The Municipality of Middlesex Centre

Engineer's Report
Needham Municipal Drain Extension

GMBP File: 519046

Date: January 2024

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235 NORTH CENTRE ROAD, SUITE 103, LONDON ON N5X 4E7 P: 519.672.9403 F: 519.800.8301 WWW.GMBLUEPLAN.CA

January 30, 2024
Our File: 519046

Mayor and Members of Council
The Municipality of Middlesex Centre

Re: Needham Municipal Drain Extension

Dear Mayor DeViet and Members of Council:

We are pleased to present our report on the "Needham Municipal Drain Extension" serving Parts of Lots 7 to 11 Concessions 11 to 12 in the Municipality of Middlesex Centre, County of Middlesex.

Authority to prepare this report was obtained by a resolution of Middlesex Centre Council as stated in its August 23, 2019 letter to appoint GM BluePlan Engineering Limited (GMBP) to prepare an Engineer's Report.

In accordance with your instructions pursuant to a request received by Council under Section 78 of the Drainage Act, R.S.O. 1990, for the request for drainage works improvements, GMBP has held an on-site meeting, undertaken a field survey, held a design review meeting and prepared for Council's consideration the following Drainage Report, Plan, Profiles and Specifications for this work to be completed on the Needham Municipal Drain Extension.

We trust that the information contained within will be satisfactory. If there are any questions or concerns please do not hesitate to contact us.

Yours truly,

GM BLUEPLAN ENGINEERING LIMITED
Per:

Brendan Shapton, M.A.Sc., P.Eng.
Encl.

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NEEDHAM MUNICIPAL DRAIN EXTENSION

THE MUNICIPALITY OF MIDDLESEX CENTRE

JANUARY 2024

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1. INTRODUCTION

At the request of a landowner in the Municipality of Middlesex Centre, Council has appointed GM BluePlan Engineering Limited (GMBP) under Section 78 of the Drainage Act to investigate improvements to be made to the Needham Municipal Drain Extension (Needham). The existing drain consists of approximately 1,142m (3,747ft) of open drain and 2,541m (8,336ft) of closed drain comprised of the Main Drain and Branch 'A', which outlets into the approximately 1,144m (3,753ft) long open drain of the Needham Municipal Drain.

A landowner has requested drainage improvements to alleviate ponding water issues at the Needham on the east side of Highbury Avenue. The landowner and property represented on the request is:

Michael McCartney	For S Pt. Lot 8	Concession 12

Based on site observations and previous drainage reports, seventy-eight properties have been determined as within the drainage area of the Needham which includes Parts of Lots 8 to 11 Concession 11, Parts of Lots 7 to 10 Concession 12, the Municipality of Middlesex Centre (Twelve Mile Road) and the County of Middlesex (Highbury Avenue and Plover Mills Road).

2. HISTORY

The Municipality of Middlesex Centre has provided background municipal drain maps and reports.

The reports available to us indicate that the Needham Municipal Drain was previously constructed or reconstructed under a report prepared by F.A. Bell, O.L.S., dated January 5, 1926. Under this report, the upstream extent of the Needham Municipal Drain was at the property line between S Pt. Lot 10 and N Pt. Lot 10 Concession 11.

Through a July 21, 1959 report prepared by C.P. Corbett, P.Eng., the Needham Municipal Drain Extension was constructed to extend the Needham Municipal Drain. This report consisted of approximately 2,926m (9,600ft) of new open drain, 1,158m (3,800ft) of open drain repair to the existing Needham Municipal Drain, 18m (60ft) of 1200mm (48") diameter corrugated metal pipe beneath Highbury Avenue and two crossings of the Interprovincial Co. pipeline Right-of-Way. The extension under this report was from the property line between S Pt. Lot 10 and N Pt. Lot 10 Concession 11 (upstream extent of the January 5, 1926 report), north to S Pt. Lot 10 Concession 12 and east across Highbury Avenue to the upstream extent at the property line between S Pt. Lot 8 and S Pt. Lot 7 Concession 12.

Improvements were last completed on the Needham Municipal Drain Extension and Needham Municipal Drain through a report prepared by A.J. Devos, P.Eng., dated October 31, 1973. These improvements included the replacement of Needham Municipal Drain Extension open drain across Lots 8 to 10 Concession 12 with two closed drains. The two closed drains (Main Drain and Branch 'A') comprise approximately 2,541m (8,336ft) of 250mm to 450mm (10" to 18") diameter field tile total. The Main Drain is south of the Interprovincial Co. pipeline Right-of-Way, extending from the outlet into the open drain in S Pt. Lot 10 Concession 12, east across Highbury Avenue to the upstream extent at the property line between S Pt. Lot 8 and S Pt. Lot 7 Concession 12. Branch 'A' is north of the Interprovincial Co. pipeline Right-of-Way, extending north from the outlet into the open drain in S Pt. Lot 10 Concession 12 across the Interprovincial Co. pipeline Right-of-Way and east to the upstream extent at Highbury Avenue. These improvements also included the reconstruction of approximately 2,280m (7,500ft) of the Needham Municipal Drain Extension and

Needham Municipal Drain open drain from N Pt. Lot 10 Concession 10 north to the upstream extent on S Pt. Lot 10 Concession 12.

Three drains, the Williams Municipal Drain, Smith Municipal Drain and Bryanston Municipal Drain, outlet into the Main Drain of the Needham Municipal Drain Extension.

The Williams Municipal Drain was constructed through a report prepared by H. M. Gibson, P.Eng., O.L.S., dated June 29, 1962. Under this report, the Williams Municipal Drain is located from the outlet into the Needham Municipal Drain Extension on S Pt. Lot 8 Concession 12 south to the upstream extent at Plover Mills Road and included two branches. Branch 'A', which outlets into the Needham Municipal Drain Extension, consisted of approximately 251m (825ft) of 200mm (8") diameter field tile and corrugated metal pipe. Branch 'B', which outlets into Branch 'A', consisted of approximately 273m (896ft) of 150mm (6") diameter field tile.

The Smith Municipal Drain was constructed under a report prepared by E. Paul Elston, P.Eng., dated May 13, 1981. Under this report, the Smith Municipal Drain is located from the outlet into the Needham Municipal Drain Extension on S Pt. Lot 8 Concession 12 on the east side of Highbury Avenue, north to the upstream extent at the property line between S Pt. Lot 8 and N Pt. Lot 8 Concession 12. The Smith Municipal Drain consisted of approximately 570m (1,870ft) of 150mm to 300mm (6" to 12") diameter field tile and corrugated metal pipe and 75m (246ft) of 150mm to 200mm (6" to 8") diameter concrete sewer pipe.

The Bryanston Municipal Drain was last reconstructed under a report prepared by M. P. DeVos, P.Eng., dated February 29, 2000. Under this report, the Bryanston Municipal Drain is located from the outlet into the Needham Municipal Drain Extension on S Pt. Lot 10 Concession 12 on the north side of Twelve Mile Road, east along Twelve Mile Road to the upstream extent at Highbury Avenue, as well as three road crossings across Twelve Mile Road. The Bryanston Municipal Drain consisted of approximately 62m (203ft) of open drain reconstruction, 238m (781ft) of 600mm (24") diameter field tile, 562m (1,844ft) of 300mm to 600mm (12" to 24") diameter sewer pipe and 15m (49ft) of 200mm (8") diameter pipe.

3. PROCEEDINGS UNDER THE DRAINAGE ACT

The Drainage Act is a vehicle by which a drainage scheme can be constructed and the cost raised by local special assessment. That is, the cost is assessed in varying proportions to lands within the watershed, as a one-time charge over and above any taxes paid. Maintenance of the drain is likewise charged to the watershed, most often in the same proportions as the original construction.

The Act has evolved over many years and attempts have been made to balance the rights of the individual against the benefits of the construction of drains that involve more than one property. The Act recognizes that perfect agreement is not possible in every case and provides a number of proceedings that give owners and others the opportunity to influence the outcome.

This Report is one of those proceedings. To aid in the understanding of the process listed below in chronological order are all normal proceedings with the notation "Completed" beside those which have been completed. This listing is a summary of many but not all parts of the Drainage Act and applies to the ordinary course of events. Further proceedings are available, and for these the Drainage Act should be consulted directly.

1. Submission of a Request. *Completed.*
2. Notification of the Project to the Upper Thames River Conservation Authority (UTRCA). *Completed.*
3. Engineer appointed. *Completed.*
4. On-site meeting. *Completed.*
5. Preparation of Report. *Completed.*
6. Report considered by Council and a By-Law is adopted.

7. Court of Revision convened to consider and deal with appeals on assessment if necessary.

8. Appeal is available from the decisions of the Court of Revision and on other matters to the Ontario Drainage Tribunal.

9. Disposition of appeals by the Tribunal, or if none, final passage of the By-Law, which establishes the drain in law and authorizes construction.

10. Construction of municipal drain improvements.

11. Levying and collecting of assessments.

4. ON-SITE MEETING

In accordance with Section 9(1) of the Drainage Act, R.S.O. 1990, an on-site meeting was held on October 23, 2019. The meeting was scheduled to take place at 9:00 am at the Bryanston Fire Station at 15321 Plover Mills Road, Bryanston, ON, N0M 2A0. Persons in attendance were:

Brad Bunke, P.Eng.	GM BluePlan Engineering Limited	-
Brendan Shapton	GM BluePlan Engineering Limited	-
Dan Anderson	Drainage Superintendent, Municipality of Middlesex Centre	-
Laura Shoebottom	N Pt. Lot 8 Concession 12	Roll No. 020-085-01
Tim (Timothy) Graham	S Pt. Lot 8 Concession 12	Roll No. 020-071
Murray Tyler & Janet Minshall-Tyler	S Pt. Lot 8 Concession 12	Roll No. 020-082
Frank Hoevenaars	S Pt. Lot 8 Concession 12	Roll No. 020-072
Louise Gillis representing Gillis Farms Inc.	Pt. Lot 8 Concession 12	Roll No. 020-077
Jon (Jonathan) Spicer	S Pt. Lot 8 Concession 12	Roll No. 020-068
Maria Rapp representing Brookwood Farms Inc.	N Pt. Lot 7 Concession 12	Roll No. 020-044
Keith Hall	S Pt. Lot 8 Concession 12	Roll No. 020-085
Michael McCartney	S Pt. Lot 8 Concession 12	Roll No. 020-084
Don Foster representing:		
• Foster Farms Inc.	• S Pt. Lot 10 Concession 12	• Roll No. 020-105
• Rob (Robert) Foster	• S Pt. Lot 10 Concession 12	• Roll No. 020-106
• 1855664 Ontario Ltd. (recently purchased property from Jean Lewington)	• S Pt. Lot 7 Concession 12	• Roll No. 020-063

A handout was distributed which described the procedures under the Drainage Act, steps already taken by Council in appointing an Engineer and a map of the pertinent part of the watershed.

Landowners provided the following comments and observations:

Laura Shoebottom stated that her front lawn is low and there is ponding every spring. Ms. Shoebottom stated that the ponding has improved since the laneway culvert was installed but is still wet. Ms. Shoebottom also stated that there is a laneway without a culvert which is holding water back. She stated that it would be better for there to be better drainage and that the Smith Municipal Drain is located at the back of her property.

Tim Graham stated that during heavy rains the front of his property is submerged and water builds up in the roadside ditch. He also stated that his neighbour, Colin Eeley, has it worse than him and that Colin's front lawn is like a lake. Mr. Graham stated that there is an old clay farm tile under his house which goes back (north) to the field. Mr. Graham also stated that there are breaks in the tile and water takes longer to get away. Mr. Graham stated that this is the worst

spring they have seen and the north side of the road (Plover Mills Road) is poorly drained in general. He stated that there is tile underneath the ditch, with drains at each property.

Murray Tyler & Janet Minshall-Tyler stated that they have the same problems as their neighbours. Mr. Tyler and Ms. Minshall-Tyler also stated that water fills up the road ditch and then flows back into their garage. Mr. Tyler and Ms. Minshall-Tyler also stated that the County used high pressure tools to clean the ditch and now water sits in the road ditch and does not move but does not come to their garage.

Frank Hoevenaars stated that water fills up at the fence line along the back corner and that he has tried filling in the low point at the back. Mr. Hoevenaars also stated that the spring runoff fills up the front lawn and takes one month to get away. Mr. Hoevenaars stated that there is a catch basin in his lawn by the driveway and that 4-5 years ago the County sucked the dirt out of the catch basin. Mr. Hoevenaars stated that he believes the Williams Municipal Drain is filled with dirt. Mr. Hoevenaars also stated that there is a wet spot in the farmers field behind the County property and the farmer can't do any work in this area until midsummer.

Louise Gillis (representing Gillis Farms Inc.) stated that there is a wet spot behind where the salt bins are on the County property and that in the spring/summer/winter it is always wet whether there is rain or not. Mrs. Gillis also stated that there is flooding up to the front at the road (Highbury Avenue). Mrs. Gillis stated that there was a blowout at the confluence of the Williams Municipal Drain and Needham. Mrs. Gillis also stated that private tile maps are available for recent work but not for the old clay tiles. Mrs. Gillis inquired about the new houses along Plover Mills Road. Keith Hall stated that there is a 4" (100mm) diameter pipe which goes into a catch basin and 6" (150mm) diameter pipe, which outlets back (north) to the Needham. Dan Anderson stated that this is a private system.

Jon Spicer stated that there is not much standing water on his property, but his property is squishy. Mr. Spicer later stated that there is pooling at the back of his property at the Williams Municipal Drain Branch 'B' and the pooling goes away after a couple of days. Mr. Spicer also stated that Colin Eeley (neighbour) gets quite a bit of water, that Colin's backyard is worse than the front yard and he has seen a canoe out in Colin's backyard. Mr. Spicer stated that Evelyn Roberts (neighbour) has pooling water but not as bad as Colin Eeley.

Maria Rapp (representing Brookwood Farms Inc.) stated that they have issues when it rains. She had no additional comments.

Keith Hall stated that the blowouts are fixed at the confluence of the Williams Municipal Drain and Needham. Mr. Hall also stated that water lays behind his property and Mike McCartney's property. Mr. Hall stated that during the spring water goes behind their properties and comes out of drain. Mr. Hall stated that he receives everyone's water because his property is the lowest point, and he gets both front and backyard flooding. Mr. Hall also stated that the water comes off the road and into his laneway, and that the culvert across Highbury Avenue helps release flow. Mr. Hall stated that the Williams Municipal Drain was CCTV'd last year as part of maintenance. He stated that there were some roots in the Williams Municipal Drain but overall nothing stopping flow. Mr. Hall also stated that the catch basin where the branches of the Williams Municipal Drain meet is in good condition and overall the drain is good condition. Mr. Hall also stated that the culvert at 12 Mile Road runs half full during heavy rain events.

Michael McCartney stated that his property floods (both front and back yards) and that he receives everyone's water as his property is the low point. Mr. McCartney also stated that during heavy rains the field behind his property pools up and then gets to the tile drain. Mr. McCartney stated that water comes off the Highbury Avenue and into his laneway. He stated that there is a culvert across Highbury Avenue to help relieve flows, and during heavy rain events water shoots across road and over the farmers land to the west. Mr. McCartney also stated that the farmer to the west of Highbury Avenue (George Van Gaalen) said the drain used to be an open ditch and it was filled in. Mr. McCartney also stated that he believes that the closed system is not enough and wants a sufficient outlet. Mr. McCartney inquired if an open drain can be created on the other side of Highbury Avenue to remove the water. Mr. McCartney also stated that he understands that farmers don't want water on their field, but he also does not want water in his basement. Mr. McCartney stated that there are 3 oil pipelines through the fields.

Don Foster (representing Foster Farms Inc., Robert Foster and 1855664 Ontario Ltd. which recently purchased property from Jean Lewington) stated that he does not want the closed system any worse than it is now. Mr. Foster also stated that he believes it is wishful thinking to have the open drain closed in on his property (Foster Farms Inc.).

Mr. Foster also inquired about the depth of the open drain and if it is possible to get more grade. Mr. Foster stated that his property (Foster Farms Inc.) and the property to the west (Robert Foster) are systematically tiled and provided a private tile map. Mr. Foster also stated that they (1855664 Ontario Ltd.) have recently purchased the Jean Lewington Farm and are planning to privately tile it.

Michelle Eeley, representing Colin Eeley (S Pt. Lot 8 Concession 12, Roll No. 020-069), provided comments by email following the on-site meeting. Mrs. Eeley stated that they have been trying fix the (water) problem since they purchased the home in 2013. Mrs. Eeley stated that they have redone the whole septic system including private tile. She also stated that when it rains, their property is always filled with water.

5. DESIGN REVIEW MEETING

A design review meeting was held on July 22, 2022 to review and discuss the proposed drain with landowners prior to finalizing the report. The meeting was scheduled to take place at 9:00pm at the Coldstream Community Centre at 10227 Ilderton Rd, Ilderton, ON N0M 2A0. Persons in attendance were:

Brad Bunke, P.Eng.	GM BluePlan Engineering Limited	-
Brendan Shapton	GM BluePlan Engineering Limited	-
Dan Anderson	Drainage Superintendent, Municipality of Middlesex Centre	-
Doug (Douglas) Francis	Pt. Lot 9 Concession 12	Roll No. 020-102-01
Alan & Heather Elgie	N Pt. Lot 8 Concession 11	Roll No. 020-145-02
Geraldine Hudson	N Pt. Lot 10 Concession 11	Roll No. 020-127
Anton & Maria Rapp representing:		
• Anton Rapp	• N Pt. Lot 7 Concession 12	• Roll No. 020-043
• Brookwood Farms Inc.	• N Pt. Lot 7 Concession 12	• Roll No. 020-044
Rob (Robert) Walz	N Pt. Lot 8 Concession 11	Roll No. 020-145-01
David & Joan Elston	N Pt. Lot 9 Concession 11	Roll No. 020-128-90
Diane Bell (& Dale Gerster)	N Pt. Lot 9 Concession 11	Roll No. 020-128-96
Louise Shoebottom representing Laura Shoebottom	N Pt. Lot 8 Concession 12	Roll No. 020-085-01
Don Foster representing:		
• Foster Farms Inc.	• S Pt. Lot 10 Concession 12	• Roll No. 020-105
• Foster Farms Inc.	• N Pt. Lot 11 Concession 11	• Roll No. 020-126
• 1855664 Ontario Ltd.	• S Pt. Lot 7 Concession 12	• Roll No. 020-063
Rob (Robert) Foster representing:		
• Robert Foster	• S Pt. Lot 10 Concession 12	• Roll No. 020-106
• Foster Farms Inc.	• S Pt. Lot 10 Concession 12	• Roll No. 020-105
• Foster Farms Inc.	• N Pt. Lot 11 Concession 11	• Roll No. 020-126
• 1855664 Ontario Ltd.	• S Pt. Lot 7 Concession 12	• Roll No. 020-063
Bill (William) & Debbie (Lina) Addison	Pt. Lot 9 Concession 12	Roll No. 020-103
David Schmoll representing Alexander Schmoll	N Pt. Lot 9 Concession 11	Roll No. 020-143
Tim (Timothy) Graham	S Pt. Lot 8 Concession 12	Roll No. 020-071
Dave Dunn	Plan 307 Pt. Lot 2	Roll No. 020-131
Keith & Leanne Hall	S Pt. Lot 8 Concession 12	Roll No. 020-085
Barbara Van Gaalen	S Pt. Lot 9 Concession 12	Roll No. 020-086
Sherri-Lynn Belair	S Pt. Lot 7 Concession 12	020-063-02

A copy of the draft design was distributed to each attendee. GMBP reviewed the project history to date and steps taken to reach this stage of the project, and presented the draft design, draft cost estimate, and draft assessments.

Landowners provided the following comments:

Sherri-Lynn Belair stated that the Lewington Municipal Drain (east of Needham) is ongoing and wants to ensure she is paying into the appropriate drain. Dan Anderson stated that Ms. Belair is not assessed into the Lewington Drain.

Rob Foster inquired how the watershed is determined and who is responsible for determining the watershed. Brad Bunke stated that it is the Engineer's responsibility to determine the watershed and that the watershed is based on the previous reports, site observations and LIDAR data. Mr. R. Foster inquired about how the Lewington Municipal Drain watershed impacts the Needham watershed and stated that portions of these watersheds overlap. Mr. Bunke stated that we will work with the Municipality to review the Lewington Municipal Drain watershed (which was provided following the design review meeting) and update the Needham watershed as required.

Mr. R. Foster inquired why the excavated material was not being removed from site. Mr. Bunke stated that removing excavated material from site is not grantable and due to the excess soil regulations removing excavated material from site can be cost prohibitive. Mr. R. Foster stated that he wants to know his options before he decides his preference for the excavated material. Following the design review meeting, Mr. R. Foster stated that his preference for the excavated material is to spread and level the excavated material adjacent to the open drain.

Keith Hall inquired if the existing drain is replaced or remains in place. Mr. Bunke stated that typically the existing drain is removed and replaced, however the existing drain can remain at the landowner's request. Mr. Bunke also stated that if the existing drain remains, it would become a private drain of the landowner and would not be part of the municipal drain.

Mr. R. Foster inquired about using a 2" (50mm) drainage coefficient instead of the 1.5" (38mm) drainage coefficient. Following the design review meeting, Mr. R. Foster decided that he does not want to pursue a 2" (50mm) drainage coefficient.

Following the design review meeting, landowners made the following comments:

Mr. R. Foster inquired if the outlet pipe could have 5" to 6" (125mm to 150mm) of freeboard from the open drain bottom instead of the proposed 10" (250mm) or the outlet pipe placed at the bottom of the open drain. Mr. R. Foster stated that he is concerned that the proposed drain may be too high for the private tile. Mr. R. Foster provided a private tile map for 1855664 Ontario Ltd. (S Pt. Lot 7 Concession 12, Roll No. 020-063). To confirm the elevation and location, the existing drain was daylighted at the outlet and Highbury Avenue following the design review meeting. After reviewing the daylighting results, the proposed drain was found to be lower than the existing drain at all locations except the first thirty metres upstream from the outlet into the open drain. Based on the provided private tile maps, this is not anticipated to impact the existing private tiles.

Barbara Van Gaalen stated that the drain has been working for 50 years and she believes it is still in good working order except for a few trouble spots. Mrs. Van Gaalen stated that if the drainage coefficient is increased (to 2" (50mm)), she believes this should be paid for by the landowners who requested the increased drainage coefficient.

Following the design review meeting, a private tile maps was provided for Alexander Schmoll (N Pt. Lot 9 Concession 11, Roll No. 020-143).

6. FINDINGS

Based on the information obtained at the on-site meeting, subsequent design review meeting and discussions thereafter, we understand that surface water ponds on Roll No. 020-085-01, Roll No. 020-071, Roll No. 020-082, Roll No. 020-072, Roll No. 020-077, Roll No. 020-085, Roll No. 020-084, Roll No. 020-069 within S Pt. Lot 8 Concession 12, east of Highbury Avenue. We also understand that blowouts have been observed along the closed drain on S Pt. Lot 8 Concession 12 and water has been observed coming out of the closed drain on S Pt. Lot 8 Concession 12. We have made an examination of the drainage area and determined that the existing drain does not provide a sufficient outlet to portions of the watershed and is not of a sufficient size to convey surface flows. Further, we have determined that regardless of its condition, the existing closed drain is undersized by current design standards. We have determined that if portions of the existing drain are improved with an outlet of sufficient size and grade then, ponding water and blowouts on these properties can be alleviated by redirecting the water to the improved drainage system.

7. BASIS FOR DESIGN

Tile drains are generally designed to have capacity to remove between 12 and 38mm of water from the watershed per day, and this rate of removal is called the drainage coefficient. 12mm is generally adequate when there is little surface water but the watershed is under-drained. When surface water is to be accommodated, 25mm to 38mm per day is typically used for the basis of design.

It is important to understand that the municipal drain in itself does not remove this amount of water. It serves as the conduit to convey water brought to it by under drainage, and for surface water finding its way or guided to the inlet structures.

It is noted that surface water ponds on several properties east of Highbury Avenue on S Pt. Lot 8 Concession 12, and therefore GMBP has selected a 38mm drainage coefficient. It should be noted that the reconstruction of the open drain is not necessary for an increase in capacity, as the existing open drain conveys a 38mm per day drainage coefficient. The reconstruction of the open drain is necessary to provide freeboard and sufficient outlet to the closed drain tiles and to provide a cleanout of the open drain. Additionally, to facilitate maintenance, decrease soil erosion and cleanouts, increase bank stabilization, and provide nutrient management, grass buffer strips, 3.0m in width, will be constructed on either side of the open drain.

This level of service will provide a good outlet for under-drainage and will conduct a useful amount of surface water. During the growing season it is expected that flooding will not normally persist for more than 24 hours.

8. ENVIRONMENTAL CONSIDERATIONS

The Needham will be subject to the review of the UTRCA, the Department of Fisheries and Oceans (DFO), and consideration under the Endangered Species Act (ESA).

GMBP has reviewed the available DFO mapping tools for aquatic species listed under the SARA. Based on this mapping, there is no indication of extirpated, endangered or threatened aquatic species, special concern aquatic species or critical habitat for extirpated, endangered or threatened aquatic species in the project area or within 1.0km downstream of the project area. However, special concerns aquatic species were identified as having the potential to be located in the Needham Municipal Drain further than 1.0km downstream of the project area. Based on this mapping, the drain within the project area and within 1.0km downstream of the project area is identified as a “Class F” under the DFO Classification. A copy of the design of the drainage improvements was submitted to DFO for review and to obtain approval for construction. DFO reviewed the design of the drainage improvements and provided a letter of advice. DFO has no concerns with the drainage improvements provided the avoidance and mitigation measures in the Letter of Advice are implemented including in-water work shall occur during periods of no flow or between July 16 and March 14 (inclusive) of any year, sediment and erosion control measures are installed, deleterious substances are prevented from entering the water, and disturbed areas are restored and re-seeded following construction.

GMBP has reviewed the available natural heritage mapping tool for species listed under the ESA. Based on this mapping, endangered, threatened and special concerns species were identified as having the potential to be located in the project area. A qualified biologist was retained to review the project area and drainage improvements with respect to species at risk under the ESA. After reviewing the project area, the qualified biologist determined that no protected species or potential habitat for protected species were identified in the project area, and that it is their opinion that the drainage improvements will not contravene the ESA provided mitigation measures are implemented including temporary sediment and erosion control fencing are installed between the project area and adjacent woodland.

As a preventative measure to mitigate risks to migratory birds protected under the Migratory Birds Convention Act, 1994, no tree, vegetation or brush removal and associated work shall occur between March 15 and August 31 (inclusive) of any given year, unless approved by a qualified biologist.

A copy of the design of the drainage improvements was submitted to UTRCA for review. UTRCA provided initial comments related to the sediment and erosion control measures during construction, erosion control at the outlet pipes, dewatering and installation methods for the Twelve Mile Road culvert and retaining wall, and utility lines at the open drain. A copy of this report will be sent to UTRCA for a permit to obtain approval for construction.

This project is anticipated to have no permanent adverse impact on any species, as it intends to continue land use in the watershed as productive farmland.

9. RECOMMENDATIONS FOR THE NEEDHAM MUNICIPAL DRAIN EXTENSION

It is our recommendation that:

1. The existing Needham open drain be reconstructed as shown on Drawings from Sta.0+000 at limit of the woodland on N Pt. Lot 10 Concession 11 (Roll No. 020-127) to Sta. 0+827 at its upstream extent on S Pt. Lot 10 Concession 12 (Roll No. 020-105). The reconstructed open drain shall include clearing and grubbing, erosion control blanket and rip rap on geotextile to control erosion.

2. Grassed buffer strips, 3.0m in width, be constructed on either side of the Needham open drain from Sta. 0+000 to Sta. 0+827. The buffer strips will facilitate maintenance, decrease soil erosion and cleanouts, increase bank stabilization and provide for nutrient management. The vegetation on the buffer strips shall be an approved grass seed mixture, or at the approval of the Drainage Superintendent the vegetation may be lawn, pasture, access or cultivated, forage-type crop. The vegetation on the buffer strips is to remain in place for an extended period of time and the buffer strips are not to be part of the normal crop rotation. Prior to working up and reseeding the buffer strips, the landowner must first obtain written permission from the Drainage Superintendent.

3. A new road crossing be constructed from Sta. 0+497 to Sta. 0+514 on Twelve Mile Road consisting of a 1800mm (72”) diameter corrugated steel pipe (CSP) with granular base and backfill, rip rap at each end, precast concrete retaining walls at the north end, a precast concrete headwall and cut off wall at the north end and regrading of the Bryanston Drain.

4. A new closed drain be constructed to replace the Needham as shown on the Drawings from Sta. 0+827 at its outlet into the Needham open drain on S Pt. Lot 10 Concession 12 (Roll No. 020-105) to Sta. 2+288 at its upstream extent at the property line between Pt. Lot 8 Concession 12 (Roll No. 020-077) and S Pt. Lot 7 Concession 12 (Roll No. 020-063). The new closed drain shall consist of approximately 43m of 900mm diameter HDPE pipe, 775m of 825mm diameter concrete field tile, 27m of 750mm diameter concrete field tile, 263m of 675mm diameter concrete field tile, 329m of 525mm diameter concrete field tile and a 200mm diameter HDPE pipe service sweep.

5. The existing Highbury Avenue road crossing at Sta. 1+645 to Sta. 1+669 be replaced with a 24m long - 750mm diameter smooth wall steel pipe installed by jack and bore, complete with a new catch basin on the west side and a new offset catch basin on the east side. The west catch basin at Sta. 1+645 shall be complete with 300mm diameter HDPE pipe to connect the existing catch basin, an earth berm and rip rap on geotextile to control erosion. The east offset catch basin at Sta. 1+669 shall be complete with a 450mm diameter HDPE pipe catch basin lead, manufactured tee, and rip rap on geotextile to control erosion. The existing Highbury Avenue road crossing shall be cut, capped, grouted and abandoned.

6. New catch basins be installed at Sta. 1+035 and 2+288 to act as inlets for surface water, maintenance access, and as possible inlets for future field tile to direct water into the closed drain. The catch basins shall be complete with an earth berm and rip rap on geotextile to control erosion.

7. Junction boxes be installed at Sta. 1+696 and Sta. 1+959.

8. The outlet be constructed of 900mm diameter HDPE pipe, complete with a rodent grate and rip rap on geotextile to control erosion.

9. The existing CB at Sta. 1+645 on the west side of Highbury Avenue is to remain and be connected to the drain with 300mm diameter HDPE pipe.

10. The drainage coefficient design standard used for this drain shall be 38 mm of rainfall per 24 hours.

The drawings included with the Report show the extent of the work, land affected, profile of the tile and other details of the work. The plan shown on Drawing No. 1 – Needham Municipal Drain Extension Plan gives the area considered to be in the drainage area of the work proposed.

During construction, contingencies may arise and will be dealt with as determined by the Engineer and included as part of construction. There will be no special assessments for contingencies. Common contingencies are clear stone bedding, tile connections and extra effort to deal with poor soil conditions.

10. WORKING AREA

The working area for construction purposes for the closed drain shall be a width of 20m centered on the proposed closed drain. The working area for construction purposes for the open drain shall be a width of 40.0m from Sta. 0+000 to Sta. 0+498 and 55.0m from Sta. 0+498 to Sta. 0+827 centred on the proposed closed drain. The working areas for maintenance purposes for the closed drain shall be a width of 10m centered on the proposed closed drain. The working area for maintenance purposes for the open drain shall be a width of 25m centered on the proposed open drain.

Each Landowner on whose property the drainage work is to be constructed shall designate access to and from the working area at the time of construction or upon failure to do so, the Engineer or Drainage Superintendent, as the case may be, shall designate access.

11. WATERSHED CHARACTERISTICS

The Drainage Area comprises approximately 210.56 hectares. Land use within the watershed is primarily agricultural.

Specific land uses within the watershed are as follows:

Agricultural	- 166.05 ha
Forested	- 21.90 ha
Residential	- 13.64 ha
Commercial & Industrial	- 1.24 ha
Roadway	- 7.73 ha

12. ALLOWANCES

Various allowances are considered part of a municipal drain. The Drainage Act provides in Sections 29 to 33 that the Engineer is to allow in money for the value of several items, as follows:

a) Section 29 – Right-of-Way

The Drainage Engineer is to provide for an allowance to be paid to the landowner whose land is proposed to be used for construction of the open drain or closed drain. The lands used for the open drain are still legally owned by the landowner on title, however, they are no longer usable for the landowner. The lands used for the closed drain and open drain access are still legally owned by the landowner on title, however, the Drainage Act creates a “Statutory Easement” which allows for future access for maintenance and repair purposes. The Act requires the landowner to be compensated for the value of the land.

Allowances for Right-of-Way are calculated based on 25% of the land value for the closed drain and open drain access, and 100% of the land value for the open drain, with the land value of $61,010/hectare.

Based on past reports we understand that a 10m Right-of-Way width is present on the existing closed drain of the Needham. No additional Right-of-Way is therefore required for the proposed closed drain works.

Based on past reports we understand that a 15m Right-of-Way width is present on the existing open drain of the Needham. To account for the increased drain width, buffer strips and access, additional Right-of-Way is required. An additional 5m Right-of-Way is required for the increased drain width and buffer strips (provided at 100% of the land value) and an additional 5m Right-of-Way is required for access (provided at 25% of the land value), for a total Right-of-Way of 25m.

b) Section 30 - Damages

The Drainage Engineer is to provide for an allowance to be paid to the landowner of land that may be damaged during construction. Typically, this section refers to agricultural crops, however, it also applies to lawns, ornamental trees and fences.

Damage from installing the closed drain is valued at $2,550.00/hectare and is based on a 20m wide working area. The allowance is calculated on a 5-year declining balance basis, with 100% of the allowance paid for the first year, as total destruction of crop is anticipated. In the following 4 years, a declining allowance is paid based on a 5m width of disturbed ground, with 80% of the allowance paid in year 2, 60% in year 3, 40% in year 4, and 20% in year 5. This is done to reflect the decreased crop yields in the area where the subsoil was disturbed for drain installation.

For example, a parcel of cropland 350m in length that is disturbed for closed drain installation would be given a damage allowance calculated as follows:

Year 1: 350m x 20m = 0.7 ha x $2,550	= $1,785
Year 2: 350m x 5m = 0.175 ha x $2,550 x 80%	= $357
Year 3: 350m x 5m = 0.175 ha x $2,550 x 60%	= $268
Year 4: 350m x 5m = 0.175 ha x $2,550 x 40%	= $179
Year 5: 350m x 5m = 0.175 ha x $2,550 x 20%	= $89
Total Damage Allowance Paid in Report	= **$2,678**

Damage from reconstructing the open drain is valued at $2,550.00/hectare, and is based on a 40.0m wide working area from Sta. Sta. 0+000 to Sta. 0+498 and a 55.0m wide working area from Sta. 0+498 to Sta. 0+827. The allowance is calculated on a 5-year declining balance basis, with 100% of the allowance paid for the first year, as total destruction of crop is anticipated. In the following 4 years, a declining allowance is paid, with 80% of the allowance paid in year 2, 60% in year 3, 40% in year 4, and 20% in year 5. This is done to reflect the decreased crop yields in the area where the excavated material is spread and leveled from the open drain reconstruction. For all 5-years, damage allowance is not to be provided for the area of the existing open drain, which is approximately 7.5m in width. For the first year, damage allowance is to be provided for the area required for the increased drain width and buffer strips, which is approximately 10.0m in width, however, damage allowance is not provided for this area in subsequent years. Therefore, from Sta. 0+000 to Sta. 0+498, the net damage width for the purpose of calculating the damage allowance in year 1 is based on a 32.5m width and a 22.5m width in subsequent years. Therefore, from Sta. 0+498 to Sta. 0+827, the net damage width for the purpose of calculating the damage allowance in year 1 is based on a 47.5m width and a 37.5m width in subsequent years.

For example, a parcel of cropland 350m in length that is disturbed for open drain reconstruction from Sta. Sta. 0+000 to Sta. 0+498 would be given a damage allowance calculated as follows:

Year 1: 350m x 32.5m = 1.1375 ha x $2,550	= $2,901
Year 2: 350m x 22.5m = 0.7875 ha x $2,550 x 80%	= $1,607
Year 3: 350m x 22.5m = 0.7875 ha x $2,550 x 60%	= $1,205
Year 4: 350m x 22.5m = 0.7875 ha x $2,550 x 40%	= $803
Year 5: 350m x 22.5m = 0.7875 ha x $2,550 x 20%	= $402
Total Damage Allowance Paid in Report	= **$6,918**

Allowances are paid regardless of what crop is grown or whether or not it is harvested in advance of construction. Municipal drains are generally constructed before beans and corn can be harvested, so the damage can be expected to occur. Crop value is calculated using a 2-year average of the “Area, Yield,

Production and Farm Value of Specified Field Crops, Ontario" as published annually by the Ontario Ministry of Agricultural, Food and Rural Affairs.

No damage allowance for future drain maintenance repair or improvement is to be paid for the removal of any vegetation, fencing or any other obstruction within the Right-Of-Way. Please see Section 15 (Maintenance) for further details.

c) Section 31 – Allowance for Existing Drains
The proposed work does not involve incorporating any existing private drains into the Needham. As such no allowances for existing drains have been provided.

d) Section 32 – Allowance for Damage Due to Insufficient Outlet
As sufficient outlet has been confirmed, there is no allowance for insufficient outlet.

e) Section 33 – Allowance for loss of Access
As crossings are provided at each property where crossings were originally provided, no loss of access allowance is considered appropriate.

The allowances are generally less than the assessment to the properties and the property owner is billed the difference when the project is complete.

GMBP determines the amounts to be paid in allowances to owners as shown in Table 1: Schedule of Right-of-Way Allowances, Table 2: Schedule of Damage Allowances, and Table 3: Summary of Allowances. The allowances shall become due and payable according to Section 62 of the Drainage Act.

Table 1: Schedule of Right-of-Way Allowances

Concession	Lot	Owner and Roll No.		Station		Additional Right-of-Way (Section 29)		Total
				Start	End	Cost ($)	Width (m)	
11	N Pt. Lot 10	Geraldine Hudson	020-127	0+000 0+000	0+438 0+438	$13,360 $3,340	5 5	$16,700
11	N Pt. Lot 10	1855664 Ontario Ltd.	020-128	0+438 0+438	0+498 0+498	$1,830 $460	5 5	$2,290
12	S Pt. Lot 10	Foster Farms Inc.	020-105	0+518 0+518 0+827	0+827 0+827 1+035	$9,430 $2,360 -	5 5 -	$11,790
12	S Pt. Lot 9	Barbra Van Gaalen	020-086	1+035	1+640	-	-	-
12	S Pt. Lot 8	Gillis Farms Inc.	020-077	1+670 1+734	2+288 Sweep	- $150	- 10	$150
						Total		**$30,930**

Table 2: Schedule of Damage Allowances

Concession	Lot	Owner and Roll No.		Station		Damages (Section 30)		Total
				Start	End	Cost ($)	Width (m)	
11	N Pt. Lot 10	Geraldine Hudson	020-127	0+000	0+438	$8,660	40	$8,660
11	N Pt. Lot 10	1855664 Ontario Ltd.	020-128	0+438	0+498	$1,190	40	$1,190
12	S Pt. Lot 10	Foster Farms Inc.	020-105	0+518 0+827	0+827 1+035	$9,650 $1,590	55 20	$11,240
12	S Pt. Lot 9	Barbra Van Gaalen	020-086	1+035	1+640	$4,630	20	$4,630
12	S Pt. Lot 8	Gillis Farms Inc.	020-077	1+670 1+734	2+288 Sweep	$4,890 $80	20	$4,970
						Total		**$30,690**

Table 3: Summary of Allowances

Concession	Lot	Owner and Roll No.		Total
11	N Pt. Lot 10	Geraldine Hudson	020-127	$25,360
11	N Pt. Lot 10	1855664 Ontario Ltd.	020-128	$3,480
12	S Pt. Lot 10	Foster Farms Inc.	020-105	$23,030
12	S Pt. Lot 9	Barbra Van Gaalen	020-086	$4,630
12	S Pt. Lot 8	Gillis Farms Inc.	020-077	$5,120
			Total	**$61,620**

13. ASSESSMENTS

Section 21 of the Drainage Act requires that the Engineer *"shall assess for benefit, outlet liability and injuring liability, and shall insert in an assessment schedule, in separate columns, the sums assessed for each opposite each parcel of land and road liable therefore."* On this project, Benefit, Outlet liability, Special Benefit and Section 26 assessments are involved.

Assessment for Benefit is described in **Section 22** of the Act, which states *"Lands, roads, buildings, utilities or other structures that are increased in value or are more easily maintained as a result of the construction, improvement, maintenance or repair of a drainage works may be assessed for benefit."* As defined in the act, Benefits to landowners can include higher market value for the property, improved appearance or better control of surface or subsurface water, or any other advantages relating to the betterment of lands, roads, buildings or structures.

Assessment for Outlet Liability is described in **Section 23(1**) of the Act which states *"Lands and roads that use a drainage works as an outlet, or for which, when the drainage works is constructed or improved, an improved outlet is provided either directly or indirectly through the medium of any other drainage works or of a swale, ravine, creek or watercourse, may be assessed for outlet liability."* Outlet liability is the part of the cost of the works that is required to provide such outlet or improved outlet.

Outlet liability for all roads was calculated using the methodology outlined in "*Outlet Liability Assessment Factors for Highway Rights of Way*", as published by the Ontario Ministry of Transportation. This methodology assigns an Equivalent Area Factor to roads based on the percentage of the Right-of-Way that is developed and the adjacent soil runoff coefficient ('C' factor). The Equivalent Area Factors for the roads is summarized in Table 4 below.

Table 4: Equivalent Area Factors for Roads

Road	Owner	Percent Developed	Runoff Coefficient	Equivalent Area Factor
Highbury Avenue	County of Middlesex	50%	0.35	2.25
Plover Mills Road	County of Middlesex	40%	0.35	2.25
Twelve Mile Road	Municipality of Middlesex Centre	30%	0.35	2.25

Assessment for Special Benefit is described in **Section 24** of the Act and is defined as any additional work or feature included in the construction, repair or improvement of a drainage works that has no effect on the functioning of the drainage works. Roll No. 020-084 is assessed a special benefit for the supply and installation of the service sweep to the property.

Section 26 of the Act specifies that *"the public utility or road authority shall be assessed for and shall pay all the increase of cost of such drainage works caused by the existence of the works of the public utility or road authority."* This means that any costs which are required solely because of the existence of Twelve Mile Road, Highbury Avenue, gas lines, oil pipelines, hydro poles and lines, Bell lines and Quadro lines will be fully

assessed to the Municipality of Middlesex Centre, County of Middlesex, Enbridge Gas, Enbridge Oil Pipeline, Hydro One, Bell and Quadro, respectively. The Section 26 assessments consist of the actual cost of the drain construction due to the road or utility, minus the normal construction cost of the drain should the road or utility not exist.

The Municipality of Middlesex Centre shall have the option of either performing the work of installing the culvert and retaining wall or may elect to have the work done by the general contractor. If done by the Municipality at its expense, the construction portion of the Section 26 assessment shall not apply. However done, the future maintenance, reconstruction, replacement or alteration of the Twelve Mile Road crossing and retaining wall, including any incidental costs shall be the responsibility of the Municipality.

The County of Middlesex shall have the option of either performing the work of installing the road crossing and catch basins or may elect to have the work done by the general contractor. If done by the County at its expense, the construction portion of the Section 26 assessment shall not apply. However done, the future maintenance, reconstruction, replacement or alteration of the Highbury Avenue crossing and catch basins, including any incidental costs shall be the responsibility of the County.

Enbridge Gas shall have the option of either performing the work of exposure prior to construction, supply and installation of the non-metallic barrier, construction of the drain adjacent to the gas line or may elect to have the work done by the general contractor. If done by Enbridge Gas at its expense, the construction portion of the Section 26 assessment shall not apply. However done, the future maintenance, reconstruction, replacement or alteration of works related to the gas line including any incidental costs shall be the responsibility of Enbridge Gas.

Enbridge Oil Pipeline shall have the option of either performing the work of construction of the drain adjacent to the oil pipelines, or may elect to have the work done by the general contractor. If done by Enbridge Oil Pipeline at its expense, the construction portion of the Section 26 assessment shall not apply. However done, the future maintenance, reconstruction, replacement or alteration of works related to the oil pipelines including any incidental costs shall be the responsibility of Enbridge Oil Pipeline.

Hydro One shall have the option of either performing the work of construction of the drain adjacent to the Hydro One poles and lines, or may elect to have the work done by the general contractor. If done by Hydro One at its expense, the construction portion of the Section 26 assessment shall not apply. However done, the future maintenance, reconstruction, replacement or alteration of works related to the Hydro One poles and lines including any incidental costs shall be the responsibility of Hydro One.

Bell shall have the option of either performing the work of exposure prior to construction, construction of the drain adjacent to the Bell line, or may elect to have the work done by the general contractor. If done by Bell at its expense, the construction portion of the Section 26 assessment shall not apply. However done, the future maintenance, reconstruction, replacement or alteration of works related to the Bell lines including any incidental costs shall be the responsibility of Bell.

Quadro shall have the option of either performing the work of exposure prior to construction, construction of the drain adjacent to the Quadro line, or may elect to have the work done by the general contractor. If done by Quadro at its expense, the construction portion of the Section 26 assessment shall not apply. However done, the future maintenance, reconstruction, replacement or alteration of works related to the Quadro lines including any incidental costs shall be the responsibility of Quadro.

Assessments were determined using a modified “Todgham” method, a method of assessment that is recognized to be a fair and equitable way of dividing costs between the benefitting landowners. This methodology involves assigning Equivalent Area Factors to various types of property which reflect their runoff potential, using Agricultural lands as a base (Ag factor = 1.0). The cost of the drain is divided into logical sections, each property is assigned to a section, and benefit and outlet assessments are determined on a property by property basis, starting at the outlet and working towards the topmost property.

There is no injuring liability assessment on this drain. No property is considered to have riparian rights insofar as assessment is concerned.

Assessments on agricultural lands may be eligible for a one third provincial grant. Neither the availability nor the amount of the grant can be determined in advance. There is no grant should the project not proceed through construction.

14. COST ESTIMATE

The cost of this municipal drain Improvement is estimated as **$915,910** and is raised by assessment from properties within the watershed. A Schedule of Estimated Assessments can be found in **Appendix A**.

GM BluePlan estimates the cost of the Needham as follows:

COST ESTIMATE - Needham Municipal Drain Municipality of Middlesex Centre		
Allowances		**$ 61,620**
Needham Drain Construction		
Expose existing drain during design stage	$ 1,095	
Expose existing drain at confluence with Smith Municipal Drain - Approx. Sta. 1+696	$ 1,200	
Expose existing drain at confluence with Williams Drain Branch 'A' - Approx. Sta. 1+959	$ 1,200	
Environmental protection measures	$ 1,000	
Clearing and grubbing	$ 6,700	
Reconstruct and deepen existing open drain including seeding, leveling of material, supply and install erosion control blanket and construction of buffer strips - Sta. 0+000 to Sta. 0+497, Sta. 0+514 to Sta. 0+827		
Excavation, including leveling salvage of existing rip rap and placement of spoil, topsoil and seed - 810m	$ 34,500	
Erosion control blanket (approx. 9,600m^2)	$ 48,000	
Supply and install 50m^2 rip rap on geotextile filter material at outlet - Sta. 0+827	$ 4,000	
Supply 43m of 900mm diameter HDPE pipe complete with rodent grate	$ 11,100	
Install 43m of 900mm diameter HDPE pipe complete with rodent grate - Sta. 0+827 to Sta. 0+870	$ 3,400	
Supply and install granular 'B' bedding and backfill to 300mm above pipe - Sta. 0+827 to Sta. 0+870 (approx. 240 tonnes)	$ 4,700	
Supply 775m of 825mm diameter concrete field tile	$ 104,400	
Install 130m of 825mm diameter concrete field tile - Sta. 1+480 to Sta. 1+610	$ 6,300	
Install 645m of 825mm diameter concrete field tile (anticipated double strip) - Sta. 0+870 to Sta. 1+480, Sta. 1+610 to Sta. 1+645	$ 40,975	
Supply 27m of 750mm diameter concrete field tile	$ 2,700	
Install 27m of 750mm diameter concrete field tile - Sta. 1+669 to Sta. 1+696	$ 1,200	
Supply 263m of 675mm diameter concrete field tile	$ 20,700	
Install 263m of 675mm diameter concrete field tile - Sta. 1+696 to 1+959	$ 9,900	

Supply 329m of 525mm diameter concrete field tile	$ 15,200	
Install 329m of 525mm diameter concrete field tile - Sta. 1+959 to 2+288	$ 10,500	
Supply and install 1 - 1500mm x 1200mm catch basin c/w bird cage grate and earth berm - Sta. 1+035	$ 4,500	
Supply and install 2 - 1200mm x 900mm junction box - Sta. 1+696, Sta. 1+959	$ 6,000	
Supply and install 1 - 1200mm x 900mm catch basin c/w bird cage grate and earth berm - Sta. 2+288	$ 3,500	
Supply and install 10m^2 rip rap at each catch basin - Sta. 1+035, Sta 2+288	$ 1,600	
Supply and install 200mm diameter HDPE pipe service service sweep c/w cap, manufactured tee (or approved equivalent), granular 'B' bedding and backfill, and clearing and grubbing of trees, brush and vegetation - Sta. 1+734 Offset (approx. 10m)	$ 2,500	
Allowance for 19mm clear crushed stone (PROVISIONAL)	$ 8,500	
Allowance for poor soil condidtions (PROVISIONAL)	$ 10,300	
Allowance for imported topsoil (PROVISIONAL)	$ 2,000	
Allowance for tile connnections (PROVISIONAL)	$ 5,900	
Contingency Fund at approx. 10% of construction	$ 37,400	
Total Estimated Drain Construction Cost		**$ 410,970**
Construction - Work to be done on Highbury Aveune		
Supply and install 24m of 750mm diameter steel pipe under Ilderton road by jack and bore method - Sta. 1+645 to Sta. 1+669	$ 29,100	
Supply and install 1 - 1500mm x 1200mm catch basin c/w bird cage grate, earth berm, 3m of 300mm diameter HDPE pipe and granular 'B' bedding and backfill for the HDPE pipe - Sta. 1+645	$ 4,100	
Supply and install 1 - 1200mm x 900mm catch basin c/w bird cage grate, 11m of 450mm diameter HDPE pipe, 750mm x 750mm x 450mm diameter manufactured tee (or approved equivalent) and granular 'B' bedding and backfill for the HDPE pipe - Offset Sta. 1+669	$ 7,000	
Supply and install 10m^2 rip rap at each catch basin - Sta. 1+645, Offset Sta. 1+669	$ 1,600	
Cap, grout and abandon existing road crossing with un-shrinkable fill (approx. 6m^3) - Sta. 1+645 to Sta. 1+669	$ 3,600	
Allowance for 19mm clear crushed stone (PROVISIONAL)	$ 500	
Contingency Fund at approx. 10% of construction	$ 4,600	
Total Estimated Road Crossing Construction Cost		**$ 50,500**
Construction - Work to be done on Twelve Mile Road		
Environmental protection measures	$ 2,000	
Dewatering, including drain by-pass and temporary cofferdams	$ 4,000	
Earth excavation for culvert installation, including stripping, stockpiling and reinstallation of topsoil, brushing of vegetation and site restoration including seed	$ 2,000	
Supply 17m of 1800mm diameter CSP culvert	$ 17,000	
Install 1800mm diameter CSP culvert including removal of existing culvert - Sta. 0+497 to 0+514	$ 10,200	

Supply and install granular 'A' base, backfill and roadbase (approx. 800 tonnes)	$ 20,000	
Supply and install precast concrete headwall and cut-off wall c/w 19mm clear crushed stone, bedding and backfill	$ 35,000	
Supply and install precast concrete retaining walls c/w bedding and backfill	$ 29,300	
Supply and place 220m^2 rip rap (total) on geotextile filter material at culvert ends - Sta. 0+497, Sta. 0+514	$ 17,600	
Re-grade Bryanston Drain including leveling and placement of spoil, topsoil and seed (approx. 10m)	$ 500	
Allowance for 19mm clear crushed stone at CSP road crossing (PROVISIONAL)	$ 500	
Allowance for Granular 'B' at CSP road crossing (PROVISIONAL)	$ 500	
Contingency Fund at approx. 10% of construction	$ 13,900	
Total Estimated Road Crossing Construction Cost		**$ 152,500**
Work to Support Enbridge Gas		
Exposure of gas lines during design stage	$ 1,920	
Exposure of gas lines at time of construction	$ 3,000	
Relocation of gas line prior to construction - Twelve Mile Road (by others)	$ -	
Supply and install non-metallic barrier (min. 9.0mm thickness) between existing gas line and drain - Highbury Avenue	$ 2,000	
Protection and temporary support of gas line during construction, including coordination - Twelve Mile Road	$ 1,500	
Protection and temporary support of gas line during construction, including coordination - Highbury Avenue	$ 3,000	
Non-construction - Coordination, on-site survey during exposure of gas lines, protection design/specifications	$ 9,500	
Contingency Fund at approx. 10% of construction	$ 2,100	
Total Estimated Work to Support Enbridge Gas Construction Cost		**$ 23,020**
Work to Support Enbridge Oil Pipeline		
Protection of oil pipeline during construction, including coordination	$ 3,000	
Non-construction - Coordination, site meeting, on-site survey during exposure work, protection design/specifications	$ 5,500	
Contingency Fund at approx. 10% of construction	$ 900	
Total Estimated Work to Support Enbridge Oil Pipeline Construction Cost		**$ 9,400**
Work to Support Bell		
Exposure of Bell lines during design stage	$ 680	
Exposure of Bell lines at time of construction	$ 1,500	
Protection and temporary support of Bell lines during construction, including coordination	$ 1,500	
Non-construction - Coordination, on-site survey during exposure of Bell lines, protection design/specifications	$ 3,600	
Contingency Fund at approx. 10% of construction	$ 700	
Total Estimated Work to Support Bell Construction Cost		**$ 7,980**

Work to Support Quadro		
Exposure of Quadro lines during design stage	$ 820	
Exposure of Quadro lines at time of construction	$ 2,000	
Relocation of Quadro lines prior to construction (by others)	$ -	
Protection and temporary support of Quadro lines during construction, including coordination	$ 2,000	
Non-construction - Coordination, on-site survey during exposure of Quadro lines, protection design/specifications	$ 4,800	
Contingency Fund at approx. 10% of construction	$ 1,000	
Total Estimated Work to Support Quadro Construction Cost		**$ 10,620**
Work to Support Hydro One		
Hydro One pole holds during construction - Highbury Avenue (by others)	$ -	
Relocation of hydro pole prior to construction - Twelve Mile Road (by others)	$ -	
Protection of Hydro One poles during construction, including coordination	$ 3,500	
Non-construction - Coordination, site meeting, protection design/specifications	$ 8,000	
Contingency Fund at approx. 10% of construction	$ 1,200	
Total Estimated Work to Support Bell Construction Cost		**$ 12,700**
Non-Construction Costs		
On Site Meeting, Survey, Plan, Profile, and Report	$ 111,300	
Tendering, Construction Review, Contract Administration and Grant Application	$ 22,500	
Species at Risk Review Report	$ 3,000	
UTRCA Permit Fee	$ 1,000	
Carrying Costs (est. @ 3% for 1 year) & Net HST (1.76%)	$ 38,800	
Total Non-Construction Costs		**$ 176,600**
TOTAL ESTIMATED COST		**$ 915,910**

*The above costs are estimates only. The final costs of engineering and administration cannot be determined until construction is completed. The above costs also do not include costs to defend the drainage report should appeals be filed with the Court of Revision, Drainage Tribunal and/or Drainage Referee as the extent of the work required cannot be determined. Should additional costs be incurred, unless directed otherwise, the costs would be assessed in pro rata fashion as per the Schedule of Assessments.

15. MAINTENANCE

As per Section 74 of the Drainage Act, after construction of the improvements the Needham Municipal Drain as described in this Report shall be maintained by Municipality of Middlesex Centre at the expense of the upstream lands and roads assessed, in the proportions set out in the By-Law which adopts this Report. Any future maintenance or repair costs shall be distributed pro rata in accordance with **Appendix B**, the Schedule of Assessments for Future Maintenance. The Schedule of Assessments for Future Maintenance is based on the equivalent contributing areas for all properties.

Future costs for maintenance of the Twelve Mile Road crossing and Highbury Avenue crossing (including the drain, upstream catch basin and downstream catch basin) are to be fully assessed to the Municipality of Middlesex Centre and County of Middlesex, respectively. As road authority, the Municipality of Middlesex Centre and the County of

Middlesex have the right under Section 69(1) to undertake any maintenance or repair to their road crossings as they deem necessary. The Drainage Superintendent should be advised of any works being undertaken.

Future costs for maintenance due to the existence of gas lines, oil pipelines, hydro poles and lines, Bell lines and Quadro lines shall be fully assessed to Enbridge Gas, Enbridge Oil Pipeline, Hydro One, Bell and Quadro, respectively. As public utilities, Enbridge Gas, Enbridge Oil Pipeline, Hydro One, Bell and Quadro have the right to maintain or repair the drain upon, along, adjoining, under or across the gas lines, Bell lines and Quadro lines, respectively. The Drainage Superintendent should be advised of any works being undertaken.

Any additional costs for future drain maintenance required for and due to the removal of vegetation, fencing or any other obstruction within the Right-Of-Way shall be assessed to the landowner. Future costs for the maintenance of the service sweep shall be fully assessed to the landowner whose property the sweep services.

Landowners should take note that there is responsibility for landowners to not damage or block flow in the municipal drain. Section 80(1) of the Drainage Act states;

> *"When a drainage works becomes obstructed by a dam, low bridge, fence, washing out of a private drain, or other obstruction, for which the owner or occupant of the land adjoining the drainage works is responsible, so that the free flow of the water is impeded thereby, the persons owning or occupying the land shall, upon reasonable notice sent by the council of the local municipality whose duty it is to maintain and repair the drainage works or by a drainage superintendent appointed by the council, remove such obstruction and, if it is not so removed within the time specified in the notice, the council or the drainage superintendent shall forthwith cause it to be removed, and the cost thereof is payable to the municipality by the owner or occupant of the land."*

Any landowners, who have questions as to their rights and responsibilities under the Drainage Act, should contact the Middlesex Centre Drainage Superintendent who can provide additional information and answer any questions that landowners may have.

Regular inspection of the culverts and drainage course should be undertaken by the Middlesex Centre Drainage Superintendent. Landowners can assist with the inspection by making regular inspections of the drain as it crosses their property, clearing debris from the drain and culverts if possible, and reporting any problems or concerns to the Drainage Superintendent who can inspect and take any necessary actions.

All of which is respectfully submitted.

Yours truly,

GM BLUEPLAN ENGINEERING LIMITED
Per:

Brendan Shapton

Brendan Shapton, M.A.Sc., P.Eng.

Disclaimer: This report is intended for the sole use of The Municipality of Middlesex Centre for the purposes as expressed in the report. Any use of or reliance upon this report by third parties is at the expressed responsibility of the third party. GM BluePlan Engineering is not responsible for any damages suffered by any third party as a result of decisions or actions made based upon the information contained in this report.

Appendix A
Schedule of Estimated Assessments for Construction

Schedule of Estimated Assessments
Prepared by GM BluePlan Engineering Limited January 2024
Needham Municipal Drain

Roll No.	Conc	Lot	Owner	Affected Area		Adjusted Area		Benefit	Outlet	Section	TOTAL	Allowances	NET
				ac.	ha.	ac.	ha.	(sect. 22)	(sect. 23)	24/26	ASSESSMENT		ASSESSMENT[1]
Lands													
020-106	12	S Pt. Lot 10	Robert Foster	38.65	15.64	38.65	15.64	$ -	$ 12,910	$ -	$ 12,910	$ -	**$ 12,910**
020-105	12	S Pt. Lot 10	Foster Farms Inc.	49.99	20.23	49.17	19.90	$ 20,210	$ 16,790	$ -	$ 37,000	$ (23,030)	**$ 13,970**
020-039	12	N Pt. Lot 10	George Bloschinsky	0.89	0.36	0.44	0.18	$ -	$ 170	$ -	$ 170	$ -	**$ 170**
020-086	12	S Pt. Lot 9	Barbara Van Gaalen	89.85	36.36	89.85	36.36	$ 56,630	$ 50,510	$ -	$ 107,140	$ (4,630)	**$ 102,510**
020-042	12	N Pt. Lot 9	Mark Cowderoy	24.69	9.99	24.69	9.99	$ -	$ 9,420	$ -	$ 9,420	$ -	**$ 9,420**
020-077	12	Pt. Lot 8	Gillis Farms Inc.	82.51	33.39	71.71	29.02	$ 45,260	$ 125,260	$ -	$ 170,520	$ (5,120)	**$ 165,400**
020-043	12	N Pt. Lot 8	Anton Rapp	26.34	10.66	17.54	7.10	$ -	$ 27,890	$ -	$ 27,890	$ -	**$ 27,890**
020-044	12	N Pt. Lot 7	Brookwood Farms Inc.	5.29	2.14	2.64	1.07	$ -	$ 5,100	$ -	$ 5,100	$ -	**$ 5,100**
020-063	12	S Pt. Lot 7	1855664 Ontario Ltd.	48.43	19.60	43.07	17.43	$ 12,600	$ 83,070	$ -	$ 95,670	$ -	**$ 95,670**
020-085-01	12	N Pt. Lot 8	Laura Shoebottom	2.45	0.99	3.68	1.49	$ -	$ 5,570	$ -	$ 5,570	$ -	**$ 5,570**
020-085	12	S Pt. Lot 8	Keith & Leanne Hall	0.62	0.25	0.94	0.38	$ 1,260	$ 1,390	$ -	$ 2,650	$ -	**$ 2,650**
020-084	12	S Pt. Lot 8	Michael McCartney	0.47	0.19	0.72	0.29	$ 3,780	$ 1,090	$ 3,430	$ 8,300	$ -	**$ 8,300**
020-083	12	S Pt. Lot 8	Scott Collins & Amy Donaldson	0.49	0.20	0.74	0.30	$ 1,260	$ 1,120	$ -	$ 2,380	$ -	**$ 2,380**
020-082	12	S Pt. Lot 8	Murray Tyler & Janet Minshall-Tyler	0.49	0.20	0.74	0.30	$ 1,260	$ 1,120	$ -	$ 2,380	$ -	**$ 2,380**
020-081	12	S Pt. Lot 8	Nigel & Mary Bartram	0.47	0.19	0.72	0.29	$ 1,230	$ 1,080	$ -	$ 2,310	$ -	**$ 2,310**
020-080	12	S Pt. Lot 8	Donald & Julene Riley	0.47	0.19	0.72	0.29	$ 1,230	$ 1,080	$ -	$ 2,310	$ -	**$ 2,310**
020-079	12	Pt. Lot 8	Jennifer Gray	0.47	0.19	0.72	0.29	$ 1,020	$ 820	$ -	$ 1,840	$ -	**$ 1,840**
020-078	12	S Pt. Lot 8	Hugh Smith & Marta Zamir	0.49	0.20	0.74	0.30	$ -	$ 150	$ -	$ 150	$ -	**$ 150**
020-076	12	S Pt. Lot 8	Zupancic Holdings Inc.	0.54	0.22	1.63	0.66	$ -	$ 340	$ -	$ 340	$ -	**$ 340**
020-074	12	S Pt. Lot 8	Middlesex County c/o County Clerk	1.11	0.45	3.34	1.35	$ -	$ 690	$ -	$ 690	$ -	**$ 690**
020-073	12	S Pt. Lot 8	Kent Hardy & Renee Vachon	0.49	0.20	0.74	0.30	$ -	$ 1,370	$ -	$ 1,370	$ -	**$ 1,370**
020-072	12	S Pt. Lot 8	Michael & Robert Kuenzlen & Jillian Williamson	0.47	0.19	0.72	0.29	$ -	$ 1,330	$ -	$ 1,330	$ -	**$ 1,330**
020-071	12	S Pt. Lot 8	Timothy Graham & Wendy Dumaresq-Graham	0.44	0.18	0.67	0.27	$ -	$ 1,240	$ -	$ 1,240	$ -	**$ 1,240**
020-070	12	S Pt. Lot 8	Christopher & Tammy Duncan	0.44	0.18	0.67	0.27	$ -	$ 1,240	$ -	$ 1,240	$ -	**$ 1,240**
020-069	12	S Pt. Lot 8	Colin Eeley	0.47	0.19	0.72	0.29	$ -	$ 1,330	$ -	$ 1,330	$ -	**$ 1,330**
020-068	12	S Pt. Lot 8	Jonathan Spicer	0.44	0.18	0.67	0.27	$ -	$ 1,240	$ -	$ 1,240	$ -	**$ 1,240**
020-067	12	S Pt. Lot 8	Terry Roberts	0.47	0.19	0.72	0.29	$ -	$ 1,330	$ -	$ 1,330	$ -	**$ 1,330**
020-066	12	S Pt. Lot 8	Jack and Catherine Harding	0.47	0.19	0.72	0.29	$ -	$ 1,330	$ -	$ 1,330	$ -	**$ 1,330**
020-065	12	S Pt. Lot 8	Peter Lamond	0.44	0.18	0.67	0.27	$ -	$ 1,240	$ -	$ 1,240	$ -	**$ 1,240**
020-064	12	S Pt. Lot 8	Stanley & Catherine Adamski	0.72	0.29	1.09	0.44	$ -	$ 2,010	$ -	$ 2,010	$ -	**$ 2,010**
020-087	12	Plan 329 Lot 9 Pt. Lot 8	David & Delores Maddock	0.32	0.13	0.49	0.20	$ -	$ 720	$ -	$ 720	$ -	**$ 720**
020-088	12	Plan 329 Lot 7 Pt. Lot 8	Beverly & Stephen Guinness	0.22	0.09	0.35	0.14	$ -	$ 70	$ -	$ 70	$ -	**$ 70**
020-089	12	Plan 329 Lot 6	Jewgenji & Rebecca Deniswitsch	0.20	0.08	0.30	0.12	$ -	$ 60	$ -	$ 60	$ -	**$ 60**
020-077-02	12	Pt. Lot 8	Carbello Pata & Naveesha Maharaj	0.64	0.26	0.96	0.39	$ -	$ 1,810	$ -	$ 1,810	$ -	**$ 1,810**
020-077-03	12	Pt. Lot 8	David McVittie & Paula Appleton	0.64	0.26	0.96	0.39	$ -	$ 1,860	$ -	$ 1,860	$ -	**$ 1,860**
020-077-04	12	Pt. Lot 8	Mary Schoenewolf	0.64	0.26	0.96	0.39	$ -	$ 1,860	$ -	$ 1,860	$ -	**$ 1,860**
020-090	12	Plan 329 Lots 4,5,15,16	Manfred Hally c/o Discovery Wood Products	0.79	0.32	1.19	0.48	$ -	$ 250	$ -	$ 250	$ -	**$ 250**
020-092	12	Plan 329 Lot 3	Melissa Tiller	0.20	0.08	0.30	0.12	$ -	$ 60	$ -	$ 60	$ -	**$ 60**
020-093	12	Plan 329 Lot 2	2840616 Ontario Inc	0.20	0.08	0.30	0.12	$ -	$ 60	$ -	$ 60	$ -	**$ 60**
020-094	12	Plan 329 Lot 1	2840616 Ontario Inc.	0.20	0.08	0.59	0.24	$ -	$ 120	$ -	$ 120	$ -	**$ 120**
020-095	12	Plan 329 Lot 10	Larry & Mary-Jane Kemp	0.20	0.08	0.30	0.12	$ -	$ 60	$ -	$ 60	$ -	**$ 60**
020-097	12	Plan 329 Lots 11, 12, 17	Hans & Heidi Scheib	0.59	0.24	0.89	0.36	$ -	$ 190	$ -	$ 190	$ -	**$ 190**

Schedule of Estimated Assessments
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Needham Municipal Drain

Roll No.	Conc	Lot	Owner	Affected Area		Adjusted Area		Benefit	Outlet	Section	TOTAL	Allowances	NET
				ac.	ha.	ac.	ha.	(sect. 22)	(sect. 23)	24/26	ASSESSMENT		ASSESSMENT[1]
Lands													
020-098	12	Plan 329 Lots 13, 14, 18	Ronald Danner	0.82	0.33	1.24	0.50	$ -	$ 260	$ -	$ 260	$ -	**$ 260**
020-100	12	Pt. Lot 9	Steven Thompson	0.49	0.20	0.74	0.30	$ -	$ 150	$ -	$ 150	$ -	**$ 150**
020-101	12	Pt. Lot 9	Michael Martinek	0.49	0.20	0.74	0.30	$ -	$ 150	$ -	$ 150	$ -	**$ 150**
020-103	12	Pt. Lot 9	William & Lina Addison	0.62	0.25	0.94	0.38	$ -	$ 200	$ -	$ 200	$ -	**$ 200**
020-102-01	12	Pt. Lot 9	Douglas & Jessica Francis	0.89	0.36	1.33	0.54	$ -	$ 280	$ -	$ 280	$ -	**$ 280**
020-102	12	E Pt. Lot 9	Iskan Khassan & Irena Krasun	0.82	0.33	1.24	0.50	$ -	$ 260	$ -	$ 260	$ -	**$ 260**
020-101-98	12	Plan 12 S Pt. Lot 9	Brian & Bonnie Martin	1.58	0.64	2.37	0.96	$ -	$ 490	$ -	$ 490	$ -	**$ 490**
020-104-04	12	S Pt. Lot 9	Lori Lauder & Michael Barnes	1.58	0.64	2.37	0.96	$ -	$ 490	$ -	$ 490	$ -	**$ 490**
020-104-01	12	Pt. Lot 9	Tana Smith	0.99	0.40	1.48	0.60	$ -	$ 310	$ -	$ 310	$ -	**$ 310**
020-128-90	11	N Pt. Lot 9	David & Joan Elston	0.79	0.32	1.19	0.48	$ -	$ 250	$ -	$ 250	$ -	**$ 250**
020-128-92	11	N Pt. Lot 9	Shauna & Adrian Dereniowski	0.79	0.32	1.19	0.48	$ -	$ 250	$ -	$ 250	$ -	**$ 250**
020-128-94	11	N Pt. Lot 9	Antero & Jacinta Almeida	0.79	0.32	1.19	0.48	$ -	$ 250	$ -	$ 250	$ -	**$ 250**
020-128-96	11	N Pt. Lot 9	Diane Bell	0.79	0.32	1.19	0.48	$ -	$ 250	$ -	$ 250	$ -	**$ 250**
020-128-98	11	N Pt. Lot 9	Elizabeth Baldassarre	0.79	0.32	1.19	0.48	$ -	$ 250	$ -	$ 250	$ -	**$ 250**
020-129	11	N Pt. Lot 9	Laura Somerville & Shawn McLean	0.69	0.28	1.04	0.42	$ -	$ 220	$ -	$ 220	$ -	**$ 220**
020-130	11	Plan 307 Lot 1	Michael Brooks & Ashley Overhold	0.25	0.10	0.37	0.15	$ -	$ 80	$ -	$ 80	$ -	**$ 80**
020-131	11	Plan 307 Pt. Lot 2	David Dunn	0.25	0.10	0.37	0.15	$ -	$ 80	$ -	$ 80	$ -	**$ 80**
020-132	11	Plan 307 Lot 3 Pt. Lot 2	Joshua Franks & Rebecca Glover	0.15	0.06	0.22	0.09	$ -	$ 50	$ -	$ 50	$ -	**$ 50**
020-126	11	N Pt. Lot 11	Foster Farms Inc.	3.14	1.27	3.14	1.27	$ -	$ 100	$ -	$ 100	$ -	**$ 100**
020-127	11	N Pt. Lot 10	Geraldine Hudson	39.39	15.94	39.39	15.94	$ 12,970	$ 3,520	$ -	$ 16,490	$ (25,360)	**$ (8,870)**
020-128	11	N Pt. Lot 10	1855664 Ontario Ltd.	25.43	10.29	25.43	10.29	$ 1,780	$ 3,440	$ -	$ 5,220	$ (3,480)	**$ 1,740**
020-143	11	N Pt. lot 9	Alexander Schmoll	29.85	12.08	28.42	11.50	$ -	$ 2,550	$ -	$ 2,550	$ -	**$ 2,550**
020-063-02	12	S Pt. Lot 7	Sherri-Lynn Belair & Frank Boros	1.88	0.76	2.82	1.14	$ -	$ 5,430	$ -	$ 5,430	$ -	**$ 5,430**
020-129-02	11	N Pt. Lot 9	Emma Oshana	0.74	0.30	1.11	0.45	$ -	$ 230	$ -	$ 230	$ -	**$ 230**
020-146	11	Pt. Lot 8	Djamel Bouazza	0.10	0.04	0.15	0.06	$ -	$ 30	$ -	$ 30	$ -	**$ 30**
020-145-01	11	N Pt. Lot 8	Robert Walz & Donna Sessions	0.17	0.07	0.27	0.11	$ -	$ 60	$ -	$ 60	$ -	**$ 60**
020-145-02	11	N Pt. Lot 8	Alan & Heather Elgie	0.22	0.09	0.35	0.14	$ -	$ 70	$ -	$ 70	$ -	**$ 70**
020-145-03	11	N Pt. Lot 8	Carlin Riley & Channon Scott	0.22	0.09	0.35	0.14	$ -	$ 70	$ -	$ 70	$ -	**$ 70**
020-145-05	11	N Pt. Lot 8	Ljubomir & Jovanka Kolundzic	0.20	0.08	0.30	0.12	$ -	$ 60	$ -	$ 60	$ -	**$ 60**
020-145-06	11	Pt. Lot 8	Municipalty of Middlesex Centre	1.21	0.49	3.63	1.47	$ -	$ 5,140	$ -	$ 5,140	$ -	**$ 5,140**
020-145-23	11	Pt. Lot 8	XO Homes Inc.	0.17	0.07	0.27	0.11	$ -	$ 500	$ -	$ 500	$ -	**$ 500**
020-145-22	11	Pt. Lot 8	John Kocak	0.25	0.10	0.37	0.15	$ -	$ 690	$ -	$ 690	$ -	**$ 690**
020-145-21	11	Pt. Lot 8	XO Homes Inc.	0.25	0.10	0.37	0.15	$ -	$ 690	$ -	$ 690	$ -	**$ 690**
Total Estimated Assessment - Lands				***501.19***	***202.83***	***494.20***	***199.97***	***$ 160,490***	***$ 393,200***	***$ 3,430***	***$ 557,120***	***$ (61,620)***	***$ 495,500***

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Needham Municipal Drain

Roll No.	Conc	Lot	Owner	Affected Area		Adjusted Area		Benefit	Outlet	Section	TOTAL	Allowances	NET
				ac.	ha.	ac.	ha.	(sect. 22)	(sect. 23)	24/26	ASSESSMENT		ASSESSMENT[1]
Roads													
		Highbury Ave.	County of Middlesex	7.19	2.91	16.21	6.56	$ 10,610	$ 15,110	$ 58,020	$ 83,740	$ -	**$ 83,740**
		Plover Mills Road	County of Middlesex	5.61	2.27	12.65	5.12	$ -	$ 19,750	$ -	$ 19,750	$ -	**$ 19,750**
		Twelve Mile Road	Municipalty of Middlesex Centre	6.30	2.55	14.18	5.74	$ 600	$ 2,950	$ 188,030	$ 191,580	$ -	**$ 191,580**
		Enbridge Gas	Enbridge Gas	-	-	-	-	$ -	$ -	$ 23,020	$ 23,020	$ -	**$ 23,020**
		Bell	Bell	-	-	-	-	$ -	$ -	$ 7,980	$ 7,980	$ -	**$ 7,980**
		Quadro	Quadro	-	-	-	-	$ -	$ -	$ 10,620	$ 10,620	$ -	**$ 10,620**
		Enbridge Oil Pipeline	Enbridge Oil Pipeline	-	-	-	-	$ -	$ -	$ 9,400	$ 9,400	$ -	**$ 9,400**
		Hydro One	Hydro One	-	-	-	-	$ -	$ -	$ 12,700	$ 12,700	$ -	**$ 12,700**
Total Estimated Assessment - Roads				***19.10***	***7.73***	***43.04***	***17.42***	***$ 11,210***	***$ 37,810***	***$ 309,770***	***$ 358,790***	***$ -***	***$ 358,790***
TOTAL ESTIMATED ASSESSMENTS				***520.29***	***210.56***	***537.24***	***217.39***	***$ 171,700***	***$ 431,010***	***$ 313,200***	***$ 915,910***	***$ (61,620)***	***$ 854,290***

[1]**Agricultural lands may be eligible for a one third provincial grant. Neither the availability nor the amount of the grant can be determined in advance**

Appendix B
Schedule of Assessments for Future Maintenance

Schedule of Assessment for Future Maintenance
Prepared by GM BluePlan Engineering Limited January 2024
Needham Municipal Drain

Conc.	Lot	Owner and Roll No.		Affected Area		Adjusted Area		Maintenance Assessment
				ac.	ha.	ac.	ha.	
Lands								
12	S Pt. Lot 10	Robert Foster	020-106	38.65	15.64	38.65	15.64	7.19%
12	S Pt. Lot 10	Foster Farms Inc.	020-105	49.99	20.23	49.17	19.90	9.15%
12	N Pt. Lot 10	George Bloschinsky	020-039	0.89	0.36	0.44	0.18	0.08%
12	S Pt. Lot 9	Barbara Van Gaalen	020-086	89.85	36.36	89.85	36.36	16.73%
12	N Pt. Lot 9	Mark Cowderoy	020-042	24.69	9.99	24.69	9.99	4.60%
12	Pt. Lot 8	Gillis Farms Inc.	020-077	82.51	33.39	71.71	29.02	13.35%
12	N Pt. Lot 8	Anton Rapp	020-043	26.34	10.66	17.54	7.10	3.27%
12	N Pt. Lot 7	Brookwood Farms Inc.	020-044	5.29	2.14	2.64	1.07	0.49%
12	S Pt. Lot 7	1855664 Ontario Ltd.	020-063	48.43	19.60	43.07	17.43	8.02%
12	N Pt. Lot 8	Laura Shoebottom	020-085-01	2.45	0.99	3.68	1.49	0.69%
12	S Pt. Lot 8	Keith & Leanne Hall	020-085	0.62	0.25	0.94	0.38	0.17%
12	S Pt. Lot 8	Michael McCartney	020-084	0.47	0.19	0.72	0.29	0.13%
12	S Pt. Lot 8	Scott Collins & Amy Donaldson	020-083	0.49	0.20	0.74	0.30	0.14%
12	S Pt. Lot 8	Murray Tyler & Janet Minshall-Tyler	020-082	0.49	0.20	0.74	0.30	0.14%
12	S Pt. Lot 8	Nigel & Mary Bartram	020-081	0.47	0.19	0.72	0.29	0.13%
12	S Pt. Lot 8	Donald & Julene Riley	020-080	0.47	0.19	0.72	0.29	0.13%
12	Pt. Lot 8	Jennifer Gray	020-079	0.47	0.19	0.72	0.29	0.13%
12	S Pt. Lot 8	Hugh Smith & Marta Zamir	020-078	0.49	0.20	0.74	0.30	0.14%
12	S Pt. Lot 8	Zupancic Holdings Inc.	020-076	0.54	0.22	1.63	0.66	0.30%
12	S Pt. Lot 8	Middlesex County c/o County Clerk	020-074	1.11	0.45	3.34	1.35	0.62%
12	S Pt. Lot 8	Kent Hardy & Renee Vachon	020-073	0.49	0.20	0.74	0.30	0.14%
12	S Pt. Lot 8	Michael & Robert Kuenzlen & Jillian Williamson	020-072	0.47	0.19	0.72	0.29	0.13%
12	S Pt. Lot 8	Timothy Graham & Wendy Dumaresq-Graham	020-071	0.44	0.18	0.67	0.27	0.12%
12	S Pt. Lot 8	Christopher & Tammy Duncan	020-070	0.44	0.18	0.67	0.27	0.12%
12	S Pt. Lot 8	Colin Eeley	020-069	0.47	0.19	0.72	0.29	0.13%
12	S Pt. Lot 8	Jonathan Spicer	020-068	0.44	0.18	0.67	0.27	0.12%
12	S Pt. Lot 8	Terry Roberts	020-067	0.47	0.19	0.72	0.29	0.13%
12	S Pt. Lot 8	Jack and Catherine Harding	020-066	0.47	0.19	0.72	0.29	0.13%
12	S Pt. Lot 8	Peter Lamond	020-065	0.44	0.18	0.67	0.27	0.12%
12	S Pt. Lot 8	Stanley & Catherine Adamski	020-064	0.72	0.29	1.09	0.44	0.20%
12	Plan 329 Lot 9 Pt. Lot 8	David & Delores Maddock	020-087	0.32	0.13	0.49	0.20	0.09%
12	Plan 329 Lot 7 Pt. Lot 8	Beverly & Stephen Guinness	020-088	0.22	0.09	0.35	0.14	0.06%
12	Plan 329 Lot 6	Jewgenji & Rebecca Deniswitsch	020-089	0.20	0.08	0.30	0.12	0.06%

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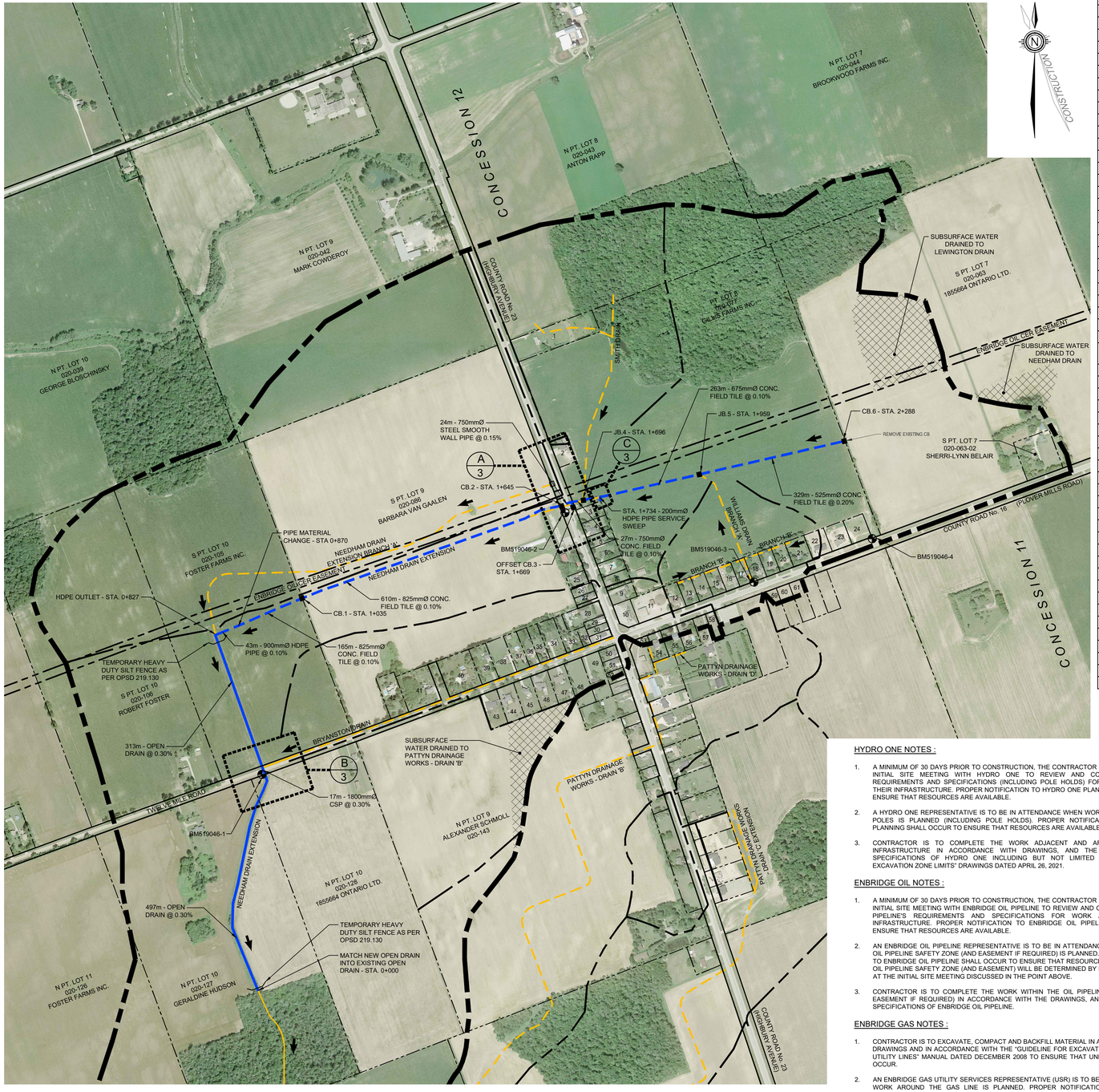
Conc.	Lot	Owner and Roll No.		Affected Area		Adjusted Area		Maintenance Assessment
				ac.	ha.	ac.	ha.	
Lands								
12	Pt. Lot 8	Carbello Pata & Naveesha Maharaj	020-077-02	0.64	0.26	0.96	0.39	0.18%
12	Pt. Lot 8	David McVittie & Paula Appleton	020-077-03	0.64	0.26	0.96	0.39	0.18%
12	Pt. Lot 8	Mary Schoenewolf	020-077-04	0.64	0.26	0.96	0.39	0.18%
12	Plan 329 Lots 4,5,15,16	Manfred Hally c/o Discovery Wood Products	020-090	0.79	0.32	1.19	0.48	0.22%
12	Plan 329 Lot 3	Melissa Tiller	020-092	0.20	0.08	0.30	0.12	0.06%
12	Plan 329 Lot 2	2840616 Ontario Inc	020-093	0.20	0.08	0.30	0.12	0.06%
12	Plan 329 Lot 1	2840616 Ontario Inc.	020-094	0.20	0.08	0.59	0.24	0.11%
12	Plan 329 Lot 10	Larry & Mary-Jane Kemp	020-095	0.20	0.08	0.30	0.12	0.06%
12	Plan 329 Lots 11, 12, 17	Hans & Heidi Scheib	020-097	0.59	0.24	0.89	0.36	0.17%
12	Plan 329 Lots 13, 14, 18 & 19	Ronald Danner	020-098	0.82	0.33	1.24	0.50	0.23%
12	Pt. Lot 9	Steven Thompson	020-100	0.49	0.20	0.74	0.30	0.14%
12	Pt. Lot 9	Michael Martinek	020-101	0.49	0.20	0.74	0.30	0.14%
12	Pt. Lot 9	William & Lina Addison	020-103	0.62	0.25	0.94	0.38	0.17%
12	Pt. Lot 9	Douglas & Jessica Francis	020-102-01	0.89	0.36	1.33	0.54	0.25%
12	E Pt. Lot 9	Iskan Khassan & Irena Krasun	020-102	0.82	0.33	1.24	0.50	0.23%
12	Plan 12 S Pt. Lot 9	Brian & Bonnie Martin	020-101-98	1.58	0.64	2.37	0.96	0.44%
12	S Pt. Lot 9	Lori Lauder & Michael Barnes	020-104-04	1.58	0.64	2.37	0.96	0.44%
12	Pt. Lot 9	Tana Smith	020-104-01	0.99	0.40	1.48	0.60	0.28%
11	N Pt. Lot 9	David & Joan Elston	020-128-90	0.79	0.32	1.19	0.48	0.22%
11	N Pt. Lot 9	Shauna & Adrian Dereniowski	020-128-92	0.79	0.32	1.19	0.48	0.22%
11	N Pt. Lot 9	Antero & Jacinta Almeida	020-128-94	0.79	0.32	1.19	0.48	0.22%
11	N Pt. Lot 9	Diane Bell	020-128-96	0.79	0.32	1.19	0.48	0.22%
11	N Pt. Lot 9	Elizabeth Baldassarre	020-128-98	0.79	0.32	1.19	0.48	0.22%
11	N Pt. Lot 9	Laura Somerville & Shawn McLean	020-129	0.69	0.28	1.04	0.42	0.19%
11	Plan 307 Lot 1	Michael Brooks & Ashley Overhold	020-130	0.25	0.10	0.37	0.15	0.07%
11	Plan 307 Pt. Lot 2	David Dunn	020-131	0.25	0.10	0.37	0.15	0.07%
11	Plan 307 Lot 3 Pt. Lot 2	Joshua Franks & Rebecca Glover	020-132	0.15	0.06	0.22	0.09	0.04%
11	N Pt. Lot 11	Foster Farms Inc.	020-126	3.14	1.27	3.14	1.27	0.58%
11	N Pt. Lot 10	Geraldine Hudson	020-127	39.39	15.94	39.39	15.94	7.33%
11	N Pt. Lot 10	1855664 Ontario Ltd.	020-128	25.43	10.29	25.43	10.29	4.73%
11	N Pt. lot 9	Alexander Schmoll	020-143	29.85	12.08	28.42	11.50	5.29%
12	S Pt. Lot 7	Sherri-Lynn Belair & Frank Boros	020-063-02	1.88	0.76	2.82	1.14	0.52%

Schedule of Assessment for Future Maintenance
Prepared by GM BluePlan Engineering Limited January 2024
Needham Municipal Drain

Conc.	Lot	Owner and Roll No.		Affected Area		Adjusted Area		Maintenance Assessment
				ac.	ha.	ac.	ha.	
Lands								
11	N Pt. Lot 9	Emma Oshana	020-129-02	0.74	0.30	1.11	0.45	0.21%
11	Pt. Lot 8	Djamel Bouazza	020-146	0.10	0.04	0.15	0.06	0.03%
11	N Pt. Lot 8	Robert Walz & Donna Sessions	020-145-01	0.17	0.07	0.27	0.11	0.05%
11	N Pt. Lot 8	Alan & Heather Elgie	020-145-02	0.22	0.09	0.35	0.14	0.06%
11	N Pt. Lot 8	Carlin Riley & Channon Scott	020-145-03	0.22	0.09	0.35	0.14	0.06%
11	N Pt. Lot 8	Ljubomir & Jovanka Kolundzic	020-145-05	0.20	0.08	0.30	0.12	0.06%
11	Pt. Lot 8	Municipalty of Middlesex Centre	020-145-06	1.21	0.49	3.63	1.47	0.69%
11	Pt. Lot 8	XO Homes Inc.	020-145-23	0.17	0.07	0.27	0.11	0.05%
11	Pt. Lot 8	John Kocak	020-145-22	0.25	0.10	0.37	0.15	0.07%
11	Pt. Lot 8	XO Homes Inc.	020-145-21	0.25	0.10	0.37	0.15	0.07%
Total Assessment - Lands				**501.19**	**202.83**	**494.20**	**199.97**	**91.96%**
Roads								
	Highbury Ave.	County of Middlesex		7.19	2.91	16.21	6.56	3.03%
	Plover Mills Road	County of Middlesex		5.61	2.27	12.65	5.12	2.37%
	Twelve Mile Road	Municipalty of Middlesex Centre		6.30	2.55	14.18	5.74	2.64%
	Enbridge Gas	Enbridge Gas		0.00	0.00	0.00	0.00	0.00%
	Bell	Bell		0.00	0.00	0.00	0.00	0.00%
	Quadro	Quadro		0.00	0.00	0.00	0.00	0.00%
	Enbridge Oil Pipeline	Enbridge Oil Pipeline		0.00	0.00	0.00	0.00	0.00%
	Hydro One	Hydro One		0.00	0.00	0.00	0.00	0.00%
Total Assessment - Roads				**19.10**	**7.73**	**43.04**	**17.42**	**8.04%**
Total Assessment - Lands and Roads				**520.29**	**221.93**	**537.24**	**217.39**	**100.00%**

Appendix C
Drawings



Map Data © 2023 Google and Suppliers

Number	Roll No.	Conc.	Lot	Legal Description	Name(s)
1	020-085-01	12	8	Con 12 N PT. Lot 8	Laura Shoebottom
2	020-085	12	8	Con 12 S PT. Lot 8	Keith & Leanne Hall
3	020-084	12	8	Con 12 S PT. Lot 8	Michael McCartney
4	020-083	12	8	Con 12 S PT. Lot 8	Scott Collins & Amy Donaldson
5	020-082	12	8	Con 12 S PT. Lot 8	Murray Tyler & Janet Minshall-Tyler
6	020-081	12	8	Con 12 S PT. Lot 8	Nigel & Mary Bartram
7	020-080	12	8	Con 12 S PT. Lot 8	Donald & Julene Riley
8	020-079	12	8	Con 12 PT. Lot 8	Jennifer Gray
9	020-078	12	8	Con 12 S PT. Lot 8	Hugh Smith & Marta Zamir
10	020-076	12	8	Con 12 S PT. Lot 8	Zupancic Holdings Inc
11	020-074	12	8	Con 12 S PT. Lot 8	Middlesex County c/o County Clerk
12	020-073	12	8	Con 12 S PT. Lot 8	Kent Hardy & Renee Vachon
13	020-072	12	8	Con 12 S PT. Lot 8	Michael & Robert Kuenzlen & Jillian Williamson
14	020-071	12	8	Con 12 S PT. Lot 8	Timothy Graham & Wendy Dumaresq-Graham
15	020-070	12	8	Con 12 S PT. Lot 8	Christopher & Tammy Duncan
16	020-069	12	8	Con 12 S PT. Lot 8	Colin Eeley
17	020-068	12	8	Con 12 S PT. Lot 8	Jonathan Spicer
18	020-067	12	8	Con 12 S PT. Lot 8	Terry Roberts
19	020-066	12	8	Con 12 S PT. Lot 8	Jack & Catherine Harding
20	020-065	12	8	Con 12 S PT. Lot 8	Peter Lamond
21	020-064	12	8	Con 12 S PT. Lot 8	Stanley & Catherine Adamski
22	020-077-02	12	8	Con 12 PT. Lot 8	Carbello Pata & Naveesha Maharaj
23	020-077-03	12	8	Con 12 PT. Lot 8	David McVittie & Paula Appleton
24	020-077-04	12	8	Con 12 PT. Lot 8	Mary Schoenewolf
25	020-087	12	9	Plan 329 Lot 9 PT. Lot 8	David & Delores Maddock
26	020-088	12	9	Plan 329 Lot 7 PT. Lot 8	Beverly & Stephen Guinness
27	020-089	12	9	Plan 329 Lot 6	Jewgenji & Rebecca Deniswitsch
28	020-090	12	9	Plan 329 Lots 4,5,15,16	Manfred Hally c/o Discovery Wood Products
29	020-092	12	9	Plan 329 Lot 3	Melissa Tiller
30	020-093	12	9	Plan 329 Lot 2	2840616 Ontario Inc
31	020-094	12	9	Plan 329 Lot 1	2840616 Ontario Inc
32	020-095	12	9	Plan 329 Lot 10	Larry & Mary-Jane Kemp
33	020-097	12	9	Plan 329 Lots 11, 12, 17	Hans & Heidi Scheib
34	020-098	12	9	Plan 329 Lots 13, 14, 18 & 19	Ronald Danner
35	020-100	12	9	Con 12 PT. Lot 9	Steven Thompson
36	020-101	12	9	Con 12 PT. Lot 9	Michael Martinek
37	020-103	12	9	Con 12 PT. Lot 9	William & Lina Addison
38	020-102-01	12	9	Con 12 PT. Lot 9	Douglas & Jessica Francis
39	020-102	12	9	Con 12 E PT. Lot 9	Iskan Khassan & Irena Krasun
40	020-101-98	12	9	Plan 12 S PT. Lot 9	Brian & Bonnie Martin
41	020-104-04	12	9	Con 12 S PT. Lot 9	Lori Lauder & Michael Barnes
42	020-104-01	12	9	Con 12 PT. Lot 9	Tana Smith
43	020-128-90	11	9	Con 11 N PT. Lot 9	David & Joan Elston
44	020-128-92	11	9	Con 11 N PT. Lot 9	Shauna & Adrian Dereniowski
45	020-128-94	11	9	Con 11 N PT. Lot 9	Antero & Jacinta Almeida
46	020-128-96	11	9	Con 11 N PT. Lot 9	Diane Bell
47	020-128-98	11	9	Con 11 N PT. Lot 9	Elizabeth Baldassarre
48	020-129-02	11	9	Con 11 N PT. Lot 9	Emma Oshana
49	020-129	11	9	Con 11 N PT. Lot 9	Laura Somerville & Shawn McLean
50	020-130	11	9	Plan 307 Lot 1	Michael Brooks & Ashley Overhold
51	020-131	11	9	Plan 307 PT. Lot 2	David Dunn
52	020-132	11	9	Plan 307 Lot 3 PT. Lot 2	Joshua Franks & Rebecca Glover
53	020-146	11	8	Con 11 PT. Lot 8	Djamel Bouazza
54	020-145-01	11	8	Con 11 N PT. Lot 8	Robert Walz & Donna Sessions
55	020-145-02	11	8	Con 11 N PT. Lot 8	Alan & Heather Elgie
56	020-145-03	11	8	Con 11 N PT. Lot 8	Carlin Riley & Channon Scott
57	020-145-05	11	8	Con 11 N PT. Lot 8	Ljubomir & Jovanka Kolundzic
58	020-145-06	11	8	Con 11 PT. Lot 8	Municipality of Middlesex Centre
59	020-145-23	11	8	Con 11 PT. Lot 8	XO Homes Inc
60	020-145-22	11	8	Con 11 PT. Lot 8	John Kocak
61	020-145-21	11	8	Con 11 PT. Lot 8	XO Homes Inc

HYDRO ONE NOTES :

1. A MINIMUM OF 30 DAYS PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL COORDINATE AN INITIAL SITE MEETING WITH HYDRO ONE TO REVIEW AND CONFIRM HYDRO ONE'S REQUIREMENTS AND SPECIFICATIONS (INCLUDING POLE HOLDS) FOR WORK ADJACENT TO THEIR INFRASTRUCTURE. PROPER NOTIFICATION TO HYDRO ONE PLANNING SHALL OCCUR TO ENSURE THAT RESOURCES ARE AVAILABLE.
2. A HYDRO ONE REPRESENTATIVE IS TO BE IN ATTENDANCE WHEN WORK AROUND THE HYDRO POLES IS PLANNED (INCLUDING POLE HOLDS). PROPER NOTIFICATION TO HYDRO ONE PLANNING SHALL OCCUR TO ENSURE THAT RESOURCES ARE AVAILABLE.
3. CONTRACTOR IS TO COMPLETE THE WORK ADJACENT AND AROUND HYDRO ONE'S INFRASTRUCTURE IN ACCORDANCE WITH DRAWINGS, AND THE REQUIREMENTS AND SPECIFICATIONS OF HYDRO ONE INCLUDING BUT NOT LIMITED TO THE "3RD PARTY EXCAVATION ZONE LIMITS" DRAWINGS DATED APRIL 26, 2021.

ENBRIDGE OIL NOTES :

1. A MINIMUM OF 30 DAYS PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL COORDINATE AN INITIAL SITE MEETING WITH ENBRIDGE OIL PIPELINE TO REVIEW AND CONFIRM ENBRIDGE OIL PIPELINE'S REQUIREMENTS AND SPECIFICATIONS FOR WORK ADJACENT TO THEIR INFRASTRUCTURE. PROPER NOTIFICATION TO ENBRIDGE OIL PIPELINE SHALL OCCUR TO ENSURE THAT RESOURCES ARE AVAILABLE.
2. AN ENBRIDGE OIL PIPELINE REPRESENTATIVE IS TO BE IN ATTENDANCE WHEN WORK IN THE OIL PIPELINE SAFETY ZONE (AND EASEMENT IF REQUIRED) IS PLANNED. PROPER NOTIFICATION TO ENBRIDGE OIL PIPELINE SHALL OCCUR TO ENSURE THAT RESOURCES ARE AVAILABLE. THE OIL PIPELINE SAFETY ZONE (AND EASEMENT) WILL BE DETERMINED BY ENBRIDGE OIL PIPELINE AT THE INITIAL SITE MEETING DISCUSSED IN THE POINT ABOVE.
3. CONTRACTOR IS TO COMPLETE THE WORK WITHIN THE OIL PIPELINE SAFETY ZONE (AND EASEMENT IF REQUIRED) IN ACCORDANCE WITH THE DRAWINGS, AND REQUIREMENTS AND SPECIFICATIONS OF ENBRIDGE OIL PIPELINE.

ENBRIDGE GAS NOTES :

1. CONTRACTOR IS TO EXCAVATE, COMPACT AND BACKFILL MATERIAL IN ACCORDANCE WITH THE DRAWINGS AND IN ACCORDANCE WITH THE "GUIDELINE FOR EXCAVATION IN THE VICINITY OF UTILITY LINES" MANUAL DATED DECEMBER 2008 TO ENSURE THAT UNDUE STRAIN DOES NOT OCCUR.
2. AN ENBRIDGE GAS UTILITY SERVICES REPRESENTATIVE (USR) IS TO BE IN ATTENDANCE WHEN WORK AROUND THE GAS LINE IS PLANNED. PROPER NOTIFICATION TO ENBRIDGE GAS PLANNING SHALL OCCUR TO ENSURE THAT RESOURCES ARE AVAILABLE.

ENVIRONMENTAL PROTECTION NOTES :

1. THE CONTRACTOR IS TO CONTROL THE PLACEMENT OF STABILIZATION WORKS TO MINIMIZE EROSION AND SEDIMENT TRAVEL IMPACTS DOWNSTREAM.
2. GEOTEXTILE FABRIC SHALL BE INDUSTRIAL POLYPROPYLENE.
3. INSTALLATION OF SILT FENCE SHALL CONFORM TO OPSD 219.130.
4. INSPECTION OF SILT FENCE SHALL BE CONDUCTED DAILY, REPAIRS TO THE FENCE MUST BE COMPLETED IMMEDIATELY AND ANY SECTION OF THE FENCE WHICH DECOMPOSES BEFORE THE END OF ITS EXPECTED USE SHALL BE REPLACED IMMEDIATELY.
5. SEDIMENT TRAPPED IN THE FILTER SHOULD BE REMOVED FOLLOWING EACH STORM AND WHEN THESE DEPOSITS REACH ½ THE HEIGHT OF THE BARRIER.
6. PERFORM WORK IN NO/LOW FLOW CONDITIONS TO MINIMIZE SEDIMENT MOVEMENT AND EROSION.
7. ALL WORK SHOULD BE HALTED IF A FORECAST OF SIGNIFICANT RAINFALL IS EXPECTED.
8. PLACE BRUSH, DEBRIS AND SEDIMENT IN SUCH A LOCATION AS TO MINIMIZE ENTRY INTO THE CHANNEL.
9. LIMIT SOIL MOVEMENT AND EROSION; USE APPROPRIATE CONTROL MEASURES BEFORE WORK BEGINS AND INSPECT AND MAINTAIN THOSE MEASURES REGULARLY UNTIL ALL DISTURBED AREAS ARE STABILIZED.
10. ANY AREAS OF DISTURBED OR BARE SOIL AROUND THE DRAIN SHOULD BE SEEDED WITH NATIVE, NON-INVASIVE HERBACEOUS MATERIAL WHILE THE GROUND IS MOIST AND CONDITIONS ARE APPROPRIATE FOR GERMINATION.
11. ALL MATERIAL AND EQUIPMENT USED FOR THE PURPOSE OF SITE PREPARATION AND PROJECT COMPLETION SHOULD BE OPERATED AND STORED IN A MANNER THAT PREVENTS ANY DELETERIOUS SUBSTANCE (EG. PETROLEUM PRODUCTS, SILT, DEBRIS, ETC.) FROM ENTERING THE WATER.
12. ANY STOCKPILED MATERIALS SHALL BE STORED AND STABILIZED AWAY FROM THE WATERCOURSE.
13. VEHICLE AND EQUIPMENT RE-FUELING AND MAINTENANCE SHALL BE CONDUCTED AWAY FROM THE WATERCOURSE.
14. ONLY APPROVED WORK IS PERMITTED IN THE WATERCOURSE AND NO MATERIAL SHALL BE RELEASED INTO THE WATERCOURSE.
15. CROSSING OF THE WATERCOURSE BY CONSTRUCTION EQUIPMENT IS NOT PERMITTED.
16. PLAN IN-WATER WORKS, UNDERTAKINGS AND ACTIVITIES TO RESPECT TIMING WINDOWS TO PROTECT FISH, INCLUDING THEIR EGGS, JUVENILES, SPAWNING ADULTS AND/OR THE ORGANISMS UPON WHICH THEY FEED. NO IN-WATER WORK SHALL OCCUR BETWEEN MARCH 15 AND JULY 15 (INCLUSIVE) OF ANY GIVEN YEAR.
17. NO TREE, BRUSH, OR VEGETATION REMOVAL AND ASSOCIATED WORK SHALL OCCUR BETWEEN MARCH 15 AND AUGUST 31 (INCLUSIVE) OF ANY GIVEN YEAR UNLESS OTHERWISE APPROVED BY A QUALIFIED BIOLOGIST.

NOTES :

1. CONTRACTOR IS TO OBTAIN UTILITY LOCATES PRIOR TO CONSTRUCTION.
2. CONTRACTOR IS TO CONNECT EXISTING TILES DURING CONSTRUCTION.

NOMENCLATURE:

LEGEND:

- WATERSHED BOUNDARY
- INTERMEDIATE WATERSHED BOUNDARY / EXTERNAL WATERSHED BOUNDARY
- PROPOSED CLOSED DRAIN
- PROPOSED OPEN DRAIN
- EX. CLOSED DRAIN
- EX. OPEN DRAIN
- R.O.W. LIMIT
- PROPERTY LINE
- BENCHMARK LOCATION
- DIRECTION OF FLOW
- EX. CATCHBASIN
- PROPOSED CATCHBASIN

BENCH MARKS :

BM519046-1 - ELEV. = 292.642m
NAIL IN NORTH FACE OF HP, LOCATED SOUTH OF TWELVE MILE ROAD 1st HP WEST OF NEEDHAM DRAIN CROSSING

BM519046-2 - ELEV. = 295.763m
NAIL IN NORTH FACE OF HP, LOCATED WEST OF HIGHBURY AVENUE 1st HP SOUTH OF ENBRIDGE OIL CER EASEMENT

BM519046-3 - ELEV. = 296.156m
NAIL IN EAST FACE OF HP, NORTH OF PLOVER MILLS ROAD, BETWEEN #15348 AND #15354 PLOVER MILLS ROAD

BM519046-4 - ELEV. = 296.081m
NAIL IN NORTHEAST FACE OF HP, HP NORTH OF PLOVER MILLS ROAD, EAST OF RESIDENTIAL PROPERTIES

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.

BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR ANY DAMAGE TO THEM.

LICENSED PROFESSIONAL ENGINEER
January 30, 2023
B. J. SHAPTON
100573170
PROVINCE OF ONTARIO
519046

NO.	DATE	REVISION DESCRIPTION	CHKD
3.	2023/01/30	ENGINEER'S REPORT	B.S.
2.	2022/07/22	DESIGN REVIEW MEETING	B.B.
1.	2019/10/23	ON-SITE MEETING	B.B.

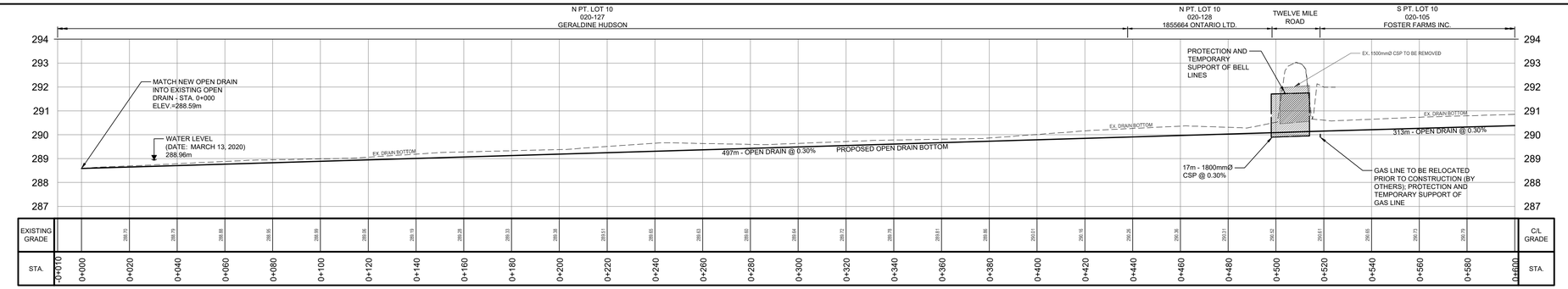
BluePlan ENGINEERING
GUELPH | OWEN SOUND | LISTOWEL | KITCHENER | LONDON | HAMILTON | GTA
235 NORTH CENTRE ROAD, UNIT 103, LONDON, ON N5X 4E7
TEL. 519-672-9403
www.gmblueplan.ca

NEEDHAM DRAIN EXTENSION

MUNICIPALITY OF MIDDLESEX CENTRE

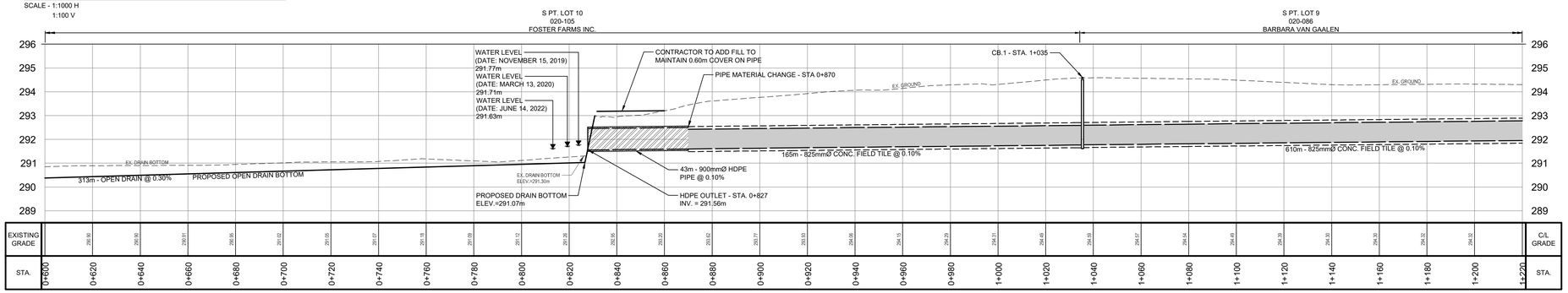
OVERALL PLAN

DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
N.M.	B.S.	519046	1
DESIGNED BY :	DATE :	SCALE :	
T.S./B.S.	APRIL 2020	1:5000	



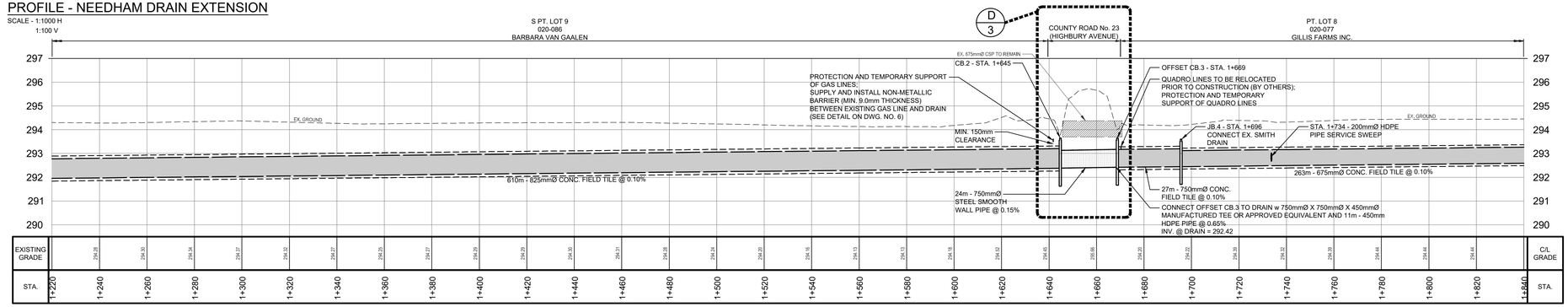
PROFILE - NEEDHAM DRAIN EXTENSION

SCALE - 1:1000 H
1:100 V



PROFILE - NEEDHAM DRAIN EXTENSION

SCALE - 1:1000 H
1:100 V



PROFILE - NEEDHAM DRAIN EXTENSION

SCALE - 1:1000 H
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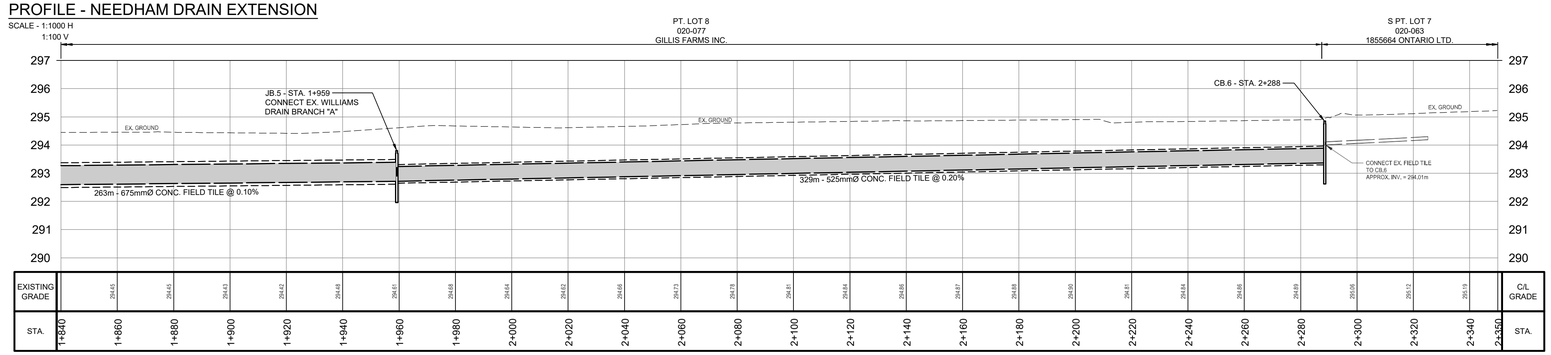

PROFILE - NEEDHAM DRAIN EXTENSION

SCALE - 1:1000 H
1:100 V

NOTES :

1. CONTRACTOR IS TO OBTAIN UTILITY LOCATES PRIOR TO CONSTRUCTION.
2. CONTRACTOR IS TO CONNECT EXISTING TILES DURING CONSTRUCTION.

NOMENCLATURE:

LEGEND:

- EX. GROUND / EX. DRAIN BOTTOM
- PROPOSED OPEN DRAIN
- CONCRETE PIPE
- CSP PIPE
- HDPE PIPE
- STEEL SMOOTH WALL PIPE
- PROPOSED CATCHBASIN / JUNCTION BOX
- EX. FIELD TILE
- EX. CSP PIPE

BENCH MARKS :

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NAIL IN NORTH FACE OF HP, LOCATED SOUTH OF TWELVE MILE ROAD 1st HP WEST OF NEEDHAM DRAIN CROSSING

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NAIL IN NORTH FACE OF HP, LOCATED WEST OF HIGHBURY AVENUE 1st HP SOUTH OF ENBRIDGE OIL CER EASEMENT

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BM519046-4 - ELEV. = 296.081m
NAIL IN NORTHEAST FACE OF HP, HP NORTH OF PLOVER MILLS ROAD, EAST OF RESIDENTIAL PROPERTIES

LICENSED PROFESSIONAL ENGINEER
January 30, 2023
B. J. SHAPTON
100573170
PROVINCE OF ONTARIO
519046

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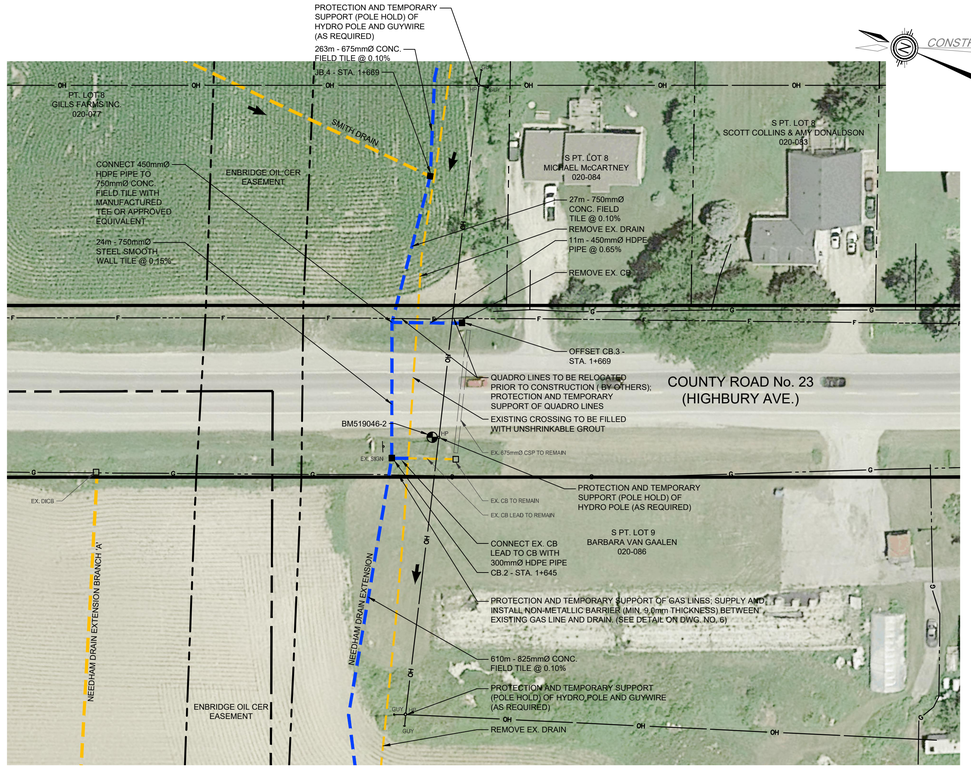
NEEDHAM DRAIN EXTENSION

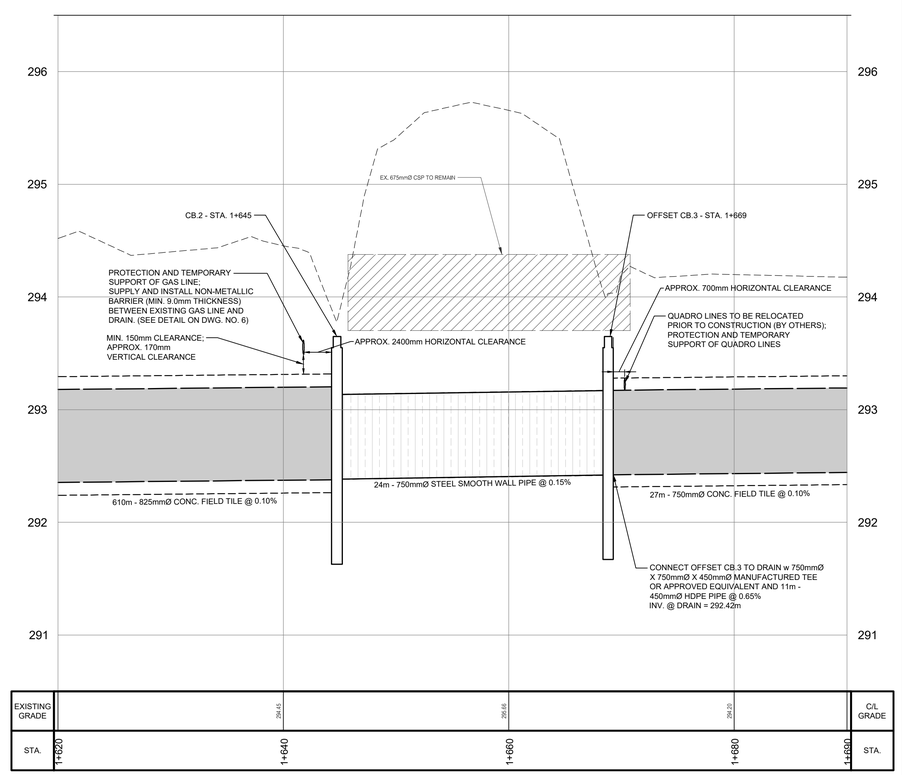
MUNICIPALITY OF MIDDLESEX CENTRE

PROFILE

DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
N.M.	B.S.	519046	2
DESIGNED BY :	DATE :	SCALE :	
T.S./B.S.	APRIL 2020	AS NOTED	



A/3 ROAD CROSSING DETAIL - HIGHBURY AVE.
SCALE 1:500



D/3 ROAD CROSSING DETAIL - HIGHBURY AVENUE
SCALE - 1:250 H
1:25 V

NOTES :

1. CONTRACTOR IS TO OBTAIN UTILITY LOCATES PRIOR TO CONSTRUCTION.
2. CONTRACTOR IS TO CONNECT EXISTING TILES DURING CONSTRUCTION.

NOMENCLATURE:

LEGEND:

- INTERMEDIATE WATERSHED BOUNDARY
- PROPOSED CLOSED DRAIN
- PROPOSED OPEN DRAIN
- EX. OPEN DRAIN
- R.O.W. LIMIT
- PROPERTY LINE
- EX. BELL
- EX. GAS
- EX. QUADRO
- EX. OVERHEAD HYDRO
- EX. GROUND / EX. DRAIN BOTTOM
- CONCRETE PIPE
- STEEL SMOOTH WALL PIPE
- EX. CSP PIPE
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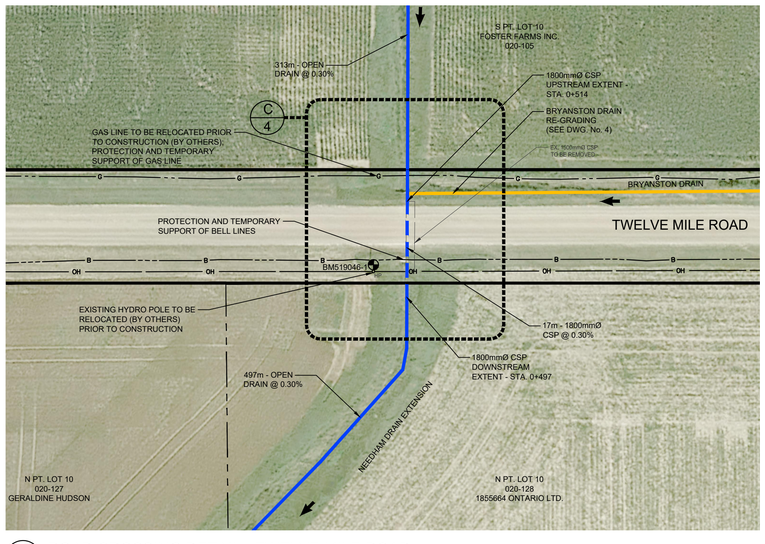
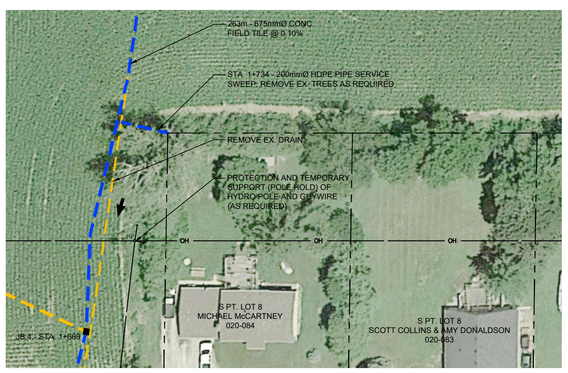
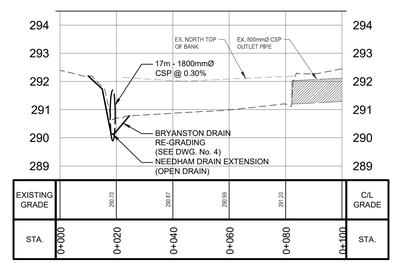


B/3 ROAD CROSSING DETAIL - TWELVE MILE ROAD
SCALE 1:500



C/3 SERVICE SWEEP DETAIL
SCALE 1:500



PROFILE - EXISTING BRYANSTON DRAIN - OPEN SECTION
SCALE - 1:1000 H
1:100 V

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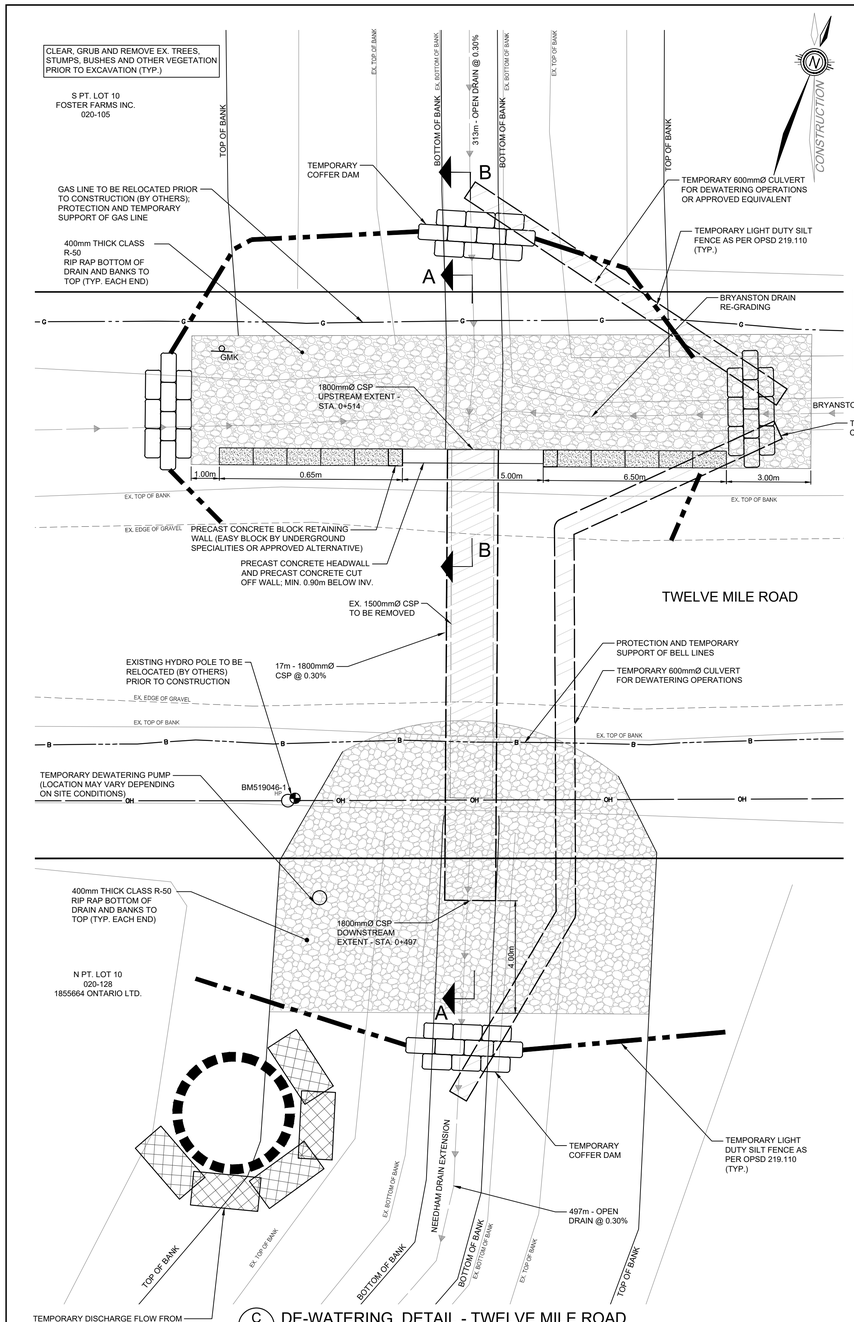
TEL. 519-672-9403 www.gmblueplan.ca

NEEDHAM DRAIN EXTENSION

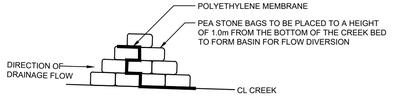
MUNICIPALITY OF MIDDLESEX CENTRE

ROAD CROSSING DETAILS

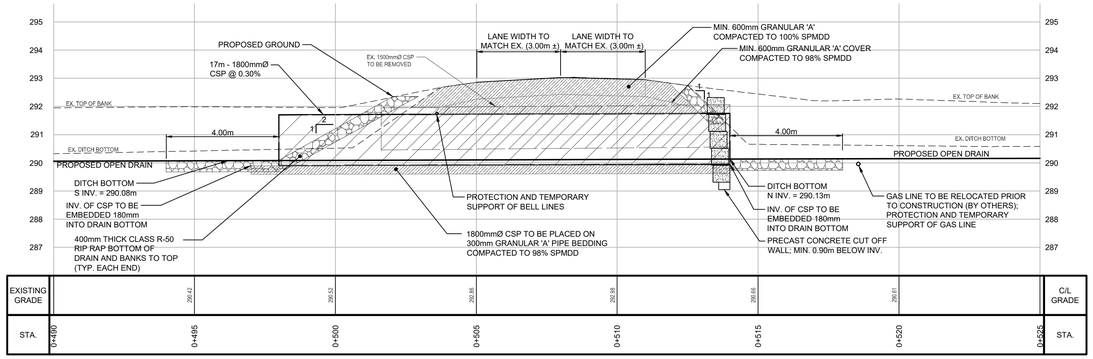
DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
N.M.	B.S.	519046	3
DESIGNED BY :	DATE :	SCALE :	
T.S./B.S.	APRIL 2020	AS NOTED	



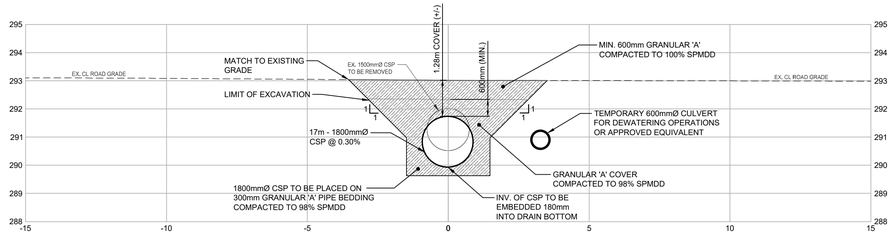
C/4 DE-WATERING DETAIL - TWELVE MILE ROAD
SCALE 1:100



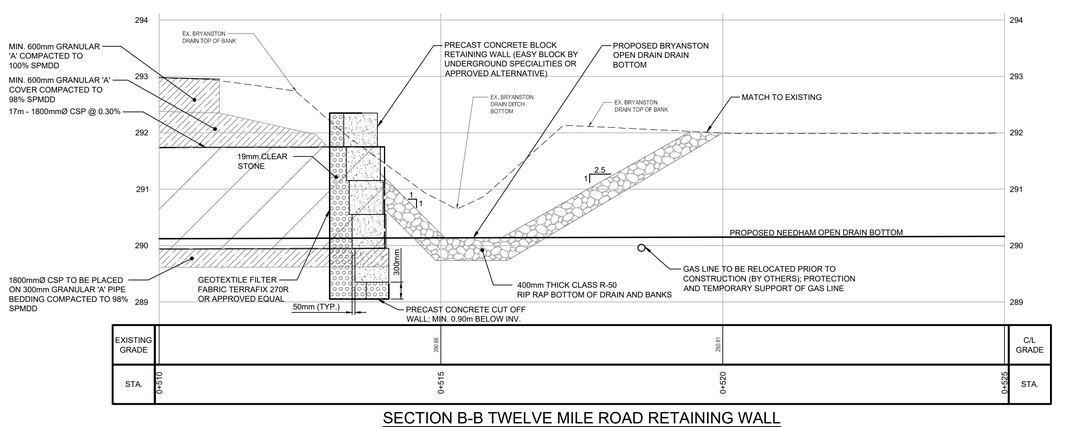
TEMPORARY COFFER DAM DETAIL
NOT TO SCALE



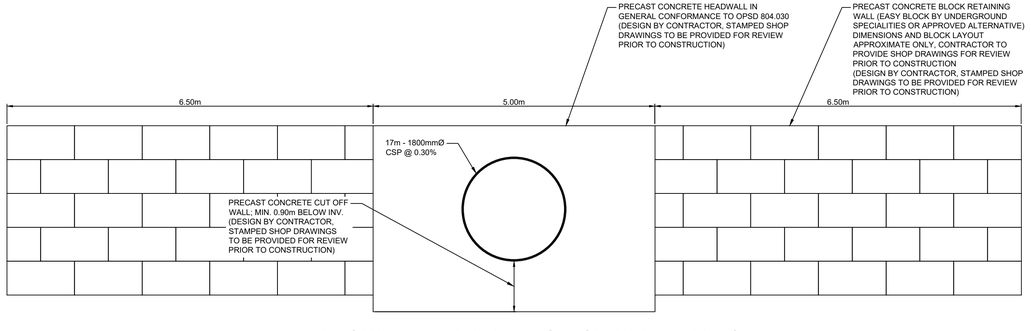
SECTION A-A TWELVE MILE ROAD CULVERT
SCALE 1:100



TWELVE MILE ROAD CULVERT - TYP. SECTION (STA. 0+508)
SCALE 1:100



SECTION B-B TWELVE MILE ROAD RETAINING WALL
SCALE 1:50



RETAINING WALL, HEADWALL AND CUT OFF WALL ELEVATION
SCALE 1:50

NOTES :

1. CONTRACTOR IS TO OBTAIN UTILITY LOCATES PRIOR TO CONSTRUCTION.
2. CONTRACTOR IS TO CONNECT EXISTING TILES DURING CONSTRUCTION.

NOMENCLATURE:

LEGEND:

- EX. GROUND / EX. DRAIN BOTTOM
- PROPOSED OPEN DRAIN
- R.O.W. LIMIT
- B — EX. BELL
- G — EX. GAS
- OH — EX. OVERHEAD HYDRO
- SILT FENCE
- CSP PIPE
- STEEL SMOOTH WALL PIPE
- EX. CSP PIPE
- BENCHMARK LOCATION
- HYDRO POLE

BENCH MARKS :

BM519046-1 - ELEV. = 292.642m
NAIL IN NORTH FACE OF HP, LOCATED SOUTH OF TWELVE MILE ROAD 1st HP WEST OF NEEDHAM DRAIN CROSSING

BM519046-2 - ELEV. = 295.763m
NAIL IN NORTH FACE OF HP, LOCATED WEST OF HIGHBURY AVENUE 1st HP SOUTH OF ENBRIDGE OIL CER EASEMENT

BM519046-3 - ELEV. = 296.156m
NAIL IN EAST FACE OF HP, NORTH OF PLOVER MILLS ROAD, BETWEEN #15348 AND #15354 PLOVER MILLS ROAD

BM519046-4 - ELEV. = 296.081m
NAIL IN NORTHEAST FACE OF HP, HP NORTH OF PLOVER MILLS ROAD, EAST OF RESIDENTIAL PROPERTIES

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.

BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR ANY DAMAGE TO THEM.

LICENSED PROFESSIONAL ENGINEER
January 30, 2024
B. J. SHAPTON
100573170
PROVINCE OF ONTARIO
519046

NO.	DATE	REVISION DESCRIPTION	CHKD
3.	2023/01/30	ENGINEER'S REPORT	B.S.
2.	2022/07/22	DESIGN REVIEW MEETING	B.B.
1.	2019/10/23	ON-SITE MEETING	B.B.

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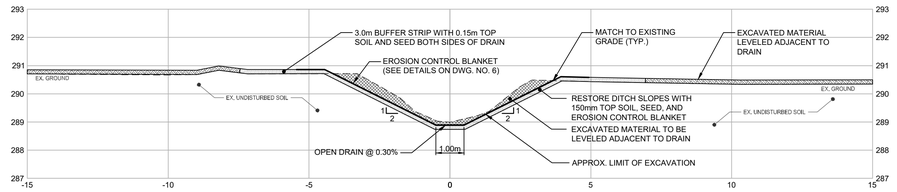
NEEDHAM DRAIN EXTENSION

MUNICIPALITY OF MIDDLESEX CENTRE

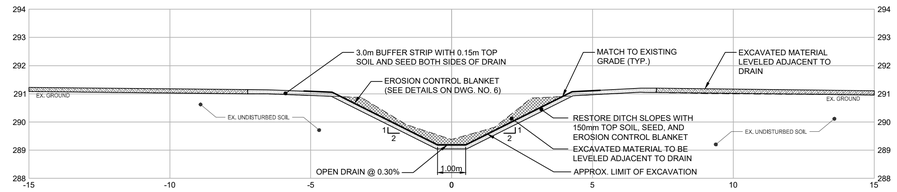
TWELVE MILE ROAD CROSSING

DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
N.M.	B.S.	519046	4
DESIGNED BY :	DATE :	SCALE :	
T.S./B.S.	APRIL 2020	AS NOTED	



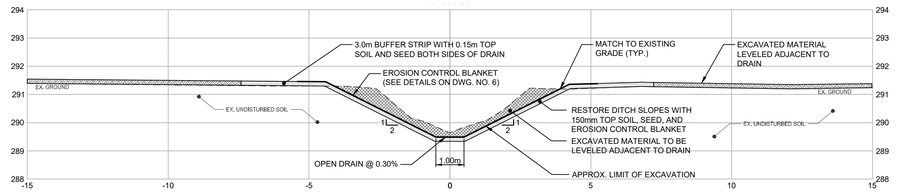
OPEN DRAIN SECTION - STA. 0+100

SCALE - 1:100



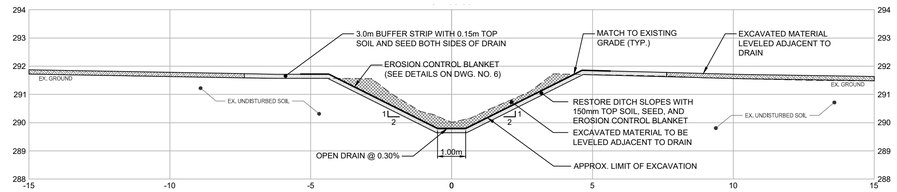
OPEN DRAIN SECTION - STA. 0+200

SCALE - 1:100



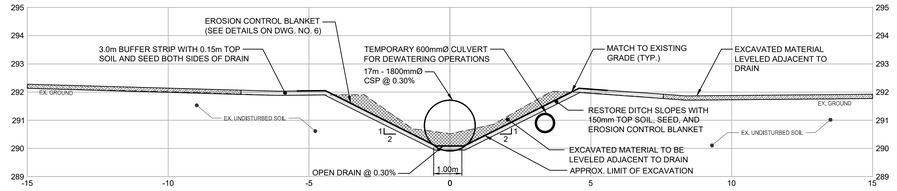
OPEN DRAIN SECTION - STA. 0+300

SCALE - 1:100



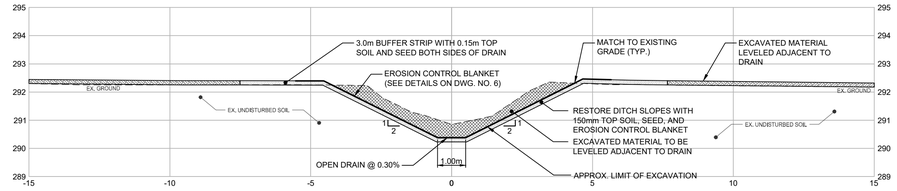
OPEN DRAIN SECTION - STA. 0+400

SCALE - 1:100



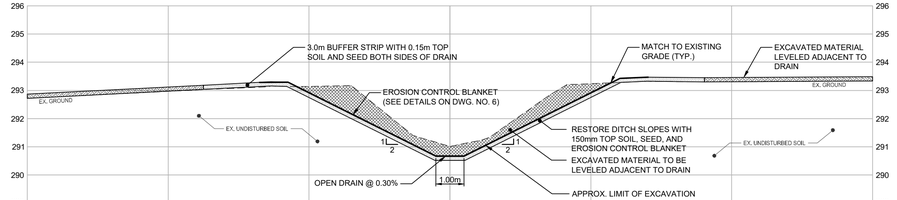
OPEN DRAIN SECTION - STA. 0+500

SCALE - 1:100



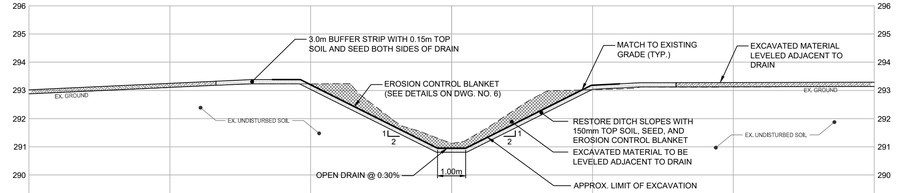
OPEN DRAIN SECTION - STA. 0+600

SCALE - 1:100



OPEN DRAIN SECTION - STA. 0+700

SCALE - 1:100



OPEN DRAIN SECTION - STA. 0+800

SCALE - 1:100

NOTES :

1. CONTRACTOR IS TO OBTAIN UTILITY LOCATES PRIOR TO CONSTRUCTION.
2. CONTRACTOR IS TO CONNECT EXISTING TILES DURING CONSTRUCTION.

NOMENCLATURE:

LEGEND:

- EX. GROUND
- EROSION CONTROL BLANKET
- EX. MATERIAL TO BE REMOVED
- EX. MATERIAL TO BE LEVELED
- TOPSOIL AND SEED

BENCH MARKS :

BM519046-1 - ELEV.= 292.642m
NAIL IN NORTH FACE OF HP, LOCATED SOUTH OF TWELVE MILE ROAD 1st HP WEST OF NEEDHAM DRAIN CROSSING

BM519046-2 - ELEV. = 295.763m
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LICENSED PROFESSIONAL ENGINEER
January 30, 2019
B. J. SHAPTON
100573170
PROVINCE OF ONTARIO
519046

NO.	DATE	REVISION DESCRIPTION	CHKD
3.	2023/01/30	ENGINEER'S REPORT	B.S.
2.	2022/07/22	DESIGN REVIEW MEETING	B.B.
1.	2019/10/23	ON-SITE MEETING	B.B.

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NEEDHAM DRAIN EXTENSION

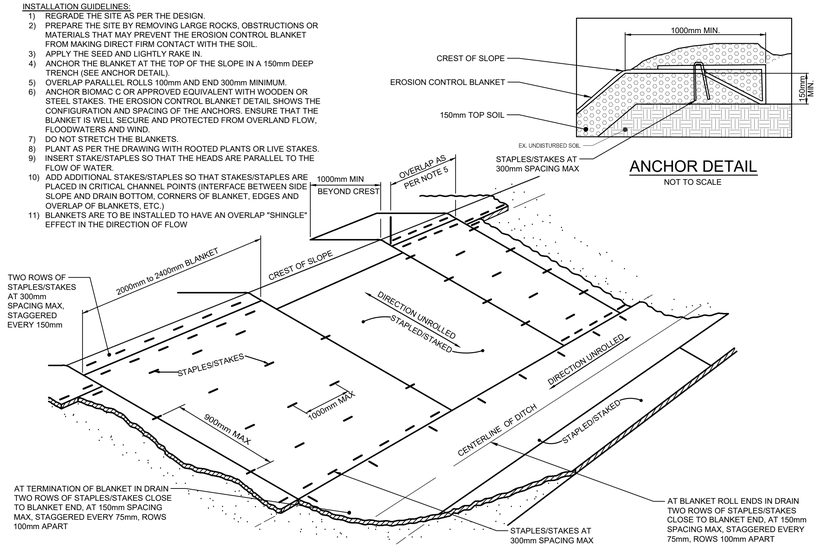
MUNICIPALITY OF MIDDLESEX CENTRE

OPEN DRAIN SECTIONS

DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
N.M.	B.S.	519046	5
DESIGNED BY :	DATE :	SCALE :	
T.S./B.S.	APRIL 2020	AS NOTED	

INSTALLATION GUIDELINES:

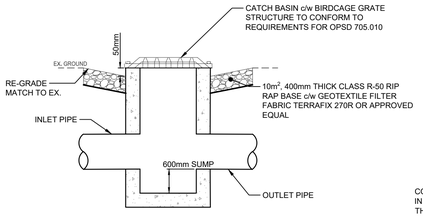
1) REGRADE THE SITE AS PER THE DESIGN.
2) PREPARE THE SITE BY REMOVING LARGE ROCKS, OBSTRUCTIONS OR MATERIALS THAT MAY PREVENT THE EROSION CONTROL BLANKET FROM MAKING DIRECT FIRM CONTACT WITH THE SOIL.
3) APPLY THE SEED AND LIGHTLY RAKE IN.
4) ANCHOR THE BLANKET AT THE TOP OF THE SLOPE IN A 150mm DEEP TRENCH (SEE ANCHOR DETAIL).
5) OVERLAP PARALLEL ROLLS 100mm AND END 300mm MINIMUM.
6) ANCHOR BIOMAC C OR APPROVED EQUIVALENT WITH WOODEN OR STEEL STAKES. THE EROSION CONTROL BLANKET DETAIL SHOWS THE CONFIGURATION AND SPACING OF THE ANCHORS. ENSURE THAT THE BLANKET IS WELL SECURE AND PROTECTED FROM OVERLAND FLOW, FLOODWATERS AND WIND.
7) DO NOT STRETCH THE BLANKETS.
8) PLANT AS PER THE DRAWING WITH ROOTED PLANTS OR LIVE STAKES.
9) INSERT STAKE/STAPLES SO THAT THE HEADS ARE PARALLEL TO THE FLOW OF WATER.
10) ADD ADDITIONAL STAKES/STAPLES SO THAT STAKES/STAPLES ARE PLACED IN CRITICAL CHANNEL POINTS (INTERFACE BETWEEN SIDE SLOPE AND DRAIN BOTTOM, CORNERS OF BLANKET, EDGES AND OVERLAP OF BLANKETS, ETC.)
11) BLANKETS ARE TO BE INSTALLED TO HAVE AN OVERLAP "SHINGLE" EFFECT IN THE DIRECTION OF FLOW



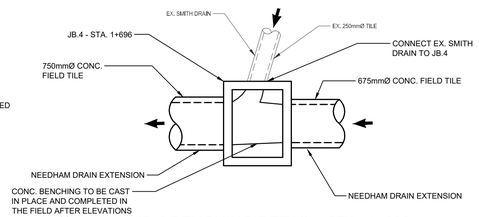
ANCHOR DETAIL
NOT TO SCALE

SUGGESTED MANUFACTURER INSTALLATION SPECIFICATIONS: EROSION CONTROL BLANKET **
NOT TO SCALE

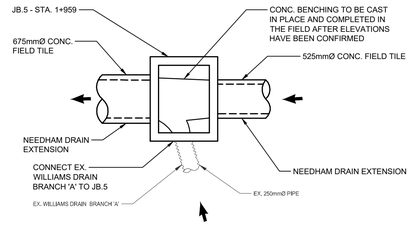
** CONTRACTOR TO CONFIRM WITH EROSION CONTROL BLANKET MANUFACTURER



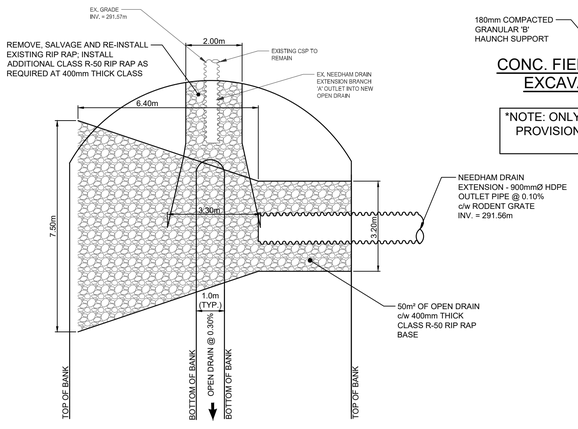
TYPICAL CATCHBASIN DETAIL
NOT TO SCALE



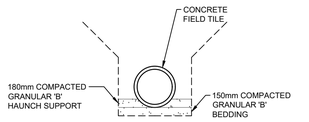
JB.4 BENCHING DETAIL - STA. 1+696
NOT TO SCALE



JB.5 BENCHING DETAIL - STA. 1+959
NOT TO SCALE

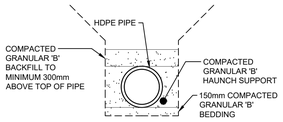


OUTLET PIPE DETAIL - PLAN
SCALE 1:100

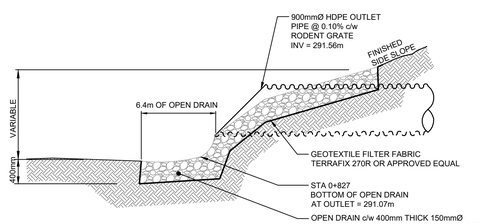


CONC. FIELD TILE BEDDING DETAIL EXCAVATOR INSTALLATION*
NOT TO SCALE

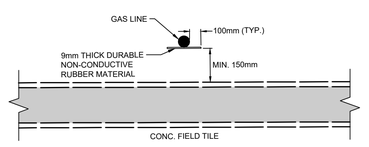
*NOTE: ONLY IF REQUIRED - SEE SPECIAL PROVISIONS OF ENGINEER'S REPORT FOR DETAILS



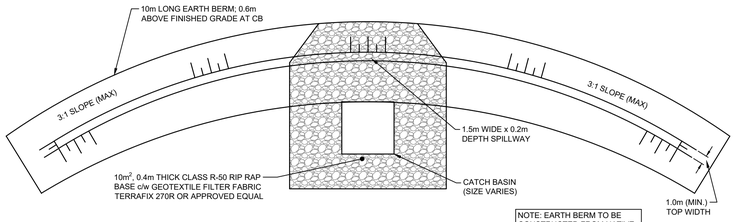
TYPICAL HDPE PIPE BEDDING DETAIL
NOT TO SCALE



MAIN DRAIN OUTLET PIPE DETAIL - PROFILE
NOT TO SCALE

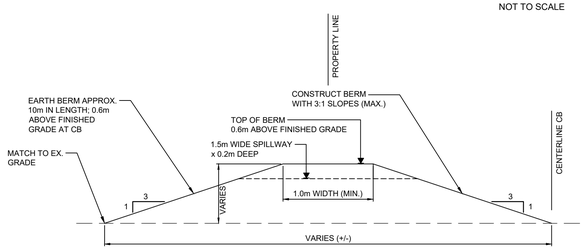


TYPICAL RUBBER PAD PROTECTION DETAIL
NOT TO SCALE

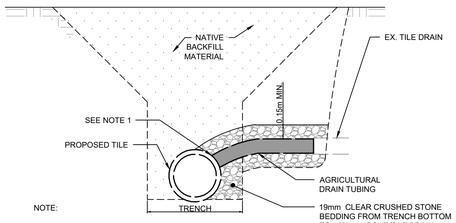


NOTE: EARTH BERM TO BE CONSTRUCTED FROM NATIVE MATERIALS EXCAVATED FROM DRAIN CONSTRUCTION COMPLETE WITH GRASS SEED.

TYPICAL BERM DETAIL - PLAN
NOT TO SCALE

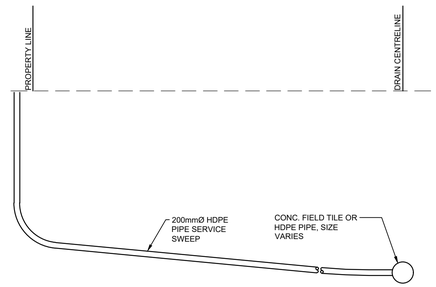


TYPICAL BERM DETAIL - SECTION
NOT TO SCALE



NOTE:
1. ALL TILE CONNECTIONS TO BE EITHER WITH AN INSERT COUPLER, MANUFACTURED TEE OR APPROVED EQUIVALENT

TYPICAL TILE CONNECTION DETAIL - SECTION
NOT TO SCALE



TYPICAL SERVICE SWEEP DETAIL
NOT TO SCALE

STRUCTURE DETAIL SCHEDULE - NEEDHAM DRAIN EXTENSION

ITEM NO.	STA.	STRUCTURE DESCRIPTION	LENGTH
N1	STA. 0+000 - STA. 0+497	OPEN DITCH @ 0.30%	497m
N2	STA. 0+497 - STA. 0+514	1800mmØ CSP CULVERT PIPE @ 0.30%	17m
N3	STA. 0+514 - STA. 0+827	OPEN DITCH @ 0.30%	313m
N4	STA. 0+827	900mmØ HDPE OUTLET PIPE c/w RODENT GRATE	
N5	STA. 0+827 - STA. 0+870	900mmØ HDPE PIPE @ 0.10%	43m
N6	STA. 0+870 - STA. 1+035	825mmØ CONC. FIELD TILE @ 0.10%	165m
N7	STA. 1+035	CB.1 1500mm x 1200mm CB c/w BIRD CAGE GRATE	
N8	STA. 1+035 - STA. 1+645	825mmØ CONC. FIELD TILE @ 0.10%	610m
N9	STA. 1+645	CB.2 1500mm x 1200mm CB c/w BIRD CAGE GRATE AND 300mmØ HDPE PIPE TO CONNECT EX. CB	
N10	STA. 1+645 - STA. 1+669	750mmØ STEEL SMOOTH WALL PIPE @ 0.15%	24m
N11	STA. 1+669	750mmØ x 750mmØ x 450mmØ MANUFACTURED TEE	
N12	STA. 1+669 OFFSET	450mmØ HDPE PIPE @ 0.65%	11m
N13	STA. 1+669 OFFSET	OFFSET CB.3 1200mm x 900mm CB c/w BIRD CAGE GRATE	
N14	STA. 1+669 - STA. 1+696	750mmØ CONC. FIELD TILE @ 0.10%	27m
N15	STA. 1+696	JB.4 1200mm x 900mm JB	
N16	STA. 1+696 - STA. 1+959	675mmØ CONC. FIELD TILE @ 0.10%	263m
N17	STA. 1+734	OFFSET 200mmØ HDPE PIPE SERVICE SWEEP	10m
N18	STA. 1+959	JB.5 1200mm x 900mm JB	
N19	STA. 1+959 - STA. 2+288	525mmØ CONC. FIELD TILE @ 0.20%	329m
N20	STA. 2+288	CB.6 1200mm x 900mm CB c/w BIRD CAGE GRATE	

STRUCTURE INFORMATION - NEEDHAM DRAIN EXTENSION

STRUCTURE	DATA
CB.1	CB.1 - STA. 1+035 1500mm x 1200mm CB c/w BIRDCAGE GRATE AND BERM T/CONC = 294.60m E INV. = 291.77m W INV. = 291.77m
CB.2	CB.2 - STA. 1+645 1500mm x 1200mm CB c/w BIRDCAGE GRATE AND BERM, 300mmØ HDPE PIPE TO CONNECT EX. CB T/CONC = 293.65m E INV. = 292.38m W INV. = 292.38m S INV. = MATCH EX. (300mmØ PIPE)
OFFSET CB.3	CB.3 - OFFSET STA. 1+669 1200mm x 900mm c/w BIRDCAGE GRATE, 450mmØ HDPE PIPE CB LEAD AND MANUFACTURED TEE T/CONC = 293.65m N INV. = 292.49m
JB.4	JB.4 - STA. 1+696 1200mm x 900mm JB BURIED APPROX. 600mm T/CONC = 293.55m N INV. = MATCH EX. 250mmØ TILE E INV. = 292.45m W INV. = 292.45m
JB.5	JB.5 - STA. 1+959 1200mm x 900mm JB BURIED APPROX. 750mm T/CONC = 293.80m S INV. = MATCH EX. 250mmØ TILE E INV. = 292.71m W INV. = 292.71m
CB.6	CB.6 - STA. 2+288 1200mm x 900mm CB c/w BIRDCAGE GRATE AND BERM T/CONC = 294.85m E INV. = 293.37m W INV. = APPROX. 294.01m (MATCH EX.)

NOTES :

1. CONTRACTOR IS TO OBTAIN UTILITY LOCATES PRIOR TO CONSTRUCTION.
2. CONTRACTOR IS TO CONNECT EXISTING TILES DURING CONSTRUCTION.

NOMENCLATURE:

LEGEND:

- EX. GROUND
- EROSION CONTROL BLANKET
- CONC. FIELD TILE
- EX. FIELD TILE
- HDPE OUTLET PIPE
- EX. CSP OUTLET PIPE

BENCH MARKS :

BM519046-1 - ELEV.= 292.642m
NAIL IN NORTH FACE OF HP, LOCATED SOUTH OF TWELVE MILE ROAD 1st HP WEST OF NEEDHAM DRAIN CROSSING

BM519046-2 - ELEV. = 295.763m
NAIL IN NORTH FACE OF HP, LOCATED WEST OF HIGHBURY AVENUE 1st HP SOUTH OF ENBRIDGE OIL CER EASEMENT

BM519046-3 - ELEV. = 296.156m
NAIL IN EAST FACE OF HP, NORTH OF PLOVER MILLS ROAD, BETWEEN #15348 AND #15354 PLOVER MILLS ROAD

BM519046-4 - ELEV. = 296.081m
NAIL IN NORTHEAST FACE OF HP, HP NORTH OF PLOVER MILLS ROAD, EAST OF RESIDENTIAL PROPERTIES

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.

BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR ANY DAMAGE TO THEM.

LICENSED PROFESSIONAL ENGINEER
January 30, 2019
B. J. SHAPTON
100573170
PROVINCE OF ONTARIO
519046

NO.	DATE	REVISION DESCRIPTION	CHKD
3.	2023/01/30	ENGINEER'S REPORT	B.S.
2.	2022/07/22	DESIGN REVIEW MEETING	B.B.
1.	2019/10/23	ON-SITE MEETING	B.B.

BluePlan ENGINEERING
GUELPH | OWEN SOUND | LISTOWEL | KITCHENER | LONDON | HAMILTON | GTA
235 NORTH CENTRE ROAD, UNIT 103, LONDON, ON N5X 4E7
TEL. 519-672-0403
www.gmblueplan.ca

NEEDHAM DRAIN EXTENSION

MUNICIPALITY OF MIDDLESEX CENTRE

ROAD CROSSING DETAILS

DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
N.M.	B.S.	519046	6
DESIGNED BY :	DATE :	SCALE :	
T.S./B.S.	APRIL 2020	AS NOTED	

Appendix D
Special Provisions

Special Provisions (Non-Tender Items)
For The Construction Of The
Needham Municipal Drain Extension
The Municipality of Middlesex Centre

1. STANDARD SPECIFICATIONS

Where reference is made to OPSS or OPSD, the Contractor shall refer to the latest revision of the Ontario Provincial Standard Specifications and the Ontario Provincial Standard Drawings. Where reference is made to OPSS, it shall be assumed to refer to OPSS.MUNI wherever equivalent municipal specifications exist. These specifications and drawings may not be bound within this document. They are available on-line from the Ontario Ministry of Transportation.

All work to be undertaken shall comply with the latest version of OPSS and OPSD, unless superseded by the Special Provisions included herein.

Where in the Specifications the word “Corporation”, “Municipality” or “Owner” occurs it shall mean the “Corporation of the Municipality of Middlesex Centre”.

Where in the Specifications the word “Engineer” occurs it shall mean “GM BluePlan Engineering Limited”.

2. SALES TAXES

Harmonized Sales Tax (H.S.T.)

The Total Tender Price shall include an allowance for H.S.T., calculated as 13% of the cost of the works as itemized in the Schedule of Unit Prices in the Form of Tender.

This allowance is simply an estimate of the amount of H.S.T. to be paid to the Contractor.

The Engineer will determine the appropriate amount of H.S.T. to be paid on each progress payment and on the final payment, and this amount may be more or less than the “allowance” included in the Total Tender Price.

3. LASER ALIGNMENT

The Contractor shall use a laser beam or equivalent line and grade control methods for laying all drain tile to maintain the on grade and alignment shown on the plans. Batter boards or any other means will not be acceptable. Tile drains shall be laid to a grade not more than +/- 25mm from the alignment as shown on the plans. Tile drains with a vertical variation of greater than 25mm may be rejected by the Engineer, and in that event the Contractor will be required to take up and re-lay those sections of tile drain at their expense.

4. TRENCHES TO BE CLOSED

No trench may be left open at the end of each day unless authorized by the Engineer. Any trench that is to be left open shall be completely fenced off with steel construction fencing. All fencing shall be at the Contractor's expense. If the Contractor neglects to fence a trench, the Engineer shall have the right to have this work done by others and charged to the Contractor.

5. ROAD SIGNS

The Contractor, at his/her own expense, shall carefully remove and satisfactorily replace Municipal Road Signs which must be removed in order to carry out the contract. Where traffic control signs, such as Stop Signs, have to be temporarily or permanently relocated, they shall be immediately reset either temporarily or permanently, as conditions dictate. All temporarily relocated signs shall be permanently reset as soon as site conditions permit. Where replacements are necessary, new signs shall conform to Middlesex Centre Development Standards.

6. DAMAGE TO TREES

A penalty of $1,000.00 will be levied against the Contractor to be deducted from monies payable under this Contract for each and every tree destroyed or damaged due to the Contractor's carelessness or negligence and which is not designated in the Contract for removal. As to what constitutes the carelessness or negligence on the part of the Contractor, the Engineer's decision shall be final.

7. COORDINATION MEETINGS

The Contractor shall attend such meetings with the Owner, Engineer, landowners and Utility Company Authorities (as necessary) as may be required by the Engineer to co-ordinate services affected by this Contract.

8. DISPOSAL OF SURPLUS OR UNSUITABLE EXCAVATED MATERIAL

All earth material excavated in carrying out the work of the various tender items included in this Contract and which is unsuitable for, or which is surplus to, the requirements for backfill shall be disposed of off-site. Excess material excavated from this site is anticipated not to meet MECP Table 1 criteria. The excess material may be disposed of at a site arranged by the contractor upon receipt of a sign-off by the property owner. The property owner must be aware and must acknowledge that the fill might not pass MECP Table 1 criteria.

The contractor shall be responsible for complying with O.Reg. 406/19 including, but not limited to, information provided to truck drivers carrying excess soil and planning for environmentally safe transportation. All excess soil and earth material shall be managed, hauled and disposed of in accordance with O.Reg. 406/19.

All concrete, asphalt pavements, curbs, sidewalks, large boulders and other “solid” materials are to be loaded and hauled separately from the other earth and granular materials and disposed of at an MECP – approved site obtained by the Contractor at no cost to the Owner.

9. COMPACTION

This Contract contains no separate tender item for compaction equipment as may be required to compact the earth or granular materials whether used for embankment construction, base courses, bedding, or backfill.

The Contract prices for the materials to be placed or the work to be carried out shall include full compensation for supplying and operating such compaction equipment as the Contractor may require and for compacting the materials to the specified density.

When it is impractical with the larger types of compaction equipment to obtain the required degree of compaction in areas where working space is limited, the Contractor shall provide and use mechanical hand compaction equipment in order to achieve the specified density.

Granular materials used as bedding shall be compacted to a density of 98% of the maximum dry density, granular backfill or base courses shall be compacted to a density of 100% of the maximum dry density. All other earth materials shall be compacted to a density of 95% of the maximum dry density.

When field tests indicate that the required degree of compaction cannot be obtained with the equipment in use or the procedure being followed, the Contractor's operations shall be halted until the Engineer is satisfied that the Contractor has made such modifications, in his/her equipment and procedure, which will produce the required results.

10. NATURAL GAS CONSTRUCTION SPECIFICATIONS

Where the Contractor is working near natural gas mains the work shall be carried out in accordance with the requirements and specifications of the Gas Company having control over such mains.

An Enbridge Gas representative shall be on-site during all construction activities in close proximity to the Enbridge gas lines. Upon Contract award, the Contractor will enter into a Crossing Agreement with Enbridge Gas. All work shall operate under the Crossing Agreement, under the policies outlined in the Operational Constraints document, and to the satisfaction of Enbridge Gas. An unofficial Crossing Agreement and Operational Constraints form can be found in Appendix F.

11. OIL PIPELINE CONSTRUCTION SPECIFICATIONS

Where the Contractor is working near oil pipeline infrastructure the work shall be carried out in accordance with the requirements and specifications of the Oil Pipeline Company having control over such infrastructure.

An Enbridge Oil Pipeline representative shall be on-site during all construction activities in close proximity, in the safety zone and within the easement of the oil pipeline infrastructure. Following Contract award and a minimum of 30 days prior to construction, the Contractor shall coordinate an initial site meeting with Enbridge Oil Pipeline to review and confirm Enbridge Oil Pipeline's requirements and specifications (including safety zones and easements) for work adjacent to their infrastructure. All work shall operate under the requirements and specifications of Enbridge Oil Pipeline.

12. OTHER CONTRACTORS WITHIN OR ADJACENT TO THE LIMITS OF THE WORK

The Contractor is advised that other work may be in progress within and adjacent to the limits of this Contract and that he/she shall co-operate with other Contractors, Utility Companies, and the Corporation and they shall be allowed free access to their work at all times.

The Engineer reserves the right to alter the method of operation on this Contract to avoid interference with other work.

13. UTILITY POLES AND LINES

Where utility poles and lines may have to be supported or de-energized, the Contractor shall be responsible for all efforts to make arrangements with hydro authority to do this work. The Contractor shall bear the costs for all coordination and any associated project delays; however, the Owner will bear the costs for the hydro authority to complete any work. The Contractor must request the hydro authority's service in writing at least 30 days in advance of the need, with final verbal confirmation 48 hours in advance. Only the hydro authority or their subcontractor may support or de-energize poles and lines. No claims for delays will be accepted if the foregoing is not observed.

14. HYDRO CONSTRUCTION SPECIFICATIONS

Where the Contractor is working near hydro infrastructure the work shall be carried out in accordance with the requirements and specifications of the hydro authority having control over such infrastructure.

A Hydro One representative shall be on-site during all construction activities in close proximity to the Hydro One infrastructure. Following Contract award and a minimum of 30 days prior to construction, the Contractor shall coordinate an initial site meeting with Hydro One to review and confirm Hydro One's requirements and specifications (including pole holds) for work adjacent to their infrastructure. All work shall operate under the requirements and specifications of Hydro One, including but not limited to the "3rd Party Excavation Zone Limits" drawings dated April 26, 2021. The "3rd Party Excavation Zone Limits" drawings dated April 26, 2021 can be found in Appendix G.

15. UTILITIES AND PIPE CROSSINGS

The location and depth of underground utilities shown on the Contract Drawings are based on information received by the Engineer. The position of all pole lines, conduits, watermains, sewers and other underground and over ground utilities and structures is not necessarily shown on the Contract Drawings and where shown, the accuracy of the position of such utilities and structures is not guaranteed. It is the Contractor's responsibility

before starting any work to contact the Municipal Authorities or Utility Companies for further information in regard to the exact location of these utilities and to take such other precautions as necessary to safeguard the utilities from damage.

Where pipes and other utilities are encountered in the excavation, these shall be maintained and supported by the Contractor to minimize damage done to them. Prior to backfilling, the Contractor shall submit to the Engineer, for his/her approval, details of the proposed method of support of such pipes and utilities and no backfilling may take place prior to the Engineer's review of such details. Approval by the Engineer of any such details will in no way relieve the Contractor from his/her responsibility to avoid any damage where possible.

16. DAMAGE BY VEHICLES AND OTHER EQUIPMENT

If at any time, in the opinion of the Engineer, damage is being or is likely to be done to any highway or any improvement thereon, other than such portions as are part of the work, by the Contractor's vehicles or other equipment, whether licensed or unlicensed, the Contractor shall, on the direction of the Engineer and at the Contractor's own expense make changes in or substitutions for such vehicles or other equipment or shall alter loading or shall in some other manner remove the cause of such damage to the satisfaction of the Engineer. Where such damage has occurred, the Contractor shall make repairs satisfactory to the Owner or, where the Owner has found it necessary to make the repairs, make payment to the Owner of the cost of repairs carried out by the Owner.

17. SURVEY BARS AND MONUMENTS

The Contractor shall be responsible for replacing all survey bars which are bent, moved, removed, due to carelessness but will not be responsible for survey bars that have to be removed for construction. The contractor shall provide a list of all damaged and removed survey bars to the Engineer.

18. MAINTENANCE OF ROAD

The Contractor shall at all times and at his/her own expense, maintain safely and adequately, all private entrance facilities throughout the length of the Contract.

19. IMPERIAL CONVERSION OF METRIC SPECIFICATIONS

The Standard Specifications governing this work are in metric units. For the purpose of this Contract it is assumed that the metric units shall be hard converted to Imperial units, wherever necessary.

20. ACCESS TO PRIVATE PROPERTIES

If a traffic lane is closed temporarily to allow asphalt paving or road grading (including patch work), local access shall be maintained as much as possible and notifications shall be made 24 hours in advance.

21. CONSTRUCTION HOURS

The Contractor will be allowed to work from 7:00 a.m. to 7:00 p.m., Monday to Friday. Additional hours may be permitted under certain circumstances if approved by the Engineer.

22. MAINTENANCE OF FLOWS

The contractor shall be responsible to maintain all drainage flows during construction. No extra payment will be made for pumping, hauling or disposing of any drainage flow or removing any granular material that enters the drainage system through manhole or catch basin frame adjustments. The contractor will be responsible for maintaining and directing storm water flows during construction so that flooding of private property and silt migration or washouts do not occur. The contractor shall be responsible to pay for any damages caused by storm water flooding due to, or as a result of, construction activities during the duration of this project.

Special Provisions
For The Construction Of The
Needham Municipal Drain Extension
The Municipality of Middlesex Centre

SPECIFICATIONS

The Special Provisions, along with the *"Specifications for the Construction of Municipal Drainage Works"* attached hereto, shall apply to and govern the construction of the *"Needham Municipal Drain Extension".*

PLAN AND REPORT

The Plan and Profile and the Engineer's Report on the proposed Drainage Works shall be a part of this Specification.

EXTENT OF WORK

1. All standard Detailed Drawings are attached to these Specifications.

2. The Contractor shall coordinate a pre-construction meeting with the Owners and Engineer prior to construction. This meeting is not required to be held immediately before construction begins and can be held in advance of construction. The Contractor shall provide at least two weeks notice prior to the pre-construction meeting. No work will be undertaken by the Contractor in advance of this meeting unless otherwise authorized by the Engineer in writing.

3. The Contractor shall notify the Owners and the Engineer forty-eight (48) hours prior to construction.

4. The Contractor shall verify the location of new closed drains with the Engineer and the landowners prior to construction.

5. The Contractor shall verify the location of any existing drains as necessary to facilitate construction.

6. The working area for construction purposes for the closed drain shall be a width of 20m centered on the proposed closed drain. The working area for construction purposes for the open drain shall be a width of 40.0m from Sta. 0+000 to Sta. 0+498 and 55.0m from Sta. 0+498 to Sta. 0+827 centred on the proposed closed drain. The working areas for maintenance purposes for the closed drain shall be a width of 10m centered on the proposed closed drain. The working area for maintenance purposes for the open drain shall be a width of 25m centered on the proposed open drain.

   Each Landowner on whose property the drainage work is to be constructed shall designate access to and from the working area at the time of construction or upon failure to do so, the Engineer or Drainage Superintendent, as the case may be, shall designate access.

7. The Contractor shall obtain road occupancy permits as necessary to facilitate construction. All work within the Highbury Avenue Right-of-Way shall conform and comply with the occupancy permit and requirements of the County of Middlesex. All work within the Twelve Mile Road Right-of-Way shall conform and comply with the occupancy permit and requirements of the Municipality of Middlesex Centre.

8. The Contractor shall obtain utility locates prior to construction.

9. All utilities shall be located and uncovered in the affected areas by the Contractor prior to construction.

10. The Contractor shall supply all materials unless otherwise stated at the time of tendering.

11. All standard catch basins shall be precast concrete catch basins as per OPSD. Knockouts shall be provided in the catch basins.

12. The catch basin grate elevations shall be set to the satisfaction of the Engineer.

13. Stone rip-rap protection and geo-textile material (Terrafix 270R or approved equivalent) shall be placed around all catch basins as part of this contract.

14. All catch basin grates shall be fastened to the new catch basins.

15. The Contractor shall supply all necessary materials to complete the connections of any existing drains to the new drain.

16. All concrete tile shall meet the requirements of ASTM C412-15. Minimum three-edge bearing crushing strength for all concrete tile to meet or exceed 2000D (Class IV) as per ASTM C412-15, unless noted otherwise. The Contractor shall have the tile manufactured specifically for this project tested for conformance to ASTM C412-15 (2000D) prior to shipment to site. The Contractor shall retain these testing records and make them available to the Engineer upon request.

17. All CSP pipe shall be minimum 2.0mm (14 gauge) with a 68mm x 13mm corrugation profile, and galvanized, unless noted otherwise.

18. All HDPE pipe shall be CSA rated 320kPa with bell and spigot complete with water-tight gasket joints (CSA B182.8 Type 1). Pipe shall be non-perforated double wall smooth interior, Boss2000 as supplied by Armtec or approved equivalent.

19. Material change across pipe connections shall be connected by sealing all around with 150mm of concrete or wrapping with a minimum 600mm wide strip filter material, with a minimum overlap of 300mm. The type of filter material shall be Terrafix 270R or approved equivalent.

20. The Contractor shall supply and wrap all concrete tile joints with geotextile filter material as part of this contract. The filter material shall completely cover the tile joint and shall have a minimum overlap of 300mm. The type of filter material shall be Terrafix 270R or approved equivalent. The minimum width of the filter material shall be as follows:

    a. 300mm wide for tile sizes 150mm diameter to 350mm diameter
    b. 400mm wide for tile sizes 400mm diameter to 750mm diameter
    c. 500mm wide for tile sizes larger than 750mm diameter

21. All clear stone shall be 19mm Type I as per OPSS.MUNI 1004.

22. All rip rap stone shall be R50 quarry stone (150mm to 300mm diameter) and placed to a depth of 400mm, as per OPSS.MUNI 1004, unless noted otherwise.

23. The Contractor shall be responsible for all trench settlement.

24. The Contractor shall supply and install catch basin markers beside all catch basins.

25. The Contractor shall strip the topsoil centered on the drain before installing the closed drain and before excavating the open drain. The width of topsoil stripping shall be at the Contractor's discretion, but all operations shall be constrained to the working width as previously denoted in the report. In locations where there may be deep cuts or excessive soil generation, the Contractor may apply to the Engineer to strip wider than the working width. The Engineer shall have the right to permit or deny this request. Topsoil shall be kept separate from subsoil as much as possible. The topsoil shall be later spread over the backfilled trench, closed drain, open drain, buffer strips and other areas disturbed by construction.

26. The Contractor shall, where directed, remove either by excavation or by crushing, any existing tile drains, inlets and/or catch basins encountered that are no longer required for the drainage system. Removal of existing tile

drains and associated drainage works shall be considered part of the work and there will be no extra payment for removal of existing drainage infrastructure.

27. The Contractor shall grade the road ditches to the new catch basins. The disturbed areas within the road Right-Of-Way shall be top soiled and seeded.

28. Contractor shall maintain the following minimum cover for all tile placed:
    - 600mm minimum cover for all HDPE pipe, unless noted otherwise
    - 750mm minimum cover for all concrete field tile, unless noted otherwise

29. The Contractor shall clean up the site and leave it in a neat and tidy condition.

30. The tender shall be based upon unit prices and shall be as detailed on the tender form.

31. Nothing in these Specifications shall be construed as requiring less than a complete and satisfactory job in accordance with the obvious intent of the Drawings and Specifications.

32. All work shall be done to the satisfaction of the Engineer.

33. In accordance with Section A.25 of the General Specifications, the Contractor shall be responsible for all faulty materials or workmanship which appears within a one year period from the date of the Engineer's final Payment Certificate. An amount equal to 3% of the final contract price shall be retained for the maintenance period. Any part of the money retained may be used to make good any deficiencies after five (5) working days' notice being given to the Contractor. This notice may be either in writing or by telephone.

34. No in-water work shall occur between March 15 and July 15 (inclusive) of any year. In-water work shall be conducted during periods of low flow.

35. Unless approved by a qualified biologist, no vegetation and brush clearing, and associated work shall occur between March 15 and August 31 (inclusive) of any year.

36. All work shall conform and comply with the requirements of the permit issued by and best practices of the Upper Thames River Conservation Authority, Ministry of the Environment, Conservation and Parks and Department of Fisheries and Oceans.

37. All work shall conform and comply with the following environmental mitigation measures:

    <u>In-Water Works</u>
    - The duration of in-water works should be minimized or spread out to lower the risk of sedimentation issues.
    - An emergency spill kit should always be on-site in the event of a spill. All workers should be properly trained on site procedures and the use of an emergency spill kit.
    - Ensure that all machinery used near water bodies arrives on site clean and is checked for fluid leaks prior to any construction activities.
    - Re-fueling and maintenance of construction equipment should be done at a minimum of 30m away from any body of water and on an impervious surface to minimize the risk of harmful substances entering the water and soil.
    - Operate machinery on land.
    - Sediment and erosion control measures will be installed where appropriate before construction occurs to minimize the risk of sedimentation of local water systems. Sediment and erosion control measures should be installed according to the Guide for Erosion and Sediment Control for Urban Construction Sites (OMNR, 2006) and applicable standards in the Ontario Provincial Standard Specification/Ontario Provincial Standard Drawings (OPSS/OPSD).
    - Sediment and erosion control measures should be inspected and maintained during construction activities near water.
    - Any disturbed ground near water will be re-vegetated as soon as possible.

- Any excavated material that is to be stockpiled near water should be placed above the high water mark to reduce sedimentation risk.

Riparian Re-Vegetation and Stabilization

- Clearing of riparian vegetation should be kept to a minimum. Use existing trails and clearings when possible.
- Immediately stabilize shoreline areas and banks after construction activities near water to reduce the risk of sedimentation.
- Re-vegetation should be done with native species suitable for the environment.

Drain Construction Work

- Minimize vegetation removal on sloped or hilled areas to reduce the impacts.
- Ensure that the grading for the site remains unaltered during and post construction of the drain.
- Minimize the disturbance to the land and avoid grading any areas containing significant land features.
- The staging area for construction shall be a minimum of 30m away from the adjacent woodland.

OPEN WORK

O-1 *Environmental Protection Measures*

Payment for this item shall be lump sum for all material, equipment and labour required for protection of the environment, including costs to supply, install, maintain, remove and dispose all arrangements to ensure debris, silt, sediment, deleterious substances, and any other material is contained and does not enter the watercourse, as shown on the Drawings and as specified by the Engineer. Protection measures shall include, but not be limited to, silt fences around stockpiled earth and topsoil, pump discharges onto grass flats and straw bale check dams or sediment traps. Any discharges of water into the stream shall be free of any silt or other deleterious material. Pumping discharges onto grass flats, straw bale check dams or sediment traps shall be used as a means to ensure that this objective is met. Payment shall also include for the removal and disposal of all deleterious substances off-site at an approved location arranged by the Contractor and restoration of the affected areas, if required.

A minimum of 7 days prior to commencing work, the Contractor shall submit to the Engineer for review an environmental management plan complete with diagrams and written procedures which shall conform and comply with the requirements of the approvals, permits and best practices issued by the Conservation Authority, Ministry of Environment, Conservation and Parks and Department of Fisheries and Oceans.

Heavy-duty silt fence shall be installed at the locations shown on the Drawings in accordance with OPSD 219.130 and to the approval of the Engineer. Silt fence shall be inspected by the Contractor periodically and after every rainfall event and maintained as necessary or as directed by the Engineer, at no additional cost. The Contractor shall also remove silt fences upon stabilization of restored surfaces. At approximately Sta. 0+000, silt fence shall also be installed between the adjacent woodland and working area to prevent incidental impacts to the woodland. Silt fence shall be Mirafi silt fence, or `Terrafence' by Terrafix, or approved equivalent. All fencing shall be installed prior to local excavations.

If a Species at Risk is observed, Ministry of Environment, Conservation and Parks (Guelph Office) shall be contacted immediately.

Notwithstanding other special provisions with respect to environmental consideration, refuelling of equipment is not to take place within 30m of the edge of the watercourse. All activities, including equipment maintenance and refuelling shall be controlled to prevent the entry of petroleum products or other deleterious substances, including any debris, waste, rubble or concrete material, from all construction operations, into the watercourse. Any such material which inadvertently enters the watercourse shall be removed by the Contractor at their own expense, in a manner satisfactory to the Engineer.

In the event that the Engineer determines that controls are unacceptable the Contractor shall cease those operations as identified by the Engineer which are causing the entry of deleterious material to watercourse.

Such operations shall remain suspended until otherwise directed by the Engineer. The controls shall be monitored and inspected by the Contractor periodically at regular intervals and after every rainfall event, and maintained as necessary or as directed by the Engineer, at no additional cost. The Contractor shall also remove the controls upon stabilization of restored surfaces.

O-2 Clearing and Grubbing

The Contractor is to clear, grub and remove the brush, trees, branches, debris, and vegetation in the existing open drain bank, open drain top of bank and working area (of the open drain and closed drain) to facilitate the construction of the open drain and closed drain as shown on the Drawings and as directed by the Engineer. This item shall apply only to those trees, shrubs, brush, bushes, stumps, debris, vegetation and windfalls designated for removal as required for construction and access for construction. This item shall include the stockpile of trees, shrubs, brush, bushes, stumps, debris, vegetation and windfalls on-site at a location designated by the Engineer and landowner. The stockpiles shall be such a distance on each side to eliminate any interference with the construction of the drain and spreading of the excavated material. The stockpiles shall be disposed of by the landowner. Clearing and grubbing shall be to the satisfaction of the Engineer.

Clearing required for this work shall be accordance with Section A.6 of the Construction Specifications. This includes removing all tree stumps in the cleared area as close as practically possible to the ground and chemically treated to prevent regrowth. This applies to all areas of the construction and access for construction.

Payment for this item shall be per metre and includes all labour, materials and equipment required to clear, grub and remove brush, trees, branches and vegetation, including stockpile on-site at a location designated by the Engineer and landowner.

O-3 Reconstruct Open Drain

The Contractor shall use a hydraulic excavator to reconstruct the open drain (Needham Drain) from approximately Sta. 0+000 to Sta. 0+827 to the proposed grade and depth as shown on the Drawings.

The Contractor shall use a hydraulic excavator to regrade the open drain (Bryanston Drain) for approximately 10m at Sta. 0+514 to the proposed grade and depth as shown on the Drawings.

The excavated material shall be deposited, spread and leveled within the working area to a maximum depth of 200mm and in accordance with the construction specifications. The Contractor shall be responsible to establish the quantity of material to be deposited, spread and leveled based on the drawings. The Contractor may apply to the Engineer to deposit, spread and level excavated material wider than the working width. The Engineer shall have the right to permit or deny this request. The Contractor shall contact all landowners before proceeding with the work to verify the location to place and level the excavated material. Excavation, reconstruction and deepening of the open drain, and spreading and leveling of excavated material required for this work shall be accordance with Section B – Open Drains of the Construction Specifications.

The Contractor shall construct and grade buffer strips, 3.0m in width, on both sides of the open drain from approximately Sta. 0+000 to Sta. 0+827. The vegetation on the buffer strips shall be an approved grass seed mixture as discussed below, or at the request of the landowner and at the approval of the Drainage Superintendent the vegetation may be lawn, pasture, access or cultivated, forage-type crop.

The topsoil is to be stripped from the open drain, buffer strips and adjacent land for leveling of excavated material as required in all areas which may be disturbed by construction, and temporarily stockpiled prior to construction. Topsoil may be re-used from the existing lands provided it is screened to remove any unwanted material such as stones, clumps of sod, sticks, etc. All areas to be topsoiled shall be fine graded to the required lines and grades, allowing for a minimum depth of 150mm of topsoil. The surface shall be free of all vegetation and other debris and free of stones which would not be covered by the depth of topsoil specified and shall be loose to a depth of 25mm at the time of placing topsoil. The Contractor shall perform such mowing, raking and picking up of debris and such discing, harrowing or other mean of scarification as may be

necessary to comply with this requirement and shall dispose of all debris off-site. All excess native topsoil (beyond cover requirements, if applicable) shall be spread and leveled as directed by the Engineer.

Any large stones or boulders which exceed 500mm in diameter shall be removed from the excavated material and buried adjacent to the ditch and at a depth so as to not interfere with farm machinery, or stockpiled at a location adjacent to the open drain as directed by the Engineer.

All trees, shrubs, brush, bushes, stumps, debris, vegetation and windfalls shall be removed from the open drain bank, slopes and working area and stockpiled to such a distance on each side to eliminate any interference with the construction of the drain and spreading of the excavated material as per Special Provision O-2.

Prior to spreading and leveling the excavated material, all trees, shrubs, brush, bushes, stumps, debris, vegetation and windfalls shall be removed from the excavated material and stockpiled to such a distance on each side to eliminate any interference with the construction of the drain and spreading of the excavated material.

The stockpiles of trees, shrubs, brush, bushes, stumps, debris, vegetation and windfalls shall be disposed of by the landowner.

The Contractor shall uniformly spread native topsoil to a depth of not less than 150mm over the excavated open drain, buffer strips, leveled excavated material and other areas disturbed by construction. All clods or lumps shall be pulverized and any roots, stones over 50mm in diameter, or foreign matter shall be raked up and removed as directed prior to placement of grass seed. The excavated open drain, buffer strips and other areas disturbed by construction shall have application of an approved grass seed mixture. The seed and fertilizer shall be in accordance with OPSS 804 for Standard Roadside Mix, or approved equivalent in accordance with Section B.12 of the Construction Specifications.

The price shall include the removal, salvage and reinstallation of any existing rip rap and rock protection encountered in the open drain on geotextile filter cloth (Terrafix 270R or approved equivalent). Rip rap and rock protection reinstallation shall be to the satisfaction of the Engineer.

The price shall include whatever measures are necessary to not disturb, damage or break the existing outlet pipe (Needham Drain Branch ‘A’) at approximately Sta. 0+827.

All tile outlets in the existing open drain shall be noted by the Contractor prior to reconstruction and excavation. The Contractor shall contact all landowners and ask them to mark all their tile outlets which enter the open drain. The price shall include whatever measures are necessary to not disturb, damage or break any existing tile or other component of the drain encountered in the open drain. All existing tile disturbed, broken or damaged during open drain reconstruction, deepening and excavation shall be repaired at the Contractor’s expense.

If the Contractor obtains a statement in writing, signed by the owner of the lands affected that they do not wish the excavated material to be leveled, the Engineer may release the Contractor from obligation in that regard. In this case, the excavated material shall be stockpiled on the property by the contractor as directed by the Engineer at no additional cost.

Payment shall be per metre of open drain reconstructed, deepened, topsoiled, seeded which includes buffer strip construction, and spreading and leveling of excavated material.

O-4 Erosion Control Blanket

Payment for this item shall be for all labour, equipment and materials necessary to supply and install erosion control blanket installed as per manufacturer’s recommendations as directed by the Engineer. Measurement for payment shall be per square metre of erosion control blanket supplied and installed, without any allowance for overlap.

The erosion control blanket shall be Terrafix Geosynthetics 'C200' (from Terrafix Geosynthetics Inc.), Maccaferri's 'Biomac C' (from Maccaferri Canada Ltd.), or approved equivalent, installed as per manufacturer's recommendations. The Contractor shall submit to the Engineer one (1) complete set of shop drawings for the erosion control blanket for review and approval prior to the purchase and installation of the erosion control blanket on-site. The drawings shall include the erosion control blanket type, specifications, sizes and dimensions, and installation specifications and layout as per the manufacturer's specifications.

O-5 Dewatering

Payment for this item shall be a lump sum for all labour, equipment and materials necessary to maintain a dry condition and maintain flow within the limits of construction for the culvert replacement until the culvert construction has been completed, including the supply, installation, maintenance, removal and disposal of all dewatering arrangements and restoration of the affected areas. Dewatering arrangements shall include, but not be limited to, temporary coffer dams, by-pass piping or pumping, sediment bag and straw bale filters, as shown on the Drawings and as specified by the Engineer.

A minimum of 7 days prior to commencing work, the Contractor shall submit to the Engineer for review a dewatering plan for the culvert replacement complete with diagrams and written procedures, which shall conform and comply with the requirements of the approvals, permits and best practices issued by the Conservation Authority, and Ministry of Environment, Conservations and Parks and Department of Fisheries and Oceans.

The temporary cofferdams, temporary by-pass culvert or pump is not to be installed until the "In-Water" timing window has taken effect. The size and length of the cofferdam barriers shown on the drawings are conceptual only. The Contractor shall be responsible for sizing and constructing the cofferdams to suit site conditions. Cofferdams shall be constructed from non-earthen material. Cofferdams constructed from bare earth material or equivalent are not acceptable. Cofferdams shall include a polyethylene membrane or approved equivalent to seal the cofferdams and minimize the amount of water entering the site.

In the event that the Engineer determines that the dewatering arrangements are unacceptable the Contractor shall cease those operations as identified by the Engineer which are causing the dewatering issues. Such operations shall remain suspended until otherwise directed by the Engineer. The dewatering arrangements shall be monitored and inspected by the Contractor periodically at regular intervals and after every rainfall event, and maintained as necessary or as directed by the Engineer, at no additional cost. The Contractor shall also not remove dewatering arrangements until culvert construction has been completed.

O-6 Earth Excavation

Payment for this item shall be lump sum for all labour, equipment and materials necessary to complete the excavation and grading for the construction of the CSP culvert including topsoil stripping for drain construction and leveling excavated material, excavation, brushing and removal of all trees, brush and vegetation and excavation of all silt and sediment material encountered within the drain, as required.

The Contractor shall be responsible to establish the quantity of material to be excavated based on the drawings. The Contractor shall strip, stockpile and reinstall native topsoil for drain construction and leveling excavated material. Topsoil shall be kept separate from subsoil as much as possible. Brushing of trees, brush and vegetation is permitted on both sides of the drain to allow the installation of the CSP culvert.

All tile outlets in the existing open drain shall be noted by the Contractor prior to excavation. The price shall include all measures necessary to not disturb, damage or break any existing tile encountered in the open drain. All existing tile disturbed, broken or damaged during construction shall be repaired at the Contractor's expense.

Excavated material shall be disposed of in accordance with Special Provision Non-Tendered Item 8.

No work for this item shall commence on this item until the dewatering plan has been submitted to the Engineer for review as per Special Provision O-5 and the construction methodology for the culvert replacement complete has been submitted to the Engineer for review as per Special Provision O-7.

O-7 CSP Culvert

Payment for this item shall be for all labour, equipment and materials necessary to supply and install the new CSP culvert, including removal and disposal of the existing culvert and removal and disposal of surplus material off-site. Measurement for payment shall be by the linear metre of CSP culvert supplied and installed.

The CSP culvert shall be 1800mm diameter with minimum 2.8mm (12 gauge) with a 125mm x 25mm corrugation profile, and galvanized. Where required, the CSP culvert shall be joined using standard couplers matching the pipe diameter and material as per the manufacturer's recommendations. The CSP culvert shall be embedded 180mm into the drain bottom. The CSP culvert shall be installed as follows (as shown on the Drawings and placed conforming to OPSD 802.010 (Flexible Pipe)):

- Bedding – Shall be Granular 'A' with a minimum thickness of 300mm placed in maximum 150mm lifts and compacted to 98% Standard Proctor Maximum Dry Density (SPMDD). The Contractor shall ensure that bedding is properly placed and compacted under the haunches of the CSP culvert. The CSP culvert shall be embedded 150mm into the drain bottom.
- Haunching – From bedding to the springline of the CSP culvert shall be Granular 'A' placed in maximum 150mm lifts and compacted simultaneously on both sides of the CSP culvert to 98% SPMDD.
- Initial backfill – From the springline to a minimum of 600mm above the top of the CSP shall be Granular 'A' placed in maximum 150mm lifts and compacted simultaneously both sides of the pipe to 98% SPMDD.
- Final backfill – Road crossing restoration shall consist of 600mm of Granular 'A' uniformly placed in maximum 150mm lifts compacted to 100% SPMDD. The road crossing width shall match existing conditions.

The Contractor shall ensure that the minimum cover on the CSP culvert is 600mm.

The Contractor shall remove the existing culvert and surplus material, and dispose of them properly off-site and taken to an approved location arranged for by the Contractor upon receipt of a sign-off by the property owner. Payment for the removal and disposal of the existing CSP culvert and surplus material shall be included in the price for this item.

Payment for Granular 'A' shall be as per Special Provision O-8.

A minimum of 7 days prior to commencing work, the Contractor shall submit to the Engineer for review the construction methodology for the culvert replacement complete with diagrams and written procedures which shall conform and comply with the requirements of the approvals, permits and best practices issued by the Conservation Authority, and Ministry of Environment, Conservation and Parks and Department of Fisheries and Oceans.

O-8 Granular 'A'

Payment for this item shall be for all labour, equipment and material necessary to supply, place, grade, and compact all Granular 'A' at locations described in the special provisions, shown on the Drawings or as directed by the Engineer. Measurement for payment shall be per tonne of Granular 'A' supplied, placed, graded and compacted confirmed by copies of aggregate supply tickets signed by the Contractor and obtained from the aggregate supplier.

O-9 Precast concrete headwall and cut off wall

Supply and install one (1) precast concrete headwall and cut off wall at approximately Sta. 0+514 as per the details on the Drawings and in general conformance with OPSD 804.030.

Payment for this item shall be for all labour, equipment and material required for excavation, removal and disposal of surplus material off-site, and supply and install the precast concrete headwall and cut off wall as

per the details on the Drawings. Payment shall be made once per each headwall and cut off wall supplied and installed to the satisfaction of the Engineer.

The Contractor shall submit to the Engineer one (1) complete set of shop drawings for the headwall and cut off wall for review and approval prior to the manufacture, purchase and installation of the structure on-site. The drawings shall be stamped by one (1) Professional Engineer licensed in the province of Ontario. The Contractor is responsible for the design of the headwall and cut off wall and the Professional Engineer's stamp on the shop drawings shall indicate that the proposed wall has been designed to meet the requirements of the site and as noted on the Drawings. The drawings shall include wall sizes and dimensions, wall layout and installation specifications. The headwall and cut off wall shall be designed to meet O.B.C. requirements. The headwall and cut off wall shall be precast concrete in general conformance with OPSD 804.030.

Headwall and cut off wall base and backfill material shall be as specified by the headwall designer or supplier.

Payment for Granular 'A' shall be as per Special Provision O-8. Payment for clear stone shall be as per Special Provision O-12.

The price shall also include all connections between unit(s), connection the retaining walls and culvert, placement and compaction of base and backfill material, geogrid, geotextiles, individual block modifications including unique dimensions, tapers, cored holes for pipe outlets, cast-in-place concrete to fill voids at pipe opening, etc. all as specified by the headwall designer or supplier.

O-10 Precast Concrete Retaining Walls

Supply and install precast concrete retaining walls at approximately Sta. 0+514 as per the details on the Drawings.

Payment for retaining walls shall be made at the unit price bid per square meter of wall face, regardless of the number or configuration of blocks, supplied and installed to the satisfaction of the Engineer. The price for this item shall be for all labour, equipment, and materials necessary to supply and install new precast concrete retaining walls as shown on the Contract Drawings. Retaining walls shall be selected from the following: Easy Blocks by Underground Specialties; or approved alternative. Alternative products shall be submitted to the Engineer for review and acceptance prior to providing any shop drawing submittals.

The Contractor shall submit to the Engineer one (1) complete set of shop drawings for the retaining walls for review and approval prior to the purchase and installation of the retaining walls on-site. The drawings shall be stamped by one (1) Professional Engineer licensed in the province of Ontario. The Contractor is responsible for the design of the retaining walls and the Professional Engineer's stamp on the shop drawings shall indicate that the proposed wall has been designed to meet the requirements of the site and as noted on the Drawings. The drawings shall include wall sizes and dimensions, wall layout and installation specifications. The retaining walls shall be designed to properly fit with the culvert and site. Where conditions are such that the retaining wall units are unable to be fit flush with the culvert, cast-in-place concrete infill shall be provided to fill all gaps between the retaining wall units, headwall and cut off wall and the culvert, including reinforcing and dowels.

Granular backfill shall be either Granular 'A', Granular 'B' or clear stone as specified by the retaining wall supplier or approved equivalent. Payment for Granular 'A' shall be as per Special Provision O-8. Payment for clear stone shall be as per Special Provision O-12. Payment for granular 'B' shall be as per Special Provision O-13. Backfill shall be compacted to 98% SPMDD or as specified by the retaining wall supplier. Wall bedding material shall be or as specified by the retaining wall supplier.

The price shall also include all connections between units, connection to the headwall, cut-off wall and culvert, granular base material, geogrid, geotextiles, subdrains, individual block modifications including unique dimensions, tapers, cored holes for pipe outlets, cast-in-place concrete infill and reinforcing at skewed corners, etc. and all other details as may be specified by the retaining wall supplier. Supply and installation of 150mm perforated pipe with geotextile filter sock shall also be included in the bid price for this item, as well as outlets through the retaining wall to grade and appropriate rodent grates.

O-11 Rip Rap

Supply and place approximately 220m² of rip rap at the ends of CSP culvert at Twelve Mile Road in accordance with the details shown on the Drawings.

Payment for this item shall be for all labour, equipment and material necessary to supply and install rip rap on geotextile filter cloth (Terrafix 270R or approved equivalent) as per the locations and dimensions shown on the Drawings or as directed by the Engineer. Measurement for payment shall be per square metre of rip rap supplied and installed.

The rip rap shall be R50 quarry stone (150mm to 300mm diameter) as per OPSS.MUNI 1004 or as approved by the Engineer on geotextile filter material, machine placed to produce a smooth locked surfaced. All rip rap and geotextile shall be installed in accordance with OPSD 810.010 Type B. Rip-rap through the stream bed shall be placed so that the top surface of the rip-rap is at the approximate elevation of the bottom of the existing or proposed drain.

O-12 19mm Clear Crushed Stone (PROVISIONAL)

Payment for this item shall be for all labour, equipment and materials necessary to supply and install well graded crushed stone where wet conditions, unsuitable material, or earth excavation below subgrade are encountered or as directed by the Engineer. Measurement for payment shall be per tonne of well graded crushed stone supplied and installed.

The well graded crushed stone shall have a maximum aggregate size of 19mm. The well graded crushed stone shall be placed to a minimum 300mm thickness wrapped in geotextile filter cloth (Terrafix 270R or approved equal), and shall extend at least one metre outside the sides of the culvert before sloping at 45 degrees to the base of the excavation.

This item shall only be used under the authorization of the Engineer.

O-13 Granular 'B' (PROVISIONAL)

Payment for this item shall be for all labour, equipment and material necessary to supply, place, grade, and compact all Granular 'B' at locations described as directed by the Engineer. Measurement for payment shall be per tonne of Granular 'B' supplied, placed, graded and compacted confirmed by copies of aggregate supply tickets signed by the Contractor and obtained from the aggregate supplier.

This item shall only be used under the authorization of the Engineer.

CLOSED WORK

C-1 Expose Existing Drain

Contractor is to expose the existing drain where the Smith Municipal Drain enters the Needham Municipal Drain at approximately Sta. 1+696 and confirm elevations prior to construction. Contractor is to supply the information to the Engineer and confirm invert elevation of the existing drain prior to construction.

Contractor is to expose the existing drain where the Williams Drain Branch 'A' enters the Needham Municipal Drain at approximately Sta. 1+959 and confirm elevations prior to construction. Contractor is to supply the information to the Engineer and confirm invert elevation of the existing drain prior to construction.

Payment for this item shall be lump sum and includes all labour, material and equipment necessary to expose the existing drain at the locations indicated above.

C-2 Rip Rap Outlet Protection

Supply and place approximately 50m² of rip rap at the outlet pipe of the Needham Main Drain into the open portion of the Needham Main Drain in accordance with the detail shown on the Drawings. All rip rap shall be supplied and placed to the standard described in Special Provision O-11.

Payment for rip-rap will be on an area basis for the actual quantity supplied and installed at the rate quoted in the tender.

C-3 HDPE Pipe

Supply and install 43m of 900mm (36") diameter HDPE pipe.

The pipe shall be installed as follows (as shown on the Drawings and placed conforming to OPSD 802.010 (Flexible Pipe)):

- Bedding – Shall be Granular 'B' with a minimum thickness of 150mm placed in maximum 150mm lifts and compacted to 98% SPDD. The Contractor shall ensure that bedding is properly placed and compacted under the haunches of the pipe.
- Haunching – From bedding to the springline of the pipe shall be Granular 'B' placed in maximum 150mm lifts and compacted simultaneously both sides of the pipe to 98% SPDD.
- Initial backfill – From the springline of the pipe to a minimum of 300mm above the top of the pipe shall be Granular 'B' placed in maximum 150mm lifts and compacted simultaneously both sides of the pipe to 98% SPDD.
- Final Backfill – From initial backfill to topsoil shall be approved granular material (native if available) free of any large stones, clumps, etc. placed in maximum 300mm lifts and compacted uniformly to 95% SPDD. Final backfill shall be placed, graded and leveled in a manner to not damage or displace the pipe.

Extra will not be paid for stoney conditions while installing the HDPE pipe unless boulders are encountered larger than can be lifted by the excavator.

Connect the successive concrete field tile by sealing all around with 150mm of concrete or wrapping with a 600mm wide strip of Terrafix 270R filter cloth, or approved equivalent.

The trench shall be backfilled to ensure that minimum cover is maintained for all HDPE pipe. If additional trench backfill is required beyond the native material available on-site, topsoil shall be used. The supply, placement, spreading and grading of imported topsoil shall be per Special Provision C-17.

Payment under this item shall be per metre supplied and installed and includes all labour, equipment and materials necessary to excavate and shape the trench, lay and connect the pipe, backfill the trench, and includes topsoil stripping and replacement. The supply, placement, grading and compaction of the Granular 'B' required for the pipe shall be as per Special Provision C-7.

C-4 Concrete Field Tile by Wheel Trencher

Supply and install 775m of 825mm (33") diameter, 27m of 750mm (30"), 263m of 675mm (27") diameter and 329m of 525mm (21") diameter concrete field tile by wheel trencher or excavator.

If the drain is to be installed at depths that exceed the installation depth of the Contractor's wheel trencher, the Contractor shall strip and stockpile the subsoil (double strip) to lower the ground elevation on which the wheel trencher operates to ensure the drain is installed at the correct depth and grade. The subsoil shall be stripped and stockpiled after the topsoil has been stripped and stockpiled. The subsoil shall be stockpiled separately from the topsoil and shall not be placed on topsoil. During backfill, the subsoil shall be placed below the topsoil and the topsoil shall be later spread over the backfilled trench and subsoil. There shall be no additional payment made beyond the tendered unit price for the strip and stockpile of subsoil (double strip) if required.

There shall be no additional payment made beyond the tendered unit price where the Contractor has elected to install the drain by excavator. If the Contractor elects to install the pipe by excavator, extra will not be paid for stoney conditions unless boulders are encountered, larger than can be lifted by the excavator.

By whatever means the pipe is installed, the Contractor shall place it so that support is provided for the bottom and sides. This may require hand work to "blind" the pipe and place and compact soil under the haunches of the pipe, and/or modification to the excavator. If the Contractor elects to install the pipe by excavator, the Contractor will be responsible for either properly shaping and preparing the trench bottom to seat the pipe to the satisfaction of the Engineer, or installing the pipe on a 150mm thick bed and 180mm haunching of compacted Granular 'B'. Refer to Drawings for pipe bedding detail.

The Contractor is responsible for any breakage of pipe in the ground, however it occurs and whether or not the method of installation is approved by the Engineer.

This item shall include the wrapping of tile joints. No additional payment will be made for wrapping of tile.

Payment under this item shall be per metre supplied and installed and includes all labour, equipment and materials necessary to excavate the trench and shape the bottom, lay and wrap the pipe, backfill and shape the trench, and includes topsoil and subsoil (double strip) stripping and replacement.

C-5 Concrete Field Tile by Excavator (Directed)

This specification only applies where the Contractor installs tile by hydraulic excavator when directed to do so by the Engineer.

The Contractor shall place the pipe on a 150mm thick bed and 180mm thick haunching of compacted Granular 'B' so that the pipe is supported from the bottom and sides. This may require hand work to "blind" the pipe and place stone under the haunches of the pipe, and/or modification to the excavator. Refer to Drawings for pipe bedding detail.

The Contractor is responsible for any breakage of pipe in the ground, however it occurs and whether or not the method of installation is approved by the Engineer.

This item shall include the wrapping of tile joints. No additional payment will be made for wrapping of tile.

Extra will not be paid for stoney conditions unless boulders are encountered, larger than can be lifted by the excavator.

The supply, placement, grading and compaction of the Granular 'B' required for the pipe shall be as per Special Provision C-7.

Payment under this item shall be per metre supplied and installed and includes all labour, equipment and materials necessary to excavate and shape the trench, lay and wrap the pipe, backfill the trench, and includes topsoil stripping and replacement.

C-6 Concrete Field Tile by Excavator (Elected)

This specification shall only apply where the Contractor elects to install the tile by hydraulic excavator when NOT specified on the Drawings or directed to do so by the Engineer.

If the Contractor elects to install the tile by hydraulic excavator in locations NOT specified to do so on the Drawings or directed by the Engineer, the Contractor shall place the pipe on a 150mm thick bed and 180mm haunching of compacted Granular 'B' so that the pipe is supported from the bottom and sides. This may require hand work to "blind" the pipe and place stone under the haunches of the pipe, and/or modification to the excavator. Refer to the Drawings Pipe Bedding Detail.

The Contractor is responsible for any breakage of pipe in the ground, however it occurs and whether or not the method of installation is approved by the Engineer.

This item shall include the wrapping of tile joints. No additional payment will be made for wrapping of tile.

Extra will not be paid for stoney conditions unless boulders are encountered, larger than can be lifted by the excavator.

No additional payment will be made above the tendered unit price for the installation of the pipe by excavator or the supply and placement of the compacted Granular 'B'.

Payment under this item shall be per metre supplied and installed and includes all labour, equipment and materials necessary to excavate and shape the trench, supply and place the compacted Granular 'B', lay and wrap the pipe, backfill the trench, and includes topsoil stripping and replacement. This applies only in locations where installation by hydraulic excavator is used and NOT specified in the Drawings or directed by the Engineer.

C-7 Granular 'B'

Payment for this item shall be for all labour, equipment and material necessary to supply, place, grade, and compact all Granular 'B' at locations described in the special provisions, shown on the Drawings or as directed by the Engineer. Measurement for payment shall be per tonne of Granular 'B' supplied, placed, graded and compacted confirmed by copies of aggregate supply tickets signed by the Contractor and obtained from the aggregate supplier.

C-8 Steel Pipe Road Crossing Installed by Jack and Bore

Supply and install 24m of 750mm (30") diameter smooth wall steel pipe. Installation to be trenchless utilizing jack and bore method.

Refer to A.12 of the Construction Specifications and OPSS.MUNI 416 – Construction Specification for Pipeline and Utility Installation by Jacking and Boring for installation requirements.

Steel pipe used on this contract shall conform to the requirements of OPSS 1802. The steel pipe shall be ASTM A252, Grade 2 steel, with a minimum yield strength of 240MPa. The pipe shall have a minimum wall thickness of 10.3mm. The Contractor shall supply the smooth wall steel pipe for installation under this item.

Bore pits are to be constructed upstream and downstream of Highbury Avenue at the locations of CB.2 and the tee for the offset CB.3 and shall be large enough to accommodate the installation of CB.2 and the tee for the offset CB.3 at the conclusion of the pipe installation.

Water tight connection of the steel pipe to the precast structures is included in price bid for this item.

Tolerance on the grade of the bore pipe from that shown on the Drawing is not more than 0.1% flatter or more than 0.3% steeper than the grade shown on the drawing.

The downstream pipe invert is to be not more than 0.1 m higher or lower than that shown on the Drawings.

Horizontal tolerance is to be not more than +/-3 m of that shown on the drawing.

Filling and restoration of bore pits shall be included as part of this item.

If the bore pipe cannot be placed by boring and jacking on account of obstructions or poor soil conditions, the Contractor shall immediately notify the Engineer. The Engineer, in consultation with the Contractor and the

Municipality, will determine a suitable alternative and instruct the Contractor accordingly. Any partial attempts shall be abandoned in place, grouted full, and capped.

No open cut lateral crossing of Highbury Avenue shall be allowed. All excavations for the purpose of Jack and Bore shall be protected with adequate sheeting, bulkheads, and sidewalls to protect Highbury Avenue. The Contractor shall provide any barricades and lights, if necessary to provide positive protection around any pit locations.

Payment for this item shall be per metre of smooth wall steel pipe supplied and installed by jack and bore and shall be compensation in full for all labour, material, and equipment necessary to supply and install 24m of 750mm diameter (30") x 10.3mm (13/32") minimum wall thickness smooth wall steel pipe by the jacking and boring method between CB.2 and offset CB.3.

C-9 Cap, Grout and Abandon Existing Road Crossing

Cut, grout, fill, cap and abandon the existing Highbury Avenue road crossing as shown on the Drawings.

Payment for this item shall be per cubic metre of grout supplied and installed and shall include all material, labour and equipment costs required to cut, grout, fill, cap and abandon the Highbury Avenue road crossing pipe by methods of low shrink flowable grout at a minimum 28 day strength of 0.5 MPa. The Contractor shall ensure that the abandoned pipe is filled solid with no air pockets or voids and that the caps are securely fastened.

The Contractor shall utilize standpipes/vent pipes to ensure the pipe has been filled solid.

The Contractor shall commence the grout and abandonment of the pipe once the pipe has been hydraulically disconnected from the drain. The Contractor shall carry out any dewatering of the pipe necessary to allow the grouting operation to proceed as intended and without dilution of the grout mixture being installed. The Contractor shall ensure that no water enters the pipe.

This item shall include all excavations, dewatering (if required), bends, fittings, blocking, tie rods, restraints, bedding, caps and all related materials and work required to isolate, cut, fill with grout and cap the existing pipe to be abandoned.

C-10 Catch Basins

Supply and install one (1) – 1200mm x 1500mm catch basin complete with birdcage grate and 600mm sump as per OPSD 705.010.

Supply and install one (1) – 1200mm x 1500mm catch basin complete with birdcage grate and 600mm sump as per OPSD 705.010. This catch basin shall include approximately 3m of 300mm diameter HDPE pipe to connect the existing offset catch basin to the drain. The HDPE pipe shall be supplied and installed to the standard described in Special Provision C-3. The supply and installation of the HDPE pipe, granular 'B' for the HDPE pipe and connection to the existing drain shall be included in the price of the catch basin and there shall be no extra payment.

Supply and install one (1) – 900mm x 1200mm catch basin complete with birdcage grate and 600mm sump as per OPSD 705.010, offset from the drain by approximately 11m. The offset catch basin shall be connected to the drain with approximately 11m of HDPE pipe and a 750mm x 750mm x 450mm diameter manufactured tee (or approved equivalent). The HDPE pipe shall be supplied and installed to the standard described in Special Provision C-3. The supply and installation of the HDPE pipe, manufactured tee (or approved equivalent) and granular 'B' for the HDPE pipe shall be included in the price of the catch basin and there shall be no extra payment.

Supply and install one (1) – 900mm x 1200mm catch basin complete with birdcage grate and 600mm sump as per OPSD 705.010.

All catch basins shall have a flat top and heavy duty galvanized steel grate (minimum bar diameter 15mm, maximum spacing 75mm) of the “birdcage” type set so that the top of the concrete is approximately 50mm above the surrounding ground. Securely fasten the grate to the structure with two galvanized bolts.

All catch basins shall be set on a 200mm thick layer of compacted Granular ‘A’ or 19mm drainage stone. Granular ‘A’ or 19mm drainage stone shall be included in the price of the catch basin and there shall be no extra payment.

All catch basins shall include at least one 150mm riser section.

All necessary minor grading and contouring to convey water to the catch basin is included. The approximate top of grate elevation has been shown on the Drawings; however the Contractor shall confirm the surface elevations prior to ordering or placing any catch basins and shall ensure that the top extends 50mm above the ground surface. For the purposes of this report, top of grate shall be equivalent to the lowest point that surface water can enter the structure.

All catch basins shall include an earthen berm, unless noted otherwise. The berm shall be constructed from native material (or approved equivalent) and to the details as shown on the Drawings. The berm shall be finished with topsoil and seed. The berm construction shall be included in the price of the catch basin and there shall be no extra payment.

All pipes connected to the catch basin shall be suitably grouted with concrete, and all grouted connections shall be completely wrapped with geotextile. Further, geotextile shall be placed over all the joints between sections of the box for the entire perimeter of the box.

Payment under this item shall be per catch basin supplied and installed and includes provision of shop drawings (as required), all labour, equipment and materials necessary to excavate and shape the trench, supply and place the compacted Granular ‘A’ or clear stone, supply, install, grout and wrap the catch basin, supply and install of pipe and tile connection items described above, backfill the trench, supply and install the grate, construction of the berm, and includes topsoil stripping and replacement (with seed as required).

Supply and install approximately 10m^2 of rip rap at each catch basin. All rip rap shall be supplied and placed to the standard described in Special Provision O-11. Payment for rip-rap will be on an area basis for the actual quantity supplied and installed at the rate quoted in the tender.

C-11 Junction Boxes

Supply and install two (2) – 900mm x 1200mm junction boxes.

All junction boxes shall be supplied from a precast manufacturer. Dimensions for junction boxes shall conform to dimensions for catch basins. An approximate top of structure elevation has been shown on the detailed plans; however the contractor shall confirm the surface and top of structure elevations prior to ordering or placing any junction boxes to confirm the elevation.

All pipes connected to the junction box shall be suitably grouted with concrete, and all grouted connections shall be completely wrapped with geotextile. Further, geotextile shall be placed over all the joints between sections of the box for the entire perimeter of the box.3

Junction boxes shall come pre-benched to the spring line with no sump, unless noted otherwise or directed by the Engineer. All buried junction boxes will be covered with a solid concrete top, minimum 150mm thick. Exposed junction boxes will have a galvanized heavy duty flat top grate, as supplied by Coldstream Concrete or approved equivalent, and fastened to the junction box with two galvanized bolts.

All junction boxes shall be set on a 200mm thick layer of compacted Granular 'A' or 19mm drainage stone. Granular 'A' or 19mm drainage stone shall be included in the price of the junction box and there shall be no extra payment.

Shop drawings prepared by the precast manufacturer and stamped by a Professional Engineer licenced in the province of Ontario are required for all junction boxes. The Contractor is to submit these shop drawings to the Engineer for review and approval prior to the fabrication of the boxes. The shop drawings are to detail the structural design to resist the applied loading on the buried boxes.

Payment under this item shall be per junction box supplied and installed and includes provision of shop drawings, all labour, equipment and materials necessary to excavate and shape the trench, supply and place the compacted Granular 'A' or clear stone, supply, install, grout and wrap the junction box, backfill the trench, and includes topsoil stripping and replacement.

C-12 Service Sweep

Supply and install a 200mm diameter HDPE pipe service sweep (approximately 10m in length) as shown on the Drawings to the satisfaction of the Engineer. The HDPE pipe shall be supplied and installed to the standard described in Special Provision C-3. Connection to the main drain shall be "earth tight" to the satisfaction of the Engineer and shall be a manufactured tee (or approved equivalent). The connection shall be sealed by a method satisfactory to the Engineer with the service capped at the surface. Granular 'B' for the HDPE pipe shall be included in the price of the service sweep and there shall be no extra payment.

The Contractor shall clear and grub trees, brush and vegetation as required for the installation of the service sweep to the standard described in Special Provision O-2. The stockpile of trees, brush and vegetation shall be such a distance on each side to eliminate any interference with the construction of the drain and spreading of the excavated material. The stockpiles shall be disposed of by the landowner.

Payment for this item shall be lump sum and include all labour, materials and equipment to remove and dispose of the trees as required, excavate, backfill, supply and install the service sweep, manufactured tee (or approved equivalent), and granular 'B' for the HDPE pipe, and restore working area to original condition for the service sweep.

C-13 Protection and Temporary Support of Utility Infrastructure, including Coordination

The Contractor's attention is drawn to the presence of underground and overhead utilities. The locations of such, if indicated on the Drawings, represent to the best of the Engineer's knowledge, the approximate location of such utilities. The Contractor shall be responsible for all utility stakeouts as well as any inspection or test pits required and the inspection of any manholes, catch basins, sewers or vaults necessary to locate the utility. The Contractor shall be wholly responsible for the accuracy of the information gathered by their own forces. The work site may also be located near multiple high voltage power transmission lines, fibre optic telephone lines, telecom lines, buried storm and sanitary sewers, buried watermain, and buried gas mains not indicated on the Drawings. The Contractor shall be aware of such utilities at all times and shall utilize equipment and methodologies in the undertaking of the work that do not constitute a hazard or safety violation under the OHSA.

The known requirements for each Utility Company to complete drain construction are shown below and are based on information received by the Engineer. The accuracy of the information below is not guaranteed and the requirements of each utility company is subject to change without notice. It is the Contractor's responsibility before starting any work to contact the Utility Companies for information in regards to the exact location of these utilities and requirements for construction in the area of these utilities, and to take such other precautions as necessary to safeguard, protect and temporarily support the utilities from damage. Exposure of the utility infrastructure shall be as per Special Provision C-14.

The Contractor shall be responsible for all efforts to make arrangements and coordinate with Utility Companies as required to complete the drain construction. All costs for coordination and any associated project delays or

standby time shall be borne by the Contractor, however, the Owner will be responsible for the costs for the Utility Company to complete any work. The Contractor shall coordinate with Utility Companies for the location, exposure, temporary relocation, temporary support, and reinstallation (where required) of the existing utilities to facilitate the drain construction.

The Contractor shall supply and install whatever means are necessary to temporarily support and protect the temporarily relocated and existing utilities during drain construction, until reinstallation of the utilities and project completion. The Contractor shall remove and dispose of the temporary support and protection measures upon project completion. Any damages incurred to a utility during construction shall be repaired at the Contractor's expense. Prior installing the temporary support and protection, the Contractor shall submit to the Engineer and Utility Companies, for their approval, details of the proposed method of support and protection of the utilities and no work may take place prior to the Engineer's and Utility Companies' review of such details. Approval by the Engineer and Utility Company of any such details will in no way relieve the Contractor from his/her responsibility to avoid any damage.

All delays and standby time caused by the temporary relocation and reinstallation of the existing utilities by the Utility Companies during construction shall be borne by the Contractor.

OPSS.MUNI 491, Construction specification for Preservation, Protection, and reconstruction of Existing Facilities applies to all existing services.

All work shall be completed to the satisfaction of Utility Companies.

Payment shall be lump sum (for each Utility Company) and include all labour, equipment and materials necessary to coordinate with the Utility Companies (including but not limited to coordination for the relocation of the utilities), and to supply, install and remove whatever means are necessary to temporarily support and protect the existing utilities until project completion. Payment shall also include any delays or standby time caused by the temporary relocation and reinstallation of the existing utilities by the Utility Companies during construction.

Enbridge Gas

The Contractor is to excavate, compact and backfill material in accordance with the Drawings, Special Provisions, and in accordance with the "Guideline for Excavation in the Vicinity of Utility Lines" manual dated December 2008 to ensure that undue strain does not occur.

An Enbridge Gas Utility Services Representative (USR) is to be in attendance when work around the gas lines are planned. Proper notification to Enbridge Gas shall occur to ensure that resources are available.

All work shall be completed to the satisfaction of Enbridge Gas. The work completed under this item shall operate under a Crossing Agreement between Enbridge Gas and the Contractor, an example of which is provided in Appendix F.

Enbridge Oil Pipeline

The Contractor shall coordinate an initial site meeting with Enbridge Oil Pipeline a minimum of 30 days prior to construction to review and confirm Enbridge Oil Pipeline's requirements and specifications for work adjacent to their infrastructure. Proper notification to Enbridge Oil Pipeline shall occur to ensure that resources are available.

An Enbridge Oil Pipeline's representative is to be in attendance when work in the Oil Pipeline Safety Zone (and easement if required) is planned. Proper notification to Enbridge Oil Pipelines shall occur to ensure that resources are available. The Oil Pipeline Safety Zone (and easement) will be determined by Enbridge Oil Pipeline at the initial site meeting discussed above.

All work shall be completed to the satisfaction of Enbridge Oil Pipeline. The Contractor shall complete the work within the Oil Pipeline Safety Zone (and easement if required) in accordance with the Drawings, Special Provisions, and requirements and specifications of Enbridge Oil Pipeline.

Bell

All work shall be completed to the satisfaction of Bell.

Quadro

The Contractor shall coordinate an initial site meeting with Quadro a minimum of 30 days prior to construction to review and confirm Quadro's requirements and specifications for work adjacent to their infrastructure. Proper notification to Quadro shall occur to ensure that resources are available.

A Quadro Representative is to be in attendance when work around their infrastructure is planned. Proper notification to Quadro shall occur to ensure that resources are available.

All work shall be completed to the satisfaction of Quadro.

Hydro One

The Contractor shall coordinate an initial site meeting with Hydro One a minimum of 30 days prior to construction to review and confirm Hydro One's requirements and specifications (including pole holds) for work adjacent to their infrastructure. If pole holds are required, the Contractor shall arrange for the pole holds with Hydro One. Proper notification to Hydro One Planning shall occur to ensure that resources are available.

A Hydro One Representative is to be in attendance when work around the hydro poles is planned (including pole holds). Proper notification to Hydro One Planning shall occur to ensure that resources are available.

All work shall be completed to the satisfaction of Hydro One. The Contractor is to complete the work adjacent to and around Hydro One's infrastructure in accordance with the Drawings, Special Provisions, and the requirements and specifications of Hydro One including but not limited to the "3rd Party Excavation Zone Limits" drawings dated April 26, 2021.

C-14 Expose Existing Utility Infrastructure

The known requirements for each Utility Company to complete drain construction are shown below and are based on information received by the Engineer. The accuracy of the information below is not guaranteed and the requirements of each utility company is subject to change without notice. It is the Contractor's responsibility before starting any work to contact the Utility Companies for information in regards to the exact location of these utilities and requirements for exposing these utilities, and to take such other precautions as necessary to safeguard, protect and temporarily support the utilities from damage. The protection and temporary support of utility infrastructure, including coordination with utility companies shall be as per Special Provision C-13.

The Contractor shall expose all utility lines by hydro excavation or approved equivalent prior to construction. Any potential conflicts shall be identified at this time, and proposed solutions will be agreed upon by the Contractor, Municipality, Utility Company and the Engineer. All delays and standby time caused by the exposure of utility infrastructures, including by the Utility Companies, shall be borne by the Contractor.

Enbridge Gas

The Contractor is to confirm elevations and location of the gas lines where the drain crosses the gas lines at Twelve Mile Road and Highbury Avenue. The Contractor is to supply the information to the Engineer for review prior to proceeding with the installation of the Twelve Mile Road crossing by CSP culvert and Highbury Avenue crossing by Jack and Bore.

All work shall be completed to the satisfaction of Enbridge Gas. The work completed under this item shall operate under a Crossing Agreement between Enbridge Gas and the Contractor, an example of which is provided in Appendix F. Payment under this item shall be lump sum and include all labour, equipment and materials necessary to expose and confirm the elevation of the existing gas lines.

Bell

The Contractor is to confirm elevations and location of the Bell lines where the drain crosses the Bell lines at Twelve Mile Road. The Contractor is to supply the information to the Engineer for review prior to proceeding with the installation of the Twelve Mile Road crossing by CSP culvert.

All work shall be completed to the satisfaction of Bell. Payment under this item shall be lump sum and include all labour, equipment and materials necessary to expose and confirm the elevation of the existing Bell lines.

Quadro

The Contractor is to confirm elevations and location of the Quadro lines where the drain crosses the Quadro lines at Highbury Avenue. The Contractor is to supply the information to the Engineer for review prior to proceeding with the installation of the drain upstream of Highbury Avenue and Highbury Avenue crossing by Jack and Bore.

All work shall be completed to the satisfaction of Quadro. Payment under this item shall be lump sum and include all labour, equipment and materials necessary to expose and confirm the elevation of the existing Quadro lines.

C-15 Non-metallic Barrier

Supply and install a non-metallic barrier (rubber) with a minimum thickness of 9.0mm between the gas line and drain at the west side of Highbury Avenue (approx. Sta. 1+642).

The Contractor shall ensure a minimum clearance of 150mm is maintained between the gas line and drain.

A minimum of 7 days prior to commencing work, the Contractor shall submit to the Engineer and Enbridge Gas for review the details of the non-metallic barrier for installation between the gas line and drain complete with diagrams and written procedures. The work of this item shall conform and comply with the requirements and specifications of Enbridge Gas.

Exposure of the gas line shall be as per Special Provision C-14. Protection and temporary support of the gas line and coordination with Enbridge Gas shall be as per Special Provision C-13.

Payment shall be lump sum and include all labour, equipment and materials necessary to supply and install the non-metallic barrier between the gas line and drain at the west side of Highbury Avenue.

C-16 19mm Clear Stone (PROVISIONAL)

Supply and install 19mm diameter clear crushed stone for bedding or envelope. Where not already specified in the contract, location for installation shall be designated by the Engineer at the time of construction.

Measurement for payment shall be per tonne of 19mm diameter clear crushed stone supplied, placed, graded and compacted confirmed by copies of aggregate supply tickets signed by the Contractor and obtained from the aggregate supplier.

This item shall only be used under the authorization of the Engineer.

C-17 Imported Topsoil (PROVISIONAL)

Supply, place, spread and grade imported topsoil to a depth of not less than 150mm. Where not already specified in the contract, location for installation shall be designated by the Engineer at the time of construction.

This item shall include the supply and installation of grass seed (if required). All clods or lumps shall be pulverized and any roots, stones over 50mm in diameter, or foreign matter shall be raked up and removed as directed prior to placement of grass seed. The seed and fertilizer shall be in accordance with OPSS 804 for Standard Roadside Mix, or approved equivalent in accordance with Section B.12 of the Construction Specifications.

Measurement for payment shall be per cubic metre of imported topsoil supplied, placed, spread and graded, including grass seed, confirmed by copies of aggregate supply tickets signed by the Contractor and obtained from the aggregate supplier.

This item shall only be used under the authorization of the Engineer.

C-18 Poor Soil Conditions (PROVISIONAL)

Poor soil conditions may be encountered. The Contractor shall immediately contact the Engineer if poor soil conditions are suspected. Should they occur and be sufficiently severe, in the opinion of the Engineer, that installation by wheel trencher is not possible; extra will be paid at the rate quoted in the tender for installation of the tile by excavator as per Special Provision C-5. Work under this item will include trench excavation of sufficient depth to install clear stone bedding if necessary, or other such action as may be necessary. All costs involved in removing the wheel trencher, crew downtime, or any other costs related to the transition from wheel trencher to excavator will be included in the cost of this item, and no additional payments will be made.

This item shall only be used under the authorization of the Engineer.

C-19 Tile Connections (PROVISIONAL)

All tile encountered shall be connected into the main drain or a catch basin. Tile connections may be made by using the same size of concrete field tile or one size larger of standard corrugated plastic drainage tubing. Connection at the main shall be “earth tight” to the satisfaction of the Engineer. All tile connections shall be done by core drilling the main drain or catch basin, and the connection shall be sealed by a method satisfactory to the Engineer. All connections shall be left uncovered for inspection by the Engineer.

The contractor will be paid as follows for the connection of tributary tile to the proposed works:

100mm Connections to	Total c/w Coring	150mm Connections to	Total c/w Coring	200mm Connections to	Total c/w Coring
250-675	$ 95.00	300-675	$ 110.00	250-675	$ 140.00
750-900	$ 140.00	750-900	$ 150.00	750-900	$ 185.00

The number of tributary tile connections required is unknown until construction commences.

The above prices include supply and install of up to a 3m length of tile, or tubing to make connections. Connections in excess of 3m shall be paid for at the rate of $15.00/m for 100mm and 150mm diameter tile, and $25.00/m for 200mm diameter tile.

This item shall only be used under the authorization of the Engineer.

Appendix E
Construction Specifications

SPECIFICATIONS
for the
CONSTRUCTION
of
MUNICIPAL DRAINAGE WORKS

Revised January 2024

GM BLUEPLAN ENGINEERING LIMITED
GUELPH – OWEN SOUND – LISTOWEL – KITCHENER – LONDON – GTA – HAMILTON

SPECIFICATIONS FOR THE CONSTRUCTION OF MUNICIPAL DRAINAGE WORKS

INDEX

SPECIFICATIONS FOR THE CONSTRUCTION OF MUNICIPAL DRAINAGE WORKS

SECTION A - GENERAL

A.1 BENCH MARKS

Bench Marks will be set by the Engineer in the vicinity of the work as shown on the accompanying Drawings. Attention is drawn to Section 13 (2) of the Drainage Act regarding liability for interference with Bench Marks.

A.2 LINE

Open drains shall run in straight lines throughout each course except that at intersections of courses it shall run on a curve of at least 15m radius. The centre line of existing open drain shall in general be the centre line of the finished work but the straight lines of the drain shall be staked by the Contractor at least one complete course ahead of the digging, and all sloping and widening necessary shall be done in such a manner as to make the finished work uniform.

The Contractor shall exercise care not to disturb any existing tile drain or drains which parallel the course of the new drain, particularly where the new and existing tile act together to provide the necessary capacity. Where any such existing drain is disturbed or damaged, the Contractor shall perform all necessary correction or repair at his expense. The Engineer will designate the general location of the tile drain, but the landowners may indicate the exact location if requested by the Contractor.

The Contractor shall verify the location of the new tile drain with the Engineer and the landowners before proceeding with the work.

A.3 PROFILE

The drain is to be excavated to regular grade lines as shown on the Drawings. These grade lines are governed entirely by the bench marks and show the bottom of the finished drain. In the case of tile drains, the grade line is that of the invert of the tile. The Profile shows, for the convenience of the Contractor and others, the approximate depths from the surface of the ground, but the bench marks must govern the construction. Open drains shall be brought to an even grade in the bottom so that water will not stand therein, except in special cases such as sediment traps.

The drain shall be constructed with a uniform grade in accordance with the Profile Drawing. A variation of 25mm from the proposed Profile shall be sufficient to require the Contractor to remedy this discrepancy.

A.4 ERRORS OR OMISSIONS

The Contractor shall satisfy themselves before the commencement of any part of the work of the meaning of the plans and specifications, and any errors or omissions they may find in Plans, Profiles or Specifications shall not relieve the responsibility of completing the work in accordance with the evident intention of such Plans, Profiles and Specifications. The Contractor shall report any such errors or omissions to the Engineer for correction before the work is commenced, and failure to do so shall relieve the Contractor of any opportunity for additional compensation.

A.5 CLEARING

(a) General

Brush, timber, logs, stumps, stones or any obstruction in the course of the work, and any brush along the banks thereof shall be removed to a sufficient distance to be clear of the excavated material or to the width as shown on the Profile.

Where included, the Special Provisions and/or Drawings lay out the amount of the work of clearing through bush and treed areas for both open and closed drains.

All brush and trees removed from the drain and banks thereof must be piled to the satisfaction of the Engineer for burning or disposal by the Owner. Where trees are to be trimmed only, trimming shall be done by saw cutting. Branch removal by excavator bucket will not be permitted.

Any deviation during construction will require the written authorization of the Engineer or the Drainage Superintendent in charge of the work. Other deviation will only be by the Special Provision applicable to and governing certain aspects of special situations.

The Contractor will be permitted to cut standing timber along the banks of the drain to the extent that may, in the opinion of the Engineer, be reasonably necessary for the operation of the excavation equipment.

The quality of workmanship shall be equal to the best in the industry and the Contractor shall be held liable for all damages incurred due to carelessness, negligence or failure to adhere to this Specification.

(b) Open Work

Clearing shall be on the spoil side as designated in the Drawings or Special Provisions. All overhanging limbs and any dead or dying trees liable to fall into the drain on the opposite side shall be cut and removed. Care shall be exercised to prevent the scraping or barking of trees outside of the clearing area.

All trees 150mm in diameter, 450mm above the ground, must be cut, trimmed and stacked in log lengths in a location accessible to the Owner. These trees shall be cut sufficiently close to the ground in the cleared area that the spoil can be leveled over them.

No brush or trees are to be left inside the slopes of the drain whether they come within the limits of the excavation or not.

Under no circumstances shall the cleared material be pushed or deposited in any way in the uncleared area so as to impede the passage through the bush or to do damage to the uncleared bush. All remaining trees, bush and trimmed limbs shall be cleared with suitable equipment and temporarily placed on the edge of the cleared area remote from the drain. After the spoil has been spread and leveled, the cleared material is to be placed in piles along the centre of the cleared area free from dirt for disposal by landowners or others. The piles of brush shall be a minimum of 60m apart. For the clearing of willows, the Contractor shall use the equipment necessary to uproot and stack the bush in piles free from dirt for disposal by others.

(c) Closed Work

Clearing width shall be as provided for in the Special Provisions.

In the normal case where the course of the drain is to be included in cultivated lands in the near future, all stumps shall be removed, and the land leveled for the full width of the clearing.

Where the course of the drain is through low, wet or swampy land and clearing prior to tile installation is impractical, then with special written permission ONLY can the tile be laid before clearing. For drainage purposes, the clearing shall be postponed until ground and weather conditions permit working within the area adjacent to the tile.

Where the course of the drain is not to be included in cultivated lands, all stumps shall be removed and the land leveled for 6m on each side of the installed tile. All stumps in the remaining cleared area shall be cut as close as is practically possible to the ground.

After the tiles have been laid, heavy machinery shall not be driven over it if there is any possibility of disturbing or damaging the tile.

Care shall be taken to prevent the scraping or barking of trees outside the cleared area.

All trees 150m in diameter, 450mm above the ground shall be cut, trimmed and stacked in log lengths, in a location accessible to the Owner.

The cleared material shall not be pushed or deposited in the uncleared area in any manner so as to impede the passage through the bush or to do damage to the uncleared bush. All trees, bush and trimmed limbs remaining shall be cleared with suitable equipment and placed in piles free from dirt at intervals of 60m for disposal by other methods.

Willows shall be cleared using the necessary equipment to uproot and stack the bush in piles free from dirt for disposal by others.

A.6 FENCES

The Contractor will be permitted to remove fences to the extent necessary to enable the Contractor to construct the drain and dispose of any excess material. Any such fences must be carefully handled so as to cause no unnecessary damage and shall be replaced by the Contractor in as good condition as found. Fences shall be properly stretched and fastened. The Contractor shall supply all wire and/or material necessary to properly reconstruct any fences. The Contractor shall not leave any fence open when they are not at work in the immediate vicinity. Replacing of the fences shall be to the satisfaction of the Engineer, or the Drainage Superintendent appointed to be in charge of the work.

A.7 TRIBUTARY OUTLETS

During the construction of an open drain, the Contractor shall guard against damaging outlets of any tributary drains and during the construction of a tile drain the Contractor shall connect all tributary tile drains to the main tile as work progresses and before backfilling the new drain. Attention is drawn to Article B.8 and Article C.5 of these Specifications. The Contractor will be held liable for damage caused by negligence or carelessness, on the part of their self, their workers or subcontractors.

A.8 ALTERATIONS

The Engineer may make minor changes in the work as it progresses. An amount proportionate to the amount contained in the Tender or as Tendered in the Schedule of Unit Prices shall be added to or deducted from the contract price to cover such changes. No changes will be made unless ordered by the Engineer or the Drainage Superintendent in charge of the works.

A.9 SPECIAL CONDITIONS

If the Contractor should encounter any unusual soil conditions of any sort which may not have been known to the Engineer, and where not provided for by these Plans and Specifications and which would make necessary alternations to the Plans and Specifications in order that the work be completed in a satisfactory and workmanlike manner, the Contractor shall immediately notify the Engineer who will make the necessary alterations.

Failure of the Contractor to so notify the Engineer shall not relieve the Contractor of the responsibility of fully completing the work to the satisfaction of the Engineer and shall make the Contractor ineligible to receive any extra compensation made necessary by the alteration.

A.10 HIGHWAYS, RAILWAYS, UTILITIES

The Contractor shall perform the work affecting any lands of any Road Authority, Railway, Telecom, Pipeline Company or Public Utility in accordance with the Specifications or permit requirements of such Authority, Company or Utility, as though said Specifications were hereto attached.

Notices Required

(a) Highways

Before any construction may take place on the right-of-way of any highway, forty-eight (48) hours notice in writing, exclusive of Saturdays, Sundays and Holidays, must be given to the appropriate District Engineer of the Ministry of Transportation of Ontario, or the Road Superintendent of the local Road Authority as the case may be.

(b) Railways

Before any construction may take place on the property of any Railway, a minimum of forty-eight (48) hours notice in writing, exclusive of Saturdays, Sundays and Holidays, must be given to the Area Engineer of the Railway Company.

Where a pipe is to be installed under Railway tracks by open cutting, a minimum of seventy-two (72) hours notice in writing, exclusive of Saturdays, Sundays and Holidays, must be given to the Area Engineer of the Railway Company.

A.11 CONTRACTOR'S LIABILITY INSURANCE

The Contractor shall protect their self and indemnify and save the Owner harmless from any and all claims which may arise from the Contractor's operations under the Contract where bodily injury, death, or property damage is caused and for this purpose shall, without restricting the generality of the foregoing, maintain an insurance acceptable to the Owner, and subject to the limits and conditions under the Articles of Agreement of the tender, per occurrence for bodily injury, death, and damage to property including loss of use thereof. The Contractor will be solely liable for all injuries and/or accidents to workers, and/or the public, and/or livestock, and/or property and for any expenses or damages created by fences being left open or improperly closed, insufficient guarding and lighting or bad workmanship at places where a drain runs along or across a road allowance or any negligence in completing the work.

The Contractor shall furnish evidence of compliance with all requirements of the Workplace Safety and Insurance Act including payments due there under.

Prior to the commencement of any work hereunder, the Contractor shall file with the Owner a copy of each insurance policy and certificate required. All such insurance shall be maintained until final completion of the work including the making good of faulty work or materials; except that coverage of completed operations liability in any event by maintained for one (1) year from the date of final payment certificate by the Engineer.

A.12 SUB-CONTRACTORS

The Contractor shall not sublet the whole or part of this Contract without the written approval of the Engineer, which approval shall not be unreasonably withheld.

A.13 STANDING CROPS AND LIVESTOCK

The Contractor shall not be held responsible for damages to standing crops within the "working area" as defined in the Engineer's Report or in the access to and from such "working area", such access having been defined by the owner of the property if the Contractor notifies the owner thereof in writing at least two (2) days prior to

commencement of the work on that portion. Similarly, the Contractor constructing a tile drain shall not be held responsible for damages or injury to livestock occasioned by leaving trenches open for inspection by the Engineer if they notify the owner in writing at least two (2) days prior to commencement of the work on that portion. But the Contractor will be held liable for such damages or injury if the backfilling of such trenches is delayed more than seven (7) days after acceptance by the Engineer.

When notified as outlined above, the owner of the property on which the drain is located shall be responsible for the protection of all livestock on said property during construction and shall also be liable for any damages caused by such livestock.

A.14 LANEWAYS

All pipes crossing laneways shall be backfilled with material that is clean, free of foreign material or frozen particles and readily tamped or compacted in place unless otherwise specified. Laneway culverts on open ditch projects shall be backfilled with material that also is not easily erodible. All backfill material shall be thoroughly compacted as directed by the Engineer.

All pipe culverts located under laneways shall be backfilled with granular material to a minimum of 900mm beyond each side of the culvert. 150mm of granular ‘A’ shall be placed under the culvert as a base. Granular material shall be placed simultaneously on each side of the culvert in 150 mm layers and compacted to 98% Standard Proctor maximum dry density. All culverts are to be assembled according to the Manufacturers Specifications. Culverts to have a minimum of 600mm of cover over the pipe unless otherwise noted on the Drawings.

The backfill over culverts and subsurface pipes at all existing laneways that have granular surfaces on open ditch and closed drainage projects shall be surfaced with a minimum of 300mm of Granular ‘B’ and 150mm of Granular ‘A’ material. All backfill shall be thoroughly compacted as directed by the Engineer. All granular material shall be placed to the full width of the travelled portion.

Any settling of backfilled material shall be repaired by or at the expense of the Contractor during the warranty period of the project as soon as required. Any existing bituminous pavement on laneways shall be placed to its original condition by the Contractor.

A.15 REMOVALS

Unless otherwise specified, the cost of removing existing catchbasins, junction boxes, tile (any size), outlets, farm bridge/culverts, and other such structures that are no longer required for the proposed drainage works and are encounter during construction are consider part of the Contract price.

A.16 FINAL INSPECTION

Final inspection will be made by the Engineer within ten (10) business days after they have received notice in writing from the Contractor that the work is completed or as soon thereafter as weather conditions permit.

If, after receiving notice from the Contractor that the work has been completed, the Engineer or Drainage Superintendent in charge of the work finds items uncompleted which entail a further inspection of the whole or part of the work, the cost of such further inspection may be charged against the Contractor.

All the work included in the Contract must, at the time of final inspection, have the full dimensions and cross-sections called for in the Plans and Specifications.

A.17 NOTICE OF COMMENCEMENT OF WORK

The Contractor shall give the Engineer and the Drainage Superintendent a minimum of seventy-two (72) hours advance notice before commencement of work on any municipal drain.

If the Contractor leaves the job site for a period of time after initiation of work, they shall give the Engineer and Drainage Superintendent a minimum of forty-eight (48) hours advance notice prior to returning to the job.

If any work is commenced without such advance notice, the Contractor shall be fully responsible for all such work undertaken prior to such notification and shall make good any works or materials used judged to be inadequate or constructed in a manner that may have been subject to alteration if made known to the Engineer prior to commencement of construction.

A.18 FIELD MEETINGS

At the Engineers discretion, a field meeting with the Contractor or representative, the Engineer and with those others that the Engineer deems to be affected, shall be held after notification of commencement of work has been given and prior to commencement of, or during construction.

A.19 SUPERVISION

The Contractor shall provide site supervisors and/or forepersons as required and assume all responsibility for control and direction of the work in accordance with the OPS General Conditions of Contract.

A.20 MAINTENANCE OR FAULTY WORKMANSHIP

The Contractor shall repair and make good any damages or faults in the drain that may appear within one (1) year after its completion (as evident by the final payment certificate) as the result of the imperfect or defective work done or materials furnished if certified by the Engineer as being due to one or both of these causes; but nothing herein contained shall be construed as in any way restricting or limiting the liability of the Contractor under the laws of the Country, Province or Locality in which the work is being done. Neither the final payment certificate nor payment there under, nor any provision in the Contract Documents shall relieve the Contractor from responsibility.

A.21 DRAINAGE SUPERINTENDENT

Where a Drainage Superintendent is appointed by the Municipality, the Drainage Superintendent may act as the Engineer’s representative if so directed by the Engineer. The Drainage Superintendent shall have the power to direct the execution of the work and to make any necessary minor adjustments.

SECTION B - OPEN DRAINS

B.1 BOTTOM WIDTH AND SIDE SLOPES

The drain shall have the full specified bottom width at the grade line at the time of final inspection. Both sides of an open drain are to be sloped as shown on the accompanying Profile. Bottom widths will vary with the size of the drain. Where the width of the bottom of the existing ditch is sufficient to permit the desired width, depth and back slopes for the new ditch to be constructed without disturbing the existing banks, such banks shall be left as is, subject to clearing required as described in Section B.7 “Obstructions”. Sides of the drain shall be smooth and have a uniform slope from top to bottom.

B.2 EXCAVATED MATERIAL

Excavated material shall be deposited on one or both sides of the drain as directed by the Engineer. In general, the material shall be placed on the low side of the drain or opposite trees and fences. The Contractor shall contact all landowners before proceeding with the work to verify the location to place and level the excavated material.

A clear berm or margin of at least 2.0m shall be left between the top edge of the ditch and the leveled spoil. In no case shall the side of the spoil bank nearest the ditch have a slope greater than 1.5m to 1m.

Any large stones or boulders which exceed 500mm in diameter shall be buried adjacent to the ditch and at a depth so as to not interfere with farm machinery.

Where it is necessary to straighten any bends or irregularities in the alignment of the ditch or to relocate any portion or all of an existing ditch, the excavated material from the new cut shall be used for backfilling the original ditch. Regardless of the distance between the new ditch and the old ditch, no extra compensation will be allowed for this work and it must be included in the Contractor’s price for the open work.

B.3 SPREADING AND LEVELLING

The spoil shall be deposited, spread and leveled up to a maximum depth of 200mm and be left so that the land on which it lies may be cultivated with adjacent lands by use of ordinary farm machinery. If the Contractor obtains a statement in writing, signed by the owner of the lands affected that they do not wish the spoil to be leveled, the Engineer may release the Contractor from obligation in that regard. Disposal of the material shall be to the satisfaction of the Engineer. Through timbered land the excavated material may be spread to a maximum depth of 600mm unless otherwise noted on the Plans governing the work.

B.4 FILLING OLD CHANNEL

At every new cut, the excavated material shall be used to fill the abandoned channel unless otherwise directed by the Engineer. Fill shall be placed to 300mm below finished ground surface.

Where the on-site soil available is of insufficient quantity or quality to fill the abandoned channel, new soil shall be imported from an approved source. The imported soil shall be of the quality necessary to support agricultural operations and shall meet the most current Table 1 standards for Agricultural Use under the “Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*” as published by the Ontario Ministry of the Environment and Climate Change. All imported soil will be subject to the approval of the receiving landowner. Fill soil placed to fill in abandoned channels shall be compacted to 95% SPMDD or as otherwise directed by the Engineer.

Abandoned channels shall be finished with a 300mm layer of topsoil of the quality necessary to support agricultural operations, and subject to the approval of the Engineer and the receiving landowner.

B.5 INLETS FOR SURFACE WATER

Inlets shall be left in the leveled spoil on each property but not over 90m apart, or as shown on the Plan or Profile. No excavated material is to be left in or any damage done to any ditches, depressions, furrows, pipes, or tiles intended to conduct water into or across the open drain.

B.6 EXCAVATION AT BRIDGE SITES

The Contractor shall be required to excavate the drain to full depths and as nearly as possible to the full widths and slopes at the sites of all bridges. Bridges of a permanent character are not to be unnecessarily disturbed. The excavation at these bridges being made, if necessary, by hand or by other suitable means.

Excavation under culverts and bridges is to conform to the grades, bottom widths and side slopes specified. The Contractor shall be held liable for any damage to any structure caused by carelessness, neglect or over-excavation. The Contractor shall immediately notify the Engineer if it should become apparent that the excavation of the drain to the grades shown on the Plan will in any way endanger any culvert or bridge and the Contractor shall discontinue work on the drain until the Engineer instructs them to proceed.

B.7 OBSTRUCTIONS

All brush, bushes, fallen timber and debris shall be removed from the banks and slopes of the drain to such a distance on each side to eliminate any interference with the spreading of the spoil bank. Grubbing shall include the removal and disposal of all stumps to the satisfaction of the Engineer. The slopes shall be cleared whether or not they are directly affected by the excavation. The roots shall be left in the banks if no bank excavation is required as part of the new channel excavation. Any trees necessarily removed are to be brushed and left for the landowner. In wooded or heavily overgrown areas, the brush, limbs, etc. may be pushed into piles back out of the way. All dead trees alongside the drain that impede the performance of the drain shall be removed prior to excavation and put in piles, unless directed otherwise by the Engineer. All brush, limbs, debris, etc. shall be put into pile for disposal by the landowner.

B.8 TILE OUTLETS IN EXISTING DITCHES

All tile outlets in existing ditches shall be noted by the Contractor prior to excavation. The Contractor shall contact all landowners and ask them to mark all their tile outlets which enter the ditch. Any tile drain outlets that were marked and are subsequently damaged by the Contractor shall be repaired by the Contractor at their expense. If any ditch bank is altered due to the construction at the tile outlet, the Contractor shall replace the altered outlet.

In general, if the existing outlet is tile only, the new outlet shall consist of undamaged lengths of tile. If the existing outlet is a metal pipe with or without a rodent grate, such outlet shall either be relocated to adjust to the new banks or shall be replaced if damaged. If any outlet becomes plugged as a result of construction, the Contractor shall be obliged to free such outlet of impediments. Where stone or concrete rip rap protection exists at any existing outlet, such protection shall be moved as necessary to protect the outlet after reconstruction of the ditch. Where any damage results to tile leading to and upstream of the outlet as a consequence of construction, the Engineer may direct the Contractor to repair such tile and shall determine fair compensation to be paid to the Contractor for performing the work.

B.9 GRASS SEED

The ditch slopes where disturbed shall be seeded using an approved seed mixture. The grass seed shall be applied no more than 3 days following the excavation of the open ditch. Grass seed shall only be applied between April 15th and November 15th, unless otherwise directed by the Engineer.

Grass seed shall be fresh, clean and new crop seed, meeting the requirements of OPSS 804 for Standard Roadside Mix, and applied at the rate of 170kg/ha (150lbs/acre).

B.10 EQUIPMENT

An approved hydraulic excavator shall be used to carry out the excavation of the open ditch unless otherwise directed by the Engineer.

B.11 COMPLETION

At the time of completion and final inspection, all work in the Contract shall have the full dimensions and cross-sections specified without any allowance for caving of banks or sediment in the ditch bottom.

SECTION C - TILE DRAINS

C.1 TILE QUALITY

All tile supplied shall be approved by the Engineer before being incorporated into the work and the Engineer shall have the right to order such tests as deemed necessary to be made upon the tile, including that of testing by an independent testing laboratory. The costs of all such tests shall be borne by the Contractor and may be deducted from monies due to the Contractor under this Contract.

C.2 LINE

New tile drains shall be constructed at an offset from and parallel to any existing ditch or defined watercourse in order that fresh backfill will not be endangered by the flow of surface water. Where any existing tile drains are to remain, the Contractor shall exercise care not to disturb any existing tile drains which follow the same course as the new drain. Where any such existing drain is disturbed or damaged, the Contractor shall perform the necessary correction or repair at their expense.

The Contractor shall verify the location of the new tile drain with the Engineer, Drainage Superintendent and the landowner before proceeding with the work.

C.3 TILE LAYING

All tile shall be laid carefully on a rounded, smooth solid bottom with all joints aligned both vertically and horizontally. All tile being laid in a straight line shall be placed together as tightly as possible with the maximum space between successive tiles not exceeding 6mm. All tile being laid on a curve shall be fitted with a maximum space between successive tiles not exceeding 6mm at any point on the circumference. Any tile joint exceeding this tolerance shall be covered with wire mesh and sealed **all around** with concrete not less than 150mm thick. The grades and location of the tile shall be as specified on the Drawings. No deviation shall be permitted without the written permission of the Engineer. The maximum trench width at the top of the tile shall not be greater than the outside diameter of the tile plus 600mm. The trench shall not be opened up for a distance greater than 60m in advance of the tile laying. All dirt, foreign material and obstructions shall be removed from inside the tile before laying. Where corrugated metal or plastic pipe is used, the joints between the pipe and the field tile shall be sealed with concrete not less than 150mm all around. When construction is stopped for the day, the open ends of all tile drains shall be protected to prevent entry by animals or unnecessary water.

The sides of the tile are to be supported by partial filling of the trench prior to inspection by the Engineer. The remainder of the excavated material shall be used to restore and maintain the natural surface of the ground. No tile shall be backfilled until inspected by the Drainage Superintendent or Engineer unless directed otherwise by the Engineer. The tile shall be backfilled such that a sufficient mound of backfill is placed over the disturbed area. The Contractor's Tender Price shall include the cost of stripping the topsoil, bulldozing of the subsoil to the depth required and subsequent replacement of subsoil and topsoil.

C.4 LOWERING OF SURFACE GRADES

If necessary, the Contractor shall strip back and stockpile the topsoil, and strip the subsoil in order that the tiling machine may trench to the correct depths. After the tile is installed, the trench shall be backfilled, subsoil replaced, and the topsoil shall be spread over the disturbed area. The Contractor's Tender Price shall include the cost of stripping the topsoil, bulldozing of the subsoil to the depth required and subsequent replacement of subsoil and topsoil.

C.5 TRIBUTARY DRAINS

Any tributary tile encountered in the course of the drain is to be carefully taken up by the Contractor and placed clear of the excavated earth. If the tributary drains encountered are clean or reasonably clean, they shall be connected into the new drain. Tributary tile drain connections into the new drain shall be made using high density polyethylene agricultural drain tubing installed on and backfilled with 19mm clear crushed stone. All tile drain connections into the new drain shall be cored hole with an InsertaTee or a manufactured “tee”.

Where the existing drains are full of sediment, the decision to connect or not to connect the new drain shall be left to the Engineer. The Contractor shall be paid for each tributary drain connection as outlined in the Form of Tender and Articles of Agreement.

The Contractor shall be responsible for all tributary tile connections for a period of one (1) year after the issuance of the final payment certificate by the Engineer. After construction, any missed tile connections required to be made into the new drain shall be paid at the same rate as defined in the Form of Tender and Agreement. The Contractor will have the option to make any subsequent tile connections or have the Municipality make the required connections and have the cost of which deducted from the holdback.

Where the Contractor is required by the Engineer to hook up an existing tile which is not encountered in the course of the drain, the cost of such work shall constitute an extra and the basis for payment shall be determined by the Engineer.

C.6 BACKFILLING

All tile shall be left open, as the laying of tile progresses, until after inspection. After laying and prior to inspection, partial filling (blinding) is to be made at the sides of the tile and compacted sufficiently to maintain the alignment. The upper 1/3 of the tile shall be left uncovered until after inspection by the Engineer or Drainage Superintendent in charge of the works. Where conditions indicate that damage may occur, arrangements shall be made for daily or continuous inspection by the Engineer or Drainage Superintendent. The Engineer or the Drainage Superintendent in charge of the work reserves the right to demand that all or any part of the works be uncovered to allow for adequate inspection and the Contractor shall supply, at their own expense, all equipment and labour to do the said work.

After the work is inspected by the Engineer or Drainage Superintendent in charge of the work, the remainder of the excavated material shall be used to restore and maintain the natural surface of the ground. Stones having any dimensions larger than 150mm shall not be used for backfill material within 300mm of the tile.

C.7 OUTLET PROTECTION

The protection at the outlet of a tile drain shall be a length of corrugated metal or plastic pipe, as specified, fitted with a rodent-proof grate. The grate shall be hinged at the top to permit the exit of foreign material from the tile and shall have a maximum spacing between bars of 50mm. The pipe shall be protected with rip rap protection consisting of quarry stone or heavy field stone and geotextile filter material in a manner satisfactory to the Engineer. The rip rap shall extend from the bottom of the trench to the original ground surface and for a distance of at least 4m from the end of the outlet pipe unless otherwise specified on the Drawings. The protection shall extend to the top of the backfilled trench and below the pipe to 400mm under the streambed and also extend 600mm into undisturbed soil on either side of the backfilled trench unless otherwise specified on the Drawings.

Where the outlet occurs at the end of an open ditch, the above rip rap protection will extend all around the end of the ditch and to a point 800mm downstream on either side unless otherwise specified on the Drawings. Where heavy overflow is likely to occur, sufficient additional rip rap and filter material shall be placed as directed by the Engineer to prevent the water cutting around the protection.

C.8 BRUSH, TREES, DEBRIS, ETC.

The Contractor is to include the removal of all excavation of whatever nature, disposal of material, removal and cutting of all brush, supplying of all labour and completing the whole work in accordance with the Plan, Profile and Specifications. Any trees necessarily removed are to be brushed and left for the Owner of the property on which they are found. All brush, limbs, etc. are to be put in piles by the Contractor and left for disposal by the landowner. No additional payment will be made for brushing of scattered trees where required by the Engineer.

Where, in the opinion of the Engineer, the drain or proposed location of the drain is heavily overgrown with small trees and brush, the Contractor may use a bulldozer or other such equipment to clear a maximum width of 20m. The resulting debris shall be placed where directed by the Engineer and/or the landowner(s) and left for disposal by the landowner(s). Where roots may interfere with the new drain, all such roots shall be grubbed and placed in a pile convenient for disposal by the landowner. No additional payment will be made for such work.

C.9 CATCH BASINS

All catch basins shall be approved reinforced precast units having inside dimensions as noted on the drawings with a 600mm sump. The sides shall be a minimum of 115mm thick, and the bottom shall have a minimum thickness of 150mm. The elevation of the top of the catch basin shall be as set by the Engineer at the time of construction. All necessary grading to convey water to the catch basin shall be included as part of the Contract.

All tile and pipe entering a catch basin shall be sealed all around with 15 MPa concrete which shall extend a minimum of 150mm beyond the **OUTSIDE WALL** of the catch basin. The **INSIDE WALL** of the catch basin shall be formed and the void around all tile and pipe entering a catch basin shall be completely filled with concrete to form a smooth flush surface.

If there are no existing drains to be connected to the catch basin at the top end of the drain, a plugged tile shall be placed in the upstream wall, with the same diameter and at the same elevation as the outlet tile.

Offset catch basins shall be offset with tile in the size specified on the drawings. All offsets shall enter into the main tile at a maximum angle of 45 degrees downstream with a maximum grade of 0.50%. The connection into the main tile shall be fitted and sealed all around with a minimum of 150mm of 15 MPa concrete. It shall be the responsibility of the Contractor to supply and install all tile required for the construction of the offset. Payment shall be made for the actual quantity installed, as measured at the time of construction, in accordance with the Unit Prices. **All** offsets shall be left open for inspection by the Engineer.

All blind inlets shall be constructed with 19mm clean, crushed stone placed to a minimum depth of 150mm over the top of the tile between the stations as specified in the Special Provisions.

C.10 ROCKS

The Contractor shall immediately contact the Engineer or Drainage Superintendent if boulders of sufficient size and number are encountered such that the Contractor cannot continue trenching with a tiling machine. The Engineer or Drainage Superintendent may direct the Contractor to use some other method of excavating to install the drain. The basis of payment for this work shall be determined by the Engineer or Drainage Superintendent.

If only scattered large stone or boulder are removed on any project, the Contractor shall either excavate a hole to bury same adjacent to the drain, or they shall haul the same to a nearby bush or fence line, or other convenient location as approved by the landowner(s).

C.11 BROKEN OR DAMAGED TILE

The Contractor shall either bury or remove all damaged tile. NO tile shall be left on the ground for the landowner(s).

C.12 FILLING IN EXISTING DITCHES

Any existing ditches designated for filling shall be backfilled sufficiently for traversing by farm machinery. If sufficient material is not available from the old spoil banks to fill in the existing ditch, the topsoil shall be stripped and the subsoil shall be bulldozed into the ditch and the topsoil shall then be spread over the backfilled waterway.

C.13 CONSTRUCTION OF GRASSED SWALES/WATERWAYS

Where the Contractor is required to construct a grassed swale/waterway, the waterway shall be graded, shaped and a seed bed prepared prior to applying the grass seed. The grass seed shall be fresh, clean and new crop seed, meeting the requirements of “Lowland Mix” as per OPS 804. Grass seed shall be applied at the rate of 170kg/ha (150lbs/acre).

C.14 RECOMMENDED PRACTICE FOR CONSTRUCTION OF SUBSURFACE DRAINAGE SYSTEMS

The latest version of The Drainage Guide for Ontario, as published by OMAFRA, shall be the guide to all methods and materials to be used in the construction of tile drains except where superceded by other Specification of the Contract.

Appendix F
Enbridge Gas Unofficial Crossing Agreement and Operational Constraints

{Prepare on Union Gas letterhead}

[Insert Date], 20____

[Applicant Company Name]
[Address]
[Domicile]
[Postal Code]

Attention: [Name and Title]

RE: _____ (Applicant)
Proposed Crossing of Union Gas Limited's NPS ___ Natural Gas Pipeline ("Union Pipeline") with a _____ (the "Facility") in Lot ___, Concession ___, Township of_____ (the "Crossing")

We acknowledge your request for Union Gas Limited ("Union") to consent to the Crossing.

Union constructs and operates natural gas transmission, distribution and storage pipeline facilities. Natural gas is viewed as the cleanest-burning fossil fuel and is an economical source of energy for those persons dependant on it for residential, industrial and commercial uses. Union's activities are regulated by the Ontario Energy Board who must determine, among other things, that our projects serve the public interest. Union must therefore protect its pipelines to ensure an uninterrupted supply of heat and energy in the public interest. Additionally, Union is a regulated utility subject to a fixed rate of return and must avoid unnecessary costs of operating its pipelines.

The Union Pipeline is contained within an easement registered against the title to the subject lands. Details of the easement agreement are available at the registry office or through our Lands Department.

In consideration of Union consenting to the Crossing, the Applicant agrees to the following general terms and conditions;

1. The Applicant and the Applicant's Contractors will make the necessary arrangements through Union contacts as defined in Appendix A.

2. The Applicant and the Applicant's Contractors will comply with the general conditions for consent in Schedule A, attached hereto;

3. The Applicant and the Applicant's Contractors will install the Crossing strictly in the manner described in Schedule B and C, attached hereto;

4. The Crossing will be designed and constructed strictly in accordance with Schedule D, your drawing dated _____, and approved by Union prior to commencing with construction.

Please have three (3) copies of this letter dated and executed by your authorized signing officer(s) and return it to the writer within 30 days of the date hereof. We will return one fully executed agreement to you whereupon it shall form an agreement between us for the Crossing. The Applicant and Applicant's Contractor shall give Union a **minimum of three (3) business days' advance notice,** by telephone and/or email, and receive confirmation before any work may begin**.**

Yours very truly,

[District Engineer]
[Title]

Read and agreed to at _____ this _____ day of

_____, 20___.

Witness:

Applicant
(Name of Company/person(s))

_____
Name/Title

_____
Name/Title

"I/we have authority to bind the corporation."

Copies to: Division/GSO
Lands (file)

APPENDIX A

Union Gas District and Contact Information

Please note the following pipelines that your proposed line would cross:

CONTACTS

NAME: _____ PHONE: _____ (office)

CELL: _____

NAME: _____ PHONE: _____ (office)

CELL: _____

London Planning (519) 667-4200 Ext. 147 to arrange for 3rd party observation

Emergency Call Centre 1-877-969-0999

CRITERIA for Crossing Union Gas Pipelines;

1. Field locates are required before any construction begins. These may be obtained by calling Ontario One Call - **ON1Call** at **1-800-400-2255.**
2. The Applicant and the Applicant's Contractors are responsible to contact appropriate personnel **three (3) business days advance notice** to arrange for 3rd party inspection for the excavation and crossing. Third part observation is required when excavating within 1.5m of a pipeline(s).
3. It is the Applicant's responsibility to verify depth of existing line to maintain this separation, using hydro vac excavation.
4. The Applicant and the Applicant's Contracts are **NOT** to make any changes to the existing grade, as to maintain the depth of the pipelines.
5. The Applicant and the Applicant's Contractors shall use extreme caution while working around these high pressure pipelines
6. Any pipe support drawings shall be reviewed by Union before beginning work.

CRITERIA for Crossing Union Gas Pipeline with Heavy Equipment;

The Applicant and the Applicant's Contractors have approval to cross the sections of pipeline stated in Appendix B with the equipment referenced in Appendix B.

The Applicant and the Applicant's Contractors shall not drive any other heavy equipment directly over the pipelines without first obtaining approval from Union Gas. If changes are required, the crossing will need to be re-assessed. Re-assessment turnaround time is 1-2 weeks, once all information is received from the Applicant.

When crossing the sections of pipeline stated in Appendix B with the above equipment, the following conditions must be followed by the Applicant and the Applicant's Contractors;

1. The number of crossings (back and forth) should be minimized.
2. The equipment must cross our pipeline perpendicular to the line (not running along the length of the line).
3. Equipment using the crossing shall be operated at slow speeds when crossing the pipeline to minimize impact loading.
4. The equipment cannot remain stationary on the pipeline.

SCHEDULE A

General Conditions for Crossing Consent

1. In this agreement:

   (a) the term "Applicant" refers to the person(s) who will own, operate and maintain the Facility;

   (b) the term "Contractor" means the person(s) who constructs and installs the Facility;

   (c) the term "Facility" refers to the works of the Applicant as described in the covering letter-agreement to this Schedule;

   (d) the term "Crossing" refers to the crossing of Union's pipeline(s) by the Facility at the location described in the covering letter-agreement to this Schedule.

2. Union consents to the Crossing to the extent that it has the right to do so and the Applicant shall be responsible for obtaining all other applicable approvals, permits, orders and permissions required to construct and install the Facility.

3. Applicant agrees to comply with all applicable rules, orders, regulations, codes and guidelines of any competent government body or organization affecting the design, installation, construction and operation of the Facility.

4. Applicant agrees to indemnify and save Union harmless against any claims, demands, actions, suits, proceedings, damages, injuries (including injuries resulting in death) that may arise as a result of the construction, installation and operation of the Facility, unless caused by the negligent or intentional acts of union, its agents, employees, licensees, invitees, successors and assigns.

5. In connection with Clause 4, above, Applicant, at its own expense shall carry and keep in full force and effect:

   (a) Comprehensive General Liability insurance with an inclusive limit for personal injury and property damage of Five Million Dollars ($5,000,000.00), and such limits may be made up of a combination of Primary and Excess Liability policy. Applicant must add Union Gas as an additional insured on this policy with respect to this agreement and have its insurers provide a waiver of subrogation in Union Gas's favour, and;

   (b) Automobile Liability Insurance ("Owned" and "Non-Owned") with an inclusive limit for bodily injury (including passengers) and property damage of One Million Dollars ($1,000,000.00).

Applicant shall submit certificates or other evidence of such insurance to Union prior to any work commencing for the Crossing.

6. Applicant agrees to personally perform the installation and construction of the Facility or else to closely supervise its installation and construction by a duly qualified contractor(s) and to ensure that said contractor(s) complies with all terms and conditions of this agreement.

7. The Applicant shall pay forthwith upon presentation of an invoice by Union, all reasonable costs incurred by Union for:

   (a) Review, approval and inspection of the Crossing;

   (b) Reinforcing, modifying or relocating Union's pipeline(s) to accommodate the installation of Applicant's Crossing or the maintenance and repair of its Facility;

   (c) Any reasonable incremental costs incurred by Union in the operation, maintenance, inspection, replacement and repair of its pipeline(s) which are caused by the Crossing.

8. The terms and conditions of this consent shall apply to the construction and installation of the Crossing and any future maintenance work that may be required.

9. This consent is for the Facility shown in Schedule C only and any additional works or facilities proposed by the Applicant shall be the subject of a separate agreement.

10. Applicant hereby agrees and acknowledges that its rights in the Crossing are subordinate to the easement(s) of Union that have been registered or obtained prior to this date and Applicant shall cooperate with all reasonable requests made by Union related to the operation, maintenance and repair of Union's pipeline(s) within the easement(s).

11. In the case of default by the Applicant to carry out any of the provisions of this agreement or if the condition of Applicant's Facility has deteriorated and adversely affects to the operation of Union's pipeline(s), Union may give written notice thereof. If the Applicant fails to take all reasonable steps to remedy the default or the deterioration of the Facility within fifteen (15) days after receipt of the written notice by Union, Union may take such steps as are necessary to remedy the default or deterioration and Applicant shall be liable for and shall pay forthwith all reasonable costs incurred by Union in this regard.

12. All notices required to be given hereunder shall be delivered by registered mail or facsimile to the addresses shown on the covering letter-agreement and shall be deemed to be received on the fifth (5th) day following mailing thereof or upon confirmation of facsimile transmission.

13. This agreement shall be governed in accordance with the laws of Ontario.

14. Neither party to this agreement shall assign or transfer their rights and obligations hereunder to a third party without first obtaining the written consent of the other party, except for a Permitted Assignment. A Permitted Assignment is an assignment by Applicant to an affiliate of the Applicant or lender(s) to Applicant. Applicant does not need consent from Union for a Permitted Assignment, but Union must receive notice regarding any assignment or proposed assignment to an affiliate.

15. The rights and obligations of the parties hereto shall terminate upon the later of:

    (a) two (2) years from the date hereof if the Applicant has not completed the construction and installation of the Facility and restoration of the lands affected by the Crossing; or,

    (b) upon the proper abandonment or removal of the Facility and restoration of the lands to a condition acceptable to Union and the owner of the property where the Crossing is situate.

16. This agreement and Schedules A, B and C constitute the entire agreement between Union and the Applicant and any change or alteration hereof shall be made in writing between the parties.

17. If any part of this agreement shall become null and void by virtue of law or governmental regulation, it shall be severed from the agreement, but the remaining terms and conditions shall remain in full force and effect.

SCHEDULE B

Installation Guidelines

Excavation

1. The following conditions shall apply whenever any construction activities shall require the need for the operation of equipment or excavation near the Union pipeline(s).

    (a) To protect exposed Union Pipeline from damage during the proposed work, Union's on-site inspector may require the Applicant to install certain safety precautions before beginning construction.

    (b) To avoid possible damage to the Union Pipeline while excavating, it shall be supported adequately, as directed by Union's on-site inspector.

    (c) To avoid possible damage to Union Pipeline, heavy equipment shall be restricted to crossing within the travelled portion of the easement unless other crossing locations are approved by Union's on-site inspector.

    (d) Applicant shall provide at least three (3) business days' advance notice prior to commencing any excavation near the Union pipeline(s).

General Conditions for Crossings of the Pipeline by Highways, Private Roads, Railways and Utilities

2 The following general conditions shall apply to Crossings of the Union Pipeline by a highway, private road, railway or utility.

    (a) In the case of a crossing of the Union Pipeline by a highway, private road, railway or utility the Crossing shall, except as otherwise provided herein, conform to the respective specifications and requirements of the current Canadian Standards Association Z662 for Gas Pipeline Systems and if the facility will result in the Union Pipeline not conforming, the Crossing may be made only if the Union Pipeline is reconstructed to conform to such requirements, the cost of which shall be borne and paid for by the Applicant.

    (b) The Applicant shall pay all costs to ensure the Union Pipeline shall, in all cases, be of sufficient strength to withstand all stresses and strains resulting from the Crossing .

    (c) The Crossing shall be constructed so as to cross the Union Pipeline at an angle as close as practicable to ninety (90) degrees, but not less than forty-five (45) degrees.

3. At any crossing of the Union Pipeline, except crossings by overhead telephone,

telegraph, telecommunication or electrical power lines, the Union Pipeline and the Facility shall be identified by suitable markers.

4. A buried utility shall cross under the Union Pipeline unless otherwise approved by Union. A clearance of not less than 0.6m shall be maintained at the point of crossing between the utility and Union Pipeline and all other underground structures. In all circumstances, minimum clearances as stipulated in the current edition of Canadian Standards Association code CAN/CSA-Z662 "Gas Pipeline Systems" shall be complied with.

   (a) Underground utility crossings shall also be subject to the following design constraints:

      (i) Utilities must be installed at a level grade across the entire width of the Union Pipeline easement with the exception of gravity dependent structures. In such cases, the minimum clearances *specified in* between the utility and Union Pipeline(s) crossed must be maintained.

      (ii) In the case of any Applicant's buried pipelines, no joints may be made over or under any Union Pipeline(s).

      (iii) If Applicant's pipeline(s) will operate under pressure, it (they) shall be pre-tested to at least the required pressure test pressure prior to its installation across the Union Pipeline easement.

      (iv) In the case of buried power cables or electrical grounding installed by open-cut method, the Applicant shall install a 75mm thick concrete slab, or suitable equivalent (i.e. patio paving stones) placed 300mm above the utility service installation, the full width of the Union Pipeline Easement. There shall be a minimum separation of 300mm between the top of the concrete slab and the bottom of the Union Pipeline(s). This separation shall be maintained over the entire width of the Union Pipeline easement(s). The concrete slab should be un-reinforced red dye concrete. The utility shall be permanently identified with "caution" tape on top of the concrete slab.

      (v) In the case of buried power cables or electrical grounding conductors installed by directional drilling, the Applicant shall install the cables with a minimum 600 mm separation between the bottom of the Union Pipeline(s) and the top of the power cable.

      (vi) in the case of buried cables, no joints, splices or other connections shall be made within the Union Pipeline easement.

      (vii) The method of installation of all utilities crossing Union Pipeline(s) below ground level must be specified in the Applicant's submission to Union.

5. A highway or private road shall be constructed so that the travelled surface thereof shall be not less than 1.2m above the top of the Union Pipeline or the casing pipe, where required. The bottom of the ditches shall be not less than 1.0m or the

minimum distance required by the local M.T.O. office above the top of the Union Pipeline or casing pipe.

Railway Crossing Requirements

6. The following conditions apply to the crossings of Union Pipeline(s) by railways and shall supplement or supersede the conditions detailed in Section 2 through 5.

(a) Where Union specifications stipulate, the Union Pipeline within the vicinity under and around the crossing as specified in CSA Z662-11 (latest edition) shall be subject to one of the following modifications:

- Replaced with new piping of sufficient grade and wall thickness to meet the design requirements for such a crossing; or

- Encased in a metal casing pipe, to be installed by Union.

    - The design requirements for the pipe in either of the cased or uncased crossings are specified in CSA Z662-11 (latest edition), except where superseded by TC E-10 (Standards Respecting Pipeline Crossing Under Railways).

    - The cost of the selected course of action shall be borne and paid for by the Applicant.

(b) Railway crossings shall be constructed to allow the following minimum clearances for cased and uncased piping as specified in TC E-10:

- (i) Cased Piping
    - One hundred and sixty-eight (168) centimetres between the top of the Union Pipeline or casing pipe and the base of the rail for a distance of at least 7.0m from the centreline of the outermost track.

    - Ninety-one (91) centimetres between the top of the Union Pipeline or casing pipe and the bottom of the railway right-of-way ditch and/or natural ground surface.

- Uncased Piping
    - Three hundred and five (305) centimetres between the top of the Union Pipeline or casing pipe and the base of the rail for a distance of at least 7.0m from the centreline of the outermost track.

    - One hundred and eighty-three (183) centimetres between the top of the Union Pipeline or casing pipe and the bottom of the railway right-of-way ditch and/or natural ground surface.

    The cost of ensuring all depth of cover requirements are met shall be borne and paid for by the Applicant.

(c) Accessible emergency shutoff valves shall be located each side of the railway within effective distances as mutually agreed to by the Chief Engineer of the railway company and the pipeline company. These valves shall be marked with signs for identification. The cost of installing said valves shall be borne and paid for by the Applicant. Where pipelines are provided with automatic control stations and/or valves that are remotely operated, no emergency shutoff vales area required.

(d) The pipeline right of way shall be prominently marked on either side of the rail crossing easement, approximately on the limits thereof, by signs in a language or languages appropriate to the region in which the sign is located. Such signs shall meet the requirements of C.S.A Z662-11 (latest edition), as amended herein. Where such signage is not deemed visible from the track by the Chief Engineer of the railroad company, the appropriate signage should be installed. The cost of installing any and all signage shall be borne and paid for by the Applicant.

Overhead Crossing Requirements

7. The following conditions apply when crossing, paralleling, or working in close proximity of the Union Pipeline by overhead and underground telephone, telegraph, telecommunication and electrical power lines.

(a) Prior to construction, unless otherwise agreed upon by both Union and Applicant, the Applicant shall determine if electrical interference between the Applicant's facilities and the Union Pipeline(s) will occur under the following conditions;

- Steady State Induced Voltage when Paralleling Pipeline
- Induced Voltage spikes from electric power line transient fault conditions
- Energizing and Arcing to pipe under ground fault conditions at poles, ground rods, anchors

If so, the Applicant is responsible for conducting an Engineering study and providing mitigation as required to ensure that no unsafe voltage levels greater than 15 volts A.C. will be impacted on the Pipeline. Generally in accordance with CSA Standard C22.3 No 6M-91 (Reaffirmed 2003 – latest edition), "Principles and Practices of Electrical Coordination Between Pipelines and Electric Supply Lines". Included in the Applicant’s facilities are the poles, pylons, towers, guys, anchors, ground rods and any other supports of an overhead line. The Engineering study shall be made available to Union Gas for review.

(b) The vertical distance between the lowest wire of an overhead line catenary and the surface of the ground within the pipeline easement shall not be less that the minimum vertical clearance distance set out in that part of the Canadian Electrical Code Part 111 (CSA Standard C22.3, "Overhead Systems and Underground Systems").

(c) The poles, pylons, towers, guys, anchors and any other supports of an overhead line and grounding items of underground line, shall be located

outside the Union Pipeline easement and not within ten (10) metres of any Union Pipeline or appurtenance, unless locations are otherwise agreed to by Union and Applicant.

(d) The Applicant, for an overhead line shall, where directed by Union, install aerial warning devices for the protection of Union personnel and equipment conducting aerial patrols.

(e) Overhead utilities are not allowed to be overhead of any above grade piping, or fenced-in area of a Union facility.

(f) Upon completion of Electrical power lines that run parallel to Union pipeline, voltage testing will be required to ensure unsafe voltage levels, are not induced on Union Pipeline(s). The Applicant will be responsible for the cost of such testing and any mitigation requirements as a result of the Applicant's facilities will be conducted by either Union or Applicant.

Blasting Requirements

8. Prior written approval is required if construction of the Facility requires the use of explosives. The Contractor shall comply with all applicable government laws, regulations and orders concerning the use, storage and transportation of explosives, including, but not limited to, the Canadian Explosives Act. The applicant shall comply with the safety requirements of Union.

9. The following conditions shall apply whenever any construction activities shall require the need for blasting when working within thirty (30) metres of the Union Pipeline.

(a) The effects of blasting shall be controlled.

(b) A leakage survey of the designated area shall be performed prior to and after blasting by the Union inspector to determine the effect of such operations, the cost of which shall be borne and paid for by the Applicant.

(c) When blasting is necessary in the vicinity of the Union Pipeline under pressure, the Applicant shall limit the intensity of the ground vibrations emanating from any particular blast, measured on the ground's surface above the pipeline at the location nearest to the blast to the following specifications:

(i) Maximum amplitude of vibrations 0.1524 mm.

(ii) Maximum horizontal peak particle velocity 50 mm/sec.

(iii) The permissible quantities of explosive per delay period shall be governed by the recorded measurements as influenced by the work site conditions.

(iv) Explosive agents must, in all instances, be acceptable to Union.

(v) Delays shall be designed to prevent double readings.

(vi) Further restrictions shall be stipulated, as required, by Union.

Cathodic Protection Requirements

10. Applicant agrees to install, at its cost, all cathodic protection facilities deemed necessary by Union to protect the Union Pipeline(s) or otherwise, reimburse Union for the costs of such facilities and installation. Testing may be required to ensure that Union's Pipeline cathodic protection system does not impact the Applicant's facilities. The Applicant is responsible for conducting this testing and implementation of any mitigation requirements.

SCHEDULE C

General Guidelines for Union Gas Collector System Installations

A. Overhead Systems (34.5 kv)

For all new overhead (34.5 kv) systems, it is recommended that any grounded part of the 34.5 kv lines (i.e. ground rods, anchors, metal poles, etc.) be installed to maintain a minimum distance of 300 mm from any pipelines. This would include all transmission, distribution and any service laterals that run from the main to the individual customer meter sets serving the homes along the pipeline system.

If this distance cannot be maintained for some reason, then these specific locations (i.e. where separation is less than 300 mm) will need to be identified and further field investigations will need to be conducted. Investigation of impacts shall occur once the system is operational to identify specific impacts and to determine potential remediation measures, as required. For any locations where facilities are installed closer than 2144 mm from the pipeline, Union shall be provided with a drawing showing the specific location with GPS coordinates, and measurements from the structure, etc. to the pipeline.

When installing or drilling (poles) near pipeline facilities, a minimum clearance of 300 mm must be maintained from any structure, anchor, etc. Appropriate locates are required and third part inspection may also be necessary when constructing near gas lines.

B. Perpendicular Underground Crossing of High Pressure Lines on Easements

Applicable Drawing – Directional Bore Details (Gas Pipeline Crossings)

When crossing high pressure transmission lines, extreme care must be taken to prevent any damage to these facilities. Cable crossings of pipeline easements shall be perpendicular to the pipeline and shall undercross the pipeline. A minimum separation distance of 300 mm shall be required between the bottom of the pipeline and top of casing containing power cables. The casing pipe must be installed at eh same elevation for the entire width of the easement. Union shall be advised of the method of construction of each crossing in advance of work for approval and be provided with a drawing (*see Schedule D for details)* for each crossing location.

Structures (poles) are not permitted to be installed on any pipeline easement corridor.

C. Perpendicular Underground Crossing of Distribution Pipelines (Road Allowance)

All locations where cables will undercross distribution lines and service lines, a minimum separation of 600 mm will be required. Cables shall be encased at all crossings for a minimum distance of 460 mm on either side of the pipeline. Union shall be advised of the method of construction of each crossing in advance of work for approval and be provided with a drawing (*see Schedule D for details*) for each crossing location.

D. Buried Cables Running Parallel to Gas Lines

For situations where buried cables are to run parallel to existing gas pipelines, a minimum separation of 600 mm will be required. If this separation distance cannot be maintained, then Union shall be advised of the method of installation of each crossing in advance of work for approval and be provided with a drawing (*see Schedule D for details*) for each crossing location.

E. Directional Drilling of Crossings

Any directional drilling shall use the wireline directional drilling method, in which route of drill head can be tracked to ensure proper clearance. Gas pipelines are to be exposed at each crossing location during directional drilling and monitoring of the drill head as it approaches the pipeline shall be completed until the drill is known to be past the pipeline. Exposure must be in the upstream direction of the drilled pipe coming towards the crossing. Drilling is to stop immediately if the drill is observed in the monitoring hole ahead of the pipeline.

F. Heavy and Compacting Equipment

Detailed load analysis will be required for crossing all pipeline with heavy and compacting equipment used in the construction of wind towers. The following detailed information will be required for each piece of heavy and compacting equipment;

- make
- model
- specifications – including dimensions, weights, track information (gauge, track width and track length)

Union will provide a form to complete for each piece of heavy and compacting equipment used in the construction of the wind towers.

SCHEDULE D

Plan Showing Approved Crossing

A drawing of each crossing shall be prepared in accordance with sub-sections A, B and D below. The drawing shall show the location and dimensions of the crossing and the clearance between the lowest catenary and the surface of the ground within the pipeline right-of-way or its projected limits.

Standard Drawing Requirements

Note: ALL VIEWS TO BE COMBINED IN ONE DRAWING.

A. Plan View

Scale

- in metric - scale of 1:500 or at a scale which clearly defines all details of the crossing.

Dimensions

- distance along the Union Pipeline easement to the crossing from a definable legal limit; ie. lot line, river, road allowance limit, etc.
- width of the Union Pipeline easement to one-tenth (0.0) of a metre.
- location of the Union Pipeline(s) within the easement to one-tenth (0.0) of a meter at right angles to the pipeline easement.
- angle of the crossing (measured to the Union Pipeline easement)
- show the width of the utility easement(s) to one tenth (0.0) of a metre.
- width of streets in vicinity of crossing.

Note: *Parallel Utility easements shall not encroach on the Union Pipeline easement without the written consent of Union.*

Identify

- legal description of the crossing location; ie. lot, section, concession, township, town, village, etc.
- all additional Union Pipeline appurtenances; ie' concrete slabs, weights, pipeline markers, etc.
- north arrow
- scale

B. Section View

The section view is to be along the proposed utility that crosses the Union Pipeline.

Scale

- in metric, vertical 1:100, horizontal 1:200 or to a scale that clearly identifies all details of the crossing.

Dimensions

- depth of the Union Pipeline(s) to one-tenth (0.0) of a metre
- Vertical distance of the proposed utility below grade to one-tenth (0.0) of a metre
- clearance to the Union Pipeline
- diameter of each Union Pipeline to be crossed
- easement or right-of-way limits

Identify

- if elevations are assumed, then reference the point of the assumed datum
- distance of the pipeline(s) to the Union Pipeline easement limits
- ground surface profile for 20m on either side of crossing
- scale

C. Profile View

The profile view is to be along the Union Pipeline and is only required if the encroachment is on the Union Pipeline easement for a definable distance; ie. parallel encroachments such as roads and any grading of the easement, etc.

Scale

- in metric, vertical 1:100, horizontal 1:200 or to a scale that clearly identifies all details of the crossing

Dimensions

- depth of the Union Pipeline(s) to one-tenth (0.0) of a metre
- depth of the proposed utility to one-tenth (0.0) of a metre
- clearance to the Union Pipeline
- diameter of each Union Pipeline to be crossed

- easement or right-of-way limits

Identify

- if elevations are assumed, then reference the point of the assumed datum
- distance of the pipeline(s) to the Union Pipeline easement limits to one-tenth (0.0) of a meter
- ground surface profile for 20m on either side of crossing
- scale
- existing Union Pipeline markers

D. Location Plan View

Scale

- in metric, scale of 1:12000 or to a scale that clearly identifies the location

Dimensions

- distance to the nearest town of major geographic feature to 0.1 of a kilometre

Identify

- township, town, village, city, county, regional municipality, etc.
- lot, concession, street, highway, road, etc.
- north arrow

TITLE BLOCK

Identify

- name of the Applicant and the name of the engineering company who compiled the drawing (where applicable)
- drawing number and the date of the drawing
- revision dates (if applicable)
- signature of the applicant and the engineering company
- legal description of the crossing location
- description of the utility
- date of the survey

ADDITIONAL INFORMATION

Identify

- all specifications of the utility, ie. diameter, wall thickness, material to be conveyed, minimum yield strength, operating pressure, field test pressure, mill test pressure, materials comprising the utility, protective devices to be installed and the proper method of installation.
- show a note referencing compliance with the applicable CSA standards, Union Gas Limited's Specifications for Pipeline Crossings and the National Energy Board Pipeline Crossing Regulations.
- date of the proposed crossing

OPERATIONAL CONSTRAINT – UNION GAS PIPELINE

COMPLIANCE MEASURES

The Contractor shall contact all pipeline owners listed below and request from them a copy of their technical guidelines for work adjacent to their pipelines.

Pipeline Owner	Contact Information
UNION GAS	

The Contractor shall comply with all conditions, requirements and procedures of the pipeline owner.

The Contractor shall submit a written application to the pipeline owner in accordance with the requirements of the pipeline owner, seeking permission to perform the work under this contract.

Activities requiring permission from the pipeline owner include;

- Construction or installation of a facility across, on, along, or under an existing pipeline right of way;
- Excavation using explosives or power-operated equipment over the right of way;
- Operation of a vehicle or mobile equipment across a right of way, outside the travelled portion of a highway or public road (any equipment or vehicle greater than a 3,800 kg pickup truck);
- Excavation using explosives or power-operated equipment within 30 metres of the pipeline right of way or;
- Seismic/vibration activity within 40 metres of a pipeline right of way.

Once the pipeline owner has given its permission, the Contractor shall comply with the following:

1. Notification of the Pipeline Owner

    - Provide the pipeline owner three working-days notice before starting any work approved in the application.

    - Provide 24 hours notice before backfilling over the pipe (if applicable).

    - Any contact with the pipe or its coating shall be reported to the pipeline owner immediately.

2. The Contractor shall comply with the following rules for excavation within three metres of the pipe;

    Excavation using power-operated equipment is not permitted within three metres of the pipe unless:

    a) The pipe has been exposed by hand under the direct supervision of the pipeline representative at the point of crossing or;

        i) where the excavation runs parallel to the pipe, the pipe has been exposed at sufficient intervals to confirm its location or,

        ii) the pipeline owner has informed the Contractor that it has confirmed the location of the pipe by probing and has staked the location of the pipeline.

b) Where the excavation crosses a pipe, the pipeline owner has informed the Contractor that it has confirmed the location of the pipe by probing and the pipe is at least 600 mm deeper than the proposed excavation.

c) Where ground conditions render exposure of the pipe by hand impractical, the pipeline owner has agreed that the excavation may be performed safely to within one metre of the pipe under the direct supervision of the pipeline representative.

The Contractor shall not move or alter the pipe or its fittings, or in any other way interfere with the pipe without the written consent of the pipeline owner.

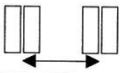
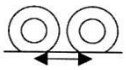
3. Equipment Loading Forms

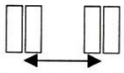
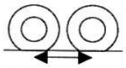
These forms must be filled out and returned to Union Gas after award. These forms will be used to perform loading calculations prior to the start of construction and will form the basis of construction stipulations.

Union Gas

Vehicles or Equipment with Tires

INDICATE UNITS

Equipment Description:			Manufacturer and Model:	
Fully Loaded Gross Vehicle Weight:			Road legal without overweight permit? Y / N	
Axle	Maximum weight on axle	Tire pressure	Distance between tire set centerlines 	Centerline distance between axle in front 
Steering				
2				
3				
4				
5				
6				
7				

Equipment Description:			Manufacturer and Model:	
Fully Loaded Gross Vehicle Weight:			Road legal without overweight permit? Y / N	
Axle	Maximum weight on axle	Tire pressure	Distance between tire set centerlines 	Centerline distance between axle in front 
Steering				
2				
3				
4				
5				
6				
7				

Submitted by:	Date:

Retain a copy with calculation spreadsheet.

8486b_2014_05
AVAILABLE ELECTRONICALLY

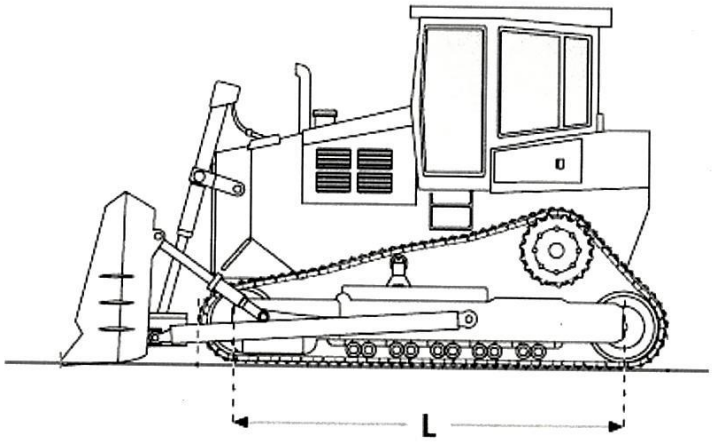
Union Gas

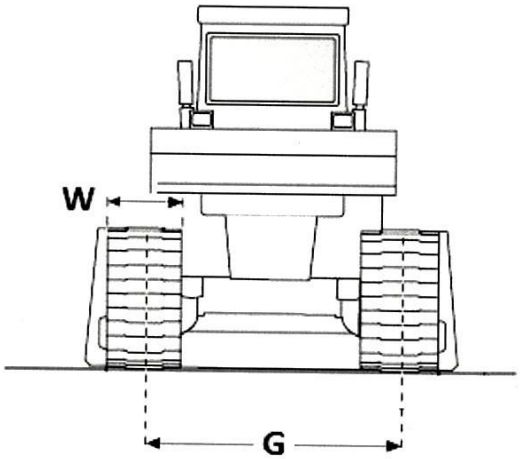
Equipment on Tracks

A Spectra Energy Company

INDICATE UNITS

Equipment Description	Manufacturer and Model	Fully Loaded Gross Vehicle Weight	Track Shoe Width (W)	Track Length on Ground (L)	Track Gauge (on centre) (G)
1					
2					
3					
4					
5					
6					





Submitted by:	Date:

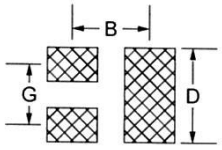
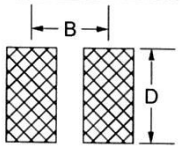
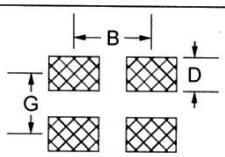
Retain a copy with calculation spreadsheet.

8486c_2014_05
AVAILABLE ELECTRONICALLY

Union Gas

Compaction Equipment

Manufacturer:	Model:
Equipment Description: *Attach equipment manufacturer's data sheets if available.*	

	Drum and 2 tires	2 drums	4 drums	Other (sketch here)
Select or sketch the correct loading diagram	 ☐	 ☐	 ☐	

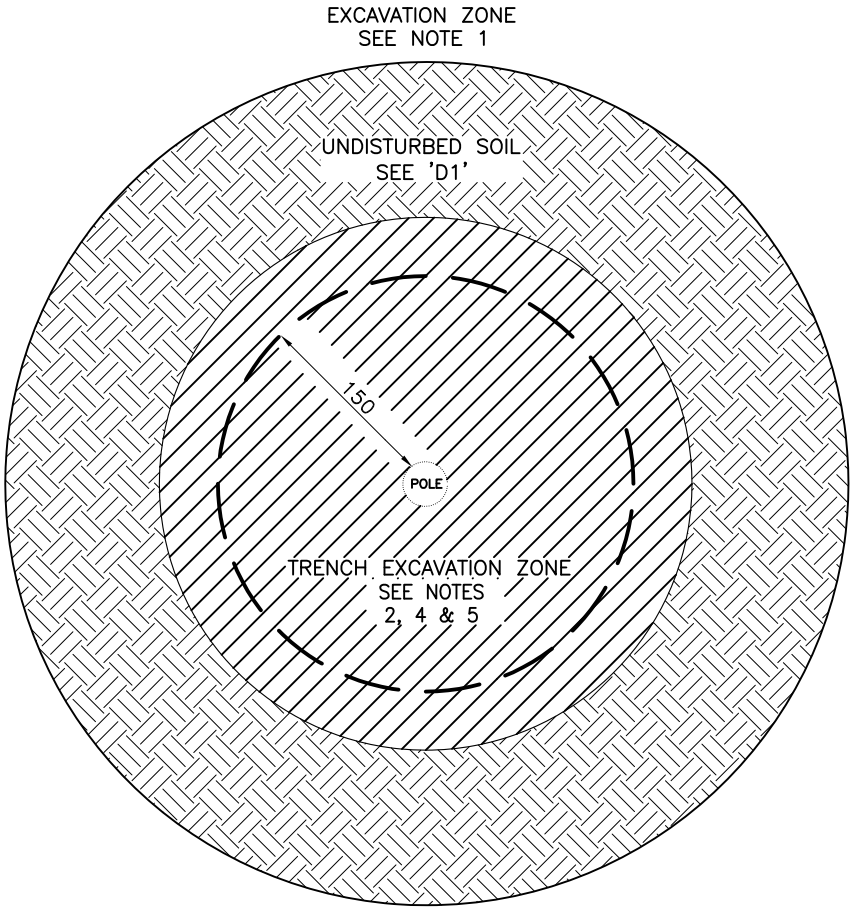
INDICATE UNITS

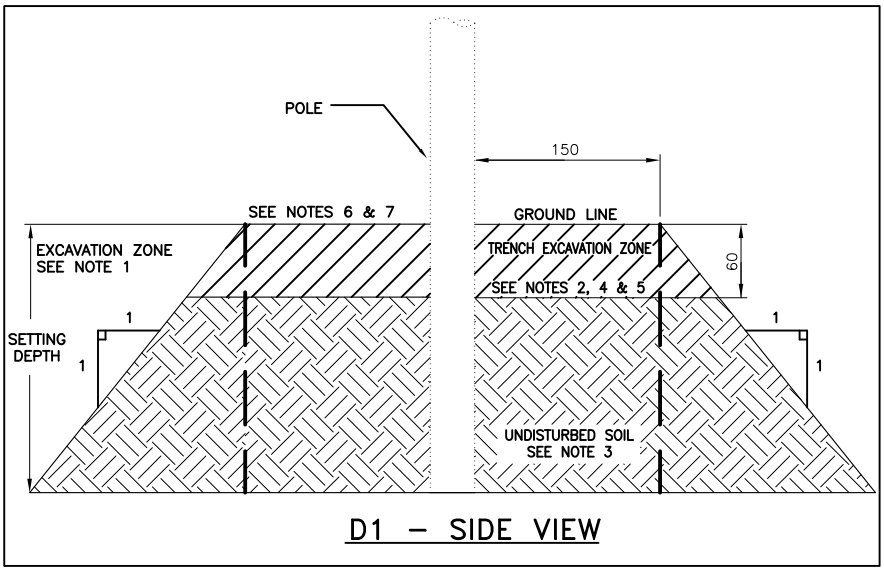
Dimensions (per circled/selected diagram)				
Drum width:	D=		Drum diameter:	
Wheelbase:	B=		Tire width:	
Gauge (on centre):	G=			
Other dimensions from sketch:	=	=	=	
Loading (include units):				
Total operating weight:	☐ Smooth drums ☐ Padfoot drums			
Static weight on front drum/axle:				
Static weight on rear drum/axle:				
Centrifugal force: High Vibration Low Vibration				
Other information which may be relevant:				

Submitted by:	Date:

Retain a copy with calculation spreadsheet.

Appendix G
Hydro One 3rd Party Excavation Zone Limit





D1 – SIDE VIEW

NOTES:

1. EXCAVATION ZONE LIMITS ARE ONLY APPLICABLE FOR CLASS 1 TO 5 (NORMAL OR BETTER) SOIL CONDITIONS. FOR CLASS 6 TO 8 (POOR OR SWAMP) SOIL CONDITIONS, CONTACT HYDRO ONE BEFORE BEGINNING ANY WORK.
2. MAXIMUM ALLOWABLE WIND SPEED FOR EXCAVATION IS 40km/h. IF THE WIND SPEED IS GREATER, COVER TRENCHES AND WORK SHALL BE HALTED IMMEDIATELY UNTIL THE SPEED HAS DECREASED.
3. FOR ANY EXCAVATION REQUIRED WITHIN THE UNDISTURBED SOIL ZONE, HYDRO ONE SHALL BE CONTACTED PRIOR TO ANY COMMENCEMENT OF SUCH EXCAVATION TO SUBMIT A 'HOLD THE POLE' REQUEST.
4. THE TRENCH EXCAVATION ZONE AROUND THE POLE BASE IS ONLY ALLOWED WHEN THERE ARE SIX(6) WIRES OR LESS ON THE POLE. IF THE POLE CONTAINS MORE THAN SIX(6) WIRES, CONTACT HYDRO ONE BEFORE BEGINNING ANY WORK.
5. THE TRENCH EXCAVATION ZONE IS ALLOWABLE FOR ONE(1) TRENCH AT A TIME. THE MAXIMUM ALLOWABLE WIDTH WILL BE 50cm AND BE AT LEAST 60cm AWAY FROM THE POLE. THE ONLY ALLOWED ALIGNMENT SHALL BE STRAIGHT WITH NO CURVES OR BENDS ACROSS UNDISTURBED SOIL ZONE. THE TRENCH SHALL BE RESTORED TO ORIGINAL CONDITION AFTER EXCAVATION HAS BEEN COMPLETED.
6. IF AT ANY TIME IN THE COURSE OF EXCAVATION THE POLE APPEARS TO BECOME UNSTABLE TO ANY DEGREE, WORK SHALL BE HALTED IMMEDIATELY AND HYDRO ONE SHALL BE CONTACTED BEFORE PROCEEDING WITH ANY ADDITIONAL EXCAVATION.
7. IF THE SPECIFIED CLEARANCES CANNOT BE MET, CONTACT HYDRO ONE BEFORE BEGINNING ANY WORK.

ALL DIMENSIONS ARE IN CENTIMETRES
UNLESS STATED OTHERWISE

Rev No.	Date	Revision Particulars	dwn	ckd	des	app

Drawn By:	Checked By:	Designed By:	Design Approved By:
PC	S.JASSAL	S.JASSAL	D.DEROSIERS
Scale: N.T.S.	Date: (yyyy/mm/dd) 2019/06/21	Pole ID:	

Hydro One Networks Inc.

Title: 3rd PARTY EXCAVATION ZONE LIMITS AROUND UNGUYED POLE LOCATIONS

Drawing No. DL6–201–0500 Rev. No. 00

A4 (210 x 297) millimetres 0 10 50 Sheet Number: /

TITLE BLOCK REV 02 – AUGUST 2014

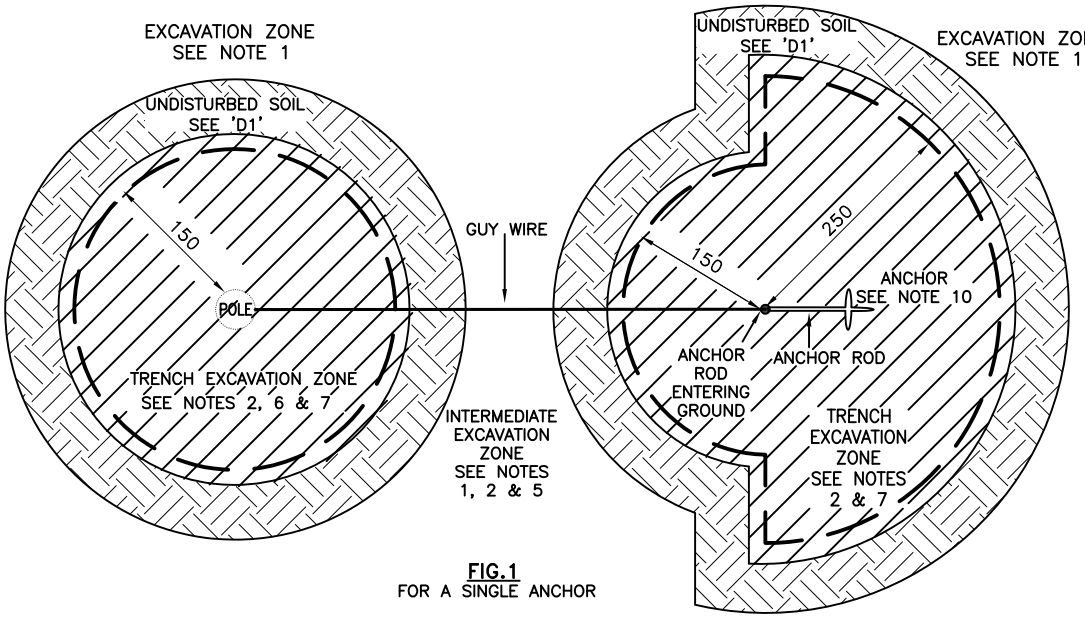
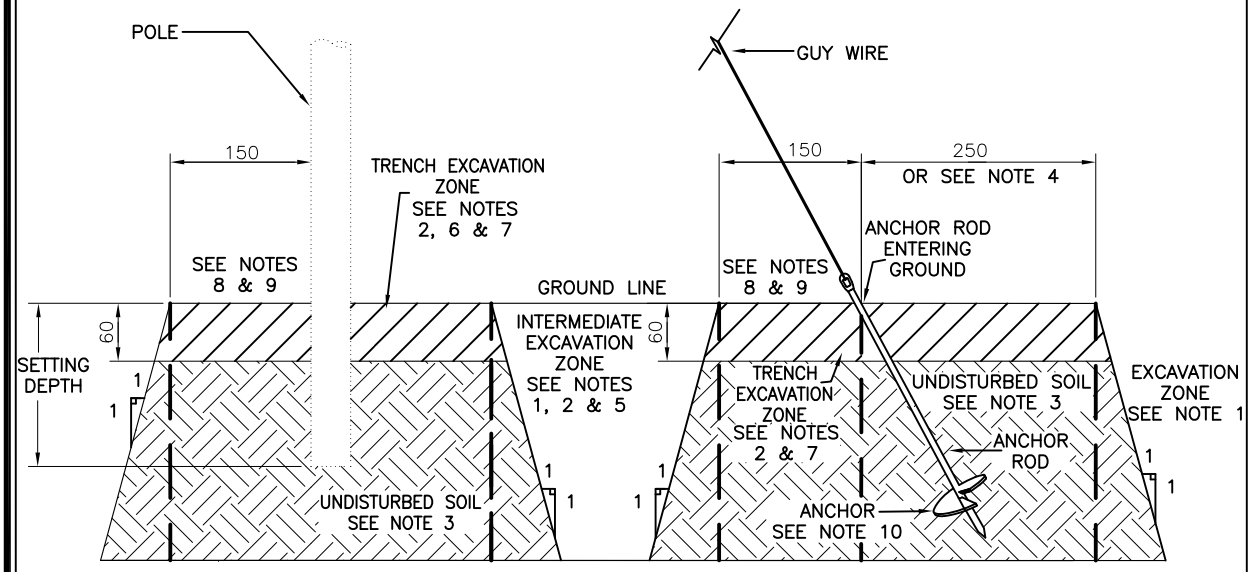


FIG.1
FOR A SINGLE ANCHOR



D1 – SIDE VIEW
FOR FIG.1

FOR SHEET 2 OF THIS DRAWING SEE DL6–202–0501

ALL DIMENSIONS ARE IN CENTIMETRES
UNLESS STATED OTHERWISE

Rev No.	Date	Revision Particulars	dwn	ckd	des	app

Drawn By:	Checked By:	Designed By:	Design Approved By:
PC	S.JASSAL	S.JASSAL	D.DEROSIERS
Scale: N.T.S.	Date: (yyyy/mm/dd) 2019/06/21	Pole ID:	

Title:
3rd PARTY EXCAVATION ZONE LIMITS
AROUND GUYED POLE LOCATIONS

Drawing No. DL6–202–0500

Rev. No. 00

Hydro One Networks Inc.

A4 (210 x 297) millimetres 0 10 50

TITLE BLOCK REV 02 – AUGUST 2014

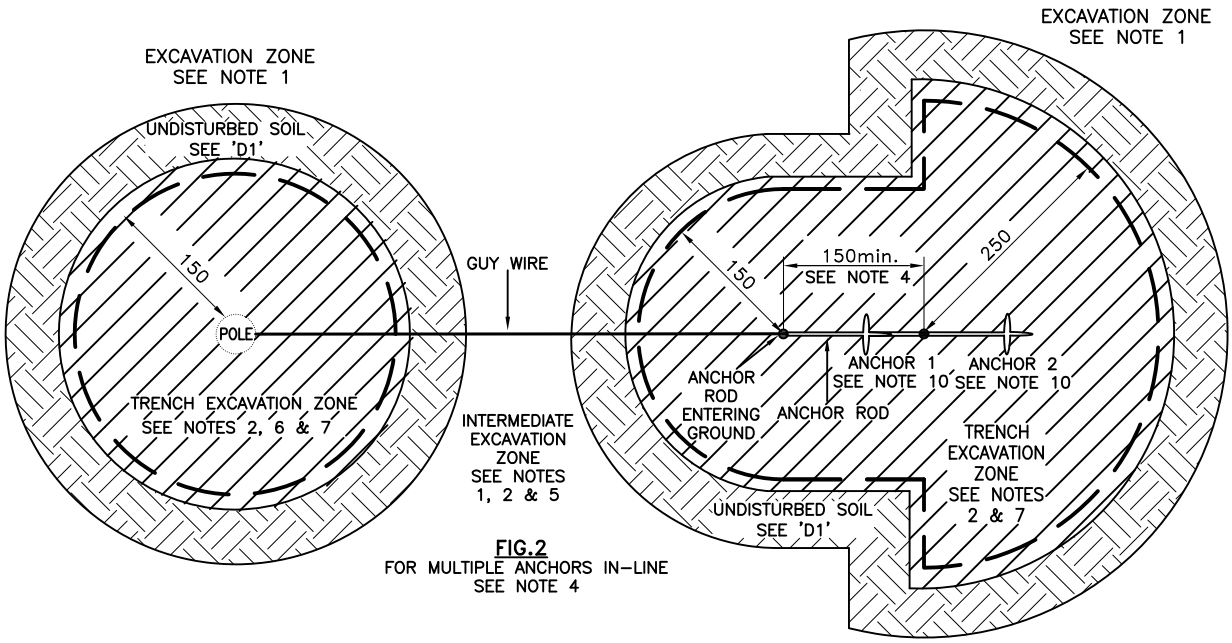


FIG.2
FOR MULTIPLE ANCHORS IN–LINE
SEE NOTE 4

NOTES:

1. EXCAVATION ZONE LIMITS ARE ONLY APPLICABLE FOR CLASS 1 TO 5 (NORMAL OR BETTER) SOIL CONDITIONS. FOR CLASS 6 TO 8 (POOR OR SWAMP) SOIL CONDITIONS, CONTACT HYDRO ONE BEFORE BEGINNING ANY WORK.
2. MAXIMUM ALLOWABLE WIND SPEED FOR EXCAVATION IS 40km/h. IF THE WIND SPEED IS GREATER, COVER TRENCHES AND WORK SHALL BE HALTED IMMEDIATELY UNTIL THE SPEED HAS DECREASED.
3. FOR ANY EXCAVATION REQUIRED WITHIN THE UNDISTURBED SOIL ZONE, HYDRO ONE SHALL BE CONTACTED PRIOR TO ANY COMMENCEMENT OF SUCH EXCAVATION TO SUBMIT A 'HOLD THE POLE' REQUEST.
4. IF THERE ARE MULTIPLE ANCHORS IN–LINE SEE 'D2'. ADD ANOTHER 150cm FOR EACH ADDITIONAL ANCHOR TO THE 150min. DIMENSION.
5. THE POLE AND ANCHOR CLEARANCES MAY OVERLAP SUCH THAT THE INTERMEDIATE EXCAVATION ZONE BETWEEN IS ELIMINATED.
6. THE TRENCH EXCAVATION ZONE AROUND THE POLE BASE IS ONLY ALLOWED WHEN THERE ARE SIX(6) WIRES OR LESS ON THE POLE. IF THE POLE CONTAINS MORE THAN SIX(6) WIRES, CONTACT HYDRO ONE BEFORE BEGINNING ANY WORK.
7. THE TRENCH EXCAVATION ZONE IS ALLOWABLE FOR ONE(1) TRENCH AT A TIME. THE MAXIMUM ALLOWABLE WIDTH WILL BE 50cm AND BE AT LEAST 60cm AWAY FROM THE POLE. THE ONLY ALLOWED ALIGNMENT SHALL BE STRAIGHT WITH NO CURVES OR BENDS ACROSS UNDISTURBED SOIL ZONE. THE TRENCH SHALL BE RESTORED TO ORIGINAL CONDITION AFTER EXCAVATION HAS BEEN COMPLETED.
8. IF AT ANY TIME IN THE COURSE OF EXCAVATION THE POLE APPEARS TO BECOME UNSTABLE TO ANY DEGREE, WORK SHALL BE HALTED IMMEDIATELY AND HYDRO ONE SHALL BE CONTACTED BEFORE PROCEEDING WITH ANY ADDITIONAL EXCAVATION.
9. IF THE SPECIFIED CLEARANCES CANNOT BE MET, CONTACT HYDRO ONE BEFORE BEGINNING ANY WORK.
10. HELIX ANCHOR SHOWN. THIS DRAWING IS APPLICABLE FOR ALL ANCHOR TYPES.

FOR SHEET 1 OF THIS DRAWING SEE DL6–202–0500

ALL DIMENSIONS ARE IN CENTIMETRES
UNLESS STATED OTHERWISE

Rev No.	Date	Revision Particulars	dwn	ckd	des	app

Drawn By:	Checked By:	Designed By:	Design Approved By:
PC	S.JASSAL	S.JASSAL	D.DEROSIERS
Scale: N.T.S.	Date: (yyyy/mm/dd) 2019/06/21	Pole ID:	

Hydro One Networks Inc.

Title: 3rd PARTY EXCAVATION ZONE LIMITS AROUND GUYED POLE LOCATIONS

Drawing No. DL6–202–0501 Rev. No. 00

A4 (210 x 297) millimetres 0 10 50

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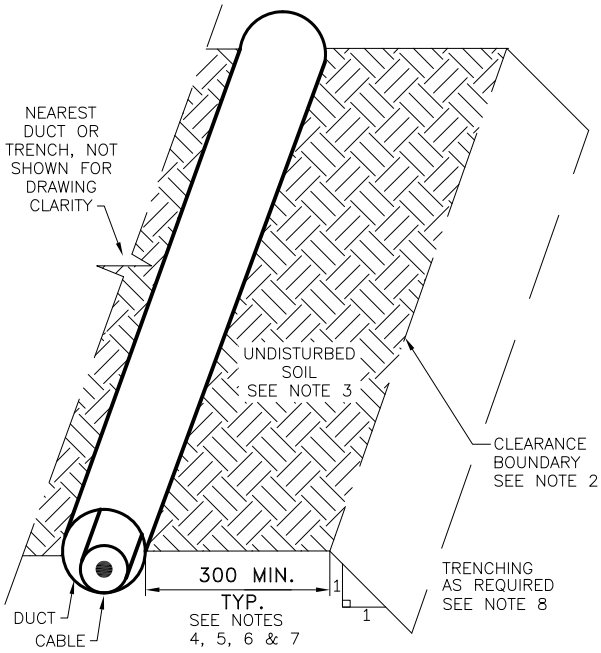


FIG.1
CABLE(S) IN–DUCT(S)
SEE 'D1'

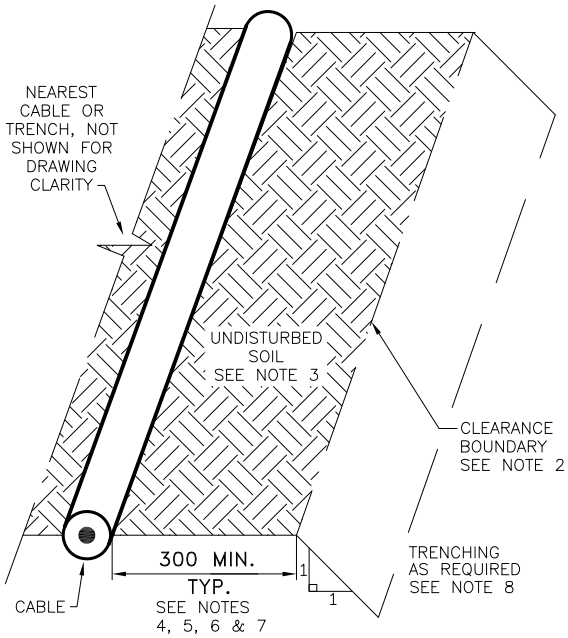
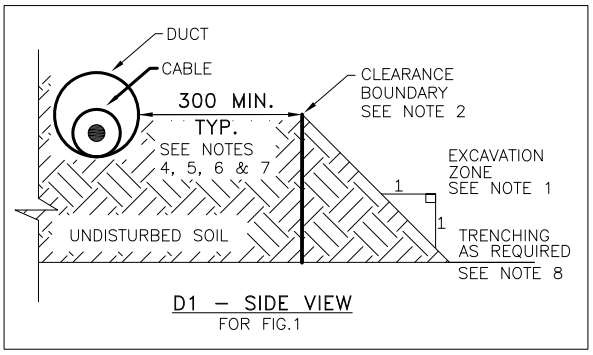
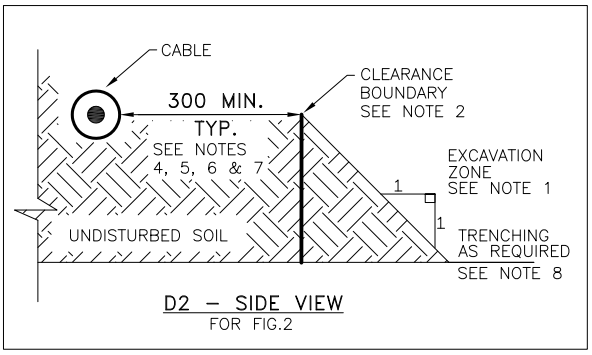


FIG.2
DIRECT BURIED CABLE(S)
SEE 'D2'



D1 – SIDE VIEW
FOR FIG.1



D2 – SIDE VIEW
FOR FIG.2

NOTES:

1. EXCAVATION ZONE LIMITS ARE ONLY APPLICABLE FOR CLASS 1 TO 5 (NORMAL OR BETTER) SOIL CONDITIONS. FOR CLASS 6 TO 8 (POOR OR SWAMP) SOIL CONDITIONS, CONTACT HYDRO ONE BEFORE BEGINNING ANY WORK.
2. THE FINAL CLEARANCE FROM THE CABLE OR DUCT, BASED ON THE LOCATE, TO THE NEAREST TRENCHES SHOULD BE 300mm MINIMUM. IF MULTIPLE CABLES OR DUCTS EXIST, THE CLEARANCES BOUNDARY SHOULD BE MEASURED FROM THE NEAREST CABLE OR DUCT.
3. FOR ANY EXCAVATION REQUIRED WITHIN THE UNDISTURBED SOIL ZONE, HYDRO ONE SHALL BE CONTACTED PRIOR TO ANY COMMENCEMENT OF SUCH EXCAVATION FOR APPROVAL.
4. SINCE THE EXACT LOCATION OF THE CABLE IS NOT KNOWN, THE GIVEN LOCATION WILL BE THE GENERAL VICINITY OF THE CABLE. EXTRA CARE SHALL BE TAKEN WHEN EXCAVATING WITHIN 1000mm OF THE CABLE, ONLY HAND DIGGING IS ALLOWED IN THIS ZONE. THE CABLE SHALL NOT BE EXPOSED AT ANY TIME. IF IT IS, WORK SHALL BE HALTED IMMEDIATELY AND HYDRO ONE SHALL BE CONTACTED BEFORE PROCEEDING ANY ADDITIONAL EXCAVATION.
5. IF SAND IS ENCOUNTERED, DO NOT REMOVE AS THE CABLE IS IN THE NEARBY VICINITY. ADD TO AND BACKFILL WITH CLEAN MASONRY SAND IF ANY SAND IS DISPLACED.
6. IF AT ANY TIME IN THE COURSE OF EXCAVATION THE CABLE APPEARS TO BECOME UNSTABLE TO ANY DEGREE, WORK SHALL BE HALTED IMMEDIATELY AND HYDRO ONE SHALL BE CONTACTED BEFORE PROCEEDING WITH ANY ADDITIONAL EXCAVATION.
7. IF THE SPECIFIED CLEARANCES CANNOT BE MET, OR IF EXCAVATION IS WITHIN VICINITY OF HYDRO ONE STATION FACILITY OR EGRESS CABLES, CONTACT HYDRO ONE BEFORE BEGINNING ANY WORK.
8. EXCAVATION TO BE DONE AT MAXIMUM ANGLE OF 45° SLOPE AWAY FROM THE CLEARANCE BOUNDARY. THE HORIZONTAL AND VERTICAL CUTS SHALL NOT BE STEEPER THAN 1:1 RATIO TO PREVENT CAVE–IN.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE STATED

Rev No.	Date	Revision Particulars	dwn	ckd	des	app
*	*	*	*	*	*	*

Drawn By:	Checked By:	Designed By:	Design Approved By:
PC	M.MATEVSKI	S.JASSAL	M.MATEVSKI
Scale: N.T.S.	Date: (yyyy/mm/dd) 2021/04/26	Pole ID:	

Hydro One Networks Inc.

Title:
3rd PARTY EXCAVATION ZONE LIMITS
AROUND UNDERGROUND POWER CABLE LOCATIONS

Drawing No.	Rev. No.
DU–03–901–0500	00

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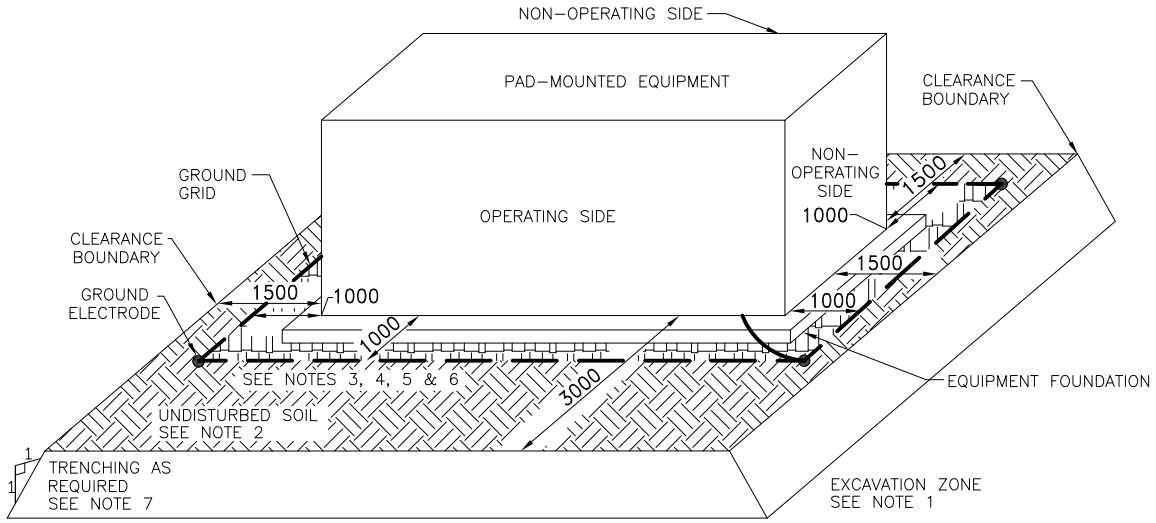

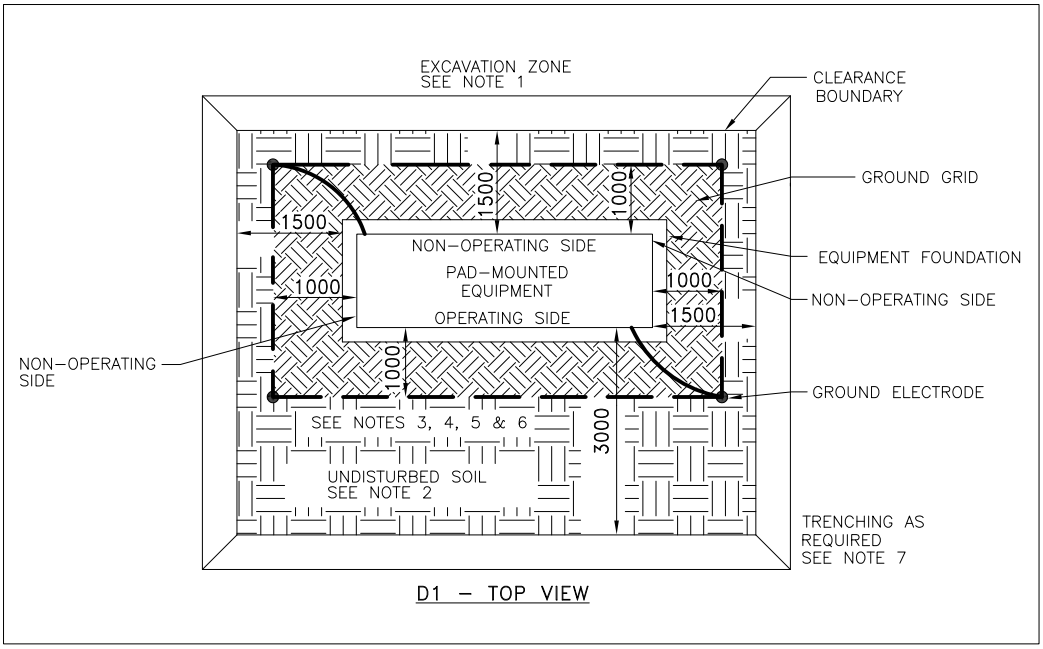

D1 – TOP VIEW

NOTES:

1. EXCAVATION ZONE LIMITS ARE ONLY APPLICABLE FOR CLASS 1 TO 5 (NORMAL OR BETTER) SOIL CONDITIONS. FOR CLASS 6 TO 8 (POOR OR SWAMP) SOIL CONDITIONS, CONTACT HYDRO ONE BEFORE BEGINNING ANY WORK.
2. FOR ANY EXCAVATION REQUIRED WITHIN THE UNDISTURBED SOIL ZONE, HYDRO ONE SHALL BE CONTACTED PRIOR TO ANY COMMENCEMENT OF SUCH EXCAVATION FOR APPROVAL.
3. EXTRA CARE SHALL BE TAKEN WHEN EXCAVATING WITHIN 2000mm OF THE PAD–MOUNTED EQUIPMENT, ONLY HAND DIGGING IS ALLOWED IN THIS ZONE.
4. IF AT ANY TIME IN THE COURSE OF EXCAVATION THE PAD–MOUNTED EQUIPMENT OR ITS FOUNDATION APPEARS TO BECOME UNSTABLE TO ANY DEGREE, WORK SHALL BE HALTED IMMEDIATELY AND HYDRO ONE SHALL BE CONTACTED BEFORE PROCEEDING WITH ANY ADDITIONAL EXCAVATION.
5. ALL METAL PARTS THAT FALL WITHIN 3000mm OF PAD–MOUNTED EQUIPMENT GROUND GRID, CONTACT HYDRO ONE FOR ADDITIONAL BONDING REQUIREMENTS FOR CONNECTIONS.
6. IF THE SPECIFIED CLEARANCES CANNOT BE MET, CONTACT HYDRO ONE BEFORE BEGINNING ANY WORK.
7. EXCAVATION TO BE DONE AT MAXIMUM ANGLE OF 45° SLOPE AWAY FROM THE CLEARANCE BOUNDARY. THE HORIZONTAL AND VERTICAL CUTS SHALL NOT BE STEEPER THAN 1:1 RATIO TO PREVENT CAVE–IN.

ALL DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE STATED

Rev No.	Date	Revision Particulars	dwn	ckd	des	app
*	*	*	*	*	*	*

Drawn By:	Checked By:	Designed By:	Design Approved By:
PC	M.MATEVSKI	S.JASSAL	M.MATEVSKI
Scale: N.T.S.	Date: (yyyy/mm/dd) 2021/04/26	Pole ID:	

Hydro One Networks Inc.

Title: 3rd PARTY EXCAVATION ZONE LIMITS AROUND PAD–MOUNTED EQUIPMENT LOCATIONS

Drawing No. DU–03–902–0500 Rev. No. 00

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