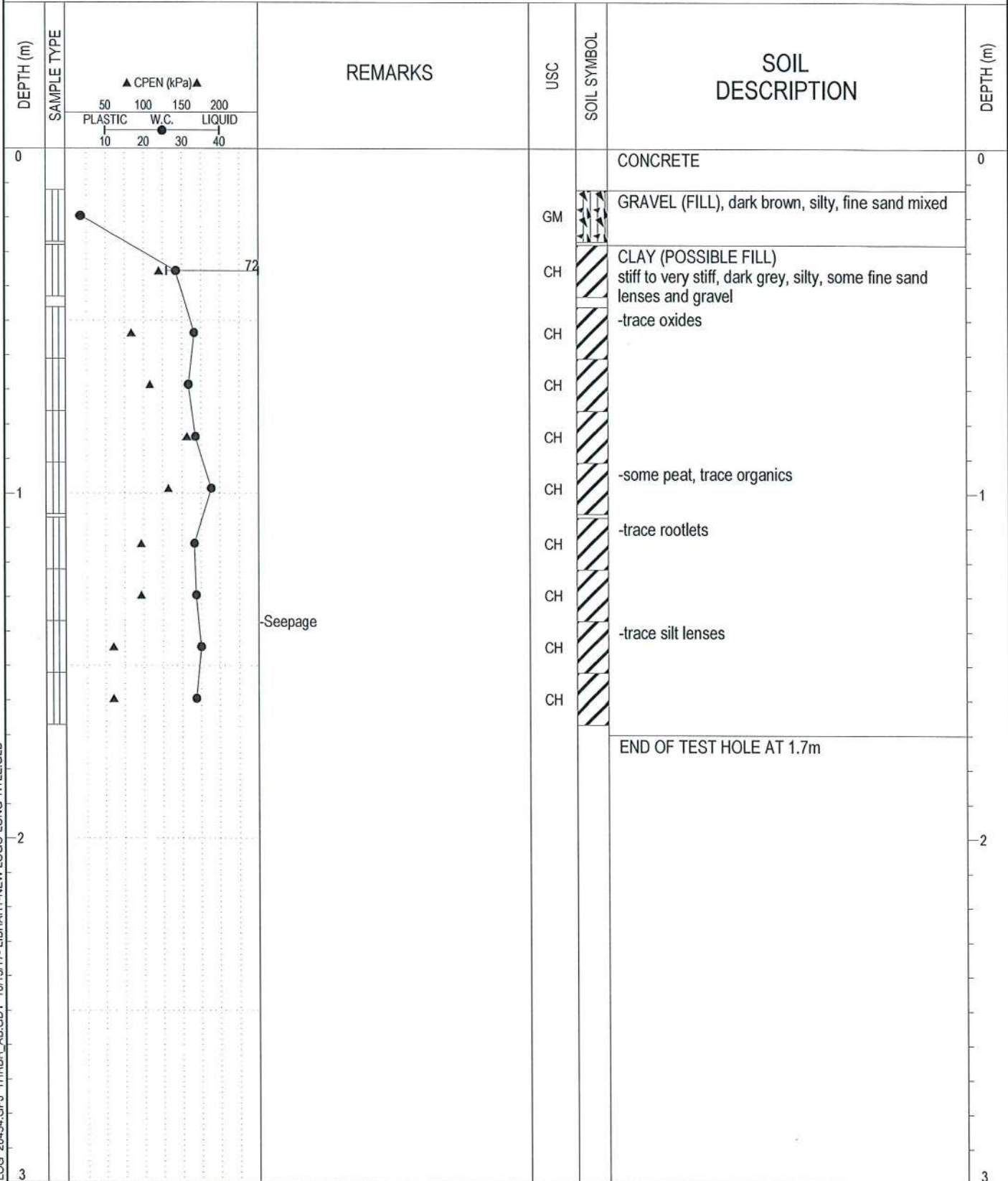
Thurber Engineering Ltd.
EDMONTON, ALBERTA,

WATER CONTENT VS DEPTH

FIGURE 5.3
THURBER PROJECT # 20454

CLIENT: Lac Ste. Anne County	PROJECT: Lac Ste Anne County Administration Building Slab Heave Assessment	BOREHOLE NO: TH17-1
DRILLING COMPANY:	DATE DRILLED: September 21, 2017	PROJECT NO: 20454
DRILL/METHOD: Hand Auger	LOCATION: See Drawing #20454-1	ELEVATION:

SAMPLE TYPE GRAB SAMPLE



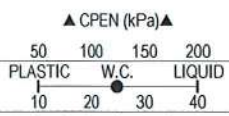
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FIELD LOGGED BY: GS	COMPLETION DEPTH: 1.7 m
PREPARED BY: PSS	COMPLETION DATE: 9/21/17
REVIEWED BY: RWT	

CLIENT: Lac Ste. Anne County	PROJECT: Lac Ste Anne County Administration Building Slab Heave Assessment	BOREHOLE NO: TH17-2
DRILLING COMPANY:	DATE DRILLED: September 21, 2017	PROJECT NO: 20454
DRILL/METHOD: Hand Auger	LOCATION: See Drawing #20454-1	ELEVATION:
SAMPLE TYPE <input type="checkbox"/> GRAB SAMPLE		

DEPTH (m)	SAMPLE TYPE	REMARKS	USC	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)
0					CONCRETE	0
			GM		GRAVEL (FILL), dark brown, silty, fine sand mixed	
			CH		CLAY (POSSIBLE FILL) stiff to very stiff, dark grey, silty, trace rootlets and fine sand	
			CH		-some oxides	
			CH			
			CH			
			CH		-trace organics	
			CH			
			CH			
					END OF TEST HOLE AT 1.6m	
3						3



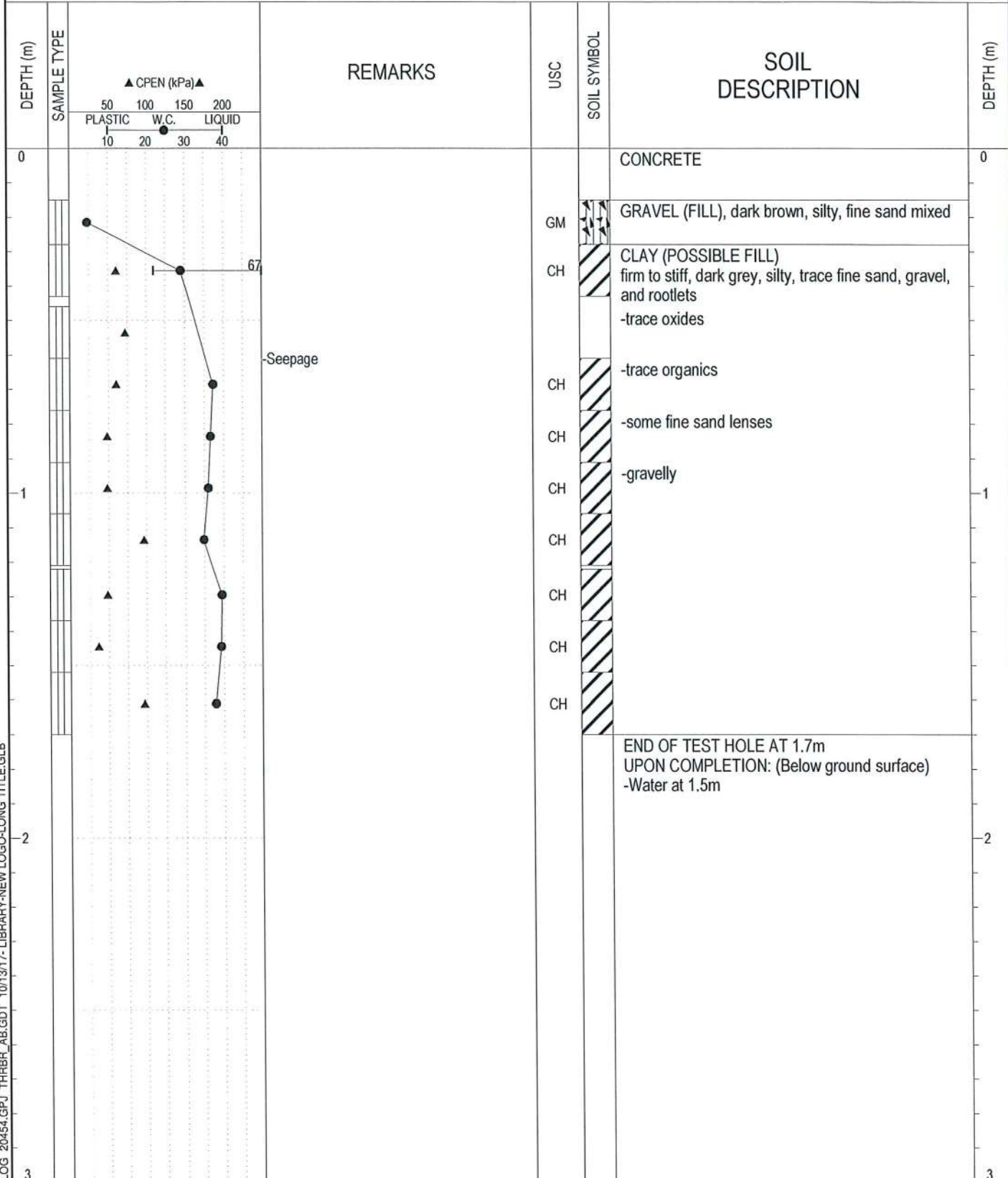
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FIELD LOGGED BY: GS	COMPLETION DEPTH: 1.6 m
PREPARED BY: PSS	COMPLETION DATE: 9/21/17
REVIEWED BY: RWT	

CLIENT: Lac Ste. Anne County	PROJECT: Lac Ste Anne County Administration Building Slab Heave Assessment	BOREHOLE NO: TH17-3
DRILLING COMPANY:	DATE DRILLED: September 21, 2017	PROJECT NO: 20454
DRILL/METHOD: Hand Auger	LOCATION: See Drawing #20454-1	ELEVATION:

SAMPLE TYPE GRAB SAMPLE



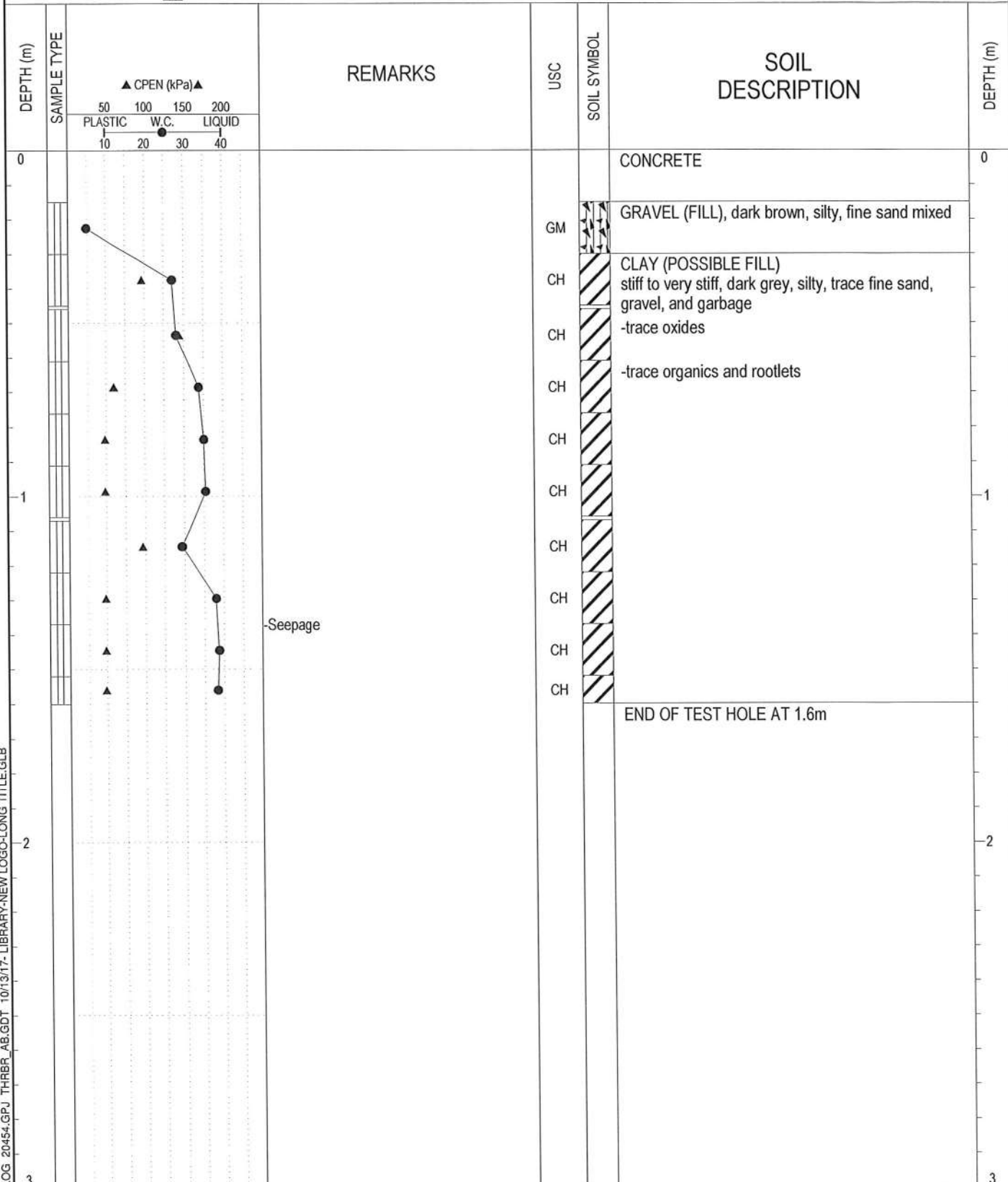
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FIELD LOGGED BY: GS	COMPLETION DEPTH: 1.7 m
PREPARED BY: PSS	COMPLETION DATE: 9/21/17
REVIEWED BY: RWT	

CLIENT: Lac Ste. Anne County	PROJECT: Lac Ste Anne County Administration Building Slab Heave Assessment	BOREHOLE NO: TH17-4
DRILLING COMPANY:	DATE DRILLED: September 21, 2017	PROJECT NO: 20454
DRILL/METHOD: Hand Auger	LOCATION: See Drawing #20454-1	ELEVATION:

SAMPLE TYPE GRAB SAMPLE



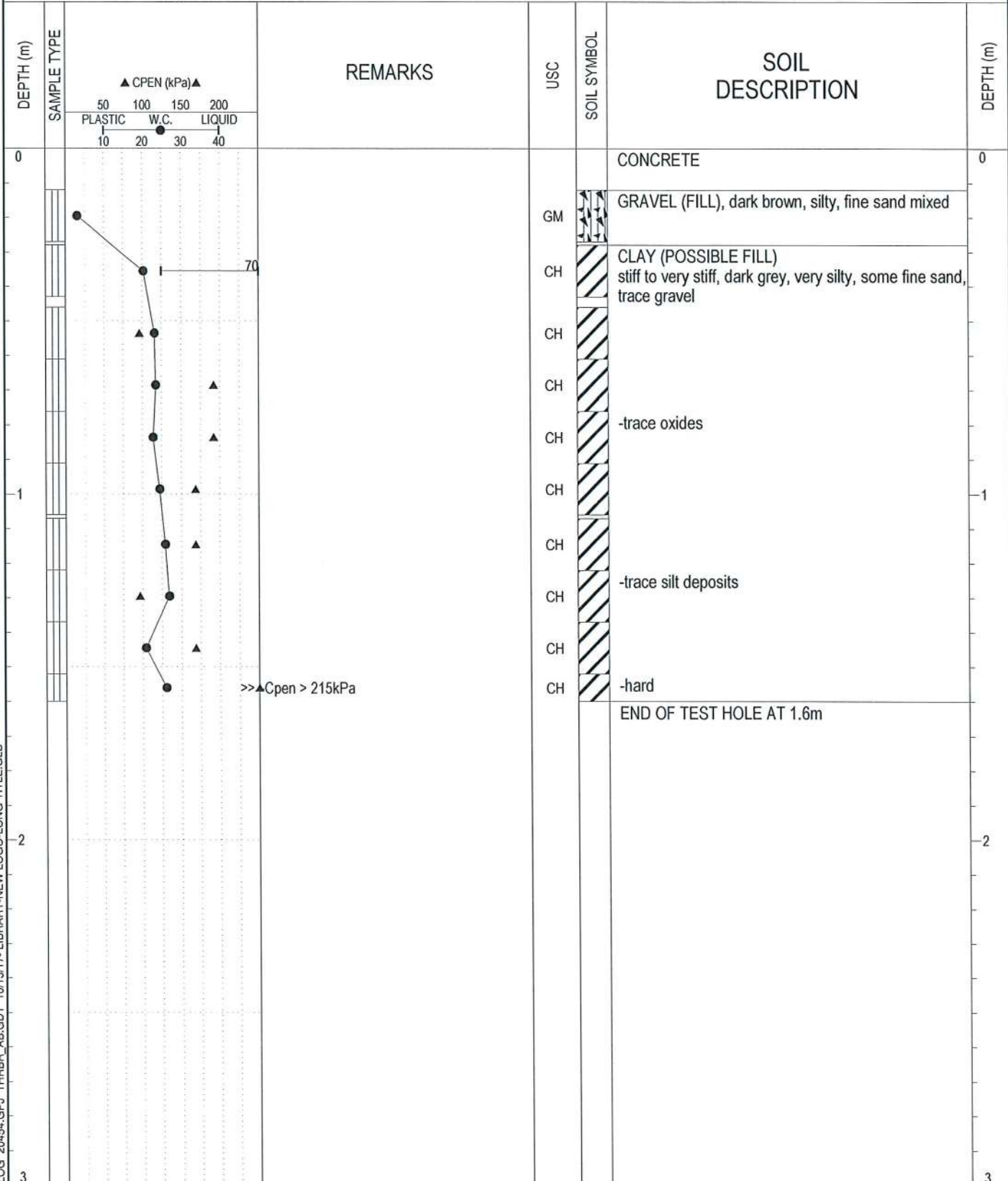
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FIELD LOGGED BY: GS	COMPLETION DEPTH: 1.6 m
PREPARED BY: PSS	COMPLETION DATE: 9/21/17
REVIEWED BY: RWT	

CLIENT: Lac Ste. Anne County	PROJECT: Lac Ste Anne County Administration Building Slab Heave Assessment	BOREHOLE NO: TH17-5
DRILLING COMPANY:	DATE DRILLED: September 21, 2017	PROJECT NO: 20454
DRILL/METHOD: Hand Auger	LOCATION: See Drawing #20454-1	ELEVATION:

SAMPLE TYPE GRAB SAMPLE



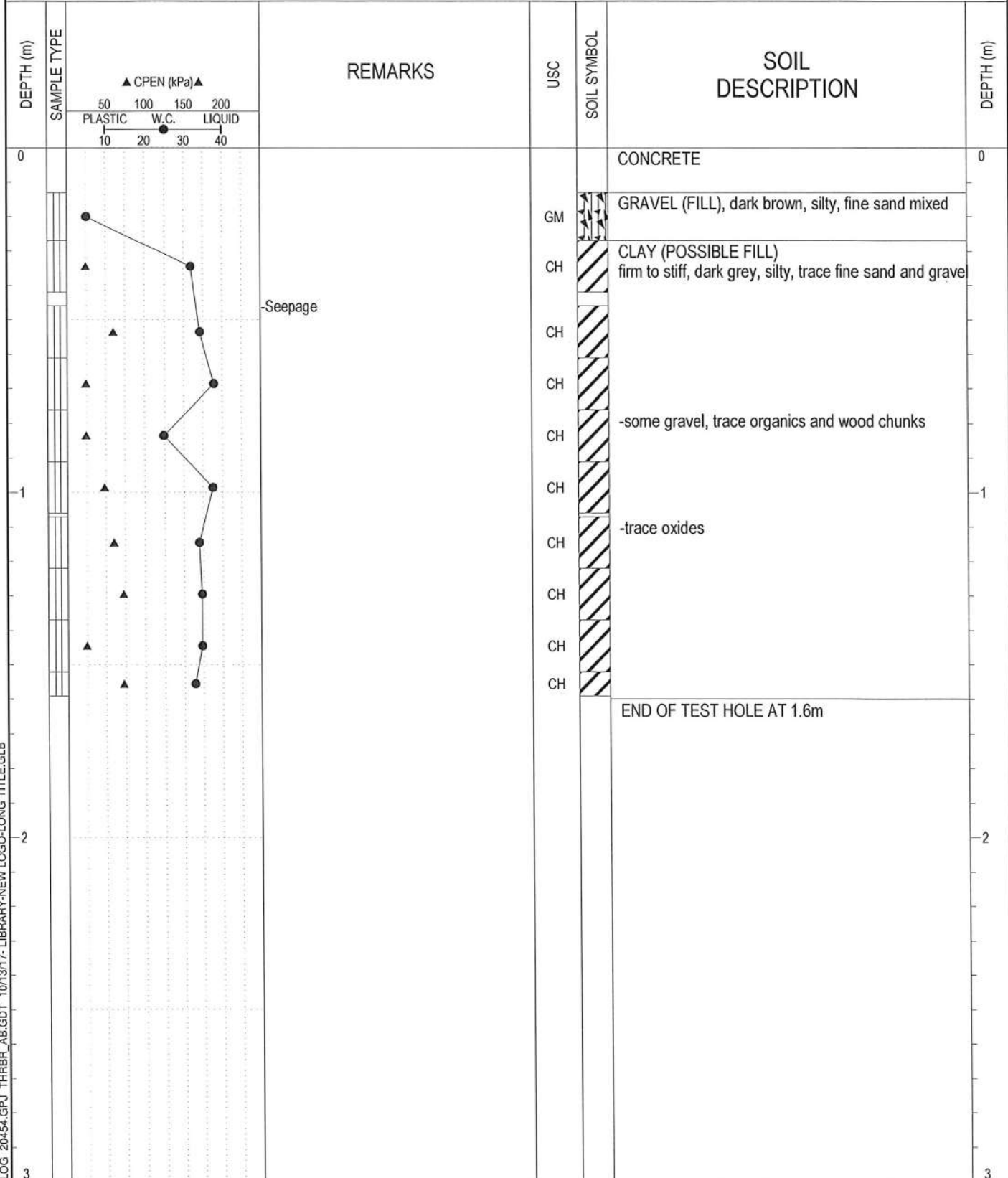
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FIELD LOGGED BY: GS	COMPLETION DEPTH: 1.6 m
PREPARED BY: PSS	COMPLETION DATE: 9/21/17
REVIEWED BY: RWT	

CLIENT: Lac Ste. Anne County	PROJECT: Lac Ste Anne County Administration Building Slab Heave Assessment	BOREHOLE NO: TH17-6
DRILLING COMPANY:	DATE DRILLED: September 21, 2017	PROJECT NO: 20454
DRILL/METHOD: Hand Auger	LOCATION: See Drawing #20454-1	ELEVATION:

SAMPLE TYPE GRAB SAMPLE



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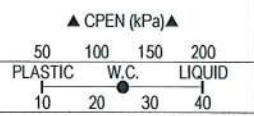


FIELD LOGGED BY: GS	COMPLETION DEPTH: 1.6 m
PREPARED BY: PSS	COMPLETION DATE: 9/21/17
REVIEWED BY: RWT	

CLIENT: Lac Ste. Anne County	PROJECT: Lac Ste Anne County Administration Building Slab Heave Assessment	BOREHOLE NO: TH17-7
DRILLING COMPANY:	DATE DRILLED: September 21, 2017	PROJECT NO: 20454
DRILL/METHOD: Hand Auger	LOCATION: See Drawing #20454-1	ELEVATION:

SAMPLE TYPE GRAB SAMPLE

DEPTH (m)	SAMPLE TYPE	REMARKS	USC	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)
0					CONCRETE	0
			GM		GRAVEL (FILL), dark brown, silty, fine sand mixed	
			CH		CLAY (POSSIBLE FILL) firm to very stiff, dark grey, silty, trace fine sand and gravel	
			CH			
			CH			
			CH			
			CH		-dark brown to dark grey	
			CH			
			CH		-trace rootlets	
			CH			
			CH			
					END OF TEST HOLE AT 1.6m UPON COMPLETION: (Below ground surface) -Squeezing in at 1.1m	
3						3



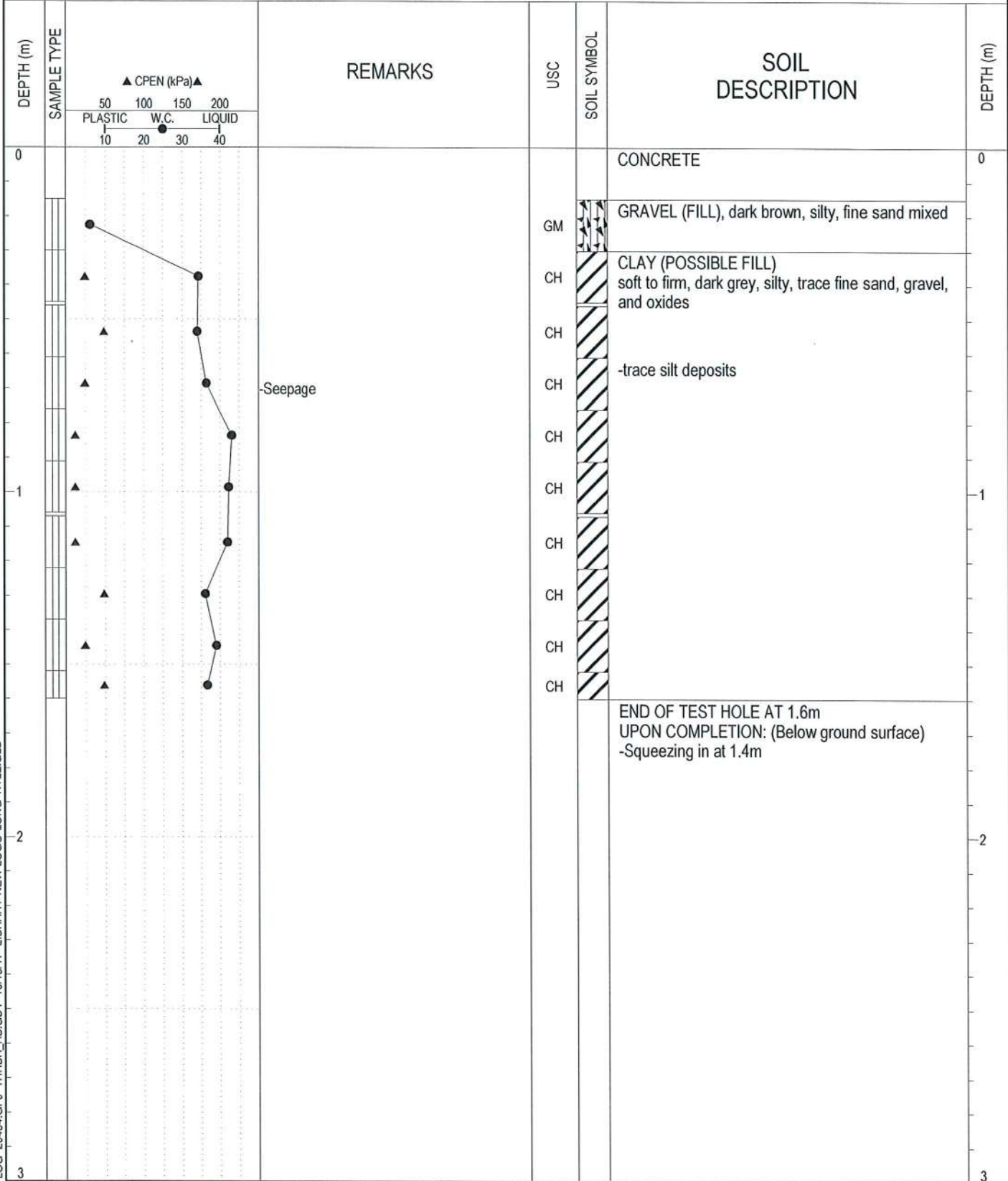
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FIELD LOGGED BY: GS	COMPLETION DEPTH: 1.6 m
PREPARED BY: PSS	COMPLETION DATE: 9/21/17
REVIEWED BY: RWT	

CLIENT: Lac Ste. Anne County	PROJECT: Lac Ste Anne County Administration Building Slab Heave Assessment	BOREHOLE NO: TH17-8
DRILLING COMPANY:	DATE DRILLED: September 22, 2017	PROJECT NO: 20454
DRILL/METHOD: Hand Auger	LOCATION: See Drawing #20454-1	ELEVATION:

SAMPLE TYPE GRAB SAMPLE



BOREHOLE LOG 20454.GPJ TH17-8-17- LIBRARY-NEW LOGO-LONG TITLE.GLB

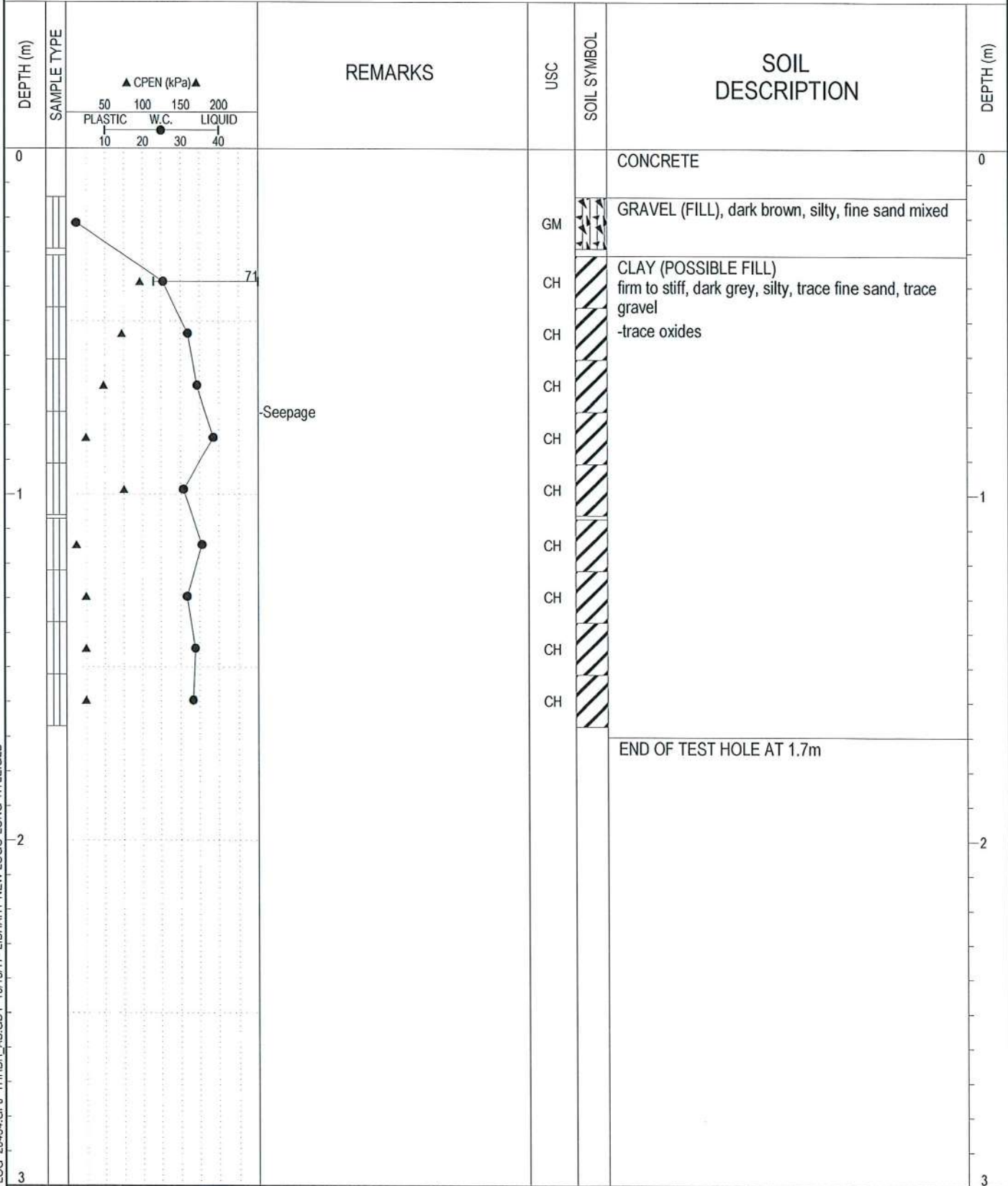


FIELD LOGGED BY: GS
 PREPARED BY: PSS
 REVIEWED BY: RWT

COMPLETION DEPTH: 1.6 m
 COMPLETION DATE: 9/22/17

CLIENT: Lac Ste. Anne County	PROJECT: Lac Ste Anne County Administration Building Slab Heave Assessment	BOREHOLE NO: TH17-9
DRILLING COMPANY:	DATE DRILLED: September 22, 2017	PROJECT NO: 20454
DRILL/METHOD: Hand Auger	LOCATION: See Drawing #20454-1	ELEVATION:

SAMPLE TYPE GRAB SAMPLE



BOREHOLE LOG 20454.GPJ THRB AB.GDT 10/13/17- LIBRARY-NEW LOGO-LONG TITLE.GLB



FIELD LOGGED BY: GS	COMPLETION DEPTH: 1.7 m
PREPARED BY: PSS	COMPLETION DATE: 9/22/17
REVIEWED BY: RWT	