



St. Clair River Shoreline Restoration Report





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1.0 Introduction

The St. Clair River flows south from Lake Huron to Lake St. Clair and is part of the boundary that separates Canada from the United States. Intensive urban and industrial development has resulted in shoreline hardening and alterations that affect littoral fish habitat, shoreline processes, and water quality. In 1987 Environment Canada designated the St. Clair River as an Area of Concern (AOC) and identified shoreline habitat restoration as part of the de-listing criteria. This 64 km stretch of shoreline is divided among private landowners, industrial companies and public

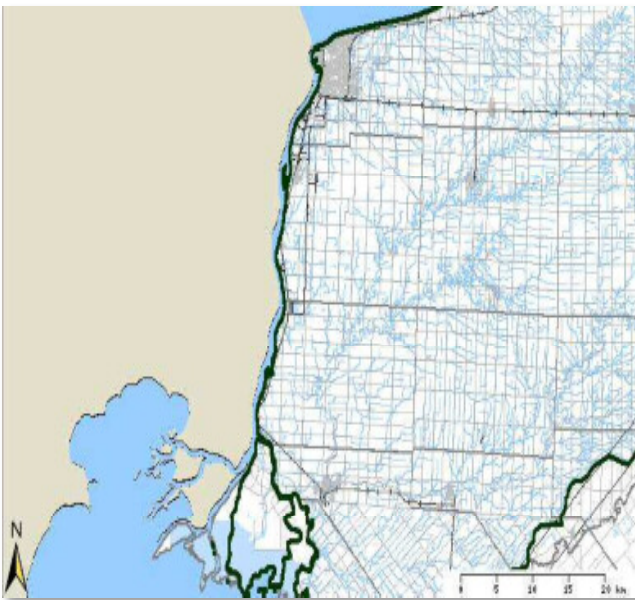


Figure 1 St. Clair River

works, within which are more than 900 shore protection structures. Many of these structures are costly to maintain, provide minimal shoreline habitat and are not providing sufficient erosion protection. The St. Clair Region Conservation Authority encourages the replacement of failing shoreline structures with soft shore engineering that would provide aquatic habitat, while improving erosion protection and aesthetics.

The St. Clair Region Conservation Authority in cooperation with Environment Canada's Great Lakes Sustainability Fund has created a shoreline structure database

to assist resource managers identify potential areas for improvement and rehabilitation. The database includes information on structure type, composition, condition, dimensions and elevation. Structure location and shape were captured using GPS equipment and linked to digital photographs taken onsite. The data collection methods have been adapted from Scudder D. Mackey's shoreline assessment protocol designed for Lake Michigan's coastline within Racine County.

The purpose of this report is to provide a summary of the shoreline projects completed along the St. Clair River in the last 20 years. We have introduced the concept of "habitat friendly" shoreline designs to all residents and industries as well as proposed enhancement and restoration options. The foremost goal is to meet the de-listing criteria and contribute towards the rehabilitation of the St. Clair River AOC.



2.0 Overview of the St. Clair River Shoreline Assessment (2006):

An assessment of the St. Clair River shoreline was carried in the year 2006. With the completed assessment of the St. Clair River shoreline, SCRCA has prepared an extensive GIS database and included supporting documentation that enables resource managers to target potential key areas for restoration and enhancement.

With regard to erosion protection, bulkheads composed of steel sheet piling (33%) and revetments of various compositions (21%) are the most common structures along the St. Clair River shoreline. Dominant materials used for revetment construction are concrete scraps such as rubble or large slabs, as well as, armour stone in the form of rip rap or large dolomite/limestone blocks. Dikes, which make up 33% of the total length are all found in the southern reach from Port Lambton to Mitchell's Bay and rarely have protected banks in the form of stone, concrete or steel. This report also outlined that over 50% of all structures in poor-fair condition the possibilities for restoration and enhancement over the next 5-15 years is quite extensive.

With the emphasis being placed on the removal of steel sheet pile walls, other areas have been identified that if corrected could make gains towards the de-listing of the St. Clair River AOC. These restoration possibilities are in the form of a variety of materials from wooden piling to concrete slabs. Both types of protection have negative impacts on water quality and shoreline habitat. Concrete revetments or "bluff dumps" are continuously in need of added material and the suspended solids during dumping and altered circulation patterns have negative affects on the local habitat and water quality (DOTA, 1995). The proposed armour stone revetments would dissipate wave energy, reduce wave reflection, as well as, provide more diverse and stable habitat fish and aquatic organisms (DOTA, 1995). A detailed description of the St. Clair River shoreline and the condition of the shoreline is provided in the section below.



3.0 Description of St. Clair River Shoreline study (2007)

This section provides excerpts from the shoreline study that evaluated conditions of St. Clair River shoreline in 2007/2008. Shoreline data was collected along the St. Clair River AOC which included the Chenal Ecarte, and a small portion of Lake St. Clair. This study began at Canatara Park and ended at Mitchell's Bay, covering approximately **87** kilometers, where **869** primary shore protection structures were inventoried. In addition, **736** secondary structures consisting of docks, groins and boat ramps; as well as, **386** outfalls consisting of drain pipes, storm drains and River mouths were identified and mapped.

The most common types of shoreline structure encountered in this study were **bulkheads/seawalls**, which were given the same classification. They cover approximately **28** kilometers of the study area. Concerns have been raised that bulkheads and seawalls have led to artificial straightening and hardening of shorelines, and gradual infilling of waters along the St. Clair River, with a loss of valuable fish habitat and natural shoreline contours and landscapes. They are most often found along residential properties and in industrial areas, and are mainly composed of steel (Figure 2). Problems arise with bulkheads when water is able to penetrate through the structure. If the structure was not installed or designed correctly, erosion will occur behind the wall and will lead to flanking and failure of the toe.



Figure 2 Typical bulkheads/seawalls along St. Clair River



As can be seen in Figure 3 below, 33% of the shoreline consists of Bulkheads, 29% is Dike and 21% is Revetment. Every reach of shoreline was given a structure ID number, including the 6.7 km of shoreline that has no protection in place. This 6.7 km of shoreline is divided among 28 smaller sections of unprotected beach, bluff and wetland and falls within the “type other” category.

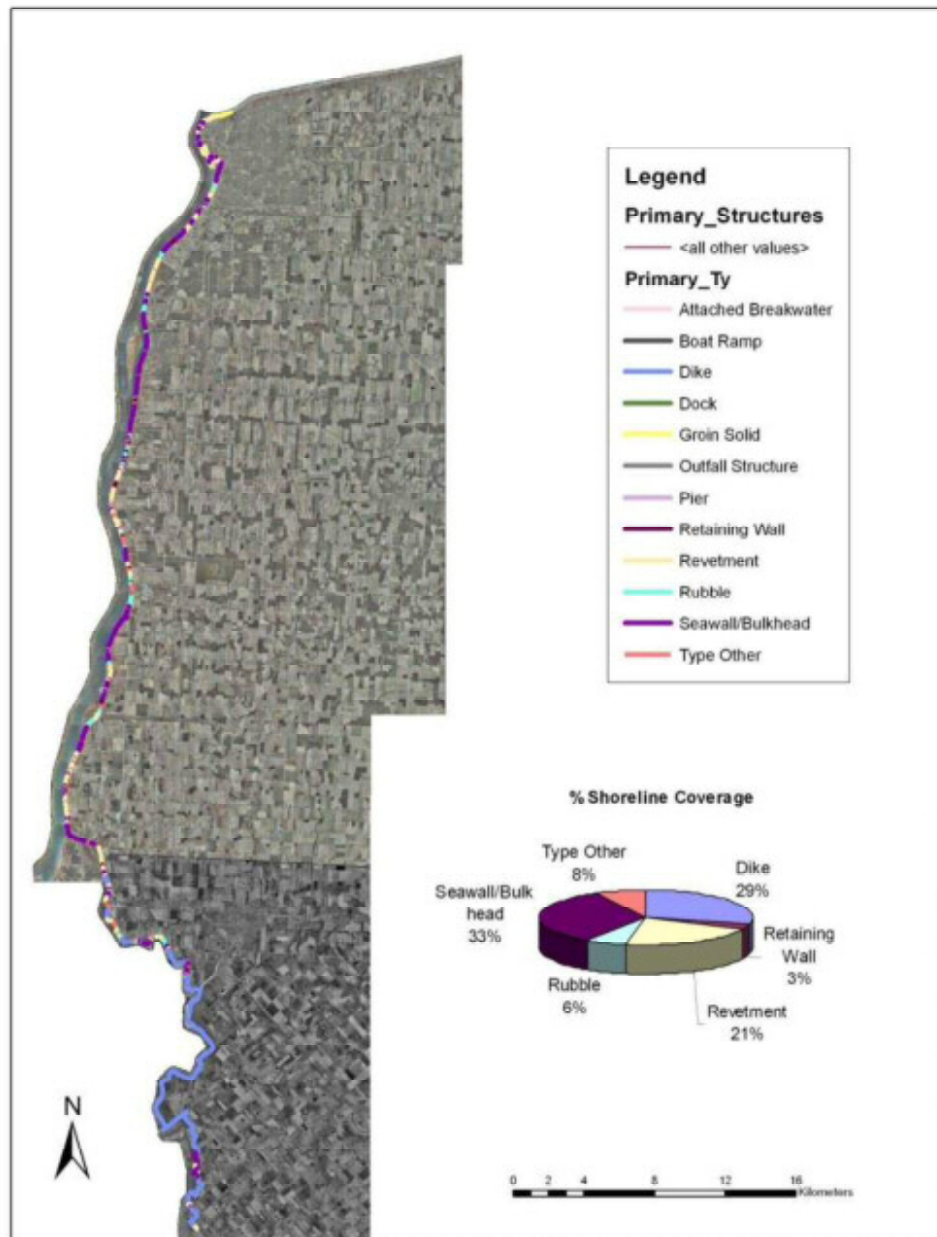


Figure 3 Primary structure distribution and % shoreline coverage



Dikes covered almost **30%** of the shoreline, found mainly along the Chenal Ecarte and the northern sections of Lake St. Clair. These were designed and constructed to prevent flooding of low lying lands during flood events. Although presently, majority of them are in good condition, they have little to no bank protection on the slope facing the water which will decrease their life span. Mature trees and hazard trees are also concerns when looking at the longevity of these dike systems.



Figure 4 Dikes along Chenal Ecarte constructed to prevent flooding

Over **18** km of shoreline is protected by revetments. These sloping structures consist of layers of stone or concrete placed along a shoreline. Rip rap is used to prevent erosion in the same way a bulkhead, but has the advantage of dissipating the wave energy. Environmentally, rip rap is favored over bulkheads made of wood, steel and concrete because it creates habitat for aquatic organisms. It also has a long life span that prevents the shoreline habitat from being disrupted from ongoing repairs and reconstruction of structures. It is the goal of this study to promote this type of soft shore protection and increase aquatic habitat along the St. Clair River Area of Concern.





Bulkheads composed of steel and revetments composed of concrete dominate the shoreline from Point Edward to Port Lambton. Dikes are clearly the most abundant structure through Chanel Ecarte and Mitchell's Bay, with other structure types protecting some sort of housing development.

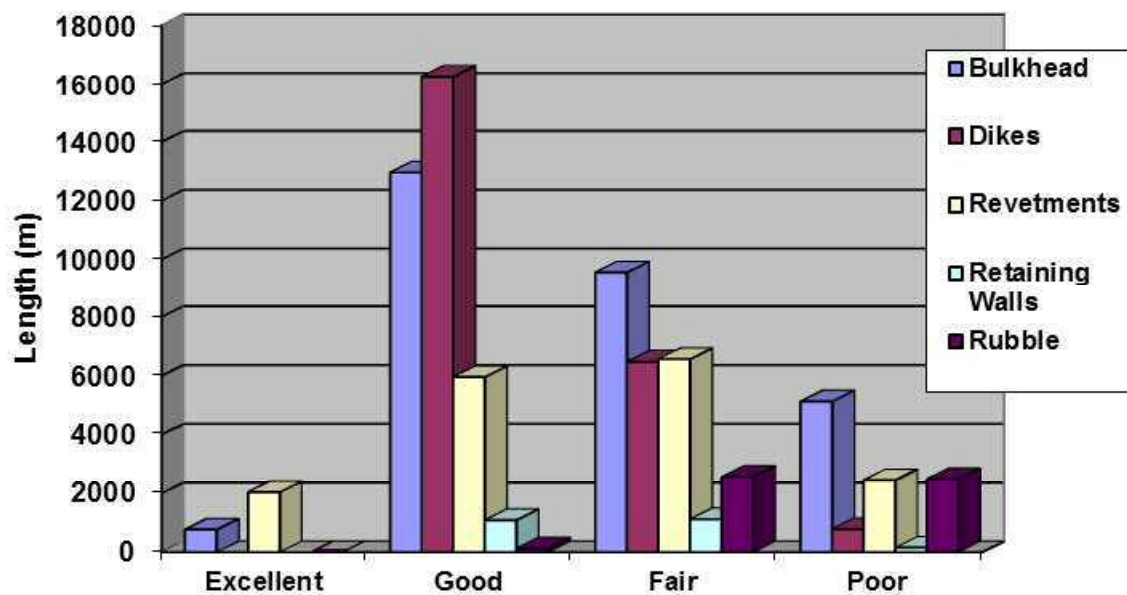


Figure 5. Shoreline length (m) of each type of shoreline structure in excellent, good, fair, and poor condition.

Condition represents the structures vertical and horizontal alignment, as well as, its aesthetic appearance. The most consistent structure in fair-poor condition is rubble. This was to be expected because rubble is indicative of a lack of engineering or merely remnants of a structure that once existed. This type of structure can be in fair-good condition because in combination with tree roots and phragmites, they sometimes have a reasonable appearance and show no signs of erosion. Revetments and bulkheads are fair-good for the most part, but with 1479 m and 1131 m respectively in poor condition, many enhancement opportunities still exist.

This study recommended that structures in poor condition required immediate attention, repair and/or replacement within the next 5 years. Structures in fair condition have a lifespan of roughly 10-15 years, at which point they would be classified as poor. This would result in a **39,940 m** of shoreline needing repair or replacement within the next 15 years.



4.0 Shoreline restoration completed along St. Clair River:

This section of the report provides information on the shoreline restoration work completed along the St. Clair River incorporating the recommendations of the **2007** study. The table below provides information on the shoreline restoration work completed along St. Clair River in the last 20 years. Appendix A below shows the location, extent of shoreline restored and pre and post construction pictures for each of the shoreline projects mentioned below.

Shoreline needing repair (2006)	39,940 m
Shoreline Restoration work completes till date (2012)	1,877 m
Percentage Complete	5 %
Projects	Shoreline revitalized
Point Edward Erosion Control Project	265 m
LAWSS Erosion control project	110 m
Point Edward waterfront shore protection	410 m
Mission Park erosion control project	115 m
Guthrie Park shore Protection Rehabilitation	700 m
Cathcart Park Project	150 m
Total shoreline work on Public property completed (2012)	1,750 m
Other Projects	
Healy	40 m
Huybers/Mills	64 m
Maynahan	23 m
Total Shoreline work (Public and Private property)	1,877 m

4.1 Point Edward Erosion Control Project 1994/1995:

The Point Edward Erosion Control Project was completed in 1995. This shoreline protection is located along the eastern shore of the St. Clair River just below the mouth of Lake Huron, along the waterfront of the Point Edward Waterfront Park. These shoreline works protect internationally significant parkland along the largest inland shipping channel in the world.

The work included removals of randomly stacked, discarded concrete, supply and placement of rip rap, armour stone and geotextile and other general site work associated with the construction of approximately 265 metres of a revetment and stepped revetment. Before and after construction pictures are provided below along with the location of the site.

4.2 LAWSS Erosion control project 2003/2004:

The work included removals of existing structures, supply and placement of rip rap, armour stone and geotextile and other general site work associated with the construction of approximately 110 metres of a revetment and stepped revetment.



4.3 Point Edward waterfront shore protection 2003/2007:

The project site is located in the Village of Point Edward along the east shore of the St. Clair River. The site includes the shoreline under the second span of the Blue Water Bridge and stretches south a distance of approximately 410 metres to the Point Edward Charity Casino.

This protection work was completed in 2 phases and was geared to provide shore stabilization, improved access and general improvement to the existing shore conditions along this section of the Point Edward Waterfront.

Phase 1 work provided protection to about 150 meter of the St.Clair shoreline and was completed in 2003. This project is also referred to as Bluewater Bridge Authority Erosion Control Project.

Phase 2 work provided shoreline protection to about 260 meter of St.Clair River shoreline, this work was completed in 2007.

4.4 Mission Park erosion control project 2008 – present:

The site is located in the City of Sarnia along the east shore of the St. Clair River (see Figure 1.1). It is located in the south end of the waterfront park area owned by the City of Sarnia. The site extends from the Seaway Centre at the north end to the ice boom structure at the south end, a distance of approximately 475 metres. The nearest cross street includes Cromwell Street at the north end and Johnson Street at the south end.

This shoreline work will be implemented in phases subject to available funding and necessity to replace severely damaged segments of the protection works. Phase 1 of this project is completed in 2008 and provided shoreline protection to about 115 m of St. Clair River shoreline. Phases 2, 3 and 4 are expected to provide shoreline protection to an additional 260 meters of St. Clair River shoreline.

4.5 Guthrie Park shore Protection Rehabilitation Project 2008 - 2011:

The site is located in the St. Clair Township along the east shore of the St. Clair River. It is located immediately south of the Talford Creek and the project site extends south approximately 700 metres in length. The site is located immediately north of the community of Corunna.

The work included removal of structures, supply and placement of rip rap, and armour stone revetment combining sloping rip rap sections with an armour stone cap and stepped sections, some of which include aquatic habitat beds. The structure also incorporates a rip rap slope or bedding below the toe armour stones in deep water areas for support. Approximately 700 metres of St. Clair River shoreline was revitalized between 2008 and 2011.



4.6 Cathcart Park Project 2011- present

The project site is located just north of the community of Sombra along the east shore of the St. Clair River. The site includes the shoreline starting at the south side of the Clay Creek and Stretches south a distance of approximately 340 metres. The current shoreline of the site includes steel sheet pile wall shore protection and a short section of unprotected shore along Clay Creek. The park also includes an internal man-made channel also protected with steel sheet pile wall. The majority of the steel sheet pile walls were in poor condition. A number of sections along the exposed shore have failed. The wall within the internal channel is generally in better condition than the exposed shore along St. Clair River.

This shoreline work will be implemented in phases subject to available funding and necessity to replace severely damaged segments of the protection works. The north end of the exposed west side of the park along the St. Clair River is the most damaged shore and is included in phase 1. Phase 1 of this project is completed in February 2012 and provided protection to about 150 m of St. Clair River shoreline.

In the further phases the remainder of the west shore along the island will be repaired prior to completing work in the internal channel. The short section of the west shore south of the south channel can be included in the latter phases when work on the ramp and/or work on the south part of the internal channel is being carried out to minimize site access restoration costs.

5.0 Future Shoreline work

A review of the shoreline conditions along the St. Clair River shoreline was performed in **2006** and a list was prepared to identify the priority sites for shoreline improvement. A few projects have been completed since then to improve the St. Clair River shoreline. It is anticipated that the remaining sites will be restored in the coming years. Table 3 below provides the list of priority sites. Several criteria's were considered to prioritize the shoreline; a few factors are outlined below:

- Condition of the primary structure
- Improvements to aquatic habitats in the river
- Loss of land in this area
- Hazards associated with existing dilapidated structures
- Public access to the waterfront
- Improvement of the general appearance of the area
- Reduce future maintenance costs



Site Location	Length of Shoreline	Condition/Remaining life
1) Guthrie Park	700 m	Restored in 3 phases (2008-2011)
2) Cathcart Park	1,340 m	150 m shoreline restored.
3) Reagan Park	670 m	Poor condition/ no remaining life
4) Sombra Park	110 m	Fair/ 10 years
5) Marshy Creek	210m	Fair/ 5 years
6) Branton Cundick Park	730 m	Fair/ 5 years
7) Mooretown centennial park	80 m	10 years
8) Courtright Waterfront Park	210 m	Concrete rubble along shoreline- safety hazard / 40 years
9) Willow Park	160 m	Good/ 15 years
10) Seagar Park	250 m	Fair/ 10 years
11) Port Lambton Park	240 m	Fair/ 5 years – can be extended with additional rubble placement
12) Brander Park	350 m	Fair/ 5 Years
Total Shoreline that can be restored.	5,050 m	
Total Shoreline that has been restored.	850 m	

Table 3 Shoreline Priority sites



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Ontario Ministry of Environment and Energy. 1995. St. Clair Area of Concern. Water Use Goals, Remedial Measures and Implementation Study.

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SCRCA. 2007. St. Clair River Restoration Assessment Project Report. Strathroy, Ontario.

Appendix

Erosion control Projects – Locations and Photographs

Erosion Control Projects: All Project Locations

Legend

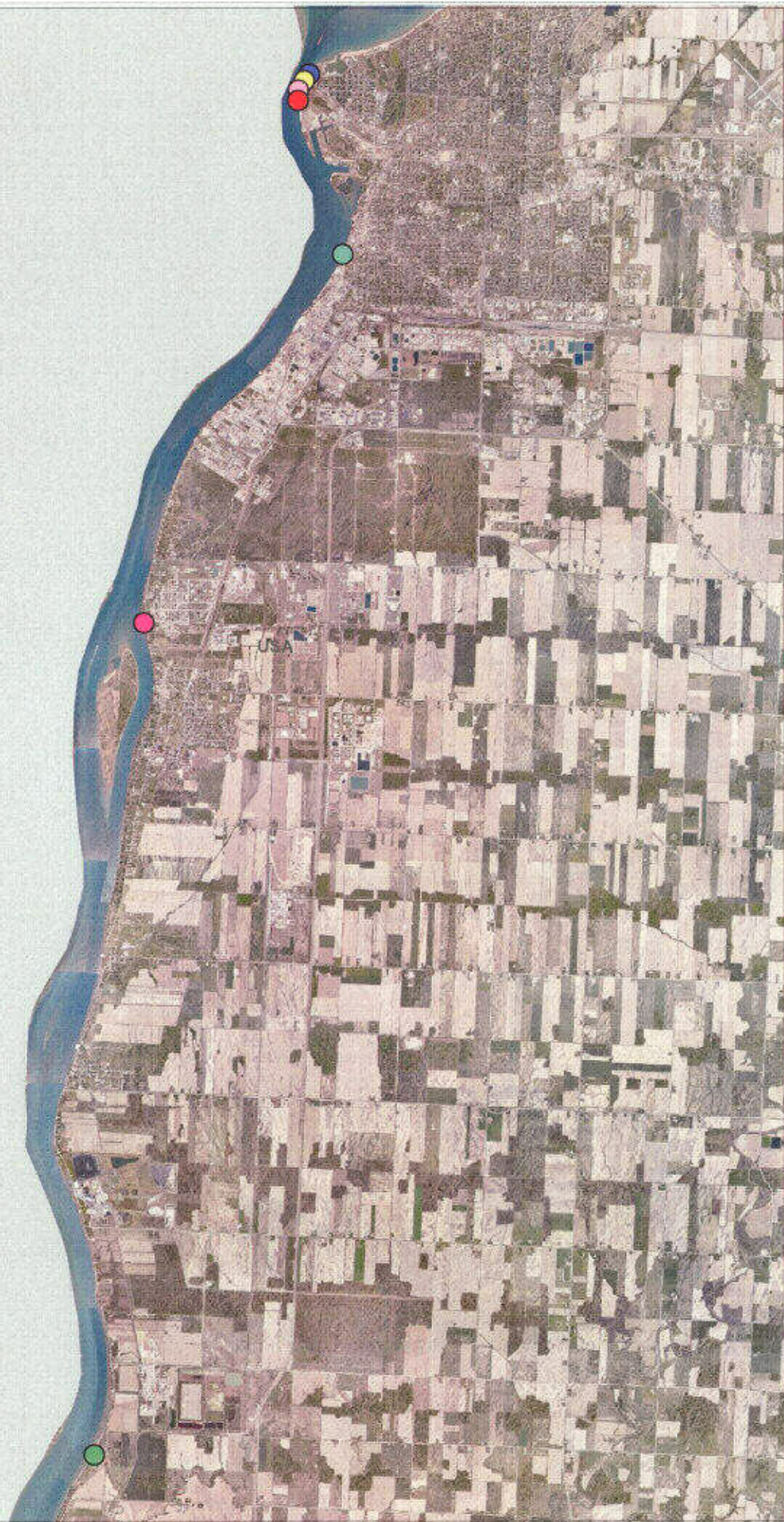
Project Location

-  LAWS, Erosion Control Project 2003/2004
-  Point Edward Erosion Control Project 1994/1995
-  Bluewater Bridge Authority Erosion Control Project 2002/2003
-  Point Edward Waterfront Shore Protection Project 2006/2007
-  Mission Park Erosion Control Project
-  Guthrie Park Shore Protection Rehabilitation Project 2008-2011
-  Cathcart Park Class EA & Detailed Design Project 2010/2011

0 0.3 0.6 1.2 1.8 2.4
Kilometers





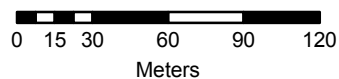
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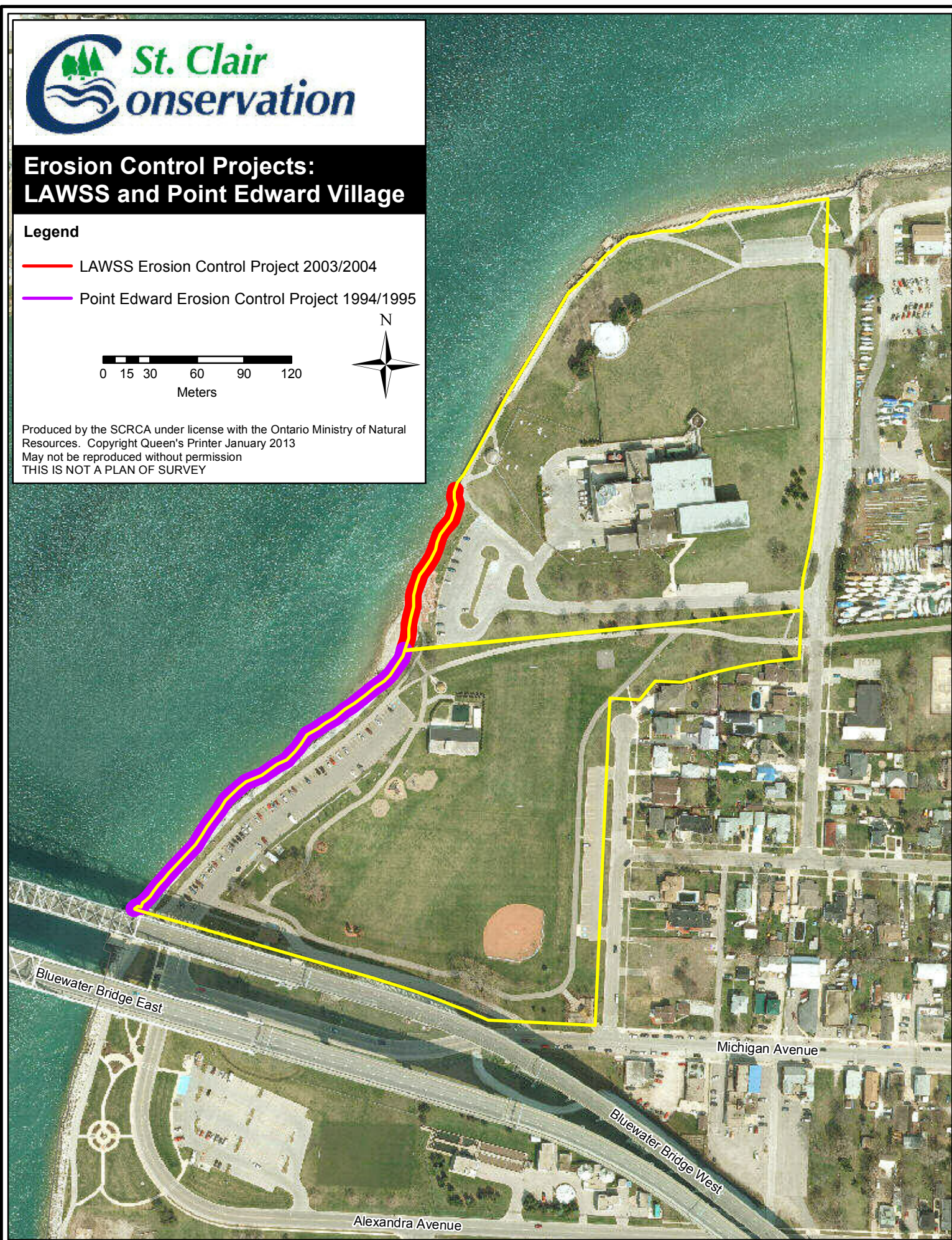
Erosion Control Projects: LAWSS and Point Edward Village

Legend

-  LAWSS Erosion Control Project 2003/2004
-  Point Edward Erosion Control Project 1994/1995



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Point Edward Erosion Control Project

1995

St. Clair River just
north of the
Bluewater Bridge

**Prior to protection
improvements**



After Protection Improvements

Top – stepped armour stone protection

Bottom – water's edge access



**Erosion Control Projects:
LAWSS and Point Edward Village**

Legend

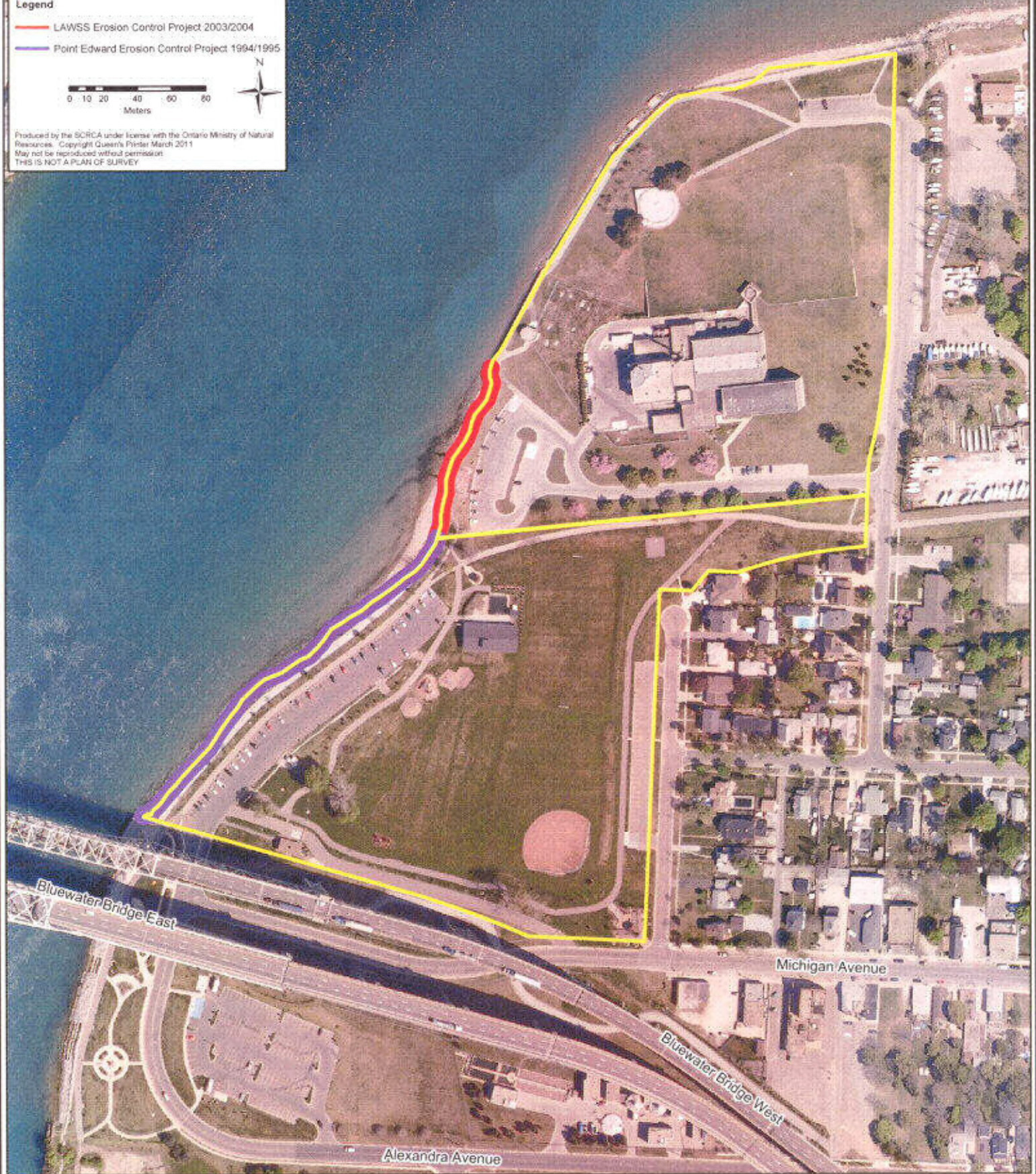
— LAWSS Erosion Control Project 2003/2004

— Point Edward Erosion Control Project 1994/1995

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Lambton Area Water Supply System Erosion Control Project

2003 - 2004

St. Clair River at the mouth of Lake Huron

Prior to protection improvements



After Protection Improvements

Top –
stepped &
sloped
armour
stone
protection

Bottom –
along cobble
beach



**Erosion Control Projects:
Bluewater Bridge Authority &
Point Edward Waterfront**

Legend

- Bluewater Bridge Authority Erosion Control Project 2002/2003
- Point Edward Waterfront Shore Protection Project 2006/2007

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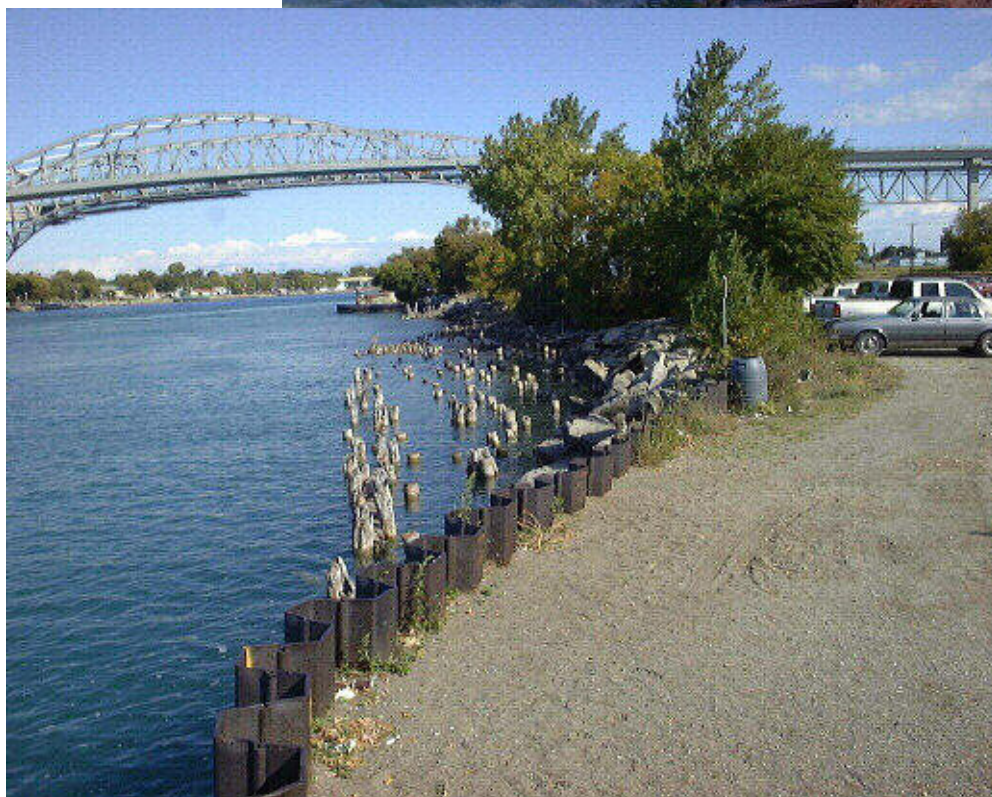


**Point Edward
Waterfront
Shore
Protection
Project**

2006 - 2007

St. Clair River
just north of the
Point Edward
Charity Casino

**Prior to
protection
improvements**



**After
Protection
Improvements**




Top – stepped
& sloped
armour stone
protection

Bottom –
shallow back
water area



**Erosion Control Projects:
Mission Park**

Legend

-  Future Class EA
-  Phase I 2008/2009
-  Proposed Phases II, III, IV

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Meters

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Class EA and Detailed Design 2008



After Construction Completed

Top – stepped
armour stone
revetment

Bottom – stepped
armour stone
transitions to a
rip rap revetment
– railings added
to existing
seawalls to
provide handicap
accessible fishing
areas



**Erosion Control Projects:
Guthrie Park**

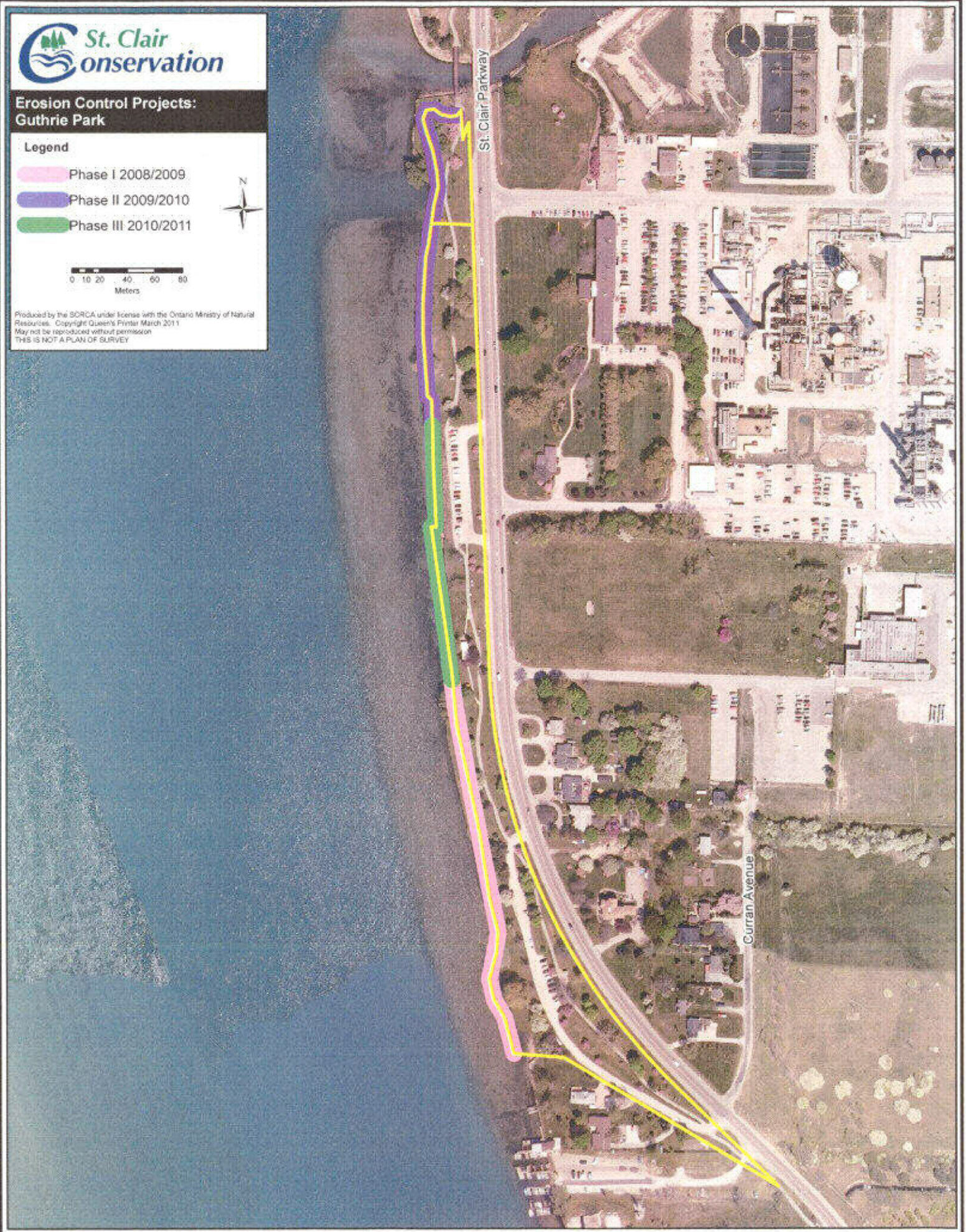
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-  Phase I 2008/2009
-  Phase II 2009/2010
-  Phase III 2010/2011

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Mission Park Shore Protection Revitalization

Commenced in 2007

(Phase I construction completed, awaiting funding confirmation to proceed to Phase II)

Sarnia Bay below Ferry Dock Hill in Sarnia

**Prior To
Construction**

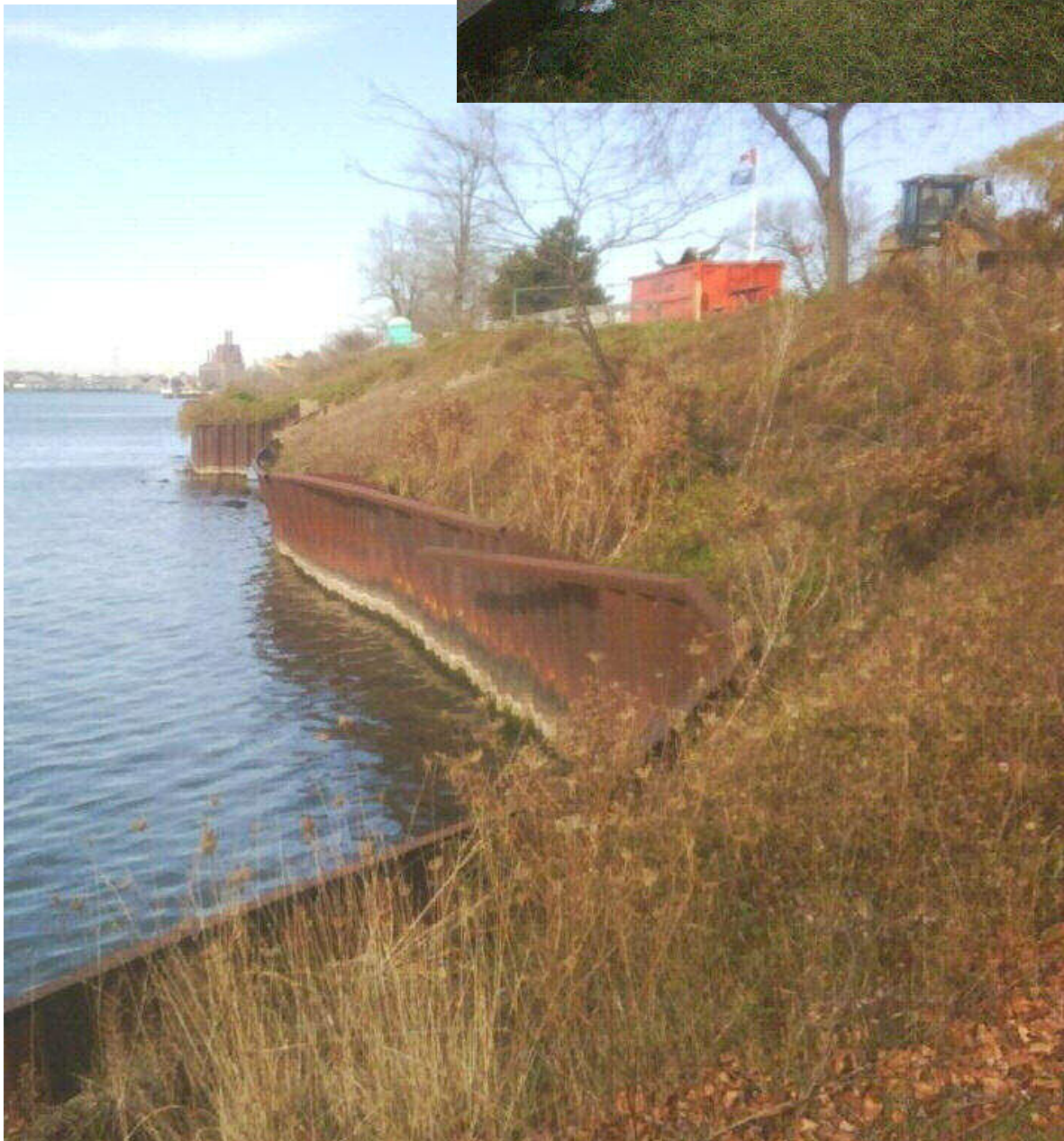


Guthrie Park Shore Protection Revitalization Project

2007-2011

St. Clair River
just north of Corunna

**Prior to Protection
Improvements**



After Protection Improvements

Combination of stepped
armour stone and sloped rip
rap revetment.

Top – water's edge access
Middle – rip rap revetment
Bottom – armour stone with
habitat pod



**Erosion Control Projects:
Cathcart Park**

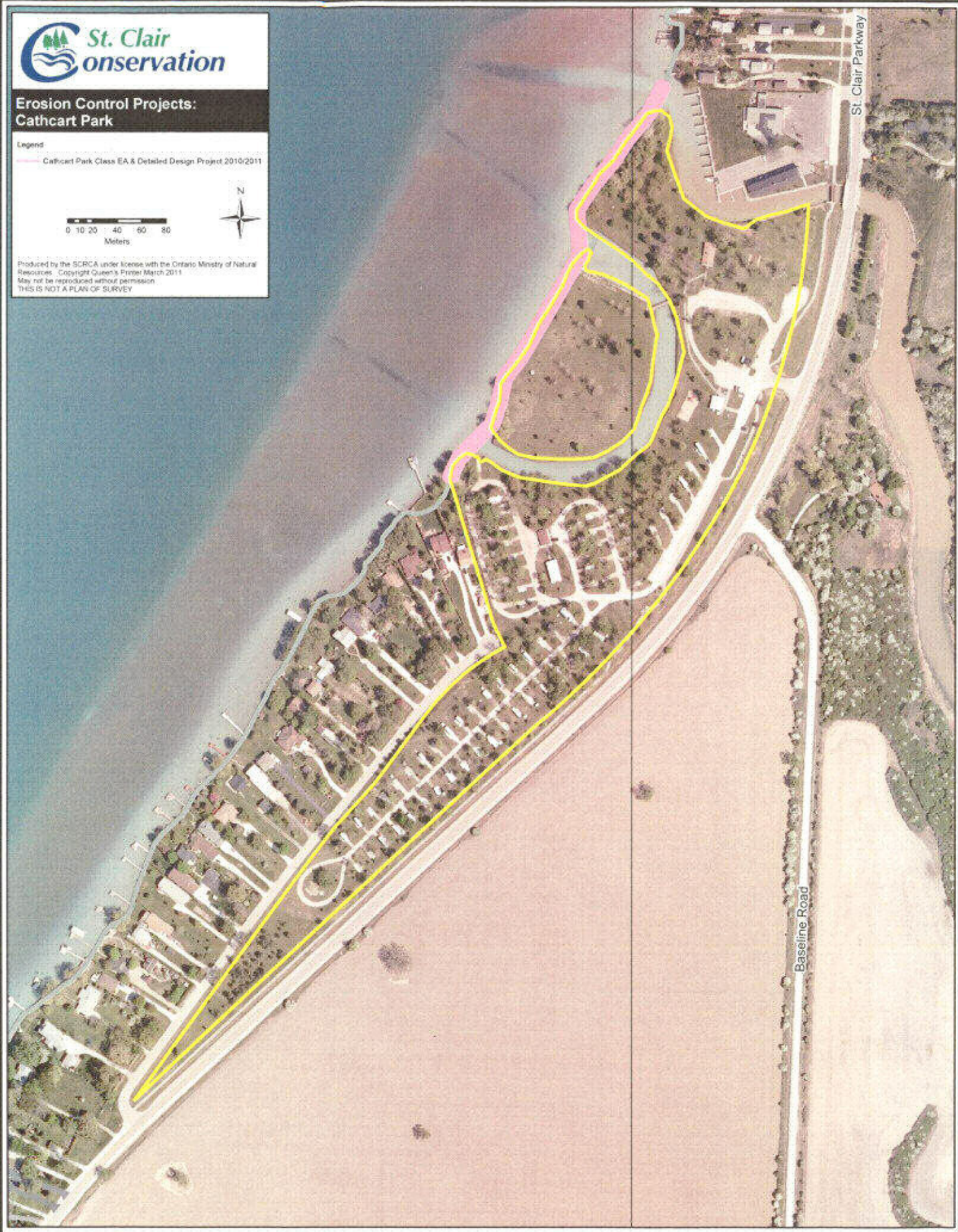
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— Cathcart Park Class EA & Detailed Design Project 2010/2011

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Cathcart Park Shore Protection Revitalization Project

2010 - Ongoing

St. Clair River
north of Sombra

Prior to Protection Improvements



Shoreline Catalogue - Project Details					
Project	Detail	Pre Project Shore Conditions	New Shore Protection Style	Ownership	Municipality
Lambton Area Water Supply System	South of Intake	Randomly stacked, discarded	Stepped and sloped armourstone	Municipal	City of Sarnia
Lambton Area Water Supply System	North of Intake	Large, stepped concrete blocks	Stepped armourstone	Municipal	City of Sarnia
Point Edward Erosion Control Project	Point Edward Waterfront	Randomly stacked, discarded	Stepped armourstone	Municipal	Village of Point Edward
Point Edward Waterfront Shore Protection	Blue Water Bridge	Discarded concrete and failing sheet steel piles	Stepped and sloped armourstone	Federal	Village of Point Edward
Point Edward Waterfront Shore Protection	Bridge to Casino	Discarded concrete and failing sheet steel piles	Stepped and sloped armourstone	Municipal	Village of Point Edward
Mission Park Shore Protection Revitalization	Southern Shore of Bay	Discarded concrete and failing sheet steel piles	Stepped and sloped armourstone	Municipal	City of Sarnia
Guthrie Park Shore Protection Revitalization	Former Parks Commission	Failing sheet steel piles	Stepped armourstone	Municipal	Township of St. Clair
Cathcart Park Shore Protection Revitalization	Former Parks Commission	Failing sheet steel piles	Stepped armourstone	Municipal	Township of St. Clair
MacDonald Park	Former Parks Commission	Failing wooden piles	Gabion baskets	Municipal	Municipality of Chatham-Kent
Healy	Same side of Parkway as Healy	Failing steel sheet piles	Sloped rip rap revetment	Private	Township of St. Clair
Huybers / Mills	Opposite side of Parkway to Healy	Randomly stacked, discarded	Sloped rip rap revetment	Private	Township of St. Clair
Maynahan	Opposite side of Parkway to Healy	Randomly stacked, discarded	Sloped rip rap revetment	Private	Township of St. Clair

Project	Commenced	Complete	Completed	Length Of Shoreline	
				Completed	To Be Completed
Lambton Area Water Supply System	2003	Yes	2004	100 m	0 m
Lambton Area Water Supply System	2012	No	No	0 m	282 m
Point Edward Erosion Control Project	1994	Yes	1995	265 m	0 m
Point Edward Waterfront Shore Protection	2002	Yes	2003	150 m	0 m
Point Edward Waterfront Shore Protection	2005	Yes	2007	260 m	260 m
Mission Park Shore Protection Revitalization	2007	No	No	115 m	345 m
Guthrie Park Shore Protection Revitalization	2008	Yes	2011	700 m	700 m
Cathcart Park Shore Protection Revitalization	2011	No	No	150 m	350 m
MacDonald Park	2007	Yes	2007	100 m	0 m
Healy	2009	Yes	2010	40 m	0 m
Huybers / Mills	2009	Yes	2010	64 m	0 m
Maynahan	2010	Yes	2011	23 m	0 m

After Protection Improvements

Combination of stepped and sloped armour stone revetment.

Top – looking up
Clay Creek from
the St. Clair River



Bottom – looking
north along the
St. Clair River

