PUC Distribution Inc.
500 Second Line East, P.O. Box 9000
Sault Ste. Marie, Ontario P6A 6P2

October 15, 2019

Kirsten Walli, Board Secretary
Ontario Energy Board
P.O. Box 2319, 27th Floor
2300 Yonge Street
Toronto, ON, M4P 1E4

Attention: Ms. Walli

Re: PUC Distribution Inc.'s 2019 4th Generation IR Distribution Rate Application
Board File No. EB-2019-0170

PUC Distribution ("PUC") is pleased to submit to the Ontario Energy Board its 2020 Electricity Rate Application (the "Application"), in accordance with the Board's Directive and Guidelines.

The Application includes a request for incremental capital to support the renewal of Sub-Station 16 ("Sub 16") (the "ICM Rate Application"). PUC's Cost of Service application filed as EB-2017-0071 on March 29, 2018, included its five-year Distribution System Plan ("DSP") supported by a comprehensive Asset Condition Assessment ("ACA"). That assessment identified Sub 16 as PUC's most critical asset for renewal. PUC is submitting the ICM Rate Application in accordance with all directives and guidelines issued by the Board and is requesting an effective date of May 1, 2020 for the implementation of the Proposed Incremental Revenue Requirement Rate Riders. The ICM Rate Application for Sub 16 is separate and distinct from PUC's Sault Smart Grid ("SSG") ICM application, filed as part of PUC's 2019 IRM application EB-2018-0219.

The filing guidelines indicate that each application should include:

- A Managers summary documenting and explaining all rate adjustments applied for;
- The primary contact information for the IRM application;
- A completed Rate Generator model and Supplementary work forms, provided by the Board, in both electronic (i.e. Excel) and PDF format;
- A PDF copy of the current Tariff Sheet;
- Supporting documentation cited within the application;
- A statement as to who will be affected by the application;
- Confirmation of the applicant's internet address;
- A statement confirming the accuracy of the billing determinants for pre-populated models; and
- A text searchable Adobe PDF format for all documents.

The primary contact for this Application and ICM Rate Application is Mark Faught, Director, Finance. Phone number 705-759-0105 or email at regulatory@ssmpuc.com. The applicant's legal counsel is John Vellone, Partner, Borden Ladner Gervais LLP, phone 416-367-6730 and email jvellone@blg.com. PUC Distribution's confirmed internet address is www.ssmpuc.com.

Affected by this Application will be PUC customers within PUC's service territory. This includes customers within the following rate classes:

- Residential
- General Service Less Than 50 kW
- General Service 50 to 4,999 kW
- Unmetered Scattered Load
- Sentinel Lighting
- Street Lighting

The billing determinants used in the pre-populated models of the 2020 Rate Generator are complete and accurate. PUC is confirming that they match our records and what was provided to the OEB through the 2018 RRR.

PUC's 2020 Electricity Rate Application will be sent to the OEB in the following form:

a) Electronic filing through the Board's web portal, consisting of one (1) electronic copy of the Application in a searchable/unrestricted PDF format, one (1) electronic copy in Microsoft Excel format of the completed Rate Generator model along with supplemental filing work forms, one (1) electronic copy of the ICM Rate Application Manager's Summary in a searchable/unrestricted PDF format, and one (1) Microsoft Excel format of the completed 2020 Capital Module ACM Model Version 5; and

b) Two (2) paper copies of the Application and the ICM Rate Application.

Sincerely,

K. Mark Faught, CPA, CMA
Director, Finance
PUC Distribution Inc.
Sault Ste. Marie Ont.
Email: regulatory@ssmpuc.com
Phone: 705-759-0105

PUC Distribution Inc.

MANAGER'S SUMMARY

2020 Incentive Regulation Mechanism

Distribution Rate Application

EB-2019-0170

For Rates Effective May 1, 2020

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Appendices:

APPLICATION

IN THE MATTER OF the Ontario Energy Board Act, 1998, S.O. 1998, c.15, (Schedule B);

AND IN THE MATTER OF an application by PUC Distribution Inc. to the Ontario Energy Board for an Order or Orders approving or fixing just and reasonable rates and other charges for electricity distribution to be effective May 1, 2020.

Title of Proceeding: An application by PUC Distribution Inc. for an Order or Orders approving or fixing just and reasonable distribution rates and other charges, effective May 1, 2020.

CONTACT INFORMATION

APPLICANT'S NAME:	PUC Distribution Inc.
Applicant's Address for Service:	500 Second Line East Sault Ste. Marie, Ontario P6A 6P2
Primary Applicant Contact:	Mark Faught, CPA, CMA Director, Finance Telephone: 705-759-0105 Fax: 705-759-6553 Email: regulatory@ssmpuc.com
Applicant's Representation:	Borden Ladner Gervais LLP Bay Adelaide Centre, East Tower 22 Adelaide Street West Toronto, Ontario M5H 4E3 Primary Contact John A.D. Vellone Partner Telephone: 416-367-6730 Fax: 416-367-6749 Email: jvellone@blg.com

Applicant's Internet Address: https://www.ssmpuc.com

CERTIFICATION OF EVIDENCE

As Vice President, Finance and Corporate Support of PUC Distribution Inc., I certify that to the best of my knowledge:

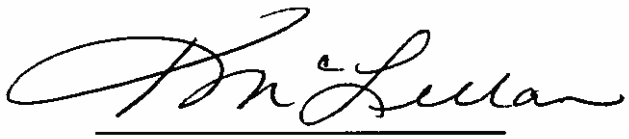
a) The evidence filed in PUC's 2020 IRM application is accurate, consistent, complete and consistent with the requirements from Chapter 3 of the *Filing Requirements for Transmission and Distribution Rate Applications* revised on July 12, 2018 and the addendum published on July 15, 2019;

b) The accuracy of the billing determinants for pre-populated models; and

c) That robust processes and internal controls are in place for the preparation, verification and oversight of variance account balances.

Respectfully,

Kelly McLellan



Vice President, Finance and Corporate Support

MANAGER'S SUMMARY

1. Introduction

The Applicant, PUC Distribution Inc. ("PUC"), hereby applies to the Ontario Energy Board (the "OEB") for approval of 2020 Distribution Rate Adjustments, based on Chapter 3 of the Filing Requirements for Electricity Distribution Rate Applications (EDR) last revised on July 12, 2018 and the addendum published on July 15, 2019.

PUC has prepared the 2020 4th Generation Incentive Rate-Setting Application consistent with Chapter 3 of the filing requirements for electricity distribution rate applications revised by the OEB on July 12, 2018 and the addendum published on July 15, 2019.

PUC has used the most current OEB's 2020 IRM Rate Generator model, Global Adjustment Analysis work form, 1595 Analysis work form, the generic LRAMVA work form and the Capital Module for ACM and ICM in the preparation of this filing, and it confirms the accuracy of the 2018 billing determinants and Trial Balance for the prepopulated models.

PUC requests that this Application be disposed of by way of a written hearing.

Figure 1 below summarizes PUC's 2020 proposed distribution rates, as compared to 2019 approved rates. The proposed 2020 rates reflect the 2020 Price Cap Adjustment as well as the 2020 adjustment for transition to fixed residential rates. These rates also include the ICM rate rider impact.

Figure 1 – 2020 Proposed Distribution Rates

Rate Class	Current MFC	Current Volumetric Charge	Price Cap Index	Proposed MFC	Proposed Volumetric Charge
Residential	$28.14	0.0043	1.05%	$32.39	-
General Service Less than 50 kW	$20.95	0.0025	1.05%	$21.45	0.0257
General Service 50 to 4,999 kW	$115.66	6.8002	1.05%	$118.40	6.9618
Unmetered Scattered Load	$12.82	0.0387	1.05%	$13.12	0.0396
Sentinel Lighting	$3.59	33.4983	1.05%	$3.68	34.2945
Street Lighting	$1.38	9.0221	1.05%	$1.41	9.2365

2. Annual Adjustment Mechanism

The annual adjustment mechanism is defined as the annual percentage change in the inflation factor less an X-Factor (i.e. productivity factor and stretch factor). As part of the supplemental report on the RRFE (Renewed Regulatory Framework for Electricity Distributors) the Board will establish the final inflation factor, productivity factor and stretch factor to apply to distributors for 2020 rate setting. The rate Generator Model initially includes rate-setting parameters from the preceding year as a placeholder. This has been populated using the inflation factor of 1.50%, productivity factor of 0.00% and a stretch factor of 0.45% (representing the fourth cohort) for a total price index adjustment of 1.05%. Board staff will update PUC's Rate Generator Model with the final parameters as established.

The price index adjustment is not applied to the following components of delivery rates:

- Rate Adders;
- Rate Riders;
- Low Voltage Service Charges;
- Retail Transmission Service Rates;
- Wholesale Market Service Rates;
- Rural and Remote Rate Protection Benefit and Charges;
- Standard Supply Service – Administration Charge;
- Capacity Based Recovery;
- Micro-FIT Service Charge;
- Specific Service Charges;
- Transformation and Primary Metering Allowances; and Smart Meter Entity Charge.

3. Revenue-to-Cost Ratio Adjustment

In PUC's 2018 Cost of Service Rate Application (EB-2017-0071) the Board's decision did not include a phase-in period to adjust the revenue-to-cost ratios. Therefore, PUC is not applying for a revenue-to-cost ratio adjustment in this application and will continue with the approved ratios for each rate class as listed in Figure 2 below:

Figure 2 – Approved Revenue-to-Cost Ratios

Class	Approved Revenue-to-Cost-Ratio	Board Target Low	Board Target High
Residential	92.62%	85.00%	115.00%
General Service < 50 kW	116.08%	80.00%	120.00%
General Service 50 to 4,999 kW	111.07%	80.00%	120.00%
Street Lighting	120.00%	70.00%	120.00%
Sentinel Lighting	97.22%	80.00%	120.00%
Unmetered Scattered Load	112.71%	80.00%	120.00%

4. Rate Design for Residential Electricity Customers

On April 2, 2015 the OEB released its Board Policy: a New Distribution Rate Design for Residential Electricity Customers (EB-2014-0210), which stated that electricity distributors will transition to a fully fixed monthly distribution service charge for residential customers which will be implemented, in most cases, over a period of four years, beginning in 2016.

In proposing a transition to a fully fixed rate design, PUC has followed the approach set out in Tab 16. Rev2Cost_GDPIPI of the 2020 IRM Rate Generator. In using the standard four-year transition to a fixed service charge, PUC calculated the monthly fixed charge increase to be greater than $4 per year. PUC mitigated this issue during their 2016 IRM application (EB-2015-0089) by applying for an extension of the transition period by one year, which was ultimately approved by the Board.

When determining PUC's residential customers 10th consumption percentile, at least 12 months of actual source 2018 data was used on all residential customers to calculate an average consumption amount per month per customer. Based on the number of customers and sorting the consumption from smallest to largest, it was determined that the 10th consumption percentile for PUC's residential customers is 294 kWh.

The total bill impact comparing PUC's total bill impacts (previous Board Approved rates vs. proposed rates) of a customer at PUC's 10th consumption percentile, increased by 9.32% for residential RPP customers as shown in Figure 3 below.

Figure 3 – Total Bill Impact – 10th Consumption Percentile

Customer Class:	RESIDENTIAL SERVICE CLASSIFICATION	
RPP / Non-RPP:	RPP	
Consumption	294	kWh
Demand	-	kW
Current Loss Factor	1.0481	
Proposed/Approved Loss Factor	1.0481	

	Current OEB-Approved			Proposed			Impact	
	Rate ($)	Volume	Charge ($)	Rate ($)	Volume	Charge ($)	$ Change	% Change
Monthly Service Charge	$ 28.17	1	$ 28.17	$ 31.97	1	$ 31.97	$ 3.80	13.49%
Distribution Volumetric Rate	$ 0.0043	294	$ 1.26	$ -	294	$ -	$ (1.26)	-100.00%
Fixed Rate Riders	$ (0.60)	1	$ (0.60)	$ 0.42	1	$ 0.42	$ 1.02	-170.00%
Volumetric Rate Riders	-$ 0.0001	294	$ (0.03)	$ -	294	$ -	$ 0.03	-100.00%
Sub-Total A (excluding pass through)			$ 28.80			$ 32.39	$ 3.59	12.45%
Line Losses on Cost of Power	$ 0.0824	14	$ 1.16	$ 0.0824	14	$ 1.16	$ -	0.00%
Total Deferral/Variance Account Rate Riders	-$ 0.0055	294	$ (1.62)	$ -	294	$ -	$ 1.62	-100.00%
CBR Class B Rate Riders	$ -	294	$ -	$ -	294	$ -	$ -	
GA Rate Riders	$ -	294	$ -	$ -	294	$ -	$ -	
Low Voltage Service Charge	$ -	294	$ -		294	$ -	$ -	
Smart Meter Entity Charge (if applicable)	$ 0.57	1	$ 0.57	$ 0.57	1	$ 0.57	$ -	0.00%
Additional Fixed Rate Riders	$ -	1	$ -	$ -	1	$ -	$ -	
Additional Volumetric Rate Riders		294	$ -	$ -	294	$ -	$ -	
Sub-Total B - Distribution (includes Sub-Total A)			$ 28.32			$ 34.12	$ 5.20	17.99%
RTSR - Network	$ 0.0061	308	$ 1.88	$ 0.0063	308	$ 1.94	$ 0.06	3.28%
RTSR - Connection and/or Line and Transformation Connection	$ -	308	$ -	$ -	308	$ -	$ -	
Sub-Total C - Delivery (including Sub-Total B)			$ 30.80			$ 36.07	$ 5.26	17.09%
Wholesale Market Service Charge (WMSC)	$ 0.0034	308	$ 1.05	$ 0.0034	308	$ 1.05	$ -	0.00%
Rural and Remote Rate Protection (RRRP)	$ 0.0005	308	$ 0.15	$ 0.0005	308	$ 0.15	$ -	0.00%
Standard Supply Service Charge	$ 0.25	1	$ 0.25	$ 0.25	1	$ 0.25	$ -	0.00%
TOU - Off Peak	$ 0.0650	191	$ 12.42	$ 0.0650	191	$ 12.42	$ -	0.00%
TOU - Mid Peak	$ 0.0940	50	$ 4.70	$ 0.0940	50	$ 4.70	$ -	0.00%
TOU - On Peak	$ 0.1340	53	$ 7.09	$ 0.1340	53	$ 7.09	$ -	0.00%
Total Bill on TOU (before Taxes)			$ 56.46			$ 61.73	$ 5.26	9.32%
HST	13%		$ 7.34	13%		$ 8.02	$ 0.68	9.32%
8% Rebate	8%		$ (4.52)	8%		$ (4.94)	$ (0.42)	
Total Bill on TOU			$ 59.29			$ 64.81	$ 5.53	9.32%

5. Electricity Distribution Retail Transmission Service Rates

PUC is applying for an increase in the network service rates in accordance with the OEB guidelines Electricity Distribution Retail Transmission Service Rates (“RTSR”), Revision 4.0 (G-2008-0001) issued June 28, 2012. The increase is calculated using the 2020 IRM Rate Generator Model issued by the OEB that applies historical wholesale and retail consumption to current and future wholesale and retail rates. When the January 1, 2020 rates are determined, the Board Staff will adjust the 2020 RTSR section of the Rate Generator Model accordingly. Consistent with prior years, PUC’s customers are not subject to the retail connection transmission service rates because PUC receives power at 115kV and owns the transformer equipment to step down to distribution levels.

A summary of the current and proposed Retail Transmission Rates is shown in Figure 4 below:

Figure 4 – RTSR – Network Rates

	Current RTSR - Network ($)	Proposed RTSR - Network ($)
Residential (kWh)	0.0061	0.0063
General Service <50 kW (kWh)	0.0057	0.0059
General Service > 50kW (kW)	2.2941	2.3582
General Service >50 kW Interval Metered (KW)	2.8852	2.9659
USL (kWh)	0.0057	0.0059
Sentinel Lighting (kW)	1.7389	1.7875
Street Lighting (kW)	1.7303	1.7787

6. Review and Disposition of Group 1 Deferral and Variance Account Balances

PUC followed the Report of the Board on Electricity Distributors' Deferral and Variance Account Review Report (the "EDDVAR Report"). The report provides that under the 4th Generation IR, the distributors Group 1 audited account balances will be reviewed and disposed of if the pre-set disposition threshold of $0.001 per kWh is exceeded. The Group 1 accounts are as follows:

- 1550 – Low Voltage Account;
- 1551 – Smart Metering Entity Charge Variance;
- 1580 – RSVA Wholesale Market Service Charge Account;
- 1580 Variance WMS, Sub-Account CBR Class A
- 1580 Variance WMS, Sub-Account CBR Class B
- 1584 – RSVA Retail Transmission Network Charges Account;
- 1586 – RSVA Retail Transmission Connection Charge Account;
- 1588 – RSVA Power Account;
- 1589 – RSVA Global Adjustment Account; and
- 1595 – Disposition and Recovery/Refund of Regulatory Balances Account.

For the 2018 period, PUC did not exceed the threshold test of $0.001 per kWh as shown in Figure 5 below and is therefore not applying for disposal of any of the Group 1 Deferral and Variance Accounts:

Figure 5 – Threshold Test

Total Claim (including Account 1568)	$584,409
Total Claim for Threshold Test (All Group 1 Account)	$540,724
Threshold Test (Total Claim per kWh)	$0.0009

PUC is not applying for disposal of the following accounts:

1551 – Smart Metering Entity Charge Variance;
1580 – Wholesale Market Service Charge;
1584 – Retail Transmission Network Charge;
1588 – RSVA Power (Excluding Global Adjustment); and
1589 – RSVA Global Adjustment
1595 – Disposition and Recovery/Refund of Regulatory Account Balances (2016 Year) (Residual Balance)
1595 – Disposition and Recovery/Refund of Regulatory Account Balances (2018 Year)

PUC does not use accounts 1550 (LV Variance Account) or 1586 (Retail Transmission Connection Charge) therefore these accounts are not included in the application for recovery.

PUC has completed Tab 3. Continuity Schedule of the Rate Generator Model and has reconciled December 31, 2018 audited balances with the April 30, 2019 RRR filing. As discussed in the Filing Requirements, distributors must provide an explanation if the account balances differ from the account balances reported through the RRR.

In Column BV of Tab 3, 2020 Continuity Schedule of Deferral and Variance Balances of the 2020 Rate Generator Model, the Variance between the 2.1.7 RRR data and the 2018 Balance (Principal and Interest) is calculated. All balances agree to the RRR balances filed for December 31, 2018 with the exception of $(546) in 1580 - RSVA – Wholesale Market Service Charge. This is a result of the costs for the Capacity Based Recovery (“CBR”). Account 1580 is made up of three components, two of which capture the CBR Charge Variance (for each of Class A and Class B customers), and a third “main” account which captures the variance in the remaining Wholesale Market Service Charge. The 2018 RRR filing included these costs in Account 1580, however, the costs have been segregated in the appropriate sub-accounts for Class A and Class B in the Model. In the RRR section 2.17 Trial Balance, Tab Sub-Accounts, only the CBR sub-accounts are reported, while the full balance of the account (all three components) is reported on the Tab “Group 1 Accounts”. In the continuity schedule in Tab 3 of the 2020 IRM Rate Generator, PUC has input only the non-CBR related WMS variance while the RRR value shows the full balance. The expected variance between the two values is equivalent to the value of the CBR sub-accounts.

In accordance with the Filing Requirements, PUC has completed the 1595 Analysis Work form and included it as *Appendix 6*.

PUC confirms that no additional adjustments have been made to any deferral or variance account balances that have been previously approved by the OEB on a final basis.

7. Wholesale Market Participants

PUC does not have any Wholesale Market Participant customers.

8. Global Adjustment (GA)

In accordance with the Chapter 3 Filing Requirements last updated July 12, 2018, distributors who serve Class A customers must allocate the recovery of the global adjustment variance balance based on their settlement process with the IESO for any residual global adjustment variance balances that accrued for Class A transition customers (i.e., customers who transitioned from Class B to A or Class A to B during the period).

Distributors must complete the GA Analysis Work form to determine whether the annual balance in Account 1589 is reasonable. The Work form compares the General Ledger principal balance to an expected principal balance based on monthly GA volumes, revenues and costs. Distributors may provide reconciling items to explain and reduce the discrepancy between the actual and expected balance. Any unexplained discrepancies should be calculated separately for each calendar year and any unexplained discrepancy for each year greater than +/- 1% of total annual IESO GA charges will be considered material.

PUC has not calculated Global Adjustment rate riders or other adjustments for Class A transition customers as PUC did not have any customers transition in 2018 in accordance with the Filing Requirements, PUC has completed the GA Analysis Work form and included it as *Appendix 5*.

<u>Global Adjustment - Description of Settlement Process</u>

In accordance with the Filing Guidelines, the description of PUC Distribution's settlement process is required to be submitted to support a Global Adjustment settlement claim. PUC is not applying for disposal of any Group 1 Deferral and Variance Accounts and therefore has not included a description of its settlement process.

9. Commodity Accounts 1588 and 1589

Effective May 23, 2017, per the ORB's letter titled Guidance on Disposition of Accounts 1588 and 1589, applicants must reflect RPP Settlement true-up claims pertaining to the period that is being requested for disposition in the RSVA Power (Account 1588) and RSVA GA (Account 1589) variance accounts.

Given issues that have arisen with commodity accounts 1588 RSVA Power and 1589 RSVA GA balances, the OEB now requires a certification by the Chief Executive Officer (CEO), or Chief Financial Officer (CFO), or equivalent. The application must include a certification that the distributor has robust processes and internal controls in place for the preparation, review, verification and oversight of the account balances being disposed, consistent with the certification requirements in Chapter 1 of the filing requirements.

In PUC's 2019 Decision and Rate Order (EB-2018-0219) OEB staff was concerned with the large balance in Account 1588 – Power. OEB staff noted typically, Account 1588 is expected to have a minimal balance that is comprised mainly of unaccounted for energy losses. OEB staff submitted that even though Account 1588 was in a credit position, PUC Distribution did not provide a sufficient explanation for the account balance. Concerning Account 1589, OEB staff noted that it was not clear about the net amount of 2017 transactions in the year (i.e. after removing the GA for Class A customers) that should be disposed to Non-RPP Class B customers. OEB staff noted that new accounting guidance for Accounts 1588 and 1589 was issued February 21, 2019, effective January 1, 2019. OEB staff noted that given the timing of the application and issuance of new accounting guidance, PUC Distribution had not taken the new accounting guidance into consideration in their application in the context of the 2017 balance currently requested for disposition, as well as the 2015 and 2016 balances that were approved for disposition on an interim basis. OEB staff submitted that Accounts 1588 and 1589 should not be disposed until PUC Distribution addressed the above noted concerns and have completed its review of the account balances in accordance with the expectations of the new accounting guidance.

In its reply submission, with respect to Account 1588 and 1589, PUC Distribution agreed with OEB staff and submitted that Accounts 1588 and 1589 should not be disposed until PUC Distribution has completed a review of the account balances in accordance with the expectations of the new accounting guidance. PUC is currently in the process of conducting an internal review against the new accounting guidance. Given that PUC is not disposing of Group 1 accounts, in the event that PUC uncovers any discrepancies in account 1588, it will have an opportunity to adjust the balance of this account in the future. This review will be completed before the fiscal period ending December 31, 2019.

No disposition of the Group 1 balances is being proposed, including the 1588 RSVA Power and 1589 RSVA GA balances.

10. Capacity Based Recovery (CBR)

PUC follows the OEB's Accounting Guidance on CBR issued on July 25, 2016. As no disposition of Group 1 balances is being proposed, CBR rate riders or adjustments for transition Class A customers are not being proposed.

11. LRAM Variance Account (LRAMVA)

In accordance with the Board's Guidelines for Electricity Distributors CDM, at a minimum, distributors must apply for disposition of the balance in the LRAMVA at the time of their Cost of Service rate applications. Distributors may apply for the disposition of the LRAMVA balance in IRM rate applications if the balance is deemed significant by the applicant. All requests for disposition of the LRAMVA must be made together with carrying charges.

PUC contracted the services of IndEco Strategic Consulting Inc. to complete the OEB provided LRAMVA work form shown in Figure 6 below. Since the LRMAVA calculation is not material, PUC is not claiming any amounts for disposition.

Figure 6 – LRAMVA calculation

A. Previous LRAMVA Application		B. Current LRAMVA Application	
Previous LRAMVA Application (EB#)	EB-2018-0219	Current LRAMVA Application (EB#)	EB-2019-0170
Application of Previous LRAMVA Claim	2019 IRM	Application of Current LRAMVA Claim	2020 IRM
Period of LRAMVA Claimed in Previous Application	2017	Period of New LRAMVA in this Application	2018
Amount of LRAMVA Claimed in Previous Application	$ 384,311.84	Period of Rate Recovery (# years)	1

Actual Lost Revenues ($)	A	**$ 128,035**
Forecast Lost Revenues ($)	B	**$ 105,078**
Carrying Charges ($)	C	**$ 893**
LRAMVA ($) for Account 1568	A-B+C	**$ 23,849**

12. Tax Changes

In its Supplemental Report of the Board on 3rd Generation Incentive Regulation for Ontario's Electricity Distributors, the OEB determined a 50/50 sharing of the impact of currently known legislation tax changes as applied to the tax level reflected in the Board-approved base rates for distributors is appropriate.

PUC has completed the OEB's 2020 IRM Rate Generator Model (Tab "8. STS-Tax Change" and Tab "9. Shared Tax-Rate Rider") and calculated annual tax changes allocated to customer rate classes based on the 2018 Board Approved billing

determinants and distribution rates (2018 COS file number EB-2017-0071). As there is no tax change from the 2018 year of the cost of service, no rate rider has been generated.

PUC will be following the direction provided in the letter issued July 25, 2019 by the OEB, entitled “Accounting Direction Regarding Bill C-97 and Other Changes in Regulatory or Legislated Tax Rules for Capital Cost Allowance” to use a variance account to track the tax impact.

13. Z-Factor Claims

Z-factor claims are intended to provide for unforeseen events outside of a distributor’s management control, regardless of a distributors’ rate-setting mechanism at the time of the event. The cost to a distributor must be material and its causation clear. In this application, PUC is not applying for a Z-factor claim.

14. Incremental Capital Module (“ICM”)

The Incremental Capital Module is intended to address the treatment of capital investment needs that arise during the rate-setting plan which are incremental to the materiality threshold. Distributors on Price Cap IR rates setting are eligible to make an ICM funding request during a Price Cap IR Application for capital investment needs which are material and incremental to the levels of funding currently assumed in the distributor’s base rates, and beyond an OEB-defined materiality threshold.

PUC submits this ICM to secure incremental capital funding for 2020 to support its Substation 16 Renewal (“Sub-16”) project. The Sub-16 project is an initiative which will support PUC’s 2018-2022 Distribution System Plan (DSP) and provide benefits to PUC’s customers. Sub-16 will be in use in 2020, therefore, PUC is requesting funding through incremental capital rate riders effective May 1, 2020.

In the ICM Summary, PUC has supported that the Sub-16 project meets the eligibility criteria for an ICM to be recovered through rates. The capital costs are outside the base upon which current rates were derived. PUC is requesting that these costs be recovered by means of a rate rider that would be in place until PUC files its next rebasing application.

To achieve this initiative, PUC is requesting approval of a net capital expenditure exceeding PUC’s 2020 materiality threshold of $3,435,125. This results in an incremental revenue requirement of $258,056.

To address the OEB Accounting Direction Regarding Bill C-97 and Other Changes in Regulatory or Legislated Tax Rules for Capital Cost Allowance, PUC considered the

CCA impact using the Accelerated Investment Incentive program in Year 1 versus a Year 1 -3 impact smoothing. This is discussed in the attached Appendix 7.

The approval of the Sub-16 Project will result in the addition of the rate riders shown in Figure 7 on the 2020 Proposed Tariff of Rates and Charges and Bill Impacts shown in Figure 8.

Figure 7 – Sub-16 Project Rate Riders

ICM Rate Rider Summary	Proposed		
Class	Service Charge Rate	Volumetric Rate	Volumetric Rate
Residential	$0.42		
General Service Less than 50 kW	$0.28	$0.0003	
General Service 50 to 4,999 kW	$1.53		$0.0902
Unmetered Scattered Load	$0.17	$0.0005	
Sentinel Lighting	$0.05		$0.4445
Street Lighting	$0.02		$0.1197

Figure 8 – Sub-16 Bill Impact

Class	Average Monthly Volume		RPP/Non-RPP	Total Proposed Bill ICM Impact ($)	Total Bill ICM Impact (%)
	kWh	kW			
Residential	700	0	RPP	0.44	0.44%
General Service Less than 50 kW	2,000	0	RPP	0.93	0.35%
General Service 50 to 4,999 kW	57,220	145	Non-RPP	16.51	0.18%
Unmetered Scattered Load	3,600	0	Non-RPP	2.23	0.34%
Sentinel Lighting	50	1	Non-RPP	0.55	1.22%
Street Lighting	199,852	585	Non-RPP	261.51	0.48%

For the full analysis of the ICM on the Sub-16 Project, please refer to Appendix 7.

15. Treatment of Costs for 'Eligible Investments'

PUC submitted its 5-year Distribution System Plan (DSP) with its 2018 Cost of Service Rate Application. As referenced within Section 2.3.9 of the DSP, PUC's distribution system is capable of accommodating REG and no capital investments are needed for capacity upgrades to facilitate the connection of renewable energy generation plant at

this time. Therefore, no requirement to establish deferral accounts for these types of costs or recovery of costs is requested or required.

16. Conservation and Demand Management Costs for Distributors

PUC's CDM programs are funded through the IESO and therefore confirms that no CDM costs are included in distribution rates.

17. Off-Ramps

An off ramp is based on a pre-defined set of conditions under which a plan based on any of the three rate-setting methods would be terminated or modified before its normal end-of-term date due to excessive over or under earnings. In this application, PUC is not applying for an off-ramp.

18. Bill Impact Summary

PUC's proposed 2020 tariff can be found in Appendix 1. Bill impacts by customer class are included in Appendix 3 and have also been updated to reflect PUC's proposal. Figure 1 below summarizes the monthly bill impacts by customer class.

Figure 9 – Bill Impact Summary

Class	Average Monthly Volume		RPP/Non-RPP	Total Current Bill	Total Proposed Bill	Total Bill Impact ($)	Total Bill Impact (%)
	kWh	kW					
Residential	700	0	RPP	$100.00	$106.17	$6.17	6.17%
Residential - 10th Percentile	294	0	RPP	$59.29	$64.81	$5.52	9.31%
General Service Less than 50 kW	2,000	0	RPP	$269.53	$280.18	$10.65	3.95%
General Service 50 to 4,999 kW	57,220	145	Non-RPP	$9,016.78	$9,386.79	$370.01	4.10%
Unmetered Scattered Load	3,600	0	Non-RPP	$647.01	$687.42	$40.41	6.25%
Sentinel Lighting	50	1	Non-RPP	$45.15	$51.96	$6.81	15.08%
Street Lighting	199,852	585	Non-RPP	$54,635.85	$53,177.56	-$1,458.29	-2.67%

Appendix 1 – 2020 Proposed Tariff of Rates and Charges

PUC Distribution Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 1, 2020

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2019-0170

RESIDENTIAL SERVICE CLASSIFICATION

This classification applies to an account taking electricity at 750 volts or less where the electricity is used exclusively in a single family unit, non-commercial. This can be a separately metered living accommodation, town house, apartment, semi-detached, duplex, triplex or quadruplex with residential zoning. Class B consumers are defined on accordance with O. Reg. 429/04. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, or as specified herein.

Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable. In addition, the charges in the MONTHLY RATES AND CHARGES - Regulatory Component of this schedule do not apply to a customer that is an embedded wholesale market participant.

It should be noted that this schedule does not list any charges, assessments, or credits that are required by law to be invoiced by a distributor and that are not subject to Ontario Energy Board approval, such as the Global Adjustment and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	31.97
Rate Rider for Recovery of Incremental Capital - effective until April 30, 2023	$	0.42
Smart Metering Entity Charge - effective until December 31, 2022	$	0.57
Retail Transmission Rate - Network Service Rate	$/kWh	0.0063

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate (WMS) - not including CBR	$/kWh	0.0030
Capacity Based Recovery (CBR) - Applicable for Class B Customers	$/kWh	0.0004
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0005
Standard Supply Service - Administrative Charge (if applicable)	$/kWh	0.2500

GENERAL SERVICE LESS THAN 50 KW SERVICE CLASSIFICATION

This classification applies to a non residential account taking electricity at 750 volts or less whose average monthly peak demand is less than, or is forecast to be less than, 50 kW. Class B consumers are defined on accordance with O. Reg. 429/04. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

PUC Distribution Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 1, 2020

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2019-0170

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, or as specified herein.

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It should be noted that this schedule does not list any charges, assessments, or credits that are required by law to be invoiced by a distributor and that are not subject to Ontario Energy Board approval, such as the Global Adjustment and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	21.17
Rate Rider for Recovery of Incremental Capital - effective until	$	0.28
Smart Metering Entity Charge - effective until December 31, 2022	$	0.57
Distribution Volumetric Rate	$/kWh	0.0254
Rate Rider for Recovery of Incremental Capital - effective until	$/kWh	0.0003
Retail Transmission Rate - Network Service Rate	$/kWh	0.0059

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate (WMS) - not including CBR	$/kWh	0.0030
Capacity Based Recovery (CBR) - Applicable for Class B Customers	$/kWh	0.0004
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0005
Standard Supply Service - Administrative Charge (if applicable)	$/kWh	0.2500

GENERAL SERVICE 50 TO 4,999 KW SERVICE CLASSIFICATION

This classification applies to a non residential account whose average monthly peak demand used for billing purposes over the past 12 months is equal to or greater than, or is forecast to be equal to or greater than, 50 kW but less than 5,000 kW. Class A and Class B consumers are defined on accordance with O. Reg. 429/04. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, or as specified herein.

PUC Distribution Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 1, 2020

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2019-0170

Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable. In addition, the charges in the MONTHLY RATES AND CHARGES - Regulatory Component of this schedule do not apply to a customer that is an embedded wholesale market participant.

If included in the following listing of monthly rates and charges, the rate rider for the disposition of WMS - Sub-account CBR Class B is not applicable to wholesale market participants (WMP), customers that transitioned between Class A and Class B during the variance account accumulation period, or to customers that were in Class A for the entire period. Customers who transitioned are to be charged or refunded their share of the variance disposed through customer specific billing adjustments. This rate rider is to be consistently applied for the entire period to the sunset date of the rate rider. In addition, this rate rider is applicable to all new Class B customers.

If included in the following listing of monthly rates and charges, the rate rider for the disposition of Global Adjustment is only applicable to non-RPP Class B customers. It is not applicable to WMP, customers that transitioned between Class A and Class B during the variance account accumulation period, or to customers that were in Class A for the entire period. Customers who transitioned are to be charged or refunded their share of the variance disposed through customer specific billing adjustments. This rate rider is to be consistently applied for the entire period to the sunset date of the rate rider. In addition, this rate rider is applicable to all new non-RPP Class B customers.

It should be noted that this schedule does not list any charges, assessments, or credits that are required by law to be invoiced by a distributor and that are not subject to Ontario Energy Board approval, such as the Global Adjustment and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	116.87
Rate Rider for Recovery of Incremental Capital - effective until	$	1.53
Distribution Volumetric Rate	$/kW	6.8716
Rate Rider for Recovery of Incremental Capital - effective until	$/kW	0.0902
Retail Transmission Rate - Network Service Rate	$/kW	2.3582
Retail Transmission Rate - Network Service Rate - Interval Metered	$/kW	2.9659

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate (WMS) - not including CBR	$/kWh	0.0030
Capacity Based Recovery (CBR) - Applicable for Class B Customers	$/kWh	0.0004
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0005
Standard Supply Service - Administrative Charge (if applicable)	$/kWh	0.2500

UNMETERED SCATTERED LOAD SERVICE CLASSIFICATION

This classification applies to an account taking electricity at 750 volts or less whose average monthly peak demand is less than, or is forecast to be less than, 50 kW and the consumption is unmetered. Such connections include cable TV power packs, bus shelters, telephone booths, traffic lights, railway crossings, etc. The customer will provide detailed manufacturer information documentation with regard to electrical demand/consumption of the proposed unmetered load. Class B consumers are defined on accordance with O. Reg. 429/04. Further servicing details are available in the Distributor's Conditions of Service.

APPLICATION

PUC Distribution Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 1, 2020

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2019-0170

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, or as specified herein.

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It should be noted that this schedule does not list any charges, assessments, or credits that are required by law to be invoiced by a distributor and that are not subject to Ontario Energy Board approval, such as the Global Adjustment and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	12.95
Rate Rider for Recovery of Incremental Capital - effective until	$	0.17
Distribution Volumetric Rate	$/kWh	0.0391
Rate Rider for Recovery of Incremental Capital - effective until	$/kWh	0.0005
Retail Transmission Rate - Network Service Rate	$/kWh	0.0059

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate (WMS) - not including CBR	$/kWh	0.0030
Capacity Based Recovery (CBR) - Applicable for Class B Customers	$/kWh	0.0004
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0005
Standard Supply Service - Administrative Charge (if applicable)	$/kWh	0.2500

SENTINEL LIGHTING SERVICE CLASSIFICATION

This classification applies to safety/security lighting with a Residential or General Service customer. This is typically exterior lighting, and unmetered. Consumption is estimated based on the equipment rating and estimated hours of use. Class B consumers are defined on accordance with O. Reg. 429/04. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

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PUC Distribution Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 1, 2020

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EB-2019-0170

Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable. In addition, the charges in the MONTHLY RATES AND CHARGES - Regulatory Component of this schedule do not apply to a customer that is an embedded wholesale market participant.

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MONTHLY RATES AND CHARGES - Delivery Component

Service Charge (per connection)	$	3.63
Rate Rider for Recovery of Incremental Capital - effective until	$	0.05
Distribution Volumetric Rate	$/kW	33.8500
Rate Rider for Recovery of Incremental Capital - effective until	$/kW	0.4445
Retail Transmission Rate - Network Service Rate	$/kW	1.7875

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate (WMS) - not including CBR	$/kWh	0.0030
Capacity Based Recovery (CBR) - Applicable for Class B Customers	$/kWh	0.0004
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0005
Standard Supply Service - Administrative Charge (if applicable)	$/kWh	0.2500

STREET LIGHTING SERVICE CLASSIFICATION

This classification applies to an account for roadway lighting with a Municipality, Regional Municipality, Ministry of Transportation and private roadway lighting operation, controlled by photo cells. The consumption for these customers will be based on the calculated connected load times the required lighting times established in the approved Ontario Energy Board street lighting load shape template. Class B consumers are defined on accordance with O. Reg. 429/04. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

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MONTHLY RATES AND CHARGES - Delivery Component

PUC Distribution Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 1, 2020

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2019-0170

Service Charge (per connection)	$	1.39
Rate Rider for Recovery of Incremental Capital - effective until	$	0.02
Distribution Volumetric Rate	$/kW	9.1168
Rate Rider for Disposition of Lost Revenue Adjustment Mechanism Variance Account (LRAMVA) (2019) - effective until April 30, 2022	$/kW	5.7106
Rate Rider for Recovery of Incremental Capital - effective until	$/kW	0.1197
Retail Transmission Rate - Network Service Rate	$/kW	1.7787

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate (WMS) - not including CBR	$/kWh	0.0030
Capacity Based Recovery (CBR) - Applicable for Class B Customers	$/kWh	0.0004
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0005
Standard Supply Service - Administrative Charge (if applicable)	$/kWh	0.2500

microFIT SERVICE CLASSIFICATION

This classification applies to an electricity generation facility contracted under the Independent Electricity System Operator's microFIT program and connected to the distributor's distribution system. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

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MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	5.40

ALLOWANCES

Transformer Allowance for Ownership - per kW of billing demand/month	$/kW	(0.60)
Primary Metering Allowance for transformer losses - applied to measured demand and energy	%	(1.00)

SPECIFIC SERVICE CHARGES

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

PUC Distribution Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 1, 2020

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2019-0170

No charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, or as specified herein.

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Customer Administration		
Account set up charge/change of occupancy charge (plus credit agency costs if applicable)	$	30.00
Returned cheque (plus bank charges)	$	15.00
Legal letter charge	$	15.00
Meter dispute charge plus Measurement Canada fees (if meter found correct)	$	30.00
Non-Payment of Account		
Late payment - per month (effective annual rate 19.56% per annum or 0.04896% compounded daily rate)	%	1.50
Reconnection charge - at meter - during regular hours	$	65.00
Reconnection charge - at meter - after hours	$	185.00
Reconnection charge - at pole - during regular hours	$	185.00
Reconnection charge - at pole - after hours	$	415.00
Other		
Special meter reads	$	30.00
Service call - customer-owned equipment		Time & Materials
Service call - after regular hours		Time & Materials
Temporary service - install & remove - overhead - no transformer		Time & Materials
Temporary service - install & remove - underground - no transformer		Time & Materials
Temporary service - install & remove - overhead - with transformer		Time & Materials
Specific charge for access to the power poles - $/pole/year (with the exception of wireless attachments)	$	44.28
Removal of overhead lines - during regular hours		Time & Materials
Removal of overhead lines - after hours		Time & Materials
Roadway escort - after regular hours		Time & Materials

RETAIL SERVICE CHARGES (if applicable)

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

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PUC Distribution Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 1, 2020

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EB-2019-0170

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Retail Service Charges refer to services provided by a distributor to retailers or customers related to the supply of competitive electricity.

One-time charge, per retailer, to establish the service agreement between the distributor and the retailer	$	101.50
Monthly Fixed Charge, per retailer	$	40.60
Monthly Variable Charge, per customer, per retailer	$/cust.	1.02
Distributor-consolidated billing monthly charge, per customer, per retailer	$/cust.	0.61
Retailer-consolidated billing monthly credit, per customer, per retailer	$/cust.	(0.61)
Service Transaction Requests (STR)		
Request fee, per request, applied to the requesting party	$	0.51
Processing fee, per request, applied to the requesting party	$	1.02
Request for customer information as outlined in Section 10.6.3 and Chapter 11 of the Retail Settlement Code directly to retailers and customers, if not delivered electronically through the Electronic Business Transaction (EBT) system, applied to the requesting party		
Up to twice a year	$	no charge
More than twice a year, per request (plus incremental delivery costs)	$	4.06
Notice of switch letter charge, per letter (unless the distributor has opted out of applying the charge as per the Ontario Energy Board's Decision and Order EB-2015-0304, issued on February 14, 2019)	$	2.00

LOSS FACTORS

If the distributor is not capable of prorating changed loss factors jointly with distribution rates, the revised loss factors will be implemented upon the first subsequent billing for each billing cycle.

Total Loss Factor - Secondary Metered Customer < 5,000 kW	1.0481
Total Loss Factor - Primary Metered Customer < 5,000 kW	1.0385

Appendix 2 – Current Tariff of Rates and Charges
(2019 Rate Order EB-2018-0219)

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

PUC Distribution Inc.

TARIFF OF RATES AND CHARGES

Effective Date May 1, 2019

Implementation Date July 1, 2019

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2018-0219

RESIDENTIAL SERVICE CLASSIFICATION

This classification applies to an account taking electricity at 750 volts or less where the electricity is used exclusively in a single family unit, non-commercial. This can be a separately metered living accommodation, town house, apartment, semi-detached, duplex, triplex or quadruplex with residential zoning. Class B consumers are defined on accordance with O. Reg. 429/04. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

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It should be noted that this schedule does not list any charges, assessments, or credits that are required by law to be invoiced by a distributor and that are not subject to Ontario Energy Board approval, such as the Global Adjustment and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	28.17
Rate Rider for Foregone Distribution Revenue - effective until April 30, 2020	$	0.75
Smart Metering Entity Charge - effective until December 31, 2022	$	0.57
Rate Rider for Disposition of Tax Loss Carry-forward - effective until April 30, 2020	$	(1.30)
Rate Rider for Disposition of Group 2 Deferral/Variance Accounts (2018) - effective until April 30, 2020	$	(0.05)
Distribution Volumetric Rate	$/kWh	0.0043
Rate Rider for Disposition of Global Adjustment Account (2018) - Applicable only for Non-RPP Customers - effective until April 30, 2020 - Approved on an Interim Basis	$/kWh	0.0004
Rate Rider for Disposition of Deferral/Variance Accounts (2019) - effective until April 30, 2020 - Approved on an Interim Basis	$/kWh	(0.0023)
Rate Rider for Disposition of Group 1 Deferral/Variance Accounts (2018) - effective until April 30, 2020 - Approved on an Interim Basis	$/kWh	(0.0032)
Rate Rider for Disposition of Lost Revenue Adjustment Mechanism Variance Account (LRAMVA) (2019) - effective until April 30, 2020	$/kWh	0.0006
Rate Rider for Disposition of Lost Revenue Adjustment Mechanism Variance Account (LRAMVA) (2018) - effective until April 30, 2020	$/kWh	0.0002

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

Rate Rider for Foregone Distribution Revenue - effective until April 30, 2020	$/kWh	(0.0009)
Retail Transmission Rate - Network Service Rate	$/kWh	0.0061

MONTHLY RATES AND CHARGES - Regulatory Component

Rate Rider for Embedded Generation Adjustment	$/kWh	(0.0004)
Wholesale Market Service Rate (WMS) - not including CBR	$/kWh	0.0030
Capacity Based Recovery (CBR) - Applicable for Class B Customers	$/kWh	0.0004
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0005
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

GENERAL SERVICE LESS THAN 50 KW SERVICE CLASSIFICATION

This classification applies to a non residential account taking electricity at 750 volts or less whose average monthly peak demand is less than, or is forecast to be less than, 50 kW. Class B consumers are defined on accordance with O. Reg. 429/04. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

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MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	20.95
Rate Rider for Foregone Distribution Revenue - effective until April 30, 2020	$	0.04
Smart Metering Entity Charge - effective until December 31, 2022	$	0.57
Rate Rider for Disposition of Tax Loss Carry-forward - effective until April 30, 2020	$	(0.86)
Distribution Volumetric Rate	$/kWh	0.0251
Rate Rider for Disposition of Global Adjustment Account (2018) - Applicable only for Non-RPP Customers - effective until April 30, 2020 - Approved on an Interim Basis	$/kWh	0.0004
Rate Rider for Disposition of Deferral/Variance Accounts (2019) - effective until April 30, 2020 - Approved on an Interim Basis	$/kWh	(0.0022)
Rate Rider for Disposition of Group 1 Deferral/Variance Accounts (2018) - effective until April 30, 2020 - Approved on an Interim Basis	$/kWh	(0.0032)
Rate Rider for Disposition of Group 2 Deferral/Variance Accounts (2018) - effective until April 30, 2020	$/kWh	(0.0001)
Rate Rider for Disposition of Lost Revenue Adjustment Mechanism Variance Account (LRAMVA) (2019) - effective until April 30, 2020	$/kWh	0.0009
Rate Rider for Disposition of Lost Revenue Adjustment Mechanism Variance Account (LRAMVA) (2018) - effective until April 30, 2020	$/kWh	0.0019
Rate Rider for Disposition of Tax Loss Carry-forward - effective until April 30, 2020	$/kWh	(0.0010)
Rate Rider for Foregone Distribution Revenue - effective until April 30, 2020	$/kWh	0.0001
Retail Transmission Rate - Network Service Rate	$/kWh	0.0057

MONTHLY RATES AND CHARGES - Regulatory Component

Rate Rider for Embedded Generation Adjustment	$/kWh	(0.0004)
Wholesale Market Service Rate (WMS) - not including CBR	$/kWh	0.0030
Capacity Based Recovery (CBR) - Applicable for Class B Customers	$/kWh	0.0004
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0005
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

GENERAL SERVICE 50 TO 4,999 KW SERVICE CLASSIFICATION

This classification applies to a non residential account whose average monthly peak demand used for billing purposes over the past 12 months is equal to or greater than, or is forecast to be equal to or greater than, 50 kW but less than 5,000 kW. Class A and Class B consumers are defined on accordance with O. Reg. 429/04. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, or as specified herein.

Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable. In addition, the charges in the MONTHLY RATES AND CHARGES - Regulatory Component of this schedule do not apply to a customer that is an embedded wholesale market participant.

If included in the following listing of monthly rates and charges, the rate rider for the disposition of WMS - Sub-account CBR Class B is not applicable to wholesale market participants (WMP), customers that transitioned between Class A and Class B during the variance account accumulation period, or to customers that were in Class A for the entire period. Customers who transitioned are to be charged or refunded their share of the variance disposed through customer specific billing adjustments. This rate rider is to be consistently applied for the entire period to the sunset date of the rate rider. In addition, this rate rider is applicable to all new Class B customers.

If included in the following listing of monthly rates and charges, the rate rider for the disposition of Global Adjustment is only applicable to non-RPP Class B customers. It is not applicable to WMP, customers that transitioned between Class A and Class B during the variance account accumulation period, or to customers that were in Class A for the entire period. Customers who transitioned are to be charged or refunded their share of the variance disposed through customer specific billing adjustments. This rate rider is to be consistently applied for the entire period to the sunset date of the rate rider. In addition, this rate rider is applicable to all new non-RPP Class B customers.

It should be noted that this schedule does not list any charges, assessments, or credits that are required by law to be invoiced by a distributor and that are not subject to Ontario Energy Board approval, such as the Global Adjustment and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	115.66
Rate Rider for Foregone Distribution Revenue - effective until April 30, 2020	$	0.24
Rate Rider for Disposition of Tax Loss Carry-forward - effective until April 30, 2020	$	(4.74)
Distribution Volumetric Rate	$/kW	6.8002
Rate Rider for Disposition of Global Adjustment Account (2018) - Applicable only for Non-RPP Customers - effective until April 30, 2020 - Approved on an Interim Basis	$/kWh	0.0004
Rate Rider for Disposition of Deferral/Variance Accounts (2019) - effective until April 30, 2020 - Approved on an Interim Basis	$/kW	(0.8067)
Rate Rider for Disposition of Group 1 Deferral/Variance Accounts (2018) - effective until April 30, 2020 - Approved on an Interim Basis	$/kW	(1.2817)

Rate Rider for Disposition of Group 2 Deferral/Variance Accounts (2018) - effective until April 30, 2020	$/kW	(0.0258)
Rate Rider for Disposition of Lost Revenue Adjustment Mechanism Variance Account (LRAMVA) (2019) - effective until April 30, 2020	$/kW	0.1369
Rate Rider for Disposition of Lost Revenue Adjustment Mechanism Variance Account (LRAMVA) (2018) - effective until April 30, 2020	$/kW	0.0962
Rate Rider for Disposition of Tax Loss Carry-forward - effective until April 30, 2020	$/kW	(0.2734)
Rate Rider for Foregone Distribution Revenue - effective until April 30, 2020	$/kW	0.0141
Retail Transmission Rate - Network Service Rate	$/kW	2.2941
Retail Transmission Rate - Network Service Rate - Interval Metered	$/kW	2.8852

MONTHLY RATES AND CHARGES - Regulatory Component

Rate Rider for Embedded Generation Adjustment	$/kWh	(0.0004)
Wholesale Market Service Rate (WMS) - not including CBR	$/kWh	0.0030
Capacity Based Recovery (CBR) - Applicable for Class B Customers	$/kWh	0.0004
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0005
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

UNMETERED SCATTERED LOAD SERVICE CLASSIFICATION

This classification applies to an account taking electricity at 750 volts or less whose average monthly peak demand is less than, or is forecast to be less than, 50 kW and the consumption is unmetered. Such connections include cable TV power packs, bus shelters, telephone booths, traffic lights, railway crossings, etc. The customer will provide detailed manufacturer information documentation with regard to electrical demand/consumption of the proposed unmetered load. Class B consumers are defined on accordance with O. Reg. 429/04. Further servicing details are available in the Distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, or as specified herein.

Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable. In addition, the charges in the MONTHLY RATES AND CHARGES - Regulatory Component of this schedule do not apply to a customer that is an embedded wholesale market participant.

It should be noted that this schedule does not list any charges, assessments, or credits that are required by law to be invoiced by a distributor and that are not subject to Ontario Energy Board approval, such as the Global Adjustment and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	12.82
Rate Rider for Foregone Distribution Revenue - effective until April 30, 2020	$	0.03
Rate Rider for Disposition of Tax Loss Carry-forward - effective until April 30, 2020	$	(0.53)
Distribution Volumetric Rate	$/kWh	0.0387
Rate Rider for Disposition of Deferral/Variance Accounts (2019) - effective until April 30, 2020 - Approved on an Interim Basis	$/kWh	(0.0023)
Rate Rider for Disposition of Group 1 Deferral/Variance Accounts (2018) - effective until April 30, 2020 - Approved on an Interim Basis	$/kWh	(0.0032)
Rate Rider for Disposition of Group 2 Deferral/Variance Accounts (2018) - effective until April 30, 2020	$/kWh	(0.0001)
Rate Rider for Disposition of Lost Revenue Adjustment Mechanism Variance Account (LRAMVA) (2019) - effective until April 30, 2020	$/kWh	(0.0005)
Rate Rider for Disposition of Lost Revenue Adjustment Mechanism Variance Account (LRAMVA) (2018) - effective until April 30, 2020	$/kWh	(0.0010)
Rate Rider for Disposition of Tax Loss Carry-forward - effective until April 30, 2020	$/kWh	(0.0016)
Rate Rider for Foregone Distribution Revenue - effective until April 30, 2020	$/kWh	0.0001
Retail Transmission Rate - Network Service Rate	$/kWh	0.0057

MONTHLY RATES AND CHARGES - Regulatory Component

Rate Rider for Embedded Generation Adjustment	$/kWh	(0.0004)
Wholesale Market Service Rate (WMS) - not including CBR	$/kWh	0.0030
Capacity Based Recovery (CBR) - Applicable for Class B Customers	$/kWh	0.0004
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0005
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

SENTINEL LIGHTING SERVICE CLASSIFICATION

This classification applies to safety/security lighting with a Residential or General Service customer. This is typically exterior lighting, and unmetered. Consumption is estimated based on the equipment rating and estimated hours of use. Class B consumers are defined on accordance with O. Reg. 429/04. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, or as specified herein.

Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable. In addition, the charges in the MONTHLY RATES AND CHARGES - Regulatory Component of this schedule do not apply to a customer that is an embedded wholesale market participant.

It should be noted that this schedule does not list any charges, assessments, or credits that are required by law to be invoiced by a distributor and that are not subject to Ontario Energy Board approval, such as the Global Adjustment and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge (per connection)	$	3.59
Rate Rider for Foregone Distribution Revenue - effective until April 30, 2020	$	0.01
Rate Rider for Disposition of Tax Loss Carry-forward - effective until April 30, 2020	$	(0.15)
Distribution Volumetric Rate	$/kW	33.4983
Rate Rider for Disposition of Deferral/Variance Accounts (2019) - effective until April 30, 2020 - Approved on an Interim Basis	$/kW	(0.7771)
Rate Rider for Disposition of Group 1 Deferral/Variance Accounts (2018) - effective until April 30, 2020 - Approved on an Interim Basis	$/kW	(1.1433)
Rate Rider for Disposition of Group 2 Deferral/Variance Accounts (2018) - effective until April 30, 2020	$/kW	(0.0229)
Rate Rider for Disposition of Lost Revenue Adjustment Mechanism Variance Account (LRAMVA) (2019) - effective until April 30, 2020	$/kW	(0.5447)
Rate Rider for Disposition of Lost Revenue Adjustment Mechanism Variance Account (LRAMVA) (2018) - effective until April 30, 2020	$/kW	(1.1660)
Rate Rider for Disposition of Tax Loss Carry-forward - effective until April 30, 2020	$/kW	(1.3742)
Rate Rider for Foregone Distribution Revenue - effective until April 30, 2020	$/kW	0.0696
Retail Transmission Rate - Network Service Rate	$/kW	1.7389

MONTHLY RATES AND CHARGES - Regulatory Component

Rate Rider for Embedded Generation Adjustment	$/kWh	(0.0004)
Wholesale Market Service Rate (WMS) - not including CBR	$/kWh	0.0030
Capacity Based Recovery (CBR) - Applicable for Class B Customers	$/kWh	0.0004
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0005
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

STREET LIGHTING SERVICE CLASSIFICATION

This classification applies to an account for roadway lighting with a Municipality, Regional Municipality, Ministry of Transportation and private roadway lighting operation, controlled by photo cells. The consumption for these customers will be based on the calculated connected load times the required lighting times established in the approved Ontario Energy Board street lighting load shape template. Class B consumers are defined on accordance with O. Reg. 429/04. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, or as specified herein.

Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable. In addition, the charges in the MONTHLY RATES AND CHARGES - Regulatory Component of this schedule do not apply to a customer that is an embedded wholesale market participant.

It should be noted that this schedule does not list any charges, assessments, or credits that are required by law to be invoiced by a distributor and that are not subject to Ontario Energy Board approval, such as the Global Adjustment and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge (per connection)	$	1.38
Rate Rider for Disposition of Tax Loss Carry-forward - effective until April 30, 2020	$	(0.06)
Distribution Volumetric Rate	$/kW	9.0221
Rate Rider for Disposition of Global Adjustment Account (2018) - Applicable only for Non-RPP Customers - effective until April 30, 2020 - Approved on an Interim Basis	$/kWh	0.0004
Rate Rider for Disposition of Deferral/Variance Accounts (2019) - effective until April 30, 2020 - Approved on an Interim Basis	$/kW	(0.4434)
Rate Rider for Disposition of Group 1 Deferral/Variance Accounts (2018) - effective until April 30, 2020 - Approved on an Interim Basis	$/kW	(1.1380)
Rate Rider for Disposition of Group 2 Deferral/Variance Accounts (2018) - effective until April 30, 2020	$/kW	(0.0221)
Rate Rider for Disposition of Lost Revenue Adjustment Mechanism Variance Account (LRAMVA) (2019) - effective until April 30, 2022	$/kW	5.7106
Rate Rider for Disposition of Lost Revenue Adjustment Mechanism Variance Account (LRAMVA) (2018) - effective until April 30, 2020	$/kW	5.5286
Rate Rider for Disposition of Tax Loss Carry-forward - effective until April 30, 2020	$/kW	(0.3701)
Rate Rider for Foregone Distribution Revenue - effective until April 30, 2020	$/kW	0.0187
Retail Transmission Rate - Network Service Rate	$/kW	1.7303

MONTHLY RATES AND CHARGES - Regulatory Component

Rate Rider for Embedded Generation Adjustment - effective until	$/kWh	(0.0004)
Wholesale Market Service Rate (WMS) - not including CBR	$/kWh	0.0030
Capacity Based Recovery (CBR) - Applicable for Class B Customers	$/kWh	0.0004
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0005
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

microFIT SERVICE CLASSIFICATION

This classification applies to an electricity generation facility contracted under the Independent Electricity System Operator's microFIT program and connected to the distributor's distribution system. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, or as specified herein.

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MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	5.40

ALLOWANCES

Transformer Allowance for Ownership - per kW of billing demand/month	$/kW	(0.60)
Primary Metering Allowance for transformer losses - applied to measured demand and energy	%	(1.00)

SPECIFIC SERVICE CHARGES

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

No charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, or as specified herein.

It should be noted that this schedule does not list any charges, assessments, or credits that are required by law to be invoiced by a distributor and that are not subject to Ontario Energy Board approval, such as the Global Adjustment and the HST.

Customer Administration

Account set up charge/change of occupancy charge (plus credit agency costs if applicable)	$	30.00
Returned cheque (plus bank charges)	$	15.00
Legal letter charge	$	15.00
Meter dispute charge plus Measurement Canada fees (if meter found correct)	$	30.00

Non-Payment of Account

Late payment - per month (effective annual rate 19.56% per annum or 0.04896% compounded daily rate)	%	1.50
Reconnection charge - at meter - during regular hours	$	65.00

Reconnection charge - at meter - after hours	$	185.00
Reconnection charge - at pole - during regular hours	$	185.00
Reconnection charge - at pole - after hours	$	415.00

Other

Special meter reads	$	30.00
Service call - customer-owned equipment		Time & Materials
Service call - after regular hours		Time & Materials
Temporary service - install & remove - overhead - no transformer		Time & Materials
Temporary service - install & remove - underground - no transformer		Time & Materials
Temporary service - install & remove - overhead - with transformer		Time & Materials
Specific charge for access to the power poles - $/pole/year		
Specific charge for access to the power poles - $/pole/year (with the exception of wireless attachments)	$	43.63
Removal of overhead lines - during regular hours		Time & Materials
Removal of overhead lines - after hours		Time & Materials
Roadway escort - after regular hours		Time & Materials

RETAIL SERVICE CHARGES (if applicable)

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Ontario Energy Board, and amendments thereto as approved by the Ontario Energy Board, or as specified herein.

Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable.

It should be noted that this schedule does not list any charges, assessments, or credits that are required by law to be invoiced by a distributor and that are not subject to Ontario Energy Board approval, such as the Global Adjustment and the HST.

Retail Service Charges refer to services provided by a distributor to retailers or customers related to the supply of competitive electricity.

One-time charge, per retailer, to establish the service agreement between the distributor and the retailer	$	100.00
Monthly Fixed Charge, per retailer	$	40.00
Monthly Variable Charge, per customer, per retailer	$/cust.	1.00
Distributor-consolidated billing monthly charge, per customer, per retailer	$/cust.	0.60
Retailer-consolidated billing monthly credit, per customer, per retailer	$/cust.	(0.60)
Service Transaction Requests (STR)		
Request fee, per request, applied to the requesting party	$	0.50
Processing fee, per request, applied to the requesting party	$	1.00
Request for customer information as outlined in Section 10.6.3 and Chapter 11 of the Retail Settlement Code directly to retailers and customers, if not delivered electronically through the Electronic Business Transaction (EBT) system, applied to the requesting party		
Up to twice a year	$	no charge
More than twice a year, per request (plus incremental delivery costs)	$	4.00
Notice of switch letter charge, per letter (unless the distributor has opted out of applying the charge as per the Ontario Energy Board's Decision and Order EB-2015-0304, issued on February 14, 2019)	$	2.00

Ontario Energy Board

Incentive Rate-setting Mechanism
Rate Generator for 2020 Filers

LOSS FACTORS

If the distributor is not capable of prorating changed loss factors jointly with distribution rates, the revised loss factors will be implemented upon the first subsequent billing for each billing cycle.

Total Loss Factor - Secondary Metered Customer < 5,000 kW	1.0481
Total Loss Factor - Primary Metered Customer < 5,000 kW	1.0385

Appendix 3 – Bill Impacts

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

The bill comparisons below must be provided for typical customers and consumption levels. Bill impacts must be provided for residential customers consuming 750 kWh per month and general service customers consuming 2,000 kWh per month and having a monthly demand of less than 50 kW. Include bill comparisons for Non-RPP (retailer) as well. **To assess the combined effects of the shift to fixed rates and other bill impacts associated with changes in the cost of distribution service, applicants are to include a total bill impact for a residential customer at the distributor's 10th consumption percentile (In other words, 10% of a distributor's residential customers consume at or less than this level of consumption on a monthly basis). Refer to section 3.2.3 of the Chapter 3 Filing Requirements For Electricity Distribution Rate Applications.**

For certain classes where one or more customers have unique consumption and demand patterns and which may be significantly impacted by the proposed rate changes, the distributor must show a typical comparison, and provide an explanation.

Note:
1. For those classes that are not eligible for the RPP price, the weighted average price including Class B GA through end of May 2018 of $0.1117/kWh (IESO's Monthly Market Report for May 2018, page 22) has been used to represent the cost of power. For those classes on a retailer contract, applicants should enter the contract price (plus GA) for a more accurate estimate. Changes to the cost of power can be made directly on the bill impact table for the specific class.
2. Please enter the applicable billing determinant (e.g. number of connections or devices) to be applied to the monthly service charge for unmetered rate classes in column N. If the monthly service charge is applied on a per customer basis, enter the number "1". Distributors should provide the number of connections or devices reflective of a typical customer in each class.

Note that cells with the highlighted color shown to the left indicate quantities that are loss adjusted.

Table 1

RATE CLASSES / CATEGORIES *(eg: Residential TOU, Residential Retailer)*	**Units**	**RPP? Non-RPP Retailer? Non-RPP Other?**	**Current Loss Factor** (eg: 1.0351)	**Proposed Loss Factor**	**Consumption (kWh)**	**Demand kW (if applicable)**	RTSR **Demand or Demand-Interval?**	**Billing Determinant Applied to Fixed Charge for Unmetered Classes (e.g. # of devices/connections).**
RESIDENTIAL SERVICE CLASSIFICATION	**kWh**	RPP	1.0481	1.0481	700		CONSUMPTION	
GENERAL SERVICE LESS THAN 50 KW SERVICE CLASSIFICATION	**kWh**	RPP	1.0481	1.0481	2,000		CONSUMPTION	
GENERAL SERVICE 50 to 4,999 kW SERVICE CLASSIFICATION	**kW**	Non-RPP (Other)	1.0481	1.0481	57,220	145	DEMAND	
UNMETERED SCATTERED LOAD SERVICE CLASSIFICATION	**kWh**	Non-RPP (Other)	1.0481	1.0481	3,600		CONSUMPTION	1
SENTINEL LIGHTING SERVICE CLASSIFICATION	**kW**	Non-RPP (Other)	1.0481	1.0481	50	1	DEMAND	1
STREET LIGHTING SERVICE CLASSIFICATION	**kW**	Non-RPP (Other)	1.0481	1.0481	199,852	585	DEMAND	8,070
Add additional scenarios if required			1.0481	1.0481				
Add additional scenarios if required			1.0481	1.0481				
Add additional scenarios if required			1.0481	1.0481				
Add additional scenarios if required			1.0481	1.0481				
Add additional scenarios if required			1.0481	1.0481				
Add additional scenarios if required			1.0481	1.0481				
Add additional scenarios if required			1.0481	1.0481				
Add additional scenarios if required			1.0481	1.0481				
Add additional scenarios if required			1.0481	1.0481				
Add additional scenarios if required			1.0481	1.0481				
Add additional scenarios if required			1.0481	1.0481				
Add additional scenarios if required			1.0481	1.0481				
Add additional scenarios if required			1.0481	1.0481				
Add additional scenarios if required			1.0481	1.0481				

Table 2

RATE CLASSES / CATEGORIES *(eg: Residential TOU, Residential Retailer)*	Units	Sub-Total A		Sub-Total B		Sub-Total C		Total Total Bill	
		$	%	$	%	$	%	$	%
RESIDENTIAL SERVICE CLASSIFICATION - RPP	kWh	$ 1.88	6.2%	$ 5.73	19.1%	$ 5.88	17.0%	$ 6.17	6.2%
GENERAL SERVICE LESS THAN 50 KW SERVICE CLASSIFICATION - RPP	kWh	$ (1.08)	-1.5%	$ 9.72	13.6%	$ 10.14	12.1%	$ 10.65	3.9%
GENERAL SERVICE 50 to 4,999 kW SERVICE CLASSIFICATION - Non-RPP (Other)	kW	$ 38.21	3.5%	$ 318.14	39.3%	$ 327.44	28.7%	$ 370.00	4.1%
UNMETERED SCATTERED LOAD SERVICE CLASSIFICATION - Non-RPP (Other)	kWh	$ 15.20	10.8%	$ 35.00	25.0%	$ 35.75	22.2%	$ 40.40	6.2%
SENTINEL LIGHTING SERVICE CLASSIFICATION - Non-RPP (Other)	kW	$ 4.06	12.0%	$ 5.98	18.6%	$ 6.03	17.7%	$ 6.82	15.1%
STREET LIGHTING SERVICE CLASSIFICATION - Non-RPP (Other)	kW	$ (2,164.01)	-9.7%	$ (1,318.83)	-6.2%	$ (1,290.52)	-5.7%	$ (1,458.28)	-2.7%

Customer Class:	RESIDENTIAL SERVICE CLASSIFICATION	
RPP / Non-RPP:	RPP	
Consumption	700	kWh
Demand	-	kW
Current Loss Factor	1.0481	
Proposed/Approved Loss Factor	1.0481	

	Current OEB-Approved			Proposed			Impact	
	Rate ($)	Volume	Charge ($)	Rate ($)	Volume	Charge ($)	$ Change	% Change
Monthly Service Charge	$ 28.17	1	$ 28.17	$ 31.97	1	$ 31.97	$ 3.80	13.49%
Distribution Volumetric Rate	$ 0.0043	700	$ 3.01	$ -	700	$ -	$ (3.01)	-100.00%
Fixed Rate Riders	$ (0.60)	1	$ (0.60)	$ 0.42	1	$ 0.42	$ 1.02	-170.00%
Volumetric Rate Riders	-$ 0.0001	700	$ (0.07)	$ -	700	$ -	$ 0.07	-100.00%
Sub-Total A (excluding pass through)			**$ 30.51**			**$ 32.39**	**$ 1.88**	**6.16%**
Line Losses on Cost of Power	$ 0.0824	34	$ 2.77	$ 0.0824	34	$ 2.77	$ -	0.00%
Total Deferral/Variance Account Rate Riders	-$ 0.0055	700	$ (3.85)	$ -	700	$ -	$ 3.85	-100.00%
CBR Class B Rate Riders	$ -	700	$ -	$ -	700	$ -	$ -	
GA Rate Riders	$ -	700	$ -	$ -	700	$ -	$ -	
Low Voltage Service Charge	$ -	700	$ -		700	$ -	$ -	
Smart Meter Entity Charge (if applicable)	$ 0.57	1	$ 0.57	$ 0.57	1	$ 0.57	$ -	0.00%
Additional Fixed Rate Riders	$ -	1	$ -	$ -	1	$ -	$ -	
Additional Volumetric Rate Riders		700	$ -	$ -	700	$ -	$ -	
Sub-Total B - Distribution (includes Sub-Total A)			**$ 30.00**			**$ 35.73**	**$ 5.73**	**19.10%**
RTSR - Network	$ 0.0061	734	$ 4.48	$ 0.0063	734	$ 4.62	$ 0.15	3.28%
RTSR - Connection and/or Line and Transformation Connection	$ -	734	$ -	$ -	734	$ -	$ -	
Sub-Total C - Delivery (including Sub-Total B)			**$ 34.48**			**$ 40.35**	**$ 5.88**	**17.04%**
Wholesale Market Service Charge (WMSC)	$ 0.0034	734	$ 2.49	$ 0.0034	734	$ 2.49	$ -	0.00%
Rural and Remote Rate Protection (RRRP)	$ 0.0005	734	$ 0.37	$ 0.0005	734	$ 0.37	$ -	0.00%
Standard Supply Service Charge	$ 0.25	1	$ 0.25	$ 0.25	1	$ 0.25	$ -	0.00%
TOU - Off Peak	$ 0.0650	455	$ 29.58	$ 0.0650	455	$ 29.58	$ -	0.00%
TOU - Mid Peak	$ 0.0940	119	$ 11.19	$ 0.0940	119	$ 11.19	$ -	0.00%
TOU - On Peak	$ 0.1340	126	$ 16.88	$ 0.1340	126	$ 16.88	$ -	0.00%
Total Bill on TOU (before Taxes)			**$ 95.23**			**$ 101.11**	**$ 5.88**	**6.17%**
HST	13%		$ 12.38	13%		$ 13.14	$ 0.76	6.17%
8% Rebate	8%		$ (7.62)	8%		$ (8.09)	$ (0.47)	
Total Bill on TOU			**$ 100.00**			**$ 106.17**	**$ 6.17**	**6.17%**

Customer Class:	GENERAL SERVICE LESS THAN 50 KW SERVICE CLASSIFICATION	
RPP / Non-RPP:	RPP	
Consumption	2,000	kWh
Demand	-	kW
Current Loss Factor	1.0481	
Proposed/Approved Loss Factor	1.0481	

	Current OEB-Approved			Proposed			Impact	
	Rate ($)	Volume	Charge ($)	Rate ($)	Volume	Charge ($)	$ Change	% Change
Monthly Service Charge	$ 20.95	1	$ 20.95	$ 21.17	1	$ 21.17	$ 0.22	1.05%
Distribution Volumetric Rate	$ 0.0251	2000	$ 50.20	$ 0.0254	2000	$ 50.80	$ 0.60	1.20%
Fixed Rate Riders	$ (0.82)	1	$ (0.82)	$ 0.28	1	$ 0.28	$ 1.10	-134.15%
Volumetric Rate Riders	$ 0.0018	2000	$ 3.60	$ 0.0003	2000	$ 0.60	$ (3.00)	-83.33%
Sub-Total A (excluding pass through)			**$ 73.93**			**$ 72.85**	**$ (1.08)**	**-1.46%**
Line Losses on Cost of Power	$ 0.0824	96	$ 7.92	$ 0.0824	96	$ 7.92	$ -	0.00%
Total Deferral/Variance Account Rate Riders	-$ 0.0054	2,000	$ (10.80)	$ -	2,000	$ -	$ 10.80	-100.00%
CBR Class B Rate Riders	$ -	2,000	$ -	$ -	2,000	$ -	$ -	
GA Rate Riders	$ -	2,000	$ -	$ -	2,000	$ -	$ -	
Low Voltage Service Charge	$ -	2,000	$ -		2,000	$ -	$ -	
Smart Meter Entity Charge (if applicable)	$ 0.57	1	$ 0.57	$ 0.57	1	$ 0.57	$ -	0.00%
Additional Fixed Rate Riders	$ -	1	$ -	$ -	1	$ -	$ -	
Additional Volumetric Rate Riders		2,000	$ -	$ -	2,000	$ -	$ -	
Sub-Total B - Distribution (includes Sub-Total A)			**$ 71.62**			**$ 81.34**	**$ 9.72**	**13.57%**
RTSR - Network	$ 0.0057	2,096	$ 11.95	$ 0.0059	2,096	$ 12.37	$ 0.42	3.51%
RTSR - Connection and/or Line and Transformation Connection	$ -	2,096	$ -	$ -	2,096	$ -	$ -	
Sub-Total C - Delivery (including Sub-Total B)			**$ 83.57**			**$ 93.71**	**$ 10.14**	**12.13%**
Wholesale Market Service Charge (WMSC)	$ 0.0034	2,096	$ 7.13	$ 0.0034	2,096	$ 7.13	$ -	0.00%
Rural and Remote Rate Protection (RRRP)	$ 0.0005	2,096	$ 1.05	$ 0.0005	2,096	$ 1.05	$ -	0.00%
Standard Supply Service Charge	$ 0.25	1	$ 0.25	$ 0.25	1	$ 0.25	$ -	0.00%
TOU - Off Peak	$ 0.0650	1,300	$ 84.50	$ 0.0650	1,300	$ 84.50	$ -	0.00%
TOU - Mid Peak	$ 0.0940	340	$ 31.96	$ 0.0940	340	$ 31.96	$ -	0.00%
TOU - On Peak	$ 0.1340	360	$ 48.24	$ 0.1340	360	$ 48.24	$ -	0.00%
Total Bill on TOU (before Taxes)			**$ 256.70**			**$ 266.83**	**$ 10.14**	**3.95%**
HST	13%		$ 33.37	13%		$ 34.69	$ 1.32	3.95%
8% Rebate	8%		$ (20.54)	8%		$ (21.35)	$ (0.81)	
Total Bill on TOU			**$ 269.53**			**$ 280.18**	**$ 10.65**	**3.95%**

Customer Class:	**GENERAL SERVICE 50 to 4,999 kW SERVICE CLASSIFICATION**	
RPP / Non-RPP:	**Non-RPP (Other)**	
Consumption	**57,220**	**kWh**
Demand	**145**	**kW**
Current Loss Factor	**1.0481**	
Proposed/Approved Loss Factor	**1.0481**	

	Current OEB-Approved			Proposed			Impact	
	Rate ($)	Volume	Charge ($)	Rate ($)	Volume	Charge ($)	$ Change	% Change
Monthly Service Charge	$ 115.66	1	$ 115.66	$ 116.87	1	$ 116.87	$ 1.21	1.05%
Distribution Volumetric Rate	$ 6.8002	145	$ 986.03	$ 6.8716	145	$ 996.38	$ 10.35	1.05%
Fixed Rate Riders	$ (4.50)	1	$ (4.50)	$ 1.53	1	$ 1.53	$ 6.03	-134.00%
Volumetric Rate Riders	-$ 0.0520	145	$ (7.54)	$ 0.0902	145	$ 13.08	$ 20.62	-273.46%
Sub-Total A (excluding pass through)			**$ 1,089.65**			**$ 1,127.86**	**$ 38.21**	**3.51%**
Line Losses on Cost of Power	$ -	-	$ -	$ -	-	$ -	$ -	
Total Deferral/Variance Account Rate Riders	-$ 2.0884	145	$ (302.82)	$ -	145	$ -	$ 302.82	-100.00%
CBR Class B Rate Riders	$ -	145	$ -	$ -	145	$ -	$ -	
GA Rate Riders	$ 0.0004	57,220	$ 22.89	$ -	57,220	$ -	$ (22.89)	-100.00%
Low Voltage Service Charge	$ -	145	$ -		145	$ -	$ -	
Smart Meter Entity Charge (if applicable)	$ -	1	$ -	$ -	1	$ -	$ -	
Additional Fixed Rate Riders	$ -	1	$ -	$ -	1	$ -	$ -	
Additional Volumetric Rate Riders		145	$ -	$ -	145	$ -	$ -	
Sub-Total B - Distribution (includes Sub-Total A)			**$ 809.72**			**$ 1,127.86**	**$ 318.14**	**39.29%**
RTSR - Network	$ 2.2941	145	$ 332.64	$ 2.3582	145	$ 341.94	$ 9.29	2.79%
RTSR - Connection and/or Line and Transformation Connection	$ -	145	$ -	$ -	145	$ -	$ -	
Sub-Total C - Delivery (including Sub-Total B)			**$ 1,142.36**			**$ 1,469.80**	**$ 327.44**	**28.66%**
Wholesale Market Service Charge (WMSC)	$ 0.0034	59,972	$ 203.91	$ 0.0034	59,972	$ 203.91	$ -	0.00%
Rural and Remote Rate Protection (RRRP)	$ 0.0005	59,972	$ 29.99	$ 0.0005	59,972	$ 29.99	$ -	0.00%
Standard Supply Service Charge	$ 0.25	1	$ 0.25	$ 0.25	1	$ 0.25	$ -	0.00%
Average IESO Wholesale Market Price	$ 0.1101	59,972	$ 6,602.95	$ 0.1101	59,972	$ 6,602.95	$ -	0.00%
Total Bill on Average IESO Wholesale Market Price			**$ 7,979.45**			**$ 8,306.89**	**$ 327.44**	**4.10%**
HST	13%		$ 1,037.33	13%		$ 1,079.90	$ 42.57	4.10%
Total Bill on Average IESO Wholesale Market Price			**$ 9,016.78**			**$ 9,386.79**	**$ 370.00**	**4.10%**

Customer Class:	**UNMETERED SCATTERED LOAD SERVICE CLASSIFICATION**	
RPP / Non-RPP:	**Non-RPP (Other)**	
Consumption	**3,600**	**kWh**
Demand	**-**	**kW**
Current Loss Factor	**1.0481**	
Proposed/Approved Loss Factor	**1.0481**	

	Current OEB-Approved			Proposed			Impact	
	Rate ($)	Volume	Charge ($)	Rate ($)	Volume	Charge ($)	$ Change	% Change
Monthly Service Charge	$ 12.82	1	$ 12.82	$ 12.95	1	$ 12.95	$ 0.13	1.01%
Distribution Volumetric Rate	$ 0.0387	3600	$ 139.32	$ 0.0391	3600	$ 140.76	$ 1.44	1.03%
Fixed Rate Riders	$ (0.50)	1	$ (0.50)	$ 0.17	1	$ 0.17	$ 0.67	-134.00%
Volumetric Rate Riders	-$ 0.0031	3600	$ (11.16)	$ 0.0005	3600	$ 1.80	$ 12.96	-116.13%
Sub-Total A (excluding pass through)			**$ 140.48**			**$ 155.68**	**$ 15.20**	**10.82%**
Line Losses on Cost of Power	$ 0.1101	173	$ 19.06	$ 0.1101	173	$ 19.06	$ -	0.00%
Total Deferral/Variance Account Rate Riders	-$ 0.0055	3,600	$ (19.80)	$ -	3,600	$ -	$ 19.80	-100.00%
CBR Class B Rate Riders	$ -	3,600	$ -	$ -	3,600	$ -	$ -	
GA Rate Riders	$ -	3,600	$ -	$ -	3,600	$ -	$ -	
Low Voltage Service Charge	$ -	3,600	$ -		3,600	$ -	$ -	
Smart Meter Entity Charge (if applicable)	$ -	1	$ -	$ -	1	$ -	$ -	
Additional Fixed Rate Riders	$ -	1	$ -	$ -	1	$ -	$ -	
Additional Volumetric Rate Riders		3,600	$ -	$ -	3,600	$ -	$ -	
Sub-Total B - Distribution (includes Sub-Total A)			**$ 139.74**			**$ 174.74**	**$ 35.00**	**25.05%**
RTSR - Network	$ 0.0057	3,773	$ 21.51	$ 0.0059	3,773	$ 22.26	$ 0.75	3.51%
RTSR - Connection and/or Line and Transformation Connection	$ -	3,773	$ -	$ -	3,773	$ -	$ -	
Sub-Total C - Delivery (including Sub-Total B)			**$ 161.25**			**$ 197.01**	**$ 35.75**	**22.17%**
Wholesale Market Service Charge (WMSC)	$ 0.0034	3,773	$ 12.83	$ 0.0034	3,773	$ 12.83	$ -	0.00%
Rural and Remote Rate Protection (RRRP)	$ 0.0005	3,773	$ 1.89	$ 0.0005	3,773	$ 1.89	$ -	0.00%
Standard Supply Service Charge	$ 0.25	1	$ 0.25	$ 0.25	1	$ 0.25	$ -	0.00%
Average IESO Wholesale Market Price	$ 0.1101	3,600	$ 396.36	$ 0.1101	3,600	$ 396.36	$ -	0.00%
Total Bill on Average IESO Wholesale Market Price			**$ 572.58**			**$ 608.33**	**$ 35.75**	**6.24%**
HST	13%		$ 74.44	13%		$ 79.08	$ 4.65	6.24%
Total Bill on Average IESO Wholesale Market Price			**$ 647.01**			**$ 687.42**	**$ 40.40**	**6.24%**

Customer Class:	**SENTINEL LIGHTING SERVICE CLASSIFICATION**	
RPP / Non-RPP:	**Non-RPP (Other)**	
Consumption	**50**	**kWh**
Demand	**1**	**kW**
Current Loss Factor	**1.0481**	
Proposed/Approved Loss Factor	**1.0481**	

	Current OEB-Approved			Proposed			Impact	
	Rate ($)	Volume	Charge ($)	Rate ($)	Volume	Charge ($)	$ Change	% Change
Monthly Service Charge	$ 3.59	1	$ 3.59	$ 3.63	1	$ 3.63	$ 0.04	1.11%
Distribution Volumetric Rate	$ 33.4983	1	$ 33.50	$ 33.8500	1	$ 33.85	$ 0.35	1.05%
Fixed Rate Riders	$ (0.14)	1	$ (0.14)	$ 0.05	1	$ 0.05	$ 0.19	-135.71%
Volumetric Rate Riders	-$ 3.0382	1	$ (3.04)	$ 0.4445	1	$ 0.44	$ 3.48	-114.63%
Sub-Total A (excluding pass through)			**$ 33.91**			**$ 37.97**	**$ 4.06**	**11.99%**
Line Losses on Cost of Power	$ 0.1101	2	$ 0.26	$ 0.1101	2	$ 0.26	$ -	0.00%
Total Deferral/Variance Account Rate Riders	-$ 1.9204	1	$ (1.92)	$ -	1	$ -	$ 1.92	-100.00%
CBR Class B Rate Riders	$ -	1	$ -	$ -	1	$ -	$ -	
GA Rate Riders	$ -	50	$ -	$ -	50	$ -	$ -	
Low Voltage Service Charge	$ -	1	$ -		1	$ -	$ -	
Smart Meter Entity Charge (if applicable)	$ -	1	$ -	$ -	1	$ -	$ -	
Additional Fixed Rate Riders	$ -	1	$ -	$ -	1	$ -	$ -	
Additional Volumetric Rate Riders		1	$ -	$ -	1	$ -	$ -	
Sub-Total B - Distribution (includes Sub-Total A)			**$ 32.25**			**$ 38.24**	**$ 5.98**	**18.55%**
RTSR - Network	$ 1.7389	1	$ 1.74	$ 1.7875	1	$ 1.79	$ 0.05	2.79%
RTSR - Connection and/or Line and Transformation Connection	$ -	1	$ -	$ -	1	$ -	$ -	
Sub-Total C - Delivery (including Sub-Total B)			**$ 33.99**			**$ 40.03**	**$ 6.03**	**17.75%**
Wholesale Market Service Charge (WMSC)	$ 0.0034	52	$ 0.18	$ 0.0034	52	$ 0.18	$ -	0.00%
Rural and Remote Rate Protection (RRRP)	$ 0.0005	52	$ 0.03	$ 0.0005	52	$ 0.03	$ -	0.00%
Standard Supply Service Charge	$ 0.25	1	$ 0.25	$ 0.25	1	$ 0.25	$ -	0.00%
Average IESO Wholesale Market Price	$ 0.1101	50	$ 5.51	$ 0.1101	50	$ 5.51	$ -	0.00%
Total Bill on Average IESO Wholesale Market Price			**$ 39.95**			**$ 45.99**	**$ 6.03**	**15.10%**
HST	13%		$ 5.19	13%		$ 5.98	$ 0.78	15.10%
Total Bill on Average IESO Wholesale Market Price			**$ 45.15**			**$ 51.96**	**$ 6.82**	**15.10%**

Customer Class:	**STREET LIGHTING SERVICE CLASSIFICATION**	
RPP / Non-RPP:	**Non-RPP (Other)**	
Consumption	**199,852**	**kWh**
Demand	**585**	**kW**
Current Loss Factor	**1.0481**	
Proposed/Approved Loss Factor	**1.0481**	

	Current OEB-Approved			Proposed			Impact	
	Rate ($)	Volume	Charge ($)	Rate ($)	Volume	Charge ($)	$ Change	% Change
Monthly Service Charge	$ 1.38	8070	$ 11,136.60	$ 1.39	8070	$ 11,217.30	$ 80.70	0.72%
Distribution Volumetric Rate	$ 9.0221	585	$ 5,277.93	$ 9.1168	585	$ 5,333.33	$ 55.40	1.05%
Fixed Rate Riders	$ (0.06)	8070	$ (484.20)	$ 0.02	8070	$ 161.40	$ 645.60	-133.33%
Volumetric Rate Riders	$ 10.8657	585	$ 6,356.43	$ 5.8303	585	$ 3,410.73	$ (2,945.71)	-46.34%
Sub-Total A (excluding pass through)			**$ 22,286.76**			**$ 20,122.75**	**$ (2,164.01)**	**-9.71%**
Line Losses on Cost of Power	$ -	-	$ -	$ -	-	$ -	$ -	
Total Deferral/Variance Account Rate Riders	-$ 1.5814	585	$ (925.12)	$ -	585	$ -	$ 925.12	-100.00%
CBR Class B Rate Riders	$ -	585	$ -	$ -	585	$ -	$ -	
GA Rate Riders	$ 0.0004	199,852	$ 79.94	$ -	199,852	$ -	$ (79.94)	-100.00%
Low Voltage Service Charge	$ -	585	$ -		585	$ -	$ -	
Smart Meter Entity Charge (if applicable)	$ -	1	$ -	$ -	1	$ -	$ -	
Additional Fixed Rate Riders	$ -	1	$ -	$ -	1	$ -	$ -	
Additional Volumetric Rate Riders		585	$ -	$ -	585	$ -	$ -	
Sub-Total B - Distribution (includes Sub-Total A)			**$ 21,441.58**			**$ 20,122.75**	**$ (1,318.83)**	**-6.15%**
RTSR - Network	$ 1.7303	585	$ 1,012.23	$ 1.7787	585	$ 1,040.54	$ 28.31	2.80%
RTSR - Connection and/or Line and Transformation Connection	$ -	585	$ -	$ -	585	$ -	$ -	
Sub-Total C - Delivery (including Sub-Total B)			**$ 22,453.81**			**$ 21,163.29**	**$ (1,290.52)**	**-5.75%**
Wholesale Market Service Charge (WMSC)	$ 0.0034	209,465	$ 712.18	$ 0.0034	209,465	$ 712.18	$ -	0.00%
Rural and Remote Rate Protection (RRRP)	$ 0.0005	209,465	$ 104.73	$ 0.0005	209,465	$ 104.73	$ -	0.00%
Standard Supply Service Charge	$ 0.25	8070	$ 2,017.50	$ 0.25	8070	$ 2,017.50	$ -	0.00%
Average IESO Wholesale Market Price	$ 0.1101	209,465	$ 23,062.08	$ 0.1101	209,465	$ 23,062.08	$ -	0.00%
Total Bill on Average IESO Wholesale Market Price			**$ 48,350.31**			**$ 47,059.79**	**$ (1,290.52)**	**-2.67%**
HST	13%		$ 6,285.54	13%		$ 6,117.77	$ (167.77)	-2.67%
Total Bill on Average IESO Wholesale Market Price			**$ 54,635.85**			**$ 53,177.56**	**$ (1,458.28)**	**-2.67%**

Customer Class:	Add additional scenarios if required
RPP / Non-RPP:	
Consumption	kWh
Demand	kW
Current Loss Factor	
Proposed/Approved Loss Factor	

	Current OEB-Approved			Proposed			Impact	
	Rate ($)	Volume	Charge ($)	Rate ($)	Volume	Charge ($)	$ Change	% Change
Monthly Service Charge		1	$ -		1	$ -	$ -	
Distribution Volumetric Rate		0	$ -		0	$ -	$ -	
Fixed Rate Riders		1	$ -		1	$ -	$ -	
Volumetric Rate Riders		0	$ -		0	$ -	$ -	
Sub-Total A (excluding pass through)			**$ -**			**$ -**	**$ -**	
Line Losses on Cost of Power	**$ 0.1101**	-	$ -	**$ 0.1101**	-	$ -	$ -	
Total Deferral/Variance Account Rate Riders		-	$ -		-	$ -	$ -	
CBR Class B Rate Riders		-	$ -		-	$ -	$ -	
GA Rate Riders		-	$ -		-	$ -	$ -	
Low Voltage Service Charge		-	$ -		-	$ -	$ -	
Smart Meter Entity Charge (if applicable)	**$ -**	1	$ -	**$ -**	1	$ -	$ -	
Additional Fixed Rate Riders		1	$ -		1	$ -	$ -	
Additional Volumetric Rate Riders		-	$ -		-	$ -	$ -	
Sub-Total B - Distribution (includes Sub-Total A)			**$ -**			**$ -**	**$ -**	
RTSR - Network		-	$ -		-	$ -	$ -	
RTSR - Connection and/or Line and Transformation Connection		-	$ -		-	$ -	$ -	
Sub-Total C - Delivery (including Sub-Total B)			**$ -**			**$ -**	**$ -**	
Wholesale Market Service Charge (WMSC)	**$ 0.0034**	-	$ -	**$ 0.0034**	-	$ -	$ -	
Rural and Remote Rate Protection (RRRP)	**$ 0.0005**	-	$ -	**$ 0.0005**	-	$ -	$ -	
Standard Supply Service Charge	**$ 0.25**	1	$ 0.25	**$ 0.25**	1	**$ 0.25**	$ -	0.00%
TOU - Off Peak	**$ 0.0650**	-	$ -	**$ 0.0650**	-	**$ -**	$ -	
TOU - Mid Peak	**$ 0.0940**	-	$ -	**$ 0.0940**	-	**$ -**	$ -	
TOU - On Peak	**$ 0.1340**	-	$ -	**$ 0.1340**	-	**$ -**	$ -	
Non-RPP Retailer Avg. Price	**$ 0.1101**	-	$ -	**$ 0.1101**	-	**$ -**	$ -	
Average IESO Wholesale Market Price	**$ 0.1101**	-	$ -	**$ 0.1101**	-	**$ -**	$ -	
Total Bill on TOU (before Taxes)			**$ 0.25**			**$ 0.25**	**$ -**	**0.00%**
HST	13%		$ 0.03	13%		$ 0.03	$ -	0.00%
8% Rebate	8%		$ (0.02)	8%		$ (0.02)	$ -	
Total Bill on TOU			**$ 0.26**			**$ 0.26**	**$ -**	**0.00%**
Total Bill on Non-RPP Avg. Price			**$ 0.25**			**$ 0.25**	**$ -**	**0.00%**
HST	13%		$ 0.03	13%		$ 0.03	$ -	0.00%
8% Rebate	8%			8%				
Total Bill on Non-RPP Avg. Price			**$ 0.28**			**$ 0.28**	**$ -**	**0.00%**
Total Bill on Average IESO Wholesale Market Price			**$ 0.25**			**$ 0.25**	**$ -**	**0.00%**
HST	13%		$ 0.03	13%		$ 0.03	$ -	0.00%
8% Rebate	8%			8%				
Total Bill on Average IESO Wholesale Market Price			**$ 0.28**			**$ 0.28**	**$ -**	**0.00%**

Appendix 4 – 2020 IRM Rate Generator Model

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

Version 2.0

Utility Name	PUC Distribution Inc.
Assigned EB Number	EB-2019-0170
Name of Contact and Title	Mark Faught, Director Finance
Phone Number	705-759-0105
Email Address	regulatory@ssmpuc.com
We are applying for rates effective	May 1, 2020
Rate-Setting Method	**Price Cap IR**
1. Select the last Cost of Service rebasing year	**2018**
2. Select the year that the balances of Accounts 1588 and 1589 were last approved for disposition ***(e.g. If 2017 balances were approved for disposition in the 2019 rate application, select 2017)***	**2016**
3. Select the year that the balances of the remaining Group 1 DVAs were last approved for disposition	**2017**
4. Select the earliest vintage year in which there is a balance in Account 1595 ***(e.g. If 2016 is the earliest vintage year in which there is a balance in a 1595 sub-account, select 2016)***	**2018**
5. Did you have any Class A customers at any point during the period that the Account 1589 balance accumulated (i.e. from the year the balance was last disposed to the year requested for disposition)?	**Yes**
6. Did you have any customers classified as Class A at any point during the period where the balance in Account 1580, Sub-account CBR Class B accumulated (i.e. from the year the balance was last disposed to the year requested for disposition)?	**Yes**
7. Retail Transmission Service Rates: PUC Distribution Inc. is:	**Transmission Connected**
8. Have you transitioned to fully fixed rates?	**No**

Legend

- Pale green cells represent input cells.
- Pale blue cells represent drop-down lists. The applicant should select the appropriate item from the drop-down list.
- Red cells represents flags to identify either non-matching values or incorrect user selections.
- Pale grey cell represent auto-populated RRR data.
- White cells contain fixed values, automatically generated values or formulae.

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

Please complete the following continuity schedule for the following Deferral/Variance Accounts. Enter information into green cells only. Please see instructions tab for detailed instructions on how to complete tabs 3 to 7. Column BV has been prepopulated from the latest 2.1.7 RRR filing.

Please refer to the footnotes for further instructions.

Account Descriptions	Account Number	2016									2017								
		Opening Principal Amounts as of Jan 1, 2016	Transactions Debit / (Credit) during 2016	OEB-Approved Disposition during 2016	Principal Adjustments[1] during 2016	Closing Principal Balance as of Dec 31, 2016	Opening Interest Amounts as of Jan 1, 2016	Interest Jan 1 to Dec 31, 2016	OEB-Approved Disposition during 2016	Interest Adjustments[1] during 2016	Closing Interest Amounts as of Dec 31, 2016	Opening Principal Amounts as of Jan 1, 2017	Transactions Debit / (Credit) during 2017	OEB-Approved Disposition during 2017	Principal Adjustments[1] during 2017	Closing Principal Balance as of Dec 31, 2017	Opening Interest Amounts as of Jan 1, 2017	Interest Jan 1 to Dec 31, 2017	OEB-Approved Disposition during 2017	Interest Adjustments[1] during 2017
Group 1 Accounts																				
LV Variance Account	1550	0				0	0				0	0				0	0			
Smart Metering Entity Charge Variance Account	1551	0				0	0				0	0			63	63	0			24,852
RSVA - Wholesale Market Service Charge[5]	1580	0				0	0				0	0			(3,344,527)	(3,344,527)	0			(65,811)
Variance WMS – Sub-account CBR Class A[5]	1580	0				0	0				0	0			(5)	(5)	0			0
Variance WMS – Sub-account CBR Class B[5]	1580	0				0	0				0	0			3,690	3,690	0			86
RSVA - Retail Transmission Network Charge	1584	0				0	0				0	0			(282,667)	(282,667)	0			(1,614)
RSVA - Retail Transmission Connection Charge	1586	0				0	0				0	0				0	0			
RSVA - Power[4]	1588	0			(614,316)	(614,316)	0			8,897	8,897	(614,316)	(1,012,943)			(1,627,260)	8,897	5,774		
RSVA - Global Adjustment[4]	1589	0			73,743	73,743	0			43,356	43,356	73,743	468,260			542,003	43,356	1,192		
Disposition and Recovery/Refund of Regulatory Balances (2013)[3]	1595	0				0	0				0	0				0	0			
Disposition and Recovery/Refund of Regulatory Balances (2014)[3]	1595	0				0	0				0	0				0	0			
Disposition and Recovery/Refund of Regulatory Balances (2015)[3]	1595	0				0	0				0	0				0	0			
Disposition and Recovery/Refund of Regulatory Balances (2016)[3]	1595	0				0	0				0	0				0	0			
Disposition and Recovery/Refund of Regulatory Balances (2017)[3]	1595	0				0	0				0	0				0	0			
Disposition and Recovery/Refund of Regulatory Balances (2018)[3]	1595	0				0	0				0	0				0	0			
Disposition and Recovery/Refund of Regulatory Balances (2019)[3] *Not to be disposed of until a year after rate rider has expired and that balance has been audited*	1595	0				0	0				0	0				0	0			
RSVA - Global Adjustment	**1589**	0	0	0	73,743	73,743	0	0	0	43,356	43,356	73,743	468,260	0	0	542,003	43,356	1,192	0	0
Total Group 1 Balance excluding Account 1589 - Global Adjustment		0	0	0	(614,316)	(614,316)	0	0	0	8,897	8,897	(614,316)	(1,012,943)	0	(3,623,446)	(5,250,705)	8,897	5,774	0	(42,488)
Total Group 1 Balance		0	0	0	(540,574)	(540,574)	0	0	0	52,253	52,253	(540,574)	(544,683)	0	(3,623,446)	(4,708,703)	52,253	6,966	0	(42,488)
LRAM Variance Account (only input amounts if applying for disposition of this account)	**1568**	0	(23)		(13,368)	(13,391)	0	(125)		3,014	2,889	(13,391)	(96,469)			(109,860)	2,889	1,482		
Total including Account 1568		0	(23)	0	(553,942)	(553,965)	0	(125)	0	55,267	55,142	(553,965)	(641,152)	0	(3,623,446)	(4,818,563)	55,142	8,448	0	(42,488)

	2018										2019				Projected Interest on Dec-31-18 Balances					2.1.7 RRR	
Closing Interest Amounts as of Dec 31, 2017	Opening Principal Amounts as of Jan 1, 2018	Transactions Debit / (Credit) during 2018	OEB-Approved Disposition during 2018	Principal Adjustments[1] during 2018	Closing Principal Balance as of Dec 31, 2018	Opening Interest Amounts as of Jan 1, 2018	Interest Jan 1 to Dec 31, 2018	OEB-Approved Disposition during 2018	Interest Adjustments[1] during 2018	Closing Interest Amounts as of Dec 31, 2018	Principal Disposition during 2019 - instructed by OEB	Interest Disposition during 2019 - instructed by OEB	Closing Principal Balances as of Dec 31, 2018 Adjusted for Disposition during 2019	Closing Interest Balances as of Dec 31, 2018 Adjusted for Disposition during 2019	Projected Interest from Jan 1, 2019 to Dec 31, 2019 on Dec 31, 2018 balance adjusted for disposition during 2019[2]	Projected Interest from Jan 1, 2020 to Apr 30, 2020 on Dec 31, 2018 balance adjusted for disposition during 2019[2]	Total Interest	Total Claim	Account Disposition: Yes/No?	As of Dec 31, 2018	Variance RRR vs. 2018 Balance *(Principal + Interest)*
0	0				0	0				0			0	0			0	0		0	0
24,852	63	(18,701)	33,839		(52,477)	24,852	556	2,003		23,404	(33,777)	22,385	(18,700)	1,019	(420)	(136)	463	(18,237)		(29,072)	1
(65,811)	(3,344,527)	(191,287)	(2,364,294)		(1,171,520)	(65,811)	(52,079)	(73,826)		(44,064)	(980,234)	(10,184)	(191,286)	(33,880)	(4,299)	(1,390)	(39,569)	(230,855)		(1,216,129)	(546)
0	(5)	235			230	0	2			2			230	2	5	2	8	0		232	0
86	3,690	(4,543)			(853)	86	(10)			76	3,690	155	(4,543)	(79)	(102)	(33)	(214)	(4,757)		(777)	0
(1,614)	(282,667)	84,818	(98,043)		(99,806)	(1,614)	(6,318)	(645)		(7,287)	(184,625)	(4,416)	84,819	(2,871)	1,906	616	(349)	84,470		(107,093)	0
0	0				0	0				0			0	0			0	0		0	0
14,671	(1,627,260)	382,487	(614,316)		(630,457)	14,671	20,938	(1,545)		37,154			(630,457)	37,154	(14,170)	(4,581)	18,403	(612,054)	Yes	(593,303)	0
44,548	542,003	768,691	73,743		1,236,951	44,548	48,479	44,610		48,416			1,236,951	48,416	27,800	8,989	85,205	1,322,156	Yes	1,285,367	0
0	0			127,552	127,552	0			(127,550)	(127,550)			127,552	(127,550)			(127,550)	0	No	0	(2)
0	0				0	0				0			0	0			0	0	No	0	0
0	0				0	0				0			0	0			0	0	No	0	0
0	0	80		187,267	187,346	0	3,489		(126,072)	(122,583)	189,267	(123,460)	(1,921)	877			877	0	No	64,762	(1)
0	0				0	0				0			0	0			0	0	No	0	0
0	0	455,088	3,028,152		(2,573,065)	0	(16,625)	32,584		(49,209)			(2,573,065)	(49,209)	(57,830)	(18,698)	(125,737)	0	No	(2,622,274)	0
0	0				0	0				0			0	0			0	0	No		0
44,548	542,003	768,691	73,743	0	1,236,951	44,548	48,479	44,610	0	48,416	0	0	1,236,951	48,416	27,800	8,989	85,205	1,322,156		1,285,367	0
(27,817)	(5,250,705)	708,175	(14,662)	314,819	(4,213,050)	(27,817)	(50,047)	(41,429)	(253,622)	(290,057)	(1,005,679)	(115,520)	(3,207,371)	(174,537)	(74,909)	(24,220)	(273,666)	(781,432)		(4,503,109)	(2)
16,731	(4,708,703)	1,476,866	59,081	314,819	(2,976,099)	16,731	(1,568)	3,181	(253,622)	(241,641)	(1,005,679)	(115,520)	(1,970,420)	(126,121)	(47,109)	(15,231)	(188,461)	540,724		(3,217,742)	(2)
4,371	(109,860)	528,978			419,118	4,371	3,120			7,491	372,491	11,820	46,627	(4,329)	1,048	339	(2,942)	43,685		426,609	0
21,102	(4,818,563)	2,005,844	59,081	314,819	(2,556,981)	21,102	1,552	3,181	(253,622)	(234,150)	(633,188)	(103,700)	(1,923,793)	(130,450)	(46,061)	(14,892)	(191,403)	584,409		(2,791,133)	(1)

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

Data on this worksheet has been populated using your most recent RRR filing.
If you have identified any issues, please contact the OEB.
Have you confirmed the accuracy of the data below? **Yes**

If a distributor uses the actual GA price to bill non-RPP Class B customers for an entire rate class, it must exclude these customers from the allocation of the GA balance and the calculation of the resulting rate riders. These rate classes are not to be charged/refunded the general GA rate rider as they did not contribute to the GA balance.

Please contact the OEB to make adjustments to the IRM rate generator for this situation.

Rate Class	Unit	Total Metered kWh	Total Metered kW	Metered kWh for Non-RPP Customers (excluding WMP)	Metered kW for Non-RPP Customers (excluding WMP)	Metered kWh for Wholesale Market Participants (WMP)	Metered kW for Wholesale Market Participants (WMP)	Total Metered kWh less WMP consumption *(if applicable)*	Total Metered kW less WMP consumption *(if applicable)*	1568 LRAM Variance Account Class Allocation ($ amounts)	Number of Customers for Residential and GS<50 classes[3]
RESIDENTIAL SERVICE CLASSIFICATION	kWh	295,617,650	0	8,593,883	0	0	0	295,617,650	0		29,837
GENERAL SERVICE LESS THAN 50 KW SERVICE CLASSIFICATION	kWh	92,759,999	0	14,222,565	0	0	0	92,759,999	0		3,414
GENERAL SERVICE 50 to 4,999 kW SERVICE CLASSIFICATION	kW	241,817,729	604,549	201,564,198	483,227	0	0	241,817,729	604,549		
UNMETERED SCATTERED LOAD SERVICE CLASSIFICATION	kWh	895,217	0	0	0	0	0	895,217	0		
SENTINEL LIGHTING SERVICE CLASSIFICATION	kW	209,111	612	0	0	0	0	209,111	612		
STREET LIGHTING SERVICE CLASSIFICATION	kW	2,398,221	7,030	2,271,157	6,658	0	0	2,398,221	7,030		
	Total	633,697,927	612,191	226,651,803	489,885	0	0	633,697,927	612,191	43,685	33,251

Threshold Test

Total Claim (including Account 1568)	$584,409	
Total Claim for Threshold Test (All Group 1 Accounts)	$540,724	
Threshold Test (Total claim per kWh) [2]	$0.0009	**Claim does not meet the threshold test.**

As per Section 3.2.5 of the 2019 Filing Requirements for Electricity Distribution Rate Applications, an applicant may elect to dispose of the Group 1 account balances below the threshold. If doing so, please select YES from the adjacent drop-down cell and also indicate so in the Manager's Summary. If not, please select NO.

NO

[1] Residual Account balance to be allocated to rate classes in proportion to the recovery share as established when rate riders were implemented.

[2] The Threshold Test does not include the amount in 1568.

[3] The proportion of customers for the Residential and GS<50 Classes will be used to allocate Account 1551.

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Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

No input required. This workshseet allocates the deferral/variance account balances (Group 1 and 1568) to the appropriate classes as per EDDVAR dated July 31, 2009

Allocation of Group 1 Accounts (including Account 1568)

Rate Class	% of Total kWh	% of Customer Numbers **	% of Total kWh adjusted for WMP	1550	1551	1580 (allocated based on Total less WMP)	1584	1586	1588 (allocated based on Total less WMP)	1568
RESIDENTIAL SERVICE CLASSIFICATION	46.6%	89.7%	46.6%							0
GENERAL SERVICE LESS THAN 50 KW SERVICE CLASSIFICATION	14.6%	10.3%	14.6%							0
GENERAL SERVICE 50 to 4,999 kW SERVICE CLASSIFICATION	38.2%	0.0%	38.2%							0
UNMETERED SCATTERED LOAD SERVICE CLASSIFICATION	0.1%	0.0%	0.1%							0
SENTINEL LIGHTING SERVICE CLASSIFICATION	0.0%	0.0%	0.0%							0
STREET LIGHTING SERVICE CLASSIFICATION	0.4%	0.0%	0.4%							0
Total	100.0%	100.0%	100.0%	0	0	0	0	0	0	0

*** Used to allocate Account 1551 as this account records the variances arising from the Smart Metering Entity Charges to Residential and GS<50 customers.*

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Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

Input required at cells C13 and C14. This workshseet calculates rate riders related to the Deferral/Variance Account Disposition (if applicable) and rate riders for Account 1568. Rate Riders will not be generated for the microFIT class.

Default Rate Rider Recovery Period (in months)	12	
DVA Proposed Rate Rider Recovery Period (in months)	12	Rate Rider Recovery to be used below
LRAM Proposed Rate Rider Recovery Period (in months)	12	Rate Rider Recovery to be used below

Rate Class	Unit	Total Metered kWh	Metered kW or kVA	Total Metered kWh less WMP consumption	Total Metered kW less WMP consumption	Allocation of Group 1 Account Balances to All Classes [2]	Allocation of Group 1 Account Balances to Non-WMP Classes Only (If Applicable) [2]	Deferral/Variance Account Rate Rider [2]	Deferral/Variance Account Rate Rider for Non-WMP (if applicable) [2]	Account 1568 Rate Rider	Revenue Reconcilation [1]
RESIDENTIAL SERVICE CLASSIFICATION	kWh	295,617,650	0	295,617,650	0	0		0.0000		0.0000	
GENERAL SERVICE LESS THAN 50 KW SERVICE CLASSIFICATION	kWh	92,759,999	0	92,759,999	0	0		0.0000		0.0000	
GENERAL SERVICE 50 to 4,999 kW SERVICE CLASSIFICATION	kW	241,817,729	604,549	241,817,729	604,549	0		0.0000		0.0000	
UNMETERED SCATTERED LOAD SERVICE CLASSIFICATION	kWh	895,217	0	895,217	0	0		0.0000		0.0000	
SENTINEL LIGHTING SERVICE CLASSIFICATION	kW	209,111	612	209,111	612	0		0.0000		0.0000	
STREET LIGHTING SERVICE CLASSIFICATION	kW	2,398,221	7,030	2,398,221	7,030	0		0.0000		0.0000	
											0.00

[1] When calculating the revenue reconciliation for distributors with Class A customers, the balances of sub-account 1580-CBR Class B will not be taken into consideration if there are Class A customers since the rate riders, if any, are calculated separately.

[2] Only for rate classes with WMP customers are the Deferral/Variance Account Rate Riders for Non-WMP (column H and J) calculated separately. For all rate classes without WMP customers, balances in account 1580 and 1588 are included in column G and disposed through a combined Deferral/Variance Account and Rate Rider.

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Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

Summary - Sharing of Tax Change Forecast Amounts

	2018	2020
OEB-Approved Rate Base	$ 99,658,054	$ 99,658,054
OEB-Approved Regulatory Taxable Income	$ 1,627,305	$ 1,627,305
Federal General Rate		15.0%
Federal Small Business Rate		9.0%
Federal Small Business Rate (calculated effective rate)[1,2]		15.0%
Ontario General Rate		11.5%
Ontario Small Business Rate		3.5%
Ontario Small Business Rate (calculated effective rate)[1,2]		11.5%
Federal Small Business Limit		$ 500,000
Ontario Small Business Limit		$ 500,000
Federal Taxes Payable		$ 244,096
Provincial Taxes Payable		$ 187,140
Federal Effective Tax Rate		15.0%
Provincial Effective Tax Rate		11.5%
Combined Effective Tax Rate	26.5%	26.5%
Total Income Taxes Payable	$ 431,236	$ 431,236
OEB-Approved Total Tax Credits (enter as positive number)	$ -	$ -
Income Tax Provision	$ 431,236	$ 431,236
Grossed-up Income Taxes	$ 586,715	$ 586,715
Incremental Grossed-up Tax Amount		$ -
Sharing of Tax Amount (50%)		**$ -**

Notes

1. Regarding the small business deduction, if applicable,
   a. If taxable capital exceeds $15 million, the small business rate will not be applicable.
   b. If taxable capital is below $10 million, the small business rate would be applicable.
   c. If taxable capital is between $10 million and $15 million, the appropriate small business rate will be calculated.

2. The OEB's proxy for taxable capital is rate base.

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

Calculation of Rebased Revenue Requirement and Allocation of Tax Sharing Amount. Enter data from the last OEB-Approved Cost of Service application in columns C through H.

As per Chapter 3 Filing Requirements, shared tax rate riders are based on a 1 year disposition.

Rate Class		Re-based Billed Customers or Connections	Re-based Billed kWh	Re-based Billed kW	Re-based Service Charge	Re-based Distribution Volumetric Rate kWh	Re-based Distribution Volumetric Rate kW	Service Charge Revenue	Distribution Volumetric Rate Revenue kWh	Distribution Volumetric Rate Revenue kW	Revenue Requirement from Rates	Service Charge % Revenue	Distribution Volumetric Rate % Revenue kWh	Distribution Volumetric Rate % Revenue kW	Total % Revenue
RESIDENTIAL SERVICE CLASSIFICATION	kWh	29,816	288,323,799	0	24.41	0.0086	0.0000	8,733,703	2,479,585	0	11,213,287	77.9%	22.1%	0.0%	58.2%
GENERAL SERVICE LESS THAN 50 KW SERVICE CLASSIFICATION	kWh	3,431	92,411,463	0	20.73	0.0248	0.0000	853,496	2,291,804	0	3,145,300	27.1%	72.9%	0.0%	16.3%
GENERAL SERVICE 50 to 4,999 kW SERVICE CLASSIFICATION	kW	357	244,620,698	614,743	114.46	0.0000	6.7295	490,347	0	4,136,913	4,627,260	10.6%	0.0%	89.4%	24.0%
UNMETERED SCATTERED LOAD SERVICE CLASSIFICATION	kWh	22	944,731	0	12.69	0.0383	0.0000	3,350	36,183	0	39,533	8.5%	91.5%	0.0%	0.2%
SENTINEL LIGHTING SERVICE CLASSIFICATION	kW	354	209,800	593	3.55	0.0000	33.1502	15,080	0	19,658	34,738	43.4%	0.0%	56.6%	0.2%
STREET LIGHTING SERVICE CLASSIFICATION	kW	8,070	2,398,221	7,030	1.37	0.0000	8.9284	132,671	0	62,767	195,437	67.9%	0.0%	32.1%	1.0%
Total		42,050	628,908,712	622,366				10,228,646	4,807,572	4,219,338	19,255,556				100.0%

Rate Class		Total kWh (most recent RRR filing)	Total kW (most recent RRR filing)	Allocation of Tax Savings by Rate Class	Distribution Rate Rider	
RESIDENTIAL SERVICE CLASSIFICATION	kWh	295,617,650		0	0.00	$/customer
GENERAL SERVICE LESS THAN 50 KW SERVICE CLASSIFICATION	kWh	92,759,999		0	0.0000	kWh
GENERAL SERVICE 50 to 4,999 kW SERVICE CLASSIFICATION	kW	241,817,729	604,549	0	0.0000	kW
UNMETERED SCATTERED LOAD SERVICE CLASSIFICATION	kWh	895,217		0	0.0000	kWh
SENTINEL LIGHTING SERVICE CLASSIFICATION	kW	209,111	612	0	0.0000	kW
STREET LIGHTING SERVICE CLASSIFICATION	kW	2,398,221	7,030	0	0.0000	kW
Total		633,697,927	612,191	$0		

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

Columns E and F have been populated with data from the most recent RRR filing. Rate classes that have more than one Network or Connection charge will notice that the cells are highlighted in green and unlocked. If the data needs to be modified, please make the necessary adjustments and note the changes in your manager's summary. As well, the Loss Factor has been imported from Tab 2.

Rate Class	Rate Description	Unit	Rate	Non-Loss Adjusted Metered kWh	Non-Loss Adjusted Metered kW	Applicable Loss Factor	Loss Adjusted Billed kWh
Residential Service Classification	Retail Transmission Rate - Network Service Rate	$/kWh	0.0061	295,617,650	0	1.0481	309,836,859
General Service Less Than 50 kW Service Classification	Retail Transmission Rate - Network Service Rate	$/kWh	0.0057	92,759,999	0	1.0481	97,221,755
General Service 50 To 4,999 kW Service Classification	Retail Transmission Rate - Network Service Rate	$/kW	2.2941	156,004,056	410,081		
General Service 50 To 4,999 kW Service Classification	Retail Transmission Rate - Network Service Rate - Interval Metered	$/kW	2.8852	85,813,673	194,468		
Unmetered Scattered Load Service Classification	Retail Transmission Rate - Network Service Rate	$/kWh	0.0057	895,217	0	1.0481	938,277
Sentinel Lighting Service Classification	Retail Transmission Rate - Network Service Rate	$/kW	1.7389	209,111	612		
Street Lighting Service Classification	Retail Transmission Rate - Network Service Rate	$/kW	1.7303	2,398,221	7,030		

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Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

Uniform Transmission Rates	Unit	2018	2019 (Jan 1 - June 30)	2019 (July 1 - Dec 31)	2020
Rate Description		**Rate**	**Rate**	**Rate**	**Rate**
Network Service Rate	kW	$ 3.61	$ 3.71	$ 3.83	$ 3.83
Line Connection Service Rate	kW	$ 0.95	$ 0.94	$ 0.96	$ 0.96
Transformation Connection Service Rate	kW	$ 2.34	$ 2.25	$ 2.30	$ 2.30

Hydro One Sub-Transmission Rates	Unit	2018	2019 (Jan 1 - June 30)	2019 (July 1 - Dec 31)	2020
Rate Description		**Rate**	**Rate**	**Rate**	**Rate**
Network Service Rate	kW	$ 3.1942	$ 3.1942	$ 3.2915	$ 3.2915
Line Connection Service Rate	kW	$ 0.7710	$ 0.7710	$ 0.7877	$ 0.7877
Transformation Connection Service Rate	kW	$ 1.7493	$ 1.7493	$ 1.9755	$ 1.9755
Both Line and Transformation Connection Service Rate	kW	$ 2.5203	$ 2.5203	$ 2.7632	$ 2.7632

If needed, add extra host here. (I)	Unit	2018	2019		2020
Rate Description		**Rate**	**Rate**		**Rate**
Network Service Rate	kW				
Line Connection Service Rate	kW				
Transformation Connection Service Rate	kW				
Both Line and Transformation Connection Service Rate	kW	$ -	$ -		$ -

If needed, add extra host here. (II)	Unit	2018	2019		2020
Rate Description		**Rate**	**Rate**		**Rate**
Network Service Rate	kW				
Line Connection Service Rate	kW				
Transformation Connection Service Rate	kW				
Both Line and Transformation Connection Service Rate	kW	$ -	$ -		$ -

		Historical 2018	Current 2019		Forecast 2020
Low Voltage Switchgear Credit (if applicable, enter as a negative value)	$				

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Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

In the green shaded cells, enter billing detail for wholesale transmission for the same reporting period as the billing determinants on Tab 10. For Hydro One Sub-transmission Rates, if you are charged a combined Line and Transformer connection rate, please ensure that both the Line Connection and Transformation Connection columns are completed.
If any of the Hydro One Sub-transmission rates (column E, I and M) are highlighted in red, please double check the billing data entered in "Units Billed" and "Amount" columns. The highlighted rates do not match the Hydro One Sub-transmission rates approved for that time period. If data has been entered correctly, please provide explanation for the discrepancy in rates.

IESO	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	127,152	$3.61	$ 459,531		$0.00			$0.00		$ -
February	109,948	$3.61	$ 397,143		$0.00			$0.00		$ -
March	98,411	$3.61	$ 355,480		$0.00			$0.00		$ -
April	97,365	$3.61	$ 351,795		$0.00			$0.00		$ -
May	63,059	$3.61	$ 227,755		$0.00			$0.00		$ -
June	67,153	$3.61	$ 242,509		$0.00			$0.00		$ -
July	69,279	$3.61	$ 250,303		$0.00			$0.00		$ -
August	71,057	$3.61	$ 256,642		$0.00			$0.00		$ -
September	70,108	$3.61	$ 253,346		$0.00			$0.00		$ -
October	75,236	$3.61	$ 271,844		$0.00			$0.00		$ -
November	111,013	$3.61	$ 400,995		$0.00			$0.00		$ -
December	104,297	$3.61	$ 376,772		$0.00			$0.00		$ -
Total	1,064,078	$ 3.61	$ 3,844,116	-	$ -	$ -	-	$ -	$ -	$ -

Hydro One	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January		$0.0000			$0.0000			$0.0000		$ -
February		$0.0000			$0.0000			$0.0000		$ -
March		$0.0000			$0.0000			$0.0000		$ -
April		$0.0000			$0.0000			$0.0000		$ -
May		$0.0000			$0.0000			$0.0000		$ -
June		$0.0000			$0.0000			$0.0000		$ -
July		$0.0000			$0.0000			$0.0000		$ -
August		$0.0000			$0.0000			$0.0000		$ -
September		$0.0000			$0.0000			$0.0000		$ -
October		$0.0000			$0.0000			$0.0000		$ -
November		$0.0000			$0.0000			$0.0000		$ -
December		$0.0000			$0.0000			$0.0000		$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Add Extra Host Here (I) (if needed)	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January		$ -			$ -			$ -		$ -
February		$ -			$ -			$ -		$ -
March		$ -			$ -			$ -		$ -
April		$ -			$ -			$ -		$ -
May		$ -			$ -			$ -		$ -
June		$ -			$ -			$ -		$ -
July		$ -			$ -			$ -		$ -
August		$ -			$ -			$ -		$ -
September		$ -			$ -			$ -		$ -
October		$ -			$ -			$ -		$ -
November		$ -			$ -			$ -		$ -
December		$ -			$ -			$ -		$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Add Extra Host Here (II) (if needed)	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January		$ -			$ -			$ -		$ -
February		$ -			$ -			$ -		$ -
March		$ -			$ -			$ -		$ -
April		$ -			$ -			$ -		$ -
May		$ -			$ -			$ -		$ -
June		$ -			$ -			$ -		$ -
July		$ -			$ -			$ -		$ -
August		$ -			$ -			$ -		$ -
September		$ -			$ -			$ -		$ -
October		$ -			$ -			$ -		$ -
November		$ -			$ -			$ -		$ -
December		$ -			$ -			$ -		$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Total	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	127,152	$ 3.6140	$ 459,531	-	$ -	$ -	-	$ -	$ -	$ -
February	109,948	$ 3.6121	$ 397,143	-	$ -	$ -	-	$ -	$ -	$ -
March	98,411	$ 3.6122	$ 355,480	-	$ -	$ -	-	$ -	$ -	$ -
April	97,365	$ 3.6132	$ 351,795	-	$ -	$ -	-	$ -	$ -	$ -
May	63,059	$ 3.6118	$ 227,755	-	$ -	$ -	-	$ -	$ -	$ -
June	67,153	$ 3.6113	$ 242,509	-	$ -	$ -	-	$ -	$ -	$ -
July	69,279	$ 3.6130	$ 250,303	-	$ -	$ -	-	$ -	$ -	$ -
August	71,057	$ 3.6118	$ 256,642	-	$ -	$ -	-	$ -	$ -	$ -
September	70,108	$ 3.6136	$ 253,346	-	$ -	$ -	-	$ -	$ -	$ -
October	75,236	$ 3.6132	$ 271,844	-	$ -	$ -	-	$ -	$ -	$ -
November	111,013	$ 3.6121	$ 400,995	-	$ -	$ -	-	$ -	$ -	$ -
December	104,297	$ 3.6125	$ 376,772	-	$ -	$ -	-	$ -	$ -	$ -
Total	1,064,078	$ 3.61	$ 3,844,116	-	$ -	$ -	-	$ -	$ -	$ -

Low Voltage Switchgear Credit (if applicable)	$ -
Total including deduction for Low Voltage Switchgear Credit	$ -

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

The purpose of this sheet is to calculate the expected billing when current 2019 Uniform Transmission Rates are applied against historical 2018 transmission units.

IESO	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	127,152	$ 3.7100	$ 471,734	-	$ 0.9400	$ -	-	$ 2.2500	$ -	$ -
February	109,948	$ 3.7100	$ 407,906	-	$ 0.9400	$ -	-	$ 2.2500	$ -	$ -
March	98,411	$ 3.7100	$ 365,104	-	$ 0.9400	$ -	-	$ 2.2500	$ -	$ -
April	97,365	$ 3.7100	$ 361,223	-	$ 0.9400	$ -	-	$ 2.2500	$ -	$ -
May	63,059	$ 3.7100	$ 233,949	-	$ 0.9400	$ -	-	$ 2.2500	$ -	$ -
June	67,153	$ 3.7100	$ 249,139	-	$ 0.9400	$ -	-	$ 2.2500	$ -	$ -
July	69,279	$ 3.8300	$ 265,337	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
August	71,057	$ 3.8300	$ 272,150	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
September	70,108	$ 3.8300	$ 268,515	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
October	75,236	$ 3.8300	$ 288,154	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
November	111,013	$ 3.8300	$ 425,181	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
December	104,297	$ 3.8300	$ 399,458	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
Total	1,064,078	$ 3.77	$ 4,007,850	-	$ -	$ -	-	$ -	$ -	$ -

Hydro One	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	-	$ 3.1942	$ -	-	$ 0.7710	$ -	-	$ 1.7493	$ -	$ -
February	-	$ 3.1942	$ -	-	$ 0.7710	$ -	-	$ 1.7493	$ -	$ -
March	-	$ 3.1942	$ -	-	$ 0.7710	$ -	-	$ 1.7493	$ -	$ -
April	-	$ 3.1942	$ -	-	$ 0.7710	$ -	-	$ 1.7493	$ -	$ -
May	-	$ 3.1942	$ -	-	$ 0.7710	$ -	-	$ 1.7493	$ -	$ -
June	-	$ 3.1942	$ -	-	$ 0.7710	$ -	-	$ 1.7493	$ -	$ -
July	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
August	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
September	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
October	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
November	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
December	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Add Extra Host Here (I)	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
February	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
March	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
April	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
May	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
June	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
July	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
August	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
September	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
October	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
November	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
December	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Add Extra Host Here (II)	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
February	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
March	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
April	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
May	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
June	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
July	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
August	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
September	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
October	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
November	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
December	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Total	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	127,152	$ 3.7100	$ 471,734	-	$ -	$ -	-	$ -	$ -	$ -
February	109,948	$ 3.7100	$ 407,906	-	$ -	$ -	-	$ -	$ -	$ -
March	98,411	$ 3.7100	$ 365,104	-	$ -	$ -	-	$ -	$ -	$ -
April	97,365	$ 3.7100	$ 361,223	-	$ -	$ -	-	$ -	$ -	$ -
May	63,059	$ 3.7100	$ 233,949	-	$ -	$ -	-	$ -	$ -	$ -
June	67,153	$ 3.7100	$ 249,139	-	$ -	$ -	-	$ -	$ -	$ -
July	69,279	$ 3.8300	$ 265,337	-	$ -	$ -	-	$ -	$ -	$ -
August	71,057	$ 3.8300	$ 272,150	-	$ -	$ -	-	$ -	$ -	$ -
September	70,108	$ 3.8300	$ 268,515	-	$ -	$ -	-	$ -	$ -	$ -
October	75,236	$ 3.8300	$ 288,154	-	$ -	$ -	-	$ -	$ -	$ -
November	111,013	$ 3.8300	$ 425,181	-	$ -	$ -	-	$ -	$ -	$ -
December	104,297	$ 3.8300	$ 399,458	-	$ -	$ -	-	$ -	$ -	$ -
Total	1,064,078	$ 3.77	$ 4,007,850	-	$ -	$ -	-	$ -	$ -	$ -

Low Voltage Switchgear Credit (if applicable)	$ -
Total including deduction for Low Voltage Switchgear Credit	$ -

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

The purpose of this sheet is to calculate the expected billing when forecasted 2019 Uniform Transmission Rates are applied against historical 2018 transmission units.

IESO	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	127,152	$ 3.8300	$ 486,992	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
February	109,948	$ 3.8300	$ 421,100	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
March	98,411	$ 3.8300	$ 376,914	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
April	97,365	$ 3.8300	$ 372,907	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
May	63,059	$ 3.8300	$ 241,516	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
June	67,153	$ 3.8300	$ 257,197	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
July	69,279	$ 3.8300	$ 265,337	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
August	71,057	$ 3.8300	$ 272,150	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
September	70,108	$ 3.8300	$ 268,515	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
October	75,236	$ 3.8300	$ 288,154	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
November	111,013	$ 3.8300	$ 425,181	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
December	104,297	$ 3.8300	$ 399,458	-	$ 0.9600	$ -	-	$ 2.3000	$ -	$ -
Total	1,064,078	$ 3.83	$ 4,075,420	-	$ -	$ -	-	$ -	$ -	$ -

Hydro One	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
February	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
March	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
April	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
May	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
June	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
July	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
August	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
September	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
October	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
November	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
December	-	$ 3.2915	$ -	-	$ 0.7877	$ -	-	$ 1.9755	$ -	$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Add Extra Host Here (I)	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
February	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
March	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
April	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
May	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
June	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
July	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
August	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
September	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
October	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
November	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
December	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Add Extra Host Here (II)	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
February	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
March	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
April	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
May	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
June	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
July	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
August	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
September	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
October	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
November	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
December	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Total	Network			Line Connection			Transformation Connection			Total Connection
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	127,152	$ 3.83	$ 486,992	-	$ -	$ -	-	$ -	$ -	$ -
February	109,948	$ 3.83	$ 421,100	-	$ -	$ -	-	$ -	$ -	$ -
March	98,411	$ 3.83	$ 376,914	-	$ -	$ -	-	$ -	$ -	$ -
April	97,365	$ 3.83	$ 372,907	-	$ -	$ -	-	$ -	$ -	$ -
May	63,059	$ 3.83	$ 241,516	-	$ -	$ -	-	$ -	$ -	$ -
June	67,153	$ 3.83	$ 257,197	-	$ -	$ -	-	$ -	$ -	$ -
July	69,279	$ 3.83	$ 265,337	-	$ -	$ -	-	$ -	$ -	$ -
August	71,057	$ 3.83	$ 272,150	-	$ -	$ -	-	$ -	$ -	$ -
September	70,108	$ 3.83	$ 268,515	-	$ -	$ -	-	$ -	$ -	$ -
October	75,236	$ 3.83	$ 288,154	-	$ -	$ -	-	$ -	$ -	$ -
November	111,013	$ 3.83	$ 425,181	-	$ -	$ -	-	$ -	$ -	$ -
December	104,297	$ 3.83	$ 399,458	-	$ -	$ -	-	$ -	$ -	$ -
Total	1,064,078	$ 3.83	$ 4,075,420	-	$ -	$ -	-	$ -	$ -	$ -

Low Voltage Switchgear Credit (if applicable)	$ -
Total including deduction for Low Voltage Switchgear Credit	$ -

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

The purpose of this table is to re-align the current RTS Network Rates to recover current wholesale network costs.

Rate Class	Rate Description	Unit	Current RTSR-Network	Loss Adjusted Billed kWh	Billed kW	Billed Amount	Billed Amount %	Current Wholesale Billing	Adjusted RTSR Network
Residential Service Classification	Retail Transmission Rate - Network Service Rate	$/kWh	0.0061	309,836,859	0	1,890,005	47.7%	1,910,627	0.0062
General Service Less Than 50 kW Service Classification	Retail Transmission Rate - Network Service Rate	$/kWh	0.0057	97,221,755	0	554,164	14.0%	560,211	0.0058
General Service 50 To 4,999 kW Service Classification	Retail Transmission Rate - Network Service Rate	$/kW	2.2941		410,081	940,767	23.7%	951,032	2.3191
General Service 50 To 4,999 kW Service Classification	Retail Transmission Rate - Network Service Rate - Interval Metered	$/kW	2.8852		194,468	561,079	14.2%	567,201	2.9167
Unmetered Scattered Load Service Classification	Retail Transmission Rate - Network Service Rate	$/kWh	0.0057	938,277	0	5,348	0.1%	5,407	0.0058
Sentinel Lighting Service Classification	Retail Transmission Rate - Network Service Rate	$/kW	1.7389		612	1,064	0.0%	1,076	1.7579
Street Lighting Service Classification	Retail Transmission Rate - Network Service Rate	$/kW	1.7303		7,030	12,164	0.3%	12,297	1.7492

The purpose of this table is to re-align the current RTS Connection Rates to recover current wholesale connection costs.

Rate Class	Rate Description	Unit	Current RTSR-Connection	Loss Adjusted Billed kWh	Billed kW	Billed Amount	Billed Amount %	Current Wholesale Billing	Adjusted RTSR-Connection
Residential Service Classification									
General Service Less Than 50 kW Service Classification									
General Service 50 To 4,999 kW Service Classification									
General Service 50 To 4,999 kW Service Classification									
Unmetered Scattered Load Service Classification									
Sentinel Lighting Service Classification									
Street Lighting Service Classification									

The purpose of this table is to update the re-aligned RTS Network Rates to recover future wholesale network costs.

Rate Class	Rate Description	Unit	Adjusted RTSR-Network	Loss Adjusted Billed kWh	Billed kW	Billed Amount	Billed Amount %	Forecast Wholesale Billing	Proposed RTSR-Network
Residential Service Classification	Retail Transmission Rate - Network Service Rate	$/kWh	0.0062	309,836,859	0	1,910,627	47.7%	1,942,840	**0.0063**
General Service Less Than 50 kW Service Classification	Retail Transmission Rate - Network Service Rate	$/kWh	0.0058	97,221,755	0	560,211	14.0%	569,656	**0.0059**
General Service 50 To 4,999 kW Service Classification	Retail Transmission Rate - Network Service Rate	$/kW	2.3191		410,081	951,032	23.7%	967,066	**2.3582**
General Service 50 To 4,999 kW Service Classification	Retail Transmission Rate - Network Service Rate - Interval Metered	$/kW	2.9167		194,468	567,201	14.2%	576,764	**2.9659**
Unmetered Scattered Load Service Classification	Retail Transmission Rate - Network Service Rate	$/kWh	0.0058	938,277	0	5,407	0.1%	5,498	**0.0059**
Sentinel Lighting Service Classification	Retail Transmission Rate - Network Service Rate	$/kW	1.7579		612	1,076	0.0%	1,094	**1.7875**
Street Lighting Service Classification	Retail Transmission Rate - Network Service Rate	$/kW	1.7492		7,030	12,297	0.3%	12,504	**1.7787**

The purpose of this table is to update the re-aligned RTS Connection Rates to recover future wholesale connection costs.

Rate Class	Rate Description	Unit	Adjusted RTSR-Connection	Loss Adjusted Billed kWh	Billed kW	Billed Amount	Billed Amount %	Forecast Wholesale Billing	Proposed RTSR-Connection
Residential Service Classification									
General Service Less Than 50 kW Service Classification									
General Service 50 To 4,999 kW Service Classification									
General Service 50 To 4,999 kW Service Classification									
Unmetered Scattered Load Service Classification									
Sentinel Lighting Service Classification									
Street Lighting Service Classification									

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

If applicable, please enter any adjustments related to the revenue to cost ratio model into columns C and E. The Price Escalator and Stretch Factor have been set at the 2018 values and will be updated by OEB staff at a later date.

Price Escalator	1.50%	Productivity Factor	0.00%	# of Residential Customers (approved in the last CoS)	29,816	Effective Year of Residential Rate Design Transition (yyyy)	2016
Choose Stretch Factor Group	IV	Price Cap Index	1.05%	Billed kWh for Residential Class (approved in the last CoS)	288,323,799	OEB-approved # of Transition Years	5
Associated Stretch Factor Value	0.45%			Rate Design Transition Years Left	1		

Rate Class	Current MFC	MFC Adjustment from R/C Model	Current Volumetric Charge	DVR Adjustment from R/C Model	Price Cap Index to be Applied to MFC and DVR	Proposed MFC	Proposed Volumetric Charge

Ontario Energy Board

Incentive Rate-setting Mechanism Rat
for 2020 Filers

Update the following rates if an OEB Decision has been issued at the time of completing this application

Regulatory Charges

Effective Date of Regulatory Charges		January 1, 2019	January 1, 2020
Wholesale Market Service Rate (WMS) - not including CBR	$/kWh	0.0030	0.0030
Capacity Based Recovery (CBR) - Applicable for Class B Customers	$/kWh	0.0004	0.0004
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0005	0.0005
Standard Supply Service - Administrative Charge (if applicable)	$/kWh	0.25	0.25

Time-of-Use RPP Prices

As of		May 1, 2019
Off-Peak	$/kWh	0.0650
Mid-Peak	$/kWh	0.0940
On-Peak	$/kWh	0.1340

Smart Meter Entity Charge (SME)

Smart Meter Entity Charge (SME)	$	0.57

Distribution Rate Protection (DRP) Amount (Applicable to LDCs under the Distribution Rate Protection program):	$	36.86

Miscellaneous Service Charges

Wireline Pole Attachment Charge	Unit	Current charge	Inflation factor *	Proposed charge ** / ***
Specific charge for access to the power poles - per pole/year	$	43.63	1.50%	44.28

Retail Service Charges		Current charge	Inflation factor*	Proposed charge ***
One-time charge, per retailer, to establish the service agreement between the distributor and the retailer	$	100.00	1.50%	101.50
Monthly fixed charge, per retailer	$	40.00	1.50%	40.60
Monthly variable charge, per customer, per retailer	$/cust.	1.00	1.50%	1.02
Distributor-consolidated billing monthly charge, per customer, per retailer	$/cust.	0.60	1.50%	0.61
Retailer-consolidated billing monthly credit, per customer, per retailer	$/cust.	(0.60)	1.50%	(0.61)
Service Transaction Requests (STR)				-
Request fee, per request, applied to the requesting party	$	0.50	1.50%	0.51
Processing fee, per request, applied to the requesting party	$	1.00	1.50%	1.02
Electronic Business Transaction (EBT) system, applied to the requesting party				
up to twice a year		no charge		no charge
more than twice a year, per request (plus incremental delivery costs)	$	4.00	1.50%	4.06
Notice of switch letter charge, per letter	$	2.00	1.50%	2.03

* inflation factor subject to change pending OEB approved inflation rate effective in 2020
** applicable only to LDCs in which the province-wide pole attachment charge applies
*** subject to change pending OEB order on miscellaneous service charges

Ontario Energy Board

Incentive Rate-setting Mechanism Rate Generator for 2020 Filers

In the Green Cells below, enter all proposed rate riders/rates. Please note that the following rates/charges are to be entered in the Final Tariff Schedule tab: Monthly Service Charge, Distribution Volumetric Rate and Retail Transmission Rates.
In column A, select the rate rider descriptions from the drop-down list in the blue cells. If the rate description cannot be found, enter the rate rider descriptions in the green cells. The rate rider description must begin with "Rate Rider for".
In column B, choose the associated unit from the drop-down menu.
In column C, enter the rate. All rate riders with a "$" unit should be rounded to 2 decimal places and all others rounded to 4 decimal places.
In column E, enter the expiry date (e.g. April 30, 2020) or description of the expiry date in text (e.g. the effective date of the next cost of service-based rate order).
In column G, a sub-total (A or B) should already be assigned to the rate rider unless the rate description was entered into a green cell in column A. In these particular cases, from the dropdown list in column G, choose the appropriate sub-total (A or B) . Sub-Total A refers to rates/rate riders that Not considered as pass through costs (eg: LRAMVA and ICM/ACM rate riders). Sub-Total B refers to rates/rate riders that are considered pass through costs.

RESIDENTIAL SERVICE CLASSIFICATION	UNIT	RATE		DATE (EG: April 30, 2020)	SUB-TOTAL
Rate Rider for Recovery of Incremental Capital	$	0.42	- effective until	2023-04-30	A
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		

GENERAL SERVICE LESS THAN 50 KW SERVICE CLASSIFICATION	UNIT	RATE		DATE (EG: April 30, 2020)	SUB-TOTAL
Rate Rider for Recovery of Incremental Capital	$	0.28	- effective until		A
Rate Rider for Recovery of Incremental Capital	$/kWh	0.0003	- effective until		A
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		

GENERAL SERVICE 50 to 4,999 kW SERVICE CLASSIFICATION	UNIT	RATE		DATE (EG: April 30, 2020)	SUB-TOTAL
Rate Rider for Recovery of Incremental Capital	$	1.53	- effective until		A
Rate Rider for Recovery of Incremental Capital	$/kW	0.0902	- effective until		A
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		

UNMETERED SCATTERED LOAD SERVICE CLASSIFICATION	UNIT	RATE		DATE (EG: April 30, 2020)	SUB-TOTAL
Rate Rider for Recovery of Incremental Capital	$	0.17	- effective until		A
Rate Rider for Recovery of Incremental Capital	$/kWh	0.0005	- effective until		A
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		

SENTINEL LIGHTING SERVICE CLASSIFICATION	UNIT	RATE		DATE (EG: April 30, 2020)	SUB-TOTAL
Rate Rider for Recovery of Incremental Capital	$	0.05	- effective until		A
Rate Rider for Recovery of Incremental Capital	$/kW	0.4445	- effective until		A
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		

STREET LIGHTING SERVICE CLASSIFICATION	UNIT	RATE		DATE (EG: April 30, 2020)	SUB-TOTAL
Rate Rider for Recovery of Incremental Capital	$	0.02	- effective until		A
Rate Rider for Recovery of Incremental Capital	$/kW	0.1197	- effective until		A
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		

microFIT SERVICE CLASSIFICATION	UNIT	RATE		DATE (EG: April 30, 2020)	SUB-TOTAL
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		
			- effective until		

Appendix 5 – GA Analysis Work form

Ontario Energy Board

GA Analysis Workform

Version 1.9

Account 1589 Global Adjustment (GA) Analysis Workform

Input cells	
Drop down cells	

Utility Name

Note 1 **Please select "Yes" in column D for any year being requested for disposition**

2014	**No**
2015	**No**
2016	**No**
2017	**No**
2018	**No**

Note 7 **Summary of GA (if multiple years requested for disposition)**

Appendix 6 – Account 1595 Analysis Work form

Ontario Energy Board

1595 Analysis Workform

Version 1.0

Account 1595 Analysis Workform

Input cells
Drop down cells

Utility Name PUC Distribution Inc. **Utility name must be selected**

Please select "yes" for the 1595 Rate Years being Requested for Disposition

2012	No
2013	No
2014	No
2015	No
2016	No
2017	No

Appendix 7 – 2020 Incremental Capital Module (ICM) Manager Summary and Appendices

IN THE MATTER OF the *Ontario Energy Board Act, 1998*, S.O.1998, c. 15, (Schedule B);

AND IN THE MATTER OF an application by PUC Distribution Inc. to the Ontario Energy Board for an Order or Orders approving or fixing just and reasonable rates and other charges for electricity distribution to be effective May 1, 2020.

PUC DISTRIBUTION INC. ("PUC")
APPLICATION FOR APPROVAL OF
INCREMENTAL REVENUE REQUIREMENT RECOVERY
THROUGH RATES FOR SUBSTATION 16 RENEWAL

MANAGER'S SUMMARY

Filed: October 15, 2019

Mr. Mark Faught, CPA, CMA
Director of Finance
PUC Services Inc.
Telephone: 705-759-0105
Fax: 705-759-6553
regulatory@ssmpuc.com

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APPLICATION FOR APPROVAL OF INCREMENTAL REVENUE REQUIREMENT RECOVERY THROUGH RATES FOR SUBSTATION 16 RENEWAL

MANAGER'S SUMMARY

Introduction

The Applicant is PUC Distribution Inc. ("PUC"). PUC is a corporation incorporated pursuant to the *Ontario Business Corporations Act* with its office in the City of Sault Ste. Marie. PUC carries on the business of distributing electricity in its service territory pursuant to PUC's Electricity Distribution License ED-2002-0546, which includes most of Sault Ste. Marie, Batchewana First Nation (Rankin Reserve), Prince Township and parts of Dennis Township. PUC hereby applies to the Ontario Energy Board ("the Board") pursuant to section 78 of the *Ontario Energy Board Act, 1998* as amended (the "OEB Act") for approval of proposed incremental revenue requirement recovery, as it relates to the renewal of Substation 16 ("Sub 16"), through rate riders effective May 1, 2020.

1. PUC is applying for a rate adjustment under the Incremental Capital Module ("ICM").

2. PUC has followed the Instructions provided in the *Report of the Board on 3rd Generation Incentive Regulation for Ontario's Electricity Distributors (*the "July 2008 Report of the Board"*), the Addendum to Filing Requirements for Electricity Distribution Rate Applications-2020 Rate Applications issued July 15, 2019*, the *Supplemental Report of the Board on 3rd Generation Incentive Regulation for Ontario's Electricity Distributors - EB-2007-0673* (the "Supplemental Report"), the *Report of the Board – New Policy Options for the Funding of Capital Investments: The Advanced Capital Module – EB-2014-0219* and the *Supplemental Report dated January 22, 2016* (together the "September 2014 Report") in relation to the incremental capital recovery request in addition to Chapter 3 of the Filing Requirements For Electricity Distribution Rate Applications - 2018 Edition for 2019 Rate Applications (the "Filing Guidelines").

3. PUC has completed the Capital Module Applicable for ACM and ICM - Version 5.
4. PUC confirms the accuracy of the billing determinants entered in the models.
5. PUC is applying for Revenue Requirement Recovery related to the ICM application for the renewal of substation 16 ("Sub 16") at 601 Third Line East that is proposed to be in-service in 2020.
6. The year 2020 will be PUC's second (2nd) year of its IRM period.
7. PUC is applying for a Deferral and Variance Account to track the costs and recovery of the Sub 16 renewal for the purposes of truing up the variance at the next Cost of Service.

PUC has provided additional information in this Application (the "Application") where PUC has determined that such information may be useful to the Board.

Notice of Application

PUC will publish the Notice of Application as per directions issued by the Board Registrar, if required.

Current Tariff of Rates and Charges

PUC has provided, in Appendix 2 of the IRM Application, a copy of its approved Tariff of Rates and Charges, effective May 1, 2018 issued by the Board on April 26, 2018.

Background

PUC's Cost of Service application filed as EB-2017-0071 on March 29, 2018[1], included its five-year Distribution System Plan ("DSP") supported by a comprehensive Asset Condition Assessment ("ACA"). That assessment identified Sub 16 as PUC's most critical asset for renewal commencing in 2018 with the bulk of the project's construction to take place in 2019. Sub 16 was identified through a rigorous prioritization process where it was selected from among other station assets in comparable condition on the basis of multiple factors. During the course of the Settlement Agreement filed on September 14, 2018, PUC agreed that the Sub 16 work planned for 2018 would not be in service in 2018. As a result, all costs for Sub 16 were removed from the Test Year.

Phase I and Phase II Environmental Site Assessment were completed at the Sub 16 site with results presented in the Phase II Environmental Site Assessment report dated January 11, 2016, attached as Appendix B.

A Geotechnical Investigation for the Sub 16 site was completed by Tulloch Engineering with results presented in the Geotechnical Report dated April 2018, attached as Appendix C.

PUC's mission is to provide cost effective, efficient, safe and reliable delivery of high-quality energy services and solutions consistent with customer needs and preferences. This mission provided the overall vision that guided the creation of the DSP. Safety and reliability are top priorities for the utility and are two key ways PUC strives to provide distribution excellence to customers. The DSP was built on the principles of excellence, safety and reliability and takes a prudent, cost effective approach to infrastructure investment and renewal to try to serve current and future customer preferences and requirements.

The DSP provided a comprehensive strategy for asset management as well as prudent, cost effective guidance for planned capital project expenditure over the five (5) years between Cost of Service applications. PUC developed a detailed Asset Management Strategy which informed the Asset Management Process section of the DSP and also provided a detailed capital expenditure plan which supports asset management, accommodates third party requirements and plans for growth and technological improvements. The Capital Expenditure portion of the DSP provided an analysis of the historical five (5) year period as well as forecasted costs for the life of the DSP. Projects

[1] PUC Distribution Inc., 2018 Cost of Service Rate Application, EB-2017-0071, available online at: http://www.rds.oeb.ca/HPECMWebDrawer/Record?q=CaseNumber=EB-2017-0071&sortBy=recRegisteredOn-&pageSize=400.

were categorized as System Access, System Renewal, System Service and General Plant. Within each category and across categories, projects were assigned a risk ranking and a priority to help PUC with resource planning and budgeting.

The DSP identified the need for the renewal of Sub 16, which is restated in this ICM.

Sub 16 Project Description

The planned Sub 16 rebuild project involves construction of a new 34.5 kV – 12.47/7.2 kV, 20 MVA municipal substation that will replace an existing end-of-life Sub 16. The station shall have two incoming 34.5 kV supplies, two 10/13.3 MVA power transformers, and four outgoing 12.47 kV feeders supplied by arc-resistant metalclad switchgear. Modern protection and controls, capable of automatically responding to mitigate unsafe conditions on the distribution system will be implemented, thus maintaining public safety in PUC's service territory. The equipment is to be housed in an aesthetically pleasing building with a residential exterior appearance.

The key investment objectives are to mitigate the risk of power outage duration and frequency (SAIDI/SAIFI) falling below PUC's performance targets as outlined on its OEB annual local distribution company (LDC) scorecard, improve operating conditions, and mitigate environmental risks.

As detailed in PUC's Asset Management Plan[2], the existing Sub 16 has been in service for over 50 years, is in very poor condition and has reached end of life. Due to the state of the existing station infrastructure, the switchgear is deemed to be unsafe to operate while energized and must be isolated and de-energized prior to operation. This results in isolation out on the 34.5kV distribution lines, which significantly reduces reliability and contingency buffers for connected customers, while increasing operating efforts and costs.

The planned Sub 16 rebuild is an upgrade from a single feed 34.5kV:12.47kV, 15MVA substation to a dual feed 34.5kV:12.47kV, 20MVA substation. Sub 16 is currently the only 12.47kV station remaining in PUC's system with a single 34.5kV feed, and is only one of two such stations rated at 15MVA. The remaining 10 of the 12 12.47kV stations are rated at 20MVA. The increase in capacity at Sub 16 will support the continuous growth of the City's North end.

Summary of Benefits

- This project will reduce the risk of prolonged power interruptions and reduce the frequency of power interruptions due to equipment failure at Sub 16.
- New switchgear and protection and control equipment will improve operating abilities and reduce operating and maintenance costs.

[2] PUC Distribution Inc., 2018 Cost of Service Rate Application, EB-2017-0071, Exhibit 2: Rate Base, filed March 29, 2018, Appendix 2 – Distribution System Plan 2018-2022, Appendix B – Asset Condition Assessment & Asset Management Plan, available online at: http://www.rds.oeb.ca/HPECMWebDrawer/Record/604151/File/document.

- The substation will be sized with consideration for future load growth within its service territory. By assuring a sustainable reliability of the power system in PUC's service territory, this project contributes towards economic development in the region.
- The protection and control system will be able to support self-healing smart grid functionality and large Distributed Energy Resource applications such as solar, wind, and energy storage.
- The substation layout and design is non-obtrusive with landscaping and brick type exterior matched to the surrounding land uses.
- The transformer bays will have barrier walls to limit transformer hum to below Ministry of Environment limits while also providing security and safety for the public.
- Transformer oil containment systems will be built into the design to mitigate the environmental risks caused by a transformer failure and oil spill.
- The new Sub 16 will allow for energized operation of its equipment therefore sustaining the redundant 34.5kV circuits feeding the Sault Area Hospital and mitigating the impacts to other critical Customers supplied from the substation. Due to the state of the existing station infrastructure, the switchgear is deemed to be unsafe to operate while energized and must be isolated and de-energized prior to operation. This results in isolation out on the 34.5kV sub-transmission lines, which eliminates one of the two 34.5kV feeds to the Sault Area Hospital.

Engineering and Construction

Engineering and design work began in 2018 and has continued during 2019, along with the production of tender documents for the equipment procurement and construction of the station. In an effort to coordinate work and take advantage of cost savings associated with the Sault Smart Grid ("SSG") project detailed in EB-2018-0219, PUC held back on releasing purchase orders for the long lead time items – power transformers and switchgear – for Sub 16, and it became necessary to move the in-service date for Sub 16 into 2020. PUC has proceeded with the ordering of power transformers and switchgear with the expected delivery in the fourth quarter of 2020 to allow sufficient time to meet the 2020 in service requirements prior to the winter season.

Major equipment, consulting, engineering and construction services are all being purchased through a Request for Proposal process. Criteria for selecting vendor's bids is based upon an evaluation matrix that considers consultant and design engineer recommendations, safety criteria, prior LDC experience, industry reputation, and price that results in a best-value selection. A detailed technical and lifecycle cost evaluation was used for the major equipment quote review.

Construction and commissioning will need to be completed before the winter of 2020 to avoid the cold load pickup risk associated with outages that may occur on feeders and equipment at other stations carrying the Sub 16 load during construction. A substantial portion of the residential load on Sub 16 includes electric heating.

The Sub 16 renewal project schedule milestones for construction and commissioning are presented in Table 1 below:

Table 1: Sub 16 Renewal Milestones

Date	Project Milestones
April 2020	Offload existing station, Equipment Removal and Site Remediation
April, May 2020	Complete Site Civil/Architectural work
June – August 2020	Equipment Installation
August, September 2020	Testing and Commissioning
October 2020	Acceptance, Training, and Turnover
October, November 2020	Document and Financial Closeout

Criteria

In the July 2008 Report of the Board, the Supplemental Report, and the September 2014 Report, the OEB established three tests for eligibility for an ICM application: Materiality, Need and Prudence.

Materiality

There are two materiality tests related to ICM applications:

Threshold

The first test is the ICM materiality threshold formula reproduced in Figure 1 below. This calculated threshold serves to demonstrate the level of capital expenditures that a distributor should be able to manage within current rates. The test states that: "Any incremental capital amounts approved for recovery must fit within the total eligible incremental capital amount" and "must clearly have a significant influence on the operation of the distributor". The projected Sub 16 capital costs are $4,728,229, as shown in Table 6 below.

Figure 1: ICM Materiality Threshold Formula

$$Threshold\ Value\ (\%) = \left(1 + \left[\left(\frac{RB}{d}\right) \times (g + PCI \times (1+g))\right]\right) \times \left((1+g) \times (1+PCI)\right)^{n-1} + X\%$$

where n is the number of years since the cost of service rebasing. Many of the parameters remain unchanged from the original formula except for the following:

- the growth factor g is annualized
- the dead band X has been reduced to 10%
- the stretch factor used in the PCI will be the factor assigned to the middle cohort (currently 0.3%) for all distributors

PUC states that it has appropriately calculated a materiality threshold of $5,665,251 using the Capital Module Applicable for ACM and ICM - Version 5.0. The threshold calculation can be found on Tab "9b. Threshold Test" on the ICM attached as Appendix A.

Eligible Incremental Capital

The Board adopted a second, project-specific materiality test in the Funding of Capital Report. The project-specific materiality test is as follows: "Minor expenditures in comparison to the overall capital budget should be considered ineligible for ACM or ICM treatment. A certain degree of project expenditure over and above the Board-defined threshold calculation is expected to be absorbed within the total capital budget". PUC has provided Table 2 to show a comparison between the summary of capital expenditures as presented in PUC's 2018 Cost of Service Settlement Proposal (Appendix A) and actual capital expenditures for 2018, in addition to the revised forecast capital expenditures for 2019, 2020 and 2021, and 2022.

Table 2: Capital Expenditure Comparison 2018-2022

Year	2018	2019 (forecast)	2020 (forecast)	2021 (forecast)	2022 (forecast)	Total	Average
	($)	($)	($)	($)	($)	($)	($)
DSP Capital Expenditures	5,358,355	8,575,803	5,444,856	6,196,546	8,708,176	34,283,736	6,856,747
Actual/Forecast Capital Expenditures	5,144,678	5,770,421	9,100,376	6,160,085	8,708,176	34,883,736	6,976,747
Sub-total - Variance	(213,677)	(2,805,382)	3,655,520	(36,461)	0	600,000	120,000

PUC adjusted its capital program to reflect the effect of deferring the Sub 16 renewal from 2019 to 2020. In the process of developing the detailed plans for Sub 16, Engineers determined that the high-level estimates that formed the basis of the Sub 16 cost presented in the EB-2017-0071 Cost of Service application, needed to be adjusted to account for feeder regulation that was determined to be necessary. The rural nature of the station with long feeders, and load densification now apparent in the north end of the City, led to the decision to specify on-load tap changers for the power transformers, instead of more costly feeder regulators. This accounts for the $600,000 variance over the IR period.

PUC calculated the Eligible Incremental Capital using the ICM model and as shown on Tab 9b, "Proposed ACM ICM Projects" in Appendix A. The maximum eligible incremental capital calculated amount for PUC is $3,435,125 as shown in Table 3 below.

Table 3: Eligible Incremental Capital

Eligible Incremental Capital	Capital Expenditures
Total 2020 Capex	$9,100,376
Less: Materiality Threshold	$5,665,251
Maximum Eligible Incremental Capital	$3,435,125

The incremental revenue requirement corresponding to the eligible incremental capital amount of $3,435,125 is $258,056 as calculated on Tab 10, "Incremental Capital Adj." in Appendix A . The revenue requirement approved in PUC's 2018 Cost of Service application is $19,448,862. The Board is guided by the words "significant influence on the operation of the distributor" and "minor expenditure in comparison to the overall capital budget" in assessing project specific materiality. The renewal of Sub 16 requires a capital investment of over $4.7M which represents more than 50% of PUC's overall capital budget of $9,100,376 for 2020. The renewal of Sub 16 represents a significant expenditure in comparison to PUC's overall capital budget.

The capital required for the renewal of Sub 16 exceeds the materiality threshold and has a significant influence on the operation of PUC. PUC is only seeking recovery of the maximum eligible incremental capital of $3,435,125, which is 72.7% of the total planned Sub 16 capital expenditures.

Need

As stated in the Filing Guidelines, distributors "must pass the Means Test (as defined in the September 2014 Report). Amounts must be based on discrete projects, and should be directly related to the claimed driver. The amounts must be clearly outside of the base upon which the rates were derived".

Means Test

Page 15 of the September 2014 Report states "If the regulated return exceeds 300 basis points above the deemed return on equity embedded in the distributor's rates, the funding for any incremental capital project will not be allowed" and on page 16 of the September 2014 Report it states "a threshold of 300 basis points retains some flexibility for distributors to maximize their earnings while also recognizing that funding in advance of the next rebasing is likely not required from a cash flow perspective". Table 4, below, shows PUC's Historical Regulated (Deemed) Return for the year prior to the 2018 Cost of Service to the most recently reported.

PUC has projected an achieved return on equity for 2019 to be 8.19%, slightly less than the deemed return.

Table 4: Historical Regulated Return

Year	Deemed Rate of Return	Achieved Rate of Return	Variance
2016	8.98%	0.98%	(8.00)%
2017	8.98%	1.78%	(7.20)%
2018	9.00%	4.25%	(4.75)%
2019 Projected	9.00%	8.19%	(0.81)%
2020 Projected	9.00%	7.48%	(1.52)%

Discrete Project

On page 13 of the September 2014 Report, the Board states that ICM requests "must be discrete projects, and not part of typical annual capital programs". The renewal of a substation is not part of a typical annual capital program for PUC.

Outside of Rate Base

In PUC's 2018 Cost of Service Application, and as shown on the Decision and Rate Order date September 27, 2018, page 11[3], the proposed 2018 investment costs for Sub 16 were explicitly excluded

[3] Decision and Rate Order, Application for electricity distribution rates and other charges beginning May 1, 2018, EB-2017-0071, September 27, 2018, available online at: http://www.rds.oeb.ca/HPECMWebDrawer/Record/621323/File/document.

from rate base as per the Settlement Agreement, and not included in the 2018 approved rates. An excerpt from that Decision is shown in Figure 2 below.

Figure 2: Except from EB-2017-0071 Decision and Rate Order (pg 11)

> **Complete Settlement:** For the purposes of the settlement of all of the issues in this proceeding, PUC agrees to adjust its 2018 rate base and Test Year capital plan to reflect the following changes:
> • PUC agrees to reduce its Test Year capital additions by $420,179. This would result in a 2018 Capital Additions of $5,388,176.
> This reduction in capital additions results from the removal of the costs associated with *Project #7 – Substation 16 Rebuild* in the Test Year given that Substation 16 will not be in service in 2018, as further described in response to interrogatories 2-CCC-42 and 2-Staff-28b and Exhibit 2/App. G/Project #7.

Therefore, all costs associated with this ICM request are clearly outside of the base upon which the rates were derived.

Additional Context Supporting the Need for Sub 16 Renewal in 2020

Sub 16 was identified in PUC's 2018 Cost of Service Application as one of two critical stations for renewal scheduled over the IR term based on age and condition data, as it relates to customer impacts, operational, environmental and safety risks. Five other substations are operating with assets in "poor" or "very poor" condition, as presented in the 2016 Asset Management Plan in that application. However, similar substations are more modern substations than Sub 16. They have 34.5kV metal enclosed switchgear providing protection from the elements which significantly reduces the risk of failing insulators and associated components, S&C switches controlled via SCADA, 125VDC systems with RTU and SCADA communication upgrades, and some have also had relay upgrades over the past 5 years. Sub 16 is PUC's last remaining station with an open bus structure in the yard supporting the 34.5kV circuits and equipment. In addition to the "poor" and "very poor" condition of the switchgear and supervisory equipment at Sub 16, both power transformers at Sub 16 are many years beyond their typical service life; T1 is 54 years old, fourteen years beyond the typical service life, and has been leaking coolant for a number of years, and T2 is 53 years old, thirteen years beyond the typical service life.

At the time of PUC's 2018 Cost of Service Application, the need for the renewal of Sub 16 was clear to PUC, but only high-level plans and estimates had been developed. Detailed planning, engineering analysis, evaluation of options, and detailed engineering specifications had yet to be completed. PUC did not believe it was prudent at the time to bring forward Sub 16 as an ACM as part of its Cost of Service application, but rather identified it clearly as one of two stations being considered for renewal over the IR period. PUC has now completed its detailed engineering analysis and developed specifications for the renewal of the substation informed by environmental and geological studies that were completed, and evaluated options for meeting the need to renew the substation.

Although reliability is the primary driver for the need to renew the station, PUC also identified safety, environmental and operational risks associated with the continued operation of the existing Sub 16 in the DSP filed in its 2018 Cost of Service Application. Switching devices at Sub 16 have been declared unsafe, due to age and equipment failure, to operate live which has a direct impact on operational costs and customer impacts.

Isolation of the station on the 34.5kV transmission circuits must preclude any maintenance, repairs, or circuit switching at Sub 16 which eliminates back-up supplies to connected customers. In the absence of feeder-specific SAIDI/SAIFI data and customer outage costs, it is not possible to estimate the cost associated with this risk. However, the only major hospital, an acute care facility, within PUC's service area (and the only major hospital for Sault Ste. Marie) is supplied from the 34.5kV transmission supplying Sub 16. This hospital services Sault Ste. Marie and the surrounding regions 24/7/365. Hospital administration have told PUC that they rely on continuous uninterrupted power to support the critical needs of their patients, and that their generator backup has limited capacity. In addition to the hospital, two old age long-term care facilities, the Algoma Treatment and Remand Centre, and the Ontario Provincial Police Station are supplied from Sub 16. The closest stations to Sub 16 are Sub 18 and Sub 20. Transformers and switchgear at these stations are in in "poor" or "very poor" condition with limited capacity to take on additional load and are unsuitable for providing contingency backup for these facilities for any length of time.

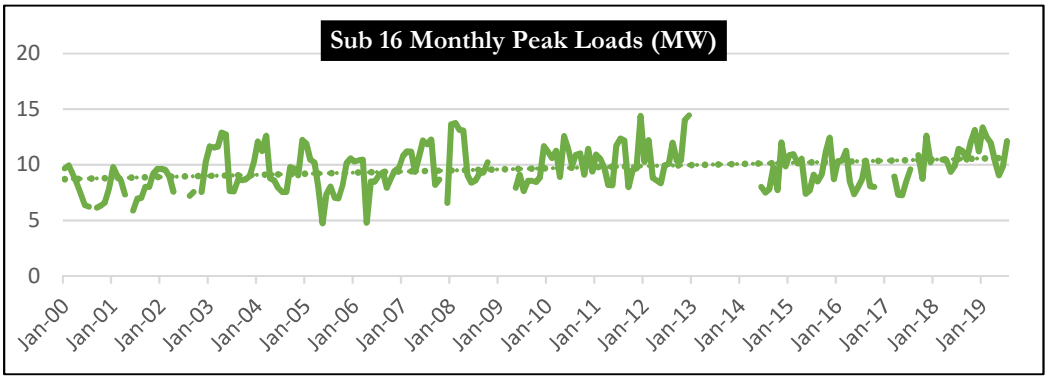
Maintaining the station in service over the past five years has required significant repairs including:

1. Transformer T1 was taken offline due to acetylene levels in oil samples and sent to GE for winding repairs.
2. Transfer switches were all tagged out due to unknown condition of the transfer bus.
3. T2 was taken offline due to diverter sight glass and explosion vent glass leaks.
4. The remote terminal unit (RTU) main control board required replacement.
5. Substation shutdown due to 34.5kV overhead apparatus tracking at various switches.
6. Failure of protection relays.

In addition to the failure risk, safety, and environmental risks PUC is currently managing at this station, additional inspection and repair costs are being incurred to service these risks. By way of comparison, PUC's newest substation (Sub 10) incurred approximately $4k of inspection and repair costs over a three-year period compared to $40k over the same period of time for inspection and repairs associated with failures at Sub 16. It is expected that the cost to maintain Sub 16 in service will continue to escalate.

Figure 3 below shows that historical loading at Sub 16 has continued to climb over the past 19 years. Peak station loading has approached station capacity a number of times over the past 10 years and load in the Sub 16 service area continues to increase.

Figure 3: Historical Loading at Sub 16



More than 2MW of new load is expected to come online within the Sub 16 service area over the next 3 years, including residential subdivisions, and commercial loads. Sub 16 may be operating close to or beyond its 15MVA capacity over the 2019/2020 winter season and will need to be monitored closely.

PUC is experiencing a densification of load in the Sub 16 service area.. As stated earlier, there is essentially no opportunity to transfer loads to nearby stations while maintaining PUC's current service levels.

The DSP indicated on pages 9 and 10 of Exhibit 2[4], that both transformer stations require complete rebuilds over the next 15 years, and 7 of the 12 existing 34.5/12.5 kV substations will need renewal before 2032.[5] This level of investment represents more than 40% of PUCs current rate base using $5M as a representative cost for a station renewal. Asset age and condition evidence presented in EB-2017-0071 for station transformers, switchgear and other assets reproduced below as Figures 4, 5, 6, and 7, illustrate the advanced service age as well as the "poor" and "very poor" condition of these assets.

[4] PUC Distribution Inc., 2018 Cost of Service Rate Application, EB-2017-0071, Exhibit 2: Rate Base, filed March 29, 2018, Appendix 2 – Distribution System Plan 2018-2022, available online at: http://www.rds.oeb.ca/HPECMWebDrawer/Record/604151/File/document.

[5] In addition to these 12 stations, PUC also has two remaining 4.2 kV distribution stations, which will be retired from service after the voltage upgrade of distribution lines has been completed prior to 2023 (see DSP at page 10 for additional details).

Figure 4: Station Transformer Age Profile

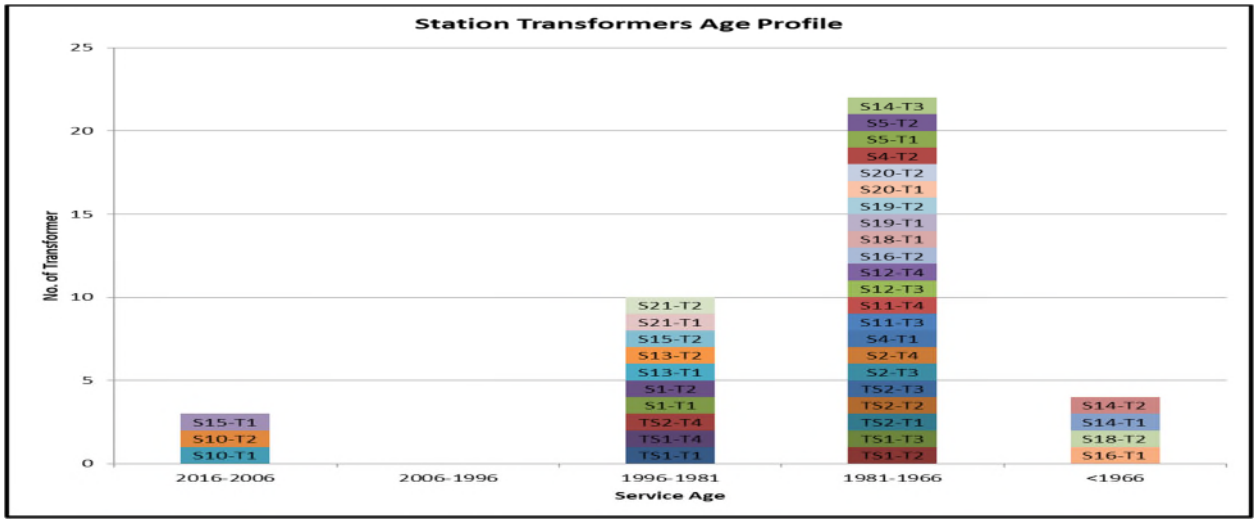


Figure 5: Substation Transformer Health Index

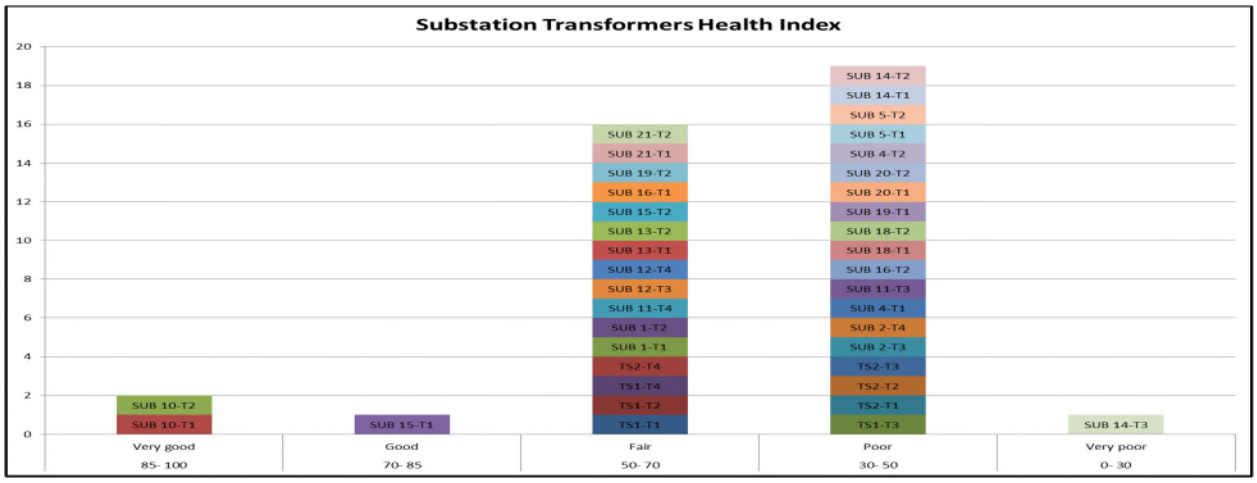


Figure 6: Substation Switchgear Health Index

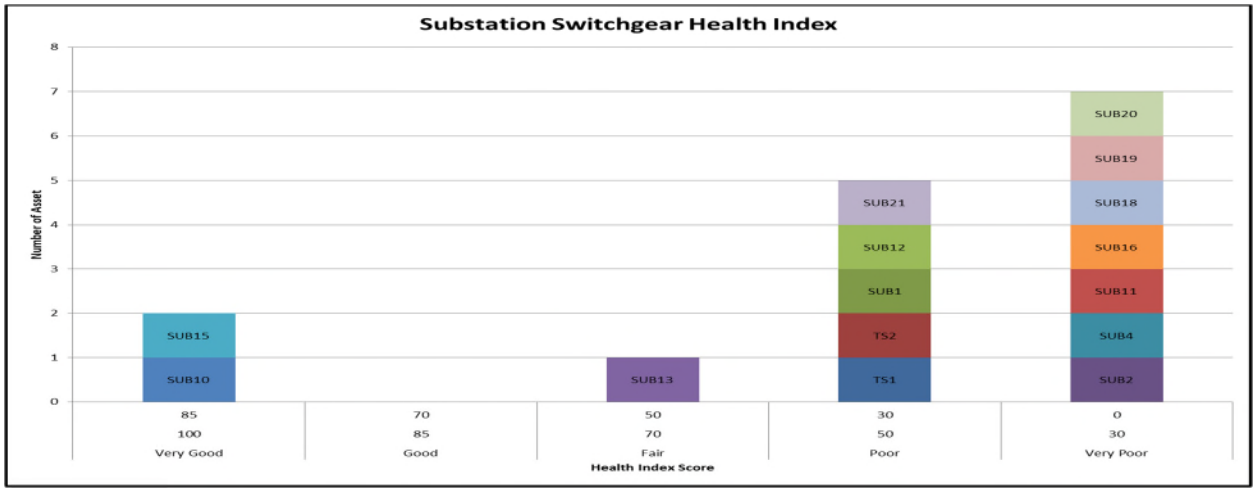
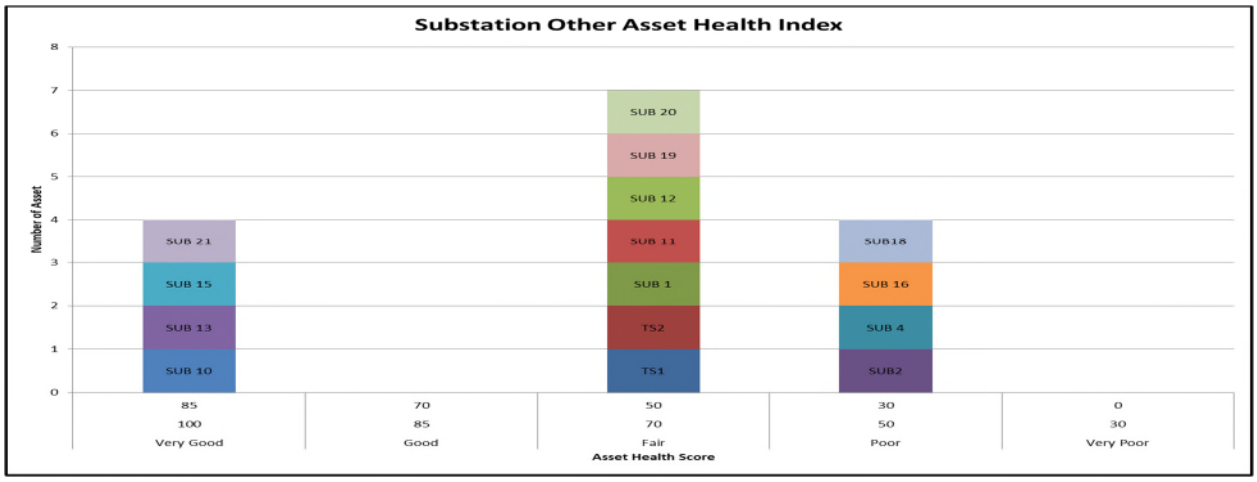


Figure 7: Health Index for Other Station Assets



PUC must pace the renewal of its station assets in order to manage rate increases. Each station renewal will cost in the order of $5M; roughly equivalent to PUC's total annual capital budget excluding station renewals. One of the Board's stated expectations for the use of the ICM mechanism, is that LDCs will use the ICM in ways that can assist with rate smoothing and not clump all investments around a given test year. Using Sub 16 as an example, the revenue requirement associated with the eligible incremental capital for each renewal is about $250k which translates to less than 0.5 % impact on the rates for residential and commercial Customers. Adding 0.5% incrementally to rates every 3-5 years for renewal of distribution station assets is a prudent and affordable approach for PUC customers.

Finally, PUC has limited resources to assign to the design and execution of large-scale projects such as station renewals while continuing to manage increasing operational challenges associated with its growing inventory of aging assets, and managing its regular programs. Renewing Sub 16 in 2020 will

ensure the station is fully in service with routine maintenance and operating procedures stabilized prior to undertaking its next station renewal scheduled for 2022.

Appendix D contains the project justification for Sub 16 that was presented in Exhibit 2 of the DSP.

Prudence

PUC's decision to proceed with the Sub 16 renewal in 2020 to PUC's new standard is the most cost-effective option for managing the risks associated with the current state of Sub 16, and represents the long-term least cost option.

Options Considered

Options considered for managing the risks associated with the current state of Sub 16 include:

1. Do nothing.
2. Rehabilitate for another 5 years and then renew Sub 16.
3. Renew Sub 16 now.
4. Non-wires alternative.
5. Transfer load to other stations and remove Sub 16 from service.
6. Renew Sub 16 like-for-like.

Option 1: Do Nothing

The Electrical Safety Association ("ESA") has inspected Sub 16 and identified seven defects that must be resolved. To resolve the defects, major design and construction is required to install oil containment systems on the power transformers, upgrade the station perimeter fencing, and upgrade the substation grounding systems. Crushed stone and temporary fencing of the proper height has been brought in to temporarily resolve the public access deficiencies, however, PUC considers the identified defects as both public safety and environmental hazards that must be permanently corrected. In addition to the costly repairs associated with these deficiencies, past end-of-life (50+ years) equipment is very deteriorated resulting in unacceptable operating risks and a reduction in service levels for Customers. PUC tested similar protection relays in service at Tarentorus TS, a station that is much newer than Sub 16, and they all failed to operate within specifications. Components within the microprocessor of the protection relays dry up over time and result in the relays drifting out of tolerances. It is likely that the relays at Sub 16 suffer from similar effects of aging and would be replaced as part of the renewal.

Option 2: Rehabilitate for another 5 years and then renew Sub 16

PUC has been rehabilitating Sub 16 for the past 10 years. This has included the replacement of one failed protection relay, replacement of cracked 34.5kV switch and fuse insulators, replacement of the RTU control board with a used one from an upgraded station, patching of the roof of the metalclad switchgear, as well as refurbishing of the T1 transformer core. The option of continuing to repair

equipment as it fails would include a number of actions, including:

- The costly correction of the ESA deficiencies stated in Option 1,
- The replacement of the 48VDC system to 125VDC to meet PUC's standard DC system and relay manufacturer power requirements,
- Upgrades to the RTU and radio systems to match the rest of PUC's system,
- The replacement of protection relays, and,
- The refurbishment of T2.

All of these upgrades might extend the service life of Sub 16 by another 5 years if the transformers or switchgear last that long. The increasing load in the Sub 16 service area will continue to push the 53 and 54 year old power transformers to their limits. PUC used previous work orders and projects to estimate the cost to rehabilitate the required equipment at approximately $900,000. PUC does not believe that spending close to one million dollars on a 50+ year old distribution station is the prudent thing to do, considering a full replacement will likely be required in any event within the next five years.

In addition to the unfavourable rehabilitation costs associated with this option, major equipment failure of the aging equipment is increasingly likely as time goes on and will result in significant unplanned outcomes including costs associated with emergency response and unacceptable impacts to service levels. The Sub 16 load would need to be transferred to Sub 18 and Sub 20 which are unsuitable for carrying the load for any period of time.

Moreover, deferring the renewal of Sub 16 will cause pacing issues, since the renewal of this station may become necessary at a later time when PUC plans to undertake other renewal projects.

Option 3: Renew Sub 16 Now

Rebuilding Sub 16 completely with a new station with modern technology up to current industry standards is the most prudent option. The capital cost of this option is about $4.7M and represents the lowest cost option. This option will resolve all ESA defects, simplify operating and maintenance, essentially eliminate outages resulting from station equipment failures, mitigate the existing worker and public safety risks, and increase operating flexibility in support of Sub 16, Sub 18, and Sub 20 Customers. This option also ensures that the Sault Area Hospital maintains both of its parallel feeds when Sub 16 is to be operated and maintained.

PUC has a number of other stations that are at end-of-life and in poor condition that will require renewal over the next 10 years. Proceeding with Sub 16 renewal now will help smooth rate impacts and mitigate other risks associated with managing multiple station projects in any given year.

Option 4: Non-wires alternative

PUC investigated reducing the new station capacity by incorporating non-wires alternatives into the new Sub 16 design. A budget estimate of $390/kWh was received from an industry leader, which PUC has engaged in the past, to install a 10MW/ 80MWh energy storage system to offset daily load peaks for the Sub 16 service territory. The estimated $35M investment would need substantial replacement after 15-20 years, bringing the project to about $65M as compared to a standard station of 40 years, at a capital cost of about $5M. This option is far too expensive and was not considered further.

PUC also considered opportunities to reduce station capacity by incorporating Customer demand management programs for the Sub 16 circuits. Most of the load on the substation is resistive, associated with electric heating, and dispersed across many small customers over a large service area. The opportunity to manage these loads for these Customers is extremely limited due to the cold winters in the Sault Ste. Marie region. Customers already take advantage where they can of time-of-use rates and other incentives as part of PUC's previous demand management initiatives.

Option 5: Transfer load to other stations and remove Sub 16 from service

PUC considered decommissioning Sub 16 and transferring all loads to adjacent distribution stations. Sub 16 is geographically located in the north-east corner of the City of Sault Ste. Marie, adjacent to Sub 18 and Sub 20 service areas. The assets at these substations are in "poor" and "very poor" condition. Sub 18 is the only other 12.47kV distribution station with a 15MVA capacity and therefore does not have available capacity to take load from Sub 16 for any length of time. The increasing load in the Sub 16 service area makes this option even more untenable. Service levels for Customers supplied from Sub 16, Sub 18, and Sub 20 would all be at risk with this option and load could not be maintained with an element out of service (n-1 design). The n-1 contingency is eliminated for many stations when considering load transfers in emergency situations on PUC's system.

The only way to make this option operationally viable, would be to extensively upgrade adjacent substations (Sub 18 and Sub 20 civil structures, transformer capacity, switchgear, and associated protection and control equipment) to support the existing Sub 16 load, including long lengths of new feeders from new switchgear to Sub 16 area tie points. PUC developed an estimated cost for this option of $9M. Therefore, removing Sub 16 from service was considered an unacceptable option from an operations and cost perspective.

Option 6: Renew Sub 16 like-for-like

Rebuilding the station like-for-like is not an option as the existing technology is obsolete. Even if parts could be fabricated, this approach is inconsistent with current standards and would be inconsistent with Regulation 22/04 requirements.

In addition to these alternatives, PUC also considered the option that involved the replacement of only T2 and the switchgear. This alternative was discounted on the basis that although T1 is in fair condition as a result of the core rebuild in 2013, the case and accessory equipment are 53 years old, and the overall station capacity would remain at 15 MVA, essentially leaving the station loaded at close to capacity. The options and results are summarized in Table 5.

Table 5: Options for the renewal of Sub 16

Options	Operational Acceptability	Technical Acceptability	Environmental Acceptability	Cost in 2019 Dollars ($M)	Financial Acceptability	Result	Comment
1- Do nothing	Unacceptable	Unacceptable	Unacceptable	N/A	N/A	Unacceptable in all categories	This is not an option as PUC is regulated by ESA and have directives to resolve multiple outstanding issues. This option would result in unacceptable deteriorating reliability, increasing operating and maintenance costs, remediation costs associated with oil leaks, longer switching and restoration associated with day-to-day business, not in keeping with customer preferences. Additionally, it is likely that within the next 5 years, PUC will have to renew the substation and therefore this option becomes Option 2.
2- Rehabilitate for another 5 years and then renew Sub 16	Acceptable	Acceptable	Acceptable	$6.4	Unacceptable	Unacceptable due to cost	This option proposes the upgrade of systems that have failed or that ESA is requiring to be fixed right now as part of rehabilitation efforts. Required deficiency upgrades directed by ESA will cause other projects in the 5-year capital program to be deferred as well. When existing end-of-life systems/components are rehabilitated/upgraded they must be brought up to today's design and safety standards. Therefore, most of the systems will require complete re-designs to meet ESA Regulation 22/04 compliance at that time.
3- Renew Sub 16 now	Acceptable	Acceptable	Acceptable	$4.7	Acceptable	**Acceptable**	Proposed Plan.
4- Non-wires alternative	Acceptable	Acceptable	Acceptable	$65	Unacceptable	Unacceptable due to cost	Too expensive for the capacity required. This option will contain assets with much shorter life expectancy. Ultimately, this option results in an estimated 50% increase in O&M associated with battery maintenance of energy storage.
5- Transfer load to other stations and remove Sub 16 from service	Unacceptable	Acceptable	Acceptable	$9.0	Acceptable	Unacceptable Does not support PUC's contingency design standard, and too costly	Nearby stations do not have capacity to support Sub 16 load for long periods of time. Operating flexibility to support PUC's standard n-1 contingency target cannot be maintained resulting in a reduction to current service levels.
6- Rebuild like-for-like	Unacceptable	Unacceptable	Acceptable	N/A	N/A	Unacceptable Does not meet today's standards	Existing technology has long been obsolete, parts are difficult to obtain, and this approach is inconsistent with today's standards.

<u>Customer Engagement</u>

Customer engagement is a key element identified in the RRFE and PUC carefully incorporates customer concerns and preferences into its capital investment plans. Customer survey results

presented in PUC's Cost of Service application (EB-2017-0071)[6] illustrated that price was customers' most important concern (58%) followed by reliability (34%).

Customers also indicated a high level of confidence in PUC's judgment in prioritizing investments (85%), and a majority of customers (69%) are willing to pay more for the replacement of aging equipment to improve safety and reliability.

On September 18, 2019, PUC engaged customers directly in a Town Hall meeting to present plans for the renewal of Sub 16, engage in dialogue and gather feedback on concerns and preferences. Customers were informed of the meeting through a press release, door-to-door notices, and posts on LinkedIn, Twitter and Facebook. The engagement was set up as a come-and-go style community event and a presentation was provided outlining the costs and benefits of the Sub 16 renewal project. The presentation is attached as Appendix E.

Generally, customers commented on possible power outages during the renewal of Sub 16, but were pleased to see PUC investing in aged infrastructure and renewal, and were happy to see the old outside bus structure being replaced with a more aesthetically pleasing design. A post-meeting follow up to the original outreach was released through social media. Customers continue to support PUC in its investment in the renewal of Sub 16.

Planning and Cost Savings / Efficiencies / Avoidance

During the course of the detailed planning for Sub 16, Engineers determined that due to the rural nature of the area served by the substation, and the continued load densification in the region, that voltage regulation would be required. PUC estimates a savings of about $240,000 by implementing a design that incorporates on load tap changers with the substation transformers instead of individual feeder voltage regulators.

Part of the design phase for Sub 16 renewal included evaluation of costs and benefits associated with gas insulated ("GIS") and air insulated ("AIS") switchgear. Engineers chose GIS switchgear over AIS switchgear for a number of reasons including overall lower project capital cost. GIS switchgear is more expensive, however, in addition to offering superior operational benefits, and requiring less maintenance, GIS switchgear requires about 50% of the building footprint required for AIS switchgear. By selecting GIS switchgear, overall project cost savings are estimated at about $200,000. In addition to specific savings associated with planning and design choices, PUC uses a procurement process, that by design, promotes quality bids that are sensitive to price. PUC's procurement process ensures that major equipment, consulting, engineering and construction services are all purchased through a competitive Request for Proposal process and contracts are awarded on a best-value basis. Vendors are invited to bid based on consultant and design engineer recommendations, prior LDC experience and industry reputation. Proposals are evaluated based on a scoring matrix that

[6] PUC Distribution Inc., 2018 Cost of Service Rate Application, EB-2017-0071, Exhibit 2: Rate Base, filed March 29, 2018, Appendix 2 – Distribution System Plan 2018-2022, Appendix H – Customer Engagement, available online at: http://www.rds.oeb.ca/HPECMWebDrawer/Record/604151/File/document.

includes relevant experience, ability to meet the technical requirements, reputation, safety criteria and price. Proposed successful bids must be evaluated by PUC staff, design engineers and project consultants, with final approval by PUC Executives. Each successful proponent is asked to find cost efficiencies wherever possible. The power transformers that have been ordered for Sub 16 were procured on this basis. Contracts for switchgear, demolition of the existing facility, and construction of the new facility will also follow this process and are expected to be awarded by the end of this year.

Conclusion of Prudence

PUC's mission is to provide cost effective, efficient, safe and reliable delivery of high-quality energy services and solutions consistent with customer needs and preferences. Safety and reliability are top priorities for PUC and are two key ways PUC strives to provide distribution excellence to customers. Capital expenditure decisions are built on the principles of excellence, safety and reliability and take a prudent, cost effective approach to infrastructure investment and renewal to try to serve current and future customer preferences and requirements. As detailed above, PUC needs to renew Sub 16 to ensure reliability and capacity to customers. In renewing Sub 16, PUC will use every means available to make cost effective decisions in order to limit the impacts to customers and rates.

PUC has taken a responsible approach to assessing the condition of its assets and putting forward a comprehensive DSP in its last rebasing application. The need for the renewal of Sub 16 was identified in that proceeding with costs expected to be incurred in 2018 and 2019. As part of the Settlement Agreement in that proceeding, PUC agreed to remove costs associated with Sub 16 from the 2018 test year rate base. Detailed planning and engineering design work continued in 2019, including the evaluation of options to meet the need for the renewal of the substation. Due to committed Customer projects and anticipated load growth in 2019 on Sub 16, PUC subsequently decided it was necessary to begin with the procurement of long lead time items for the Sub 16 project, and it is expected that the renewed substation will be in service the fourth quarter of 2020.

ICM Model

PUC has completed the 2020 Capital Module Applicable to ACM and ICM - Version 5.0, and has provided both a hard copy (see Appendix A) and a live Excel file of the model.

PUC confirms the consumption and demands entered in the model are consistent with the Reporting and Record Keeping Requirements filed with the Board. The data entered into Tab 5 "Rev_Req_Check" is consistent with the revenue requirement workform submitted as part of EB-2017-0071 – 2018 Cost of Service application.

The Sub 16 capital costs are separated into three (3) categories and are shown below in Table 6 with the amortization expense and CCA calculations. The projected Sub 16 capital costs are $4,728,229.

Table 6: Sub 16 Capital Cost Categories

Cost Category	Capital Cost ($)	Amortization Expense ($)	Useful Life	Kinectrics Range
Buildings and Fixtures	700,000	14,000	50	50 - 75
DS Equipment	3,928,229	98,206	40	30 - 40
System Supervisory Equipment	100,000	5,000	20	15 - 30
Total Costs	**4,728,229**	**117,206**		

PUC has utilized the useful lives for buildings and station assets as presented in EB-2017-0071, Appendix 2-BB[7] consistent with the Board Kinectrics Report, dated July 2010[8].

CCA Smoothing

Bill C-97 includes an Accelerated Investment Incentive which affects PUC's Capital Cost Allowance (CCA) calculations in this ICM application. The incentive allows a write-off of a larger share of the costs of newly acquired capital assets in the year of investment or the asset becoming available for use. The accelerated investment incentive is composed of two elements:

i) A 50% increase in the available CCA deduction for assets acquired after November 20, 2018 that become available for use before 2024, and
ii) The suspension of the CCA half-year rule for assets acquired after November 20, 2018 that become available for use before 2028.

The incentives are available only in the year of acquisition; the CCA deductions will revert to the current level in years beyond the year of acquisition.

Table 7 below illustrates the calculation of the CCA deductions for the Sub 16 project for the years 2020 to 2022. The CCA for the additions in 2020 is based on total assets put in service in 2020 (no half-year rule) at a CCA rate increased by 50%. Subsequent years are based on the undepreciated capital cost at the normal CCA rate. Since the incentive is only available in the year of acquisition, inflating year one CCA, PUC used the three (3) year average CCA for the 2020 ICM.

[7] Chapter 2 Appendices – Filing Requirements for Electricity Distribution Rate Applications, Appendix 2-BB – Service Life Comparison, available online at: http://www.rds.oeb.ca/HPECMWebDrawer/Record/604163/File/document.

[8] Asset Depreciation Study for the Ontario Energy Board (Kinectrics Inc. Report No: K-418033-RA-001-R000), dated July 8, 2010, available online at: https://www.oeb.ca/oeb/_Documents/EB-2010-0178/Kinetrics-418033-OEB%20Asset%20Amortization-%20Final%20Rep.pdf.

Table 7: CCA Calculations

Year 1 2020	Cost of Addition	UCC	CCA	+50% Adjustment Bill 97 Enacted	Adjusted UCC	Adjusted CCA
1808 Building and Fixtures	$700,000	$700,000	$28,000	$350,000	$1,050,000	$84,000
1820 DS Equipment	$3,928,229	$3,928,229	$157,129	$1,964,114	$5,892,343	$471,387
1980 System Supervisory Equipment	$100,000	$100,000	$4,000	$50,000	$150,000	$12,000
Total	**$4,728,229**	**$4,728,229**	**$189,129**	**$2,364,114**		**$567,387**
Year 2 2021	**Cost of Addition**	**UCC**	**CCA**		**Adjusted UCC**	**Adjusted CCA**
1808 Building and Fixtures	$700,000	$672,000	$53,760		$616,000	$49,280
1820 DS Equipment	$3,928,229	$3,771,099	$301,688		$3,456,841	$276,547
1980 System Supervisory Equipment	$100,000	$96,000	$7,680		$88,000	$7,040
Total	**$4,728,229**	**$4,539,099**	**$363,128**			**$332,867**
Year 3 2022	**Cost of Addition**	**UCC**	**CCA**		**Adjusted UCC**	**Adjusted CCA**
1808 Building and Fixtures	$700,000	$618,240	$49,459		$566,720	$45,338
1820 DS Equipment	$3,928,229	$3,469,411	$277,553		$3,180,294	$254,424
1980 System Supervisory Equipment	$100,000	$88,320	$7,066		$80,960	$6,477
Total	**$4,728,229**	**$4,175971**	**$334,078**			**$306,238**
***after 1st year regular CCA calculations are applicable**			**Average CCA 2020-2022**			**$402,164**

Effect of Smoothing of CCA Deduction

In a letter to LDC's dated July 25, 2019 regarding "Accounting Direction Regarding Bill C-97 and Other Changes in Regulatory or Legislated Tax Rules for Capital Cost Allowance"[9], the Board stated "The OEB recognizes that there may be timing differences that could lead to volatility in tax deductions over the rate-setting term. The OEB may consider a smoothing mechanism to address this." PUC is proposing to use a three year average CCA deduction in this ICM application in order to smooth the effects of the accelerated CCA over the three period until its next Cost of Service rate application.

Table 8 below illustrates that smoothing of the CCA over the three year period eliminates the revenue deficiency which would otherwise be the result of the accelerated CCA in year 1.

[9] Available online at: https://www.oeb.ca/sites/default/files/OEBltr-Acctng-Guidance-Bill-C97-20190725.pdf.

Table 8: Effect of CCA Smoothing on Revenue Deficiency

	Year 1	Year 2	Year 3	Total
CCA not smoothed				
CCA in rates	$567,387	$567,387	$567,387	$1,702,162
Actual CCA	$567,387	$332,867	$306,238	$1,206,493
Difference	**$0**	**$234,520**	**$261,150**	**$495,460**
Revenue deficiency at 26.5%				**$131,352**
CCA smoothed				
CCA in rates	$402,164	$402,164	$402,164	$1,206,493
Actual CCA	$567,387	$332,867	$306,238	$1,206,493
Difference	**($165,223)**	**$69,297**	**$95,926**	**$0**
Revenue deficiency at 26.5%				**$0**

Revenue Requirement

The revenue requirement calculation for the incremental capital costs can be found on Tab 10 "Incremental Capital Adj." in Appendix A. The incremental capital revenue requirement calculated by the model is $258,056 as shown in Table 9 below.

Table 9 - Incremental Capital Revenue Requirement 2020

Current Revenue Requirement				
Current Revenue Requirement - Total			$ 19,273,165	A
Eligible Incremental Capital for ACM/ICM Recovery	**Total Claim**		**Eligible for ACM / ICM**	
Incremental Capital	4,728,229		$ 3,435,125	B
Depreciation Expense	117,206		$ 85,152	C
CCA	402,164		$ 292,178	V
Return on Rate Base				
Incremental Capital			$ 3,435,125	B
Depreciation Expense			$ 85,152	C
Incremental Capital to be included in Rate Base			$ 3,392,549	D = B - C/2
Deemed Short Term Debt %	4%	E	$ 135,702	G = D * E
Deemed Long Term Debt %	56%	F	$ 1,899,827	H = D * F
Short Term Interest	2.29%	I	$ 3,108	K = G * I
Long Term Interest	4.12%	J	$ 78,273	L = H * J
Return on Rate Base - Interest			$ 81,380	M = K + L
Deemed Equity %	40.00%	N	$ 1,357,019	P = D * N
Return on Rate Base -Equity	9.00%	O	$ 122,132	Q = P * O
Return on Rate Base - Total			$ 203,512	R = M + Q
Amortization Expense				
Amortization Expense - Incremental		C	$ 85,152	S
Grossed up PIL's				
Regulatory Taxable Income		O	$ 122,132	T
Add Back Amortization Expense		S	$ 85,152	U
Deduct CCA			$ 292,178	V
Incremental Taxable Income			$ 84,895	W = T + U - V
Current Tax Rate	26.5%	X		
PIL's Before Gross Up			$ 22,497	Y = W * X
Incremental Grossed Up PIL's			$ 30,608	Z = Y / (1 - X)
Incremental Revenue Requirement				
Return on Rate Base - Total Amortization		Q	$ 203,512	AA
Expense - Total		S	$ 85,152	AB
Incremental Grossed Up PIL's		Z	$ -30,608	AC
Incremental Revenue Requirement			$ 258,056	**AD = AA + AB + AC**

The Working Capital Allowance used in the ICM is 7.50%, and the Cost of Capital used is 2.29% for Short Term Interest, 4.12% for Long Term Interest, a 9.00% Deemed Return on Equity and calculated Incremental Grossed up PILs is a credit of $30,608. As per the September 2014 Report and Filing Guidelines, the Board decided that the half-year rule would apply only in the final year (4th) of the Price Cap IR plan term. PUC is in the 2nd year of the IRM and notes that the half-year rule was not applied in the calculation of incremental depreciation.

PUC does not forecast significant future growth within its overall service territory over the IR term, so PUC has not included any revenue off-sets to the incremental capital revenue requirement.

PUC is requesting $258,056 in total incremental cost recovery.

Rate Riders

The calculation of rate riders to recover the requested incremental revenue requirement is presented at Tab 11 in Appendix A and summarized in Table 10 below. As per the Board's letter issued July 16, 2015 (EB-2012-0410), Residential rate riders are applied on a fixed basis only.

Table 10 - Proposed Incremental Revenue Requirement Rate Riders

Rate Class	Total Revenue by Rate Class	Billed Customers or Connections	Billed kWh	Billed kW	Service Charge Rate Rider	Distribution Volumetric Rate kWh Rate Rider	Distribution Volumetric Rate kW Rate Rider
		From Sheet 4	From Sheet 4	From Sheet 4	Col F / Col K / 12	Col G / Col L	Col H / Col M
RESIDENTIAL	$ 150,182	29,816	288,323,799	-	$ 0.42	$ -	$ -
GENERAL SERVICE LESS THAN 50 KW	$ 42,221	3,431	92,411,463	-	$ 0.28	$ 0.0003	$ -
GENERAL SERVICE 50 TO 4,999 KW	$ 62,041	357	244,620,598	614,743	$ 1.53	$ -	$ 0.0902
UNMETERED SCATTERED LOAD	$ 530	22	944,731	-	$ 0.17	$ 0.0005	$ -
SENTINEL LIGHTING	$ 466	354	209,800	593	$ 0.05	$ -	$ 0.4445
STREET LIGHTING	$ 2,615	8,070	2,398,221	7,030	$ 0.02	$ -	$ 0.1197
Total	$ 258,056	42,050	628,908,612	622,366			

Deferral and Variance Account

PUC requests Board approval to create a deferral and variance account to track the costs and recovery of costs related to the Sub 16 renewal with the intention of truing up the balance at PUC's next Cost of Service. PUC will follow the accounting treatment for deferral and variance accounts as described in the Accounting Procedures Handbook and the ACM Report.

Bill Impacts

The proposed rate impacts summarized in Table 11 below, reflect the calculated Incremental Revenue Requirement Rate Riders related to the recovery of incremental revenue requirement as it pertains to the renewal of Sub 16.

Table 11 –Proposed Bill Impacts by Rate Class for Incremental Revenue Requirement

Rate Class	Volumes		% Change (IRM)	% Change (ICM)	% Change (IRM+ ICM)
	kWhs	kWs			
Residential - Time of Use	700	0	5.73	0.44	6.17
Residential – 10th Percentile	294	0	8.57	0.74	9.31
General Service Less Than 50 kW	2,000	0	3.61	0.35	3.95
General Service 50 to 4,999 kW	57,220	145	3.92	0.18	4.10
Unmetered Scattered Load	3,600	0	5.90	0.34	6.25
Sentinel Lighting	50	1	13.86	1.22	15.08
Street Lighting	199,852	585	-3.15	0.48	-2.67

Conclusions

PUC has complied with the Board's Chapter 3 of the Filing Requirements for Transmission and Distribution Applications issued July 12, 2018 and all ACM/ICM Reports and Supplemental Reports.

The ICM is intended to address the treatment of a distributor's capital investment needs that arise during the rate-setting plan that are incremental to a materiality threshold. The ICM is a funding mechanism for significant, incremental and discrete capital projects for which a utility is granted rate recovery in advance of its next rebasing application. In the application above, PUC submits that it has shown the materiality, need and prudence for the incremental capital expenditure as presented.

The proposed rate impacts reflect PUC's 2018 distribution rates, adjusted for a Price Cap Index of 0.9; this includes a Productivity Factor of 0.3 based on the assignment of PUC to the middle cohort Stretch Factor per OEB Policy for ACM/ICM applications, and the calculated Incremental Revenue Requirement Rate Riders as they pertain to costs associated with the renewal of Sub 16.

Consequences of Non-Approval of this ICM

If the approval for incremental revenue requirement is not granted, PUC will be faced with a significant negative cash flow of $315,000 per year in the short term, and a negative incremental revenue requirement of $258,056. The expected impact on ROE from the additional capital and depreciation expense with no recovery would be to lower ROE by 0.6%.

Relief Sought

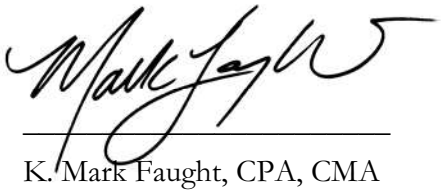
PUC is making an Application for an Order or Orders approving the following:

1. The proposed Rate Riders for recovery of Incremental Revenue Requirement as it relates to the renewal of Sub 16 and set out in Appendix A to the Application as just and reasonable rates and charges pursuant to Section 78 of the OEB Act, to be effective May 1, 2020.
2. An accounting order for the creation of a USofA 1508 Deferral and Variance sub-account to

record costs and recoveries related to the Incremental Revenue Requirement application.

Form of Hearing Requested
PUC requests that this Application be disposed of by way of a written hearing.

Respectfully submitted this 15 day of October, 2019.



K. Mark Faught, CPA, CMA
Director, Finance
PUC Distribution Inc.

Attachments

Appendix A	2020_Capital_Module_ACM_Model Version 5
Appendix B	Phase II Environmental Site Assessment report dated January 11, 2016
Appendix C	Geotechnical Report dated April 2018
Appendix D	Project Description for Sub 16
Appendix E	Town Hall Presentation

Appendix A

2020_Capital_Module_ACM_Model Version 5

Ontario Energy Board

Capital Module
Applicable to ACM and ICM

Note: Depending on the selections made below, certain worksheets in this workbook will be hidden.

Version 5.00

Utility Name	PUC Distribution Inc.
Assigned EB Number	EB-2019-0170
Name of Contact and Title	Mark Faught, Director Finance
Phone Number	705-759-0105
Email Address	regulatory@ssmpuc.com
Is this Capital Module being filed in a CoS or Price-Cap IR Application?	Price-Cap IR
Rate Year	2020
Indicate the Price-Cap IR Year (1, 2, 3, 4, etc) in which PUC Distribution Inc. is applying:	2
Next OEB Scheduled Rebasing Year	2023
PUC Distribution Inc. is applying for:	ICM Approval
Last Rebasing Year:	2018
The most recent complete year for which actual billing and load data exists	2018
Current IPI	1.20%
Strech Factor Assigned to Middle Cohort*	III
Stretch Factor Value	0.30%
Price Cap Index	0.90%

Based on the inputs above, the growth factor utilized in the Materiality Threshold Calculation will be determined by:

Revenues Based on 2018 Board-Approved Distribution Demand

Revenues Based on 2017 Actual Distribution Demand

Notes

Pale green cells represent input cells.

Pale blue cells represent drop-down lists. The applicant should select the appropriate item from the drop-down list.

White cells contain fixed values, automatically generated values or formulae.

While this model has been provided in Excel format and is required to be filed with the applications, the onus remains on the applicant to ensure the accuracy of the data and the results.

**As per ACM/ICM policy, the middle cohort stretch factor is applied to all ACM/ICM applications.*

OEB policies regarding rate-setting and rebasing following distributor consolidations could allow a distributor to not rebase rates for up to ten years. A distributor could also apply for and receive OEB approval to defer rebasing. If a distributor is under Price Cap IR for more than four years after rebasing and applies for an ICM, this spreadsheet will need to be adapted to accommodate those circumstances. The distributor should contact OEB staff to discuss the circumstances so that a customized model can be provided.

Ontario Energy Board

Capital Module
Applicable to ACM and ICM

PUC Distribution Inc.

Select the appropriate rate classes as they appear on your most recent Board-Approved Tariff of Rates and Charges, excluding the MicroFit Class.

How many classes are on your most recent Board-Approved Tariff of Rates and Charges? **6**

Select Your Rate Classes from the **Blue Cells** below. Please ensure that a rate class is assigned to **each shaded cell.**

	Rate Class Classification
1	RESIDENTIAL
2	GENERAL SERVICE LESS THAN 50 kW
3	GENERAL SERVICE 50 TO 4,999 KW
4	UNMETERED SCATTERED LOAD
5	SENTINEL LIGHTING
6	STREET LIGHTING

Ontario Energy Board

Capital Module
Applicable to ACM and ICM

PUC Distribution Inc.

Input the billing determinants associated with PUC Distribution Inc.'s Revenues Based on 2018 Board-Approved Distribution Demand. Input the current approved distribution rates. Sheets 4 & 5 calculate the NUMERATOR portion of the growth factor calculation.

		2018 Board-Approved Distribution Demand			Current Approved Distribution Rates		
Rate Class	**Units**	**Billed Customers or Connections**	**Billed kWh**	**Billed kW (if applicable)**	**Monthly Service Charge**	**Distribution Volumetric Rate kWh**	**Distribution Volumetric Rate kW**
RESIDENTIAL	$/kWh	29,816	288,323,799		28.17	0.0043	
GENERAL SERVICE LESS THAN 50 kW	$/kWh	3,431	92,411,463		20.95	0.0251	
GENERAL SERVICE 50 TO 4,999 KW	$/kW	357	244,620,598	614,743	115.66		6.8002
UNMETERED SCATTERED LOAD	$/kWh	22	944,731		12.82	0.0387	
SENTINEL LIGHTING	$/kW	354	209,800	593	3.59		33.4983
STREET LIGHTING	$/kW	8,070	2,398,221	7,030	1.38		9.0221

Ontario Energy Board

Capital Module
Applicable to ACM and ICM

PUC Distribution Inc.

Calculation of pro forma 2018 Revenues. No input required.

	2018 Board-Approved Distribution Demand			Current Approved Distribution Rates										
Rate Class	Billed Customers or Connections	Billed kWh	Billed kW (if applicable)	Monthly Service Charge	Distribution Volumetric Rate kWh	Distribution Volumetric Rate kW	Service Charge Revenue	Distribution Volumetric Rate Revenue kWh	Distribution Volumetric Rate Revenue kW	Revenues from Rates	Service Charge % Revenue	Distribution Volumetric Rate % Revenue kWh	Distribution Volumetric Rate % Revenue kW	Total % Revenue
	A	B	C	D	E	F	G	H	I	J	K = G / J	L = H / J	M = I / J	N
RESIDENTIAL	29,816	288,323,799		28.17	0.0043	0.0000	10,079,001	1,239,792	0	11,318,793	89.0%	11.0%	0.0%	58.2%
GENERAL SERVICE LESS THAN 50 kW	3,431	92,411,463		20.95	0.0251	0.0000	862,553	2,319,528	0	3,182,081	27.1%	72.9%	0.0%	16.4%
GENERAL SERVICE 50 TO 4,999 KW	357	244,620,598	614,743	115.66	0.0000	6.8002	495,487	0	4,180,375	4,675,863	10.6%	0.0%	89.4%	24.0%
UNMETERED SCATTERED LOAD	22	944,731		12.82	0.0387	0.0000	3,384	36,561	0	39,946	8.5%	91.5%	0.0%	0.2%
SENTINEL LIGHTING	354	209,800	593	3.59	0.0000	33.4983	15,250	0	19,864	35,115	43.4%	0.0%	56.6%	0.2%
STREET LIGHTING	8,070	2,398,221	7,030	1.38	0.0000	9.0221	133,639	0	63,425	197,065	67.8%	0.0%	32.2%	1.0%
Total	**42,050**	**628,908,612**	**622,366**				**11,589,315**	**3,595,881**	**4,263,665**	**19,448,862**				**100.0%**

Ontario Energy Board

Capital Module
Applicable to ACM and ICM

PUC Distribution Inc.

Applicants Rate Base

Last COS Rebasing: 2018

Average Net Fixed Assets

Gross Fixed Assets - Re-based Opening	$ 106,264,141	A			
Add: CWIP Re-based Opening		B			
Re-based Capital Additions	$ 5,358,355	C			
Re-based Capital Disposals		D			
Re-based Capital Retirements		E			
Deduct: CWIP Re-based Closing	-$ 420,179	F			
Gross Fixed Assets - Re-based Closing	$ 111,202,317	G			
Average Gross Fixed Assets			$	108,733,229	H = (A + G) / 2
Accumulated Depreciation - Re-based Opening	$ 13,880,189	I			
Re-based Depreciation Expense	$ 3,780,329	J			
Re-based Disposals		K			
Re-based Retirements		L			
Accumulated Depreciation - Re-based Closing	$ 17,660,518	M			
Average Accumulated Depreciation			$	15,770,354	N = (I + M) / 2
Average Net Fixed Assets			**$**	**92,962,876**	O = H - N

Working Capital Allowance

Working Capital Allowance Base	$ 89,269,060	P			
Working Capital Allowance Rate	7.5%	Q			
Working Capital Allowance			**$**	**6,695,180**	R = P * Q
Rate Base			**$**	**99,658,055**	S = O + R

Return on Rate Base

Deemed ShortTerm Debt %	4.00%	T	$	3,986,322	W = S * T
Deemed Long Term Debt %	56.00%	U	$	55,808,511	X = S * U
Deemed Equity %	40.00%	V	$	39,863,222	Y = S * V
Short Term Interest	2.29%	Z	$	91,287	AC = W * Z
Long Term Interest	4.12%	AA	$	2,299,311	AD = X * AA
Return on Equity	9.00%	AB	$	3,587,690	AE = Y * AB
Return on Rate Base			**$**	**5,978,287**	AF = AC + AD + AE

Distribution Expenses

OM&A Expenses	$ 11,543,633	AG			
Amortization	$ 3,780,329	AH			
Ontario Capital Tax		AI			
Grossed Up Taxes/PILs	$ 586,716	AJ			
Low Voltage		AK			
Transformer Allowance	$ 82,800	AL			
		AM			
		AN			
		AO			
			$	**15,993,478**	AP = SUM (AG : AO)

Revenue Offsets

Specific Service Charges	-$ 2,698,600	AQ			
Late Payment Charges		AR			
Other Distribution Income		AS			
Other Income and Deductions		AT	**-$**	**2,698,600**	AU = SUM (AQ : AT)
Revenue Requirement from Distribution Rates			**$**	**19,273,165**	AV = AF + AP + AU

Rate Classes Revenue

Rate Classes Revenue - Total (Sheet 4)		$	19,448,862	AW

Ontario Energy Board

Capital Module
Applicable to ACM and ICM

PUC Distribution Inc.

Input the billing determinants associated with PUC Distribution Inc.'s Revenues Based on 2017 Actual Distribution Demand. This sheet calculates the DENOMINATOR portion of the growth factor calculation.
Pro forma Revenue Calculation.

	2017 Actual Distribution Demand			Current Approved Distribution Rates										
Rate Class	Billed Customers or Connections	Billed kWh	Billed kW	Monthly Service Charge	Distribution Volumetric Rate kWh	Distribution Volumetric Rate kW	Service Charge Revenue	Distribution Volumetric Rate Revenue kWh	Distribution Volumetric Rate Revenue kW	Total Revenue By Rate Class	Service Charge % Revenue	Distribution Volumetric Rate % Revenue kWh	Distribution Volumetric Rate % Revenue kW	Total % Revenue
	A	B	C	D	E	F	G	H	I	J	K = G / J_{total}	L = H / J_{total}	M = I / J_{total}	N
RESIDENTIAL	29,729	282,820,547		28.17	0.0043	0.0000	10,049,591	1,216,128	0	11,265,720	52.0%	6.3%	0.0%	58.3%
GENERAL SERVICE LESS THAN 50 kW	3,417	91,035,995		20.95	0.0251	0.0000	859,034	2,285,003	0	3,144,037	4.4%	11.8%	0.0%	16.3%
GENERAL SERVICE 50 TO 4,999 KW	361	245,166,376	610,764	115.66	0.0000	6.8002	501,039	0	4,153,317	4,654,356	2.6%	0.0%	21.5%	24.1%
UNMETERED SCATTERED LOAD	21	907,713		12.82	0.0387	0.0000	3,231	35,128	0	38,359	0.0%	0.2%	0.0%	0.2%
SENTINEL LIGHTING	361	213,661	619	3.59	0.0000	33.4983	15,552	0	20,735	36,287	0.1%	0.0%	0.1%	0.2%
STREET LIGHTING	8,070	2,398,221	7,030	1.38	0.0000	9.0221	133,639	0	63,425	197,065	0.7%	0.0%	0.3%	1.0%
Total	**41,959**	**622,542,513**	**618,413**				**11,562,086**	**3,536,260**	**4,237,478**	**19,335,824**				**100.0%**

Ontario Energy Board

Capital Module
Applicable to ACM and ICM

PUC Distribution Inc.

Current Revenue from Rates

This sheet is used to determine the applicant's most current allocation of revenues (after the most recent revenue to cost ratio adjustment, if applicable) to appropriately allocate the incremental revenue requirement to the classes.

	Current OEB-Approved Base Rates			2018 Board-Approved Distribution Demand										
Rate Class	Monthly Service Charge	Distribution Volumetric Rate kWh	Distribution Volumetric Rate kW	Re-based Billed Customers or Connections	Re-based Billed kWh	Re-based Billed kW	Current Base Service Charge Revenue	Current Base Distribution Volumetric Rate kWh Revenue	Current Base Distribution Volumetric Rate kW Revenue	Total Current Base Revenue	Service Charge % Total Revenue	Distribution Volumetric Rate % Total Revenue	Distribution Volumetric Rate % Total Revenue	Total % Revenue
	A	B	C	D	E	F	G	H	I	J	L = G / J_{total}	M = H / J_{total}	N = I / J_{total}	O
RESIDENTIAL	28.17	0.0043	0	29,816	288,323,799	0	10,079,001	1,239,792	0	11,318,793	51.82%	6.37%	0.00%	58.2%
GENERAL SERVICE LESS THAN 50 kW	20.95	0.0251	0	3,431	92,411,463	0	862,553	2,319,528	0	3,182,081	4.43%	11.93%	0.00%	16.4%
GENERAL SERVICE 50 TO 4,999 KW	115.66	0	6.8002	357	244,620,598	614,743	495,487	0	4,180,375	4,675,863	2.55%	0.00%	21.49%	24.0%
UNMETERED SCATTERED LOAD	12.82	0.0387	0	22	944,731	0	3,384	36,561	0	39,946	0.02%	0.19%	0.00%	0.2%
SENTINEL LIGHTING	3.59	0	33.4983	354	209,800	593	15,250	0	19,864	35,115	0.08%	0.00%	0.10%	0.2%
STREET LIGHTING	1.38	0	9.0221	8,070	2,398,221	7,030	133,639	0	63,425	197,065	0.69%	0.00%	0.33%	1.0%
Total							**11,589,315**	**3,595,881**	**4,263,665**	**19,448,862**				**100.0%**

Ontario Energy Board

Capital Module
Applicable to ACM and ICM

PUC Distribution Inc.

No Input Required.

Final Materiality Threshold Calculation

$$Threshold\ Value\ (\%) = 1 + \left[\left(\frac{RB}{d}\right) \times (g + PCI \times (1+g))\right] \times \left((1+g) \times (1+PCI)\right)^{n-1} + 10\%$$

Cost of Service Rebasing Year		**2018**	
Price Cap IR Year in which Application is made		**2**	n
Price Cap Index		**0.90%**	PCI
Growth Factor Calculation			
Revenues Based on 2018 Board-Approved Distribution Demand		**$19,448,862**	
Revenues Based on 2017 Actual Distribution Demand		**$19,335,824**	
Growth Factor		**0.58%**	$g\ (Note\ 1)$
Dead Band		**10%**	
Average Net Fixed Assets			
Gross Fixed Assets Opening	$	106,264,141	
Add: CWIP Opening	$	-	
Capital Additions	$	5,358,355	
Capital Disposals	$	-	
Capital Retirements	$	-	
Deduct: CWIP Closing	-$	420,179	
Gross Fixed Assets - Closing	$	111,202,317	
Average Gross Fixed Assets	$	108,733,229	
Accumulated Depreciation - Opening	$	13,880,189	
Depreciation Expense	$	3,780,329	
Disposals	$	-	
Retirements	$	-	
Accumulated Depreciation - Closing	$	17,660,518	
Average Accumulated Depreciation	$	15,770,354	
Average Net Fixed Assets	$	92,962,876	
Working Capital Allowance			
Working Capital Allowance Base	$	89,269,060	
Working Capital Allowance Rate		8%	
Working Capital Allowance	$	6,695,180	
Rate Base	**$**	**99,658,055**	RB
Depreciation	**$**	**3,780,329**	d

Threshold Value (varies by Price Cap IR Year subsequent to CoS rebasing)

Price Cap IR Year 2019	**149%**
Price Cap IR Year 2020	**150%**
Price Cap IR Year 2021	**150%**
Price Cap IR Year 2022	**151%**
Price Cap IR Year 2023	**152%**
Price Cap IR Year 2024	**152%**
Price Cap IR Year 2025	**153%**
Price Cap IR Year 2026	**154%**
Price Cap IR Year 2027	**154%**
Price Cap IR Year 2028	**155%**

Threshold CAPEX $Threshold\ Value\ \times d$

Price Cap IR Year 2019	**$ 5,643,130**
Price Cap IR Year 2020	**$ 5,665,251**
Price Cap IR Year 2021	**$ 5,687,702**
Price Cap IR Year 2022	**$ 5,710,487**
Price Cap IR Year 2023	**$ 5,733,612**
Price Cap IR Year 2024	**$ 5,757,081**
Price Cap IR Year 2025	**$ 5,780,899**
Price Cap IR Year 2026	**$ 5,805,073**
Price Cap IR Year 2027	**$ 5,829,607**
Price Cap IR Year 2028	**$ 5,854,506**

Note 1: The growth factor g is annualized, depending on the number of years between the numerator and denominator for the calculation. Typically, for ACM review in a cost of service and in the fourth year of Price Cap IR, the ratio is divided by 2 to annualize it. No division is normally required for the first three years under Price Cap IR.

Ontario Energy Board

Capital Module
Applicable to ACM and ICM

PUC Distribution Inc.

Identify ALL Proposed ACM and ICM projects and related CAPEX costs in the relevant years

	Cost of Service	*Price Cap IR*		*Price Cap IR*
	Test Year	Year 1		Year 2
	2018	2019		2020
CAPEX[1]	$ 4,938,176	$ 5,770,421		$ 9,100,376
Materiality Threshold		$ 5,643,130		$ 5,665,251
Maximum Eligible Incremental Capital (Forecasted Capex less Threshold)		$ 127,291		$ 3,435,125

			Test Year	Year 1 2019			Year 2 2020		
Project Descriptions:	**Type**		2018	**Proposed ACM/ICM**	**Amortization Expense**	**CCA**	**Proposed ACM/ICM**	**Amortization Expense**	**CCA**
Substation 16 Rebuild	**New ICM**						$ 4,728,229	$ 117,206	$ 402,164
Total Cost of ACM/ICM Projects				$ -	$ -	$ -	$ 4,728,229	$ 117,206	$ 402,164
Maximum Allowed Incremental Capital				$ -			$ 3,435,125		

1. For the Cost of Service Test Year, CAPEX refers to the CAPEX approved in the DSP. For subsequent Price CAP IR years, the CAPEX to be entered is the actual CAPEX. For the current Price Cap IR year, the CAPEX to be entered is the proposed CAPEX including any ICM/updated ACM project CAPEX for the year.

Ontario Energy Board

Capital Module
Applicable to ACM and ICM

PUC Distribution Inc.

Incremental Capital Adjustment **Rate Year:** 2020

Current Revenue Requirement

Current Revenue Requirement - Total	$ 19,273,165	A

Eligible Incremental Capital for ACM/ICM Recovery

	Total Claim	Eligible for ACM/ICM (Full Year Prorated Amount) (from Sheet 10b)	
Amount of Capital Projects Claimed	$ 4,728,229	$ 3,435,125	B
Depreciation Expense	$ 117,206	$ 85,152	C
CCA	$ 402,164	$ 292,178	V

ACM/ICM Incremental Revenue Requirement Based on Eligible Amount in Rate Year

Return on Rate Base

Incremental Capital			$	3,435,125	B
Depreciation Expense (prorated to Eligible Incremental Capital)			$	85,152	C
Incremental Capital to be included in Rate Base (average NBV in year)			$	3,392,549	D = B - C/2
	% of capital structure				
Deemed Short-Term Debt	4.0%	E	$	135,702	G = D * E
Deemed Long-Term Debt	56.0%	F	$	1,899,827	H = D * F
	Rate (%)				
Short-Term Interest	2.29%	I	$	3,108	K = G * I
Long-Term Interest	4.12%	J	$	78,273	L = H * J
Return on Rate Base - Interest			$	81,380	M = K + L
	% of capital structure				
Deemed Equity %	40.00%	N	$	1,357,019	P = D * N
	Rate (%)				
Return on Rate Base -Equity	9.00%	O	$	122,132	Q = P * O
Return on Rate Base - Total			$	203,512	R = M + Q

Amortization Expense

Amortization Expense - Incremental	C	$	85,152	S

Grossed up Taxes/PILs

Regulatory Taxable Income	O	$	122,132	T
Add Back Amortization Expense (Prorated to Eligible Incremental Capital)	S	$	85,152	U
Deduct CCA (Prorated to Eligible Incremental Capital)		$	292,178	V
Incremental Taxable Income		-$	84,895	W = T + U - V
Current Tax Rate 26.5%	X			
Taxes/PILs Before Gross Up		-$	22,497	Y = W * X
Grossed-Up Taxes/PILs		-$	30,608	Z = Y / (1 - X)

Incremental Revenue Requirement

Return on Rate Base - Total	Q	$	203,512	AA
Amortization Expense - Total	S	$	85,152	AB
Grossed-Up Taxes/PILs	Z	-$	30,608	AC
Incremental Revenue Requirement		$	258,056	AD = AA + AB + AC

Ontario Energy Board

Capital Module
Applicable to ACM and ICM

PUC Distribution Inc.

Calculation of incremental rate rider. Choose one of the 3 options: Fixed and Variable Rate Riders

Rate Class	Service Charge % Revenue	Distribution Volumetric Rate % Revenue kWh	Distribution Volumetric Rate % Revenue kW	Service Charge Revenue	Distribution Volumetric Rate Revenue kWh	Distribution Volumetric Rate Revenue kW	Total Revenue by Rate Class	Billed Customers or Connections	Billed kWh	Billed kW	Service Charge Rate Rider	Distribution Volumetric Rate kWh Rate Rider	Distribution Volumetric Rate kW Rate Rider
	From Sheet 7	*From Sheet 7*	*From Sheet 7*	Col C * Col I_{total}	Col D* Col I_{total}	Col E* Col I_{total}	*Col I_{total}*	*From Sheet 4*	*From Sheet 4*	*From Sheet 4*	Col F / Col K / 12	Col G / Col L	Col H / Col M
RESIDENTIAL	51.82%	6.37%	0.00%	133,732	16,450	0	150,182	29,816	288,323,799		0.42	0.0000	0.0000
GENERAL SERVICE LESS THAN 50 kW	4.43%	11.93%	0.00%	11,445	30,776	0	42,221	3,431	92,411,463		0.28	0.0003	0.0000
GENERAL SERVICE 50 TO 4,999 KW	2.55%	0.00%	21.49%	6,574	0	55,467	62,041	357	244,620,598	614,743	1.53	0.0000	0.0902
UNMETERED SCATTERED LOAD	0.02%	0.19%	0.00%	45	485	0	530	22	944,731		0.17	0.0005	0.0000
SENTINEL LIGHTING	0.08%	0.00%	0.10%	202	0	264	466	354	209,800	593	0.05	0.0000	0.4445
STREET LIGHTING	0.69%	0.00%	0.33%	1,773	0	842	2,615	8,070	2,398,221	7,030	0.02	0.0000	0.1197
Total	**59.59%**	**18.49%**	**21.92%**	**153,772**	**47,712**	**56,572**	**258,056**	**42,050**	**628,908,612**	**622,366**			
							258,056						
							From Sheet 11, E93						

Appendix B

Phase II Environmental Site Assessment report dated January 11, 2016

Phase II Environmental Site Assessment

601 Third Line East
Sault Ste. Marie, Ontario

Prepared for:

Tulloch Engineering and Surveying
71 Black Road, Unit #8
Sault Ste. Marie, ON P6B 0A3

Attn: Mr. Josh Lelievre

January 11, 2016

Pinchin File: 110533.001

MEMBER OF THE PINCHIN GROUP

Issued To:	**Tulloch Engineering and Surveying**
Contact:	**Mr. Josh Lelievre** **Project Manager**
Issued On:	**January 11, 2016**
Pinchin File:	**110533.001**
Issuing Office:	**126 Queen Street East, Suite 3, Sault Ste. Marie, ON P6A 1Y5**
Primary Pinchin Contact:	**Christian Tenaglia, Office Manager**

Author:
Joshua Sikorski, C.E.T.
Operations Manager
705.575.9207 ext. 3504
jsikorski@pinchin.com

Reviewer:
Christian Tenaglia, P.Eng., M.E.S., EP, QP_{ESA}
Office Manager – Sault Ste. Marie
705.575.9207 ext. 3502
ctenaglia@pinchin.com

EXECUTIVE SUMMARY

Pinchin Ltd. (Pinchin) was retained through an Authorization to Proceed signed by Mr. Josh Lelievre of Tulloch Engineering and Surveying (Client) to conduct a Phase II Environmental Site Assessment (ESA) of the property located at 601 Third Line East in Sault Ste. Marie, Ontario (hereafter referred to as the Site).

The Site is developed as an electrical transformer substation with a single-storey mechanical building (Site Building), occupied by PUC Services Inc.

Pinchin was advised by the Client that the purpose of the Phase I ESA was to assess potential issues of environmental concern as part of the internal due diligence requirements for the redevelopment of the Site.

Based on the results of the Phase I ESA completed by Pinchin, the following could result in potential subsurface impacts at the Site:

- Black staining (approximately 4 m^2) was observed on the ground surface adjacent to the west transformer. The Site Representative reported that the source of the staining was an oil leak within the west transformer.

Based on the above-mentioned finding, Pinchin recommended that a Phase II ESA be conducted at the Site in order to assess for the presence of environmental impacts.

The Phase II ESA was completed at the Site by Pinchin on December 3, 2015, and consisted of the advancement of four boreholes and three hand auger holes.

Select “worst case” soil samples collected during the borehole drilling program were submitted for laboratory analysis of benzene, toluene, ethylbenzene, xylenes (BTEX), petroleum hydrocarbons (PHCs) in the F1 through F4 fractionations (F1-F4) and polychlorinated biphenyls (PCBs).

Based on Site-specific information, the soil and groundwater quality was assessed based on the Ontario Ministry of the Environment and Climate Change *Table 2 Standards* for industrial/commercial/community land use and medium/fine-textured soil.

The reported concentrations of BTEX, PHCs (F1-F4) and PCBs in the soil samples submitted for analysis met the *Table 2 Standards*, with the exception of soil sample HA-1 collected at hand auger location BH5, which had concentrations of PHCs (F2 and F3) that exceeded the *Table 2 Standard* and soil sample BH6 collected at hand auger location BH6, which had concentrations of PHCs (F2 and F3) that exceeded the *Table 2 Standard*.

The findings of this Phase II ESA identified PHC-impacted soil at hand auger locations BH5 and BH6. As such, it is Pinchin's recommendation that a remedial excavation be completed in the vicinity of these hand auger locations to remove the soil exceeding the *Table 2 Standard*.

This Executive Summary is subject to the same standard limitations as contained in the report and must be read in conjunction with the entire report.

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APPENDICES

FIGURES

TABLES

1.0 INTRODUCTION

Pinchin Ltd. (Pinchin) was retained through an Authorization to Proceed signed by Mr. Josh Lelievre of Tulloch Engineering and Surveying (Client) to conduct a Phase II Environmental Site Assessment (ESA) of the property located at 601 Third Line East in Sault Ste. Marie, Ontario (hereafter referred to as the Site). The Site location is shown on Figure 1 (all Figures are provided in Appendix I).

The Site is developed as an electrical transformer substation with a single-storey mechanical building (Site Building), occupied by PUC Services Inc. (PUC).

Pinchin was advised by the Client that the purpose of the Phase I ESA was to assess potential issues of environmental concern as part of the internal due diligence requirements for the redevelopment of the Site.

This Phase II ESA was completed in general accordance with the Canadian Standards Association document entitled "*Phase II Environmental Site Assessment, CSA Standard Z769-00 (R2013)*", dated 2000 and reaffirmed in 2013.

1.1 Background

Pinchin completed a Phase I ESA of the Site for the Client, the findings of which were provided in the report entitled "*Phase I Environmental Site Assessment, 601 Third Line East, Sault Ste. Marie, Ontario*", dated January 11, 2016. The results of the Phase I ESA completed by Pinchin identified the following area of potential environmental concern (APEC) that could give rise to potential subsurface impacts in connection with the Site:

- Black staining (approximately 4 m^2) was observed on the ground surface adjacent to the west transformer. The Site Representative reported that the source of the staining was an oil leak within the west transformer.

Based on the above-mentioned finding, it was Pinchin's recommendation that a Phase II ESA be conducted at the Site in order to assess the above-noted APEC for the presence of environmental impacts.

1.2 Scope of Work

The scope of work completed by Pinchin, as outlined in the Pinchin proposal entitled "*Proposal for Phase I and II Environmental Site Assessments, 601 Third Line East, Sault Ste. Marie, Ontario*" submitted to the Client on November 18, 2015, included the following:

- Advancement of four boreholes following the clearance of underground services;

- Submission of select "worst case" soil samples for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (collectively referred to as BTEX), petroleum hydrocarbons (PHCs) in the F1 to F4 fraction ranges (F1-F4) and polychlorinated biphenyls (PCBs);
- Comparison of the soil laboratory analytical results to the applicable regulatory criteria; and
- Preparation of a factual report detailing the findings of the Phase II ESA and recommendations.

Given the close proximity of the staining to the transformer, three additional hand augered boreholes were advanced within the stained area to collect shallow surface soil samples of the PHC impacted material.

2.0 METHODOLOGY

The investigation methodology was conducted in general accordance with the Ontario Ministry of the Environment and Climate Change (MOECC, formerly the Ontario Ministry of the Environment) document entitled *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario"* dated December 1996 (*MOECC Sampling Guideline*), the Association of Professional Geoscientists of Ontario document entitled *"Guidance for Environmental Site Assessments under Ontario Regulation 153/04 (as amended)"*, dated April 2011 (*APGO Guideline*) and Pinchin's standard operating procedures (SOPs).

2.1 Borehole Investigation

Pinchin retained North Drilling (North) to complete the borehole drilling program at the Site on December 3, 2015 following the clearance of underground services in the vicinity of the work area by public utility locators and a private utility locator retained by Pinchin. North is licensed by the MOECC in accordance with Ontario Regulation 903 (as amended) to undertake borehole drilling activities.

The boreholes were advanced to a maximum depth of 6.71 mbgs using a Geoprobe 7822DT direct push drill rig. Soil samples were collected at continuous 1.5 metre intervals using 8.3 centimetre (cm) outer diameter (OD) direct push soil samplers with dedicated single-use sample liners. Discrete soil samples were collected from the single-use liners and containerized in laboratory-supplied glass sampling jars. The hand auger holes were advanced in restricted locations which the drill rig was unable to operate due to permanent structures on-Site. The hand auger holes were advanced to a maximum depth of 0.76 mbgs. Soil samples were collected at continuous 0.30 metre intervals. Discrete soil samples were collected from the interior of the hand auger spoon and containerized in laboratory-supplied glass sampling jars.

Subsurface soil conditions were logged on-Site by Pinchin personnel at the time of drilling. Soil samples were examined for visual and olfactory evidence of impacts and a portion of each sample was analyzed in the field for petroleum-derived vapour concentrations in soil headspace using a hydrocarbon surveyor operated in methane elimination mode (RKI Eagle).

The locations of the boreholes and hand augers are shown on Figure 2 and a description of the subsurface stratigraphy encountered during the drilling program is documented in the borehole logs included in Appendix II.

2.2 Sampling and Laboratory Analysis

2.2.1 Soil

One most apparent “worst case” soil sample, based on vapour concentrations as well as visual and/or olfactory considerations, recovered from each borehole and two of the hand auger holes were submitted for laboratory analysis of BTEX, PHCs (F1-F4) and PCBs.

In addition, representative soil samples were submitted for pH analysis and grain size distribution analysis to confirm the Site Condition Standards applicable to the Site as provided in the MOECC document entitled “*Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*”, dated April 15, 2011 (*MOECC Standards*).

The borehole and hand auger locations are shown on Figure 2. Table 2 provides a summary of the soil samples submitted for laboratory analysis.

2.2.2 Analytical Laboratory

Selected soil and groundwater samples were delivered to AGAT Laboratories Ltd. (AGAT) in Mississauga, Ontario for analysis. AGAT is an independent laboratory accredited by the Standards Council of Canada and the Canadian Association for Laboratory Accreditation. Formal chain of custody records of the sample submissions were maintained between Pinchin and the staff at AGAT.

2.3 QA/QC Protocols

Various quality assurance/quality control (QA/QC) protocols were followed during the Phase II ESA to ensure that representative samples were obtained and that representative analytical data were reported by the laboratory.

Field QA/QC protocols that were employed by Pinchin included the following:

- Soil samples were extracted from the interior of the sampling device (where possible), rather than from areas in contact with the sampler walls to minimize the potential for cross-contamination;
- Soil samples were placed in laboratory-supplied glass sample jars;
- Soil samples were placed in coolers on ice immediately upon collection, with appropriate sample temperatures maintained prior to submission to the laboratory;
- Dedicated and disposable nitrile gloves were used for sample handling;
- Non-dedicated monitoring and sampling equipment (e.g., sampling spoons, hand augers) was cleaned before initial use and between uses to minimize the potential for cross-contamination by washing with an Alconox™/potable water mixture followed by a deionized water rinse; and
- Sample collection and handling procedures were performed in general accordance with the *MOECC Sampling Guideline*, the *APGO Guideline* and Pinchin's SOPs for Phase II ESAs.

AGAT's internal laboratory QA/QC consisted of the analysis of laboratory duplicate, method blank, matrix spike and spiked blank samples.

2.4 Site Condition Standards

The Site is an industrial property located in the City of Sault Ste. Marie. It is Pinchin's understanding that potable water for the Site and surrounding area is supplied by privately-owned supply wells.

Ontario Regulation 153/04 (as amended) states that a Site is classified as an "environmentally sensitive area" if the pH of the surface soil (less than 1.5 mbgs) is less than 5 or greater than 9, the pH of the subsurface soil (greater than 1.5 mbgs) is less than 5 or greater than 11, or if the Site is an area of natural significance or is adjacent to or contains land within 30 metres of an area of natural significance. Two representative soil samples collected from the boreholes advanced at the Site were submitted for pH analysis. The pH values measured in the submitted soil samples were within the limits for non-sensitive sites. The Site is also not an area of natural significance and it is not adjacent to, nor does it contain land within 30 metres of, an area of natural significance. As such, the Site is not an environmentally sensitive area.

Two representative soil samples collected from the boreholes advanced at the Site were submitted for 75 micron single-sieve grain size analysis. Based on the results of this analysis, the soil at the Site is interpreted to be medium/fine-textured for the purpose of selecting the appropriate *MOECC Standards.*

The pH and grain size analytical results are summarized in Table 3.

Based on the above, the appropriate Site Condition Standards for the Site are:

- "Table 2: Full Depth Generic Site Condition Standards for Use in a Potable Ground Water Condition", provided in the *MOECC Standards* (*Table 2 Standards*) for:
  - Medium/fine-textured soils; and
  - Industrial/commercial/community property use.

As such, the analytical results have been compared to these *Table 2 Standards*.

3.0 RESULTS

3.1 Site Geology and Hydrogeology

Based on the soil samples recovered during the borehole drilling program, the soil stratigraphy at the drilling locations below the gravel generally consists of fill material comprised of sand and gravel to a depth between approximately 0 and 0.76 mbgs.

Native subsurface material underlying the fill material was observed to generally consist of silt or clay and silt that extended to the maximum borehole completion depth of 6.70 mbgs. Moist to wet soil conditions were generally observed at 0.76 mbgs.

A detailed description of the subsurface stratigraphy encountered during borehole advancement is documented in the borehole logs located in Appendix II.

Fort Creek is located approximately 0.3 kilometre (km) southwest of the Site. The topography of the Site and surrounding area were observed to slope towards the southeast. Groundwater flow at the Site is inferred to be towards the southwest based on the topography of the Site area and the location of Fort Creek.

3.2 Soil Headspace Vapour Concentrations

Vapour concentrations measured in the headspace of soil samples collected during the drilling investigation are presented on the borehole logs in Appendix II and ranged from 0 parts per million by volume (ppm_v) to a maximum of 10 ppm_v in soil sample BH1 SS2 collected at a depth of 0.76 to 1.37 mbgs, BH2 SS2 collected at a depth of 1.52 to 2.13 mbgs and BH4 SS3 collected at a depth of 1.52 to 2.13 mbgs.

3.3 Field Observations

No odours or staining were observed in the soil samples collected during the borehole drilling program, with the exception of soil samples:

- HA1 SS1 through SS5 from borehole location BH5, ranging from 0 to 0.76 mbgs;
- HA2 SS1 through SS4 from borehole location BH6, ranging from 0 to 0.61 mbgs; and
- HA3 SS1 through SS5 from borehole location BH7, ranging from 0 to 0.76 mbgs.

3.4 Analytical

3.4.1 Soil

As indicated in Table 3, reported concentrations of BTEX, PHCs (F1-F4) and PCBs in the soil samples submitted for analysis met the *Table 2 Standard*, with the following exceptions:

- Soil sample HA-1 collected at hand auger location BH5 exceeded the *Table 2 Standard* for PHCs (F2) (800 micrograms per gram (µg/g) vs. the *Table 2 Standard* of 250 µg/g) and PHCs (F3) (9,200 µg/g vs. the *Table 2 Standard* of 2,500 µg/g); and
- Soil sample HA-2 collected at hand auger location BH6 exceeded the *Table 2 Standard* for PHCs (F2) (1,800 µg/g vs. the *Table 2 Standard* of 250 µg/g) and PHCs (F3) (16,000 µg/g vs. the *Table 2 Standard* of 2,500 µg/g).

The laboratory Certificate of Analysis for the soil samples is provided in Appendix IV.

4.0 FINDINGS AND CONCLUSIONS

Based on the work completed, the following is a summary of the activities and findings of this Phase II ESA:

- Pinchin retained North to advance four boreholes and three hand auger holes at the Site on December 3, 2015. The boreholes were advanced to a maximum depth of 6.71 mbgs using a Geoprobe 7822DT direct push drill rig and manual hand augering equipment;
- The soil stratigraphy at the drilling locations generally consists of sand and gravel fill material to a depth between approximately 0 and 0.76 mbgs overlying native soil comprised of silt and clay and silt that extended to the maximum borehole completion depth of 6.70 mbgs. The soil was generally observed to be moist to wet at 0.76 mbgs;
- Based on Site-specific information, the soil quality was assessed based on the *Table 2 Standard* for industrial/commercial/community land use and medium/fine-textured soils;

- Six “worst case” soil samples based on the results of field screening were submitted for laboratory analysis of BTEX, PHCs (F1-F4) and PCBs; and
- Reported concentrations in the soil samples submitted for analysis of BTEX, PHCs (F1-F4) and PCBs satisfied their respective *Table 2 Standard*, with the exception of soil sample HA-1 collected at hand auger location BH5, which had a concentration of PHCs (F2 and F3) that exceeded the *Table 2 Standard*, and the soil sample HA-2 collected at hand auger location BH6, which had concentrations of PHCs (F2 and F3) that exceeded the *Table 2 Standard.*

The findings of this Phase II ESA identified PHC-impacted soil at hand auger locations BH5 and BH6. As such, it is Pinchin’s recommendation that a remedial excavation be completed in the vicinity of these hand auger locations to remove the soil exceeding the *Table 2 Standard*.

5.0 LIMITATIONS

This Phase II ESA was performed for Tulloch Engineering and Surveying (Client) in order to investigate potential environmental impacts at 601 Third Line East, Sault Ste. Marie, Ontario (Site). The term recognized environmental condition means the presence or likely presence of any hazardous substance on a property under conditions that indicate an existing release, past release, or a material threat of a release of a hazardous substance into structures on the property or into the ground, groundwater, or surface water of the property. This Phase II ESA does not quantify the extent of the current and/or recognized environmental condition or the cost of any remediation.

Conclusions derived are specific to the immediate area of study and cannot be extrapolated extensively away from sample locations. Samples have been analyzed for a limited number of contaminants that are expected to be present at the Site, and the absence of information relating to a specific contaminant does not indicate that it is not present.

No environmental site assessment can wholly eliminate uncertainty regarding the potential for recognized environmental conditions on a property. Performance of this Phase II ESA to the standards established by Pinchin is intended to reduce, but not eliminate, uncertainty regarding the potential for recognized environmental conditions on the Site, and recognizes reasonable limits on time and cost.

This Phase II ESA was performed in general compliance with currently acceptable practices for environmental site investigations, and specific Client requests, as applicable to this Site. The scope of work completed by Pinchin, as part of this Phase II ESA, is not sufficient (in and of itself) to meet the reporting requirements for the submission of a Record of Site Condition (RSC) in accordance with Ontario Regulation 153/04 (as amended). If an RSC is an intended end product of work conducted at the Site, further consultation and/or work will be required.

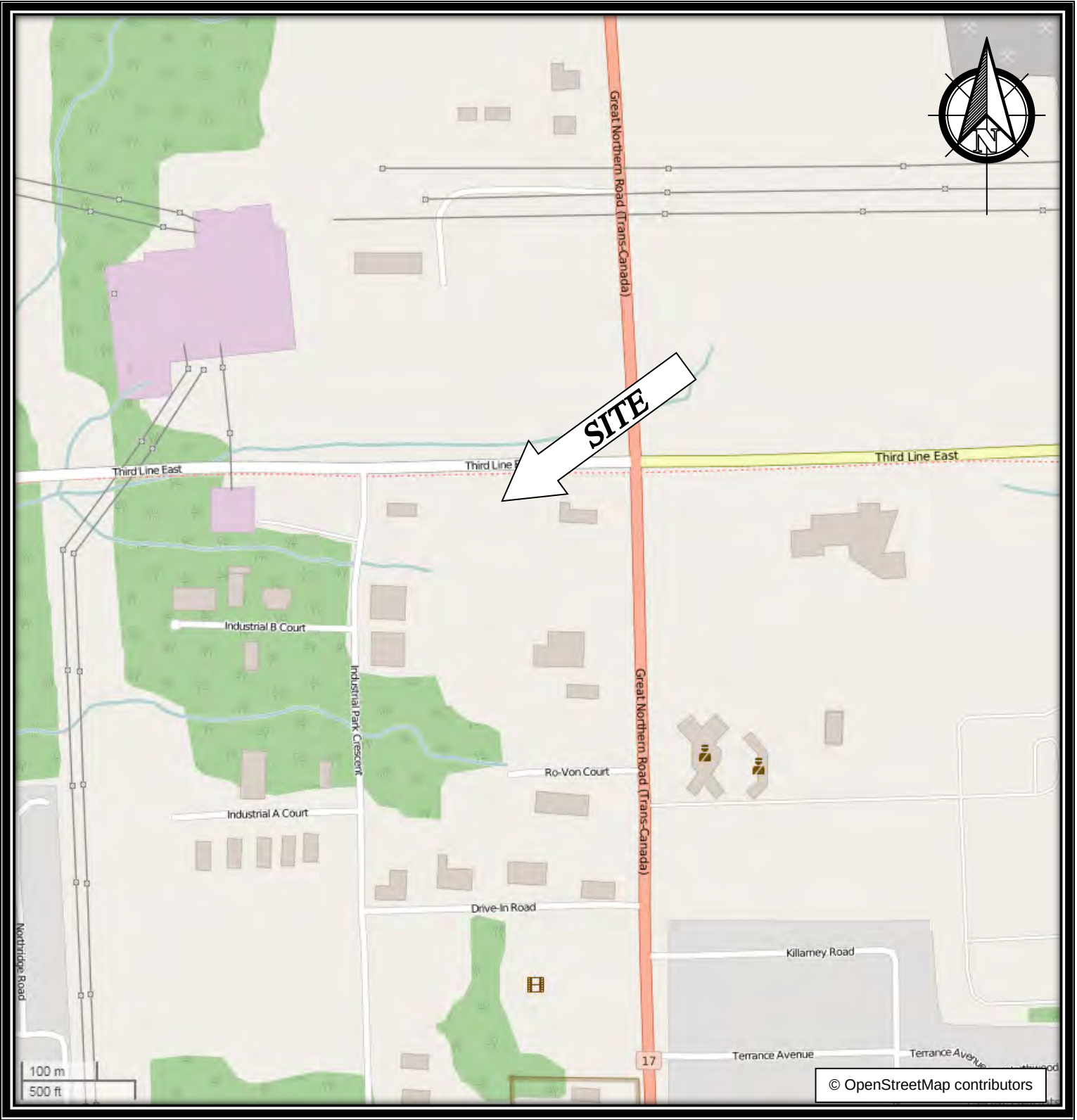
This report was prepared for the exclusive use of the Client, subject to the conditions and limitations contained within the duly authorized work plan. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. If additional parties require reliance on this report, written authorization from Pinchin will be required. Pinchin disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed. Furthermore, this report should not be construed as legal advice.

Pinchin will not be responsible for any consequential or indirect damages. Pinchin will only be liable for damages resulting from the negligence of Pinchin. Pinchin will not be liable for any losses or damage if the Client has failed, within a period of two years following the date upon which the claim is discovered (Claim Period), to commence legal proceedings against Pinchin to recover such losses or damage unless the laws of the jurisdiction which governs the Claim Period which is applicable to such claim provides that the applicable Claim Period is greater than two years and cannot be abridged by the contract between the Client and Pinchin, in which case the Claim Period shall be deemed to be extended by the shortest additional period which results in this provision being legally enforceable.

Pinchin makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and these interpretations may change over time.

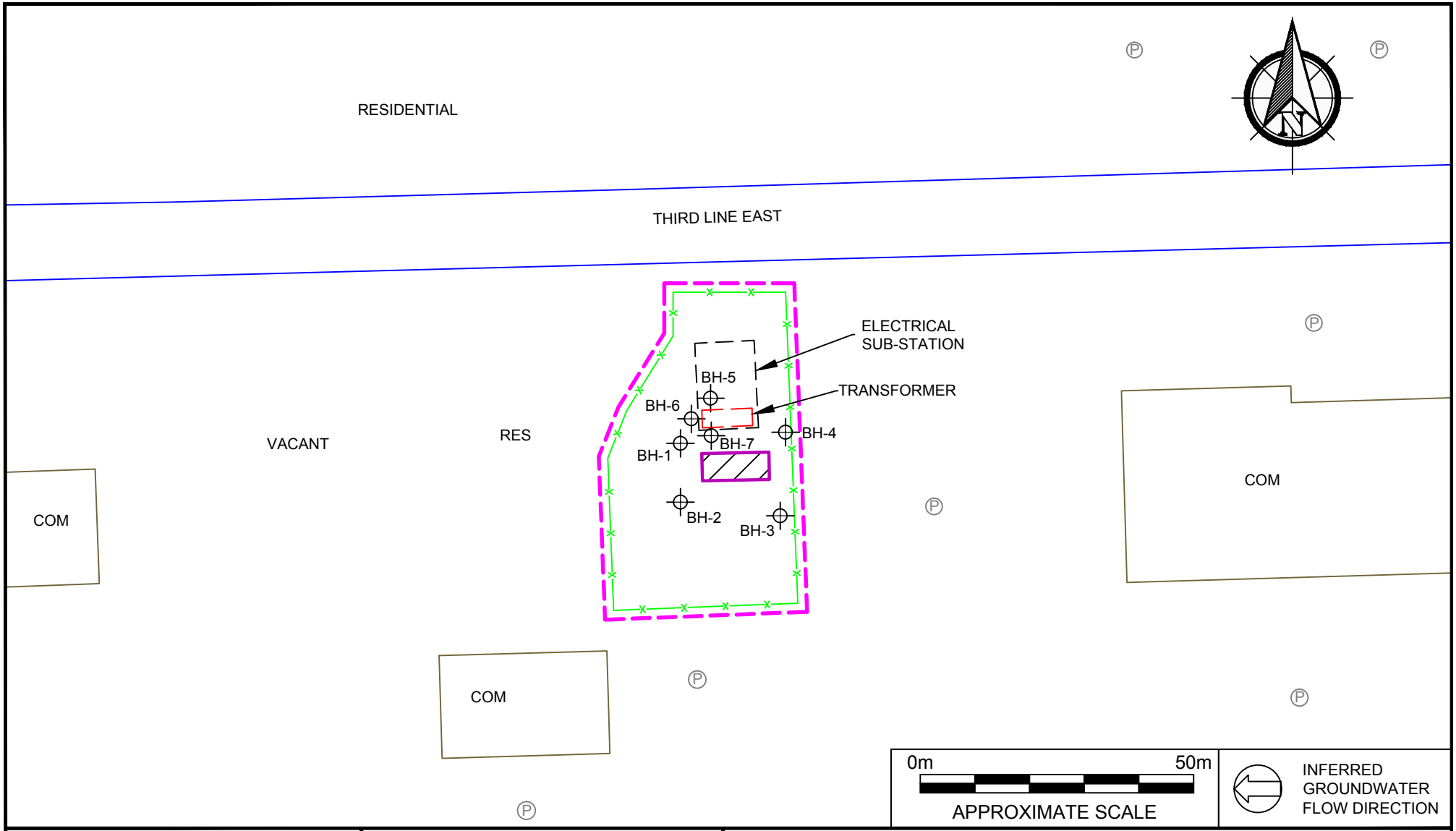
APPENDIX I

Figures



PINCHIN

PROJECT NAME: PHASE II ENVIRONMENTAL SITE ASSESSMENT			
CLIENT NAME: TULLOCH ENGINEERING AND SURVEYING			
PROJECT LOCATION: 601 THIRD LINE EAST, SAULT STE. MARIE, ONTARIO			
FIGURE NAME: KEY MAP			FIGURE NO.: 1
SCALE: AS SHOWN	PROJECT NO.: 110533.001	DATE: JANUARY 2016	



PINCHIN

LEGEND

- SITE PERIMETER
- SITE BUILDING
- RES - RESIDENTIAL
- COM - COMMERCIAL
- RFO - RETAIL FUEL OUTLET
- FENCE
- P - PARKING
- BOREHOLE LOCATION

PROJECT NAME
PHASE II ENVIRONMENTAL SITE ASSESSMENT

CLIENT NAME
TULLOCH ENGINEERING AND SURVEYING

PROJECT LOCATION
601 THIRD LINE EAST, SAULT STE. MARIE, ONTARIO

FIGURE NAME
BOREHOLE LOCATION PLAN

FIGURE NO.
2

APPROXIMATE SCALE	PROJECT NO.	DATE
AS SHOWN	110533.001	JANUARY 2016

APPENDIX II

Borehole Logs

Pinchin Ltd.
126 Queen Street East, Suite 3
Sault Ste. Marie, Ontario,
P6A 1Y5

Stratigraphic and Instrumentation Log: BH1

Project No.: 110533.001
Project: Phase II Environmental Site Assessment
Client: Tulloch Engineering and Surveying
Location: 601 Third Line East, Sault Ste. Marie, Ontario

Logged By: R. Morrison
Entered By: R. MacLeod
Project Manager: C. Tenaglia
Drill Date: December 3, 2015

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation
0		Ground Surface	0.00
		Sand and gravel, brown, damp, no odour, no staining	-0.76
1		Silt, some sand, brown, moist, no odour, no staining	-1.50
2		Silt, brown, damp to wet, no odour, no staining	-3.70
3			
4		Clay and silt, brown, saturated, no odour, no staining	-6.70
5			
6			
7		End of Borehole	
8			

SAMPLE

Number	Type	Sample	N-Value	Recovery (%)	Vapour Reading (ppm) (ppm: 50, 100, 150, 200)
SS1	SS	Grab	NA	50	0.0
SS2	SS	Grab	NA	75	10.0
SS3	SS	Grab	NA	75	5.0
SS4	SS	Grab	NA	75	0.0
SS5	SS	Grab	NA	90	0.0
SS6	SS	Grab	NA	100	0.0
SS7	SS	Grab	NA	100	5.0
SS8	SS	Grab	NA	100	0.0
SS9	SS	Grab	NA	100	0.0

Monitoring Well

Drilled By: North Drilling
Drill Method: Direct Push/Split Spoon
Vapour Instrument: RKI Eagle
Well Casing Size: N/A

Datum: Local
Casing Elevation: N/A
Ground Elevation: N/A
Sheet: 1 of 1

Pinchin Ltd.
126 Queen Street East, Suite 3
Sault Ste. Marie, Ontario,
P6A 1Y5

Stratigraphic and Instrumentation Log: BH2

Project No.: 110533.001
Project: Phase II Environmental Site Assessment
Client: Tulloch Engineering and Surveying
Location: 601 Third Line East, Sault Ste. Marie, Ontario

Logged By: R. Morrison
Entered By: R. MacLeod
Project Manager: C. Tenaglia
Drill Date: December 3, 2015

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation
0		Ground Surface	0.00
		Clay and gravel, brown, wet, no odour, no staining	-0.76
1		Silt and sand, brown, wet, no odour, no staining	
2			
3			
4			
5			-5.30
		Clay and silt, brown, wet, no odour, no staining	
6			-6.70
		End of Borehole	
7			
8			

SAMPLE

Number	Type	Sample	N-Value	Recovery (%)	Vapour Reading (ppm)
SS1	SS	Grab	NA	5	0.0
SS2	SS	Grab	NA	75	5.0
SS3	SS	Grab	NA	75	10.0
SS4	SS	Grab	NA	75	5.0
SS5	SS	Grab	NA	100	5.0
SS6	SS	Grab	NA	100	5.0
SS7	SS	Grab	NA	100	0.0
SS8	SS	Grab	NA	100	0.0
SS9	SS	Grab	NA	100	0.0

Vapour Reading (ppm): ppm — 50, 100, 150, 200

Monitoring Well

Drilled By: North Drilling
Drill Method: Direct Push/Split Spoon
Vapour Instrument: RKI Eagle
Well Casing Size: N/A

Datum: Local
Casing Elevation: N/A
Ground Elevation: N/A
Sheet: 1 of 1

Pinchin Ltd.
126 Queen Street East, Suite 3
Sault Ste. Marie, Ontario,
P6A 1Y5

Stratigraphic and Instrumentation Log: BH3

Project No.: 110533.001
Project: Phase II Environmental Site Assessment
Client: Tulloch Engineering and Surveying
Location: 601 Third Line East, Sault Ste. Marie, Ontario

Logged By: R. Morrison
Entered By: R. MacLeod
Project Manager: C. Tenaglia
Drill Date: December 3, 2015

SUBSURFACE PROFILE

SAMPLE

Depth (m)	Symbol	Description	Elevation	Number	Type	Sample	N-Value	Recovery (%)	Vapour Reading (ppm)	Monitoring Well
		Ground Surface	0.00							
0		Sand and gravel, brown, damp, no odour, no staining	-0.76	SS1	SS	Grab	NA	50	0.0	
1		Silt and sand, brown, wet to saturated, no odour, no staining		SS2	SS	Grab	NA	50	0.0	
				SS3	SS	Grab	NA	50	0.0	
2				SS4	SS	Grab	NA	100	5.0	
3				SS5	SS	Grab	NA	100	0.0	
4			-4.60	SS6	SS	Grab	NA	100	0.0	
		Clay and silt, brown, saturated, no odour, no staining		SS7	SS	Grab	NA	100	0.0	
5				SS8	SS	Grab	NA	100	0.0	
6			-6.70	SS9	SS	Grab	NA	100	0.0	
		End of Borehole								
7										
8										

Vapour Reading (ppm): ppm, 50, 100, 150, 200

Drilled By: North Drilling
Drill Method: Direct Push/Split Spoon
Vapour Instrument: RKI Eagle
Well Casing Size: N/A

Datum: Local
Casing Elevation: N/A
Ground Elevation: N/A
Sheet: 1 of 1

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Sault Ste. Marie, Ontario,
P6A 1Y5

Stratigraphic and Instrumentation Log: BH4

Project No.: 110533.001
Project: Phase II Environmental Site Assessment
Client: Tulloch Engineering and Surveying
Location: 601 Third Line East, Sault Ste. Marie, Ontario

Logged By: R. Morrison
Entered By: R. MacLeod
Project Manager: C. Tenaglia
Drill Date: December 3, 2015

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation
0		Ground Surface	0.00
		Sand and gravel, brown, damp, no odour, no staining	-0.76
1		Silt and sand, brown, saturated, no odour, no staining	
2			
3			-3.80
4		Clay and silt, brown, saturated, no odour, no staining	
5			
6			-6.70
7		End of Borehole	
8			

SAMPLE

Number	Type	Sample	N-Value	Recovery (%)	Vapour Reading (ppm)
SS1	SS	Grab	NA	50	0.0
SS2	SS	Grab	NA	50	0.0
SS3	SS	Grab	NA	75	10.0
SS4	SS	Grab	NA	75	0.0
SS5	SS	Grab	NA	100	5.0
SS6	SS	Grab	NA	100	0.0
SS7	SS	Grab	NA	100	0.0
SS8	SS	Grab	NA	100	0.0
SS9	SS	Grab	NA	100	0.0

Vapour Reading (ppm) ppm: 50 100 150 200

Monitoring Well

Drilled By: North Drilling
Drill Method: Direct Push/Split Spoon
Vapour Instrument: RKI Eagle
Well Casing Size: N/A

Datum: Local
Casing Elevation: N/A
Ground Elevation: N/A
Sheet: 1 of 1

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Stratigraphic and Instrumentation Log: BH5

Project No.: 110533.001
Project: Phase II Environmental Site Assessment
Client: Tulloch Engineering and Surveying
Location: 601 Third Line East, Sault Ste. Marie, Ontario

Logged By: R. Morrison
Entered By: R. MacLeod
Project Manager: C. Tenaglia
Drill Date: December 3, 2015

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation
0		Ground Surface	0.00
		Sand and gravel, brown, wet, PHC odour, some staining staining	
			-0.30
		Gravel and clay, grey and brown, wet, PHC odour, some staining	
			-0.60
		Sand and gravel, brown, wet, PHC odour, some staining	
			-0.76
		End of Borehole Due to Refusal on cobbles	
1			

SAMPLE

Number	Type	Sample	N-Value	Recovery (%)	Vapour Reading (ppm)
SS1	SS	Grab	NA	100	5.0
SS2	SS	Grab	NA	100	0.0
SS3	SS	Grab	NA	100	0.0
SS4	SS	Grab	NA	100	0.0
SS5	SS	Grab	NA	100	0.0

Vapour Reading (ppm): ppm; 50, 100, 150, 200

Monitoring Well

Drilled By: Pinchin Ltd.
Drill Method: Hand Auger
Vapour Instrument: RKI Eagle
Well Casing Size: N/A

Datum: Local
Casing Elevation: N/A
Ground Elevation: N/A
Sheet: 1 of 1

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Stratigraphic and Instrumentation Log: BH6

Project No.: 110533.001
Project: Phase II Environmental Site Assessment
Client: Tulloch Engineering and Surveying
Location: 601 Third Line East, Sault Ste. Marie, Ontario

Logged By: R. Morrison
Entered By: R. MacLeod
Project Manager: C. Tenaglia
Drill Date: December 3, 2015

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation
0		Ground Surface	0.00
		Sand and gravel, brown, wet, PHC odour, some staining	
			-0.60
		End of Borehole Due to Refusal on cobbles	
1			

SAMPLE

Number	Type	Sample	N-Value	Recovery (%)	Vapour Reading (ppm) (△ ppm △ 50 100 150 200)
SS1	SS	Grab	NA	100	0.0
SS2	SS	Grab	NA	100	0.0
SS3	SS	Grab	NA	100	0.0
SS4	SS	Grab	NA	100	0.0

Monitoring Well

Drilled By: Pinchin Ltd.
Drill Method: Hand Auger
Vapour Instrument: RKI Eagle
Well Casing Size: N/A

Datum: Local
Casing Elevation: N/A
Ground Elevation: N/A
Sheet: 1 of 1

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Stratigraphic and Instrumentation Log: BH7

Project No.: 110533.001
Project: Phase II Environmental Site Assessment
Client: Tulloch Engineering and Surveying
Location: 601 Third Line East, Sault Ste. Marie, Ontario

Logged By: R. Morrison
Entered By: R. MacLeod
Project Manager: C. Tenaglia
Drill Date: December 3, 2015

SUBSURFACE PROFILE				SAMPLE						
Depth (m)	Symbol	Description	Elevation	Number	Type	Sample	N-Value	Recovery (%)	Vapour Reading (ppm) △ ppm △ 50 100 150 200	Monitoring Well
0		Ground Surface	0.00							
		Sand and gravel, brown, wet, PHC odour, some staining		SS1	SS	Grab	NA	100	0.0	
				SS2	SS	Grab	NA	100	0.0	
				SS3	SS	Grab	NA	100	0.0	
				SS4	SS	Grab	NA	100	0.0	
		Sand and gravel and clay, brown and grey, wet, PHC odour, some staining	-0.60	SS5	SS	Grab	NA	100	0.0	
		End of Borehole Due to Refusal on cobbles	-0.76							
1										

Drilled By: Pinchin Ltd.
Drill Method: Hand Auger
Vapour Instrument: RKI Eagle
Well Casing Size: N/A

Datum: Local
Casing Elevation: N/A
Ground Elevation: N/A
Sheet: 1 of 1

APPENDIX III

Summary Tables

TABLE 1
SAMPLES SUBMITTED FOR LABORATORY ANALYSIS
Tulloch Engineering and Surveying
601 Third Line East, Sault Ste Marie, Ontario

Samples			Parameters					
Borehole / Monitoring Well ID	Sample ID	Sample Depth Range (mbgs)	SOIL SAMPLES	PHCs (F1-F4) & BTEX	PCBs	pH	Grain Size Analysis	Rationale/Notes
BH1	BH1 SS2	0.8 - 1.4		●	●			Soil sample collected to assess extent of contamination from transformer loss.
BH2	BH2 SS3	1.5 - 2.1		●	●			Soil sample collected to assess extent of contamination from transformer loss.
BH3	BH3 SS4	2.3 - 2.7		●	●			Soil sample collected to assess extent of contamination from transformer loss.
BH4	BH4 SS3	1.5 - 2.1		●	●			Soil sample collected to assess extent of contamination from transformer loss.
BH4	BH4 SS2	0.8 - 1.4				●	●	Soil sample collected to assess pH and grain size analysis.
BH4	BH4 SS4	2.3 - 2.9				●	●	Soil sample collected to assess pH and grain size analysis.
BH5	HA-1	0.5 - 0.6		●	●			Soil sample collected to assess extent of contamination from transformer loss.
BH6	HA-2	0.3 - 0.5		●	●			Soil sample collected to assess extent of contamination from transformer loss.

Notes:

PHCs (F1-F4)	Petroleum Hydrocarbons (Fraction 1 to Fraction 4)
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
PCBs	Polychlorinated Biphenyls
mbgs	Metres Below Ground Surface
MOECC	Ontario Ministry of the Environment and Climate Change

TABLE 2
pH AND GRAIN SIZE ANALYSIS FOR SOIL
Tulloch Engineering and Surveying
601 Third Line East, Sault Ste Marie, Ontario

Parameter	*Units*	*MOECC Site Condition Standard Selection Criteria*	*Sample Designation*	
			Sample Collection Date (dd/mm/yyyy)	
			Sample Depth (mbgs)	
			BH4 SS2	*BH4 SS4*
			03/12/2015	*03/12/2015*
			0.76 - 1.37	*2.29 - 2.89*
			Surface	*Sub-Surface*
pH		Surface: 5 < pH < 9 Subsurface: 5 < pH < 11	6.6	6.9
Sieve #200 <0.075 mm	%	50%	7	1
Sieve #200 >0.075 mm	%	50%	93	99
		Grain Size Classification	**FINE**	**FINE**

Notes:

BOLD	Environmentally Sensitive Area (Based Upon pH of Surface Soil)
BOLD	Environmentally Sensitive Area (Based Upon pH of Sub-Surface Soil)
NA	Not Analysed
mbgs	Metres Below Ground Surface

TABLE 3

PETROLEUM HYDROCARBON, BTEX AND PCB ANALYSIS FOR SOIL

Tulloch Engineering and Surveying

601 Third Line East, Sault Ste Marie, Ontario

Parameter	*MOECC Table 2 Standards**	*Sample Designation*					
		Sample Collection Date (dd/mm/yyyy)					
		Sample Depth (mbgs)					
		BH1 SS2	*BH2 SS3*	*BH3 SS4*	*BH4 SS3*	*HA1*	*HA2*
		03/12/2015	*03/12/2015*	*03/12/2015*	*03/12/2015*	*03/12/2015*	*03/12/2015*
		0.6 - 1.2	*2.4 - 3.2*	*2.8- 3.2*	*1.2 - 1.8*	*2.4 - 3.1*	*0.6 - 1.2*
Polychlorinated Biphenyls	1.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzene	0.4	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Toluene	9	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Ethylbenzene	1.6	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Xylenes (Total)	30	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Petroleum Hydrocarbons F1 (C_6 - C_{10})	65	<5	<5	<5	<5	<5	<5
Petroleum Hydrocarbons F2 (>C_{10} - C_{16})	250	<10	<10	<10	14	**800**	**1800**
Petroleum Hydrocarbons F3 (>C_{16} - C_{34})	2500	51	<50	<50	110	**9200**	**16000**
Petroleum Hydrocarbons F4 (>C_{34} - C_{50})	6600	<50	<50	<50	<50	<50	<50

Notes:

MOECC Table 2 Standards*	Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, April 15, 2011, Table 2 Standards, Medium/Fine-Textured Soils, Potable Groundwater Condition, for Industrial/Commercial/Community Property Use.
BOLD	Exceeds Site Condition Standard
Units	All Units in µg/g
mbgs	Metres Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
PHCs (F1-F4)	Petroleum Hydrocarbons (Fraction 1 to Fraction 4)
PCBs	Polychlorinated Biphenyls

APPENDIX IV

Laboratory Certificate of Analysis

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: PINCHIN LTD
126 QUEEN STREET EAST, SUITE #3
SAULT STE. MARIE, ON P6A1Y5
(705) 575-9207

ATTENTION TO: Jake Rebellato

PROJECT: PHC Phase II

AGAT WORK ORDER: 15T050012

SOIL ANALYSIS REVIEWED BY: Elizabeth Polakowska, MSc (Animal Sci), PhD (Agri Sci), Inorganic Lab Supervisor

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Dec 10, 2015

PAGES (INCLUDING COVER): 10

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 15T050012

PROJECT: PHC Phase II

CLIENT NAME: PINCHIN LTD

ATTENTION TO: Jake Rebellato

SAMPLING SITE:

SAMPLED BY:Rod Morrison

O. Reg. 153(511) - ORPs (Soil) - pH

DATE RECEIVED: 2015-12-04

DATE REPORTED: 2015-12-10

		SAMPLE DESCRIPTION:		BH4 SS2	BH4 SS4
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		12/3/2015	12/3/2015
Parameter	Unit	G / S	RDL	7260543	7260547
pH, 2:1 CaCl2 Extraction	pH Units		NA	6.55	6.89

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T1(All)

7260543-7260547 pH was determined on the 0.01M CaCl2 extract obtained from 2:1 leaching procedure (2 parts extraction fluid:1 part wet soil).

Certified By: Elizabeth Rotakowska

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Certificate of Analysis

AGAT WORK ORDER: 15T050012

PROJECT: PHC Phase II

CLIENT NAME: PINCHIN LTD

ATTENTION TO: Jake Rebellato

SAMPLING SITE:

SAMPLED BY:Rod Morrison

Particle Size by Sieve (Wet)

DATE RECEIVED: 2015-12-04

DATE REPORTED: 2015-12-10

		SAMPLE DESCRIPTION:		BH4 SS2	BH4 SS4
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		12/3/2015	12/3/2015
Parameter	Unit	G / S	RDL	7260543	7260547
Sieve Analysis - 75 um (retained)	%		N/A	7	1
Sieve Analysis - 75 um (passing)	%		N/A	93	99
Soil Texture				Fine	Fine

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

7260543-7260547 Value reported is the amount of sample passing through or retained on sieve after wash with water and represents proportion by weight particles smaller or larger than indicated sieve size.

Certified By: Elizabeth Rotakowska

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Certificate of Analysis

AGAT WORK ORDER: 15T050012

PROJECT: PHC Phase II

CLIENT NAME: PINCHIN LTD

ATTENTION TO: Jake Rebellato

SAMPLING SITE:

SAMPLED BY:Rod Morrison

O. Reg. 153(511) - PCBs (Soil)

DATE RECEIVED: 2015-12-04

DATE REPORTED: 2015-12-10

		SAMPLE DESCRIPTION:		BH1 SS2	BH2 SS3	BH3 SS4	BH4 SS3	HA-1 1.5-2'	HA-2 1-1.5'
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		12/3/2015	12/3/2015	12/3/2015	12/3/2015	12/3/2015	12/3/2015
Parameter	Unit	G / S	RDL	7260536	7260537	7260540	7260544	7260548	7260551
Aroclor 1242	µg/g		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	µg/g		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	µg/g		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	µg/g		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Polychlorinated Biphenyls	µg/g	1.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Moisture Content	%		0.1	17.8	20.0	24.8	21.3	10.1	2.5
Surrogate	Unit	Acceptable Limits							
Decachlorobiphenyl	%	60-140		88	99	112	80	64	71

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Medium and Fine Textured Soils

7260536-7260551 Results are based on the dry weight of soil extracted.

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 15T050012

PROJECT: PHC Phase II

CLIENT NAME: PINCHIN LTD

ATTENTION TO: Jake Rebellato

SAMPLING SITE:

SAMPLED BY:Rod Morrison

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2015-12-04

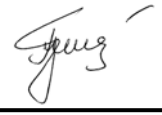
DATE REPORTED: 2015-12-10

		SAMPLE DESCRIPTION:		BH1 SS2	BH2 SS3	BH3 SS4	BH4 SS3	HA-1 1.5-2'	HA-2 1-1.5'
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		12/3/2015	12/3/2015	12/3/2015	12/3/2015	12/3/2015	12/3/2015
Parameter	Unit	G / S	RDL	7260536	7260537	7260540	7260544	7260548	7260551
Benzene	µg/g	0.4	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Toluene	µg/g	9	0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Ethylbenzene	µg/g	1.6	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Xylene Mixture	µg/g	30	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
F1 (C6 to C10)	µg/g		5	<5	<5	<5	<5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g	65	5	<5	<5	<5	<5	<5	<5
F2 (C10 to C16)	µg/g	250	10	<10	<10	<10	14	800	1800
F3 (C16 to C34)	µg/g	2500	50	51	<50	<50	110	9200	16000
F4 (C34 to C50)	µg/g	6600	50	<50	<50	<50	<50	<50	<50
Gravimetric Heavy Hydrocarbons	µg/g	6600	50	NA	NA	NA	NA	NA	NA
Moisture Content	%		0.1	17.8	20.0	24.8	21.3	10.1	2.5
Surrogate	Unit	Acceptable Limits							
Terphenyl	%	60-140		77	103	112	85	74	91

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Medium and Fine Textured Soils

7260536-7260551 Results are based on sample dry weight.
The C6-C10 fraction is calculated using Toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Certified By:



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Guideline Violation

AGAT WORK ORDER: 15T050012

PROJECT: PHC Phase II

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CLIENT NAME: PINCHIN LTD

ATTENTION TO: Jake Rebellato

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
7260548	HA-1 1.5-2'	ON T2 S ICC MFT	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	F2 (C10 to C16)	250	800
7260548	HA-1 1.5-2'	ON T2 S ICC MFT	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	F3 (C16 to C34)	2500	9200
7260551	HA-2 1-1.5'	ON T2 S ICC MFT	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	F2 (C10 to C16)	250	1800
7260551	HA-2 1-1.5'	ON T2 S ICC MFT	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	F3 (C16 to C34)	2500	16000

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FAX (905)712-5122
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Quality Assurance

CLIENT NAME: PINCHIN LTD
PROJECT: PHC Phase II
SAMPLING SITE:

AGAT WORK ORDER: 15T050012
ATTENTION TO: Jake Rebellato
SAMPLED BY:Rod Morrison

Soil Analysis

RPT Date: Dec 10, 2015			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - ORPs (Soil) - pH															
pH, 2:1 CaCl2 Extraction	7258785		7.39	7.50	1.5%		101%	90%	110%	NA			NA		
Comments: NA signifies Not Applicable.															
Particle Size by Sieve (Wet)															
Sieve Analysis - 75 um (retained)	7260543	7260543	7	7	0.0%	N/A	NA			NA			NA		
Sieve Analysis - 75 um (passing)	7260543	7260543	93	93	0.0%	N/A	NA			NA			NA		
Comments: NA signifies Not Applicable.															

Certified By: Elizabeth Pololowska

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FAX (905)712-5122
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Quality Assurance

CLIENT NAME: PINCHIN LTD
AGAT WORK ORDER: 15T050012

PROJECT: PHC Phase II
ATTENTION TO: Jake Rebellato

SAMPLING SITE:
SAMPLED BY:Rod Morrison

Trace Organics Analysis

RPT Date: Dec 10, 2015			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (Soil)															
Benzene	7265194		< 0.02	< 0.02	NA	< 0.02	106%	60%	130%	103%	60%	130%	113%	60%	130%
Toluene	7265194		< 0.08	< 0.08	NA	< 0.08	97%	60%	130%	93%	60%	130%	106%	60%	130%
Ethylbenzene	7265194		< 0.05	< 0.05	NA	< 0.05	87%	60%	130%	93%	60%	130%	114%	60%	130%
Xylene Mixture	7265194		< 0.05	< 0.05	NA	< 0.05	94%	60%	130%	99%	60%	130%	110%	60%	130%
F1 (C6 to C10)	7265194		< 5	< 5	NA	< 5	115%	60%	130%	115%	85%	115%	117%	70%	130%
F2 (C10 to C16)	7260551	7260551	1800	1900	5.4%	< 10	98%	60%	130%	102%	80%	120%	78%	70%	130%
F3 (C16 to C34)	7260551	7260551	16000	18000	11.8%	< 50	104%	60%	130%	106%	80%	120%	83%	70%	130%
F4 (C34 to C50)	7260551	7260551	< 50	< 50	NA	< 50	86%	60%	130%	93%	80%	120%	86%	70%	130%
O. Reg. 153(511) - PCBs (Soil)															
Aroclor 1242	7255770		< 0.1	< 0.1	NA	< 0.1	NA	60%	140%	NA	60%	140%	NA	60%	140%
Aroclor 1248	7255770		< 0.1	< 0.1	NA	< 0.1	NA	60%	140%	NA	60%	140%	NA	60%	140%
Aroclor 1254	7255770		< 0.1	< 0.1	NA	< 0.1	NA	60%	140%	NA	60%	140%	NA	60%	140%
Aroclor 1260	7255770		< 0.1	< 0.1	NA	< 0.1	NA	60%	140%	NA	60%	140%	NA	60%	140%
Polychlorinated Biphenyls	7255770		< 0.1	< 0.1	NA	< 0.1	88%	60%	140%	101%	60%	140%	111%	60%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable(NA).

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: PINCHIN LTD

AGAT WORK ORDER: 15T050012

PROJECT: PHC Phase II

ATTENTION TO: Jake Rebellato

SAMPLING SITE:

SAMPLED BY:Rod Morrison

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	pH METER
Sieve Analysis - 75 um (retained)		KROETSCH 2007; SHEPPARD 2007	SIEVE
Sieve Analysis - 75 um (passing)		KROETSCH 2007; SHEPPARD 2007	SIEVE
Trace Organics Analysis			
Aroclor 1242	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Aroclor 1248	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Aroclor 1254	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Aroclor 1260	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Polychlorinated Biphenyls	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Moisture Content		MOE E3139	BALANCE
Benzene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Toluene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Ethylbenzene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Xylene Mixture	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
F1 (C6 to C10)	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
F2 (C10 to C16)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
F3 (C16 to C34)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
F4 (C34 to C50)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009		GC/FID

AGAT Laboratories
5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Laboratory Use Only
Work Order #: 1ST050012
Cooler Quantity:
Arrival Temperatures: 8.4 | 8.8 | 5.2
Custody Seal Intact: ☐Yes ☐No ☐N/A
Notes:

Report Information:
Company: Pinchin Ltd.
Contact: Jake Rebellato
Address: 126 Queen Street East, Sault Ste Marie ON, P6A 1Y5
Phone: 705-575-9201 Fax: 705-575-7968
Reports to be sent to:
1. Email: saultstemarieoffice@pinchin.com
2. Email:

Regulatory Requirements: ☐ No Regulatory Requirement
(Please check all applicable boxes)
☒ Regulation 153/04 Table 2 (Indicate One)
☒ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☒ Fine
☐ Sewer Use ☐ Sanitary ☐ Storm
Region (Indicate One)
☐ Regulation 558 ☐ CCME ☐ Prov. Water Quality Objectives (PWQO) ☐ Other (Indicate One)

Turnaround Time (TAT) Required:
Regular TAT ☒ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ 1 Business Day
OR Date Required (Rush Surcharges May Apply):
Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

Project Information:
Project: PUC Phase II
Site Location: 499 Third Line ~~E~~, Sault Ste Marie
Sampled By: Rod Morrison
AGAT Quote #: PO: 110533
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a **Record of Site Condition?** ☐ Yes ☒ No
Report Guideline on *Certificate of Analysis* ☒ Yes ☐ No

Invoice Information: Bill To Same: Yes ☒ No ☐
Company:
Contact:
Address:
Email:

Sample Matrix Legend
B Biota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	(Check Applicable) ORPs: ☐B-HWS ☐Cl ☐CN ☐Cr6+ ☐EC ☐FOC ☐NO3/NO2 ☐Total N ☐Hg ☐pH ☐SAR	Nutrients: ☐TP ☐NH3 ☐TKN ☐NO3 ☐NO2 ☐NO3/NO2	Volatiles: ☐VOC ☒BTEX ☐THM	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use	pH / Grain
BH1 SS2	Dec 3		3	S								X	X				X				
BH2 SS3	1		3	1								X	X				X				
BH3 SS4			3									X	X				X				
BH4 SS2			1																	X	
BH4 SS3			3									X	X				X				
BH4 SS4			1																	X	
HA-1 1.5-2'			3									X	X				X				
HA-2 1-1.5'	↓		3	↓								X	X				X				

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Rod Morrison Rod Morrison	Dec 3/15		Sharon's Dec 4/15	9:00am	
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 1
N°: T013049

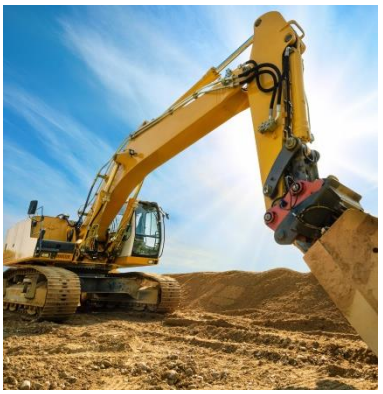
Appendix C

Geotechnical Report dated April 2018

TULLOCH ENGINEERING

GEOTECHNICAL REPORT

601 Third Line East PUC Substation 16
Sault Ste Marie, Ontario



April 2018

TULLOCH Project #: 15-1176

TULLOCH

71 Black Road
Unit 8
Sault Ste Marie, ON
P6B 0A3

T. 705 949.1457
F. 705 949.9606
866 806.6602
saultstemarie@tulloch.ca

www.TULLOCH.ca

April 20, 2017

PUC Services Inc.
500 Second Line East
PO Box 9000
Sault Ste.
Marie, P6A 6P2

Attention: **Mr. Rob Harten, P.Eng., Engineering Manager**

Re: **Geotechnical Investigation for 601 Third Line East Substation 16 Reconstruction, Sault Ste Marie, Ontario**

Dear Sir:

TULLOCH Engineering Inc. (TULLOCH) has prepared the following revised geotechnical report for the proposed reconstruction of the PUC Substation 16.

This report is based on the results of the borehole investigations completed on site and on the subsurface materials encountered, as well as new information provided to TULLOCH by WSP, the Design Consultant.

We trust the enclosed is adequate for your needs at this time. If there is anything further we can provide please contact us at your convenience.

Sincerely,

TULLOCH Engineering Inc.

Sean Hinchberger, Ph.D., P.Eng.
General Manager, Geotechnical Specialist

TABLE OF CONTENTS

Appendices

1. INTRODUCTION AND SCOPE

TULLOCH Engineering (TULLOCH) has been retained by PUC Services Inc. (PUC) to conduct a geotechnical investigation for the proposed reconstruction of the Substation 16, located at 601 Third Line East, Sault Ste Marie, Ontario. A geotechnical site plan can be found in Appendix A of this report. Abbreviations, terminology and principal symbols commonly used throughout the report, are enclosed in Appendix B.

The purpose of this report is to provide geotechnical foundation design recommendations and design parameters based on the subsurface soil and groundwater conditions on-site and as supported by

- Desk top review of area geology
- Review of relevant existing geotechnical reports in the vicinity
- Subsurface geotechnical investigation
- Analytical results of soil laboratory testing
- Review of Design Materials

This report supersedes TULLOCH's original preliminary report dated on March 07, 2016 and includes recommendations based on design drawings provided to TULLOCH by the Design Consultant, WSP.

2. SITE GEOLOGY

Data obtained from the Ontario Geological Survey Maps, as published by the Ministry of Natural Resources, indicate that the site is located in a glaciolacustrine plain that is mostly comprised of clay and silt material. The topography of the dominant landform for the area is low lying planes dissected by drainage gullies. The surface drainage condition is considered dry. The underlying bedrock at the site is within the Paleozoic era and the subgroup is of the lower and middle Cambrian. The bedrock is of the Jacobsville formation consisting of sandstone, siltstone, shale and conglomerate (Ontario Geological Survey Map 2419, published 1979).

3. GEOTECHNICAL INVESTIGATIONS

The geotechnical field investigation was undertaken on December 3rd, 2015. The investigation consisted of advancing a total of four (4) boreholes to a depth of 6.7 m to delineate and identify the subsurface soil strata and groundwater conditions. Prior to completing drilling operations, arrangements were made for utility locates and health & safety awareness was conducted in accordance with PUC Health and Safety Policy.

The boreholes were advanced with a Geoprobe 7822DT drill rig, advancing continuous 50 mm casing using the direct push method, along with standard soil sampling equipment which is owned and operated by North Drilling Ltd. Soil samples were obtained with a 51 mm outside diameter split spoon barrel in conjunction with Standard Penetration Tests (SPT), "N" values (ASTM D1586) at 0.76 metre intervals in the upper 3.0 m, and 1.52 m intervals thereafter. The SPT "N" values were used to assess the compactness condition of the overburden soils.

Upon completion of the drilling program, the depth to groundwater was measured in the open boreholes and the boreholes were backfilled and sealed with bentonite pellets. The drilling and soil sampling was completed under the full-time supervision of a TULLOCH representative, who logged the drilling operations and identified the soil samples as they were retrieved. The recovered soil samples were sealed in plastic bags and transported to our laboratory for detailed examination and testing. All samples will be stored for six (6) months and then disposed of unless directed otherwise.

In addition, a historical geotechnical investigation was completed at an adjacent site in 2011 by M.R. Wright & Associates Co. LTD (MRW) for Great Lakes Power Transmission (GLPT). Boreholes from the MRW Geotechnical Report (MRW, 2011, Project G11310) are included in Appendix F.

4. RESULTS OF THE GEOTECHNICAL INVESTIGATION

4.1 Soil Stratigraphy

The soil conditions encountered during the advancement of boreholes are summarized and discussed below. Detailed results of each borehole are illustrated on the enclosed borehole logs

attached as Appendix C to this report. The 2011 borehole logs for the GLPT substation (MRW, 2011) are presented in Appendix F. The classification of soil samples was completed using the Unified Soil Classification System.

The following is a summary of the subgrade profiles encountered in geotechnical investigations.

Sandy Gravel

A layer of sandy gravel was encountered at the surface of each borehole. The sandy gravel was likely imported fill from previous construction activities. The thickness of the sandy gravel was approximately 600 mm. The SPT 'N' values were in the range of 4 to 22 blows per 300 mm indicating a relative density of loose to compact.

Clayey Silt (ML) to Silty Clay (CL)

Clayey Silt to Silty Clay, hereinafter referred to as 'Clayey Silt', was encountered below the sandy gravel in all boreholes to a depth of about 6.7 m, at which the boreholes were terminated. The SPT 'N' values were in the range of 0 (i.e. the sampler and rods sank under the weight of the hammer) to 9 blows per 300 mm indicating a very loose to loose state. Grain size distribution tests completed for this material showed of 1-4 % sand, 84-86 % silt, and 10-15 % clay. The natural moisture content is in a range of 25.4-68.2% indicating wet to saturated conditions. Given the non-plastic nature of this material, it probably contains organics. The undrained shear strength of the silt is estimated in the range 20 kPa to 50kPa.

The silt layer extends to depth of 7m to 21.6m, which is reported in MRW geotechnical report (MRW, 2011).

Glacial Till

Based on MRW geotechnical report (2011), there is a glacial till encountered underlying the clayey silt from 14 -25 m depth, which predominantly comprises silt. The till also contained trace to some gravel, trace to some sand, trace clay, was grey, compact to very dense, moist to wet and fine to medium grained. Uncorrected SPT "N" values within the material ranged from 21 to greater than 100 blows per 300mm, classifying the material as being a compact to very dense. The details are included in Appendix E.

4.2 Groundwater Conditions

Ground water levels were observed at approximately 1.5 m below ground surface in the open boreholes upon completion of drilling.

4.3 Laboratory Testing

Grain size distribution, Atterberg limits and moisture content analyses were conducted on select soil samples obtained from sub-grade materials at the TULLOCH's Laboratory. It should be noted the Atterberg limit testing was attempted by failed due to low plasticity of the tested specimens. Data in the MRW report indicate W_L=30% and I_p=15% corresponding to CL. TULLOCH Laboratory results are presented on individual borehole logs and in Appendix D.

Grain size distribution analyses are summarized in the Table 4-1.

Table 4-1 Particle Size Distribution Analyses Summary

Borehole /Sample	Sample Depth (mbgs)	Sand (%)	Silt (%)	Clay (%)
BH1/ SS4	2.29 – 2.9	4	86	10
BH1 /SS7	4.57 – 5.18	1	84	15

5. GEOTECHNICAL RECOMMENDATIONS

5.1 Overview of the Proposed Building

Figures 5-1 and 5-2 show the site plan and a building cross-section. It should be noted that the design is at a preliminary stage as indicated on the drawings provided to TULLOCH.

It is understood that the proposed building comprises an one-storey masonry structure founded on cast-in-place reinforced concrete foundation walls and shallow footings. The main floor is a concrete slab cast on steel decking supported by wide flange steel beams; the roof consists of steel decking supported on joints.

There are two sections to the building. The west side of the structure is an operation building; the east side contains the transformers with a grass weight of about 50,000lbs. There is no roof over the transformers.

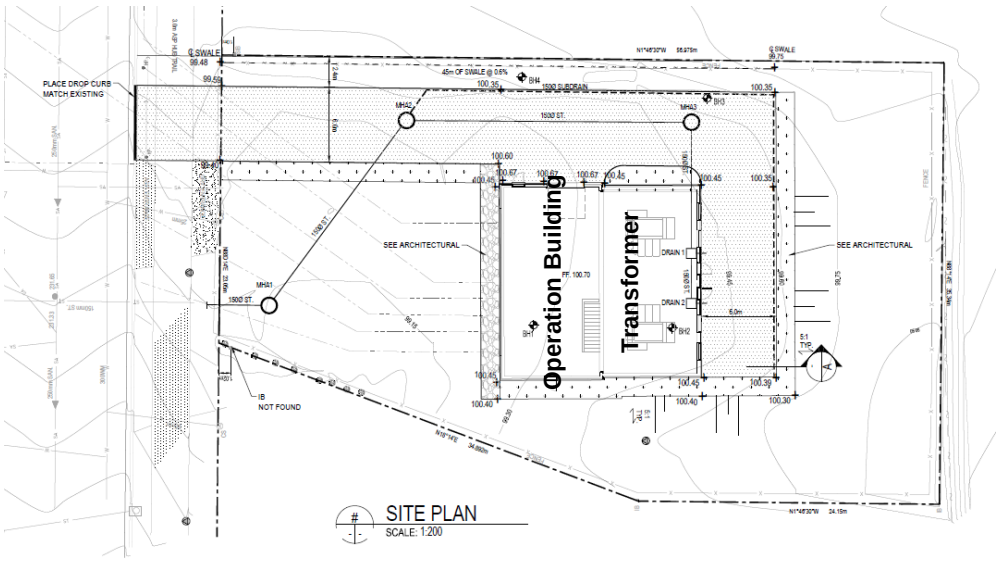
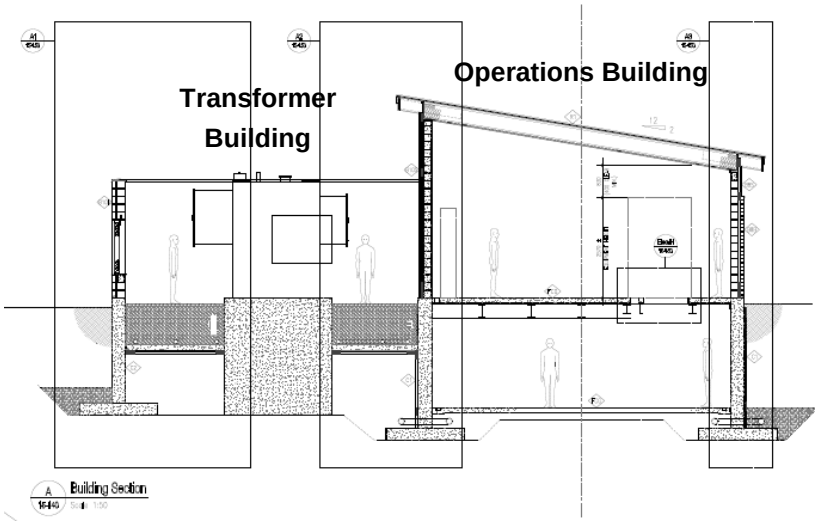


Figure 5-1: Building Plan (Source: DWG 161-14282-00-C1.0)



(Note: The footing type is preliminary and for illustration purpose only)

Figure 5-2: Buidling Section (Source: D-ES16-15-140)

5.2 In-situ Soil Parameters

Table 5-1 summarizes the recommended soil parameters based on the geotechnical investigation results.

Table 5-1 Recommended Soil Properties

Soil Properties	Clayey Silt	Sand & Gravel Fill
Internal Friction Angle, ϕ' (°)	28	36
Unit Weight, γ' (kN/m^3)	18	20.5
Cohesion, c' (kPa)	0	0
Earth Pressure Coefficient at Rest, K_o	0.53	0.41
Passive Lateral Earth Pressure, coefficient, K_p	2.76	3.85
Active Lateral Earth Pressure, Coefficient, K_a	0.36	0.25

5.3 Grade Changes

Based on the subgrade conditions at the project site, the high ground water table on site will make it difficult to construct foundations below the ground water table and frost penetration depth. The water level encountered upon completion of drilling was approximately 1.5 m below ground surface. It is highly recommended to construct the foundation above the water table in order to avoid disturbance of the very loose to loose silt deposit, which may cause constructability issues.

Based on Figure 5-1 (DWG 161-14282-00-C1.0), fill will be placed around the perimeter of the building to: (a) accommodate a basement level, (b) avoid constructing foundations below the water table, and (c) to provide frost cover.

Table 5-2 summarizes the proposed grade changes adjacent to the new building relative to the original ground surface.

The addition of fill at this site will cause settlement of the clayey silt, which will impact the building and site services. The magnitude of the ground settlement due to the raised grade is estimated to be in the order of 30-60 mm.

Table 5-2: Proposed Grade Change

Location	Original Ground El. (m)	Proposed New Ground El. (m)	Grade Change/Fill Thickness (m)
NE Corner	99.45	100.45	+1.0
SE Corner	99.45	100.45	+1.0
NW Corner	99.2	100.45	+1.25
SW Corner	99.2	100.45	+1.25

with the values provided, we will not have less than 1m wide footings

5.4 Foundation Recommendations

5.4.1 Shallow Foundations

Provided the building footings are not large, i.e. width less than 1m, then the proposed operations building can be founded above the groundwater table on conventional strip and spread footings situated on the native clayey silt. The anticipated bearing level will be between 0.3 m and 1.5 m below existing grade. The following bearing capacities are recommended for this case:

- Factored geotechnical resistance at the Ultimate Limit States (ULS) = 75 kPa (the resistance factor of 0.5 is used);
- Geotechnical resistance at the Serviceability Limit States (SLS) = 50 kPa, corresponding to 25 mm settlement.

Based on the geotechnical investigations, the bearing capacity of the clayey silt deposit decreases significantly below a depth of 1.5 m bgs. Deep foundation or an engineered raft should be used for heavy structures or settlement sensitive structures.

The current design drawings indicate that fill will be placed around the perimeter of the operations building. Since this building has a basement level, the addition of the perimeter fill will cause differential settlement between the perimeter walls and interior columns. To avoid this, the foundations for the interior columns should comprise grade beams connected to the perimeter footings. The grade beams should be stiff enough to minimize the differential movement.

The addition of fill around the building perimeter will also lead to increased settlement at the building corners relative to the mid-point of the perimeter walls. As such, perimeter foundation walls and footings should be structurally designed using the following subgrade modulus values to avoid cracking at the corners:

- k_s = 10,000 kN/m^3 for the perimeter foundations except within 5m of the building corners;
- k_s = 2,000 kN/m^3 within 5m of the building corners.

5.4.2 Slab-On-Grade

If shallow foundations are used, then a slab on grade can be utilized for the majority of the operations build basement floor since the contact pressure in most areas will be in the order of 15 kPa.

For construction, a heavy non-woven geotextile (250 g/m^2) should be placed between the native soil and the granular base for the floor slab. Since compaction will disturb the clayey silt subgrade, the floor slab can be constructed on a 300 mm thick layer of 25 mm clear stone. A geotextile

separator must be provided at all locations where the native soil is in contact with the clear stone layer.

A modulus of subgrade reaction in the order of 15 to 20 MN/m^3 may be utilized for the design. The slab should be equipped with a vapor barrier and a sump should be provided to remove water from the clear stone.

5.4.3 Raft Foundation

A structural raft foundation will perform better than individual footings at this site due to the thick clayey silt (ML) deposit. A well-designed structural raft will mitigate the differential settlement expected to occur due to the placement of fill around the operations building perimeter. Construction of a raft foundation will consist of the following:

- Excavate the existing subsurface materials to the depth of 1.5m bgs (just above the ground water table) as required beneath the footprint of the proposed operations building;
- Place a heavy non-woven geotextile (250 g/m^2) on the excavated native soil surface.
- Backfill with 300 mm thick 25mm clear stone (Note: a non-woven geotextile separator is required at all locations where the clear stone contacts native soils);
- Cast-in-pace construction of a structural raft on the clear stone bedding.

The factored geotechnical resistance of a raft at the Ultimate Limit States (ULS) is 75 kPa (the resistance factor of 0.5 is used). The SLS load will be governed by the magnitude of the differential settlement that utilities entering the building can tolerate.

A subgrade modulus of 10 MN/m^3 is recommended for the raft foundation design and grade beams, if required.

Although this option will reduce the risk of differential settlement of the operations building, TULLOCH anticipates 30-60 mm of total post-construction settlement for the operations building based on the current design. As such, differential movement will occur between the building and the transformer (see below) and the building the ground adjacent to the operations building.

Utilities that enter the structure will need to be designed to accommodate this amount of differential movement. If the utilities cannot be designed to accommodate differential movement between the transformer and operations building, then a single raft foundation should be adopted for all structures.

5.4.4 Transformer Foundation

It is understood that the design consultant is proposing to place the transformers on large cast-in-place concrete box foundations, which are approximately 3 m long by 2.4 m wide by 2.4 m high. The combined mass of the concrete and transformer will impose a pressure of 140 kPa on the underlying soft soils at the site, which is approaching the bearing capacity of the foundation soil. Such a high bearing pressure is not feasible. Accordingly, the transformers should be founded on either driven, bored or helical piles end-bearing on or in the firm strata below the soft clay. Bases on the MRW report, excerpts attached in Appendix F, a dense to very dense Till deposit exists at an estimated depth of 20-25m bgs (MRW, 2011).

The following sections provide recommendations for micropiles and helical piles, which TULLOCH believes are more appropriate for the proposed transformer buildings than driven pile.

5.4.5 Helical Piles

The following geotechnical design loads can be utilized at the present stage of design for helical piles advanced into the lower dense till deposit. It is assumed that double helix piles will be required; the bottom helix will have a diameter of 30 or 40 cm and the assumed shaft diameter is 8.9 cm.

Table 5-3: Helical Pile Capacity (Geotechnical) tension

Helix Diameter (cm)	Depth (mbgs)	Compression[1]		Extension [2]
		Factored ULS (kN)	SLS (kN)[3]	Factored ULS (kN)
30	22	220	Not applied	165
40	22	375	Not Applied	280

Note: 1,2- the resistant factors of 0.4 and 0.3 are used for compression and extension, respectively; 3- the estimated SLS corresponding to 25mm settlement does not govern the design.

The following should be taken into account for the design and construction:

- The helical pile must be drilled at least 1m into the dense till at a depth of about 22m bgs.
- The expected settlement is less than 25mm for foundations designed based on the limit state loads in Table 5-3.
- The upper portions of helical piles must be designed with appropriate allowances for corrosion loses (in the range of groundwater fluctuation). The lower helixes will penetrate low permeable clayey silt and should not be subject to major corrosion.

- Insulation should be provided under the concrete caps to minimize frost heave forces on the helical piles. Otherwise, the adfreeze uplift resistance should be checked using the adfreeze bond stress of 100 kPa between steel and frozen soil.
- The capacities listed in Table 5-3 should be sufficient for design and tender purposes. The actual installed capacity of the piles should be verified during construction by measuring torque and using appropriate correlations between torque and axial load capacity.
- The factored structural capacity of the helical piles must be checked.
- If the helical piles are installed closer than 1m centre to centre spacing, then TULLOCH should be contacted to provide reduced pile capacities accounting for group interaction.
- As noted above, differential settlement between the transformer foundation and the service/operation building is estimated in the range of 20-40mm, the connection cable should be designed to accommodate the differential settlement.

5.4.6 Micropiles

5 m grouted column below level of till. This makes the micropiles how long in comparison? (26m, 4m longer)

Similar pile capacities can be achieved using micropiles socketed into the lower dense till deposit. Table 5-4 lists the recommended geotechnical design loads for 178 and 219 mm (HSS) micropiles, post-grouted below the clayey silt/till interface.

Table 5-4: Micro-pile Capacity (Geotechnical) tension

Diameter (mm)	Depth (mbgs)	Compression[1]		Extension [2]
		Factored ULS (kN)[3]	SLS (kN)[4]	Factored ULS (kN)
178	25	250	Not Applied	185
219	25	315	Not Applied	235

Note: 1, 2- the resistant factors of 0.4 and 0.3 are used for compression and extension, respectively. 3- the post-grout bonding strength of 250kPa is used to estimate the bearing capacity of the micropile socked in Till. 4- the estimated SLS corresponding to 25mm settlement does not govern the design.

The following should be taken into account during implementation of this project:

- It is assumed that the micropile pile consists of a HSS from the underside of the footing to 0.5m below the top of the till deposit; below the this, there is a min. 5 m post-grouted socket into the till (i.e. uncased socket); a central steel bar running from the top of the pile to the toe designed to transfer load from the casing to the socket.
- A specialty contractor will be required to design-build the micropiles.
- Load tests should be conducted to confirm the factual socket depth in till and the design axial capacity of the micro-piles.

- The expected settlement is less than 25mm for foundations designed based on the limit state loads in Table 5-4.
- The pile loads listed in Table 5-4 can be used for piles spaced at least 1m apart center-to-center. The designer should contact TULLOCH for group interaction factors if closer spacing is required.

5.5 Open Cut Excavations

Where workers must enter excavations deeper than 1.2 metres, the trench excavations may be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act (OHSA), Ontario Regulation 213/9, Construction Projects, January 1, 2010, Part III - Excavations, Section 226. Alternatively, the excavation walls should be supported by engineered close shoring, bracing, or trench boxes complying with Sections 235 to 239 and 241 under 0. Reg. 231/91, s. 234(1).

Based on the OHSA, the in-situ soils may be classified as Type 3 soils above the groundwater table and Type 4 soils below the groundwater table. Temporary excavation side slopes in Type 3 soils should remain stable at a slope of 1H:1V. Temporary excavation side slopes in Type 4 soils should remain stable at a slope of 3H:1V. The in-situ soils can be excavated using conventional earthmoving equipment.

Based on the borehole investigation, ground water can be expected at a depth of 1.5 m below ground surface. Excavation above the groundwater table within the native soils should be relatively straight forward and should remain stable at a slope of 1H:1V. However, excavations below the groundwater table (which is not recommended) will become more difficult. For excavations below the groundwater table, the following comments are provided:

- Prior to commencing excavations, it is critical that all existing surface water and potential surface water is controlled and diverted away from the proposed excavation to prevent infiltration and subgrade softening. At no time should excavations be left open for a period of time that will expose them to precipitation and cause subgrade softening or side slope slumping;
- Generally, groundwater inflow within silt sized particles can be controlled to a depth of up to approximately 600 to 900 mm below the water table by installing strategically placed filtered sumps and pumping the collected water out of the excavations. Deeper excavations in this type of material will require more positive control, such as using well points and/or interlocking steel sheet piles extending below the groundwater table and likely into the saturated silts. Excavations below the water table in the silt will experience loosening and sloughing of the base and sides to 3H:1V, unless the groundwater level is previously lowered. It should be noted that the groundwater level will rise once pumping

has been terminated. This will create hydrostatic conditions beneath the structure. Therefore, drainage will be required. It is extremely important that silt is prevented from entering the weeping tiles. Failure to do so could result in undermining of the foundation and potential damage to the structure;

- All collected water should be discharge a sufficient distance away from the excavation to prevent re-entry. Sediment control measures, such as a silt fence should be installed at the discharge point of the dewatering system. The utmost care should be taken to avoid any potential adverse impacts on the environment;
- Proposals for a suitable dewatering system based on the groundwater elevation at the time of construction should be reviewed by a competent person. The method used should not adversely impact any nearby structures. Proposals should be submitted to the prime consultant for review and approval prior to construction. A permit to take water may be required from the Ministry of the Environment.
- Seasonal variations in the ground water table should be expected, with higher levels occurring during the wet weather conditions in the spring and fall and lower levels occurring during the summer dry weather conditions.

5.6 Perimeter Building Drainage and Foundation Wall Backfill

Should footings be placed below the ground water table, a perimeter weeping tile system is required. The exterior perimeter weeping tile system should be comprised of perforated drainage pipe with a factory installed filter sock, bedded in 19 mm clear crushed stone and wrapped in a geotextile filter fabric such as Terrafix 270R (or equivalent). It should be installed with positive drainage into a sump pit or other suitable gravity outlet. The portion of the piping that connects the exterior weeping tile system into the sump pit should comprise of solid piping to prevent exterior water from being introduced into the interior sub-slab stone. Rainwater leaders should not be connected to the perimeter weeping tile system. If the founding elevation is below the ground water table, a drainage layer must be constructed below the foundation as per OBC 2012 section 9.14.4. The drainage layer should be underlain with a woven geotextile (Terrafix 200W or equivalent). A sump pit and pump in accordance with OBC 2012 section 9.14.5.2. Water proofing must be installed on walls and floors OBC 2012 section 9.13.3. Weeping tiles should also be installed I the drainage layer under the floor and around the structure. TULLOCH can provide further recommendation for building drainage once the structural drawings are complete and finished floor elevations have been established.

To assist in maintaining the building dry from surface water, it is recommended that finished exterior grades around the building be sloped down and away at a 2% gradient or more, for a distance of at least 2.0 m. Any surface discharge rainwater leaders should be constructed with

solid piping that discharges with positive drainage at least 1.5 m away from the building foundation to a drainage swale or appropriate storm drainage system.

The exterior foundation backfill should extend a minimum lateral distance of 600 mm out from the foundation wall and should consist of free-draining granular material such as Granular 'B' Type 1 (OPSS 1010), with a maximum aggregate size not exceeding 150 mm. It is critical that particles greater than 150 mm in diameter are not in contact with the foundation wall to prevent point loading and overstressing. The backfill material used against the foundation walls must be placed so that the allowable lateral capacities of the foundation walls are not exceeded. The backfill should be placed in equal lifts, not exceeding 300 mm differential on each side during backfilling operations. Foundation walls in basement areas must be provided with adequate bracing that can withstand unbalanced loading during backfilling.

Backfilling operations should be carried out with the following minimum requirements:

- Adequate heavy smooth drum or padfoot vibratory compaction equipment (suited to soil type) should be used to break down large pieces of soil and compact the soils;
- Loose lift thicknesses should not exceed 0.3 m (12") for granular soils;
- The soils must be at suitable moisture contents to achieve compaction to a minimum 95% SPMDD in non-structural areas; backfill materials that will support sidewalks and parking lots must be compacted to a minimum of 100% SPMDD; service trenches excavated within the zone of influence of footings for the structure must be compacted to a minimum of 100% SPMDD;
- It is recommended that inspection and testing be carried out during construction to confirm backfill quality, thickness and to ensure that compaction requirements are achieved;
- Service trench backfill materials may consist of approved excavated soils with no particles greater than 100 mm and no topsoil or other deleterious materials; and,
- If construction operations are undertaken in the winter, strict attention should be given to the condition of the backfill material to make certain that frozen material is not used.

5.7 Service Pipe Bedding

The sand and gravel (free of organics) encountered in the geotechnical investigation are generally considered suitable for indirect support of the site service pipes. All organics (if encountered) must be sub-excavated from below service pipes and structures and the excavations must be backfilled in accordance with Section 5.6 of this report. Pipe embedment, cover and backfill should be in accordance with OPSD-802.010 and as provided in the following sections.

5.7.1 Flexible Pipes

The pipe bedding should be shaped to receive the bottom of the pipe. The granular material placed under the haunches of the pipe must be compacted to 95% SPMDD prior to the continued placement and compaction of the embedment material. The homogeneous granular material used for embedment should be placed and compacted uniformly around the pipe. Should wet conditions be encountered at the base of the trench, then the pipe bedding should consist of 19 mm clear stone (meeting OPS Specifications) wrapped completely in a geotextile fabric such as Terrafix 270 or equivalent.

5.7.2 Rigid Pipes

In general, the pipe installation recommendations for rigid pipes may follow those for flexible pipes, except that the minimum bedding depth below a rigid pipe should be 0.15D (where D is the pipe diameter). In no case should this dimension be less than 150 mm or greater than 300 mm. Pipe embedment, cover and backfill for rigid pipes should be undertaken in accordance with OPSD-802.030 or OPSD-802.031.

5.8 Frost Protection

The estimated frost penetration depth at the site is 1.8 m for the Sault Ste Marie Area. Footings should be provided with at least 1.8 m of soil cover for frost protection above the underside of the footing or an equivalent combination of soil cover and rigid insulation. If 1.8 m of soil cover is not possible, 152 mm thick high density Styrofoam insulation on grade and extending horizontally 1.8 m beyond the building/slab footprint.

5.9 Site Classification for Seismic Response

The 2012 Ontario Building Code (OBC) stipulates the methodology for earthquake design analysis. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration and the site classification for seismic site response. The parameters for determination of Site Classification for Seismic Site Response are set out in Table 4.1.8.4.A of the 2012 OBC. The site classification is based on the average shear wave velocity in the top 30 metres of the site stratigraphy. If the average shear wave velocity is not known, the site class can be estimated from energy corrected Standard Penetration Resistance (N60) and/or the average undrained shear strength of the soil in the top 30 metres. Based on Table 4.1.8.4.A of the 2012 OBC, this site has been classified as a Class E, soft soil. These seismic design parameters should be reviewed in detail by the structural engineer and incorporated into the design as required by article 4.1.8.7 of the Ontario Building Code.

6. CLOSURE

We trust that the information and recommendations in this report will be found to be complete and adequate for your consideration. Should further elaboration be required for any portion of this project, we would be pleased to provide assistance.

Respectfully submitted,

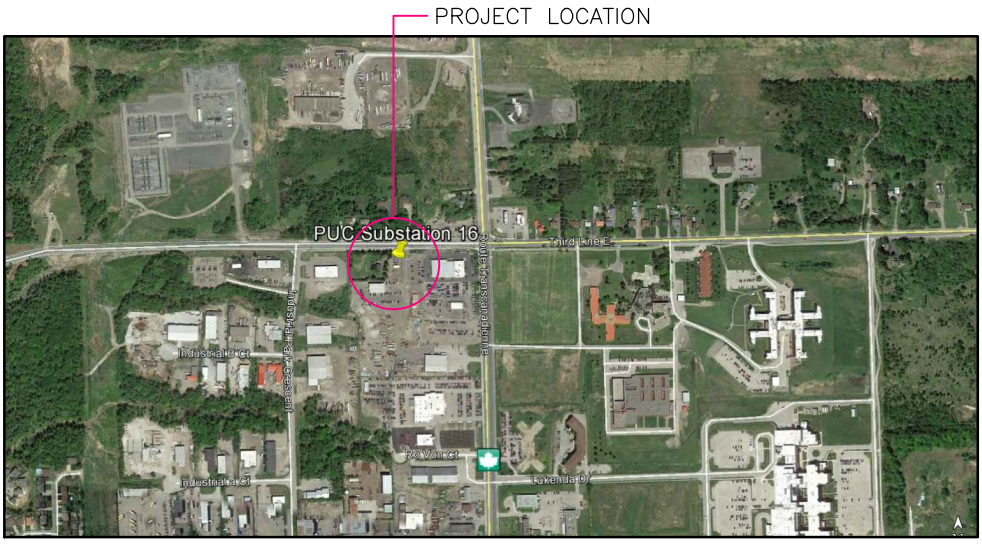
George Liang, Ph.D., P. Eng.,
Geotechnical Engineer

Sean Hinchberger, Ph.D., PEng.,
Geotechnical Specialist

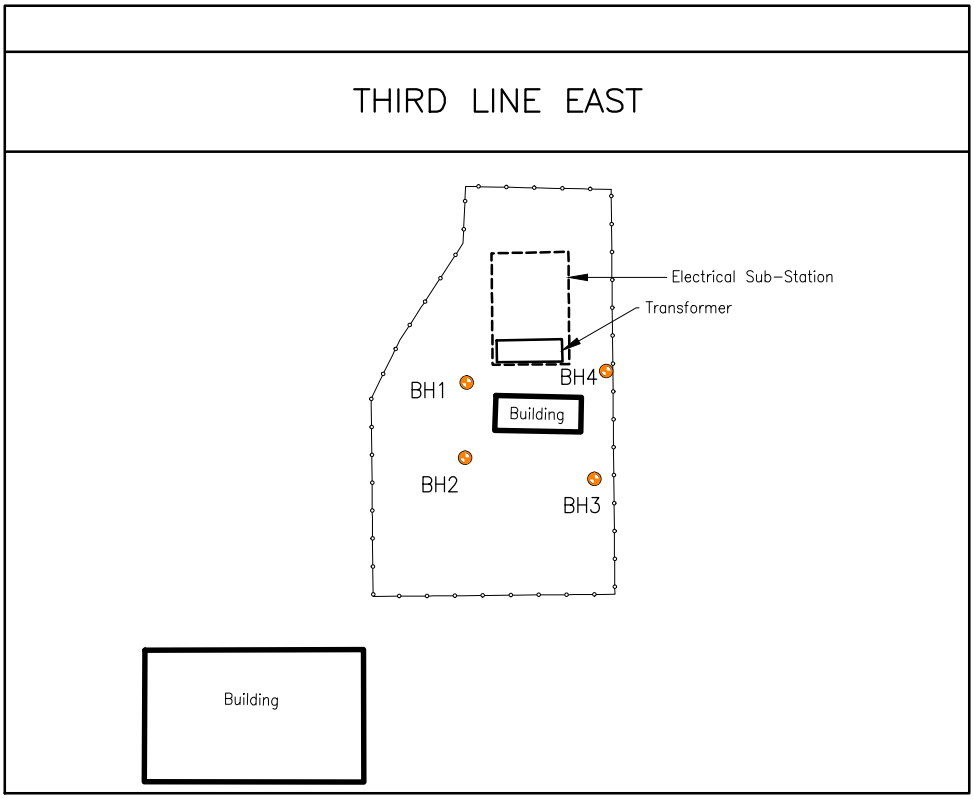
APPENDIX A

SITE LOCATION PLAN

PROJECT NORTH



SITE PLAN SHOWING PROJECT LOCATION



SITE PLAN SHOWING BOREHOLE LOCATIONS

SCALE : NTS

"IMAGERY IS COURTESY OF GOOGLE EARTH"

Project GEOTECHNICAL INVESTIGATION FOR PUC SUBSTATION 16	**Consultant** TULLOCH ENGINEERING	**Scale** NTS	
		Dr. D.A.Mousseau	**Ch.** J.Black
Title KEY PLAN & SITE PLAN SHOWING BOREHOLE LOCATIONS		**Date** February 23, 2016	
		CAD File 15-1176-Site Plan	**Dwg. No.** 1

APPENDIX B

ABBREVIATIONS, TERMINOLOGY, AND PRINCIPAL SYMBOLS USED

ABBREVIATIONS, TERMINOLOGY AND PRINCIPAL SYMBOLS USED IN REPORT AND BOREHOLE LOGS

Borehole & Test Pit Logs

Sampling method

AA	Auger Sample	**W**	Washed Sample
SS	Split Spoon Sample	**HQ**	Rock Core (63.5mm diam.)
ST	Thin Walled Shelby Tube	**NQ**	Rock Core (47.5mm diam.)
BS	Block Sample	**BQ**	Rock Core (36.5mm diam.)

In-Situ Soil Testing

Standard Penetration Test (SPT), "N" value is the number of blows required to drive a 51mm outside diameter split barrel sampler into the soil a distance of 300 mm with a 63.5kg weight free falling a distance of 760mm after an initial penetration of 150mm has been achieved. The SPT, "N" value is qualitative term used to interpret the compactness condition of cohesion less soils and is used only as a very approximation to estimate the consistency and undrained shear strength of cohesive soils.

Dynamic Cone Penetration Test (DCPT) is the number of blows required to drive a cone with a 60 degree apex attached to "A" size drill rods continuously into the soil for each 300mm penetration with a 63.5 kg weight free falling a distance of 760mm.

Cone Penetration Test (CPT) is an electronic cone point with a 10 cm^2 base area with a 60 degree apex pushed through the soil at a penetration rate of 2cm/s.

Field Vane Test (FVT) consists of a vane blade, a set of rods and torque measuring apparatus used to determine the undrained shear strength of cohesive soils.

Soil Descriptions

The soil descriptions and classifications are based on an expanded Unified Soil Classification System (USCS). The USCS classifies soils on the basis of engineering properties. The system divides soils into three major categories; coarse grained and highly organic soils. The soil is then subdivided based on either gradation or plasticity characteristics. The classification excludes particles larger than 75mm. To aid in quantifying materal amounts by eight within the respective grain size fractions the following terms have been included to expand the USCS:

Soil Classification		Terminology	Proportion
Clay	<0.002 mm		
Silt	0.002 to 0.06 mm	"trace", trace sand, etc.	1% to 10%
Sand	0.075 to 4.75 mm	"some", some sand, etc.	10% to 20%
Gravel	4.75 to 75 mm	Adjective, sandy, gravelly, or (with)	20% to 35%
Cobbles	75 to 200 mm	and, and gravel, and silt, etc.	>35%
Boulders	>200 mm	noun, Sand, Gravel, Silt, etc.	>35% and main fraction

Notes:

- Soil properties, such as strength, gradation, plasticity, structure, etcetera, dictate the soils engineering behaviour over grain size fractions;
- With the exception of soil samples tested for grain size distribution or plasticity, all soil samples have been classified based on visual and tactile observations. The accuracy of visual and tactile observation is not sufficient to differentiate between changes in soil classification or precise grain size and is therefore an approximate description.

The following table outlines the qualitative terms used to describe the relative density condition of cohesionless soil:

Cohesionless Soil	
Compactness Condition	**SPT N-Index (blows per 300 mm)**
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50

The following table outlines the qualitative terms used to describe the consistency of cohesive soils related to undrained shear strength and SPT, N-Index:

Cohesive Soil		
Consistency	**Undrained Shear Strength (kPa)**	**SPT N-Index (blows per 300 mm)**
Very soft	<12	<2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

Note: Utilizing the SPT, N-value to correlate the consistency and undrained shear strength of cohesive soils is only very approximate and needs to be used with caution.

Soil & Rock Physical Properties

General

W	Natural water content or moisture content within the soil sample
γ	Unit weight
γ'	Effective unit weight
γ_d	Dry unit weight
γ_{sat}	Saturated unit weight
ρ	Density
ρ_s	Density of solid particles
ρ_w	Density of water
ρ_d	Dry density
ρ_{sat}	Saturated density
e	Void ratio
n	Porosity
S_r	Degree of saturation
E_{50}	Strain of 50% maximum stress (cohesive soil)

Consistency

W	Liquid limit
W_P	Plastic limit
I_p	Plasticity limit
W_s	Shrinkage limit
I_L	Liquidity index
I_C	Consistency index
e_{max}	Void ratio in loosest state
e_{min}	Void ratio in densest state
I_D	Density index (formerly relative density)

Shear Strength

C_u, S_u	Undrained shear strength parameter (total stress)
C'_d	Drained shear strength parameter (effective stress)
r	Remolded shear strenght
τp	Peak residual shear strength
τr	Residual shear strength
ø'	Angle of interface friction, coefficient of friction = tan ø'

Consolidation (One Dimensional)

Cc	Compression index (normally consolidated range)
Cr	Recompression index (over consolidated range)
Cs	Swelling index
mv	Coefficient of volume change
cv	Coefficient of consolidation
Tv	Time factor (vertical direction)
U	Degree of consolidation
s'o	Overburden pressure
s'p	Reconsolidation pressure (most probable)
OCR	Overconsolidation ratio

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Permeability

The following table outlines the terms used to describe the degree of permeability of soil and common soil types associated with the permeability rates:

Permeability (cm/s)	Degree of Permeability	Common Associated Soil Type
$>10^{-1}$	Very High	Clean Gravel
10^{-1} to 10^{-3}	High	Clean Sand, Clean Sand and Gravel
10^{-3} to 10^{-5}	Medium	Fine Sand to Silty Sand
10^{-5} to 10^{-7}	Low	Silt and Clayey Silt (low plasticity)
$<10^{-7}$	Practically Impermeable	Silty Clay (medium to high plasticity)

Rock Coring

Rock Quality Designation (RQD) is an indirect measure of the number of fractures within a rock mass, Deere et al. (1967). It is the sum of sound pieces of rock core equal to or greater than 100 mm recovered from the core run, divided by the total length of the core run, expressed as a percentage. If the core section is broken due to mechanical or handling, the pieces are fitted together and if 100 mm or greater included in the total sum.

RQD is calculated as follows:

$$\text{RQD (\%)} = \frac{\Sigma \text{ Length of core pieces} > 100 \text{ mm} \times 100}{\text{Total length of core run}}$$

The following is the Classification of Rock with Respect to RQD Value:

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

APPENDIX C

BOREHOLE LOG

Borehole Log: BH 1

TULLOCH ENGINEERING

Project No: **15-1176**
Project: **PUC Substation 16 Geotechnical Investigation**
Site Location: **Sault Ste. Marie, Ontario**
Client: **PUC Services Inc.**

Logged By: **B.Ahde**
Compiled By: **D.A.Mousseau**
Reviewed By: **J.Black**

Depth (m)	DESCRIPTION	Elevation (m)	Sample Number	Sample Type	Recovery (%)	Blows / 0.3m	Undrained Shear Strength (Cu, kPa)	Water Content (%)	Remarks / Grain Size (%) Gr Sa Si Cl
0	Geodetic Ground Elevation	0.00							
0	Sandy Gravel, Trace Silt, Compact, Brown, Moist		1	AS	67	22		4.7	
		-0.76							
1			2	AS	92	17			
2	Silt, Some Clay, Trace Sand, Compact To Loose, Brown, Moist		3	AS	75	9		27.3	Water @ 1.52m
			4	AS	75	9		27.2	0 4 86 10
3		-3.05	5	AS	88	3		28.8	
4	Silt, Some Clay, Trace Sand, Very Loose, Brown, Wet		6	AS	83	2		31.4	
5			7	AS	83	3		28.4	0 1 84 15
		-5.33							
6	Silty Clay, Very Soft, Brown, Wet		8	AS	100	1		40.6	
			9	AS	100	1		39.3	
		-6.70							
7	End of Borehole								
8									

Standard Penetration Resistance (Blows / 0.3m): 10 20 30 40 50 60 70 80 90

Undrained Shear Strength (Cu, kPa): 25 50 75 100 125 150 175 200

Water Content Data (%): 10 20 30 40 50 60 70 80

Drilled By: **North Drilling**

Drill Method: **GeoProbe**

Drill Date: **December 3, 2015**

Sample Type
AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
WL. Liquid Limit
WP. Plastic Content
$+_s$ Field Vane, S - Sensitivity
- Lab Vane
w - Wash
O- SPT(Standard Penetration Test)
O - DCPT (Dynamic Cone Penetration)
WH - Weight Of Hammer

WP W WL

Datum:

Location:

Sheet: **1 of 1**

Borehole Log: BH 2

TULLOCH ENGINEERING

Project No: **15-1176**
Project: **PUC Substation 16 Geotechnical Investigation**
Site Location: **Sault Ste. Marie, Ontario**
Client: **PUC Services Inc.**

Logged By: **B.Ahde**
Compiled By: **D.A.Mousseau**
Reviewed By: **J.Black**

Well	Strata Plot (m)	Depth (m)	DESCRIPTION	Elevation (m)	Sample Number	Sample Type	Recovery (%)	Blows / 0.3m
		0	Geodetic Ground Elevation	0.00				
		0	Sandy Gravel & Clay, Trace Silt, Very Loose, Brown, Wet	-0.76	1	AS	13	4
		1			2	AS	67	9
		2	Silt, Some Clay, Trace Sand, Compact To Loose, Brown, Moist	-3.05	3	AS	75	3
		2			4	AS	75	5
		3			5	AS	75	2
		4			6	AS	92	2
		4	Silt, Some Clay, Trace Sand, Very Loose, Brown, Wet		7	AS	92	2
		5			8	AS	100	1
		6		-6.70	9	AS	100	1
		6	End of Borehole					
		7						
		8						

Undrained Shear Strength (Cu, kPa): 25 50 75 100 125 150 175 200
Standard Penetration Resistance, Blows / 0.3m: 10 20 30 40 50 60 70 80 90
Water Content Data (%): 10 20 30 40 50 60 70 80

Remarks

Grain Size (%) — Gr Sa Si Cl

Water @ 1.52m

Drilled By: **North Drilling**

Drill Method: **GeoProbe**

Drill Date: **December 3, 2015**

Sample Type
AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
WL. Liquid Limit
WP. Plastic Content
$+_s$ Field Vane, S - Sensitivity
- Lab Vane
w - Wash
O- SPT(Standard Penetration Test)
O - DCPT (Dynamic Cone Penetration)
WH - Weight Of Hammer

WP W WL

Datum:

Location:

Sheet: **1 of 1**

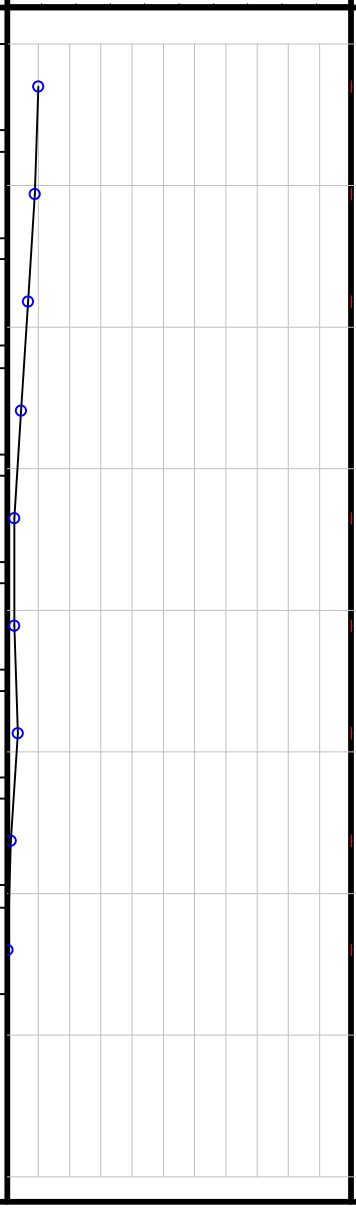
Borehole Log: BH 3

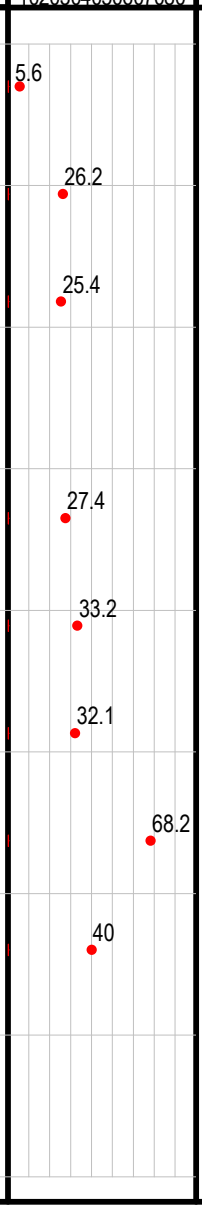
TULLOCH ENGINEERING

Project No: 15-1176
Project: PUC Substation 16 Geotechnical Investigation
Site Location: Sault Ste. Marie, Ontario
Client: PUC Services Inc.

Logged By: B.Ahde
Compiled By: D.A.Mousseau
Reviewed By: J.Black

Well	Strata Plot (m)	Depth (m)	DESCRIPTION	Elevation (m)	Sample Number	Sample Type	Recovery (%)	Blows / 0.3m
		0	Geodetic Ground Elevation	0.00				
			Sandy Gravel & Clay, Trace Silt, Clay & Organics, Loose, Brown, Moist	-0.76	1	AS	55	9
		1	Silt, Some Clay, Trace Sand, Compact To Loose, Brown, Moist		2	AS	75	8
		2		-2.28	3	AS	55	6
			Silt, Some Clay, Trace Sand, Very Loose, Brown, Wet		4	AS	75	4
		3			5	AS	100	2
		4			6	AS	92	2
		5			7	AS	100	3
		6			8	AS	100	1
				-6.70	9	AS	100	WH
		7	End of Borehole					
		8						





Remarks

Grain Size (%)

Gr	Sa	Si	Cl

Water @ 1.52m

Drilled By: North Drilling

Drill Method: GeoProbe

Drill Date: December 3, 2015

Sample Type
AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
WL. Liquid Limit
WP. Plastic Content
$+_S$ Field Vane, S - Sensitivity
- Lab Vane
w - Wash
O- SPT(Standard Penetration Test)
O - DCPT (Dynamic Cone Penetration)
WH - Weight Of Hammer

WP W WL

Datum:

Location:

Sheet: 1 of 1

Borehole Log: BH 4

TULLOCH ENGINEERING

Project No: **15-1176**
Project: **PUC Substation 16 Geotechnical Investigation**
Site Location: **Sault Ste. Marie, Ontario**
Client: **PUC Services Inc.**

Logged By: **B.Ahde**
Compiled By: **D.A.Mousseau**
Reviewed By: **J.Black**

Well	Strata Plot (m)	Depth (m)	DESCRIPTION	Elevation (m)	Sample Number	Sample Type	Recovery (%)	Blows / 0.3m
		0	Geodetic Ground Elevation	0.00				
		0	Sandy Gravel, Trace Silt & Clay, Compact, Brown, Moist	-0.76	1	AS	55	10
		1	Silt, Some Clay, Trace Sand, Compact To Loose, Brown, Moist		2	AS	67	5
		2			3	AS	67	5
		2			4	AS	75	7
		3		-3.05	5	AS	92	2
		4	Silt, Some Clay, Trace Sand, Very Loose, Brown, Wet		6	AS	92	2
		5			7	AS	100	2
		5			8	AS	100	1
		6			9	AS	100	1
		6		-6.70				
		7	End of Borehole					
		8						

Undrained Shear Strength (Cu, kPa)
25 50 75 100 125 150 175 200

Standard Penetration Resistance
Blows / 0.3m
10 20 30 40 50 60 70 80 90

Water Content Data (%)
10 20 30 40 50 60 70 80

Remarks

Grain Size (%)
Gr Sa Si Cl

Water @ 1.52m

Drilled By: **North Drilling**

Drill Method: **GeoProbe**

Drill Date: **December 3, 2015**

Sample Type
AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
WL. Liquid Limit
WP. Plastic Content
$+_s$ Field Vane, S - Sensitivity
- Lab Vane
w - Wash
O- SPT(Standard Penetration Test)
O - DCPT (Dynamic Cone Penetration)
WH - Weight Of Hammer

WP W WL

Datum:

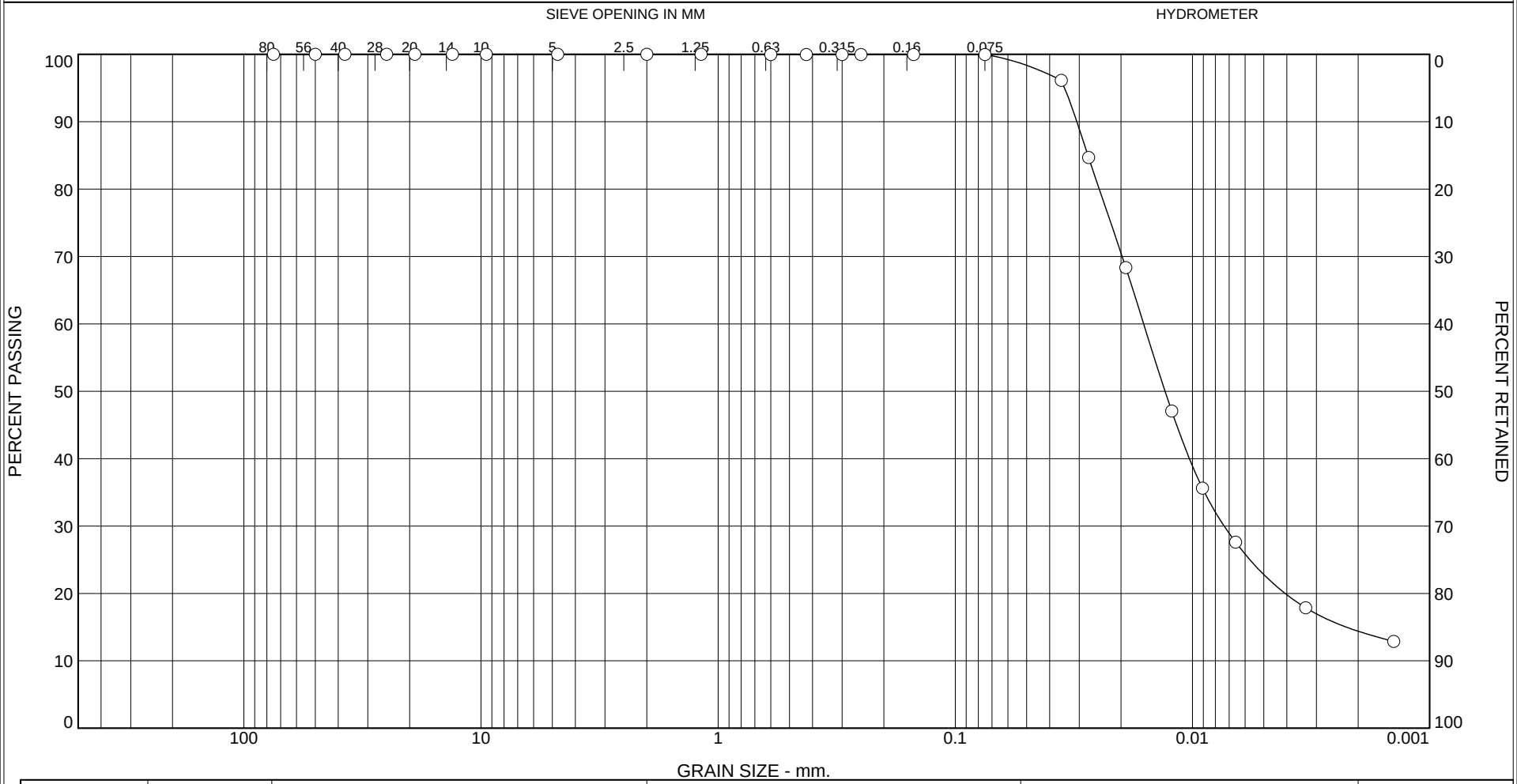
Location:

Sheet: **1 of 1**

APPENDIX D

LABORATORY RESULTS

Particle Size Distribution Report



	% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
			Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
○	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	28.2	56.1	14.4

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH 1 Depth: 4.57m - 5.18m Sample Number: AS #7	12/03/15		12/14/15

Client PUC

Project Substation 16

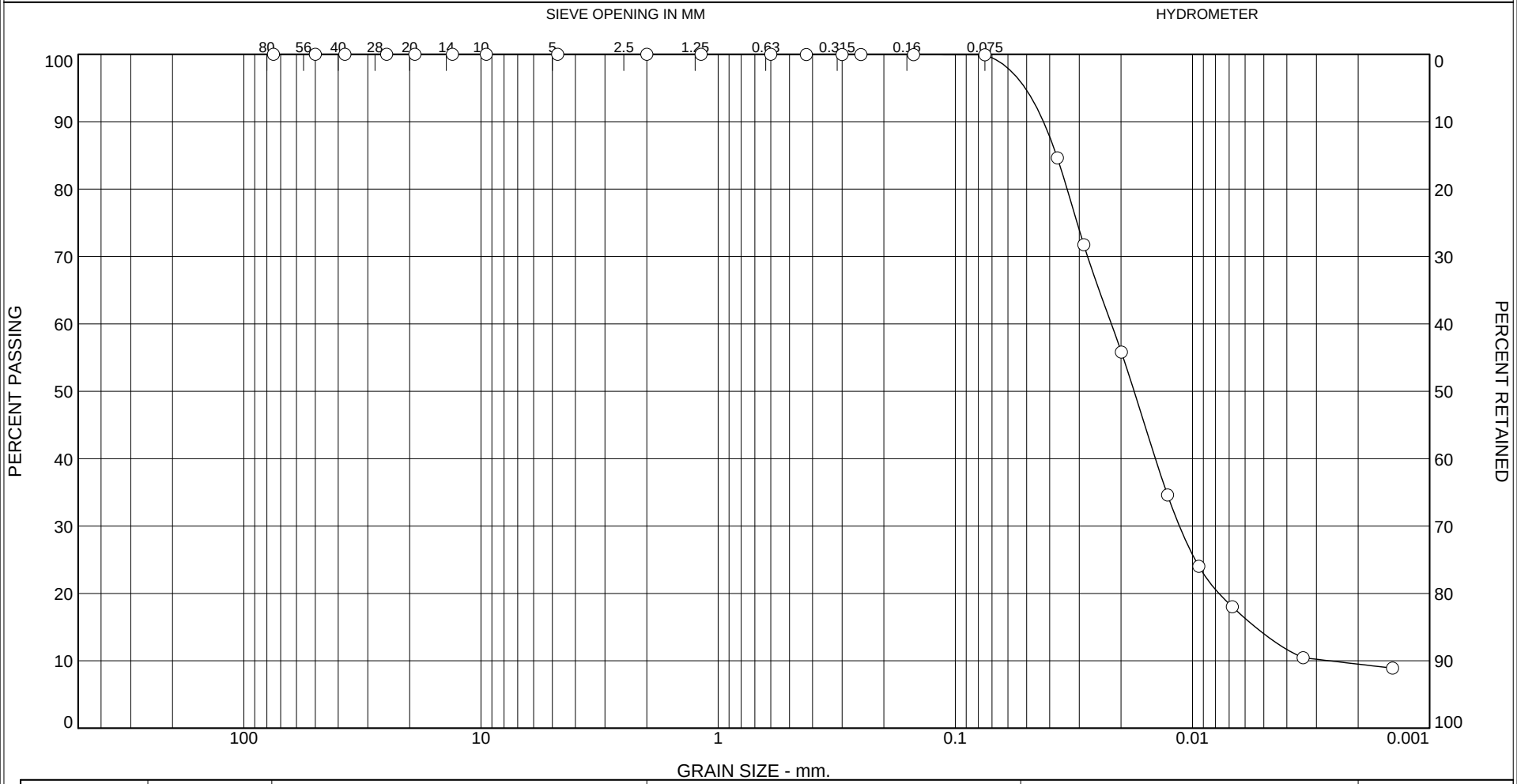
Project No. 15-1176 Figure

TULLOCH ENGINEERING
71 Black Road
Unit 3
Sault Ste.
Marie, ON
P6B 0A3
T. 705 949.1457
F. 705 949.9606
TF. 866 806.6602
adam.byers@TULLOCH.ca

○ SA6745
F.M.=0.00

Tested By: B. Ahde

Particle Size Distribution Report



	% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
			Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
○	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	4.0	39.9	46.5	9.5

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH 1 Depth: 2.29m - 2.9 m Sample Number: SA #4	12/03/15		12/14/15

Client PUC

Project Substation 16

Project No. 15-1176 Figure

TULLOCH ENGINEERING
71 Black Road
Unit 3
Sault Ste.
Marie, ON
P6B 0A3
T. 705 949.1457
F. 705 949.9606
TF. 866 806.6602
adam.byers@TULLOCH.ca

○ SA 6744
F.M.=0.00

Tested By: B.Ahde

APPENDIX E

LIMITATIONS

REPORT LIMITATIONS AND GUIDELINES FOR USE

This information has been provided to help manage risks with respect to the use of this report.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

This geotechnical report has been prepared for the exclusive use of the client, their authorized agents, and other members of the design team. It is not intended for use by others, and the information contained herein is not applicable to other sites, or for purposes other than those specified in the report.

TULLOCH Engineering (TULLOCH) cannot be held responsible for reliance on the information contained in this report, by persons other than the client or 'authorized' agent without prior written approval.

SUBSURFACE CONDITIONS CAN CHANGE

This geotechnical investigation report is based on existing conditions at the time the study was performed, and our opinion of soil conditions are strictly based on soil samples collected at specific borehole locations. The findings and conclusions of our reports may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations.

LIMITATIONS TO PROFESSIONAL OPINIONS

Interpretations of subsurface conditions are based on field observations from boreholes and/or test pits that were spaced to capture a 'representative' snap shot of subsurface conditions. Site exploration identifies subsurface conditions only at points of sampling. TULLOCH reviews field and laboratory data and then applies our professional judgment to formulate an opinion of subsurface conditions throughout the site. Actual subsurface conditions may differ, between sampling locations, from those indicated in this report.

LIMITATIONS OF RECOMMENDATIONS

Subsurface soil conditions should be verified by a qualified geotechnical engineer during construction. TULLOCH should be notified if any discrepancies to this report or unusual conditions are found during construction.

Sufficient monitoring, testing and consultation should be provided by TULLOCH during construction and/or excavation activities, to confirm that the conditions encountered are consistent with those indicated by the borehole and/or test pit investigation, and to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated. In addition, monitoring, testing and consultation by

TULLOCH should be completed to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining TULLOCH for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions. However, please be advised that any construction/excavation observations by TULLOCH is over and above the mandate of this geotechnical investigation and therefore, additional fees would apply.

MISINTERPRETATION OF GEOTECHNICAL ENGINEERING REPORT

Misinterpretation of our report by other design team members can result in costly problems. You could lower that risk by having TULLOCH confer with appropriate members of the design team after submitting the report. Also retain TULLOCH to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having TULLOCH participate in pre-bid and preconstruction conferences, and by providing construction observation. Please be advised that retaining TULLOCH to participation in any 'other' activities associated with this project is over and above the mandate of this geotechnical investigation and therefore, additional fees would apply.

CONTRACTORS RESPONSIBILITY FOR SITE SAFETY

This geotechnical report is not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and to adjacent properties. It is ultimately the contractor's responsibility that the Ontario Occupational Health and Safety Act is adhered to, and site conditions satisfy all 'other' acts, regulations and/or legislation that may be mandated by federal, provincial and/or municipal authorities.

SUBSURFACE SOIL AND/OR GROUNDWATER CONTAMINATION

This report is geotechnical in nature and specifically excludes the investigation, detection, prevention or assessment of the presence of subsurface contaminants. Accordingly, the scope of services does not include any interpretations, recommendations, findings, or conclusions regarding the detection, assessment, prevention or abatement of contaminants, and no conclusions or inferences should be drawn regarding contamination, as they may relate to this project. The term "contamination" includes, but is not limited to, molds, fungi, spores, bacteria, viruses, PCBs, petroleum hydrocarbons, inorganics, pesticides/insecticides, volatile organic compounds, polycyclic aromatic hydrocarbons and/or any of their byproducts.

APPENDIX F

MRW GEOTECHNICAL INVESTIGATION REPORT (2011)

Consulting Engineers

MRW

M.R. WRIGHT & ASSOCIATES CO. LTD.

SAULT STE. MARIE • ONTARIO

Geotechnical Report

Great Lakes Power
Third Line Egress Renovations Project
Sault Ste. Marie, Ontario

November 30, 2011
Project G11310

ENGINEERING OFFICE
Member of Consulting Engineers of Ontario
Certification of Authorization Professional Engineers of Ontario
Member of Association of Canadian Engineering Companies

Consulting Engineers of Ontario

Professional Engineers Ontario

ASSOCIATION OF CONSULTING ENGINEERING COMPANIES | CANADA

Geotechnical Report

Great Lakes Power
Third Line Egress Renovations Project
Sault Ste. Marie, Ontario

Prepared for:

PowerTel Utilities Contractors Limited
Attn: Mr. Michael Krueger
150 Regional Road 10
Whitefish, Ontario
P0M 3E0

Prepared by:

M.R. Wright and Associates Co. Ltd.
Consulting Engineers
Sault Ste. Marie, Ontario
P6B 0A3

November 30, 2011
MRW Project G11310

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Appendices

1.0 Introduction and Scope

Great Lakes Power Transmission (GLPT) is expanding the Third Line Transformer Station, located in Sault Ste. Marie, Ontario. The station is located on the north side of Third Line East approximately 0.3 miles west of Great Northern Road (Highway 17). The site location and proposed substation expansion is shown on Figure 1.

The Consulting Engineering firm of M. R. Wright and Associates Co. Ltd. (MRW) has been retained by PowerTel Utilities Contractors Limited (PowerTel) to perform a geotechnical evaluation and provide subsequent geotechnical design parameters and recommendations to be used by Power Engineers to refine a deep foundation design for the support of power transmission poles.

It is understood by MRW that a preliminary pole foundation design by Power Engineers consists of a 35 foot (ft) long 7 ft diameter drilled concrete caisson. This design was based on limited soil information obtain within the vicinity of the new development.

Our geotechnical comments, recommendations and design parameters within this report are based on the results of the field investigation and our understanding of the project scope.

It is understood by MRW that the foundations are to be designed to resist the following loads:

- Bending moment of 1,300 ft-kips at the base of the pole;
- Axial load of 12 kips, and;
- Shearing load of 25 kips.

The purpose of the geotechnical evaluation was to delineate the subsurface soil and groundwater conditions at the site by advancing four sampled boreholes and three Dynamic Cone Penetration Tests (DCPT). The borehole and DCPT locations are shown on Figure 1. Based on the results of the geotechnical investigation, the following data and geotechnical engineering recommendations are provided herein:

- A review of relevant area geology and geotechnical background information;
- A summary and interpretation of all relevant geological surface and subsurface information;
- A detailed description of soil and groundwater conditions including borehole logs and design parameters for LPILE;
- Foundation design comments and recommendations;
- Frost penetration depth;

- Site classification for seismic site response.

Abbreviations, terminology and principal symbols commonly used throughout the report, test hole logs and appendices are enclosed in Appendix E.

2.0 Site Description and Geological Setting

Data obtained from the Northern Ontario Geology Terrain Study Map 5012, as published by the Ministry of Natural Resources, indicate that the site is located in glaciolacustrine plain that is mainly comprised of clay and silt material. The topography of the dominant landform for the area is mainly low local relief, and is plain, dissected/gullied. The surface drainage is considered dry.

The local topography generally slopes down in a southwest direction. There are pockets of low lying areas that are somewhat swampy and covered by cattails which is considered wet.

3.0 Geotechnical Field Investigation and Methodology

The geotechnical field investigation was performed from November 3 to 7, 2011. The field investigation consisted of advancing four sampled boreholes (BH1 to BH3 and BH5) and three Dynamic Cone Penetration Test's (DCPT1 to DCPT3). The approximate spatial locations of the boreholes are indicated on Figure 1.

Borehole BH4 was intended to be advanced at the southeast corner of Second Line East and Sackville Road, was not completed as part of this geotechnical investigation. It is understood by MRW that the borehole may be advanced in the future.

The boreholes were advanced with the use of a Track-Mounted Mobile CME850 drill rig equipped with 200 mm diameter continuous flight hollow stem augers and standard soil sampling equipment, which was operated by Marathon Drilling Co. Ltd. Soil samples were obtained with a 2 ft long 2 inch outside diameter split spoon barrel in conjunction with Standard Penetration Tests, "N" values (ASTM D1586) at 2.5 ft intervals in the upper 10 ft and 5 ft intervals thereafter. The Standard Penetration Test (SPT) "N" values were used to assess the compactness condition of the overburden soils.

Continuous Dynamic Cone Penetration testing was performed with a 60 degree apex cone attached to "A" size drill rods. The number of blows were recorded for each foot of soil penetration advanced by a 140 lb weight free falling a distance of 2.5 ft.

Upon completion of the drilling program, monitoring wells were installed within each borehole to measure the stabilized groundwater. The piezometers were installed with the Ontario Ministry of Environment Regulation 903.

The soil sampling operation was completed under the full time review of a MRW technician. MRW's technician logged the drilling operations and identified the soil samples as they were retrieved. The recovered soil samples were sealed into plastic bags and carefully transported to our laboratory for detailed examination and testing. All soil samples were classified according to visual and index properties by the project engineer.

4.0 Laboratory Testing

Select soil samples collected from the boreholes were submitted to MRW's Materials Testing Laboratory and Testmark Laboratory Limited (Testmark), in accordance with the applicable ASTM Standards to determine the following:

- Water content;
- Grain size distribution;
- Atterberg limits;
- Unit weight;
- pH;
- Sulfate;
- Chlorides, and;
- Resistivity.

The water content, grain size distribution and Atterberg Limits of the material tested are summarized on the borehole logs in Appendix A and our laboratory analytical reports in Appendix B. Although laboratory testing was performed to estimate the unit weight of the soil, the unit weights provided on the borehole logs is an overall representation of a specific soil horizon for geotechnical design purposes. The laboratory testing was utilized to corroborate with soils that are the same/similar in composition and water content. Results from the laboratory testing are included in Appendix B. We note that the testing was performed on disturbed soil samples and is subject to an according degree of error. As such, interpretation is required by an experienced geotechnical engineer who is familiar with the local soil types and conditions. Unit weight testing was not performed on relatively undisturbed soil samples obtained from thin wall Shelby tubes in case consolidation or triaxial compression testing is required in the future.

It is noted that due to the limitations of retrieving soil samples with a 2 inch diameter split spoon barrel, the grain size distribution results may not be representative of the in-situ soil matrix and reflect the larger particles observed by the geotechnical field technician. These observations are reflected on the borehole logs.

The pH, resistivity, chlorides and sulfate content of select soil samples were submitted to Testmark's laboratory. The test results are summarized in Section 5.3 of this report. A copy of Testmark's analytical report is included in Appendix C.

The collected samples were also compared against previous geotechnical information from the area, for consistency and calibration of results.

5.0 Geophysical Logging of Subsurface Conditions

Details of the soil and groundwater conditions encountered within each borehole are included in Appendix A, Borehole Logs. The borehole logs include textural descriptions of the subsoil in accordance with an expanded Unified Soil Classification System (USCS) and indicate the soil boundaries inferred from non-continuous sampling and observations during the borehole advancement. These boundaries reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The expanded USCS classification is explained in further detail in Appendix E.

5.1 Borehole Soil Stratigraphy

The soil stratigraphy encountered within boreholes BH1 to BH3 and BH5 generally consisted of altering layers of silt and silty clay (silty and clayey phases of soil) in the upper 20 to 30 ft or so. Below this depth, the soils became more homogeneous and predominantly silty clays of low plasticity. The silty clays overlaid a glacial till deposit. It is noted that within borehole BH1, the silty clay generally increased in clay content below 50 ft in depth and tended to have a higher plasticity. The silty clay also had a higher plasticity within borehole BH3 between approximately 35 to 40 ft below grade. In addition, an initial 5 ft layer of sand material was encountered within borehole BH1 and an initial 2.5 ft of sand and gravel fill within borehole BH2.

From an engineering perspective, the soils can be combined into five categories and are summarized below:

- Upper sand – encountered in borehole BH1 from approximately 0 to 5 ft;
- Upper and lower silt – the upper silt layer was encountered in all boreholes from approximately 0 to 10 ft and the lower silt layer was encountered in boreholes BH1 and BH5 from approximately 15 to 30 ft and borehole BH3 from 25 to 30 ft;
- Intermediate clayey silt to silty clay – encountered in all boreholes from approximately 5 to 20 ft and up to 25 ft in borehole BH3.
- Lower silty clay – encountered in all boreholes from approximately 20 to 65 ft
- Glacial till – encountered in all boreholes from approximately 42 to 76 ft.

- Underlying sandstone bedrock was not proven in any boreholes.

All boreholes and DCPT's extended to refusal or competent end bearing material within the glacial till deposit. The refusal depths or competent end bearing material are outlined in the table below:

Borehole/DCPT No.	Refusal Depth (ft)
BH1	75.7
BH2	51
BH3	67
BH5	60
DCPT1	57.3
DCPT2	53.3
DCPT3	50.7

5.1.1 General Soil Description and Physical Properties

Initial Sand Layer – BH1

The initial layer of sand encountered within borehole BH1 contained trace to some silt, trace organics (rootlets), was brown, loose to compact, damp, fine to medium grained and poorly graded. Uncorrected SPT "N" values form 2.5 to 4 ft were 11 blows per 1 ft, classifying the material as having a compact compactness condition.

Initial Sand and Gravel Fill – BH2

The sand and gravel fill encountered within borehole BH2 contained trace cobbles, trace boulders, trace silt, trace clay, was brown, loose to compact, dry to damp, fine to medium grained and poorly graded.

Upper Silt (All Boreholes) & Lower Silt – BH1, BH3 and BH5

The upper and lower silt deposit contained trace to some sand, trace to some clay, was typically reddish brown in the upper layer and grey in the lower layer. Uncorrected SPT "N" values within the material ranged from 1 to 9 blows per 1 ft, classifying the material as having a very loose to loose compactness condition.

The lower layer of silt tended to have increased clay content and exhibited slight plasticity. The upper silt layer was dry to damp and the lower layer of silt was moist to wet.

Intermediate Clayey Silt to Silty Clay

The intermediate clayey silt to silty clay was typically reddish brown and of low plasticity.

Uncorrected SPT "N" values within the material ranged from 0 to 4 blows per 1 ft, classifying the material as very soft to soft in consistency. The undrained shear strengths of the material as measured from field vanes ranged from 0.92 to 1.26 kip/ft^2, classifying the material as firm to stiff in consistency. The undrained shear strengths may have indicated a higher consistency due to silt seams within the material. Based on tactile observations of the material, a soft to firm consistency is a more appropriate description.

The sensitivity of the clayey silt to silty clay ranged from 2.7 to 6 and is generally considered to be moderately sensitive to disturbance.

Lower Silty Clay

The lower silty clay was typically greyish brow to grey in colour and of low plasticity.

Uncorrected SPT "N" values within the material ranged from 0 to 1 blow per 1 ft, classifying the material as very soft in consistency. The undrained shear strengths of the material as measured from field vanes ranged from 0.84 to 1.1 kip/ft^2, classifying the material as firm in consistency. The undrained shear strengths may have indicated a higher consistency due to silt seams within the material. Based on tactile observations of the material, a soft consistency is a more appropriate description.

The sensitivity of the clayey silt to silty clay ranged from 2.2 to 9.5 and is generally considered to be sensitive to disturbance.

Glacial Till

The glacial till deposit encountered underlying the silty clay, predominantly comprised silt. The till also contained trace to some gravel, trace to some sand, trace clay, was grey, compact to very dense, moist to wet and fine to medium grained. Uncorrected SPT "N" values within the material ranged from 21 to greater than 100 blows per 1 ft, classifying the material as having a compact to very dense compactness condition. We note that a blow count of 1 was observed at the initial contact of the till layer within borehole BH1. This is likely due to unequal hydrostatic head in the casing and is not considered representative of the overall compactness condition of the till material.

The glacial till deposit was encountered between 41 to 65 ft below grade and was sampled to a depth between 51 to 76 ft below grade. The split spoon barrel was bouncing (i.e. SPT "N" values greater than 100 blows/ft) on a probable boulder within boreholes BH1, BH2, and BH5. Within borehole BH3 two consecutive sets of SPT "N" values of 21 and 28 blows per foot were achieved and the borehole was terminated at this depth.

Based on the spoon bouncing and the SPT, "N" values we would anticipate a very dense bouldery till. Underlying sandstone bedrock was not proven in any borehole.

5.1.2 Summary of Soil Conditions

In general, based on the information encountered within the boreholes and DCPT's, the soils consist of a relatively thick stratum of alternating soil layers that predominantly consist of silt and silty clay (silty and clayey phases of soil). This stratum thickness ranges from approximately 41 ft (BH2) to 65 ft (BH1). This stratum was typically very loose to loose consisting of non-cohesive soils (silt and sand) and soft to firm cohesive soils (clayey silt to silty clay). This stratum was underlain by a compact to very dense glacial till deposit that predominantly comprised of silt, some gravel and some sand, trace clay and probable boulders below the sampled depth. Based upon previous investigations we would anticipate sandstone bedrock to be encountered at varying depths below the till.

5.1.3 Summary of Soil Engineering Properties for LPILE

The following table outlines soil engineering properties based on current laboratory test results and previous geotechnical information from the area:

Soil Type	Unit Weight γ (kips/ft^3)	Effective Unit Weight γ' (kips/ft^3)	Effective Angle of Internal Friction ϕ'	Cohesion c (kips/ft^2)	Modulus of Lateral Subgrade K_h (kips/ft^3)	Strain at 50% Maximum Stress E_{50}	Average Ultimate Skin Friction q_s (kips/ft^2)
Intermediate Clayey Silt to Silty Clay	0.114	0.052	24°	1.0	180	0.01	0.65
Lower Silt	0.114	0.052	26°	N/A	150	N/A	0.22
Lower Silty Clay	0.105	0.043	22°	1.0	85	0.015	0.6
Glacial Till	0.133	0.071	36°	N/A	260	N/A	1.25

Notes (for previous table)

- The upper 10 ft of soil should be ignored when determining the axial pile capacity and horizontal pile resistance, due to freeze thaw and wetting and drying cycles. As such, the upper sand, upper silt and upper clayey silt have not been included in the above table;
- The effective unit weight (γ') of the soil should be utilized when calculating the axial pile capacity and horizontal pile resistance;
- Even though the lower silty clay is softer than the upper silty clay, the cohesion (c) between the upper silty clay and the lower silty clay are similar due to increasing pressure with depth;
- The modulus of lateral subgrade reaction (K_h) is based on submerged soil (i.e. 100% saturation);
- The average ultimate skin friction is based on cast in place concrete caissons and varies with embedment depth.

5.2 Groundwater Conditions

The groundwater elevations at the borehole locations were measured upon completion of drilling and between 4 to 6 days after drilling on November 10, 2011, once stabilized. The measured stabilized groundwater conditions are summarized on the borehole logs in Appendix A and the table below.

Borehole/DCPT No.	Measured Groundwater Depth (ft)
BH1	1.5
BH2	1.5
BH3	10.0
BH5	12.5
DCPT1	*12.0
DCPT2	*6.0
DCPT3	*1.0

*****The groundwater within DCPT's 1 to 3 were estimated based on visual observations on the side of the rods upon removal and are estimates only.

Seasonal variations in the water table should be expected, with higher levels occurring during wet weather conditions in the spring and fall and lower levels occurring during dry weather conditions. As such, the measured groundwater table should be assumed to fluctuate as much as 3 ft between wet and dry seasons. We note that the groundwater elevation has been measured during a relatively wet time of year.

5.3 Soil Corrosion Assessment

The pH, resistivity, chlorides and sulfate content of select soil samples were submitted to Testmarks's laboratory. A copy of Testmark's analytical report is included in Appendix C and is summarized in the following table.

Borehole & Sample No.	Soil Type	Depth (ft)	Water Content (%)	pH	Resistivity ohm-cm	Chlorides (µg/g)	Sulfate (µg/g)
BH1-2	Sand	2.5 to 4.5	16.5	4.77	75757	18.7	2.3
BH1-3	Silt	5 to 7	17.1	7.44	25188	29.6	1.9
BH1-11	Silty Clay	40 to 42	21.9	8.06	16233	27.3	7
BH2-4	Silt	7.5 to 9.5	21.6	6.93	6968	98.9	53.9
BH3-8	Silt	25 to 27	22.3	8.02	13736	25.8	6.6
BH5-4	Clayey Silt	7.5 to 9.5	31.2	8.29	25125	38.5	6.4
BH5-12	Silty Clay	44.5 to 46.5	28	8.36	19305	38.4	5.3

5.3.1 Concrete

The Canadian Standards Association (CSA) outlines the guidelines for sulfate attack (corrosion) within Table 3 of the Concrete Code A23.1-04. The code generally stipulates that when the water-soluble sulfate in the soil is less than 0.10% the concrete will not be subjected to sulfate attack. Slightly acidic soils with a pH value of 4.5 can slightly etch concrete surfaces, usually without affecting the long term performance of the concrete. The laboratory analytical results conducted on the submitted soil samples indicate that the sulfate content is a maximum of 53.9 µg/g (0.005% by weight), which is considered negligible and does not exceed Table 3 of CSA Standard A23.1-04. The lowest pH value was 4.77, indicating the soil is slightly acidic and is not considered to affect the overall performance of the concrete. As such, Type 10 Portland cement would be suitable for this project.

5.3.2 Metal Components

Aside from pH, resistivity, chlorides, and sulfate, there are many factors that could potentially affect the corrosion rate of metal components. Based on the test results only, the soils appear to be mildly corrosive to metal.

These comments are somewhat general and should be reviewed in detail by an electrical engineer based on the laboratory test results and local conditions.

6.0 Geotechnical Design Comments & Recommendations

6.1 Discussion

It is understood by MRW that a preliminary foundation design by Power Engineers consists of a 35 ft long 7 ft diameter concrete caisson. This preliminary foundation design was based on limited soil information obtain within the vicinity of the new development.

It is also understood by MRW that the foundations are to be designed to resist the following loads:

- Bending moment of 1,300 ft-kips at the base of the power pole;
- Axial load of 12 kips, and;
- Shearing load of 25 kips.

6.2 Concrete Caisson

6.2.1 General

The upper 10 ft of soil should be ignored when determining the axial capacity, uplift capacity and horizontal capacity due to freeze thaw and wetting and drying cycles.

6.2.2 Ultimate & Allowable End Bearing Capacity

The ultimate and allowable end bearing capacity is a function of the soil type at the underside of the concrete caisson, embedment depth, base diameter and depth to an underlying stronger bearing stratum (i.e. dense till or bedrock).

6.2.2.1 Glacial Till

The best soil bearing stratum is the underlying dense to very dense glacial till deposit (not considering the underlying sandstone bedrock). For concrete caissons end bearing on the dense to very dense glacial till deposit, the ultimate end bearing capacity is 26 kips/ft^2.

As per the Canadian Foundation Engineering Manual, the ultimate end bearing capacity should be multiplied by a geotechnical resistance factor of 0.4 to obtain a factored Ultimate Limit State (ULS) design.

To limit settlements to within approximately 1 inch or less, an allowable bearing reaction of 7.5 kips/ft^2 is estimated for Serviceability Limit State (SLS) design.

6.2.2.2 Lower Silty Clay

A 35 ft long 7 ft diameter cast-in-place concrete caisson is anticipated to bear in the lower silty clay deposit.

For concrete caissons end bearing in the silty clay stratum at approximately 35 ft below the existing grade, the ultimate end bearing capacity is 4 kips/ft^2.

To limit settlements to within approximately 1 inch or less, an allowable bearing reaction of 1 kip/ft^2 is estimated for SLS design.

The capacity of the pile will change, depending on caisson length, shaft diameter and base diameter. If required, once the caisson design nears completion, MRW can provide updated capacities based on a revised design.

6.2.3 Uplift Resistance

The caissons ultimate uplift resistance is equal to the shaft resistance that can be mobilized along the surface area of the pile shaft.

Based on the soils encountered within the geotechnical investigation, and for augured cast-in-place concrete caissons, the ultimate shaft resistance can be taken as the total axial resistance.

A factored geotechnical axial resistance for ULS design is taken as the total ultimate axial resistance multiplied by geotechnical resistance factor of 0.3 for uplift.

6.2.4 Pile Downdrag with Potential Grade Raise

Any potential grade increase should be limited to 2 ft above the existing elevation to prevent consolidation settlements of the soils and negative skin friction (down drag) on the caissons.

If a grade increase in excess of 2 ft is required, downdrag forces should be considered and the piles should be designed with additional capacity to resist downdrag forces. If required, MRW can provide recommendations for reducing the geotechnical axial capacity of the pile based on the proposed grade increase. Depending on the grade increase, consolidation testing may have to be performed on a representative number of soil samples. During the geotechnical investigation MRW retrieved a total a five thin walled Shelby tubes that may be utilized for consolidation testing, if this scenario occurs.

6.2.5 Horizontal Capacity

The horizontal capacity will be analyzed by the prime consulting engineer (Power Engineers) utilizing the computer software program “LPILE” and the estimated soil properties outline in Section 5.1.3 of this report, as well as the borehole logs in Appendix A.

We note that the horizontal capacity of the caisson can be increased by providing an expanded base at the toe.

6.2.6 Load Testing

The vertical axial resistance and horizontal resistance should be confirmed on a representative number of caissons by load testing. Based on the soil conditions encountered within the boreholes, this should be performed on at least two caissons. If required, the load testing program may be augmented, once additional information is obtained during the installation of the caissons.

6.2.7 Installation Comments and Recommendations

To alleviate soil basal heave at the bottom of the augured hole the drilling contractor should utilize a drilling slurry to maintain pressure at the base of the excavation. All concrete is to be installed immediately upon completion of auguring, as delay may result in significant soil strength loss, both vertically and horizontally. Alternatively, the contractor may install auger-cast caissons by pumping concrete under pressure while the auger is withdrawn.

For augured caissons, a thin layer of soil immediately adjacent to the shaft will be remolded during auguring, in addition to a gradual softening due to stress release, which results in a temporary corresponding reduction in frictional shaft resistance. Based on the soil strength parameters obtained during our geotechnical investigation, the temporary frictional resistance will be approximately 20% of the final working frictional resistance. With time, the soil will regain its shear strength (thixotropy) and corresponding shaft resistance. This is estimated to take a minimum of 2 to 3 weeks after caisson installation. As such, MRW recommends waiting at least 2 to 3 weeks prior to installing structures on the caissons or load testing.

Prior to auguring, it is critical that all existing surface water and potential surface water be controlled and diverted away from the work site to prevent infiltration. This scenario is likely to occur at borehole location BH2.

The caisson should be spaced at a minimum distance of 2.5 times the caisson diameter to avoid interference between caissons.

Augured cast-in-place concrete caissons are to be installed by an experienced contractor familiar with the auger-cast process and soil conditions. This is critical to ensure the caisson performs as designed.

The installation of the caissons should be monitored on a full time basis by a qualified geotechnical consultant.

6.3 Frost Penetration Depth

For the soil conditions encountered, the frost penetration depth can be expected to extend to a depth of up to 6 ft below grade.

For a 35 ft long 7 ft diameter cast-in-place concrete caisson, vertical movement from frost adhesion should not be an issue.

6.4 Site Classification for Seismic Site Response

The 2006 Ontario Building Code (OBC) stipulates the methodology for earthquake design analysis. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration and the site classification for seismic site response. The parameters for determination of Site Classification for Seismic Site Response are set out in Table 4.1.8.4.A of the 2006 OBC. The site classification is based on the average shear wave velocity in the top 30 metres of the site stratigraphy. If the average shear wave velocity is not know, the site class can be estimated from energy corrected Standard Penetration Resistance (N_{60}) and/or the average undrained shear strength of the soil in the top 30 metres.

At this site there have been no shear wave velocity measurements. As such, Standard Penetration Tests (SPT) and the undrained shear strengths of the soil have been used to determine the site classification. Based on Table 4.1.8.4.A of the 2006 OBC, this site has been classified as a Class E.

These seismic design parameters should be reviewed in detail by the structural engineer and incorporated into the design as required by article 4.1.8.7 of the Ontario Building Code.

7.0 Limitations

We have prepared this report for the exclusive use of PowerTel Utilities Contractors Limited and their authorized agents.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practises in the field of geotechnical engineering, for the Third Line Egress Renovations Project in Sault Ste. Marie, Ontario. Classification and identification of soils, and geologic units have been based upon commonly accepted methods employed in professional geotechnical practice. No warranty or other conditions, expressed or implied, should be understood.

Regardless how exhaustive a geotechnical investigation is performed, the investigation cannot identify all the subsurface conditions. In addition, subsurface conditions between test holes may differ from the conditions encountered during our geotechnical investigation. Therefore, no warranty is expressed or implied that the entire site is representative of the subsurface information obtained at the specific test hole locations. If during construction, subsurface conditions differ from then what was encountered within our test holes and the additional subsurface information provided to us, MRW should be contacted to review our recommendations.

This report does not alleviate the contractor, owner, or any other parties of their respective responsibilities.

Please refer to Appendix D, Report Limitations and Guidelines for Use, which pertains to this report.

8.0 Closure

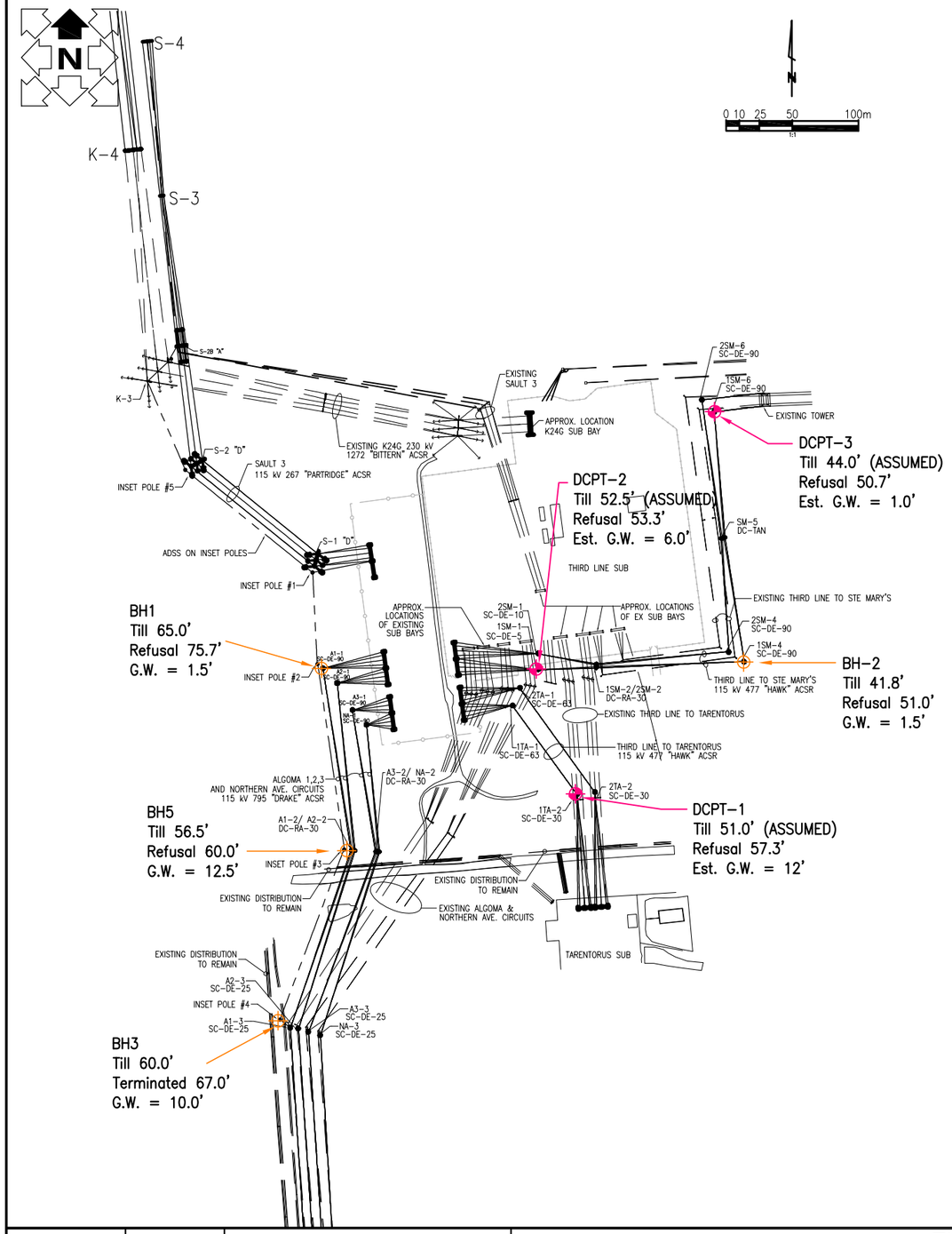
We trust that the information and recommendations in this report will be found to be complete and adequate for your consideration. Should further elaboration be required for any portion of this project, we would be pleased to provide assistance.

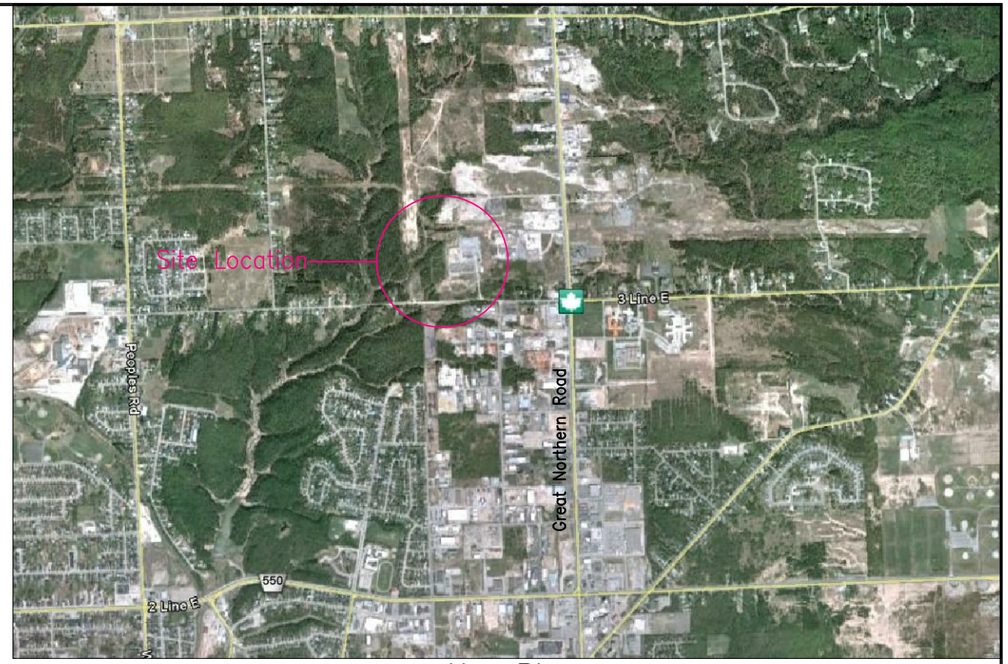
Respectfully submitted,

Maurice Corriveau, P.Eng.
Geotechnical Engineer

Greg Saunders, P.Eng.
Senior Engineer

Figure 1 - Site Reference & Borehole Location Plan





Key Plan

Great Lakes Power
Egress Renovations Project
Third Line, Sault Ste. Marie, Ontario

NOTES

- DRAWING PROVIDED BY POWER ENGINEERS TO DEPICT BOREHOLE LOCATIONS
- BOREHOLE LOCATIONS ARE APPROXIMATE AND HAVE NOT BEEN SURVEYED

LEGEND

BH1 – BOREHOLE LOCATION, ADVANCED FROM NOVEMBER 3 TO 7, 2011

DCPT1 – DYNAMIC CONE PENETRATION TEST ADVANCED FROM NOVEMBER 3 TO 7, 2011

TILL 53.0' – DEPTH TO GLACIAL TILL

REFUSAL 53.3' – REFUSAL ON PROBABLE BOULDER

TERMINATED 67.0' – TERMINATED IN STRATUM WITH SPT, "N" VALUES GREATER THAN 21 BLOWS/FT

G.W. – STABILIZED GROUND WATER MEASURED ON NOV. 10, 2011

EST. G.W. – ESTIMATED GROUND WATER FROM SIDE OF DRILL RODS

EXISTING DISTRIBUTION
ADSS
OPGW
PROPOSED CENTERLINE ROUTE
EXISTING ROUTE TO BE TERMINATED

DRAWN BY:	D.A.MOUSSEAU
APPROVED BY:	M.CORRIVEAU
DATE CREATED:	11/24/2011
REVISION #:	
REVISION DATE:	

Consulting Engineers
MRW
M. R. WRIGHT & ASSOCIATES CO. LTD.
SAULT STE. MARIE, ONTARIO

FIGURE 1: BOREHOLE LOCATION PLAN
GEOTECHNICAL EVALUATION
GLP THIRD LINE EGRESS RENOVATIONS PROJECT
SAULT STE. MARIE, ONTARIO
MRW PROJECT G11310

CLIENT:

PowerTel Utilities Contractors Ltd.

Appendix A Borehole and Dynamic Cone Logs

Borehole Log: BH1

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Depth (ft)	Elevation (ft)	DESCRIPTION	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft	Grain Size % (Gr Sa Si Cl)
	0.0	Geodetic Ground Elevation					
0		Sand, trace to some silt, trace organics (rootlets), brown, loose to compact, damp, fine to medium grained	1-1	AS	NA	NA	
1	-1.0						
2	-2.0						
3	-3.0						
			1-2	SS	70	11	
4	-4.0						
5	-5.0	Silt, trace sand, trace clay, reddish brown, loose, dry to damp, fine to medium grained					
6	-6.0		1-3	SS	100	6	
7	-7.0						
8	-8.0	Clayey Silt, trace organics (rootlets), reddish brown, very soft, moist, low plasticity, varved					
			1-4	SS	100	1	
9	-9.0						
10	-10.0	Silty clay, trace sand, trace rootlets, reddish brown, very soft, moist to wet, low plasticity, varved					
11	-11.0	γ' = 0.052 kcf C = 1 ksf Kh = 180 kcf E_{50} = 0.01	1-5	SS	100	0	7 50 43 W_l = 30.1% W_p = 15.9% Cu = 1ksf r = 0.231ksf Cu = 1ksf r = 0.231ksf
12	-12.0						
13	-13.0						
14	-14.0						
15	-15.0	Silt, trace to some clay, grey, very loose to loose, moist to wet					
16	-16.0	γ' = 0.052 kcf Ø' = 26° Kh = 150 kcf	1-6	SS	60	9	2 85 13
17	-17.0						
18	-18.0						
19	-19.0						
20	-20.0						

Dynamic Penetration Resistance: 10 20 30 40 50 60 70 80 90
Undrained Shear Strength (Cu, ksf): 0.5 1 1.5 2 2.5 3 3.5 4 4.5
Water Content (%): 10 30 50 70

S = 4.3
S = 4.3

Drilled By: Marathon Drilling

Drill Method: Hollow Stem Auger/Split Spoon

Drill Date: November 5, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
ST - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Limit
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 1 of 4

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Borehole Log: BH1

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft	Dynamic Penetration Resistance (10 20 30 40 50 60 70 80 90) / Undrained Shear Strength (Cu, ksf) (0.5 1 1.5 2 2.5 3 3.5 4 4.5)	Water Content (%) (10 30 50 70)	Remarks / Grain Size % (Gr Sa Si Cl)
		21	Silt, trace to some clay, grey, very loose to loose, moist to wet γ' = 0.052 kcf Ø' = 26° Kh = 150 kcf	-21.0	1-7	SS	50	2			
		22		-22.0							
		23		-23.0							
		24		-24.0							
		25		-25.0							
		26		-26.0	1-8	SS	70	4			
		27		-27.0							
		28		-28.0							
		29		-29.0							
		30	Clayey silt, grey, very soft, wet, low plasticity, varved γ' = 0.052 kcf C = 1 ksf Kh = 180 kcf E_{50} = 0.01	-30.0							
		31		-31.0	1-9	SS	65	2			
		32		-32.0							
		33		-33.0							
		34		-34.0							
		35	Silty clay, greyish red, very soft, wet, varved γ' = 0.043 kcf C = 1 ksf Kh = 85 kcf E_{50} = 0.015	-35.0							
		36		-36.0	1-10	SS	100	0			Cave depth = 36 ft
		37		-37.0							
		38		-38.0					S = 3.6		Cu = 1.05ksf r = 0.294ksf
		39		-39.0					S = 2.2		Cu = 1.26ksf r = 0.567ksf
		40		-40.0							

Drilled By: Marathon Drilling

Drill Method: Hollow Stem Auger/Split Spoon

Drill Date: November 5, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
ST - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_P - Plastic Limit
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 2 of 4

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Borehole Log: BH1

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Depth (ft)	Description	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft	Undrained Shear Strength (Cu, ksf)	Water Content (%)	Remarks
41	Silty clay, greyish red, very soft, wet, low plasticity, varved γ' = 0.043 kcf C = 1 ksf Kh = 85 kcf E_{50} = 0.015	-41.0	1-11	SS	100	0			
42		-42.0							
43		-43.0					S = 6.2		Cu = 1.3ksf r = 0.21ksf
44		-44.0					S = 5.2		Cu = 1.09ksf r = 0.21ksf
45		-45.0							
46		-46.0	1-12	ST					
47		-47.0							
48		-48.0					S = 3.4		Cu = 1ksf r = 0.294ksf
49		-49.0					S = 5		Cu = 1.26ksf r = 0.252ksf
50	Reddish brown, damp to moist, below 50 ft depth	-50.0							
51		-51.0	1-13	SS	100	0			W_l = 30.4% W_p = 18.7%
52		-52.0							
53		-53.0							
54		-54.0							
55		-55.0							
56		-56.0	1-14	ST					
57		-57.0							
58		-58.0					S = 3.1		Cu = 1.176ksf r = 0.378ksf
59		-59.0					S = 4		Cu = 1.176ksf r = 0.294ksf
60		-60.0							

Drilled By: Marathon Drilling

Drill Method: Hollow Stem Auger/Split Spoon

Drill Date: November 5, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
ST - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Limit
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 3 of 4

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Borehole Log: BH1

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft	Dynamic Penetration Resistance (10 20 30 40 50 60 70 80 90) / Undrained Shear Strength (Cu, ksf) (0.5 1 1.5 2 2.5 3 3.5 4 4.5)	Water Content (%) (10 30 50 70)	Remarks / Grain Size % Gr	Sa	Si	Cl
		61	Silty clay, greyish red, very soft, wet, low plasticity, varved γ' = 0.043 kcf C = 1 ksf Kh = 85 kcf E_{50} = 0.015	-61.0	1-15	SS	100	0				1	69	30
		62		-62.0										
		63		-63.0										
		64		-64.0										
		65	Till-silt, some gravel, trace to some sand, trace to some clay, grey, very loose, moist to wet, fine to medium grained γ' = 0.071 kcf Ø' = 36° Kh = 260 kcf	-65.0										
		66		-66.0	1-16	SS	100	1						
		67		-67.0										
		68		-68.0										
		69		-69.0										
		70	Dense to very dense below 70 ft depth	-70.0										
		71		-71.0	1-17	SS	100	32						
		72		-72.0										
		73		-73.0										
		74		-74.0										
		75		-75.0	1-18	SS	35	>100						
		76	End of Borehole Spilt spoon bouncing on probable boulder	-76.0										
		77		-77.0										
		78		-78.0										
		79		-79.0										
		80		-80.0										

Drilled By: Marathon Drilling

Drill Method: Hollow Stem Auger/Split Spoon

Drill Date: November 5, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
ST - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_P - Plastic Limit
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

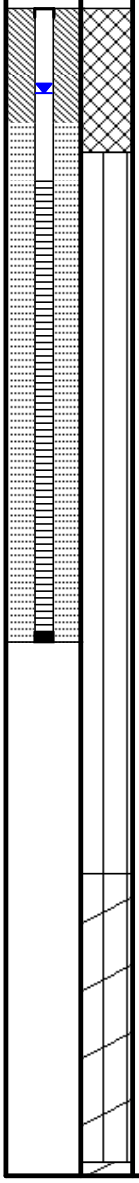
Sheet: 4 of 4

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Borehole Log: BH2

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau



Depth (ft)	Description	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft
	Geodetic Ground Elevation	0.0				
0	Fill, sand and gravel, trace silt, trace cobbles, trace boulders, brown, loose to compact, dry to damp, fine to coarse grained, poorly graded		2-1	AS	NA	NA
3	Silt, trace to some sand, red to greyish brown, loose, dry to damp, fine grained, well graded		2-2	SS	80	7
5	Trace clay, damp to wet, below 5ft depth		2-3	SS	65	5
7	No sand below 7.5ft depth		2-4	SS	75	6
11			2-5	SS	60	3
15	Clayey silt, greyish brown, soft, moist to wet, low plasticity, varved γ' = 0.052 kcf C = 1 ksf Kh = 180 kcf E_{50} = 0.01		2-6	SS	100	2
20		-20.0				

Dynamic Penetration Resistance: 10 20 30 40 50 60 70 80 90
Undrained Shear Strength (Cu, ksf): 0.5 1 1.5 2 2.5 3 3.5 4 4.5
S = 3.5
S = 2.72

Water Content (%): 10 30 50 70

Remarks

Grain Size %: Gr Sa Si Cl
2 96 2

Cu = 1.26ksf
r = 0.357ksf
Cu = 1.428ksf
r = 0.525ksf

Drilled By: Marathon Drilling
Drill Method: Hollow Stem Auger/Split Spoon
Drill Date: November 3, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
ST - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_P - Plastic Limit
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:
Station #:
Sheet: 1 of 3

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Borehole Log: BH2

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

SUBSURFACE PROFILE					SAMPLE				Dynamic Penetration Resistance (10 20 30 40 50 60 70 80 90) / Undrained Shear Strength (Cu, ksf) (0.5 1 1.5 2 2.5 3 3.5 4 4.5)	Water Content (%) (10 30 50 70)	Remarks / Grain Size % (Gr Sa Si Cl)
Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft			
		21	Silty clay, reddish brown, very soft, low plasticity, moist to wet, varved γ' = 0.043 kcf C = 1 ksf Kh = 85 kcf E_{50} = 0.015	-21.0	2-7	SS	100	0			
		22		-22.0							
		23		-23.0					S = 9.5		Cu = 1ksf r = 0.105ksf
		24		-24.0					S = 5.3		Cu = 1ksf r = 0.189ksf
		25		-25.0							
		26		-26.0	2-8	ST					
		27		-27.0							
		28		-28.0					S = 4.4		Cu = 0.84ksf r = 0.189ksf
		29		-29.0					S = 3.6		Cu = 0.84ksf r = 0.231ksf
		30		-30.0							
		31		-31.0	2-9	SS	100	0			1 53 46 W_l = 30.9% W_p = 17.3%
		32		-32.0							
		33		-33.0					S = 7.3		Cu = 0.92ksf r = 0.126ksf
		34		-34.0					S = 4		Cu = 0.84ksf r = 0.21ksf
		35		-35.0							
		36		-36.0	2-10	SS	100	0			
		37		-37.0							
		38		-38.0					S = 5.3		Cu = 1ksf r = 0.189ksf
		39		-39.0					S = 5.3		Cu = 1ksf r = 0.189ksf
		40		-40.0	2-11a	SS	100	1			

Drilled By: Marathon Drilling

Drill Method: Hollow Stem Auger/Split Spoon

Drill Date: November 3, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
ST - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Limit
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 2 of 3

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Borehole Log: BH2

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft	Dynamic Penetration Resistance (10 20 30 40 50 60 70 80 90) / Undrained Shear Strength (Cu, ksf) (0.5 1 1.5 2 2.5 3 3.5 4 4.5)	Water Content (%) (10 30 50 70)	Remarks / Grain Size % (Gr Sa Si Cl)
		41	Silty clay, reddish brown, very soft, moist to wet, low plasticity, varved	-41.0	2-11b	SS	100	1			W_l = 25.7% W_p = 17.0%
		42	Till, silt, trace to some gravel, trace clay, grey, dense, damp to moist	-42.0							
		43		-43.0							
		44	γ' = 0.071 kcf Ø' = 36° Kh = 260 kcf	-44.0							
		45		-45.0							
		46	Sandy, dense to very dense below 46 ft depth	-46.0	2-12	SS	80	40			5 38 45 12
		47		-47.0							
		48		-48.0							
		49		-49.0							
		50		-50.0							
		51	End of Borehole	-51.0	2-13	SS	40	>100			
		52	Split spoon bouncing on probable boulder	-52.0							
		53		-53.0							
		54		-54.0							
		55		-55.0							
		56		-56.0							
		57		-57.0							
		58		-58.0							
		59		-59.0							
		60		-60.0							

Drilled By: Marathon Drilling

Drill Method: Hollow Stem Auger/Split Spoon

Drill Date: November 3, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
ST - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Limit
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

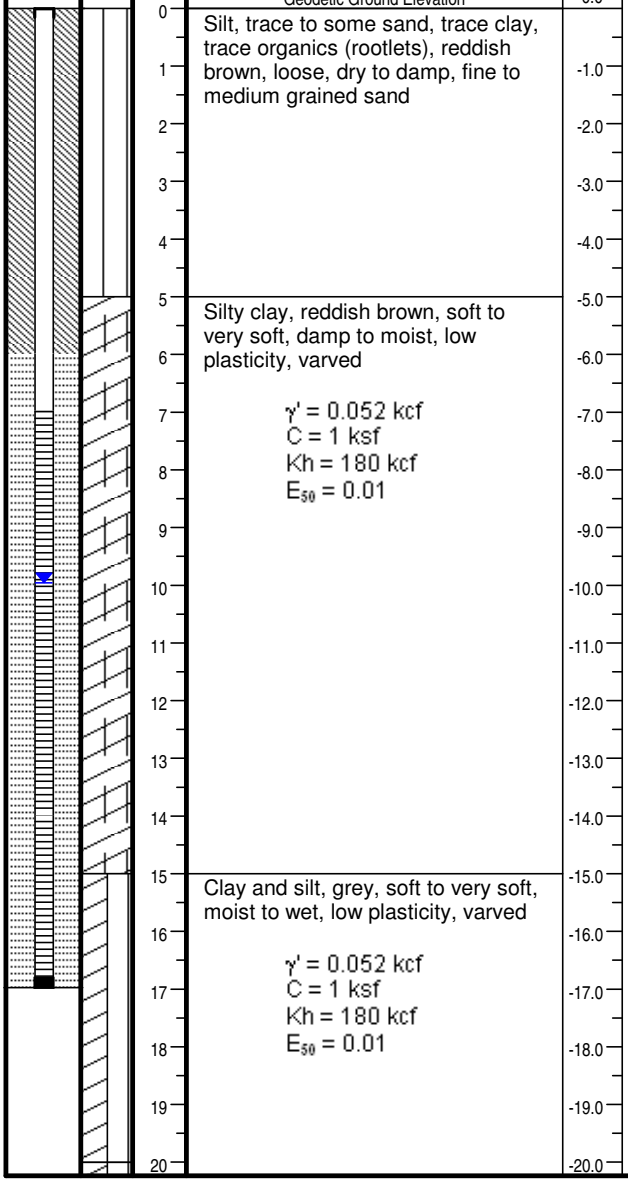
Sheet: 3 of 3

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Borehole Log: BH3

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau



Depth (ft)	Elevation (ft)	DESCRIPTION	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft	Remarks / Grain Size % (Gr Sa Si Cl)
0	0.0	Geodetic Ground Elevation					
0		Silt, trace to some sand, trace clay, trace organics (rootlets), reddish brown, loose, dry to damp, fine to medium grained sand	3-1	AS	NA	NA	
5	-5.0	Silty clay, reddish brown, soft to very soft, damp to moist, low plasticity, varved γ' = 0.052 kcf C = 1 ksf Kh = 180 kcf E_{50} = 0.01	3-2	SS	80	7	
			3-3	SS	100	1	4 59 37
			3-4	SS	100	1	
			3-5	ST			68 32 W_l = 28.0% W_p = 19.0% Cu = 1ksf r = 0.168ksf Cu = 0.924ksf r = 0.21ksf
15	-15.0	Clay and silt, grey, soft to very soft, moist to wet, low plasticity, varved γ' = 0.052 kcf C = 1 ksf Kh = 180 kcf E_{50} = 0.01	3-6	SS	100	1	
20	-20.0						

Dynamic Penetration Resistance: 10 20 30 40 50 60 70 80 90
Undrained Shear Strength (Cu, ksf): 0.5 1 1.5 2 2.5 3 3.5 4 4.5
Water Content (%): 10 30 50 70
S = 6
S = 4.4

Drilled By: Marathon Drilling
Drill Method: Hollow Stem Auger/Split Spoon
Drill Date: November 4, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
ST - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Limit
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:
Station #:
Sheet: 1 of 4

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Borehole Log: BH3

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft	Dynamic Penetration Resistance / Undrained Shear Strength (Cu, ksf)	Water Content (%)	Remarks / Grain Size % (Gr Sa Si Cl)
		21	Clay and silt, grey, soft to very soft, low plasticity, moist to wet, varved γ' = 0.052 kcf C = 1 ksf Kh = 180 kcf E_{50} = 0.01	-21.0	3-7	SS	60	1			
		25	Silt, some clay, grey, very loose, moist to wet γ' = 0.052 kcf Ø' = 26° Kh = 150 kcf	-25.0	3-8	SS	75	2			88 12
		30	Silty clay, grey, very soft, moist to wet, low plasticity, varved γ' = 0.043 kcf C = 1 ksf Kh = 85 kcf E_{50} = 0.015 High plasticity at 35 ft depth	-30.0	3-9	SS	65	0	S = 4 S = 2.4		Cu = 1ksf r = 0.252ksf Cu = 1.05ksf r = 0.441ksf Cave depth = 35ft
		35		-35.0	3-10	SS	100	0	S = 4 S = 4.3		W_l = 58.1% W_p = 23.0% Cu = 0.84ksf r = 0.21ksf Cu = 1.09ksf r = 0.252ksf
		40		-40.0							

Drilled By: Marathon Drilling

Drill Method: Hollow Stem Auger/Split Spoon

Drill Date: November 4, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
ST - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Limit
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 2 of 4

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Borehole Log: BH3

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft	Dynamic Penetration Resistance / Undrained Shear Strength (Cu, ksf)	Water Content (%)	Remarks / Grain Size %
		41	Silty clay, grey, very soft, moist to wet, low plasticity, varved γ' = 0.043 kcf C = 1 ksf Kh = 85kcf E_{50} = 0.015	-41.0	3-11	SS	100	0			Cu = 1.09ksf r = 0.252ksf
		42		-42.0							
		43		-43.0					S = 4.3		
		44		-44.0					S = 4.5		Cu = 1.05ksf r = 0.231ksf
		45		-45.0							
		46		-46.0	3-12	SS	100	0			W_l = 29.3% W_p = 18.3%
		47		-47.0							
		48		-48.0							
		49		-49.0							
		50		-50.0							
		51		-51.0	3-13	SS	100	0			
		52		-52.0							
		53		-53.0							
		54		-54.0							
		55		-55.0							
		56		-56.0	3-14	SS	100	0			
		57		-57.0							
		58		-58.0							
		59		-59.0							
		60		-60.0							

Drilled By: Marathon Drilling

Drill Method: Hollow Stem Auger/Split Spoon

Drill Date: November 4, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
ST - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Limit
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 3 of 4

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Borehole Log: BH3

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

SUBSURFACE PROFILE					SAMPLE				Dynamic Penetration Resistance (10 20 30 40 50 60 70 80 90) / Undrained Shear Strength (Cu, ksf) (0.5 1 1.5 2 2.5 3 3.5 4 4.5)	Water Content (%) (10 30 50 70)	Remarks / Grain Size % (Gr Sa Si Cl)
Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft			
		61	Till, silt, trace to some sand, trace to some gravel, trace clay, grey, compact, moist to wet, fine to medium grained γ' = 0.071 kcf Ø' = 36° Kh = 260 kcf	-61.0	3-15	SS	65	21			
		62		-62.0							
		63		-63.0							
		64		-64.0							
		65		-65.0							
		66		-66.0	3-16	SS	70	28			
		67	End of Borehole	-67.0							
		68		-68.0							
		69		-69.0							
		70		-70.0							
		71		-71.0							
		72		-72.0							
		73		-73.0							
		74		-74.0							
		75		-75.0							
		76		-76.0							
		77		-77.0							
		78		-78.0							
		79		-79.0							
		80		-80.0							

Drilled By: Marathon Drilling

Drill Method: Hollow Stem Auger/Split Spoon

Drill Date: November 4, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
ST - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_P - Plastic Limit
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 4 of 4

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Borehole Log: BH5

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft	Dynamic Penetration Resistance (10 20 30 40 50 60 70 80 90) / Undrained Shear Strength (Cu, ksf) (0.5 1 1.5 2 2.5 3 3.5 4 4.5)	Water Content (%) (10 30 50 70)	Remarks / Grain Size % (Gr Sa Si Cl)
			Geodetic Ground Elevation	0.0							
		0	Silt, some sand, trace to some clay, trace organics (rootlets), brown, loose to very loose, damp		5-1	AS	NA	NA			
		1		-1.0							
		2	No organics below 2.5 ft depth	-2.0							
		3		-3.0	5-2	SS	90	9			
		4		-4.0							
		5		-5.0							
		6		-6.0	5-3	SS	90	4			1 87 12
		7	Clayey silt, reddish brown, soft, brown, damp, low plasticity, varved	-7.0							
		8		-8.0	5-4	SS	100	2			
		9		-9.0							
		10	Silty clay, reddish brown, soft, damp to moist, low plasticity, varved	-10.0							
		11	γ' = 0.052 kcf C = 1 ksf Kh = 180 kcf E_{50} = 0.01	-11.0	5-5	SS	90	1			
		12		-12.0							
		13		-13.0							
		14		-14.0							
		15	Silt, trace to some clay, grey, loose, damp to moist	-15.0							
		16	γ' = 0.052 kcf Ø' = 26° Kh = 150 kcf	-16.0	5-6	SS	90	6			
		17		-17.0							
		18		-18.0							
		19		-19.0							
		20		-20.0							Depth to Cave = 20 ft

Drilled By: Marathon Drilling

Drill Method: Hollow Stem Auger/Split Spoon

Drill Date: November 6, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
ST - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_P - Plastic Limit
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 1 of 3

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Borehole Log: BH5

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Depth (ft)	Elevation (ft)	DESCRIPTION	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft	Dynamic Penetration Resistance (10 20 30 40 50 60 70 80 90) / Undrained Shear Strength (Cu, ksf) (0.5 1 1.5 2 2.5 3 3.5 4 4.5)	Water Content (%) (10 30 50 70)	Remarks / Grain Size % (Gr Sa Si Cl)
21	-21.0	Silt, trace to some clay, grey, loose, moist to wet γ' = 0.052 kcf Ø' = 26° Kh = 150 kcf	5-7	SS	45	5			
25	-25.0		5-8	SS	50	3			
30	-30.0	Silty clay, greyish brown, very soft, moist to wet, low plasticity, varved γ' = 0.043 kcf C = 1 ksf Kh = 85 kcf E_{50} = 0.015	5-9	SS	100	0			62 38
35	-35.0		5-10	ST			S = 4 S = 4.9		Cu = 1ksf r = 0.252ksf Cu = 0.924ksf r = 0.189ksf
40	-40.0								

Drilled By: Marathon Drilling

Drill Method: Hollow Stem Auger/Split Spoon

Drill Date: November 6, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
ST - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_P - Plastic Limit
W_L - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 2 of 3

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Borehole Log: BH5

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft	Remarks
		41	Silty clay, greyish brown, very soft, moist to wet, low plasticity, varved γ' = 0.043 kcf C = 1 ksf Kh = 85 kcf E_{50} = 0.015	-41.0	5-11	SS	100	0	58 42 W_l = 29.3% W_p = 18.1%
		46		-46.0	5-12	SS	100	0	
		51		-51.0	5-13	SS	100	1	W_l = 33.8% W_p = 20.8%
		55	Grey below 55ft depth	-55.0	5-14	SS	100	0	
		57	Till, silt, trace to some gravel, trace to some sand, trace clay, grey, very dense, moist to wet, varved γ' = 0.071 kcf Ø' = 36° Kh = 260 kcf Spilt spoon bouncing on probable End of Borehole	-57.0	5-15	SS	25	>100	
		60		-60.0					

Dynamic Penetration Resistance: 10 20 30 40 50 60 70 80 90
Undrained Shear Strength (Cu, ksf): 0.5 1 1.5 2 2.5 3 3.5 4 4.5
Water Content (%): 10 30 50 70
Grain Size %: Gr Sa Si Cl

Drilled By: Marathon Drilling
Drill Method: Hollow Stem Auger/Split Spoon
Drill Date: November 6, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
ST - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Limit
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:
Station #:
Sheet: 3 of 3

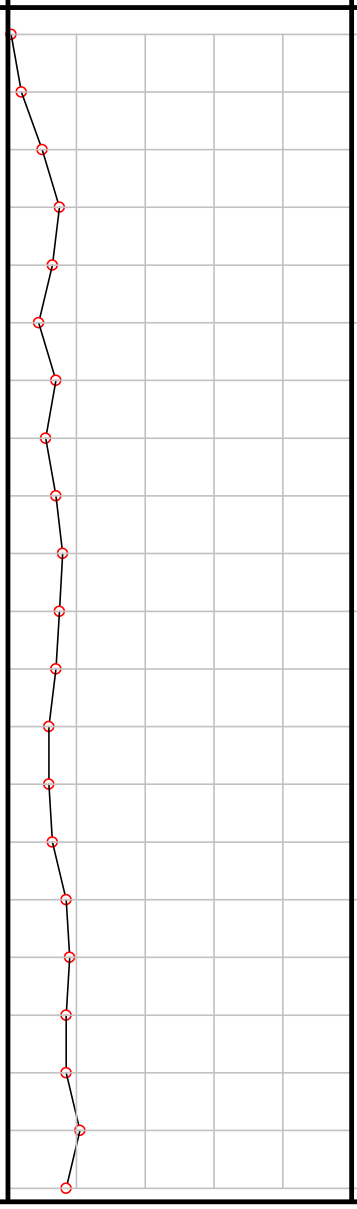
▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

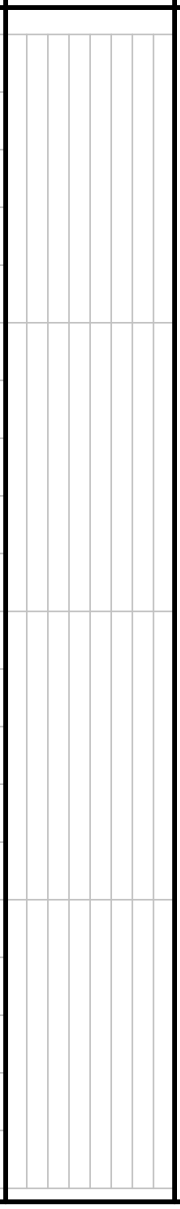
Draft Borehole Log: DCPT-1

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft
		0	Geodetic Ground Elevation	0.0				
		0	Assumed silt		1-1	DCPT		1
		1		-1.0	1-2	DCPT		4
		2		-2.0	1-3	DCPT		10
		3		-3.0	1-4	DCPT		15
		4		-4.0	1-5	DCPT		13
		5		-5.0	1-6	DCPT		9
		6		-6.0	1-7	DCPT		14
		7		-7.0	1-8	DCPT		11
		8		-8.0	1-9	DCPT		14
		9		-9.0	1-10	DCPT		16
		10	Assumed clayey silt	-10.0	1-11	DCPT		15
		11		-11.0	1-12	DCPT		14
		12		-12.0	1-13	DCPT		12
		13		-13.0	1-14	DCPT		12
		14		-14.0	1-15	DCPT		13
		15		-15.0	1-16	DCPT		17
		16		-16.0	1-17	DCPT		18
		17		-17.0	1-18	DCPT		17
		18		-18.0	1-19	DCPT		17
		19		-19.0	1-20	DCPT		21
		20		-20.0	1-21	DCPT		17





Remarks

Grain Size %
Gr Sa Si Cl

Estimated Groundwater from rods at 12ft

Drilled By: Marathon Drilling

Drill Method: Dynamic Cone

Drill Date: Nov. 7, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Content
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

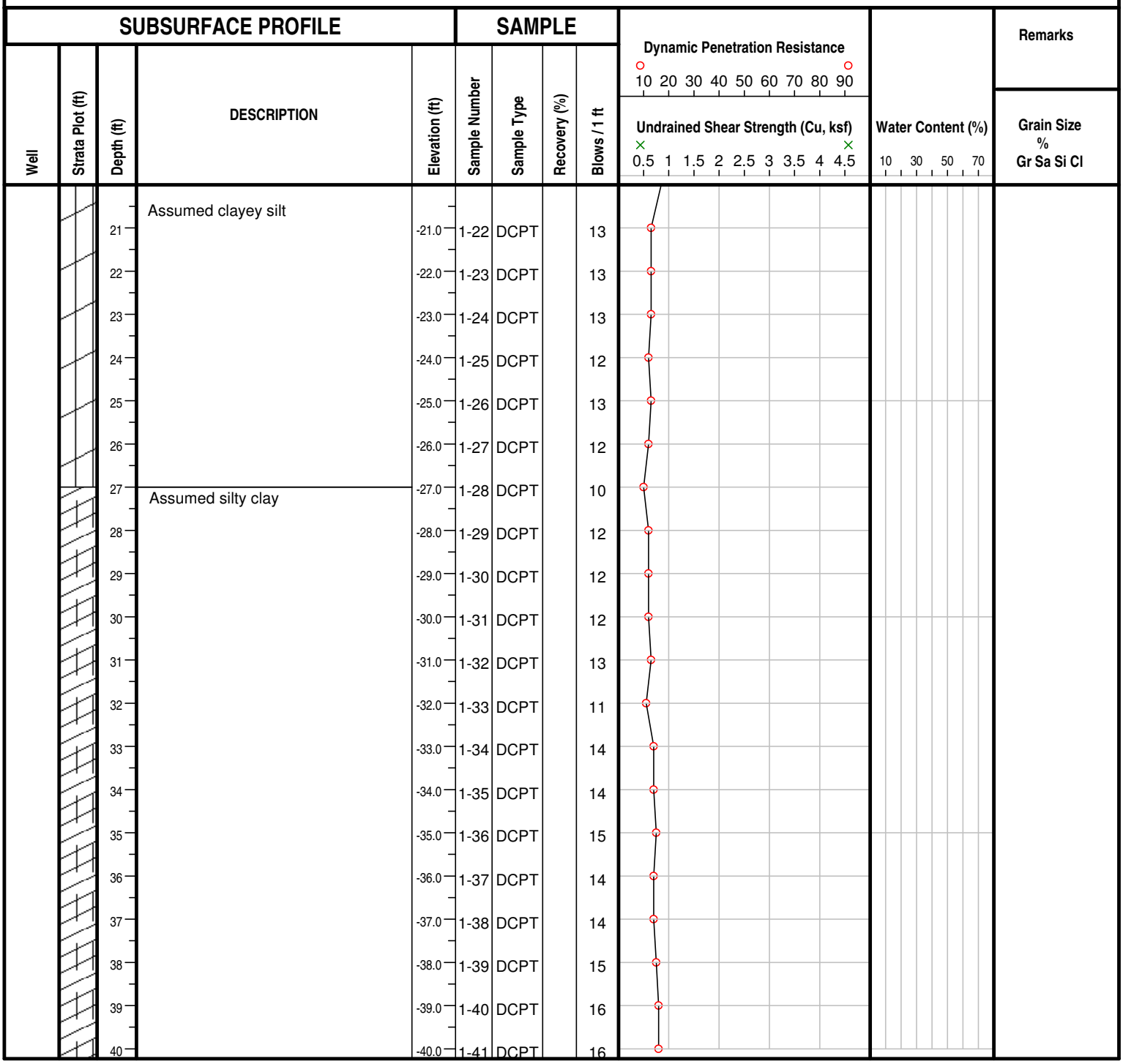
Sheet: 1 of 3

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Draft Borehole Log: DCPT-1

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau



Drilled By: Marathon Drilling

Drill Method: Dynamic Cone

Drill Date: Nov. 7, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Content
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 2 of 3

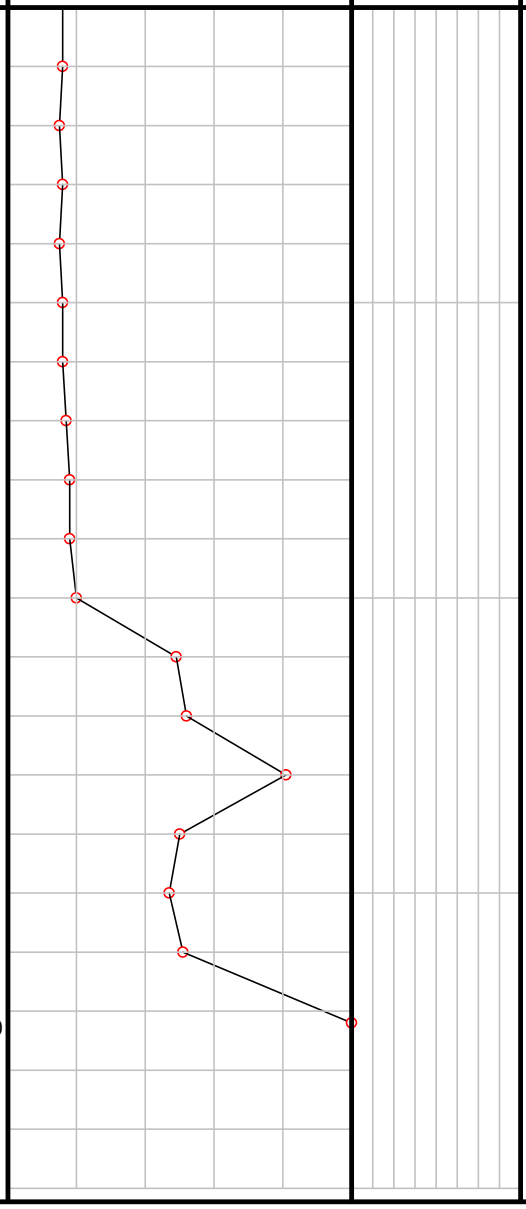
▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Draft Borehole Log: DCPT-1

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Depth (ft)	Description	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft
41	Assumed silty clay	-41.0	1-42	DCPT		16
42		-42.0	1-43	DCPT		15
43		-43.0	1-44	DCPT		16
44		-44.0	1-45	DCPT		15
45		-45.0	1-46	DCPT		16
46		-46.0	1-47	DCPT		16
47		-47.0	1-48	DCPT		17
48		-48.0	1-49	DCPT		18
49		-49.0	1-50	DCPT		18
50		-50.0	1-51	DCPT		20
51	Assumed till	-51.0	1-52	DCPT		49
52		-52.0	1-53	DCPT		52
53		-53.0	1-54	DCPT		81
54		-54.0	1-55	DCPT		50
55		-55.0	1-56	DCPT		47
56		-56.0	1-57	DCPT		51
57		-57.0	1-58	DCPT		>100
58	End of DCPT Bouncing	-58.0				
59		-59.0				
60		-60.0				



Drilled By: Marathon Drilling

Drill Method: Dynamic Cone

Drill Date: Nov. 7, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_P - Plastic Content
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 3 of 3

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Draft Borehole Log: DCPT-2

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft	Dynamic Penetration Resistance / Undrained Shear Strength (Cu, ksf)	Water Content (%)	Remarks / Grain Size % Gr Sa Si Cl
			Geodetic Ground Elevation	0.0							
		0	Assumed silt		2-1	DCPT		1			
		1		-1.0	2-2	DCPT		4			
		2		-2.0	2-3	DCPT		7			
		3		-3.0	2-4	DCPT		10			
		4		-4.0	2-5	DCPT		6			
		5		-5.0	2-6	DCPT		12			
		6		-6.0	2-7	DCPT		15			Estimated groundwater from rods at 6ft
		7		-7.0	2-8	DCPT		14			
		8		-8.0	2-9	DCPT		14			
		9		-9.0	2-10	DCPT		16			
		10	Assumed clayey silt	-10.0	2-11	DCPT		19			
		11		-11.0	2-12	DCPT		16			
		12		-12.0	2-13	DCPT		14			
		13		-13.0	2-14	DCPT		15			
		14		-14.0	2-15	DCPT		16			
		15	Assumed silt	-15.0	2-16	DCPT		15			
		16		-16.0	2-17	DCPT		19			
		17		-17.0	2-18	DCPT		17			
		18		-18.0	2-19	DCPT		15			
		19		-19.0	2-20	DCPT		17			
		20		-20.0	2-21	DCPT		20			

Dynamic Penetration Resistance: 10 20 30 40 50 60 70 80 90
Undrained Shear Strength (Cu, ksf): 0.5 1 1.5 2 2.5 3 3.5 4 4.5
Water Content (%): 10 30 50 70

Drilled By: Marathon Drilling

Drill Method: Dynamic Cone

Drill Date: Nov. 7, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Content
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 1 of 3

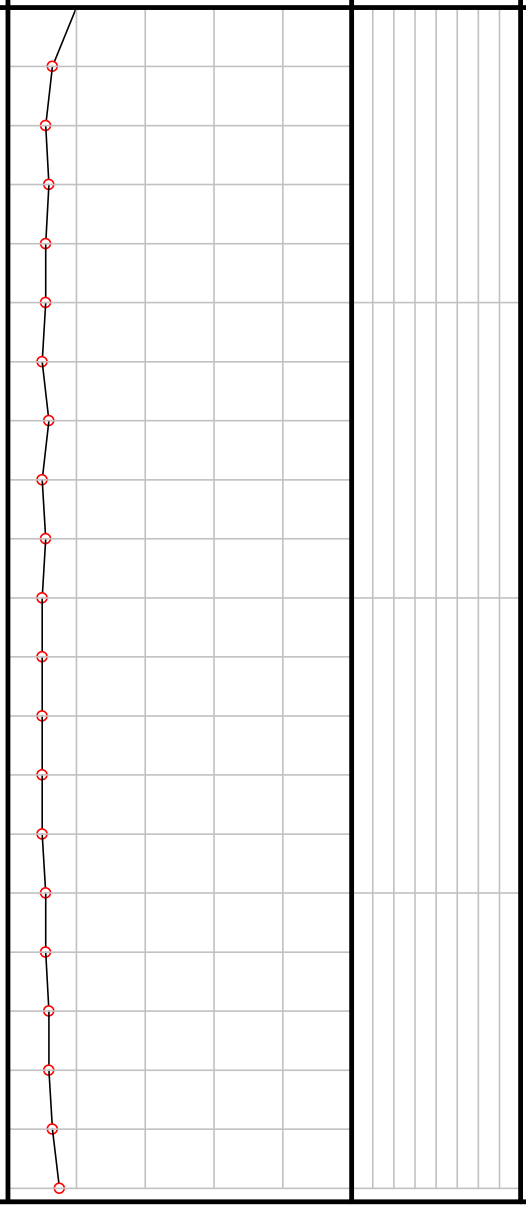
▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Draft Borehole Log: DCPT-2

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft
		21	Assumed silt	-21.0	2-22	DCPT		13
		22		-22.0	2-23	DCPT		11
		23		-23.0	2-24	DCPT		12
		24		-24.0	2-25	DCPT		11
		25		-25.0	2-26	DCPT		11
		26		-26.0	2-27	DCPT		10
		27		-27.0	2-28	DCPT		12
		28		-28.0	2-29	DCPT		10
		29		-29.0	2-30	DCPT		11
		30	Assumed silty clay	-30.0	2-31	DCPT		10
		31		-31.0	2-32	DCPT		10
		32		-32.0	2-33	DCPT		10
		33		-33.0	2-34	DCPT		10
		34		-34.0	2-35	DCPT		10
		35		-35.0	2-36	DCPT		11
		36		-36.0	2-37	DCPT		11
		37		-37.0	2-38	DCPT		12
		38		-38.0	2-39	DCPT		12
		39		-39.0	2-40	DCPT		13
		40		-40.0	2-41	DCPT		15



Remarks

Grain Size %
Gr Sa Si Cl

Drilled By: Marathon Drilling

Drill Method: Dynamic Cone

Drill Date: Nov. 7, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Content
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

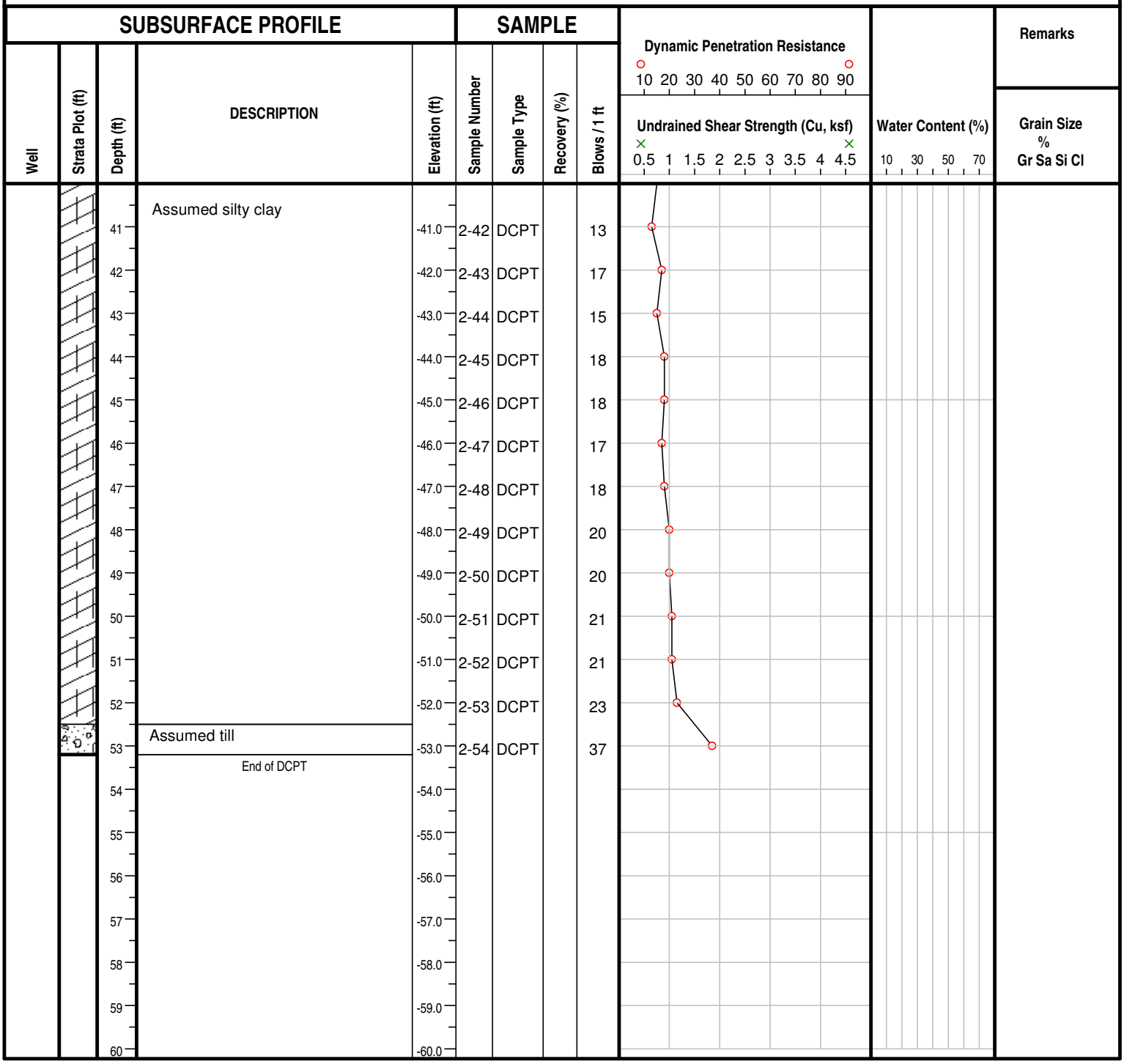
Sheet: 2 of 3

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Draft Borehole Log: DCPT-2

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau



Drilled By: Marathon Drilling

Drill Method: Dynamic Cone

Drill Date: Nov. 7, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Content
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 3 of 3

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Draft Borehole Log: DCPT-3

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft	Dynamic Penetration Resistance (10 20 30 40 50 60 70 80 90) / Undrained Shear Strength (Cu, ksf) (0.5 1 1.5 2 2.5 3 3.5 4 4.5)	Water Content (%) (10 30 50 70)	Remarks / Grain Size % Gr Sa Si Cl
		0	Geodetic Ground Elevation	0.0							
		0	Assumed silt		3-1	DCPT		0			Estimated groundwater from rods at 1ft
		1		-1.0	3-2	DCPT		2			
		2		-2.0	3-3	DCPT		9			
		3		-3.0	3-4	DCPT		13			
		4		-4.0	3-5	DCPT		16			
		5		-5.0	3-6	DCPT		20			
		6		-6.0	3-7	DCPT		22			
		7		-7.0	3-8	DCPT		19			
		8	Assumed clayey silt	-8.0	3-9	DCPT		13			
		9		-9.0	3-10	DCPT		10			
		10		-10.0	3-11	DCPT		12			
		11		-11.0	3-12	DCPT		16			
		12		-12.0	3-13	DCPT		17			
		13		-13.0	3-14	DCPT		17			
		14		-14.0	3-15	DCPT		13			
		15		-15.0	3-16	DCPT		19			
		16		-16.0	3-17	DCPT		17			
		17		-17.0	3-18	DCPT		17			
		18		-18.0	3-19	DCPT		13			
		19		-19.0	3-20	DCPT		12			
		20		-20.0	3-21	DCPT		11			

Drilled By: Marathon Drilling

Drill Method: Dynamic Cone

Drill Date: Nov. 7, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Content
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 1 of 3

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Draft Borehole Log: DCPT-3

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

SUBSURFACE PROFILE					SAMPLE				Dynamic Penetration Resistance 10 20 30 40 50 60 70 80 90 / Undrained Shear Strength (Cu, ksf) 0.5 1 1.5 2 2.5 3 3.5 4 4.5	Water Content (%) 10 30 50 70	Remarks / Grain Size % Gr Sa Si Cl
Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft			
			Assumed silty clay								
		21		-21.0	3-22	DCPT		13			
		22		-22.0	3-23	DCPT		12			
		23		-23.0	3-24	DCPT		14			
		24		-24.0	3-25	DCPT		12			
		25		-25.0	3-26	DCPT		14			
		26		-26.0	3-27	DCPT		15			
		27		-27.0	3-28	DCPT		14			
		28		-28.0	3-29	DCPT		16			
		29		-29.0	3-30	DCPT		14			
		30		-30.0	3-31	DCPT		16			
		31		-31.0	3-32	DCPT		17			
		32		-32.0	3-33	DCPT		17			
		33		-33.0	3-34	DCPT		18			
		34		-34.0	3-35	DCPT		14			
		35		-35.0	3-36	DCPT		18			
		36		-36.0	3-37	DCPT		15			
		37		-37.0	3-38	DCPT		18			
		38		-38.0	3-39	DCPT		18			
		39		-39.0	3-40	DCPT		14			
		40		-40.0	3-41	DCPT		19			

Drilled By: Marathon Drilling

Drill Method: Dynamic Cone

Drill Date: Nov. 7, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Content
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 2 of 3

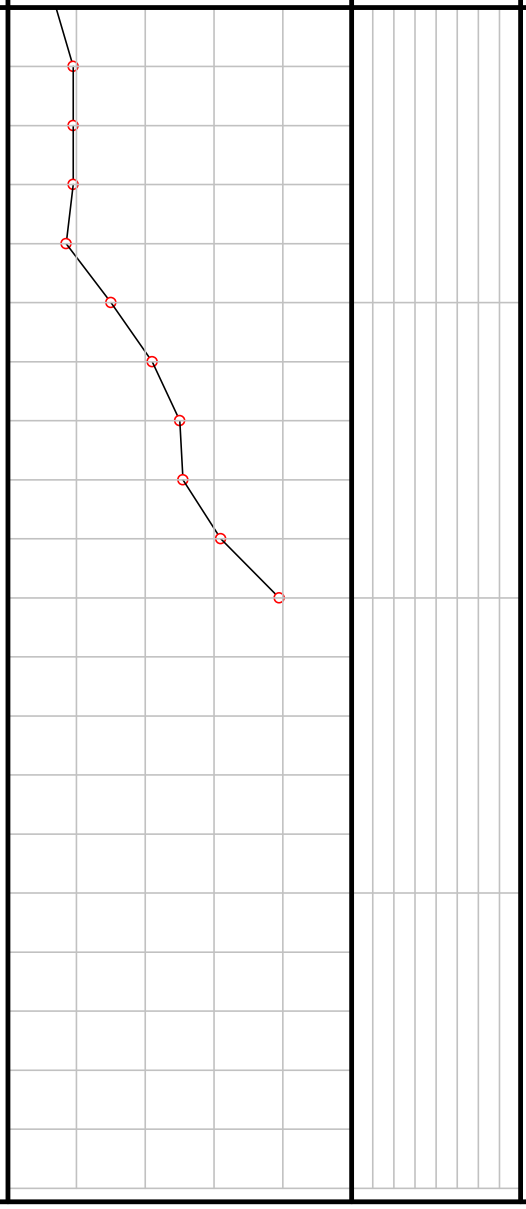
▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Draft Borehole Log: DCPT-3

Project No: G11310
Project: Great Lakes Power, Third Line Egress Renovations
Site Location: Third Line, Sault Ste. Marie
Client: PowerTel Utilities Contractors Limited

Logged By: W. Tabaczuk
Compiled By: L. DiAngelo
Reviewed By: M. Corriveau

Well	Strata Plot (ft)	Depth (ft)	DESCRIPTION	Elevation (ft)	Sample Number	Sample Type	Recovery (%)	Blows / 1 ft
		41	Assumed silty clay	-41.0	3-42	DCPT		19
		42		-42.0	3-43	DCPT		19
		43		-43.0	3-44	DCPT		17
		44	Assumed till	-44.0	3-45	DCPT		30
		45		-45.0	3-46	DCPT		42
		46		-46.0	3-47	DCPT		50
		47		-47.0	3-48	DCPT		51
		48		-48.0	3-49	DCPT		62
		49		-49.0	3-50	DCPT		79
		50		-50.0	3-51	DCPT		78
		51	End of DCPT	-51.0				
		52		-52.0				
		53		-53.0				
		54		-54.0				
		55		-55.0				
		56		-56.0				
		57		-57.0				
		58		-58.0				
		59		-59.0				
		60		-60.0				



Remarks

Grain Size %
Gr Sa Si Cl

Drilled By: Marathon Drilling

Drill Method: Dynamic Cone

Drill Date: Nov. 7, 2011

Sample Type
AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ- Rock Core
W - Water Content
W_p - Plastic Content
W_l - Liquid Limit
X Field Vane, S - Sensitivity
- Lab Vane
w - Wash
o - SPT(Standard Penetration Test)
O - DCPT (Dyanamic Cone Penetration)

Datum:

Station #:

Sheet: 3 of 3

▼ Freestanding groundwater measured in monitoring well. Depth to cave measured on completion of drilling.

Appendix B MRW's Laboratory Analytical Reports for Soil Samples

Consulting Engineers
MRW
M.R. WRIGHT & ASSOCIATES CO. LTD.
SAULT STE. MARIE • ONTARIO

Testing Lab

71 Black Road - Unit 3
Sault Ste. Marie, ON
P6B 0A3
Phone: (705) 945-5090
Fax: (705) 945-5092
Email: d.stadnisky@mrweng.ca

MOISTURE CONTENT TEST

PROJECT NO: G11310

DATE SAMPLED: November 5, 2011

PROJECT: GLP, 3rd Line Egress Renovation

SOURCE: BH1

Sample Location	SA #	Wet Weight	Dry Weight	TARE	Moisture Content	
SS 1-3, 5' to 7'		696.9	605.6	190.4	18.0%	
SS 1-4, 7.5' to 9.5'		659.7	492.4	214.2	37.6%	
SS 1-5, 10' to 12'	5828	1178.9	886.6	166.9	28.9%	
SS 1-6, 15' to 17'	5829	1145.9	988.3	289.3	18.4%	
SS 1-7, 20' to 22'		842.0	696.4	192.9	22.4%	
SS 1-9, 30' to 32'		1201.2	978.4	241.9	23.2%	
SS 1-10, 35' to 37'		1215.1	963.5	201.8	24.8%	
SS 1-13, 50' to 52'		1874.9	1482.2	546.7	29.6%	
SS 1-15, 60' to 62'	5830	1169.2	921.4	197.6	25.5%	
SS 1-16, 65' to 67'		1769.7	1579.1	270.3	12.7%	

REMARKS:

CLIENT: PowerTel Utilities Contractors Ltd.
COPIES TO: PowerTel Utilities Contractors Ltd.

DATE TESTED: November 10, 2011 Technician J. Garside

WE HEREBY CERTIFY TESTING PROCEDURES IN ACCORDANCE WITH ASTM C566 FOR THAT PORTION OF TESTING PERFORMED BY THIS COMPANY.

Consulting Engineers
MRW
M.R. WRIGHT & ASSOCIATES CO. LTD.
SAULT STE. MARIE • ONTARIO

Testing Lab

71 Black Road - Unit 3
Sault Ste. Marie, ON
P6B 0A3
Phone: (705) 945-5090
Fax: (705) 945-5092
Email: d.stadnisky@mrweng.ca

MOISTURE CONTENT TEST

PROJECT NO: G11310

DATE SAMPLED: November 5, 2011

PROJECT: GLP, 3rd Line Egress Renovation

SOURCE: BH2

Sample Location	SA #	Wet Weight	Dry Weight	TARE	Moisture Content	
SS 2-5, 10' to 12'	5831	1251.4	1065.3	369.8	21.1%	
SS 2-6, 15' to 17'		1737.2	1447.3	528.1	24.0%	
SS 2-7, 20' to 22'		1676.8	1248.7	389.9	33.3%	
SS 2-9, 30' to 32'	5832	1405.0	1006.6	179.8	32.5%	
SS 2-10, 35' to 37'		1694.8	1274.1	375.6	31.9%	
SS 2-11A, 40' to 41'		1595.9	1279.6	521.2	29.4%	
SS 2-12, 45' to 47'	5833	1753.6	1629.6	388.9	9.1%	

REMARKS:

CLIENT: PowerTel Utilities Contractors Ltd.
COPIES TO: PowerTel Utilities Contractors Ltd.

DATE TESTED: November 10, 2011 Technician J. Garside

WE HEREBY CERTIFY TESTING PROCEDURES IN ACCORDANCE WITH ASTM C566 FOR THAT PORTION OF TESTING PERFORMED BY THIS COMPANY.

Consulting Engineers
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Testing Lab

71 Black Road - Unit 3
Sault Ste. Marie, ON
P6B 0A3
Phone: (705) 945-5090
Fax: (705) 945-5092
Email: d.stadnisky@mrweng.ca

MOISTURE CONTENT TEST

PROJECT NO: G11310

DATE SAMPLED: November 5, 2011

PROJECT: GLP, 3rd Line Egress Renovation

SOURCE: BH3

Sample Location	SA #	Wet Weight	Dry Weight	TARE	Moisture Content	
SS 3-3, 5' to 7'	5834	1476.1	1106.8	190.4	28.7%	
SS 3-4, 7.5' to 9.5'		1202.6	898.5	214.2	30.8%	
TWS 3-5, 10' to 12'	5835	1624.8	1342.9	400.8	23.0%	
SS 3-6, 15' to 17'		865.3	671.9	198.1	29.0%	
SS 3-8, 25' to 27'	5836	950.2	859.0	545.8	22.6%	
SS 3-10, 35' to 37'		1454.6	989.7	192.9	36.8%	
SS 3-12, 45' to 47'		1601.4	1205.6	242.0	29.1%	
SS 3-13, 50' to 52'		1205.2	920.5	209.4	28.6%	
SS 3-14, 55' to 57'		1615.0	1235.9	270.3	28.2%	

REMARKS:

CLIENT: PowerTel Utilities Contractors Ltd.
COPIES TO: PowerTel Utilities Contractors Ltd.

DATE TESTED: November 10, 2011 Technician J. Garside

WE HEREBY CERTIFY TESTING PROCEDURES IN ACCORDANCE WITH ASTM C566 FOR THAT PORTION OF TESTING PERFORMED BY THIS COMPANY.

Consulting Engineers
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Testing Lab

71 Black Road - Unit 3
Sault Ste. Marie, ON
P6B 0A3
Phone: (705) 945-5090
Fax: (705) 945-5092
Email: d.stadnisky@mrweng.ca

MOISTURE CONTENT TEST

PROJECT NO: G11310

DATE SAMPLED: November 5, 2011

PROJECT: GLP, Third Line Egress Renovations Project

SOURCE: BH5

Sample Location	SA #	Wet Weight	Dry Weight	TARE	Moisture Content	
SS 5-3, 4.5' to 6.5'	5837	1588.6	1333.2	518.8	23.9%	
SS 5-5, 9.5' to 11.5'		1382.7	1082.5	528.7	35.2%	
SS 5-6, 14.5' to 16.5'		1172.7	1004.2	375.7	21.1%	
SS 5-7, 19.5' to 21.5'		1439.3	1169.1	530.2	29.7%	
SS 5-8, 24.5' to 26.5'		1245.9	1054.1	389.9	22.4%	
SS 5-9, 29.5' to 31.5'	5838	1734.8	1435.0	528.0	24.8%	
SS 5-11, 39.5' to 41.5'	5839	1700.8	1306.8	391.3	30.1%	
SS 5-12, 44.5' to 46.5'		982.7	844.6	530.1	30.5%	
SS 5-13, 49.5' to 51.5'		871.8	746.1	412.0	27.3%	
SS 5-14, 54.5' to 56.5'		1971.7	1586.4	536.1	26.8%	

REMARKS:

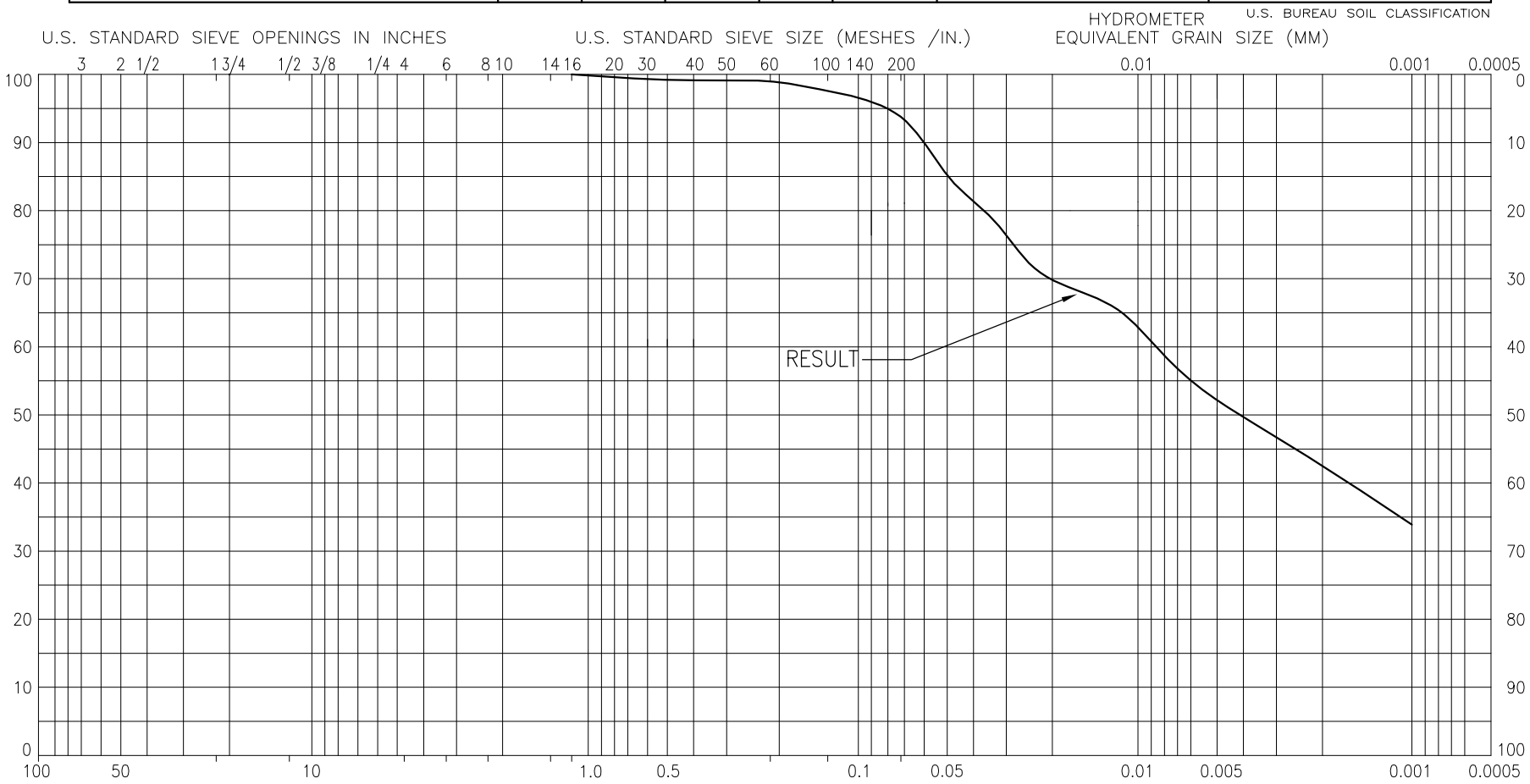
CLIENT: PowerTel Utilities Contractors Ltd.
COPIES TO: PowerTel Utilities Contractors Ltd.

DATE TESTED: November 10, 2011 Technician J. Garside

WE HEREBY CERTIFY TESTING PROCEDURES IN ACCORDANCE WITH ASTM C566 FOR THAT PORTION OF TESTING PERFORMED BY THIS COMPANY.

GRAVEL	FINE GRAVEL	SAND				SILT	CLAY
		COARSE	MEDIUM	FINE	VERY FINE		

U.S. BUREAU SOIL CLASSIFICATION



GRAVEL		SAND			CLAY & SILT
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED CLASSIFICATION

GRAIN SIZE DISTRIBUTION

Consulting Engineers
MRW
M. R. WRIGHT & ASSOCIATES CO. LTD.
SAULT STE. MARIE, ONTARIO

TESTING LAB

71 Black Road – Unit 3
Sault Ste. Marie, Ontario P6B 0A3
Phone: 1–(705)–945–5090
Fax: 1–(705)–945–5092
email: d.stadnisky@mrweng.ca

PROJECT: GLP, Third Line Egress Renovations Project

GRAIN SIZE DISTRIBUTION No. SA 5828

SAMPLED FROM: SS 1–5, 10' to 12'

SAMPLED BY: W. Tabaczuk OF: M.R. WRIGHT AND ASSOC.

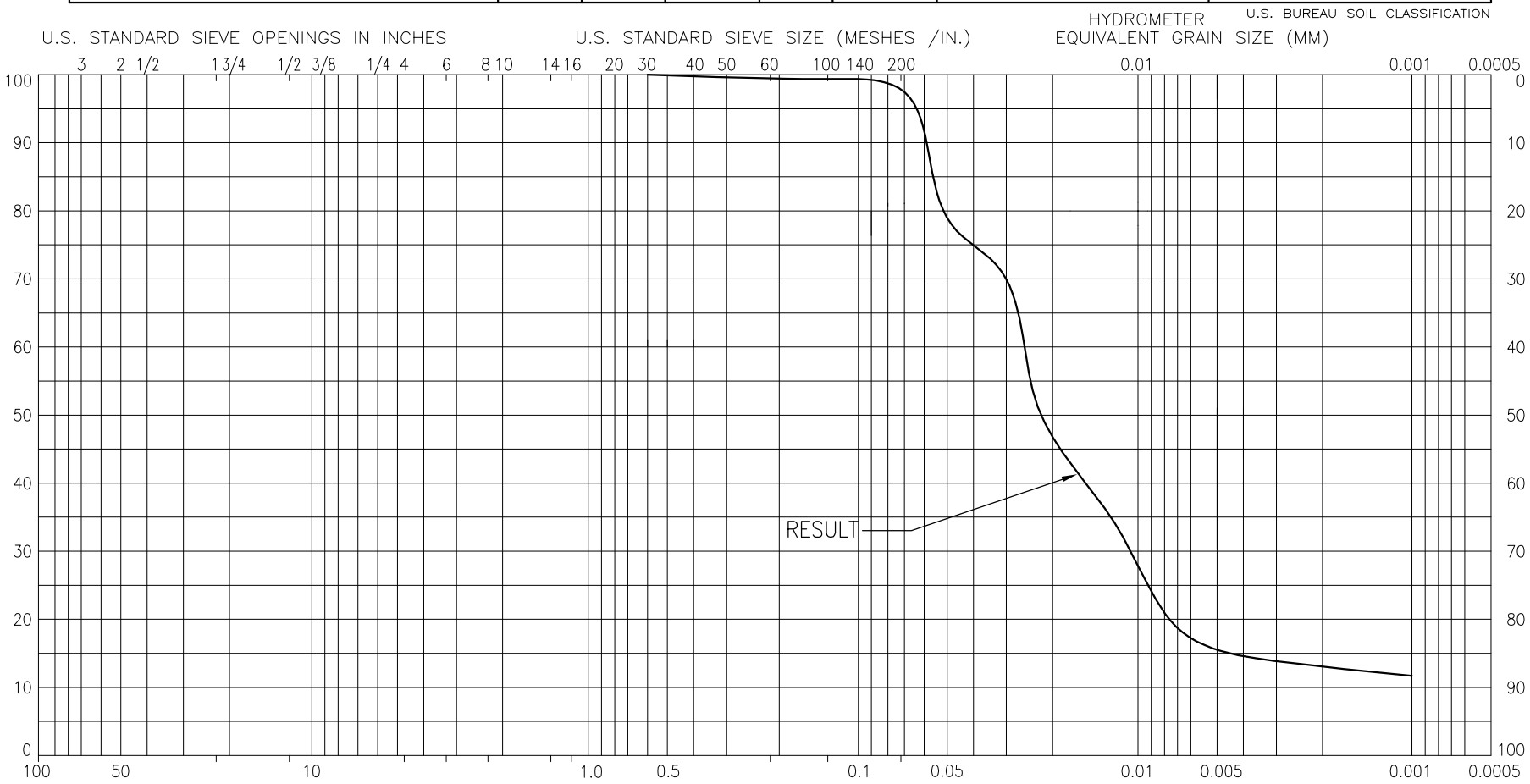
TESTED BY: D. Stadnisky

DATE TESTED: Novmeber 15, 2011

CONTRACT No: G11310

GRAVEL	FINE GRAVEL	SAND				SILT	CLAY
		COARSE	MEDIUM	FINE	VERY FINE		

U.S. BUREAU SOIL CLASSIFICATION



GRAVEL		SAND			CLAY & SILT
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED CLASSIFICATION

GRAIN SIZE DISTRIBUTION

Consulting Engineers
MRW
M. R. WRIGHT & ASSOCIATES CO. LTD.
SAULT STE. MARIE, ONTARIO

TESTING LAB

71 Black Road – Unit 3
Sault Ste. Marie, Ontario P6B 0A3
Phone: 1–(705)–945–5090
Fax: 1–(705)–945–5092
email: d.stadnisky@mrweng.ca

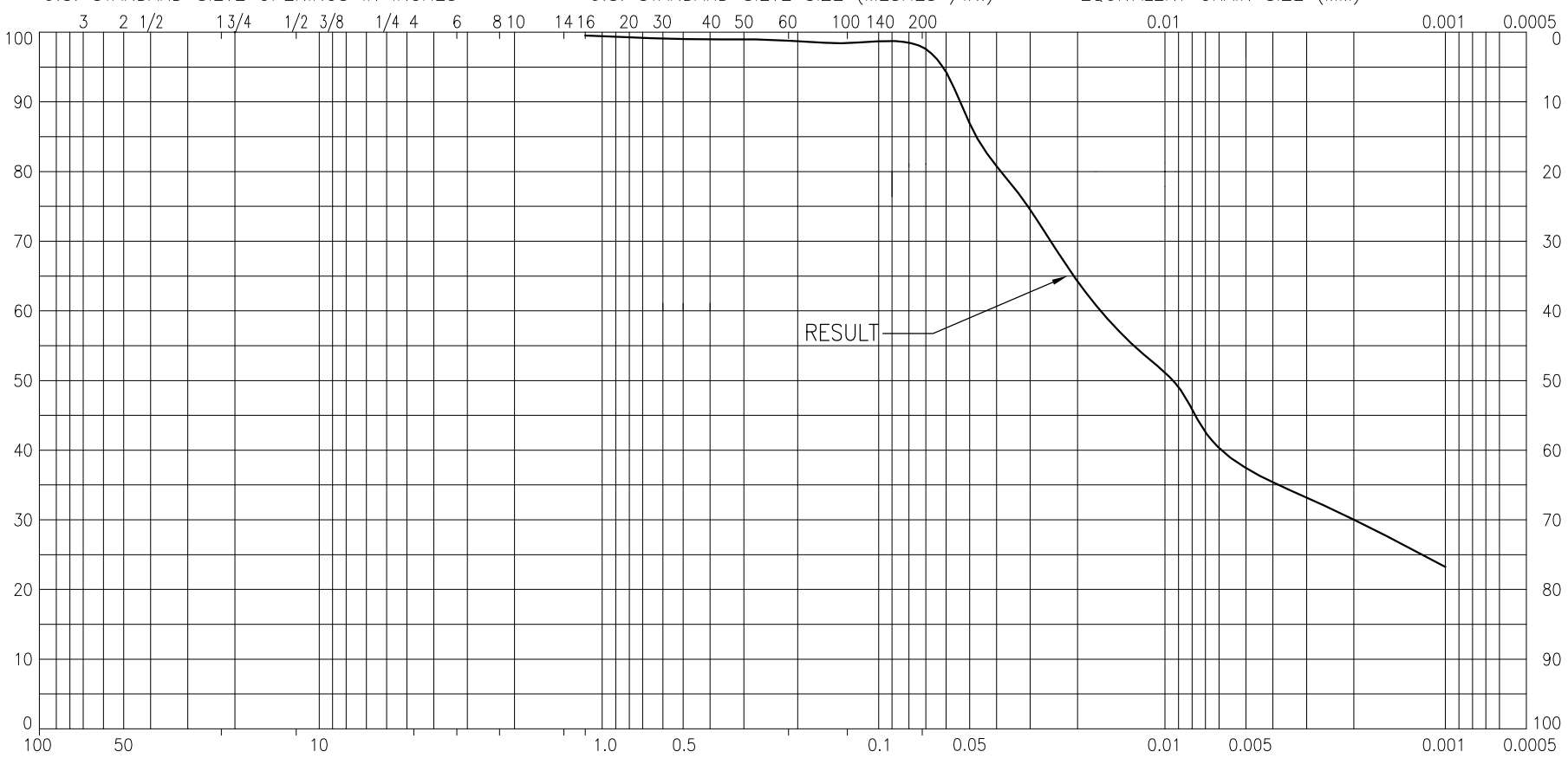
PROJECT: GLP, Third Line Egress Renovations Project — GRAIN SIZE DISTRIBUTION No. SA 5829

SAMPLED FROM: SS 1–6, 15' to 17' — SAMPLED BY: W. Tabaczuk — OF: M.R. WRIGHT AND ASSOC.

TESTED BY: D. Stadnisky — DATE TESTED: Novmeber 15, 2011 — CONTRACT No: G11310

GRAVEL	FINE GRAVEL	SAND				SILT	CLAY
		COARSE	MEDIUM	FINE	VERY FINE		

U.S. BUREAU SOIL CLASSIFICATION



GRAVEL		SAND			CLAY & SILT
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED CLASSIFICATION

GRAIN SIZE DISTRIBUTION

Consulting Engineers
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M. R. WRIGHT & ASSOCIATES CO. LTD.
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TESTING LAB

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Sault Ste. Marie, Ontario P6B 0A3
Phone: 1–(705)–945–5090
Fax: 1–(705)–945–5092
email: d.stadnisky@mrweng.ca

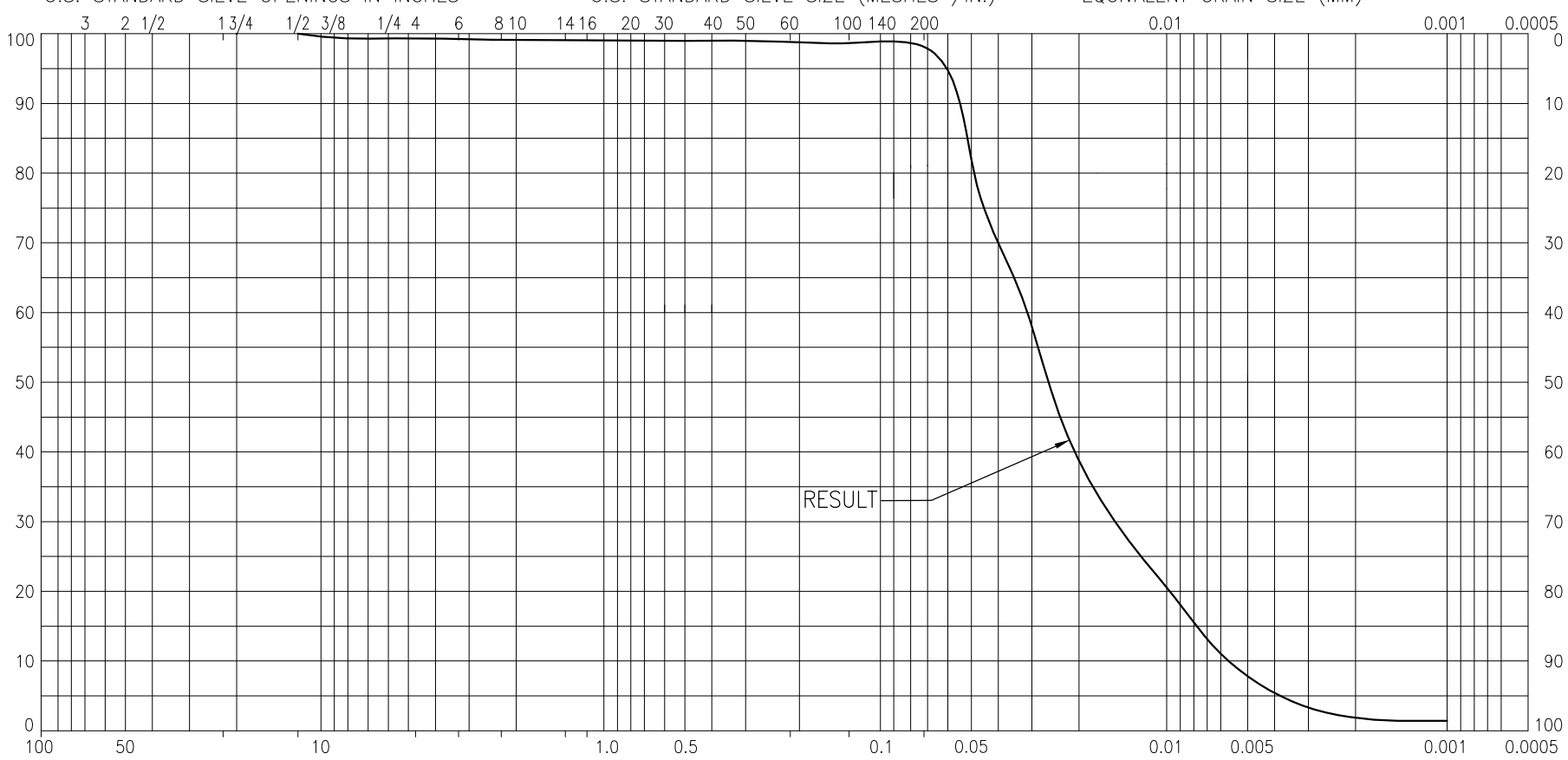
PROJECT: GLP, Third Line Egress Renovations Project — GRAIN SIZE DISTRIBUTION No. SA 5830

SAMPLED FROM: SS 1–15, 60' to 62' — SAMPLED BY: W. Tabaczuk — OF: M.R. WRIGHT AND ASSOC.

TESTED BY: D. Stadnisky — DATE TESTED: Novmeber 15, 2011 — CONTRACT No: G11310

GRAVEL	FINE GRAVEL	SAND				SILT	CLAY
		COARSE	MEDIUM	FINE	VERY FINE		

U.S. BUREAU SOIL CLASSIFICATION



GRAVEL		SAND			CLAY & SILT
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED CLASSIFICATION

GRAIN SIZE DISTRIBUTION

Consulting Engineers
MRW
M. R. WRIGHT & ASSOCIATES CO. LTD.
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TESTING LAB

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Sault Ste. Marie, Ontario P6B 0A3
Phone: 1–(705)–945–5090
Fax: 1–(705)–945–5092
email: d.stadnisky@mrweng.ca

PROJECT: GLP, Third Line Egress Renovations Project

GRAIN SIZE DISTRIBUTION No. SA 5831

SAMPLED FROM: SS 2–5, 10' to 12'

SAMPLED BY: W. Tabaczuk OF: M.R. WRIGHT AND ASSOC.

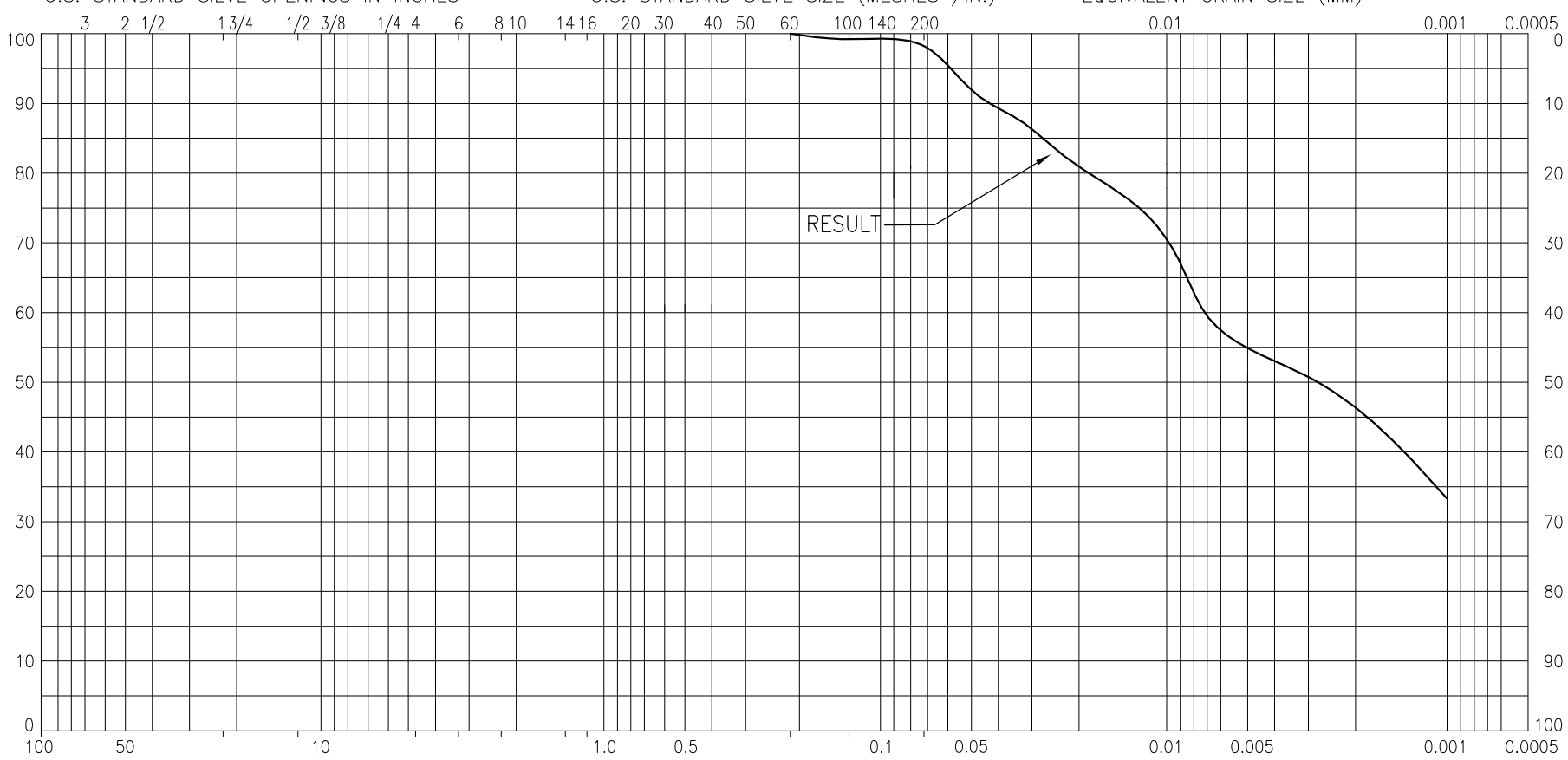
TESTED BY: D. Stadnisky

DATE TESTED: Novmeber 15, 2011

CONTRACT No: G11310

GRAVEL	FINE GRAVEL	SAND				SILT	CLAY
		COARSE	MEDIUM	FINE	VERY FINE		

U.S. BUREAU SOIL CLASSIFICATION



GRAVEL		SAND			CLAY & SILT
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED CLASSIFICATION

GRAIN SIZE DISTRIBUTION

Consulting Engineers
MRW
M. R. WRIGHT & ASSOCIATES CO. LTD.
SAULT STE. MARIE, ONTARIO

TESTING LAB

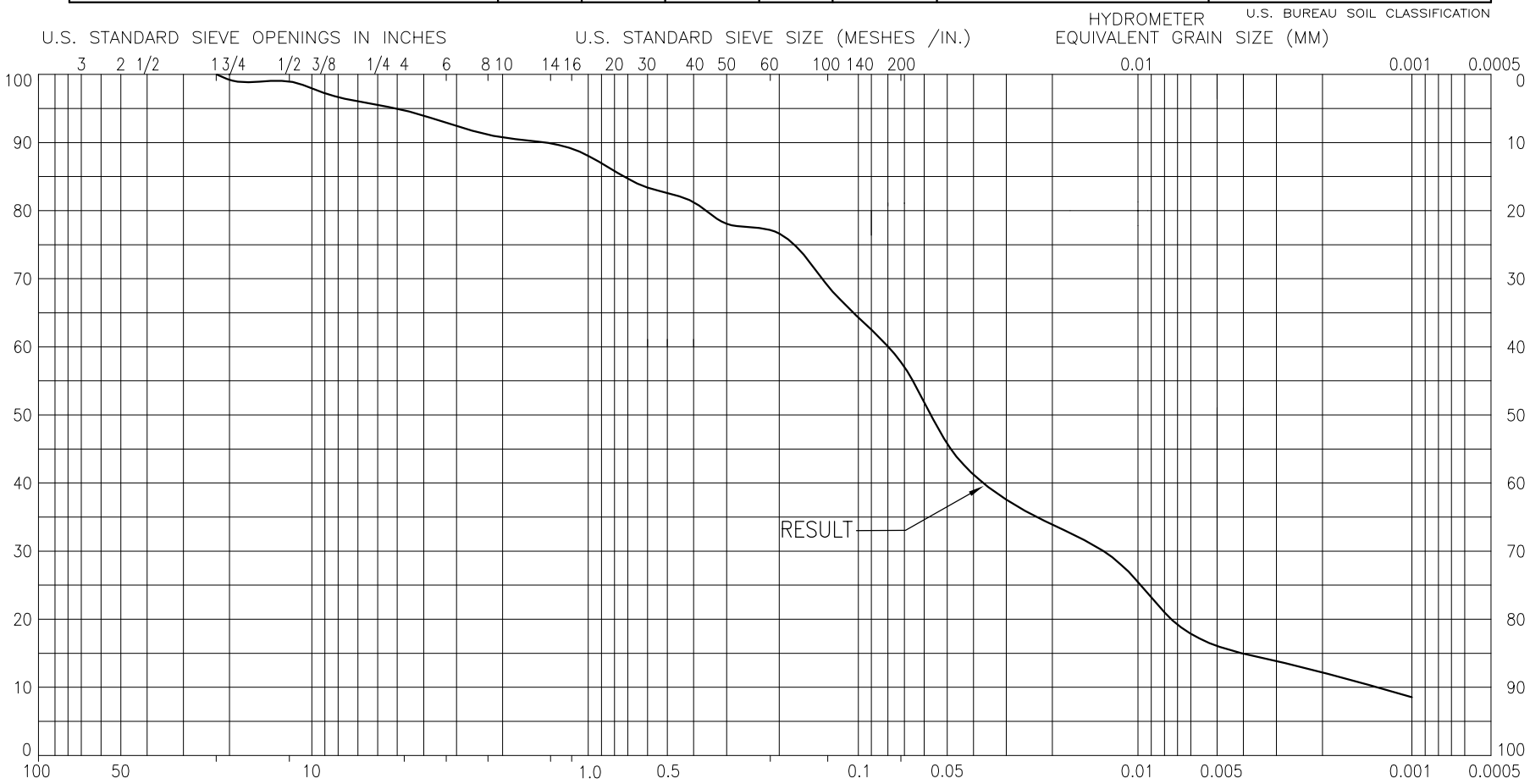
71 Black Road – Unit 3
Sault Ste. Marie, Ontario P6B 0A3
Phone: 1–(705)–945–5090
Fax: 1–(705)–945–5092
email: d.stadnisky@mrweng.ca

PROJECT: GLP, Third Line Egress Renovations Project — GRAIN SIZE DISTRIBUTION No. SA 5832

SAMPLED FROM: SS 2–9, 30' to 32' — SAMPLED BY: W. Tabaczuk — OF: M.R. WRIGHT AND ASSOC.

TESTED BY: D. Stadnisky — DATE TESTED: Novmeber 15, 2011 — CONTRACT No: G11310

GRAVEL	FINE GRAVEL	SAND				SILT	CLAY
		COARSE	MEDIUM	FINE	VERY FINE		



GRAVEL		SAND			CLAY & SILT
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED CLASSIFICATION

GRAIN SIZE DISTRIBUTION

Consulting Engineers
MRW
M. R. WRIGHT & ASSOCIATES CO. LTD.
SAULT STE. MARIE, ONTARIO

TESTING LAB

71 Black Road – Unit 3
Sault Ste. Marie, Ontario P6B 0A3
Phone: 1–(705)–945–5090
Fax: 1–(705)–945–5092
email: d.stadnisky@mrweng.ca

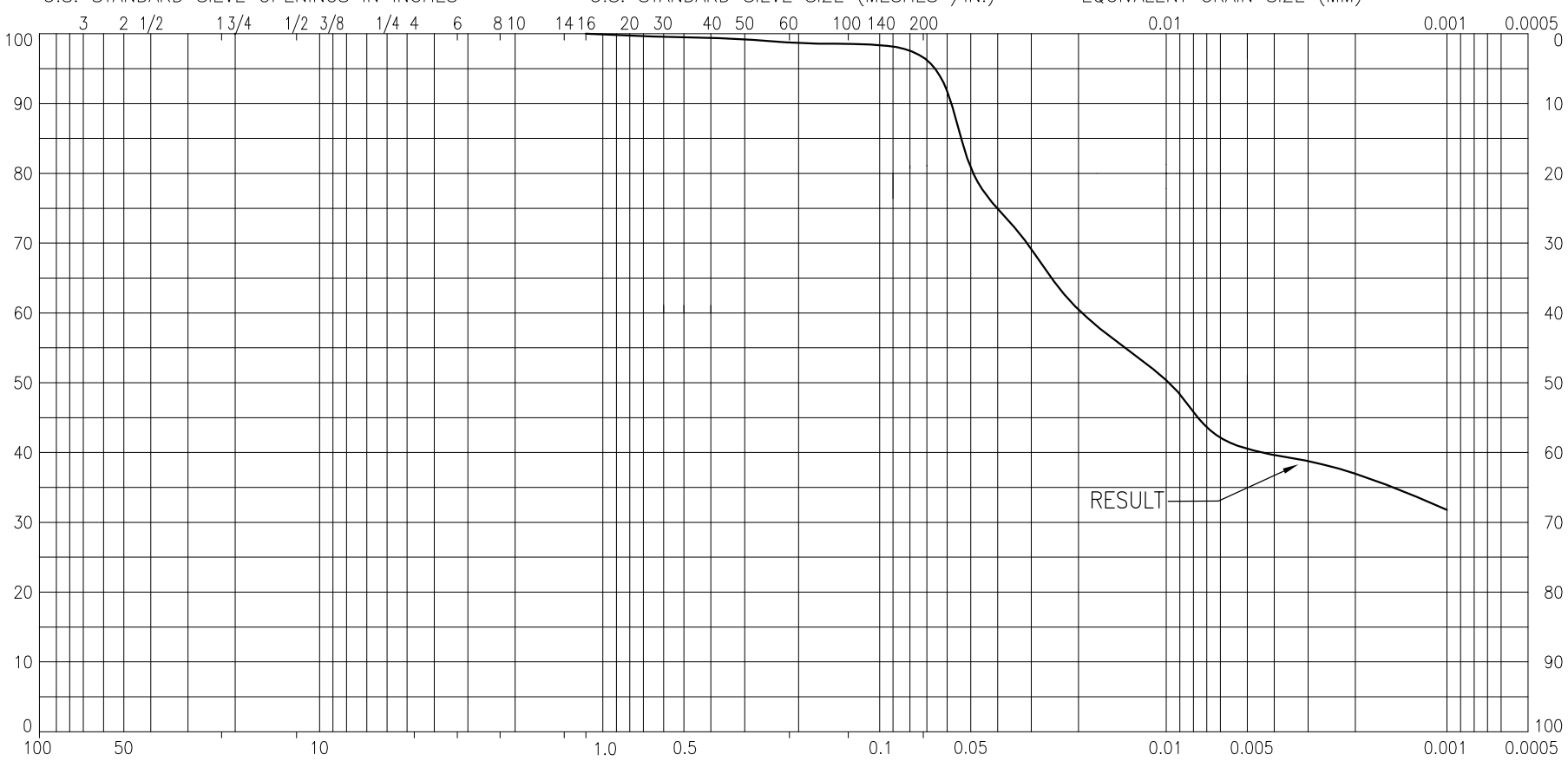
PROJECT: GLP, Third Line Egress Renovations Project — GRAIN SIZE DISTRIBUTION No. SA 5833

SAMPLED FROM: SS 2–12, 45' to 47' — SAMPLED BY: W. Tabaczuk — OF: M.R. WRIGHT AND ASSOC.

TESTED BY: D. Stadnisky — DATE TESTED: Novmeber 15, 2011 — CONTRACT No: G11310

GRAVEL	FINE GRAVEL	SAND				SILT	CLAY
		COARSE	MEDIUM	FINE	VERY FINE		

U.S. BUREAU SOIL CLASSIFICATION



GRAVEL		SAND			CLAY & SILT
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED CLASSIFICATION

GRAIN SIZE DISTRIBUTION

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Fax: 1–(705)–945–5092
email: d.stadnisky@mrweng.ca

PROJECT: GLP, Third Line Egress Renovations Project

GRAIN SIZE DISTRIBUTION No. SA 5834

SAMPLED FROM: SS 3–3, 5' to 7'

SAMPLED BY: W. Tabaczuk OF: M.R. WRIGHT AND ASSOC.

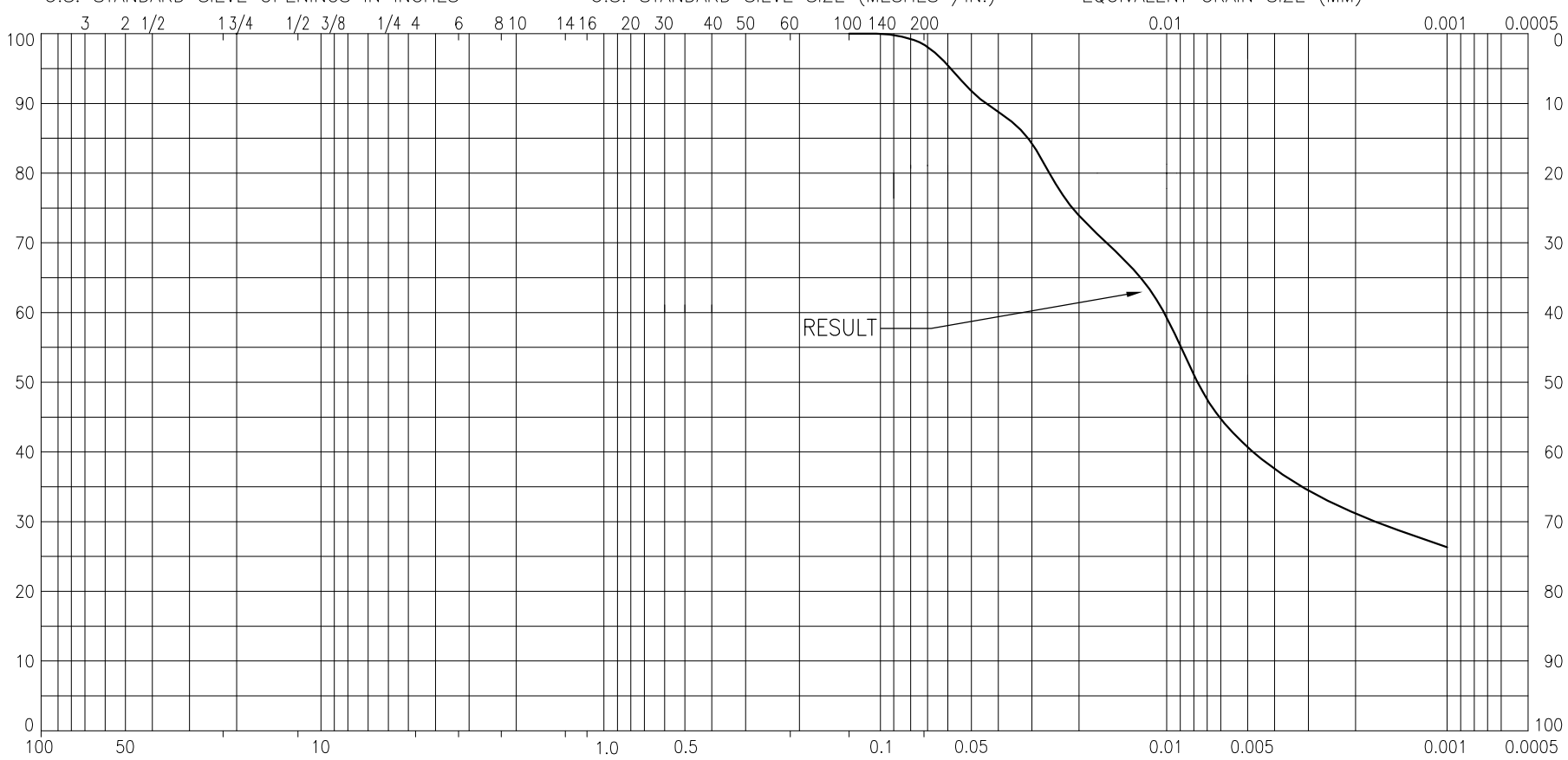
TESTED BY: D. Stadnisky

DATE TESTED: Novmeber 15, 2011

CONTRACT No: G11310

GRAVEL	FINE GRAVEL	SAND				SILT	CLAY
		COARSE	MEDIUM	FINE	VERY FINE		

U.S. BUREAU SOIL CLASSIFICATION



GRAVEL		SAND			CLAY & SILT
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED CLASSIFICATION

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Phone: 1–(705)–945–5090
Fax: 1–(705)–945–5092
email: d.stadnisky@mrweng.ca

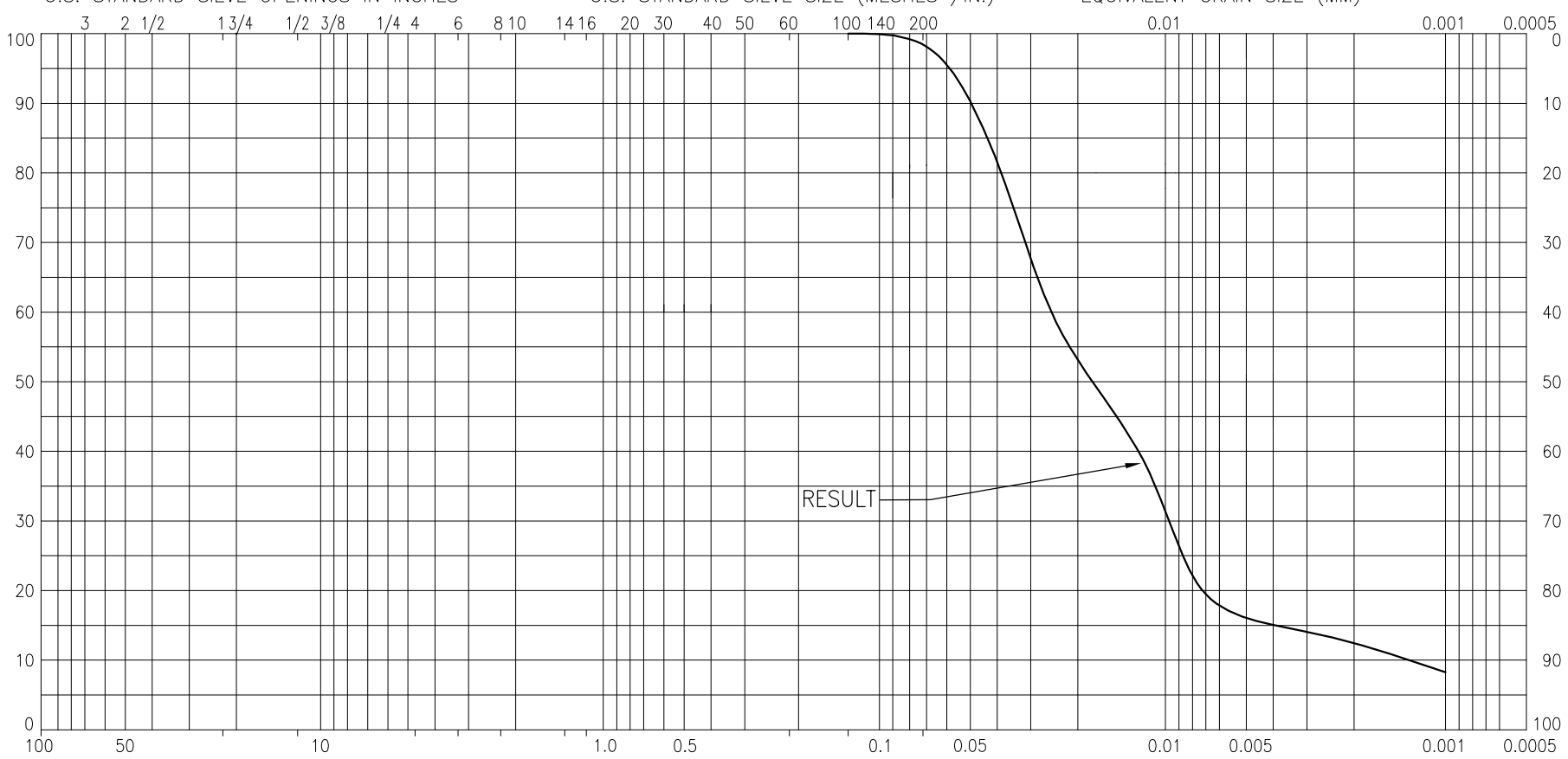
PROJECT: GLP, Third Line Egress Renovations Project — GRAIN SIZE DISTRIBUTION No. SA 5835

SAMPLED FROM: TWS 3–5, 10' to 12' — SAMPLED BY: W. Tabaczuk — OF: M.R. WRIGHT AND ASSOC.

TESTED BY: D. Stadnisky — DATE TESTED: Novmeber 15, 2011 — CONTRACT No: G11310

GRAVEL	FINE GRAVEL	SAND				SILT	CLAY
		COARSE	MEDIUM	FINE	VERY FINE		

U.S. BUREAU SOIL CLASSIFICATION



GRAVEL		SAND			CLAY & SILT
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED CLASSIFICATION

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Phone: 1–(705)–945–5090
Fax: 1–(705)–945–5092
email: d.stadnisky@mrweng.ca

PROJECT: GLP, Third Line Egress Renovations Project

GRAIN SIZE DISTRIBUTION No. SA 5836

SAMPLED FROM: SS 3–8, 25' to 27'

SAMPLED BY: W. Tabaczuk OF: M.R. WRIGHT AND ASSOC.

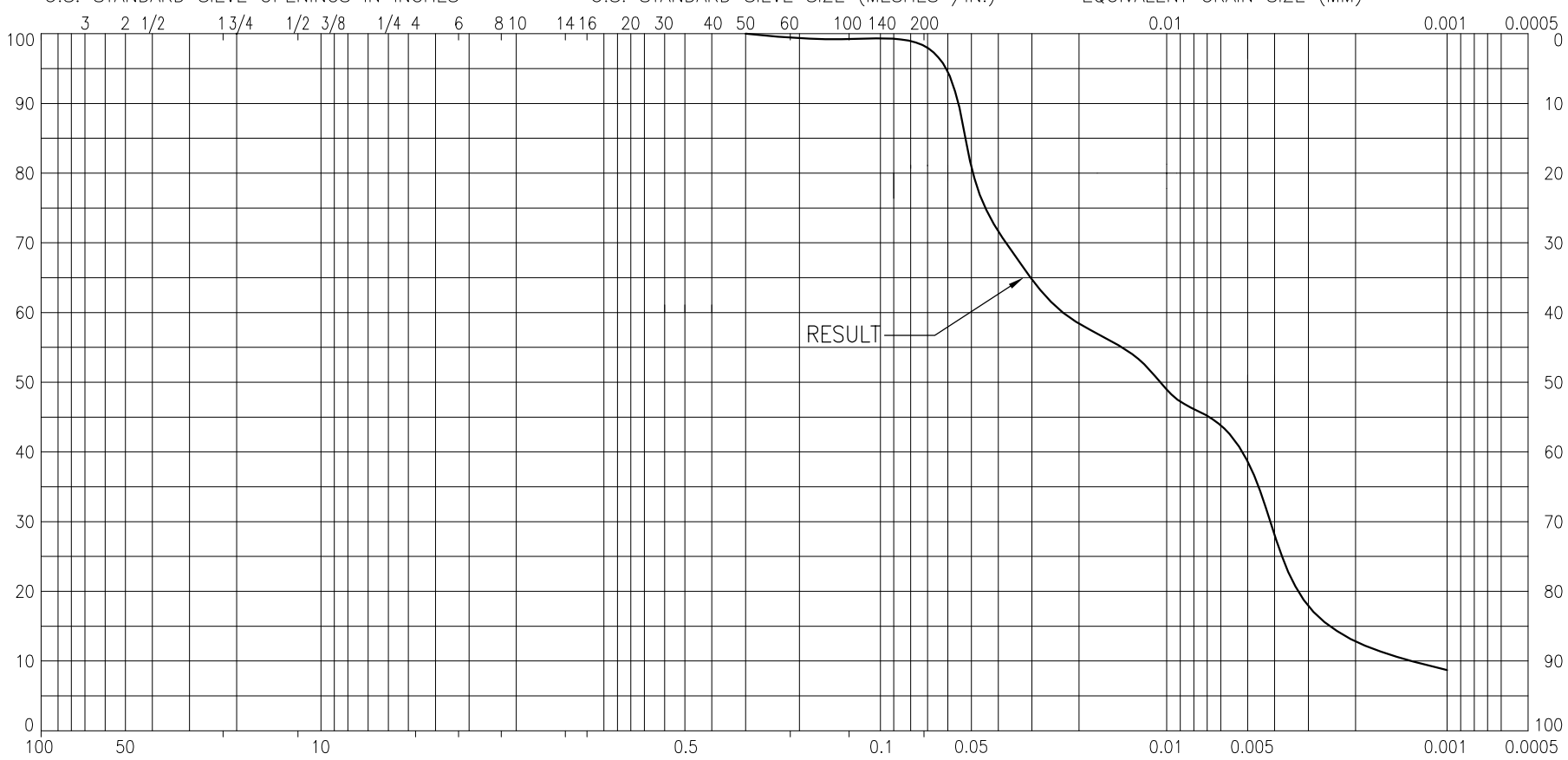
TESTED BY: D. Stadnisky

DATE TESTED: Novmeber 15, 2011

CONTRACT No: G11310

GRAVEL	FINE GRAVEL	SAND				SILT	CLAY
		COARSE	MEDIUM	FINE	VERY FINE		

U.S. BUREAU SOIL CLASSIFICATION



GRAVEL		SAND			CLAY & SILT
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED CLASSIFICATION

GRAIN SIZE DISTRIBUTION

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Phone: 1–(705)–945–5090
Fax: 1–(705)–945–5092
email: d.stadnisky@mrweng.ca

PROJECT: GLP, 3rd Line Egress Renovation

GRAIN SIZE DISTRIBUTION No. SA 5837

SAMPLED FROM: SS 5–3, 4.5' to 6.5'

SAMPLED BY: W. Tabaczuk OF: M.R. WRIGHT AND ASSOC.

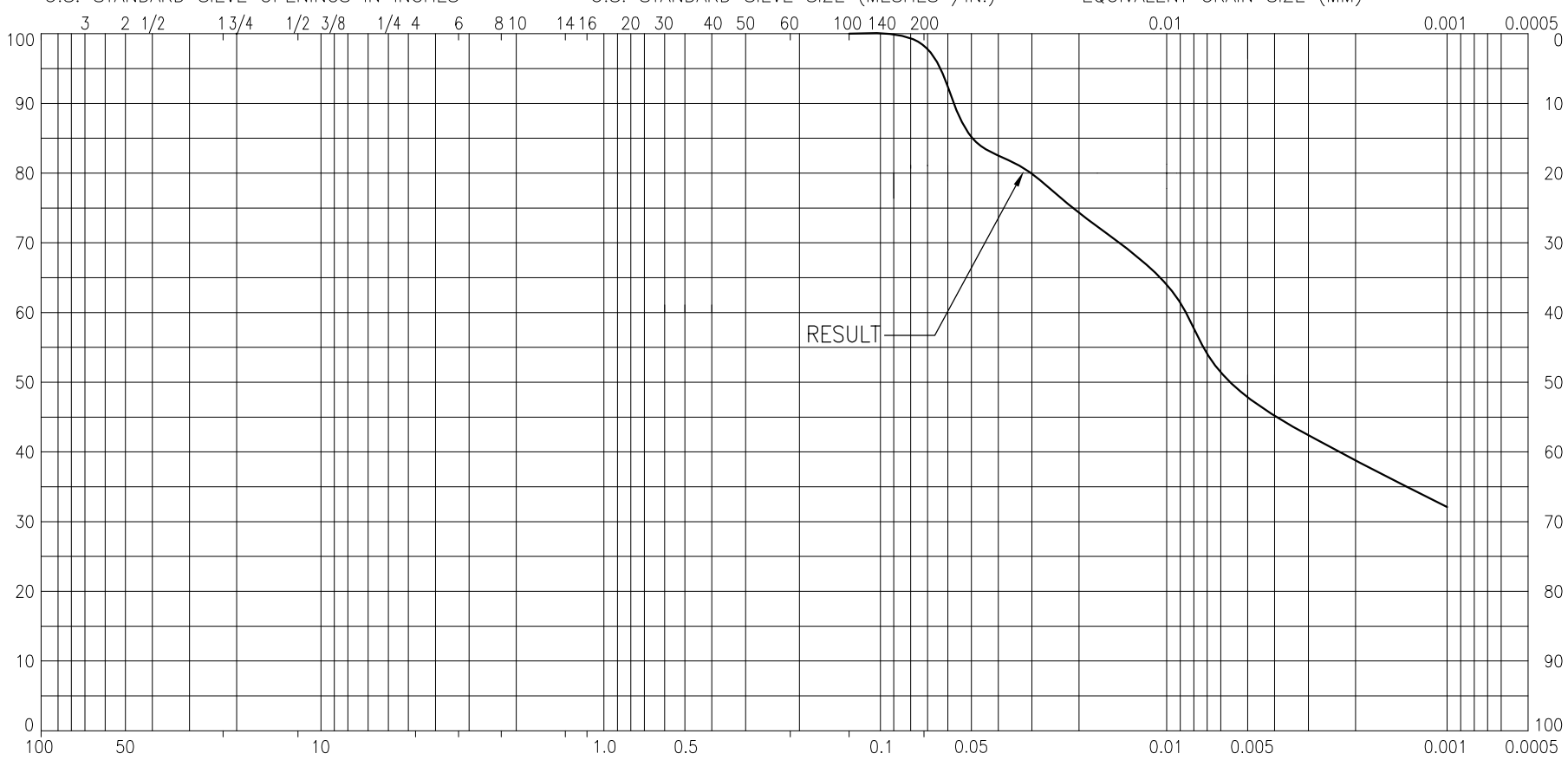
TESTED BY: D. Stadnisky

DATE TESTED: Novmeber 15, 2011

CONTRACT No: G11310

GRAVEL	FINE GRAVEL	SAND				SILT	CLAY
		COARSE	MEDIUM	FINE	VERY FINE		

U.S. BUREAU SOIL CLASSIFICATION



GRAVEL		SAND			CLAY & SILT
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED CLASSIFICATION

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Phone: 1–(705)–945–5090
Fax: 1–(705)–945–5092
email: d.stadnisky@mrweng.ca

PROJECT: GLP, Third Line Egress Renovations Project

GRAIN SIZE DISTRIBUTION No. SA 5838

SAMPLED FROM: SS 5–9, 29.5' to 31.5'

SAMPLED BY: W. Tabaczuk OF: M.R. WRIGHT AND ASSOC.

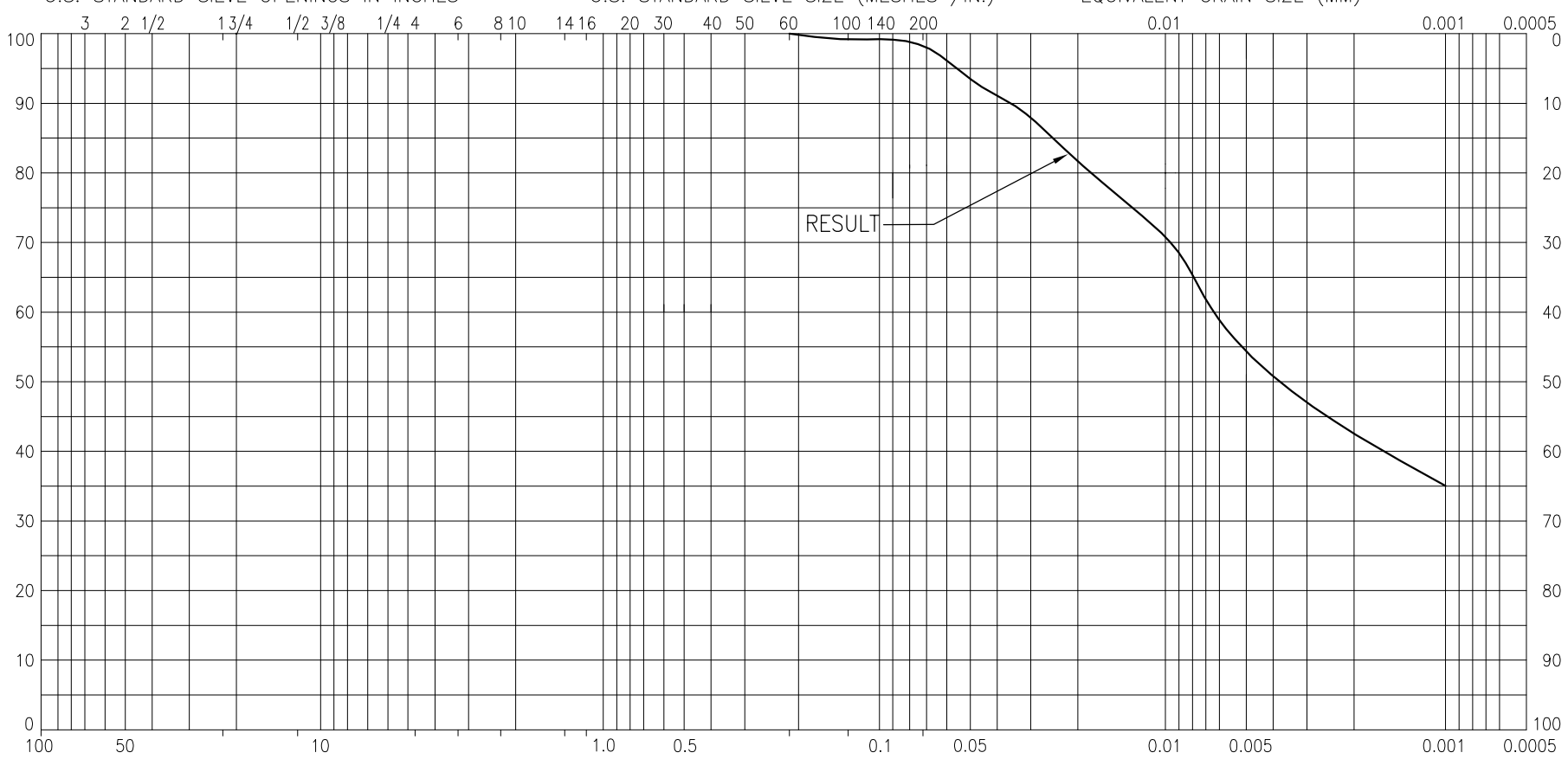
TESTED BY: D. Stadnisky

DATE TESTED: Novmeber 15, 2011

CONTRACT No: G11310

GRAVEL	FINE GRAVEL	SAND				SILT	CLAY
		COARSE	MEDIUM	FINE	VERY FINE		

U.S. BUREAU SOIL CLASSIFICATION



GRAVEL		SAND			CLAY & SILT
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED CLASSIFICATION

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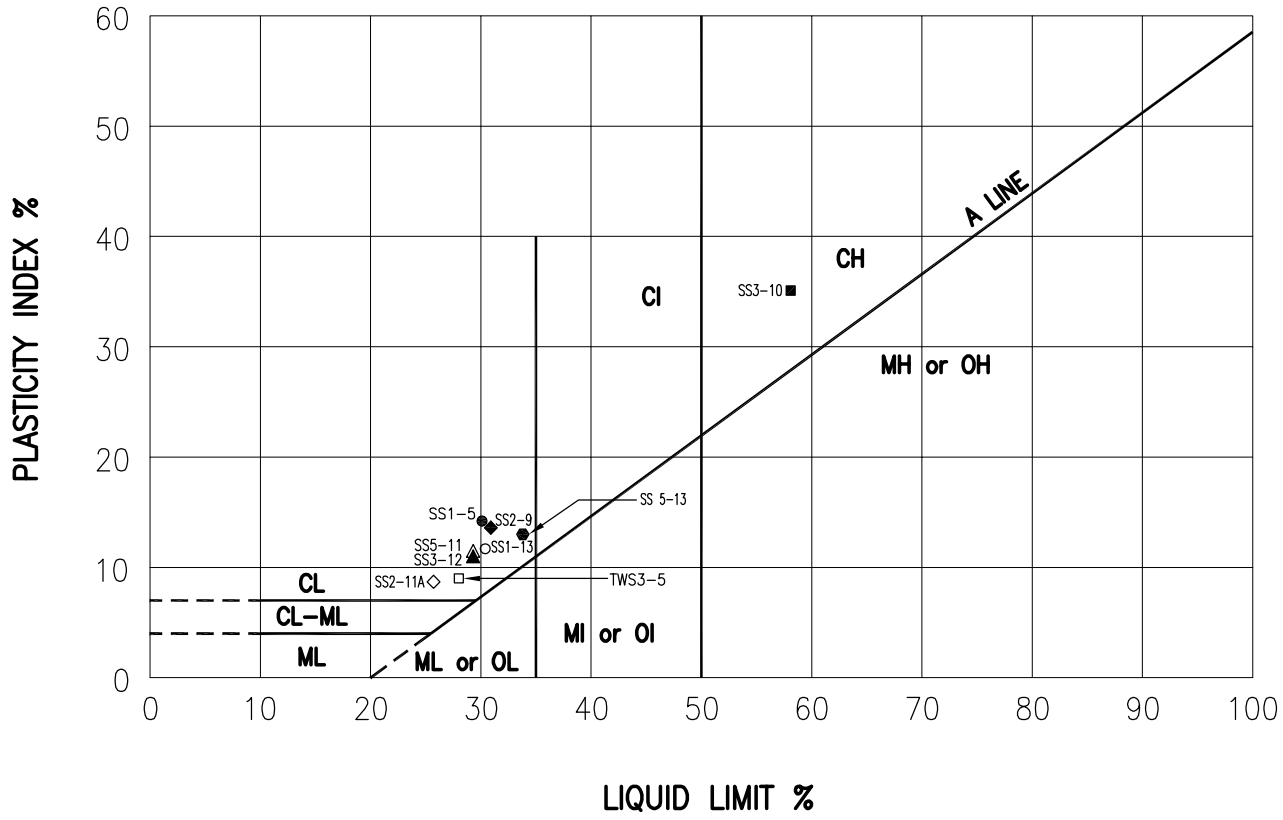
Phone: 1–(705)–945–5090
Fax: 1–(705)–945–5092
email: d.stadnisky@mrweng.ca

PROJECT: GLP, Third Line Egress Renovations Project — GRAIN SIZE DISTRIBUTION No. SA 5839

SAMPLED FROM: SS 5–11, 39.5' to 41.5' — SAMPLED BY: W. Tabaczuk — OF: M.R. WRIGHT AND ASSOC.

TESTED BY: D. Stadnisky — DATE TESTED: Novmeber 15, 2011 — CONTRACT No: G11310



SYMBOL	SAMPLE LOCATION	SAMPLE NUMBER	DEPTH RANGE (ft)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	MOISTURE CONTENT (%)
●	BH1	SS 1-5	10-12	30.1	15.9	14.2	28.9
○	BH1	SS 1-13	50-52	30.4	18.7	11.7	29.6
◆	BH2	SS 2-9	30-32	30.9	17.3	13.6	32.5
◇	BH2	SS 2-11A	40-41	25.7	17.0	8.7	29.4
□	BH3	TWS 3-5	10-12	28.0	19.0	9.0	23.0
■	BH3	SS 3-10	35-37	58.1	23.0	35.1	36.8
▲	BH3	SS 3-12	45-47	29.3	18.3	11.0	29.1
△	BH5	SS 5-11	39.5-41.5	29.3	18.1	11.2	30.1
⬣	BH5	SS 5-13	49.5-51.5	33.8	20.8	13.0	27.3

TECHNICIAN:	M.CORRIVEAU
DRAWN BY:	D.MOODY
DATE CREATED:	11/28/2011
REVISION #:	
REVISION DATE:	

Consulting Engineers
MRW
M. R. WRIGHT & ASSOCIATES CO. LTD.
SAULT STE. MARIE, ONTARIO

PLASTICITY CHART

GLP, THIRD LINE EGRESS
RENOVATION PROJECT
SAULT STE. MARIE, ON
MRW PROJECT G11310

CLIENT: POWERTEL

Consulting Engineers
MRW
M.R. WRIGHT & ASSOCIATES CO. LTD.
SAULT STE. MARIE • ONTARIO

Testing Lab

71 Black Road - Unit 3
Sault Ste. Marie, ON
P6B 0A3
Phone: (705) 945-5090
Fax: (705) 945-5092
Email:

UNIT WEIGHT

PROJECT NO: G11310

DATE SAMPLED: November 5, 2011

PROJECT: GLP, Third Line Egress Renovations Project

SOURCE: BH1, BH2 & BH3

Sample Location	Soil Type	Unit Weight (lbs/ft^3)	Moisture Content		
SS 1-3, 5' to 7'	Silt	113	18.0%		
SS 1-4, 7.5' to 9.5'	Clayey Silt	94.0	37.6%		
SS 1-5, 10' to 12'	Silty Clay	119.0	28.9%		
SS 1-7, 20' to 22'	Silt	120.5	22.4%		
SS 1-10, 35' to 37'	Silty Clay	116.5	24.8%		
SS 1-15, 60' to 62'	Silty Clay	115.0	25.5%		
SS 2-9, 30' to 32'	Silty Clay	107.0	32.5%		
SS 3-6, 15' to 17'	Clay & Silt	111.7	29.0%		

REMARKS:Testing was performed on disturbed soil samples and subject to an according degree of error

CLIENT: PowerTel Utilities Contractors Ltd.
COPIES TO: PowerTel Utilities Contractors Ltd.

DATE TESTED: November 18, 2011 Technician D. Stadnisky

WE HEREBY CERTIFY TESTING PROCEDURES IN ACCORDANCE WITH CAN/CSA-A23.2-M94 FOR THAT PORTION OF TESTING PERFORMED BY THIS COMPANY.

Appendix C Testmark's Laboratory Analytical Reports for Soil Samples

This report has been approved by:

Rita Rienguette, Chem. Eng. Tech.
Organic Section Head

Mary King, Ph.D.
Inorganic Section Head

Sample Data:

Sample Name: SAND - BH1 - 2 **Date: 11/05/11** **Matrix: Soil** **Lab #: 383769**

Anions Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Bromide	0.5	<0.5	µg/g	20111115.R5F
Chloride	1	18.7	µg/g	20111115.R5F
Fluoride	0.05	<0.05	µg/g	20111115.R5F
Nitrate (as N)	0.15	0.26	µg/g	20111115.R5F
Nitrite (as N)	0.1	<0.1	µg/g	20111115.R5F
Phosphate	1.5	<1.5	µg/g	20111115.R5F
Sulfate	1	2.3	µg/g	20111115.R5F

Moisture				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
% Moisture	0.1	16.5	%	20111114.R99A

pHSOIL				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
pH	N/A	4.77	pH	20111115.R2B

Resistivity Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Resistivity	N/A	75757	ohm-cm	20111115.R12B

Sample Name: SILT - BH1 - 3 **Date: 11/05/11** **Matrix: Soil** **Lab #: 383770**

Anions Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Bromide	0.5	<0.5	µg/g	20111115.R5F
Chloride	1	29.6	µg/g	20111115.R5F
Fluoride	0.05	<0.05	µg/g	20111115.R5F
Nitrate (as N)	0.15	0.49	µg/g	20111115.R5F
Nitrite (as N)	0.1	<0.1	µg/g	20111115.R5F
Phosphate	1.5	<1.5	µg/g	20111115.R5F
Sulfate	1	1.9	µg/g	20111115.R5F

Moisture				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
% Moisture	0.1	17.1	%	20111114.R99A

pHSOIL				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
pH	N/A	7.44	pH	20111115.R2B

Resistivity Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Resistivity	N/A	25188	ohm-cm	20111115.R12B

Sample Name: SILTY CLAY - BH1 - 11 **Date: 11/05/11** **Matrix: Soil** **Lab #: 383771**

Anions Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Bromide	0.5	<0.5	µg/g	20111115.R5F
Chloride	1	27.3	µg/g	20111115.R5F
Fluoride	0.05	<0.05	µg/g	20111115.R5F
Nitrate (as N)	0.15	0.38	µg/g	20111115.R5F
Nitrite (as N)	0.1	<0.1	µg/g	20111115.R5F
Phosphate	1.5	<1.5	µg/g	20111115.R5F
Sulfate	1	7	µg/g	20111115.R5F

Moisture				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
% Moisture	0.1	21.9	%	20111114.R99A

pHSOIL				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
pH	N/A	8.06	pH	20111115.R2B
pH (Dup)	N/A	8.14	pH	20111115.R2B

Resistivity Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Resistivity	N/A	16233	ohm-cm	20111115.R12B

Sample Name: SILT BH2 - 4 **Date: 11/03/11** **Matrix: Soil** **Lab #: 383772**

Anions Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Bromide	0.5	<0.5	µg/g	20111115.R5F
Chloride	1	98.9	µg/g	20111115.R5F
Fluoride	0.05	0.38	µg/g	20111115.R5F
Nitrate (as N)	0.15	0.53	µg/g	20111115.R5F
Nitrite (as N)	0.1	<0.1	µg/g	20111115.R5F
Phosphate	1.5	<1.5	µg/g	20111115.R5F
Sulfate	1	53.9	µg/g	20111115.R5F

Moisture				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
% Moisture	0.1	21.6	%	20111114.R99A

pHSOIL				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
pH	N/A	6.93	pH	20111115.R2B

Resistivity Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Resistivity	N/A	6968	ohm-cm	20111115.R12B

Sample Name: CLAY SILT BH3 - 8 **Date: 11/04/11** **Matrix: Soil** **Lab #: 383773**

Anions Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Bromide	0.5	<0.5	µg/g	20111115.R5F

Sample Name: CLAY SILT BH3 - 8 **Date: 11/04/11** **Matrix: Soil** **Lab #: 383773**

Anions Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Chloride	1	25.8	µg/g	20111115.R5F
Fluoride	0.05	<0.05	µg/g	20111115.R5F
Nitrate (as N)	0.15	0.36	µg/g	20111115.R5F
Nitrite (as N)	0.1	<0.1	µg/g	20111115.R5F
Phosphate	1.5	<1.5	µg/g	20111115.R5F
Sulfate	1	6.6	µg/g	20111115.R5F

Moisture				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
% Moisture	0.1	22.3	%	20111114.R99A

pHSOIL				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
pH	N/A	8.02	pH	20111115.R2B

Resistivity Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Resistivity	N/A	13736	ohm-cm	20111115.R12B

Sample Name: CLAY SILT BH5 - 4 **Date: 11/06/11** **Matrix: Soil** **Lab #: 383774**

Anions Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Bromide	0.5	<0.5	µg/g	20111115.R5F
Chloride	1	38.5	µg/g	20111115.R5F
Fluoride	0.05	0.41	µg/g	20111115.R5F
Nitrate (as N)	0.15	0.67	µg/g	20111115.R5F
Nitrite (as N)	0.1	<0.1	µg/g	20111115.R5F
Phosphate	1.5	<1.5	µg/g	20111115.R5F
Sulfate	1	6.4	µg/g	20111115.R5F

Moisture				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
% Moisture	0.1	31.2	%	20111114.R99A

pHSOIL				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
pH	N/A	8.29	pH	20111115.R2B

Resistivity Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Resistivity	N/A	25125	ohm-cm	20111115.R12B

Sample Name: SILTY CLAY BH5 - 12 **Date: 11/06/11** **Matrix: Soil** **Lab #: 383775**

Anions Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Bromide	0.5	<0.5	µg/g	20111115.R5F
Chloride	1	38.4	µg/g	20111115.R5F
Fluoride	0.05	0.38	µg/g	20111115.R5F

Sample Name: SILTY CLAY BH5 - 12 **Date: 11/06/11** **Matrix: Soil** **Lab #: 383775**

Anions Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Nitrate (as N)	0.15	0.65	µg/g	20111115.R5F
Nitrite (as N)	0.1	<0.1	µg/g	20111115.R5F
Phosphate	1.5	<1.5	µg/g	20111115.R5F
Sulfate	1	5.3	µg/g	20111115.R5F

Moisture				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
% Moisture	0.1	28	%	20111114.R99A

pHSOIL				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
pH	N/A	8.36	pH	20111115.R2B

Resistivity Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Resistivity	N/A	19305	ohm-cm	20111115.R12B

Sample Name: DUP-1 **Date: 11/06/11** **Matrix: Soil** **Lab #: 383776**

Anions Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Bromide	0.5	<0.5	µg/g	20111115.R5F
Chloride	1	34.5	µg/g	20111115.R5F
Fluoride	0.05	0.47	µg/g	20111115.R5F
Nitrate (as N)	0.15	0.68	µg/g	20111115.R5F
Nitrite (as N)	0.1	<0.1	µg/g	20111115.R5F
Phosphate	1.5	<1.5	µg/g	20111115.R5F
Sulfate	1	10	µg/g	20111115.R5F

Moisture				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
% Moisture	0.1	28.2	%	20111114.R99A

pHSOIL				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
pH	N/A	8.09	pH	20111115.R2B

Resistivity Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Resistivity	N/A	26385	ohm-cm	20111115.R12B

MDL *Method detection limit or minimum reporting limit.*
% Rec *Surrogate compounds are added to the sample in some cases and the recovery is reported as a percent recovered.*
QAQCID *This is a unique reference to the quality control data set used to generate the reported value.*
Data reported for organic analysis in soil samples are corrected for moisture content
Matrix *If the matrix is a leachate, the sample was extracted according to regulation 558.*
INT *Interferences*
TNTC *Too numerous to count*
ND *Not detected*

Quality Control Data:

Anions Soil

Lab Control Sample 1						
Parameter	**MDL**	**Units**	**UCL**	**Result**	**LCL**	**QAQCID**
Bromide	N/A	%	130	103	70	20111115.R5F
Chloride	N/A	%	130	98	70	20111115.R5F
Fluoride	N/A	%	130	100	70	20111115.R5F
Nitrate (as N)	N/A	%	130	92	70	20111115.R5F
Nitrite (as N)	N/A	%	130	96	70	20111115.R5F
Phosphate	N/A	%	130	90	70	20111115.R5F
Sulfate	N/A	%	130	98	70	20111115.R5F

Lab Control Sample 2						
Parameter	**MDL**	**Units**	**UCL**	**Result**	**LCL**	**QAQCID**
Bromide	N/A	%	130	102	70	20111115.R5F
Chloride	N/A	%	130	103	70	20111115.R5F
Fluoride	N/A	%	130	100	70	20111115.R5F
Nitrate (as N)	N/A	%	130	99	70	20111115.R5F
Nitrite (as N)	N/A	%	130	99	70	20111115.R5F
Phosphate	N/A	%	130	91	70	20111115.R5F
Sulfate	N/A	%	130	97	70	20111115.R5F

Method Blank						
Parameter	**MDL**	**Units**	**UCL**	**Result**	**LCL**	**QAQCID**
Bromide	0.5	mg/kg	1	<0.5	<0.5	20111115.R5F
Chloride	1	mg/kg	2	<1	<1	20111115.R5F
Fluoride	0.05	mg/kg	0.1	<0.05	<0.05	20111115.R5F
Nitrate (as N)	0.5	mg/kg	<0.5	<0.5	<0.5	20111115.R5F
Nitrite (as N)	0.25	mg/kg	<0.25	<0.25	<0.25	20111115.R5F
Phosphate	1.5	mg/kg	3	<1.5	<1.5	20111115.R5F
Sulfate	1	mg/kg	2	<1	<1	20111115.R5F

pHSOIL

Lab Control Sample						
Parameter	**MDL**	**Units**	**UCL**	**Result**	**LCL**	**QAQCID**
pH	N/A	pH	7.15	6.97	6.85	20111115.R2B

UCL Upper Control Limit
LCL Lower Control Limit

Appendix D Report Limitations and Guidelines for Use

REPORT LIMITATIONS AND GUIDELINES FOR USE

This information has been provided to help manage risks with respect to the use of this report.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

This geotechnical report has been prepared for the exclusive use of the client, their authorized agents, and other members of the design team. It is not intended for use by others, and the information contained herein is not applicable to other Sites, or for purposes other than those specified in the report.

M.R. Wright & Associates Company Limited (MRW) cannot be held responsible for reliance on the information contained in this report, by persons other than the client or 'authorized' agent without prior written approval.

SUBSURFACE CONDITIONS CAN CHANGE

This geotechnical investigation report is based on existing conditions at the time the study was performed, and our opinion of soil conditions are strictly based on soil samples collected at specific test hole locations. The findings and conclusions of our reports may be affected by the passage of time, by manmade events such as construction on or adjacent to the Site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations.

LIMITATIONS TO PROFESSIONAL OPINIONS

Interpretations of subsurface conditions are based on field observations from test pits that were spaced to capture a 'representative' snap shot of subsurface conditions. Site exploration identifies subsurface conditions only at points of sampling. MRW reviews field and laboratory data and then applies our professional judgment to formulate an opinion of subsurface conditions throughout the Site. Actual subsurface conditions may differ, between sampling locations, from those indicated in this report.

LIMITATIONS OF RECOMMENDATIONS

Subsurface soil conditions should be verified by a qualified geotechnical engineer during construction. MRW should be notified if any discrepancies to this report or unusual conditions are found during construction.

Sufficient monitoring, testing and consultation should be provided by MRW during construction and/or excavation activities, to confirm that the conditions encountered are consistent with those indicated by the test pit investigation, and to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated. In addition, monitoring, testing and consultation by MRW should be completed to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining MRW for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions. However, please be advised that any construction/excavation observations by MRW is over and above the mandate of this geotechnical investigation and therefore, additional fees would apply.

MISINTERPRETATION OF GEOTECHNICAL ENGINEERING REPORT

Misinterpretation of our report by other design team members can result in costly problems. You could lower that risk by having MRW confer with appropriate members of the design team after submitting the report. Also retain MRW to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having MRW participate in pre-bid and preconstruction conferences, and by providing construction observation. Please be advised that retaining MRW to participation in any 'other' activities associated with this project is over and above the mandate of this geotechnical investigation and therefore, additional fees would apply.

CONTRACTORS RESPONSIBILITY FOR SITE SAFETY

This geotechnical report is not intended to direct the contractor's procedures, methods, schedule or management of the work Site. The contractor is solely responsible for job Site safety and for managing construction operations to minimize risks to on-Site personnel and to adjacent properties. It is ultimately the contractor's responsibility that the Ontario Occupational Health and Safety Act is adhered to, and Site conditions satisfy all 'other' acts, regulations and/or legislation that may be mandated by federal, provincial and/or municipal authorities.

SUBSURFACE SOIL AND/OR GROUNDWATER CONTAMINATION

This report is geotechnical in nature and was not performed in accordance with any environmental guidelines. As such, any environmental comments are very preliminary in nature and based solely on field observations. Accordingly, the scope of services do not include any interpretations, recommendations, findings, or conclusions regarding the, assessment, prevention or abatement of contaminants, and no conclusions or inferences should be drawn regarding contamination, as they may relate to this project. The term "contamination" includes, but is not limited to, molds, fungi, spores, bacteria, viruses, PCBs, petroleum hydrocarbons, inorganics, pesticides/insecticides, volatile organic compounds, polycyclic aromatic hydrocarbons and/or any of their byproducts.

The total amount of all claims the Client may have against MRW or any present or former partners, executive officers, directors, stockholders or employees thereof under this engagement, including but not limited to claims for negligence, negligent misrepresentation and breach of contract, shall be strictly limited to the amount of MRW's professional fees for this assignment. No claim may be brought against MRW in contract or in tort more than two (2) years after the Services were completed or terminated under this agreement. Completion of services shall be deemed to be the last date on any invoice issued by MRW for services provided and as such will constitute the stature of limitations.

Appendix E Abbreviations, Terminology and Principal Symbols used in Report and Test Hole Log

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Structural | Civil & Municipal | Environmental | Geotechnical | Mechanical & Electrical | Inspection & Testing

ABBREVIATIONS, TERMINOLOGY & PRINCIPAL SYMBOLS USED IN REPORT AND TEST HOLE LOGS

Borehole & Test Pit Logs

Sampling Method

AS	Auger Sample	**w**	Washed Sample
SS	Split Spoon Sample	**HQ**	Rock Core (63.5 mm diam.)
ST	Thin Walled Shelby Tube	**NQ**	Rock Core (47.5 mm diam.)
BS	Block Sample	**BQ**	Rock Core (36.5 mm diam.)

In-Situ Soil Testing

Standard Penetration Test (SPT), "N" value is the number of blows required to drive a 51 mm outside diameter spilt barrel sampler into the soil a distance of 300 mm with a 63.5 kg weight free falling a distance of 760 mm after an initial penetration of 150 mm has been achieved. The SPT, "N" value is a qualitative term used to interpret the compactness condition of cohesionless soils and is used only as a very approximation to estimate the consistency and undrained shear strength of cohesive soils.

Dynamic Cone Penetration Test (DCPT) is the number of blows required to drive a cone with a 60 degree apex attached to "A" size drill rods continuously into the soil for each 300 mm penetration with a 63.5 kg weight free falling a distance of 760 mm.

Cone Penetration Test (CPT) is an electronic cone point with a 10 cm^2 base area with a 60 degree apex pushed through the soil at a penetration rate of 2 cm/s.

Field Vane Test (FVT) consists of a vane blade, a set of rods and torque measuring apparatus used to determine the undrained shear strength of cohesive soils.

Soil Descriptions

The soil descriptions and classifications are based on an expanded Unified Soil Classification System (USCS). The USCS classifies soils on the basis of engineering properties. The system divides soils into three major categories; coarse grained, fine grained and highly organic soils. The soil is then subdivided based on either gradation or plasticity characteristics. The classification excludes particles larger than 75 mm. To aid in quantifying material amounts by weight within the respective grain size fractions the following terms have been included to expand the USCS:

Soil Classification		Terminology	Proportion
Clay	<0.002 mm		
Silt	0.002 to 0.06 mm	“trace”, trace sand, etc.	1% to 10%
Sand	0.075 to 4.75 mm	“some”, some sand, etc.	10% to 20%
Gravel	4.75 to 75 mm	adjective, sandy, gravelly, etc.	20% to 35%
Cobbles	75 to 200 mm	and, and gravel, and silt, etc.	>35%
Boulders	>200 mm	noun, Sand, Gravel, Silt, etc.	>35% and main fraction

Notes:

- Soil properties, such as strength, gradation, plasticity, structure, etcetera, dictate the soils engineering behaviour over grain size fractions;

- With the exception of soil samples tested for grain size distribution or plasticity, all soil samples have been classified based on visual and tactile observations. The accuracy of visual and tactile observation is not sufficient to differentiate between changes in soil classification or precise grain size and is therefore an approximate description.

The following table outlines the qualitative terms used to describe the compactness condition of cohesionless soil:

Cohesionless Soil	
Compactness Condition	**SPT N-Index (blows per 300 mm)**
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50

The following table outlines the qualitative terms used to describe the consistency of cohesive soils related to undrained shear strength and SPT, N-Index:

Cohesive Soil		
Consistency	**Undrained Shear Strength (kPa)**	**SPT N-Index (blows per 300 mm)**
Very soft	<12	<2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

Note: Utilizing the SPT, N-Index value to correlate the consistency and undrained shear strength of cohesive soils is only very approximate and needs to be used with caution.

71 Black Rd., Unit 8
Sault Ste. Marie, Ontario
P6B 0A3
www.mrweng.ca

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Phone (705) 945-5090
Fax (705) 949-3026
Email: mrw@mrweng.ca

Soil & Rock Physical Properties

General

W	Natural water content or moisture content within soil sample
γ	Unit weight
γ'	Effective unit weight
γ_d	Dry unit weight
γ_{sat}	Saturated unit weight
ρ	Density
ρ_s	Density of solid particles
ρ_w	Density of Water
ρ_d	Dry density
ρ_{sat}	Saturated density
e	Void ratio
n	Porosity
S_r	Degree of saturation
E_{50}	Strain at 50% maximum stress (cohesive soil)

Consistency

w_L	Liquid limit
w_P	Plastic limit
I_P	Plasticity index
w_s	Shrinkage limit
I_L	Liquidity index
I_c	Consistency index
e_{max}	Void ratio in loosest state
e_{min}	Void ratio in densest state
I_D	Density index (formerly relative density)

Shear Strength

c_u, s_u	Undrained shear strength parameter (total stress)
c'_d	Drained shear strength parameter (effective stress)
r	Remolded shear strength
τ_p	Peak residual shear strength
τ_r	Residual shear strength
ø'	Angle of interface friction, coefficient of friction = tan ø'

Consolidation (One Dimensional)

C_c	Compression index (normally consolidated range)
C_r	Recompression index (over consolidated range)
C_s	Swelling index
m_v	Coefficient of volume change
c_v	Coefficient of consolidation
T_v	Time factor (vertical direction)
U	Degree of consolidation
σ'_o	Overburden pressure
σ'_p	Preconsolidation pressure (most probable)
OCR	Overconsolidation ratio

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Email: mrw@mrweng.ca

Permeability

The following table outlines the terms used to describe the degree of permeability of soil and common soil types associated with the permeability rates:

Permeability (k cm/s)	Degree of Permeability	Common Associated Soil Type
$>10^{-1}$	Very High	Clean Gravel
10^{-1} to 10^{-3}	High	Clean Sand, Clean Sand and Gravel
10^{-3} to 10^{-5}	Medium	Fine Sand to Silty Sand
10^{-5} to 10^{-7}	Low	Silt and Clayey Silt (low plasticity)
$<10^{-7}$	Practically Impermeable	Silty Clay (medium to high plasticity)

Rock Coring

Rock Quality Designation (RQD) is an indirect measure of the number of fractures within a rock mass, Deere et al. (1967). It is the sum of sound pieces of rock core equal to or greater than 100 mm recovered from the core run, divided by the total length of the core run, expressed as a percentage. If the core section is broken due to mechanical or handling, the pieces are fitted together and if 100 mm or greater included in the total sum.

RQD is calculated as follows:

$$\text{RQD (\%)} = \frac{\Sigma \text{ Length of core pieces} > 100 \text{ mm} \times 100}{\text{Total length of core run}}$$

The following is the Classification of Rock with Respect to RQD Value:

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

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Consulting Engineers

MRW

M.R. WRIGHT & ASSOCIATES CO. LTD.

Since being established in 1961, MRW has earned a reputation for providing quality engineering services through a teamwork approach with our clients and staff. MRW is an employee owned firm providing engineering consulting services in the civil, environmental, structural and geotechnical disciplines. MRW also operates a Canadian Standards Association certified materials testing laboratory to service specific needs of the construction industry for quality control of soils, aggregates, concrete and asphalt.

Head Office

71 Black Road, Unit #8
Sault Ste. Marie, ON
P6B 0A3
T. (705) 945-5090
F. (705) 949-3026
mrw@mrweng.ca

Kingston Office

190 Binnington Ct, Ste 200
Kingston, ON
K7M 8R6
T. (613) 536-5090
F. (613) 536-5094
kingston@mrweng.ca

www.mrweng.ca

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Appendix D

Project Description for Sub 16

A. General Information					
Project/Activity	#8 - Substation 16 Rebuild				
Project Number	1C300-3-7 - A				
Investment Category	System Renewal				
	2018	**2019**	**2020**	**2021**	**2022**
Capital Cost (5.4.5.2 A.1)	$ 419,687				
Capital Contribution	$ -				
Net Cost	$ 419,687				
O&M Cost (5.4.5.2 A.1)	**2018**	**2019**	**2020**	**2021**	**2022**

Customer Attachments and Load (5.4.5.2 A.2)

Number of Customers fed from Sub 16 Feeders: Approximately 2417
Load Impacted: Approximately 10MW annual average

Start Date (5.4.5.2 A.3)	2016-01-07			**In Service Date (5.4.5.2 A.3)**	2019-12-20
Expenditure Timing for the Test Year	**2018 Q1**	**2018 Q2**	**2018 Q3**	**2018 Q4**	
	$ 104,922		$ 209,844	$ 104,922	

Project Summary

As detailed in the Asset Management Plan, this substation has been in service for just under 50 years, is in very poor condition and has reached end of life. The planned Sub 16 rebuild is an upgrage from a 34.5k -12.47/7.2kV, 15MVA station to a 34.5kV - 12.47/7.2kV, 26.6MVA substation that will have two incoming 34.5kV supplies, two 10/13.3 MVA power transformers, and four outgoing 12.47kV feeders supplied by arc resistant metalclad switchgear. Due to the state of the existing station infrastructure, the switchgear is deemed to be unsafe to operate while energized and must be isolated and de-energized prior to operation. This results in isolation out on the 34.5kV distribution lines, which significantly reduces reliability and contigency buffers for connected customers.

Risk Identification & Mitigation (5.4.5.2 A.4)

PUC does not have the resource requirements to design and construct substations. The work of the detailed design and construction will be outsourced to an experienced and reputable consultant and contractor to mitigate risks during the project implementation. No risks are anticipated with the proposed outsourcing plan. PUC plans to bypass the Sub 16 34.5kV feeds during the construction phase in order to keep the dual feed supplying affected customers, as referenced above in the Project Summary section.

Comparative information on expenditures for equivalent projects/activities (5.4.5.2 A.5)

PUC's Substation 10 rebuild was completed in 2015 for a total of $4,483,000 and the total estimated cost of the Sub 16 rebuild is $3,910,244.00. Sub 16 is estimated to be less than Sub 10 due to a different switchgear type being used which will allow the building sfootprint to be reduce by about 40%.

REG Investment Details including Capital and OM&A costs (5.4.5.2 A.6)

The protection relays are modern micro-processor and IP based relays that are capable of reverse power flow to accommodate REG applications.

Leave to Construct approval under Section 92 of the OEB Act (5.4.5.2 A.7)

This project does not fall in the category requiring leave to construct.

Attach other project reference material i.e. images, drawings and or reference material

"1C300-3-7 - EST 3707 - DSP Material Capital Asset Justification - Sub 16 Rebuild Attachment 1"

B. Evaluation criteria and information requirements for each project/activity

Efficiency, Customer Value & Reliability - Investment Main Driver (5.4.5.2 B.1.a)

Power supply reliability is the key driver for this project. This project will reduce the risk of prolonged power interruptions and reduce the frequency of power interruptions due to equipment failure at Sub 16.

Efficiency, Customer Value & Reliability - Investment Secondary Driver (5.4.5.2 B.1.a)

Operating efficiency is the secondary driver to this project. New switchgear and protection and control equipment will improve operating abilities, and reduce operating costs.

Efficiency, Customer Value & Reliability - Investment Objectives and/or Performance Targets (5.4.5.2 B.1.a)

The investment objectives are to mitigate the risk of power outage duration and frequency falling below PUC's performance targets as outlined on it's OEB annual LDC scorecard.

Efficiency, Customer Value & Reliability - Source and nature of the information used to justify the investment (5.4.5.2 B.1.a)

The source for information for justification of this project is the Asset Management Plan, which was prepared by taking into account all relevant information pertaining to the condition of station and

and lines assets.

Efficiency, Customer Value & Reliability - Priority Level/Project Prioritization and Reasoning (5.4.5.2 B.1.b) Priority relative to other investments

This project has been determined as a high priority due to the old age and very poor condition of power transformers and switchgear at the existing Sub 16.

Analysis of Project & Alternatives - Effect of the investment on system operation efficiency and cost -effectiveness (5.4.5.2 B.1.c)

There are no economical alternatives to this project.

Analysis of Project & Alternatives - Net benefits accruing to customers (5.4.5.2 B.1.ci)

Net benefits accruing to customers have been qualitatively described above but have not been quantitatively calculated because accurate information on customer interruption costs is not readily available.

Analysis of Project & Alternatives - Impact of the investment on reliability performance including frequency and duration of outages (5.4.5.2 B.1.cii)

This project, by reducing the risk of in-service equipment failures, will reduce the risk of prolonged or highly frequent outages. It mitigates the risk of reliability performance falling below PUC's targets as outlined on its OEB annual scorecard.

Project Alternatives (Design, Scheduling, Funding/Ownership) (5.4.5.2 B.1.ciii)

There are no other practical and cost effective design or funding alternatives, or co-ownership options available. This project received a high priority based on the criteria presented in the Asset Management Plan.

Safety (5.4.5.2 B2)

Modern protection and controls, capable of automatically responding to mitigate unsafe conditions on the distribution system will be implemented, thus mainting public safety in PUC's service territory.

Cyber-Security, privacy (5.4.5.2 B.3) (where applicable)

The SCADA and protection and control systems will be connected to PUC's fibre network connecting most of PUC owned facilities. This fibre network is protected by PUC's corporate IT managed services which utilizes NIST cybersecurity standards and regulations.

Co-Ordination, Interoperability (5.4.5.2 B.4i) Recognized Standards, co-ordination with utilities, regional planning, and/or 3rd party providers (where applicable)

The protection and controls meeting interoperability standards will be specified and implemented for this project. Power transformers and switchgear conforming to ESA, CSA, and IEEE standards will be utilized.

Co-Ordination, Interoperability (5.4.5.2 B.4ii) Future technological functionality and/or future operational requirements (where applicable)

The protection relays are modern micro-processor and IP based relays that are capable of reverse power flow to accommodate REG applications. The relays are also capable of being incorporated into PUC's IESO mandated Under-Frequency Load Shedding scheme.

Economic Development (5.4.5.2 B.5) (where applicable)

The substation will be sized with consideration for future load growth within its service territory. By assuring a sustainable reliability of the power system in PUC's service territory, this project contributes towards economic development in the region. Also, the protection and control system will be able to support large REG applications. Lastly, residents or businesses will not have an issue developing near the substation as the layout and design is non obtrusivecally with landscaping and brick type exterior matched to the surrounding land uses. The transformer bays will also have barrier walls to limit transformer hum to below MOE limits.

Environmental Benefits (5.4.5.2 B.6) (where applicable)

Transformer Oil Containment systems will be built into the design to mitigate the environmental risks caused by a transformer failure and oil spill.

C. Category-Specific Requirements - System Renewal

Asset Performance-related operational targets & asset lifecycle optimization policies and practices (refer to 5.2.3 & 5.3.3) (5.4.5.2 SR-C1.1)

This project was prioritized through asset life cycle optimization techniques as detailed in the PUC's Asset Management Plan.

Information on the condition of the assets relative to their typical life-cycle and performance record (5.4.5.2 SR-C1.2)

As seen in the Asset Management Plan, the condition of the existing assets at Sub 16 has been determined as poor or very poor, presenting a high risk of failure. Sub 16's SCADA RTU has been failed since the winter of 2017 which results in all troubleshooting and operations being performed through site visits and there is a lack of real time knowledge when equipment fails. Also, 24VDC protection relays are no longer available and a workaround power supply conversion was required aroud 2013 to allow newer 125VDC relays to be installed where several 1980s vintage relays were failing timing tests. Lastly, one of the two 7.5MVA transformers failed and wos repaired approximately 7 years ago at considerable expense.

The number of customers in each class potentially affected by failure of the assets (5.4.5.2 SR-C1.3)

Number of Residential Customers: 1975
Number of General Service <50kW: 396

Number of General Service <50kW: 396
Number of General Service >50kW: 46

Quantitative customer impacts (5.4.5.2 SR-C1.4)

The main impact of this project on customers served from Sub 16 are mitigating the risk of SAIFI and SAIDI worsening due to the anticipated failures of the equipment determined to be in poor or very poor condition.

Qualitative customer impacts (5.4.5.2 SR-C1.5)

Customer satisfaction will improve with the rebuild of Sub 16 as the risk of failure and the potential for reduced outage impacts.

Value of customer impact in terms of characteristics of customers potentially affected by failure that have bearing on the criticality and/or cost of failure (5.4.5.2 SR-C1.6)

The station currently supports one of the fasted growing areas of development in the city along the north Highway 17 corridor and this growth is expected to continue for the foreseeable future. A new hospital was added in the area about 7 years ago and both C&I and subdivision developments continue to spring up. With the poor condition of assets in the existing Sub 16 and the growing customer base, impacts of reliability are affecting more and more customers as time goes on.

Timing and Priority of Project (5.4.5.2 SR-C2)

This project is given a high priority when compared to other projects. Substation 16 is on the edge of town with some long distance feeders and PUC will be pushing other stations, that are picking up the load during the construction, to their limits if the rebuild extends into the winter (high loading) months.

Consequences for system O&M costs (5.4.5.2 SR-C3)

The new Sub 16 will reduce O&M when compared to the existing Sub 16 O&M requirements. The existing station contains open bus and switches on lattice structures with equipment exposed to the harsh northern Ontario environment. The new station will have all equipment except transformers fully enclosed and the type of switchgear to be utilized has monitoring capabilities and minimal maintenance requirements.

Impact on reliability performance and/or safety (5.4.5.2 SR-C4)

As mentioned above the modern micro-processor based protection relays and new switchgear will offer major benefits for operating safety and public safety by reacting to faults on the system. Also, the transformers will be separated by a firewall, have oil containment, and be surrounded by noise reducing exterior walls. The rebuild of Sub 16 will increase system reliability and safety.

Analysis of Project Benefits and Timing (5.4.5.2 SR-C5)

This project has been given a high priority because it offers a high benefit for risk mitigation and the health its existing equipment was ranked as poor and very poor.

Like for Like Renewal Analysis, Alternatives Comparison (like for like vs. not like for like, timing, rate of replacements, etc.) (5.4.5.2 SR-C6)

The station rebuild will not be like for like as new technology and designs are available to increase operating and maintenance efficiencies. All of the equipment and designs will be specified to meet the current version of applicable standards and to fully meet the current and future needs of customers.

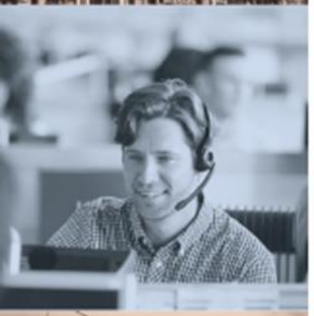
Appendix E

Town Hall Presentation

PUC Distribution Inc.

Town Hall
Substation 16 Rebuild
September 18, 2019




Who We Are

Community Owned and Operated:

Shareholder is the Corporation of the City of Sault Ste. Marie

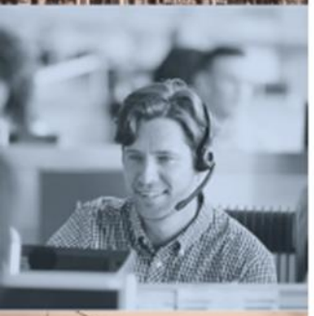
Shared Services Model between Electric, Water and Waste Water Services:

Creates efficiencies and cost savings

<u>Core Values:</u>

Responsive, Ownership, Safety, Innovative, Entrepreneurial



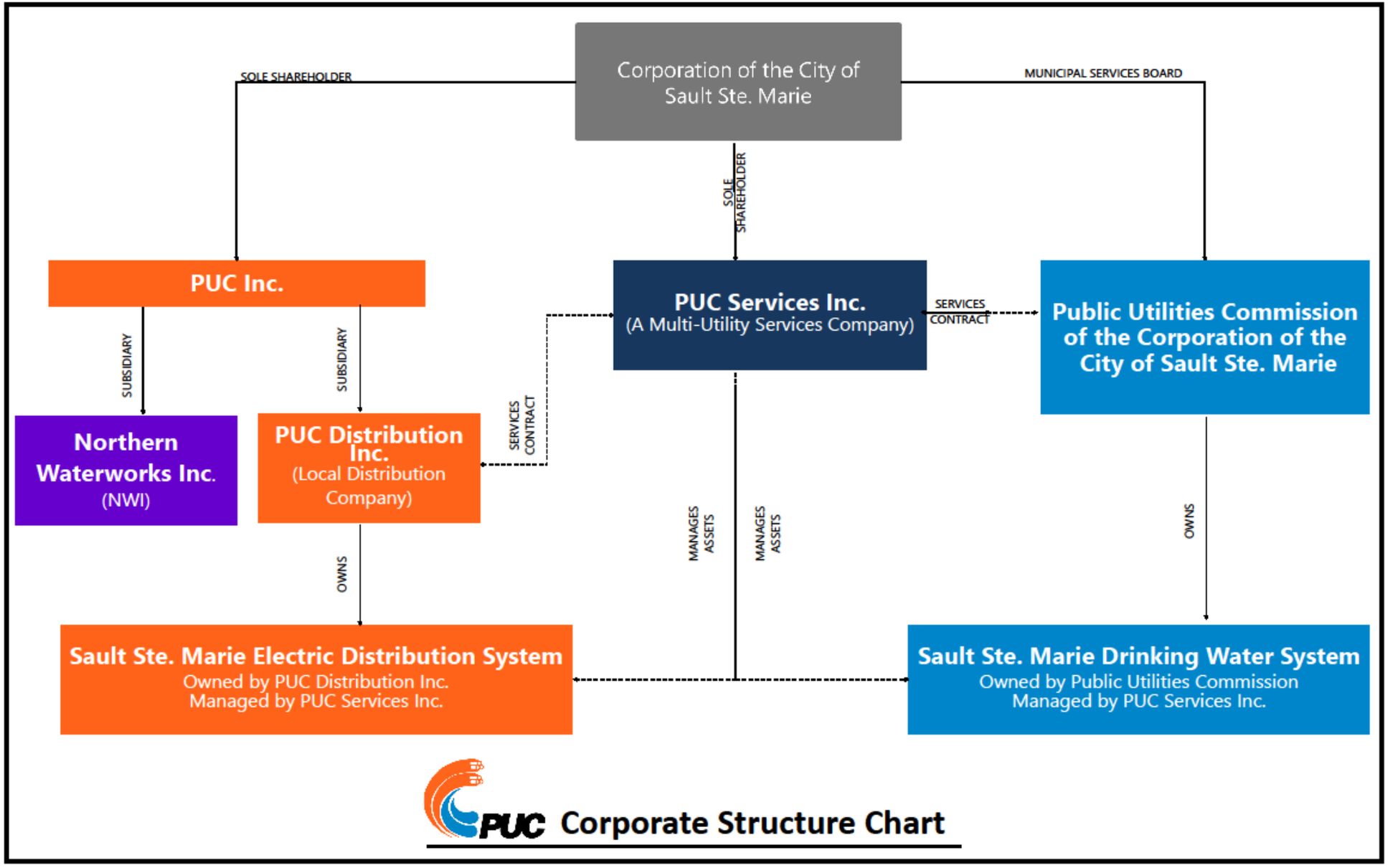

Who We Are Continued

Mission:

To provide cost effective, efficient, safe and reliable delivery of high-quality energy services and solutions consistent with customer needs and preferences.

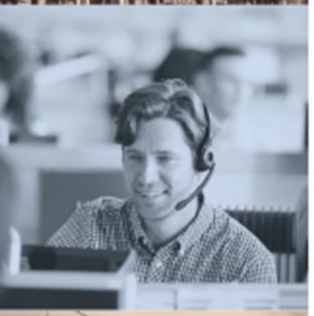
Vision:

To be recognized as a progressive electric distribution company committed to delivering value, innovation, prosperity and excellence.



PUC Corporate Structure Chart




PUC Distribution At A Glance

33,600
RESIDENTIAL & BUSINESS CUSTOMERS

342 KM²
SERVICE TERRITORY

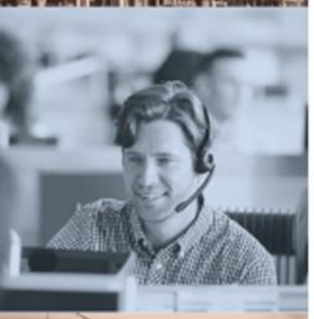
2
TRANSMISSION STATIONS

14
DISTRIBUTION STATIONS

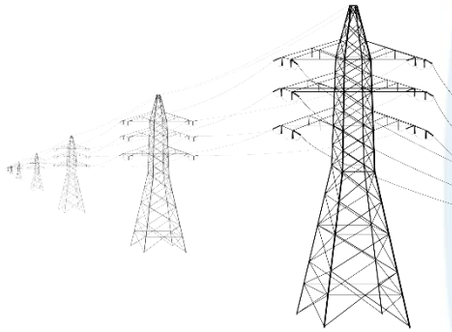
12,700
DISTRIBUTION POLES

740 KM
OF LOCAL DISTRIBUTION LINE



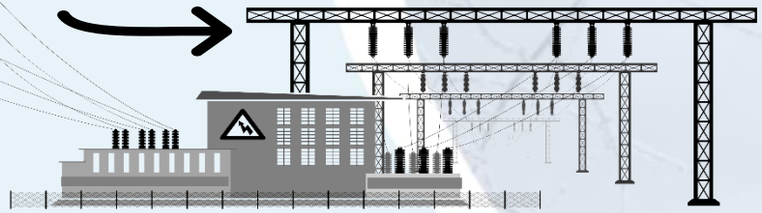




What is a Substation?



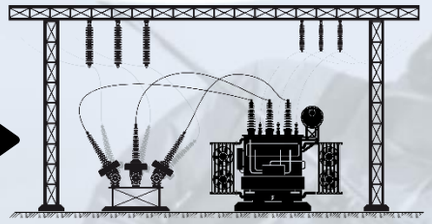
Transmission Lines

115KV



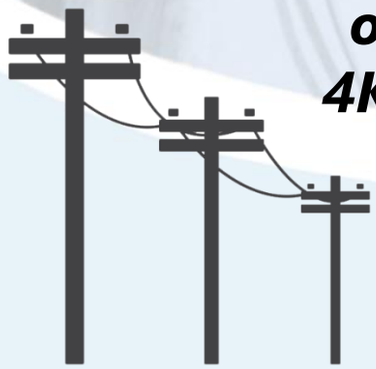
Transformer Station

34KV

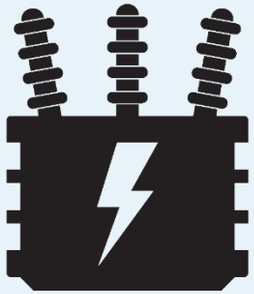


Distribution Station /Sub-Station

12KV or 4KV

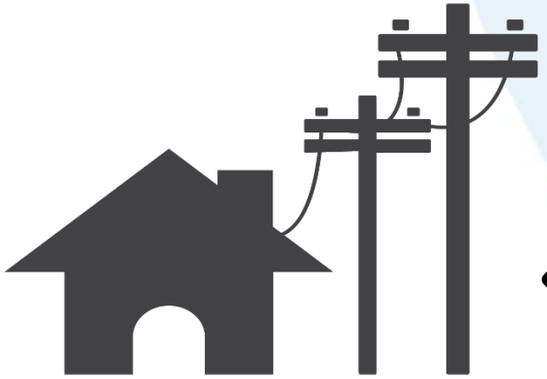


Overhead & Underground Systems



Distribution Transformers

120 V

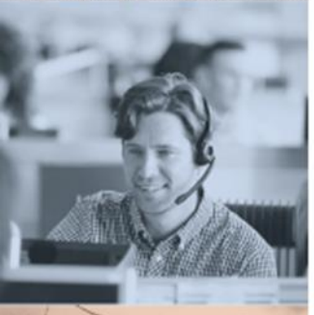


Customers

Substation 16

- It's physical location is on Third Line, directly behind Prouse Motors
- Sub-16 services a large portion of the city's North End and supplies electricity to 2,417 customers
- Sub-16 rebuild project is a multi-year endeavour with construction beginning in 2020

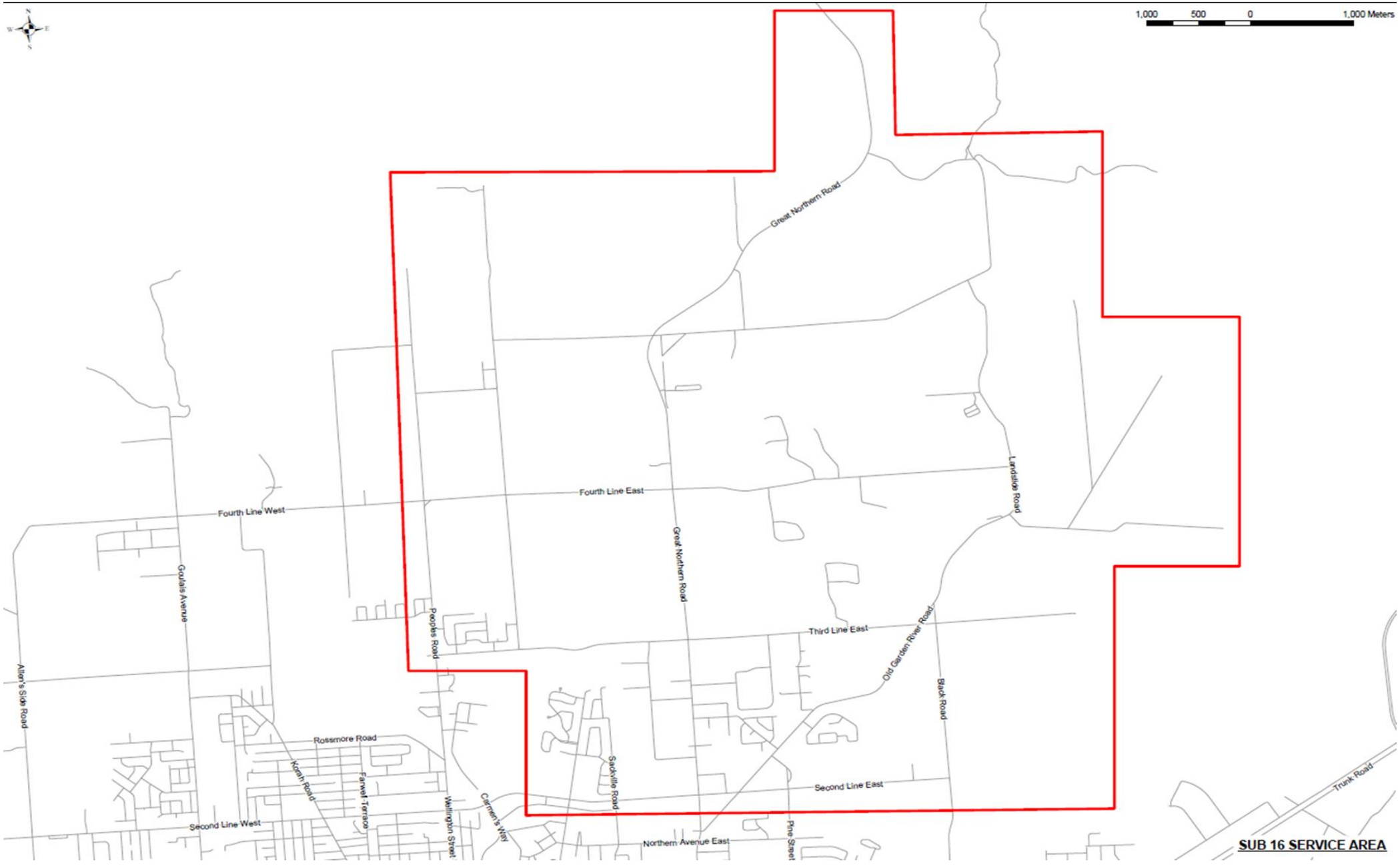


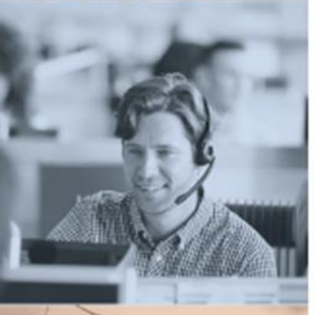

Why Rebuild Sub-16?

- Sub-16 has been in service for over 50 years and has exceeded its life expectancy
- Conditional assessment of substation 16 confirmed it is in poor condition relative to other substations
- This results in increased operating and maintenance (O&M) costs as the station needs physical isolation before operating the switchgear

Sub-16 Service Area



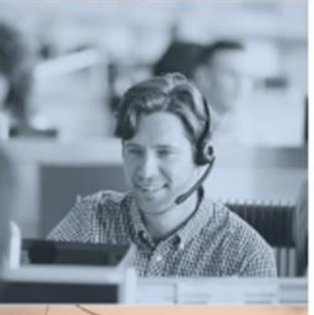



5 Solutions Considered

1. Supply substation-16 Customers from Neighbour Substations
2. Explore Green Energy Solutions
3. Run Substation to Fail
4. Proactively Refurbish Station Components
5. Replace Substation




Solutions Considered

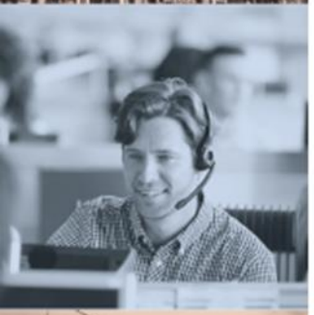
1. **Supply Sub-16 Customers from Neighbour Substations**

   - Neighbouring stations do not have required capacity and are also nearing the end of their useful life

2. **Explore Green Energy Solutions**

   - Including “non-wires” solutions, embedded generation, energy storage and customer demand management
   - At present, the technology needed is too expensive and unsuitable for a viable alternative




Solutions Considered

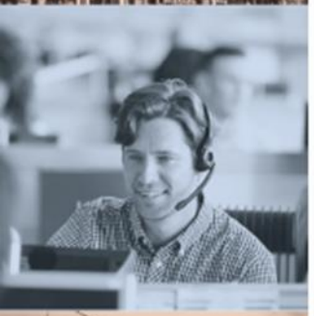
3. Run Substation to Fail

- Will likely result in an increased number of outages in the future, and an increase in O&M costs for PUC
- Will result in Electrical Safety Authority (ESA) Regulatory Non-Compliance

4. Proactively Refurbish Station Components

- Existing end-of-life systems must be brought up to today's design and safety standard
- Individual components will require complete re-design to meet today's standards
- Existing equipment is obsolete and no longer available for purchase or technical support



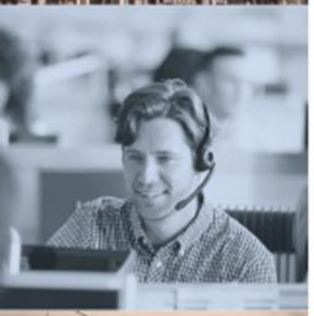




Solutions Considered

5. Replace Substation16

VS.




Benefits of Replacing The Substation

- Reduce the risk of *prolonged* power interruptions
- Reduce the *frequency* of power interruptions due to equipment failure at current substation
- New switchgear and modern protection/control equipment to improve operating abilities
- Capable of automatically responding to control unsafe conditions
- Reduction in operating and maintenance costs

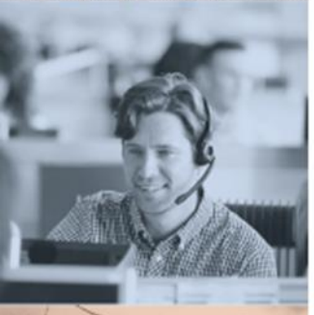
Benefits Continued

New sub-station will:

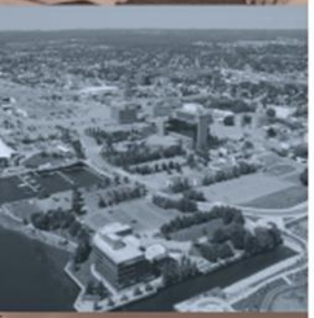
- Increase capacity to accommodate future growth in the service territory
- Assure the reliability of the community's electrical system
- Contribute toward economic development in the region

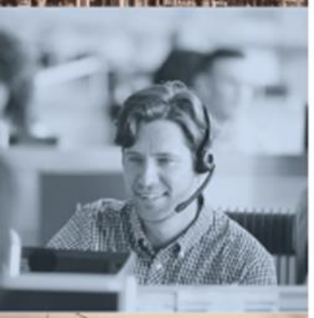
Example Of A Modern Substation




Example Of A Modern Substation



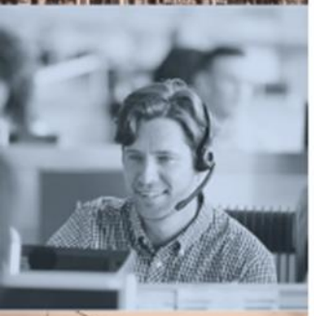

Benefits Continued

Aesthetic:
Design features of the new substation will be aesthetically pleasing for nearby residents and businesses

Safety:
Transformer barrier walls will limit the ambient noise (humming), provide security and provide safety by being blast and fire-proof

Environmental:
Environment risks have been mitigated in the new design by incorporating Transformer Oil Containment systems



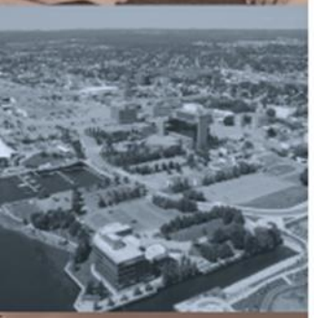

Benefits Continued

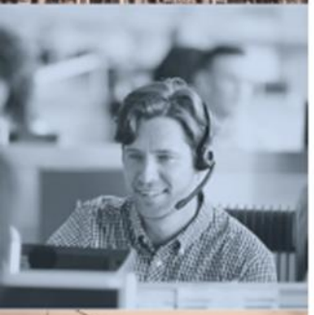
- Can support self-healing smart grid functionality and large distributed energy resources (DER)
- Ie. Solar, wind, energy storage

Key Investment:

- Control the risk of power outage duration and frequency falling below PUC's targets

Overall, our goal is to maintain the public's safety and improve service quality in PUC's service territory




Estimated Rate Adders

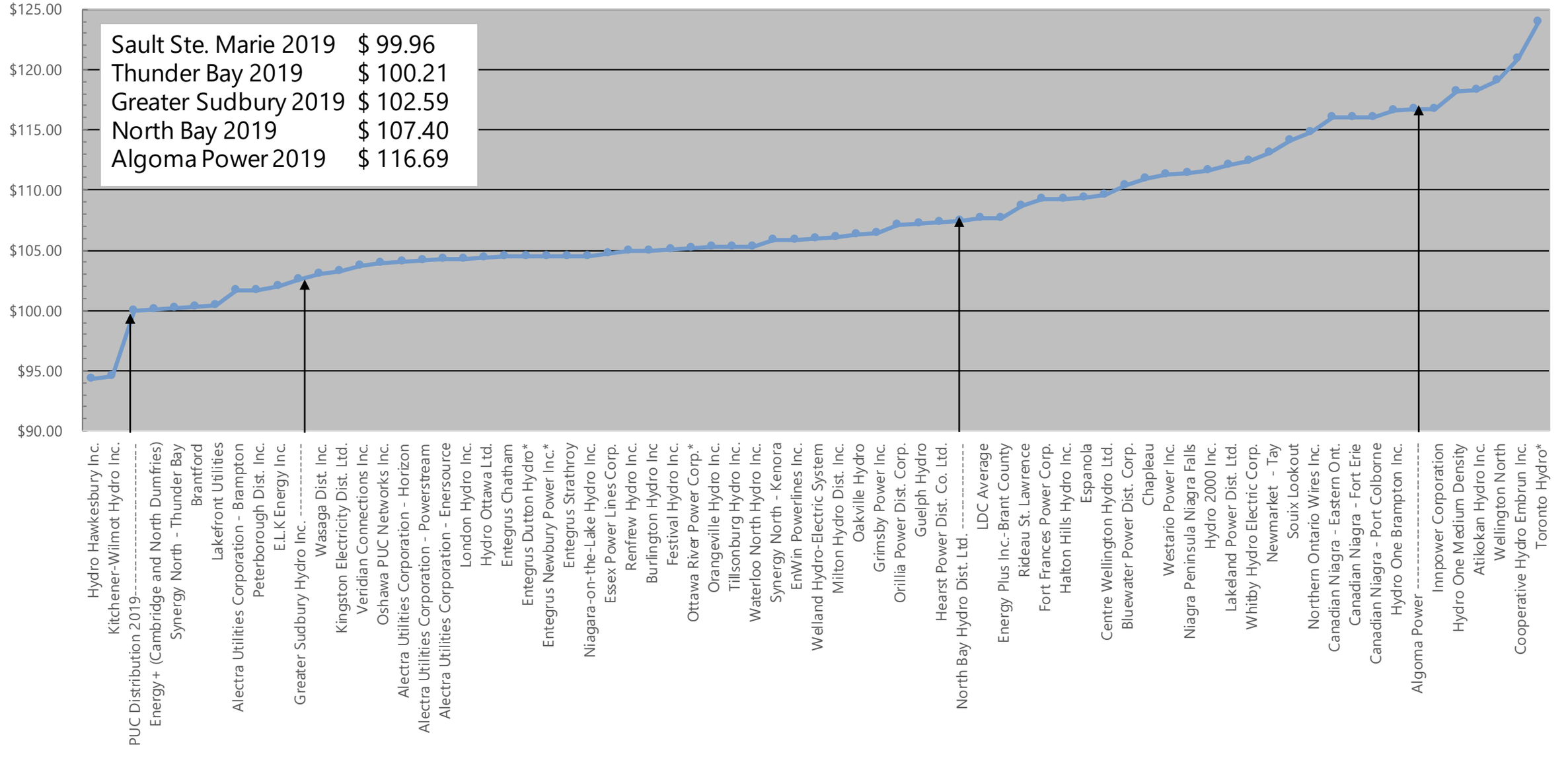
The 2019-2020 budget for the project is approximately $4.7 million

Customer Rate Class	Fixed Charge (Per month)	Variable Charge
Residential	$0.48	$0.0000/kWh
General Service <50 kW	$0.32	$0.0004/kWh
General Service >50 kW	$1.75	$0.1027/kW

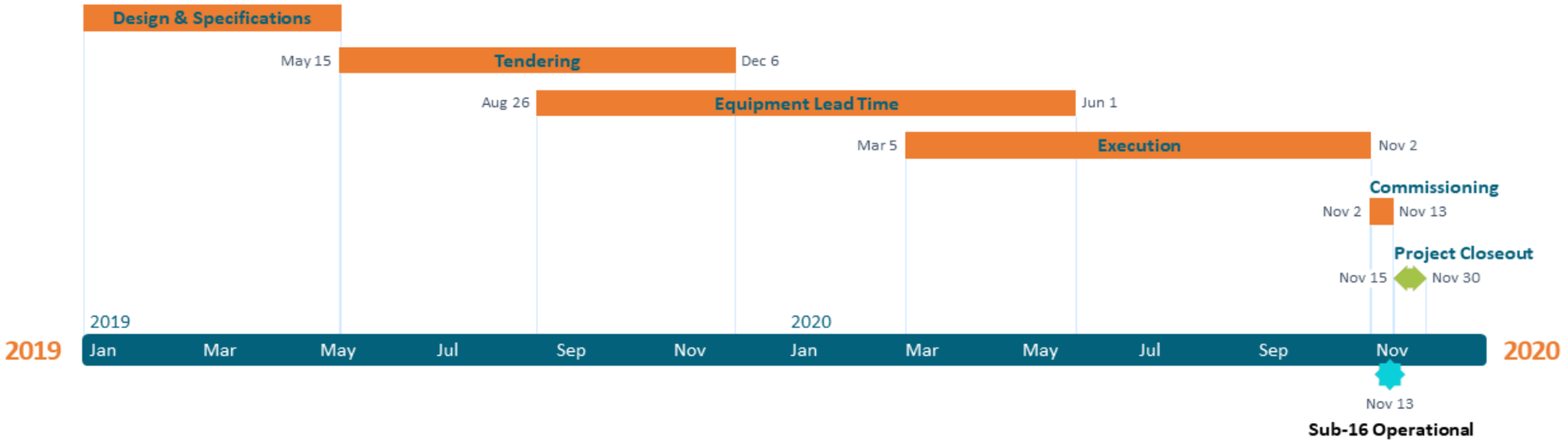
Bill Impact

Customer Rate Class	Monthly Volume		Total Bill Impact ($)	Total Bill Impact (%)
	kWh	kW		
Residential	700	0	$0.50	0.50%
General Service <50 kW	2,000	0	$1.18	0.44%
General Service >50 kW	57,220	145	$18.80	0.21%

Residential – 700 kWh monthly bill for 2019 – OEB Bill Calculator Generated



Project Schedule

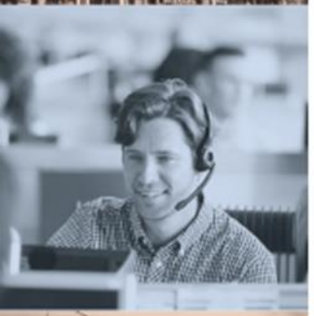


- Construction scheduled to take place from April 2020 to November 2020

Summary

- By reinvesting and renewing infrastructure that is at the end of its life cycle, PUC will ensure a sustainable electrical distribution system for our community

Upgrading Substation 16 will support the continuous development of the City's North End



Thank You