

FINAL DRAINAGE REPORT

REPAIR AND IMPROVEMENT OF THE DRIEDGER DRAIN

MUNICIPALITY OF LEAMINGTON



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File No. 14-391

October 16, 2017

REPAIR AND IMPROVEMENT OF THE DRIEDGER DRAIN INDEX

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October 16, 2017

Mayor and Municipal Council
Corporation of the Municipality of Leamington
111 Erie Street North
Leamington, Ontario N8H 2Z9

Re: Repair and Improvement of the Driedger Drain
Municipality of Leamington
Project No. 14-391

Mayor and Members of Council:

1.0 AUTHORIZATION

Pursuant to Section 4 of the Drainage Act, 1990, the Corporation of the Municipality of Leamington accepted a signed petition for drainage works from the Leamington road authority for drainage on Mersea Road 6 between Essex Road 37 and Mersea Road 21. The Corporation of the Municipality of Leamington appointed the firm of RC Spencer Associates Inc. to prepare a preliminary report under the provisions of “The Drainage Act, 1990” as per the attached correspondence letter dated April 23, 2015.

As authorized by Council, we held an on-site meeting and examination on June 24, 2015 to determine the area requiring drainage. We found that the petition is valid under Section 4(1)(c) of the Drainage Act. After the on-site meeting, we made a survey and examination of the drainage along Mersea Road 6 between Essex Road 37 and Mersea Road 21, situated within Lots 224-225, Concession NTR and Lots 19-20, Concession 6, Municipality of Leamington. A preliminary report was prepared and issued on June 1, 2016, then presented to Council and the affected landowners on September 12, 2016. At that meeting, Mr. Len Driedger and Mr. Jim Tiessen asked that additional alternatives be examined for providing drainage along the south ends of their properties. An additional site meeting was held with these two property owners on November 10, 2016 to discuss options for providing additional drainage along the south ends of their two properties and the possibility of using the Settrington Drain as an outlet. At the end of that meeting, both Mr. Len Driedger and Mr. Jim Tiessen indicated that they did not wish to pursue any additional drainage improvements other than Option 1 outlined in the preliminary report.

The results of the November 10, 2016 site meeting was reported to Council and Council instructed RC Spencer Ltd to prepare a final report for the construction of a new municipal drain based upon Option 1 contained in the preliminary report. The new municipal drain will be called the “Driedger Drain”.

Our appointment and the works relating to the construction of the above mentioned municipal drain are in accordance with Section 4 of the “Drainage Act, R.S.O. 1990, Chapter D.17”. Accordingly the firm of RC Spencer Associates Inc. has performed all of the necessary surveys, investigations, etc., and we report thereon as follows.

2.0 BACKGROUND

In early 2014, landowners from 1944 Mersea Road 6, Mr. and Mrs. Erwin Reidl, applied for a building permit for a residential dwelling. During the review of the application it was determined that their outlet for stormwater drainage was the Settingington Drain. A lot was severed off a farm parcel and thereby required to have a mutual agreement with the original land owner to allow the new lot access into the Settingington Drain. At that time the builder believed drainage could be provided to the new home by cleaning out the existing bottom of the adjacent Mersea Road 6 roadside ditch. The builder was advised by the Municipality Drainage Superintendent that the roadside ditch was not a legal outlet for storm runoff water from private lands and that he must direct the rainwater westerly to the Settingington Drain. Upon further inspection of the Settingington Drain, the builder and the owner both decided it was not feasible to cross through an adjoining bush lot in order to drain their stormwater into the Settingington Drain. Accordingly the residents requested alternative options from the Municipality.

Municipal Administration began a review of the area and determined that there are several residential lots and three large farm parcels, presently directing their storm water into the roadside ditches for drainage outlet. Mr. Len Driedger, owner of the farm parcel on the north side of Mersea Road 6 advised the Municipality he had drainage concerns and he therefore proceeded to clean out a portion of the roadside ditch along the north side of Mersea Road 6 at his own expense to improve the drainage for his farm.

The Municipality’s Drainage Superintendent has reviewed the various options with the landowners and the road authority and all are in agreement that the roadside ditch should be converted to a municipal drain, thus allowing for future maintenance and cost sharing.

In general, landowners wishing to improve their drainage by directing their stormwater to a road allowance may do so under the provisions of the Drainage Act by establishing a municipal drain. Accordingly maintenance and cost sharing would be determined through a drainage report prepared by an Engineer and approved by the Municipal Council.

3.0 CURRENT SURROUNDING MUNICIPAL DRAINS

The following current drainage reports were reviewed for the purpose of establishing the drainage area for the proposed Driedger Drain:

- a) Drainage report prepared by William J. Settingington, P.Eng. for the “Reconsidered Report - Upper Part of the Derbyshire Drain” and dated March 25, 1977, being the current report from Highway 3 to the upstream end of the drain north of Mersea Road 6.
- b) Drainage report prepared by William J. Settingington, P.Eng. for the “Goslin Drain” and dated December 16, 1981, being the current report from the old Chesapeake and Ohio Railway northerly to 5th Concession Road.
- c) Drainage report prepared by William J. Settingington, P.Eng. for the “Part of the Upper Part of the Derbyshire Drain” and dated September 18, 1981, being the current report for north of Highway 3 (north limit of Larry Derbyshire) northerly to approximately 416 metres north of the old Chesapeake and Ohio Railway.
- d) Drainage report prepared by Nick J. Peralta, P.Eng. for the “West Branch of the Derbyshire Drain” and dated July 2, 1982, being the current report from Derbyshire Drain south of Kings Highway 3 north westerly for approximately 550 metres.
- e) Drainage report prepared by Gerard Rood, P.Eng. for the “Settingington Drain Maintenance Schedule” and dated December 1, 2010, being the maintenance schedule and watershed plan for the Settingington Drain from Piggott Creek Drain to the upper end at the south side of Mersea Road 6.

4.0 SITE MEETINGS

4.1 June 24, 2015 On-Site Meeting

The on-site meeting was held on June 24, 2015 on Mersea Road 6 in Leamington.
A summary of the meeting is listed below:

In Attendance:

Lu-Ann Barreto
Lou Zarlenga, P.Eng.
Amy Grenier
Dennis Driedger
Len Driedger
Jeremy Krueger
Peter Neufeld
Erwin Reidl
J. Vellinga / K. Barnesky

Representing:

Municipality of Leamington
RC Spencer Associates Inc.
RC Spencer Associates Inc.
Landowner
Landowner
ECH County Roads
Landowner
Landowner
Landowner

The Drainage Superintendent, Lu-Ann Barreto, made introductions, announced the Engineer on Record and reviewed the purpose of the meeting and history of the drainage along Mersea Road 6.

The Engineer on Record, Lou Zarlenga, P.Eng., provided a brief history of the Drainage Act and summary of the procedures under Section 4 of the Drainage Act and described the affected drainage area and answered questions as follows:

Purpose of Meeting:

1. The Municipality received a Petition for Drainage from the road authority under Section 4 of the Drainage Act.
2. Council, at their 23 April 2015 public meeting, appointed Lou Zarlenga, P.Eng. of RC Spencer Associates Inc. to examine the drainage area and prepare a Preliminary Drainage Report for the proposed Driedger Drain.
3. The purpose of the site meeting held is to review the drainage concerns and document landowner concerns for better understanding of the drainage issues.
4. Mr. Zarlenga, P.Eng., will inspect the drain; confirm the drainage area; confirm the drainage outlet is sufficient to handle the inletting stormwater/run-off, and conduct a land drainage survey.
5. Landowners may receive a call from the Engineer to assist in determining the drainage area.
6. A Preliminary Engineer's Report will be completed and filed with the Municipality and circulated to the affected landowners. This report will detail the engineer's findings and cost estimate for the drainage works. As this is a preliminary report, a schedule of assessment is not prepared.

The Drainage Superintendent noted that while the petition started, landowners had hired a private contractor to perform cleaning of the roadside ditch along Mersea Road 6. The roadside ditch is not a municipal drain, the upstream owners are not currently paying their share of the maintenance costs for drainage.

Mr. Len Driedger raised concern that the roadside ditch is not routinely maintained.

Concern was raised that the Derbyshire Drain needs to be cleaned as well. The Drainage Superintendent noted that they had attempted to have this done; however, funding was not available.

The Engineer raised concern about private landowners performing road drain maintenance. It was noted that this work was done by Marc Rivard, who is an experienced drainage contractor (Rivard Excavating) and the work was acknowledged by the Drainage Superintendent.

The Engineer is to determine the upstream drainage limits, and requested a diagram of the drainage tiling if available for the farm land from Mr. Driedger.

The Drainage Superintendent requested the Engineer to survey the 2nd residential lot and wood lot which are currently assessed to the Settingington Drain.

It was noted that the tenant for the Barnesky farm, situated on the south side of Mersea Road 6 east of Municipal No. 2000, is Mr. Len Driedger.

It was noted that the tenant for Mr. Ron Bailey is Mr. Peter Neufeld.

Further to the onsite meeting, the Municipality Drainage Superintendent contacted our office and requested clarification of the following:

- a) Clarification of the drainage area for the review of the Settingington Drain.
- b) Extend our proposed land survey to the west up to County Road 37 to determine proper drainage boundary.
- c) The Municipality Drainage Superintendent confirmed that the proposed new municipal drain would commence at the Derbyshire Drain near the two existing solar panel installations. The proposed Driedger Drain would flow easterly following the course of the existing road side ditch up to 1944 Road 6, at which point the drain would cross Road 6, then head easterly along the north side of Road 6.
- d) The Drainage Superintendent requested that we check the existing Corrugated Steel Pipe that crosses Road 6 situated near Municipal Number 1944 Road 6 for flow capacity and pipe condition.
- e) The Municipality Drainage Superintendent suggested that we consider a tile drain and an open drain along the north side of Mersea Road 6; however the existence of several Hydro One poles may pose additional concerns.

On November 23, 2015, subsequent to the site meeting, further discussions were held with Mr. Leonard Driedger. The following is a summary of the items discussed:

- a) There are 3 catchbasins connected with 100 mm diameter tile situated on the north side of Mersea Road 6 previously installed by Mr. Driedger.
- b) The approximate drainage area was discussed, and according to Mr. Driedger, the approximate drainage area for his existing 100 mm diameter tile on the north side of Mersea Road 6 is as follows:
 - 15 Acres from Municipal Number 600 (Jim and Christine Tiessen),
 - 70 Acres from Driedger Farms (rolls 730-00300 and 730-00500), and
 - 30 Acres from Dennis and Karen Driedger (Municipal Number 2010).

- c) It was discussed whether Mr. Driedger would like to include the tile drain on the north side of Mersea Road 6 as part of the municipal drain. A preference had not been determined at that time. Accordingly Option 2 has been provided in the preliminary report for consideration of the additional branch Drain for Mr. Driedger and Mr. Tiessen.
- d) An additional two catchbasins are situated on the south side of Mersea Road 6 at approximately stations 0+100 and 0+200. Mr. Driedger believes these head directly to the Derbyshire Drain to the east. At the time of the site visit, the catchbasin was submerged under water, and no connections were located within the roadside ditch on the north side of Mersea Road 6. Therefore, it was determined these two catchbasins on the south side of Mersea Road 6 do not drain into the north side of Mersea Road 6.
- e) Discussion was held with Mr. Driedger for placing additional catch basins in the proposed municipal drain near Municipal No. 2000 on the south side of Mersea Road 6. Mr. Driedger was not in favour of an additional catchbasin for the farm field, unless it was just for draining the south side of Mersea Road 6 within the road R.O.W.
- f) On November 26, 2015, further discussion with Mr. Jim Tiessen, owner of Municipal No. 600, was held. The following items were discussed:
 - The agricultural land at Municipal No. 600, located on the north side of Mersea Road 6 at County Road 37 is assessed to the Settrington Drain situated on the south side of Mersea Road 6; however, there is no pipe connection to the Settrington Drain. Mr. Tiessen confirmed that the drainage tiles for this lot (Drainage area of 13.8 Acres) are heading to the east (through Mr. Driedger's tile) towards the Derbyshire Drain and that there is an existing catchbasin along Mersea Road 6 at the low spot catching surface storm water. He mentioned that it was tiled sometime in 1992-1993, and that, since the construction of a gas line, there have been issues with flooding along the road and his land.
 - Additionally, discussion was held for an option to provide a new branch tile drain along Mersea Road 6. Mr. Tiessen had no preference at the time. Option 2 has been provided in this preliminary report for further consideration.

4.2 November 10, 2016 On-Site Meeting

An additional site meeting was held with Mr. Len Driedger and Mr. Jim Tiessen on November 10, 2016 to discuss options for providing additional drainage along the south ends of their two properties and the possibility of using the Settrington Drain as an outlet. At that meeting, the following conclusions were reached:

- I. The existing Settrington Drain situated on the south side of Road 6 would not be adequate in its existing condition to provide drainage to their lands situated on the north side of Road 6.

2. The southerly situated portion of the Jim Tiessen farm, located north of Road 6, does not currently drain into the Settrington Drain. These noted Tiessen lands actually drain into the above noted 100mm diameter Len Driedger clay tile and the roadside ditch along Road 6 which empties into the Derbyshire Drain.
3. The existing 100mm diameter clay tile previously installed by Len Driedger is currently intact and does provide limited drainage to the immediate adjacent agricultural and road lands.

Len Driedger commented his lands do occasionally flood after heavy rains. The existing clay tile and roadside ditch eventually take the floodwater away to the Derbyshire outlet.

Len Driedger and Jim Tiessen agreed once the roadside ditch along Road 6 is improved according to the details provided in the preliminary drainage report, the drainage of their lands will improve significantly.

4. The preliminary drainage report also provides for alternative tile drain systems together with estimated costs to provide for increasing the size of the existing 100mm diameter clay tile, however, both Len Driedger and Jim Tiessen agreed the estimated cost of increasing the size of the existing 100mm diameter tile is too expensive and do not wish to pursue enlarging the existing 100mm diameter tile.
5. Mr. Len Driedger and Jim Tiessen indicated once the improvements are made to the existing roadside ditches identified in the preliminary report they will monitor the rain events and subsequent time for rainwater to drain away.
6. In summary, both Mr. Driedger and Mr. Tiessen indicated they did not wish to pursue any additional drainage improvements other than what is presently proposed in the preliminary drainage report.

Additionally, Mr. Driedger and Mr. Tiessen indicated they did not wish to pursue increasing the size of the existing 100mm diameter clay tile.

5.0 INSPECTION AND SURVEY

We commenced our survey of the proposed Driedger Drain at Station 0+000 being situated at the centerline of the Derbyshire Drain on the north side of Mersea Road 6 in the Municipality of Leamington. We then proceeded westerly, following the upstream course of the ditch to Station 0+700 being situated at the west limit of municipal number 1940 Mersea Road 6. And further situated at the head of the Settrington Drain.

Paint marks were placed every 25 metres along the edge of pavement on Mersea Road 6.

On September 2, 2015, geodetic elevations were taken on the Mersea Road 6 roadside ditch bottom and top of water and top of bank every 25 metres, and full cross sections every 100 metres using standard survey equipment.

Examination of the existing Derbyshire Drain started at Mersea Road 6 and continued downstream (southerly) approximately 750 metres. It was noted that at Station 0+00 there was approximately 500mm (20 inches) of standing water being held back in the Derbyshire Drain throughout. The standing water posed an impediment to the repair and improvement of the Mersea Road 6 ditch. Recently, the Derbyshire Drain was maintained pursuant to the current drainage report for that drain.

- a) The extent of the drainage investigation was to review the condition of the existing roadside drain commencing at the existing Derbyshire Drain proceeding westerly along Mersea Road 6 to County Road 37 being approximately 639 metres in length. During the initial walkthrough, we also reviewed the condition of the existing outlet drain, being the Derbyshire Drain, to determine whether it provides a sufficient outlet. However it was apparent that there was a substantial depth of standing water in the Derbyshire Drain. This was rectified by the recent clean-out.
- b) We commenced our preliminary inspection at the existing drain outlet from the Road 6 roadside ditch into the Derbyshire Drain. It was apparent that the Derbyshire Drain, being the main outlet drain for the Road 6 roadside ditch, would also require routine maintenance to remove bottom sediment and other minor blockages in order to provide a sufficient outlet for the proposed Driedger Drain. Accordingly, we continued our inspection of the proposed Driedger Drain along the proposed new drain route along Road 6 toward the Reidl residence being approximately 639 metres from the Derbyshire Drain.
- c) Additionally, a land survey of the roadside ditch was performed starting at the Derbyshire Drain at Station 0+000 and proceeding westerly along Mersea Road 6 to Station 0+639. Distances were painted on the edge of the asphalt road for reference.
- d) Our investigation included a detailed topographic survey of the existing roadside ditch including all culverts located within the roadside ditch. We prepared a preliminary hydraulic analysis of the proposed new Drain, and also prepared a photo survey of the culverts and various portions of the new Drain. We further determined the extent of the drainage basin and affected lands contributing storm runoff. A hydraulic analysis was performed to determine required drainage pipe sizes.
- e) We further utilized aerial photographs, topographical mapping, Municipality GIS mappings, Essex County soil maps and current drainage reports for the surrounding Drains in order to perform our preliminary review of the drainage basin.
- f) Discussions with adjacent landowners were also undertaken to determine the agricultural tile drainage contributing to the drainage area. The drainage area for the proposed municipal Drain (tentatively called the Driedger Drain) has been determined to be approximately 45.0 Hectares.

6.0 DESCRIPTION OF WATERSHED AREA

The drainage area for the Driedger Drain was determined through a review of current reports for the surrounding drains, along with modifications through survey and discussions with landowners as depicted in the accompanying drawings.

Municipal Number 600 (Tiessen) was originally assessed to the Settingington Drain and the Goslin Drain. However, the 100mm diameter tile drain installed by Mr. Driedger currently outlets to the roadside ditch along Mersea Road 6. Accordingly the Tiessen lands do not drain into the Settingington Drain or the Goslin Drain. This fact should be corrected in the current reports via an updated maintenance schedules or a subsequent disconnection reports.

The total land area situated within the drainage basin, within the Municipality of Leamington, is approximately 41.2 Hectares, as shown on the attached drawing. This area is predominately agricultural with little residential development.

7.0 SOIL TYPE AND LAND USE

The lands within the drainage limits of the proposed Driedger Drain are situated within an area classified as Berrien Sandy Loam. This being a brown sandy loam over yellow and then mottled sand with clay at about 3 to 6 feet. This soil has fair to poor drainage characteristics as shown in the Essex County Soil Map, Survey Number 11, dated in 1947.

The topography of the watershed area upstream is relatively flat and the bottom gradient of the existing roadside ditch is less than 0.10%.

8.0 EXISTING CONDITIONS

The existing Drain along Mersea Road 6 is currently a roadside ditch which outlets to the Derbyshire Drain. Maintenance of this ditch has been previously performed by the current landowners with permission of the road authority. Recently, there have been homes built on the south side of the road which have directed water to the roadside ditch; therefore, it has been requested by the road authority that this drain be converted to a municipal drain for scheduled maintenance and fair cost distribution.

The existing ditch along Mersea Road 6 is currently an open roadside ditch along the north side of the road with a top width varying from approximately 6.0 to 6.5 metres from Station 0+000 (at Derbyshire Drain) to Station 0+486 metres westerly. The ditch then crosses Mersea Road 6 at Station 0+486 via a 300mm diameter culvert to the south side of the road and continues westerly to Station 0+639. The top width of the ditch along the south side of Mersea Road 6 is 3.5 to 4.0 metres wide.

All of the access and road culverts in the roadside drain were visually examined during the course of our survey. Specific culvert numbers have been designated for ease of reference between the specifications and the drawings. From Station 0+000 to Station 0+639 there are

presently 2 pipe culverts along the roadside ditch. The locations, dimensions, condition and use of each culvert are as follows:

Culvert No. 9: Station 0+486 –Mersea Road 6

A 10 m length of 300 mm diameter corrugated steel pipe crosses Mersea Road 6. This culvert is deficient in hydraulic capacity and in poor structural condition. It is recommended that a new 600mm diameter smooth wall pipe be installed at the proper grade.

Culvert No. 10: Station 0+539.5 – Erwin Riedl (Roll No. 610-02915)

A 7 m length of 450 mm diameter plastic pipe provides access across the drain to this property from Mersea Road 6. This culvert is in good condition, yet installed higher than proposed grade; therefore this pipe could be salvaged and re-used.

9.0 FINDINGS AND OBSERVATIONS

As a result of our survey and examination of the existing drainage along the proposed Driedger Drain and the outlet at Derbyshire Drain, we have found the following:

a) Outlet condition (Derbyshire Drain):

The existing Derbyshire Drain was in poor condition, and it was recommended that this drain be cleaned in accordance with the latest drainage report prior to any work being done on the Driedger Drain in order to provide a sufficient outlet to the proposed Driedger Drain. Maintenance work has recently been carried out on the Derbyshire Drain and it now provides sufficient outlet for the Driedger Drain.

b) Sideslopes:

Presently, the sideslopes are constructed at approximately 1:1, this being very steep and difficult to maintain. Minimum sideslopes for municipal drains are 1.5:1, with a preferred minimum of 2:1 (2 units horizontal for every 1 unit vertical). Leaving or incorporating the existing 1:1 sideslope is not a viable design option.

Given the existing conditions and proximity of the ditch to the edge of pavement, a minimum slope of 1.5:1 is recommended (1½ units horizontal to one unit vertical).

c) Hydro Poles:

We found that 8 hydro poles are situated along the north side of Mersea Road 6 from Station 0+00 to 0+700. The hydro poles are further situated very near the north ditch bank. Accordingly, any proposed improvement of the roadside ditch incorporating an open drain would require protective works to the hydro poles. The recommended protective work would consist of a culvert pipe with granular backfill around the pipe complete with quarried rock erosion protection at each end of the culvert pipe. As an alternative to the culvert pipes, a hydro pole guy wire can be placed on the private farmland anchoring the hydro pole from moving towards the road. There would be 8 anchor poles. This option would also require an easement agreement between Hydro One and the landowner (Mr. Len Driedger, and Mr. and Mrs. Dennis Driedger). Past practice has found the guy wire

option not favoured by the landowners. A further option would be to enclose the open ditch with a suitable sized pipe; however this would be more expensive. In this regard, the required pipe would be a 900mm diameter.

A Hydro One representative was contacted in regards to the proposed drainage works and potential conflict with the noted hydro poles. We further indicated the protective culvert work to the 8 hydro poles would be undertaken by the Municipality through the Drainage Act and Engineers report and the cost of the culvert pipes and protective work would be assessed to Hydro One pursuant to Section 26 of the Drainage Act due to the utility being in proximity to a municipal drain.

d) Agricultural Tile Drains:

There are presently five tile drains which outlet to the roadside ditch between stations 0+000 and 0+639, as shown on the attached drawing profile.

The 100mm diameter tile drain along the north side of Mersea Road 6 from station 0+486 westerly to County Road 37 is undersized for municipal drain standards

e) Road Culverts

There presently exists a 300mm diameter corrugated steel pipe crossing Mersea Road 6 at Station 0+486. This culvert is in poor condition and the north end is crushed.

f) Condition of Existing Ditch Banks

The following is a generalization of the existing bank conditions:

- | | |
|------------------------|--|
| Station 0+000 to 0+486 | - Drain located on north side of Mersea Road 6 |
| | - Sideslopes are vegetated, steep but stable. |
| | - Water being held back along bottom of drain |
| Station 0+486 to 0+639 | - Drain located on south side of Mersea Road 6 |
| | - Very Shallow Drain |
| | - Sideslopes are vegetated and stable. |

10.0 DESIGN CONSIDERATIONS

10.1 Design Criteria

The following design criteria have been applied:

- | | |
|---|---|
| a) Bottom Grade | 0.1% |
| b) Drain sideslopes | 1.5:1 (1.5 units horizontal to 1 unit vertical) |
| c) Buffer Strips | (see attached Municipality standards) |
| d) Grass lined channel | |
| - Minimum flow velocity | 0.30 metre per second |
| - Maximum flow velocity | 1.20 metre per second |
| e) Erosion Protection | |
| - quarried rock on sideslopes if water velocity is greater than 1.20 metres per second. | |
| - grass on sideslopes if water velocity is less than 1.20 metres per second. | |

10.2 Hydraulic Investigation

In order to determine the extent of required repairs, type of material and sizing of culverts within the drain, certain hydraulic characteristics of the Drain were reviewed. The rational method was applied to the overall drainage area, as well as the areas upstream of various culverts, and separately for the branch drain. A summary of the analysis results are as follows:

- a) The 8 proposed culverts located at the hydro poles along the north side of Mersea Road 6 from Station 0+000 to 0+486 are sized for the minor storm event (2 to 5 year return period) as 900mm diameter smooth walled pipes with a slope of 0.10 percent. The hydraulic capacity of the new access culverts meet the current design standards recommended by the Ontario Ministry of Agriculture and Food.
- b) The new proposed culvert located across Mersea Road 6 at Station 0+486 is sized for the 1:50 year storm event as a 600mm diameter with a slope of 0.5 percent.
- c) The access culvert at Station 539.5 is sized for the minor storm event (2 to 5 year return period). The existing 450 mm diameter BOSS pipe will be salvaged, reinstalled and be extended by 2.5 m.

Design invert elevations of the new bridges noted above are approximately 10% of the pipe diameter below the governing gradeline for the bottom of the open drain. This embedment will enhance aquatic habitat.

11.0 PRELIMINARY REPORT

The preliminary report dated June 1, 2016 was considered by Council on February 27, 2017 and the recommendations contained in that report were approved by Council. We utilized the recommendations contained in the preliminary report when preparing this final report.

12.0 RECOMMENDATIONS

Based on our review of the history, the information obtained during the site meeting, subsequent discussions with the landowners and the Municipality, a review of the survey data, and our detailed analyses and designs, we recommend that the Driedger Drain be constructed by converting the roadside ditch into a municipal drain and by carrying out the work as described below.

a) Station 0+000 to 0+486

Minor excavation of existing roadside ditch on the north side of Mersea Road 6 to remove sediment, and re-grading of sideslopes from Station 0+000 to 0+486.

Installation of 900mm diameter culverts with rip rap end treatment at each hydro pole from Station 0+000 to 0+486. There are 8 hydro poles in total.

A 3.0 m wide buffer strip will be established along the north side of the drain. A copy of Municipal Policy No. E09 is attached as part of “Appendix D”. It explains restrictions and obligations imposed upon the landowner.

b) Station 0+486

Remove and replace existing 300mm diameter CSP with new 600mm diameter culvert crossing Mersea Road 6.

c) Station 0+486 to 0+639

Excavate and deepen drain along south side of Mersea Road 6.

Remove and salvage existing 450 mm diameter Boss pipe which serves as an access culvert at Station 539.5. Reinstall this culvert and install an additional 2.5 m of pipe.

13.0 DRAWINGS AND SPECIFICATIONS

As part of this report, we have attached design drawings for the proposed culvert. There is a set of nine drawings that show the following:

- a) the location of the proposed Driedger Drain and the approximate limits of the watershed;
- b) a profile for the proposed drain;
- c) cross-sections (Station 0+000 to Station 0+300);
- d) cross-sections (Station 0+400 to Station 0+600);
- e) cross-sections at hydro poles (Stations 0+005, 0+076, 0+123 and 0+192);
- f) cross-sections at hydro poles (Stations 0+260, 0+323, 0+388 and 0+450);
- g) plan, longitudinal section and cross-section details for the Mersea Road 6 culvert;
- h) plan, longitudinal section and cross-section details for 8 Hydro One culverts; and
- i) plan, longitudinal section and cross-section details for an access culvert at Station 0+539.5

Also attached as **Appendix ‘B’** are:

- a) **‘Special Provisions’** for the drain construction which set out specifications and construction details for the various aspects of the required works to be conducted under this report;
- b) **‘General Specifications for Open Drains’**;
- c) **‘Environmental Protection Special Provisions’**.

Also attached as **Appendix ‘C’** is an **‘Endangered Species Act Review’** providing pertinent information.

Also attached as **Appendix ‘D’** is a **‘Correspondence Section’** providing copies of some correspondence.

14.0 ALLOWANCES

Implementation of the works provided herein will require the use of some privately owned lands. Under the provisions of the Drainage Act, the owners of lands required to construct a drainage project, or to obtain access to drainage works, or to dispose of excavated material must be compensated for the loss or use of the land. The excavated material is to be disposed of as set out in the Special Provisions in the attached Appendix “B”.

In accordance with Section 29 of the Drainage Act, we have determined the amount to be paid for the private land occupied by the drain or occupied by permanent buffer strips or land used to gain access to the drain for construction purposes. These amounts are shown in the following Schedule under the heading “Land”. In accordance with Section 30 of the Drainage Act, we determined the amounts to be paid to the owners for damages to lands and crops (if any) occasioned by the operation of equipment and the disposal of material excavated from the drain. These amounts are shown in the following Schedule under the heading “Damages”.

For this project, a 3 m wide grassed buffer strip will be established along the north side of the drain from Station 0+000 to Station 0+486. All of the excavated subsoil will be loaded , hauled and be disposed of off site. A working corridor will be provided along the north side of the drain from Station 0+000 to Station 0+486. From Station 0+486 to Station 0+639, the equipment will operate from the roadside of the drain and the excavated material will be loaded, hauled and disposed of off site.

Accordingly in our determination of the amounts to be paid for allowances, we have used the following allowance rates.

- Land used for Drain construction \$ 8,000 /acre (\$19,800/hectare)
- Land used for disposal purposes \$ 800 /acre (\$1,980/hectare)
- Land used for access purposes \$ 800 /acre (\$1,980/hectare)
- Land used for buffer area purpose \$ 8,000 /acre (\$19,800/hectare)

Land value was discussed with Mr. Len Driedger, who indicated the approximate value of agriculture land is \$8,000 per acre. This was reviewed and found to be reasonable.

The working corridors designated in the specifications shall be provided by the landowners, in the future, to allow access for the operation of equipment to carry out future maintenance of the drain.

SCHEDULE OF ALLOWANCES

Roll No.	Con.	Lot or Part	Owner	Land		Damages
730-00600	6	Pt Lot 20	D. & K. Driedger	0.2005 Ha	\$ 3,970.00	\$ 900.00
730-00500	6	Pt Lot 19	L. Driedger	0.0140 Ha	\$ 280.00	\$ 80.00
610-02905	NTR	Pt Lot 225	R. & L. Bailey	0.0102 Ha	\$ 200.00	-
610-02915	NTR	Pt Lot 225	E. Riedl	-	-	-
610-02910	NTR	Pt Lot 225	E. & D. Riedl	-	-	-
TOTALS -				0.2247	\$ 4,450.00	\$ 980.00

15.0 ESTIMATE OF COSTS

Our estimate of the total cost of the proposed work, including the cost of the engineer's report and all incidental expenses, is made up as follows:

CONSTRUCTION ITEMS

1. Open Drain Construction – Station 0+000 to 0+639

- a) Excavation of new drain from Station 0+000 to Station 0+639 along both banks of existing roadside drain on Road 6 including salvaging of existing topsoil and placing same on the new drain area, hauling and disposing of subsoil material. (approx. 1,900 m³) The work includes the removal of any brush and trees required to construct the new open drain and the disposal of those materials off-site. Relocate existing tile outlet pipes as required. **\$ 15,200.00**

- b) Supply and install a total of approximately 10 square metres of quarried rock protection at pipe ends at Station 0+000, approximately 300 mm in depth including all required excavation, disposal of surplus materials, and placement of geotextile non-woven filter fabric. **\$ 450.00**

- c) Supply and install a total of approximately 15 square metres of quarried rock protection at pipe ends at Station 0+483 approximately 300 mm in depth including all required excavation, disposal of surplus materials, and placement of geotextile non-woven filter fabric. **\$ 700.00**

d) Supply and place seeding and mulching of all excavated areas of new drain and buffer strip. (approx. 6,100 m ²)	\$ 4,600.00
Sub-Total for Item No. 1 -	\$ 20,950.00

2. Culvert No. 9 at Station 0+486, under Mersea Road 6

a) Excavate, remove and dispose of existing 300 mm diameter corrugated steel pipe approximately 10 metre long culvert, including end treatment and road asphalt.	\$ 500.00
b) Supply to site 14.0 metres of 600 mm H.D.P.E. pipe, 320 kPa and required couplers.	\$ 1,900.00
c) Supply 20-25mm clear stone material for pipe bedding, being approximately 5 tonnes.	\$ 150.00
d) Supply granular material including approximately 73 tonne of granular 'A' for pipe bedding and backfill to bottom of road base.	\$ 2,200.00
e) Supply 300 mm layer of granular 'A' material for road shoulders and road base, approximately 60 tonne	\$ 1,800.00
f) Supply labour and equipment to excavate for and install specified pipe including all drain excavation, compaction, disposal of surplus material and all drain bank and road restoration and bank seeding & mulching.	\$ 2,400.00
g) Supply and install a total of approximately 50 square metres (30 tonne) of quarried and graded erosion stone (150mm - 230mm) protection on the drain banks at both ends of culvert pipe, approximately 300mm in depth including all required excavation, disposal of surplus materials, and placement of Terrafix 270R or equal geotextile non-woven filter fabric.	\$ 2,200.00
h) Supply and place hot mix, hot laid asphaltic concrete 120mm thick.	\$ 1,050.00
Sub-Total for Item No. 2 -	\$ 12,200.00

3. Culvert No. 10 at Station 0+539.5, serving Roll No. 610-02915

- | | |
|--|--------------------|
| a) Excavate, remove and salvage of existing 450 mm diameter BOSS pipe 7 metre long access bridge, including quarried rock end treatment. | \$ 400.00 |
| b) Supply an additional 2.5 metres of 450 mm diameter Boss 2000 pipe and couplers, 320 kPa. Total length of new culvert to be 9.5 m. | \$ 250.00 |
| c) Supply 20-25mm clear stone material for pipe bedding, being approximately 3 tonnes. | \$ 100.00 |
| d) Supply granular material including approximately 16 tonne of granular 'B' for pipe bedding and backfill to bottom of road base. | \$ 400.00 |
| e) Supply 300 mm layer of granular 'A' material for road shoulders and road base, approximately 37 tonne | \$ 1,100.00 |
| f) Supply labour and equipment to excavate for and install specified pipe including all drain excavation, compaction, disposal of surplus material and all drain bank and road restoration and bank seeding & mulching. | \$ 1,100.00 |
| g) Supply and install a total of approximately 22 square metres (14 tonne) of quarried and graded erosion stone (150mm - 230mm) protection on the drain banks at both ends of culvert pipe, approximately 300mm in depth including all required excavation, disposal of surplus materials, and placement of Terrafix 270R or equal geotextile non-woven filter fabric. | \$ 1,000.00 |

Sub-Total for Item No. 3 -

\$ 4,350.00

4. Culverts at Hydro Poles – 8 Locations – Culverts 1 to 8

- | | |
|---|---------------------|
| a) Supply eight - 9.0 m lengths of 900 mm diameter Hel-Cor corrugated steel pipe 2.0 mm thick (14 gauge) wall thickness, aluminized steel Type II with 68 mm x 13 mm corrugations with rolled annular ends and required couplers. | \$ 15,700.00 |
| b) Supply 20-25mm clear stone material for pipe bedding, being approximately 32 tonnes. | \$ 1,130.00 |

c) Supply granular material including approximately 686 tonne of granular 'B' for pipe backfill up to bottom of granular 'A' surface layer.	\$ 17,150.00
d) Supply 300 mm layer of granular 'A' material for surface layer across existing ditch approximately 168 tonne	\$4,950.00
e) Supply labour and equipment to excavate for and install specified pipes including all drain excavation, compaction, disposal of surplus material and all drain bank and road restoration and bank seeding & mulching.	\$ 12,550.00
f) Supply and install a total of approximately 328 square metres (200 tonne) of quarried and graded erosion stone (150mm - 230mm) protection on the drain banks at both ends of culvert pipe, approximately 300mm in depth including all required excavation, disposal of surplus materials, and placement of Terrafix 270R or equal geotextile non-woven filter fabric.	\$ 14,600.00
Sub-Total for Item No. 4 -	\$ 66,080.00
5. Traffic Control during construction	\$ 4,000.00
Sub-Total for Item No. 5 -	\$ 4,000.00
6. Supply, install and maintain silt fence for duration of project.	\$ 1,000.00
Sub-Total for Item No. 6 -	\$ 1,000.00
SUB TOTAL FOR CONSTRUCTION	\$ 108,580.00
H.S.T. ON INCIDENTALS (1.76%) NET	\$ 1,920.00
TOTAL FOR CONSTRUCTION (including H.S.T.)	\$ 110,500.00
7. TOTALS FOR INCIDENTALS	
Allowances under Sections 29 - Land	\$ 4,450.00
Allowances under Sections 30 - Damages	\$ 980.00
Site meetings, survey, estimate, preliminary report, final report, specifications and drawings	\$ 6,850.00

Extra work requested by landowners	\$ 4,375.00
Tender the works	\$ 1,920.00
Contract Administration and Inspections	\$ 14,225.00
Contingency Allowance (if required)	\$ 1,750.00
<hr/>	
SUBTOTAL FOR INCIDENTALS – Item No. 7	\$34,550.00
H.S.T. ON INCIDENTALS (1.76%) NET	\$ 600.00
	<hr/>
TOTAL FOR INCIDENTALS	\$ 35,150.00
<hr/>	
TOTAL ESTIMATED COST	\$ 145,650.00

The estimate provided in this report was prepared according to current materials and installation prices as of the date of this report. In the event of delays from the time of filing of the report by the Engineer to the time of tendering the work, it is understood that the estimate of cost is subject to inflation. The rate of inflation shall be calculated using the Consumer Price Index applied to the cost of construction from the date of the report to the date of tendering.

16.0 PUBLIC UTILITIES & ROAD AUTHORITY – OPTION TO CONSTRUCT

It may become necessary to temporarily or permanently relocate utilities that may conflict with the construction recommended under this report. In accordance with Section 26 of the Drainage Act, we assess any relocation cost against the public utility having jurisdiction. Under Section 69 of the Drainage Act, the public utility is at liberty to do the work with its own forces, but if it should not exercise this option within a reasonable length of time, the Municipality will arrange to have this work completed and the costs will be charged to the appropriate public utility.

In accordance with Section 69 of “The Drainage Act, 1990” a public utility or road authority may exercise the option to carry out the construction work recommended on its right of way or near its utility with its own forces within a reasonable length of time and without unnecessary delay.

The Road Authority shall notify the Municipality within 28 days after receiving the notice of the meeting to consider the engineer’s report, if they intend to exercise the option to construct the road crossing beneath Mersea Road 6. Should the road authority not exercise its option within a reasonable time, the Municipality can arrange to have the road culvert replaced and the actual costs will be assessed to the road authority in accordance with Section 26 of “The Drainage Act, 1990”.

Hydro One shall notify the Municipality within 28 days after receiving the notice of the meeting to consider the engineer’s report, if they intend to exercise the option to construct the 8 Hydro

One culverts. Should Hydro One not exercise its option within a reasonable time, the Municipality can arrange to have the 8 Hydro One culvert constructed and the actual costs will be assessed to Hydro One in accordance with Section 26 of “The Drainage Act, 1990”.

17.0 ASSESSMENT SCHEDULE

We have assessed the estimated costs against the affected lands and road as listed in Schedule 'A' under "Value of Special Benefit," "Value of Benefit" and "Value of Outlet." Details of the “Benefit”, “outlet” and “Special Benefit” assessments listed in Schedule 'A' are described in the following section entitled “Assessment Rationale”.

The Special Benefit assessments shown in Schedule ‘A’ were derived as follows:

1. The cost of constructing the eight Hydro culverts at Stations 0+005, 0+067, 0+123, 0+192, 0+260, 0+323, 0+388 and 0+450 (Culverts No. 1 to 8) is estimated at \$67,240.00 including Net GST. This cost plus the associated portion of the cost of preparing this report and overhead costs in the amount of \$15,910.00 represents the total estimated cost of the construction of the 8 hydro culverts in the amount of \$83,150.00 . This amount is assessed 100% against the public utility as a **non-proratable Special Benefit assessment**. The actual amount of this Special Benefit assessment will be based upon the actual cost of this work plus \$15,910.00 .

Should the Ontario Hydro elect to construct the eight culverts at the existing hydro poles (Section 26.0 increased cost items) with their own forces, as per Section 69 of the Drainage Act, R.S.O., 1990, the utility company shall remain responsible for their allotment of costs for the preparation of this report and overhead costs in the amount of \$15,910.00 . Should the utility company elect not to undertake this work, the actual cost of constructing the eight culverts opposite each hydro pole, should be kept separate when tendering out the entire drainage works and be added to their allotment of costs for the preparation of this report and overhead costs in the amount of \$15,910.00 .

2. The cost of constructing the road crossing at Station 0+486 (Culverts No. 9) is estimated at \$12,410.00 including net GST. This cost plus the associated portion of the cost preparing this report and overhead costs in the amount of \$2,940.00 represents the total estimated cost of the construction of road crossing in the amount of \$15,350.00. This amount is assessed 100% against the road authority as a **non-proratable Special Benefit assessment**. The actual amount of this Special Benefit assessment will be based upon the actual cost of this work plus \$2,940.00 .

Should the Road Authority elect to construct the drainage works across their road right-of-ways (Section 26.0 increased cost items) with their own forces, as per Section 69 of the Drainage Act, R.S.O., 1990, the Road Authority shall remain responsible for their allotment of costs for the preparation of this report and overhead costs in the amount of \$2,940.00 . Should the Road Authority elect not to undertake this work, the actual

cost of the road culvert construction shall be kept separate when tendering out the entire drainage works and be added to their allotment of costs for the preparation of this report and overhead costs in the amount of \$2,940.00 .

3. The cost of replacing the access culvert at Station 0+539.5 (Culverts No. 10) is estimated at \$4,425.00 including Net GST. This cost plus the associated portion of the cost preparing this report and overhead costs in the amount of \$1,025.00 represents the total estimated cost of the access culvert replacement in the amount of \$5,450.00 . This amount is assessed 50% against the adjoining property served by this culvert and 50% against the upstream lands on an affected area basis and is included as part of the “Outlet” assessment against those properties. The assessments for this culvert are **proratable assessments**.

After assessing the part of the cost of the project that relates to the “Special Benefits” for the road crossing, the eight Hydro culverts, and Culvert No. 10 (Roll No. 610-02915), the remainder of the costs relating to drainage improvements and outlet liability for the access culvert, are assessed as “Benefit” assessments and “Outlet” assessments against the lands and road within the drainage area. Prior to prorating these costs against the properties shown in “Schedule A” the “Special Benefits” against Hydro One and Mersea Road 6 shall be removed from “Schedule A”. The “Special Benefit” against Roll No. 610-02915 for Culvert No. 10 shall remain in Schedule ‘A’ to be prorated with the other costs on the drainage project.

18 ASSESSMENT RATIONALE

18.1 General Information, Definitions and Authority to Assess Costs

Under the Drainage Act, assessments against individual properties are normally comprised of three (3) assessment components. These are “Benefit”, “Outlet” and “Special Benefit”.

The following terms related to assessments are defined and described in the Drainage Act as follows:

- Benefit – means the advantages to any lands, roads, buildings or other structures from the construction, improvement, repair or maintenance of a drainage works, such as will result in a higher market value or increased crop production or improved appearance or better control of surface or subsurface water or any other advantages relating to the betterment of lands, road, buildings or other structures.

Assessment for Benefit is provided for under Section 22 of the Act wherein 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.

- Outlet Liability – means the part of the cost of the construction, improvement or maintenance of a drainage works that is required to provide such outlet or improved outlet.

Assessment for Outlet Liability is provided for under Section 23(1) of the Act wherein 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. The assessment amount is provided for under Section 23(3) of the Act wherein the assessment for outlet liability shall be based upon the volume and rate of flow of the water artificially caused to flow upon the injured land or road or into the drainage works from the lands and roads liable for such assessments.

- Special Benefit – means 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.
- Public Utility – means a person having jurisdiction over any water works, gas works, electric heat, light and power works, telegraph and telephone lines, railways however operated, street railways and works for the transmission of gas, oil, water or electrical power or energy, or any similar works supplying the general public with necessities or conveniences.
- Road Authority – means a body having jurisdiction and control of a common or public highway or road, or any part thereof, including a street, bridge and any other structure incidental thereto and any part thereof.

Assessment to Road Authority is provided for under Section 26 of the Act wherein in addition to all other sums lawfully assessed against the property of a public utility or road authority under this Act, and notwithstanding that the public utility or road authority is not otherwise assessable under this Act, 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.

18.2 Determination of Assessments

For the purpose of preparing the Schedule of Assessment for this report the following criteria have been used:

The cost of performing the general drainage improvement items of work such as brushing, excavation of the drain, disposal of material, rock protection and seeding and mulching, and overhead costs are estimated at \$ 41,700.00 This amount is assessed as Benefit and Outlet assessments and is divided as 70% Benefit (\$29,200.00) and 30% Outlet (\$12,500.00). In addition, the 50% of the cost of the access culvert construction including overhead (\$2,725.00) is assessed as part of the Outlet assessments against the lands and road in the watershed.

- a) Total Value of Benefit for the Driedger Drain was calculated to be \$ 29,200.00 which sum was then assessed to all affected lands lying adjacent to the drain at an average rate of \$ 706.20 per hectare. The Benefit assessments are determined relative to our judgement and estimation of the amount of benefit that each property will actually receive by carrying out the recommended work.
- b) Total Value of Outlet for the Driedger Drain excluding the outlet assessments for the access culvert, was calculated to be \$ 12,500.00 which sum was then assessed to all affected lands situated within the drainage basin at an average rate of \$302.31 per equivalent hectare of agricultural land. The actual outlet assessment rate varies from \$ 233.43 to \$ 439.44 per equivalent agricultural hectare based on the location of each land parcel along the length of the Drain. Lands situated at the upper end of the drain will be assessed at the higher rates as they use more of the Drain. Also, the property land use will have an effect on storm runoff from the lands, therefore the equivalent agricultural rate is multiplied by 2 for residential lands and by 5 for roads.
- c) Special Benefit– The cost of performing special works to the drain that are required to service select properties are assessed to the individual property or properties for which the special works are provided.

In the case of the access bridge, the cost of improvements are assessed 50% (\$2,725.00) to the adjacent landowner as a Special Benefit and 50% (\$2,725.00) to the affected upstream landowners as Outlet assessments at a rate of \$ 108.97 per equivalent agricultural hectare.

Total Value of Special Benefit for the Drain was calculated to be \$ 101,225 which sum was assessed to affected lands as follows.

- Total of \$2,725.00 to Roll No. 6910-02915 for a replacement access culvert.
- Total of \$15,350.00 to Municipality of Leamington as the owner of Mersea Road 6 for the replacement of the road crossing.
- Total of \$83,150.00 against Hydro One for the construction of eight culverts to support hydro poles.

19.0 FUTURE MAINTENANCE

We recommend that future works of repair and maintenance on the Driedger Drain be carried out by the Municipality and that the costs be assessed against the affected lands and road in the Driedger Drain watershed in accordance with the provisions as described below using “Schedule A”. Future maintenance costs shall be levied pro rata on the affected lands and road that are located upstream of the future maintenance works.

We recommend that the costs of future works of repair and maintenance of the drain be as described below:

1. The Road crossing (Culvert No. 9) shall be maintained at the sole expense of the Road Authority.
2. The eight Hydro One culverts (Culverts Nos. 1 to 8) shall be maintained at the sole expense of the Public Utility.
3. The cost of maintaining Culvert No. 10, the access culvert, shall be assessed 50% against the property served by this culvert as a “Special Benefit”. The remaining 50% of the future maintenance costs for this culvert will be assessed against the upstream lands and road that drain through this culvert as “Outlet” assessments in proportion to the Outlet assessments shown in “Schedule A” for those properties upstream of the culvert.
4. All other work shall be assessed against the lands and road listed in Schedule “A” in the same relative proportions as the amounts listed under “Value of Benefit” and “Value of Outlet.” The “Special Benefit” assessments shall be deleted from the schedule prior to prorating the costs.

Furthermore, all of the above provisions for the future maintenance of this culvert shall remain as noted above until otherwise determined under the provisions of the ‘Drainage Act RSP 1990 Chapter D. 17’.

20.0 FISHERIES ISSUES

The Federal Fisheries Act requires that no deleterious substances be introduced to fish habitat and that there be no net loss of fish habitat as a result of any undertaking. Any activities that may introduce deleterious substances or result in loss of fish habitat may require a permit from the Minister of Fisheries, Oceans and the Canadian Coast Guard. To reduce administration and time spent evaluating relatively simple projects that have easily predicted impacts that are easily mitigated, the Department of Fisheries and Oceans Canada (DFO) has instituted a self-assessment process. This means that certain activities or activities within certain types of water bodies may be undertaken by the proponent without contacting DFO, provided that appropriate avoidance and mitigation measures are followed.

A self-assessment of the project has been completed. The DFO lists of types of water bodies and activities that do not require review by their office have been reviewed. The project activities and water bodies involved fall within those categories and this project can be self assessed. The Environmental Specifications attached to this report provides appropriate avoidance and mitigation measures for the Contractor to adhere to.

21.0 ENVIRONMENTAL IMPACT

The existing west drain bank is mainly grass covered. The east bank for most areas is covered in light to medium brush. Should repair work proceed it may be necessary to remove the existing vegetation and brush to permit construction of the works. Any areas disturbed by construction would be restored with new grass vegetation or quarried rock erosion protection. Implementation of silt devices will be required for any construction work to ensure that silt and suspended debris are not carried into the downstream watercourse.

During our survey and examination of the drain we did not observe any fish or wildlife; however, the drain banks undoubtedly provide cover and habitat for small animals. Disturbance of portions of the drain banks will be unavoidable, but would be kept to a minimum. The bank disturbance would also be of a temporary nature. It is not anticipated that any significant degradation of the local natural environment would result from the proposed repair options.

- Should an environmental impact assessment be requested, as per Section 6 of the Drainage Act, this assessment would be paid for by the requesting party.
- ERCA has been notified of the proposed works (see attached response from ERCA).

22.0 GRANTS

In accordance with the provisions of Sections 85, 86 and 87 of the Drainage Act, a grant in the amount of 33–1/3 percent of the assessment eligible for a grant may be made in respect to the assessment made under this report upon privately owned lands used for agricultural purposes. The assessments levied against privately owned agricultural land must also satisfy all other eligibility criteria set out in the Agricultural Drainage Infrastructure Program policies. Most of the privately owned lands are used for agricultural purposes and are eligible under the A.D.I.P. policies. We are not aware of any lateral drains involved in this work that would not be eligible for a grant. We recommend that application be made to the Ontario Ministry of Agriculture and Food in accordance with Section 88 of the Drainage Act, for this grant, as well as for all other grants for which this work may be eligible.

23.0 ORDER OF PROCEDURE UNDER THE DRAINAGE ACT – SECTION 4

The following is the general order of procedure that is followed in order to establish a Municipal Drainage System after a petition is presented to the Municipality, pursuant to Section 4 of the Drainage Act.

- a) Council accepts petition.
- b) Council appoints an Engineer.
- c) Engineer conducts on site meeting.
- d) Engineer determines sufficiency of the petition.
- e) Need for preparation of Preliminary Report is decided.
- f) Engineer completes and provides Preliminary Report if required.
- g) Council considers Preliminary Report at a public meeting with affected landowners.
- h) At the meeting to consider the Preliminary Report Council gives opportunity to any person who signed the petition to withdraw his signature and Council also gives opportunity to any person owning land in the area requiring drainage to sign the petition if they had not already done so. If at the end of the meeting the petition does not contain a sufficient number of names the process stops and

the original petitioners are charged the cost to date. If at the end of the meeting the petition contains a sufficient number of names the Council may instruct the Engineer to prepare a final report.

- i) The engineer prepares Final Report and provides copy to Municipality.
- j) Council considers Final Report at a public meeting with the affected landowners.
- k) At the meeting to consider the final report Council again gives opportunity to have names deleted or added to the petition, as per the procedures described in (h) above. The process stops if the petition is not sufficient. If the petition is sufficient the Council may adopt the Drainage Report. If adopted the Municipal Clerk prepares a provisional by-law for the recommended work and sends copies of the by-law to affected parties and arranges for a further meeting of Council for the Court of Revision.
- l) The Court of Revision is held at a subsequent meeting with the affected landowners to discuss any disputes regarding assessment of cost to lands and roads.
- m) Council passes by-law for construction of the work after statutory waiting periods and appeal periods expire.
- n) Tenders are received by the Municipality to perform the recommended work and construction is carried out. Inspection of the construction work may be provided by the Town Drainage Superintendent or by an inspector from the engineering office.
- o) Upon completion of construction the Municipal Clerk will finalize all applicable costs and submit grant applications to the Ministry of Agriculture, Food and Rural Affairs, if applicable. The clerk will then send a final net assessment to the affected landowners.

All of which is respectfully submitted.

RC SPENCER ASSOCIATES INC.


Lou Zarlenga, P.Eng.



REVIEWED BY


Dennis McCready, P.Eng.



APPENDIX 'A'

SCHEDULES OF ASSESSMENT

**FOR THE
REPAIR AND IMPROVEMENT
OF THE
DRIEDGER DRAIN**

**IN THE
MUNICIPALITY OF LEAMINGTON
COUNTY OF ESSEX**

**SCHEDULE A
SCHEDULE OF ASSESSMENT
DRIEDGER DRAIN**

MUNICIPALITY OF LEAMINGTON

A) MUNICIPAL LANDS								
ENTRY NO.	DESCRIPTION	HECTARES OWNED (Ha)	AFFECTED AREA (Ha)	OWNER	(SECTION 22) VALUE OF BENEFIT	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
1	Mersea Road 6	N/A	1.450	Municipality of Leamington	\$ 11,680.00	\$ 2,898.00	\$ 15,350.00	\$ 29,928.00
Total Affected Lands (Hectares)			1.450					
Total Assessment on Municipal Lands					\$ 11,680.00	\$ 2,898.00	\$ 15,350.00	\$ 29,928.00

B) PRIVATELY OWNED - NON-AGRICULTURAL LANDS										
ENTRY NO.	ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	HECTARES OWNED (Ha)	AFFECTED AREA (Ha)	OWNER	(SECTION 22) VALUE OF BENEFIT	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
2	-	-	-	N/A	0.000	Ontario Hydro	\$ -	\$ -	\$ 83,150.00	\$ 83,150.00
3	610-02910	NTR	Part Lot 225	0.355	0.355	Erwin & Debbie Riedl	\$ 730.00	\$ 345.00	\$ -	\$ 1,075.00
4	610-02915	NTR	Part Lot 225	0.355	0.355	Erwin Reidl	\$ 730.00	\$ 282.00	\$ 2,725.00	\$ 3,737.00
5	610-03005	NTR	Part Lot 225	0.560	0.560	James & Maria Greenside	\$ 1,460.00	\$ 349.00	\$ -	\$ 1,809.00
Total Affected Lands (Hectares)					1.270					
Total Assessment on Privately Owned Non-Agricultural Lands (Not Grantable)							\$ 2,920.00	\$ 976.00	\$ 85,875.00	\$ 89,771.00

C) PRIVATELY OWNED - AGRICULTURAL LANDS (GRANTABLE)										
ENTRY NO.	ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	HECTARES OWNED (Ha)	AFFECTED AREA (Ha)	OWNER	(SECTION 22) VALUE OF BENEFIT	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
6	610-02905	NTR	Part Lot 225	19.080	0.375	Ronald & Lynda Bailey	\$ 730.00	\$ 88.00	\$ -	\$ 818.00
7	730-00100	6	Part Lot 19	5.585	5.385	Jim & Christine Tiessen	\$ 1,170.00	\$ 1,844.00	\$ -	\$ 3,014.00
8	730-00300	6	Part Lot 19	24.686	8.023	JN Driedger Farms	\$ 1,750.00	\$ 2,747.00	\$ -	\$ 4,497.00
9	730-00500	6	Part Lot 19	37.636	15.995	Leonard Driedger	\$ 7,300.00	\$ 4,606.00	\$ -	\$ 11,906.00
10	730-00600	6	Part Lot 20	38.445	8.850	Dennis & Karen Driedger	\$ 3,650.00	\$ 2,066.00	\$ -	\$ 5,716.00
Total Affected Lands (Hectares)					38.628					
Total Assessment on Privately Owned Agricultural Lands (Grantable)							\$ 14,600.00	\$ 11,351.00	\$ -	\$ 25,951.00

TOTAL ASSESSMENT FOR SCHEDULE A (SECTIONS A, B & C)	\$ 29,200.00	\$ 15,225.00	\$ 101,225.00	\$ 145,650.00
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TOTAL LANDS AFFECTED (Ha)	
A) Municipal Lands	1.450
B) Non-Agricultural Lands	1.270
C) Agricultural Lands	38.628
Total Lands Affected:	41.348

NOTE: Assessment Values have been rounded to the nearest whole dollar for presentation purposes.

1 Hectare = 2.471 Acres

APPENDIX 'B'

SPECIAL PROVISIONS AND SPECIFICATIONS

**FOR THE
REPAIR AND IMPROVEMENT
OF THE
DRIEDGER DRAIN**

**IN THE
MUNICIPALITY OF LEAMINGTON
COUNTY OF ESSEX**

SPECIAL PROVISIONS

1.0 GENERAL SPECIFICATIONS

The General Specifications attached hereto are part of Appendix 'B'. It forms part of this specification and is to be read with these specifications and the Drawings contained in the report. Where there is a difference between the requirements of the Special Provisions and the General Specifications, the Special Provisions shall take precedence.

2.0 DESCRIPTION OF WORK

- a) Excavation of new drain from Station 0+000 to Station 0+639 along both banks of existing roadside drain on Road 6 including salvaging of existing topsoil and placing same on the new drain area, hauling and disposing of subsoil material. (approx. 1,900 m³) The work includes the removal of any brush and trees required to construct the new open drain and the disposal of those materials off-site.
- b) Supply and install a total of approximately 10 square metres of quarried rock protection at pipe ends at Station 0+000, approximately 300 mm in depth including all required excavation, disposal of surplus materials, and placement of geotextile non-woven filter fabric.
- c) Supply and install a total of approximately 15 square metres of quarried rock protection at pipe ends at Station 0+483 approximately 300 mm in depth including all required excavation, disposal of surplus materials, and placement of geotextile non-woven filter fabric.
- d) Supply and place seeding and mulching of all excavated areas of new drain and buffer strip. (approx. 6,100 m²)
- e) The removal and reconstruction of the existing road crossing at Station 0+486 (Culvert No. 9) including granular bedding and backfill, asphalt repair and rip-rap end treatment.
- f) The removal, salvage and reconstruction of the existing access culvert at Station 0+539.5 (Culvert No. 10) including granular bedding and backfill, road surface repair and rip-rap end treatment.
- g) The construction of eight culverts opposite eight existing hydro poles (Culverts No. 1 to 8) including supply of pipe, granular 'B' bedding and backfill, and granular 'A' surface layer.
- h) Traffic control.
- i) Silt control.

3.0 ACCESS TO THE WORK

Access to the drain shall be from Mersea Road 6. Through traffic must be maintained at all times along all municipal roads. All required traffic control is as per Section 8 in the General Specifications. The Contractor shall make his/her own arrangements for any additional access for his/her convenience. All road areas and grass lawn areas disturbed shall be restored to original conditions at the Contractor's expense.

4.0 WORKING AREA

From Station 0+000 to Station 0+486, the designated working area on the private lands north of the drain shall be restricted to a working corridor having a width of 10 m plus a 3 m width for the new buffer strip, as measured from the top of the finished north bank of the drain.

From Station 0+486 to Station 0+639, shall be located on the road property and shall be designated in the field by the Drainage Superintendent in consultation with the Road Superintendent.

Any damages to lands and/or roads from the Contractor's work shall be rectified to pre-existing conditions at the Contractor's expense.

5.0 EXCAVATION AND DISPOSAL OF EXCAVATED MATERIAL

Topsoil removed from the site shall be salvaged and spread on the new drain banks prior to seeding. All excavated subsoil material shall become the property of the contractor who shall load, haul and dispose of the excess excavated material off-site.

In all cases, the Contractor shall use the benchmarks to establish the proposed grade. However, for convenience, the drawings provide the approximate depth from the surface of the ground and from the existing drain bottom to the proposed grades. **THE CONTRACTOR SHALL NOT EXCAVATE DEEPER THAN THE GRADELINES SHOWN ON THE DRAWINGS.** Should over-excavation of the drain bank occur, the Contractor will **not** be permitted to repair with native material packed into place by the excavator and reshaped. Should over-excavation occur, the Contractor will be required to have a bank repair detail engineered by a Professional Engineer (hired by the Contractor), to ensure long term stability of the bank is maintained. Such repairs shall be subject to approval by the Engineer and will be at no extra cost to the item.

Seeding of the disturbed drain banks shall be completed immediately following drain construction and as specified in Section 8.

All excavation work shall be done in such a manner as to not harm any vegetation or trees, not identified in this report or by the Drainage Superintendent for clearing. Any damages to trees or vegetation caused by the Contractors work shall be rectified to the satisfaction of the Drainage Superintendent.

The Contractor shall exercise caution around existing tile inlets and shall confirm with the property owners that all tiles have been located and tile ends repaired as specified.

6.0 CULVERT CONSTRUCTION

6.1 Location of Access Culvert

In general, the new access culvert (Culvert No. 10) shall be installed as shown on the drawings attached to the engineer's report. Prior to installation, the Contractor shall contact the Drainage Superintendent to confirm the exact location for the new culvert. The Drainage Superintendent, in consultation with the property owner, shall establish the exact location for the new culvert in the field.

The new road culvert (Culvert No. 9) and the Hydro One culverts (Culverts 1 to 8) shall be installed as shown on the drawings attached to the engineer's report.

6.2 Reference specifications

Materials shall be as follows:

Hydro One Culverts (Culverts No. 1 to 8)

Each culvert shall consist of a 9 m length of 900 mm diameter CSP with a corrugation profile of 68 mm x 13 mm and a minimum metal thickness of 2.0 mm.

All CSP materials shall be aluminized (Type II) steel with rerolled ends. The access culvert construction must conform to OPSS 421(Construction) and 1801(Materials). New culvert shall be joined with annular aluminized corrugated wide bolt and angle couplers (minimum of 8 corrugation overlap and 2.0mm wall thickness) and no single pipe less than 6.0m in length. All pipes connected with couplers shall abut to each other with no more than a 25mm gap between pipes prior to installation of the coupler.

Road Crossing (Culvert No. 9)

The road crossing shall consist of a 14 m length of 600 mm diameter H.D.P.E. pipe. The pipe shall be Boss 2000 pipe with a minimum strength of 320 kPa or approved equal. Install pipe according to OPSS standards and the manufacturer's recommendations.

Access Culvert Pipe Material (Culvert No. 10)

The access culvert shall have a total length of 9.5 m. It shall consist of 450 mm diameter H.D.P.E. pipe. The pipe shall be Boss 2000 pipe with a minimum strength of 320 kPa or approved equal. Install pipe according to OPSS standards and the manufacturer's recommendations. The existing access culvert can be salvaged and reused if it meets the specifications and is in good, undamaged condition, otherwise new materials shall be provided by the contractor.

Bedding Below Pipe Invert

20-25mm clear stone conforming to OPSS Division 10.

Bedding and Backfill Material for Hydro Culverts (Culverts Nos. 1 to 8)

Granular 'B' conforming to OPSS Division 10, up to the bottom of the 300 mm layer of Granular A surface material.

Bedding and Backfill Material for Road Culvert (Culvert No. 9)

Granular 'A' made from crushed limestone conforming to OPSS Division 10.

Bedding and Backfill Material for Access Culvert (Culvert No. 10)

Granular 'B' made from crushed limestone conforming to OPSS Division 10.

Driveway Surface

Granular 'A' made from crushed limestone conforming to OPSS Division 10. Minimum 300mm thickness.

Erosion Stone for Sloping End Protection

All stone to be used for erosion protection shall be 125-250mm clear quarried rock or OPSS 1004, minimum 300mm thickness.

Topsoil

Topsoil conforming to OPSS, 100mm thickness.

Select Native Material

Select earth material, dry, free from broken concrete, steel, wood and deleterious substances.

Filter Fabric

"Non-Woven" geotextile filter fabric with a minimum strength equal to or greater than Terrafix 270R, Amoco 4546, Mirafi 140NC or approved equivalent.

6.3 Dry Culvert Installation

Suitable dykes shall be constructed in the drain so that the installation of the pipe can be accomplished in the dry. The drain bottom shall be cleaned, prepared, shaped and compacted to suit the new culvert configuration, as shown on the drawings. Granular materials shall be compacted to 100% of their maximum dry density.

6.4 Sloping Stone End Protection

Endwalls shall be constructed of quarry stone rip rap material, as shown on the Drawings. Each endwall shall extend from the invert of the new culvert to the top of the proposed lane. The endwalls shall be sloped to a minimum of 1 vertical to 1.5 horizontal unless stated otherwise with a filter fabric underlay surrounding the pipe and spanning across the entire width of the drain, wrapping around the drain banks to align with the ends of the new pipe culvert. The minimum thickness requirement of the erosion stone layer is 300mm with no portion of the filter fabric to be exposed to sunlight.

6.5 Lateral Tile Drains

Should the Contractor encounter any lateral tiles within the proposed culvert limits as shown and also those not shown on the attached drawings, the Contractor shall re-route the outlet tile drain(s) in consultation with the Drainage Superintendent, as required, to accommodate the new culvert. **Tile drain outlets through the wall of the new culvert pipe will not be permitted.** All costs associated with re-routing lateral tile drains (if any) shall be at the Contractor's expense.

6.6 Asphalt Pavement Restoration

Asphalt roads shall be constructed as follows:

- 40 mm HL3 surface asphalt
- 80 mm HL4 base asphalt (two 40 mm lifts)

Final restoration of the asphalt road surface must be restored to the approved surface following the completion of the road crossing, as approved by and to the satisfaction of the Road Superintendent.

The Contractor shall saw-cut the asphalt pavement prior to removal of the existing culvert taking precautions not to undermine the adjoining pavement structure. Mill top layer into existing asphalt minimum 25 mm deep, 600 mm wide across the entire road surface at all saw-cuts (full road width). Where the pavement and underlying granular base is disturbed by the culvert replacement work, the Contractor shall be required at his/her own expense to saw-cut the asphalt pavement surface a minimum 300 mm beyond the disturbed portion prior to milling the 600 mm wide transition strips and repaving. The new asphalt shall be hot in place HL4 asphalt mix in two 40 mm lifts for the base course rolled and compacted to minimum 98% of the Marshall Density followed by HL3 grade asphalt for the surface course in one lift of 40 mm compacted to minimum 98% of the Marshall Density. Any road line painting removed by the pavement operations shall be restored on the new pavement surface.

7.0 STONE EROSION PROTECTION (SEP)

The Contractor shall supply and install the required quantities of graded stone rip-rap erosion protection materials where specified at the outlets of four tile drains outletting

into the open drain at Stations 0+001, 0+480, and two drains at 0+483. All stone to be used for erosion protection shall be 125 - 250 mm clear **quarried rock** or OPSS 1001 placed over a non-woven filter fabric Terrafix 270R or approved equivalent. **Concrete rip-rap will not be permitted.**

The minimum thickness requirement of the erosion stone layer is 300 mm with no portion of the filter fabric to be exposed. All work must be completed to the satisfaction of the Drainage Superintendent.

8.0 BUFFER STRIP

From Station 0+000 to Station 0+486, a 3.0 m wide buffer strip will be established along the north side of the drain starting at the top of the finished north bank. Seeding shall be carried out in accordance with the following **Section 9.0**.

9.0 SEEDING

The disturbed grassed areas resulting from the new drainage works, as well as, the disturbed or newly excavated drain banks and the new buffer strip, shall be seeded and mulched as specified herein. The existing ground surface to be seeded shall be loosened to a depth of 25 mm and shall be rendered uniformly loose for that 25 mm depth. The surface shall be predominantly fine and free from weeds and other unwanted vegetation. All other loose surface litter shall be removed and disposed of.

Grass seed shall be Canada No. 1 grass seed mixture meeting the requirements of a Waterway Slough Mixture as supplied by Growmark or approved equal, as follows:

<i>Creeping Red Fescue</i>	20%
<i>Meadow Fescue</i>	30%
<i>Tall Fescue</i>	30%
<i>Timothy</i>	10%
<i>White Clover</i>	10%

Bags shall bear the label of the supplier indicating the content by species, grade and mass. Other grass seed mixtures will be considered with approval of Engineer and Drainage Superintendent. Seed shall be applied at a rate of 200 kg per 10,000 m². Fertilizer shall be 8-32-16 applied at 350 kg per 10,000 m². It shall be in granular form, dry, free from lumps and in bags bearing the label of the manufacturer, indicating mass and analysis. Seeding and mulching shall be in accordance with OPSS specifications

The seeding shall be deemed "Completed by the Contractor" when the seed has established in all areas to the satisfaction of the Engineer. Re-seeding and/or other methods required to establish the grass will be given consideration to achieve the end result and the costs shall be incidental to the works.

10.0 SILT CONTROL

The contractor shall supply, install, maintain and remove a temporary water permeable filter fence (silt fence) to remove suspended particulars from the water passing through it. At the commencement of construction, the contractor shall install a silt fence across the outlet of the drain. The silt fence shall be constructed of a minimum 1.0 m wide geotextile securely fastened to steel posts. The geotextile shall be attached to the up-gradient side of the posts. Where required, wire or any other type of support may be constructed between the geotextile and the posts in order to improve the load carrying capacity of the silt fence. The geotextile may be a woven or a non-woven material that has a minimum tensile strength of 100 lbs., permittivity of at least 90 gal/min/ft² and an apparent opening size of US Sieve No. 30.

Steel posts of sufficient strength to support the silt fence shall be used. The maximum post spacing shall be approximately 2 m. Every effort must be made to ensure that the bottom edge of the silt fence is in continuous contact with the bottom of the channel.

The silt fence shall remain in place until the project is complete. The contractor shall maintain the silt fence until it is removed. Upon removal, the silt accumulation upstream of the fence shall also be removed. The cost of supply, installation, maintenance and removal of the silt fence shall be included in the Lump Sum price bid for this item.

11.0 ENDANGERED SPECIES ACT REQUIREMENTS

A copy of an “Agreement under the Endangered Species Act” dated June 29, 2010 is available for review at the Municipality of Leamington’s office. The contractor shall comply with the requirements of the “Mitigation Plan” and the mitigation measures contained in that document.

GENERAL SPECIFICATION FOR OPEN DRAINS

(Revised 2016 11 25)

SECTION 1 - AGREEMENT AND GENERAL CONDITIONS

- (1) Payment for the work shall be on a lump sum basis unless otherwise indicated. The Contractor agrees to enter into a formal contract with the Municipality upon acceptance of the tender. The General Conditions of the contract shall be those of the Stipulated Price Contract CCDC2-Engineers, 2008 or the most recent revision of this document. The form of agreement between Owner and Contractor shall be that of the previously stated document or a form of agreement specifically prepared by the Municipality for this purpose.
- (2) All work shall be in first class condition, comply fully with the report, Special Provisions, General Specifications and the Drainage Act, and be carried out to the satisfaction and approval of the Drainage Superintendent for the Municipality. Upon completion of the project, the work will be inspected by the Engineer and the Drainage Superintendent. Any deficiencies noted during the final inspection shall be immediately rectified by the Contractor. Final inspection will be made by the Engineer within 20 days after the Drainage Superintendent has received notice in writing from the Contractor that the work is completed, or as soon thereafter as weather conditions permit.
- (3) The Contractor shall complete all work on or before the date fixed at the time of tendering. The Contractor will be held liable for any damages or expenses occasioned by his/her failure to complete the work on time and for any expenses of inspection, superintending, re-tendering or re-surveying, due to their neglect or failure to carry out the work satisfactorily or in a timely manner. Any such expenses or damages may be deducted by the Drainage Superintendent from the amount of the contract or may be recovered by the Municipality from the Contractor and his sureties.
- (4) The Contractor shall be required to submit to the Municipality a Certificate of Good Standing from the Workplace Safety and Insurance Board prior to the commencement of the work and the Contractor shall be required to submit to the Municipality a Certificate of Clearance for the project from the Workplace Safety and Insurance Board before final payment is made to the Contractor.
- (5) The Contractor shall keep the work under his/her personal control, and shall not assign, transfer, or sublet any portion without first obtaining the written consent of the Municipality.

SECTION 2 - EXAMINATION OF SITE, PLANS AND SPECIFICATIONS

- (1) Each tenderer must visit the site and review the plans and specifications before submitting his tender and must satisfy himself as to the extent of the work and local conditions to be met during the construction. He is not to claim at any time after submission of his tender that there was any misunderstanding of the terms and conditions of the contract relating to site conditions. The Contractor will be at liberty, before bidding, to examine any data in the possession of the Municipality or of the Engineer.
- (2) The quantities shown or indicated on the drawings or in the report are estimates only and are for the sole purpose of indicating to the tenderers the general magnitude of the work. The tenderer is responsible for checking the quantities for accuracy prior to submitting his tender.

SECTION 3 - CONTRACTOR'S LIABILITY

- (1) The Contractor, his/her agents and all workmen or persons under his control including sub-contractors, shall use due care that no person or property is injured and that no rights are infringed in the prosecution of the work. The Contractor shall be solely responsible for all damages, by whomsoever claimable, in respect to any injury to persons or property of whatever description and in respect of any infringement of any right, privilege or easement whatever, occasioned in the carrying on of the work, or by any neglect on the Contractor's part.
- (2) The Contractor, shall indemnify and hold harmless the Municipality and the Engineer, their agents and employees from and against claims, demands, losses, costs, damages, actions, suits, or proceedings arising out of or attributable to the Contractor's performance of the contract.

SECTION 4 – ONTARIO PROVINCIAL STANDARDS

- (1) Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD) shall apply and govern at all times unless otherwise amended or extended in these Specifications or on the Drawing. Access to the electronic version of the Ontario Provincial Standards is available online through the MTO website, free of charge to all users. To access the electronic standards on the Web go to <http://www.mto.gov.on.ca/english/transrd/>. Under the title Technical manuals is a link to the Ontario Provincial Standards. Users require Adobe Acrobat to view all pdf files.

SECTION 5 – APPROVALS, PERMITS AND NOTICES

- (1) The construction of the works and all operations connected therewith are subject to the approval, inspection, by-laws and regulations of all Municipal, Provincial, Federal and other authorities having jurisdiction in respect to any matters embraced in this Contract. The Contractor shall obtain all approvals and permits and notify the affected authorities when carrying out work in the vicinity of any public utility, power, underground cables, railways, etc.

SECTION 6 – NOTIFICATION OF WORK

- (2) Prior to commencing any work of installing any new bridge or removing any existing structures, the Contractor shall inform the Municipal Drainage Superintendent of his intent to commence work at least 48 hours prior to commencing any work. The Owner or Contractor shall endeavor to install and complete the new structure without delay once the work has commenced. If for any reason the work does not proceed continuously then the Owner or Contractor shall notify the Drainage Superintendent in advance of any backfilling operation or headwall construction so that he may schedule inspection of same.

SECTION 7 – CONSTRUCTION SAFETY

- (1) The Contractor shall comply with all the requirements of the Occupational Health and Safety Act, 2013, and the regulations passed in connection therewith, as administered by the Ontario Ministry of Labour and all subsequent amendments of the said Act.
- (2) The Contractor shall exercise all possible precaution against injury to persons or property resulting from his work. The Contractor shall leave no trenches, pits, holes or excavations uncovered, without providing sufficient protection at all times. The Contractor shall install, erect and provide barricades, signs, traffic cones, flashers, lights, plates, warning and other devices, materials and personnel as may be required at his own expense in order to provide for the safe passage and control of traffic and to ensure public safety. All traffic control shall be in accordance with the latest standards of the Ministry of Transportation.

SECTION 8 – TRAFFIC CONTROL

- (1) The Contractor shall not perform excavation operations from the travelled portion of the roadway nor close a road or reduce the width or number of traffic lanes available for traffic except as specified in the contract documents or approved by the Engineer.
- (2) The Contractor will be required to control vehicular and pedestrian traffic along roads at all times and shall, at his/her own expense, provide for placing and maintaining such barricades, signs, flags, lights and flag persons as may be required to ensure public safety. The Contractor will be solely responsible for controlling traffic and shall appoint a representative to maintain the signs and warning lights at night, on weekends and holidays and at all other times that work is not in progress. The costs associated with provision of proper signage, barricades, lights and flag persons shall be considered incidental to the works to remove the old bridge and complete the new bridge installation.
- (3) **During all phases of the project, adjoining public roadways shall remain open to through traffic with at least one lane being open to through traffic at all times.**
- (4) All traffic control during construction shall be strictly in accordance with the **Occupational Health and Safety Act** and the current version of the **Ontario Traffic Manuals**. Access to the electronic version of the **Ontario Traffic Manual** is available online through the MTO website, free of charge to all users. To access the electronic standards on the Web go to <http://www.mto.gov.on.ca/english/transrd/>, click on "Library Catalogue", under the "Title", enter "Ontario Traffic Manual" as the search. Open the applicable "Manual(s)" by choosing the "Access Key", once open look for the "Attachment", click the PDF file. Users require Adobe Acrobat to view all PDF files.
- (5) **Contractors are reminded of the requirements of the Occupational Health and Safety Act pertaining to Traffic Protection Plans for workers and Traffic Control Plan for Public Safety.**

SECTION 9 – GENERAL CO-ORDINATION

- (1) The Contractor shall be responsible for the coordination between the working forces of other organizations and utility companies in connection with this work. The Contractor shall have no cause of action against the Municipality or the Engineer for delays based on the allegation that the site of the work was not made available to him by the Municipality or the Engineer by reason of the acts, omissions, misfeasance or non-feasance of other organizations or utility companies engaged in other work.

SECTION 10 – STATIONS AND BENCHMARKS

- (1) Reference Stations measured in meters, are indicated on the drawings and represent stations along the course of the work. Stationing is shown along the profile at 25 m intervals numbered consecutively, 0+000, 0+025, 0+050, 0+075, etc. Where cut depths are shown on the profile, they represent the approximate depth, in meters, of the finished drain as measured from the surface of the ground to the design gradeline for the bottom of the open drain. Where excavation depths are shown on the profile, they represent the approximate depth, in meters, from the existing drain bottom down to the design gradeline for the bottom of the open drain.
- (2) The Contractor will be held responsible during the progress of the work for the preservation of all reference stakes, bench marks and survey markers which fall within the limits of the work. The cost of replacing any bench mark or survey marker defaced or destroyed by the Contractor as a result of his work will be deducted from any monies due the Contractor.

SECTION 11 - ALIGNMENT

- (1) Except where specified otherwise, the excavation will follow as nearly as possible the course of the existing drain with sloping and widening carried out on each bank as required to produce the specified cross-section. Wherever sharp or irregular bends occur, all sloping and widening is to be done on that side of the drain that will tend to reduce the curve and improve the alignment of the channel.
- (2) Where one drain bank adjoins the travelled part of any roadway or laneway, all sloping and widening is to be done on that side of the drain farthest from the roadway unless otherwise directed by the Engineer.
- (3) Where the drain bank adjoins an existing fence which is not specified for removal or relocation all required sloping and widening shall be carried out on that side of the drain farthest from the fence.
- (4) Where a drain is to be moved off a road allowance and onto adjoining lands, the top edge of the nearest finished drain bank is to be not closer than 1 metre to the limit of the road allowance or top edge of the abandoned channel. The centreline of the new channel is to be as straight as possible even though this 1 metre dimension is exceeded in places.
- (5) Where a new drain is constructed, its centre line will be as straight as possible and any changes in direction shall be in the form of smooth, regular bends.
- (6) Where a new drain is to be constructed adjoining an existing fence line, the Contractor shall lay out a suitable centre line such that the top edge of the adjacent drain bank, at its widest point, will not be closer than 1 metre to the fence and the Contractor shall use this centre line to establish the drain location.
- (7) The Contractor must lay out the proposed centre line in the field for approval by the Drainage Superintendent prior to construction.

SECTION 12 - PROFILE

- (1) The excavation of the drain must be at least to the depth intended by the grade line shown on the Profile, which grade line is governed by the bench marks. The Profile shows, for the convenience of the Contractors and others, the approximate depth of excavation from the surface of the ground to the final invert of the channel in metres and decimals of a metre and also the approximate depth of excavation from the bottom of the existing channel to the final invert of the channel. Bench marks, which have been established along the course of the drain, shall govern the final elevation of the drain. The location and elevation of the bench marks are shown on the Drawings.

SECTION 13 - BOTTOM WIDTH AND SIDE SLOPES

- (1) The bottom widths and the side slopes of the various sections of the finished drain are to be true to line and grade as shown on the Profile.
- (2) Contractors will not be restricted to the exact dimensions specified but must excavate clear of the specified cross-sections and may excavate such additional depth or width as may be required to accommodate the use of suitable excavating equipment or to allow for minor sedimentation prior to final inspection provided that at no place are the side slopes of the excavation to be cut steeper than the slope specified on the Profile. The Contractor is not to excavate the drain bottom so much deeper than the grade line as to result in the formation of pockets in the drain bottom that will cause water to stand in pools along the drain. Should over-excavation of the drain bank occur, the Contractor will **not** be permitted to repair with native material packed into place by the excavator and reshaped. Should over-excavation occur, the Contractor will be required to have a bank repair detail engineered by a Professional Engineer (hired by the Contractor), to ensure long term stability of the bank is maintained. Such repairs shall be subject to approval by the Engineer and will be at no extra cost to the item.

SECTION 14 - OBSTRUCTIONS

- (1) All brush, timber, logs, stumps, stones, or other obstructions encountered within the limits of the channel along the course of the drain are to be removed by the Contractor. Timber, logs and stumps are to be dealt with in the same manner as specified for brush and trees. Large stones and other similar materials are to be piled near the limit of the spread area so as not to interfere with the spreading of the excavated material. The disposal of this material shall be the owner's responsibility.

SECTION 15 - BRUSH AND TREES

- (1) Brushing shall be carried out on the entire drain within the above identified sections of the drain where required and as specified herein. **All** brush and trees located within the drain side slopes shall be cut parallel to the side slopes, as close to the ground as practicable. Tree branches that overhang the drain shall be trimmed. Small branches and limbs are to be disposed of by the Contractor along with the other brush. Tree stumps, where removed to facilitate the drain excavation and reshaping of the drain banks, may be burned by the Contractor where permitted; otherwise, they shall be disposed of, off the site. All thorn trees shall be disposed of off-site.
- (2) Where the existing bottom widths and side slopes of the drain are sufficient to permit the specified deepening of the drain without disturbing the existing banks above the present drain bottom, the Contractor will be required to cut the brush and trees on the sloping banks flush with the surface of the banks but he will not be required to remove their roots and stumps unless they will obviously create obstructions to the flow of water in the drain.
- (3) Where it is necessary to widen the drain and excavate material from the sloping banks, all brush and trees within the limits of the channel and within 1 metre of the top of the drain banks and within the spread area are to be cut and those roots and stumps in the drain bottom and on the banks where the widening takes place shall be completely removed unless the Drainage Superintendent permits the Contractor to cut the roots and stumps flush with the surface of the finished banks.
- (4) The Contractor shall make every effort to preserve mature trees which are beyond the drain side slopes, and the working corridors. If requested to do so by the Drainage Superintendent, the Contractor shall preserve certain mature trees within the designated working corridors.
- (5) Where there is a fence adjoining the drain, he will be required to cut the brush in the fence line and on the side of the fence opposite the drain only if the excavating equipment will be operated from this side or excavated material is to be placed and levelled on this side.
- (6) The Contractor shall cut off flush with the ground all brush and trees having a diameter of 150 mm or less from the disposal area. Should the Contractor find it necessary to remove trees having a diameter of 150 mm or larger from the disposal area in order to permit the efficient excavation of the drain or spreading of excavated material, he will be at liberty to do so only on permission of the Drainage Superintendent in charge of the work.
- (7) All trees over 200 mm in diameter that are cut are to be trimmed of branches, and the trunks, along with branches over 200 mm in diameter, are to be cut up into log lengths and piled for the use of the adjoining owner unless the owner advises the Drainage Superintendent he does not want them, in which case they are to be disposed of by the Contractor along with the other brush. Small branches and limbs are to be disposed of by the Contractor along with the other brush. Tree stumps may be burned by the Contractor where permitted; otherwise, they shall be disposed of by him away from the site of the work.
- (8) Following completion of the work, the Contractor is to trim up any broken or damaged limbs on trees which remain standing, disposing of the branches cut off along with other brush and leaving the trees in a neat and tidy condition.
- (9) Brush and trees removed from the drain and banks thereof and from the disposal area are to be put into piles by the Contractor, in locations where they can be safely burned, and are to be burned by the Contractor after obtaining the necessary permits, as required. If, in the opinion of the Drainage Superintendent, any of the piles are too wet or green to be burned, he will so advise the Contractor who may then arrange, to the Drainage Superintendent's satisfaction, an agreement in writing, with the owners where the piles are located, for them to burn the material when dry enough. If a satisfactory agreement cannot be made, the Contractor to haul away the unburned materials to an approved dump site.
- (10) Since the trees and brush that are cut off flush with the earth surface may sprout new growth later, it is strongly recommended that the Municipality make arrangements for spraying this new growth at the appropriate time so as to kill the trees and brush.
- (11) Prior to and during the course of burning operations the Contractor shall comply with the guidelines prepared by the Air Quality Branch of the Ontario Ministry of the Environment and shall ensure that the Environmental Protection Act is not violated.
- (12) In no case will brush or trees be buried in the spoil bank or within the excavated material.
- (13) The Contractor will be required to brush rake the excavated material to remove brush and trees from the spoil if so instructed by the Drainage Superintendent.
- (14) As part of this work, the Contractor shall remove any loose timber, logs, stumps, large stones or other debris from the drain bottom and from the side slopes. Timber, logs, stumps, large stones or other debris shall be disposed of off-site.

SECTION 16 – EXCAVATION OF DRAIN

- (1) All excavated material shall be handled as specified in the following section. Materials deposited on the farmlands shall be within the working corridors, at least 2.0 m from the top of the drain bank, or as specified on the drawings. Upon allowing drying of excavated

- materials (if necessary) and as approved by the Drainage Superintendent, the Contractor shall level excavated materials as specified. Excavated material shall not be placed on dykes, in ditches, tiles or depressions intended to conduct water into the drain.
- (2) Seeding of the disturbed drain banks shall be completed immediately following drain construction as specified in the Special Provisions.
 - (3) All excavation work shall be done in such a manner as to not harm any vegetation or trees, not identified in this report or by the Drainage Superintendent for clearing. Any damages to trees or vegetation caused by the Contractors work shall be rectified to the satisfaction of the Drainage Superintendent.
 - (4) The Contractor shall exercise caution around existing tile inlets and shall confirm with the property owners that all tiles have been located and tile ends repaired as specified.

SECTION 17 - DISPOSAL OF EXCAVATED MATERIAL

- (1) Where a part of the drain is being relocated, the Contractor shall strip the topsoil from the alignment of the new course and stockpile it for re-use following the completion of the subsoil operations. Subsoil excavated from the new course is to be used first to fill the existing course which is to be abandoned. Where the Contractor can conveniently do so, he may deposit the material in the old course as he excavates it from the new course but where the distance separating the new course from the old course is too great to permit this the excavated material must be loaded onto trucks, hauled to the abandoned drain and placed in the old channel. The material shall be placed in the abandoned channel in layers no greater than 300 mm in thickness. Each layer shall be thoroughly compacted with the levelling equipment available at the site prior to the placement of the subsequent layers. The abandoned channel shall be filled to an elevation at least 300 mm higher than the adjacent natural ground elevation to allow for settlement. If insufficient material is available to fill the old course, the surface of the material shall be graded so as to eliminate any low areas that would collect water.
- (2) Excess excavated material not required for the filling of an abandoned channel or material excavated from the drain under normal construction, repair, or improvement shall be deposited and spread on the immediately adjoining farm lands in the locations set out in the Special Specifications. The material shall be deposited and spread no closer than 2 metres from the top edge of the adjacent drain bank and at least 1 metre clear of all fences.
- (3) Where the excavated material is deposited in bush land, it is to be spread and levelled in the form of a spoil bank over at least the full width of the strip that has been cleared to permit the passage of excavating equipment but in no case is the top surface to be left more than 600 mm above the natural ground level even though this may require additional clearing to produce a sufficient disposal area. On completion, the spoil bank is to be left so that it is smooth enough to drive an ordinary farm vehicle along it.
- (4) Where the adjoining land is sufficiently clear to permit cultivation, the Contractor shall deposit the excavated material on the property and spread the material over a width that, after spreading, the excavated material will generally have a thickness of approximately 150 mm. The Contractor shall utilize a minimum spread width of 6 metres and a maximum spread width of 20 metres even though this results in a depth of material in excess of 150 mm. The material shall be thoroughly spread and levelled with suitable equipment and left in a condition which permits cultivation with ordinary farm equipment without causing undue hardship on farm machinery and personnel.
- (5) After the excavated material has been spread and levelled, any stockpiled topsoil is to be spread over it to a depth of no more than 100 mm.
- (6) No excavated material is to be placed on lawns or ornamental shrubbery but is to be deposited on either or both sides of the lawn on the farm lands immediately adjacent to the lawn.
- (7) Excavated material or topsoil shall not be placed in ditches, tiles or depressions intended to conduct water into the drain.
- (8) The material shall be sufficiently levelled to allow further working by agricultural implements.
- (9) All stones and other debris removed from the drain, which may interfere with agricultural implements, shall be disposed of off-site.
- (10) The Drainage Superintendent in charge will be the sole judge as to the proper disposal of material under the contract and this specification

SECTION 18 - FENCES

- (1) Where it is necessary to remove any fences which parallel the course of the drain in order to permit the excavation of the drain or the disposal of excavated material the Contractor shall remove the fence. An allowance will be made to the owners of the properties to compensate them for damages to fences which are considered capable of restraining cattle. The Contractor shall notify the owner of his intentions to remove the fence at least 7 days prior to doing so. Any owner has the option to salvage his fencing materials but must do so sufficiently in advance of the Contractor's operations so as to cause no unnecessary delays to him. If the owner does not remove his fences, the Contractor shall carefully take down the fence and leave the materials neatly placed beyond the limit of the spread area for disposal or reconstruction by the owner. The owner will be responsible to construct and maintain any temporary fencing during the progress of the work. The landowners and not the Contractor will be responsible for the control of livestock in the adjoining field during the period of construction. Unless otherwise specified, the Contractor will not be required to reconstruct the fences following the completion of the work of excavation and levelling.
- (2) No permanent fencing shall be constructed or reconstructed without the approval of the Drainage Superintendent. Any fences that are constructed or reconstructed along the course of the drain are to be kept at least 1 metre clear of the top edge of the adjacent drain bank.
- (3) Where the Contractor finds it necessary to remove any fences which cross the drain, he shall remove the fencing materials in a careful, workmanlike manner. Unless otherwise directed the Contractor shall reconstruct the cross fences in as good a condition as the old material permits.

SECTION 19 - ROAD CROSSINGS

- (1) Where the drain crosses the travelled part of a road through a bridge, the Contractor shall excavate the drain to its specified dimensions through the bridge opening, using care to avoid damaging it. If after the drain has been excavated at any bridge structure it appears to the Drainage Superintendent that repairs or replacement may be required, he shall so advise the Road Authority having jurisdiction over the particular bridge.
- (2) Where a new bridge is required or where any underpinning, strengthening or repairs is rendered necessary by the work, it is to be carried out by the Road Authority at its own expense.

- (3) Where the drain crosses the travelled part of a road through a pipe that does not have to be replaced or lowered, the Contractor shall clean the pipe to its full cross-sectional area using care to avoid damaging it.
- (4) Where the existing pipe is of sufficient size and is in a good state of repair but requires to be lowered, the Contractor shall carefully remove it, clean it to its full cross-sectional area and replace it in the drain as specified herein.
- (5) Where the existing pipe must be replaced, the Contractor shall carefully remove it from the drain, clean it to its full cross-sectional area, and leave it beside the drain for removal by the Road Authority. Unless otherwise instructed he shall install the new road culvert as supplied by the Road Authority. All backfill material shall be compacted granular material supplied by the Road Authority, unless otherwise specified.
- (6) The Contractor shall notify the Road Authority having jurisdiction over the structure under construction at least 72 hours in advance of any construction activities.

SECTION 20 - FARM AND ACCESS CULVERTS

- (1) Where a farm or access culvert or bridge does not have to be replaced or lowered, the Contractor shall clean it to its full cross-sectional area using care to avoid causing damage to it in the process.
- (2) Where a pipe culvert is to be lowered, the Contractor shall carefully remove it, clean it to its full cross-sectional area and replace it in the drain with its invert set 10% of the pipe diameter below the grade line.
- (3) Where a culvert is to be replaced, the Contractor shall carefully remove it from the drain, clean it to its full cross-sectional area and leave it on the drain bank. If the pipe was originally supplied and installed by the property owner, it shall be left for disposal by the owner. If the pipe was installed under the provisions of The Drainage Act, it shall be disposed of as directed by the Drainage Superintendent and any salvage value from the sale of the pipe shall be credited to the drain. Wooden or concrete farm or access bridges which must be removed from the drain shall be disposed of in the same manner.
- (4) Where a pipe culvert is to be installed in the drain, all materials shall be supplied by the Drainage Superintendent as an expense to the drain. The Contractor shall install the pipe in the location directed by the Drainage Superintendent in accordance with the specifications governing the installation.
- (5) Where a new culvert is to be installed, the owner may request the Drainage Superintendent to have it placed in a different location from the existing one and this will be permitted so long as the relocation does not result in an increase in the area draining through the culvert. Adequate notice of the change must be given to the Contractor. In no case may the existing culvert be left in the drain when it has been specified that it is to be removed.

SECTION 21 - FARM AND ACCESS PIPE CULVERT INSTALLATION

21.1 Location and Elevation of Access Culvert or Farm Cuvert

- (1) In general, the new access or farm culvert shall be installed as shown on the drawings attached to the engineer's report. Prior to installation, the Contractor shall contact the Drainage Superintendent to confirm the exact location for the new culvert. The Drainage Superintendent, in consultation with the property owner, shall establish the exact location for the new culvert in the field.
- (2) The invert (inside bottom) bottom of the pipe shall be set according to the elevations shown on the accompanying plans. For the purpose of construction the bench mark indicated on the accompanying plans shall be used to determine the elevation of the proposed enclosure.

21.2 Dry Culvert Installation

- (1) Suitable dykes shall be constructed in the drain so that the installation of the pipe can be accomplished in the dry. The Contractor shall perform the excavation, placement of bedding, pipe and backfill in a dry condition and shall provide all required pumps and/or equipment to enable the work to proceed in the dry.

21.3 Pipe Installation

- (1) The required pipe shall be set in the drain to the dimensions shown on the accompanying drawings and the Contractor shall carry out all required excavation to install the pipe and specified rip-rap end treatment. The drain bottom shall be cleaned, prepared, shaped and compacted to suit the new culvert configuration, as shown on the drawings. The Contractor shall excavate sufficient material from the drain banks and bottom to permit placement of the pipe and backfill material. The minimum trench width as shown on the drawings, shall be provided from the face of the pipe to the excavated trench wall along each bank to provide working room to compact the backfill material.
- (2) The surface on which the culvert is to be laid shall be true to grade and alignment and shaped to accept the materials to be placed. The pipe shall be laid to the alignment and grade shown in the report but may not be placed on a bed containing frozen materials.
- (3) The end protection to each end of the pipe structure shall be as specified in the Special Provisions and on the Drawings and in accordance with the following applicable specifications.
- (4) All newly excavated portions of the drain bank shall be seeded.
- (5) The Contractor shall dispose of all surplus excavated material at an approved disposal site at his expense.
- (6) Rivetted corrugated steel pipe shall be laid with the inside circumferential laps pointing in the direction of the flow. The longitudinal laps shall be located in the upper half of the pipe.
- (7) All helical corrugated steel pipe shall be supplied with re-rolled annular ends and shall be installed so that the helix angle is constant for the total length of the installation and each pipe section shall be installed next to the previous section such that the lock-seam forms a continuous helix.
- (8) Corrugated steel pipe sections shall be joined together by means of plant fabricated couplers having a minimum wall thickness of 1.6 mm and a 10 c width. The couplers shall be installed to lap approximately equal portions of the pipe sections being connected, such that the corrugations or projections of the coupler properly engage the pipe corrugations.
- (9) Where fabrication of structural plate structures by the Contractor is specified, they must be assembled in the trench or at the side of the excavation. If the assembled structure has to be moved to its final position, it shall be moved in such a manner that no damage or distortion is caused to the structure. The materials shall be assembled and handled in accordance with the manufacturers specifications and directions.
- (10) The whole of the work shall be done in a neat, thorough and workmanlike manner such that the alignment of the bridge pipe at each location meets the full satisfaction of the drainage superintendent.

21.4 Backfilling and Compaction

- (1) Backfill and cover material on each side of the culvert pipe shall be carefully placed simultaneously on each side of the pipe so that damage to or movement of the pipe is avoided. At no time shall the levels on each side differ by more than the 300 mm uncompacted layer. Then, a 300mm thick layer of Granular 'A' material, O.P.S.S. Spec 1010 shall be constructed as a road base. All backfill materials shall be placed in layers not exceeding 300mm (12") in thickness, loose measurement. Each layer shall be thoroughly compacted in place to a Standard Proctor Density of 100% by means of mechanical compactors. The Contractor shall provide sufficient water to the granular material such that optimum compaction levels are achieved. The equipment used and method of compacting the backfill material shall be to the full satisfaction of the Drainage Superintendent.

SECTION 22 – LATERAL TILE DRAINS

- (1) Should the Contractor encounter any lateral tiles within the proposed culvert limits as shown and also those not shown on the attached drawings, the Contractor shall re-route the outlet tile drain(s) in consultation with the Drainage Superintendent, as required, to accommodate the new culvert. **Tile drain outlets through the wall of the new culvert pipe will not be permitted.** All costs associated with re-routing lateral tile drains (if any) shall be at the Contractor's expense. Care must be taken in handling plastic drain pipe in cold weather to avoid causing damage.
- (2) Plastic drain pipe shall be held in position on planned grade immediately after installation by careful placement of backfill material.

SECTION 22 – CULVERT END PROTECTION - SLOPING RIP-RAP

- (1) Where specified, the Contractor shall install quarried rip-rap erosion protection materials on the slopes at both ends of the pipe. The backfill and quarried rip-rap protection over the ends of the pipe shall be sloped at 1.5 horizontal to 1 vertical or to a flatter slope specified on the drawings. All stone used for rip-rap culvert end protection shall be 125-225 mm clear quarried rock or OPSS.MUNI 1004 and be placed with a minimum thickness of 300mm thickness. Prior to placing rip-rap materials on the backfill materials, the Contractor shall lay a non-woven geotextile filter fabric equal to a "Terrafix 270R" or approved equal. The geotextile filter fabric shall extend from the bottom of the pipe to the top of each side slope of the drain and between both side slopes of the drain. No portion of the filter fabric shall remain exposed to sunlight. The Contractor shall take extreme care to not damage the geotextile filter fabric when placing the rip-rap on top of the filter fabric. The geotextile filter fabric and quarried stone shall be placed to the complete satisfaction of the Drainage Superintendent. **Concrete rip-rap or round stone will not be permitted.**
- (2) Where a clay layer is specified beneath the Rip-Rap End Protection, it shall be a 500 mm thick layer of cohesive clay material that is dry select earth material free of topsoil, organic matter, broken concrete, steel, wood and deleterious substances. It shall be placed and shaped before the filter fabric layer is placed.

SECTION 23 - BAGGED CONCRETE HEADWALLS – SINGLE BAG THICKNESS

- (1) Sacked concrete end walls that do not exceed 1.8 m in height shall be constructed of a single row of sacked concrete. The installation of the end wall shall be governed by the drawings. The end wall treatment shall extend to the same elevation as the finished travelled surface and fit to the top of bank elevation on both banks and in any event be a minimum of 300 mm above the crown of the pipe.
- (2) Where specified and after the Contractor has set in place the new pipe and partially backfilled same, he shall install new concrete filled jute bag headwalls at each end of the pipe. When constructing the concrete jute bag headwalls, the Contractor shall place the bags so that the completed headwall will have a slope inward from the bottom of the pipe to the top of the finished headwall, the slope of the headwall shall be one unit horizontal to five units vertical.
- (3) The Contractor shall completely backfill in behind the new concrete jute bag headwalls with granular material, Granular "B" per O.P.S.S. 1010, and the granular material shall be compacted in place with a Standard Proctor Density of 100%. The placing of the jute bag headwalls and the backfilling shall be performed in lifts simultaneously. The granular backfill shall be placed and compacted in lifts not to exceed 300mm (12") in thickness.
- (4) The concrete jute bag headwalls shall be constructed by filling jute bags with concrete. All concrete used to fill the jute bags shall have a minimum compressive strength of 20 MPa in 28 days and shall be provided and placed only as a wet mix. Under no circumstances shall the concrete to be used for filling the jute bags be placed as a dry mix. The jute bags, before being filled with concrete, shall have a dimension of 460mm x 660mm (18" x 26"). The jute bags shall be filled with concrete so that when they are laid flat they will be approximately 100mm (4") thick, 300mm (12") to 380mm (15") wide and 460mm (18") long.
- (5) The concrete jute bag headwall to be provided at the end of the pipe shall be of single bag wall construction or as specified otherwise. The concrete filled bags shall be laid so that the 460mm (18") dimension is parallel with the longitudinal length of the new pipe. The concrete filled bags shall be laid on a footing of plain concrete being 460mm (18") wide or as otherwise specified, extending for the full length of the wall, and from 0.3 metres (1.0') below the bottom of the corrugated pipe to the bottom of the culvert pipe. All concrete used for the footing shall have a minimum compressive strength of 20 MPa in 28 days.
- (6) The completed jute bag headwalls shall be securely embedded a minimum of 0.50m (20") into the side slopes of the drain. At the road side of the bridge the Contractor shall flair outwards each headwall approximately 1.5m (5.0') as directed by the Drainage Superintendent.
- (7) Upon completion of the jute bag headwall the Contractor shall cap the top row of concrete filled bags with a layer of plain concrete, 150mm (6") thick, and hand trowelled to obtain a pleasing appearance. The concrete cap shall be the same width as the bagged wall and excess concrete will not be allowed to be placed on the cap area. The concrete cap shall not overhang the bagged wall on the driveway side of the wall.
- (8) The Contractor shall fill all voids between the concrete filled jute bags and the corrugated steel pipe with concrete, particular care being taken underneath the pipe haunches to fill all voids.

SECTION 24 – BAGGED CONCRETE HEADWALLS – DOUBLE BAG THICKNESS

- (1) Sacked concrete end walls that exceed 1.8 m in height shall be constructed of double rows of sacked concrete.
- (2) The concrete filled bags are to be laid so that the 460mm (18") dimension is perpendicular (at right angles) to the longitudinal length of the new pipe. Therefore the long dimension of the bag will be visible when the headwall is complete.

SECTION 25 – GROUTED CONCRETE RIP-RAP WALL

- (1) Where specified, the Contractor may construct a grouted concrete rip rap headwall. The specifications for the installation of a concrete filled jute bag headwall shall be followed with the exception that broken sections of concrete may be substituted for the jute bags. The concrete rip rap shall be approximately 460mm (18") square and 100mm (4") thick and shall have two flat parallel sides. The rip rap shall be fully mortared in place using a mixture composed of three parts of clean, sharp sand to one part of Portland Cement.

SECTION 26 – PRECAST CONCRETE HEADWALLS

- (1) Where specified as an alternative, the Contractor may supply and install precast concrete headwalls. Said precast headwalls shall be a custom made product, manufactured by Underground Specialties (Windsor) or similar provider.
- (2) The precast concrete headwall or precast blocks or modules shall be of the shape, size and dimensions shown on the drawings.
- (3) Precast provider to provide stamped engineering drawing for precast headwall and Geotextile restrainers for approval.
- (4) Excavation for the headwalls shall be in conformance with O.P.S.S. Section 902.
- (5) The supply and placement of concrete shall be in conformance with O.P.S.S. Section 904. All concrete shall have a strength of 33 MPa after 28 days. All concrete shall be air entrained to an air content of $6\% \pm 1.5\%$ by volume for 19mm maximum size of aggregate. Minimum cover for concrete shall be 40mm (1 1/2").
- (6) The supply and placement of reinforcing steel shall be in conformance with O.P.S.S. Section 905. The reinforcing steel shall be grade 400 and shall be of the size and type shown on the drawings.
- (7) The Contractor shall place the precast headwall so that it is straight and plumb. The method of backfilling the side slope trenches shall be such that no voids remain under the haunches of the sloping concrete headwall. The Contractor's method of achieving this shall be approved prior to start of construction.
- (8) The Contractor shall provide a sufficient opening in the headwalls so that when the headwalls are set and plumb the corrugated steel pipe may be inserted or adjusted to grade. The void between the corrugated steel pipe and opening in the headwall shall be fully mortared in place using a mixture composed of three parts of clean, sharp sand to one part of Portland Cement.
- (9) After the corrugated steel pipe has been set and partially backfilled with Granular "B" per O.P.S.S. 1010 and compacted to 100% Standard Proctor Density, geotextile tie backs to the precast concrete headwalls in accordance to approved stamped headwall and restraining devices.

SECTION 27 - TILE OUTLET PIPES AND ROAD DRAINS

- (1) Where existing tile outlet pipes of cast iron, asbestos cement, corrugated steel or other rigid material are encountered along the course of the drain, and where they will be removed or rendered useless by the work, the Contractor, as part of his work, shall reinstall the outlet pipes in the re-graded bank.
- (2) Where, in the course of the grading operation tile drains having no outlet pipe are encountered or the existing outlet pipe is not suitable for re-installation, the Contractor shall install an outlet pipe manufactured for that purpose. The outlet pipe shall be one size larger than the diameter of the tile, 3 metres in length, and supplied by the Drainage Superintendent as an expense to the drain.
- (3) All outlet pipes installed shall be at least 3 metres long and shall be embedded 2.5 metres into the bank of the drain and shall protrude 0.5 metres beyond its face. The outlet end shall be fitted with a removable wire rodent guard.
- (4) Where a drain adjoining a road is relocated, the Drainage Superintendent shall arrange to have all existing private and road drains which cross beneath the road extended across the old course of the drain to the drain in its new location. The cost of all pipe materials to extend these drains together with the installation costs will be borne by the Road Authority having jurisdiction.

SECTION 28 – RIP-RAP EROSION PROTECTION

- (1) The Contractor shall supply and install the required quantities of graded stone rip-rap erosion protection materials where specified. All stone used for rip-rap culvert end protection shall be 125-225 mm clear quarried rock or OPSS.MUNI 1004 and be placed with a minimum thickness of 300mm thickness. Prior to placing rip-rap materials on the backfill materials, the Contractor shall lay a non-woven geotextile filter fabric equal to a "Terrafix 270R" or approved equal. No portion of the filter fabric shall remain exposed to sunlight. The Contractor shall take extreme care to not damage the geotextile filter fabric when placing the rip-rap on top of the filter fabric. The geotextile filter fabric and quarried stone shall be placed to the complete satisfaction of the Drainage Superintendent.
Concrete rip-rap or round stone will not be permitted.

SECTION 29 – LOCATION OF STRUCTURES, ETC.

- (1) The Contractor shall satisfy himself as to the exact location, nature and extent of any existing structure, utility or other object which he may encounter during the course of the work. The Contractor shall indemnify and save harmless the Municipality and the Engineer for any damages which he may cause or sustain during the progress of the work. He shall not hold the Municipality or the Engineer liable for any legal action arising out of any claims brought about by such damage caused by him.

SECTION 30 - LAWN RESTORATION

- (1) Where the construction works cross a lawn, the Contractor shall take extreme care to avoid damaging the lawn, shrubs and trees encountered. Upon completion of the work, the Contractor shall completely restore the area by the placement and fine grading of topsoil and seeding or sodding the area as specified by the Engineer or Drainage Superintendent.

SECTION 31 – PROPERTY BARS AND SURVEY MONUMENTS

- (1) The Contractor shall be responsible for marking and protecting all property bars and survey monuments during construction. All missing, disturbed or damaged property bars and survey monuments shall be replaced at the Contractor's expense, by an Ontario Land Surveyor.

SECTION 32 - CLEAN UP AND RESTORATION

- (1) The Contractor shall leave the whole of the site of the work in a neat, thorough and workmanlike appearance to the full satisfaction of the Drainage Superintendent. He shall haul away any excess earth from the site. He shall haul to the site, at his own expense, sufficient earth to fill any depressions caused by his work. All debris and waste materials specified for disposal by others shall be left in a neat condition. All materials to be disposed of under this contract shall be removed by the Contractor and the site left in a neat

and tidy condition. The site shall be left, as closely as possible, in the same condition it was in prior to the commencement of the work.

- (2) As part of the work and upon completion, the Contractor shall remove and dispose of, off-site any loose timber, logs, stumps, large stones, rubber tires, cinder blocks or other debris from the drain bottom and from the side slopes. Where the construction works cross a lawn, the Contractor shall take extreme care to avoid damaging the lawn, shrubs and trees encountered. Upon completion of the work, the Contractor shall completely restore the area by the placement and fine grading of topsoil and seeding or sodding the area as specified by the Engineer or Drainage Superintendent.

SECTION 33 - UTILITIES, RAILWAYS, ETC.

- (1) The Contractor shall note that overhead and underground utilities such as hydro, gas, telephone and water are not necessarily shown on the drawings. Before commencing work, the Contractor will investigate the location of any and all railways, utility lines, wires, pipes, poles, towers, cables, etc. which may interfere with the proposed work. He will take all necessary steps to avoid damaging these. The Contractor will be liable for any damage to utilities and should any damage result to them from his operations, he will be completely responsible for these damages and will save harmless the Municipality and the Engineer from any legal actions which may arise as a result of such damage.
- (2) If permits are required to allow the work to be carried out on or adjacent to any utilities, pipelines, railways, etc., the Contractor shall obtain these at his own expense.
- (3) All work on or adjacent to any utility, pipeline, railway, etc., is to be carried out in accordance with the requirements of the utility, pipeline, railway, or other, as the case may be, and its specifications for such work form part of this specification and apply.
- (4) In accordance with Section 26 of the Drainage Act, if utilities are encountered during the installation of the drainage works that conflict with the work, the operating utility company shall relocate the utility at their own costs. The Contractor however will be responsible to co-ordinate these required relocations and their co-ordination work shall be considered incidental to the project.

SECTION 33 – DAMAGE TO TRAVELLED PORTION OF MUNICIPAL ROADS

- (1) The Contractor shall be responsible for any damage caused by him to any portion of the municipal road system, especially to the travelled portion. When excavation work is being carried out and the excavation equipment is placed on the travelled portion of a road, the travelled portion shall be protected by having the excavation equipment placed on satisfactory timber planks or timber pads. If any parts of the travelled portion of the road are damaged by the Contractor, the Municipality shall have the right to have the necessary repair work done by its employees and the cost of all labour and materials used to carry out the repair work shall be deducted from the Contractor's contract and credited to the Municipality.

SECTION 34 – MAINTAINING FLOWS

- (1) The Contractor shall maintain the flow of any drainage works encountered in the progress of the work at no expense to the Owner. The Contractor shall obtain written approval from the Engineer in charge to stop up any drain and if necessary provide pumping equipment, build necessary by-passes, etc. at no expense to the Owner.

SECTION 35 – MAINTENANCE

- (1) The successful Tenderer shall guarantee the work for a period of one (1) year from the date of acceptance (as evidenced by the final inspection report), thereof from deficiencies that, in the opinion of the Engineer, were caused by faulty workmanship or materials. The successful Tenderer shall, at his/her own expense, make good and repair deficiencies and every part thereof, all to the satisfaction of the Engineer. Should the successful Tenderer for any cause, fail to do so, then the Municipality may do so and employ such other person or persons as the Engineer may deem proper to make such repairs or do such work, and the whole costs, charges and expense so incurred may be deducted from any amount due to the Tenderer or may be collected otherwise by the Municipality from the Tenderer. Nothing herein contained shall be construed as in any way restricting or limiting the liability of the Contractor under the appropriate laws under which the work is being done.

SECTION 36 - DRAINAGE SUPERINTENDENT

- (1) Where the word "Drainage Superintendent" is used in this specification, it shall mean the person or persons appointed by the Council of the Municipality having jurisdiction, to superintend the work.
- (2) The Drainage Superintendent will be permitted to make minor variations in the, work so long as these variations will result in either a more satisfactory drain or a more economical one. These variations, however, must not be such as to change the intent of the work performed nor are they to reduce the standard of quality.

SECTION 37 - SPECIAL PROVISIONS

- (1) The Part of the Specifications headed "Special Provisions" which is attached hereto forms part of this Specification and is to be read with it. Where there is any difference between the requirements of this General Specification and those of the Special Provisions, the Special Provisions shall govern.

RC SPENCER ASSOCIATES INC.

Windsor, Leamington & Chatham, Ontario

ENVIRONMENTAL PROTECTION SPECIAL PROVISIONS

(Revised 2016 11 25)

SECTION 1 – GENERAL

- (1) These Environmental Protection Special Provisions shall apply and form part of this Contract. All costs associated to confirming with these Special Provisions shall be included in the Tender prices bid.

SECTION 2 - FIRES

- (1) Fires and burning of rubbish on site will be permitted only with special approval from the Municipality.

SECTION 3 - DISPOSAL OF WASTES

- (1) The Contractor shall not bury rubbish and waste materials on site unless approved by the Engineer and all applicable approving authorities. The site shall be maintained free of accumulated waste and rubbish. All waste materials should be disposed of in a legal manner at a site approved by all local approving authorities and the Engineer.
- (2) The Contractor shall not allow deleterious substances, waste or volatile materials such as mineral spirits, or paint thinner, to enter into waterways, storm or sanitary sewers.
- (3) The disposal of dredge material where applicable shall be in accordance with the above.

SECTION 4 - POLLUTION CONTROL

- (1) The Contractor shall maintain under this Contract temporary erosion, sediment and pollution control features installed.
- (2) The Contractor shall control emissions from equipment and plant to local authorities emission requirements.
- (3) The Contractor shall not cause excessive turbidity when performing in-water work. The Contractor shall not allow any debris, fill or other foreign matter to enter into the waterway. The Contractor shall remove from the waterway, all extraneous materials resulting from in-water work.
- (4) The Contractor shall abide by local noise By-Laws for the duration of the Contract.
- (5) Spills of deleterious substances into waterways and on land shall be immediately contained by the Contractor and the Contractor shall cleanup in accordance with Provincial regulatory requirements. All spills shall be reported to the Ontario Spills Action Centre (1-800-268-6060), local authorities having jurisdiction and the Engineer. To reduce the risk of fuel entering the waterway, refuelling of machinery must take place a safe distance from the waterway. The Contractor shall note that the Engineer or the Owner takes no responsibility for spills, this shall be the sole responsibility of the Contractor.

SECTION 5 - WHMIS

- (1) The Contractor shall comply with the requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials and regarding labelling and the provision of material safety data sheets acceptable to Labour Canada.

SECTION 6 - DRAINAGE

- (1) The Contractor shall not pump water containing suspended materials into waterways, sewers or drainage systems. The Contractor shall be solely responsible for the control, disposal or runoff of water containing suspended materials or other harmful substances in accordance with these specifications, and local authority requirements. The Contractor shall provide temporary drainage and pumping as necessary to keep excavations and the site free from water.
- (2) The Contractor shall install and maintain sediment control devices as indicated on the Contract Drawing and as directed by the Engineer.

SECTION 7 - PROTECTION OF VEGETATION

- (1) The Contractor shall exercise the utmost caution to ensure that existing trees and plants on-site and on adjacent properties are not damaged or disturbed unless noted otherwise in the Removals Special Provisions of this Contract. The Contractor shall restrict tree removal to areas indicated on the Contract Drawings and/or designated on-site. No trees or shrubs shall be removed without the approval of the Engineer.

SECTION 8 - DUST CONTROL

- (1) The Contractor will be solely responsible for controlling dust nuisance resulting from his operations, both on the site and within adjacent right-of-ways.
- (2) Water and calcium chloride shall be applied to areas on or adjacent to the site as authorized by the Engineer as being necessary and unavoidable for the prevention of dust nuisance or hazard to the public. No payment will be made for dust control unless otherwise specified in the Special Provisions.

SECTION 9 - RESTRICTIONS FOR IN-WATER WORKS

- (1) The Contractor shall only perform in-water works during times when conditions permit reasonable production rates to be achieved. The Contractor shall be required to adopt good housekeeping practices that minimize disturbance to the site and the adjacent waterway.

- (2) The Contractor shall note that this Project is subject to approval from the Essex Region Conservation Authority and as such, any possible turbidity caused by the construction of shore protection works is of key importance.
- (3) The Contractor shall minimize the turbidity (sedimentation) produced by any in-water works construction or operations. The Contractor will be ordered to cease operations if, in the opinion of the Engineer or authorities having jurisdiction, the in-water work is producing unacceptable amounts of turbidity in the waterway. Based on this, the Contractor shall either adjust his operation(s) to produce lower turbidity levels, wait for more favourable conditions before operations will be allowed to continue, or undertake approved mitigating measures (e.g. sediment control, etc.). All costs associated with the above will be the sole responsibility of the Contractor, and no claims for extras or delays will be considered.

SECTION 10 - FISH HABITAT

No work shall be undertaken when there is likelihood of adverse effects on fish spawning or fish habitat in downstream waters. The Contractor shall implement the following measures to avoid causing harm to fish and fish habitat:

10.1 - Site Selection

- (1) Design and plan activities and works in the water body such that loss or disturbance to aquatic habitat is minimized and sensitive spawning habitats are avoided.
- (2) Design and construct approaches to the water body such that they are perpendicular to the watercourse to minimize loss or disturbance to riparian vegetation.
- (3) Undertake all instream activities in isolation of open or flowing water to maintain the natural flow of water downstream and avoid introducing sediment into the watercourse.

10.2 - Standard Practices

- (1) Work will not be conducted at times when flows are elevated due to local rain events, storms or seasonal floods. Construct the work 'in the dry' and cut only trees necessary to do the work (no clear-cutting) and as specified in the Construction Specifications. All disturbed areas and all disturbed soils on both banks and within the channel, including spoil, must be stabilized immediately, and upon completion of work returned to a pre-disturbed state or better as soon as conditions allow.

10.3 - Timing Windows

- (1) For spring spawning fish in southwestern Ontario, The timing window for construction, is July 15 to March 15. This covers all warmwater fish species, which is the type of fish that will be found in essentially all the small watercourses and drains in southwestern Ontario. Do not carry out in-water work and any work affecting fish or fish habitat outside of the timing window without prior authorization from the appropriate authorities for emergency situations affecting public safety.

10.4 - Contaminant and Spill Management

- (1) Plan activities near water such that materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, poured concrete, or other chemicals do not enter the watercourse. All activities should be controlled to prevent the entry of petroleum products, debris, rubble, concrete or other deleterious substances into the water.
- (2) Develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance and keep an emergency spill kit on site.
- (3) Ensure that building material used in a watercourse has been handled and treated in a manner to prevent the release or leaching of substances into the water that may be deleterious to fish.

10.5 - Erosion and Sediment Control

- (1) Develop and implement an 'Erosion and Sediment Control Plan' for the site that minimizes risk of sedimentation of the water body during all phases of the project. Erosion and sediment control measures should be maintained until all disturbed ground has been permanently stabilized, suspended sediment has resettled to the bed of the water body or settling basin, and runoff water is clear. The plan should, where applicable, include:
 - Installation of effective erosion and sediment control measures before starting work to prevent sediment from entering the water body.
 - Measures for managing water flowing into the site, as well as, water being pumped/diverted from the site such that sediment is filtered out prior to the water entering a water body. For example, pumping/diversion of water to a vegetation area, construction of a settling basin or other filtration system.
 - Site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is required (e.g., dredging, culvert work). To prevent sediment entry into the Drain, in the event of an unexpected rainfall, silt barriers and/or traps must be placed in the channel during the works and until the site has been stabilized. All sediment and erosion control measures are to be in accordance with related Ontario Provincial Standards. It is incumbent on the proponent and his/her contractors to ensure that sediment and erosion control measures are functioning properly and are maintained/upgraded as required.
 - Measures for containing and stabilizing waste material (e.g., dredging spoils, construction waste and materials, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby water bodies to prevent re-entry.
 - Regular inspection and maintenance of erosion and sediment control measures and structures during the course of construction. Repairs to erosion and sediment control measures and structures if damage occurs. Sediment in the barriers/traps must be removed and stabilized on land to prevent entry of sediment into the water. Removal of non-biodegradable erosion and sediment control materials once the site is stabilized.

10.6 - Fish Protection

- (1) Ensure that all in-water activities, or associated in-water structures, do not interfere with fish passage, constrict the channel width, or reduce flows.
- (2) Retain a qualified professional to ensure applicable permits for relocating fish are obtained and to capture any fish trapped within an isolated/enclosed area at the work site and safely relocate them to an appropriate location in the same waters. Fish may need to be relocated again, should flooding occur on the site.
- (3) Screen any water intakes or outlet pipes to prevent entrainment or impingement of fish. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself.
- (4) Avoid using explosives in or near water. Use of explosives in or near water produces shock waves that can damage a fish's swim bladder and rupture internal organs. Blasting vibrations may also kill or damage fish eggs or larvae.

10.7 - Operation of Machinery

- (1) Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species, and noxious weeds. Wash, refuel, and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.
- (2) Whenever possible operate machinery on land above the high water mark, on ice, or from a floating barge in a manner that minimizes disturbance to the banks and bed of the water body.
- (3) To cross a municipal drain or watercourse, use the existing crossing structures within the designated working corridors or construct temporary crossing structures approved by the Engineer. Fording will not be permitted unless approved by the Engineer and carried out by the Contractor according to the requirements determined by the Engineer.

10.8 - Culvert Work

- (1) It is important to apply the relevant mitigation measures outlined above, to ensure that no deleterious materials reach fish habitat and that there are no detrimental impacts to physical fish habitat.
- (2) Existing culverts may be repaired, replaced, and removed, and debris may be removed from them, without contacting DFO. Important things to consider are:
 - the timing window, which will be July 15 to March 15 for almost 100% of projects;
 - that fish passage must not be obstructed;
 - that the channel cannot be realigned;
 - that culverts are designed for a minimum embedment of 10% below grade;
 - that new material placed below the high water mark must be properly stabilized and protected from erosion;
 - that the channel must not be narrowed; and
 - that work must be done when there is no flowing water.
- (3) It is best to time work when stream flows are at a minimum, but contingency measures should be in place in the event that a heavy rain occurs. Cofferdams or other features should be used above the area of construction and water above it should be pumped into the stream channel downstream of the construction. If the initial dewatering strands fish, they should be captured and placed downstream in the wetted area. It may be necessary to get a permit from MNRF to move the fish.

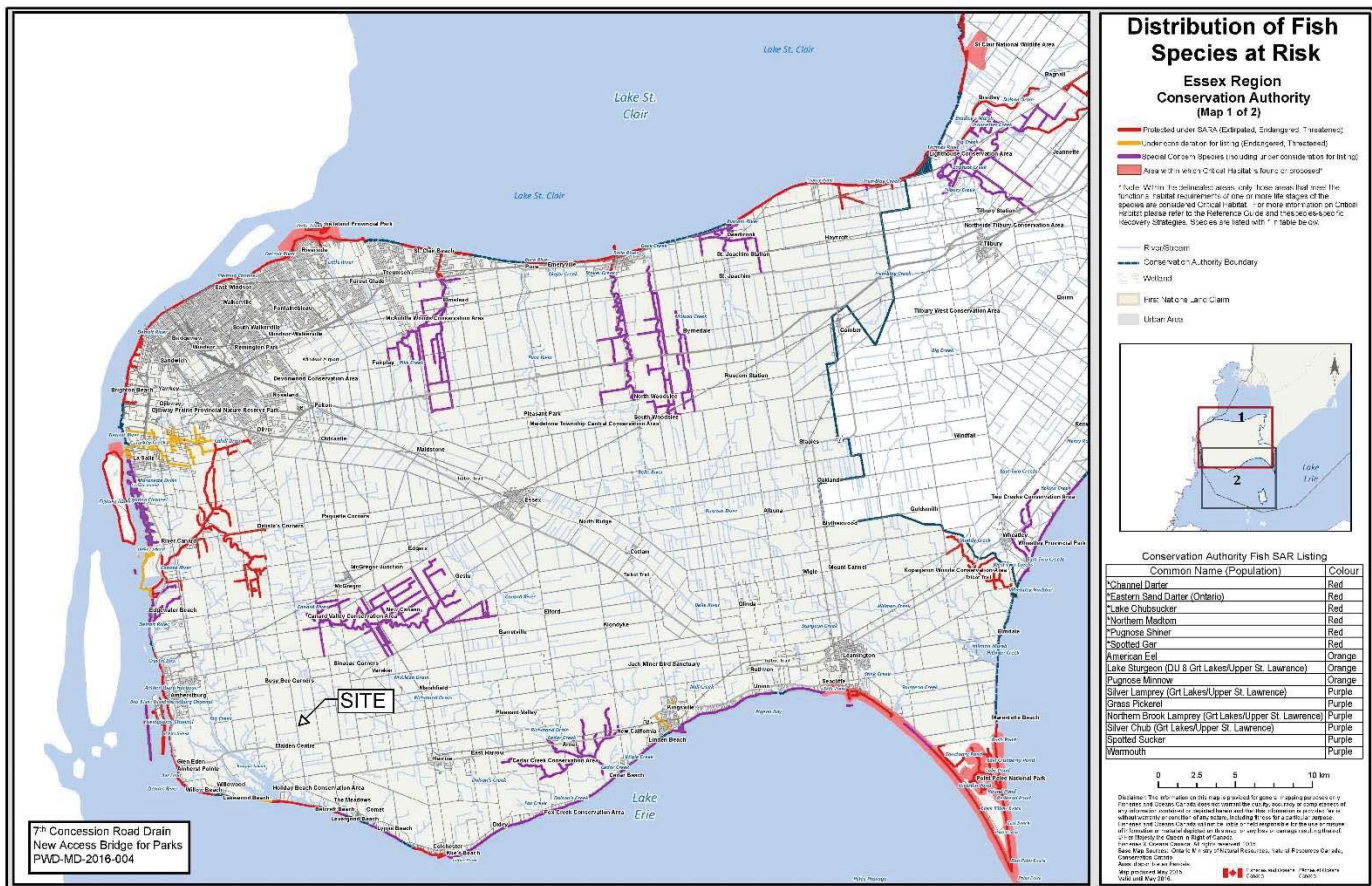
SECTION 11 - ENDANGERED SPECIES ACT

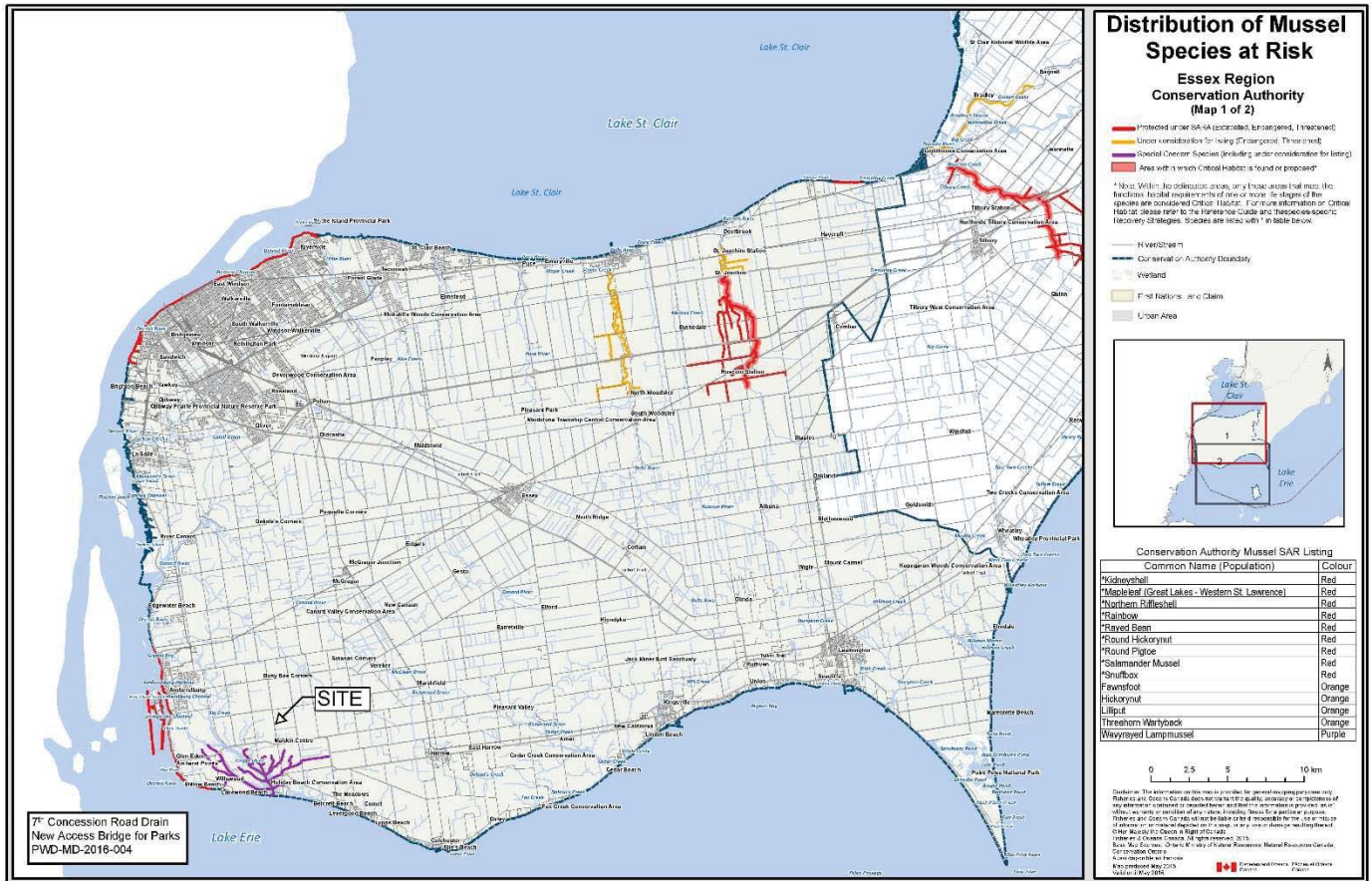
- (1) All work must comply with the current version of the Ontario Endangered Species Act, 2007, S.O. 2007, c.6; O. Reg.230/08: (Species at Risk In Ontario); and O. Reg. 242/08: (General).
- (2) The Municipality shall obtain the most current Endangered Species information available from MNRF and other sources. A designated persons employed by the Municipality will be responsible for reviewing habitat maps to determine if registration of prescribed activities or full review and approval by MNRF and other agencies is required.
- (3) Prior to the start of any construction activities, the Contractor shall meet with the Municipal Designate to obtain a copy of specific mitigation procedures for dealing with endangered species should they be encountered anytime during construction.

RC SPENCER ASSOCIATES INC.
Windsor, Leamington & Chatham, Ontario

APPENDIX 'C'

ENDANGERED SPECIES ACT REVIEW





SNAKES OF ONTARIO IDENTIFIER

An identification guide to the Massasauga Rattlesnake and other Ontario snakes.

Recovery through education and conservation.

This guide will help you identify the Massasauga Rattlesnake and other snakes in Ontario. The Massasauga is one of five Ontario snakes with blotches. Snakes on this identifier are grouped by appearance (blotched, striped and no pattern). When you see a snake, look at its size and pattern. Does it have blotches, stripes, or no pattern?

Snakes are illustrated at quarter-life size. These snakes are not found in all Ontario regions. Consult a field guide for maps of snakes in your area. The size of snakes includes U.S. populations as listed in 'Conant, Roger and Joseph T. Collins. 1991 *A Field Guide to Reptiles and Amphibians of Eastern and Central North America*. 3rd edition. Houghton Mifflin Co. Boston'



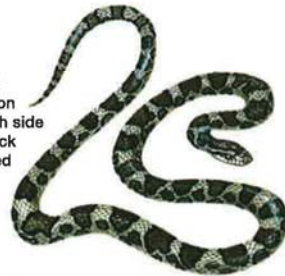
For information on the Toronto Zoo's Rattlesnake Workshop write to:

Toronto Zoo - Rattlesnakes
361-A Old Finch Ave.
Scarborough, ON, CANADA M1B 5K7
email: alentin@torontozoo.ca
Visit the Massasauga Rattlesnake
Recovery Team website: www.massasauga.ca

Milk

Lampropeltis triangulum

- 61-90 cm; record 132.1 cm
- Cream, tan, or light grey with red or dark brown black-bordered blotches or rings on back alternating with blotches along each side
- Young have red blotches bordered in black
- Blotch on neck may appear Y or V shaped
- Belly whitish with black checkerboard pattern
- Scales smooth; anal scale single
- Lays eggs
- SPECIAL CONCERN (COSEWIC); SPECIAL CONCERN (OMNR)



Green/Brown Phase

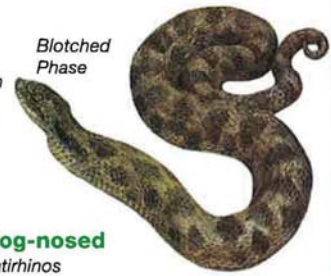
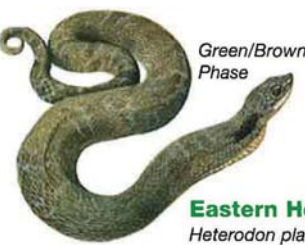
Blotched Phase



Eastern Hog-nosed

Heterodon platirhinos

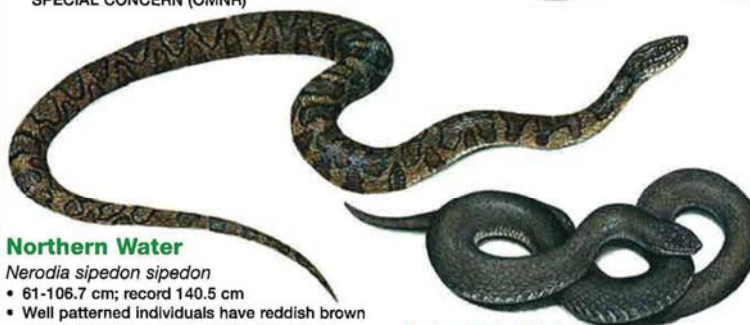
- 51-84 cm; record 115.6 cm
- Large dark blotches down back alternating with smaller blotches along sides
- When threatened, spreads neck to display darker neck pattern and will roll over to play dead
- Can be blotched phase, plain grey, green-brown or even black
- Heavy-bodied
- Flat head with upturned snout
- Belly yellow-grey with greenish grey pattern
- Underside of tail lighter colour than body
- Scales keeled; anal scale divided
- Lays eggs
- THREATENED (COSEWIC); THREATENED (OMNR)



Northern Water

Nerodia sipedon sipedon

- 61-106.7 cm; record 140.5 cm
- Well patterned individuals have reddish brown squarish blotches down back with row of alternating blotches along each side
- At front of body, some blotches extend as saddles over back and on to sides
- Pattern on older individuals may be obscured and they appear black or brown
- Usually found in or near water
- Belly cream with irregular rows of reddish half moon crescents
- Scales keeled; anal scale divided
- Gives birth to live young



Lake Erie Water

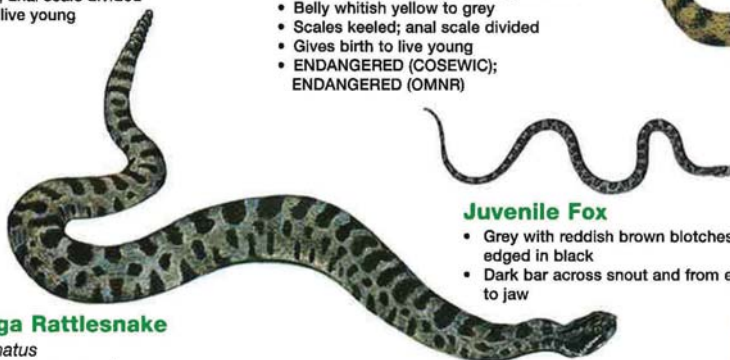
Nerodia sipedon insularum

- 61-106.7 cm; record 140.5 cm
- A sub-species of the more wide spread Northern Water snake
- Range from uniformly grey with no markings to dark grey-brown with some banding
- Only found at western end of Lake Erie and on Pelee and surrounding islands
- Belly whitish yellow to grey
- Scales keeled; anal scale divided
- Gives birth to live young
- ENDANGERED (COSEWIC); ENDANGERED (OMNR)



Juvenile Fox

- Grey with reddish brown blotches edged in black
- Dark bar across snout and from eye to jaw



Eastern Fox

Elaphe gloydi

- 91-137 cm; record 179.1 cm (large snake)
- Yellow-brown with large brown or black blotches on back that alternate with smaller blotches along sides
- May have red-brown head
- Belly yellow with black checkerboard pattern
- Scales weakly keeled; anal scale divided
- Lays eggs
- THREATENED (COSEWIC); THREATENED (OMNR)



Massasauga Rattlesnake

Sistrurus catenatus

- Ontario's only venomous snake
- 47.2-76 cm; record 100.3 cm
- Grey to brownish grey with darker blotches along back and several rows of alternating blotches along sides; blotches edged in white
- Black snakes with no pattern, very rare
- Pit on each side of head between eye and nostril
- Distinct segmented rattle
- Tall thick, squarish; does not taper to a point like all others
- Does not always rattle a warning; relies on pattern and remaining motionless to go undetected
- Heavy bodied; often found coiled
- Belly black
- Scales keeled; anal scale single
- Gives birth to live young
- THREATENED (COSEWIC); THREATENED (OMNR)



DeKay's Brown

Storeria dekayi

- 23-33 cm; record 49.2 cm (small snake)
- Light grey-brown to red-brown
- Two rows of spots along light coloured stripe on back
- Rows of spots may be joined by narrow lines
- Dark downward bar on side of head
- Juveniles have three yellowish spots on neck
- Belly cream or pinkish
- Scales keeled; anal scale divided
- Gives birth to live young

Northern Red-bellied

Storeria occipitomaculata occipitomaculata

- 20.3-25.4 cm; record 40.6 cm (small snake)
- Reddish brown to grey-brown in colour
- Three light brown or yellow spots on neck
- Orange-red belly; few dark spots may be present
- Scales keeled; anal scale divided
- Gives birth to live young

Smooth Green

Opheodrys vernalis

- 30.3-51 cm; record 66 cm
- Bright green and shiny
- Belly white or yellow
- Scales smooth; anal scale divided
- Lays eggs

Ring-necked

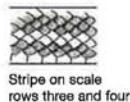
Diadophis punctatus

- 25.4-38 cm; record 70.6 cm
- Shiny steel blue, slate or brown in colour
- Neck ring and belly orange-yellow
- Scales adjacent to neck ring darker
- Belly has interrupted row of small black spots
- Scales smooth; anal scale divided
- Lays eggs

Eastern Ribbon

Thamnophis sauritus

- 45.7-66 cm; record 96.5 cm
- Black with 3 yellow stripes
- Lateral stripes on scale rows 3 and 4
- Distinct white half-moon spot in front of eye
- May have brown colour along each side of belly
- Belly yellow-green
- Scales keeled; anal scale single
- Gives birth to live young
- SPECIAL CONCERN (COSEWIC); SPECIAL CONCERN (OMNR)



Stripe on scale rows three and four

Queen

Regina septemvittata

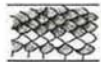
- 38-61 cm; record 92.1 cm
- Yellow-brown with yellow stripe along lower flank
- 3-5 dark stripes may be found on back
- Belly cream-yellow; brown stripes may be visible
- Usually found near rivers and marshes
- Scales keeled; anal scale divided
- Gives birth to live young
- THREATENED (COSEWIC); THREATENED (OMNR)

Eastern Garter

Thamnophis sirtalis sirtalis

- 45.7-66 cm; record 123.8 cm
- Black, green or brown with three yellow or yellow-green stripes
- Stripes may be orange or reddish in some parts of range
- Some snakes may be all black with no stripes (melanistic)
- Lateral stripes on scale rows 2 and 3
- May have dark scales or spots between stripes giving it a checkered pattern
- Belly yellowish green
- Scales keeled; anal scale single
- Gives birth to live young

Stripe on scale rows two and three



Blue Racer

Coluber constrictor foxii

- 90-152 cm; record 182.90 cm (large snake)
- Grey to greenish blue
- Head dark, throat white
- Belly light blue
- Only found on Pelee Island
- Scales smooth; anal scale divided
- Lays eggs
- ENDANGERED (COSEWIC); ENDANGERED (OMNR)

Red-sided Garter

Thamnophis sirtalis parietalis

- 41-66 cm; record 124.1 cm
- Black-brown with 3 yellow stripes
- Red bars between stripes and reddish wash on sides between scales
- Lateral stripes on scale rows 2 and 3
- Belly green-black
- In Ontario, only found along the Manitoba border
- Scales keeled; anal scale single
- Gives birth to live young

Juvenile Blue Racer

- Grey with central row of dark grey-brown blotches
- Few or no blotches on brown or grey tail
- Side of head speckled white and black

Butler's Garter

Thamnophis butleri

- 38-51 cm; record 69.2 cm
- Black or brown-green with 3 yellow stripes
- Stripes may be orange
- Lateral stripes on scale row 3 extending onto row 2 below and 4 above
- Towards back of body lateral stripe on scale rows 2 and 3
- Smallish head
- Belly green-yellow
- Only found in SW Ontario
- Scales keeled; anal scale single
- Gives birth to live young
- THREATENED (COSEWIC); THREATENED (OMNR)

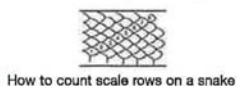
Eastern Rat

Elaphe obsoleta

- 106.7-183 cm; record 256.5 cm (large snake)
- In some, faint blotched pattern may be seen
- Throat white
- Belly grey-brown wash
- Scales weakly keeled; anal scale divided
- Lays eggs
- THREATENED (COSEWIC); THREATENED (OMNR)

Juvenile Eastern Rat

- Light grey with grey-brown blotches on body and tail
- Dark bar across snout and from eye to jaw



How to count scale rows on a snake



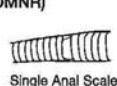
Smooth Scales



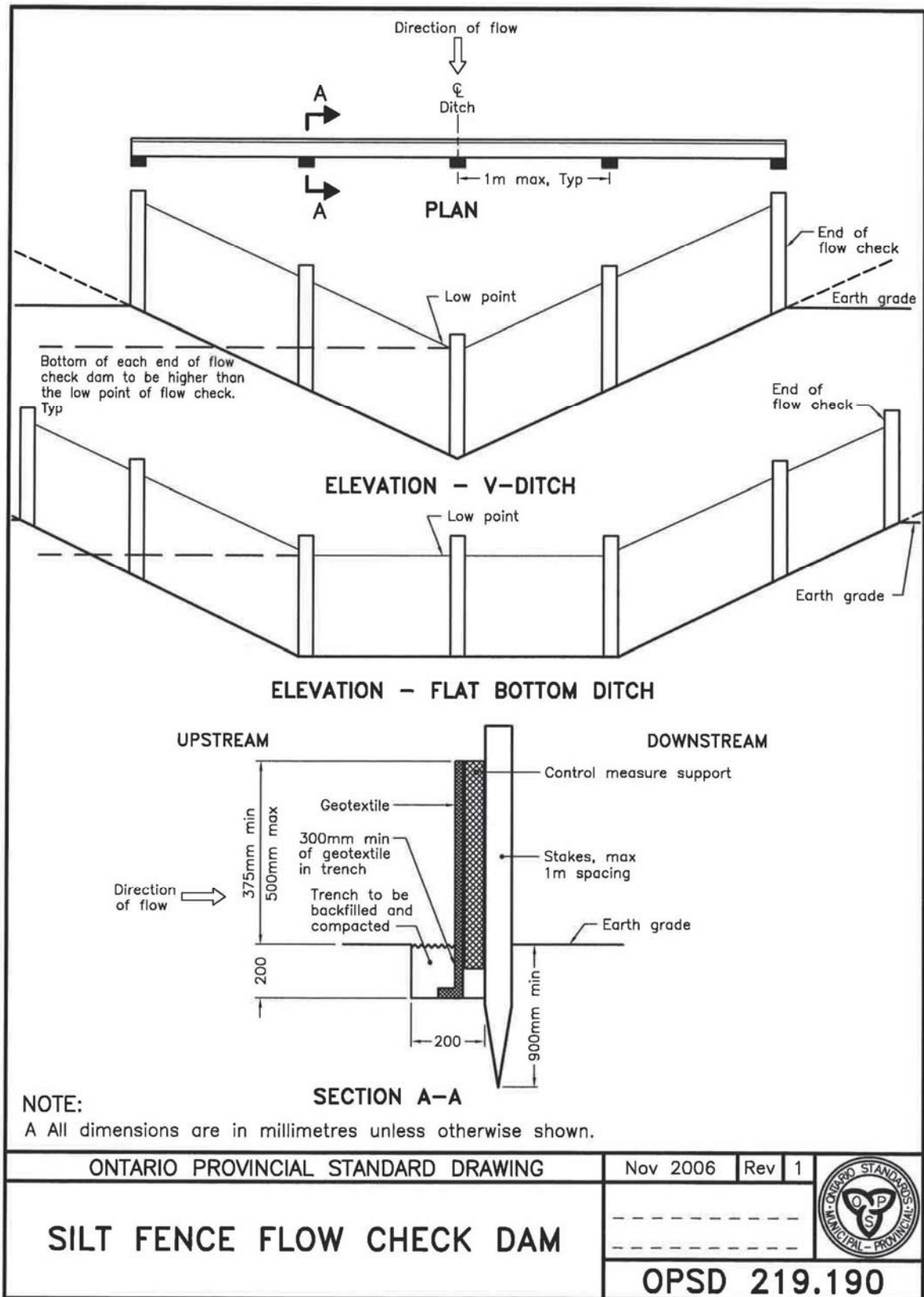
Keeled Scales



Divided Anal Scale



Single Anal Scale



APPENDIX 'D'

CORRESPONDENCE

File 14-391



Essex Region
Conservation
Authority



360 Fairview Avenue West, Suite 311, Essex, ON, Canada, N8M 1Y6 | P 519-776-5209 | F 519-776-8688 | erca.org | ourgreenlegacy.org

Partner Municipalities

Town of Amherstburg

Town of Essex

Town of Kingsville

Town of Lakeshore

Town of LaSalle

Municipality of
Leamington

Township of Pelee

Town of Tecumseh

City of Windsor

02 April 2015

Municipality of Leamington

111 Erie Street North
Leamington, Ontario
N8H 2Z9

Attention: Ms. Kim Siddall, Manager of Legislative Services

Dear Ms. Siddall:

RE: Petition for New Drainage Works
Mersea Rd 6 (Driedger Drain)
Lots 224 & 225, Concession NTR
Municipality of Leamington

The Essex Region Conservation Authority (ERCA) has received your notification dated March 20, 2015 regarding the petition for the drainage of certain lands by means of the drainage works designated above. The following information is provided with regard to the subject proposal.

The subject lands are located within the limit of regulation (Section 28 of the *Conservation Authorities Act*) for the Derbyshire Drain which is under the jurisdiction of the Essex Region Conservation Authority. Prior to undertaking work in this area, a "Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Permit" is required from this office. The Derbyshire Drain is currently a municipal drain located on the north side of Mersea Road 6. The proposed new Driedger Municipal Drain is to be located in the same general area. Based on a review of our files, this office has no record of local natural heritage features within or adjacent to this section of the proposed new municipal drain. This does not however remove the Municipality's responsibility to contact other provincial or federal agencies that may have concerns with this proposal.

If during the design of the project, significant natural heritage features are identified, this office could request a biological assessment of the identified features as part of our requirements under Section 28 of the *Conservation Authorities Act*. The proponent would have a qualified biologist undertake a biological assessment of the proposed works. The purpose of the biological assessment is to ensure that the proposed works will not adversely impact any natural heritage issues and/or to determine measures that will mitigate any potential adverse impacts. For any biological assessment that is required in order to satisfy issues related to the *Conservation Authorities Act*, the cost of the biological assessment is the responsibility of the proponent.

/...2



Member



Ms. Siddall
02 April 2015
Mersea Road 6 (Driedger Drain)
Page 2

With respect to the Department of Fisheries and Oceans (DFO) concerns and comments, the proposed works outletting into the Derbyshire Drain will need to be self-assessed by the Municipality of Leamington, the proponent, through the DFO website at <http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>. Through the self-assessment process, the proponent will be able to determine if the proposed works will require a formal authorization under the *Fisheries Act*.

In order to obtain a federal authorization, it may be necessary to provide habitat compensation for the proposed works. In general, the resulting habitat impacts must be replaced with equivalent habitat features. Determining if a proposed project is acceptable/compensatable would require biological investigations and would depend on the actual proposed works. The costs related to the biological investigations are the responsibility of the proponent.

The DFO will also need to be contacted regarding the *Species at Risk Act* for federally listed aquatic species at risk fish and associated approval requirements.

The Proposed New Municipal Drain may contain significant species (aquatic species at risk as well as plants, animals, habitat, etc.) that are protected under the provincial *Endangered Species Act*. The ERCA does not screen for species that are protected under the provincial *Endangered Species Act*. It is the proponent's responsibility to ensure all issues related to the provincial *Endangered Species Act* are addressed. All inquiries regarding the provincial *Endangered Species Act* should be made with the Aylmer office of the Ontario Ministry of Natural Resources and Forestry (MNRF) (ESAScreeningRequest.AylmerDistrict@ontario.ca).

It is our understanding that the engineering firm of R.C. Spencer Engineering will be preparing a Preliminary Report for the drainage works. Prior to your consultant moving forward with design for any proposed works, we recommend that they contact this office to discuss same.

If further information or clarification is required, please do not hesitate to contact this office.

Yours truly,



Cynthia Casagrande
Regulations Technician

JH/CC/cc





POLICY NO.	E09-Buffer Strips
DATE ENACTED:	March 3, 2003
AMENDED BY:	C-69-12
PAGE:	1 of 2

SUBJECT: PROCEDURAL STEPS FOR INCORPORATION OF BUFFER STRIPS IN DRAINAGE REPORTS

OBJECTIVE: To ensure that the incorporation of buffer strips in drainage reports are handled consistently.

ACTIVITY: This is intended to be a policy for setting the recommended width of buffer strips and to set the value of compensation based on the rate percentage on the average assessed value per hectare for agriculture lands in a drainage report on Municipal Drains. In addition this policy is for the protection of the buffer strips under Section 80 of the Drainage Act.

POLICY:

As buffer strips become implemented into a Municipal Drain by an Engineer's Report the need to handle the situation in a prompt and fair manner will be required.

1. Compensation due to Loss of Land:

The Drainage Engineer will be responsible for calculating the compensation for loss of land pursuant to Section 30 of the Drainage Act.

2. Width of Buffer Strips:

The standard width for a buffer strip for all drainage reports shall be 3m (10'). This would be required on both sides of the open municipal drains throughout the course of the drain.

3. Activities Within the Buffer Strip:

The area within the limits of the buffer strip:

- Shall not be tilled
- Shall not have drainage furrows cut through the buffer
- Shall not be sprayed with any herbicide product without consulting the Municipal Drainage Superintendent
- Shall comply with the Nutrient Management Act in respect to applying fertilizers.

4. Landowner Damaging a Buffer Strip Contained within An Engineer's Report:

Notify the landowner in writing (in accordance with Section 80 of the Drainage Act)

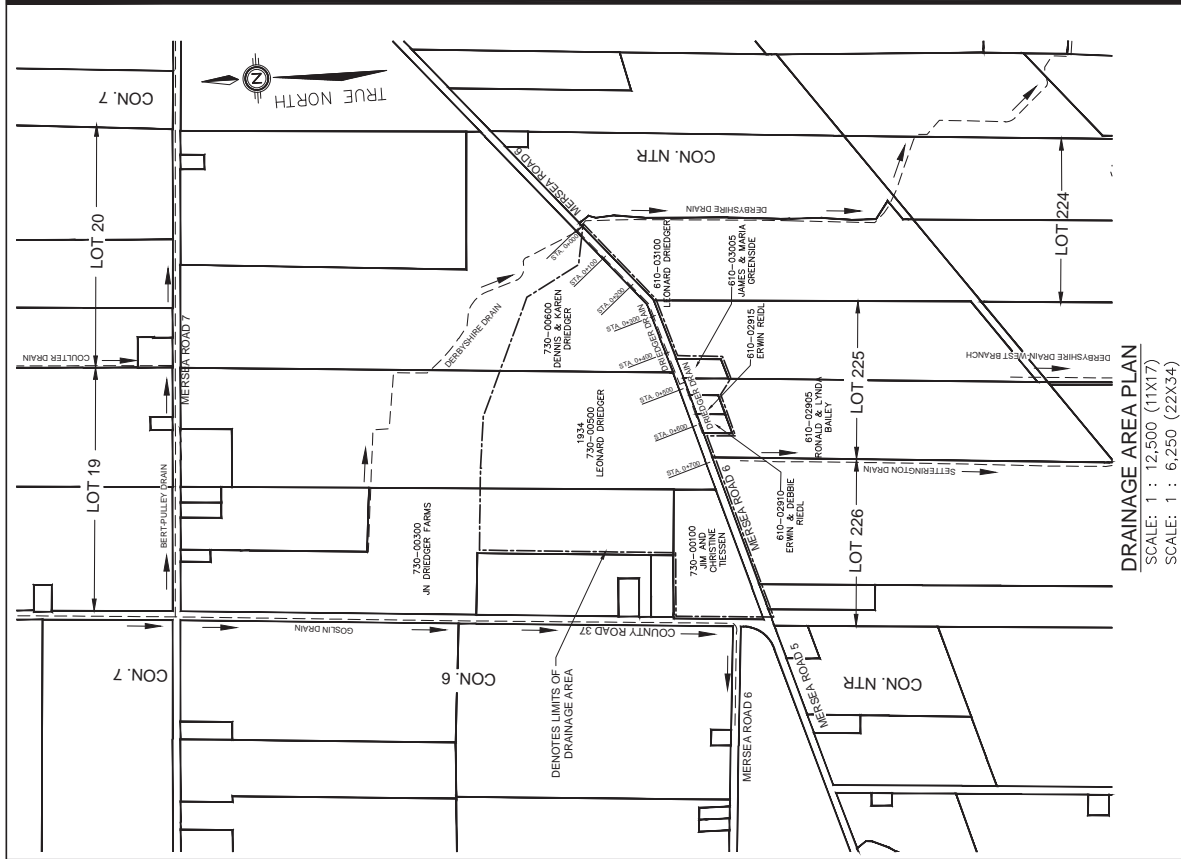
- a) Of the damage which has been caused, the extent of the repairs and the length of time in which the landowner has to repair the damage.
- b) And that if the landowner does not comply within the written order of the municipality, the municipality will make the necessary repairs and the costs incurred will be charged to the landowner (Section 80(1)).

- c) And if the owner of the land does not pay the cost of the repairs to the municipality, the municipality will pay the costs and subsequently place their costs on the collector's roll for this property and collect them as taxes accordingly (Section 80(2)).

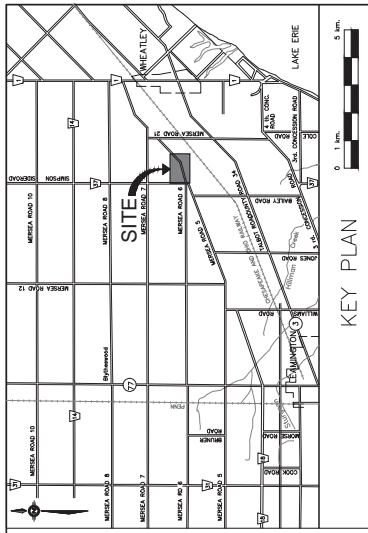
5. Maintenance of Buffer Strips Contained within an Engineer's Report:

That "normal" maintenance of buffer strips will be completed by the Drainage Superintendent as described in the Engineer's Report. However, should the land owner desire a manicured lawn buffer strip or specific landscaped quality, the landowner will be responsible for maintaining the buffer strip at their time and expense.

(DR 23/03)
(DR 9/12)



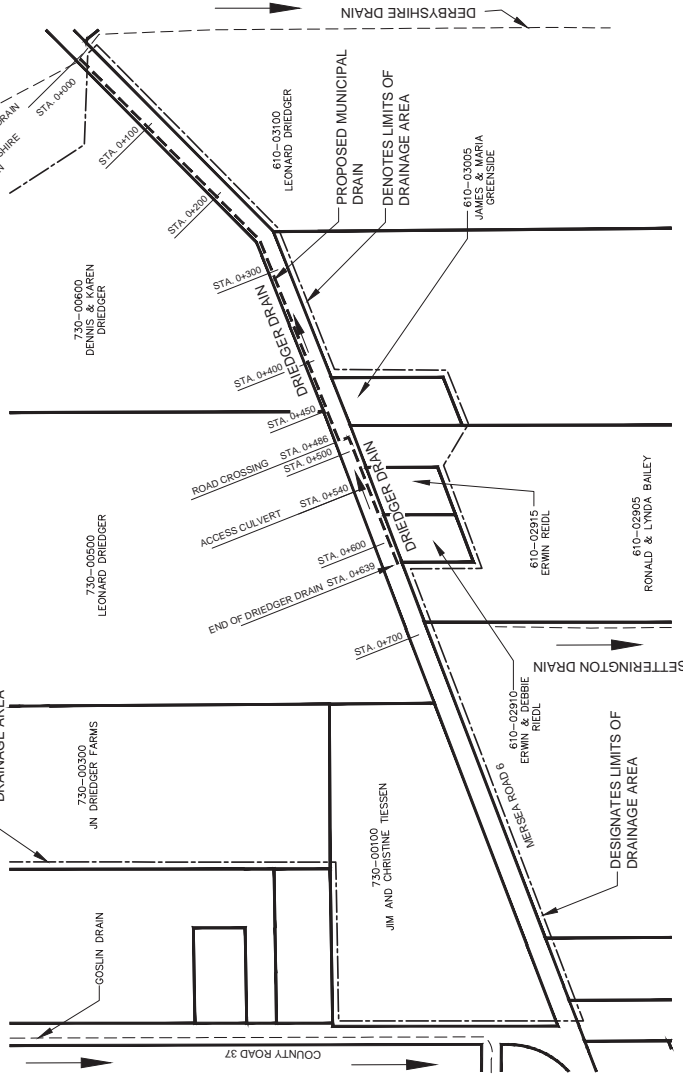
DRAINAGE AREA PLAN
SCALE: 1 : 12,500 (11X17)
SCALE: 1 : 6,250 (22X34)



KEY PLAN

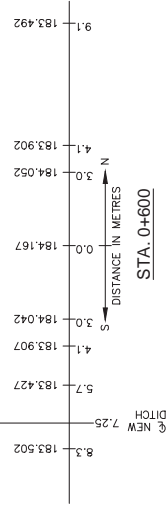
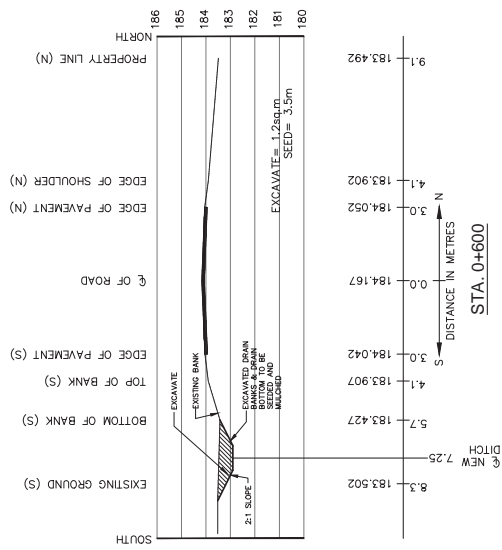
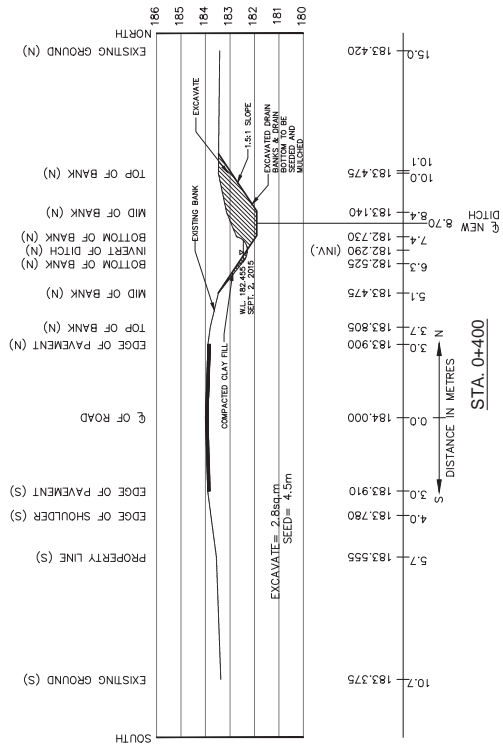
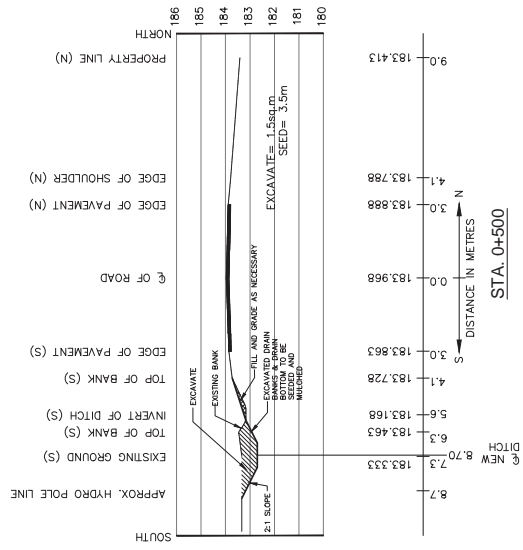
BENCHMARKS		
NUMBER	STATION	DESCRIPTION
NO. 1	0+000	NORTH INVERT OF DERBYSHIRE DRAIN ROAD CROSSING 120mm CSP
NO. 2		NAIL IN HYDRO POLE AT MERSIA ROAD 6 (NORTH SIDE) 6" ABOVE GRADE
NO. 3	0+900	NAIL IN HYDRO POLE #BESSIE (NORTH OF SPEED SIGN) 6" ABOVE GRADE
NO. 4	0+750	NAIL IN HYDRO POLE #BESSIE (NORTH SIDE, WEST OF WHITE HOUSE) 6" ABOVE GRADE

DESIGNATES LIMITS OF DRAINAGE AREA



DRAINAGE AREA PLAN ENLARGEMENT
SCALE: 1 : 5,000 (11X17)
SCALE: 1 : 2,500 (22X34)

 RC SPECIAL ASSOCIATE INC. Registered Professional Engineer Ontario Professional Engineer No. 12345 Ontario Professional Engineer No. 67890	 LEAMINGTON ONTARIO CANADA	DESIGN CHECKED D.M. DRAWN R.A.B. CHECKED D.M. DATE OCT 16, 2017 SCALE AS SHOWN	PROJECT NO. 14-391 SHEET NO. 1 OF 9
		DRAINAGE AREA PLAN DRAINAGE DRAIN	



SCALE:

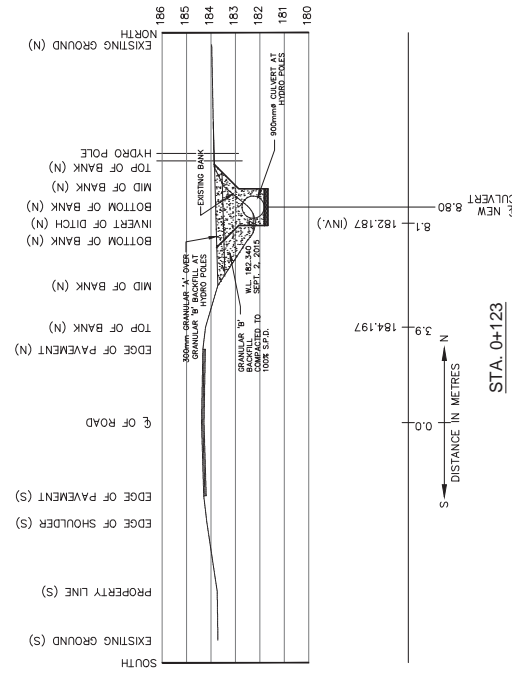
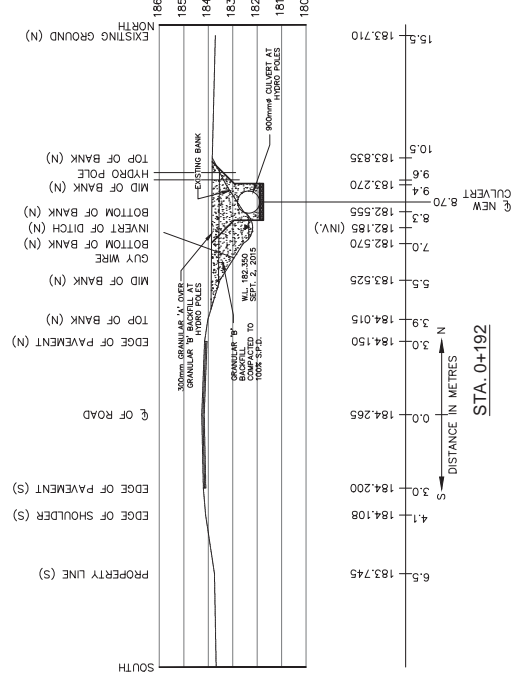
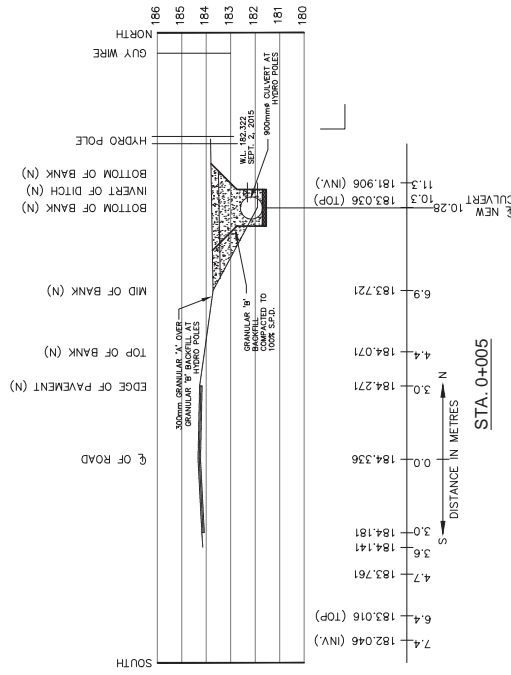
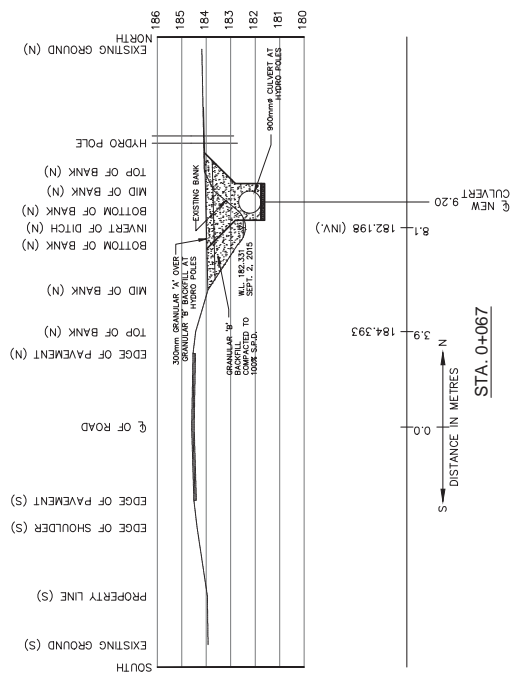
1 : 200 (11X17)

1 : 200 (11X17)
1 : 100 (22X34)

LEGEND:

W.L. - WATER LEVEL

									PROJECT NO. 14-391	SHEET NO. 4 OF 9
									DESIGN L.Z. CHECKED D.M. DRAWN R.A.B. CHECKED D.M. DATE OCT 16, 2017 SCALE AS SHOWN	DRIEDGER DRAIN DRAIN CROSS SECTION (STA. 0+400 TO STA. 0+600)

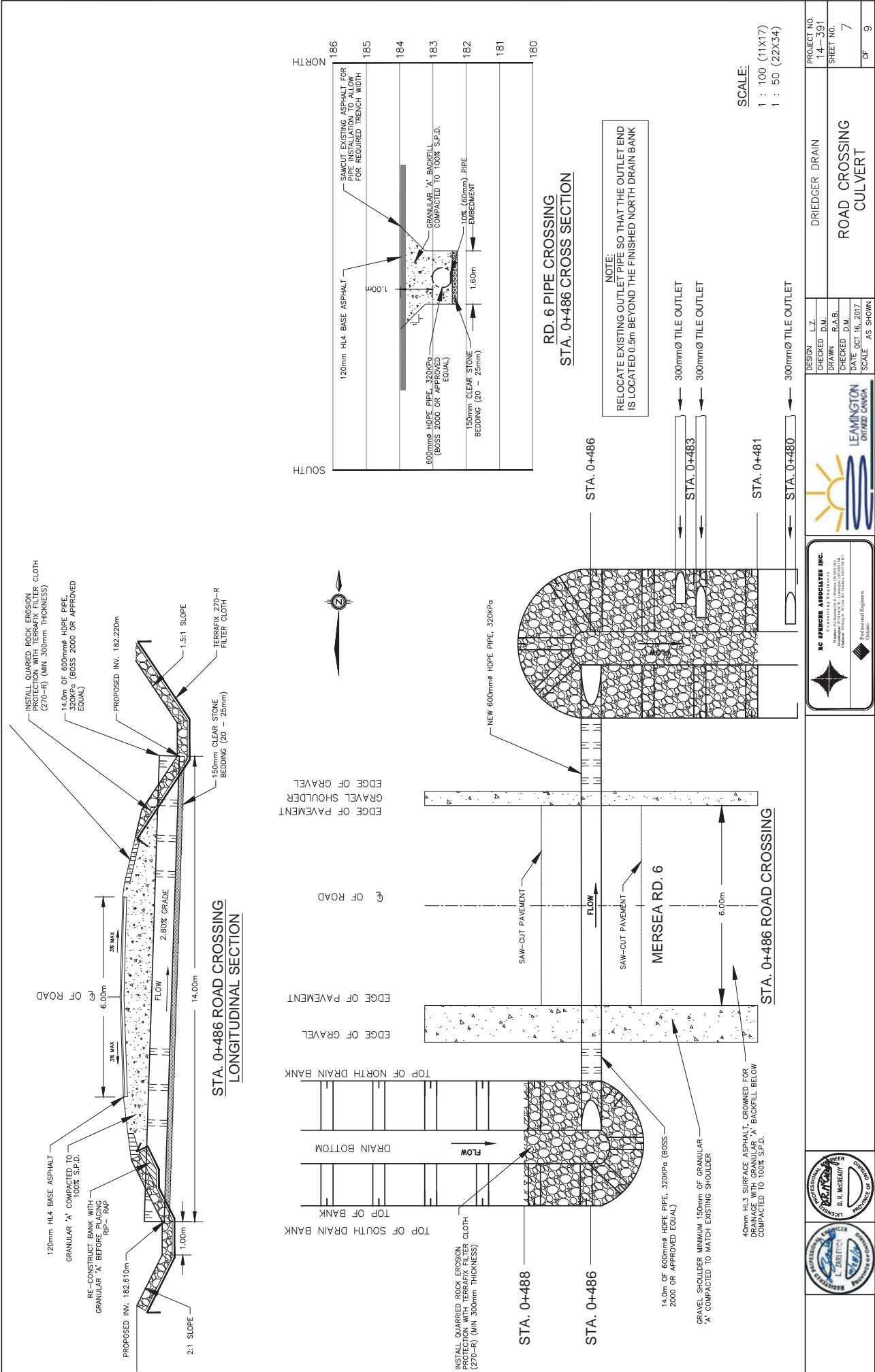


SCALE:
1:200 (11X17)
1:150 (22X34)

LEGEND:

W.L. - WATER LEVEL

 	 <p>BC SPENCER ASSOCIATES INC. CONSULTING ENGINEERS 1000 SHEPPARD AVENUE EAST SUITE 100 SCARBOROUGH, ONTARIO M1S 1T5 CANADA TEL: (416) 291-1100 FAX: (416) 291-1101 WWW.BCSPENCER.COM</p>	 <p>LEAMINGTON ONTARIO CANADA</p>	DESIGN	L.Z.	DRIEDGER DRAIN	PROJECT NO.	14-391	
			CHECKED	D.M.		DRAWN	R.A.B.	SHEET NO.
				CHECKED	D.M.	DRAIN CROSS SECTION AT HYDRO CULVERT	DATE	OCT 16, 2017
							SCALE	1:200



EDGE OF PAVEMENT

EDGE OF GRAVEL

TOP OF BANK

EDGE OF DRAIN

TOP OF BANK

MIN. 300mm GRANULAR 'A' COMPACTED TO 100% S.F.D.

9.5m OF 450mm HDPE PIPE, 320kPa

150mm TO 230mm QUARRIED ROCK PLACED 300mm THICK OVER TERRAIN 270-R GEOTEXTILE FABRIC

R=5m

W=5m

DRIEDGER DRAIN

FLOW

FLOW

6.0m



1 : 100 (11X17)
1 : 50 (22X34)

RC SPENCER ASSOCIATES INC.
Consulting Engineers
 Windsor: 261 Dufferin St., Windsor, ON N9N 1G0
 London: 15 Eglar St., London, ON N6E 1A4
 Chatham: 10 King St., Chatham, ON N7B 1E1

Professional Engineers
 Ontario

DESIGN	L.Z.	DRIEDGER DRAIN NEW CULVERT INSTALLATION ERWIN REIDL	PROJECT NO.
CHECKED	D.M.		14-391
DRAWN	R.A.B.		SHEET NO.
CHECKED	D.M.		9
DATE	OCT 16, 2017		OF
SCALE	AS SHOWN		9