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# **GARDINER TS LOAD BALANCING**

**Region: Peterborough to Kingston**

**Revision: FINAL**

**Date: October 7, 2015**

**Prepared by: “Peterborough to Kingston” Region Local Planning Study Team**



<b>Peterborough to Kingston Region Local Planning Study Team</b>
<b>Organization</b>
Hydro One Networks Inc. (Lead Transmitter)
Hydro One Networks Inc. (Distribution)
Kingston Hydro (Embedded LDC)

## **DISCLAIMER**

This Local Planning Report was prepared for the purpose of developing wires-only options and recommending a preferred solution(s) to address the local needs identified in the [Needs Assessment \(NA\) report](#) for the Peterborough to Kingston Region that do not require further coordinated regional planning. The preferred solution(s) that have been identified through this Local Planning Report may be reevaluated based on the findings of further analysis. The load forecast and results reported in this Local Planning Report are based on the information and assumptions provided by study team participants.

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### LOCAL PLANNING EXECUTIVE SUMMARY

<b>REGION</b>	Peterborough to Kingston (the “Region”)		
<b>LEAD</b>	Hydro One Networks Inc. (“Hydro One”)		
<b>START DATE</b>	April 10, 2015	<b>END DATE</b>	October 7, 2015
<b>1. INTRODUCTION</b>			
<p>The purpose of this Local Planning (LP) report is to develop wires-only options and recommend a preferred solution that will address the local needs identified in the <a href="#">Needs Assessment (NA) report</a> for the Peterborough to Kingston Region. The development of the LP report is in accordance with the regional planning process as set out in the Ontario Energy Board’s (OEB) Transmission System Code (TSC) and Distribution System Code (DSC) requirements and the “Planning Process Working Group (PPWG) Report to the Board”.</p>			
<b>2. LOCAL NEED ADDRESSED IN THIS REPORT</b>			
<p>The <a href="#">Needs Assessment (NA) report</a> for the Peterborough to Kingston Region indicated that Gardiner TS T1/T2 DESN1 is forecasted to exceed its normal supply capacity in the near term. Gardiner TS T3/T4 DESN2 is lightly loaded. The local need addressed in this report will be how to best alleviate the station capacity issue at Gardiner TS T1/T2 DESN1.</p>			
<b>3. ALTERNATIVES CONSIDERED</b>			
<p>The alternatives considered were:</p> <ol style="list-style-type: none"> <li>1) Transfer load from Gardiner TS T1/T2 DESN1 to Gardiner TS T3/T4 DESN</li> <li>2) Do Nothing</li> </ol>			
<b>4. PREFERRED ALTERNATIVE</b>			
<p>Transferring load from Gardiner TS T1/T2 DESN1 to Gardiner TS T3/T4 DESN2 is the preferred alternative as it addresses the station capacity issue at Gardiner TS T1/T2 DESN1. Transferring some of the existing load at Gardiner TS T1/T2 DESN1 to Gardiner TS T3/T4 DESN2 is the most straight forward and cost effective option.</p>			
<b>5. RECOMMENDATIONS</b>			
<p>Hydro One Distribution will proceed with a detailed estimate for the load transfer work at Gardiner TS. The detailed estimate for the load transfer work is expected to be completed mid-2016. The expected in-service date for this work is end of 2018.</p>			

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## 1 Introduction

The Needs Assessment (NA) for the Peterborough to Kingston Region was triggered in response to the Ontario Energy Board’s (OEB) Regional Infrastructure Planning process approved in August 2013. To prioritize and manage the regional planning process, Ontario’s 21 regions were assigned to one of three groups. The NA for Group 1 and 2 Regions is complete and will be initiated for Group 3 Regions later this year. The Peterborough to Kingston Region belongs to Group 2. The NA for this Region was triggered on December 12, 2014 and was completed on Feb 10, 2015. The NA for the Peterborough to Kingston Region was prepared jointly by the study team, including Local Distribution Companies (LDC), Independent Electric System Operator (IESO), Ontario Power Authority (merged with IESO as of January 2015 and herein referred to as IESO), and Hydro One. The [NA report](#) can be found on Hydro One’s Regional Planning website. The study team identified needs that are emerging in the Peterborough to Kingston Region over the next ten years (2014 to 2023) and recommended whether they should be further assessed through the transmitter-led Local Planning (LP) process or the IESO-led Scoping Assessment (SA) process.

This report was prepared by the Peterborough to Kingston Region LP study team (Table 1) and led by the transmitter, Hydro One Networks Inc. (Hydro One). The report captures the results of the assessment based on information provided by LDCs and Hydro One.

**Table 1: Study Team Participants for Peterborough to Kingston Region**

<b>Organization</b>
Hydro One Networks Inc. (Lead Transmitter)
Hydro One Networks Inc. (Distribution)
Kingston Hydro (Embedded LDC)

## 2 Regional Description

The Peterborough to Kingston Region includes Frontenac County, Hasting County, Northumberland County, Peterborough County, and Prince Edward County. Please refer to the [NA Report](#) for further details. The Peterborough to Kingston Region and its approximate boundaries are shown in Figure 1. The facilities in the Region are depicted in the single line diagram shown in Figure 2.

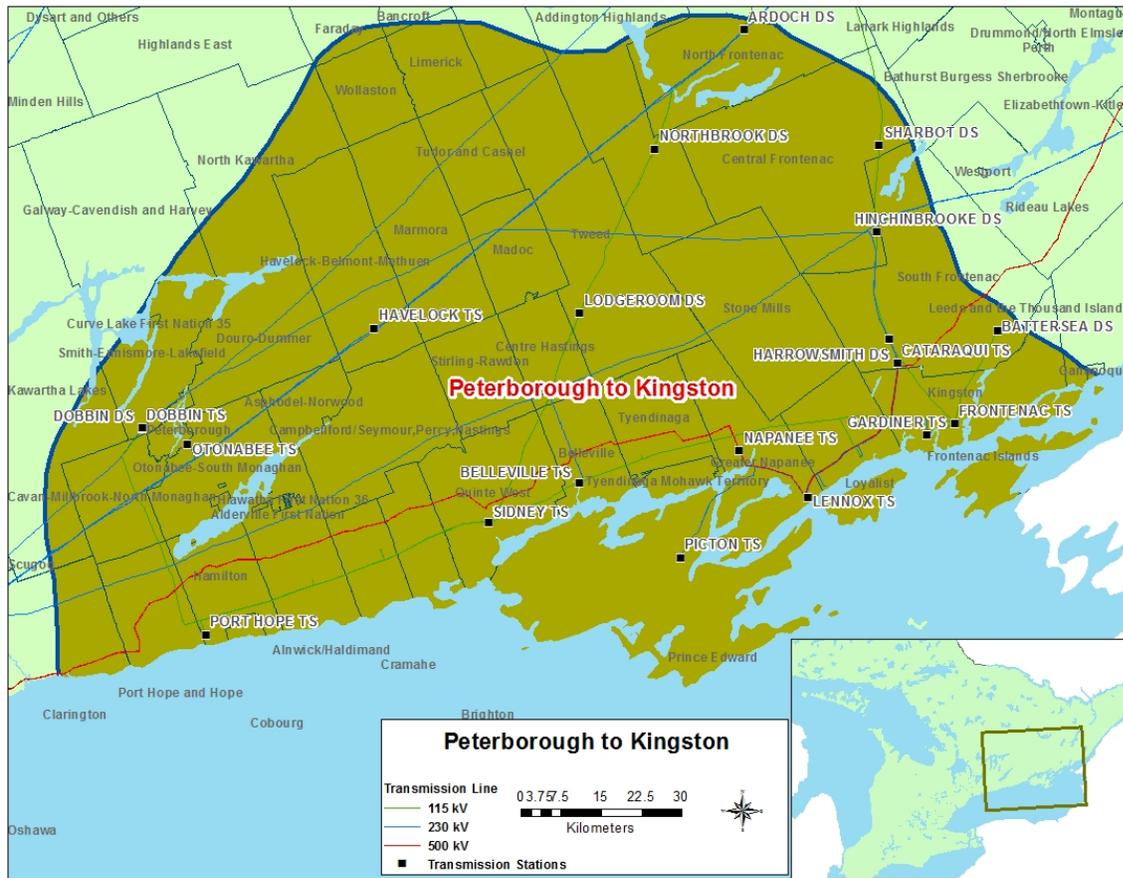
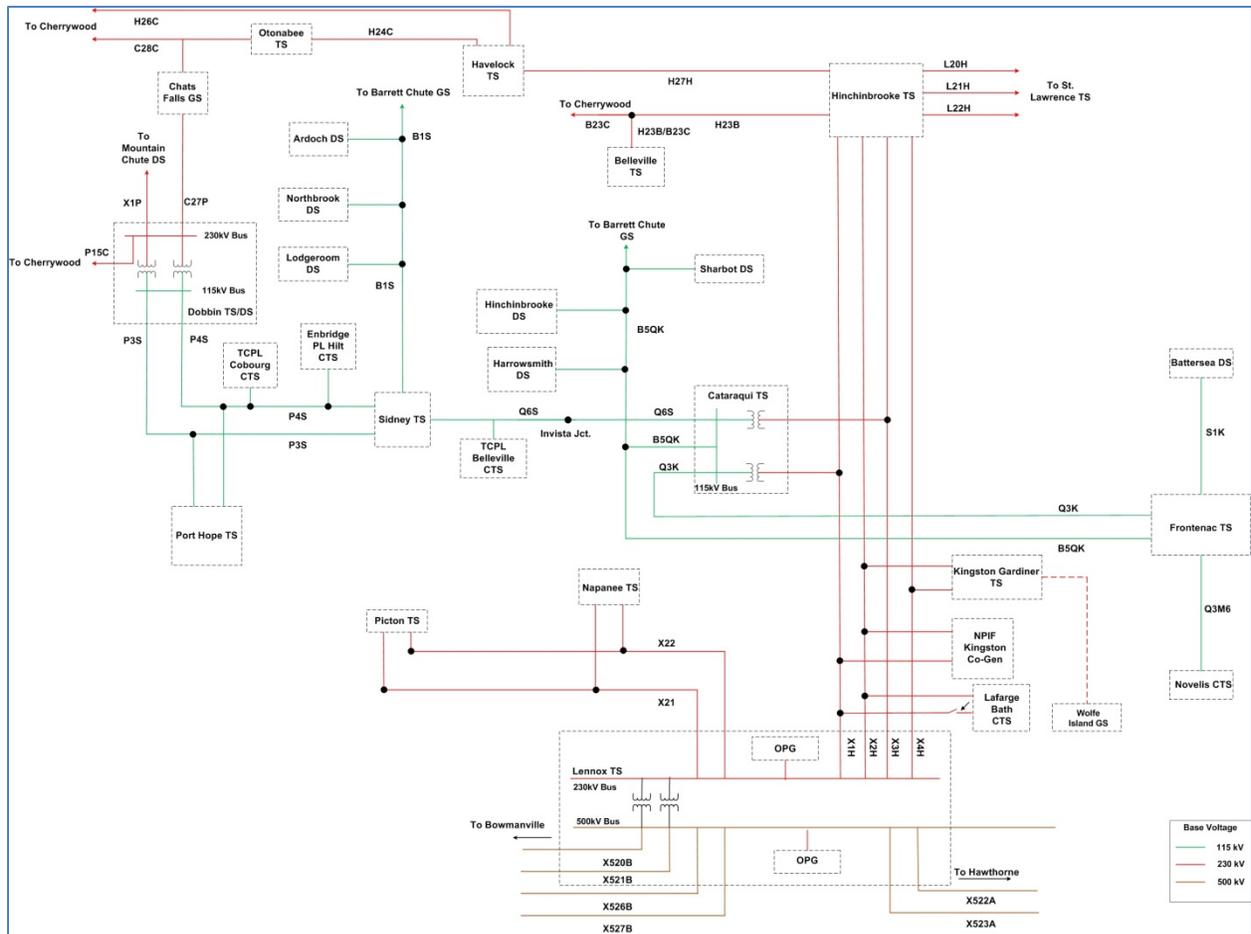


Figure 1: Peterborough to Kingston Region Map



**Figure 2: Single Line Diagram – Peterborough to Kingston Region**

### **3 Peterborough to Kingston Region Needs**

As an outcome of the NA process, the study team identified a need to address the normal supply capacity at Gardiner TS T1/T2 DESN1. Since this need can be clearly addressed by a straightforward wires solution, the study team agreed that it should be further planned directly by the impacted LDC and the transmitter through the LP process and that further coordinated regional planning was not required. Hydro One with the impacted LDCs further undertook planning assessments to develop options and recommend a wires only solution(s). Gardiner TS (230/44 kV)

#### **3.1 Gardiner TS (230/44kV)**

Gardiner TS T1/T2 DESN1 is forecasted to exceed its normal supply capacity from 2014 to 2023 based on the gross load forecast (approximately 112% and 117% of Summer 10-Day LTR in 2014 and 2023 respectively). However, based on the net load forecast which takes planned CDM targets and DG contributions into consideration, this issue will be avoided. Nevertheless, the station will still be loaded at 100% of its thermal capacity at that time. The load forecast provided by LDCs and the CDM and DG forecast provided by the IESO are attached in Appendix A.

### **4 Options Considered**

This section describes the options considered to address the local need described in section 3.1.

#### **4.1 Gardiner TS Load Balancing**

Prior to the regional planning process, Hydro One Distribution had already planned on re-distributing the load at Gardiner TS by transferring one feeder from Gardiner TS T1/T2 DESN1 to Gardiner TS T3/T4 DESN2. This would alleviate the loading concerns at Gardiner TS T1/T2 DESN1 for this study period. The preliminary budgetary cost estimate for this project is about \$1.5M.

#### **4.2 Do Nothing**

Do nothing is not a viable option since it could result in the violation of transformer ratings at Gardiner TS T1/T2 DESN1, which is not acceptable.

## 5 Recommendation

The study team agreed that transferring one feeder from Gardiner TS T1/T2 DESN1 to Gardiner TS T3/T4 DESN2 would relieve the thermal loading at Gardiner TS T1/T2 DESN1. This is a cost effective solution that will ensure that any additional load growth during the study period at Gardiner TS can be accommodated without exceeding the station thermal limit. Hydro One Distribution will be proceeding with the development of a plan to transfer the load along with a cost estimate for the work by the end of 2015. The expected in-service date for this feeder load transfer is end of 2018.

## 6 References

- i) [Planning Process Working Group \(PPWG\) Report to the Board: The Process for Regional Infrastructure Planning in Ontario – May 17, 2013](#)
- ii) [IESO Ontario Resource and Transmission Assessment Criteria \(ORTAC\) – Issue 5.0](#)
- iii) [Peterborough to Kingston Region Needs Assessment Report](#)

## Appendix A: Load Forecast for Peterborough to Kingston Region

Table A1: Gross Load Forecast (MW)

Transformer Station	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Ardoch DS T1	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2
Battersea DS T1/T2	9.4	9.4	9.4	9.4	9.3	9.2	9.1	9.1	9.0	9.0
Belleville TS T1/T2	141.5	131.7	131.4	131.1	130.8	129.8	128.7	128.6	128.3	128.0
Dobbin DS T1	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Dobbin DS T2	6.3	6.2	6.2	6.2	6.2	6.2	6.1	6.1	6.1	6.1
Dobbin TS T3/T4	83.5	83.2	83.0	83.0	82.7	81.6	80.5	80.3	79.9	79.5
Frontenac TS T3/T4	100.8	101.5	102.3	103.3	104.0	103.8	103.6	104.4	105.0	105.5
Gardiner TS T1/T2	125.3	124.9	124.8	125.2	124.8	122.9	121.2	120.9	120.4	119.8
Gardiner TS T3/T4	15.8	15.8	15.9	15.9	16.0	15.8	15.7	15.7	15.7	15.7
Harrowsmith DS T1	9.0	9.1	9.1	9.2	9.2	9.2	9.3	9.3	9.3	9.4
Harrowsmith DS T2	9.0	9.1	9.1	9.2	9.2	9.2	9.3	9.3	9.3	9.4
Havelock TS T1/T2	63.5	63.3	63.2	63.2	63.1	62.4	61.8	61.7	61.5	61.3
Hinchinbrooke DS T1	6.5	6.5	6.5	6.5	6.5	6.4	6.4	6.3	6.3	6.3
Lodgeroom DS T1	5.1	5.2	5.2	5.2	5.2	5.2	5.3	5.3	5.3	5.3
Lodgeroom DS T2	5.0	5.0	5.0	5.0	5.0	5.1	5.1	5.1	5.1	5.1
Napanee TS T1/T2	55.1	52.6	52.5	53.1	53.3	53.0	52.7	53.1	53.4	53.6
Northbrook DS T1	6.8	6.8	6.8	6.8	6.8	6.8	6.7	6.7	6.7	6.6
Otonabee TS T1/T2	43.6	43.4	43.1	43.1	42.9	42.4	41.9	41.7	41.5	41.3
Otonabee TS T1/T2	84.3	83.8	83.4	83.4	83.0	81.8	80.8	80.5	80.0	79.6
Picton TS T1/T2	54.6	46.4	46.6	47.0	47.2	46.8	46.4	46.7	46.8	46.9
Port Hope TS T1/T2	53.1	49.7	49.3	49.4	49.4	48.9	48.5	48.5	48.4	48.3
Port Hope TS T3/T4	64.1	63.4	63.2	63.2	63.0	62.1	61.3	61.1	60.9	60.6
Sharbot DS T1	4.3	4.3	4.3	4.3	4.3	4.3	4.2	4.2	4.2	4.2
Sidney TS T1/T2	64.1	63.9	63.8	64.0	63.9	63.1	62.4	62.4	62.2	62.1
LaFarge Canada CTS	21.0	21.0	21.0	22.0	17.0	17.0	17.0	17.0	17.0	17.0
Enbridge PL Hilt CTS	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
TCPL Cobourg CTS	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
TCPL Belleville CTS	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1

Table A2: Net Load Forecast (MW)

<b>Transformer Station</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
Ardoch DS T1	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4
Battersea DS T1/T2	10.0	10.0	10.1	10.1	10.1	10.1	10.2	10.2	10.2	10.2
Belleville TS T1/T2	148.9	149.3	149.6	149.9	150.3	150.6	150.9	151.3	151.6	152.0
Dobbin DS T1	5.6	5.7	5.8	5.8	5.9	5.9	6.0	6.1	6.1	6.2
Dobbin DS T2	6.3	6.3	6.4	6.4	6.4	6.5	6.5	6.6	6.6	6.6
Dobbin TS T3/T4	84.3	84.6	84.9	85.3	85.6	85.9	86.2	86.5	86.8	87.1
Frontenac TS T3/T4	106.2	107.6	108.9	110.3	111.7	113.0	114.4	115.8	117.2	118.5
Gardiner TS T1/T2	140.5	141.3	142.2	143.1	143.7	144.3	144.9	145.5	146.1	146.7
Gardiner TS T3/T4	16.0	16.1	16.2	16.4	16.5	16.6	16.8	16.9	17.1	17.2
Harrowsmith DS T1	9.0	9.1	9.1	9.2	9.2	9.2	9.3	9.3	9.4	9.4
Harrowsmith DS T2	9.0	9.1	9.1	9.2	9.2	9.2	9.3	9.3	9.4	9.4
Havelock TS T1/T2	64.0	64.2	64.4	64.6	64.9	65.1	65.3	65.5	65.7	66.0
Hinchinbrooke DS T1	6.6	6.6	6.6	6.7	6.7	6.7	6.7	6.7	6.8	6.8
Lodgeroom DS T1	5.1	5.2	5.2	5.2	5.2	5.3	5.3	5.3	5.3	5.4
Lodgeroom DS T2	5.1	5.1	5.2	5.2	5.2	5.2	5.2	5.3	5.3	5.3
Napanee TS T1/T2	71.1	72.0	72.8	73.6	74.4	75.2	76.0	76.9	77.7	78.5
Northbrook DS T1	6.9	6.9	7.0	7.0	7.0	7.0	7.1	7.1	7.1	7.2
Otonabee TS T1/T2	45.5	45.6	45.7	45.8	45.9	46.0	46.1	46.1	46.2	46.3
Otonabee TS T1/T2	88.0	88.2	88.3	88.5	88.6	88.8	88.9	89.0	89.2	89.3
Picton TS T1/T2	55.1	55.7	56.3	56.9	57.5	58.2	58.8	59.4	60.0	60.6
Port Hope TS T1/T2	53.7	54.0	54.3	54.5	54.8	55.1	55.4	55.7	56.0	56.3
Port Hope TS T3/T4	64.7	65.0	65.3	65.5	65.8	66.1	66.4	66.6	66.9	67.2
Sharbot DS T1	4.4	4.4	4.4	4.4	4.4	4.5	4.5	4.5	4.5	4.5
Sidney TS T1/T2	77.3	77.7	78.0	78.3	78.7	79.0	79.3	79.7	80.0	80.3
LaFarge Canada CTS	21.0	21.0	21.0	22.0	17.0	17.0	17.0	17.0	17.0	17.0
Enbridge PL Hilt CTS	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
TCPL Cobourg CTS	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
TCPL Belleville CTS	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1

Table A3: Conservation Demand Management (Percent of Gross Load)

	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
C&S	0.0%	0.2%	0.5%	0.6%	1.1%	1.6%	1.9%	2.3%	2.5%	2.6%
TOU	0.2%	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
EE programs	0.5%	0.8%	1.0%	1.1%	1.3%	2.1%	3.1%	3.2%	3.6%	4.2%
Total	1%	1%	2%	2%	3%	4%	5%	6%	6%	7%

Table A4: Distributed Generation (MW)

<b>Transformer Station</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
Ardoch DS T1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2
Battersea DS T1/T2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Belleville TS T1/T2	6.7	16.2	16.2	16.6	16.6	16.6	16.6	16.6	16.6	16.6
Dobbin DS T1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Dobbin DS T2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Frontenac TS T3/T4	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
Gardiner TS T1/T2	13.8	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
Lodgeroom DS T1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lodgeroom DS T2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Napanee TS T1/T2	15.5	18.3	18.7	18.7	18.9	18.9	18.9	18.9	18.9	18.9
Otonabee TS T1/T2	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Otonabee TS T1/T2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Picton TS T1/T2	0.0	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
Port Hope TS T1/T2	0.2	3.5	3.9	3.7	4.0	4.0	4.0	4.0	4.0	4.0
Port Hope TS T3/T4	0.0	0.46	0.52	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sidney TS T1/T2	12.7	12.	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7