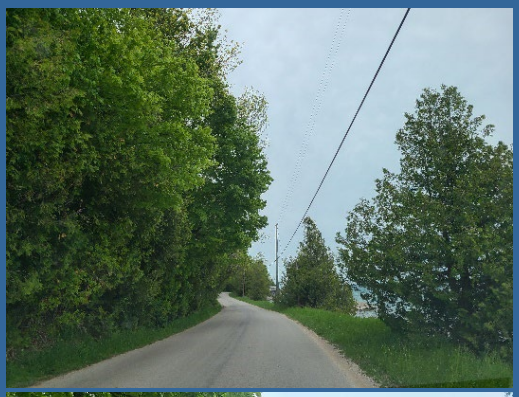
Town of South Bruce Peninsula Project #2120
Engineering Services and Preliminary
Design for the Reconstruction of Mallory Beach Road
June 2023




Preliminary Design of the Rehabilitation of Mallory Beach Road, South Bruce Peninsula

Submitted by:

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1.0 Executive Summary

Planmac Engineering Inc., hereafter referred to as Planmac, has been retained by Town of South Bruce Peninsula to complete a preliminary design assessment and report of Mallory Beach Road. This report herein serves to review and analyse the site's existing conditions, document the findings from the condition assessment and provide recommendations for the rehabilitation of the roadway.

The project's scope of work included data collection, field investigations (topographic, geotechnical, drainage and natural sciences), project management, approval recommendations, public consultation and preliminary design.

Rehabilitation/reconstruction of the road is planned to improve the performance, safety, drainage and ride conditions. The results of the geotechnical investigation accounted for a review of key components of the road improvement strategy which anticipated the following:

- In-place full depth reclamation of the existing pavement and underlying granulars;
- Placement of new hot mix asphalt;
- Replacement of centreline culverts in poor condition;
- Identification and repair of pavement distress areas;
- Geodetic ditching/ditch clean-outs where necessary to improve road drainage.

Mallory Beach Road within the 3.6km Study Area requires various improvements to improve drainage and to conform to safety standards. Pavement structure improvements are to include complete reconstruction of the subsurface to withstand current and future traffic loads. During this reconstruction, regrading of the roadway surface including possible blasting of surrounding bedrock formations will occur to improve grading to conform with transportation standards, increase visibility of oncoming traffic around current blind corners and improve drainage. There are a number of currently installed culverts that will need to be replaced during the reconstruction process to improve drainage or due to deterioration of installed culverts. Ditches and swales will be formed or improved along the north side of the roadway where possible to improve drainage and prevent pooling of water on the roadway. Additional advisory signage will be introduced where the current posted speed limits and associated design speeds do not meet current design standards. There are various instances of private utilities installed throughout the study area that do not have authorization and are routed underground or through culverts that will need to be relocated during construction activities. Throughout the entirety of the roadway allowance there are property encroachments of private installations within the road allowance that are recommended to be addressed by the Township with property owners. Possible methods to address the encroachments include relocations or address property acquisitions or easements.

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The existing roadway platform and horizontal and vertical alignment are substandard at various locations. Addressing the deficiencies at many locations would require property acquisition, relocation of structures and fill widening into the lake. It was determined by the study team in consultation with the municipality that it is not feasible to address all of these deficiencies throughout the study limits. In order to improve the roadway and address these issues, the study team recommends select improvements including addition of pavement marking and signage and sight line improvements while maintaining the reduced regulatory speed limits. The roadway will continue to perform as a low-speed residential roadway with improved safety together with the new pavement structure that will provide an enhanced extended service life.

2.0 Introduction

The Township of South Bruce Peninsula (SBP) has retained Planmac Engineering Inc. (Planmac) to undertake a preliminary detailed road design study and develop cost estimates associated with the reconstruction of Mallory Beach Road from County Road 9 to Kathleen Avenue.

3.0 Existing Roadway

3.1 Description

Study Area

The subject road segment as shown in **Exhibit 1** is approximately 3.6km in length and runs parallel with Georgian Bay to the south. The road is an approximately 7.0m wide paved road, consisting of narrow gravel shoulders on either side. The road has a posted speed of 40 km/h. The horizontal alignment is generally tangent with a few curves along the shore. The vertical alignment includes several abrupt vertical curves. Shallow ditches are present at spot locations whereas the majority of the roadway is lacking any form of ditches with the exception of some catch basins at select locations connected to outlet crossing culverts.

Background and Existing Conditions

The road currently has no municipal services, namely water, sanitary, and sewer, with no long-term plan to provide these services. The properties are serviced by septic tanks with tile beds and wells. However, some residential properties have shore-well water lines crossing under the road or fed through Town culverts or buried in the roadway. This has been confirmed with properties owners that responded to initial consultation letters (note not all property owners provided replies). The road has single dwelling residential homes on it that are noted to be both permanent and seasonal homes. The existing road does not appear to have a formal drainage network. It is noted that the road allowance is narrow, and it appears that properties have ownership on both sides of the road that encroach on the road allowance. Ownership on the south side of the road allowance is to allow for water access to Georgian Bay.

In 2019, it was determined Mallory Beach Road is in need of rehabilitation/resurfacing. Furthermore, the reconstruction of the road has been requested by the Mallory Beach Ratepayers' Association for several years.

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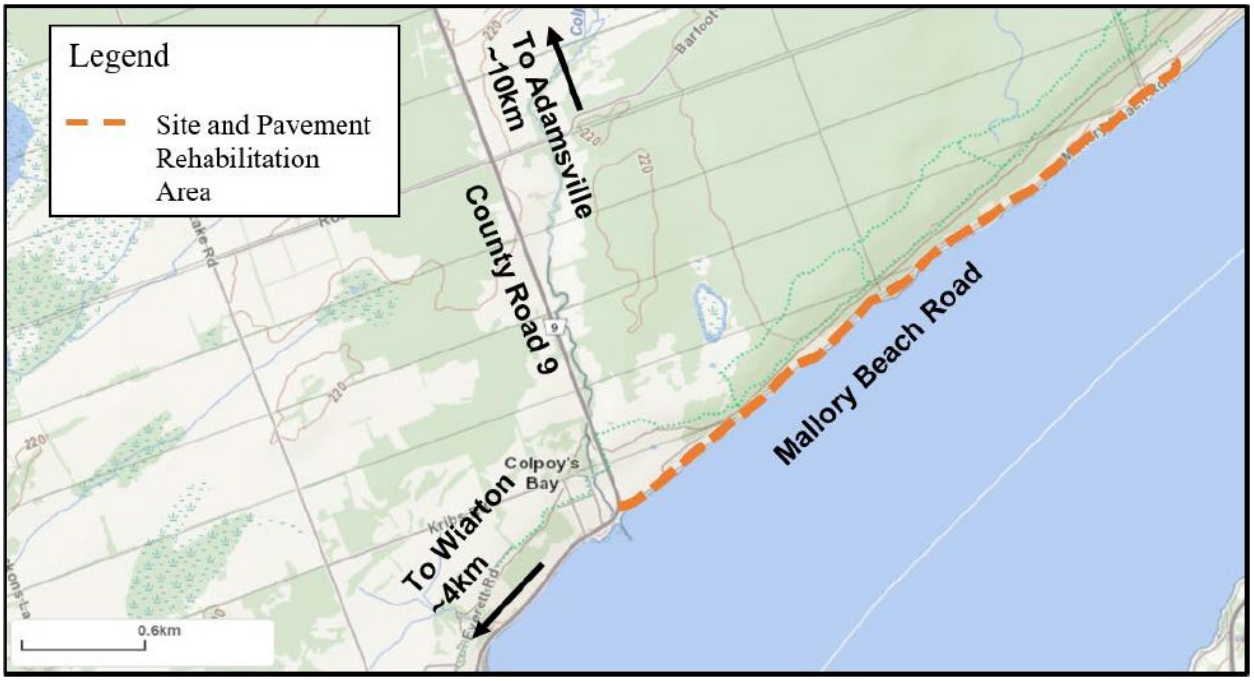
A full inventory of existing conditions and field notes was completed by the Planmac team for this assignment. Findings and preliminary recommendations are superimposed onto engineering survey drawings. These are located in **Appendix E** for reference.

Exhibit 1: Location of the subject roadway Key Map.



3.2 Condition of Roadway

Profile Vertical Curve Evaluation

The existing speed limit for Mallory Beach Rd. within the study area is 40 km/h. An assessment was conducted of the existing profile vertical alignment of the roadway, and in several locations due to extreme curvature, the current posted speed fails geometric design standards. Please refer to **Exhibit 2** for a summary on the Seven (7) Point of Vertical Intersection (PVI) stations that fail design standards. The full Profile Vertical Curve Evaluation is included in **Appendix A**.

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Exhibit 2: Summary table of roadway segments that do not conform with current speed limit.

PVI Station	Grade In	Grade Out	Type	Length	Rate of vertical Curvature K	Design Speed based on available K (Km/h)
0+055.47	-8.60%	0.52%	Sag	70	7.681	30
0+928.79	5.77%	-4.14%	Crest	38	3.835	30
1+009.53	-4.14%	9.88%	Sag	85	6.061	30
1+207.07	-8.11%	0.83%	Sag	40	4.475	20
1+599.84	-1.69%	8.44%	Sag	45	4.443	20
1+638.78	8.44%	-1.63%	Crest	32	3.177	30
2+092.16	-7.60%	1.39%	Sag	27	3.004	20

Roadway Alignment Evaluation

An evaluation of the roadway horizontal alignment was conducted. It was concluded that the existing roadway's horizontal alignment speed conforms to the posted 40 km/h speed limit. No improvements or other measures are necessary for the roadway horizontal alignment for the purpose of conforming to the posted speed limit. At the east project limits exists a right horizontal curve and intersecting roadway. Vegetation is overgrown on the inside of the roadway horizontal curve which poses a sight line restriction. Clearing of vegetation at that location will improve sight lines. An alternative that may be considered during detail is to reconstruct the curvature in order to create a three-leg intersection. The Roadway Alignment Report Table is included in **Appendix B**.

3.2.1 Sideroads and Entrances

Mallory Beach Rd. throughout the study area contains only one sideroad, Gatis Lane, at the westernmost portion of the project limits. Gatis Lane is a two-lane roadway with a paved surface. Most driveway entrances consist of gravel or paved surfaces. A few of the driveways have concrete surfaces; 225 Mallory Beach Rd. has two catch basins built into the concrete driveway that are within 1.0m of the roadway. Driveways range in size from single lane, widths of >= 10 m gravel and paved entrances that service multiple properties.

3.2.2 Traffic Analysis

A traffic counting station was installed by the Township in order to collect existing traffic volume data. The following summary of the existing traffic volumes findings are provided based on the information produced by the Township's consultant and is included in **Appendix I**.

Volume

Based on counts gathered within 24-hour windows at various locations within the study area;

- Average 24 hour vehicle counts are 415,
- Peak traffic volumes occur between 3PM and 6PM on days where data was collected.

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- 15% of days have traffic volumes that exceed 500 vehicles per day

Average traffic volumes collected indicate that the roadway does not vary significantly from local roadway classifications.

Speed Data Analysis

Speed data was collected at five locations within the study area, with each survey lasting for an average of 8.2 days;

- Total average speeds across all locations and times was 41 km/h;
- The fastest speed recorded during the studies was 122 km/h;
    - Of the fastest speeds recorded during the studies, the average fastest vehicle travelled at 89 km/h
- 20% of vehicles (about 85 per day) exceed the posted speed limit of 40 km/h.
- The average speed of vehicles do not exceed the speed limit.

3.2.3 Pavement Condition

In most areas, pavement is without any significant cracking or damage due to frost heaving. Throughout the entirety of the study area, there are portions of the roadway that are deteriorating or contain patchwork from culvert installation. Using a series of 20 boreholes, the current pavement condition was evaluated and is described by DS Consultants Ltd, and the full Geotechnical Report can be found in **Appendix C.** The pavement structure consists of 70 mm to 120 mm of asphalt overlying 460 mm to 1140 mm or granular base/subbase. Sand and gravel with cobbles and trace organic material was found in a compact/dense state underlaying the pavement structure and exceeded depths of 2.0 m below ground surface at all borehole locations. Sandy list, come clay and trace gravel was the predominant subgrade material found underlying granular full and sand and gravel possible fill. Boulders and bedrock outcroppings are present alongside the roadway at various locations along this section of Mallory Beach Road. Groundwater was recorded at 1 m below the ground surface on April 29th, 2021. It should be noted that groundwater levels are subject to fluctuations in response to seasonal or major weather events.

3.2.4 Drainage and Hydrology

Hydraulic Analysis and Present Culvert Capacities

Resilient Consulting was retained to conduct hydraulic analysis of the study area using topographic data collected form SMC Geomatics and site inspection data from Planmac. Existing culvert capacities that do not satisfy necessary drainage volumes will require larger or additional culverts to satisfy constraints. Under existing conditions, there are no storm sewer services along Mallory Beach Road. A large portion of runoff from the north of Mallory Beach Road is conveyed to the Bay via existing roadside ditches that cross below the road through culverts at various locations. In some sections where culverts do not exist, runoff will sheet flow over the road and into the Bay. Due to the escarpment on the north side of the road, some culverts have large external drainage areas. A summary of culvers that need to be replaced due to condition is included below in **Exhibit 3.**

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Exhibit 3: Summary of culverts that are to be replaced during any future construction activities.

Area ID	Culvert ID	Proposed Upgrade Type	Proposed Capacity (m3/s)	Proposed Diameter (mm)	5 Year Flow to Convey (m3/s)
A3	A3.2	Larger Culvert	0.1731	450	0.1740
A4	A4.1	Additional Culvert	0.1936	450	0.201
A6	A6.1	Larger Culvert	0.1682	450	0.1430
A9	A9.1	Larger Culvert	0.2114	525	0.1840
A10	A10.1	Larger Culvert	0.3117	600	0.3110
A10	A10.2	Larger Culvert	0.3358	450	0.3110
A11	A11.1	Larger Culvert	0.3301	600	0.3330
A12	A12.1	Larger Culvert	0.1452	375	0.1010
A12	A12.3	Larger Culvert	0.1053	375	0.1010
A13	A13.2	Larger Culvert	0.1131	375	0.0890

3.2.5 Legal Survey

Throughout the study there are encroachments on the road allowance to both the north and south sides of the roadway. Property encroachments were verified based on the legal survey. The locations of these occupational interests within the roadway allowance are summarized in **Appendix K.** Entries in this table include most significant property encroachments, however, all property encroachments are not limited to this table and can be found in the complete legal survey in **Appendix F.**

There are several locations where the existing roadway is not centered within the road allowance. This would be on private property. Acquisitions would be required from private owners in order to correct this problem.

3.4 Utilities

Municipal and Regional Utilities

The existing properties are not serviced by municipal water and sewer services utilities. All properties are on private water well supply and private sanitary septic systems.

The project consultation process included circulation to the following utility companies; replies are included in **Exhibit 4** below.

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Exhibit 4: **Utility Companies contacted, and the replies received**.

Utility Company Contacted	Reply Received
Hydro One	Please see the attached. I have identified one secondary u/g that goes under the road at // Mallory Beach Rd. As mentioned // are multiple privately owned secondary sub fed services to buildings on the shoreline, unfortunately Hydro One has no records to identify them. If you need anything further, please let me know.
Bell	N/a
Bruce Street Technologies Ltd.	N/a
Bruce Telecom	N/a
Connect the Dots Fibre Communications	N/a
GB TEL	As per Alastair Ross' email, I am reaching out with GBTEL's comments concerning this project. GBTEL does not have any assets in this area but are interested in possibly installing some, should road construction commence. We are interested in doing something similar to that which is being done in Wiarton's "Big Dig" – that is, if there is a common trench that we could bury our duct in while construction is underway, we could minimize aesthetic impacts and reduce costs. Should a common trench not be possible, we would also be possibly interested in plowing in duct prior to the completion of the project, again, in the interests of keeping the final product as clean-looking as possible.
Rogers	N/a
Union Gas	There's no Enbridge Gas infrastructure in this area, no further comments or concerns.

Privately Installed Utilities

Several of the current culverts contain private water and electrical lines that were placed by residents. A circulation to property owners was completed and some property owners verified buried lines or lines in culvert structures. Inquiries were sent to Mike Neumann from several landowners, and their replies are included below in **Exhibit 5**.

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Exhibit 5: Inquiries sent to Project Coordinators by Landowners

We recently purchased a property at // Mallory Beach Road and a water line and electricity both run under the road to our water pump on Colpoy's Bay. I am not certain exactly where it is located but it is definitely there. I hope this information is helpful even though it is incomplete. // and I are both available at this email if we can help in any way.
We reside at // Mallory Beach Road and in response to your request for information for your upcoming study we would like to inform you we have water lines and an electrical line running under Mallory Beach Road from our shore well to our home.
I live at // Mallory Beach Road and received a notice in my mailbox the other day. There are currently two utilities under the road for my house; our water line and an electrical line. I have lived here since September 2018 and don't know exactly where they are. I believe they were both installed about 50 years ago. Our neightbours lived in this house in the '70s, they would have a better idea. With the road being resurfaced is there an opportunity to bring the current utilities under the road up to code?
My residence is // this is to inform you of fact that both water & electric utilities have been run under the roadway which provide service to the property.
This is // at // Mallory Beach Road. We have a water line running under the road and out into the Bay. I trust that it won't be damaged during any Pulverization process.
We were checking on our cottage at // Mallory Beach Rd., South Bruce Peninsula a couple of weeks ago and we noticed some new survey markers on our property. // and he forwarded our letter to //. She was kind enough to forward a notice that apparently was given to property owners via hand delivery or mailbox as we had not received anything and do not have a mailbox at Mallory Beach. We noticed on the Legend that you requested notice if anybody had private water or other utility assets that may be within the roadway and yes, we have an intake pipe running from the bay under the roadway to service our cottage.
I was talking to //and he suggested I get in touch with you regarding this matter. This is in response to your request to provide information regarding utility assets located within the roadway. There is a water intake pipe from the bay and electrical line to the waterfront, at // Mallory Beach Road.

4.0 Environmental

This project will be completed in accordance with the approved Schedule 'A+' planning process as outlined in the Municipal Class Environmental Assessment Document (October 2000 as amended in 2007, 2011 & 2015), published by the Municipal Engineer's Association.

Fish & Wildlife

The Grey Sauble Conservation Authority and any governing bodies will be contacted for information on limitations imposed by fish and wildlife species and habitat, as well as Species at Risk (SAR) and habitat. Limitations imposed by these factors should be limited or not present. Although this project should not include any in water works, any in water works will be conducted during in-water timing windows that

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govern the Study Area. A permit application may be necessary in conjunction with culvert replacements or new culvert installations.

A brief review of the online aquatic SAR atlas provided by the Department of Fisheries and Oceans Canada (DFO) concluded that there are not fish SAR or related habitat in the study area or adjacent waters. This is under the assumption that work in Georgian Bay is not necessary based on the preliminary design recommendations. Since the culverts that need to be replaced only carry water during rain events, alterations to these existing watercourses are not suspected to have any significant or permanent negative effects to fish or fish habitat. Timing window restrictions will most likely apply.

Vegetation

Immediately beside the roadway there is vegetation on both sides in most of the study area, excluding only driveways and parking areas. The vegetation present includes grasses and herbaceous plants, shrubs, and in many areas, trees. Tree species composition is mostly mixed deciduous and cedar, with isolated coniferous stands. Many of the tree's proximity to the roadway are at a distance where they need not be disturbed during construction activities. Some minor removals or pruning may be necessary.

The trees to be removed in the case of construction activities include a several mature hardwoods and red pine, and an approximately 100m patch of juvenile cedar. As of May 2021, there are several saplings and juvenile trees directly adjacent to the roadway that do not provide considerable avian or wildlife habitat and may need to be removed during the construction process.

4.2 Recreation

Alongside the roadway there are no public recreation facilities, parks, walkways, or water access. The roadway has no dedicated cycling lane.

4.3 Public Consultation

Public service entities, utility companies and residents were notified of the study using study commencement letters that included information on the reach of the study and activities that may take place therein. The sample letter used that was sent to private and public entities is included in **Appendix G**; the consultation contact table and Stakeholder Contact list used is included in **Appendix H. Exhibit 6** below includes the entities contacted and the dates that commencement materials were sent.

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Exhibit 6: External Agencies, Utility Companies and Indigenous Communities Contacted with Commencement Materials

Entity Contacted	Date Contacted
Town of South Bruce Peninsula - Fire services	2021-04-14
Bruce County - Director, Transportation and Environmental Services	2021-04-14
Bruce Country - Emergency Management	2021-04-14
Bruce County - Operations Manager, Transportation and Environmental Services	2021-04-14
MNRF - Owen Sound	2021-04-14
OPP - Wiarton	2021-04-14
Beausoleil First Nation	2021-04-14
Chippewas of Georgina Island	2021-04-14
Chippewas of Nawash Unceded First Nation	2021-04-14
Chippewas of Rama First Nation	2021-04-14
Metis Nation of Ontario - Owen Sound Office	2021-04-14
Saugeen First Nation	2021-04-14
Wahta Mohawks First Nation	2021-04-14
Hydro One	2021-04-14
Bell	2021-04-14
Bruce Street Technologies Ltd.	2021-04-14
Bruce Telecom	2021-04-14
Connect the Dots Fibre Communications	2021-04-14
GB TEL	2021-04-14
Rogers	2021-04-14
Union Gas	2021-04-14

A second issue of the study commencement was issued to property owners on February 9th, 2022 as a reminder of the proposed works and at the request of municipal council. In addition to property owners directly within the study area, this follow-up notice was provided to property owners that are beyond the study limits but will be affected by the project including those that reside at the end of Mallory Beach Road. This follow-up notice can be found attached in **Appendix L**.

4.4 Summary of Public Consultation

The public consultation process was successful, and valuable input was provided on both the viewpoints of the community and individuals. In addition to notice provided by landowners on private utilities that exist beneath the roadway and structures that are within the road allowance, concerns were voiced regarding the proposed project and its impact on residents.

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A letter was drafted by landowners and sent in separately by many individuals that voiced concerns regarding the efficacy of proposed works and the primary considerations of the project. The primary notes were on the safety of the road and that the road does not currently meet provincial standards of lane width. Residents feel that the road is too narrow for safe passage of large vehicles such as trucks, school busses, and emergency vehicles; poor sight lines in some areas, overgrowth of trees and the narrow lane width creates a hazard for opposing traffic and pedestrian. This letter can be found in the first row of the table in the attached **Appendix M**.

The ”S bend” was also an area of concern in many of the comments received, and it was evident that landowners feel that the speeds at which vehicles are likely to travel through this area are dangerous and above the posted limit of 40 km/h. One common suggestion received was the conversion of this area to a three-way stop intersection, forcing vehicles to stop.

Encroachments on both private land and the road allowance were a common comment. Some residents asked that their private utilities remain untouched in any construction works, and there were concerns voiced about the roadway encroaching on private land, specifically near the “S bend”. Many residents including those that sent the common letter expressed those private structures within the road allowance should be disregarded and that they should not have an affect on the design of improvements to road geometry and that private structures should be removed if necessary.

Common suggestions that were made included road painting to encourage drivers to maintain their own lanes, the installation of guardrails in dangerous areas, widening of the road and improvements to sightlines in dangerous areas, and implementation of traffic calming measures including reduced speed limits and increased signage. Landowners also expressed concern that the traffic volumes may not be reflective of actual traffic volumes during peak seasons, as the timeframe at which data was collected compromises the integrity of the data.

There were comments that suggested that works not be done at all, or minimal works be done allowing any current issues with the road to remain, also serving to not disturb any of the trees or private infrastructure. Overall, the majority of comments were about the roadway width, traffic speeds, and overall safety of travel for both pedestrian and vehicular traffic. The full summary of comments and their replies can be found attached in **Appendix M**.

5.0 Alternatives Review and Evaluation

5.1 Evaluation of Alternatives

Vertical Alignment

Given the roadway’s close proximity to driveways and other physical limitations, reconstruction of these portions of roadway will not be possible and it is recommended that additional signage be added to these areas. The improvements necessary will involve providing advance signage to alert approaching vehicles of sight line restrictions. These improvements can also be provided to enhance the safety of pedestrians.

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Pavement Design Alternatives

For new construction, the recommended pavement structure for road reconstruction is provided in Table 4 of the Geotechnical report in **Appendix C**. Based upon typical urban road standards and supported by subgrade soil properties as determined from visual examination and textural classification of the soil samples. A function design life of eight to ten years to the first rehabilitation, assuming regular maintenance is carried out. If required, a more refined pavement structure design can be performed based on specific traffic data and design life requirements and will involve specific laboratory tests to determine frost susceptibility and strength characteristics of the subgrade soils, as well as specific data input form the client.

Roadway Width

During Detail Design, the designer should assess the feasibility of introducing platform and alignment changes in each phase based on the project constraints such as: proximity or the water, utilities, private encroachments. Where possible, the designer should design the roadway with a wider platform at select locations depending on the available platform.

Increasing the width of the road will achieve multiple goals;

- Allow a safe area for vehicles to pull off the roadway,
- Provide the space necessary for large commercial vehicles,
- Provide a larger space for pedestrian and cyclist traffic,
- Provide more space for regular maintenance vehicles, and increase the feasibility of future rehabilitation activities.

6.0 Discussion and Recommendations

6.1 Traffic Staging

Construction will be staged with works being completed on one half of the road and then switched to the other. This will minimize disruption to road users. Single lane traffic will be controlled by temporary traffic signals or flagging operations in conformance with OTM Book 7 requirements. A traffic management plan will be prepared during detail design. Contract special provisions are recommended that will limit the number of work zones over the project limits in order to minimize the amount of traffic queue areas. Several work zones are expected for works associated with culvert trenching replacements, ditch/swales and roadway reconstruction for example.

6.2 Roadside Safety

During detail design, the roadway cross-section will require some assessment at steepened embankments. The existing embankments based on their steepness and proximity to the lake will warrant guiderail protection systems. Once the pavement design has been finalized during detail design, guiderail systems with end treatments may be warranted. Cable guiderail systems will not be sufficient since there is an insufficient deflection platform available for such a system. Introduction of a guiderail barrier will require steel beam guiderail with energy attenuators.

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6.3 Entrances and Intersections

There are numerous entrance access locations to the roadway. Many entrances include obstruction such as planters or bollards in the right of way. These may require removal with the roadway design work. Based on the roadway reconstruction work, entrances will require reconstruction and reinstatement for some distance from the newly constructed roadway (+/-5m). The final limit of entrance construction will be determined during detail design. The roadway reconstruction proposed will limit any grade raise which will limit the reconstruction distance of the driveways.

6.4 Utilities

Utility conflicts for construction activities are not expected for public utilities (phone or hydro poles). Utility conflicts do exist for private services at some locations (water supply lines or power supply lines). These lines will require relocation if encountered during culvert replacement or excavations for drainage improvements or roadway construction.

6.5 Vertical Alignment

Since the vertical alignment fails current design standards at several locations and significant grading options to address the alignment will not be feasible. It is recommended to install advisory signage at these locations to alert approaching traffic of the visual sight line deficiencies at these locations. Appropriate signage can be determined during detail design.

6.6 Drainage and Hydrology

To encourage conveyance of runoff through the upgraded culverts, a swale is proposed on the north side of Mallory Beach Road, where property lines allow. The proposed swale will need to be incorporated into the new road design during detail design. A typical cross section for roadside swales has been included in the figure below. It is noted that the swale dimension below may not be able to fit in the available right of way at many locations. During detail design, an assessment of the swale geometry is required which may involve further refinement by filling the excavation area with more rip rap/clear stone and filter fabric to promote infiltration. The amount of backfill may extend to the near edge of pavement elevation. The swale has been sized to convey the 5-year flow with 0.3m freeboard to the top of subgrade.

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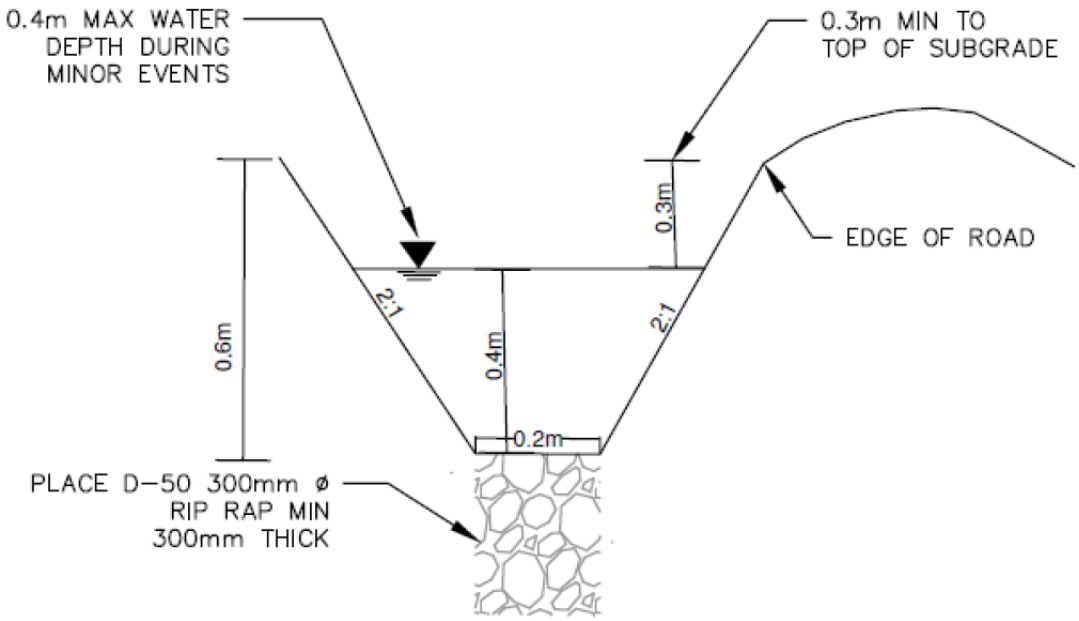

Exhibit 7: Summary of Recommended Culvert Additions and Upgrades and their Capacities.

Area ID	Culvert ID	Proposed Upgrade Type	Proposed Capacity (m3/s)	Proposed Diameter (mm)	5 Year Flow to Convey (m3/s)
A3	A3.2	Larger Culvert	0.1731	450	0.1740
A4	A4.1	Additional Culvert	0.1936	450	0.201
A6	A6.1	Larger Culvert	0.1682	450	0.1430
A9	A9.1	Larger Culvert	0.2114	525	0.1840
A10	A10.1	Larger Culvert	0.3117	600	0.3110
A10	A10.2	Larger Culvert	0.3358	450	0.3110
A11	A11.1	Larger Culvert	0.3301	600	0.3330
A12	A12.1	Larger Culvert	0.1452	375	0.1010
A12	A12.3	Larger Culvert	0.1053	375	0.1010
A13	A13.2	Larger Culvert	0.1131	375	0.0890

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6.7 Environmental

In the case of tree removal becoming a necessity, the following must occur;

- Tree measurements and classification,
- Application for permit of removal with the Grey Sauble Conservation Authority (GSCA),
- Trees will need to be. Tree removals will need to avoid periods of active nesting activity. Typically fall to early spring is the most appropriate time to address removals in order to avoid nesting activities. Consultation with GSCA is recommended during detail design in order to establish the appropriate timing window.
    - If there are trees that are to be removed outside of provided timing windows, then it is likely a qualified biologist will be hired to check for nests or SAR bird species.

6.8 Pavement Design

The Pavement Design report including recommendations for Pavement Structure Thickness can be found in the attached Appendix C. The following recommendations were made;

Pulverization of the existing roadway and reconstruction of the granular base/sub-base.

Pulverized material will be used in the reconstruction of a new granular base with new material introduced.

The road surface will have a universal grade raise, and in some areas (i.e. concrete driveways, catch basins) this option will be difficult.

Slope improvements (at least a two percent grade universally) should be made, and in many areas, drainage improvements including possible subdrains should be installed to prevent roadside pooling and softening of the sub-grade.

Blasting may be required for possible road widening or otherwise cut areas due to presence of boulders and bedrock outcroppings.

In areas where grade increase is not possible, partial depth reconstruction can be completed while maintaining the existing granular subbase material.

6.9 Property Encroachments Based on Legal Survey

Based on the results of the legal survey, several encroachments were identified in the right of way. The Township may wish to consider addressing property acquisitions to address non-conforming issues or initiate consultations with property owners to relocate obstructions present in the right of way if possible. It is acknowledged that some obstructions include building structures and therefore relocations are not feasible although items considered to be point hazards in the right of way which can be relocated should be considered.

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6.10 Discussion of Traffic and Speed

Overall, traffic volumes that were collected by the Township's consultant do not warrant reclassification of the road, and the road can remain classified as a "Local Roadway".

Average vehicle speed does not exceed the posted speed limit of 40 km/h. Based on the number of speed limit violations, it is recommended that OPP speed limit enforcement be employed during peak traffic times and/or seasons.

No additional special provisions other than the recommendations produced in this report or design features are recommended based solely on the information collected in the speed and traffic study, due to overall compliance with regulations and limitations. The recommended changes to speed limits in select locations based on alignment and visibility should be retained as they correspond to safety standards.

7.0 Cost Estimate

A preliminary design cost estimate has been developed based on the major recommendations included with this report. The cost estimate is subject to further refinement during detail design. The cost estimate does not include provisions for any utility relocations or property acquisitions. Please refer to **Appendix J** for the cost estimate.

Based on discussions with Town Staff, we have developed a phase-cost estimate, in which work types are broken down into phases based on level of importance or urgency. Constructing projects in phases as presented herein have a higher total cost, as through constructing in multiple seasons requires higher transport, staging, mobilization and demobilization costs. Where such plans are effective are dividing the overall cost of a project into smaller, manageable parts. These estimates are designed with the assumption that phase 1 works are completed during the spring-fall season of 2023, and other phases are carried out in subsequent years during the appropriate time periods. Rate estimates are subject to change following complete detail design.

These estimates were designed with lower costs in phases 1 and 2, allowing the Town time necessary to budget for higher cost items that are included in Phase 3.

Phase 1.

Phase 1 shall include high priority areas where alignment is not optimized, or sightline visibility is poor, as well as other portions of the roadway that are currently considered hazardous by modern engineering standards. Drainage rectification measures, 'shave and pave' asphalt wearing surface repairs, realignment, pavement marking, and signage are also included in phase 1.

Phase 2.

Phase 2 shall include the S-bend at the eastern most end of the study area, including signage, reconstruction, pavement marking, and drainage fixes where necessary. These works will also include re-aligning the roadway so that the edge of the constructed road does not fall outside of the Right-of-

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way. Phase 2 will extend westerly to evenly distribute work into even work seasons, and divide cost into even sections.

Phase 3.

Phase 3 shall include all other areas that would have at that point not yet been addressed in the first two phases, including 'shave and pave' asphalt wearing surface repairs, correction to drainage features, signage and road marking. If all works were to be completed in one construction season (Costs herein are assumed for 2023 season) then the total preliminary cost estimate is estimated To be $1.55 million (rounded). Please note that pavement milling and paving (shave and pave) is not the recommended pavement rehabilitation strategy that will produce an extended service life. This option was developed as a lower cost option but will not last as long as what is recommended in the geotechnical report.

If the works are divided into three phases as discussed above the costs are;

- Phase 1 – estimated to be $400,000 (rounded)
- Phase 2 – estimated to be $230,000 (rounded)
- Phase 3 – estimated to be $1.25 million (rounded)

Total estimated costs by dividing works into three phases is $1.55 million (rounded).

8.0 Closing

It is the opinion of Planmac Engineering Inc. that all recommended improvements be conducted to match industry standards and improve the safety of the roadway. This includes reconstruction of the entire road base, widening of the roadway, the introduction of and improvements to existing drainage measures and the construction of guiderails. Reconstruction of the road should include improvements to the shape of the road, and where possible, a universal grade increase. Property encroachment on the road allowance should be addressed, relocating structures where possible to allow for adequate reconstruction of the road.

As a less extensive alternative to completing all recommended activities, we recommend that at minimum, the following improvements be made to improve overall road safety and address the areas of concern:

- Widening and regrading specific areas of concern, especially where existing site lines are poor. This will require review of these areas in detail in order to determine if widenings can be address without significant property acquisitions and fill widenings
- Increasing drainage/construction of swales in areas of concern, especially in flood prone areas, or in areas of steep grade that have no existing drainage measures in place,
- Relocation of private structures that encroach on the road, especially in cases where these encroachments create an impedance or danger to roadway traffic,
- The installation of traffic calming measures, including increased signage and pavement markings,

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- As an alternative to a complete reconstruction of the existing road, a resurfacing is recommended universally to address the current pavement conditions as outlined in the background geotechnical study.

The information and opinions expressed in this report are solely for the benefit of Town of South Bruce Peninsula ("the Client"). We request that discretion be exercised when sharing this report, and request that Town of South Bruce Peninsula notify Planmac prior to sharing this report with external parties. The report shall not be relied upon for any purposes other than intended for the Client without the expressed written consent of Planmac. No portion of this report shall be used as a single entity.

Any use which a third party makes of this report, or any reliance or decisions to be made based on it, are the responsibility of such third parties. Planmac accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions based on this report. We expressly waive responsibility for the effects of any action taken as a result of this service unless we are specifically advised and participate in this action, in which case our responsibility will be agreed to at that time. No other warranty, expressed or implied is made.

We trust that this report and associated recommendations meets your needs at this time. Should you require any additional engineering support, field notes, additional photographs or any other documentation supporting our findings, or if you have anything you would like to discuss, please feel free to contact us at any time.

This report has been prepared by the following:

Yours truly,

Report Prepared By:

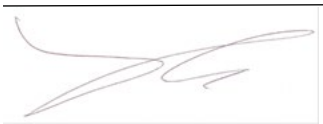
Axel Neumann

Project Coordinator

Report Reviewed By:

Mike Neumann, P. Eng.

President / Project Manager



Jeff Huang, P.Eng.

Vice President / Senior Engineer

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Appendix A

Profile Vertical Curve Evaluation Report

Client:	**Prepared by:**
Client	Preparer
Client Company	Your Company Name
Address 1	123 Main Street

Date: 2021-05-31 5:01:15 PM
HSD = Headlight
Sight Distance,

Profile Name: Mallory Rd Proposed Profile
Station Range: Start: 0+000.00, End: 3+667.55

PVI Station	Grade In	Grade Out	Type	Length	Rate of vertical Curvature K	Design Speed based on available K (Km/h)
0+055.47	-8.60%	0.52%	Sag	70	7.681	30
0+155.00	0.52%	-0.56%	Crest	40	37.048	60
0+211.61	-0.56%	1.43%	Sag	40	20.052	60
0+248.41	1.43%	-2.35%	Crest	30	7.922	50
0+292.13	-2.35%	1.17%	Sag	40	11.36	40
0+334.50	1.17%	-1.03%	Crest	40	18.193	60
0+385.38	-1.03%	1.04%	Sag	50	24.108	60
0+493.45	1.04%	-1.26%	Crest	35	15.201	60
0+542.62	-1.26%	0.85%	Sag	30	14.191	50
0+585.91	0.85%	-0.79%	Crest	45	27.306	60
0+724.78	-0.79%	2.57%	Sag	65	19.328	60
0+780.30	2.57%	-2.02%	Crest	32	6.976	50
0+874.54	-2.02%	5.77%	Sag	70	8.989	40
0+928.79	5.77%	-4.14%	Crest	38	3.835	30
1+009.53	-4.14%	9.88%	Sag	85	6.061	30
1+077.42	9.88%	-2.23%	Crest	50	4.126	40
1+164.48	-2.23%	-8.11%	Crest	35	5.958	40
1+207.07	-8.11%	0.83%	Sag	40	4.475	20
1+257.24	0.83%	2.51%	Sag	31	18.471	50
1+308.93	2.51%	-1.66%	Crest	55	13.183	60
1+383.64	-1.66%	0.07%	Sag	55	31.74	60
1+443.38	0.07%	-1.24%	Crest	25	19.056	60
1+479.02	-1.24%	0.51%	Sag	32	18.22	50
1+530.83	0.51%	-1.69%	Crest	30	13.635	60
1+599.84	-1.69%	8.44%	Sag	45	4.443	20

1+638.78	8.44%	-1.63%	Crest	32	3.177	30
1+677.47	-1.63%	-0.43%	Sag	25	20.861	60
1+773.24	-0.43%	-0.75%	Crest	60	188.104	60
1+873.27	-0.75%	2.55%	Sag	43	13.021	50
1+929.74	2.55%	-0.03%	Crest	35	13.56	60
1+995.39	-0.03%	1.74%	Sag	25	14.11	50
2+053.89	1.74%	-7.60%	Crest	38	4.066	40
2+092.16	-7.60%	1.39%	Sag	27	3.004	20
2+128.73	1.39%	-1.58%	Crest	30	10.11	60
2+166.03	-1.58%	1.09%	Sag	40	14.954	50
2+229.87	1.09%	-2.11%	Crest	40	12.496	60
2+288.31	-2.11%	0.46%	Sag	50	19.474	60
2+366.56	0.46%	-0.42%	Crest	20	22.619	60
2+415.13	-0.42%	1.90%	Sag	40	17.232	60
2+451.61	1.90%	1.02%	Crest	20	22.719	60
2+544.58	1.02%	-1.93%	Crest	50	16.969	60
2+592.77	-1.93%	-0.31%	Sag	22	13.586	50
2+706.51	-0.31%	0.88%	Sag	60	50.215	60
2+751.29	0.88%	-0.43%	Crest	25	18.969	60
2+791.33	-0.43%	0.97%	Sag	42	29.901	60
2+845.28	0.97%	-1.96%	Crest	35	11.952	60
2+950.31	-1.96%	0.40%	Sag	45	19.12	60
3+004.82	0.40%	1.14%	Sag	20	26.813	60
3+053.11	1.14%	-1.77%	Crest	40	13.746	60
3+091.94	-1.77%	0.05%	Sag	33	18.14	60
3+240.00	0.05%	0.68%	Sag	100	160.18	60
3+353.44	0.68%	0.20%	Crest	100	210.491	60
3+483.17	0.20%	-0.45%	Crest	25	38.658	60
3+542.89	-0.45%	5.70%	Sag	60	9.758	40
3+609.06	5.70%	-0.60%	Crest	72	11.423	60

Summary of PVI stations that do not conform with reccomended posted speed limit of 40 km/h

PVI Station	Grade In	Grade Out	Type	Length	Rate of vertical Curvature K	Design Speed based on available K (Km/h)
0+055.47	-8.60%	0.52%	Sag	70	7.681	30
0+928.79	5.77%	-4.14%	Crest	38	3.835	30
1+009.53	-4.14%	9.88%	Sag	85	6.061	30
1+207.07	-8.11%	0.83%	Sag	40	4.475	20
1+599.84	-1.69%	8.44%	Sag	45	4.443	20
1+638.78	8.44%	-1.63%	Crest	32	3.177	30
2+092.16	-7.60%	1.39%	Sag	27	3.004	20

Appendix B

Roadway Alignment Report

Date: 2021-05-31 2:15:57 PM

Alignment Name: Mallory Rd Existing. CL
Description:
Station Range: Start: 0+000.00, End: 3+667.01

PI Station	Curve Radius	Design speed based on superelevated cross section (Km/h)	Design speed based on Normal Crown cross section (Km/h)
0+000.00	Start		
0+023.11	50		
0+078.62	184	60	-
0+184.61	760	60	40
0+295.67	425	60	-
0+409.05	603	60	40
0+567.04	300	60	
0+605.96	300	60	
0+830.50	335	60	
0+923.97	60	40	
0+990.00	180	60	
1+147.80	510	60	40
1+259.47	130	60	
1+313.57	130	60	
1+381.01	400	60	
1+448.37	500	60	40
1+548.02	450	60	
1+605.80	160	60	
1+650.54	100	50	
1+744.99	1100	60	50
1+877.13	185	60	
1+946.63	100	50	
2+042.55	100	50	
2+132.22	200	60	
2+188.63	200	60	

2+241.15	120	50	
2+324.46	200	60	
2+388.02	350	60	
2+445.34	650	60	40
2+498.82	300	60	
2+658.49	450	60	
2+844.29	180	60	
2+925.80	1500	60	50
3+094.56	400	60	
3+207.73	350	60	
3+334.27	1100	60	50
3+455.36	350	60	
3+570.74	33	40	
3+642.61	28	40	
3+667.01	End		

Alignment PI Station Report

Client:
Client
Client Company
Address 1

Appendix C

REPORT ON

Geotechnical Investigation
Mallory Beach Road Reconstruction
Wiarton, ON

PREPARED FOR

Planmac Engineering Inc.

PREPARED BY:

DS Consultants Ltd.

DS Project No: 21-130-400
Date: June 21, 2021

DS CONSULTANTS LTD.
40 Bell Farm Rd., Unit 8
Barrie, Ontario, L4M 5L3
Telephone: (705) 721-9392
www.dsconsultants.ca

Table of Contents

DRAWINGS

1. INTRODUCTION

DS Consultants Limited (DS) was retained by Planmac Engineering Inc. (Planmac) to undertake a geotechnical investigation for the reconstruction of Mallory Beach Road in Wiarton, Ontario. The section of Mallory Beach Rd. to be reconstructed includes about 3.6 km of paved road between County Road 9 and Kathleen Avenue as shown in **Drawing 1**. To complete the investigation, DS conducted twenty (20) boreholes using continuous flight auger equipment and sampling with a 50mm outer diameter split spoon barrel sampler. The purpose of the boreholes was to determine the asphalt depth, depth of granular Base/Sub-Base, and to classify subgrade materials for the construction of a new pavement structure. It is understood that the town would like to complete pavement rehabilitation consisting of surface pulverization and resurfacing of the road.

This report is provided on the basis of the terms of reference presented above and, on the assumption, that the design will be in accordance with applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings or test pits and reporting before the recommendations can cater to the changed design.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for Planmac Engineering Inc. and its designers. Use of this report by third party without DS consent is prohibited.

2. FIELD AND LABORATORY WORK

Twenty (20) boreholes (BH21-1 to BH21-7, BH21-9, BH21-11 to BH21-17, and BH21-19 to BH21-23) were completed at the site on April 26th and 27th, 2021 to depths ranging from 0.7 to 3.7 m below ground surface in locations shown in Drawing 1. Boreholes were advanced using a truck-mounted continuous flight auger system and samples were retrieved by means of a 50mm outer diameter split spoon barrel sampler which was hammered into the ground in conformance with the requirements of a Standard Penetration Test (SPT). During the investigation, DS completed visual examination, recorded depths of the existing pavement structure/subgrade and collected samples for laboratory analysis.

Water level observations were made during drilling and in the open boreholes upon completion of the drilling. Additionally, one (1) 50mm diameter monitoring well was installed at borehole BH21-12 for stabilized water level monitoring.

Following the drilling, soil samples were transported to DS soil lab for testing of moisture content and grain size analyses of six (6) selected soil samples. The test results are presented in **Drawing 21A** and **21B** and on the borehole logs.

3. SITE AND SUBSURFACE CONDITIONS

The borehole location plan is shown on **Drawing 1**. General notes on sample description are provided on Enclosure 2A. The subsurface conditions in the boreholes are presented in the individual test pit logs presented in **Drawing 2** to **21**. The subsurface conditions presented in the logs can be generalized as follows in Section 3.1.

3.1 EXISTING PAVEMENT AND SOIL CONDITIONS

Pavement Structure: Boreholes were completed on paved surface and encountered a pavement structure consisting of 70 mm to 120 mm of asphalt overlying 460 to 1140 mm of granular base/subbase. Table 1 summarize the asphalt and granular thicknesses at the borehole locations. The value of Granular Base Equivalency (GBE) has been estimated based on equivalency factors of 1.25 and 0.75 for the existing asphalt and existing granular base/subbase, respectively.

Table 1 - Thicknesses of Asphalt and Granular Base/Subbase

Borehole No.	Asphalt (mm)	Granular Base/Subbase (mm)	Granular Base Equivalency GBE (mm)	Subgrade Soil type(s) to Borehole termination depth
BH21-1	90	460	455	**NATIVE:** Sandy silt till, some gravel
BH21-2	80	1140	955	**POSSIBLE FILL:** Sand and gravel, trace cobbs, trace organic
BH21-3	80	680	610	**FILL:** Sand and gravel
BH21-4	70	1000	835	**NATIVE:** Sandy silt
BH21-5	70	830	710	**NATIVE:** Sandy silt some gravel
BH21-6	70	730	635	**NATIVE:** Sandy silt, trace gravel
BH21-7	90	710	645	**NATIVE:** Sandy silt, some gravel
BH21-9	90	1010	870	**NATIVE:** Silty sand, trace gravel
BH21-11	70	780	670	**NATIVE:** Sandy silt, trace gravel
BH21-12	100	780	710	**NATIVE:** Sandy silt, trace gravel
BH21-13	120	640	630	**FILL:** Sand and gravel
BH21-14	70	640	565	**FILL:** Sand and gravel
BH21-15	90	1110	945	**NATIVE:** Sandy silt, trace gravel
BH21-16	80	970	825	**NATIVE:** Sandy silt, trace gravel
BH21-17	70	730	635	**NATIVE:** Sandy Silt, trace gravel
BH21-19	70	1130	935	**NATIVE:** Sandy silt till, trace gravel
BH21-20	70	1000	835	**NATIVE:** Sandy gravel and rock fragments
BH21-21	80	1130	945	**NATIVE:** Sandy silt
BH21-22	90	670	615	**POSSIBLE FILL:** Sand and gravel some cobbles

BH21-23	70	690	605	**NATIVE:** Sandy silt
Average GBE (mm) = 730				

Grain size analysis of four samples of base/sub-base (BH21-2/GS1, BH21-12/SS1, BH21-19/SS1 and BH21-22/GS1) were completed. The results are presented in **Drawing 22A** and are shown on the borehole logs with the following fractions:

Table 2: Granular Base/Subbase Sieve Results and Percentages

Borehole No.	Sample No.	Gravel %	Sand %	Silt + Clay %
BH21-2	GS1	32	48	20
BH21-12	SS1	64	30	6
BH21-19	SS1	38	52	10
BH21-22	GS1	50	37	14

Sand and Gravel/Sandy Gravel Fill: Sand and gravel with cobbles and trace organic material was found underlaying the pavement structure and extended to depths of 0.8 to 2.1 m below ground surface at all borehole locations. The sand and gravel was found in a compact to dense state. This layer may have been the granular fill as part of a previous pavement structure. Boreholes BH21-2, BH21-3, BH21-13, BH21-14, BH21-20 and BH21-22 were terminated in sand and gravel fill.

Sandy Silt/Silty Sand/Sandy Silt Till: Sandy silt, some clay, trace gravel was the predominant subgrade material found underlying granular fill and sand and gravel possible fill. Grain size analysis of two samples of sandy silt material (BH21-1/SS3 and BH21-12/SS3) were completed. Boreholes BH21-1, BH21-4 to BH21-12, BH21-15 to BH21-19, BH21-21, and 21-23 were all terminated in this layer. The results are presented in **Drawing 22B** and are shown on the borehole logs, with the following fractions:

Table 3: Sandy Silt Sieve Results and Percentages

Test Pit No.	Sample No.	Gravel %	Sand %	Silt%	Clay %
BH21-1	SS3	10	36	37	17
BH21-12	SS3	1	24	55	20

Bedrock/Boulders: Boulders and bedrock outcroppings are present alongside the roadway at various locations along this section of Mallory Beach Road. Auger refusal occurred at boreholes BH21-2, BH21-3, BH21-4, BH21-13, and BH21-14 on possible boulders or bedrock.

3.2 GROUNDWATER CONDITIONS

One monitoring well was installed in BH21-12 for stabilized groundwater level monitoring. Non-stabilized water levels were measured in open boreholes upon completion of drilling at all boreholes where water was encountered. The stabilized water level in BH21-12 was recorded at 1 m below ground surface on April 29th, 2021. Water was also found in the open boreholes at BH21-15 (0.8mbgs) and BH21-21 (1.2mbgs) upon completion of drilling. The water is anticipated to be a reflection of the water table in these areas. Wet soils were encountered in other boreholes however no other boreholes had standing water in the hole upon completion. It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events.

4. DISCUSSION AND RECOMMENDATIONS

Based on the grain size analyses results carried out on two samples of granular base (BH21-2 GS1, BH21-22 GS1), and two samples of subbase (BH21-12 SS1, BH21-19 SS1) the existing granular base contains fines of 14% to 20%, and subbase contains fines of 6% to 10%. The granular base does not conform with the general requirements for Granular 'B' material (in accordance with Table 2, OPSS 1010). Considering this, the granular base in the existing pavement structure is not suitable for reuse as granular material. If a grade increase is possible for the road design, the existing roadway can be rehabilitated by partial depth reconstruction. The existing asphalt can be pulverized along with existing granular base to a depth of 200 mm. The existing materials can be compacted and left in place as select subgrade material. Place 150 mm new granular base (Granular 'A' OPSS) over the pulverized material. Pave with 100 mm Hot mix asphalt (40mm HL3 over 60 mm HL8) is recommended. The pulverized asphalt mixed with granular must be compacted 98% standard proctor maximum dry density (SPMDD). The Granular subbase and granular base materials must be compacted to 100% standard proctor maximum dry density (SPMDD).

If a grade increase is not possible, partial depth reconstruction can be completed while maintaining the existing granular subbase material. The existing asphalt and base material must be removed to a depth of 250mm from the existing surface. The existing subbase shall be rolled with a smooth drum roller and any soft spots shall be repaired with OPSS granular 'B'. Place 150mm of new granular base (Granular 'A' OPSS) over the existing subbase. Pave with 100 mm Hot mix asphalt (40mm HL3 over 60 mm HL8) is recommended. The Granular base materials must be compacted to 100% standard proctor maximum dry density (SPMDD).

Subject to final grades, blasting may be required for possible road widening or otherwise cut areas due to presence of boulders and bedrock outcroppings alongside the roadway. Boulders or possible bedrock was encountered in the boreholes at the location of boreholes BH21-2 to BH21-4, BH21-13, and BH21-14.

Alternatively for new construction, the recommended pavement structure for road reconstruction is provided in Table 4. It is based upon typical urban road standards and is supported by subgrade soil properties as determined from visual examination and textural classification of the soil samples. A functional design life of eight to ten years has been used to establish the pavement recommendations. This represents the number of years to the first rehabilitation, assuming regular maintenance is carried out. If required, a more refined pavement structure design can be performed based on specific traffic data and design life requirements and will involve specific laboratory tests to determine frost susceptibility and strength characteristics of the subgrade soils, as well as specific data input from the client.

The excavation of the existing roadway may result in excess soil which is not suitable for use on the construction contract. Excess soil must be tested before off-site disposal. DS should be retained for environmental testing of excess soil during construction.

Table 4: Recommended Pavement Structure Thickness

Pavement Layer	Compaction Requirements	Rural Collector
Asphaltic Concrete	92.0 to 96.5% Maximum Relative Density (MRD)	40 mm HL 3 or SP 12.5 60 mm HL 8 or SP 19.0
OPSS Granular A Base (or 20mm Crusher Run Limestone)	100% SPMDD*	150 mm
OPSS Granular B Base (or 50mm Crusher Run Limestone)	100% SPMDD	450 mm
Estimated GBE (mm)		**610**

Notes:

* Denotes Standard Proctor Maximum Dry Density, ASTM-D698

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. The subgrade for possible widening must be compacted to 98% SPMDD. Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped (preferably at a minimum grade of two percent). Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Subdrains should be installed to intercept excess subsurface moisture and prevent subgrade softening.

Additional comments on the construction of access roadways are as follows:

1. The most severe loading conditions on pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted access lanes, half-loads during paving, etc., may be required, especially if construction is carried out during unfavorable weather.

2. It is recommended that DS Consultants Limited be retained to review the final pavement structure designs and drainage plans prior to construction to ensure that they are consistent with the recommendations of this report.

5. GENERAL COMMENTS AND LIMITATIONS OF REPORT

DS Consultants Limited (DS) should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, DS will assume no responsibility for interpretation of the recommendations in the report.

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to DS at the time of preparation. Unless otherwise agreed in writing by DS, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. DS accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

DS CONSULTANTS LIMITED

Matthew Zammit, M.A.Sc., P.Eng

Geotechnical Engineer

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Senior Consultant

Fanyu Zhu, Ph.D., P.Eng.

Drawings

C:\Project\21-130-400\BH Location Map.qgs

Borehole	Easting	Northing	Elevation
BH21-1	490253.43	4958646.56	181.462
BH21-2	490381.45	4958739.24	179.226
BH21-3	490510.26	4958840.92	178.917
BH21-4	490642.78	4958944.84	178.17
BH21-5	490783.79	4959066.05	178.531
BH21-6	490900.57	4959166.17	178.283
BH21-7	491014.93	4959263.47	179.112
BH21-9	491268.16	4959477.14	180.043
BH21-11	491481.42	4959692.36	181.144
BH21-12	491593.63	4959777.61	180.281
BH21-13	491710.53	4959883.51	181.066
BH21-14	491794.34	4959945.70	181.722
BH21-15	491994.79	4960056.25	178.313
BH21-16	492134.83	4960152.31	179.345
BH21-17	492289.15	4960261.34	179.247
BH21-19	492546.55	4960506.06	177.946
BH21-20	492687.37	4960601.68	177.729
BH21-21	492836.89	4960727.56	178.645
BH21-22	492983.39	4960825.21	179.049
BH21-23	492986.52	4960889.45	181.825

Legend

- Borehole Location
- Monitoring Well Location

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Project: Geotechnical Investigation - Mallory Beach Road, Wiarton, ON

Title: **BOREHOLE LOCATION PLAN**

N

Client: Planmac Engineering Inc.

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	S.W.	M.Z.	May 2021
Rev: 0	Scale: As Shown	Project No.: 20-130-400	Figure No.: 1

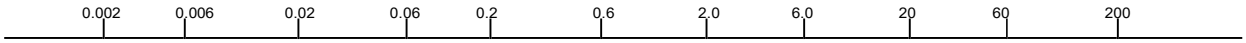
Image/Map Source: *Google Satellite Image*

1A: Notes on Sample Descriptions

1. All sample descriptions included in this report generally follow the Unified Soil Classification. Laboratory grain size analyses provided by DS also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that, with the exception of those samples where a grain size analysis and/or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated, nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

LOG OF BOREHOLE BH21-1

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4958646.56 E 490253.427

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/27/2021

REF. NO.: 21-130-400
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / 0.3 m "N"	ELEVATION
181.5 / 0.0	**ASPHALT:** 90mm				
181.4 / 0.1	**GRANULAR FILL:** gravel and sand (460mm), brown, moist, compact to dense	1	SS	37	181
180.9 / 0.6	**SANDY SILT:** some clay, trace to some gravel, grey to black, moist, compact to dense	2	SS	32	
180.0 / 1.5	**SANDY SILT TILL:** some gravel, black to red, moist, very dense	3	SS	79	180
179.3 / 2.1	**END OF BOREHOLE:** Notes: 1) Borehole dry and open upon completion				

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

METHANE AND GRAIN SIZE DISTRIBUTION (%)	GR	SA	SI	CL
grinding				
	10	36	37	17

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

LOG OF BOREHOLE BH21-2

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4958739.24 E 490381.452

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/26/2021

REF. NO.: 21-130-400
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.2												
179.1 0.0	**ASPHALT:** 80mm											
0.1	**GRANULAR FILL:** gravel and sand (1140mm), brown, moist, compact to dense		1	SS	44		179		○			32 48 (20)
178.5												
0.8	**SAND AND GRAVEL:** trace cobbles, trace organics, dense		2	SS	38				○			grinding
1							178					
177.9												auger refusal, boulder or bedrock
1.4	**END OF BOREHOLE:** Notes: 1) Borehole dry upon completion 2) Cave-in to 1mbgs											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

LOG OF BOREHOLE BH21-3

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4958840.924 E 490510.264

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/27/2021

REF. NO.: 21-130-400
ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE & Sensitivity, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
178.9												
178.8 0.0	**ASPHALT:** 80mm											
0.1	**GRANULAR FILL:** gravel and sand (680mm), brown, moist, compact to dense		1	SS	>100				○			
178.2 0.8	**END OF BOREHOLE:** Notes: 1) Borehole open and dry upon completion											boulder or bedrock

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

LOG OF BOREHOLE BH21-4

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4958944.844 E 490642.783

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/26/2021

REF. NO.: 21-130-400
ENCL NO.: 5

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS "N" 0.3 m	ELEVATION	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
178.2 178.0 0.0	**ASPHALT:** 70mm					
178.1 0.1	**GRANULAR FILL:** gravel and sand (1000mm), brown, moist, compact				178	
	trace organics, trace cobbles, dense	1	SS	20		grinding
177.1 1.1	**SANDY SILT:** brown to grey, wet, dense	2	SS	45	177	
176.8 1.4	**END OF BOREHOLE:** Notes: 1) Borehole dry upon completion 2) cave in to 0.9 mbgs					possible boulder or bedrock

STRATA PLOT

GROUND WATER CONDITIONS

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

LOG OF BOREHOLE BH21-5

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4959066.053 E 490783.787

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/27/2021

REF. NO.: 21-130-400
ENCL NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
178.5												
178.4	**ASPHALT:** 70mm											
0.1	**GRANULAR FILL:** gravel and sand (830mm), brown, moist, compact to dense		1	SS	46		178		○			
	trace organics, trace cobbles											
177.6												
0.9	**SANDY SILT:** some gravel, grey, moist, compact to dense		2	SS	26				○			grinding while augering
							177					
			3	SS	>100				○			rock in tip of SS3
176.4												
2.1	**END OF BOREHOLE:** Notes: 1) Borehole dry and open upon completion											

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH21-6

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4959166.17 E 490900.569

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/27/2021

REF. NO.: 21-130-400
ENCL NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
178.3							
178.2 0.0	**ASPHALT:** 70mm						
0.1	**GRANULAR FILL:** gravel and sand (730mm), brown, moist, dense to very dense		1	SS	66		178
177.5							
0.8	**SAND AND GRAVEL:** trace cobbles, moist to wet, very dense		2	SS	53		
1							177
176.8							
1.5	**SANDY SILT:** trace gravel, grey, wet, compact		3	SS	24		
2							
176.2							
2.1	**END OF BOREHOLE:** Notes: 1) water level at 0.9m during drilling						

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

METHANE AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

grinding entire depth

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH21-7

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4959263.473 E 491014.93

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/26/2021

REF. NO.: 21-130-400
ENCL NO.: 8

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
179.1 / 0.0	**ASPHALT:** 90mm						179
0.1	**GRANULAR FILL:** gravel and sand (710mm), brown, moist, dense to very dense		1	SS	>100		
178.3							
0.8	**SAND AND GRAVEL:** some organics, some cobbles, brown, moist. dense		2	SS	43		178
177.6							
1.5	**SANDY SILT:** some gravel, grey, moist, compact		3	SS	29		
177.0							177
2.1	**END OF BOREHOLE:** Notes: 1) Borehole dry and open upon completion						

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

METHANE AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

grinding while augering

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH21-9

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4959477.135 E 491268.163

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/26/2021

REF. NO.: 21-130-400
ENCL NO.: 9

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
180.0												
180.0 / 0.0	**ASPHALT:** 90mm						180					
0.1	**GRANULAR FILL:** gravel and sand (1010mm), brown, moist, compact to very dense		1	SS	29				○			
1 / 178.9			2	SS	69		179		○			grinding
1.1	**SAND AND GRAVEL:** trace organics, trace cobbles, brown, moist, very dense											
178.5												
1.5	**SILTY SAND:** trace gravel, brown, moist, very dense		3	SS	>100				○			
2 / 177.9							178					
2.1	**END OF BOREHOLE:** Notes: 1) Borehole dry and open upon completion											

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH21-11

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4959692.356 E 491481.417

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/26/2021

REF. NO.: 21-130-400
ENCL NO.: 10

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
181.1												
181.0 / 0.0	**ASPHALT:** 70mm											
0.1	**GRANULAR FILL:** gravel and sand (780mm), brown, moist, dense		1	SS	43		181		○			
180.3												
0.9	**SAND AND GRAVEL:** some cobbles trace organics, brown, moist, compact		2	SS	26		180		○			grinding
179.6												
1.5	**SANDY SILT:** trace gravel, brown, wet, dense		3	SS	30				○			
179.0												
2.1	**END OF BOREHOLE:** Notes: 1) water level at 1.5mbgs during drilling											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH21-12

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4959777.607 E 491593.633

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/27/2021

REF. NO.: 21-130-400
ENCL NO.: 11

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
180.3						
0.0 / 180.2	**ASPHALT:** 100mm					
0.1	**GRANULAR FILL:** gravel and sand (780mm), trace silt, brown, moist, dense	1	SS	40	180	64 30 (6)
179.3					bentonite	
1.0	**SAND AND GRAVEL:** trace cobbles, brown, moist, dense to very dense	2	SS	57	W. L. 179.3 m Apr 29, 2021	grinding to 1.4m
178.8					179	
1.5	**SANDY SILT:** some clay, trace gravel, grey, wet, compact to dense	3	SS	10	sand / Screen	wet spoon 1 24 55 20
		4	SS	12	178 screen in natural	
		5	SS	33	177	
176.6						
3.7	**END OF BOREHOLE:**					

Notes:
1) 50 mm diameter monitoring well installed upon completion
2) Water level Readings:

Date:	Water Depth (mbgs)
April 29, 2021	1.00

SOIL PROFILE; SAMPLES; GROUND WATER CONDITIONS; STRATA PLOT

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

LOG OF BOREHOLE BH21-13

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4959883.512 E 491710.529

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/27/2021

REF. NO.: 21-130-400
ENCL NO.: 12

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
181.1												
0.0 180.9	**ASPHALT:** 120mm						181					
0.1	**GRANULAR FILL:** gravel and sand (640mm), trace org, brown, moist, dense		1	SS	45				○			
180.3												
0.8	**END OF BOREHOLE:** Notes: 1) Borehole dry and open upon completion											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH21-14

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4959945.701 E 491794.34

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/26/2021

REF. NO.: 21-130-400
ENCL NO.: 13

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
181.7											
181.7 / 0.0	**ASPHALT:** 70mm										
0.1	**GRANULAR FILL:** gravel and sand (640mm), trace organics, brown, moist, dense to very dense		1	SS	77				○		
181.0							181				
0.8	**END OF BOREHOLE:** Notes: 1) Borehole dry and open upon completion										

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH21-15

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4960056.251 E 491994.788

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/27/2021

REF. NO.: 21-130-400
ENCL NO.: 14

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
178.3												
178.2 0.0	**ASPHALT:** 90mm											
0.1	**GRANULAR FILL:** gravel and sand (1110mm), brown, moist, dense to very dense		1	SS	56		178		○			
1 177.1			2	SS	66				○			grinding
1.2	**SAND AND GRAVEL:** some cobbles trace organics, brown, moist to wet, dense						177					
176.8												
1.5	**SANDY SILT:** trace gravel, grey, wet, compact		3	SS	28				○			wet spoon
2 176.2												
2.1	**END OF BOREHOLE:** Notes: 1) water level at 0.8mbgs upon completion of drilling											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

LOG OF BOREHOLE BH21-16

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4960152.314 E 492134.826

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/26/2021

REF. NO.: 21-130-400
ENCL NO.: 15

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.3												
179.0	**ASPHALT:** 80mm											
0.1	**GRANULAR FILL:** gravel and sand (970mm), brown, moist, dense to very dense		1	SS	76		179		○			
1 178.3												grinding
1.1	**SAND AND GRAVEL:** some cobbles, trace organics, brown, moist, dense		2	SS	48		178		○			
177.8												
1.5	**SANDY SILT:** trace gravel, brown to grey, wet, compact		3	SS	23				○			
2 177.2												
2.1	**END OF BOREHOLE:** Notes: 1) water level at 1.5mbgs during drilling 2) borehole open upon completion.											

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH21-17

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4960261.342 E 492289.146

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/27/2021

REF. NO.: 21-130-400
ENCL NO.: 16

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.2												
179.0 0.0	**ASPHALT:** 70mm											
0.1	**GRANULAR FILL:** gravel and sand (730mm), brown, moist, dense		1	SS	47		179		○			alligator cracking
178.4												
0.8	**SILTY SAND TILL:** some gravel, red, wet, compact		2	SS	26		178		○			
177.7												
1.5	**SANDY SILT:** trace gravel, red, wet, dense		3	SS	33				○			
177.1												
2.1	**END OF BOREHOLE:** Notes: 1) water level at 1.0mbgs during drilling 2) borehole open upon completion.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

LOG OF BOREHOLE BH21-19

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4960506.056 E 492546.55

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/27/2021

REF. NO.: 21-130-400
ENCL NO.: 17

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
177.9 / 0.0	**ASPHALT:** 70mm				
177.8 / 0.1	**GRANULAR FILL:** gravel and sand (1130mm), brown, moist, dense to very dense	1	SS	57	
176.7 / 1.2	**SAND AND GRAVEL:** trace organics, brown, moist, dense to very dense	2	SS	59	177
176.4 / 1.5	**SANDY SILT TILL:** trace gravel, red to grey, wet, dense	3	SS	40	176
175.8 / 2.1	**END OF BOREHOLE:** Notes: 1) water level at 1.5mbgs during drilling 2) borehole open upon completion.				

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

METHANE AND GRAIN SIZE DISTRIBUTION (%)

	GR	SA	SI	CL
1	38	52		(10)
2			grinding to 1.2m	

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH21-20

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4960601.682 E 492687.371

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/26/2021

REF. NO.: 21-130-400
ENCL NO.: 18

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
177.7												
177.6 0.0	**ASPHALT:** 70mm											
0.1	**GRANULAR FILL:** gravel and sand (1000mm), brown, moist, dense to very dense		1	SS	56		177		○			
1 176.7												
1.1	**SANDY GRAVEL:** with rock fragments, grey, saturated, compact to dense		2	SS	43				○			grinding below 1m
												wet spoon
			3	SS	29		176		○			
2 175.6												
2.1	**END OF BOREHOLE:** Notes: 1) water level at 1.5mbgs during drilling 2) borehole cave-in to 1.04mbgs.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

LOG OF BOREHOLE BH21-21

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4960727.56 E 492836.889

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/27/2021

REF. NO.: 21-130-400
ENCL NO.: 19

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
178.6							
178.6 0.0	**ASPHALT:** 80mm						
0.1	**GRANULAR FILL:** gravel and sand (1130mm), brown, moist, dense to very dense		1	SS	56		178
1			2	SS	38		
177.4							
1.2	**SAND AND GRAVEL:** trace organics, brown, moist to wet at 1.2m, dense						
177.1							
1.5	**SANDY SILT:** grey, wet, dense		3	SS	47		177
2							
176.5							
2.1	**END OF BOREHOLE:** Notes: 1) water level at 1.2 mbgs upon completion 2) borehole cave-in to 1.2mbgs upon completion.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

METHANE AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH21-22

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4960825.21 E 492983.391

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/27/2021

REF. NO.: 21-130-400
ENCL NO.: 20

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.0												
179.0	**ASPHALT:** 90mm						179					
0.1	**GRANULAR FILL:** gravel and sand (670mm), some silt, brown, moist, dense to very dense		1	SS	60				○			50 37 (14)
178.3												
0.8	**SAND AND GRAVEL:** some cobbles, brown, moist, compact to dense		2	SS	30		178		○			grinding entire depth
1												
			3	SS	29				○			
2												
176.9							177					
2.1	**END OF BOREHOLE:** Notes: 1) borehole open and dry upon completion											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH21-23

PROJECT: Geotechnical Investigation
CLIENT: Planmac Engineering Inc.
PROJECT LOCATION: Mallory Beach Road, Wiarton, ON
DATUM: Geodetic
BOREHOLE LOCATION: N 4960889.447 E 492986.519

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150
Date: Apr/27/2021

REF. NO.: 21-130-400
ENCL NO.: 21

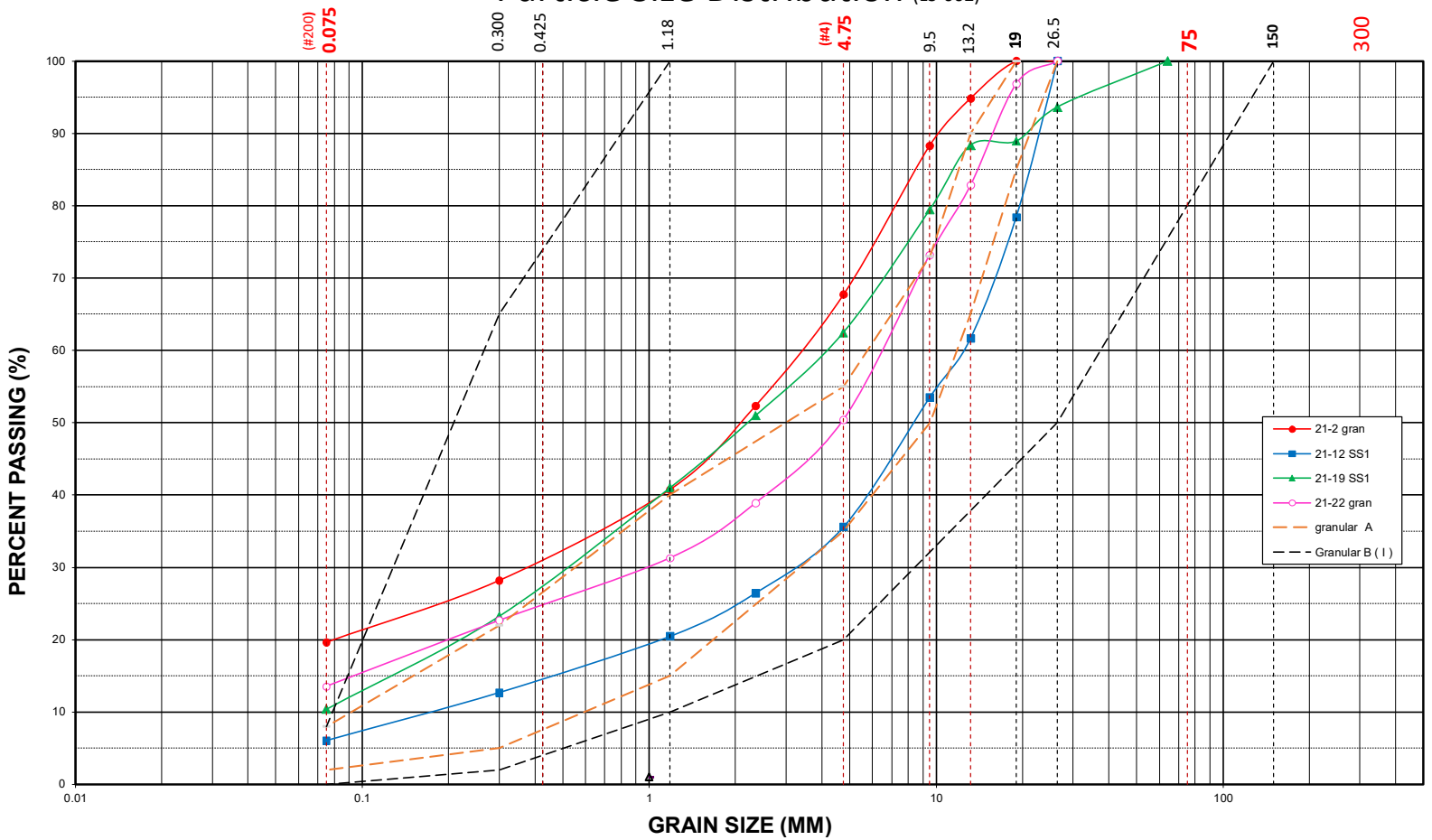
SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
181.8											
181.8 0.0	**ASPHALT:** 70mm										
0.1	**GRANULAR FILL:** gravel and sand (690mm), brown, moist, dense		1	SS	33				○		
181.1											
0.8	**SAND AND GRAVEL:** trace organics, brown, moist, compact to dense		2	SS	47		181		○		grinding entire depth
			3	SS	23		180		○		
179.8											
2.0 179.7	**SANDY SILT:** grey, wet, compact										
2.1	**END OF BOREHOLE:** Notes: 1) water level at 2mbgs during drilling 2) borehole open upon completion.										

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG 21-130-400 BOREHOLE LOGS.GPJ DS.GDT 21/5/14

Particle Size Distribution (LS-602)



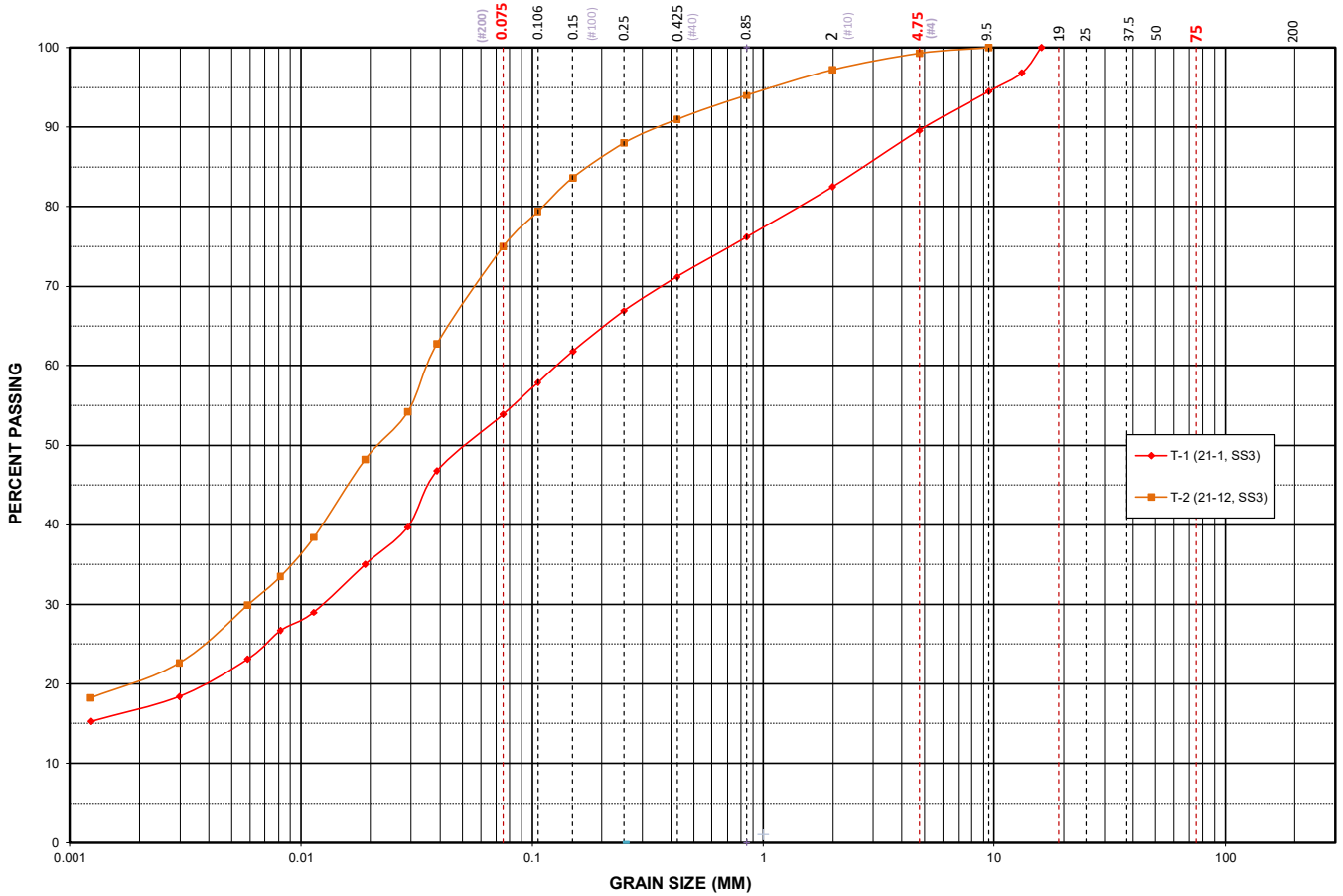
Silt and Clay	Sand			Gravel		Cobble +
Silt -	Fine	Medium	Coarse	Fine	Coarse	

Specification and Comments:	OPSS1010

DS CONSULTANTS LTD.
6221 Highway 7, Unit 16
Vaughan, Ontario, L4H 0K8
Telephone: (905) 264-9393
www.dsconsultants.ca

Project:	**Mallory Beach Road**	Project No.:	**21-130-400**
Client:	**Planmac**	Date:	**May/07/2021**
Location:	**Wiarton, ON**	Figure No.:	22A

Particle Size Distribution (ASTM-D421/D422)



Silt and Clay		Sand			Gravel		Cobble +
Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	

Specification and Comments:

DS CONSULTANTS LTD.
6221 Highway 7, Unit 16
Vaughan, Ontario, L4H 0K8
Telephone: (905) 264-9393
www.dsconsultants.ca

Project:	Geotechnical Investigation - Mallory Beach Road	Tested by :	Matt
Project No.:	21-130-400	Date:	May-11-2021
Client:	Planmac Engineering Inc.	Dwg. No.	22B

Appendix D

Drainage Study

Mallory Beach Road – South Bruce Peninsula

June 2021
2021-012
Planmac Engineering Inc.

RESILIENT CONSULTING CORPORATION
PO BOX 643
WHITBY, ON L1N 5V3
info@resilientconsulting.ca
@resilientccorp

RESILIENT CONSULTING

Prepared By:
Resilient Consulting

Name: Adam Nespolo, P.Eng.
Title: Project Engineer

Reviewed By:
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Name: Mark Bassingthwaite, P.Eng.
Title: Senior Water Resources Engineer

Table of Contents

List of Tables and Figures

List of Appendices

1 Introduction

The Town of South Bruce Peninsula (the 'Town') has retained Planmac Engineering Inc. (Planmac) for the planning and detailed design for the reconstruction of Mallory Beach Road. Resilient Consulting Corporation (Resilient) is a sub-consultant to Planmac, providing drainage support to evaluate existing and proposed rehabilitated conditions.

Mallory Beach Road is bounded by an escarpment to the north, and Georgian Bay to the south. The area is regulated by the Grey Sauble Conservation Authority. This report summarizes the hydrology and hydraulic findings for the reconstruction of this road as well as recommends proposed upgrades to the drainage system.

2 Existing Conditions

Mallory Beach Road is approximately 6.7 kilometers long. The scope of this project will be addressing the portion of Mallory Beach Road between Bruce Road 9 and Kathleen Avenue, which is approximately 3.6 kilometers long. There are approximately 325-375 developed and undeveloped lots, with residential dwellings being a mix of seasonal and full time residences. See **Figure 1** below for the study area.

Under existing conditions, there are no storm sewer services along Mallory Beach Road. A large portion of runoff from the north of Mallory Beach Road is conveyed to the Bay via existing roadside ditches that cross below the road through culverts at various locations. In some sections where culverts do not exist, runoff will sheet flow over the road and into the Bay. Due to the escarpment on the north side of the road, some culverts have large external drainage areas.

Figure 1: Study Area

3 Background Information

The following list of documents were referenced in preparing this design brief.

- Topographic Survey by SMC Geomatics in May 2021;
- Geotechnical Investigation prepared by DS Consultants dated May 2021
- MTO Drainage Management Manual, 1997; and,
- MTO Drainage Design Standards, January 2008.

4 Hydrologic Analysis

The purpose of the hydrology analysis is to determine major and minor event peak flows in support of the roadway redesign as per the MTO Drainage Design Standards for Highway Surface Drainage (MTO HDDS). The MTO HDDS SD-1 identifies that Rural Local Roads Drainage System shall be designed to convey the 5-year flow. The 5-year design storm was used to appropriately size replacement structures.

Imagery Derived Point Cloud Information was used to generate external contours for the subject area in addition to the topographic survey completed for the Mallory Beach Road. The contours were used to delineate drainage areas to the existing road outlets. Hydrologic modelling was prepared for the drainage areas using the modelling program Visual OTTHYMO (VO). Since the contributing drainage area is comprised mainly of pervious landscape, NASHYD commands were used in VO to represent the contributing drainage areas. Peak flow rates were determined for the 2-, 5- and 100-year storm events using the 12-hour SCS storm distribution generated using MTO IDF values for the site area. Results of the VO analysis are summarized in **Table 1** below. See the **Drainage Area Plans (DAP)** for the AREA ID references.

Table 1: Generated Flows (m^3/s)

AREA ID	2 YEAR (m^3/s)	5 YEAR (m^3/s)	100 YEAR (m^3/s)
A1	0.010	0.019	0.054
A2	0.089	0.178	0.520
A3	0.086	0.174	0.511
A4	0.101	0.201	0.579
A5	0.019	0.040	0.118
A6	0.070	0.143	0.422
A7	0.035	0.068	0.195
A8	0.025	0.050	0.146
A9	0.093	0.184	0.526
A10	0.155	0.311	0.902
A11	0.167	0.333	0.963
A12	0.051	0.101	0.295
A13	0.045	0.089	0.259
A14	0.083	0.165	0.476
A15	0.129	0.260	0.762
A16	0.108	0.217	0.630
A17	0.053	0.105	0.301

5 Hydraulic Analysis

As per the MTO HDDS SD-13, culverts under the roadway are to convey the Minor System Design Flow and Major System Design Flow. CulvertMaster was used to assess the hydraulics of the existing and proposed culvert configurations. All existing culverts under the road were modelled using information from site inspections completed by Planmac, along with topographic information collected by SMC Geomatics in May 2021. The existing capacity of each culvert crossing was calculated using maximum headwater elevations that were determined utilizing existing road grades. The existing culvert capacities are summarized in **Table 2**. Refer to the **Appendix B** for the existing capacity CulvertMaster calculations and output report. The capacities and flow requirements are also summarized on the **DAP** drawings.

Table 2: Culvert Capacities (m^3/s)

Area ID	Culvert ID	Culvert Capacity (m^3/s)	5 Year Flow to Convey (m^3/s)	Additional Capacity Required	Additional Capacity Provided by
A1	A1.1	0.0611	0.0190	No	
	A1.2	0.1391	0.0190	No	
A2	A2.1A	0.8989	0.1780	No	
	A2.1B	1.7584	0.1780	No	
A3	A3.1	0.2927	0.1740	No	
	A3.2	0.0744	0.1740	**Yes**	**Larger culvert**
A4	A4.1	0.0680	0.2010	**Yes**	**Additional culvert**
A5	A5.1	0.2113	0.0400	No	
	A5.2	0.1324	0.0400	No	
A6	A6.1	0.0675	0.1430	**Yes**	**Larger culvert**
A7	A7.1A	0.1846	0.0680	No	
	A7.1B	0.3295	0.0680	No	
	A7.2	0.1650	0.0680	No	
	A7.3	0.0921	0.0680	No	
A8	A8.1	0.0658	0.0500	No	
	A8.2	0.0675	0.0500	No	
A9	A9.1	0.1053	0.1840	**Yes**	**Larger culvert**
A10	A10.1	0.0620	0.3110	**Yes**	**Larger culvert**
	A10.2	0.1100	0.3110	**Yes**	**Larger culvert**
A11	A11.1	0.1465	0.3330	**Yes**	**Larger culvert**
A12	A12.1	0.0895	0.1010	**Yes**	**Larger culvert**
	A12.2A	0.0920	0.1010	No	
	A12.2B	0.1131	0.1010	No	
	A12.3	0.0647	0.1010	**Yes**	**Larger culvert**
A13	A13.1	0.0647	0.0890	No	
	A13.2	0.0703	0.0890	**Yes**	**Larger culvert**
A17	A17.1	0.2826	0.1050	No	

As per the MTO HDDS SD-13, private culverts (driveway culverts) shall be designed to convey the Minor System Design Flow. The minimum recommended size for driveway culverts is 250mm CSP.

As per the MTO HDDS SD-9, roadside ditches shall be designed to convey both the Minor System Design Flow and the Major System Design Flow. The maximum depth of flow in the ditch associated with the Minor Flow shall be 1.0m with a minimum free board of 0.3m to the top of subgrade. The image below indicates the minimum design standards for roadside ditches.

Roadside Ditch Design Parameters	
Maximum Side Slope (1):	2H:1V
Minimum Longitudinal Slope	0.3 percent
Base Width - Desirable Standard - Minimum Standard	1.0 metre Zero (V-ditch)
Minimum Ditch Depth for Minor System Design Flow: • Normal Ditch (road at grade or in cut) • Ditch at toe of Fill Slope	 0.50 metres 0.25 metres
Distance that roadside ditch invert shall be below the road subgrade elevation • Desirable Standard • Minimum Standard	 0.5 metres 0.3 metres
Note (1): Flatter side slopes may be incorporated into the design in accordance with the Roadside Design Manual (formerly the Roadside Safety Manual) and geotechnical characteristics.	

Figure 2: MTO HDDS Roadside Ditch Design Parameters

6 Proposed Hydraulic Upgrades

Results of the hydraulic analysis indicate that nine (9) culverts within the project area have insufficient capacity to convey the 5-year flow below Mallory Beach Road. These identified culverts are to be upsized accordingly, with resizing requirements outlined in **Table 3** below. In addition, an additional culvert is required to convey runoff from Drainage Area A4, as detailed in **Table 4**. Refer to **Appendix C** for the proposed culvert calculations. Additional culverts will be sized as needed to ensure conveyance of all drainage contributing towards Mallory Beach Road following the redesign of the roadway by Planmac. Locations for the upsized culverts and proposed culvert are shown on the **DAP** figures.

Table 3: Proposed Upsize Culvert Capacities (m^3/s)

Area ID	Culvert ID	Existing Culvert Capacity (m^3/s)	Proposed Capacity (m^3/s)	Proposed Diameter (mm)	5 Year Flow to Convey (m^3/s)
A3	A3.2	0.0744	0.1731	450	0.1740
A6	A6.1	0.0675	0.1682	450	0.1430
A9	A9.1	0.1053	0.2114	525	0.1840
A10	A10.1	0.0620	0.3117	600	0.3110
A10	A10.2	0.1100	0.3358	450	0.3110
A11	A11.1	0.1465	0.3301	600	0.3330
A12	A12.1	0.0895	0.1452	375	0.1010
A12	A12.3	0.0647	0.1053	375	0.1010
A13	A13.2	0.0703	0.1131	375	0.0890

Table 4: Proposed Culvert Capacities (m^3/s)

Area ID	Culvert ID	Proposed Capacity (m^3/s)	Proposed Diameter (mm)	5 Year Flow to Convey (m^3/s)
A4	A4.2	0.1936	450	0.201

To encourage conveyance of runoff through the upgraded culverts, a swale is proposed on the north side of Mallory Beach Road, where property lines allow. The proposed swale is to be incorporated into the new road design by Planmac. A typical cross section for roadside swales has been included on **Figure DE** and in the figure below**.** The swale has been sized to convey the 5 year flow with 0.3m freeboard to the top of subgrade. Capacity calculations for the swale are included in **Appendix C**.

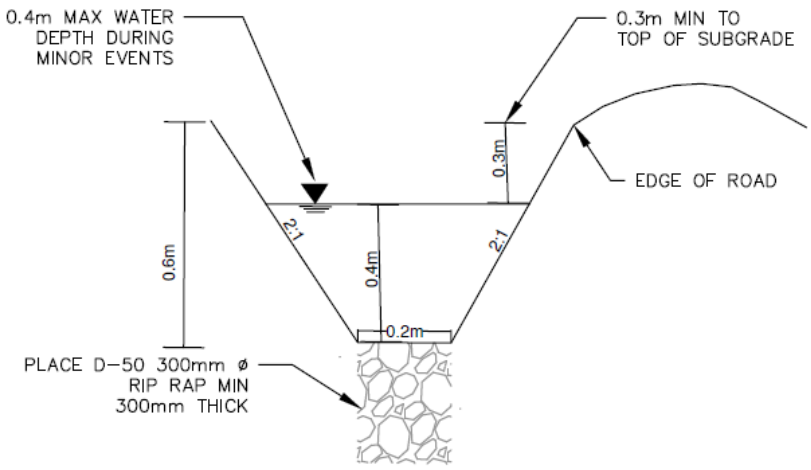
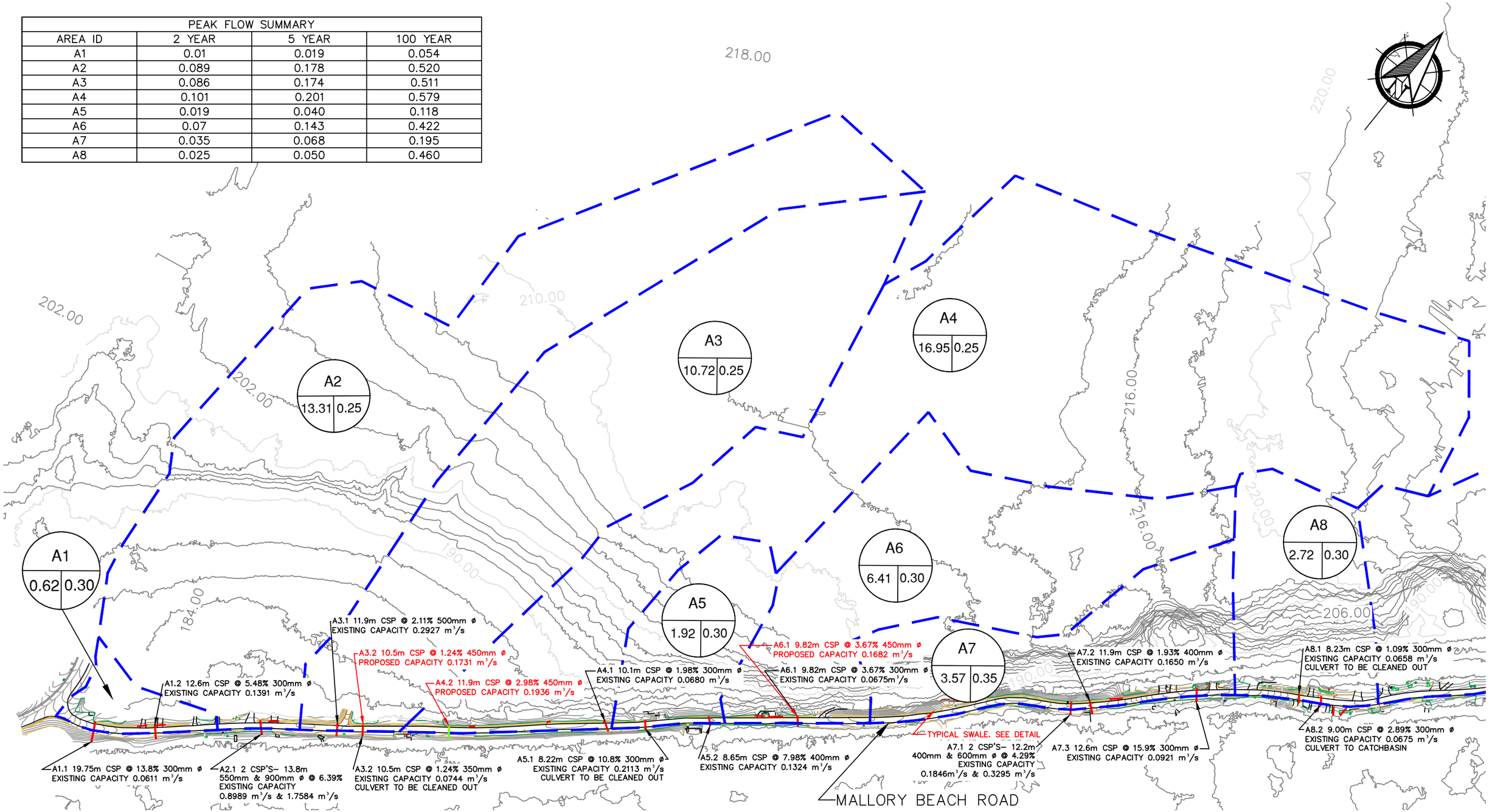


Figure 3: Typical Swale Detail

7 Conclusions

In conclusion, Resilient completed a hydrologic and hydraulic analysis of Mallory Beach Road to assess the existing drainage system and proposed hydraulic upgrades. We identified areas that are under capacity in existing conditions and proposed upsized culverts or additional culverts where necessary. Resilient also completed a capacity calculation for the roadside ditch that should be installed on the north side of the road and recommended the size and typical detail.

PEAK FLOW SUMMARY			
AREA ID	2 YEAR	5 YEAR	100 YEAR
A1	0.01	0.019	0.054
A2	0.089	0.178	0.520
A3	0.086	0.174	0.511
A4	0.101	0.201	0.579
A5	0.019	0.040	0.118
A6	0.07	0.143	0.422
A7	0.035	0.068	0.195
A8	0.025	0.050	0.460



RESILIENT CONSULTING

LEGEND

- EXISTING CULVERTS
- EXISTING SWALES
- TREES
- DRAINAGE AREA
- PROPOSED CULVERT

A6 (6.41 | 0.30) — AREA ID; RUNOFF COEFFICIENT; AREA (ha)

DRAINAGE AREA PLAN

RECONSTRUCTION OF MALLORY BEACH ROAD
TOWN OF SOUTH BRUCE PENINSULA

DATE:	JUNE 2021	PROJECT No.:	2021-012
SCALE:	1:3500	FIGURE No.:	DAP-1

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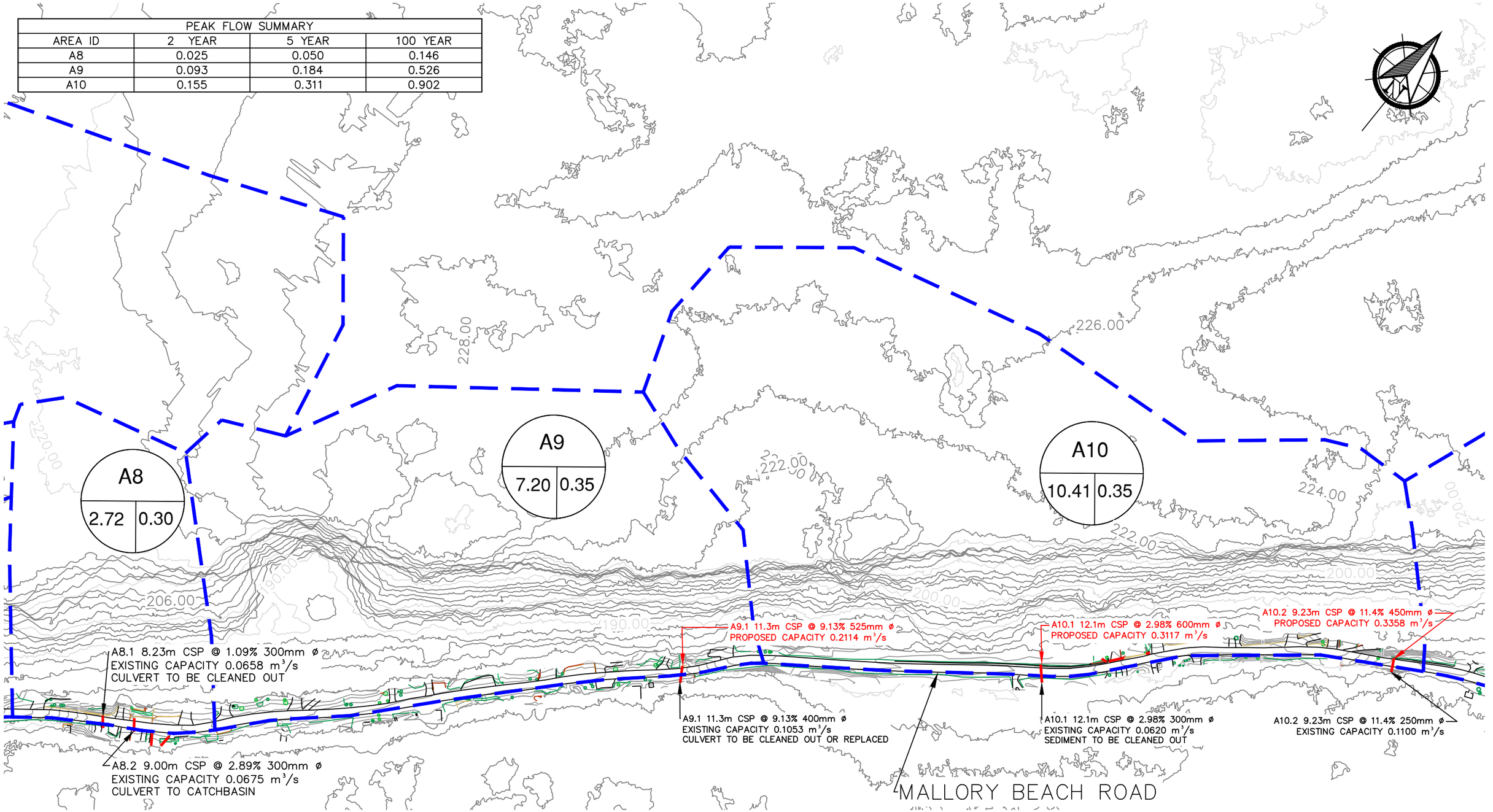
PEAK FLOW SUMMARY			
AREA ID	2 YEAR	5 YEAR	100 YEAR
A8	0.025	0.050	0.146
A9	0.093	0.184	0.526
A10	0.155	0.311	0.902



RESILIENT CONSULTING

LEGEND

- EXISTING CULVERTS
- EXISTING SWALES
- TREES
- DRAINAGE AREA

A6 (6.41 | 0.30)
- AREA ID
- RUNOFF COEFFICIENT
- AREA (ha)

DRAINAGE AREA PLAN

RECONSTRUCTION OF MALLORY BEACH ROAD
TOWN OF SOUTH BRUCE PENINSULA

DATE:	JUNE 2021	PROJECT No.:	2021-012
SCALE:	1:2500	FIGURE No.:	DAP-2

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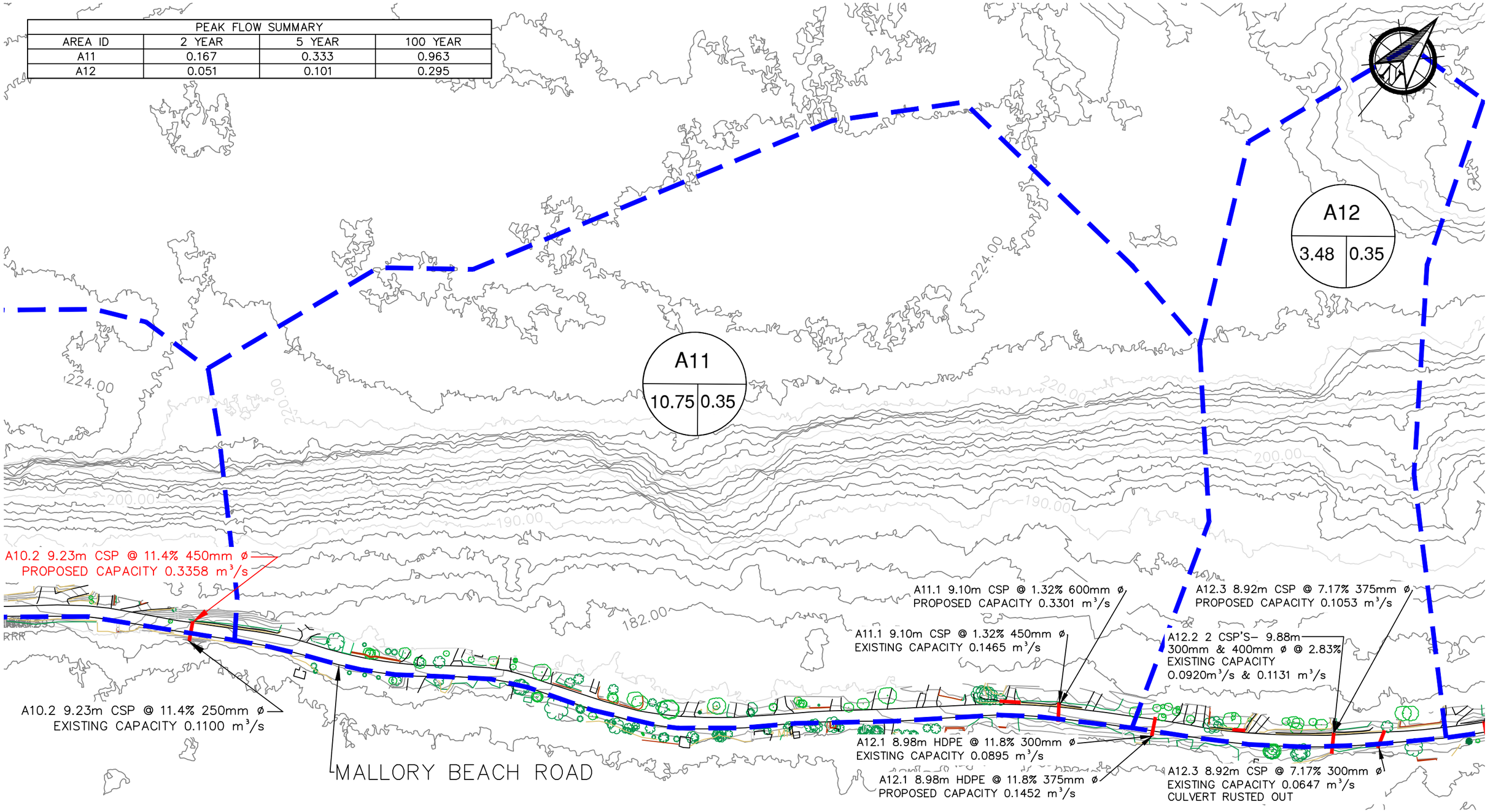
PEAK FLOW SUMMARY			
AREA ID	2 YEAR	5 YEAR	100 YEAR
A11	0.167	0.333	0.963
A12	0.051	0.101	0.295



RESILIENT CONSULTING

LEGEND

- EXISTING CULVERTS
- EXISTING SWALES
- TREES
- DRAINAGE AREA

A6 — AREA ID
6.41 | 0.30 — RUNOFF COEFFICIENT
AREA (ha)

DRAINAGE AREA PLAN

RECONSTRUCTION OF MALLORY BEACH ROAD
TOWN OF SOUTH BRUCE PENINSULA

DATE:	JUNE 2021	PROJECT No.:	2021-012
SCALE:	1:1750	FIGURE No.:	DAP-3

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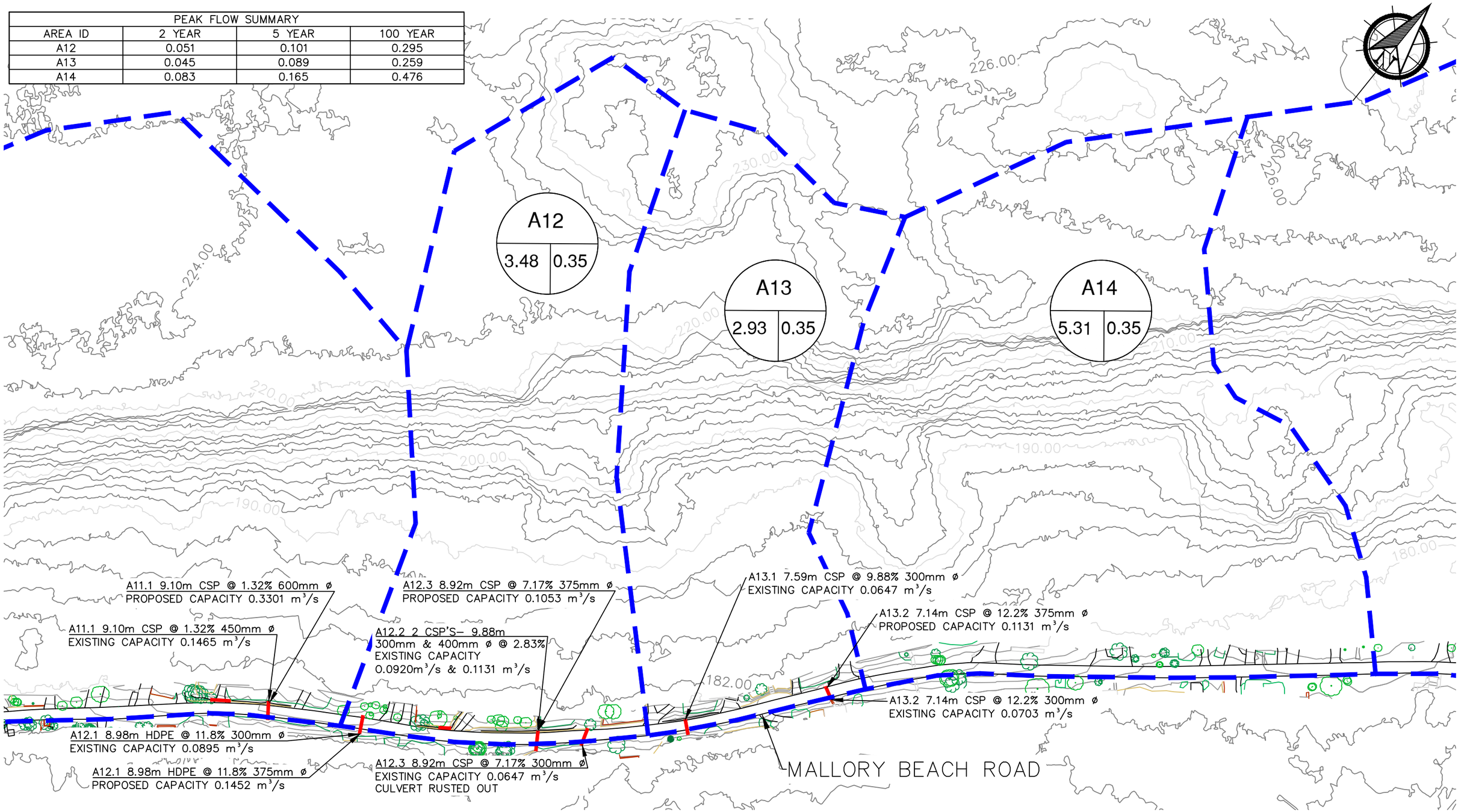
PEAK FLOW SUMMARY			
AREA ID	2 YEAR	5 YEAR	100 YEAR
A12	0.051	0.101	0.295
A13	0.045	0.089	0.259
A14	0.083	0.165	0.476



RESILIENT CONSULTING

LEGEND

- EXISTING CULVERTS
- EXISTING SWALES
- TREES
- DRAINAGE AREA

A6 — AREA ID
6.41 | 0.30 — RUNOFF COEFFICIENT
AREA (ha)

DRAINAGE AREA PLAN

RECONSTRUCTION OF MALLORY BEACH ROAD
TOWN OF SOUTH BRUCE PENINSULA

DATE:	JUNE 2021	PROJECT No.:	2021-012
SCALE:	1:1750	FIGURE No.:	DAP-4

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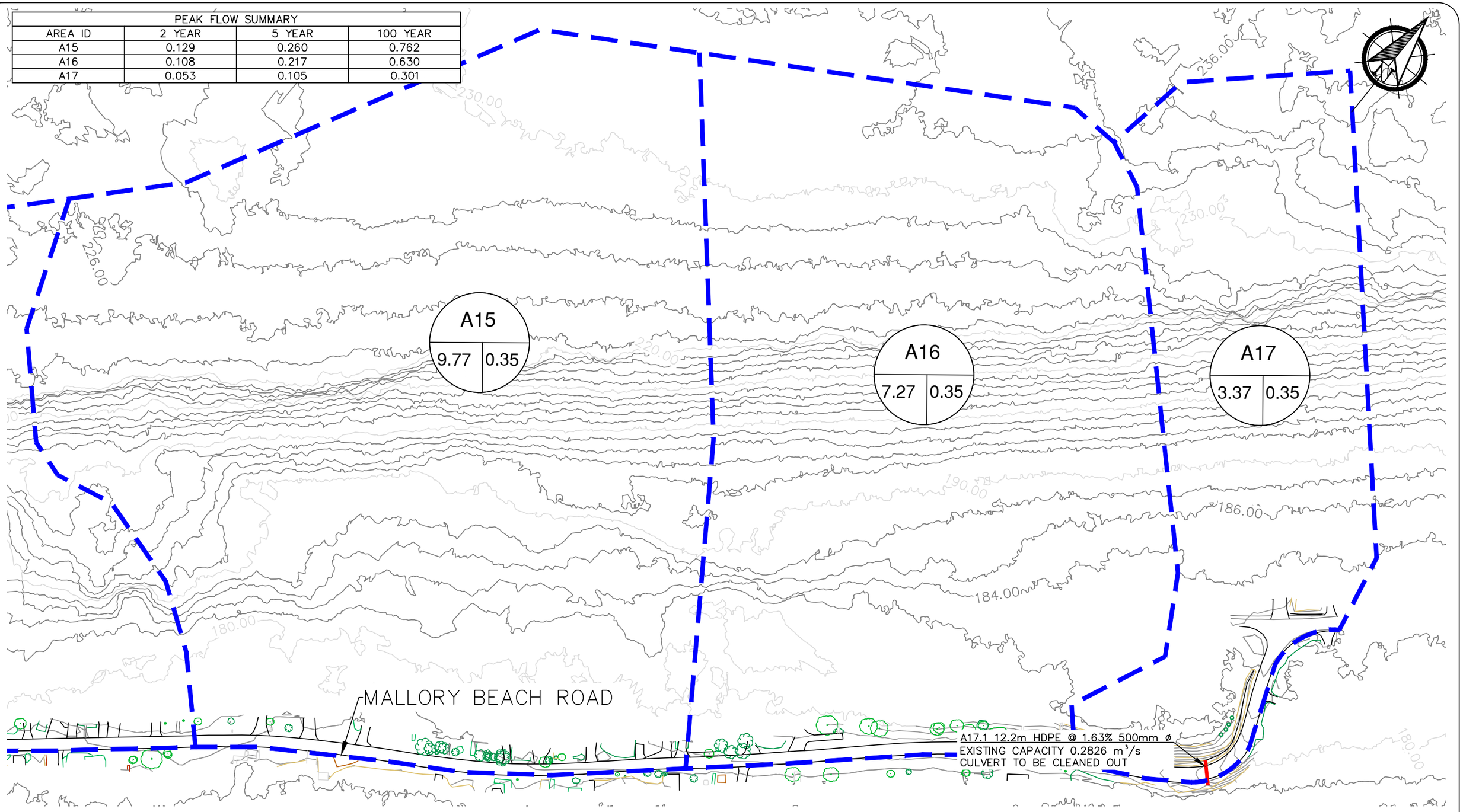
PEAK FLOW SUMMARY			
AREA ID	2 YEAR	5 YEAR	100 YEAR
A15	0.129	0.260	0.762
A16	0.108	0.217	0.630
A17	0.053	0.105	0.301



RESILIENT CONSULTING

LEGEND

- EXISTING CULVERTS
- EXISTING SWALES
- TREES
- DRAINAGE AREA

A6 — AREA ID
6.41 | 0.30 — RUNOFF COEFFICIENT
AREA (ha)

DRAINAGE AREA PLAN

RECONSTRUCTION OF MALLORY BEACH ROAD
TOWN OF SOUTH BRUCE PENINSULA

DATE:	JUNE 2021	PROJECT No.:	2021-012
SCALE:	1:1750	FIGURE No.:	DAP-5

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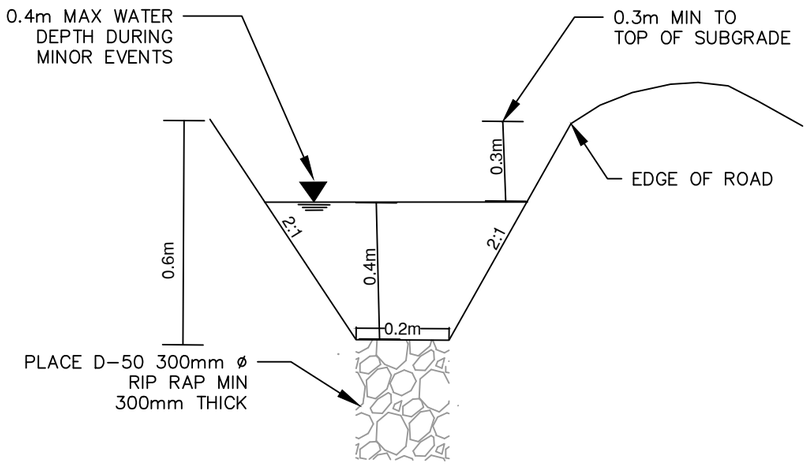

TYPICAL SWALE DETAIL
N.T.S.

RESILIENT CONSULTING

LEGEND

TYPICAL SWALE DETAIL

RECONSTRUCTION OF MALLORY BEACH ROAD
TOWN OF SOUTH BRUCE PENINSULA

DATE:	JUNE 2021	PROJECT No.:	2021-012
SCALE:	AS SHOWN	FIGURE No.:	DE

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APPENDIX A

Hydrologic Analysis

RESILIENT CONSULTING

Pre-Development
Input Parameters (NASHYD)
Mallory Beach Road
File No. 2021-012
Date : June 2021
Prepared by: SD
Checked by: AN

Pre-Development Drainage Area

Parameter	Unit	Description	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17
Area	ha	Watershed Area	0.62	13.31	10.72	16.95	1.92	6.41	3.57	2.72	7.20	10.41	10.75	3.48	2.93	5.31	9.77	7.27	3.37
TP	hr	Unit Hydrograph Time to Peak	0.15	0.64	0.48	0.75	0.32	0.30	0.10	0.40	0.12	0.21	0.19	0.22	0.20	0.19	0.25	0.21	0.16
DT	min	Time Step Increment	15																
DWF	cms	Dry Weather Flow (Base Flow)	0																
CN	-	SCS Curve Number	57																
IA	mm	Initial Abstraction	10																
N	-	Number of Linear Reservior	3																

Time of Concentration Calculation

Area Number	Area	Cpre	CN	L	Elevation Change	Sw	Tc Airport	Tp (Airport)
	(ha)			(m)	(m)	(%)	(min)	(hr)
A1	0.62	0.30	57	89	6.0	6.71	13.16	0.15
A2	13.31	0.25	57	1004	35.2	3.51	58.03	0.64
A3	10.72	0.25	57	703	34.2	4.86	43.58	0.48
A4	16.95	0.25	57	1330	44.8	3.37	67.68	0.75
A5	1.92	0.30	57	434	28.9	6.66	29.08	0.32
A6	6.41	0.30	57	436	35.8	8.20	27.20	0.30
A7	3.57	0.35	57	122	38.6	31.58	8.65	0.10
A8	2.72	0.30	57	654	41.9	6.40	36.15	0.40
A9	7.20	0.35	57	179	47.9	26.79	11.05	0.12
A10	10.41	0.35	57	324	44.6	13.78	18.51	0.21
A11	10.75	0.35	57	291	45.3	15.56	16.87	0.19
A12	3.48	0.35	57	376	52.5	13.94	19.89	0.22
A13	2.93	0.35	57	338	54.2	16.06	17.97	0.20
A14	5.31	0.35	57	300	48.13	16.05	16.94	0.19
A15	9.77	0.35	57	438	52.73	12.04	22.51	0.25
A16	7.27	0.35	57	366	53.83	14.72	19.25	0.21
A17	3.37	0.35	57	249	49.34	19.82	14.40	0.16

Ontario IDF CURVE LOOKUP

Active coordinate

44° 47' 15" N, 81° 6' 44" W (44.787500,-81.112500)

Retrieved: Wed, 02 Jun 2021 20:20:40 GMT

Location summary

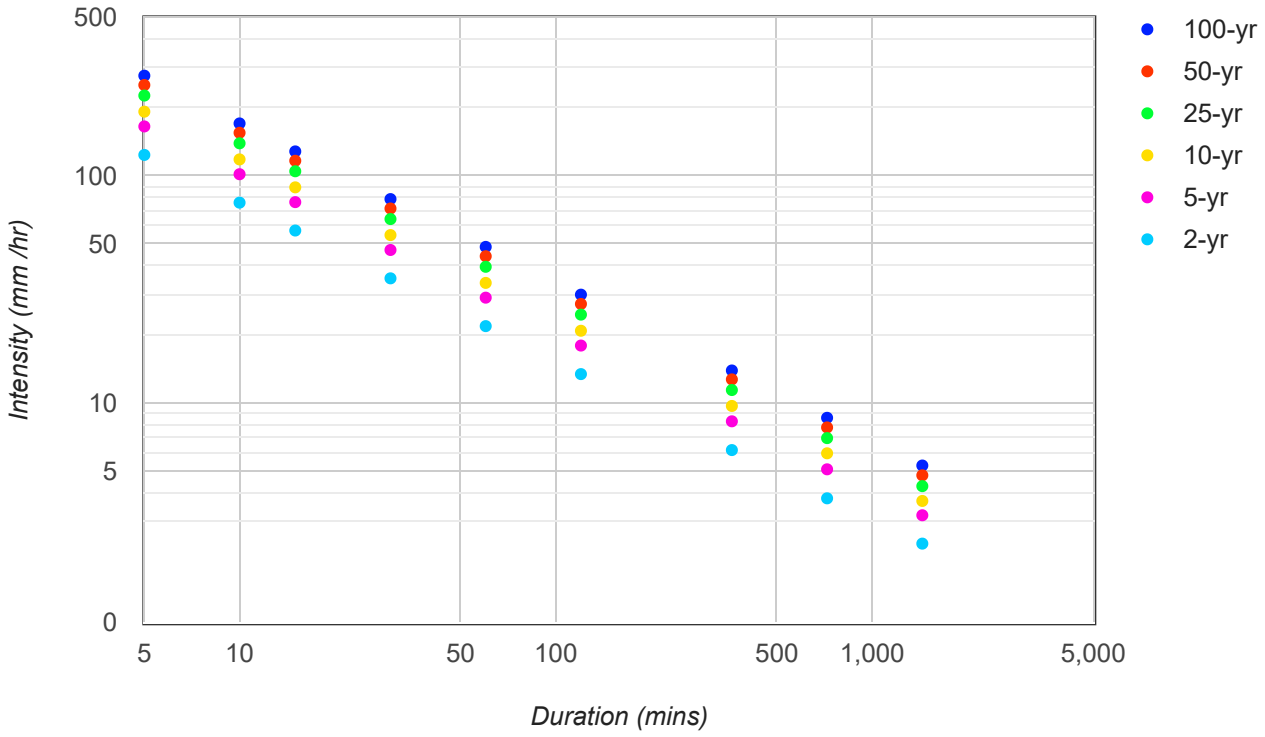
These are the locations in the selection.

IDF Curve: 44° 47' 15" N, 81° 6' 44" W (44.787500,-81.112500)

Results

An IDF curve was found.

Coordinate: 44.787500, -81.112500
IDF curve year: 2010



Coefficient summary

IDF Curve: 44° 47' 15" N, 81° 6' 44" W (44.787500,-81.112500)

Retrieved: Wed, 02 Jun 2021 20:20:40 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	21.8	29.1	33.8	39.8	44.3	48.7
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

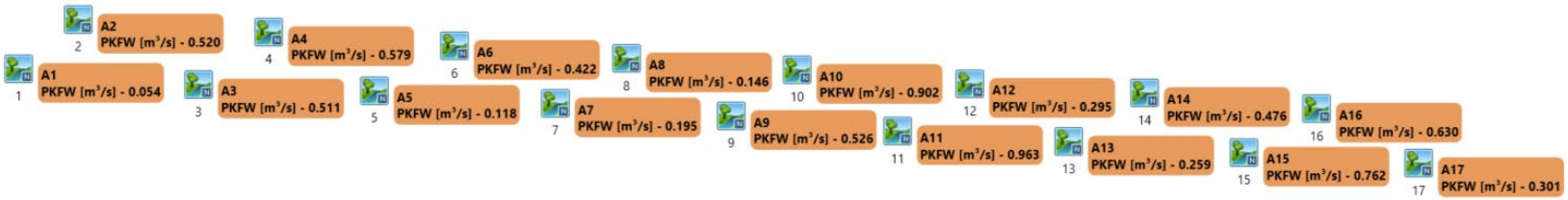
Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	123.8	76.3	57.5	35.4	21.8	13.4	6.2	3.8	2.4
5-yr	165.3	101.8	76.7	47.2	29.1	17.9	8.3	5.1	3.2
10-yr	192.0	118.3	89.1	54.9	33.8	20.8	9.7	6.0	3.7
25-yr	226.1	139.3	104.9	64.6	39.8	24.5	11.4	7.0	4.3
50-yr	251.6	155.0	116.7	71.9	44.3	27.3	12.7	7.8	4.8
100-yr	276.6	170.4	128.3	79.1	48.7	30.0	13.9	8.6	5.3

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	10.3	12.7	14.4	17.7	21.8	26.9	37.4	46.1	56.7
5-yr	13.8	17.0	19.2	23.6	29.1	35.9	49.9	61.5	75.7
10-yr	16.0	19.7	22.3	27.4	33.8	41.6	58.0	71.4	88.0
25-yr	18.8	23.2	26.2	32.3	39.8	49.0	68.3	84.1	103.6
50-yr	21.0	25.8	29.2	36.0	44.3	54.6	76.0	93.6	115.3
100-yr	23.1	28.4	32.1	39.5	48.7	60.0	83.5	102.9	126.8

Terms of Use


A1
PKFW [m³/s] - 0.054
1
A2
PKFW [m³/s] - 0.520
2
A3
PKFW [m³/s] - 0.511
3
A4
PKFW [m³/s] - 0.579
4
A5
PKFW [m³/s] - 0.118
5
A6
PKFW [m³/s] - 0.422
6
A7
PKFW [m³/s] - 0.195
7
A8
PKFW [m³/s] - 0.146
8
A9
PKFW [m³/s] - 0.526
9
A10
PKFW [m³/s] - 0.902
10
A11
PKFW [m³/s] - 0.963
11
A12
PKFW [m³/s] - 0.295
12
A13
PKFW [m³/s] - 0.259
13
A14
PKFW [m³/s] - 0.476
14
A15
PKFW [m³/s] - 0.762
15
A16
PKFW [m³/s] - 0.630
16
A17
PKFW [m³/s] - 0.301
17

```
************************************
** SIMULATION:100yr 12hr 15min SCS **
************************************

---------------------
|   READ STORM    |    Filename: C:\Users\sdasilva\AppD
|                 |           ata\Local\Temp\
|                 |           57ab3bf1-f9cb-4409-a201-14d1bf60ac32\000fe8cc
| Ptotal=102.89 mm |    Comments: 100yr 12hr 15min SCS
---------------------
            TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
             hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
            0.25    0.00 |  3.50    4.12 |  6.75   18.52 | 10.00    3.60
            0.50    2.57 |  3.75    4.12 |  7.00    8.23 | 10.25    3.60
            0.75    2.57 |  4.00    4.12 |  7.25    8.23 | 10.50    2.06
            1.00    2.57 |  4.25    4.12 |  7.50    6.17 | 10.75    2.06
            1.25    2.57 |  4.50    6.17 |  7.75    6.17 | 11.00    2.06
            1.50    2.57 |  4.75    6.17 |  8.00    6.17 | 11.25    2.06
            1.75    2.57 |  5.00    8.23 |  8.25    6.17 | 11.50    2.06
            2.00    2.57 |  5.25    8.23 |  8.50    3.60 | 11.75    2.06
            2.25    2.57 |  5.50   12.35 |  8.75    3.60 | 12.00    2.06
            2.50    3.09 |  5.75   12.35 |  9.00    3.60 | 12.25    2.06
            2.75    3.09 |  6.00   49.39 |  9.25    3.60 |
            3.00    3.09 |  6.25  135.81 |  9.50    3.60 |
            3.25    3.09 |  6.50   18.52 |  9.75    3.60 |

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| CALIB             |
| NASHYD   (  0001)|   Area    (ha)=   0.62   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=   0.15

    Unit Hyd Qpeak  (cms)=   0.158

    PEAK FLOW       (cms)=   0.054 (i)
    TIME TO PEAK    (hrs)=   6.250
    RUNOFF VOLUME    (mm)=  23.140
    TOTAL RAINFALL   (mm)= 102.890
    RUNOFF COEFFICIENT   =   0.225

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB             |
| NASHYD   (  0002)|   Area    (ha)=  13.31   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=   0.64

    Unit Hyd Qpeak  (cms)=   0.794

    PEAK FLOW       (cms)=   0.520 (i)
    TIME TO PEAK    (hrs)=   6.750
    RUNOFF VOLUME    (mm)=  30.283
    TOTAL RAINFALL   (mm)= 102.890
    RUNOFF COEFFICIENT   =   0.294
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0003)| Area (ha)= 10.72 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.48

Unit Hyd Qpeak (cms)= 0.853

PEAK FLOW (cms)= 0.511 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 30.192
TOTAL RAINFALL (mm)= 102.890
RUNOFF COEFFICIENT = 0.293

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0004)| Area (ha)= 16.95 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.75

Unit Hyd Qpeak (cms)= 0.863

PEAK FLOW (cms)= 0.579 (i)
TIME TO PEAK (hrs)= 7.000
RUNOFF VOLUME (mm)= 30.304
TOTAL RAINFALL (mm)= 102.890
RUNOFF COEFFICIENT = 0.295

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0005)| Area (ha)= 1.92 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.32

Unit Hyd Qpeak (cms)= 0.229

PEAK FLOW (cms)= 0.118 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 29.704
TOTAL RAINFALL (mm)= 102.890
RUNOFF COEFFICIENT = 0.289

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0006)| Area (ha)= 6.41 Curve Number (CN)= 57.0

|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)= 0.30

Unit Hyd Qpeak (cms)= 0.816

PEAK FLOW (cms)= 0.422 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 29.540
TOTAL RAINFALL (mm)= 102.890
RUNOFF COEFFICIENT = 0.287

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0007)| Area (ha)= 3.57 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)= 0.10

Unit Hyd Qpeak (cms)= 1.364

PEAK FLOW (cms)= 0.195 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 13.121
TOTAL RAINFALL (mm)= 102.890
RUNOFF COEFFICIENT = 0.128

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0008)| Area (ha)= 2.72 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)= 0.40

Unit Hyd Qpeak (cms)= 0.260

PEAK FLOW (cms)= 0.146 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 30.055
TOTAL RAINFALL (mm)= 102.890
RUNOFF COEFFICIENT = 0.292

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0009)| Area (ha)= 7.20 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)= 0.12

Unit Hyd Qpeak (cms)= 2.292

PEAK FLOW (cms)= 0.526 (i)
TIME TO PEAK (hrs)= 6.250

RUNOFF VOLUME (mm)= 18.099
TOTAL RAINFALL (mm)= 102.890
RUNOFF COEFFICIENT = 0.176

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0010)| Area (ha)= 10.41 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.21

Unit Hyd Qpeak (cms)= 1.893

PEAK FLOW (cms)= 0.902 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 27.660
TOTAL RAINFALL (mm)= 102.890
RUNOFF COEFFICIENT = 0.269

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0011)| Area (ha)= 10.75 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.19

Unit Hyd Qpeak (cms)= 2.161

PEAK FLOW (cms)= 0.963 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 26.673
TOTAL RAINFALL (mm)= 102.890
RUNOFF COEFFICIENT = 0.259

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0012)| Area (ha)= 3.48 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.22

Unit Hyd Qpeak (cms)= 0.604

PEAK FLOW (cms)= 0.295 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 28.034
TOTAL RAINFALL (mm)= 102.890
RUNOFF COEFFICIENT = 0.272

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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---------------------
| CALIB           |
| NASHYD  (  0013)|  Area   (ha)=  2.93   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia     (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=  0.20

   Unit Hyd Qpeak  (cms)=  0.560

   PEAK FLOW      (cms)=  0.259 (i)
   TIME TO PEAK   (hrs)=  6.250
   RUNOFF VOLUME  (mm)=  27.212
   TOTAL RAINFALL  (mm)= 102.890
   RUNOFF COEFFICIENT  =  0.264

   (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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---------------------
| CALIB           |
| NASHYD  (  0014)|  Area   (ha)=  5.31   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia     (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=  0.19

   Unit Hyd Qpeak  (cms)=  1.067

   PEAK FLOW      (cms)=  0.476 (i)
   TIME TO PEAK   (hrs)=  6.250
   RUNOFF VOLUME  (mm)=  26.673
   TOTAL RAINFALL  (mm)= 102.890
   RUNOFF COEFFICIENT  =  0.259

   (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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---------------------
| CALIB           |
| NASHYD  (  0015)|  Area   (ha)=  9.77   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia     (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=  0.25

   Unit Hyd Qpeak  (cms)=  1.493

   PEAK FLOW      (cms)=  0.762 (i)
   TIME TO PEAK   (hrs)=  6.250
   RUNOFF VOLUME  (mm)=  28.834
   TOTAL RAINFALL  (mm)= 102.890
   RUNOFF COEFFICIENT  =  0.280

   (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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---------------------
| CALIB           |
| NASHYD  (  0016)|  Area   (ha)=  7.27   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia     (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=  0.21

   Unit Hyd Qpeak  (cms)=  1.322
```

PEAK FLOW (cms)= 0.630 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 27.660
TOTAL RAINFALL (mm)= 102.890
RUNOFF COEFFICIENT = 0.269

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0017)| Area (ha)= 3.37 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.16

Unit Hyd Qpeak (cms)= 0.804

PEAK FLOW (cms)= 0.301 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 24.289
TOTAL RAINFALL (mm)= 102.890
RUNOFF COEFFICIENT = 0.236

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

****
** SIMULATION:10yr 12hr 15min SCS **
****

| READ STORM | Filename: C:\Users\sdasilva\AppD
| | ata\Local\Temp\
| | f9e7b63a-3009-490a-b339-ca37356366a5\f5b70919
| Ptotal= 71.41 mm | Comments: 10yr 12hr 15min SCS

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	2.86	6.75	12.85	10.00	2.50
0.50	1.79	3.75	2.86	7.00	5.71	10.25	2.50
0.75	1.79	4.00	2.86	7.25	5.71	10.50	1.43
1.00	1.79	4.25	2.86	7.50	4.28	10.75	1.43
1.25	1.79	4.50	4.28	7.75	4.28	11.00	1.43
1.50	1.79	4.75	4.28	8.00	4.28	11.25	1.43
1.75	1.79	5.00	5.71	8.25	4.28	11.50	1.43
2.00	1.79	5.25	5.71	8.50	2.50	11.75	1.43
2.25	1.79	5.50	8.57	8.75	2.50	12.00	1.43
2.50	2.14	5.75	8.57	9.00	2.50	12.25	1.43
2.75	2.14	6.00	34.28	9.25	2.50		
3.00	2.14	6.25	94.26	9.50	2.50		
3.25	2.14	6.50	12.85	9.75	2.50		

| CALIB |
| NASHYD (0001)| Area (ha)= 0.62 Curve Number (CN)= 57.0

|ID= 1 DT=15.0 min | Ia   (mm)= 10.00   # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)=   0.15

    Unit Hyd Qpeak (cms)=   0.158

    PEAK FLOW   (cms)=   0.026 (i)
    TIME TO PEAK   (hrs)=   6.250
    RUNOFF VOLUME   (mm)= 11.370
    TOTAL RAINFALL (mm)= 71.410
    RUNOFF COEFFICIENT =   0.159

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0002)| Area   (ha)= 13.31   Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia   (mm)= 10.00   # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)=   0.64

    Unit Hyd Qpeak (cms)=   0.794

    PEAK FLOW   (cms)=   0.248 (i)
    TIME TO PEAK   (hrs)=   6.750
    RUNOFF VOLUME   (mm)= 14.882
    TOTAL RAINFALL (mm)= 71.410
    RUNOFF COEFFICIENT =   0.208

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0003)| Area   (ha)= 10.72   Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia   (mm)= 10.00   # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)=   0.48

    Unit Hyd Qpeak (cms)=   0.853

    PEAK FLOW   (cms)=   0.243 (i)
    TIME TO PEAK   (hrs)=   6.500
    RUNOFF VOLUME   (mm)= 14.837
    TOTAL RAINFALL (mm)= 71.410
    RUNOFF COEFFICIENT =   0.208

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0004)| Area   (ha)= 16.95   Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia   (mm)= 10.00   # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)=   0.75

    Unit Hyd Qpeak (cms)=   0.863

    PEAK FLOW   (cms)=   0.278 (i)
    TIME TO PEAK   (hrs)=   7.000

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    RUNOFF VOLUME    (mm)=  14.893
    TOTAL RAINFALL   (mm)=  71.410
    RUNOFF COEFFICIENT   =   0.209

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| NASHYD   (  0005)|   Area    (ha)=   1.92   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.32

    Unit Hyd Qpeak  (cms)=   0.229

    PEAK FLOW       (cms)=   0.056 (i)
    TIME TO PEAK    (hrs)=   6.250
    RUNOFF VOLUME    (mm)=  14.597
    TOTAL RAINFALL   (mm)=  71.410
    RUNOFF COEFFICIENT   =   0.204

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| NASHYD   (  0006)|   Area    (ha)=   6.41   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.30

    Unit Hyd Qpeak  (cms)=   0.816

    PEAK FLOW       (cms)=   0.200 (i)
    TIME TO PEAK    (hrs)=   6.250
    RUNOFF VOLUME    (mm)=  14.517
    TOTAL RAINFALL   (mm)=  71.410
    RUNOFF COEFFICIENT   =   0.203

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB           |
| NASHYD   (  0007)|   Area    (ha)=   3.57   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.10

    Unit Hyd Qpeak  (cms)=   1.364

    PEAK FLOW       (cms)=   0.094 (i)
    TIME TO PEAK    (hrs)=   6.250
    RUNOFF VOLUME    (mm)=   6.448
    TOTAL RAINFALL   (mm)=  71.410
    RUNOFF COEFFICIENT   =   0.090

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| NASHYD  (  0008)|  Area    (ha)=   2.72   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=   0.40

    Unit Hyd Qpeak  (cms)=   0.260

    PEAK FLOW       (cms)=   0.070 (i)
    TIME TO PEAK    (hrs)=   6.500
    RUNOFF VOLUME    (mm)=  14.770
    TOTAL RAINFALL   (mm)=  71.410
    RUNOFF COEFFICIENT   =   0.207

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| NASHYD  (  0009)|  Area    (ha)=   7.20   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=   0.12

    Unit Hyd Qpeak  (cms)=   2.292

    PEAK FLOW       (cms)=   0.254 (i)
    TIME TO PEAK    (hrs)=   6.250
    RUNOFF VOLUME    (mm)=   8.895
    TOTAL RAINFALL   (mm)=  71.410
    RUNOFF COEFFICIENT   =   0.125

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| NASHYD  (  0010)|  Area    (ha)=  10.41   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=   0.21

    Unit Hyd Qpeak  (cms)=   1.893

    PEAK FLOW       (cms)=   0.432 (i)
    TIME TO PEAK    (hrs)=   6.250
    RUNOFF VOLUME    (mm)=  13.593
    TOTAL RAINFALL   (mm)=  71.410
    RUNOFF COEFFICIENT   =   0.190

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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---------------------
| CALIB           |
| NASHYD  (  0011)|  Area    (ha)=  10.75   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=   0.19

    Unit Hyd Qpeak  (cms)=   2.161
```

PEAK FLOW (cms)= 0.462 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 13.108
TOTAL RAINFALL (mm)= 71.410
RUNOFF COEFFICIENT = 0.184

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0012)| Area (ha)= 3.48 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.22

Unit Hyd Qpeak (cms)= 0.604

PEAK FLOW (cms)= 0.141 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 13.777
TOTAL RAINFALL (mm)= 71.410
RUNOFF COEFFICIENT = 0.193

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0013)| Area (ha)= 2.93 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.20

Unit Hyd Qpeak (cms)= 0.560

PEAK FLOW (cms)= 0.124 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 13.373
TOTAL RAINFALL (mm)= 71.410
RUNOFF COEFFICIENT = 0.187

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0014)| Area (ha)= 5.31 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.19

Unit Hyd Qpeak (cms)= 1.067

PEAK FLOW (cms)= 0.228 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 13.108
TOTAL RAINFALL (mm)= 71.410
RUNOFF COEFFICIENT = 0.184

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0015)| Area (ha)= 9.77 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.25

Unit Hyd Qpeak (cms)= 1.493

PEAK FLOW (cms)= 0.363 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 14.170
TOTAL RAINFALL (mm)= 71.410
RUNOFF COEFFICIENT = 0.198

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0016)| Area (ha)= 7.27 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.21

Unit Hyd Qpeak (cms)= 1.322

PEAK FLOW (cms)= 0.302 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 13.593
TOTAL RAINFALL (mm)= 71.410
RUNOFF COEFFICIENT = 0.190

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0017)| Area (ha)= 3.37 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.16

Unit Hyd Qpeak (cms)= 0.804

PEAK FLOW (cms)= 0.145 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 11.936
TOTAL RAINFALL (mm)= 71.410
RUNOFF COEFFICIENT = 0.167

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

****
** SIMULATION:25yr 12hr 15min SCS **
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---------------------
|    READ STORM    |    Filename: C:\Users\sdasilva\AppD
|                  |            ata\Local\Temp\
|                  |            f9e7b63a-3009-490a-b339-ca37356366a5\b02cf820
| Ptotal= 84.08 mm |    Comments: 25yr 12hr 15min SCS
---------------------
            TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
             hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
            0.25    0.00 |  3.50    3.36 |  6.75   15.13 | 10.00    2.94
            0.50    2.10 |  3.75    3.36 |  7.00    6.73 | 10.25    2.94
            0.75    2.10 |  4.00    3.36 |  7.25    6.73 | 10.50    1.68
            1.00    2.10 |  4.25    3.36 |  7.50    5.04 | 10.75    1.68
            1.25    2.10 |  4.50    5.04 |  7.75    5.04 | 11.00    1.68
            1.50    2.10 |  4.75    5.04 |  8.00    5.04 | 11.25    1.68
            1.75    2.10 |  5.00    6.73 |  8.25    5.04 | 11.50    1.68
            2.00    2.10 |  5.25    6.73 |  8.50    2.94 | 11.75    1.68
            2.25    2.10 |  5.50   10.09 |  8.75    2.94 | 12.00    1.68
            2.50    2.52 |  5.75   10.09 |  9.00    2.94 | 12.25    1.68
            2.75    2.52 |  6.00   40.36 |  9.25    2.94 |
            3.00    2.52 |  6.25  110.99 |  9.50    2.94 |
            3.25    2.52 |  6.50   15.13 |  9.75    2.94 |

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| CALIB           |
| NASHYD   (  0001)|   Area    (ha)=   0.62   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=   0.15

    Unit Hyd Qpeak  (cms)=   0.158

    PEAK FLOW       (cms)=   0.037 (i)
    TIME TO PEAK    (hrs)=   6.250
    RUNOFF VOLUME    (mm)=  15.759
    TOTAL RAINFALL   (mm)=  84.080
    RUNOFF COEFFICIENT   =   0.187

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| NASHYD   (  0002)|   Area    (ha)=  13.31   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=   0.64

    Unit Hyd Qpeak  (cms)=   0.794

    PEAK FLOW       (cms)=   0.349 (i)
    TIME TO PEAK    (hrs)=   6.750
    RUNOFF VOLUME    (mm)=  20.624
    TOTAL RAINFALL   (mm)=  84.080
    RUNOFF COEFFICIENT   =   0.245

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB |
| NASHYD (0003)| Area (ha)= 10.72 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.48

Unit Hyd Qpeak (cms)= 0.853

PEAK FLOW (cms)= 0.342 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 20.562
TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.245

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0004)| Area (ha)= 16.95 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.75

Unit Hyd Qpeak (cms)= 0.863

PEAK FLOW (cms)= 0.390 (i)
TIME TO PEAK (hrs)= 7.000
RUNOFF VOLUME (mm)= 20.638
TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.245

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0005)| Area (ha)= 1.92 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.32

Unit Hyd Qpeak (cms)= 0.229

PEAK FLOW (cms)= 0.079 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 20.229
TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.241

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0006)| Area (ha)= 6.41 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.30

Unit Hyd Qpeak (cms)= 0.816

PEAK FLOW (cms)= 0.282 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 20.118
TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.239

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0007)| Area (ha)= 3.57 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.10

Unit Hyd Qpeak (cms)= 1.364

PEAK FLOW (cms)= 0.131 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 8.936
TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.106

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0008)| Area (ha)= 2.72 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.40

Unit Hyd Qpeak (cms)= 0.260

PEAK FLOW (cms)= 0.098 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 20.468
TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.243

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0009)| Area (ha)= 7.20 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.12

Unit Hyd Qpeak (cms)= 2.292

PEAK FLOW (cms)= 0.356 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 12.326
TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.147

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0010)| Area (ha)= 10.41 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.21

Unit Hyd Qpeak (cms)= 1.893

PEAK FLOW (cms)= 0.607 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 18.837
TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.224

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0011)| Area (ha)= 10.75 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.19

Unit Hyd Qpeak (cms)= 2.161

PEAK FLOW (cms)= 0.648 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 18.165
TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.216

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0012)| Area (ha)= 3.48 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.22

Unit Hyd Qpeak (cms)= 0.604

PEAK FLOW (cms)= 0.198 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 19.092
TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.227

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0013)| Area (ha)= 2.93 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00

---------- U.H. Tp(hrs)= 0.20

Unit Hyd Qpeak (cms)= 0.560

PEAK FLOW (cms)= 0.174 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 18.532
TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.220

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0014)| Area (ha)= 5.31 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)= 0.19

Unit Hyd Qpeak (cms)= 1.067

PEAK FLOW (cms)= 0.320 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 18.165
TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.216

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0015)| Area (ha)= 9.77 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)= 0.25

Unit Hyd Qpeak (cms)= 1.493

PEAK FLOW (cms)= 0.511 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 19.637
TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.234

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0016)| Area (ha)= 7.27 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)= 0.21

Unit Hyd Qpeak (cms)= 1.322

PEAK FLOW (cms)= 0.424 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 18.837

TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.224

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0017)| Area (ha)= 3.37 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.16

Unit Hyd Qpeak (cms)= 0.804

PEAK FLOW (cms)= 0.203 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 16.542
TOTAL RAINFALL (mm)= 84.080
RUNOFF COEFFICIENT = 0.197

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

****
** SIMULATION:2yr 12hr 15min SCS **
****

| READ STORM | Filename: C:\Users\sdasilva\AppD
| | ata\Local\Temp\
| | 57ab3bf1-f9cb-4409-a201-14d1bf60ac32\5f27f099
| Ptotal= 46.06 mm | Comments: 2yr 12hr 15min SCS

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	1.84	6.75	8.29	10.00	1.61
0.50	1.15	3.75	1.84	7.00	3.68	10.25	1.61
0.75	1.15	4.00	1.84	7.25	3.68	10.50	0.92
1.00	1.15	4.25	1.84	7.50	2.76	10.75	0.92
1.25	1.15	4.50	2.76	7.75	2.76	11.00	0.92
1.50	1.15	4.75	2.76	8.00	2.76	11.25	0.92
1.75	1.15	5.00	3.68	8.25	2.76	11.50	0.92
2.00	1.15	5.25	3.68	8.50	1.61	11.75	0.92
2.25	1.15	5.50	5.53	8.75	1.61	12.00	0.92
2.50	1.38	5.75	5.53	9.00	1.61	12.25	0.92
2.75	1.38	6.00	22.11	9.25	1.61		
3.00	1.38	6.25	60.80	9.50	1.61		
3.25	1.38	6.50	8.29	9.75	1.61		

| CALIB |
| NASHYD (0001)| Area (ha)= 0.62 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.15

Unit Hyd Qpeak (cms)= 0.158

PEAK FLOW (cms)= 0.010 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 4.357
TOTAL RAINFALL (mm)= 46.060
RUNOFF COEFFICIENT = 0.095

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0002)| Area (ha)= 13.31 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.64

Unit Hyd Qpeak (cms)= 0.794

PEAK FLOW (cms)= 0.089 (i)
TIME TO PEAK (hrs)= 6.750
RUNOFF VOLUME (mm)= 5.703
TOTAL RAINFALL (mm)= 46.060
RUNOFF COEFFICIENT = 0.124

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0003)| Area (ha)= 10.72 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.48

Unit Hyd Qpeak (cms)= 0.853

PEAK FLOW (cms)= 0.086 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 5.685
TOTAL RAINFALL (mm)= 46.060
RUNOFF COEFFICIENT = 0.123

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0004)| Area (ha)= 16.95 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.75

Unit Hyd Qpeak (cms)= 0.863

PEAK FLOW (cms)= 0.101 (i)
TIME TO PEAK (hrs)= 7.000
RUNOFF VOLUME (mm)= 5.707
TOTAL RAINFALL (mm)= 46.060
RUNOFF COEFFICIENT = 0.124

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0005)| Area (ha)= 1.92 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.32

Unit Hyd Qpeak (cms)= 0.229

PEAK FLOW (cms)= 0.019 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 5.594
TOTAL RAINFALL (mm)= 46.060
RUNOFF COEFFICIENT = 0.121

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0006)| Area (ha)= 6.41 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.30

Unit Hyd Qpeak (cms)= 0.816

PEAK FLOW (cms)= 0.070 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 5.563
TOTAL RAINFALL (mm)= 46.060
RUNOFF COEFFICIENT = 0.121

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0007)| Area (ha)= 3.57 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.10

Unit Hyd Qpeak (cms)= 1.364

PEAK FLOW (cms)= 0.035 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 2.471
TOTAL RAINFALL (mm)= 46.060
RUNOFF COEFFICIENT = 0.054

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0008)| Area (ha)= 2.72 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00

---------- U.H. Tp(hrs)= 0.40

Unit Hyd Qpeak (cms)= 0.260

PEAK FLOW (cms)= 0.025 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 5.659
TOTAL RAINFALL (mm)= 46.060
RUNOFF COEFFICIENT = 0.123

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0009)| Area (ha)= 7.20 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)= 0.12

Unit Hyd Qpeak (cms)= 2.292

PEAK FLOW (cms)= 0.093 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 3.408
TOTAL RAINFALL (mm)= 46.060
RUNOFF COEFFICIENT = 0.074

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0010)| Area (ha)= 10.41 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)= 0.21

Unit Hyd Qpeak (cms)= 1.893

PEAK FLOW (cms)= 0.155 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 5.209
TOTAL RAINFALL (mm)= 46.060
RUNOFF COEFFICIENT = 0.113

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0011)| Area (ha)= 10.75 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)= 0.19

Unit Hyd Qpeak (cms)= 2.161

PEAK FLOW (cms)= 0.167 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 5.023

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    TOTAL RAINFALL   (mm)=  46.060
    RUNOFF COEFFICIENT   =   0.109

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| NASHYD   (  0012)|   Area    (ha)=   3.48   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.22

    Unit Hyd Qpeak  (cms)=   0.604

    PEAK FLOW       (cms)=   0.051 (i)
    TIME TO PEAK    (hrs)=   6.250
    RUNOFF VOLUME    (mm)=   5.279
    TOTAL RAINFALL   (mm)=  46.060
    RUNOFF COEFFICIENT   =   0.115

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| NASHYD   (  0013)|   Area    (ha)=   2.93   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.20

    Unit Hyd Qpeak  (cms)=   0.560

    PEAK FLOW       (cms)=   0.045 (i)
    TIME TO PEAK    (hrs)=   6.250
    RUNOFF VOLUME    (mm)=   5.124
    TOTAL RAINFALL   (mm)=  46.060
    RUNOFF COEFFICIENT   =   0.111

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| NASHYD   (  0014)|   Area    (ha)=   5.31   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.19

    Unit Hyd Qpeak  (cms)=   1.067

    PEAK FLOW       (cms)=   0.083 (i)
    TIME TO PEAK    (hrs)=   6.250
    RUNOFF VOLUME    (mm)=   5.023
    TOTAL RAINFALL   (mm)=  46.060
    RUNOFF COEFFICIENT   =   0.109

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| NASHYD  (  0015)|  Area    (ha)=   9.77   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=   0.25

   Unit Hyd Qpeak  (cms)=   1.493

   PEAK FLOW      (cms)=   0.129 (i)
   TIME TO PEAK    (hrs)=   6.250
   RUNOFF VOLUME    (mm)=   5.430
   TOTAL RAINFALL   (mm)=  46.060
   RUNOFF COEFFICIENT   =   0.118

   (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB           |
| NASHYD  (  0016)|  Area    (ha)=   7.27   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=   0.21

   Unit Hyd Qpeak  (cms)=   1.322

   PEAK FLOW      (cms)=   0.108 (i)
   TIME TO PEAK    (hrs)=   6.250
   RUNOFF VOLUME    (mm)=   5.209
   TOTAL RAINFALL   (mm)=  46.060
   RUNOFF COEFFICIENT   =   0.113

   (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| CALIB           |
| NASHYD  (  0017)|  Area    (ha)=   3.37   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=   0.16

   Unit Hyd Qpeak  (cms)=   0.804

   PEAK FLOW      (cms)=   0.053 (i)
   TIME TO PEAK    (hrs)=   6.250
   RUNOFF VOLUME    (mm)=   4.574
   TOTAL RAINFALL   (mm)=  46.060
   RUNOFF COEFFICIENT   =   0.099

   (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
**********************************
** SIMULATION:50yr 12hr 15min SCS **
**********************************

--------------------
|   READ STORM    |   Filename: C:\Users\sdasilva\AppD
|                 |           ata\Local\Temp\
|                 |           f9e7b63a-3009-490a-b339-ca37356366a5\9ed185bf
```

| Ptotal= 93.59 mm | Comments: 50yr 12hr 15min SCS

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	3.74	6.75	16.85	10.00	3.28
0.50	2.34	3.75	3.74	7.00	7.49	10.25	3.28
0.75	2.34	4.00	3.74	7.25	7.49	10.50	1.87
1.00	2.34	4.25	3.74	7.50	5.62	10.75	1.87
1.25	2.34	4.50	5.62	7.75	5.62	11.00	1.87
1.50	2.34	4.75	5.62	8.00	5.62	11.25	1.87
1.75	2.34	5.00	7.49	8.25	5.62	11.50	1.87
2.00	2.34	5.25	7.49	8.50	3.28	11.75	1.87
2.25	2.34	5.50	11.23	8.75	3.28	12.00	1.87
2.50	2.81	5.75	11.23	9.00	3.28	12.25	1.87
2.75	2.81	6.00	44.92	9.25	3.28		
3.00	2.81	6.25	123.54	9.50	3.28		
3.25	2.81	6.50	16.85	9.75	3.28		

CALIB	NASHYD (0001)	Area (ha)= 0.62	Curve Number (CN)= 57.0
ID= 1 DT=15.0 min	Ia (mm)= 10.00	# of Linear Res.(N)= 3.00	U.H. Tp(hrs)= 0.15

Unit Hyd Qpeak (cms)= 0.158

PEAK FLOW (cms)= 0.045 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 19.371
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.207

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	NASHYD (0002)	Area (ha)= 13.31	Curve Number (CN)= 57.0
ID= 1 DT=15.0 min	Ia (mm)= 10.00	# of Linear Res.(N)= 3.00	U.H. Tp(hrs)= 0.64

Unit Hyd Qpeak (cms)= 0.794

PEAK FLOW (cms)= 0.432 (i)
TIME TO PEAK (hrs)= 6.750
RUNOFF VOLUME (mm)= 25.352
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.271

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	NASHYD (0003)	Area (ha)= 10.72	Curve Number (CN)= 57.0
ID= 1 DT=15.0 min	Ia (mm)= 10.00	# of Linear Res.(N)= 3.00	

---------- U.H. Tp(hrs)= 0.48

Unit Hyd Qpeak (cms)= 0.853

PEAK FLOW (cms)= 0.425 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 25.275
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.270

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0004)| Area (ha)= 16.95 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)= 0.75

Unit Hyd Qpeak (cms)= 0.863

PEAK FLOW (cms)= 0.482 (i)
TIME TO PEAK (hrs)= 7.000
RUNOFF VOLUME (mm)= 25.369
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.271

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0005)| Area (ha)= 1.92 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)= 0.32

Unit Hyd Qpeak (cms)= 0.229

PEAK FLOW (cms)= 0.098 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 24.867
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.266

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0006)| Area (ha)= 6.41 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)= 0.30

Unit Hyd Qpeak (cms)= 0.816

PEAK FLOW (cms)= 0.351 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 24.730

TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.264

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0007)| Area (ha)= 3.57 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.10

Unit Hyd Qpeak (cms)= 1.364

PEAK FLOW (cms)= 0.162 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 10.985
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.117

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0008)| Area (ha)= 2.72 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.40

Unit Hyd Qpeak (cms)= 0.260

PEAK FLOW (cms)= 0.122 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 25.161
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.269

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0009)| Area (ha)= 7.20 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.12

Unit Hyd Qpeak (cms)= 2.292

PEAK FLOW (cms)= 0.439 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 15.152
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.162

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0010)| Area (ha)= 10.41 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.21

Unit Hyd Qpeak (cms)= 1.893

PEAK FLOW (cms)= 0.751 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 23.155
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.247

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0011)| Area (ha)= 10.75 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.19

Unit Hyd Qpeak (cms)= 2.161

PEAK FLOW (cms)= 0.802 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 22.330
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.239

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0012)| Area (ha)= 3.48 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.22

Unit Hyd Qpeak (cms)= 0.604

PEAK FLOW (cms)= 0.245 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 23.469
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.251

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0013)| Area (ha)= 2.93 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.20

Unit Hyd Qpeak (cms)= 0.560

PEAK FLOW (cms)= 0.215 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 22.780
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.243

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0014)| Area (ha)= 5.31 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.19

Unit Hyd Qpeak (cms)= 1.067

PEAK FLOW (cms)= 0.396 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 22.329
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.239

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0015)| Area (ha)= 9.77 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.25

Unit Hyd Qpeak (cms)= 1.493

PEAK FLOW (cms)= 0.633 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 24.138
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.258

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0016)| Area (ha)= 7.27 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.21

Unit Hyd Qpeak (cms)= 1.322

PEAK FLOW (cms)= 0.525 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 23.155
TOTAL RAINFALL (mm)= 93.590
RUNOFF COEFFICIENT = 0.247

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------------------------------------------------------------------
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| CALIB           |
| NASHYD  (  0017)|  Area    (ha)=  3.37   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=  0.16

   Unit Hyd Qpeak  (cms)=  0.804

   PEAK FLOW      (cms)=  0.251 (i)
   TIME TO PEAK    (hrs)=  6.250
   RUNOFF VOLUME    (mm)=  20.334
   TOTAL RAINFALL   (mm)=  93.590
   RUNOFF COEFFICIENT   =  0.217

   (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
**********************************
** SIMULATION:5yr 12hr 15min SCS **
**********************************

---------------------
|   READ STORM    |   Filename: C:\Users\sdasilva\AppD
|               |           ata\Local\Temp\
|               |           57ab3bf1-f9cb-4409-a201-14d1bf60ac32\dbeb3100
| Ptotal= 61.48 mm |   Comments: 5yr 12hr 15min SCS
---------------------
           TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
            hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
           0.25    0.00 |  3.50    2.46 |  6.75   11.07 | 10.00    2.15
           0.50    1.54 |  3.75    2.46 |  7.00    4.92 | 10.25    2.15
           0.75    1.54 |  4.00    2.46 |  7.25    4.92 | 10.50    1.23
           1.00    1.54 |  4.25    2.46 |  7.50    3.69 | 10.75    1.23
           1.25    1.54 |  4.50    3.69 |  7.75    3.69 | 11.00    1.23
           1.50    1.54 |  4.75    3.69 |  8.00    3.69 | 11.25    1.23
           1.75    1.54 |  5.00    4.92 |  8.25    3.69 | 11.50    1.23
           2.00    1.54 |  5.25    4.92 |  8.50    2.15 | 11.75    1.23
           2.25    1.54 |  5.50    7.38 |  8.75    2.15 | 12.00    1.23
           2.50    1.84 |  5.75    7.38 |  9.00    2.15 | 12.25    1.23
           2.75    1.84 |  6.00   29.51 |  9.25    2.15 |
           3.00    1.84 |  6.25   81.15 |  9.50    2.15 |
           3.25    1.84 |  6.50   11.07 |  9.75    2.15 |

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| CALIB           |
| NASHYD  (  0001)|  Area    (ha)=  0.62   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=  0.15

   Unit Hyd Qpeak  (cms)=  0.158

   PEAK FLOW      (cms)=  0.019 (i)
   TIME TO PEAK    (hrs)=  6.250
   RUNOFF VOLUME    (mm)=  8.317
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    TOTAL RAINFALL   (mm)=  61.480
    RUNOFF COEFFICIENT   =   0.135

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| NASHYD   (  0002)|   Area    (ha)=  13.31   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.64

    Unit Hyd Qpeak  (cms)=   0.794

    PEAK FLOW       (cms)=   0.178 (i)
    TIME TO PEAK    (hrs)=   6.750
    RUNOFF VOLUME    (mm)=  10.886
    TOTAL RAINFALL   (mm)=  61.480
    RUNOFF COEFFICIENT   =   0.177

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| NASHYD   (  0003)|   Area    (ha)=  10.72   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.48

    Unit Hyd Qpeak  (cms)=   0.853

    PEAK FLOW       (cms)=   0.174 (i)
    TIME TO PEAK    (hrs)=   6.500
    RUNOFF VOLUME    (mm)=  10.853
    TOTAL RAINFALL   (mm)=  61.480
    RUNOFF COEFFICIENT   =   0.177

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB           |
| NASHYD   (  0004)|   Area    (ha)=  16.95   Curve Number   (CN)= 57.0
|ID= 1 DT=15.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.75

    Unit Hyd Qpeak  (cms)=   0.863

    PEAK FLOW       (cms)=   0.201 (i)
    TIME TO PEAK    (hrs)=   7.000
    RUNOFF VOLUME    (mm)=  10.893
    TOTAL RAINFALL   (mm)=  61.480
    RUNOFF COEFFICIENT   =   0.177

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB |
| NASHYD (0005)| Area (ha)= 1.92 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.32

Unit Hyd Qpeak (cms)= 0.229

PEAK FLOW (cms)= 0.040 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 10.677
TOTAL RAINFALL (mm)= 61.480
RUNOFF COEFFICIENT = 0.174

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0006)| Area (ha)= 6.41 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.30

Unit Hyd Qpeak (cms)= 0.816

PEAK FLOW (cms)= 0.143 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 10.619
TOTAL RAINFALL (mm)= 61.480
RUNOFF COEFFICIENT = 0.173

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0007)| Area (ha)= 3.57 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.10

Unit Hyd Qpeak (cms)= 1.364

PEAK FLOW (cms)= 0.068 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 4.717
TOTAL RAINFALL (mm)= 61.480
RUNOFF COEFFICIENT = 0.077

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0008)| Area (ha)= 2.72 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.40

Unit Hyd Qpeak (cms)= 0.260

```
    PEAK FLOW      (cms)=   0.050 (i)
    TIME TO PEAK   (hrs)=   6.500
    RUNOFF VOLUME   (mm)=  10.803
    TOTAL RAINFALL  (mm)=  61.480
    RUNOFF COEFFICIENT  =   0.176

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB           |
| NASHYD  (  0009)|  Area   (ha)=   7.20  Curve Number  (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia     (mm)=  10.00  # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.12

    Unit Hyd Qpeak  (cms)=   2.292

    PEAK FLOW      (cms)=   0.184 (i)
    TIME TO PEAK   (hrs)=   6.250
    RUNOFF VOLUME   (mm)=   6.506
    TOTAL RAINFALL  (mm)=  61.480
    RUNOFF COEFFICIENT  =   0.106

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| NASHYD  (  0010)|  Area   (ha)=  10.41  Curve Number  (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia     (mm)=  10.00  # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.21

    Unit Hyd Qpeak  (cms)=   1.893

    PEAK FLOW      (cms)=   0.311 (i)
    TIME TO PEAK   (hrs)=   6.250
    RUNOFF VOLUME   (mm)=   9.943
    TOTAL RAINFALL  (mm)=  61.480
    RUNOFF COEFFICIENT  =   0.162

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB           |
| NASHYD  (  0011)|  Area   (ha)=  10.75  Curve Number  (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia     (mm)=  10.00  # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.19

    Unit Hyd Qpeak  (cms)=   2.161

    PEAK FLOW      (cms)=   0.333 (i)
    TIME TO PEAK   (hrs)=   6.250
    RUNOFF VOLUME   (mm)=   9.588
    TOTAL RAINFALL  (mm)=  61.480
    RUNOFF COEFFICIENT  =   0.156

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB           |
| NASHYD  (  0012)|  Area   (ha)=  3.48  Curve Number  (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia     (mm)=  10.00  # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=  0.22

    Unit Hyd Qpeak  (cms)=  0.604

    PEAK FLOW      (cms)=  0.101 (i)
    TIME TO PEAK   (hrs)=  6.250
    RUNOFF VOLUME   (mm)=  10.077
    TOTAL RAINFALL  (mm)=  61.480
    RUNOFF COEFFICIENT  =  0.164

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB           |
| NASHYD  (  0013)|  Area   (ha)=  2.93  Curve Number  (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia     (mm)=  10.00  # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=  0.20

    Unit Hyd Qpeak  (cms)=  0.560

    PEAK FLOW      (cms)=  0.089 (i)
    TIME TO PEAK   (hrs)=  6.250
    RUNOFF VOLUME   (mm)=  9.782
    TOTAL RAINFALL  (mm)=  61.480
    RUNOFF COEFFICIENT  =  0.159

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB           |
| NASHYD  (  0014)|  Area   (ha)=  5.31  Curve Number  (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia     (mm)=  10.00  # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=  0.19

    Unit Hyd Qpeak  (cms)=  1.067

    PEAK FLOW      (cms)=  0.165 (i)
    TIME TO PEAK   (hrs)=  6.250
    RUNOFF VOLUME   (mm)=  9.588
    TOTAL RAINFALL  (mm)=  61.480
    RUNOFF COEFFICIENT  =  0.156

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB           |
| NASHYD  (  0015)|  Area   (ha)=  9.77  Curve Number  (CN)= 57.0
|ID= 1 DT=15.0 min |  Ia     (mm)=  10.00  # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=  0.25
```

Unit Hyd Qpeak (cms)= 1.493

PEAK FLOW (cms)= 0.260 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 10.365
TOTAL RAINFALL (mm)= 61.480
RUNOFF COEFFICIENT = 0.169

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0016)| Area (ha)= 7.27 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.21

Unit Hyd Qpeak (cms)= 1.322

PEAK FLOW (cms)= 0.217 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 9.943
TOTAL RAINFALL (mm)= 61.480
RUNOFF COEFFICIENT = 0.162

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0017)| Area (ha)= 3.37 Curve Number (CN)= 57.0
|ID= 1 DT=15.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.16

Unit Hyd Qpeak (cms)= 0.804

PEAK FLOW (cms)= 0.105 (i)
TIME TO PEAK (hrs)= 6.250
RUNOFF VOLUME (mm)= 8.731
TOTAL RAINFALL (mm)= 61.480
RUNOFF COEFFICIENT = 0.142

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

APPENDIX B

Existing Hydraulics

Culvert Calculator Report
A1-1

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	180.40	m	Headwater Depth/Height	1.14	
Computed Headwater Elevation	180.40	m	Discharge	0.0611	m³/s
Inlet Control HW Elev.	180.35	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	180.40	m	Control Type	Entrance Control	

Grades					
Upstream Invert	180.05	m	Downstream Invert	177.32	m
Length	19.75	m	Constructed Slope	0.138177	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.11	m
Slope Type	Steep		Normal Depth	0.11	m
Flow Regime	Supercritical		Critical Depth	0.19	m
Velocity Downstream	2.44	m/s	Critical Slope	0.024189	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	180.40	m	Upstream Velocity Head	0.08	m
Ke	0.90		Entrance Loss	0.07	m

Inlet Control Properties					
Inlet Control HW Elev.	180.35	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A1-2

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.14	m	Headwater Depth/Height	2.68	
Computed Headwater Elevation	179.14	m	Discharge	0.1391	m³/s
Inlet Control HW Elev.	179.14	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.07	m	Control Type	Inlet Control	

Grades					
Upstream Invert	178.32	m	Downstream Invert	177.63	m
Length	12.61	m	Constructed Slope	0.054811	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.28	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.28	m
Velocity Downstream	1.99	m/s	Critical Slope	0.056529	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.07	m	Upstream Velocity Head	0.19	m
Ke	0.90		Entrance Loss	0.17	m

Inlet Control Properties					
Inlet Control HW Elev.	179.14	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A2-1a

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.80	m	Headwater Depth/Height	1.78	
Computed Headwater Elevation	179.80	m	Discharge	0.8989	m³/s
Inlet Control HW Elev.	179.80	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.72	m	Control Type	Inlet Control	

Grades					
Upstream Invert	178.83	m	Downstream Invert	177.95	m
Length	13.76	m	Constructed Slope	0.063972	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.35	m
Slope Type	Steep		Normal Depth	0.35	m
Flow Regime	Supercritical		Critical Depth	0.49	m
Velocity Downstream	3.55	m/s	Critical Slope	0.031881	m/m

Section					
Section Shape	Horizontal Ellipse		Mannings Coefficient	0.024	
Section Material	Concrete		Span	0.86	m
Section Size	550 x 860 mm		Rise	0.55	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.72	m	Upstream Velocity Head	0.33	m
Ke	0.20		Entrance Loss	0.07	m

Inlet Control Properties					
Inlet Control HW Elev.	179.80	m	Flow Control	N/A	
Inlet Type	Groove end projecting (horizontal ellipse)		Area Full	0.4	m²
K	0.00450		HDS 5 Chart	29	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Calculator Report
A2-1b

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.80	m	Headwater Depth/Height	1.12	
Computed Headwater Elevation	179.80	m	Discharge	1.7584	m³/s
Inlet Control HW Elev.	179.76	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.80	m	Control Type	Entrance Control	

Grades					
Upstream Invert	178.83	m	Downstream Invert	177.95	m
Length	13.76	m	Constructed Slope	0.063953	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.42	m
Slope Type	Steep		Normal Depth	0.41	m
Flow Regime	Supercritical		Critical Depth	0.61	m
Velocity Downstream	3.97	m/s	Critical Slope	0.014015	m/m

Section					
Section Shape	Horizontal Ellipse		Mannings Coefficient	0.024	
Section Material	Concrete		Span	1.35	m
Section Size	860 x 1350 mm		Rise	0.86	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.80	m	Upstream Velocity Head	0.30	m
Ke	0.20		Entrance Loss	0.06	m

Inlet Control Properties					
Inlet Control HW Elev.	179.76	m	Flow Control	N/A	
Inlet Type	Groove end projecting (horizontal ellipse)		Area Full	0.9	m²
K	0.00450		HDS 5 Chart	29	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Calculator Report
A3-1

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.13	m	Headwater Depth/Height	1.88	
Computed Headwater Elevation	179.13	m	Discharge	0.2927	m³/s
Inlet Control HW Elev.	179.09	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.13	m	Control Type	Outlet Control	

Grades					
Upstream Invert	178.27	m	Downstream Invert	178.02	m
Length	11.86	m	Constructed Slope	0.021072	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.38	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.38	m
Velocity Downstream	2.02	m/s	Critical Slope	0.032654	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.13	m	Upstream Velocity Head	0.16	m
Ke	0.90		Entrance Loss	0.15	m

Inlet Control Properties					
Inlet Control HW Elev.	179.09	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A3-2

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	178.68	m	Headwater Depth/Height	1.34	
Computed Headwater Elevation	178.68	m	Discharge	0.0744	m³/s
Inlet Control HW Elev.	178.64	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	178.68	m	Control Type	Outlet Control	

Grades					
Upstream Invert	178.27	m	Downstream Invert	178.14	m
Length	10.45	m	Constructed Slope	0.012435	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.21	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.21	m
Velocity Downstream	1.38	m/s	Critical Slope	0.026976	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	178.68	m	Upstream Velocity Head	0.05	m
Ke	0.90		Entrance Loss	0.05	m

Inlet Control Properties					
Inlet Control HW Elev.	178.64	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A4-1

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.38	m	Headwater Depth/Height	1.18	
Computed Headwater Elevation	179.38	m	Discharge	0.0680	m³/s
Inlet Control HW Elev.	179.36	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.38	m	Control Type	Outlet Control	

Grades					
Upstream Invert	179.02	m	Downstream Invert	178.82	m
Length	10.08	m	Constructed Slope	0.019839	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.20	m
Slope Type	Mild		Normal Depth	0.22	m
Flow Regime	Subcritical		Critical Depth	0.20	m
Velocity Downstream	1.32	m/s	Critical Slope	0.025546	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.38	m	Upstream Velocity Head	0.07	m
Ke	0.90		Entrance Loss	0.07	m

Inlet Control Properties					
Inlet Control HW Elev.	179.36	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A5-1

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	181.01	m	Headwater Depth/Height	5.48	
Computed Headwater Elevation	181.01	m	Discharge	0.2113	m³/s
Inlet Control HW Elev.	181.01	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	180.79	m	Control Type	Inlet Control	

Grades					
Upstream Invert	179.34	m	Downstream Invert	178.45	m
Length	8.22	m	Constructed Slope	0.108273	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.30	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.30	m
Velocity Downstream	2.91	m/s	Critical Slope	0.134036	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	180.79	m	Upstream Velocity Head	0.43	m
Ke	0.90		Entrance Loss	0.38	m

Inlet Control Properties					
Inlet Control HW Elev.	181.01	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A5-2

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.16	m	Headwater Depth/Height	1.31	
Computed Headwater Elevation	179.16	m	Discharge	0.1324	m³/s
Inlet Control HW Elev.	179.12	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.16	m	Control Type	Entrance Control	

Grades					
Upstream Invert	178.66	m	Downstream Invert	177.97	m
Length	8.65	m	Constructed Slope	0.079806	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.18	m
Slope Type	Steep		Normal Depth	0.18	m
Flow Regime	Supercritical		Critical Depth	0.27	m
Velocity Downstream	2.42	m/s	Critical Slope	0.025350	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.38	m
Section Size	375 mm		Rise	0.38	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.16	m	Upstream Velocity Head	0.12	m
Ke	0.90		Entrance Loss	0.11	m

Inlet Control Properties					
Inlet Control HW Elev.	179.12	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A6-1

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.11	m	Headwater Depth/Height	1.21	
Computed Headwater Elevation	179.11	m	Discharge	0.0675	m³/s
Inlet Control HW Elev.	179.08	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.11	m	Control Type	Entrance Control	

Grades					
Upstream Invert	178.74	m	Downstream Invert	178.38	m
Length	9.82	m	Constructed Slope	0.036660	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.18	m
Slope Type	Steep		Normal Depth	0.18	m
Flow Regime	Supercritical		Critical Depth	0.20	m
Velocity Downstream	1.52	m/s	Critical Slope	0.025440	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.11	m	Upstream Velocity Head	0.09	m
Ke	0.90		Entrance Loss	0.08	m

Inlet Control Properties					
Inlet Control HW Elev.	179.08	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A7-1a

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	178.80	m	Headwater Depth/Height	1.77	
Computed Headwater Elevation	178.80	m	Discharge	0.1846	m³/s
Inlet Control HW Elev.	178.80	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	178.77	m	Control Type	Inlet Control	

Grades					
Upstream Invert	178.13	m	Downstream Invert	177.61	m
Length	12.20	m	Constructed Slope	0.042876	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.28	m
Slope Type	Steep		Normal Depth	0.28	m
Flow Regime	Supercritical		Critical Depth	0.31	m
Velocity Downstream	2.04	m/s	Critical Slope	0.034465	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.38	m
Section Size	375 mm		Rise	0.38	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	178.77	m	Upstream Velocity Head	0.17	m
Ke	0.90		Entrance Loss	0.16	m

Inlet Control Properties					
Inlet Control HW Elev.	178.80	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A7-1b

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	178.80	m	Headwater Depth/Height	1.10	
Computed Headwater Elevation	178.80	m	Discharge	0.3295	m³/s
Inlet Control HW Elev.	178.74	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	178.80	m	Control Type	Entrance Control	

Grades					
Upstream Invert	178.13	m	Downstream Invert	177.61	m
Length	12.20	m	Constructed Slope	0.042876	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.29	m
Slope Type	Steep		Normal Depth	0.29	m
Flow Regime	Supercritical		Critical Depth	0.37	m
Velocity Downstream	2.41	m/s	Critical Slope	0.018786	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	178.80	m	Upstream Velocity Head	0.16	m
Ke	0.90		Entrance Loss	0.14	m

Inlet Control Properties					
Inlet Control HW Elev.	178.74	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A7-2

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	178.89	m	Headwater Depth/Height	1.65	
Computed Headwater Elevation	178.89	m	Discharge	0.1650	m³/s
Inlet Control HW Elev.	178.84	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	178.89	m	Control Type	Outlet Control	

Grades					
Upstream Invert	178.26	m	Downstream Invert	178.03	m
Length	11.91	m	Constructed Slope	0.019312	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.30	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.30	m
Velocity Downstream	1.73	m/s	Critical Slope	0.030436	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.38	m
Section Size	375 mm		Rise	0.38	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	178.89	m	Upstream Velocity Head	0.11	m
Ke	0.90		Entrance Loss	0.10	m

Inlet Control Properties					
Inlet Control HW Elev.	178.84	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A7-3

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	183.96	m	Headwater Depth/Height	1.51	
Computed Headwater Elevation	183.96	m	Discharge	0.0921	m³/s
Inlet Control HW Elev.	183.93	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	183.96	m	Control Type	Entrance Control	

Grades					
Upstream Invert	183.50	m	Downstream Invert	181.50	m
Length	12.60	m	Constructed Slope	0.158730	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.14	m
Slope Type	Steep		Normal Depth	0.14	m
Flow Regime	Supercritical		Critical Depth	0.24	m
Velocity Downstream	2.86	m/s	Critical Slope	0.031968	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	183.96	m	Upstream Velocity Head	0.12	m
Ke	0.90		Entrance Loss	0.11	m

Inlet Control Properties					
Inlet Control HW Elev.	183.93	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A8-1

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.70	m	Headwater Depth/Height	1.18	
Computed Headwater Elevation	179.70	m	Discharge	0.0658	m³/s
Inlet Control HW Elev.	179.68	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.70	m	Control Type	Outlet Control	

Grades					
Upstream Invert	179.34	m	Downstream Invert	179.25	m
Length	8.23	m	Constructed Slope	0.010936	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.20	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.20	m
Velocity Downstream	1.31	m/s	Critical Slope	0.025084	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.70	m	Upstream Velocity Head	0.05	m
Ke	0.90		Entrance Loss	0.04	m

Inlet Control Properties					
Inlet Control HW Elev.	179.68	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A8-2

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.70	m	Headwater Depth/Height	1.21	
Computed Headwater Elevation	179.70	m	Discharge	0.0675	m³/s
Inlet Control HW Elev.	179.67	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.70	m	Control Type	Entrance Control	

Grades					
Upstream Invert	179.33	m	Downstream Invert	179.07	m
Length	9.00	m	Constructed Slope	0.028889	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.19	m
Slope Type	Steep		Normal Depth	0.19	m
Flow Regime	Supercritical		Critical Depth	0.20	m
Velocity Downstream	1.39	m/s	Critical Slope	0.025440	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.70	m	Upstream Velocity Head	0.09	m
Ke	0.90		Entrance Loss	0.08	m

Inlet Control Properties					
Inlet Control HW Elev.	179.67	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A9-1

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	178.80	m	Headwater Depth/Height	1.13	
Computed Headwater Elevation	178.80	m	Discharge	0.1053	m³/s
Inlet Control HW Elev.	178.75	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	178.80	m	Control Type	Entrance Control	

Grades					
Upstream Invert	178.37	m	Downstream Invert	177.34	m
Length	11.27	m	Constructed Slope	0.091393	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.16	m
Slope Type	Steep		Normal Depth	0.16	m
Flow Regime	Supercritical		Critical Depth	0.24	m
Velocity Downstream	2.40	m/s	Critical Slope	0.022314	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.38	m
Section Size	375 mm		Rise	0.38	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	178.80	m	Upstream Velocity Head	0.10	m
Ke	0.90		Entrance Loss	0.09	m

Inlet Control Properties					
Inlet Control HW Elev.	178.75	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A10-1

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	180.10	m	Headwater Depth/Height	1.15	
Computed Headwater Elevation	180.10	m	Discharge	0.0620	m³/s
Inlet Control HW Elev.	180.07	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	180.10	m	Control Type	Entrance Control	

Grades					
Upstream Invert	179.75	m	Downstream Invert	179.39	m
Length	12.07	m	Constructed Slope	0.029826	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.18	m
Slope Type	Steep		Normal Depth	0.18	m
Flow Regime	Supercritical		Critical Depth	0.19	m
Velocity Downstream	1.38	m/s	Critical Slope	0.024344	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	180.10	m	Upstream Velocity Head	0.08	m
Ke	0.90		Entrance Loss	0.07	m

Inlet Control Properties					
Inlet Control HW Elev.	180.07	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

A10.2 250mm EXISTING CULVERT

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data		
Roughness Coefficient	0.024	
Channel Slope	0.114	m/m
Normal Depth	250.0	mm
Diameter	250.0	mm
Discharge	0.11	m^3/s

Results		
Discharge	0.11	m^3/s
Normal Depth	250.0	mm
Flow Area	0.0	m^2
Wetted Perimeter	0.8	m
Hydraulic Radius	62.5	mm
Top Width	0.00	m
Critical Depth	240.6	mm
Percent Full	100.0	%
Critical Slope	0.099	m/m
Velocity	2.21	m/s
Velocity Head	0.25	m
Specific Energy	0.50	m
Froude Number	(N/A)	
Maximum Discharge	0.12	m^3/s
Discharge Full	0.11	m^3/s
Slope Full	0.114	m/m
Flow Type	Undefined	

GVF Input Data		
Downstream Depth	0.0	mm
Length	0.0	m
Number Of Steps	0	

GVF Output Data		
Upstream Depth	0.0	mm
Profile Description	N/A	
Profile Headloss	0.00	m
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	250.0	mm
Critical Depth	240.6	mm
Channel Slope	0.114	m/m
Critical Slope	0.099	m/m

Culvert Calculator Report
A11-1

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	180.05	m	Headwater Depth/Height	1.09	
Computed Headwater Elevation	180.05	m	Discharge	0.1465	m³/s
Inlet Control HW Elev.	179.98	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	180.05	m	Control Type	Outlet Control	

Grades					
Upstream Invert	179.55	m	Downstream Invert	179.55	m
Length	9.10	m	Constructed Slope	0.000330	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.27	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.27	m
Velocity Downstream	1.47	m/s	Critical Slope	0.019936	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	180.05	m	Upstream Velocity Head	0.04	m
Ke	0.90		Entrance Loss	0.04	m

Inlet Control Properties					
Inlet Control HW Elev.	179.98	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A12-1

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	180.62	m	Headwater Depth/Height	1.21	
Computed Headwater Elevation	180.62	m	Discharge	0.0895	m³/s
Inlet Control HW Elev.	180.60	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	180.62	m	Control Type	Entrance Control	

Grades					
Upstream Invert	180.25	m	Downstream Invert	179.19	m
Length	8.98	m	Constructed Slope	0.118040	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.11	m
Slope Type	Steep		Normal Depth	0.10	m
Flow Regime	Supercritical		Critical Depth	0.23	m
Velocity Downstream	3.90	m/s	Critical Slope	0.007784	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	180.62	m	Upstream Velocity Head	0.11	m
Ke	0.20		Entrance Loss	0.02	m

Inlet Control Properties					
Inlet Control HW Elev.	180.60	m	Flow Control	N/A	
Inlet Type	Groove end projecting		Area Full	0.1	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Calculator Report
A12-2a

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.35	m	Headwater Depth/Height	1.18	
Computed Headwater Elevation	179.35	m	Discharge	0.1131	m³/s
Inlet Control HW Elev.	179.31	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.35	m	Control Type	Entrance Control	

Grades					
Upstream Invert	178.90	m	Downstream Invert	178.62	m
Length	9.88	m	Constructed Slope	0.028340	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.23	m
Slope Type	Steep		Normal Depth	0.23	m
Flow Regime	Supercritical		Critical Depth	0.25	m
Velocity Downstream	1.57	m/s	Critical Slope	0.023094	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.38	m
Section Size	375 mm		Rise	0.38	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.35	m	Upstream Velocity Head	0.11	m
Ke	0.90		Entrance Loss	0.10	m

Inlet Control Properties					
Inlet Control HW Elev.	179.31	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A12-2b

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.35	m	Headwater Depth/Height	1.48	
Computed Headwater Elevation	179.35	m	Discharge	0.0920	m³/s
Inlet Control HW Elev.	179.35	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.35	m	Control Type	Outlet Control	

Grades					
Upstream Invert	178.90	m	Downstream Invert	178.62	m
Length	9.88	m	Constructed Slope	0.028340	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.24	m
Slope Type	Mild		Normal Depth	0.25	m
Flow Regime	Subcritical		Critical Depth	0.24	m
Velocity Downstream	1.52	m/s	Critical Slope	0.031955	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.35	m	Upstream Velocity Head	0.11	m
Ke	0.90		Entrance Loss	0.09	m

Inlet Control Properties					
Inlet Control HW Elev.	179.35	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A12-3

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.60	m	Headwater Depth/Height	1.18	
Computed Headwater Elevation	179.60	m	Discharge	0.0647	m³/s
Inlet Control HW Elev.	179.56	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.60	m	Control Type	Entrance Control	

Grades					
Upstream Invert	179.24	m	Downstream Invert	178.60	m
Length	8.92	m	Constructed Slope	0.071749	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.14	m
Slope Type	Steep		Normal Depth	0.14	m
Flow Regime	Supercritical		Critical Depth	0.20	m
Velocity Downstream	1.94	m/s	Critical Slope	0.024878	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.60	m	Upstream Velocity Head	0.09	m
Ke	0.90		Entrance Loss	0.08	m

Inlet Control Properties					
Inlet Control HW Elev.	179.56	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A13-1

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.23	m	Headwater Depth/Height	1.18	
Computed Headwater Elevation	179.23	m	Discharge	0.0647	m³/s
Inlet Control HW Elev.	179.19	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.23	m	Control Type	Entrance Control	

Grades					
Upstream Invert	178.87	m	Downstream Invert	178.12	m
Length	7.59	m	Constructed Slope	0.098814	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.13	m
Slope Type	Steep		Normal Depth	0.13	m
Flow Regime	Supercritical		Critical Depth	0.20	m
Velocity Downstream	2.19	m/s	Critical Slope	0.024878	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.23	m	Upstream Velocity Head	0.09	m
Ke	0.90		Entrance Loss	0.08	m

Inlet Control Properties					
Inlet Control HW Elev.	179.19	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A13-2

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.75	m	Headwater Depth/Height	1.25	
Computed Headwater Elevation	179.75	m	Discharge	0.0703	m³/s
Inlet Control HW Elev.	179.71	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.75	m	Control Type	Entrance Control	

Grades					
Upstream Invert	179.37	m	Downstream Invert	178.50	m
Length	7.14	m	Constructed Slope	0.121849	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.13	m
Slope Type	Steep		Normal Depth	0.13	m
Flow Regime	Supercritical		Critical Depth	0.21	m
Velocity Downstream	2.42	m/s	Critical Slope	0.026034	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.75	m	Upstream Velocity Head	0.09	m
Ke	0.90		Entrance Loss	0.08	m

Inlet Control Properties					
Inlet Control HW Elev.	179.71	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A17-1

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.39	m	Headwater Depth/Height	1.03	
Computed Headwater Elevation	179.39	m	Discharge	0.2826	m³/s
Inlet Control HW Elev.	179.38	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.39	m	Control Type	Entrance Control	

Grades					
Upstream Invert	178.84	m	Downstream Invert	178.64	m
Length	12.23	m	Constructed Slope	0.016353	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.27	m
Slope Type	Steep		Normal Depth	0.25	m
Flow Regime	Supercritical		Critical Depth	0.36	m
Velocity Downstream	2.51	m/s	Critical Slope	0.005377	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	0.53	m
Section Size	525 mm		Rise	0.53	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.39	m	Upstream Velocity Head	0.16	m
Ke	0.20		Entrance Loss	0.03	m

Inlet Control Properties					
Inlet Control HW Elev.	179.38	m	Flow Control	N/A	
Inlet Type	Groove end projecting		Area Full	0.2	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

APPENDIX C

Proposed Hydraulics

Culvert Calculator Report
A10-1 PROPOSED

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	180.10	m	Headwater Depth/Height	1.07	
Computed Headwater Elevation	180.10	m	Discharge	0.3117	m³/s
Inlet Control HW Elev.	180.04	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	180.10	m	Control Type	Entrance Control	

Grades					
Upstream Invert	179.45	m	Downstream Invert	179.09	m
Length	12.07	m	Constructed Slope	0.029826	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.31	m
Slope Type	Steep		Normal Depth	0.31	m
Flow Regime	Supercritical		Critical Depth	0.36	m
Velocity Downstream	2.07	m/s	Critical Slope	0.018360	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	180.10	m	Upstream Velocity Head	0.15	m
Ke	0.90		Entrance Loss	0.14	m

Inlet Control Properties					
Inlet Control HW Elev.	180.04	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A10-2 PROPOSED

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.43	m	Headwater Depth/Height	2.14	
Computed Headwater Elevation	179.43	m	Discharge	0.3358	m³/s
Inlet Control HW Elev.	179.43	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.32	m	Control Type	Inlet Control	

Grades					
Upstream Invert	178.45	m	Downstream Invert	177.40	m
Length	9.23	m	Constructed Slope	0.113759	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.26	m
Slope Type	Steep		Normal Depth	0.26	m
Flow Regime	Supercritical		Critical Depth	0.40	m
Velocity Downstream	3.47	m/s	Critical Slope	0.039502	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.32	m	Upstream Velocity Head	0.25	m
Ke	0.90		Entrance Loss	0.22	m

Inlet Control Properties					
Inlet Control HW Elev.	179.43	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A11-1 PROPOSED

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	180.05	m	Headwater Depth/Height	1.07	
Computed Headwater Elevation	180.05	m	Discharge	0.3301	m³/s
Inlet Control HW Elev.	180.02	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	180.05	m	Control Type	Outlet Control	

Grades					
Upstream Invert	179.40	m	Downstream Invert	179.32	m
Length	9.10	m	Constructed Slope	0.008788	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.37	m
Slope Type	Mild		Normal Depth	0.51	m
Flow Regime	Subcritical		Critical Depth	0.37	m
Velocity Downstream	1.76	m/s	Critical Slope	0.018801	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	180.05	m	Upstream Velocity Head	0.10	m
Ke	0.90		Entrance Loss	0.09	m

Inlet Control Properties					
Inlet Control HW Elev.	180.02	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A12-1 PROPOSED

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	180.62	m	Headwater Depth/Height	1.15	
Computed Headwater Elevation	180.62	m	Discharge	0.1452	m³/s
Inlet Control HW Elev.	180.60	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	180.62	m	Control Type	Entrance Control	

Grades					
Upstream Invert	180.18	m	Downstream Invert	179.32	m
Length	8.98	m	Constructed Slope	0.095768	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.14	m
Slope Type	Steep		Normal Depth	0.13	m
Flow Regime	Supercritical		Critical Depth	0.28	m
Velocity Downstream	3.86	m/s	Critical Slope	0.006780	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	0.38	m
Section Size	375 mm		Rise	0.38	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	180.62	m	Upstream Velocity Head	0.13	m
Ke	0.20		Entrance Loss	0.03	m

Inlet Control Properties					
Inlet Control HW Elev.	180.60	m	Flow Control	N/A	
Inlet Type	Groove end projecting		Area Full	0.1	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Calculator Report
A12-3 PROPOSED

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.60	m	Headwater Depth/Height	1.13	
Computed Headwater Elevation	179.60	m	Discharge	0.1053	m³/s
Inlet Control HW Elev.	179.55	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.60	m	Control Type	Entrance Control	

Grades					
Upstream Invert	179.17	m	Downstream Invert	178.53	m
Length	8.92	m	Constructed Slope	0.071749	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.17	m
Slope Type	Steep		Normal Depth	0.17	m
Flow Regime	Supercritical		Critical Depth	0.24	m
Velocity Downstream	2.19	m/s	Critical Slope	0.022314	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.38	m
Section Size	375 mm		Rise	0.38	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.60	m	Upstream Velocity Head	0.10	m
Ke	0.90		Entrance Loss	0.09	m

Inlet Control Properties					
Inlet Control HW Elev.	179.55	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A13-2 PROPOSED

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.75	m	Headwater Depth/Height	1.18	
Computed Headwater Elevation	179.75	m	Discharge	0.1131	m³/s
Inlet Control HW Elev.	179.69	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.75	m	Control Type	Entrance Control	

Grades					
Upstream Invert	179.30	m	Downstream Invert	178.43	m
Length	7.14	m	Constructed Slope	0.121849	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.15	m
Slope Type	Steep		Normal Depth	0.15	m
Flow Regime	Supercritical		Critical Depth	0.25	m
Velocity Downstream	2.71	m/s	Critical Slope	0.023094	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.38	m
Section Size	375 mm		Rise	0.38	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.75	m	Upstream Velocity Head	0.11	m
Ke	0.90		Entrance Loss	0.10	m

Inlet Control Properties					
Inlet Control HW Elev.	179.69	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A3-2 PROPOSED

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	178.68	m	Headwater Depth/Height	1.12	
Computed Headwater Elevation	178.68	m	Discharge	0.1731	m³/s
Inlet Control HW Elev.	178.66	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	178.68	m	Control Type	Outlet Control	

Grades					
Upstream Invert	178.17	m	Downstream Invert	178.04	m
Length	10.45	m	Constructed Slope	0.012435	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.29	m
Slope Type	Mild		Normal Depth	0.36	m
Flow Regime	Subcritical		Critical Depth	0.29	m
Velocity Downstream	1.57	m/s	Critical Slope	0.021407	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	178.68	m	Upstream Velocity Head	0.08	m
Ke	0.90		Entrance Loss	0.07	m

Inlet Control Properties					
Inlet Control HW Elev.	178.66	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A4.2 NEW

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	178.67	m	Headwater Depth/Height	1.25	
Computed Headwater Elevation	178.67	m	Discharge	0.1936	m³/s
Inlet Control HW Elev.	178.63	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	178.67	m	Control Type	Entrance Control	

Grades					
Upstream Invert	178.10	m	Downstream Invert	177.74	m
Length	12.09	m	Constructed Slope	0.029777	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.28	m
Slope Type	Steep		Normal Depth	0.28	m
Flow Regime	Supercritical		Critical Depth	0.31	m
Velocity Downstream	1.83	m/s	Critical Slope	0.022743	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	178.67	m	Upstream Velocity Head	0.14	m
Ke	0.90		Entrance Loss	0.12	m

Inlet Control Properties					
Inlet Control HW Elev.	178.63	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A6-1 PROPOSED

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	179.11	m	Headwater Depth/Height	1.14	
Computed Headwater Elevation	179.11	m	Discharge	0.1682	m³/s
Inlet Control HW Elev.	179.06	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	179.11	m	Control Type	Entrance Control	

Grades					
Upstream Invert	178.59	m	Downstream Invert	178.23	m
Length	9.82	m	Constructed Slope	0.036660	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.24	m
Slope Type	Steep		Normal Depth	0.24	m
Flow Regime	Supercritical		Critical Depth	0.29	m
Velocity Downstream	1.92	m/s	Critical Slope	0.021116	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.11	m	Upstream Velocity Head	0.12	m
Ke	0.90		Entrance Loss	0.11	m

Inlet Control Properties					
Inlet Control HW Elev.	179.06	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
A9-1 PROPOSED

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	178.80	m	Headwater Depth/Height	1.03	
Computed Headwater Elevation	178.80	m	Discharge	0.2114	m³/s
Inlet Control HW Elev.	178.73	m	Tailwater Elevation	176.70	m
Outlet Control HW Elev.	178.80	m	Control Type	Entrance Control	

Grades					
Upstream Invert	178.25	m	Downstream Invert	177.22	m
Length	11.27	m	Constructed Slope	0.091393	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.20	m
Slope Type	Steep		Normal Depth	0.20	m
Flow Regime	Supercritical		Critical Depth	0.31	m
Velocity Downstream	2.84	m/s	Critical Slope	0.018808	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.53	m
Section Size	525 mm		Rise	0.53	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	178.80	m	Upstream Velocity Head	0.13	m
Ke	0.90		Entrance Loss	0.11	m

Inlet Control Properties					
Inlet Control HW Elev.	178.73	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Typicale Swale Design

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

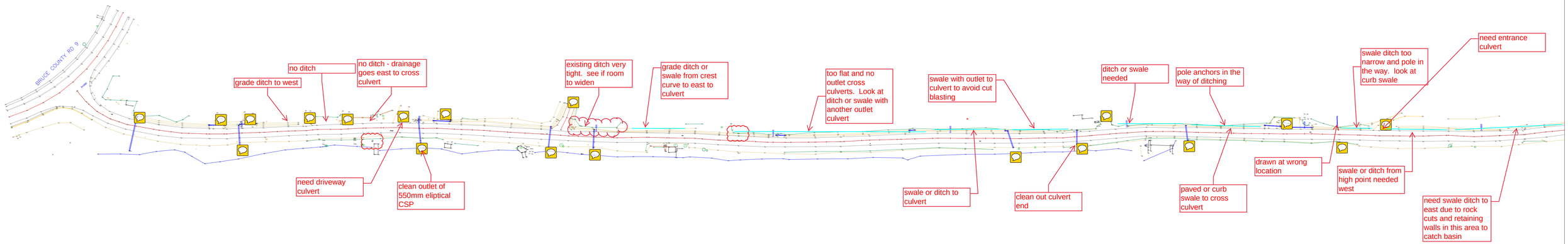
Input Data		
Roughness Coefficient	0.030	
Channel Slope	0.003	m/m
Left Side Slope	2.000	H:V
Right Side Slope	2.000	H:V
Bottom Width	0.20	m
Discharge	0.33	m^3/s

Results		
Normal Depth	0.4	m
Flow Area	0.5	m^2
Wetted Perimeter	2.2	m
Hydraulic Radius	0.2	m
Top Width	1.99	m
Critical Depth	0.3	m
Critical Slope	0.018	m/m
Velocity	0.67	m/s
Velocity Head	0.02	m
Specific Energy	0.47	m
Froude Number	0.432	
Flow Type	Subcritical	

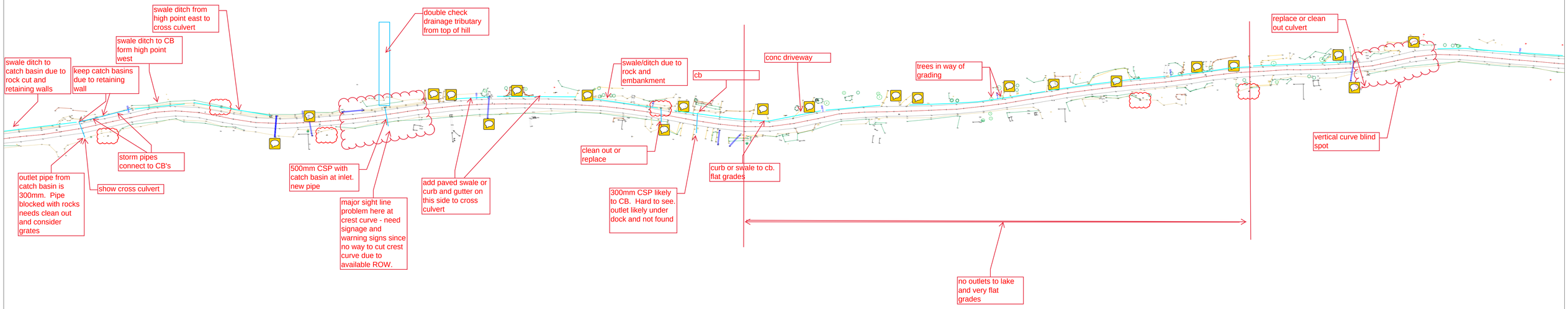
GVF Input Data		
Downstream Depth	0.0	m
Length	0.0	m
Number Of Steps	0	

GVF Output Data		
Upstream Depth	0.0	m
Profile Description	N/A	
Profile Headloss	0.00	m
Downstream Velocity	0.00	m/s
Upstream Velocity	0.00	m/s
Normal Depth	0.4	m
Critical Depth	0.3	m
Channel Slope	0.003	m/m
Critical Slope	0.018	m/m

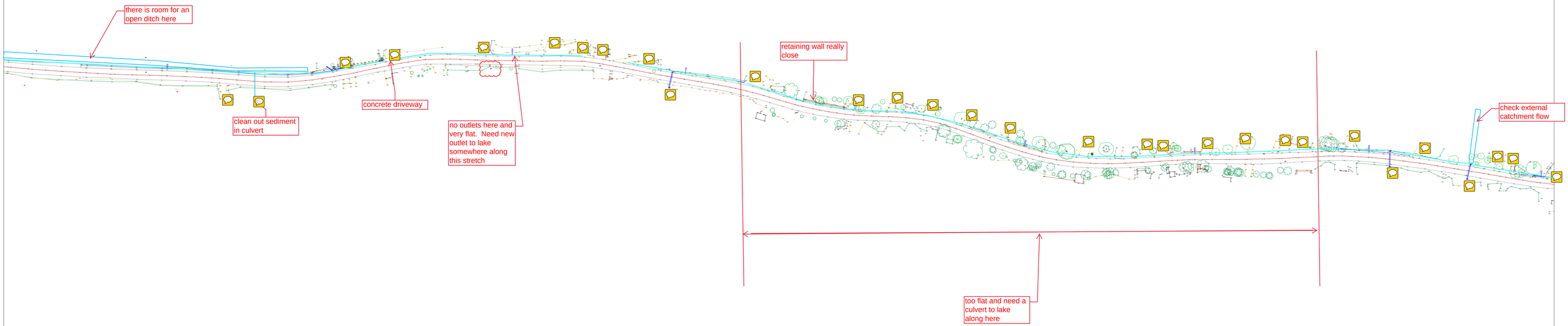
Appendix E



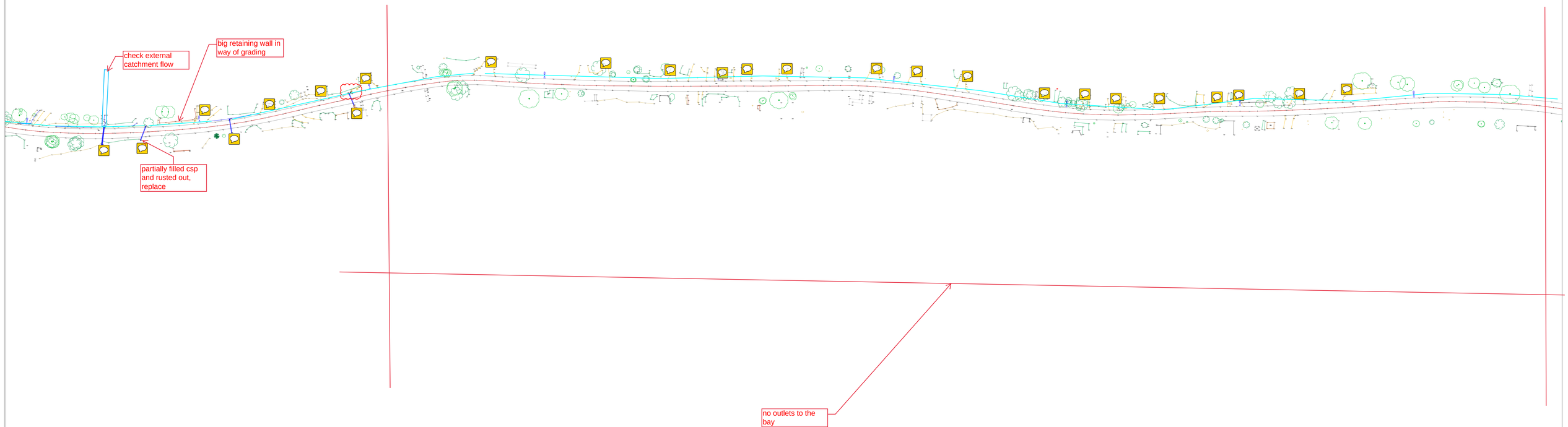
MALLORY BEACH ROAD
SHEET 1 OF 5
SCALE 1:1000



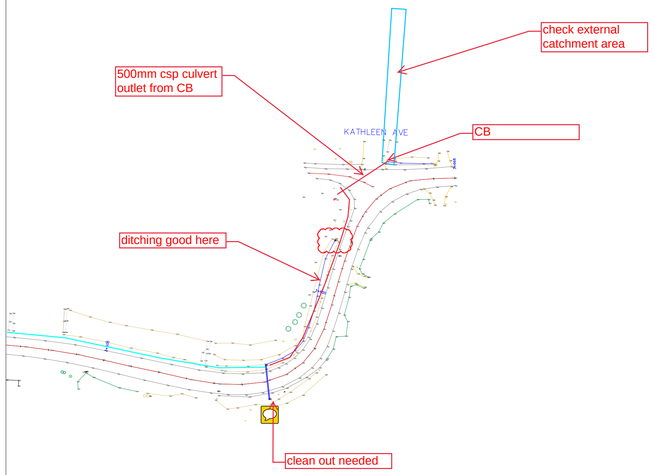
MALLORY BEACH ROAD
SHEET 2 OF 5
SCALE 1:1000



MALLORY BEACH ROAD
SHEET 3 OF 5
SCALE 1:1000



MALLORY BEACH ROAD
SHEET 4 OF 5
SCALE 1:1000



MALLORY BEACH ROAD
SHEET 5 OF 5
SCALE 1:1000

Appendix F

TULLOCH ENGINEERING

5 Seguin Street
Parry Sound, ON
P2A 1A9

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F. 705 746.7685
TF. 888 238.8883
parrysound@TULLOCH.ca
WWW.TULLOCH.ca

June 22, 2021
212341

PLANMAC ENGINEERING INC.

Mr. Jeff Huang, P.Eng.
Vice President & Manager
80 North Queen Street
Toronto, ON
M8Z 2C9
jhuang@planmac.com

Re: ***Mallory Beach Road Street Line Survey (RFP 21-09)***

Mr. Huang,

I am pleased to provide you with our Draft Plan of Survey detailing the limits of Mallory Beach Road from County Road 9 to its intersection with Katherine Avenue, some 3.5 kilometres in total length. This survey assignment was completed in accordance with the legal survey scope of work presented in RFP 21-09 issued by the Town of South Bruce Peninsula.

The scope of work for this portion of the overall assignment involved an extensive search of title for some 110 properties that abut the roadway along its 3.5 kilometre length. For each individual property, the Property Identification Number (PIN) was obtained. From this document, we were then able to determine the name of the owner currently on title. This information has been illustrated on the Street Line Survey.

For the field work portion of this assignment, the attending field crew located approximately 131 existing survey monuments. Of those survey monuments found, roughly 16 were determined to be disturbed and another 47 monuments were needed to be set in order to properly define the limits of the road.

From this large number of survey monuments, we were able to confidently re-establish the westerly limits of the road with extremely good results when compared to the underlying Registered Plans. From this westerly road limit, we set a width of 20.117 metres (66 feet) easterly to determine the easterly limit of the Original Shore Road Allowance as illustrated on the various Registered Plans throughout the length of the project.

It is worthy to note that the waterside limit of the Original Shore Road Allowance may be further east than that of the limit of Mallory Beach Road (as established by this assignment) for a number of reasons (recession of the water, infilling etc.) but for this assignment, the easterly limit of

Mallory Beach Road was set at 20.117 from the westerly limit of the various Registered Plan units. I would strongly recommend that a discussion with the Municipal Solicitor be undertaken prior to finalizing the extent of Municipal ownership. Should it be determined that the extents of Mallory Beach Road are different than illustrated, additional survey work will be required which are deemed outside of the scope of this portion of the overall assignment.

It is further worth noting that, in a number of locations, it was found that neighbouring properties had occupational interests within the 20.117m strip of Mallory Beach Road. It was outside the scope of this portion of the assignment to identify and illustrate these occupational interests, however, these interests should be identified throughout the topographic collection process being completed by others.

After an assessment of the topographic survey in conjunction with the legal survey submitted herewith, it is recommended that the occupational interests of adjacent landowners be discussed with the Municipal Solicitor to determine what legal ramifications they may pose.

In conclusion, we are pleased to provide this draft version of our Plan of Survey to Planmac Engineering Inc. as part of the larger detail design assignment for Mallory Beach Road. Upon Planmac approval, a signed copy of the plan shall be provided as the final project deliverable.

On the premise that our involvement in this portion of your project has been finalized, I would like to thank you for the opportunity to carry out this work. We are grateful for the opportunity to work with you and your team at Planmac and we look forward to working together again soon.

Kind regards,

Darren Walker, OLS

PLAN OF SURVEY OF
UNIT 67, REGISTERED PLAN D–10
ROAD, REGISTERED PLAN D–23
ROAD, REGISTERED PLAN D–24
(TRAVELLED ROAD), REGISTERED PLAN D–24
(TRAVELLED ROAD), REGISTERED PLAN D–25
PART OF TOWNSHIP ROAD (BY BY–LAW NO. 83)
(BEING PART OF LOT 33, CONCESSIONS 8 & 10)
PART OF PARK LOT A, REGISTERED PLAN 379 AND
PART OF THE ORIGINAL SHORE ROAD ALLOWANCE
(LYING IN FRONT OF LOTS 33 TO 35, CONCESSION 8 EBR,
IN FRONT OF LOT 33, CONCESSION 10 EBR
AND IN FRONT OF LOT 32, CONCESSION 11)
GEOGRAPHIC TOWNSHIP OF ALBEMARLE
TOWN OF SOUTH BRUCE PENINSULA
COUNTY OF BRUCE
TULLOCH GEOMATICS INC., O.L.S.
2021

5m 0 5 25m
SCALE 1:500

METRIC:

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

GROUND DISTANCES SHOWN HEREON CAN BE CONVERTED TO UTM GRID BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.999579.

BEARING NOTE:

BEARINGS ARE UTM GRID DERIVED FROM GPS OBSERVATIONS (PPP) AND ARE REFERRED TO THE CENTRAL MERIDIAN OF ZONE 17 (81°00' WEST LONGITUDE) NAD83 (CSRS) (2010).

CONVERGENCE NOTE:

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NOTE: NORTHERLY LIMIT OF MALLORY BEACH ROAD CONFIRMED BY REGISTERED PLANS D–10, D–22. D–23, D–24 AND D–25 (B.A. PLANS 386, 1051, 1052, 1053 AND 1054 RESPECTIVELY)

LEGEND:

■	DENOTES FOUND MONUMENT
□	DENOTES PLANTED MONUMENT
SIB	DENOTES STANDARD IRON BAR
SIBBC	DENOTES STANDARD IRON BAR WITH CAP
SSIB	DENOTES SHORT STANDARD IRON BAR
IB	DENOTES IRON BAR
IBBC	DENOTES IRON BAR WITH CAP
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CC	DENOTES CUT CROSS
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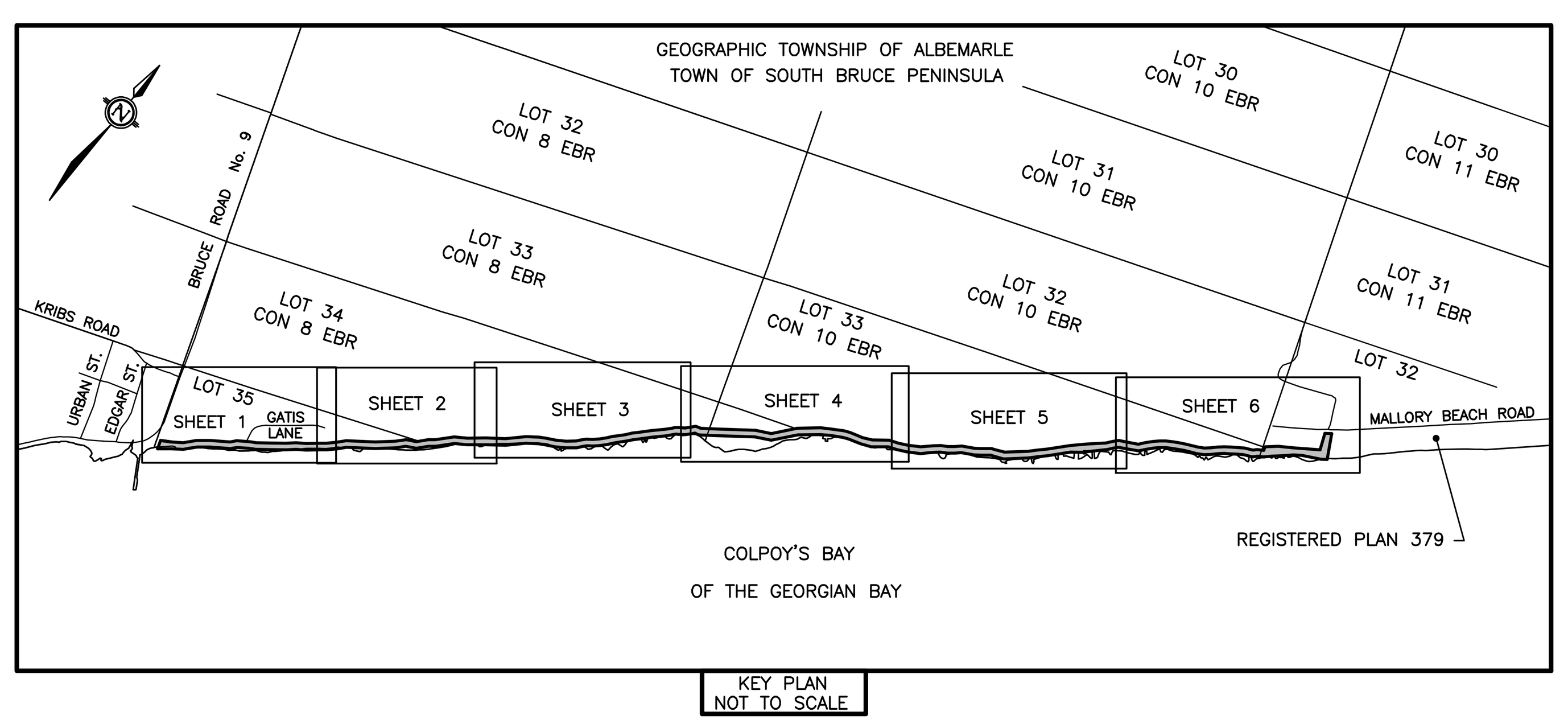
888	DENOTES J.C. MILNE, O.L.S
B&C	DENOTES BRUBACHER CAMPBELL LIMITED, O.L.S.
OU	DENOTES ORIGIN UNKNOWN
P	DENOTES REGISTERED PLAN D–22 (BOUNDARIES ACT PLAN BA–1051)
P1	DENOTES REGISTERED PLAN D–10 (BOUNDARIES ACT PLAN BA–386)
P2	DENOTES REGISTERED PLAN D–23 (BOUNDARIES ACT PLAN BA–1052)
P3	DENOTES REGISTERED PLAN D–24 (BOUNDARIES ACT PLAN BA–1053)
P4	DENOTES REGISTERED PLAN D–25 (BOUNDARIES ACT PLAN BA–1054)
P5	DENOTES PLAN 3R–3880
P6	DENOTES PLAN 3R–6435
P7	DENOTES PLAN 3R–2235
M	DENOTES MEASURED
S	DENOTES SET
PPN	DENOTES PROPORTION
CF	DENOTES CALCULATED FROM
WIT	DENOTES WITNESS
ORP	DENOTES OBSERVED REFERENCE POINT
E.B.R.	DENOTES EAST OF BURY ROAD
B.A.	DENOTES BOUNDARIES ACT
(3804)	DENOTES TIE TO WATER'S EDGE AS SHOWN ON PLAN 23R–2235 AND REGISTERED PLANS D–10, D–22, D–23, D–24 AND D–25

INTEGRATION COORDINATE TABLE

OBSERVED REFERENCE POINTS DERIVED FROM GPS OBSERVATIONS USING THE PRECISE POINT POSITIONING (PPP) SERVICE, UTM ZONE 17 (CSRS)(2010) COORDINATES TO RURAL ACCURACY PER SEC. 14(2) OF O.REG 216/10

POINT ID	NORTHING	EASTING
ORP A	4958625.066	490258.972
ORP B	4958748.474	490405.963
ORP C	4958933.470	490641.167
ORP D	4959120.142	490861.253
ORP E	4959310.293	491078.352
ORP F	4959492.517	491301.395
ORP G	4959696.650	491503.638
ORP H	4959931.635	491788.911
ORP I	4960036.758	491980.567
ORP J	4960198.188	492213.827
ORP K	4960359.371	492400.671
ORP L	4960398.547	492444.462
ORP M	4960505.007	492568.376
ORP N	4960679.306	492796.275
ORP O	4960846.598	493027.751

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE–ESTABLISH THE CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.



GEOGRAPHIC TOWNSHIP OF ALBEMARLE
TOWN OF SOUTH BRUCE PENINSULA
LOT 30 CON 10 EBR
LOT 30 CON 11 EBR
LOT 32 CON 8 EBR
LOT 31 CON 10 EBR
LOT 33 CON 8 EBR
LOT 31 CON 11 EBR
LOT 34 CON 8 EBR
LOT 33 CON 10 EBR
LOT 32 CON 10 EBR
LOT 32
LOT 35
KRIBS ROAD
SHEET 1
SHEET 2
SHEET 3
SHEET 4
SHEET 5
SHEET 6
MALLORY BEACH ROAD
COLPOY'S BAY
OF THE GEORGIAN BAY
REGISTERED PLAN 379

KEY PLAN
NOT TO SCALE

TABLE OF TIES TO WATER'S EDGE AS PLOTTED FROM REGISTERED PLANS D–10 & D–22

POINT	NORTHING	EASTING
3800	4958651.6	490291.4
3801	4958673.2	490320.8
3802	4958704.4	490348.5
3803	4958729.0	490378.6
3804	4958765.2	490429.4
3805	4958780.4	490442.7
3806	4958802.0	490473.1
3807	4958812.0	490490.1
3808	4958836.6	490521.5
3809	4958868.8	490562.6
3810	4958889.2	490585.1
3811	4958906.9	490610.2
3812	4958934.2	490642.0
3813	4958947.5	490658.7

LOT 35
CONCESSION 8 E.B.R.
GEOGRAPHIC TOWNSHIP OF ALBEMARLE
TOWN OF SOUTH BRUCE PENINSULA
COUNTY OF BRUCE
LOT 34
LOT 35
ROAD ALLOWANCE BETWEEN CONCESSIONS 7 & 8 EBR
TRAVELLED ROAD KNOWN LOCALLY AS BRUCE COUNTY ROAD No. 9
D–10 UNIT 49
PLAN
REGISTERED
D–10 No. 386
UNIT 47
UNIT 46
PLAN ACT PLAN
UNIT 1, REGISTERED PLAN D–22
REGISTERED (BOUNDARIES
PART 1, 3R–4568
PART 2, 3R–4568
PART 3, 3R–4568
PART 4, 3R–4568
REGISTERED (BOUNDARIES ACT PLAN
PLAN D–22 No. 1051)
UNIT 45
PIN 33140–0038
(KEITH D. COUCH)
PIN 33140–0194
(PUBLIC AUTHORITY HAVING JURISDICTION)
REGISTERED PLAN D–10
REGISTERED PLAN D–22
UNIT 1
PIN 33140–0052
(GLEN FLOYD HOFSTETTER CONNIE MARIE HOFSTETTER)
UNIT 2
PIN 33140–0056
(BRUCE HILLYARD MILLER SUSAN MILLER)
UNIT 3
PIN 33140–0057
(PETER JOHN KIRKHAM SUSAN DIANE HASSE–ZEPEDA)
UNIT 4
PIN 33140–0058
(DAVID JOHN CLIPSHAM)
UNIT 17
PIN 33140–0131
(DAVID JOHN CLIPSHAM)
UNIT 5
PIN 33140–0059
(1870657 ONTARIO INC.)
UNIT 6
PIN 33140–0060
(MATTHEW HARRY MEULENSTEEN MEGAN LEAH MEULENSTEEN)
UNIT 7
PIN 33140–0061
(RONALD JAMES GATIS SHEILA BARBARA LENNOX GATIS)
REGISTERED (BOUNDARIES
PLAN ACT PLAN
D–22 No. 1051)
UNIT 8
PIN 33140–0062
(CATHERINE ELLEN ROBERTSON JANET WARNOCK WOOLFREY)
UNIT 9
PIN 33140–0063
(ROBERT ERNEST JEROME SUSAN MARLENE FERRIER)
UNIT 10
PIN 33140–0064
(C.E. WHICHER LIMITED)
UNIT 11
PIN 33140–0065
(RONALD JAMES GATIS SHEILA BARBARA LENNOX GATIS)
UNIT 12
PIN 33140–0066
(RONALD JAMES GATIS SHEILA BARBARA LENNOX GATIS)
UNIT 13
PIN 33140–0067
(WIEP ANTILL)
SOUTHERLY CORNER UNIT 10 REG'D PLAN D–22
COUNTY ROAD No. 9
UNIT 67
PIN 33140–0049
(THE CORPORATION OF THE TOWNSHIP OF ALBEMARLE)
NO PIN ASSIGNED
ORIGINAL SHORE ROAD ALLOWANCE
(TRAVELLED ROAD KNOWN LOCALLY AS MALLORY BEACH ROAD)
NO PIN ASSIGNED
ORIGINAL SHORE ROAD ALLOWANCE
SHORE ROAD ALLOWANCE
SEE SHEET 2 MATCH LINE
N59°28'10"E (P&M) 34.077
N50°43'00"E (P1&M) 35.470
N53°45'20"E (P&M) 34.881
N41°31'00"E (P&M) 41.209
N50°46'30"E (P&M) 20.604 (P&S)
N50°46'30"E (P&M) 20.605
41.209
30.358 (P&M)
N54°35'50"E (P&M)
30.358 (P&M)
60.716 (P&M)
N41°10'40"E (P&S) 20.239
20.239 (P&M)
N54°31'35"E (P&M)
20.238 (P&M)
40.477 (P&M)
N59°31'50"E (P&M) 19.269
N51°56'10"E (P&M)
38.539 (P&S)
20.632 (P&M)
N51°54'00"E (P&M)
30.946 (P&M)
51.578 (P&M)
N47°52'30"E (P&M) 30.949
N54°50'25"E (P&M) 30.949
N49°17'50"E (P&M) 41.264
N51°26'30"E (P&M) 20.632
N49°59'05"E
192.7±
TIE LINE ONLY
192.007
1653.3± (ORP A TO ORP G)
N51°48'50"E
TIE LINE ONLY
300.1±
299.366
N49°41'45"E
288.712
SIB ORP Ⓐ
SIB ORP Ⓑ
ORP Ⓒ SIB
WATER'S EDGE AS SHOWN ON PLAN D–10 (B.A. PLAN No. 386)
WATER'S EDGE AS SHOWN ON PLAN D–22 (B.A. PLAN No. 1051)
WATER'S EDGE AS SHOWN ON PLAN D–22 (B.A. PLAN No. 1051)
3800
3801
3804
3807
3811
3813
20.117
COLPOY'S BAY
OF THE GEORGIAN BAY
REGISTERED PLAN D–10
UNIT 65

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:
1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT AND THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 11th DAY OF JUNE, 2021.

DRAFT

JUNE 1_, 202_
DATE

DARREN R. WALKER
ONTARIO LAND SURVEYOR

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
XXXXXXX

THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR In accordance with Regulation 1026, Section 29(3).

SHEET 1 OF 6

TULLOCH
TULLOCH GEOMATICS INC.
5 SEGUIN ST.
PARRY SOUND, ON
P2A 1A9
T. 705 746.8404
F. 705 746.7685
888 238.8883
parrysound@tulloch.ca

DRAWN BY: MAL | FILE: 212341

ACAD FILE:Parry Sound:\2021\212341 Mallory Beach Road\Project Drawings\212341 Mallory Beach.dwg

PLAN OF SURVEY OF
UNIT 67, REGISTERED PLAN D–10
ROAD, REGISTERED PLAN D–23
ROAD, REGISTERED PLAN D–24
(TRAVELLED ROAD), REGISTERED PLAN D–24
(TRAVELLED ROAD), REGISTERED PLAN D–25
PART OF TOWNSHIP ROAD (BY BY–LAW NO. 83)
(BEING PART OF LOT 33, CONCESSIONS 8 & 10)
PART OF PARK LOT A, REGISTERED PLAN 379 AND
PART OF THE ORIGINAL SHORE ROAD ALLOWANCE
(LYING IN FRONT OF LOTS 33 TO 35, CONCESSION 8 EBR,
IN FRONT OF LOT 33, CONCESSION 10 EBR
AND IN FRONT OF LOT 32, CONCESSION 11)
GEOGRAPHIC TOWNSHIP OF ALBEMARLE
TOWN OF SOUTH BRUCE PENINSULA
COUNTY OF BRUCE
TULLOCH GEOMATICS INC., O.L.S.
2021

5m 0 5 25m

SCALE 1:500

METRIC:

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

GROUND DISTANCES SHOWN HEREON CAN BE CONVERTED TO UTM GRID BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.999579.

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LEGEND:

■	DENOTES FOUND MONUMENT
□	DENOTES PLANTED MONUMENT
SIB	DENOTES STANDARD IRON BAR
SIBBC	DENOTES STANDARD IRON BAR WITH CAP
SSIB	DENOTES SHORT STANDARD IRON BAR
IB	DENOTES IRON BAR
IBBC	DENOTES IRON BAR WITH CAP
RIB	DENOTES ROUND IRON BAR
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CC	DENOTES CUT CROSS
RPL	DENOTES ROCK PLUG (IB IN ROCK)
H&M	DENOTES HEWETT & MILNE LTD. O.L.S.
J&C	DENOTES J.C. MILNE, O.L.S
B&C	DENOTES BRUBACHER CAMPBELL LIMITED, O.L.S.
OU	DENOTES ORIGIN UNKNOWN
P	DENOTES REGISTERED PLAN D–22 (BOUNDARIES ACT PLAN BA–1051)
P1	DENOTES REGISTERED PLAN D–10 (BOUNDARIES ACT PLAN BA–386)
P2	DENOTES REGISTERED PLAN D–23 (BOUNDARIES ACT PLAN BA–1052)
P3	DENOTES REGISTERED PLAN D–24 (BOUNDARIES ACT PLAN BA–1053)
P4	DENOTES REGISTERED PLAN D–25 (BOUNDARIES ACT PLAN BA–1054)
P5	DENOTES PLAN 3R–3880
P6	DENOTES PLAN 3R–6435
P7	DENOTES PLAN 3R–2235
M	DENOTES MEASURED
S	DENOTES SET
PPN	DENOTES PROPORTION
CF	DENOTES CALCULATED FROM
WIT	DENOTES WITNESS
ORP	DENOTES OBSERVED REFERENCE POINT
E.B.R.	DENOTES EAST OF BURY ROAD
B.A.	DENOTES BOUNDARIES ACT
(3804)	DENOTES TIE TO WATER'S EDGE AS SHOWN ON PLAN 23R–2235 AND REGISTERED PLANS D–10, D–22, D–23, D–24 AND D–25

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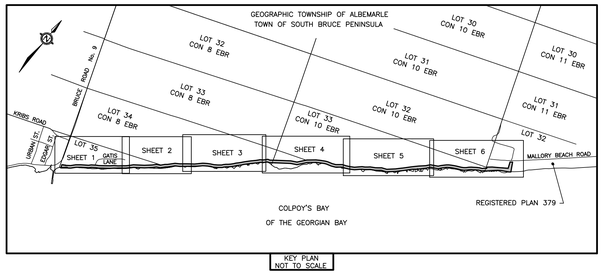
POINT ID	NORTHING	EASTING
ORP A	4958625.086	490258.972
ORP B	4958748.474	490405.963
ORP C	4958933.470	490641.167
ORP D	4959120.142	490861.253
ORP E	4959310.293	491078.352
ORP F	4959492.517	491301.395
ORP G	4959696.650	491503.638
ORP H	4959931.635	491788.911
ORP I	4960036.758	491980.567
ORP J	4960198.188	492213.827
ORP K	4960359.371	492400.671
ORP L	4960398.547	492444.462
ORP M	4960505.007	492568.376
ORP N	4960679.306	492796.275
ORP O	4960846.598	493027.751
COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE–ESTABLISH THE CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.		



KEY PLAN
NOT TO SCALE

LOT 34

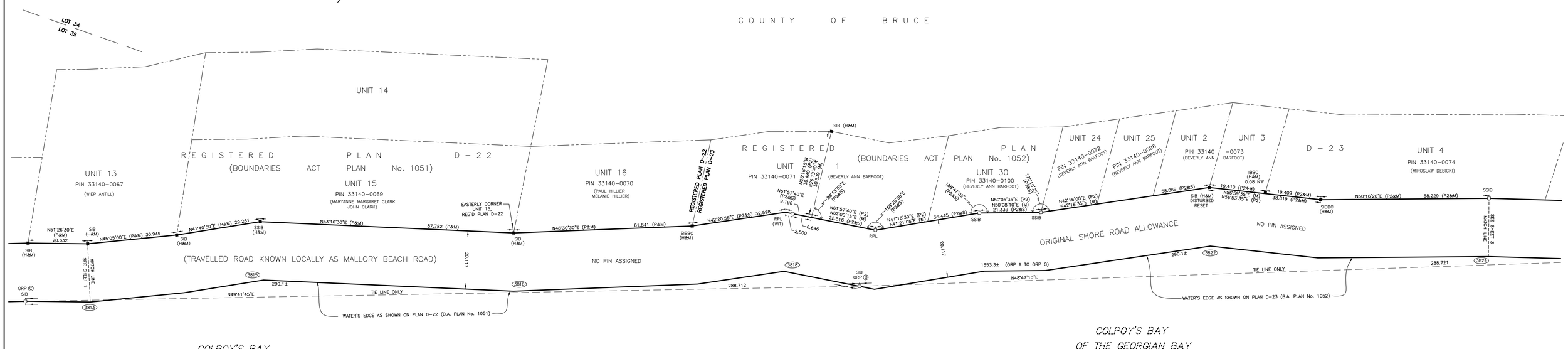
CONCESSION 8 E.B.R.

GEOGRAPHIC TOWNSHIP OF ALBEMARLE

TOWN OF SOUTH BRUCE PENINSULA

COUNTY OF BRUCE

TABLE OF TIES TO WATER'S EDGE AS PLOTTED FROM REGISTERED PLANS D–22 AND D–23		
POINT	NORTHING	EASTING
3813	4958947.5	490658.7
3814	4958970.5	490681.8
3815	4958991.3	490700.3
3816	4959043.0	490769.6
3817	4959085.3	490817.4
3818	4959107.6	490837.7
3819	4959122.6	490865.9
3820	4959151.5	490891.4
3821	4959165.1	490907.6
3822	4959207.7	490946.4
3823	4959228.1	490977.8
3824	4959265.8	491023.2



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888 238.8883
parrysound@tulloch.ca

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ACAD FILE:P:\arry Sound\2021\212341 Mallory Beach Road\Project Drawings\212341 Mallory Beach.dwg

PLAN OF SURVEY OF
UNIT 67, REGISTERED PLAN D–10
ROAD, REGISTERED PLAN D–23
ROAD, REGISTERED PLAN D–24
(TRAVELLED ROAD), REGISTERED PLAN D–24
(TRAVELLED ROAD), REGISTERED PLAN D–25
PART OF TOWNSHIP ROAD (BY BY–LAW NO. 83)
(BEING PART OF LOT 33, CONCESSIONS 8 & 10)
PART OF PARK LOT A, REGISTERED PLAN 379 AND
PART OF THE ORIGINAL SHORE ROAD ALLOWANCE
(LYING IN FRONT OF LOTS 33 TO 35, CONCESSION 8 EBR,
IN FRONT OF LOT 33, CONCESSION 10 EBR
AND IN FRONT OF LOT 32, CONCESSION 11)
GEOGRAPHIC TOWNSHIP OF ALBEMARLE
TOWN OF SOUTH BRUCE PENINSULA
COUNTY OF BRUCE
TULLOCH GEOMATICS INC., O.L.S.
2021

5m 0 5 25m

SCALE 1:500

METRIC:

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

GROUND DISTANCES SHOWN HEREON CAN BE CONVERTED TO UTM GRID BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.999579.

BEARING NOTE:

BEARINGS ARE UTM GRID DERIVED FROM GPS OBSERVATIONS (PPP) AND ARE REFERRED TO THE CENTRAL MERIDIAN OF ZONE 17 (81°00' WEST LONGITUDE) NAD83 (CSRS) (2010).

CONVERGENCE NOTE:

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NOTE: NORTHERLY LIMIT OF MALLORY BEACH ROAD CONFIRMED BY REGISTERED PLANS D–10, D–22, D–23, D–24 AND D–25 (B.A. PLANS 386, 1051, 1052, 1053 AND 1054 RESPECTIVELY)

LEGEND:

■	DENOTES FOUND MONUMENT
□	DENOTES PLANTED MONUMENT
SIB	DENOTES STANDARD IRON BAR
SIBBC	DENOTES STANDARD IRON BAR WITH CAP
SSIB	DENOTES SHORT STANDARD IRON BAR
IB	DENOTES IRON BAR
IBBC	DENOTES IRON BAR WITH CAP
RIB	DENOTES ROUND IRON BAR
IP	DENOTES IRON PIPE
CP	DENOTES CONCRETE PIN AND WASHER
CC	DENOTES CUT CROSS
HOB	DENOTES HOUSE OBSERVED (IB IN ROCK)
H&M	DENOTES HOWITT & MUNT LTD. O.L.S.
R&A	DENOTES R. MENE, O.L.S.
B&C	DENOTES BRUBACHER CAMPBELL LIMITED, O.L.S.
OU	DENOTES ORIGIN UNKNOWN
P	DENOTES REGISTERED PLAN D–22 (BOUNDARIES ACT PLAN BA–1051)
P1	DENOTES REGISTERED PLAN D–10 (BOUNDARIES ACT PLAN BA–386)
P2	DENOTES REGISTERED PLAN D–23 (BOUNDARIES ACT PLAN BA–1052)
P3	DENOTES REGISTERED PLAN D–24 (BOUNDARIES ACT PLAN BA–1053)
P4	DENOTES REGISTERED PLAN D–25 (BOUNDARIES ACT PLAN BA–1054)
P5	DENOTES PLAN 3R–3466
P6	DENOTES PLAN 3R–8430
P7	DENOTES PLAN 3R–2235
M	DENOTES MEASURED
S	DENOTES SET
PPN	DENOTES PROPORTION
CF	DENOTES CALCULATED FROM
WIT	DENOTES WITNESS
ORP	DENOTES OFFSET REFERENCE POINT
BOB	DENOTES CREST OF BURY ROAD
B.A.	DENOTES BOUNDARIES ACT
(3802)	DENOTES TIE TO WATER'S EDGE AS SHOWN ON PLAN 23R–2235 AND REGISTERED PLANS D–10, D–22, D–23, D–24 AND D–25

INTEGRATION COORDINATE TABLE

OBSERVED REFERENCE POINTS DERIVED FROM GPS OBSERVATIONS USING THE PRECISE POINT POSITIONING (PPP) SERVICE, UTM ZONE 17 (CSRS)(2010) COORDINATES TO RURAL ACCURACY PER SEC. 14(2) OF O.REG 216/10

POINT ID	NORTHING	EASTING
ORP A	4958625.066	492258.972
ORP B	4958748.474	490405.963
ORP C	4959833.470	490641.167
ORP D	4959120.142	490861.253
ORP E	4959310.293	491078.352
ORP F	4959492.517	491301.395
ORP G	4959898.650	491503.638
ORP H	4959931.635	491788.911
ORP I	4960036.758	491980.567
ORP J	4960198.188	492213.827
ORP K	4960359.371	492400.671
ORP L	4960398.547	492444.462
ORP M	4960505.007	492568.376
ORP N	4960679.306	492796.275
ORP O	4960846.598	493027.751

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE–ESTABLISH THE CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

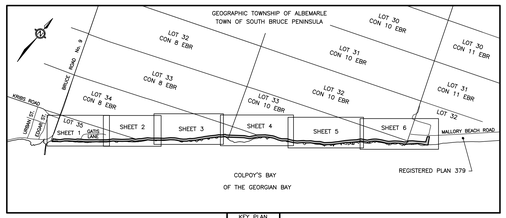
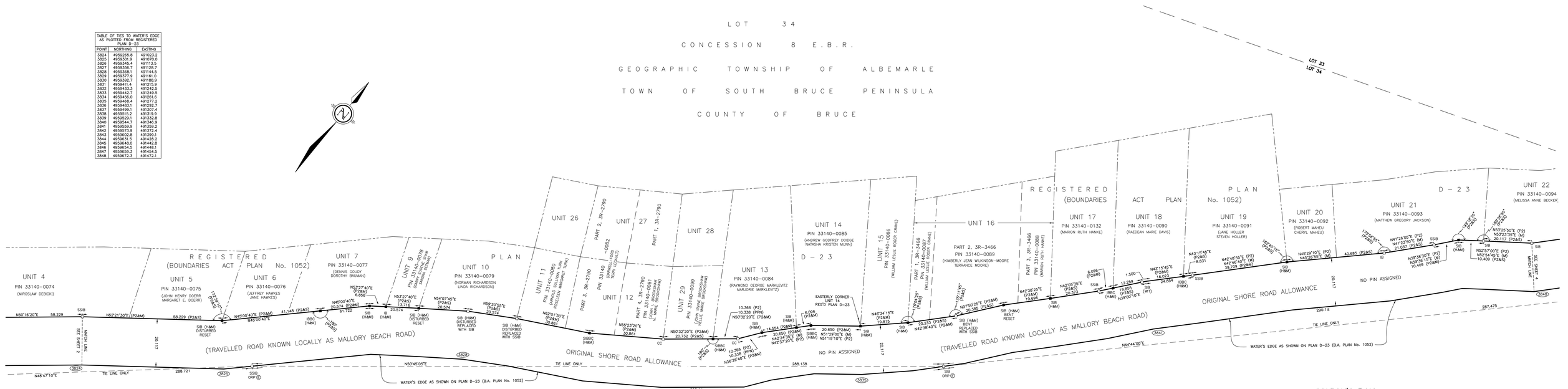


TABLE OF TIES TO WATER'S EDGE AS PLOTTED FROM REGISTERED PLAN D–23		
POINT	NORTHING	EASTING
3824	4959265.8	491023.2
3825	4959301.9	491070.0
3826	4959345.4	491113.5
3827	4959356.7	491128.7
3828	4959368.1	491144.5
3829	4959377.9	491161.0
3830	4959392.7	491188.9
3831	4959411.1	491215.9
3832	4959429.4	491249.5
3833	4959442.7	491249.5
3834	4959456.0	491261.6
3835	4959468.4	491277.2
3836	4959483.1	491292.7
3837	4959499.1	491307.4
3838	4959515.2	491319.9
3839	4959529.1	491332.8
3840	4959544.7	491346.9
3841	4959559.9	491359.2
3842	4959573.9	491372.4
3843	4959602.8	491399.1
3844	4959631.5	491428.2
3845	4959648.0	491442.8
3846	4959654.5	491448.1
3847	4959659.3	491454.5
3848	4959672.3	491472.1



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PLAN OF SURVEY OF
UNIT 67, REGISTERED PLAN D-10
ROAD, REGISTERED PLAN D-23
ROAD, REGISTERED PLAN D-24
(TRAVELLED ROAD), REGISTERED PLAN D-24
(TRAVELLED ROAD), REGISTERED PLAN D-25
PART OF TOWNSHIP ROAD (BY BY-LAW NO. 83)
(BEING PART OF LOT 33, CONCESSIONS 8 & 10)
PART OF PARK LOT A, REGISTERED PLAN 379 AND
PART OF THE ORIGINAL SHORE ROAD ALLOWANCE
(LYING IN FRONT OF LOTS 33 TO 35, CONCESSION 8 EBR,
IN FRONT OF LOT 33, CONCESSION 10 EBR
AND IN FRONT OF LOT 32, CONCESSION 11)
GEOGRAPHIC TOWNSHIP OF ALBEMARLE
TOWN OF SOUTH BRUCE PENINSULA
COUNTY OF BRUCE
TULLOCH GEOMATICS INC., O.L.S.
2021

5m 0 5 25m
SCALE 1:500

METRIC:

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NOTE: NORTHERLY LIMIT OF MALLORY BEACH ROAD CONFIRMED BY REGISTERED PLANS D-10, D-22. D-23, D-24 AND D-25 (B.A. PLANS 386, 1051, 1052, 1053 AND 1054 RESPECTIVELY)

LEGEND:

■	DENOTES FOUND MONUMENT
□	DENOTES PLANTED MONUMENT
SIB	DENOTES STANDARD IRON BAR
SIBBC	DENOTES STANDARD IRON BAR WITH CAP
SSIB	DENOTES SHORT STANDARD IRON BAR
IB	DENOTES IRON BAR
IBBC	DENOTES IRON BAR WITH CAP
RIB	DENOTES ROUND IRON BAR
IP	DENOTES IRON PIPE
CP	DENOTES CONCRETE PIN AND WASHER
CC	DENOTES CUT CROSS
RPL	DENOTES ROCK PLUG (IB IN ROCK)
H&M	DENOTES HEWETT & MILNE LTD. O.L.S.
888	DENOTES J.C. MILNE, O.L.S
B&C	DENOTES BRUBACHER CAMPBELL LIMITED, O.L.S.
OU	DENOTES ORIGIN UNKNOWN
P	DENOTES REGISTERED PLAN D-22 (BOUNDARIES ACT PLAN BA-1051)
P1	DENOTES REGISTERED PLAN D-10 (BOUNDARIES ACT PLAN BA-386)
P2	DENOTES REGISTERED PLAN D-23 (BOUNDARIES ACT PLAN BA-1052)
P3	DENOTES REGISTERED PLAN D-24 (BOUNDARIES ACT PLAN BA-1053)
P4	DENOTES REGISTERED PLAN D-25 (BOUNDARIES ACT PLAN BA-1054)
P5	DENOTES PLAN 3R-3880
P6	DENOTES PLAN 3R-6435
P7	DENOTES PLAN 3R-2235
M	DENOTES MEASURED
S	DENOTES SET
PPN	DENOTES PROPORTION
CF	DENOTES CALCULATED FROM
WIT	DENOTES WITNESS
ORP	DENOTES OBSERVED REFERENCE POINT
E.B.R.	DENOTES EAST OF BURY ROAD
B.A.	DENOTES BOUNDARIES ACT
(3804)	DENOTES TIE TO WATER'S EDGE AS SHOWN ON PLAN 23R-2235 AND REGISTERED PLANS D-10, D-22, D-23, D-24 AND D-25

INTEGRATION COORDINATE TABLE

OBSERVED REFERENCE POINTS DERIVED FROM GPS OBSERVATIONS USING THE PRECISE POINT POSITIONING (PPP) SERVICE, UTM ZONE 17 (CSRS)(2010) COORDINATES TO RURAL ACCURACY PER SEC. 14(2) OF O.REG 216/10

POINT ID	NORTHING	EASTING
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ORP B	4958748.474	490405.963
ORP C	4958933.470	490641.167
ORP D	4959120.142	490861.253
ORP E	4959310.293	491078.352
ORP F	4959492.517	491301.395
ORP G	4959696.650	491503.638
ORP H	4959931.635	491788.911
ORP I	4960036.758	491980.567
ORP J	4960198.188	492213.827
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ORP L	4960398.547	492444.462
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ORP N	4960679.306	492796.275
ORP O	4960846.598	493027.751

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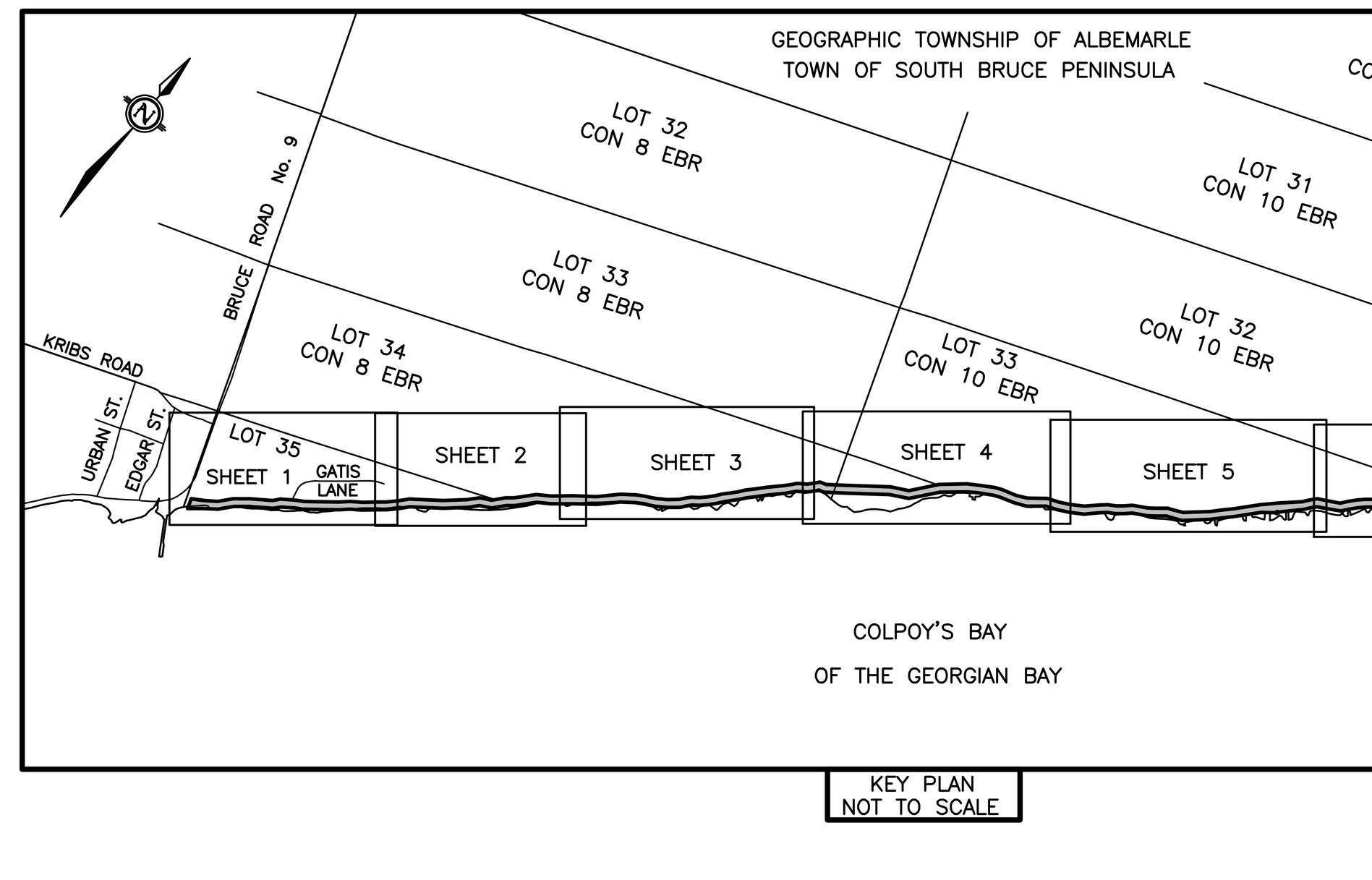

GEOGRAPHIC TOWNSHIP OF ALBEMARLE
TOWN OF SOUTH BRUCE PENINSULA
LOT 30 CON 10 EBR
LOT 32 CON 8 EBR
LOT 31 CON 10 EBR
LOT 30 CON 11 EBR
LOT 33 CON 8 EBR
LOT 32 CON 10 EBR
LOT 31 CON 11 EBR
LOT 34 CON 8 EBR
LOT 33 CON 10 EBR
LOT 32
SHEET 1
SHEET 2
SHEET 3
SHEET 4
SHEET 5
SHEET 6
MALLORY BEACH ROAD
REGISTERED PLAN 379
COLPOY'S BAY
OF THE GEORGIAN BAY

KEY PLAN
NOT TO SCALE

TABLE OF TIES TO WATER'S EDGE AS PLOTTED FROM REGISTERED PLANS D-23 AND D-24

POINT	NORTHING	EASTING
3848	4959672.3	491472.1
3849	4959688.7	491487.1
3850	4959693.8	491491.7
3851	4959696.4	491499.9
3852	4959948.3	491813.9
3853	4959967.9	491846.9
3854	4959975.1	491863.0
3855	4959986.9	491901.3
3856	4960000.9	491931.9
3857	4960033.3	491971.8
3858	4960043.4	491997.6

LOT 33
CONCESSION 8 E.B.R.
GEOGRAPHIC TOWNSHIP OF ALBEMARLE
TOWN OF SOUTH BRUCE PENINSULA
COUNTY OF BRUCE
LOT 33
CONCESSION 10 E.B.R.
GEOGRAPHIC TOWNSHIP OF ALBEMARLE
TOWN OF SOUTH BRUCE PENINSULA
COUNTY OF BRUCE
UNIT 22
PIN 33140-0094
(MELISSA ANNE BECKER)
UNIT 23
PIN 33140-0095
(RICHARD BLAKE HEDGES LOTTE HEDGES)
20.117 TOWNSHIP ROAD
REGISTERED PLAN D-23
REGISTERED PLAN D-24
REGISTERED (BOUNDARIES ACT PLAN No. 1053)
UNIT 1
PIN 33140-0001
(ARLENE ELIZABETH MACNAY KENNETH STERLING MACNAY RAMSAY GORDON MACNAY)
UNIT 30
UNIT 34
PIN 33140-0031
(DONALD JOHN LEONARD LAURIE LYNN LEONARD)
ROAD (BY REGISTERED PLAN D-24)
PIN 33140-0102
(THE CORPORATION OF THE TOWNSHIP OF ALBEMARLE)
(TRAVELLED ROAD KNOWN LOCALLY AS MALLORY BEACH ROAD)
PIN 33140-0101
(THE CORPORATION OF THE TOWNSHIP OF ALBEMARLE)
UNIT 9
PIN 33140-0002
(ARLENE ELIZABETH MACNAY STERLING KENNETH MACNAY RAMSAY GORDON MACNAY)
UNIT 33
PIN 33140-0032
(DONALD JOHN LEONARD LAURIE LYNN LEONARD)
UNIT 2
PIN 33140-0003
(LISA ANN KLINGER ESTATE OF CHARLES ERICKSON)
UNIT 3
PIN 33140-0004
(LISA ANN KLINGER ESTATE OF CHARLES ERICKSON)
PLAN
UNIT 4
PIN 33140-0009
(DAVID HENRY ELLIOTT KERINA ANNE ELLIOTT)
UNIT 5
UNIT 6
PIN 33140-0006
(CURTIS ROY GLOADE MARGARET MARY GLOADE)
UNIT 7
PIN 33140-0007
(GEORGE ANDREW BURT WANDA JEAN LOCKE)
UNIT 8
PIN 33140-0008
(RUTH V. WINTERHALT)
D-24
UNIT 10
PIN 33140-0010
(ROBERT ANDREW COLTON MICHELLE CATHERINE-ANNE COLTON)
PART 3, 3R-7940
REGISTERED (BOUNDARIES ACT
UNIT 11
PIN 33140-0011
(MERCEDES CACHIN DE FUCHS)
PLAN No. 1053)
UNIT 12
PIN 33140-0012
(LINDA JANE CHURCH JAMES WILSON CHURCH)
UNIT 13
UNIT 14
UNIT 15
D-24
UNIT 16
PIN 33140-0017
(THOMAS JOHN GRIFFITHS NANCY LOUISE GRIFFITHS)
ORIGINAL SHORE ROAD ALLOWANCE
NO PIN ASSIGNED
COLPOY'S BAY
OF THE GEORGIAN BAY
WATER'S EDGE AS SHOWN ON PLAN D-24 (B.A. PLAN No. 1053)
LIMIT ESTABLISHED 20.117 FROM AND PARALLEL TO THE WESTERLY LIMIT OF "ROAD" BY PLAN D-24
TIE LINE ONLY
MATCH LINE SEE SHEET 3
MATCH LINE SEE SHEET 5

SHEET 4 OF 6

TULLOCH

TULLOCH GEOMATICS INC.
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DRAWN BY: MAL
FILE: 212341

ACAD FILE:Parry Sound:\2021\212341 Mallory Beach Road\Project Drawings\212341 Mallory Beach.dwg

PLAN OF SURVEY OF
UNIT 67, REGISTERED PLAN D–10
ROAD, REGISTERED PLAN D–23
ROAD, REGISTERED PLAN D–24
(TRAVELLED ROAD), REGISTERED PLAN D–24
(TRAVELLED ROAD), REGISTERED PLAN D–25
PART OF TOWNSHIP ROAD (BY BY–LAW NO. 83)
(BEING PART OF LOT 33, CONCESSIONS 8 & 10)
PART OF PARK LOT A, REGISTERED PLAN 379 AND
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(LYING IN FRONT OF LOTS 33 TO 35, CONCESSION 8 EBR,
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GEOGRAPHIC TOWNSHIP OF ALBEMARLE
TOWN OF SOUTH BRUCE PENINSULA
COUNTY OF BRUCE
TULLOCH GEOMATICS INC., O.L.S.
2021

5m 0 5 25m
SCALE 1:500

METRIC:

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LEGEND:

■	DENOTES FOUND MONUMENT
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SIBBC	DENOTES STANDARD IRON BAR WITH CAP
SSIB	DENOTES SHORT STANDARD IRON BAR
IB	DENOTES IRON BAR
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CC	DENOTES CUT CROSS
RPL	DENOTES ROCK PLUG (IB IN ROCK)
H&M	DENOTES HEWETT & MILNE LTD. O.L.S.
888	DENOTES J.C. MILNE, O.L.S
B&C	DENOTES BRUBACHER CAMPBELL LIMITED, O.L.S.
OU	DENOTES ORIGIN UNKNOWN
P	DENOTES REGISTERED PLAN D–22 (BOUNDARIES ACT PLAN BA–1051)
P1	DENOTES REGISTERED PLAN D–10 (BOUNDARIES ACT PLAN BA–386)
P2	DENOTES REGISTERED PLAN D–23 (BOUNDARIES ACT PLAN BA–1052)
P3	DENOTES REGISTERED PLAN D–24 (BOUNDARIES ACT PLAN BA–1053)
P4	DENOTES REGISTERED PLAN D–25 (BOUNDARIES ACT PLAN BA–1054)
P5	DENOTES PLAN 3R–3880
P6	DENOTES PLAN 3R–6435
P7	DENOTES PLAN 3R–2235
M	DENOTES MEASURED
S	DENOTES SET
PPN	DENOTES PROPORTION
CF	DENOTES CALCULATED FROM
WIT	DENOTES WITNESS
ORP	DENOTES OBSERVED REFERENCE POINT
E.B.R.	DENOTES EAST OF BURY ROAD
B.A.	DENOTES BOUNDARIES ACT
(3804)	DENOTES TIE TO WATER'S EDGE AS SHOWN ON PLAN 23R–2235 AND REGISTERED PLANS D–10, D–22, D–23, D–24 AND D–25

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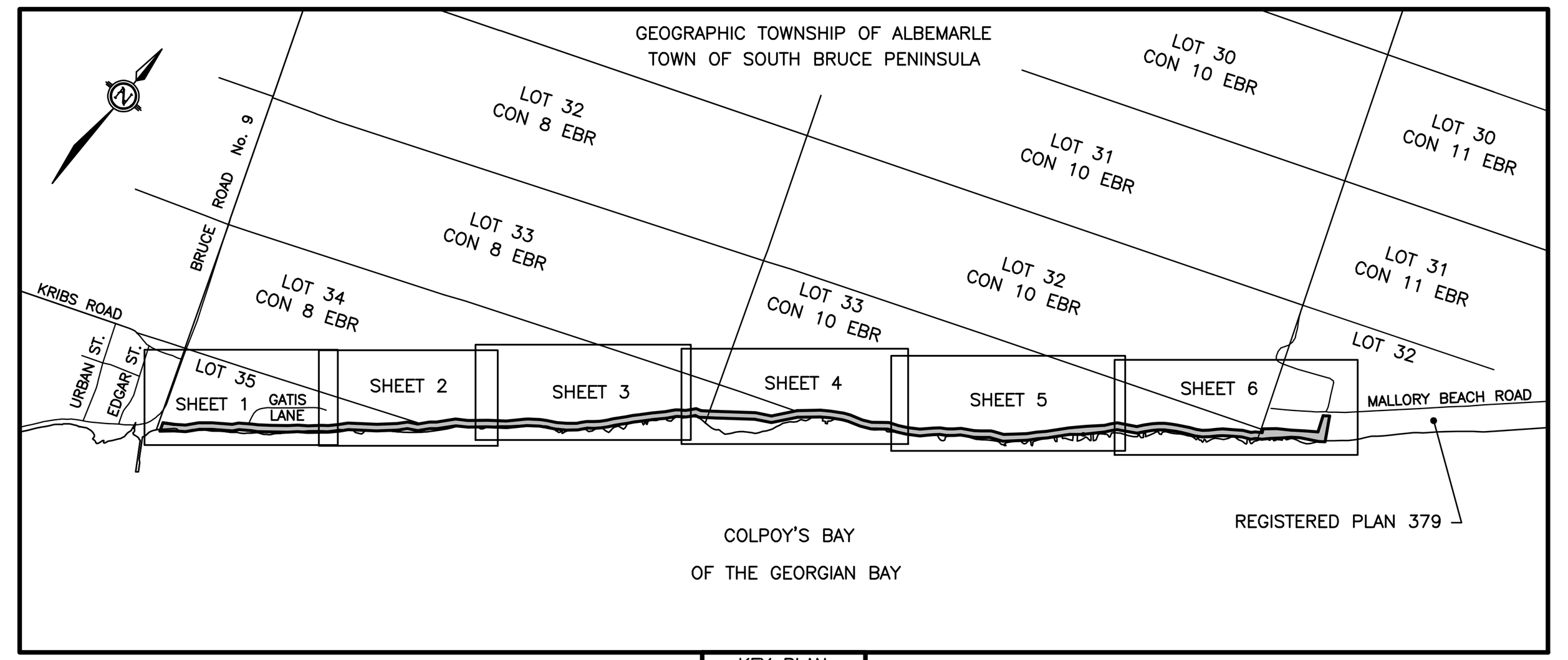
ORP N	4960679.306	492796.275
ORP O	4960846.598	493027.751

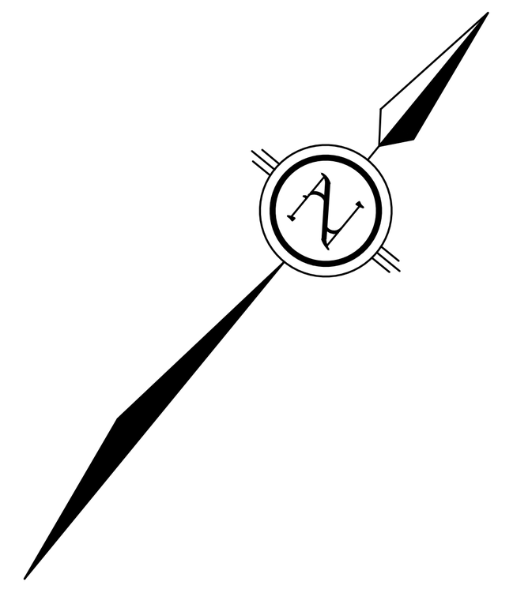
COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE–ESTABLISH THE CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.



KEY PLAN
NOT TO SCALE

TABLE OF TIES TO WATER'S EDGE AS PLOTTED FROM REGISTERED PLANS D–24 & D25

POINT	NORTHING	EASTING
3858	4960043.4	491997.6
3859	4960057.1	492025.4
3860	4960079.4	492060.8
3861	4960094.3	492076.3
3862	4960100.9	492083.0
3863	4960107.3	492089.8
3864	4960120.5	492104.5
3865	4960131.7	492122.7
3866	4960146.5	492140.8
3867	4960159.6	492154.9
3868	4960179.1	492189.0
3869	4960192.2	492206.5
3870	4960210.2	492228.6
3871	4960213.2	492235.5
3872	4960226.6	492266.4
3873	4960275.8	492322.3
3874	4960298.2	492343.0
3875	4960319.3	492364.2
3876	4960405.3	492450.4
3877	4960447.5	492491.5
3878	4960463.2	492504.0
3879	4960474.6	492513.9



	SHEET 5 OF 6
TULLOCH	TULLOCH GEOMATICS INC. 5 SEGUIN ST. PARRY SOUND, ON P2A 1A9 T. 705 746.8404 F. 705 746.7685 888 238.8883 parrysound@tulloch.ca
DRAWN BY: MAL	FILE: 212341

ACAD FILE:Parry Sound:\2021\212341 Mallory Beach Road\Project Drawings\212341 Mallory Beach.dwg

PLAN OF SURVEY OF
UNIT 67, REGISTERED PLAN D–10
ROAD, REGISTERED PLAN D–23
ROAD, REGISTERED PLAN D–24
(TRAVELLED ROAD), REGISTERED PLAN D–24
(TRAVELLED ROAD), REGISTERED PLAN D–25
PART OF TOWNSHIP ROAD (BY BY–LAW NO. 83)
(BEING PART OF LOT 33, CONCESSIONS 8 & 10)
PART OF PARK LOT A, REGISTERED PLAN 379 AND
PART OF THE ORIGINAL SHORE ROAD ALLOWANCE
(LYING IN FRONT OF LOTS 33 TO 35, CONCESSION 8 EBR,
IN FRONT OF LOT 33, CONCESSION 10 EBR
AND IN FRONT OF LOT 32, CONCESSION 11)
GEOGRAPHIC TOWNSHIP OF ALBEMARLE
TOWN OF SOUTH BRUCE PENINSULA
COUNTY OF BRUCE
TULLOCH GEOMATICS INC., O.L.S.
2021

5m 0 5 25m

SCALE 1:500

METRIC:

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

GROUND DISTANCES SHOWN HEREON CAN BE CONVERTED TO UTM GRID BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.999579.

BEARING NOTE:

BEARINGS ARE UTM GRID DERIVED FROM GPS OBSERVATIONS (PPP) AND ARE REFERRED TO THE CENTRAL MERIDIAN OF ZONE 17 (81°00' WEST LONGITUDE) NAD83 (CSRS) (2010).

CONVERGENCE NOTE:

A CONVERGENCE (ROTATION) FACTOR OF 0°04'30" CLOCKWISE HAS BEEN APPLIED TO THE ASTRONOMIC BEARINGS OF UNDERLYING PLANS P1 TO P6 AND A ROTATION FACTOR OF 0°03'00" CLOCKWISE HAS BEEN APPLIED TO THE ASTRONOMIC BEARINGS OF UNDERLYING PLAN P7 TO ACCOUNT FOR DIFFERENT REFERENCE MERIDIANS.

NOTE: NORTHERLY LIMIT OF MALLORY BEACH ROAD CONFIRMED BY REGISTERED PLANS D–10, D–22. D–23, D–24 AND D–25 (B.A. PLANS 386, 1051, 1052, 1053 AND 1054 RESPECTIVELY)

LEGEND:

■	DENOTES FOUND MONUMENT
□	DENOTES PLANTED MONUMENT
SIB	DENOTES STANDARD IRON BAR
SIBBC	DENOTES STANDARD IRON BAR WITH CAP
SSIB	DENOTES SHORT STANDARD IRON BAR
IB	DENOTES IRON BAR
IBBC	DENOTES IRON BAR WITH CAP
RIB	DENOTES ROUND IRON BAR
IP	DENOTES IRON PIPE
CP	DENOTES CONCRETE PIN AND WASHER
CC	DENOTES CUT CROSS
RPL	DENOTES ROCK PLUG (IB IN ROCK)
H&M	DENOTES HEWETT & MILNE LTD. O.L.S.
888	DENOTES J.C. MILNE, O.L.S
B&C	DENOTES BRUBACHER CAMPBELL LIMITED, O.L.S.
OU	DENOTES ORIGIN UNKNOWN
P	DENOTES REGISTERED PLAN D–22 (BOUNDARIES ACT PLAN BA–1051)
P1	DENOTES REGISTERED PLAN D–10 (BOUNDARIES ACT PLAN BA–386)
P2	DENOTES REGISTERED PLAN D–23 (BOUNDARIES ACT PLAN BA–1052)
P3	DENOTES REGISTERED PLAN D–24 (BOUNDARIES ACT PLAN BA–1053)
P4	DENOTES REGISTERED PLAN D–25 (BOUNDARIES ACT PLAN BA–1054)
P5	DENOTES PLAN 3R–3880
P6	DENOTES PLAN 3R–6435
P7	DENOTES PLAN 3R–2235
M	DENOTES MEASURED
S	DENOTES SET
PPN	DENOTES PROPORTION
CF	DENOTES CALCULATED FROM
WIT	DENOTES WITNESS
ORP	DENOTES OBSERVED REFERENCE POINT
E.B.R.	DENOTES EAST OF BURY ROAD
B.A.	DENOTES BOUNDARIES ACT
(3804)	DENOTES TIE TO WATER'S EDGE AS SHOWN ON PLAN 23R–2235 AND REGISTERED PLANS D–10, D–22, D–23, D–24 AND D–25

INTEGRATION COORDINATE TABLE

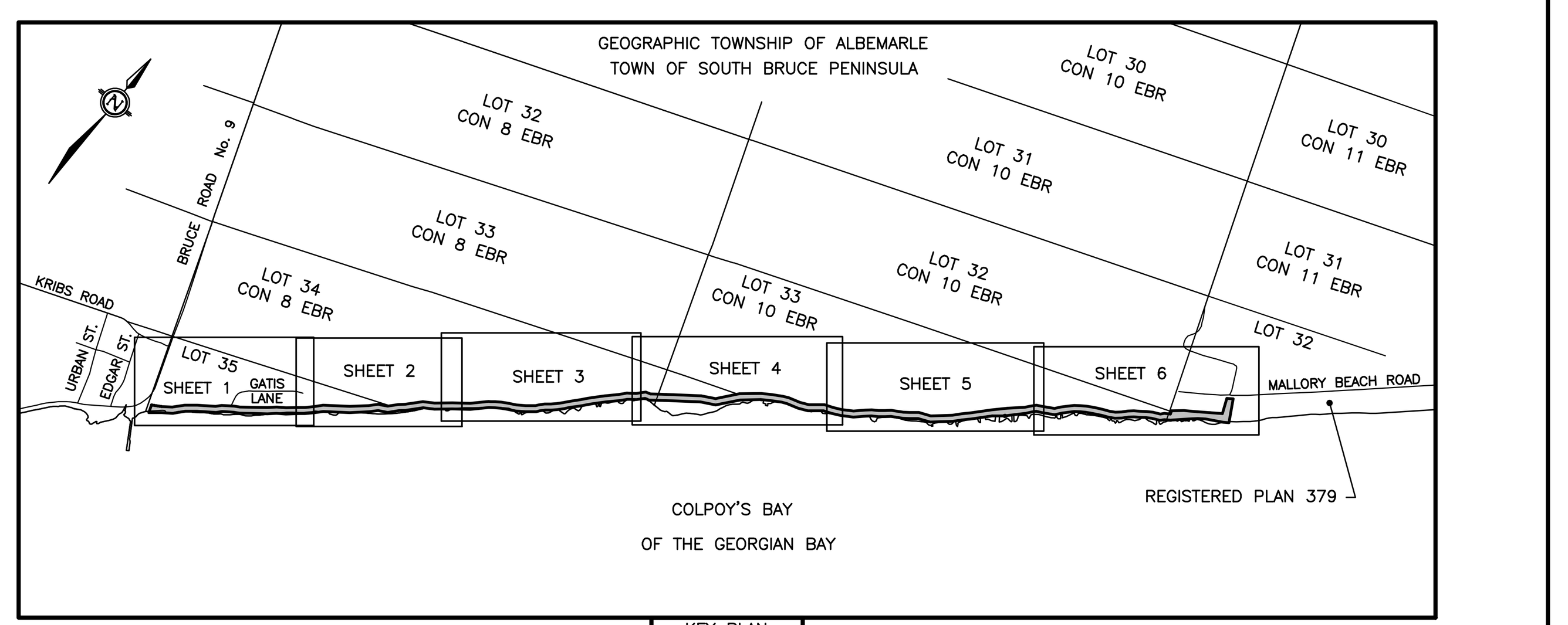
OBSERVED REFERENCE POINTS DERIVED FROM GPS OBSERVATIONS USING THE PRECISE POINT POSITIONING (PPP) SERVICE, UTM ZONE 17 (CSRS)(2010) COORDINATES TO RURAL ACCURACY PER SEC. 14(2) OF O.REG 216/10

POINT ID	NORTHING	EASTING
ORP A	4958625.066	490258.972
ORP B	4958748.474	490405.963
ORP C	4958933.470	490641.167
ORP D	4959120.142	490861.253
ORP E	4959310.293	491078.352
ORP F	4959492.517	491301.395
ORP G	4959696.650	491503.638
ORP H	4959931.635	491788.911
ORP I	4960036.758	491980.567
ORP J	4960198.188	492213.827
ORP K	4960359.371	492400.671
ORP L	4960398.547	492444.462
ORP M	4960505.007	492568.376
ORP N	4960679.306	492796.275
ORP O	4960846.598	493027.751

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE–ESTABLISH THE CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

TABLE OF TIES TO WATER'S EDGE AS PLOTTED FROM REGISTERED PLAN D–25 & PLAN 3R–2235

POINT	NORTHING	EASTING
3879	4960474.6	492513.9
3880	4960481.9	492528.1
3881	4960504.1	492567.7
3882	4960522.7	492582.5
3883	4960540.3	492598.6
3884	4960553.1	492611.5
3885	4960564.1	492625.2
3886	4960574.0	492640.5
3887	4960583.6	492656.8
3888	4960592.5	492673.5
3889	4960600.9	492690.6
3890	4960609.4	492709.2
3891	4960620.8	492728.7
3892	4960635.9	492745.8
3893	4960651.2	492760.4
3894	4960663.2	492773.8
3895	4960674.2	492789.5
3896	4960686.3	492805.6
3897	4960697.4	492822.0
3898	4960709.5	492847.8
3899	4960720.2	492857.2
3900	4960730.9	492873.9
3901	4960747.0	492890.4
3902	4960771.1	492917.0
3903	4960792.5	492940.0
3904	4960807.6	492960.9
3904	4960835.3	493012.1



GEOGRAPHIC TOWNSHIP OF ALBEMARLE
TOWN OF SOUTH BRUCE PENINSULA
LOT 32 CON 8 EBR
LOT 33 CON 8 EBR
LOT 34 CON 8 EBR
LOT 33 CON 10 EBR
LOT 32 CON 10 EBR
LOT 31 CON 10 EBR
LOT 31 CON 11 EBR
LOT 30 CON 11 EBR
SHEET 1
SHEET 2
SHEET 3
SHEET 4
SHEET 5
SHEET 6
MALLORY BEACH ROAD
COLPOY'S BAY
OF THE GEORGIAN BAY
REGISTERED PLAN 379

KEY PLAN
NOT TO SCALE

LOT 32
CONCESSION 10 E.B.R.
GEOGRAPHIC TOWNSHIP OF ALBEMARLE
TOWN OF SOUTH BRUCE PENINSULA
COUNTY OF BRUCE
LOT 32
LOT 33
REGISTERED
(BOUNDARIES ACT PLAN
PLAN
No. 1054)
D–25
UNIT 5
UNIT 6
UNIT 7
UNIT 4
UNIT 8
UNIT 9
UNIT 10
UNIT 11
UNIT 12
UNIT 13
UNIT 14
UNIT 15
UNIT 16
UNIT 17
UNIT 18
UNIT 19
UNIT 20
UNIT 21
UNIT 22
UNIT 23
UNIT 24
UNIT 25
PIN 33140–0106
PIN 33140–0107
(CHRISTINE MICHELLE LEMON)
PIN 33140–0108
PIN 33140–0109
PIN 33140–0110
PIN 33140–0111
PIN 33140–0112
PIN 33140–0123
PIN 33140–0124
ORIGINAL SHORE ROAD ALLOWANCE
NO PIN ASSIGNED
(TRAVELLED ROAD KNOWN LOCALLY AS MALLORY BEACH ROAD)
WATER'S EDGE AS SHOWN ON PLAN D–25 (B.A. PLAN No. 1054)
TIE LINE ONLY
WATER LOT
CL1126
COLPOY'S BAY
OF THE GEORGIAN BAY
ROAD ALLOWANCE BETWEEN CONCESSIONS 10 & 11 E.B.R.
KATHLEEN AVENUE
(BY REGISTERED PLAN 379)
PIN 33140–0580
(THE CORPORATION OF THE TOWN OF SOUTH BRUCE PENINSULA)
(TRAVELLED ROAD KNOWN LOCALLY AS MALLORY BEACH ROAD)
LOT 76
LOT 75
LOT 74
LOT 73
LOT 72
LOT 71
LOT 70
LOT 69
MOUNTAIN DRIVE
LOT 68
LOT 67
LOT 66
REGISTERED
PLAN
379
PART 1, 3R–2235
PIN 33140–0283
(SUZANNE EILEEN CONNOR)
PART 2, 3R–2235
PIN 33140–0284
PART 3, 3R–2235
PIN 33140–0285
(C.A. BECKER EQUIPMENT LIMITED)
PART 4, 3R–2235
PIN 33140–0286
(ROSS THOMAS DAVIDSON)
PARK
LOT
A
REGISTERED
PLAN
379
PART 5, 3R–2235
PIN 33140–0579
(THE CORPORATION OF THE TOWNSHIP OF ALBEMARLE)
ORIGINAL SHORE ROAD ALLOWANCE
(MARINE ALLOWANCE SHOWN ON REGISTERED PLAN 379)
WATER'S EDGE AS SHOWN ON 3R–2235
LOT 1
LOT 2
LOT 3
LOT 4
PIN 33140–0228
COLPOY'S BAY
OF THE GEORGIAN BAY

SHEET 6 OF 6
TULLOCH
TULLOCH GEOMATICS INC.
5 SEGUIN ST.
PARRY SOUND, ON
P2A 1A9
T. 705 746.8404
F. 705 746.7685
888 238.8883
parrysound@tulloch.ca

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Appendix G

NOTICE OF STUDY COMMENCEMENT
Reconstruction of Mallory Beach Road
Municipal Class Environmental Assessment

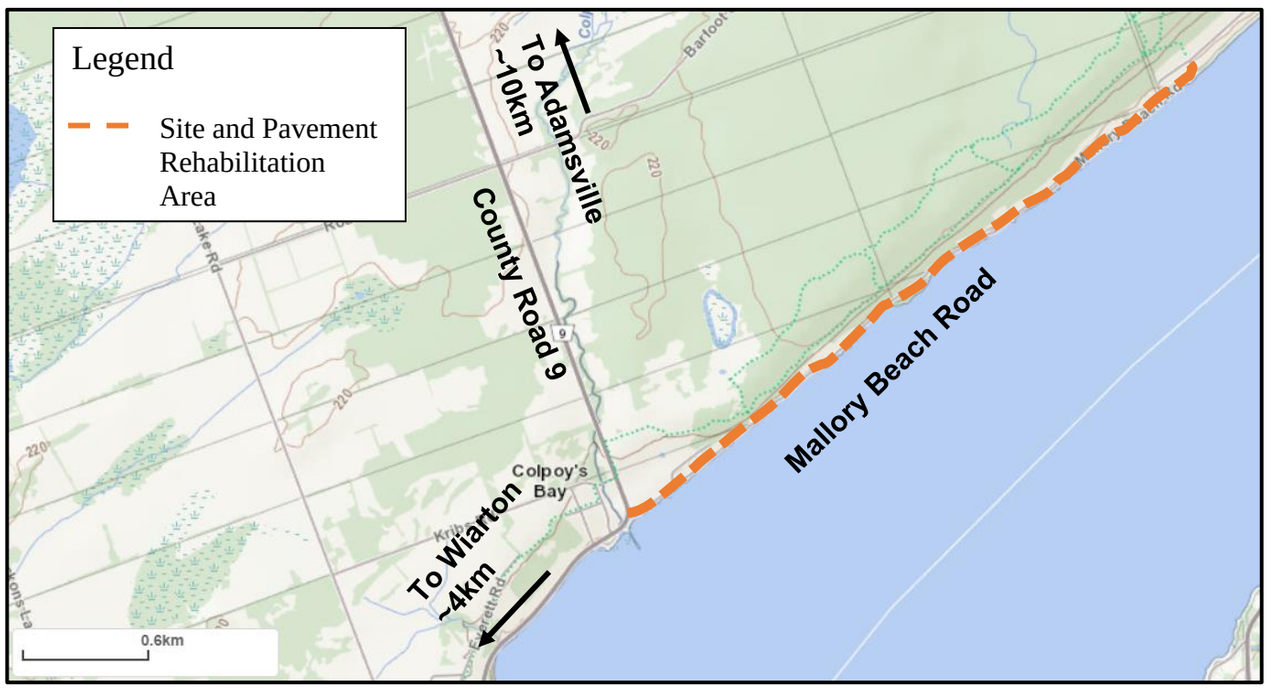
The Study

Planmac Engineering Inc. has been retained by the Town of South Bruce Peninsula to undertake a Municipal Class Environmental Assessment (EA) and Preliminary Design for the reconstruction of Mallory Beach Road for 3.6 km from County Road 9 to Kathleen Avenue. The location of the site is shown on the below map. The reconstruction will involve pavement rehabilitation which may consist of surface pulverization and resurfacing of the road surface to ensure an extended life expectancy is achieved.

The Process

The project will be completed in accordance with the approved Schedule 'A+' planning process as outlined in the Municipal Class Environmental Assessment Document (October 2000 as amended in 2007, 2011 & 2015), published by the Municipal Engineer's Association. Topographical and geotechnical survey work is to begin spring/summer 2021.

Public Information Materials will be posted on the Town's website at a later date to provide an update on the Preliminary Design, Municipal Class EA process and traffic management during construction. A further notice will be sent out to stakeholders and local landowners advising of when the materials will be available and how to provide input and comments. Given the uncertainty with COVID-19, an in-person Public Information Centre will not form part of this study.



Should you have any questions regarding this project or information to aid the design process and/or environmental assessment, please feel free to contact the undersigned. To aid the design and construction, we are also interested in hearing if you have any private water or other utility assets that may be located within the roadway.

Mr. Mike Neumann, P.Eng.
Project Manager
Planmac Engineering Inc.
80 North Queen Street, Suite 400
Toronto, ON M8Z 2C9
(416) 626-5300 ext. 204
mneumann@planmac.com

Mr. Chris Cornfield
Manager of Operations – Public Works
Town of South Bruce Peninsula
315 George Street, PO Box 310
Wiarton, ON N0H 2T0
(519) 534-1400 ext. 131
chris.cornfield@southbrucepeninsula.com

This notice issued April 14, 2021

Comments and information regarding this project are being collected in accordance with the *Municipal Freedom of Information and Protection of Privacy Act* for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments received will become a part of the public record.

PLANMAC ENGINEERING INC.

April 13, 2021 Planmac File: 2120

David Elliott
President
Mallory Beach Ratepayers Association Inc.

Via email

Dear Mr. Elliott:

Subject: Notice of Study Commencement
Reconstruction of Mallory Beach Road, Town of South Bruce Peninsula
Municipal Class Environmental Assessment Study

Planmac Engineering Inc. has been retained by the Town of South Bruce Peninsula to undertake a Municipal Class Environmental Assessment (EA) and Preliminary Design for the reconstruction of Mallory Beach Road for 3.6 km from County Road 9 to Kathleen Avenue. The location of the site is shown on the below map.

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The project will be completed in accordance with the approved Schedule 'A+' planning process as outlined in the Municipal Class Environmental Assessment Document (October 2000 as amended in 2007, 2011 & 2015), published by the Municipal Engineer's Association.

An environmental screening of the work area will be undertaken to identify any potential environmental impacts and in the development of appropriate mitigation measures (e.g. erosion and sediment control and tree/shrub removal timing).

Public Information Materials will be posted on the Town's website at a later date to provide an update on the Preliminary Design, Municipal Class EA process and traffic management during construction. A further notice will be sent out to stakeholders and local landowners advising of when the materials will be available and how to provide input and comments. Given the uncertainty with COVID-19, an in-person Public Information Centre will not form part of this study.

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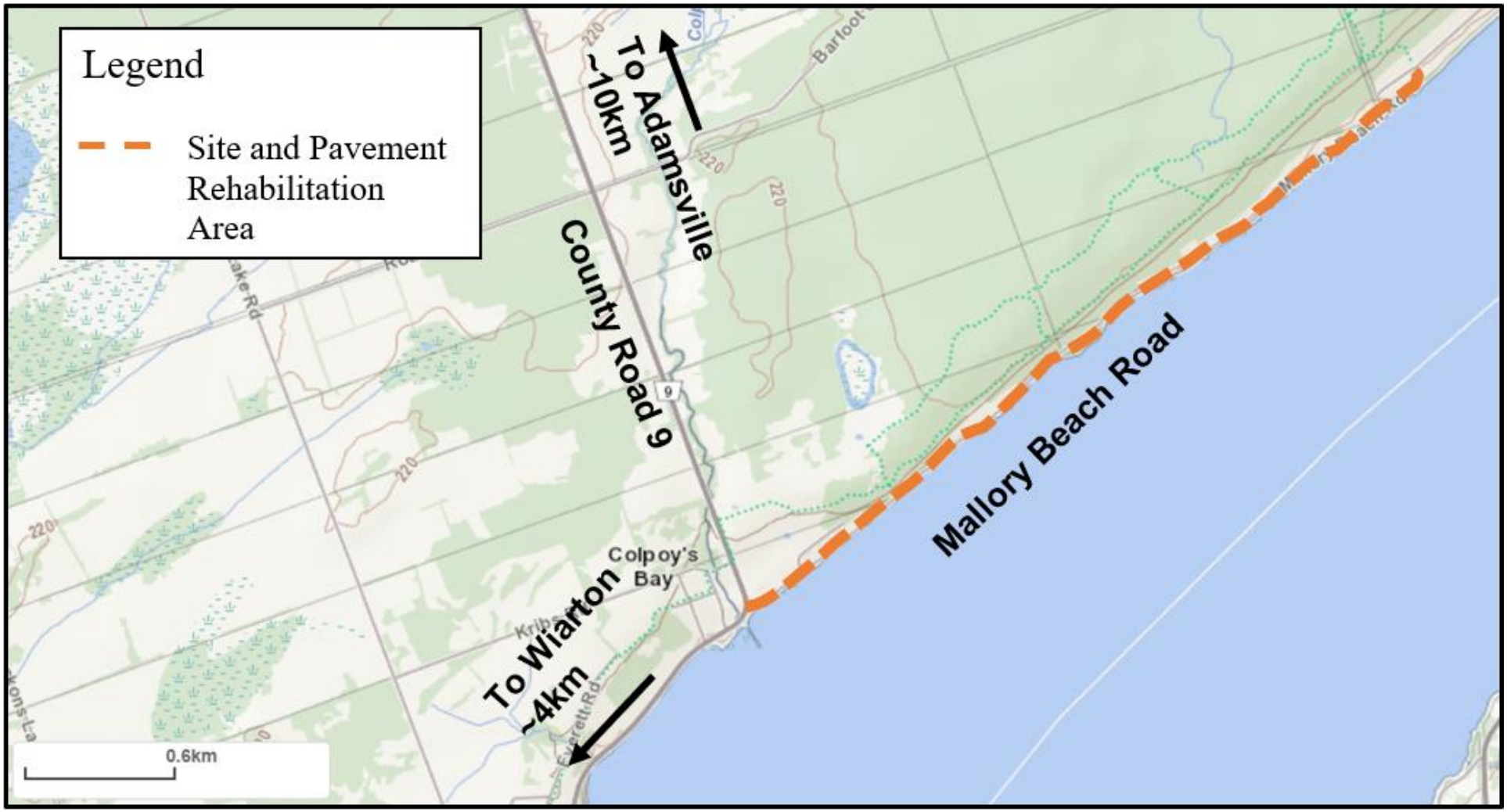
Sincerely,

Mike Neumann, P.Eng.
Senior Project Manager, Planmac Engineering Inc.
Tel: (416) 626-5300 x 204
Email: mneumann@planmac.com

cc: Lara Widdifield, Director of Public Works, Town of South Bruce Peninsula
Chris Cornfield, Manager of Operations (Public Works), Town of South Bruce Peninsula
Jeff Huang, Deputy Project Manager, Planmac Engineering Inc.
Alastair Ross, Environmental Planner, Planmac Engineering Inc.

Encl. Key Map

Key Map - Reconstruction of Mallory Beach Road



PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2120

Dan L. Thompson
District Manager
Ministry of Natural Resources and Forestry, Midhurst Office
2284 Nursery Road
Midhurst, ON L9X 1N8

Dear Dan Thompson:

Subject: Notice of Study Commencement
Reconstruction of Mallory Beach Road, Town of South Bruce Peninsula
Municipal Class Environmental Assessment Study

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Sincerely,

Mike Neumann, P.Eng.
Senior Project Manager, Planmac Engineering Inc.
Tel: (416) 626-5300 x 204
Email: mneumann@planmac.com

cc: Lara Widdifield, Director of Public Works, Town of South Bruce Peninsula
Chris Cornfield, Manager of Operations (Public Works), Town of South Bruce Peninsula
Jeff Huang, Deputy Project Manager, Planmac Engineering Inc.
Alastair Ross, Environmental Planner, Planmac Engineering Inc.

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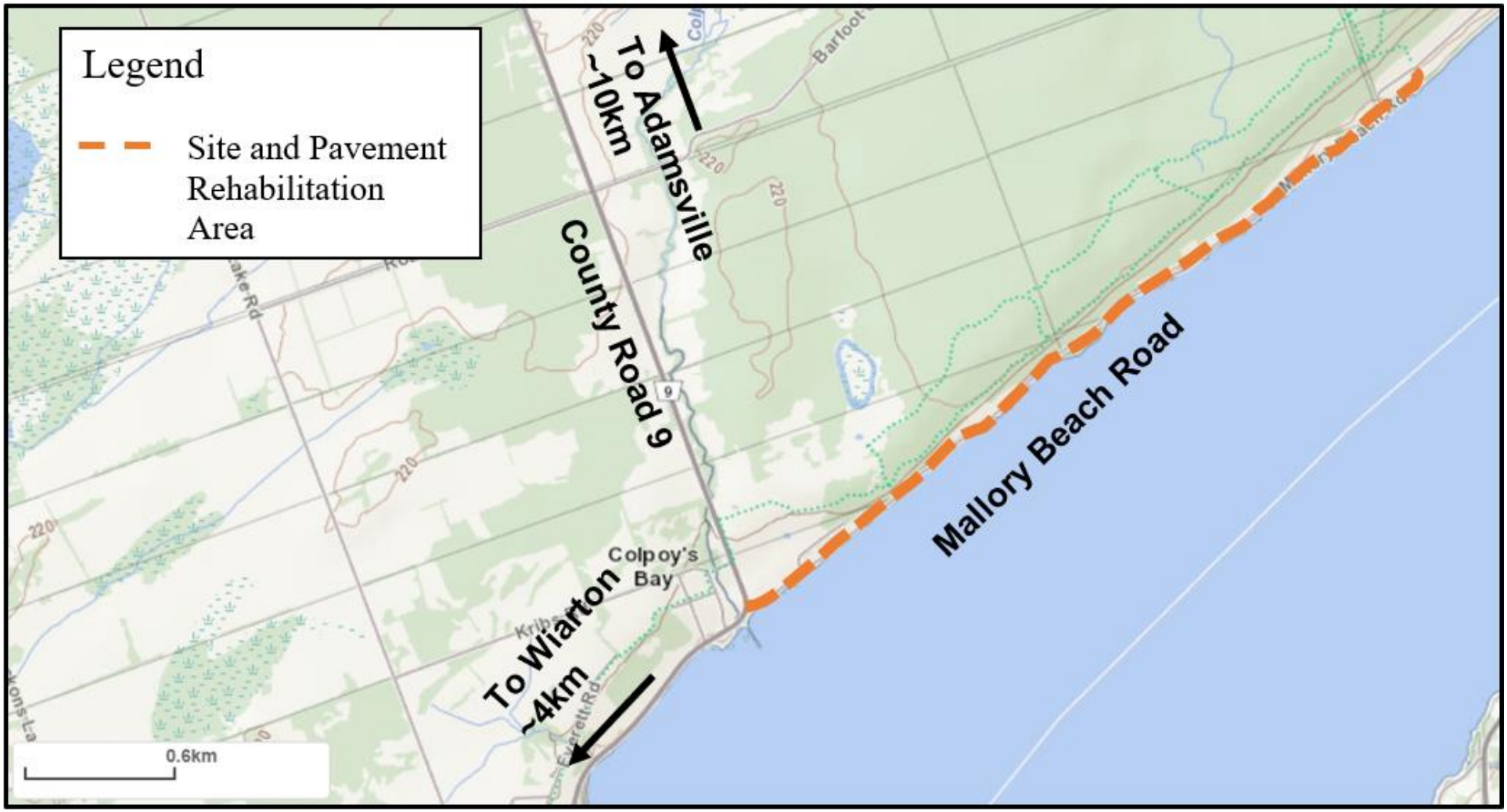

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2120

Jerry Haan
Operations Manager, Transportation and Environmental Services
Bruce County
30 Park Street
Walkerton, ON N0G 2V0

Dear Jerry Haan:

Subject: Notice of Study Commencement
Reconstruction of Mallory Beach Road, Town of South Bruce Peninsula
Municipal Class Environmental Assessment Study

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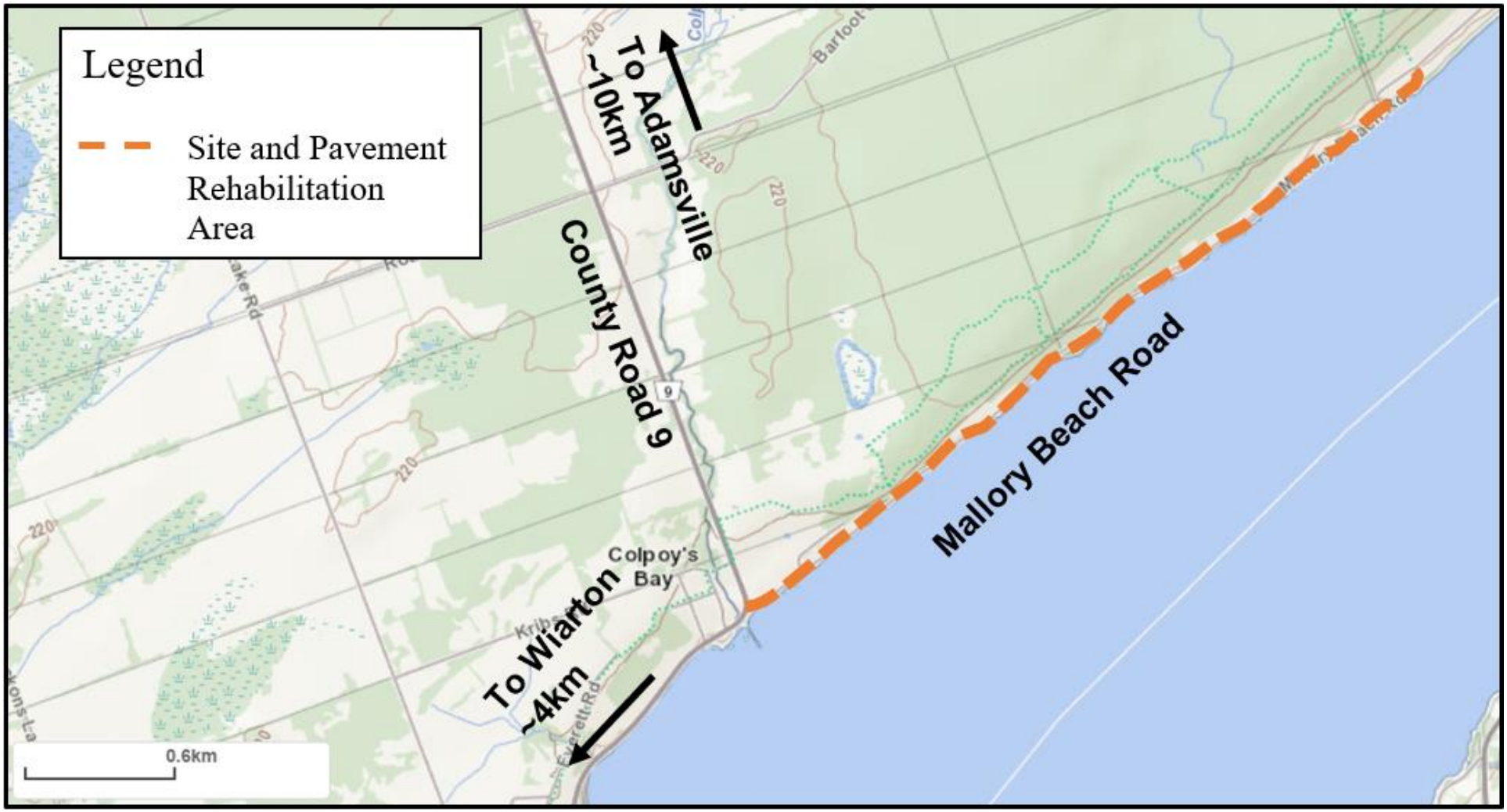
Sincerely,

Mike Neumann, P.Eng.
Senior Project Manager, Planmac Engineering Inc.
Tel: (416) 626-5300 x 204
Email: mneumann@planmac.com

cc: Lara Widdifield, Director of Public Works, Town of South Bruce Peninsula
Chris Cornfield, Manager of Operations (Public Works), Town of South Bruce Peninsula
Jeff Huang, Deputy Project Manager, Planmac Engineering Inc.
Alastair Ross, Environmental Planner, Planmac Engineering Inc.

Encl. Key Map

Key Map - Reconstruction of Mallory Beach Road



PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2120

David Smith
Community Emergency Management Coordinator
Bruce County
30 Park Street
Walkerton, ON N0G 2V0

Dear David Smith:

Subject: Notice of Study Commencement
Reconstruction of Mallory Beach Road, Town of South Bruce Peninsula
Municipal Class Environmental Assessment Study

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Sincerely,

Mike Neumann, P.Eng.
Senior Project Manager, Planmac Engineering Inc.
Tel: (416) 626-5300 x 204
Email: mneumann@planmac.com

cc: Lara Widdifield, Director of Public Works, Town of South Bruce Peninsula
Chris Cornfield, Manager of Operations (Public Works), Town of South Bruce Peninsula
Jeff Huang, Deputy Project Manager, Planmac Engineering Inc.
Alastair Ross, Environmental Planner, Planmac Engineering Inc.

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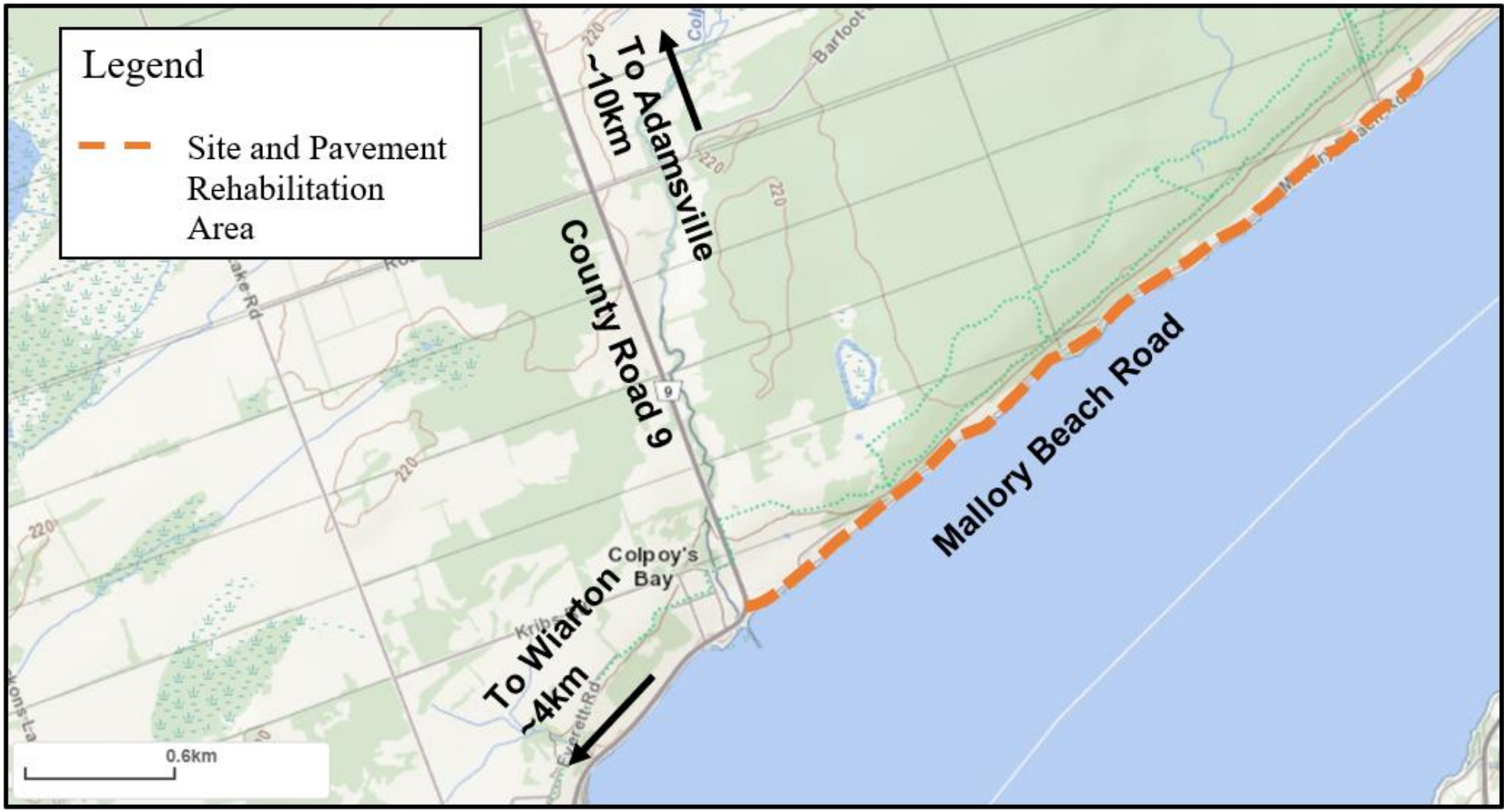

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2120

Miguel Pelletier
Director - Transportation and Environmental Services
Bruce County
30 Park Street
Walkerton, ON N0G 2V0

Dear Miguel Pelletier:

Subject: Notice of Study Commencement
Reconstruction of Mallory Beach Road, Town of South Bruce Peninsula
Municipal Class Environmental Assessment Study

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Email: mneumann@planmac.com

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Chris Cornfield, Manager of Operations (Public Works), Town of South Bruce Peninsula
Jeff Huang, Deputy Project Manager, Planmac Engineering Inc.
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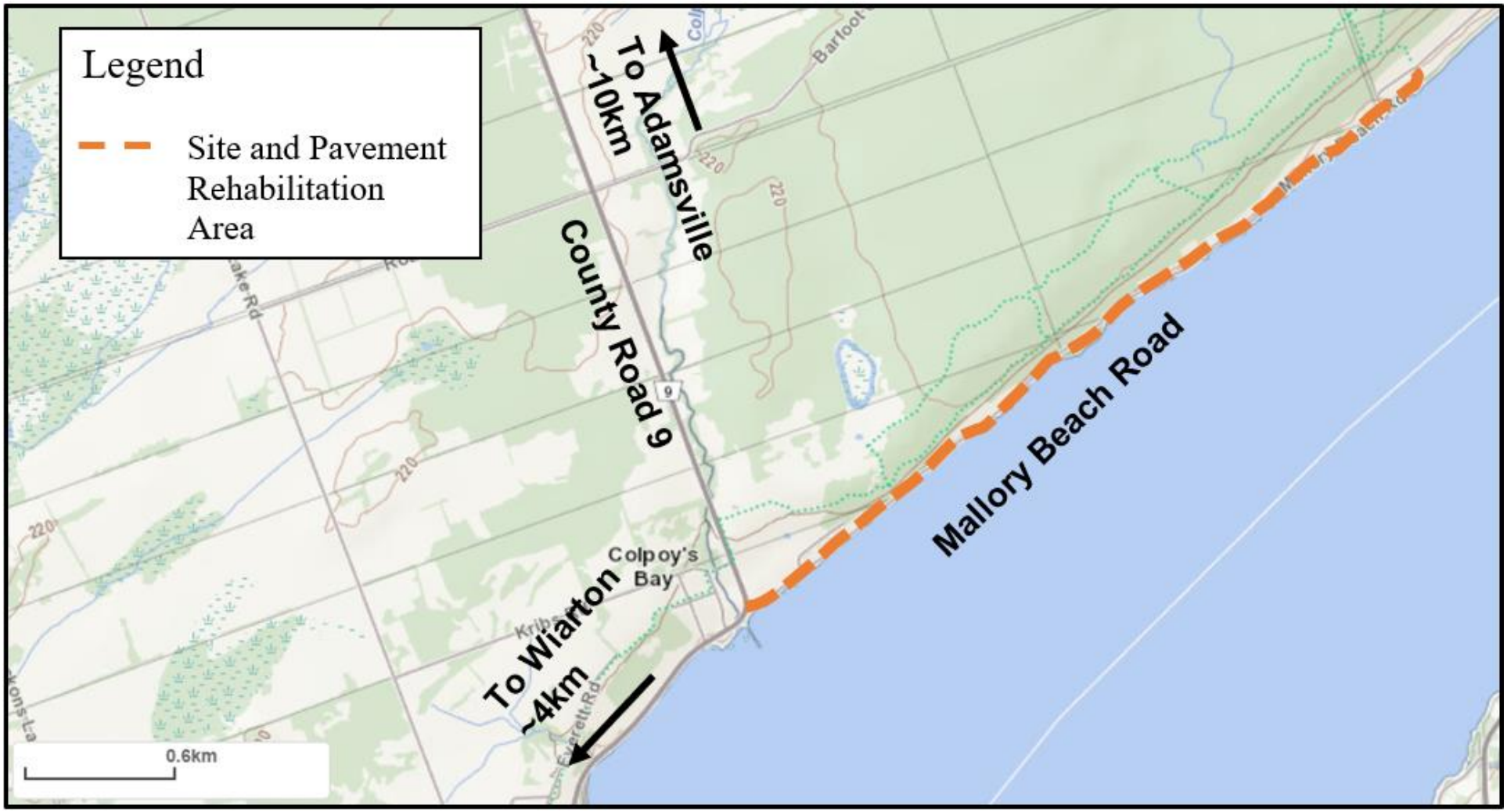
Encl. Key Map

Key Map - Reconstruction of Mallory Beach Road



PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2120

Chief Daniel Robinson
South Bruce Peninsula Fire Services
382 George Street
Wiarton, ON N0H 2T0

Dear Chief Robinson:

Subject: Notice of Study Commencement
Reconstruction of Mallory Beach Road, Town of South Bruce Peninsula
Municipal Class Environmental Assessment Study

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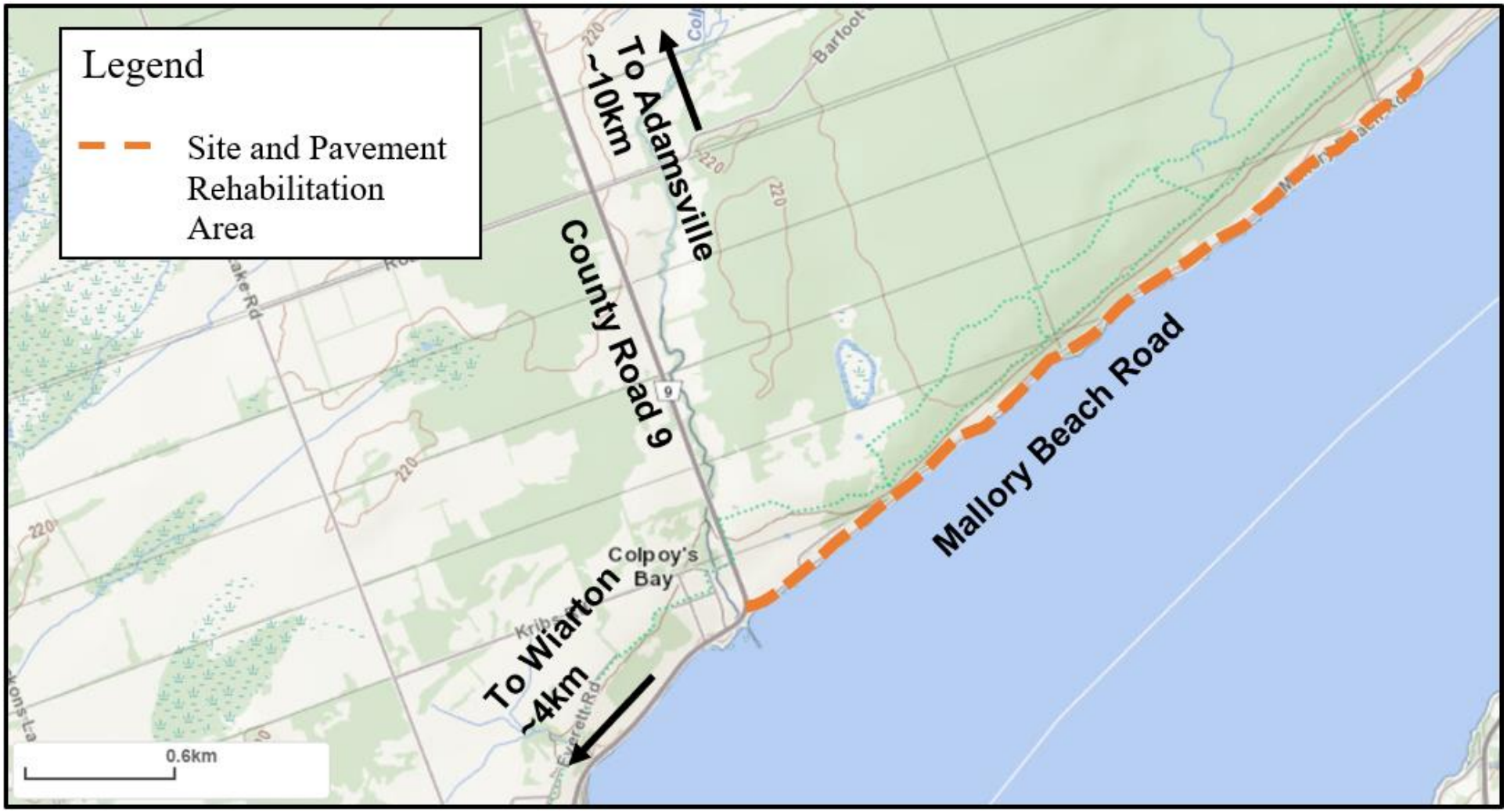

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2120

Ontario Provincial Police - Wiarton
50 Berford Street
Wiarton, ON N0H 2T0

To Whom It May Concern:

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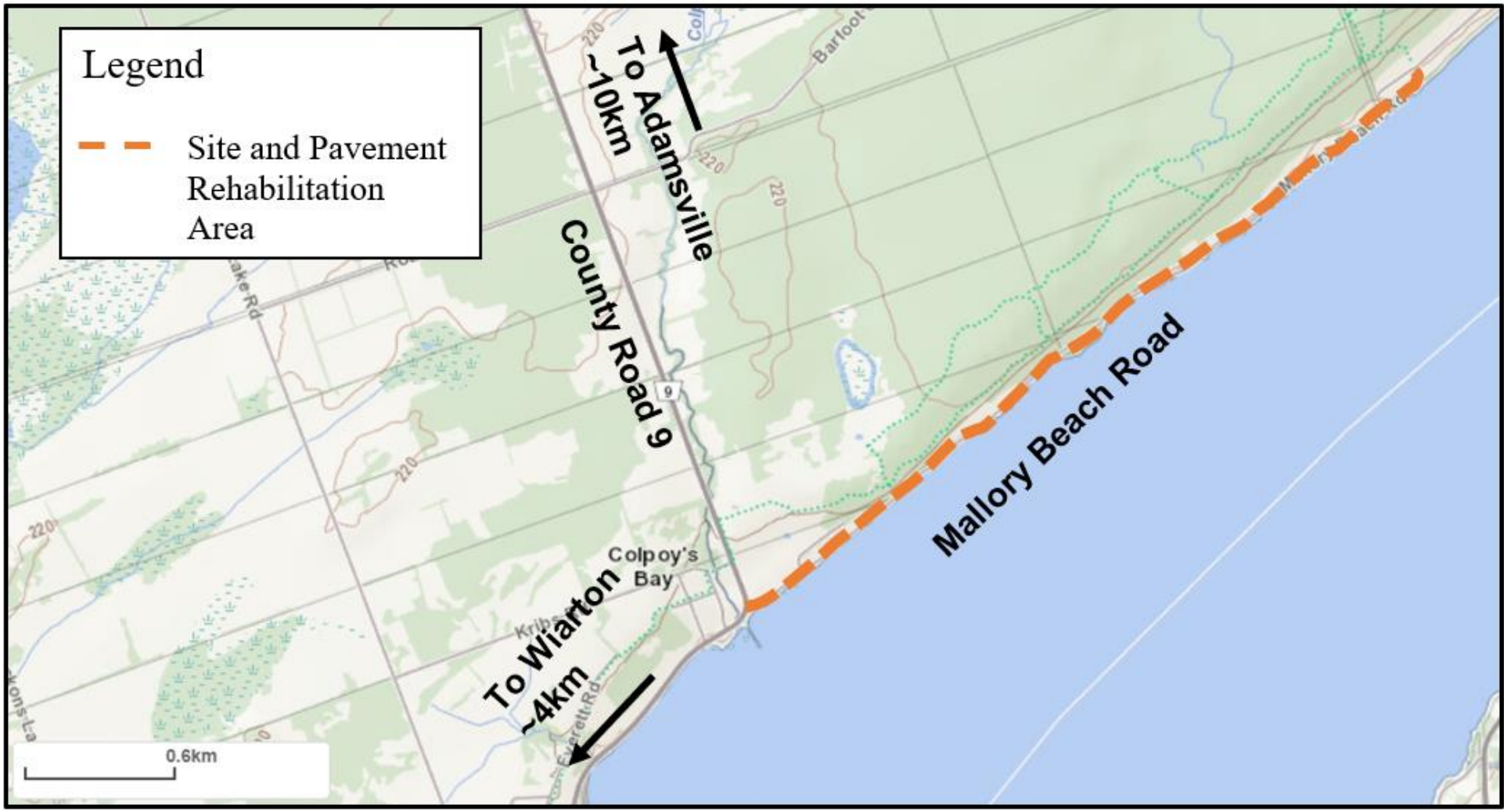

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2120

Rachelle Brunelle-McColl
President
Métis Nation of Ontario (MNO) Owen Sound Office (District 7)
380 9th Street East
Owen Sound, ON N4K 1P1

Dear Rachelle Brunelle-McColl:

Subject: Notice of Study Commencement
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Municipal Class Environmental Assessment Study

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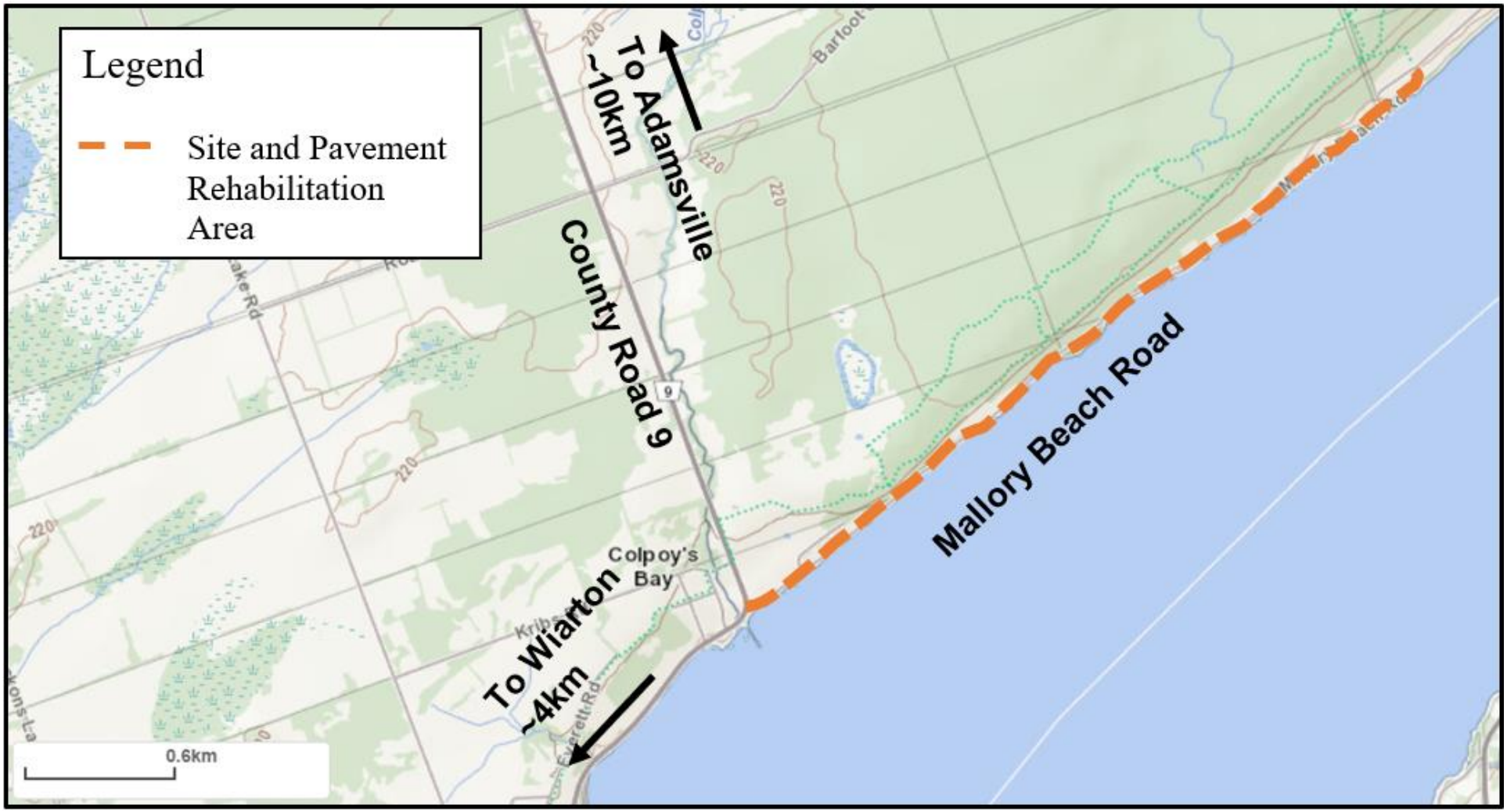

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2120

Chief Greg Nadjiwon
Chippewas of Nawash Unceded First Nation
132 Lakeshore Boulevard
Neyaashiinigmiing, ON N0H 2T0

Dear Chief Nadjiwon:

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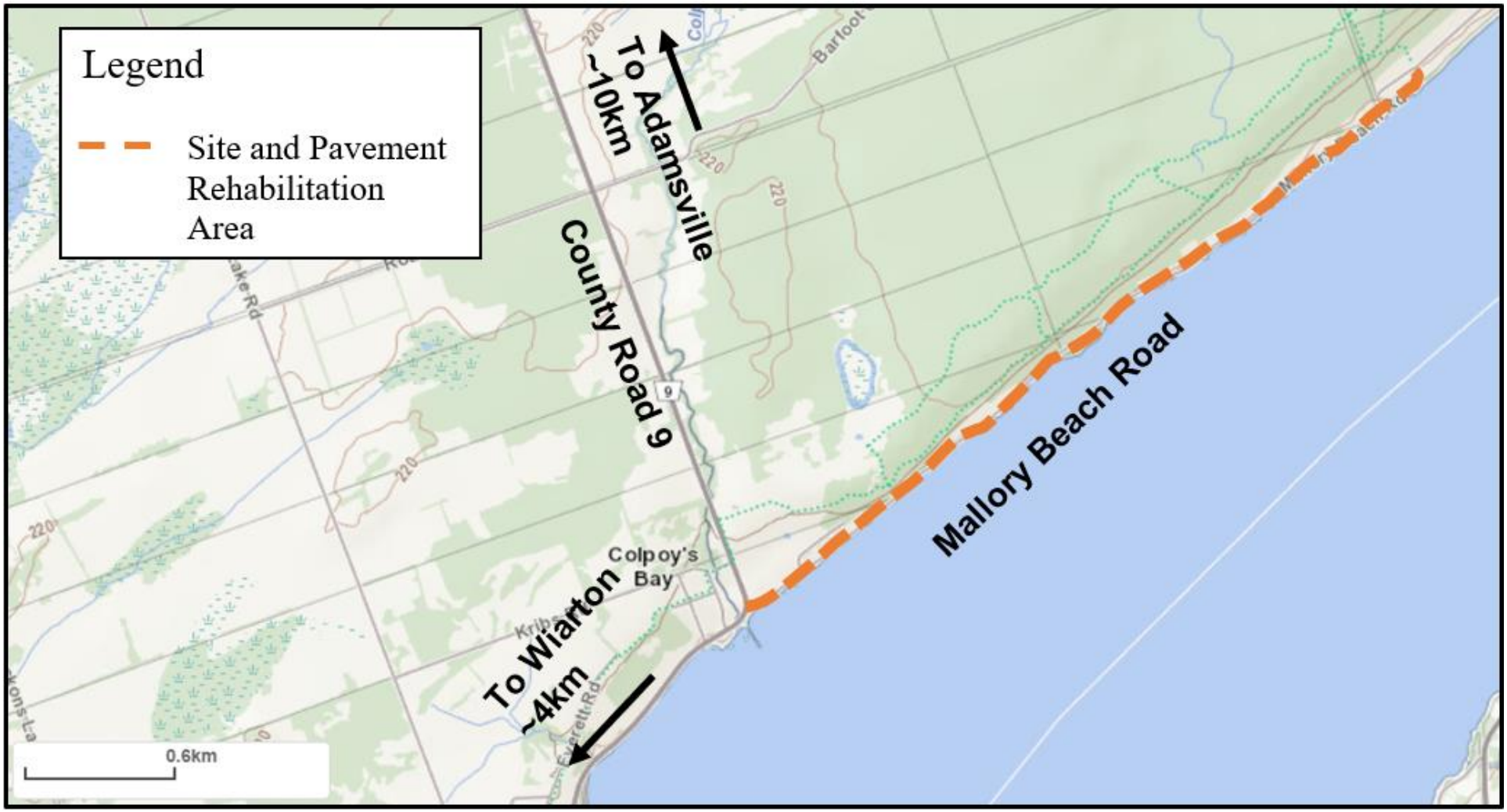

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2120

Chief Lester Anoquot
Saugeen First Nation
6493 Highway 21, RR 1
Southampton, ON N0H 2L0

Dear Chief Anoquot:

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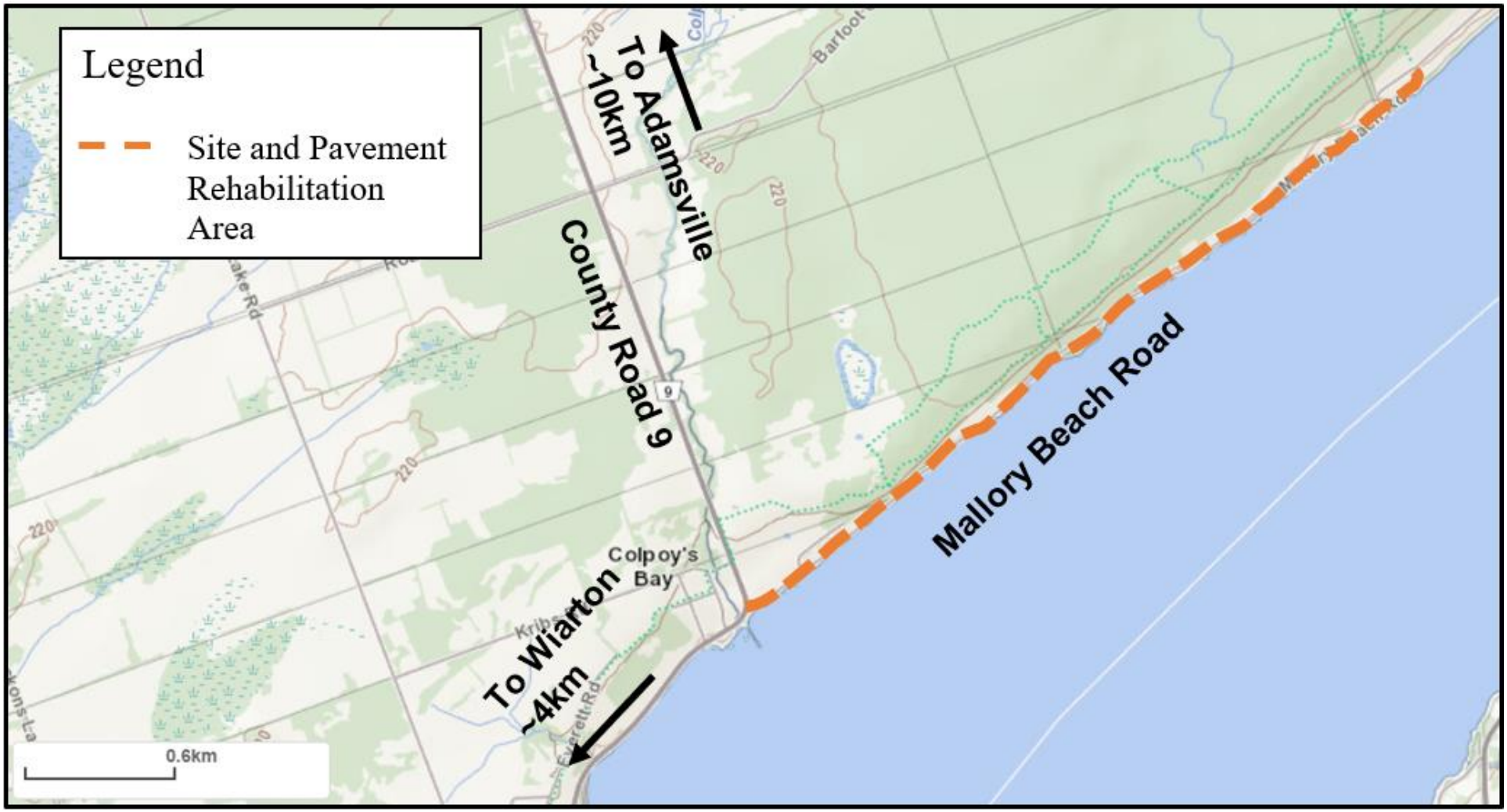

PLANMAC ENGINEERING INC.

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Chief Guy Monague
Beausoleil First Nation
11 O'Gemaa Miikaan
Christian Island, ON L9M 0A9

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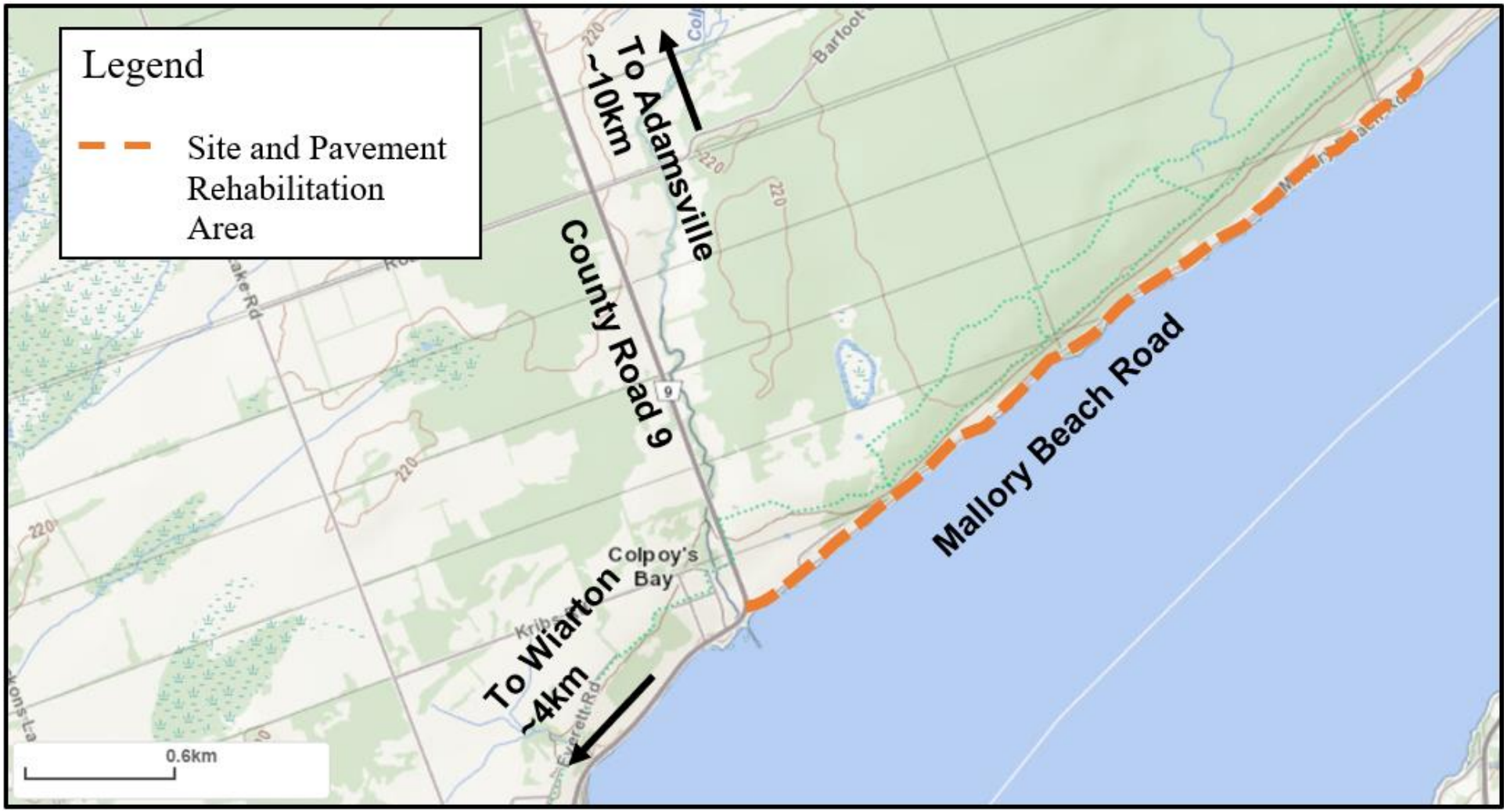

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2120

Chief Edward Williams
Chippewas of Rama First Nation
5884 Rama Road, Suite 200
Rama, ON L3V 6H6

Dear Chief Williams:

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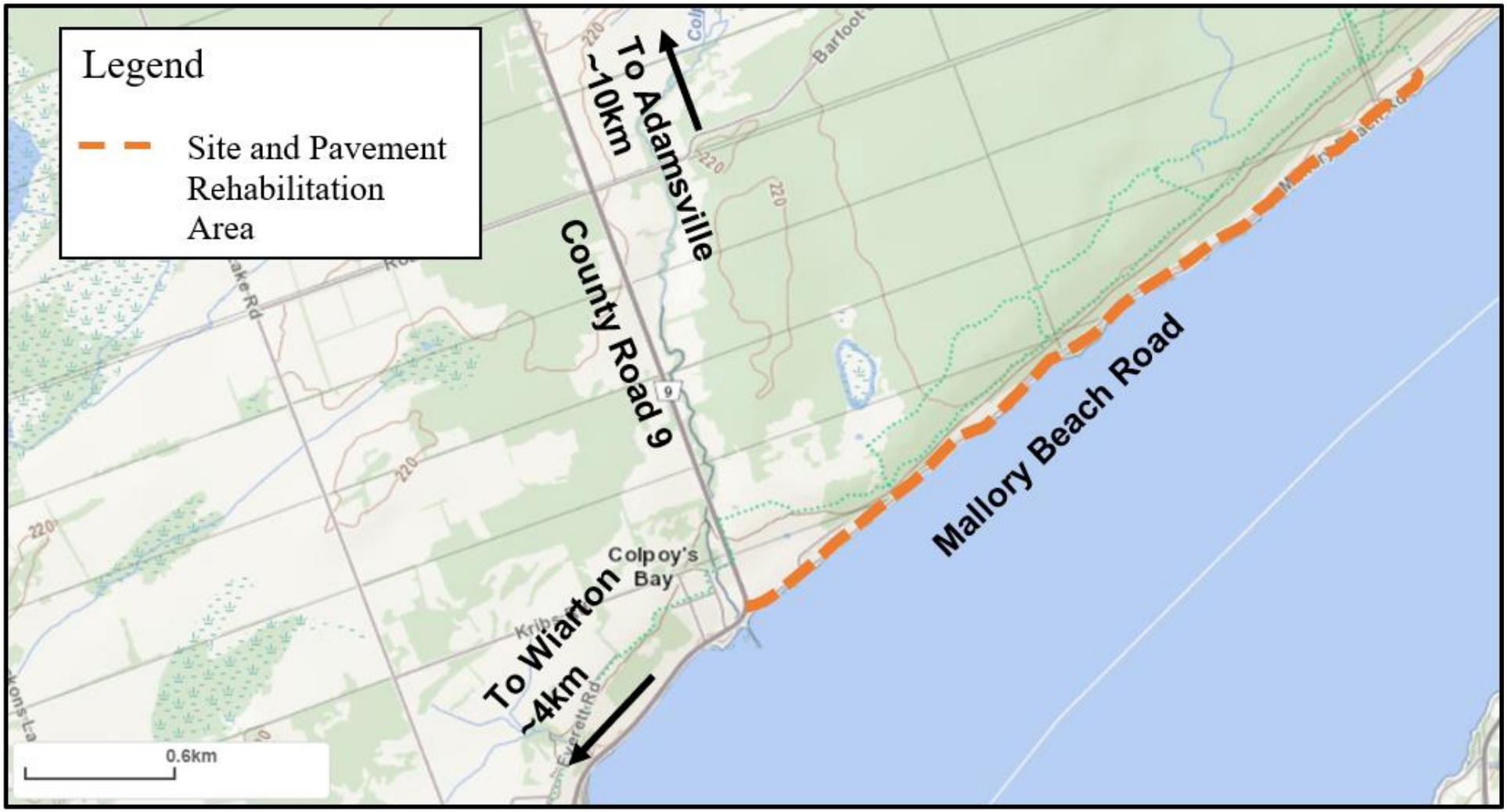

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2120

Chief Phillip Franks
Wahta Mohawks First Nation
2664 Muskoka Road #38, PO Box 260
Bala, ON P0C 1A0

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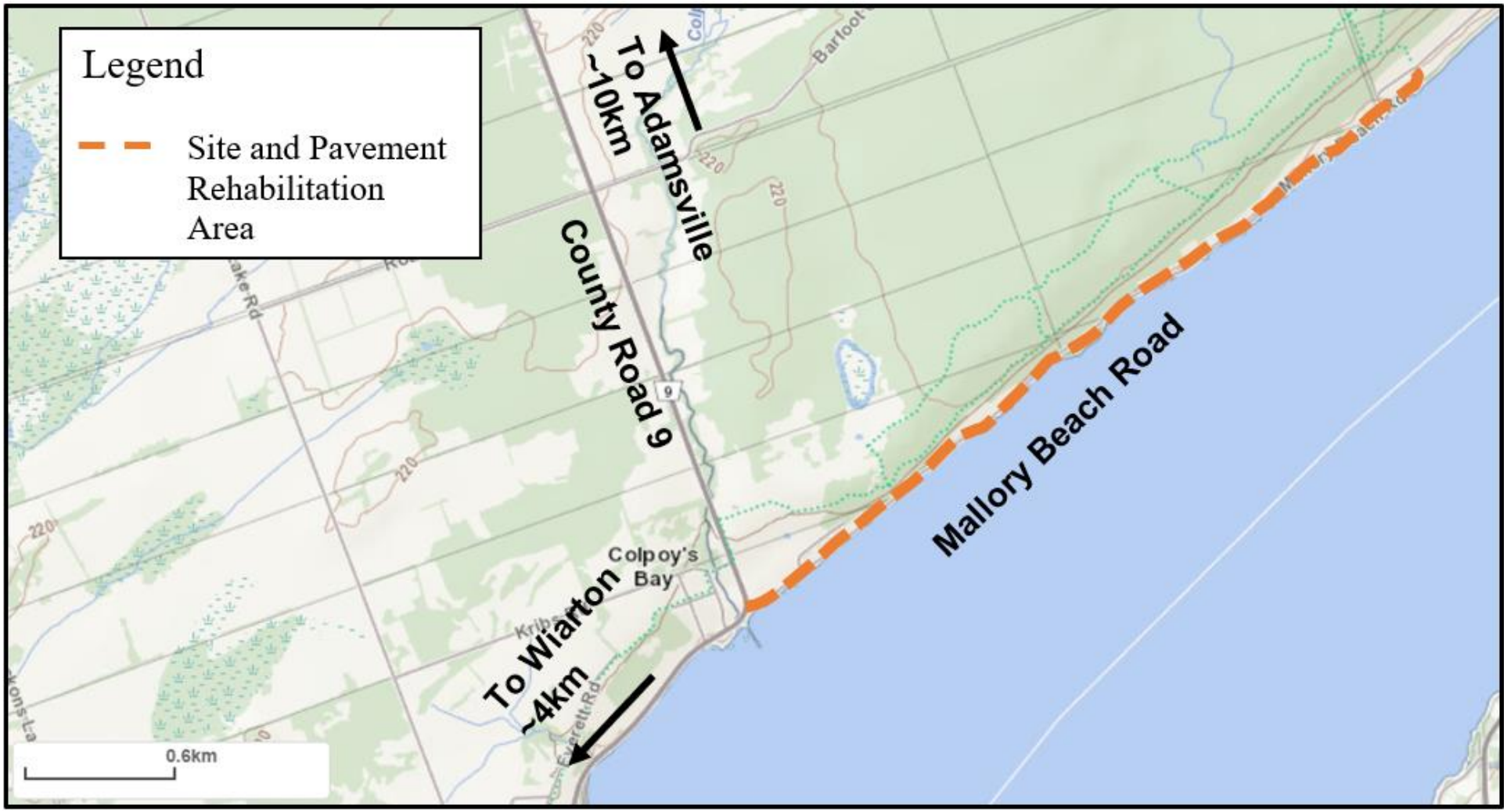

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2120

Chief Donna Big Canoe
Chippewas of Georgina Island
Georgina Island Administration Office, RR 2 Box N-13
Sutton West, ON L0E 1R0

Dear Chief Big Canoe:

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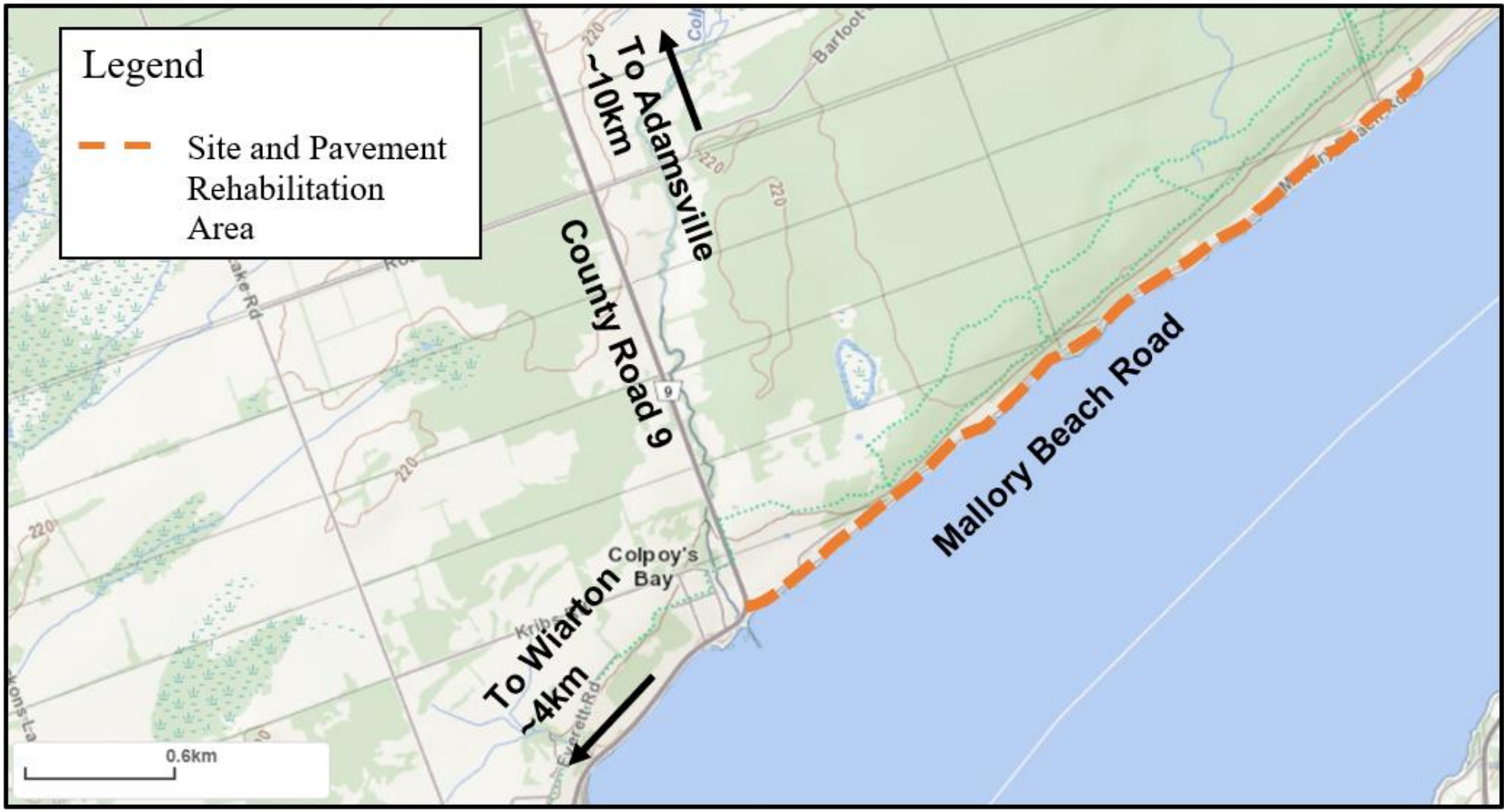

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2120

Ms. Karry Sandy-Mackenzie
Claims Coordinator
Williams Treaty First Nation
8 Creswick Court
Barrie, ON L4M 2S7

Dear Ms. Sandy-Mackenzie:

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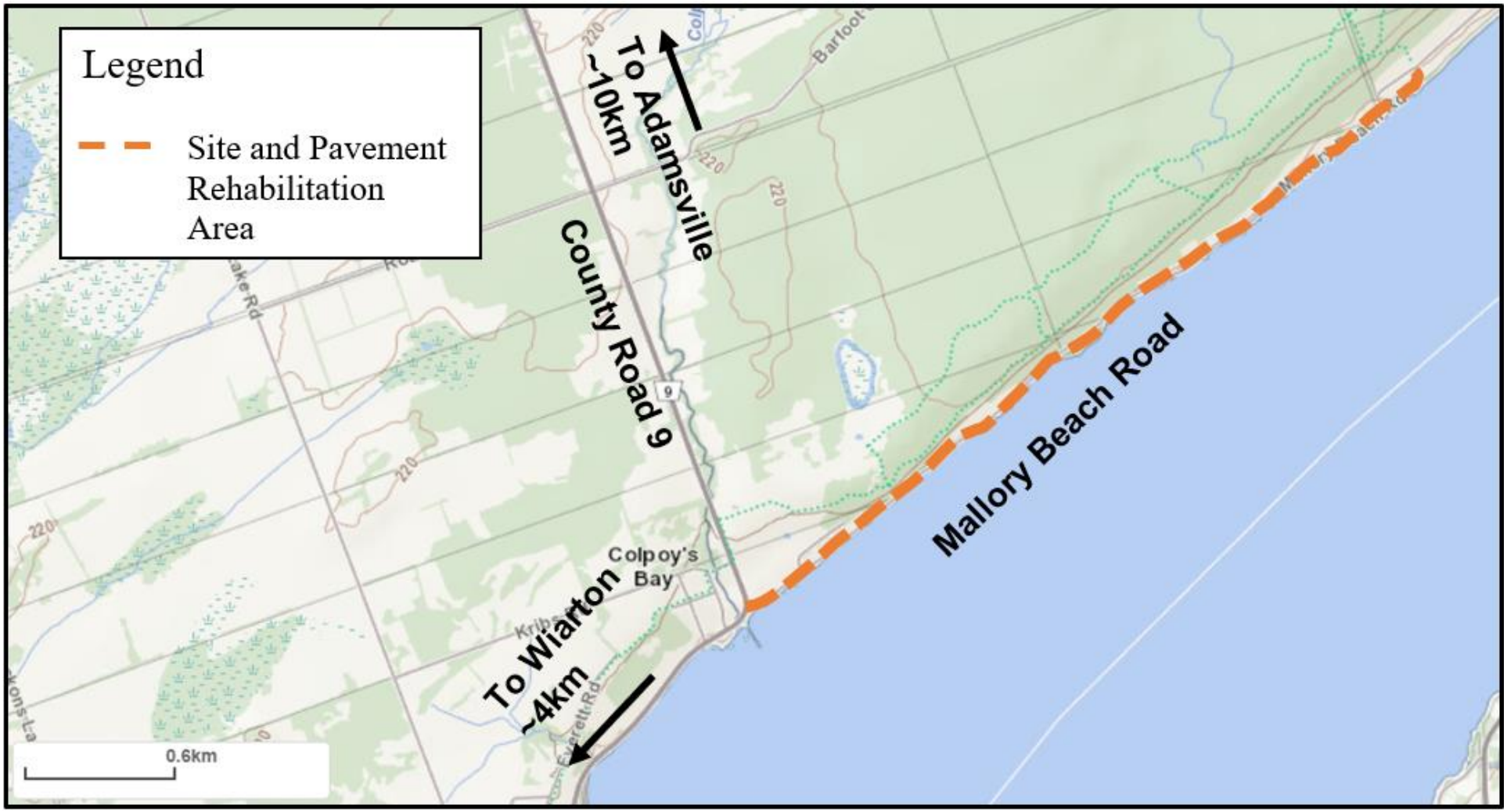


PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2113

Satish Saini
Senior Network Management Officer
Hydro One

Via email

Dear Satish Saini:

Subject: Notice of Study Commencement
Reconstruction of Mallory Beach Road, Township of South Bruce Peninsula
Municipal Class Environmental Assessment Study

Planmac Engineering Inc. has been retained by the Town of South Bruce Peninsula to undertake a Municipal Class Environmental Assessment (EA) and Preliminary Design for the reconstruction of Mallory Beach Road for 3.6 km from County Road 9 to Kathleen Avenue. The location of the site is shown on the below map.

The project will be completed in accordance with the approved Schedule 'A+' planning process as outlined in the Municipal Class Environmental Assessment Document (October 2000 as amended in 2007, 2011 & 2015), published by the Municipal Engineer's Association.

Your cooperation in providing any utility asset information within the shown study area is anticipated and appreciated. If you have any questions please call me at (416) 626-5300 x 204 or email me at mneumann@planmac.com.

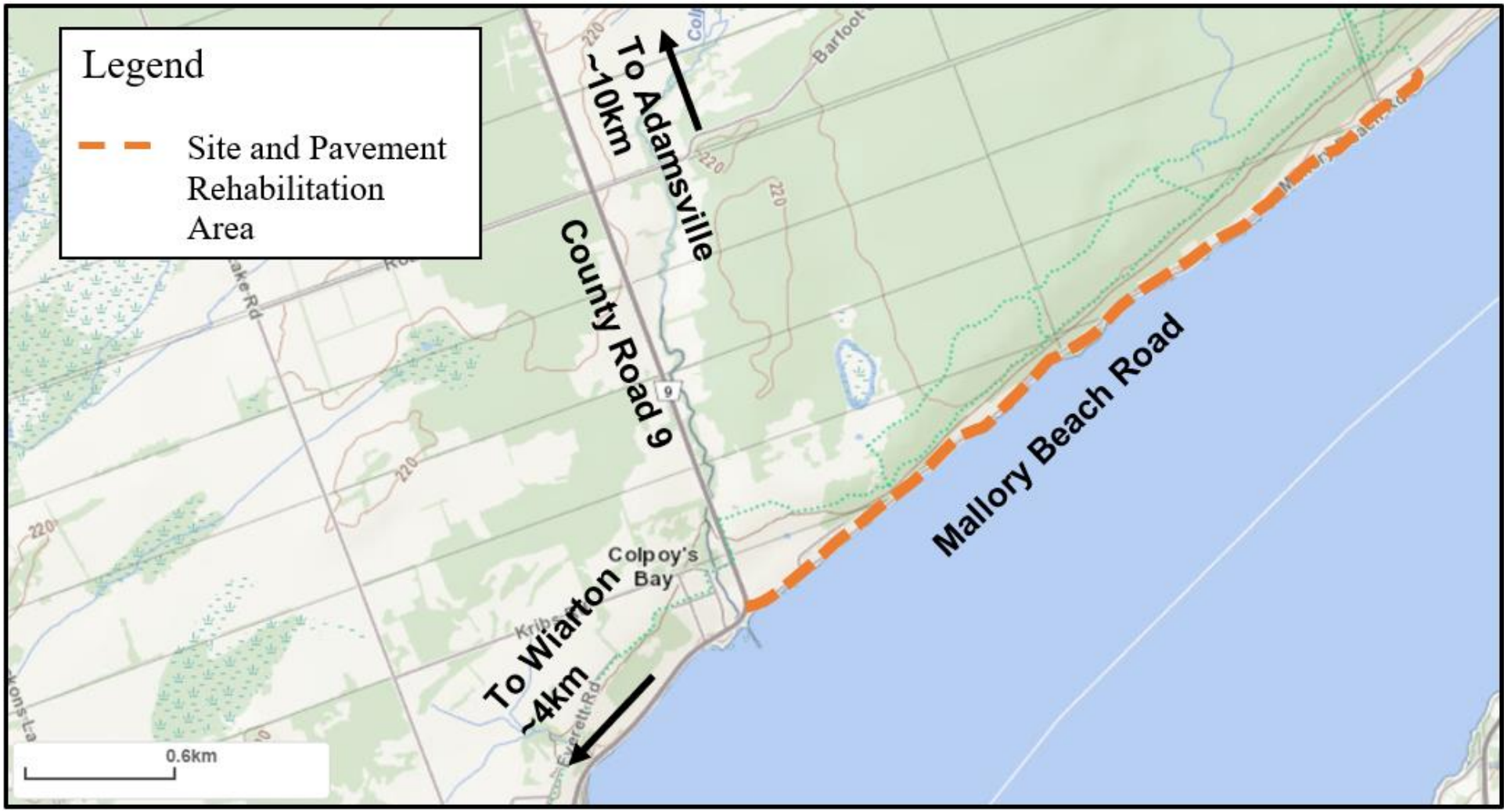
Sincerely,

Mike Neumann, P.Eng.
Senior Project Manager, Planmac Engineering Inc.
Tel: (416) 626-5300 x 204
Email: mneumann@planmac.com

cc: Lara Widdifield, Director of Public Works, Town of South Bruce Peninsula
Chris Cornfield, Manager of Operations (Public Works), Town of South Bruce Peninsula
Jeff Huang, Deputy Project Manager, Planmac Engineering Inc.
Alastair Ross, Environmental Planner, Planmac Engineering Inc.

Encl. Key Map

Key Map - Reconstruction of Mallory Beach Road



PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2113

Carrier Girardin
Bell

Via email

Dear Carrier Girardin:

Subject: Notice of Study Commencement
Reconstruction of Mallory Beach Road, Township of South Bruce Peninsula
Municipal Class Environmental Assessment Study

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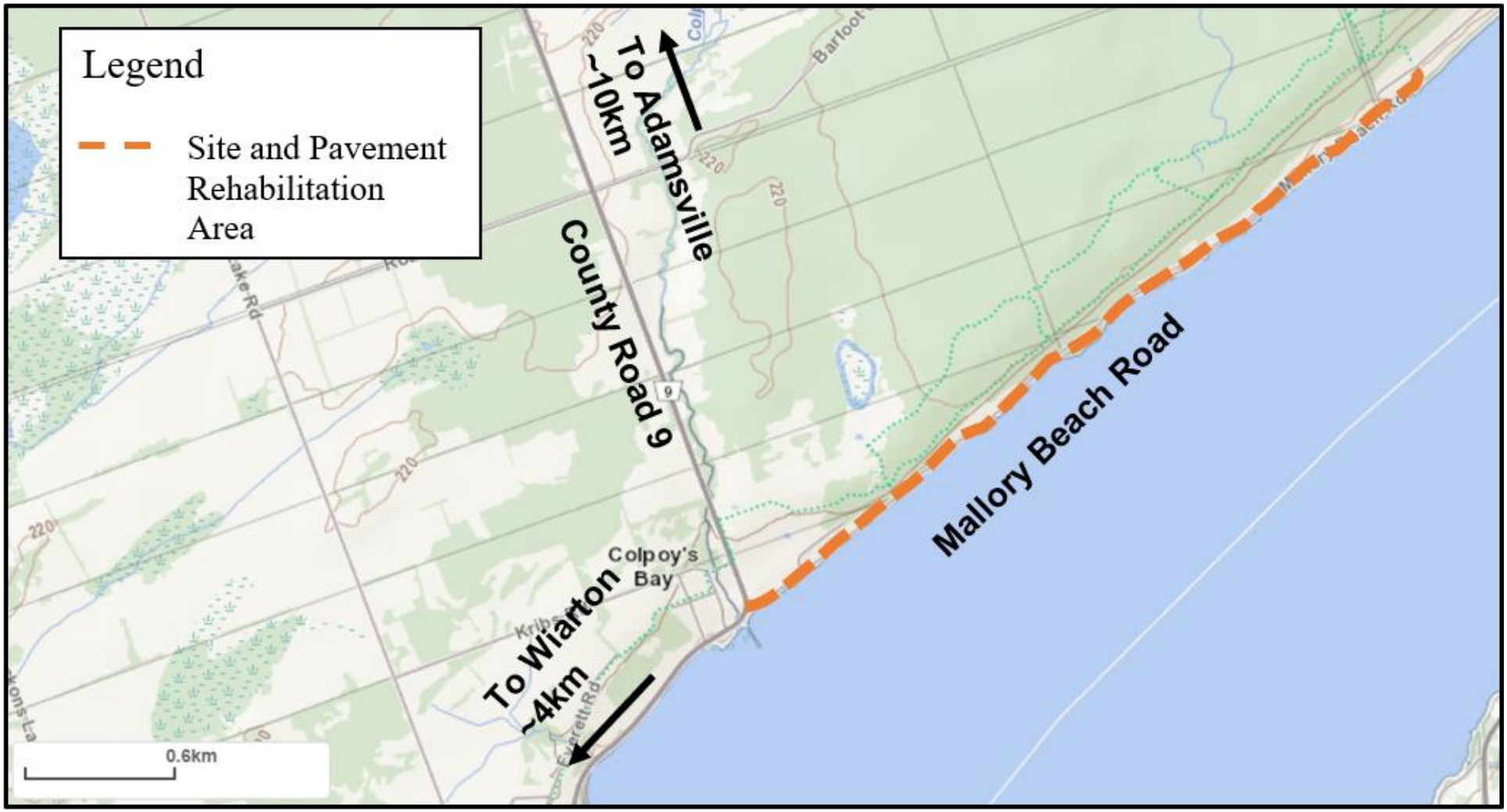

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2113

Nick Kellar
Implementation Manager
Bell

Via email

Dear Nick Kellar:

Subject: Notice of Study Commencement
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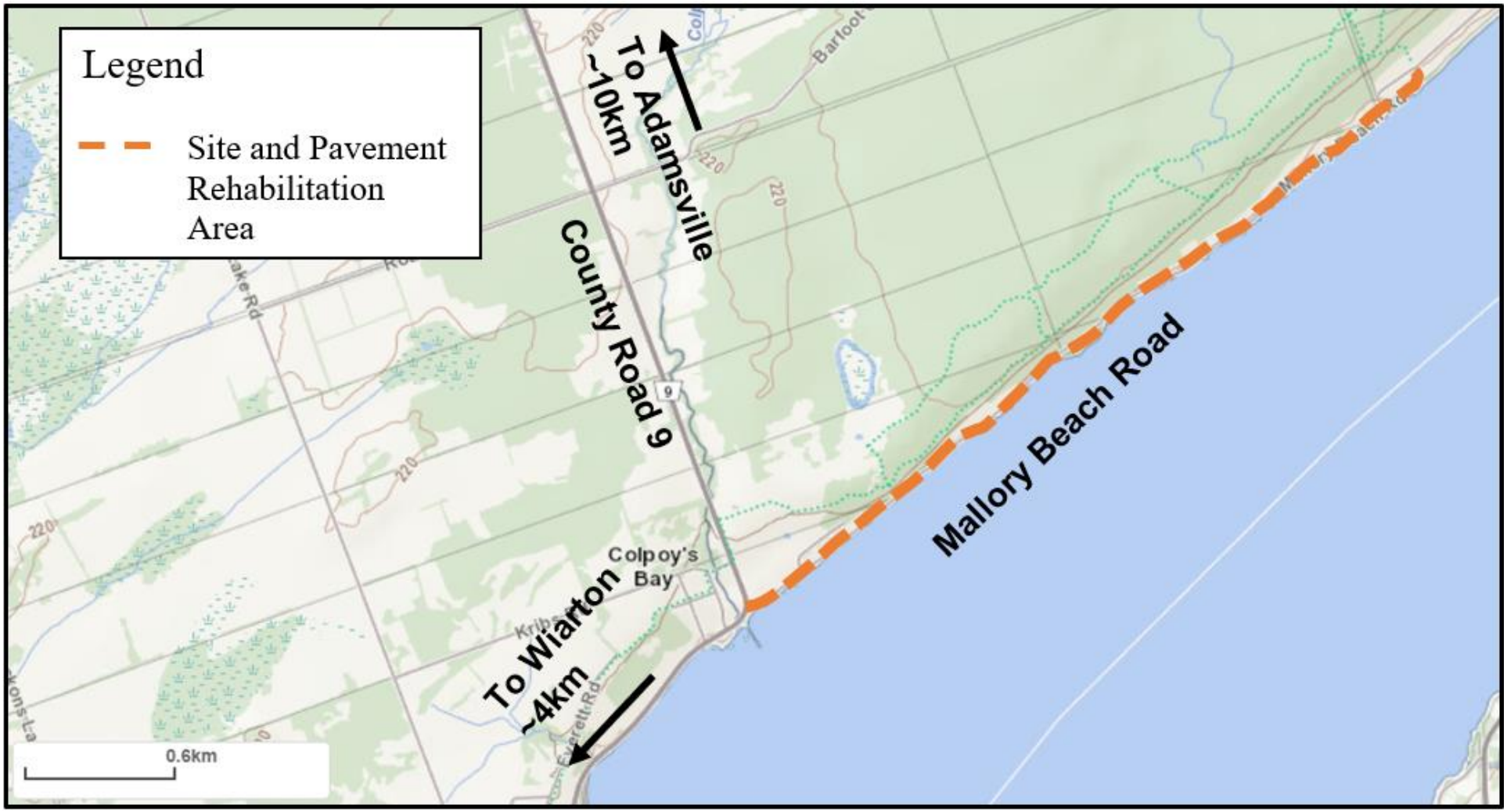

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2113

Tony Dominguez
Rogers

Via email

Dear Tony Dominguez:

Subject: Notice of Study Commencement
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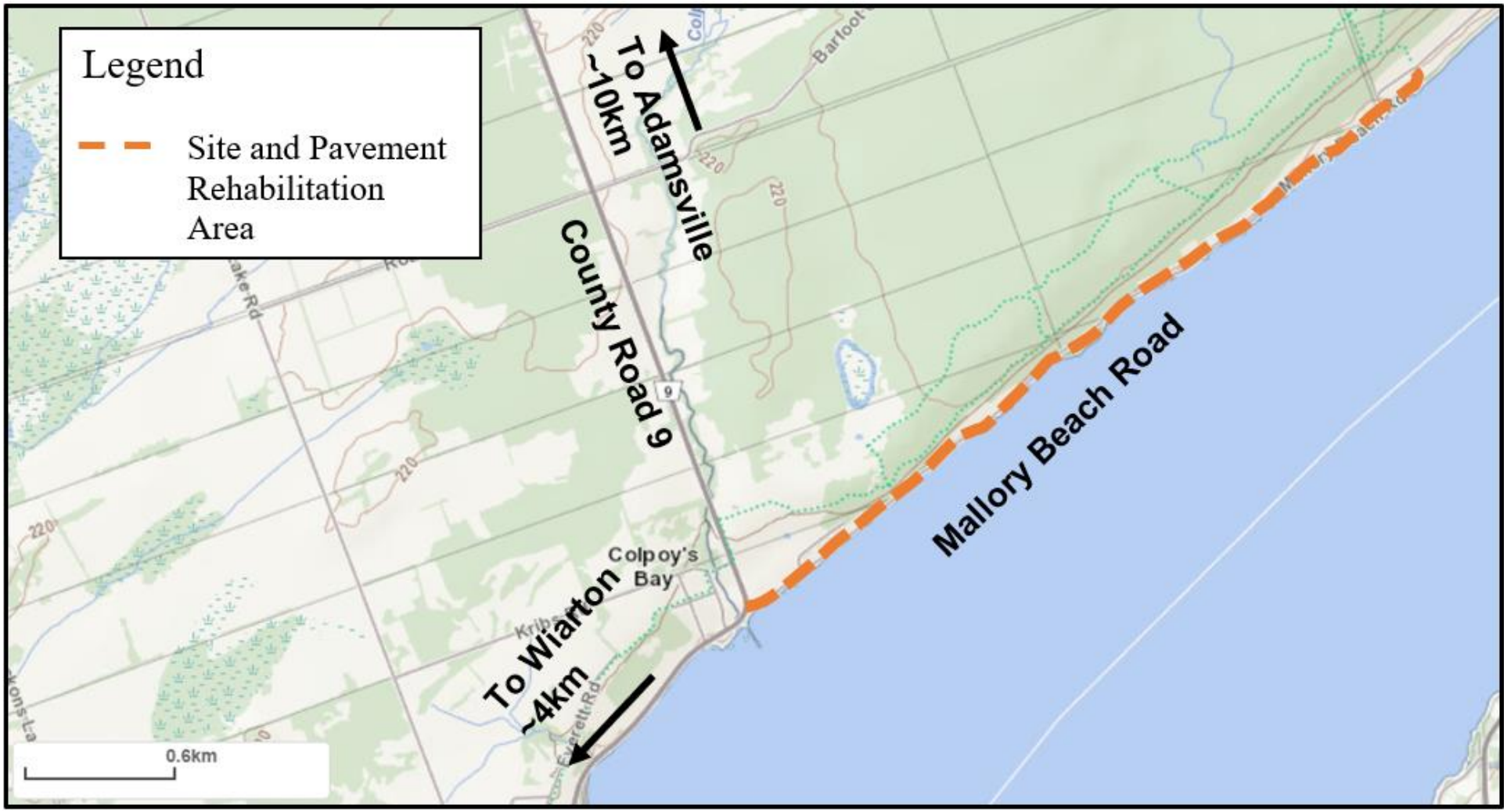

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2113

Kevin Schimus
Advisor, Construction & Project Management
Union Gas

Via email

Dear Kevin Schimus:

Subject: Notice of Study Commencement
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Municipal Class Environmental Assessment Study

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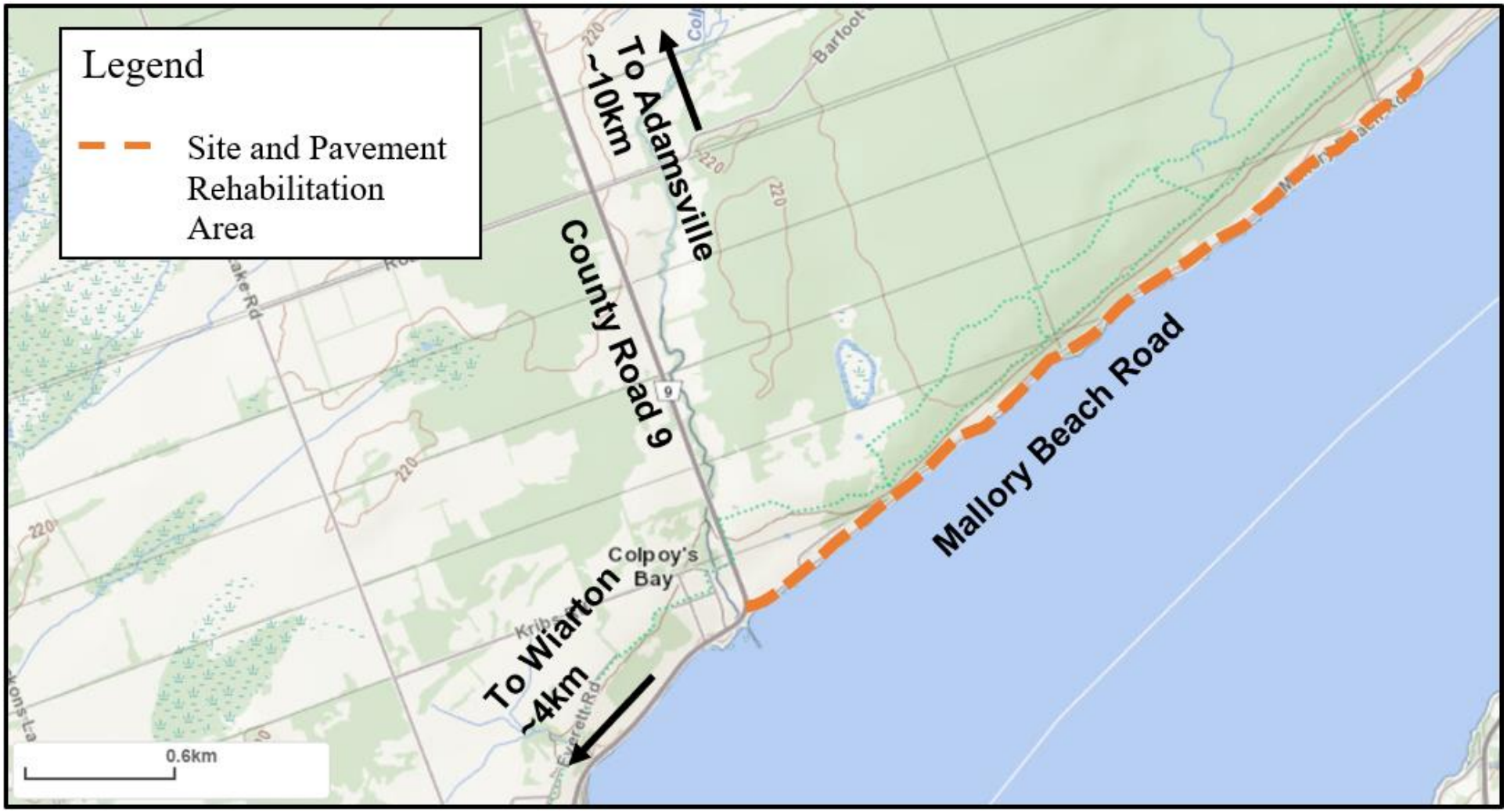

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2113

Michael Andrews
President & CEO
Bruce Telecom
3145 Highway 21 North
Tiverton, ON N0G 2T0

Dear Michael Andrews:

Subject: Notice of Study Commencement
Reconstruction of Mallory Beach Road, Township of South Bruce Peninsula
Municipal Class Environmental Assessment Study

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Email: mneumann@planmac.com

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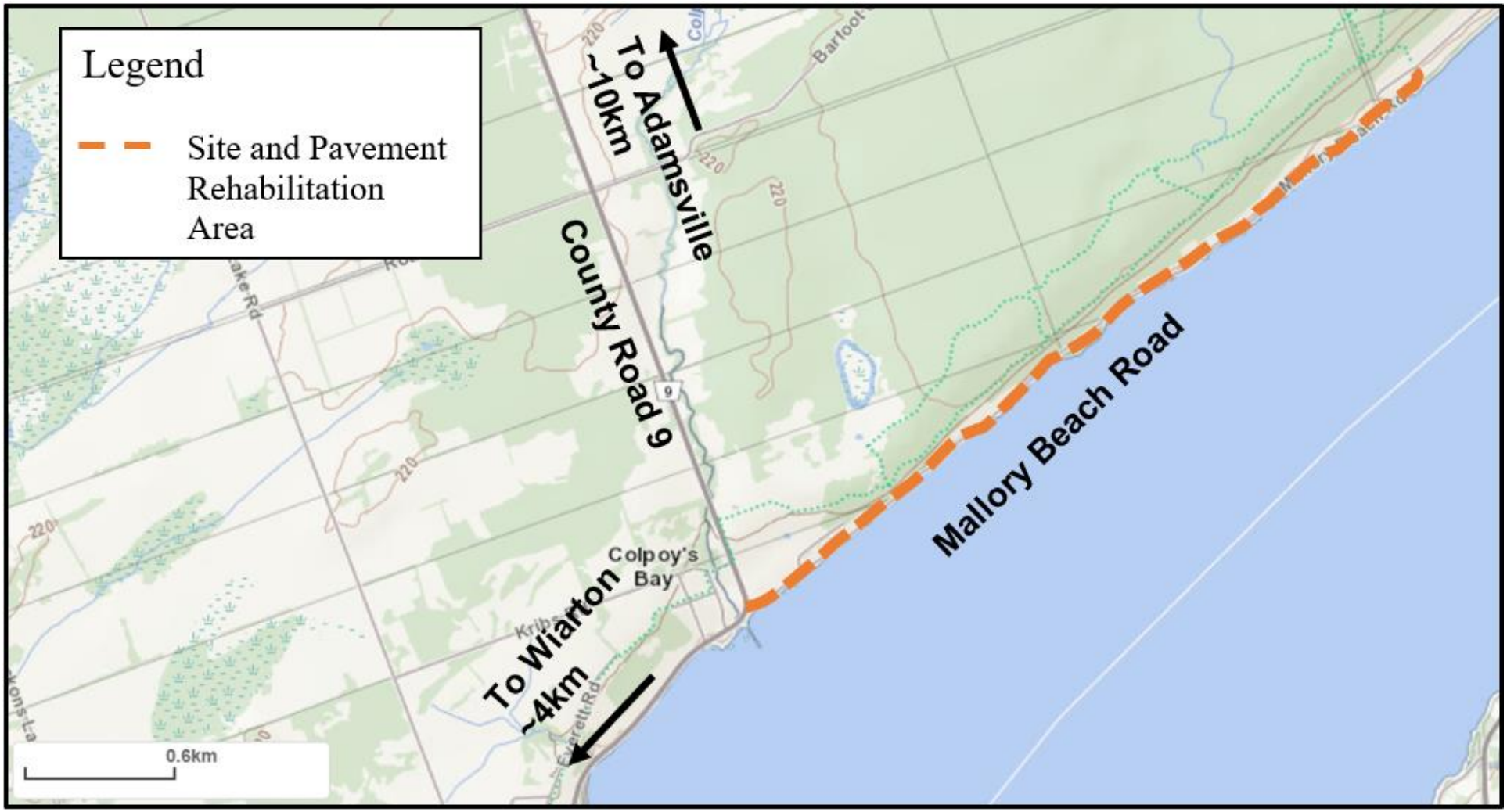

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2113

Blair Almond
President
Bruce Street Technologies Limited
Box 1049, 3 Grey Street North
Thornbury, ON N0H 2P0

Dear Blair Almond:

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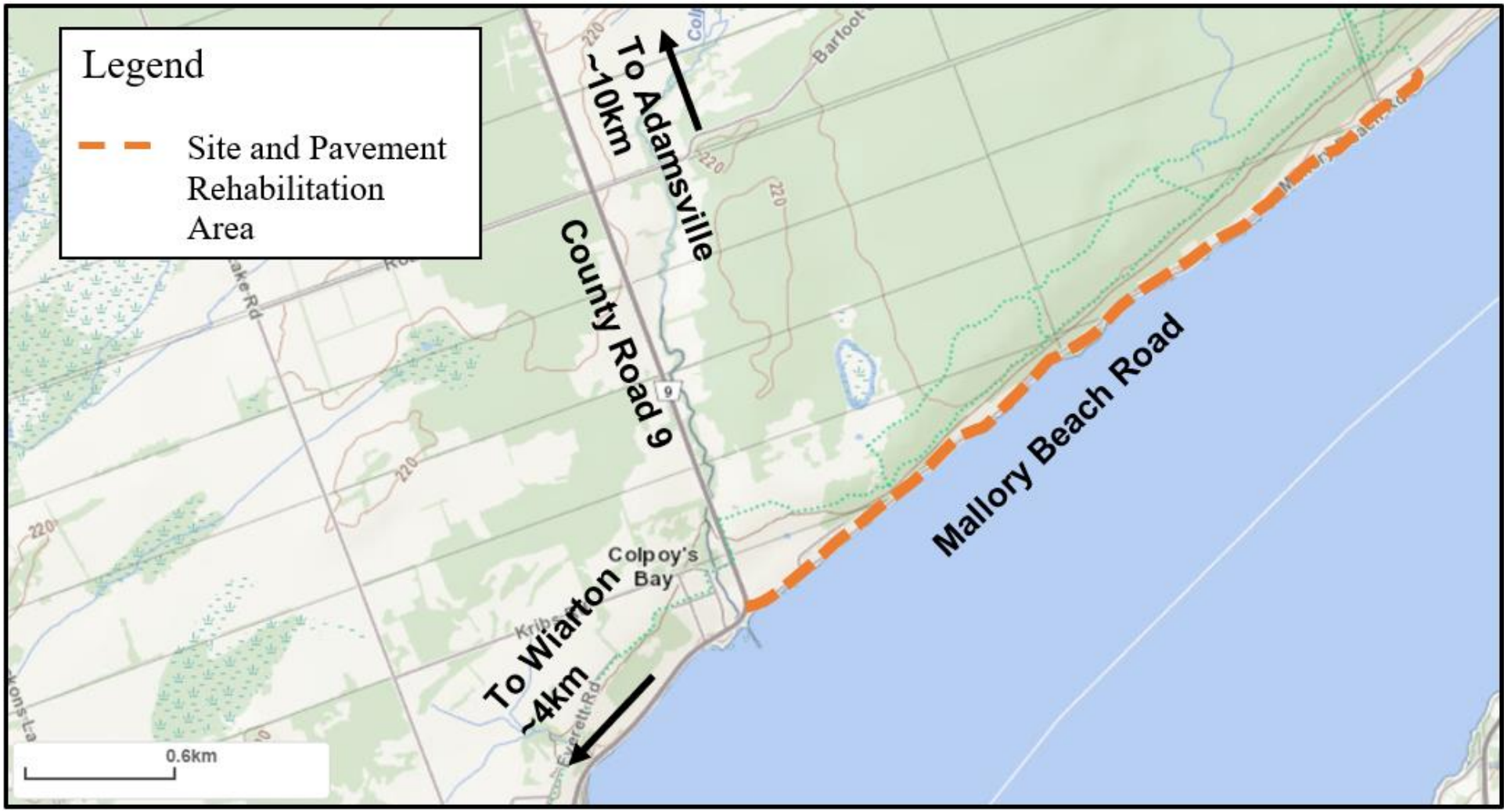

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2113

Jason Moore
Owner/Director
Connect The Dots Fibre Communications Inc.
134 Margraret Street
Meaford, ON N4L 1C1

Dear Jason Moore:

Subject: Notice of Study Commencement
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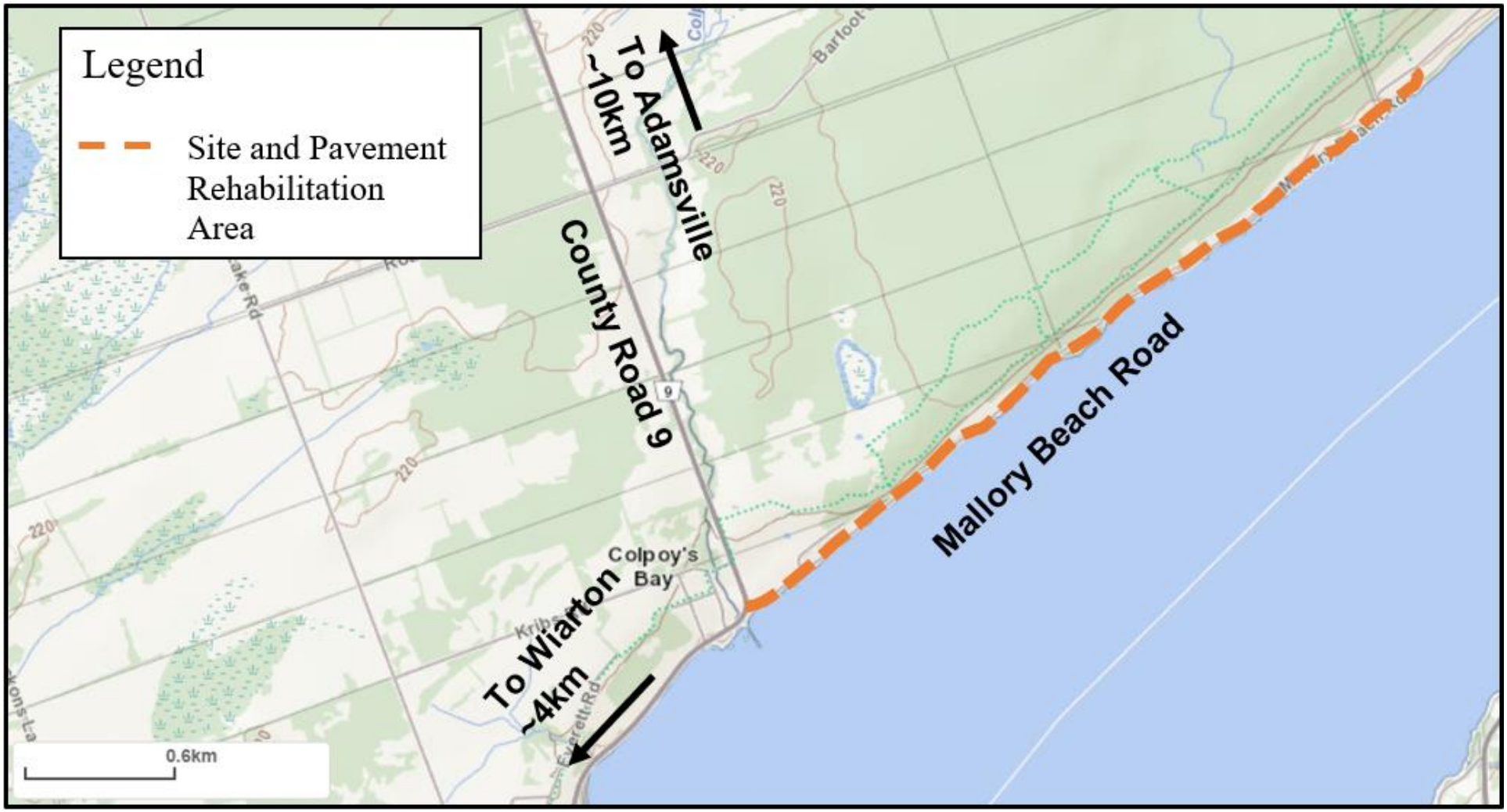

PLANMAC ENGINEERING INC.

April 14, 2021 Planmac File: 2113

Richard Gils
President
GB Tel Incorporated
PO Box 10032 Keeling Place
Owen Sound, ON N4K 0B3

Dear Richard Gils:

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Email: mneumann@planmac.com

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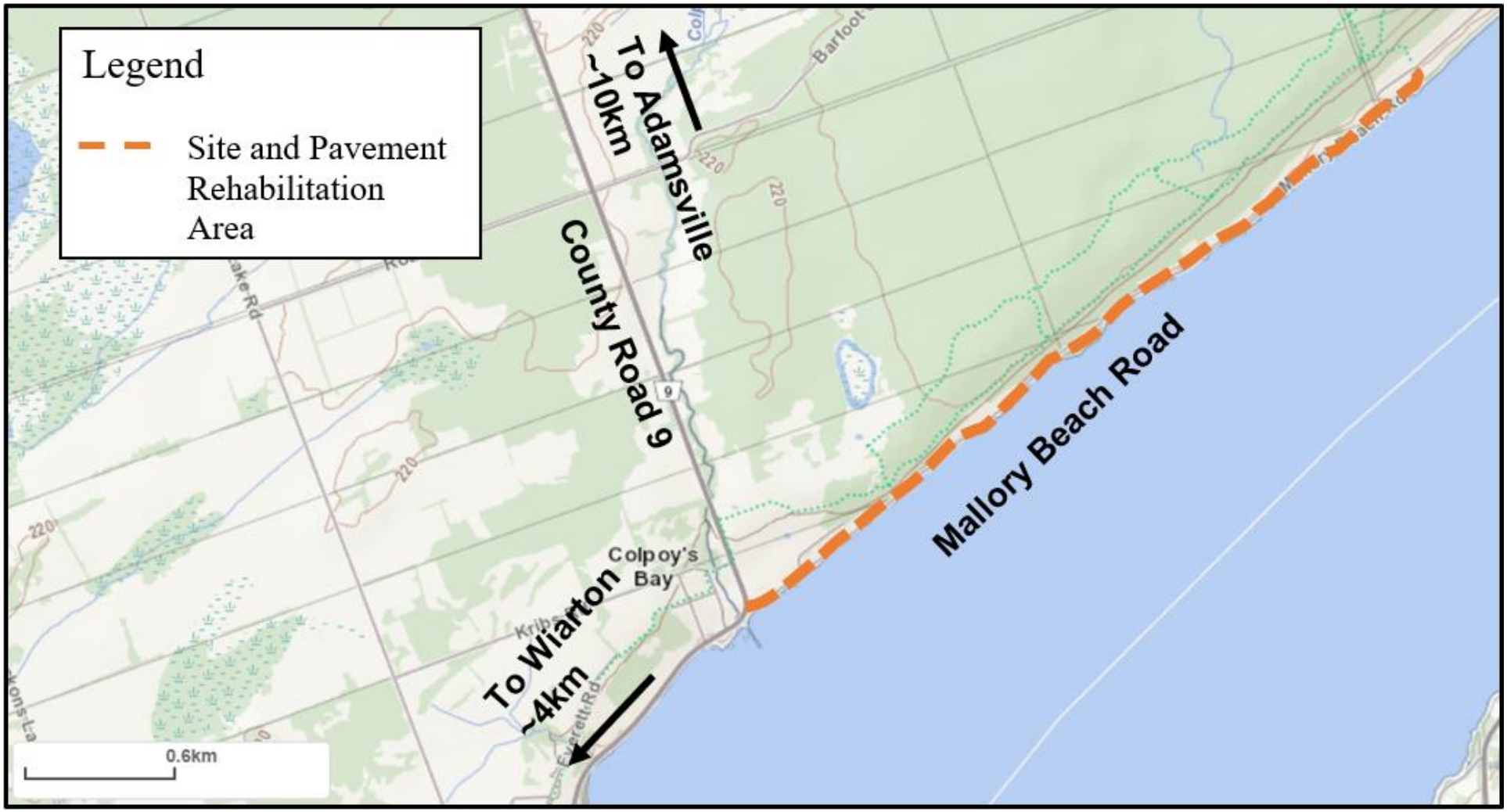

Appendix H

Group	Title	First Name	Last Name	Role
External Agencies				
Ministry of the Environment, Conservation and Parks	Project Information Form will be sent to MECP as per EA protocol. Separate spreadshe			
Ministry of Natural Resources and Forestry	Ms.	Tracy	Allison	Resources Management Supervisor
Bruce County	Mr.	Jerry	Haan	Operations Manager
Bruce County	Mr.	David	Smith	Community Emergency Management Coordinator
Bruce County	Mr.	Miguel	Pelletier	Director - Transportation and Environmental Services
South Bruce Peninsula	Chief	Daniel	Robinson	Chief, Fire Services
Ontario Provincial Police - Wiarton	Sirs			
Mallory Beach Ratepayers Association	Mr.	David	Elliott	President
Indigenous Communities				
Métis Nation of Ontario	Ms.	Rachelle	Brunelle-McColl	President
First Nation	Chief	Greg	Nadjiwon	Chief
First Nation	Chief	Lester	Anoquot	Chief
First Nation	Chief	Guy	Monague	Chief
First Nation	Chief	Edward	Williams	Chief
First Nation	Chief	Phillip	Franks	Chief
First Nation	Chief	Donna	Big Canoe	Chief
First Nation	Ms.	Karry	Sandy-Mackenzie	Claims Coordinator
Utilities				
Hydro One		Satish	Saini	Senior Network Management Officer
Bell		Carrier	Girardin	
Bell		Nick	Kellar	Implementation Manager
Rogers		Tony	Dominguez	

Union Gas		Kevin	Schimus	Advisor, Construction & Project Management
Brue Telecom		Michael	Andrews	President & CEO
Bruce Street Technologies Ltd.		Blair	Almond	President
Connect The Dots		Jason	Moore	Owner/Director
GB Tel		Richard	Gils	President

Company / Agency	Address	City	Province	Postal Code	Phone (#)
et provided with Study Commencement materials.					
Ministry of Natural Resources and Forestry, Owen Sound Field Office	1450 7th Avenue East	Owen Sound	ON	N4K 2Z1	[redacted]
Bruce County Transportation and Environmental Services	30 Park Street	Walkerton	ON	N0G 2V0	(519) 881-1291
Bruce County Emergency Management	30 Park Street	Walkerton	ON	N0G 2V0	(519) 881-1291
Bruce County Transportation and Environmental Services	30 Park Street	Walkerton	ON	N0G 2V0	(519) 881-1291
South Bruce Peninsula Emergency Service/Fire	382 George Street	Wiarton	ON	N0H 2T0	(519) 534-1400 ext. 142
Ontario Provincial Police - Wiarton	50 Berford St	Wiarton	ON	N0H 2T0	(519) 534-1323
Mallory Beach Ratepayers Association					
Métis Nation of Ontario (MNO) Owen Sound Office (District 7)	380 9th Street East	Owen Sound	ON	N4K 1P1	(705) 527-1228 ext. 215
Chippewas of Nawash Unceded First Nation	132 Lakeshore Boulevard	Neyaashiinigmiing	ON	N0H 2T0	(519) 372 3069
Saugeen First Nation	6493 Highway 21, RR 1	Southampton	ON	N0H 2L0	(519) 797 2781
Beausoleil First Nation	11 O'Gemaa Miikaan	Christian Island	ON	L9M 0A9	
Chippewas of Rama First Nation	5884 Rama Road, Suite 200	Rama	ON	L3V 6H6	(705) 325-3611
Wahta Mohawks First Nation	2664 Muskoka Road #38, PO Box 260	Bala	ON	P0C 1A0	(705) 762 2354
Chippewas of Georgina Island	Georgina Island Administration Office, RR 2 Box N-13	Sutton West	ON	L0E 1R0	(705) 437 1337
Williams Treaty First Nation	8 Creswick Court	Barrie	ON	L4M 2S7	
Hydro One					
Bell					
Bell					
Rogers					

Union Gas					
Bruce Telecom	3145 Highway 21 North	Tiverton	ON	N0G 2T0	
Bruce Street Technologies Limited	Box 1049, 3 Grey Street North	Thornbury	ON	N0H 2P0	
Connect The Dots Fibre Communications Inc.	134 Margraret Street	Meaford	ON	N4L 1C1	
GB Tel Incorporated	PO Box 10032 Keeling Place	Owen Sound	ON	N4K 0B3	

Appendix I

Table 1: Summary and Analysis of Speed Data

Speed Data Summary and Analysis							
Location	Count	Average speed (km/h)	Fastest speed (km/h)	Speed Violations (%)	Enforcable violations	Enforcement rating	Window of Study (days)
1	3107.00	41.00	84.00	0.28	879.00	Medium	9.00
2	3123.00	37.00	104.00	0.13	396.00	Medium	8.00
3	3270.00	32.00	55.00	0.01	25.00	Low	8.00
4	3762.00	41.00	81.00	0.24	909.00	Medium	8.00
5	4568.00	42.00	122.00	0.28	1262.00	Medium	8.00
MEDIAN:	3270.00	41.00	84.00	0.24	879.00	N/a	8.00
AVERAGE:	3566.00	38.60	89.20	0.19	694.20	N/a	8.20
Per day:	434.88	N/a	N/a	N/a	84.66	N/a	N/a

Table 2: Summary and Analysis of Traffic Count Data

Vehicle Count Data (Daily Totals)			
104	410	412	577
367	448	125	612
382	495	394	457
318	453	411	399
402	417	426	479
342	407	441	454
346	82	440	471
385	190	417	504
513	486	392	425
559	463	78	182
523	89	146	465
413	482		

Vehicle Count Data Analysis	
Mean	386.59
Median	415.00
Mode	417.00
Count	46.00
Count over 500	6.00
Count under 500	40.00
% of Days over 500	0.15

Appendix J

30% Design Review
SCHEDULE OF QUANTITIES & UNIT PRICES

Town of South Bruce Peninsula - Reconstruction of Mallory Beach Road

Item No.	SP No.	OPSS Reference	Description	Unit	Est. Qty	Unit Price	Total Price
Part A - General Items							
A.01	1	-	Site Mobilization and Demobilization	L.S.	100%	$ 20,000.00	$ 20,000.00
A.02	2	706	Traffic Control and Signs	L.S.	100%	$ 35,000.00	$ 35,000.00
A.03	3	-	Access to Work Area	L.S.	100%	$ 20,000.00	$ 20,000.00
A.04	4	-	Performance Bond	L.S.	100%	$ 8,000.00	$ 8,000.00
A.05	5	-	Labour and Material Payment Bond	L.S.	100%	$ 8,000.00	$ 8,000.00
					Part A - Sub Total		$ 91,000.00
Part B - Environmental Works							
B.01	6	771, 805	Environmental Protection - Silt Fence	L.S	100%	$ 8,000.00	$ 8,000.00
B.02	7	201	Environmental Protection - Close Cut Clearing	L.S.	100%	$ 5,000.00	$ 5,000.00
B.03	8	182, 185, 517, 539, 805	Temporary Flow Passage System Including Coffer Dams and Dewatering	L.S.	100%	$ 35,000.00	$ 35,000.00
B.04	9	511	Supply and Place D-50 Rip-Rap - 300mm Thick	m^2	720	$ 125.00	$ 90,000.00
B.05	10	511	Supply and Place Geotextile	m^2	720	$ 10.00	$ 7,200.00
					Part B - Sub Total		$ 48,000.00
Part C - Road / Civil Works							
C.01	11	206	Earth Excavation for Swale	m^3	576	$ 25.00	$ 14,400.00
C.02	12	310	Supply, Place, and Compact 50 mm HL3 Hot Mix Asphalt	t	3,087	$ 190.00	$ 586,530.00
C.03	13	510	Asphalt Removal - Partial Depth (50 mm)	m^2	25,200	$ 9.00	$ 226,800.00
C.04	14	510	Removal of Pipes and Culverts	m	31	$ 90.00	$ 2,790.00
C.05	15	421, 401	Supply, Place 375mm Pipe Culvert	m	40	$ 500.00	$ 20,000.00
C.06	16	421, 401	Supply, Place 450mm Pipe Culvert	m	50	$ 600.00	$ 30,000.00
C.07	17	421, 401	Supply, Place 525mm Pipe Culvert	m	14	$ 700.00	$ 9,800.00
C.08	18	421, 401	Supply, Place 600mm Pipe Culvert	m	33	$ 800.00	$ 26,400.00
C.09	19	510	Removal of Cable Guide Rail	m	50	$ 25.00	$ 25.00
C.10	20	510	Removal of Anchor Block	each	2	$ 500.00	$ 1,000.00
C.11	21	1504, 1505	Supply, Place Steel Beam Guide Rail	m	50	$ 400.00	$ 20,000.00
C.12	22	732	Supply, Place SBEAT	each	2	$ 7,500.00	$ 15,000.00
C.13	23	180, 804	Site Restoration / Sodding	L.S	100%	$ 45,000.00	$ 45,000.00
C.14	24	180, 804	Pavement Marking	m	3,600	$ 15.00	$ 54,000.00
					Part D - Sub Total		$ 1,051,745.00

Part D - Contingency							
D.01	25	-	Contingency (20%)	Allow	100%		$ 238,149.00
					Part E - Sub Total		$ 238,149.00
Part E - Utility Works							
E.01	26	-	Temporary Protection of Utilities	L.S.	100%	$ 50,000.00	$ 50,000.00
					Part F - Sub Total		$ 50,000.00
Part F - Provisional Items							
F.01	26	206, 803, 804, 805	Ditch Cleanout	m	100	$ 50.00	$ 5,000.00
F.02	27	202	Drill and Blast Rock	m	100	$ 500.00	$ 50,000.00
					Part F - Sub Total		$ 55,000.00
Estimated Total (Excluding HST)							**$ 1,533,894.00**

30% Design Review
SCHEDULE OF QUANTITIES & UNIT PRICES

Town of South Bruce Peninsula - Reconstruction of Mallory Beach Road
Phase 1 (2023) - Areas with Poor Sight Lines / Hazards

Item No.	SP No.	OPSS Reference	Description	Unit	Est. Qty	Unit Price	Total Price
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A.05	5	-	Labour and Material Payment Bond	L.S.	100%	$ 8,000.00	$ 8,000.00
					Part A - Sub Total		$ 76,000.00
Part B - Environmental Works							
B.01	6	771, 805	Environmental Protection - Silt Fence	L.S	100%	$ 2,000.00	$ 2,000.00
B.02	7	201	Environmental Protection - Close Cut Clearing	L.S.	100%	$ 2,000.00	$ 2,000.00
B.03	8	182, 185, 517, 539, 805	Temporary Flow Passage System Including Coffer Dams and Dewatering	L.S.	100%	$ 10,000.00	$ 10,000.00
B.04	9	511	Supply and Place D-50 Rip-Rap - 300mm Thick	m^2	144	$ 125.00	$ 18,000.00
B.05	10	511	Supply and Place Geotextile	m^2	144	$ 10.00	$ 1,440.00
					Part B - Sub Total		$ 33,440.00
Part C - Road / Civil Works							
C.01	11	206	Earth Excavation for Swale	m^3	58	$ 25.00	$ 1,440.00
C.02	12	310	Supply, Place, and Compact 50 mm HL3 Hot Mix Asphalt	t	309	$ 190.00	$ 58,653.00
C.03	13	510	Asphalt Removal - Partial Depth (50 mm)	m^2	2,520	$ 9.00	$ 22,680.00
C.04	14	510	Removal of Pipes and Culverts	m	0	$ 90.00	$ -
C.05	15	421, 401	Supply, Place 375mm Pipe Culvert	m	0	$ 500.00	$ -
C.06	16	421, 401	Supply, Place 450mm Pipe Culvert	m	0	$ 600.00	$ -
C.07	17	421, 401	Supply, Place 525mm Pipe Culvert	m	0	$ 700.00	$ -
C.08	18	421, 401	Supply, Place 600mm Pipe Culvert	m	0	$ 800.00	$ -
C.09	19	510	Removal of Cable Guide Rail	m	50	$ 25.00	$ 1,250.00
C.10	20	510	Removal of Anchor Block	each	2	$ 500.00	$ 1,000.00
C.11	21	1504, 1505	Supply, Place Steel Beam Guide Rail	m	50	$ 400.00	$ 20,000.00
C.12	22	732	Supply, Place SBEAT	each	2	$ 7,500.00	$ 15,000.00
C.13	23	180, 804	Site Restoration / Sodding	L.S	100%	$ 45,000.00	$ 45,000.00
C.14	24	180, 804	Pavement Marking	m	360	$ 15.00	$ 5,400.00

				Part D - Sub Total			$ 170,423.00
Part D - Contingency							
D.01	25	-	Contingency (20%)	Allow	100%		$ 55,972.60
				Part E - Sub Total			$ 55,972.60
Part E - Utility Works							
E.01	26	-	Temporary Protection of Utilities	L.S.	100%	$ 15,000.00	$ 15,000.00
				Part F - Sub Total			$ 15,000.00
Part F - Provisional Items							
F.01	26	206, 803, 804, 805	Ditch Cleanout	m	0	$ 50.00	$ -
F.02	27	202	Drill and Blast Rock	m	100	$ 500.00	$ 50,000.00
				Part F - Sub Total			$ 50,000.00
Estimated Total (Excluding HST)							**$ 400,835.60**

30% Design Review
SCHEDULE OF QUANTITIES & UNIT PRICES

Town of South Bruce Peninsula - Reconstruction of Mallory Beach Road
Phase 2 (2024) - The S Curve at Sta. 3+540.620 to 3+667.014

Item No.	SP No.	OPSS Reference	Description	Unit	Est. Qty	Unit Price	Total Price
Part A - General Items							
A.01	1	-	Site Mobilization and Demobilization	L.S.	100%	$ 20,000.00	$ 20,000.00
A.02	2	706	Traffic Control and Signs	L.S.	100%	$ 10,000.00	$ 10,000.00
A.03	3	-	Access to Work Area	L.S.	100%	$ 20,000.00	$ 20,000.00
A.04	4	-	Performance Bond	L.S.	100%	$ 8,000.00	$ 8,000.00
A.05	5	-	Labour and Material Payment Bond	L.S.	100%	$ 8,000.00	$ 8,000.00
					Part A - Sub Total		$ 66,000.00
Part B - Environmental Works							
B.01	6	771, 805	Environmental Protection - Silt Fence	L.S	100%	$ 2,000.00	$ 2,000.00
B.02	7	201	Environmental Protection - Close Cut Clearing	L.S.	100%	$ 2,000.00	$ 2,000.00
B.03	8	182, 185, 517, 539, 805	Temporary Flow Passage System Including Coffer Dams and Dewatering	L.S.	100%	$ 5,000.00	$ 5,000.00
B.04	9	511	Supply and Place D-50 Rip-Rap - 300mm Thick	m^2	36	$ 125.00	$ 4,500.00
B.05	10	511	Supply and Place Geotextile	m^2	36	$ 10.00	$ 360.00
					Part B - Sub Total		$ 13,860.00
Part C - Road / Civil Works							
C.01	11	206	Earth Excavation for Swale	m^3	29	$ 25.00	$ 720.00
C.02	12	310	Supply, Place, and Compact 50 mm HL3 Hot Mix Asphalt	t	154	$ 190.00	$ 29,326.50
C.03	13	510	Asphalt Removal - Partial Depth (50 mm)	m^2	1,260	$ 9.00	$ 11,340.00
C.04	14	510	Removal of Pipes and Culverts	m	0	$ 90.00	$ -
C.05	15	421, 401	Supply, Place 375mm Pipe Culvert	m	0	$ 500.00	$ -
C.06	16	421, 401	Supply, Place 450mm Pipe Culvert	m	13	$ 600.00	$ 7,800.00
C.07	17	421, 401	Supply, Place 525mm Pipe Culvert	m	0	$ 700.00	$ -
C.08	18	421, 401	Supply, Place 600mm Pipe Culvert	m	0	$ 800.00	$ -
C.09	19	510	Removal of Cable Guide Rail	m	0	$ 25.00	$ -
C.10	20	510	Removal of Anchor Block	each	0	$ 500.00	$ -
C.11	21	1504, 1505	Supply, Place Steel Beam Guide Rail	m	0	$ 400.00	$ -
C.12	22	732	Supply, Place SBEAT	each	0	$ 7,500.00	$ -
C.13	23	180, 804	Site Restoration / Sodding	L.S	100%	$ 45,000.00	$ 45,000.00
C.14	24	180, 804	Pavement Marking	m	180	$ 15.00	$ 2,700.00

				Part D - Sub Total			$ 96,886.50
Part D - Contingency							
D.01	25	-	Contingency (20%)	Allow	100%		$ 35,349.30
				Part E - Sub Total			$ 35,349.30
Part E - Utility Works							
E.01	26	-	Temporary Protection of Utilities	L.S.	100%	$ 15,000.00	$ 15,000.00
				Part F - Sub Total			$ 15,000.00
Part F - Provisional Items							
F.01	26	206, 803, 804, 805	Ditch Cleanout	m	53	$ 50.00	$ 2,650.00
F.02	27	202	Drill and Blast Rock	m	0	$ 500.00	$ -
				Part F - Sub Total			$ 2,650.00
Estimated Total (Excluding HST)							**$ 229,745.80**

30% Design Review
SCHEDULE OF QUANTITIES & UNIT PRICES

Town of South Bruce Peninsula - Reconstruction of Mallory Beach Road
Phase 3 (2025) - Remaining Areas

Item No.	SP No.	OPSS Reference	Description	Unit	Est. Qty	Unit Price	Total Price
Part A - General Items							
A.01	1	-	Site Mobilization and Demobilization	L.S.	100%	$ 20,000.00	$ 20,000.00
A.02	2	706	Traffic Control and Signs	L.S.	100%	$ 20,000.00	$ 20,000.00
A.03	3	-	Access to Work Area	L.S.	100%	$ 20,000.00	$ 20,000.00
A.04	4	-	Performance Bond	L.S.	100%	$ 8,000.00	$ 8,000.00
A.05	5	-	Labour and Material Payment Bond	L.S.	100%	$ 8,000.00	$ 8,000.00
					Part A - Sub Total		$ 76,000.00
Part B - Environmental Works							
B.01	6	771, 805	Environmental Protection - Silt Fence	L.S	100%	$ 2,000.00	$ 2,000.00
B.02	7	201	Environmental Protection - Close Cut Clearing	L.S.	100%	$ 2,000.00	$ 2,000.00
B.03	8	182, 185, 517, 539, 805	Temporary Flow Passage System Including Coffer Dams and Dewatering	L.S.	100%	$ 10,000.00	$ 10,000.00
B.04	9	511	Supply and Place D-50 Rip-Rap - 300mm Thick	m^2	612	$ 125.00	$ 76,500.00
B.05	10	511	Supply and Place Geotextile	m^2	612	$ 10.00	$ 6,120.00
					Part B - Sub Total		$ 96,620.00
Part C - Road / Civil Works							
C.01	11	206	Earth Excavation for Swale	m^3	490	$ 25.00	$ 12,240.00
C.02	12	310	Supply, Place, and Compact 50 mm HL3 Hot Mix Asphalt	t	2,624	$ 190.00	$ 498,550.50
C.03	13	510	Asphalt Removal - Partial Depth (50 mm)	m^2	21,420	$ 9.00	$ 192,780.00
C.04	14	510	Removal of Pipes and Culverts	m	31	$ 90.00	$ 2,790.00
C.05	15	421, 401	Supply, Place 375mm Pipe Culvert	m	26	$ 500.00	$ 13,000.00
C.06	16	421, 401	Supply, Place 450mm Pipe Culvert	m	29	$ 600.00	$ 17,400.00
C.07	17	421, 401	Supply, Place 525mm Pipe Culvert	m	12	$ 700.00	$ 8,400.00
C.08	18	421, 401	Supply, Place 600mm Pipe Culvert	m	22	$ 800.00	$ 17,600.00
C.09	19	510	Removal of Cable Guide Rail	m	0	$ 25.00	$ -
C.10	20	510	Removal of Anchor Block	each	0	$ 500.00	$ -
C.11	21	1504, 1505	Supply, Place Steel Beam Guide Rail	m	0	$ 400.00	$ -
C.12	22	732	Supply, Place SBEAT	each	0	$ 7,500.00	$ -
C.13	23	180, 804	Site Restoration / Sodding	L.S	100%	$ 45,000.00	$ 45,000.00
C.14	24	180, 804	Pavement Marking	m	3,060	$ 15.00	$ 45,900.00
					Part D - Sub Total		$ 853,660.50

Part D - Contingency							
D.01	25	-	Contingency (20%)	Allow	100%		$ 205,256.10
					Part E - Sub Total		$ 205,256.10
Part E - Utility Works							
E.01	26	-	Temporary Protection of Utilities	L.S.	100%	$ 15,000.00	$ 15,000.00
					Part F - Sub Total		$ 15,000.00
Part F - Provisional Items							
F.01	26	206, 803, 804, 805	Ditch Cleanout	m	47	$ 50.00	$ 2,350.00
F.02	27	202	Drill and Blast Rock	m	0	$ 500.00	$ -
					Part F - Sub Total		$ 2,350.00
Estimated Total (Excluding HST)							**$ 1,248,886.60**

Appendix K

Appendix K: Summary of Significant Occupational Interests and their Locations within the Roadway Allowance

Type of Occupancy	911 Number	Landowner Name
Driveway, Gravel	Not Available	[redacted]
Driveway, Gravel	11	[redacted]
Driveway, Gravel; Mailbox	15	[redacted]
Driveway, Asphalt; Mailbox	17	[redacted]
Driveway, Gravel; Mailbox	21	[redacted]
Driveway, Aphalt	23	[redacted]
Parking space, Gravel; Deck; Building	71	[redacted]
Driveway, Gravel	Not Available	[redacted]
Driveway, Gravel	107	[redacted]
Driveway, Gravel	111	[redacted]
Driveway, Gravel	113	[redacted]
Driveway, Asphalt; Mailbox; Mailbox; Steps; Steps; Building	117	[redacted]
Driveway, Asphalt; Driveway, Gravel	121	[redacted]
Driveway, Gravel; Mailbox; Driveway, Gravel; Rock Wall	123	[redacted]
Driveway, Concrete; Mailbox: Rock Wall; Parking Space	125/129	[redacted]
Driveway, Concrete; Mailbox; gravel parking space	131	[redacted]
Driveway, Gravel; Mailbox; Building	135	[redacted]
Driveway, Gravel; Mailbox; Garden	137	[redacted]
Driveway, Gravel; Steps; Building; Mailbox	141	[redacted]
Driveway, Gravel; Mailbox; Building; Stone Wall	145	[redacted]
Driveway, Gravel; Steps; Deck	149	[redacted]
Driveway, Gravel; Mailbox; Stone steps; Dock	153	[redacted]
Driveway, Gravel; Building; Stone Wall;	155	[redacted]
Driveway, Asphalt; Mailbox; Driveway, Asphalt; Driveway, Gravel; Landscaping	157	[redacted]
Driveway, Gravel; Driveway, Gravel; Mailbox	165	[redacted]
Driveway, Gravel;	191	[redacted]
Diveway; Gravel	193	[redacted]
Driveway, Gravel; Bulding	199	[redacted]
Driveway, gravel	203	[redacted]
Driveway, gravel	207	[redacted]

Driveway, Gravel; Wood staircase	209	[redacted]
Driveway, gravel; Deck; Building	215	[redacted]
Building; Driveway, Gravel	221	[redacted]
Driveway, Gravel	227	[redacted]
Driveway, Asphalt	229	[redacted]
Driveway, Asphalt	235	[redacted]
Driveway, Gravel	237	[redacted]
Driveway, Gravel; Mailbox	239	[redacted]
Driveway, Asphalt	241	[redacted]
Driveway, Gravel; Mailbox	243	[redacted]
Driveway, Gravel; Mailbox	245	[redacted]
Driveway, Asphalt; Driveway, Asphalt	247	[redacted]
Driveway, Gravel	249	[redacted]
Driveway, Gravel	253/259	[redacted]
Driveway, Gravel	261	[redacted]
Driveway, Gravel	275	[redacted]
Driveway, Asphalt; Driveway, Asphalt, Mailbox	279	[redacted]
Driveway, Gravel	295	[redacted]
Driveway, Gravel; Driveway, Gravel;	299	[redacted]
Driveway, Gravel; Driveway, Gravel; Driveway, Asphalt; Mailbox	301	[redacted]
Driveway, Gravel; Mailbox	303	[redacted]
Driveway, Gravel	305	[redacted]
Driveway, Asphalt; Mailbox	307	[redacted]
Driveway, Gravel	313	[redacted]
Driveway, Gravel	315	[redacted]
Driveway, Gravel; Mailbox	323	[redacted]
Driveway, Gravel	325	[redacted]
Driveway, Gravel; Mailbox	327	[redacted]
Driveway, Asphalt; Mailbox; Driveway, Gravel	329	[redacted]
Driveway, Gravel; Mailbox	331	[redacted]
Driveway, Gravel; Mailbox	333	[redacted]
Driveway	337	[redacted]

Appendix L

FOLLOW UP NOTICE OF STUDY COMMENCEMENT
Reconstruction of Mallory Beach Road
Municipal Class Environmental Assessment

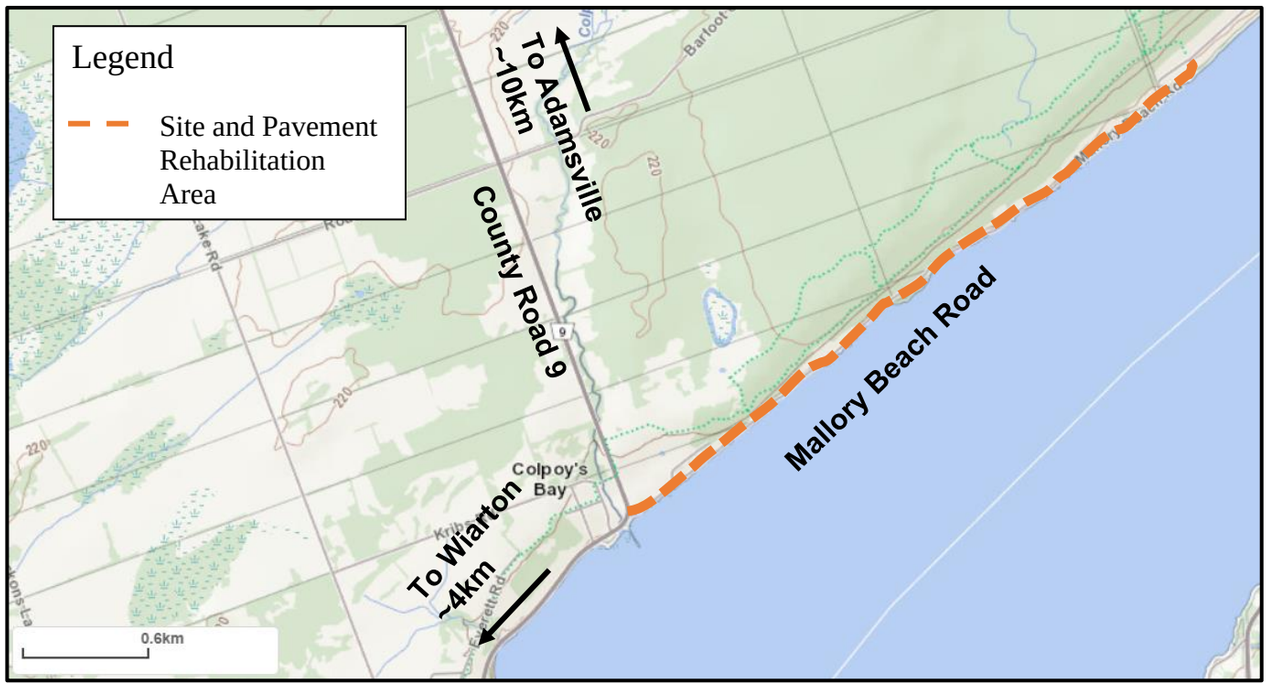
Please be advised that a notice of study commencement was originally issued to property owners in April 2021 based on properties within the study limits indicated in the key map below. Further to consultations received for the project, this follow up notice of study commencement is provided to all property owners originally circulated for the project and those property owners that are beyond the study limits to the end of Mallory Beach Road.

The Study

Planmac Engineering Inc. has been retained by the Town of South Bruce Peninsula to undertake a Municipal Class Environmental Assessment (EA) and Preliminary Design for the reconstruction of Mallory Beach Road for 3.6 km from County Road 9 to Kathleen Avenue. The location of the site is shown on the below map. The reconstruction will involve pavement rehabilitation which may consist of surface pulverization and resurfacing of the road surface to ensure an extended life expectancy is achieved.

The Process

The project will be completed in accordance with the approved Schedule 'A+' planning process as outlined in the Municipal Class Environmental Assessment Document (October 2000 as amended in 2007, 2011 & 2015), published by the Municipal Engineer's Association. Topographical, legal, and geotechnical survey work was completed in the spring/summer 2021. The preliminary design was presented to council in October 2021.



Should you have any questions regarding this project or information to aid the design process and/or environmental assessment, please feel free to contact the undersigned. To aid the design and construction, we are also interested in hearing if you have any private water or other utility assets that may be located within the roadway.

Mr. Mike Neumann, P.Eng.
Project Manager
Planmac Engineering Inc.
80 North Queen Street, Suite 400
Toronto, ON M8Z 2C9
(416) 626-5300 ext. 204
mneumann@.com

Mr. Chris Cornfield
Manager of Operations – Public Works
Town of South Bruce Peninsula
315 George Street, PO Box 310
Wiarton, ON N0H 2T0
(519) 534-1400 ext. 131
chris.cornfield@southbrucepeninsula.com

This notice issued Date, 2022

Comments and information regarding this project are being collected in accordance with the *Municipal Freedom of Information and Protection of Privacy Act* for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments received will become a part of the public record.

Appendix M

Comment	Response
Road Construction for Mallory Beach Road, Town of South Bruce Peninsula Mallory Beach Road has multi million-dollar homes, is by far the largest single street property tax income for SBP and is the poorest, most unsafe road in the town. The planned MBR reconstruction should improve vehicular safety, pedestrian safety and emergency access. The town and design team will have significant liability risks if the road is not brought up to Ontario Road standards and minimum requirements for fire access. This is the only opportunity to bring the road to at least minimal standards and increase road safety by reclaiming and using the road allowance. The road is of a 'Through road' classification with daily traffic of in excess of 500 vehicles per day. (Road study 3 years ago was 500-1000). The speed limit is posted at 40 KPH. The road is very narrow and circuitous horizontally and vertically with very poor sight lines. There is significant pedestrian traffic which must walk on the roadway surface as there are no shoulders and no space to step off the hard surface. The road has four daily school buses. This 8 km road services over 300 residences, has only one entrance and is a dead end. The road presently is only 5m to 5,5m in width with no shoulders and boxed in on either side with obstructions. Ontario geometric road standards and codes for fire truck access require a minimum of 6m.(20 ft) Large vehicles, including fire trucks are 2.6 M in body width and 3.2 M with mirrors. Currently, the lane width is 2.5 to 2.75 m. Fire trucks cannot pass each other on the road and this was evident last year with a house fire which completely blocked the road for several hours. Co-incident emergencies on the road could be calamitous and with the growing number of residences more likely. Without increased road width, evacuation due to a forest fire would be impossible with total blockage of incoming emergency fire vehicles.	We have received your letter dated [redacted] Thank you for taking the time to write to us with your thoughts and concerns. Your comments will be taken into consideration as we proceed and will be included in the Study File. Should you wish to contact us again, please feel free to reach out; my coordinates are provided below for your convenience.

Comment	Response
If the reconstruction maintains the current road width of 5m and 5,5m, again with no shoulders, and edged by structures, the town and others will have significantly increased liability risks. It is below Ontario geometric standards in width and sight lines, is below fire access requirements and does not address pedestrian safety . The shore side of this road project is Crown land that has been illegally improved, with structures, ramps and landscaping encroaching onto the road allowance. These unauthorized uses should not impact road design, or safety, nor create liability or cost for the town, province and taxpayers. Please include in the ongoing "Community Risk assessment" We demand at least the minimal standards for vehicular and pedestrian safety, as well as emergency vehicle access or the town will be held liable for mishaps due to sub standard design. In Canada, the 1995 Urban Supplement, now an integral part of the Geometric Design Guide for Canadian Roads,8 7 Considering the wide variety and number of grant programs available, the eligibility of projects of this nature should obviously be checked with the relevant authorities. recommends lane widths of 3.0 m to 3.7 m for residential streets and widths of 3.3 m to 3.7 m for collector and secondary arterial streets (speed limit 60 km/h and under). This federal guide and the provincial guides ensuing therefrom do not have regulatory status restricting municipalities and their engineers. The fact that these guides recommend a minimum width of 3.3 m (frequently 3.5 m and wider in provincial guides) for the majority of streets may partially explain the preference of Canadian engineers for wider traffic lanes, even in urban areas. In fact, one might assume that compliance with the minimum recommended value may help to protect an engineer against the risk of legal action in the event of a collision (Los Angeles County, 2011, pp. 1-5). It should be noted, however, that the guides for road design in some provinces are more favourable than others to the implementation of 3.0 m wide traffic lanes in municipal street networks. References: https://www.ncchpp.ca/docs/2014_EnvBati_LaneWidth_En.pdf	
Thanks for meeting with the Mallory Beach Ratepayers Association last week. I wasn't able to attend but listened to the recording today. I don't remember receiving a letter about the project but wanted to inform you that I have 2 water lines and a hydro line going underneath Mallory Beach Road from my property.	No Response
I live at [redacted] Mallory Beach Road and received a notice in my mail box the other day.	Thanks for getting in touch with us and providing the location notice below. We are

Comment	Response
There are currently two utilities under the road for my house; our water line and an electrical line. I have lived here since [redacted] and don't know exactly where they are. I believe they were both installed about [redacted] years ago. Our neighbors lived in this house in the [redacted], they would have a better idea. With the road being resurfaced is there an opportunity to bring the current utilities under the road up to code?	developing preliminary design options right now. This will include residential crossings and what to do since there are so many. Please encourage your neighbours to reach out to us so we can better locate private utilities. Stay tuned for more information as the study develops.
I have been told to let you know that we have a storm water drain and our main water line from the bay to the house all running under the road and the road allowance	No response
I am responding to the letter dated [redacted] from TSBP in regards to construction along Mallory Beach Road . We are located at [redacted] Mallory Beach Road. Just to advise you we do have water and hydro lines under the roadway Can you advise a time-line for the actual Road design and start time for the project	Sorry for the delayed reply. Thanks for letting us know about the water and hydro lines under the roadway from your property. The road design and start of project will be subject to the completion of the environmental assessment. At this time it has not been determined when the detail design will be completed.
FYI we have a conduit under the roadway for our water supply from the bay. The conduit runs an electrical cable for power to our deck on the shore, as well as the cable for our internet dish which is on the shore.	No response
We own [redacted] properties on the Mallory Beach Rd where we live full time. Our combined taxes are well over [redacted] per year! We absolutely want the reconstruction of the road to our home to be completed as quickly as possible! Redesign of MBR is obviously required now and the current issues will be aggravated with future increased traffic volume. There is new construction happening regularly and the summer months are very busy with cottages. Please read the letter below and know that we agree wholeheartedly. [Rest of comment same as the first comment in this table]	No response
Thank you for taking the time to explain the Mallory Beach Road reconstruction project and answer questions on August 19, 2021. As requested, we are passing along utility info located within the roadway. We are at [redacted] Mallory Beach Road, and want to ensure you are aware that there is an electrical wire that goes through the culvert under the road to the waterfront (near the left side of the property	Thanks for Letting us Know.

Comment	Response
line). This provides electricity to a [redacted] - it has been there for many years prior to our ownership. Please let us know if you require any further details.	
First Comment: I live on Mallory Beach Road and attended the presentation that was done back in August on the road reconstruction plans. After that meeting I forwarded my key comments to the Mallory Beach Ratepayers Association [redacted] and was hoping that my comments would make it into their report back to the council. The MBRA sent us their presentation yesterday and it does not seem like they have represented all of the key aspects I was trying to bring forward. As such I felt it would be advantageous for me to send you the comments that I had sent to the MBRA on [redacted] so you may use some of these ideas as you progress with the next steps. Let me first say that I truly believe the road is in dire need of the reconstruction you have planned. In my opinion the road is not wide enough in many sections and this really should be addressed as part of the reconstruction. The width issue makes the road unsafe for traffic to pass along it and also makes it extremely unsafe for walkers or bikers to travel along when traffic approaches. Here are my key comments: • One person in the presentation meeting commented that no one past the S Bend should make any comments about the road reconstruction. The reality is that people after the S bend are dramatically impacted by the before S bend section of road since we have to traverse it two ways in order to get from and to our homes/cottages. • I think the speed study done by the engineers was done at the wrong time in March/April before the summer visitors are travelling on the road and we were also in some lock down conditions due to the pandemic so I believe the study was not at all representative of the traffic and the speeds on the road, and therefore should be redone (I think recent data was gathered again but was not in the prime summer months). • The presenter indicated that the road width varied from 5 m to 5.5 m. If 5.5 m is considered normal for a 40 kph road I believe the road should be widened to 5.5 or 6 m (whatever the standard size should be) for the entire 3.6 km section they are planning to work on. I believe the road is currently too narrow in several locations. I have personally been run into the ditch by the snow grader in the winter time and I know I'm not the only person that has been forced off the road. In addition we have a small RV and I basically have to completely stop on the road when encountering opposing traffic as there is not enough room for vehicles to properly pass each other. • I believe the tree canopy needs to be cut back so trucks and RV's can drive along the road. When we drive our [redacted] on the road there are several locations where we	Reply to first comment: Thank you for your detailed comments.

Comment	Response
have to drive in the centre of the road because the tree branches are hitting our roof. I suspect this is even worse for full size trucks or for the school bus which goes down the road everyday. It might be good to actually get some feedback from the bus driver about any difficulties they have in traversing the road. • I know many of the residents along the 3.6 km section are concerned about the speed and this is why I think a new traffic study should be done in a summer time window. I always follow the 40 kph speed limit and I know often times I'll have someone sitting on my back bumper like they want to drive much faster so I do believe there are people travelling too fast. • In the presentation it talked about guard rails and I agree that there are a couple of locations where the drop off into the water is dangerous and with the narrowness of the road this is a concern. I know the people living at those locations would not like to have to go over a guard rail to get to the water but from a safety perspective this should be done. • During the 2020 high water levels the water was very close to coming across the road at [redacted] MBR when there was significant wave action. This poses a massive risk to anyone who lives past this point as it could completely block our ability to get in or out on our dead end road. I think the road should be raised up vertically a small amount at that location in order to avoid the road being washed out or potentially stopping people from beyond that point from being able to drive the road. Especially a concern for any emergency vehicles that might need to come down the road. • Back on the speed situation I suspect the OPP do not have the resources to do more speed checks along the road. I think the sign in Colpoy's village is very effective at slowing the traffic down and this could be considered for somewhere along MBR. One possible location for this type of sign could be on the straight away where the one cottage is on the water side as that wouldn't impact households and it was mentioned that people speed up in that area. • There was mention of speed bumps along the road but personally I would not like to see this. I don't believe the snow grader could properly clear the snow over this type of bump and they would continually be damaged. • We are seeing a steady increase in rental properties along the road and I believe this is also part of the problem with the speeding. Renters are not going to respect the community and in turn likely will not follow the speed limit. I think the MBRA could help to verify that properties being rented are licensed (based on the new rules going into effect in 2022) and in turn that the property owners include in their property info to the renters that the road speed is 40 and must be observed. We used to have a rental property and I know that typically there is a welcome package that is sent to renters before they arrive and that is where the speed limit could be mentioned.	

Comment	Response
• When they do the work it would be best to make sure the work is done in one season. The mess up in Wiarton having the main street dug up for two consecutive years was not the best choice, although understandable with the budgetary concerns. Hopefully the work can be done in one summer. • I wonder if we should be considering approaching some of the internet providers to mention that the road will be dug up and could they run broadband cable lines (fiber) in conduit along the road while this work in underway. Currently we have rather pathetic internet alternatives available to us. The Swift Broadband initiative are bringing access to [redacted] MBR on our road but not going any further. If they were aware that the road would be under construction maybe they would consider bringing broadband further along the road. • In the Q&A someone mentioned that lines should be on the road and I fully agree. If we had the centre line painted more people would realize that they are driving on the wrong side of the road. I have encountered many times where someone is on my side of the road and I've had to drive on the shoulder to avoid being hit by the car. • In the Q&A someone mentioned reverting the road to gravel to control the speed. I am completely against this and I would think the people living on the 3.6 km section would also totally disagree with this as they would be living in a constant dust cloud. I can't imagine sitting on the shore and being constantly covered with dust. The road surface should be the same as now or asphalt, either would be fine in my view. I know I have included a lot of details here but I think it is very important to consider all of the available public input on this very important project. If you have any questions on my input above please let me know and I hope you find it useful as you proceed to the next stages. Second Comment: Hi [redacted], we've seen a report from the MBRA on what they presented to council and it doesn't fully represent the people beyond the S bend that actually use the section of the road the most. One of the ideas discussed was to gather input from all of those people that live beyond the S bend similar to the questionnaire or survey that was done for the people before the S bend. Can you let me know if steps are being taken to gather that input and if so what the timeline would be? I think it is incredibly important that the people who use the road the most have a say in what the reconstruction should include.	Reply to Second Comment: Thanks for the follow up. I do not have a timeline on the planned work at this time. I will check with the Town regarding next steps.

Comment	Response
Third Comment: In my opinion (and for many others past the S bend) traffic calming measures will not do anything to address the fundamental issues with the road. The issue is that the road is too narrow which causes the safety concerns and I'm afraid opens the town to liability concerns due to the road not meeting the proper road standards. I can fully appreciate that it is a large ticket item and that is likely why it's been moved out in the capital forecast. However this will mean that the safety concerns remain for another 3 years at a minimum. Mallory Beach Road is likely one of the highest tax revenue sources for the town but doesn't appear to be getting a fair shake to address this road safety issue, especially based on it being the 4th worst road in the township and I believe the other 3 roads were addressed. I do recognize that my input will not change the course of the current direction. But I would request that as a minimum step the town at least invest in gathering the proper input from the people past the S bend. The questionnaire/survey that was done earlier in 2021 only asked for input from the people prior to the S bend. This means that the people that use the road the most (those that live beyond the S bend) were not consulted in any way on what the priorities should be. Since the capital plan has been pushed out 3 years it seems like there is ample time to facilitate this data gathering so more balanced decisions can be made about next steps. Could we have the same questionnaire/survey that was sent out earlier in the year sent to the people past the S bend?	Reply to Third Comment: Attached is the commencement notice that was issued in April for your files.
I am seeking some clarity on the status and timing of the EA for the Reconstruction of Mallory Beach Road. First, let me thank you for sending a second notice of the study to all properties on Mallory Beach Road. This provides a much welcomed opportunity for all road users to be aware of the project and provide comments to the Town. Can you please provide an explanation of where the project stands. Having reviewed the Council minutes of [redacted] I am unclear as to Council's direction to staff and the consultant. As well as outlining next steps, would you kindly provide a timeline for those steps, including the timeline for residents to provide comments on the Preliminary Design and when it will be	Thank you for taking the time and interest to contact us for clarification. The feedback provided by Council was to re-engage the public to ensure everyone, including those affected by the project but located outside of the project limits, have a chance to voice their concerns/opinions. In the meantime, Planmac and the Town are forming a final recommendation for Council. The options range the full gamut from "do nothing" to full reconstruction. The more intensive the solution, however, the more complex and costly the project becomes. One

Comment	Response
considered next by Council. Also, can you advise as to the year in which the upgrading is scheduled to commence, as set out in the Town's Capital Budget.	major unknown in the complexity of a future project is the prevalence of private, undocumented and likely non-code-conforming water and electrical lines. Council expressed concern over the legal implications relating to these lines, specifically who should have to pay for relocating them and the Town's rights and obligations to accommodate them. There is also the issue of significant encroachments of private structures (homes, boathouses, stairs, walls, etc.) within the road allowance, which should be the area that could have accommodated drainage and road geometry improvements. It is likely, at this point, that the final recommendation will be to undertake a lesser project, improving only the most inadequate locations. The ultimate recommendation will be presented to Council for formal direction at an upcoming Council meeting, once we have allowed a reasonable time for any more incoming input from the affected residents. In the Capital Forecast, Staff had tentatively scheduled the project for 2025-2026 (pending budget approval), due to the expected cost of a full reconstruction project. If the approved solution proves to be a smaller project, Staff could propose that the date be advanced somewhat, pending budget availability at future budget deliberations. I trust that answers your questions. Should you have any further concerns, please feel free

Comment	Response
	to contact the undersigned or our Consultant, copied on this email.
This email is in response to your Notice of Study Commencement for the Reconstruction of Mallory Beach Road. We are located at [redacted] Mallory Beach Road ([redacted]. This is to notify you that we have both hydro and water lines running beneath the road. Please let us know if you require any further information.	No response
I live at [redacted] Mallory Beach Road just beyond "the S bend". The road seems to be getting more hazardous with increased traffic at a corner which is somewhat blind now. It would make a great deal of sense to me if this could be made a 3 way stop.	No response
We live at [redacted] and we get our water directly from the bay. There is a pipe that runs under the roads, MBR and Kathleen. Will the proposed construction on the road affect us?	No response
Mike, thanks for the information you shared at the recent meeting hosted by the Mallory Beach Ratepayers' Association. I wanted to reach out and let you know we believe there is an electric cable under the road in front of our cottage [redacted] Mallory Beach Road) going to the boathouse. It is live during the warmer months, and almost certainly not to code as it has been there a long time. There may also be a water line under the road close to the SouthWest corner of the lot. If it is there, it is likely of the same approximate vintage as the electrical cable. During construction, we would like to ask if a conduit (suitable for future water and/or electrical) can be placed across the road at our property close to the boathouse and to the right of our driveway facing the water. If there is an additional cost to us in getting this work done, please let me know. If you need any further information I can be reached at this email or by calling me at	No response
I am just letting you know that we have a water and hydro line that goes across the road at [redacted] Mallory Beach Road. I do know where those lines are and can advise when necessary.	No response
I hope this note finds you well and the summer has been treating you well! I have been hearing that if we have a water line that crossed Mallory Beach Road we are supposed to let	No response

Comment	Response
the town know due to the road reconstruction? I had not received anything on this but wanted to reach out as my waterline crosses from my shore well to my house at [redacted] Mallory Beach Rd.	
I'm [redacted], a resident of Mallory Beach, and am reaching out to you to share experiences regarding the Mallory Beach Road conditions, and to ask for your support, and action to bring the road up to Ontario road standards, and to meet fire access requirements. Over the past seven years as a cottager and resident, I have seen marked increases in road traffic (particularly during Covid times) and unsafe conditions, with a number of home improvements being done meaning more contractors, more heavy equipment (backhoes, tree cutting, dump trucks, lumber delivery trucks, etc.). The traffic begins around 6 am and continues until into the evening. Two homes near to me were being built the past [redacted] years and often large vehicles as well as contractor vehicles were parked along the road side, often impeding safe travel on the road past the S bend. It also meant that meeting this kind of traffic (delivery and large service vehicles) along the narrower portions of Mallory Beach from Bruce Road 9 to the S bend, could be dangerous (I had to swerve and move off the road on 4 occasions over the past 2 years to avoid being hit by large vehicles as well as homeowner or cottager vehicles being driven well above the 40 km speed limit). I am an avid walker and get out several times a day for my own health and wellness, and to walk my dog, and have had to head to the ditch a number of times while larger vehicles as well as home owner or cottager vehicles met along the road and often were driving well beyond the 40 km speed limit (especially along the section before the S bend, and also beyond the S bend with people speeding up as they pass the S bend going speeds upwards of the 40 km up to and beyond 80km). The past [redacted] to [redacted] years, I have noticed with weather pattern changes, that we have had more water running across the road especially around the little hill and bend near the [redacted] to [redacted]s and also around the hill of the [redacted] to [redacted] area. The water runs across the road in these two areas and then freezes, causing very slippery conditions. A good friend was on her way to visit me, driving the 40 km speed limit a year ago, and slipped off the road in that area due to the slippery conditions. She was lucky to not go off the road into the water. Two years ago, while I served as a board member of the MBRA-Mallory Beach Ratepayers' Association, Board Executive members conducted a poll of board members, and among the top concerns of a majority of members were the road conditions, and road safety concerns (including speeding). To summarize, as indicated above my main concerns are: -the road when created many years ago for the few cottages is no longer up to standard (and has not been for some years) for an Ontario road and presents a number of safety, liability and	No Response

Comment	Response
fire access risks for the current and growing number of residents and cottagers of Mallory Beach. Given that the road does not meet current Ontario road standards, and poses a liability risk as well as a fire vehicle access risk, I am asking the SBP Council and Mallory Beach Road Reconstruction engineers and road construction team, to listen to, to acknowledge and to act upon the concerns of residents and subsequently, to approve, and put in place a plan to begin as soon as possible, the reconstruction of Mallory Beach Road that ensures at least the minimum Ontario road standards for vehicle and pedestrian safety and also for emergency vehicle (especially fire vehicles) access. Please see the additional statistical information provided below by one of our community members. Thank you for your time to read my letter, to hear my concerns, and I look forward to your plans to act on my concerns and those of my neighbours and other residents of MBR, to bring Mallory Beach Road in line with required Ontario road standards.	
Hi I am a property owner at [redacted] Mallory Beach Road [redacted] It seems that the bend is becoming much more problematic as it is almost a blind corner now and traffic both ways often "cuts the middle" often at high speends. Wouldn't a 3 way stop make a lot of sense?	No response
This is [redacted] at [redacted] Mallory Beach Road. We have a water line running under the road and out into the Bay.. I trust that it won't be damaged during any Pulverization process.	Thanks for getting back to us on it. I have copied [redacted]
Hi guys. I wanted to make sure that the road reconstruction planning team was aware that I currently have power and water running under the road, through a culvert, at [redacted] Mallory beach road. I would be interested in installing a proper conduit under the road if the opportunity existed during reconstruction.	Thanks for your information [redacted]
I wish to comment on the Mallory Beach Road. I have a cottage at [redacted] Mallory Beach Road. We have been travelling that road since 2005. Where we are at [redacted] which is past the S bend, it is nice and straight and wide so that we can	No response

Comment	Response
meet other cars or pedestrians without a problem. But up to the S bend, there needs to be improvements made as it is a dangerous section of road. The surface has deteriorated over the winter. There are too many cottagers in this section that have improved the water side of the road (not sure how this was allowed) and in the summer you have to be extra careful that a child or dog doesn't run out in front of you. There are far too many people out walking that you have to watch. There is hardly enough room to meet another car, let alone a large truck. There are too many hills and curves that you can't see far enough ahead of you to see what you are coming up to. There was a house fire in the fall of 2000. The fire trucks blocked the road that it couldn't be used for several hours. Not sure how it could be done but the road needs widened and some hills cut down and the resurfaced. The only way to do it is to widen it on the water side. It would piss off the people who have spent money on that side but it isn't their property to begin with. The road should be made wide enough that people can walk or run without being in the way of traffic. There has been a lot of home construction on Mallory Beach Rd lately resulting in more large truck traffic causing a more dangerous road.	
[Comment same as the first comment in this table]	No response
My name is [redacted] and I live on [redacted] off of Mallory beach road. I am fully supportive and in agreeance with the Mallory beach road reconstruction. I have children that ride a school bus down the road to and from school every day and would be happy to know that if a fire truck needed to access my house that they would be able to.	No response
I addition to the *response* below provided by Mallory Beach Road Group which we support, we have added some additional comments from [redacted] Mallory Beach Rd. 1. Existing embankments could be graded to ensure proper drainage and required guiderail protection systems installed to ensure safety during severe weather conditions or where the passing of two vehicles makes it treacherous. 2. Trees and any other vegetation could be removed or trimmed to ensure clear line of sights, where possible. 3. Appropriate signage to identify hidden curves and other visual hazards could be installed. 4. Speed postings should remain at 40 km/h. Based on my experience in the city, 30 km/h only works if strongly enforced. 5. Where necessary to prevent water pooling and erosion suitable culverts should be replaced and/or installed where necessary.	Thank you for sending us your comments. We will take them into consideration, and they will be included in the final study file.

Comment	Response
6. Where possible, the road should be widened to ensure there are safe places for pedestrians to walk or stand to avoid close calls with vehicles. 7. If the entire length from Bruce Rd 9 to the S-bend cannot be resurfaced, those portions of the roadway that are deteriorating or contain patchwork from culvert installation or rights of ways to the water could be resurfaced in at least 100 meter sections to avoid future deterioration. 8. Boulders and bedrock outcroppings that are present alongside the roadway could be removed or guarded were possible to minimize collisions with these hazards. 9. As an avid cyclist who does approximately 4000 kilometers per year, I would like to see a Hot mix asphalt surface as apposed to a Tar & chip. If you have ever experienced road rash, you would understand why it's preferable. 10. As a wish list item, I would like to see a "Share the Road" signage at the start of MBR at Bruce Rd 9 end. Even though Mallory beach is a dead end road, it's long enough to that this sign would bring awareness to those who use the road to be careful. [Rest of comment same as first comment in this table]	
I have a couple of comments to make after watching the zoom meeting Q&A. We live on [redacted] and did not receive this hand delivered letter(which I believe we should have). But my point is we had no idea that people were being asked if they have any underground utilities until now. We do have an underground water line'. Secondly we feel that due to safety concerns a three way stop is needed at Mallory and Kathleen.	No response
Thanks for the follow up Notice for MBR. When this all started the answer was to Widen the Road and make it safe for 2 way Traffic especially in the Winter. I don't see that in the update, Please advise	I apologize for the delayed response. The project was undertaken to identify opportunities to improve the pavement structure to provide an extended service life, address drainage issues, safety issues and environmental impact assessment. The study did review roadway geometry including opportunities to widen or address grade changes (raising or lowering). Areas not compliant were identified for possible improvements. Unfortunately, a widening of the roadway continuously along the entire length poses significant challenges including but not limited to: purchase of property from

Comment	Response
	private owners, relocation of built structures, utility relocation, may require infilling of the shoreline, and resultant environmental impacts. As such, the scope of work involved to widen the entire roadway is very significant and beyond the original project intent. I trust that clarifies our rationale. Should you have any further questions or concerns, please feel free to contact me.
Good morning [redacted] Thank you for your time and information regarding the work to happen on Mallory Beach Road through the zoom meeting last week. I own the cottage at [redacted] MBR. We have a very old metal waterline under the road but found that due to damage over the winters due to storms and ice, currently run a small plastic pipe through the culvert into the bay and over our lawn to the pump. This is just from late May to October as this is just a summer property. I am particularly concerned about the speed of traffic on the road and the danger to children and adults walking/running, cycling, or merely crossing the road to and from the shore. I very much support whatever traffic calming measures can be included in the design of the road to address this danger. I'm worried that your early spring traffic study does not accurately reflect the much heavier road use in the summer. I look forward to learning more about this project.	Thanks [redacted] I have copied staff on this message so that they are also aware of your comments. We are certainly interested in providing recommendations to improve traffic safety which is also documented in our engineering study.
[Comment is the same as the first comment in this table.]	Thank you for sending us your comments. We will take them into consideration, and they will be included in the final study file.
Thank you for sending out the follow up notice of the Study on Mallory Beach Rd. We live at [redacted] Mallory beach rd. and we have electricity and water line going underneath rd.	If [redacted] has any follow-up questions, he will contact you. We appreciate you reaching out to us.
In reply to the Zoom meeting that took place August 19, 2021 and letter dated April 13, 2021, we have a few concerns, as do many who live and own properties along Mallory Beach Road. First, this is currently a shared road - bikers, walkers, runners, scooters etc.	No Response

Comment	Response
Each owner/resident certainly will have their own concerns, as properties along the road are all differently landscaped and located. It is our hope that each matter is thoroughly reviewed in the best interest of all. **"S" Bend - STOP SIGNS:** Each year – along the curve - the traffic seems to move further to the west edge as the safety of the "S" bend becomes more concerning. With water access now restricted to any resident from the "S" bend to 6th Ave there has been a large increase in pedestrian traffic as residents walk to enjoy some time at the Bay. It is an unsafe corner for any person or child who could previously walk unattended along the road. Speed is also a factor at this corner. Stop signs in all directions would require all vehicles to look before continuing along the curve and hence slowing the speed of traffic. This corner also becomes a difficult area (blind curve) for residents and visitors/hikers to enter and exit Kathleen Ave, the Bruce Trail access point and [redacted] Mallory Beach Road. Construction traffic has been on the increase over the past years and many if not all use the "S" bend as a turnaround point. This too is a safety concern. On a personal note: The **property stake** [redacted] Mallory Beach Road) is currently within the curve of the "S" bend. We did previously bring this to the attention of the Township and have asked that there be some consideration when/if any reconstruction were to take place. (Possibly straightening the curve back slightly so as not to encroach our property line) **SPEED LIMIT:** The speed limit is also of a great concern. As everyone is aware, Mallory Beach Road is a 'dead end', the only real use being for residents and 'Sunday' drivers out enjoying a view of the Bay. As drivers we realize, a posted 40kmh speed limit/or other is often used by drivers as a guideline. Most drivers rarely drive at the posted speed. Mallory Beach Road would be a safer community for all by reducing the posted limit to 30kmh – (County Road 9 to Kathleen Ave). Any widening of the road will only increase the speed of the traffic.	
[redacted] of [redacted] Mallory Beach Road called as she was concerned about being required to remove encroaching structures. She said something about trying to make decisions on the future viability of her property and asked me whether it's true that you can't get approval for a boathouse these days. I said I can't comment on that other than if it's on the road allowance we would say no and beyond that, you would have to deal with Crown Lands as very few own the land on the other side of the road. She acknowledged that both the dwelling and boathouse are on the road allowance. I said regarding us tearing down encroachments, that it's unlikely that Council will pursue the mandatory removal of existing structures but we are definitely clamping down on new ones. It's more likely that the encroachments are going to	Thanks for letting me know. I sent digital and hard copies a while back. I left the hard copy at the council meeting presentation. Attached are the files and hope this helps.

Comment	Response
shape (i.e. limit) what we can do to improve the road from the perspectives of widening, sightlines and drainage. She requested the drawing that shows the legal survey with the encroachments, and when I tried looking it up while I was on the phone with her, I realized we don't seem to have a digital version of it. Could you please provide a digital version of the legal showing the encroachments? Thank you in advance. [redacted] PS please let me know if you require her contact info for your comments file	
We are residents of Mallory Beach Rd. We have been hearing many different things about the proposed road improvements. Would you please let us know what stage the improvement planning is at? Is the town requesting property owner input regarding these improvements? As requested, we sent notification to PlanMac Engineering advising that we have water and hydro under the road at our location. It was our understanding that each property owner would be contacted in relation to their section of the road prior to final design. Is this correct? Our personal thoughts are that the road does not need to be widened. A good resurfacing is required but there are sections that need major reconstruction.	Thank you for taking the time and interest to contact us. When the project was before Council in October (as a mid-project engagement session with Council), Council directed us to to re-engage the public to ensure everyone, including those affected by the project but located outside of the project limits, have a chance to voice their concerns/opinions. The project notification was our invitation to share your comments, and we do welcome you to provide them to us. In the meantime, Planmac and the Town are forming a final recommendation for Council. The options range the full gamut from "do nothing" to full reconstruction. The more intensive the solution, however, the more complex and costly the project becomes. One major unknown in the complexity of a future project is the prevalence of private, undocumented and likely non-code-conforming water and electrical lines. Council expressed concern over the legal implications relating to these lines, specifically who should have to pay for relocating them and the Town's rights and obligations to accommodate them. There is also the issue of significant encroachments of private structures (homes, boathouses,

Comment	Response
	stairs, walls, etc.) within the road allowance, which should be the area that could have accommodated drainage and road geometry improvements. It is likely, at this point, that the final recommendation will be to undertake a lesser project, improving only the most inadequate locations. The ultimate recommendation will be presented to Council for formal direction at an upcoming Council meeting, once we have allowed a reasonable time for any more incoming input from the affected residents. Once the study is 100% complete, Staff will mail out a notice of project completion that summarizes the results and directs interested persons to our website, to “close the loop” and remind everyone that we are always willing to receive their concerns. In the Capital Forecast, Staff had tentatively scheduled the project for 2025-2026 (pending budget approval), due to the expected cost of a full reconstruction project. If the approved solution proves to be a smaller project, Staff could propose that the date be advanced somewhat, pending budget availability at future budget deliberations. I trust that answers your questions. Should you have any further concerns, please feel free to contact the undersigned or our Consultant, copied on this email.

Comment	Response
We have had our cottage on [redacted] for 40 years. We travel Mallory Beach Road every weekend during spring, summer & close up in late fall. There has been a substantial increase of permanent residents thus increased road traffic as well as the school buses that come in each day during the school year. Each year we come the road in from Colpoys to the S bend is worse. The trees have become more overgrown & the surface has become rougher & more bumpy. Even if a little TLC were initiated it would make a big difference. We would really like to see at least the surface be repaired & some of the large trees & branches be trimmed & removed to make the site line on the curves be made safer. There has been talk for years about road repairs & nothing has been done and I feel that it is about time that it be our turn. PLEASE really consider making these road repairs a priority this year!	Thank you very much for sending us your comments; they will be included in our study file and considered as we proceed
Comments first and then a solution idea Like the rest of the Town, Mallory Beach Road owners spend thousands on building permits and inspections for setbacks, structures, footings, drainage, decks, stairs, railings etc. Electrical work and plumbing must be inspected to ensure that they pass the appropriate codes. There is one exception: shoreline land on the south side of Mallory Beach road where permits, codes and property standards are ignored and increased property value is not taxed. Although it is not fair, I suggest that most MBR owners aren't too concerned about the possible increased risks for those properties. The encroachments onto the road allowance is of concern as it affects the safety of us all and makes the Town susceptible to significant lawsuits. The town and taxpayers have no responsibility to repair or replace structures , water or electrical lines that were done subcode, without permits and on road allowance. Encroachments are not done in error, and the risks are known. Consider the number of encroachments in the last couple years. The road allowance must be recovered now as the population serviced by the road increases with the many new builds. The reconstruction could include two "Big O" conduits under the road for each property to help with their services. Also interesting. The few owners demanding more speed restrictions are those in the areas of greatest concerns having the largest encroachments	From [redacted] Thanks so much for reaching out. I have cc'd our Public Works Director for her comment. Thanks and have a great week! From [redacted] Thank you for your additional comments. They will be included in the study file.

Comment	Response
North Bruce has an encroachment policy (Attached). It would be interesting if the current council could pass this , leaving it to the next council to authorize the improvents to the shore land but take back the road allowance.	
I was talking to Mr. [redacted] at the Town of South Bruce Peninsula and he suggested I get in touch with you regarding this matter. This is in response to your request to provide information regarding utility assets located within the roadway. There is a water intake pipe from the bay and electrical line to the waterfront, at [redacted] Mallory Beach Road. I purchased this property 1 1/2 year ago but was able to contact the previous owner. There is a 6" metal culvert that both water line and electrical go through under the road (about 4' below the road surface). It is located on the east side of the driveway.	Thanks very much for letting us know. Do you know where it goes under the road? Is it through a culvert or buried in the roadway materials? We will make a note of it for the report.
My residence is [redacted] is to inform you of fact that both water & electric utilities have been run under the roadway which provide service to the property.	No Response
My husband and I have a property on Mallory Beach Rd. We are not in agreement with the proposal to widen and pave the road. We do not want all the trees to be cut down and we believe a wider, freshly paved road will contribute to speeding, which is already a safety issue. We are also concerned about spending this much money on something that does not need to be done. If you are not the people to whom I should be voicing my concerns, please point me in the right direction.	No Response
Our cottage/home is located at [redacted] Mallory Beach Road We are one of the few homes that will be directly affected by any changes at the S-Bend. I hope that all homeowners concerns will be taken into consideration. Over the past years, I have sent several notices to the County and others regarding changes that have been proposed prior to this study. The S-Bend has more recently been a bit of challenge with the changes in traffic and new homes being built bringing in a large number of heavy vehicles. We do have concerns with what changes may or may not be completed at the S-Bend. **Mallory Beach Road encroaches our property line**	No Response

Comment	Response
Our **property stakes** (SW corner) are in the road and have been asphalted over with some of the minor repairs done to date. The S-Bend continues to curve closer to our back property line and vehicles tend to follow the widening curve making it an unsafe corner. Our feeling is that the 'S' needs to be somewhat straightened and vehicles should be required to stop making it safer for pedestrians and vehicles using this corner. Perhaps a T-intersection with a 3-way stop. Most residents are respectful but as warmer months near that changes. I have attached a earlier notice forwarded on the Reconstrution.	
[redacted] We live at [redacted] Mallory Beach Rd, I have Water and Hydro under the road. Also I have an [redacted] buried in the ground by the road. not sure how close it is to the road.	Thanks for the information [redacted]
In addition to the below, as a mother, it was disheartening to hear that a new school bus driver had refused to drive down MBR after her 1st day doing the route due to safety concerns. [Rest of comment is the same as the first comment in this table]	No Response
We have a home at [redacted] Mallory Berach Road. We have both water and electrical crossing underneath road to provide water to our home on north side of road and power from home to pump house/boat house to service pumps and electrical needs at our [redacted] dock area. These services are imperative to be maintained. Please contact me with any concerns or direction and feel free to call at [redacted] We have around [redacted] feet of frontage and landscaped on both sides of road and an [redacted]	No Response
I own property on Mallory Beach Road, and unfortunately was unable to attend the August presentation regarding the Mallory Beach Road reconstruction plans, but did read the presentation materials circulated by the Mallory Beach Ratepayers Association (MBRA) and some of the dialogue surrounding the presentation. I want to be sure the municipality receives my input directly as I missed the opportunity to provide feedback to the MBRA before they sent in their response, and my point of view might be different from their response in any case. I've been a property owner and member of the MBRA since [redacted] and the poor road conditions have been a topic on the agenda of many Annual General Meetings (AGMs). I'm personally aware of at least one instance of a formal letter going from the MBRA to the municipality requesting that something be done about the road (2011), and I know for sure that the request to get road repairs prioritized for Mallory Beach Rd was made many times in person to the municipal and provincial leaders attending the MBRA's AGM. So I am happy to see that finally there's some attention to the poor condition of the road.	Thank you for your comments. They will be included in the Study File.

Comment	Response
Having said that, this project is a massive opportunity to do the right thing and I'm not sure what I've read and heard about the project and feedback is making full use of the opportunity. Here is my feedback. <u>Road width & clearance</u> The current road width is very narrow in on many parts of the road under reconstruction proposal, making it challenging for two vehicles to pass safely, particularly given the absence of shoulders, and the abundance of obstructions bordering/overhanging the side of the road (vegetation, mailboxes, parking pads, gardens, etc.). In addition the overhead clearance for bigger vehicles – RVs, cars with trailers, school buses, etc. – is also an issue in areas. So much so, that these vehicles need to drive down the middle of the road, putting other traffic in danger yet again. As much as I like the picturesque trees, the canopy growth must be cut back in order to provide 2-way traffic with good sightlines. There is a road allowance that should be used to properly widen the entire length of the road to the standard, and provide for safe passage of personal and commercial vehicles, pedestrians, cycles and most importantly emergency vehicles. <u>Volume of traffic & speed concerns</u> The most recent traffic study was conducted in March-April during the current pandemic. It reported about 400 or less vehicles travelling daily – probably an understated number as the seasonal residents and those complying with Ontario's "stay at home" order were not travelling to their properties during that time. An earlier one from a few years ago reported 500+ vehicles per day. More and more empty lots are being built upon, and the number of rental properties are growing, so traffic volumes will only go up. In conjunction with the traffic study, a number of residents are complaining about speed in spite of the 40 km/h postings. This is definitely an issue I've observed and I know we've used temporary speed signs provided by the OPP in past years to help remind people of the maximum speed. Maybe something like the sign and post installed in Colpoys village this summer could work, as it appeared to be having an impact from what I could tell. I don't believe speed bumps are the answer as they will make winter and other maintenance difficult. Enforcement of speed limits on this road just like any other is necessary and important, and mostly lacking. <u>Other points</u> - I agree with putting guardrails up where recommended, to ensure safety. - Painted lines to indicate lanes may help with drivers who drive down the middle of the road, and in some cases force some of us to pull over on someone's property to get out of their way.	

Comment	Response
- Attention to areas of the road which could be flooded during high water times should be given – raising the road level perhaps? The issue was observed last summer near 315 MBR. We can't afford to have a one-way road blocked for ingress/egress, especially in the case of an emergency. - Keeping the construction to one season would be ideal. - Maybe use this time as an opportunity to invite internet providers to re-assess their position on laying fibre while the road is being dug up. - All Mallory Beach Road property owners have a say in this matter, not just those with properties on the 3.6 km road under proposal. The property owners beyond the S-bend to the end of the road have to drive the full 3.6 stretch of road to get into and out from our properties. In conclusion, if we don't have a road that is maintained to the standards, there could be serious life-altering consequences, the liability of which all of us would bear, especially the municipality. I have stopped riding my bike on the road, and am not comfortable walking on the road from the S-bend to County Rd 9 – it's just too narrow and there's no place to go when vehicles drive past to feel comfortable or safe. [Rest of Comment same as the first comment in this table.]	
As you are well aware, Mallory Beach Road between County Road 9 and the S Bend is in terrible shape. We have lived on this road for [redacted] years and absolutely love it. We live beyond the S bend and have no complaints for our road but the drive in some places is really scary, especially during winter months. Visitors to our place have always commented on the first part of the road and been nervous about meeting oncoming cars, especially at the first hill where there are huge humps in the road, coming up a hill and around a bend. I respectfully request that the road be made safer at such places. I realize that reconstruction of the road before the S bend is a huge project with many variances but the safety for residents and other users of the road is of paramount importance. I dread hearing about an accident that would end in someone losing their life, as the road is narrow between a rock face and a body of water, with no place to escape or avoid an accident. I think at this point, the road becomes a liability for the Town. Thank you for taking the time to read and consider my comments.	Thank you for sending us your comments. We will take them into consideration as we proceed, and they will be included in the final study file. Thank you very much for your time. Should you have any further questions or concerns, please don't hesitate to reach out.
We're sending this as longtime cottage owners at [redacted] Beach Road since [redacted] Our property is not located along the reconstruction area but we have to traverse this section of the	Thank you for sending us your comments. We will take them into consideration as we

Comment	Response
road every single time we enter or exit our property. Thank goodness you came to the realization that we should also be asked for our input as this is our road too! We feel that the MBRA possibly misrepresented the views of the property owners on MB Rd in favour of the property owners located along the reconstruction area. Obviously they are more directly impacted by the noise, dust and inconvenience or any road construction than we are past the S-bend, but we feel they are more concerned about keeping the road in its current deplorable condition to slow traffic past their places and avoid removal of their personal encroachments onto the road allowance. Frankly we've often been shocked that these encroachments such as walls, mailboxes, signs, etc. have been allowed by the town on an on-going basis for the last 50 years! We are very concerned about the continual degradation of MB Rd which has made it unsafe due to the potholes, uneven surface, lack of shoulders, improper drainage, water ponding and ice buildup , not to mention the twists and turns and blind corners. The narrow roadway makes it almost impossible to pass any trucks or RV's without having to pull over and pray that your vehicle isn't going to topple into the lake! We absolutely need to undergo road improvements along this stretch of Mallory Beach Rd.before someone is hurt or killed! This section of our cottage road is also extremely vulnerable during times of high water levels which we recently experienced. There were months when we were greatly concerned that the road might become undermined and washed out, preventing us from being able to access our property. The higher areas of the roadway, with a severe drop to the water, need to be reinforced with rocks to prevent this from happening. With one of the highest property tax bases (if not THE highest) in South Bruce, it's time council allocates some funds in our direction. Please keep us informed about future council decisions by email or by our property tax mailing addresses. The majority of property owners on MB Rd are not permanent residents and do not have mail boxes.	proceed, and they will be included in the final study file. Thank you very much for your time. Should you have any further questions or concerns, please don't hesitate to reach out.
Mallory Beach road needs reconstruction and is currently unsafe. With a vehicle count nearing 1000 vehicles per day and having several new full time residences being built, safety should be the priority considering: Sight lines, Width for pedestrians walking Width for larger vehicles passing (2020 fire emergency showed that issue). Drainage.	No Response

Comment	Response
Canopy overgrowth preventing full use of road surface width As there can be no ownership of municipal/crown land (No "Squatters rights")and the traffic count will rise, the road allowance should be fully recovered at this time. Encroachments on crown/town property is the property owners problem and post construction adjustment costs should be theirs. The crown land on the South side of MBR has had significant grade changes and many structures, stairs and landscaping changes completed, especially in the last 2 ,3 years. None have been done with permits or by code. In the past, because of liability concerns, the municipality has disallowed and demanded removal of steps, benches or any alterations done on similar property near the waters on the Avenues. All property owners must abide by all set back rules, pay for permits and inspections, and follow property standard rules preventing storage of anything in their front yards. On this crown land, and well onto the road allowance, all these rules have been ignored and everything has been allowed: Steps, decks, patios, sheds, buildings, car parking, boat ramps into the lake and unsightly storage of boats, cars, docks etc. With this reconstruction, there should be no effort or funds spent on repair of any structure / grade or landscaping on the south side of MBR other than that required to achieve proper road width, drainage and sight lines for this project. Any other repair there by the municipality can be taken as authorization and will therefore include liability. There are many sub standard electrical cables, extension cords buried across the roadway. Any costs of repair or replacement , bringing them to code should be borne by the property owner. It is firstly unreasonable to allow the complete disregard of the bylaws concerning setbacks, safety, property standards, drainage and building codes on the south side of MBR and then secondly to demand that taxpayers fund the replacement or repair of these structures, elevations, utilities or landscaping. Anll required removals or repairs of these "Improvements " should be at the builders expense.	

Comment	Response
Post construction trenching across the road should be disallowed by bylaw. Perhaps during pre construction, property owners could be offered 100 feet of "Big O" installed under the roadway for a flat fee.	
I'm a resident of Mallory Beach Road and I live past the S bend. I read the minutes of the council meeting and I have a suggestion. When there is an opportunity to fix the road why not widen it, as was done to our part of Mallory Beach Road. It would be safer for everyone, pedestrians, cyclists and cars. I like the idea of a centre line on the road.	No Response
We live at [redacted] Mallory Beach Road. We received your notice dated April 14, 2021, and have been looking out for the update on the Town's website and the further notice referred to in the April document. To date we have not been able to locate any update on the Town website, but we understand from the Mallory Beach Ratepayers Association that you are now moving into the next phase of the process. We have received the Power Point slides you sent to MBRA, and would appreciate your clarification about what additional documentation is available, and what process you are planning to follow for the 'Detailed Design' phase of the project. We would also like to let you know that we do have a water line that draws from Colpoy's Bay and runs under the road. The section of the line under the road was in place before we owned the property ([redacted]. I can indicate the approximate alignment, since we have replaced both the section of the waterline from the shoreline into the bay (around [redacted] and the section running into the house (in [redacted] when the new house was built). I can't be certain of the depth of the line under the road, but know that the point of connection to the new line in [redacted] was at least 4 foot deep, possibly deeper. In almost [redacted] years we have never had a problem with the section of the line under the road freezing. We would appreciate hearing how the road reconstruction is likely to impact on our waterline, and would be happy to meet with you onsite to discuss the details.	No Response
In response to our challenge as to the accuracy of data on speed and traffic volume on Mallory Beach Road, you invited that we give alternate location options to gather new data. I thank you for the invitation. I have no doubt that the traffic volume has been captured if your data set was gathered in the 4 summer months. I do, however offer, as a daily observer, that traffic volume drops precipitously by mid September. The attendant question is whether the highly 'local' traffic in the fall to spring months sees	No Response

Comment	Response
speeders at the same proportion as in summer months. I fear that the proportion changes with the season as does the volume. This can be answered by fall traffic counts and compared to summer counts. Nevertheless, I would offer that likely speeding locations as reported by residents and as personally witnessed are likely to be found near Fire #: [redacted] Thank you for the time you have devoted to hearing resident concerns and feedback on safety concerns . The MBRA will attempt to further investigate the possibility of Council designating a portion of the road as a Community Safety Zone. On a personal note, I would continue to urge that you assess the 'S' bend as a demonstrable safety issue for area residents as they walk to cross or exit MBR and as a 4 way intersection. Given limited visibility, quick change in direction, construction vehicle 3-point turning at the corner, increased pedestrian traffic to the lakefront at the corner, and dangerous left turning onto Kathleen Ave, both safety and traffic quieting would be accomplished by an all-way stop installation now and independent of road reconstruction. Finally, the Mallory Beach Ratepayers Association is open to some partnering with the municipality on costing of speed control devices. Please feel free to contact me at any time should you require more information or clarity, Feel free to drop by for. a coffee should you come for a site inspection.	
I have been away for the winter, so somewhat out of the loop. Do you or the Town have any planned meetings with representatives of the Mallory Beach Ratepayers Group or with any Mallory Beach Road property owners? What is the status of the reconstruction project or of any planned upgrades/changes to the road? Response: Planmac and the Town are forming a final recommendation for Council, which will be presented to Council for formal direction at an upcoming Council meeting. We do not have a specific date for that yet. Once the study is 100% complete, Staff will mail out a notice of project completion that summarizes the results and directs interested persons to our website, to "close the loop" and remind everyone that we are always willing to receive their concerns. As for the current trajectory of what the final solution is likely to be, it has become apparent that the more	

Comment	Response
intensive the solution, the more complex and costly the project becomes. One major unknown in the complexity of a future project is the prevalence of private, undocumented and likely non-code-conforming water and electrical lines. Council expressed concern over the legal implications relating to these lines, specifically who should have to pay for relocating them and the Town's rights and obligations to accommodate them. There is also the issue of significant encroachments of private structures (homes, boathouses, stairs, walls, etc.) within the road allowance, which should be the area that could have accommodated drainage and road geometry improvements. It is likely, at this point, that the final recommendation, representing the best overall benefit for cost solution, will be to improve only the most inadequate locations. The timing of the project will depend on budget availability.	
I am submitting the following for your information based on my past involvement in the reconstruction of the Mallory Beach Road from the S bend to the eastern dead end and my years of travelling in and out of this road . I hope it will be of some help in your future deliberations with respect to the 3.6 kms to the S bend. [redacted]At that time the road was stone chipped and brought up to provincial standards which meant that several beautiful trees that were on the road allowance came crashing down, no ands if or buts. Unfortunately at that time some [redacted]years ago the MBRA only went from the east end of the road to the S bend and therefore the 3.6 km section to the S bend was not part of our involvement to improve the road. Someone at the recent Zoom meeting mentioned going back to gravel to slow down the speed. This drew a chuckle from me when I recalled those hot dry summers past when residents along that 3.6 km stretch would be out on the road with hoses watering down the dust. I have been travelling in and out of Mallory Beach road for 72 years by car, truck, bike , motorcycle and on foot, sorry no horse, and I will admit this 3.6 km stretch is long overdue for improvement and ideally should be brought up to provincial standards as happened from the S bend to the eastern dead end in 1996. Speaking of the S bend, years ago due to possible wave action crossing the road just before the bend during high water years there was a high and low road and the high road took you up to Kathleen Ave and then back on to Mallory Beach Road, then called Llewelyn Drive, named	No Response

Comment	Response
after Mallory's wife. Impossible to do that now with the homes on Kathleen. If you look close today you can see a trace of the high road leading to Kathleen just before the S bend. Originally the land at the S bend was designated park but that didn't last. [redacted] In conclusion I might even add that at one time several years ago there was talk of considering to bring in the road from the top of the escarpment and come down at the S bend in order to reduce the traffic on the 3.6 km stretch. I have no further details about that idea or whether that may be a viable alternative to consider today.	
The recent presentation for the road reconstruction suggested a traffic count of approx 400. Note that it was done in April, before the summer traffic and was done during lockdown: questionably valid. 3 years ago, in the Road study, the traffic count was 500-1000. Speed is an issue on all residential roads. MBR is no exception. It is not a sidewalk and with the large numbers of people walking , there should be space off the pavement to walk. We were told previously that 40 kph is the lowest enforceable speed	Hi [redacted], I just want to confirm receipt of your e-mails and note that your comments and suggestions will be taken in consideration as part of the Environmental Assessment public consultation process for the project. As you are aware this is going to be a challenging project with lots of differing perspectives. Thanks for taking the time to provide your input and have a great weekend.
We recently purchased a property at [redacted] Mallory Beach Road and a water line and electricity both run under the road to our water pump on Colpoy's Bay. I am not certain exactly where it is located but it is definitely there. I hope this information is helpful even though it is incomplete. [redacted] and I are both available at this email if we can help in any way. Have a lovely day	No Response
We reside at [redacted] Mallory Beach Road and in response to your request for information for your upcoming study we would like to inform you we have water lines and an electrical line running under Mallory Beach Road from our shore well to our home.	No Response
Just to follow up on the voicemail that I left, wondering when we might be able to meet with yourself and the Town Staff to discuss the questions/issues that we have raised. We see this interaction as valuable, as it is our intention to make a presentation to Town council on the	Thanks for letting me know. I will get back to you on a possible meeting date once we have

Comment	Response
issues that we have that are beyond the scope of your project. A meeting would help to eliminate items that you are already addressing in your report to Council and allow us to concentrate on issues that are of concern to us, but beyond your scope. Unfortunately, I will be out of the country from [redacted]. If the opportunity to arrange a meeting occurs prior to my return, please contact [redacted] or [redacted]	consulted with the Town. I am sure that we will be able to connect by the time you return.
My name is [redacted] and I live on [redacted] off of Mallory beach road. I am fully supportive and in agreeance with the Mallory beach road reconstruction. I have children that ride a school bus down the road to and from school every day, and would be happy to know that if a fire truck needed to access my house that they would be able to.	Thanks for reaching out to us. The roadway is accessible for emergency vehicles although has several very challenging areas that do not meet current design standards. The environmental assessment being completed will address recommendations to improve the existing roadway geometry.
We were checking on our cottage at [redacted] Mallory Beach Rd. , South Bruce Peninsula a couple of weeks ago and we noticed some new survey markers on our property. We contacted [redacted] Town of South Bruce Peninsula and he forwarded our letter to [redacted]. She was kind enough to forward a notice that apparently was given to property owners via hand delivery or mailbox as we had not received anything and do not have a mailbox at Mallory Beach. We noticed on the Legend that you requested notice if anybody had private water or other utility assets that may be within the roadway and yes, we have an intake pipe running from the bay under the roadway to service our cottage. If you have any questions or are sending out any further information, our mailing address is [redacted]	Thanks for the information.