

Prepared By:



County Of Bruce

Master Plan - Bruce County Roads 25 & 33
Roads and Drainage
Town of Saugeen Shores

GMBP File: M-1552

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Be an explorer.

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**MASTER PLAN - BRUCE COUNTY ROADS 25 & 33
ROADS AND DRAINAGE**

COUNTY OF BRUCE

JULY 2016

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1. INTRODUCTION

The County of Bruce (County), as the proponent, is the operating authority for Bruce Roads 25 and 33 (BR25 & BR33) in the southerly area of the Town of Saugeen Shores (Town). The County has identified that surface asphalt and drainage deficiencies exist with each road and that, prior to undertaking minor repairs and in consideration of future plans, a comprehensive review of road and drainage systems within a broader context and Study Area would be in order. The Town, as a principle partner in this undertaking, has identified future developments, which would extend three streets southerly to new intersections with BR25. One of those streets, Bruce Street, is intended as a collector road, which would parallel Goderich Street (Highway 21) from BR25 in the south to Concession Road 10 in the north.

The Study Area, as outlined in Figure No. 1, is generally bounded by Lake Ridge Drive in the north, the Concession Road 4 outlet in the south, the Rail Trail in the east and Lake Huron in the west. Lands to the north of BR25 to Lake Ridge Drive have recently experienced significant development pressure and continue to evolve from rural land uses to urban land uses, including residential subdivisions and commercial developments, within the urban area of the Town. Included in the planning processes for those developments, various Traffic Impact Studies and Storm Water Management Plans were prepared, on a “micro” level, which prompted the County to consider it prudent to explore and address the following issues at a more “macro” level prior to the scheduled road maintenance:

- i) Traffic patterns and volumes on BR25 and BR33 are anticipated to change over the next few years due to planned development and changes to the Town’s road system,
- ii) BR25 is expected to evolve from its current rural cross section to an urban cross section, including Town sewer and water services and pedestrian facilities,
- iii) The existing “Tee” intersection of BR33 with BR25 does not meet current design criteria for a secondary highway,
- iv) Existing drainage deficiencies along BR25 present a constraint to planned development, which would utilize the BR25 drainage system as an outlet, and
- v) The Baker Subdivision located west of BR33 experiences seasonal flooding, which should be addressed.

The County has initiated this Master Plan study, under the Municipal Class Environmental Assessment (EA) process, appropriately to plan various road and drainage undertakings within the Study Area in a comprehensive manner. The Master Plan will assist in planning individual projects toward an appropriate overall development strategy within the Study Area. Upon resolution of the Master Plan, individual projects may proceed under the appropriate Schedule, following the EA process, using the Master Plan as a basis.

The purpose of this report is to document the master planning process, which addresses Phases 1 and 2 of the EA, toward the selection of a preferred Master Plan for Road and Drainage systems within the Study Area.

The documentation includes the following:

- i) A description of the project background,
- ii) Identification of problems and opportunities for road and drainage systems,
- iii) A consolidation of the findings of various background studies,
- iv) Identification of alternative solutions to the identified problems and opportunities,
- v) Evaluation and assessment of alternative road and drainage solutions,
- vi) A summary of First Nations, agency and public consultation, and
- vii) The selection of a preferred set of alternative solutions, which make up the Master Plan.

The Master Plan is organized with this documentation of the process, including Appendices, which contain more specific information.

2. BACKGROUND

The following Sections provide a brief background of the existing road and drainage systems, their deficiencies, and opportunities identified through the process.

2.1 Roads

BR25 is a two lane rural road section, which extends from a signalized intersection at Goderich Street westerly to Lake Huron. BR33 (Lake Range Road) is also a two lane rural road section, which extends from a stop-controlled “tee” intersection with BR25, southerly beyond the limits of the Study Area. BR33 was previously up-loaded from the Town to the County and is used by many residents of the Town to access the neighbouring Bruce Nuclear Power Development. Currently, the road surfaces are in a deteriorated condition, with maintenance scheduled within the County’s 5-year plan. The “tee” intersection of BR33 with BR25 is located near the top of a bluff, and sight lines do not meet current design criteria for a secondary highway, although the intersection is adequate for local road service.

The County considers that current traffic volumes would justify neither a need for additional lanes nor an urbanized cross section on either of BR25 or BR33. However, the Town’s Local Official Plan identifies future residential lands uses in the area, which would extend Stickel Street, Bruce Street, and Ridge Street southerly to intersect with BR25. The Town’s Local Official Plan further considers the future extension of Bruce Street northerly through the former Town of Port Elgin (from BR25 northerly to Concession Road 10), as a secondary major traffic route parallel to Goderich Street (Highway 21 Connecting Link). Consequently, there could be a change in traffic flow patterns and a significant impact on the traffic volume on BR25, between BR33 and Goderich Street, which may require additional lanes and/or traffic signals. Further, the Lake Ridge Estates (LRE) Subdivision, planned at the north-westerly corner of Goderich Street and BR25, is required to extend water and sanitary sewer services, and to urbanize the adjacent section of BR25. The ultimate cross section associated with this development needs to be appropriately planned in consideration of potential future lane requirements and a multi-purpose recreational path planned by the Town along the BR25 corridor.

2.2 Drainage

About 2003, the LRE Subdivision presented a Conceptual Storm Water Management Plan, which intended to outlet flows, at pre-development flow rates, to the north ditch system along BR25. Bruce County noted that the lands, in their pre-development condition, did not outlet runoff from the property to the ditch system, but rather drained by overland sheet flow to the west and, further, that the capacity of the existing ditch on BR25 is inadequate to accept flows additional to those from a Phase 1 of the LRE development. Subsequently, a storm sewer system was considered along the BR25 corridor, which would address drainage deficiencies in the area. The significant project cost and the need to establish an enlarged outlet across a public beach to Lake Huron prompted the County to consider other alternative solutions.

The Baker Subdivision is located below the bluff west of BR33 and south of BR25. Historically, the area has suffered from seasonal flooding, which is identified as another issue to be reviewed through this Master Planning process.

2.3 Summary of Preliminary Discussion

Through preliminary discussions with various stakeholders, several potential features are considered for inclusion into the Master Planning process. Minutes of Several Meetings during the process one documented in **Appendix A**, with the following summary:

- i) The County and Town anticipate that three planned intersections with BR25 will affect the traffic pattern between BR33 and Goderich Street to a degree where a re-aligned intersection of BR33 with the Bruce Street intersection may improve traffic circulation,
- ii) The expected increase in traffic flows, as a result of recent and planned developments within the Study Area, may require additional traffic lanes, and or traffic signals at the new intersections, on BR25.
- iii) The planned Lake Ridge Estates (LRE) subdivision requires water and sanitary sewer services to be installed on BR25 for its own uses, and the Town wishes to consider installing the balance of the planned infrastructure concurrent with the reconstruction of BR25.
- iv) A new east-west trail along the BR25 corridor could connect two existing north-south trails.
- v) The County wished to divest lesser-used road sections to the Town.
- vi) The Town wishes, ultimately, to have the length of BR25, from Bruce Street to Saugeen Beach Road as an urban cross section.
- vii) A new storm sewer could be extended along BR25 to a new outlet at Lake Huron, to alleviate current drainage issues along the BR25 corridor, and to accommodate future conditions within the Study Area.
- viii) A diversion of flows along a re-aligned BR33 could possibly address current flooding issues within the Baker Subdivision.
- ix) The Baker Subdivision does not have sanitary sewers. The installation of a planned sanitary sewer system should correspond with drainage improvements.

3. MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT – MASTER PLANS

The Municipal Class Environmental Assessment (EA) planning and design process, prepared by the Municipal Engineers Association, 2015, applies to municipal infrastructure projects. The process involves a 5-Phase approach to project planning, with the planning requirements dependent upon the complexity of the project, to meet the requirements of the Environmental Assessment Act. The EA outlines typical project types under each of Schedules A, A+, B and C type projects. The types of projects listed increase in complexity and potential environmental impact with each schedule. Master Plans are long range plans that recognize the need to integrate infrastructure requirements for existing and future land uses with environmental assessment planning principles. As such, Master Plans address Phases 1 and 2 of the Municipal Class EA process.

The key principles of successful environmental assessment planning include:

- i) Consultation with the public and review agencies,
- ii) Consideration of a reasonable range of alternatives,
- iii) Consideration of effects of the alternative solutions on the Natural, Social, Cultural, Built and Economic environments,
- iv) Systematic evaluation,
- v) Clear documentation, and
- vi) Traceable decision making.

The defined scope of work, at this time, includes a review of alternative solutions, consultation with the public and review agencies, and completion of a Master Plan Document as per Phases 1 and 2 of the EA process flowchart, included as **Figure No. 2**. We note that the EA process allows for individual projects, identified within the Master Plan, to proceed under the appropriate Schedule using the Master Plan as a basis.

4. PLANNING CONSIDERATIONS

As an upper tier government, the County establishes land use planning policies in the Bruce County Official Plan (BCOP June 21, 2010 – office consolidation June, 2013), provided in **Appendix B**. The BCOP identifies land uses with a broad area perspective, including such designations as “primary urban community”, and “agricultural areas” and “hazard land areas”, as illustrated in the Schedule A Land Use Plan. The BCOP also identifies a County-wide transportation plan as illustrated in the Schedule B Transportation Plan. BR33 is identified as a “rural collector” road, connecting the “primary urban community” of Saugeen Shores with the “secondary urban community” of the Bruce Nuclear Power Development.

As a lower tier government, the Town establishes more local land use planning policies in the Town of Saugeen Shores Local Official Plan (SSLOP). The current SSLOP, dated March 26, 2014 (office consolidation September 2014) is included in **Appendix B**. The Schedule A Land Use Plan identifies predominantly residential land uses adjacent to BR25 and BR33. The SSLOP Schedule B Transportation Plan identifies Bruce Street as a proposed collector road to align with a southerly connection to BR33 at the Lot 25/26 boundary.

Both the BCOP and SSLOP identify a southerly limit of the “planned settlement area” generally at the Lot 28/29 boundary, but extending southerly along both Goderich Street and BR33. A balance of the lands south of the Lot 28/29 boundary is designated as agricultural.

5. BACKGROUND STUDIES

Several background studies were completed or referenced during this Master Planning process. The following is a summary of background reports, which may be beneficial in advancing individual projects under a Schedule “B” or “C” Environmental Assessment process;

- i) Bruce Road 25 Traffic Needs Assessment Study, January 2009 - Gamsby and Mannerow Limited (**Appendix C**)
- ii) Addendum to Traffic Needs Assessment Study, April 2012 – Gamsby and Mannerow Limited (**Appendix C**)
- iii) Baker Subdivision Stormwater Management Study, September 2004 – Gamsby and Mannerow Limited (**Appendix D**)
- iv) Bruce Road 25 Stormwater Management Report, May 2010 – Gamsby and Mannerow Limited (**Appendix D**)
- v) Bruce Road 33 Diversion Options, November 2011 – Gamsby and Mannerow Limited (**Appendix D**)
- vi) Lot 26 Outlet Channel, June 2012 – Gamsby and Mannerow Limited (**Appendix D**)
- vii) Natural Environment Impact Study Bruce Road 25, April 2010 – Aquatic and Wildlife Services (**Appendix E**)
- viii) Stage 1 and 2 Archaeological Assessment Bruce Road 25, July 2008 – Mayer Heritage Consultants Limited (**Appendix F**)
- ix) Stage 1 Archaeological Assessment Bruce Road 25 Re-Alignment, February 2010 - Mayer Heritage Consultants Limited (**Appendix G**)
- x) Water and Sanitary Sewer Servicing Master Plan, 2009 – Genivar (**Appendix E**)

Note: Some of the background studies did not include all of the options or subject areas, or have not been updated to the current date.

These background reports informed the evaluation and assessment of alternatives and will be beneficial in advancing specific projects toward implementation.

6. PROBLEM / OPPORTUNITY IDENTIFICATION

The County, as proponent, and the Town, as a principle partner, are taking a pro-active approach in assessing a variety of road and drainage related issues within the Study Area. The problems and opportunities identified for review through this Master Plan process are summarized as follows:

6.1 Roads

The proponent intends to improve road surfaces on BR25 and BR33, to plan safe and efficient road infrastructure within the settlement area boundary, and to support the Town's "Active Transportation" initiatives within the Subject Area; with regard to planned development.

6.2 Drainage

The proponent intends to address drainage deficiencies along BR25, to address flooding issues experienced within the Baker Subdivision west of BR33, to improve existing drainage along BR33, and to consider an appropriate outlet(s).

7. PROJECT INITIATION

Initial planning for the project began about 2009. At that time, a new BR25 trunk storm sewer to Lake Huron was being considered alone. During those discussions, other road and drainage issues arose, as noted in Section 2.3. Additional background studies and field review was considered appropriate to develop a Master Plan level of alternative solutions.

7.1 Notice of Project Initiation

A Notice of Project Initiation was advertised in the Shoreline Beacon newspaper on September 22nd, 2015. The Notice included an invitation to a Phase 1 discretionary Public Information Centre. A copy of the Notice is included in **Appendix H**.

As part of Phase 2 of the EA process, a Notice of a required Public Information Centre was advertised in the Shoreline Beacon newspaper on May 2nd, 2016. A copy of the Notice is included in **Appendix I**.

7.2 Discretionary Public Information Centre

A discretionary Public Information Centre (PIC#1) was held on October 7th, 2015 at the Rotary Hall in the Saugeen Shores Recreation Complex.

At this PIC#1, general concepts and preliminary solutions were presented. This PIC#1 helped to establish the problem / opportunity statement and to complete a list of alternative solutions to be evaluated and assessed through the process.

Presentation materials for PIC#1 are provided in **Appendix H**. About 100 people attended, with 50 signing in. Twenty one comment sheets were returned, which are summarized in **Appendix I**.

Key results of PIC#1 include the following:

- i) There was significant public interest in developing Active Transportation Routes along BR25, from Goderich Street to Lake Huron, and a bicycle route along BR33.
- ii) Additional drainage alternatives were developed.
- iii) Potential alignment options for BR33 were clarified.

7.3 Required Public Information Centre

A required Public Information Centre (PIC#2) was held on May 18th, 2016 at the Rotary Hall in Saugeen Shores Recreation Complex.

At this PIC#2, the alternatives evaluation and the preliminary preferred solutions were presented in an “Open House” format with the Project Team available for discussion. This PIC#2 helped to confirm that the preliminary preferred solutions were supported by the public.

Presentation materials for PIC#2 are provided in **Appendix H**. About 60 people attended, with 26 signing in. Seven comment sheets were returned, which are summarized in **Appendix L**.

Key Results of PIC#2 include the following:

- i) Public interest supported Alternative #3 of the Roads solutions, the re-alignment of BR33 to intersect BR25 at the planned Bruce Street.
- ii) Public interest did not support Alternative #5 of the Drainage solutions, the diversion of the flows from the re-aligned BR33/BR25 intersection through the Baker Subdivision.
- iii) Public interest preferred Alternative #3 of the Drainage solutions, the construction of a new storm sewer on BR25 to a new outlet at Lake Huron.

8. STUDY PROCESS

The process toward selecting a preferred Master Plan for Roads and Drainage involves two main steps. The first step is to develop, assess and evaluate alternative solutions, and to resolve a preferred master plan solution for roads, since alternative solutions for drainage may be contingent upon the roads solution. The second step is to develop alternative solutions for drainage, based on the preferred master plan for roads. These alternatives for drainage are then assessed and evaluated to resolve a preferred master plan for drainage.

In each of the preferred Master Plan solutions, specific projects are identified, some of which may require an additional degree of study to fulfill Schedule “B” or “C” project requirements, under the EA process, to support construction of that specific project within the context of the Master Plan.

The processes followed to assess and evaluate alternatives are summarized in the following sections:

8.1 Assessment of Alternatives

The potential benefits and impacts of each alternative are assessed against social, cultural, natural, technical and economic factors (environments). The ability of each alternative appropriately to address the defined problem and/or opportunity statement is also included in the assessment.

The assessment is based on the existing environmental conditions compiled through field visits, site specific studies completed to date, and secondary source information.

The assessment also incorporates comments received from public agencies and area residents through the consultation process.

Comments and feedback on the range of alternative solutions are incorporated into the assessment accordingly.

Construction cost estimates are provided in some instances and, where provided, are preliminary and intended only to provide an order of magnitude of construction costs for comparison purposes. The costs of planning activities, engineering design, property, permits, mitigation, easements, legal costs and potential cost sharing are not included.

8.2 Evaluation of Alternatives

A comparative examination of the advantages and disadvantages of the alternatives is completed.

The evaluation is carried out using the Reasoned Argument method, comparing differences in impacts and providing a clear rationale for the selection of the recommended preferred alternative.

The Do Nothing Alternative is not typically carried forward into the evaluation of alternatives because it typically does not address the problem and/or opportunity. Normally, only alternatives that address the problem are evaluated. However, for comparison purposes, the Do Nothing Alternative is carried forward in the evaluations.

9. PHASE 2 ROADS ALTERNATIVES

This Section progresses through Phase 2 of the Master Planning process for roads systems, beginning with a general discussion. Alternative solutions are identified, environments are inventoried, impacts are identified and alternative solutions are assessed and evaluated. The general proposed actions of each Roads alternative are shown in **Figure No. 3**.

9.1 General Considerations for Road Systems Alternatives

The main existing roads within the Study Area are Goderich Street (Highway 21 Connecting Link), BR25 and BR33. Goderich Street is a four lane urban section arterial road. BR25 and BR33 are two lane rural section arterial roads. Although current traffic volumes would not warrant changes to the existing number of lanes, planned development within the Town will extend two local roads (Stickel Street and Ridge Street) and one collector road (Bruce Street) southerly to intersect BR25; creating four off-set “tee” intersections between Goderich Street and BR33. These planned road intersections are expected to increase traffic volumes on BR25, between Bruce Street and Goderich Street. The location of the Stickel Street intersection is based on the Lake Ridge Estates Plan of Subdivision. The location of the Bruce Street intersection is not fixed, but is planned as an extension to the existing road allowance; as based on the Town’s Official Plan. The location of the Ridge Street intersection is based on the Bluewater Estates (BWE) Draft Plan of Subdivision.

The planned Lake Ridge Estates (LRE) subdivision will extend Stickel Street southerly to BR25. As part of the development plans for the subdivision, the adjacent section of BR25, from Stickel Street to Goderich Street will be constructed to an urban standard, complete with watermain, sanitary sewer and storm sewer infrastructure, curbs and multi-purpose trail. The planned Blue Water Estates Subdivision will extend Ridge Street to BR25. There is no current development plan that would extend Bruce Street to BR25; however, the extension is planned in the Town’s Official Plan.

The existing segment of BR33 from its intersection with BR25, south to the where the re-alignment meets its original configuration, is referred to as Lake Range Road for the alternatives that consider the possible re-alignment.

The possible re-alignment layouts of BR33 are shown on **Figure No. 4**.

9.2 Alternative Solutions for Road Master Plans

Alternative solutions to the identified problems for the roads system are summarized as follows:

- i) Do Nothing / Existing Conditions,
- ii) Intersection and Capacity Improvements on BR25,
- iii) Re-Align BR33 to Intersect BR25 at Future Bruce Street Intersection Location.

9.3 Inventory of Environments for Road Systems

The following sections summarize an inventory of issues to be addressed under each of the respective environments. The social, cultural, natural, technical and economic impacts of each Road alternative is summarized as a table provided in **Appendix M**.

9.3.1 Social Environment

The Social environment includes the interests of directly and indirectly affected public members in the usage of the built facility, and governance issues between the upper and lower tier governments. Potential construction impacts to directly affected public members would be addressed under the project specific EA.

The following summarizes an inventory of the Social environment:

Usage of the Built Facility

- Maintenance of access to existing residences should be considered.
- For some alternatives, land acquisition for additional right-of-way may be necessary.
- The aesthetic impacts of an urban road cross section should be considered.
- Some land owners adjacent to BR25 indicated a concern with respect to increased traffic, road widening, safety and land use.
- Some land owners in the area of the BR33 re-alignment alternative indicated a preference for the road to not cross their property.
- The Town's OP (Schedule B) illustrates a proposed BR33 alignment, which crosses the north westerly corner of an agricultural designation, which should be avoided.
- There is significant public interest in developing "active transportation" opportunities in this area, including an east / west multi-purpose trail along BR25, and bicycle lanes southerly along BR33.

Governance

- Currently, the County is responsible for BR25 from Goderich Street westerly to the intersection of Saugeen Beach Road at Lake Huron. The County is interested in divesting the portion of BR25 west of the BR33 intersection (in any case) to the Town, since more local issues are expected to predominate with planned development within the urban designation. The road section south of the existing intersection of BR25 and BR33 should also be considered for divestiture, if a BR33 re-alignment is preferred.
- The road section west of the existing intersection of BR25 and BR33 should be considered for an urban cross section.
- The ability of the alternative adequately to address the identified problem and/or opportunity should be considered.

Cultural Environment

The Cultural environment includes the interests of First Nation groups and built heritage.

The following summarizes an inventory of the Cultural environment:

- Archaeological potential should be investigated. A Project Screening Checklist is provided in **Appendix K**.
- First Nations should be consulted for their specific interests.
- Cultural heritage should be reviewed. A Project Screening Checklist is provided in **Appendix K**.

9.3.2 Natural Environment

The Natural environment for roads alternatives considers terrestrial habitat for flora and fauna, including Species at Risk and special policy areas.

The following summarizes an inventory of the Natural environment:

- Vegetation.
- Wildlife and Wildlife Habitat.
- Species at Risk and Habitat.
- Special Policy areas.
- Water Quality.

9.3.3 Technical Environment

The Technical environment includes design standards, approvals and constructability. Traffic Study information is considered. Maintenance and asset ownership are also considered. Bruce County is the Road Authority for BR25 and BR33. The Town is the Road Authority for other roads in the area.

The following summarizes an inventory of the Technical environment:

- The design of the County roads system should consider a secondary highway standard.
- Future traffic levels should be assessed.
- Safety and efficiency of movement for the driving and pedestrian public should be considered.
- Intersection control should be considered.
- Project constructability should be assessed.
- Maintenance should be considered.
- Agency approvals for projects should be considered.

9.3.4 Economic Environment

The Economic environment includes the construction costs, and other project-related costs such as land costs, professional fees and application fees. Preliminary (Class D) construction cost estimates for the capital works can be considered for overall project comparison purposes. Development interests in the area would be expected to contribute financially to road capacity increase, so cost sharing may be considered. Operating and maintenance costs are also included in the Economic environment.

The following summarizes an inventory of the Economic environment:

- Construction costs.
- Cost sharing opportunities.
- Maintenance costs.

9.4 Impact of Alternatives on Environments

The following provides a summary of the background reports, which informed the impact of alternative solutions on the respective environments:

9.4.1 Traffic Studies

In January, 2009, a report entitled “Bruce Road 25 Needs Assessment Study” was prepared by Gamsby and Mannerow Limited (G&M). The purpose of the report was to estimate the potential traffic generated by planned development and to recommend the configuration of the planned intersections. Key findings of the Needs Assessment Study are summarized as follows:

- i) Intersection upgrades would not be necessary for the BR25 / Goderich Street intersection.
- ii) A minimum 3-lane cross section, from Goderich Street to Stickel Street is recommended, however, both the County and Town prefer a 4-lane road cross section between Bruce Street and Goderich Street, to minimize traffic conflicts, and to improve traffic safety.
- iii) Traffic signals would not be warranted on BR25 at the three planned intersections with Goderich Street, at Stickel Street, Bruce Street or Ridge Street.

Subsequently, the County proposed the re-alignment of BR 33 to intersect BR25 at the future Bruce Street intersection location. In June 2012, an “Addendum to the BR25 Needs Assessment Study” was prepared to consider the configurations of these alternatives. Key findings of the Addendum to the BR25 Needs Assessment Study are summarized as follows:

- i) Considering that a multi-purpose trail linkage is planned on the north side of BR25, from Goderich Street to Saugeen Beach Road, a signalized intersection at a re-aligned BR33 intersection would be recommended to provide a safe crossing for pedestrian traffic,
- ii) Centre left turn lanes on BR25 from Goderich Street to Bruce Street should be considered in the preliminary design as a minimum,
- iii) A dedicated left turn lane for each of the four legs of the Bruce Street/ BR33 and BR25 intersection should be considered in the preliminary design for this intersection.

9.4.2 Cultural Heritage Studies

In assessing the cultural potential of lands within the Study Area, the Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes and the Criteria for Evaluating Archaeological Potential checklist forms, provided by the Ministry of Tourism, Culture and Sport (MTCS) were prepared and provided in **Appendix K**. Based on that preliminary review, the area has some potential for both of these cultural heritage aspects. Archaeological investigations were referenced and included as **Appendix F**. No previous studies have been conducted in regards to the Built Heritage Resources and Cultural Heritage Landscapes of the Study Area at the time of this report. It is recommended that the necessary studies be conducted as part of the projects resulting from the recommendations from this Study.

A Stage 1 and 2 archaeological evaluation was completed by Mayer Heritage Consultants for the lands along BR25. Although the Stage 1 report concludes that the area has some potential for archaeological resources, the Stage 2 investigation along BR25 did not uncover any archaeological resources, and concluded that no further study was necessary for that area. An additional Stage 1 archaeological evaluation of the lands potentially affected by the BR33 re-alignment under Alternative 3 also was completed, which also indicated some potential for archaeological resources.

If the Master Plan selects Alternative 3, the BR33 re-alignment planning process would follow a Schedule “B” EA, if less than \$2.4M, at which time a Stage 2 investigation for the subject lands should be completed.

9.4.3 Natural Environment Impact Studies

In 2010, a Fish and Habitat and Aquatic Impact Assessment, included in **Appendix E**, was completed by Aquatic and Wildlife Services for the natural watercourse which crosses Bruce Road 25 west of Shipley Avenue and crosses private lands on a northerly route to Lake Huron.

An Environmental Impact Study for the lands along the re-alignment route(s) has not yet been conducted. The lands are currently under agricultural development. An EIS would be necessary to further inform the EA for the new road alignment for Alternative 3.

A discussion of the impact of each of the Alternatives on the respective environments is presented in the following sections.

9.4.4 Alternative #1 – Do Nothing

The Do Nothing Alternative would have the following environmental impacts:

Social

Usage of the Built Facility

- Maintenance of access to existing residences would remain.
- Land acquisition for additional right-of-way would not be necessary.
- The aesthetic impacts of an urban road cross section would not be an issue.
- Adjacent to BR25, traffic would increase without appropriate lane capacity increase, thus presenting safety concerns. Property use may be impacted due to traffic increase without appropriate lane capacity.
- The BR33 re-alignment alternative would not occur.
- The Town’s OP (Schedule B) illustrates a proposed BR33 alignment, which crosses the north westerly corner of an agricultural designation, which would not be an issue.
- Active transportation opportunities in this area, including an east / west multi-purpose trail along BR25, and bicycle lanes southerly along BR33 could still be considered.

Governance

- The County could divest the portion of BR25 west of the BR33 intersection to the Town.
- No divestiture of the existing road section south of the existing intersection of BR25 and BR33 would occur.
- No change to the existing road cross section west of the existing intersection of BR25 and BR33.
- The Do Nothing alternative would not address the identified problems and opportunities.

Cultural

- There would be no effect on the Cultural environment.

Natural

- There would be no effect on the Natural environment.

Technical

- The intersection of BR25 and BR33 would remain deficient with respect to secondary highway standards.
- Future traffic levels would not be supported by the existing lanes
- Safety and efficiency of movement for the driving and pedestrian public would worsen as planned Town roads are extended from the north to BR25.
- Stop-controlled “Tee” intersections would be planned at each of the Stickel Street, Bruce Street, Ridge Street and BR33 intersections with BR25
- Project constructability would not be an issue.
- Short term maintenance may consist of surface repairs, but long term maintenance may become problematic with increased traffic.
- Agency approvals would not be an issue.

Economic

- Although this alternative would have the lowest capital cost, there would be long-term costs associated with traffic inefficiencies, which are difficult to quantify.

9.4.5 Alternative #2 – Intersection Improvements

The Intersection Improvement Alternative would have the following environmental impacts:

Social

Usage of the Built Facility

- Maintenance of access to existing residences would remain.
- Land acquisition for additional right-of-way would be necessary on the north side of BR25 at Goderich Street, and at the existing BR25 / BR33 intersection.
- The aesthetic impacts of an urban road cross section may be mitigated with a landscaping plan.
- Along to BR25, traffic would increase without appropriate lane capacity increase, thus presenting safety concerns. Property use may be impacted due to traffic increase without appropriate lane capacity.
- The BR33 re-alignment alternative would not occur.
- The Town’s OP (Schedule B) illustrates a proposed BR33 alignment, which crosses the north westerly corner of an agricultural designation, which would not be an issue.
- Active transportation opportunities in this area, including an east / west multi-purpose trail along BR25, and bicycle lanes southerly along BR33 could still be considered.

Governance

- The County could divest the portion of BR25 west of the BR33 intersection to the Town.
- Divestiture of the existing road section south of the existing intersection of BR25 and BR33 would be unlikely.
- No change to the existing road cross section west of the existing intersection of BR25 and BR33 would occur.
- This alternative would only partially address the identified problems and opportunities.

Cultural

- There would be no effect on the Cultural environment.

Natural

- There would be no effect on the Natural environment.

Technical

- The intersection of BR25 and BR33 would be upgraded to achieve a secondary highway standard.
- Future traffic levels would not be supported by the existing lanes
- Safety and efficiency of movement for the driving and pedestrian public would be accommodated at intersections, but not with lane capacity on BR25, as planned Town roads are extended from the north to BR25.
- Stop-controlled “Tee” intersections would be planned at each of the Stickel Street, Bruce Street, Ridge Street and BR33 intersections with BR25.
- Project constructability would follow conventional road construction processes.
- Maintenance issues would be typical.
- Agency approvals would not be an issue.

Economic

- This alternative would be in the middle of the alternatives in terms of capital cost. There would be some long-term costs associated with traffic inefficiencies, which are difficult to quantify.

9.4.6 Alternative #3 – Re-Align Bruce Road 33 to Bruce Street Intersection

The BR33 re-alignment alternative would have the following environmental impacts:

Social

Usage of the Built Facility

- Maintenance of access to existing residences would remain. Driveway entrances and a connection of Baker Road to the new re-aligned BR33 would need to be resolved
- Land acquisition for additional right-of-way would be necessary at each quadrant of the BR25 at Goderich Street intersection, but not at the existing BR25 / Lake Range Road intersection, to support a local road standard.
- The aesthetic impacts of an urban road cross section may be mitigated with a landscaping plan.
- Along BR25, traffic increase would be mitigated with appropriate lane capacity increase and barrier curb, thus addressing safety concerns. Property use may receive some impact, however, lane widening would occur within the existing road allowance and property use would be mitigated through building setbacks.
- The design requirements and route selection for the BR33 re-alignment alternative can mitigate preferences for the road to not cross noted property.
- The design requirements and route selection can avoid the the north westerly corner of an agricultural designation. The Town’s OP can be updated accordingly.
- Active transportation opportunities could be accommodated in this area, including an east/west multi-purpose trail along BR25, and bicycle lanes southerly along BR33.

Governance

- The County could divest the portion of BR25 west of the BR33 intersection to the Town, and the portion of BR33 from BR25 to the re-alignment location.
- The existing road cross section west of the existing intersection of BR25 and BR33 could be urbanized.
- This alternative would fully address the identified problems and opportunities.

Cultural

- Once a route is selected through the EA process, a Stage 2 archeological investigation for the subject lands should be completed to confirm there would be no effect on the Cultural environment, or if mitigation measures would be necessary.

Natural

- An EIS would be necessary to further inform the EA for the new road alignment to confirm there would be no effect on the Natural environment, or if mitigation measures would be necessary.

Technical

- The existing intersection of BR25 and Lake Range Road would remain as a local road standard.
- Future traffic levels would be fully supported by the proposed lanes. A 4-lane cross section is considered preferable by both the Town and the County on BR25 between Goderich Street and Bruce Street, narrowing to 2-lanes west of Bruce Street.
- Safety and efficiency of movement for the driving and pedestrian public would be accommodated as planned Town roads are extended from the north to BR25.
- Stop-controlled "Tee" intersections would be planned at each of the Stickel Street, Ridge Street and BR33 intersections with BR25.
- A traffic signal is considered appropriate at the planned BR25 / BR33 intersection for pedestrian safety, although a traffic circle may be considered in a specific EA.
- Project constructability would follow conventional road construction processes.
- Generally, the design speed for a re-aligned BR33 would be 20 km/hr greater than the legal posted speed. There are several alignment options for BR33, but the minimum horizontal radius is 420 metres for a 100 km/hr design speed (80 km/hr posted speed), and 190 metres for a 70 km/hr design speed (50 km/hr posted speed); for normal cross fall. A 70 km/hr design speed would produce an alignment, which would avoid properties, the owners of which indicated a preference to not be impacted. Other alignment options are shown in **Figure No. 4**.
- The extension of Baker Road easterly to the re-aligned BR33 should be considered.
- The connection of Lake Range Road to the re-aligned BR33 should be considered.
- Maintenance issues would be typical.
- Planning and design for BR25, between Goderich Street and planned Bruce Street/ re-aligned BR33, would require a Schedule "B" EA. Construction of a new BR33 would require a Schedule "B" EA if less than \$2.4M.

Economic

- This alternative would be in the most costly in terms of capital cost, but would mitigate long-term costs associated with traffic inefficiencies, which are difficult to quantify.

9.5 Assessment and Evaluation of Roads Alternatives

The Social, Cultural, Natural, Technical and Economic environment impacts identified for each of the Roads alternatives allows for the evaluation of a preferred Roads solution by assessing them through the comparison of their respective environment impacts. The evaluation of the Roads alternatives is summarized by tables included in **Appendix M**.

9.5.1 Assessment and Evaluation of Social Environment Impacts

In evaluating the Roads alternatives with respect to the Social environment, the key criteria of comparison are the alternatives' abilities to support future development interests, address residents' interest in developing Active Transportation Routes, and reduce the instances of off-set tee intersections with planned streets, all along BR25.

In regards to the three main criteria, Alternative #1 does not address the identified problems/opportunities identified and is not preferred. For comparison with the other alternatives, it should be noted that four off-set tee intersections would exist as result of this alternative's implementation and two of them, Bruce Street and existing BR33, would be of relatively "heavy use".

While Alternative #2 would also result in the same four off-set tee intersections along BR25, it does support the interests of future development and Active Transportation Routes and is therefore preferred over Alternative #1. However, similar to Alternative #1, Alternative #2 is not ideal since two of its off-set tee intersections, Bruce Street and existing BR33, would still receive a relatively "heavy use".

Alternative #3 would address all three of the main comparison criteria for the Social environment evaluation. This alternative would support future development and Active Transportation Routes along BR25, similar to Alternative #2, but the number of resulting off-set tee intersections is reduced to three as the re-aligned BR33 would create a signalized intersection at the planned Bruce Street. This signalized intersection would also reduce the number of "heavy use" tee intersections from the two instances, common to Alternatives #1 and #2, to just one at Bruce Street.

9.5.2 Assessment and Evaluation of Cultural Environment Impacts

Little comparison can be made between the Roads alternatives in terms of their impact to the Cultural environment. The result of previously completed Stage 1 and Stage 2 Archaeological Assessments have cleared the BR25 right-of-way of archaeological concern and, consequently, Alternatives #1 and #2 are considered to pose little risk to the Cultural environment.

A Stage 1 Archaeological Assessment was prepared for the lands potentially impacted by the re-alignment of BR33 as proposed by Alternative #3. The Assessment indicated the potential for archaeological interests and the need for a more intrusive Stage 2 Archaeological Assessment to be conducted to verify the presence/absence of archaeological resources. If archaeological interests were found to exist within the re-aligned BR33 lands, the complexity and constructability of the alternative may be affected in support of their conservation.

Given the level of previous anthropogenic disturbance to the re-aligned BR33 lands as a result of farming and residential land uses, the potential for the presence of archaeological resources is reduced. Regardless of the Assessment's determination, mitigation measures such as different re-alignments for the proposed BR33 section or resource relocation would minimize the potential for Cultural interests to impede a new, re-aligned BR33 to BR25.

In summary, none of the alternatives is expected to have a significant impact to the Cultural environment and the lack of distinction that can be established in their comparison does not indicate a preferred alternative.

9.5.3 Assessment and Evaluation of Natural Environment Impacts

While the Do Nothing approach of Alternative #1 presents little impact to natural features within the Study Area, it also offers little opportunity to improve upon existing conditions.

Through the widening of BR25, minor removal of vegetation adjacent to the roadway would be required. The improvement of sight lines at the BR25 and BR33 intersection would be achieved by the removal of vegetation; both Alternative #1 and #2 would require such vegetation removal. However, it is believed that the removal of this vegetation is anticipated to have more of an aesthetic impact than an ecological one since BR25 would be reconstructed predominantly in the same location.

Alternative #3 would require the clearing of vegetation along the lands required for the proposed BR33 re-alignment. The vegetation encountered along the route is expected generally to be agricultural species. Natural EIS efforts, consisting of field surveys conducted over a period of time, would be required to verify the presence of sensitive and/or significant wildlife and habitat. However, mitigation measures, such as relocating the proposed BR33 re-alignment, could be implemented relatively easily to safeguard natural resources if they were found to exist within the currently proposed route.

Similar to the evaluation of the Cultural Environment, no considerable difference exists between the Roads alternatives in terms of their impact to the Natural Environment. While Alternative #3 has a greater potential to be affected by the presence of Natural interests, it does not indicate a considerable disadvantage since measures are available to mitigate the potential effects. As a result, no Roads alternative is considered preferred as a solution based on impact to the Natural environment.

9.5.4 Assessment and Evaluation of Technical Environment Impacts

In the aspect of the Technical environment, the Alternatives were assessed on an ability to support future development interests, improve traffic movement efficiency, as well as to promote pedestrian and vehicular safety

Alternative#1 does not support the development interests in the area and results in four off-set tee intersections, two of which would eventually receive "heavy use". By not reducing the number of off-set tee intersections or improving the poor sight lines of the intersection of BR25 and BR33, this alternative does not promote pedestrian or vehicular safety.

The widening and improvement of BR25 would support future development interests along the roadway and improve the safety of pedestrian and vehicular traffic. These proposed actions, common to Alternatives #2 and #3, make these alternatives preferable to Alternative #1.

However, the number of off-set tee intersections, or the number of them that would receive “heavy use”, is not reduced by the proposed improvements of Alternative #2 from those of Alternative #1.

The number of these intersections is reduced by the re-alignment of BR33 to BR25 with a signalized intersection at the future Bruce Street location, as proposed by the Alternative #3. Therefore, Alternative #3 is the preferred alternative with respect to the Technical environment as it provides the greatest degree of addressing the identified problem/opportunities while promoting vehicular and pedestrian safety.

9.5.5 Assessment and Evaluation of Economic Environment Impacts

Between the three Roads alternatives, Alternative #1 incurs the least amount of construction cost. Of any related construction cost, the entirety of it would be expected to be paid for by public funding. The opportunity for cost sharing options is not expected since it would not support future development interests. In terms of non-construction costs, the opportunity cost in not addressing the identified problems/opportunities is significant; future development is limited, divestiture of roads would not be possible, traffic efficiency would not improve, and improved safety along the roadway is not promoted.

The construction cost of Alternative #2 would be greater than Alternative #1 due to intersection improvements along BR25 but this increase could be partially mitigated by a possible cost sharing with adjacent land development as the new development roads are extended southerly to intersect with BR25. Non-construction costs of Alternative #2 would be lesser than Alternative #1, as many of the identified problems/opportunities are addressed; traffic efficiency and safety would be improved, and divestiture would be possible.

Incurring the greatest construction costs of the Roads alternatives, Alternative #3 adds a new re-aligned BR33 roadway and a signalized intersection to the costs of Alternative #2. By its support of future development interest though, cost sharing with private developments adjacent to BR25 may be possible to mitigate a portion of these greater construction costs. Although the additional background information studies for Cultural and Natural resources necessary to clear the lands of the re-aligned BR33 would add to the non-construction costs of Alternative #3, the opportunity costs are minimized by all identified problems/opportunities being addressed by this alternative.

Varying from the lower construction cost/higher non-construction costs (lower benefits) balance of Alternative #1, to the higher construction cost/lower non-construction costs (greater benefits) balance of Alternative #3, and the combination of both in Alternative #2, no single alternative differs from the rest of the alternatives to be considered less or more preferred based on their impacts to the Economic environment.

9.5.6 Evaluation of Roads Alternatives Results

Evaluation of the Roads alternatives confirmed that the Do Nothing approach of Alternative #1 is not viable. Not preferred over any other alternative on the basis of its impacts in any of the Social, Cultural, Natural, Technical or Economic environments, or at least by any measurable advantage, Alternative #1 does not address the problems/opportunities identified within the Study Area.

Preferred over Alternative #1, Alternative #2 proposes several improvements that address many of the identified problems/opportunities within the Study Area, such as supporting future development interests as well as Active Transportation Routes along BR25. Yet, it is not ideal in terms of the four resulting off-set tee intersections; two of which would be of “heavy use”.

Due to the re-alignment of BR33 and installation of a signalized intersection at its connection with BR25 at the future Bruce Street location, Alternative #3 reduces the number of off-set tee intersections and those that would receive “heavy use” from four to three, and two to one, respectively. Alternative #3 proposes the widening and improvement of BR25 as Alternative #2 does, and supports future development and Active Transportation Routes interests as such.

Upon evaluation of all Roads alternatives, Alternative #3, while requiring additional background studies to fully assess its impacts on the Cultural and Natural environments, is the preferred Roads solution recommended for the overall Master Plan. Its preference can be attributed to its ability to address all identified problems/opportunities within the Study Area.

10. PHASE 2 DRAINAGE ALTERNATIVES

This Section progresses through Phase 2 of the Master Planning process for drainage systems, beginning with a general discussion. Alternative solutions are identified, environments are inventoried, impacts are identified and alternative solutions are assessed and evaluated. The general proposed actions of each drainage alternative are shown in **Figure No. 5** and provided in **Appendix O**. Design flows were modelled at several nodes for each alternative, which are summarized **Appendix P**.

10.1 General Considerations for Drainage Systems Alternatives

Runoff generated within the Study Area generally drains from easterly areas above the bluff, westerly to the Lake Huron coastline as a collection of several independent drainage systems with separate outlets.

Runoff from the Lake Ridge Estates and Leeder properties currently drains to the north ditch along BR25, or overland down the bluff. The BR25 drainage system currently consists of roadside ditches, which drain westerly to a small watercourse west of Shipley Avenue. This watercourse, which has limited capacity, conveys flows northerly, across private properties, to its outlet at Lake Huron.

As planned development progresses, stormwater management infrastructure is expected to direct the surface flows, from these lands southerly along the planned Stickel, Bruce and Ridge Streets to BR25, to an appropriate public drainage system and outlet.

Existing SWM facilities on the Wal-Mart and Lake Ridge Estates lands have piped outlets designed to drain their respective 1:100 year design flows without surcharge. A receiving drainage system on BR25 must provide appropriate capacity for these flows.

Based on the preceding review of Roads alternatives, the Preliminary Preferred Solution for roads includes a re-alignment of BR33 to intersect BR25 at the planned Bruce Street location. The County plans to change the section of BR25 between Goderich Street and future Bruce Street from a rural cross section to an urban cross section, complete with watermain, sanitary sewer and storm sewer. All drainage alternatives, except the Do Nothing alternative, consider the planned urbanization between Goderich Street and the planned Bruce Street location on BR25.

Storm sewer systems are typically designed as a “minor system” to convey the 1:5 year design flows. Overland flow routes generally are considered as a “major system” to convey the 1:100 year design flows. Since BR25 is planned with an urban cross section between Goderich Street and the planned BR33 intersection, the storm sewer system is planned to convey the 1:100 year design flow through this reach. Downstream of this reach, the capacity of the drainage infrastructure must provide sufficient capacity for the continued conveyance of this 1:100 year design flow downstream to an appropriate outlet at Lake Huron. A diversion of flow from one drainage area to another requires that there is no detrimental impact to the drainage area into which, or from which, flow is diverted.

Ultimately, the urban cross section would be expected to be extended by the Town from the planned Bruce Street intersection to Lake Huron; replacing the existing rural cross section. Drainage alternatives consider the urbanization of this section of BR25 where supported by the proposed drainage improvements.

For the purpose of this study, stormwater runoff peak flows used in the analyses consider existing development conditions. Usual standards require any future development to resolve how post-development runoff peak flows would be controlled to less than or equal to existing runoff peak flow rates. Therefore, existing runoff peak flow rates are expected to represent the peak flow rates under full development conditions.

In addition to the BR25 lands, drainage problems have been identified within the Baker Subdivision and Gore Drain areas of the Study Area.

The existing drainage system within the Baker Subdivision includes culverts and ditches to direct runoff from the area to Lake Huron. The drainage system is not considered to provide adequate drainage, since the Baker Subdivision currently experiences seasonal drainage problems.

In the southerly portion of the Study Area, local residents have identified drainage problems along BR33 to the existing Gore Drain Outlet.

The MTCS forms prepared as part of the review of the Roads alternatives indicating cultural potential for archaeological and heritage aspects of the Study Area can be attributed to the review of Drainage alternatives as well. These forms are included in **Appendix K**.

10.2 Alternative Solutions for Drainage Master Plans

Alternative solutions to the identified problems/opportunities for drainage systems are summarized below. Although the titles reflect the management scheme for the major drainage system, minor drainage systems are also considered within each alternative.

- i) Do Nothing / Existing Conditions,
- ii) Upgrade Existing Drainage Systems,
- iii) Construct a New Storm Sewer on BR25 to a New Outlet at Lake Huron,
- iv) Divert Flows at BR25/BR33 Intersection Northerly to South End Drain,
- v) Divert Flows at BR25/BR33 Intersection Southerly to a New Storm Sewer through the Baker Subdivision,
- vi) Divert Flows at BR25/BR33 Intersection Southerly to a New Channel Across Lot 26 to Existing Gore Drain Outlet West of Saugeen Beach Road,
- vii) Divert Flows at BR25/BR33 Intersection Southerly to Existing Gore Drain Outlet at BR33.

Each alternative is illustrated in **Appendix O**. Design flows, modelled at several nodes for each alternative, are summarized in **Appendix P**.

10.3 Inventory of Environments for Drainage Systems

The following sections summarize an inventory of issues to be addressed under each of the respective environments:

10.3.1 Social Environment

The Social environment includes the interests of directly and indirectly affected public members in the usage of the built facility, and governance issues between the upper and lower tier governments. Potential construction impacts to directly affected public members would be addressed under the project specific EA.

The following summarizes an inventory of the Social environment:

- Maintenance of access to existing residences should be considered.
- For some alternatives, land acquisition for additional right-of-way may be necessary.
- The aesthetic impacts of drainage improvements should be considered.
- Implications of drainage improvements on Land Use Planning
- The ability of the alternative adequately to address the identified problem and/or opportunity should be considered.

10.3.2 Cultural Environment

The Cultural environment includes the interests of First Nation groups and built heritage.

The following summarizes an inventory of the Cultural environment:

- Archaeological potential should be investigated.
- First Nations should be consulted for their specific interests.
- Cultural heritage should be reviewed.

10.3.3 Natural Environment

The Natural environment for drainage alternatives considers terrestrial habitat for flora and fauna, including Species at Risk and special policy areas.

The following summarizes an inventory of the Natural environment:

- Vegetation.
- Wildlife and Wildlife Habitat.
- Species at Risk and Habitat.
- Special Policy areas.
- Water Quality.

10.3.4 Technical Environment

The Technical environment includes design standards, approvals and constructability. Maintenance and asset ownership are also considered. Improvements made to the Study Area's drainage systems are also evaluated based on flood and erosion protection.

The following summarizes an inventory of the Technical environment:

- Project constructability should be assessed.
- Safety and standards of drainage infrastructure.
- Minimize drainage infrastructure while addressing the identified issues/ opportunities.
- Protection from Flooding and Erosion.
- Potential impacts to runoff water quality
- Maintenance of drainage systems should be considered.
- Agency approvals for projects should be considered.

10.3.5 Economic Environment

The Economic environment includes the construction costs, and other project-related costs such as land costs, professional fees and application fees. Preliminary (Class D) construction cost estimates for the capital works can be considered for overall project comparison purposes. Development interests in the area would be expected to contribute financially to drainage infrastructure improvement, so cost sharing may be considered. Operating and maintenance costs are also included in the Economic environment.

The following summarizes an inventory of the Economic environment:

- Construction costs.
- Cost sharing opportunities.
- Maintenance costs.

10.4 Impact of Alternative Solutions on Environments

The following provides a summary of the impact of the alternative solutions on the respective environments. The social, cultural, natural, technical and economic impacts of each Drainage alternative is summarized as a table provided in **Appendix N**.

10.4.1 Alternative #1 – Do Nothing/Existing Conditions

This alternative reflects the existing drainage conditions within the Study Area as no drainage improvements are proposed.

The Do Nothing/ Existing Conditions Alternative would have the following environmental impacts:

Social

- Maintenance of access to existing residences would remain and no disruption would be expected since no construction works are proposed.
- Land acquisition in support of drainage objectives would not be necessary.
- Lack of drainage servicing may limit or restrict the potential for development
- No aesthetic impact would occur.
- The Town's intention, ultimately to urbanize the BR25 roadway complete with Active Transportation Routes, from its intersection with the re-aligned BR33 to Saugeen Beach Road is not supported by a Do Nothing approach.
- This alternative fails to address the identified problem/opportunities to any degree. No provision would be made to correct the seasonal drainage problems within the Baker Subdivision and the continued use of the existing BR25 north ditch fails to provide an appropriate outlet for the LRE and Wal-Mart SWM ponds as well as the planned development.

Cultural

- There would be no effect on the Cultural environment as no drainage improvements are considered in this alternative.

Natural

- There would be no effect on the Natural environment as no drainage improvements are considered in this alternative.

Technical

- No new planned drainage infrastructure is proposed as part of this alternative. Consequently, no agency approvals or permits would be required and no constructability issues would exist.
- Although potential deterioration of the existing level of water quality would be reduced as a result of no proposed drainage alterations, there would also be no opportunity to improve upon it by incorporating treatment design aspects into a new SWM system.
- Existing systems do not meet current standards and will continue to inadequately service the Study Area. The current north ditch along BR25 provides insufficient capacity to convey existing flows to the outlet watercourse west of Shipley Avenue for runoff associated with a 1:5 year design storm event; the Saugeen Shores municipal standards require conveyance for a 1:100 year design storm event. In certain areas, the ditch back slope does not fully contain flow within the public right-of-way and may permit spill onto private property during greater runoff events.

- The outlet of the LRE SWM pond drains to this ditch. Future development along BR25 would not be supported. Current drainage provisions on BR25 do not provide sufficient capacity to receive the flow associated with existing conditions.
- The seasonal drainage issues within the Baker Subdivision are not addressed by a Do Nothing approach.

Economic

- Would incur no construction cost as no new drainage infrastructure is proposed to be designed or installed within the Study Area (Relative Construction Cost: 1).
- Would incur considerable non-construction related costs in terms of opportunity cost. This drainage alternative does not address the identified problem and/or opportunity. Failure to address the identified problems, results in the continuation of seasonal drainage problems for the Baker Subdivision with the potential of further deterioration and more severe complications. Failure to address the identified opportunity also results in the limiting or restricting of planned development within the Study Area. This impediment to planned development restricts growth of Saugeen Shores as a town and hinders municipal efforts of fulfilling the objectives of the Official Plan (Relative Non-Construction Cost: 4).

10.4.2 Alternative #2 – Upgrade Existing Drainage Systems

The following drainage improvements are considered as part of this alternative:

- Improvement of the north-side ditch along BR25, from the intersection at the re-aligned BR33 to the existing outlet watercourse west of Shipley Avenue, to convey the 1:100 year design flow.
- The existing watercourse outlet west of Shipley Avenue significantly upgraded to convey the 1:100 year design flow.
- A storm sewer system, designed to convey the 1:5 year design flows, installed within the Baker Subdivision. The system would maintain the existing outlet in-line with Baker Road, with a second, new outlet at the boat launch, in-line with George Street.
- Basic ditching improvements made to improve drainage along BR33 to the Gore Drain.

The Upgrade Existing Drainage Systems Alternative would have the following environmental impacts:

Social

BR25 System

- The north ditch on BR25 would be significantly upgraded to convey the design flows from the future flow conditions of the adjacent lands. An enlargement of the north ditch would require that additional land be acquired to increase the width of the existing right-of-way to the north in order to provide the necessary space.
- The existing watercourse outlet west of Shipley Avenue would be significantly upgraded. This outlet traverses several private properties that would be impacted by both temporary construction access as well as permanent channel widening. Aesthetics of this channel would be greatly affected as some private properties contain built features on and adjacent to the watercourse. A widening of this channel would be expected to result in the removal or alteration of these features.
- There is no right of access to these private lands in order to undertake a channel widening project. Given the effect that such a project would have upon the current aesthetics of the channel, permission from the private landowners is considered unlikely.
- Existing driveway access would be minimally affected. Minor access interruption would occur during construction as temporary traffic control measures would be implemented with detours. The construction of an improved ditch along BR25 is expected to require a relatively shorter time frame to construct than a storm sewer.

Consequently, a shorter period of lesser traffic impacts to BR25 and the surrounding area could be expected for this alternative than the other alternatives (less the Do Nothing approach of Alternative #1).

- With the increase in flow rate expected to be received by the outlet watercourse under future conditions, the potential for erosion along the watercourse is increased but would be mitigated by the resizing of the channel.
- By conveying the Wal-Mart and LRE SWM pond outflows, as well as the 1:100 year design flows from BR25 lands, to an appropriate outlet at Lake Huron, this drainage alternative could address the problem/opportunity of supporting planned development along BR25.
- The sandy shoreline at BR25 would not be affected.
- The Town's intention, ultimately to urbanize the BR25 roadway complete with Active Transportation Routes, from its intersection with the re-aligned BR33 to Saugeen Beach Road is not supported by this drainage alternative.

Baker Subdivision System

- The two storm sewer systems would be constructed within the existing road rights-of-way as per typical storm sewer design. Therefore, no additional land within the Baker Subdivision would be required for the new storm sewer systems.
- Installation of the storm sewers would temporarily affect the driveway accesses during construction. Construction of the local minor storm sewer would be expected to incur a shorter period of interrupted driveway access than a major diversion storm sewer installation would.
- A new outlet for the George Street storm sewer system would be created at the existing boat launch as part of the drainage alternative. It is expected that a new outlet would have little impact to its current public use. The cobble shoreline at the boat launch would be expected to have less potential for erosion and aesthetic impact to its current public use than in comparison to a sandy shoreline such as the one that exists at BR25.
- No changes to land use planning are anticipated as a result of the new drainage infrastructure.
- The drainage servicing provided by the new local minor storm sewer systems within the Baker Subdivision would address the identified problem/opportunity of seasonal drainage issues.
- Social environment impacts are generally equal for the Baker Subdivision System between all drainage alternatives except Alternative #5 (and Alternative #1 since it proposes no improvements) which may experience longer temporary access disruption and greater impact to the existing boat launch area due to the larger pipe diameters of the George Street storm sewer system.

Cultural

- A previously conducted Stage 1 and Stage 2 Archaeological Assessment cleared the existing BR25 right-of-way of Cultural Resources. Therefore, proposed works along BR25 would not be expected to impact the Cultural environment.
- A Stage 1 and Stage 2 Archaeological Assessment would be necessary to evaluate archaeological potential where excavation has not previously occurred.
- Standard construction mitigation measures would be employed to protect any archaeological resources discovered during construction.
- While no Archeological Assessment has been conducted for the Baker Subdivision, the previous disturbance of the area, by its residential development and other anthropogenic activities, reduce its archeological potential.
- By opting for an improved ditch to convey increased BR25 flow rates, as opposed to a storm sewer system, the increased potential to disrupt existing landscapes along the northerly limit of BR25 as well as the watercourse outlet west of Shipley Avenue results in a greater possible impact to Cultural resources.

Natural

BR25 System

- By conveying the Wal-Mart and LRE SWM pond outflows, as well as future flow conditions, along BR25 via an open-channel flow, the vegetation adjacent to the BR25 north ditch would be removed as part of the necessary widening to increase its capacity.
- Similar to the BR25 north ditch, vegetation adjacent to the outlet watercourse west of Shipley Avenue would be removed as part of its widening to increase the flow capacity. To allow for construction access to the watercourse widening works, vegetation would most likely need to be removed.
- A Natural Environment Impact Study (EIS) would be necessary to verify the presence/absence of sensitive flora and fauna species along the BR25 widening and the watercourse widening and construction access.
- If sensitive habitat resources are verified with an EIS along the route, then mitigation measures would be considered at that time. Pending the results of the EIS, the number and/or severity of impacts to the various environments could increase and affect the feasibility of the alternative.
- A previous Fish Habitat and Aquatic Impact Assessment identified sensitive fish habitat within the outlet watercourse west of Shipley Avenue. The addition of the upstream flows, from the Wal-Mart SWM pond and future flow conditions of BR25 lands, to a sensitive fish habitat could have detrimental Natural environment impacts. The complexity, timeframe, and costs of the project would possibly increase from possible environmental reviews and mitigation measures.
- The protection of water quality during the widening of the watercourse outlet may be more challenging due to a flowing water environment.
- Water quality protection could be achieved using a perforated storm sewer system above the bluff, and natural channel design for BR25 and BR33 ditches.
- No known or candidate significant wildlife habitat impacted.
- No known Species at Risk would be expected to be affected by construction.
- No known Provincially Significant Wetlands or Areas of Natural and Scientific Interest would be affected by construction.

Baker Subdivision System

- Construction activity is expected to be within the existing road right-of-way; no impact to vegetation is expected as a result.
- A Natural Environment Impact Study (EIS) would be necessary to verify the presence/absence of sensitive flora and fauna species at the new boat launch outlet location.
- If sensitive habitat resources are verified with an EIS along the route, then mitigation measures would be considered at that time. Pending the results of the EIS, the number and/or severity of impacts to the various environments could increase and affect the feasibility of the alternative.
- Conventional water quality protection practices would be sufficient during construction and no special measures would be expected to be required, other than sediment and erosion controls.
- Oil Grit Separator systems may be used to protect surface water quality post-construction.
- No known or candidate significant wildlife habitat impacted.
- No known Species at Risk would be expected to be affected by construction.
- No known Provincially Significant Wetlands or Areas of Natural and Scientific Interest are affected by construction.

Technical

BR25 System

- The north ditch on BR25 would be considerably enlarged to convey the 1:100 year design flow in order to provide an appropriate outlet for the Wal-Mart and LRE SWM ponds, and to support future flow conditions.
- The outlet watercourse west of Shipley Avenue would be enlarged to accommodate the 1:100 year design flow to support the additional upstream flows of the BR25 received from the BR25 north ditch.
- Flood prone areas should be mapped along the outlet watercourse to investigate the effects of increased flow rates received from the BR25 north ditch.
- Increased flow rates from the BR25 lands may create safety concerns across private properties along the outlet watercourse. Greater flow rates within the outlet would be expected to possibly increase the watercourse's flow velocity and/or depth.
- Erosion protection should be considered for the effects of greater flow rates on the BR25 north ditch as well as the outlet watercourse. The potential for erosion may be attributed to the conveyance of greater flow rates as well as the disturbance of the soils within the ditch area as part of a widening.
- Water quality protection could be achieved using a perforated storm sewer system in areas of highly permeable soils above the bluff. The use of perforated pipe would permit a reduction of total suspended solids in sewer flows where infiltration into the subsurface occurs. Natural channel design could be implemented for water quality protection along BR25 and BR33 ditches.
- Significant earthworks would be necessary to widen the BR25 north ditch along its approximately 800 m length from the intersection of the re-aligned BR33 and BR25, to the watercourse outlet west of Shipley Avenue.
- Difficult construction along outlet watercourse as it would be conducted in flowing water conditions.
- The proposed works would need review and approval from the MOECC and SVCA to obtain the required permits.
- New storm sewer systems would require a Schedule "A+" Environmental Assessment, for section of BR25 storm sewer east of the re-aligned BR33.

Baker Subdivision System

- Two storm sewer systems would be designed to convey the 1:5 year design flow as is typical of a local minor system.
- Storm sewer sizing as a local minor system would minimize the required pipe diameters while addressing standards, safety, flooding, and water quality.
- No safety issues are expected as a result of drainage improvements.
- Conventional construction practices would be expected for the drainage improvements of the alternative; no special construction measures are expected to be required in completing the construction, other than sediment and erosion controls.
- Construction of storm sewers may be in an area of high groundwater table, which may present some constructability issues.
- Oil Grit Separators may be necessary at the outlets since inadequate space for water quality ponds is expected to be available upstream.
- New storm sewer systems would require a Schedule "A+" Environmental Assessment, assuming trenchless technology is used to cross under existing watercourse (Sch. A+ 1).
- The proposed works would need review and approval from the MOECC and SVCA to obtain the required permits.
- Timing for storm sewer installation should coincide with planned sanitary sewer installation.

Economic

- Would incur moderate construction cost due to minimization of the level of subsurface built infrastructure on BR25, and the storm sewer sizing in Baker Subdivision (Relative Construction Cost: 2).
- Would incur considerable non-construction costs due to the additional lands required to widen the BR25 right-of-way to support ditch widening. Also, the alternative would require studies to determine and mitigate the effects of additional flows to the existing watercourse outlet (Relative Non-Construction Cost: 4).

10.4.3 Alternative #3 – Construct a New Storm Sewer on BR25 to a New Outlet at Lake Huron

The following drainage improvements are considered as part of this alternative:

- The extension of a BR25 storm sewer system, designed to convey the 1:100 year design flow from the re-aligned BR33/BR25 intersection, to the top of the bluff west of the Lake Range Road intersection.
- A storm sewer, sized to convey the 1:5 year design flow, extended westerly from the Lake Range Road intersection to a new outlet at Lake Huron; in-line with BR25.
- Flows in excess of the storm sewer capacity would surcharge to, and be conveyed by, the BR25 road surface; draining westerly to the existing watercourse outlet west of Shipley Avenue. Flows within this watercourse would be slightly less than under existing conditions.
- A storm sewer system, designed to convey the 1:5 year design flows, installed within the Baker Subdivision. The system would maintain the existing outlet in-line with Baker Road, with a second, new outlet at the boat launch, in-line with George Street.
- Basic ditching improvements made to improve drainage along BR33 to the Gore Drain.

The Construct a New Storm Sewer on BR25 to a New Outlet at Lake Huron Alternative would have the following environmental impacts:

Social

BR25 System

- Storm sewer would be constructed within the existing right-of-way and, therefore, no additional land would be required.
- The watercourse outlet west of Shipley Avenue would be maintained as existing. Flow rates would be moderated with high flows diverted to the new outlet at BR25.
- Existing driveway access would not be affected. Minor access interruption would occur during construction.
- A new, major storm sewer outlet across the sandy shoreline at BR25 may have possible aesthetic and erosion implications, which may be mitigated with design features.
- Temporary traffic control measures would be implemented during the construction of the BR25 storm sewer, with detours to mitigate the effects. The installation of larger diameter pipes associated with the flows from a larger tributary area would be expected to require a longer time frame to complete than a diversion of flows at BR33 south and a local minor storm sewer system to the west. Consequently, a longer period of interrupted traffic conditions for BR25 and the surrounding area could be expected than the other alternatives.
- Little impact to private lands would be expected as the new storm sewer would be constructed within the existing right-of-way.

- The conveyance of the Wal-Mart and LRE SWM pond outflows as well as the 1:100 year design flows from BR25 lands to an appropriate outlet at Lake Huron, addresses the problem/opportunity of supporting planned development along BR25.
- The construction of a BR25 storm sewer system west of the re-aligned BR33 intersection provides an opportunity to fulfill the Town's intention ultimately of urbanizing the roadway while addressing drainage concerns. An urbanized BR25 roadway could incorporate a high flow drainage route and Active Transportation Routes into the cross section as strongly supported by public PIC input.

Baker Subdivision System

- The two storm sewer systems would be constructed within the existing road rights-of-way as per typical storm sewer design. Therefore, no additional land within the Baker Subdivision would be required for the new storm sewer systems.
- Installation of the storm sewers would temporarily affect the driveway accesses during construction. Construction of the local minor storm sewer would be expected to incur a shorter period of interrupted driveway access than a major diversion storm sewer installation would.
- A new outlet for the George Street storm sewer system would be created at the existing boat launch as part of the drainage alternative. It is expected that a new outlet would have little impact to its current public use. The existing boat launch area's cobble shoreline would be expected to have less potential for erosion and impact to its current public use than in comparison to a sandy shoreline such as the one that exists at BR25.
- No changes to land use planning are anticipated as a result of the new drainage infrastructure.
- The drainage servicing provided by the new local minor storm sewer systems within the Baker Subdivision would address the identified problem/opportunity of seasonal drainage issues.
- Social environment impacts are generally equal for the Baker Subdivision System between all drainage alternatives except Alternative #5 (and Alternative #1 since it proposes no improvements) which may experience longer temporary access disruption and greater impact to the existing boat launch area due to the larger pipe diameters of the George Street storm sewer system.

Cultural

- A previously conducted Stage 1 and Stage 2 Archaeological Assessment cleared the existing BR25 right-of-way of Cultural Resources. Therefore, proposed works along BR25 would not be expected to impact the Cultural environment.
- A Stage 1 and Stage 2 Archaeological Assessment would be necessary to evaluate archaeological potential where excavation has not previously occurred.
- Standard construction mitigation measures would be employed to protect any archaeological resources discovered during construction.
- While no Archeological Assessment has been conducted for the Baker Subdivision, the previous disturbance of the area, by its residential development and other anthropogenic activities, reduce its archeological potential.

Natural

BR25 System

- Would result in minimal impact to vegetation along BR25 as installation of BR25 sewers would be within the existing road right-of-way.
- The watercourse outlet west of Shipley Avenue would be maintained as existing since moderated flow rates would be expected.
- A previous Fish Habitat and Aquatic Impact Assessment identified minor mitigation measures to be implemented for the protection of sensitive aquatic wildlife and habitat within the outlet watercourse, west of Shipley Avenue, if storm sewers were to be installed along BR25.

- The improvements in drainage brought by new storm sewers would reduce erosion and sediment transfer along BR25.
- Conventional water quality protection practices would be sufficient during construction and no special measures would be expected to be required.
- Potential for erosion and aesthetic impacts due to a new drainage outlet across the sandy shoreline at BR25 would be mitigated by design features.
- Water quality protection could be achieved using a perforated storm sewer system above the bluff, and natural channel design for the BR33 ditches. The use of a second, minor storm sewer below the bluff could be used to receive the runoff from the BR25 road surface, keeping it separate from the polished flows conveyed from above the bluff.
- No known or candidate significant wildlife habitat impacted.
- No known Species at Risk would be expected to be affected by construction.
- No known Provincially Significant Wetlands or Areas of Natural Scientific Interest.

Baker Subdivision Systems

- Construction activity is expected to be within the existing road right-of-way; no impact to vegetation is expected as a result.
- A Natural Environment Impact Study (EIS) would be necessary to verify the presence/absence of sensitive flora and fauna species at the new boat launch outlet location.
- If sensitive habitat resources are verified with an EIS along the route, then mitigation measures would be considered at that time. Pending the results of the EIS, the number and/or severity of impacts to the various environments could increase and affect the feasibility of the alternative.
- Conventional water quality protection practices would be sufficient during construction and no special measures would be expected to be required.
- Oil Grit Separator systems may be used to protect surface water quality post-construction.
- No known or candidate significant wildlife habitat impacted.
- No known Species at Risk would be expected to be affected by construction.
- No known Provincially Significant Wetlands or Areas of Natural Scientific Interest.

Technical

BR25 System

- The BR25 storm sewer system, designed to convey the 1:100 year design flow, would be extended from the re-aligned BR33/BR25 intersection, to the top of the bluff near the Lake Range Road intersection.
- A storm sewer, sized to convey the 1:5 year design flow, would be extended westerly from the Lake Range Road intersection to a new outlet at Lake Huron; in-line with BR25. In this reach, the steeper road surfaces would convey surplus flow to a 1:100 year design flow to existing watercourse outlet.
- The moderation of flows received by the outlet watercourse west of Shipley Avenue due to the high flows diverted to the new outlet in-line with BR25 would result in lower flow rates than existing. Consequently, the watercourse outlet would be maintained as existing and the potential for flooding and erosion would be reduced.
- Potential safety concern due to the proximity of the BR25 outlet to public land use at the sandy shoreline. This would be mitigated by design features. No other potential safety issues are expected.
- Water quality protection could be achieved using a perforated storm sewer system in areas of highly permeable soils above the bluff. The use of perforated pipe would permit a reduction of total suspended solids in sewer flows where infiltration into the subsurface occurs. Natural channel design could be implemented for water quality protection along BR33 ditches.

The use of a second, minor storm sewer below the bluff could be used to receive the runoff from the BR25 road surface, keeping it separate from the polished flows conveyed from above the bluff.

- Conventional construction practices would be expected for the drainage improvements of the alternative; no special construction measures are expected to be required in completing the construction, other than sediment and erosion controls.
- Construction of storm sewers may be in an area of high groundwater table, which may present some constructability issues. Dewatering systems may be necessary.
- The planning process for a new storm sewer on BR25 would require a Schedule “B” Environmental Assessment, assuming sewer installation would not use trenchless technology to cross under the existing watercourse (Sch. B 14). The storm sewer could be completed as a Schedule “A+” activity if trenchless technology is used to cross the watercourse.
- The proposed works would need review and approval from the MOECC and SVCA to obtain the required permits.

Baker Subdivision System

- Two storm sewer systems would be designed to convey the 1:5 year design flow as is typical of a local minor system.
- Storm sewer sizing as a local minor system would minimize the required pipe diameters while addressing standards, safety, flooding, and water quality.
- No safety issues are expected as a result of drainage improvements.
- Conventional construction practices would be expected for the drainage improvements of the alternative; no special construction measures are expected to be required in completing the construction, other than sediment and erosion controls.
- Construction of storm sewers may be in an area of high water table, which may present some constructability issues. Dewatering systems may be necessary.
- Oil Grit Separators may be necessary at the outlets since inadequate space for water quality ponds is expected.
- New storm sewer systems would require a Schedule “A+” Environmental Assessment, assuming trenchless technology is used to cross under existing watercourse (Sch. A+ 1).
- The proposed works would need review and approval from the MOECC and SVCA to obtain the required permits.
- Timing for storm sewer installation should coincide with planned sanitary sewer installation.

Economic

- Would incur moderate construction costs for extending the storm sewer west of re-aligned BR33 but conveyance of the additional flows would be within existing right-of-way lands and would not involve a diversion (Relative Construction Cost: 3).
- Would incur relatively little non-construction costs since no additional lands being required in support of the drainage improvements. Drainage planning and design within the Study Area would be less complex than for flow diversion alternatives. Existing drainage patterns would be about the same as existing. (Non-Construction Cost: 1)

10.2.1 Alternative #4 – Divert Flows at BR25/BR33 Intersection Northerly to South End Drain

The following drainage improvements are considered as part of this alternative:

- The diversion of the 1:100 year design flow northerly, at the re-aligned BR33/BR25 intersection, through the Bluewater Estates Subdivision, to the existing South End Drain outlet system.

- A storm sewer, designed to convey 1:5 year design flows, installed west of the diversion at the re-aligned BR33/BR25 intersection and extended westerly to a new outlet at Lake Huron; in-line with BR25.
- Flows in excess of the storm sewer capacity would surcharge to, and be conveyed by, the BR25 road surface; draining westerly to the existing watercourse outlet west of Shipley Avenue. Flows within this watercourse would be less than under existing conditions.
- The existing watercourse outlet west of Shipley Avenue would not be altered, since design flows would be less than existing.
- A storm sewer system, designed to convey the 1:5 year design flows, installed within the Baker Subdivision. The system would maintain the existing outlet in-line with Baker Road, with a second, new outlet at the boat launch, in-line with George Street.
- Basic ditching improvements made to improve drainage along BR33 to the Gore Drain.

The Divert Flows at BR25/BR33 Intersection Northerly to South End Drain Alternative would have the following environmental impacts:

Social

BR25 System/South End Drain Diversion System

- Storm sewer would be constructed within the existing right-of-way and, therefore, no additional land would be required.
- The diversion route from BR25 could follow Stickel, Bruce, or Ridge Street alignments to the South End Drain to reduce the land requirements for the drainage alternative. Storm sewer systems below the road surface would be required to service these developments. Thus, an enlargement of the existing storm sewer systems to a major diversion system would be necessary to convey diverted flows from BR25 to the South End Drain.
- The watercourse outlet west of Shipley Avenue would be maintained as existing. Flow rates would be moderated with high flows diverted to the South End Drain.
- Existing driveway access would not be affected. Minor access interruption would occur during construction.
- A new, minor storm sewer outlet across the sandy shoreline at BR25 may have possible aesthetic and erosion implications, which may be mitigated with design features.
- The SWM pond planned for the BWE development would need to be enlarged to receive the additional volume of runoff associated with the BR25 diversion as the resulting inflow.
- Temporary traffic control measures would be implemented during the construction of the BR25 storm sewers, with detours to mitigate the effects. The installation of the smaller diameter pipes associated with a local minor storm sewer system on BR25, from west of the re-aligned BR33 intersection to a new outlet at the shoreline, would be expected to require a shorter time frame to complete than a major storm sewer system with no diversion of flows at BR33 south. Consequently, a shorter period of interrupted traffic conditions for BR25 and the surrounding area could be expected than Alternative #3.
- The construction of a BR25 storm sewer system west of the re-aligned BR33 intersection provides an opportunity to fulfill the Town's intention ultimately of urbanizing the roadway while addressing drainage concerns. An urbanized BR25 roadway could incorporate a high flow drainage route and Active Transportation Routes into the cross section as strongly supported by public PIC input.
- The South End Drain system was not designed to receive additional flows, which may restrict planned development.

Baker Subdivision System

- The two storm sewer systems would be constructed within the existing road rights-of-way as per typical storm sewer design. Therefore, no additional land within the Baker Subdivision would be required for the new storm sewer systems.
- Installation of the storm sewers would temporarily affect the driveway accesses during construction. Construction of the local minor storm sewer would be expected to incur a shorter period of interrupted driveway access than a major diversion storm sewer installation would.
- A new outlet for the George Street storm sewer system would be created at the existing boat launch as part of the drainage alternative. It is expected that a new outlet would have little impact to its current public use. The existing boat launch area's cobble shoreline would be expected to have less potential for erosion and impact to its current public use than in comparison to a sandy shoreline such as the one that exists at BR25.
- No changes to land use planning are anticipated as a result of the new drainage infrastructure.
- The drainage servicing provided by the new local minor storm sewer systems within the Baker Subdivision would address the identified problem/opportunity of seasonal drainage issues.
- Social environment impacts are generally equal for the Baker Subdivision System between all drainage alternatives except Alternative #5 (and Alternative #1 since it proposes no improvements) which may experience longer temporary access disruption and greater impact to the existing boat launch area due to the larger pipe diameters of the George Street storm sewer system.

Cultural

- A previously conducted Stage 1 and Stage 2 Archaeological Assessment cleared the existing BR25 right-of-way of Cultural Resources. Therefore, proposed works along BR25 would not be expected to impact the Cultural environment.
- A Stage 1 and Stage 2 Archaeological Assessment would be necessary to evaluate archaeological potential where excavation has not previously occurred.
- Stage 1 and Stage 2 Archaeological Assessments were previously completed for the BWE subdivision. The Assessments did not identify a potential for archeological potential resources.
- Standard construction mitigation measures would be employed to protect any archaeological resources discovered during construction.
- While no Archeological Assessment has been conducted for the Baker Subdivision, the previous disturbance of the area, by its residential development and other anthropogenic activities, reduce its archeological potential.

Natural

BR25 System/South End Drain Diversion System

- Would result in minimal impact to vegetation along BR25 as installation of BR25 sewers would be within the existing road right-of-way.
- The watercourse outlet west of Shipley Avenue would be maintained as existing since moderated flow rates would be expected.
- A previous Fish Habitat and Aquatic Impact Assessment identified minor mitigation measures to be implemented for the protection of sensitive aquatic wildlife and habitat within the outlet watercourse, west of Shipley Avenue, if storm sewers were to be installed along BR25.
- Construction activity would be within road rights-of-way through BWE and limited impact to vegetation and habitat is expected as a result.
- Improvements in drainage would reduce erosion and sediment transfer.

- Conventional water quality protection practices would be sufficient during construction and no special measures would be expected to be required.
- Potential for erosion and aesthetic impacts due to a new drainage outlet across the sandy shoreline at BR25 would be mitigated by design features.
- Water quality protection could be achieved using a perforated storm sewer system above the bluff, and natural channel design for the BR33 ditches and possible improvements to the SED outlet system. The use of a second, minor storm sewer below the bluff could be used to receive the runoff from the BR25 road surface, keeping it separate from the polished flows conveyed from above the bluff.
- BWE SWM pond may have to be expanded to address additional stormwater quality requirements as the additional runoff diverted from BR25 would result in a greater inflow than for what was originally designed.
- No known or candidate significant wildlife habitat impacted.
- No known Species at Risk would be expected to be affected by construction.
- No known Provincially Significant Wetlands or Areas of Natural Scientific Interest.

Baker Subdivision Systems

- Construction activity is expected to be within the existing road right-of-way; no impact to vegetation is expected as a result.
- A Natural Environment Impact Study (EIS) would be necessary to verify the presence/absence of sensitive flora and fauna species at the new boat launch outlet location.
- If sensitive habitat resources are verified with an EIS along the route, then mitigation measures would be considered at that time. Pending the results of the EIS, the number and/or severity of impacts to the various environments could increase and affect the feasibility of the alternative.
- Conventional water quality protection practices would be sufficient during construction and no special measures would be expected to be required.
- Oil Grit Separator systems may be used to protect surface water quality post-construction.
- No known or candidate significant wildlife habitat impacted.
- No known Species at Risk would be expected to be affected by construction.
- No known Provincially Significant Wetlands or Areas of Natural Scientific Interest.

Technical

BR25 System

- A major storm sewer above the bluff to the diversion at re-aligned BR33/BR25 intersection would convey the 1:100 year design flow in order to provide an outlet for the Wal-Mart and LRE SWM ponds, and support future flow conditions.
- A separate, local minor storm sewer west of the diversion would convey the 1:5 year design flows, from lands west of Bruce Street along BR25, to the new outlet at the shoreline at Lake Huron.
- The moderation of flows received by the outlet watercourse west of Shipley Avenue due to the high flows diverted to the new outlet in-line with BR25 would result in lower flow rates than existing. Consequently, the watercourse outlet would be maintained as existing and the potential for flooding and erosion would be reduced.
- Potential safety concern due to the proximity of the BR25 outlet to public land use at the sandy shoreline. This would be mitigated by design features. No other potential safety issues are expected.
- Water quality protection could be achieved using a perforated storm sewer system in areas of highly permeable soils above the bluff. The use of perforated pipe would permit a reduction of total suspended solids in sewer flows where infiltration into the subsurface occurs. Natural channel design could be implemented for water quality protection along BR33 ditches. The use of a second, minor storm sewer

below the bluff could be used to receive the runoff from the BR25 road surface, keeping it separate from the polished flows conveyed from above the bluff.

- By diverting a portion of the current tributary area for the watercourse outlet west of Shipley Avenue, north to the South End Drain system, the area draining to the outlet watercourse would be reduced. A reduction in overall tributary area would reduce the potential for flooding and erosion as a result of future flow conditions within the Study Area.
- Conventional construction practices would be expected for the drainage improvements of the alternative; no special construction measures are expected to be required in completing the construction, other than sediment and erosion controls.
- Construction of storm sewers may be in an area of high groundwater table, which may present some constructability issues. Dewatering systems may be necessary.
- The planning process for a new storm sewer on BR25 would require a Schedule "B" Environmental Assessment, assuming sewer installation would not use trenchless technology to cross under the existing watercourse (Sch. B 14). The storm sewer could be completed as a Schedule "A+" activity if trenchless technology is used to cross the watercourse.
- The proposed works would need review and approval from the MOECC and SVCA to obtain the required permits.

South End Drain Diversion System

- The 1:100 year design flow from BR25 would be conveyed by new storm sewers northerly to the BWE SWM pond to provide an outlet for the LRE and Wal-Mart SWM ponds' discharges, and support future flow conditions.
- Significant degree of large size storm sewer installation required from BR25 to the planned BWE SWM pond in order to convey the 1:100 year design flow.
- Existing infrastructure in the diversion route may have to be replaced or upgraded to accommodate the greater runoff rates associated with the BR25 diversion.
- The existing outlet infrastructure of the South End Drain is of limited capacity. In diverting the BR25 flows to the South End Drain, either the capacity of the outlet system would have to be increased or the planned SWM pond of the BWE development upstream would have to be enlarged to attenuate the flows to the existing capacity. Both options would require additional design and construction efforts, and possibly greater land requirements.
- In addition to quality control, the planned BWE SWM pond would require an expansion for the purpose of meeting water quality treatment guidelines. Oil Grit Separators may be necessary if inadequate space exists to achieve the desired level of treatment by the pond's size alone.
- Water quality protection could be achieved using a perforated storm sewer system in areas of highly permeable soils above the bluff. The use of perforated pipe would permit a reduction of total suspended solids in sewer flows where infiltration into the subsurface occurs. Natural channel design could be implemented for the outlet system if improvements are required. The use of a second, minor storm sewer below the bluff could be used to receive the runoff from the BR25 road surface, keeping it separate from the polished flows conveyed from above the bluff.
- No safety issues are expected as a result of drainage improvements.
- New Storm Sewer from BR25 to north would require Schedule "B" Environmental Assessment where not within an existing road allowance or utility corridor.
- New SWM pond would require Schedule "B" Environmental Assessment where additional property is required.
- The proposed works would need review and approval from the MOECC and SVCA to obtain the required permits.

Baker Subdivision System

- Two storm sewer systems would be designed to convey the 1:5 year design flow as is typical of a local minor system.
- Storm sewer sizing as a local minor system would minimize the required pipe diameters while addressing standards, safety, flooding, and water quality.
- No safety issues are expected as a result of drainage improvements.
- Conventional construction practices would be expected for the drainage improvements of the alternative; no special construction measures are expected to be required in completing the construction, other than sediment and erosion controls.
- Construction of storm sewers may be in an area of high water table, which may present some constructability issues. Dewatering systems may be necessary.
- Oil Grit Separators may be necessary at the outlets since inadequate space for water quality ponds is expected.
- New storm sewer systems would require a Schedule "A+" Environmental Assessment, assuming trenchless technology is used to cross under existing watercourse (Sch. A+ 1).
- The proposed works would need review and approval from the MOECC and SVCA to obtain the required permits.
- Timing for storm sewer installation should coincide with planned sanitary sewer installation.

Economic

- Would incur significant construction costs due to the installation of large diameter pipes through an established subdivision area and the improvements required to increase the capacity of the existing South End Drain outlet (Relative Construction Cost: 6).
- Would incur significant non-construction costs in the necessary review and possible redesign of BWE infrastructure and the South End Drain outlet (Relative Non-Construction Cost: 5).

10.4.4 Alternative #5 – Divert Flows at BR25/BR33 Intersection Southerly to a New Storm Sewer through the Baker Subdivision

The following drainage improvements are considered as part of this alternative:

- The diversion of the 1:100 year design flow southerly, at the re-aligned BR33/BR25 intersection, along the re-aligned BR33 route to a new outlet through the Baker Subdivision.
- A storm sewer, designed to convey 1:5 year design flows, installed west of the diversion at the re-aligned BR33/BR25 intersection and extended westerly to a new outlet at Lake Huron; in-line with BR25.
- Flows in excess of the storm sewer capacity would surcharge to, and be conveyed by, the BR25 road surface; draining westerly to the existing watercourse outlet west of Shipley Avenue. Flows within this watercourse would be less than under existing conditions.
- The existing watercourse outlet west of Shipley Avenue would not be altered, since design flows would be less than existing.
- A storm sewer system is considered within the Baker Subdivision. The system would include a storm sewer designed to convey the 1:5 year design flow to the existing outlet in-line with Baker Road, and a storm sewer designed to convey the 1:100 year plus the diverted flow to a second, new outlet at the boat launch, in-line with George Street.

- Basic ditching improvements made to improve drainage along BR33 to the Gore Drain.

The Divert Flows at BR25/BR33 Intersection Southerly to a New Storm Sewer through the Baker Subdivision Alternative would have the following environmental impacts:

Social

BR25/BR33 System

- Storm sewer would be constructed within the existing right-of-way and, therefore, no additional land would be required.
- The diversion route from BR25 would follow the new road alignment of BR33 to Baker Road in an effort to reduce the land requirements for the drainage alternative. A roadside ditch would be required to service the re-aligned BR33 roadway's own drainage as per typical rural cross sections. Thus, an enlargement of the ditch's typical design cross section would be all that is required to convey diverted flows from BR25 to Baker Road.
- The watercourse outlet west of Shipley Avenue would be maintained as existing. Flow rates would be moderated with high flows diverted to the new Baker Subdivision storm sewer outlet, in-line with George Street.
- Existing driveway access would not be affected. Minor access interruption would occur during construction.
- A new, minor storm sewer outlet across the sandy shoreline at BR25 may have possible aesthetic and erosion implications, which may be mitigated with design features.
- Temporary traffic control measures would be implemented during the construction of the BR25 storm sewers, with detours to mitigate the effects. The installation of the smaller diameter pipes associated with a local minor storm sewer system on BR25, from west of the re-aligned BR33 intersection to a new outlet at the shoreline, would be expected to require a shorter time frame to complete than a major storm sewer system with no diversion of flows at BR33 south. Consequently, a shorter period of interrupted traffic conditions for BR25 and the surrounding area could be expected than Alternative #3.
- The conveyance of the Wal-Mart and LRE SWM pond outflows as well as the 1:100 year design flows from BR25 lands to an appropriate outlet at Lake Huron, addresses the problem/opportunity of supporting planned development along BR25.
- The construction of a BR25 storm sewer system west of the re-aligned BR33 intersection provides an opportunity to fulfill the Town's intention ultimately of urbanizing the roadway while addressing drainage concerns. An urbanized BR25 roadway could incorporate a high flow drainage route and Active Transportation Routes into the cross section as strongly supported by public PIC input.

Baker Subdivision System

- The two storm sewer systems would be constructed within the existing road rights-of-way as per typical storm sewer design. Therefore, no additional land within the Baker
- Installation of the storm sewers would temporarily affect the driveway accesses during construction. Construction of the local minor storm sewer would be expected to incur a shorter period of interrupted driveway access than a major diversion storm sewer installation would.
- A new outlet for the George Street storm sewer system would be created at the existing boat launch as part of the drainage alternative. It is expected that a new outlet would have little impact to its current public use. The existing boat launch area's cobble shoreline would be expected to have less potential for erosion and impact to its current public use than in comparison to a sandy shoreline such as the one that exists at BR25. However, the potential for a major diversion of the BR25 flows through the

Baker Subdivision to this new outlet has a greater potential to impact this area than would a local minor storm sewer.

- No changes to land use planning are anticipated as a result of the new drainage infrastructure.
- The drainage servicing provided by the new local minor and major diversion storm sewer systems within the Baker Subdivision would address the identified problem/opportunity of seasonal drainage issues that exist there as well as the drainage issues concerning the planned development and SWM ponds from the BR25 lands.
- Compared to an alternative with a local minor storm sewer system on George Street, this drainage alternative may experience longer temporary access disruption and greater impact to the existing boat launch area due to the larger pipe diameters associated with a major diversion storm sewer system.

Cultural

- A previously conducted Stage 1 and Stage 2 Archaeological Assessment cleared the existing BR25 right-of-way of Cultural Resources. Therefore, proposed works along BR25 would not be expected to impact the Cultural environment.
- A Stage 1 and Stage 2 Archaeological Assessment would be necessary to evaluate archaeological potential where excavation has not previously occurred.
- While a Stage 2 Archeological Assessment of a diversion route from BR25 to Lot 26 would be necessary, an Assessment would be completed as part of the Roads' solution to re-align BR33. Diversion of the flows from BR25 along BR33 would therefore not initiate extra archeological study efforts than what would already be necessary.
- Standard construction mitigation measures would be employed to protect any archaeological resources discovered during construction.
- While no Archeological Assessment has been conducted for the Baker Subdivision, the previous disturbance of the area, by its residential development and other anthropogenic activities, reduce its archeological potential.

Natural

BR25/BR33 System

- Would result in minimal impact to vegetation along BR25 as installation of BR25 sewers would be within the existing road right-of-way.
- The watercourse outlet west of Shipley Avenue would be maintained as existing since moderated flow rates would be expected.
- A previous Fish Habitat and Aquatic Impact Assessment identified minor mitigation measures to be implemented for the protection of sensitive aquatic wildlife and habitat within the outlet watercourse, west of Shipley Avenue, if storm sewers were to be installed along BR25.
- Construction activity would be conducted within existing rights-of-way. Limited impact to vegetation and habitat is expected given the level of anthropogenic disturbance along BR33.
- Improvements in drainage would reduce erosion and sediment transfer.
- Conventional water quality protection practices would be sufficient during construction and no special measures would be expected to be required.
- Potential for erosion and aesthetic impacts due to a new drainage outlet across the sandy shoreline at BR25 would be mitigated by design features.
- Water quality protection could be achieved using a perforated storm sewer system above the bluff, and natural channel design for the BR33 ditches. The use of a second, minor storm sewer below the bluff

could be used to receive the runoff from the BR25 road surface, keeping it separate from the polished flows conveyed from above the bluff.

- Natural channel design could be implemented for water quality protection of the diversion ditch along the re-aligned BR33.
- A Natural Environment Impact Study (EIS), to be completed for this road re-alignment alternative, would address the presence/absence of sensitive flora and fauna species along the outlet route, and appropriate mitigation measures.
- No known or candidate significant wildlife habitat impacted.
- No known Species at Risk or habitat impacted.
- No known Provincially Significant Wetlands, Environmental Significant Areas, and/or Areas of Natural and Scientific Interest impacted.

Baker Subdivision Systems

- Construction activity is expected to be within the existing road right-of-way; no impact to vegetation is expected as a result.
- A Natural Environment Impact Study (EIS) would be necessary to verify the presence/absence of sensitive flora and fauna species at the new boat launch outlet location.
- If sensitive habitat resources are verified with an EIS along the route, then mitigation measures would be considered at that time. Pending the results of the EIS, the number and/or severity of impacts to the various environments could increase and affect the feasibility of the alternative.
- Conventional water quality protection practices would be sufficient during construction and no special measures would be expected to be required.
- Oil Grit Separator systems may be used to protect surface water quality post-construction.
- No known or candidate significant wildlife habitat impacted.
- No known Species at Risk would be expected to be affected by construction.
- No known Provincially Significant Wetlands or Areas of Natural and Scientific Interest.

Technical

BR25/BR33 System

- A major storm sewer above the bluff to the diversion at Bruce Street would convey the 1:100 year design flow in order to provide an outlet for the Wal-Mart and LRE SWM ponds, and support future flow conditions.
- A separate, local minor storm sewer west of the diversion would convey the 1:5 year design flows, from lands west of Bruce Street along BR25, to the new outlet at the shoreline at Lake Huron.
- The moderation of flows received by the outlet watercourse west of Shipley Avenue due to the high flows diverted to the new outlet in-line with BR25 would result in lower flow rates than existing. Consequently, the watercourse outlet would be maintained as existing and the potential for flooding and erosion would be reduced.
- Potential safety concern due to the proximity of the BR25 outlet to public land use at the sandy shoreline. This would be mitigated by design features. No other potential safety issues are expected.
- Water quality protection could be achieved using a perforated storm sewer system in areas of highly permeable soils above the bluff. The use of perforated pipe would permit a reduction of total suspended solids in sewer flows where infiltration into the subsurface occurs. Natural channel design could be implemented for water quality protection along BR33 ditches. The use of a second, minor storm sewer below the bluff could be used to receive the runoff from the BR25 road surface, keeping it separate from the polished flows conveyed from above the bluff.
- By diverting a portion of the current tributary area for the watercourse outlet west of Shipley Avenue, south to the Baker Subdivision system, the area draining to the outlet watercourse would be reduced.

A reduction in overall tributary area would reduce the potential for flooding and erosion as a result of future flow conditions within the Study Area.

- Conventional construction practices would be expected for the drainage improvements of the alternative; no special construction measures are expected to be required in completing the construction, other than sediment and erosion controls.
- Construction of storm sewers may be in an area of high groundwater table, which may present some constructability issues. Dewatering systems may be necessary.
- The planning process for a new storm sewer on BR25 would require a Schedule “B” Environmental Assessment, assuming sewer installation would not use trenchless technology to cross under the existing watercourse (Sch. B 14). The storm sewer could be completed as a Schedule “A+” activity if trenchless technology is used to cross the watercourse.
- The proposed works would need review and approval from the MOECC and SVCA to obtain the required permits.

Baker Subdivision System

- The Baker Street storm sewer system would be designed to convey the 1:5 year design flow. Storm sewer sizing as a local minor system would minimize the required pipe diameters while addressing standards, safety, flooding, and water quality.
- The George Street storm sewer system would be designed to convey the diverted flow plus the local 1:100 year design flow.
- No safety issues are expected as a result of drainage improvements. Safety considerations may be required for the outlet in-line with BR25 due to the relatively greater outflow due to the diverted flows.
- Conventional construction practices would be expected for the drainage improvements of the alternative; no special construction measures are expected to be required in completing the construction, other than sediment and erosion controls.
- Construction of storm sewers may be in an area of high water table, which may present some constructability issues. Dewatering systems may be necessary.
- Due to inadequate space for the construction of water quality treatment ponds, the installation of Oil Grit Separators at the outlets of the storm sewer systems may be necessary to treat runoff before discharging into Lake Huron. Since the George Street storm sewer outlet receives the diverted flows from a large catchment area, it would require a significantly more complex Oil Grit Separator system than if it was a local minor sewer system.
- New storm sewer systems would require a Schedule “A+” Environmental Assessment, assuming trenchless technology is used to cross under existing watercourse (Sch. A+ 1).
- The proposed works would need review and approval from the MOECC and SVCA to obtain the required permits.
- Timing for storm sewer installation should coincide with planned sanitary sewer installation.

Economic

- Would incur moderate construction costs as the need for new storm sewer infrastructure downstream of the re-aligned BR33 is eliminated by the diversion of runoff through the Baker Subdivision. However, this diversion would result in larger diameter pipes in the Baker Subdivision than what would be required for a local, minor system (Relative Construction Cost: 4).
- Would incur relatively little non-construction costs due to no additional lands being required in support of the drainage improvements. The studying of the effects of drainage improvements on the drainage patterns within the Study Area are more complex than if the flows were conveyed to the outlet at the sandy shoreline at BR25. The diversion along the re-aligned BR33 intercepts the runoff from the land that it traverses, conveying it south to the Baker Subdivision. The existing drainage patterns are

therefore altered relatively more than Alternative #3 and would require a slightly higher cost to study the impacts that the diversion causes (Non-Construction Cost: 2).

- A cost-benefit analysis should be conducted to review the option of including a SWM pond at Baker Street and BR33 to reduce the sizing of downstream storm sewers by attenuating upstream diverted flows.

10.4.5 Alternative #6 – Divert Flows at BR25/BR33 Intersection Southerly to a New Channel Across Lot 26 to Existing Gore Drain Outlet West of Saugeen Beach Road

The following drainage improvements are considered as part of this alternative:

- The diversion of the 1:100 year design flow southerly, at the re-aligned BR33/BR25 intersection, along the re-aligned BR33 route to a new outlet across Lot 26. The new “engineered” channel outlet across Lot 26 would be designed to convey the 1:100 year design storm flow plus the diverted flow.
- A new outlet across Lot 26 would be designed to keep diverted flows separate from the existing wetland hydrology within Lot 26, to avoid adversely impairing the function of the wetland hydrology within Lot 26 (i.e. maintaining wetland flows across new outlet).
- The new channel would outlet across Saugeen Beach Road, westerly along an existing right-of-way, to intersect with the existing Gore Drain outlet, prior to discharging to Lake Huron.
- A storm sewer, designed to convey 1:5 year design flows, is considered west of the diversion at the re-aligned BR33/BR25 intersection and extended westerly to a new outlet at Lake Huron; in-line with BR25.
- Flows in excess of the storm sewer capacity would surcharge to, and be conveyed by, the BR25 road surface; draining westerly to the existing watercourse outlet west of Shipley Avenue. Flows within this watercourse would be less than under existing conditions.
- The existing watercourse outlet west of Shipley Avenue would not be altered, since design flows would be less than existing.
- A storm sewer system, designed to convey the 1:5 year design flows, installed within the Baker Subdivision. The system would maintain the existing outlet in-line with Baker Road, with a second, new outlet at the boat launch, in-line with George Street.
- Basic ditching improvements made to improve drainage along BR33 to the Gore Drain.

The Divert Flows at BR25/BR33 Intersection Southerly to a New Channel Across Lot 26 to Existing Gore Drain Outlet West of Saugeen Beach Road Alternative would have the following environmental impacts.

Social

BR25/BR33 System/Lot 26 System

- Storm sewer would be constructed within the existing right-of-way and, therefore, no additional land would be required.
- The diversion route from BR25 would follow the new road alignment of BR33 to the Lot 26 in an effort to reduce the land requirements for the drainage alternative. A roadside ditch would be required to service the re-aligned BR33 roadway's own drainage as per typical rural cross sections. Thus, an enlargement of the ditch's typical design cross section would be all that is required to convey diverted flows from BR25 to the Lot 26 property.
- This alternative would require a drainage easement and significant construction across Lot 26 from BR33 to Lake Huron.

- The watercourse outlet west of Shipley Avenue would be maintained as existing. Flow rates would be moderated with high flows diverted to the new outlet across Lot 26.
 - Existing driveway access would not be affected. Minor access interruption would occur during construction.
 - A new, minor storm sewer outlet across the sandy shoreline at BR25 may have possible aesthetic and erosion implications, which may be mitigated with design features.
-
- Temporary traffic control measures would be implemented during the construction of the BR25 storm sewers, with detours to mitigate the effects. The installation of the smaller diameter pipes associated with a local minor storm sewer system on BR25, from west of the re-aligned BR33 intersection to a new outlet at the shoreline, would be expected to require a shorter time frame to complete than a major storm sewer system with no diversion of flows at BR33 south. Consequently, a shorter period of interrupted traffic conditions for BR25 and the surrounding area could be expected than Alternative #3.
 - The conveyance of the Wal-Mart and LRE SWM pond outflows as well as the 1:100 year design flows from BR25 lands to an appropriate outlet at Lake Huron, addresses the problem/opportunity of supporting planned development along BR25.
 - The construction of a BR25 storm sewer system west of the re-aligned BR33 intersection provides an opportunity to fulfill the Town's intention ultimately of urbanizing the roadway while addressing drainage concerns. An urbanized BR25 roadway could incorporate a high flow drainage route and Active Transportation Routes into the cross section as strongly supported by public PIC input.

Baker Subdivision System

- The two storm sewer systems would be constructed within the existing road rights-of-way as per typical storm sewer design. Therefore, no additional land within the Baker Subdivision would be required for the new storm sewer systems.
- Installation of the storm sewers would temporarily affect the driveway accesses during construction. Construction of the local minor storm sewer would be expected to incur a shorter period of interrupted driveway access than a major diversion storm sewer installation would.
- A new outlet for the George Street storm sewer system would be created at the existing boat launch as part of the drainage alternative. It is expected that a new outlet would have little impact to its current public use. The existing boat launch area's cobble shoreline would be expected to have less potential for erosion and impact to its current public use than in comparison to a sandy shoreline such as the one that exists at BR25.
- No changes to land use planning are anticipated as a result of the new drainage infrastructure.
- The drainage servicing provided by the new local minor storm sewer systems within the Baker Subdivision would address the identified problem/opportunity of seasonal drainage issues.
- Social environment impacts are generally equal for the Baker Subdivision System between all drainage alternatives except Alternative #5 (and Alternative #1 since it proposes no improvements) which may experience longer temporary access disruption and greater impact to the existing boat launch area due to the larger pipe diameters of the George Street storm sewer system.

Cultural

- A previously conducted Stage 1 and Stage 2 Archaeological Assessment cleared the existing BR25 right-of-way of Cultural Resources. Therefore, proposed works along BR25 would not be expected to impact the Cultural environment.
- A Stage 1 and Stage 2 Archaeological Assessment would be necessary to evaluate archaeological potential where excavation has not previously occurred.

- While a Stage 2 Archeological Assessment of a diversion route from BR25 to the Gore Drain outlet would be necessary, an Assessment would be completed as part of the Roads' solution to re-align BR33. Diversion of the flows from BR25 along BR33 would therefore not initiate extra archeological study efforts than what would already be necessary.
- Standard construction mitigation measures would be employed to protect any archaeological resources discovered during construction.
- While no Archeological Assessment has been conducted for the Baker Subdivision, the previous disturbance of the area, by its residential development and other anthropogenic activities, reduce its archeological potential.
- The effects of the increased flow on the Gore Drain system have not been fully studied but it is expected that there is higher potential to disrupt the existing landscapes.

Natural

BR25/BR33 System

- Would result in minimal impact to vegetation along BR25 as installation of BR25 sewers would be within the existing road right-of-way.
- The watercourse outlet west of Shipley Avenue would be maintained as existing since moderated flow rates would be expected.
- A previous Fish Habitat and Aquatic Impact Assessment identified minor mitigation measures to be implemented for the protection of sensitive aquatic wildlife and habitat within the outlet watercourse, west of Shipley Avenue, if storm sewers were to be installed along BR25.
- Construction activity would be within existing rights-of-way above the bluff to Lot 26.
- Construction activity would be conducted within existing rights-of-way. Limited impact to vegetation and habitat is expected given the level of anthropogenic disturbance along BR33.
- Improvements in drainage would reduce erosion and sediment transfer.
- Conventional water quality protection practices would be sufficient during construction and no special measures would be expected to be required.
- Potential for erosion and aesthetic impacts due to a new drainage outlet across the sandy shoreline at BR25 would be mitigated by design features.
- Water quality protection could be achieved using a perforated storm sewer system above the bluff, and natural channel design for the BR33 ditches. The use of a second, minor storm sewer below the bluff could be used to receive the runoff from the BR25 road surface, keeping it separate from the polished flows conveyed from above the bluff.
- Natural channel design could be implemented for water quality protection of the diversion ditch along the re-aligned BR33.
- No known or candidate significant wildlife habitat impacted.
- No known Species at Risk.
- No known Provincially Significant Wetland or Areas of Natural and Scientific Interest.

Lot 26 System

- As a heavily-wooded property with little previous anthropogenic disturbance, there exists a high potential for vegetation disturbance within Lot 26 due to the outlet channel and the access route needed for its construction. Similarly, the construction within Lot 26 has a high potential to adversely affect the terrestrial and aquatic species that are located there.
- Once a route is determined, a Natural Environment Impact Study (EIS) should be conducted to verify the presence/absence of sensitive flora and fauna species along the outlet route across Lot 26. An EIS would add to the complexity, cost and timeframe of the drainage alternative solution.

- If sensitive habitat resources are verified with an EIS along the route, then mitigation measures would be considered at that time. Pending the results of the EIS, the number and/or severity of impacts to the various environments could increase and possibly affect the feasibility of the alternative.
- Through the use of natural channel design strategies, water quality protection would be achieved across Lot 26.
- The Lot 26 property and Gore Drain outlet are part of a SVCA Regulated Area. Consequently, the drainage channel across it would require their approval, increasing the complexity involved with the design process for the drainage alternative solution.
- The effects that the increased flow from the BR25 diversion would have on the Gore Drain outlet is not known and would need to be studied and mitigated.

- Depending on the results of the required Natural environmental studies, the mitigation measures proposed by them may affect other aspects of the project such as constructability and costs.
- In general, the effects that routing the diverted flows across the Lot 26 lands has on the Natural environment is not currently known to a great degree. The studies required to investigate the Lot 26 routing would require considerable financial and time commitment. Once the studies have been conducted, their results may impact the other considered environments and the alternative solution's overall feasibility.
- Due to the lack of anthropogenic disturbance within the interior wetland and woodland areas of the Lot 26 property, there is a higher potential that a Species at Risk, significant wildlife, and/or significant habitat.
- No known Provincially Significant Wetland or Areas of Natural and Scientific Interest.

Baker Subdivision System

- Construction activity is expected to be within the existing road right-of-way; no impact to vegetation is expected as a result.
- A Natural Environment Impact Study (EIS) would be necessary to verify the presence/absence of sensitive flora and fauna species at the new boat launch outlet location.
- If sensitive habitat resources are verified with an EIS along the route, then mitigation measures would be considered at that time. Pending the results of the EIS, the number and/or severity of impacts to the various environments could increase and possibly affect the feasibility of the alternative.
- Conventional water quality protection practices would be sufficient during construction and no special measures would be expected to be required.
- Oil Grit Separator systems may be used to protect surface water quality.
- No known or candidate significant wildlife habitat impacted.
- No known Species at Risk.
- No known Provincially Significant Wetland or Areas of Natural and Scientific Interest.

Technical

BR25/BR33 System

- A major storm sewer above the bluff to the diversion at Bruce Street would convey the 1:100 year design flow in order to provide an outlet for the Wal-Mart and LRE SWM ponds, and support future flow conditions.
- A separate, local minor storm sewer west of the diversion would convey the 1:5 year design flows, from lands west of Bruce Street along BR25, to the new outlet at the shoreline at Lake Huron.
- The moderation of flows received by the outlet watercourse west of Shipley Avenue due to the high flows diverted to the new outlet in-line with BR25 would result in lower flow rates than existing. Consequently, the watercourse outlet would be maintained as existing and the potential for flooding and erosion would be reduced.

- Potential safety concern due to the proximity of the BR25 outlet to public land use at the sandy shoreline. This would be mitigated by design features. No other potential safety issues are expected.
- Water quality protection could be achieved using a perforated storm sewer system in areas of highly permeable soils above the bluff. The use of perforated pipe would permit a reduction of total suspended solids in sewer flows where infiltration into the subsurface occurs. Natural channel design could be implemented for water quality protection along BR33 ditches. The use of a second, minor storm sewer below the bluff could be used to receive the runoff from the BR25 road surface, keeping it separate from the polished flows conveyed from above the bluff.
- By diverting a portion of the current tributary area for the watercourse outlet west of Shipley Avenue, south to a new Lot 26 channel, the area draining to the outlet watercourse would be reduced. A reduction in overall tributary area would reduce the potential for flooding and erosion as a result of future flow conditions within the Study Area.
- Conventional construction practices would be expected for the drainage improvements of the alternative; no special construction measures are expected to be required in completing the construction, other than sediment and erosion controls.
- Construction of storm sewers may be in an area of high groundwater table, which may present some constructability issues. Dewatering systems may be necessary.
- The planning process for a new storm sewer on BR25 would require a Schedule "B" Environmental Assessment, assuming sewer installation would not use trenchless technology to cross under the existing watercourse (Sch. B 14). The storm sewer could be completed as a Schedule "A+" activity if trenchless technology is used to cross the watercourse.
- The proposed works would need review and approval from the MOECC and SVCA to obtain the required permits.

Lot 26 System

- As an option, a SWM pond at Lot 26 and BR33 may reduce flow rates to minimize the size of the downstream channel. With proper design, a SWM pond may also provide for water quality control prior to release across Lot 26. By reducing the flows received by the downstream channel, further polishing of the runoff as it is conveyed by the channel can be achieved. Additional land would be required to support this option.
- A new "engineered" outlet across Lot 26 would be designed to convey the 1:100 year design flow from the existing catchment plus the diverted flow from the BR25 lands east of the Bruce Street intersection and runoff intercepted by the re-aligned BR33 ditch.
- The new channel across Lot 26 would be designed to keep diverted flows separate from the existing wetland hydrology within Lot 26, to avoid adversely impairing the function of the wetland hydrology within Lot 26. Structures installed into the sides of, and below, the new channel would allow the wetland to maintain its current flow by bypassing under the outlet
- The conveyance of runoff from a large contributing area by open-channel flow creates potential safety concerns; safety measures may require consideration.
- Diversion of flows to Lot 26 would lessen the existing flooding issues in the Baker Subdivision as the diversion along BR25 would intercept some of the tributary areas currently draining to it.
- Erosion protection along entire surface drainage route and at the piped outlet location on Lot 26 would be required.
- A possible high groundwater table in the Lot 26 area may present some constructability issues for a new channel.
- Would require a Schedule "C" Environmental Assessment for flow diversion from one watercourse (west of Shipley Avenue) to another watercourse (Gore Drain) outlet (Sch. C 8).

Baker Subdivision System

- Two storm sewer systems would be designed to convey the 1:5 year design flow as is typical of a local minor system.
- Storm sewer sizing as a local minor system would minimize the required pipe diameters while addressing standards, safety, flooding, and water quality.
- No safety issues are expected as a result of drainage improvements.
- Conventional construction practices would be expected for the drainage improvements of the alternative; no special construction measures are expected to be required in completing the construction, other than sediment and erosion controls.
- Construction of storm sewers may be in an area of high water table, which may present some constructability issues. Dewatering systems may be necessary.
- Oil Grit Separators may be necessary at the outlets since inadequate space for water quality ponds is expected.
- New storm sewer systems would require a Schedule "A+" Environmental Assessment, assuming trenchless technology is used to cross under existing watercourse (Sch. A+ 1).
- The proposed works would need review and approval from the MOECC and SVCA to obtain the required permits.
- Timing for storm sewer installation should coincide with planned sanitary sewer installation.

Economic

- Would incur moderate construction costs to complete the expected construction of the Lot 26 channel, a heavily wooded area far from the BR25 diversion point, as well as improvements to the Gore Drain outlet at Lake Huron. Improvements may include an increase in capacity to convey the diverted flow from the Lot 26 channel. Construction costs would be expected to be slightly less than a diversion further south along BR33 to the Gore Drain system from BR33 (Relative Construction Cost: 5).
- Would incur significant non-construction costs as study-intensive design would be required to determine the effects of the additional flows received by the Gore Drain outlet at Lake Huron where it receives the diverted flows from BR25 lands and easterly lands along the re-aligned BR33 (Relative Non-Construction Cost: 6).

10.4.6 Alternative #7 – Divert Flows at BR25/BR33 Intersection Southerly to Existing Gore Drain Outlet at BR33

The following drainage improvements are considered as part of this alternative:

- The diversion of the 1:100 year design flow southerly, at the re-aligned BR33/BR25 intersection, along the re-aligned BR33 to the existing Gore Drain at BR33.
- A storm sewer, designed to convey 1:5 year design flows, installed west of the diversion at the re-aligned BR33/BR25 intersection and extended westerly to a new outlet at Lake Huron; in-line with BR25.
- Flows in excess of the storm sewer capacity would surcharge to, and be conveyed by, the BR25 road surface; draining westerly to the existing watercourse outlet west of Shipley Avenue. Flows within this watercourse would be less than under existing conditions.
- The existing watercourse outlet west of Shipley Avenue would not be altered, since design flows would be less than existing.
- A storm sewer system, designed to convey the 1:5 year design flows, installed within the Baker Subdivision. The system would maintain the existing outlet in-line with Baker Road, with a second, new outlet at the boat launch, in-line with George Street.

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- Basic ditching improvements made to improve drainage along BR33 to the Gore Drain.

The Divert Flows at BR25/BR33 Intersection Southerly to Existing Gore Drain Outlet at BR33
Alternative would have the following environmental impacts.

Social

BR25/BR33 System/Gore Drain System

- Storm sewer would be constructed within the existing right-of-way and, therefore, no additional land would be required.
- The diversion route from BR25 would follow the new road alignment of BR33 to the Gore Drain in an effort to reduce the land requirements for the drainage alternative. A roadside ditch would be required to service the re-aligned BR33 roadway's own drainage as per typical rural cross sections. Thus, an enlargement of the ditch's typical design cross section would be all that is required to convey diverted flows from BR25 to the Gore Drain.
- Public comments from PIC efforts have expressed concern for existing flooding and erosion issues. This drainage alternative would significantly increase the amount of flow received by the Gore Drain and possibly exacerbate the current issues identified by the public.
- The watercourse outlet west of Shipley Avenue would be maintained as existing. Flow rates would be moderated with high flows diverted to the Gore Drain outlet.
- Existing driveway access would not be affected. Minor access interruption would occur during construction.
- A new, minor storm sewer outlet across the sandy shoreline at BR25 may have possible aesthetic and erosion implications, which may be mitigated with design features.
- Temporary traffic control measures would be implemented during the construction of the BR25 storm sewers, with detours to mitigate the effects. The installation of the smaller diameter pipes associated with a local minor storm sewer system on BR25, from west of the re-aligned BR33 intersection to a new outlet at the shoreline, would be expected to require a shorter time frame to complete than a major storm sewer system with no diversion of flows at BR33 south. Consequently, a shorter period of interrupted traffic conditions for BR25 and the surrounding area could be expected than Alternative #3.
- The conveyance of the Wal-Mart and LRE SWM pond outflows as well as the 1:100 year design flows from BR25 lands to an appropriate outlet at Lake Huron, addresses the problem/opportunity of supporting planned development along BR25.
- The construction of a BR25 storm sewer system west of the re-aligned BR33 intersection provides an opportunity to fulfill the Town's intention ultimately of urbanizing the roadway while addressing drainage concerns. An urbanized BR25 roadway could incorporate a high flow drainage route and Active Transportation Routes into the cross section as strongly supported by public PIC input.

Baker Subdivision System

- The two storm sewer systems would be constructed within the existing road rights-of-way as per typical storm sewer design. Therefore, no additional land within the Baker Subdivision would be required for the new storm sewer systems.

- Installation of the storm sewers would temporarily affect the driveway accesses during construction. Construction of the local minor storm sewer would be expected to incur a shorter period of interrupted driveway access than a major diversion storm sewer installation would.
 - A new outlet for the George Street storm sewer system would be created at the existing boat launch as part of the drainage alternative. It is expected that a new outlet would have little impact to its current public use. The existing boat launch area's cobble shoreline would be expected to have less potential for erosion and impact to its current public use than in comparison to a sandy shoreline such as the one that exists at BR25.
 - No changes to land use planning are anticipated as a result of the new drainage infrastructure.
 - The drainage servicing provided by the new local minor storm sewer systems within the Baker Subdivision would address the identified problem/opportunity of seasonal drainage issues.
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- Social environment impacts are generally equal for the Baker Subdivision System between all drainage alternatives except Alternative #5 (and Alternative #1 since it proposes no improvements) which may experience longer temporary access disruption and greater impact to the existing boat launch area due to the larger pipe diameters of the George Street storm sewer system.

Cultural

- A previously conducted Stage 1 and Stage 2 Archaeological Assessment cleared the existing BR25 right-of-way of Cultural Resources. Therefore, proposed works along BR25 would not be expected to impact the Cultural environment.
- A Stage 1 and Stage 2 Archaeological Assessment would be necessary to evaluate archaeological potential where excavation has not previously occurred.
- While a Stage 2 Archeological Assessment of a diversion route from BR25 to the Baker Subdivision would be necessary, an Assessment of the route would be completed as part of the Roads' solution to re-align BR33. Diversion of the flows from BR25 along BR33 would therefore not initiate extra archeological study efforts than what would already be necessary.
- Standard construction mitigation measures would be employed to protect any archaeological resources discovered during construction.
- While no Archeological Assessment has been conducted for the Baker Subdivision, the previous disturbance of the area, by its residential development and other anthropogenic activities, reduce its archeological potential.

Natural

BR25/BR33 System

- Would result in minimal impact to vegetation along BR25 as installation of BR25 sewers would be within the existing road right-of-way.
- The watercourse outlet west of Shipley Avenue would be maintained as existing since a moderated flow rates would be expected.
- A previous Fish Habitat and Aquatic Impact Assessment identified minor mitigation measures to be implemented for the protection of sensitive aquatic wildlife and habitat within the outlet watercourse, west of Shipley Avenue, if storm sewers were to be installed along BR25.
- Construction activity would be within the existing right-of-way above the bluff to the Gore Drain. The potential for harm to the Natural environment is reduced if construction is contained within the existing right-of-way as alterations to that land's natural state have previously been made and no new natural areas need be disturbed.
- Limited impact to vegetation and habitat is expected by the construction of the diversion channel along BR33 given the level of anthropogenic disturbance of the lands such as agricultural land use.

- Improvements in drainage would reduce erosion and sediment transfer.
- Conventional water quality protection practices would be sufficient during construction and no special measures would be expected to be required.
- Potential for erosion and aesthetic impacts due to a new drainage outlet across the sandy shoreline at BR25 would be mitigated by design features.
- Water quality protection could be achieved using a perforated storm sewer system above the bluff, and natural channel design for the BR33 ditches. The use of a second, minor storm sewer below the bluff could be used to receive the runoff from the BR25 road surface, keeping it separate from the polished flows conveyed from above the bluff.
- No known or candidate significant wildlife habitat impacted.
- No known Species at Risk.
- No known Provincially Significant Wetland or Areas of Natural and Scientific Interest.

Gore Drain System

- Diversion of flows to the Gore Drain will have a high potential to adversely affect terrestrial and aquatic species along it and the fish habitat at its outlet.
- A Natural Environment Impact Study (EIS) should be conducted to verify the presence/absence of sensitive flora and fauna species along Gore Drain outlet route. An EIS would add to the complexity, cost and timeframe of the drainage alternative solution.
- If sensitive habitat resources are verified with an EIS then resource relocation may be required.
- High level of water quality protection during construction.
- As the drainage channel is to be constructed through the wetland areas of Lot 26, the measures required to protect the existing water quality during its construction may be more challenging.
- Along the BR33 diversion channel from BR25 to the Gore Drain, water quality protection would be achieved by using natural channel design to polish the flows.
- Given the relatively undisturbed natural characteristics of the Gore Drain area, there exists a higher level of potential that a Species at Risk exists within the property.
- The Gore Drain system is part of a SVCA Regulated Area. Consequently, the diversion of flows to it, or improvements made to it, would require their approval, increasing the complexity involved with the design process for the drainage alternative solution.
- The effects that the increased flow from the BR25 diversion would have on the Gore Drain outlet is not known and would need to be studied and mitigated.
- Depending on the results of the required Natural environmental studies, the mitigation measures proposed by them may affect other aspects of the project such as constructability and costs.
- In general, the effect that routing the diverted flows to the Gore Drain has on the Natural environment is not currently known to a great degree. The studies required to investigate the Gore Drain routing would require considerable financial and time commitment. Once the studies have been conducted, their results may impact the other considered environments and the alternative solution's overall feasibility.
- No known or candidate significant wildlife habitat impacted but evaluation would be necessary.
- Potential for a Species at Risk to exist in Gore Drain system west of BR33 due to lack of previous anthropogenic disturbance.
- No known Provincially Significant Wetland or Areas of Natural and Scientific Interest.

Baker Subdivision System

- Construction activity is expected to be within the existing road right-of-way; no impact to vegetation is expected as a result.

- A Natural Environment Impact Study (EIS) would be necessary to verify the presence/absence of sensitive flora and fauna species at the new boat launch outlet location.
- If sensitive habitat resources are verified with an EIS along the route, then mitigation measures would be considered at that time. Pending the results of the EIS, the number and/or severity of impacts to the various environments could increase and possibly affect the feasibility of the alternative.
- Conventional water quality protection practices would be sufficient during construction and no special measures would be expected to be required.
- Oil Grit Separator systems may be used to protect surface water quality.
- No known Species at Risk.
- No known Provincially Significant Wetland or Areas of Natural and Scientific Interest.

Technical

BR25/BR33 System

- A major storm sewer above the bluff to the diversion at Bruce Street would convey the 1:100 year design flow in order to provide an outlet for the Wal-Mart and LRE SWM ponds, and support future flow conditions.
- A separate, local minor storm sewer west of the diversion would convey the 1:5 year design flows, from lands west of Bruce Street along BR25, to the new outlet at the shoreline of Lake Huron.
- The moderation of flows received by the outlet watercourse west of Shipley Avenue due to the high flows diverted to the new outlet in-line with BR25 would result in lower flow rates than existing. Consequently, the watercourse outlet would be maintained as existing and the potential for flooding and erosion would be reduced.
- Potential safety concern due to the proximity of the BR25 outlet to public land use at the sandy shoreline. This would be mitigated by design features. No other potential safety issues are expected.
- Water quality protection could be achieved using a perforated storm sewer system in areas of highly permeable soils above the bluff. The use of perforated pipe would permit a reduction of total suspended solids in sewer flows where infiltration into the subsurface occurs. Natural channel design could be implemented for water quality protection along BR33 ditches. The use of a second, minor storm sewer below the bluff could be used to receive the runoff from the BR25 road surface, keeping it separate from the polished flows conveyed from above the bluff.
- By diverting a portion of the current tributary area for the watercourse outlet west of Shipley Avenue, south to the Gore Drain system, the area draining to the outlet watercourse would be reduced. A reduction in overall tributary area would reduce the potential for flooding and erosion as a result of future flow conditions within the Study Area.
- Conventional construction practices would be expected for the drainage improvements of the alternative; no special construction measures are expected to be required in completing the construction, other than sediment and erosion controls.
- Construction of storm sewers may be in an area of high groundwater table, which may present some constructability issues. Dewatering systems may be necessary.
- The planning process for a new storm sewer on BR25 would require a Schedule "B" Environmental Assessment, assuming sewer installation would not use trenchless technology to cross under the existing watercourse (Sch. B 14). The storm sewer could be completed as a Schedule "A+" activity if trenchless technology is used to cross the watercourse.
- The proposed works would need review and approval from the MOECC and SVCA to obtain the required permits.

Gore Drain System

- An optional SWM pond at the Gore Drain outlet and BR33 could be considered to receive and attenuate the flow rates diverted from BR25. This attenuation would minimize the downstream impacts for flooding and erosion and ultimately the effect of aquatic wildlife and their habitats. A SWM pond could also be designed to provide for water quality control prior to release to Gore Drain outlet. It should be noted that a SWM pond would require Schedule “B” Environmental Assessment where additional property is required (Sch. B 2) which would increase the scope of the required design efforts for the drainage solution.
- With no attenuation provided by a SWM pond, the increased flow from the BR25 diversion to the Gore Drain outlet could present possible safety issues with respect to both flooding and erosion in an area that currently is reported to suffer from these issues.
- Diversion of flows to the Gore Drain would lessen the existing flooding issues in the Baker Subdivision as the diversion along BR25 would intercept some of the tributary areas currently draining to it. However, the prevention of new flooding issues in the Gore Drain System as a result of the diversion may be difficult.
- Downstream peak flows to the Gore Drain outlet would not be permitted to exceed the current peak flow rates. The drainage patterns contributing to the current flow rate received by the outlet are not expected to be altered as a result of this alternative. Therefore, any additional flow as a result of a diversion would only increase the flow rate to the Gore Drain outlet. This poses significant design challenges and generally requires very large SWM facilities in trying to manage diverted flows additional to existing flows. In implementing SWM facilities, either the existing Gore Drain flows or both the Gore Drain and diverted flows would need to be attenuated to maintain the existing flows.
- Erosion protection along entire surface drainage route would be required, and along the Gore Drain outlet would have to be addressed.
- As part of erosion protection measures, the downstream high flow durations would not be permitted to exceed current high flow durations. This is due to the threshold velocity that exists for natural channels where, if the conveyed flow exceeded, an erosion event would occur. Even if upstream attenuation was applied to the Gore Drain flows, the increase in runoff volume, due to the diverted drainage, would permit the erosion event, when it occurred, to be sustained for a longer period of time.
- Must address downstream flooding and erosion controls for a range of runoff events.
- Water quality provisions on BR25 and within Baker Subdivision may be addressed separately.
- The diversion channel from BR25 along the re-aligned BR33 would require a Schedule “C” Environmental Assessment for flow diversion to watercourse outlet (Sch. C 8).

Baker Subdivision System

- Two storm sewer systems would be designed to convey the 1:5 year design flow as is typical of a local minor system.
- Storm sewer sizing as a local minor system would minimize the required pipe diameters while addressing standards, safety, flooding, and water quality.
- No safety issues are expected as a result of drainage improvements.
- Conventional construction practices would be expected for the drainage improvements of the alternative; no special construction measures are expected to be required in completing the construction, other than sediment and erosion controls.
- Construction of storm sewers may be in an area of high water table, which may present some constructability issues. Dewatering systems may be necessary.
- Oil Grit Separators may be necessary at the outlets since inadequate space for water quality ponds is expected.
- New storm sewer systems would require a Schedule “A+” Environmental Assessment, assuming trenchless technology is used to cross under existing watercourse (Sch. A+ 1).

- The proposed works would need review and approval from the MOECC and SVCA to obtain the required permits.
- Timing for storm sewer installation should coincide with planned sanitary sewer installation.

Economic

- Would incur significant construction costs to complete the expected improvements to the Gore Drain outlet, a heavily wooded area far from the BR25 diversion point, needed to increase its capacity to convey the diverted 1:100 design flows (Relative Construction Cost: 7).
- Would incur significant non-construction costs as a study-intensive design would be required to determine the effects of the additional flows received by the Gore Drain outlet as a result of a diversion from BR25 lands and easterly lands along the re-aligned BR33 (Relative Non-Construction Cost: 7).

10.5 Assessment and Evaluation of Drainage Alternatives

The Social, Cultural, Natural, Technical and Economic environment impacts identified for each of the Drainage alternatives allows for the evaluation of a preferred Drainage solution by assessing them through the comparison of their respective environment impacts. An assessment and evaluation based on each environment is included in the following sections. The evaluation of the Drainage alternatives is summarized by tables included in **Appendix N**.

10.5.1 Assessment and Evaluation of Social Environment Impacts

While Alternative #1 does not present any additional land requirements, disruption due to construction or impact to public spaces, such as the sandy shoreline at BR25, it is not preferred since it does not address the problem or opportunities identified within the Study Area. In addition, the urbanization of BR25, including the publicly supported construction of an Active Transportation Route, west of its intersection with the re-aligned BR33, is not supported by this alternative.

Alternative #2 is not preferred as it is the most disruptive to private property. Additional land would be required along BR25 to facilitate the required widening of the north ditch. The existing water course outlet would be significantly upgraded and affect the several private properties it traverses. In addition, no right of access exists to the private lands to undertake the channel widening efforts, and landowner permission is unlikely. Furthermore, similar to Alternative #1, this alternative does not support the Town's intention of BR25 urbanization.

With respect to the Shipley Avenue watercourse, the remainder of the alternatives, Alternatives #3 through #7, would be preferred over Alternative #2, as the outlet watercourse west of Shipley Avenue would remain as it currently exists, and the flows it receives would be moderated.

Initially, the Town expected that the construction of a storm sewer outlet across the sandy shoreline in-line with BR25 would not be supported by the public feedback. The installation of a storm sewer to this location may affect use as a public beach; especially for Alternative #3 which proposes to convey the greatest flows to this outlet of all the Drainage alternatives. Following the public consultation efforts of PIC#1 and PIC#2, the public feedback that was received did not oppose an outlet at this location regardless of the level of its expected discharge/size.

As proposed by Alternative #4, the diversion from BR25 north to the South End Drain outlet via the Bluewater Estates development is possible but not by the storm sewer infrastructure, current or planned, provided along the route. As such, the system would need to be redesigned to receive the additional flows which would be expected to require an enlarged planned SWM pond, and storm sewers and outfall. If these conditions could not be achieved, development within Bluewater Estates would possibly be restricted.

By diverting the BR25 flows at re-aligned BR33 south to the Baker Subdivision, Alternative #5 permits an outlet to Lake Huron that would affect the shoreline's public use less than if all BR25 flows were to outlet as proposed by Alternative #3. As the proposed major outlet location of Alternative #5, the existing boat launch and cobble shoreline in-line with George Street would be less impacted by major flows than one directed to the sandy shoreline in-line with BR25.

In considering a diversion of BR25 flows to a channel across Lot 26, as proposed in Alternative #6, public feedback from the Owner of the property expressed an acceptance of a possible routing through these lands.

Alternative #7 is not preferred on the basis of opposing resident feedback for concern of worsening the existing drainage problems that exist in the area surrounding the Gore Drain outlet.

Based on the Social environment, Alternatives #1, #2, and #7 would not be preferred mostly due to not addressing the identified problems/opportunities, disruption to private lands, and public feedback, respectively. However, based on public feedback, the relative support/opposition to the remaining alternatives is not considerable enough to prefer one over another.

10.5.2 Assessment and Evaluation of Cultural Environment Impacts

By lack of proposed infrastructure works, Alternative #1 does not pose a threat to any possible Cultural resources within the Study Area and would not be the least preferred Drainage alternative. Unfavourably, the Do Nothing approach does not address the identified problems/opportunities, and, therefore, is not preferred.

Stage 1 and 2 Archaeological Assessments have not been conducted for lands potentially impacted by Alternative 2 through 6 but the level of unassessed areas varies between them. The presence of Cultural resources encountered as part of each alternative is not known, but the potential for encountering them can be correlated to the level of undisturbed areas that each alternative would alter. With many of the other Cultural impacts common to these alternatives, the amount of undisturbed land to be affected becomes the main criterion for comparison.

Alternatives #3 through #5 result in the relatively same amount of disruption to the previously undisturbed lands within the Study Area and, therefore, require the relatively same degree of background Cultural studies. As a result, they are equally preferred with respect to one another.

Alternative #2 requires study of a slightly larger area of Cultural potential since it includes additional ROW lands for its ditch widening, and proposes a widening of the outlet watercourse west of Shipley Avenue. According to the Ministry of Tourism, Culture and Sport, most Cultural resources are found in proximity to watercourses and bodies of water. This potential, when associated with the outlet watercourse, makes Alternative #2 less preferred than many of the other Alternatives.

Alternative #6 and Alternative #7 would require the greatest amount of disruption to previously undisturbed lands within the Study Area. These alternatives are least preferred since they would require the greatest degree of Cultural studies.

10.5.3 Assessment and Evaluation of Natural Environment Impacts

Similar to the Cultural environment, Alternative #1 does not pose a threat to the Natural environment as it does not propose any changes within the Study Area but this also does not offer any improvement either. In addition, it does not address the identified problems or opportunities of the Study.

It is known from a previously conducted Fish and Habitat and Aquatic Impact Assessment that sensitive Natural aspects exist within the watercourse outlet west of Shipley Avenue.

Assuming an appropriate design that includes measures which permit an allowable base flow, a reduction or maintenance of flows directed to the watercourse outlet would be expected to reduce the potential for risk to the wildlife that exists there than if an increased level of flows was directed to the watercourse.

Alternatives #3 through #7 would result in a decrease of flows directed to the outlet watercourse. Alternative #3 would yield the least degree of inflow reduction to the watercourse outlet flows but this is not necessarily a negative impact as a level of inflow reduction still results. Alternative #2 would result in an increase of inflow to this watercourse outlet and is, therefore, not preferred.

Although it is possible for Alternative #4 to achieve water quality objectives before discharging to the South End Drain outlet, it would most likely require the planned Bluewater Estates SWM pond to be enlarged. For this reason, and the unknown impacts to South End Drain system, Alternative #4 is not the most preferred alternative in the sense of Natural environment impacts.

The distinction of preference between Alternative #3 and Alternative #5 in terms of their Natural environment impacts stems from their degree of potential impacts on the Lake Huron shoreline. Alternative #3 intends to locate its major outlet for BR25 flows to the public beach at a sandy shoreline at BR25 while Alternative #5 would divert these flows to an outlet located an existing boat launch at a cobble shoreline. Given the current level of anthropogenic impact to the shoreline and cobble's lower potential for erosion, Alternative #5 is preferred over Alternative #3, from a Natural environment perspective.

The lands required for a diversion route across Lot 26 and the Gore Drain system are both SVCA regulated areas. While the presence of sensitive wildlife, habitat, etc. has not been verified in these areas, the designation of these areas to the discretion of a conservation authority indicates a greater probability of their existence and potential for negative impacts. With consideration of this, Alternative #6 and Alternative #7 have the greatest uncertainty in terms of their diverted flows' respective effects on the Natural environment. While careful design could mitigate the effects of the diversion if they were determined, they would still result in the greatest impact to the Natural environment of all the alternatives and are therefore the least preferred.

10.5.4 Assessment and Evaluation of Technical Environment Impacts

Alternative #1 is not preferred due to its inability to address the problems/opportunities identified by the Study.

Alternative #2 requires a great degree of earthworks for its implementation. The construction of the channel improvements for both the BR25 north ditch and the outlet watercourse may be difficult; construction would be

performed in flowing water conditions and construction access is not currently permitted along the water course outlet. Regardless of these constructability issues, by conveying the BR25 flows on the surface west of the re-aligned BR33/BR25, mitigation of risks with regards to erosion and safety would be essential. The amount of effort required to overcome the Technical challenges of Alternative #2 make it less preferred than other Drainage alternatives.

Alternatives #3 and #5 are the most preferred solution by evaluation of all Technical environment impacts. These two alternatives direct the major flows from the re-aligned BR33/BR25 intersection to outlets at Lake Huron via proposed storm sewers installed in areas that would require a storm sewer regardless. Although design of the systems would need to mitigate safety, erosion, and water quality impacts, the conveyance of the large flows from re-aligned BR33/BR25 is generally a matter of increasing the diameter of pipes already proposed to be installed along their respective outlet paths. Alternative #5 would require pipes of larger diameter within the Baker Subdivision and a minor BR25 storm sewer system west of the re-aligned BR33, while Alternative #3 would result in the opposite effect.

Alternative #3 does not require the design and construction of a major diversion channel along the re-aligned BR33, but requires greater consideration to mitigating its effect on the shoreline. From comparison of their technical impacts, Alternative #3 and #5 possess a similar balance of impacts and a preference of one over the other cannot be clearly indicated.

A significant review of the existing and planned storm infrastructure in the Bluewater Estates development would be required to determine the effects of diverted flows from BR25 before Alternative #4 could be implemented. The result of this review would most likely suggest the need for the increased capacity of the South End Drain outlet infrastructure, the Bluewater Estates SWM Pond, the Bluewater Estates storm sewers, or any combination of these. The considerable length of storm sewer required to convey the diverted flows to the South End Drain outlet system would be pipes of relatively large diameters.

Alternative #6 would involve challenging design and construction issues as a result of the existing conditions in Lot 26. Even if the constructability issues of creating a major channel across a treed wetland are excluded, the design challenges of maintaining the existing hydrology of Lot 26, as part of the protection of its Natural environment, would be challenging. Given the degree of these design and constructability challenges, Alternative #6 is not preferred.

The diversion of BR25 flows to the Gore Drain would require extensive Technical review, and possible redesign, of the existing outlet system to ensure that the effects of the additional flows do not promote deterioration; especially considering flooding and erosion potentials. The resulting flows through the Gore Drain would have to be equal to or less than the current flows. To accommodate the additional runoff from the re-aligned BR33/BR25 intersection, SWM pond(s) would most likely be required to provide the attenuation of peak runoff rates discharging to the Gore Drain system. If peak flow rates of the Gore Drain could be maintained, or reduced by attenuation, the increased volume of flow could still erode the system due to longer flow durations. As such, Alternative #7 is not a preferred Drainage alternative.

10.5.5 Assessment and Evaluation of Economic Environment Impacts

In evaluating the Economic environment impacts of the Drainage alternatives, both the construction costs (labour and materials) and the non-construction costs (professional fees, property, permits, mitigation and possible other improvements) are considered.

Alternative #1 has the lowest construction cost but also a considerable non-construction cost, associated with its lack of proposed drainage works. Although there is no construction cost to maintaining existing conditions,

there is a moderate opportunity cost to not addressing the identified problems/opportunities; future development along, and urbanization (including ATRs) of, BR25 is not supported. This restricts the planned growth of the Town in its southerly area. Drainage issues in the Baker Subdivision would not be remediated.

The construction efforts associated with earthworks would be anticipated to incur relatively little construction costs in comparison to the alternatives that propose storm sewers to convey flows through the same areas, such as Alternative #2 with BR25. However, the requirement for additional right-of-way land along BR25 to facilitate the widening of its north ditch as well as the further studies required to improve the watercourse outlet incur a considerable level of non-construction costs. As a result, there is some degree of preference for Alternative #2 but it is not significant.

Moderate construction costs and low non-construction costs would be incurred through Alternative #3. The cost of labour and materials required to extension the BR25 major storm sewer west of the re-aligned BR33/BR25 intersection would be considerable but it would within the existing right-of-way lands; no additional property would be required to support drainage improvements. Relative to the other Drainage alternatives, and to the benefits achievable, the overall costs of Alternative #3 are the most preferable.

Alternative #4 would incur significant costs for both construction and non-construction costs for to overcome the Technical environment impacts of conveying the diverted flows to the South End Drain. Evaluation of the current and planned infrastructure, and its possible redesign, would incur significant efforts and costs to complete. Regardless of the outlet's capacity, it is anticipated that large diameter pipes would be required to convey diverted flows over a considerable distance to it, incurring significant labour and materials costs. As such, Alternative #4 is one of the least preferred alternatives in relation to the Economic environment.

The non-construction costs of Alternative #5 would be similar to those of Alternative #3 with respect to land requirements. No additional lands would be required in support of proposed drainage improvements and the major George Street storm sewer would be installed in an area that required storm sewers regardless. The land required for the diversion channel along re-aligned BR33 would be negligible since it would essentially act as an enlarged ditch in conjunction with the intended rural cross section of the roadway. However, the construction and non-construction costs would be slightly greater than Alternative #3 since the diversion would have nominal costs for its design and construction.

Alternative #6 and #7 would incur significant construction and non-construction costs predominantly due to the required studies and difficult construction. In addition to Alternative #2, Alternatives #6 and #7 are the least preferred Drainage alternatives with respect to the Economic environment. Significant economic resources would be required not only to determine the effects that the diverted flows would have on the Natural environment of each property, but also design to mitigate those effects as part of the Technical environment. Depending on the required measures, the cost of their implementation would be great due to the constructability issues.

10.5.6 Evaluation of Drainage Alternatives Results

By comparison of each Drainage alternative, on the basis of its respective impacts to the various environments, two preliminary preferred Drainage solutions were "short-listed". Alternative #3 and Alternative #5, based on their impacts to the environments relative to the other Drainage alternatives, were selected by means of the evaluation process.

Based on public responses received from PIC#2 efforts, of these two Drainage alternatives, Alternative #3 (Construct a New Storm Sewer on BR25 to a New Outlet at Lake Huron) was the preferred approach. Therefore, the drainage improvements proposed by Alternative #3 represent the preferred Drainage solution for the overall Master Plan.

11. AGENCY AND PUBLIC REVIEW

This Master Plan is issued as a first draft to document the background information prepared and to explain the alternatives considered. It is being circulated in its current form to County and Town staff, for initial comments on the preliminary preferred set of alternatives being considered in this Master Plan process.

Once initial comments are received and considered, the preliminary preferred set of alternatives will be presented to County and Town Councils for adoption as a preferred solution. Documentation will be made available to the public for final review. For a Master Plan there is no requirement for a 30-day review period and no opportunity for Part II Order requests.

Consultation activities leading up to the assessment of alternatives included the following:

- i) Various Meetings held between 2009 and 2015 (**Appendix A**).
- ii) An initial circulation to various agencies in 2010 (**Appendix K**),
- iii) Various individual discussions with directly affected land owners over a 5 year period (2010 – 2015),
- iv) A discretionary Public Information Centre (PIC#1) on October 7th, 2015 including written comments received from a number of area residents; many of whom would be potentially directly impacted by the Alternatives under consideration (**Appendix H**),
- v) A required Public Information Centre (PIC#2) held on May 18th, 2016 (**Appendix I**),
- vi) An agency circulation on May 2nd, 2016 (**Appendix K**),
- vii) First Nations contacts on September 9th, 2015 and April 22nd, 2016 (**Appendix J**),

12. PRELIMINARY PREFERRED MASTER PLAN

The intention of the Master Plan process is ultimately to identify a broad “systems” approach toward addressing the identified problems and/or opportunities.

Based on the level of review and comments received, the Preliminary Preferred Master Plan includes the following elements:

- Re-align Bruce Road 33 to intersect BR25 at the planned Bruce Street location,
- A 4-lane urban cross section on BR25 from Goderich Street (Highway 21) to the planned Bruce Street intersection,
- A dedicated left turn lane on eastbound BR25 at Goderich Street.
- A stop-controlled “Tee” intersection on the planned Stickel Street at BR25,
- Traffic signals at the planned Bruce Street/BR25 intersection,
- A 2-lane urban cross section on BR25 from the planned Bruce Street intersection to Saugeen Beach Road,
- A stop-controlled “Tee” intersection on the planned Ridge Street at BR25,
- An Active Transportation Route from Goderich Street to Saugeen Beach Road on north side of BR25.
- Divestiture of BR33 from BR25 southerly to about Baker Road from the County to the Town,

- Divestiture of BR25 from the planned Bruce Street intersection westerly to Saugeen Beach Road from the County to the Town,
- Construct a new 1:100 year capacity storm sewer westerly on BR25 from Goderich Street to Lake Range Road,
- Construct a new 1:5 year capacity storm sewer westerly on BR25 from Lake Range Road to Lake Huron,
- Provide a 1:100 year overland flow route within an urban road cross section on BR25 from Lake Range Road westerly to spill to the watercourse west of Shipley Avenue.
- Provide a secondary local storm sewer system on BR25 west of Lake Range Road to collect and treat road runoff prior to discharging to the watercourse outlet west of Shipley Avenue
- Construct a local area storm sewer system within the Baker Subdivision, and,
- Complete ditch improvements along BR33.

A “Master Plan” drawing, provided in Appendix Q, illustrates the main features, and direction for, this Master Plan, resulting from the process.

13. NEXT STEPS

The next steps in this project planning are as follows:

- i) Town and County staff review,
- ii) Update Project File based on comments received,
- iii) Present to Bruce County and Town of Saugeen Shores Councils for acceptance,
- iv) Update Project File based on comments received,
- v) Issue “Notice of Completion”, and
- vi) Post the Master Plan for reference.
- vii) Individual projects may require additional review following an appropriate Schedule under the Municipal Class EA.

All of which is respectfully submitted,

GM BLUEPLAN ENGINEERING LIMITED
Per:

PRELIMINARY

John B. Slocombe, P.Eng.

**APPENDIX A:
MINUTES OF MEETINGS**

**APPENDIX B:
PLANNING INFORMATION**

**APPENDIX C:
ROADS REPORT**

**APPENDIX D:
DRAINAGE REPORT**

**APPENDIX E:
NATURAL ENVIRONMENT REPORTS**

**APPENDIX F:
ARCHAEOLOGICAL REPORTS**

**APPENDIX G:
MASTER SERVICING STUDY**

**APPENDIX H:
PHASE 1 DISCRETIONARY PIC**

**APPENDIX I:
PHASE 2 REQUIRED PIC**

**APPENDIX J:
FIRST NATIONS CONSULTATION**

**APPENDIX K:
AGENCY CONSULTATION**

**APPENDIX L:
PUBLIC CONSULTATION**

**APPENDIX M:
EVALUATION & ASSESSMENT – ROADS**

**APPENDIX N:
EVALUATION & ASSESSMENTS – DRAINAGE**

**APPENDIX O:
DRAWINGS OF DRAINAGE ALTERNATIVES**

**APPENDIX P:
SUMMARY OF MODELLED FLOWS**

**APPENDIX Q:
PREFERRED SET OF SOLUTIONS (MASTER PLAN)**