Peralta Engineering

ENGINEER'S REPORT

(Drainage Act, RSO 1990, c. D.17)

PROJECT **J.C. Smith & McPherson Drain Improvements**
(Geographic Township of Sandwich South)
Town of Tecumseh, County of Essex
Project No. D14-011

August 2, 2024

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Peralta Engineering

PREAMBLE

MUNICIPAL DRAINS AND THE DRAINAGE ACT

The "Drainage Act" is one of the oldest pieces of legislation in Ontario, passed in 1859. It provides a democratic procedure for the construction, improvement and maintenance of drainage works. A procedure whereby the Municipality may assist in providing a legal drainage outlet for surface and subsurface waters not attainable under common law. Accordingly, provides much-needed assistance to facilitate the problems of obtaining a legal drainage outlet, engineering and cost distribution.

The Drainage Act provides a legal procedure by which an "area requiring drainage" may receive an outlet drain constructed to dispose of excess stormwater runoff to a sufficient outlet. This drainage infrastructure is otherwise known as a "Municipal Drain". Municipal Drains are identified by Municipal By-Law that adopts an Engineer's Report. The drainage engineer has the obligation to prepare an unbiased Engineer's Report based on information presented in written form, orally, and from visual inspection; in accordance with currently accepted design criteria. These reports form the legal basis for construction and management of the Municipal Drain. As such, an Engineer's Report shall contain specific details such as plans, profiles, and specifications that define the location, size and depth of the drainage infrastructure, together with establishing how costs are shared amongst all stakeholders.

Through the democratic procedure, the Engineer's Report is presented to all Stakeholders in front of Municipal Council (or a Drainage Board appointed by Council) for consideration. The Drainage Act provides an appeal process to address various aspects of Municipal Drains. These appeal bodies are the Court of Revision, the Ontario Drainage Tribunal and the Drainage Referee.

For additional information, Fact Sheets, and reference materials regarding the Drainage Act and Municipal Drains, please visit: **https://www.ontario.ca/page/agricultural-drainage**

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Town of Tecumseh, County of Essex
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August 2, 2024

Mayor and Municipal Council
Corporation of the Town of Tecumseh
917 Lesperance Road
Tecumseh, Ontario
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I. INTRODUCTION

In accordance with the instructions received by letter dated May 20, 2014, from the Town of Tecumseh's Clerk, we have prepared the following report that provides for the necessary improvements to the J.C. Smith Drain and McPherson Drain to address the poor overall functionality of both drains. The J.C. Smith Drain is located along the west side of the 10th Concession Road, and generally extends the full length of the roadway between County Road 8 and South Talbot Road. The McPherson Drain also extends along the east side of the 10th Concession Road, from County Road 8 to South Talbot Road. The two drains are interconnected by multiple road crossing culverts, with the McPherson Drain being the larger of the two municipal drains. Both drains are predominantly used to drain the agricultural properties on both sides of the 10th Concession Road and various residential parcels. Due to a topographical ridgeline that cuts through the region approximately midway between County Road 8 and South Talbot Road, the outlets for the drains vary, with the northern half of the watershed draining to the West Branch of the Delisle Drain, and the southern half draining to the Colchester Townline Drain and the Webster Drain.

Our appointment and the works relative to the repair and improvement of the J.C. Smith Drain and McPherson Drain proposed under this report, is in accordance with Section 78 of the "Drainage Act, RSO 1990, Chapter D.17 as amended 2021". We have performed all of the necessary survey, investigations, etc., of the J.C. Smith Drain and McPherson Drain, and we report thereon as follows.

II. BACKGROUND

J.C. Smith Drain – Governing Reports

From our review of the Town's drainage files, we have determined that the J.C. Smith Drain was last repaired and improved under two separate engineer's reports. The initial report that established this drainage system as a Municipal Drain was prepared by C.G.R. Armstrong, P.Eng., dated September 29th, 1967, carried

out through the Township of Sandwich South By-Law No. 1584. In general, this report established the J.C. Smith Drain by moving the existing roadside ditch further west of the road allowance to prevent and mitigate damage to the roadway. Twelve (12) access culverts were constructed under this report. The latest report was prepared by Maurice Armstrong, P.Eng., dated August 16th, 1977, carried out through the Township of Sandwich South By-Law No. 77-51. This report cleaned and deepened a portion of the southern part of the J.C. Smith Drain, as well as a portion of the Webster Drain. The road crossing culvert across from the Webster Drain was cleaned, and a single culvert was lowered under this report.

McPherson Drain – Governing Reports

The McPherson Drain has been an established drainage system dating back to 1884. However, various reports have been prepared over the years that supercede past details and no longer govern over this Municiapl Drain. The McPherson Drain was last repaired and improved under an Engineer's Report prepared by C.G.R. Armstrong, P.Eng., dated October 3rd, 1947, carried out through the Township of Sandwich South By-Law No. 979. In general, this report deepened and improved only the northern length of the drain and included the installation of a single, new access culvert. No other bridges are referenced in this report. We also reviewed the Engineer's Report by C.G.R. Armstrong, P.Eng., dated June 15th, 1938, carried out through Sandwich South By-Law, which deepened and cleaned out the entire drain length.

We find that the reports outlined above serve as the governing By-Laws for each Municipal Drain, through the provisions of the Drainage Act. Accordingly, we have used these above noted reports in part to assist us in establishing the affected watershed for the project as well as the open drain design parameters.

Other Drainage References

Although the above-mentioned engineering reports serve as the governing By-Laws for the subject drains, a number of additional reports were provided to us by the Town and were referenced over the course of our review for this project. These include:

1) South Malden Road Drain (Lower Portion) and Graham Drain Improvements - June 18th, 2015 report by Shane R. McVitty P.Eng.

2) Maintenance Schedule of Assessment Colchester Townline Drain - January 22nd, 2014 report by Halliday P. Pearson, P.Eng.

3) Incorporation of Existing Access Culverts into the Colchester Townline Drain - January 15th, 2014 report by Halliday P. Pearson, P.Eng.

4) Repair and Improvement to the South Malden Road Drain (Upper Portion) - October 23rd, 2013 report by Halliday P. Pearson, P.Eng.

5) Reconsidered Drainage Report for the Webster Drain – January 7th, 2002 report by Bruce D. Crozier, P.Eng.

6) Mergl Drain - December 22nd, 1992 report by L. Zarlenga, P.Eng.

7) West Branch of the Delisle Drain - December 18th, 1985 report by Maurice Armstrong, P.Eng.

8) Northerly Part of the Santo Drain - September 26th, 1983 report by Maurice Armstrong, P.Eng.

9) South Talbot Road Drain and O'Connell Outlet Drain – September 2nd, 1981 report by C.G.R. Armstrong, P.Eng.

10) Malden Road Drain East, the South Talbot Road Drain East, the 12th Line Drain, the Croft Drain, and the South Talbot Road Drain West - October 15th, 1980 report by Maurice Armstrong, P.Eng.

11) Ninth Line Drain and Branch - May 25th, 1979 report by Maurice Armstrong, P.Eng.

12) E.A. Sullivan Drain - October 16th, 1967 report by C.G.R. Armstrong, P.Eng.

13) St. Julian Drain – February 2nd, 1962 report by C.G.R. Armstrong, P.Eng.

In addition to the above-mentioned reports, we requested that the Town provide us with updated roll information for the affected parcels within the drain watersheds. Said information has assisted in the establishment of the Assessment Schedules for the J.C. Smith Drain and McPherson Drain included within this report.

Definition of Access Structures

Access structures within a Municipal Drain can be defined as a drainage pipe or culvert within the open channel that allows the conveyance of runoff within the drain's alignment that facilitates vehicular ingress and egress to an adjacent property. Access structures can come in the form of a simple access **bridge** under the property's driveway or a combination of an access bridge and an extension of the access bridge to enclose a lawn or boulevard area (otherwise known as **lawn piping**). The combination of a bridge and lawn piping is considered an **enclosure**. In addition to access structures, road crossings, and culverts, that carry runoff from one side of the road to the other have also been identified within this report.

Existing Access Structures – J.C. Smith Drain

From our detailed research of the September 29th, 1967, report by C.G.R. Armstrong, P.Eng., and the August 16th, 1977, report by Maurice Armstrong, P.Eng., we have determined that of the existing twenty-five (25) access structures within J.C. Smith Drain, eleven (11) have either been referred to or constructed under the 1967 or 1977 By-Laws. Therefore, these access structures are considered legal entities with respect to the J.C. Smith Drain. As such, these structures are currently eligible to have the costs for their replacement and/or improvement shared by the lands and roads within the drains watershed that contribute runoff into the drain, upstream of said structures.

Based on our review, we have determined that the following existing access structures have been established under the auspices of the Drainage Act:

Table 1 – Access Structures Established Under the Drainage Act in the J.C. Smith Drain

STRUCTURE NO.	ROLL NUMBER	OWNER
2W	410-02540	Mergl Seeds Ltd.
4W	410-02500	William & Joanne Leon
7W	410-02400	Gregory Markham
8W	410-02300	Town of Tecumseh Water Department Gregory Price
9W	410-02200	Gerard & Cindy Revenberg
11W	410-02100	Gianni & Shirley Sfalcin
12W	410-02000	Amandeep & Jaspal Baines
14W	410-02000	Amandeep & Jaspal Baines
17W	410-01900	Shirley Wilson
19W	410-01800	Revenberg Holdings Ltd
22W	410-01700	Revenberg Holdings Ltd.

From our research, we have determined that fourteen (14) access structures within the J.C. Smith Drain have been constructed without the benefit of an Engineer's Report or Municipal By-Law. These bridges are:

Table 2 – Access Structures Not Established Under the Drainage Act in the J.C. Smith Drain

STRUCTURE NO.	ROLL NUMBER	OWNER
1W	-	Town of Tecumseh
3W	410-02500	William & Joanne Leon
5W	-	Town of Tecumseh Water Department
6W	410-02400	Gregory Markham
10W	-	Town of Tecumseh Water Department
13W	410-02010	Andrew & Jodi Brewin
15W	-	Town of Tecumseh Water Department
16W	410-01900	Shirley Wilson
18W	-	Town of Tecumseh Water Department
20W	-	Town of Tecumseh Water Department
21W	410-01700	Revenberg Holdings Ltd.
23W	-	Town of Tecumseh Water Department
24W	410-01660	Brian & Lisa McGuire
25W	410-01500	Vince Gemus Holdings Inc.

It should be noted that these fourteen (14) access structures, installed without the benefit of an Engineer's Report under the provisions of the Drainage Act or Municipal By-Law, are considered to be private bridges within the J.C. Smith Drain. As a structure that has never been identified within an Engineer's Report, it is unknown when these access structures were installed, nor are we aware of the quality of materials used or the standards to which these access structures were constructed. Therefore, these structures are not currently legal entities with respect to the Municipal Drain and are currently considered private structures. As such, the repair and improvements of these access structures shall be the sole responsibility of the abutting landowner until a time when the access structures have been identified through the provisions of the Drainage Act.

Existing Access Structures – McPherson Drain

From our detailed research of the June 15th, 1938, and the October 3rd, 1947, reports by C.G.R. Armstrong, P.Eng., we have determined that of the existing five (5) access bridges within McPherson Drain, only one (1) has either been referred to or constructed under the 1938 or 1947 By-Laws. Therefore, this access structure is currently eligible to have the costs for its replacement and/or improvement shared by the lands and roads within the drains watershed that contribute runoff into the drain, upstream of this structure.

Based on our review, we have determined that the following existing access bridge has been established under the auspices of the Drainage Act:

Table 3 – Access Structures Established Under the Drainage Act in the McPherson Drain

STRUCTURE NO.	ROLL NUMBER	OWNER
5E	410-02650	Nancy Steeves

From our research, we have determined that four (4) bridges within the McPherson Drain have been constructed without the benefit of an Engineer's Report or Municipal By-Law. These bridges are:

Table 4 – Access Structures Not Established Under the Drainage Act in the McPherson Drain

STRUCTURE NO.	ROLL NUMBER	OWNER
1E	-	Town of Tecumseh
2E	410-02550	Roberta Diemer
3E	410-02550	Roberta Diemer
4E	410-02600	Peter & Nancy Steeves

It should be noted that these four (4) bridges, installed without the benefit of an Engineer's Report under the provisions of the Drainage Act or Municipal By-Law, are considered to be private bridges within the McPherson Drain. As a structure that has never been identified within an Engineer's Report, it is unknown when these access structures were installed, nor are we aware of the quality of materials used or the standards to which these access structures were constructed. Therefore, these structures are not currently legal entities with respect to the Municipal Drain and are currently considered private structures. As such, the repair and improvements of these access structures shall be the sole responsibility of the abutting landowner until a time when the access structures have been identified through the provisions of the Drainage Act.

III. PRELIMINARY EXAMINATION AND ON-SITE MEETINGS

J.C. Smith Drain Meeting

After reviewing all of the available drainage information and documentation provided by the Drainage Superintendent, we arranged to schedule an On-Site Meeting for July 23rd, 2014, at 6407 10th Concession Road. In attendance were the following: Eleanor Mergl, Dwight Farough, Shirley Wilson, William Leon, Sam Paglia, (Drainage Superintendent), and Shane McVitty (N.J. Peralta Engineering Ltd.).

Following Mr. Paglia's introduction of Mr. McVitty as the Engineer appointed by the Town to perform an investigation of the subject drainage works, Mr. Paglia explained the purpose of the meeting and provided a brief description of the J.C. Smith Drain. Mr. Paglia explained that a request for an improvement to the drain was made by Mr. Brian McGuire, who lives at 6407 10th Concession Road (Roll No. 410-01660) to the Town Drainage Department. It was noted that Mr. McGuire was not in attendance at the meeting to specifically outline the intention behind his request or his observations of the drain and its functionality. Regardless, Mr. Paglia indicated that The Town responded to the request by appointing N.J. Peralta Engineering Ltd. to perform the necessary examinations of the entire drain, including all of its access structures, required to prepare an engineering report for the improvements to the drain in accordance with the Drainage Act.

Mr. Paglia offered a brief explanation regarding the scope of work of the project. Mr. Paglia indicated that many of the drains within the Town of Tecumseh have not been maintained in several years and, in some cases, the governing reports date back over 60 years. Mr. McVitty added that the last major work on the J.C. Smith Drain was completed under a report by C.G.R. Armstrong, P.Eng., dated September 29th, 1967 and that this report established the drain under the Drainage Act. Mr. Paglia indicated that due to the age of the governing report, the assessment schedule is out of date no longer provides the Town with a fair way of assessing the costs of maintenance work. The only way to update the schedule of assessment and undertake the necessary improvements to the drain concurrently is to appoint an Engineer to prepare a report. Given the length of time since the last drain improvement, it is sensible to evaluate the entire drain and make the necessary improvements. Mr. Paglia indicated that the Engineer will decide the extent of these improvements, through their survey, review, and examinations.

It was noted that many of those in attendance were also present to take part in the On-Site Meeting for the McPherson Drain, which is a Municipal Drain that exists on the east side of the 10th Concession Road. It was also noted that some of these landowners are currently assessed into both the McPherson Drain and the J.C. Smith Drain. Mr. Paglia explained that the McPherson Drain improvements were initiated by the Town of Tecumseh under Section 78 of the Drainage Act. He added that the reason for this was once again to address the age of the current governing report and assessment schedule. Also, given that the J.C. Smith Drain and the McPherson Drain are interconnected through road crossing culverts and that the two drains have overlapping watersheds, it was the Town's opinion that appointing an Engineer to examine both drains was a sensible course of action. As such, N.J. Peralta Engineering Ltd. was appointed to perform the necessary examinations of the entire McPherson Drain, including all of its culverts and access bridges, and prepare an engineering report for the improvements to the drain in accordance with the Drainage Act.

Mr. Paglia further described the process by which municipal drainage works are conducted under the Drainage Act. He explained that the first step in responding to the Town's request for the drain improvement is the On-Site Meeting with the ratepayers. He explained that the purpose of the On-Site Meeting was to introduce the project, explain the process, and solicit comments, concerns and experiences concerning the proposed work as well as other issues that residents may have with the drain. Mr. Paglia then went on to explain the next steps in the process, including the Engineer's Report, the Public Information Centre, Council consideration of the report, and the appeals processes through the Court of Revision and Tribunal. The attendees were told that they would be notified of these meetings in advance and would be provided a copy of the report prior to the Public Information Centre.

Mr. McVitty went on to describe his preliminary review of the J.C. Smith Drain. The J.C. Smith Drain was last improved under a report that dates back to 1967. A subsequent Engineer's Report was completed in 1977 but only considered a portion of the south end of the drain as well as a short length of the Webster Drain. No other reports were uncovered in Mr. McVitty's historical review of the Town's archives.

Mr. McVitty indicated that a number of culvert pipes and driveway accesses currently exist within the drain. Also, there are a number of culverts that seem to have been installed as access to fire hydrants. Mr. McVitty opined that most of these fire hydrant culverts appeared to be in fairly good condition and suggested that they must have been recently installed. It was the consensus of those present that the watermain was installed approximately 10 years ago and the culverts were installed at this time. William Leon indicated that it was his opinion that some of these fire hydrant culverts were installed incorrectly and sit too high in the drain. Mr. McVitty indicated that all of the culverts, including the fire hydrant culverts, will be reviewed as part of his work. If it is found that the fire hydrant culverts are inadequate, or were incorrectly installed, then the Drainage Report will make provisions to have them corrected. The costs to do so, would be assessed to the Town Water Department. The costs to install or improve all other access culverts within the drain will also be assessed in the report. Mr. McVitty indicated that the report would provide cost sharing percentages for each culvert based on a number of factors, including the location of the culvert, the length of the culvert, and whether the culvert was previously established as part of the drain.

A question was raised regarding the timing of the culvert replacement and specifically whether this could be deferred if there is any life remaining in the pipe. Mr. McVitty indicated that each culvert will be evaluated and those culverts that do not need to be replaced will be left if they satisfy the overall functionality of the drain. He added that delaying the replacement of a culvert for a couple of years is not always the most economical solution when the project involves the replacement of a number of other culverts. Also, to have the culvert replaced later may require another Engineer's Report, which will add cost to the project. Nonetheless, Mr. McVitty indicated that he will be contacting all culvert owners to discuss the condition of their culverts and bridges once he has completed his survey and investigations. Landowners will also be contacted for information regarding land drainage patterns as necessary.

Eleanor Mergl inquired about the length of time that a Contractor is accountable for their work following the completion of a project. Mr. McVitty indicated that drainage projects usually carry with them a 1-year maintenance period starting from the date that the project is declared substantially complete. Rectification of deficiencies that are discovered during that period is the responsibility of the Contractor. Ms. Mergl expressed concerns with the Colchester Townline Drain and Mr. Paglia identified that this matter can be discussed/addressed outside the scope of this project.

Ms. Mergl questioned the reasoning behind removing trees that don't seem to cause the drain any problems and specifically pointed out the presence of a large walnut tree within the J.C. Smith Drain. Mr. McVitty indicated that trees that don't pose a problem to the drain are most often left alone, while those that interfere with the improvement work or will imped the flow within the drain will need to be removed. He added that the tree in question, from his preliminary review, is quite large and certainly seems to be located in the middle of the drain. If it is found to be a problem, it may have to be removed. Mr. McVitty indicated that this will be reviewed as part of his examinations.

Ms. Mergl indicated that her property directly abuts the drain and questioned how the material from the drain clean-out would be handled. Mr. McVitty indicated that the spoil removed from the drain where it

abuts agricultural lands will be spread out evenly on the farmlands and the landowner will be compensated for the loss of crop production. Ms. Mergl questioned whether she could have the material trucked away and not spread on her property. Mr. McVitty indicated that this could be done, however, her property would be assessed for all the additional costs of the trucking. Mr. McVitty added that he could estimate this extra cost and provide it for Ms. Mergl to help her decide how she would like to have the material handled near her land.

Following the question/answer period, some of the landowners in attendance provided insight into the watershed and their property drainage patterns. These were noted by Mr. McVitty on a plan map of the area for later usage throughout his examinations.

McPherson Drain Meeting

Immediately following the On-Site Meeting for the J.C. Smith Drain, a second meeting was held to discuss the McPherson Drain. In attendance were the following: Eleanor Mergl, Dwight Farough, Shirley Wilson, William Leon, Charles Farough, Dan Diemer, Sam Paglia, (Drainage Superintendent), and Shane McVitty (N.J. Peralta Engineering Ltd.).

Mr. Paglia explained the purpose of the meeting and provided a brief description of the McPherson Drain. Mr. Paglia explained that the McPherson Drain improvements were initiated by the Town of Tecumseh under Section 78 of the Drainage Act. Much like at the meeting for the J.C. Smith Drain, he added that N.J. Peralta Engineering Ltd. was appointed to perform the necessary examinations of the entire McPherson Drain, including all of its culverts and access bridges, and prepare an engineering report for the improvements to the drain in accordance with the Drainage Act.

Mr. McVitty indicated that the last major work on the McPherson Drain was completed under a report by C.G.R. Armstrong, P.Eng., dated October 3rd, 1947, and that this report generally deepened the northern portion of the drain and included the installation of a new, single access culvert. Prior to this report, the entire length of the drain was addressed through a report prepared by C.G.R Armstong, P.Eng., dated June 15th, 1938.

For those that were not in attendance at the J.C. Smith Drain meeting, Mr. Paglia re-iterated the need for a completely new Drainage Report for the McPherson Drain, citing the age of the governing By-Law and an out-of-date Assessment Schedule. He also ran through the process by which municipal drainage works are conducted under the Drainage Act.

Mr. McVitty indicated that all of the culverts within the McPherson Drain will be reviewed as part of his work. Reasons for culvert replacement and improvement was discussed, along with a general description of the basis of assessment for same.

Dan Diemer indicated that he recently purchased his property and that it presently has two (2) access culverts, one for his home and the other for the farmland. He indicated that he would like to have the farm access relocated to better suit his property. He added that the farm culvert was only recently installed and thought that it was in good shape. Mr. McVitty indicated that re-locating the culvert should not be a problem provided it is the proper size and long enough to accommodate the minimum top width and

erosion protection at the ends. Following the meeting, Mr. Diemer and Mr. McVitty visited the location of the existing culvert and reviewed the proposed relocation site.
Dwight Farough requested that the drain be deepened where it abuts his land at Roll No. 410-03600. He also suggested that the drain in front of his property runs north, and not south as is shown on the existing profile from the previous Engineer's Report. Charles Farough also suggested that the water actually drains north in front of his land. Mr. McVitty indicated that the survey will provide a clear indication of the direction by which the drain currently runs and whether or not the deepening of the drain is feasible.

Following the question/answer period, some of the landowners in attendance provided insight into the watershed and their property drainage patterns. These were noted by Mr. McVitty on a plan map of the area for later usage throughout his examinations.

IV. FIELD SURVEY AND INVESTIGATIONS

Following the On-Site Meetings, we arranged to carry out a topographic survey of the existing alignments of both the J.C. Smith Drain and the McPherson Drain along their complete lengths. Our surveys included the taking of all necessary levels and cross sections, the detailing of all access structures along the course of both drains, survey and examination of each of the road crossings culverts that connect the two drains, all as required for the preparation of our report. Our survey also included locating and picking up property bars where available within the area of the proposed work.

For the purposes of establishing the required cross sections for the repair and improvements of the drains, we investigated and reviewed the current by-law reports for each drain. We also examined the watershed area of the drain utilizing the latest Schedule of Assessments from these Reports. Our examination of the watershed area also included a review of the latest engineer's reports of all nearby Municipal drains.

For the purpose of establishing the watershed area upstream of each of the existing access bridges, as well as determining the pipe size requirements for their replacement, we investigated and reviewed the past Engineer's Report on the J.C. Smith Drain and the McPherson Drain. We also carried out cross-checks of the watershed limits utilizing the most recent reports of the numerous municipal drains within geographical proximity of J.C. Smith and McPherson Drains. In addition, we had discussions with various property owners and carried out site visits to verify the watershed limits upstream of each access bridge being improved herein. We also utilized current LiDAR information to cross-check the watershed limits at various locations throughout the watershed. All of the above investigations not only provided us with the suitable watershed area affecting the size of each subject access bridge but also provided us with the information needed to assist us with the preparation of our Construction Schedule of Assessment and Future Maintenance Schedules of Assessments for this project.

As part of our report preparation, we prepared preliminary cost estimates for bridge replacements and contacted each of the affected Owners to review the proposed work. In most cases, we were able to have discussions with the affected Bridge Owners regarding their expectations and access bridge requirements.

V. HYDRAULIC ANALYSIS AND DESIGN REQUIREMENTS

"A Guide for Engineers Working Under the Drainage Act in Ontario" - OMAFRA Publication 852 (2018), is the current reference documentation used by Engineers carrying out work on Municipal Drains through provisions of the Drainage Act. Based on this document, the 2-year return period storm design (50% chance of occurring each year) is the recommended design standard for the minor flow path (channel) applied to Municipal Drains within rural Ontario, specific to open drain channels and low-hazard agricultural access crossings. The exception is for residential, industrial, and commercial properties where flooding could create significant damage to the surrounding properties, a higher 5-year (20% chance of occurring each year) to 10-year (10% chance of occurring each year) return period storm design could be utilized. Considering the lands adjacent to these Municipal Drains are mixed residential and rural land-use, a minimum five (5) year return period storm design was utilized for the evaluation of the minor flow path for the open drain. The major flow path (overland) conveys the less frequent, more extreme, storm events.

Residential, major agricultural culverts or bridge structures within a Municipal Drain require a 5-year to 10-year return period (20% to 10% chance of occurring each year, respectively) as the recommended design criteria. Considering most of the agricultural crossings are of low-hazard variety, a 5-year return period was utilized in the analysis of the residential and agricultural crossings. For culverts in Municipal Drains crossing Municipal Roads, a 10-year return period (10% chance of occurring each year) storm is the recommended design criteria.

VI. FINDINGS AND RECOMMENDATIONS

ERCA, DFO and MNRF Considerations

During the course of our investigations, this drainage project was discussed and reviewed in detail with Ms. Cynthia Casagrande and Summer Locknick, of the ERCA. The J.C. Smith Drain and the McPherson Drain are both located within ERCA regulated area and are therefore under their jurisdiction. As such, an ERCA Permit is required for the drainage improvements being proposed under this report. Further to the above, the ERCA provided us with their comments and concerns through email correspondence, and said emails are included herein as **Appendix "A"**. Through correspondence with the ERCA, we have accounted for all of the ERCA concerns and issues in our design and recommend that this drainage works be constructed in total compliance with said ERCA comments.

With respect to the Department of Fisheries and Oceans (DFO) concerns and comments, the proposed works within this Municipal Drain were "self-assessed" by the Engineer, through the DFO website and the utilization of the "Guidance for Maintaining and Repairing Municipal Drains in Ontario" to determine whether this project shall be reviewed by the DFO. Both Municipal Drains have been established as Class 'F' by the DFO. Based on the DFO Self-Assessment website and the guidance document, we have determined that the project activities would not require a DFO review for the works proposed under this project, so long as standard measures for fish habitat and migration are implemented. Typically, these measures include a minimum 10% embedment of the invert for all culverts below the existing drain bottom or design bottom of the drain, whichever is lower, to ensure a continued path for fish migration through the culvert. Further mitigations include conducting work in dry conditions, immediate bank stabilization, sediment controls, removal of sediment traps, controlled activities to prevent entry of deleterious substances, and restricted

culvert lengths. The DFO Species at Risk Screening Maps, confirm that there are no species at risk, fish or mussels identified in this area.

The Ministry of Natural Resources and Forestry (MNRF) has transitioned the responsibilities of the Species at Risk Provincial Legislation to the Ministry of Environment, Conservation and Parks (MECP). Section 23.9 of the Endangered Species Act, 2007 allows the Municipality to conduct eligible repair, maintenance, and improvement work under the Drainage Act that exempts these works from Sections 9 and 10 of this Act, so long as they follow the rules within Ontario Regulation 242/08.

In recognition of the potential impacts that Species at Risk may experience as a result of the subject works, the Town of Tecumseh has provided comprehensive mitigation measures as well as species identification guides for reference. These documents, entitled "*Species at Risk Mitigation Plan for Drainage Works*" will be provided to the successful Tenderer and shall be available for viewing at the Municipal Office for those interested. Additionally, the Town's Species at Risk Mitigation Plans can be viewed by using the link provided below.

https://www.tecumseh.ca/en/living-here/resources/Documents/Final_Tecumseh-Mitigation-Plan-02Mar18_0.pdf

J.C. Smith Drain and McPherson Drain - Open Drain Improvements

Based on our detailed survey, investigations, examinations, discussions, and determinations at the On-Site Meeting and subsequent follow-up, we would recommend that both the J.C. Smith Drain and the McPherson Drain be repaired and improved along their entire lengths. We find that there are areas along the course of both open drains where silt and sediment have accumulated and are partially obstructing the original capacity of the drains. Therefore, we recommend that the drain bottoms be excavated to remove the accumulations of silt and sediment and restore the drains to their original design cross-sections and proper capacity so that they may function as intended. We also find that the complete length of both drains is congested with trees of various sizes, brush, and phragmites, to such an extent that they can no longer provide proper drainage to the lands and roads that they are intended to serve. Accordingly, we also recommend that all brush, trees, etc., be close cut and grubbed out along the course of both drains and according to the attached Specifications.

Improvements to both the J.C. Smith Drain and the McPherson Drain have been provided for in our Report, are shown on the plans, and are in accordance with the Specifications forming part of the Drainage Report.

Access Structures and Road Crossing Improvements

As part of our work, we reviewed each of the access structures and road crossings within the J.C. Smith Drain and McPherson Drain in detail. In order to establish a basis for replacement of each structure, we examined and analyzed each bridge structure based on the following criteria:

1. The condition of the existing culvert and headwalls.

2. The culvert size and the capacity required for a minimum 1:5-year storm event for access structures and 1:10-year storm event for road crossings.

3. The invert elevations of the culvert pipe relative to the design grade.

4. The existing driveway top width relative to the minimum standard.

Recommendations regarding proposed replacement or improvements to each structure within both drains are provided in further detail as follows:

J.C. Smith Drain – Access Structure Improvements

Based on our detailed survey, investigations, examinations, discussions, and review with the landowners that currently have access structures within the J.C. Smith Drain, we offer the following findings and recommendations relative to the drainage works to be carried out as part of this drainage project.

From our survey, investigations, and the analysis criteria mentioned herein, we find and recommend the following:

Bridge 1W - (Town of Tecumseh & Mergl Seeds Ltd., 410-02540)

We find this existing bridge comprises a corrugated steel pipe with an HDPE smoothwall plastic pipe extension with sloped quarried limestone end to be in good condition. We recommend that the culvert be flushed clean as part of these drainage works, and that no other work be carried out on this bridge at this time. We also recommend that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report.

Bridge 2W - (Mergl Seeds Ltd., 410-02540)

We find this existing corrugated steel pipe access bridge to be in poor physical condition. A tree that is in poor health is also growing on top of the access bridge. Additionally, we find that the existing broken concrete and rubble headwalls are in poor condition, collapsed, and are partially blocking the ends of the culvert pipe. Through discussions with the Landowner, we understand that this bridge is no longer being used to access the adjacent farm property and is no longer required.

As such, we recommend that Bridge 2W and the tree be completely removed and disposed of from the drain and that the drain cross-section be restored to the proposed drain parameters. From our research, we have determined that this existing bridge was a legal part of the drain and shall be formally abandoned under Section 19 of the "Drainage Act, R.S.O. 1990, Chapter D.17".

Enclosure 2P - (Adam Lacey & Anita Marinelli, 410-02530)

At the request of the Owner, we have provided all of the necessary details required for a new enclosure serving as the primary access and lawn piping for this parcel.

Based on our detailed review and through our discussions, we find that the new enclosure shall require approximately 66.10 metres (216.86 ft.) of HDPE smoothwall pipe. The access bridge portion of this enclosure consists of 12.00 metres (39.37 ft.) of pipe length, resulting in a driveway top width of a standard 6.10 metres (20.0 ft.) and the lawn piping portion consists of the remaining 53.90 metres (176.84 ft.). The Owner confirmed that the new access bridge portion of the enclosure shall be positioned at the south end of the

property. We recommend that the upstream end of the new drain enclosure be fitted with a sloped quarried limestone end treatment. At the downstream end of the enclosure, a ditch inlet catch basin shall be installed to allow the collection of surface runoff from the yard and the existing farm swale at the north end to enter the system. The downstream end of the enclosure shall connect to the south end of **Bridge 3W**.

Due to the financial implications of the overall enclosure, the Owner had requested the potential for this enclosure to be installed in a phased approach. Therefore, we recommend that, at a minimum, the primary access portion shall be installed in the initial construction phase, with the lawn piping portion to be installed in a subsequent phase. Depending on the timing of the subsequent phase, the lawn piping portion may be subject to any future changes to regulatory policy, design standards, and permitting. The Owner has been made aware and has agreed to this provision.

Based on the above, we recommend that the access bridge and lawn piping portion be installed according to the details provided on the plans and as further set out in the specifications forming part of this report. Furthermore, as a new structure installed to serve the new property, we recommend that 100% of the associated costs for both the access and the lawn piping portion, be assessed to the Owner. However, the cost of future maintenance of the access portion shall be assessed according to the provisions set out within this report. For the lawn piping portion of the enclosure, we recommend that 100% of the future maintenance costs be assessed entirely to the Owner according to the provisions and as set out within this report.

Bridge 3W - (William & Joanne Leon, 410-02500)

Due to the presence of its collapsed and broken concrete headwalls, we were unable to locate the existing culvert and the overall condition of the pipe was indeterminate at the time of our inspections. Additionally, the access appears to be holding back water and the width of the driveway access is narrow. Through discussions with the Owner, and in consideration of the condition of the bridge, we recommend that this bridge be entirely replaced as set out on the accompanying plans and in the specifications forming part of this report.

Enclosure 4W - (William & Joanne Leon, 410-02500)

We find this existing CSP drain Enclosure 4W to be hydraulically inadequate to convey the flows from the upstream lands and roads. We also find that the existing pipe is not on proper design grade and is impeding flow through the drain, causing water to back up near its upstream end. We also find the existing headwalls, comprised of loose, broken concrete pieces, to be in poor shape and are falling into the drain. Based on these deficiencies and discussions with the Owner, we recommend that the entire drain enclosure pipe be replaced with a larger diameter culvert pipe and set to the appropriate elevations and grade. We also recommend that the existing asphalt driveway be carefully sawcut as part of the work and restored with new asphalt, with said asphalt restoration being assessed entirely to the Owners of the adjacent lands. We also recommend that new, sloped, quarried limestone erosion protection be installed at both ends and that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report.

Bridge 5W - (Town of Tecumseh Water Department)

We find this existing corrugated steel pipe access bridge to be in good condition and on grade. However, we find that the existing end treatments, comprised of grass to be inadequate. As such, we recommend that the culvert be flushed clean as part of these drainage works, and that the headwalls be replaced with sloped quarried limestone erosion protection. We also recommend that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report.

Bridge 6W - (Gregory Markham, 410-02400)

We find this existing corrugated steel pipe access bridge with concrete headwalls to be in good condition. We recommend that the culvert be flushed clean as part of these drainage works, and that no other work be carried out on this bridge at this time. We also recommend that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report.

Bridge 7W - (Gregory Markham, 410-02400)

We find this existing corrugated steel pipe access bridge with broken pieces of concrete for end treatments to be in good condition. We recommend that the culvert be flushed clean as part of these drainage works, and that no other work be carried out on this bridge at this time. We also recommend that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report.

Bridge 8W - (Town of Tecumseh Water Department and Gregory Price, 410-02300)

We find this existing corrugated steel pipe access bridge to be in good condition and on grade. However, we find that the existing end treatments comprised of gravel and broken concrete pieces to be in poor condition. As such, we recommend that the culvert be flushed clean as part of these drainage works, and that the headwalls be replaced with sloped quarried limestone erosion protection. We also recommend that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report.

Bridge 9W - (Gerard & Cindy Revenberg, 410-02200)

We find this existing corrugated steel pipe access bridge with concrete headwalls to be in good condition and on grade. We recommend that the culvert be flushed clean as part of these drainage works, and that no other work be carried out on this bridge at this time. We also recommend that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report.

Bridge 10W - (Town of Tecumseh Water Department)

We find this existing corrugated steel pipe access bridge to be in good condition and on grade. However, we find that the existing culvert does not provide a driveway top width that meets the minimum culvert length requirements for fire hydrant access (OPSD 217.050) of 4.0 metres. We also find that the existing end

treatments comprise of gravel and provide very little erosion protection around the ends of the existing culvert pipe. As such, we recommend that a new HDPE culvert be installed that provides for a minimum driveway top width of 4.0 metres as part of these drainage works, and that the gravel headwalls be replaced with sloped quarried limestone erosion protection. We also recommend that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report.

Bridge 11W - (Gianni & Shirley Sfalcin, 410-02100)

We find this existing corrugated steel pipe access bridge with rubble headwalls to be in good condition and on grade. We recommend that the culvert be flushed clean as part of these drainage works, and that no other work be carried out on this bridge at this time. We also recommend that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report.

Bridge 12W - (Amandeep & Jaspal Baines, 410-02000)

We find this existing corrugated steel pipe access bridge with concrete headwalls to be in good condition and on grade. We recommend that the culvert be flushed clean as part of these drainage works, and that no other work be carried out on this bridge at this time. We also recommend that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report.

Bridge 13W - (Andrew & Jodi Brewin, 410-02010)

Through discussions with the Landowner, we have learned that an adjustment to the lot layout has rendered this bridge unnecessary and will no longer be required by the Owner. Access to the newly adjusted property limits will be provided via Enclosure 14W. As such, we recommend that Bridge 13W be completely removed and disposed of from the drain and that the drain cross-section be restored as necessary. From our research, we have determined that this existing bridge was not a legal part of the drain and therefore, does not require formal abandonment pursuant to Section 19 of the "Drainage Act, RSO 1990, Chapter D.17".

Enclosure 14W - (Andrew & Jodi Brewin, 410-02010 and Amandeep & Jaspal Baines, 410-02000)

We find this existing CSP drain enclosure to be in poor physical condition and hydraulically inadequate to convey the flows from the upstream lands and roads. We also find that the existing pipe is not on proper design grade and is impeding flow through the drain, causing water to back up near its upstream end. We also find the existing headwalls comprise of loose broken concrete pieces at the upstream end and loosely pack topsoil at the downstream end to be inadequate. Based on these deficiencies, we recommend that the entire drain enclosure pipe be replaced with a larger diameter culvert pipe. We also recommend that two (2) new catch basins be installed as part of the enclosure replacement to collect boulevard surface runoff with positive surface grading according to the details shown on the plans. We also recommend that the upstream and downstream ends of the new drain enclosure be protected with sloped quarried limestone end protection as set out in the specifications and drawings forming part of this report.

Bridge 15W - (Town of Tecumseh Water Department)

We find this existing corrugated steel pipe access bridge to be in good condition, but not on proper design grade. We also find that the existing culvert does not provide for a driveway top width that meets minimum culvert length requirements for fire hydrant access (OPSD 217.050) of 4.0 metres. Additionally, we find that the existing headwalls are comprised of gravel and provide very little erosion protection around the ends of the existing culvert pipe. As such, we recommend that a new HDPE culvert be installed that provides for a minimum driveway top width of 4.0 metres as part of these drainage works, as shown on the accompanying plans. We also recommend that new sloped quarried limestone erosion protection be installed and that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report. We also recommend that any adjustments that may be required to the existing fire hydrant or hydrant valve, be completed in coordination with the Town of Tecumseh Water Department, and that the cost of said adjustments be entirely borne by the Water Department.

Bridge 16W - (Shirley Wilson, 410-01900)

We find this existing corrugated steel pipe access bridge to be hydraulically inadequate and not on proper design grade to convey the flows from the upstream lands and roads, impeding flow through the drain, causing water to back up near its upstream end. We also find the existing headwalls, comprised of broken concrete pieces, to be in poor shape and are falling into the drain. Based on these deficiencies, we recommend that this access bridge be entirely replaced, with a larger diameter culvert pipe, and as set out on the accompanying plans and in the specifications forming part of this report.

Enclosure 17W - (Shirley Wilson, 410-01900)

We find this existing corrugated steel enclosure pipe bridge to be in good condition and on grade. However, we find that the existing headwalls, comprised of gravel and broken concrete pieces, to be in poor condition. As such, we recommend that the culvert be flushed clean as part of these drainage works, and that the headwalls be replaced with sloped, quarried limestone erosion protection. We also recommend that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report.

Bridge 18W - (Town of Tecumseh Water Department)

We find this existing corrugated steel pipe access bridge to be in good condition, but not on proper design grade. We also find that the existing headwalls are comprised of gravel and provide very little erosion protection around the ends of the existing culvert pipe. As such, we recommend that the existing culvert be removed and re-laid to the proper design grade of the drain as shown on the accompanying plans. We also recommend that new, sloped, quarried limestone erosion protection be installed and that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report. We also recommend that any adjustments that may be required to the existing fire hydrant or hydrant valve, be completed in coordination with the Town of Tecumseh Water Department, and that the cost of said adjustments be entirely borne by the Water Department.

Enclosure 19W (Revenberg Holdings Ltd., 410-01800)

We find the existing corrugated steel enclosure to be hydraulically inadequate and not on proper design grade to convey the flows from the upstream lands and roads, impeding flow through the drain, causing water to back up near its upstream end. Additionally, we find the existing upstream headwalls, comprised of loose broken concrete pieces, to be in poor shape and are falling into the drain. The downstream headwalls are comprised of eroded earthen banks and provide very little erosion protection around the ends of the existing culvert pipe. Based on these deficiencies, we recommend that the entire drain enclosure pipe be replaced with new, smoothwall interior plastic pipe. We also recommend that new, sloped, quarried limestone erosion protection be installed at both ends and that the new enclosure be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report.

Bridge 20W - (Town of Tecumseh Water Department)

We find this existing corrugated steel pipe access bridge to be in good condition, but not on proper design grade. We also find that the existing culvert does not provide for a driveway top width that meets minimum culvert length requirements for fire hydrant access (OPSD 217.050) of 4.0 metres. Additionally, we find that the existing headwalls are comprised of gravel and provide very little erosion protection around the ends of the existing culvert pipe. As such, we recommend that a new HDPE culvert be installed that provides for a minimum driveway top width of 4.0 metres as part of these drainage works, as shown on the accompanying plans. We also recommend that new sloped quarried limestone end protection be installed and that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report. We also recommend that any adjustments that may be required to the existing fire hydrant or hydrant valve, be completed in coordination with the Town of Tecumseh Water Department, and that the cost of said adjustments be entirely borne by the Water Department.

Bridge 21W - (Revenberg Holdings Ltd., 410-01700)

Through discussions with the Landowner, we have learned that this bridge is unnecessary and will no longer be required by the Owner. Access to this property will be provided off of the 10th Concession Road via Bridge 22W. As such, we recommend that Bridge 21W be completely removed and disposed of from the drain and that the drain cross-section be restored as necessary. From our research, we have determined that this existing bridge was not a legal part of the drain and therefore does not require formal abandonment pursuant to Section 19 of the "Drainage Act, RSO 1990, Chapter D.17".

Bridge 22W - (Revenberg Holdings Ltd., 410-01700)

We find the existing bridge culvert is in poor condition and in need of replacement. We recommend that this access bridge be replaced as set out in the accompanying plans and in the specifications forming part of this report. Through discussions with the Owners and their representatives, they have requested that the access bridge be replaced to provide a minimum 9.10 metres (30.0 ft.) top width. Therefore, we further recommend that the additional top width requested by the Owner be provided with all of the cost to provide the additional top width beyond the standard 6.10 metre (20.00 ft.) top width assessed 100% to the Owner.

Bridge 23W - (Town of Tecumseh Water Department)

We find this existing corrugated steel pipe access bridge to be hydraulically inadequate and not on proper design grade to convey the flows from the upstream lands and roads, impeding flow through the drain, causing water to back up near its upstream end. We also find that the existing headwalls are comprised of gravel and provide very little erosion protection around the ends of the existing culvert pipe.

In addition, this report provides provisions to enclose the frontage of the property to the north. When it comes time to complete the enclosure phase of the project, we recommend that the pipes of **23W** and **24W** be joined together to form a single continuous enclosure. In the interim and based on the deficiencies mentioned above, we recommend that Bridge 23W be entirely replaced with a larger diameter culvert pipe and the length extended to provide for a top width of 4.0 in accordance with (OPSD 214.050) and as set out on the accompanying plans and in the specifications forming part of this report. We also recommend that any adjustments that may be required to the existing fire hydrant or hydrant valve, be completed in coordination with the Town of Tecumseh Water Department, and that the cost of said adjustments be entirely borne by the Water Department.

Enclosure 24W - (Brian & Lisa McGuire, 410-01660)

We find this existing corrugated steel pipe access bridge to be hydraulically inadequate and not on proper design grade to convey the flows from the upstream lands and roads, impeding flow through the drain, causing water to back up near its upstream end. We also find the existing headwalls, comprised of loose, broken concrete pieces, to be in poor shape and are falling into the drain. Based on these deficiencies and at the request of the Owner, we have provided all of the necessary details required for a new enclosure serving as the primary access and lawn piping for this parcel.

Based on our detailed review and through our discussions, we find that the new enclosure shall require approximately 47.40 metres (155.51 ft.) of HDPE smoothwall pipe. The access bridge portion of this enclosure consists of 10.50 metres (34.45 ft.) of pipe length resulting in a driveway top width of a standard 6.10 metres (20.0 ft.), and the lawn piping portion consists of the remaining 36.90 metres (121.06 ft.). The Owner confirmed that the new access bridge portion of the enclosure shall remain in the existing location. We recommend that the downstream end of the new drain enclosure be fitted with a sloped quarried limestone end treatment. The upstream end of the enclosure shall connect to the outlet of **Bridge 23W**.

Due to the financial implications of the overall enclosure, the Owner had requested the potential for this enclosure to be installed in a phased approach. Therefore, we recommend, at a minimum, that the primary access portion shall be installed in the initial construction phase, with the lawn piping portion to be installed in a subsequent phase. Depending on the timing of the subsequent phase, the lawn piping portion may be subject to any future changes to regulatory policy, design standards, and permitting. The Owner has been made aware and has agreed to this provision.

Based on the above, we recommend that the access bridge and lawn piping portion be installed according to the details provided on the plans and as further set out in the specifications forming part of this report. Furthermore, since the original access bridge portion of the enclosure was never identified in any previous By-Law, we recommend that 100% of the construction cost for its installation be assessed to the Owner and that the cost of future maintenance of this bridge be assessed according to the provisions set out within this report. For the lawn piping portion of the enclosure, we recommend that 100% of the construction cost

for its installation and all future maintenance costs be assessed to the Owner according to the provisions set out within this report.

Bridge 25W - (Vince Gemus Holdings Inc., 410-01500)

We find this existing corrugated steel pipe access bridge to be hydraulically inadequate and not on proper design grade to convey the flows from the upstream lands and roads, impeding flow through the drain, causing water to back up near its upstream end. We also find that the existing headwalls are comprised of gravel and provide very little erosion protection around the ends of the existing culvert pipe. Based on these deficiencies, we recommend that this access bridge be entirely replaced, with a larger diameter culvert pipe, as set out on the accompanying plans and in the specifications forming part of this report.

McPherson Drain - Bridge Improvements

Based on our detailed survey, investigations, examinations, discussions, and review with the landowners that currently have access structures within the McPherson Drain, we offer the following findings and recommendations relative to the drainage works to be carried out as part of this drainage project.

From our survey, investigations, and the analysis criteria mentioned herein, we find and recommend the following:

Bridge 1E - (Town of Tecumseh)

We find this existing culvert comprises a corrugated steel pipe, with its upstream (north) end protected with sloped quarried limestone and its downstream end tied directly into the 10th Concession Road crossing culvert in the Colchester Townline Drain, to be in good condition. We recommend that the culvert be flushed clean as part of these drainage works, and that no other work be carried out on this bridge at this time. We also recommend that the bridge be maintained in the future in accordance with the details provided on the plans and as further set out in the specifications forming part of this report.

Bridge 1P - (Zachary Pan & Xiaotong Tang, 410-04000)

At the request of the Owner, we have provided all of the necessary details required for the future installation of a new bridge to access this parcel. We recommend that the new bridge be installed according to the details provided on the plans and as further set out in the specifications forming part of this report. Further, since this will be a new bridge for this parcel, we recommend that 100% of the construction cost for its installation be assessed to the Owner, and that the cost of future maintenance of this bridge be assessed according to the provisions set out within this report.

Bridge 2E & Bridge 3P - (Roberta Diemer, 410-02550)

Through discussions with the Landowner, we have learned that Bridge 2E is inconveniently located for its intended purposes. To rectify this, the Landowner has requested that the bridge be removed and re-installed northerly at a location that better suits their needs. In light of this, we recommend that Bridge 2E be completely removed and the existing pipe be transferred and reinstalled as **Bridge 3P**, as further described herein and shown on the accompanying plans, and that the drain cross-section at the former location of Bridge 2E be restored as necessary. From our research, we have determined that this existing

bridge was not a legal part of the drain and therefore, does not require formal abandonment pursuant to Section 19 of the "Drainage Act, RSO 1990, Chapter D.17".

Bridge 3E - (Roberta Diemer, 410-02550)

We find the existing bridge culvert to be in poor physical condition and in need of replacement with a new culvert. Although the existing stone headwall appears to be in fair condition, the deconstruction of the headwall to replace the culvert would significantly compromise the integrity of the existing headwall. Based on discussions with the Owner, it has been determined that the replacement bridge shall be accompanied with sloped quarried limestone end treatment. As such, we recommend that this access bridge be replaced as set out in the accompanying plans and in the specifications forming part of this report.

Bridge 4E - (Peter & Nancy Steeves, 410-02600)

We find the existing bridge culvert to be in poor physical condition and in need of replacement with a new culvert. We also find that the existing headwalls, comprised of broken concrete pieces, to be in poor condition. We recommend that this access bridge be replaced as set out in the accompanying plans and in the specifications forming part of this report.

Bridge 5E - (Nancy Steeves, 410-02650)

We find the existing bridge culvert is to be in poor physical condition and in need of replacement with a new culvert. However, we also find that the existing concrete headwalls are in good shape and can be salvaged as part of the overall improvements to the bridge. Accordingly, we recommend that the existing culvert pipe be carefully removed and a new HDPE plastic pipe be inserted through the existing headwalls, complete with all necessary grouting and concrete underpinning of the existing headwalls. Further, we recommend that this access bridge be improved as set out in the accompanying plans and in the specifications forming part of this report.

Road Crossing Improvements

Based on our detailed survey, investigations, examinations, discussions, and review with Town Staff, we offer the following findings and recommendations relative to the road crossing culverts that presently connect the McPherson and J.C. Smith Drains to one another.

Road Crossing 1C - (Town of Tecumseh)

We find the existing road crossing culvert across the 10th Concession Road to be in poor physical condition, hydraulically inadequate, and in need of replacement. This road crossing is of particular importance as it provides a means of outlet for one of the southern, sub-watersheds of the McPherson Drain (shown as *McPherson Drain Sub-Watershed No.2* on Sheet 2 of 18 of the plans) into the Webster Drain. We recommend that this road crossing be replaced with a new, 900mm diameter, 320kPa Smoothwall HDPE culvert pipe, complete with sloped quarried limestone erosion protection and full asphalt surface restoration, all as set out on the accompanying plans and in the specifications forming part of this report.

Road Crossing 2C - (Town of Tecumseh)

We find that this existing road crossing pipe is filled with sediment, in poor condition, and serves no benefit in the overall functionality of either drain. Further, through the design and grading of both the J.C. Smith Drain and the McPherson Drain provided under this report, we find that this crossing is no longer required. Accordingly, and at the request of Town staff, we recommend that this culvert be left in place, capped and plugged at both ends and completely filled with lean grout. From our research, we have determined that this existing road crossing was not a legal part of the drain and therefore does not require formal abandonment pursuant to Section 19 of the "Drainage Act, RSO 1990, Chapter D.17".

Road Crossing 3C - (Town of Tecumseh)

We find the existing road crossing culvert across the 10th Concession Road to be in poor physical condition, hydraulically inadequate and in need of replacement. We recommend that this road crossing be replaced with a new 525mm diameter, 320kPa Smoothwall HDPE culvert pipe, complete with sloped quarried limestone erosion protection and full asphalt surface restoration, all as set out on the accompanying plans and in the specifications forming part of this report.

Road Crossing 4C - (Town of Tecumseh)

We find the existing road crossing pipe to be in poor condition, filled with sediment, and serves no benefit in the overall functionality of either drain. Further, through the design and grading of both the J.C. Smith Drain and the McPherson Drain provided under this report, we find that this crossing is no longer required. Accordingly, and at the request of Town Staff, we recommend that this culvert be left in place, capped and plugged at both ends and completely filled with lean grout. From our research, we have determined that this existing road crossing was not a legal part of the drain and therefore does not require formal abandonment pursuant to Section 19 of the "Drainage Act, RSO 1990, Chapter D.17".

Road Crossing 5C - (Town of Tecumseh)

We find the existing road crossing culvert across the 10th Concession Road to be in poor physical condition, hydraulically inadequate, and in need of replacement. We recommend that this road crossing be replaced with a new, 750mm diameter, 320kPa Smoothwall HDPE culvert pipe, complete with sloped quarried limestone erosion protection and full asphalt surface restoration, all as set out on the accompanying plans and in the specifications forming part of this report.

Road Crossing 6C - (Town of Tecumseh)

We find the existing road crossing culvert across the 10th Concession Road to be in good condition and does not need to be replaced or otherwise improved at this time. Based on our discussions with Town Staff, we have not completed any additional design for the future replacement of this road crossing. It is our understanding that plans and specifications will be finalized to suit any new reconstruction of the intersection of the 10th Concession Road and South Talbot Road when the time comes. In the meantime, we recommend that the culvert be flushed clean as part of these drainage works, and that no other work be carried out on this road crossing at this time.

Summary

Based on the above, we further recommend that the cost for the improvements of all access structures and road crossings, be assessed to the access structure user, along with all lands and roads contributing to each structure in accordance with the cost sharing percentages outlined in this report. All of same has been provided for within the Construction Schedule of Assessment included within this report and are further described under **SECTION IX – COST DISTRIBUTION AND CONSTRUCTION SCHEDULE OF ASSESSMENT RATIONALE.**

We recommend that the J.C. Smith Drain and McPherson Drain, including the open drain, the access structures, and road crossings as noted, be repaired and improved in accordance with this report, the attached specifications, and the accompanying drawings, and that all of the works associated with same be carried out in accordance with Section 78 and Section 19 (where applicable) of the "Drainage Act, RSO 1990, Chapter D.17, as amended 2021".

VII. ALLOWANCES AND COMPENSATION

As part of the improvements to the J.C. Smith Drain and McPherson Drain, various properties are directly affected by the proposed drainage improvements. As such, certain properties affected by the proposed drainage improvements are entitled to allowances and/or compensation through Sections 29 through Section 30 of the Drainage Act.

Allowances for Land Taken

Through Section 29 of the Drainage Act, an allowance to specific landowners can provided for the right-of-way required for the construction and maintenance of a Municipal Drain. Allowances provided under this section of the Act are generally allocated only once and at the time when the land is taken for the required purpose. This allowance is typically provided for lands that are permanently and/or periodically taken out of production/use as a result of the drainage works. Providing a one-time allowance for the use of these lands establishes the legal right to utilize the lands for the purpose of the initial and periodic future improvements to this Municipal Drain.

The JC Smith Drain and McPherson Drain has previously been established as a Municipal Drain. Therefore, the affected lands along the course of the open drains have already been compensated for the land taken under previous Engineer's Reports and By-Laws. Therefore, further compensation for the use of the specified working corridor shall not be required through Section 29 of the "Drainage Act, RSO 1990, Chapter D.17, as amended 2021".

Allowances for Damages

Through Section 30 of the Drainage Act, an allowance to specific landowners are provided for damages caused by the construction and future maintenance of a Municipal Drain. Allowances provided under this section of the Act are generally allocated to properties that endure damages caused to lands and crops as a result of the disposal of materials removed from the drainage system as part of this project. Furthermore, non-agricultural areas disturbed by the drainage works that can be fully restored to pre-construction

condition (such as lawns, access routes, fences, etc.) are typically specified for full restoration and are not compensated. We find that each of the following Owners is entitled to and should receive the following amounts as compensation for damages to lands and crops, if any, namely:

J.C. Smith Drain

1)	410-02540 (Mergl Seeds Ltd.),	Owner,	Part Lot 1, Concession 9		$1,192.00
2)	410-02500 (William & Joanne Leon),	Owner,	Part Lot 2, Concession 9		$332.00
3)	410-02400 (Gregory Markham),	Owner,	Part Lot 2, Concession 9		$333.00
4)	410-02300 (Gregory Price),	Owner,	Part Lot 2, Concession 9		$336.00
5)	410-02200 (Gerard & Cindy Revenberg),	Owner,	Part Lot 2, Concession 9		$337.00
5)	410-02100 (Gianni & Shirley Sfalcin),	Owner,	Part Lot 3, Concession 9		$464.00
6)	410-02000 (Amandeep & Jaspal Baines),	Owner,	Part Lot 3, Concession 9		$349.00
7)	410-01900 (Shirley Wilson),	Owner,	Part Lot 3, Concession 9		$419.00
8)	410-01800 (Revenberg Holdings Ltd.),	Owner,	Part Lot 4, Concession 9		$388.00
9)	410-01700 (Revenberg Holdings Ltd.),	Owner,	Part Lot 4, Concession 9	$	732.00
10)	410-01500 (Vince Gemus Holdings Inc.),	Owner,	Part Lot 5, Concession 9	$	543.00
	TOTAL FOR DAMAGES				**$ 5,425.00**

McPherson Drain

1)	410-04000 (Zachary Pan & Xiaotang Tang),	Owner,	Part Lot 1, Concession 10	$1,309.00
	410-03900 (Claret Capital Holdings Inc.),	Owner,	Part Lot 2, Concession 10	$971.00
3)	410-03600 (Dwight Farough),	Owner,	Part Lot 2 & 3, Concession 10	$717.00
4)	410-02550 (Roberta Diemer),	Owner,	Part Lot 3, Concession 10	$466.00
5)	410-02600 (Peter & Nancy Steeves),	Owner,	Part Lot 3, Concession 10	$365.00
6)	410-02700 (John & Catherine Lafferty),	Owner,	Part Lot 4 & 5, Concession 10	$1,842.00
	TOTAL FOR DAMAGES			**$ 5,670.00**

These allowances are based on spreading excavated material from the drain on the abutting agricultural lands to a maximum depth of 100mm and are based on a value of $1,500.00 per acre ($3,707.00 per hectare) for the affected land. These allowances are calculated using a rate per acre of $850.00 for year one, $425.00 for year two, and $225.00 for the third year, after which it is considered that the lands will have returned to their normal production. At the location of all lawn areas, the excavated material shall be hauled away and therefore no allowances have been provided to these abutting Owners for disposal of excavated material.

We have provided for the necessary compensation for damages in our estimate, as is provided for under Subsection (b) of Section 29 and pursuant to Section 30 of the "Drainage Act, RSO 1990, Chapter D.17, as amended 2021".

VIII. ESTIMATE OF COST

Our estimate of the total cost of this work, including all incidental expenses is the sum of **SEVEN HUNDRED AND FORTY ONE THOUSAND TWO HUNDRED AND SIXTY DOLLARS ($741,260.00),** made up as follows:

CONSTRUCTION ITEMS					
PART A – J.C. Smith Drain Improvements					
Item	Description	Est Qty	Unit	Unit Price	Total
1.	**J.C. Smith Drain Cleaning (Station 0+003.1 to Station 2+603.2);** Provide all labour, equipment and materials to improve the **J.C. Smith Drain** including carrying out bottom dipping of the drain to remove accumulated sediment and restoring the drain to the profile grade shown on the plans, including excavation of drain bottom, trimming banks, removal of trees and brush from the banks of the drain, spreading and levelling, loading and handling, hauling and disposing of material along lawns as specified; placement of imported topsoil and seed and mulch on exposed drain side slopes, including supply of all topsoil and spreading and grading, seeding and mulching complete.	2,301	LM	$ 15.38	$ 35,400.00
2.	**Station 0+003.1 to 2+603.2 – Access Structure Flushing and Cleaning;** Carry out flushing and cleaning of drain culvert pipes to remove accumulated sediment, including removal of any deleterious materials, all hauling and disposal of material, complete:				
a.)	**Bridge No. 1W**: 14.1 metres	1.0	Lump Sum	$ 1,400.00	$ 1,400.00
b.)	**Bridge No. 6W**: 8.3 metres	1.0	Lump Sum	$ 800.00	$ 800.00
c.)	**Bridge No. 7W:** 9.2 metres	1.0	Lump Sum	$ 900.00	$ 900.00
d.)	**Bridge No. 8W**: 14.2 metres	1.0	Lump Sum	$ 1,400.00	$ 1,400.00
e.)	**Bridge No. 9W**: 8.5 metres	1.0	Lump Sum	$ 850.00	$ 850.00

Item	Description	Est Qty	Unit	Unit Price	Total
f.)	**Bridge No. 11W:** 8.2 metres	1.0	Lump Sum	$ 800.00	$ 800.00
g.)	**Bridge No. 12W:** 7.4 metres	1.0	Lump Sum	$ 750.00	$ 750.00
h.)	**Enclosure No. 17W**: 52.7 metres	1.0	Lump Sum	$ 5,300.00	$ 5,300.00
Access Structures – J.C. Smith Drain					
3.	**Bridge 2W, Station 0+438.4 to Station 0+446.3;** Provide all labour, equipment, and materials to remove and dispose of the existing tree, together with the 7.9 metre (25.9 ft.) long CSP culvert, broken concrete end treatments, including the restoration of side slopes along the length of the existing culvert, with topsoil, seed, and mulch, complete. (Mergl Seeds Ltd. 410-02540)	1.0	Lump Sum	$ 3,900.00	$ 3,900.00
4.	**Enclosure 2P, Station 0+539.2 to Station 0+605.2;** Provide all labour, equipment and materials to construct a new enclosure consisting of a total length of 66.0 metres (216.54 ft.); (Adam Lacey & Anita Marinelli 410-02530)				
a.)	Provide all labour, equipment, and materials to install new 12.0 metres (39.37 ft.) of 450mm diameter, 320kPa, smooth wall HDPE plastic pipe, including sloped quarried limestone end treatments, granular bedding, granular backfill within driveway limits, excavation, compaction, cleanup and restoration, complete.	1.0	Lump Sum	$ 9,900.00	$ 9,900.00
b.)	Approximately 54.0 metres (177.17 ft.) of 450mm diameter, 320kPa, smooth wall HDPE plastic pipe, supply and installation of a single (1) cross 600mm x 600mm catch basin complete with cast iron grate, installation of floatation anchors, native backfill within lawn piping portion, swale grading, topsoil, seeding and mulching, excavation, compaction, cleanup and restoration, complete.	1.0	Lump Sum	$ 26,600.00	$ 26,600.00

Item	Description	Est Qty	Unit	Unit Price	Total
5.)	**Bridge 3W, Station 0+605.1 to Station 0+618.6;** Provide all labour and equipment to remove and dispose of the existing CSP culvert and end treatments; provide all labour, equipment and materials to construct a new access bridge consisting of 11.0 metres (40.00 ft.) of 450mm diameter, 320kPa, smooth wall HDPE plastic pipe, with construction of sloped quarried limestone end treatments, including the installation of floatation anchors, granular bedding and backfill, granular driveway approach, excavation, compaction, swale transitioning, topsoil, seeding and mulch, cleanup and restoration, complete. (William & Joanne Leon 410-02500)	1.0	Lump Sum	$ 13,200.00	$ 13,200.00
6.)	**Enclosure 4W, Station 0+707.8 to Station 0+738.2;** Provide all labour, equipment and materials to construct a new enclosure and access driveway consisting of a total length of 30.50 metres (100.07 ft.) and place a minimum of 100mm thick hot mix asphalt. (William & Joanne Leon 410-02500)				
a.)	Provide all labour and equipment to neatly sawcut and dispose existing asphalt, together with the removal and disposal of the existing CSP culvert and end treatments; provide all labour, equipment and materials to construct a new enclosure and access driveway consisting of 30.5 metres (100.07 ft.) of 600mm diameter, 320kPa, smooth wall HDPE plastic pipe, including excavation, removal and disposal of tree, construction of sloped quarried limestone end treatments, granular bedding and backfill, granular driveway approaches protection and support of existing hydro pole and guy wires, excavation, compaction, topsoil, seeding and mulch, cleanup and restoration, complete.	1.0	Lump Sum	$ 27,900.00	$ 27,900.00
b.)	Provide all labour, equipment and materials to place a minimum of 100mm of thick hot mix asphalt, including placements, compaction, clean-up, complete.	3.5	Lump Sum	$ 2,000.00	$ 2,000.00

Item	Description	Est Qty	Unit	Unit Price	Total
7.	**Bridge 5W, Station 0+744.7 to Station 0+753.4;** Provide all labour and equipment to remove and dispose of existing end treatments; provide all labour, equipment and materials to install new sloped quarried limestone end protection, including excavation, placement, grading, and compaction, complete. (Town of Tecumseh Water Department)	1.0	Lump Sum	$ 2,000.00	$ 2,000.00
8.	**Bridge 8W, Station 0+898.0 to Station 0+912.4;** Provide all labour and equipment to remove and dispose of existing end treatments; provide all labour, equipment and materials to install new sloped quarried limestone end protection, including excavation, placement, grading, and compaction, complete. (Town of Tecumseh Water Department) and (Gregory Price, 410-02300)	1.0	Lump Sum	$ 2,000.00	$ 2,000.00
9.	**Bridge 10W, Station 1+367.7 to Station 1+374.9;** Provide all labour and equipment to remove the existing CSP culvert pipe and deliver to the Town of Tecumseh's Public Works yard. Provide all labour, equipment, and materials to construct a new access bridge consisting of 8.0 metres (26.25 ft.) of 600mm diameter, 320kPa, smooth wall HDPE plastic pipe, including excavation, removal and disposal of existing pipe, construction of sloped quarried limestone end treatments, installation of floatation anchors, granular bedding and backfill, granular driveway approach, excavation, compaction, cleanup and restoration, complete. (Town of Tecumseh Water Department)	1.0	Lump Sum	$ 9,600.00	$ 9,600.00
10.	**Bridge 13W, Station 1+492.2 to Station 1+499.6;** Provide all labour, equipment and materials to remove and dispose of the existing 7.4 metres (24.3 ft.) long CSP culvert and concrete headwalls, including the restoration of sideslopes side slopes along the existing bridge, complete with topsoil and seed and mulch, complete. (Andrew & Jodi Brewin 410-02010)	1.0	Lump Sum	$ 2,600.00	$ 2,600.00

Item	Description	Est Qty	Unit	Unit Price	Total
11.	**<u>Enclosure 14W, Station 1+526.3 to Station 1+619.6;</u>** Provide all labour, equipment and materials to construct a new enclosure and access driveway consisting of a total length of 94.80 metres (311.0 ft.) and place a minimum of 100mm thick hot mix asphalt (Andrew & Jodi Brewin 410-02010 and Amandeep & Jaspal Baines 410-02000)				
a.)	Provide all labour and equipment to remove and dispose of existing enclosure pipe and end treatments; provide all labour, equipment and materials to construct a new enclosure and access driveways consisting of 94.80 metres (311.0 ft.) of 525mm diameter, 320kPa, smooth wall HDPE plastic pipe, including excavation, removal and disposal of trees, construction of sloped quarried limestone end treatments, supply and installation of two (2) cross 600mm x 600mm catchwater basins complete with 525mm diameter eccentric reducers and cast iron grates, installation of floatation anchors, granular bedding and backfill, granular driveway approaches protection excavation, compaction, topsoil, seeding and mulch, cleanup and restoration, complete.	1.0	Lump Sum	$ 45,700.00	$ 45,700.00
b.)	Provide all labour, equipment and materials to place a minimum of 100mm of thick hot mix asphalt, including placements, compaction, clean-up, complete.	1.0	Lump Sum	$ 2,000.00	$ 2,000.00
12.	**<u>Bridge 15W, Station 1+678.7 to Station 1+686.4;</u>** Provide all labour and equipment to remove the existing CSP culvert pipe and deliver to the Town of Tecumseh's Public Works yard. Provide all labour, equipment, and materials to construct a new access bridge consisting of 8.0 metres (26.25 ft.) of 600mm diameter, 320kPa, smooth wall HDPE plastic pipe, including excavation, construction of sloped quarried limestone end treatments, granular driveway approach, excavation, compaction, fence removal and re-installation, topsoil, seeding and mulch, cleanup and restoration, complete. (Town of Tecumseh Water Department)	1.0	Lump Sum	$ 9,200.00	$ 9,200.00

Item	Description	Est Qty	Unit	Unit Price	Total
13.	**Bridge 16W, Station 1+723.1 to Station 1+733.6;** Provide all albour and equipment to remove the existing CSP culvert; provide all labour, equipment, and materials to construct a new access bridge consisting of 10.5 metres (34.45 ft.) of 600mm diameter, 320kPa, smooth wall HDPE plastic pipe, including excavation, construction of sloped quarried limestone end treatments, installation of floatation anchors, granular bedding and backfill, granular driveway approach, excavation, compaction, topsoil, seeding and mulch, cleanup and restoration, complete. (Shirley Wilson 410-01900)	1.0	Lump Sum	$ 11,200.00	$ 11,200.00
14.	**Enclosure 17W, Station 1+755.8 to Station 1+808.5;** Provide all labour and equipment to remove and dispose of existing end treatments; provide all labour, equipment and materials to install new sloped quarried limestone end protection, including excavation, placement, grading, and compaction, complete. (Shirley Wilson 410-01900)	1.0	Lump Sum	$ 2,000.00	$ 2,000.00
15.	**Bridge 18W, Station 1+835.7 to Station 1+845.3;** Provide all labour, equipment and materials to remove and lower the existing 9.6 metres (31.50 ft.) CSP culvert pipe to the design grades shown on the plans, including excavation, removal and lowering of existing pipe, construction of sloped quarried limestone end treatments, granular driveway approach, excavation, compaction, topsoil, seeding and mulch, cleanup and restoration, complete. (Town of Tecumseh Water Department)	1.0	Lump Sum	$ 5,400.00	$ 5,400.00

Item	Description	Est Qty	Unit	Unit Price	Total
16.	**Enclosure 19W, Station 1+923.6 to Station 1+989.6;** Provide all labour and equipment to remove and dispose of existing enclosure pipe and end treatments; provide all labour, equipment, and materials to construct a new enclosure and access driveways consisting of 66.0 metres (216.5 ft.) of 600mm diameter, 320kPa, smooth wall HDPE. plastic pipe, including excavation, construction of sloped quarried limestone end treatment at both ends, supply and installation of a single (1) cross 600mm x 600mm catchwater basins complete with cast iron grates, installation of floatation anchors, granular bedding and backfill, granular driveway approaches protection excavation, compaction, topsoil, seeding and mulch, cleanup and restoration, complete. (Revenberg Holdings Ltd 410-01800)	1.0	Lump Sum	$ 29,000.00	$ 29,000.00
17.	**Bridge 20W, Station 1+999.9 to Station 2+007.1;** Provide all labour and equipment to remove the existing CSP culvert pipe and deliver to the Town of Tecumseh's Public Works yard. Provide all labour, equipment, and materials to construct a new access bridge consisting of 7.9 metres (25.9 ft.) of 600mm diameter, 320kPa, smooth wall HDPE plastic pipe, including excavation, removal of existing pipe, construction of sloped quarried limestone end treatments, granular driveway approach, excavation, compaction, topsoil, seeding and mulch, cleanup and restoration, complete. (Town of Tecumseh Water Department)	1.0	Lump Sum	$ 7,300.00	$ 7,300.00
18.	**Bridge 21W, Station 2+023.6 to Station 2+029.7;** Provide all labour, equipment, and materials to remove and dispose of the existing 6.0 metre (19.68 ft.) long CSP culvert and headwalls, including the restoration of side slopes along the existing culvert, complete with topsoil and seed and mulch, complete. (Revenberg Holdings Ltd. 410-01700)	1.0	Lump Sum	$ 2,600.00	$ 2,600.00

Item	Description	Est Qty	Unit	Unit Price	Total
19.	**Bridge 22W, Station 2+211.6 to Station 2+225.1;** Provide all labour and equipment to remove and dispose of existing CSP culvert and end treatments; provide all labour, equipment and materials to construct a new access bridge consisting of 13.5 metres (44.29 ft.) of 750mm diameter, 320kPa, smooth wall HDPE plastic pipe, including excavation, construction of sloped quarried limestone end treatments, installation of floatation anchors, granular bedding and backfill, granular driveway approach, excavation, compaction, topsoil, seeding and mulch, cleanup and restoration, complete. (Revenberg Holdings Ltd 410-01700)	1.0	Lump Sum	$ 15,500.00	$ 15,500.00
20.	**Bridge 23W, Station 2+307.8 to Station 2+316.1;** Provide all labour and equipment to remove the existing CSP culvert pipe and deliver to the Town of Tecumseh's Public Works yard. Provide all labour, equipment and materials to construct a new access bridge consisting of 8.3 metres (27.23 ft.) of 750mm diameter, 320kPa, smooth wall HDPE plastic pipe, including excavation, removal and disposal of existing pipe and headwalls, construction of sloped quarried limestone end treatments, installation of floatation anchors, granular bedding and backfill, granular driveway approach, excavation, compaction, topsoil, seeding and mulch, cleanup and restoration, complete. (Town of Tecumseh Water Department)	1.0	Lump Sum	$ 11,000.00	$ 11,000.00
21.	**Enclosure 24W, Station 2+334.8 to Station 2+344.9;** Provide all labour, equipment and materials to construct a new enclosure consisting of a total length of 47.4 metres (155.51 ft.); (Brian & Lisa McGuire 410-01660)				

Item	Description	Est Qty	Unit	Unit Price	Total
a.)	Provide all labour and equipment to remove and dispose of the existing 6.0 meter (19.7 ft.) long CSP culvert; provide all labour, equipment, and materials to install new 10.50 metres (34.45 ft.) of 750mm diameter, 320kPa, smooth wall HDPE plastic pipe, including sloped quarried limestone end treatments, granular bedding, granular backfill within driveway limits, excavation, compaction, cleanup and restoration, complete.	1.0	Lump Sum	$ 13,000.00	$ 13,000.00
b.)	Approximately 36.90 metres (121.06 ft.) of 750mm diameter, 320kPa, smooth wall HDPE plastic pipe, supply, and installation of a single (1) cross 600mm x 600mm catchwater basins complete with cast iron grates, installation of floatation anchors, native backfill within lawn piping portion, swale grading, topsoil, seeding and mulching, excavation, compaction, cleanup and restoration, complete.	1.0	Lump Sum	$ 25,500.00	$ 25,500.00
22.	**<u>Bridge 25W, Station 2+359.6 to Station 2+370.1;</u>** Provide all labour and equipment to remove and dispose of existing enclosure pipe and end treatment; provide all labour, equipment and materials to construct a new access bridge consisting of 10.5 metres (34.45 ft.) of 600mm diameter, 320kPa, smooth wall HDPE plastic pipe, including excavation, removal and disposal of existing pipe and headwalls, construction of sloped quarried limestone end treatments, installation of floatation anchors, granular bedding and backfill, granular driveway approach, excavation, compaction, topsoil, seeding and mulch, cleanup and restoration, complete. (Vince Gemus Holdings Inc. 410-01500)	1.0	Lump Sum	$ 12,000.00	$ 12,000.00
				SUBTOTAL FOR PART A =	**$336,700.00**

PART B – McPherson Drain Improvements					
Item	Description	Est Qty	Unit	Unit Price	Total
23.	**<u>McPherson Drain Cleaning (Station 0+002.5 to Station 2+715.4);</u>** Provide all labour, equipment and materials to improve the **McPherson Drain** including carrying out bottom dipping of the drain to remove accumulated sediment and restoring the drain to the profile grade shown on the plans, including excavation of drain bottom, trimming banks, removal of trees and brush from the banks of the drain, spreading and levelling, loading and handling, hauling and disposing of material along lawns as specified, placement of imported topsoil and seed and mulch on exposed drain side slopes, including supply of all topsoil and spreading and grading, seeding and mulching complete.	2,712.9	LM	$ 15.85	$ 43,000.00
24.	**<u>Station 0+002.5 to 2+715.4 – Access Structure Flushing and Cleaning;</u>** Carry out flushing and cleaning of drain culvert pipes to remove accumulated sediment, including removal of any deleterious materials, all hauling and disposal of material, complete:				
a.)	**Bridge No. 1E**: 7.5 metres	1.0	Lump Sum	$ 750.00	$ 750.00
Access Structures – McPherson Drain					
25.	**<u>Bridge 1P, Station 0+509.0 to Station 0+522.0;</u>** Provide all labour, equipment and materials to construct a new access bridge consisting of 13.0 metres (42.65 ft.) of 600mm diameter, 320kPa, smooth wall HDPE plastic pipe, including construction of sloped quarried limestone end treatments, installation of floatation anchors, granular bedding and backfill, excavation, compaction, cleanup and restoration, complete. (Zachary Pan & Xiaotong Tang, 410-04000)	1.0	Lump Sum	$ 10,700.00	$ 10,700.00

Item	Description	Est Qty	Unit	Unit Price	Total
26.	**Bridge 2E, Station 1+365.8 to Station 1+375.0;** Provide all labour, equipment, and materials to carefully remove the existing 9.2 metres (30.18 ft.) long CSP culvert and headwalls and transfer the culvert pipe to Station 1+464.9 for re-use in the construction of new Bridge 3P; including the restoration of side slopes along the existing Bridge 2E, complete with topsoil and seed and mulch, complete. (Roberta Diemer 410-02550)	1.0	Lump Sum	$ 2,600.00	$ 2,600.00
27.	**Bridge 3P, Station 1+458.8 to Station 1+471.0;** Provide all labour, equipment and materials to construct a new access bridge consisting of 9.2 metres (30.18 ft.) of salvaged CSP culvert pipe from Bridge 2E, joined together with a new, 3.0 metre (9.8 ft.) long, 600mm diameter, 2.8mm thick, Aluminized Steel Type II corrugated Hel-Core pipe with annular ends and 68mm x 13mm corrugations, using a 9C coupler, including construction of sloped quarried limestone end treatments, granular bedding and backfill, granular driveway approach, excavation, compaction, topsoil, seeding and mulch, cleanup and restoration, complete. (Roberta Diemer 410-02550)	1.0	Lump Sum	$ 13,500.00	$ 13,500.00
28.	**Bridge 3E, Station 1+518.3 to Station 1+529.3;** Provide all labour, equipment and materials to neatly saw cut, remove and dispose of existing tar and chip surface and construct a new access bridge consisting of 12.0 metres (39.37 ft.) of 600mm diameter, 320kPa, smooth wall HDPE plastic pipe, including excavation, removal and disposal of existing pipe and headwalls, construction of sloped quarried limestone end treatments, full granular bedding and backfill, excavation, compaction, topsoil, seeding and mulch, cleanup and restoration, complete. (Roberta Diemer 410-02550)	1.0	Lump Sum	$ 18,000.00	$ 18,000.00

Item	Description	Est Qty	Unit	Unit Price	Total
29.	**Bridge 4E, Station 1+642.9 to Station 1+656.9;** Provide all labour and equipment to remove and dispose of existing enclosure pipe and end treatment; provide all labour, equipment and materials to construct a new access bridge consisting of 14.0 metres (45.9 ft.) of 600mm diameter, 320kPa, smooth wall HDPE plastic pipe, including excavation, removal and disposal of existing pipe and headwalls, construction of sloped quarried limestone end treatments, installation of floatation anchors, granular bedding and backfill, granular driveway approach, excavation, compaction, topsoil, seeding and mulch, cleanup and restoration, complete. (Peter & Nancy Steeves 410-02600)	1.0	Lump Sum	$ 17,200.00	$ 17,200.00
30.	**Bridge 5E, Station 1+764.0 to Station 1+769.5;** Provide all labour, equipment and materials to excavate and carefully remove and dispose of the existing CSP culvert pipe while maintaining the existing concrete headwalls; provide all labour, equipment and materials to install a new culvert pipe through the existing headwalls consisting of 5.5 metres (18.0 ft.) of 600mm diameter, 320kPa, smooth wall HDPE plastic pipe, including excavation, enlarging of the existing headwall openings as required, grout filling between new pipe and existing headwalls, underpinning of existing concrete headwalls using 300mm thick, 30mPa concrete, installation of sloped quarried limestone erosion protection, granular bedding and backfill, granular driveway approach, excavation, compaction, topsoil, seeding and mulch, cleanup and restoration, complete. (Nancy Steeves 410-02650)	1.0	Lump Sum	$ 10,200.00	$ 10,200.00
				SUBTOTAL FOR PART B=	**$115.950.00**

PART C – Road Crossings					
Item	Description	Est Qty	Unit	Unit Price	Total
31.	**Road Crossing 1C, Station 0+758.1;** Provide all labour and equipment to neatly saw cut, remove and dispose of existing asphalt and completely remove the existing roadway culvert pipe under the 10th Concession Road; provide all labour, equipment and materials to construct a new roadway crossing consisting of 13.4 metres (43.96 ft.) of 900mm diameter, 320kPa, smooth wall HDPE plastic pipe; including, excavation and removal; granular bedding and backfill; sloped quarried limestone on filter cloth end treatment including additional stone along banks of Webster Drain as shown on the plans; hotmix asphalt restoration (approximately 10.0t of asphalt); gravel shoulder restoration, lawn and grassed area restoration, excavation, topsoil, compaction, grading, seeding and mulching, and cleanup and restoration, traffic control flagman and construction signage, complete.	1.0	Lump Sum	$ 36,000.00	$ 36,000.00
32.	**Road Crossing 2C, Station 1+617.4;** Provide all labour, equipment and materials to expose both ends of the existing 300mm diameter HDPE crossing pipe, place and/or pump approximately 3.0 m^3 of lean grout and plug entire culvert to make it watertight and abandon, complete.	1.0	Lump Sum	$ 2,000.00	$ 2,000.00
33.	**Road Crossing 3C, Station 1+814.8;** Provide all labour and equipment to neatly saw cut, remove and dispose of existing asphalt and completely remove the existing roadway culvert pipe under the 10th Concession Road; provide all labour, equipment and materials to construct a new roadway crossing consisting of 13.4 metres (43.96 ft.) of 525mm diameter, 320kPa, smooth wall HDPE plastic pipe; including, excavation and removal; granular bedding and backfill; sloped quarried limestone on filter cloth end treatment including additional stone across the drain cross-section as shown on the plans; hotmix asphalt restoration (approximately 5.0t of asphalt); gravel shoulder restoration, lawn and grassed area restoration, excavation, topsoil, compaction, grading, seeding and mulching, and cleanup and restoration, traffic control flagman and construction signage, complete.	1.0	Lump Sum	$ 24,500.00	$ 24,500.00

Item	Description	Est Qty	Unit	Unit Price	Total
34.	**Road Crossing 4C, Station 1+939.8;** Provide all labour, equipment and materials to expose both ends of the existing 200mm diameter CSP crossing pipe, place and/or pump approximately 2.5 m^3 of lean grout and plug entire culvert to make it watertight and abandon.	1.0	Lump Sum	$ 2,000.00	$ 2,000.00
35.	**Road Crossing 5C, Station 2+356.7;** Provide all labour and equipment to neatly saw cut, remove and dispose of existing asphalt and completely remove the existing roadway culvert pipe under the 10th Concession Road; provide all labour, equipment and materials to construct a new roadway crossing consisting of 15.5 metres (50.9 ft.) of 750mm diameter, 320kPa, smooth wall HDPE plastic pipe; including, excavation and removal; granular bedding and backfill; sloped quarried limestone on filter cloth end treatment including additional stone across the drain cross-section as shown on the plans; hotmix asphalt restoration (approximately 7.0t of asphalt); gravel shoulder restoration, lawn and grassed area restoration, excavation, topsoil, compaction, grading, seeding and mulching, and cleanup and restoration, traffic control flagman and construction signage, complete.	1.0	Lump Sum	$ 32,500.00	$ 32,500.00
36.	**Road Crossing No.6C, Station 2+597.7;** Carry out flushing and cleaning of existing concrete box culvert to remove accumulated sediment and restore the drain to the profile grade on the plans, including removal of any deleterious materials, all hauling and disposal of material, complete.	1.0	Lump Sum	$ 2,000.00	$ 2,000.00
				SUBTOTAL FOR PART C=	**$99,000.00**

CONSTRUCTION TOTALS SUMMARY	
TOTAL FOR PART A – J.C. Smith Drain (brought forward)	$ 336,700.00
TOTAL FOR PART B – McPherson Drain (brought forward)	$ 115,950.00
TOTAL FOR PART C – Road Crossings (brought forward)	$ 99,000.00
SUBTOTAL	**$ 551,650.00**
Net HST (1.76%)	**$ 9,709.00**
TOTAL FOR CONSTRUCTION =	**$ 561,359.00**

INCIDENTALS	
Report, Estimates and Specifications	$ 59,500.00
Survey, Assistance, Expenses and Drawings	$ 70,300.00
Cost of Preparing New Maintenance Schedules of Assessment	$ 5,400.00
Duplicating Drawings and Report	$ 1,400.00
Estimated Cost of Public Information Centre, including Attendance by Engineer, and Associated Report Amendments	$ 3,000.00
Estimated Cost for Letting Contract including the preparation of Tender Documents and Tender Review	$ 1,400.00
Estimated Cost for Part-Time Inspection for Bridges and Open Drain Work and, Supervision during Construction (approx. 3-week duration)	$ 19,100.00
Estimated Cost for Geotechnical Inspections During Construction (Road Crossings)	$ 5,000.00
Net HST on the above items (1.76%)	$ 2,906.00
Estimate Cost for ERCA Permit	$ 800.00
TOTAL FOR INCIDENTALS =	**$ 168,806.00**
TOTAL FOR DAMAGES (brought forward) =	**$ 11,095.00**
TOTAL FOR CONSTRUCTION (brought forward) =	**$ 561,359.00**
TOTAL ESTIMATE =	**$ 741,260.00**

IX. DRAWINGS AND SPECIFICATIONS

As part of this report, we have attached design drawings for the proposed improvements to the J.C. Smith Drain and McPherson Drain. The design drawings show the subject drain location, the affected properties within the watershed area, and the details of the work necessary to be completed to provide for the proper improvement of the drain, access structures, and road crossings. The design drawings also include profiles, details, and cross-sections relative to the works being provided for under this Report.

Furthermore, Benchmarks have been established and included therein for use by the Contractor when performing the construction works. The design drawings attached within this report labelled herein **Appendix "B"** have been reduced in size and the scales shown do not apply. However, full-scale drawings can be viewed at the Tecumseh Municipal Offices if required.

Also attached, we have prepared Specifications which set out the required construction details for the various aspects of the works to be constructed under this report.

X. COST DISTRIBUTION AND CONSTRUCTION SCHEDULE OF ASSESSMENT RATIONALE

We would recommend that all of the costs associated with the improvements to the J.C. Smith Drain and McPherson Drain, including all related incidental expenses, be charged against the lands and roads affected per the attached **Construction Schedule of Assessment**.

It should be noted that the attached Construction Schedule of Assessment shall be utilized only for the sharing of all of the costs associated with the work being provided for under this report and said Construction Schedule of Assessment should not be utilized, under any circumstance, for the sharing of any future maintenance works conducted to any portion of the Municipal Drainage System established herein.

Assessment Components

The total individual assessments, within the Construction Schedule of Assessments, are comprised of four (4) separate assessment components, including:

i. Benefit *is defined as 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, roads, buildings or other structures, as it relates to Section 22 of the Drainage Act.*

ii. Outlet Liability *is defined as part of the cost of the construction, improvement or maintenance of a drainage works that is required to provide such outlet or improved outlet, as it relates to Section 23 of the Drainage Act.*

iii. Special Benefit *is defined as any additional work or feature included in the construction, repair or improvement of a drainage works that has no effect on the functioning of the drainage works, as it relates to Section 24 of the Drainage Act.*

iv. Special Non-Proratable (Section 26) Assessment *is defined as; in addition to all other sums lawfully assessed against the property of a public utility or road authority under this Act, and despite the fact that the public utility or road authority is not otherwise assessable under the 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.*

Assessment Rationale

Generally speaking, based on the assessment components outlined above, these costs associated with this project have been distributed within the attached Construction Schedule of Assessment, based on the following principles:

Benefit Assessment - The removal and excavation of accumulated sediment within the open channel will improve the flow of water through the drainage system. The improvements to the drain will enhance the hydraulic capacity of the channel and provide a sufficient outlet for the drainage system. As a result, the

properties located close to the J.C. Smith Drain and McPherson Drain channel benefit from the improvements to the open drain, reducing the backup of flood water and potential damages to their property. In addition to the drain cleaning, properties which reside adjacent to the open drain are entitled to access their lands. These properties gain an advantage from an access structure constructed within the Municipal Drain for the purposes of accessing their lands. Therefore, the Benefit Assessment shown within the Construction Schedule of Assessment is levied against those properties that reside in close proximity to the drain and who gain an advantage for the betterment of their lands, based on the definition provided above.

Special Benefit Assessment – Any special feature requested or required for the sole betterment of a single property, that does not affect the functionality of the drainage system shall be assessed as a Special Benefit Assessment. This Special Benefit Assessment would also include any special features to enhance a property, such as driveway surface pavement, etc.

Outlet Assessment – According to the parameters set within Section 23 of the Drainage Act, all lands which utilize the Municipal Drain as a drainage outlet may be assessed for Outlet Liability. As further outlined within Section 23(3) of the Drainage Act, the Outlet Assessment is "***...based on the volume and rate of flow of the water artificially caused to flow***...". Based on the characteristics of the lands that contribute flow to the J.C. Smith Drain and McPherson Drain, runoff factors have been applied based on the land use of each property to reflect the actual amount of water that is artificially collected and discharged into this Municipal Drain. Therefore, developed lands (residential, commercial, industrial lots and roads) have an increased run-off factor applied to their assessment. Contrarily, lands which have surface (or subsurface) runoff that exits the watershed, or contains woodlots would have a decreased run-off factor applied to their assessment. Furthermore, additional factors have been included in these outlet assessments that relate to soil types and the location of where each property's runoff enters the J.C. Smith Drain and McPherson Drain.

Assessments Shared with the Watershed

Based on the details of this project, we have established our construction assessment rationale and determinations relative to the various improvements being carried out to the J.C. Smith Drain and McPherson Drain. Through this review, we have determined that specific components of this project shall be assessed to the lands and roads within the J.C. Smith Drain and McPherson Drain watershed. These components include the following:

a) Drain Cleanout: These works alongside and within the open drain form part of the general maintenance and upkeep of the Municipal Drain. These works include the removal of all brush and trees to facilitate the removal of accumulated sediment. These works are necessary to enhance the hydraulic carrying capacity of the channel, restore the drain to its optimal design and provide peak performance, together with providing a sufficient outlet for the drainage system. Based on the current condition of the drain, and the works required to restore and maintain the necessary conveyance of flow through the system, these improvements are focused on the portions of the watercourse where work is required. All of the construction costs, together with the applicable incidental costs, associated with the drain cleanout of the J.C. Smith Drain and McPherson Drain amount to a total estimated cost of **$119,323.00**. These costs shall be assessed to all upstream lands and roads that contribute their runoff to the J.C. Smith Drain and McPherson Drain.

b) Allowances: All allowances and compensation outlined within this report are to be distributed to individual property owners for the damages and land taken to facilitate the necessary improvements to the J.C. Smith Drain and McPherson Drain. The total amount of payment to these affected lands is **$11,095.00.** These costs shall be assessed to all lands and roads adjacent to the entire length of J.C. Smith Drain and McPherson Drain, together with all upstream lands and roads that contribute their runoff to this Municipal Drain.

c) Access Structure Improvements: Through our investigations, it was found several access structures within both Municipal Drains require improvements. Where a primary access structure has been previously identified within past by-laws and forms a legal entity with respect to the existing Municipal Drain, the costs for improvements for the access portion of the structure shall be shared with the bridge user and upstream lands. With the access structure established as an entity within this Municipal Drain, where flows from upstream contributed to the sizing and overall deterioration of this access structure, these costs shall be shared with the adjacent property and all upstream lands and roads that contribute flows through this structure. For private access structures, not previously identified in past by-laws, all associated costs for improvements shall be assessed entirely to the benefitting owner. The construction costs, together with the applicable incidental costs, associated with the various improvements to the access structures amount to a total estimated cost of **$401,132.00**. The costs for access structures have been shared with all affected landowners in accordance with the percentages shown in the following table:

Table 5 – Cost Sharing for Access Structures Improvements in the J.C. Smith Drain

BRIDGE NO.	ROLL NUMBER	OWNER	% TO BENEFITING OWNER	% TO UPSTREAM LANDS & ROADS
1W	410-02540	Mergl Seeds Ltd. *(Secondary)* Town of Tecumseh Roads	50% 50%	0%
2W	410-02540	Mergl Seeds Ltd. *(Primary)*	74%	26%
2P	410-02530	Adam Lacey & Anita Marinelli *(New)*	100%	0%
3W	410-02500	William & Joanne Leon *(Secondary)*	100%	0%
4W	410-02500	William & Joanne Leon *(Primary)* Town of Tecumseh Roads	44% 46%	10%
5W		Town of Tecumseh Water Department	100%	0%
6W	410-02400	Gregory Markham *(Secondary)*	100%	0%
7W	410-02400	Gregory Markham *(Primary)*	73%	27%
8W	410-02300	Gregory Price Town of Tecumseh Water Department	41% 44%	15%

BRIDGE NO.	ROLL NUMBER	OWNER	% TO BENEFITING OWNER	% TO UPSTREAM LANDS & ROADS
9W	410-02200	Gerard & Cindy Revenberg *(Primary)*	74%	26%
10W		Town of Tecumseh Water Department	100%	0%
11W	410-02100	Gianni & Shirley Sfalcin *(Primary)*	75%	25%
12W	410-02000	Amandeep & Jaspal Baines *(Secondary)*	100%	0%
13W	410-02010	Andrew & Jodi Brewin *(Secondary)*	100%	0%
14W	410-02000 410-02010	Amandeep & Jaspal Baines *(Primary)* Andrew & Jodi Brewin *(Primary)* Town of Tecumseh Roads Town of Tecumseh Water Department	37% 18% 14% 18%	13% 0%
15W		Town of Tecumseh Water Department	100%	0%
16W	410-01900	Shirley Wilson *(Secondary)*	100%	0%
17W	410-01900	Shirley Wilson *(Primary)*	89%	11%
18W		Town of Tecumseh Water Department	100%	0%
19W	410-01800	Revenberg Holdings Ltd. *(Primary)* Town of Tecumseh Roads	24% 67%	9%
20W		Town of Tecumseh Water Department	100%	0%
21W	410-01700	Revenberg Holdings Ltd. *(Secondary)*	100%	0%
22W	410-01700	Revenberg Holdings Ltd. *(Primary – 30ft Top Width)*	78%	22%
23W		Town of Tecumseh Water Department	100%	0%
24W	410-01600	Brian & Lisa McGuire *(Primary)*	100%	0%
25W	410-01500	Vince Gemus Holdings Inc. *(Primary)*	100%	0%

Table 6 – Cost Sharing for Access Structures Improvements in the McPherson Drain

BRIDGE NO.	ROLL NUMBER	OWNER	% TO BENEFITING OWNER	% TO UPSTREAM LANDS & ROADS
1E		Town of Tecumseh Roads	100%	0%
1P	410-04000	Zachary Pan & Xiaotong Tang *(New)*	100%	0%
2E	410-02550	Roberta Diemer *(Secondary)*	100%	0%
3P	410-02250	Roberta Diemer *(Secondary)*	100%	0%
3E	410-02250	Roberta Diemer *(Primary)*	100%	0%
4E	410-02600	Peter & Nancy Steeves *(Primary)*	100%	0%
5E	410-02650	Nancy Steeves *(Primary)*	74%	26%

As a result of the above, the total cost to be assessed to the affected lands and roads within the J.C. Smith Drain and McPherson Drain watershed is an estimated value of **$531,550.00**.

Special Non-Proratable Assessments

The Special Assessments outlined below are to provide additional clarification and summarize the assessments listed under Section 6 of the Construction Schedule of Assessment, based on the assessment rationale determined in the preceding paragraphs:

A. We determined that a Special Assessment shall be assessed to the **Town of Tecumseh Roads Department** for the increase of cost to the project related to each of the road crossing culverts required for the drainage system. This extra **non-proratable** cost to the project consists of all construction works associated with Construction Items 31 through 36, within this report. The estimated net increase in cost to the project caused by these above special improvements in the J.C. Smith Drain and McPherson Drain, together with all related incidental expenses is **$138,921.00**.

The above estimated Special Assessment to the Town of Tecumseh Roads Department pursuant to **Section 26** of the Drainage Act, is listed under Section 6 of the Construction Schedule of Assessment and is to be **non-proratable**. The incidental cost portion associated with the above net cost consists of an amount of **$38,179.00**.

Once the construction of this work is completed, the Town of Tecumseh Roads Department shall be assessed for the **actual construction costs** for Construction Items 31 through 36, together with its share of the project incidental costs associated with these works, in the estimated amount of **$38,179.00**. This combined total represents the actual Section 26 Special Assessment amount to be assessed to the Town of Tecumseh Roads Department for this work and this actual amount shall replace the estimated amount outlined in Section 6 of the Construction Schedule of Assessment when charging out the works to the affected lands and roads.

B. We determined that a Special Assessment shall be assessed to the **Town of Tecumseh Water Department** for the increase of cost to the project related to the replacement of the access structures to facilitate existing fire hydrants adjacent to the J.C. Smith Drain. This extra **non-proratable** cost to the project consists of all construction works associated with Construction Items 7, 9, 12, 15, 17, and 20, within this report. The estimated net increase in cost to the project caused by these above special improvements in the J.C. Smith Drain and McPherson Drain, together with all related incidental expenses is **$70,789.00**.

The above estimated Special Assessment to the Town of Tecumseh Water Department pursuant to **Section 26** of the Drainage Act, is listed under Section 6 of the Construction Schedule of Assessment and is to be **non-proratable**. The incidental cost portion associated with the above net cost consists of an amount of **$12,665.00.**

Once the construction of this work is completed, the Town of Tecumseh Water Department shall be assessed for the **actual construction costs** for Construction Items 7, 9, 12, 15, 17, and 20, together with its share of the project incidental costs associated with these works, in the estimated amount of **$12,665.00.** This combined total represents the actual Section 26 Special Assessment amount to be assessed to the Town of Tecumseh Water Department for this work and this actual amount shall replace the estimated amount outlined in Section 6 of the Construction Schedule of Assessment when charging out the works to the affected lands and roads.

Distribution of Unforeseen Costs

These non-proratable assessments to the Town of Tecumseh do not include any unforeseen costs that may arise during construction, nor does it include any potential costs for appeals to the Court of Revision, Tribunal or Referee. Any costs to the project associated with dealing with any of these Appeals shall be shared by all assessments in the Construction Schedule of Assessment including all Section 6 non-proratable assessments, as well as any Special Benefit Assessments on a pro-rata basis, or as otherwise established in any decisions from these forums.

Furthermore, during construction, it may become necessary to temporarily or permanently relocate existing utilities that may conflict with the works outlined within this report. Under these circumstances, the relocation of these utilities shall be assessed for any relocation costs against the public utility having jurisdiction in accordance with Section 26 of the Drainage Act. In accordance with Section 69 of the Drainage Act, the utility company is allowed the option to carry out this work utilizing their own forces and at their own cost. However, should they not exercise this option within a reasonable time, the Municipality may arrange to have this work completed and the costs for this work shall be charged to the appropriate public utility. Furthermore, any unforeseen construction costs directly related to the Section 26 works shall be assessed entirely, as an extra, to the applicable Road Authority or Utility.

Agricultural Grants and Grant Eligibility

The Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA) issued Administrative Policies for the Agricultural Drainage Infrastructure Program (ADIP). This program provides financial assistance for eligible costs and assessed lands pursuant to the Drainage Act. Sections 85 to 90 of the Drainage Act allow the Minister to provide grants for various activities under said Act. Sections 85 and 87 make it very clear that grants are provided at the discretion of the Minister. Based on the current ADIP, "lands used for agricultural

purposes" may be eligible for a grant in the amount of 1/3 of their total assessment. The policy defines "lands used for agricultural purposes" as those lands eligible for the "Farm Property Class Tax Rate". The Municipal Clerk has provided this information to the Engineer from the current property tax roll and the Engineer has further confirmed this information with the AGMaps Geographic Information Portal Services through OMAFRA. Properties that meet the criteria for "lands used for agricultural purposes" are shown in the attached Assessment Schedules under the subheading "**5. PRIVATELY OWNED – AGRICULTURAL LANDS (grantable)**" are expected to be eligible for the 1/3 grant from OMAFRA. Under these provisions, we expect that this project will qualify for the grant normally available for agricultural lands. We would, therefore, recommend that the Town of Tecumseh make an application, on their behalf, for a Grant from the Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA) in the amount of 1/3 of their total assessment for this project, in accordance with the provisions of Sections 85 and 88 of the "Drainage Act, RSO 1990, Chapter D.17, as amended 2021". Even though it is our opinion that certain lands shall likely be eligible for grants, there is no guarantee that these lands will qualify or that grants may be available in the future.

Although some lands are eligible for the above-noted grants, the current ADIP policies outline circumstances where grants may not be available. More specifically, grants may not be available based on the following provisions:

1. **Policy 2.3.i(i)** – For every drain, every agricultural property is entitled to one drain crossing. Any additional crossing on this property will not be eligible for grant.

2. **Policy 2.3.i(ii)** – Notwithstanding (i) above, any new crossing required as a result of any lot severance that occurred after July 28, 2004, is not eligible for grant.

3. **Policy 2.3.i(iii)** – Any special feature on a crossing (e.g. decorative headwalls, surface pavement, etc.), is not eligible for grant.

Furthermore, during our investigations, we determined that some agricultural lands, which may be used for agricultural purposes, are not currently eligible for this grant primarily because they do not have a Farm Tax Classification. These lands are as follows:

Table 7 - Agricultural Lands Currently Not Eligible for Grant

Roll Number	Owner's Name
410-02000	Amandeep & Jaspal Bains
410-03900	Claret Capital Holdings Inc.

These lands, in the Schedules of Assessment, have been categorized and listed under the heading "**5. PRIVATELY OWNED – AGRICULTURAL LANDS (non-grantable)**" which means that these properties would not be eligible for the OMAFRA grant. If these agricultural lands qualify for the Farm Tax Classification, it would be anticipated that they would have been eligible for the grant. From our research into how the Farm Tax Classifications are determined, and from further discussions with OMAFRA representatives, in order to gain a Farm Tax Classification, the Owner would need to meet the following criteria:

1) Property Owner must be a Canadian Citizen or Permanent Resident of Canada

2) Registered Farm Business that generates a minimum gross income of $7,000.00.

For the agricultural lands currently listed under the heading "**5. PRIVATELY OWNED – AGRICULTURAL LANDS (non-grantable)**" one of the above items is likely the reason why they are not eligible for the OMAFRA grant. Therefore, we encourage these eligible landowners, who meet these criteria, to apply to become eligible for this grant. For more information on Farm Property Class Tax Rate Program, please visit: http://omafra.gov.on.ca/english/policy/ftaxfaq.html

As part of this project, we have provided separate Maintenance Schedules of Assessment for the J.C. Smith Drain and McPherson Drain. It should be noted that the preparation of these new Maintenance Schedules of Assessment under Section 76 of the Drainage Act is not normally eligible for the grant. However, according to Section 2.3(e) of the OMAFRA "Agricultural Drainage Infrastructure Program: Administrative Policies", where the cost of developing new Assessment Schedules is less than 25% of the engineering costs for the total project, the engineering cost expended towards the preparation of same shall be eligible for the grant. Since the engineering costs for the preparation of Maintenance Schedules of Assessment included herein are less than 25% of the overall engineering costs, we would expect that all of the agricultural assessments associated with the preparation of the new maintenance schedule **shall** be eligible for the grant.

We would, therefore, recommend that all of the costs associated with the preparation of these new Maintenance Schedules of Assessment be charged against the lands and roads affected per the attached Construction Schedule of Assessment included herein. Lands that are used for agricultural purposes have been listed in the Construction Schedule of Assessment under Subheading **"5. PRIVATELY OWNED - AGRICULTURAL LANDS (grantable)".**

XI. FUTURE MAINTENANCE

J.C Smith and McPherson Drain – Open Drain

After the completion of all of the works associated with this Engineer's Report, we would recommend that these Municipal Drains be kept up and maintained in the future through the Town of Tecumseh and at the expense of the lands and roads included within the Maintenance Schedules of Assessment attached herein and labelled **Appendix "C**".

The J.C. Smith Drain and McPherson Drain are cross-connected and are broken into various sub-watersheds with various drainage outlets. Therefore, we have provided three (3) distinct maintenance schedules of assessments for each sub-watershed where maintenance provisions shall be established and distributed on the following basis:

1. J.C Smith Drain – Sub-Watersheds No. 1, 2, and 3

   When future maintenance works are performed within the J.C Smith Drain – Sub-Watershed No. 1, 2, and 3, we recommend that the cost for these works of future maintenance shall be shared by the

abutting landowners and upstream affected lands and roads, following the same proportions established within the **Future Maintenance Schedules of Assessment for J.C. Smith Drain – Sub-Watershed No. 1, 2, and 3** respectively, included within **Appendix "C"**. Each Schedule of Assessment has been developed based on an assumed cost of **$5,000.00** and the future maintenance costs shall be levied pro-rata to the affected lands and roads that are adjacent to and situated upstream of this section of drain for which future maintenance works have been carried out. Therefore, when **$5,000.00** worth of future maintenance work is expended on each sub-watershed, the assessment to each of the individual affected property owners and roads shall be levied per the specific Maintenance Schedule of Assessment. It should be clearly understood that the amounts shown within this Schedule are only for prorating future maintenance costs for the drain and do not form part of the current cost for the work.

2. McPherson Drain – Sub-Watersheds No. 1, 2, and 3

When future maintenance works are performed within the McPherson Drain – Sub-Watershed No. 1, we recommend that the cost for these works of future maintenance shall be shared by the abutting landowners and upstream affected lands and roads, following the same proportions established within the **Future Maintenance Schedules of Assessment #1 for McPherson Drain – Sub-Watershed No. 1, 2, and 3** respectively, included within **Appendix "C"**. Each Schedule of Assessment has been developed based on an assumed cost of **$5,000.00** and the future maintenance costs shall be levied pro-rata to the affected lands and roads that are adjacent to and situated upstream of this section of drain for which future maintenance works have been carried out. Therefore, when **$5,000.00** worth of future maintenance work is expended on each sub-watershed, the assessment to each of the individual affected property owners and roads shall be levied per the specific Maintenance Schedule of Assessment. It should be clearly understood that the amounts shown within this Schedule are only for prorating future maintenance costs for the drain and do not form part of the current cost for the work.

The attached Future Maintenance Schedules of Assessment are to be utilized only for the maintenance of the open drain, together with the flushing of sediment material within any existing access structures in the drain. If spot maintenance is performed within the specified reach of the drain, it is recommended that only those lands adjacent and upstream of the maintenance site be assessed for any future costs. It shall be noted that these schedules shall not be utilized for any other maintenance and repair works being conducted to any of the existing access or roadway crossing structures. These existing structures are to be assessed in a different fashion, as outlined below.

J.C. Smith Drain and McPherson Drain - Working Corridors and Access Routes

Access routes and working corridors have either been established in previous By-Laws or established within this Engineer's Report to help facilitate the necessary drainage improvements and future maintenance of the J.C. Smith Drain and McPherson Drain. The lands in which these working corridors and access routes have been established have previously been compensated for and shall remain in perpetuity for initial construction and future maintenance works on the J.C. Smith Drain and McPherson Drain. Therefore, when construction and/or future maintenance works are being conducted, the Contractor shall be expected to keep all future equipment and forces within the established working corridors for any future maintenance performed on the J.C. Smith Drain and McPherson Drain.

J.C. Smith Drain and McPherson Drain – Access Structures and Road Crossings

It shall be noted that for the J.C. Smith Drain and McPherson Drain, a mechanism shall be established herein so that the Municipality can undertake future maintenance works to the existing access structures and roadway crossing structures (where applicable) within this Municipal Drain. Therefore, when any future maintenance works to any of the existing access structures or road crossings within the J.C. Smith Drain and McPherson Drain are required, the following cost-sharing percentages for each structure shall be utilized:

J.C. Smith Drain

Table 8 – Future Maintenance for Access & Road Structures in the J.C. Smith Drain

BRIDGE NO.	ROLL NUMBER	OWNER	% TO BENEFITING OWNER	% TO UPSTREAM LANDS & ROADS
1W	410-02540	Mergl Seeds Ltd. *(Primary)* Town of Tecumseh Roads	50% 50%	0%
2W	410-02540	Mergl Seeds Ltd.	N/A (Removed)	
2P	410-02530	Adam Lacey & Anita Marinelli *(Primary)*	Access Portion: 75%	25%
			Lawn Piping Portion: 100%	0%
3W	410-02500	William & Joanne Leon *(Secondary)*	100%	0%
4W	410-02500	William & Joanne Leon *(Primary)* Town of Tecumseh Roads	41% 48%	11%
5W		Town of Tecumseh Water Department	100%	0%
6W	410-02400	Gregory Markham *(Secondary)*	100%	0%
7W	410-02400	Gregory Markham *(Primary)*	73%	27%
8W	410-02300	Gregory Price *(Primary)* Town of Tecumseh Water Department	41% 44%	15%
9W	410-02200	Gerald & Cindy Revenberg *(Primary)*	74%	26%
10W		Town of Tecumseh Water Department	100%	0%
11W	410-02100	Gianni & Shirley Sfalcin *(Primary)*	75%	25%
12W	410-02000	Amandeep & Jaspal Baines *(Secondary)*	100%	0%
13W	410-02010	Andrew & Jodi Brewin	N/A (Removed)	

BRIDGE NO.	ROLL NUMBER	OWNER	% TO BENEFITING OWNER	% TO UPSTREAM LANDS & ROADS
14W	410-02000	Amandeep & Jaspal Baines *(Primary)*	37%	13%
	410-02010	Andrew & Jodi Brewin *(Primary)*	18%	0%
		Town of Tecumseh Roads	14%	
		Town of Tecumseh Water Department	18%	
15W		Town of Tecumseh Water Department	100%	0%
16W	410-01900	Shirley Wilson *(Secondary)*	100%	0%
17W	410-01900	Shirley Wilson *(Primary)*	89%	11%
18W		Town of Tecumseh Water Department	100%	0%
19W	410-01800	Revenberg Holdings Ltd. *(Primary)*	24%	9%
		Town of Tecumseh Roads	67%	
20W		Town of Tecumseh Water Department	100%	0%
21W	410-01700	Revenberg Holdings Ltd.	N/A (Removed)	
22W	410-01700	Revenberg Holdings Ltd. *(Primary)*	72%	28%
23W		Town of Tecumseh Water Department	100%	0%
24W	410-01660	Brian & Lisa McGuire *(Primary)*	Access Portion 72%	28%
			Lawn Piping Portion 100%	0%
25W	410-01500	Vince Gemus Holdings Inc. *(Primary)*	72%	28%

McPherson Drain

Table 9 – Future Maintenance for Access & Road Structures in the McPherson Drain

BRIDGE NO.	ROLL NUMBER	OWNER	% TO BENEFITING OWNER	% TO UPSTREAM LANDS & ROADS
1E		Town of Tecumseh Roads	100%	0%
1P	410-04000	Zachary Pan & Xiaotong Tang *(Primary)*	75%	25%
2E	410-02550	Roberta Diemer	N/A (Removed)	

BRIDGE NO.	ROLL NUMBER	OWNER	% TO BENEFITING OWNER	% TO UPSTREAM LANDS & ROADS
3P	410-02550	Roberta Diemer *(Secondary)*	100%	0%
3E	410-02550	Roberta Diemer *(Primary)*	75%	25%
4E	410-02600	Peter & Nancy Steeves *(Primary)*	74%	26%
5E	410-02650	Nancy Steeves *(Primary)*	74%	26%

Primary Access Bridges with Cost Sharing:

Access structures that are considered the primary access to the associated property relative to the J.C. Smith Drain and McPherson Drain and have cost-sharing provisions associated with each are those that have been previously identified and/or improved under an existing Engineer's Report passed through Municipal By-Law. The sharing percentages between the abutting owner and the upstream lands and roads affected by each structure have been established on the basis of where it is located relative to the entire reach of the drain and based on a standard bridge top width of 6.10 metres (20.00 ft.). For those accesses having a top width wider than the standard 6.10 metres (20.00 ft.), the additional cost for the additional top width is assessed entirely to the benefitting property. For those with a wider than standard access width (or lawn piping), a blended cost-sharing percentage has been provided above that accounts for the bridge user share of the increased bridge length beyond the length available to provide the standard 6.10 metres (20.00 ft.) minimum driveway top width.

As noted above, part of the future maintenance cost of each access bridge portion shall be assessed as a "Benefit Assessment" against the property or properties served by the access. The remainder of the maintenance cost will be assessed as "Outlet Assessments" only to the lands and roads upstream of each access bridge and prorated to the assessments shown in the same proportions established within the **Future Maintenance Schedules of Assessment** for each sub-watershed attached herein and labelled **Appendix "C"**. The future maintenance costs for each affected access bridge structure within the drain shall be levied pro rata on only the affected lands and roads that are situated upstream of the particular access bridge for which future maintenance works have been carried out.

We would further recommend that all access bridge structures in this drain, for which future maintenance costs are to be shared with upstream lands and roads within the watershed, be maintained by the Municipality and that said maintenance work would include works to the access bridge culvert, their bedding and backfill, end treatment, and any other ancillary work. Should concrete, asphalt or other special surfaces over these access bridge driveways require removal as part of the maintenance work these surfaces should be repaired or replaced as part of the work. Likewise, if any fencing, gate, decorative walls, guard rails or other special features exist that will be impacted by the maintenance work, they are also to be removed and restored or replaced as part of the bridge maintenance work. However, the cost of the supply and installation of any surface material other than Granular "A" material, and the cost of removal and restoration or replacement, if necessary, of any special features, shall be totally assessed to the benefiting adjoining owner served by said access bridge and/or road crossing structures.

Road Crossings and Fire Hydrant Access Structures:

As noted above, each road crossing and fire hydrant access structure within the J.C. Smith Drain and/or the McPherson Drain is within or under the jurisdiction of a road authority or public utility. Therefore, under no circumstances shall any of the costs for the maintenance or replacement of these structures be assessed to any upstream lands or roads within the drain's watershed. In the circumstance where a fire hydrant access portion forms part of an enclosure, the cost-sharing provision outlined above includes the Town's share of the overall cost of the enclosure.

Furthermore, when future maintenance is required to these structures, each governing road authority or public utility may elect to carry out the future works on these structures using their own forces, through Section 69 of the Drainage Act, if they choose to do so. If these structures are to be replaced under an Engineer's Report through the provisions of the Drainage Act, it is recommended that Section 26 be utilized for the increased cost to the project as a result of their existence.

Future Maintenance Summary

All of the above provisions for the future maintenance of the J.C. Smith Drain and McPherson Drain shall remain as aforesaid until otherwise varied and/or determined under the provisions of the "Drainage Act, RSO. 1990, Chapter, D.17, as amended 2021", or subsequent amendments made thereto.

All of which is respectfully submitted,

N.J. PERALTA ENGINEERING LTD.

Antonio B. Peralta, P.Eng.

ABP/kk

CONSTRUCTION SCHEDULE OF ASSESSMENT

3. MUNICIPAL LANDS:

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
	South Talbot Road			0.33	0.133	Town of Tecumseh	$ 79.00	$ 50.00	$ -	$ 129.00
	10th Concession Road			12.78	5.174	Town of Tecumseh	$ 69,492.00	$ 19,426.00	$ -	$ 88,918.00
	Total on Municipal Lands						**$ 69,571.00**	**$ 19,476.00**	**$ -**	**$ 89,047.00**

4. PRIVATELY OWNED - NON-AGRICULTURAL LANDS:

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-01660	9	4	1.05	1.05	0.425	Brian & Lisa McGuire	$ 50,631.00	$ 251.00	$ -	$ 50,882.00
410-02010	9	3	1.22	1.22	0.494	Andrew & Jodi Brewin	$ 11,110.00	$ 3,391.00	$ 2,800.00	$ 17,301.00
410-02701	10	5	1.00	1.00	0.405	Kathy-Lynn McCarthy	$ 60.00	$ 106.00	$ -	$ 166.00
410-02650	10	3	0.57	0.57	0.231	Nancy Steeves	$ 9,938.00	$ 190.00	$ -	$ 10,128.00
410-02530	9	1	0.99	0.99	0.401	Adam Lacey & Anita Marinelli	$ 48,571.00	$ 2,142.00	$ -	$ 50,713.00
	Total on Privately Owned - Non-Agricultural Lands						**$ 120,310.00**	**$ 6,080.00**	**$ 2,800.00**	**$ 129,190.00**

5. PRIVATELY OWNED - AGRICULTURAL LANDS (grantable):

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-01500	9	5	54.64	3.00	1.214	Vince Gemus Holdings Inc.	$ 16,166.00	$ 198.00	$ -	$ 16,364.00
410-01700	9	4	60.61	60.61	24.529	Revenberg Holdings Ltd.	$ 22,496.00	$ 7,820.00	$ -	$ 30,316.00
410-01800	9	4	29.34	29.34	11.874	Revenberg Holdings Ltd.	$ 12,365.00	$ 8,220.00	$ -	$ 20,585.00
410-01900	9	3	30.96	16.00	6.475	Shirley Wilson	$ 10,719.00	$ 2,457.00	$ -	$ 13,176.00
410-02100	9	3	34.05	3.00	1.214	Gianni & Shirley Sfalcin	$ 2,141.00	$ 1,255.00	$ -	$ 3,396.00

5. PRIVATELY OWNED - AGRICULTURAL LANDS (grantable): ***Continued***

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-02200	9	2	24.85	2.00	0.809	Gerard & Cindy Revenberg	$ 1,726.00	$ 765.00	$ -	$ 2,491.00
410-02300	9	2	24.86	2.00	0.809	Gregory Price	$ 2,725.00	$ 655.00	$ -	$ 3,380.00
410-02400	9	2	24.63	2.00	0.809	Gregory Markham	$ 1,763.00	$ 441.00	$ -	$ 2,204.00
410-02500	9	2	24.30	2.00	0.809	William & Joanne Leon	$ 16,380.00	$ 1,393.00	$ -	$ 17,773.00
410-02540	9	1	63.29	8.00	3.238	Mergl Seeds Ltd.	$ 7,905.00	$ 3,655.00	$ -	$ 11,560.00
410-02700	10	4 & 5	47.41	47.41	19.187	John & Catherine Lafferty	$ 8,463.00	$ 2,374.00	$ -	$ 10,837.00
410-02702	10	5	1.63	1.63	0.660	Frank Lafferty Ltd.	$ 83.00	$ 158.00	$ -	$ 241.00
410-02600	10	3	73.35	17.00	6.880	Peter & Nancy Steeves	$ 24,490.00	$ 2,623.00	$ -	$ 27,113.00
410-02550	10	3	35.34	17.00	6.880	Roberta Diemer	$ 25,680.00	$ 2,749.00	$ -	$ 28,429.00
410-03600	10	2 & 3	53.94	25.00	10.117	Dwight Farough	$ 3,065.00	$ 2,209.00	$ -	$ 5,274.00
410-04000	10	1	34.40	1.00	0.405	Zachary Pan & Xiaotong Tang	$ 14,676.00	$ 637.00	$ -	$ 15,313.00
Total on Privately Owned - Agricultural Lands (grantable).....							**$ 170,843.00**	**$ 37,609.00**	**$ -**	**$ 208,452.00**

5. PRIVATELY OWNED - AGRICULTURAL LANDS (non-grantable):

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-01700	9	4	60.50	60.61	24.529	Revenberg Holdings Ltd.	$ 3,396.00	$ -	$ -	$ 3,396.00
410-01900	9	3	31.21	16.00	6.475	Shirley Wilson	$ 14,629.00	$ -	$ -	$ 14,629.00
410-02000	9	3	33.00	7.63	3.088	Amandeep & Jaspal Baines	$ 27,575.00	$ 5,417.00	$ -	$ 32,992.00
410-02400	9	2	24.64	2.00	0.809	Gregory Markham	$ 1,045.00	$ -	$ -	$ 1,045.00
410-02500	9	2	23.68	2.00	0.809	William & Joanne Leon	$ 17,241.00	$ -	$ 2,800.00	$ 20,041.00
410-02550	10	3	35.51	17.00	6.880	Roberta Diemer	$ 21,030.00	$ -	$ -	$ 21,030.00
410-03900	10	2	52.49	50.00	20.235	Claret Capital Holdings Inc.	$ 7,434.00	$ 4,294.00	$ -	$ 11,728.00
Total on Privately Owned - Agricultural Lands (non-grantable).....							**$ 92,350.00**	**$ 9,711.00**	**$ 2,800.00**	**$ 104,861.00**

6. SPECIAL NON PRO-RATEABLE ASSESSMENTS (non-agricultural Sec.26):

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
	10th Concession Road			0.00	0.000	Town of Tecumseh	$ 138,921.00	$ -	$ -	$ 138,921.00
	Town of Tecumseh Water Dept.			0.00	0.000	Town of Tecumseh	$ 70,789.00	$ -	$ -	$ 70,789.00
	Total on Special Non Pro-Rateable Assessments (non-agricultural Sec.26).....						**$ 209,710.00**	**$ -**	**$ -**	**$ 209,710.00**
TOTAL ASSESSMENT				**312.56**	**126.493**		**$ 662,784.00**	**$ 72,876.00**	**$ 5,600.00**	**$ 741,260.00**

1 Hectare = 2.471 Acres

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SPECIFICATIONS

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Peralta Engineering

STANDARD SPECIFICATIONS

General

(Revised January 2024)

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I. GENERAL CONDITIONS FOR SPECIFICATIONS

The specifications, together with the accompanying drawings and appendices, delineate the furnishing of all labour, equipment, materials, and supplies required for the performance of all operations relating to the construction and/or improvements of a Municipal Drain under the most recent revision of the Drainage Act and/or amendments made thereto. These specifications serve to supplement and/or amend the current Ontario Provincial Standard Specifications and Standard Drawings, adopted by the Ontario Municipal Engineers Association. "Special Provisions" are included as part of the overall document and shall be read in conjunction with these standard specifications. Where a discrepancy occurs between the requirements of the Standard Specifications and the Special Provisions, the Special Provisions shall govern. In the event that the Specifications, Information to Tenderers, or the Form of Agreement do not apply to a specific condition or circumstance with respect to this project, the applicable section or sections from the Canadian Construction Documents Committee (CCDC) shall govern and be used to establish the requirements of the work.

Any reference to "Drainage Superintendent" and/or "Consulting Engineer" within this document shall refer to the person (or persons) appointed by the Council of the Municipality having jurisdiction over the drainage works.

All work shall be done in a first-class and workmanlike manner, complete in all respects and including all items specified herein, or as necessary for the accomplishment of a complete, satisfactory, and approved installation.

II. REVIEW OF SITE, PLANS, AND SPECIFICATIONS

As part of the Tender process, each tenderer shall visit the site(s) and review all documentation associated with the project prior to their tender submission and satisfy themselves with the full extent of the scope of work and conditions to complete the project. The Contractor may request, at any time prior to the closing of the tender, to examine any associated information available from the Drainage Superintendent and/or Consulting Engineer. Claims that there are any misunderstandings of the terms and conditions of the Contract related to site conditions will not be permitted.

The quantities identified within the Construction Items, Drawings and/or Specifications are estimates only and are intended for the sole purpose of identifying the general extent of the proposed work. The tenderer shall be responsible to verify the quantities for accuracy prior to submitting their tender.

III. MAINTENANCE PERIOD

The successful tenderer shall guarantee and warrant the work for a period of twelve (12) months from the time that substantial completion is issued. Upon the expiry of the maintenance period, with ordinary wear and tear, the work shall remain in such condition as will meet with the approval of the Consulting Engineer, and it will be responsible for rectification in a manner satisfactory to the Consulting Engineer. The cost thereof, of any imperfect work due to or arising from materials, equipment or plant incorporated into or used in the construction thereof, or due to or arising from workmanship or methods of construction, that is discovered by any means at any time prior to the issuance of the Final Certificate. The Consulting Engineer shall decide as to the nature, extent, cause of, and responsibility for imperfect work and the necessity for and the method of rectification thereof. In the event that the Contractor fails to comply with the above and address any deficiencies, the Municipality may complete these deficiencies, with the guidance of the Consulting Engineer, to make such repairs or complete such works, and the whole costs, charges and/or expenses so incurred may be deducted from any amount due or collected from the Contractor.

IV. LIABILITY OF THE CONTRACTOR

The Contractor, its agents, workforce and/or sub-contractors, shall satisfy itself as to the exact location, nature and extent of any existing structure, utility or other objects that it may encounter during the course of the work. The Contractor will be responsible for any damage caused by it to any person, property, public utilities, and/or municipal infrastructure. The Contractor shall indemnify and save harmless, the Municipality and the Consulting Engineer for any damages which it may cause or sustain during the progress of the work. The Contractor shall not hold the Municipality or the Consulting Engineer liable for any legal action arising out of any claims brought about by such damage caused by it.

V. GENERAL COORDINATION

The Contractor shall be responsible for the coordination with other organizations, agencies, and utility companies in connection with the works. The Contractor shall not take action against the Municipality or the Engineer for delays caused by the site being unavailable to them by the Municipality or Consulting Engineer because of the acts, omissions, conduct or misconduct of other organizations or utility companies engaged in other work.

VI. LEGAL SURVEY BARS AND MONUMENTS

The Contractor is to note that legal survey bars may exist within the work site, and it shall take whatever steps necessary to protect these features. If any iron bar or monument is damaged or removed by the Contractor, it shall arrange for an Ontario Land Surveyor licensed in the Province of Ontario to restore same, all at the Contractor's expense.

VII. MAINTAINING CONVEYANCE

The drainage works shall not be conducted at times when flows in the drain are elevated due to local rain events, storms, or seasonal floods. Work shall be completed during times when the drain is dry or frozen.

When performing excavation work, care should be taken not to interfere with, plug up, or damage any existing surface drains, swales, and lateral or main tile ends. The Contractor shall be responsible to maintain permanent flow at all times. Temporary damming of flow is permitted to conduct the necessary works. However, the Contractor is responsible to monitor and ensure no damage occurs as a result of its actions. Under no circumstances shall temporary damming be permitted for an extended period (ie. overnight, etc.) without a suitable water control plan approved by the Drainage Superintendent, Consulting Engineer and/or the Conservation Authority.

VIII. APPROVALS, PERMITTING, AND INSPECTION

The works proposed under this project is subject to the approval, inspection, regulations, and by-laws of all Municipal, Provincial, and Federal entity, or any other agency having jurisdiction associated with the drainage works established herein. The Contractor shall ensure that all applicable permits and approvals are procured from all affected authorities prior to carrying out any of the prescribed works identified within the Contract, or in the vicinity of any public utility, railway and/or road authority.

The drainage works forming part of this project, including all appurtenances, shall be completely inspected by the Town Drainage Superintendent and/or the Consulting Engineer's Inspector prior to its completion. Under no circumstance shall the Contractor commence the construction or backfill of any underground feature without the site presence of the Drainage Superintendent and/or the Consulting Engineer's Inspector to inspect and approve said installation. The Contractor shall provide a minimum of forty-eight (48) hours' notice to the Drainage Superintendent and/or the Consulting Engineer prior to the commencement of the work. All works shall be performed during normal working hours of the Drainage Superintendent and/or the Consulting Engineer from Monday to Friday unless written authorization is provided by them to amend these working hours.

Upon completion of the works and prior to the demobilization and removal of all equipment and materials from the site, the Contractor shall notify the Drainage Superintendent and/or Consulting Engineer to arrange a final inspection of the works. The final inspection is intended to ensure that all aspects of the drainage work are satisfactorily completed and/or identify any outstanding deficiencies. Any outstanding deficiencies shall be addressed expeditiously as weather permits.

IX. TRAFFIC CONTROL

The Contractor shall ensure that the travelling public is always protected while utilizing the roadway for its access. The Contractor shall be required to carry out all the necessary steps to direct traffic and provide temporary diversion of traffic around work sites, including provision of all lights, signs, flag persons, and barricades required to protect the safety of the travelling public. The Contractor shall be required to submit a Traffic Control Plan to the Consulting Engineer for approval from the governing Road Authorities. The Traffic Control Plan shall be carried out in accordance with the requirements of the Ontario Traffic Manual's Book 7 for Temporary Conditions. Should the Contractor have to close any roads for the proposed works, it shall arrange to obtain the necessary authorizations from the Municipality, County, or Provincial Roads Departments (if applicable) and distribute notification of detours around the site. The Contractor shall also ensure that all emergency services, school bus companies, etc. are contacted about the disruption to access

at least 48 hours in advance of same. All detour routes shall be established in consultation with the Municipality and County Roads Department (if applicable).

Due to the extent of the work and the area for carrying out the work, the Contractor shall be required to carry out all of the necessary steps to direct traffic and provide temporary diversion of traffic around work sites, including the provision of all lights, signs, flag persons, and barricades required to protect the safety of the travelling public. Any accesses or areas used in carrying out the works are to be fully restored to their original conditions by the Contractor, including topsoil placement and lawn restoration as directed by the Drainage Superintendent and/or the Consulting Engineer. Restoration shall include but not be limited to all necessary levelling, grading, shaping, topsoil, seeding and mulching, and granular placement required to make good any damage caused.

The Contractor shall note that any deviation from the specified access for the construction of the culvert without the explicit approval of the adjacent landowners and the Drainage Superintendent could result in the Contractor being liable for damages sustained. The value for such damage shall be determined by the Drainage Superintendent and the Consulting Engineer and be subsequently deducted from the Contract Price. Where applicable, the Contractor shall be responsible for any damage caused by them to any portion of the road right-of-way. They shall take whatever precautions are necessary to avoid damage to the roadway. Any damage to the roadway must be restored to its' original condition upon completion of the works.

X. FENCING AND/OR STRUCTURES

Where it is necessary to take down any fence and/or structure to proceed with the work, same shall be done by the Contractor across or along that portion of the work where such fence and/or structure is located. The Contractor shall be required to exercise extreme care in the removal of any fencing and/or structure, to ensure minimum damage to same. The Contractor shall be required to replace any fence and/or structure that is taken down in order to proceed with the work, and the fence and/or structure shall be replaced in a neat and workmanlike manner. The Contractor shall not be required to procure any new materials for rebuilding the fence and/or structure provided that it has used reasonable care in the removal and replacement of same. When any fence and/or structure is removed by the Contractor, and the Owner thereof deems it advisable and procures new material for replacing the fence and/or structure so removed, the Contractor shall replace the fence and/or structure using new materials and the materials from the present fence and/or structure shall remain the property of the Owner.

XI. BENCHMARKS

For use by the Contractor, Benchmarks have been established along the course of the work. The plans include details illustrating the available Benchmarks and the work to be carried out. Benchmarks have been indicated and the Elevations have been shown and shall be utilized by the Contractor in carrying out its work. The Contractor shall note that specific design elevations and grades have been provided for the proposed works. The plans also set out side slopes, bottom width, and other requirements relative to its installation. In all cases, the Contractor is to utilize the specified Benchmarks to establish the identified elevations and grades. The Contractor shall ensure that it takes note of the direction of flow and sets all grades to match the direction of flow within the drain.

XII. ENVIRONMENTAL CONSIDERATIONS

Prior to commencing work, the Contractor must familiarize themselves with all associated environmental approvals and mitigations. The Contractor shall review the results of any environmental reviews performed for the project, including documents for the purpose of identification of known Species at Risk within the project area and mitigation measures for species and habitat protection. It is the responsibility of the Contractor to make certain that necessary provisions are undertaken to ensure the protection of all Species at Risk and their habitats throughout the course of construction. The Contractor will be responsible for providing the necessary equipment and materials required by any mitigation plans and shall contact the Drainage Superintendent immediately if any Endangered Species are encountered during construction.

XIII. FINAL CLEANUP AND RESTORATION

The whole of the work shall be satisfactorily cleaned up, and during the course of the construction, no portion shall be left in any untidy or incomplete state before subsequent portions are undertaken. Following the completion of the work, the Contractor is to trim up any broken or damaged limbs on trees which are to remain standing, and it shall dispose of said branches along with other brush, thus leaving the trees in a neat and tidy condition. The whole of the work shall be satisfactorily cleaned up, and during the course of the construction, no work shall be left in any untidy or incomplete state before subsequent portions are undertaken.

Any accesses or areas used in carrying out the works are to be fully restored to their original conditions by the Contractor, including topsoil placement and lawn restoration as directed by the Drainage Superintendent and/or the Consulting Engineer. Restoration shall include, but not be limited to, all necessary levelling, grading, shaping, topsoil, seeding and mulching, and granular placement required to make good any damage caused. Any damages caused, resulting from non-compliance with the above-noted provisions, shall be restored by the Contractor to its original condition, at the Contractor's expense. All roadways, driveways and access bridges, or any other means of access onto the job site shall be fully restored to their former condition at the Contractor's expense. In the event that the Contractor fails to satisfactorily clean up any portion of these accesses, the Consulting Engineer shall order such cleanup to be carried out by others and the cost of same to be deducted from any monies owing to the Contractor.

XIV. GENERAL CONDITIONS

a) The Drainage Superintendent or Consulting Engineer shall have the authority to carry out minor changes to the work where such changes do not lessen the efficiency of the work.

b) The Contractor shall provide a sufficient number of layout stakes and grade points so that the Drainage Superintendent and Consulting Engineer can review same and check that the work will generally conform with the design and project intent.

c) The Contractor will be responsible for any damage caused by it 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 the road, the travelled portion shall be protected by having the excavation equipment placed on satisfactory timber planks or timber pads. If

any part of the travelled portion of the road is 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. The Contractor, upon completing the works, shall clean all debris and junk, etc., from the roadside of the drain, and leave the site in a neat and workmanlike manner. The Contractor shall be responsible for keeping all public roadways utilized for hauling materials free and clear of mud and debris.

d) The Contractor will 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 will 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.

e) The Contractor shall furnish a Performance and Maintenance Bond along with a separate Labour and Material Payment Bond within ten (10) days after notification of the execution of the Agreement by the Owner unless otherwise established within the Tender Documents. One copy of said bonds shall be bound into each of the executed sets of the Contract. Each Performance and Maintenance Bond and Labour and Material Payment Bond shall be in the amount of 100% of the total Tender Price. All Bonds shall be executed under corporate seal by the Contractor and a surety company, authorized by law to carry out business in the Province of Ontario. The Bonds shall be acceptable to the Owner in every way and shall guarantee faithful performance of the contract during the period of the contract, including the period of guaranteed maintenance which will be in effect for twelve (12) months after substantial completion of the works.

The Tenderer shall include the cost of bonds in the unit price of the Tender items as no additional payment will be made in this regard.

f) The Contractor shall be required, as part of this Contract, to provide Comprehensive Liability Insurance coverage for not less than $5,000,000.00 on this project unless otherwise established in the Tender Documents, and shall name the Municipality and its' officials, and the Consulting Engineer and its staff as additional insured under the policy. The Contractor must submit a copy of this policy to both the Municipal Clerk and the Consulting Engineer prior to the commencement of work.

g) Monthly progress orders for payment shall be furnished the Contractor by the Drainage Superintendent. Said orders shall be for not more than 90% of the value of the work done and the materials furnished on the site. The paying of the full 90% does not imply that any portion of the work has been accepted. The remaining 10% will be paid 60 days after the final acceptance and completion of the work and payment shall not be authorized until the Contractor provides the following:

i) a Certificate of Clearance for the project from the Workplace Safety and Insurance Board
ii) proof of advertising
iii) a Statutory Declaration, in a form satisfactory to the Consulting Engineer and the Municipality, that all liabilities incurred by the Contractor and its Sub-Contractors in carrying out the Contract have been discharged and that all liens in respect of the Contract and Sub-Contracts thereunder have expired or have been satisfied, discharged or provided for by payment into Court.

The Contractor shall satisfy the Consulting Engineer or Municipality that there are no liens or claims against the work and that all of the requirements as per the Construction Act, 2018 and its' subsequent amendments have been adhered to by the Contractor.

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Peralta Engineering

STANDARD SPECIFICATIONS

FOR OPEN DRAINS

(Revised September 2024)

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DETAILS

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I. GENERAL CONDITIONS FOR SPECIFICATIONS

These specifications, together with the accompanying drawings and appendices, delineate the furnishing of all labour, equipment, materials, and supplies required for the performance of all operations relating to the construction and/or improvements of a Municipal Drain under the most recent revision of the Drainage Act and/or amendments made thereto. These specifications serve to supplement and/or amend the current Ontario Provincial Standard Specifications and Standard Drawings, adopted by the Ontario Municipal Engineers Association. "Special Provisions" are included as part of the overall document and shall be read in conjunction with these standard specifications. Where a discrepancy occurs between the requirements of the Standard Specifications and the Special Provisions, the Special Provisions shall govern. In the event that the Specifications, Information to Tenderers, or the Form of Agreement do not apply to a specific condition or circumstance with respect to this project, the applicable section, or sections from the Canadian Construction Documents Committee (CCDC) shall govern and be used to establish the requirements of the work.

Any reference to "Drainage Superintendent" and/or "Consulting Engineer" within this document shall refer to the person (or persons) appointed by the Council of the Municipality having jurisdiction over the drainage works.

All work shall be done in a first-class and workmanlike manner, complete in all respects and including all items specified herein, or as necessary for the accomplishment of a complete, satisfactory, and approved installation.

II. GEOMETRY AND ALIGNMENT

Except for details otherwise specified, any drain excavation shall adhere to the course of the existing drain, as close as practical, with the defined sloping and widths carried out on each bank as required to produce the specified cross-section. The works shall be of the size, shape, type, depth, width, etc., as shown in the accompanying drawings and as determined from the Benchmark.

At locations where sharp or irregular bends exist, all excavation, sloping, and widening shall be completed on the side of the drain which will provide a reduced radius and improve the alignment of the channel. When works are completed adjacent to a fence row or the travelled portion of the roadway/laneway, all excavation, sloping and widening shall be completed from the furthest side of the drain from this feature, unless otherwise established by the Drainage Superintendent and/or Consulting Engineer.

Where a drain is intended to be relocated from the road allowance and onto private lands, the top edge of the nearest drain bank shall be set a minimum of 1.0 metres from the road right-of-way or the top of the former channel to be abandoned. The centerline of the proposed channel shall be as straight as practical with any change in the direction provided with a smooth transition and set to the radii established within the accompanying drawings.

The Contractor shall provide a sufficient number of layout stakes and grade points so that the Drainage Superintendent and/or Consulting Engineer can review and verify that the work will generally conform with the design and project intent. The cost of placing layout stakes shall form part of their tender price.

III. PROFILE

The excavation of the drain must adhere to the depths and grades as established within the accompanying Profile. For the convenience of the Contractor, the profile indicates the approximate depth of cut from the existing ground levels to the proposed new drain bottom elevation. Benchmarks have been established along the course of the drain and shall govern the final elevation of the drain. These Benchmarks have been included as part of the accompanying drawings.

The Contractor shall ensure that the profile grades are constructed with an even gradient to prevent standing water. Laser Control must be provided to maintain drain lines and grades, and the Contractor shall have a qualified Operator to set up and operate the equipment. In some instances, but only at the discretion of the Consulting Engineer, an approved system of batter boards or stakes may be utilized for this purpose. However, the cost of placing grade stakes and determining the cut information shall be provided by or paid for entirely by the Contractor.

IV. BOTTOM WIDTHS AND SIDE SLOPES

As indicated on the accompanying profile and cross-sections, bottom widths and side slopes have been provided for the various sections of the drain. These parameters shall represent the finished grade of the cross-section. Although these parameters have been established as a guide for the Contractor, the finished cross-section shall closely resemble the cross-section established within the accompanying drawings. Minor deviations are permitted to accommodate the existing restrictions. However, under no circumstances shall the finished side slopes be steeper, nor the bottom width narrower, than those established within the accompanying drawings. Unless otherwise stipulated, the Contractor shall not excavate the drain bottom deeper than the established grade resulting in the formation of pockets that will cause standing water within the drain. Any corrections to the grades resulting in over-excavation of the drain bottom shall be corrected per the Consulting Engineer's recommendations and at the Contractor's expense.

Based on the overall depths and widths of the drain, the Contractor shall ensure that appropriate excavating equipment is utilized for the works and ensure that no damage is caused by the use of improper excavating equipment.

V. OBSTRUCTIONS

All stones, brush, timber, logs, stumps, or other potential obstructions encountered within the limits of the channel or along the course of the drain, shall be removed by the Contractor. Any large stones, concrete, or other materials of this nature shall be neatly piled near the extreme limit of the maintenance corridor so that it shall not interfere with the spreading or placement of any excavated materials. All timber, logs, and stumps shall be dealt with in the same manner established in the proceeding sections related to the Removal of Brush, Trees and Debris. Once placed in appropriate locations, these materials shall become the responsibility of the adjacent landowner.

VI. DEAD WOOD REMOVAL

Any and all dead trees located within the drain cross-section and within the established working corridors shall be neatly cut into logs with a chainsaw, piled and set near the extreme limit of the maintenance corridor for the use of the adjoining property owner unless otherwise directed by the Drainage Superintendent and/or Consulting Engineer. In addition to the dead wood located within the drain and working corridor, the Contractor shall also remove and dispose of all dead wood located on the opposite side within a 1.0-metre perpendicular distance into the headland beyond the top of the drain bank where no brushing is intended.

VII. REMOVAL OF BRUSH, TREES, AND DEBRIS

Where the existing side slopes and drain bottom of the drain is sufficient to permit the necessary sediment removal without disturbing the existing drain banks above the present drain bottom, the Contractor will be required to cut the brush and trees flush with the slope of the drain. However, it is imperative not to remove any stumps or roots associated with the trees, unless they present a clear obstruction to the flow within the drain. Any healthy trees in the drain situated along the top 0.30 metres from the top of the bank could be left if they are not impeding the flow in the drain. All of the brushing works shall be carried out from the same side of the drain where the excavation of the drain is being carried out.

Where it is necessary to widen the drain channel and excavate material from the drain bank, all brush and trees within the excavated portion, including the spread area and within 1.0 metres from the top of the bank, all trees and brush shall be removed and those roots and stumps within the drain channel shall be completely grubbed out unless otherwise established by the Drainage Superintendent and/or the Consulting Engineer. As part of the drain widening process, where there are any trees, brush, or debris adjacent to the drain, or where the excavated spoil materials are to be spread (including any brush piles, rubbish piles or rock piles), this material shall be grubbed out and close cut, and be burned or otherwise disposed of, by the Contractor, unless otherwise noted within the Special Provisions.

All trees intended to be removed and having a diameter greater than 150mm shall have their branches trimmed and the trunks/branches cut into logs not longer than 2.0 metres in length. These logs shall be piled for the use of the adjoining property owner unless otherwise directed by the Drainage Superintendent and/or Consulting Engineer. All trees intended to be removed and having a diameter of 150mm or less shall be cut off flush with the ground and brushed. Brushing is to be carried out by means of shredding or machine type equipment excluding any trees with a diameter of 150mm or greater, which are to be cut by

tree shears, chainsaw, or a similar method. Any stumps remaining as a result of tree removal shall have a maximum stump height of 75mm (3"), where practical. Small branches, limbs, and brush shall be disposed of by the Contractor unless otherwise established within the Special Provisions.

Following the completion of the work, the Contractor is to trim up any broken or damaged limbs on trees which are to remain standing, and it shall dispose of said branches along with other brush, thus leaving the trees in a neat and tidy condition.

Under no circumstances shall brush, branched, trees, or rubbish be allowed to be buried in the spoil bank or within the excavated material, and the Contractor will require to brush rake the excavated material to remove all such debris if so instructed by the Drainage Superintendent.

Where there is any brush, trees or debris along the course of the drainage works, including the full width of any access, all such brush, trees or debris shall be close-cut and grubbed out, and the whole shall be burned or otherwise satisfactorily disposed of by the Contractor. The brush and trees removed along the course of the work are to be put into piles by the Contractor in locations where they can be safely burned by it, or hauled away and disposed of, by the Contractor to a site to be obtained by it at its expense. Prior to and during the course of the burning operations, the Contractor shall comply with the guidelines prepared by the Air Quality Branch of the Ontario Ministry of the Environment, Conservation and Parks and shall ensure that the Environmental Protection Act is not violated. The Contractor will be required to notify the local fire authorities and cooperate with them in the carrying out of any work. The removal of brush and trees shall be carried out in close consultation with the Drainage Superintendent or Consulting Engineer to ensure that no decorative trees or shrubs are disturbed by the operations of the Contractor that can be saved. It is the intent of this project to save as many trees and bushes as practical within the roadway allowances and on private lands.

VIII. FENCING

Where it is necessary to take down any fence to proceed with the work, the same shall be done by the Contractor across or along that portion of the work where such fence is located. The Contractor will be required to exercise extreme care in the removal of any fencing so as to cause a minimum of damage to the same. The Contractor will be required to replace any fence that is taken down in order to proceed with the work, and the fence shall be replaced in a neat and workmanlike manner. The Contractor will not be required to procure any new materials for rebuilding the fence, provided that it has used reasonable care in the removal and replacement of same. When any fence is removed by the Contractor, and the Owner thereof deems it advisable and procures new material for replacing the fence so removed, the Contractor shall replace the fence using the new materials and the materials from the present fence shall remain the property of the Owner.

IX. PLANTED CROPS AND LIVESTOCK

Where required, provisions for loss of, or damages to, crops along the working corridors of the drain have been established within the Engineer's Report for this drain. As a result, the Contractor shall not be liable for such loss or damage as part of the project, unless these damages extend beyond the established working corridor.

Should the Property Owner wish to harvest any crop within the established working corridor, then it shall be the responsibility of the property to do so prior to construction. Likewise, it will be the Property Owner's responsibility to keep their livestock clear of the construction area upon 24 hours of advanced notice by the Contractor. Upon notice, the Contractor shall not be liable for any damage to livestock, the drain, materials or equipment caused by the Owner's livestock.

X. SEDIMENTATION REMOVAL

When drain cleaning is specified for an existing drain alignment, the works intend to remove all sedimentation built up within the drain channel. As part of these operations, the Contractor shall remove all accumulated sediment within the channel while minimizing the disturbances of the existing side slopes of the drain when carrying out its maintenance work, unless otherwise specified. However, trimming of the drain bank may be required in areas where drain bank failures have occurred, the banks are over-steepened and unstable, or where overhangs exist. At these locations, the drain bank on the side from which the excavation equipment is operating shall be trimmed to the specified slope. Any deviation from the specified drain parameters shall be directed by the Drainage Superintendent and/or the Consulting Engineer and no claims for extra compensation for minor drain bank trimming will be considered. It shall be noted that no drain excavations or cleaning shall be performed until after all brushing operations have been completed.

XI. ROAD CROSSINGS AND ACCESS CULVERTS

Where an existing road crossing structure or private access (bridge/culvert) exists along the course of the drain, the Contractor shall excavate and remove all accumulated sediment through the full cross-section of its opening. The Contractor shall take extra care not to damage the existing structure. Upon the completion of the cleaning process, if it is found that repairs or replacement is required to the structure, the Contractor shall notify the Drainage Superintendent of its condition.

It is recommended that the Drainage Superintendent notify the governing road authority having jurisdiction over the structure of its condition. Where the necessary repairs, underpinning, strengthening, or replacement of a road crossing structure is required, these works shall be conducted under the authority of the governing Road Authority and at their expense.

XII. EXCAVATED MATERIALS

Where specified, the excavated material to be cast on the adjoining agricultural lands shall be well and evenly spread over a sufficient space so that no portion of the excavated material is more the six (6) inches in depth, or as otherwise identified within the Special Provisions. The excavated material shall be kept at least five (5) feet clear of the finished top of the bank of the drain. The Contractor shall take special care not to fill up any existing tiles, ditches, furrows, or drains. The excavated material to be spread upon the lands shall be free from deleterious materials (rocks, boulders, stumps, rubble, or other similar material) if encountered. All deleterious materials shall be hauled away and disposed of at a site to be obtained by the Contractor at their expense. With the placement of spread excavated materials along the working corridor, surface water inlets shall be installed through the spread excavated materials at natural low runs or at locations specified by the Drainage Superintendent or Consulting Engineer at the time of construction.

Under no circumstances shall any excavated material be placed in any ditches, furrows, pipes, tiles, or depressions intended to convey runoff to the open drain.

Where the drain passes along any farmhouse or dwelling, driveway, lawn area, garden plot, built-up residential or grassed area, the excavated materials from the drain for the full width of these areas shall be hauled away by the Contractor and spread on the adjoining agricultural lands as part of the tendered price. The Contractor will be required to operate its equipment from the roadside where applicable, in front of these areas. The Contractor should visit the drain sites and confirm for itself the extent of trucking required on this project. All of the excavated material across the full width of the municipal roadways, including all of the sediment material cleaned from within the concrete roadway bridges, shall be completely trucked away by the Contractor and taken for half the length and spread on the adjoining lands on both sides of the Roadway.

The Contractor shall be responsible for keeping all laneways, and all private and public roadways free and clear of mud and debris resulting from their use of any access and hauling purposes.

XIII. TILE OUTLET PIPES AND ROAD DRAINS

Along the length of the drain, the Contractor may encounter tile mains, lateral tiles, or road drains along the bottom or within the drain's bank. Where an existing tile outlet pipe is removed, damaged, or altered by the excavation of the drain, the Contractor will be required to protect or extend any existing tile ends to maintain the drainage from the adjacent lands. All existing tiles shall be extended utilizing a minimum of 3.0 metres of Boss 1000 (or equal plastic pipe) of the same diameter as the existing tile, or one (1) size bigger than, and installed in accordance with the "**Standard Lateral Tile Detail**" included within the accompanying drawings.

Connections shall be made using a Manufacturer's coupling wherever possible. For other connections, the Contractor shall utilize a grouted connection. Grouted mortar joints shall be composed of three (3) parts of clean, sharp sand to one (1) part of Portland Cement with just sufficient water added to provide a stiff plastic mix, and the mortar connection shall be performed to the full satisfaction of the Drainage Superintendent and/or the Consulting Engineer. The mortar joint shall be of sufficient mass around the full circumference of the joint on the exterior side to ensure a tight, solid seal.

XIV. TEMPORARY SEDIMENT CONTROLS AND ENVIRONMENTAL CONSIDERATIONS

The Contractor shall be required to implement stringent erosion and sedimentation controls during the course of the work to minimize the amount of silt and sediment being carried downstream. It is intended that work on this project be carried out during relatively dry weather to ensure the proper site and drain conditions and to avoid conflicts with sediment being deposited into the outlet drainage systems. All disturbed areas shall be restored as quickly as possible with grass seeding and mulching installed to ensure a protective cover and to minimize any erosion from the work site subsequent to construction. The Contractor may be required to provide temporary silt fencing and straw bales as outlined further in these specifications.

All of the work shall be carried out in accordance with any permits or authorizations issued by the Conservation Authority or the Department of Fisheries and Oceans (DFO), copies of which shall be provided,

if available. The Contractor is advised that no work shall be carried out in the existing drain from March 15th to July 15th, of any given year.

As part of its work, the Contractor shall implement the following measures that shall ensure that any potential adverse effects on fish and fish habitat shall be mitigated:

a) As per standard requirements, work shall not be conducted at times when flows in the drain are elevated due to local rain events, storms, or seasonal floods. Work shall be done in the dry.

b) All disturbed soils on the drain banks and within the channel, including spoil, must be stabilized immediately upon completion of work. The restoration of the site must be completed to a like or better condition than what existed prior to the works. The spoil material must be hauled away and disposed of at a suitable site or spread an appropriate distance from the top of the drain bank to ensure that it is not washed back into the drain.

c) To prevent sediment entry into the Drain, in the event of an unexpected rainfall, temporary silt barriers and/or traps must be placed in the channel during the works and until the site has been stabilized. All temporary sediment and erosion control measures (straw bale check dam or silt fences) shall conform to the Ontario Provincial Standards OPSD 219.130, OPSD 219.180, or approved equivalent. The Contractors shall ensure that sediment and erosion control measures are functioning properly and are maintained/upgraded as required. Any temporary sediment features must be removed upon completion of the construction. All costs associated with the supply and installation of temporary erosion control measures shall be included in the tender price for the project.

d) Silt or sand accumulated in the barrier traps must be removed and stabilized on land once the site is stabilized.

e) All activities including maintenance procedures should be controlled to prevent the entry of petroleum products, debris, rubble, concrete, or other deleterious substances into the water. Vehicular refueling and maintenance should be conducted away from the water.

XV. UTILITIES

The Contractor will be responsible at all times for a complete investigation to determine the location of all such utilities or structures known or unknown, and it shall indemnify and save harmless the Consulting Engineer and the Municipality for any responsibility, injury, or liability arising from any damage to such utilities or structures by the Contractor.

The Contractor shall protect all other services located in the vicinity of the proposed drainage works including any sanitary sewers and connections, watermains and connections, telephone and gas services, along with any private systems and services. Any damaged components shall be replaced by the Contractor, totally at its own expense and it shall fully restore the functionality of same.

The Contractor shall further contact or notify such Utility Company or Commission of its intention to carry out work in the area and cooperate with such Utility Company or Commission in the location, maintenance and preservation of all such utilities. The location of the pipes and appurtenances as shown on the drawings is approximate and may be changed by the Consulting Engineer if deemed advantageous for the progress of the work.

XVI. GENERAL EROSION PROTECTION

Where specified, or as directed by the Drainage Superintendent or Consulting Engineer, the Contractor shall install sloped quarried limestone erosion protection, on a slope no steeper than 1.50 horizontal to 1.00 vertical. It shall have a depth of 300mm and shall extend from the top bank to the toe of the bank, all in accordance with the **"Standard Erosion Protection Detail"** shown within the accompanying drawings. Where sloped quarried limestone is to be placed, it shall be underlain with a synthetic non-woven geotextile filter fabric. All work shall be completed to the full satisfaction of the Drainage Superintendent and/or the Consulting Engineer.

The quarried limestone shall be provided as shown and detailed and shall vary in size from a minimum of 100mm (4") to a maximum of 250mm (10"). The quarried limestone pieces shall be carefully tamped into place with the use of a shovel bucket so that, when complete, the quarried limestone erosion protection shall be consistent, uniform, and tightly laid in place. Prior to placing the quarried limestone, the Contractor shall place non-woven geotextile filter fabric "MacTex MX140" conforming to OPSS 1860 Class 1 or approved equal, as an underlay underneath all areas to be covered in quarried limestone erosion protection. The Contractor shall take extreme care not to damage the geotextile filter fabric when placing the quarried limestone. The placement of the geotextile filter fabric and the quarried limestone, and the completion of the quarried limestone erosion protection shall be conducted to the full satisfaction of the Drainage Superintendent and/or Consulting Engineer.

XVII. ROCK CHUTE SURFACE INLETS

Where specified, or as directed by the Drainage Superintendent or Consulting Engineer, the Contractor shall construct rock chutes to provide drainage for low-lying areas. All rock chutes and swale inlets shall be constructed to a minimum width of 2.0 metres and provided as a V-shaped channel through the middle. It is intended that the rock chute and swale inlets be constructed so that all water will flow within the confines of the rock protection. The Contractor shall deepen the centre portion of the rock chute, or swale inlet, so that when the stone is laid to a minimum 305mm thickness, a definite V-shape shall remain through the centre portion of the rock protection to direct all water safely to the new drain bottom. Furthermore, the rock chutes and swale invert shall be installed in accordance with the **"Standard Rock Chute Surface Inlet Detail"** shown within the accompanying drawings.

XVIII. TOPSOIL, SEED AND MULCH

Unless otherwise noted in the Special Provisions, the Contractor shall be required to restore all existing grassed areas and drain side slopes damaged or disturbed by the works, and place topsoil and seed and mulch over said areas including any specific areas noted within the Drawings. The Contractor shall be required to provide all materials to cover the above-mentioned surface areas with approximately 50mm of

good, clean, dry topsoil on slopes and 100mm of good, clean, dry topsoil on horizontal surfaces, fine-graded and spread in place ready for seeding and mulching. The Contractor is to note that prior to fine grading the topsoil over the backfilled areas, positive drainage is to be provided off of these areas and into the swales, and the Contractor shall also be required to make minor changes where necessary to ensure positive drainage. The Contractor shall be required to restore all existing grassed areas and roadway boulevard areas damaged by the work and shall provide topsoil and seed and mulch over all of these areas. The placing and grading of all topsoil shall be carefully carried out according to Ontario Provincial Standard Specifications, Form 802, dated November 2010, or as subsequently amended or as amended by these Specifications. Once the topsoil has been properly placed and fine-graded, the Contractor shall seed and mulch the area. Seeding and mulching operations shall be carried out according to Ontario Provincial Standard Specifications, Form 572, dated November 2003, or as subsequently amended or as amended by these Specifications. The seeding mixture shall be OSECO Seed Mixture Canada No. 1, as available from Morse Growers Supply in Leamington, or equal. As part of the seeding and mulching operation, the Contractor will be required to provide either a hydraulic mulch mix or a spread straw mulch with an adhesive binder in accordance with OPSS 1103.05.03 dated November 2016, or as subsequently amended, to ensure that the grass seed will be protected during germination and provide a thick, uniform cover to protect against erosion, where necessary. All work shall be completed to the full satisfaction of the Drainage Superintendent or the Consulting Engineer.

In order to promote good germination, if the seeding and mulching operation is carried out in the spring, the seeding mixture shall contain oats. If the seeding and mulching operation is carried out in the fall, the mixture shall contain rye. The seeding and mulching operations within the newly excavated drain slopes shall be carried out as soon as practical. All other areas shall only be carried out as weather conditions permit in either the months of May or June in the spring or during September and October in the fall unless written permission is obtained from either the Drainage Superintendent or the Consulting Engineer. All of the work relative to the placement of topsoil and the seeding and mulching operation shall be meticulously done and completed in a good and workmanlike manner all to the full satisfaction of the Drainage Superintendent or Consulting Engineer.

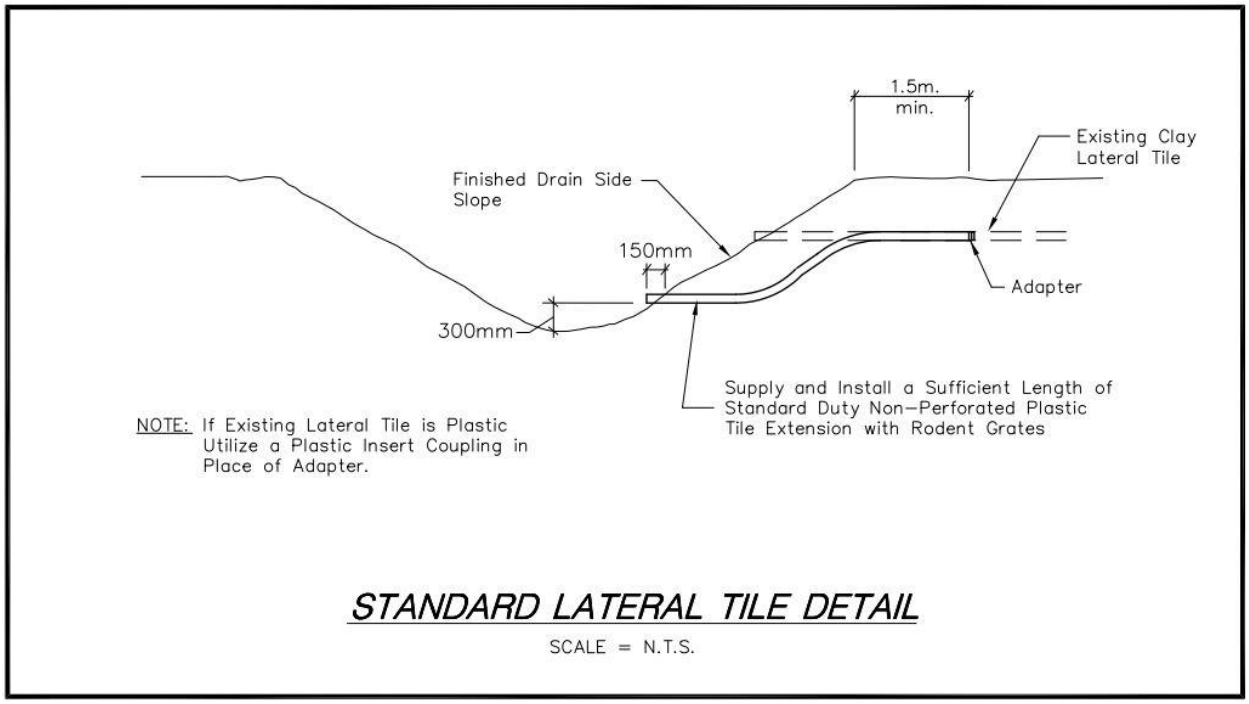

Figure 1 - Standard Lateral Tile Detail

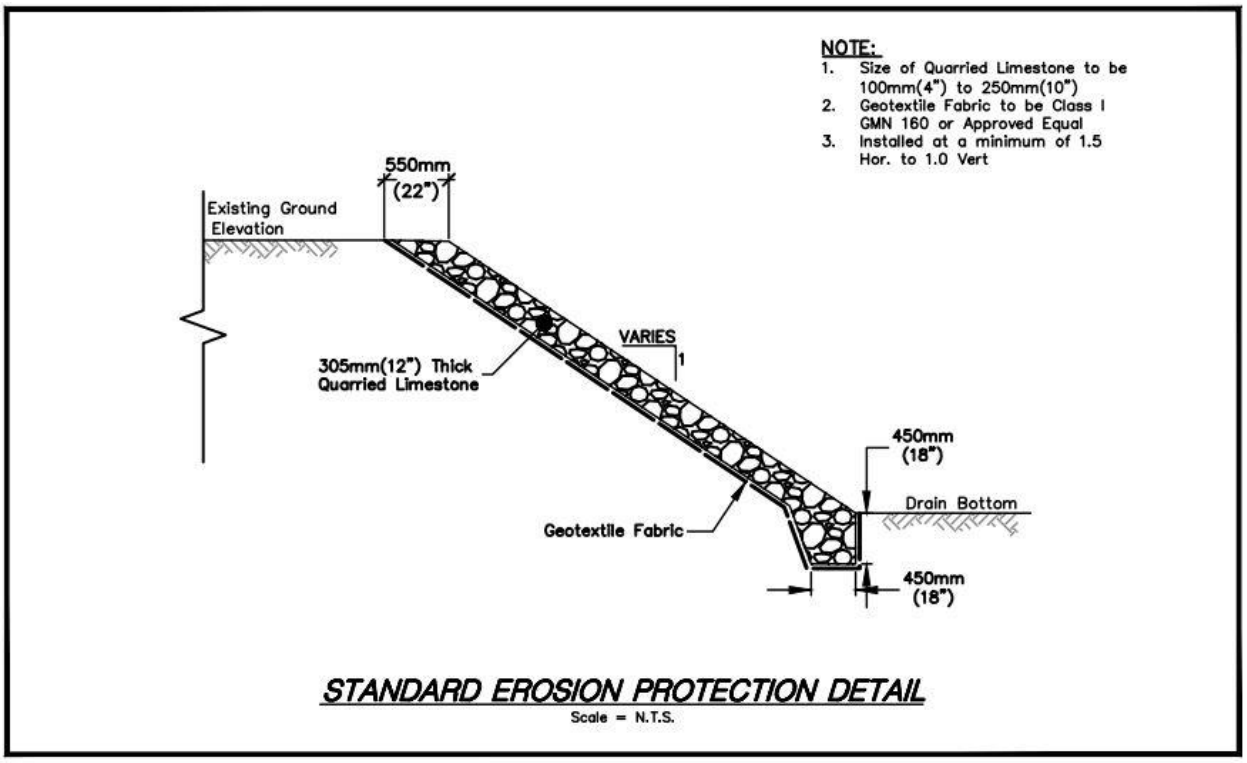

Figure 2 - Standard Erosion Protection Detail

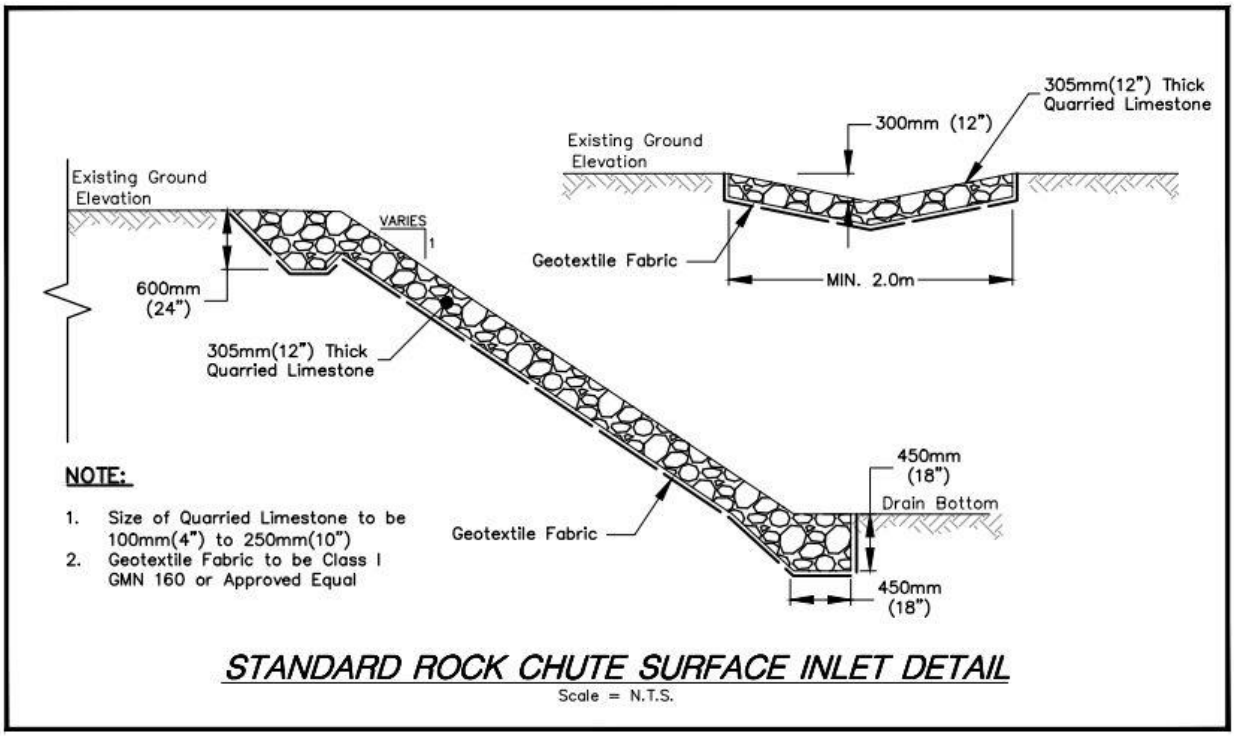

Figure 3 - Standard Rock Chute Surface Inlet Detail

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Peralta Engineering

STANDARD SPECIFICATIONS

FOR ACCESS BRIDGE INSTALLATIONS

(Revised July 2024)

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DETAILS

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I. GENERAL INFORMATION FOR SPECIFICATIONS

These specifications, together with the accompanying drawings and appendices, delineate the furnishing of all labour, equipment, materials, and supplies required for the performance of all operations relating to the construction and/or improvements of a Municipal Drain under the most recent revision of the Drainage Act and/or amendments made thereto. These specifications serve to supplement and/or amend the current Ontario Provincial Standard Specifications and Standard Drawings, adopted by the Ontario Municipal Engineers Association. "Special Provisions" are included as part of the overall document and shall be read in conjunction with these Standard Specifications. Where a discrepancy occurs between the requirements of the Standard Specifications and the Special Provisions, the Special Provisions shall govern. In the event that the Specifications, Information to Tenderers, or the Form of Agreement do not apply to a specific condition or circumstance with respect to this project, the applicable section, or sections from the Canadian Construction Documents Committee (CCDC) shall govern and be used to establish the requirements of the work.

Any reference to "Drainage Superintendent" and/or "Consulting Engineer" within this document shall refer to the person (or persons) appointed by the Council of the Municipality having jurisdiction over the drainage works.

All work shall be done in a first-class and workmanlike manner, complete in all respects and including all items specified herein, or as necessary for the accomplishment of a complete, satisfactory, and approved installation.

II. REMOVAL OF BRUSH, TREES, AND DEBRIS

Where there is any brush, trees, or debris along the course of the drainage works, including the full width of the access, all such brush, trees or debris shall be close-cut and grubbed out, and the whole shall be chipped up for recycling, burned, hauled away or satisfactorily disposed of by the Contractor at its expense. Prior to and during the course of the 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. The Contractor will be required to notify the local fire authorities and cooperate with them in the carrying out of any work. The removal of brush and trees shall be carried out in close consultation with the Drainage Superintendent or Consulting Engineer to ensure that no decorative trees or shrubs are disturbed by the operations of the Contractor that can be saved. It is the intent of this project to save as many trees and bushes as practical within the roadway allowances and on private lands.

The Contractor shall protect all other trees, bushes, and shrubs located along the length of the drainage works except for those trees that are noted within the accompanying drawings or in consultation with the

Drainage Superintendent, the Consulting Engineer, and the affected Owner(s). The Contractor shall note that protecting and saving the trees may require the Contractor to carry out handwork around the trees, bushes, and shrubs to complete the necessary final site grading and restoration.

Following the completion of the work, the Contractor is to trim up any broken or damaged limbs on trees which are to remain to stand, and it shall dispose of said branches along with other brush, thus leaving the trees in a neat and tidy condition.

The Contractor shall remove all deleterious materials and debris along the course of the open drain and any such materials located in the bridge culverts while carrying out its cleaning of same. All such deleterious materials and debris shall be loaded up and hauled away by the Contractor to a site to be obtained by it at their expense.

If applicable, where identified on the drawings, and to ensure a safe separation distance is maintained, the Contractor shall install tree protection fencing at the projected limit of the excavation and beneath the drip line of the identified tree(s). The fencing shall be comprised of orange vinyl snow fencing secured at 3.00-metre intervals with iron T-posts driven 600mm into the ground and should be in place until construction work is completed. During construction, no equipment, materials, or tools shall be stored beyond the tree protection fencing.

III. UTILITIES

The Contractor will be responsible at all times for complete investigation to determine the location of all such utilities or structures known or unknown, and it shall indemnify and save harmless the Engineer and the Municipality for any responsibility, injury, or liability arising from any damage to such utilities or structures by the Contractor.

The Contractor shall protect all other services located in the vicinity of the proposed drainage works including any sanitary sewers and connections, watermains and connections, telephone and gas services, along with any private systems and services. Any damaged components shall be replaced by the Contractor, totally at its own expense and it shall fully restore the functionality of same.

The Contractor shall further contact or notify such Utility Company or Commission of its intention to carry out work in the area and cooperate with such Utility Company or Commission in the location, maintenance and preservation of all such utilities. The location of the pipes and appurtenances as shown on the drawings is approximate and may be changed by the Engineer if deemed advantageous for the progress of the work.

IV. NOTICE OF PROJECT COMMENCEMENT AND HOURS OF OPERATION

The Contractor shall provide a minimum of forty-eight (48) hours' notice to the Drainage Superintendent and/or the Consulting Engineer prior to the commencement of the work. The installation of the culvert structure is to be performed during normal working hours of the Drainage Superintendent and/or the Consulting Engineer from Monday to Friday unless written authorization is provided by them to amend such working hours.

V. EXCAVATIONS, REMOVALS AND DISPOSALS

All excavation shall be made in compliance with the drawings and in such a manner and at such depths and widths as will give ample room for installing the pipe, the bracing, sheeting, or otherwise supporting the sides of the excavation and for the pumping of groundwater if encountered. The Contractor is fully responsible for the safety of all its men and equipment and must conform completely with the provisions of the "Construction Safety Act" and "Regulations for Construction Projects".

Where an existing culvert is being replaced, the Contractor shall be required to excavate and completely remove the existing culvert and headwalls in their entirety, as well as any other deleterious materials that may be encountered in removing such materials, unless otherwise noted. All unsuitable or deleterious materials from the excavation and removal of existing culverts and the drain shall be hauled away and disposed of by the Contractor to a site to be obtained by it at its own expense. In all cases, the disposal of any trucked material with be the responsibility of the Contractor and it shall ensure that any permits required for fill disposal are obtained from the appropriate authority. The Contractor will be responsible for keeping all private and public roadways free and clear of mud and debris resulting from its use of same for access and hauling purposes.

The Contractor is to note that when replacing the existing structures, it shall be required to excavate a trench having a width not less than the new pipe outside diameter plus a 600mm working width on both sides of the new pipe.

During the course of its excavation operations, the Contractor will be required to salvage all available topsoil. Where necessary, this material shall be stockpiled by the Contractor in order to avoid contamination and shall be utilized in carrying out any topsoil placement along all specified or disturbed areas, in preparation for the seeding and mulching operation to be carried out as part of the restoration works.

The bottom of the trenches must be carefully excavated and trimmed to the elevation and shape of the bottom of the pipe. The bottom of the trenches shall be recessed to receive the pipe in order to allow the pipe to be uniformly supported for its entire length. Corrections in the depth of excavation caused by the Contractor excavating to an extent greater than that required for the elevation of the pipe shall be made by bedding the pipe with 20mm (3/4") clear stone granular material is placed at the time that the pipes are being installed, at the Contractors expense.

No extras will be allowed for excavating any hardpan, boulders, rocks, ice or other obstacles found in the excavation or in the line of the trench or for any pumping or baling of water required in the excavation of the work. The trench must be drained or pumped in order to avoid the necessity of making joints under water. The trench must also be drained to avoid any possibility of groundwater entering the pipe in the trench until the installation has been successfully completed.

VI. PIPE INSTALLATION

The new pipe shall be set in the alignment and to the grade elevations established in the accompanying drawings. The same shall not be altered unless otherwise directed by the Drainage Superintendent or Consulting Engineer prior to construction of same. Any changes relative to the culvert must be approved by the Consulting Engineer prior to proceeding with construction.

The Contractor shall lay the culvert pipe to the lines, levels, and grades as shown in the accompanying drawings or as may be laid out and established by the Engineer prior to the time of construction. The Contractor shall be held responsible for said lines, levels and grades of the pipe and should the Engineer determine that the Contractor has not satisfactorily adhered to such lines, levels and grades, it may direct the Contractor to take up and re-lay any portion of the drain which does not conform to such lines, levels and grades.

Laser control must be provided to maintain drain lines and grades, and the Contractor shall have a qualified Operator to set up and operate the equipment. In some instances, but only at the discretion of the Engineer, an approved system of batter boards may be utilized for this purpose; However, the cost of placing grade stakes and determining the cut information shall be provided by or paid for entirely by the Contractor.

The Contractor should note that, because the pipe is being installed with an excavator, it is expected that they will provide a minimum of 150mm (6") of either compacted MTO Granular "A", Granular "B" (Type II) or 20mm (3/4") clear stone bedding material, as outlined within OPSS Form 1010 The Contractor shall ensure that a good firm base is provided under the drain pipe, and they shall provide for this item as part of their tender price.

HDPE Pipe Installation

When HDPE plastic pipes are specified, they shall be joined together with the use of a water-tight bell and gasket joining system, secured in accordance with the Manufacturer's recommendations. The minimum length of a continuous pipe section shall be no less than 6.10 metres (20.00 ft.). The HDPE plastic pipe for this installation must be of the length, size, and strength identified in the Drawings, Special Provisions, and approved by the Drainage Superintendent and the Consulting Engineer prior to its placement in the drain.

For new smoothwall HDPE culvert pipes that are shown on the Drawings to have sloped quarried limestone erosion protection at their ends, both ends of the pipe shall be securely anchored against floatation utilizing two (2) steel T-bar fence posts having a minimum length of 1.80 metres (6.00 ft.) or approved equal, on each side of the pipe, together with heavy steel galvanized wire secured between them across the top of the pipe. The top of each post shall be set no higher than the top of the proposed culvert. Pipe anchors shall be installed in accordance with the "**Floatation Anchor Details**" outlined herein.

Aluminized Steel Pipe Installation

When Aluminized Steel Corrugated Hel-Cor pipe and/or Aluminized Steel Type II UltraFlo pipe is specified, the culvert shall be installed with a minimum number of couplers and longer pipe sections are to be utilized whenever possible. Under no circumstances shall the culvert sections be less than 4.00 metres in length. All pipe lengths shall be of the size and gauge noted in the drawings and shall be coupled together with Aluminized Steel Type II 10C having a thickness consistent with the culvert pipe material. The overall pipe for this installation must be of the length, size, and thickness as identified in the Drawings, Special Provisions, and approved by the Drainage Superintendent and/or the Consulting Engineer prior to its placement in the drain.

General Pipe Installation

The Contractor shall be required to provide all labour, equipment, and materials to set the pipe to the required design grades. Where couplers are required, the Contractor shall utilize the appropriate coupler provided by and per the specifications of the Manufacturer. The Contractor shall supply all material and labour to provide

a non-woven filter cloth wrap around the full circumference of the coupler joint connection, as part of their tender price. The filter cloth wrap connection shall be a minimum of 250mm (10") wider than the width of the proposed coupler and shall overlap a minimum of 200mm (8"), as available from Underground Specialties Inc., of Windsor, Ontario, or equal. The specific type to be utilized shall be approved by the Drainage Superintendent and/or the Consulting Engineer prior to its placement. The installation of all joints must be inspected and approved by the Drainage Superintendent or Consulting Engineer prior to any backfilling of same.

The Contractor shall also note that the placement of the culvert is to be performed totally in the dry, and it shall be prepared to take whatever steps are necessary to ensure same, all to the satisfaction of the Drainage Superintendent and/or Consulting Engineer. The installation of the complete length of pipe, including all appurtenances, shall be completely inspected by the Drainage Superintendent and/or the Consulting Engineer's Inspector prior to backfilling any portions of same. Under no circumstance shall the Contractor commence the construction or backfill of the pipe without the site presence of the Drainage Superintendent and/or the Consulting Engineer's Inspector to inspect and approve said installation.

All pipe materials shall be stored and handled by the Contractor at its own expense. It shall be responsible for the safe storage of all materials, for obtaining storage areas, for the safe transportation and distribution of all the materials at the job site, and for inspection in order to determine defects and breakage. No additional recompense will be allowed to the Contractor for any loss incurred by it in the storage and handling of the materials.

Pipe, fittings, and all accessory appurtenances must be loaded and unloaded by lifting with means of a hoist or a skid to avoid shock or damage. Under no circumstances shall any drain material or materials for drain appurtenances be dropped.

If the culvert is laid in freezing weather, the Contractor shall take all the necessary precautions to prevent damage to the pipe or to any of the materials used in the construction of the work. In addition, the Contractor shall take care that no frozen ground or backfill is placed in the trench backfilling adjacent to the culvert. All pipe and the various other materials used in the placing of said pipe shall be installed in strict compliance with the Manufacturer's recommendations.

The installation of the complete length of the new culvert pipe, including all appurtenances, shall be completely inspected by the Drainage Superintendent and/or the Consulting Engineer's Inspector prior to backfilling any portions of same. Under no circumstance shall the Contractor commence the construction or backfill of the culvert pipe without the site presence of the Drainage Superintendent and/or the Consulting Engineer's Inspector to inspect and approve the said installation.

VII. DRAINAGE STRUCTURE INSTALLATION

Where required, all materials for the catch basins shall comply with Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD) with respect to materials, qualities, and installation details. The catch basins and maintenance holes shall be founded on a good, dry, firm, undisturbed earth base for its entire bottom surface area, or 20mm (3/4") clear stone bedding, if necessary. Corrections in depth of excavation caused by the Contractor excavating to an extent greater than that required for the structures shall be backfilled to the proper grade elevation by embedding the catch basin maintenance holes floor area with

20mm (3/4") clear stone granular bedding. A sump is to be provided in each structure which shall be a minimum of 450mm deep measured from the proposed invert of the covered drain or connection to the proposed concrete floor elevation of the structure. The structure shall be set to allow for connection of all of the inlet and outlet pipes and shall be installed as shown and detailed on the Drawings. The top elevation of the structure shall be installed to the elevations noted on the Drawings or as further directed by the Drainage Superintendent or the Consulting Engineer. All structure sections and adjustment units shall be joined together with standard gasket material, caulking, or grout as required by the Manufacturer, or as set out in the applicable OPSS and OPSD.

All structures, where applicable, shall include a minimum of two (2) adjustment units in accordance with OPSD 704.011. All work shall be completed as shown and detailed on the Drawings.

The Contractor shall connect all covered drains and connections in the catch basin maintenance holes with the use of a mortar joint or standard rubber boot cast into the units by the Manufacturer. Said mortar joint shall be provided at the internal and exterior of the catch basin maintenance holes wall for the full circumference of the covered drain and be of a sufficient mass to produce a sealed joint, all to be performed to the satisfaction of the Drainage Superintendent or the Consulting Engineer. Where possible, the Contractor shall employ a standard factory fitting or adapter to connect between the various pipes, tiles, and catch basin maintenance holes, otherwise a mortar joint connection can be utilized.

VIII. CULVERT BACKFILL

Where the new culvert pipe is located under the driveway, the Contractor shall backfill the entire trench for the width of the driveway with Granular "B"(Type II) or Granular "A", or locally approved equivalent compacted in place to a minimum 98% of Standard Proctor Density with the exception of the top 300mm which should be backfilled with Granular "A" material also compacted in place to a Standard Proctor Density of 100%. Where the new culvert pipe is located along the lawn area, the Contractor shall be required to backfill the entire trench with good clean native backfill material with the exception of the top 100mm which shall be good clean black loamy topsoil readied for seeding and mulching. It should be noted that if there is a shortage of native backfill material available, the Contractor shall supply same all at its own expense. The Contractor should also note that prior to commencing its excavation that all existing topsoil should be scavenged for reuse on the project; if there is a shortage, the Contractor shall be required to supply the balance of the topsoil needed, all at its own expense. All of the native backfill material shall be compacted in place to a minimum Standard Proctor Density of 96%.

All backfill material shall be placed in compacted in maximum lifts of approximately 300mm thick. The Contractor is required to provide whatever mechanical equipment necessary, such as jumping jack and/or plate tamper, in order to achieve the necessary compaction levels, especially along the haunches of the new pipe. All areas shall be graded in accordance with the profile and cross-sections shown in the accompanying drawings, including provision of cross-fall on boulevard areas as shown and detailed in accordance with the **"Typical Driveway Crossing Backfill Detail**" outlined herein.

IX. BRIDGE END PROTECTION

Sloped Quarried Limestone Erosion Protection

When specified, the Contractor shall install sloped quarried limestone end protection at both ends of the pipe, or where shown, on a slope no steeper than 1.50 horizontal to 1.00 vertical and shall extend from the end of the new pipe to the top elevation shown. The top 305mm (12") of backfill material over the ends of the pipe, from the invert of said pipe to the top of the driveway elevation of the culvert, shall be quarried limestone. The quarried limestone to be placed on the sloped ends of the culvert shall be underlain with a synthetic non-woven geotextile filter fabric. The sloped quarried limestone protection is to be rounded as shown on the plan details and shall also extend along the drain side slopes to a point directly in line with the ends of the culvert pipe. All work shall be completed to the satisfaction of the Drainage Superintendent and/or the Consulting Engineer.

The quarried limestone shall be provided as shown and detailed and shall vary in size from a minimum of 100mm (4") to a maximum of 250mm (10"). The quarried limestone pieces shall be carefully tamped into place with the use of a shovel bucket so that, when complete, the quarried limestone erosion protection shall be consistent, uniform, and tightly laid in place. Prior to placing the quarried limestone, the Contractor shall place non-woven geotextile filter fabric "MacTex MX140" conforming to OPSS 1860 Class 1 or approved equal, as an underlay underneath all areas to be covered in quarried limestone erosion protection. The Contractor shall take extreme care not to damage the geotextile filter fabric when placing the quarried limestone. The placement of the geotextile filter fabric and the quarried limestone, and the completion of the quarried limestone erosion protection shall be conducted to the satisfaction of the Drainage Superintendent and/or Consulting Engineer. Sloped quarried limestone erosion protection shall be installed in accordance with the "**Typical Quarried Limestone End Protection Detail"** outlined herein.

Precast Interlocking Concrete Block Headwalls

When precast interlocking concrete block headwalls are specified, the concrete blocks shall be rectangular in shape with square corners and be a minimum size of 600mm x 600mm x 1200mm (2' x 2' x 4'), as available from Underground Specialties Inc./Wolseley Inc. (Canada) or approved equal. Blocks with modified lengths may be utilized to fill in staggered sections of the block wall. All blocks shall be cast in one pour with no cold joints and shall have a minimum compression strength of 20MPa at 28 days. All precast concrete blocks shall be formed with interlocking pockets and tenons and each block shall be assembled in a staggered formation to prevent sliding at the interface between blocks. All precast concrete blocks shall be uniform in size with relatively smooth and consistent joints and shall have a stone exterior finish. Each block shall be fitted with a lifting ring that will not interfere with the assembly of the block wall once they are set in place. Cap blocks shall be utilized on the top course of the wall with the top of the cap blocks having a stone exterior finish. The precast interlocking concrete block headwalls are available from Underground Specialties Inc./Wolseley Inc. (Canada) or approved equal.

Precast interlocking blocks that abut the pipe shall be cast as one solid piece and shall be cut and shaped to fit closely around the perimeter of the pipe. The face of the wall shall not extend beyond the end of the pipe. All minor gaps between the blocks and the pipe shall be sealed with no shrink grout for the full depth of the blocks. At the base of the wall, a base block shall be used at the bottom of the interlocking block wall. The base block shall be founded on a firm solid base. When necessary, the Contractor shall provide a minimum of 200mm thickness of level compacted granular bedding, or a lean concrete footing, as a firm foundation for the blocks. The base block shall be set level and shall convey a vertical projection throughout its full height and shall include

filter cloth behind the wall for the full height of the blocks to prevent soil migration through any joints. Filter cloth fabric shall be non-woven geotextile material and be minimum "MacTex MX140"meeting OPSS Class I. Both headwalls shall be assembled concurrently with a continuous uni-axial geogrid SG350, or equal, installed across the entire structure at every second course of blocks, to tie each headwall to the other. In the event that the distance between headwalls exceeds 10.00 metres (32.81 ft.), the Contractor shall install the uni-axial geogrid for a distance of 3.00 metres (9.84 ft.) inward from each headwall and at every second course. Both the non-woven filter cloth and the uni-axial geogrid are available from Armtec Construction Products or approved equal.

The blocks shall extend up from the pipe invert and cross the full width of the drain and be embedded a minimum of 500mm into the drain banks. Where required for the top of the block wall to match the height of the completed driveway, the Contractor shall embed the bottom course of blocks into the drain bottom at the appropriate depth to achieve the required top elevation of the wall.

The Contractor shall arrange for the Supplier to provide interlocking block layout drawings outlining block assembly of the proposed headwall to the Consulting Engineer for approval prior to proceeding with fabrication and assembly of same. The Contractor shall arrange with the Supplier for technical assistance with the assembly of the structure on-site in full accordance with the requirements of the Supplier. All assembly installation shall be carried out to avoid any damage to the pipe and shall follow the Supplier's recommendation in every respect to ensure a proper and safe installation.

The precast interlocking concrete block headwalls shall be installed vertically and shall extend from the end of the new pipe to the top elevation of the driveway. Under no circumstances shall the interlocking block wall be installed with an outward projection. When complete, the outside face of the headwall shall be installed flush with the end of the proposed culvert. The precast interlocking concrete block headwall shall be installed perpendicular to the drain banks. Headwalls are to be installed so that daylighting is provided off the travelled roadway if required. The daylighting is to be designed to deflect outwardly from approximately the extreme roadside face of the new culvert to a point just beyond the top bank of the drain. The outward projection of the new headwalls shall be deflected at approximately a 45-degree angle, and the maximum outward deflection shall not be greater than shown on the accompanying Drawings, parallel to the projection of the straight portion of the finished wall. The straight portion of the precast interlocking concrete block headwall shall be installed perpendicular to the drain banks. The Contractor shall also be required to backfill the area behind the new headwall with granular fill.

The Contractor shall also be required to satisfactorily backfill the area in behind the new headwall with granular fill as already specified in the preceding paragraphs for backfilling of the bridge culvert. The top elevation of the headwalls, opposite the travelled roadway, are to be set no less than 75mm (3"), below the existing ground elevation unless shown on the drawings. The alignment of these headwalls shall be performed to the satisfaction of the Drainage Superintendent or the Consulting Engineer. Block Headwalls shall be installed in accordance with the **"Precast Interlocking Concrete Block Headwall End Protection Details"** outlined herein.

Upon completion of the headwall installation, the Contractor shall also provide sloped quarried limestone erosion protection adjacent and along all of the new concrete headwalls, at the general locations and to the widths shown within the details included therein. Furthermore, the installation of the quarried limestone shall adhere to the parameters outlined in **Section IX. Sloped Quarried Limestone Erosion Protection – Concrete Block Headwalls.**

Concrete-Filled Jutebag Headwalls

When specified, the Contractor shall install new concrete jute bag headwalls at the locations and parameters indicated on the drawing. When constructing the concrete jute bag headwalls, the Contractor shall place the bags so that the completed headwall will have an inward batter from the bottom of the pipe to the top of the finished headwall. The slope of the headwall shall be one (1) unit horizontal to five (5) units vertical. The Contractor shall satisfactorily backfill behind the jutebag headwalls with granular material similar to the rest of the structure, and the same compaction levels specified herein for backfilling the adjacent culvert. 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 305mm (12") in thickness.

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 21MPa in 28 days and shall be provided and placed only as a wet mix. Under no circumstance 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 (18") x 660mm (26"). The jute bags shall be filled with concrete so that when they are laid flat, they will be approximately 100mm (4") thick, 305mm (12") to 380mm (15") wide and 460mm (18") long. The completed jute bag headwalls shall be securely embedded a minimum of 500mm (20") measured perpendicular to the side slopes of the drain.

If indicated on the Drawings, daylighting may be installed off the travelled roadway, and the same are designed to deflect outwardly. The outward deflection shall be deflected at the specified angle to the straight portion of the finished headwall. The top elevations of the daylighted headwalls are to be set no less than 75mm (3″) below the existing ground elevation unless otherwise designed. The alignment of these headwalls shall be performed to the satisfaction of the Drainage Superintendent or Consulting Engineer.

Upon completion of the jute bag headwall the Contractor shall cap the top row of concrete-filled bags with a layer of plain concrete, minimum 150mm (6″) thick, and hand trowelled to obtain a brushed finish appearance. If the cap is made more than 150mm thick, the Contractor shall provide two (2) continuous 15M reinforcing bars (or equivalent mesh) set at mid-depth and equally spaced in the cap. 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. All concrete used for the footing, cap and bags shall have a minimum compressive strength of 21MPa in 28 days and include 6% ± 1% air entrainment. Concrete-filled jute bag headwalls shall be installed in accordance with the **"Typical Concrete Filled Jute Bag Headwall End Protection Details"** outlined herein.

X. SLOPED QUARRIED LIMESTONE EROSION PROTECTION FOR VERTICAL HEADWALLS

The sloped quarried limestone erosion protection shall be embedded into the side slopes of the drain at a minimum thickness of 305mm and shall be underlain in all cases with a synthetic filter mat. The filter mat shall not only be laid along the flat portion of the erosion protection but also contoured to the exterior limits of the quarried limestone and the unprotected slope. The width and slope of the general erosion protection shall be as established in the accompanying drawing or as otherwise directed by the Drainage Superintendent and/or the Consulting Engineer during construction. In placing the erosion protection, the Contractor shall carefully tamp the quarried limestone pieces into place with the use of a shovel bucket so that the erosion protection when completed will be consistent, uniform and tightly laid. In no instance shall the quarried limestone protrude beyond the exterior contour of the unprotected drain side slopes along

either side of said protection. The synthetic filter mat to be used shall be **non-woven** geotextile MacTex MX140 conforming to OPSS 1860 Class I, as available from Armtec Construction Products, or approved equal. The quarried limestone to be used shall be graded in size from a minimum of 100mm (4") to a maximum of 250mm (10"), and is available from Walker Aggregates, in Amherstburg, Ontario, or approved equal. Sloped quarried limestone erosion protection shall be installed in accordance with the "**Typical Quarried Limestone End Protection Detail"** outlined herein.

XI. ANCILLARY WORK

During the course of any repair or improvements, the Contractor will be required to protect or extend any existing tile ends or swales to maintain the drainage from the adjacent lands. All existing tiles within the proposed alignment shall be extended utilizing Boss 1000 or equal plastic pipe of the same diameter as the existing tile and shall be installed in accordance with the **"Standard Lateral Tile Detail"** outlined herein unless otherwise noted. Connections shall be made using a Manufacturer's coupling wherever possible. Openings into new pipes shall be neatly saw-cut to the satisfaction of the Drainage Superintendent and/or the Consulting Engineer. For other connections, the Contractor shall utilize a grouted connection. Grouted mortar joints shall be composed of three (3) parts of clean, sharp sand to one (1) part of Portland Cement with just sufficient water added to provide a stiff plastic mix. The mortar joint shall be of sufficient mass around the full circumference of the joint on the exterior side to ensure a tight, solid seal. The Contractor is to note that any intercepted pipes along the length of the existing pipes are to be extended and diverted to the downstream end of the new pipe unless otherwise noted in the accompanying drawings.

Where the culvert installation interferes with the discharge of an existing swale, the Contractor shall re-grade the existing swales to allow for the surface flows to freely enter the drain. Any disturbed grass areas shall be fully restored with topsoil, seed and mulch. The Contractor shall also be required as part of the culvert replacement to excavate and widen the drain bottom where required to fit the new pipes in order to provide a smooth transition between the new culvert installation and the existing drain.

The Contractor, when doing their excavation or any other portion of the work, shall be very careful not to interfere with, plug up or damage, any existing surface drains, swales and lateral or main tile ends. If it is found that said existing drains are interfered with in any way, the Contractor will be required to unplug or repair said drains immediately, at no extra cost to the project. If it is found that any existing lateral tiles or main tile drains or tile ends have been cut off or damaged in any way during the course of the work, the Contractor will be required to either repair or replace same, to the satisfaction of the Drainage Superintendent and the Consulting Engineer.

The Contractor shall take steps to protect all legal survey bars during the course of its work. If any bars are removed or damaged, the Contractor shall arrange for an Ontario Land Surveyor licensed in the Province of Ontario to replace same, all at its cost.

All of the work required towards the installation and improvements to all structures shall be performed in a neat and workmanlike manner and the general site shall be restored to its' original condition, and all of same is to be performed to the satisfaction of the Drainage Superintendent and the Consulting Engineer.

XII. TOPSOIL, SEED AND MULCH

During the course of its excavation operations, the Contractor will be required to salvage all available topsoil. Where necessary, this material shall be stockpiled by the Contractor in order to avoid contamination and shall be utilized in carrying out the topsoil placement along all specified newly excavated and filled or disturbed areas, in preparation for the seeding and mulching operation to be carried out as part of the restoration works. The Contractor shall be required to use the scavenged topsoil stripped from the drain banks. The balance of the topsoil required shall be obtained by the Contractor at its own expense.

The Contractor shall be required to restore all existing grassed areas and drain side slopes damaged or disturbed by the structure installation and/or removal, and place topsoil and seed and mulch over said areas including any specific areas noted on the Drawings. The Contractor shall be required to provide all the material and to cover the above-mentioned surface areas with approximately 50mm of good, clean, dry topsoil on slopes and 100mm of good, clean, dry topsoil on horizontal surfaces, fine graded and spread in place ready for seeding and mulching. The Contractor is to note that prior to fine grading the topsoil over the backfilled areas, positive drainage is to be provided off of these areas and into the swales, and the Contractor shall also be required to make minor changes where necessary to ensure same. The Contractor shall be required to restore all existing grassed areas and roadway boulevard areas damaged by the culvert work and shall provide topsoil and seed and mulch over all of these areas. The placing and grading of all topsoil shall be carefully carried out according to Ontario Provincial Standard Specifications, Form 802, dated November 2010, or as subsequently amended or as amended by these Specifications. Once the topsoil has been properly placed and fine-graded, the Contractor shall seed and mulch the area. Seeding and mulching operations shall be carried out according to Ontario Provincial Standard Specifications, Form 572, dated November 2003, or as subsequently amended or as amended by these Specifications. The seeding mixture shall be OSECO Seed Mixture Canada No. 1, as available from Morse Growers Supply in Leamington, or equal. As part of the seeding and mulching operation, the Contractor will be required to provide either a hydraulic mulch mix or a spread straw mulch with an adhesive binder in accordance with OPSS 1103.05.03 dated November 2016, or as subsequently amended, to ensure that the grass seed will be protected during germination and provide a thick, uniform cover to protect against erosion, where necessary. All work shall be completed to the satisfaction of the Drainage Superintendent or the Consulting Engineer.

All of the work relative to the placement of topsoil and the seeding and mulching operation shall be meticulously done and completed in a good and workmanlike manner all to the satisfaction of the Drainage Superintendent or Consulting Engineer.

XIII. FINAL CLEANUP AND RESTORATION

The whole of the work shall be satisfactorily cleaned up, and during the course of the construction, no portion shall be left in any untidy or incomplete state before subsequent portions are undertaken.

All roadways, driveways and access bridges, or any other means of access onto the job site shall be fully restored to their former condition at the Contractor's expense. Before authorizing Final Payment, the Drainage Superintendent or the Consulting Engineer shall inspect the work in order to be sure that the proper restoration has been performed. In the event that the Contractor fails to satisfactorily clean up any

portion of these accesses, the Consulting Engineer shall order such cleanup to be carried out by others and the cost of same to be deducted from any monies owing to the Contractor.

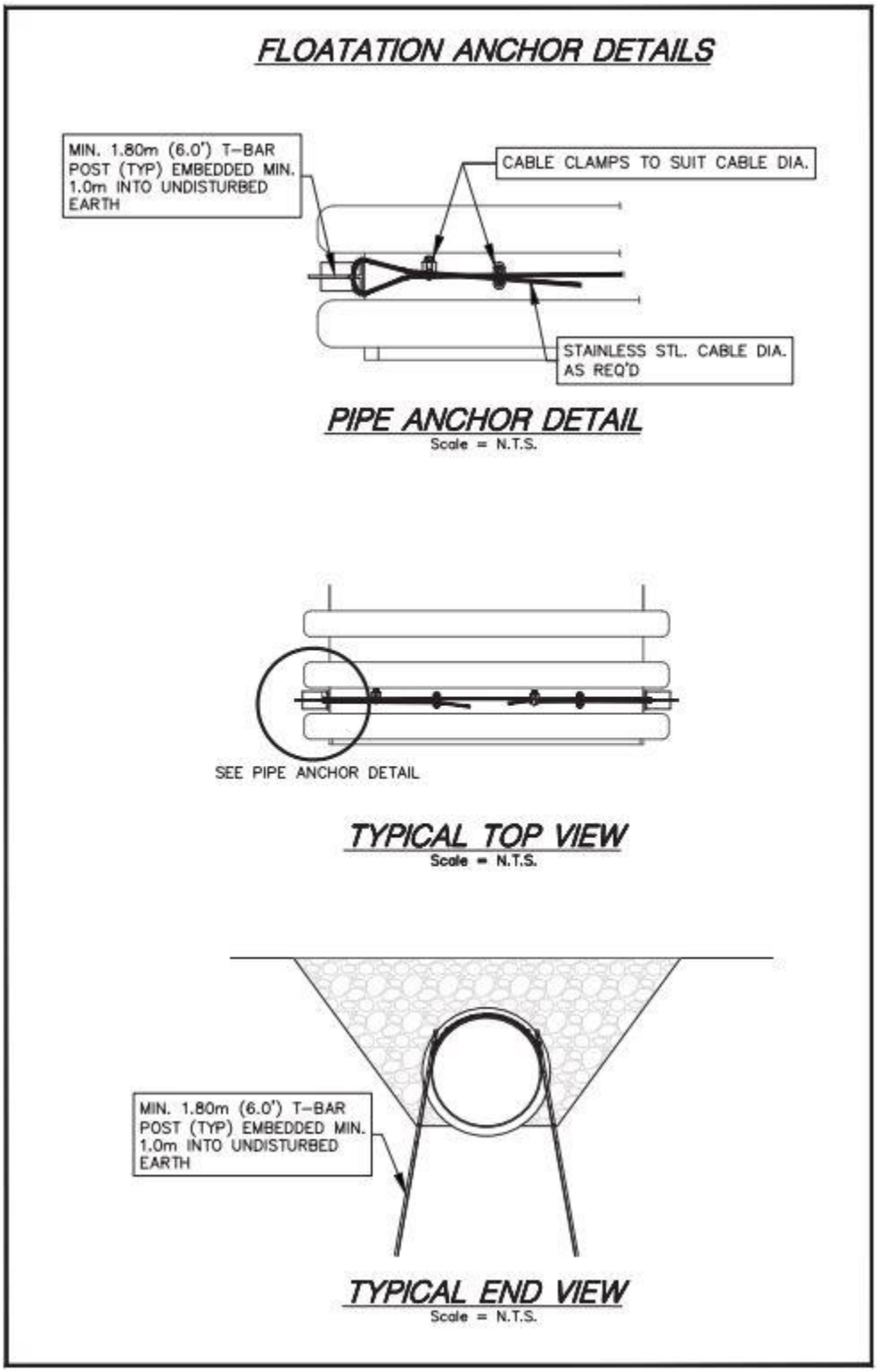

Figure 1 - Flotation Anchor Details

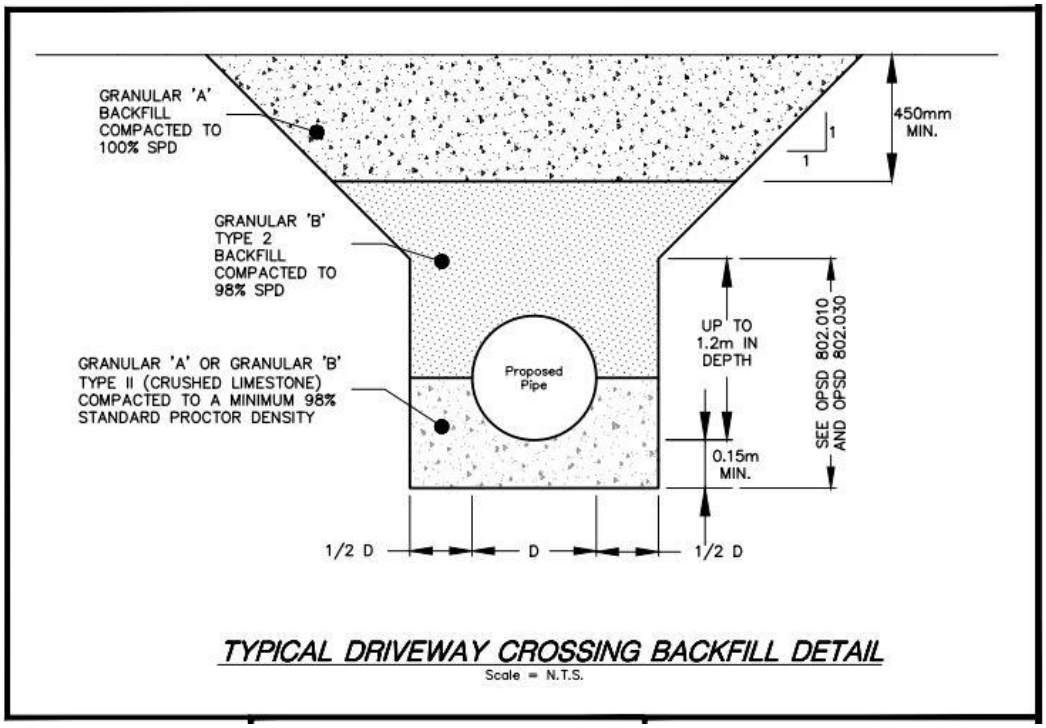

Figure 2- Typical Driveway Crossing Backfill Detail

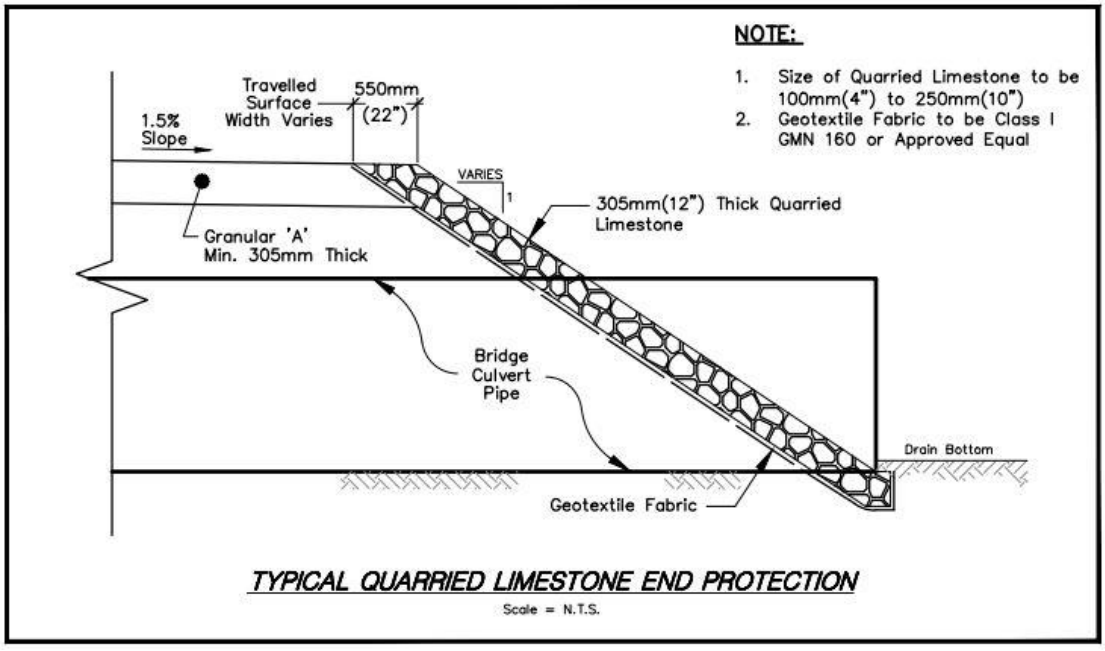

Figure 3 - Typical Quarried Limestone End Protection Detail

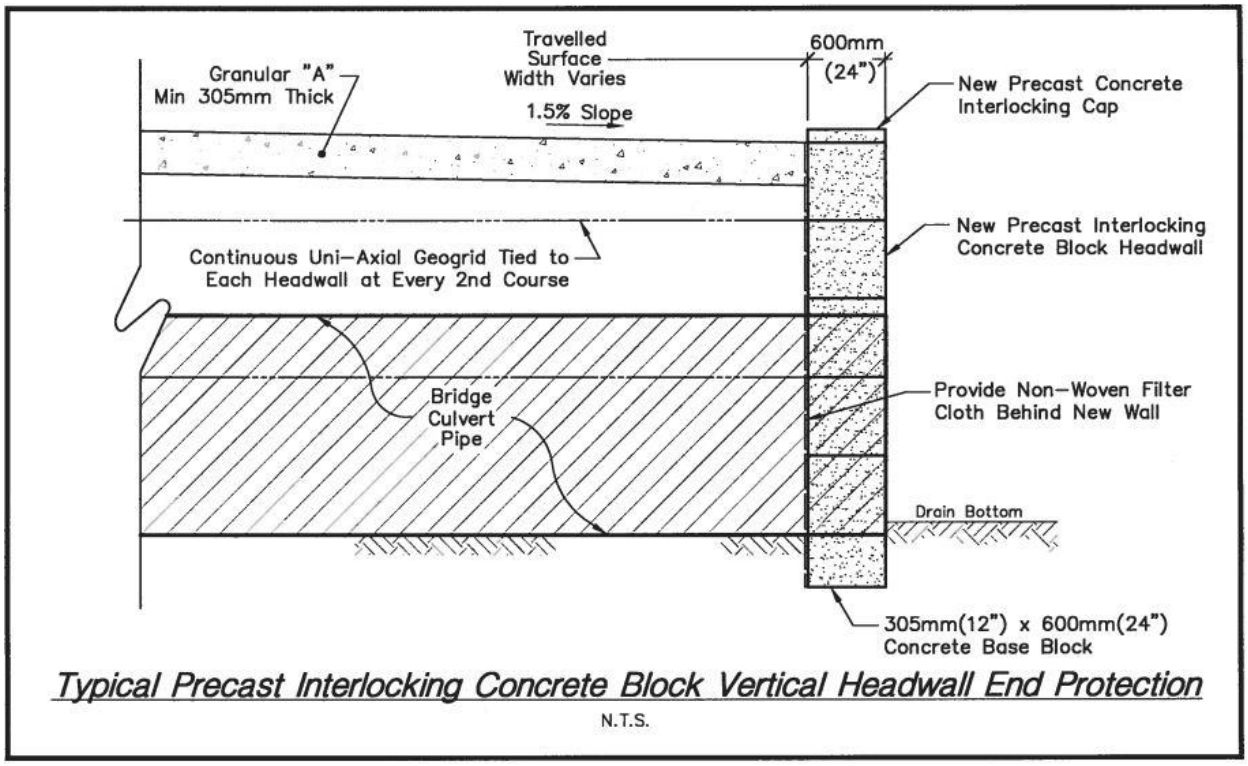

Figure 5 - Typical Precast Interlocking Concrete Block Vertical Headwall End Protection Detail

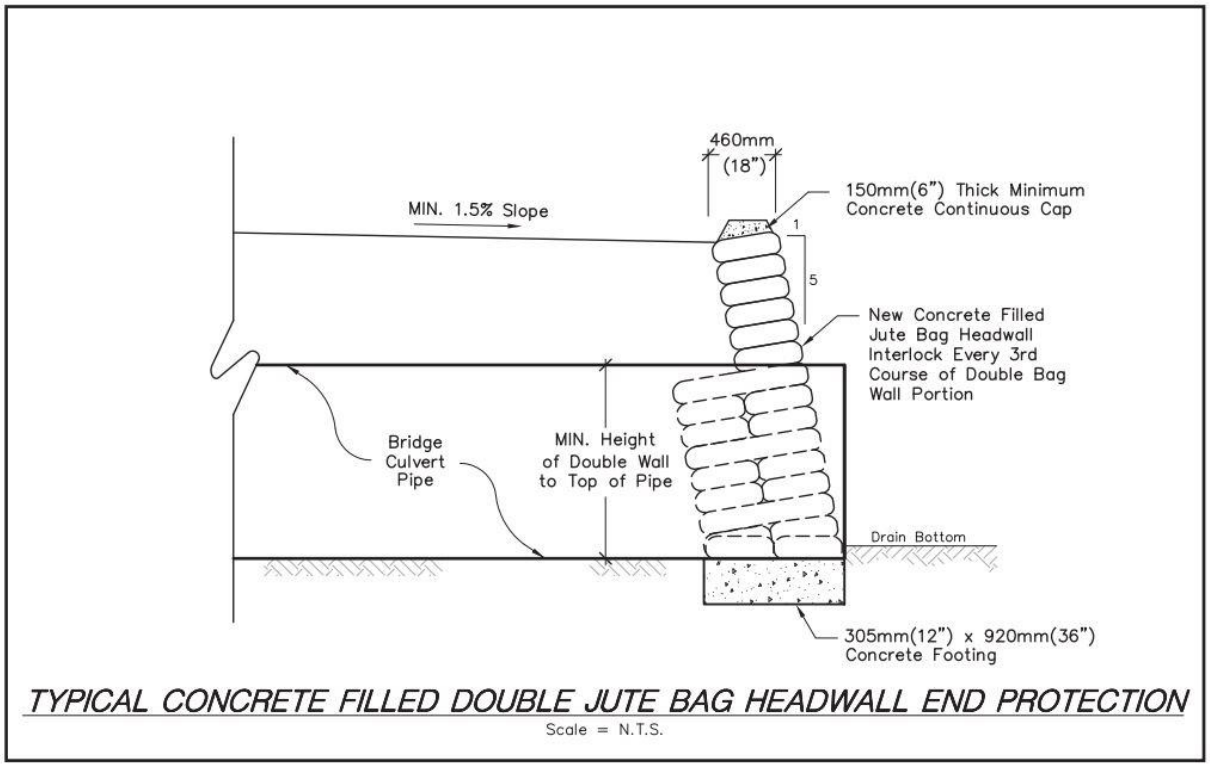

Figure 4 - Typical Concrete Filled Double Jute Bag Headwall End Protection Detail

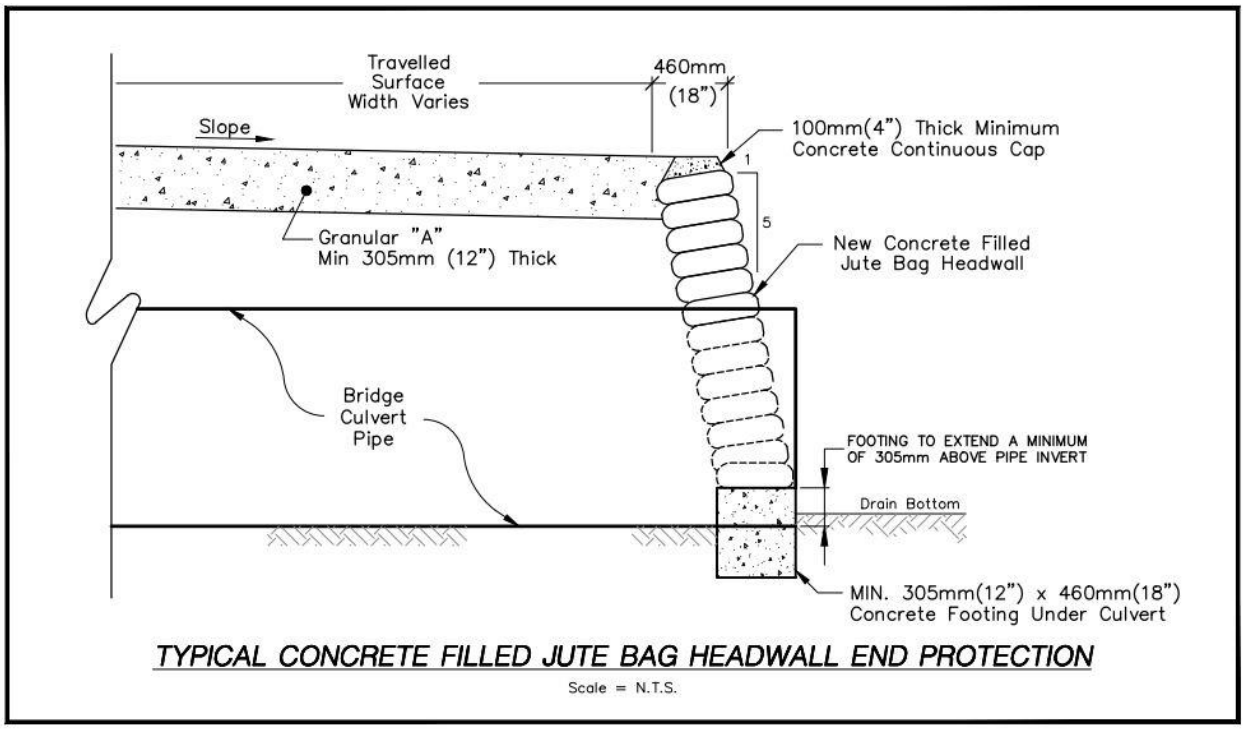

Figure 6 - Typical Concrete Filled Jute Bag Headwall End Protection Detail

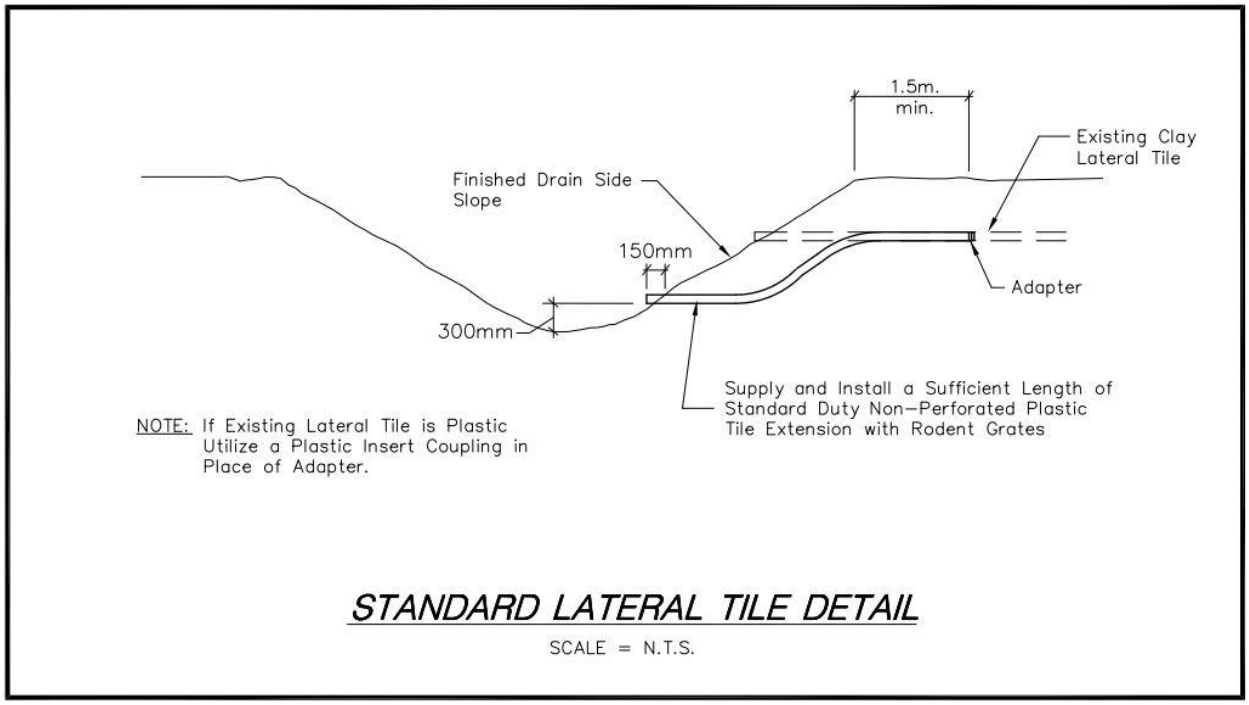

Figure 7 - Standard Lateral Tile Detail

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Peralta Engineering

STANDARD SPECIFICATIONS

FOR ENCLOSURE/COVERED DRAIN INSTALLATIONS

(Revised January 2024)

TABLE OF CONTENTS

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I. GENERAL INFORMATION FOR SPECIFICATIONS

These specifications, together with the accompanying drawings and appendices, delineate the furnishing of all labour, equipment, materials and supplies required for the performance of all operations relating to the construction and/or improvements of a Municipal Drain under the most recent revision of the Drainage Act and/or amendments made thereto. These specifications serve to supplement and/or amend the current Ontario Provincial Standard Specifications and Standard Drawings, adopted by the Ontario Municipal Engineers Association. "Special Provisions" are included as part of the overall document and shall be read in conjunction with these standard specifications. Where a discrepancy occurs between the requirements of the Standard Specifications and the Special Provisions, the Special Provisions shall govern. In the event that the Specifications, Information to Tenderers, or the Form of Agreement do not apply to a specific condition or circumstance with respect to this project, the applicable section or sections from the Canadian Construction Documents Committee (CCDC) shall govern and be used to establish the requirements of the work.

Any reference to "Drainage Superintendent" and/or "Consulting Engineer" within this document shall refer to the person (or persons) appointed by the Council of the Municipality having jurisdiction over the drainage works

All work shall be done in a first-class and workmanlike manner, complete in all respects and including all items specified herein, or as necessary for the accomplishment of a complete, satisfactory, and approved installation.

II. TRAFFIC CONTROL

The Contractor shall ensure that the travelling public is always protected while utilizing the roadway for its access. The Contractor shall be required to carry out all the necessary steps to direct traffic and provide temporary diversion of traffic around work sites, including the provision of all lights, signs, flag persons, and barricades required to protect the safety of the travelling public. The Contractor shall be required to submit a Traffic Control Plan to the Consulting Engineer for approval from the governing Road Authorities. The Traffic Control Plan shall be carried out in accordance with the requirements of the Ontario Traffic Manual's Book 7 for Temporary Conditions. Should the Contractor have to close the road for the proposed works, it shall arrange to obtain the necessary authorizations from the Municipality and County Roads Departments (if applicable) and distribute notification of detours around the site. The Contractor shall also ensure that all emergency services, school bus companies, etc. are contacted about the disruption to access at least 48 hours in advance of same. All detour routes shall be established in consultation with the Municipality and County Roads Department.

Due to the extent of the work and the area for carrying out the work, the Contractor shall be required to carry out all of the necessary steps to direct traffic and provide temporary diversion of traffic around work sites, including the provision of all lights, signs, flag persons, and barricades required to protect the safety of the travelling public. Any accesses or areas used in carrying out the works are to be fully restored to their original conditions by the Contractor, including topsoil placement and lawn restoration as directed by the Drainage Superintendent and/or the Consulting Engineer. Restoration shall include but not be limited to all necessary levelling, grading, shaping, topsoil, seeding and mulching, and granular placement required to make good any damage caused.

The Contractor shall note that any deviation from the specified access for the construction of the enclosure/covered drain without the explicit approval of the adjacent landowners and the Drainage Superintendent could result in the Contractor being liable for damages sustained. The value for such damage shall be determined by the Drainage Superintendent and the Consulting Engineer and be subsequently deducted from the Contract Price. Where applicable, the Contractor shall be responsible for any damage caused by them to any portion of the road right-of-way. They shall take whatever precautions are necessary to avoid damage to the roadway. Any damage to the roadway must be restored to its' original condition upon completion of the works.

III. REMOVAL OF BRUSH, TREES AND DEBRIS

Where there is any brush, trees or debris along the course of the drainage works, including the full width of the access, all such brush, trees or debris shall be close-cut and grubbed out, and the whole shall be chipped up for recycling, burned, hauled away or satisfactorily disposed of by the Contractor at its expense. Prior to and during the course of the 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. The Contractor will be required to notify the local fire authorities and cooperate with them in the carrying out of any work. The removal of brush and trees shall be carried out in close consultation with the Drainage Superintendent or Consulting Engineer to ensure that no decorative trees or shrubs are disturbed by the operations of the Contractor that can be saved. It is the intent of this project to save as many trees and bushes as practical within the roadway allowances and on private lands.

The Contractor shall protect all other trees, bushes, and shrubs located along the length of the drainage works except for those trees that are established within the accompanying drawings or in consultation with the Drainage Superintendent, the Consulting Engineer, and the affected Owner(s). The Contractor shall note that protecting and saving the trees may require the Contractor to carry out handwork around the trees, bushes, and shrubs to complete the necessary final site grading and restoration.

Following the completion of the work, the Contractor is to trim up any broken or damaged limbs on trees which are to remain to stand, and it shall dispose of said branches along with other brush, thus leaving the trees in a neat and tidy condition.

The Contractor shall remove all deleterious materials and debris along the course of the open drain and any such materials located in the bridge culverts while carrying out its cleaning of same. All such deleterious

materials and debris shall be loaded up and hauled away by the Contractor to a site to be obtained by it at their expense.

If applicable, where identified on the drawings, and to ensure a safe separation distance is maintained, the Contractor shall install tree protection fencing at the projected limit of the excavation and beneath the drip line of the identified tree(s). The fencing shall be comprised of orange vinyl snow fencing secured at 3.00-metre intervals with iron T-posts driven 600mm into the ground and should be in place until construction work is completed. During construction, no equipment, materials or tools shall be stored beyond the tree protection fencing.

IV. FENCING AND/OR STRUCTURES

Where it is necessary to take down any fence and/or structure to proceed with the work, same shall be done by the Contractor across or along that portion of the work where such fence and/or structure is located. The Contractor shall be required to exercise extreme care in the removal of any fencing and/or structure, to ensure minimum damage to same. The Contractor shall be required to replace any fence and/or structure that is taken down in order to proceed with the work, and the fence and/or structure shall be replaced in a neat and workmanlike manner. The Contractor shall not be required to procure any new materials for rebuilding the fence and/or structure provided that it has used reasonable care in the removal and replacing of same. When any fence and/or structure is removed by the Contractor, and the Owner thereof deems it advisable and procures new material for replacing the fence and/or structure so removed, the Contractor shall replace the fence and/or structure using new materials and the materials from the present fence and/or structure shall remain the property of the Owner.

V. UTILITIES

The Contractor will be responsible at all times for complete investigation to determine the location of all such utilities or structures known or unknown, and it shall indemnify and save harmless the Engineer and the Municipality for any responsibility, injury, or liability arising from any damage to such utilities or structures by the Contractor.

The Contractor shall protect all other services located in the vicinity of the proposed drainage works including any sanitary sewers and connections, watermains and connections, telephone and gas services, along with any private systems and services. Any damaged components shall be replaced by the Contractor, totally at its own expense and it shall fully restore the functionality of same.

The Contractor shall further contact or notify such Utility Company or Commission of its intention to carry out work in the area and cooperate with such Utility Company or Commission in the location, maintenance and preservation of all such utilities. The location of the pipes and appurtenances as shown on the drawings is approximate and may be changed by the Engineer if deemed advantageous for the progress of the work.

VI. NOTICE OF PROJECT COMMENCEMENT AND HOURS OF OPERATION

The Contractor shall provide a minimum of forty-eight (48) hours' notice to the Drainage Superintendent and/or the Consulting Engineer prior to the commencement of the work. The installation of the culvert structure is to be performed during normal working hours of the Drainage Superintendent and/or the Consulting Engineer from Monday to Friday unless written authorization is provided by them to amend such working hours.

VII. EXCAVATIONS, REMOVALS AND DISPOSALS

All excavation shall be made in compliance with the drawings and in such a manner and at such depths and widths as will give ample room for installing the pipe, the bracing, sheeting, or otherwise supporting the sides of the excavation and for the pumping of groundwater if encountered. The Contractor is fully responsible for the safety of all its men and equipment and must conform completely with the provisions of the "Construction Safety Act" and "Regulations for Construction Projects".

Where an existing culvert is being replaced, the Contractor shall be required to excavate and completely remove the existing culvert and headwalls in their entirety, as well as any other deleterious materials that may be encountered in removing such materials, unless otherwise noted. All unsuitable or deleterious materials from the excavation and removal of existing culverts and the drain shall be hauled away and disposed of by the Contractor to a site to be obtained by it at its own expense. In all cases, the disposal of any trucked material with be the responsibility of the Contractor and it shall ensure that any permits required for fill disposal are obtained from the appropriate authority. The Contractor will be responsible for keeping all private and public roadways free and clear of mud and debris resulting from its use of same for access and hauling purposes.

The Contractor is to note that when replacing the existing structures, it shall be required to excavate a trench having a width not less than the new pipe outside diameter plus a 600mm working width on both sides of the new pipe.

During the course of its excavation operations, the Contractor will be required to salvage all available topsoil. Where necessary, this material shall be stockpiled by the Contractor in order to avoid contamination and shall be utilized in carrying out any topsoil placement along all specified or disturbed areas, in preparation for the seeding and mulching operation to be carried out as part of the restoration works.

The bottom of the trenches must be carefully excavated and trimmed to the elevation and shape of the bottom of the pipe. The bottom of the trenches shall be recessed to receive the pipe in order to allow the pipe to be uniformly supported for its entire length. Corrections in the depth of excavation caused by the Contractor excavating to an extent greater than that required for the elevation of the pipe shall be made by bedding the pipe with 20mm (3/4") clear stone granular material is placed at the time that the pipes are being installed, at the Contractors expense.

No extras will be allowed for excavating any hardpan, boulders, rocks, ice or other obstacles found in the excavation or in the line of the trench or for any pumping or baling of water required in the excavation of the work. The trench must be drained or pumped in order to avoid the necessity of making joints under water. The trench must also be drained to avoid any possibility of groundwater entering the pipe in the trench until the installation has been successfully completed.

VIII. PIPE INSTALLATION

The new pipe shall be set in the alignment and to the grade elevations established in the accompanying drawings. The same shall not be altered unless otherwise directed by the Drainage Superintendent or Consulting Engineer prior to construction of same. Any changes relative to the enclosure/covered drain must be approved by the Consulting Engineer prior to proceeding with construction.

The Contractor shall lay the enclosure/covered drain pipe to the lines, levels, and grades as shown in the accompanying drawings or as may be laid out and established by the Engineer prior to the time of construction. The Contractor shall be held responsible for said lines, levels and grades of the drain pipe and should the Engineer determine that the Contractor has not satisfactorily adhered to such lines, levels and grades, it may direct the Contractor to take up and re-lay any portion of the drain which does not conform to such lines, levels and grades.

Laser control must be provided to maintain drain lines and grades, and the Contractor shall have a qualified Operator to set up and operate the equipment. In some instances, but only at the discretion of the Engineer, an approved system of batter boards may be utilized for this purpose; However, the cost of placing grade stakes and determining the cut information shall be provided by or paid for entirely by the Contractor.

The Contractor should note that, because the pipe is being installed with an excavator, it is expected that they will provide a minimum of 150mm (6") of either compacted MTO Granular "A", Granular "B" (Type II) or 20mm (3/4") clear stone bedding material, as outlined within OPSS Form 1010 The Contractor shall ensure that a good firm base is provided under the drain pipe, and they shall provide for this item as part of their tender price.

HDPE Pipe Installation

When HDPE plastic pipes are specified, they shall be joined together with the use of a water-tight bell and gasket joining system, secured in accordance with the Manufacturer's recommendations. The minimum length of a continuous pipe section shall be no less than 6.10 metres (20.00 ft.). The HDPE plastic pipe for this installation must be of the length, size, and strength identified in the Drawings, Special Provisions, and approved by the Drainage Superintendent and the Consulting Engineer prior to its placement in the drain.

For new smoothwall HDPE culvert pipes that are shown on the Drawings to have sloped quarried limestone erosion protection at their ends, both ends of the pipe shall be securely anchored against floatation utilizing two (2) steel T-bar fence posts having a minimum length of 1.80 metres (6.00 ft.) or approved equal, on each side of the pipe, together with heavy steel galvanized wire secured between them across the top of the pipe. The top of each post shall be set no higher than the top of the proposed culvert. Pipe anchors shall be installed in accordance with the "Floatation Anchor Details" outlined within the accompanying drawings.

Aluminized Steel Pipe Installation

When Aluminized Steel Corrugated Hel-Cor pipe and/or Aluminized Steel Type II UltraFlo pipe is specified, the culvert shall be installed with a minimum number of couplers and longer pipe sections are to be utilized whenever possible. Under no circumstances shall the culvert sections be less than 4.00 metres in length. All pipe lengths shall be of the size and gauge noted in the drawings and shall be coupled together with Aluminized Steel Type II 10C having a thickness consistent with the culvert pipe material. The overall pipe for this installation

must be of the length, size, and thickness as identified in the Drawings, Special Provisions, and approved by the Drainage Superintendent and/or the Consulting Engineer prior to its placement in the drain.

General Pipe Installation

The Contractor shall be required to provide all labour, equipment and materials to set the pipe to the required design grades. Where couplers are required, the Contractor shall utilize the appropriate coupler provided by and per the specifications of the Manufacturer. The Contractor shall supply all material and labour to provide a non-woven filter cloth wrap around the full circumference of the coupler joint connection, as part of their tender price. The filter cloth wrap connection shall be a minimum of 250mm (10") wider than the width of the proposed coupler and shall overlap a minimum of 200mm (8"), as available from Underground Specialties Inc., of Windsor, Ontario, or equal. The specific type to be utilized shall be approved by the Drainage Superintendent and/or the Consulting Engineer prior to its placement. The installation of all joints must be inspected and approved by the Drainage Superintendent or Consulting Engineer prior to any backfilling of same.

The Contractor shall also note that the placement of the enclosure/covered drain is to be performed totally in the dry, and it shall be prepared to take whatever steps are necessary to ensure same, all to the satisfaction of the Drainage Superintendent and/or Consulting Engineer. The installation of the complete length of pipe, including all appurtenances, shall be completely inspected by the Drainage Superintendent and/or the Consulting Engineer's Inspector prior to backfilling any portions of same. Under no circumstance shall the Contractor commence the construction or backfill of the pipe without the site presence of the Drainage Superintendent and/or the Consulting Engineer's Inspector to inspect and approve said installation.

All pipe materials shall be stored and handled by the Contractor at its own expense. It shall be responsible for the safe storage of all materials, for obtaining storage areas, for the safe transportation and distribution of all the materials at the job site, and for inspection in order to determine defects and breakage. No additional recompense will be allowed to the Contractor for any loss incurred by it in the storage and handling of the materials.

Pipe, fittings, and all accessory appurtenances must be loaded and unloaded by lifting with means of a hoist or a skid to avoid shock or damage. Under no circumstances shall any drain material or materials for drain appurtenances be dropped.

If the drain pipe is laid in freezing weather, the Contractor shall take all the necessary precautions to prevent damage to the pipe or to any of the materials used in the construction of the work. In addition, the Contractor shall take care that no frozen ground or backfill is placed in the trench backfilling adjacent to the drain pipe. All pipe and the various other materials used in the placing of said pipe shall be installed in strict compliance with the Manufacturer's recommendations.

The installation of the complete length of the new culvert pipe, including all appurtenances, shall be completely inspected by the Drainage Superintendent and/or the Consulting Engineer's Inspector prior to backfilling any portions of same. Under no circumstance shall the Contractor commence the construction or backfill of the culvert pipe without the site presence of the Drainage Superintendent and/or the Consulting Engineer's Inspector to inspect and approve the said installation.

IX. DRAINAGE STRUCTURE INSTALLATION

Where required, all materials for the catchbasins shall comply with Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD) with respect to materials, qualities, and installation details. The catchbasins and maintenance holes shall be founded on a good, dry, firm, undisturbed earth base for its entire bottom surface area, or 20mm (3/4") clear stone bedding, if necessary. Corrections in depth of excavation caused by the Contractor excavating to an extent greater than that required for the structures shall be backfilled to the proper grade elevation by embedding the catchbasin maintenance holes floor area with 20mm (3/4") clear stone granular bedding. A sump is to be provided in each structure which shall be a minimum of 450mm deep measured from the proposed invert of the covered drain or connection to the proposed concrete floor elevation of the structure. The structure shall be set to allow for connection of all of the inlet and outlet pipes and shall be installed as shown and detailed on the Drawings. The top elevation of the structure shall be installed to the elevations noted on the Drawings or as further directed by the Drainage Superintendent or the Consulting Engineer. All structure sections and adjustment units shall be joined together with standard gasket material, caulking, or grout as required by the Manufacturer, or as set out in the applicable OPSS and OPSD.

All structures, where applicable, shall include a minimum of three (3) adjustment units in accordance with OPSD 704.011. All work shall be completed as shown and detailed on the Drawings.

The Contractor shall connect all covered drains and connections in the catchbasin maintenance holes with the use of a mortar joint or standard rubber boot cast into the units by the Manufacturer. Said mortar joint shall be provided at the internal and exterior of the catchbasin maintenance holes wall for the full circumference of the covered drain and be of a sufficient mass to produce a sealed joint, all to be performed to the satisfaction of the Drainage Superintendent or the Consulting Engineer. Where possible, the Contractor shall employ a standard factory fitting or adapter to connect between the various pipes, tiles, and catchbasin maintenance holes, otherwise a mortar joint connection can be utilized.

X. ENCLOSURE/COVERED DRAIN BACKFILL

Where the new enclosure/covered drain pipe is located under the driveway, the Contractor shall backfill the entire trench for the width of the driveway with Granular Type II "B" or Granular "A", or locally approved equivalent compacted in place to a minimum 98% of Standard Proctor Density with the exception of the top 300mm which should be backfilled with Granular "A" material also compacted in place to a Standard Proctor Density of 100%. Where the new enclosure/covered drain pipe is located along the lawn area, the Contractor shall be required to backfill the entire trench with good clean native backfill material with the exception of the top 100mm which shall be good clean black loamy topsoil readied for seeding and mulching. It should be noted that if there is a shortage of native backfill material available, the Contractor shall supply same all at its own expense. The Contractor should also note that prior to commencing its excavation that all existing topsoil should be scavenged for reuse on the project; if there is a shortage, the Contractor shall be required to supply the balance of the topsoil needed, all at its own expense. All of the native backfill material shall be compacted in place to a minimum Standard Proctor Density of 96%.

All backfill material shall be placed in compacted in maximum lifts of approximately 300mm thick. The Contractor is required to provide whatever mechanical equipment necessary, such as jumping jack and/or plate tamper, in order to achieve the necessary compaction levels, especially along the haunches of the new

pipe. All areas shall be graded in accordance with the profile and cross-sections shown in the accompanying drawings, including provision of cross-fall on boulevard areas as shown therein.

XI. CONSTRUCTING NEW SWALES

The Contractor shall provide all labour, equipment, and materials in order to construct the swales, to the lines, levels, and grades as is shown and detailed in the accompanying drawings. The centreline of the finished swale grade elevation and swale cross-section, at various locations along the length of the drain, are to be provided as shown and detailed in the design drawings. The Contractor shall be required to strictly adhere to this swale design unless otherwise directed and approved by the Consulting Engineer.

The swale shall generally be constructed with a V-section centered over the proposed lawn piping, or as the alignment shows in the drawings, to ensure positive flow of the surface drainage into the sloped quarried limestone end treatments which act as outlets for the swale sections or other surface inlet structures, if applicable. All materials excavated from the swale including all deleterious materials shall be hauled away and disposed of by the Contractor to a site to be obtained by it at its own expense.

The alignment of the swales throughout shall be to the satisfaction of the Drainage Superintendent and the Consulting Engineer. All of the work shall be done in a neat, thorough, and workmanlike manner also to their full satisfaction.

XII. SLOPED QUARRIED LIMESTONE EROSION PROTECTION

When specified, the Contractor shall install sloped quarried limestone end protection at both ends of the pipe, or where shown, on a slope no steeper than 1.50 horizontal to 1.00 vertical and shall extend from the end of the new pipe to the top elevation shown. The top 305mm (12") of backfill material over the ends of the pipe, from the invert of said pipe to the top of the driveway elevation of the enclosure/covered drain, shall be quarried limestone. The quarried limestone to be placed on the sloped ends of the enclosure/covered drain shall be underlain with a synthetic non-woven geotextile filter fabric. The sloped quarried limestone protection is to be rounded as shown on the plan details and shall also extend along the drain side slopes to a point directly in line with the ends of the culvert pipe. All work shall be completed to the satisfaction of the Drainage Superintendent and/or the Consulting Engineer.

The quarried limestone shall be provided as shown and detailed and shall vary in size from a minimum of 100mm (4") to a maximum of 250mm (10"). The quarried limestone pieces shall be carefully tamped into place with the use of a shovel bucket so that, when complete, the quarried limestone erosion protection shall be consistent, uniform, and tightly laid in place. Prior to placing the quarried limestone, the Contractor shall place non-woven geotextile filter fabric "MacTex MX140" conforming to OPSS 1860 Class 1 or approved equal, as an underlay underneath all areas to be covered in quarried limestone erosion protection. The Contractor shall take extreme care not to damage the geotextile filter fabric when placing the quarried limestone. The placement of the geotextile filter fabric and the quarried limestone, and the completion of the quarried limestone erosion protection shall be conducted to the satisfaction of the Drainage Superintendent and/or Consulting Engineer.

XIII. PRECAST INTERLOCKING CONCRETE BLOCK HEADWALLS

When precast interlocking concrete block headwalls are specified, the concrete blocks shall be rectangular in shape with square corners and be a minimum size of 600mm x 600mm x 1200mm (2' x 2' x 4'), as available from Underground Specialties Inc./Wolseley Inc. (Canada) or approved equal. Blocks with modified lengths may be utilized to fill in staggered sections of the block wall. All blocks shall be cast in one pour with no cold joints and shall have a minimum compression strength of 20MPa at 28 days. All precast concrete blocks shall be formed with interlocking pockets and tenons and each block shall be assembled in a staggered formation to prevent sliding at the interface between blocks. All precast concrete blocks shall be uniform in size with relatively smooth and consistent joints and shall have a stone exterior finish. Each block shall be fitted with a lifting ring that will not interfere with the assembly of the block wall once they are set in place. Cap blocks shall be utilized on the top course of the wall with the top of the cap blocks having a stone exterior finish. The precast interlocking concrete block headwalls are available from Underground Specialties Inc./Wolseley Inc. (Canada), or approved equal.

Precast interlocking blocks that abut the pipe shall be cast as one solid piece and shall be cut and shaped to fit closely around the perimeter of the pipe. The face of the wall shall not extend beyond the end of the pipe. All minor gaps between the blocks and the pipe shall be sealed with no shrink grout for the full depth of the blocks. At the base of the wall, a base block shall be used at the bottom of the interlocking block wall. The base block shall be founded on a firm solid base. When necessary, the Contractor shall provide a minimum of 200mm thickness of level compacted granular bedding, or a lean concrete footing, as a firm foundation for the blocks. The base block shall be set level and shall convey a vertical projection throughout its full height and shall include filter cloth behind the wall for the full height of the blocks to prevent soil migration through any joints. Filter cloth fabric shall be non-woven geotextile material and be minimum "MacTex MX 140" meeting OPSS Class I. Both headwalls shall be assembled concurrently with a continuous uni-axial geogrid SG350, or equal, installed across the entire structure at every second course of blocks, to tie each headwall to the other. In the event that the distance between headwalls exceeds 10.00 metres (32.81 ft.), the Contractor shall install the uni-axial geogrid for a distance of 3.00 metres (9.84 ft.) inward from each headwall and at every second course. Both the non-woven filter cloth and the uni-axial geogrid are available from Armtec Construction Products or approved equal.

The blocks shall extend up from the pipe invert and cross the full width of the drain and be embedded a minimum of 500mm into the drain banks. Where required for the top of the block wall to match the height of the completed driveway, the Contractor shall embed the bottom course of blocks into the drain bottom at the appropriate depth to achieve the required top elevation of the wall.

The Contractor shall arrange for the Supplier to provide interlocking block layout drawings outlining block assembly of the proposed headwall to the Consulting Engineer for approval prior to proceeding with fabrication and assembly of same. The Contractor shall arrange with the Supplier for technical assistance with the assembly of the structure on-site in full accordance with the requirements of the Supplier. All assembly installation shall be carried out to avoid any damage to the pipe and shall follow the Supplier's recommendation in every respect to ensure a proper and safe installation.

The precast interlocking concrete block headwalls shall be installed vertically and shall extend from the end of the new pipe to the top elevation of the driveway. Under no circumstances shall the interlocking block wall be installed with an outward projection. When complete, the outside face of the headwall shall be installed flush with the end of the proposed culvert. The precast interlocking concrete block headwall shall be installed

perpendicular to the drain banks. Headwalls are to be installed so that daylighting is provided off the travelled roadway, if required. The daylighting is to be designed to deflect outwardly from approximately the extreme roadside face of the new culvert to a point just beyond the top bank of the drain. The outward projection of the new headwalls shall be deflected at approximately a 45-degree angle, and the maximum outward deflection shall not be greater than shown on the accompanying Drawings, parallel to the projection of the straight portion of the finished wall. The straight portion of the precast interlocking concrete block headwall shall be installed perpendicular to the drain banks. The Contractor shall also be required to backfill the area behind the new headwall with granular fill.

The Contractor shall also be required to satisfactorily backfill the area in behind the new headwall with granular fill as already specified in the preceding paragraphs for backfilling of the bridge culvert. The top elevation of the headwalls, opposite the travelled roadway, are to be set no less than 75mm (3"), below the existing ground elevation, unless shown on the drawings. The alignment of these headwalls shall be performed to the satisfaction of the Drainage Superintendent or the Consulting Engineer. The installation of the precast interlocking concrete block headwalls shall also comply with the "Block Headwall Installation Instructions for Culverts" provided by Underground Specialties Inc./Wolseley Inc., or equal.

Upon completion of the headwall installation, the Contractor shall also provide sloped quarried limestone erosion protection adjacent and along all of the new concrete headwalls, at the general locations and to the widths shown within the details included therein. Furthermore, the installation of the quarried limestone shall adhere to the parameters outlined in Section XV. Sloped Quarried Limestone Erosion Protection – Concrete Block Headwalls.

XIV. CONCRETE-FILLED JUTEBAG HEADWALLS

When specified, the Contractor shall install new concrete jutebag headwalls at the locations and parameters indicated on the drawing. When constructing the concrete jutebag headwalls, the Contractor shall place the bags so that the completed headwall will have an inward batter from the bottom of the pipe to the top of the finished headwall. The slope of the headwall shall be one (1) unit horizontal to five (5) units vertical. The Contractor shall satisfactorily backfill behind the jutebag headwalls with granular material similar to the rest of the structure, and the same compaction levels specified herein for backfilling the adjacent culvert. The placing of the jutebag headwalls and the backfilling shall be performed in lifts simultaneously. The granular backfill shall be placed and compacted in lifts not to exceed 305mm (12") in thickness.

The concrete jutebag headwalls shall be constructed by filling jutebags with concrete. All concrete used to fill the jutebags shall have a minimum compressive strength of 21MPa in 28 days and shall be provided and placed only as a wet mix. Under no circumstance shall the concrete to be used for filling the jutebags be placed as a dry mix. The jutebags, before being filled with concrete, shall have a dimension of 460mm (18") x 660mm (26"). The jutebags shall be filled with concrete so that when they are laid flat, they will be approximately 100mm (4") thick, 305mm (12") to 380mm (15") wide and 460mm (18") long. The completed jutebag headwalls shall be securely embedded a minimum of 500mm (20") measured perpendicular to the side slopes of the drain.

If indicated on the Drawings, daylighting may be installed off the travelled roadway, and the same are designed to deflect outwardly. The outward deflection shall be deflected at the specified angle to the straight portion of the finished headwall. The top elevations of the daylighted headwalls are to be set no less than 75mm (3")

below the existing ground elevation, unless otherwise designed. The alignment of these headwalls shall be performed to the satisfaction of the Drainage Superintendent or Consulting Engineer.

Upon completion of the jute bag headwall the Contractor shall cap the top row of concrete-filled bags with a layer of plain concrete, minimum 150mm (6") thick, and hand trowelled to obtain a brushed finish appearance. If the cap is made more than 150mm thick, the Contractor shall provide two (2) continuous 15M reinforcing bars (or equivalent mesh) set at mid-depth and equally spaced in the cap. The Contractor shall fill all voids between the concrete-filled jutebags and the corrugated steel pipe with concrete, particular care being taken underneath the pipe haunches to fill all voids. All concrete used for the footing, cap and bags shall have a minimum compressive strength of 21MPa in 28 days and include 6% ± 1% air entrainment.

XV. SLOPED QUARRIED LIMESTONE EROSION PROTECTION – CONCRETE BLOCK HEADWALLS

The sloped quarried limestone erosion protection shall be embedded into the side slopes of the drain at a minimum thickness of 305mm and shall be underlain in all cases with a synthetic filter mat. The filter mat shall not only be laid along the flat portion of the erosion protection but also contoured to the exterior limits of the quarried limestone and the unprotected slope. The width and slope of the general erosion protection shall be as established in the accompanying drawing or as otherwise directed by the Drainage Superintendent and/or the Consulting Engineer during construction. In placing the erosion protection, the Contractor shall carefully tamp the quarried limestone pieces into place with the use of a shovel bucket so that the erosion protection when completed will be consistent, uniform and tightly laid. In no instance shall the quarried limestone protrude beyond the exterior contour of the unprotected drain side slopes along either side of said protection. The synthetic filter mat to be used shall be **non-woven** geotextile MacTex MX 140 conforming to OPSS 1860 Class I, as available from Armtec Construction Products, or approved equal. The quarried limestone to be used shall be graded in size from a minimum of 100mm (4") to a maximum of 250mm (10"), and is available from Walker Aggregates, in Amherstburg, Ontario, or approved equal.

XVI. BENCHMARKS

For use by the Contractor, we have established a Benchmark at the location where the structures are being replaced. The Drawings include details illustrating the work to be carried out. Benchmarks have been indicated and the Elevations have been shown and shall be utilized by the Contractor in carrying out its work. The Contractor shall note that a specific design elevation grade has been provided for the invert at each end of the pipe in the accompanying Drawings. The Drawings also sets out the pipe size, materials, and other requirements relative to the installation of the enclosure/covered drain structure. In all cases, the Contractor is to utilize the specified drain grade to set any new pipe installation. The Contractor shall ensure that it takes note of the direction of flow and sets all pipes to assure that all grades flow from upstream to downstream to match the direction of flow within the drain.

XVII. ANCILLARY WORK

During the course of any repair or improvements, the Contractor will be required to protect or extend any existing tile ends or swales to maintain the drainage from the adjacent lands. All existing tiles shall be extended utilizing Boss 1000 or equal plastic pipe of the same diameter as the existing tile and shall be installed in accordance with the **"Standard Lateral Tile Detail"** unless otherwise noted. Connections shall be made using a Manufacturer's coupling wherever possible. Openings into new pipes shall be neatly saw-cut to the satisfaction of the Drainage Superintendent and/or the Consulting Engineer. For other connections, the Contractor shall utilize a grouted connection. Grouted mortar joints shall be composed of three (3) parts of clean, sharp sand to one (1) part of Portland Cement with just sufficient water added to provide a stiff plastic mix. The mortar joint shall be of sufficient mass around the full circumference of the joint on the exterior side to ensure a tight, solid seal. The Contractor is to note that any intercepted pipes along the length of the existing pipes are to be extended and diverted to the downstream end of the new pipe unless otherwise noted in the accompanying drawings.

Where the enclosure/covered drain installation interferes with the discharge of an existing swale, the Contractor shall re-grade the existing swales to allow for the surface flows to freely enter the drain. Any disturbed grass areas shall be fully restored with topsoil, seed and mulch. The Contractor shall also be required as part of the enclosure/covered drain replacement to excavate and widen the drain bottom where required to fit the new pipes in order to provide a smooth transition between the new culvert installation and the existing drain.

The Contractor, when doing their excavation or any other portion of the work, shall be very careful not to interfere with, plug up or damage, any existing surface drains, swales and lateral or main tile ends. If it is found that said existing drains are interfered with in any way, the Contractor will be required to unplug or repair said drains immediately, at no extra cost to the project. If it is found that any existing lateral tiles or main tile drains or tile ends have been cut off or damaged in any way during the course of the work, the Contractor will be required to either repair or replace same, to the satisfaction of the Drainage Superintendent and the Consulting Engineer.

The Contractor shall take steps to protect all legal survey bars during the course of its work. If any bars are removed or damaged, the Contractor shall arrange for an Ontario Land Surveyor licensed in the Province of Ontario to replace same, all at its cost.

All of the work required towards the installation and improvements to all structures shall be performed in a neat and workmanlike manner and the general site shall be restored to its' original condition, and all of same is to be performed to the satisfaction of the Drainage Superintendent and the Consulting Engineer.

XVIII. TOPSOIL, SEED AND MULCH

During the course of its excavation operations, the Contractor will be required to salvage all available topsoil. Where necessary, this material shall be stockpiled by the Contractor in order to avoid contamination and shall be utilized in carrying out the topsoil placement along all specified newly excavated and filled or disturbed areas, in preparation for the seeding and mulching operation to be carried out as part of the restoration works. The Contractor shall be required to use the scavenged topsoil stripped from the drain banks. The balance of the topsoil required shall be obtained by the Contractor at its own expense.

The Contractor shall be required to restore all existing grassed areas and drain side slopes damaged or disturbed by the structure installation and/or removal, and place topsoil and seed and mulch over said areas including any specific areas noted on the Drawings. The Contractor shall be required to provide all the material and to cover the above-mentioned surface areas with approximately 50mm of good, clean, dry topsoil on slopes and 100mm of good, clean, dry topsoil on horizontal surfaces, fine graded and spread in place ready for seeding and mulching. The Contractor is to note that prior to fine grading the topsoil over the backfilled areas, positive drainage is to be provided off of these areas and into the swales, and the Contractor shall also be required to make minor changes where necessary to ensure same. The Contractor shall be required to restore all existing grassed areas and roadway boulevard areas damaged by the enclosure/covered drain work, and shall provide topsoil and seed and mulch over all of these areas. The placing and grading of all topsoil shall be carefully carried out according to Ontario Provincial Standard Specifications, Form 802, dated November 2010, or as subsequently amended or as amended by these Specifications. Once the topsoil has been properly placed and fine graded, the Contractor shall seed and mulch the area. Seeding and mulching operations shall be carried out according to Ontario Provincial Standard Specifications, Form 572, dated November 2003, or as subsequently amended or as amended by these Specifications. The seeding mixture shall be OSECO Seed Mixture Canada No. 1, as available from Morse Growers Supply in Leamington, or equal. As part of the seeding and mulching operation, the Contractor will be required to provide either a hydraulic mulch mix or a spread straw mulch with an adhesive binder in accordance with OPSS 1103.05.03 dated November 2016, or as subsequently amended, to ensure that the grass seed will be protected during germination and provide a thick, uniform cover to protect against erosion, where necessary. All work shall be completed to the satisfaction of the Drainage Superintendent or the Consulting Engineer.

All of the work relative to the placement of topsoil and the seeding and mulching operation shall be meticulously done and completed in a good and workmanlike manner all to the satisfaction of the Drainage Superintendent or Consulting Engineer.

XIX. FINAL CLEANUP AND RESTORATION

The whole of the work shall be satisfactorily cleaned up, and during the course of the construction, no portion shall be left in any untidy or incomplete state before subsequent portions are undertaken.
All roadways, driveways and access bridges, or any other means of access onto the job site shall be fully restored to their former condition at the Contractor's expense. Before authorizing Final Payment, the Drainage Superintendent or the Consulting Engineer shall inspect the work in order to be sure that the proper restoration has been performed. In the event that the Contractor fails to satisfactorily clean up any portion of these accesses, the Consulting Engineer shall order such cleanup to be carried out by others and the cost of same to be deducted from any monies owing to the Contractor.

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Peralta Engineering

STANDARD SPECIFICATIONS

FOR ROAD CULVERT REPLACMENTS

(Revised May 2024)

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DETAILS

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I. GENERAL CONDITIONS FOR SPECIFICATIONS

These specifications, together with the accompanying drawings and appendices, delineate the furnishing of all labour, equipment, materials, and supplies required for the performance of all operations relating to the construction and/or improvements of a Municipal Drain under the most recent revision of the Drainage Act and/or amendments made thereto. These specifications serve to supplement and/or amend the current Ontario Provincial Standard Specifications and Standard Drawings, adopted by the Ontario Municipal Engineers Association. "Special Provisions" are included as part of the overall document and shall be read in conjunction with these Standard Specifications. Where a discrepancy occurs between the requirements of the Standard Specifications and the Special Provisions, the Special Provisions shall govern. In the event that the Specifications, Information to Tenderers, or the Form of Agreement do not apply to a specific condition or circumstance with respect to this project, the applicable section, or sections from the Canadian Construction Documents Committee (CCDC) shall govern and be used to establish the requirements of the work.

Any reference to "Drainage Superintendent" and/or "Consulting Engineer" within this document shall refer to the person (or persons) appointed by the Council of the Municipality having jurisdiction over the drainage works.

All work shall be done in a first-class and workmanlike manner, complete in all respects and including all items specified herein, or as necessary for the accomplishment of a complete, satisfactory, and approved installation.

II. REMOVAL OF BRUSH, TREES, AND DEBRIS

Where there is any brush, trees, or debris along the course of the drainage works, including the full width of the access, all such brush, trees or debris shall be close-cut and grubbed out, and the whole shall be chipped up for recycling, burned, hauled away or satisfactorily disposed of by the Contractor at its expense. Prior to and during the course of the 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. The Contractor will be required to notify the local fire authorities and cooperate with them in the carrying out of any work. The removal of brush and trees shall be carried out in close consultation with the Drainage Superintendent or Consulting Engineer to ensure that no decorative trees or shrubs are disturbed by the operations of the Contractor that can be saved. It is the intent of this project to save as many trees and bushes as practical within the roadway allowances and on private lands.

The Contractor shall protect all other trees, bushes, and shrubs located along the length of the drainage works except for those trees that are noted within the accompanying drawings or in consultation with the Drainage Superintendent, the Consulting Engineer, and the affected Owner(s). The Contractor shall note that protecting and saving the trees may require the Contractor to carry out handwork around the trees, bushes, and shrubs to complete the necessary final site grading and restoration.

Following the completion of the work, the Contractor is to trim up any broken or damaged limbs on trees which are to remain to stand, and it shall dispose of said branches along with other brush, thus leaving the trees in a neat and tidy condition.

The Contractor shall remove all deleterious materials and debris along the course of the open drain and any such materials located in the bridge culverts while carrying out its cleaning of same. All such deleterious materials and debris shall be loaded up and hauled away by the Contractor to a site to be obtained by it at their expense.

If applicable, where identified on the drawings, and to ensure a safe separation distance is maintained, the Contractor shall install tree protection fencing at the projected limit of the excavation and beneath the drip line of the identified tree(s). The fencing shall be comprised of orange vinyl snow fencing secured at 3.00-metre intervals with iron T-posts driven 600mm into the ground and should be in place until construction work is completed. During construction, no equipment, materials, or tools shall be stored beyond the tree protection fencing.

III. UTILITIES

The Contractor will be responsible at all times for complete investigation to determine the location of all such utilities or structures known or unknown, and it shall indemnify and save harmless the Engineer and the Municipality for any responsibility, injury, or liability arising from any damage to such utilities or structures by the Contractor.

The Contractor shall protect all other services located in the vicinity of the proposed drainage works including any sanitary sewers and connections, watermains and connections, telephone and gas services, along with any private systems and services. Any damaged components shall be replaced by the Contractor, totally at its own expense and it shall fully restore the functionality of same.

The Contractor shall further contact or notify such Utility Company or Commission of its intention to carry out work in the area and cooperate with such Utility Company or Commission in the location, maintenance and preservation of all such utilities. The location of the pipes and appurtenances as shown on the drawings is approximate and may be changed by the Engineer if deemed advantageous for the progress of the work.

IV. NOTICE OF PROJECT COMMENCEMENT AND HOURS OF OPERATION

The Contractor shall provide a minimum of forty-eight (48) hours' notice to the Drainage Superintendent and/or the Consulting Engineer prior to the commencement of the work. The installation of the culvert structure is to be performed during normal working hours of the Drainage Superintendent and/or the Consulting Engineer from Monday to Friday unless written authorization is provided by them to amend such working hours.

V. EXCAVATION, REMOVALS, AND DISPOSAL

In order to facilitate the new road crossing culvert, the Contractor shall be required to carefully saw-cut and remove the existing asphalt pavement to the lengths and widths necessary to safely facilitate the removal of the existing culvert, or as established within the accompanying drawings. Details of the asphalt replacement requirements are further outlined in the subsequent headings. The Contractor shall also remove all existing backfill, headwalls, and any existing culvert materials, as well as any other deleterious materials that may be encountered in removing said materials. The Contractor shall also ensure that the excavations allow for a minimum of 600mm clear distance on both sides of the new culvert to all for the proper installation, backfill, and granular compaction to facilitate the new culvert installation. The Contractor shall also be required to completely dispose of all materials to a site to be obtained by it at its own expense.

As part of the work, the Contractor shall be required to excavate, transition and clean the side slopes and drain bottom up to a maximum distance of 10.00 metres (32.80 ft.) both upstream and downstream of the new culvert length, or as outlined on the accompanying plans. The sediment material from this excavation shall under no circumstance be utilized for the backfilling of the culvert, and same must be totally trucked away and disposed of at a site to be obtained by it at its own expense.

All unsuitable and deleterious materials from the excavation and removal of the existing culvert and drain shall be hauled away and disposed of by the Contractor to a site to be obtained by it at its expense. Likewise, any material excavated to allow for the granular approaches to the bridge, driveway transitions, or installation of new end walls shall also be hauled away and disposed of by the Contractor.

VI. PIPE INSTALLATION

The new pipe shall be set in the alignment and to the grade elevations established in the accompanying drawings. These details shall not be altered unless otherwise directed by the Drainage Superintendent or Consulting Engineer prior to construction of same. Any changes relative to the culvert must be approved by the Consulting Engineer prior to proceeding with construction.

The Contractor shall lay the culvert pipe to the lines, levels, and grades as shown in the accompanying drawings or as may be laid out and established by the Engineer prior to the time of construction. The Contractor shall be held responsible for said lines, levels and grades of the pipe and should the Engineer determine that the Contractor has not satisfactorily adhered to such lines, levels and grades, it may direct the Contractor to take up and re-lay any portion of the drain which does not conform to such lines, levels and grades.

Laser control must be provided to maintain drain lines and grades, and the Contractor shall have a qualified Operator to set up and operate the equipment. In some instances, but only at the discretion of the Engineer, an approved system of batter boards may be utilized for this purpose; However, the cost of placing grade stakes and determining the cut information shall be provided by or paid for entirely by the Contractor.

The Contractor should note that, because the pipe is being installed with an excavator, it is expected that they will provide a minimum of 150mm (6") of either compacted MTO Granular "A", Granular "B" (Type II) or 20mm

(3/4") clear stone bedding material, as outlined within OPSS Form 1010 The Contractor shall ensure that a good firm base is provided under the drain pipe, and they shall provide for this item as part of their tender price.

HDPE Pipe Installation

When HDPE plastic pipes are specified, they shall be joined together with the use of a water-tight bell and gasket joining system, secured in accordance with the Manufacturer's recommendations. The minimum length of a continuous pipe section shall be no less than 6.10 metres (20.00 ft.). The HDPE plastic pipe for this installation must be of the length, size, and strength identified in the Drawings, Special Provisions, and approved by the Drainage Superintendent and the Consulting Engineer prior to its placement in the drain.

For new smoothwall HDPE culvert pipes that are shown on the Drawings to have sloped quarried limestone erosion protection at their ends, both ends of the pipe shall be securely anchored against floatation utilizing two (2) steel T-bar fence posts having a minimum length of 1.80 metres (6.00 ft.) or approved equal, on each side of the pipe, together with heavy steel galvanized wire secured between them across the top of the pipe. The top of each post shall be set no higher than the top of the proposed culvert. Pipe anchors shall be installed in accordance with the "**Floatation Anchor Details**" outlined herein.

Aluminized Steel Pipe Installation

When Aluminized Steel Corrugated Hel-Cor pipe and/or Aluminized Steel Type II UltraFlo pipe is specified, the culvert shall be installed with a minimum number of couplers and longer pipe sections are to be utilized whenever possible. Under no circumstances shall the culvert sections be less than 4.00 metres in length. All pipe lengths shall be of the size and gauge noted in the drawings and shall be coupled together with Aluminized Steel Type II 10C having a thickness consistent with the culvert pipe material. The overall pipe for this installation must be of the length, size, and thickness as identified in the Drawings, Special Provisions, and approved by the Drainage Superintendent and/or the Consulting Engineer prior to its placement in the drain.

General Pipe Installation

The Contractor shall be required to provide all labour, equipment, and materials to set the pipe to the required design grades. Where couplers are required, the Contractor shall utilize the appropriate coupler provided by and per the specifications of the Manufacturer. The Contractor shall supply all material and labour to provide a non-woven filter cloth wrap around the full circumference of the coupler joint connection, as part of their tender price. The filter cloth wrap connection shall be a minimum of 250mm (10") wider than the width of the proposed coupler and shall overlap a minimum of 200mm (8"), as available from Underground Specialties Inc., of Windsor, Ontario, or equal. The specific type to be utilized shall be approved by the Drainage Superintendent and/or the Consulting Engineer prior to its placement. The installation of all joints must be inspected and approved by the Drainage Superintendent or Consulting Engineer prior to any backfilling of same.

The Contractor shall also note that the placement of the culvert is to be performed totally in the dry, and it shall be prepared to take whatever steps are necessary to ensure same, all to the satisfaction of the Drainage Superintendent and/or Consulting Engineer. The installation of the complete length of pipe, including all appurtenances, shall be completely inspected by the Drainage Superintendent and/or the Consulting Engineer's Inspector prior to backfilling any portions of same. Under no circumstance shall the Contractor commence the construction or backfill of the pipe without the site presence of the Drainage Superintendent and/or the Consulting Engineer's Inspector to inspect and approve said installation.

All pipe materials shall be stored and handled by the Contractor at its own expense. It shall be responsible for the safe storage of all materials, for obtaining storage areas, for the safe transportation and distribution of all the materials at the job site, and for inspection in order to determine defects and breakage. No additional recompense will be allowed to the Contractor for any loss incurred by it in the storage and handling of the materials.

Pipe, fittings, and all accessory appurtenances must be loaded and unloaded by lifting with means of a hoist or a skid to avoid shock or damage. Under no circumstances shall any drain material or materials for drain appurtenances be dropped.

If the culvert is laid in freezing weather, the Contractor shall take all the necessary precautions to prevent damage to the pipe or to any of the materials used in the construction of the work. In addition, the Contractor shall take care that no frozen ground or backfill is placed in the trench backfilling adjacent to the culvert. All pipe and the various other materials used in the placing of said pipe shall be installed in strict compliance with the Manufacturer's recommendations.

The installation of the complete length of the new culvert pipe, including all appurtenances, shall be completely inspected by the Drainage Superintendent and/or the Consulting Engineer's Inspector prior to backfilling any portions of same. Under no circumstance shall the Contractor commence the construction or backfill of the culvert pipe without the site presence of the Drainage Superintendent and/or the Consulting Engineer's Inspector to inspect and approve the said installation.

VII. DRAINAGE STRUCTURE INSTALLATION

Where required, all materials for the catch basins shall comply with Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD) with respect to materials, qualities, and installation details. The catch basins and maintenance holes shall be founded on a good, dry, firm, undisturbed earth base for its entire bottom surface area, or 20mm (3/4") clear stone bedding, if necessary. Corrections in depth of excavation caused by the Contractor excavating to an extent greater than that required for the structures shall be backfilled to the proper grade elevation by embedding the catch basin maintenance holes floor area with 20mm (3/4") clear stone granular bedding. A sump is to be provided in each structure which shall be a minimum of 450mm deep measured from the proposed invert of the covered drain or connection to the proposed concrete floor elevation of the structure. The structure shall be set to allow for connection of all of the inlet and outlet pipes and shall be installed as shown and detailed on the Drawings. The top elevation of the structure shall be installed to the elevations noted on the Drawings or as further directed by the Drainage Superintendent or the Consulting Engineer. All structure sections and adjustment units shall be joined together with standard gasket material, caulking, or grout as required by the Manufacturer, or as set out in the applicable OPSS and OPSD.

All structures, where applicable, shall include a minimum of two (2) adjustment units in accordance with OPSD 704.011. All work shall be completed as shown and detailed on the Drawings.

The Contractor shall connect all covered drains and connections in the catch basin maintenance holes with the use of a mortar joint or standard rubber boot cast into the units by the Manufacturer. Said mortar joint shall be provided at the internal and exterior of the catch basin maintenance holes wall for the full circumference of

the covered drain and be of a sufficient mass to produce a sealed joint, all to be performed to the satisfaction of the Drainage Superintendent or the Consulting Engineer. Where possible, the Contractor shall employ a standard factory fitting or adapter to connect between the various pipes, tiles, and catch basin maintenance holes, otherwise a mortar joint connection can be utilized.

VIII. CULVERT BACKFILL

Where the new culvert pipe is located under the roadway, the Contractor shall backfill the entire trench for the width with Granular "B" (Type II) compacted in place to a minimum 98% of Standard Proctor Density and topped with a minimum 450mm thickness of Granular "A" compacted in place to a minimum 100% Standard Proctor Density. All backfill material shall be placed in compacted in maximum lifts of approximately 300mm thick. The Contractor is required to provide whatever mechanical equipment necessary, such as jumping jack and/or plate tamper, in order to achieve the necessary compaction levels, especially along the haunches of the new pipe. All areas shall be graded in accordance with the profile and cross-sections shown in the accompanying drawings, including provision of cross-fall on boulevard areas as shown and detailed in accordance with the **"Typical Roadway Crossing Backfill Detail**" outlined herein.

The new road crossing installation shall be provided with a minimum depth of cover from the top of the pipe of 450mm (18"). If the pipes are placed at their proper elevations, the same should be achieved. If the Contractor finds that the minimum cover is not being met, they shall notify the Drainage Superintendent and the Consulting Engineer immediately so that steps can be taken to rectify the condition prior to the placement of any backfill. The minimum cover requirement is critical and must be attained. In order for these new structures to properly fit the channel parameters, all of the design grade elevations must be strictly adhered to. As a check, all of the above structure design grade elevations should be confirmed before commencing to the next stage of the road crossing installation. The Contractor is also to check that the pipe invert grades and set structure elevations are correct by referencing the Benchmark.

IX. BRIDGE END PROTECTION

Sloped Quarried Limestone Erosion Protection

When specified, the Contractor shall install sloped quarried limestone end protection at both ends of the pipe, or where shown, on a slope no steeper than 1.50 horizontal to 1.00 vertical and shall extend from the end of the new pipe to the top elevation shown. The top 305mm (12") of backfill material over the ends of the pipe, from the invert of said pipe to the top of the driveway elevation of the culvert, shall be quarried limestone. The quarried limestone to be placed on the sloped ends of the culvert shall be underlain with a synthetic non-woven geotextile filter fabric. The sloped quarried limestone protection is to be rounded as shown on the plan details and shall also extend along the drain side slopes to a point directly in line with the ends of the culvert pipe. All work shall be completed to the satisfaction of the Drainage Superintendent and/or the Consulting Engineer.

The quarried limestone shall be provided as shown and detailed and shall vary in size from a minimum of 100mm (4") to a maximum of 250mm (10"). The quarried limestone pieces shall be carefully tamped into place with the use of a shovel bucket so that, when complete, the quarried limestone erosion protection shall be consistent, uniform, and tightly laid in place. Prior to placing the quarried limestone, the Contractor shall place non-woven geotextile filter fabric "MacTex MX140" conforming to OPSS 1860 Class 1 or approved equal, as an

underlay underneath all areas to be covered in quarried limestone erosion protection. The Contractor shall take extreme care not to damage the geotextile filter fabric when placing the quarried limestone. The placement of the geotextile filter fabric and the quarried limestone, and the completion of the quarried limestone erosion protection shall be conducted to the satisfaction of the Drainage Superintendent and/or Consulting Engineer. Sloped quarried limestone erosion protection shall be installed in accordance with the "**Typical Quarried Limestone End Protection Detail"** outlined herein.

Precast Interlocking Concrete Block Headwalls

When precast interlocking concrete block headwalls are specified, the concrete blocks shall be rectangular in shape with square corners and be a minimum size of 600mm x 600mm x 1200mm (2' x 2' x 4'), as available from Underground Specialties Inc./Wolseley Inc. (Canada) or approved equal. Blocks with modified lengths may be utilized to fill in staggered sections of the block wall. All blocks shall be cast in one pour with no cold joints and shall have a minimum compression strength of 20MPa at 28 days. All precast concrete blocks shall be formed with interlocking pockets and tenons and each block shall be assembled in a staggered formation to prevent sliding at the interface between blocks. All precast concrete blocks shall be uniform in size with relatively smooth and consistent joints and shall have a stone exterior finish. Each block shall be fitted with a lifting ring that will not interfere with the assembly of the block wall once they are set in place. Cap blocks shall be utilized on the top course of the wall with the top of the cap blocks having a stone exterior finish. The precast interlocking concrete block headwalls are available from Underground Specialties Inc./Wolseley Inc. (Canada) or approved equal.

Precast interlocking blocks that abut the pipe shall be cast as one solid piece and shall be cut and shaped to fit closely around the perimeter of the pipe. The face of the wall shall not extend beyond the end of the pipe. All minor gaps between the blocks and the pipe shall be sealed with no shrink grout for the full depth of the blocks. At the base of the wall, a base block shall be used at the bottom of the interlocking block wall. The base block shall be founded on a firm solid base. When necessary, the Contractor shall provide a minimum of 200mm thickness of level compacted granular bedding, or a lean concrete footing, as a firm foundation for the blocks. The base block shall be set level and shall convey a vertical projection throughout its full height and shall include filter cloth behind the wall for the full height of the blocks to prevent soil migration through any joints. Filter cloth fabric shall be non-woven geotextile material and be minimum "MacTex MX140"meeting OPSS Class I. Both headwalls shall be assembled concurrently with a continuous uni-axial geogrid SG350, or equal, installed across the entire structure at every second course of blocks, to tie each headwall to the other. In the event that the distance between headwalls exceeds 10.00 metres (32.81 ft.), the Contractor shall install the uni-axial geogrid for a distance of 3.00 metres (9.84 ft.) inward from each headwall and at every second course. Both the non-woven filter cloth and the uni-axial geogrid are available from Armtec Construction Products or approved equal.

The blocks shall extend up from the pipe invert and cross the full width of the drain and be embedded a minimum of 500mm into the drain banks. Where required for the top of the block wall to match the height of the completed driveway, the Contractor shall embed the bottom course of blocks into the drain bottom at the appropriate depth to achieve the required top elevation of the wall.

The Contractor shall arrange for the Supplier to provide interlocking block layout drawings outlining block assembly of the proposed headwall to the Consulting Engineer for approval prior to proceeding with fabrication and assembly of same. The Contractor shall arrange with the Supplier for technical assistance with the assembly of the structure on-site in full accordance with the requirements of the Supplier.

All assembly installation shall be carried out to avoid any damage to the pipe and shall follow the Supplier's recommendation in every respect to ensure a proper and safe installation.

The precast interlocking concrete block headwalls shall be installed vertically and shall extend from the end of the new pipe to the top elevation of the driveway. Under no circumstances shall the interlocking block wall be installed with an outward projection. When complete, the outside face of the headwall shall be installed flush with the end of the proposed culvert. The precast interlocking concrete block headwall shall be installed perpendicular to the drain banks. Headwalls are to be installed so that daylighting is provided off the travelled roadway if required. The daylighting is to be designed to deflect outwardly from approximately the extreme roadside face of the new culvert to a point just beyond the top bank of the drain. The outward projection of the new headwalls shall be deflected at approximately a 45-degree angle, and the maximum outward deflection shall not be greater than shown on the accompanying Drawings, parallel to the projection of the straight portion of the finished wall. The straight portion of the precast interlocking concrete block headwall shall be installed perpendicular to the drain banks. The Contractor shall also be required to backfill the area behind the new headwall with granular fill.

The Contractor shall also be required to satisfactorily backfill the area in behind the new headwall with granular fill as already specified in the preceding paragraphs for backfilling of the bridge culvert. The top elevation of the headwalls, opposite the travelled roadway, are to be set no less than 75mm (3"), below the existing ground elevation unless shown on the drawings. The alignment of these headwalls shall be performed to the satisfaction of the Drainage Superintendent or the Consulting Engineer. Block Headwalls shall be installed in accordance with the **"Precast Interlocking Concrete Block Headwall End Protection Details"** outlined herein.

Upon completion of the headwall installation, the Contractor shall also provide sloped quarried limestone erosion protection adjacent and along all of the new concrete headwalls, at the general locations and to the widths shown within the details included therein. Furthermore, the installation of the quarried limestone shall adhere to the parameters outlined in **Section IX. Sloped Quarried Limestone Erosion Protection – Concrete Block Headwalls.**

Concrete-Filled Jutebag Headwalls

When specified, the Contractor shall install new concrete jute bag headwalls at the locations and parameters indicated on the drawing. When constructing the concrete jute bag headwalls, the Contractor shall place the bags so that the completed headwall will have an inward batter from the bottom of the pipe to the top of the finished headwall. The slope of the headwall shall be one (1) unit horizontal to five (5) units vertical. The Contractor shall satisfactorily backfill behind the jutebag headwalls with granular material similar to the rest of the structure, and the same compaction levels specified herein for backfilling the adjacent culvert. 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 305mm (12") in thickness.

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 21MPa in 28 days and shall be provided and placed only as a wet mix. Under no circumstance 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 (18") x 660mm (26"). The jute bags shall be filled with concrete so that when they are laid flat, they will be approximately 100mm (4")

thick, 305mm (12") to 380mm (15") wide and 460mm (18") long. The completed jute bag headwalls shall be securely embedded a minimum of 500mm (20") measured perpendicular to the side slopes of the drain.

If indicated on the Drawings, daylighting may be installed off the travelled roadway, and the same are designed to deflect outwardly. The outward deflection shall be deflected at the specified angle to the straight portion of the finished headwall. The top elevations of the daylighted headwalls are to be set no less than 75mm (3") below the existing ground elevation unless otherwise designed. The alignment of these headwalls shall be performed to the satisfaction of the Drainage Superintendent or Consulting Engineer.

Upon completion of the jute bag headwall the Contractor shall cap the top row of concrete-filled bags with a layer of plain concrete, minimum 150mm (6") thick, and hand trowelled to obtain a brushed finish appearance. If the cap is made more than 150mm thick, the Contractor shall provide two (2) continuous 15M reinforcing bars (or equivalent mesh) set at mid-depth and equally spaced in the cap. 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. All concrete used for the footing, cap and bags shall have a minimum compressive strength of 21MPa in 28 days and include 6% ± 1% air entrainment. Concrete-filled jute bag headwalls shall be installed in accordance with the **"Typical Concrete Filled Jute Bag Headwall End Protection Details"** outlined herein.

X. SLOPED QUARRIED LIMESTONE EROSION PROTECTION FOR VERTICAL HEADWALLS

Where it is necessary to take down any fence and/or structure to proceed with the work, same shall be done by the Contractor across or along that portion of the work where such fence and/or structure is located. The Contractor shall be required to exercise extreme care in the removal of any fencing and/or structure, to ensure minimum damage to same. The Contractor shall be required to replace any fence and/or structure that is taken down in order to proceed with the work, and the fence and/or structure shall be replaced in a neat and workmanlike manner. The Contractor shall not be required to procure any new materials for rebuilding the fence and/or structure provided that it has used reasonable care in the removal and replacement of same. When any fence and/or structure is removed by the Contractor, and the Owner thereof deems it advisable and procures new material for replacing the fence and/or structure so removed, the Contractor shall replace the fence and/or structure using new materials and the materials from the present fence and/or structure shall remain the property of the Owner.

XI. ASPHALT PAVEMENT REMOVAL AND REPLACEMENT

The Contractor shall be required to neatly saw-cut the existing asphalt and shall be restored with fully compacted Granular "A" backfill and a minimum of 100mm thick hot mix asphalt, to be placed in a minimum two (2) equal lifts, or to the existing asphalt thickness if greater, to match the existing roadway elevation. All road asphalt shall be saw cut to a point 300mm beyond the trench limits. Furthermore, prior to the asphalt restoration, the Contractor shall provide a 600mm wide milled header to facilitate the asphalt repair. All of which shall be restored as shown in the "**Roadway Crossing Backfill Detail**" within the accompanying drawings. The Contractor shall be required to dispose of all removed asphalt material and shall compact the Granular "A" as well as the hot mix asphalt to 100% of Standard proctor Density, and complete all of the roadway restorations to the full satisfaction of the County of Essex Roads Department, the Drainage Superintendent, and the Consulting Engineer. If deemed necessary by the County of Essex Roads

Department, the Consulting Engineer shall arrange geotechnical consultation for the proper compaction of the road restoration. Any works associated with the facilitation of the geotechnical consultation shall be included within the Contractors' tender price.

The Contractor shall supply and place hot-mix asphaltic concrete pavement, conforming to O.P.S.S. Form 310, Type HL-3 base course and surface course. The Contractor shall supply asphaltic mix designs to the Engineer for approval prior to any asphalt being laid.

All equipment used for placing and compacting the asphalt shall be approved by the Engineer. A paver shall be used for spreading and initial compaction of the asphalt. It shall be equipped with a distributing screw in front, adjustable screeds and be capable of spreading the mixture without segregation, in thickness from 12.5mm to 75mm and in width from a minimum of 1.80 metres to a maximum width of 4.00 metres, in increments of 0.15 metres. It shall also be equipped with a 3.00 metres straight edge for detecting variations from horizontal of 3.8mm in 3.00 metres.

The Contractor shall spread and compact the course of asphaltic concrete on a dry and solid base. The asphaltic concrete pavement delivered shall have a minimum temperature of 118 degrees Celsius (245 degrees F) and a maximum temperature of 150 degrees Celsius (300 degrees F) after spreading and prior to initial rolling. The Engineer shall reject any material which does not meet temperature requirements.

The Contractor shall hand spread asphaltic concrete at base widening, deep or irregular sections, intersections, turnouts, etc. The asphaltic concrete shall be rolled in accordance with O.P.S.S. Form 310. The Contractor shall compact the asphaltic concrete until 97% of the density achieved in the laboratory has been reached. Hand tampers shall be used to compact asphaltic concrete in areas where machines have no access. All joints, curbs, gutters, manholes, catch water basins and other structures at the point of contact with the asphaltic concrete, shall be painted with SS-1 Emulsion, O.P.S.S. Form 1102 or approved equal. The Contractor shall repair any faulty work under the Engineer's supervision.

XII. ANCILLARY WORK

During the course of any repair or improvements, the Contractor will be required to protect or extend any existing tile ends or swales to maintain the drainage from the adjacent lands. All existing tiles within the proposed alignment shall be extended utilizing Boss 1000 or equal plastic pipe of the same diameter as the existing tile and shall be installed in accordance with the **"Standard Lateral Tile Detail"** outlined herein unless otherwise noted. Connections shall be made using a Manufacturer's coupling wherever possible. Openings into new pipes shall be neatly saw-cut to the satisfaction of the Drainage Superintendent and/or the Consulting Engineer. For other connections, the Contractor shall utilize a grouted connection. Grouted mortar joints shall be composed of three (3) parts of clean, sharp sand to one (1) part of Portland Cement with just sufficient water added to provide a stiff plastic mix. The mortar joint shall be of sufficient mass around the full circumference of the joint on the exterior side to ensure a tight, solid seal. The Contractor is to note that any intercepted pipes along the length of the existing pipes are to be extended and diverted to the downstream end of the new pipe unless otherwise noted in the accompanying drawings.
Where the culvert installation interferes with the discharge of an existing swale, the Contractor shall re-grade the existing swales to allow for the surface flows to freely enter the drain. Any disturbed grass areas shall be fully restored with topsoil, seed and mulch. The Contractor shall also be required as part of the

culvert replacement to excavate and widen the drain bottom where required to fit the new pipes in order to provide a smooth transition between the new culvert installation and the existing drain.

The Contractor, when doing their excavation or any other portion of the work, shall be very careful not to interfere with, plug up or damage, any existing surface drains, swales and lateral or main tile ends. If it is found that said existing drains are interfered with in any way, the Contractor will be required to unplug or repair said drains immediately, at no extra cost to the project. If it is found that any existing lateral tiles or main tile drains or tile ends have been cut off or damaged in any way during the course of the work, the Contractor will be required to either repair or replace same, to the satisfaction of the Drainage Superintendent and the Consulting Engineer.

The Contractor shall take steps to protect all legal survey bars during the course of its work. If any bars are removed or damaged, the Contractor shall arrange for an Ontario Land Surveyor licensed in the Province of Ontario to replace same, all at its cost.

All of the work required towards the installation and improvements to all structures shall be performed in a neat and workmanlike manner and the general site shall be restored to its' original condition, and all of same is to be performed to the satisfaction of the Drainage Superintendent and the Consulting Engineer.

XIII. TOPSOIL, SEED AND MULCH

During the course of its excavation operations, the Contractor will be required to salvage all available topsoil. Where necessary, this material shall be stockpiled by the Contractor in order to avoid contamination and shall be utilized in carrying out the topsoil placement along all specified newly excavated and filled or disturbed areas, in preparation for the seeding and mulching operation to be carried out as part of the restoration works. The Contractor shall be required to use the scavenged topsoil stripped from the drain banks. The balance of the topsoil required shall be obtained by the Contractor at its own expense.

The Contractor shall be required to restore all existing grassed areas and drain side slopes damaged or disturbed by the structure installation and/or removal, and place topsoil and seed and mulch over said areas including any specific areas noted on the Drawings. The Contractor shall be required to provide all the material and to cover the above-mentioned surface areas with approximately 50mm of good, clean, dry topsoil on slopes and 100mm of good, clean, dry topsoil on horizontal surfaces, fine graded and spread in place ready for seeding and mulching. The Contractor is to note that prior to fine grading the topsoil over the backfilled areas, positive drainage is to be provided off of these areas and into the swales, and the Contractor shall also be required to make minor changes where necessary to ensure same. The Contractor shall be required to restore all existing grassed areas and roadway boulevard areas damaged by the culvert work and shall provide topsoil and seed and mulch over all of these areas. The placing and grading of all topsoil shall be carefully carried out according to Ontario Provincial Standard Specifications, Form 802, dated November 2010, or as subsequently amended or as amended by these Specifications. Once the topsoil has been properly placed and fine-graded, the Contractor shall seed and mulch the area. Seeding and mulching operations shall be carried out according to Ontario Provincial Standard Specifications, Form 572, dated November 2003, or as subsequently amended or as amended by these Specifications. The seeding mixture shall be OSECO Seed Mixture Canada No. 1, as available from Morse Growers Supply in Leamington, or equal. As part of the seeding and mulching operation, the Contractor will be required to

provide either a hydraulic mulch mix or a spread straw mulch with an adhesive binder in accordance with OPSS 1103.05.03 dated November 2016, or as subsequently amended, to ensure that the grass seed will be protected during germination and provide a thick, uniform cover to protect against erosion, where necessary. All work shall be completed to the satisfaction of the Drainage Superintendent or the Consulting Engineer.

All of the work relative to the placement of topsoil and the seeding and mulching operation shall be meticulously done and completed in a good and workmanlike manner all to the satisfaction of the Drainage Superintendent or Consulting Engineer.

XIV. FINAL CLEANUP AND RESTORATION

The whole of the work shall be satisfactorily cleaned up, and during the course of the construction, no portion shall be left in any untidy or incomplete state before subsequent portions are undertaken.

All roadways, driveways and access bridges, or any other means of access onto the job site shall be fully restored to their former condition at the Contractor's expense. Before authorizing Final Payment, the Drainage Superintendent or the Consulting Engineer shall inspect the work in order to be sure that the proper restoration has been performed. In the event that the Contractor fails to satisfactorily clean up any portion of these accesses, the Consulting Engineer shall order such cleanup to be carried out by others and the cost of same to be deducted from any monies owing to the Contractor.

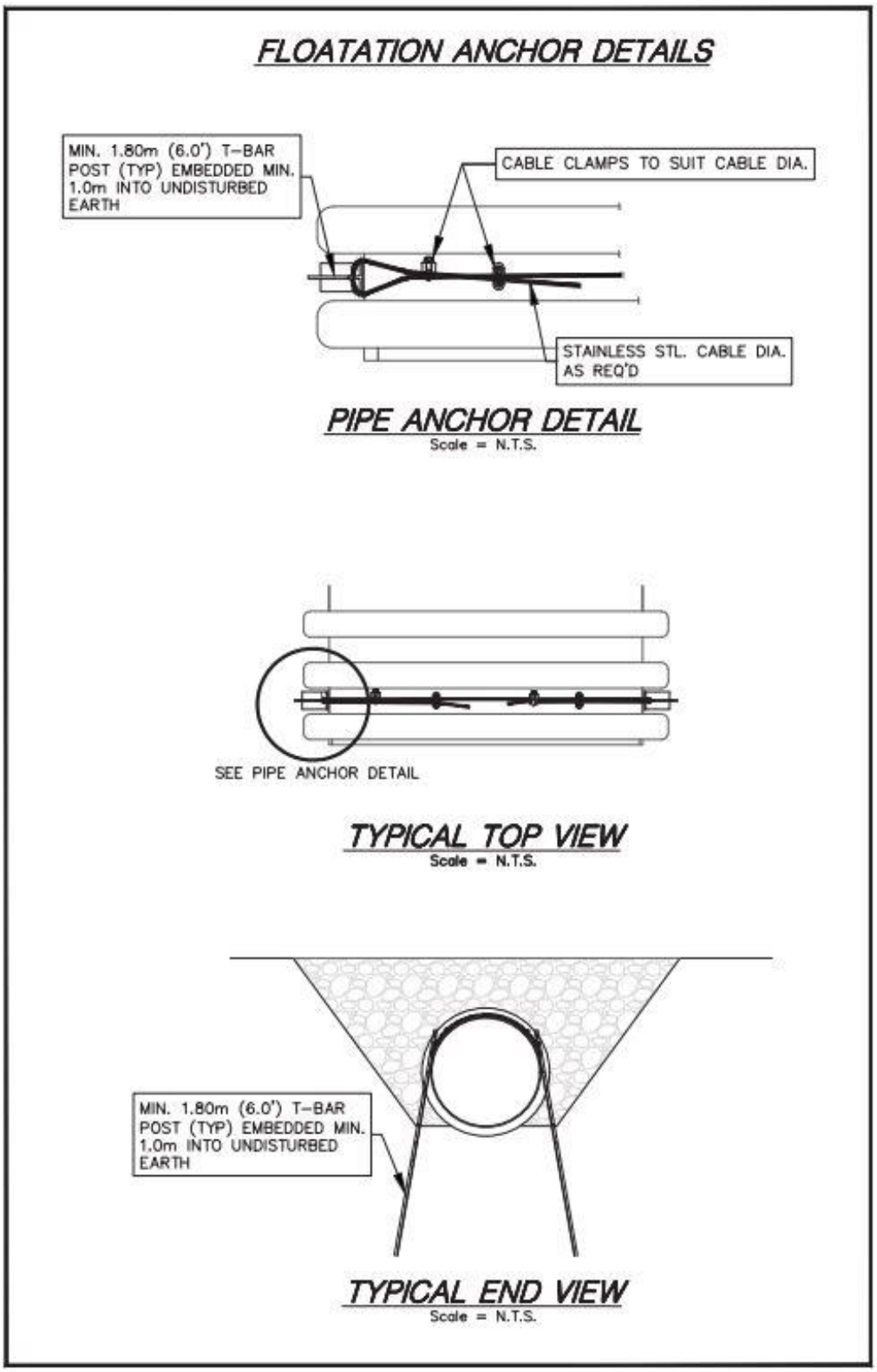

Figure 1 – Flotation Anchor Details

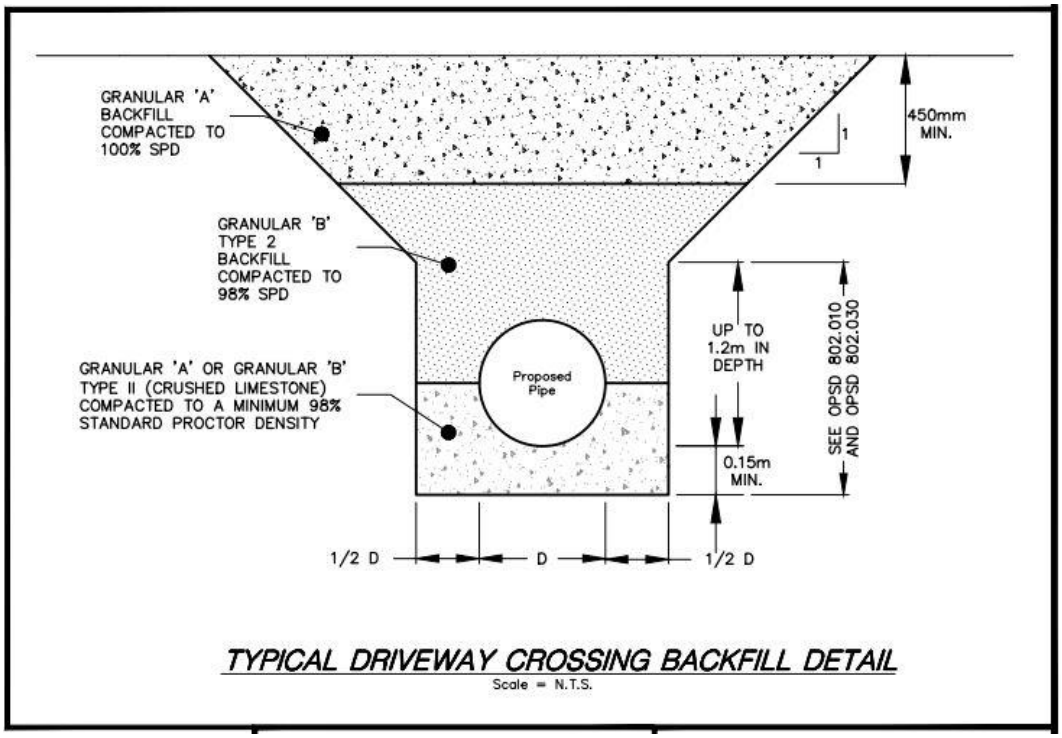

Figure 2 – Typical Driveway Crossing Backfill Detail

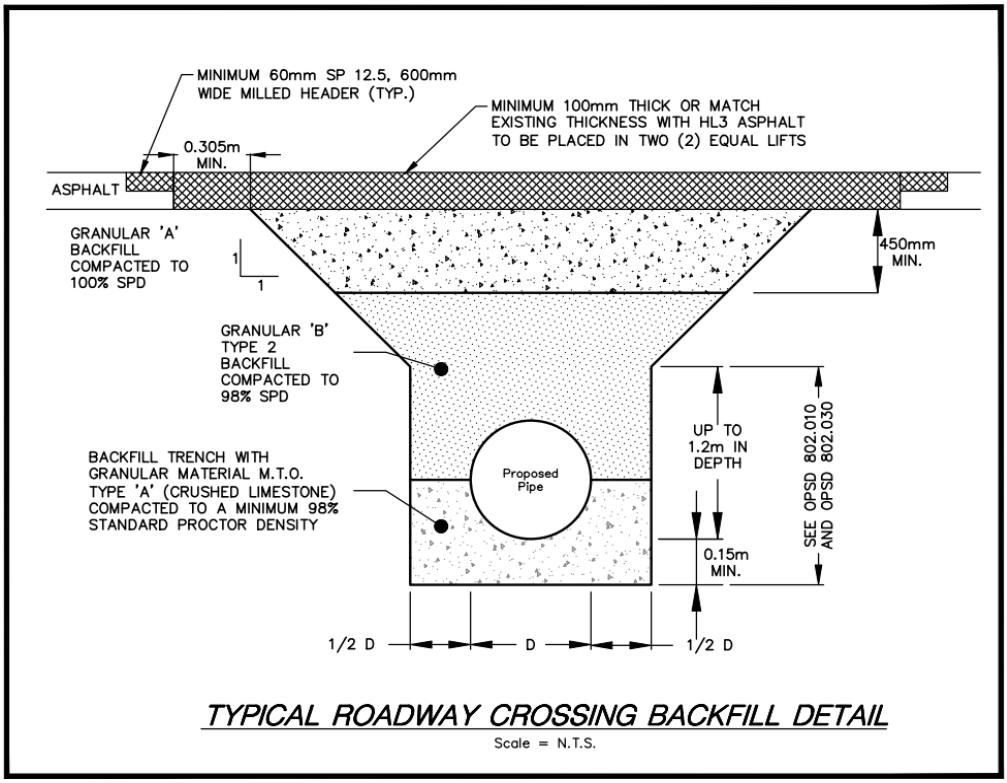

Figure 3 – Typical Roadway Crossing Backfill Detail

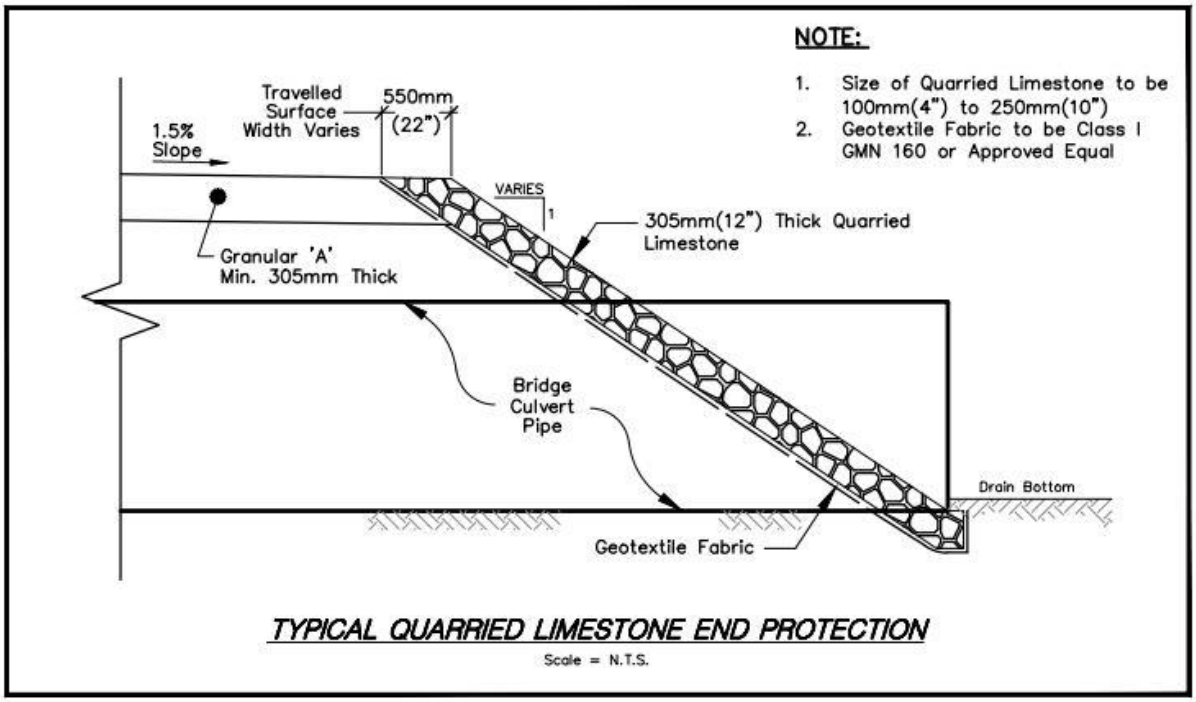

Figure 4 – Typical Quarried Limestone End Protection

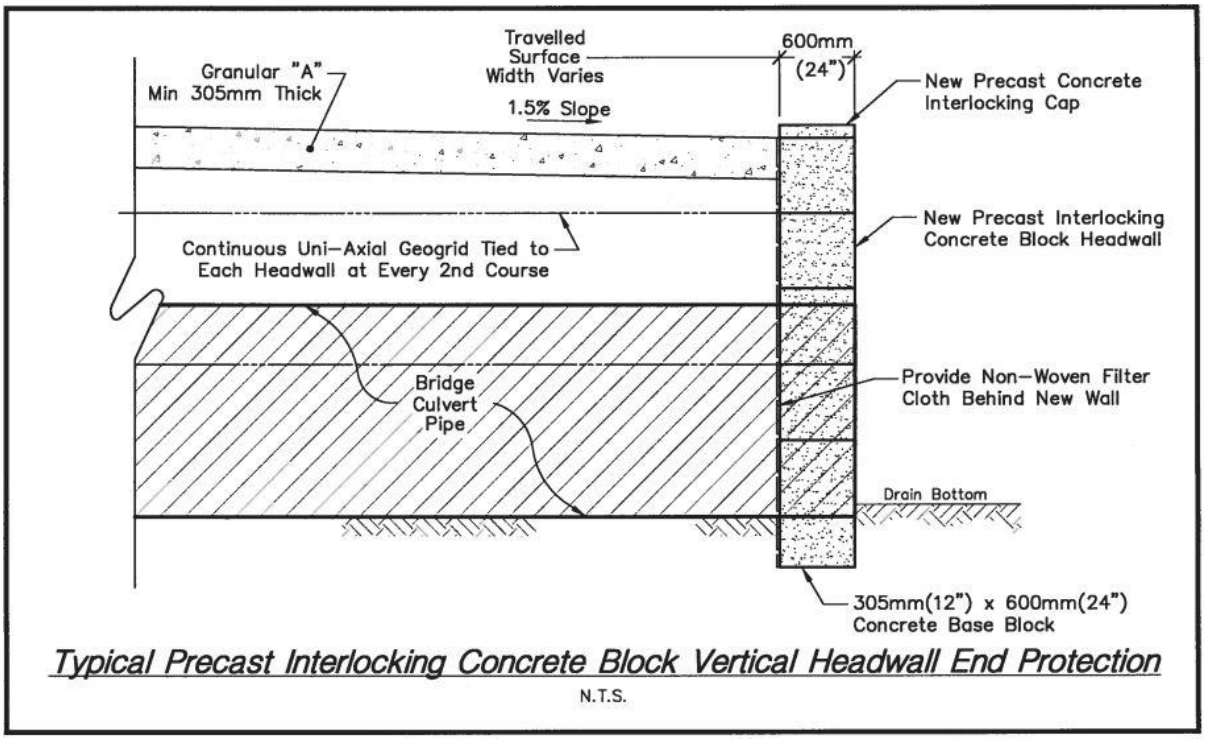

Figure 5– Typical Precast Interlocking Concrete Block Vertical Headwall End Protection

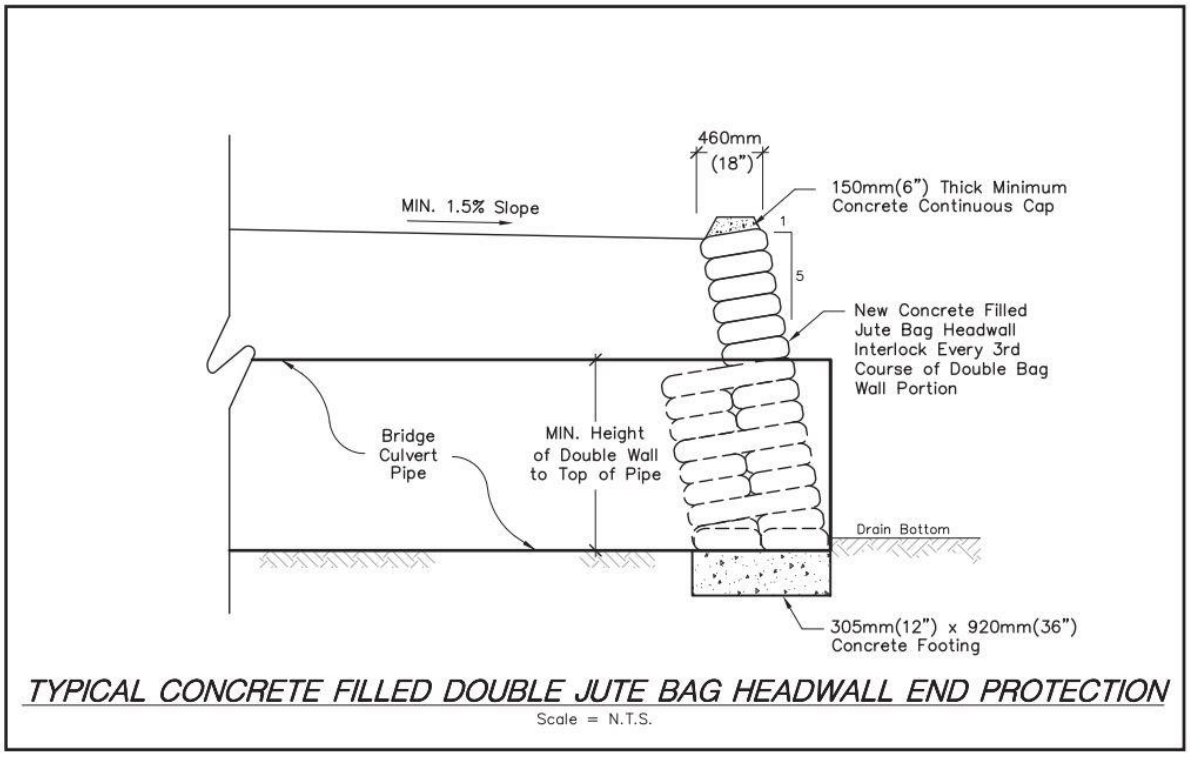

Figure 6– Typical Concrete Filled Double Jute Bag Headwall End Protection

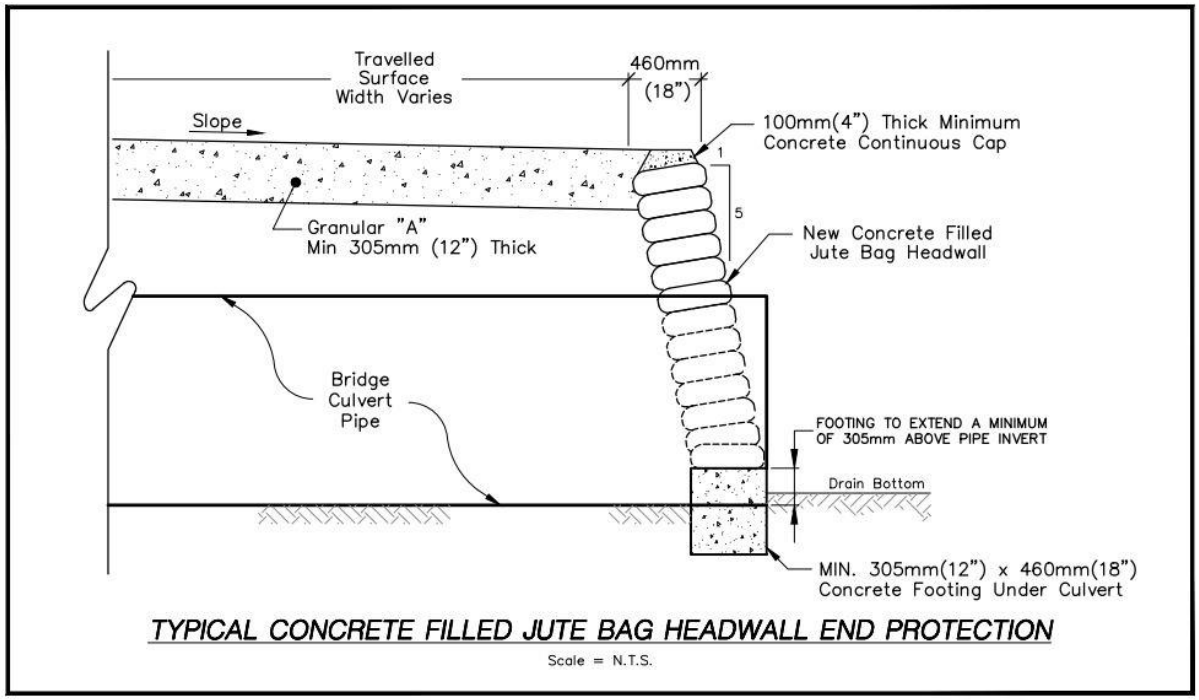

Figure 7– Typical Concrete Filled Jute Bag Headwall End Protection

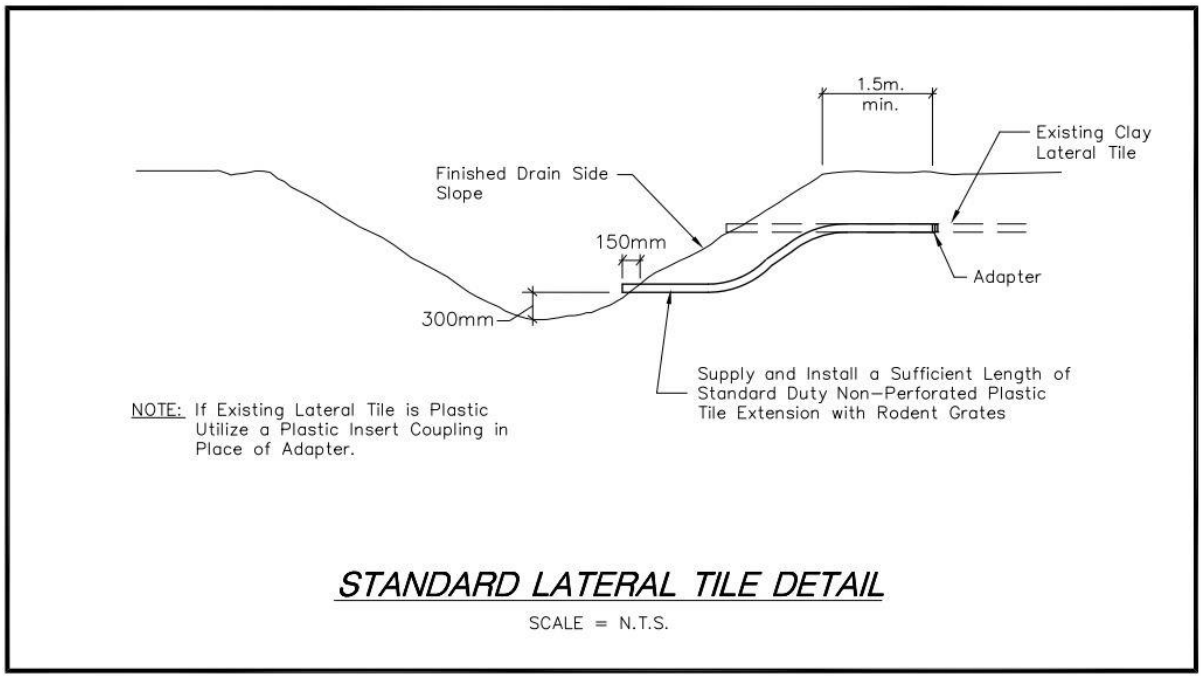

Figure 8– Standard Lateral Tile Detail

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SPECIAL PROVISIONS

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I. GENERAL SCOPE OF WORK

These specifications, along with the Report, Appendices, Standard Specifications and the accompanying drawings, consider the furnishings of all labour, equipment and materials required for the performance of all operations related to the drain improvements on the J.C. Smith Drain and the McPherson Drain, within the Geographic Township of Sandwich South. The J.C. Smith Drain and the McPherson Drain are open Municipal Drains located along the east side and west side of 10th Concession Road, respectively. The south limit of the Municipal Drains is County Road 8, and the north limit is South Talbot Road. The south portion of both Municipal Drains outlets to the Colchester Townline Drain, the middle portion of both Municipal Drains outlets to the Webster Drain and the north portion of the Municipal Drains outlets to the West Branch of the Delisle Drain. The work under this project comprises of the removal and replacement of several bridges and enclosures, the installation of several new bridges and enclosures and the cleaning of both Municipal Drains.

The Contractor shall provide all labour, equipment and materials to complete the drain improvements along the entire length of both open drains, together with the removal and replacement of sixteen (16) existing access bridges and enclosures, the removal and disposal of three (3) existing access bridges, the installation of two (2) new access bridges, flushing, cleaning, lowering and improving of twelve (12) existing culvert pipes, the removal and replacement of three (3) and the capping and abandoning of two (2) existing road crossing culverts under the 10th Concession Road. These works include the removal of existing culverts and headwalls, the installation of new culvert pipes, new end protection comprising of sloped quarried limestone end protection, granular bedding, granular approach and backfill, granular transition areas, and all ancillary work related thereto including cleanup and restoration. The proposed work is intended to address the cleaning of the open drain and the replacement of deteriorated structures in accordance with the current standards. The Contractor is advised that the existing culverts that are not being improved shall be cleaned out as part of the work under this project.

All work shall be carried out in accordance with these Special Provisions and Standard Specifications that serve to supplement and/or amend the current Ontario Provincial Standard Specifications and Standard Drawings, adopted by the Ontario Municipal Engineers Association. The Contractor shall review the information outlined within **Appendix "A"**. The works shall be further carried out in accordance with the accompanying drawings labelled herein as **Appendix "B"**. Where there are differences between the Special Provisions and the Standard Specifications included herein, the Special Provisions shall govern. The works shall be of the size, type, depth, etc., as is shown in the accompanying drawings, as determined from the **Benchmark**, and as may be further laid out at the site at the time of construction. All work carried out under this project shall be completed to the satisfaction of the Drainage Superintendent or the Consulting Engineer.

II. CONSERVATION AUTHORITY AND DFO CONSIDERATIONS

The Contractor shall be required to implement stringent erosion and sedimentation controls during the course of the work to minimize the amount of silt and sediment being carried downstream. It is intended that work on this project be carried out during relatively dry weather to ensure the proper site and drain conditions and to avoid conflicts with sediment being deposited into the outlet drainage systems. All disturbed areas shall be restored as quickly as possible with grass seeding and mulching installed to ensure a protective cover and to minimize any erosion from the work site subsequent to construction. The Contractor may be required to provide temporary silt fencing and straw bales as outlined further in these specifications.

All of the work shall be carried out in accordance with any permits or authorizations issued by the Conservation Authority or the Department of Fisheries and Oceans (DFO), copies of which shall be provided, if available. The Contractor is advised that no work shall be carried out in the existing drain from March 15 to July 15, of any given year.

As part of its work, the Contractor shall implement the following measures that shall ensure that any potential adverse effects on fish and fish habitat shall be mitigated:

a) As per standard requirements, work shall not be conducted at times when flows in the drain are elevated due to local rain events, storms, or seasonal floods. Work shall be done in the dry.

b) All disturbed soils on the drain banks and within the channel, including spoil, must be stabilized immediately upon completion of work. The restoration of the site must be completed to a like or better condition than what existed prior to the works. The spoil material must be hauled away and disposed of at a suitable site or spread an appropriate distance from the top of the drain bank to ensure that it is not washed back into the drain.

c) 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 its contractors to ensure that sediment and erosion control measures are functioning properly and are maintained/upgraded as required.

d) Silt or sand accumulated in the barrier traps must be removed and stabilized on land once the site is stabilized.

e) All activities including maintenance procedures should be controlled to prevent the entry of petroleum products, debris, rubble, concrete, or other deleterious substances into the water. Vehicular refueling and maintenance should be conducted away from the water.

Not only shall the Contractor comply with all of the above, but it shall also be required to further comply with any mitigation measures included within the email correspondence with the Conservation Authority. Furthermore, the Contractor shall also review and comply with the "Best Management Practices – Culvert Replacements in Municipal Drains" document prepared by the DFO, included within **Appendix "A"**.

III. MECP CONSIDERATIONS

Under the Species at Risk Provincial Legislation, set in place with the Ministry of Environment, Conservation and Parks (MECP), Section 23.9 of the Endangered Species Act, 2007, allows the Municipality to conduct eligible repair, maintenance, and improvement work under the Drainage Act that exempts these works from Sections 9 and 10 of this Act, so long as they follow the rules within Ontario Regulation 242/08.

In recognition of the potential impacts that Species at Risk may experience as a result of the subject works, the Town of Tecumseh has provided comprehensive mitigation measures as well as species identification guides for reference. These documents, entitled "*Species at Risk Mitigation Plan for Drainage Works*" will be provided to the Contractor. With the results of said review, including documents for the purpose of identification of known Species at Risk within the project area and mitigation measures for species and habitat protection. It is the responsibility of the Contractor to make certain that necessary provisions are undertaken to ensure the protection of all Species at Risk and their habitats throughout the course of construction.

The Contractor will be responsible for providing the necessary equipment and materials required by the mitigation plans and shall contact the Drainage Superintendent immediately if any Endangered Species are encountered during construction.

IV. ACCESS TO WORK

The Contractor is advised that the majority of the work to be carried out on this project extends along both sides of the 10th Concession Road, and along the course of the existing open Municipal Drains within private lands. The Contractor shall have access for the full width of the roadway abutting the proposed drainage works. The Contractor may use the entire width of the 10th Concession Road, and South Talbot Road rights-of-way as necessary to permit the completion of the work required to be carried out for this project.

When conducting work on the open drains, the Contractor shall gain access to the J.C. Smith Drain and McPherson Drain from the 10th Concession Road. The Contractor shall also have the means of accessing onto private lands by utilizing existing access bridges and culverts where deemed necessary, provided that they shall be responsible for any damage caused to same by their operations.

V. WORKING CORRIDORS AND OPEN DRAIN MAINTENANCE PROVISIONS

The Contractor is advised that the majority of the work to be carried out on this project extends along the east and the west sides of the 10th Concession Road.

Once access is obtained onto the site, the Contactor shall be expected to keep the construction equipment and forces within the following areas, and execute the specified provisions:

1) J.C. Smith Drain:

   The Contactor shall utilize the west side of the J.C. Smith Drain for a distance of 6.1 metres (20 ft.), measured from the west top of drain bank, for the excavation and levelling of spoil materials when working within agricultural fields.

2) McPherson Drain:

   The Contactor shall utilize the east side of the McPherson Drain for a distance of 6.1 metres (20 ft.), measured from the east top of drain bank, for the excavation and levelling of spoil materials when working within agricultural fields.

The Contractor shall refer to the "Standard Specifications for Open Drains" when working in areas adjacent to lawns, residential properties, paddocks, cedar lines, or woodlots. In the event that a landowner owns property on both sides of the drain, the landowner can choose which side of the drain to place the spoil. The landowner shall notify the Drainage Superintendent of their preference of spoil placement prior to the commencement of the works on the drain.

Any damages caused, resulting from non-compliance of the above noted provisions, shall be restored by the Contractor to its original condition, at the Contractor's expense.

VI. EXCAVATION, REMOVALS AND DISPOSAL

The open drain shall be excavated to the lines, levels, grades and cross sections as shown on the accompanying drawings or as may be further established by the Town Drainage Superintendent or the Consulting Engineer at the time of the work. The drain shall be carefully excavated so as to not disturb the existing banks, rock protection, and vegetation, except for those portions of the drain where widening or restoration of a stable drain bank configuration is required. Where existing rock protection has to be removed to provide the proposed bank protection, the Contractor shall salvage the rock and use same to carry out the required bank protection as outlined further in these specifications. The bottom width of the drain and the side slopes of the excavation shall conform to the dimensions given on the drawings. In no case shall the drain bottom project above the grade line as shown on the accompanying drawings, and as determined from the Benchmarks. The finished side slopes of the drain shall be no steeper than 1.5 horizontal to 1.0 vertical on both the roadside and on the landward side. The Contractor shall be very careful to not unnecessarily deepen the drain. In the event that over-excavation of the drain has occurred, and drain banks have been compromised, the Contractor will not be permitted to place native fill compacted into place and reshaping. In this case, the Contractor will be required to obtain a Licensed Professional Engineer, at its own expense, to prepare a repair detail to ensure that long-term stability is maintained. Such repairs shall be subject to approval of the Town Drainage Superintendent and/or the Consulting Engineer. No extras shall be charged to the project for over-excavation repairs.

The Contractor should visit the drain site and confirm for itself the extent of trucking required on this project. All culverts, bridges, and enclosures, along the drain being maintained on this project are to be flushed out and cleaned to the same grades and widths as the design parameters provided and attached herein for the drains and the cleaning out of all of same shall be performed to the full satisfaction of the Town Drainage

Superintendent and/or Consulting Engineer. All of the excavated material within existing culverts and across the full width of the municipal roadways, including all of the sediment material cleaned from within the structures shall be completely trucked away by the Contractor and disposed of at its own expense. All areas disturbed by these works shall be fully restored to their original condition at the Contractor's expense.

VII. SPECIAL PROVISIONS FOR ACCESS STRUCTURE REPLACEMENT AND IMPROVEMENTS

General

The Contractor shall provide all material, labour, and equipment to replace the existing access bridges, enclosures, and road crossings within the J.C. Smith Drain and McPherson Drain requiring work, as outlined on the plans, the Schedule of items, and in these specifications.

The existing culvert pipes slated to be removed from the existing access bridges and enclosures along the J.C. Smith Drain and McPherson Drain shall be replaced with new Aluminized Steel Type II Corrugated Hel-Cor Pipe, or with new 320 kPa, Smooth Wall HDPE pipe, with all pipes having the minimum thickness, corrugation profiles and strength as shown on the plans. All road crossings slated to be removed shall be replaced with 320 kPa smoothwall HDPE pipe culvert, assembled with the use of bell and spigot-type joints with rubber gaskets. All culvert pipes within this project shall be set to the grades as shown on the plans or as otherwise established herein and the Town Drainage Superintendent or the Consulting Engineer may make minor changes to the bridge alignment as they deem necessary to suit the site conditions.

Flushing and Cleaning of Culverts

For all bridges not being replaced, the Contractor shall clean through the existing structures to remove all sediment and accumulated materials and provide for the drain cross-section as shown on the profiles and plans. All cleaning and flushing work shall be carried out to the complete satisfaction of the Town Drainage Superintendent and/or the Consulting Engineer. The Contractor will be required to remove all materials taken out of the access culverts and haul away and dispose of same at a site to be obtained by it at its own expense.

The following culverts within the J.C. Smith Drain and the McPherson Drain shall remain in place and shall be cleaned through according to these specifications:

J.C. Smith Drain

1. Bridge 1W (Town of Tecumseh & Mergl Seeds Ltd., 410-02540)
2. Bridge 6W (Gregory Markham, 410-02400)
3. Bridge 7W (Gregory Markham, 410-02400)
4. Bridge 9W (Gerard & Cindy Revenberg, 410-02200)
5. Bridge 10W (Town of Tecumseh Water Department)
6. Bridge 11W (Gianni & Shirley Sfalcin, 410-02100)
7. Bridge 12W (Amandeep & Jaspal Bains, 410-02000)
8. Enclosure 17W (Shirley Wilson, 410-01900)

McPherson Drain

9. Bridge 1E (Town of Tecumseh)

Road Crossings

10. Road Crossing 6C (Town of Tecumseh)

In the future, when repair, improvement, or replacement is required on any of the culverts not being replaced at this time, the Contractor shall complete all such work in accordance with the charts accompanying the details on the plans. The Contractor may utilize the same or equivalent end treatments materials. However, should the Landowner or Drainage Superintendent wish to use an alternative end treatments design, they may do so by making the appropriate adjustments to the pipe lengths as noted on the charts accompanying the details on the plans.

Culvert Replacement and Improvements - J.C. Smith Drain

The Contractor shall provide for the construction and improvements to the structures along the J.C. Smith Drain. We are providing below not only the general description of the works being carried out for each structure, but also detailed information regarding any special provisions also being provided as part of the structure improvements, as follows:

Bridge 2W - (Mergl Seeds Ltd. 410-02540)

The Contractor shall supply all equipment, material and labour required to remove and dispose of the existing CSP culvert pipe, broken concrete end treatments, and the existing large tree adjacent to the culvert. The Contractor shall restore the drain to the proposed drain cross-section parameters, complete with topsoil, seed, and mulch per the details for **Bridge No. 2W**.

Enclosure 2P - (Adam Lacey & Anita Marinelli 410-02530)

The Contractor is advised that the access bridge portion of this property has been installed prior to the completion of this report. The enclosure portion of this access is a Provisional item and may be constructed at a later date, as specified by the landowner.

The enclosure portion of the access shall be installed and maintained in accordance with the plans, cross-sections and profile accompanying the details on the plans for **Enclosure No. 2P**. The contractor shall note that as part of the works for Enclosure No. 2P, a proposed catch basin shall be located at the property line between M.N. 7035 and M.N. 7205 and connected to the south end of **Bridge No. 3W**. The Contractor shall also note that the swale that enters the drain between the two properties is also to be diverted such that it outlets into the proposed catch basin.

Bridge 3W - (William & Joanne Leon 410-02500)

The Contractor shall completely remove the existing culvert pipe and any end protection and dispose of same as outlined previously in these specifications. The Contractor shall then supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Bridge No. 3W**. The Contractor's attention

is drawn to the existing swale at the southerly end of the bridge located between M.N. 7035 and M.N. 7205. The Contractor shall divert same as necessary so that it will outlet through the rock protection on the pipe end and discharge freely to the drain. The Contractor shall also note that once **Enclosure No. 2P** is installed, the south end of **Bridge No. 3W** shall be connected to the proposed catch basin located at the property line between M.N. 7035 and M.N. 7205. At that time, the aforementioned swale shall be diverted such that it outlets into the proposed catch basin.

Enclosure 4W - (William & Joanne Leon 410-02500)

The Contractor shall completely remove the existing corrugated steel pipe and end treatments and dispose of same as outlined previously in these specifications. The Contractor shall then supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Enclosure 4W** on the plans. Enclosure 4W shall be backfilled according to the preceding specifications, and according to the Typical Backfill Details included in the accompanying drawings.

The Contractor shall also note the existing tree south of the existing asphalt driveway shall be removed in order to facilitate the installation of the new enclosure pipe. The Contractor shall protect all other existing trees located adjacent to the proposed driveway.

The Contractor shall also be required to neatly saw-cut the existing asphalt driveway and provide a new asphalt surface within the limits of the saw-cut as detailed on the plans. The asphalt driveway shall be restored using compacted granular materials as set out in the general specifications and as shown on the drawings. The Contractor shall provide a minimum 100mm thick, compacted hot mix HL-3 asphalt to restore the existing asphalt driveway or match the existing thickness of the existing asphalt that is there.

The Contractor's attention is also drawn to the presence of an existing hydro pole and support wire located in the vicinity of the proposed work. The Contractor shall make every effort to avoid the hydro pole and support wire and shall at all times be responsible for their protection and care throughout the course of the work. Prior to commencing work, a pre-construction meeting shall be held where a representative from Hydro One shall be invited to discuss the particulars of working around these hydro poles and support wires. Should additional support, bracing, and or holding of the existing hydro pole be required by Hydro One, the Contractor shall be responsible for arranging with Hydro One to ensure that these measures are implemented to the full satisfaction of the utility company.

Bridge 5W - (Town of Tecumseh Water Department)

The Contractor shall carefully excavate and remove the existing corrugated steel pipe and end treatments as outlined previously in these specifications. This pipe is to be delivered to the Town of Tecumseh Public Works yard. The Contractor shall supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Bridge No. 5W**. The Contractor shall provide sloped quarried limestone end treatments at each end of the culvert.

The Contractor's attention is drawn to an existing water service, water metre, fire hydrant and hydrant valve that are all located adjacent to the existing culvert pipe. It is the Contractor's responsibility to protect said water components at all times during excavations and installation of the new enclosure pipe. If the water service line or hydrant lead is found to be in direct conflict with the proposed culvert pipe, the Contractor is to notify the Town Drainage Superintendent or Consulting Engineer immediately so that the Town Water Department can

make provisions to lower the water service as necessary to avoid conflict with the new culvert pipe. The Contractor shall not in any way perform any work on the water service or water metre without explicit permission and supervision from the Town Water Department. The Contractor is to consider all of this when pricing the installation of the new enclosure and should note that no additional payments will be made due to the existence of or conflict with the existing water service, metre, hydrant, hydrant valve or hydrant lead.

Bridge 8W - (Town of Tecumseh Water Department and Gregory Price 410-02300)

The Contractor shall carefully excavate and remove the existing end treatments and provide new sloped quarried limestone end protection on non-woven filter cloth at both end of the existing culvert.

Bridge 10W - (Town of Tecumseh Water Department)

The Contractor shall carefully excavate and remove the existing CSP culvert that comprises Bridge 10W, as shown on the accompanying plans. This pipe is to be delivered to the Town of Tecumseh Public Works yard. The Contractor shall supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Bridge No. 10W**. The Contractor shall provide sloped quarried limestone end treatments at each end of the culvert.

The Contractor's attention is drawn to an existing water service, water metre, fire hydrant and hydrant valve that are all located adjacent to the existing culvert pipe. It is the Contractor's responsibility to protect said water components at all times during excavations and installation of the new enclosure pipe. If the water service line or hydrant lead is found to be in direct conflict with the proposed culvert pipe, the Contractor is to notify the Town Drainage Superintendent or Consulting Engineer immediately so that the Town Water Department can make provisions to lower the water service as necessary to avoid conflict with the new culvert pipe. The Contractor shall not in any way perform any work on the water service or water metre without explicit permission and supervision from the Town Water Department. The Contractor is to consider all of this when pricing the installation of the new enclosure, and should note that no additional payments will be made due to the existence of or conflict with the existing water service, metre, hydrant, hydrant valve or hydrant lead.

Bridge 13W - (Andrew & Jodi Brewin 410-02010)

The Contractor is advised that the bridge has been removed prior to the completion of this report. Therefore, no work is required to this access structure.

Enclosure 14W - (Andrew & Jodi Brewin, 410-02010) and Amandeep & Jaspal Baines (410-02000)

The Contractor shall completely remove the existing corrugated steel pipe, catch basins, and end treatments and dispose of same as outlined previously in these specifications. The Contractor shall then supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Enclosure 14W**. Enclosure 14W shall be backfilled according to the preceding specifications, and according to the Typical Backfill Details included in the accompanying drawings.

The Contractor shall also supply and install two (2) in-line catch basins at Stations 1+540.1 and 1+558.3 as illustrated within the accompanying drawings. These catch basins shall be comprised of a 600mm diameter, 320kPa, smoothwall interior, HDPE plastic pipe. Both new catch basins shall be joined to the enclosure using 525mm diameter eccentric reducers. The new catch basins, once installed, shall also be required to have a new,

cast iron, inset catch basin grate from Underground Specialties Inc. or approved equal. The new in-line catch basins being provided as part of the drainage work has been included to collect surface water flows from the adjacent boulevard and swale and therefore shall be set 50mm below the adjacent ground elevation.

The Contractor shall also note a number of existing trees located adjacent to the alignment of the existing enclosure pipe that shall be removed in order to facilitate the removal of the existing pipe and the installation of the new enclosure pipe. The Contractor shall protect all other existing trees in the area unless otherwise noted on the accompanying drawings.

The Contractor's attention is drawn to an existing water service, water metre, fire hydrant and hydrant valve that are all located adjacent to the existing culvert pipe. It is the Contractor's responsibility to protect said water components at all times during excavations and installation of the new enclosure pipe. If the water service line or hydrant lead is found to be in direct conflict with the proposed culvert pipe, the Contractor is to notify the Town Drainage Superintendent or Consulting Engineer immediately so that the Town Water Department can make provisions to lower the water service as necessary to avoid conflict with the new culvert pipe. The Contractor shall not in any way perform any work on the water service or water metre without explicit permission and supervision from the Town Water Department. The Contractor is to consider all of this when pricing the installation of the new enclosure, and should note that no additional payments will be made due to the existence of or conflict with the existing water service, metre, hydrant, hydrant valve or hydrant lead.

The Contractor’s attention is also drawn to the presence of an existing hydro pole and support wire located in the vicinity of the proposed work. The Contractor shall make every effort to avoid the hydro pole and support wire and shall at all times be responsible for their protection and care throughout the course of the work. Prior to commencing work, a pre-construction meeting shall be held where a representative from Hydro One shall be invited to discuss the particulars of working around these hydro poles and support wires. Should additional support, bracing, and or holding of the existing hydro pole be required by Hydro One, the Contractor shall be responsible for arranging with Hydro One to ensure that these measures are implemented to the full satisfaction of the utility company.

For all existing pipe connections to the new covered drain, the Contractor shall utilize manufacturer fittings, insert-a-tee, or mortar joint connections at both ends. The mortar joint shall be provided between the connection to the covered drain, with same being of sufficient mass to produce a sealed joint, all to be performed to the full satisfaction of the Town Drainage Superintendent or Consulting Engineer. The Contractor shall also be required to cut and trim the portion of the lateral pipe inside of the covered drain pipe to the full satisfaction of the Town Drainage Superintendent or Consulting Engineer. The Contractor is to note that any intercepted pipes along the length of the covered drain are to be extended and connected to the new pipe unless otherwise noted in the accompanying drawings. Lateral drains shall be extended with high density polyethylene pipe equivalent in diameter to the existing lateral drain. The Contractor shall provide all of the equipment, labour, and materials required to connect all said tile at no additional cost to the project, and all of same shall be performed to the full satisfaction of the Town Drainage Superintendent or the Consulting Engineer and shall not be backfilled until it is inspected by them.

At both ends of the new enclosure, the Contractor shall provide a sloped quarried limestone end treatment, all carried out in accordance with these specifications.

Bridge 15W - (Town of Tecumseh Water Department)

The Contractor shall carefully excavate and remove the existing CSP culvert that comprises Bridge 15W, as shown on the accompanying plans. This pipe is to be delivered to the Town of Tecumseh Public Works yard. The Contractor shall supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Bridge No. 15W**. The Contractor shall also note the existing wire fence located along the adjacent, western property line. If required, the Contractor shall carefully remove said fence to facilitate the installation of the culvert pipe. The re-installation of the fence shall be the complete responsibility of the Contractor, all as outlined within these specifications. The Contractor shall provide sloped quarried limestone end treatments at each end of the culvert.

The Contractor's attention is drawn to an existing fire hydrant and hydrant valve that are all located adjacent to the existing culvert pipe. It is the Contractor's responsibility to protect said hydrant and valve water components at all times during excavations and installation of the culvert pipe. If the hydrant lead is found to be in direct conflict with the proposed culvert pipe, then the Contractor is to notify the Town Drainage Superintendent or Consulting Engineer immediately so that the Town Water Department can make provisions to lower the hydrant lead as necessary to avoid conflict with the new culvert pipe. The Contractor shall not in any way perform any work hydrant, valve, or hydrant lead without explicit permission and supervision from the Town Water Department. The Contractor is to consider all of this when pricing the installation of the new enclosure, and should note that no additional payments will be made due to the existence of or conflict with the existing hydrant, hydrant valve or hydrant lead.

Bridge 16W - (Shirley Wilson 410-01900)

The Contractor shall completely remove the existing corrugated steel pipe and any end protection and dispose of same as outlined previously in these specifications. The Contractor shall then supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Bridge No. 16W**. The Contractor shall also note the existing fence and gate located along the adjacent, western property line. If required, the Contractor shall carefully remove said fence and gate to facilitate the installation of the culvert pipe. The re-installation of the fence shall be the complete responsibility of the Contractor, all as outlined within these specifications. The Contractor shall provide sloped quarried limestone end treatments at each end the new culvert installation.

Enclosure 17W - (Shirley Wilson 410-01900)

The Contractor shall carefully excavate and remove the existing end treatments and provide new sloped quarried limestone end protection on non-woven filter cloth at both end of the existing culvert.

However, in the future, when it is deemed necessary to replace this enclosure, the Contractor shall completely remove the existing corrugated steel pipe, and end treatments and dispose of same as outlined previously in these specifications. The Contractor shall then supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Enclosure 17W**. Enclosure 17W shall be backfilled according to the preceding specifications, and according to the Typical Backfill Details included in the accompanying drawings.

The Contractor's attention is drawn to an existing water metre and service lead that is located adjacent to the existing culvert pipe. It is the Contractor's responsibility to protect said water components at all times during

excavations and installation of the new enclosure pipe. If the water service line is found to be in direct conflict with the proposed culvert pipe, the Contractor is to notify the Town Drainage Superintendent or Consulting Engineer immediately so that the Town Water Department can make provisions to lower the water service as necessary to avoid conflict with the new culvert pipe. The Contractor shall not in any way perform any work on the water service or water metre without explicit permission and supervision from the Town Water Department.

The Contractor's attention is also drawn to the presence of an existing hydro pole located in the vicinity of the proposed work. The Contractor shall make every effort to avoid the hydro pole and shall at all times be responsible for their protection and care throughout the course of the work. Prior to commencing work, a pre-construction meeting shall be held where a representative from the hydro company shall be invited to discuss the particulars of working around this hydro pole. Should additional support, bracing, and or holding of the existing hydro pole be required by the hydro company, the Contractor shall be responsible for arranging same to ensure that these measures are implemented to the full satisfaction of the utility company.

For all existing pipe connections to the new covered drain, the Contractor shall utilize manufacturer fittings, insert-a-tee, or mortar joint connections at both ends. The mortar joint shall be provided between the connection to the covered drain, with same being of sufficient mass to produce a sealed joint, all to be performed to the full satisfaction of the Town Drainage Superintendent or Consulting Engineer. The Contractor shall also be required to cut and trim the portion of the lateral pipe inside of the covered drain pipe to the full satisfaction of the Town Drainage Superintendent or Consulting Engineer. The Contractor is to note that any intercepted pipes along the length of the covered drain are to be extended and connected to the new pipe unless otherwise noted in the accompanying drawings. Lateral drains shall be extended with high density polyethylene pipe equivalent in diameter to the existing lateral drain. The Contractor shall provide all of the equipment, labour, and materials required to connect all said tile at no additional cost to the project, and all of same shall be performed to the full satisfaction of the Town Drainage Superintendent or the Consulting Engineer and shall not be backfilled until it is inspected by them.

At both ends of the new enclosure, the Contractor shall provide a sloped quarried limestone end treatment, all carried out in accordance with these specifications.

Bridge 18W - (Town of Tecumseh Water Department)

The Contractor shall carefully excavate and remove the existing corrugated steel pipe for reuse. Once removed, the Contractor shall then re-install the existing CSP pipe as set out in the plans, cross sections and profile forming part of the details for **Bridge No. 18W**. The Contractor shall provide sloped quarried limestone end treatments at each end of the culvert.

The Contractor's attention is drawn to an existing fire hydrant and hydrant valve that are all located adjacent to the existing culvert pipe. It is the Contractor's responsibility to protect said hydrant and valve water components at all times during excavations and installation of the culvert pipe. If the hydrant lead is found to be in direct conflict with the proposed culvert pipe, the Contractor is to notify the Town Drainage Superintendent or Consulting Engineer immediately so that the Town Water Department can make provisions to lower the hydrant lead as necessary to avoid conflict with the new culvert pipe. The Contractor shall not in any way perform any work hydrant, valve, or hydrant lead without explicit permission and supervision from the Town Water Department. The Contractor is to consider all of this when pricing the installation of the new enclosure, and should note that no additional payments will be made due to the existence of or conflict with the existing hydrant, hydrant valve or hydrant lead.

Enclosure 19W - (Revenberg Holdings Ltd., 410-01800)

The Contractor shall completely remove the existing corrugated steel pipe, catch basins, and end treatments and dispose of same as outlined previously in these specifications. The Contractor shall then supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Enclosure 19W**. Enclosure 19W shall be backfilled according to the preceding specifications, and according to the Typical Backfill Details included in the accompanying drawings.

The Contractor shall also supply and install a single (1) in-line catch basin at Stations 1+967.0 as illustrated within the accompanying drawings. This catch basins shall be comprised of a 600mm diameter, 320kPa, smoothwall interior, HDPE plastic pipe. The new catch basin shall be joined to the enclosure using 600mm diameter eccentric reducers. The new catch basin, once installed, shall also be required to have a new, cast iron, inset catch basin grate from Underground Specialties Inc. or approved equal. The new in-line catch basin being provided as part of the drainage work has been included to collect surface water flows from the adjacent boulevard and swale and therefore shall be set 50mm below the adjacent ground elevation.

The Contractor's attention is drawn to an existing water service and water metre located adjacent to the existing culvert pipe. It is the Contractor's responsibility to protect said water components at all times during excavations and installation of the new enclosure pipe. If the water service line is found to be in direct conflict with the proposed culvert pipe, the Contractor is to notify the Town Drainage Superintendent or Consulting Engineer immediately so that the Town Water Department can make provisions to lower the water service as necessary to avoid conflict with the new culvert pipe. The Contractor shall not in any way perform any work on the water service or water metre without explicit permission and supervision from the Town Water Department. The Contractor is to consider all of this when pricing the installation of the new enclosure, and should note that no additional payments will be made due to the existence of or conflict with the existing water service or metre.

The Contractor’s attention is also drawn to the presence of an existing hydro poles located in the vicinity of the proposed work. The Contractor shall make every effort to avoid the hydro poles and shall at all times be responsible for their protection and care throughout the course of the work. Prior to commencing work, a pre-construction meeting shall be held where a representative from Hydro One shall be invited to discuss the particulars of working around these hydro poles. Should additional support, bracing, and or holding of the existing hydro pole be required by Hydro One, the Contractor shall be responsible for arranging with Hydro One to ensure that these measures are implemented to the full satisfaction of the utility company.

For all existing pipe connections to the new covered drain, the Contractor shall utilize manufacturer fittings, insert-a-tee, or mortar joint connections at both ends. The mortar joint shall be provided between the connection to the covered drain, with same being of sufficient mass to produce a sealed joint, all to be performed to the full satisfaction of the Town Drainage Superintendent or Consulting Engineer. The Contractor shall also be required to cut and trim the portion of the lateral pipe inside of the covered drain pipe to the full satisfaction of the Town Drainage Superintendent or Consulting Engineer. The Contractor is to note that any intercepted pipes along the length of the covered drain are to be extended and connected to the new pipe unless otherwise noted in the accompanying drawings. Lateral drains shall be extended with high density polyethylene pipe equivalent in diameter to the existing lateral drain. The Contractor shall provide all of the equipment, labour, and materials required to connect all said tile at no additional cost to the project, and all of same shall be performed to the full satisfaction of the Town Drainage Superintendent or the Consulting Engineer and shall not be backfilled until it is inspected by them.

At both ends of the new enclosure, the Contractor shall provide a sloped quarried limestone end treatment, all carried out in accordance with these specifications.

Bridge 20W - (Town of Tecumseh Water Department)

The Contractor shall carefully excavate and remove the existing CSP culvert that comprises Bridge 20W, as shown on the accompanying plans. This pipe is to be delivered to the Town of Tecumseh Public Works yard. The Contractor shall supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Bridge No. 20W**. The Contractor shall provide sloped quarried limestone end treatments at each end of the culvert.

The Contractor's attention is drawn to an existing fire hydrant and hydrant valve that are all located adjacent to the existing culvert pipe. It is the Contractor's responsibility to protect said hydrant and valve water components at all times during excavations and installation of the culvert pipe. If the hydrant lead is found to be in direct conflict with the proposed culvert pipe, the Contractor is to notify the Town Drainage Superintendent or Consulting Engineer immediately so that the Town Water Department can make provisions to lower the hydrant lead as necessary to avoid conflict with the new culvert pipe. The Contractor shall not in any way perform any work hydrant, valve, or hydrant lead without explicit permission and supervision from the Town Water Department. The Contractor is to consider all of this when pricing the installation of the new enclosure, and should note that no additional payments will be made due to the existence of or conflict with the existing hydrant, hydrant valve or hydrant lead.

Bridge 21W - (Revenberg Holdings Ltd., 410-01700)

The Contractor shall completely remove the existing corrugated steel pipe and headwalls and dispose of same as previously outlined in these specifications. Upon completion of the removal of the culvert pipe and headwalls, the Contractor shall be required to restore the former bridge site to its design cross section. The design parameters of the J.C. Smith Drain consist of a 0.92 metre (3.00 ft.) bottom width, 0.16% grade, and 1.5 horizontal to 1.0 vertical side slopes.

Bridge 22W - (Revenberg Holdings Ltd., 410-01700)

The Contractor shall completely remove the existing corrugated steel pipe and any end protection and dispose of same as outlined previously in these specifications. The Contractor shall then supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Bridge No. 22W**. The Contractor shall also widen the existing approach to the driveway as shown on the plans to 9.14 metre (30.0 ft.) top width over the bridge.

Bridge 23W - (Town of Tecumseh Water Department)

The Contractor shall carefully excavate and remove the existing CSP culvert that comprises Bridge 23W, as shown on the accompanying plans. This pipe is to be delivered to the Town of Tecumseh Public Works yard. The Contractor shall also remove any existing end protection and dispose of same as outlined previously in these specifications. The Contractor shall supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Bridge No. 23W**. The Contractor shall also note the presence of an existing Standard Iron Bar (S.I.B.) located approximately mid-span of the existing culvert and it is to take steps

to protect same. If this iron bar is damaged by the Contractor in any way, it shall arrange for an Ontario Land Surveyor licensed in the Province of Ontario to restore same, all at its cost.

The Contractor's attention is drawn to the existing fire hydrant and hydrant valve that are located adjacent to the existing culvert pipe. It is the Contractor's responsibility to protect said hydrant and valve water components at all times during excavations and installation of the culvert pipe. If the hydrant, valve, or hydrant lead is found to be in direct conflict with the proposed culvert pipe, the Contractor is to notify the Town Drainage Superintendent or Consulting Engineer immediately so that the Town Water Department can make provisions as necessary to avoid conflict with the new culvert pipe. The Contractor shall not in any way perform any work hydrant, valve, or hydrant lead without explicit permission and supervision from the Town Water Department. The Contractor is to consider all of this when pricing the installation of the new enclosure and should note that no additional payments will be made due to the existence of or conflict with the existing hydrant, hydrant valve or hydrant lead.

Enclosure 24W - (Brian & Lisa McGuire 410-01660)

The Contractor shall completely remove the existing corrugated steel pipe and any end protection and dispose of same as outlined previously in these specifications. The Contractor shall supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details the bridge portion for **Enclosure No. 24W**. The enclosure portion of this access is a Provisional item and may be constructed at a later date, as specified by the landowner. The Contractor shall provide sloped quarried limestone end treatments at each end the new culvert installation.

As part of the enclosure portion, the Contractor shall also supply and install a single (1) in-line catch basin at Stations 2+324.8 as illustrated within the accompanying drawings. This catch basins shall be comprised of a 600mm diameter, 320kPa, smoothwall interior, HDPE plastic pipe. The new catch basin shall be joined to the enclosure using 600mm diameter eccentric reducers. The new catch basin, once installed, shall also be required to have a new, cast iron, inset catch basin grate from Underground Specialties Inc. or approved equal. The new in-line catch basin being provided as part of the drainage work has been included to collect surface water flows from the adjacent boulevard and swale and therefore shall be set 50mm below the adjacent ground elevation. When the enclosure portion shall be installed, it shall be connected to the north end of **Bridge No. 23W** where the sloped quarried limestone end protection shall be removed, and the pipe connection be fastened with manufacturer's recommended fittings.

The Contractor's attention is drawn to an existing water service and water metre located adjacent to the existing culvert pipe. It is the Contractor's responsibility to protect said water components at all times during excavations and installation of the new enclosure pipe. If the water service line or metre is found to be in direct conflict with the proposed culvert pipe, the Contractor is to notify the Town Drainage Superintendent or Consulting Engineer immediately so that the Town Water Department can make the necessary provisions. The Contractor shall not in any way perform any work on the water service or water metre without explicit permission and supervision from the Town Water Department. The Contractor is to consider all of this when pricing the installation of the new enclosure, and should note that no additional payments will be made due to the existence of or conflict with the existing water service and/or metre.

Bridge 25W - (Vince Gemus Holdings Inc. 410-01500)

The Contractor shall completely remove the existing corrugated steel pipe and any end protection and dispose of same as outlined previously in these specifications. The Contractor shall then supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Bridge No. 25W**. The Contractor's attention is drawn to the existing swale near the southerly end of the bridge. The Contractor shall divert same as necessary so that it will outlet through the rock protection on the pipe end and discharge freely to the drain.

Culvert Replacement and Improvements - McPherson Drain

The Contractor shall provide for the construction and improvements to the structures along the McPherson Drain. We are providing below not only the general description of the works being carried out for each structure, but also detailed information regarding any special provisions also being provided as part of the structure improvements, as follows:

Bridge 1P - (Zachary Pan & Xiaotong Tang 410-04000)

The Contractor is advised that the access bridge for this property has been installed prior to the completion of this report.

Bridge 2E and Bridge 3P - (Roberta Diemer 410-02550)

The Contractor shall carefully remove the existing corrugated steel pipe that comprises **Bridge 2E** and transfer same to Station 1+464.9 where it will be re-used in the construction of **Bridge 3P** as further described herein. Upon completion of the removal of the culvert pipe and headwalls, the Contractor shall be required to restore the former bridge site throughout its entire length to its design cross section. The design parameters of the McPherson Drain at this location consists of a 0.92 metre (3.00 ft.) bottom width, 0.48% grade, and 1.5 horizontal to 1.0 vertical side slopes.

The Contractor shall then supply and install a new, 3.0 metre (9.84 ft.) long, Aluminized Steel, Type II corrugated Hel-Cor pipe and couple same to the end of the salvaged pipe from Bridge 2E using a new 9C coupler, at the location shown on the plans for Bridge 3P, centred at Station 1+464.9. The Contractor shall provide for all brushing, grubbing and topsoil removal to prepare for the pipe installation, and install sloped quarried limestone on filter cloth end protection at each end of the new access culvert.

Bridge 3E - (Roberta Diemer 410-02550)

The Contractor shall completely remove the existing corrugated steel pipe and stone/concrete headwall protection and dispose of same as outlined previously in these specifications. The Contractor shall supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Bridge No. 3E**. The Contractor shall provide sloped quarried limestone end treatments at both ends of the new culvert pipe. The Contractor shall also be required to neatly saw-cut the existing tar and chip asphalt and provide a full depth granular backfill as detailed on the plans.

Bridge 4E - (Peter & Nancy Steeves, 410-02600)

The Contractor shall completely remove the existing corrugated steel pipe and any end protection and dispose of same as outlined previously in these specifications. The Contractor shall supply and install a new pipe as set out in the plans, cross sections and profile forming part of the details for **Bridge No. 4E**. The Contractor shall provide sloped quarried limestone end treatments at each end the new culvert installation.

Bridge 5E - (Nancy Steeves 410-02650)

The Contractor shall carefully remove the existing corrugated steel pipe while protecting the existing concrete headwalls. Once the pipe has been removed, the Contractor shall carefully expand the existing opening to allow for the new pipe. As part of the opening expansion, the Contractor will be required to underpin the existing concrete footing with a minimum 300mm thick concrete at both ends. Once satisfactorily expanded and underpinned, the Contractor shall supply and install a new, HDPE smoothwall plastic pipe as set out in the plans, cross sections and profile forming part of the details for **Bridge 5E**. The Contractor shall provide concrete grout to secure the new pipe in place through the walls. The Contractor shall also be required to install sloped quarried limestone erosion protection adjacent to both headwalls as shown on the plans.

Road Crossings

The Contractor shall provide for the construction and improvements to the road crossings that connect the J.C. Smith and McPherson Drains. We are providing below not only the general description of the works being carried out for each structure, but also detailed information regarding any special provisions also being provided as part of the structure improvements, as follows:

Road Crossings 1C, 3C and 5C - (10th Concession Road, Town of Tecumseh)

The Contractor shall completely remove the existing corrugated steel pipes and headwalls and dispose of same as outlined previously in these specifications. The Contractor shall supply and install new pipe as set out within the plans, profiles, and cross sections that form part of the details for **Road Crossing 1C, Road Crossing 3C and Road Crossing 5C** of the plans. The new road crossing culverts shall each be comprised of 320kPa, smoothwall HDPE pipe to the size and lengths outlined within the accompanying plans.

The Contractor shall neatly sawcut, remove and restore the existing asphalt with the use of a minimum 100mm thick or match existing thickness of asphalt, with compacted hot mix asphalt placed in minimum two (2) 50mm thick lifts. The existing asphalt shall be carefully saw cut and disposed of. The placement of the new asphalt shall be in a diamond shape as illustrated within the accompanying plans and shall be placed as outlined within the preceding paragraphs. The Contractor shall also provide sloped quarried limestone end treatments at each end the road crossing culverts. The Contractor should also pay careful attention to the details on the plans for each crossing as they may delineate areas near the ends of the crossings that require additional erosion protection.

The Contractor shall be responsible to restore any damage caused to the roadway at its own cost. All damaged hard surface roadway areas shall be neatly saw cut and the damaged materials removed and disposed of by the Contractor prior to carrying out any restoration work. The Contractor shall note that it will be required to cut the existing asphalt to a point approximately 300mm beyond the top of the trench cut so that a stepped asphalt repair is provided. The extent of the repairs shall be established in consultation with the Town Drainage

Superintendent, the Road Authority, and the Engineer and the repairs shall be completed to their full satisfaction.

The Contractor's attention shall also be drawn to the existing watermain located on the west side of the 10th Concession Road. This watermain shall be located and exposed prior to the replacement of the proposed road crossing culverts, to ensure that the structure will not conflict with same.

All the work associated with **Road Crossing 1C, Road Crossing 3C and Road Crossing 5C** replacement and improvements shall be carried out to the full satisfaction of the Town Drainage Superintendent, the Consulting Engineer, and the Town of Tecumseh Roads Department.

Road Crossings 2C and 4C - (10th Concession Road, Town of Tecumseh)

The Contractor shall locate, expose and plug both ends of the existing road crossing culverts identified on the plans as **Road Crossing 2C and Road Crossing 4C.** These are located at Station 1+617.4 and Station 1+939.8 respectively. The existing culvert pipes at these locations shall be capped, plugged, and filled completely with lean grout to prevent further water from entering the pipes. Once capped, the existing pipes shall be abandoned and left in place.

Road Crossings 6C - (10th Concession Road, Town of Tecumseh)

The Contractor shall clean through the existing concrete box culvert to remove all sediment and accumulated materials and provide for the drain cross section as shown on the profiles and plans, all as specified herein.

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APPENDIX "A"

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APPENDIX A-1

Essex Region Conservation Authority Correspondence

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Kiara Kirkland

From: Tony Peralta
Sent: July 30, 2024 3:56 PM
To: Summer Locknick
Cc: Matthew Shiha; Anne-Marie Moniz; Hannah Waldt
Subject: FW: FW: J.C. Smith Drain and McPherson Drain - Request for Review
Attachments: 20240730 D14011-12 JC Smith & McPherson Drain Improvements_PRELIMINARY.pdf

Good afternoon Summer;

Below you will find previous correspondence with ERCA regarding the J.C. Smith Drain and McPherson Drain improvements. Since this submission, there have been several minor changes based on landowner requests that delayed the completion of this engineer's report. All of these details have now been addressed and we are in the process of finalizing the report.

Further to the summary outlined below, two new access bridges have been proposed and have temporarily been installed through ERCA's permitting process. Other than that, there have been some minor modifications to enclosure lengths and pipe material details. Attached you will find the latest set of design drawings for your review.

If you have any questions or comments, please feel free to contact us.

Regards,

Peralta Engineering

Tony Peralta, P.Eng.
tony@peraltaengineering.com | 519-733-6587 x 122
N.J. Peralta Engineering Ltd. - Consulting Engineers
45 Division St. N., Kingsville ON N9Y 1E1
peraltaengineering.com

From: Cynthia Casagrande <CCasagrande@erca.org>
Sent: Tuesday, May 30, 2017 9:25 AM
To: Tony Peralta <tony@peraltaengineering.com>
Cc: Sam Paglia <spaglia@tecumseh.ca>; Dan Jenner <DJenner@erca.org>
Subject: RE: FW: J.C. Smith Drain and McPherson Drain - Request for Review

Dear Tony:

Re: Review of Preliminary J. C. Smith Drain and McPherson Drain Improvements
Your Project No. D14-011

Thank you for providing the preliminary information with respect to this proposed project. We have reviewed this preliminary information and find it acceptable.

We look forward to receiving a copy of the Final Drainage Report for our review and approval through the Drainage Act processes. In addition to an approved Final Drainage Report, we will require an ERCA application for permit form and

the application for permit fee of $800.00 for this project to proceed. Please forward this information and/or alternative direction at your earliest convenience.

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

Yours truly,

Cynthia Casagrande
Regulations Coordinator
Essex Region Conservation Authority
360 Fairview Avenue West, Suite 311
Essex ON N8M 1Y6
(519) 776-5209, Ext. 349

From: Tony Peralta [mailto:tony@peraltaengineering.com]
Sent: Friday, May 26, 2017 5:39 PM
To: Cynthia Casagrande <CCasagrande@erca.org>
Cc: Sam Paglia <spaglia@tecumseh.ca>; Dan Jenner <DJenner@erca.org>
Subject: Re: FW: J.C. Smith Drain - Request for Review

Good afternoon Cynthia,

As you may be aware, we have been appointed by the Town of Tecumseh, under Section 78 of the Drainage Act, to provide improvements to the J.C. Smith Drain and McPherson Drain. The subject drains are located on the east and west sides of the 10th Concession Road, within Lots 1 – 5, Concession IX, in the Town of Tecumseh. Both drains are interconnected through road crossing culverts that run beneath Concession 10 Road.

We have completed our design of the drainage works for the subject drains and have attached a preliminary drawings of same for your review. To summarize our design proposal, we offer the following:

- Under this project, we will be cleaning and restoring the grades of both drains. Very minimal bank trimming is required, as shown in the attached cross sections.
- We will be replacing many of the numerous existing access bridges and enclosures currently located in the both drains. Those that are in good shape and are hydraulically fit will remain in place and we will provide provisions for their ultimate replacement under maintenance by the Town when the time comes. The culvert type, size and lengths are shown on the Bridge Detail sheets, attached for your review. Each structure will be installed such that their inverts are embedded to a minimum of 10% of their diameter.
- Three of the existing five road crossing culverts beneath the 10th Concession Road will be replaced. We have determined that the remaining two are in very poor shape and are no longer needed in order for the system to function. As such, we intend to cap them and leave them in place for removal at some time in the future when the Town sees fit.
- We have submitted a request for review to the DFO and have received confirmation from them that the project will not need formal approval from their office. Additionally, the Town of Tecumseh has performed a Species at Risk review on behalf of the MNR. The results of this review will be included in our final report.
- You'll note from the plans that "Enclosure 19W" does not currently have a preliminary design. We have been having difficulty getting in contact with the owner of the property at this location to discuss the work on this particular enclosure, but nonetheless wished to get the ball rolling with your review. For the purposes of your review, it would be safe to assume that this culvert will be replaced entirely with a new, 600mm dia., CSP enclosure pipe, complete with graded swale over top of the pipe and catch basins as required. If this changes, we will update you accordingly.

We trust that this information is satisfactory. However, if you have any concerns or require additional information, please contact us at your earliest opportunity. Finally, a copy of our final drainage report will be forwarded to your office by the Municipality for review.

Regards,

Tony Peralta, P.Eng.

N.J. Peralta Engineering Ltd.
45 Division Street North
Kingsville, ON
N9Y 1E1
(519)733-6587 office
(519)733-6588 fax

-------- Original Message --------
Subject: FW: J.C. Smith Drain - Request for Review
From: Cynthia Casagrande <CCasagrande@erca.org>
To: Shane McVitty <Shane@peraltaengineering.com>
Cc: "Sam Paglia" <spaglia@tecumseh.ca>
Date: Tue, 5 Aug 2014 10:16:21 -0400

Dear Shane:

As per your e-mail, you have requested information regarding the proposed improvements, including culvert replacements, to the J. C. Smith Drain on the west side of the 10th Concesson Road in the Town of Tecumseh. Please be advised that the subject drain is located within an area that is under the jurisdiction of the Essex Region Conservation Authority (ERCA) (Section 28 of the *Conservation Authorities Act*). Prior to undertaking works, a permit is required from this office. For your information, we have included a 2014 application for permit. The application for permit fee is $800.00.

Your submission for permit must include the following:

- letter/report describing the rationale behind the proposed design
- design drawings
- level of service of new culvert in comparison to existing culverts within the drain
- provide upstream and downstream culvert sizes
- a proposed sediment and erosion control plan
- a proposed water control plan
- a contingency plan for rain events that exceed the capacity of the proposed water control system
- restoration details
- details of the standard mitigation measures that are to be followed during construction

As part of the proposed work, the following mitigation measures shall be implemented to avoid any adverse effects and impacts to the waterway:

1. Work will not be conducted at times when flows are elevated due to local rain events, storms or seasonal floods. Work will be done in the dry. Works are not to undertaken between March 15th and June 30th. (If works are required to be undertaken between March 15th and June 30th to address public safety issues, a request should be submitted to this office).

2. All disturbed soils on both banks and within the channel, including spoil, must be stabilized immediately upon completion of work. The restoration of the site must be completed to a like or better condition to what existed prior to the works. The spoil material must be spread an appropriate distance from the top of the drain bank to ensure that it is not washed back into the drain.

3. 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.

4. Silt or sand accumulated in the barriers/traps must be removed and stabilized on land once the site is stabilized.

5. All activities, including maintenance procedures, should be controlled to prevent the entry of petroleum products, debris, rubble, concrete or other deleterious substances into the water. Vehicular refueling and maintenance should be conducted away from the water.

Should any requirements and/or conditions regarding the proposed works be specified by the DFO, through the self-assessment process, then these conditions and possible changes would need to be reflected in a modified ERCA authorization/approval.

We look forward to you providing our office with an opportunity to review your preliminary design proposal prior to completing the final design.

If you have any questions, please do not hesitate to contact our office.

Yours truly,

Cynthia Casagrande
Regulations Technician
Essex Region Conservation Authority
360 Fairview Avenue West, Suite 311
Essex ON N8M 1Y6
(519) 776-5209, Ext. 349

From: Shane McVitty [mailto:Shane@peraltaengineering.com]
Sent: Friday, July 25, 2014 10:47 AM
To: Cynthia Casagrande
Cc: Sam Paglia; John Henderson
Subject: J.C. Smith Drain - Request for Review

Good Morning Cynthia,

As you are aware, we have been appointed by the Town of Tecumseh, under Section 78 of the Drainage Act, to provide improvements to the J.C. Smith Drain. We have attached a map illustrating the location of the drains for your reference. The subject drain is located on the west side of the 10th Concession Road, within Lots 1 – 5, Concession IX, in the Town of Tecumseh.

On Wednesday, July 23rd, an on-site meeting was held to discuss the nature of the project and to solicit comments from landowners as well as the Town Drainage Superintendent. As a result of our meeting, we anticipate the following work to take place:

- Full drain clean-out along the entire length of the J.C. Smith Drain, including brushing, sediment removal, and bank improvements as required.
- Replacement of some, if not all, of the existing access bridges currently in place within the drain. These bridges range in size from 450mm to 600mm and are all CSP (sizes, condition and type will be confirmed through our investigations). From our preliminary review, 12 bridges were originally installed under a drainage report completed in 1967. In addition, we have learned that a number of additional bridges were installed to provide access to fire hydrants by the Town approximately 10 years ago when the watermain was installed. We anticipate having to replace all of the 1967 bridges and will evaluate the design and sufficiency of the hydrant bridges and will make recommendations regarding their replacement based on same. Ultimately, our inspections and examinations, as well as discussions with the bridge owners, will verify the scope of the bridge replacement work

At this time, we would appreciate ERCA comments, concerns or considerations that may impact this project. Please note that it is our intention to notify your office again once we have a preliminary design in place for your review.

We understand that the existing partnership agreements between DFO and Conservation Authorities (CA's) have lapsed and accordingly, we will be undertaking a self-assessment of the proposed works to the J.C. Smith Drain through the DFO website. The results of this assessment will determine whether a formal submission to the DFO for a "Request for Review" is warranted. If this is to be the case, then we will submit a request to the DFO and will copy your office on the submission.

We will also be contacting the Town of Tecumseh regarding the MNR screening process under Section 23 of the Endangered Species Act, 2007. We intend on incorporating the MNR mitigation measures, as required, as part of our report.

Thank you for your time and attention to this matter. If you require any further information or clarification, please feel free to contact us.
--

Shane McVitty, P.Eng.

N.J. Peralta Engineering Ltd.
45 Division Street North
Kingsville, ON
N9Y 1E1
(519)733-6587 office
(519)733-6588 fax

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APPENDIX A-2

DFO Best Management Practices
Culvert Replacements

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Best Management Practices – Culvert Replacements in Municipal Drains

This document describes the conditions on which one may proceed with a culvert replacement in a municipal drain without DFO approval/notification. All municipal, provincial, or federal legislation that applies to the work being proposed must be respected. If the conditions/requirements below cannot be met, please complete the drain notification form and submit it to the Fisheries Protection Program form review at: FisheriesProtection@dfo-mpo.gc.ca.

Potential Impacts to Fish Habitat

- Infilling fish habitat by encroachment of the water crossing footprint or channel realignment to accommodate culvert
- Harmful substrate alteration of fish habitat (e.g. blockage of groundwater upwellings, critical SAR habitat, spawning areas)
- Removal of riparian vegetation and cover along the banks of the municipal drain
- Removal of edge habitat (e.g. undercut bank, shallower areas with lower velocity, aquatic vegetation) creation of barriers to fish movement (e.g. perched crossings, velocity barriers, alteration of the natural stream gradient)
- Alteration of channel flow velocity and/or depth (e.g. oversized culvert resulting in insufficient depth for fish passage at low flow or undersized culvert resulting in a flow velocity barrier at high flow)
- Alteration of channel morphology and sediment transport processes caused by the physical structure of the crossing resulting in upstream and downstream sediment aggradation/erosion
- Re-entry of sediment that was removed/stockpiled into the watercourse
- Erosion downstream from sudden release of water due to the failure of site isolation
- Stranding of fish in isolated ponds following de-watering of the site
- Impingement or entrainment of fish when de-watering pumps are used
- Short term or chronic transport of deleterious substances, including sediment, into fish habitat from construction or road drainage

Requirements

The following requirements must be met:

- There are no aquatic Species at Risk present in the work zone or impact zone. To confirm there are no aquatic Species at Risk present, refer to the document, A Guide for Interpreting Fish and Mussel Species at Risk Maps in Ontario which can be found at: http://www.dfo-mpo.gc.ca/Library/356763.pdf. Links for Ontario Conservation Area specific fish and mussel maps that include critical habitat extents and a list of aquatic Species at Risk found within the conversation authority boundary can be found on Page 5 of A Guide for Interpreting Fish and Mussel Species at Risk Maps in Ontario.
- The culvert is embedded into the streambed and must allow for the free passage of fish.
- The work involves like-for-like replacements of existing road or private access culverts on all drain types without SAR.
- On C and F Drains only, this can also include replacements with extensions and end walls for the purposes of providing the property or road with safe access, but the project permanent footprint will not increase more than 250 m^2 below the high water mark.
- The project does not involve replacing a bridge or arch with one or more culverts installed in parallel or a larger-diameter culvert with more than one culvert installed in parallel.

- The project does not involve building more than one culvert installed in parallel on a single watercourse crossing site (e.g. twin culvert).
- The project does not involve temporarily narrowing the watercourse to an extent or for a duration that is likely to cause erosion, structural instability or fish passage problems.
- The municipal drain has no flow/low flow or is frozen to the bottom at the time of the replacement.
- In-water work is scheduled to respect timing windows (Tables 1 and 2) to protect fish, including their eggs, juveniles, spawning adults, and/or the organisms upon which they feed.
- The work can be conducted using the Culvert Removal Method described below and Standard Measures to Avoid Causing *Serious Harm to Fish* will be implemented when required.

Note: If your project must be conducted without delay in response to an emergency (e.g. the project is required to address an emergency that poses a risk to public health or safety or to the environment or property), you may apply for an Emergency Authorization (http://www.dfo-mpo.gc.ca/asp/forceDownload.asp?FilePath=/pnw-ppe/reviews-revues/Emergency-Authorizations-Autorisations-Urgences-eng.pdf).

Culvert Removal Methodology

- Plan/manage the work site in a manner that prevents sediment from entering the municipal drain by installing sediment and erosion control materials where required. Ensure that a sediment and erosion control plan is developed and modified as necessary for the site.
- Where required, install effective erosion and sediment control measures before starting work to prevent sediment from entering the municipal drain.
- Implement site isolation measures when in-water work is required.
    - Install an impervious barrier upstream of the work area (Figure 1). If possible, install a secondary barrier upstream of the work area for added protection.
    - Attempt to drive out the fish from the work area and then install the impervious barrier downstream of the work area. This may reduce or eliminate the need for a fish salvage.
    - When the drain is flowing, maintain downstream flows (e.g. bypass water around the work site using pumps or flume pipes; Figure 2). Provide temporary energy dissipation measures (e.g. rip-rap) at discharge point of the hose or temporary outlet pipe when required. Routinely inspect bypass pump and hose or pipe to ensure proper operation. Inspect discharge point for erosion and reposition hose/pipe or install additional temporary energy dissipation material as needed.
    - Dewater the isolated work area. The hose for a pump may discharge along the top of the bank into existing vegetation; however, the area should be monitored for signs of erosion. Reposition the hose or install additional temporary energy dissipation material as needed.
    - A fish screen with openings no larger than 2.54 mm (0.10 inches) should be equipped on any pump used during the operation. Note: Additional information regarding fish screens can be found in the DFO Freshwater Intake End-of-Pipe Fish Screen Guideline document (http://www.dfo-mpo.gc.ca/Library/223669.pdf).
    - Collect any fish present in the isolated work area and relocate them downstream.
    - Fish salvage operations must be conducted under a license issued by the Ontario Ministry of Natural Resources and Forestry (MNRF). The MNRF should be contacted well in advance of any work to obtain the required fish collection license.
- Install the culvert so that it is embedded into the streambed; ensure the culvert remains passable (e.g. does not become perched) by fish and wildlife.

- Decommission the site isolation in a manner that minimizes the introduction of sediment. The downstream isolation barrier shall gradually be removed first, to equalize water levels inside and outside of the isolated area and to allow suspended sediments to settle.
- Stabilize and remove waste from the site.
- Where required, maintain effective erosion and sediment control measures until complete re-vegetation of disturbed areas is achieved.

Figure 2. Isolation of Site

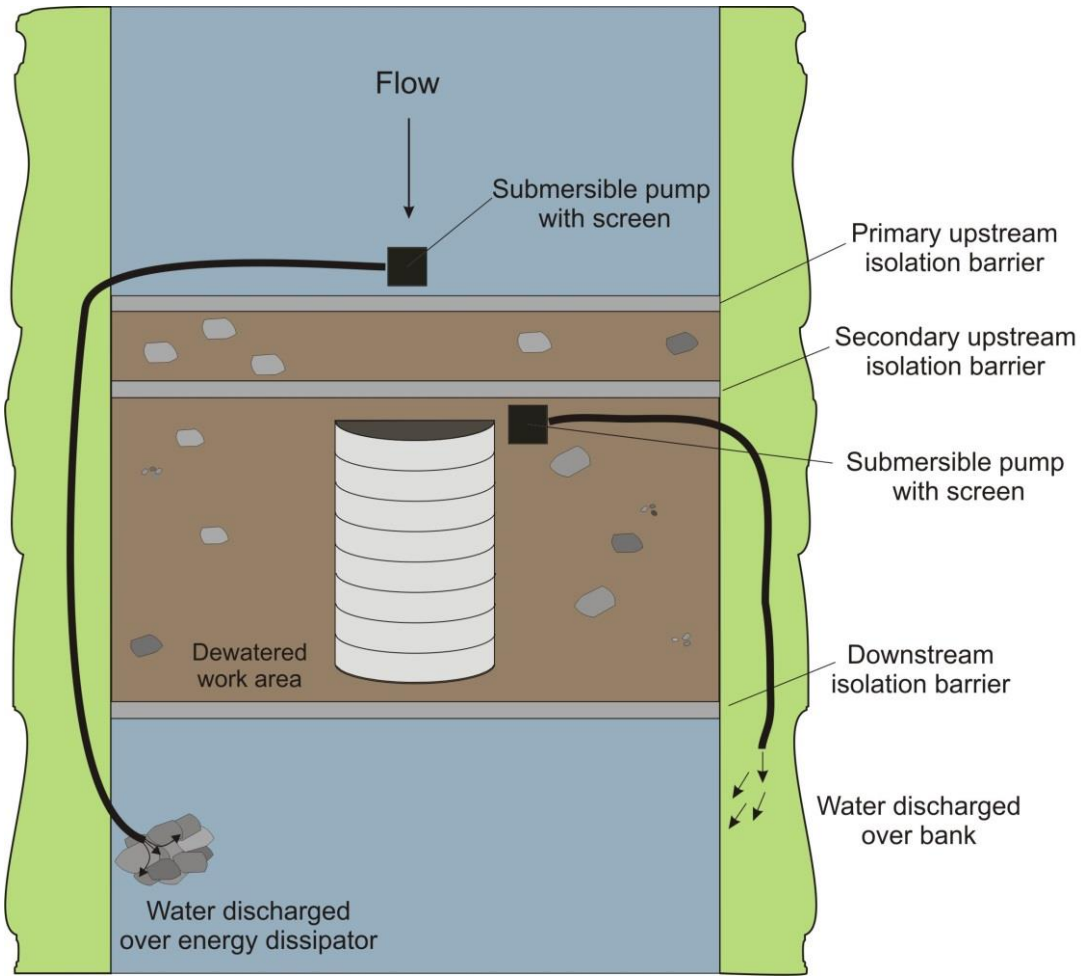

Figure 3. Isolation and Bypass Diversion when Working In-Water

Timing Windows

Figure 1 and Tables 1 and 2 can be used to determine the Restricted Activity period for the drain based on its classification. Note: Timing windows identified on Conservation Authority permits or Ministry of Natural Resources (Government of Ontario) work permits may differ and take precedence.

Figure 1. Ontario's Northern and Southern Region boundaries for determining application of restricted activity timing windows.

Table 1. Restricted Activity timing windows for the protection of spawning fish and developing eggs and fry in the Northern Region. Dates represent when work should be avoided.

Drain Type	Restricted Activity Period
A	September 1 to July 15
B	September 1 to July 15
C	April 1 to July 15
D	September 1 to July 15
E	April 1 to July 15

Table 2. Restricted Activity timing windows for the protection of spawning fish and developing eggs and fry in the Southern Region. Dates represent when work should be avoided.

Drain Type	Restricted Activity Period
A	September 15 to July 15
B	March 15 to July 15
C	March 15 to July 15
D	October 1 to July 15
E	March 15 to July 15

Standard Measures to Avoid Causing *Serious Harm to Fish*

When implementing a culvert removal project in a municipal drain, the *Fisheries Act* still requires an individual/company to ensure they avoid causing *serious harm to fish* during any activities in or near water. The following advice will help one avoid causing harm and comply with the *Act* (for additional information see http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/measures-mesures-eng.html).

1. Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
2. Whenever possible, operate machinery on land above the high water mark or on ice and in a manner that minimizes disturbance to the banks and bed of the municipal drain.
    - Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks.
    - Limit machinery fording of the municipal drain to a one-time event (i.e., over and back), and only if no alternative crossing method is available. If repeated crossings of the municipal drain are required, construct a temporary crossing structure.
    - 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.
    - Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
3. Install effective sediment and erosion control measures before starting work to prevent sediment from entering the municipal drain. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.
4. 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 municipal drain and runoff water is clear.
5. Undertake all in-water activities in isolation of open or flowing water while maintaining the natural flow of water downstream and avoid introducing sediment into the municipal drain.
6. Ensure applicable permits for relocating fish are obtained and relocate any fish that become trapped in isolated pools or stranded in newly flooded areas to the main channel of the watercourse.
7. Ensure that the water that is being pumped/diverted from the site is filtered (sediment remove) prior to being released (e.g. pumping/diversion of water to a vegetated area).
8. Implement measures for containing and stabilizing waste material (e.g. dredging spoils, construction waste and materials, commercial logging waste, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby waterbodies to prevent re-entry.
9. Stabilize shoreline or banks disturbed by any activity associated with the project to prevent erosion and/or sedimentation, preferably through re-vegetation with native species suitable for the site.
10. If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, then ensure that appropriately-sized, clean rock is used; and that rock is installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment.
11. Remove all construction materials from site upon project completion.

APPENDIX "B"

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PLANS, PROFILES, DETAILS, & SECTIONS

OF THE

J.C. SMITH DRAIN AND MCPHERSON DRAIN IMPROVEMENTS

IN THE

TOWN OF TECUMSEH (Former Geographic Township of Sandwich South)

IN THE

COUNTY OF ESSEX • ONTARIO

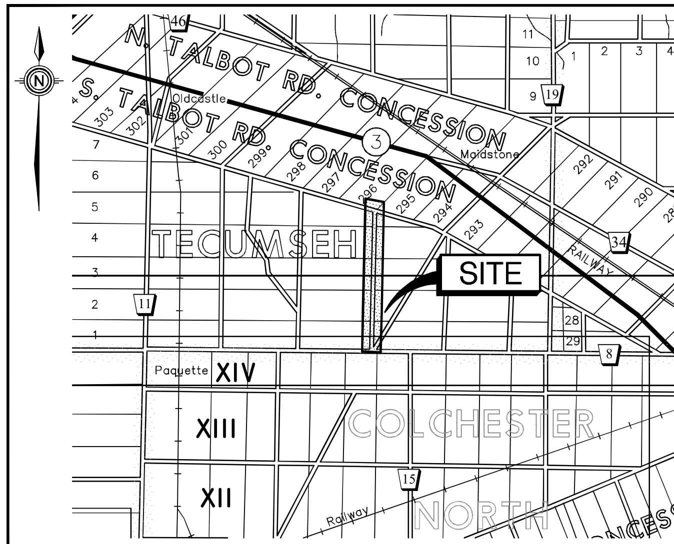
THESE DRAWINGS HAVE BEEN REDUCED IN SIZE AND THE SCALE THEREFORE VARIES. FULL SCALE DRAWINGS CAN BE VIEWED AT THE MUNICIPAL OFFICES IF REQUIRED.

TOWN OF TECUMSEH

MAYOR: GARY MCNAMARA
CLERK: ROBERT AUGER
DRAINAGE SUPERINTENDENT: MATTHEW SHIHA

SHEET INDEX

SHT. No.	DESCRIPTION
1	COVER AND OVERALL WATERSHED PLAN
2	INDIVIDUAL WATERSHED PLANS
3	PROFILE – J.C. SMITH DRAIN
4	PROFILE – MCPHERSON DRAIN
5	CROSS SECTIONS
6	CROSS SECTIONS
7	CROSS SECTIONS
8	CROSS SECTIONS
9	CROSS SECTIONS
10	BRIDGE LOCATION PLAN
11	ROAD CROSS CULVERTS SECTIONS AND STANDARD DETAILS
12	BRIDGE DETAIL PLANS
13	BRIDGE DETAIL PLANS
14	BRIDGE DETAIL PLANS
15	BRIDGE DETAIL PLANS
16	BRIDGE DETAIL PLANS
17	BRIDGE DETAIL PLANS
18	BRIDGE DETAIL PLANS
PROJECT NUMBER: D14-011	



KEY PLAN

Scale = N.T.S.

BENCHMARKS

1. TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, APPROXIMATELY 28.0m NORTH OF THE COUNTY ROAD 8 CENTRELINE. ELEV. = 193.607m
2. TOP OF NAIL SET IN WEST FACE OF HYDRO POLE LOCATED ON THE EAST SIDE OF 10TH CONCESSION ROAD, APPROXIMATELY 6.0m SOUTH SOUTH END OF BRIDGE 1P. ELEV. = 192.960m
3. TOP OF NAIL SET IN EAST FACE OF HYDRO POLE LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, APPROXIMATELY 13.5m NORTH OF SOUTH END OF BRIDGE 2W. ELEV. = 193.170m
4. TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 5W IN FRONT OF MUN. NO. 7035. ELEV. = 193.122m
5. TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 8W IN FRONT OF MUN. NO. 6979. ELEV. = 193.694m
6. TOP OF NAIL SET IN WEST FACE OF HYDRO POLE LOCATED ON THE EAST SIDE OF 10TH CONCESSION ROAD, APPROXIMATELY 19.0m NORTH OF BRIDGE 9W. ELEV. = 193.047m
7. TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 10W IN FRONT OF MUN. NO. 6715. ELEV. = 193.806m
8. TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT ENCLOSURE 14W IN FRONT OF MUN. NO. 6655. ELEV. = 193.812m
9. TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 15W IN FRONT OF THE FARM AT MUN. NO. 6603. ELEV. = 193.502m
10. TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 18W IN FRONT OF THE FARM AT MUN. NO. 6507. ELEV. = 193.143m
11. TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 20W, JUST NORTH OF MUN. NO. 6507. ELEV. = 192.918m
12. TOP OPERATING OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 23W IN FRONT OF MUN. NO. 6407. ELEV. = 192.328m
13. TOP OF NORTH–WEST CORNER OF WEST CONCRETE WINGWALL OF THE 10TH CONCESSION ROAD BRIDGE OF THE MCPHERSON DRAIN, JUST SOUTH OF SOUTH TALBOT ROAD. ELEV. = 191.821m

PROJECT NOTES:

GENERAL NOTES:

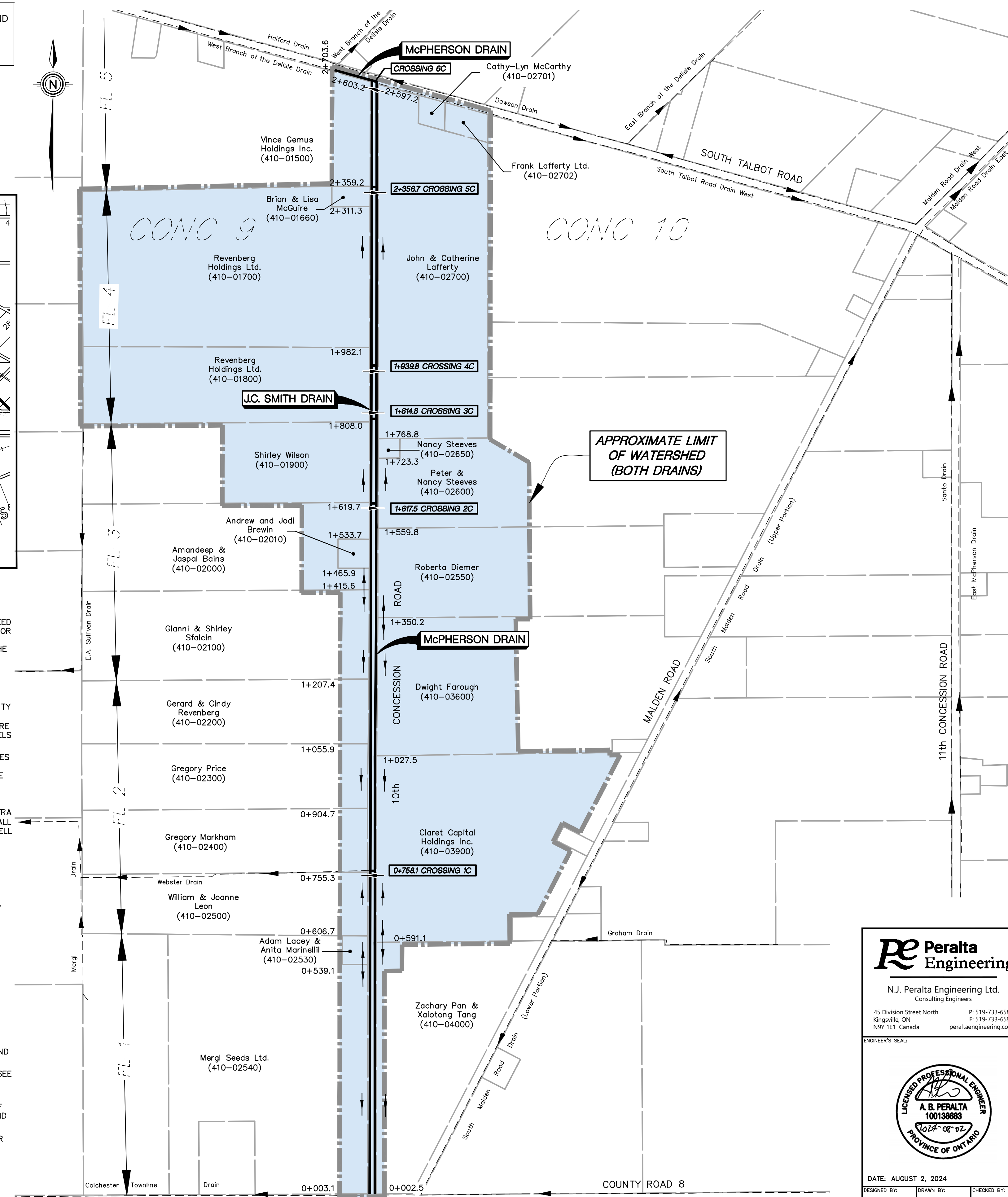
1. THE ACCURACY OF EXISTING UTILITIES SHOWN ON THESE DRAWINGS ARE NOT GUARANTEED BY THE OWNER OR N.J. PERALTA ENGINEERING LTD. OTHER UTILITIES MAY BE PRESENT OR THE UTILITIES SHOWN MAY DIFFER IN SIZE OR LOCATION SHOWN. CONTRACTOR SHALL LOCATE AND VERIFY DEPTHS OF ALL UTILITIES PRIOR TO CONSTRUCTION AND ADVISE THE ENGINEER OF ANY CONFLICTS. SUPPORT UTILITIES WHEN ENCOUNTERED.
2. ALL PLAN DIMENSIONS AND ELEVATIONS SHOWN IN METRES UNLESS OTHERWISE NOTED. DIMENSIONS DENOTE HORIZONTAL DISTANCE ALONG GROUND UNLESS OTHERWISE NOTED.
3. ALL PIPE DIAMETERS SHOWN IN MILLIMETRES UNLESS OTHERWISE NOTED.
4. PROPERTY LINES SHOWN ARE APPROXIMATE AND BASED ON TOWN OF TECUMSEH (COUNTY OF ESSEX) GIS INFORMATION AND LIMITED PROPERTY MARKERS FOUND DURING TOPOGRAPHIC SURVEY. PROPERTY LINES SHOWN ARE FOR GENERAL REFERENCE ONLY ARE SHALL NOT BE USED TO ESTABLISH OR CONFIRM PROPERTY BOUNDARIES. STATION LABELS FOR PROPERTY LINES ARE APPROXIMATE.
5. CONTRACTOR SHALL LAY OUT NEW WORK BASED ON LOCATIONS OF EXISTING STRUCTURES AND MAY ADJUST THE LOCATION OF PROPOSED WORK TO SUIT EXISTING CONDITIONS DURING CONSTRUCTION WITH APPROVAL BY THE ENGINEER AND/OR THE TOWN DRAINAGE SUPERINTENDENT.

DRAIN NOTES:

6. ALL NEW DRAIN PIPE TO BE TO BE BOSS 2000 PIPE (320 kPa) WITH WATER–TIGHT ULTRA STAB JOINING SYSTEM (BELL AND GASKET) BY ARMTEC, OR APPROVED EQUAL DUAL–WALL SMOOTHWALL INSIDE CORRUGATED OUTSIDE HDPE PIPE WITH 320 kPa STIFFNESS AND BELL AND GASKET WATERTIGHT JOINTS. MINIMUM 300mm COVER, UNLESS OTHERWISE NOTED.
7. INSTALL FLOATATION ANCHORS AT ENDS OF ALL HDPE PLASTIC PIPE WITH SLOPED END TREATMENT. SEE DETAIL ON SHEET 11.
8. PROVIDE SLOPED QUARRIED LIMESTONE END TREATMENTS ON ALL CULVERT ENDS. SEE DETAIL ON SHEET 11.
9. ALL CATCHBASIN'S SHALL BE 600mm DIAMETER BOSS 2000 PIPE WITH FACTORY FABRICATED (WELDED) STUBS AND SUMP (AS APPLICABLE), AND COMPLETE WITH HEAVY DUTY CAST IRON GRATE.
   - 9.1. MAINLINE DIAMETER $< 600\varnothing$ = STANDARD BASIN WITH MINIMUM 450mm SUMP.
   - 9.2. MAINLINE DIAMETER $\leq 600\varnothing$ = SADDLE TYPE (ROTATED TEE STYLE) BASIN
10. BACKFILL OF NEW DRAIN ENCLOSURES SHALL BE PER TYPICAL BACKFILL DETAIL, OR GEOTECHNICAL REPORT.
11. DRAINS CROSSING ABOVE WATERMAINS SHALL HAVE PIPE SECTIONS CENTRED OVER THE WATERMAIN. MINIMUM CLEAR VERTICAL OF 0.50m UNLESS STATED OTHERWISE OR APPROVED BY THE ENGINEER OR TOWN.
12. PROPOSED SWALES SHALL BE CENTRED OVER THE PROPOSED ENCLOSURE ALIGNMENT.

RESTORATION NOTES:

13. PLACE MINIMUM 4" (100mm) THICK TOPSOIL ON NEW CUT DITCH AND SWALE BANKS, AND ALL DISTURBED AREAS. HYDRA–SEED TO GRASS PER OPSS 804.
14. PROVIDE TEMPORARY SEDIMENT CONTROL MEASURES IN ACCORDANCE WITH OPSS 805. SEE OPSD 219.130 AND OPSD 219.180.
15. CONTRACTOR SHALL PROTECT ALL PRIVATE FEATURES (SUCH AS FENCES, SPRINKLERS, FLOWER BEDS, ETC.). IN THE EVENT THAT A PRIVATE FEATURE IS IN THE ALIGNMENT OF THE NEW COVERED DRAINAGE SYSTEM, THE CONTRACTOR SHALL CAREFULLY REMOVE AND RE–INSTALL THE PRIVATE FEATURE TO ITS ORIGINAL STATE, UNLESS OTHERWISE NOTED.
16. GRAVEL DRIVEWAY SHALL BE RESTORED WITH MINIMUM 300mm THICK GRANULAR 'A' (OR MATCH EXISTING THICKNESS). SEE DETAIL ON SHEET 11.
17. ASPHALT DRIVEWAYS SHALL BE RESTORED WITH MINIMUM 100mm THICK HL3 ASPHALT SURFACE (OR MATCH EXISTING THICKNESS) WITH MINIMUM 300mm THICK GRANULAR 'A' BASE. SEE DETAIL ON SHEET 11.
18. ASPHALT ROADWAY SHALL BE RESTORED WITH MINIMUM 100mm THICH HL3 ASPHALT SURFACE (OR MATCH EXISTING THICKNESS), WITH MINIMUM 450mm THICK GRANULAR 'A' BASE. SEE DETAIL ON SHEET 11.



OVERALL J.C. SMITH AND McPHERSON DRAINS WATERSHED PLAN

Scale = 1:5,000

Peralta Engineering

N.J. Peralta Engineering Ltd.
Consulting Engineers

45 Division Street North
Kingsville, ON
N9Y 1E1 Canada

P: 519-733-6587
F: 519-733-6588
peraltaengineering.com

ENGINEER'S SEAL:

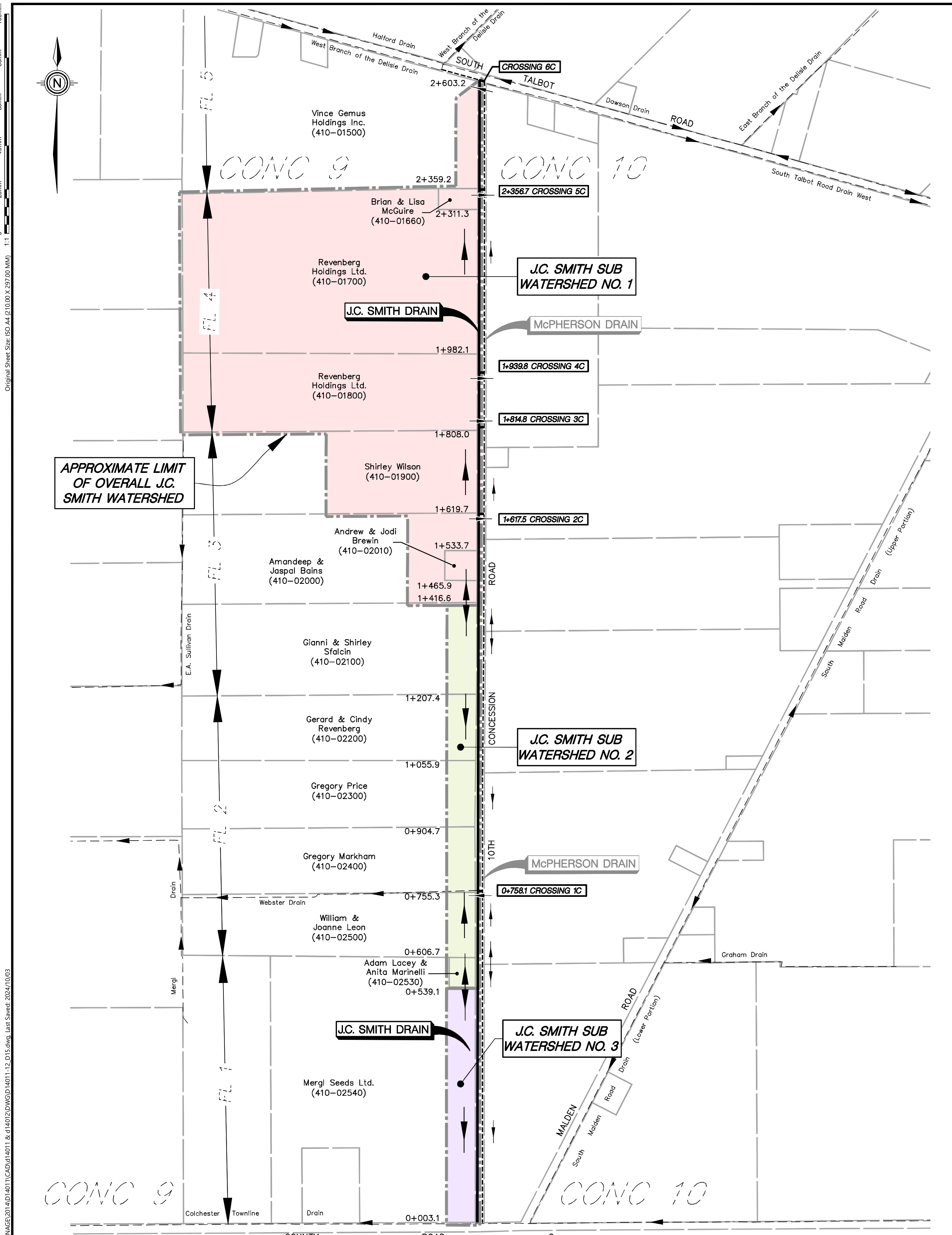
LICENSED PROFESSIONAL ENGINEER
A. B. PERALTA
100138683
2024-08-02
PROVINCE OF ONTARIO

DATE: AUGUST 2, 2024

DESIGNED BY:	DRAWN BY:	CHECKED BY:
B.N.D./A.B.P.	B.N.D.	A.B.P.

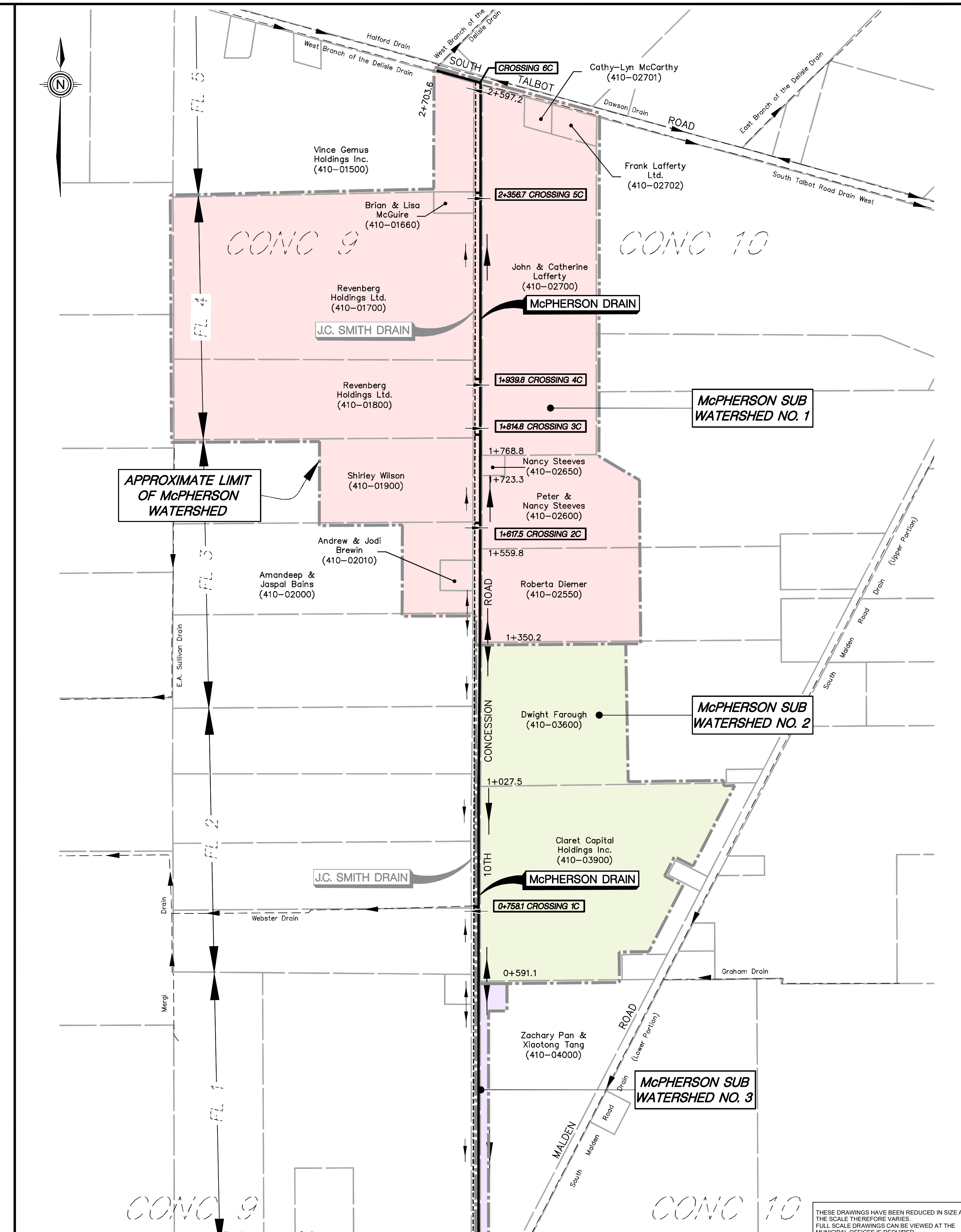
PROJECT No.:	SHEET No.:
D14-011	1 OF 18

z:\PROJECTS\DRAINAGE\2014\D14011\CAD\d14011 & d14012\DWG\D14011-12_D15.dwg, Last Saved: 2024/10/03



J.C. SMITH DRAIN WATERSHED PLAN

Scale = 1:5,000



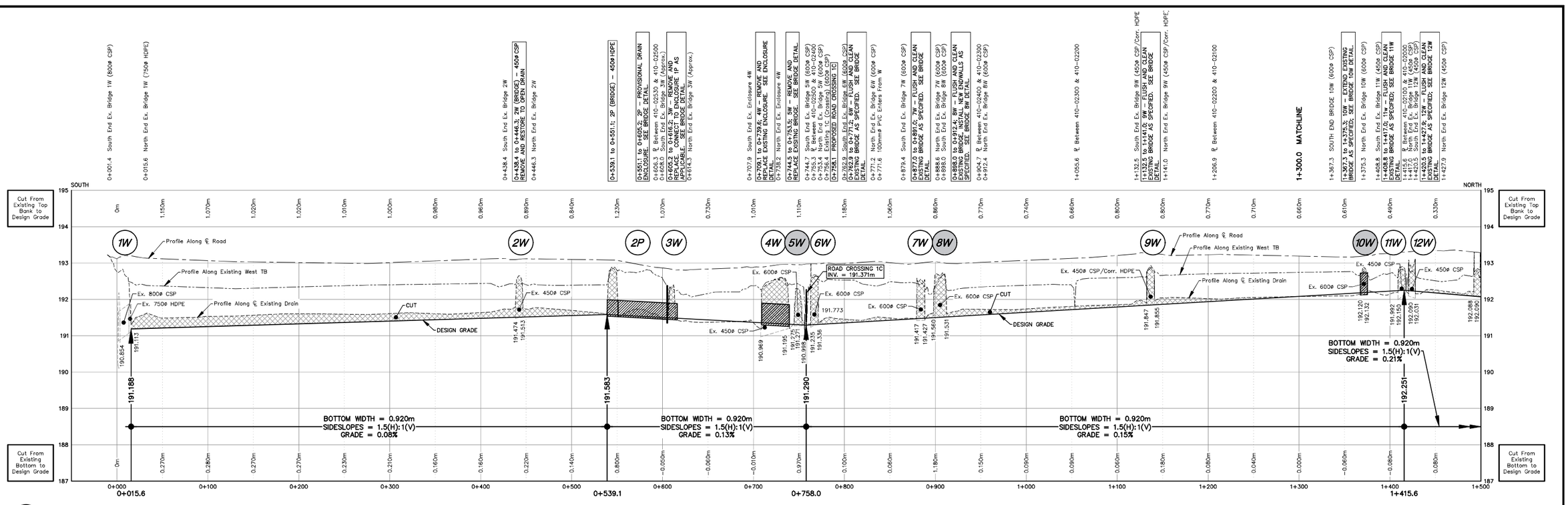
MCPHERSON DRAIN WATERSHED PLAN

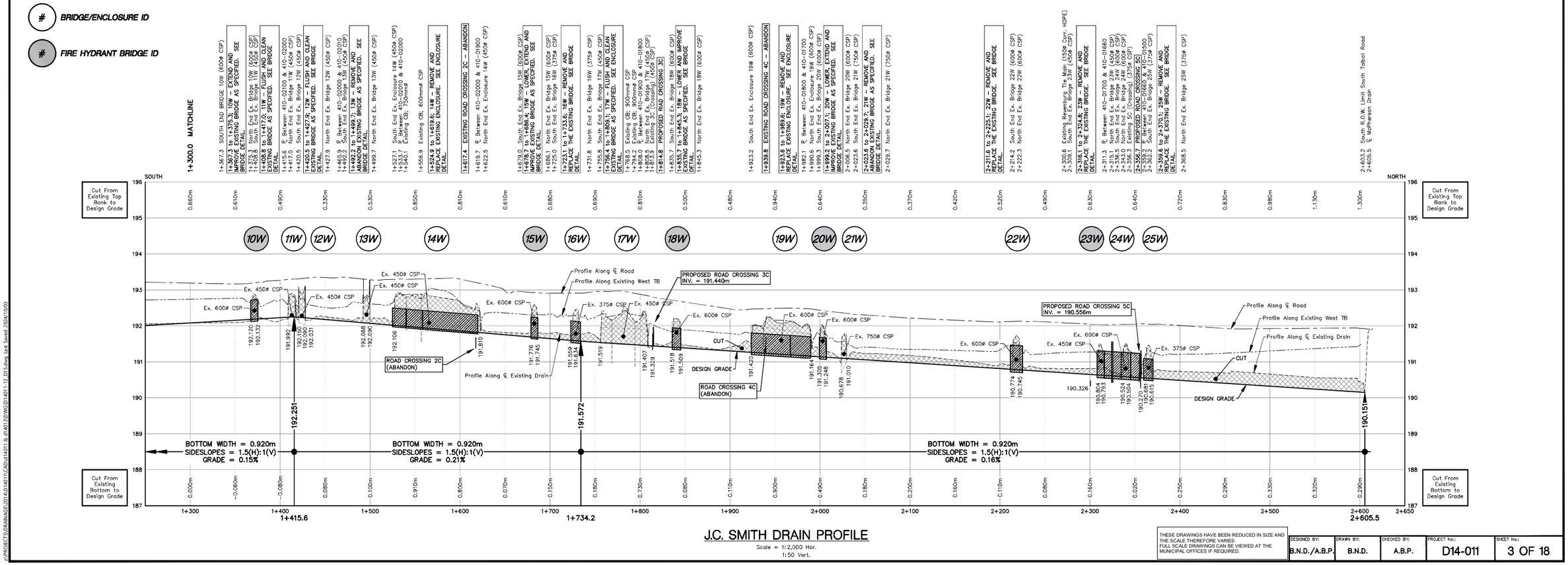
Scale = 1:5,000

THESE DRAWINGS HAVE BEEN REDUCED IN SIZE AND THE SCALE THEREFORE VARIES. FULL SCALE DRAWINGS CAN BE VIEWED AT THE MUNICIPAL OFFICES IF REQUIRED.

INDIVIDUAL WATERSHED PLANS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	PROJECT No.:	SHEET No.:
B.N.D./A.B.P.	B.N.D.	A.B.P.	D14-011	2 OF 18





(#) BRIDGE/ENCLOSURE ID

(#) FIRE HYDRANT BRIDGE ID

J.C. SMITH DRAIN PROFILE

Scale = 1:2,000 Hor.
1:50 Vert.

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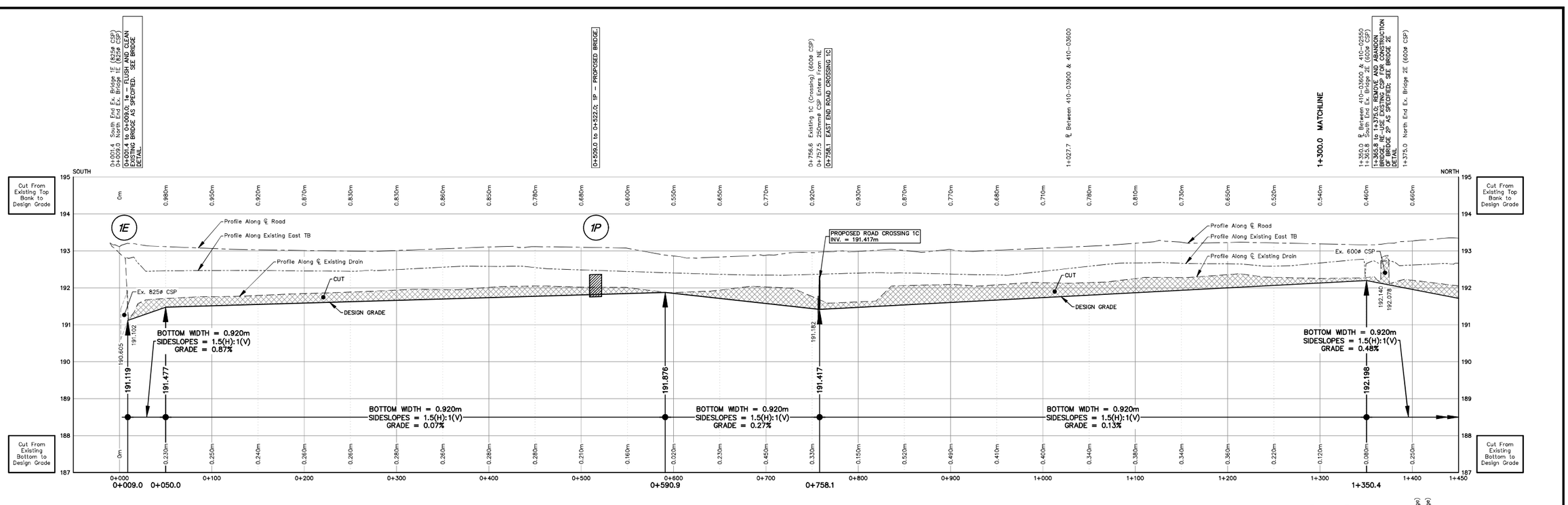

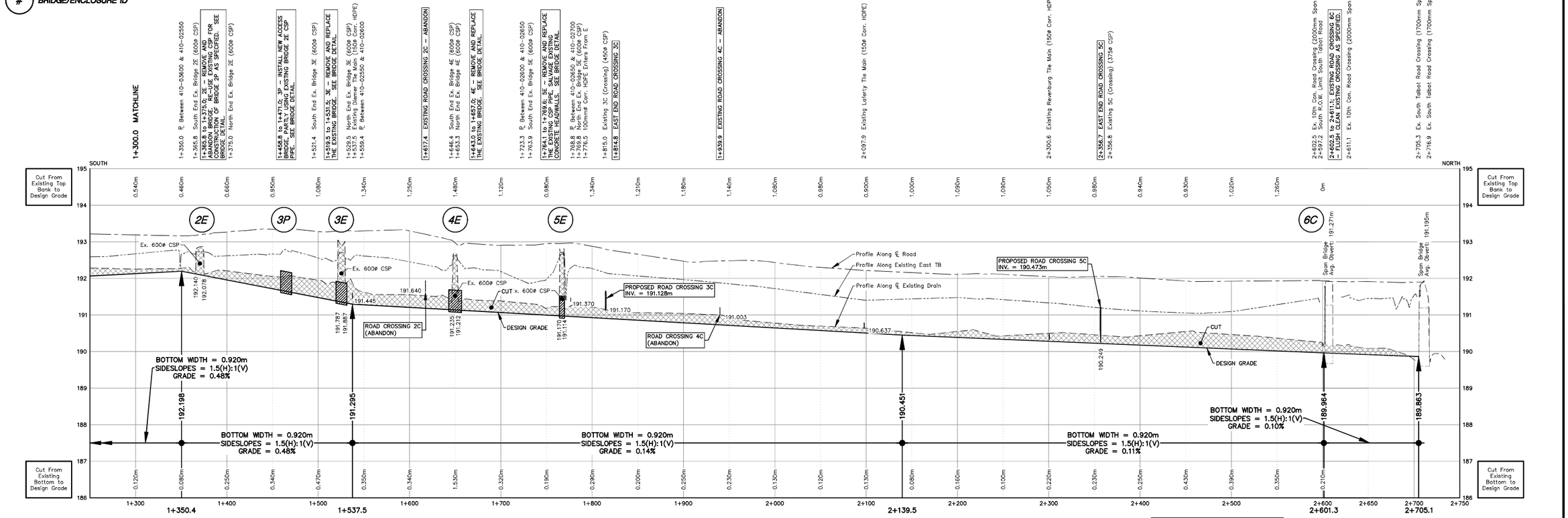

MCPHERSON DRAIN PROFILE

Scale = 1:2,000 Hor.
1:50 Vert.

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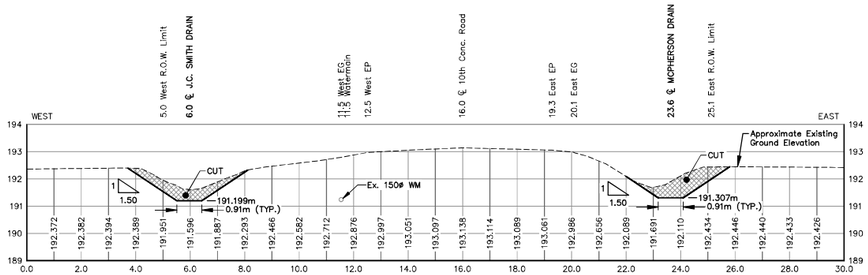

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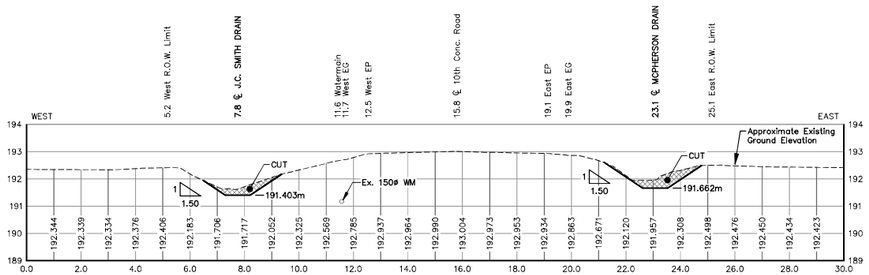

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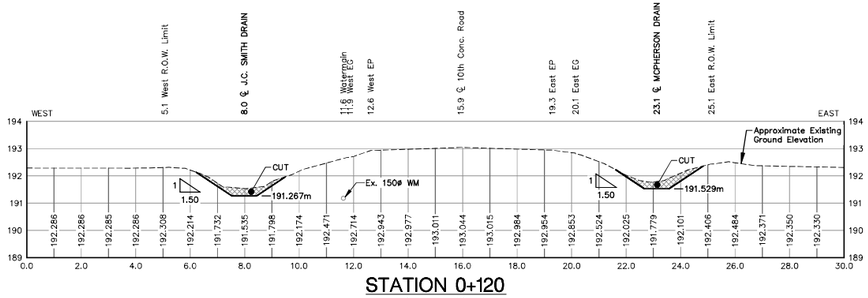

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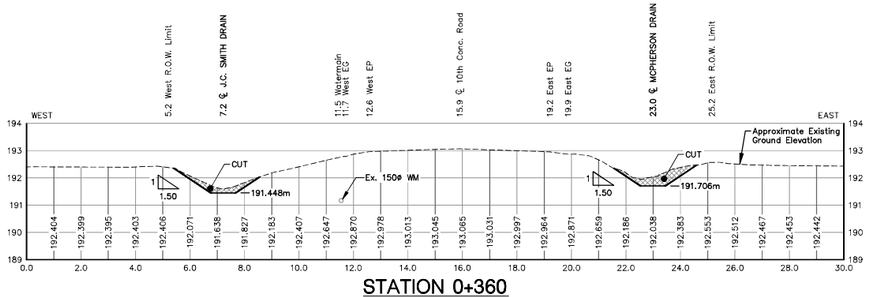

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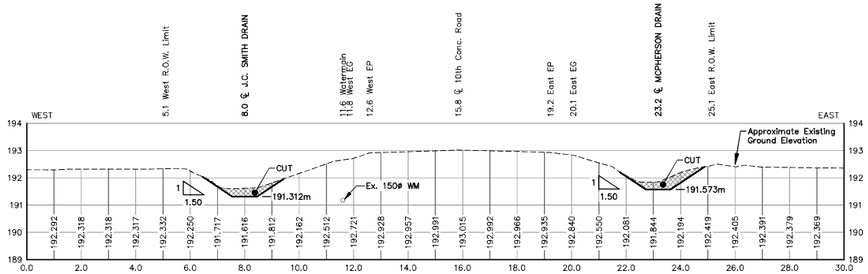

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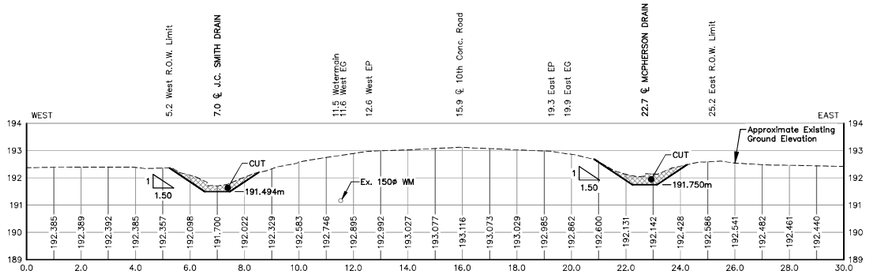

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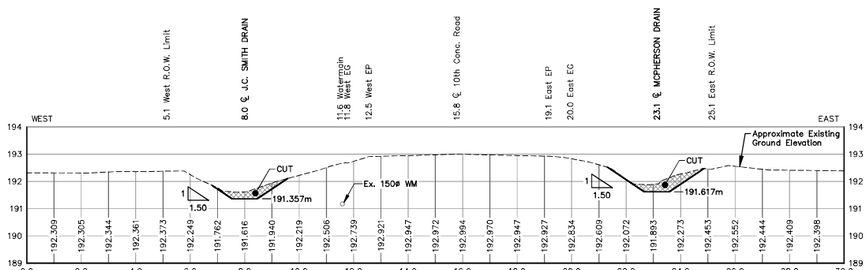

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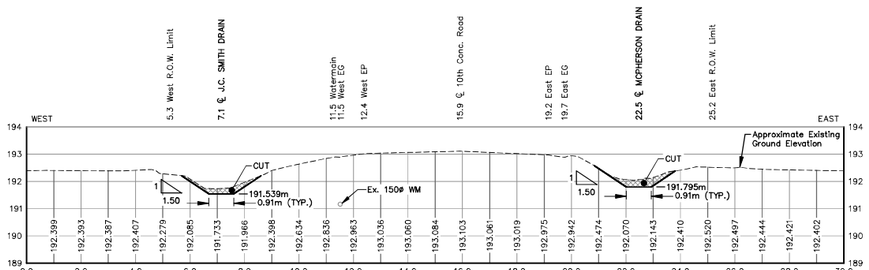

STATION 0+480

Scale = 1:100

NOTES:

1. MINIMUM DRAIN BANK SLOPE FOR ALL SECTIONS SHALL BE 1.5(H):1(V).
2. BOTTOM WIDTH FOR ALL DRAIN CROSS SECTIONS SHALL BE 0.914m (3.0 FT).

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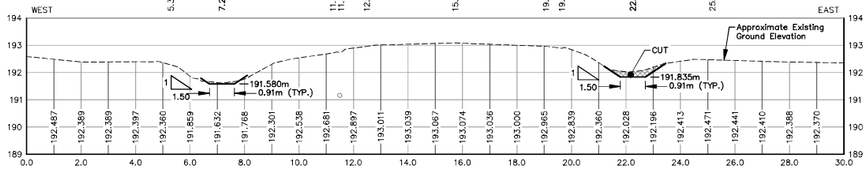
B.N.D./A.B.P.	B.N.D.	A.B.P.	D14-011	5 OF 18



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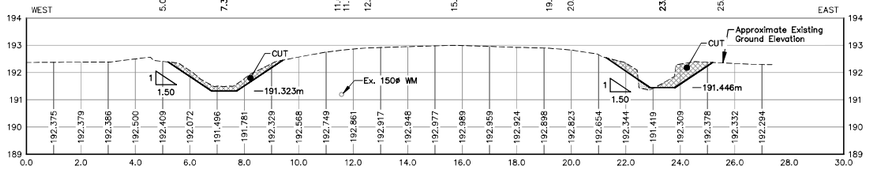
Scale = 1:100



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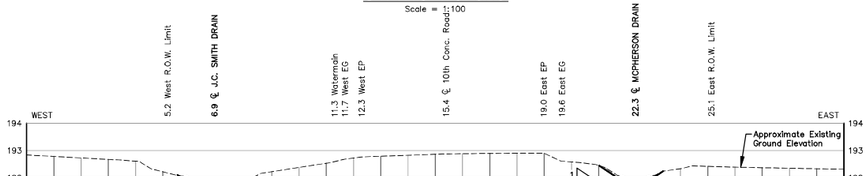

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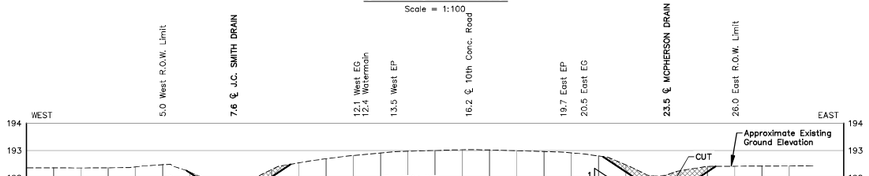
Scale = 1:100



STATION 0+840

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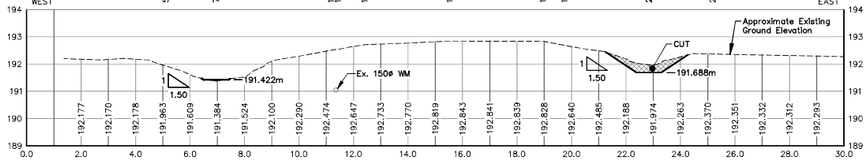

STATION 0+660

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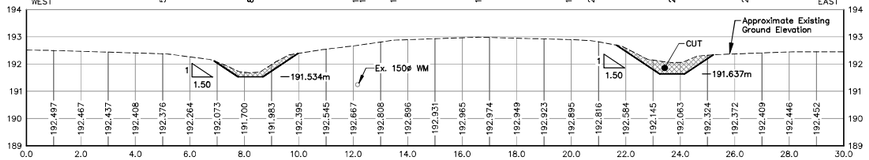
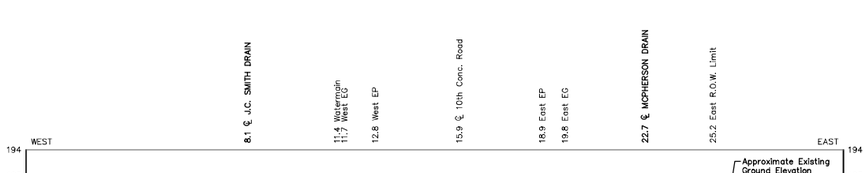


STATION 0+925

Scale = 1:100



STATION 0+700

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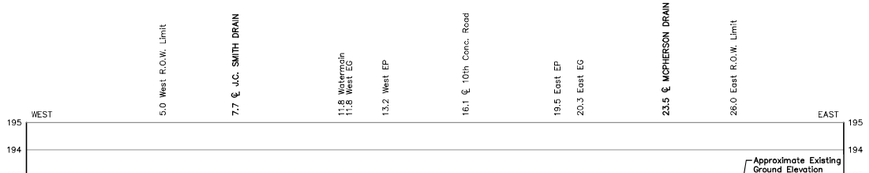

STATION 0+960

Scale = 1:100

NOTES:

1. MINIMUM DRAIN BANK SLOPE FOR ALL SECTIONS SHALL BE 1.5(H):1(V).
2. BOTTOM WIDTH FOR ALL DRAIN CROSS SECTIONS SHALL BE 0.914m (3.0 FT).

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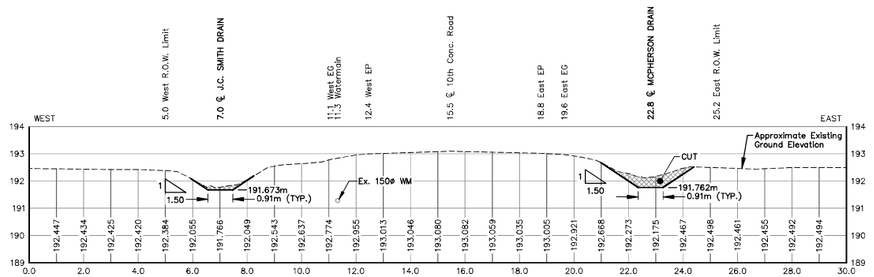
B.N.D./A.B.P.	B.N.D.	A.B.P.	D14-011	6 OF 18



STATION 1+020

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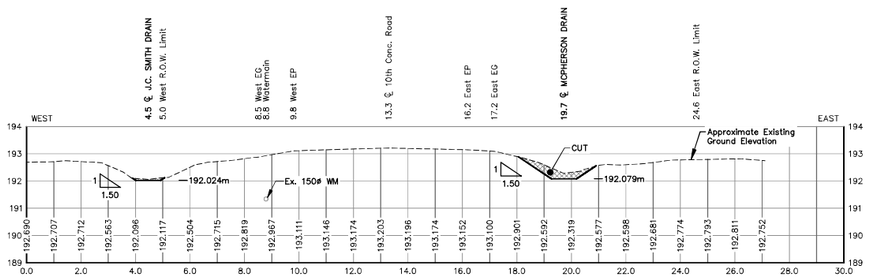

STATION 1+260

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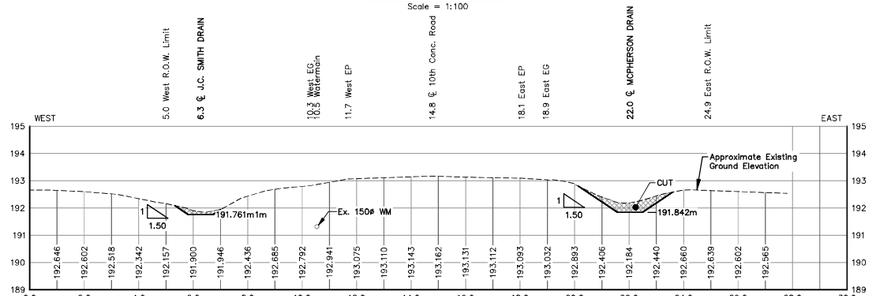

STATION 1+080

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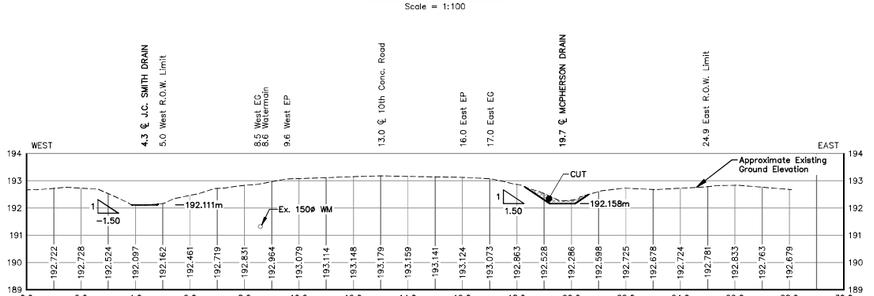

STATION 1+320

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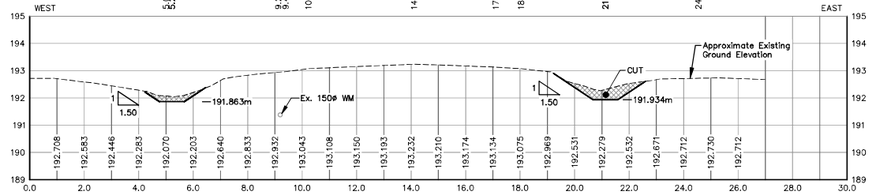

STATION 1+150

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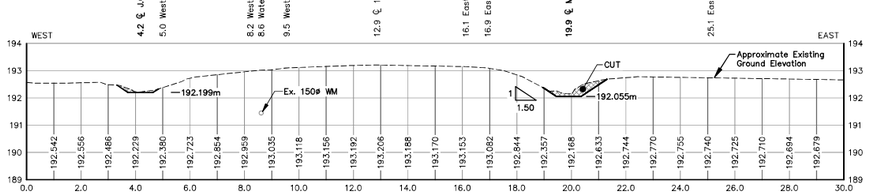

STATION 1+380

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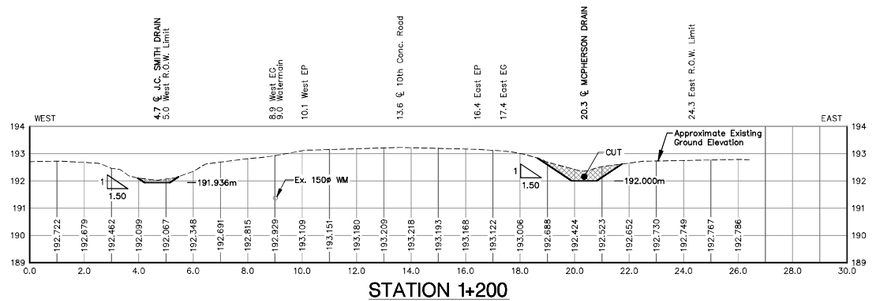

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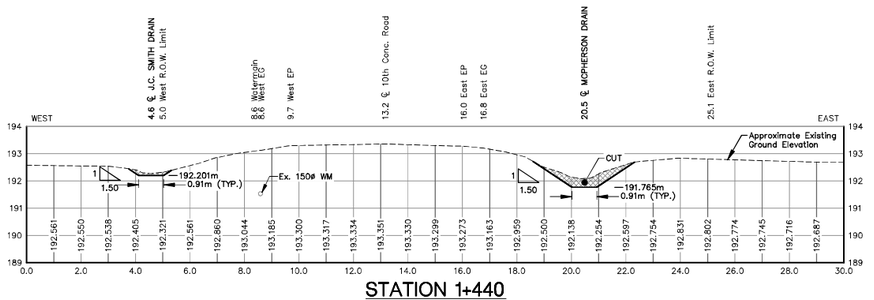

STATION 1+440

Scale = 1:100

NOTES:

1. MINIMUM DRAIN BANK SLOPE FOR ALL SECTIONS SHALL BE 1.5(H):1(V).
2. BOTTOM WIDTH FOR ALL DRAIN CROSS SECTIONS SHALL BE 0.914m (3.0 FT).

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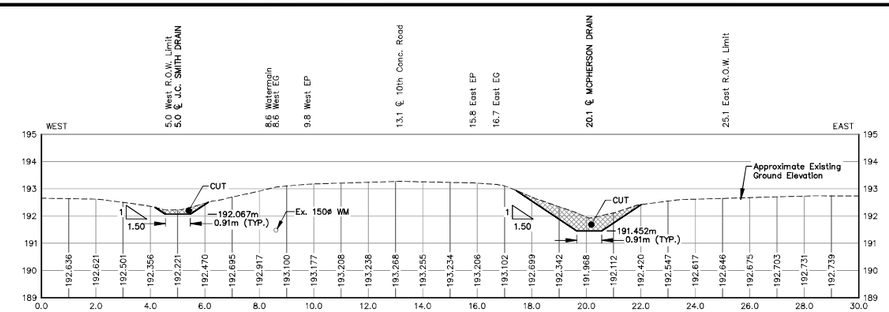
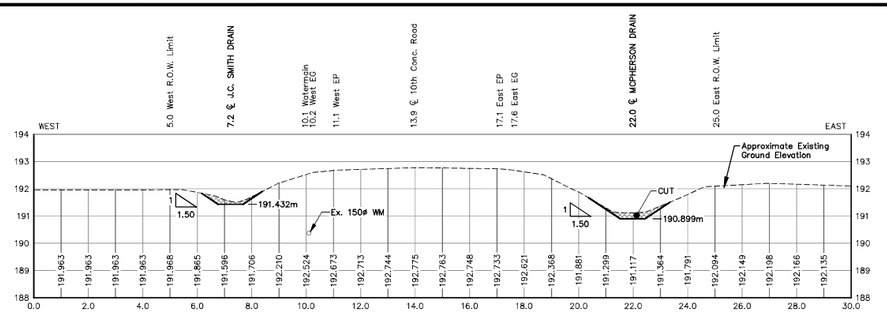


STATION 1+505

Scale = 1:100



STATION 1+820

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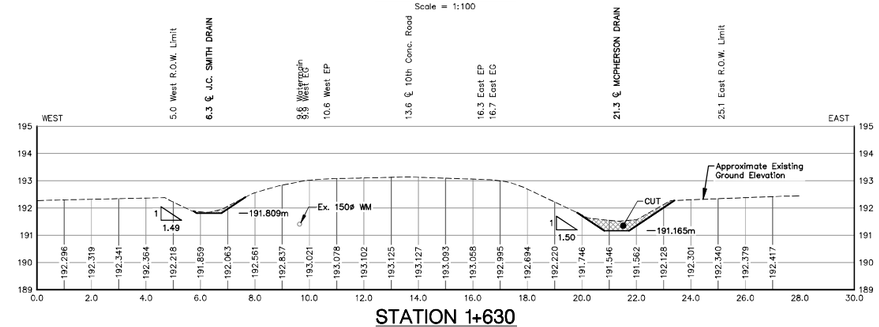

STATION 1+630

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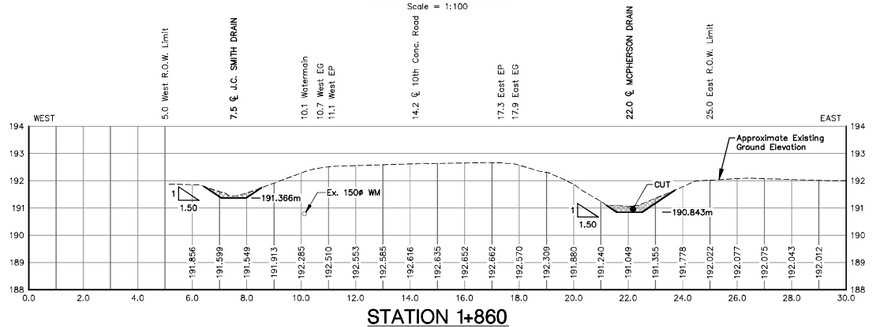

STATION 1+860

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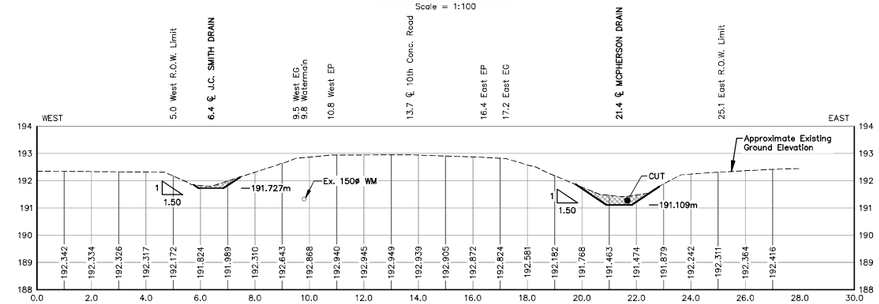

STATION 1+670

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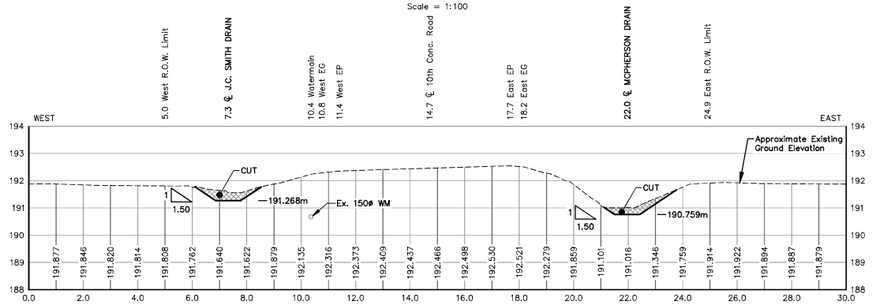

STATION 1+920

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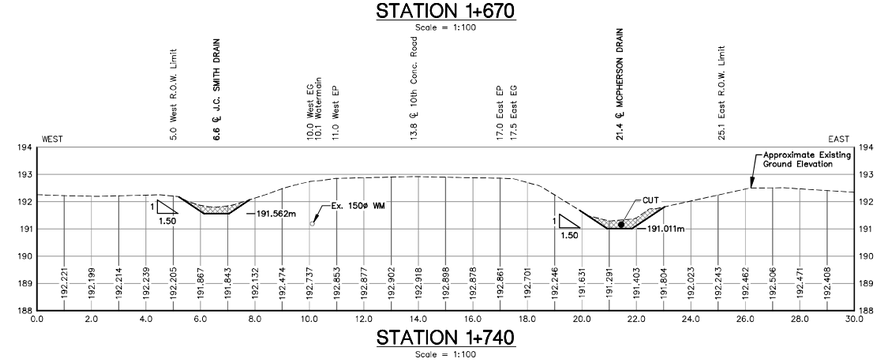

STATION 1+740

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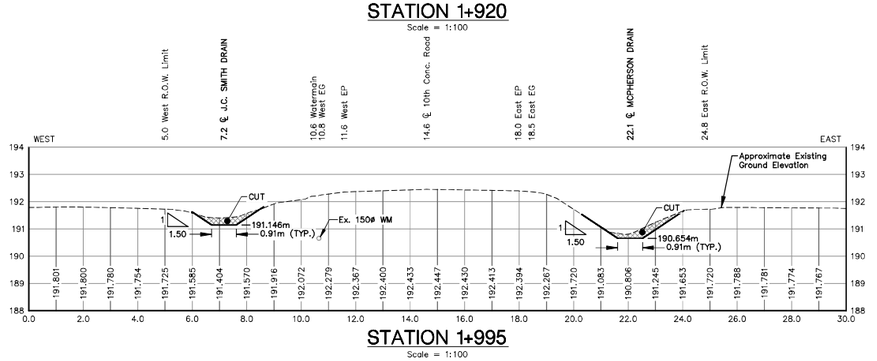

STATION 1+995

Scale = 1:100

NOTES:

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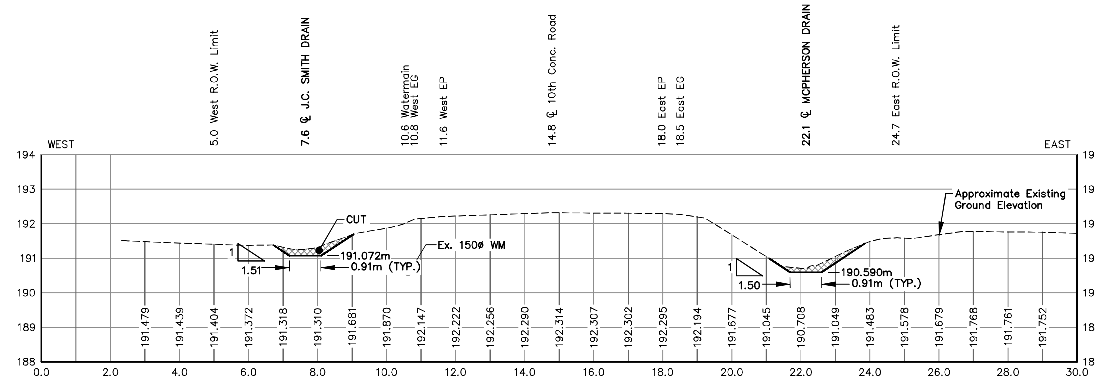

STATION 2+040

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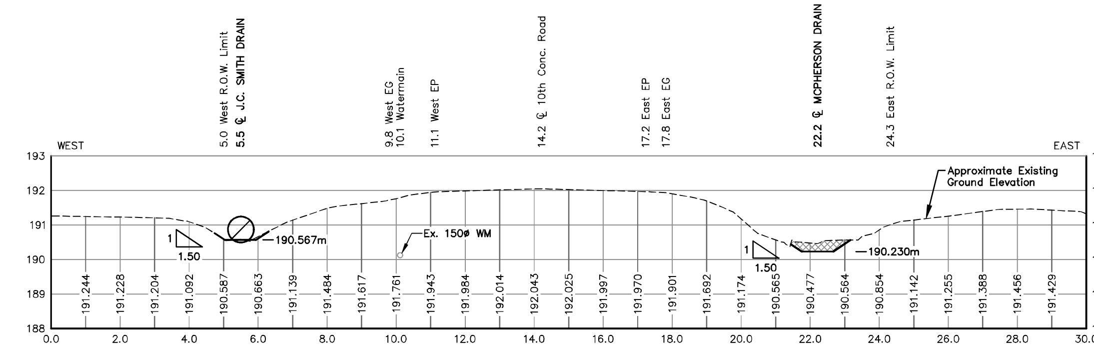

STATION 2+350

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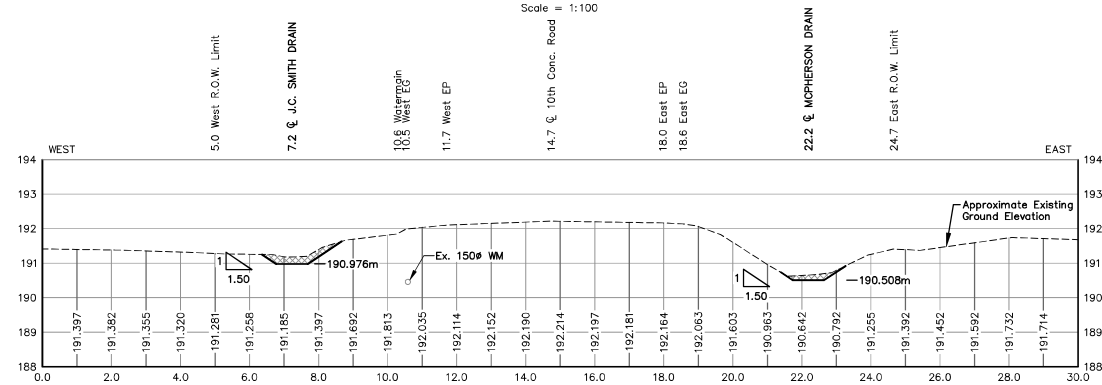

STATION 2+099

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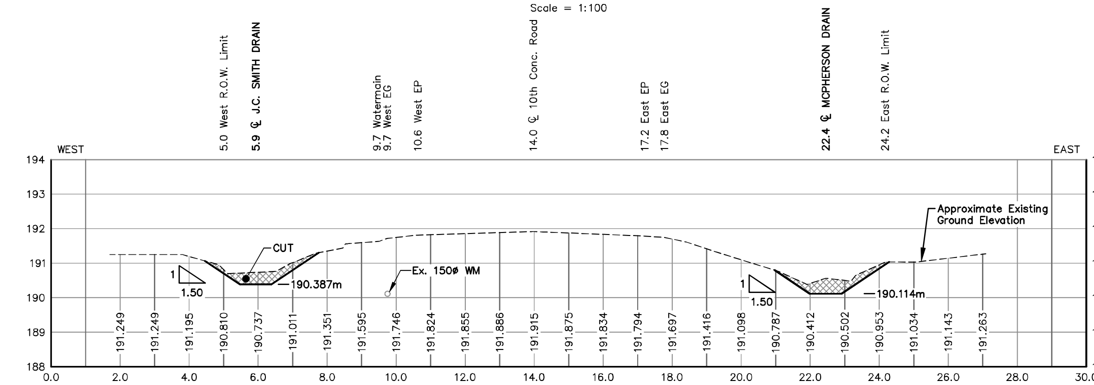

STATION 2+460

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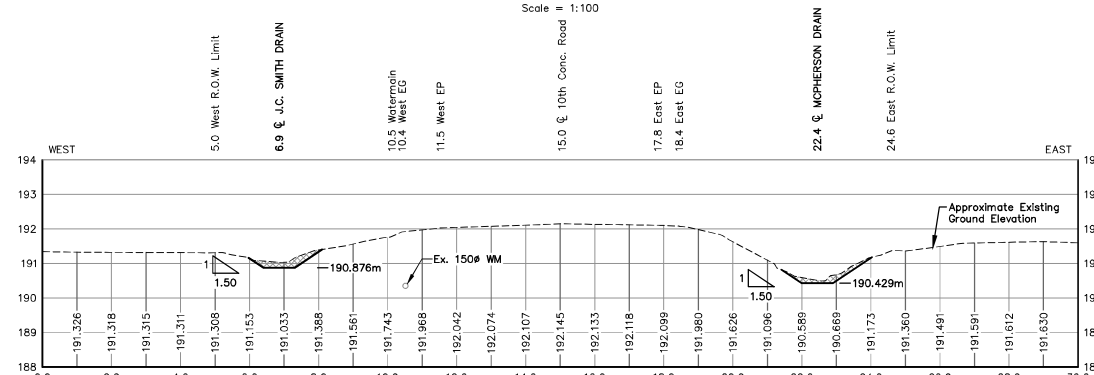

STATION 2+161

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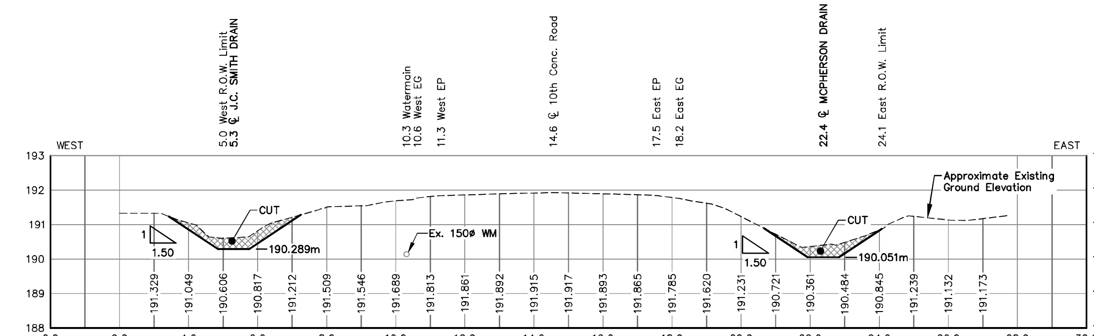

STATION 2+520

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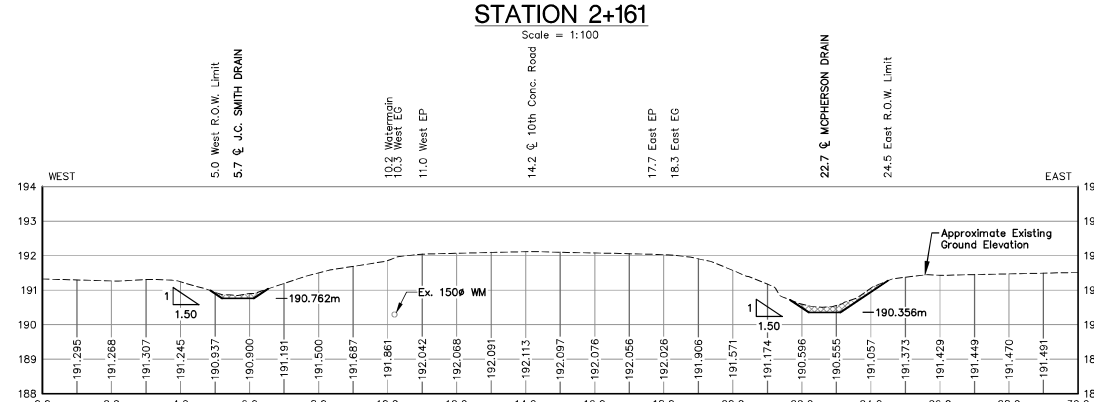

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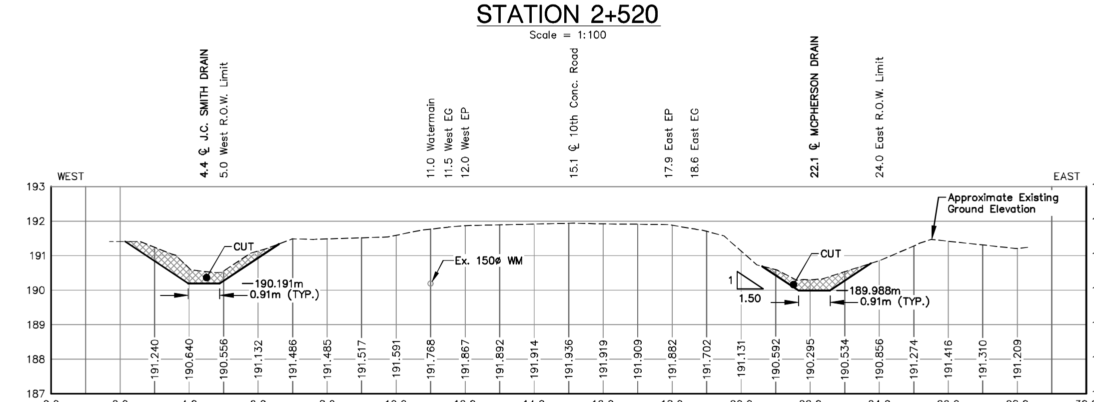

STATION 2+580

Scale = 1:100

NOTES:

1. MINIMUM DRAIN BANK SLOPE FOR ALL SECTIONS SHALL BE 1.5(H):1(V).
2. BOTTOM WIDTH FOR ALL DRAIN CROSS SECTIONS SHALL BE 0.914m (3.0 FT).

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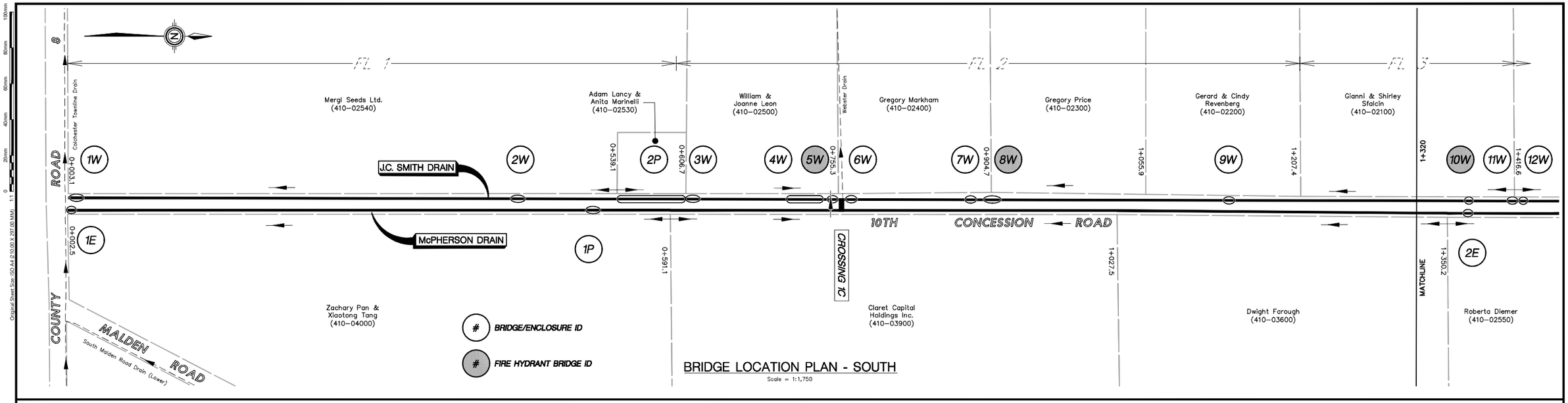
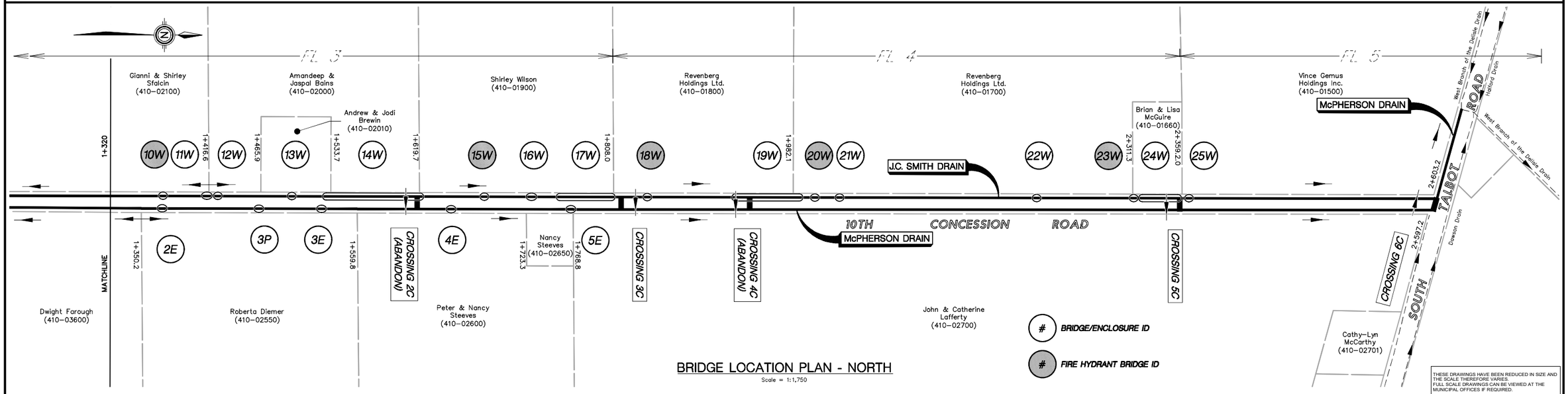


BRIDGE LOCATION PLAN - SOUTH

Scale = 1:1,750



BRIDGE LOCATION PLAN - NORTH

Scale = 1:1,750

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SHEET INDEX - BRIDGES, ENCLOSURES, AND CROSSINGS

J.C. SMITH DRAIN (WEST SIDE)

BRIDGE 1W	(TECUMSEH & MERGL SEEDS LTD. 410-02540)	(SHEET 13)	– FLUSH AND CLEAN
BRIDGE 2W	(MERGL SEEDS LTD. 410-02540)	(SHEET 13)	– REMOVE AND RESTORE TO OPEN DRAIN
ENCLOSURE 2P	(LACEY & MARINELLI 410-02530)	(SHEET 13)	– NEW ENCLOSURE
BRIDGE 3W	(LEON 410-02500)	(SHEET 13)	– BRIDGE REPLACEMENT
ENCLOSURE 4W	(LEON 410-02500)	(SHEET 13)	– ENCLOSURE REPLACEMENT
BRIDGE 5W	(TECUMSEH, FIRE HYDRANT)	(SHEET 13)	– FLUSH, CLEAN AND REPLACE END TREATMENTS
BRIDGE 6W	(MARKHAM 410-02400)	(SHEET 14)	– FLUSH AND CLEAN
BRIDGE 7W	(MARKHAM 410-02400)	(SHEET 14)	– FLUSH AND CLEAN
BRIDGE 8W	(TECUMSEH & PRICE 410-02300)	(SHEET 14)	– FLUSH, CLEAN, AND REPLACE END TREATMENTS
BRIDGE 9W	(REVENBERG 410-02200)	(SHEET 14)	– FLUSH AND CLEAN
BRIDGE 10W	(TECUMSEH, FIRE HYDRANT)	(SHEET 14)	– BRIDGE REPLACEMENT
BRIDGE 11W	(SFALCIN 410-02100)	(SHEET 14)	– FLUSH AND CLEAN
BRIDGE 12W	(BAINS 410-02000)	(SHEET 14)	– FLUSH AND CLEAN
BRIDGE 13W	(BREWIN 410-02010)	(SHEET 14)	– REMOVE AND RESTORE TO OPEN DRAIN
ENCLOSURE 14W	(BREWIN 410-020100 & BAINS 410-0200)	(SHEET 15)	– ENCLOSURE REPLACEMENT
BRIDGE 15W	(TECUMSEH, FIRE HDYRANT)	(SHEET 16)	– BRIDGE REPLACEMENT
BRIDGE 16W	(WILSON 410-001900)	(SHEET 16)	– BRIDGE REPLACEMENT
ENCLOSURE 17W	(WILSON 410-001900)	(SHEET 16)	– REPLACE END TREATMENTS
BRIDGE 18W	(TECUMSEH, FIRE HYDRANT)	(SHEET 16)	– LOWER CULVERT AND REPLACE END TREATMENTS
ENCLOSURE 19W	(REVENBERG HOLDINGS LTD. 410-01800)	(SHEET 17)	– ENCLOSURE REPLACEMENT
BRIDGE 20W	(TECUMSEH, FIRE HYDRANT)	(SHEET 17)	– BRIDGE REPLACEMENT
BRIDGE 21W	(REVENBERG HOLDINGS LTD. 410-01700)	(SHEET 17)	– REMOVE AND RESTORE TO OPEN DRAIN
BRIDGE 22W	(REVENBERG HOLDINGS LTD. 410-01700)	(SHEET 17)	– BRIDGE REPLACEMENT
BRIDGE 23W	(TECUMSEH, FIRE HYDRANT)	(SHEET 17)	– BRIDGE REPLACEMENT
ENCLOSURE 24W	(McGUIRE 410-01660)	(SHEET 18)	– NEW ENCLOSURE TO REPLACE BRIDGE
BRIDGE 25W	(VINCE GEMUS HOLDINGS INC. 410-01500)	(SHEET 18)	– BRIDGE REPLACEMENT

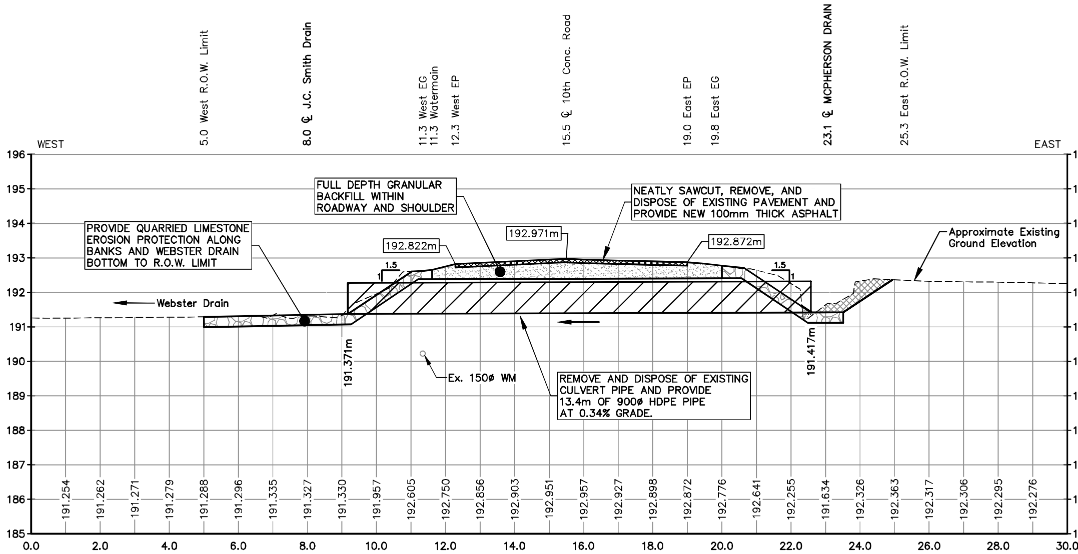
MCPHERSON DRAIN (EAST SIDE)

BRIDGE 1E	(TECUMSEH)	(SHEET 12)	– FLUSH AND CLEAN
BRIDGE 1P	(PAN & TANG 410-04000)	(SHEET 12)	– NEW BRIDGE
BRIDGE 2E	(DIEMER 410-02550)	(SHEET 14)	– REMOVE AND RESTORE TO OPEN DRAIN
BRIDGE 3P	(DIEMER 410-02550)	(SHEET 14)	– NEW BRIDGE
BRIDGE 3E	(DIEMER 410-02550)	(SHEET 14)	– BRIDGE REPLACEMENT
BRIDGE 4E	(STEEVES 410-02600)	(SHEET 16)	– BRIDGE REPLACEMENT
BRIDGE 5E	(STEEVES 410-02650)	(SHEET 16)	– BRIDGE REPLACEMENT, CONCRETE HEADWALLS TO REMAIN

ROAD CROSSINGS

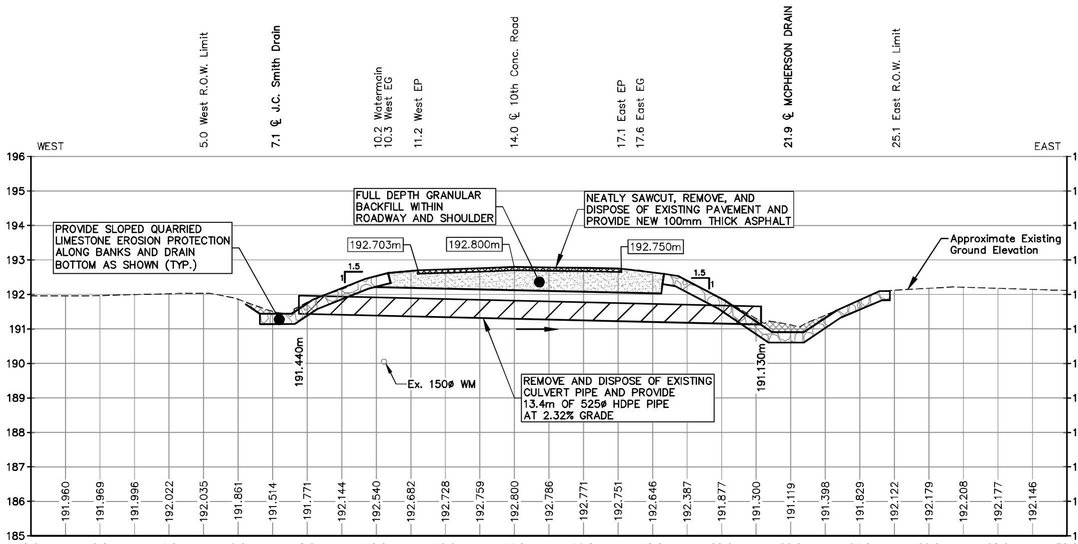
CROSSING 1C	(TECUMSEH)	(SHEETS 11 & 13)	– FULL REPLACEMENT
CROSSING 2C	(TECUMSEH)	(SHEET 15)	– PLUG AND ABANDON
CROSSING 3C	(TECUMSEH)	(SHEETS 11 & 16)	– FULL REPLACEMENT
CROSSING 4C	(TECUMSEH)	(SHEET 17)	– PLUG AND ABANDON
CROSSING 5C	(TECUMSEH)	(SHEETS 11 & 18)	– FULL REPLACEMENT
CROSSING 6C	(TECUMSEH)	(NOT SHOWN)	– FLUSH AND CLEAN

DESIGNED BY:	DRAWN BY:	CHECKED BY:
B.N.D./A.B.P.	B.N.D.	A.B.P.
PROJECT No.: D14-011	SHEET No.: 10 OF 18	



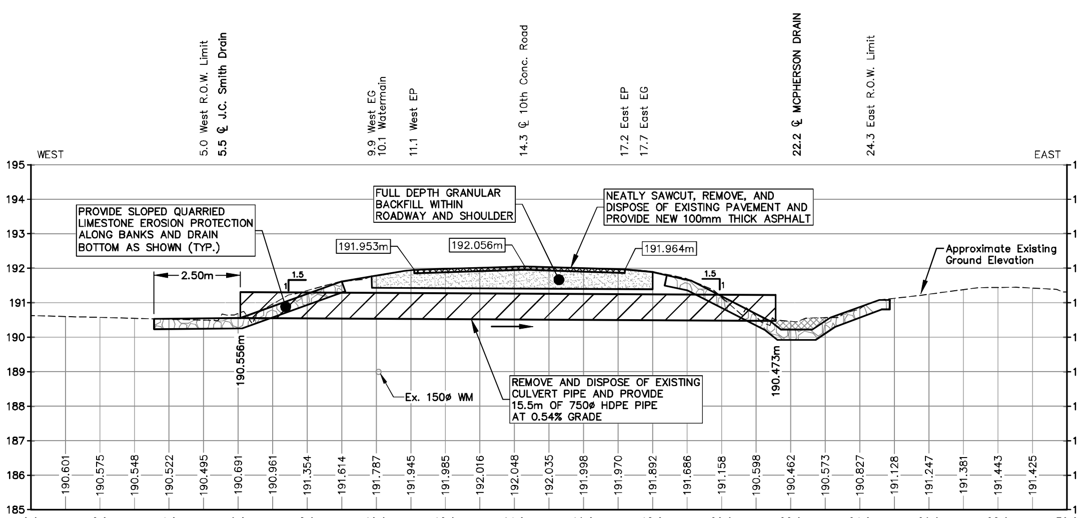
ROAD CROSSING 1C - STA. 0+758

Scale: 1:100



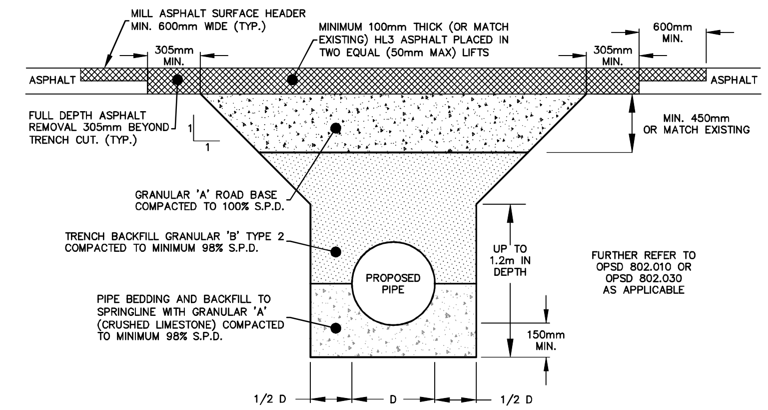
ROAD CROSSING 3C - STA. 1+815

Scale: 1:100



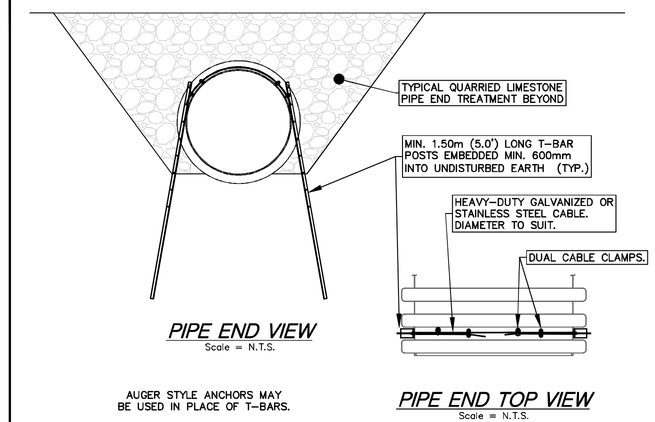
ROAD CROSSING 5C - STA. 2+357

Scale: 1:100



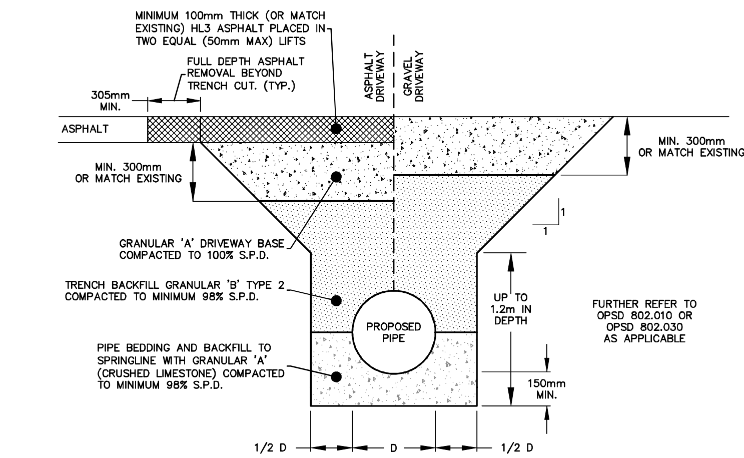
TYPICAL ROADWAY CROSSING BACKFILL DETAIL

Scale = N.T.S.



PIPE FLOATATION ANCHOR DETAIL

Scale = N.T.S.

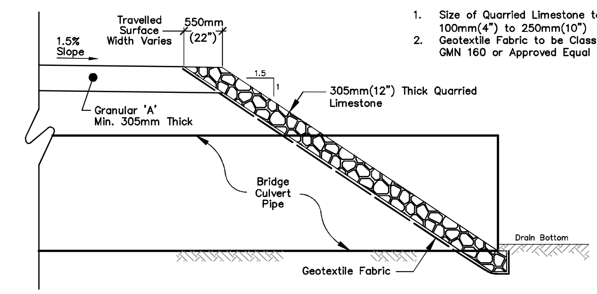


TYPICAL DRIVEWAY CROSSING BACKFILL DETAIL

Scale = N.T.S.

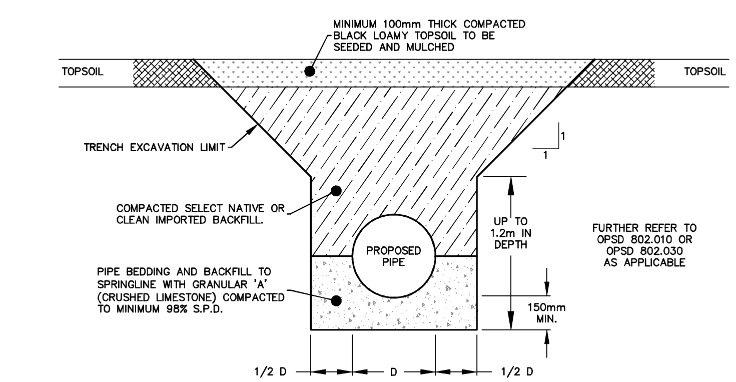
NOTE:

1. Size of Quarried Limestone to be 100mm(4") to 250mm(10")
2. Geotextile Fabric to be Class I GMN 160 or Approved Equal



TYPICAL QUARRIED LIMESTONE END TREATMENT DETAIL

Scale = N.T.S.



TYPICAL BOULEVARD AREA BACKFILL DETAIL

Scale = N.T.S.

NOTES:

1. MINIMUM DRAIN BANK SLOPE FOR ALL SECTIONS SHALL BE 1.5(H):1(V).
2. BOTTOM WIDTH FOR ALL DRAIN CROSS SECTIONS SHALL BE 0.914m (3.0 FT).

THESE DRAWINGS HAVE BEEN REDUCED IN SIZE AND THE SCALE THEREFORE VARIES. FULL SCALE DRAWINGS CAN BE VIEWED AT THE MUNICIPAL OFFICES IF REQUIRED.

DESIGNED BY:	DRAWN BY:	CHECKED BY:	PROJECT No.:	SHEET No.:
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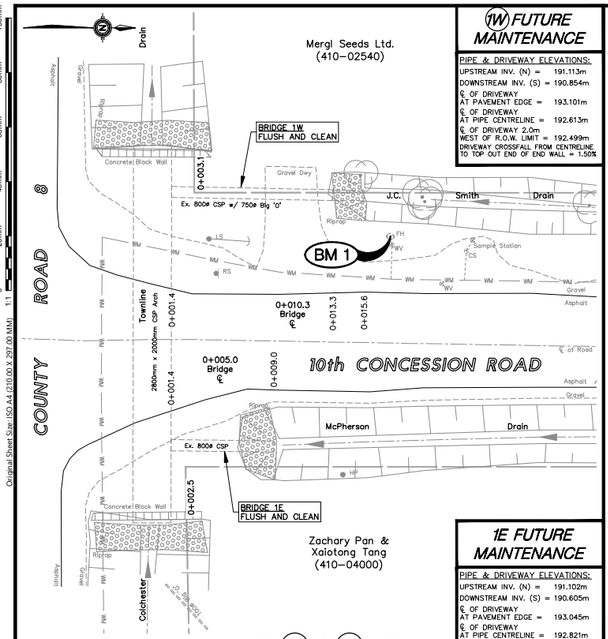


BRIDGE (1W) & (1E) DETAIL

Scale = 1:200

(1W) FUTURE MAINTENANCE

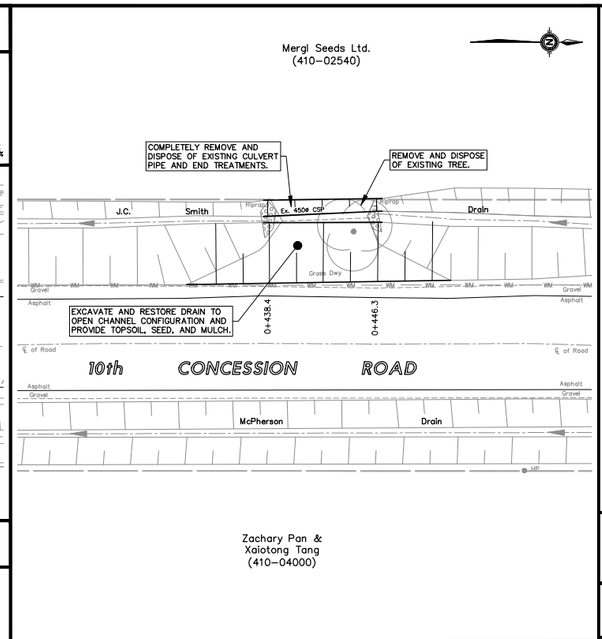
PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (N) = 191.113m
DOWNSTREAM INV. (S) = 190.854m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 193.101m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.613m
℄ OF DRIVEWAY 2.0m WEST OF R.O.W. LIMIT = 192.499m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

1E FUTURE MAINTENANCE

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (N) = 191.102m
DOWNSTREAM INV. (S) = 190.605m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 193.045m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.821m
℄ OF DRIVEWAY AT EAST OF R.O.W. LIMIT = 192.805m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

	PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
BRIDGE 1W	800mmø	14.1m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL
BRIDGE 1E	800mmø	7.5m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

BENCHMARK:
TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF THE 10TH CONCESSION ROAD, APPROXIMATELY 28.0m NORTH OF THE COUNTY ROAD 8 CENTRELINE.
ELEV. = 193.607m



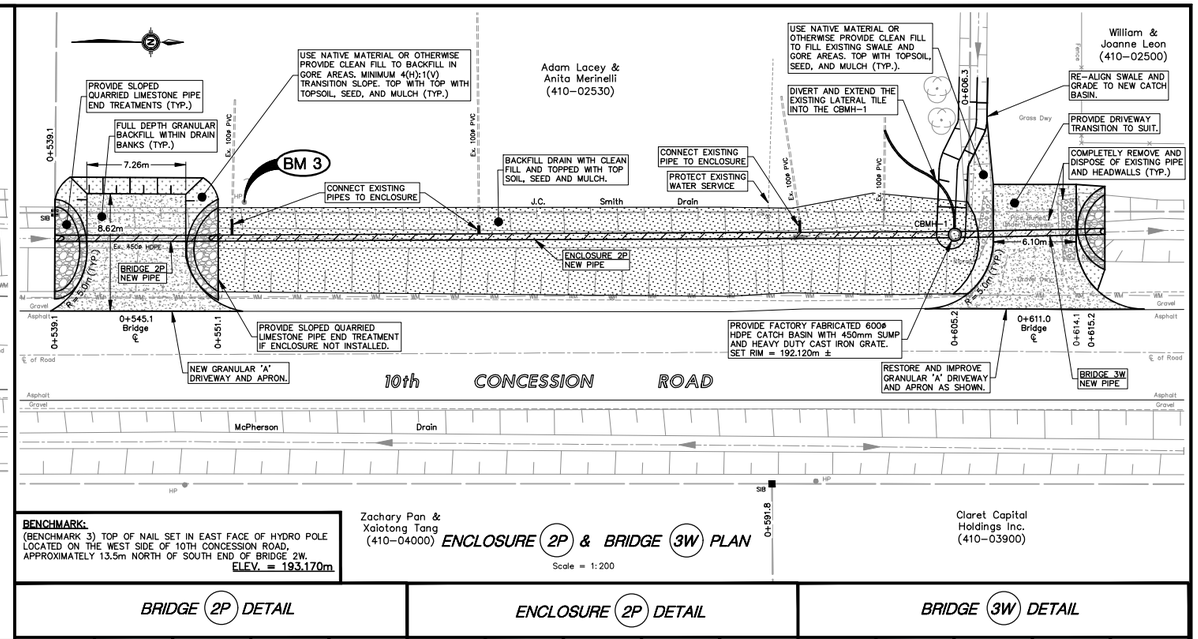
BRIDGE (2W) DETAIL

Scale = 1:200

BENCHMARK:
TOP OF NAIL SET IN WEST FACE OF EXISTING HYDRO POLE LOCATED ON THE EAST SIDE OF THE 10TH CONCESSION ROADM APPROXIMATELY 8.0m SOUTH OF SOUTH END OF BRIDGE (1P)
ELEV. = 192.960m

REMOVE AND ABANDON

DRAIN DETAILS:
UPSTREAM DRAIN BOTTOM ELEV. (0+446.8) = 191.513m
DOWNSTREAM DRAIN BOTTOM ELEV. (0+438.1) = 191.507m
DESIGN GRADE = 0.08%
BOTTOM WIDTH = 0.91m
SIDE SLOPES = 1.5H : 1.0V



BENCHMARK:
(BENCHMARK 3) TOP OF NAIL SET IN EAST FACE OF HYDRO POLE LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, APPROXIMATELY 13.5m NORTH OF SOUTH END OF BRIDGE 2W.
ELEV. = 193.170m

Zachary Pan &
Xiaotong Tang
(410-04000)

ENCLOSURE (2P) & BRIDGE (3W) PLAN

Scale = 1:200

BRIDGE (2P) DETAIL

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
450mmø	12.0m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (S) = 191.538m
DOWNSTREAM INV. (N) = 191.522m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.843m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.547m
℄ OF DRIVEWAY 2.0m WEST OF R.O.W. LIMIT = 192.299m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

NEW BRIDGE DESIGN

ENCLOSURE (2P) DETAIL

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
450mmø	54.0m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE ELEVATIONS:
UPSTREAM INV. (S) = 191.522m
DOWNSTREAM INV. (N) = 191.450m

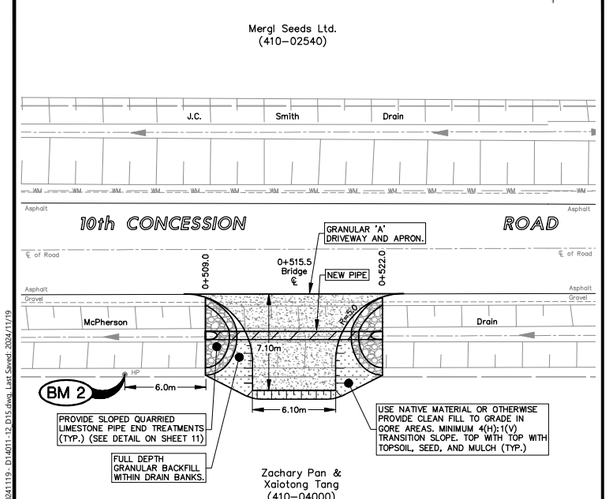
FUTURE ENCLOSURE DESIGN

BRIDGE (3W) DETAIL

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
450mmø	11.0m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (S) = 191.450m
DOWNSTREAM INV. (N) = 191.435m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.737m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.472m
℄ OF DRIVEWAY 2.0m WEST OF R.O.W. LIMIT = 192.292m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

BRIDGE REPLACEMENT



BRIDGE (1P) DETAIL

Scale = 1:200

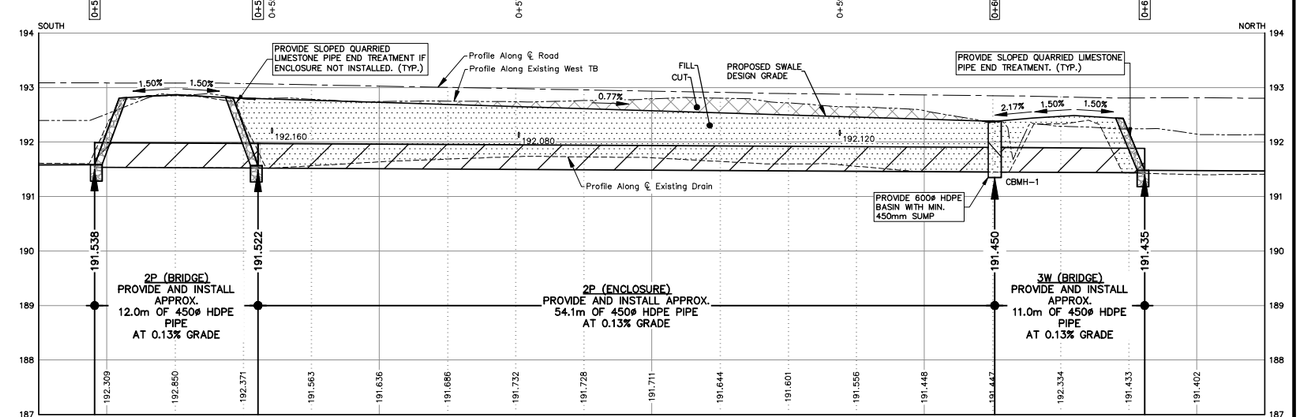
BENCHMARK:
2. TOP OF NAIL SET IN WEST FACE OF HYDRO POLE LOCATED ON THE EAST SIDE OF 10TH CONCESSION ROAD, APPROXIMATELY 6.0m SOUTH SOUTH END OF BRIDGE 1P.
ELEV. = 192.960m

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	13.0m	320 kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

NEW BRIDGE DESIGN

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (N) = 191.765m
DOWNSTREAM INV. (S) = 191.756m
DESIGN GRADE = 0.07%
℄ OF DRIVEWAY AT ROADWAY EDGE = 192.963m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.803m
℄ OF DRIVEWAY 1.0m EAST OF R.O.W. LIMIT = 192.594m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF HEADWALL = 1.50%

THESE DRAWINGS HAVE BEEN REDUCED IN SIZE AND THE SCALE THEREFORE VARIES.
FULL SCALE DRAWINGS CAN BE VIEWED AT THE MUNICIPAL OFFICES IF REQUIRED.



BRIDGE AND ENCLOSURE (2P) & BRIDGE (3W) PROFILE

Scale = 1:200 (H)
1:50 (V)

DESIGNED BY:	DRAWN BY:	CHECKED BY:	PROJECT No.:	SHEET No.:
B.N.D./A.B.P.	B.N.D.	A.B.P.	D14-011	12 OF 18

Z:\PROJECTS\2014\D14011\CAD\D14011 & D14013\DWG\20141119 - D14011-12 D15 Area Last Saved: 2014/11/19
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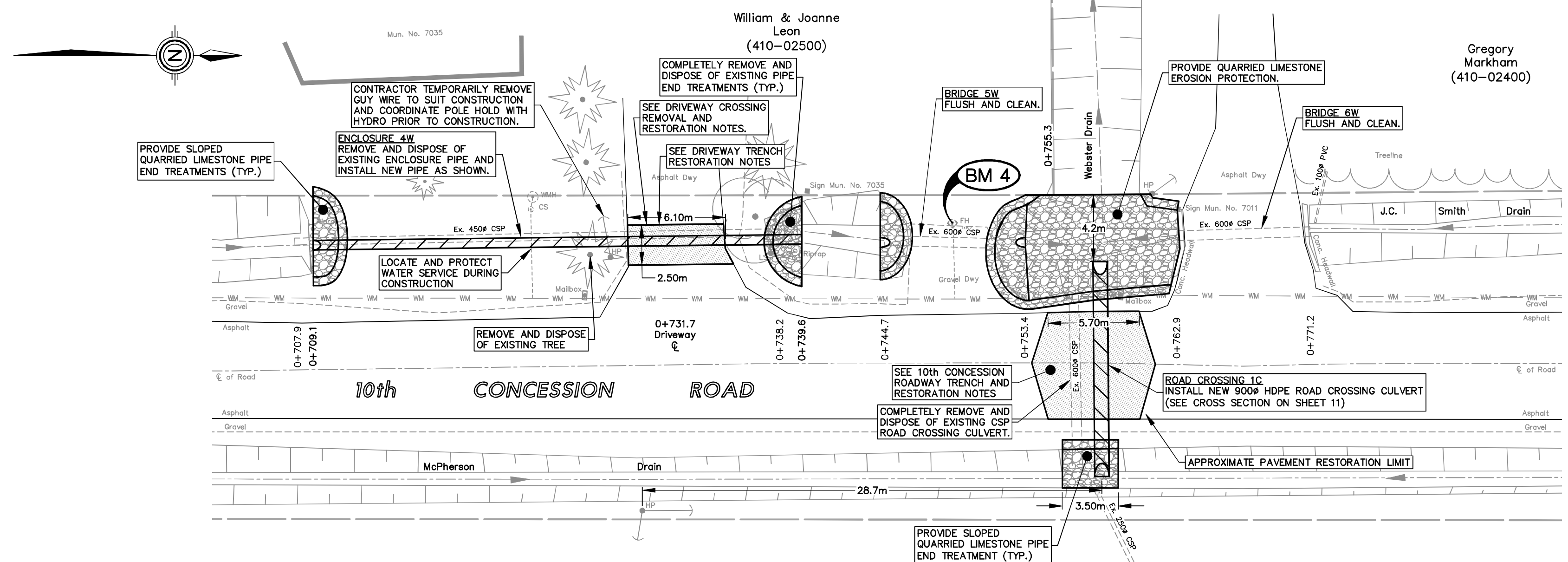


BENCHMARK:
(BENCHMARK 4) TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 5W IN FRONT OF MUN. NO. 7035.

ELEV. = 193.122m

ENCLOSURE (4W)

Scale = 1:200

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	30.5m	320 kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (S) = 191.296m
DOWNSTREAM INV. (N) = 191.255m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.852m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.615m
℄ OF DRIVEWAY AT R.O.W. LIMIT = 192.583m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = SEE PROFILE (THIS SHEET)

ENCLOSURE REPLACEMENT

BRIDGE (5W) DETAIL

Scale = 1:200

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	9.1m	320 kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (S) = 191.248m
DOWNSTREAM INV. (N) = 191.236m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.951m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.290m
℄ OF DRIVEWAY AT R.O.W. LIMIT = 192.306m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

FUTURE MAINTENANCE

ROAD CROSSING (1C) DETAIL

Scale = 1:200

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
900mmø	13.4m	320 kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (E) = 191.417m
DOWNSTREAM INV. (W) = 191.371m
℄ OF ROADWAY = 192.971m
EAST SIDE PAVEMENT EDGE = 192.872m
WEST SIDE PAVEMENT EDGE = 192.822m

ROAD CROSSING REPLACEMENT

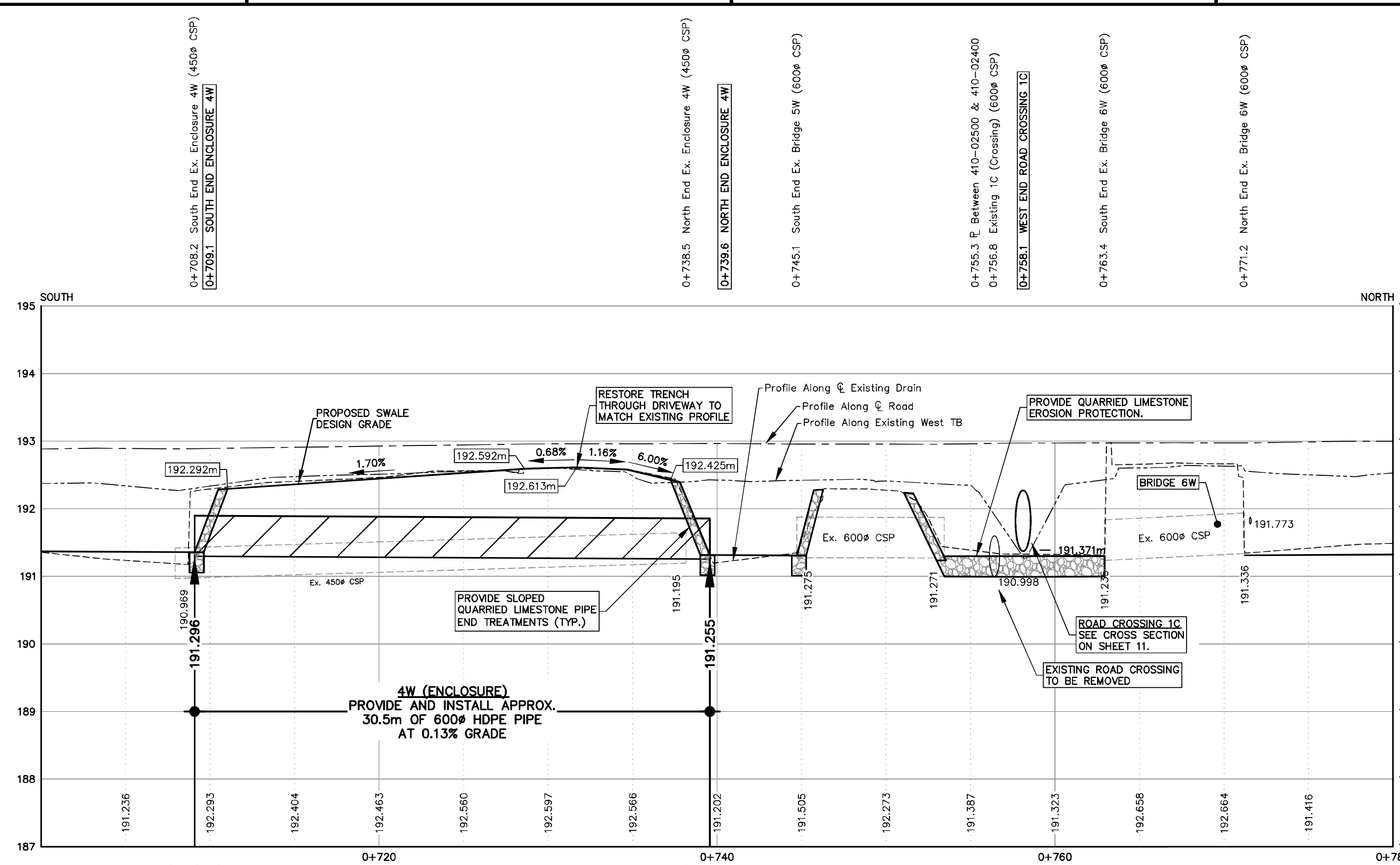
BRIDGE (6W) DETAIL

Scale = 1:200

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	8.3m (Vert. Walls) 12.0m (Sloped Ends)	320 kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (N) = 191.250m
DOWNSTREAM INV. (S) = 191.238m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.866m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.687m
℄ OF DRIVEWAY 2.0m WEST OF R.O.W. LIMIT = 192.595m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

FUTURE MAINTENANCE



ENCLOSURE (4W) & BRIDGE (5W) & BRIDGE (6W) PROFILE

Scale = 1:200 (H)
1:50 (V)

NOTE:
CAREFULLY REMOVE AND SET ASIDE MAILBOXES, MUNICIPAL SIGNS AND RE-INSTALL UPON COMPLETION OF ENCLOSURE AND ROAD CROSSING INSTALLATION.

DRIVEWAY TRENCH RESTORATION NOTES:

DRIVEWAY BACKFILL:
FULL DEPTH GRANULAR BACKFILL WITHIN DRIVEWAY LIMITS.

ASPHALT REMOVAL & RESTORATION:
NEATLY SAWCUT, EXCAVATE, AND REMOVE AND DISPOSE OF EXISTING ASPHALT PAVEMENT AND PROVIDE NEW 100mm THICK ASPHALT (OR MATCH EXISTING)

10th CONCESSION ROADWAY RESTORATION NOTES:

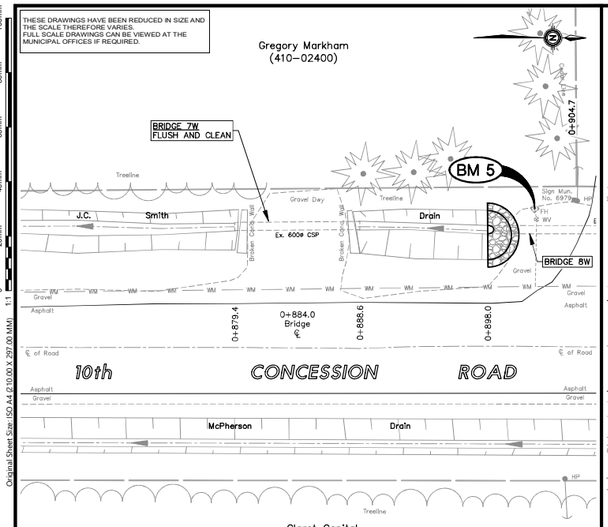
ROADWAY BACKFILL:
FULL DEPTH GRANULAR BACKFILL WITHIN ROADWAY LIMITS AND FOR 1.0m FROM EDGE OF GRAVEL (SEE DETAIL ON SHEET 11).

ASPHALT REMOVAL & RESTORATION:
NEATLY ANGLE SAWCUT, EXCAVATE, AND REMOVE AND DISPOSE OF EXISTING ASPHALT PAVEMENT AND PROVIDE NEW 100mm THICK ASPHALT (OR MATCH EXISTING)

THESE DRAWINGS HAVE BEEN REDUCED IN SIZE AND THE SCALE THEREFORE VARIES. FULL SCALE DRAWINGS CAN BE VIEWED AT THE MUNICIPAL OFFICES IF REQUIRED.

DESIGNED BY:	DRAWN BY:	CHECKED BY:	PROJECT No.:	SHEET No.:
B.N.D./A.B.P.	B.N.D.	A.B.P.	D14-011	13 OF 18

THESE DRAWINGS HAVE BEEN REDUCED IN SIZE AND THE SCALE THEREFORE VARIES. FULL SCALE DRAWINGS CAN BE VIEWED AT THE MUNICIPAL OFFICES IF REQUIRED.



BRIDGE (7W) DETAILS

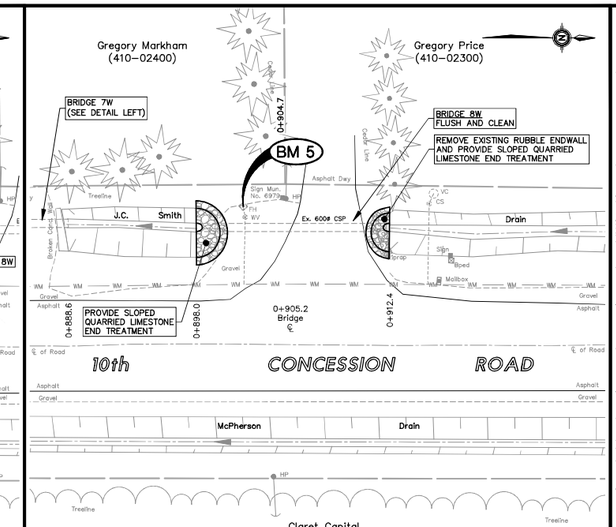
Scale = 1:200

BENCHMARK:
(BENCHMARK 5) TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 8W IN FRONT OF MUN. NO. 6979.
ELEV. = 193.694m

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
525mmø	14.0m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

FUTURE MAINTENANCE

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (N) = 191.433m
DOWNSTREAM INV. (S) = 191.412m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.886m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.596m
℄ OF DRIVEWAY 2.0m WEST OF R.O.W. LIMIT = 192.355m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%



BRIDGE (8W) DETAILS

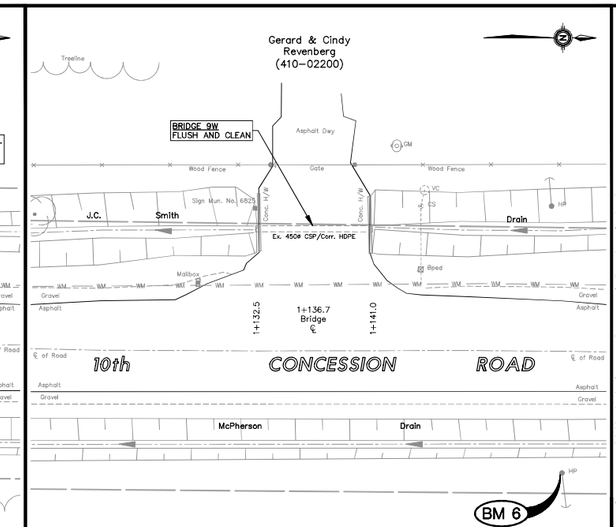
Scale = 1:200

BENCHMARK:
(BENCHMARK 5) TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 8W IN FRONT OF MUN. NO. 6979.
ELEV. = 193.694m

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	14.2m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

FUTURE MAINTENANCE

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (N) = 191.456m
DOWNSTREAM INV. (S) = 191.435m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.888m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.739m
℄ OF DRIVEWAY AT WEST OF R.O.W. LIMIT = 192.664m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%



BRIDGE (9W) DETAILS

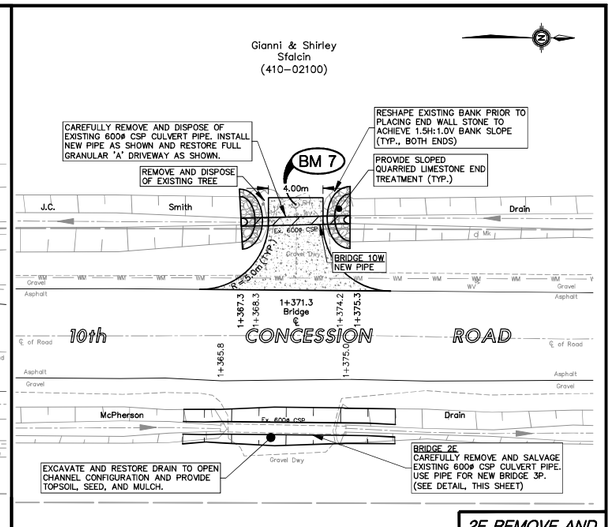
Scale = 1:200

BENCHMARK:
(BENCHMARK 6) TOP OF NAIL SET IN WEST FACE OF HYDRO POLE LOCATED ON THE EAST SIDE OF 10TH CONCESSION ROAD, APPROXIMATELY 19.0m NORTH OF BRIDGE 9W.
ELEV. = 193.047m

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	8.5m (Vertical walls) 11.0m (Sloped ends)	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

FUTURE MAINTENANCE

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (N) = 191.807m
DOWNSTREAM INV. (S) = 191.791m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 193.110m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.983m
℄ OF DRIVEWAY 3.0m WEST OF R.O.W. LIMIT = 192.885m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%



BRIDGE (10W) & (2E) DETAILS

Scale = 1:200

10W BRIDGE REPLACEMENT

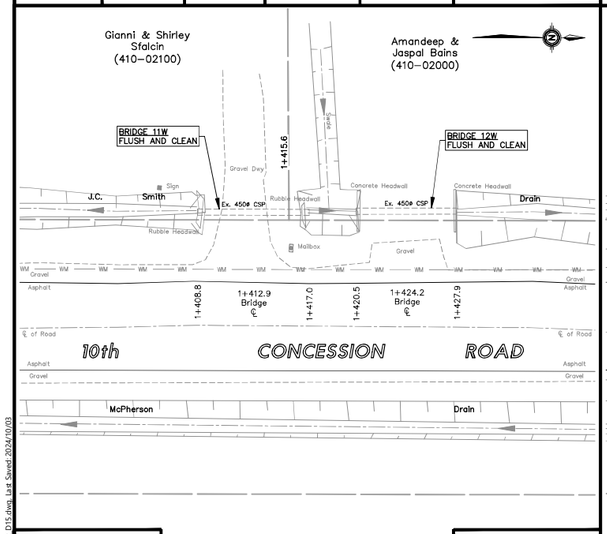
PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (N) = 192.132m
DOWNSTREAM INV. (S) = 192.120m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 193.075m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.889m
℄ OF DRIVEWAY 4.0m WEST OF R.O.W. LIMIT = 192.761m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

BRIDGE 10W	PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
	600mmø	8.0m	320 kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

2E REMOVE AND ABANDON

DRAIN DETAILS:
UPSTREAM DRAIN BOTTOM ELEV. (1+365.8) = 191.124m
DOWNSTREAM DRAIN BOTTOM ELEV. (1+375.0) = 192.079m
DESIGN GRADE = 0.48%
BOTTOM WIDTH = 0.91m
SIDE SLOPES = 1.5H : 1.0V

BENCHMARK:
(BM 7)TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 10W IN FRONT OF MUN. NO. 6715.
ELEV. = 193.806m



BRIDGE (11W) & (12W) DETAILS

Scale = 1:200

11W FUTURE MAINTENANCE

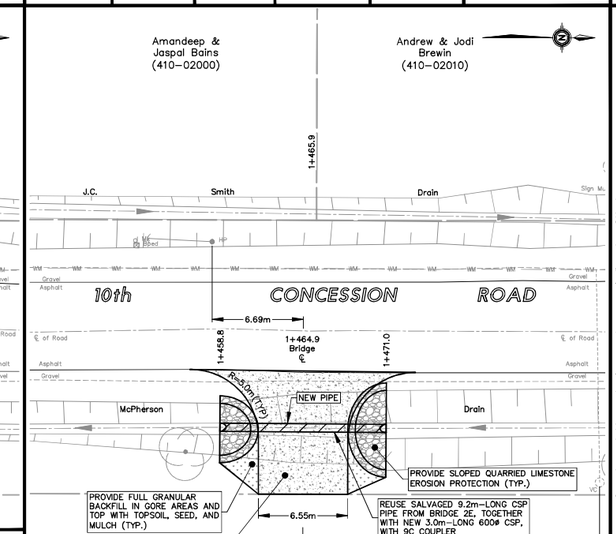
PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (N) = 192.209m
DOWNSTREAM INV. (S) = 192.195m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 193.205m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.897m
℄ OF DRIVEWAY 5.0m WEST OF R.O.W. LIMIT = 192.760m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

12W FUTURE MAINTENANCE

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (S) = 192.198m
DOWNSTREAM INV. (N) = 192.178m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 193.239m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 193.000m
℄ OF DRIVEWAY 4.0m WEST OF R.O.W. LIMIT = 192.759m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

	PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
BRIDGE 11W	450mmø	9.4m	320 kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL
BRIDGE 12W	450mmø	7.5m (Vertical walls) 10.0m (Sloped ends)	320 kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

BENCHMARK:
(BM 7)TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 10W IN FRONT OF MUN. NO. 6715.
ELEV. = 193.806m



BRIDGE (3P) DETAILS

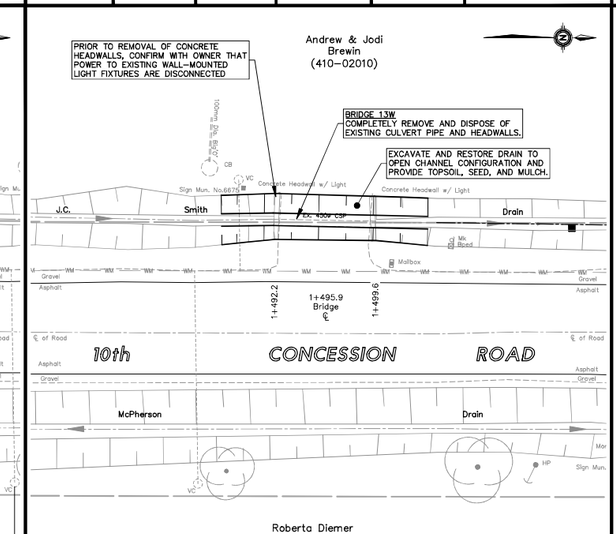
Scale = 1:200

NEW BRIDGE

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (N) = 191.614m
DOWNSTREAM INV. (S) = 191.556m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 193.267m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 193.074m
℄ OF DRIVEWAY AT R.O.W. LIMIT = 192.846m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

BENCHMARK:
(BENCHMARK 7) TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 10W IN FRONT OF MUN. NO. 6715.
ELEV. = 193.806m

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	12.2m (TOTAL)	2.8mm THICK	68mm X 13mm	Alum. Steel Type II Corrugated Hel-Cor Pipe

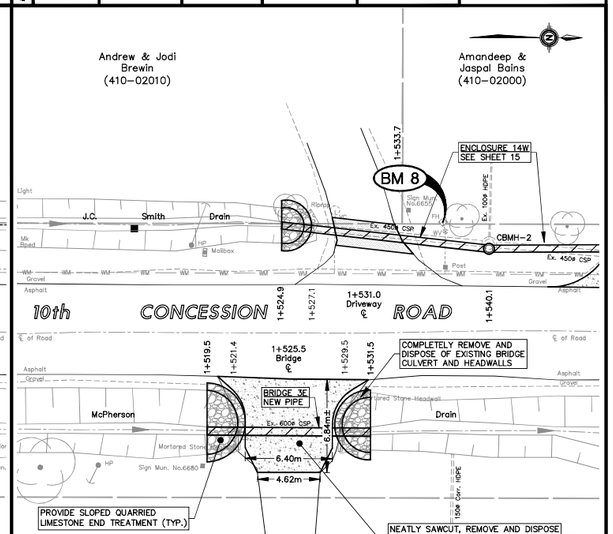


BRIDGE (13W) DETAILS

Scale = 1:200

REMOVE AND ABANDON

BENCHMARK:
(BENCHMARK 8) TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT ENCLOSURE 14W IN FRONT OF MUN. NO. 6655.
ELEV. = 193.812m



BRIDGE (3E) DETAILS

Scale = 1:200

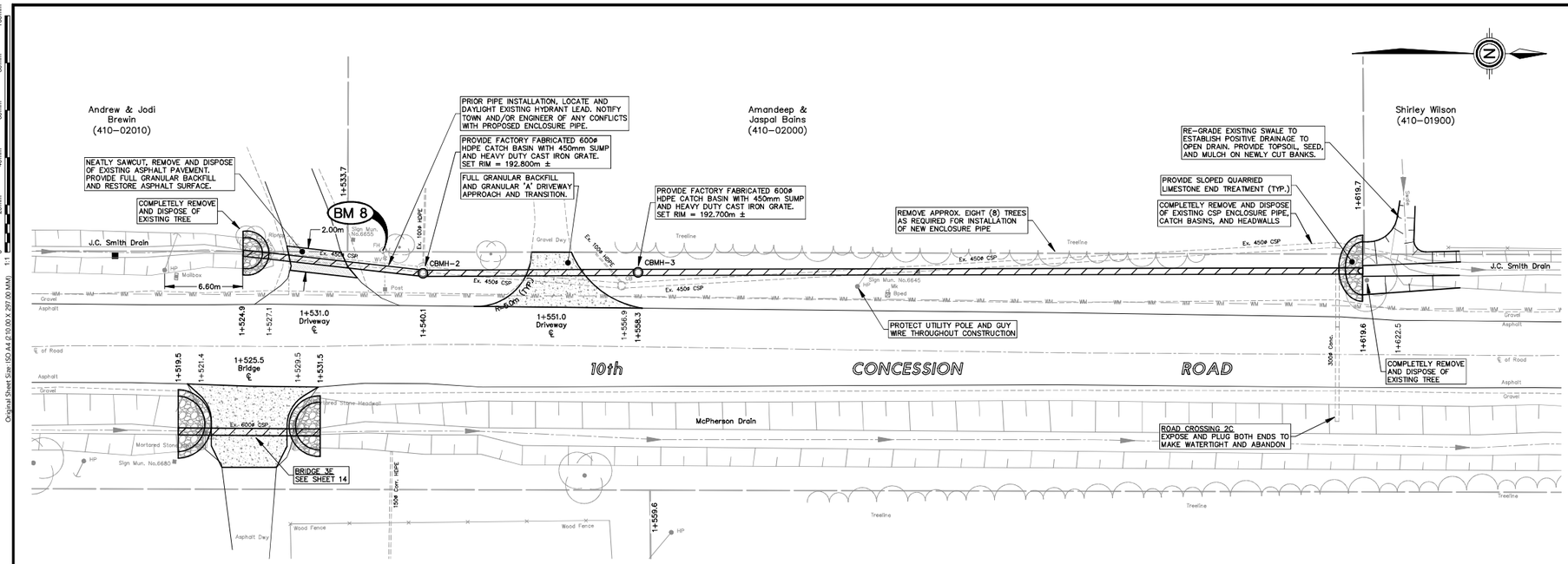
BRIDGE REPLACEMENT

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (S) = 191.322m
DOWNSTREAM INV. (N) = 191.264m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 193.171m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.932m
℄ OF DRIVEWAY R.O.W. LIMIT = 192.654m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

BENCHMARK:
(BENCHMARK 8) TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT ENCLOSURE 14W IN FRONT OF MUN. NO. 6655.
ELEV. = 193.812m

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	12.0m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

DESIGNED BY:	DRAWN BY:	CHECKED BY:	PROJECT No.:	SHEET No.:
B.N.D./A.B.P.	B.N.D.	A.B.P.	D14-011	14 OF 18

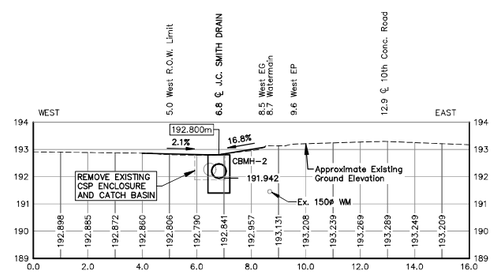


BENCHMARK:
(BENCHMARK 8) TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT ENCLOSURE 14W IN FRONT OF MUN. NO. 6655.

ELEV. = 193.812m

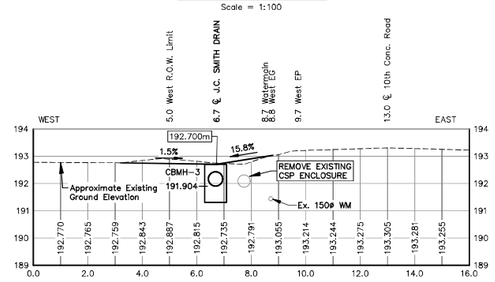
ENCLOSURE (14W) PLAN

Scale = 1:200



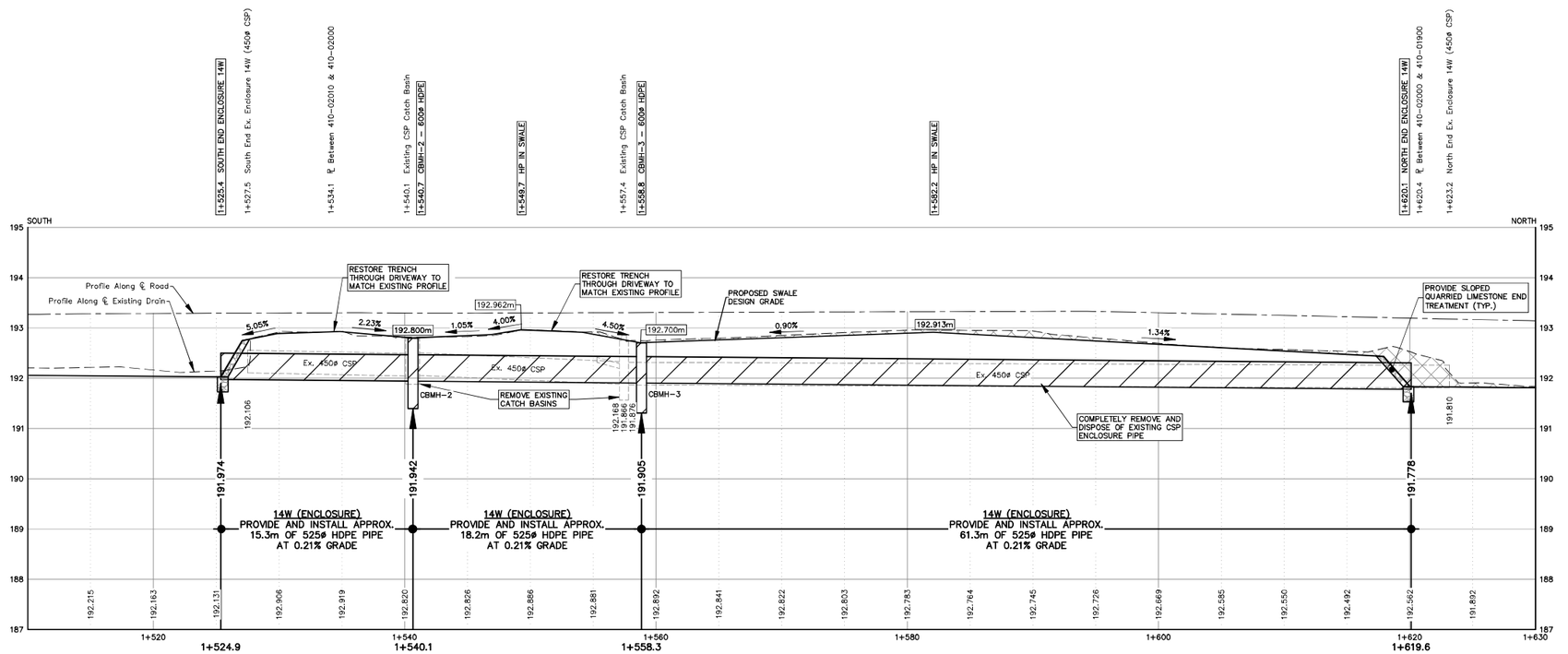
STATION 1+540.1

Scale = 1:100



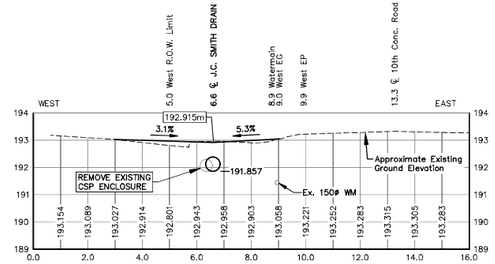
STATION 1+558.3

Scale = 1:100



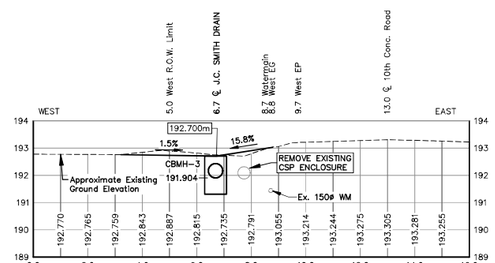
ENCLOSURE (14W) PROFILE

Scale = 1:200 (H)
1:25 (V)



STATION 1+581.6

Scale = 1:100

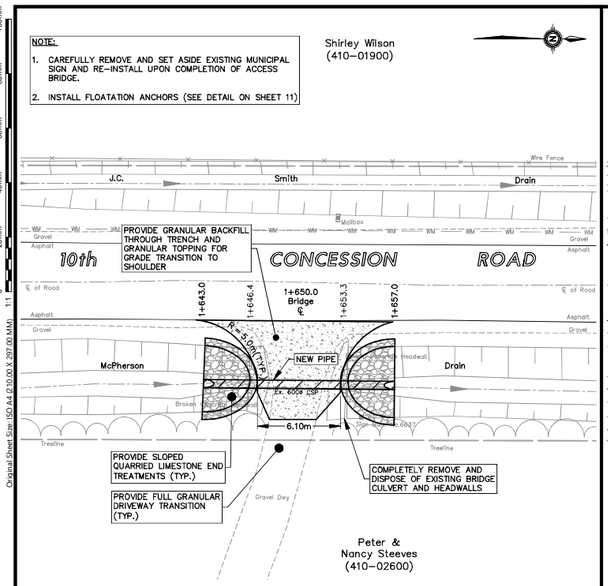


STATION 1+558.3

Scale = 1:100

THESE DRAWINGS HAVE BEEN REDUCED IN SIZE AND THE SCALE THEREFORE VARIES. FULL SCALE DRAWINGS CAN BE VIEWED AT THE MUNICIPAL OFFICES IF REQUIRED.

DESIGNED BY:	DRAWN BY:	CHECKED BY:	PROJECT No.:	SHEET No.:
B.N.D./A.B.P.	B.N.D.	A.B.P.	D14-011	15 OF 18



BRIDGE (4E) DETAILS

Scale = 1:200

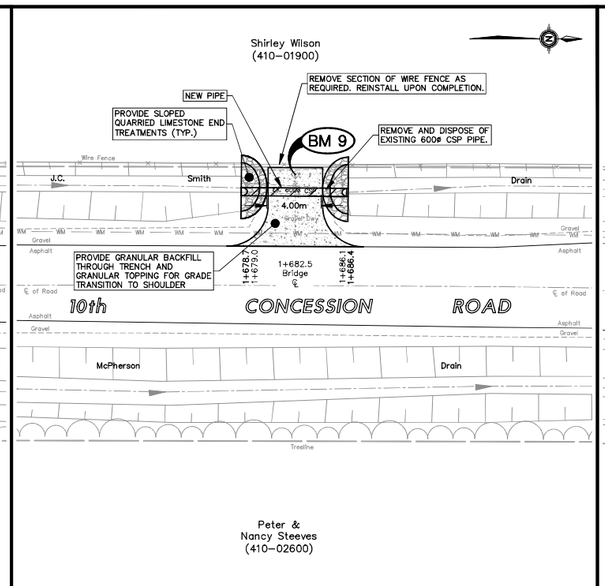
BENCHMARK:
(BENCHMARK 9) TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 15W IN FRONT OF THE FARM AT MUN. NO. 6603.

ELEV. = 193.502m

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	14.0m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (S) = 191.090m
DOWNSTREAM INV. (N) = 191.067m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.913m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.795m
℄ OF DRIVEWAY 2.0m WEST OF R.O.W. LIMIT = 192.640m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

BRIDGE REPLACEMENT



BRIDGE (15W) DETAILS

Scale = 1:200

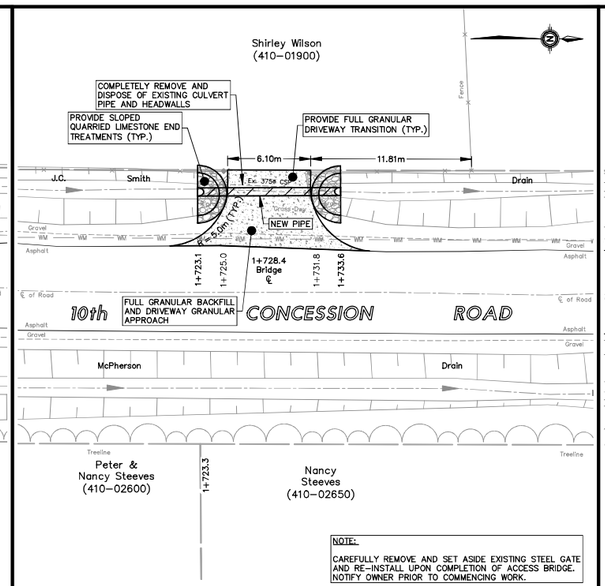
BENCHMARK:
(BENCHMARK 9) TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 15W IN FRONT OF THE FARM AT MUN. NO. 6603.

ELEV. = 193.502m

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	8.0m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (S) = 191.649m
DOWNSTREAM INV. (N) = 191.629m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.900m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.580m
℄ OF DRIVEWAY AT R.O.W. LIMIT = 192.327m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

BRIDGE REPLACEMENT



BRIDGE (16W) DETAILS

Scale = 1:200

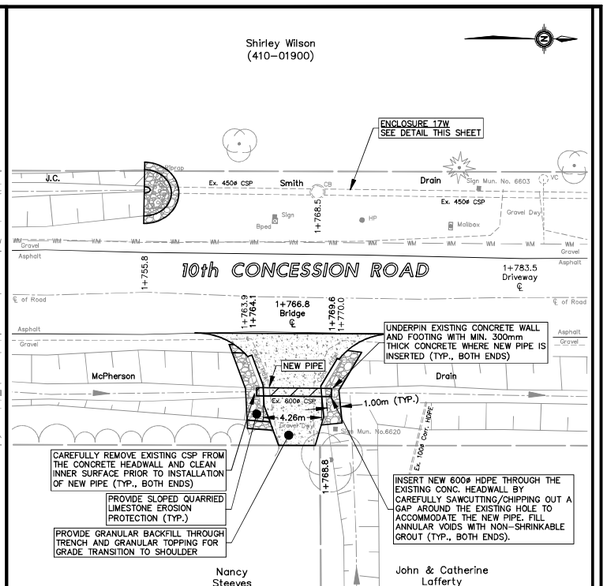
BENCHMARK:
(BENCHMARK 9) TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 15W IN FRONT OF THE FARM AT MUN. NO. 6603.

ELEV. = 193.502m

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	10.5m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (S) = 191.536m
DOWNSTREAM INV. (N) = 191.512m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.814m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.521m
℄ OF DRIVEWAY 2.0m WEST OF R.O.W. LIMIT = 192.282m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

BRIDGE REPLACEMENT



BRIDGE (5E) DETAILS

Scale = 1:200

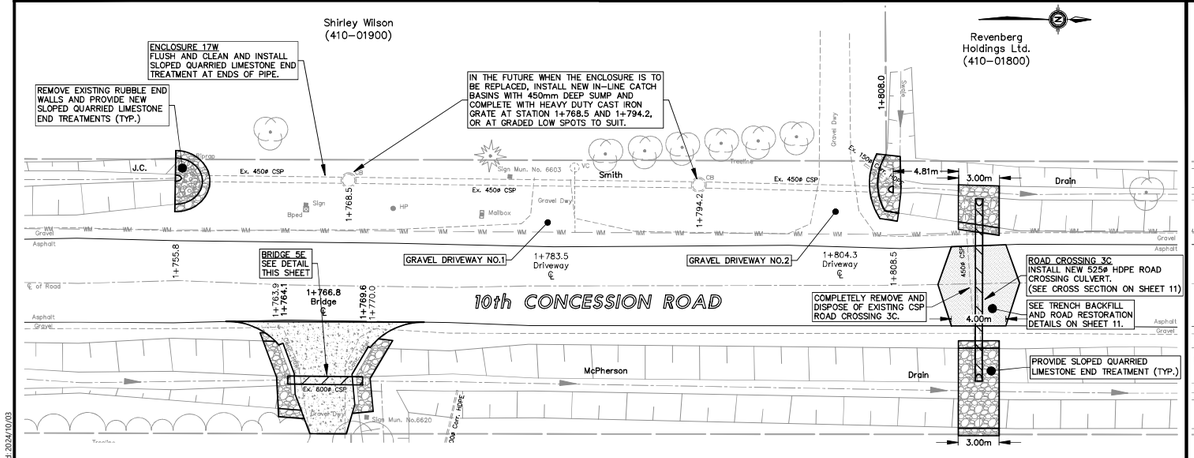
BENCHMARK:
(BENCHMARK 10) TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 18W IN FRONT OF THE FARM AT MUN. NO. 6507.

ELEV. = 193.143m

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	5.5m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (S) = 190.917m
DOWNSTREAM INV. (N) = 190.909m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.919m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.780m
℄ OF DRIVEWAY AT R.O.W. LIMIT = 192.657m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

BRIDGE REPLACEMENT



BENCHMARK:
(BENCHMARK 10) TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 18W IN FRONT OF THE FARM AT MUN. NO. 6507.

ELEV. = 193.143m

DRIVEWAY TRENCH RESTORATION NOTES:

DRIVEWAY BACKFILL:
FULL DEPTH GRANULAR BACKFILL WITHIN DRIVEWAY LIMITS.

ASPHALT REMOVAL & RESTORATION:
NEATLY SAWCUT, EXCAVATE, AND REMOVE AND DISPOSE OF EXISTING ASPHALT PAVEMENT AND PROVIDE NEW 100mm THICK ASPHALT (OR MATCH EXISTING)

10th CONCESSION ROADWAY RESTORATION NOTES:

ROADWAY BACKFILL:
FULL DEPTH GRANULAR BACKFILL WITHIN ROADWAY LIMITS AND FOR 1.0m FROM EDGE OF GRAVEL (SEE DETAIL).

ASPHALT REMOVAL & RESTORATION:
NEATLY ANGLE SAWCUT, EXCAVATE, AND REMOVE AND DISPOSE OF EXISTING ASPHALT PAVEMENT AND PROVIDE NEW 100mm THICK ASPHALT (OR MATCH EXISTING)

ENCLOSURE (17W) DETAIL

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	52.7m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:
DRAIN GRADE = 0.16%
UPSTREAM INV. (S) = 191.476m
DOWNSTREAM INV. (N) = 191.390m
CB NO.1 (AT STA. 1+768.5) INV. = 191.455m
CB NO. 2 (AT STA. 1+794.2) INV. = 191.413m
℄ OF DRIVEWAY NO.1 AT PAVEMENT EDGE = 192.813m
℄ OF DRIVEWAY NO.1 AT PIPE CENTRELINE = 192.538m
℄ OF DRIVEWAY NO.1 2.0m WEST OF R.O.W. LIMIT = 192.375m
DRIVEWAY CROSSFALL FROM CENTRELINE = 1.5%
℄ OF DRIVEWAY NO.2 AT PAVEMENT EDGE = 192.739m
℄ OF DRIVEWAY NO.2 AT PIPE CENTRELINE = 192.495m
℄ OF DRIVEWAY NO.2 AT R.O.W. LIMIT = 192.267m
DRIVEWAY CROSSFALL FROM CENTRELINE = 1.5%

FUTURE MAINTENANCE

BRIDGE (5E) DETAIL

SEE DETAIL, THIS SHEET

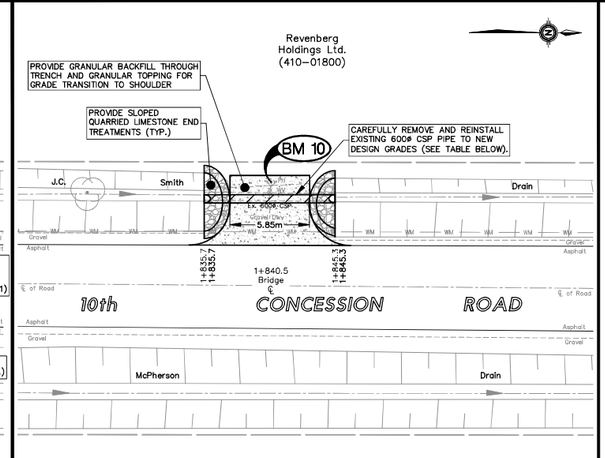
BRIDGE REPLACEMENT

ROAD CROSSING (3C) DETAIL

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
525mmø	13.4m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (W) = 191.440m
DOWNSTREAM INV. (E) = 191.130m
℄ OF ROADWAY = 192.800m
EAST SIDE PAVEMENT EDGE = 192.750m
WEST SIDE PAVEMENT EDGE = 192.703m

ROAD CROSSING REPLACEMENT



BRIDGE (18W) DETAILS

Scale = 1:200

BENCHMARK:
(BENCHMARK 10) TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 18W IN FRONT OF THE FARM AT MUN. NO. 6507.

ELEV. = 193.143m

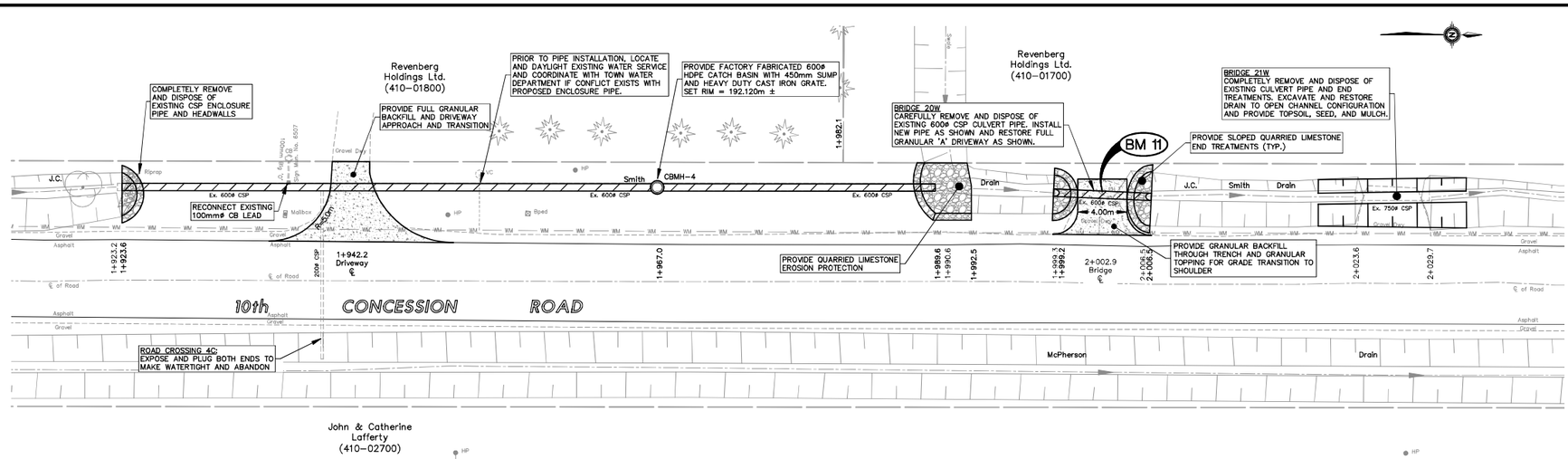
PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	9.6m (existing)	2.8mm THICK	68mm X 13mm	Alum. Steel Type II Corrugated Helical Pipe

LOWER & IMPROVE BRIDGE

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (S) = 191.346m
DOWNSTREAM INV. (N) = 191.330m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.587m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.211m
℄ OF DRIVEWAY AT R.O.W. LIMIT = 191.893m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

THESE DRAWINGS HAVE BEEN REDUCED IN SIZE AND THE SCALE THEREFORE VARIES. FULL SCALE DRAWINGS CAN BE VIEWED AT THE MUNICIPAL OFFICES IF REQUIRED.

DESIGNED BY:	DRAWN BY:	CHECKED BY:	PROJECT No.:	SHEET No.:
B.N.D./A.B.P.	B.N.D.	A.B.P.	D14-011	16 OF 18



ENCLOSURE (19W) & BRIDGE (20W) & BRIDGE (21W) & CROSSING (4C) PLAN

Scale = 1:200

BENCHMARK:
(BENCHMARK 11) TOP OPERATING NUT OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 20W, JUST NORTH OF MUN. NO. 6507.

ELEV. = 192.918m

ENCLOSURE (19W) DETAILS

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	66.0m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:

UPSTREAM INV. (S) = 191.200m
DOWNSTREAM INV. (N) = 191.096m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.310m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.002m
℄ OF DRIVEWAY AT R.O.W. LIMIT = 191.840m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = SEE PROFILE (THIS SHEET)

ENCLOSURE REPLACEMENT

BRIDGE (20W) DETAILS

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	7.9m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:

UPSTREAM INV. (S) = 191.079m
DOWNSTREAM INV. (N) = 191.066m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.310m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 192.002m
℄ OF DRIVEWAY AT R.O.W. LIMIT = 191.840m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

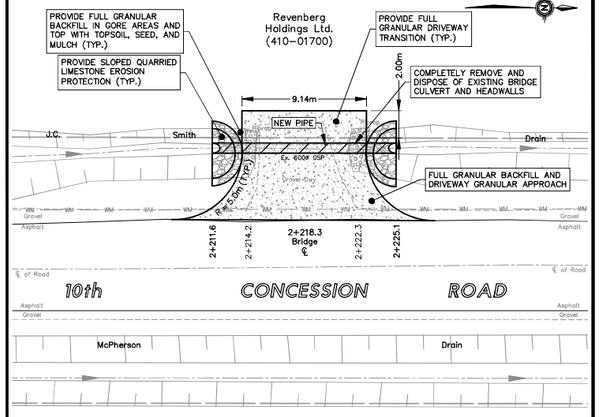
BRIDGE REPLACEMENT

BRIDGE (21W) DETAILS

PIPE & DRIVEWAY ELEVATIONS:

UPSTREAM DRAIN BOTTOM ELEV. (2+023.6) = 191.100m
DOWNSTREAM DRAIN BOTTOM ELEV. (2+029.7) = 191.090m
DESIGN GRADE = 0.16%
BOTTOM WIDTH = 0.91m
SIDE SLOPES = 1.5H : 1.0V

REMOVE & ABANDON



BRIDGE (22W) DETAILS

Scale = 1:200

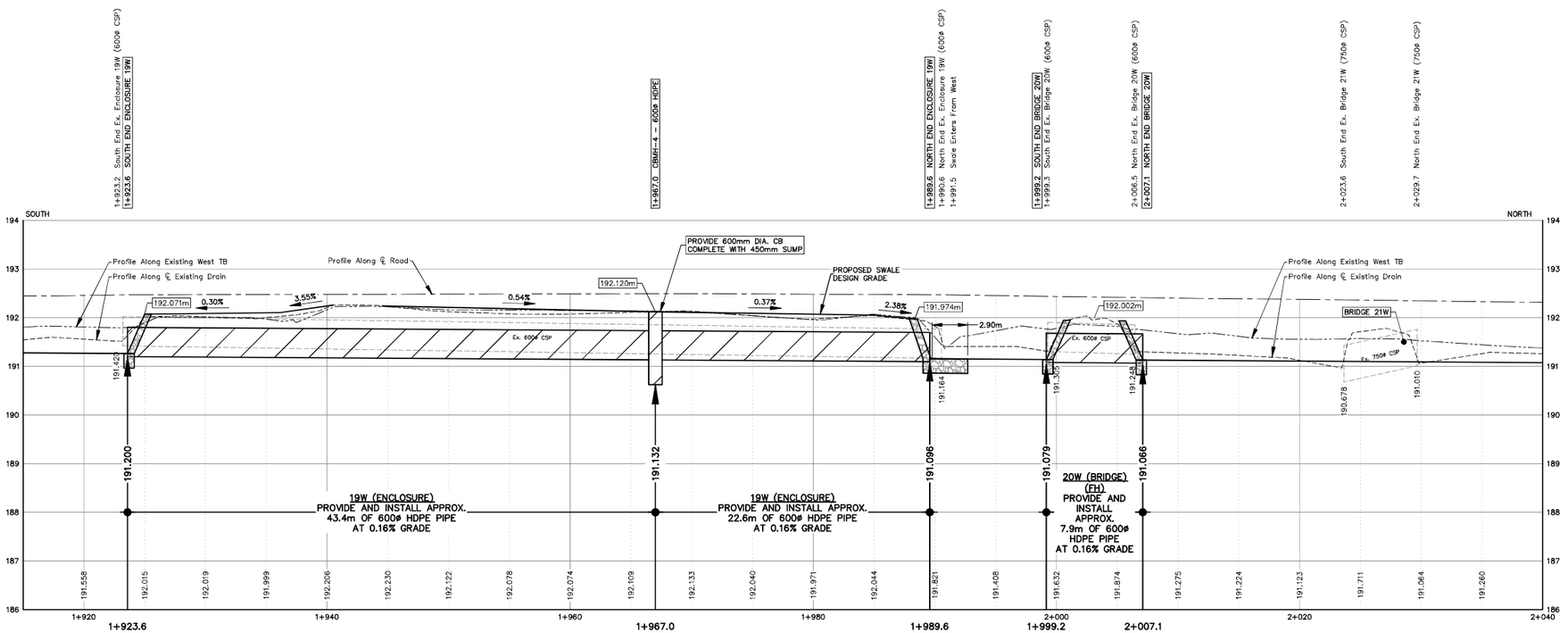
BENCHMARK:
(BENCHMARK 12) TOP OPERATING OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 23W IN FRONT OF MUN. NO. 6407.

ELEV. = 192.328m

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
750mmø	13.5m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

BRIDGE REPLACEMENT

PIPE & DRIVEWAY ELEVATIONS:
UPSTREAM INV. (S) = 190.717m
DOWNSTREAM INV. (N) = 190.695m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 192.043m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 191.737m
℄ OF DRIVEWAY 2.0m WEST OF R.O.W. LIMIT = 191.500m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%



ENCLOSURE (19W) & BRIDGE (20W) & BRIDGE (21W) PROFILE

Scale = 1:200 (H)
1:50 (V)

THESE DRAWINGS HAVE BEEN REDUCED IN SIZE AND THE SCALE THEREFORE VARIES. FULL SCALE DRAWINGS CAN BE VIEWED AT THE MUNICIPAL OFFICES IF REQUIRED.

DESIGNED BY:	DRAWN BY:	CHECKED BY:	PROJECT No.:	SHEET No.:
B.N.D./A.B.P.	B.N.D.	A.B.P.	D14-011	17 OF 18

Original Sheet Size ISO A4 (210.00 X 297.00 MM) 1:1 0 20mm 40mm 60mm 80mm 100mm

GENERAL NOTES:

1. PRIOR TO CULVERT REPLACEMENT, CONTRACTOR IS TO COORDINATE WITH TECUMSEH WATER DEPARTMENT FOR THE RELOCATION OF THE EXISTING FIRE HYDRANT AND VALVE AS REQUIRED FOR THE INSTALLATION OF THE NEW CULVERT PIPE.
2. PRIOR TO HYDRANT RELOCATION, THE CONTRACTOR IS TO ENSURE THAT THE BENCHMARK IS SUFFICIENTLY TRANSFERRED TO A SUITABLE LOCATION AND TO THE FULL SATISFACTION OF THE ENGINEER AND/OR DRAINAGE SUPERINTENDENT.
3. CAREFULLY REMOVE AND SET ASIDE ALL MAILBOXES AND MUN. SIGNS AND RE-INSTALL UPON COMPLETION OF ACCESS BRIDGES.
4. INSTALL FLOATATION ANCHORS AT BOTH ENDS OF ALL PLASTIC PIPE USING TWO STEEL TEE BAR POSTS ON EITHER SIDE OF THE PIPE JOINED TOGETHER WITH HEAVY GALVANIZED WIRE (SEE DETAIL ON SHEET 11).

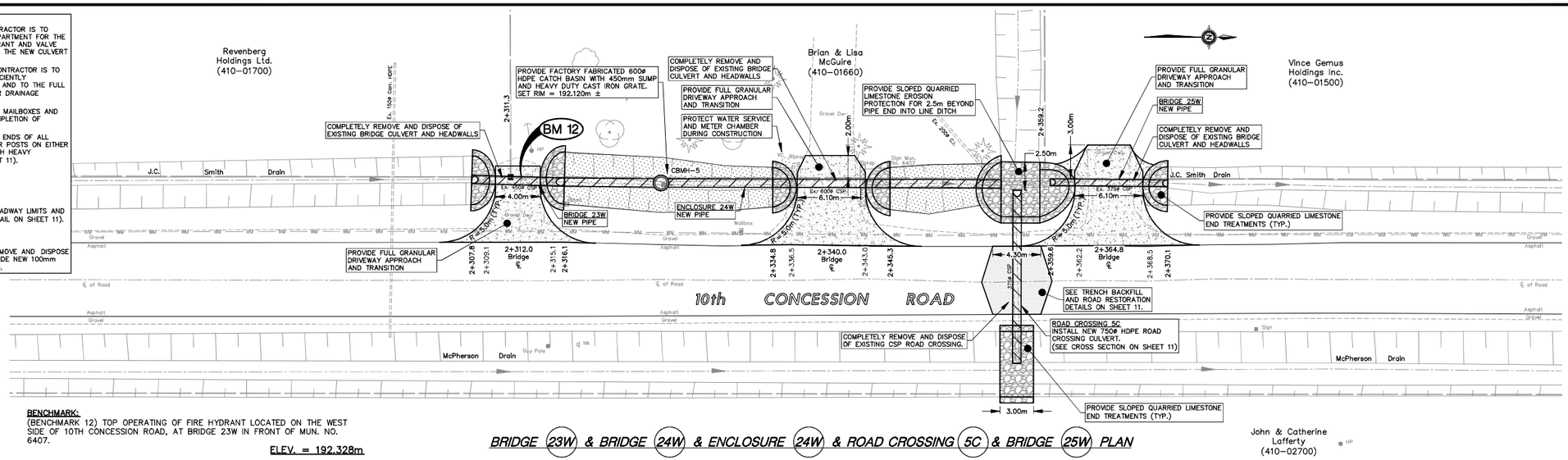
ROADWAY RESTORATION NOTES:

ROADWAY BACKFILL

FULL DEPTH GRANULAR BACKFILL WITHIN ROADWAY LIMITS AND FOR 1.0m FROM EDGE OF GRAVEL (SEE DETAIL ON SHEET 11).

ASPHALT REMOVAL & RESTORATION

NEATLY ANGLE SAWCUT, EXCAVATE, AND REMOVE AND DISPOSE OF EXISTING ASPHALT PAVEMENT AND PROVIDE NEW 100mm (MIN.) THICK ASPHALT (OR MATCH EXISTING).



BENCHMARK:
(BENCHMARK 12) TOP OPERATING OF FIRE HYDRANT LOCATED ON THE WEST SIDE OF 10TH CONCESSION ROAD, AT BRIDGE 23W IN FRONT OF MUN. NO. 6407.

ELEV. = 192.328m

BRIDGE (23W) & BRIDGE (24W) & ENCLOSURE (24W) & ROAD CROSSING (5C) & BRIDGE (25W) PLAN

Scale = 1:200

BRIDGE (23W) DETAILS

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
750mmø	8.3m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:

UPSTREAM INV. (S) = 190.561m
DOWNSTREAM INV. (N) = 190.547m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 191.927m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 191.603m
℄ OF DRIVEWAY 2.0m WEST OF R.O.W. LIMIT = 191.267m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

BRIDGE REPLACEMENT

BRIDGE (24W) DETAIL

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
750mmø	10.5m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:

UPSTREAM INV. (S) = 190.516m
DOWNSTREAM INV. (N) = 190.499m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 191.938m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 191.626m
℄ OF DRIVEWAY 2.0m WEST OF R.O.W. LIMIT = 191.481m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.5%

BRIDGE REPLACEMENT

ENCLOSURE (24W) DETAIL

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
750mmø	47.4m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:

UPSTREAM INV. (S) = 190.560m
DOWNSTREAM INV. (N) = 190.483m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 191.938m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 191.626m
℄ OF DRIVEWAY 2.0m WEST OF R.O.W. LIMIT = 191.481m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.5%

ENCLOSURE REPLACEMENT

ROAD CROSSING (5C) DETAIL

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
750mmø	15.5m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & ROAD ELEVATIONS:

UPSTREAM INV. (W) = 190.556m
DOWNSTREAM INV. (E) = 190.473m
℄ OF ROADWAY = 192.056m
EAST SIDE PAVEMENT EDGE = 191.946m
WEST SIDE PAVEMENT EDGE = 191.953m

ROAD CROSSING REPLACEMENT

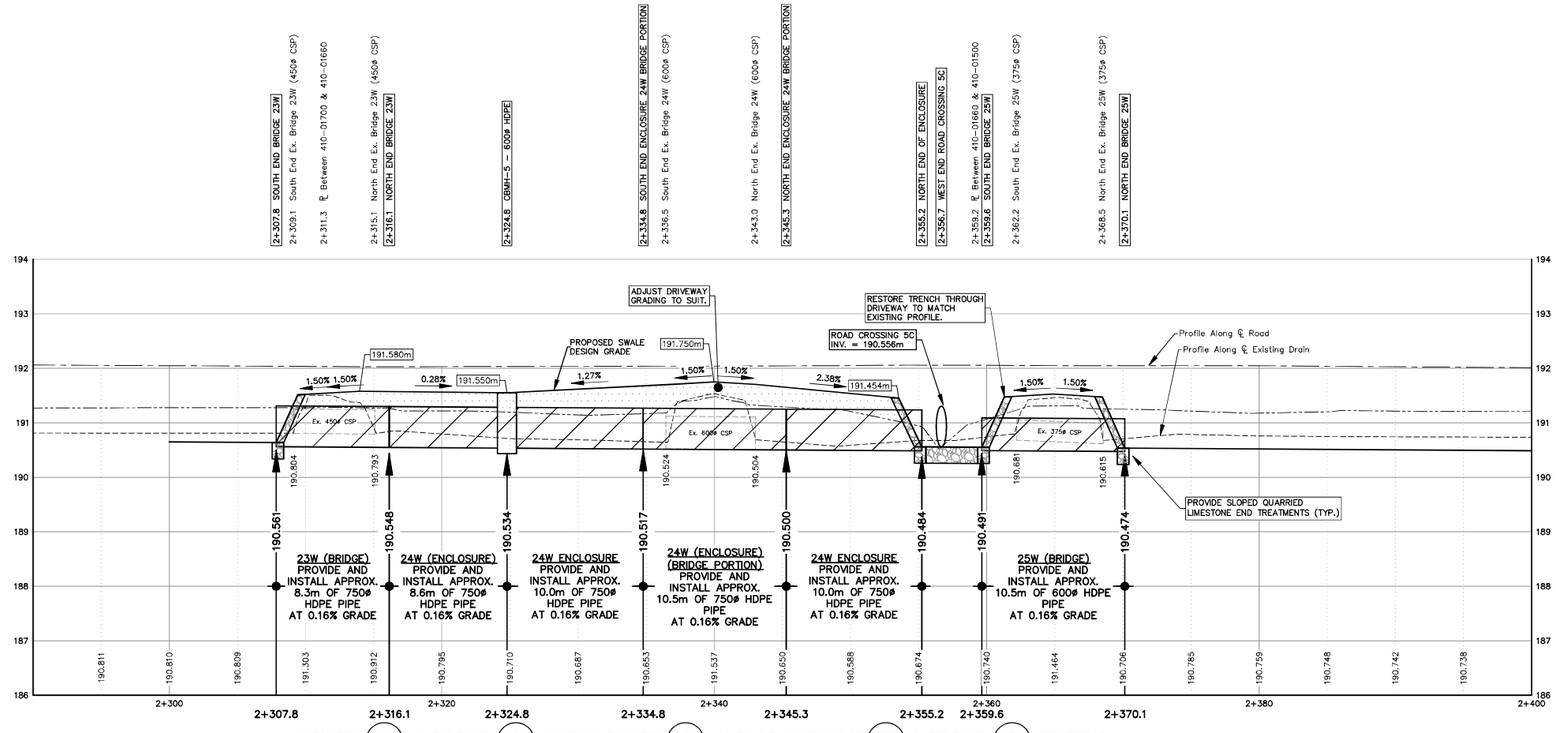
BRIDGE (25W) DETAIL

PIPE SIZE:	PIPE LENGTH:	PIPE GAUGE:	CORRUGATIONS:	TYPE OF PIPE:
600mmø	10.5m	320kPa	SMOOTHWALL INTERIOR	H.D.P.E. SMOOTHWALL

PIPE & DRIVEWAY ELEVATIONS:

UPSTREAM INV. (S) = 190.491m
DOWNSTREAM INV. (N) = 190.474m
℄ OF DRIVEWAY AT PAVEMENT EDGE = 191.950m
℄ OF DRIVEWAY AT PIPE CENTRELINE = 191.530m
℄ OF DRIVEWAY 3.0m WEST OF R.O.W. LIMIT = 191.277m
DRIVEWAY CROSSFALL FROM CENTRELINE TO TOP OUT END OF END WALL = 1.50%

BRIDGE REPLACEMENT



BRIDGE (23W) & BRIDGE (24W) & ENCLOSURE (24W) & ROAD CROSSING (5C) & BRIDGE (25W) PROFILE

Scale = 1:200 (H)
1:50 (V)

THESE DRAWINGS HAVE BEEN REDUCED IN SIZE AND THE SCALE THEREFORE VARIES. FULL SCALE DRAWINGS CAN BE VIEWED AT THE MUNICIPAL OFFICES IF REQUIRED.

DESIGNED BY:	DRAWN BY:	CHECKED BY:	PROJECT No.:	SHEET No.:
B.N.D./A.B.P.	B.N.D.	A.B.P.	D14-011	18 OF 18

APPENDIX "C"

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APPENDIX C-1

Future Maintenance Schedule
J.C. Smith Drain - Subwatershed No.1

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FUTURE MAINTENANCE SCHEDULE OF ASSESSMENT

J.C. Smith Drain - Subwatershed No. 1

3. MUNICIPAL LANDS:

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
	10th Concession Road			12.78	5.174	Town of Tecumseh	$ 1,078.00	$ 682.00	$ -	$ 1,760.00
	Total on Municipal Lands						**$ 1,078.00**	**$ 682.00**	**$ -**	**$ 1,760.00**

4. PRIVATELY OWNED - NON-AGRICULTURAL LANDS:

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-01660	9	4	1.06	1.06	0.429	Brian & Lisa McGuire	$ 44.00	$ 23.00	$ -	$ 67.00
410-02010	9	3	0.85	1.22	0.494	Andrew & Jodi Brewin	$ 51.00	$ 61.00	$ -	$ 112.00
	Total on Privately Owned - Non-Agricultural Lands						**$ 95.00**	**$ 84.00**	**$ -**	**$ 179.00**

5. PRIVATELY OWNED - AGRICULTURAL LANDS (grantable):

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-01500	9	5	54.64	3.00	1.214	Vince Gemus Holdings Inc.	$ 63.00	$ 19.00	$ -	$ 82.00
410-01700	9	4	60.61	60.61	24.529	Revenberg Holdings Ltd.	$ 893.00	$ 553.00	$ -	$ 1,446.00
410-01800	9	4	29.34	29.34	11.874	Revenberg Holdings Ltd.	$ 432.00	$ 342.00	$ -	$ 774.00
410-01900	9	3	30.96	16.00	6.475	Shirley Wilson	$ 286.00	$ 210.00	$ -	$ 496.00
	Total on Privately Owned - Agricultural Lands (grantable)						**$ 1,674.00**	**$ 1,124.00**	**$ -**	**$ 2,798.00**

5. PRIVATELY OWNED - AGRICULTURAL LANDS (non-grantable):

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-02000	9	3	33.00	7.63	3.088	Amandeep & Jaspal Baines	$ 153.00	$ 113.00	$ -	$ 266.00
	Total on Privately Owned - Agricultural Lands (non-grantable)						**$ 153.00**	**$ 113.00**	**$ -**	**$ 266.00**
	TOTAL ASSESSMENT			**133.54**	**53.408**		**$ 3,000.00**	**$ 2,003.00**	**$ -**	**$ 5,003.00**

APPENDIX C-2

Future Maintenance Schedule
J.C. Smith Drain - Subwatershed No.2

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FUTURE MAINTENANCE SCHEDULE OF ASSESSMENT

J.C. Smith Drain - Subwatershed No. 2

3. MUNICIPAL LANDS:

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
	10th Concession Road			12.78	5.174	Town of Tecumseh	$ 1,197.00	$ 877.00	$ -	$ 2,074.00
	Total on Municipal Lands						**$ 1,197.00**	**$ 877.00**	**$ -**	**$ 2,074.00**

4. PRIVATELY OWNED - NON-AGRICULTURAL LANDS:

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-02530	9	1	0.99	0.99	0.401	Adam Lacey & Anita Marinelli	$ 275.00	$ 224.00	$ -	$ 499.00
	Total on Privately Owned - Non-Agricultural Lands						**$ 275.00**	**$ 224.00**	**$ -**	**$ 499.00**

5. PRIVATELY OWNED - AGRICULTURAL LANDS (grantable):

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-02100	9	3	34.05	3.00	1.214	Gianni & Shirley Sfalcin	$ 416.00	$ 297.00	$ -	$ 713.00
410-02200	9	2	24.85	2.00	0.809	Gerard & Cindy Revenberg	$ 278.00	$ 176.00	$ -	$ 454.00
410-02300	9	2	24.86	2.00	0.809	Gregory Price	$ 278.00	$ 156.00	$ -	$ 434.00
410-02400	9	2	24.63	2.00	0.809	Gregory Markham	$ 278.00	$ 135.00	$ -	$ 413.00
410-02500	9	2	24.30	2.00	0.809	William & Joanne Leon	$ 278.00	$ 135.00	$ -	$ 413.00
	Total on Privately Owned - Agricultural Lands (grantable)						**$ 1,528.00**	**$ 899.00**	**$ -**	**$ 2,427.00**
	TOTAL ASSESSMENT			**24.77**	**10.026**		**$ 3,000.00**	**$ 2,000.00**	**$ -**	**$ 5,000.00**

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APPENDIX C-3

Future Maintenance Schedule
J.C. Smith Drain - Subwatershed No.3

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FUTURE MAINTENANCE SCHEDULE OF ASSESSMENT

J.C. Smith Drain - Subwatershed No. 3

3. MUNICIPAL LANDS:

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
	10th Concession Road			12.78	5.174	Town of Tecumseh	$ 980.00	$ 1,116.00	$ -	$ 2,096.00
	Total on Municipal Lands						**$ 980.00**	**$ 1,116.00**	**$ -**	**$ 2,096.00**

5. PRIVATELY OWNED - AGRICULTURAL LANDS (grantable):

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-02540	9	1	63.29	8.00	3.238	Mergl Seeds Ltd.	$ 1,520.00	$ 1,384.00	$ -	$ 2,904.00
	Total on Privately Owned - Agricultural Lands (grantable)						**$ 1,520.00**	**$ 1,384.00**	**$ -**	**$ 2,904.00**
	TOTAL ASSESSMENT			**20.78**	**8.411**		**$ 2,500.00**	**$ 2,500.00**	**$ -**	**$ 5,000.00**

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APPENDIX C-4

Future Maintenance Schedule
McPherson Drain - Subwatershed No.1

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FUTURE MAINTENANCE SCHEDULE OF ASSESSMENT

McPherson Drain - Subwatershed No. 1

3. MUNICIPAL LANDS:

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
	South Talbot Road			0.33	0.133	Town of Tecumseh	$ 12.00	$ 8.00	$ -	$ 20.00
	10th Concession Road			12.78	5.174	Town of Tecumseh	$ 240.00	$ 274.00	$ -	$ 514.00
	Total on Municipal Lands						**$ 252.00**	**$ 282.00**	**$ -**	**$ 534.00**

4. PRIVATELY OWNED - NON-AGRICULTURAL LANDS:

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-01660	9	4	1.05	1.05	0.425	Brian & Lisa McGuire	$ 19.00	$ 21.00	$ -	$ 40.00
410-02010	9	3	1.22	1.22	0.494	Andrew & Jodi Brewin	$ 22.00	$ 38.00	$ -	$ 60.00
410-02701	10	5	1.00	1.00	0.405	Kathy-Lynn McCarthy	$ 9.00	$ 16.00	$ -	$ 25.00
410-02650	10	3	0.57	0.57	0.231	Nancy Steeves	$ 12.00	$ 12.00	$ -	$ 24.00
	Total on Privately Owned - Non-Agricultural Lands						**$ 62.00**	**$ 87.00**	**$ -**	**$ 149.00**

5. PRIVATELY OWNED - AGRICULTURAL LANDS (grantable):

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-01500	9	5	54.64	3.00	1.214	Vince Gemus Holdings Inc.	$ 27.00	$ 16.00	$ -	$ 43.00
410-01700	9	4	60.61	60.61	24.529	Revenberg Holdings Ltd.	$ 359.00	$ 411.00	$ -	$ 770.00
410-01800	9	4	29.34	29.34	11.874	Revenberg Holdings Ltd.	$ 172.00	$ 224.00	$ -	$ 396.00
410-01900	9	3	30.96	16.00	6.475	Shirley Wilson	$ 124.00	$ 149.00	$ -	$ 273.00
410-02700	10	4 & 5	47.41	47.41	19.187	John & Catherine Lafferty	$ 1,288.00	$ 361.00	$ -	$ 1,649.00
410-02702	10	5	1.63	1.63	0.660	Frank Lafferty Ltd.	$ 13.00	$ 24.00	$ -	$ 37.00
410-02600	10	3	73.35	17.00	6.880	Peter & Nancy Steeves	$ 308.00	$ 178.00	$ -	$ 486.00
410-02550	10	3	35.34	17.00	6.880	Roberta Diemer	$ 330.00	$ 197.00	$ -	$ 527.00
	Total on Privately Owned - Agricultural Lands (grantable).....						**$ 2,621.00**	**$ 1,560.00**	**$ -**	**$ 4,181.00**

5. PRIVATELY OWNED - AGRICULTURAL LANDS (non-grantable):

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-02000	9	3	32.54	7.63	3.088	Amandeep & Jaspal Baines	$ 65.00	$ 71.00	$ -	$ 136.00
	Total on Privately Owned - Agricultural Lands (non-grantable).....						**$ 65.00**	**$ 71.00**	**$ -**	**$ 136.00**
	TOTAL ASSESSMENT			**216.57**	**87.646**		**$ 3,000.00**	**$ 2,000.00**	**$ -**	**$ 5,000.00**

APPENDIX C-5

Future Maintenance Schedule
McPherson Drain - Subwatershed No.2

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FUTURE MAINTENANCE SCHEDULE OF ASSESSMENT

McPherson Drain - Subwatershed No. 2

3. MUNICIPAL LANDS:

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
	10th Concession Road			12.78	5.174	Town of Tecumseh	$ 208.00	$ 270.00	$ -	$ 478.00
	Total on Municipal Lands						**$ 208.00**	**$ 270.00**	**$ -**	**$ 478.00**

5. PRIVATELY OWNED - AGRICULTURAL LANDS (grantable):

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-03600	10	2 & 3	53.94	25.00	10.117	Dwight Farough	$ 815.00	$ 588.00	$ -	$ 1,403.00
	Total on Privately Owned - Agricultural Lands (grantable)						**$ 815.00**	**$ 588.00**	**$ -**	**$ 1,403.00**

5. PRIVATELY OWNED - AGRICULTURAL LANDS (non-grantable):

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-03900	10	2	51.71	50.00	20.235	Claret Capital Holdings Inc.	$ 1,977.00	$ 1,142.00	$ -	$ 3,119.00
	Total on Privately Owned - Agricultural Lands (non-grantable)						**$ 1,977.00**	**$ 1,142.00**	**$ -**	**$ 3,119.00**
	TOTAL ASSESSMENT			**87.78**	**35.526**		**$ 3,000.00**	**$ 2,000.00**	**$ -**	**$ 5,000.00**

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APPENDIX C-6

Future Maintenance Schedule
McPherson Drain - Subwatershed No.3

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FUTURE MAINTENANCE SCHEDULE OF ASSESSMENT

McPherson Drain - Subwatershed No. 3

3. MUNICIPAL LANDS:

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
	10th Concession Road			12.78	5.174	Town of Tecumseh	$ 2,656.00	$ 1,687.00	$ -	$ 4,343.00
	Total on Municipal Lands						**$ 2,656.00**	**$ 1,687.00**	**$ -**	**$ 4,343.00**

5. PRIVATELY OWNED - AGRICULTURAL LANDS (grantable):

Tax Roll Number	Con. or Plan Number	Lot or Part of Lot	Acres Owned	Acres Affected	Hectares Affected	Owner's Name	Value of Benefit	Value of Outlet	Value of Special Benefit	TOTAL VALUE
410-04000	10	1	34.40	1.00	0.405	Zachary Pan & Xiaotong Tang	$ 344.00	$ 313.00	$ -	$ 657.00
	Total on Privately Owned - Agricultural Lands (grantable)						**$ 344.00**	**$ 313.00**	**$ -**	**$ 657.00**
	TOTAL ASSESSMENT			**13.78**	**5.578**		**$ 3,000.00**	**$ 2,000.00**	**$ -**	**$ 5,000.00**

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