Adam Stiers
Manager
Regulatory Applications
Leave to Construct
Regulatory Affairs

tel 519-436-4558
adam.stiers@enbridge.com
EGIRegulatoryProceedings@enbridge.com

Enbridge Gas Inc.
50 Keil Drive North,
Chatham, ON N7M 5M1
Canada

March 14, 2022

**VIA EMAIL and RESS**

Nancy Marconi
Registrar
Ontario Energy Board
2300 Yonge Street, 27th Floor
Toronto, ON M4P 1E4

Dear Nancy Marconi:

**Re: Enbridge Gas Inc. ("Enbridge Gas")**
**Ontario Energy Board File: EB-2020-0293**
**St. Laurent Ottawa North Replacement Project**
**Undertakings Responses**

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Consistent with the Ontario Energy Board's ("OEB") Procedural Order No. 6, enclosed are the responses of Enbridge Gas to undertakings received during the virtual technical conference in the above noted proceeding.

Please contact the undersigned if you have any questions.

Yours truly,

(Original Digitally Signed)

Adam Stiers
Manager, Regulatory Applications – Leave to Construct

c.c. Guri Pannu (Enbridge Gas Counsel)
Charles Keizer (Torys)
Zora Crnojacki (OEB Staff)
Intervenors (EB-2020-0293)

ENBRIDGE GAS INC.

Undertaking Response to FRPO

To provide the coating of the Windsor and London lines

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**Response:**

The London Lines pipeline system was originally a combination of bare steel sections without coating, and sections coated with barrette enamel, or durnite.

The Windsor Line pipeline system was originally a combination of bare steel sections without coating, and sections coated with coal tar.

For reference, the St. Laurent pipeline system was coated with coal tar (for the NPS 12 segments), like the Windsor Line pipeline system.[1]

[1] The NPS 16 segment of the existing St. Laurent pipeline system (400 m in length) was replaced in 2012 due to corrosion with a more modern yellow jacket coated pipeline.

ENBRIDGE GAS INC.

Undertaking Response to FRPO

To provide more specificity of how far from the 2006 repair the 2013 repairs were made.

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**Response:**

The distance between the 2006 repair location and the 2013 repair location is approximately 500 m.

ENBRIDGE GAS INC.

Undertaking Response to FRPO

To confirm the depth of the two pipelines

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**Response:**

The depth of the pipeline at the 2006 repair location was approximately 2 m from the surface to the top of the pipeline.

The depth of the pipeline at the 2013 repair location was approximately 2.2 m from the surface to top of pipeline.

ENBRIDGE GAS INC.

Undertaking Response to FRPO

To advise, for the issue that was described in Attachment 2, when the repair was done, was the casing removed also.

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**Response:**

To facilitate the 2006 pipeline condition inspection and repairs, a small section of casing, approximately 1 m at the north end of the casing, was cut out. The casing under the railway crossing was not removed.

ENBRIDGE GAS INC.

Undertaking Response to FRPO

To advise the cost of the inspection referred to on Page 8

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**Response:**

The cost of the 2017 NPS 34 Trafalgar – Parkway to Lisgar robotic crawler inspection was approximately $731,447. This cost includes the work required to install a tool entry fitting, charging ports, antenna ports and the $265,000 charge directly attributed to Pipetel Technologies to supply and run the tool.

Regarding the results of the inspection, the run was deemed successful and the data was analyzed according to standard integrity practices in effect at the time of inspection. There were no features reported that met dig criteria. Furthermore, it should be noted that the NPS 34 Trafalgar – Parkway to Lisgar pipeline was replaced in 1986, is not constructed of the same material or coating and as a result, the conclusions of this inspection are not transferrable to the St. Laurent pipeline.

ENBRIDGE GAS INC.

Undertaking Response to FRPO

To provide technical assessment documentation on the assessment of the 1.2-kilometer main

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**Response:**

As detailed in the Company's Application and interrogatory responses, the majority of the St. Laurent pipeline(s) is located under roadway.

Accordingly, on October 17, 2016, the Company assessed whether there was any appropriate location (outside of the roadway) to install a launcher for a PipeTel ILI crawler tool. Such a location would need to provide adequate space for: launcher equipment set up, charging station set up, and supporting inspection crews and equipment. The technical information gathered in support of this assessment and the Company's conclusions are set out in Attachment 1 (2016 Proposed Launcher Sites Review) and Attachment 2 (Existing Fitting Review for the ILI NPS 12 St. Laurent Pipeline). Members of the Company's Planning and Integrity departments visited the sites noted in Attachments 1 and 2 and determined that the best possible location for the ILI launcher was likely at 525 St. Laurent Blvd.

The Company also completed analysis to determine the location of potential PipeTel ILI crawler tool charge points (required as the ILI crawler tool has limited battery capacity),[1] and to determine whether the ILI tool was compatible with existing pipeline fittings (please see Attachment 3 for details of this analysis).

In July 2017, Enbridge Gas also engaged Rosen (an alternate ILI vendor) regarding their ILI crawler tools/technology. Rosen confirmed that while they have ILI technology (MFL & Geometry) that has had success inspecting low pressure pipelines in the past within operating pressure ranges 100-175psi, Rosen would require a very detailed pipebook (pipeline records) and a list of all the fittings on the pipeline to more confidently ascertain that their tool would indeed be able to navigate the entire pipeline. As the St. Laurent pipeline system pressure is 275 psi, proceeding further with Rosen was not appropriate.

As discussed in the Company's response at Exhibit JT1.12, Enbridge Gas tentatively scheduled in-line inspection for a small segment of the St. Laurent pipeline (approximately 1.5 km depending upon the tool's ability to successfully pass through the two spherical 3-way tee and elbow fitting combinations at Blasdell Ave. just north of

[1] The PipeTel ILI crawler tool only has a battery capacity that allows it to travel approximately 350 m out and back in or approximately 700 m in total to another charge point.

Recharge Point #2, otherwise it would only be approximately 1.2 km) with PipeTel for October 2019 if the PipeTel ILI crawler tool was actually able to pass through the existing pipeline and fittings. The segment of the St. Laurent pipeline proposed for inspection is detailed in Figure 1.

Figure 1

When considering the appropriateness of using the PipeTel ILI crawler tool on the St. Laurent pipeline(s) (NPS 12), the Company relied upon the following information from PipeTel:

**PipeTel Explorer 10/14 limitations**

1. 45 degree slope manageable and inspectable; however, the tool may be able to inspect a higher slope or lesser slope depending on internal line conditions (Grease, oil, slippery conditions).
2. Pipetel Explorer 10/14 will be appropriate for inspection of the respective NPS12 line section; pending review of pipeline assets and bends along the proposed section of pipe.
3. The Explorer 10/14 tool cannot traverse across the 395m of NPS16; the tracks cannot extend to 16"OD putting the robot at risk of falling on its side. As such, it will not collect data across the respective NPS16 section of pipe.
4. Unacceptable Fittings :
    a. **Reducers** – If reducers remain ILI vendors can supply multi-diameter tools; however, reducer drawings must be thoroughly examined and must have a smooth transition at least OD length and no step changes, etc.
    b. Internal diameter path must be smooth and straight through the pipeline fitting, thus, **Bottom out line stopper fittings** would not be acceptable.
    c. ILI tools are cylindrically shaped, thus any non-cylindrical ID pipeline fittings will pose an issue for a successful ILI campaign (ie. **Plug valves, block valves with non-cylindrical ID's**, **etc**)
    d. Nothing that sticks into the pipeline Internal diameter (**temperature probes, coupons, etc**).
    e. Without consideration of wall thickness, generally the minimum radius for a **Bends** is 1.5 Diameter, 90 degrees with 1.5D length between bends if they are back to back.
    f. **Spherical 3 way T's** are usually acceptable; however, they can cause tool damage (if they are slotted and the slot spacing is too large, ILI sensors could sustain damage and risk the success of the ILI campaign).
    g. **SVN 's** are acceptable unless it results in material protruding through and into the pipelines internal diameter.
    h. **Insulating flange** – sometimes IF gaskets can protrude into the pipeline, it can potentially rip off sensors, damage the tool and result in degraded data or a failed ILI campaign.
    i. **Casings** are generally acceptable.
    j. **Dresser fittings (repair sleeves)** are acceptable.
    k. **Expansion Joint** 's are not impossible but not ideal, pipe joints must be perfectly aligned. Ideally expansion joints should be replaced with straight pipe and welded.

Please see Attachment 4 for a copy of the proposed ILI crawler tool inspection plan (EGD St Laurent – Insp Plan – 20181004) and Attachment 5 for a copy of the corresponding cost estimate for the PipeTel ILI scope of work only (EGD St Laurent – Insp Plan – 20181004 – Appendix D).[2]

[2] The estimated total cost for PipeTel ILI and 3 integrity digs and repairs was $1.364 million. This includes the PipeTel estimated costs of $318,750 ($255,000 as shown in Appendix D + 25% contingency), $295,000 for installation of the Launcher/Receiver, installation of 2 Charge Points and support of the ILI Contractor (including contingency) and $750,000 ($250,000 x 3 integrity digs) for the estimated 3 integrity digs resulting from the ILI. The conservative 3 estimated integrity digs were based on the number of integrity digs required after completing similar ILI on approximately 400 m of the NPS 20 Cherry to Bathurst pipeline (similar vintage pipeline).

It is important to note that while Enbridge Gas has demonstrated that robotic ILI crawler tools are suitable for the Company's transmission integrity management program, there are a number of functional considerations that need to be addressed on a case-by-case basis (in consultation with tool vendors) before concluding that such ILI is appropriate. Enbridge Gas historically utilized crawler tools solely in isolated pipelines, only recently (beginning in 2021) has the Company begun to use these tools more broadly in instances where the Company has had the ability to easily isolate pipelines being inspected if necessary (thus mitigating some overall project risk). Utilizing ILI crawler tools in this manner does have some limitations however, including:

- Being limited to pipelines with a maximum operating pressure of 750 psi which can result in requiring pressure restrictions or having to shut pipelines down (further complicating inspections and operations). If a pipeline can't be shut down, the amount of flow bypass needs to be reviewed in the Company's network models to satisfy end loads.
- PipeTel also strongly recommends that operators perform an in-line cleaning prior to the inspection for the best chance at a successful inspection. This is rarely possible without retrofit work, which defeats the purpose of leveraging this technology in traditionally "unpiggable" pipelines.

In May 2021, while completing an inspection of the NPS 26 transmission pipeline between Parkway and Lisgar (approximately 2 km in an urban environment similar in some respects to the St. Laurent pipeline(s)), the communication link between the radio controller and the PipeTel crawler tool experienced unexplained interference resulting in a failed inspection. Specifically, PipeTel was concerned that had the inspection continued they would lose contact with the tool, effectively stranding the tool in the pipeline. For this reason, PipeTel recommended that the inspection be aborted and the tool retracted. This was the second such incident of this nature experienced by the Company using these tools. These experiences have caused the Company to question the feasibility of utilizing ILI crawler tools in certain conditions and environments.

## 1. 6584:49 Tremblay Rd and Pickering Pl

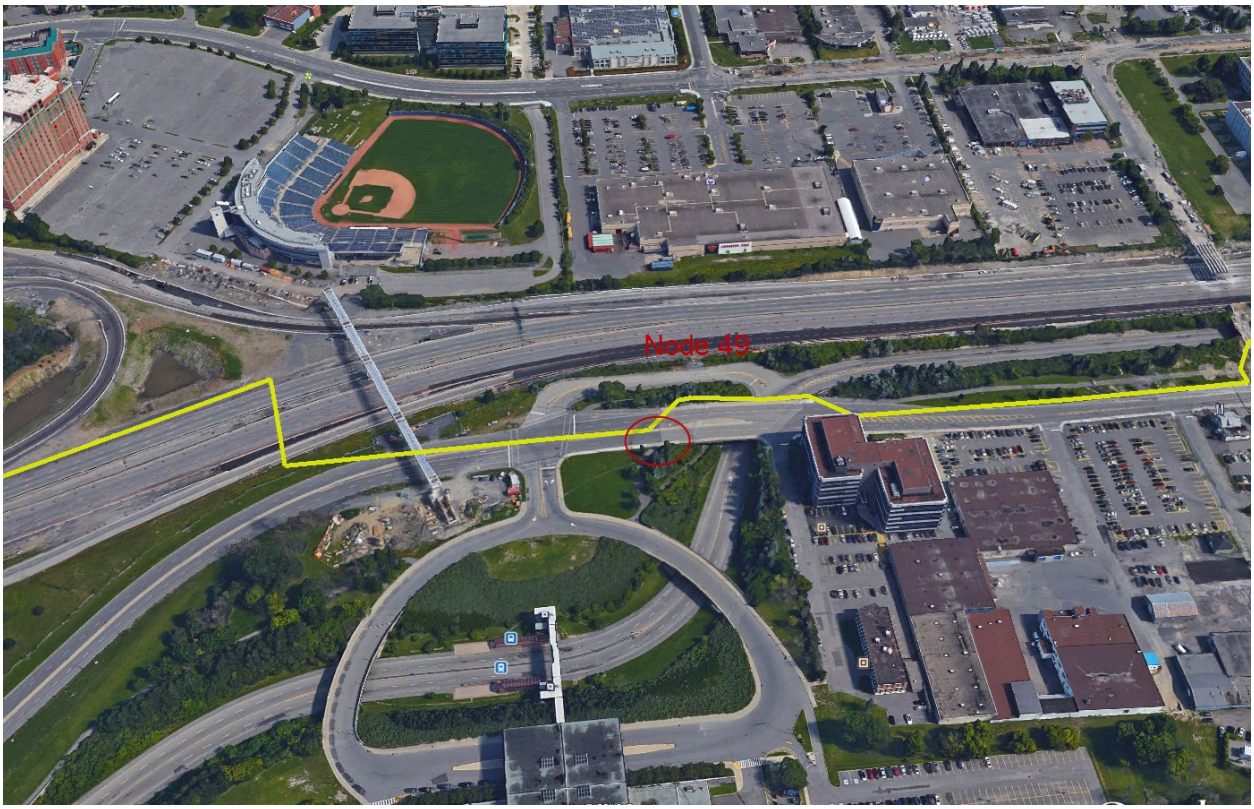
1 NPS12 Wmson Shortstopp 300D Spherical 3-Way Tee with 300D shortplug and Flange Asme B16.25

Not sure if this fitting can be used because it is a 300 series

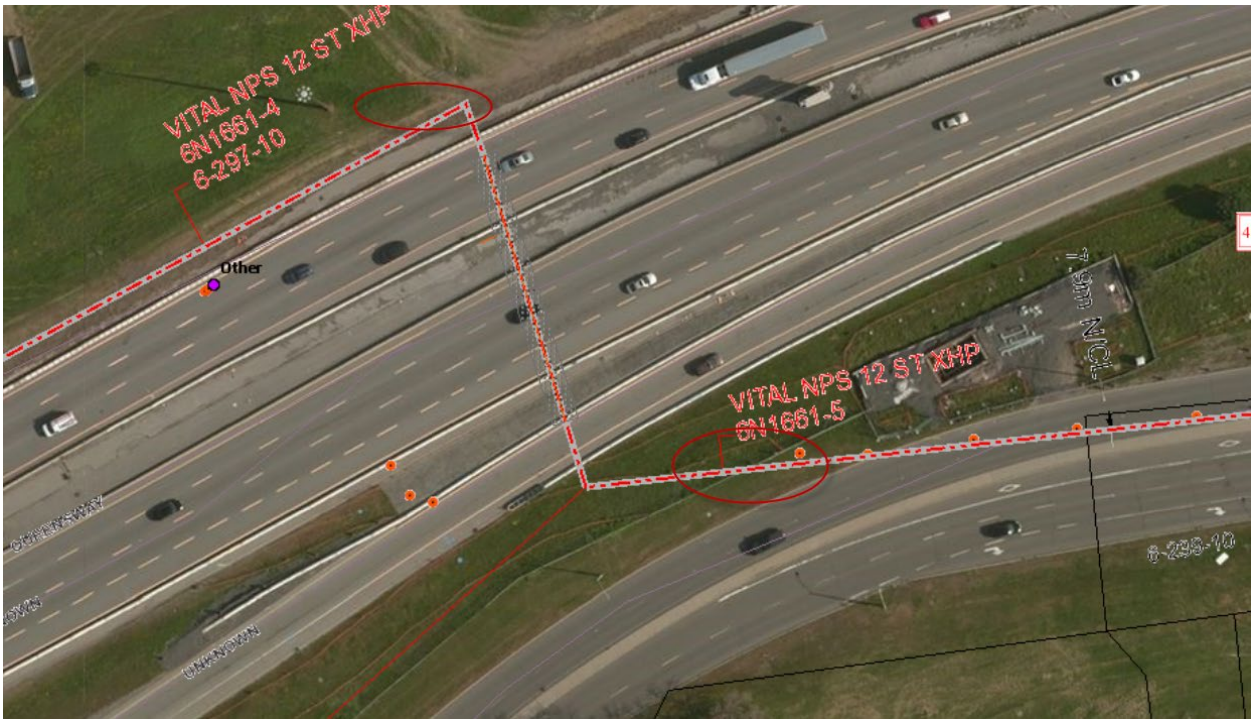
Note there is a S3WT at node 45 but this fitting is not to be stopped as there is a dent on the pipe as per Engineering.

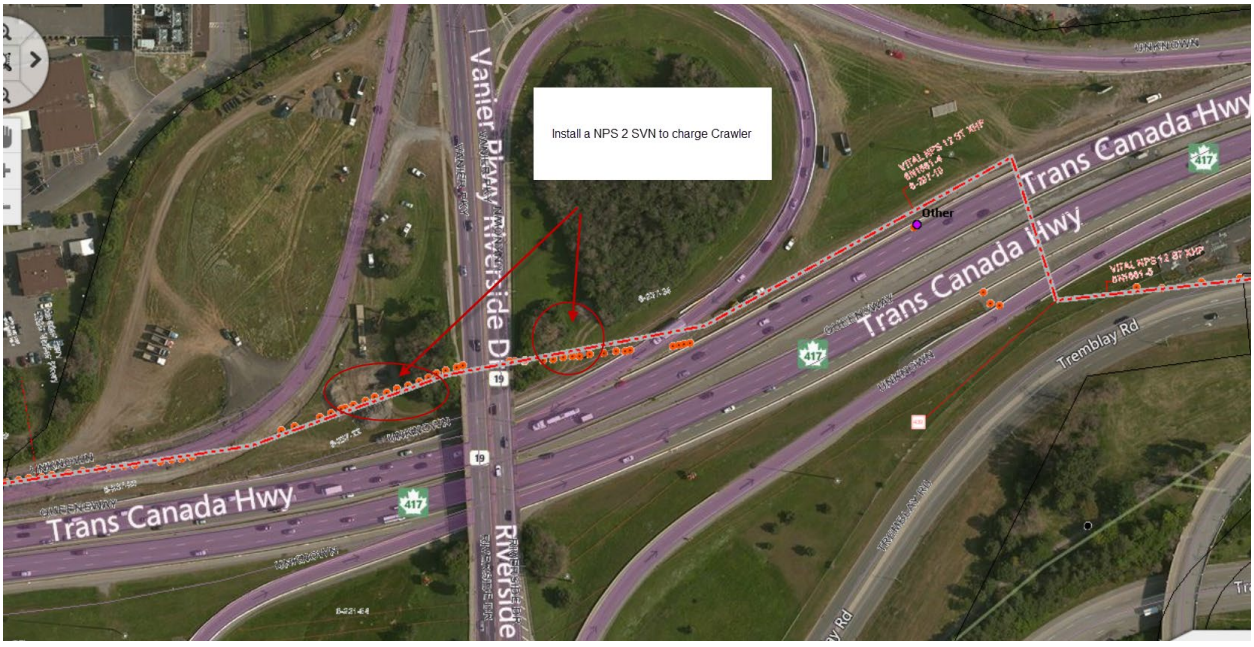
Created RCR to get these added to GIS

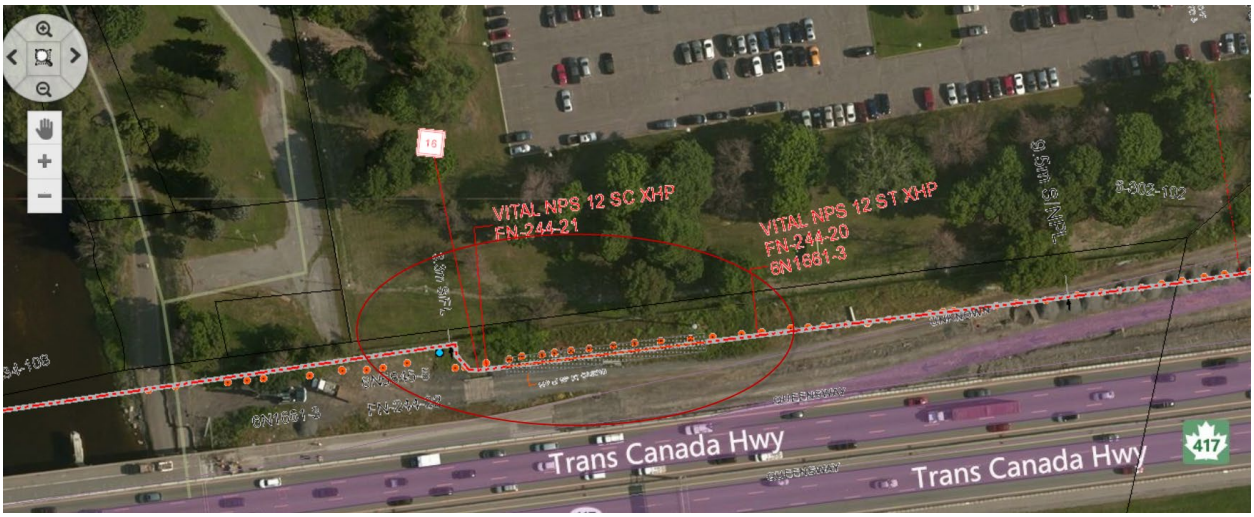
350m to the west 45.4m installed in 10/1/1985 and 304.6 installed 12/1/1958



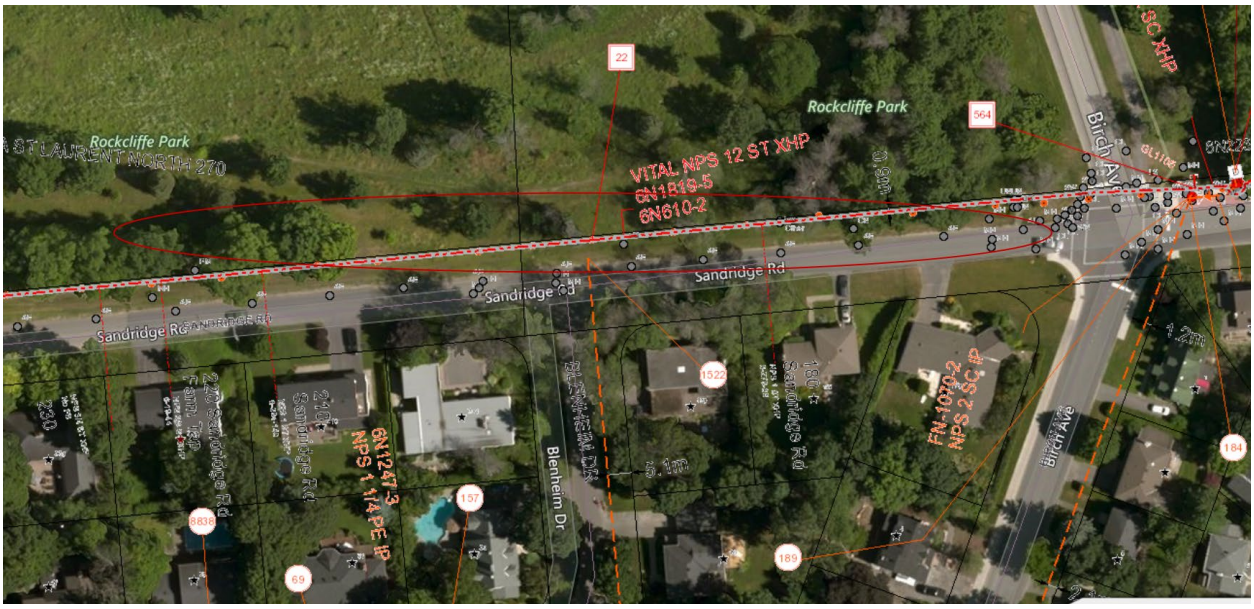
Install 2 SVN to charge crawler overnight or install Stopple Fitting if 600 series is required.



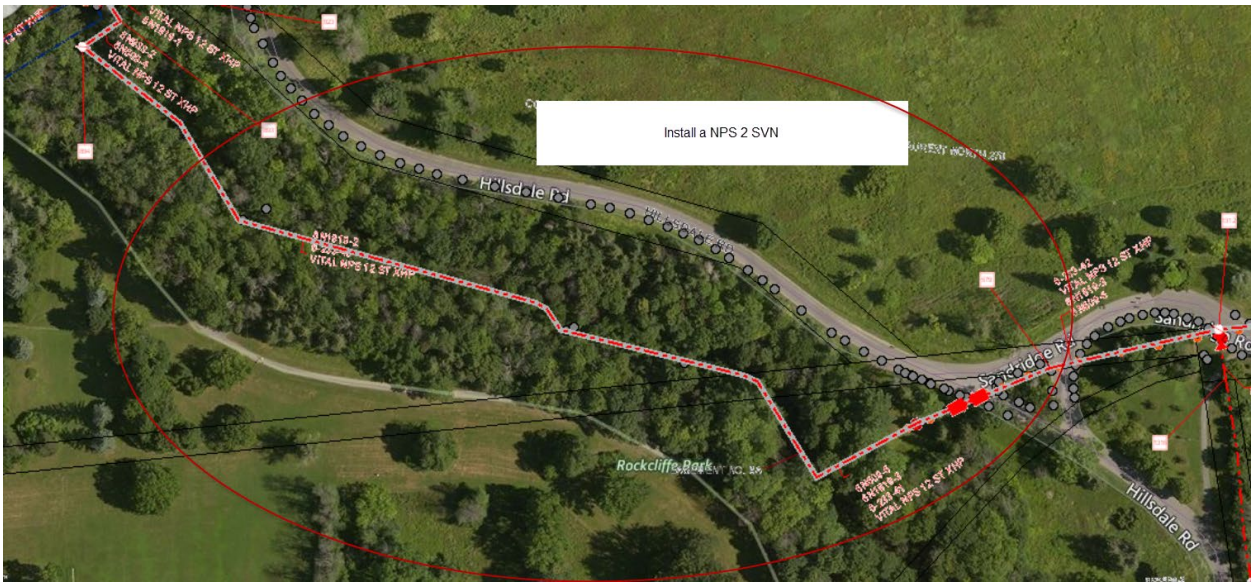






**2.** Install a Stopple on the north side of Sandridge Rd anywhere between Lakeway Dr and Blenheim Dr




West




East Install a 2 SVN for a charging station on St Laurent north of Gaspe Ave but depending on where the launcher is I have taken it from node 22 which is at Sandridge Rd and east of Blenheim Dr.

1. **Install a S3WT on 525 St Laurent just south of Dunbarton Crt just north of Node 1009**

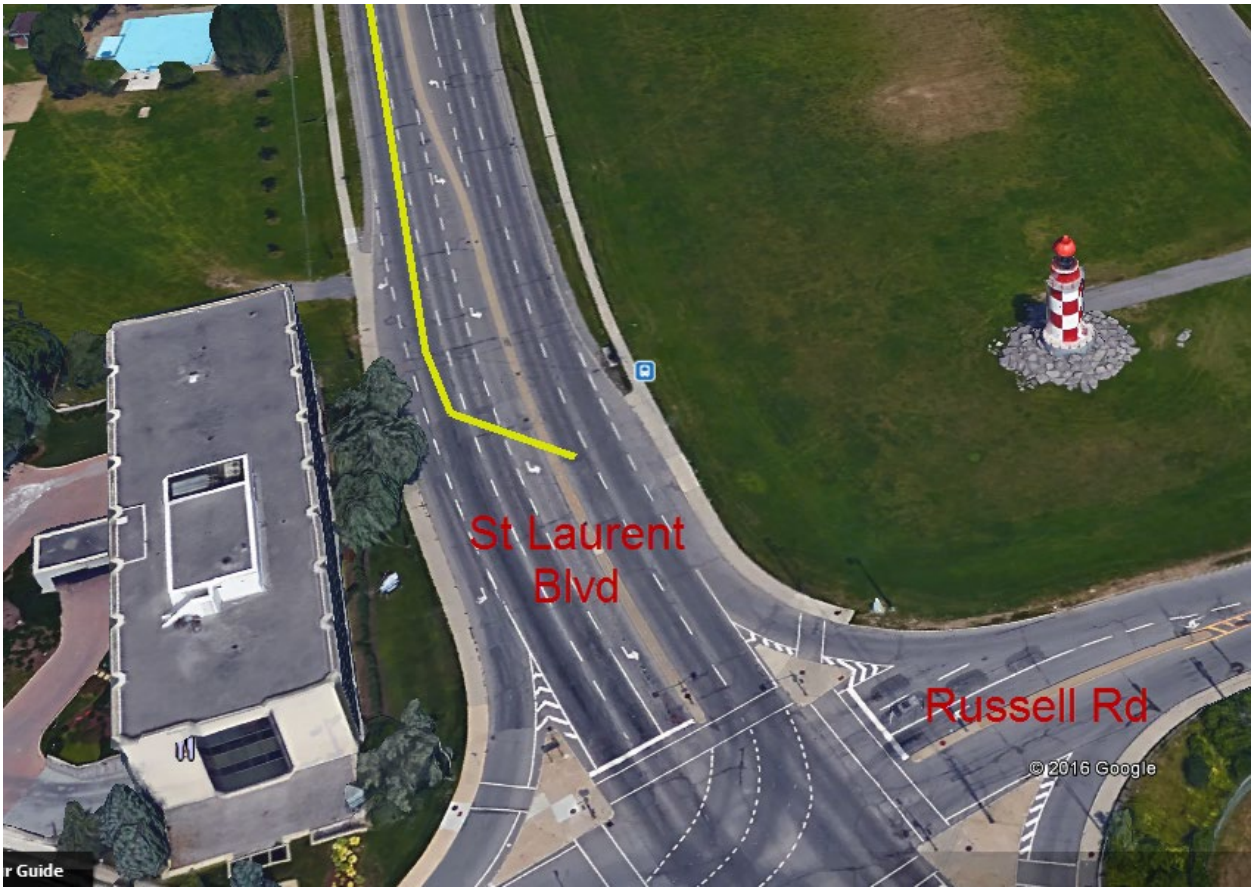
North 844.1 m installed 7/1/1958 – 29 Services – need to find a charging point.

South 94.6m installed 11/1/1986, 126 m installed in 7/1/1958 to Montreal Rd 5.1 m installed in 9/13/2006 and 584.9m installed in 1958. Need to find a charging point approx. 700m. – 21 Services

# Existing S3WT Fittings for the ILI NPS 12 St. Laurent North

1. **6584:653:1969** NPS 6 Connection to Network 6580 U/S of valve 3142391

Spherical 3-Way Tee 12x6 WmSon Shortstopp 300D Rating 4960 kPa

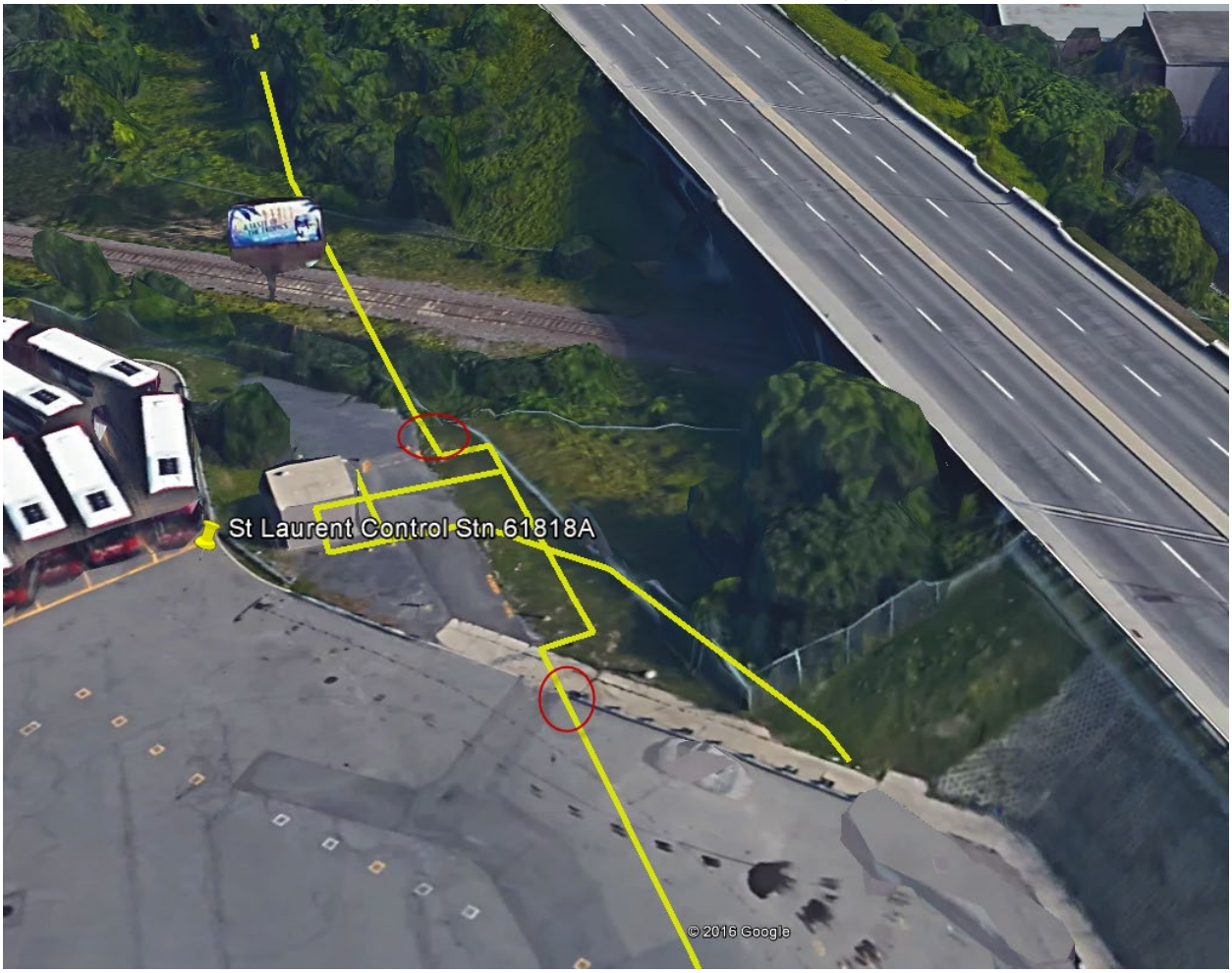


2. **3584:1947** St Laurent @ Outlet to Stn 61818A to North

Spherical 3-Way Tee 12x4 WmSon Shortstopp 300D Rating 4960 kPa
377.6m of NPS 12 installed in 8/1/1962 – 2 customers

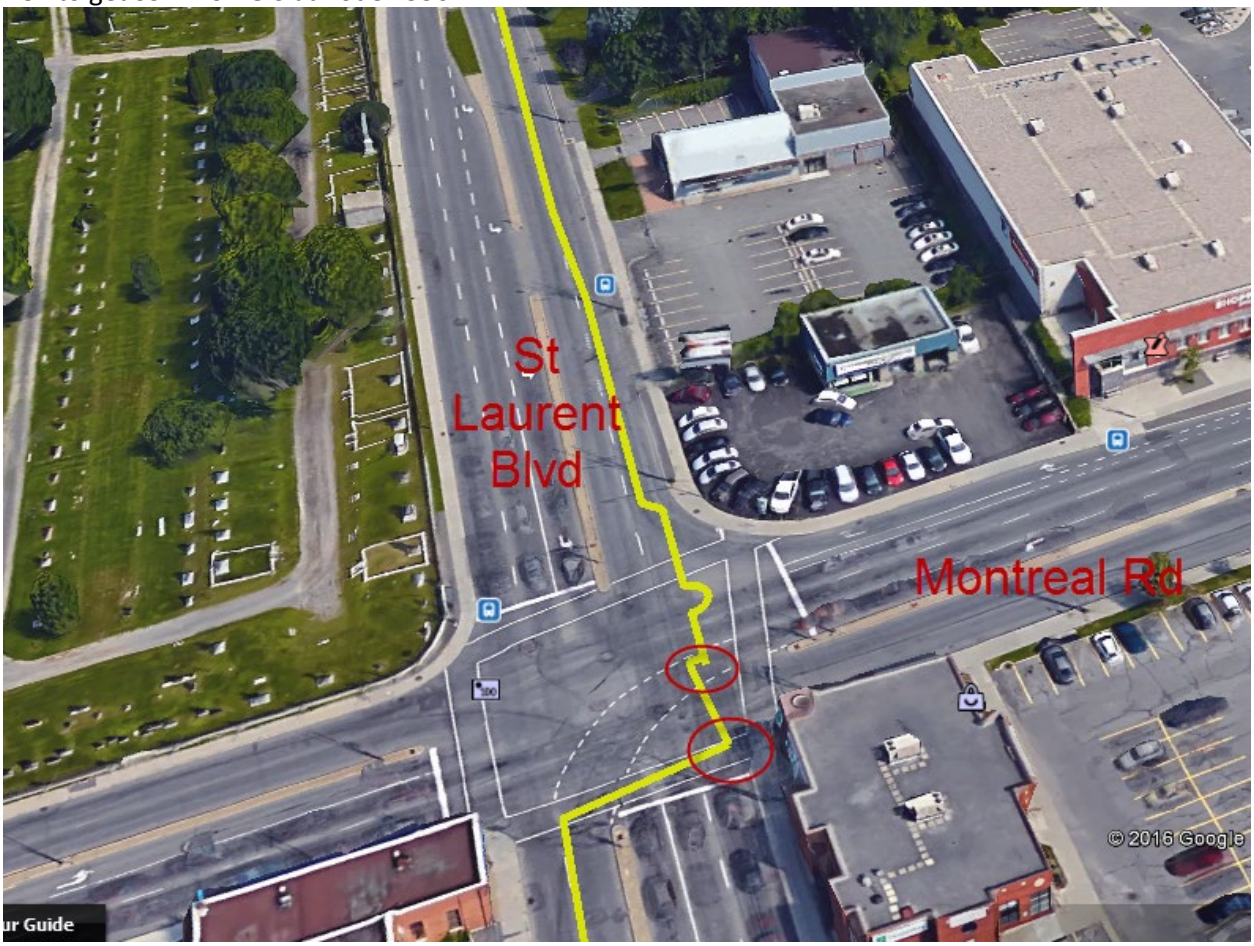
3. **3584:1958** St Laurent @ Outlet to Stn 61818A to South

Spherical 3-Way Tee 12x4 WmSon Shortstopp 300D Rating 4960 kPa
320 m of NPS 12 installed in 8/1/1962 and 199.5 m of NPS 12 installed 5/1/1986 - no customers



## 4. 3584:18 & 3584:1956 St Laurent at Montreal Rd

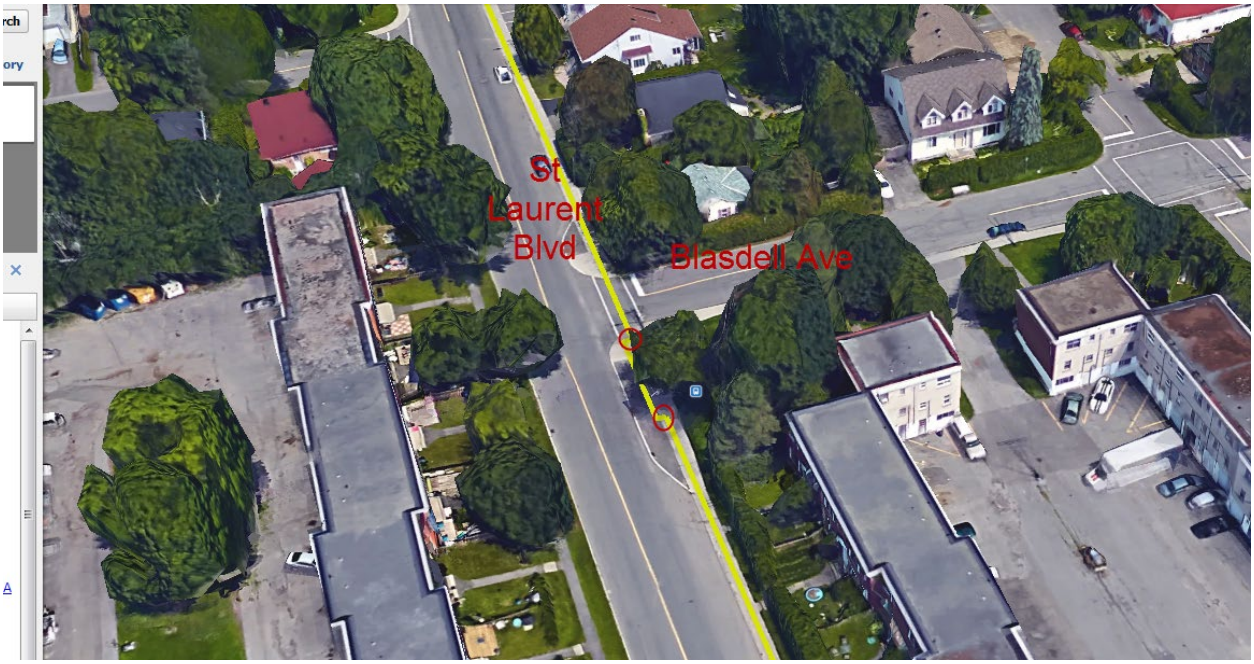
2 NPS 12 Spherical 3-Way Tee WmSon Shortstopp 300D Rating 4960 kPa
6N5532-6 and 6-254-104
RCR to get S3WT on GIS at node 1956



**5. 3584:1960:1961** St Laurent south of Blasdell Ave

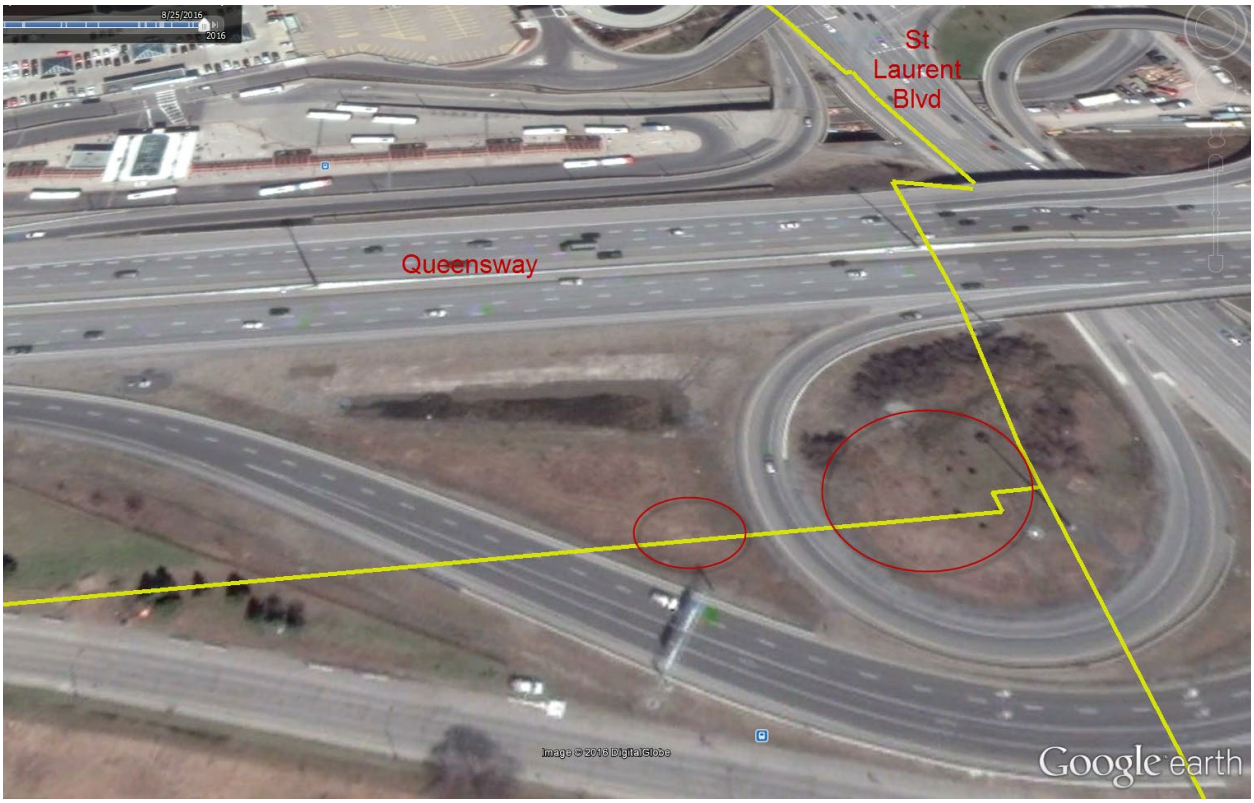
2 NPS 12 Spherical 3-Way Tee WmSon Shortstopp 300D Rating 4960 kPa

6N5598-1



**6.** Potential to install a NPS 12 Stopple fitting on St Laurent Blvd/Tremblay Rd in order to ILI North. Waiting on feedback if the tool will crawler through the 16". The crawler cannot go through the NPS 16. Therefore could install the stopper on the NPS 12 on Tremblay.

The installation of the Stopple may not be required as found 2 S3WT on Tremblay at Belfast Rd



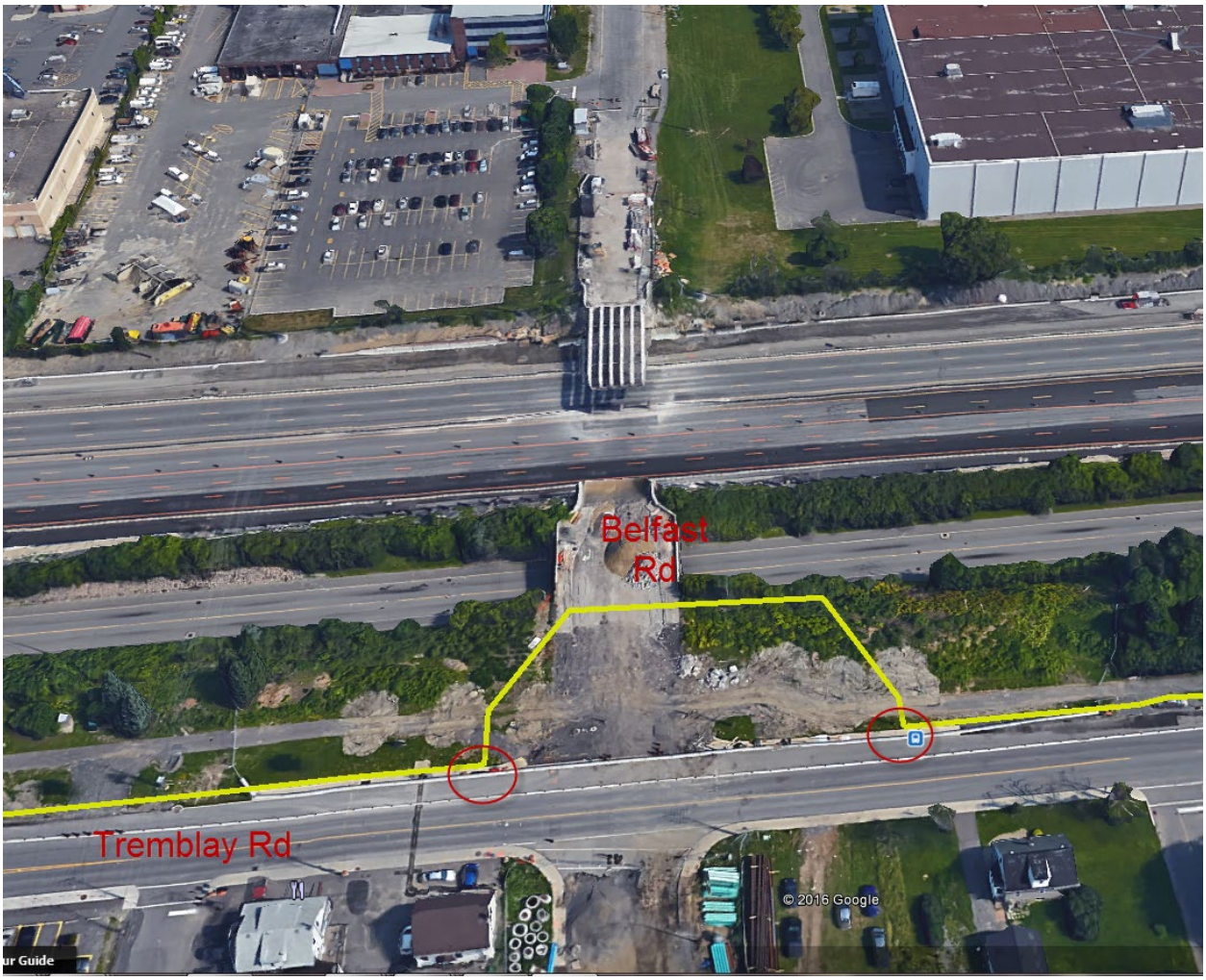
## 7. 6584:41 and 8. 6584:39 Tremblay Rd and Belfast Rd

2 NPS12 Wmson Shortstopp 300D Spherical 3-Way Tee with 300D shortplug Class 300 Std WT

Created RCR to get these added to GIS

East could cover 350m of NPS 12 installed in 12/1/1958 – 5 services

West 350m NPS 12 252.7 m installed in 12/1/1958 and 97.3 m installed in 11/11/2005 – 2 services



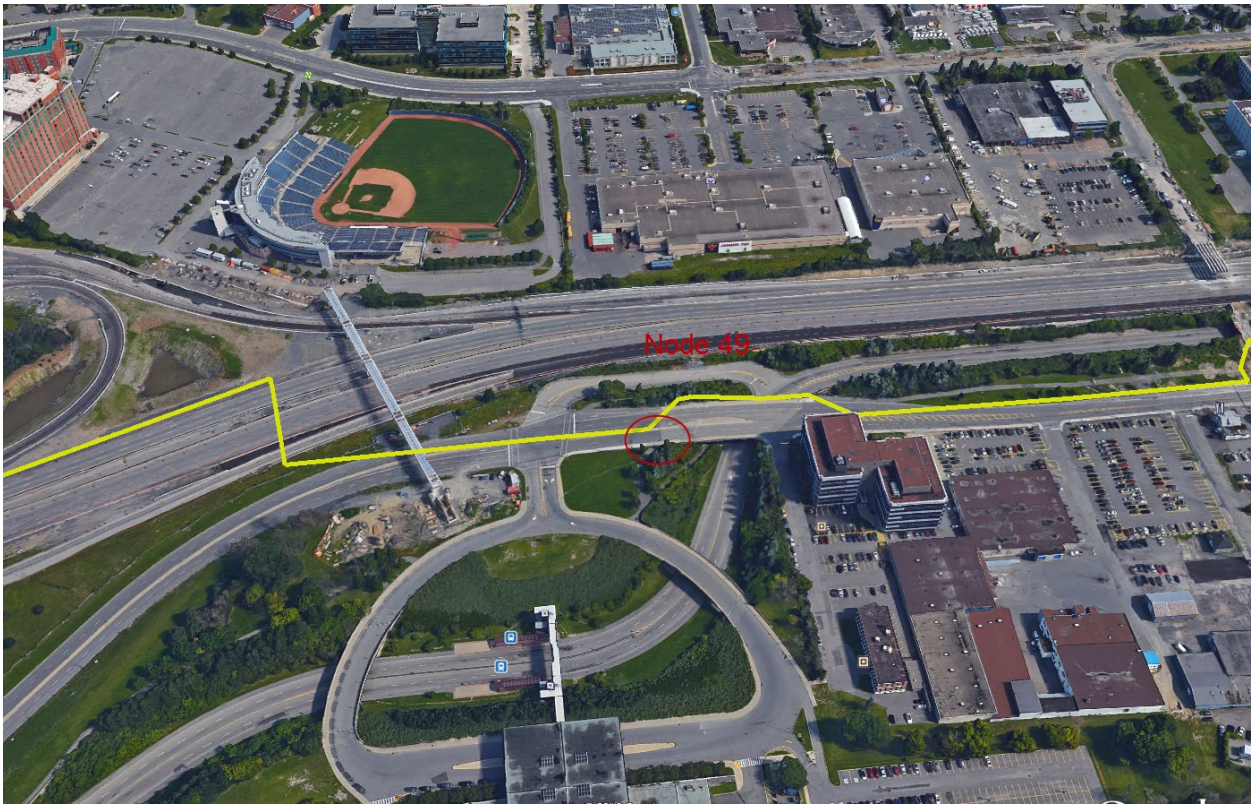

## 8. 6584:49 Tremblay Rd and Pickering Pl

1 NPS12 Wmson Shortstopp 300D Spherical 3-Way Tee with 300D shortplug and Flange Asme B16.25

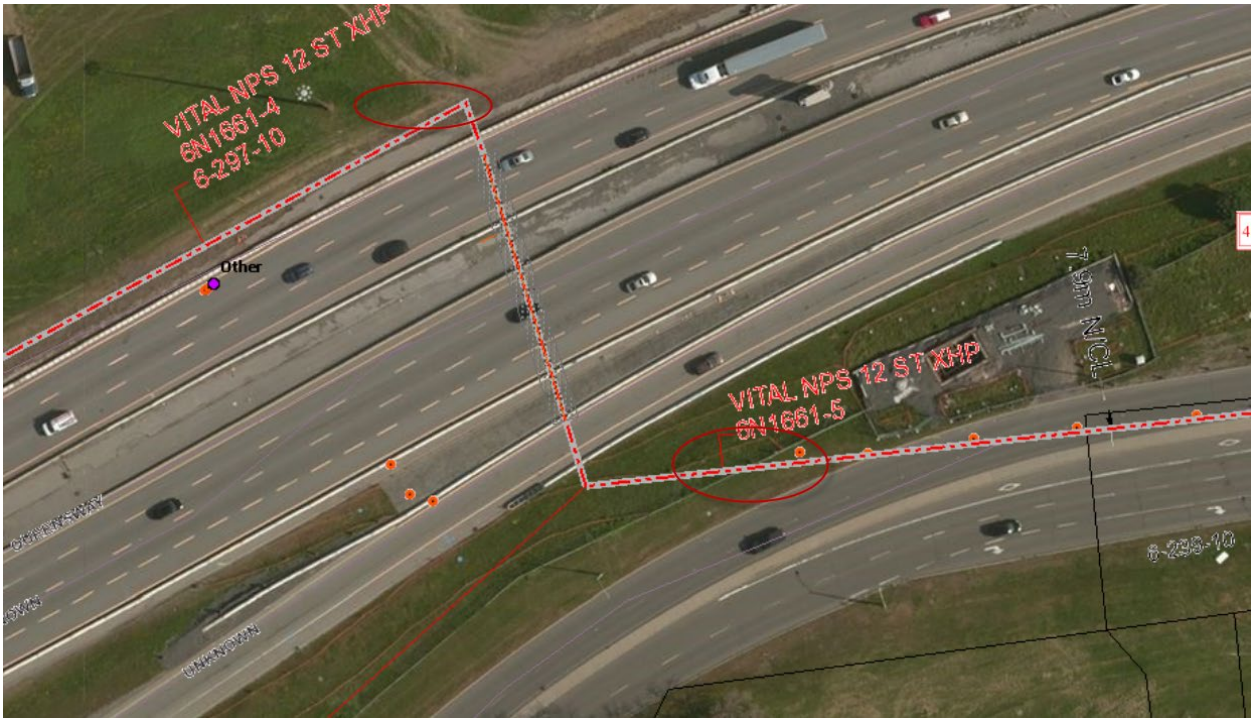
Note there is a S3WT at node 45 but this fitting is not to be stopped as there is a dent on the pipe as per Engineering.

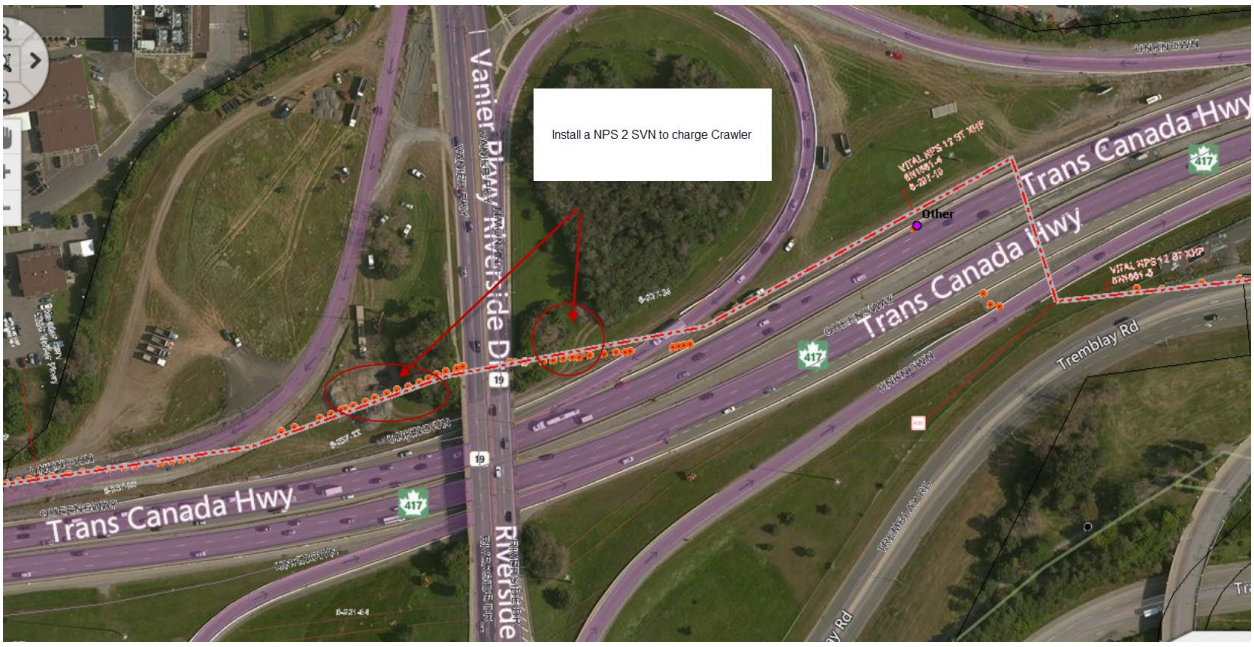
Created RCR to get these added to GIS

350m to the west 45.4m installed in 10/1/1985 and 304.6 installed 12/1/1958




Install 2 SVN to charge crawler overnight


VITAL NPS 12 ST XHP
6N1661-4
6-297-10
Other
VITAL NPS 12 ST XHP
6N1661-5
UNKNOWN


Install a NPS 2 SVN to charge Crawler
Vanier Pkwy
Riverside Dr
Trans Canada Hwy
Trans Canada Hwy
Trans Canada Hwy
Tremblay Rd
Other
417
19
UNKNOWN

## 10. Install a S3WT on 525 St Laurent just south of Dunbarton Crt just north of Node 1009

North 844.1 m installed 7/1/1958 – 29 Services – need to find a charging point.

South 94.6m installed 11/1/1986, 126 m installed in 7/1/1958 to Montreal Rd 5.1 m installed in 9/13/2006 and 584.9m installed in 1958. Need to find a charging point approx. 700m. – 21 Services

# ILI Inspection St Laurent Control Station

| | PMTS | Size | Length | Date Installed | Field Notes | Intersection | Fittings | Number of Services | |
|---|---|---|---|---|---|---|---|---|---|
| **South** | | | | | | | | | |
| 6584:1958 (1974) | | S3WT 12x4 | | | | St Laurent Control Station | | | |
| 6584:668:1974 | 3258385 | 12 | 377.6 | 8/1/1962 | 6N1950-4 | | | 2 | |
| 6584:668:847 | 77816 | 12 | 18 | 12/1/1978 | 6N1946-1 | | | 0 | |
| | | | | | 6N1946-1 | | | | |
| | | | | | 6N3524-5 | | | | |
| 6584:32:847 | 3810007 | 12 | 25.9 | 12/9/2014 | 05-04-36-1 | Belfast Rd | | 0 | |
| | | | | | 6N1946-1 | | | | |
| | | | | | 6N3524-5 | | | | |
| 6584:32:667 | 3810006 | 12 | 9.4 | 12/9/2014 | 05-04-36-1 | | | 0 | |
| | | | | | 6N1946-2 | | | | |
| | | | | | 6N1950-4 | | | | |
| 6584:31:667 | 3775438 | 12 | 14.9 | 8/1/1962 | 6-237-145-146 | | | 0 | |
| | | | | | 6N1946-2 | | | | |
| | | | | | 6N1950-4 | | | | |
| 6584:31:786 | 3775439 | 12 | 566 | 8/1/1962 | 6-237-145-146 | Innes Rd | | 7 | |
| | | | 1011.8 | | | | | 9 | |
| **North** | | | | | | | | | |
| 6584:1947 | | S3WT 12x4 | | | | St Laurent Control Station | | | |
| | | | | | 6N1945-5-6 | | | | |
| | | | | | 6N1950-4 | | | | |
| 6584:729:1947 | 2931462 | 12 | 289 | 8/1/1962 | 85-B1-5148-16 | | | 0 | |
| 6584:15:729 | 77876 | 12 | 1.6 | 8/1/1962 | 6N1945-5 | | | 0 | |
| 6584:15:965 | 77863 | 12 | 15 | 8/1/1962 | 6N1945-5 | | | 0 | |
| | | | | | 6N1945-5 | | | | |
| 6584:881:965 | 77860 | 12 | 199.5 | 5/1/1986 | 6N1948-5 | Tremblay Rd | | 0 | |
| | | | | | 6N1945-4-5 | | | | |
| | | | | | 6N1948-2 | | | | |
| | | | | | 6N1947-6 | | | | |
| 6584:881:882 | 77870 | 16 | 86.9 | 7/1/1985 | 6N2351-2 | | | 0 | |
| | | | 592 | | | | | 0 | |
| **Tremblay Rd** | | | | | | | | | |
| **East** | | | | | | | | | |
| 6584:41 | | S3WT | | | | | | | |
| 6584:41:424 | 3872168 | 12 | 29.7 | 12/1/1958 | 6N2415-3 | | 90 | 1 | |
| | | | | | 6N2415-4 | | | | |
| 6584:424:753 | 76847 | 12 | 70 | 12/1/1958 | 85-B1-5148N-3 | Avenue N | | 2 | |
| 6584:753:755 | 76817 | 12 | 64.5 | 12/1/1958 | 6N2415-3 | Avenue O | | 1 | |
| 6584:422:755 | 76829 | 12 | 70 | 12/1/1958 | 6N2415-3 | Avenue P | | 0 | |
| | | | | | 6N2415-3-4 | | | | |
| 6584:420:422 | 76816 | 12 | 86 | 12/1/1958 | 85-B1-5148N-3 | Avenue Q | | 0 | |
| | | | | | 6N2415-4 | | | | |
| 6584:418:420 | 76830 | 12 | 64 | 12/1/1958 | 85-B1-5148N-3 | Avenue R | CC | 1 | |
| | | | | | 6N2415-4 | | | | |
| 6584:416:418 | 76837 | 12 | 65.2 | 12/1/1958 | 85-B1-5148N-3 | Avenue S | | 2 | |
| | | | | | 6N2415-4 | | | | |
| 6584:416:751 | 76841 | 12 | 80 | 12/1/1958 | 85-B1-5148N-3 | Avenue T | | 4 | 1 service Cutoff |
| 6584:751:1363 | 76823 | 12 | 10 | 12/1/1958 | 6N2415-4 | Avenue U | CC | 1 | |
| 6584:1362:1363 | 76832 | 12 | 2.7 | 12/1/1958 | 6N2415-4 | | Valve | 0 | |
| | | | | | 6N2415-4-5 | | | | |
| | | | | | 85-B1-5148N-3-4 | | | | |
| 6584:891:1362 | 77857 | 12 | 312.7 | 12/1/1958 | 6-295-26 | | | 2 | 1 service Cutoff |
| 6584:891 | | Could Install NPS 12 Stopple Fitting or Charging station | | | | | | | |
| | | | 854.8 | | | | | 14 | |
| **West** | | | | | | | | | |
| 6584:39 | | S3WT | | | | | | | |
| 6584:39:428 | 3872154 | 12 | 46 | 12/1/1958 | 6N2415-2-3 | Avenue L | | 2 | |
| | | | | | 6N2415-2 | | | | |
| 6584:45:428 | 3957613 | 12 | 58.2 | 12/1/1958 | 6-297-17-18 | | S3WT | 0 | |
| 6584:45:48 | 3957879 | 12 | 28.5 | 11/11/2015 | 6N6074-4-5 | | 5 EL90 | 0 | |
| 6584:47:48 | 3957880 | 12 | 24.5 | 11/11/2015 | 6N6074-4-5 | | 16" Casing | 0 | |
| | | | | | | | 4 EL90 | | |
| 6584:47:49 | 3957619 | 12 | 44.3 | 11/11/2015 | 6N6074-4-5 | Pickering PL | EL45 | 0 | |
| 6584:49:934 | 3957614 | 12 | 45.4 | 10/1/1985 | 6N2414-6 | | | 0 | |
| 6584:433:439 | 76836 | 12 | 204.2 | 12/1/1958 | 6N1661-4-5 | | | 0 | |
| | | | | | 6N1661-3-4 | | 2 EL90 | | |
| 6584:16:439 | 3577741 | 12 | 620.6 | 12/1/1958 | 6-297-9-10 | | 5 Casings | 5 | 1 service Cutoff |
| | | | 1071.7 | | | | | 7 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **St Laurent North** | Need to determine if the tool can move through the 16" | | | | | | | | |
| 6584:882 | Install a Stopple Fitting Potential Dressers that they couldn't find | | | | | | | | |
| | | | | | 6N1947-6<br>6N1948-2<br>6N2351-2 | | Valve | | |
| 6584:882:883 | 77844 | 16 | 45.2 | 7/1/1985 | 6N1945-4<br>6N1947-6<br>6N1948-2<br>6N2351-2 | | Casing | 0 | |
| 6584:883:884 | 77871 | 16 | 63.4 | 7/1/1985 | 6N1945-4<br>6N1947-6<br>6N1948-2<br>6N2351-2 | | Casing | 0 | |
| 6584:884:885 | 77861 | 16 | 1 | 7/1/1985 | 6N1945-4<br>6-301-34<br>6N1947-5<br>6N1948-1<br>6N2351-2 | | EL90 | 0 | |
| 6584:885:886 | 77897 | 16 | 48.5 | 7/1/1985 | 6N1945-4<br>6N1947-5<br>6N1948-1<br>6N2351-2 | | EL90 | 0 | |
| 6584:886:1976 | 3367235 | 16 | 20.5 | 7/1/1985 | 6N1945-4 | | | 0 | |
| 6584:4:1976 | 3377435 | 16 | 33.5 | 5/2/2012 | 6N5835-6<br>6N1947-5<br>6N1948-1<br>6N2351-2 | | | 0 | |
| 6584:4:887 | 3411115 | 16 | 6 | 7/1/1985 | 6N1945-4<br>6N1947-5<br>6N1948-1<br>6N1945-3 | | | 0 | |
| 6584:887:1978 | 3367353 | 16 | 20.5 | 6/26/1985 | 6N1945-4<br>6N1947-5<br>6N1948-1<br>6N1945-3 | | | 0 | |
| 6584:888:1978 | 3367354 | 16 | 69.6 | 6/26/1985 | 6N1945-4 | | LSF | 1 | |
| | | | 308.2 | | | | | 1 | |
| 6584:888:1934 | 77874 | 12 | 30.1 | 8/22/2000 | 6N1945-3<br>6N5040-5 | | | 0 | |
| 6584:794:1934 | 77830 | 12 | 236.4 | 7/3/1958 | 6N1945-3<br>6-238-15-16 | | LSF<br>CC - pumpkined | 15 | 2 Live Stubs |
| | | | 266.5 | | | | | 15 | |
| **St Laurent North** | 525 St Laurent just south of Bunbarton Crt | | | | | | | | |
| | Determine if it is a good location for a Stopple Fitting | | | | | | | | |
| 6584:1009 | Install a Stopple fitting | | | | | | | | |
| 6584:1009:1128 | 88237 | 12 | 340 | 7/1/1958 | 6N1944-1-2<br>6-237-134-136<br>85-B1-5148-5<br>6-290-127<br>6N-1943-6 | 525 St Laurent to Dunbarton Crt | LSF | 6 | 1 service Cutoff |
| 6584:525:1128 | 88253 | 12 | 199.3 | 7/1/1958 | 6N1944-1<br>6-237-132-134 | Dundarton Crt to Karen Way | | 2 | |
| 6584:35:525 | 88239 | 12 | 304.8 | 7/1/1958 | 6N-1943-5-6<br>6-237-126-131 | Karen Way to Hemlock Rd | | 21 | |
| | | | 844.1 | | | | | 29 | |
| **South** | Determine if it is a good location for a Stopple Fitting | | | | | | | | |
| 6584:1009 | Install a Stopple fitting | | | | | | | | |
| 6584:1009:1010 | 88232 | 12 | 94.6 | 11/1/1986 | 6N1944-2<br>6N1948-4 | | 2 LSF<br>2 NPS 2 SVN<br>2 EL90 | 1 | |
| 6584:1010:1956 | 2954226 | 12 | 126 | 7/1/1958 | 6N1944-2-3<br>6-237-138-139 | Montreal Rd | Casing | 1 | |
| 6584:1956:1972 | 3213823 | 12 | 2.5 | 9/13/2006 | 6-254-105<br>6N5532-5-6 | Montreal Rd | Casing<br>S3WT<br>Insulating Fitting | 0 | |
| 6584:1971:1972 | 3213824 | 12 | 1.6 | 9/13/2006 | 6-254-105<br>6N5532-5-6 | Montreal Rd | S3WT | 0 | |
| 6584:18:1971 | 3213822 | 12 | 1 | 9/13/2006 | 6-254-105<br>6N5532-5-6 | Montreal Rd | 2 EL90<br>Casing | 0 | |
| 6584:18:131 | 77880 | 12 | 246.9 | 12/1/1958 | 6N1944-3<br>6-238-2-3 | Montreal Rd to Noranda Ave | Valve<br>2 CC - Pumpkined | 9 | 1 service Cutoff |
| 6584:131:1967 | 3167822 | 12 | 338 | 7/1/1958 | 6N1944-3-5<br>6-238-4-5<br>85-B1-5148-8 | Noranda Ave to Cote St | | 21 | |
| | | | 810.6 | | | | | 32 | |

6584-49 on in a Pit west of Pickering Place and Tremblay
Location of the S3WT is 2.2 m west of the Street Light on the Bridge and 6.5m north

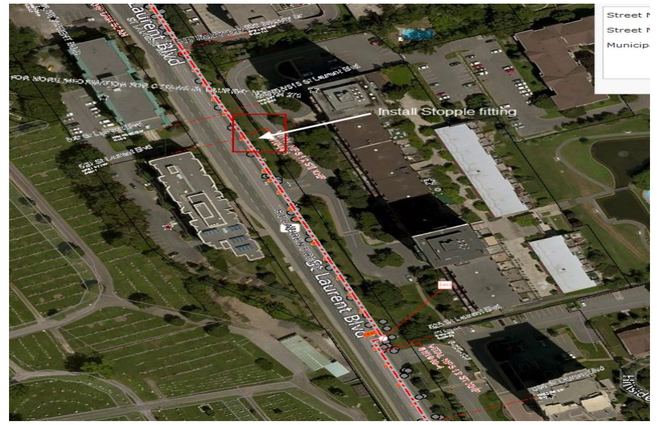
| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S3WT | | | 1176615 | Wmson Short Stopp 300 D Spherical Three Way Tee with 300 D Short Plug & Flange Asme B16.25 | | | | | | | |
| Going West | | | | | | | | | | | |
| 6584:49:934 | | | 45.4 | 6N2414-6 | 10/1/1985 | | | | | 6.35 | |
| | 49 | SVN | | cover 2.2 m | .8m to west | | | | | | |
| | | SVN | | cover 1.2 m | .6m to the north | | | | | | |
| | | S3WT | | cover 2.2 m | | 0 | 6N6074-4 | | | | |
| | | P12 | | cover 1.2 m | | 45.4 | 6N2414-6 | | | 6.35 | approx 10.8 |
| ? | | EL45 | | | | 45.4 | 6N2414-6 | | | | |
| | | | | 6N2414-6 | | | | | | | |
| 6584:933:934 | | | 48.5 | 6N1661-5 | 10/1/1985 | | | | | 6.35 | |
| | | | | between | | | | | | | |
| | | P12 | | 1.2-2.5 | | 21.6 | | | | | |
| | | EL45 | | cover 1.2 m | 0 | | 6N2414-6 | | | | |
| | | EL45 | | cover 1 m | | 19 | 6N2414-6 | | | | |
| | | EL 45 | | cover 1 m | | 6.4 | 6N2414-6 | | | | |
| | | EL 45 | | cover 2.4 m | | 1.2 | 6N2414-6 | | | | |
| | | LSF | | cover 1.7m | | 0.3 | 6N2414-6 | | | | |
| 6584:433:933 | | | 30 | 6N1661-5 | 12/1/1958 | | | | | 6.35 | |
| 6584:433:439 | | | 204.2 | 6N1661-4-5 | 12/1/1958 | | | | | 6.35 | |
| | | Pumpkin | | unknown | ? | | 6N1661-5 | | | | |
| | | Fabricated Sleeve | | unknown | | 120.2 | 6N1661-4-5 | | | | |
| | | | | 6N1661-3-4 | | | | | | | |
| 6584:16:439 | | | 620.6 | 6-297-9-10 | 9/11/1901 | | | | | | |
| | | EL45 | | 1.5 | approx 17 | | 6N1661-4 | | | | |
| | | 2NBT | | 1.5 | 0 | | | | | | |
| | | Pumpkin | | 1.5 | 0 | | | | | | |
| | | Casing | | 1.5 | | 42.6 | | | | | |
| | | EL90 | | 1.5 | | 1.3 | | | | | |
| | | EL45 | | 2.7 | | 109.7 | | | | | |
| | | P12 | | 2.7 | | 1.8 | | | | | |
| | | Casing | | 2.7 | | 27.4 | | | | | |
| | | P12 | | 3 | | 56.4 | | | | | |
| | | Casing | | 3 | | 240.3 | | | | | |
| | | EL45 | | 3 | | 1.2 | | | | | |
| | | Bend | | 1.5 | | 105.4 | | | | | |
| | | P12 | | 0.9 | | 15.2 | | | | | |
| | | Casing | | 0.9 | | 13.7 | | | | | |
| | | Potential Valve | | 0.9 | | 38.7 | No valve found Oct 85 | | | | |
| | | P12 | | 1.5 | | 117 | | | | | |
| | | Casing | | 3.7 | | 46.6 | | | | | CNE Tracks |
| 6584:13:16 | | | | 292.4 | 6/7/2012 | | | | | | |

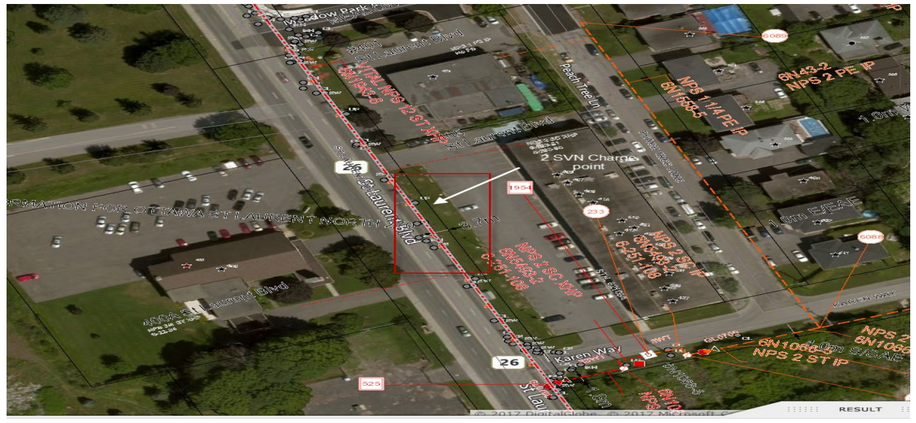
Sandridge Rd between Lakeway Dr and Blenheim Dr

| Going West | | Wall Thickness | | | Number of connections | |
|---|---|---|---|---|---|---|
| | | | | 6N609-6<br>6N610-1-2<br>6N1819-3-5 | | |
| 6584:22:1312 | 489.2 | 6.35 | 12/1/1959 | 85-B1-5148A-4<br>6N609-6 | 10 | Blenheim Dr to Hillsdale Rd |
| 6584:579:1312 | 60 | 6.35 | 12/1/1959 | 6-233-42<br>6N1819-3<br>6N609-4-6 | 0 | |
| 6584:579:894 | 380.2 | 6.35 | 12/1/1959 | 6-233-40-42<br>6N1819-1-3<br>85-B1-5148A-2 | 0 | Valve GL0013 Norstrom 500 WOG valve |
| Going East/South | | | | | | |
| 6584:22:564 | 124.4 | 6.35 | 12/1/1959 | 6N610-2<br>6N1819-5 | 1 | |
| 6584:564:1723 | 18 | 6.35 | 7/1/1958 | 6N610-2<br>6N1819-5 | 0 | |
| 6584:558:1723 | 445.9 | 6.35 | 7/1/1958 | 6N610-2-3<br>6N1819-5-6 | 19 | |
| 6584:558:731 | 51.7 | 6.35 | 7/1/1958 | 6N1943-3<br>6-237-118 | 4 | |
| 6584:559:731 | 30 | 6.35 | 7/1/1958 | 6N1943-3<br>6-237-119 | 2 | |
| Install SVN for a charging station | | | | | | |
| 6584:20:559 | 171 | 6.35 | 7/1/1958 | 6N1943-3-4<br>6-237-119-120<br>6N3530-4<br>2533-1 | 16 | |
| 6584:20:1960 | 58 | 6.35 | 7/1/1958 | 6N1943-4<br>6-237-121 | 2 | |
| 6584:1960:1961 | 7 | 6.35 | 9/26/2008 | 6N5598-1 | 0 | |
| 6584:14:1961 | 142 | 6.35 | 7/1/1958 | 6N1943-4-5<br>6-237-122-124 | 1 | |

Sandridge Rd between Lakeway Dr and Blenheim Dr

| | | | | | | |
|---|---|---|---|---|---|---|
| Going West | | Wall Thickness | | | Number of connections | |
| | | | | 6N609-6<br>6N610-1-2<br>6N1819-3-5 | | |
| 6584:22:1312 | 489.2 | 6.35 | 12/1/1959 | 85-B1-5148A-4<br>6N609-6<br>6-233-42 | 10 | Blenheim Dr to Hillsdale Rd |
| 6584:579:1312 | 60 | 6.35 | 12/1/1959 | 6N1819-3 | 0 | |
| | | | | 6N609-4-6<br>6-233-40-42<br>6N1819-1-3 | | |
| 6584:579:894 | 380.2 | 6.35 | 12/1/1959 | 85-B1-5148A-2 | 0 | Valve GL0013 Norstrom 500 WOG valve |
| Going East/South | | | | | | |
| | | | | 6N610-2 | | |
| 6584:22:564 | 124.4 | 6.35 | 12/1/1959 | 6N1819-5<br>6N610-2 | 1 | |
| 6584:564:1723 | 18 | 6.35 | 7/1/1958 | 6N1819-5 | 0 | |
| | | | | 6N610-2-3 | | |
| 6584:558:1723 | 445.9 | 6.35 | 7/1/1958 | 6N1819-5-6<br>6N1943-3 | 19 | |
| 6584:558:731 | 51.7 | 6.35 | 7/1/1958 | 6-237-118<br>6N1943-3 | 4 | |
| 6584:559:731 | 30 | 6.35 | 7/1/1958 | 6-237-119 | 2 | |
| Install SVN for a charging station | | | | | | |
| | | | | 6N1943-3-4<br>6-237-119-120<br>6N3530-4 | | |
| 6584:20:559 | 171 | 6.35 | 7/1/1958 | 2533-1<br>6N1943-4 | 16 | |
| 6584:20:1960 | 58 | 6.35 | 7/1/1958 | 6-237-121 | 2 | |
| 6584:1960:1961 | 7 | 6.35 | 9/26/2008 | 6N5598-1<br>6N1943-4-5 | 0 | |
| 6584:14:1961 | 142 | 6.35 | 7/1/1958 | 6-237-122-124 | 1 | |



Installation of WmSon Stopple Fitting just north of 545 St Laurent

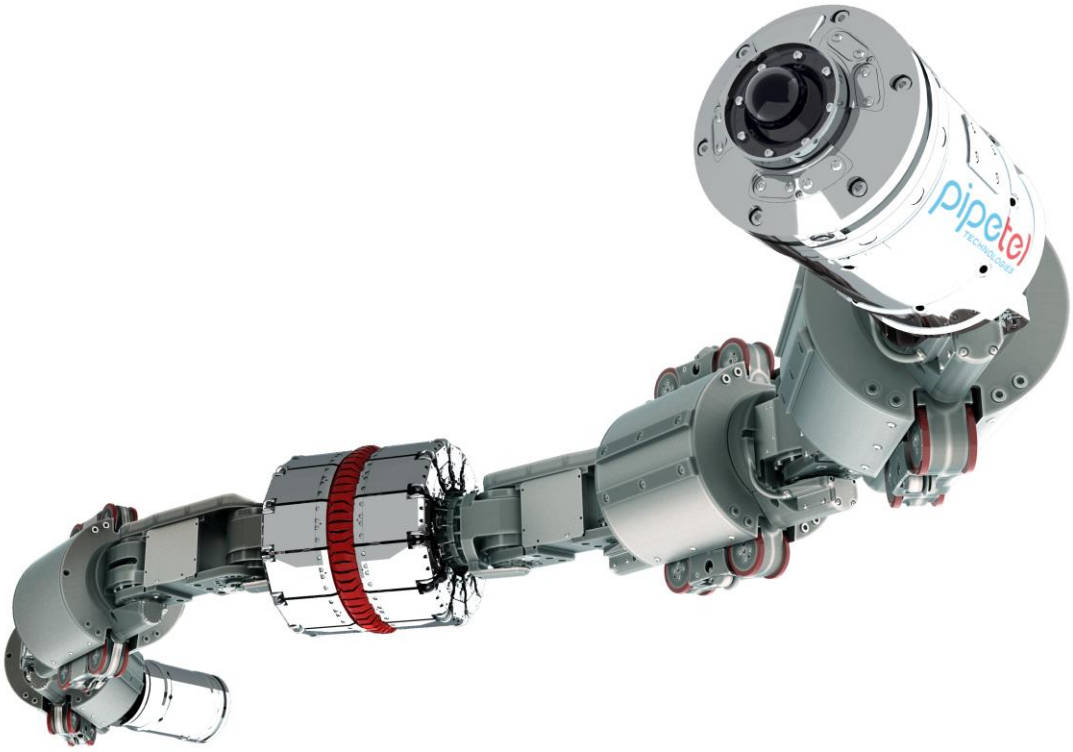
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **St Laurent** | 525 St Laurent just south of Bunbarton Crt | | | | | | | | |
| **North** | Determine if it is a good location for a Stopple Fitting | | | | | | | | |
| 6584:1009 | Install a Stopple fitting | | | | | | | | |
| | | | | | 6N1944-1-2 | | | | |
| | | | | | 6-237-134-136 | | | | |
| | | | | | 85-B1-5148-5 | | | | |
| 6584:1009:1128 | 88237 | 12 | 340 | 7/1/1958 | 6-290-127 | 525 St Laurent to Dunbarton Crt | LSF | 6 | |
| | | | | | 6N-1943-6 | | | | |
| | | | | | 6N1944-1 | | | | |
| 6584:525:1128 | 88253 | 12 | 199.3 | 7/1/1958 | 6-237-132-134 | Dundarton Crt to Karen Way | | 2 | |
| Install 2 SVN south of Meadow Park Pl approx 75 m north of Karen Way. Therefore from Launcher aprrox. 609 m | | | | | | | | | |
| | | | | | 6N-1943-5-6 | | | | |
| 6584:35:525 | 88239 | 12 | 304.8 | 7/1/1958 | 6-237-126-131 | Karen Way to Hemlock Rd | | 21 | Charge Point |
| | | | 844.1 | | | | | 29 | |
| | | | | | 6N-1943-5 | | | | |
| 6584:19:35 | 88256 | 12 | 108.2 | 7/1/1958 | 6-237-125-126 | | | 5 | |
| | | | | | 6N-1943-4-5 | | | | |
| 6584:19:44 | 3949702 | 12 | 91.6 | 7/1/1958 | 6-237-122-124 | | | 6 | |
| | | | | | 6N-1943-4-5 | | | | |
| 6584:23:44 | 3949703 | 12 | 50.5 | 7/1/1958 | 6-237-122-124 | | | 2 | |
| | | | | | 6N-1943-4-5 | | | | |
| 6584:21:23 | 3563981 | 12 | 7 | 7/1/1958 | 6-237-122-124 | | | 0 | |
| | | | | | 6N-1943-4-5 | | | | |
| 6584:14:21 | 3563979 | 12 | 7 | 7/1/1958 | 6-237-122-124 | | | 0 | |
| | | | | | 6N-1943-4-5 | | | | |
| 6584:14:1961 | 3563977 | 12 | 142 | 7/1/1958 | 6-237-122-124 | | | 1 | Turn around |
| | | | 406.3 | | | 1250.4 | | 14 | |
| Install 1 SVN south of Blasdell Ave | | | | | | | | | |
| | | | | | 6N5598-1 | | | | |

# Enbridge Gas Distribution Inspection Plan

Robotic Inline Inspection of St. Laurent (NPS 12)
Ottawa, ON

Revision 1
October 4, 2018

Confidential and Proprietary



Pipeline inspection without compromise.

CANADA 30 Lesmill Road, Unit 2, Toronto, ON M3B 2T6 + U.S.A. 300 International Drive, Suite 100, Williamsville, NY 14221
Main: 416-510-8588 pipetelone.com Toll free: 1 855-747-3835

# Looking Back, Moving Forward

| | |
|---|---|
| 2002 | US DOT PHMSA gas ruling<br>NYSEARCH began R&D of Explorer |
| 2008 | First demonstration of Explorer 6/8 in live operating pipeline |
| 2008 to 2010 | Additional demonstration in various live operating pipelines and refinement of Explorer |
| 2010 | Pipetel founded |
| 2011 | First robotic inline inspection of an 8 inch pipeline by Explorer 6/8 |
| 2012 | First time Enbridge Gas Distribution uses Pipetel Technologies for an inspection |
| October, 2018 | St. Laurent – Current Inspection Plan of robotic inline inspection of St. Laurent Pipeline in Ottawa, ON |
| 2019 | St. Laurent – Tentative inspection date of robotic inline inspection of St. Laurent in Ottawa, ON |

# Contents

# Message from Pipetel

Pipetel is committed to collaborating with our clients in improving safety and reliability of pipeline assets by continuing to develop the latest inspection technology and services. We aim to provide the knowledge, experience, integrity, and customer services expected of the leader in robotic pipeline inspection services.

Our team at Pipetel strives to exceed our clients' expectations, regardless of the circumstances. We will proactively take steps to meet your needs through open and timely communication.

We ask our clients to:

- Collaborate with us to elevate the standard
- Never compromise on quality

Should you have any suggestions or would like to discuss any aspects of your experience working with us, please contact me or any of my team directly.

We look forward to learning from working with you.

Yours Truly,

*Paul Laursen*

Paul Laursen, P. Eng.
President
(416) 510-8588 ext 113
plaursen@pipetelone.com

# Robotic Inline Inspection of St. Laurent (NPS 12), Ottawa, ON

The purpose of this document is to provide recommendations on performing robotic inline inspection of St. Laurent pipeline segment operated by Enbridge Gas Distribution (Enbridge) in Ottawa, ON. This document describes the scope and process of inspecting St. Laurent to ensure that Enbridge and Pipetel Technologies (Pipetel) understand each other's responsibilities, expectations, and preparation required to complete this inspection.

In summary,

- The inspection will take place over 6 days in a single mobilization and demobilization.
- Explorer 10/14 will enter and exit the pipe through an NPS 12 TDW Stopple (Class 600) fitting or other equivalent fitting mounted on the pipeline segment.
- Explorer 10/14 will be inline charged at 2 locations along the pipeline.
- This inspection is scheduled for 2019.

St. Laurent is an NPS 12 pipeline located in Ottawa, ON. The total distance of the pipeline segment which is to be inspected is 1,630 meters. The table below summarizes the pipeline segment.

| Pipeline | Year Installed | Diameter (NPS) | Length (m) | Wall thickness (mm) | Type |
|---|---|---|---|---|---|
| St. Laurent | TBD | 12 | 1,630 | TBD | TBD |

# 1. Overview

## 1.1. Project Date

- This inspection is tentatively scheduled for 2019.
- The tables below show the estimated duration of inspecting the pipeline.

| Pipeline | Diameter (NPS) | Approximately Length to inspect (feet) | Tentative inspection date | Estimated number of hours required for inspection | MFL sensor configuration |
|---|---|---|---|---|---|
| St. Laurent | 12 | 1,630 | TBD | 48 | 12 inch |

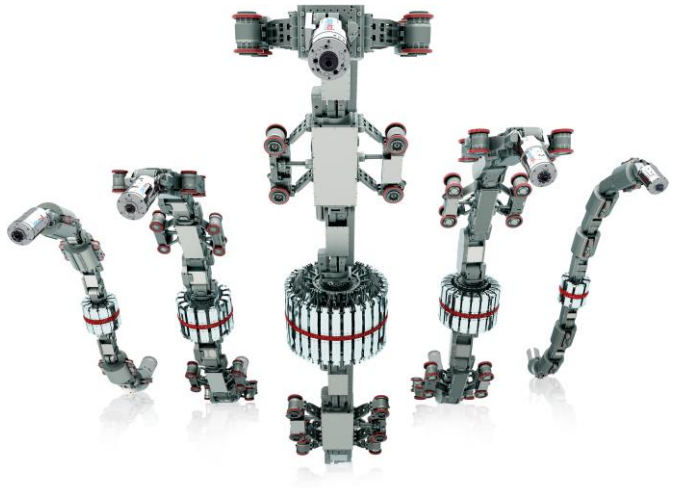
## 1.2. Summary of Pipeline

| | Unit | St. Laurent |
|---|---|---|
| Figure in Appendix A | | Figure 3 |
| Nominal diameter | NPS | 12 |
| Outside diameter | inch | 12.750 |
| Number of casings | | TBD |
| Wall thickness | mm | TBD |
| Pipe length | m | 1,630 |
| Year of installation | | TBD |
| Type of pipe | | TBD |
| MAOP | psi | TBD |
| Proposed inspection pressure | psi | TBD |
| Flow rate | ft/s | TBD |
| Flow direction | | TBD |

- Specific pipeline features identified in these pipelines will be or are listed in Appendix B – Pipeline Features

pipetel TECHNOLOGIES

## 1.3. Specification of Explorer iLi



### EXPLORER iLi 6*

Pipe Diameter: 6"
Maximum WT: TBD
Rated Pressure: 750psi
Self-Propelled Inspection Speed: 20ft/min
By Pass: 50%
Minimum Bore: 80% of OD

### EXPLORER iLi 8

Pipe Diameter: 8"
Maximum WT: 0.320"
Rated Pressure: 750psi
Self-Propelled Inspection Speed: 20ft/min
By Pass: 50%
Minimum Bore: 80% of OD

### EXPLORER iLi 10/14

Pipe Diameter: 10", 12", 14"
Maximum WT: 0.450"
Rated Pressure: 750psi
Self-Propelled Inspection Speed: 20ft/min
By Pass: 50%
Minimum Bore: 80% of OD

### EXPLORER iLi 16/18

Pipe Diameter: 16", 18"
Maximum WT: 0.500"
Rated Pressure: 750psi
Self-Propelled Inspection Speed: 20ft/min
By Pass: 50%
Minimum Bore: 80% of OD

### EXPLORER iLi 20/26

Pipe Diameter: 20", 22", 24", 26"
Maximum WT: 0.500"
Rated Pressure: 750psi
Self-Propelled Inspection Speed: 20ft/min
By Pass: 50%
Minimum Bore: 80% of OD

### EXPLORER iLi 30/36

Pipe Diameter: 30", 32", 34", 36"
Maximum WT: 0.650"
Rated Pressure: 750psi
Self-Propelled Inspection Speed: 20ft/min
By Pass: 50%
Minimum Bore: 80% of OD

- ✔ Bi-Directional
- ✔ Tetherless
- ✔ Inline Charging
- ✔ Video
- ✔ MFL Metal Loss Sensor
- ✔ LDS Deformation Sensor
- ✔ Vertical Segment
- ✔ Back to Back
- ✔ Mitered Bend
- ** Plug Valve
- ✔ Valve (full port)
- ✔ Tee (barred or unbarred)

*Explorer 6 not currently available. Specification may change as availability is defined.

** Plug valve available for 20" and 24" pipelines

## 1.4. Specifications of Metal Loss Sensors

| General Metal Loss Sizing Specification | Nominal Pipe | Cased Pipe |
|---|---|---|
| Depth at POD = 90% | 0.10t | 0.20t |
| Depth accuracy (80% confidence) | ± 0.10t | ± 0.20t |
| Width accuracy (80% confidence) | ± 0.75 inches<br>± 20 mm | ± 1 inches<br>± 25 mm |
| Length accuracy (80% confidence) | ± 0.5 inch<br>± 12 mm | ± 0.75 inch<br>± 20 mm |

- t = wall thickness
- Detection threshold and sizing accuracy in bends are unspecified
- Detection threshold increases to 0.15t and depth sizing accuracy degrades to ±0.15t in seamless pipe
- Depth sizing accuracy degrades to ±0.20t near girth welds or in heat affected zones

## 1.5. Specifications of Deformation Sensors

| Sizing Specification | Dent |
|---|---|
| Depth at POD = 90% | 1% of pipe nominal OD |
| Depth accuracy at 80% confidence | ± 1% of pipe nominal OD |
| Width accuracy at 80% confidence | ± 2 inches<br>± 50 mm |
| Length accuracy at 80% confidence | ± 1 inch<br>± 25 mm |

## 1.6. Explorer Robot Dimensions

| Sizing Specification | Unit | Explorer 8 | Explorer 10/14 | Explorer 16/18 | Explorer 20/26 | Explorer 30/36 |
|---|---|---|---|---|---|---|
| Length of Robot | feet | 10 | 10 | 13 | 15 | 20 |
| Length of Robot Carrier | feet | 12 | 12 | 17 | 17 | 25 |
| Weight of Robot | lbs | 250 | 250 | 600 | 900 | 1,500 |
| Weight of Robot Carrier | lbs | 250 | 250 | 1,200 | 1,200 | 1,750 |

## 1.7. Limitations

- Minimum distance between back-to-back AND out-of-plane (rolled) elbows. There is no limitation on back-to-back elbows that are in-plane.

Back-to-Back, Out of Plane Elbow Distances

| Explorer | Minimum Distance (feet) | Comfortable Distance (feet) |
|---|---|---|
| 8 | 4 | 5 |
| 10/14 | 4 | 8 |
| 16/18 | 4 | 6 |
| 20/26 | 4 | 6 |
| 30/36 | 6 | 9 |

*Distances are measured between adjacent welds attaching elbows

- In order to negotiate some fittings and bends, the MFL sensor needs to be collapsed during each fitting. As a result, some data may be lost for elbows and bends.
- Explorer cannot traverse through liquid

## 1.8. Benefits of an Explorer iLi

The 2002 United States Department of Transportation gas pipeline ruling started an initiative that saw collaboration between academics, industry and government agencies to meet these new regulations. The Northeast Gas Association/NYSEARCH led a research and development program leading to a ground-breaking technology developed by Carnegie Mellon University and the Southwest Research Institute.

Pipetel and InvoDane Engineering then refined the technology. The result is the Explorer iLi robots, which is a range of inspection robots that provide pipeline operators with accurate and relevant information on the state of their pipelines, to develop reliable maintenance programs.

Since 2010, Pipetel has been providing a full non-destructive and visual inspection service for natural gas transmission and distribution pipelines from 6 to 36 inches in diameter. The company offers a range of inspection services followed up with detailed reporting data.

### Benefits include:

- High resolution magnetic flux leakage (MFL), caliper, and video data are acquired providing insight on the conditions of the pipeline.
- Explorer iLi robots are capable of navigating the most challenging pipeline features that prohibit conventional inline inspection tools from navigating.
- Explorer iLi inspections are conducted under normal operating gas pipeline conditions. There is no need to shut down the pipeline for the inspection.
- Explorer can be launched and received through industry standard hot tap fittings, standard launcher and receiver, or other existing fittings on the pipeline.
- Distance of an Explorer inspection can be extended by inline charging.
- No tether is required for Explorer allowing for longer inspection.
- Explorer inspects pipe at a speed that is optimal for the metal loss sensing and eliminates the possibility of any data loss due to speed excursion.

# 2. Pre Inspection Requirements

## 2.1. Shipping Address

- Explorer 10/14 and auxiliary equipment will be shipped to the following Enbridge location. The equipment arrival at this location should be no later than 3 to 4 days prior to the start of the inspection. Enbridge will aid Pipetel in receiving and storing the equipment.

  Enbridge will provide a shipping address as available.

- Pipetel personnel will use this facility as the base for performing maintenance of Explorer during the inspection. Please grant Pipetel personnel access to this facility throughout the duration of the inspection.

## 2.2. Equipment Required

Materials above the sandwich valve (excluding gasket and bolts for the sandwich valve) will be provided by Pipetel. Materials below the sandwich valve including the sandwich valve and associated gaskets will be supplied by Enbridge. The table below provides details of materials and equipment to be provided by Enbridge.

Table 1 Equipment to be supplied by the gas company

| Item | Description | Qty |
|---|---|---|
| Crane/Back-hoe | For lifting launcher (at least 3,000 lbs) | 1 |
| Flatbed trailer | For transporting the launcher equipment and the robot to the site and back to the shop. | 1 |
| Nitrogen tank, fittings and hoses | For purging launch chamber, 1/2" NPS fittings on launcher | 1 |
| Socket set | For installing valve & launcher | 1 |
| Combustible gas indicator (CGI) | For sniffing gas content | 1 |
| Cleaning supplies to satisfy environmental regulation (if any) | Hazardous material disposal container | 1 |
| Site safety equipment | Fire extinguisher, first aid kit, etc. | 1 |
| Contingency equipment | To recover Explorer from pipeline should it become stranded | 1 |
| Site permit if necessary | | 1 |
| Traffic control if necessary | | 1 |
| Indoor workspace for overnight storage and work | 110V AC outlet, access from 7 am to midnight | 1 |

## 2.3. TDW Equipment or Equivalent

Table 2 Equipment to be supplied by TDW

| Item | Description | Qty |
|---|---|---|
| TDW NPS 12 sandwich valve (600 lb class) and completion plug | | 1 |
| TDW NPS 2 gate valve or ball valve for "Thread-O-Ring" or Mueller Save-A-Valve fitting | | 6 |
| TDW "Thread-O-Ring" or Mueller Save-A-Valve fittings, NPS 2 | For plugging NPS 2 antenna tap after inspection | 6 |
| TDW tapping machine | For tapping NPS 12 pipeline | 1 |
| TDW sight glass and magnet for removing shaving | For use with NPS 12 hot tap fitting, 600 lb. class | 1 |
| TDW NPS 12 Stopple fitting | NPS 12 hot tap fitting | 1 |
| Nuts and bolts for NPS 12 Flanges- Class 600 | | TBD |
| Gaskets (600 lb) | NPS 12 | 1 |

*The quantities presented do not include contingency

## 2.4. Launch Site Preparation

The following work needs to be completed at each launch site prior to Day 1 of inspection:

- Obtain and secure site work permit.
- Arrange traffic control if necessary.
- Installation of hot tap fittings and NPS 2 TDW TOR fitting or NPS 2 Mueller Save-a-Valve fitting (for In-line charger/antenna) at the chosen location of the hot tap. Exact locations to be determined between Enbridge and Pipetel.
- Tapping of pipeline should be performed with a hole-saw no smaller than:
  - ✓ 1.4375 inch diameter hole saw for NPS 2 TOR fittings
  - ✓ 1.5 inch diameter hole saw for NPS 2 Mueller Save-a-Valve fittings
  - ✓ 11.812 inch diameter hole-saw for 12 Stopple fittings
- Installation of sandwich valve and verification of seal of valve are to be completed prior to the inspection.

## 2.5. High Risk Inspection Areas

Enbridge should inform Pipetel if the pipeline is known to pass through an area of high risk (i.e. railway or river crossing). If a pipeline passes through a region where robot recovery would be impossible, the optional coverage outlined in Appendix D should be considered.

# 3. Inspection Requirements

## 3.1. Site Support

- A list of site equipment to be supplied by Enbridge is shown in Section 2.2.
- In addition, Enbridge personnel are expected to carry out the following tasks. Pipetel employees will provide consultation as required.
  - ✓ Perform any necessary cleaning of the inspection equipment to satisfy any environmental regulation
  - ✓ Operate valves on the pipeline
  - ✓ Enbridge support required during inline charging of Explorer
  - ✓ Perform any work on the pipeline
  - ✓ Handle any abnormal operating conditions

## 3.2. Safety

- Pipetel will conduct a safety meeting each day prior to commencement of inspection.
- All Pipetel personnel will be equipped with the following safety equipment.
  - ✓ Hard hat
  - ✓ Goggles
  - ✓ Safety vest with reflective strips
  - ✓ Work gloves
  - ✓ Steel-toed shoes
  - ✓ Flame resistant 6 oz. Nomex coverall

## 3.3. Procedures

- Mounting and dismounting of the Explorer launch tube, Explorer, and the in-line charging system and in-line antenna will follow the procedure attached in Appendix C – Procedure.
- Approval from Enbridge on this procedure is required prior to the commencement of the inspection.

## 3.4. Calibration

- Explorer 10/14 is calibrated before an inspection.

## 3.5. Deployment of Explorer

- Explorer 10/14 is to be launched into and retrieved from the pipeline through a TDW Class 600 Stopple fitting.
- The Pipetel launcher is attached to a TDW sandwich valve on top of the Stopple fitting.
- The launcher assembly must be installed parallel with the pipeline.
- The launcher setup on an NPS 12 TDW Stopple fitting is shown in Figure 1.

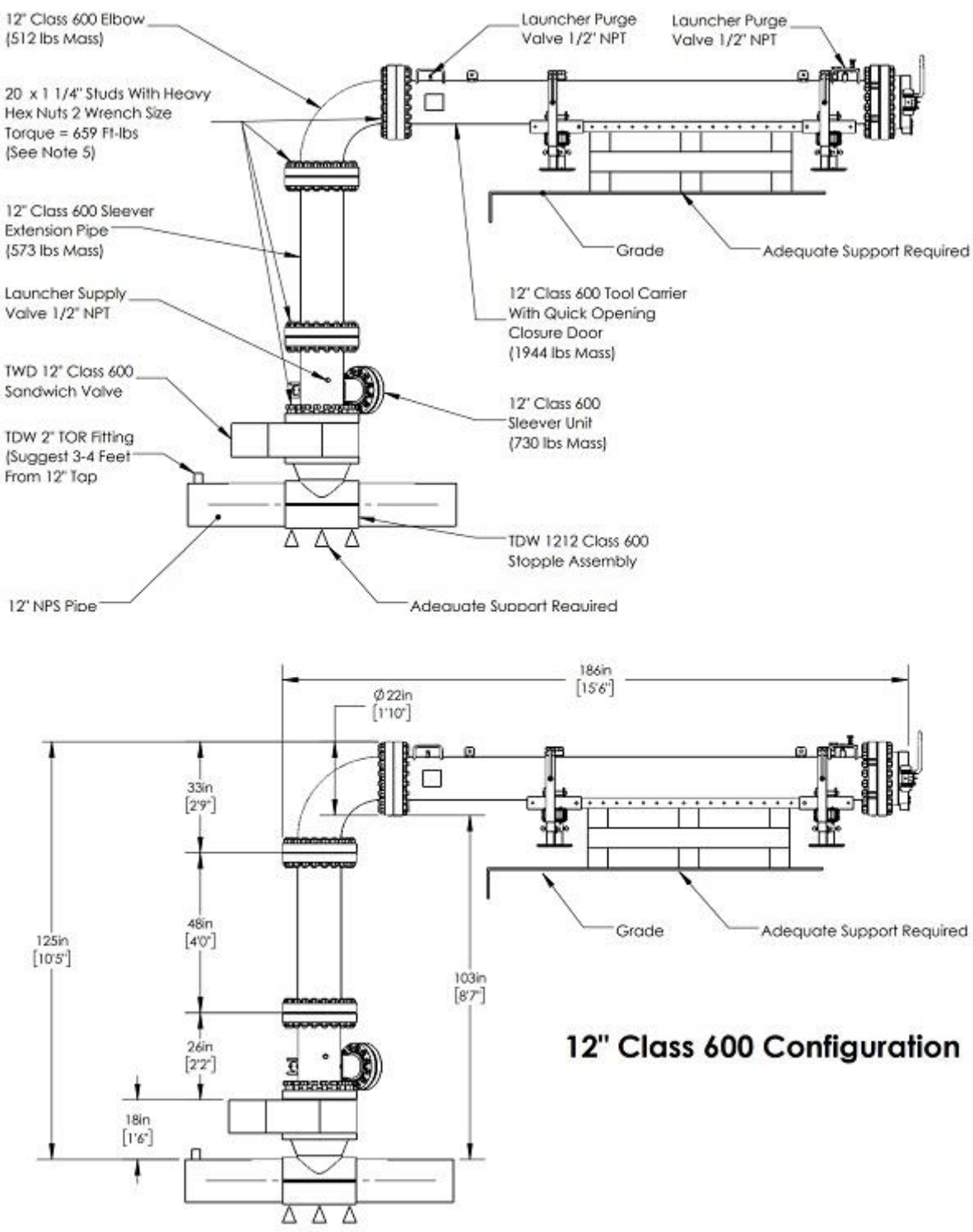



**Figure 1 Schematic of launcher setup for an NPS 12 pipeline**

## 3.6. Antenna Installation

- An NPS 2 TDW TOR fitting or an NPS 2 Mueller Save-a-Valve fitting for the Explorer antenna must be installed 1 – 2 meters away from the Stopple fitting.
- A detailed antenna installation procedure is presented in Appendix C – Procedure

## 3.7. Inline Charging System Installation

- Explorer needs to be inline charged at 2 locations. A schematic of the setup is shown in Figure 2.
- Each charging station requires two (2) NPS 2 TOR fittings installed at the top of the pipe and at a minimum of 4 feet apart for charging device and antenna.

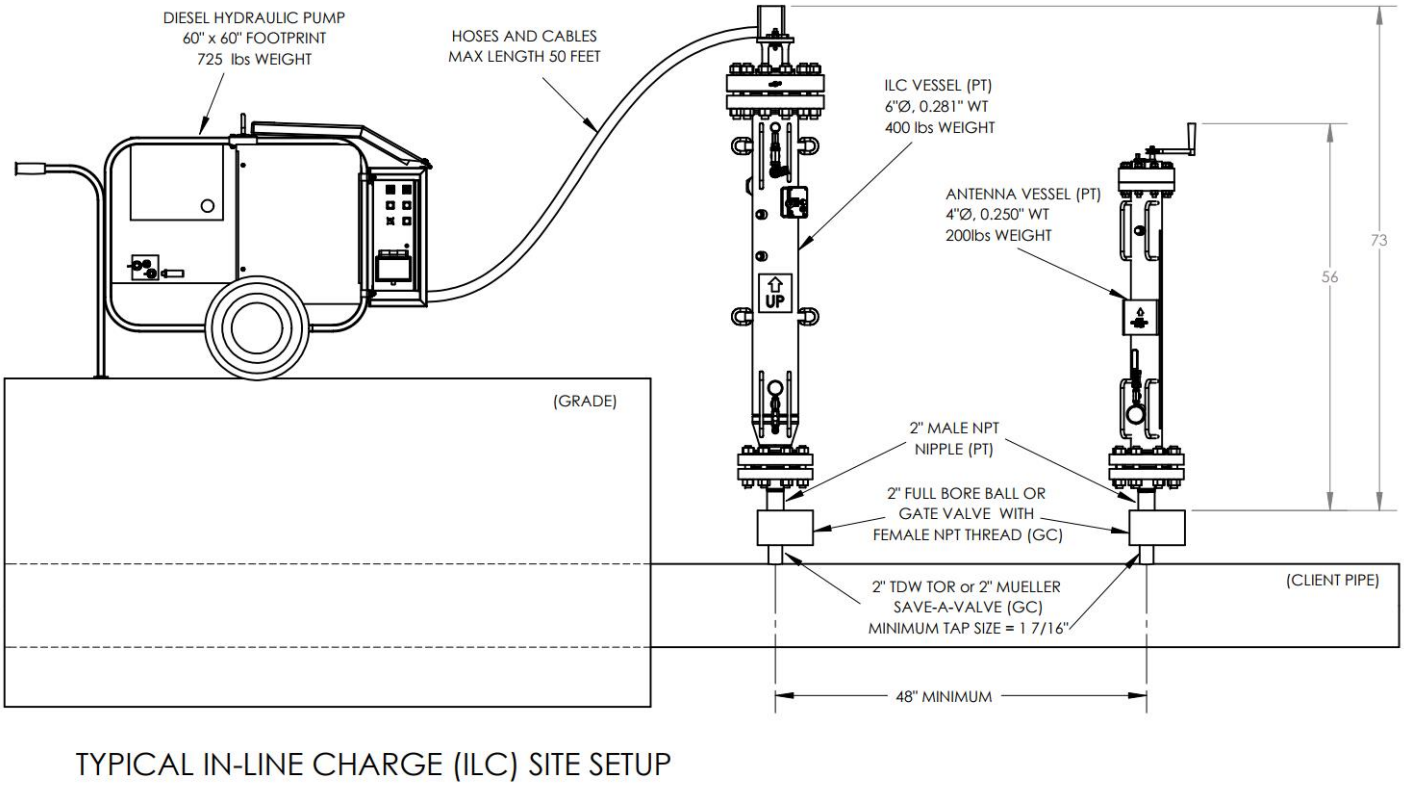



**Figure 2 Schematic of inline charging system and antenna setup**

## 3.8. Inspection Schedule

- A tentative schedule is shown below. Refer to Figure 3 for a schematic of the pipeline.

| Day | Date | Pipetel Crew Activity |
|---|---|---|
| Sun | Day 1 | Pipetel personnel arrive in Ottawa |
| Mon | Day 2 | Pipetel crew prepares the Explorer for inspection. |
| Tue | Day 3 | Inspection of pipeline segment and inline charge |
| Wed | Day 4 | Inspection of pipeline segment and inline charge |
| Thu | Day 5 | Buffer Day |
| Fri | Day 6 | Pipetel personnel and equipment leave Ottawa |

## 3.9. Cleaning of Explorer

- Enbridge shall provide cleaning personnel to clean the Explorer robot following each run. Explorer shall be cleaned by a combination of vacuuming and wiping with degreaser following each run. Spraying or pressuring washing with water should not be performed.

## 3.10. Run Acceptance Criteria

- The Run Acceptance Criteria defined by Enbridge will be adhered to. These criteria are expected to be provided by Enbridge.

- Pipetel personnel will determine the acceptance of each run within 24 hours of completing each inspection.

# 4. Post Inspection Requirements

## 4.1. Preliminary Data Analysis and Reporting

- All integrity data acquired from each run will be analyzed.
- A preliminary report will be submitted no more than 20 days from the completion of inspection.
- Enbridge may provide specific reporting format.
- The unit of reporting is Metric.

## 4.2. Final Data Analysis and Reporting

- All integrity data acquired from each run will be analyzed.
- A final report will be submitted no more than 45 days from the completion of inspection.
- Enbridge may provide specific reporting format.
- The unit of reporting is Metric.

## 4.3. Data Validation

- Enbridge shall supply an NPS 12 spool piece with anomalies within the specification of Explorer to inspect before and after the inspection. The data obtained will be included in the final report as validation of Explorer 10/14.

# 5. Contact Information


## Scott Chamourian
B.Eng
Solutions Manager
(416) 510-8588 ext 125
(647) 770-1830
schamourian@pipetelone.com

## Michael Kobelak
B.Eng
Solutions Manager
(416) 510-8588 ext 153
(647) 570-4588
mkobelak@pipetelone.com

## Eduard Usurelu
P.Eng M.Sc.
Manager, Inspection Solutions
(416) 510-8588 ext 114
(716) 239-5853
eusurelu@pipetelone.com

## Rod Lee
P.Eng, M.Sc. MBA
Director, Client Relations and Strategic Development
(416) 510-8588 ext 112
(716) 393-0594
rlee@pipetelone.com

www.pipetelone.com

# 6. Appendix A – Schematic of Pipeline


Figure 3 : Inspection schematic of the NPS 12 pipeline

# 7. Appendix B – Pipeline Features

- To be provided

# 8. Appendix C – Procedure

- To be provided

# 9. Appendix D - Inspection Cost

- The cost of inspecting this pipeline will follow the General Rate Schedule shown below.
- The cost shown includes all planning efforts prior to the inspection, execution of the inspection on site, data analysis and reporting for all inspected segments.
- Navigation of bell bell chill rings, mechanical couplings, or heavy welds could result in an extended inspection schedule and added wear and tear on Explorer. Pipetel reserves the rights to adjust this pricing structure should these features be present in the pipeline.
- Terms of payment is also described in the General Rate Schedule.

| | |
|---|---|
| Cost per Mobilization and Demobilization | $45,000 |
| Explorer Robotic Inspection<br>Cost per inspection<br>(Each inspection is from Stopple, cut-out, or charge point to another Stopple, cut-out or charge point)<br>Each inspection includes:<br>1. High resolution MFL inspection<br>2. Laser deformation sensor<br>3. High resolution video inspection | $70,000 |
| Contingency (while on site) | Cost per Launch |
| Inspection re-run | $50,000 |
| Failed run | $0 |
| Optional Insurance Coverage for Robot if Robot becomes permanently stranded in pipe up to $500,000 (recommended for high risk location where recovery of robot may be prohibitive) | $15,000 |
| Standby Rate | |
| Personnel standby rate per day per person | $2,000 |
| Equipment standby rate per day | $3,000 |
| Terms | |
| Non-refundable deposit due on reserving Explorer for inspection | 25% |
| Completion of site work | 35% |
| Issuance of final report | 40% |

| Inspection Cost for 2018 | |
|---|---|
| Cost per Mobilization and Demobilization | $45,000 |
| Number of Inspections | 3 |
| Inspection Costs | 3 x $70,000 = $210,000 |
| Total Cost | $255,000 |
| Total Cost with Optional Insurance | $255,000 + $15,000 = $270,000 |

Applicable sales taxes will be added to all invoices

ENBRIDGE GAS INC.

Undertaking Response to FRPO

[NOT MARKED]

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**Response:**

N/A

ENBRIDGE GAS INC.

Undertaking Response to FRPO

To provide examples -- and they can be done confidentiality-redacted for anything that is not public information -- examples of where the utility has actually incurred the costs that support the numbers that are seen in evidence.

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**Response:**

The information and assumptions detailed in the Company's response to Exhibit I.FRPO.25 has been relied upon since 2010 to estimate the high-level cost to repair a critical pipeline, make safe and re-light affected customers, in a scenario where a loss of containment requires pipeline isolation to complete repairs. The first use of this cost estimate was in relation to the Company's NPS 16 ST Anderson Road Replacement project in the City of Ottawa, where pipeline replacement was subsequently executed from Jan – Mar 2011.

For the Anderson Road Replacement project the Company estimated that it could cost approximately $38 million to repair the NPS 16 ST pipeline, make safe and re-light affected customers in a circumstance where a loss of containment required the isolation of the pipeline to facilitate the repairs on the impacted section of pipeline under winter conditions. For this Anderson Road replacement project, an isolation of the pipeline would have resulted in the interruption of gas supply to approximately 26,860 customers.

The assumptions used in the cost estimate regarding potential claims was based on actual damage data from two incidents (Innes Rd in Ottawa and Agincourt Mall in Toronto). Based on the information from those two incidents, the Company established the assumption that 75% of Commercial customers would file claims with an average claim cost of $5,000 per day.

For the purposes of establishing the current Project cost estimate of $54 million to repair, make safe, and re-light affected customers, the Company conservatively assumed that only approximately 40% of Commercial customers would file a claim.

As added context, in a recent summer conditions incident (June 2021) on the NPS 20 ST HP Lake Shore pipeline in Mississauga (a residential area) the Company isolated the pipeline to facilitate repairs and received 16 claims for a total of $33,539. As the total number of customers directly impacted by the isolation in this incident was 27 approximately 59% of impacted customers filed a claim at an average claim cost of $2,096 per day (combined residential and commercial). Considering that this incident occurred during summer conditions when impacts to customers would have been somewhat limited (winter incidents being expected to cause more severe impacts to a

greater number of customers) it is a strong indication of the reasonability of the Company's estimate in Exhibit B and response to FRPO's interrogatories.

ENBRIDGE GAS INC.

Undertaking Response to FRPO

To provide the number of catastrophic failures Enbridge has had in its history.

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**Response:**

In the context of accepting this undertaking the term “catastrophic failure” was defined as a full rupture of pipeline with the equivalent surface area of two full diameter exposed ends venting to atmosphere.

Enbridge Gas does not have a record of any such “catastrophic failure” event having occurred on any pipelines that are similar in nature to the St. Laurent pipeline system (NPS 12 or greater and 1,900 kPa or greater).

ENBRIDGE GAS INC.

Undertaking Response to FRPO

To provide a mock scenario for feeding Gazifère

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**Response:**

Mock emergency scenario exercises are completed annually across the company, including in the Eastern region (which includes Gazifère) together with relevant external stakeholders and agencies. Exercises validate the emergency management program and training, familiarize personnel with roles and responsibilities in the event of an emergency, practice the skills of emergency response, test procedures and protocols, identify opportunities to improve emergency plans, and develop working relationships with other emergency response organizations.

There is no specific study or report produced as a result of these exercises relating system-specific volumetric impacts to flows of gas feeding Gazifere, and/or customer outage estimates and impacts. Exercises were conducted for Ottawa and Gazifere in June 2019 and October 2021, but only in relation to emergency response by personnel and agencies.

ENBRIDGE GAS INC.

Undertaking Response to FRPO

To go back to find out what lengths of pipe that are .6 metres or less are not underneath the road.

---

**Response:**

Based on the results of the Company's Depth of Cover survey, there are no lengths of pipeline located underneath roadway with 0.6 m or less depth of cover.

ENBRIDGE GAS INC.

Undertaking Response to ED

To advise on who on the team is, the subject-matter expert on the topic of inline robotics, and particularly what their experience and qualifications are.

---

**Response:**

Enbridge Gas does not currently employ any subject matter experts in robotic in-line inspection ("ILI") technology. Instead, and consistent with many other natural gas utilities, the Company employs integrity engineers that are charged with maintaining a relationship with ILI service providers as well as a general knowledge of ILI technologies/capabilities, such as: what components are required to insert and remove the ILI tools from the Company's pipelines, and what hazards ILI tools can reliably detect within the Company's pipelines. Accordingly, it is typical practice for Enbridge Gas integrity engineers to leverage the expertise of ILI tool vendors, such as Pipetel, where required.

ENBRIDGE GAS INC.

Undertaking Response to ED

To confirm the date the decision was made not to proceed

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**Response:**

In case it was deemed to be a prudent course of action, the Company tentatively scheduled in-line inspection ("ILI") for the St. Laurent pipeline(s) for October 21, 2019, using the PipeTel crawler tool.

In November 2018, Enbridge Gas used the PipeTel ILI crawler tool on a section of the NPS 20 Lake Shore pipeline from Cherry St. to Bathurst St. in the City of Toronto. Importantly, there were significant similarities between the existing Cherry to Bathurst pipeline and the St. Laurent pipeline(s), most notably that they were both 1950s vintage steel pipelines located within densely populated urbanized environments with a history of failures and mounting integrity concerns. Ultimately the ILI completed on the Cherry to Bathurst pipeline confirmed the Company's expectations (which like the conclusions made on the St. Laurent pipeline(s) was based on a variety of inspections, surveys, historical records/studies, integrity digs and repairs) that the pipeline needed to be replaced. As a result, ratepayers bore the cost of both the ILI as well as the replacement.

With this recent experience with the Cherry to Bathurst pipeline in mind and based on the information set out within Exhibit B of its Application, the Company made the decision in March 2019 not to proceed with the ILI using the PipeTel crawler tool. Specifically, the Company determined that it was unnecessary to proceed with ILI as it expects that the results of the inspection would (like Cherry to Bathurst) only confirm what the Company already knows; that the St. Laurent pipeline(s) need to be replaced as soon as possible and that it is prudent to avoid the additional expense of approximately $1.364 million for the same ($614,000 for ILI + $750,000 for 3 estimated integrity digs resulting from the ILI).

ENBRIDGE GAS INC.

Undertaking Response to ED

To update Enbridge's analysis on whether robotic inline inspection would be inappropriate based on the latest specifications from PipeTel, in terms of battery life and other areas that would impact on the appropriateness of robotic inline inspection, from Enbridge's view.

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**Response:**

As requested, Enbridge Gas consulted with PipeTel following the Technical Conference regarding their latest specifications and the Company's conclusions regarding the appropriateness of robotic in-line inspection ("ILI") for the St. Laurent pipeline system.

PipeTel confirmed that based on the specifications for their latest commercially available tool technology, no substantial improvements have been made in battery life or signal technology that would result in Enbridge Gas drawing a different conclusion regarding the appropriateness of or requirements for (e.g., number of charging stations or antenna points) robotic ILI for the St. Laurent pipeline system.

ENBRIDGE GAS INC.

Undertaking Response to ED

To provide specifications that were provided by PipeTel that would have been used to analyze the appropriateness of robotic inline inspection, to the extent they can be found.

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**Response:**

Please see the response at Exhibit JT1.6.

ENBRIDGE GAS INC.

Undertaking Response to ED

To update table 13 to include both the abandonment costs and the ip pe costs, and that Enbridge include any caveats that it wishes about the appropriateness of the comparison, and the parties be left to debate the appropriateness at the hearing with the net present value figures provided by Enbridge.

---

**Response:**

An updated version of Table 13, including abandonment costs and the IP PE costs, is set out below:

Table 13: Comparison of Repair Option and Replace Option (Project) Costs Including Abandonment and IP PE Costs

| ($ millions) | Repair Option | Replace Option |
|---|---|---|
| Total Cost | $33.0 | $111.5 |
| Net Present Value | ($7.7) | ($91.2) |

**Note:**

Replace Option includes both the abandonment costs and the IP PE costs, etc.

The NPV impact for the abandonment cost is approximately ($6.9) million.

Total abandonment cost is approximately 10.3 million.

Please see the Company's Updated Application at Exhibit B, Tab 1, Schedule 1, pp. 44-45, paras. 64-68, for a description of how the costs were estimated over time for each of the original Repair Option and Replace Option included in the Company's evidence.

For the Repair Option, the reliability engineering analysis (AHI) was completed to project the expected number of leaks over a 40-year horizon based on corrosion failure data only (as discussed in Exhibit B, the existing pipeline(s) exhibit a variety of additional integrity concerns aside from corrosion). The repairs were assumed to be cut-outs that required a temporary bypass to be constructed to maintain gas supply downstream of the leak event. The Company determined the cost for cut outs based on St. Laurent Replacement Project (EB-2019-0006) Phase 2 actual costs for construction in a similar location.

These estimates are conservative as they do not consider any specific locational complexities/challenges associated with excavation required to complete the cut outs of the impacted pipeline section(s) despite the pipeline(s) being located primarily within roadway and in densely urban areas. The cost per cut-out was estimated to be $420,000, which was calculated by using an estimated cost of $350,000 plus 20%

contingency. This cost was multiplied by the leak projections per year and inflated at a rate of 2% per annum to determine the anticipated costs incurred each year between 2023-2062. The estimated costs were then discounted using methods prescribed in the OEB's E.B.O. 188, to arrive at an NPV.

It is also important to note that the Repair Option NPV calculated:

- does not include costs for any of the secondary impacts discussed in Exhibit B, Table 12 (e.g., the long term annual economic impacts to residents and local businesses resulting from nearly constant construction within roadways);
- assumes that each of the 40.9 corrosion and fitting leaks that will occur will not require large segments of pipeline to be replaced (which is not certain at this time and could drastically increase the cost of the Repair Option);
- does not include consideration of any non-corrosion related pipeline failures or loss of containment that could result from the remaining integrity concerns known to impact the St. Laurent pipeline system (as discussed at Exhibit B, Tab 1, Schedule 1, pp. 13-34), including but not limited to:
    - dents
    - deficient cathodic protection
    - coating degradation
    - latent third-party damages
    - manufacturing defects
    - poor internal fusion on seam welds and fittings
    - multiple field applied coatings
    - shallow depth of cover
    - unrestrained compression couplings
    - degradation due to stray current from hydro infrastructure and contaminated soils

In addition, given the known existing integrity concerns and the ongoing degradation of the existing 1958 vintage St. Laurent pipeline(s), continuing to manage pipeline failures and other integrity concerns in a reactive manner exposes ratepayers and the general public to an unacceptable level of risk. At a minimum, continuing to reactively repair the pipeline(s) means that the public is inconvenienced for nearly each repair as most of the pipeline(s) are located under roadway and would require lane closures, restricted access to local businesses and for residents. Security of supply may also be impacted as the St. Laurent pipeline system is a single-source network. Depending on the root cause of a pipeline failure event, pipeline operating pressures may need to be reduced, or the pipeline may have to be shutdown (please also see the *Consequences of a Failure* section at Exhibit B, Schedule 1, pp. 7-12).

The Company is required to ensure that it can continue to safely and reliably meet its obligation to serve the firm contractual demands of customers. As detailed in the Company's response to Exhibit I.STAFF.6:

> The St. Laurent pipeline is a vintage steel main located in a highly urbanized setting within the City of Ottawa, so any defect or failure that could release gas would require a significant emergency response and could have severe consequences and impacts making any such failure unacceptable.

Any pipeline failure/integrity event could also require isolation of the pipeline to facilitate repairs. If this were to occur on a 47 Degree Day (Peak Design Temperature), customer loss/outage could be up to 62,200, the cost would be approximately $54 million to resolve, and the health of customers experiencing outage without alternative sources of heating could suffer due to extreme temperatures (in the extreme, resulting in loss of life). Please also see the Company's Updated Application at Exhibit B, Tab 1, Schedule 1, para. 19 and Table 1 for additional details and discussion of these impacts.

ENBRIDGE GAS INC.

Undertaking Response to ED

To update table 13 to include the overall ILI's, the overall retrofits, abandonment costs and the IP pe cost, with any caveats or qualifications

---

**Response:**

An updated version of Table 13, including the overall ILI's, the overall retrofits required for ILI, abandonment costs and the IP PE costs, is set out below:

Table 13: Comparison of Repair Option and Replace Option (Project) Costs Including Abandonment

| ($ millions) | Repair Option | Replace Option |
|---|---|---|
| Total Cost | $63.8 | $111.5 |
| Net Present Value | ($33.9) | ($91.2) |

**Note:**
Replace Option includes both the abandonment costs and the IP PE costs, etc.
The NPV impact for the abandonment cost is approx. ($6.9) million.
Total abandonment cost is approx. 10.3 million.

The updated Table 13 for the Repair Option above includes the cost to complete the required retrofits to facilitate ILI for the entirety of the St. Laurent pipeline(s) and the cost to complete the subsequent first ILI of the pipeline. The updated Repair Option cost analysis in Table 13 only includes the integrity digs equivalent to the 40.9 projected (corrosion) leaks resulting from the AHI analysis. It does not include the additional integrity digs and repairs that would be driven by numerous pipeline anomalies expected to be identified through the ILI of the entire pipeline (please see the response at Exhibit JT1.15 for discussion of these additional integrity concerns/anomalies).

With regard to the Retrofit + Repair Option, the St. Laurent system would:

(i) Require an immediate capital outlay of not less than $30.2 million to retrofit for ILI (as discussed in Exhibit B);[1]

(ii) Expose ratepayers to ongoing repair costs that are not fully predictable at this time; and

[1] Exhibit B, Tab 1, Schedule 1, pp. 37-38, Tables 8 & 9.

(iii) Result in the accumulation of a great number of small segments being replaced over time until the pipeline is a patchwork of repair sleeves and joints. Each repair would have a different installation date/year that would need to be tracked and monitored and would present its own unique operational vulnerabilities compared to the proposed Project.

From a socio-economic and environmental perspective proceeding with the Retrofit + Repair Option would be extremely costly and disruptive to the public for many years to come as it would force the Company to complete multiple planned and unplanned (potentially even emergency) construction projects mostly within roadways rather than the single two-phased Project proposed. Further, once the retrofits and ILI are completed it is expected that, given its vintage and associated known integrity issues, the ILI assessment results would likely only confirm the systemic nature of the integrity concerns/anomalies described, or worse.

Based on the volume and severity of known integrity concerns set out in Exhibit B, and considering the Company's experience with similar vintage steel natural gas mains (e.g., the NPS 20 Cherry to Bathurst project as discussed in the response at Exhibit JT1.12), retrofitting the St. Laurent pipeline system for ILI is redundant and unnecessary as the ILI results will trigger immediate additional mitigative actions up to the full pipeline replacement that is the subject of the current Updated Application. Accordingly, any such mitigative action except for the full replacement would needlessly expose ratepayers to both increased risk of outage in the interim as well as a greater cost burden in the longer-term, having paid for both the proposed Project and ILI (at a cost totaling more than $150 million), this approach is not in the best interest of ratepayers or the general public.

The Company does not consider investment into retrofitting the existing pipelines with ILI-compatible fittings, valves, and filter components to be prudent or reasonable. For all the above stated reasons, the updated Repair Option cost analysis set out in Table 13 above are understated. The Company expects that the Retrofit + Repair Option will not be economic once all pipeline anomalies are addressed and will expose ratepayers to an unacceptable level of ongoing operational risk and uncertainty in the long-term compared to the proposed Replace Option (the Project) which establishes a firm end-date for the risk of outage at a known cost and in a manner that provides maximum certainty of effectiveness.

ENBRIDGE GAS INC.

Undertaking Response to ED

To provide an excel spreadsheet with how you arrive at the new table 13, breaking down the different components

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**Response:**

Please see Attachment 1.

Please also see the response at Exhibit I.ED.17, for a full breakdown of the components of the total cost figures in Table 13 for the Replace Option.

## DCF Analysis - 40 Year Horizon

### St. Laurent Repair Option

**Project Year ($000's)**

| | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Operating Cash Flow** | | | | | | | | | | |
| Revenue | - | - | - | - | - | - | - | - | - | - |
| Expenses: | | | | | | | | | | |
| O & M Expense | - | (700) | - | - | - | - | - | - | - | - |
| Municipal Tax | (47) | (48) | (48) | (49) | (50) | (51) | (52) | (53) | (54) | (55) |
| Income Tax | 12 | 198 | 13 | 13 | 13 | 14 | 14 | 14 | 14 | 15 |
| Net Operating Cash Flow | (34) | (549) | (36) | (36) | (37) | (38) | (38) | (39) | (40) | (40) |
| **Capital** | | | | | | | | | | |
| Incremental Capital | (27) | (30,230) | (34) | (38) | (43) | (48) | (55) | (62) | (69) | (78) |
| Change in Working Capital | - | - | - | - | - | - | - | - | - | - |
| Total Capital | (27) | (30,230) | (34) | (38) | (43) | (48) | (55) | (62) | (69) | (78) |
| **CCA Tax Shield** | | | | | | | | | | |
| CCA Tax Shield | 0.64 | 721.37 | 438.57 | 412.59 | 388.52 | 365.98 | 344.89 | 324.69 | 306.25 | 289.05 |
| **Net Present Value** | | | | | | | | | | |
| PV of Operating Cash Flow | (36) | (547) | (34) | (33) | (32) | (32) | (31) | (30) | (29) | (28) |
| PV of Capital | (28) | (30,122) | (32) | (35) | (38) | (41) | (44) | (47) | (51) | (55) |
| PV of CCA Tax Shield | 1 | 719 | 419 | 377 | 340 | 307 | 277 | 250 | 226 | 204 |
| Total NPV by Year | (63) | (29,951) | 352 | 309 | 270 | 235 | 203 | 173 | 145 | 120 |

**Project NPV** **(33,917)**

| 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| (56) | (57) | (58) | (59) | (60) | (61) | (62) | (63) | (64) | (66) | (67) | (68) | (69) | (70) | (72) | (73) | (74) |
| 15 | 15 | 15 | 16 | 16 | 16 | 16 | 17 | 17 | 17 | 18 | 18 | 18 | 19 | 19 | 19 | 20 |
| (41) | (42) | (43) | (43) | (44) | (45) | (46) | (47) | (47) | (48) | (49) | (50) | (51) | (52) | (53) | (54) | (55) |
| (88) | (100) | (112) | (127) | (143) | (161) | (182) | (205) | (232) | (261) | (295) | (333) | (376) | (424) | (479) | (541) | (611) |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| (88) | (100) | (112) | (127) | (143) | (161) | (182) | (205) | (232) | (261) | (295) | (333) | (376) | (424) | (479) | (541) | (611) |
| 273.03 | 258.14 | 244.34 | 231.58 | 219.83 | 209.05 | 199.24 | 190.36 | 182.41 | 175.39 | 169.29 | 164.13 | 159.91 | 156.68 | 154.46 | 153.30 | 153.26 |
| (28) | (27) | (26) | (26) | (25) | (24) | (24) | (23) | (23) | (22) | (22) | (21) | (21) | (20) | (20) | (19) | (19) |
| (60) | (65) | (70) | (75) | (81) | (88) | (95) | (103) | (111) | (120) | (130) | (140) | (152) | (164) | (178) | (192) | (208) |
| 185 | 167 | 152 | 138 | 125 | 114 | 104 | 95 | 88 | 81 | 75 | 69 | 65 | 61 | 57 | 54 | 52 |
| 97 | 76 | 56 | 37 | 19 | 2 | (15) | (31) | (46) | (62) | (77) | (92) | (108) | (124) | (140) | (157) | (174) |

| 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | |
| (76) | (77) | (78) | (80) | (81) | (83) | (84) | (86) | (87) | (89) | (90) | (92) | (94) | (95) | (97) | - |
| 20 | 20 | 21 | 21 | 22 | 22 | 22 | 23 | 23 | 24 | 24 | 24 | 25 | 25 | 26 | - |
| (56) | (57) | (58) | (59) | (60) | (61) | (62) | (63) | (64) | (65) | (66) | (68) | (69) | (70) | (71) | |
| (690) | (779) | (879) | (993) | (1,122) | (1,267) | (1,431) | (1,617) | (1,827) | (2,064) | (2,332) | (2,634) | (2,977) | (3,363) | (3,801) | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | |
| (690) | (779) | (879) | (993) | (1,122) | (1,267) | (1,431) | (1,617) | (1,827) | (2,064) | (2,332) | (2,634) | (2,977) | (3,363) | (3,801) | - |
| 154.40 | 156.81 | 160.59 | 165.84 | 172.70 | 181.33 | 191.91 | 204.63 | 219.72 | 237.47 | 258.16 | 282.15 | 309.83 | 341.64 | 4,088.75 | |
| (18) | (18) | (17) | (17) | (16) | (16) | (16) | (15) | (15) | (14) | (14) | (14) | (13) | (13) | (13) | - |
| (225) | (243) | (263) | (285) | (308) | (333) | (360) | (390) | (422) | (457) | (494) | (535) | (579) | (627) | (679) | - |
| 50 | 49 | 48 | 48 | 47 | 48 | 48 | 49 | 51 | 53 | 55 | 57 | 60 | 64 | 730 | - |
| (193) | (212) | (232) | (254) | (277) | (301) | (328) | (356) | (386) | (419) | (454) | (491) | (532) | (576) | 39 | - |

**DCF Analysis - 40 Year Horizon**

**St. Laurent Replace Option**
**InService Date: Dec 31 - 2023**
**Project Year ($000's)**

| | 2019-2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Operating Cash Flow** | | | | | | | | | | |
| Revenue | - | - | - | - | - | - | - | - | - | - |
| Expenses: | | | | | | | | | | |
| O & M Expense | - | - | - | - | - | - | - | - | - | - |
| Municipal Tax | - | - | (74) | (76) | (77) | (78) | (80) | (81) | (83) | (84) |
| Income Tax | - | - | 20 | 20 | 20 | 21 | 21 | 22 | 22 | 22 |
| Net Operating Cash Flow | - | - | (55) | (56) | (57) | (58) | (59) | (60) | (61) | (62) |
| **Capital** | | | | | | | | | | |
| Incremental Capital | (1,524) | (70,093) | (28,757) | (11,098) | - | - | - | - | - | - |
| Change in Working Capital | - | - | - | - | - | - | - | - | - | - |
| Total Capital | (1,524) | (70,093) | (28,757) | (11,098) | - | - | - | - | - | - |
| **CCA Tax Shield** | | | | | | | | | | |
| CCA Tax Shield | - | 1,669 | 1,713 | 4,128 | 1,306 | 1,227 | 1,154 | 1,084 | 1,019 | 958 |
| **Net Present Value** | | | | | | | | | | |
| PV of Operating Cash Flow | | | (52) | (51) | (50) | (48) | (47) | (46) | (45) | (44) |
| PV of Capital | (1,632) | (69,219) | (27,448) | (10,147) | - | - | - | - | - | - |
| PV of CCA Tax Shield | - | 1,648 | 1,635 | 3,774 | 1,144 | 1,030 | 927 | 835 | 752 | 677 |
| Total NPV by Year | (1,632) | (67,571) | (25,865) | (6,423) | 1,094 | 981 | 880 | 789 | 707 | 633 |

**Project NPV** **(91,231)**

| 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| (86) | (87) | (89) | (90) | (92) | (94) | (95) | (97) | (99) | (101) | (102) | (104) | (106) | (108) |
| 23 | 23 | 24 | 24 | 24 | 25 | 25 | 26 | 26 | 27 | 27 | 28 | 28 | 29 |
| (63) | (64) | (65) | (66) | (68) | (69) | (70) | (71) | (73) | (74) | (75) | (77) | (78) | (79) |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 901 | 847 | 796 | 748 | 703 | 661 | 621 | 584 | 549 | 516 | 485 | 456 | 429 | 403 |
| (43) | (42) | (40) | (39) | (39) | (38) | (37) | (36) | (35) | (34) | (33) | (32) | (31) | (31) |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 610 | 549 | 494 | 445 | 401 | 361 | 325 | 293 | 263 | 237 | 214 | 192 | 173 | 156 |
| 567 | 507 | 454 | 406 | 362 | 323 | 288 | 257 | 229 | 203 | 180 | 160 | 142 | 125 |

| 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| (110) | (112) | (114) | (116) | (118) | (120) | (122) | (125) | (127) | (129) | (131) | (134) | (136) | (139) | (141) | (144) | (146) | (149) |
| 29 | 30 | 30 | 31 | 31 | 32 | 32 | 33 | 34 | 34 | 35 | 35 | 36 | 37 | 37 | 38 | 39 | 39 |
| (81) | (82) | (84) | (85) | (87) | (88) | (90) | (92) | (93) | (95) | (97) | (98) | (100) | (102) | (104) | (106) | (107) | (109) |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 379 | 356 | 335 | 315 | 296 | 278 | 261 | 246 | 231 | 217 | 204 | 192 | 180 | 169 | 159 | 150 | 141 | 1,329 |
| (30) | (29) | (28) | (28) | (27) | (26) | (26) | (25) | (24) | (24) | (23) | (23) | (22) | (22) | (21) | (21) | (20) | (20) |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 140 | 126 | 114 | 103 | 92 | 83 | 75 | 67 | 61 | 55 | 49 | 44 | 40 | 36 | 32 | 29 | 26 | 237 |
| 110 | 97 | 85 | 75 | 65 | 57 | 49 | 42 | 36 | 31 | 26 | 22 | 18 | 14 | 11 | 9 | 6 | 218 |

ENBRIDGE GAS INC.

Undertaking Response to ED

To provide a specific estimate -- although it can be a high-level estimate -- of the cost savings from downsizing from a NPS 16 to a NPS 12.

---

**Response:**

As previously stated in the Company's pre-filed evidence and Interrogatory Responses, Enbridge Gas has applied to the OEB for an order granting leave to construct the Project recognizing the current condition and ongoing degradation of the St. Laurent pipeline system and the corresponding unacceptable level of risk to ratepayers and the public of system failure. The Project is not designed to serve any future growth in natural gas demands, but rather to ensure that the Company can continue to meet its obligation to serve the firm contractual needs of its existing customers under peak design conditions.

As a result, based on its OEB-approved demand forecasting methodology and current contractual customer commitments, it is not appropriate to seek to downsize the proposed NPS 16 to NPS 12 as doing so would inhibit the Company's ability to meet its firm contractual obligations to natural gas customers who only just experienced conditions nearly as extreme as design conditions for this system.[1]

However, in an effort to be as responsive as possible and for illustrative purposes only, the Company has provided a high-level estimate of the savings that could occur from downsizing the NPS 16 section of pipeline to NPS 12 in Table 1. The estimated costs in Table 1 are based on the following assumptions:

- Material costs;[2]
- Trenching – 3-5% savings resulting from reducing trench size to 12-inch;
- Similar labour and equipment costs; and
- Identical drilling costs.

[1] Please see the response at Exhibit I.M.1.PP.1
[2] Based on quotes received from suppliers.

Table 1

| Item | Quantity | Difference | Actual | Total |
|---|---|---|---|---|
| **Pipe** | 2772 | 67.50 | | 187,110.00 |
| **Fittings** | | | | |
| EL 45 | 5 | 729.00 | | 3,645.00 |
| EL 90 | 25 | 1,526.00 | | 38,150.00 |
| 16 x 12 Reducer | 3 | | 555.00 | 1,665.00 |
| 3WT | 1 | 60,765.90 | | 60,765.90 |
| Cap | 12 | 90.00 | | 1,080.00 |
| **Trenching Savings** | 5% | | 20,000,000.00 | 1,000,000.00 |
| **Total** | | | | $ 1,292,415.90 |

It is important to note that when calculating the savings created by trenching an NPS 12 compared to a NPS 16, a range was provided of 3-5%. Enbridge Gas used 5% in the calculations set out in Table 1. If the calculation were re-run with the existing NPS 16 crossing HWY 417 remaining in the proposed project design and using the 3% savings from trenching, the estimated total savings for downsizing the pipeline to NPS 12 would be approximately $892,415.

ENBRIDGE GAS INC.

Undertaking Response to ED

To provide a response to ED 21 based on cubic metres per hour

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**Response:**

Please see Table 1 below for the information requested by ED in Exhibit I.M.1.ED.21. As stated in the Company's initial response to Exhibit I.M.1.ED.21 (filed February 22, 2022), annual demand ($m^3$) and design day demand ($m^3/d$) are not incorporated into distribution system modelling. There is no direct correlation between annual demand ($m^3$), design day demand ($m^3/d$), and peak hour demand ($m^3/hr$) as each are highly dependent on temperature and individual customer demand profiles through the respective periods. For these reasons, the Company respectfully declines to calculate a ratio of annual demand to design day demand.

Table 1

| 2021/2022 | Annual Demand ($m^3$) | Design Day Demand ($m^3/h$) |
|---|---|---|
| EGD | 11,630,241,595 | 5,391,911 |
| Union North West | 413,859,289 | 217,658 |
| Union North East | 1,102,049,948 | 481,862 |
| Union South | 5,837,971,625 | 2,525,408 |
| **2022/2023** | | |
| EGD | 11,738,607,591 | 5,475,684 |
| Union North West | 414,813,549 | 218,178 |
| Union North East | 1,105,084,916 | 487,711 |
| Union South | 5,889,444,853 | 2,584,211 |
| **2023/2024** | | |
| EGD | 11,826,335,656 | 5,496,197 |
| Union North West | 417,862,360 | 228,502 |
| Union North East | 1,112,613,711 | 486,455 |
| Union South | 5,944,678,840 | 2,634,816 |
| **2024/2025** | | |
| EGD | 11,828,617,856 | 5,523,910 |
| Union North West | 417,182,388 | 228,954 |
| Union North East | 1,110,942,838 | 489,470 |
| Union South | 5,953,351,053 | 2,649,169 |
| **2025/2026** | | |
| EGD | 11,899,200,490 | 5,557,987 |
| Union North West | 418,497,201 | 228,175 |
| Union North East | 1,114,201,841 | 489,042 |
| Union South | 5,982,094,566 | 2,644,499 |

Notes:

a. Annual Demand is sourced from the Gas Supply Plan[1]
b. Conversion from TJ to $m^3$ for Annual Demand was done using the following:
    i. EGD Rate Zone 38.85 GJ/$10^3m^3$
    ii. EGD Rate Zone 38.71 GJ/$10^3m^3$
    iii. EGD Rate Zone 39.32 GJ/$10^3m^3$
c. Peak Hour Demand in $m^3/hr$ is calculated at design conditions of design temperature and interruptible customers off.

[1] EB-2022-0072, p. 24

ENBRIDGE GAS INC.

Undertaking Response to FRPO

For the valve leaks discovered February 17th, 2022, to confirm how the leaks was determined, and the supporting evidence

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**Response:**

The valve leaks were identified as a result of the Company's annual and biennial valve inspection program (annual inspection on Valve GL0494 on February 17, 2022; and biennial inspection on Valve GL0353/GL0434 on February 8, 2022). The detailed reports completed for these leaks are set out below:

**Valve GL0494**

On Feb 17, 2022 at 11:21 am from our valve inspection program with an annual inspection frequency WO 34287184 Valve# GL0494 - ON: St Laurent Blvd, 109.5m N/FH | AT: St Laurent Blvd, 15.9m W/FH was leaking and unable to take accurate reading due to rain.

WO 34521865 Leak Confirmation was created and completed Feb 17, 2022 at 12:21 pm comment Gas bubbling from box for valve GL0494, unable to get accurate readings because of rain and water. Supervisors advised

WO 34521902 was created for repair on Feb 17, 2022 and completed Feb 22, 2022

WO 34522598 Leak Monitoring created on March 4 and completed March 7, 2022 with the comment 7% LEL in valve box. May be saturation, repairs were already made

WO 34597059 Leak Monitoring created March 7, 2022

**Valve GL0353/GL0434**

On Feb 8, 2022 at 1:22 pm AR&I Valves with Biennial Inspection Frequency WO 34295323 Valve# GL0353 - ON: 456 Tremblay Rd, 25.0m N/NBL | AT: 456 Tremblay Rd, 5.0m E/WBL 15% VOLUME DETECTED IN BOX, NO MIGRATION. SUSPECTED GREASE PORT ON GEAR VALVE.

WO 34477719 Leak Confirmation on Valve GL0353 was created and completed Feb 8, 2022 - VALVE GL0353 - LEAKING IN BOX, NO MIGRATION. SUSPECT GREASE STEM PORT ON VALVE.

WO 34481173 Leak Monitoring 458 Tremblay created Feb 9, 2022 and completed Feb 23, 2022 Original reading was 45% gas, vented valve box and reading held at 17% gas. No spread.

WO 34558076 Valve Repair created Feb 25, 2022 9:13 am THIS VALVE WAS REPORTD AS LEAKING IN ERROR. WRONG NUMBER. DID REQUIRE CLEANOUT. KEYED,TURNED,0 LEL. NEW LEAK CREATED FOR CORRECT VALVE.

WO 34585104 Leak Confirmation – Valve GL0434 458 TREMBLAY RD , OTTAWA created March 3, 2022 at 10:54 am VALVE LEAKING FROM STEM. WILL TRY TO GREASE TO STOP LEAK. SEE REPAIR WO.

WO 34585142 Valve Repair created March 3, 2022 11:01 am and completed March 3, 2022 2:28 pm REPLACED GREASE STEM, GREASED,TURNED,GREASED. VALVE NO LONGER LEAKING FROM STEM.

WO 34542589 Leak Monitoring created Feb 23, 2022 and completed March 7, 2022 0.4% LEL may be saturation

WO 34597090 Leak Monitoring for Valve GL0434 created March 7, 2022

While an initial inspection was completed on Valve GL0353 where gas was detected in the valve box, the actual leak was confirmed to be on Valve GL0434 due to the proximity of the two valves (leaking gas was migrating).

ENBRIDGE GAS INC.

Undertaking Response to PP

To file a written plan, and include a version date

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**Response:**

Attachment 1 to this response, contains Enbridge Gas's latest proposed construction schedule to meet a Phase 3 in-service date of December 2022. Attachment 1 also includes additional detail regarding: number of construction crews and their approximate work locations; and anticipated dates for construction activities deemed critical to meeting a 2022 Project in-service date. This schedule will be updated or confirmed once the OEB renders a decision regarding the current Application.

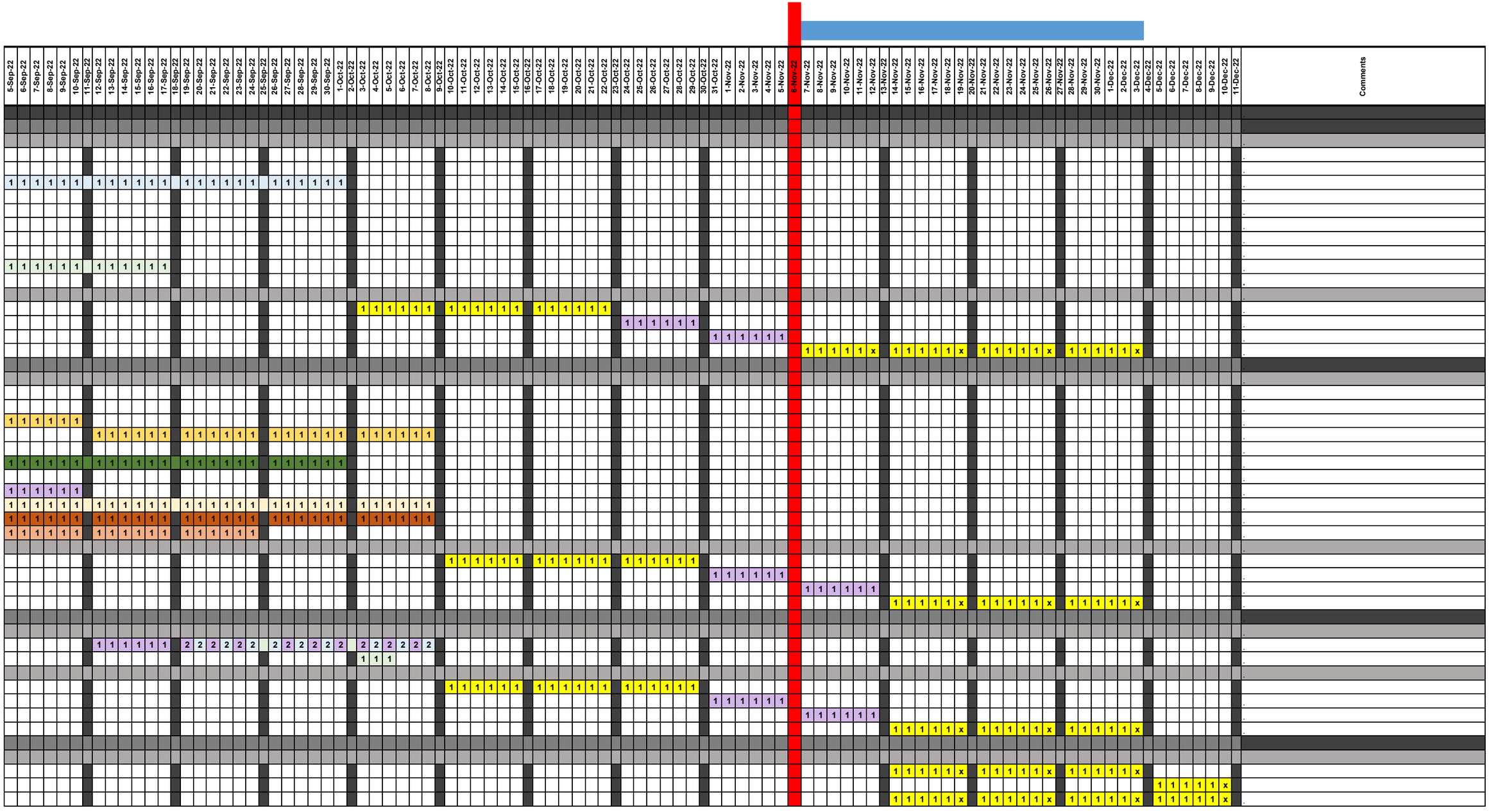
The Company's latest construction schedule assumes that the OEB will approve the Company's Application and all required permits will granted (for Phase 3) for a construction start date of June 1, 2022. Enbridge Gas has reviewed the construction schedule weekly since late February 2022 to ensure all underlying assumptions remain valid and most recently validated all assumptions on March 3, 2022.

Saint Laurent 2022 - Draft Schedule
Planned Start

ST Crew (1) - OC 16 | ST Crew (2) - OC 16 | ST Crew (3) - OC 12 | ST Crew (4) - OC 12 | ST Crew (5) - OC 12 | ST Crew (6) - OC 12 | ST Crew (7) - Rock HDD | ST Crew (8) - 100T HDD | PL Crew (1) - Main | PL Crew (2) - SRV ABN | ST Crew (3) - Main | ST Crew (4) - SRV ABN | ST Crew (5) - Main | ST Crew (6) - SRV ABN

| Task # | Description |
|---|---|
| 21 | STEEL INSTALLATION |
| 22 | Section 1 - 16" STEEL |
| 23 | Section 1 - Install |
| 24 | OC transpo station to St Laurent Blvd |
| 25 | Across St Laurent to Shore St |
| 26 | Shore St to CN railway |
| 31 | CN railway to 1424 Micheal St |
| 33 | 1424 Michael St to 1328 Michael St |
| 37 | Drill shot under 417 |
| 39 | Labelle Street |
| 40 | Cyrville Road & Cummings Ave |
| 41 | Cumming Ave (Cyrville to Ogilvie Rd) |
| 42 | Ogilvie Rd & Cummings Ave |
| 44 | Section 1 - Tie in/test/cleanup |
| 45 | Pigging & Hydrotest & Drying |
| 46 | Final tie at OC transpo district station |
| 47 | Final tie at Ogilvie & Cumming Reducer |
| 48 | Cleanup |
| 49 | SECTION 2 - 12" STEEL |
| 50 | Section 2 - Install |
| 52 | Cumming Ave - Offset to Donald St |
| 54 | Donald St intersection |
| 55 | Cumming Ave - Donald St to Montreal Rd |
| 63 | Montreal Rd - Cummings Ave to Brittany Dr |
| 64 | Brittany Dr - Montreal Rd to St Laurent Blvd |
| 69 | St Laurent Blvd - Brittany Dr to Hemlock Rd |
| 71 | Across Hemlock Rd on St Laurent Blvd |
| 72 | St Laurent Blvd - Hemlock Rd to Sandridge Ave |
| 79 | Sandridge Road - St Laurent Blvd to Birch Ave |
| 80 | Across Birch Ave on Sandridge |
| 81 | Sandridge Raod - Birch Ave to End Cap |
| 83 | Section 2 - Tie in/test/cleanup |
| 84 | Pigging & Hydrotest & Drying |
| 85 | Final tie at Ogilvie & Cumming Reducer |
| 86 | Final tie at Sandridge |
| 87 | Cleanup |
| 88 | SECTION 3 - 6" STEEL |
| 89 | Section 3 Install |
| 90 | Montreal Rd - Station 6B768 to Brittany |
| 91 | Offset to Middle of Road |
| 92 | Section 3 - Tie in/test/cleanup |
| 93 | Hydrotest |
| 94 | Final tie in at Station 6B769 |
| 95 | Final tie in at Brittany on Montreal Rd |
| 96 | Cleanup (asphalt restoration) |
| 97 | FINALIZE STEEL |
| 98 | Finalization |
| 99 | MRR Conditioning (Odourization) |
| 100 | Energization & Commissioning |
| 101 | Clear up & demobilization |

29-May-22 | 30-May-22 | 31-May-22 | 1-Jun-22 | 2-Jun-22 | 3-Jun-22 | 4-Jun-22 | 5-Jun-22 | 6-Jun-22 | 7-Jun-22 | 8-Jun-22 | 9-Jun-22 | 10-Jun-22 | 11-Jun-22 | 12-Jun-22 | 13-Jun-22 | 14-Jun-22 | 15-Jun-22 | 16-Jun-22 | 17-Jun-22 | 18-Jun-22 | 19-Jun-22 | 20-Jun-22 | 21-Jun-22 | 22-Jun-22 | 23-Jun-22 | 24-Jun-22 | 25-Jun-22 | 26-Jun-22 | 27-Jun-22 | 28-Jun-22 | 29-Jun-22 | 30-Jun-22 | 1-Jul-22 | 2-Jul-22 | 3-Jul-22 | 4-Jul-22 | 5-Jul-22 | 6-Jul-22 | 7-Jul-22 | 8-Jul-22 | 9-Jul-22 | 10-Jul-22 | 11-Jul-22 | 12-Jul-22 | 13-Jul-22 | 14-Jul-22 | 15-Jul-22 | 16-Jul-22 | 17-Jul-22 | 18-Jul-22 | 19-Jul-22 | 20-Jul-22 | 21-Jul-22 | 22-Jul-22 | 23-Jul-22 | 24-Jul-22 | 25-Jul-22 | 26-Jul-22 | 27-Jul-22 | 28-Jul-22 | 29-Jul-22 | 30-Jul-22 | 31-Jul-22 | 1-Aug-22 | 2-Aug-22 | 3-Aug-22 | 4-Aug-22 | 5-Aug-22 | 6-Aug-22 | 7-Aug-22 | 8-Aug-22 | 9-Aug-22 | 10-Aug-22 | 11-Aug-22 | 12-Aug-22 | 13-Aug-22 | 14-Aug-22 | 15-Aug-22 | 16-Aug-22 | 17-Aug-22 | 18-Aug-22 | 19-Aug-22 | 20-Aug-22 | 21-Aug-22 | 22-Aug-22 | 23-Aug-22 | 24-Aug-22 | 25-Aug-22 | 26-Aug-22 | 27-Aug-22 | 28-Aug-22 | 29-Aug-22 | 30-Aug-22 | 31-Aug-22 | 1-Sep-22 | 2-Sep-22 | 3-Sep-22 | 4-Sep-22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Comments

Saint Laurent 2022 - Draft Schedule
Planned Start

ST Crew (1) - OC 16 | ST Crew (3) - OC 12 | ST Crew (5) - OC 12 | ST Crew (7) - Rock HDD | PL Crew (1) - Main | ST Crew (3) - Main | ST Crew (5) - Main
ST Crew (2) - OC 16 | ST Crew (4) - OC 12 | ST Crew (6) - OC 12 | ST Crew (8) - 100T HDD | PL Crew (2) - SRV ABN | ST Crew (4) - SRV ABN | ST Crew (6) - SRV ABN

| Task # | Description |
|---|---|
| 102 | PLASTIC INSTALLATION |
| 103 | St Laurent to Sandridge |
| 104 | S1 - 6" PE Install |
| 105 | St Laurent Blvd - Montreal Rd to Hemlock Rd |
| 109 | St Laurent Blvd - Hemlock Rd to Jeffery Ave |
| 113 | S2 - 4" PE Install |
| 114 | St Laurent Blvd - Jeffery Ave to Sandridge |
| 117 | Sandridge Road - St Laurent Blvd to Birch Ave |
| 119 | S3 - 2" PE Install |
| 120 | Finter Street |
| 121 | Sandridge Road - Birch Ave to Lakeway Drive |
| 122 | S4 - Services & Abandonment |
| 123 | St Laurent Blvd - Montreal Rd to Hemlock Rd |
| 124 | St Laurent Blvd - Hemlock Rd to Jeffery Ave |
| 125 | St Laurent Blvd - Jeffery Ave to Sandridge |
| 126 | Finter Street |
| 127 | Sandridge Road - St Laurent Blvd to Birch Ave |
| 128 | Sandridge Road - Birch Ave to Lakeway Drive |
| 129 | S6 - Final Tie & Clean Up |
| 130 | Cleanup (asphalt restoration) |
| 131 | Coventry Rd |
| 132 | S1 - 6" PE Install |
| 133 | Convetry Road - 400 Coventry Rd to St Laurent Blvd |
| 140 | St Laurent Intersection |
| 141 | Ogilvie Road - St Laurent Blvd to Cummings |
| 143 | S4 - Services & Abandonment |
| 144 | Convetry Road - 400 Coventry Rd to St Laurent Blvd |
| 145 | Ogilvie Road - St Laurent Blvd to Cummings |
| 146 | S6 - Final Tie & Clean Up |
| 147 | Cleanup (asphalt restoration) |
| 148 | Montreal to Sandridge Rd |
| 149 | S1 - 6" PE Install |
| 150 | St Laurent Blvd |
| 153 | S4 - Services & Abandonment |
| 154 | St Laurent Blvd |
| 155 | S6 - Final Tie & Clean Up |
| 156 | Cleanup (asphalt restoration) |

29-May-22 | 30-May-22 | 31-May-22 | 1-Jun-22 | 2-Jun-22 | 3-Jun-22 | 4-Jun-22 | 5-Jun-22 | 6-Jun-22 | 7-Jun-22 | 8-Jun-22 | 9-Jun-22 | 10-Jun-22 | 11-Jun-22 | 12-Jun-22 | 13-Jun-22 | 14-Jun-22 | 15-Jun-22 | 16-Jun-22 | 17-Jun-22 | 18-Jun-22 | 19-Jun-22 | 20-Jun-22 | 21-Jun-22 | 22-Jun-22 | 23-Jun-22 | 24-Jun-22 | 25-Jun-22 | 26-Jun-22 | 27-Jun-22 | 28-Jun-22 | 29-Jun-22 | 30-Jun-22 | 1-Jul-22 | 2-Jul-22 | 3-Jul-22 | 4-Jul-22 | 5-Jul-22 | 6-Jul-22 | 7-Jul-22 | 8-Jul-22 | 9-Jul-22 | 10-Jul-22 | 11-Jul-22 | 12-Jul-22 | 13-Jul-22 | 14-Jul-22 | 15-Jul-22 | 16-Jul-22 | 17-Jul-22 | 18-Jul-22 | 19-Jul-22 | 20-Jul-22 | 21-Jul-22 | 22-Jul-22 | 23-Jul-22 | 24-Jul-22 | 25-Jul-22 | 26-Jul-22 | 27-Jul-22 | 28-Jul-22 | 29-Jul-22 | 30-Jul-22 | 31-Jul-22 | 1-Aug-22 | 2-Aug-22 | 3-Aug-22 | 4-Aug-22 | 5-Aug-22 | 6-Aug-22 | 7-Aug-22 | 8-Aug-22 | 9-Aug-22 | 10-Aug-22 | 11-Aug-22 | 12-Aug-22 | 13-Aug-22 | 14-Aug-22 | 15-Aug-22 | 16-Aug-22 | 17-Aug-22 | 18-Aug-22 | 19-Aug-22 | 20-Aug-22 | 21-Aug-22 | 22-Aug-22 | 23-Aug-22 | 24-Aug-22 | 25-Aug-22 | 26-Aug-22 | 27-Aug-22 | 28-Aug-22 | 29-Aug-22 | 30-Aug-22 | 31-Aug-22 | 1-Sep-22 | 2-Sep-22 | 3-Sep-22 | 4-Sep-22


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Comments

ENBRIDGE GAS INC.

Undertaking Response to FRPO

To provide a round number of a percentage increase for winter construction

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**Response:**

Winter construction (occurring from January to the end of March) requires construction contractors to take into consideration a variety of unique variables that could impact construction productivity, including but not limited to:

- frost,
- shorter days,
- hoarding and heating required for coating of weld joints,
- slower production rate,
- clearing of snow, and
- temporary reinstatement.

These variables impact each project and contractor differently so the Company cannot provide a specific winter construction cost premium. However, in the Company's experience winter construction can be expected to result in approximately a 25% - 30% increase in overall project costs.

ENBRIDGE GAS INC.

Undertaking Response to PP

To clarify the derivation of the 47 HDD

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**Response:**

The Company's current Peak Gas Day Design Criteria (PGDDC) utilizes multi-peaks and a 1 in 5 recurrence intervals. This approach was approved by the OEB in its EB-2011-0354 Decision and Order.

In responding to this undertaking, Enbridge Gas discovered that the Planning Design Criteria that was used for the Eastern Region should have been 48.2 HDD (as approved in EB-2011-0354) rather than 47 HDD.

Although modelled demands would increase if 48.2 HDD were used, there is no impact to Project need or scope as the difference is not material.

ENBRIDGE GAS INC.

Undertaking Response to PP

To explain why the posterity report dated July 31, 2021 was not filed with the Enbridge evidence dated September 13, 2021; to provide a copy of the scope of work, if executed, and if not, to explain why not

---

**Response:**

As Enbridge Gas worked to resolve the matters causing the OEB to place the original Project Application into abeyance, the Company was also awaiting a Decision and Order from the OEB on its Integrated Resource Planning ("IRP") Proposal. Given that the OEB's Decision and Order on the IRP Proposal could have impacted the Project, Enbridge Gas engaged the Posterity Group ("Posterity") to review the potential of meeting the needs of the Project with an Integrated Resource Planning alternative ("IRPA") in July 2021 (please see the scope of work established for these purposes at Attachment 1 to this response).

Following its engagement of Posterity, and as noted in Exhibit B, the OEB issued its Decision and Order on Enbridge Gas's IRP Proposal on July 22, 2021. Following receipt of this Decision, Enbridge Gas applied the OEB-approved Binary Screening Criteria to the Project and determined that it was not appropriate or necessary to conduct further IRP assessment, as the Project is driven by integrity concerns that must be addressed within three years and no demand or supply side solution can resolve the integrity concerns. As a result, there was no need to include any IRP-related evidence as part of its Updated Application filed with the OEB on September 10, 2021.

POSTERITY GROUP

# **Scoping Document:** St. Laurent LTC Support

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Date: July 8, 2021

Suzette Mills, Scott Hicks
Enbridge Gas Inc.
500 Consumers Road
North York, M2J 1P8

Posterity Group
140 Yonge Street, Unit 200
Toronto, ON M5C 6S3

POSTERITY GROUP

# Contents

POSTERITY GROUP

# 1 Background and Objectives

**Context**

Enbridge Gas Inc. (EGI) has several leave to construct (LTC) applications planned for 2021, including the St. Laurent application which is currently awaiting decision from the Ontario Energy Board. To support integrated resource planning alternatives (IRPA) analysis for these LTC applications, EGI requires an IRPA specific model and dataset that can be easily scaled to produce outputs specific to each LTC sub-region.

**Priorities for Posterity Group's Support**

- ✓ Cost-effectively combine and modify relevant information and assumptions from the APS and ETSA datasets to develop a basic IRPA specific model and dataset that can be used to support high-level IRPA analysis for LTC applications.
- ✓ Develop scaled version of IRPA model to support St. Laurent LTC analysis.

# 2 Support Activities

**The first two work packages are focused on developing a basic IRPA specific model and dataset to support the St. Laurent LTC analysis.**

***Work Package 1 - Develop basic IRPA specific model and dataset.***

*Value and outcomes for Enbridge:*

- The model's dataset will allow EGI to estimate how energy efficiency and demand response could impact peak-hour and peak-day in different locations, the cost of acquiring these impacts, and over what timeframe.
- Having a dataset and model with pre-established assumptions and measures, including IRPA specific measures (e.g., early replacement and demand response), will allow EGI to undertake IRPA analysis more easily and more quickly for specific LTC applications.

We understand the following information and assumptions should be included in the IRPA model:

*Reference Case*

- The updated ETSA reference case should be used instead of the APS reference case; the reference case for the ETSA project was calibrated to weather adjusted 2019 consumption and also aligns with the company's 2020 forecasts of sales volumes and customer accounts by segment.

*Reference Case Structure and Assumptions*

- Maintain sector disaggregation developed for DSM analysis.
- Maintain geographic account mapping.
- Maintain industrial and large volume segment re-mapping.
- Disaggregate 'contract' customers (but further rate-class level details are not required).

*Achievable Potential Analysis / Budget Assumptions*

- Develop participation rates for ScB using updated theoretical payback and diffusion curve assumptions; this scenario assumes no budget cap and full incremental project costs being covered by utility incentives.

*IRPA Specific Measures and Screening Approaches*

- Include previously developed residential demand response measure.
- Maintain the same set of assumptions, by sector, for measures that results in consumption savings and daily peak savings, but are assumed to have negligible peak hour savings (e.g., adaptive thermostat)
- Maintain TRC 1.0 threshold

*Measure Input Assumptions*

- 'Residential Home Energy Reports', 'Commercial Education Capacity Building' measures should remain disabled in the model.
- Measures removed due to being categorized as 'not applicable' should remain disabled in the model.
- Maintain measures updated to reflect EGI historic experience and current TRM assumptions.
- Maintain measures that were modified to reflect known changes to performance standards.

*Activities:*

- Combine and modify relevant existing information and assumptions to develop IRPA model
- Run model to develop IRPA outputs and QC model outputs
- Post outputs to Excel

***Work Package 2 – Scale Down IRPA Model to Support St. Laurent LTC***

*Value and outcomes for Enbridge:*

- Scaling the IRPA model to support specific LTC applications will allow EGI to develop location (sub-region) specific estimates.
- This scaled model approach will be faster and more defensible than trying to derive estimates from rate-zone level outputs; it will also be more cost effective than developing a unique model for LTC impacted customers.

*Activities:*

This work package involves scaling down the IRPA model to support the St. Laurent LTC application with a focus on minimizing effort:

- Receive data on customers impacted by LTC application, including location, # of accounts by segment, and annual volumes by segment.
- Scale down one of the 5 legacy rate-zone regions to align with customer data
- Run model to develop IRPA outputs for specific LTC and QC model outputs
- Assess output to answer the following questions:
    - Is there enough potential in ScB to deliver the reduction EGI needs in order to downsize the pipe?

    - How much would that cost (at max ScB levels)?
    - How many years of ScB would be required to deliver that reduction?
- Post outputs to Excel

## 3 Timeline

- ***Work Package 1 & 2***: completed 3 weeks from project initiation.

# 4 Estimated Level of Effort

The table below presents a level of effort estimate for Work Packages 1 and 2.

| Work Package | Level of Effort (Hrs) | Budget ($200/hr) |
|---|---|---|
| 1 - Develop basic IRPA specific model and dataset | 60 | $12,000 |
| 2 – Scale down IRPA model to support St. Laurent LTC | 45-50 | $9,000-$10,000 |
| ***Sub-Total (WP1, WP2)*** | ***105-110*** | ***$21,000-$22,000*** |

Similar to previous engagements with EGI, we recommend EGI consider the total budgets for Work Packages 1 and 2 as budget ceilings; we propose undertaking work on an hourly basis with a monthly billing cycle for fees incurred in the preceding month.

ENBRIDGE GAS INC.

Undertaking Response to PP

To explain what the unconstrained scenario in the posterity analysis is meant to represent; to confirm that it doesn't include any IRP alternatives other than DSM.

---

**Response:**

The "Unconstrained Scenario" is defined by Navigant in the 2019 Ontario Electricity and Natural Gas Achievable Potential Study (Table ES-1) and includes two criteria:[1]

1. Incentives set at 100% of incremental cost of each measure.

2. Assumes idealized program design (i.e. few market barriers and higher adoption rates).

Confirmed, the Posterity analysis does not include any alternatives other than DSM-type alternatives.

[1] https://www.ieso.ca/-/media/Files/IESO/Document-Library/conservation/APS/2019-Achievable-Potential-Study.ashx

ENBRIDGE GAS INC.

Undertaking Response to OEB STAFF

To advise if the 1 percent estimate is based on past experience throughout the distribution system.

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**Response:**

Enbridge Gas completed a risk assessment of the St. Laurent pipeline system as part of the risk management process described in ISO 31000, to support its decision making. In the context of Asset Management, this assessment is part of the Company's informed decision framework.

A risk assessment is a way to assess uncertainties by recognizing the complexity of the operating environment and simplifying it through the application of a risk assessment methodology. This allows for the comparison of the result of assessment against predefined risk evaluation criteria (such as Enbridge Gas's Standard Operational Risk Matrix). Through this process, the Company engages in constructive discussion with those with knowledge of the relevant assets and the repair processes to establish appropriate assumptions that recognize the limitations of such assessments. Parameters used in a risk assessment are not a perfect prediction of future, but are a best estimation based on information available and Company experience at the time of the assessment.

When Enbridge Gas assessed the risk of loss of containment ("LOC") on the St. Laurent pipeline system due to corrosion on gas mains (importantly, this assessment was limited to corrosion anomalies only), two outcomes were considered:

1. Shut down the pipeline; or
2. Repair the pipeline without shutting it down.

As indicated in the Technical Conference, the chances that the line needs to be shut down for repair depends on many factors, such as the size of the leak, customer demand at the time of the leak, accessibility of the leak, and the imminent dangers to the health and safety of the surrounding area and property. By applying a probability to shutting down the line in order to complete a repair, Enbridge Gas is inherently recognizing that not all leaks would lead to the shutdown of the pipeline. To simplify the assessment of these factors, the Company assumes a probability reflecting the likelihood that the pipeline will be shut down in order to complete repairs.

This probability assumption is assigned based on the Company's general experience of distribution operations. This probability is an order of magnitude estimation to differentiate between a rare event (shutdown the pipeline to complete a repair) and a much more common event (repair the pipeline without shutting it down).

ENBRIDGE GAS INC.

Undertaking Response to ED

To do a review of ed 25 to confirm whether any clarification is going to be made with respect to the section on feasibility of electrification.

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**Response:**

In addition to the clarifications offered in its response at Exhibit I.M.1.ED.25 to the Company's Responding Evidence (page 5), Enbridge Gas wishes to confirm that the direct energy conversions of the energy provided by the Project as being equivalent to:

- 1.64 GW of electricity (based on the total capacity of the proposed pipeline(s)); and

- 1.47 GW of electricity (based on forecast peak natural gas demand to be served by the proposed pipeline(s))

as well as its comparison to the current peak demands for the City of Ottawa (served via Hydro Ottawa) and the Pickering Nuclear Generating Station, was provided for illustrative purposes only, to give a sense of scale of the energy delivered through the Company's facilities to customers in Ottawa and Gatineau.

Further, the Company wishes to reiterate that its calculations did not incorporate any of the many additional variables necessary (some of which were named by ED within its questions at Exhibit I.M.1.ED.25) to accurately determine the actual feasibility of fully electrifying the City of Ottawa and Gatineau in place of providing natural gas service via the St. Laurent pipeline system.

The foregoing qualification would also apply to any conclusion as to the electricity generation, transmission and/or distribution infrastructure that would need to be built and placed into service to eliminate the St. Laurent pipeline system.

ENBRIDGE GAS INC.

Undertaking Response to FRPO

To attempt to determine the reasons for the code change and to provide them; if they can't, to explain why.

---

**Response:**

The Company has reviewed its records of past CSA Code changes, dating as far back as Z184-1968. Z184 preceded Z662 as the Code and Standard for the Design and Operation of Gas Transmission and Distribution Systems.

Under Z184-1968, Construction Types based on class location are to be designed for railway crossings with Casings, except for crossings of Railways, which may be installed with or without casings in accordance with the following conditions:

For Railway Tracks:

- When the maximum stress due to internal pressure of the carrier pipe does not exceed 20% of the min yield strength
- The wall thickness is greater than or equal to the wall thickness as specified in Table 15 (of Z184-1968)

For Secondary or Industrial Tracks:

- When the total combined stress of the carrier pipe does not exceed 50% of the min yield strength
- The wall thickness is greater than or equal to the wall thickness as specified in Table 15 (of Z184-1968)

Within CSA Z662-19 (the current standard), Uncased Steel pipeline crossings are allowable, provided:

- Pipe has been designed to sustain the loads
- Hoop stress does not exceed:
  - 50% of minimum yield, for secondary or industrial tracks
  - 30% of minimum yield, for crossings other than secondary or industrial tracks
- Pipe wall thickness is not less than given in Table 4.10
- The design requirements extend 7m beyond centerline of track,
- And all circumferential welds are nondestructively inspected.

While the design requirements for railway crossings have changed slightly since 1968, the prevailing standard has always made reference to and allowance for uncased steel pipeline railway crossings.[1]

In reviewing the Company's Standard Operating Manual from 1964, casing pipe for railway crossings was not required if carrier pipe did not exceed NPS 6 in diameter. Carrier pipe in excess of NPS 6 was to be encased unless authorized by Order of the OEB. Therefore, although uncased crossings have been allowable according to Codes in the past (under certain design considerations) Company Operating practices may have differed from specifications of Code. However, Company Operating practices have always met the minimum Code requirements.

It is also important to note that the most recent version of the Canadian Transportation Commission document ("TC E-10") dated June 21, 2000, also provides allowance for either cased or uncased railway crossings, provided certain design criteria are met. The Company has found reference to TC E-10, dating back as far as 1964, however, the Company was unable to locate the original document.

In summary, uncased crossings have been allowed by Code, at least as early as 1968 (under certain design considerations). While the Company Operating practices at times may have differed from Code, it always met the minimum Code requirement (requiring railway crossings to be cased if the carrier pipe is larger than NPS 6).

The Company was not able to find any information identifying the reasons or rationale for any specific changes in the Code updates within its records. While a record of such information may be informative, what is most important is having a record of prevailing Code to ensure compliance.

[1] The requirements outlined above are a summary of general criteria and are not to be considered as a comprehensive assessment of Code requirements.

ENBRIDGE GAS INC.

Undertaking Response to FRPO

To see if there are any additional technical reports or documentation relied upon for purposes of a decision to proceed with the pipeline.

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**Response:**

No additional technical reports or documentation was relied upon by Enbridge Gas for the purposes of forming its decision to proceed with the Project.

Instead, the Company relied upon the information filed as part of its pre-filed evidence and interrogatory responses, including: historical records searches, integrity dig reports, repair reports, tacit knowledge, pipeline condition studies, Asset health analysis and failure projection, depth of cover surveys, and indirect assessments.

Please also see the responses at Exhibit I.FRPO.15 and Exhibit I.FRPO.27.