



Cherry Beach Shoreline Protection Class Environmental Assessment

City of Hamilton

Project File Final Report

September 2014

EXECUTIVE SUMMARY

In 2007, Shoreplan Engineering Limited was retained by the City of Hamilton (City), to conduct a review of the erosion processes occurring on the Cherry Beach shoreline. The review identified high erosion rates and a very steep bank with no established vegetation. As a result of the review, the City retained Dillon Consulting Limited (Dillon) and Shoreplan Engineering Limited (Shoreplan) to complete the Municipal Class Environmental Assessment (EA) process to further examine the potential effects on property or lands that may be unsafe for development and to identify appropriate erosion mitigation measures, including a preferred conceptual design. The project involves the restoration of approximately 300 m of eroding Lake Ontario shoreline.

Cherry Beach is located in Stoney Creek on the southwest shore of Lake Ontario, east of Millen Road. The Study Area is bounded by Lake Ontario to the north, North Service Road to the south, runs from west of 1 Private Road to east of 3 Private Road. The study area consists of publicly owned lands and private residences.

The EA study followed the requirements for a Schedule “B” Municipal Class EA project under the *Municipal Class EA* (October 2000, as amended in 2007 and 2011). A Schedule “B” project follows Phases 1 and 2 of the Municipal Class EA process and is subject to an “environmental screening.” Phases 1 and 2 of the Class EA process involves:

- Phase 1, “Problem/Opportunity Identification,” provides justification of the need for shoreline protection in the Study Area (**Section 2**)
- Phase 2, “Alternative Solutions,” consists of the identification and evaluation of alternative solutions to the problems identified in Phase 1 (**Section 3**).

To determine the best approach to protecting the area from ongoing erosion processes, Dillon and Shoreplan evaluated the following alternative shoreline protection design solutions:

- “Do Nothing”
- Alternative 1: Revetment
- Alternative 2: Three Headlands and Two Beach Cells
- Alternative 3: Two Groynes and One Beach Cell
- Alternative 4: One Groyne and Once Beach Cell
- Alternative 5: Three Groynes and Two Beach Cells

Based on the EA study, Alternative 1, Revetment was selected as the preferred design solution. This alternative consists of a two layer structure consisting of randomly placed armour stones overlaying a layer of rip rap. The revetment will follow the existing shoreline from the channel at the east end of the site and merges to the existing revetment at the west limit of the Study Area. The revetment will be interrupted at the location of the private properties. It may be extended across the properties, if the owners participate in the undertaking, or appropriate end walls constructed at the property boundaries.

Based on the objective of avoiding or minimizing adverse environmental impacts, the environmental screening process involves:

- Preparation of an inventory of the environment potentially affected by the proposed shoreline protection measures (**Section 4**)
- Public and agency consultation undertaken for the project (**Section 5**)
- Development of the recommended Preliminary Design (**Section 6**)
- An impact assessment of the recommended design, including measures to avoid/mitigate any adverse impacts (**Section 6**).

Approvals, timing restrictions and anticipated schedule for future project implementation, including Detailed Design and construction, are summarized in **Section 7**.

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1.0 INTRODUCTION

In 2007, Shoreplan Engineering Limited was retained by the City of Hamilton (City), to conduct a review of the erosion processes occurring on the Cherry Beach shoreline. The review identified high erosion rates and a very steep bank with no established vegetation. As a result of the review, the City retained Dillon Consulting Limited (Dillon) and Shoreplan Engineering Limited (Shoreplan) to complete the Municipal Class Environmental Assessment (EA) process to further examine the potential effects on property or lands that may be unsafe for development and to identify appropriate erosion mitigation measures, including a preferred conceptual design. The project will involve the restoration of approximately 300 m of eroding Lake Ontario shoreline.

The purpose of this report is to document the process for a Schedule B project under the Municipal Class EA.

1.1 Study Area

Cherry Beach is located in the Stoney Creek lower end neighbourhood on Lake Ontario, east of Millen Road. As shown on Figure 1, the Study Area is bounded by Lake Ontario to the north, North Service Road to the south, and runs from west of 1 Private Road to east of 3 Private Road. The Study Area consists of residences, many of which were former cottages. More recent residential developments are located adjacent to the Study Area to the east and west. The City is interested in developing the area as open space/waterfront trail connection and other future development opportunities.

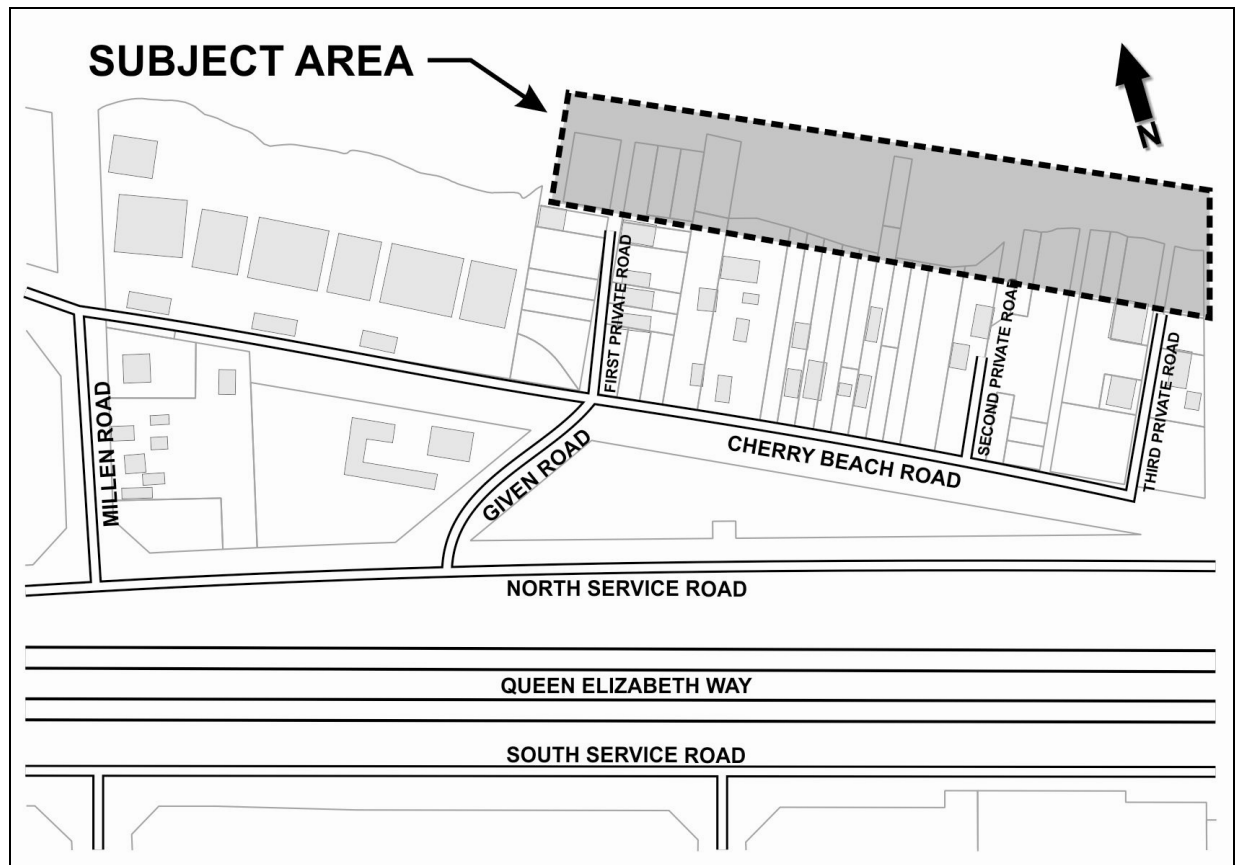


Figure 1: Study Area

1.2 Class Environmental Assessment Process

Municipal infrastructure projects must meet the requirements of the Ontario *EA Act*. The Municipal Class EA (October 2000, as amended in 2007 and 2011) applies to a group or “class” of municipal water, wastewater and roads projects which occur frequently and have relatively minor and predictable impacts. These projects are approved under the *EA Act*, as long as they are planned, designed and constructed according to the requirements of the Class EA document.

The specific requirements of the Class EA for a particular project depend on the type of project, its complexity and the significance of environmental impacts. Four categories of projects are identified in the document, including Schedule “A,” “A+,” “B” and “C” projects. The proposed Cherry Beach Shoreline Protection Infrastructure project is classified as a Schedule “B” project (MCEA, 2011).

A Schedule “B” project follows Phases 1 and 2 of the Municipal Class EA process and is subject to an “environmental screening.” Phases 1 and 2 of the Class EA process involves:

- Phase 1, “Problem/Opportunity Identification,” provides justification of the need for shoreline protection in the Study Area (Section 2)
- Phase 2, “Alternative Solutions,” consists of the identification and evaluation of alternative solutions to the problems identified in Phase 1 (Section 3).

Based on the objective of avoiding or minimizing adverse environmental impacts, the environmental screening process involves:

- Preparation of an inventory of the environment potentially affected by the proposed shoreline protection measures (Section 4)
- Public and agency consultation undertaken for the project (Section 5)
- Development of the recommended Preliminary Design (Section 6)
- An impact assessment of the recommended design, including measures to avoid/mitigate any adverse impacts (Section 6).

Approvals, timing restrictions and anticipated schedule for future project implementation, including Detailed Design and construction, are summarized in **Section 7**.

2.0 PHASE 1, “PROBLEM/OPPORTUNITY IDENTIFICATION”

The shoreline engineering assessment conducted by Shoreline Engineering Limited in 2007 identified high erosion rates and a very steep bank with no established vegetation. Without any shoreline protection infrastructure the naturally occurring erosion will continue to affect the adjacent properties, and lands may be unsafe for future use and development.

2.1 Problem and/or Opportunity Statement

Based on the information presented above, the problem/opportunity statement for the project is as follows:

The Cherry Beach shoreline is being subject to naturally occurring erosion processes that are effecting property and lands and limiting the development potential of the area. Erosion

mitigation measures may be required to stabilize the area for future use and development, and to provide an opportunity to enhance those uses.

3.0 PHASE 2, “ALTERNATIVE SOLUTIONS”

Phase 2 of the Class EA process consists of the identification and evaluation of alternative solutions to the problems/opportunities identified in Phase 1. Public and agency consultation to discuss these alternative solutions occurred throughout Phase 2, as summarized in **Section 5**.

3.1 Alternative Design Solutions

To determine the best approach to protecting the area from ongoing erosion processes, Dillon and Shoreplan evaluated the following alternative shoreline protection design solutions:

- “Do Nothing”
- Alternative 1: Revetment
- Alternative 2: Three Headlands and Two Beach Cells
- Alternative 3: Two Groynes and One Beach Cell
- Alternative 4: One Groyne and Once Beach Cell
- Alternative 5: Three Groynes and Two Beach Cells.

Based on direction provided during Technical Steering Committee meetings following the Public Information Centre (May 2012), the extent of the proposed shoreline protection was limited to the western limit of publicly owned lands, coincident with areas where shoreline protection measures have been implemented by private property owners.

3.1.1 “Do Nothing”

The Class EA process requires the evaluation of a “Do Nothing” strategy. Under the “Do Nothing” approach, the unprotected shoreline of the site will continue to erode. The rate of erosion along the site may vary in the future due to the influence of protected adjacent shores and the formation of a crescent shape shore in between. However, assuming that the historic rate of erosion of 0.56 m/year (see **Section 4.3.1**) applies, the property will be completely eroded back

to Cherry Beach Road within approximately 130 years. Private properties within the Study Area that are partly protected may become isolated if their protection is maintained.

The “Do Nothing” approach does not address the Problem/Opportunity Statement identified in Phase 1 of the study. The financial cost of leaving the shoreline unprotected has not been established.

3.1.2 Alternative 1: Revetment

Alternative 1 proposes a revetment shoreline treatment. The revetment will be a two layer structure consisting of randomly placed armour stones overlaying a layer of rip rap. The toe will be specially placed and founded on firm natural till at an elevation of approximately 72.0 m. The structure will have a slope of approximately 2h:1v. Cap stones will be placed to an elevation slightly higher than the backshore elevation directly behind the structure. Preliminary design suggests a crest elevation of 78.75 m. An alternate section using special placement for the armour stone could be considered in the detailed design. A plan of the revetment alternative is presented on **Figure 2**. The revetment sections, both random and special placement, are shown on **Figure 3A** and **Figure 3B**.

The revetment follows the existing shoreline from the channel at the east end of the site and merges to the existing revetment near the west limit of the Study Area. The structure tucks into the shoreline at the location of the existing shingle pocket beach. The existing concrete rubble will be removed and the beach will be enhanced with the placement of cobble beach material. The cobble beach will be backed by an armour stone seawall which will remain partially buried under normal conditions. A section of the seawall at the existing beach location is also presented on **Figure 3A**.

The revetment will be interrupted at the location of the private properties. It may be extended across the properties, if the owners participate in the undertaking, or appropriate end walls will be constructed at the property boundaries.

All details of the revetment were designed at a preliminary design level suitable for EA analysis. The details may be modified in the detailed design phase of the project.

3.1.3 Alternative 2: Three Headlands and Two Beach Cells

As shown on **Figure 4**, Alternative 2 proposes three headlands and two cobble beach cells. The headlands are formed by hardening and accentuating natural headlands on the site. The headlands in Alternative 2 are not extended out into the lake and the beaches are formed inland of the existing shoreline. The purpose of the hardened headlands is to retain cobble beach material between them. The protection structure for the headlands is the same typical revetment structure as in Alternative 1 and shown on **Figure 3A**.

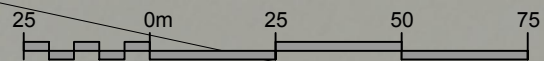
The most easterly section of the shoreline in the Study Area is protected by a revetment structure. The revetment follows the existing shoreline for approximately 50 m before tucking into the shoreline to form the east headland. The second headland is located west of the private property. A third headland is formed at the western limit of the Study Area by wrapping the revetment around inland from the existing revetment on adjacent private property.

Cobble beach material is to be placed between the headlands in the beach alignment shown. The alignments of the beach cells were prepared using a net direction of wave energy. The beaches face the northeast direction (see **Section 4.3.3**). The beaches were assumed to be constructed of cobble size material, generally in the order of 100 mm to 150 mm. The beaches are expected to establish a slope of approximately 6h:1v below the high water line and 3h:1v above the high water line. A flatter area is expected to establish at the approximately 78.0 m elevation of the backshore. This is the case for beaches that are included in various alternatives presented.

The beaches can be established in one of two ways. The headland can be constructed as indicated and the beach areas in between allowed to eroded naturally over time. Once the banks are eroded close to the back of beach position, the remainder of the beach area is excavated and cobble placed. This approach reduces the cost of excavation, but does not create a beach for immediate use of the public. An alternate approach is to excavate the beach areas when the headland are being constructed and place the cobble material at the initial construction time.

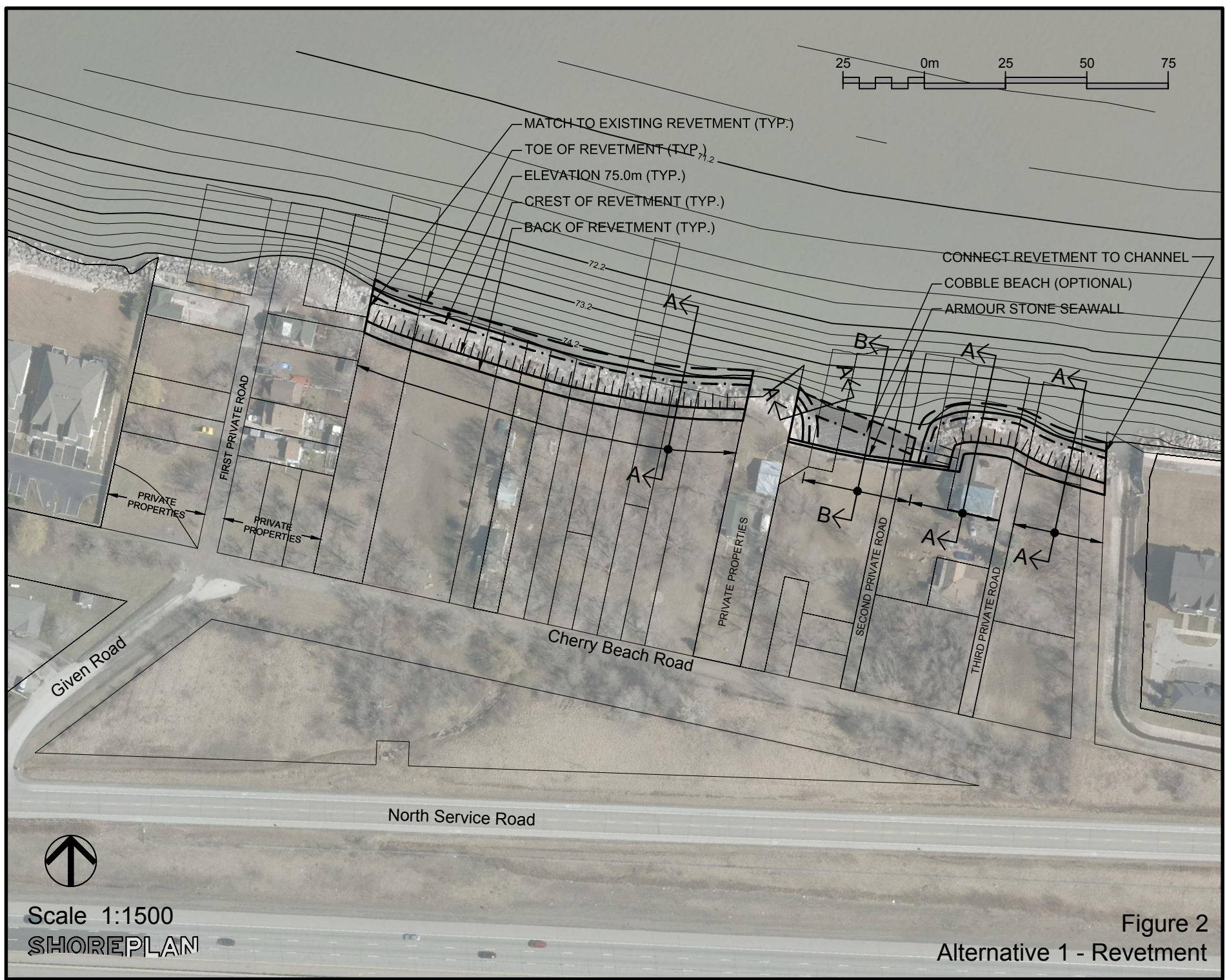
3.1.4 Alternative 3: Two Groynes and One Beach Cell

As shown on **Figure 5**, Alternative 3 proposes one cobble beach cell contained by two groynes.



- MATCH TO EXISTING REVETMENT (TYP.)
- TOE OF REVETMENT (TYP.)
- ELEVATION 75.0m (TYP.)
- CREST OF REVETMENT (TYP.)
- BACK OF REVETMENT (TYP.)

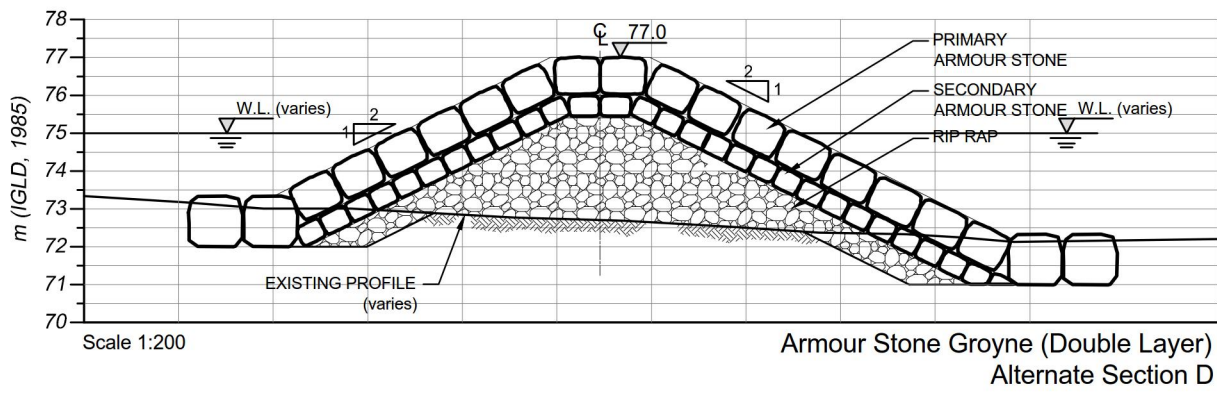
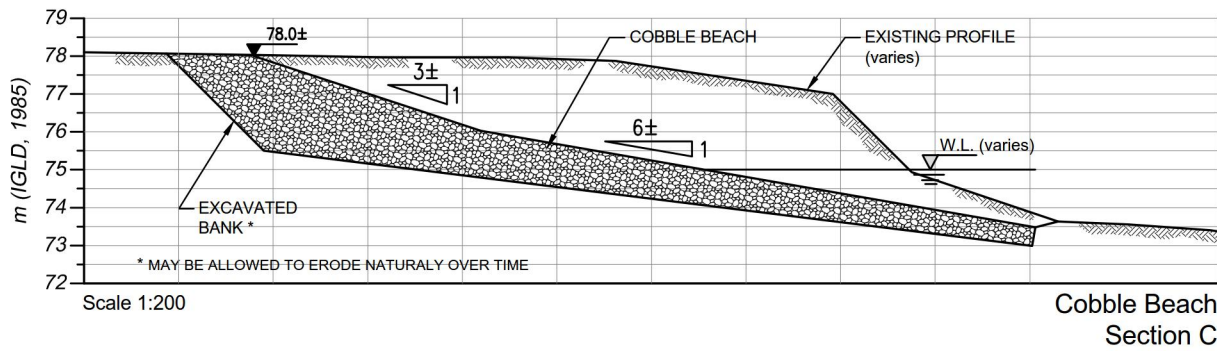
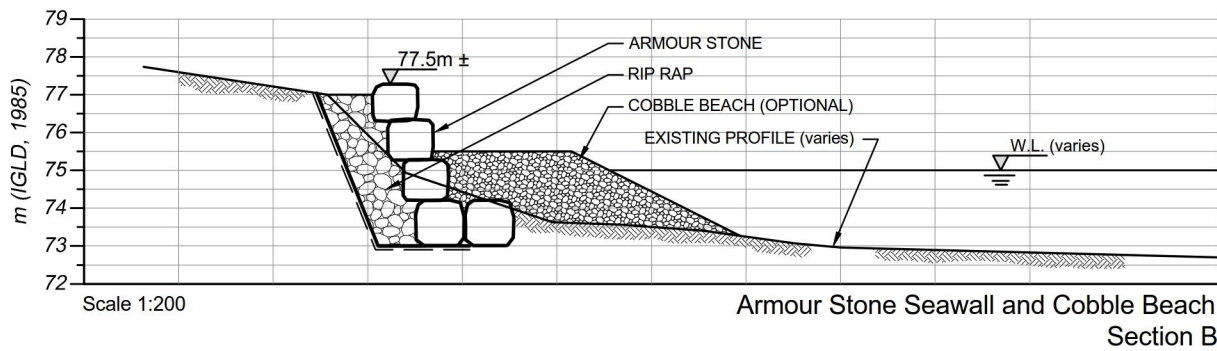
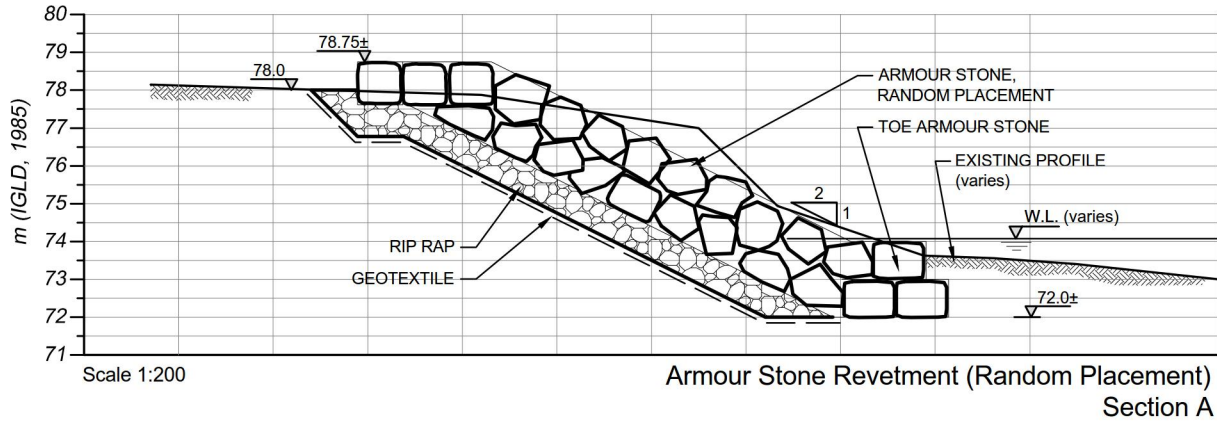
- CONNECT REVETMENT TO CHANNEL
- COBBLE BEACH (OPTIONAL)
- ARMOUR STONE SEAWALL



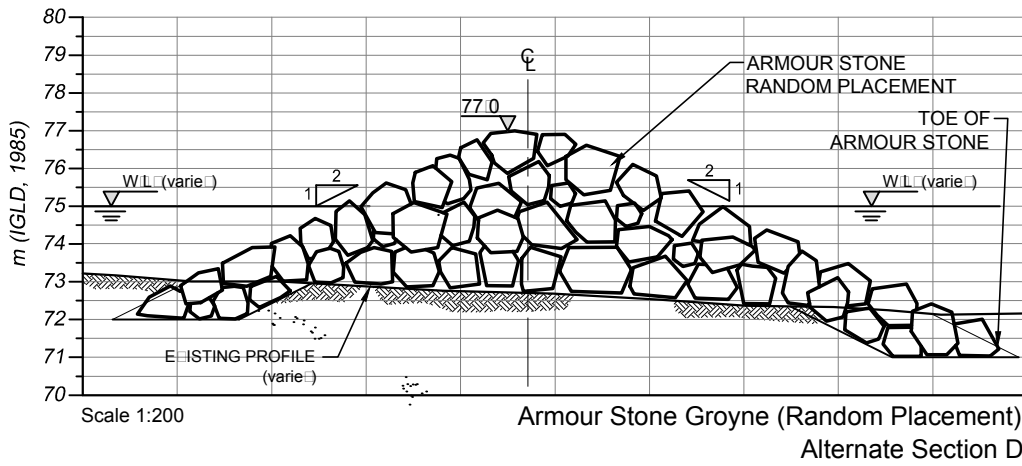
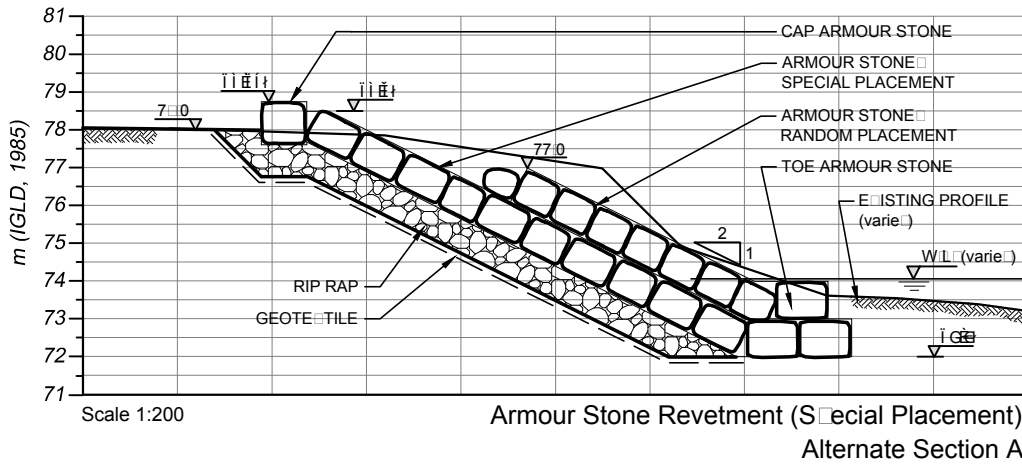
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SHOREPLAN

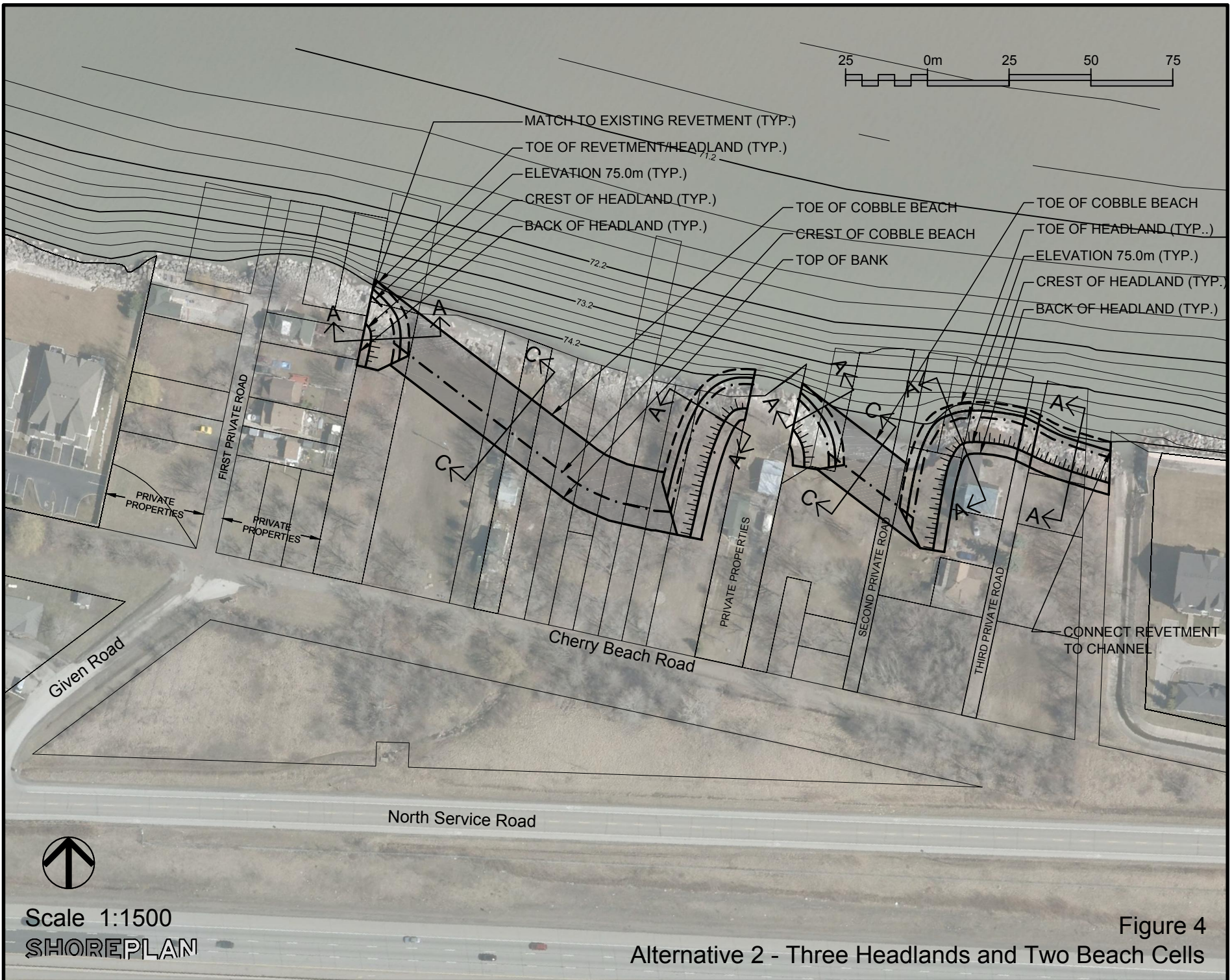
Figure 2
 Alternative 1 - Revetment

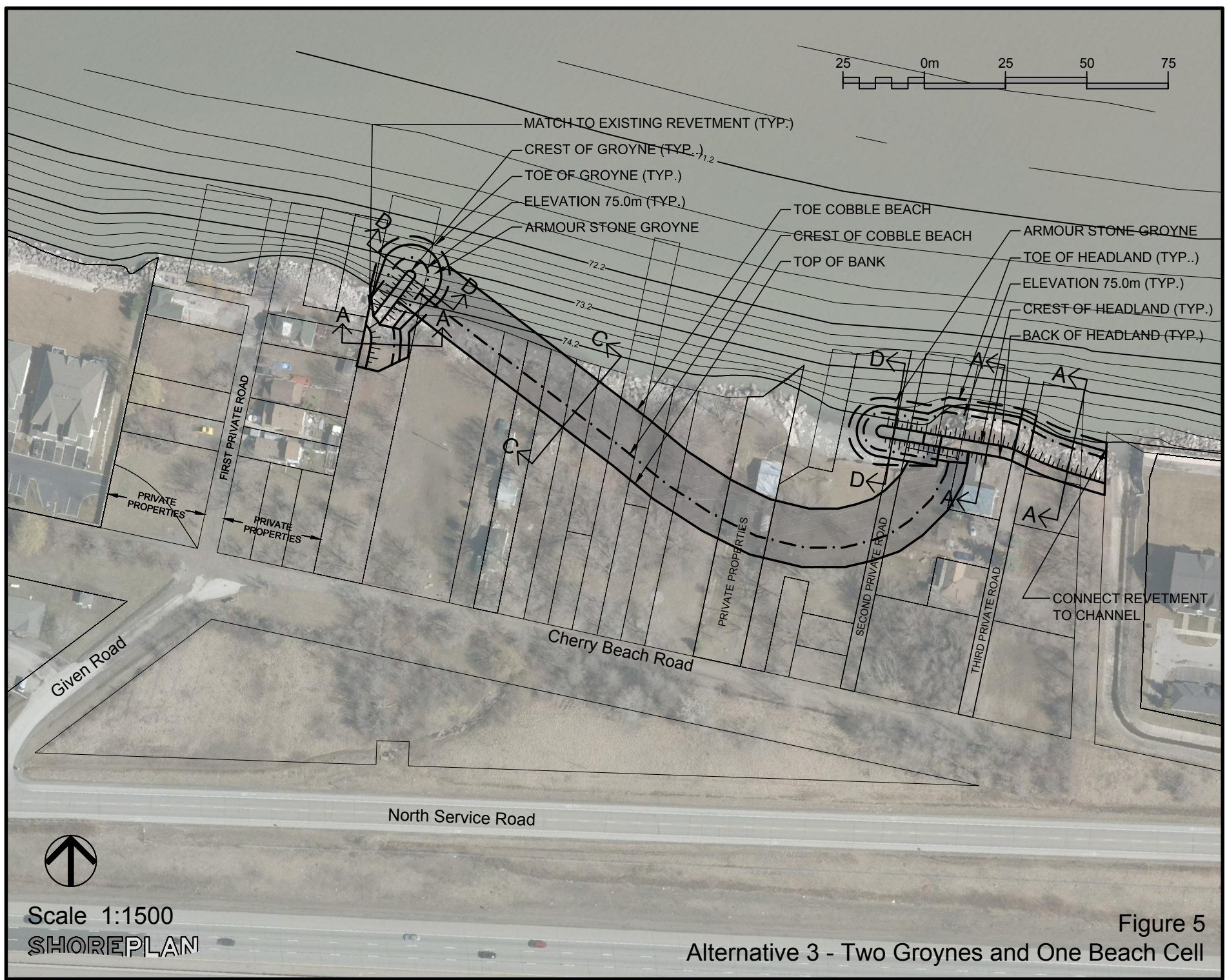
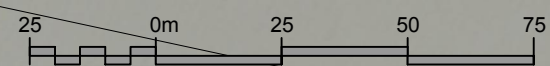
Cherry Beach Shoreline Protection
 Figure 3A: Typical Sections for Alternatives



Cherry Beach Shoreline Protection
 Figure 3B: Alternate Sections for Revetment and Groyne







Scale 1:1500
SHOREPLAN

Figure 5
 Alternative 3 - Two Groynes and One Beach Cell

This alternative attempts to create a single large beach with only very slight extension of the works into the lake.

The two groynes create hard points and act to contain the cobble beach material placed between them. The alignment of the cobble beach has been prepared using a method described for alternative 2 above. (see **Section 4.3.3**). The most westerly section of the beach is straight and expected to align to directly face the northeasterly wave direction. Towards the east, the beach alignment curves in a crescent shape. Similar to Alternative 2, the beach is expected to establish a grade of approximately 6h:1v below the waterline and 3h:1v above the waterline. The beach profile is will dynamically adapt to changing water levels and coastal conditions.

East of the easterly groyne, the shoreline is protected by a revetment structure which follows the existing shoreline and connects to the channel. The easterly groyne extends from the end of the revetment and is aligned to the existing shoreline. The most westerly groyne is aligned parallel to the northeasterly wave direction and perpendicular to the predicted beach alignment. The closest distance between the toes of the two groynes is approximately 130 m.

Typical preliminary sections through the groynes are shown on **Figure 3A**. The formal armour stone groyne is composed of a rip rap core protected by two layers of armour stone. The primary armour stones are typically of larger stone size and overlay a secondary armour stone layer of smaller stone size. Preliminary design suggests a crest elevation of 77 m for the groynes. The sides of the groynes slope down to the existing profile at approximately 2h:1v and have a double toe stone founded on firm natural till. A second alternate cross-section is proposed for the groynes on **Figure 3B**. It consists of randomly placed armour stone to a crest elevation of 77 m and with side slopes of 2h:1v.

3.1.5 Alternative 4: One Groyne and One Beach Cell

As shown on **Figure 6**, Alternative 4 proposes a cobble beach cell enclosed by a headland and an armour stone groyne. This alternative is very similar to Alternative 3 except that the western groyne has been replaced by a headland. This eliminates any extension of the proposed works into the lake. The headland is formed by wrapping a revetment around the corner from the west limit of the site and its form is similar to the west headland in alternative 2. This has effectively moved the “hard point” containing the beach on the west further inland. As a result the beach

alignment is very similar in form to Alternative 3 (**Figure 5**) except that it has been shifted inland approximately 20 m.

3.1.6 Alternative 5: Three Groynes and Two Beach Cells

As shown on **Figure 7**, Alternative 5 proposes three armour stone groynes accommodating two cobble beach cells. The most easterly section of the site is protected by an approximately 50 m long section of revetment. The revetment extends from the channel to the east groyne. This alternative considers building of the entire shore protection works system lakeward of the existing shoreline.

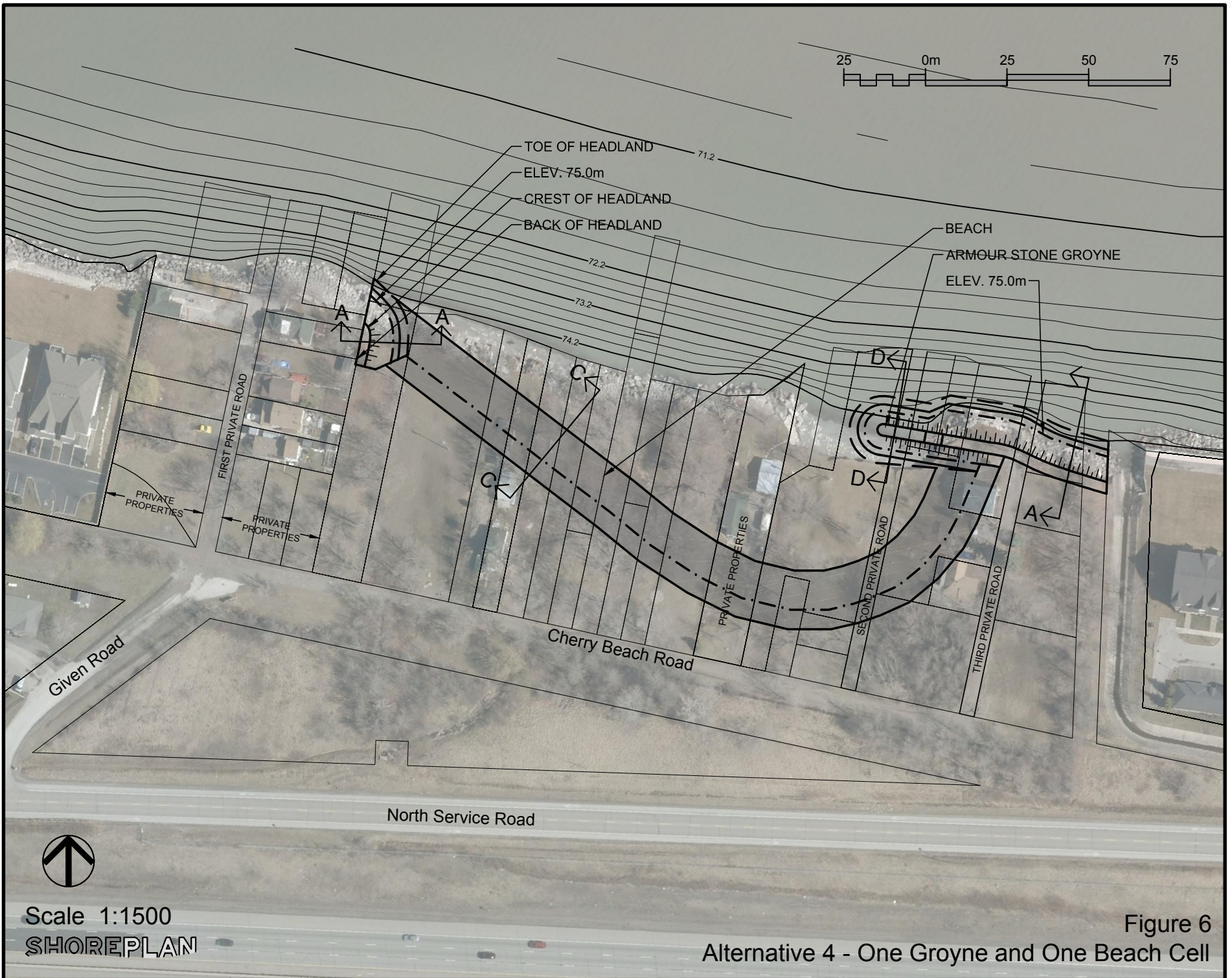
The three groynes extend perpendicularly from the existing shoreline. The two most easterly groynes measure approximately 40 m to 50 m to the toe and the longer westerly groyne measures approximately 70 m to the toe. The two alternate typical sections for the groynes are the same as those described for Alternative 4 (**Figure 3A** and **Figure 3B**). The three groynes contain two cobble beach cells. The eastern beach cell measures approximately 60 m along the existing shoreline and the western beach cells measures approximately 100 m. The alignments of the two beach cells have been prepared using a net wave energy direction from the north-east. The lengths and positions of the groynes have been selected so that the back of the beach alignment just touches the existing shoreline.

From the base of the two easterly groynes, armour stone seawalls extend approximately 40 m along the existing shoreline towards the west. These armour seawalls are at the back of the beach and act as a secondary defense where the alignment of the proposed beach is the most inland.

3.2 Comparative Evaluation of Alternative Design Solutions

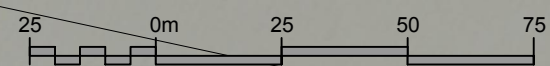
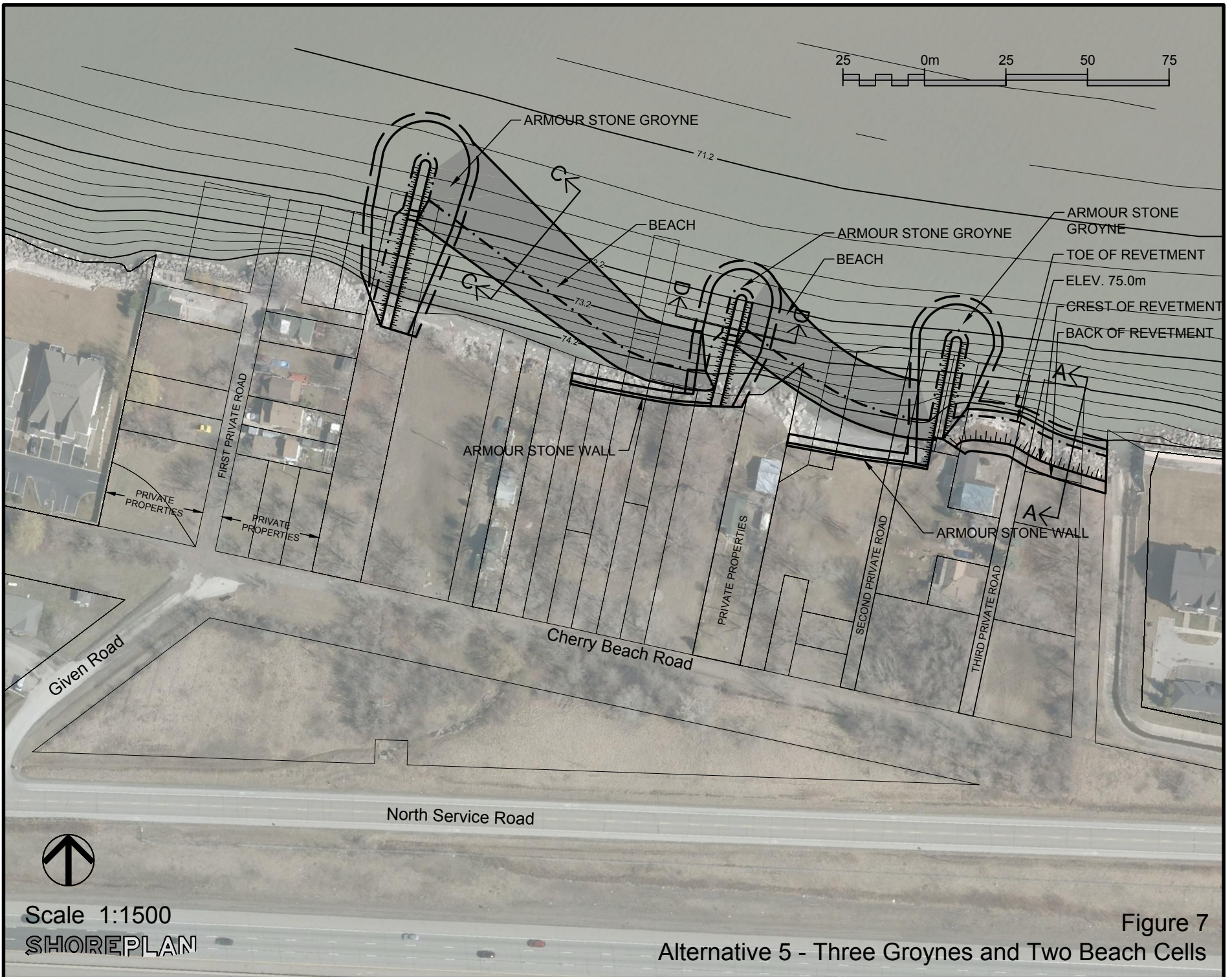
Existing environmental conditions potentially affected by the alternative design solutions are described in **Section 4**. **Table 1** includes a description of the criteria used to evaluate impacts to the natural features, coastal landscape, socioeconomic and cultural environments, as well as technical and engineering considerations.

Table 2 is a comparative evaluation of the alternative design solutions based on the evaluation criteria, as presented at the Public Information Centre (PIC) in May 2012.



Scale 1:1500
SHOREPLAN

Figure 6
 Alternative 4 - One Groyne and One Beach Cell



ARMOUR STONE GROUYNE

BEACH

ARMOUR STONE GROUYNE

BEACH

ARMOUR STONE GROUYNE

TOE OF REVETMENT

ELEV. 75.0m

CREST OF REVETMENT

BACK OF REVETMENT

ARMOUR STONE WALL

ARMOUR STONE WALL

FIRST PRIVATE ROAD

SECOND PRIVATE ROAD

THIRD PRIVATE ROAD

Given Road

Cherry Beach Road

North Service Road

PRIVATE PROPERTIES

PRIVATE PROPERTIES

PRIVATE PROPERTIES

Table 1: Description of Evaluation Criteria

	Criteria	Description
Natural Environment	Aquatic habitat	Alternatives that minimize destruction/removal of existing aquatic habitat or provide for opportunities to protect or create aquatic habitat are preferred.
	Habitat linkages	Alternatives that link existing habitats or provide the opportunity to link habitats are preferred.
	Terrestrial habitat	Alternatives that minimize destruction/removal of existing terrestrial habitat or provide for opportunities to protect or create terrestrial habitat are preferred.
	Vegetation	Alternatives that minimize tree and vegetation removal or preserve vegetation are preferred.
Socio-Economic and Cultural Environment	Maximize Available Parkland and Recreational Opportunities	Alternatives that protect larger areas for parkland development and connect with existing or planned waterfront trails are preferred.
	Access to water	Alternatives that allow for public access to the water are preferred.
	Appearance	Alternatives that are aesthetically appealing, primarily from the land and secondarily from the water, are preferred.
	Capital cost	Alternatives with the least relative capital cost are preferred.
	Maintenance cost	Alternatives with the least relative maintenance costs are preferred.
	Historic/cultural features & resources	Alternatives that have the least impact on designated properties, buildings of architectural/historical interest, cemeteries, and registered archaeological sites are preferred.
	Impact on adjacent property	Alternatives that minimize impacts to adjacent property during construction and operation are preferred.
	Public safety	Alternatives that incorporate public safety features, such safe access to the water, are preferred.
Views and vistas	Alternatives that maintain and improve views and vistas of the lake are preferred.	
Coastal Environment	Littoral drift	Alternatives that do not interfere with littoral drift are preferred.
	Other coastal processes	Alternatives that do not increase wave reflection are preferred.
	Surface drainage	Alternatives that do not require alteration of site drainage are preferred.
	Unique landforms	Alternative that do not destroy unique landforms are preferred.
	Updrift/downdrift impacts	Alternatives that do not cause impacts to adjacent shore are preferred. Impacts can be caused by interference with littoral drift and/or changes in wave reflection.
	Water quality and circulation	Alternatives that maintain and improve water quality are preferred.
Technical and Engineering	Erosion mitigation	Alternatives that mitigate erosion over the longest period of time within and adjacent to the Study Area are preferred.
	Existing structures or infrastructure	Alternatives that avoid existing utilities, structures and infrastructure are preferred.
	Risk to life and property	Alternatives that minimize risk to life and properties due to erosion and flooding in and adjacent to the Study Area are preferred.
	Scheduling (Phasing)	Alternatives that can be implemented in phases are generally preferred as they provide more flexibility with respect to capital budgeting and construction implementation

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Table 2: Comparative Evaluation of Alternatives

Criteria	Alternative 1 Revetment	Alternative 2 Three Headlands Two Beaches Cell	Alternative 3 One Groynes and Headland One Beach Cell	Alternative 4 Revetment and Headland One Beach	Alternative 5 Three LONG Groynes Two Beach Cells
Natural Environment					
Aquatic habitat	Alternative will not encroach into the aquatic habitat. -	Alternative will not encroach into the aquatic habitat. -	Alternative will encroach into aquatic habitat potentially resulting in a HADD. *	Alternative will encroach into aquatic habitat potentially resulting in a HADD. *	Alternative will encroach into aquatic habitat potentially resulting in a HADD. *
Habitat linkages	Does not change the current habitat linkage -	Does not change the current habitat linkage. -	Does not change the current habitat linkage. -	Does not change the current habitat linkage. -	Does not change the current habitat linkage. -
Terrestrial habitat	Alternative will not encroach into the terrestrial habitat. ✓	Alternative will encroach into small woodland with manicured lawn and early successional meadow, this woodland does not provide habitat to regionally/provincially rare species or provincial species at risk (SAR) listed under ESA, 2007. -	Alternative will encroach into small woodland with manicured lawn and early successional meadow, this woodland does not provide habitat to regionally/provincially rare species or provincial SAR listed under ESA, 2007. -	Alternative will encroach into small woodland with manicured lawn and early successional meadow, this woodland does not provide habitat to regionally/provincially rare species or provincial SAR listed under ESA, 2007. -	Alternative will not encroach into the terrestrial habitat. ✓
Vegetation	Little grass and shrub vegetation will have to be removed from the shoreline and approximately ten trees will be removed, including three hazard trees. ✓	Approximately 20 trees will have to be removed, trees are common urban species or non-natives, other vegetation to be removed are primarily non-native grasses and forbs. -	Approximately 30 trees will have to be removed, trees are common urban species or non-natives, other vegetation to be removed are primarily non-native grasses and forbs. *	Approximately 40 trees will have to be removed, trees are common urban species or non-natives, other vegetation to be removed are primarily non-native grasses and forbs. *	Little grass and shrub vegetation will have to be removed from the shoreline and approximately ten trees will be removed, including three hazard trees. ✓
Socio-Economic and Cultural Environment					
Maximize Available Parkland and Recreational Opportunities	Permits future trail connection and maintains extent of area proposed for park. ✓	Permits future trail connection. Minor reduction in land area of proposed park. ✓	Permits future trail connection. Reduces land area of proposed park. *	Permits future trail connection. Reduces land area of proposed park. *	Permits future trail connection and increases extent of area proposed for park. ✓
Access to water	Limited access to water. Large armour stone steps can be provided. -	Beach and access created along western public park. ✓	Beach and access created along western public parklands and beach created in area currently occupied by privately owned residence. ✓	Beach and access created along western public parklands. Beach created near eastern public parklands area and displaces two buildings which may provide for additional public access to water. ✓	Beach and access created along western public parklands. ✓
Appearance	Hardened shoreline along entire length of Study Area. Very similar to common protection approach. -	Limited hardened shoreline and beach areas created. ✓	Limited hardened shoreline and beach areas created however hardened shoreline includes a groyne. ✓	Limited hardened shoreline and beach areas created. ✓	Three groynes may be perceived as visually unappealing. *

Criteria	Alternative 1 Revetment	Alternative 2 Three Headlands Two Beaches Cell	Alternative 3 One Groynes and Headland One Beach Cell	Alternative 4 Revetment and Headland One Beach	Alternative 5 Three LONG Groynes Two Beach Cells
Capital Cost	\$2.1M to \$2.3M -	(No cobble added) \$2.0M to \$2.7M -	(No cobble added) \$1.4M to \$1.5M -	(No cobble added) \$1.6M to \$1.7M -	\$2.5M to \$2.7M -
Maintenance cost	0.5 % to 2.0% annually of capital cost Readily completed form shore. -	0.5 % to 2.0% annually of capital cost Readily completed form shore. -	0.5 % to 2.0% annually of capital cost Readily completed form shore. -	0.5 % to 2.0% annually of capital cost Readily completed form shore. -	0.5 % to 2.0% annually of capital cost More difficult work; may require marine access. x
Historic and cultural features or resources	No know historic or cultural features. Area has archaeological potential and this option will protect existing lands. ✓	No know historic or cultural features. Area has archaeological potential and this option will not protect all existing lands. x	No know historic or cultural features. Area has archaeological potential and this option will not protect all existing lands. x	No know historic or cultural features. Area has archaeological potential and this option will protect the smallest area of existing lands. x	No know historic or cultural features. Area has archaeological potential and this option will protect existing lands. ✓
Impact on adjacent property	Minor impacts anticipated during construction. No impacts anticipated during operation. -	Minor impacts anticipated during construction. No impacts anticipated during operation. -	Minor impacts anticipated during construction. No impacts anticipated during operation. -	Minor impacts anticipated during construction. No impacts anticipated during operation. -	Impacts anticipated during construction. No impacts anticipated during operation. x
Public safety	Provides for opportunity to integrate safety features. ✓	Provides for opportunity to integrate safety features. ✓	Provides for opportunity to integrate safety features. ✓	Provides for opportunity to integrate safety features. ✓	Provides for opportunity to integrate safety features. ✓
Views and vistas	Closely maintains existing views and vistas. -	Views and vistas maintained with addition of beach areas. ✓	Views and vistas improved with large beach area however one groyne created. ✓	Views and vista improved with large beach area and limited shoreline hardening. ✓	Views and vistas impacted by three groynes. x
Physical Considerations					
Littoral drift	Loss of sediment source along the protected shoreline. Potential for deflection of littoral drift by increased wave reflection. x	Loss of sediment source along the protected shoreline. Littoral drift will be deflected and a very small sediment shadow is created. x	Loss of sediment source along the protected shoreline. Littoral drift will be deflected and a very small sediment shadow is created. x	Loss of sediment source along the protected shoreline. x	Loss of sediment source along the protected shoreline. Littoral drift will be deflected and a small sediment shadow is created. x
Other coastal processes	Increases wave reflection. -	Protects part of nearshore area. ✓	No other costal impacts. -	No other costal impacts. -	Protects large part of nearshore area. ✓
Surface drainage	No change. -	No change. -	No change. -	No change. -	No change. -
Unique landforms	None. -	None. -	None. -	None. -	None. -
Updrift/downdrift impacts	None. -	Littoral drift will be deflected and a very small sediment shadow is created Impact mitigated by presence of protection on downdrift side. -	None. -	None. -	Littoral drift will be deflected and a small sediment shadow is created Impact mitigated by presence of protection on downdrift side. -
Water quality and circulation	None. -	May collect debris and algae in the littoral "shadow." x	May collect debris and algae in the littoral "shadow." x	May collect debris and algae in the littoral "shadow." x	May collect debris and algae in the littoral "shadow." x

Criteria	Alternative 1 Revetment	Alternative 2 Three Headlands Two Beaches Cell	Alternative 3 One Groynes and Headland One Beach Cell	Alternative 4 Revetment and Headland One Beach	Alternative 5 Three LONG Groynes Two Beach Cells
Technical and Engineering					
Erosion mitigation	Very effective; Commonly used Design life, generally taken as 25 to 50 years. ✓	Very effective. Design life, generally taken as 25 to 50 years. ✓	Very effective. Design life, generally taken as 25 to 50 years. ✓	Very effective. Design life, generally taken as 25 to 50 years. ✓	Very effective. Design life, generally taken as 25 to 50 years. ✓
Existing structures and infrastructure	No conflicts with existing structures or infrastructure. Existing buildings on City owned lands to be removed. -	No conflicts with existing structures or infrastructure. Existing buildings on City owned lands to be removed. -	No conflicts with existing structures or infrastructure. Existing buildings on City owned lands to be removed. -	No conflicts with existing structures or infrastructure. Existing buildings on City owned lands to be removed. -	No conflicts with existing structures or infrastructure. Existing buildings on City owned lands to be removed. -
Risk to life and property	Risk to life and property prevented. ✓	Risk to life and property prevented. ✓	Risk to life and property prevented. ✓	Risk to life and property prevented. ✓	Risk to life and property prevented. ✓
Scheduling (phasing and implementation)	Allows phasing. ✓	Allows phasing. ✓	Allows limited phasing of construction. Requires all property to be in public ownership. *	Allows limited phasing of construction. Requires all property to be in public ownership. *	Allows phasing. ✓
Overall Evaluation					
	Equally Preferred	Equally Preferred	Equally Preferred	Least Preferred	Least Preferred
✓ Represents a positive impact * Represents a negative impact - Represents neither a positive nor negative impact (neutral).					

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Based on the evaluation presented in **Table 2**, Alternatives 1, 2 and 3 were identified as equally preferred. Each of the three preliminary preferred alternatives were identified as having benefits depending on the ultimate land ownership scenario.

Based on the public and agency comments received at and following the PIC, the three preliminary preferred alternatives were further evaluated to determine the preferred alternative design solution. **Table 3** is a comparative evaluation of Alternatives 1, 2 and 3 based on natural features, coastal landscape, socioeconomic and cultural environments, as well as technical and engineering considerations.

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Table 3: Comparative Evaluation of Alternatives 1, 2 and 3

Criteria	Alternative 1 Revetment	Alternative 2 Three Headlands and Two Beach Cells	Alternative 3 Two Groynes, Headland, One Beach Cell
Natural Environment			
Aquatic habitat	Alternative may not encroach into the aquatic habitat. <i>If working in the water, appears to be less intrusion into fish habitat than Alternative 3, and minimal change to current alignment of shoreline.</i> -	Alternative may not encroach into the aquatic habitat. <i>If Working in the water, appears to be the least intrusive into fish habitat and least amount of change to current shoreline alignment.</i> -	Alternative will encroach into aquatic habitat potentially resulting in a HADD and results in the largest change to shoreline configuration, which increases diversity in shoreline features but may alter existing migration patterns. x
Habitat linkages	Does not change the current habitat linkage. -	Does not change the current habitat linkage. -	Does not change the current habitat linkage. -
Terrestrial habitat	Alternative will not encroach into the terrestrial habitat. ✓	Alternative will encroach into small woodland with manicured lawn and early successional meadow. This woodland does not provide habitat to provincial SAR protected under ESA (2007), but does contain candidate (potential) marginal foraging habitat for Eastern Milksnake, a provincially rare species listed as Special Concern under the ESA (2007). The early successional meadow areas contain marginal foraging habitat for Monarch Butterfly, also a provincially rare species listed as Special Concern under the ESA (2007). -	Alternative will encroach into small woodland with manicured lawn and early successional meadow, this woodland does not provide habitat to provincial SAR protected under ESA (2007), but does contain candidate (potential) marginal foraging habitat for Eastern Milksnake, a provincially rare species listed as Special Concern under the ESA (2007). The early successional meadow areas contain marginal foraging habitat for Monarch Butterfly, also a provincially rare species listed as Special Concern under the ESA (2007). -
Vegetation	Little grass and shrub vegetation will have to be removed from the shoreline and approximately ten trees will be removed, including three hazard trees. ✓	Approximately 20 trees will have to be removed including three hazard trees. Trees are common urban species or non-natives. Other vegetation species to be removed are primarily non-native grasses and forbs. -	Approximately 30 trees will have to be removed including three hazard trees. Trees are common urban species or non-natives, other vegetation species to be removed are primarily non-native grasses and forbs. x
Socio-Economic & Cultural Environment			
Maximize Recreational Opportunities	Permits future trail connection. ✓	Permits future trail connection. ✓	Permits future trail connection. ✓
Maximize Development Opportunities	Maintains extent of area proposed for development. ✓	Minor reduction in land area of proposed development. -	Reduces land area of proposed development. x
Access to water	Limited access to water. Large armour stone steps can be provided. -	Beach and access created along western public park. ✓	Beach and access created along western public parklands and beach created in area currently occupied by privately owned residence. ✓
Appearance (Subject to Land Use)	Hardened shoreline along entire length of Study Area. Very similar to common protection approach. -	Limited hardened shoreline and beach areas created. Beach may form by excavation or natural erosion. -	Limited hardened shoreline and beach areas created however hardened shoreline includes a groyne. Beach area may form by excavation or natural erosion. -

Criteria	Alternative 1 Revetment	Alternative 2 Three Headlands and Two Beach Cells	Alternative 3 Two Groynes, Headland, One Beach Cell
Impact on adjacent property	<p>Purchase of properties and private roads not required. No negative impact expected to erosion at adjacent properties.</p> <p>Some properties will be affected by works if cobble is added to beach.</p> <p>Access will be required along entire length of shoreline.</p> <p>Time to complete construction on City lands is estimated to be approximately 53 working days. Least construction impact, but least long-term benefit for remaining/protected homes due to lack of beach areas.</p> <p>Construction and operation effects on condominiums to the east and west would be least for this alternative.</p> <p style="text-align: center;">-</p>	<p>Purchase of properties and private roads not required. No negative impact expected to erosion at adjacent properties.</p> <p>If excavation used to create beach, larger construction effects anticipated for adjacent property owners.</p> <p>Time to complete construction on City lands is estimated to be 83 Working Days. Longest construction impact, but greatest long-term benefit for remaining/ protected properties through provision of large local beach and parkland.</p> <p>Construction of eastern and western beach and revetment would temporarily affect adjacent properties during construction.</p> <p>Construction and operation effects on condominiums to the east and west would occur for additional 30 days in comparison to Alternative 1.</p> <p style="text-align: center;">-</p>	<p>Requires purchase of properties and private roads.</p> <p>Time to complete construction on City lands is estimated to be 73 Working Days. Moderate construction impact and moderate long-term benefit to remaining/ protected homes through provision of small local beach and parkland.</p> <p>Groyne construction (and in water works) in vicinity of private homes will result in longer construction impacts.</p> <p>If beach is excavated, construction effects would be greater for adjacent properties to the east and the west of the site due to additional 20 days of construction activity in comparison to Alternative 1.</p> <p>Construction and operation effects on condominiums to the east and west would occur for additional 30 days in comparison to Alternative 1.</p> <p style="text-align: center;">x</p>
Public safety	<p>Provides for opportunity to integrate safety features.</p> <p style="text-align: center;">✓</p>	<p>Provides for opportunity to integrate safety features.</p> <p style="text-align: center;">✓</p>	<p>Provides for opportunity to integrate safety features.</p> <p style="text-align: center;">✓</p>
Views and vistas (Subject to Land Use)	<p>Closely maintains existing views and vistas.</p> <p style="text-align: center;">-</p>	<p>Views and vistas improved with the addition of beach areas closer to private homes and look-outs at east side of beaches. Some properties will have more land fronting on the lake.</p> <p style="text-align: center;">-</p>	<p>Views and vistas maintained or improved with large beach area. West groyne marginally obstructs views for some waterfront properties.</p> <p style="text-align: center;">-</p>
Capital Cost	<p>Similar capital cost.</p> <p style="text-align: center;">-</p>	<p>Similar capital cost.</p> <p style="text-align: center;">-</p>	<p>Similar capital cost.</p> <p style="text-align: center;">-</p>
Maintenance cost	<p>0.5 % to 2.0% annually of capital cost. Readily completed from shore.</p> <p style="text-align: center;">-</p>	<p>0.5 % to 2.0% annually of capital cost. Readily completed from shore.</p> <p style="text-align: center;">-</p>	<p>0.5 % to 2.0% annually of capital cost. Readily completed from shore.</p> <p style="text-align: center;">-</p>
Historic and cultural features or resources	<p>No know historic or cultural features. Area has archaeological potential and this option will protect existing lands.</p> <p style="text-align: center;">✓</p>	<p>No know historic or cultural features. Area has archaeological potential and this option will not protect all existing lands.</p> <p style="text-align: center;">x</p>	<p>No know historic or cultural features. Area has archaeological potential and this option will not protect all existing lands.</p> <p style="text-align: center;">x</p>
Physical Considerations			
Littoral drift	<p>Loss of sediment source along the protected shoreline.</p> <p style="text-align: center;">-</p>	<p>Loss of sediment source along the protected shoreline.</p> <p>Wave reflection will be reduced in the beach area.</p> <p style="text-align: center;">-</p>	<p>Loss of sediment source along the protected shoreline</p> <p>Littoral drift will be marginally deflected and a very small sediment shadow may be created. Potentially impacted area is protected with armour stone structures and will not be impacted by the potential marginal change in sediment movement.</p> <p style="text-align: center;">x</p>
Other coastal processes	<p>No other coastal impacts.</p> <p style="text-align: center;">-</p>	<p>No other coastal impacts.</p> <p style="text-align: center;">-</p>	<p>Protects part of nearshore area.</p> <p style="text-align: center;">-</p>

Criteria	Alternative 1 Revetment	Alternative 2 Three Headlands and Two Beach Cells	Alternative 3 Two Groynes, Headland, One Beach Cell
Surface drainage	No change. -	No change. -	No change. -
Unique landforms	None. -	None. -	None. -
Updrift/downdrift impacts	None. -	None. -	Littoral drift will be marginally deflected and a very small sediment shadow is created. Impact mitigated by presence of protection on downdrift side. -
Water quality and circulation	May collect debris and algae on the small beach. -	May collect debris and algae on the beaches. -	May collect debris and algae on the beaches and in the littoral "shadow." *
Technical and Engineering			
Erosion mitigation	Very effective. Commonly used Design life, generally taken as 25 to 50 years. ✓	Very effective. Design life, generally taken as 25 to 50 years. ✓	Very effective. Design life, generally taken as 25 to 50 years. ✓
Existing structures and infrastructure	No conflicts with existing structures or infrastructure. Existing buildings on City owned lands to be removed. -	No conflicts with existing structures or infrastructure. Existing buildings on City owned lands to be removed. -	No conflicts with existing structures or infrastructure. Existing buildings on City owned lands to be removed. -
Risk to life and property	Risk to life and property reduced on City property. ✓	Risk to life and property reduced on City property. If property issues not resolved may result in effects, including continued erosion on adjacent properties unless private works are completed (at owners' expense or as negotiated with the City). *	Risk to life and property reduced on City property. ✓
Scheduling (phasing and implementation)	Allows phasing ✓	Allows phasing ✓	Allows limited phasing of construction. Requires all property to be in public ownership *
Overall Evaluation			
	Most Preferred	Preferred	Least Preferred
✓ Represents a positive impact * Represents a negative impact - Represents neither a positive nor negative impact (neutral).			

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3.3 Preferred Alternative Design Solution

As outlined in **Table 3**, Alternative 1, Revetment, is the preferred design solution. This alternative consists of a two layer structure consisting of randomly placed armour stones overlaying a layer of rip rap. The revetment will follow the existing shoreline from the channel at the east end of the site and merges to the existing revetment at the west limit of the Study Area. A detailed description of the preliminary design solution is included in **Section 6** of this report.

4.0 DESCRIPTION OF THE ENVIRONMENT

This section of the Project File Report summarizes the environmental inventory prepared as part of the Schedule B environmental screening process. It covers all environmental conditions affected by the installation of the proposed shoreline protection infrastructure.

4.1 Cultural Resources

The City has developed a draft Archaeology Management Plan (2012) to identify areas within the City that have known archeological sites, potential for archeological resources and specific locations with sensitive cultural remains (e.g., cemeteries). As shown on **Figure 8**, the Management Plan indicates that the Study Area has archaeological potential.

In August 2013, Timmins Martelle Heritage Consultants (TMHC) conducted a Stage 1 and 2 archaeological assessment in the Cherry Beach Development area as part of a separate City initiated acquisition program to facilitate the potential development of a future waterfront park in the area of Cherry Beach Road. The assessment was prepared according to the Ministry of Tourism, Culture and Sport's (MTCS) Standards and Guidelines (2011) consisting of best practices for consulting archaeologists.

The Study Area for the TMHC assessment falls within Lots 17 and 18, Broken Front Concession, in the Geographic Township of Saltfleet, former County of Wentworth. The 2.7 ha Study Area is bounded to the west by the Bal Harbour residential development, to the south by North Service Road, to the east by the Seaside Village residential development, and to the north by Lake Ontario. As shown on **Figure 9**, the Study Area for the current shoreline protection Class EA has been assessed as part of the Stage 1/2 Archeological Assessment for the Cherry Beach Development.

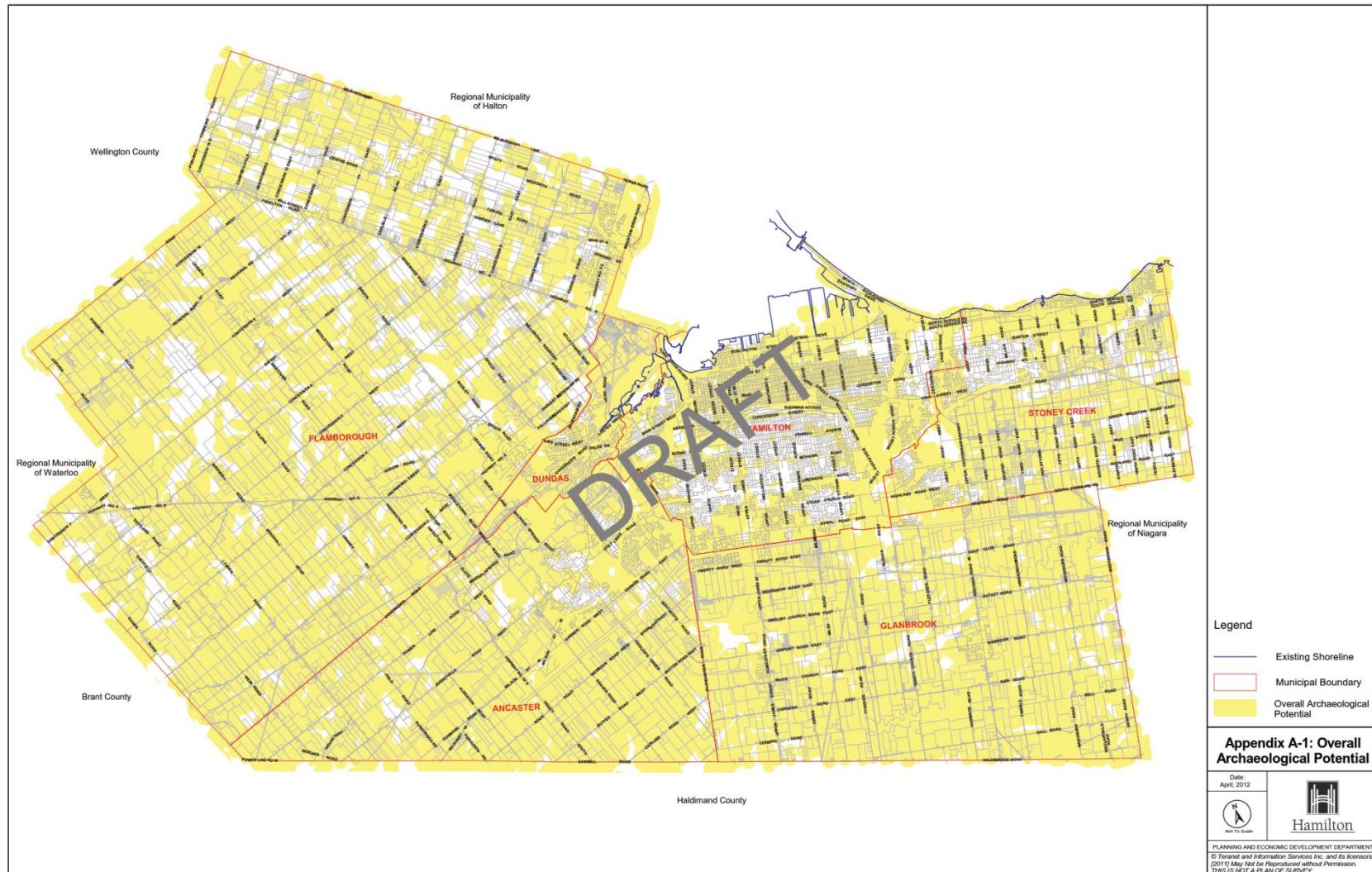


Figure 8: City of Hamilton Draft Archaeology Management Plan - Overall Archaeological Potential
 (Source: City of Hamilton, 2012)



Figure 9: Study Area for Stage 1 and 2 Archaeological Assessment, Cherry Beach Road
 (Source: Timmins Martelle Heritage Consultants Inc., 2013)

The Stage 1 assessment revealed that the Study Area had potential for archaeological resources. Potential for the discovery of First Peoples sites is indicated by the proximity (within 300 m) of a primary water source (Lake Ontario) and a glacial shoreline of Lake Iroquois. The potential for the discovery of historic era sites is demonstrated by proximity (within 300 m) to a primary water source (Lake Ontario) and its potential association with early settlers on the area (Henry Utter and the Carpenter family).

A Stage 2 assessment consisting of a test pit survey was carried out for the Study Area (Parcels A-F) and demonstrated that portions of the Study Area contained a variable amount of stratified soils (including some area of fill) over an intact buried soil horizon (brown sandy loam), and non-stratified topsoil (brown sandy loam). These areas retained archaeological potential. Therefore, the majority of the Study Area (54%) was test pitted at 5 metre intervals, including:

- Roughly 9% of the Study Area was extensively disturbed by prior land altering activities and former building footprints
- The remainder of the Study Area was low and wet (<2%), or disturbed beachfront with imported rock (8%). Therefore, roughly 10% of the Study Area was identified as having low archaeological potential. The visual assessment eliminated these portions from Stage 2 survey
- Remaining portions of the Study Area (36%) were judgmentally test pitted at 10 metre intervals. These areas were not obviously disturbed on the surface but test pitting confirmed underlying disturbance related to former development on the properties.

The test pit survey of Parcel B resulted in the identification of one artifact bearing location, Location 1 (AhGw-292). Location 1 contained an artifact of special interest (a fragment of Aboriginal ceramic) requiring further archaeological investigation.

Based on these considerations, TMHC recommended that:

- Surveyed parcels where no archaeological resources were encountered during the Stage 2 archaeological assessment should be considered free of archaeological concern and no further archaeological assessment work is recommended (Parcels A, C, D, E, and F)

- Location 1 (AhGw-292), a native ceramic findspot identified in Parcel B, is recommended for a Stage 3 archaeological assessment. Because of the potential for the ceramic sherd to be from the fill layer, Location 1 is considered a small pre-contact site.

As recommended, TMHC completed a Stage 3 archaeological assessment for the southern portion of Parcel B in the area surrounding the identified site (Location 1). The City's Cultural Heritage Planner indicated that, based on the results of the Stage 3 work, no further assessment work is necessary (A. Golden, personal correspondence, January 2014).

The Stage 1, 2, and 3 Archeological Assessment reports for Site AhGw-292 prepared by TMHC were submitted to the Ministry of Tourism, Cultural, and Sports (MTCS) in January 2014. Based on the review by the MTCS the following recommendation was made on February 11, 2014:

“The study area may be considered free of any further archaeological concern and no further archaeological assessment work is recommended”.

4.2 Terrestrial and Aquatic Habitat

As part of the Class EA Study, Dillon completed an ESA (2007) screening as well as a background natural heritage review of the Study Area's existing conditions. The ESA screening included a background information review to document natural features (e.g., wetlands, woodlands, Areas of Natural and Scientific Interest (ANSI), Environmentally Sensitive Areas, etc.) and SAR occurrences in and adjacent to the Study Area. A preliminary site investigation was performed on February 28, 2012, to confirm the presence or absence of both terrestrial and aquatic natural features and/or SAR habitat within the Study Area. Subsequent site visits were performed as a part of Linkage Assessment that was completed in the Study Area in 2013, which provide further details on the site natural heritage attributes, sensitivities and functions. The field study information is provided in **Table 4**.

The Existing Conditions Report (updated May 2014), including the ESA Screening, is provided in **Appendix A**.

Table 4: Field Study Information

Field Survey	Dates	Conditions	Timing	Personnel
Vegetation Assessment and Tree Inventory	February 28, 2012	-1°C, cloudy	Morning	J. Harris
	July 26, 2012	22°C, drizzle	Morning	J. Harris
	May 13, 2013	6°C, cloudy	Afternoon	R. Baxter
	September 3, 2013	20°C, cloudy	Midday	R. Baxter
Ecological Land Classification	February 28, 2012	-1°C, cloudy	Morning	J. Harris
	July 26, 2012	22°C, drizzle	Morning	J. Harris
	May 13, 2013	20°C, cloudy	Midday	R. Baxter
	September 03, 2013			
Breeding Bird Surveys	June 05, 2013	12°C, cloudy	Early	R. Baxter
	June 19, 2013	20°C, clear	Morning Morning	
Migratory Bird Survey	April 30, 2013	15°C, cloudy	Midday	R. Baxter
	May 13, 2013	6°C, cloudy	Midday	
	May 17, 2013	10°C, clear	Morning	
	August 30, 2013	30°C, clear	Morning	
	September 18, 2013	20°C, clear	Midday	
Aquatic Habitat Assessment	February 28, 2012	-1°C, cloudy	Morning	B. Gottfried
	May 17, 2013	15°C, cloudy	Morning	R. Baxter
	May 22, 2013	23°C, cloudy	Morning	R. Baxter
	July 17, 2013	32°C, clear	Morning	B. Gottfried
Wildlife Surveys (Incidental)	Occurred during other surveys	Various	Various	R. Baxter J. Harris B. Gottfried

4.2.1 Background Information Review

A review of secondary source information relevant to the project was completed prior to field studies. The findings of this review are as follows:

- An HCA Regulated Area associated with Lake Ontario and a channelized watercourse is located within the Study Area. The policies of *O.Reg 161/06: Regulation of*

Development, Interference with Wetlands and Alterations to Shorelines and Watercourses apply to the development

- Two areas of the Study Area are designated as *Linkage* on Schedule B of the City of Hamilton Urban Official Plan. According to the Official Plan “Linkage areas are “natural areas within the landscape that ecologically connect Core Areas. They are avenues along which plants and animals can propagate, genetic interchange can occur, populations can move in response to environmental changes and life cycle requirements and species can be replenished from other natural areas. Conserving linkages also protects and enhances Core Areas”
- A small portion of the Study Area is also designated as Parks and Open General Space on Schedule B of the OP. According to the Official Plan, lands designated as Open Space are “public or private areas where the predominant use of or function of the lands is for recreational activities, conservation management and other open space uses”
- A Core Area (i.e., Community Beach Ponds Environmentally Significant Area) is located west of the Study Area in the Green Millen Shore Estates Condo Development Area as shown on Schedule B of the OP. According to the Official Plan, Core Areas are “include key natural heritage features, key hydrological features and provincially significant and local natural areas that are more specifically identified by Schedule B-1-8 – Detailed Natural Heritage Features. Core Areas are the most important components in terms of biodiversity, productivity, and ecological and hydrological functions”
- Lake Ontario is designated as a Key Hydrologic Feature (Lakes and Littoral Zones, Streams) in Schedule B-5 of the Official Plan.

Natural Heritage Information Centre

Through review of historic occurrence records for SAR and Species of Conservation Concern (SCC) for the City of Hamilton, it was determined that there is the potential for 64 SAR/SCC to occur in the general area of the project (see **Appendix A**).

A review of the NHIC Database records indicates that a number of SAR and SCC have the potential to occur in the immediate vicinity of the Study Area, including:

- Gray Ratsnake (Carolinian Population), listed both provincially and federally as Endangered
- Timber Rattlesnake, listed both provincially and federally as Extirpated
- Jefferson Salamander, listed provincially as Threatened and federally as Endangered

- Spotted Wintergreen, listed both provincially and federally as Endangered

In addition, five vascular plants, two lichen species and one bird SCC were identified as potentially occurring within the Study Area based on NHIC Database elemental occurrence records (**Table 5**).

Table 5: List of Provincially Rare Species with the Potential to Occur in the Study Area

Scientific Name	Common Name	S-Rank
Plants		
<i>Aplectrum hyemale</i>	Puttyroot	S2
<i>Carex oligocarpa</i>	Eastern Few-fruited Sedge	S3
<i>Hieracium paniculatum</i>	Paniced Hawkweed	S2?
<i>Nuphar advena</i>	Large Yellow Pond-lily	S3
<i>Onosmodium molle</i> ssp. <i>hispidissimum</i>	Soft-hairy False Gromwell	S2
Lichen		
<i>Bacidia trachona</i>	-	S1S2
<i>Diplotomma epipolium</i>	-	S1S2
Birds		
<i>Nycticorax nycticorax</i>	Black-crowned Night-heron	S3B, S3N
S1 – extremely rare, S2 – very rare, S3 – rare/uncommon, S4 – common and apparently secure, S5 – very common, S? – ranking uncertain/rank not assigned.		

There are also historical records for two vascular plant species which have an S-rank of SX, meaning these species are considered to be Extirpated from Ontario. These species include:

- White Milkweed (*Asclepias variegata*)
- Square-stemmed Rose Pink (*Sabatia angularis*).

There are no records in the NHIC Database of Provincially Significant Wetlands (PSWs) or ANSI within 120 m of the Study Area.

DFO Fish and Mussel Mapping

A review of the Fisheries and Oceans Canada's (DFO) Fish and Mussel mapping for the Hamilton Conservation Authority (HCA) jurisdiction indicated that there are no records of

aquatic SAR with the potential to occur along the shoreline, drains or channels within or immediately adjacent to the Study Area.

4.2.2 Existing Conditions – Terrestrial Ecosystems

Topography

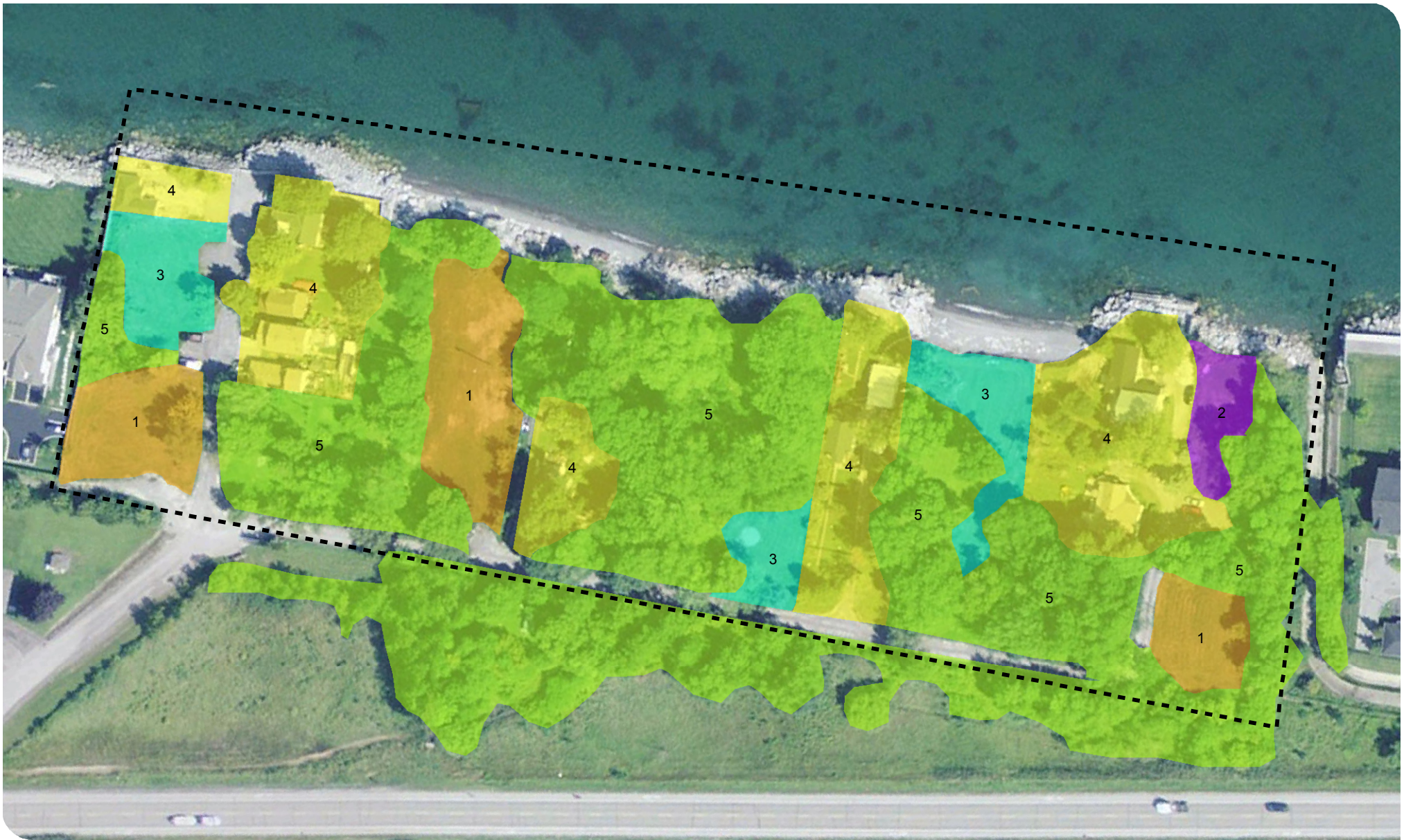
The Study Area is generally flat with a distinct relief in topography along the shoreline. The topography along the shoreline is dynamic and influenced by wave action. The grade beyond the shoreline has been altered, and as a result, the topography is flat and homogenous.

Ecological Land Classification (ELC)

Vegetation communities within the Study Area were classified according to the MNR's ELC for Southern Ontario. The Study Area is predominantly residential lots and deciduous woodland (**Figure 10**), with three natural ecological communities and five cultural community designations were observed. All natural vegetation units surveyed are considered common in Ontario. **Table 6** outlines the communities documented during ELC surveys.

The soil composition throughout the site was found to be sandy with an abundance of coarse fragments. The moisture regime is unknown due to the difficulty of acquiring a full 120 cm soil profile due to the compaction of soil in the Study Area.

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CITY OF HAMILTON
CHERRY BEACH ROAD

Figure 10: Ecological Land Classification



ROAD

STUDY AREA

1) MEGM3: DRY-FRESH GRAMINOID MEADOW

2) MEMM3: DRY-FRESH MIXED MEADOW

3) MANICURED GRASS

4) CVR_3: SINGLE FAMILY RESIDENTIAL

5) WODM 4 Dry-Fresh Deciduous Woodland

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR

MAP CREATED BY: JJA
MAP CHECKED BY: JH
MAP PROJECTION: NAD 1983 UTM Zone 17N

FILE LOCATION:
\\GIS\125934 - Cherry Beach\Mapping\Figure 3 Ecological Land Classification.mxd



SCALE 1:1,500

0 10 20 40 60 80 Meters

PROJECT: 12-5934

STATUS: DRAFT

DATE: 03/20/12



Table 6: Description of ELC Communities

ELC Code	Classification	Soils	Vegetation	Comments
NATURAL COMMUNITIES				
MEMM3	Dry-Fresh Mixed Meadow	Silty Loam; moisture = 2 (Fresh)	This meadow community contains areas of Canada Goldenrod (<i>Solidago canadensis</i>) and White Sweet-Clover (<i>Melilotus albus</i>), with a mix of graminoid and forb species throughout. Species observed include Wild Carrot (<i>Daucus carota</i>), Orchard Grass (<i>Dactylis glomerata</i>), Kentucky Blue Grass (<i>Poa pratensis</i>), Quack Grass (<i>Elymus repens</i>) and Common Ragweed (<i>Ambrosia artemisiifolia</i>). The meadow primarily consists of an herbaceous ground layer (below 0.5 m) with rare occurrences of woody shrub and tree species present in the understory (0.5 m to 2 m in height) and sub-canopy (2 m to 10 m in height). Woody species observed include Staghorn Sumac (<i>Rhus typhina</i>), Manitoba Maple (<i>Acer negundo</i>), Black Locust (<i>Robinia pseudoacacia</i>) and Green Ash (<i>Fraxinus pennsylvanica</i>). Non-native species have a dominant presence in this community.	This community occurs in several locations throughout the Study Area. North of Cherry Beach Road, the community takes form as three smaller polygons that are mechanically maintained (cut) periodically and are situated on former residential properties. South of Cherry Beach Road, the community is found as manicured linear polygons that border North Service Road.
WODM4	Dry-Fresh Deciduous Woodland	Silty Loam; moisture = 2 (Fresh)	This woodland community is a mix of natural woodland areas and naturalizing deciduous hedgerows associated with former residential properties. The woodland contains abundant Green Ash and occasional Manitoba Maple, White Willow (<i>Salix alba</i>), Black Locust, and Silver Maple (<i>Acer saccharinum</i>) in the canopy layer (> 10 m in height). The sub-canopy contains abundant Manitoba Maple with occasional White Poplar (<i>Populus alba</i>) and Norway Maple (<i>Acer platanoides</i>). The understory consists of primarily non-native woody species including Common Buckthorn (<i>Rhamnus cathartica</i>), Tartarian Honeysuckle (<i>Lonicera tatarica</i>) and Red Raspberry (<i>Rubus idaeus</i>). The ground layer is also comprised of mainly non-native species such as Wild Carrot, Kentucky Blue Grass, Orchard Grass, Common Dandelion (<i>Taraxacum officinale</i>) and Common Burdock (<i>Arctium minus</i>).	This community occurs primarily within the eastern portion of the Study Area, north and south of Cherry Beach Road. The community is dominated by non-native species typical of urban areas. North of Cherry Beach Road, the community is situated on former residential property lands. The residences that were once located on these properties have been removed. There are also two remaining residences that are privately owned and occupied.
OAD	Open Water	n/a	This community type represents open water features with little to no submergent and emergent vegetation observable from the shoreline. There may be aquatic submergent vegetation (e.g., pondweed, milfoil) that was not visible from the shoreline.	This community is associated with Lake Ontario. For health and safety reasons an in-water vegetation assessment was not completed.
CULTURAL COMMUNITIES				
SHO	Open Shoreline Community Series	n/a	This community consists of artificial shoreline erosion control structures (e.g., rip rap and retaining walls) with natural shoreline areas that are actively eroding. Natural shoreline areas are comprised of cobble, coarse sand and crushed mussel shells.	Community occurs along the approx. 500 m of Lake Ontario shoreline that borders the northern extent of the Study Area.
CVR_3	Single Family Residential	n/a	Vegetation associated with this community consists of manicured lawns, ornamental gardens and other landscaped features (e.g., landscape trees).	This community is located in several locations throughout the Study Area. Residential properties are located off of 1 Private Road, 2 Private Road and 3 Private Road. One large private community (Bal Harbour) is located in the northwest corner of the Study Area and two smaller private homes are located in the southwest corner off of Millen Road. A large private community (Seaside Village) is located east of the Study Area and borders the channelized drain the acts as the eastern boundary of the Study Area.

ELC Code	Classification	Soils	Vegetation	Comments
CVC_1	Business Sector	n/a	Vegetation associated with this community consists of manicured lawns, ornamental gardens and landscape trees.	This community consists of one large polygon (Lake Trail Motel) located in the south centre of the Study Area.
n/a	Mown Grass	n/a	Vegetation associated with this community consists of non-native Kentucky Blue Grass or meadow communities that are routinely mown throughout the growing season.	Community is associated with residential housing and business sector but also as two smaller polygons in the northeast corner and as linear polygons located within the road right-of-way for North Service Road.
TAGM5	Fencerow	n/a	This community consists of deciduous tree species growing along a property line. Species are similar in composition to the WODM4 community, but are primarily on private lands.	This linear community is located along the property line of the Lake Trail Motel and adjacent residential properties.

Vegetation Survey Results

A total of 96 plant species were documented in the Study Area while conducting the ELC survey. A list of plant species observed during field studies within the Study Area is included in **Appendix A – Table 2**. Of the 96 species observed, seven (7) were identified down to Genus level due to the timing of vegetation field surveys and the absence of key identification plant features (e.g., flowering parts). Of the remaining 89 species, 36% are listed as native species and 64% are listed as introduced species. The plant species observed are considered to have Secure (S5) or Apparently Secure (S4) populations within the Province of Ontario. Species with a S4 ranking are common and Apparently Secure in Ontario; usually with more than 100 occurrences in the province. Species with a S5 ranking are defined as very common with a demonstrably Secure population in Ontario.

None of the plant species identified as potentially occurring SAR or SCC during the collection of background information belong to any of the Genus' where the specimen was not able to be further identified down to species. Some SAR and SCC flower only in the spring but are perennials and can still be identified using other features. None of the spring flowering plants were identified within the Study Area.

The City's local rarity status for each species was also noted (if applicable) using the ranking available in the Hamilton Naturalist's Club Nature Counts Project – Hamilton Natural Areas Inventory (2003). The native species observed during the field surveys are considered to be common to the Hamilton area.

Tree Inventory Results

The tree inventory revealed that the Study Area contained native and non-native woodland tree species. Thirty-one (31) live trees were documented within 20 m of the shoreline edge and road access options. One dead snag was also observed.

Of these 31 live trees, eight species were observed:

- Eight Green Ash (*Fraxinus pennsylvanica*)
- Six Silver Maple (*Acer saccharinum*)
- Two Norway Maple (*Acer platanoides*)
- Eight Manitoba Maple (*Acer negundo*)
- One Sugar Maple (*Acer saccharum*)

- One Large-toothed Aspen (*Populus grandidentata*)
- Two Black Locust (*Robinia pseudo-acacia*)
- Three White Willow (*Salix alba*).

The majority of these trees were found to be in “Good” condition (58%), while 29% were in “Fair” condition, and 12% in “Poor” condition. Three trees examined showed signs of being potential hazard trees based on their location along the shoreline. The ground under these potential hazard trees has eroding away and has created a situation where the trees are prone to failure. Additional information regarding the tree species observed is provided in **Appendix A**.

Breeding and Migratory Bird Surveys

Breeding Bird

Breeding bird point counts and area searches were completed within the Study Area on June 5, 2013 and June 19, 2013. A list of the 24 bird species observed within or adjacent to the Study Area during the breeding season is provided in **Appendix A – Table 5**. The species observed are common in meadow, forest and forest edge environments found in Ontario as indicated by their primary nesting habitat (Couturier, 1999).

The majority of birds observed have primary habitats within open woodland or urban areas, which correlates with the breeding season survey results, as most species were utilizing the open woodland within the Study Area. Species richness and abundance within the Study Area was limited. In particular, the small, fragmented meadow habitats had very low species richness and abundance, with a few individual species (e.g., Eastern Kingbird, American Goldfinch, etc.) primarily in the meadow habitat south of Cherry Beach Road and north of the North Service Road.

A total of four area-sensitive open country bird species were observed during breeding bird surveys including American Goldfinch (*Carduelis tristis*), Eastern Kingbird (*Tyrannus tyrannus*), Northern Rough-winged Swallow (*Stelgidopteryx serripennis*), and Barn Swallow (*Hirundo rustica*); however, candidate area-sensitive breeding bird habitat, including open country breeding bird habitat, marsh bird breeding habitat, shrub/early successional bird breeding habitat and woodland area-sensitive bird breeding bird habitat, as defined by the Significant Wildlife Habitat Technical Guide (SWHTG), does not exist within the Study Area.

One provincially *Threatened* SAR, Barn Swallow, was observed aerial foraging within the Study Area. Barn Swallow generally require buildings or other man-made structures for nesting, which are present in the Study Area, but are located on private lands and at the time of site investigation surveys could not be accessed to assess nesting activity.

One SCC, Caspian Tern (*Hydroprogne caspia*), was observed either flying over or foraging on Lake Ontario during the breeding bird survey. This species was not observed landing within the Study Area or exhibiting breeding evidence during the breeding bird surveys.

Migratory Bird

Six migratory bird survey events were completed on April 30, 2013, May 13 2013, May 17, 2013, August 30, 2013, September 18, 2013 and October 8, 2013. Woodland habitat size and the absence of provincial indicator species preclude the potential shorebird or landbird migratory stopover area habitat from consideration as provincially significant wildlife habitat. A total of 49 species were observed during the spring and fall migratory bird surveys, with 10 species observed flying over the site or on Lake Ontario. Therefore, a total of 39 species were observed within the Study Area boundaries (principally woodland), with a species richness of 23 in the spring migratory season and 27 in the fall migratory season. Fifteen (15) avian migrants were also observed during the breeding season, which signifies that 23 species (nine in spring and 20 in fall) were exclusively migratory species; although, it is expected that some individuals of bird species observed during the breeding and migratory periods solely used the Study Area for migratory purposes.

Spring

For this assessment we have assumed that the species observed during the migratory period were migrants, and applied no correction factor to exclude potential resident breeding birds. Overall species richness was 23 migratory bird species. Species richness was relatively stable throughout the 2013 spring migratory season, with 15 species being observed on April 30, 2013, 12 species being observed on May 13, 2013, and 12 species on May 17, 2013. A total of 118 individual birds were observed during spring migration; 35 on April 30, 2013, 32 on May 13, 2013, and 51 on May 17, 2013.

Migratory birds observed were mainly passerines that utilized woodland habitat. Other lesser used habitats included meadow areas, as well as shoreline and open water of Lake Ontario

(e.g., Common Terns (*Sterna hirundo*), Double-Crested Cormorant (*Phalacrocorax auritus*) and Long-Tailed Duck (*Clangula hyemalis*) were observed flying low over or floating on the lake).

Fall

Species richness and abundance in the Cherry Beach Study Area increased as the 2013 fall migratory season progressed, with two species being observed on August 30, 2013, 14 on September 18, 2013 and 18 species on October 8, 2013. Overall fall species richness was 27 species of predominately common passerines. A total of 67 individual birds were observed during spring migration; one on August 30, 2013, 23 on September 18, 2013, and 43 on October 8, 2013. Birds were primarily observed in open woodland habitat, with occasional use of shoreline, open water and meadow habitats within and immediately adjacent to the Study Area.

A complete list of birds observed during migratory bird surveys is provided in **Appendix A – Table 5**. In addition, **Appendix A – Table 5** lists bird SAR and SCC that were not observed on site, but were recorded in the general area during Ontario Breeding Bird Atlas from 2001-2005. A discussion of the potential for the site to provide habitat for these species is provided in **Appendix A – Table 7**.

Incidental Wildlife Observations

Incidental wildlife species observed on the Study Area are listed in **Table 7**. The majority of species listed below are considered to have *Secure* (Srank of S5) populations in Ontario or are introduced species (SNA). The Monarch Butterfly (*Danaus plexippus*) is considered a SCC and is discussed further below.

Table 7: Incidental Wildlife Species Documented

Scientific Name	Common Name	SARA ¹	ESA ²	SRank ³
<i>Canis latrans</i>	Coyote	---	---	S5
<i>Mustela vison</i>	Mink	---	---	S5
<i>Sciurus carolinensis</i>	Grey Squirrel	---	---	S5
<i>Sylvilagus floridanus</i>	Eastern Cottontail	---	---	S5
<i>Pieris rapae</i>	Cabbage White	---	---	SNA
<i>Danaus plexippus</i>	Monarch*	SC	SC	S2N,S4B
<i>Vanessa atalanta</i>	Red Admiral	---	---	S5
<i>Nymphalis antiopa</i>	Mourning Cloak	---	---	S5
<i>Colias philodice</i>	Clouded Sulphur	---	---	S5
---	Salmonid species	---	---	---
* Denotes a SCC				
1. Federal SAR Act (Source: SARA Public Registry, 2007)				
2. Provincial Endangered Species Act (Source: OMNR website, 2007)				
3. Subnational (Provincial) Rank (Source: OMNR National Heritage Information Centre website, 2007).				

Wildlife Habitat

An evaluation for provincially significant wildlife habitat was carried out according to the SWHTG and associated Ecoregion 7E Criteria Schedules. Candidate Significant Wildlife Habitats were identified and evaluated in **Appendix A – Table 9**. None of the habitats identified as candidate were evaluated to be provincially significant.

While the woodland area did not meet the size criteria (>5 ha) for consideration as a provincially Significant Wildlife Habitat Landbird Migratory Stopover Area; a moderate diversity of migratory bird species were observed in the Study Area during surveys in the spring and fall of 2013 (see **Appendix A - Section 4.5**).

Woodland migratory *en route* stopover areas in the urban boundary within 1 km of Lake Ontario are in short supply. It has been determined that the woodland migratory landbird stopover site in the Study Area is used by migratory birds as shelter, refuge and foraging habitat, and represent approximately 1.4% of the potential habitat in the Stoney Creek Planning Unit within 1 km of Lake Ontario. Through examination of the research on the subject of migratory bird habitat, it has also been determined that sites such as Cherry Beach facilitate movement to larger stopover areas in the natural heritage system (e.g., Core Areas, ESAs, Niagara Escarpment, etc.) and

likely support cross-lake migratory flights. In this context, the woodland within the Cherry Beach Study Area could be considered a locally important migratory stopover area for landbirds.

As a locally important migratory bird *en route* stopover area, the Study Area functions as a refuge and foraging site for migratory passerines as they migrate between larger migratory stopover habitats along the Lake Ontario shoreline and inland. These larger migratory stopover habitats include the Niagara Escarpment, Confederation Park, Fifty Point Conservation Area and the Community Beach Ponds ESA/Core Area, among others. Stopover sites such as the type observed in the Study Area are beneficial in that they provide ecological connectivity to significant migratory bird stopover sites within the broader natural heritage system

Woodlands

The woodland in the Study Area is located in the Stoney Creek Planning Unit, which contains 6% to 8% forest cover (City of Hamilton Planning and Development Department 2005), and therefore requires a minimum patch size of 2 ha to be considered significant based on the **Size** criterion. The woodland that is located within the Study Area is < 2 ha (i.e., 1.95 ha). The woodland meets the **Proximity to Water** criteria as it is located within 30 m of hydrological features (i.e., Lake Ontario and unnamed streams). However, the woodland is not significant as it does not meet other criterion (e.g., age, interior forest habitat, proximity/connectivity and rare species) established under the UHOP (2013).

4.2.3 Existing Conditions – Aquatic Habitat Assessment

Sections of the Lake Ontario shoreline within the Study Area showed signs of active erosion in areas without erosion protection measures. Shoreline associated with current and former residential properties are typically reinforced with scattered armour stone, scrap concrete and steel. Recent developments, such as the private community of Bal Harbour, have extensively altered shorelines through the use of armour stone. The shoreline is receding where adequate protection against wave action has not been provided.

Generally, substrates within the Study Area were observed to be uniform, containing coarse sand with an abundance of finely crushed shells, believed to be Zebra Mussel (*Dreissena polymorpha*) or Quagga Mussel (*Dreissena rostriformis bugensis*). The coarse sand substrate provides relatively uniform beach habitat and wave action deposits of this sandy substrate were observed

along the Study Area's shoreline. Small amounts of cobble were also observed in both the west and east Study Area limits.

In the central portion of the Study Area, the riparian area is primarily a gradually sloping coarse sand beach containing erosion protection measures leading up to the grass and tree covered shore. In the eastern portion of the Study Area, similar habitat exists with slightly greater erosion protection from vertical armour stone block walls and constructed rock revetments. Further, the banks appeared more stable and more recently reinforced on the east side of the Study Area with the exception of a large erosion scar. The top of bank in this area is elevated higher above the water level in the east as compared to the central portion of the site. The eastern top of bank is on average about 3 m above the lake level at the time of assessment. Coarse sand and shell substrate, with minor amounts of cobble was also observed in the eastern portion of the Study Area.

To the extent observed through visual assessment, there was a gradually sloping aquatic habitat extending from the shoreline into the lake. Minimal overhead bank and in-water cover was observed. Slight overhead bank cover is provided through short periods of afternoon shade by trees concentrated in the western portion of the Study Area. In-water cover from west to east was consistent and was comprised of displaced bank reinforcement materials (i.e., scrap concrete and armour stone) to a depth of approximately one metre. The nature of the surrounding habitat suggests that these sporadic in-water features may provide cover and refuge for fish species. No aquatic vegetation was observed along the shoreline within the Study Area.

From west to east across the Study Area, the aquatic features on the property itself observed are as follows:

- Two Corrugated Steel Pipes (CSP) were observed at the end of Millen Road at the western boundary of the Study Area. Pipes convey storm-water and discharge into Lake Ontario and do not support fish populations
- A channel located in the fencerow that borders the Lake Trail Motel and Bal Harbour Community appears to act as storm-water drainage and does not function as fish habitat. The channel was dry at the time of surveys
- Drainage from an unknown source was observed on the western side of Lot 18. The underground concrete pipe approximately 0.7 m in outside diameter was observed to be

discharging minor flow during the winter. This drainage feature conveys overland flow and does not function as fish habitat. At the time of 2013 surveys, the channel was dry

- Along the banks of the #53 Cherry Beach Road property lies two steel cement mixers that have been put in place as a rudimentary erosion protection measure
- A CSP approximately 1 m in diameter, near the #59 Cherry Beach Road property was observed to convey flow. This pipe outlet conveys flow from an open drainage ditch south of Cherry Beach Road which does not provide fish habitat.
- Other features including two 15 cm weeping tile drains and two 5 cm steel water pipes were observed to be dry in the footprint of the large, actively erosion scar, which begins at the northern end of #2 Private Road and continues east along the shoreline for approximately 45 m
- On the eastern Study Area boundary there is a channelized concrete drain, which at the time of winter assessment was discharging flow. This altered drain may provide fish migration habitat during times of high flow.

The homogeneous nature of the aquatic habitat found along the Lake Ontario within the Study Area suggests that there are no critically limiting habitat features found within the project footprint. Further, with the exception of the eastern most drainage feature, the drainage features observed within the Study Area do not provide fish habitat or support fish populations due to insufficient and ephemeral flow and a lack of connectivity to Lake Ontario. Overall, the Lake Ontario shoreline habitat observed appeared suitable for baitfish use (e.g., cyprinids), but also is likely foraging habitat for larger predatory species along the perimeter (e.g., salmonids). A salmonid species in post-spawn conditions (e.g., caudal area deterioration and lesions) was observed incidentally during a terrestrial site investigation surveys within Lake Ontario.

SAR screenings of DFO Conservation Ontario mapping and MNR data found no records of aquatic SAR within the Study Area.

4.2.4 Species at Risk and Species of Conservation Concern

Monarch Butterfly (SCC) and Barn Swallow (SAR – designated as Threatened) were found to have marginal foraging habitat within the Study Area based on observational occurrences of foraging behaviour. There was also low potential, marginal nesting habitat for Barn Swallow that could not be confirmed due to site access restrictions.

Eastern Milksnake (*Lampropeltis triangulum*) was not observed during field investigations. As this species is a habitat generalist, there is marginal foraging habitat in meadow and open woodland communities within the Study Area; however, given the small habitat size, lack of cover objects, absence of quality hibernacula, habitat fragmentation and proximity to roads and other anthropogenic disturbances, it is unlikely that this species occupies the Study Area.

In addition, review of DFO Conservation Ontario mapping and MNR data found no records of aquatic SAR within the Study Area.

A habitat screening for species identified through secondary source information is provided in **Appendix A – Table 7**, which includes the habitat requirements for SAR and provincially rare species (SCC). In addition to NHIC database species occurrence information, species identified by the MNR as having historical occurrences within the City municipal boundary were added to the screening evaluation. A determination on the potential habitat in the Study Area and a description of the rationale used to make this determination is also provided.

4.3 Coastal Environment

As part of the Class EA Study, Shoreplan completed a background review of the coastal environment within the Study Area, including erosion rates, water levels, wave analysis sand sediment transport. Additional technical details and preliminary cost estimates are included in **Appendix B**.

4.3.1 Erosion Rates

Erosion rates along this reach of shoreline are among the highest of the south shore of Lake Ontario. Signs of high erosion are readily observed at the site and include a very steep bank with no vegetation established on the bank.

The Coastal Zone Atlas (MNR 1975) shows the nearest erosion station (Station O-38) located approximately 400 m east of the site. The data at this station is limited to a very short period (approximately one year) and indicates an erosion rate of 0.49 m/year. over this period. The Coastal Zone Atlas provides long term erosion rates for two stations further east and west of the site. Those erosion rates cover periods in excess of 40 years. These rates are 0.85 m/year and 0.93 m/year. for the east (O-37) and west (O-39) stations respectively.

The Stoney Creek Waterfront Study (F.J. Reinders and Associates and Conroy Dowson Planning Consultants Inc., 1981) provides data referenced to work by Coakley and Rutka. However, full references are not provided for these sources. Rutka indicates an erosion rate of 1.1 m/year for an erosion station at Millen Road and 1.2 m/year for an erosion station just west of Dewitt Road. These rates are based on a review of 1931 to 1969 air photos. Coakley also reports a rate of 1.1 m/year at Millen Road. No time period is reported with this estimate.

Recently, Baird (2010) prepared a shore protection design for Green Millen Shores. Green Millen Shores is located immediately west of Millen Road and in close proximity to the Study Area. They reported an erosion rate of 0.56 m/year for that reach of unprotected shoreline.

The use of 0.5 m/year is suggested as a reasonable average rate of recession at this site given the range of data described above. We have given a greater weight to more recently established rate a nearby site.

4.3.2 Water levels

Water levels on Lake Ontario fluctuate on a short term, seasonal and long term basis. Lake water level fluctuations alter the position of the shoreline and impact coastal processes. An understanding of water level fluctuations was important to the development of alternative design solutions and the detailed assessment of the preferred alternative.

Short-term fluctuations last from less than an hour up to several days and are caused by local and regional meteorological conditions. These fluctuations are most noticeable during storm events when barometric pressure differences and surface wind stresses cause temporary imbalances in water levels at different locations on the lake. These storm surges, or wind-setup, are most noticeable at the ends of Lake Ontario, particularly when the wind blows down the length of the Lake. Due to the depth of Lake Ontario, storm surge is not as severe as occurs elsewhere on the Great Lakes (such as in Lake Erie).

Seasonal fluctuations reflect the annual hydrologic cycle which is characterized by higher net basin supplies during the spring and early part of summer with lower supplies during the remainder of the year. Water levels generally peak in the summer (June) with the lowest water levels generally occurring in the winter (December). The average annual water level fluctuation

is approximately 0.5 m. Although water levels below chart datum are rare, the lowest monthly mean on record is approximately 73.8 m (IGLD, 1985).

Long-term water level fluctuations on the Great Lakes are the result of persistently high or low net basin supplies. More than a century of water level records show that there is variability in the average at seasonal, inter-annual and decadal scales, making it difficult to predict long-term water level fluctuations. Some climate change studies that examined the impact of global warming have suggested that long-term average water levels on the Great Lakes will be lower than they are today. Those studies have also shown that temporal lake level variability is anticipated to increase. Those changes, however, are expected to have a lesser impact on average Lake Ontario water levels than on the upstream lakes because Lake Ontario water levels are regulated. Within the regulation scheme however, water levels can fluctuate by over 1 m. The International Joint Commission has been considering possible changes to the regulation of Lake Ontario but no final decision has been made at the time of writing this report. Currently, most approving agencies, including HCA, require that the 100-year instantaneous water level, typically those determined by MNR, be used for the design and assessment of shoreline protection structures. Within the Cherry Beach Study Area, the instantaneous water level elevation is 76.0 m.

A summary of the water level variations and wind set up in this part of Lake Ontario is presented in **Table 8**. The summary is based on a water level analysis completed by the Ontario Ministry of Natural Resources (1989). Presently, the International Great Lakes Datum (IGLD), 1985, is the datum used for Lake Ontario. To convert IGLD 1985 datum to Geodetic Datum in the Grimsby area, 0.08 m must be added to the IGLD 1985 elevation.

Table 8: Water Level and Set Up Summary for Lake Ontario at Burlington

Return Period (Years)	5	10	25	50	100
Instantaneous Water Level (metres, IGLD85)	75.57	75.69	75.83	75.92	76.01
Highest Annual Monthly Water Level (metres, IGLD85)	75.2	75.3	75.4	75.5	75.5
Wind Set Up, Wind Surges (metres)	0.44	0.53	0.67	0.79	0.94

4.3.3 Wave Analysis

Wave conditions were analyzed using numerical models. A hindcast was prepared to determine the offshore wave conditions using wind data. A two-dimensional spectral wave transformation was used to bring the offshore waves onto the site under the influence of nearshore bathymetry. Each of these elements is discussed below.

Offshore Wave Climate

Wave hindcasting was used to estimate the wave climate at an offshore location where changes in water depths do not effect wave generation and propagation. Recorded wind data measured at the Toronto Island Airport was used to predict the wave conditions that would have been generated by those winds. The wind speeds were scaled based on extensive hindcast calibrations carried out on past projects.

The wave hindcast provides hourly estimates of the wave conditions for a 36 year period from January 1973 to December 2008. This is a sufficiently large database to be considered representative of the long term wave conditions. Wind data is available prior to 1973, but was not utilized due to the higher percentage of data missing.

Figure 11 shows the highest hindcast wave heights and total wave energy distribution by direction for the 36 year hindcast. As shown on **Figure 11**, the largest offshore wave heights come from the east. The wave energy distribution shows a large peak from the north-northeast and a much smaller one from north-northwest. There are larger wave heights coming from the east than the northwest due to the longer overwater fetches to the east. The small energy peak from north-northwest is due to the frequency of winds that come from the western quadrant, blowing over the relatively short fetch from Burlington Beach.

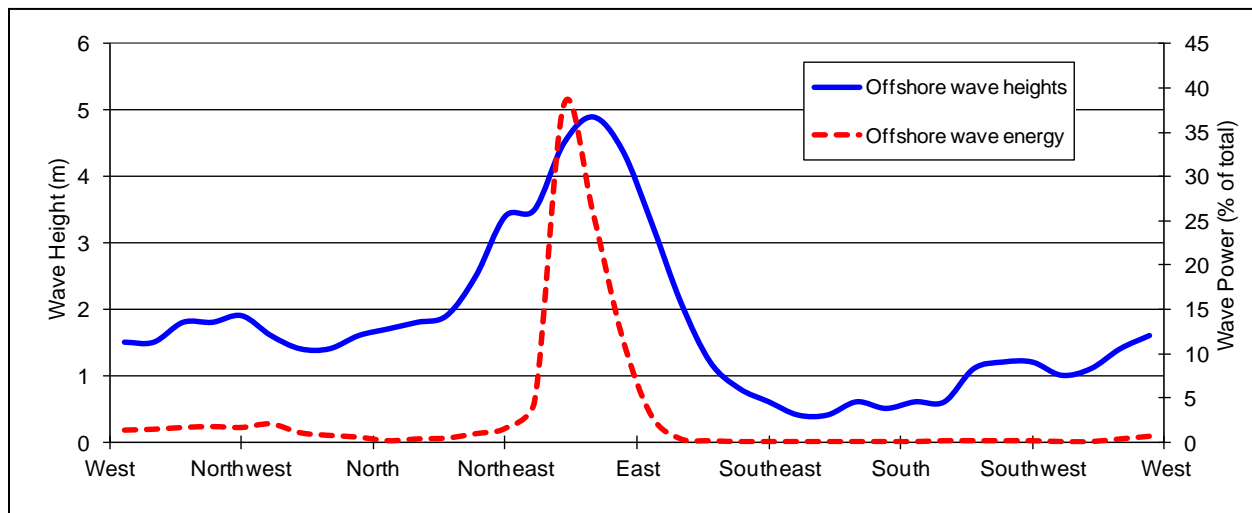


Figure 11: Distribution of Offshore Wave Heights and Wave Energy

Figure 12 shows wave height and period exceedance curves for the hindcast data set. These plots show the percentage of time that a given wave height or period are exceeded.

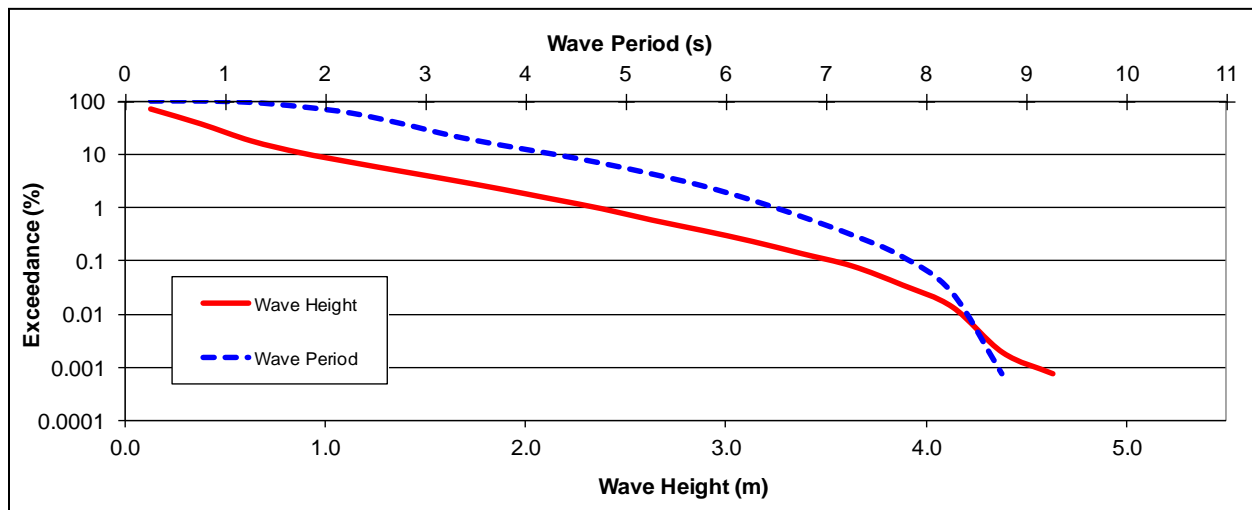


Figure 12: Wave Height and Period Exceedance Curves

Nearshore Waves

Nearshore wave information was required for the design of shoreline protection structure related to sizing of materials, shoreline orientation and maximum elevations required.

Nearshore wave conditions were produced by transferring the 36 years of hourly hindcast wave data from deep water in to the site using a two-dimensional spectral wave transformation model.

Wave transformation models are required to account for the effects the changing bathymetry has on the waves as they propagate into the site. **Figure 13** shows sample results from the wave transformation model. The offshore wave condition considered in **Figure 13** is a 5.5 m 10.0s wave coming from east-northeast. This represents the 100-year return period wave condition as determined from a peak-over-threshold extreme value analysis of storm events from the 36-year hindcast. The wave was transferred assuming the 100-year instantaneous water level of 76.0 m GSC. The nearshore design wave is depth limited, which means that under design conditions the nearshore wave height is a function of the nearshore water depth, not the deep-water wave height.

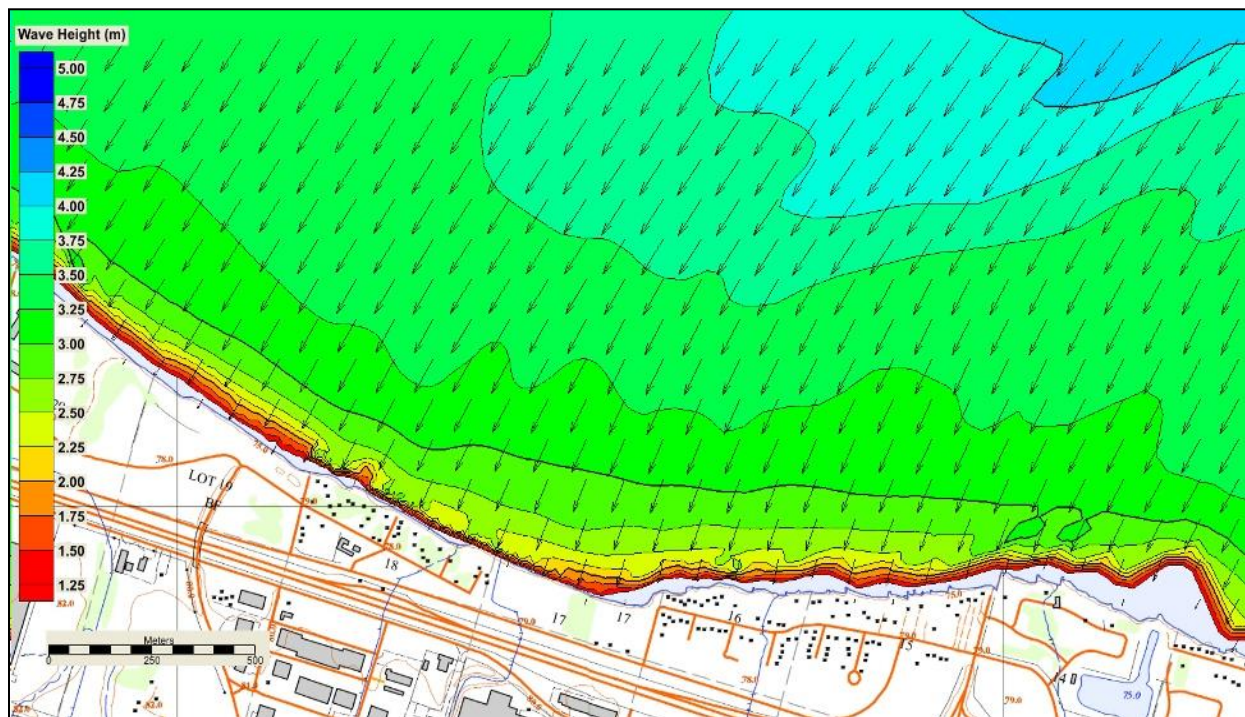


Figure 13: Example of Wave Transformation Model Results

A nearshore wave climate was produced by determining nearshore waves for a number of representative offshore wave conditions. Those results were used to establish interpolation limits for transferring each wave from the 36-year hourly hindcast data set. This produced a 36-year data set of hourly estimates of zero-moment wave height, peak wave period and mean wave direction for a nearshore node in front of the site. **Figure 14** shows a comparison of the offshore and nearshore wave energy distributions. The two peaks have moved closer together in the nearshore and the easterly peak still dominates.

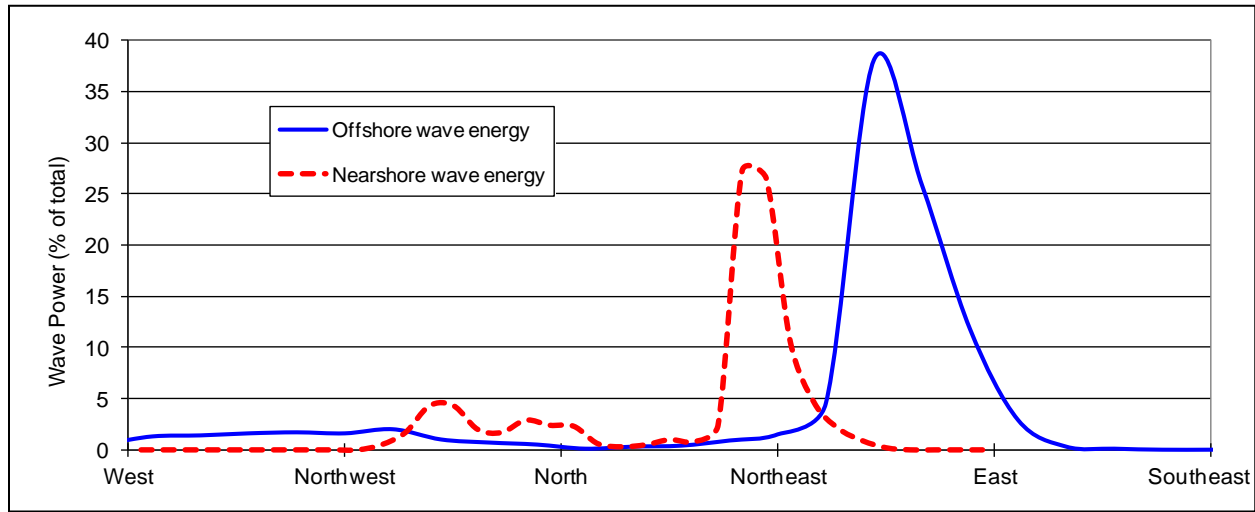


Figure 14: Comparison of Offshore and Nearshore Wave Energy Distributions

4.3.4 Sediment Transport

Sediment transport in the area can be described in terms of potential transport and actual transport. Potential transport refers to the amount of sediment that waves can transport, assuming a limitless supply of sediment. Actual transport refers to the amount transported in areas where supply of sediment limited and less than can be transported by wave action. Actual transport applies at the Cherry Beach site.

Potential sediment transport was not calculated as part of this EA study. At most sites along the shore of the Great Lakes where the shoreline is not aligned perpendicular to the net wave energy, the potential sediment transport exceeds 100,000 cubic metres and may reach several times that amount. The obvious lack of littoral deposit at the site indicates that the potential sediment transport far exceeds the actual sediment transport. Reinders (1981) reported that the net sediment transport is in a westerly direction and the estimated actual sediment transport rate to be 1800 to 4000 cubic metres per year for the Stoney Creek shoreline. This is considered a low annual rate of material.

4.4 Existing and Future Land Uses

Appendix C includes all of the land use schedules and mapping materials referred to in this section.

Existing Land Uses

The Study Area is an old lakefront area enclave which contains City owned properties, many of which were former cottage sites. As shown on **Figure 15**, the area consists of vacant land containing meadow, manicured lawn and deciduous woodland. Existing views and vistas will be closely maintained.

Lands adjacent to the Study Area include additional private residences, as well as recent condominium developments to the east (Seaside Village) and west (Bal Harbour Estates). The Lake Trail Motel is located on North Service Road.

City of Hamilton Urban Official Plan

As outlined on Schedule E, Urban Structure, and Schedule E-1, Urban Land Use Designations, to the City's Urban Official Plan (August 2013), lands within the Study Area are designated "Neighbourhoods." Permitted uses include residential uses and complementary facilities and services such as parks, schools, trails, recreation centres, places of worship, small retail stores, offices, restaurants, and personal and government services.

Additional land uses adjacent to the Study Area include:

- The Seaside Village residential development is located north of North Service Road, east of Third Private Road
- The Bal Harbour residential development is located north of Cherry Beach Road between Millen Road and 1 Private Road
- The Lake Trail Motel is located on North Service Road, south of the Bal Harbour development

The Study Area also contains natural heritage features designated "Linkages" and "Parks and General Open Space" on Schedule B, Natural Heritage System. Lake Ontario is designated as a "Key Hydrologic Feature, Lakes and Littoral Zones" on Schedule B-5. The following natural heritage policies outlined in the Official Plan are relevant to this project:

- "Core Areas" within the natural heritage system include "key hydrological features" as the most important components in terms of biodiversity, productivity, and ecological and



CITY OF HAMILTON
CHERRY BEACH ROAD

Figure 15: Existing Land Uses



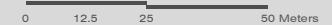
ROADS	PARCEL	VACANT LAND
STREAMS	City Owned Parcels	RESIDENTIAL URBAN
STUDY AREA	EASEMENT	COMMERCIAL / RESIDENTIAL URBAN



MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR, City of Hamilton

MAP CREATED BY: EAR
MAP CHECKED BY: GT
MAP PROJECTION: NAD 1983 UTM Zone 17N

FILE LOCATION:
G:\GIS\125934 Cherry Beach\Cherry Beach Land Use Map_revised June 2014.mxd



hydrological functions. Official Plan policies are intended to preserve and enhance these areas (**Section 2.3**).

- “Linkages” are defined as natural areas within the landscape that ecologically connect “Core Areas.” Official Plan policies are intended to protect, restore and enhance these areas to sustain the natural heritage system whenever possible (**Section 2.7**).

In addition, it is the City’s goal to establish and maintain an integrated parks and recreation system (**Section 3.3**). Wherever possible, parks shall be linked with other open space lands, walkways, bicycle/multi-use paths and trails.

Hamilton Conservation Authority – Regulated Areas

Lands within the Study Area are regulated for development by the Hamilton Conservation Authority (HCA) (O.Reg 97/04, Map sheet 78). Any development within a Regulated Area, including the proposed shoreline protection works, is prohibited unless a permit is issued by HCA.

The extent of Regulated Area has been determined by HCA. It normally extends to the furthest inland hazard, plus a buffer to ensure that all potential hazards are addressed. The erosion hazard is the governing hazard at this site. The extent of the erosion hazard was determined on the basis of 0.5 m/year average annual recession rate and 3h:1v stable slope allowance for an average 3 m high bank. The total erosion hazard is 59 m from the toe of bank.

Development can encroach into the erosion hazard if suitable protection works are provided to control the hazard. In this case, the development setback can be reduced by the erosion that would occur over the design life of the revetment. Typically design life of a revetment is taken as being 25 years to 50 years.

Niagara Escarpment Plan

As outlined on Map 2, City of Hamilton, to the Niagara Escarpment Plan (2005), lands within the Study Area are not subject to the *Niagara Escarpment Planning and Development Act* (revised 2012).

Future Development

The Lake Ontario Waterfront Trail extends 350 km along the shores of Lake Ontario, from Stoney Creek to Quinte West. A portion of the trail runs through the City from Stoney Creek

alongside Lake Ontario to Burlington. The Lake Ontario Waterfront Trail links to the Red Hill Valley Trail at Centennial Parkway.

The City is interested in creating a future waterfront park/open space in the area of Cherry Beach Road, including a possible future connection to the trail system. Future development potential of City and privately owned properties will be maintained.

Provincial Policy Statement

The Provincial Policy Statement (PPS) (2014) issued under the *Planning Act* requires that any municipal decisions be “consistent” with the PPS. As outlined in the PPS (Policy 3.1.2), development and site alteration are not permitted within:

- The dynamic beach hazard
- Defined portions of the one hundred year flood level along connecting channels (the St. Mary's, St. Clair, Detroit, Niagara and St. Lawrence Rivers)
- Areas that would be rendered inaccessible to people and vehicles during times of flooding hazards, erosion hazards and/or dynamic beach hazards, unless it has been demonstrated that the site has safe access appropriate for the nature of the development and the natural hazard
- A floodway regardless of whether the area of inundation contains high points of land not subject to flooding.

Despite policy 3.1.2, development and site alteration may be permitted in certain areas, including:

- Where the development is limited to uses which by their nature must locate within the floodway, including flood and/or erosion control works or minor additions or passive non-structural uses which do not affect flood flows (Policy 3.1.4)
- Where the two zone concept for flood plains is applied, development and site alteration may be permitted in the flood fringe, subject to appropriate flood proofing to the flooding hazard elevation or another flooding hazard standard approved by the Minister of Natural Resources (Policy 3.1.6).

In addition, development and site alteration may be permitted in those portions of hazardous lands and hazardous sites where the effects and risk to public safety are minor so as to be

managed or mitigated in accordance with provincial standards, as determined by the demonstration and achievement of all of the following (Policy 3.1.6):

- Development and site alteration is carried out in accordance with flood-proofing standards, protection works standards, and access standards
- Vehicles and people have a way of safely entering and exiting the area during times of flooding, erosion and other emergencies
- New hazards are not created and existing hazards are not aggravated
- No adverse environmental impacts will result.

5.0 PUBLIC AND AGENCY CONSULTATION

Public and agency consultation occurred throughout the project in accordance with the requirements of the Municipal Class EA. **Appendix D** includes all of the consultation materials referred to in this section.

5.1 Contact List

The Contact List for the project consists of potentially interested/affected Federal Departments, Provincial Ministries, the HCA, First Nations and landowners. The Contact List was updated throughout the project to include additional agency contacts and residents who attended the PIC.

5.2 First Nations Consultation

In addition to Aboriginal Affairs and Northern Development Canada (AANDC) and Ministry of Aboriginal Affairs (MAA), the First Nations groups that were consulted with throughout the course of the project were:

- Huron-Wendat Nation
- Six Nations Eco-Centre
- Hamilton Executive Director for Aboriginal Coalition
- Haudenosaunee Resource Centre
- Mississaugas of New Credit First Nation.

The above groups were circulated copies of the Notice of Commencement and PIC and Notice of Completion. No responses were received from First Nations stakeholders during the Class EA Study.

5.3 Notice of Study Commencement and Public Information Centre

The Notice of Study Commencement and PIC was mailed to the Contact List in April 2012. A copy of the notice was placed in the April 19, 2012 and April 26, 2012, editions of the Stoney Creek News.

5.4 Public Information Centre

A PIC was held on May 3, 2012, at Our Lady of Peace Catholic Elementary School (252 Dewitt Road, Stoney Creek, ON). The purpose of the PIC was to obtain public and agency input on the alternative design solutions for shoreline protection measures within the Study Area.

Displays, Handouts and Attendance

The PIC was an informal walk-in session with displays summarizing the work completed to date. Dillon, Shoreplan and City staff were available to explain the displays, answer questions and record comments.

The displays summarized:

- Municipal Class EA process
- A summary of the existing environment, including terrestrial and aquatic ecosystems, shoreline conditions and erosion hazard, and socio-economic factors
- Phase 1, “Problem/Opportunity Identification
- Phase 2, “Alternatives Solutions,” including:
 - Alternative 1, Revetment
 - Alternative 2, Three Headlands, Two Beach Cells
 - Alternative 3, Two Groynes, Headland, One Beach Cell
 - Alternative 4, One Groyne, Headland, One Beach Cell
 - Alternative 5, Three Long Groynes, Two Beach Cells
- Evaluation of Alternatives, including a description of the evaluation criteria
 - Alternatives 1, 2 and 3 were identified as equally preferred

- Next steps in the project.

Approximately 20 residents signed the Record of Attendance.

Written Submissions

Seven (7) responses to the notice were received at and following the PIC, including:

Agencies

- Niagara Escarpment Commission (NEC) stated that the Study Area is outside the Niagara Escarpment Plan and NEC has no comment on the project. No further correspondence required
- Hamilton Conservation Authority (HCA) stated that the majority of the lands within the Study Area are regulated for development by HCA. Any proposed shoreline protection works will require a permit from HCA. The Conservation Authority also provided details about its expectations related to natural environment site investigation methodology and aquatic assessment minimum requirements
- Ministry of Transportation (MTO) stated that the Study Area is outside of MTO's permit control area. MTO has no comments on the project and further correspondence is not required
- Ministry of the Environment (MOE) provided a brief outline of the required format for a Schedule "B" Project File, including stakeholder and agency consultation requirements
- Ministry of Natural Resources stated that an authorization under the *Public Lands Act* may be required prior to construction. MNR also provided an initial screening for SAR and significant wildlife habitat in the Study Area.

Landowners

- One resident commented that as part of the project, consideration should be given to the outflow from the storm sewer at the west side of his property in the Seaside Village development as it is washing away the erosion protection wall
- One resident stated that Alternative 5 is preferred. The resident supports converting the Cherry Beach area into a large public park/open space, including the purchase of existing private homes by the City.

5.5 Additional Stakeholder Consultation

Technical Steering Committee

Throughout the project, meetings were held with the City's Technical Steering Committee for the project. The committee included staff representation from all relevant City departments, including Public Works and Planning and Economic Development. The following Technical Steering Committee meetings were held:

- A Technical Steering Committee meeting was held on January 24, 2012, to introduce City Staff and key team members, ensure everyone had an understanding of the project history, and discuss the project plan and timeline. Key discussions items included outlining project objectives and required stakeholder and agency consultation.
- A second Technical Steering Committee meeting was held on July 24, 2012, to provide a project status update, and discuss the evaluation of alternative solutions and selection of preferred alternatives, including potential effects and proposed mitigation.
- A final Technical Steering Committee meeting was held on November 6, 2013, to review the problem/opportunity statement, alternative concepts and preferred alternative concept design.

Agency Stakeholder – Meeting 1

An agency stakeholder meeting was held in July 2012 to introduce the project and obtain feedback on the evaluation of alternatives and proposed mitigation measures. At that time, Alternatives 1, 2 and 3 were presented as equally preferred. The meeting was attended by representatives of MOE, MNR and HCA.

In response to the meeting invitation, Transport Canada (TC) advised that an application under the *Navigable Waters Protection Act* (NWPA) may be required prior to construction.

Agency Stakeholder – Meeting 2

A second agency stakeholder meeting was held on November 6, 2013, to reintroduce the project and obtain feedback on the revised evaluation of alternatives and proposed mitigation measures. Based on the revised evaluation matrix, Alternative 1 was identified as most preferred. The meeting was attended by representatives of MOE, MNR, HCA and TC.

TC noted that navigability should be considered in the evaluation of alternatives. TC stated that Lake Ontario is a listed waterway (Schedule 2) and an application under the NWPA is required for Alternatives 1, 2 and 3. TC also noted that the new *Navigation Protection Act* (NPA) will likely be in effect prior to project completion, at which time requirements under for an approval from TC should be reviewed.

Local Stakeholder Meeting

Stakeholder meetings were held with individual landowners and local condominium groups on June 26, 2014. The purpose of these meetings was to reintroduce the project and provide details about the evaluation and selection of the preferred solution.

Four representatives from the condominium groups attended the first meeting. Four individual landowners attended the second meeting. Key discussion items included the following:

- Design details of the revetment, including armour stone protection and cobble beach section;
- Design and uses of the proposed park area ;
- Potential impacts/benefits of the preferred alternative (revetment) for erosion/sedimentation in the privately owned sections of the shoreline;
- Access to the beach;
- Existing concerns related to damaged or highly vulnerable areas of the shoreline/current shoreline protection structures;
- Management of surface drainage to the lake; and
- Next steps, timeline and budget of the project, and potential for phasing during the implementation stage.

5.6 Notice of Study Completion

The Notice of Study Completion was mailed to the Contact List in September 2014. A copy of the notice will be placed in the September 11, 2014 and September 18, 2014 editions of the Stoney Creek News. The report will be made available from September 15, 2014 to October 15, 2014 for the required 30-day public review period. If no comments are received, then implementation of the preferred option will proceed.

6.0 PROJECT DESCRIPTION

6.1 Selected Design

The preferred alternative design at Cherry Beach Road is the revetment shoreline treatment (Alternative 1). **Figure 16** shows the site plan for the preferred alternative shore protection.

The shore protection consists of a double layer revetment structure. The toe of the revetment will be founded on firm till at an elevation of approximately 72.0 m. Armour stone is to be randomly placed on the sides of the structure with a slope of approximately 2h:1v. The structure will rise to a crest elevation of approximately 78.75 m. The armour stones overlay a layer of rip rap and geotextile. Cap armour stones with a top elevation of 78.75 m, will be specially placed at the crest of the structure along the shoreline to create a uniform line. Behind the structure, the ground elevation steps down to match existing grade of approximately 78.0 m.

Cobble beach material will be placed in front of the wall. The cobble beach material will consist of approximately 50 mm to 150 mm diameter washed cobble stone. The material will be placed in a berm with a natural angle of repose and be allowed to be reshaped by wave action. The beach slope will adjust to varying water levels and wave conditions. The beach will tend to establish a slightly steeper slope (approximately 3h:1v) above the high water line and a flatter slope below (in the order of 6h:1v). A flatter section is expected to establish adjacent to the armour stone seawall. A typical beach profile is presented in Figure 3A.

The revetment will be interrupted at the location of the private properties. It may be extended across the properties, if the owners participate in the undertaking, or appropriate end walls constructed at the property boundaries.

All details of the revetment were designed at a preliminary design level suitable for environmental assessment analysis. The details may be modified in the detailed design phase of the project.

6.2 Benefits, Impacts and Mitigation

The proposed shoreline protection measures will stabilize the area for future use and development and provide an opportunity to enhance those uses. **Table 9** at the end of **Section 6**

provides a detailed impact assessment of the selected design and provides measures to avoid/minimize any impacts.

6.2.1 Cultural Resources

As outlined in **Section 4.1**, TMHC has recently completed Stage 1, 2 and 3 Archaeological Assessments on all lands within the Study Area. Impacts on archaeological resources will be avoided by obtaining archaeological clearance from MTCS prior to construction. No construction can occur prior to clearance from the Ministry.

6.2.2 Natural Environment

Terrestrial Ecosystems

The potential impacts to the terrestrial ecosystem associated with the rehabilitation of the Lake Ontario shoreline are primarily related to the ecological function of the local landbird migratory stopover habitat. Woodland features within the study area provide a local stopover for birds during the spring and fall and rehabilitation activities may result in a behavioural deterrent for certain bird species.

Potential Terrestrial Impacts

The potential impacts to the local landbird migratory stopover area habitat identified in the study area are described for site disturbances associated with the proposed construction activities. The potential impacts of the rehabilitation are:

- Landscape tree removal
- Disturbance of wildlife habitat
- Colonization of non-native species
- Erosion and sedimentation of natural features.

Landscape Tree Removal

The development of the Cherry Beach Area may require the removal of landscape trees and ground vegetation. Landscape tree removal may result in the following impacts on a site level:

- Decrease in canopy cover
- Decreased floral species richness

- Loss of native vegetation
- Physical injury, root damage, and compaction of trees not intended for removal that may result from construction operations.

Landscape tree removal to facilitate site access and construction of the shoreline restoration structures could result in a minor reduction of vegetation cover on the site. Woodland cover (135.6 ha) in the area from Confederation Park to Fifty Point Conservation Area within 1 km of Lake Ontario is currently low (i.e., 10.6%) with respect to land use planning targets established for highly functional natural heritage systems. Vegetation removal will be minimized and the overall treed vegetative cover maintained or increased to avoid or minimize the effects tree removal.

Disturbance of Wildlife Habitat

Habitat for flora and fauna may be affected by development in the following ways:

- Direct wildlife mortality through collision/interaction with construction equipment
- Temporary disruption and avoidance of local landbird migratory stopover habitat due to construction activity.

The designated Linkage area contains 1.95 ha of woodland cover which represents 1.4% of the available migratory stopover habitat within 1 km of the lake from Confederation Park to Fifty Point Conservation Area. Tree removal will involve the removal of up to ten individual landscape trees principally along the shoreline. As a result, residual effects to the form and function of woodland migratory bird stopover and foraging habitat are not expected. If tree removal were planned during the breeding bird period, then disturbance or destruction of nests in trees slated for removal could result.

General wildlife impact mitigation measures and ecological restoration have been recommended for the study area below to mitigate or avoid these potential wildlife disturbance effects.

Colonization of Non-native Species

A potential indirect impact of the rehabilitation is the colonization of exotic species. Physical site disturbance may increase the likelihood that exotic and/or invasive flora species will be introduced to the surrounding vegetation communities. Invasive flora can establish in disturbed sites more readily than native flora and can then encroach into adjacent undisturbed areas. This

effect is already present within the study area with a number of Black Locust, Manitoba Maple and herbaceous non-native species that are prevalent throughout the site. This effect can be mitigated through the use of native species in landscaping plans.

Aquatic Habitat

There are no critically limiting aquatic habitat features found within the project footprint. Further, with the exception of the eastern most drainage feature, the drainage features observed within the study area do not provide fish habitat or support fish populations due to insufficient and ephemeral flow and a lack of connectivity to Lake Ontario. However, the shoreline habitat observed appeared suitable for baitfish use and potentially as foraging habitat for larger predatory fish species. Also, the substrate along the shoreline indicates that Quagga and Zebra Mussels have had a substantial influence on the local aquatic environment.

Potential Aquatic Impacts

There is the potential for Lake Ontario to be negatively affected by development if construction best practices are not implemented. Potential aquatic impacts are generally associated with site preparation and erosion and sedimentation during construction. Erosion near the Lake Ontario is currently the issue proposed to be addressed through implementation of the preferred alternative for shoreline restoration; however, construction activity could temporarily result in increased erosion and site instability. Erosion in the construction area could lead to sediment loading in the lake during peak flows and reduced water quality along the lake shoreline immediately adjacent to the site.

It is the expectation that the proposed shoreline restoration works will ultimately have a net positive effect on aquatic systems along the Lake Ontario shoreline as the frequency and magnitude of erosion and sedimentation should decrease.

Terrestrial and Aquatic Mitigation Recommendations

The recommended mitigation options proposed in this section have been determined based on the natural features and ecological functions identified within and adjacent to the study area. Where local site-specific impacts are unavoidable and/or to enhance ecological function of the study area, additional restoration activities are recommended.

The potential impacts identified include landscape tree removal, disturbance of wildlife habitat, erosion and sedimentation of natural features and colonization of non-native invasive species. A

variety of mitigation techniques can be used to minimize or eliminate the above-mentioned impacts. Specifically, three key areas are identified for mitigation, enhancement and/or restoration, including:

- Management Recommendations
- Wildlife Impact Mitigation during Construction
- Erosion and Sediment Control.

Detailed mitigation measures will be finalized in consultation with the HCA and the City as part of the detailed design of the Cherry Beach Shoreline Restoration Area.

Management Recommendations

To mitigate the potential tree removal, edge effects, and invasion of exotic species described above, the following best practices are recommended for vegetation clearing and construction:

- Waste piles and any non-natural debris within the clearing area should be removed prior to vegetation clearing
- A qualified professional (e.g., arborist or forester) should selectively fell trees recommended for removal away from the existing woodland. Where feasible, select felled logs and other organic debris should be placed carefully in the woodland to provide cover for wildlife. Small trees, shrubs, and ground vegetation situated immediately adjacent to any clearing should be preserved
- If feasible, stumps and roots should not be grubbed to allow for groundcover regeneration from the undisturbed seed bank
- If woody material is removed and chipped, some of the chips can be used as mulch for root compaction mitigation (discussed below) and restoration plantings. However, covering too large an area with a layer of mulch can inhibit growth and regeneration and should be avoided
- Tree protection zones should be established with fencing along the boundary of the critical root zone of trees to be retained
- Ongoing monitoring and maintenance of tree protection measures should occur throughout construction of the development
- The grade of the rehabilitation works should match the existing grade of the study area. Grading or earthworks of any kind should not take place within tree protection zones, unless under the supervision of a qualified arborist

- The use of heavy machinery within the root zones of trees located in the forest adjacent to the trail should be avoided to prevent soil compaction and physical damage to roots. Where heavy machinery must be used within the woodland edge, a thick layer (10 cm in depth) of wood chips should be placed over a heavyweight geotextile along the edge to mitigate impacts to roots. Mulch should be free of weeds, seeds and inorganic or toxic materials
- If structural fill is required to build up areas, periods of high runoff volumes (e.g., spring and fall) should be avoided to prevent deposition of sediment in tree root zones, where possible
- If excavation or grade elevation changes are required near the woodland edge, an arborist should expose the root system(s) systematically to determine where root pruning is recommended
- To improve aeration and drainage, aeration of compacted soils near the woodland edge using standard core aerators should be considered
- Trees located along any new woodland edges adjacent to park infrastructure that may conflict with construction activity (e.g., encroaching limbs or roots) should be pruned by a qualified arborist
- During construction, the woodland edge should be inspected periodically for indicators of tree dieback. If there is visual evidence that suggests tree dieback within the woodland edge, a condition assessment should be completed by a qualified arborist
- In areas that become heavily invaded by invasive exotic species (e.g., Common Buckthorn), selective removal of large specimens should take place.
- Within 12 months of the completion development construction, a qualified arborist should assess preserved trees. Trees which are dead, in poor health, or hazardous should be removed or pruned, as determined by the arborist. Tree removal, if necessary, should occur prior to park use to avoid the risk of trees falling and causing harm or damage to people and/or property.

The City Forestry Department should be contacted prior to removal of any trees in order to determine if a Tree Management Plan would be required.

Wildlife Impact Mitigation during Construction

General strategies to mitigate impacts to wildlife habitat during site preparation and construction described above are as follows:

- Vegetation removal should not take place during the established core breeding bird season, (i.e., April 15th to August 1st) as per the federal *Migratory Bird Convention Act, 1994*. If removals must occur during this time period, a qualified biologist should inspect trees and other vegetated areas for nesting birds. If an active nest is found, tree removal cannot take place until nest activity has subsided (i.e., young have fledged) as determined by the qualified biologist
- If possible, site preparation (vegetation removal) and construction restrictions could be extended from March 1st until October 31st to reduce stress and disturbance to migratory birds
- Avoid construction lay-down and staging with the woodland boundary
- Maximize the distance of construction equipment used from the woodland edge to avoid disturbance
- Limit the use of lighting and avoid light trespass into the woodland feature, where possible
- Advise contractor and construction staff through drawing specifications and awareness training to visual monitoring for wildlife species and avoid/report encounters.

Erosion and Sediment Control Measures

As discussed in above, development may increase the availability of sediment for erosion and transport by surface drainage. In order to mitigate the adverse impacts caused by the release of sediment-laden runoff, an erosion and sediment control plan is recommended for the site. Control measures must be selected that are appropriate for the erosion potential of the site and it is important that they be implemented and modified on a staged basis to reflect the site activities. Furthermore, erosion and sedimentation control structure effectiveness decreases with sediment loading and therefore, inspection and maintenance is required.

For the rehabilitation area, erosion and sedimentation control should be implemented for the lake and woodland areas. Control measures should be detailed in an Erosion and Sedimentation Control (ESC) Plan that is prepared as part of the rehabilitation design. The following is a description of general erosion and sediment controls that could be implemented:

- Silt fencing or a reasonable alternative should be installed at construction limits and grading limits subject to drainage from the rehabilitation area prior to any topsoil stripping, and in other locations, such as topsoil stockpile areas. Silt fences should be

properly installed and constructed with heavy duty wire fencing material to properly support the geotextile

- Mud Mat should be installed at the construction entrance prior to commencing earthworks to minimize the tracking of mud onto municipal roads
- Rock Check Dams and/or Filter Socks should be constructed in swales and ditches to reduce flow velocities and trap sediment in surface water drainage
- Water should be pumped to a filter bag that discharges over a vegetated buffer strip and through a combination rock check dam and/or filter sock design at least 15 m from a drainage feature and 30 m from the lake's edge
- A backhoe or similar machinery should be used to remove any accumulated sediments
- Surface stabilization should be applied to all stockpiles, temporary sediment basins and cut-off swales should be stabilized as quickly as possible with terra-seed to prevent erosion. If the works are undertaken outside of the growing season, an erosion control blanket will be required to be installed over the surface
- Erosion control blankets may be required for sloped restoration areas regardless of timing. The erosion control blankets are a biodegradable system that promotes ideal growing conditions while protecting seed and topsoil from wind and water erosion, as well as wildlife that would feed on the planted seeds
- ESC measures should be monitored regularly and/or after every 10 mm or greater rainfall event as they could require periodic cleaning, maintenance and/or re-construction. If damaged control measures are found, they should be repaired and/or replaced promptly. Site inspection staff and construction managers should refer to the Erosion and Sediment Control Inspection Guide (2008) prepared by the Greater Golden Horseshoe Area Conservation Authorities. This Inspection Guide provides information related to the inspection reporting, problem response and proper installation techniques.

6.2.3 Coastal Environment

The revetment will prevent further erosion along the Cherry Beach shoreline within the Study Area. It will also connect with protection structures on adjacent properties and in that way reinforce protection provided by the existing works, which has a positive impact on the adjacent property.

One potentially negative impact of erosion protection is a slight reduction in sediment supply to the littoral drift system. As described in **Section 4.3.4**, there is a low supply of sediment along

this section of shoreline. The reduction of sediment supply is very small in terms of absolute amount of sediment, but unprotected shore that supply material along south shore of Lake Ontario are becoming rare. The loss of source sediment from the subject site will not have notable impact on the local littoral system. The placement of imported cobble beach material in the pocket beach has been incorporated to mitigate impacts on the littoral system. This pre-filling reduces the collection of littoral material and the loss of littoral material from the system.

An important consideration is the structural integrity of the shore protection structure. The use of single layer structures is common on Lake Ontario where the waves reaching the structure are depth-limited. Along the shoreline of the study site a double layer structure is proposed as the preferred method based on preliminary analysis. Maintenance requirements of a double layer revetment are expected to be less over the design life. Undercutting of the toe of a revetment is also a typical problem with revetment structures. This has been mitigated by excavation of the toe deep into the lake bottom.

During construction, measures will be taken to minimize negative impacts on the coastal environment. As required, no in-water work will be carried out during sensitive fisheries spawning seasons. As the work is not expected to alter a fishery or be directly located in a fish spawning area, we anticipate that there will be no regulatory timing constraints for near-shore or in-water construction activity. The use of a silt curtain has not been proposed for this site since the site is exposed to the open lake and a silt curtain would be ineffective due to wave action. However, temporary placement of armour stone will be used to minimize wave induced erosion and sedimentation impacts during construction. The armour stone, boulders and cobble will be specified as clean material.

6.2.4 Socio-Economic Environment

Existing Land Uses

The revetment will connect with protection structures on adjacent properties, reinforcing the protection provided by these existing works. The purchase of additional properties and private roads is not required; however 2nd Private Road will be affected by works as a result of cobble being placed on the City owned beach. Impacts on condominium developments to the east and west will be minimal during construction and operation. Access will be required along entire length of shoreline during construction.

Adjacent properties will continue to be susceptible to erosion unless owners install additional shoreline protection. Any such works would be at the property owners own expense or as negotiated with the City.

Future Development

Future development will be controlled by the policies of the PPS and the City Official Plan. Lands within the Study Area are regulated for development by the Hamilton Conservation Authority (HCA). A permit for the proposed shoreline protection works is required from HCA prior to construction.

Conformity to City of Hamilton Official Plan

The proposed shoreline protection infrastructure conforms to the City Official Plan:

- “Core Areas” within the natural heritage system, including “key hydrological features” will be preserved and enhanced (**Section 2.3**)
- Natural heritage “Linkages” will be protected restored and enhanced (**Section 2.7**).

In addition, the City is interested in creating a future waterfront park/open space in the area of Cherry Beach Road, including a possible future connection to the trail system.

Consistency with Provincial Policy Statement (PPS)

The proposed shoreline protection infrastructure is consistent with the PPS issued under the *Planning Act*, including policies for “Natural Hazards”. Consistent with the Policy Statement:

- Installation of the proposed shoreline protection will be carried out in accordance with flood-proofing standards, protection works standards, and access standards
- No new hazards will be created and existing hazards will be mitigated
- Adverse environmental impacts are not anticipated.

Navigability

In 2012, the federal government approved amendments to the *Navigable Waters Protection Act* (NWPA). The amendments to the NWPA received Royal Assent in December 2012. Subsequently, the *Navigation Protection Act* came into force in April 2014.

Lake Ontario is included on Part 1 of the List of Scheduled Waters under the NPA. A Notice to the Minister (of Transport) is required for all works on listed waterways under the NPA, with the exception of “designated works” listed in the Minor Works Order allows for works to be built if they meet the criteria for the applicable class of works, as well as specific terms and conditions for construction. Works meeting the assessment criteria of the Minor Works Order are classed as “designated works” under the NPA and may proceed without a Notice to the Minister as long as they comply with the legal requirements. The classes of works established by the Order include erosion-protection works.

During Detailed Design, the proposed work will be assessed to ensure that it meets the criteria established for its class and that all legal requirements set out in the Order are met. A formal approval under the NPA is not anticipated.

Construction Impacts

Time to complete construction on City lands is estimated to be approximately two months (53 Working Days). During construction, access to the site will be restricted to approved routes and access roads will be located as far away from homes as possible. Access to private properties will be maintained during construction.

Short-term construction impacts such as noise, vibrations and air quality on existing adjoining land uses can be mitigated by standard measures implemented during construction.

Table 9: Benefits, Impacts and Mitigation Measures

Environmental Feature	Potential Benefits and Impacts	Avoidance, Mitigation and Monitoring Measures
Cultural Resources		
Archaeological Resources	Potential impacts avoided by completion of Stage 1, 2 and 3 Archaeological Assessments.	<ul style="list-style-type: none"> • Archaeological clearance from the Ministry of Tourism and Culture is required prior to construction.
Natural Environment		
Terrestrial Environment	Potential impacts to trees include soil compaction, grade changes and physical damage.	<ul style="list-style-type: none"> • Access to the site will be restricted to approved routes • Develop and implement an Erosion and Sediment Control Plan • Provide an arborist report with a tree removal/preservation plan • Minimizing root loss through the use of proper pruning and maintenance techniques • Avoid soil compaction through the use of traction mats and mulch, and the use of former driveways to get to the shore (where possible) • Establish Tree Protection Zones through erection of tree protection barriers (fencing/hoarding) to keep equipment from damaging trees and root systems • Plant large calliper trees (e.g., 500 mm) at a 3:1 compensation ratio • Use native seed mixes in open areas to prevent colonization of non-native invasive species • Complete post-construction tree maintenance and monitoring (as required).

Environmental Feature	Potential Benefits and Impacts	Avoidance, Mitigation and Monitoring Measures
	<p>Potential impacts to birds include disruption to migrant species, destruction of nests and interruption of breeding activities (e.g., nest abandonment)</p>	<ul style="list-style-type: none"> • Access to the site will be restricted to approved routes • If possible, complete vegetation removal outside the breeding bird period (April 15th to August 1st) • If vegetation removal is required during the breeding bird season, a nest search performed by a qualified biologist is recommended prior to clearing activities to determine the nesting activity in the project area. If active nests are observed, then additional mitigation is warranted (e.g., nest buffer) until the nesting attempt has finalized (i.e., chicks have fledged) • Outside of the breeding season, minimize vegetation removal during the core bird migratory periods (March to May and August to October) within woodland habitat, which acts a non-provincially significant (local) landbird migratory stopover area.
<p>Aquatic Environment</p>	<p><u>If Working from Land</u></p> <p>Potential impacts to the aquatic environment could affect resident and migratory fish species. SAR have not been documented onsite.</p> <p>Potential impacts to fish include the release of sediment and other materials into the aquatic habitat.</p>	<ul style="list-style-type: none"> • Establish an Erosion and Sediment Control Plan, which is to be followed throughout the construction phase. Incorporate strategic staging of construction activities. • Repair and refueling of construction machinery to be completed away from the water (30 metre setback).

Environmental Feature	Potential Benefits and Impacts	Avoidance, Mitigation and Monitoring Measures
	<p><u>If Working in the Water</u></p> <p>Potential impacts to the aquatic environment could affect resident and migratory fish species. SAR have not been documented onsite.</p> <p>Potential impacts to fish include the alteration of existing fish and fish habitat and release of sediment and other materials into the aquatic habitat.</p>	<ul style="list-style-type: none"> • Establish an Erosion and Sediment Control Plan, which is to be followed throughout the construction phase. Incorporate strategic staging of construction activities • Conduct fish salvage within the site isolation area (if necessary) • Conduct in-water work during fisheries timing window (if necessary) • Minimize construction footprint during in-water work (if necessary) • Repair and refueling of construction machinery to be completed away from the water (30 metre setback).
Coastal Environment		
Sediment Transport	Reduction in sediment supply to the littoral drift system.	<ul style="list-style-type: none"> • Placement of imported cobble beach material will mitigate impacts on the littoral system.
Wave Action	Impacts to structural integrity of the shore protection structure and potential impacts to the coastal environment caused by wave action.	<ul style="list-style-type: none"> • Undercutting of the toe of a revetment mitigated by excavation of the toe deep into the lake bottom • Double layer structure proposed to reduce maintenance requirements over the design life • Temporary placement of armour stone used to minimize wave impact during construction • Armour stone, boulders and cobble will be specified as clean material.
Socio-Economic Environment		
Short-Term Construction Impacts	Short-term construction impacts include noise, vibrations and air quality impacts.	<ul style="list-style-type: none"> • Abide by local Noise By-law • Maintain machinery in good working order to reduce noise and odours • Maximize distance of access roads from homes (to the extent feasible).

Environmental Feature	Potential Benefits and Impacts	Avoidance, Mitigation and Monitoring Measures
Existing Land Uses	<p>Proposed revetment will connect with protection structures on adjacent properties, reinforcing protection provided by these existing works.</p> <p>Impacts on condominium developments will be minimal during construction and operation. Access will be required along entire length of shoreline during construction.</p>	<ul style="list-style-type: none"> • Access to private properties will be maintained during construction.
Future Development	<p>Future development potential of City and privately owned properties maintained. Allows potential future waterfront park/open space, including possible future connection to local trail system.</p>	<ul style="list-style-type: none"> • Future development will be controlled by the PPS and City of Hamilton Official Plan • A permit for the proposed shoreline protection works is required from HCA prior to construction.
Conformity to City of Hamilton Official Plan	<p>Conforms to natural heritage and land use policies of the Official Plan.</p>	<p>Not required.</p>
Consistency with Provincial Policy Statement	<p>Consistent with “Natural Hazards” policies.</p>	<p>Not required.</p>
Navigability	<p>Lake Ontario is included on Part 1 of the List of Scheduled Waters under the <i>NPA</i>.</p>	<ul style="list-style-type: none"> • Proposed work will be assessed to ensure that it meets the criteria established for its class and all legal requirements set out in the Minor Works Order are met • Approval from Transport Canada under the <i>NPA</i> may be required prior to construction.

7.0 PROJECT IMPLEMENTATION

7.1 Approvals

The following permits and approvals are required prior to construction:

- City endorsement of the Class EA Project File
- Transport Canada Notice to the Minister under the *Navigation Protection Act (NPA)* may be required. A formal approval under the NPA is not anticipated
- Ministry of Natural Resources authorization under the *Public Lands Act* may be required
- Written approval from HCA under *O.Reg. 161/06*, Section 28 of the *Conservation Authorities Act* prior to undertaking any work in regulated areas.

Based on the information that has been collected to date, it is anticipated that a permit under the provincial *Endangered Species Act* or federal *SAR Act* will not be required.

7.2 Timing Restrictions

Timing restrictions for construction of the project include:

- Vegetation removal should not take place during the established core breeding bird season, (i.e., **April 15** to **August 1**) as per the federal *Migratory Bird Convention Act*. If removals must occur during this time period, a qualified biologist should inspect trees and other vegetated areas for nesting birds. If an active nest is found, tree removal cannot take place until nest activity has subsided (i.e., young have fledged) as determined by the qualified biologist
- If possible, site preparation (vegetation removal) and construction restrictions should be extended from **March 1** until **October 31** to reduce stress and disturbance to migratory birds
- If required, in-water work may be subject to the fisheries timing restrictions, to be confirmed with HCA during Detailed Design.

7.3 Project Schedule

Following endorsement by City Council, this Project File will be placed on the “public record” for 30 days for public and agency review and comments. During the 30-day review period, the Municipal Class EA entitles any person who has significant concerns about the project to request the Minister of the Environment to issue a Part II Order to change the status of the project from a Class EA to an individual environmental assessment.

The schedule for Detailed Design and construction of the proposed shoreline protection infrastructure is subject to budget priorities and all necessary permits and approvals.

The Detailed Design Phase involves:

- Preparation of Detailed Design drawings and Contract Documents for the construction of the proposed shoreline protection infrastructure, including:
 - Technical Design Brief
 - Erosion and Sedimentation Control Plan
 - All design and construction related approvals
- The “up listing” of SAR species will be checked during Detailed Design.

As required by the Municipal Class EA, the drawings and contract documents must incorporate all of the environmental and mitigation measures identified in this Project File report to avoid/mitigate adverse impacts. During Detailed Design, all mitigation measures will be developed in more detail, as required.

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