DRAINAGE REPORT
FOR THE

ROAD BRIDGE REPLACEMENT & FARM ACCESS CULVERT OVER THE LACHANCE DRAIN (BANWELL ROAD IMPROVEMENTS)

IN THE CITY OF WINDSOR & TOWN OF TECUMSEH

DILLON CONSULTING

FINAL
24 MARCH 2025
OLIVER E. T. MOIR, P.ENG.
FILE No. 23-6875

File No. 23-6875

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Drainage Report for the
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LACHANCE DRAIN
(BANWELL ROAD IMPROVEMENTS)
In the City of Windsor & Town of Tecumseh

Mayor and Council:

Instructions

Council appointed Dillon Consulting Limited under Section 78 of the Drainage Act on 10 November 2023 to prepare a report for the improvement of the Lachance Drain. The purpose of the appointment is to make recommendations for the replacement of the Banwell Road culvert as part of the Banwell Road Improvements.

On 18 January 2025, the owner of property Roll No. 570-34500 submitted a request for a new farm access culvert under Section 78 of the Act to the Town of Tecumseh. The access culvert is needed because the Banwell Road Improvements remove the existing access to said farm property. The request is therefore considered part of the drainage works required on the Lachance Drain to accommodate the road improvements works.

Watershed Description

The Lachance Drain commences along the south side of Intersection Road at Shawnee Road where it flows westerly as a closed drain to approximately the western boundary of Lot 148 where it begins to flow in an open channel until it crosses Banwell Road. It then turns southerly along the east side of Lot 143 for 365 metres before turning westerly outletting to the Little River Drain. The total length of the drain is approximately 2,442 metres.

The watershed area for the road culvert is approximately 65 ha (161 acres) and is nearly entirely within the Town of Tecumseh. The watershed area for the farm access culvert is approximately 26 ha (63 acres). The lands comprising the watershed are under mixed agricultural and residential use. Agricultural lands are randomly tiled. There is little topographic relief. From the Ontario Soil Survey (provided by the Ontario Ministry of Agriculture, Food and Rural Affairs), the principle surficial soil in the study area is described as Brookston Clay. Brookston clay is characterized as a poor draining soil type.

Drain History

The recent history of Engineers' reports for the Lachance Drain follows:

- **25 March 2022 by Mark D. Hernandez, P.Eng.:** The report recommended a drain realignment of a portion of the drain west of Banwell Road to accommodate development of the NextStar Energy Battery Production facility.
- **3 May 2019 by Mark D. Hernandez, P.Eng.:** The report recommended the cleaning, brushing and repair of the entire drain including the establishment of grass buffers.
- **7 September 1988 by Lou Zarlenga, P.Eng.:** The report recommended the cleaning and brushing of the entire drain including the replacement of all culverts.
- **3 August 1968 by C.G.R. Armstrong, P.Eng.:** The report recommended the repair and improvement of the drain.

On-Site Meeting

An on-site meeting was held on 21 March 2023. A record of this meeting is provided in Schedule 'A', which is appended hereto.

Survey

Our survey was carried out in 2023 as part of the road improvements. Topographic survey acquired from the 2019 and 2022 reports was also referenced. The survey is comprised of the recording of topographic data in the location of the proposed road crossing.

Design Considerations

The City of Windsor is undertaking the reconstruction of Banwell Road to facilitate the change from a rural to an urban road cross section. As part of the Banwell Road improvements the road crossing over the Lachance Drain will require replacement.

An existing 13.9 m long, 1880 mm by 1260 mm corrugated steel pipe arch with concrete block end protection provides a road crossing. Recently, the culvert was extended to the west with a 30 m long, 1880 mm x 1260 mm corrugated steel pipe arch with sloping stone end wall by the City of Windsor to accommodate an access for the NextStar battery plant construction. The extension was completed outside of the provisions of the Drainage Act.

A Guide for Engineers working under the Drainage Act in Ontario, OMAFRA Publication 852 (2018) is the current reference document used by engineers carrying out work on municipal drains under the Act. The 2-year design storm is the recommended design standard applied to municipal drains within rural Ontario specific to open drain channels and low hazard agricultural field access crossings. For urban road crossings where there is a greater risk to public health and safety from potential flooding, a higher 25-year design storm is more appropriate. The proposed culvert is designed for the 25-year design storm flows. The farm access culvert is designed for the 2-year design storm flows.

We believe that these design standards should provide a reasonable level of service, but it should be clearly understood that runoff generated from large storms or fast snow melts may sometimes exceed the capacity of the proposed systems and result in surface ponding for short periods of time.

Allowances

No allowances under Section 29 for land used or Section 30 for damages have been provided since construction is to take place from the road allowance and all restoration to existing grassed areas and private land is included as part of the work. No Schedule 'B' for allowances is appended hereto.

Recommendations

For the improved Banwell Road crossing over the Lachance Drain, we recommend that the culvert be replaced with a new 58.56 m long, 1800 x 1500 mm precast concrete box culvert complete with vertical concrete block headwalls on the westerly downstream end, and sloping stone end wall on the easterly upstream end. The bridge is referred to as Bridge No. 5, which is consistent with the bridge numbering in the governing by-law report dated 3 May 2019.

We recommend a new farm access culvert (referring to as Bridge No. 6) be installed to provide access to the property Roll No. 570-34500 considering the property is losing its access off Banwell Road because of the road improvements. The new culvert shall consist of a 1000 mm diameter corrugated steel pipe, 9.1 metre wide granular driveable top width with sloping stone end walls.

Recommendations

Based on our review of the history, the information obtained during the site meeting and our examination and analysis of the survey data, we recommend that the Lachance Drain be improved as described below:

Item	Description	Amount
	SECTION 26 NON PRO-RATEABLE COSTS	
1.	Bridge removal, as follows:	
	• Station 1+706 (Banwell Road) - Remove and dispose of 44 m long, 1880 x 1260 mm CSPA and concrete block end wall from east end off-site. Salvage and stockpile existing rip rap from west end.	$20,000.00
2.	Bridge No. 5 – Station 1+706 (City of Windsor Road Authority) – Banwell Road, as follows:	
	a) Supply and installation of a new 58.56 m long, 1800 x 1500 mm concrete box culvert (CHBDC CAN/CSA S6-06) (designed by Contractor), complete with concrete cut-off walls (designed by Contractor) Granular 'A' bedding and backfill (approximately 695 tonnes). Work includes waterproofing of joints complete with protection board.	$340,900.00

Item	Description	Amount
	b) Supply and installation of concrete block retaining wall on the downstream end (designed by Contractor). Works include supply & installation of Inspector guard rail on headwall (approx. 10 m long).	$44,500.00
	c) Supply and installation of stone erosion protection sloping end wall on upstream end (approximately 30 m^2). Works include 500 mm thick native material buffer underneath stone.	$2,700.00
	d) Supply and installation of stone erosion protection apron on upstream end (approximately 30 m^2).	$2,700.00
3.	Bridge No. 6 – Station 2+055.5 (Roll No. 570-34500) – Supply and installation of a new 19 m long, 1000 mm diameter aluminized Type II corrugated steel pipe (CSP) (68 mm x 13 mm corrugations). Clearstone bedding material beneath pipe, minimum 150 mm thickness (approximately 15 tonnes). Granular 'B' backfill up to pipe springline of pipe (approximately 15 tonnes). Clean native or imported clean native backfill material from springline of pipe culvert to the underside of Granular 'A' driveway material and outside of driveway portion to construct the 0.50 m wide native buffer strips (approximately 165 m^3). Granular 'A' (crushed limestone) compacted driveway surface, minimum 200 mm thickness (approximately 65 tonnes). Sloping stone end walls c/w filter cloth underlay (approximately 45 m^2). Grass buffer strips (0.5 metre wide) on each side of driveway to be spread with 100 mm thick topsoil, fine graded and seeded.	$19,700.00
4.	Temporary silt control measures during construction including supply and installation of rock check dam and sediment trap downstream of the work.	$3,000.00
5.	Maintenance of flows during construction.	$15,000.00
	SUB-TOTAL – SECTION 26 NON PRO-RATEABLE COSTS	**$448,500.00**
6.	Survey, report, assessment and final inspection (cost portion)	$41,500.00
7.	ERCA application, review and permit fee	$800.00
	TOTAL – SECTION 26 NON PRO-RATEABLE COSTS	**$490,800.00**

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

Should the Road Authority elect to construct the drainage works across their road right-of-ways (Section 26.0 increased cost items) with their own forces, as per Section 69 of the Drainage Act, R.S.O., 1990, the Road Authority shall remain responsible for their allotment of costs for the preparation of this report as outlined in our estimate. Should the Road Authority elect not to undertake this work, the work items, as noted under Section 26 above, should be kept separate when tendering out the entire drainage works.

Assessment of Costs

The individual assessments are comprised of three (3) assessment components:

i. Benefit (*advantages relating to the betterment of lands, roads, buildings, or other structures resulting from the improvement to the drain).*

ii. Outlet Liability *(part of cost required to provide outlet for lands and roads).*

iii. Special Benefit *(additional work or feature that may not affect function of the drain).*

We have assessed the estimated costs against the affected lands and roads as listed in Schedule 'C' under "Value of Special Benefit", "Value of Benefit" and "Value of Outlet." Since there is only one Special Benefit assessment, a separate schedule for Details of the Value of Special Benefit (Schedule 'D') is not required or included herein.

Assessment Rationale for Special Benefit Assessment

Special Benefit assessment shown in Schedule 'C' was derived as follows:

1. As the proposed works are directly a result of the proposed road improvements, all associated engineering and construction costs for the preparation and consideration of this report shall be assessed 100% to the City of Windsor Road Authority under Section 26 of the Drainage Act.

Utilities

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

Future Maintenance

We recommend that future work of repair and maintenance of the Banwell Road bridge (Bridge No. 5) be carried out by the City of Windsor and the costs assessed 100% to the City of Windsor Road Authority as a Section 26 assessment for the road crossing. The assessment under Section 26 of the Drainage Act shall be a non-proratable assessment.

Future work of repair and maintenance of the farm access culvert (Bridge No. 6) is to be carried out by the Town of Tecumseh and the costs assessed 50% to the abutting landowner as a special benefit assessment and 50% be prorated to the upstream watershed based on the proportions set out in Schedule 'E' attached herein.

We have included the residential lands and roads within Lots 148 and 150, Concession 1 as a block assessment, referred to as Block 'A'

These provisions for maintenance are subject, of course, to any variations that may be made under the authority of the Drainage Act.

Drawings and Specifications

Attached to this report is Schedule 'F', which are specifications setting out the details of the recommended works and Schedule 'G' which represent the drawings that are attached to this report. Page numbering is consistent with the Contract Drawings for the E.C. Row Expressway/Banwell Road improvement project.

MD-7L – Watershed Plan

MD-8 – Plan & Section Details

MD-9 – Bridge Details

MD-10 – Miscellaneous Details

MD-11 – Farm Access Bridge Details

Approvals

The construction and/or improvement to drainage works, including repair and maintenance activities, and all operations connected there are subject to the approval, inspection, by-laws and regulations of all Municipal, Provincial, Federal and other authorities having jurisdiction in respect to any matters embraced by the proposed works. Prior to any construction or maintenance works, the Municipality or proponent designated on the Municipality's behalf shall obtain all required approvals/permits and confirm any construction limitations including timing windows, mitigation/off-setting measures, standard practices or any other limitations related to in-stream works.

Respectfully submitted,

DILLON CONSULTING LIMITED

Oliver E. T. Moir, P.Eng.

OEM:wlb:lld

SCHEDULE "A"

MEETING SUMMARY

Subject:	Gouin Drain & Lachance Drain Virtual 'On-Site' Meeting
Date:	March 21, 2024, 3:00pm
Location:	Virtual Call
Our File:	23-6875

Attendees

Matthew Shiha	Town of Tecumseh
Tom Graziano	City of Windsor
Oliver Moir	Dillon Consulting Limited (Dillon)
Chris Patten	Dillon
Jonny Ngai	Dillon
Tyler Natais	Dillon
Mark Fishleigh	County of Essex
Julie Lachance	Landowner
Gilles Lacombe	Landowner
Frank Palobo	Landowner
Lane Chevalier	Landowner
Kyle Savoie	NextStar Energy
Call-In Participants	

Notes

Item	Discussion	Action by
1.	Introductions: • Dillon introduced the staff from Dillon, City of Windsor & Town of Tecumseh.	INFO.
2.	Project Overview: • Summary of the Drainage Act • Drains are maintained by the Municipality as per the by-law • Report will be going to Council	INFO.
3.	Scope: • The report to be completed as part of the EC Row Expressway/Banwell Road Improvement project. • Improvement will implement curbs, multi-lane, median, storm sewer installation and widening of right-of-way (Upgrade from the existing rural roadway to an urban roadway). • Gouin Drain commences in the Town of Tecumseh, passing through the City of Windsor and outlets to the Little River Drain and consists of open drain with access bridges. • Lachance Drain commences in the Town of Tecumseh, passing through the City of Windsor and outlets to the Little River Drain. The drain crosses Banwell Road immediately south of Intersection Road.	INFO.

Item	Discussion	Action by
	Improvement will include large culverts crossing Banwell Road including upgrade of existing outlet west of Banwell Road. • Overall scope of work is to ensure culverts will have adequate capacity of the road improvement and maintaining existing flows. • Cost of the construction and future maintenance will be bore by City of Windsor. • Dillon is seeking input from land owner upstream of the proposed work as part of the report.	
4.	Next Step: • Prepare a report and submit to the City. • Revision follows, including cost of future maintenance. • Currently, the work will generate additional cost to land over for now or in the future. • The City does not expect to distribute the final reports as the scope of work is not expected impact upstream landowners. Affected landowners will receive a copy of the report ahead of the Meeting to Consider. However, landowners can request for a copy of the report.	INFO.
5.	Questions: • Julie Lachance: Is there government grant for the proposed work? o Dillon: There is a $50 million grant for the road improvement. Any of the drainage improvement will be paid by the City of Windsor, either through taxes or grants. The $50 million grant will be contributed to the project, however how much and to which portion of the work has yet to be finalized. There will be no cost to the landowners for the proposed work. Grant from OMAFRA does not apply to this project. • Kyle Savoie: It appears the study is limited to culvert enclosure, but does it impact downstream? o Dillon: Currently, the proposed work and current design does not impact anything downstream. Should this change in the future for this project, landowners will be informed at that time. • Shivani (called in by phone number): When will the work begin? o Dillon: Banwell Road and improvement of the drain are anticipated to be completed by the 2025/2026 construction season. The original scope was to completed the work by 2027, however the City of Windsor expedited the work and aim to completed the work by 2026. • Lane Chevalier: Would like to see the report once completed. o Dillon & City: A report will be provided once completed.	INFO.

Errors and/or Omissions

These minutes were prepared by Oliver Moir, P.Eng who should be notified of any errors and/or omissions.

"SCHEDULE C"
SCHEDULE OF ASSESSMENT
LACHANCE DRAIN - (BANWELL ROAD CULVERT)
CITY OF WINDSOR

SECTION 26 (NON PRO-RATABLE)

Roll No.	Con.	Description	Owner	Special Benefit	Benefit	Outlet	Total Assessment
Banwell Road			City of Windsor Road Authority	$490,800.00	$0.00	$0.00	$490,800.00
Total Section 26 Increased Costs (Non Pro-ratable)				$490,800.00	$0.00	$0.00	$490,800.00
TOTAL ASSESSMENT				**$490,800.00**	**$0.00**	**$0.00**	**$490,800.00**

"SCHEDULE E"
SCHEDULE OF ASSESSMENT FOR FUTURE MAINTENANCE (BRIDGE No. 6)
LACHANCE DRAIN
TOWN OF TECUMSEH

MUNICIPAL LANDS:

Description	Area Affected (Acres)	(Ha.)	Owner	Special Benefit	Benefit	Outlet	Total Assessment
Block A (Lands)	20.12	8.14	Town of Tecumseh	$0.00	$0.00	$2,317.00	$2,317.00
Block A (Roads)	6.30	2.55	Town of Tecumseh	$0.00	$0.00	$1,210.00	$1,210.00
Intersection Road	0.41	0.17	Town of Tecumseh	$0.00	$0.00	$79.00	$79.00
Total on Municipal Lands				$0.00	$0.00	$3,606.00	$3,606.00

PRIVATELY-OWNED - AGRICULTURAL LANDS (GRANTABLE)

Roll No.	Con.	Description	Area Affected (Acres)	(Ha.)	Owner	Special Benefit	Benefit	Outlet	Total Assessment
570-34500	3	N. Lot 144 to N. Pt. Lot 147 RP12R13756 Pt. 1	1.06	0.43	Eugene C. Lachance	$5,000.00	$0.00	$41.00	$5,041.00
570-34550	3	Pt. Lot 147 RP12R13756 Pt. 2	16.38	6.63	Clement H. R. Lachance	$0.00	$0.00	$629.00	$629.00
570-34700	3	Pt. Lot 148	18.85	7.63	Clement & Jeannette L. B. Lachance	$0.00	$0.00	$724.00	$724.00
Total on Privately-Owned - Agricultural Lands (Grantable)						$5,000.00	$0.00	$1,394.00	$6,394.00
TOTAL ASSESSMENT						**$5,000.00**	**$0.00**	**$5,000.00**	**$10,000.00**

	(Acres)	(Ha.)
Total Area:	**63.12**	**25.54**

"SCHEDULE F"
DRAINAGE REPORT FOR THE
ROAD BRIDGE REPLACEMENT OVER THE
LACHANCE DRAIN (BANWELL ROAD)
IN THE CITY OF WINDSOR

SPECIAL PROVISIONS - GENERAL

1.0 GENERAL SPECIFICATIONS

The General Specifications attached hereto is part of "Schedule F." It also forms part of this specification and is to be read with it, but where there is a difference between the requirements of the General Specifications and those of the Special Provisions which follow, the Special Provisions will take precedence.

2.0 DESCRIPTION OF WORK

The work to be carried out under this Contract includes, but is not limited to, the supply of all **labour, equipment and materials** to complete the following items:

- Bridge removal, as follows:
  - Station 1+706 (Banwell Road) - Remove and dispose of 44 m long, 1880 x 1260 mm CSPA and concrete block end wall from east end off-site. Salvage and stockpile existing rip rap from west end.
- Banwell Road Bridge – City of Windsor Road Authority, as follows:
  - Supply and installation of a new 58.56 m long, 1800 x 1500 mm concrete box culvert (CHBDC CAN/CSA S6-06) (designed by Contractor), complete with concrete cut-off walls (designed by Contractor) Granular 'A' bedding and backfill (approximately 695 tonnes). Work includes waterproofing of joints complete with protection board.
  - Supply and installation of concrete block retaining wall on the downstream end (designed by Contractor). Works include supply & installation of Inspector guard rail on headwall (approx. 10 m long).
  - Supply and installation of stone erosion protection sloping end wall on upstream end (approximately 30 m^2). Works include 500 mm thick native material buffer underneath stone.
  - Supply and installation of stone erosion protection apron on upstream end (approximately 30 m^2).

- Bridge No. 6 – Station 2+055.5 (Roll No. 570-34500) –Supply and installation of a new 19 m long, 1000 mm diameter aluminized Type II corrugated steel pipe (CSP) (68 mm x 13 mm corrugations). Clearstone bedding material beneath pipe, minimum 150 mm thickness (approximately 15 tonnes). Granular 'B' backfill up to pipe springline of pipe (approximately 15 tonnes). Clean native or imported clean native backfill material from springline of pipe culvert to the underside of Granular 'A' driveway material and outside of driveway portion to construct the 0.50 m wide native buffer strips (approximately 165 m^3). Granular 'A' (crushed limestone) compacted driveway surface, minimum 200 mm thickness (approximately 65 tonnes). Sloping stone end walls c/w filter cloth underlay (approximately 45 m^2). Grass buffer strips (0.5 metre wide) on each side of driveway to be spread with 100 mm thick topsoil, fine graded and seeded.
- Temporary silt control measures during construction including supply and installation of rock check dam and sediment trap downstream of the work.
- Maintenance of flows during construction.

3.0 ACCESS TO THE WORK

Access to the drain shall be from Intersection Road and Banwell Road rights-of-way. Through traffic must be maintained at all times, along municipal roads unless otherwise approved by the appropriate Road Authority, and in accordance with the General Specifications. The Contractor is required to abide by NextStar Energy's health and safety requirements when entering upon NextStar lands.

All road areas, grass lawn areas and fence lines disturbed shall be restored in accordance with Section 10.0 & 11.0 at the Contractor's expense. The Contractor shall make his/her own arrangements for any additional access for his/her convenience.

4.0 WORKING AREA

The working area at the bridge site shall be restricted to the Banwell Road and Intersection Road right-of-ways, as well as the 9 metre wide working corridor on the south side of the drain, measured from the south top of bank.

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

SPECIAL PROVISIONS – BRIDGE WORK

5.0 ROAD BRIDGE WORK (BRIDGE No. 5)

5.1 Existing Structure(s)

The Contractor shall completely remove the existing road culvert(s) as follows:

- Banwell Road, consisting of a 44 m long, 1880 mm x 1260 mm corrugated steel pipe arch (CSPA) with a concrete block end wall on the east end and sloping stone end wall on the west end.

5.2 Location of Bridge Replacement

The bridge replacement shall be located and installed as shown on the drawings.

5.3 Materials for New Road Bridge

Materials shall be as follows:

Culvert Pipe	*New 58.56 metres long, 1800 mm span x 1500 mm rise quality precast concrete box culvert as per CHBDC CAN/CSA S06-06.*
Pipe Bedding Below Pipe	*Granular 'A' conforming to OPSS Division 10.*
Beneath Road Surface and Shoulders, Backfill to Bottom of Granular 'A' Road Subgrade materials	*Granular 'A' conforming to OPSS Division 10.*
Beyond Road Surface and Shoulders, Backfill 300 mm Above Pipe to Finished Topsoil Layer	*Dry native material free of topsoil, organic matter, broken concrete, steel, wood and deleterious substances. Alternatively, Granular 'A' or 'B' conforming to OPSS Division 10.*
Native Material Buffer	*Dry native material free of topsoil, organic matter, broken concrete, steel, wood and deleterious substances.*
Concrete Blocks	*New Interlocking Concrete Blocks. The concrete to be used for the block endwalls shall have a minimum strength of 25 MPa shall be air entrained concrete with air content ranging from 5-7%. The void space between the blocks and pipe shall be formed and filled with concrete minimum 20 MPa and shall be air entrained concrete with air content ranging from 5-7%.*
Filter Fabric	*"Non-Woven" geotextile filter fabric with a minimum strength equal to or greater than Terrafix 270R, Amoco 4546, Mirafi 140NC or approved equivalent.*
Erosion Stone	*All stone to be used for erosion protection shall be 125 - 250 mm clear quarried rock or OPSS.Muni 1004, minimum 300 mm thickness.*

5.4 Culvert Installation

Suitable dykes shall be constructed in the drain so that the installation of the pipe can be accomplished in the dry. The drain bottom shall be cleaned, prepared, shaped and compacted to suit the new culvert configuration, as shown on the drawings. Granular materials shall be compacted to 100% of their maximum dry density; native materials shall be compacted to 95% of their maximum dry density.

5.5 Sloping Stone Erosion Protection

Sloping stone erosion protection shall be constructed of quarry stone rip-rap, as shown on the drawings and as specified herein. The erosion protection shall be sloped 1 vertical to 1.5 horizontal including a filter fabric underlay, with a minimum 1 m wide along the drain banks and drain bottom adjacent to the concrete block headwalls. The minimum thickness requirement of the erosion stone layer is 300 mm with no portion of the filter fabric to be exposed.

5.6 Native Materials

Native materials suitable for use as backfill, as defined under Section 5.3, shall be salvaged from the existing bridge site as required to complete the work as shown on the drawings. Any surplus native materials (if any) not required in the bridge installation shall be disposed of off-site.

5.7 Site Cleanup and Restoration

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

6.0 PRECAST CONCRETE BOX CULVERT INCLUDING APPURTENANCES

6.1 General

OPSS.MUNI 422 shall apply and govern expect as extended or amended herein.

6.2 Scope of Work

This item covers the design, detailing, supply, delivery, and installation of the precast box culvert as shown in the Contract Drawings. Included in this item are the following:

- The detailed design of the precast culvert and cut-off walls.
- Preparation and submission of sealed working drawings.
- Incorporation and comments made by the Contract Administrator.
- The supply of the precast culvert and cut-off walls.
- The delivery to the site and installation of the precast culvert and cut-off walls.
- Coordination of interface connection design and installation with design and installation of precast block retaining walls.

6.3 Design and Submission Requirements

Design of the precast concrete culvert and appurtenances are the responsibility of the Contractor. The design is to confirm to the CSA S6-19 (Canadian Highway Bridge Design Code) as implemented for CL-625 ONT Live Loading, the geotechnical report and the requirements of the specification and should be in accordance with good engineering practices.

Design shall include, but not limited to: sequence of culvert placement, foundation preparation, material specifications, all dimensions, and design criteria.

At least eight (8) weeks before commencement of fabrication, the Contractor shall submit to the Owner/Engineer, one (1) digital set of working drawings for acceptance.

These drawings shall include:

- All design, fabrication, and construction drawings and specifications for precast culvert and appurtenances.
- Waterproofing requirements at wall joints and geotextile requirements at precast block RSS walls.
- Details of excavation, granular bedding, and backfill.
- Design assumption and parameters.
- Installation procedures.

The drawing shall bear the seal and signature of two (2) Engineers, a Design Engineer and a Design Checking Engineer, both licensed to practice in Ontario. The Design Engineer shall have demonstrated expertise for the work. The Design Engineer shall have a minimum of five (5) years experiences in designing concrete culverts of similar nature and scope to the required work. One person cannot perform both the Design Engineer and Design Checking Engineer roles.

6.4 Construction

Box units shall be installed to the alignment and grade specified in the Contract Drawings.

Box units shall not be installed on bedding containing frozen material.

End units to accommodate concrete appurtenances shall be as specified in the Contract Documents.

The box units shall be installed to make a continuous line forming a box culvert or box sewer. The gap at box unit joints shall not exceed 20 mm.

Earth excavation necessary for the construction of the culverts, bedding (if required by design), and backfill shall be in accordance with the Contract Drawings and OPSS.MUNI 902.

6.5 Utility Supports

Where required, the Contractor shall construct permanent reinforced concrete utility supports following specifications and requirements of the respective Utility Companies. Utility supports, shall be considered incidental to culvert construction. No payment shall be made for supports either temporary or permanent.

Utility supports shall be constructed as required by the respective utility companies per their respective standards and guidelines as outlined therein.

6.6 Maximum Acceptable Grade Tolerances

Maximum acceptable deviations in the culvert shall be +/- 0.02% which is equivalent to 20 mm in 100 m of installation.

Certificate of Conformance upon Completion of the Work

Upon completion of installation, the Contractor shall submit to the Contract Administrator a Certificate of Conformance sealed and signed by the Design Engineer. The Certificate shall state that the work has been carried out in general conformance with the stamped working drawings and Contract Documents.

7.0 RETAINING WALLS

7.1 General

OPSS.MUNI 940 shall apply and govern expect as extended or amended herein.

7.2 Scope of Work

The work shall include the design, detailing, supply, delivery and installation of the retaining walls at the following locations:

- New Lachance Drain Culvert Endwall (west end)

Included in this item is the following:

- The detailed design of the precast block retaining walls with the ability to support the connectivity of a pedestrian railing, bike railing, etc.;
- Preparation and submission of sealed working drawings;
- Incorporation of comments made by the Engineer;
- The supply and delivery of the blocks and related materials;
- The on-site installation of the precast block retaining walls in accordance with Manufacturer's recommendations/requirements;
- The supply and placement of granular backfill material and subdrain for the retaining wall.

The retaining wall shall be Redi-Rock by Miller Group or approved equivalent selected based on the following MSE Attributes:

- Application: Wall/ Slope
- Geometry: Vertical
- Appearance: High
- Performance: High

7.3 Design and Submission Requirements

Design:

Design of the retaining walls is the responsibility of the Contractor. The design is to conform to the latest version of CHBDC CSA-S6 as implemented for Ontario CL-625-ONT Live Loading and railing loading, the geotechnical report and the requirements of the specification and should be in accordance with good engineering practice.

Design shall include but not be limited to sequence of stone or block placement, foundation preparation, material specifications, all dimensions and design criteria. The design shall consider but not be limited to global stability, soil loss, drainage and the potential for erosion of the wall base.

Improvements to the subgrade for founding the MSE such as additional excavation, additional granular material and/or subgrade strengthening, as determined by a geotechnical engineer and MSE designer, shall be completed by the Contractor at no additional cost to the Owner.

The following shall be considered for the design of retaining walls:

- Differential hydrostatic pressures;
- Water level in front of retaining wall vs. water level within/behind wall;
- Potential for loss of fines (piping) from the granular backfill;
- Potential use of courser backfills with little or no fines at/below HWL;
- Pullout capacity and frictional resistance between reinforcements and select backfill under submerged conditions (buoyant unit weight);
- Adequate wall embedment depth;
- Adequate reinforcement length;
- Scour protection rip-rap –properly sized and filter graded; and
- CHBDC structure design requirements for a 75-year service life – stability, durability, long term performance.

8.0 CULVERT WATERPROOFING

8.1 General

OPSS.MUNI 914 shall apply and govern expect as extended or amended herein.

8.2 Materials

The waterproofing system shall comply with those listed in the Table 1.

Table 1: Waterproofing Materials for Joints

Manufacturer	Self-Adhering Waterproofing Membrane	Primer/Adhesive	Joint Sealant
WR Meadows	MEL-ROL	Mel-prime	Pointing mastic
Henry	Blueskin WP200	Blueskin Primer	570-05 Polybitume
Grace Construction Products	Bituthene System 4000	Bituthene System 4000 Surface Conditioner	Bituthene Liquid Membrane

Notes:

1. The membrane shall be applied with the primer/adhesive
2. The self-adhering waterproofing membrane, the primer/adhesive, and the joint sealant shall be from the same manufacturer.

8.3 Construction

Operational Constraints:

All waterproofing materials shall be properly stored and maintained at the waterproofing manufacturer's recommended temperatures.

Waterproofing shall be completed after the culvert has been installed according to the Contract Documents.

Prior to application of waterproofing:

a) Concrete curing shall be completed according to the Contract Documents.

b) Concrete cured using burlap and water or moisture vapour barrier shall be air cured for at least 72 hours.

c) Any voids or spalls in the concrete shall be repaired as specified in the Contract Documents

d) The concrete surface shall be clean and smooth with any sharp projections or fins removed.

e) The surface of the concrete shall be abrasive blast cleaned according to OPSS 929 to expose sound, laitance-free concrete.

Self-Adhering Waterproofing Membrane:

a) Extent of Coverage

Except as specified below, joints on the top surface of the culvert and 50% of the vertical portion of the joints, from the top of the culvert to the culvert mid-height, shall be waterproofed using the self-adhering waterproofing membrane.
The membrane shall go top of steel connector plates, where present, and shall be extended to cover the entire connector plate.

Self-adhering waterproofing membrane shall not be applied to joints located in portions of the culvert that will not be covered with earth or granular material, as specified in the Contract Documents.

When the Contract Documents specify the placement of a protection or distribution slab on the top surface of the culvert, the self-adhering waterproofing membrane placement on the joints shall be limited to the 50% vertical portion plus a maximum 200 mm width on each side of the top of the culvert, measured from the culvert top edges

Protection board shall be applied to cover the membrane applied to the vertical surfaces of the culvert.

b) Application of Self-Adhering Waterproofing Membrane

The self-adhering waterproofing membrane shall be installed according to the waterproofing manufacturer's recommendations, and the following:

i. The minimum air and concrete surface temperature at the time of primer/adhesive and membrane application shall be 5 ◦C.

ii. The concrete surface shall be dry at the time of application of the primer/adhesive.

iii. Immediately prior to the application of the primer the concrete surface shall be cleaned with a jet or oil-free compressed air to remove all dust and other foreign material.

iv. The primer/adhesive shall be evenly applied with a roller or brush at a rate of 6.2 to 7.4 m^3/L, or at a higher rate if recommended by the waterproofing manufacturer.

v. The primer/adhesive shall be prevented from entering the culvert joint.

vi. If the primer/adhesive is left exposed for more than 12 hours, the primer/adhesive shall be evenly reapplied prior to application of the membrane.

vii. Release paper shall be removed prior to placement of the membrane.

viii. The membrane shall be installed with a minimum overlap between sheets of 65 mm for both horizontal and vertical applications and shall be firmly bonded to the concrete surface.

ix. All terminations of the membrane shall be sealed against moisture ingress with the joint sealant listed in Table 1, with minimum thickness of 3 mm and minimum width of 25 mm.

x. Protection board applied to the membrane on the vertical surfaces of the culvert shall be secured to the membrane using the joint sealant listed in Table 1.

Prior to applying hot applied rubberized asphalt waterproofing to the top surface of the culvert, an inspection of the self-adhering waterproofing membrane installation shall be undertaken in the presence of the Contact Administrator. Any required repairs shall be carried out, to the satisfaction of the Engineer, prior to proceeding with hot applied rubberized asphalt waterproofing of the top surface of the culvert.

Defects of deficiencies affecting the performance of the self-adhering waterproofing membrane including but not limited to tears in the membrane of inadequate overlaps, shall be repaired by removal of the membrane in the affected area and reapplication to meet the requirements of this specification.

c) Sampling

The following samples of the primer/adhesive, self-adhering waterproofing membrane and protection board shall be taken in the presence of the Engineer:

i. Self-adhering waterproofing membrane (1 m in length).

ii. Protection board (700 mm x 500 mm).

iii. Primer/adhesive (approximately 500 ml).

The samples shall be placed in a bag along with Form PH-CC-340 and given to the Engineer.

Waterproofing of Precast Concrete Culvert:

After application of self-adhering waterproofing membrane to the joints, hot applied rubberized asphalt waterproofing membrane with protection board shall be applied to the top surface of the culvert or, when a protection or distribution slab is specified, to the top of the protection or distribution slab.

The application shall be according to OPSS 914, with the following amendments and additions:

a) All references to deck in OPSS 914 shall mean the top surface of the culvert, or, when a protection or distribution slab is specified, the top surface of the protection or distribution slab.

b) The application shall be to the top surface of the culvert that will be covered with fill material and extend to 1000 mm beyond the limit of the fill material specified in the Contract Documents.

c) The application shall also cover the self-adhering waterproofing membrane applied to the joints.

d) Membrane reinforcement shall be applied at the joints between precast concrete culvert elements. The membrane reinforcement shall be placed directly over the waterproofing membrane and pressed in while it is still tacky. The membrane reinforcement shall than be covered with an additional layer of waterproofing membrane.

e) The application, including the protection board, shall extend 300 mm down the vertical faces from:

   i. The top of the culvert or, when specified

   ii. The top of the protection or distribution slab.

f) If a headwall is specified in the Contract Documents, the application shall extend a minimum of 50 mm up the headwall.

Protection board shall extend over all areas of waterproofing on the horizontal and vertical surfaces of the culvert.

Backfilling shall not proceed until conditions specified in the Inspection After the Waterproofing of the Culvert Prior to Backfilling clause of OPSS 912 have been met.

9.0 STONE EROSION PROTECTION (SEP)

The Contractor shall supply and install the required quantities of graded stone rip-rap erosion protection materials where specified. All stone to be used for erosion protection shall be 125 - 250 mm clear **quarried rock** or OPSS 1001 placed over a non-woven filter fabric Terrafix 270R or approved equivalent. **Concrete rip-rap will not be permitted.**

The minimum thickness requirement of the erosion stone layer is 300 mm with no portion of the filter fabric to be exposed.

10.0 TOPSOIL AND FINE GRADING

10.1 General

City of Windsor Standard Specifications S-34 shall apply and govern except as amended or extended herein.

10.2 Scope of Work

Scope of work to include the supply, installation and fine grading of minimum 100 mm thick topsoil for restoration, including but not limited to the preparation for the placement of seed/sod and boulevard restoration.

The Contractor shall note that Ontario Regulation 406/19 is in effect and any soil imported to the project area shall meet the Table 3.1 Full Depth Excess Soil Quality Standards (ESQS) in a Non-Potable Ground Water Condition and Residential/Parkland/Institutional Property Use.

11.0 HYDRAULIC SEED AND MULCH

11.1 General

City of Windsor Standard Specifications S-15 and OPSS Form 572 shall apply and govern except as amended or extended herein.

11.2 Scope of Work

Seed bags shall bear the label of the supplier indicating the content by species, grade and mass.

Fertilizer shall be free from lumps and in bags bearing the label of the manufacturer, indicating mass and analysis.

Seeding and mulching shall be a one step process in which the seed, fertilizer and hydraulic mulch are applied simultaneously in a water slurry via the hydraulic seeder/mulcher. The materials shall be added to the supply tank while it is being loaded with water. The materials shall be thoroughly mixed into a homogeneous water slurry and shall be distributed uniformly over the prepared surface. The materials shall be measured by mass or by a mass-calibrated volume measurement, acceptable to the Engineer.

The hydraulic seeder/mulcher shall be equipped with mechanical agitation equipment capable of mixing the materials into a homogenous state until applied. The discharge pumps and gun nozzles shall be capable of applying the material uniformly.

The Contractor shall monitor the placed seed and water the seeded areas as required to promote proper germination and growth. Any weed growth evident prior to establishment of grass shall be removed at the Contractor's expense. The Contractor will be required to submit his seed mixture design for approval prior to seeding.

Watering shall include any additional traffic controls required during the regular waterings.

Standard Seed Mix

The following seed mix shall be used in boulevard areas:

- 40% Turf Type Perennial Rye
- 40% Fescue
- 20% Blue Grass

Nurse Crop:

- Annual Rye Grass

Low Maintenance Seed Mix **(Provisional)**

The following seed mix shall be used on the embankments on the north side of Provincial Road:

Grasses, Sedges and Rushes:

- Big Bluestem (Andropogon Gerardi) 25%

- Canada Wild Rye (Elymus Canadensis) 25%
- Switch Grass (Pancicum Virgatum) 25%
- Fox Sedge (Carex Vulpinoidea) 1-5%
- Bebb's Sedge (Carex bebbii) 1-5%
- Soft Rush (Juncus Effusus) 1-5%

Forbs:

- Nodding Bur Marigold (Bidens Cemua) 1-5%
- Showy Tick Trefoil (Desmodium Canadense) 1-5%
- Common Boneset (Eupatorium Perfoliatum) 1-5%
- Gray-Headed Coneflower (Ratibida Pinnata) 1-5%
- Blue Vervain (Verbena Hastata) 1-5%
- Missouri Ironweed (Vemonia Missurica) 1-5%

Nurse Crop:

- Annual Oats (Avena Sativa), or
- White Millet (Panicum Milliaceum)

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

12.0 TEMPORARY SILT CONTROL

The Contractor shall implement temporary erosion and sediment control measures through the course of the drainage works in accordance with OPSS.MUNI 805. An erosion and sediment control plan shall be submitted to the Drainage Superintendent or Engineer for review and approval prior to commencing the works. The measures shall be maintained in working order throughout the duration of the contract and removed upon completion of the works.

12.1 Rock Check Dam

Rock check dam shall be installed downstream of work prior to commencing construction. The location and exact dimensions of the rock check dam will be confirmed with the Drainage Superintendent prior to their installation. Installation shall be in accordance with OPSD 219.211 with the modifications to size as discussed with the Drainage Superintendent.

The rock check dam will not be removed until as directed by the Drainage Superintendent.

12.2 Refuge Stilling Pool

The Contractor shall construct a refuge stilling pool in the bottom of the open drain in accordance with OPSD 219.220 and immediately upstream of the rock check dam. The contractor shall excavate the pool in the drain bottom to enhance fish habitat. The pool shall have a length of 4 metres, a bottom width of 1.0 metres with 1:1 side slopes and a depth below design grade of 300 mm. A stone rip-rap lining, countersunk and 200 mm thick with filter fabric underlay, shall be placed in the bottom. The pool shall be centred on the finished bottom width of the drain as specified herein. Material excavated from the pool shall be disposed of in the same manner as all other material excavated from the channel bottom.

13.0 MAINTENANCE OF FLOWS

The Contractor shall, at his own cost and expense, for all stages of construction provide for and maintain the flow of all sewers, drains, ditches and water courses which may be encountered during the progress of the work including connections of existing sewer pipe and leads as well as installation of temporary sewers and catchbasins to maintain positive drainage in the boulevards. The Contractor will be required to reconnect all existing sewers at the end of each work day.

Should the Contractor wish to divert, block or otherwise impede or alter flows in any existing sewers, drains, ditches or water courses, he shall be required to submit details and sketches of the proposed methods, to the Engineer for approval, prior to proceeding. If the Contractor wishes to divert flows by way of a pumped by-pass system, stamped engineering drawings are required. This submission shall include any emergency measures which may be required in the event of heavy rainfalls, sewer surcharging, flooding, etc.

The Contractor shall note that by-pass rates for the Gouin Drain and Lachance Drain are as follows:

Lachance Drain

- 2-year 4 hour event: 1.50 m^3/s
- 25-year 4 hour event: 2.81 m^3/s

The Contractor will be required to provide a comprehensive by-pass plan to control flows at both drain locations during the installation of the new drain enclosures. The by-pass plan must be stamped by a professional Engineer.

14.0 NATURAL ENVIRONMENT MITIGATION MEASURES

The Contractor shall be responsible for completing drainage works in compliance with the following natural environment mitigation measures.

14.1 Fish Salvage

The Contractor is responsible for completing fish salvages and relocations to a suitable body of water necessary to complete the works. Fish salvage and relocations shall occur prior to the commencement of affected works under a License to Collect Fish for Scientific Purposes obtained from the Ministry of Natural Resources.

14.2 General Mitigation Measure During Construction

To avoid and mitigate the potential for prohibited effects to fish and fish habitat, the Contractor shall implement the measures listed below:

- Plan in-water works, undertakings and activities to respect timing windows, or as stipulated by the Ministry of Natural Resources and Forestry (MNRF), to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed and migrate.
- Capture, relocate and monitor for fish trapped within isolated, enclosed, or dewatered areas.
- Dewater gradually to reduce the potential for stranding fish.
- Screen intake pipes to prevent entrainment or impingement of fish.
- Use the code of practice for water intake screens.
- Apply the interim code of practice for temporary cofferdams and diversion channels.

- Limit impacts on riparian vegetation to those approved for the work, undertaking or activity.
- Limit access to banks or areas adjacent to waterbodies.
- Re-vegetate disturbed areas.
- Replace/restore any other disturbed habitat features and remediate any areas impacted by the work, undertaking or activity.
- Conduct in-water undertakings and activities during periods of low flow.
- Limit the duration of in-water works, undertakings and activities so that it does not diminish the ability of fish to carry out one or more of their life processes (spawning, rearing, feeding, migrating).
- Develop and implement a Sediment Control Plan to minimize sedimentation of the waterbody during all phases of the work, undertaking or activity.
- Conduct all in-water works, undertakings or activities in isolation of open or flowing water to reduce the introduction of sediment into the watercourse.
- Schedule work to avoid wet, windy and rainy periods (and heed weather advisories).
- Inspect and maintain regularly the erosion and sediment control measures and structures during all phases of the project.
- Operate machinery on land, or from barges or on ice.
- Monitor the watercourse to observe signs of sedimentation during all phases of the work, undertaking or activity and take corrective action.
- Dispose and stabilize all dredged material above the high-water mark of nearby waterbodies to prevent entry in the water.
- Maintain an appropriate depth and flow (i.e., base flow and seasonal flow of water) for the protection of fish and fish habitat.
- Do not deposit any deleterious substances in the water course.

14.3 Spill Response Plan

The Contractor shall develop and implement a response plan to avoid a spill of deleterious substances. At a minimum, the plan shall include the following:

- Keep an emergency spill kit on site during the work, undertaking or activity.
- Report any spills of sewage, oil, fuel or other deleterious material, whether near or directly into a water body.
- Ensure clean-up measures are suitably applied so as not to result in further alteration of the bed and/or banks of the watercourse.
- Maintain all machinery on site in a clean condition and free of fluid leaks.
- 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.
- Dispose all construction, demolition or commercial logging materials waste above the high water mark of nearby waterbodies to prevent re-entry.

15.0 FARM ACCESS BRIDGE WORK (BRIDGE No. 6)

15.1 Location of Bridge Replacement

The bridge replacement shall be located and installed as shown on the drawings.

15.2 Access to the Work

The Contractor shall access and construct the bridge entirely from Banwell Road and the 9 metre wide working corridor on the south side of the drain, including transportation of all materials and equipment (access from Intersection Road **not** permitted). Through traffic must be maintained at all times, along municipal roads unless otherwise approved by the appropriate Road Authority, and in accordance with the General Specifications. All road areas and grass lawn areas disturbed shall be restored at the Contractor's expense.

15.3 Materials for New Farm Access Bridge

Materials shall be as follows:

Culvert Pipe	*New 19.0 m long, 1000 mm diameter aluminized Type II corrugated steel pipe (CSP) wall thickness of 2.0 mm and 68 mm x 13 mm corrugations with rerolled ends. New culvert shall be joined with annular aluminized corrugated wide bolt and angle couplers (minimum of 8 corrugations overlap and 2.0 mm wall thickness) and no single pipe less than 6.0 m in length. All pipes connected with couplers shall abut to each other with no more than a 25 mm gap between pipes prior to installation of the coupler and wrapped with filter fabric.*
Pipe Bedding Below Pipe	*20-25 mm clear stone conforming to OPSS Division 10.*
Backfill from Pipe Invert up to Pipe Springline	*Granular 'B' conforming to OPSS Division 10. Alternatively, Granular 'A' conforming to OPSS Division 10*
Backfill from Pipe Springline up to Underside of Driveway Surface	*Dry native material free of topsoil, organic matter, broken concrete, steel, wood and deleterious substances. Alternatively, Granular 'A' or 'B' conforming to OPSS Division 10.*
Driveway Surface	*Granular 'A' made from crushed limestone conforming to OPSS Division 10. Minimum 200 mm thickness.*
Buffer Strips	*Dry native material free of topsoil, organic matter, broken concrete, steel, wood and deleterious substances.*
Erosion Stone	*All stone to be used for erosion protection shall be 125 - 250 mm clear quarried rock or OPSS.Muni 1004, minimum 300 mm thickness.*
Filter Fabric	*"Non-Woven" geotextile filter fabric with a minimum strength equal to or greater than Terrafix 270R, Amoco 4546, Mirafi 140NC or approved equivalent.*

15.4 Lateral Tile Drains

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

GENERAL SPECIFICATIONS

1.0 AGREEMENT AND GENERAL CONDITIONS

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

Where the word "Drainage Superintendent" is used in this specification, it shall mean the person or persons appointed by the Council of the Municipality having jurisdiction to superintend the work.

Tenders will be received and contracts awarded only in the form of a lump sum contract for the completion of the whole work or of specified sections thereof. The Tenderer agrees to enter into a formal contract with the Municipality upon acceptance of the tender. The General Conditions of the contract and Form of Agreement shall be those of the Stipulated Price Contract CCDC2-Engineers, 1994 or the most recent revision of this document.

2.0 EXAMINATION OF SITE, PLANS AND SPECIFICATIONS

Each tenderer must visit the site and review the plans and specifications before submitting his/her tender and must satisfy himself/herself as to the extent of the work and local conditions to be met during the construction. Claims made at any time after submission of his/her tender that there was any misunderstanding of the terms and conditions of the contract relating to site conditions, will not be allowed. The Contractor will be at liberty, before bidding to examine any data in the possession of the Municipality or of the Engineer.

The quantities shown or indicated on the drawings or in the report are estimates only and are for the sole purpose of indicating to the tenderers the general magnitude of the work. The tenderer is responsible for checking the quantities for accuracy prior to submitting his/her tender.

3.0 MAINTENANCE PERIOD

The successful Tenderer shall guarantee the work for a period of one (1) year from the date of acceptance thereof from deficiencies that, in the opinion of the Engineer, were caused by faulty workmanship or materials. The successful Tenderer shall, at his/her own expense, make good and repair deficiencies and every part thereof, all to the satisfaction of the Engineer. Should the successful Tenderer for any cause, fail to do so, then the Municipality may do so and employ such other person or persons as the Engineer may deem proper to make such repairs or do such work, and the whole costs, charges and expense so incurred may be deducted from any amount due to the Tenderer or may be collected otherwise by the Municipality from the Tenderer.

4.0 GENERAL CO-ORDINATION

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

5.0 RESPONSIBILITY FOR DAMAGES TO UTILITIES

The Contractor shall note that overhead and underground utilities such as hydro, gas, telephone and water are not necessarily shown on the drawings. It is the Contractor's responsibility to contact utility companies for information regarding utilities, to exercise the necessary care in construction operations and to take other precautions to safeguard the utilities from damage. All work on or adjacent to any utility, pipeline, railway, etc., is to be carried out in accordance with the requirements of the utility, pipeline, railway, or other, as the case may be, and its specifications for such work are to be followed as if they were part of this specification. The Contractor will be liable for any damage to utilities.

6.0 CONTRACTOR'S LIABILITY

The Contractor, his/her agents and all workmen or persons under his/her control including sub-contractors, shall use due care that no person or property is injured and that no rights are infringed in the prosecution of the work. The Contractor shall be solely responsible for all damages, by whomsoever claimable, in respect to any injury to persons or property of whatever description and in respect of any infringement of any right, privilege or easement whatever, occasioned in the carrying on of the work, or by any neglect on the Contractor's part.

The Contractor shall indemnify and hold harmless the Municipality and the Engineer, their agents and employees from and against claims, demands, losses, costs, damages, actions, suits, or proceedings arising out of or attributable to the Contractor's performance of the contract.

7.0 PROPERTY BARS AND SURVEY MONUMENTS

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

8.0 MAINTENANCE OF FLOW

The Contractor shall, at his/her own cost and expense, permanently provide for and maintain the flow of all drains, ditches and water courses that may be encountered during the progress of the work.

9.0 ONTARIO PROVINCIAL STANDARDS

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

10.0 APPROVALS, PERMITS AND NOTICES

The construction of the works and all operations connected therewith are subject to the approval, inspection, by-laws and regulations of all Municipal, Provincial, Federal and other authorities having jurisdiction in respect to any matters embraced in this Contract.

The Contractor shall obtain all approvals and permits and notify the affected authorities when carrying out work in the vicinity of any public utility, power, underground cables, railways, etc.

11.0 SUBLETTING

The Contractor shall keep the work under his/her personal control, and shall not assign, transfer, or sublet any portion without first obtaining the written consent of the Municipality.

12.0 TIME OF COMPLETION

The Contractor shall complete all work on or before the date fixed at the time of tendering. The Contractor will be held liable for any damages or expenses occasioned by his/her failure to complete the work on time and for any expenses of inspection, superintending, re-tendering or re-surveying, due to their neglect or failure to carry out the work in a timely manner.

13.0 TRAFFIC CONTROL

The Contractor will be required to control vehicular and pedestrian traffic along roads at all times and shall, at his/her own expense, provide for placing and maintaining such barricades, signs, flags, lights and flag persons as may be required to ensure public safety. The Contractor will be solely responsible for controlling traffic and shall appoint a representative to maintain the signs and warning lights at night, on weekends and holidays and at all other times that work is not in progress. All traffic control during construction shall be strictly in accordance with the **Occupational Health and Safety Act** and the current version of the **Ontario Traffic Manuals**. Access to the electronic version of the **Ontario Traffic Manual** is available online through the MTO website, free of charge to all users. To access the electronic standards on the Web go to http://www.mto.gov.on.ca/english/transrd/, click on "Library Catalogue," under the "Title," enter "Ontario Traffic Manual" as the search. Open the applicable "Manual(s)" by choosing the "Access Key," once open look for the "Attachment," click the pdf file. Users require Adobe Acrobat to view all pdf files.

Contractors are reminded of the requirements of the Occupational Health and Safety Act pertaining to Traffic Protection Plans for workers and Traffic Control Plan for Public Safety.

14.0 SITE CLEANUP AND RESTORATION

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

15.0 UTILITY RELOCATION WORKS

In accordance with Section 26 of the Drainage Act, if utilities are encountered during the installation of the drainage works that conflict with the placement of the new culvert, the operating utility company shall relocate the utility at their own costs. The Contractor however will be responsible to co-ordinate these required relocations (if any) and their co-ordination work shall be considered incidental to the drainage works.

16.0 FINAL INSPECTION

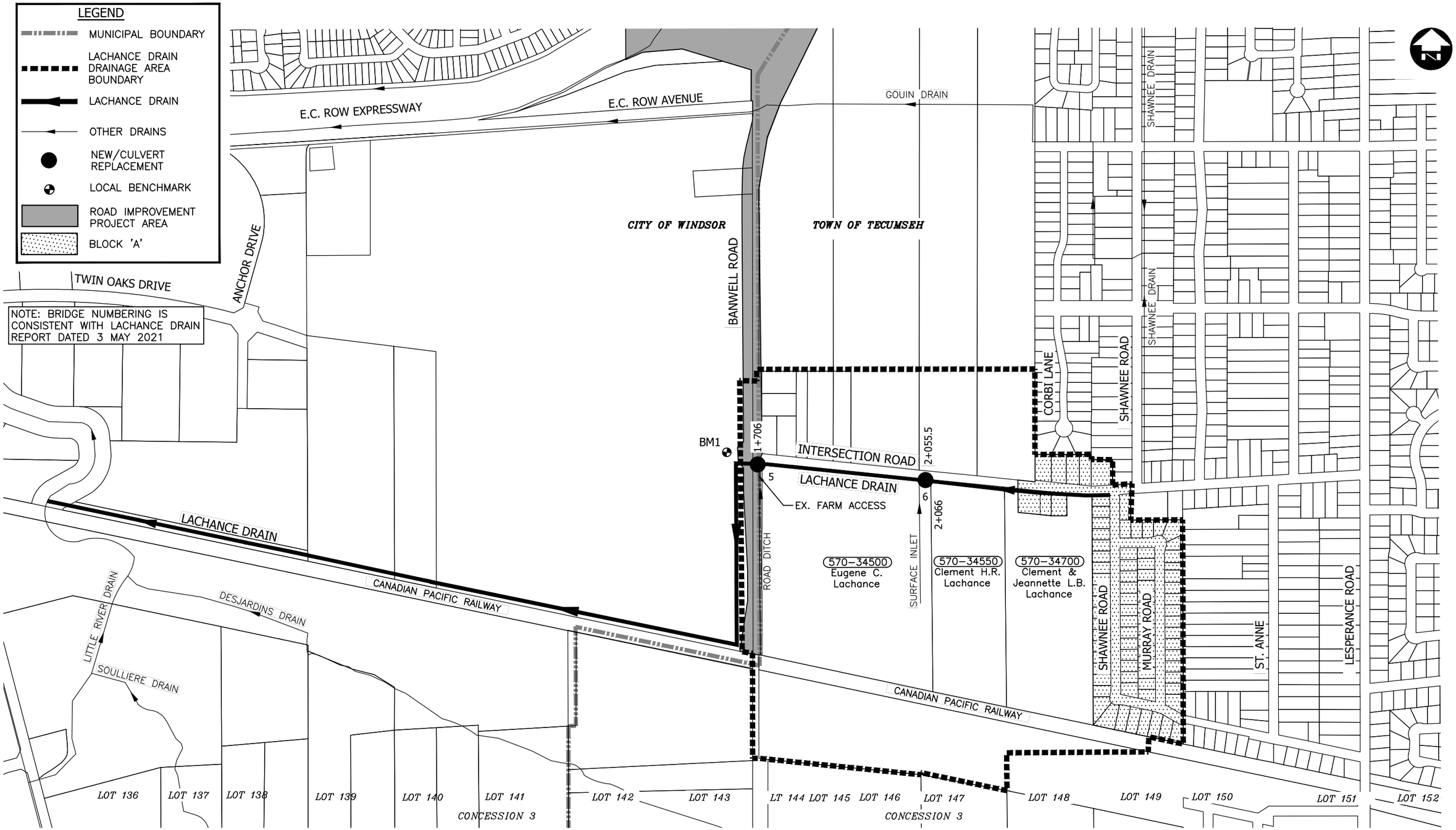
All work shall be carried out to the satisfaction of the Drainage Superintendent for the Municipality, in compliance with the specifications, drawings and the Drainage Act. Upon completion of the project, the work will be inspected by the Engineer and the Drainage Superintendent.

Any deficiencies noted during the final inspection shall be immediately rectified by the Contractor.

Final inspection will be made by the Engineer within 20 days after the Drainage Superintendent has received notice in writing from the Contractor that the work is completed, or as soon thereafter as weather conditions permit.

17.0 FISHERIES CONCERNS

Standard practices to be followed to minimize disruption to fish habitat include embedment of the culvert a minimum 10% below grade, constructing the work 'in the dry' and cutting only trees necessary to do the work (no clear-cutting). No in-water work is to occur during the timing window unless otherwise approved by the appropriate authorities.



WATERSHED PLAN

SCALE=1:7,500

'SCHEDULE G'

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

APPROVED AS TO FORM, IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF DILLON CONSULTING LIMITED AS TO DESIGN AND SPECIFICATION.

DAVID SIMPSON, P.ENG.
COMMISSIONER OF INFRASTRUCTURE SERVICES
THE CORPORATION OF THE CITY OF WINDSOR

LICENCED PROFESSIONAL ENGINEER
O. E. T. MOIR
100505851
2025/03/24
PROVINCE OF ONTARIO

THE CITY OF WINDSOR
ONTARIO, CANADA

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
2	FINAL REPORT SUBMISSION	MAR. 24/25	OEM
1	CLIENT REVIEW	MAR. 6/25	OEM

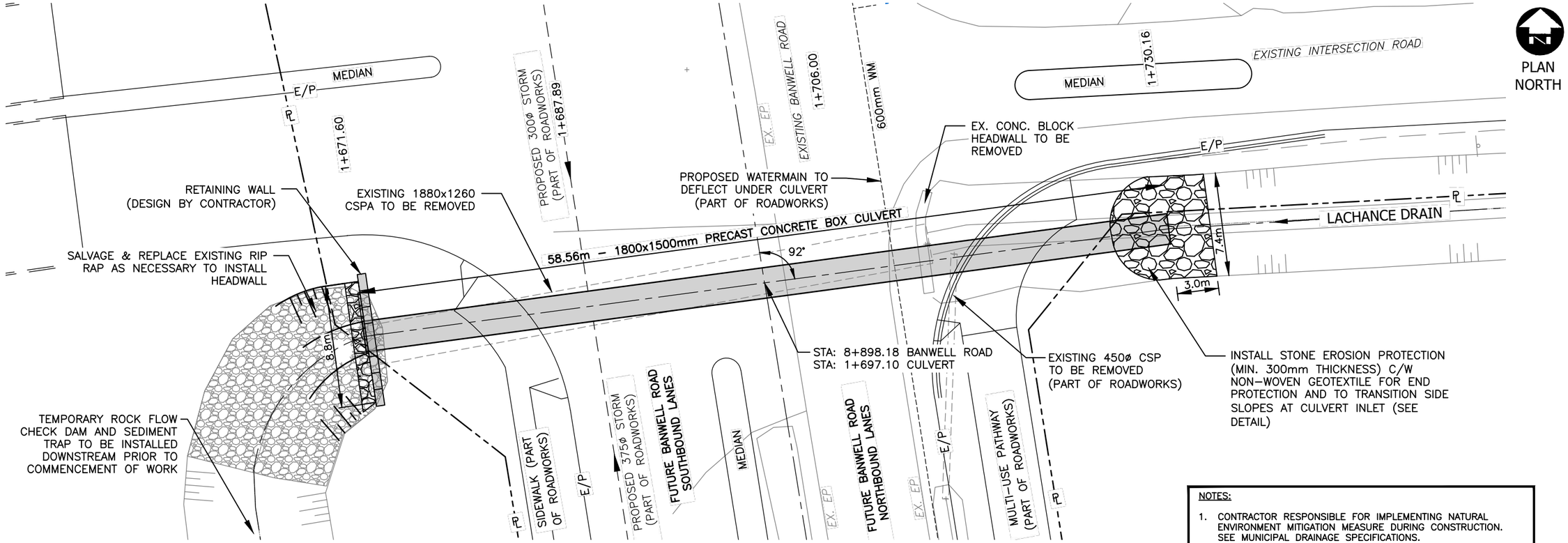
DESIGN	SJC
REVIEWED BY	CDP
DRAWN	SJC
CHECKED BY	OEM
DATE	March 24, 2025
SCALE	AS SHOWN

BANWELL ROAD / E.C. ROW INTERCHANGE AND CORRIDOR IMPROVEMENTS

LACHANCE DRAIN WATERSHED PLAN

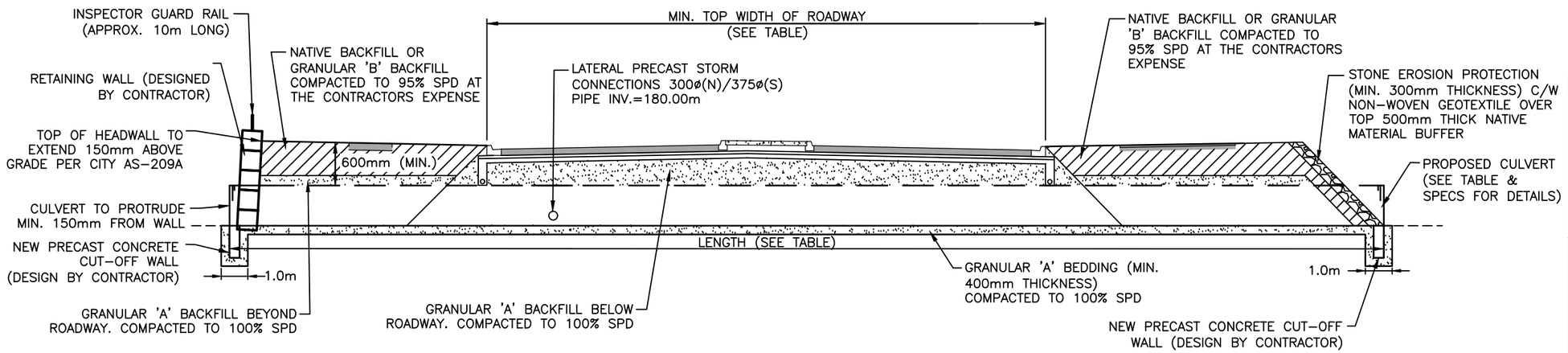
PROJECT NO. 23-6875

SHEET NO. MD-7L



PLAN

SCALE 22x34– 1:150
SCALE 11x17– 1:300



LONGITUDINAL SECTION

N.T.S.

NOTES:

1. CONTRACTOR RESPONSIBLE FOR IMPLEMENTING NATURAL ENVIRONMENT MITIGATION MEASURE DURING CONSTRUCTION. SEE MUNICIPAL DRAINAGE SPECIFICATIONS.
2. ALL DISTURBED AREAS TO BE RESTORED WITH TOPSOIL (MIN. 100mm THICKNESS), FINE GRADED AND SEEDED.

SITE BENCHMARK

BM

BM1 – PK NAIL IN TOP OF CONCRETE MANHOLE ON WEST SIDE OF BANWELL ROAD AT INTERSECTION ROAD, ALONG THE PROJECTION OF INTERSECTION ROAD. PK NAIL IS 0.4m WEST OF THE EDGE AND 0.7m SOUTH OF NORTH EDGE.

ELEVATION=182.775m

NOTE: CONTRACTOR TO VERIFY BENCHMARKS PRIOR TO CONSTRUCTION.

ADDITIONAL BENCHMARKS TO BE SET DURING CONSTRUCTION.

CONTRACTOR IS RESPONSIBLE FOR ARRANGING UTILITY LOCATES PRIOR TO CONSTRUCTION.

'SCHEDULE G'

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DAVID SIMPSON, P.ENG.
COMMISSIONER OF INFRASTRUCTURE SERVICES
THE CORPORATION OF THE CITY OF WINDSOR

LICENSED PROFESSIONAL ENGINEER
O. E. T. MOIR
100505851
2025/03/24
PROVINCE OF ONTARIO

THE CITY OF WINDSOR
ONTARIO, CANADA

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
6	FINAL REPORT SUBMISSION	MAR. 24/25	OEM
5	ISSUED FOR TENDER	FEB. 14/25	OEM
4	100% CLIENT REVIEW	JAN. 30/25	OEM
3	90% CLIENT REVIEW	DEC. 5/24	OEM
2	60% CLIENT REVIEW	AUG. 29/24	OEM
1	30% CLIENT REVIEW	APR. 22/24	OEM

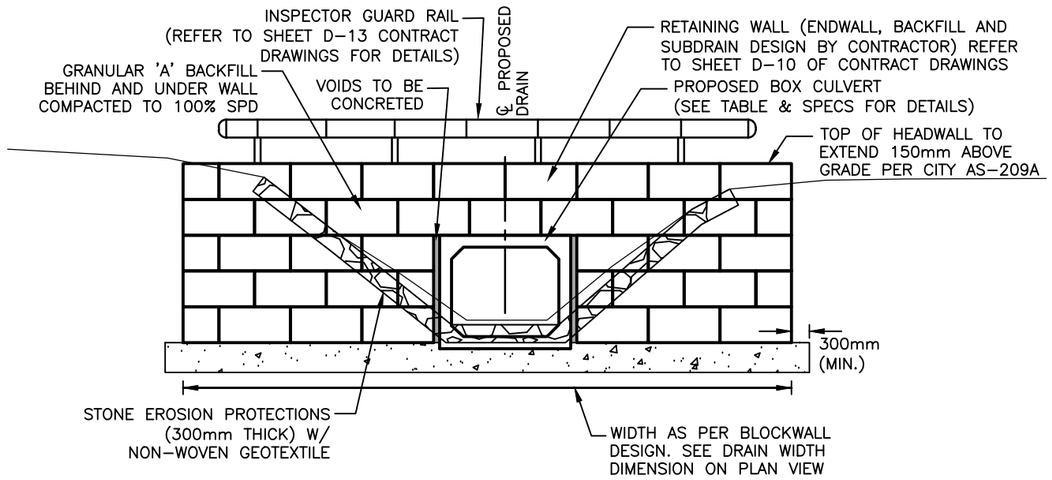
DESIGN: OEM | REVIEWED BY: CDP
DRAWN: WLB | CHECKED BY: TRO
DATE: March 24, 2025
SCALE: AS SHOWN

BANWELL ROAD / E.C. ROW INTERCHANGE AND CORRIDOR IMPROVEMENTS

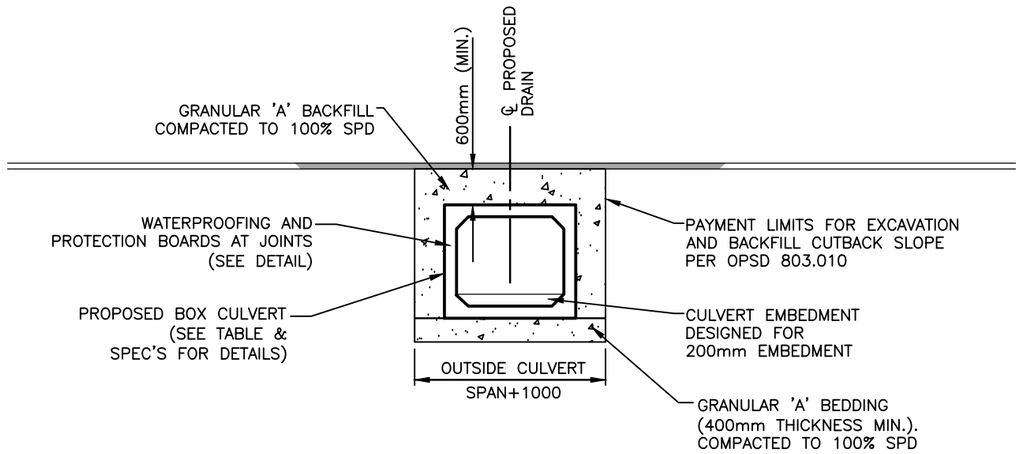
LACHANCE DRAIN
PLAN & SECTION DETAILS

PROJECT NO. 23-6875

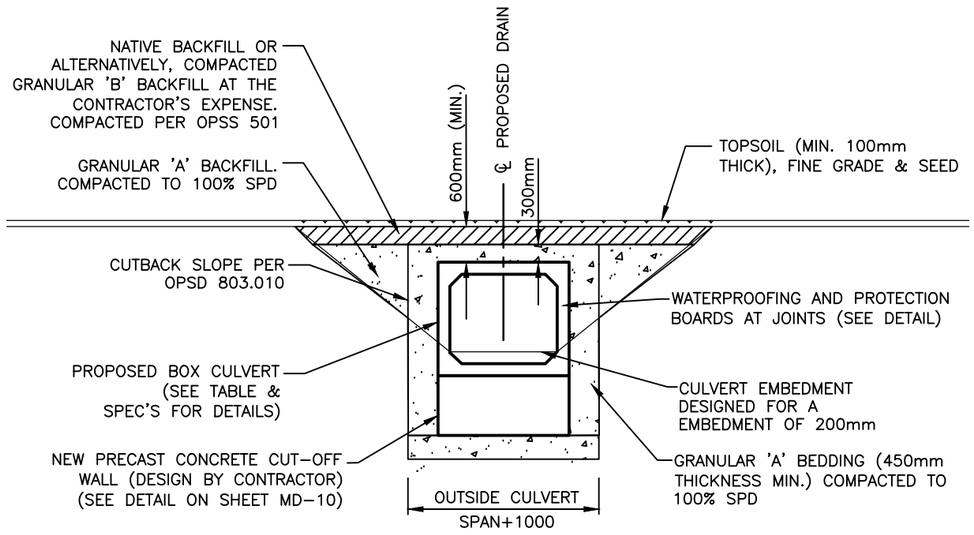
SHEET NO. MD-8



SECTION VIEW (BLOCK ENDWALL)
N.T.S.



SECTION VIEW (ROAD PORTION)
N.T.S.



SECTION VIEW (BEYOND ROAD PORTION)
N.T.S.

NOTES:

1. STONE EROSION PROTECTION SHALL BE 150mm – 300mm QUARRIED ROCK OR OPSS 1001.
2. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS OF THE PROPOSED WORK AND ALL DETAILS ON SITE AND REPORT ANY DISCREPANCIES TO THE CONTRACT ADMINISTRATOR.
3. BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH SIDES OF THE CULVERT KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.
4. NO BEDDING OR CONCRETE SHALL BE PLACED UNTIL THE EXCAVATION AND THE CHARACTER OF THE FOUNDATION HAVE BEEN APPROVED BY A FOUNDATION ENGINEER. CARE SHALL BE TAKEN NOT TO DISTURB THE FOUNDING SOILS.
5. CONTRACTOR TO PROTECT ALL EXISTING UTILITIES WITH A METHOD APPROVED BY THE GOVERNING UTILITY.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING FLOW THROUGH THE WORK AREA.
7. DEWATERING WILL BE REQUIRED TO CONSTRUCT THE CULVERT AND RETAINING WALLS. THE DESIGN OF THE DEWATERING SYSTEM SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE DEWATERING SYSTEM SHALL LOWER THE GROUND WATER TABLE A MINIMUM 0.5m BELOW THE FINAL SUBGRADE LEVEL.
8. PRECAST CONCRETE BOX CULVERT CUT-OFF WALLS & BLOCK ENDWALLS TO BE DESIGNED & SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE PROVINCE OF ONTARIO.
9. CONTRACTOR SHALL SUBMIT P. ENG STAMPED SHOP DRAWINGS TO PROJECT ENGINEER PRIOR TO FABRICATION OF CULVERT.
10. CONTRACTOR TO PREPARE & SUBMIT PLAN FOR MAINTENANCE OF FLOWS AND AN EROSION SEDIMENT CONTROL PLAN TO PROJECT ENGINEER FOR REVIEW & APPROVAL PRIOR TO COMMENCEMENT OF THE WORKS.

TABLE – ROAD CULVERT DESIGN INFORMATION

DESCRIPTION	ROAD CULVERT
PIPE INVERT ELEV. U/S SIDE(m)	179.51
PIPE INVERT ELEV. D/S SIDE(m)	179.47
DRAIN BOTTOM (m) (DESIGN) (AT CENTRELINE OF CULVERT)	179.70
MIN. TOP WIDTH OF ROADWAY (m)	32.2
MIN. CULVERT GRADE (%)	0.06
CULVERT TYPE	BOX
CULVERT MATERIAL	CONCRETE
CULVERT LENGTH (m)	58.56
CULVERT SIZE (mm)	1800x1500
CULVERT ENDWALL TYPE	CONC. BLOCK (D/S) SLOPING STONE (U/S)
TOP ELEV. OF CONCRETE BLOCK END WALL	182.67 (D/S)

'SCHEDULE G'

APPROVED AS TO FORM, IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF DILLON CONSULTING LIMITED AS TO DESIGN AND SPECIFICATION.

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100505851
2025/03/24
PROVINCE OF ONTARIO

THE CITY OF WINDSOR
ONTARIO, CANADA

DILLON CONSULTING

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6	FINAL REPORT SUBMISSION	MAR. 24/25	OEM
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3	90% CLIENT REVIEW	DEC. 5/24	OEM
2	60% CLIENT REVIEW	AUG. 29/24	OEM
1	30% CLIENT REVIEW	APR. 22/24	OEM

DESIGN: OEM | REVIEWED BY: CDP
DRAWN: WLB | CHECKED BY: TRO
DATE: March 24, 2025
SCALE: AS SHOWN

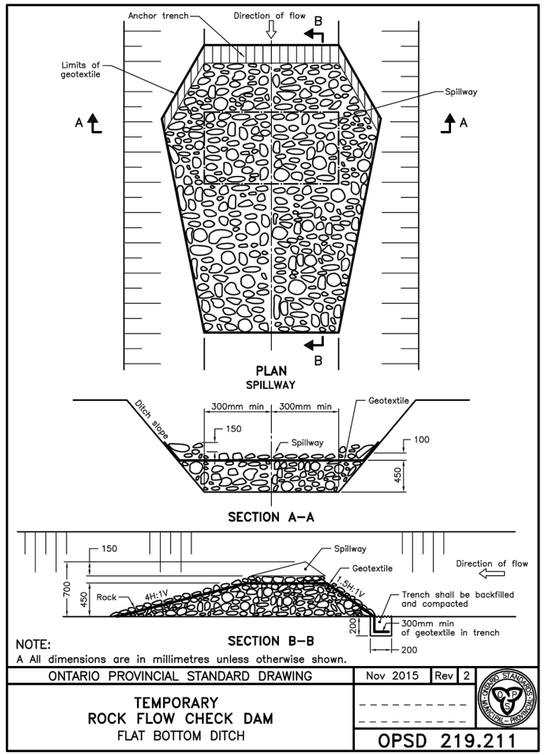
BANWELL ROAD / E.C. ROW INTERCHANGE AND CORRIDOR IMPROVEMENTS

LACHANCE DRAIN BRIDGE DETAILS

PROJECT NO. 23-6875

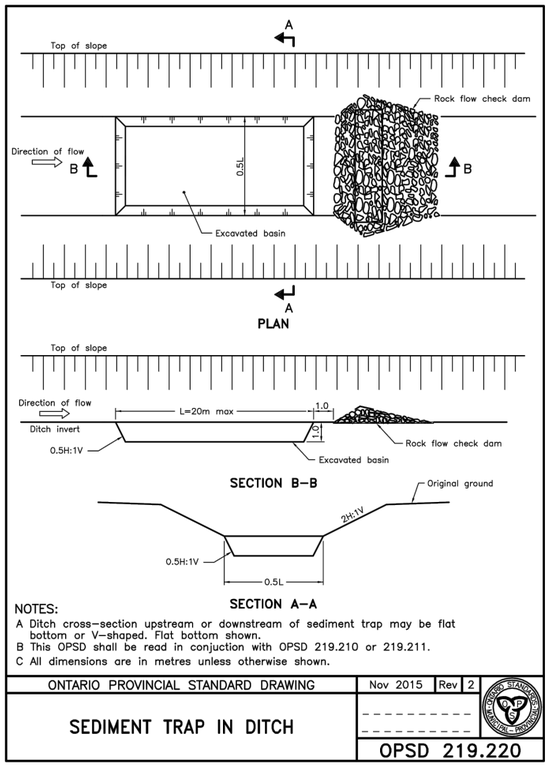
SHEET NO. MD-9

FILENAME: C:\PW WORKING DIRECTORY\PROJECTS 2022\DILLON_330DAUMSTOCK\236875-03-URH-CON-LACHANCEDRAIN PLOTTED BY: MOIR, OLIVER
PLOT DATE: 2025-03-21 @ 12:34:12 PM PLOT SCALE: 1:25.4 PLOT STYLE: DILLON-STANDARD.CTB
WINDSOR



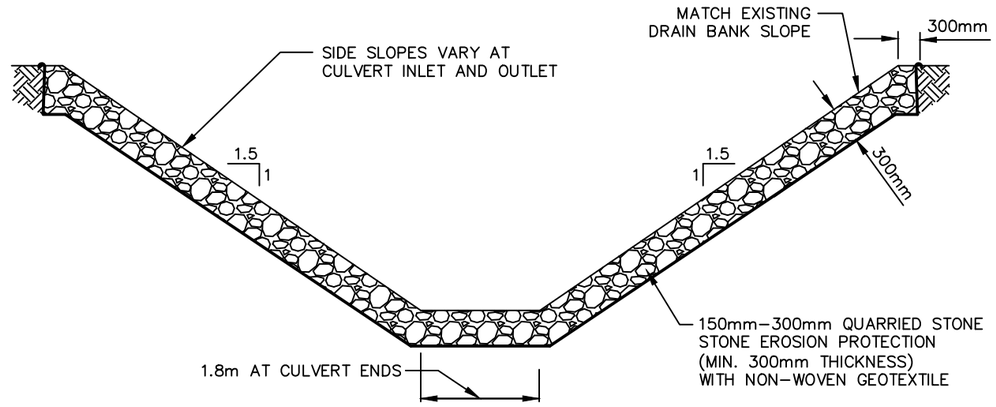
NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
TEMPORARY ROCK FLOW CHECK DAM FLAT BOTTOM DITCH		OPSD 219.211



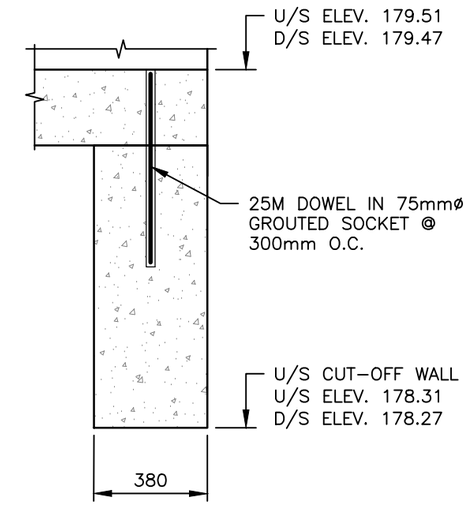
NOTES:
A Ditch cross–section upstream or downstream of sediment trap may be flat bottom or V–shaped. Flat bottom shown.
B This OPSD shall be read in conjuction with OPSD 219.210 or 219.211.
C All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
SEDIMENT TRAP IN DITCH		OPSD 219.220



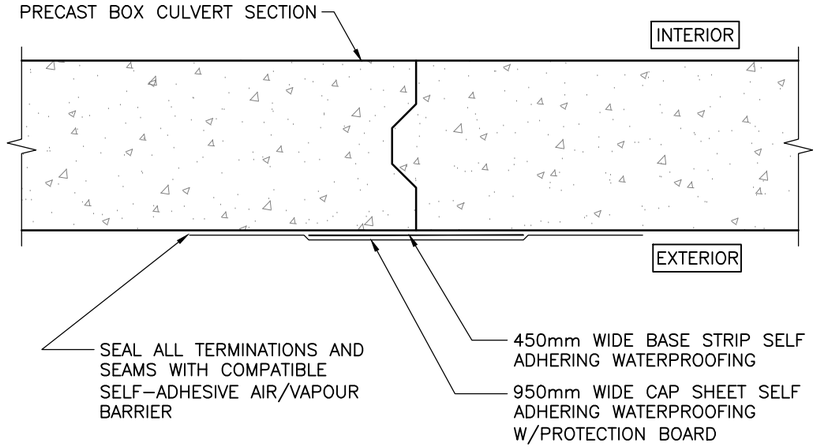
STONE EROSION PROTECTION AT INLET AND OUTLET (SECTION VIEW)

N.T.S.



CUT-OFF WALL DETAIL

NOT TO SCALE



NOTE:
- DO NOT WATERPROOF EXPOSED JOINTS.

PRECAST JOINT WATERPROOFING DETAIL

N.T.S.

'SCHEDULE G'

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100505851
2025/03/24
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4	100% CLIENT REVIEW	JAN. 30/25	OEM
3	90% CLIENT REVIEW	DEC. 5/24	OEM
2	60% CLIENT REVIEW	AUG. 29/24	OEM
1	30% CLIENT REVIEW	APR. 22/24	OEM

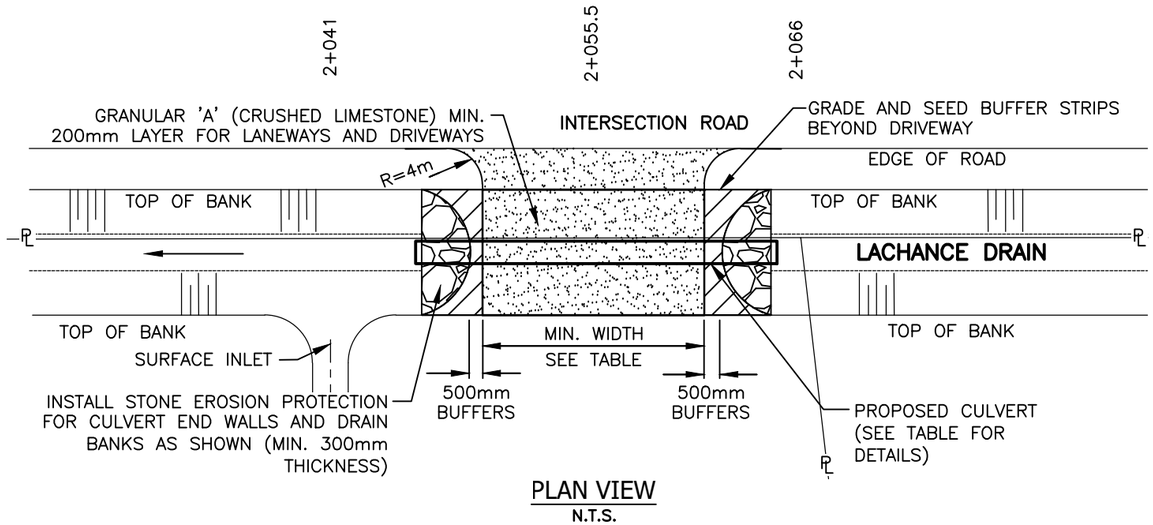
DESIGN: OEM | REVIEWED BY: CDP
DRAWN: WLB | CHECKED BY: TRO
DATE: March 24, 2025
SCALE: AS SHOWN

BANWELL ROAD / E.C. ROW INTERCHANGE AND CORRIDOR IMPROVEMENTS

LACHANCE DRAIN
MISCELLANEOUS DETAILS

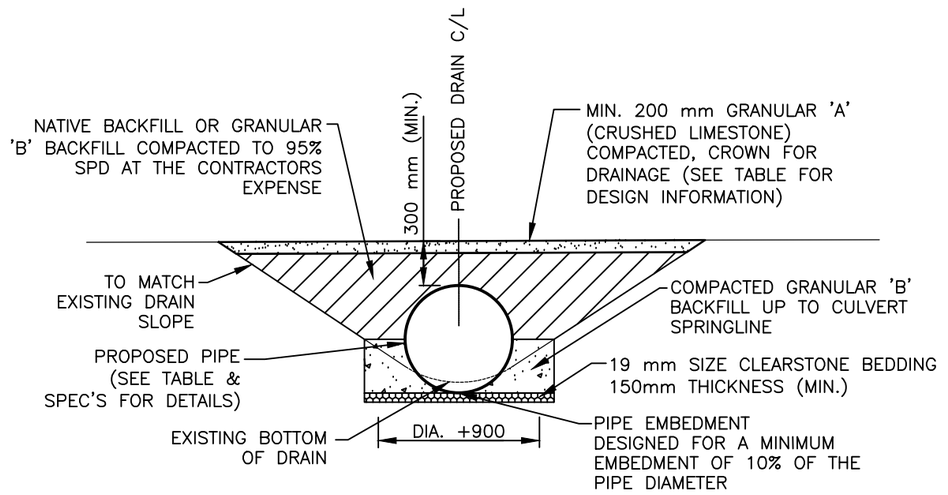
PROJECT NO. 23-6875

SHEET NO. MD-10

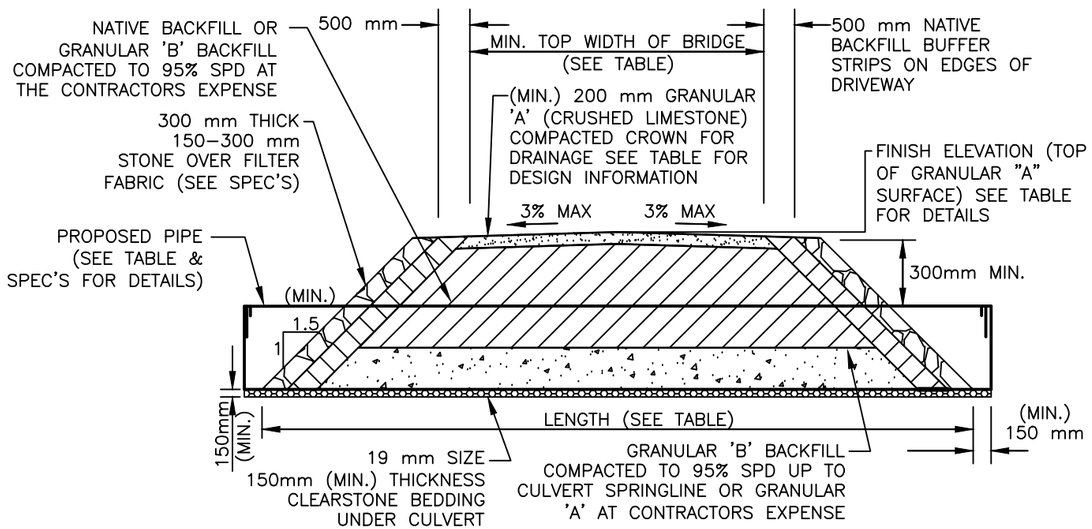


PLAN VIEW
N.T.S.

NOTE:
FARM TILES ENCOUNTERED IN CONFLICT WITH THE CULVERT SHALL BE REROUTED DOWNSTREAM OF THE CULVERT. NO CONNECTIONS THROUGH THE CULVERT ARE PERMITTED.



SECTION VIEW
N.T.S.



LONGITUDINAL SECTION
N.T.S.

TABLE – FARM CULVERT DESIGN INFORMATION	
DESCRIPTION	BRIDGE DETAILS
PIPE INVERT ELEV. U/S SIDE(m)	179.81
PIPE INVERT ELEV. D/S SIDE(m)	179.79
DRAIN BOTTOM (m) (DESIGN) (AT CENTRELINE OF CULVERT)	179.90
TOP DRIVEWAY SURFACE ELEV. (m)	182.38
MIN. TOP WIDTH OF DRIVEWAY (m)	9.1
MIN. CULVERT GRADE (%)	0.10
CULVERT TYPE	CIRCULAR
CULVERT MATERIAL	ALUMINIZED CSP
CULVERT LENGTH (m)	19.00
CULVERT SIZE (mm)	1000
CULVERT CORRUGATIONS (mm)	68x13
CULVERT ENDWALL TYPE	SLOPING STONE

'SCHEDULE G'

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2025/03/24
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No.	ISSUED FOR	DATE	BY
2	FINAL REPORT SUBMISSION	MAR. 24/25	OEM
1	CLIENT REVIEW	MAR. 6/25	OEM

DESIGN SJC | REVIEWED BY CDP
DRAWN SJC | CHECKED BY OEM
DATE March 24, 2025
SCALE AS SHOWN

BANWELL ROAD / E.C. ROW INTERCHANGE AND CORRIDOR IMPROVEMENTS

LACHANCE DRAIN
FARM ACCESS BRIDGE DETAILS

PROJECT NO. 23-6875

SHEET NO. MD-11