

PHILION MUNICIPAL DRAIN INCL. BRANCH 1, 2, 3

**S. 78(1) ENGINEER'S REPORT
THE CITY OF CLARENCE-ROCKLAND**

PREPARED BY

SHADE GROUP INC
4625 MARCH ROAD
ALMONTE, ONTARIO
K0A 1A0

PREPARED FOR

THE CITY OF CLARENCE-ROCKLAND
1560 LAURIER STREET
ROCKLAND, ON
K4K 1P7

**SHADE
GROUP** INC

REV 02 – JULY 17, 2026

EXECUTIVE SUMMARY

This Engineer's Report has been prepared under Section 78(1) of the *Drainage Act, R.S.O. 1990, c. D. 17*. The primary purpose of this report is to update the culvert specifications on the Philion Municipal Drain to meet current standards and by-laws. Many of the previously installed crossings have reached (or are near) end-of-service-life and require replacement in the near future and like-for-like replacement is not possible. During the initial background review stage – it was also observed that changes had been made to Branch No. 3. The previous governing alignment had been altered, and so this report also includes an update to Branch No. 3.

The Philion Municipal Drain is comprised of a Main Drain and three branches: Branch No. 1, Branch No. 2 and Branch No. 3. The total contributing drainage area for the Main Drain is estimated to be approximately 297 hectares.

Shade Group Inc. was appointed as the engineer under By-law No. 2024-104 on November 13th, 2024, to undertake a Section 78 improvement of the Philion Municipal Drain.

This report includes recommended culvert replacement sizes for the Main Drain, Branch No. 1 and Branch No. 2. There are no culverts located on Branch No. 3. This report also includes specifications for the realigned portion of Branch No. 3. For general open channel maintenance, the previous Engineer's Report will continue to govern. As no concerns were raised with respect to existing flooding or erosion concerns, the scope of work was limited to updating only that which was required based on current by-laws. In the absence of concerns raised, we have assumed that the existing open channel is operating as intended.

Enclosed within the Appendices of this report you will find: a location plan showing the location of the watershed and drains (**Appendix A**), a map of the watershed and associated engineering plans (**Appendix B**), updated assessment schedules for the distribution of costs associated with current and future maintenance of each respective section of drain (**Appendix C**), hydrologic and hydraulic analysis calculations supporting the design of the crossings (**Appendix D**), construction specifications and Standard Drawings to be referenced for the construction works (**Appendix E**), construction cost estimates for each section (**Appendix F**), applicable permits for the immediate planned construction works (**Appendix G**) and the applicable project by-laws (**Appendix H**).

TABLE OF CONTENTS

1.0	OBJECTIVE	1
2.0	DRAIN HISTORY	1
3.0	DRAINAGE ACT, 1990, PROCESS	1
3.1	TO DATE.....	1
3.2	NEXT STEPS.....	2
3.3	RESOLUTION AND BY-LAW.....	3
3.4	LIMITATIONS	3
4.0	DESCRIPTION OF THE WATERSHED + ALIGNMENT OF DRAIN.....	3
5.0	CROSSINGS.....	4
5.1	WATERSHED REVIEW	4
5.2	HISTORICAL PERFORMANCE	5
5.3	CROSSING SIZING	6
5.4	CROSSING LENGTHS	7
5.5	CULVERT INSTALLATION	7
5.6	REINSTATEMENT OF ASPHALT DRIVEWAYS.....	7
6.0	OPEN CHANNEL.....	8
6.1	DRAIN CROSS-SECTION AND PROFILE: MAIN DRAIN, BRANCH NO. 1 & BRANCH NO. 2	8
6.2	DRAIN CROSS-SECTION AND PROFILE – BRANCH NO. 3	8
6.3	BRANCH NO. 3 – PARTIAL ABANDONMENT	8
7.0	ASSESSMENTS	8
8.0	FUTURE MAINTENANCE.....	9
8.1	CROSSING REPLACEMENTS – TIMING.....	9
9.0	SPECIAL CONSIDERATIONS	10
	DRAIN CLASSIFICATION & AGENCY CONSULTATION.....	10
	EROSION AND SEDIMENT CONTROL	10
	UTILITIES	11
10.0	ENGINEERING COSTS	11
11.0	CONSTRUCTION AND MAINTENANCE COSTS	11
11.1	ASSESSMENT OF ENCLOSURE C18.....	12
11.2	ROAD CROSSINGS	12
11.3	ASSESSMENT OF ENGINEERING FEES	13
11.4	COST ESTIMATES USED FOR THE ASSESSMENT SCHEDULES	13
12.0	ADIP GRANT	13
13.0	CLOSING	14

APPENDICES

APPENDIX A: LOCATION PLAN

APPENDIX B: ENGINEERED PLANS

APPENDIX C: ASSESSMENT SCHEDULES

APPENDIX D: HYDROLOGIC AND HYDRAULIC ANALYSIS

APPENDIX E: CONSTRUCTION SPECIFICATIONS AND STANDARD DRAWING

APPENDIX F: CONSTRUCTION COST ESTIMATES

APPENDIX G: PERMITS

APPENDIX H: BY-LAWS

REVISIONS, SUBMISSIONS + KEY DATES

Revision #	Comments	Date
-	On-Site Meeting – Caledonia Community Centre	March 18, 2025
00	Draft Submitted to Drainage Superintendent	March 2, 2026
01	Submission to DFO and SNCA	March 12, 2026
02	Submission to City of Clarence Rockland for Adoption	July 17, 2026
-	Meeting to Consider	August 19, 2026
-	Court of Revision	

BY-LAWS

By-law	Description	Date
2024-104	By-law to Appoint Engineer	November 13, 2024
	First and Second Reading of By-Law	
	Third Reading of By-Law	

1.0 OBJECTIVE

This Engineer's Report has been prepared under Section 78(1) of the *Drainage Act, R.S.O. 1990, c. D. 17*. The primary purpose of this report is to update the culvert specifications on the Philion Municipal Drain to meet current standards and by-laws. The culvert lengths adopted under the previous Engineer's Report are too short to meet the requirements for current farming practices, and the specified side slopes of the crossings do not meet current standards and by-laws for locations along a public road. Many of the previously installed crossings have reached (or are near) end-of-service-life and require replacement in the near future and like-for-like replacement is not possible.

As part of the undertaking, it was also observed that changes had been made to Branch No. 3. The previous governing alignment had been altered, and so this report also includes an update to address the inconsistencies between the governing report and the field conditions.

2.0 DRAIN HISTORY

The Drainage Superintendent for the City of Clarence-Rockland was contacted for information about the governing report for the Philion Municipal Drain. We understand that the governing report for the Philion Municipal Drain is from 1977 and was authored by McNeely Engineering Ltd. We understand the report to have been adopted under By-Law #30 (Township of Clarence). The 1977 Report reads as an adoption of a new petition, suggesting there were no previous reports prior to 1977.

For details pertaining to the profile and ditch cross-section of Philion Main Drain, Branch No. 1 and Branch No. 2, refer back to the 1977 Engineer's Report. No changes are proposed to the profile or open-channel cross-section of the Main Drain, Branch No. 1 or Branch No. 2, under this current (2026) report. With that, the previous prepared report (1977) will continue to govern for future maintenance specifications of the open channel.

3.0 DRAINAGE ACT, 1990, PROCESS

3.1 TO DATE

Shade Group Inc. was appointed as the engineer under By-law No. 2024-104 on November 13th, 2024, to undertake a Section 78 improvement of the Philion Municipal Drain.

Invitations to the on-site meeting were mailed to landowners within the watershed inviting them to attend an on-site meeting at the Ronald Lalonde Community Centre. The meeting was held at 7:00 p.m. on Tuesday, March 18, 2025. There were 12 landowners in attendance, as well as 2 representatives of South Nation Conservation Authority, and multiple representatives from the City of Clarence-Rockland.

Landowners were invited to advise if there were any concerns with flooding or performance of the system, and were invited to provide input on any change requests. A preliminary updated watershed boundary map was also presented at the meeting, for which landowners could provide input. Landowners were also invited to present contracts relating to managed forest. A number of landowners provided their managed forest information following the meeting.

No concerns were raised regarding flooding or erosion along the Main Drain or its branches, although some outlier issues were raised including road work and concerns along the unopened road allowance south of Landry Road. However, these concerns were not directly related to flooding or erosion issues on the Main Drain nor its branches, and as such, alternative solutions were presented to landowners raising these concerns, including the option to petition for a new drain, or raise concerns with the City's Public Works Department.

Following the on-site meeting, Shade Group staff conducted a full inventory of the existing crossings using a GNSS receiver, collecting an inventory of the installed infrastructure. A full survey of the entire drainage channel was not conducted as development of new profile drawings was determined not to be necessary, given there were no concerns raised with the performance of the existing system. Instead, the previous governing profiles – including specifications for the channel cross-section – are to remain as the governing design, with the exception of Branch No. 3.

3.2 NEXT STEPS

Following the submission of this report, the report will be brought to a Meeting to Consider (Drainage Act - Section 42).

The clerk shall send a copy of the report and a notice stating the date on which the report was filed, the name or designation of the drainage works; and the date of the council meeting at which the report will be considered, to the prescribed people (Section 41).

The Meeting to Consider is hosted by council, and council may then adopt the report by provisional by-law by giving two readings (Section 45(1)).

Following the Meeting to Consider, and assuming a provisional by-law is adopted by two readings, a notice is sent, including a copy of the provisional by-law of the time and place for the first sitting of the Court of Revision. This notice is sent to each body or person as entitled under Section 41 of the Drainage Act.

Following the completion of addressing all appeals; or the time for appealing has expired, the council may pass the provisional by-law by a third reading, thereby authorizing construction (or maintenance) of the drainage works. Work may then be commenced as early as ten days after the by-law is passed, if no notice of intention to make an application to quash the by-law has been filed with the clerk of the council (Section 58(1)).

Replacement of crossings is anticipated to be completed on an “as-needed” basis, only replacing infrastructure as it is needed. Infrastructure that is still in acceptable condition as deemed so by the Drainage Superintendent – will be left until such a time as replacement is needed.

3.3 RESOLUTION AND BY-LAW

Appendix H has been included in this report as a place to attach the applicable by-laws associated with this Section 78 undertaking. The by-law from Shade Group's initial appointment is enclosed with this submission, and it is recommended that the Municipality attach a copy of the report adoption by-law following its third reading.

3.4 LIMITATIONS

The process overview described in Section 3.2 is provided as a general summary of the next steps to completion. Should the process described herein conflict with the specifications of the Drainage Act, the Drainage Act shall govern. The process described is provided as a summary only, the Municipal clerk shall be responsible for ensuring that the applicable administrative works are completed in accordance with the specifications of the Drainage Act.

4.0 DESCRIPTION OF THE WATERSHED + ALIGNMENT OF DRAIN

The following has been quoted from the 1977 Engineer's Report as the governing “Extent of the Drain”

“The drain commences at a point located in the south side of the road allowance of County Road No. 1 (Du Golf Road) between lot 10 and lot 11 approximately 3,091 feet west of the intersection of the aforementioned county road and the road allowance between Concession V and VI and runs easterly parallel to the road (Du Golf Road) for 3,091 feet, then crossing the County Road, runs 809 feet northerly in the west road ditch of the road allowance between Concession V and VI, then crossing the road allowance between Concession V and Concession VI runs 1,550 feet easterly, then north-easterly for 1,100 feet terminating with sufficient outlet into a gully.

The Branch No. 1 commences at a point located outside the right of way on the north side of the road allowance of County Road No. 1 (Du Golf Road) between lot 10 and 11 approximately 3,341 feet west of the intersection of the aforementioned county road and the road allowance between Concession V and Concession VI and runs easterly parallel to the road for 3,341 feet where it joins the main drain at Station 23+01.

The Branch No. 2 commences at a point located in the south road ditch of County Road No. 1 (Du Golf Road) between lot 10 and 11 approximately 1,100 feet east of the intersection of the aforementioned County Road (Du Golf Road) and the road allowance between Concession V and VI and runs northerly for 1,155 feet, where it joins the main drain at Station 46+00.”

The Branch No. 3 has been altered from its previous governing alignment as described in the 1977 report and is now proposed to be adopted as follows:

Branch No. 3 commences at a point located in the north road ditch of the County Road No. 1 between lot 10 and lot 11 directly opposite the lot line between the East half and West half of lot 10, concession V and runs northerly for 157m (515 feet) and then turns west for another 243m (797 feet), intersecting with Branch No. 2 at approximately Station 6+88 of Branch No. 2.

The realigned portion of Branch No. 3 is located along the southern limits of the property line for Roll No. 0316-016-005-04300 (Property ID 1). This alignment of Branch No. 3 seeks to adopt existing field conditions, as the channel is already constructed in this manner. As no concerns have been raised regarding flooding on either Branch No. 2 or Branch No. 3, no improvements are being proposed on Branch No. 2 nor the Main Drain to account for this change in alignment. A review of historical aerial imagery suggests that changes to Branch No. 3 were made sometime between 2014 and 2016, thereby suggesting the realigned channel has been operating without issue for around 10 years. Changes proposed to Branch No. 3 are considered minor and would not be expected to have any measurable change to flooding or erosion, with conditions very similar to those experienced for the past 10 years.

The governing lengths and contributing drainage areas are approximately as follows:

Table 1: Philion Municipal Drain – 2026 Summary

Drain Name	Length	Contributing Drainage Area
Main Drain	6550 ft / 1,996 m	298 hectares
Branch No. 1	3341 ft / 1,018 m	25 hectares
Branch No. 2	1155 ft / 352 m	56 hectares
Branch No. 3	1312 ft / 400 m	7 hectares

The majority of the Philion Municipal Drain watershed is comprised of active agricultural lands, with seven small (<2 acres) residential properties fronting directly along Du Golf Road and Landry Road.

A Location Plan outlining the project location within the City of Clarence-Rockland has been enclosed in **Appendix A**, while a watershed map providing details for the project can be found in **Appendix B**.

5.0 CROSSINGS

5.1 WATERSHED REVIEW

Shade Group conducted a high-level field review of the watershed on September 3, 2025. Drone footage was used to assess the overall drainage area characteristics in comparison to available satellite imagery. Based on that review, it appears that the overall conditions observed in recent satellite imagery are consistent with recent on-site conditions. The majority of the watershed is

comprised of active agricultural lands with a number of residential properties fronting along Du Golf Road and Landry Road.

Minor changes were made to the 1977 watershed boundary, updating the boundary based on publicly available LiDAR data. As the Philion Municipal Drain is a tributary to Cobbs Lake, another municipal drain, a review of the recently updated Cobbs Lake Creek Municipal Drain watershed boundary was also conducted and compared to the updated boundary developed by Shade Group. The final updated Watershed Map is a reflection of feedback received at the on-site meeting, a review of LiDAR topographic data, and a review of the Cobbs Lake Creek Municipal Drain watershed boundary.

A copy of the Watershed Map prepared by Shade Group has been enclosed in **Appendix B**.

5.2 HISTORICAL PERFORMANCE

No concerns pertaining to historical flooding have been brought forth by landowners, municipal staff, or other applicable stakeholders for the Philion Municipal Drain nor the branches.

The author of this report conducted a hydrologic and hydraulic analysis of the various culverts within the system based on current design standards and has prepared recommendations for the proposed replacement diameters in Section 5.3 of this report. Details pertaining to the hydrologic and hydraulic analysis are enclosed in **Appendix D**.

As there have not been any concerns with flooding brought forth, it is recommended that replacement only be completed as the existing infrastructure reaches end-of-life (i.e. only as-needed).

5.3 CROSSING SIZING

Table 2 provides a summary of crossings on the Philion Municipal Drain.

Table 2: 2026 Crossing Summary – Philion Main Drain

Culvert ID #	Crossing Use	Proposed Material	Max. Length (m)	Min. Proposed Diameter (mm)
Branch No. 1				
C1	Access Culvert – Agricultural	HDPE	12	450
C2	Access Culvert – Agricultural		15	600
Main Drain				
C3	Access Culvert – Commercial	HDPE	15	750
C4	Secondary Access		15	750
C5	Access - Residential		12	750
C6	Access - Residential		12	900
C7	Access – Residential		12	900
C8	Access – Residential		12	900
C9	Access – Residential		12	900
C10	Access – Residential		15	900
C11	Access – Residential		15	900
R12	Road Crossing – Du Golf Road		21	1400
C13	Access – Residential		15	1200
R14	Road Crossing – Landry Road		16	1400
C15	Farm Crossing		18	1500
Branch No. 2				
R16	Road Crossing – Du Golf Road	HDPE	21	1050
C17	Farm Crossing (New)		9	750
C18	Enclosure - Farm Crossing		27	750

Special Considerations

R14: The length noted is based on existing conditions, as this crossing has been recently replaced by the municipality (2023 replacement per information provided by others).

C17: The landowner has requested a new crossing. The property does not currently have a crossing installed. The proposed pipe length is based on using a proposed crossing platform with of 6m, intended for farm crossing purposes. I understand the intended current use may just be for recreational use. To remain consistent with the design specifications, the proposed pipe length is based on an agricultural crossing to allow for future replacement if needed. Should the landowner wish to specify a shorter length, that could be addressed with the Drainage Superintendent at the time of installation. The specified pipe length is intended as the maximum length to accommodate future replacement.

Where a specified diameter is not readily available, or considerably more costly than installation of a slightly larger diameter standard size, the Drainage Superintendent may install the next immediate size *up*; as long as it is proven cost-effective to do so. The diameters mentioned herein

are considered as *minimums*. The specified material may not be substituted for an alternative unless a review is undertaken by an engineer to determine there will be no adverse impacts to the capacity by way of the substitution. The design has been prepared using an assumed Manning's roughness of 0.012.

5.4 CROSSING LENGTHS

Proposed lengths for crossings have been calculated using the following minimum standards:

Agricultural crossings: 6m platform width

Residential crossings: minimum 4.5m platform width (or match existing if >4.5m). Max 6m.

Crossing lengths have been established based on:

- Minimum noted platform width;
- Allowance for 2:1 end treatments;
- Pipe lengths typically sold in minimum 3m increments.

5.5 CULVERT INSTALLATION

Whenever feasible, pipes are to be installed at a minimum slope of 0.5% with a minimum embedment of 150mm below the ditch grade at both the inlet and outlet sites of the crossing. It is acknowledged this is not practical for enclosures and instead, enclosures would be installed at the same gradient as the existing channel. Rip-rap (or equivalent approved stone) is to be placed at the inlet and outlet sites of each crossing to assist in mitigating erosion and stabilization of the end treatment. Rip-rap is to be underlain with geotextile, which shall be keyed in per the manufacturer's specifications. End treatment shall be installed as per Shade Group Standard Drawing 4, as enclosed in **Appendix E**. Crossings shall be installed with a minimum cover of 0.3m and side slopes shall be no more than 2(horizontal):1(vertical).

All culverts shall be HDPE and minimum 320 kPa. Culverts shall be centred on the entrance and in the ditch line.

5.6 REINSTATEMENT OF ASPHALT DRIVEWAYS

Reinstatement of asphalt driveways has *not* been included as part of the project costs. Reinstatement to gravel will be considered the standard. Where an existing driveway is asphalt, it shall be at the landowner's expense to reinstate the asphalt. Hauling off and disposing of the existing asphalt *overtop of the culvert* are considered part of the costs associated with the culvert replacement.

6.0 OPEN CHANNEL

6.1 DRAIN CROSS-SECTION AND PROFILE: MAIN DRAIN, BRANCH NO. 1 & BRANCH NO. 2

The specifications for open channel maintenance of the Philion Main Drain, Branch No. 1 and 2, shall remain as outlined in the previous adopted governing report (McNeely, 1977). The associated profile and specified drain cross-section shall remain in accordance with the governing report (McNeely, 1977). No changes to the profile or drainage channel cross-section have been proposed for the Main Drain, Branch No. 1 or Branch No. 2.

6.2 DRAIN CROSS-SECTION AND PROFILE – BRANCH NO. 3

As modifications have been made to Branch No. 3, a new profile has been prepared for the realignment. The profile and plan view for Branch No. 3 are included in **Appendix B**. These details are to be used for the initial construction works, and shall be referenced for future maintenance in perpetuity.

6.3 BRANCH NO. 3 – PARTIAL ABANDONMENT

The former adopted alignment of Branch No. 3 shall be partially abandoned as shown on the attached plans (**Appendix B**).

7.0 ASSESSMENTS

An update to the assessment schedule for the Philion Municipal Drain has been undertaken to fairly allocate the costs of current and future maintenance to all properties encompassed within the contributing drainage area.

As per Section 21 of the *Drainage Act*, “The engineer in the report shall assess for benefit, outlet liability and injuring liability, and shall insert in an assessment schedule, in separate columns, the sums assessed for each opposite each parcel of land and road liable therefor.” Since this is an existing drain and no works are proposed that would be considered injurious to lands or roads, injuring liability is not applicable. No allowances have been provided.

Benefit assessments were assigned to lands that meet the criteria defined under the *Drainage Act*, which states: “lands, roads, buildings, utilities, or other structures that are increased in value or are more easily maintained as a result of the construction, improvement, maintenance or repair of a drainage works may be assessed for benefit” (R.S.O. 1990, c. D.17, s. 22).

Lands within the watershed are assessed for outlet liability, which is defined as: “lands and roads that use a drainage works as an outlet, or for which, when the drainage works is constructed or improved, an improved outlet is provided either directly or indirectly through the medium of any other drainage works or of a swale, ravine, creek or watercourse” (R.S.O. 1990, c. D.17, s. 23(1)).

The method for determining the apportionment of benefit and outlet liability assessments is at the discretion of the appointed Drainage Engineer, who must exercise their best judgment to determine an approach that is fair to all assessed parties. The apportionment of outlet versus benefit liability has been kept consistent with the previous governing report, as I do not feel that there has been considerable change to what would be considered the "benefit" area or the benefiting landowners. This results in an approximate 35% outlet to 65% benefit split for the Main Drain, Branch No. 1 and Branch No. 2, while Branch No. 3 was assessed as 20% outlet, 80% benefit.

For this project, the Drainage Engineer has generally applied the *Factored Areas Method* to assess the individual assessments for each property. Further details on the method can be found in **Appendix C**. Under this method, properties are assigned factors based on land use, proximity to the drain (distance factor), and general location within the watershed (sub-section factor). These values are used to calculate a "factored area," which enables a fair comparison of lands within the watershed. The assignment of these factors is done on a case-by-case basis, as deemed appropriate and fair by the engineer.

8.0 FUTURE MAINTENANCE

All maintenance works are to be performed in accordance with the governing specifications of the applicable Engineer's Report.

For maintenance of the open channel for the Main Drain, Branch No. 1 and Branch No. 2, the 1977 Engineer's Report shall govern with respect to the specifications (plan and profile).

For crossing replacements on the Main Drain, Branch No. 1 and Branch No. 2, as well as maintenance of the open channel for Branch No. 3, this report shall be considered governing.

Assessment of all maintenance works shall be performed in accordance with the assessment schedules outlined in this report.

Maintenance of the open channel for the Main Drain, Branch No. 1 and Branch No. 2 shall be considered works as performed under Section 74 of the Drainage Act.

8.1 CROSSING REPLACEMENTS – TIMING

Removal and replacement of the crossings on the Philion Municipal Drain (Main Drain and all branches) is to be carried out on an as-needed basis, only as infrastructure reaches its end-of-service-life. As infrastructure becomes in need of replacement, the replacement should be done in conformance with the specifications outlined herein.

Replacement works will be determined by the Drainage Superintendent.

9.0 SPECIAL CONSIDERATIONS

DRAIN CLASSIFICATION & AGENCY CONSULTATION

As part of the preparation of this report, the author conducted a review of AgMaps, the Geographic Information System managed by the Ministry of Agriculture, Food and Agribusiness. AgMaps identifies the downstream limits of the Main Drain and Branch No. 1 as Class 'F', while Branch No. 2 and Branch No. 3 are listed as "not rated". The upstream limits of the Main Drain are currently mapped as Class 'C' (reviewed February 2026), though it's noted it was listed as "not rated" during a previous access of AgMaps by the author in 2025. As Branch No. 2 and Branch No. 3 outlet to the downstream section of the Main Drain (a Class 'F' drain), and there are no other connection points; it can reasonably be assumed that Branch No. 2 and Branch No. 3 would also be considered Class 'F' drains.

Class 'F' drains are defined as intermittent watercourses that are dry for at least 3 months of the year, while Class 'C' drains are generally considered to have flow year-round.

No fisheries studies were conducted as part of Shade Group's scope.

This report was submitted to Fisheries and Oceans Canada for review, and a Letter of Advice was received. The letter has been enclosed in Appendix G and shall be referenced during construction in the immediate future. Construction works beyond May 2028 should consult with the latest approval process in place at the time of such works.

This report was also submitted to South Nation Conservation Authority for review and a permit has been received for initial works proposed. The received permit has been enclosed in Appendix G and shall be referenced during construction in the immediate future. Note the permit only covers certain works and expires June 8, 2028.

EROSION AND SEDIMENT CONTROL

Permanent erosion and sediment control measures for the works outlined herein are anticipated to generally be limited to the proposed end treatment of the crossings. End treatment installation shall be in accordance with Shade Group Standard Drawing 4 as enclosed in **Appendix E**. Additional permanent erosion and sediment control practices have been proposed as part of the realignment of Branch No. 3. Erosion and sediment control measures for Branch No. 3 are noted on the Plan View for the Realignment of Branch No. 3 enclosed within **Appendix B**.

Additional erosion and sediment control measures may be required at the direction of the engineer, municipality, SNCA or DFO, as needed to address site conditions at the time that the works are performed. The review and implementation of erosion and sediment control measures is intended to be a living practice, where additional measures may be required depending on the conditions at the time of the work.

It is assumed the installation will be performed by an experienced, competent contractor, following standard industry practices for the protection of watercourses. This includes

consideration of weather conditions when planning work and not performing works in or near watercourses when measurable rainfall is expected.

UTILITIES

The contractor shall acquire applicable utility clearance prior to excavation as per the Ontario Underground Infrastructure Notification System Act. Should utility conflicts be identified, Shade Group shall be notified.

Additional construction specifications are outlined in **Appendix E**.

10.0 ENGINEERING COSTS

The costs associated with the preparation of this report are estimated to be \$34,185 (exclusive of applicable taxes). Of this, \$29,185 (excl. taxes) is engineering fees associated with the general updates, while a separate \$5,000 (excl. taxes) is exclusively to accommodate the update to Branch No. 3. This estimate does not account for any appeals to the Court of Revision, Tribunal, or the Referee. Fees associated with the updates to the assessment schedule were less than 25% of the total engineering fees.

All engineering costs are to be assessed to the landowners in accordance with the assessment schedules provided in **Appendix C** – Schedules E, F, G, and H.

The breakdown of engineering fees to each respective drain section were as follows:

Main Drain: 80% of General Engineering Fees (\$23,348.00)

Branch No. 1: 7.5% of General Engineering Fees (\$2,188.88)

Branch No. 2: 10.5% of General Engineering Fees (\$3,064.42)

Branch No. 3: 2% of General Engineering Fees (\$583.70) + \$5,000 Special Assessment

The special assessment of an additional \$5,000 has been assessed to Property ID 1 to account for the additional engineering fees with the realignment of Branch No. 3.

A breakdown of the engineering fee calculations can be found in **Appendix F**, with the *Construction Cost Estimates*.

11.0 CONSTRUCTION AND MAINTENANCE COSTS

The final scope of immediate maintenance required is at the discretion of the Drainage Superintendent. The construction cost estimates have been prepared based on an assumed full bottom cleanout of the entire length of the system, and includes the cost associated with the full replacement of all applicable culverts (excluding those very recently replaced). The actual anticipated scope will be at the discretion of the Drainage Superintendent. Only those crossings reaching end-of-service-life will be immediately replaced, with the remainder replaced on an as-

needed basis as their end-of-service-life approaches. With that, replacement works may be conducted over a number of years for the foreseeable future.

Estimated construction costs are based on consultation with suppliers and based on historical available data associated with labour and equipment costs. Discounts may be available for bulk purchasing of pipe, which has *not* been reflected in the current estimate. Similarly, final costs may be cheaper when multiple crossings are replaced at the same time. Costs reflect 2026 pricing.

Estimated project summary costs are provided in **Appendix F**, Construction Cost Estimates. Note that these costs reflect a *total* construction cost for the entire project. In some cases, given that maintenance is only to be completed as-needed, immediate project costs may be considerably lower, and where the project works are limited to one or two culvert replacements, only those *upstream* of the work would be assessed for the works completed. The purpose of providing the Construction Cost Estimates is to provide landowners with an economy of scale of what a replacement may cost.

The project subtotals do not include the replacement of any road crossing culverts. Should the road crossing culverts require replacement, the full cost of replacement would be borne by the road authority as per Section 26 of the Drainage Act.

11.1 ASSESSMENT OF ENCLOSURE C18

No immediate works are required on crossing C18 as it appears to have been (relatively) recently installed. The HDPE pipe does not show any immediate need for repair or replacement.

When it comes time to replace the crossing, the costs shall be split as follows:

- 12m – costs associated with the installation of an approximately 12m crossing shall be assessed to the landowners upstream of the works, in accordance with the stipulations of the Drainage Act. These costs shall include the reinstatement of ~12m of crossing overtop and applicable end treatments.
- 15m – costs associated with the remaining additional 15m, including the remaining reinstatement, are to be assessed solely to the benefiting property owner (Property ID 1).

For on-going maintenance; typical maintenance of enclosures may include some routine flushing. As this maintenance work is general comparable in cost to that of open channel maintenance, the maintenance works shall be assessed in accordance with the regular assessment schedule.

11.2 ROAD CROSSINGS

The costs associated with the replacement of road crossings are to be borne by the applicable road authority. This includes the following crossings:

- Crossing R12 and R16 – Du Golf Road
- Crossing R14 – Landry Road

Crossing R14 was recently replaced and is not anticipated to require any work for the foreseeable future.

11.3 ASSESSMENT OF ENGINEERING FEES

A separate set of assessment schedules was prepared for the one-time engineering fees associated with the preparation of this report. I felt that the inclusion of benefit assessment to apportion the engineering fees presented a significant increased burden on those assessed benefit. As the primary focus was on addressing culverts, and as those outletting to the drain generate runoff that is driving the sizing of the culverts, I feel that the use of outlet assessment for the distribution of the one-time engineering fees was fairer. With that, separate assessment schedules are presented in Schedules 'E' through 'H' (**Appendix C**) outlining the distribution of Engineering Fees. Note that for properties classed as Farm Property Class Tax Rate, these engineering fees would typically be considered Grant Eligible as well. See Section 12.0 – ADIP Grant, or contact the Drainage Superintendent, for more information about grant eligibility.

11.4 COST ESTIMATES USED FOR THE ASSESSMENT SCHEDULES

As the intention is to undertake construction works on an as-needed basis, and not as a single project, we have assigned an arbitrary \$50,000 construction value for the Main Drain assessment schedule.

A value of \$15,275 was used for Branch No. 1, which would reflect an estimate of what typical maintenance may cost. To the best of my knowledge, no immediate works are planned for Branch No. 1.

A value of \$13,830 was used for Branch No. 2, which would reflect an estimate of what typical maintenance on the open channel would be expected to cost; as well as the costs associated with the new crossing (C17).

A value of \$1,540 was used for Branch No. 3, which reflects current open channel maintenance of the section upstream of the realignment (Stn 0+000 – 0+140), including a 10% contingency. A separate special assessment has been assigned to a single owner for the realignment of Branch No. 3.

When work is undertaken, only those *upstream* of the completed works will be assessed for works completed; in the apportionments reflected in the attached assessment schedule. Assessed values to landowners would be reflective of construction costs at the time of the work, pro-rated in the same apportionments as the enclosed assessment schedules.

The assessment schedules can be found in **Appendix C**.

12.0 ADIP GRANT

Properties that are registered with the Ontario Ministry of Agriculture, Food and Agribusiness (OMAFRA) for the Farm Property Class Tax Rate Program may be eligible for a 1/3 grant from the

Province. As eligibility requires active status with OMAFA at the time of the works, the grant has not been reflected on the current assessment schedules. If you have questions on whether your property is eligible for grant, please contact the Drainage Superintendent to discuss.

13.0 CLOSING

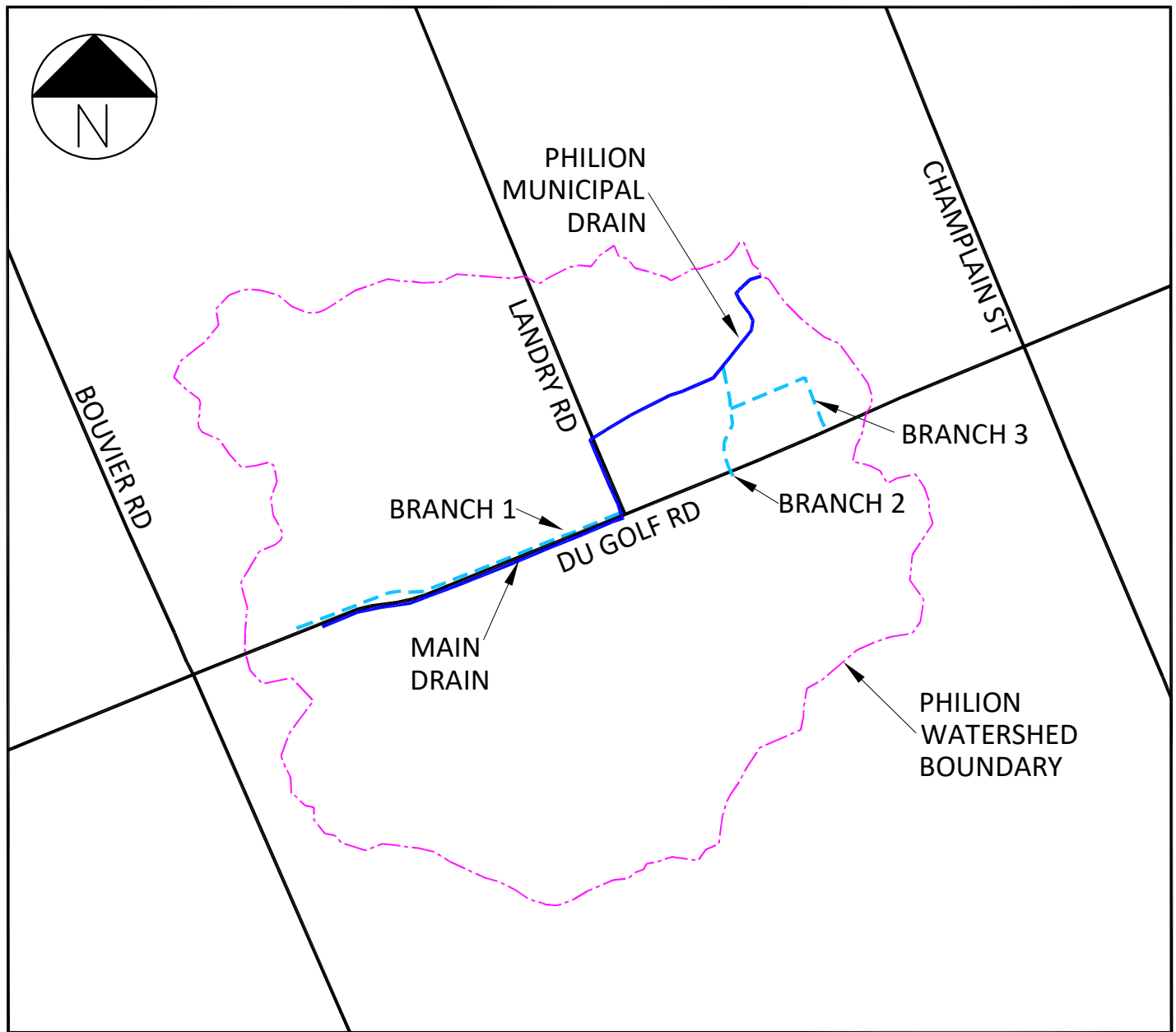
This report is respectfully submitted to the Council of the City of Clarence Rockland this July 17, 2026.

Monica Shade, P. Eng.
Drainage Engineer
Shade Group Inc.



APPENDIX A

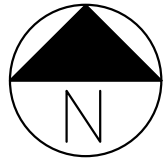
LOCATION PLAN



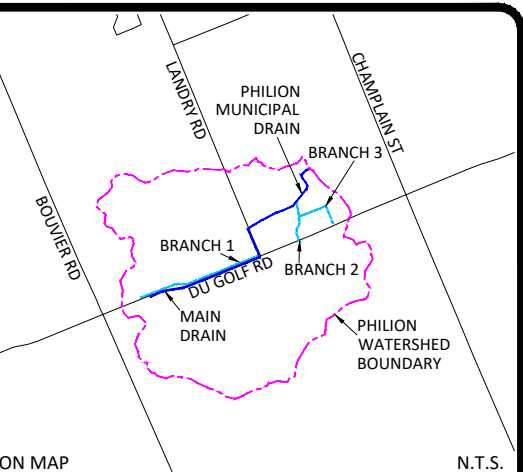
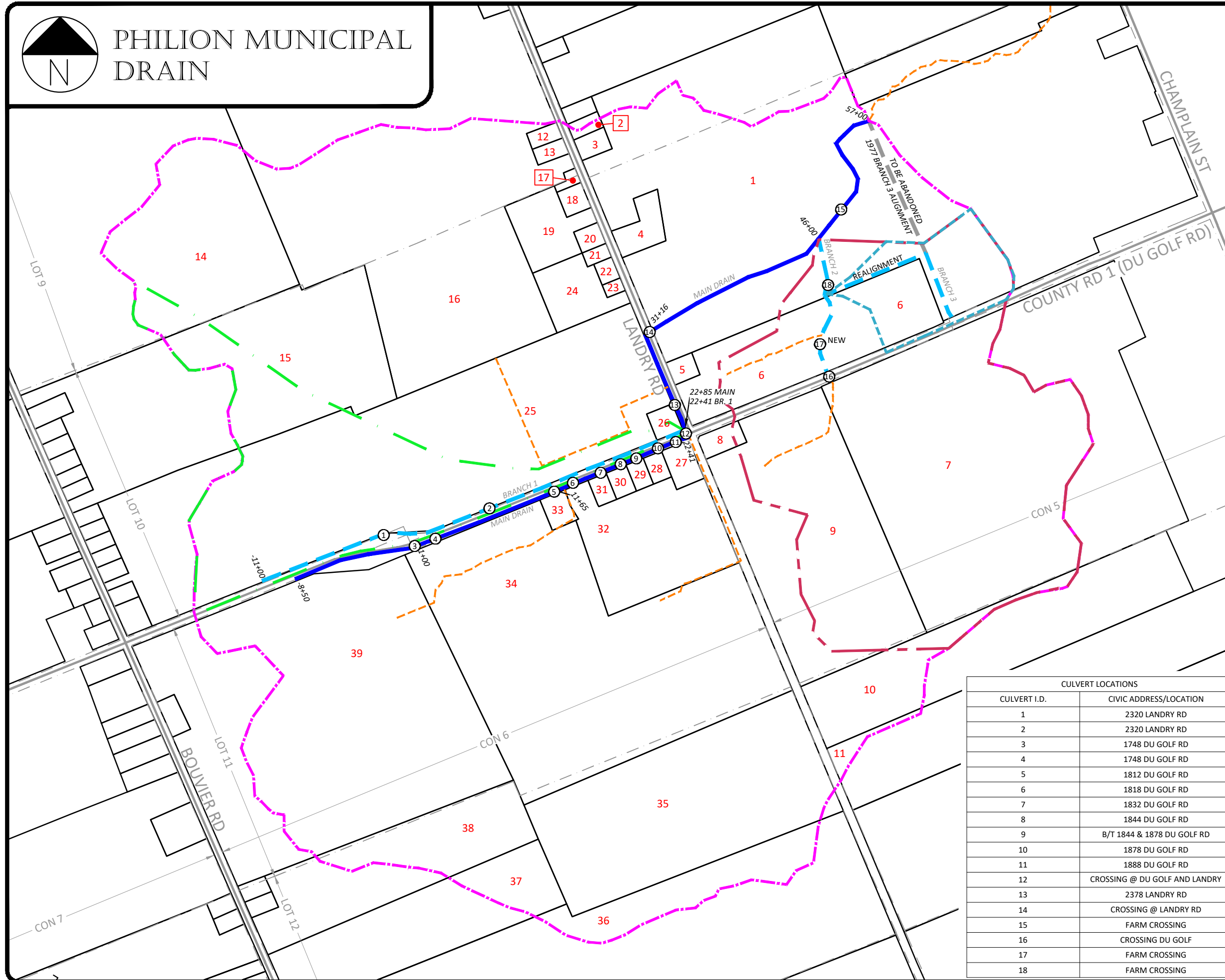
LOCATION PLAN
N.T.S.

APPENDIX B

ENGINEERED PLANS



PHILION MUNICIPAL DRAIN



SITE LOCATION MAP

N.T.S.



ALL DIMENSIONS ARE IN METRES. DO NOT SCALE DRAWING

PAGE SIZE 11" x 17" SCALE 1:8,500

SHADE GROUP INC.
4625 MARCH ROAD
ALMONTE, ONTARIO
K0A 1A0



LEGEND

- APPROX. PROPERTY LINES (GIS DATA)
- ROAD
- PHILION MUNICIPAL DRAIN - MAIN DRAIN ALIGNMENT
- PHILION MUNICIPAL DRAIN WATERSHED BOUNDARY
- BRANCH 1 SUBWATERSHED BOUNDARY
- BRANCH 2 SUBWATERSHED BOUNDARY
- BRANCH 3 SUBWATERSHED BOUNDARY
- WATERCOURSES
- PHILION BRANCH DRAINS
- LOT AND CONCESSION LINES
- STATIONS (FT) FROM 1977 ENGINEER'S REPORT
- CULVERT I.D. AND APPROX. LOCATION
- PROPERTY I.D. NUMBER

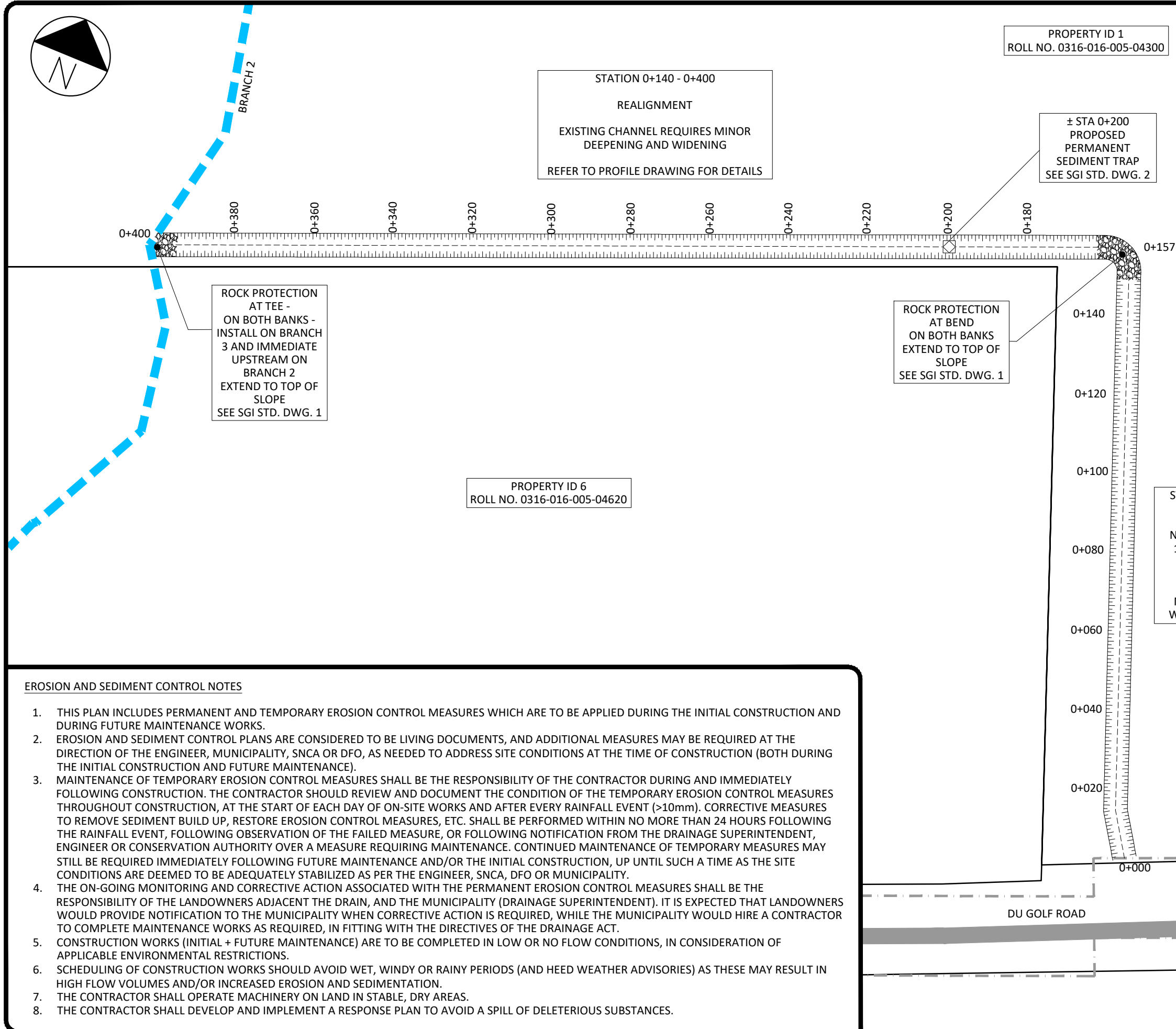
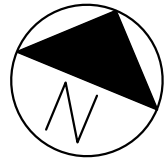
CULVERT LOCATIONS	
CULVERT I.D.	CIVIC ADDRESS/LOCATION
1	2320 LANDRY RD
2	2320 LANDRY RD
3	1748 DU GOLF RD
4	1748 DU GOLF RD
5	1812 DU GOLF RD
6	1818 DU GOLF RD
7	1832 DU GOLF RD
8	1844 DU GOLF RD
9	B/T 1844 & 1878 DU GOLF RD
10	1878 DU GOLF RD
11	1888 DU GOLF RD
12	CROSSING @ DU GOLF AND LANDRY
13	2378 LANDRY RD
14	CROSSING @ LANDRY RD
15	FARM CROSSING
16	CROSSING DU GOLF
17	FARM CROSSING
18	FARM CROSSING

00	ISSUED WITH FINAL REPORT	JULY 17, 2026
REV.	DESCRIPTION	DATE

STAMP

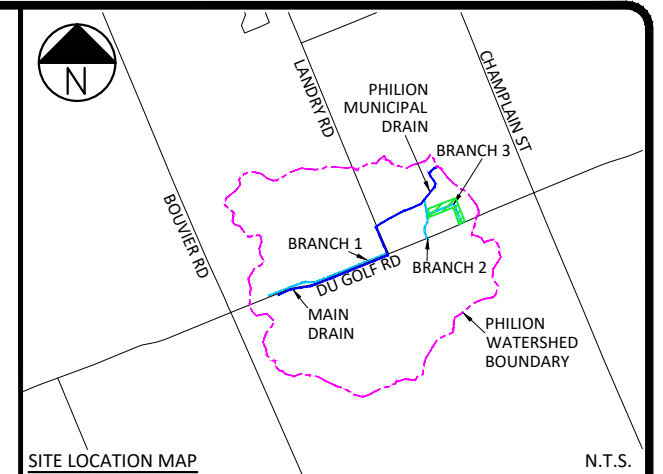


PROJECT TITLE	PHILION MUNICIPAL DRAIN
DRAWING TITLE	WATERSHED MAP
DRAWING NO.	1 OF 1



EROSION AND SEDIMENT CONTROL NOTES

1. THIS PLAN INCLUDES PERMANENT AND TEMPORARY EROSION CONTROL MEASURES WHICH ARE TO BE APPLIED DURING THE INITIAL CONSTRUCTION AND DURING FUTURE MAINTENANCE WORKS.
2. EROSION AND SEDIMENT CONTROL PLANS ARE CONSIDERED TO BE LIVING DOCUMENTS, AND ADDITIONAL MEASURES MAY BE REQUIRED AT THE DIRECTION OF THE ENGINEER, MUNICIPALITY, SNCA OR DFO, AS NEEDED TO ADDRESS SITE CONDITIONS AT THE TIME OF CONSTRUCTION (BOTH DURING THE INITIAL CONSTRUCTION AND FUTURE MAINTENANCE).
3. MAINTENANCE OF TEMPORARY EROSION CONTROL MEASURES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR DURING AND IMMEDIATELY FOLLOWING CONSTRUCTION. THE CONTRACTOR SHOULD REVIEW AND DOCUMENT THE CONDITION OF THE TEMPORARY EROSION CONTROL MEASURES THROUGHOUT CONSTRUCTION, AT THE START OF EACH DAY OF ON-SITE WORKS AND AFTER EVERY RAINFALL EVENT (>10mm). CORRECTIVE MEASURES TO REMOVE SEDIMENT BUILD UP, RESTORE EROSION CONTROL MEASURES, ETC. SHALL BE PERFORMED WITHIN NO MORE THAN 24 HOURS FOLLOWING THE RAINFALL EVENT, FOLLOWING OBSERVATION OF THE FAILED MEASURE, OR FOLLOWING NOTIFICATION FROM THE DRAINAGE SUPERINTENDENT, ENGINEER OR CONSERVATION AUTHORITY OVER A MEASURE REQUIRING MAINTENANCE. CONTINUED MAINTENANCE OF TEMPORARY MEASURES MAY STILL BE REQUIRED IMMEDIATELY FOLLOWING FUTURE MAINTENANCE AND/OR THE INITIAL CONSTRUCTION, UP UNTIL SUCH A TIME AS THE SITE CONDITIONS ARE DEEMED TO BE ADEQUATELY STABILIZED AS PER THE ENGINEER, SNCA, DFO OR MUNICIPALITY.
4. THE ON-GOING MONITORING AND CORRECTIVE ACTION ASSOCIATED WITH THE PERMANENT EROSION CONTROL MEASURES SHALL BE THE RESPONSIBILITY OF THE LANDOWNERS ADJACENT THE DRAIN, AND THE MUNICIPALITY (DRAINAGE SUPERINTENDENT). IT IS EXPECTED THAT LANDOWNERS WOULD PROVIDE NOTIFICATION TO THE MUNICIPALITY WHEN CORRECTIVE ACTION IS REQUIRED, WHILE THE MUNICIPALITY WOULD HIRE A CONTRACTOR TO COMPLETE MAINTENANCE WORKS AS REQUIRED, IN FITTING WITH THE DIRECTIVES OF THE DRAINAGE ACT.
5. CONSTRUCTION WORKS (INITIAL + FUTURE MAINTENANCE) ARE TO BE COMPLETED IN LOW OR NO FLOW CONDITIONS, IN CONSIDERATION OF APPLICABLE ENVIRONMENTAL RESTRICTIONS.
6. SCHEDULING OF CONSTRUCTION WORKS SHOULD AVOID WET, WINDY OR RAINY PERIODS (AND HEED WEATHER ADVISORIES) AS THESE MAY RESULT IN HIGH FLOW VOLUMES AND/OR INCREASED EROSION AND SEDIMENTATION.
7. THE CONTRACTOR SHALL OPERATE MACHINERY ON LAND IN STABLE, DRY AREAS.
8. THE CONTRACTOR SHALL DEVELOP AND IMPLEMENT A RESPONSE PLAN TO AVOID A SPILL OF DELETERIOUS SUBSTANCES.



SITE LOCATION MAP

SCALE BAR 0 10 25 50m

DO NOT SCALE DRAWING

PAGE SIZE TABLOID SCALE 1:1,000

SHADE GROUP INC.
4625 MARCH ROAD
ALMONTE, ONTARIO
K0A 1A0

SHADE
GROUP INC.

LEGEND

- APPROX. PROPERTY LINES (GIS DATA)
- ROAD
- LOT AND CONCESSION LINES
- TOP OF SLOPE
- DITCH CENTERLINE

CHANNEL CROSS-SECTION

CHANNEL CROSS-SECTION TO MATCH 1977 SPECIFICATIONS

0.91m (3FT) BOTTOM WIDTH
1.5:1 SIDE SLOPES

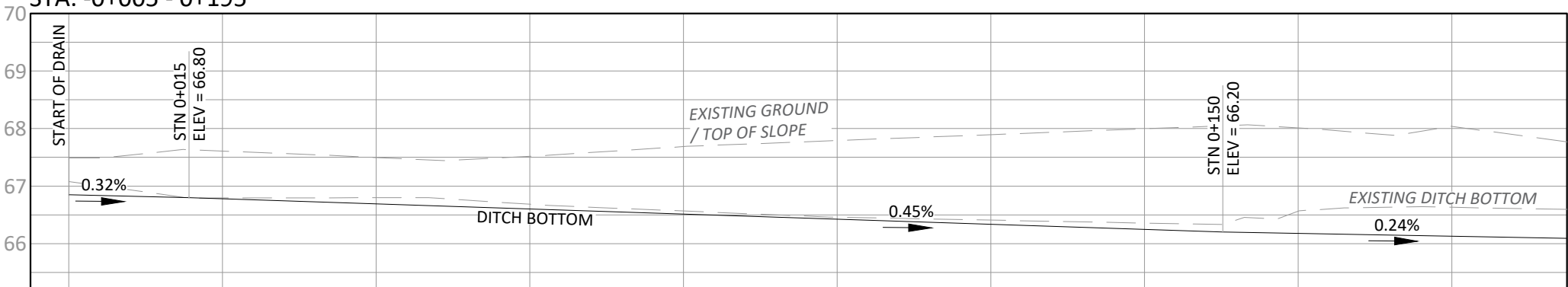
00	ISSUED WITH FINAL REPORT	JULY 17, 2026
REV.	DESCRIPTION	DATE

STAMP



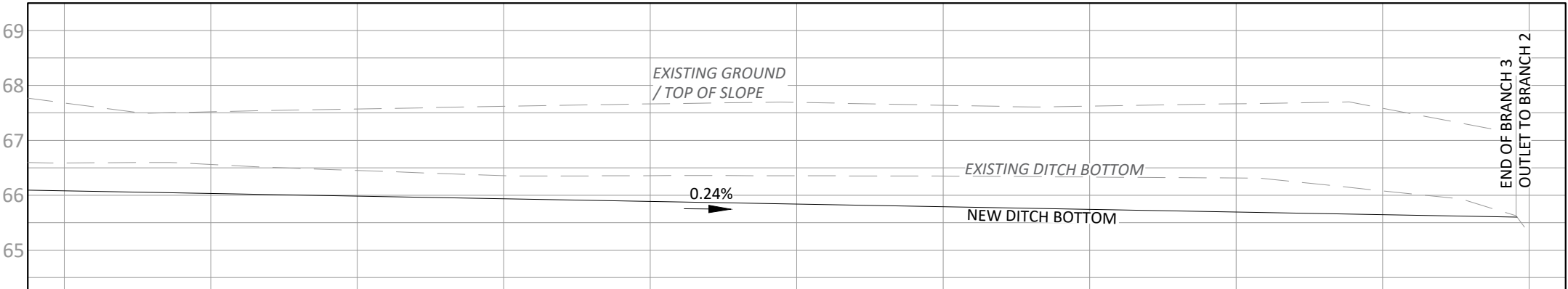
PROJECT TITLE	PHILION MUNICIPAL DRAIN
DRAWING TITLE	BRANCH 3 REALIGNMENT PLAN VIEW
DRAWING NO.	1 OF 2

PHILION DRAIN - BRANCH 3
REALIGNMENT PROFILE
STA. -0+005 - 0+195

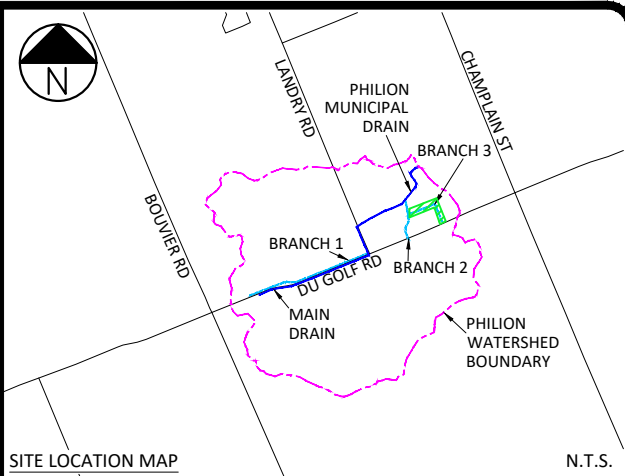


ELEVA- TIONS	EX. GROUND PR. DITCH INV.	67.49 66.85	67.61 66.78	67.50 66.69	67.52 66.60	67.69 66.51	67.79 66.42	67.89 66.33	68.00 66.25	68.01 66.18	68.04 66.13
STATIONS		0+000	0+020	0+040	0+060	0+080	0+100	0+120	0+140	0+160	0+180

PHILION DRAIN - BRANCH 3
REALIGNMENT PROFILE
STA. 0+195 - 0+405



ELEVA- TIONS	EX. GROUND PR. DITCH INV.	67.68 66.08	67.52 66.03	67.57 65.98	67.62 65.94	67.66 65.89	67.69 65.84	67.64 65.79	67.62 65.74	67.67 65.69	67.58 65.65	67.08
STATIONS		0+200	0+220	0+240	0+260	0+280	0+300	0+320	0+340	0+360	0+380	0+400



SCALE BAR0200400m

ALL DIMENSIONS ARE IN METRES. DO NOT SCALE DRAWING

PAGE SIZE: TABLOIDSCALE: H: 1:750 V: 1:100

SHADE GROUP INC.
4625 MARCH ROAD
ALMONTE, ONTARIO
K0A 1A0



GENERAL NOTES

1. ALL TOPOGRAPHY, GROUND ELEVATIONS AND SURVEY DATA ARE SHOWN FOR INFORMATION PURPOSES ONLY AND IMPLY NO GUARANTEE OF ACCURACY. ALL DIMENSIONS AND ELEVATIONS TO BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. ALL ELEVATIONS SHOWN ARE GEODETIC.
2. ALL DISTURBED AREAS ARE TO BE SEEDED AS SOON AS FEASIBLE.
3. WORKS SHALL BE COMPLETED IN LOW OR NO FLOW CONDITIONS.
4. ANY CHANGES MADE TO THIS PLAN ARE TO BE VERIFIED AND APPROVED BY SHADE GROUP INC.

CHANNEL CROSS-SECTION

CHANNEL CROSS-SECTION TO MATCH 1977 SPECIFICATIONS

0.91m (3FT) BOTTOM WIDTH
1.5:1 SIDE SLOPES

00	ISSUED WITH FINAL REPORT	JULY 17, 2026
REV.	DESCRIPTION	DATE

STAMP

PROJECT TITLE	PHILION MUNICIPAL DRAIN
DRAWING TITLE	BRANCH 3 REALIGNMENT PROFILE
DRAWING NO.	2 OF 2

APPENDIX C

ASSESSMENT SCHEDULES

The following sections are intended to provide insight into the methodology used to calculate assessments.

C.1 LAND USE FACTORS

Each property was assigned a land use based on current aerial mapping. The assigned values for the respective land use have been summarized in Table A.

Table A: Land Use Factors

Land Use Description	Factor
Agricultural / Vacant Land / Unprotected Forests	1.00
Commercial	4.00
Managed Forest	0.70
Large Lot Residential (>2ha)	1.00
Small Residential (<2ha)	2.00
Roads	3.00

Unprotected forest refers to undeveloped lands that may include significant tree cover but are not registered as part of the Managed Forest Tax Incentive Program. Lands not registered as part of the Managed Forest Tax Incentive Program would be assigned the same factor as agricultural or vacant lands and they are not generally protected by current legislation to remain as forested lands.

C.2 DISTANCE FACTORS

Each property within the drain was assigned a distance factor based on offsetting measurements from the drain. The distance factors in this report are as follows:

Table B: Distance Factors for Philion Drain

Offset (m)	Factor
0 – 200	1.00
200 – 400	0.75
400 – 600	0.50
600 – 800	0.25
>800	0.10

The channel alignment was offset by the respective amounts noted in Table B, and the areas between the offsets were assigned the corresponding factors.

Each property was assigned a value based on its location relative to the channel. Where properties were encompassed within multiple factor areas, a prorated factor value was established (e.g. if half the property is within the 250m offset and the other half within 250-500m; the property would be assigned a value of $0.5 \times 1.0 + 0.5 \times 0.75 = 0.875$).

C.3 SUB-SECTION FACTORS

Each property was assigned a factor between 1.0 and 0.10 based on their relative location in the watershed. Properties farthest upstream (top of the watershed) benefit from the entire length of the drain and were assigned a factor of 1.0, while properties at the outlet of the drain only make use of a small relative apportionment of the total system; and were assigned a smaller factor. Factors were determined based on the approximate outlet station where water from the property would be expected to enter the respective drain, and pro-rated accordingly.

For example, when calculating the assessments for a property draining into the Main Drain at the Landry Road crossing culvert (approximately Station 1,220), the sub-section factor would be calculated as follows:

$$(1,996\text{m} - 1,220\text{m}) / 1,996\text{m} = 0.39$$

This calculation equates the total linear length of the drain used (1,996 m – 1,220); where 1,996m is the total length of the drain in meters with Station 1,996 being the outlet of the system (downstream end point); and 1,220 is the point at water from the property being considered is expected to drain into the system. The ratio of that equation is then assigned as a factor. The summation of these factors (land use, distance, and sub-section) was used to determine an equivalent land area, which was used to determine the apportionment of the associated outlet liability for each property.

Assessment Schedule - Updated 2026
Schedule 'A'
Philion Drain - Main Drain
Construction - For Future Maintenance

Property ID No.	Roll No.	Lot	Concession	Area Drained (Hectares)	Outlet	Benefit	Net Assessment *
1	0316016-005-04300	9+10	5	34.8	\$ 2,400.03	\$ 10,036.84	\$ 12,436.87
2	0316016-005-04102	9		0.1	\$ 11.58	\$ -	\$ 11.58
3	0316016-005-04104	9		0.4	\$ 29.68	\$ -	\$ 29.68
4	0316016-005-04100	10		1.0	\$ 118.82	\$ -	\$ 118.82
5	0316016-005-04190	10		0.3	\$ 52.20	\$ -	\$ 52.20
6	0316016-005-04620	10		9.3	\$ 273.75	\$ -	\$ 273.75
7	0316016-005-04600	11		26.8	\$ 268.36	\$ -	\$ 268.36
8	0316016-005-04612	11		0.5	\$ 37.52	\$ -	\$ 37.52
9	0316016-005-04610	11		18.1	\$ 808.71	\$ -	\$ 808.71
10	0316016-005-04900	12		5.1	\$ 30.99	\$ -	\$ 30.99
11	0316016-005-05000	12		0.6	\$ 4.08	\$ -	\$ 4.08
12	0316016-006-04515	9	6	0.3	\$ 32.36	\$ -	\$ 32.36
13	0316016-006-04520	9		0.3	\$ 32.98	\$ -	\$ 32.98
14	0316016-006-04600	9		12.3	\$ 169.06	\$ -	\$ 169.06
15	0316016-006-04800	10		12.0	\$ 164.56	\$ -	\$ 164.56
16	0316016-006-04500	10		26.8	\$ 526.44	\$ 1,310.49	\$ 1,836.93
17	0316016-006-04700	9+10		0.1	\$ 17.51	\$ -	\$ 17.51
18	0316016-006-04710	10		0.4	\$ 36.81	\$ -	\$ 36.81
19	0316016-006-04901	10		2.2	\$ 231.97	\$ -	\$ 231.97
20	0316016-006-04805	10		0.3	\$ 69.63	\$ -	\$ 69.63
21	0316016-006-04900	10		0.2	\$ 23.10	\$ -	\$ 23.10
22	0316016-006-04808	10		0.2	\$ 26.16	\$ -	\$ 26.16
23	0316016-006-04810	10		0.1	\$ 21.21	\$ -	\$ 21.21
24	0316016-006-04504	10		2.1	\$ 260.67	\$ -	\$ 260.67
25	0316016-006-05000	10		32.8	\$ 1,297.22	\$ 3,862.46	\$ 5,159.68

Assessment Schedule - Updated 2026
Schedule 'A'
Pillion Drain - Main Drain
Construction - For Future Maintenance

Property ID No.	Roll No.	Lot	Concession	Area Drained (Hectares)	Outlet	Benefit	Net Assessment *
26	0316016-006-05100	10	6	0.4	\$ 80.20	\$ 271.84	\$ 352.04
27	0316016-006-05350	11		0.6	\$ 135.49	\$ 425.26	\$ 560.75
28	0316016-006-05355	11		0.3	\$ 63.97	\$ 190.21	\$ 254.18
29	0316016-006-05360	11		0.3	\$ 62.70	\$ 180.10	\$ 242.80
30	0316016-006-05365	11		0.3	\$ 75.71	\$ 210.35	\$ 286.06
31	0316016-006-05370	11		0.3	\$ 72.50	\$ 191.99	\$ 264.49
32	0316016-006-05380	11		7.5	\$ 844.16	\$ 2,571.18	\$ 3,415.34
33	0316016-006-05374	11		0.4	\$ 124.17	\$ 305.00	\$ 429.17
34	0316016-006-05300	11		32.0	\$ 1,946.40	\$ 2,520.37	\$ 4,466.77
35	0316016-006-05700	12		18.6	\$ 232.02	\$ -	\$ 232.02
36	0316016-006-06000	12		4.9	\$ 52.01	\$ -	\$ 52.01
37	0316016-006-05900	12		2.4	\$ 20.97	\$ -	\$ 20.97
38	0316016-006-05800	12		5.3	\$ 126.21	\$ -	\$ 126.21
39	0316016-006-05600	11		28.1	\$ 2,594.73	\$ 2,605.69	\$ 5,200.42
Sub-Total					\$ 13,376.64	\$ 24,681.78	\$ 38,058.42

*Estimated Assessment does not include Farm Tax Credit (FTC). Farm Tax Credit eligibility to be confirmed at time of maintenance.

Assessment Schedule - Updated 2026
Schedule 'A'
Philion Drain - Main Drain
Construction - For Future Maintenance

Roads

Road Name	Owner	Outlet	Benefit	Net Assessment
Landry Road	City of Clarence/Rockland	\$ 391.78	\$ 1,214.34	\$ 1,606.12
Unopened Road Allowance b/w Con 5 & 6	City of Clarence/Rockland	\$ 278.33	\$ 616.19	\$ 894.52
County Road 1 (Du Golf Road)	United Counties of Prescott-Russell	\$ 3,503.32	\$ 5,937.62	\$ 9,440.94
Sub-Total		\$ 4,173.43	\$ 7,768.15	\$ 11,941.58

Summary

Real Properties	\$ 13,376.64	\$ 24,681.78	\$ 38,058.42
City of Clarence/Rockland	\$ 670.11	\$ 1,830.53	\$ 2,500.64
United Counties of Prescott and Russel	\$ 3,503.32	\$ 5,937.62	\$ 9,440.94
Sub-Total (Pre-Tax/Grant)	\$ 17,550.07	\$ 32,449.93	\$ 50,000.00

Assessment Schedule - Updated 2026
Schedule 'B'
Philion Drain - Branch No. 1
Construction - For Future Maintenance

Property ID No.	Roll No.	Lot	Concession	Area Drained (Hectares)	Outlet	Benefit	Net Assessment *
14	0316016-006-04600	9	6	1.0	\$ 11.58	\$ -	\$ 11.58
15	0316016-006-04800	10		4.1	\$ 226.60	\$ -	\$ 226.60
25	0316016-006-05000	10		18.5	\$ 3,931.66	\$ 6,061.88	\$ 9,993.54
26	0316016-006-05100	10		0.1	\$ 1.77	\$ 266.27	\$ 268.04
Sub-Total					\$ 4,171.61	\$ 6,328.15	\$ 10,499.76

*Estimated Assessment does not include Farm Tax Credit (FTC). Farm Tax Credit eligibility to be confirmed at time of maintenance.

Roads

Road Name	Owner	Outlet	Benefit	Net Assessment
County Road 1 (Du Golf Road)	United Counties of Prescott-Russell	\$ 1,096.82	\$ 3,678.42	\$ 4,775.24
Sub-Total		\$ 1,096.82	\$ 3,678.42	\$ 4,775.24

Summary

Real Properties	\$ 4,171.61	\$ 6,328.15	\$ 10,499.76
United Counties of Prescott and Russel	\$ 1,096.82	\$ 3,678.42	\$ 4,775.24
Sub-Total (Pre-Tax/Grant)	\$ 5,268.43	\$ 10,006.57	\$ 15,275.00

Assessment Schedule - Updated 2026
Schedule 'C'
Philion Drain - Branch No. 2
Construction - For Future Maintenance

Property ID No.	Roll No.	Lot	Concession	Area Drained (Hectares)	Outlet	Benefit	Net Assessment *
1	0316016-005-04300	10	5	5.8	\$ 251.55	\$ 898.95	\$ 1,150.50
6	0316016-005-04620	10		7.5	\$ 871.97	\$ 3,595.81	\$ 4,467.78
7	0316016-005-04600	11		26.8	\$ 1,629.83	\$ -	\$ 1,629.83
8	0316016-005-04612	11		0.1	\$ 13.32	\$ -	\$ 13.32
9	0316016-005-04610	11		12.6	\$ 1,460.93	\$ -	\$ 1,460.93
10	0316016-005-04900	12		1.1	\$ 8.72	\$ -	\$ 8.72
Sub-Total					\$ 4,236.32	\$ 4,494.76	\$ 8,731.08

*Estimated Assessment does not include Farm Tax Credit (FTC). Farm Tax Credit eligibility to be confirmed at time of maintenance.

Roads

Road Name	Owner	Outlet	Benefit	Net Assessment
County Road 1 (Du Golf Road)	United Counties of Prescott-Russell	\$ 604.16	\$ 4,494.76	\$ 5,098.92
Sub-Total		\$ 604.16	\$ 4,494.76	\$ 5,098.92

Summary

Real Properties	\$ 4,236.32	\$ 4,494.76	\$ 8,731.08
United Counties of Prescott and Russel	\$ 604.16	\$ 4,494.76	\$ 5,098.92
Sub-Total (Pre-Tax/Grant)	\$ 4,840.48	\$ 8,989.52	\$ 13,830.00

Assessment Schedule - Updated 2026
Schedule 'D'
Philion Drain - Branch No. 3
Construction + For Future Maintenance

Property ID No.	Roll No.	Lot	Concession	Area Drained (Hectares)	Outlet	Benefit	Special Assessment **	Net Assessment *
1	0316016-005-04300	10	5	4.1	\$ 182.12	\$ 491.64	\$ 10,090.00	\$ 673.76
6	0316016-005-04620	10		2.5	\$ 81.01	\$ 122.91	\$ -	\$ 203.92
Sub-Total					\$ 263.13	\$ 614.55	\$ 10,090.00	\$ 877.68

*Estimated Assessment does not include Farm Tax Credit (FTC). Farm Tax Credit eligibility to be confirmed at time of maintenance.

Roads

Road Name	Owner	Outlet	Benefit	Special Assessment	Net Assessment
County Road 1 (Du Golf Road)	United Counties of Prescott-Russell	\$ 47.78	\$ 614.54	\$ -	\$ 662.32
Sub-Total		\$ 47.78	\$ 614.54	\$ -	\$ 662.32

Summary

Real Properties	\$ 263.13	\$ 614.55	\$ 10,090.00	\$ 10,967.68
United Counties of Prescott and Russel	\$ 47.78	\$ 614.54	\$ -	\$ 662.32
Sub-Total (Pre-Tax/Grant)	\$ 310.91	\$ 1,229.09	\$ 10,090.00	\$ 11,630.00

**The Special Assessment is a one time assessment that should cover the costs associated with initial permitting for the realignment, and the re-shaping from Station 0+140 to 0+400; as well as the associated installation of permanent erosion control measures. Future maintenance should not account for this line item and future maintenance should be assessed solely based on the outlet / benefit breakdown. Future maintenance assessed costs include the reinstatement of permanent erosion control measures.

Assessment Schedule - Updated 2026

Schedule 'E'

Philion Drain - Main Drain

One Time Engineering Assessment for Update

Property ID No.	Roll No.	Lot	Concession	Area Drained (Hectares)	One Time Engineering
1	0316016-005-04300	9+10	5	34.8	\$ 3,192.91
2	0316016-005-04102	9		0.1	\$ 15.41
3	0316016-005-04104	9		0.4	\$ 39.48
4	0316016-005-04100	10		1.0	\$ 158.07
5	0316016-005-04190	10		0.3	\$ 69.44
6	0316016-005-04620	10		9.3	\$ 364.18
7	0316016-005-04600	11		26.8	\$ 357.01
8	0316016-005-04612	11		0.5	\$ 49.91
9	0316016-005-04610	11		18.1	\$ 1,075.88
10	0316016-005-04900	12		5.1	\$ 41.23
11	0316016-005-05000	12		0.6	\$ 5.43
12	0316016-006-04515	9	6	0.3	\$ 43.05
13	0316016-006-04520	9		0.3	\$ 43.87
14	0316016-006-04600	9		12.3	\$ 224.91
15	0316016-006-04800	10		12.0	\$ 218.93
16	0316016-006-04500	10		26.8	\$ 700.36
17	0316016-006-04700	9+10		0.1	\$ 23.29
18	0316016-006-04710	10		0.4	\$ 48.97
19	0316016-006-04901	10		2.2	\$ 308.61
20	0316016-006-04805	10		0.3	\$ 92.63

Assessment Schedule - Updated 2026

Schedule 'E'

Philion Drain - Main Drain

One Time Engineering Assessment for Update

Property ID No.	Roll No.	Lot	Concession	Area Drained (Hectares)	One Time Engineering
21	0316016-006-04900	10	6	0.2	\$ 30.74
22	0316016-006-04808	10		0.2	\$ 34.80
23	0316016-006-04810	10		0.1	\$ 28.22
24	0316016-006-04504	10		2.1	\$ 346.79
25	0316016-006-05000	10		32.8	\$ 1,725.77
26	0316016-006-05100	10		0.4	\$ 106.69
27	0316016-006-05350	11		0.6	\$ 180.26
28	0316016-006-05355	11		0.3	\$ 85.10
29	0316016-006-05360	11		0.3	\$ 83.41
30	0316016-006-05365	11		0.3	\$ 100.72
31	0316016-006-05370	11		0.3	\$ 96.45
32	0316016-006-05380	11		7.5	\$ 1,123.04
33	0316016-006-05374	11		0.4	\$ 165.19
34	0316016-006-05300	11		32.0	\$ 2,589.42
35	0316016-006-05700	12		18.6	\$ 308.68
36	0316016-006-06000	12		4.9	\$ 69.19
37	0316016-006-05900	12		2.4	\$ 27.90
38	0316016-006-05800	12		5.3	\$ 167.90
39	0316016-006-05600	11		28.1	\$ 3,451.94
Sub-Total				\$	17,795.78

*Estimated Assessment does not include Farm Tax Credit (FTC). Farm Tax Credit eligibility to be confirmed at time of

Assessment Schedule - Updated 2026

Schedule 'E'

Philion Drain - Main Drain

One Time Engineering Assessment for Update

Roads

Road Name	Owner	One Time Engineering
Landry Road	City of Clarence/Rockland	\$ 521.21
Unopened Road Allowance b/w Con 5 & 6	City of Clarence/Rockland	\$ 370.27
County Road 1 (Du Golf Road)	United Counties of Prescott-Russell	\$ 4,660.74
Sub-Total		\$ 5,552.22

Summary

Real Properties	\$ 17,795.78
City of Clarence/Rockland	\$ 891.48
United Counties of Prescott and Russel	\$ 4,660.74
Sub-Total (Pre-Tax/Grant)	\$ 23,348.00

Assessment Schedule - Updated 2026

Schedule 'F'

Philion Drain - Branch No. 1

One Time Engineering Assessment for Update

Property ID No.	Roll No.	Lot	Concession	Area Drained (Hectares)	One Time Engineering
14	0316016-006-04600	9	6	1.0	\$ 4.81
15	0316016-006-04800	10		4.1	\$ 94.15
25	0316016-006-05000	10		18.5	\$ 1,633.49
26	0316016-006-05100	10		0.1	\$ 0.73
Sub-Total					\$ 1,733.18

*Estimated Assessment does not include Farm Tax Credit (FTC). Farm Tax Credit eligibility to be confirmed at time of

Roads

Road Name	Owner	Outlet
County Road 1 (Du Golf Road)	United Counties of Prescott-Russell	\$ 455.70
Sub-Total		\$ 455.70

Summary

Real Properties	\$ 1,733.18
United Counties of Prescott and Russel	\$ 455.70
Sub-Total (Pre-Tax/Grant)	\$ 2,188.88

Assessment Schedule - Updated 2026

Schedule 'G'

Philion Drain - Branch No. 2

One Time Engineering Assessment for Update

Property ID No.	Roll No.	Lot	Concession	Area Drained (Hectares)	One Time Engineering
1	0316016-005-04300	10	5	5.8	\$ 159.25
6	0316016-005-04620	10		7.5	\$ 552.03
7	0316016-005-04600	11		26.8	\$ 1,031.81
8	0316016-005-04612	11		0.1	\$ 8.43
9	0316016-005-04610	11		12.6	\$ 924.88
10	0316016-005-04900	12		1.1	\$ 5.52
Sub-Total				\$ 2,681.92	

*Estimated Assessment does not include Farm Tax Credit (FTC). Farm Tax Credit eligibility to be confirmed at time of

Roads

Road Name	Owner	Outlet
County Road 1 (Du Golf Road)	United Counties of Prescott-Russell	\$ 382.50
Sub-Total		\$ 382.50

Summary

Real Properties	\$ 2,681.92
United Counties of Prescott and Russel	\$ 382.50
Sub-Total (Pre-Tax/Grant)	\$ 3,064.42

Assessment Schedule - Updated 2026

Schedule 'H'

Philion Drain - Branch No. 3

One-Time Assessment - Realignment + Engineering Fees

Property ID No.	Roll No.	Lot	Concession	Area Drained (Hectares)	One Time Engineering	Engineering Special Benefit	Net Assessment *
1	0316016-005-04300	10	5	4.1	\$ 341.92	\$ 5,000.00	\$ 5,341.92
6	0316016-005-04620	10		2.5	\$ 152.09	\$ -	\$ 152.09
Sub-Total					\$ 494.01	\$ 5,000.00	\$ 5,494.01

*Estimated Assessment does not include Farm Tax Credit (FTC). Farm Tax Credit eligibility to be confirmed at time of maintenance.

Roads

Road Name	Owner	Outlet	Special Benefit	Net Assessment
County Road 1 (Du Golf Road)	United Counties of Prescott-Russell	\$ 89.69	\$ -	\$ 89.69
Sub-Total		\$ 89.69	\$ -	\$ 89.69

Summary

Real Properties	\$ 494.01	\$ 5,000.00	\$ 5,494.01
United Counties of Prescott and Russel	\$ 89.69	\$ -	\$ 89.69
Sub-Total (Pre-Tax/Grant)	\$ 583.70	\$ 5,000.00	\$ 5,583.70

Assessment Schedule - Updated 2026
Summary of Engineering Assessed Costs
Philion Drain - Main Drain + Branch No. 1, Branch No. 2, Branch No. 3
One Time Engineering Assessment for Update

Property ID No.	Roll No.	Lot	Concession	Area Drained (Hectares)	Main Drain	Branch No 1	Branch No 2	Branch No 3	Total
1	0316016-005-04300	9+10	5	34.8	\$ 3,192.91	\$ -	\$ 159.25	\$ 5,341.92	\$ 8,694.08
2	0316016-005-04102	9		0.1	\$ 15.41	\$ -	\$ -	\$ -	\$ 15.41
3	0316016-005-04104	9		0.4	\$ 39.48	\$ -	\$ -	\$ -	\$ 39.48
4	0316016-005-04100	10		1.0	\$ 158.07	\$ -	\$ -	\$ -	\$ 158.07
5	0316016-005-04190	10		0.3	\$ 69.44	\$ -	\$ -	\$ -	\$ 69.44
6	0316016-005-04620	10		9.3	\$ 364.18	\$ -	\$ 552.03	\$ 152.09	\$ 1,068.30
7	0316016-005-04600	11		26.8	\$ 357.01	\$ -	\$ 1,031.81	\$ -	\$ 1,388.82
8	0316016-005-04612	11		0.5	\$ 49.91	\$ -	\$ 8.43	\$ -	\$ 58.34
9	0316016-005-04610	11		18.1	\$ 1,075.88	\$ -	\$ 924.88	\$ -	\$ 2,000.76
10	0316016-005-04900	12		5.1	\$ 41.23	\$ -	\$ 5.52	\$ -	\$ 46.75
11	0316016-005-05000	12		0.6	\$ 5.43	\$ -	\$ -	\$ -	\$ 5.43
12	0316016-006-04515	9	6	0.3	\$ 43.05	\$ -	\$ -	\$ -	\$ 43.05
13	0316016-006-04520	9		0.3	\$ 43.87	\$ -	\$ -	\$ -	\$ 43.87
14	0316016-006-04600	9		12.3	\$ 224.91	\$ 4.81	\$ -	\$ -	\$ 229.72
15	0316016-006-04800	10		12.0	\$ 218.93	\$ 94.15	\$ -	\$ -	\$ 313.08
16	0316016-006-04500	10		26.8	\$ 700.36	\$ -	\$ -	\$ -	\$ 700.36
17	0316016-006-04700	9+10		0.1	\$ 23.29	\$ -	\$ -	\$ -	\$ 23.29
18	0316016-006-04710	10		0.4	\$ 48.97	\$ -	\$ -	\$ -	\$ 48.97
19	0316016-006-04901	10		2.2	\$ 308.61	\$ -	\$ -	\$ -	\$ 308.61
20	0316016-006-04805	10		0.3	\$ 92.63	\$ -	\$ -	\$ -	\$ 92.63

Assessment Schedule - Updated 2026
Summary of Engineering Assessed Costs
Philion Drain - Main Drain + Branch No. 1, Branch No. 2, Branch No. 3
One Time Engineering Assessment for Update

Property ID No.	Roll No.	Lot	Concession	Area Drained (Hectares)	Main Drain	Branch No 1	Branch No 2	Branch No 3	Total
21	0316016-006-04900	10	6	0.2	\$ 30.74	\$ -	\$ -	\$ -	\$ 30.74
22	0316016-006-04808	10		0.2	\$ 34.80	\$ -	\$ -	\$ -	\$ 34.80
23	0316016-006-04810	10		0.1	\$ 28.22	\$ -	\$ -	\$ -	\$ 28.22
24	0316016-006-04504	10		2.1	\$ 346.79	\$ -	\$ -	\$ -	\$ 346.79
25	0316016-006-05000	10		32.8	\$ 1,725.77	\$ 1,633.49	\$ -	\$ -	\$ 3,359.26
26	0316016-006-05100	10		0.4	\$ 106.69	\$ 0.73	\$ -	\$ -	\$ 107.42
27	0316016-006-05350	11		0.6	\$ 180.26	\$ -	\$ -	\$ -	\$ 180.26
28	0316016-006-05355	11		0.3	\$ 85.10	\$ -	\$ -	\$ -	\$ 85.10
29	0316016-006-05360	11		0.3	\$ 83.41	\$ -	\$ -	\$ -	\$ 83.41
30	0316016-006-05365	11		0.3	\$ 100.72	\$ -	\$ -	\$ -	\$ 100.72
31	0316016-006-05370	11		0.3	\$ 96.45	\$ -	\$ -	\$ -	\$ 96.45
32	0316016-006-05380	11		7.5	\$ 1,123.04	\$ -	\$ -	\$ -	\$ 1,123.04
33	0316016-006-05374	11		0.4	\$ 165.19	\$ -	\$ -	\$ -	\$ 165.19
34	0316016-006-05300	11		32.0	\$ 2,589.42	\$ -	\$ -	\$ -	\$ 2,589.42
35	0316016-006-05700	12		18.6	\$ 308.68	\$ -	\$ -	\$ -	\$ 308.68
36	0316016-006-06000	12		4.9	\$ 69.19	\$ -	\$ -	\$ -	\$ 69.19

Assessment Schedule - Updated 2026
Summary of Engineering Assessed Costs
Philion Drain - Main Drain + Branch No. 1, Branch No. 2, Branch No. 3
One Time Engineering Assessment for Update

Property ID No.	Roll No.	Lot	Concession	Area Drained (Hectares)	Main Drain	Branch No 1	Branch No 2	Branch No 3	Total
37	0316016-006-05900	12	6	2.4	\$ 27.90	\$ -	\$ -	\$ -	\$ 27.90
38	0316016-006-05800	12		5.3	\$ 167.90	\$ -	\$ -	\$ -	\$ 167.90
39	0316016-006-05600	11		28.1	\$ 3,451.94	\$ -	\$ -	\$ -	\$ 3,451.94
Sub-Total					\$ 17,795.78	\$ 1,733.18	\$ 2,681.92	\$ 5,494.01	\$ 27,704.89

*Estimated Assessment does not include Farm Tax Credit (FTC). Farm Tax Credit eligibility to be confirmed at time of

Roads

Road Name	Owner	Main Drain	Branch No 1	Branch No 2	Branch No 3	Total
Landry Road	City of Clarence/Rockland	\$ 521.21	\$ -	\$ -	\$ -	\$ 521.21
Unopened Road Allowance b/w Con 5 & 6	City of Clarence/Rockland	\$ 370.27	\$ -	\$ -	\$ -	\$ 370.27
County Road 1 (Du Golf Road)	United Counties of Prescott-Russell	\$ 4,660.74	\$ 455.70	\$ 382.50	\$ 89.69	\$ 5,588.63
Sub-Total		\$ 5,552.22	\$ 455.70	\$ 382.50	\$ 89.69	\$ 6,480.11

Summary

Real Properties	\$ 17,795.78	\$ 1,733.18	\$ 2,681.92	\$ 5,494.01	\$ 27,704.89
City of Clarence/Rockland	\$ 891.48	\$ -	\$ -	\$ -	\$ 891.48
United Counties of Prescott and Russel	\$ 4,660.74	\$ 455.70	\$ 382.50	\$ 89.69	\$ 5,588.63
Sub-Total (Pre-Tax/Grant)	\$ 23,348.00	\$ 2,188.88	\$ 3,064.42	\$ 5,583.70	\$ 34,185.00

APPENDIX D

HYDROLOGIC AND HYDRAULIC ANALYSIS

CULVERT DESIGN CONSIDERATIONS

SOIL CONDITIONS

As part of the preparation of this report, the author conducted a review of AgMaps, the Geographic Information System managed by the Ministry of Agriculture, Food and Agribusiness, for reference to the soil conditions of the watershed. AgMaps identifies the Hydrologic Soil Group as a mixture of B-C and C-D.

The soils are described as Bearbrook and Achigan. Bearbrook is described as clay, stonefree, dark grey soils with non-calcareous layered red and grey clay parent materials with poor drainage. Achigan soils are described as gravel and sand, with minor fraction of silt and rarely of clay. These descriptions have been extracted from Soil Survey of Russell & Prescott Counties (Report No. 33 of the Ontario Soil Survey, Soils Research Institute, Ontario Agricultural College, Guelph, 1962).

HYDROLOGY & HYDRAULICS – CROSSINGS

Hydrologic design of all crossings and enclosures within the watershed was completed using Visual OTTHYMO 6.2 as well as the Rationale Method, while a hydraulic analysis was performed using HY-8. The Rationale Method was only applied when the contributing area was <1km². Calculations in Visual OTTHYMO were completed using a NASH unit hydrograph. Intensities were determined from the MTO IDF Curve Lookup. Peak flow rates were calculated for the 2, 5, 10, 25, 50 and 100-year storm events.

Peak flows were calculated using the Rationale Method as well as against the 12-Hour SCS Type II and 24-Hour SCS Type II distributions using Visual OTTHYMO. The most conservative result was then used as the design flow.

The minimum design standard has been determined in reference to the Highway Drainage Design Standards from the Ministry of Transportation, in reference to Section WC-1, which notes that for culverts with a diameter of less than 6m, local roads are to be designed to a 10-year storm event. Although a driveway entrance would not be considered a local road, there is no lesser standard specified in WC-1 (Water Crossings). Private entrances are only referenced in the Highway Drainage Design Standards in reference to crossings *not* on a watercourse. This approach is – in my opinion – considered conservative, however despite being conservative, there was limited need for an increase in culvert sizes on the drain, with the exception of requiring a change in material from CSP to HDPE. Furthermore, I feel that this approach will allow for accommodation of changes in climate over the next 30-40 years. Crossings intended for agricultural purposes (C1, C2, C15, C17 and C18) were sized to a 5-year storm event in fitting with the recommendations for a “field crossing” from *A Guide for Engineer's Working under the Drainage Act in Ontario – Publication 852*.

Elevations used in the calculation have been referenced back to the governing profile drawings for each drain. Shade Group staff conducted a field survey to collect elevations using a GNSS

receiver – and these values were used to assess relative elevations between the various factors (e.g. depth of channel, top of driveway/access, etc.). The surveyed data was then referenced back to the profile elevations.

Enclosed within the following pages is a breakdown of the hydrology for each culvert; and resulting hydraulic calculations. Full output results from Visual OTTHMO have not been enclosed given the sheer volume of the data. The results from VO have been summarized in the each of the aforementioned hydrologic analysis sheets. Similarly, visual output results from HY8 have not been enclosed, and instead the resulting Culvert Summary Table data has been enclosed.

Philion Drain - Branch 1

Methodology VISUAL OTTHYMO
Unit Hydrograph NASHYD
Description C1
Location Agricultural Field Entrance - Prop ID 25
Use Agricultural
Design Storm 5-Year HW/D < 1.5
Check Storm 100-Year

Watershed Area A= 7.03 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	6.800	66.08
Impervious	98.00	0.230	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	6.800	0.16
Impervious	0.90	0.230	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN < 70	Ia = 0.075S
S =	130.38
Ia =	9.78

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
427	1.87	52

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
0	0.00	0.00	0

Total Tc (min)	Total Tp (hr)
52	0.58

Intensity

Return Period	Intensity (mm/hr)
2-Year	21.8
5-Year	28.9
10-Year	33.7
25-Year	39.6
50-Year	44.0
100-Year	48.4

Peak Flow

Return Period	Results (m ³ /s)			
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max
2-Year	0.07	0.06	0.08	0.08
5-Year	0.09	0.11	0.14	0.14
10-Year	0.10	0.15	0.20	0.20
25-Year	0.12	0.21	0.27	0.27
50-Year	0.13	0.26	0.32	0.32
100-Year	0.15	0.31	0.38	0.38

Design Storm

Check Storm

Philion Drain - Branch 1

Methodology HY-8 RESULTS
Description C1
Pipe Diameter 450mm Ø HDPE
Pipe Length 12m
Design Storm 5-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.08	0.08	75.01	0.29	0.30	0.20	0.17	0.17	0.09	1.21	0.89
0.11	0.11	75.08	0.36	0.37	0.23	0.20	0.20	0.10	1.34	0.99
0.14	0.14	75.14	0.43	0.43	0.27	0.24	0.24	0.12	1.47	1.08
0.17	0.16	75.20	0.49	0.48	0.30	0.26	0.26	0.13	1.56	1.14
0.20	0.17	75.21	0.50	0.49	0.30	0.26	0.26	0.15	1.57	1.21
0.23	0.17	75.22	0.51	0.50	0.31	0.26	0.26	0.16	1.58	1.26
0.26	0.17	75.22	0.52	0.50	0.31	0.26	0.26	0.17	1.59	1.31
0.29	0.17	75.23	0.53	0.50	0.31	0.27	0.27	0.18	1.60	1.35
0.32	0.18	75.24	0.53	0.51	0.32	0.27	0.27	0.19	1.61	1.39
0.35	0.18	75.24	0.54	0.51	0.32	0.27	0.27	0.20	1.62	1.43
0.38	0.18	75.25	0.54	0.52	0.32	0.27	0.27	0.21	1.63	1.47

5-Year Check

Design Criteria HW/D < 1.5

HW = 0.43 m
D = 0.45 m
HW/D = 0.96

Pass

100-Year Check

HW Elev = 75.25 m
CL Elev = 75.19 m
Overtopping = 0.06 m

Philion Drain - Branch 1

Methodology VISUAL OTTHYMO
Unit Hydrograph NASHYD
Description C2
Location Agricultural Field Entrance - Prop ID 25
Use Agricultural
Design Storm 5-Year HW/D < 1.5
Check Storm 100-Year

Watershed Area A= 11.69 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	11.330	66.02
Impervious	98.00	0.360	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	11.330	0.15
Impervious	0.90	0.360	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN < 70	Ia = 0.075S
S =	130.75
Ia =	9.81

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
654	2.14	61

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
0	0.00	0.00	0

Total Tc (min)	Total Tp (hr)
61	0.69

Intensity

Return Period	Intensity (mm/hr)
2-Year	19.4
5-Year	25.7
10-Year	29.9
25-Year	35.1
50-Year	39.1
100-Year	42.9

Peak Flow

Return Period	Results (m ³ /s)			
	Rational Method	12-Hour SCS Type II	24-Hour SCS Type II	Max
2-Year	0.10	0.08	0.11	0.11
5-Year	0.13	0.16	0.21	0.21
10-Year	0.15	0.22	0.29	0.29
25-Year	0.18	0.31	0.39	0.39
50-Year	0.20	0.38	0.48	0.48
100-Year	0.21	0.46	0.57	0.57

Design Storm

Check Storm

Philion Drain - Branch 1

Methodology HY-8 RESULTS
Description C2
Pipe Diameter 600mm Ø HDPE
Pipe Length 15m
Design Storm 5-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.11	0.11	70.13	0.30	0.33	0.27	0.18	0.18	0.14	1.23	0.72
0.16	0.16	70.20	0.37	0.40	0.32	0.22	0.22	0.17	1.37	0.80
0.21	0.21	70.28	0.45	0.49	0.39	0.26	0.26	0.20	1.51	0.88
0.25	0.25	70.34	0.51	0.54	0.44	0.29	0.29	0.22	1.60	0.93
0.29	0.29	70.41	0.59	0.61	0.54	0.32	0.32	0.24	1.71	0.97
0.34	0.34	70.49	0.67	0.69	0.54	0.35	0.35	0.26	1.81	1.02
0.39	0.39	70.66	0.77	0.87	0.54	0.37	0.37	0.28	1.92	1.05
0.43	0.43	70.83	0.87	1.03	0.54	0.39	0.39	0.29	2.02	1.09
0.48	0.48	71.01	1.00	1.22	0.54	0.41	0.41	0.31	2.13	1.12
0.52	0.52	71.18	1.14	1.38	0.54	0.43	0.43	0.33	2.24	1.15
0.57	0.54	71.23	1.18	1.43	0.54	0.44	0.44	0.34	2.27	1.18

5-Year Check

Design Criteria HW/D < 1.5

HW = 0.45 m

D = 0.6 m

HW/D = 0.75 **Pass**

100-Year Check

HW Elev = 71.23 m

CL Elev = 71.21 m

Overtopping = 0.02 m

Philion Drain - Main Drain

Methodology
Unit Hydrograph
Description
Location
Use
Design Storm
Check Storm

VISUAL OTTHYMO
NASHYD
C3
Commercial Entrance - Prop ID 34
Commercial Access
 10-Year HW/D < 1.5
 100-Year

Watershed Area A= 17.61 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	17.350	65.49
Impervious	98.00	0.260	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	17.350	0.14
Impervious	0.90	0.260	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN < 70	Ia = 0.075S
S =	133.86
Ia =	10.04

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
746	1.27	79

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
0	0.00	0.00	0

Total Tc (min)	Total Tp (hr)
79	0.88

Intensity

Return Period	Intensity (mm/hr)
2-Year	16.3
5-Year	21.6
10-Year	25.1
25-Year	29.5
50-Year	32.8
100-Year	36.0

Peak Flow

Return Period	Results (m ³ /s)			
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max
2-Year	0.11	0.10	0.14	0.14
5-Year	0.15	0.20	0.26	0.26
10-Year	0.17	0.27	0.35	0.35
25-Year	0.20	0.38	0.48	0.48
50-Year	0.23	0.47	0.59	0.59
100-Year	0.25	0.56	0.70	0.70

Design Storm

Check Storm

Philion Drain - Main Drain

Methodology HY-8 RESULTS
Description C3
Pipe Diameter 750mm HDPE
Pipe Length 15m
Design Storm 10-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.14	0.14	72.69	0.30	0.33	0.20	0.19	0.19	0.12	1.25	1.09
0.20	0.20	72.76	0.37	0.41	0.25	0.23	0.23	0.14	1.38	1.21
0.25	0.25	72.83	0.44	0.47	0.29	0.26	0.26	0.17	1.49	1.31
0.31	0.31	72.89	0.50	0.53	0.32	0.30	0.30	0.19	1.59	1.39
0.35	0.35	72.93	0.55	0.58	0.35	0.32	0.32	0.20	1.66	1.45
0.42	0.42	73.01	0.62	0.65	0.39	0.35	0.35	0.22	1.77	1.53
0.48	0.48	73.06	0.68	0.71	0.42	0.38	0.38	0.24	1.86	1.59
0.53	0.53	73.12	0.75	0.76	0.44	0.41	0.41	0.25	1.94	1.64
0.59	0.59	73.18	0.83~	0.81	0.47	0.43	0.43	0.27	2.02	1.69
0.64	0.64	73.26	0.91~	0.87	0.51	0.45	0.45	0.28	2.10	1.73
0.70	0.70	73.35	0.99~	0.92	0.54	0.47	0.47	0.29	2.18	1.77

10-Year Check

Design Criteria HW/D < 1.5

HW = 0.55 m

D = 0.75 m

HW/D = 0.73 **Pass**

100-Year Check

HW Elev = 73.35 m

CL Elev = 74.21 m

Overtopping = 0 m

Philion Drain - Main Drain

Methodology
Unit Hydrograph
Description
Location
Use
Design Storm
Check Storm

VISUAL OTTHYMO
NASHYD
C4
Secondary Entrance - Prop ID 34
Commercial
10-Year HW/D < 1.5
100-Year

Watershed Area A= 18.50 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	18.220	65.50
Impervious	98.00	0.280	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	18.220	0.14
Impervious	0.90	0.280	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	Ia = 0.075S
S =	133.79
Ia =	10.03

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
746	1.27	79

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
30	2.40	0.71	1
24	1.10	0.48	1

Total Tc (min)	Total Tp (hr)
80	0.90

Intensity

Return Period	Intensity (mm/hr)
2-Year	16.1
5-Year	21.3
10-Year	24.8
25-Year	29.1
50-Year	32.4
100-Year	35.6

Peak Flow

Return Period	Results (m ³ /s)			
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max
2-Year	0.12	0.10	0.14	0.14
5-Year	0.16	0.20	0.27	0.27
10-Year	0.18	0.28	0.37	0.37
25-Year	0.21	0.39	0.50	0.50
50-Year	0.24	0.49	0.61	0.61
100-Year	0.26	0.58	0.72	0.72

Design Storm

Check Storm

Philion Drain - Main Drain

Methodology HY-8 RESULTS
Description C4
Pipe Diameter 750mm HDPE
Pipe Length 15m
Design Storm 10-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.14	0.14	71.52	0.30	0.33	0.26	0.19	0.19	0.15	1.25	0.83
0.20	0.20	71.59	0.38	0.41	0.32	0.23	0.23	0.18	1.38	0.93
0.26	0.26	71.66	0.45	0.48	0.37	0.26	0.26	0.21	1.50	1.00
0.31	0.31	71.72	0.51	0.54	0.41	0.30	0.30	0.23	1.60	1.07
0.37	0.37	71.78	0.57	0.60	0.46	0.33	0.33	0.26	1.70	1.12
0.43	0.43	71.85	0.64	0.66	0.51	0.36	0.36	0.28	1.79	1.17
0.49	0.49	71.91	0.70	0.72	0.56	0.39	0.39	0.30	1.87	1.21
0.55	0.55	71.97	0.77	0.78	0.63	0.41	0.41	0.32	1.96	1.25
0.60	0.60	72.04	0.85~	0.85	0.68	0.44	0.44	0.33	2.04	1.28
0.66	0.66	72.12	0.94~	0.92	0.68	0.46	0.46	0.35	2.13	1.32
0.72	0.72	72.24	1.03	1.05	0.68	0.48	0.48	0.37	2.21	1.35

10-Year Check

Design Criteria HW/D < 1.5

HW = 0.57 m

D = 0.75 m

HW/D = 0.76 **Pass**

100-Year Check

HW Elev = 72.24 m

CL Elev = 73.13 m

Overtopping = 0.00 m

Philion Drain - Main Drain

Methodology	VISUAL OTTHYMO	
Unit Hydrograph	NASHYD	
Description	C5	
Location	Residential Entrance - Prop ID 33	
Use	Residential	
Design Storm	10-Year	HW/D < 1.5
Check Storm	100-Year	

Watershed Area A= 20.73 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	20.300	65.68
Impervious	98.00	0.430	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	20.300	0.15
Impervious	0.90	0.430	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	Ia = 0.075S
S =	132.70
Ia =	9.95

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
746	1.27	78

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
30	2.40	0.71	1
183	1.10	0.48	6
111	0.23	0.22	8

Total Tc (min)	Total Tp (hr)
94	1.05

Intensity

Return Period	Intensity (mm/hr)
2-Year	14.4
5-Year	19.1
10-Year	22.2
25-Year	26.1
50-Year	29.0
100-Year	31.9

Peak Flow

Return Period	Results (m ³ /s)				
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max	
2-Year	0.12	0.10	0.14	0.14	Design Storm
5-Year	0.16	0.20	0.27	0.27	
10-Year	0.19	0.28	0.37	0.37	
25-Year	0.22	0.40	0.50	0.50	
50-Year	0.24	0.49	0.61	0.61	
100-Year	0.27	0.58	0.72	0.72	Check Storm

Philion Drain - Main Drain

Methodology HY-8 RESULTS
Description C5
Pipe Diameter 750mm HDPE
Pipe Length 12m
Design Storm 10-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.14	0.14	69.34	0.30	0.33	0.26	0.19	0.26	0.23	0.84	0.48
0.20	0.20	69.42	0.38	0.41	0.32	0.23	0.31	0.28	0.98	0.53
0.26	0.26	69.49	0.45	0.48	0.37	0.26	0.35	0.32	1.10	0.57
0.31	0.31	69.55	0.51	0.54	0.41	0.30	0.39	0.36	1.21	0.61
0.37	0.37	69.61	0.57	0.60	0.46	0.33	0.42	0.39	1.30	0.64
0.43	0.43	69.67	0.64	0.66	0.50	0.36	0.45	0.42	1.41	0.66
0.49	0.49	69.73	0.70	0.72	0.56	0.39	0.48	0.45	1.50	0.69
0.55	0.55	69.79	0.77	0.78	0.62	0.41	0.50	0.48	1.60	0.71
0.60	0.60	69.86	0.85~	0.85	0.68	0.44	0.53	0.50	1.69	0.73
0.66	0.66	69.95	0.94~	0.92	0.68	0.46	0.55	0.52	1.79	0.74
0.72	0.72	70.04	1.03	1.03	0.68	0.48	0.58	0.55	1.88	0.76

10-Year Check

Design Criteria HW/D < 1.5

HW = 0.57 m

D = 0.75 m

HW/D = 0.76 **Pass**

100-Year Check

HW Elev = 70.04 m

CL Elev = 70.54 m

Overtopping = 0.00 m

Philion Drain - Main Drain

Methodology VISUAL OTTHYMO
Unit Hydrograph NASHYD
Description C6
Location Residential Entrance - Prop ID 32
Use Residential
Design Storm 10-Year HW/D < 1.5
Check Storm 100-Year

Watershed Area A= 56.89 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	56.440	65.26
Impervious	98.00	0.450	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	56.440	0.14
Impervious	0.90	0.450	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	la = 0.075S
S =	135.21
la =	10.14

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
746	1.27	79

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
30	2.40	0.71	1
183	1.10	0.48	6
146	0.23	0.22	11

Total Tc (min)	Total Tp (hr)
97	1.09

Intensity

Return Period	Intensity (mm/hr)
2-Year	14.0
5-Year	18.6
10-Year	21.7
25-Year	25.4
50-Year	28.3
100-Year	31.1

Peak Flow

Return Period	Results (m ³ /s)				
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max	
2-Year	0.30	0.27	0.37	0.37	Design Storm
5-Year	0.40	0.53	0.70	0.70	
10-Year	0.47	0.74	0.96	0.96	
25-Year	0.55	1.03	1.32	1.32	
50-Year	0.61	1.28	1.61	1.61	
100-Year	0.67	1.53	1.90	1.90	Check Storm

Philion Drain - Main Drain

Methodology HY-8 RESULTS
Description C6
Pipe Diameter 900mm HDPE
Pipe Length 12m
Design Storm 10-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.37	0.37	69.49	0.51	0.57	0.63	0.30	0.31	0.39	1.56	0.64
0.52	0.52	69.62	0.64	0.70	0.81	0.37	0.39	0.47	1.71	0.70
0.68	0.68	69.74	0.77	0.82	0.81	0.43	0.45	0.53	1.86	0.75
0.83	0.83	69.87	0.90	0.94	0.81	0.48	0.51	0.59	2.01	0.79
0.96	0.96	69.98	1.03	1.06	0.81	0.52	0.55	0.63	2.14	0.82
1.14	1.14	70.21	1.24	1.29	0.81	0.58	0.60	0.68	2.31	0.86
1.29	1.27	70.39	1.42	1.47	0.81	0.61	0.65	0.73	2.42	0.89
1.44	1.28	70.43	1.44	1.51	0.81	0.61	0.69	0.77	2.33	0.91
1.59	1.28	70.46	1.45	1.53	0.81	0.61	0.73	0.81	2.25	0.93
1.75	1.28	70.48	1.44	1.56	0.81	0.61	0.76	0.84	2.18	0.96
1.90	1.27	70.50	1.42	1.58	0.81	0.61	0.79	0.87	2.12	0.98

10-Year Check

Design Criteria HW/D < 1.5

HW = 1.03 m

D = 0.9 m

HW/D = 1.14 **Pass**

100-Year Check

HW Elev = 70.50 m

CL Elev = 70.38 m

Overtopping = 0.12 m

Philion Drain - Main Drain

Methodology VISUAL OTTHYMO
Unit Hydrograph NASHYD
Description C7
Location Residential Entrance - Prop ID 31
Use Residential
Design Storm 10-Year HW/D < 1.5
Check Storm 100-Year

Watershed Area A= 59.66 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	59.180	65.27
Impervious	98.00	0.480	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	59.180	0.14
Impervious	0.90	0.480	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	la = 0.075S
S =	135.18
la =	10.14

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
746	1.27	79

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
30	2.40	0.71	1
183	1.10	0.48	6
211	0.23	0.22	16

Total Tc (min)	Total Tp (hr)
102	1.14

Intensity

Return Period	Intensity (mm/hr)
2-Year	13.6
5-Year	18.0
10-Year	20.9
25-Year	24.6
50-Year	27.3
100-Year	30.0

Peak Flow

Return Period	Results (m ³ /s)				
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max	
2-Year	0.31	0.27	0.38	0.38	Design Storm
5-Year	0.41	0.54	0.71	0.71	
10-Year	0.47	0.75	0.97	0.97	
25-Year	0.56	1.05	1.33	1.33	
50-Year	0.62	1.29	1.62	1.62	Check Storm
100-Year	0.68	1.55	1.93	1.93	

Philion Drain - Main Drain

Methodology HY-8 RESULTS
Description C7
Pipe Diameter 900mm HDPE
Pipe Length 12m
Design Storm 10-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.38	0.38	69.35	0.52	0.58	0.66	0.31	0.31	0.39	1.61	0.64
0.53	0.53	69.48	0.65	0.71	0.81	0.38	0.38	0.47	1.77	0.70
0.69	0.69	69.60	0.78	0.83	0.81	0.43	0.45	0.54	1.92	0.75
0.84	0.84	69.73	0.92	0.96	0.81	0.49	0.50	0.59	2.07	0.79
0.97	0.97	69.84	1.04	1.07	0.81	0.53	0.54	0.63	2.19	0.82
1.15	1.15	70.09	1.27	1.32	0.81	0.58	0.60	0.69	2.37	0.86
1.31	1.31	70.31	1.49	1.54	0.81	0.62	0.64	0.73	2.52	0.89
1.47	1.33	70.35	1.52	1.58	0.81	0.63	0.68	0.77	2.44	0.91
1.62	1.34	70.38	1.54	1.61	0.81	0.63	0.72	0.81	2.36	0.94
1.78	1.34	70.40	1.53	1.63	0.81	0.63	0.76	0.85	2.29	0.96
1.93	1.33	70.42	1.52	1.65	0.81	0.62	0.79	0.88	2.22	0.98

10-Year Check

Design Criteria HW/D < 1.5

HW = 1.04 m

D = 0.9 m

HW/D = 1.16 **Pass**

100-Year Check

HW Elev = 70.42 m

CL Elev = 70.31 m

Overtopping = 0.11 m

Philion Drain - Main Drain

Methodology VISUAL OTTHYMO
Unit Hydrograph NASHYD
Description C8
Location Residential Entrance - Prop ID 30
Use Residential
Design Storm 10-Year HW/D < 1.5
Check Storm 100-Year

Watershed Area A= 61.32 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	60.810	65.27
Impervious	98.00	0.510	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	60.810	0.14
Impervious	0.90	0.510	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	Ia = 0.075S
S =	135.13
Ia =	10.13

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
746	1.27	79

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
30	2.40	0.71	1
183	1.10	0.48	6
266	0.23	0.22	20

Total Tc (min)	Total Tp (hr)
107	1.19

Intensity

Return Period	Intensity (mm/hr)
2-Year	13.2
5-Year	17.5
10-Year	20.4
25-Year	23.9
50-Year	26.6
100-Year	29.2

Peak Flow

Return Period	Results (m ³ /s)				
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max	
2-Year	0.31	0.27	0.38	0.38	Design Storm
5-Year	0.41	0.53	0.71	0.71	
10-Year	0.47	0.75	0.97	0.97	
25-Year	0.56	1.04	1.32	1.32	
50-Year	0.62	1.29	1.61	1.61	Check Storm
100-Year	0.68	1.54	1.91	1.91	

Philion Drain - Main Drain

Methodology HY-8 RESULTS
Description C8
Pipe Diameter 900mm HDPE
Pipe Length 12m
Design Storm 10-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.38	0.38	69.24	0.52	0.58	0.66	0.31	0.31	0.39	1.61	0.64
0.53	0.53	69.37	0.65	0.71	0.81	0.37	0.38	0.47	1.77	0.70
0.69	0.69	69.49	0.77	0.83	0.81	0.43	0.44	0.53	1.92	0.75
0.84	0.84	69.61	0.91	0.95	0.81	0.49	0.50	0.59	2.06	0.79
0.97	0.97	69.73	1.04	1.07	0.81	0.53	0.54	0.63	2.19	0.82
1.14	1.14	69.96	1.25	1.30	0.81	0.58	0.60	0.69	2.36	0.86
1.30	1.30	70.18	1.47	1.52	0.81	0.62	0.64	0.73	2.51	0.89
1.45	1.34	70.24	1.53	1.58	0.81	0.63	0.68	0.77	2.46	0.91
1.60	1.34	70.27	1.54	1.61	0.81	0.63	0.72	0.81	2.38	0.94
1.76	1.34	70.29	1.54	1.63	0.81	0.63	0.75	0.84	2.30	0.96
1.91	1.34	70.32	1.53	1.66	0.81	0.63	0.79	0.88	2.24	0.98

10-Year Check

Design Criteria HW/D < 1.5

HW = 1.04 m

D = 0.9 m

HW/D = 1.16 **Pass**

100-Year Check

HW Elev = 70.32 m

CL Elev = 70.20 m

Overtopping = 0.12 m

Philion Drain - Main Drain

Methodology VISUAL OTTHYMO
Unit Hydrograph NASHYD
Description C9
Location Residential Entrance - Prop ID 29
Use Residential
Design Storm 10-Year HW/D < 1.5
Check Storm 100-Year

Watershed Area A= 61.87 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	61.340	65.28
Impervious	98.00	0.530	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	61.340	0.14
Impervious	0.90	0.530	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	la = 0.075S
S =	135.08
la =	10.13

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
746	1.27	79

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
30	2.40	0.71	1
183	1.10	0.48	6
304	0.23	0.22	23

Total Tc (min)	Total Tp (hr)
109	1.22

Intensity

Return Period	Intensity (mm/hr)
2-Year	12.9
5-Year	17.2
10-Year	20.0
25-Year	23.5
50-Year	26.1
100-Year	28.7

Peak Flow

Return Period	Results (m ³ /s)				
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max	
2-Year	0.30	0.27	0.37	0.37	Design Storm
5-Year	0.40	0.53	0.70	0.70	
10-Year	0.47	0.74	0.96	0.96	
25-Year	0.55	1.03	1.31	1.31	
50-Year	0.61	1.27	1.60	1.60	
100-Year	0.67	1.53	1.89	1.89	Check Storm

Philion Drain - Main Drain

Methodology HY-8 RESULTS
Description C9
Pipe Diameter 900mm HDPE
Pipe Length 12m
Design Storm 10-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.37	0.37	69.14	0.51	0.57	0.65	0.30	0.30	0.39	1.60	0.64
0.52	0.52	69.27	0.64	0.70	0.81	0.37	0.37	0.46	1.76	0.70
0.67	0.67	69.39	0.76	0.82	0.81	0.43	0.44	0.53	1.90	0.75
0.83	0.83	69.51	0.90	0.94	0.81	0.48	0.50	0.59	2.05	0.79
0.96	0.96	69.63	1.03	1.06	0.81	0.52	0.54	0.63	2.18	0.82
1.13	1.13	69.86	1.23	1.29	0.81	0.57	0.59	0.68	2.34	0.86
1.28	1.26	70.05	1.42	1.48	0.81	0.61	0.64	0.73	2.46	0.88
1.43	1.29	70.09	1.46	1.52	0.81	0.62	0.68	0.77	2.38	0.91
1.59	1.30	70.11	1.47	1.54	0.81	0.62	0.71	0.80	2.30	0.93
1.74	1.29	70.14	1.46	1.57	0.81	0.62	0.75	0.84	2.22	0.96
1.89	1.28	70.16	1.45	1.59	0.81	0.61	0.78	0.87	2.16	0.98

10-Year Check

Design Criteria HW/D < 1.5

HW = 1.03 m

D = 0.9 m

HW/D = 1.14 **Pass**

100-Year Check

HW Elev = 70.16 m

CL Elev = 70.04 m

Overtopping = 0.12 m

Philion Drain - Main Drain

Methodology VISUAL OTTHYMO
Unit Hydrograph NASHYD
Description C10
Location Residential Entrance - Prop ID 28
Use Residential
Design Storm 10-Year HW/D < 1.5
Check Storm 100-Year

Watershed Area A= 62.92 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	62.360	65.29
Impervious	98.00	0.560	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	62.360	0.14
Impervious	0.90	0.560	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	Ia = 0.075S
S =	135.01
Ia =	10.13

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
746	1.27	79

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
30	2.40	0.71	1
183	1.10	0.48	6
354	0.23	0.22	27

Total Tc (min)	Total Tp (hr)
113	1.26

Intensity

Return Period	Intensity (mm/hr)
2-Year	12.6
5-Year	16.7
10-Year	19.5
25-Year	22.9
50-Year	25.5
100-Year	28.0

Peak Flow

Return Period	Results (m ³ /s)				
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max	
2-Year	0.30	0.27	0.37	0.37	Design Storm
5-Year	0.40	0.52	0.70	0.70	
10-Year	0.47	0.73	0.95	0.95	
25-Year	0.55	1.02	1.30	1.30	
50-Year	0.61	1.26	1.59	1.59	
100-Year	0.67	1.51	1.88	1.88	Check Storm

Philion Drain - Main Drain

Methodology HY-8 RESULTS
Description C10
Pipe Diameter 900mm HDPE
Pipe Length 15m
Design Storm 10-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.37	0.37	69.03	0.51	0.58	0.72	0.30	0.30	0.39	1.60	0.64
0.52	0.52	69.16	0.64	0.71	0.81	0.37	0.37	0.46	1.76	0.70
0.67	0.67	69.28	0.76	0.83	0.81	0.43	0.44	0.53	1.90	0.75
0.82	0.82	69.41	0.90	0.96	0.81	0.48	0.49	0.58	2.05	0.79
0.95	0.95	69.54	1.02	1.09	0.81	0.52	0.54	0.63	2.17	0.82
1.12	1.12	69.81	1.23	1.36	0.81	0.57	0.59	0.68	2.34	0.85
1.28	1.28	70.03	1.44	1.58	0.81	0.61	0.63	0.72	2.49	0.88
1.43	1.31	70.10	1.49	1.65	0.81	0.62	0.67	0.76	2.43	0.91
1.58	1.32	70.12	1.51	1.67	0.81	0.62	0.71	0.80	2.35	0.93
1.73	1.32	70.14	1.51	1.69	0.81	0.62	0.75	0.84	2.28	0.95
1.88	1.31	70.17	1.49	1.72	0.81	0.62	0.78	0.87	2.20	0.98

10-Year Check

Design Criteria HW/D < 1.5

HW = 1.02 m

D = 0.9 m

HW/D = 1.13 **Pass**

100-Year Check

HW Elev = 70.17 m

CL Elev = 70.06 m

Overtopping = 0.11 m

Philion Drain - Main Drain

Methodology VISUAL OTTHYMO
Unit Hydrograph NASHYD
Description C11
Location Residential Entrance - Prop ID 27
Use Residential
Design Storm 10-Year HW/D < 1.5
Check Storm 100-Year

Watershed Area A= 64.27 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	63.690	65.30
Impervious	98.00	0.580	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	63.690	0.14
Impervious	0.90	0.580	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	la = 0.075S
S =	134.99
la =	10.12

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
746	1.27	79

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
30	2.40	0.71	1
183	1.10	0.48	6
397	0.23	0.22	30

Total Tc (min)	Total Tp (hr)
116	1.30

Intensity

Return Period	Intensity (mm/hr)
2-Year	12.4
5-Year	16.4
10-Year	19.1
25-Year	22.5
50-Year	25.0
100-Year	27.4

Peak Flow

Return Period	Results (m ³ /s)			
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max
2-Year	0.30	0.27	0.37	0.37
5-Year	0.40	0.52	0.69	0.69
10-Year	0.47	0.73	0.95	0.95
25-Year	0.55	1.02	1.30	1.30
50-Year	0.61	1.26	1.59	1.59
100-Year	0.67	1.51	1.88	1.88

Design Storm

Check Storm

Philion Drain - Main Drain

Methodology HY-8 RESULTS
Description C11
Pipe Diameter 900mm HDPE
Pipe Length 15m
Design Storm 10-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.37	0.37	68.94	0.51	0.58	0.63	0.30	0.30	0.39	1.60	0.64
0.52	0.52	69.06	0.64	0.70	0.81	0.37	0.37	0.46	1.76	0.70
0.67	0.67	69.19	0.76	0.83	0.81	0.43	0.44	0.53	1.90	0.75
0.82	0.82	69.31	0.90	0.95	0.81	0.48	0.49	0.58	2.05	0.79
0.95	0.95	69.44	1.02	1.08	0.81	0.52	0.54	0.63	2.17	0.82
1.12	1.12	69.71	1.23	1.35	0.81	0.57	0.59	0.68	2.34	0.85
1.28	1.27	69.92	1.43	1.56	0.81	0.61	0.63	0.72	2.48	0.88
1.43	1.29	69.96	1.46	1.60	0.81	0.62	0.67	0.76	2.39	0.91
1.58	1.30	69.99	1.47	1.63	0.81	0.62	0.71	0.80	2.30	0.93
1.73	1.29	70.01	1.46	1.65	0.81	0.62	0.75	0.84	2.23	0.95
1.88	1.28	70.03	1.45	1.67	0.81	0.61	0.78	0.87	2.16	0.98

10-Year Check

Design Criteria HW/D < 1.5

HW = 1.02 m

D = 0.9 m

HW/D = 1.13 **Pass**

100-Year Check

HW Elev = 70.03 m

CL Elev = 69.92 m

Overtopping = 0.11 m

Philion Drain - Main Drain

Methodology VISUAL OTTHYMO
Unit Hydrograph NASHYD
Description R12
Location Du Golf Road Crossing (County Road)
Use Collector Road
Design Storm 25-Year HW/D < 1.5
Check Storm 100-Year

Watershed Area A= 115.42 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	114.770	65.19
Impervious	98.00	0.650	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	114.770	0.13
Impervious	0.90	0.650	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	Ia = 0.075S
S =	135.66
Ia =	10.17

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
746	1.27	79

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
30	2.40	0.71	1
183	1.10	0.48	6
439	0.23	0.22	33

Total Tc (min)	Total Tp (hr)
120	1.34

Peak Flow

Return Period	Results (m ³ /s)				
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max	
2-Year	N/A	0.46	0.64	0.64	Design Storm
5-Year		0.91	1.21	1.21	
10-Year		1.28	1.66	1.66	
25-Year		1.78	2.27	2.27	
50-Year		2.20	2.77	2.77	
100-Year		2.63	3.29	3.29	Check Storm

Philion Drain - Main Drain

Methodology HY-8 RESULTS
Description R12
Pipe Diameter 1400mm HDPE
Pipe Length 21m
Design Storm 25-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.64	0.64	68.88	0.56	0.66	0.46	0.40	0.50	0.52	1.26	0.74
0.91	0.91	69.02	0.71	0.80	0.55	0.48	0.60	0.61	1.41	0.81
1.17	1.17	69.14	0.83	0.93	0.64	0.55	0.68	0.69	1.55	0.86
1.44	1.44	69.25	0.95	1.04	0.72	0.61	0.75	0.77	1.68	0.91
1.70	1.70	69.36	1.07	1.15	0.78	0.67	0.82	0.83	1.80	0.95
1.96	1.96	69.47	1.18	1.25	0.84	0.73	0.87	0.89	1.92	0.99
2.27	2.27	69.58	1.31	1.37	0.92	0.78	0.94	0.95	2.05	1.02
2.49	2.49	69.67	1.41	1.45	0.97	0.82	0.98	0.99	2.15	1.05
2.76	2.76	69.76	1.53	1.55	1.03	0.87	1.03	1.04	2.27	1.07
3.02	3.02	69.88	1.67~	1.65	1.09	0.91	1.07	1.08	2.38	1.10
3.29	3.29	70.02	1.81~	1.75	1.16	0.95	1.11	1.13	2.49	1.12

25-Year Check

Design Criteria HW/D < 1.5
 HW = 1.31 m
 D = 1.4 m
 HW/D = 0.94 **Pass**

100-Year Check

HW Elev = 70.02 m
 CL Elev = 70.12 m
 Freeboard = 0.10 m

Philion Drain - Main Drain

Methodology VISUAL OTTHYMO
Unit Hydrograph NASHYD
Description C13
Location Residential Entrance - Prop ID 26
Use Residential
Design Storm 10-Year HW/D < 1.5
Check Storm 100-Year

Watershed Area A= 130.32 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	128.990	65.34
Impervious	98.00	1.330	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	128.990	0.14
Impervious	0.90	1.330	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	Ia = 0.075S
S =	134.75
Ia =	10.11

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
746	1.27	79

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
30	2.40	0.71	1
183	1.10	0.48	6
439	0.23	0.22	33
65	0.14	0.17	6

Total Tc (min)	Total Tp (hr)
126	1.41

Peak Flow

Return Period	Results (m ³ /s)				
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max	
2-Year	N/A	0.51	0.71	0.71	Design Storm
5-Year		1.00	1.33	1.33	
10-Year		1.40	1.81	1.81	
25-Year		1.94	2.48	2.48	
50-Year		2.40	3.02	3.02	
100-Year		2.87	3.57	3.57	Check Storm

Philion Drain - Main Drain

Methodology HY-8 RESULTS
Description C13
Pipe Diameter 1200mm HDPE
Pipe Length 15m
Design Storm 10-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.71	0.71	68.68	0.65	0.73	0.86	0.39	0.49	0.61	1.36	0.63
1.00	1.00	68.84	0.81	0.89	1.08	0.47	0.60	0.72	1.53	0.69
1.28	1.28	68.99	0.96	1.04	1.08	0.55	0.70	0.82	1.69	0.74
1.57	1.57	69.14	1.12	1.19	1.08	0.61	0.78	0.90	1.86	0.77
1.81	1.81	69.28	1.27	1.33	1.08	0.67	0.84	0.96	2.00	0.80
2.14	1.99	69.41	1.40	1.46	1.08	0.70	0.92	1.04	2.04	0.84
2.43	1.97	69.46	1.37	1.51	1.08	0.70	0.98	1.10	1.92	0.86
2.71	1.90	69.50	1.33	1.55	1.08	0.69	1.03	1.15	1.81	0.89
3.00	1.83	69.54	1.28	1.59	1.08	0.67	1.08	1.21	1.71	0.91
3.28	1.78	69.57	1.25	1.62	1.08	0.66	1.08	1.26	1.67	0.93
3.57	1.75	69.60	1.23	1.65	1.08	0.65	1.08	1.31	1.64	0.95

10-Year Check

Design Criteria HW/D < 1.5
 HW = 1.27 m
 D = 1.2 m
 HW/D = 1.06 **Pass**

100-Year Check

HW Elev = 69.60 m
 CL Elev = 69.37 m
 Overtopping = 0.23 m

Philion Drain - Main Drain

Methodology VISUAL OTTHYMO
Unit Hydrograph NASHYD
Description R14
Location Landry Road Crossing
Use Local Road
Design Storm 10-Year HW/D < 1.5
Check Storm 100-Year

Watershed Area A= 198.81 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	197.390	65.24
Impervious	98.00	1.420	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	197.390	0.14
Impervious	0.90	1.420	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	Ia = 0.075S
S =	135.36
Ia =	10.15

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
746	1.27	79

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
30	2.40	0.71	1
183	1.10	0.48	6
439	0.23	0.22	33
249	0.14	0.17	24

Total Tc (min)	Total Tp (hr)
144	1.61

Peak Flow

Return Period	Results (m ³ /s)				
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max	
2-Year	N/A	0.70	0.97	0.97	Design Storm
5-Year		1.37	1.82	1.82	
10-Year		1.92	2.49	2.49	
25-Year		2.67	3.40	3.40	
50-Year		3.30	4.14	4.14	Check Storm
100-Year		3.94	4.91	4.91	

Philion Drain - Main Drain

Methodology HY-8 RESULTS
Description R14
Pipe Diameter 1400mm HDPE
Pipe Length 16m
Design Storm 10-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.97	0.97	68.31	0.72	1.74	0.58	0.43	1.26	0.71	0.67	0.68
1.36	1.36	68.51	0.90	1.94	0.70	0.53	1.26	0.84	0.94	0.75
1.76	1.76	68.71	1.07	2.14	0.82	0.61	1.26	0.95	1.21	0.80
2.15	2.15	68.91	1.24	2.34	0.94	0.69	1.26	1.04	1.48	0.84
2.49	2.49	69.09	1.39	2.52	1.05	0.75	1.26	1.11	1.72	0.87
2.94	2.94	69.41	1.63	2.84	1.26	0.82	1.26	1.20	2.03	0.91
3.33	3.13	69.56	1.74	2.99	1.26	0.85	1.26	1.27	2.16	0.94
3.73	3.08	69.60	1.71	3.03	1.26	0.84	1.26	1.33	2.12	0.96
4.12	3.00	69.63	1.66	3.06	1.26	0.83	1.26	1.39	2.07	0.99
4.52	2.94	69.66	1.63	3.09	1.26	0.82	1.26	1.45	2.02	1.01
4.91	2.87	69.69	1.59	3.12	1.26	0.81	1.26	1.50	1.98	1.03

10-Year Check

Design Criteria HW/D < 1.5
 HW = 1.39 m
 D = 1.4 m
 HW/D = 0.99 **Pass**

100-Year Check

HW Elev = 69.69 m
 CL Elev = 69.53 m
 Overtopping = 0.16 m

Philion Drain - Main Drain

Methodology VISUAL OTTHYMO
Unit Hydrograph NASHYD
Description C15
Location Agricultural Crossing - Prop ID 1
Use Agricultural
Design Storm 5-Year HW/D < 1.5
Check Storm 100-Year

Watershed Area A= 280.80 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	278.070	65.32
Impervious	98.00	2.730	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	278.070	0.14
Impervious	0.90	2.730	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	Ia = 0.075S
S =	134.85
Ia =	10.11

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
746	1.27	79

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
30	2.40	0.71	1
183	1.10	0.48	6
439	0.23	0.22	33
792	0.14	0.17	77

Total Tc (min)	Total Tp (hr)
197	2.20

Peak Flow

Return Period	Results (m ³ /s)				
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max	
2-Year	N/A	0.80	1.08	1.08	Design Storm
5-Year		1.55	2.03	2.03	
10-Year		2.15	2.77	2.77	
25-Year		2.99	3.79	3.79	
50-Year		3.68	4.62	4.62	Check Storm
100-Year		4.39	5.47	5.47	

Philion Drain - Main Drain

Methodology HY-8 RESULTS
Description C15
Pipe Diameter 1500mm HDPE
Pipe Length 18m
Design Storm 5-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
1.08	1.08	64.70	0.74	0.82	0.72	0.45	0.60	0.75	1.36	0.70
1.52	1.52	64.88	0.93	1.00	0.88	0.55	0.73	0.88	1.54	0.77
2.03	2.03	65.08	1.12	1.20	1.07	0.65	0.86	1.01	1.73	0.83
2.40	2.40	65.21	1.26	1.33	1.26	0.71	0.94	1.09	1.87	0.86
2.84	2.84	65.38	1.44	1.50	1.35	0.78	1.03	1.18	2.04	0.90
3.27	3.27	65.54	1.64	1.66	1.35	0.85	1.11	1.26	2.21	0.93
3.71	3.71	65.74	1.86~	1.85	1.35	0.91	1.18	1.33	2.38	0.96
4.15	4.15	66.03	2.12	2.15	1.35	0.97	1.25	1.40	2.57	0.99
4.59	4.43	66.24	2.30	2.36	1.35	1.00	1.31	1.46	2.68	1.01
5.03	4.40	66.31	2.28	2.43	1.35	1.00	1.35	1.52	2.64	1.04
5.47	4.39	66.36	2.27	2.48	1.35	1.00	1.35	1.58	2.63	1.06

5-Year Check

Design Criteria HW/D < 1.5

HW = 1.12 m

D = 1.5 m

HW/D = 0.75 **Pass**

100-Year Check

HW Elev = 66.36 m

CL Elev = 66.19 m

Overtopping = 0.17 m

Philion Drain - Branch 2

Methodology	VISUAL OTTHYMO
Unit Hydrograph	NASHYD
Description	R16
Location	Du Golf Road Crossing (County Road)
Use	Collector Road
Design Storm	25-Year HW/D < 1.5
Check Storm	100-Year

Watershed Area A= 41.51 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	41.177	65.26
Impervious	98.00	0.333	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	41.177	0.14
Impervious	0.90	0.333	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	la = 0.075S
S =	135.18
la =	10.14

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
80	6.88	15
630	1.59	68

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
0	0.00	0.00	0

Total Tc (min)	Total Tp (hr)
83	0.92

Intensity

Return Period	Intensity (mm/hr)
2-Year	15.8
5-Year	20.9
10-Year	24.3
25-Year	28.6
50-Year	31.8
100-Year	34.9

Peak Flow

Return Period	Results (m ³ /s)			
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max
2-Year	0.25	0.22	0.31	0.31
5-Year	0.33	0.44	0.58	0.58
10-Year	0.38	0.62	0.80	0.80
25-Year	0.45	0.86	1.09	1.09
50-Year	0.50	1.06	1.33	1.33
100-Year	0.55	1.27	1.58	1.58

Design Storm

Check Storm

Philion Drain - Branch 2

Methodology HY-8 RESULTS
Description R16
Pipe Diameter 1050mm Ø HDPE
Pipe Length 21m
Design Storm 25-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.31	0.31	67.53	0.41	0.46	0.37	0.25	0.25	0.31	1.45	0.74
0.44	0.44	67.64	0.51	0.56	0.46	0.31	0.31	0.37	1.61	0.81
0.56	0.56	67.73	0.61	0.65	0.53	0.36	0.36	0.42	1.75	0.87
0.69	0.69	67.81	0.69	0.74	0.60	0.41	0.41	0.47	1.86	0.92
0.82	0.82	67.90	0.78	0.82	0.66	0.45	0.45	0.51	1.97	0.96
0.94	0.94	67.98	0.86	0.90	0.74	0.49	0.49	0.55	2.07	1.00
1.09	1.09	68.07	0.96	0.99	0.83	0.53	0.53	0.59	2.19	1.04
1.20	1.20	68.14	1.03	1.06	0.95	0.56	0.56	0.61	2.27	1.07
1.33	1.33	68.22	1.13	1.15	0.95	0.59	0.59	0.65	2.36	1.09
1.45	1.45	68.31	1.24~	1.24	0.95	0.62	0.62	0.67	2.45	1.12
1.58	1.58	68.45	1.36	1.37	0.95	0.65	0.65	0.70	2.55	1.15

25-Year Check

Design Criteria HW/D < 1.5
 HW = 0.96 m
 D = 1.05 m
 HW/D = 0.91 **Pass**

100-Year Check

HW Elev = 68.45 m
 CL Elev = 69.14 m
 Freeboard = 0.69 m

Philion Drain - Branch 2

Methodology	VISUAL OTTHYMO	
Unit Hydrograph	NASHYD	
Description	C17	
Location	New Agricultural Crossing - Prop ID 6	
Use	Agricultural	
Design Storm	5-Year	HW/D < 1.5
Check Storm	100-Year	

Watershed Area A= 44.22 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	43.701	65.39
Impervious	98.00	0.519	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	43.701	0.14
Impervious	0.90	0.519	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	Ia = 0.075S
S =	134.45
Ia =	10.08

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
80	6.88	15
630	1.59	68

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
85	0.40	0.29	5

Total Tc (min)	Total Tp (hr)
87	0.97

Intensity

Return Period	Intensity (mm/hr)
2-Year	15.2
5-Year	20.1
10-Year	23.4
25-Year	27.5
50-Year	30.6
100-Year	33.6

Peak Flow

Return Period	Results (m ³ /s)				
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max	
2-Year	0.26	0.23	0.32	0.32	Design Storm
5-Year	0.34	0.45	0.60	0.60	
10-Year	0.40	0.63	0.82	0.82	
25-Year	0.47	0.88	1.11	1.11	
50-Year	0.52	1.09	1.36	1.36	Check Storm
100-Year	0.57	1.31	1.61	1.61	

Philion Drain - Branch 2

Methodology HY-8 RESULTS
Description C17
Pipe Diameter 750mm Ø HDPE
Pipe Length 9m
Design Storm 5-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.32	0.32	67.25	0.52	0.56	0.56	0.30	0.30	0.31	1.61	0.75
0.45	0.45	67.38	0.66	0.69	0.68	0.37	0.37	0.37	1.82	0.82
0.60	0.60	67.54	0.85	0.86	0.68	0.43	0.43	0.43	2.03	0.89
0.71	0.69	67.67	0.99	0.98	0.68	0.47	0.47	0.47	2.17	0.93
0.84	0.71	67.70	1.01	1.02	0.68	0.48	0.48	0.51	2.19	0.97
0.96	0.72	67.73	1.03	1.04	0.68	0.48	0.49	0.55	2.17	1.01
1.09	0.73	67.75	1.05	1.06	0.68	0.48	0.52	0.59	2.07	1.04
1.22	0.73	67.76	1.06	1.08	0.68	0.49	0.55	0.62	1.98	1.07
1.35	0.73	67.78	1.06	1.10	0.68	0.49	0.59	0.65	1.89	1.10
1.48	0.72	67.80	1.04	1.11	0.68	0.48	0.62	0.68	1.81	1.13
1.61	0.71	67.81	1.02	1.13	0.68	0.48	0.64	0.71	1.74	1.15

5-Year Check

Design Criteria HW/D < 1.5

HW = 0.85 m

D = 0.75 m

HW/D = 1.13 **Pass**

100-Year Check

HW Elev = 67.81 m

CL Elev = 67.51 m

Overtopping = 0.30 m

Philion Drain - Branch 2

Methodology	VISUAL OTTHYMO		
Unit Hydrograph	NASHYD		
Description	C18		
Location	Agricultural Crossing - Prop ID 1		
Use	Agricultural		
Design Storm	5-Year	HW/D < 1.5	
Check Storm	100-Year		

Watershed Area A= 47.02 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	46.501	65.36
Impervious	98.00	0.519	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	46.501	0.14
Impervious	0.90	0.519	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	Ia = 0.075S
S =	134.59
Ia =	10.09

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
80	6.88	15
630	1.59	68

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
220	0.40	0.29	13

Total Tc (min)	Total Tp (hr)
95	1.06

Intensity

Return Period	Intensity (mm/hr)
2-Year	14.3
5-Year	18.9
10-Year	22.0
25-Year	25.9
50-Year	28.8
100-Year	31.6

Peak Flow

Return Period	Results (m ³ /s)				
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max	
2-Year	0.26	0.23	0.32	0.32	Design Storm
5-Year	0.34	0.45	0.60	0.60	
10-Year	0.40	0.63	0.82	0.82	
25-Year	0.47	0.88	1.12	1.12	
50-Year	0.52	1.08	1.36	1.36	Check Storm
100-Year	0.57	1.30	1.61	1.61	

Philion Drain - Branch 2

Methodology HY-8 RESULTS
Description C18
Pipe Diameter 750mm Ø HDPE
Pipe Length 27m
Design Storm 5-Year
Check Storm 100-Year

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth(m)	Outlet Control Depth(m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.32	0.32	66.20	0.52	0.59	0.54	0.30	0.30	0.31	1.61	0.75
0.45	0.45	66.36	0.66	0.74	0.68	0.37	0.37	0.37	1.82	0.82
0.60	0.60	66.70	0.85	1.08	0.68	0.43	0.43	0.43	2.03	0.89
0.71	0.69	66.98	0.99	1.36	0.68	0.47	0.47	0.47	2.17	0.93
0.84	0.70	67.00	1.00	1.38	0.68	0.47	0.47	0.51	2.18	0.97
0.96	0.71	67.01	1.01	1.40	0.68	0.48	0.48	0.55	2.19	1.01
1.09	0.71	67.03	1.02	1.41	0.68	0.48	0.51	0.59	2.05	1.04
1.22	0.71	67.04	1.02	1.42	0.68	0.48	0.54	0.62	1.94	1.07
1.35	0.71	67.05	1.02	1.43	0.68	0.48	0.58	0.65	1.85	1.10
1.48	0.70	67.06	1.01	1.44	0.68	0.47	0.61	0.68	1.77	1.13
1.61	0.70	67.07	0.99	1.45	0.68	0.47	0.63	0.71	1.71	1.15

5-Year Check

Design Criteria HW/D < 1.5

HW = 0.85 m

D = 0.75 m

HW/D = 1.13 **Pass**

100-Year Check

HW Elev = 67.07 m

CL Elev = 66.97 m

Overtopping = 0.10 m

Philion Drain - Branch 3

Methodology
Unit Hydrograph
Description
Location
Use
Design Storm
Check Storm

VISUAL OTTHYMO
NASHYD
Branch No. 3
Branch No. 3
Agricultural
5-Year
100-Year

Watershed Area

A= 6.98 ha

Curve Number

Land Use	Curve Number	Area (ha)	Balanced Curve Number
Pervious	65.00	6.827	65.71
Impervious	98.00	0.150	

*Reference Source: Central Oregon Stormwater Manual - Table 5-1 Runoff Curve Numbers

Runoff Coefficient

Land Use	Runoff Coefficient	Area (ha)	Balanced Runoff Coefficient
Pervious	0.13	6.827	0.15
Impervious	0.90	0.150	

*Reference Source: Hydrological Analysis + Design - Richard H. McCuen, 2006

Initial Abstraction

CN <70	Ia = 0.075S
S =	132.55
Ia =	9.94

Time of Concentration

Total Overland Flow Distance (m)	Slope of Land (%)	Overland Flow Tc (min)
161	0.93	40

Ditch Length (m)	Ditch Slope (%)	Ditch Velocity (m/s)	Ditch Tc (min)
400	0.31	0.26	26

Total Tc (min)	Total Tp (hr)
66	0.74

Intensity

Return Period	Intensity (mm/hr)
2-Year	15.8
5-Year	20.9
10-Year	24.3
25-Year	28.6
50-Year	31.8
100-Year	34.9

Peak Flow

Return Period	Results (m ³ /s)			
	Rationale Method	12-Hour SCS Type II	24-Hour SCS Type II	Max
2-Year	0.04	0.22	0.31	0.31
5-Year	0.06	0.44	0.58	0.58
10-Year	0.07	0.62	0.80	0.80
25-Year	0.08	0.86	1.09	1.09
50-Year	0.09	1.06	1.33	1.33
100-Year	0.10	1.27	1.58	1.58

Design Storm

Check Storm

Capacity Review

Philion Drain - Branch 3 Realignment

Maximum Capacity - Shallowest Depth

Ditch Invert =	66.69	m	
Top of Slope Elev =	67.50	m	
Bottom Width =	0.91	m	
Depth =	0.81	m	
Side Slopes	66.67	%	(1.5:1)

Roughness Coeff	0.03	
Channel Slope	0.24	%
Area	1.72	m ²
Wetted Perimeter	3.83	m
R	0.45	m
Q	1.65	m ³ /s

APPENDIX E

CONSTRUCTION SPECIFICATIONS AND STANDARD DRAWINGS

Please refer to the following construction specifications and instructions for the Philion Municipal Drain project

Main Drain + Branches No. 1 and 2

Working Space

The working space for the Main Drain, Branch No. 1 and Branch No. 2 shall remain as per the specifications outlined in the 1977 Engineer's Report. Where no such specifications have been provided, the following shall be applied:

- The standard working space along the drain will be whichever side is best suited for construction. As much of the Main Drain fronts on residential properties, it is anticipated that work will likely need to be performed from the road-side, to avoid damaging the maintained lawns (and costly reinstatement associated with such work).
- When the drain is adjacent a farm field or other rural, undeveloped property, the working space will be considered as 25m from the top of bank, as necessary to allow construction to be completed and the excavated material to be spread.
- When the drain is adjacent a residential property, the working space will be reduced to 8m, and all excavated material is to be hauled off-site, with costs for hauling assessed to the drain.
- The working space is to be kept free of permanent obstructions, including trees, fences, structures or other permanent features. Obstructions impeding future maintenance works will be removed by the Drainage Superintendent or the property owner, at the expense of the property owner.

Spreading of Material – Agricultural Lands

The Main Drain and Branches No. 1 and 2 are anticipated to only require standard maintenance. When undertaking such maintenance adjacent to agricultural lands, material excavated from the channel shall be spread on the adjacent lands, no closer than 5m from the top of bank. Material shall be spread to a maximum depth of 150mm, with relief channels cut at a maximum spacing of 50m.

Offsite Disposal – Residential Lots

On small residential lots (<2 hectares), excavated material from the channel is to be disposed of offsite. The costs for offsite disposal should be accounted for in future maintenance tenders, with offsite disposal costs assessed to the drain (upstream landowners). The Contractor will be responsible for adhering to applicable excess soil legislation, or other applicable legislation that may apply at the time of maintenance, when considering the transfer of soils away from the drain. Determination of a disposal site can be coordinated between the Contractor and the Drainage Superintendent.

Branch No. 3

Maintenance / Excavation of New Alignment (Station 0+147-0+400)

The new bottom of the ditch shall be excavated to an even grade so that no water may lie stagnant therein.

The new channel shall be excavated in conformance with the specifications outlined herein and in conformance with the engineered plans included in **Appendix B** of the Engineer's Report.

Design Criteria	Specification
Side Slopes	1.5 Horizontal to 1 Vertical
Grade	Varies – see profile
Bottom Width	0.91m (3 ft)

Excavated material shall be spread on the adjacent field (Property ID 1). All material shall be set no closer than 5m from the top of bank of the channel, and spread to a maximum depth of 150mm. Relief channels are to be cut through the spoils at a maximum spacing of 50m to ensure that overland flow from adjacent lands is not impeded by the spread material.

Construction and associated maintenance works shall be completed in low or no flow conditions. Works shall be completed as efficiently as possible; works should not be left partially started and unattended for long periods of time. It is expected that the duration of the contract shall be no more than 2 weeks for the initial excavation and construction works; unless otherwise authorized by the Drainage Superintendent, the applicable permitting agencies or the engineer.

Works shall be completed in conformance with the permit specifications from the applicable approval agencies. Permits received are enclosed with **Appendix G** and are to be read in full by the contractor prior to commencing construction. Copies of the permits are to be kept on-site during construction.

Sediment Trap Installation

A sediment trap has been proposed along the new alignment; at approximately Station 0+200.

A standard drawing for the sediment trap has been included at the end of these written construction specifications.

The sediment trap is considered as permanent erosion control measures and shall be reinstated during future maintenance works.

Rock Protection Installation

Rock protection shall be installed at those locations shown on the enclosed plans (**Appendix B**) to provide bank and channel stabilization along the new alignment. The rock shall be underlain with geotextile and shall be placed with machinery capable of controlling the drop of the rock, rather than dumped over the edge of the bank. The rock shall be placed immediately following preparation of the banks. The minimum thickness of the rock shall be 300mm unless otherwise

specified in the engineered plans. The rock shall be angular in nature. It shall be installed along both the inner and outer bank, as well as along the bottom width and is to be embedded. A standard drawing for the rock protection for bank stabilization has been included at the end of these written construction specifications.

The rock protection is a permanent erosion control measure and shall be reinstated as needed during future maintenance practices.

Seeding

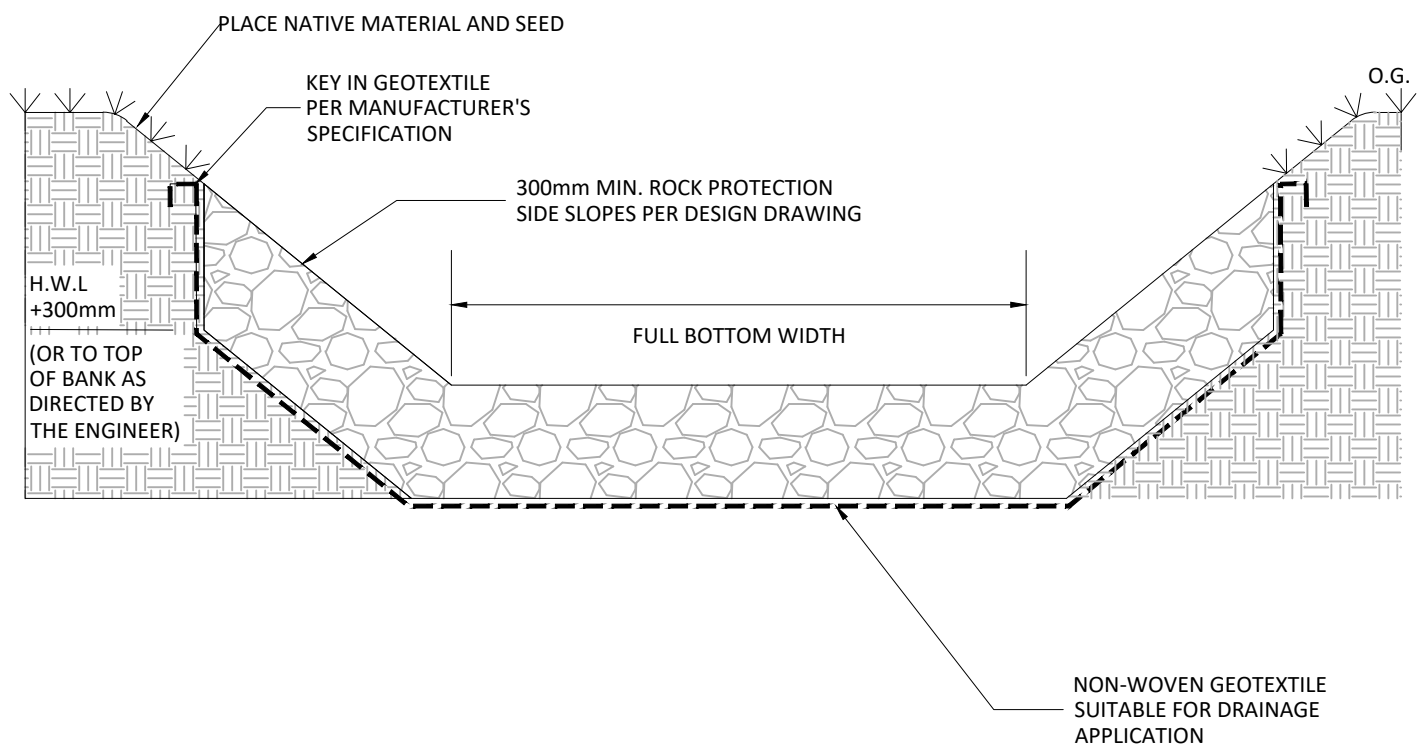
The newly maintained channel is to be seeded as soon as possible after excavation, with seed placed along the disturbed bank. Seed may be hand spread or hydroseeded.

Seed mix shall be in conformance with OPSS.Muni 804: Crown Vetch Mix or Lowland Mix. Should the contractor wish to deviate from the specifications, it will need to be demonstrated that the proposed seed mix is appropriate for the intended application. Seed shall be applied at a rate of 150 lbs/acre.

Seed shall not be placed from November 1 through April 30 of any calendar year. Should excavation occur between November 1 and April 30, seeding shall be done as soon as possible after April 30, or as directed by the Drainage Superintendent or the Drainage Engineer.

Attached Standard Drawings:

- SGI Std Drawing 1 – Rock Protection
- SGI Std Drawing 2 – Sediment Trap
- SGI Std Drawing 4 – Culvert Protection



NOTE:

1. SURFACE OF ROCK PROTECTION TO BE FLUSH WITH THE FINISHED SURFACE OF DRAIN UPSTREAM AND DOWNSTREAM OF THE EROSION CONTROL. MIN. SIDE SLOPE AS SPECIFIED IN THE ENGINEER'S REPORT OR THE CONTRACT DRAWINGS.
2. ROCK TO BE R-50 PER OPSS 1004.05.05.02 OR OPSS 1004.05.05.03. BLAST ROCK MAY BE SUBSTITUTED SUBJECT TO ENGINEER APPROVAL.

PETITION DRAIN STANDARD DRAWING

TYPICAL ROCK PROTECTION EROSION CONTROL

DETAIL DWG.NO.
SGI STD. DWG. 1

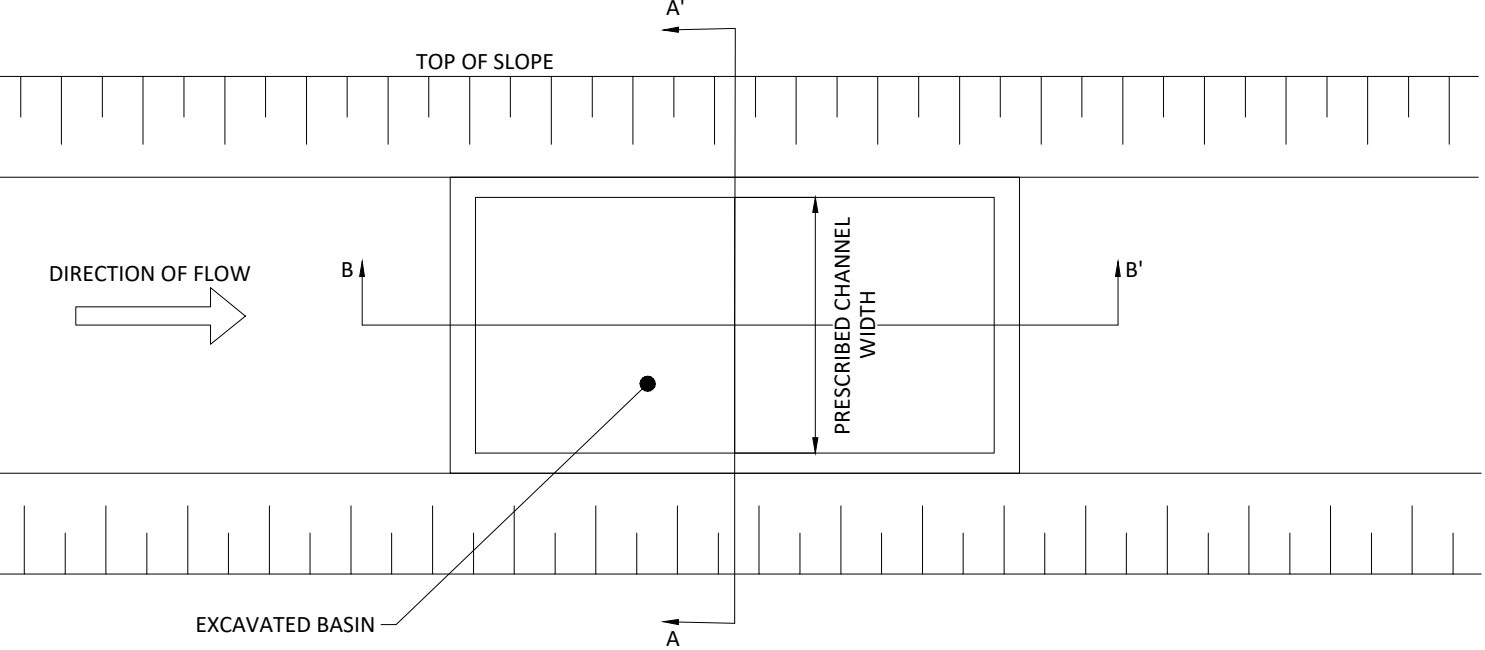
REVISION
1.0

DATE
Jan/24

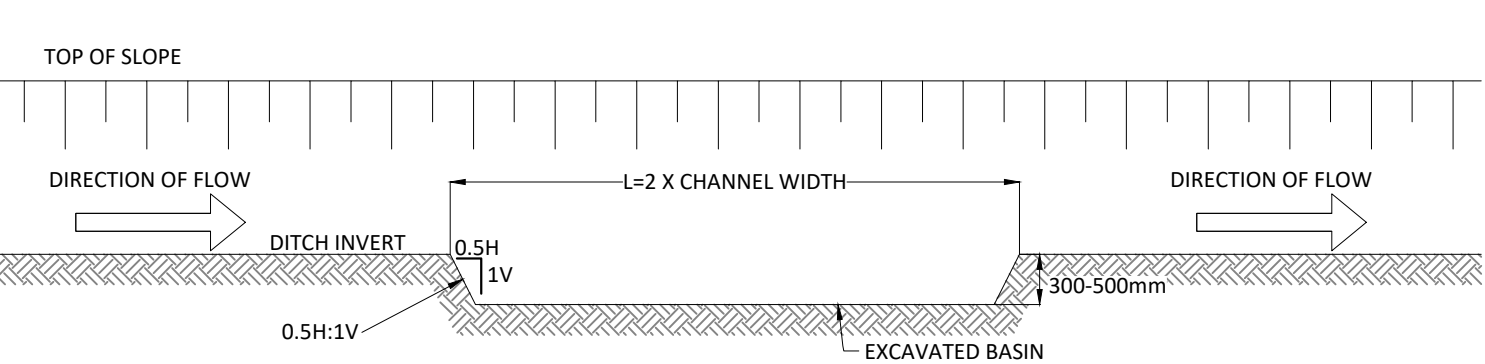
SCALE
N.T.S

**SHADE
GROUP** INC.

PLAN



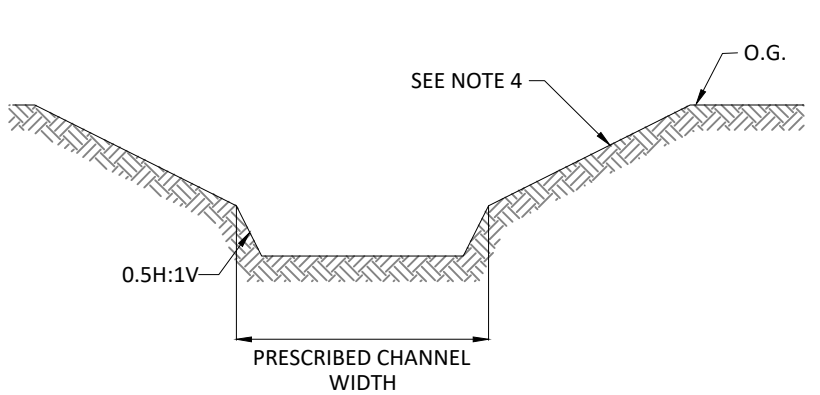
SECTION B-B'



NOTES:

1. THIS DRAWING MODIFIES OPSD 219.220
2. DITCH CROSS-SECTION UPSTREAM OR DOWNSTREAM OF SEDIMENT TRAP MAY BE FLAT BOTTOM OR V-SHAPED, FLAT BOTTOM SHOWN.
3. MIN. SIDE SLOPES AS SPECIFIED IN ENGINEER'S REPORT OR CONTRACT DRAWINGS
4. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN.

SECTION A-A'



PETITION DRAIN STANDARD DRAWING

EXCAVATED SEDIMENT TRAP

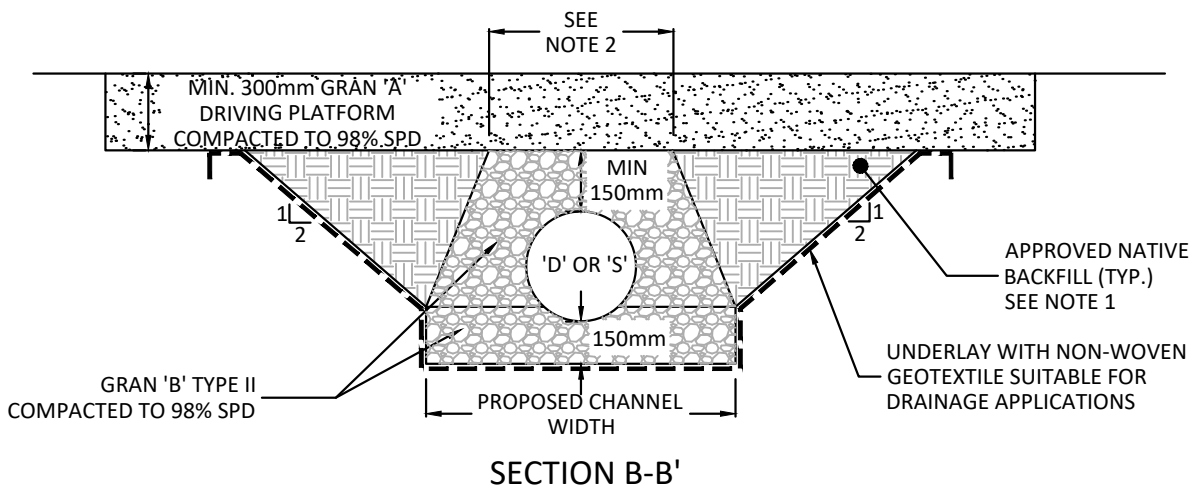
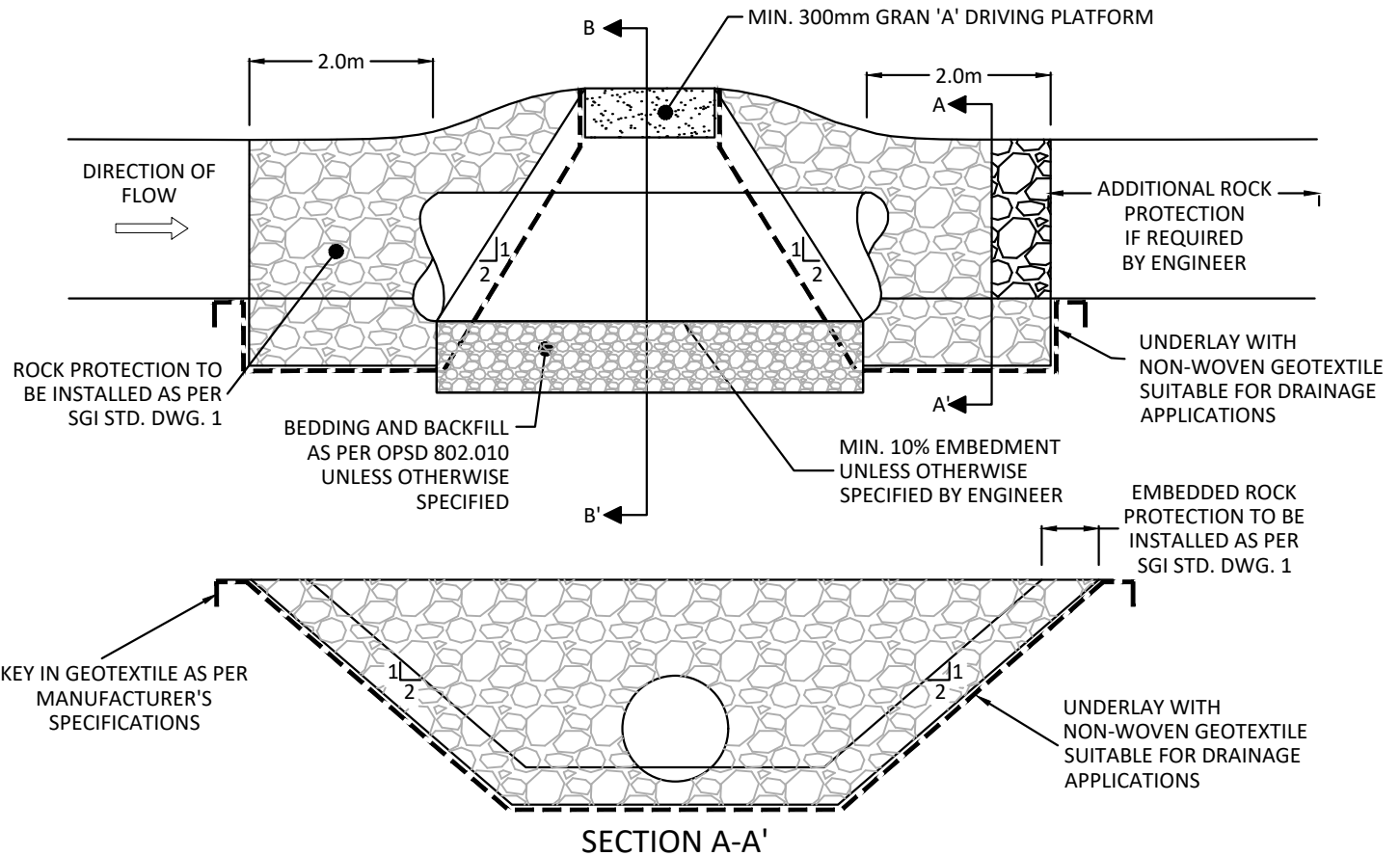
DETAIL DWG.NO.
SGI STD. DWG. 2

REVISION
1.0

DATE
Jan/24

SHADE
GROUP INC.

SCALE
N.T.S



NOTES:

1. APPROVED NATIVE BACKFILL MATERIAL MAY CONSIST OF DRY CLAY, SAND OR GRANULAR MATERIAL WITH NO LARGE STONES, BOULDERS, DEBRIS OR ORGANIC MATERIAL. BACKFILL MUST BE PLACED IN LIFTS NOT EXCEEDING 300mm IN THICKNESS AND COMPACTED. ALL REQUIREMENTS FOR GRANULAR BEDDING, COVER AND SURFACE COURSE MUST BE MET PRIOR TO PLACING ANY BACKFILL.
2. FOR CIRCULAR CULVERTS, THE TOP-WIDTH OF COVER MATERIAL SHALL BE A MINIMUM OF THE DIAMETER OF THE PIPE ('D') PLUS 0.5 X 'D' EACH WAY FOR A TOTAL OF 2.0 X 'D'. FOR ARCH CULVERTS, THE TOP-WIDTH OF COVER MATERIAL SHALL BE A MINIMUM OF THE SPAN OF THE PIPE ('S') PLUS 0.75 X 'S' EACH WAY FOR A TOTAL OF 2.5 X 'S'. THE MINIMUM BOTTOM WIDTH SHALL CONFORM WITH THE PROPOSED CHANNEL WIDTH UPSTREAM/DOWNSTREAM OF THE CULVERT.
3. FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR ALL PIPES.

PETITION DRAIN STANDARD DRAWING

CULVERT INLET/END
PROTECTION

DETAIL DWG.NO.
SGI STD. DWG. 4

REVISION
00

DATE
FEB/24

**SHADE
GROUP**
INC.

SCALE
N.T.S

APPENDIX F

CONSTRUCTION COST ESTIMATES

Phillion Municipal Drain - Main Drain
Estimated Construction Cost

Construction Estimate				
Item	Unit	Quantity	Cost/Unit	Total
Remove and Replace Crossing C3 Remove existing pipe + dispose, Install 750mm Ø HDPE x 15m, Install applicable end treatment, Reinstatement of gravel crossing	m	15	\$ 700.00	\$ 10,500.00
Remove and Replace Crossing C4 Remove existing pipe + dispose, Install 750mm Ø HDPE x 15m, Install applicable end treatment, Reinstatement of gravel crossing	m	15	\$ 700.00	\$ 10,500.00
Remove and Replace Crossing C5 Remove existing pipe + dispose incl. asphalt cut and disposal, Install 750mm Ø HDPE x 12m, Install applicable end treatment, Reinstatement of driveway to gravel	m	12	\$ 850.00	\$ 10,200.00
Remove and Replace Crossing C6 Remove existing pipe + dispose, Install 900mm Ø HDPE x 12m, Install applicable end treatment Reinstatement of gravel crossing	m	12	\$ 900.00	\$ 10,800.00
Remove and Replace Crossing C8 Remove existing pipe + dispose, Install 900mm Ø HDPE x 12m, Install applicable end treatment Reinstatement of gravel crossing	m	12	\$ 975.00	\$ 11,700.00
Remove and Replace Crossing C9 Remove existing pipe + dispose, Install 900mm Ø HDPE x 12m, Install applicable end treatment Reinstatement of gravel crossing	m	12	\$ 975.00	\$ 11,700.00
Remove and Replace Crossing C10 Remove existing pipe + dispose, incl. asphalt cut, Install 900mm Ø HDPE x 15m, Install applicable end treatment Reinstatement of driveway to gravel only	m	15	\$ 950.00	\$ 14,250.00
Remove and Replace Crossing C11 Remove existing pipe + dispose, incl. asphalt cut, Install 900mm Ø HDPE x 15m, Install applicable end treatment Reinstatement of driveway to gravel only	m	15	\$ 950.00	\$ 14,250.00

Philion Municipal Drain - Main Drain
Estimated Construction Cost

Construction Estimate

Item	Unit	Quantity	Cost/Unit	Total
Remove and Replace Crossing C15 Remove existing pipe + dispose, Install 1500mm Ø HDPE x 18m, Install applicable end treatment Reinstatement of gravel crossing	m	18	\$ 1,075.00	\$ 19,350.00
Open Channel Maintenance - Residential Frontage	m	370	\$ 50.00	\$ 18,500.00
Open Channel Maintenance	m	1,630	\$ 10.00	\$ 16,300.00

Sub-Total - Construction Costs	\$	148,050.00
Contingency Allowance - Construction	10%	\$ 14,805.00
Sub-Total - Construction Costs (Pre-Tax)	\$	162,855.00

Engineering Estimate

Item	Unit	Quantity	Cost/Unit	Total
Engineer's Report	Lump Sum	80%	\$ 29,185.00	\$ 23,348.00
Sub-Total - Engineering Costs (Pre-Tax)			\$	23,348.00

Permitting Fees

Item	Unit	Quantity	Cost/Unit	Total
Initial Permitting Fees	Lump Sum	100%	\$ 1,370.00	\$ 1,370.00
Sub-Total - Engineering Costs (Pre-Tax)			\$	1,370.00

Summary

Sub-Total - Construction Costs (Pre-Tax)	\$	162,855.00
Sub-Total - Engineering Costs (Pre-Tax)	\$	23,348.00
Estimated Permitting Fees	\$	1,370.00
Estimated Project Total	\$	187,573.00

Philion Municipal Drain - Branch 1
Estimated Construction Cost

Construction Estimate				
Item	Unit	Quantity	Cost/Unit	Total
Remove and Replace Crossing C1 Remove existing pipe + dispose, Install 450mm Ø HDPE x 12m, Install applicable end treatment, Reinstatement of gravel crossing	m	12	\$ 450.00	\$ 5,400.00
Remove and Replace Crossing C2 Remove existing pipe + dispose, Install 600mm Ø HDPE x 15m, Install applicable end treatment, Reinstatement of gravel crossing	m	15	\$ 485.00	\$ 7,275.00
Open Channel Maintenance - Residential Frontage	m	70	\$ 20.00	\$ 1,400.00
Open Channel Maintenance	m	950	\$ 10.00	\$ 9,500.00
Sub-Total - Construction Costs				\$ 23,575.00
Contingency Allowance - Construction	10%			\$ 2,357.50
Sub-Total - Construction Costs (Pre-Tax)				\$ 25,932.50

Engineering Estimate				
Item	Unit	Quantity	Cost/Unit	Total
Engineer's Report	Lump Sum	7.5%	\$ 29,185.00	\$ 2,188.88
Sub-Total - Engineering Costs (Pre-Tax)				\$ 2,188.88

Permitting Fees				
Item	Unit	Quantity	Cost/Unit	Total
Estimated Permitting Fees	Lump Sum	-	\$ -	\$ -
Sub-Total - Engineering Costs (Pre-Tax)				\$ -

Summary				
Sub-Total - Construction Costs (Pre-Tax)				\$ 25,932.50
Sub-Total - Engineering Costs (Pre-Tax)				\$ 2,188.88
Estimated Permitting Fees				\$ -
Estimated Project Total				\$ 28,121.38

Philion Municipal Drain - Branch 2
Estimated Construction Cost

Construction Estimate				
Item	Unit	Quantity	Cost/Unit	Total
Install New Crossing C17 Install 600mm Ø HDPE x 9m Install applicable end treatment Instate gravel entrance	m	9.0	\$ 950.00	\$ 8,550.00
Open Channel Maintenance	m	340	\$ 10.00	\$ 3,400.00
Sub-Total - Construction Costs				\$ 11,950.00
Contingency Allowance - Construction	10%			\$ 1,195.00
Sub-Total - Construction Costs (Pre-Tax)				\$ 13,145.00

Engineering Estimate				
Item	Unit	Quantity	Cost/Unit	Total
Engineer's Report	Lump Sum	10.5%	\$ 29,185.00	\$ 3,064.43
Sub-Total - Engineering Costs (Pre-Tax)				\$ 3,064.43

Permitting Fees				
Item	Unit	Quantity	Cost/Unit	Total
Permitting Fees	Lump Sum	100%	\$ 685.00	\$ 685.00
Sub-Total - Engineering Costs (Pre-Tax)				\$ 685.00

Summary				
Sub-Total - Construction Costs (Pre-Tax)				\$ 13,145.00
Sub-Total - Engineering Costs (Pre-Tax)				\$ 3,064.43
Estimated Permitting Fees				\$ 685.00
Estimated Project Total				\$ 16,894.43

Philion Municipal Drain - Branch 3 Realignment
Estimated Construction Cost

Construction Estimate

Item	Unit	Quantity	Cost/Unit	Total
Station 0+000 - 0+140 Maintenance	m	140	\$ 10.00	\$ 1,400.00
Station 0+140 - 0+400 Excavation	m	260	\$ 15.00	\$ 3,900.00
Sediment Trap	ea	1	\$ 150.00	\$ 150.00
Rock Protection	m ²	150	\$ 30.00	\$ 4,500.00
Sub-Total - Construction Costs				\$ 9,950.00
Contingency Allowance - Construction		10%		\$ 995.00
Sub-Total - Construction Costs (Pre-Tax)				\$ 10,945.00

Engineering Estimate

Item	Unit	Quantity	Cost/Unit	Total
Engineer's Report - Main Project - Update	Lump Sum	2%	\$ 29,185.00	\$ 583.70
Engineer's Report - Special Assessment	Lump Sum	100%	\$ 5,000.00	\$ 5,000.00
Sub-Total - Engineering Costs (Pre-Tax)				\$ 5,583.70

Permitting Fee Estimate

Item	Unit	Quantity	Cost/Unit	Total
Permitting Fees	Lump Sum	100%	\$ 685.00	\$ 685.00
Sub-Total - Engineering Costs (Pre-Tax)				\$ 685.00

Summary

Sub-Total - Construction Costs (Pre-Tax)	\$ 10,945.00
Sub-Total - Engineering Costs (Pre-Tax)	\$ 5,583.70
Sub-Total - Permitting Fees	\$ 685.00
Estimated Project Total	\$ 17,213.70

*As the realignment serves benefit to Property ID 1 - The majority of the costs have been assessed as a special assessment to Property ID 1. The breakdown for the special assessment is as follows:

	Property ID 1	Shared to Subwatershed
Construction	\$ 9,405.00	\$ 1,540.00
Engineering	\$ 5,000.00	\$ 583.70
Permitting Fees	\$ 685.00	\$ -
Subtotal	\$ 15,090.00	\$ 2,123.70

APPENDIX G

PERMITS



Fisheries and Oceans
Canada

Ontario and Prairie Region
Fish and Fish Habitat Protection Program
867 Lakeshore Rd.
Burlington, ON
L7S 1A1

Pêches et Océans
Canada

Région de l'Ontario et des Prairies
Programme de protection du poisson et de son habitat
867 chemin Lakeshore
Burlington, ON
L7S 1A1

May 28, 2026

Our file *Notre référence*
26-HCAA-00536

City of Clarence-Rockland
1560 Laurier Street
Rockland, ON K4K 1P7

Subject: Drainage Improvements, Philion Drain Branch 3, Class Unrated & C, City of Clarence-Rockland (26-HCAA-00536) – Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat

Dear City of Clarence-Rockland:

The Fish and Fish Habitat Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your proposal on March 12, 2026. We understand that you propose to:

- Conduct drainage improvements on Philion Drain Branch 3 and abandon a portion of the drain (~250m² footprint below the ordinary high water mark);
 - Install a sediment trap along the new alignment;
 - Install rock protection at certain sections of the branch; and,
- Remove an existing culvert on the Philion Drain and replace with a 750mm diameter by 12m long culvert (~9m² footprint below the ordinary high water mark).

Our review considered the following information:

- Request for Review form and associated documents submitted on March 12, 2026; and,
- Email correspondence with Monica Shade from Shade Group Inc. confirming additional project details.

Your proposal has been reviewed to determine whether it is likely to result in:

- the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat which are prohibited under subsections 34.4(1) and 35(1) of the *Fisheries Act*; and,

- effects to listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act*.

The aforementioned impacts are prohibited unless authorized under their respective legislation and regulations.

To avoid and mitigate the potential for prohibited effects to fish and fish habitat (as listed above), we recommend implementing the measures listed below:

- Carry out the project in accordance with [timing windows](#);
 - No in-water work between March 15 and July 15;
- Capture fish trapped within an isolated or enclosed area and relocate them to the same watercourse or water body;
 - Capture and relocate any fish as per applicable permits;
 - Use the interim standard: [Fish capture and relocation](#)
- Avoid obstructing or interfering with the movement and migration of fish;
- Maintain a functioning vegetated riparian zone between the project site and the ordinary high water mark;
 - Use existing trails, roads, access points or cut lines;
 - Limit vegetation removal, pruning and grubbing to the area required for accessing the project site;
 - Limit access to shorelines and banks or areas adjacent to the watercourse or water body;
 - Construct roads, access points and approaches perpendicular to the watercourse or water body;
 - Use methods to reduce soil compaction (e.g., swamp mats, pads);
 - Reinstall stream banks and slopes of the affected riparian zone;
 - Re-vegetate the affected riparian zone with native species suitable for the project site;
- Limit disturbance of fish habitat features (e.g., aquatic plants, rocks, woody material) to the area required to carry out the project;
- Limit operation of vehicles and machinery to the area required to carry out the project;
- Restore the bed and banks, gradient and contour affected by the project;
- Develop and implement an erosion and sediment control plan for all phases of the project;
 - Use the interim standard: [Planning for land-based erosion and sediment control](#)
 - Conduct all operations in isolation of open or flowing water;
 - Follow standard for [in-water site isolation](#);
 - Regularly observe the watercourse or water body for signs of suspended sediment during all phases of the project and take corrective action when and where required;

- Inspect the erosion and sediment controls regularly during all phases of the project;
- Repair the sediment controls during all phases of the project;
- Use biodegradable materials for erosion and sediment controls whenever possible;
- Remove all non-biodegradable erosion and sediment controls once the site has been stabilized;
- Dispose of, and stabilize, all excavated material above the ordinary high water mark or top of bank of nearby watercourses or water bodies;
- Keep the erosion and sediment controls in place until all disturbed ground has been stabilized and suspended sediments have settled;
- Operate machinery on land, from barges or on ice during all phases of the project;
- Use only clean materials;
- Avoid introducing sediment in the water, like silt, clay and sand;
- Manage sediment laden water flowing onto or through the site during all phases of the project;
- Install erosion and sediment controls prior to beginning the project;
- Pump sediment laden water into a vegetated area or a filtration system (e.g., settling basin);
- Release water gradually when suspended sediment has settled in the settling basin and water is clear;
- Develop a plan to prevent deleterious substances from entering a watercourse or water body;
- Aquatic invasive species are introduced and spread through transporting water, sands and sediments and using contaminated construction equipment. To prevent the spread of aquatic invasive species during construction in aquatic environments:
 - Ensure all equipment arrives on site clean and free of invasive species;
 - Clean, drain and dry any equipment used in the water; and,
 - Never move organisms or water from one body of water to another.

Provided that you incorporate these measures into your plans, the Program is of the view that your proposal is not likely to result in the contravention of the above mentioned prohibitions and requirements.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website ([Projects near water \(dfo-mpo.gc.ca\)](http://projects.nearwater.dfo-mpo.gc.ca)) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to remain in compliance with the *Fisheries Act*, and the *Species at Risk Act*.

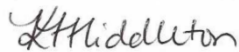
It is also your *Duty to Notify* DFO if you have caused, or are about to cause, the death of fish by means other than fishing and/or the harmful alteration, disruption or destruction

of fish habitat. Such notifications should be directed to DFO.OPHabitat.MPO@dfo-mpo.gc.ca or 1-855-852-8320.

We recommend that you notify this office at least 10 days before starting your project and that a copy of this letter be kept on site while the work is in progress. Send your notification to the DFO 10 day notification mailbox: DFO.OP10DayNotification-Notification10JourOP.MPO@dfo-mpo.gc.ca. It remains your responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to your proposal.

If you have any questions with the content of this letter, please contact Kaela Middleton by email at Kaela.Middleton@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,

A handwritten signature in dark ink, appearing to read 'K Middleton', written in a cursive style.

Kaela Middleton
Biologist, Triage and Planning
Fish and Fish Habitat Protection Program



PERMIT FOR ACTIVITY WITHIN A REGULATED AREA

Section 28.1 of the *Conservation Authorities Act*, R.S.O. 1990, c. C.27
& Ontario Regulation 41/24: Prohibited Activities, Exemptions and Permits



Permit Holder: City of Clarence-Rockland
1560 Laurier Street
Rockland, ON K4K 1P7

Decision: Issued with Conditions

Issued: June 8, 2026

Expires: June 8, 2028

Project Description: Culvert replacements and Municipal Drain modification

Subject Property(ies): 1748 du Golf Rd;
1812 du Golf Rd;
1957 du Golf Rd; and
Pt Lot 10, Con 5 (Landry Road), Roll No. 031601600504300
Clarence-Rockland

The attached
Schedules form

part of this permit for the approved project. The permitted activity must be undertaken in
accordance with the stated conditions.

- Schedule A - Conditions
- Schedule B - Project Description, Plans, and Reports
- Schedule C - Additional Comments
- Schedule D - General Terms
- Schedule E - Public Notice Poster

A copy of this permit must be kept at the subject property and the public notice poster
must be posted in a publicly visible area at the subject property when work is taking place.
The permit holder shall provide written notice to SNC within **30 days** of project completion.

Permit review completed by Claire Lemay, Senior Planner. Technical review completed by
Shahin Zand P.Eng., Water Resources Engineer.

Dated at Finch, Ontario, this 8th day of June 2026.

Jennifer Boyer, MSc, MCIP RPP
Managing Director, Approvals



SCHEDULE A: CONDITIONS

The Permit Holder must adhere to the following conditions:

General

1. The Project shall be carried out as per the project description, plans, and reports (Schedule "B").
2. The Permit Holder shall abide by the recommendations/conclusions of the Draft Engineer's Report, prepared by Monica Shade, P.Eng. (Shade Group Inc) and dated March 12, 2026 (Schedule "B").
3. No changes to the Project shall take place without prior SNC authorization or duly enacted amendments to the permit.

Reporting, Notification, and Monitoring

4. SNC may enter the subject property at any reasonable time during the permit's period of validity and at any reasonable time within one year of the permit's expiry to ensure compliance with the permit and the conditions. SNC shall give reasonable notice to the Permit Holder and occupier of the subject property prior to entry. This condition does not authorize entry into a dwelling or other building situated on the subject property.
5. The Permit Holder shall provide written notice within 30 days of project completion to regulations@nation.on.ca.
6. The public notice poster shall be posted in a publicly visible area at the subject property when work is taking place (Schedule "E").



SCHEDULE B: PROJECT DESCRIPTION, PLANS, AND REPORTS

SNC understands the following work will be completed (the "Project"):

1. Replacement of two culverts and installation of one new culvert and channel modification for the Philion Municipal Drain.
2. Culvert C4 to be replaced with a new 750mm diameter 15m long smoothwall HDPE culvert at the entrance of 1748 Du Golf Road.
3. Culvert C5 to be replaced with a new 750mm diameter 12m long smoothwall HDPE culvert at the entrance of 1812 Du Golf Road.
4. New Culvert C17 with 750mm diameter and 9m length to be installed at the entrance of 1957 Du Golf Road.
5. Branch No. 3 of Philion Municipal Drain to be deepened and widened.

The details of the Project are outlined in the following documents provided to SNC:

1. South Nation Conservation Section 28.1 Permit Application Form - signed by Jeal-Luc Jubinville (City of Clarence-Rockland) and Monica Shade (Shade Group Inc.) dated on March 17, 2026.
2. "Philion Municipal Drain Incl. Branch 1, 2, 3" S. 78(1) Engineer's Report, prepared by Shade Group Inc, for the City of Clarence-Rockland, DRAFT Rev 01, dated March 12, 2026, not signed or stamped.
3. "Philion Drain – Culvert Details Summary" prepared by Shade Group Inc., dated 2026.
4. Memo from Shade Group Inc. to South Nation Conservation Authority, "Re. Application 2026-CLR-R043 – Philion Municipal Drain, Clarence-Rockland," prepared by Monica Shade, P.Eng., dated April 20, 2026.



SCHEDULE C: ADDITIONAL COMMENTS

1. SNC understands that the current alignment of Branch No. 3 of the Philion Municipal Drain is being retroactively adopted. Changes to the channel (widening and deepening) are minor.
2. SNC understands that the new culverts / replacement culverts are required to be lengthened from the original design to accommodate municipal safety standards.
3. Technical review of the DRAFT Engineer's Report considered all proposed changes to the design of the culverts and channels of the Philion Municipal Drain, including future changes not included in this permit.



SCHEDULE D: GENERAL TERMS

1. Period of Validity

This permit is valid for the duration stated on page one. No notice will be issued on expiration. It is the responsibility of the Permit Holder to ensure a valid permit is in effect while work on the Project is taking place. The Permit Holder may, at least 60 days before the expiry of the permit, submit an application and pay a fee to request an extension. The period of validity cannot be extended beyond 60 months.

2. Modifying the Permit

This permit is for the Project as described in Schedule "B". Proposed changes to the Project must be submitted in writing to SNC for review and approval prior to undertaking the changes. Additional fees for permit amendments may apply.

3. Other Permits and Approvals

Nothing in this permit relieves the Permit Holder from the obligation of obtaining, where necessary, regulatory approval from other agencies or government bodies including federal ministries, provincial ministries, the municipality, landowner, or authority having legal jurisdiction regarding development at the above noted location or any adjacent lands that may be impacted by the Project. SNC makes no representation as to whether the Permit Holder must obtain any other approval(s) regarding the Project. SNC hereby confirms that it is the Permit Holder's sole responsibility to ensure that it applies for and obtains all necessary regulatory approvals prior to undertaking the Project. This permit does not relieve the Permit Holder of the obligation to maintain ongoing landowner permission to undertake the Project where the Permit Holder is not the owner of the subject property. This permit does not review, certify, or provide permission for any works that may be located outside the subject property boundaries.

4. Right to Hearing

A Permit Holder who disagrees with the conditions attached to their permit may request a hearing before the SNC Board of Directors within 30 days of the date of issuance of their permit and prior to the commencement of work. Please contact SNC for further details.

5. Permit Cancellation

SNC may cancel a permit if it has reasonable grounds to believe the conditions of the permit are not being met or if false information was submitted as part of the permit application.

6. Offence

It is an offence to contravene the conditions of a permit. A person who commits an offence under the *Conservation Authorities Act* is liable on conviction:

- a) in the case of an individual,
 - (i) to a fine of not more than \$50,000 or to a term of imprisonment of not more than three months, or to both, and



- (ii) to an additional fine of not more than \$10,000 for each day or part of a day on which the offence occurs or continues; and
- b) in the case of a corporation,
 - (i) to a fine of not more than \$1,000,000, and
 - (ii) to an additional fine of not more than \$200,000 for each day or part of a day on which the offence occurs or continues.

Despite the maximum fines, a court that convicts a person of an offence may increase the fine it imposes on the person by an amount equal to the amount of the monetary benefit that was acquired by the person, or that accrued to the person, as a result of the commission of the offence.

In addition to any other remedy or penalty provided by law, the court, upon convicting a person of an offence, may order the convicted person to,

- a) remove, at the convicted person's expense, any development within such reasonable time as the court orders; and
- b) take such actions as the court directs, within the time the court may specify, to repair or rehabilitate the damage that results from or is in any way connected to the commission of the offence.

7. Liability

The Permit Holder acknowledges that the sole function of this permit is to confirm the Project is consistent with Part VI of the *Conservation Authorities Act*, O. Reg. 41/24, and SNC policies. SNC makes no representations or warranties regarding any other aspect of the Project.

By accepting this permit, the Permit Holder agrees:

- a) to indemnify and save harmless, SNC and its officers, employees, and agents, from and against all damage, injury, loss, costs, claims, demands, actions, and proceedings, arising out of or resulting from any act or omission of the Permit Holder or of any of their agents, employees, or contractors relating to any of the particular terms or conditions of this permit; and
- b) that this permit shall not release the Permit Holder from any legal liability or obligation and remains in force subject to all limitations, requirements, and liabilities imposed by law.

SNC assumes no responsibility or liability for flood, erosion, or slope failure damage that may occur to the subject property, nor any activity undertaken by the Permit Holder affecting the property interests of adjacent landowners.



PERMIT NOTICE AVIS DE PERMIS

PERMIT ISSUED UNDER SECTION 28.1
CONSERVATION AUTHORITIES ACT, R.S.O. 1990, c. C.27

PERMIS DÉLIVRÉ EN VERTU DE L'ARTICLE 28.1
OFFICES DE PROTECTION DE LA NATURE (LOI SUR LES), L.R.O. 1990, CHAP. C.27

2026-CLR-R043

Date Issued/ June 8, 2026
Date de délivrance

Expiry Date/ June 8, 2028
Date d'expiration

Subject Property/ Du Golf Rd & Landry Rd
Propriété visée Clarence-Rockland

To be posted in a publicly visible location while work is taking place.
À afficher dans un endroit visible par le public pendant les travaux.



APPENDIX H

BY-LAWS

Corporation of the City of Clarence-Rockland

By-law 2024-104

Being a By-Law to authorize the award of a contract to Shade Group Inc. for engineering services for the revision of the Philion Municipal Drain.

WHEREAS the Engineer's Report for the Philion Municipal Drain was adopted in 1977 by the Township of Clarence; and

WHEREAS notice requirements under subsection 78(2) of the Drainage Act have been met;

WHEREAS the Council of the Corporation of the City of Clarence-Rockland deems it expedient to award a contract to Shade Group Inc. for engineering services to prepare a report pursuant to subsection 78(1) of the Drainage Act to address the issues associated with the maintenance, capacity, efficiency and erosion of the Philion Municipal Drain;

Therefore, the Council of the City of Clarence-Rockland enacts as follows:

1. That the Mayor and the Clerk be authorized to award a contract in the amount of \$26,685, excluding HST to Shade Group Inc. for the preparation of a report pursuant to subsection 78(1) of the Drainage Act to address the issues associated with the maintenance, capacity, efficiency and erosion of the Philion Municipal Drain.
2. That this by-law shall come into force on the day of its adoption.

Read, passed and adopted in open council this 13th day of November 2024.

Mario Zanth, Mayor

Monique Ouellet, Clerk