An aerial photograph showing a shoreline. On the left, there is a dense, dark forested area. Above the forest, there are some buildings and a road. The shoreline curves from the top left towards the bottom left. To the right of the shoreline is a large body of water, which appears to be a bay or a large pond. The water has a textured, grainy appearance.

Shoreline Management Plan 1994

ausable bayfield conservation authority

ABCA MISSION STATEMENT

The mission of the Ausable Bayfield Conservation Authority is to provide leadership and management, in cooperation with the community, to maintain and enhance the watershed resources now and in the future.

SHORELINE VISION STATEMENT

The Shoreline Management Plan is based on a vision for the future where continuing shoreline erosion, the occurrence of severe storms, and bluff failure are not accompanied by unpredicted hardships to shoreline property, where beaches exist along the shoreline, where access to the lake is achieved, and where the environment and natural landscape of the shoreline continuously improves.

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The Ausable Bayfield Conservation Authority (ABCA) would like to express its appreciation for the time and effort of all those who contributed to the development of the Shoreline Management Plan (SMP). We would particularly like to acknowledge the help we received from the Shoreline Management Committee which was comprised of the Project and Technical Committees. These dedicated individuals, representing numerous organizations, worked long hours to aid in putting this plan together. Below is a list of the individuals and the organization they represent.

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This report was prepared by Patrick Donnelly with support from Dave Anglin and Bill Baird of Baird & Associates, Ottawa, and Snell and Cecile Ltd. (Environmental Consultants), Beard Winter and Associates (Law Office), and Geomatics International Ltd. (Geographic Information Systems).

EXECUTIVE SUMMARY

Observations of the Great Lakes shorelines made over a number of years clearly demonstrate two phenomena that are of considerable concern to landowners and organizations with planning responsibilities. These phenomena are that the shoreline at many locations continues to slowly change through a process of erosion or accretion, and that during storms, particularly those occurring during periods of high water level, considerable damage occurs at the shoreline.

In response to these issues, and particularly the latter issue of storm damage and flooding, the Ministry of Natural Resources (MNR) prepared guidelines for the preparation of Great Lakes shoreline management plans that have the objective of preventing recurrence of shoreline damage.

The responsibility for the implementation of these guidelines was given to the Conservation Authorities. This recognized the local knowledge, interests and concerns of each Conservation Authority along the different shorelines of the Great Lakes. It also recognized the close involvement with the municipalities under which the Conservation Authorities operate.

This report describes the Shoreline Management Plan developed by the Ausable Bayfield Conservation Authority for that section of the Lake Huron shoreline within its jurisdiction.

Recognizing the need for a plan which would be effective in its implementation and accepted by the lakeshore users, project and technical committees were formed to provide local knowledge, expertise, direction and guidance to the creation of a SMP. These committees proved to be of great benefit to the development of the plan.

The Plan in isolation has no status. The strength of the Plan is contingent upon the consensus of the various groups which form the Steering Committee. The Steering Committee was composed of two subcommittees: the Project Committee with membership comprised of municipal and cottage association representatives, and the Technical Committee with membership from County Planning Departments, Ministry of Natural Resources offices, Pinery Provincial Park, and adjacent Conservation Authorities. The Plan is intended to be a reference document to direct changes to the land use planning documents of the lakeshore municipalities. It is also written to be of assistance to other municipal, provincial and federal government agencies, who by nature of their work, focus on the lakeshore and the unique characteristics and hazards which it possesses. Much of the data contained within this Plan is not new, however, it is collected and summarized into this document to provide a separate comprehensive planning guide specifically for the lakeshore.

A first step was to identify the principal concerns of the community that relate to the shoreline, as well as opportunities that a shoreline management plan could provide, while recognizing that the principal thrust of the plan was to be the prevention of damage through proper management. This was accomplished through a polling of landowners and interested persons who attended two Public Meetings (held July 20, 1990 and July 26, 1991) on the topic of shoreline management. This was a valuable exercise that documented the concern for shoreline stabilization and storm damage protection; the environment; water-dependent activities; improved public space and economic development.

Previous studies have described the dynamic nature of the shoreline, illustrated by the fact that many thousands of cubic metres of sand are transported along the shoreline to the south each year by the action of waves and that sections of the shoreline are eroding at rates varying from zero to greater than one metre per year.

The process of long-term erosion and accretion that has occurred to the shoreline was determined and the hazard areas with respect to erosion were defined. This was completed using a 1935 shoreline survey and recent 1988 photogrammetric mapping. Lines were drawn on 1:2,000 scale maps to indicate the probable future shoreline position in one hundred years, based on an extrapolation of the 1935 to 1988 shoreline comparison.

In the short term, typically during severe storms or during periods of high rainfall in the spring, severe damage may occur as a result of a localized failure of the bluff. During periods of high water levels, wave damage to structures built close to the shoreline and flooding may also occur. These damages are very site specific and can best be avoided by either defining hazard areas or following improved design procedures for structures.

Bluff stability issues are addressed by defining a line set back from the base of bluff a distance defined by the intersection by a three (horizontal) to one (vertical) slope with the elevation of the top of the bluff. Within this area, there is a risk of sudden failure of the bluff. Limits of flooding are addressed by defining a line which is the limit that waves could reach during a water level event with a probability of occurrence of once in one hundred years.

With this information, the basis of a policy to direct development along the shoreline, recognizing the long-term erosion of the shorelines and short-term damage, was developed. This consisted of defining hazard areas on which new development should not occur and where re-development of existing areas should be scaled to the degree of hazard which exists.

Some of the dilemmas and issues to be faced in the development of a shoreline management plan became clear. These included the following:

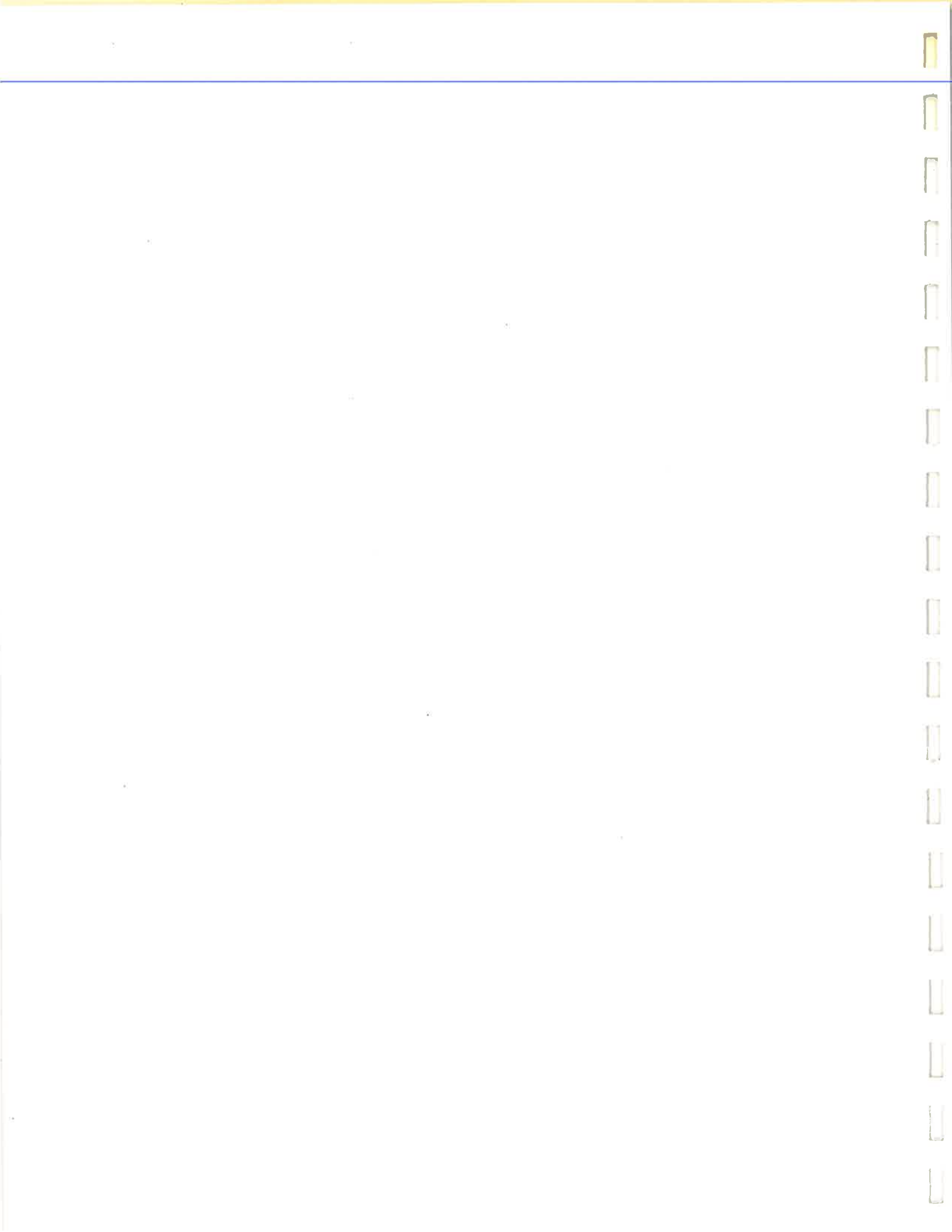
- ▶ The bluff shoreline in many areas is naturally eroding and many riparian property owners want to stop that process and maintain their property.
- ▶ Erosion of the bluffs provides (1) the sand that makes up the beach at the base of the bluff and (2) the sand that maintains the extensive beaches between Grand Bend and Kettle Point.
- ▶ If the shoreline and the area landward are effectively stabilized, the nearshore lake bottom may continue to erode, exposing the shoreline to more severe wave conditions.
- ▶ The cost of structures designed to stabilize the shoreline may be very high and incompatible with the value of the property.
- ▶ We must recognize that the land adjacent to the shoreline is a natural hazard area where the shoreline may be eroding and there is a risk of flooding, damage by storms and bluff failure. Along much of the shoreline, residences have already been built in this hazard area.
- ▶ Bluff failure is a complex phenomenon with many possible contributing factors.
- ▶ Ownership of the shoreline/beach at some locations is not clearly understood and requires verification to ensure that actions, such as the construction of protection structures, are completed subject to the necessary approvals.
- ▶ Groynes are shoreline structures that have been extensively used in some areas, either to provide a beach for recreation or as shore protection. In some specific cases, these structures have been claimed to be the cause of erosion to adjacent properties.

In response to the concern of shoreline owners with stabilization of the shoreline and prevention of damage during storms, the document, "Considerations for Shore Protection Structures" (Baird, 1992) was prepared as part of this shoreline management plan. These guidelines describe the shoreline process to be considered in designing structures, and provide examples of different designs. In general, this demonstrates that structures designed to stabilize the shoreline in areas where significant erosion is taking place will be extremely costly and it is unlikely that they will ever be built given the present political and economic climate. For these reasons, the most effective response to mitigating shoreline hazards in the severely affected areas may range from structural measures to the relocation of the residence away from the shoreline.

In addition, the guidelines provide design considerations for specific shore structures. It is noted that continuing erosion of the shoreline is controlled by erosion of the nearshore lake bottom and, as very little is known about the lake bottom in terms of erosion rates or its composition, this should be further investigated. This design factor may make shore protection unfeasible and further substantiates the recommendation of residence relocation be given consideration as a long-term solution.

The Shoreline Management Plan provides a detailed description of the shoreline with maps that include lines marking flood limits, future erosion, stable slope allowances for bluffs, and areas of beaches where the features are constantly changing in response to waves and wind. These limits form the basis for a policy to control development in order to prevent future storm-related damage. This policy is explained in detail.

In summary, the Shoreline Management Plan is based on a vision for the future where continuing shoreline erosion, the occurrence of severe storms, and bluff failure are not accompanied by unpredicted hardships to shoreline property owners, where beaches exist along the shoreline, where access to the lake can be achieved and where the environment and natural landscape of the shoreline continuously improve.



Chapter 1

INTRODUCTION

- 1.1 Shoreline Management Plan
- 1.2 MNR Policy Concerning Shoreline Management Plans
- 1.3 Overall Objectives of the ABCA Shoreline Management Plan
- 1.4 Implementation of the ABCA Shoreline Management Plan



CHAPTER 1 INTRODUCTION

The purpose of this chapter is to provide a general overview of the course and to introduce the basic concepts and terminology used throughout the book. The chapter is divided into two main sections: the first section discusses the importance of the course and the second section discusses the basic concepts and terminology.



Section 1.1 SHORELINE MANAGEMENT PLANS

In the fall of 1986, the water levels on the Great Lakes rose to record levels. Wave action during storms occurring in this period caused damage to thousands of lakeshore properties. To respond to the public concern, the Province of Ontario appointed an advisory group to investigate, review and make recommendations concerning shoreline management. This group, called the Shoreline Management Advisory Committee, recommended that a pro-active approach to shoreline management be undertaken by the Conservation Authorities, which are existing organizations involved in resource management on a watershed basis. It was primarily based on these recommendations that the Minister of Natural Resources delegated the responsibility of shoreline management to the individual Conservation Authorities which have jurisdiction along the Great Lakes shoreline.

The principal objective of a Shoreline Management Plan is to reduce or eliminate damage that may occur to residences or development adjacent to the shoreline during severe storms in periods of high water and prevent new development from occurring in hazardous areas. To respond to this objective, a SMP will typically identify areas associated with flooding, erosion, storm damage, bluff failure, and blowing sand, establish setbacks from the shoreline for new development, and will provide shoreline management options, including protection, for existing developed areas.

The Plan in isolation has no status. The strength of the Plan is contingent upon the consensus of the various groups which form the Steering Committee. The Steering Committee was composed of two subcommittees: the Project Committee with membership comprised of municipal and cottage association representatives, and the Technical Committee with membership from County Planning Departments, Ministry of Natural Resources offices, Pinery Provincial Park and adjacent Conservation Authorities. The Plan is intended to be a reference document to direct changes to the land use planning documents of the lakeshore municipalities. It is also written to be of assistance to other municipal, provincial and federal government agencies, who by nature of their work, focus on the lakeshore and the unique characteristics and hazards which it possesses. Much of the data contained within this Plan is not new, however, it is collected and summarized into this document to provide a separate comprehensive planning guide specifically for the lakeshore.

In February of 1988, the Ausable Bayfield Conservation Authority (ABCA) became the **lead government commenting agency** for land use planning as it relates to the hazards of flooding and erosion along the Lake Huron shoreline, stretching from the north end in Lot 30, Concession 1, Goderich Township to the south, including the Village of Bayfield, Townships of Stanley, Hay, Stephen, and the Village of Grand Bend to the southerly limit in Bosanquet Township at the community of Port Franks (see Figure 1). The ABCA was directed to prepare a Shoreline Management Plan to include these seven municipalities. Several background reports and data were gathered to support the development of a SMP. These reports included the "Lake Huron Shore Processes Study" (Reinders, 1989), which addressed the entire southeastern shore of Lake Huron, an "Inventory of Erosion Control Structures" (ABCA, 1990), "Considerations for Shore Protection Structures" (Baird, 1994) and detailed 1:2,000 scale mapping for the shoreline.

Section 1.2 MINISTRY OF NATURAL RESOURCES POLICY CONCERNING SHORELINE MANAGEMENT PLANS

On a lake-wide basis the role, components, objectives and principles of Ministry of Natural Resources policy with regard to shoreline management are stated in the "MNR Guidelines for Developing Great Lakes Shoreline Management Plans" (MNR, 1987) as follows:

Role of Government

- ▶ To provide order and equity in the use/non-use of Great Lakes-St. Lawrence River shore lands; and
- ▶ To protect society, including all levels of government, from being forced to bear unreasonable social and economic burdens of unwise land use.

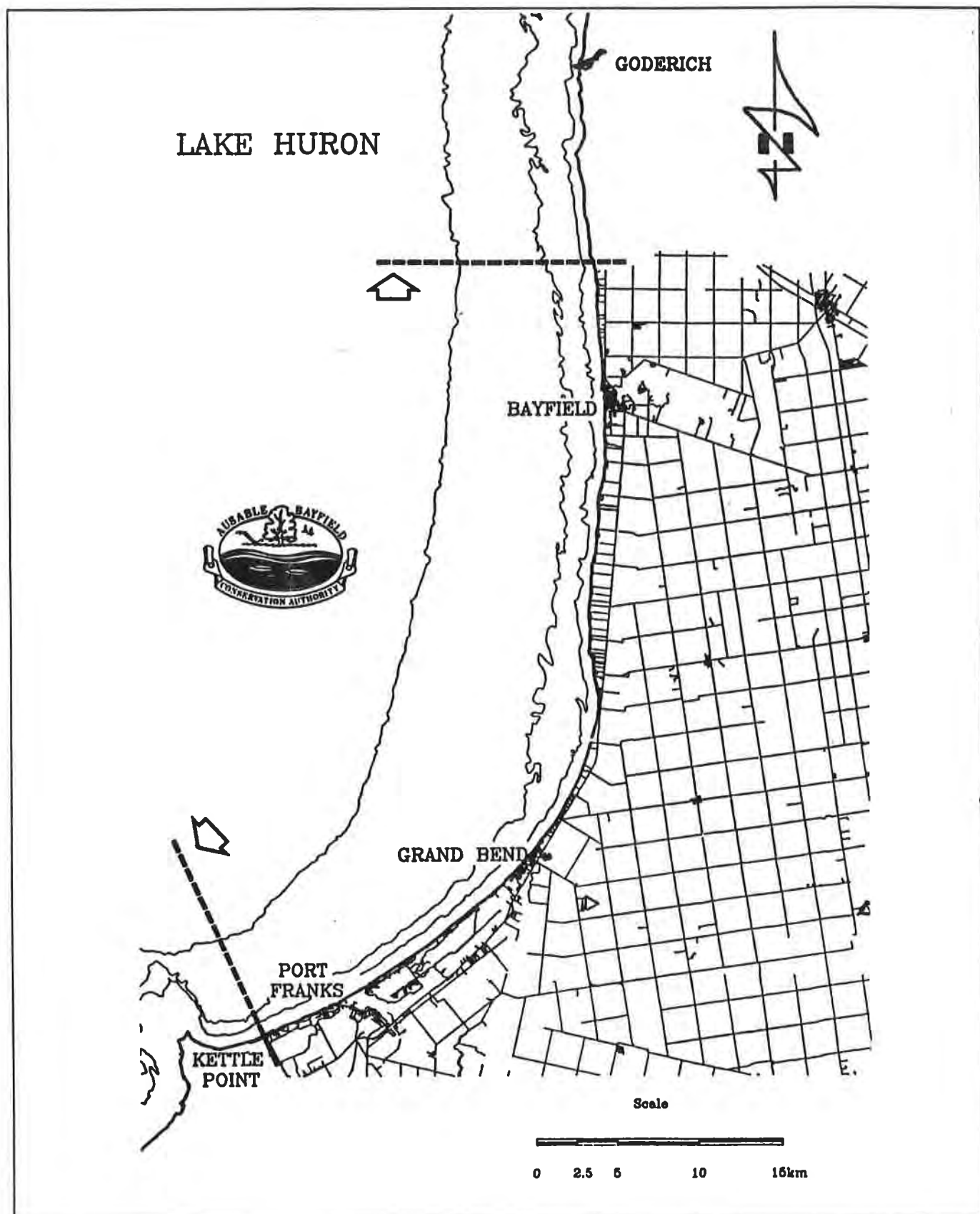


Figure 1: Ausable Bayfield Conservation Authority Area of Jurisdiction

Components of Management of Shores Susceptible to Flooding, Erosion, Storm Damage, Unstable Bluffs and the Action of Wind (Beaches)

Prevention	Land use planning, regulation development, and public awareness
Protection	Non-structural/structural measures and residence relocation
Emergency response	Flood forecasting/warning and flood/erosion disaster relief
Environment	Impact assessment of land use on the shoreline environment
Public information	Ensure public participation and input into creation and implementation of shoreline management
Monitoring	Monitor changes to local conditions affecting shoreline management and modify the SMP at appropriate intervals

Objectives of Ministry of Natural Resources Shoreline Policy

- ▶ To minimize risks to life, property damage and social disruption; and
- ▶ To encourage a coordinated approach in the wise use and management of lands susceptible to flooding and/or erosion.

Principles of Ministry of Natural Resources Shoreline Policy

- ▶ Effective shore land management can only occur on the basis of a comprehensive littoral cell or shoreline sediment compartment with due consideration given to shore processes and updrift/downdrift effects of development;
- ▶ Local conditions, including geophysical, hydrophysical, environmental, economic and social characteristics vary from one reach to another and, accordingly, must be taken into account in the planning and management of flood and /or erosion susceptible lands;
- ▶ The degree of risk (threat to life and property damage) can vary from shore lands to shore lands; the potential for development to safely occur may exist in some shore land locations and may be too hazardous in other shore land locations;
- ▶ New development susceptible to flood, erosion, and/or other water-related hazards (including the dynamic nature of sand) or which will cause or aggravate flood, erosion and/or other water-related hazards to existing and/or approved uses and shore lands, must not be permitted to occur unless the flood, erosion and/or other water-related hazards have been overcome;
- ▶ Shore land development, where permitted, will be undertaken in an environmentally sound manner in recognition of other resource values;
- ▶ Shore land management and land use planning are distinct, yet allied, activities that require overall coordination on the part of municipalities, Conservation Authorities, the Ministry of Natural Resources and the Ministry of Municipal Affairs;

The objective of this specific shoreline management plan is to implement the MNR policy guidelines while considering the unique characteristics of the shoreline, the requirements of the community, and the responsibilities of the Ausable Bayfield Conservation Authority.

Section 1.3 OVERALL OBJECTIVES OF THE ABCA SHORELINE MANAGEMENT PLAN

These objectives are:

- 1) To prevent storm-related damage to residences adjacent to the shoreline by designating hazard areas and by implementing a policy that prevents development and significant reconstruction in this area; and by providing guidelines for the design of properly engineered shore protection structures to be built in relation to existing development that fully consider the dynamic nature of the shoreline and potential impacts on adjacent properties;
- 2) To identify and document shoreland hazards, and bring these facts to the attention of the shore community;
- 3) To improve the environment and quality of life in the area adjacent to the shoreline by designating environmentally important areas and by encouraging and supporting the implementation of existing regulations designed to conserve the natural environment;
- 4) To provide a basis for continuing economic development of the region through effective planning that maintains the high quality of the environment of the region;
- 5) To provide a plan for the future such that future generations can enjoy an improved quality of life in the region.

To meet these objectives, the shoreline management plan contains the following:

- ▶ detailed description of the shoreline and shoreline processes,
- ▶ 1:2,000 scale maps showing flood limits, calculated extent of future erosion, stable slope allowances (for bluffs), and dynamic beach limits (for sand dune areas),
- ▶ policy that controls development within the defined hazard areas,
- ▶ guidelines for the design of shore protection structures,
- ▶ identification of environmentally significant areas,
- ▶ emergency response considerations, and
- ▶ recommendations for future monitoring of the shoreline.

Section 1.4 IMPLEMENTATION OF THE ABCA SHORELINE MANAGEMENT PLAN

The implementation of the ABCA's SMP is to be achieved with the overall support of the groups and agencies involved in its preparation, including:

- a) the adoption of the plan by each of the seven municipalities which share lakeshore frontage;
- b) the support for the plan by the individuals who represent the shoreline community on the established steering committees;
- c) the adoption of the plan by the Lambton and Huron County Planning Departments which will, with the cooperation of the municipalities, incorporate the recommendations of the SMP into the lakeshore municipality's planning documents (e.g. zoning bylaws, secondary plans and official plans);
- d) the support of the various government agencies who have an interest in the shoreline through legislation or regulations; and
- e) the review of the plan by the general public through the use of open houses, news releases and bulletins during the spring and summer of 1993.

Chapter 2

BACKGROUND

- 2.1 The ABCA Shoreline
- 2.2 What is a Shoreline Management Plan?
- 2.3 Specific Issues
- 2.4 Cottage Country - the changing demands
- 2.5 Public Consultation
- 2.6 Shoreline Ownership



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Photograph courtesy of Lambton Heritage Museum

Section 2.1 THE ABCA SHORELINE

The shoreline over which the ABCA has jurisdiction can be generally divided into three areas.

a) The northerly section of the shoreline (usually described as the bluff region north of Grand Bend) consists of till bluffs. The northern boundary of the ABCA jurisdiction ends in Lot 30, Concession 1, Goderich Township, almost mid-way between the Village of Bayfield and the Town of Goderich. Along most of the shoreline, adjacent to the top of bluff, are many cottages. A principal issue along sections of this shoreline is the continuing erosion of the bluff and nearshore lakebottom, and the associated loss of land. Flooding from Lake Huron is not a principal issue as most development exists above flood elevations. However, surface water drainage problems do occur and aggravate inadequate road and lot drainage, as well as lakebank erosion.

b) The southerly section of the shoreline (generally described as the dune region) consists of the Grand Bend/Pinery/Ipperwash beach; a principal consideration is in maintaining the beach and dune system. The southernmost boundary of the ABCA jurisdiction is the Camp Ipperwash Military Reserve, south of the community of Port Franks.

c) Finally, there are the three river mouths at the communities of Bayfield, Grand Bend and Port Franks. Concerns in these areas include flooding, wind erosion and shoreline stabilization. Flooding in these areas is mainly associated with ice jamming problems or lake storm action, or a combination of both events.

The inland boundary of the shoreline will vary dependent upon the criteria used to define it. For example, if surface drainage and water quality concerns were used, then the headwaters of the shoreline gullies located adjacent to the Wyoming moraine, a long, elevated area parallel to the shore of Lake Huron, might be appropriate. For ease of definition, Highway #21 is generally regarded as the inland border for the purpose of this study.

2.1.1 LITTORAL CELL MANAGEMENT

The shore area under the jurisdiction of the ABCA is totally contained within a littoral cell which stretches from Goderich Harbour in the north to Kettle Point in the south. The value of managing the shoreline on a "littoral cell" basis was documented in the Lake Huron Shore Processes Study (1989) and, therefore the SMP includes discussion of, and makes recommendations regarding those locations which are within this littoral cell, but lie outside the ABCA's jurisdiction. Active participation by the Maitland Valley C.A. and the Chatham, Wingham and Alymer Offices of MNR in this SMP allowed a consistent approach to shoreline management within the entire littoral cell. The cell is viewed as a key component of the shoreline ecosystem and therefore provides the overall boundaries on which to base discussions.

The impact of the Goderich harbour structures on the sediment transport along the ABCA shoreline was discussed in the previously mentioned Shore Processes Study. As part of that study, further analysis suggested that bypassing of sand around the harbour structure would benefit the shoreline to the south (Baird, 1992). The findings of the recent analyses are discussed in Section 3.2.5 "Goderich Harbour Analysis".

2.1.2 HISTORICAL SHORELINE SETTLEMENT

NATIVE SETTLEMENT

Early history of native settlement along this section of Lake Huron shoreline is limited to archaeological data collected in the area now included within the Pinery Provincial Park and Port Franks area. This general area within the sand dune region formerly supported abundant numbers of wildlife and provided easy access to the lake for the resident natives known as the Attawandarons, or "Neutrals". In addition, a readily usable supply of flint for tools and weapons was available from the bedrock outcropping known sometimes as "Stony Point" (Dixon, 1963). Present Indian Reserve property is found near Kettle Point, comprising the Kettle Point / Stoney Point Indian Bands of Chippewas (Wright, 1986). Prior to World War II, the land currently occupied by the Ipperwash Military Camp was designated as a reservation for these two tribal councils.

GRAND BEND (BREWSTER'S MILL)

The present-day village was originally named after a settler who established a saw mill on the banks of the Ausable River. It was later renamed to reflect the course that the river followed as it flowed through this region, making an abrupt "bend", and flowing approximately 13 miles south to Port Franks. In 1892, a channel was cut through the sand dunes to Lake Huron. Therefore, the river mouth and harbour were artificially created at Grand Bend. The Old Ausable Channel still runs south through the Southcott Pines and Huron Woods residential areas and eventually through the Pinery Provincial Park (Dixon, 1963). It is interesting to note that the Parkhill Creek — and not the Ausable River — now provides the flow of water through Grand Bend. Refer to the discussion on Port Franks which follows.

BAYFIELD

Named after an admiral in the British navy who undertook extensive surveys of the Great Lakes, the Town of Bayfield was created following the survey of the Bayfield River mouth area at the request of the Baron de Tuyll. This baron was working for the Canada Company during the late 1800s and recognized the area as a potential harbour and settlement. The town was surveyed in a similar fashion to the plan for the Town of Goderich, using a central town square with roads radiating out in a shape similar to spokes in a wheel.

ST. JOSEPH

Although currently only a hamlet at the western end of Highway #84, this community was originally planned to be a major port, canal entrance and railway link to the interior. It boasted a brickyard, organ factory, winery, post office and a hotel, all constructed on the speculation that the site was to be a major transportation link. The architect of optimism was a resident named Narcisse Cantin who promoted the idea of a canal linking Lake Huron (at St. Joseph) to Lake Erie (at Port Stanley). So convincing was he that the federal government built a dock at St. Joseph in 1904; all the calculations were made as to the overall elevation difference between the two lakes and the distance saving that the new canal would make to the St. Lawrence Seaway project, which at that time was also being planned. (Dixon, 1963).

PORT FRANKS

As previously mentioned, this area was the natural outlet of the Ausable River since the course of the river turned at Grand Bend and flowed south. However, this region has such an abundance of sand and strong northwesterly winds that the river outlet has moved to numerous locations over its history (both naturally and due to human influence). The most dramatic project in this area was the dredging of "The Canada Company Cut" (also known as "The Cut"), between 1873 and 1875, to outlet the Ausable River directly to Lake Huron without its flowing north, through the "bend" at Grand Bend and then back south to Port Franks. In the process, this resulting channel was used to drain the post-glacial lakes (now Thedford/Klondyke Marsh Area) named Lake George and Lake Burwell (Dixon, 1963). The last remaining lake, called lake Smith, was drained in the 1960s.

2.1.3 GENERAL SHORELINE DESCRIPTION

This section provides a description of erosion processes from a less technical perspective in an attempt to forge a link between the necessary technical findings of this study and the visual observations of shoreline property owners on the Great Lakes. Examples of both bluff and sandy shores are presented. A description of the shoreline specific to the region under ABCA jurisdiction is provided in Section 3.2.

2.1.3.1 Cohesive Shores (or the "Bluff Region")

In this section, some typical cohesive bluff shorelines are described. Representative examples have been selected from the shoreline of Lake Huron between Goderich and Kettle Point. Within this 80-kilometre length of cohesive till shoreline, the erosion of the bluff has varied from zero to 1.3 metres per year over the last 50 years. Three typical cohesive bluff shoreline profiles representing low erosion, medium erosion and high erosion are

described, followed by a discussion of the changes to these shorelines which occur as water levels change.

LOCATIONS WITH LOW EROSION

There are many sections of shoreline where there has been no significant recession of the bluff over the last fifty years. The face of these bluffs is covered by extensive vegetation, including mature trees. Fronting the bluff is a relatively wide beach, with a width between the waterline and the bluff of 10 to 15 metres (i.e. the "visible" beach). If one swims lakeward from the beach, one will observe that when the sand stops, the lake bottom is covered with rounded gravel containing occasional boulders. This is a "lag deposit" formed as the glacial till lake bottom has slowly eroded and left behind the coarser material (gravel and boulders) that it contained in its soil matrix. A schematic cross-section of this situation is shown in Figure 2.

During periods of low water levels, the beach becomes wider. The lower water level exposes more sand and there is less wave energy at the shoreline to transport sand along the shoreline. Sand will be blown by wind along the beach, particularly during fall storms, and a small dune of sand may form against the toe of the bluff. Swimmers will find that they can walk a significant distance offshore in the shallow water, and may have difficulty bringing boats to the beach without touching bottom. They will also notice the stony nature of the lake bottom offshore.

During periods of low or even average water levels, past landowners have built boat houses, storage sheds, small patios and walkways on the beach at the toe of the bluff to provide a base for beach activities. Frequently, steps have been built down the bluff face from the cottage to the beach at these locations. During periods of high water levels, the visible beach becomes narrower because it is covered by the higher water level. In addition, greater water depths under these conditions allow more wave energy to reach the shoreline. This results in an increase in the transport of sand along the shore, which may also reduce the beach width.

During storms at high water levels, wave runoff onto the beach may reach the toe of the bluff where small structures such as boat houses and patios have been built, and where small sand dunes may have developed. During these periods, small structures may receive considerable damage. In addition, the sand deposited against the toe of the bluff may be eroded and any vegetation on the sand lost.

Some landowners may feel threatened by this situation and, in response to this situation, have tried to build shore protection structures. Frequently, groynes are considered as it is perceived that if a beach can be developed similar to that which existed during low water periods, the bluff will be suitably protected. Some observations have shown that the bluff has not receded during the high water periods and the shore protection structures that have been built have prevented property damage (i.e. to buildings, etc.), not erosion of the shoreline. In other cases, a combination of structures has inhibited wave erosion, but has not slowed surface erosion, which is caused by precipitation and land drainage.

In these areas of low erosion, bluff stability may still be an issue. The shoreline and bluff was formed by wave action during a period of higher water levels prior to any recorded surveys. It is possible that the bluff last eroded during high water levels in the 1800s. The bluffs have remained relatively steep and are susceptible to sliding and slumping due to "land-side" influences such as an increase in surface or groundwater flow. There are reports of bluffs that have been stable for twenty years experiencing slump failures as a result of extreme rainfall. Clearly, landowners in areas of low erosion do need to be concerned with surface and ground water issues, such as agricultural practice, vegetation clearing, drainage, etc. regardless of water levels, wave action and shoreline erosion.

LOCATIONS WITH MEDIUM EROSION

There are large reaches of shoreline where the long-term average recession rate, measured over fifty years, is less than 0.6 metres per year. Typically, these bluffs have some vegetation, consisting of grasses, small trees and bushes. Fronting the bluff is a small beach, in the order of five to ten metres wide. If one swims lakeward from the beach, one will observe that the lake bottom consists of clay, as well as rounded gravels and some cobbles. The clay tends to produce a lot of sediment and the lake bottom may feel slimy and have a soupy consistency during wave action. A schematic diagram of this situation is shown in Figure 3.

Similar to the low erosion situation, the beach becomes wider during periods of low water and narrower during periods of high water. Also, residents may have built small structures at the base of the bluff during periods of low water levels.

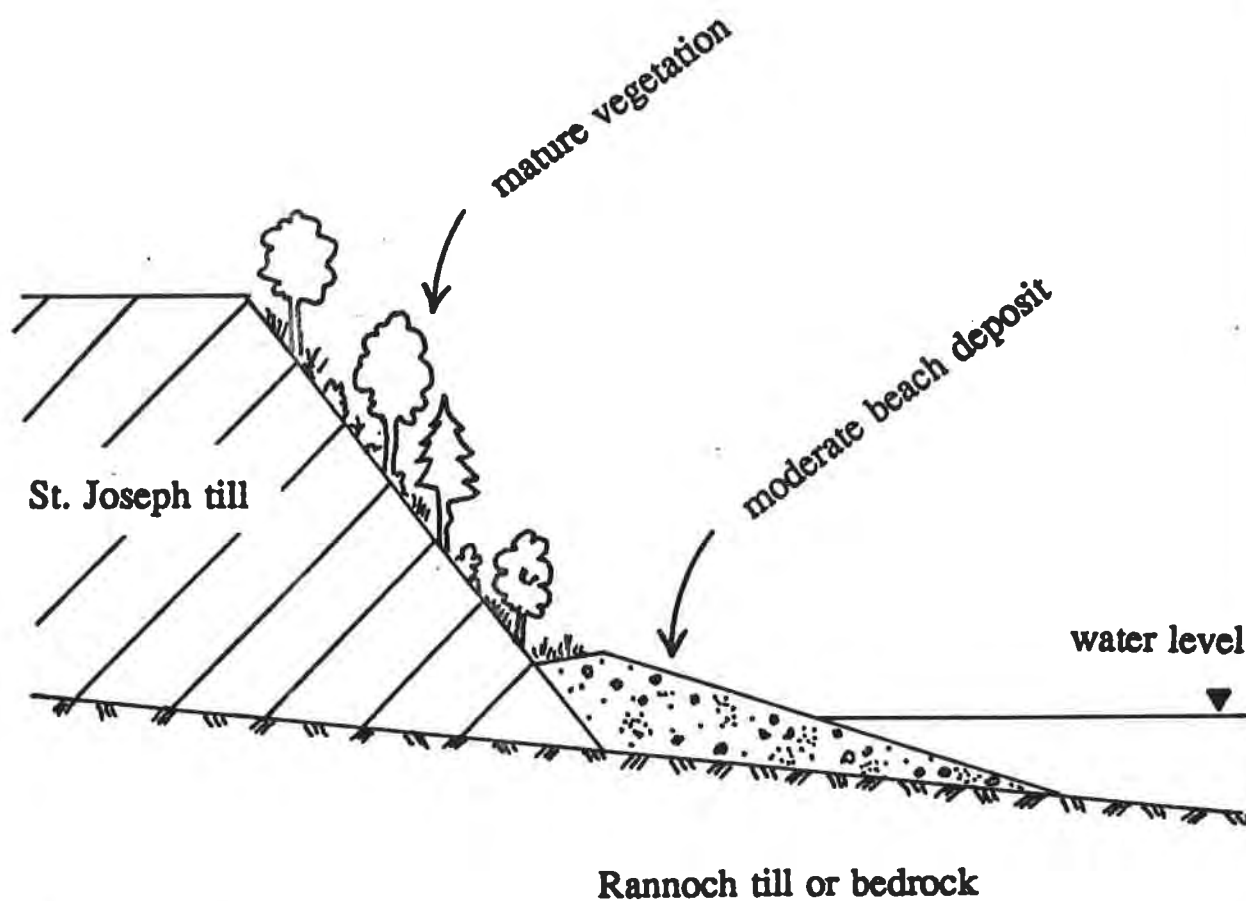
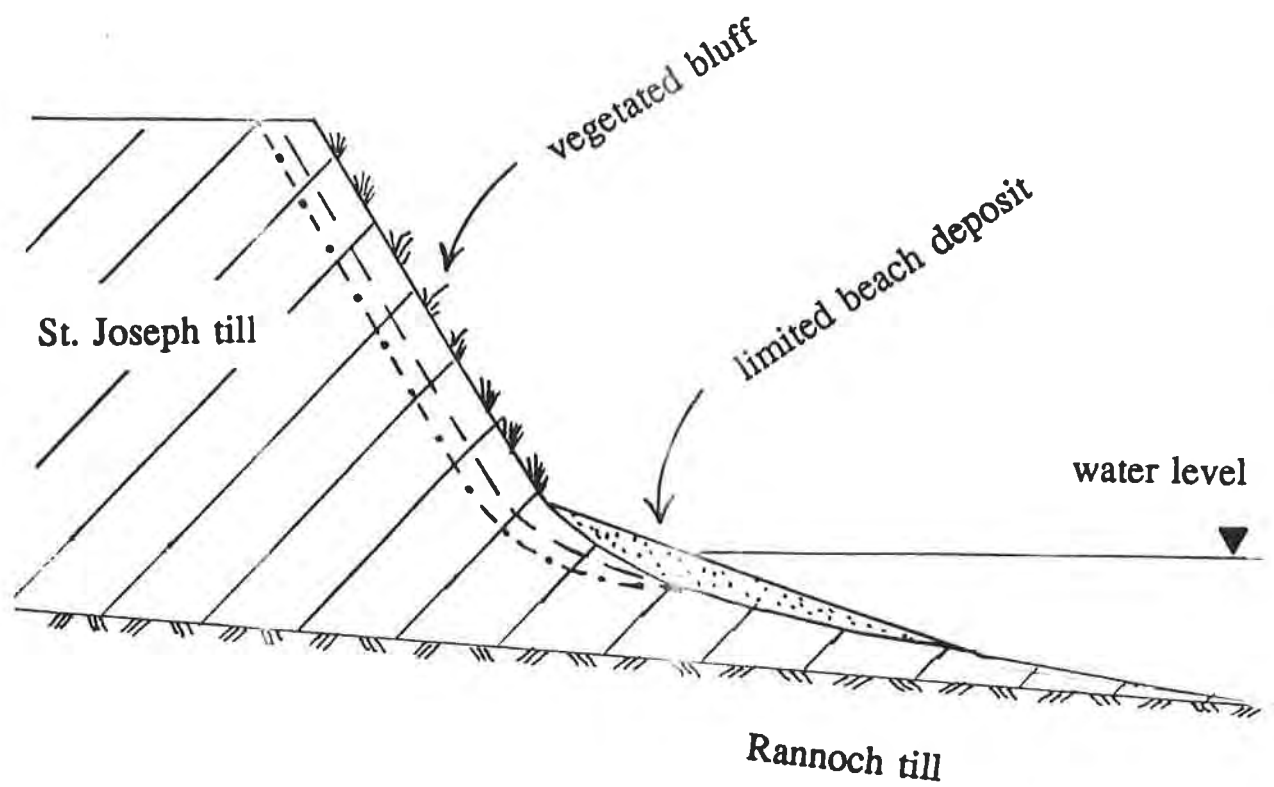


Figure 2: Low Erosion Schematic Cross-Section



not to scale

Figure 3: Medium Erosion Schematic Cross-Section

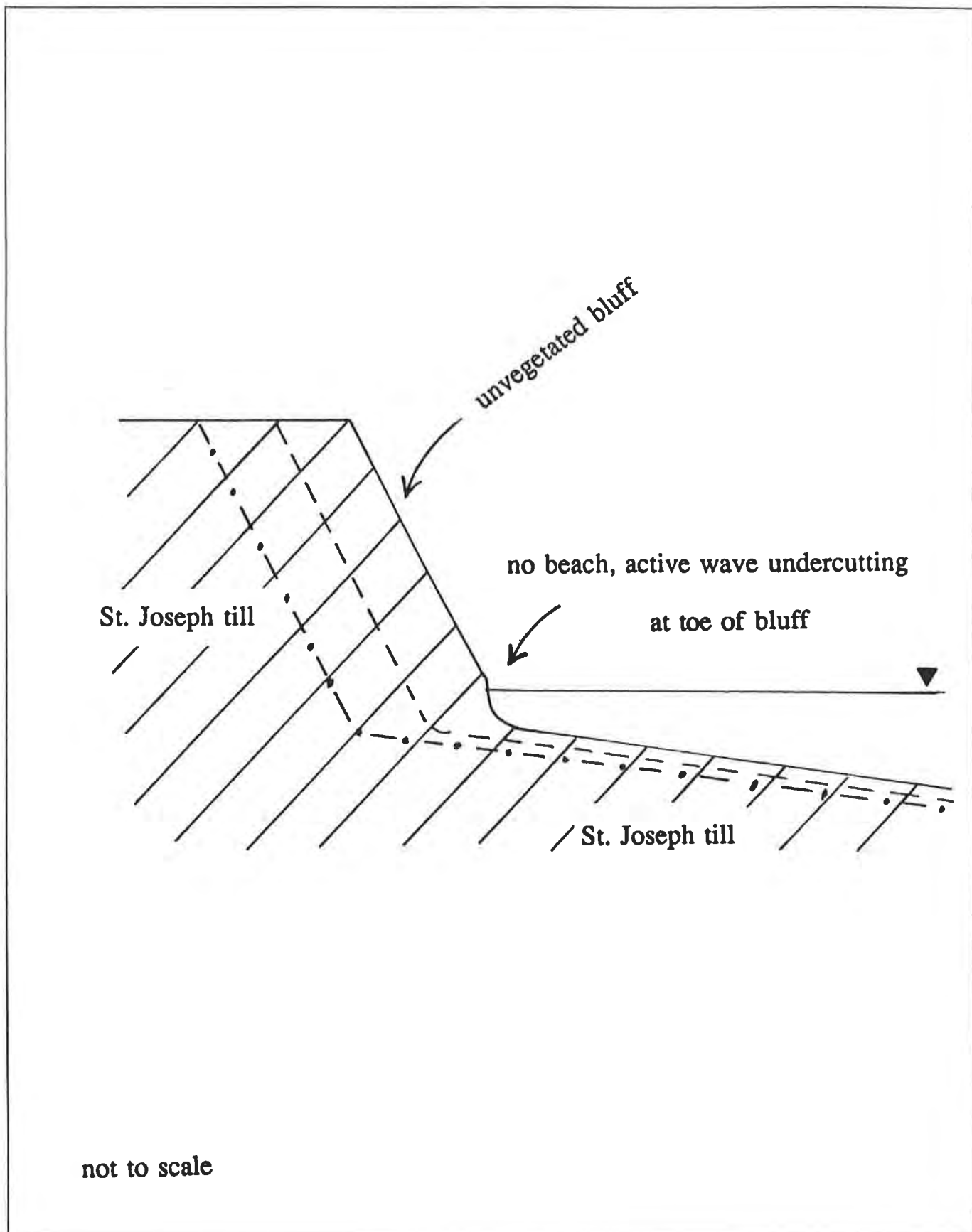


Figure 4: High Erosion Schematic Cross-Section

During periods of storms and high water levels, the beach may effectively disappear, only to reappear again once conditions return to normal. Regardless of whether some beach remains in place, wave runup reaches the base of the bluff. Some minor undercutting of the bluff may occur, often leading to limited slumping of the bluff. Other contributing factors to bluff erosion may include surface runoff, groundwater flow, seepage and freeze-thaw action. In general, the resultant recession of the bluff is not large, and only occurs infrequently, principally during storms during periods of high water level (for example 1973-76 and 1985-86). It is important to realize, however, that the nearshore lake bottom adjacent to and under the beach is continuing to slowly erode regardless of the water level and would eventually lead to bluff erosion.

Bluff stability is a greater issue in this situation than in the low erosion situation. The bluff recession that does occur tends to limit the growth of vegetation on the bluff and maintains a steep bluff base. Both these issues make the bluff more susceptible to major slumping with increased loading from larger groundwater flow. Given that higher water levels on the Great Lakes also result from increased precipitation, there may be an indirect correlation between high water levels and increased bluff failures.

In order to stabilize the bluff, many landowners have attempted to stop wave action from reaching the toe of the bluff by building some form of shore protection at the toe of the bluff. In general seawalls and revetments are utilized and are typically constructed of concrete rubble, gabion baskets, steel sheet piling and quarried stone, although other materials and types of structures have also been used. Commonly, these structures have been built in spite of the fact that the nearshore lake bottom in front of the structure will continue to erode and eventually undermine the structure.

However, because the erosion of the nearshore lake bottom in these areas is relatively small, effective protection to the shoreline may be achieved for a period of time. If, in 20 years, the shore protection is to be replaced, it will require a larger structure because of increased water depths resulting from the ongoing erosion of the nearshore lake bottom.

LOCATIONS WITH HIGH EROSION

There are a few reaches of shoreline where high erosion — reaching a long-term average recession rate of 1.3 metres per year — has been experienced over the last fifty years. The bluffs have no vegetation cover and major slumps of the bluff are visible. In front of the bluff may be a very small beach, but frequently there is no beach. The water in front of the bluff is often very turbid because of the suspended sediments and during wave action has a very soupy consistency close to the lake bottom. The water depths close to the shoreline are noticeably deeper than in the other two situations. The lake bottom consists of exposed till with very little gravel or other more resistant material. A schematic cross-section of this situation is shown in Figure 4.

During periods of low water levels, a small beach may exist or the till bottom may be exposed. However, in either case, wave runup reaches the toe of the bluff. During periods of high water levels, the waves act directly on the bluff, leading to undercutting at the toe of the bluff, oversteepening of the bluff face, and ultimately failure of the bluff.

In most areas where high rates of erosion occur, the shoreline has, for obvious reasons, not been developed. The design of shore protection structures in such areas must make allowance for the continuing erosion of the nearshore lake bottom, which may be occurring at rates of five to ten centimetres per year (vertical downcutting rate). As a result of this irreversible process, the water will get deeper and the wave action at the shoreline will become larger over time. Consequently, any structure designed to stabilize the shoreline in areas subject to severe erosion will have to be a very massive and costly structure. In many instances, the cost of construction of such shore protection will not be compatible with the value of the land to be protected.

2.1.3.2 Sandy Shores (or the "Dune Region")

The processes which lead to erosion and deposition on sandy shores are related to the action of both water and wind. There is a wide range of beach conditions along this shore, from the wide and shallow beach at Ipperwash Beach (featuring several offshore sand bars) to the slightly steeper beaches to the north (i.e. Port Blake and Maple Grove). The beaches fall into the category of mainland beach and file beach. Almost all of the beaches in this area have historically featured wide and healthy backshore dunes. Many of these dunes still exist in

their natural state; however, in some cases, buildings have been constructed on the dunes, and in other places, the dunes have been partly or entirely removed.

2.1.3.3 The Dune - Beach System

As we develop a better understanding of nature, we realize the delicate balances involved in natural systems. Beaches are no exception. Waves generated during storms naturally erode the beach. At the beginning of a storm, waves will be observed to break very near the beach during larger storms as sand is removed from the upper part of the beach and deposited offshore. The sand that is deposited offshore helps to build up the height of the offshore bars. As the bars build during the storm, creating shallower depths over them, the waves will tend to break further offshore on these bars instead of closer to shore. Once the bars are able to intercept the waves in this manner, the erosion near the shoreline will be reduced. In this way, the natural beach has a built-in protection system, and erosion of the upper beach is a good indication of a healthy system at work. Smaller waves which follow in the hours and days after the storm will slowly reconstruct the beach, moving sand from the offshore bars back onto the beach. In general, smaller waves tend to cause the movement of sand towards the shore and larger waves cause offshore transport.

From the above explanation, it may be clear that storms which occur at higher water levels will lead to even greater erosion. As the water level rises, the offshore bars become less effective at intercepting the waves before they reach the shore. Owing to the magnitude of the water level rise in 1985 and 1986, a very large amount of sand was removed from the beach and the dunes to build up the offshore bars to intercept the waves. When there is not enough sand on the upper beach to build up the bars sufficiently, the waves will begin to erode the dunes. The backshore dunes are, in effect, a secondary reserve of sand that is withdrawn only at times of severe storms and especially at high lake levels. As observed in 1986, the dunes will continue to erode over several storms; this is because the duration of a single storm is not sufficient to build up the required offshore buffer to the waves. However, if the high water levels had continued to persist, the beach would eventually stabilize — at least to the extent that only normal erosion would occur during storms (i.e. erosion of the upper beach and not the dune face). Again, in time, the eroded sand from both the dune and the beach will be replaced by natural processes. While the beach may recover quite quickly, the dune may take some time to build up again and this may not occur substantially until water levels are lower. The dune rebuilds through the transport of wind-blown sand and the wider beaches associated with periods of falling water levels are required to provide ideal conditions for dune regeneration.

During periods of falling water levels, as occurred in the years following 1986, the water appears to be very shallow for some distance offshore. One is able to wade much further offshore than normally. This is because the wader is walking on the offshore buffer that nature constructed to protect the shore; as noted, in time this sand will be returned to the upper (above water) part of the beach.

The cycle of dune-beach erosion including a severe erosion event at a peak lake level is depicted in Figure 5. During pre-storm or average conditions, small waves break over the inner bar. There is a wide upper beach and healthy vegetated dunes. At the beginning of a storm at a very high lake level, the waves break violently very close to shore, causing erosion of the upper beach and dune. The eroded sand is deposited offshore, building the bars. Later in the storm, the waves break over the elevated bars. The active beach zone limit corresponds to the maximum extent of erosion. As the water levels return to average, the bars begin to migrate onshore, bringing sand back to the beach. Also, wind-blown sand will rebuild the dunes. Eventually, the beach will return to its original form and the cycle is completed.

Exceptions to this general description of the dune-beach system can arise. At some sites, the erosion of relict dunes (i.e. dunes which are not actively building) may be followed by very slow or incomplete recovery. Also, at sites where the sandy supply has been depleted by updrift littoral barriers (e.g. harbour structures) the recovery may again be incomplete.

Shore property damage occurs where landowners have inadvertently constructed houses, boathouses, etc. within the active beach zone. Along much of the Bosanquet Township shoreline, dwellings have been constructed behind the first row of dunes are the fringe of the active system. The high water levels of 1972 and 1986 caused the upper beach to respond in a manner which brought it close to the inshore limit of its active range of positions.

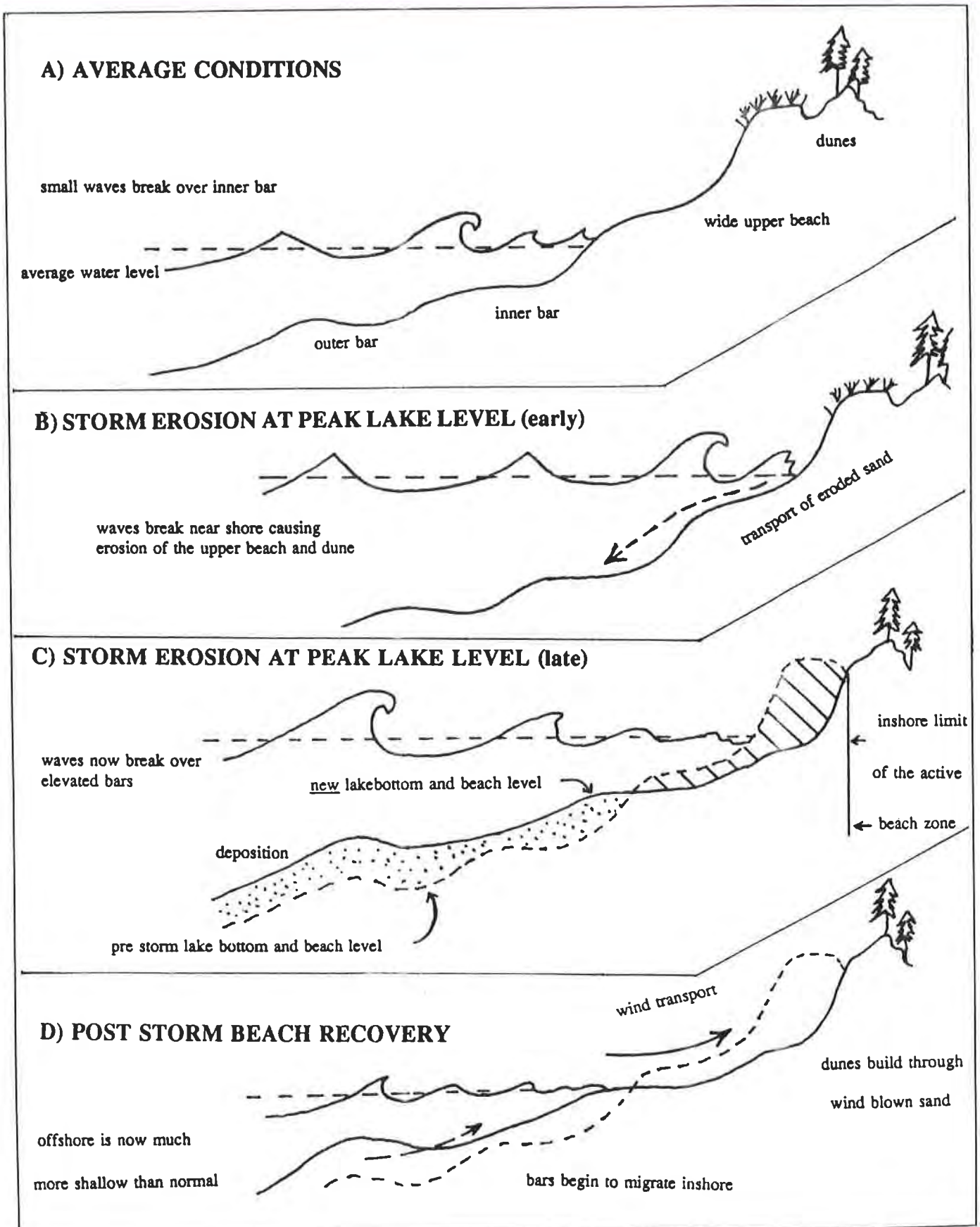


Figure 5: Cycle of Dune-beach Erosion

Shore protection that may have been constructed in response to storms at more normal lake levels was found inadequate at the record high lake levels. Since the shore protection, in the form of various walls and sloping revetment, denies the offshore part of the beach the buffer sand it requires (by eliminating or reducing erosion), large waves are able to continually strike the shore. Under these conditions much of the shore protection was either damaged or destroyed. However, even where shore protection exists, the beach will eventually rebuild. The speed at which the beach recovers will be greater in front of sloping shore protection; beach rebuilding is slower in front of vertical walls.

An example may be considered to demonstrate the importance of storm surges. Generally, in the months of October and November many damaging winter storms occur before the shore ice has had a chance to build up and protect the beach. In October of 1986, the level of Lake Huron was almost one metre above the long-term average for that time of year. However, the peak lake level during a storm is also partly due to the storm surge. During the October storms of 1986, the peak lake level probably reached 1.5 metres above long-term average levels (0.5 metres from storm surge and one metre due to the average lake level conditions).

2.1.3.4 Alongshore Sand Transport or Littoral Drift

In the above paragraphs, the discussion relates to the movement of sand in a direction perpendicular to the beach — in other words, in an onshore-offshore (or cross-shore) direction. Sand also moves along the shoreline (i.e. parallel to the shore); and this is often referred to as littoral drift (or alongshore transport). In a natural open beach situation, the existence of alongshore sand transport is less noticeable than the erosion caused by cross-shore transport (as discussed above). However, where either a natural or artificial obstruction to alongshore transport exists, sand will build up on the incoming (or updrift) side of the obstruction. Probably the most commonly observed example of this phenomenon is the sand build-up on one side of a groyne. The direction in which the sand moves along the beach depends on the approaching direction of the waves. On average through a year, there may or may not be one predominant direction of transport.

At locations where there is a dominant direction of sand transport (as is the case along the ABCA shoreline), the continual supply of sand from updrift is essential to the stability of the beach. This transport occurs along the shore and to distances well offshore (especially over bars) and is generally invisible to the human eye. Erosion problems arise when the alongshore sand transport is blocked to some extent. While there may be a build-up of sand on one side of a groyne, there may also be erosion over some distance on the other side of the groyne. Problems of a much larger scale occur where very large piers or jetties have been constructed to protect harbours. (Refer to Section 3.2.5, "Goderich Harbour Analysis")

Section 2.2 WHAT IS A SHORELINE MANAGEMENT PLAN?

The overall objectives of a SMP are to develop and support solutions to current and future problems and issues along the shoreline. A SMP will:

- i) strive to minimize risks to life, property damage and social disruption by preventing storm-related damage to residences from flooding, erosion, storm damage, and bluff failure at the shoreline and suggesting protection of sections of the shoreline where existing development exists,
- ii) prevent new development in areas susceptible to significant lakeshore hazards,
- iii) strive to bring about improvements to the environment and the quality of life in the area,
- iv) be a background document for economic development in the region, and
- v) provide a framework for the wise management and use of shorelands so that future generations enjoy an improved quality of life, both environmentally and economically.

As discussed by Baird (1991) in a discussion paper on SMPs, these objectives are not unique to a SMP and they are, perhaps, the general objectives of many forms of official plans. There are many plans, policies and regulations developed by many different levels of government that apply in some way to the shoreline. Frequently these documents have been prepared in isolation. A SMP can integrate the principal concerns of the public that

relate to the shoreline, as well as the adjacent land and water areas, into one comprehensive document to be adopted by all levels of government. As a consensus plan, the document should be supported by the public at large, and be subscribed to by all levels of government and all interest groups having jurisdiction over, or having an interest in the area.

The objectives of a SMP are not complex and are largely a matter of common knowledge. As stated in the MNR Guidelines for Developing Shoreline Management Plans (MNR, 1987), the objectives are prevention, protection, emergency response, public information, environment and monitoring. However, the development of a consensus plan may become complex because of the technical issues involved and because of diverse and conflicting demands put on the use of the shoreline by different groups. The development of a plan must aim for clarity and simplicity in the final product. The implementation of a plan requires the support of all levels of government, achieved by full participation at all stages, and the resolution of conflicts in open debate. Implementation will be achieved by fitting the plan into the existing structure of policy, regulations and acts that govern activities in the areas adjacent to the shoreline.

The conclusion that is being drawn by those agencies developing SMPs is that while specific issues are important and should be addressed in detail, in the long term the well being of the ecosystem of the watershed adjacent to the shoreline should be improved and enhanced for the overall benefit of the community.

At an early stage in the program it was agreed that effective representation from both the counties, all seven municipalities, MNR offices and cottage associations would be needed to provide the views and concerns of the lakeshore stakeholders. A steering committee was formed to oversee the project and to provide direction. This committee was made of up two groups: the Project Committee representing the direct owners of the shoreline, and the relevant municipalities, with each having equal vote on the committee, and the Technical Committee which represents the other regulatory bodies which currently exist for the lakeshore. The Project Committee was formed with representation from each of the seven municipalities, from four cottage associations, and from the Pinery Provincial Park (MNR). The Technical Committee was formed with representation from Huron County Planning Department, Lambton County Planning Department, Huron County Public Health Department, Ministry of Natural Resources (Chatham, Wingham and Aylmer Offices as well as the Lands and Water Policy Section, Toronto), Maitland Valley Conservation Authority, and the St. Clair Region Conservation Authority (refer to acknowledgement page of this report). The wide representation on committees was intended to provide a diverse background for comments on the creation of the plan.

Specific issues for the ABCA shoreline are discussed in the following section. The principal focus of the ABCA shoreline management plan is to address the danger to life and property damage that may occur during severe storms, particularly during periods of high lake water levels, through preventative means as well as protection. In doing so, it must consider processes, in particular shore erosion and long-term recession. In addition, a wide variety of lakeshore users, landowners, government agencies, and non-government organizations (NGOs) were polled during public meetings (July 20, 1990 and July 26, 1991 at the Stanley Township Complex), and their input on lakeshore processes and management issues was requested in subsequent mailings.

These issues identified through public consultation were collected and ranked by the SMP Steering Committee (see Table 1, ABCA Shoreline Management Issues), and form the scope and priority of issues which are included in the SMP.

Section 2.3 SPECIFIC ISSUES

The issues specific to the shoreline within the ABCA jurisdiction, as determined by the Steering Committee of the SMP, are discussed below and illustrated in Table 1. They cover a wide range of topics and include those listed as components of a SMP by the MNR guidelines.

Although the scope of the SMP was broadened as much as feasible to include the issues relevant to this specific Lake Huron shoreline, priorities were necessary to reflect the mandate of the Conservation Authority and limitations in project funding. As a result, the topics or issues are prioritized into high, medium, and low priority issues. High priority issues will result in new initiatives being proposed through the implementation of the SMP and support given to existing applicable policies or regulations. Medium priority issues will consider new initiatives, however the emphasis will be on supporting existing policies. Low priority issues will be included within the plan,

however no new specific initiatives are proposed. It should be noted that the high degree of overlap between issues and the intended approach to dealing with them through implementation of the SMP may result in many of the low priority issues being dealt with indirectly.

The issues are explained in the following sections and their priority in the SMP is indicated.

Table 1: Shoreline Issues

RANKING OF ISSUES

DETAILED ISSUES (Identified and sorted by issue heading)	GENERAL ISSUES	OVERALL OBJECTIVE	GOAL	SHORELINE MANAGEMENT PLAN (SMP) RESPONSE (Priority)
Storm damage <ul style="list-style-type: none"> • water levels • frequency of occurrence of storms • prediction of occurrence of storms • setbacks • right to protect land • ownership • relocation of structures 	Property and Shoreline Damage Threat to Life Loss of Land	Storm Damage Response (short term)	Prevention of Damage	New Policy Setback Areas Identified High
Structures <ul style="list-style-type: none"> • water levels • design methodology • maintenance of structures • adverse impacts of structures • cost • ownership of structures • recreation on beach • access impacts 	Erosion of Bluff (loss of land) Erosion of Beach (loss of sand)	Shoreline Stabilization (long term)	Protection/ Stabilization of shoreline	New Policy Areas identified High
Access <ul style="list-style-type: none"> • beach use (swimming, picnicking, viewing, camping) • ownership • noise • impact on private cottagers 	Adequacy of access for protection installation and maintenance, for marine emergency situations, for building relocation and for pedestrian access.	Access (to lake and shoreline)	Increase or Improve General Access	New Policy and support existing Medium
Development <ul style="list-style-type: none"> • road closings • beach use • beach ownership • zoning changes • water levels • stormwater management • cottage conversion/additions • septic tank servicing • standards for structural changes • land prices • strip development 	Lake access Bluff erosion/shoreline damage Water quality Development considerations	Regulation of Shoreline Development	Improve the Planning of Developments (prevention)	New Policy and support existing Medium
Environment <ul style="list-style-type: none"> • development control • dredging/dredge disposal • bird migration • Kerner Blue butterfly area • fisheries • wetlands • sand dune systems • woodlots • zebra mussels 	Degradation of the Environment Water quality Loss of habitat Loss of environmentally significant areas	Regulation of Shoreline Development	Improve the Planning of Developments (prevention)	New Policy and support existing Medium
Water Use <ul style="list-style-type: none"> • marina capacity • boat launches • storm warning • storm refuge • boat holding tanks and pumpout facilities • noise • bank erosion 	Lack of access to and use of Lake Huron	Water Dependent Activities	Increased Access to Water Dependent Activities	No Specific Initiative Support existing policy Low
Green space <ul style="list-style-type: none"> • wilderness areas • trails • park areas • tree planting • heritage issues • historical issues 	Lack of recreational facilities Lack of maintenance of public areas Lack of improvements to public areas	Recreational, Aesthetic and Environmental Improvement	Improved Quality of Life	No Specific Initiative Low
Economy <ul style="list-style-type: none"> • maintain share of tourist \$s • municipal taxes from shoreline properties • business park planning 	Economic future	Economy of the Region	Vibrant Economy	No Specific Initiative Low

2.3.1 STORM DAMAGE REDUCTION (HIGH PRIORITY)

Storm damage reduction and any threat to life is a primary objective and has been given high priority in this SMP. The principal hazard along the northerly section of this study area is bluff instability and future bluff erosion, and the threat they pose to existing residential structures built close to the top of the bluff. The hazard along the southerly section is the dynamic nature of sand dunes and their proximity to the adjacent residential development which has been built within this dynamic zone.

The issue of shore protection from storm damage is a common objective of shoreline management. In a discussion of coastal management alternatives for reducing storm impacts, Wood (1990) concludes that "management alternatives for reducing storm impacts at a coast should have the following objectives:

- a) to protect life and property from loss due to direct and indirect storm impact effects. This objective may be met through the concept of delineated risk-related zones;
- b) to transfer the economic costs of storm-related loss in designated risk zones from the federal and state (provincial) taxpayer to the property owner at risk;
- c) to discourage or prohibit inappropriate development from occurring in designated risk zones; and
- d) to encourage improvements in redevelopment practices (e.g. the review of variances to existing land use planning criteria) in designated high risk zones".

This plan responds to all four objectives stated above. Mapping of erosion prone areas and the development of setbacks are included in the mapping section (see Section 3.1). Setbacks for new development were calculated from analyses of historical shoreline change, and setbacks based on lake flooding effects were also completed. These setbacks are further discussed in Section 3.3.

2.3.2 SHORELINE STABILIZATION (HIGH PRIORITY)

This issue is the loss of land that is naturally occurring in some areas due to shoreline erosion, and that is particularly severe during or after extreme storms which occur during periods of high lake water levels. The previously discussed issue of storm damage may be encompassed, in that if the shoreline is stabilized, storm damage to property may also be eliminated. This is, however, unlikely due to the impracticality of stabilizing long reaches of unstable shoreline and the impact this may have on the overall sediment budget of the littoral cell.

Shoreline stabilization is an issue in most urban areas adjacent to the Great Lakes shorelines. Shoreline stabilization has tended to be undertaken when the value of the land and municipal infrastructure being lost by erosion exceeds the value of structures required to stabilize the shoreline.

In many areas of the world, where the shoreline consists of a large sand beach on which the economy and way of life of the region depends, very specific shoreline management plans have been developed to stabilize the beach. For example, significant effort is given to stabilizing and maintaining the beaches of Florida and the Gold Coast in Queensland, Australia. At a smaller scale, the Village of Grand Bend is also seeking advice as to how best to manage the sand along its beaches.

Along this section of Lake Huron, the shore and bluff erosion that has occurred in the past has been identified to be a part of a process that includes and has an impact on a much larger area. The eroding shores and bluffs provide a supply of sand and gravel to the nearshore system. This material is transported alongshore by wave action, and results in a narrow beach along the shoreline. This beach provides a valuable recreational resource, and provides a degree of natural protection to the bluff. Alongshore transport continues to carry the sand towards the south, where it is finally trapped in the Grand Bend/Pinery/Ipperwash beach area. The new sand that arrives at this location replaces natural losses of sand from the beach system (such as wind-blown transport to the dunes and offshore transport to deep water), and assists in maintaining this complex feature. This overall process is the subject of the recently completed Lake Huron Shoreline Processes Study (Reinders, 1989). Clearly, if the shoreline erosion is stopped and the supply of sand eliminated, the consequence of increased recession of the southern sand beaches and dunes must be considered.

This SMP addresses shoreline stabilization by describing design considerations for structures to protect the shoreline and procedures for supplying alternative sources of sand to the shoreline, also known as beach

nourishment (see Section 3.4). It should be noted that effective long-term protection to a shoreline is a complex technical issue, as is a procedure for artificially supplying sand to the shoreline. While these are achievable objectives and there are many precedents for these solutions, the cost and difficulty in implementing and maintaining these solutions would be major considerations.

2.3.3 ENVIRONMENTAL PROTECTION (MEDIUM PRIORITY)

Environmental issues are seen as a secondary focus of this SMP. While very important to the region, environmental issues are addressed by emphasizing existing regulations and policies as they affect the shoreline and not by developing new regulations. As such they are considered to be secondary issues.

Environmental protection is the objective of many levels of government and is the subject of numerous acts and regulations which relate to the shoreline and adjacent land and water areas. The objective in this document is to identify and inventory environmentally sensitive and significant areas (see Figure 6), and to ensure their protection possibly through zoning regulations, restrictions on development and construction, and possibly the purchase of hazard lands where feasible and when they become available. This includes highlighting the policies described in existing acts that are intended to protect the shoreline environment. Environmental protection with regard to the shoreline is a policy of the MNR, as stated below:

"to ensure that existing and future shoreline land use recognizes the coastal process which take place in the coastal zone and consider the impact to the coastal ecosystem and the principles of sustainable development". (MNR, 1993).

Resources such as fish and wildlife habitat, fish spawning areas, habitat for birds during migratory fly-overs, wetlands, beach/dune systems and woodlots are all important to preserve and enhance where possible. An example of environmental protection through existing legislation is taken from the Fisheries Act, regarding fisheries habitat. It has the objective of a net gain of productive capacity for fisheries resources, guided by a "no net loss" principle. Thus, any proposed development which may adversely affect fish habitat could be rejected, or possibly accepted if suitable mitigation is provided (i.e. habitat replacement).

A secondary role can also be achieved if the SMP is viewed as a document to encourage habitat development and creation. The maintenance or establishment of green corridors along the lakeshore and along gulleys will enhance many aspects of the environment including fish and wildlife habitat and water quality.

2.3.4 WATER QUALITY (MEDIUM PRIORITY)

More than 90 percent of the ABCA watershed is agricultural and therefore a principal concern with regard to the environment is water quality, which is dictated at least in part by agricultural use. Water quality was a primary concern of cottage residents who were polled by ABCA staff during public meetings and open houses on the topic of lakeshore processes and management. For this reason, water quality is discussed separately in the following section.

The issue of water quality was identified by almost every group responding to the ABCA inquiry. Specific concerns include agricultural runoff into rivers, streams and the lake, contamination from septic systems, and the water quality in the Ausable River at Grand Bend. Agricultural runoff is a continuing issue with the Authority and extends the scope of the SMP beyond the shoreline to include the adjacent upstream areas.

With respect to septic systems, new systems are regulated by the Ministry of the Environment and Energy (MOEE) (through approvals given by the Public Health Department in Huron County or an agent acting under the auspices of MOEE in Lambton County). However, existing systems which were installed before these regulations, or which have deteriorated, will have an effect on the water quality. Mandatory requirements for routine maintenance of these systems is one possible approach to ensure water quality standards are met (i.e. a maintenance certification program). Other approaches are being investigated through work being undertaken by the Clean Up Rural Beaches (CURB) Program, and through the Rural Servicing Study completed by Huron County (Huron Co., 1992).

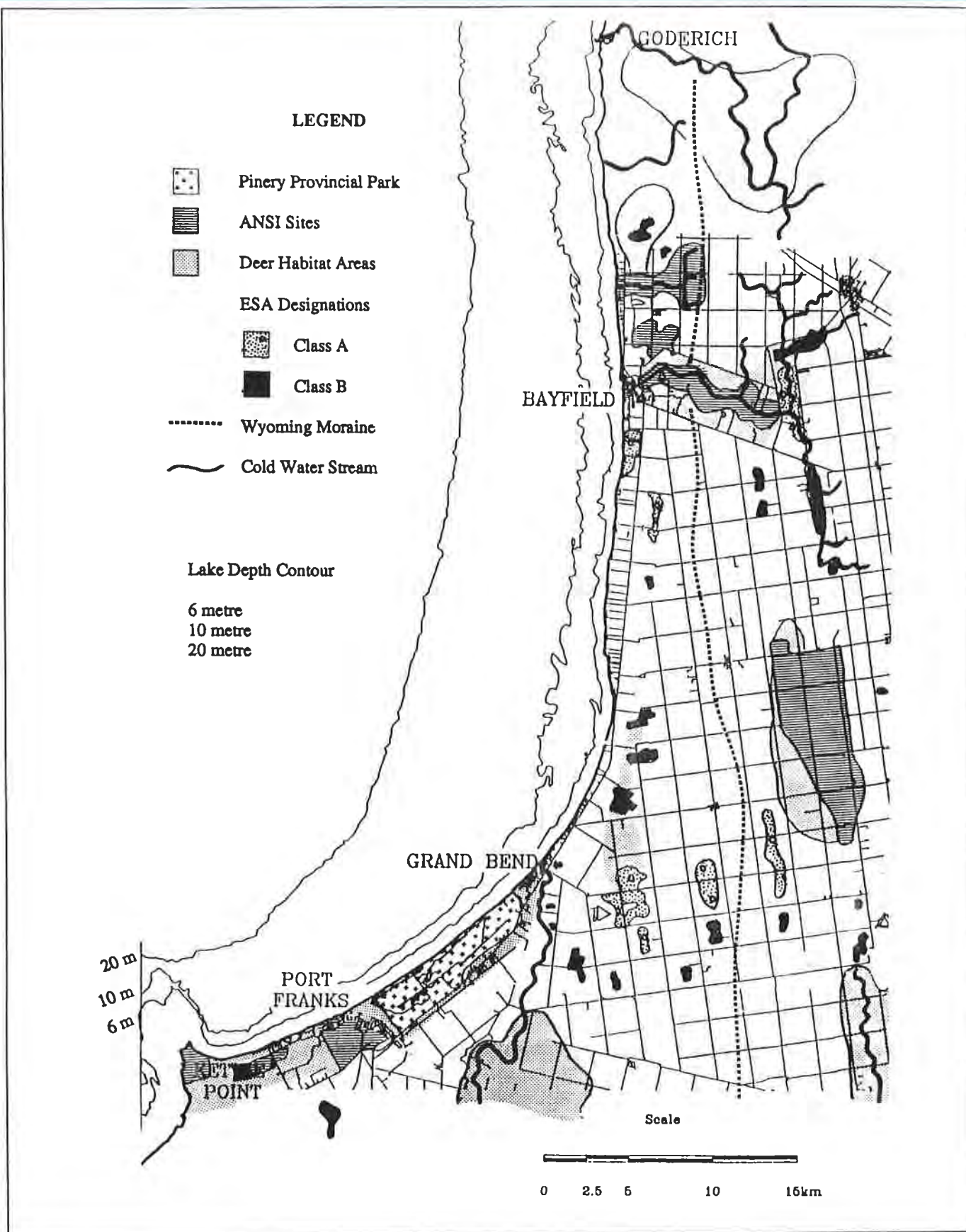


Figure 6: Environmental Features

2.3.5 DEVELOPMENT PRESSURE (MEDIUM PRIORITY)

The shoreline has an inherent attraction to development proposals planned for additional residential lots. As a result of the increased demand for such lots, an increase in activity has generally been found to occur in the number of such proposals. A preliminary review of such proposals, both recently and historically, has provided an overview of the number of potential and available lots for seasonal residential use along the shoreline region. Some of this increase in development activity, and the increase in the conversion of cottages to permanent homes, can be attributed to the extension of the Lake Huron Water Supply north along Highway 21 to service the shoreline. This pipeline, extended in 1989 and 1990 to include Hay and Stanley Townships, has provided an uninterrupted water supply to these seasonal areas. A concern now exists that existing septic systems may be subject to failure as a result of the increased water usage. As a result, and due to concerns of the cumulative impact of new systems, the MOEE implemented a pause in 1990 on all new residential development which relies on individual septic systems for sewage disposal. In cooperation with MOEE and as a result of the Ministry's concerns, Huron County Planning Department completed a Rural Servicing Study (Huron County Planning and Development Department, 1992) to provide direction for the County on this issue.

In addition to the increased development pressure found in the cottage areas of the shoreline, the communities have similarly experienced development pressure. The Village of Bayfield may be the exception to this trend; however, this may be controlled by the lack of land available for expansion. The adjacent lands of Goderich Twp. and Stanley Twp. have undergone limited development (i.e. Harbour Lights Development Ltd. to the north and the Robinson and Smith subdivision proposals to the south).

The hamlet of St. Joseph has undergone considerable change both within the existing community framework and east along Highway #84. An attempt was also made in 1987 to expand the "urban" designation within the secondary plan southward to include the Bayview Subdivision area. If successful, this would have permitted, or recognized, the year-round use of the residences in this area and effectively extended the boundary of the hamlet south by 1.5 kilometres. The application for an official plan amendment was denied and an appeal was never filed.

Grand Bend and the adjacent area within Bosanquet Twp. has perhaps undergone the most development with regard to new subdivisions and multi-unit developments. The construction of the condominium complex on the beach is the most notable development in recent years, and likely also the most controversial. In addition to this intensive development, the area south within Bosanquet Twp. has had proposals for the establishment of approximately 800 residential lots for future development. The Village has expanded the urban boundary in 1993 to incorporate parts of Bosanquet and Stephen Townships as part of the boundary adjustment application it submitted. Sewage treatment to this area is also being reviewed to anticipate the need for expansion of the existing facilities.

Port Franks and the surrounding areas have had a smaller number of development proposals. A trailer park/modular unit park was built in 1991 along Northville Crescent. This site, although not directly on the shoreline, is within the backdune region and is near an Environmentally Significant Area, known to contain habitat of the Karner Blue butterfly, an endangered species which is protected by the Endangered Species Act.

2.3.6 ACCESS TO THE SHORELINE (MEDIUM PRIORITY)

The issue of access to the shoreline focuses on three main factors:

- a) the physical constraints of the shoreline bluff and dune features and obtaining access over these features;
- b) the ownership of the shoreline (public versus private) and the constraints this can place on access;
- c) the existing density of development along the shoreline and the pressures for new development on vacant lakefront properties (what few remain), or expansion of development inland on adjacent areas.

There are a number of access problems related to existing lots. Many second-tier, vacant lots will require access to the lake once development occurs. This involves both legal and practical access to the shoreline. Areas such as Armstrong East cottage area have legal access by the unimproved road allowances, but gain actual access by boat by crossing the Ausable River.

The concept of increasing public access when new development occurs is a common approach in other management plans, and numerous examples in the U.S. can be found (Baird, 1991). However, more locally, the

question of private versus public access into cottage areas is currently being debated as an increasing number of development proposals are considered utilizing existing "private" roads. It appears that interpretation of both the Surveys Act and the Road Access Act is required to understand who may seek access over such roadways (Donnelly, 1991).

Access must also be considered to enable equipment to install and maintain shoreline protection, to access the lakebank for remedial drainage, tree clearing, and earth-moving for bank stability projects, and for use in relocating buildings. It is also needed for such marine emergencies as search and rescue operations and contaminant spill clean-up at beach level. (Environment Canada, 1994).

2.3.7 WATER-DEPENDENT ACTIVITIES (LOW PRIORITY)

The development of increased water-dependent activities (including commercial and sport fishing, recreational boating and swimming) is a low priority of the SMP. Physical access down the bluff for boat launching purposes was investigated by Hay Township Council in 1990. They determined that the existing road access at St. Joseph was the most appropriate location between Bayfield and Grand Bend and that the creation of a new access more suitable for boat launching in the vicinity was not economically feasible. The objective of this topic would be to support the development of water-dependent activities in a controlled manner that has economic benefits to the community, provides a service to the community, and protects the environment.

Much of the discussion regarding this topic is linked to the previous section regarding access. The SMP should recognize the existing policies and regulations of the various agencies such as Small Craft Harbours of the Department of Fisheries and Oceans and the Ministry of Tourism and Recreation, which reflect these common goals.

2.3.8 IMPROVEMENT OF "GREEN SPACE" (LOW PRIORITY)

The implementation of recreational, aesthetic and environmental improvements to the shore zone is not a primary focus of this SMP. However, the need to carefully consider the capacity of the shoreline to absorb increased residential development and the subsequent increased use of the shoreline resource is a medium priority of this Plan. The objective of this aspect of a SMP would be to improve the overall quality of life within the region by encouraging, supporting and regulating factors such as the following:

- development control (see Section 3.3),
- use of vegetative buffers between land uses,
- increased occurrence of "green space", especially in the form of linear corridors along the lakeshore and along the gully channels,
- regulatory controls over appropriate building setbacks,
- land designation for hiking trails, wilderness areas, etc.,
- improvements to public areas to provide quality recreation, and
- standards of environmental protection and promotion for all new development.

Statements such as clean, green and diverse, are part of the ABCA "Conservation Strategy", a document which guides the management of the entire watersheds for the next 25 years. Other SMPs in the United States recognize the importance of balancing economic growth with the maintenance of open space and scenic vistas (Baird, 1991). Similar recommendations have been made by the Royal Commission on the Future of the Toronto Waterfront in their recent report, "Regeneration"; they identify a number of key words to direct the future of Toronto's waterfront, including clean, green, usable, diverse, open, accessible, connected, affordable, and attractive (Crombie, 1992).

2.3.9 ECONOMIC DEVELOPMENT (LOW PRIORITY)

Although economic development is a low priority of this SMP, many authors of SMPs have noted that

effective shoreline management has been important to the economic development of a region. In addition to other specific planning activities designed to encourage economic development of a region, it is clear that successful communities will develop in areas where environmental protection is practised.

It is interesting to note that Travis (1990), in describing the experience of the San Francisco Bay Conservation and Development Commission, which has the objectives of preventing unnecessary filling and improving shoreline access and aesthetics, states that "environmental protection is the foundation of a strong economy". He attributes San Francisco's flourishing economy to the healthy environment in which it exists, and the quality of life it provides to its residents. Economic development can be encouraged by supporting the tourist industry, through the provisions of boating facilities and access to the shoreline, and by making the shoreline of Lake Huron an environmentally attractive area.

Section 2.4 COTTAGE COUNTRY - THE CHANGING DEMANDS

When a shoreline traverse was completed along Lake Huron in 1935 by a team of Ontario Land Surveyors (discussed in Section 3.1, Mapping), many of the areas were already shown as cottage areas. Cottage areas such as Egerton Beach, Stanley Twp., Beach O'Pines, Bosanquet Twp. and Turnbull's Grove, Hay Twp. were already being used for seasonal use. As noted in observations made by Authority staff and outlined in "Shoreline Management: A Conservation Authority Perspective" (Donnelly, 1990), the shoreline cottage community has undergone many changes. These changes include the following:

- a) The original cottages along much of the shoreline (typically single-storey, wood structures built on cement blocks or slabs) are being replaced with much larger, more permanent, year-round residences. The conversion of cottages to permanent use frequently occurs as they are re-built or renovated and such things as insulation and general "winterizing" occurs. This concept is not unique to the ABCA shoreline and is discussed further in Great Lakes Shore Management Guide (Strelchuck, 1981). This trend has been addressed by some municipalities in their development agreements for new Plans of Subdivision by the inclusion of a warning registered on title that the subdivision is within an area zoned for seasonal use and without a full complement of services by the Township. Further investigation into this issue needs to focus on the requirements of the building code which does specify a minimum criteria for seasonal cottage construction (Building Code, 1993 - Section 9.36), however with no maximum criteria to differentiate from permanent residences.
- b) The original cottage "communities" were often made up of families or extended families who had "gentlemen's agreements" or accepted arrangements regarding such things as access, beach use, communal water systems, and sometimes even lot line locations. The "family-style fabric" of these areas is quickly becoming obsolete and the need to formalize many of the previous arrangements now exists.
- c) In some cases, the original cottage areas were not planned for a more dense use of the area by residences (i.e. second and third row of cottages) all requiring access to the beach, road access to cottages, and additional space for septic field loadings into the subsoil.
- d) The original cottage areas were not planned with consideration for erosion of the lakebed and lakebank. The increased drainage methods of inland areas associated with more recent agricultural practice have not always been compatible with existing cottage development patterns.
- e) The original cottage developments had very little impact on the shoreline and on littoral drift due to limited technology for shore protection and a limited need for such protection. The municipal assessment criteria for properties within both Lambton and Huron Counties have recently been changed to reflect 1988 fair market assessment. This update, from 1980 and 1984 values respectively for the two counties, occurs periodically and generally increases the values in keeping with recent property value trends. As a result, lakeshore properties have recently experienced an increase in assessment (generally by approximately 40 percent). This factor, plus the

general increase in open market prices which this assessment increase reflects, will provide additional pressure on the desire to "protect" the land from the erosion forces of the lake, as well as additional pressure to increase services to these cottage areas.

In summary, because of increased population and greater disposable income, the development pressure along the shoreline is increasing and careful consideration of the capacity of this region to maintain such growth is needed. Such investigations as the Rural Servicing Study, completed by Huron County, and the standard review of Official Plans for all lakeshore municipalities need to be undertaken with these concerns in mind. Otherwise, it should be recognized that a long linear community from Port Franks to Goderich may result. Such a community would severely stress the shoreline resources and the result would be devastating if not carefully planned.

Section 2.5 PUBLIC CONSULTATION

Public and municipal input to the SMP were achieved using these four main methods:

- i) Public Meetings
- ii) Steering Committee
- iii) Publications
- iv) Open Houses

Public Meetings were held at the Stanley Township Community Centre on July 20, 1990 and July 26, 1991 to discuss shoreline issues and to introduce the initial concepts of shoreline management. More than 200 people attended each of the two meetings both held on Friday evenings to enable landowners — especially cottagers arriving at the lake for the weekend — the opportunity to attend. Those who attended were asked to list the issues which they felt were important and needed to be addressed in any subsequent shoreline management plan (see Section 2.2 and 2.3 for a discussion of these issues).

The inaugural meeting of the Steering Committee for the SMP occurred on December 11, 1990. Since that time the Shoreline Management Committee, which was composed of two sub-committees, (the Technical and Project Committees), met a total of 25 times to provide local knowledge, expertise, direction and advice on the creation and adoption of the SMP. The membership of the committees is listed in the acknowledgements section (page iv).

A direct mailing was sent in May, 1992 to the 2,500 lakeshore residents to advise them of the creation of a first draft of the SMP and where to obtain more detailed information. Second and third mailings (February and May, 1993) were sent to residents, answering common questions about the SMP and advising them of the completion of the second draft of the document. These mailings were supplemented by the creation of factsheets regarding shoreline matters (e.g. water levels, shore erosion and the history of the shoreline), news releases, and distribution of information packages (including the various drafts of the SMP) to each of the 65 cottage/ratepayers associations. The mailing also advised residents of the schedule of open houses planned for the summers of 1992 and 1993 (see Appendix C).

A total of five open houses were held at various locations along the shoreline, all on Saturdays throughout the summer in 1992, to display information, provide copies of the draft SMP and explain to residents the methodologies used to analyze the shore environment. More than 500 people attended these sessions and, when asked for written comments on the plan, more than 300 supplied such comments. These comments were considered by the Steering Committee, answers were provided where requested, and revisions made to create the second draft of the SMP released June 1, 1993, again for public scrutiny.

Two public meetings were held in June, 1993 to provide information and answer questions regarding the 2nd Draft. The document was first released to cottage associations/ratepayers groups on May 21, 1993 in a special meeting for group representatives. Both forums for information dissemination included a formal presentation which was not part of the program of the earlier 1992 open houses.

Considerable opposition to the SMP was encountered throughout the process. Initially, much of this opposition related to concerns about the information being provided, the intent of the SMP and how it would be implemented. However, it should be noted that the Committee has tried to address many of the concerns in

providing a final version of the SMP. The ABCA Committee has suggested changes which reflect the concerns of groups such as the Lake Huron Preservation Association, other lakeshore property owners and the lakeshore municipalities.

Extensive public involvement was viewed by the Steering Committee as being crucial to the success of the project. The Committee recognized the need to raise the level of understanding of shoreline residents to the natural processes occurring along the shoreline, to raise the awareness of lakeshore residents as to how their individual property fits into the overall shoreline system, and to improve the level of detailed information contained in the SMP by consulting long-time shoreline residents. Their assistance in bringing new information to the SMP and verifying the results of analysis completed throughout the SMP was invaluable.

Section 2.6 SHORELINE OWNERSHIP

Until June of 1990, the entire Lake Huron shore in Huron County was considered by MNR to be public property because the original patent to the Canada Company specifically reserved to the Crown all beds of all navigable waters and portions of the banks of navigable waters. As further discussed in Section 4.2.5, the Chilcott decision in June 1990 determined that certain letters patent issued by the Crown to the Canada Company are "void for uncertainty" (Chilcott, 1990). This decision specifically dealt with the north beach (between Main Street and the Ausable River mouth) in the Village of Grand Bend and is a site specific ruling. The beach at Grand Bend is an accretional feature (termed a "filet beach") formed almost entirely due to the construction of the harbour protection. The only other similar filet beach in the study area lies to the north of the Bayfield harbour protection and is assumed to be in private ownership.

Due to the varying interpretations of Crown reserves and patents, it is imperative to examine each one individually to determine the ownership status of a specific lot which includes the foreshore region. There is a need to determine if any reservations are stated and if those reservations can be determined. Next, the village or township survey needs to be reviewed to determine if the lakeward border of the survey is a straight line or irregular, matching that of the irregular nature of the shoreline. Surveyors' notes, if available, can also assist in determining if a reserve was indicated along the shore. Then the individual property title must be examined to assess if the title is subject to a right-of-way or easement in favour of a third party (Strelchuck, 1981) (Winter, 1991).

The research described above will assist in determining where the lakeward boundary of the lot is located. However, additional factors need also be considered:

- i) If the property is truly riparian and extends to the water's edge, then it will accrete and recede with the water level changes. Another term for this is an "ambulatory property line".
- ii) The definition of "high water mark" is not clear in legal documents, and could have a number of different interpretations including "water's edge" (also known as "wet bank") and "mean high water mark" (also known as "dry bank").
- iii) The title to a property is a combination of the actual grant of land and the actual use to which the land has been put. This not only applies to use by the owner, but by all predecessors in title.
- iv) Related to the use of the land previously mentioned, the common law concept of "adverse possession" is where a person, without legal title, may gain title to land registered in the name of a third party. It is defined as the "continuous, open, notorious and adverse use of land by a person or a continuous line of persons, none of whom have registered claim or paper title to the land in question" (Winter, 1991). The time span of claimed "use" is a critical component to this claim and varies in length dependent upon whether the land is claimed is public or private.
- v) Lastly, ownership of land can revert to, or escheat to, the Crown. This is the case when no heirs to an estate exist or a limited company which owns lakeshore property is dissolved without dealing with the land in question. In both cases the Crown re-establishes ownership.

Chapter 3

PLAN COMPONENTS

- 3.1 Mapping
- 3.2 Shoreline Description
- 3.3 Lakeshore Development Guidelines
- 3.4 Shore Protection
- 3.5 Environmental Overview
- 3.6 Emergency Response
- 3.7 Future Monitoring
- 3.8 Communication Strategy



CHAPTER 3 THEORY OF THE FIRM

The firm is a collection of individuals who are organized to produce goods and services. The firm is a legal entity that can own property, enter into contracts, and sue or be sued. The firm is a collection of individuals who are organized to produce goods and services. The firm is a legal entity that can own property, enter into contracts, and sue or be sued.



In order to fulfill the requirements of the guidelines for creating Shoreline Management Plans (see Chapter 1, Introduction), certain components need to be addressed. These components have been augmented by issues of concern which the Steering Committee of the SMP recognized as being critical to this length of shoreline. The issues (referred to in Table 1) are incorporated under the general headings of the components.

The subsections of the plan are briefly described and the MNR-required components [in brackets] are listed as follows:

- i) **Mapping:** identification of the lakeshore hazards which occur in the shoreline region and the methodology used to determine the severity of the erosion hazard [Prevention].
- ii) **Shoreline Description:** description of the shoreline by specific reach (a section of shoreline which possesses similar characteristics) to recognize common problems (related to hazards, existing development, access to the beach, the environment, drainage and other factors). This responds to many of the issues prioritized by the SMP Steering Committee [and in part addresses many of MNR's components such as Protection].
- iii) **Lakeshore Development Policy:** the recommended approach to managing existing development and new development within the lakeshore region, referred to by MNR as the Regulatory Shoreland Zone [Prevention].
- iv) **Shore Protection:** a summary of the document prepared to support the SMP, which recommends protection alternatives and protection types dependent on the shoreline characteristics [Protection].
- v) **Environment:** an overview of the lakeshore ecosystem and management options to protect, and where possible enhance, the existing environment [Environment]. Many of the issues identified by the SMP Steering Committee are included within this discussion.
- vi) **Emergency Response:** a description of the existing response plan which the ABCA uses and how additions to the plan can be made to address lakeshore hazards [Emergency Response].
- vii) **Future Monitoring:** direction on how future monitoring of the shoreline can assist in the recognition of changes to the shoreline and verification of the extent of the hazards involved. Recommendations on how, where and what to monitor to ensure a more complete understanding of the lakeshore environment are presented [Monitoring].

These components form the majority of the discussion within the SMP, and are provided in the following sections.

Section 3.1 MAPPING

3.1.1 INTRODUCTION

Mapping is an integral component of any land use management project. In the coastal zone, it is essential to be able to detect shoreline position change to make estimates of erosion and accretion. As described in Anders and Byrnes (1991), these data are used for many purposes including developing sediment budgets, examining geomorphologic variations in the coastal zone, studying the role of natural processes and human alteration to shoreline positions, establishing setback lines, and predicting future shoreline change. Shoreline mapping is therefore a major component of this shoreline management study.

Prior to 1988, complete mapping for the shoreline area was limited to the relatively small scale coverage of

the 1:50,000 scale National Topographic Series (NTS) maps (updated in 1985), or 1:10,000 scale aerial photographs taken as part of the Coastal Zone Atlas (1975) project. The Coastal Atlas was a federal/provincial government initiative intended as a planning tool for managing the Canadian shorelands of the Great Lakes. Although adequate for a provincial scale analysis, more specific shoreline management projects were limited in the detail which could be achieved. Detailed mapping of the shoreline was restricted to specific sites. Such mapping was completed for a variety of reasons and illustrated different features (i.e. plans of subdivision, harbour protection plans, township zoning bylaw maps), depending on the objective of the mapping.

The Flood Damage Reduction Program (FDRP) shoreline mapping project is a federal/provincial government initiative to identify shoreline hazard areas at a scale of 1:2,000. Preliminary shoreline mapping for the ABCA shoreline (based on 1988 aerial photography) was used as a basis for comparison of shoreline location with a historical land survey (completed in 1935) for the entire shoreline region. Using this shoreline comparison spanning 53 years, future projections of shoreline positions were determined and zones of hazard or caution were identified.

The shoreline mapping was then used as a base map for the plotting of other data sources (i.e. development area constraints, environmentally significant areas, drainage courses, land use inventory) to provide direction for land use management decisions. However, the identification of hazard areas due to flooding, erosion and dynamic beach effects is a primary factor when formulating management options. The methodology used in comparing the 1935 historical shoreline survey to the 1988 shoreline mapping involved transferring the paper copy of the 1935 information into a digital (computer) format to allow direct comparison with the digital 1988 mapping. This comparison was undertaken on a computer-based Geographic Information System (GIS). The following section details the data sources and procedures used in this comparison.

3.1.2 METHODOLOGY

The historical shoreline survey from 1935 provides an invaluable tool for comparison to more recently acquired data to illustrate shoreline location change. The shoreline 1:2,000 scale mapping produced from 1988 aerial photographs provided the basis for such a comparison. These data and the comparison methodology are described in the following discussion.

1935 SHORE TRAVERSE SURVEY

During the summers of 1934 and 1935, survey crews from the Department of Lands and Forests, Province of Ontario traversed the shoreline from Sarnia to Kincardine documenting the shoreline features. The shoreline between Kettle Point and Goderich was surveyed in July and August of 1935.

The survey incorporates a traverse line which follows the beach between the toe of the bluff and the water's edge (north of Grand Bend) or between the dunes and the water's edge (south of Grand Bend). Along this traverse line, offset measurements and angles were taken to significant features such as water's edge, high water mark/toe of bluff, and where possible, top of bluff.

In general, offsets to the water's edge and high water mark/toe of bluff were taken every 80 metres, while offset measurements to the top of bluff were taken irregularly and at greater spacing (likely due to difficult access from the beach to the top of the bluff). Cross-sections of the beach and part way up the bluff were also measured, generally at a spacing of 400 metres.

In addition, survey check-points or tie-ins were established by measuring from the traverse line to fixed features along the traverse (i.e. corners of buildings, survey monuments or iron survey bars). This enabled the traverse line to be relocated with respect to physical features in existence at the time of the survey. Figure 7 illustrates the type of data shown on this historical survey.

VILLAGE OF BAYFIELD - 1935 Shoreline Characteristics

(showing detail of west end of Wellington Street - now Bayfield Terrace)

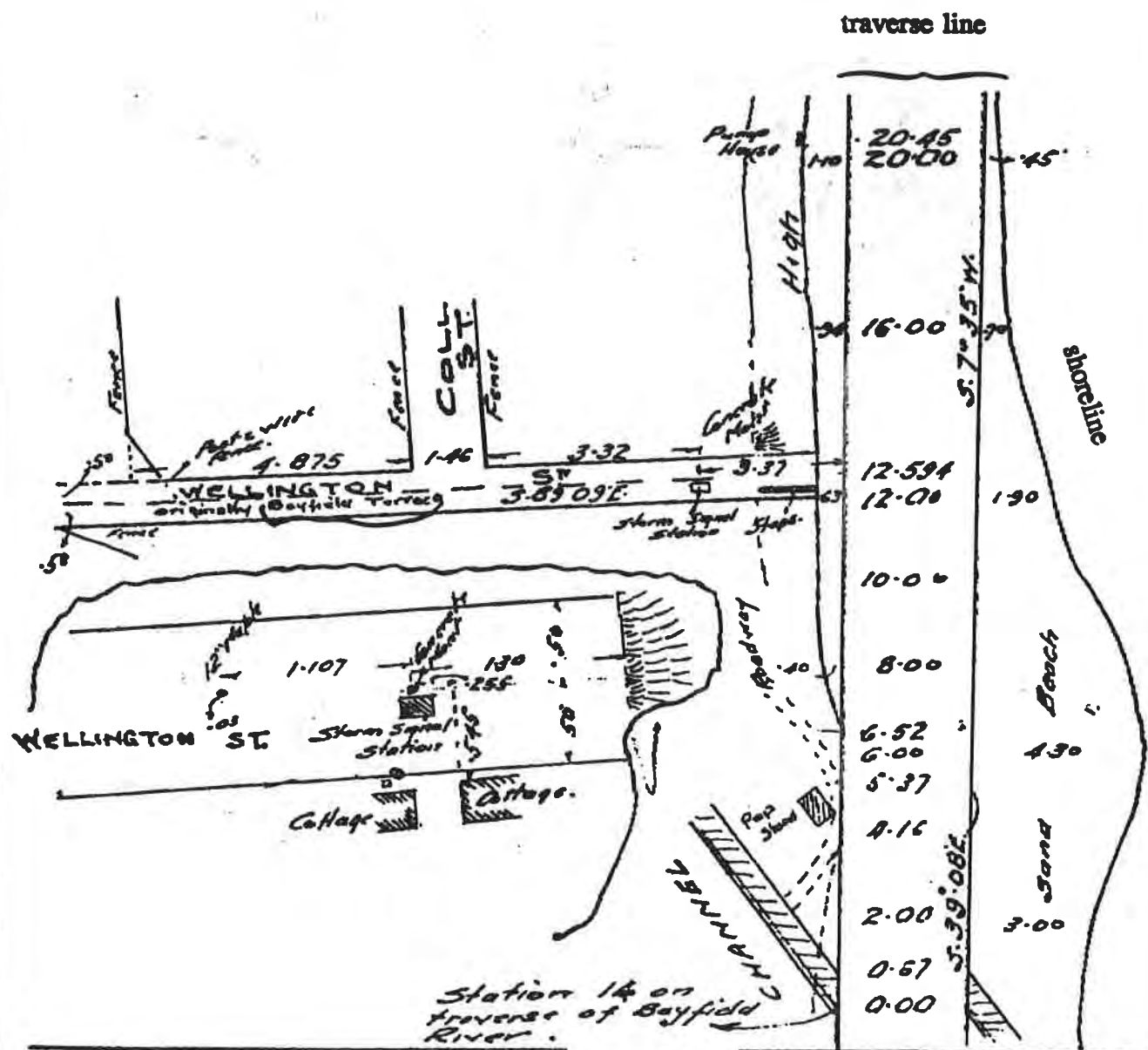


Figure 7: 1935 Shore Traverse Survey

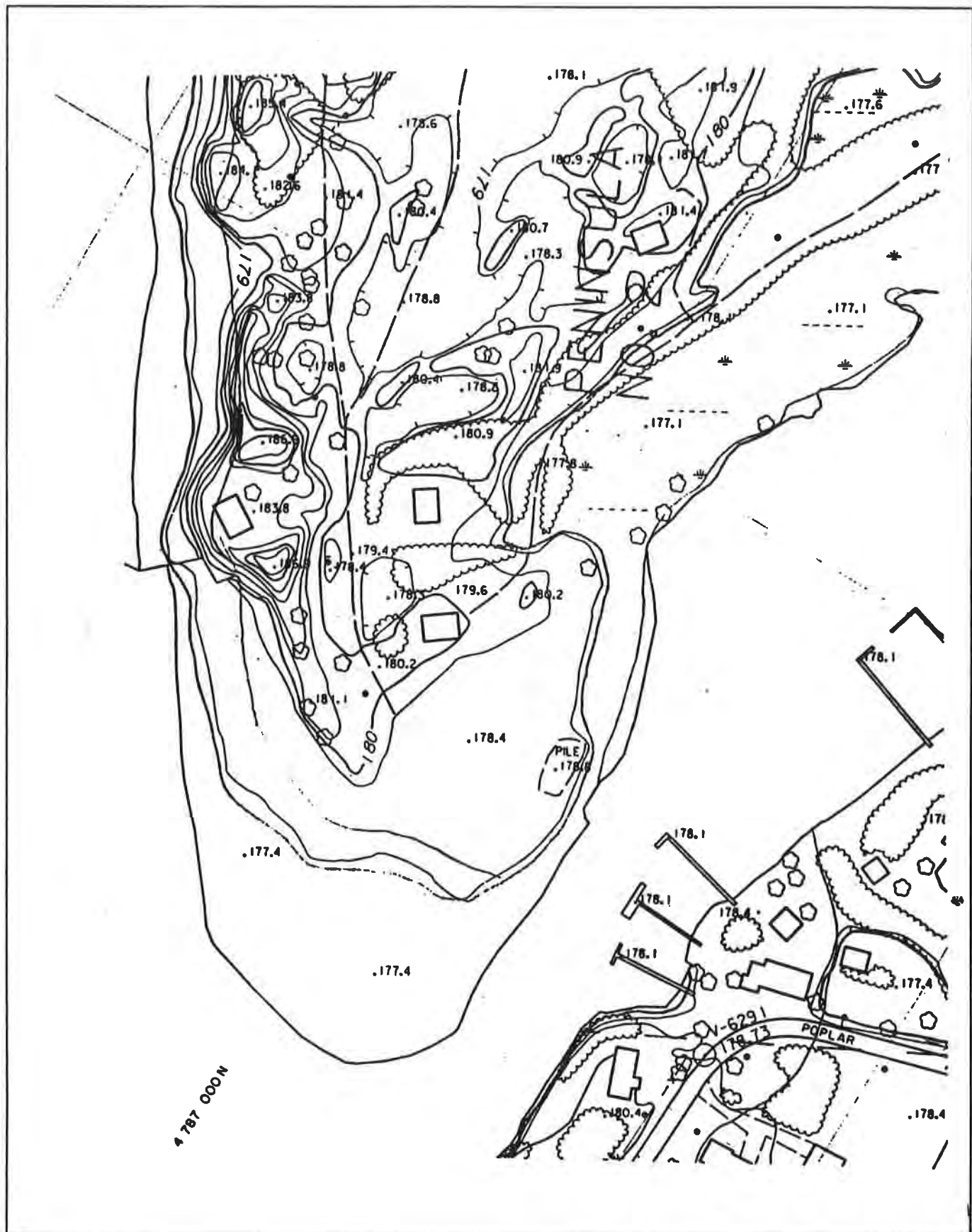


Figure 8: 1988 Shoreline Mapping

1988 SHORELINE MAPPING

This mapping, based on April, 1988 aerial photography, was completed in both digital and paper copy format. Preliminary copies of both formats were available during this project and were used for comparison with the historical shoreline survey. The shoreline mapping was completed at a 1:2,000 scale, and physical shoreline features such as toe of bluff, water's edge and top of bluff are readily identifiable from the mapping. The maps portray the shoreline in a continuous strip with full contour detail (one metre contour interval with 0.5 metres interpolated) from the shoreline to a minimum distance of 250 metres landward from top of bluff. Where gullies occur, they are mapped a minimum distance inland to Highway #21, with topographic detail measured 50 metres back from top of bank. Figure 8 shows an example of the shoreline mapping and Appendix D provides the maps at a reduced scale. These smaller scale maps show the area affected by the Regulatory Lakeshore defined in Section 3.3 "Lakeshore Development Guidelines".

SHORELINE CHANGE DETERMINATION

A method was needed to enable a direct comparison of the 1935 shore traverse survey to the 1988 shoreline mapping. It was determined that due to the length of shoreline (over 60 kilometres), the method would need to incorporate the effects of the curvature of the earth. The method would also need to allow for geodetic referencing the historical survey into map projection coordinates (either latitude/longitude or the Universal Transverse Mercator (UTM) system) used in the shoreline mapping.

After considerable discussion with consultants and representatives of the MNR, Lands and Water Policy Branch, an appropriate method was determined. The method utilized a Geographic Information System (GIS) called SPANS, and involved transferring the 1935 shoreline traverse data from its original paper copy format into a digital file to allow direct comparison with the 1988 shoreline mapping. Initial geodetic referencing of the 1935 survey (i.e. tying it into the UTM coordinate system) was provided by control points on the harbour structures at Goderich, Bayfield and Grand Bend, as well as at a road intersection near Kettle Point. These control points were easily identified on both sets of mapping, and were supplemented by secondary tie-ins, as discussed later, in order to improve the accuracy of the 1935-1988 shoreline comparison.

The 1935 traverse line and offset measurements to the different shoreline features were manually entered into a digital file and subsequently converted to UTM coordinates using a data editing program called COGO, which is a component of ARCINFO, another type of GIS. These data were reviewed and verified to eliminate data input errors, as well as several errors apparent on the original paper copy of the 1935 survey.

Upon conversion to UTM coordinates, the 1935 survey was transferred into the digital FDRP file to allow a direct comparison of the shoreline features in 1935 and 1988. The overlay of the two surveys using the control points discussed above showed excellent agreement to the north of Bayfield, but suggested that an error was present in the 1935 survey south of Bayfield. An extensive review of the available data was undertaken in an effort to locate and correct this error. However, it was only possible to determine that the error (or errors) likely existed between Bayfield and St. Joseph. In order to provide an improved overlay of the two surveys, a number of secondary tie-ins (22 in total) were utilized at various locations along the shoreline, including:

- a) the centre of Hwy. #21 (the Bluewater Highway),
- b) survey monuments and iron survey bars,
- c) cottage structures and buildings which existed in both 1935 and 1988,
- d) harbour features such as Public Works bench marks (Grand Bend) and the storm signal station — now removed (Bayfield).

All these features were identified on the historical survey and were relocated in the field at the present time (except the location of the Bayfield storm signal station which was confidently re-established using adjacent building locations). Using these additional tie-ins, the 1935 shoreline traverse was "fitted" to the 1988 shoreline mapping. A discussion of the accuracy of the resulting shoreline comparison is presented in Section 3.1.3.

In order to compare water's edge locations, values were adjusted to reflect the difference in average water levels between July/August, 1935 and April, 1988 (i.e. water levels were approximately 0.7 metres higher in 1988). The comparison of the location of the toe of the bluff was generally based on the high water mark from the 1935

survey (this feature is representative of the toe of bluff along most of this shoreline). Only localized comparisons of the top of bluff locations were possible due to the limited offsets to this feature measured in 1935. Finally, an additional comparison at mid-slope on the bluff was undertaken at locations where the bluff cross-section was measured in 1935, in order to assess changes in the location of the bluff face without the localized short-term effects of slumped material at the toe, or exaggerated top of bluff recession due to surface runoff effects. This mid-slope location was determined to best be represented by the 180-metre contour. An example of the shoreline comparison is shown in Figure 9.

3.1.3 ACCURACY DISCUSSION

Calculation of shoreline location change has been achieved by the comparison of several different data sources: aerial photography, mapping and land surveys. Since modern-day mapping is generally completed from aerial photos, topographic maps are generally considered the finished product of such projects. Each data source is discussed below with reference to accuracy.

a) Aerial Photographs

The photography used in producing the FDRP shoreline maps was completed with strict compliance to the guidelines for FDRP mapping (Schedule "C" of the Canada-Ontario Flood Damage Reduction Program, January 1985, and Floodplain Management in Ontario - Technical Guidelines, MNR). In general, the scale of photography (which is defined by the flight altitude and camera lens), date of flying and the conditions during flight are the critical components necessary for accuracy. These photos were taken at a scale of 1:8,000 on April 20, 1988.

Historical aerial photographs for the ABCA shoreline were used primarily for verifying certain locations and features. Often the scale of such photography limits their usefulness for other applications. As an example, the Coastal Zone Atlas, completed in 1975 by the federal and provincial governments, includes photo maps produced at a scale of 1:10,000 which can only be used for broad-scale analysis of features.

b) FDRP Shoreline Mapping

This mapping, completed at a scale of 1:2,000, is produced under strict compliance to standards set by both the Ontario and Canadian government mapping agencies (MNR, Surveys and Mapping Branch, Toronto, and Energy, Mines, and Resources (EMR), Ottawa). The standards for accuracy are detailed in Schedule "C" (January 1985) of the Canada-Ontario Flood Damage Reduction Program, and Floodplain Management in Ontario - Technical Guidelines, MNR. In general, the accuracy can be described as 0.3 metres in elevation, and 0.6 metres planimetric. It is also to these specifications that aerial photography is completed to enable the strict compliance with the mapping standards set forth by EMR.

c) Historical Shoreline Surveys

As discussed above for both mapping and photography, the accuracy is dependent upon the standards with which the data are collected. Assuming certain standards are maintained, ground surveys completed by qualified personnel are very accurate. The fact that this historical survey was completed by Ontario Land Surveyors (OLS) — whose work appears elsewhere along the shoreline involving property surveys — lends credibility to the accuracy of the work completed in 1934-1935.

In general, historical land surveys involve certain limitations which should be considered when they are used as a basis for comparison (Anders and Byrnes, 1991).

However, the 1935 shoreline survey benefitted by occurring over a short time span of one month conducted by two survey parties who maintained a high level of accuracy (measurements made in chains and recorded to three decimal places or to an accuracy of 0.8 inches). Offset measurements along the traverse line were taken at regular intervals (every 4 chains = 264 feet = 80 metres) with periodic measurements taken to the top of the bluff. These factors enabled a shoreline comparison with recent information and provided an accurate depiction of shoreline changes.

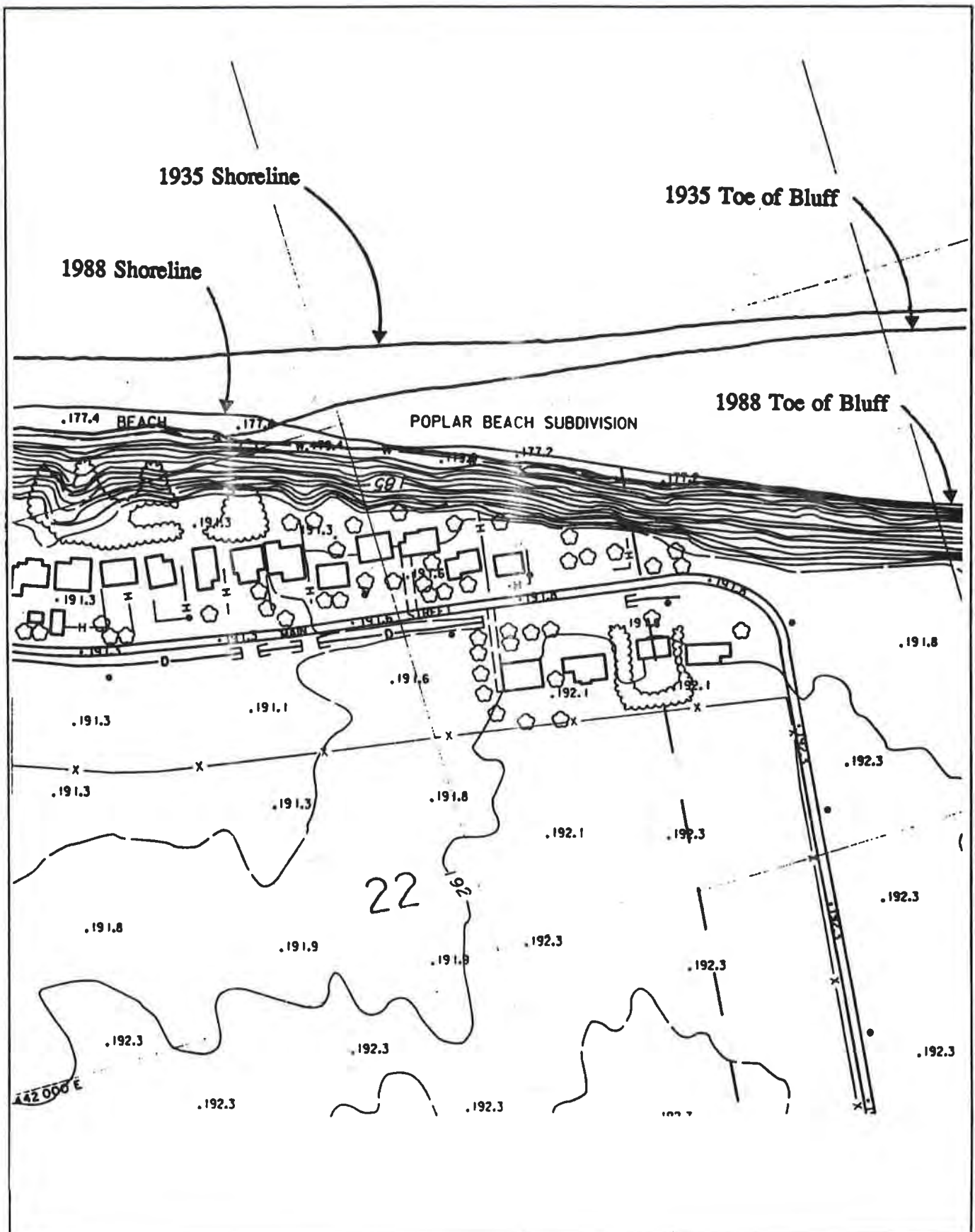


Figure 9: Example of Shoreline Change Comparison

d) Shoreline Location Comparison

The method used in comparing the two data sources is the final consideration regarding accuracy. The procedure involved entering the historical survey information into the GIS system where the digital shoreline mapping information had been previously entered. The comparison was made directly utilizing the GIS software.

In summarizing the accuracy of the shoreline comparison between 1935 and 1988, it was determined that the alongshore (i.e. north-south) length of the 1935 traverse between control points at Goderich and Bayfield was within 1.5 metres over this distance of approximately 20 kilometres. Due to this high level of accuracy, and based on intermediate tie-ins to specific features along the length of shoreline, the cross-shore (i.e. east-west) positional accuracy of the 1935 shoreline features is considered to be approximately two metres. This represents an accuracy of 0.04 m/yr if divided over the 53-year comparison period (1935 to 1988).

It is more difficult to quantify the accuracy of the comparison south of Bayfield due to an apparent error in the 1935 survey between Bayfield and St. Joseph, and the requirement to "fit" the 1935 survey to the 1988 shoreline mapping using the intermediate tie-ins at various locations along the shoreline between Bayfield and Kettle Point. In effect, the fitting procedure stretched or shrank the alongshore shoreline traverse to fit between adjacent tie-ins. Based on the results of this analysis, and on additional tie-ins not used in the fitting procedure, it is considered that the cross-shore (i.e. perpendicular to the shoreline orientation at any particular location) positional accuracy of the 1935 shoreline features for the entire shoreline within the context of this SMP is approximately three metres (or 0.06 m/yr over the 53-year comparison period). The only exception to this discussion is the area between Bayfield and St. Joseph where the apparent error (or errors) in the 1935 survey exists. In this area (specifically shoreline map sheets 32 through 38), the cross-shore positional accuracy at the 1935 shoreline features may be more in the order of seven to ten metres (or 0.13 to 0.19 m/yr over the 53-year comparison period).

Caution is therefore advised in interpreting the historical shoreline location in this area. Any attempts to improve the accuracy of the 1935 survey data within this region of Stanley Twp would require re-establishing ground control points and separating the survey into smaller segments. In this way the problem area may be isolated and the 1935 survey error may become more apparent. This suggestion is included in Section 5.3, Recommendations.

3.1.4 SUMMARY

In their discussion on the accuracy of shoreline location change when comparing maps and aerial photographs, Anders and Byrnes (1991) state that three important factors need be considered when quantifying shoreline change:

- a) original data sources and techniques to extract information must be of high quality so accuracy is not jeopardized;
- b) large scale maps and air photos have the greatest potential for providing reliable shoreline change measurements; and
- c) the time period spanned by two sets of shoreline position information must be significant relative to potential errors in mapping procedure so that the magnitude of measured change is larger than the inherent errors. The credibility of recorded shoreline change is improved the larger the time span between data sets.

The ABCA Shoreline Management Plan addresses all of these considerations in that:

- i) the data and techniques are original and of high quality;
- ii) the scale of analysis exceeds the recommended map base scale (from Anders and Byrnes, 1991) of 1:10,000 (the SMP uses 1:2,000 scale mapping); and
- iii) the time period involved is significant (53 years) when considering that it spans three periods of record high lake levels (1953, 1973 and 1986) and two periods of record low lake levels (1937 and 1964).

The historical shoreline location change has been plotted and an example is illustrated in Figure 9. Verification of these changes has been undertaken using additional data sources where available. These include:

- Canada/Ontario Great Lakes Flood and Erosion Mapping (1978)
- Great Lakes Erosion Monitoring program data (1981)

- Land Registry surveys (including original, cottage area surveys)
- Sequential aerial photographs (vertical and oblique angle)
- Hydrographic field sheets
- Quaternary geology and bedrock maps
- Great Lakes shoreline erosion survey, University of Waterloo (1986)

In the bluff areas of the shoreline, the change in shoreline is determined for the bluff features and a corresponding rate of recession is determined (total distance receded / 53 years = calculated average annual recession rate). This rate is then used to establish an erosion setback as described and illustrated in Section 3.3, Lakeshore Development Standards.

In summary, the high degree of data accuracy and the long length of record which the comparison of shoreline spans, make this analysis as complete and detailed as any shoreline comparisons for the Great Lakes (either in the U.S.A. or Canada).

Section 3.2 ABCA SHORELINE DESCRIPTION

3.2.1 INTRODUCTION

The Ausable Bayfield Conservation Authority has jurisdiction over the 60-kilometre length of Lake Huron shoreline between Sideroad 30 in Goderich Township, north of the Village of Bayfield, and Port Franks (approximately) as shown in Figure 1. This includes the shorelines of a portion of Goderich Township, the Village of Bayfield, Stanley Township, Hay Township, Stephen Township, the Village of Grand Bend, and a portion of Bosanquet Township (including the community of Port Franks). Pinery and Ipperwash Provincial Parks, and the Ipperwash Military Reserve are all outside the ABCA's jurisdiction, but have been included in the following discussion of the ABCA shoreline due their location within its general limits. In addition, parts of Goderich and Bosanquet Townships are also outside of the ABCA jurisdiction, however, they are included in descriptions of the shoreline as they are located within the overall littoral cell (management unit) discussed within Section 2.1.1 "Littoral Cell Management".

3.2.2 GENERAL BACKGROUND

As a result of the glacial history of this area, the entire region is covered by deep glacial deposits. A schematic cross-section through the eastern shoreline of Lake Huron is presented in Figure 10, and indicates the presence of bedrock overlain by Rannoch till, which in turn is overlain by St. Joseph till. Figure 11 presents a longitudinal section along the ABCA shoreline which indicates the approximate elevation of the interfaces between these different materials, as deduced from available well and borehole records. It is important to note that these records are generally located landward of the shoreline, and that similar variations to those indicated in the alongshore direction may also occur in the cross-shore direction. Thus, the longitudinal profile presented in Figure 11 will not accurately represent conditions in the nearshore area, but it does provide a general indication of the variation in stratigraphy along the ABCA shoreline and how it influences the shape of the shoreline (e.g. headlands and bays).

The tills contain differing proportions of sand and gravel in the soil matrix. The Rannoch till is very resistant to wave action as a result of its relatively high gravel content, and has significantly affected the evolution of the Lake Huron shoreline. Specifically, the Rannoch till is believed to form submerged resistant shelves throughout this area, acting like bedrock when lag deposits of coarse gravel armour the exposed surface of the lake bottom. These shallow shelves cause waves to break and dissipate their energy offshore, thus reducing the exposure of the shoreline to wave-induced erosion, and resulting in the development of a headland as the adjacent shorelines continue to erode.

The St. Joseph till contains a smaller proportion of gravel than the Rannoch till, and is thus significantly

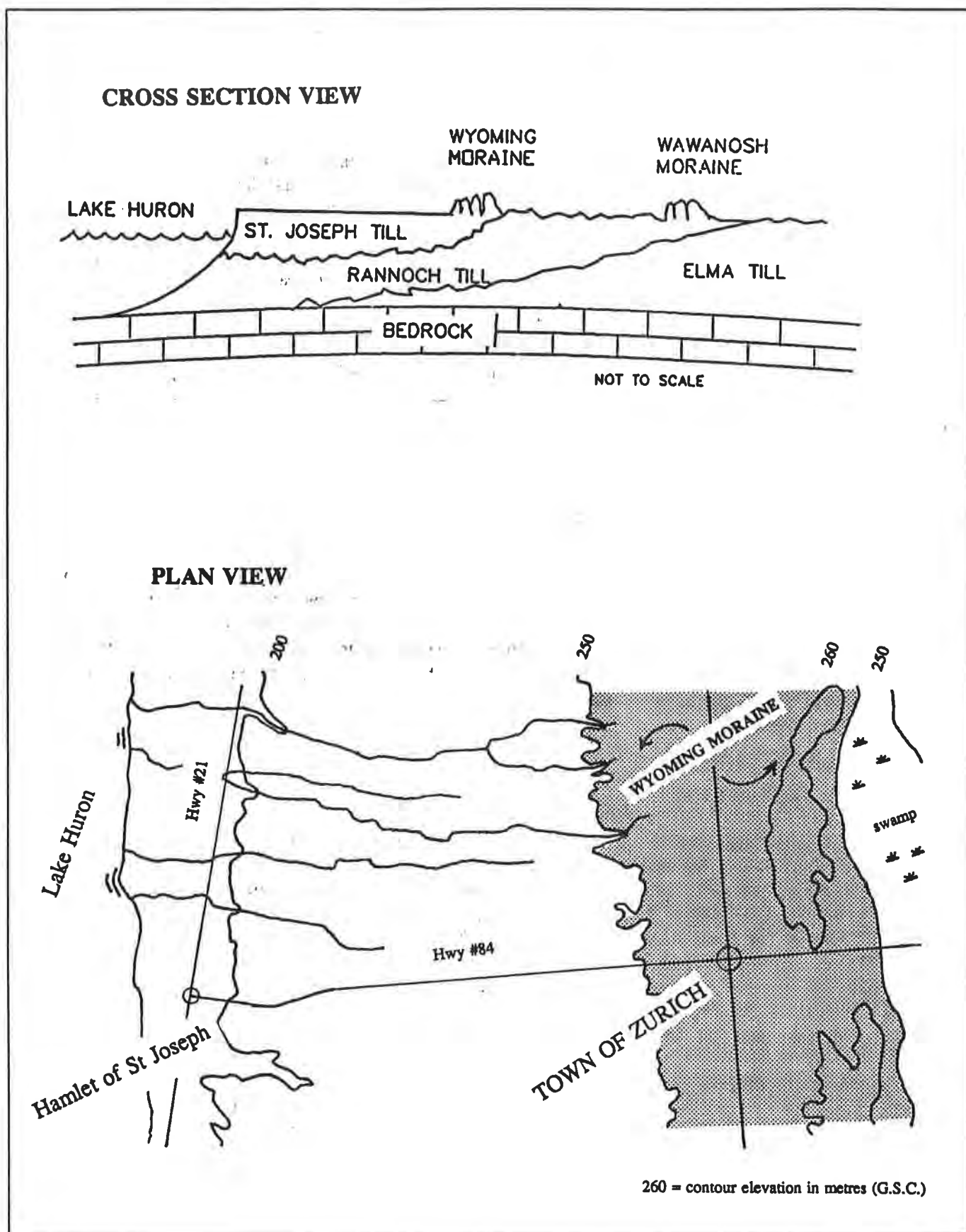


Figure 10: Geology Cross-Section

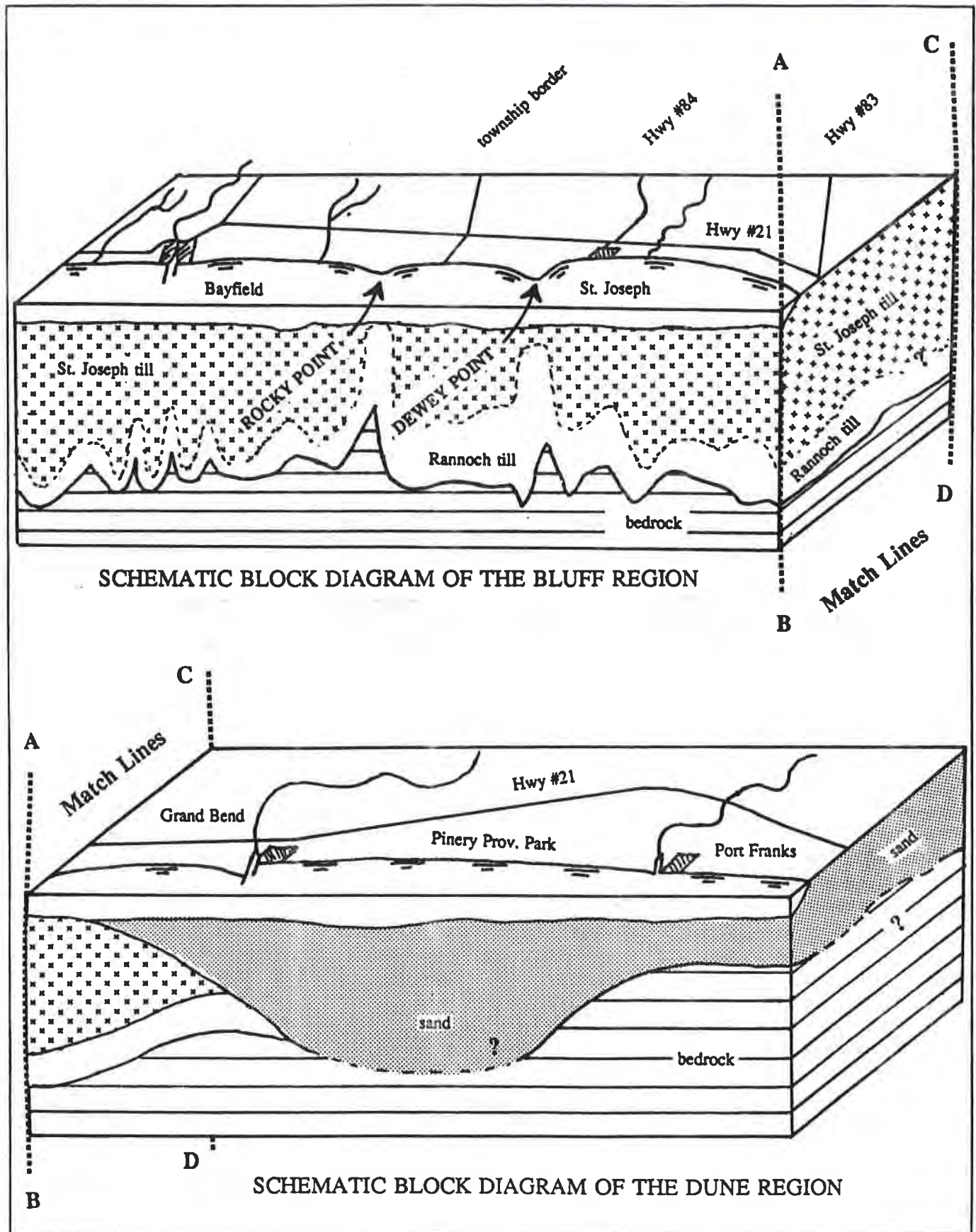


Figure 11: Waterfront Cross-Section

less durable than the Rannoch till. The majority of the exposed bluffs in this area consist of St. Joseph till, which is readily eroded by wave action. Although wave action at the shore is the dominant force in the evolution of the shoreline, the response of the shoreline to wave action depends on the composition of the soil at the shoreline and on the nearshore lake bottom. Specifically, the presence of exposed Rannoch till on the nearshore lake bottom and at the base of the bluff results in a relatively stable (non-erodible) shoreline, while the presence of St. Joseph till on the nearshore lake bottom and at the base of the bluff results in an eroding shoreline (both the bluff and the nearshore lake bottom). It is believed that shore erosion is controlled and limited by the more resistant Rannoch till along much of the ABCA shoreline. Rocky Point and Dewey Point are examples of relatively stable headlands where the Rannoch till layer rises to an elevation close to the mean lake level (refer to Figure 11).

Erosion of the bluffs and nearshore lake bottom supplies sediment (clay, silt, sand and gravel) to the shore zone. These materials are transported by wave action and currents (also referred to as "littoral drift"). The finer sediments (clay and silt particles) are carried in suspension, and tend to deposit offshore in deep water, while the coarser sediments (sand and gravel) are transported along the shoreline and form beaches, dunes and nearshore bars. The extent of these beaches and bars is dependent on a number of factors, including the supply of sand and gravel to a particular location, and the nearshore wave climate and water depths.

3.2.3 ABCA SHORELINE CHARACTERISTICS

The ABCA shoreline can be generally classified into the bluff region north of Highway #83 where erosion commonly occurs, and the dune region south from Highway #83 to Kettle Point where deposition commonly occurs. The different characteristics of these two areas are summarized below, followed by a brief description of development along the shoreline in general.

North of Highway #83, the shoreline has a north-south orientation and consists of narrow sand beaches fronting till bluffs of moderate height (12 to 18 metres). The bluff height tends to decrease to the south (approximately six metres high at Highway #83) until they disappear completely within the Maple Grove cottage area of Stephen Township. Numerous gullies exist along this section of shoreline; these gullies have developed as a result of surface runoff, and may be stable or actively eroding. The bluffs have historically been eroding as a result of wave action undercutting the toe of the bluffs, which eventually leads to bluff instability and slumping. Short-term erosion can be affected by drainage conditions and improper management practices along the bluff area. The extent of erosion varies; in recent years, some sections have eroded at rates calculated in the order of 1.0 to 1.3 m/yr while other sections have been relatively stable. Long-term erosion rates have been calculated for the entire length of the ABCA shoreline by comparing a detailed shoreline traverse completed in August 1935 with photogrammetric mapping completed in April 1988 (refer to Section 3.1). These long term erosion rates are illustrated on Figures 12 and 13 which show the shoreline location and are summarized on Table 2 for the ABCA shoreline north of Highway #83.

Only two reaches of shoreline had long-term erosion rates greater than 0.6 m/yr during this 53-year period. These were the Melena Heights and Lakewood Gardens/Sunny Ridge/Poplar Beach areas. The majority of the shoreline had long-term erosion rates of less than 0.3 m/yr during this period.

As discussed above, the erosion of the bluffs is preceded by, and controlled by, a slow but continuing erosion of the nearshore lake bottom. Although most of the visible erosion (i.e. bluff erosion above the water line) occurs during periods of high water levels, the controlling process of nearshore erosion continues during low water periods. However, the distribution of erosion rates across the nearshore zone may vary with fluctuating water levels.

The erosion of the bluffs and nearshore lake bottom along this section of shoreline, as well as gully erosion and creek and river sediment transport, provide materials to the nearshore area. Of particular interest is the coarser material, specifically sands and gravels, which can form beaches and bars along the shoreline and thus provide some protection to the shoreline, as well as recreational benefits. Along the ABCA shoreline north of Highway #83, it has been estimated (Reinders, 1989) that approximately 72 percent of the supply of sand and gravel to the nearshore area comes from bluff erosion, 10 percent from gully erosion, 17 percent from lake bed erosion, and 10 percent from creeks and rivers. This material is transported along the shoreline by waves and wave-induced currents. The magnitude of this transport is a function of the wave conditions (principally wave height and direction), water depth close to the shoreline and availability of sediments. In general, the transport rate is limited

Table 2: Bluff Shoreline Erosion (1935-1988)
(based on long term bluff erosion rates)

MUNICIPALITY (shore length)	HIGH > 0.6 m/yr.	MEDIUM 0.3 to 0.6 m/yr	LOW < 0.3 m/yr.
<u>Goderich</u> (5220 m) (Shore Length)	Birchcliff Melena Heights 390 m	Salvation Army Pt. Lot 40, Conc. 1 1,230 m	"remaining" areas 3,600 m
<u>Bayfield</u> (2,730 m) (Shore Length)	N/A 0 m	Bruce Cres. Pioneer Park 180 m	"remaining" areas 2,550 m
<u>Stanley</u> (10,985 m) (Shore Length)	N/A 0 m	Crystal Springs Gammage Baron de Tuyl Huron Church Camp Snowden Acres Durand Huronview 760 m	"remaining" areas 10,225 m
<u>Hay</u> (13,710 m) (Shore Length)	Lakewood Gardens Sunnyridge Poplar Beach 1,850 m	Vista Beach Driftwood Trailer Park Pt. Lot 9, LRW Conc. Bayview 1,310 m	"remaining" areas 12,350 m
<u>Stephen</u> (1,500 m) (Bluff Region Shore Length)	N/A 0	N/A 0	"entire area" 1,500 m
TOTAL	2,240 m (2.2 km)	3,480 m (3.4 km)	30,225 m (30.2 km)

by the supply of sand to the shoreline, although the wave energy has the potential to transport much greater quantities. This situation is typical along Great Lakes shorelines. Due to the wave climate and shoreline orientation in this area, the net transport is from north to south, although short-term reversals do occur in response to individual storms. Wind generated sand movement does occur in the bluff region where bluff height is small and beach sand accumulates. This occurs in the southern extent of the bluff region where a transition region does exist gradually forming dunes at the toe of the bluff which decreases in height as we proceed south.

To the south of Highway #83 and Grand Bend, the shoreline orientation changes from north-south to northeast-southwest, and the shoreline characteristics change from cohesive till bluffs to sand dunes. As a result of the change in shoreline orientation, the sediment transport rate decreases significantly, and deposition of sand along the shoreline has, historically, occurred. This transition region from till bluffs to sand dunes continues (e.g. Kingsmere and Maple Grove areas) until the bluffs are no longer apparent and the file beach at Grand Bend dominates the shoreline. Over thousands of years the deposition of sand has resulted in the development of an

extensive beach-dune system along the Grand Bend/Pinery/Ipperwash shoreline. The deposition of sand along this section of shoreline is offset to some extent by wind-blown (aeolian) losses from the beach to the dune and offshore losses to deep water. Of importance to shoreline management in this area is the fact that the stability of this beach-dune system is dependent on the supply of sand provided by updrift erosion processes, in particular bluff erosion between Grand Bend and Goderich. The stability of the dunes may become a consideration where wave and wind action may physically alter the dune shape.

Development along the ABCA shoreline includes 63 cottage areas, as well as the hamlet of St. Joseph, the Village of Bayfield, the Village of Grand Bend, and Port Franks (ABCA, 1990). In general, the residential subdivisions are located on the tableland behind the top of the bluff, although there are isolated cases where development has taken place on a beach terrace lakeward of the base of the bluff. The subdivisions range in size from six to 60 residences, and generally consist of a row parallel to the top of the bluff, with varying building setbacks; in many cases, additional rows of development have also been constructed inland of the first row. Many of these subdivisions have installed shoreline protection structures of varying type and quality. Groynes and seawalls are the predominant structures, although revetments have been constructed at some locations. Shoreline protection tends to be more extensive in the vicinity of the villages, where development along the shoreline is more intensive. Finally, there are a few areas which have less intensive development (conservation areas, municipal parks and trailer parks), as well as some undeveloped areas, but they are the exception. A summary of the protection structures found along the ABCA shoreline is contained in the "Inventory of Erosion Control Structures" (ABCA, 1990).

3.2.4 SHORELINE PROCESSES

A description of shoreline processes on Lake Huron between McRae Point and Sarnia is provided in Reinders (1989). This report documents the alongshore movement of sand occurring within each of four littoral cells on the lake. Each littoral cell is a "self-contained coastal system, where the ongoing shoreline processes are not affected by the processes of the neighbouring cells". As such, shoreline management of one cell can proceed independently of any other cell. In particular, sand is not transported between cells.

The ABCA shoreline is entirely within the littoral cell defined by Goderich harbour to the north and Kettle Point to the southwest. Specifically, the large harbour structures at Goderich and the rock headland and shelf at Kettle Point act as barriers to sand transport at these locations. This littoral cell has been further subdivided into four subcells in order to describe the sediment transport rates along the shoreline, with the boundaries to the subcells located approximately at Goderich harbour, St. Christopher's Beach, Bayfield Harbour, Maple Grove subdivision (two kilometres north of Grand Bend harbour) and Kettle Point.

SUBCELL 1 GODERICH HARBOUR TO ST. CHRISTOPHER'S BEACH (REACH G IN REINDERS, 1989)

Between Goderich harbour and St. Christopher's Beach (this subcell is outside the jurisdiction of the ABCA), the shoreline and bluffs are protected by a combination of exposed bedrock in the nearshore zone, beaches and shoreline protection structures, resulting in no significant bluff erosion. Limited erosion of the lake bottom supplies approximately 1,000 m³/yr of sand to the nearshore area (Reinders, 1989). Sediment transport is negligible in this area due to the very limited supply and the sheltering effect of the Goderich harbour structures.

SUBCELL 2 ST. CHRISTOPHER'S BEACH TO BAYFIELD HARBOUR (REACH H IN REINDERS, 1989)

Between St. Christopher's Beach and Bayfield harbour, the shoreline consists of cohesive bluffs fronted by narrow sand beaches. Within the ABCA's jurisdiction (i.e. south from Lot 30, Concession 1), approximately 30 percent (ABCA, 1991) of the shoreline has been protected to some extent, generally using groynes and/or seawalls.

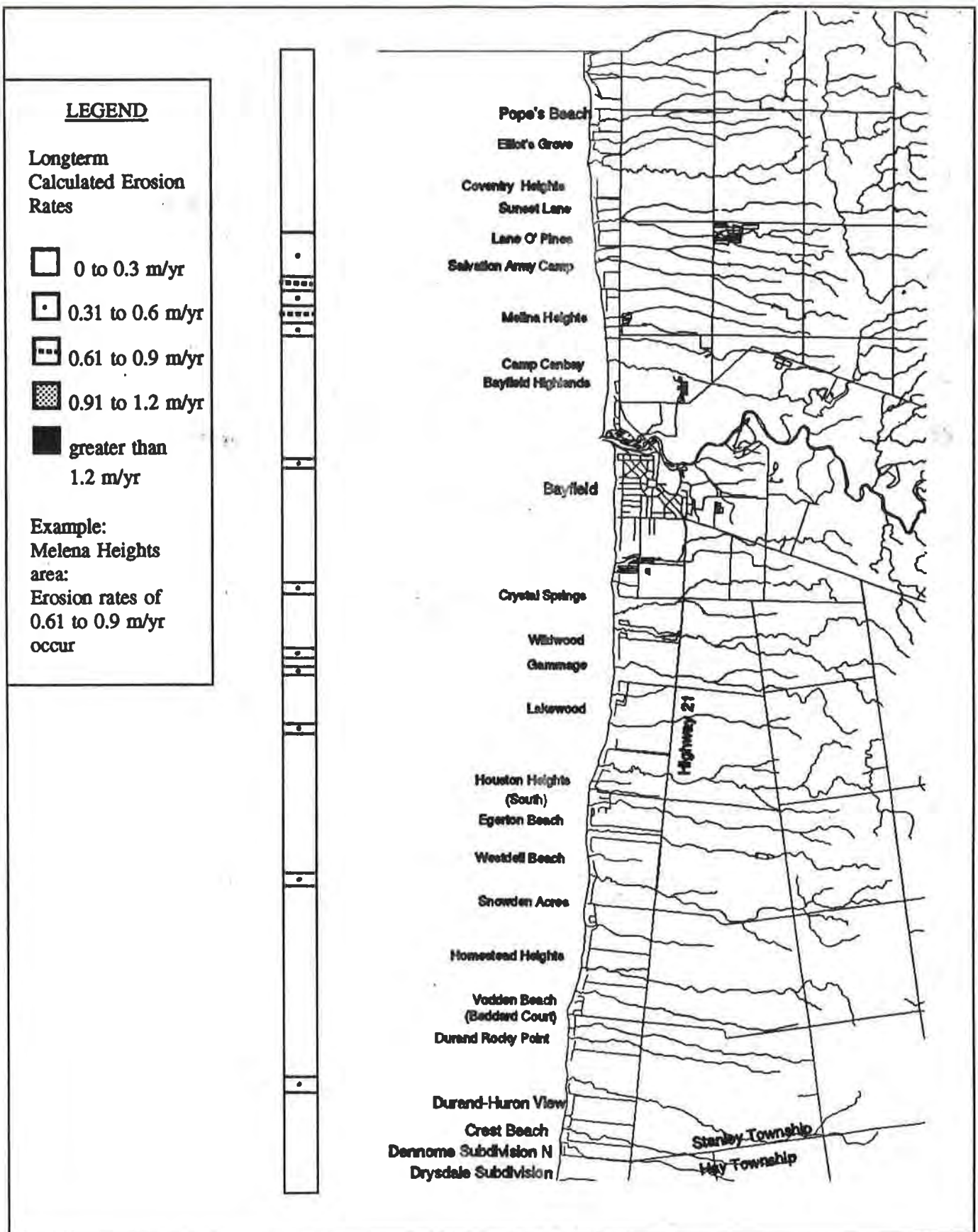


Figure 12: Shoreline Erosion Rates (Bayfield to Rocky Point)

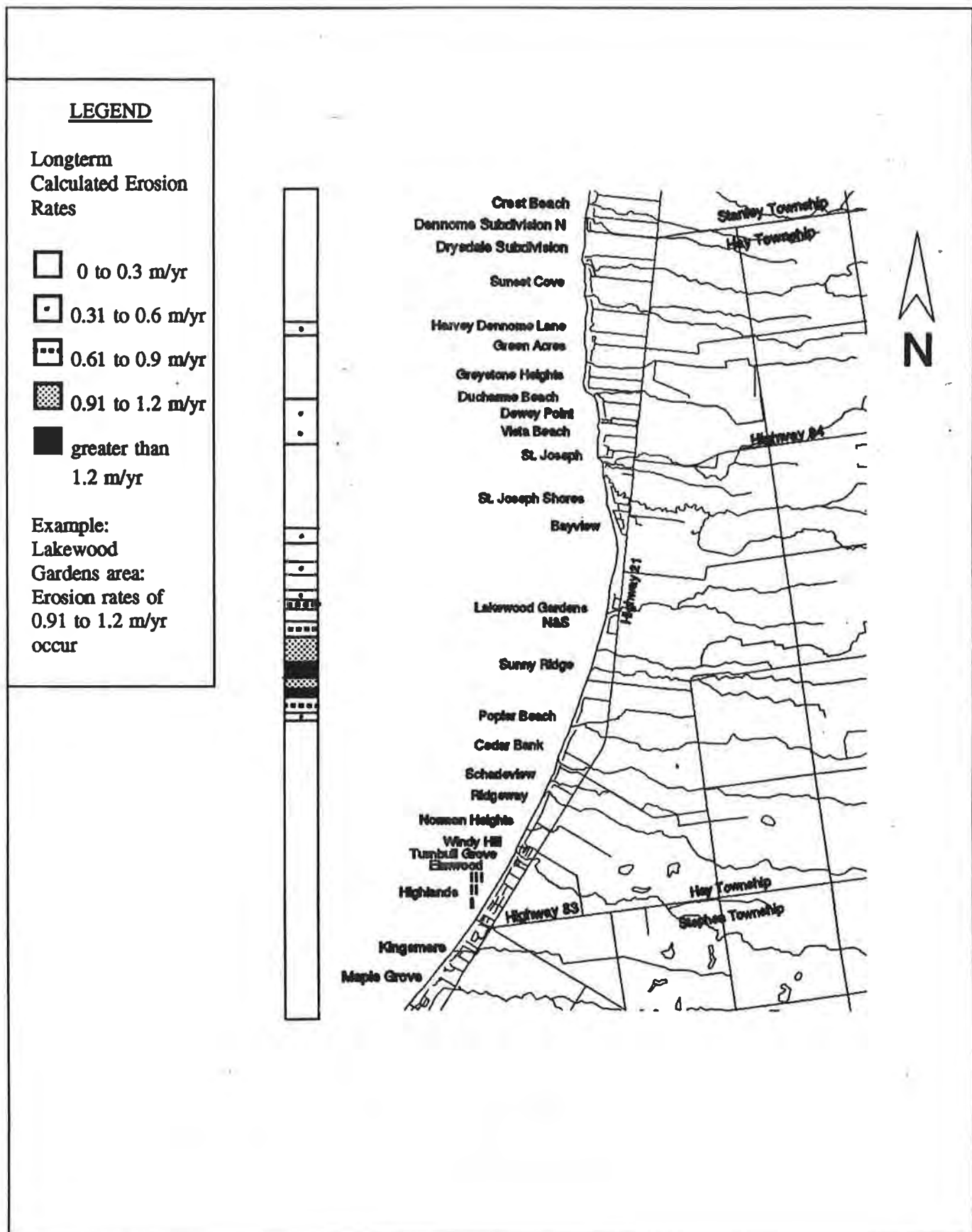


Figure 13: Shoreline Erosion Rates (Rocky Point to Port Blake)

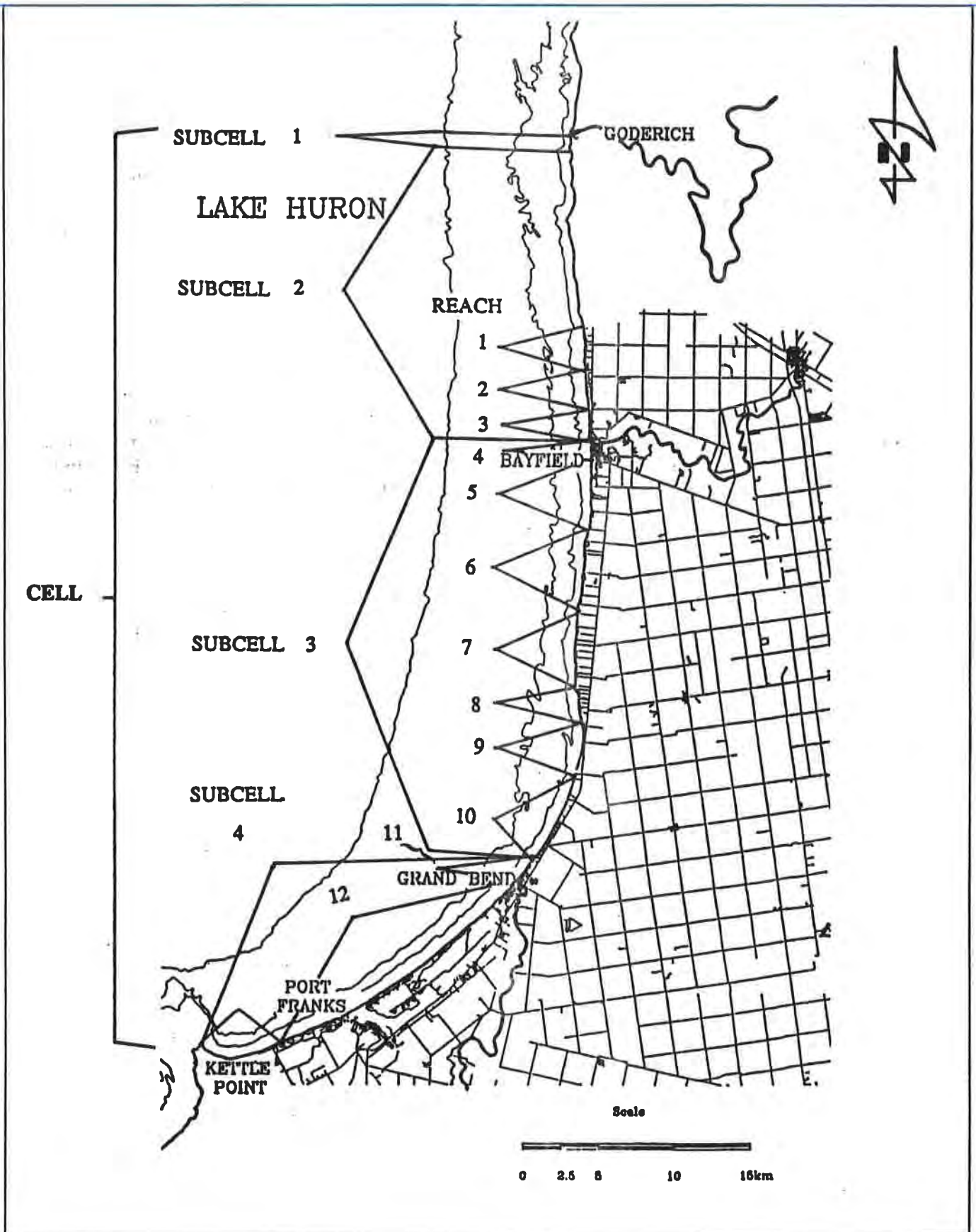


Figure 14: Shoreline Littoral Cell, Subcells and Reaches

A comparison of 1935 and 1988 bluff locations indicates that bluff erosion in this area ranges from zero to 0.9 m/yr, with the highest calculated erosion in the Melena Heights area. Reinders (1989) estimated that bluff erosion supplies an average of 13,100 m³/yr of sand to the nearshore zone, and that gully and lake bed erosion supply approximately 4,100 and 2,800 m³/yr respectively.

A unique feature along this section of shoreline has developed as a result of the construction of the Bayfield harbour structures in the late 1880s. Due to their impact on the alongshore transport processes, historical accretion of sand has occurred to the north of these structures, resulting in a relatively wide file beach extending from the jetty north to the Jowett's Grove area. Provided that land-side influences on the bluff are controlled, the general condition of the bluff behind the file beach is stable as evidenced by the historical cottage development and bluff conditions. However, this beach has achieved an equilibrium condition, and sand now bypasses Bayfield harbour and is transported further south into the next subcell.

SUBCELL 3 BAYFIELD HARBOUR TO MAPLE GROVE SUBDIVISION (REACH I IN REINDERS, 1989)

Between Bayfield harbour and Maple Grove subdivision, the shoreline again consists of cohesive bluffs fronted by narrow sand beaches. Approximately 40 percent (ABCA, 1991) of this reach of shoreline has protection to some extent, with groynes and/or seawalls being the predominant structures. Bluff erosion ranges from zero to 1.3 m/yr, with the most extreme erosion in the Lakewood Gardens/Sunny Ridge/Poplar Beach area. Bluff erosion supplies an average of approximately 32,600 m³/yr of sand to the nearshore zone, while gully and lake bottom erosion supply approximately 4,200 and 7,400 m³/yr respectively (Reinders, 1989).

Unique features along this section of shoreline include Rocky Point and Dewey Point, both of which are headlands projecting into the lake relative to the adjacent shorelines. As noted earlier, the long-term stability of these points relative to the adjacent sections of shoreline is due to the presence of hard Rannoch till on the nearshore lake bottom rather than soft St. Joseph till (refer to Figure 11). Of particular interest to shoreline management in these two areas is the fact that some cottage development is located on a beach terrace at the base of the bluff in addition to the more typical development on the tableland inland from the top of the bluff.

SUBCELL 4 MAPLE GROVE SUBDIVISION TO KETTLE POINT (REACH J IN REINDERS, 1989)

Between Maple Grove subdivision and Kettle Point, the shoreline consists of relatively wide beaches fronting sand dunes. This reach of shoreline represents the deposition zone for the material which has been eroded from the bluffs, gullies and lake bed along the "updrift" shoreline to the north. Reinders (1989) initially defined the transition between Subcells 3 and 4 (Reinders' Reaches I and J) at the westerly extension of the Highway 83 road allowance. However, based on a detailed review of the shoreline characteristics in this area, it appears that the transition from a cohesive bluff shoreline to a sand dune shoreline lacking cohesion actually occurs in the vicinity of Maple Grove subdivision, which is approximately 1.2 kilometres south of Highway #83. This location has thus been adopted as the boundary between Subcells 3 and 4.

Over thousands of years, the deposition of sand between Grand Bend and Kettle Point has resulted in the present day, fully-developed, beach-dune system. However, a comparison of shoreline conditions in 1935 and 1988 indicates that although the dune face has been relatively stable, the beach width has decreased substantially over this 53-year period. Some of this change may be due to reversible (temporary) beach profile adjustment in response to different water level and wave conditions during the periods preceding the two surveys. Specifically, the 1935 survey was completed following an extended period (several years) of very low lake levels, while the 1988 survey was completed shortly after the record high lake levels of 1985-86. In addition, the 1935 survey was completed in August, following the relatively calm summer season, while the 1988 survey was completed in April, following the relatively stormy fall/winter season. Both of these factors would lead to a narrower beach (above the waterline) in 1988, as indicated by the survey results.

However, it is likely that a net loss of sand from the Pinery/Ipperwash beach system has occurred since

1935 (i.e. irreversible — permanent — beach erosion due to a negative sediment budget, with sand losses exceeding sand supply). This loss may be due in part to the reduced supply of sand to this area caused by the construction of Goderich harbour in 1916, as well as possible losses to deep water caused by the harbour structures at Bayfield and Grand Bend. Losses from the beach also occur as a result of aeolian (wind) transport to the dunes and offshore transport to deep water during storms. Due to limitations in the available data, specifically the absence of detailed beach and nearshore profiles at the time of the two surveys, it is not possible to estimate the volumetric change in the beach system over the period of available data. Thus, it is not possible to quantify the relative roles of temporary beach profile adjustment and permanent beach erosion on the observed recession of the waterline.

Similar to Bayfield, a file beach has developed to the north of the Grand Bend harbour structures (built in 1904). This beach extends to the Maple Grove area, and appears to have reached an equilibrium condition so that sand is now bypassing the harbour structures to be deposited further downdrift. Limited shoreline protection has been constructed to the north of the harbour, while extensive protection has been constructed to the south of the harbour, particularly within the Village limits. This protection consists of groynes, seawalls and revetments intended to limit erosion of the dune during periods of high water.

3.2.5 GODERICH HARBOUR ANALYSIS

The potential impact of the Goderich harbour structures on the sediment transport along the ABCA shoreline was analyzed as part of this study (Baird, 1992). The findings of this analysis suggest:

- a) The full impact of sand bypassing at Goderich on the downdrift shoreline would take decades to be realized; conversely, the full impacts of the construction of the harbour at Goderich (completed in 1916) were probably not realized until approximately 1970.
- b) Sand bypassing at Goderich would generally result in a significant increase in beach width between Grand Bend and Goderich, with positive impacts on shoreline and bluff erosion in this area.
- c) A comparison of shoreline features between Grand Bend and Kettle Point in 1935 and 1988 indicates that while the dunes have been relatively stable, the waterline has moved landward and the beach has become considerably narrower; this waterline recession may be the result of reversible (temporary) beach profile adjustment and/or irreversible (permanent) beach erosion. Given limitations in the available data, it has not been possible to quantify the relative roles of these two processes on the observed waterline recession.
- d) It is likely that a net loss of sand from the Pinery/Ipperwash beach system has occurred since 1935 (i.e. due to a negative sediment budget, with sand losses exceeding sand supply). This loss may be due in part to the reduction in sand supply caused by the construction of Goderich harbour, as well as possible offshore losses caused by harbour structures at Bayfield and Grand Bend. Losses from the beach also occur as a result of wind-blown transport to the dunes and offshore transport to deep water during storms. Due to the limited data available, it is not possible to quantify the relative roles of these different factors on the observed waterline recession.
- e) The benefit of bypassing sand at Goderich would be an eventual increase in sand supply to the beach of 27,000 m³/yr; this is equivalent to a reduced erosional stress in the order of 0.05 to 0.1 m/yr (horizontal distance) over the 27 kilometre length of shoreline between Grand Bend and Kettle Point. This benefit would not reach the Pinery/Ipperwash area for many years after bypassing at Goderich had been initiated.

In summary, bypassing of sand at Goderich would benefit the shoreline to the south. Wider beaches between Goderich and Grand Bend would provide increased protection to the shoreline, as well as increased recreational benefits. A qualitative assessment of the potential benefits to the Pinery/Ipperwash beach system is limited by the available data. Future investigations are recommended in order to develop a detailed sediment budget for this reach of shoreline (in particular the magnitude of onshore and offshore losses), and to assess the long-term stability of the beach system, recognizing the dynamic nature of beach profiles under varying conditions.

At the request of the Steering Committee for this project, the Canadian Coast Guard (who has jurisdiction over the Goderich harbour facility) was contacted and these results of the preliminary analyses were presented. Future options are being investigated with this agency.

3.2.6 DETAILED DISCUSSION OF THE SHORELINE

In this section, a detailed discussion of the shoreline between Lot 30, Concession 1 in Goderich Township and Port Franks is presented. As Subcell 1 and most of Subcell 2 are outside of the ABCA jurisdiction, the descriptions begin in that portion of Subcell 2 which is within the ABCA boundaries. This discussion is based on a detailed summary of shoreline characteristics and erosion control structures (ABCA, 1990), hydrographic survey data, aerial photographs, technical reports, site visits and shoreline erosion analyses (see Section 3.1.2) undertaken by Baird and Associates and Geomatics International Ltd.

The reaches are identified by numbers one to 12 and subcells are identified as numbers one to four on the bathymetric map (see Figure 14). For ease of reference, structures which have been erected along the shoreline are described as shore protection structures, although no attempt has been made to comment on their effectiveness.

SUBCELL 2 ST. CHRISTOPHER'S BEACH TO BAYFIELD HARBOUR

This subcell of the shoreline is approximately 20 kilometres long and is primarily outside of the area under the jurisdiction of the ABCA, being contained within the Maitland Valley Conservation Authority jurisdiction (see Section 2.1.1. Littoral Cell Management). The most northerly 14 kilometres within the Maitland shoreline consists of high steep till bluffs containing seasonal residential development similar to the area south within the ABCA jurisdiction. The remaining length of shoreline within this subcell is 6 kilometres long and consists of bluffs 16 to 20 metres high, with an average slope of 28° from the horizontal. The top of the bluff over most of the shoreline has a two- to three-metre vertical scarp face which is bare of vegetation. The toe of the bluff is commonly oversteepened with poor vegetative cover to an elevation of two to three metres above beach level. The middle section of the bluff usually has a more gentle slope and is well covered with vegetation, usually mature cedars, poplars and white birch, as well as grasses.

Thirty percent of this shoreline contains shore protection structures in one form or another (i.e. groynes, seawalls or revetments). Twelve different cottage subdivisions exist in this subcell with approximately 138 cottages located at the top of the bluffs. The subcell is further divided into three reaches and labelled as Reaches 1, 2, and 3.

REACH 1 SIDEROAD 30 TO SUNSET LANE, GODERICH TWP.

Shoreline Map Numbers: 44 and 43

General

This reach includes the cottage areas of LaVrangué Beach, Pope's Beach, Elliott's Grove, Fox Hill, Coventry Heights and Sunset Lane, and is a typical till shoreline representative of this region. The bluffs are 20 metres high and erosion rates are less than 0.3 m/yr. North of the outlet of Gully Creek, the shoreline has no shore protection structures, which is likely a consequence of the limited erosion in this area, possibly due to the stabilization of the nearshore, and therefore the shoreline, by gravel lag deposits from the Rannoch till south of Gully Creek. Both Coventry Heights and Sunset Lane have much of their shoreline altered by structures (60 percent).

Erosion

Rates of erosion are less than 0.3 m/yr for this reach. Pope's Beach experienced bank movement in April, 1991 which extended across three cottage lots along the top of the bank (approx. one metre wide and dropped one metre).

Access

Public access to the beach is limited to Sideroad 30 which crosses the northern border of this reach. However, it is not improved for actual access.

Environment

The Gully Creek area is designated as a Class A ESA by the ABCA due to the cold water stream (a significant trout stream) and surrounding woodlot along the gully banks. Development has occurred on the north side and is planned for the south gully side.

Drainage

Many of the northern cottage areas have wooded areas inland which can be used as storage areas for surface drainage. As is commonly the case, no overall drainage plans exist for most of the cottage areas and gully lots are being developed for cottage use.

Planning Issues

Development plans for the vacant property south of Gully Creek have incorporated the lakebank to remain as a separate parcel of land rather than creating lots which extend down the lakebank. This approach is preferred by this SMP.

REACH 2 LANE O'PINES TO CAMP CANBAY, GODERICH TWP

Shoreline Map Numbers: 43, 42 and 41

General

This reach includes the cottage areas of Lane O'Pines, Lighthouse Cove Trailer Park, Salvation Army Camp, Birchcliff, Melena Heights and Part Lot 40. This shoreline has many shore protection structures (34 in number; 17 are groynes). An increase in the overall erosion rate for this reach (0.3 to 0.9 m/yr) separates this reach from adjacent shorelines.

Erosion

In the vicinity of Melena Heights cottage area, the nearshore lake bottom is eroding, and the water depths close to the shoreline are deeper than in the adjacent areas. This is evident from a hydrographic survey completed by the Canadian Hydrographic Service (CHS) in 1981 (see Figure 15) and from a diving inspection of the nearshore lake bottom (by W.F. Baird, September 10, 1991). Consequently, this area experiences the second highest bluff erosion rates in all of the ABCA jurisdiction (long-term erosion rates of up to 0.9 m/yr).

Protection

It is considered that many of the existing shore protection structures built in this area (groynes and sea walls) will not provide protection for many more years, and if no action is taken, severe erosion of the bluffs will take place in the next few years. If improved shore protection is to be constructed in this area, it is recommended that a revetment structure, as opposed to groynes or seawalls, be built and that allowances be made for the continuing erosion of the nearshore lake bottom in the revetment design. This type of structure would be considerably more costly than the existing structures. It would, however, be capable of stabilizing the shoreline.

Access

Public access is limited to the Sideroad 35 road allowance which follows the gully at the north end of Lane O'Pines. However, the access is not improved through the gully.

Drainage

As part of a development proposal, the Oteva Municipal Drain empties into the gully which borders Lighthouse Cove Trailer Park. This drain is designed to handle surface water from the north.

Planning Issues

The Lighthouse Cove Trailer Park has expanded to double its original size and rebuilt the main office which is within 10 metres of the top of an eroding bank.

Other

Other noteworthy features are a nearly vertical scarp located along the lakebank at Birchcliff (which can be seen from Bayfield Harbour two kilometres south), and a five-metre high waterfall located within a rapidly eroding gully flowing through Lot 40, Concession 1.

REACH 3 CAMP CANBAY, GODERICH TWP. TO BAYFIELD HARBOUR, VILLAGE OF BAYFIELD

Shoreline Map Numbers: 41 and 40

General

This reach includes Camp Canbay, Bayfield Highlands, Jowett's Grove, and Ronethroy Cottages. The till bluff is protected by the extensive sand beach (referred to as a file beach) held in place by the harbour structure. It is important to note that the harbour structures must continue to be maintained in order for this beach to remain in place. The transition region from the north end of the file beach will need to be carefully monitored and assessed to fully understand the role that Lake Huron water levels have on bluff erosion of this sensitive area.

Erosion

Due to the sand beach at the toe of the bank, the erosion rates in this reach are less than 0.1 m/yr.

Access

A private beach access exists as part of the marina/condominium complex north of the harbour. No improved, public access locations exist.

Planning Issues

A large-scale development (40 residential lots) which includes regrading the bluff is planned for the area located on the north side of the harbour along the lakebank.

SUBCELL 3 BAYFIELD HARBOUR TO MAPLE GROVE, STEPHEN TWP.

This subcell forms the majority of the ABCA bluff shoreline and accounts for the majority of residences located in the risk zone, either related to erosion or flooding. Within this subcell are found the headland features known as Dewey and Rocky Points which locally provide more stable bluff conditions and permit cottage development at beach level. This subcell is further divided into seven reaches and they are labelled Reaches 4 to 10.

REACH 4 BAYFIELD HARBOUR TO PAUL BUNYAN CAMP, VILLAGE OF BAYFIELD

Shoreline Map Numbers: 40 and 39

General

The 1.8-kilometre length of shoreline between the harbour and the southern limit of the Bayfield experiences unique problems because of the harbour structures. It is generally considered that the north to south movement of sand along the shoreline to the north is forced offshore by the harbour structures and returns only slowly to the shoreline to the south. Consequently, the shoreline to the south of the harbour is partially "starved" of beach sand and it may have experienced increased erosion of the bluff as a result. The beach in this area, including the Village Public Beach, is relatively narrow, and numerous erosion control structures have been built in an attempt to protect the 19-metre high, relatively unstable bluffs from eroding further. Groyne protection constructed in this area may not be effective due to the lack of long shore sand movement.

These bluffs generally have a slope of 32° with 70 percent vegetative cover (grasses, wild flowers, shrubs,

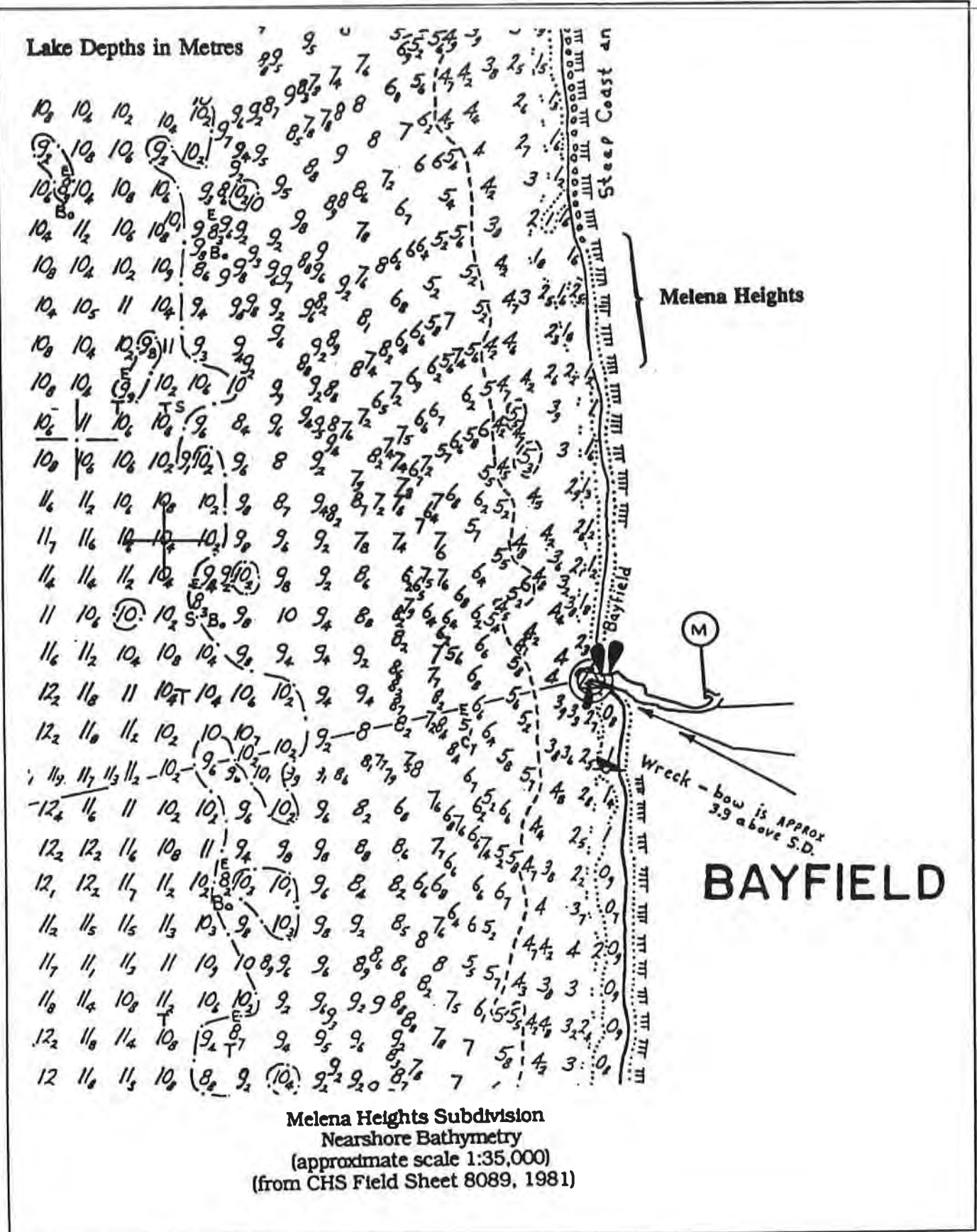


Figure 15: Melena Heights - Bathymetric Chart

cedars and poplars). However, six sections of the bluff (each between 30 and 80 metres long) are completely bare of vegetative cover. Bluff erosion is evident along much of the shoreline and a scarp face is located at the top of the bluff in one location.

Shore protection structures exist along 53 percent of this shoreline. These structures are located between the harbour and the south end of Tuyl Street, which corresponds to the section of the bluff which is eroding and has dwellings situated along the top of the bluff.

This shoreline exemplifies where it might be in the public interest for the Village to acquire riparian rights to the base of the bluff and beach and construct community shore protection. For example, a series of offshore breakwaters containing beach fill would protect the shoreline and provide a continuous public beach along the shoreline. This type of approach, although costly, could provide significant recreational benefits to the community.

Erosion

The owner of a large estate located near Pioneer Park has regraded the lakebank and constructed a rock revetment at the toe to improve stability. A second site, located at the southerly end of Tuyl Street, has a residence situated part way down the lakebank; further review of the site is warranted to assess the risk. An erosion monitoring station (#H-90-30) exists along the south border of Pioneer Park and records an average erosion rate of .3 m/yr.

Access

Pioneer Park and Bayfield Public Beach provide improved access directly to the beach, and Longhill Road enables access to the south harbour structure and adjacent beach. Huron Terrace road allowance formerly paralleled the lakebank along the top of the bluff before erosion of the bluff reduced or eliminated this road. The section between Dow and Christy Streets was the focus of concern in August, 1989 when adjacent landowners took steps to close the public road and purchase the remaining property.

Drainage

Due to a high water table, the Village has installed three large storm sewer outlets (two at the west end of Develan and Cameron Streets, and one near the south end of Tuyl Street) which flow year-round. Evidence of bank seepage has been found at the south end of the Village adjacent to the vacant field.

Planning Issues

An amendment to the Village zoning bylaw in 1992 has established a top of bank building setback for the lakebank equal to 30 metres which is consistent with the remainder of Huron County.

Other

A shipwreck, partially visible at average lake levels, exists approximately 110 metres offshore and north of the Public Beach.

REACH 5 PAUL BUNYAN CAMP TO HOUSTON HEIGHTS, STANLEY TWP.

Shoreline Map Numbers: 38, 37 and 36

General

Reach 5 includes the cottage areas of Crystal Springs, Wildwood, Glitter Bay, Lakewood Beach, and Elmslie Drive, plus the Huron Church Camp and the Baron de Tuyl property. In addition, two undeveloped parcels of lakefront cover 450 metres of the shoreline. The reach typically has 15-metre high bluffs with slopes of 30° and beaches less than 12 metres in width. There are more scarp faces at the top of the bluff and evidence of ground water seepage on the bluff face in this area than exist in the rest of the township. The erosion rate varies from minimal (Houston Heights) to approximately 0.6 m/yr (Glitter Bay Subdivision).

Erosion

Although the erosion rate is generally less than 0.3 m/yr, isolated areas of 0.6 m/yr exist. In April, 1991 the Elmslie Drive area of the shoreline experienced considerable bank movement caused in part by high runoff and saturated soil conditions. At a second site, the ABCA was involved in a project to assist in stabilizing a gully which was undergoing erosion that threatened two cottages. At a third location in this reach, a cottage lot owner in Wildwood subdivision has regraded the lakebank and installed bank toe protection as part of his development plans.

Access

A well-maintained, private access exists in the Paul Bunyan Camp for the use of camp patrons. Public access to the beach is limited to Sideroads 1 and 5; however only #5 is developed to provide actual access. Sideroad 5 borders the Baron de Tuyl Crown land parcel which has a public beach and limited parking available.

Environment

One of the last remaining, large expanses of wooded lakeshore exists within this reach covering 102 ha of land and including Wildwood, Glitter Bay, Baron de Tuyl, Lakewood Beach, and Elmslie Drive areas. This wooded parcel is identified as a Class A, ESA by the ABCA due to the large size and tree species present (described as a mature, beech/maple upland forest).

Drainage

The Genoch Municipal Drain was installed to drain a portion of Lot 5, LRW Concession and provide outlet directly south of Lakewood Beach. This drain is noteworthy in that it has made provision for erosion control within the outletting lakeshore gully and has involved the participation of the cottage residents. At a second site, road drainage is contained and outletted down the lakebank to a protected outlet at the beach adjacent to Sideroad 5.

Planning Issues

Within the ESA, two large residential subdivisions are proposed which would substantially reduce the forest cover area. Both proposals have undergone review of the woodlot condition and options to reduce impact to the forest were considered as part of the proposals for development.

Other

Related to access, one cottage lot owner has constructed a suspended walkway, 60 metres in length, over a gully to allow access to the beach.

REACH 6 HOUSTON HEIGHTS TO ROCKY POINT, STANLEY TWP.

Shoreline Map Numbers: 36, 35, 34 and 33

General

This reach includes the cottage areas of Houston Heights (North and South), Egerton Beach, Westdell Beach, Snowden Acres, Homestead Heights, Bluehaven Beach and Vodden Beach and ends at Rocky Point. In addition, this reach, which ends at Rocky Point, boasts the only functional township lakeshore park. This shoreline is unique, both for the township and for the ABCA shoreline, due to the high concentration of steel sheet pile groynes and seawalls. Beach widths are generally wider (approximately 20 metres wide), although there are some subdivisions (Westdell and Snowden Acres) with beaches less than 10 metres wide. Houston Heights North, Houston Heights South, Egerton Beach and Snowden Acres South all have beaches 20 to 25 metres wide, and contain 24 steel sheet groynes in four series. This section of shoreline has experienced little or no bluff erosion. The only location experiencing erosion of greater than 0.3 m/yr is at Snowden Acres. The extensive steel sheet pile groynes along this section of shoreline appear to have been built to hold the sand beach in place for recreational activities and to protect the toe of the bluff during periods of high water.

Erosion

Although erosion is not severe, localized events, such as the bank movement in Westdell Beach in April, 1991, do occur. This slump was 1.5 metres in width and crossed five of the lots at the south end of the subdivision. Material from the slump flowed onto the beach and caused some damage to existing seawalls.

Access

Stanley Township Park, located at the west end of Sideroad 10, provides improved access to the beach, picnic shelter and limited parking.

Environment

A large woodlot and abandoned fieldstone farmhouse is located inland from Egerton Beach.

Drainage

Snowden Acres has a pipe outletting road drainage water at the top of the lakebank which has contributed to the creation of a gully. Corrective measures need to be taken and were considered in a failed bid for a municipal drain which was applied for in 1980.

Planning Issues

Egerton Beach is one of the older cottage areas (pre 1935) along the ABCA shoreline and has preserved two parcels of land for communal use (i.e. for playground/tennis courts and for septic tank installations).

Other

An interesting feature along this shoreline is a beach terrace located part way down the lakebank at Egerton and Westdell Beaches, formed by another stage or level of Lake Huron (the post-glacial Lake Algonquin). This stranded beach feature has been enhanced by the Egerton Beach cottage owners and incorporated into the survey plan as a walkway along part of the lakefront. Vodden Beach is located at Rocky Point which is a relatively stable area of the shoreline due to the occurrence of the more resistant Rannoch Till in the lakebank. The stability is evidenced by the absence of cracking found on cement structures (i.e. boathouses) located near this location.

REACH 7 ROCKY POINT, STANLEY TWP. TO DEWEY POINT, HAY TWP.

Shoreline Map Numbers: 33, 32, 31, 30 and 29

General

This reach stretches from lakeshore "point to point", or between headland features including the cottage areas of Durand Rocky Point, Durand Huronview, Crest Beach, Dennome and Drysdale Beach in Stanley Township. South into Hay Township it includes Sunset Cove, Harvey Dennome, Greystone Beach, Northridge and Ducharme Beach. One undeveloped parcel also exists at the most northerly end of Hay Township, covering 360 m of lakefront. Fifteen dwellings are located on the beach in the southern part of Stanley Township. Durand-Huron View and Dennome subdivisions each have one cottage on the beach, while the Drysdale subdivision has 13 cottages on the beach. All of the houses on the beach have shoreline protection (usually a steel sheet or concrete seawall).

Erosion

Bluff erosion is generally less than 0.3 m/yr. From the Township boundary (Drysdale) to Dewey Point (including Sunset Cove, Harvey Dennome, and Greystone Heights), the bluffs are completely covered by cedars, birch, maples and grasses. Thirty-nine per cent of this shoreline contains twenty-five different seawalls, installed to protect the toe of the bluff from wave action during periods of high water. The natural protection provided by the "points", as a result of the gravel lag deposits associated with the Rannoch till, protect the nearshore lake bottom. This protection is also likely to be the reason why the shoreline between the two is relatively stable.

Access

No improved, public access locations exist along the shoreline, despite the existence of three township road allowances (Stanley Sideroad 20, Stanley Sideroad 30 — the township border — and Hay Sideroad 5). The access road for the cottages on the beach at Drysdale also acts as a seawall to reduce storm damage during high lake levels.

Drainage

Cottage owners in the vicinity of the gully in Sunset Cove have difficulty getting access during high runoff periods as the access road crosses the gully twice on reaching beach level. One cottage at the south end of this area is constructed "straddling" the gully outlet.

Planning Issues

A multi-lot severance, which would form second-tier development at Vodden Beach, has raised the question of adequate storm drainage through an existing gully outlet. Adjacent property to the south is also being investigated for a 25-lot residential subdivision.

REACH 8 DEWEY POINT TO ST. JOSEPH SHORES, HAY TWP.Shoreline Map numbers: 29 and 28General

This reach includes the cottage areas of Vista Beach and Antoinette's Lane, as well as Driftwood Beach Trailer Park, and the permanent residential areas of St. Joseph and St. Joseph Shores. The shoreline orientation south of Dewey Point changes slightly to extend further easterly until a point along the shoreline approximated by Hay Sideroad 15 (Bayview area). The reach extending to St. Joseph consists of 13-metre high bluffs that have a vegetation cover of grasses. Shore protection structures exist along 18 percent of the shoreline, and are primarily composed of groynes and seawalls.

Erosion

Immediately south of Dewey Point, increased bluff erosion (greater than 0.3 m/yr) is experienced at Vista Beach and Driftwood Trailer Park. Bluff erosion then reduces and the shoreline is relatively stable until St. Joseph. In St. Joseph Shores, the lakebank of three lots has been regraded to a more stable slope (3:1 slope) and bank toe protection has been installed. A second site, north of Antoinette's Lane, was altered by regrading the bluff, installing drainage improvements, and placing rock at the bluff toe. A large estate home was constructed at the top of the bluff on a parcel of land previously divided into 5 subdivision lots.

Environment

The gully which flows through St. Joseph Shores subdivision was originally promoted as a "wildlife sanctuary and ravine". Restrictions on individual titles have ensured that the gully environment is preserved as evidenced by thick forest cover and walkways which cross the ravine area for local use.

Access

Private beach access is provided to park patrons at Driftwood Beach Trailer Park. This reach also provides the only public vehicular access to the lake between Bayfield and Grand Bend, with a boat launch facility located at St. Joseph.

Drainage

Driftwood Trailer Park is the site of the Jeffrey Municipal Drain (a closed drain) which was constructed by installing drainage improvements through a gully and then infilling the gully. At a second site, in Vista Beach, surface water drainage problems exist; however, outlet into the municipal drain was not possible. The last vacant lakeshore cottage lot within this cottage area, which contains a small gully, is planned for development.

Planning Issues

South of Driftwood Trailer Park is a vacant parcel of lakefront land. The trailer park has received permission to expand operations eastward, to allow more trailers and a campground.

Other

A landowner placed material on the beach to form a boat ramp without permission from MNR under the Public Lands Act. MNR action was postponed, however, as a result of the Interim Policy on the Management of Canada Company Beaches (see Section 4.2.5 "Policy and Implementation"). The material on the beach will need to be removed if this policy changes as a result of other court decisions.

REACH 9 ST. JOSEPH SHORES TO POPLAR BEACH, HAY TWP.

Shoreline Map Numbers: 28, 27, 26 and 25

General

This reach includes the cottage areas of Bayview Estates, Lakewood Gardens, Sunnyridge and Poplar Beach. The change in shoreline orientation achieves a maximum easterly extent near Bayview Estates where the shore comes within 100 metres of Highway #21.

Erosion

South of St. Joseph Shores, the bluff erosion increases progressively, and exceeds 0.6 m/yr throughout the Lakewood Gardens/Sunny Ridge/Poplar Beach area, reaching a maximum of approximately 1.3 m/yr between Sunnyridge and Poplar Beach. It is clear that this high-bluff erosion rate — the largest in the ABCA area — occurs as a result of erosion of the nearshore lake bottom and is a sediment source area for the shoreline to the south. The deeper water adjacent to the shoreline that exists in this area relative to the neighbouring shorelines is evident in the hydrographic survey (CHS, 1981) shown in Figure 16. To protect this shoreline from continuing erosion (if necessary) would require a very extensive and costly armour stone revetment that would allow for the extensive downcutting of the nearshore lake bottom that will occur in the future.

Access

Hay Sideroad 15 does provide improved pedestrian access to the beach (limited parking) and the adjacent site was formerly the site of a public picnic shelter. In contrast, Hay Sideroad 20 ends at the top of a steep, eroding bank.

Environment

Bayview Subdivision was the site of a sample survey which the ABCA carried out concerning the use and maintenance of septic systems. This investigation is referenced under Section 3.5 "Environmental Overview".

Drainage

Lakewood Gardens has a substantial erosion control structure located in the gully under the Highway #21 crossing. The concern for the erosion and proximity of the shoreline to the highway is reflected in the scale of this protection, installed by the Ministry of Transportation. A municipal drain is proposed for the southern half of this subdivision area with the water to outlet into this existing erosion control structure.

Planning Issues

A number of planning-related issues exist in this reach, all related to the severity of the erosion. Sunnyridge is an existing cottage area which has had minimal development. This is likely related to the severe erosion of the lakebank as evidenced by each of the three existing cottages having to be moved back at least once from the lakeshore. Lot layout of this area needs to be redesigned or land use restrictions need to be applied to long term erosion susceptible lands in the area to ensure the future safety of development.

Poplar Beach, adjacent to the south, has an approved 26-lot subdivision located immediately inland from

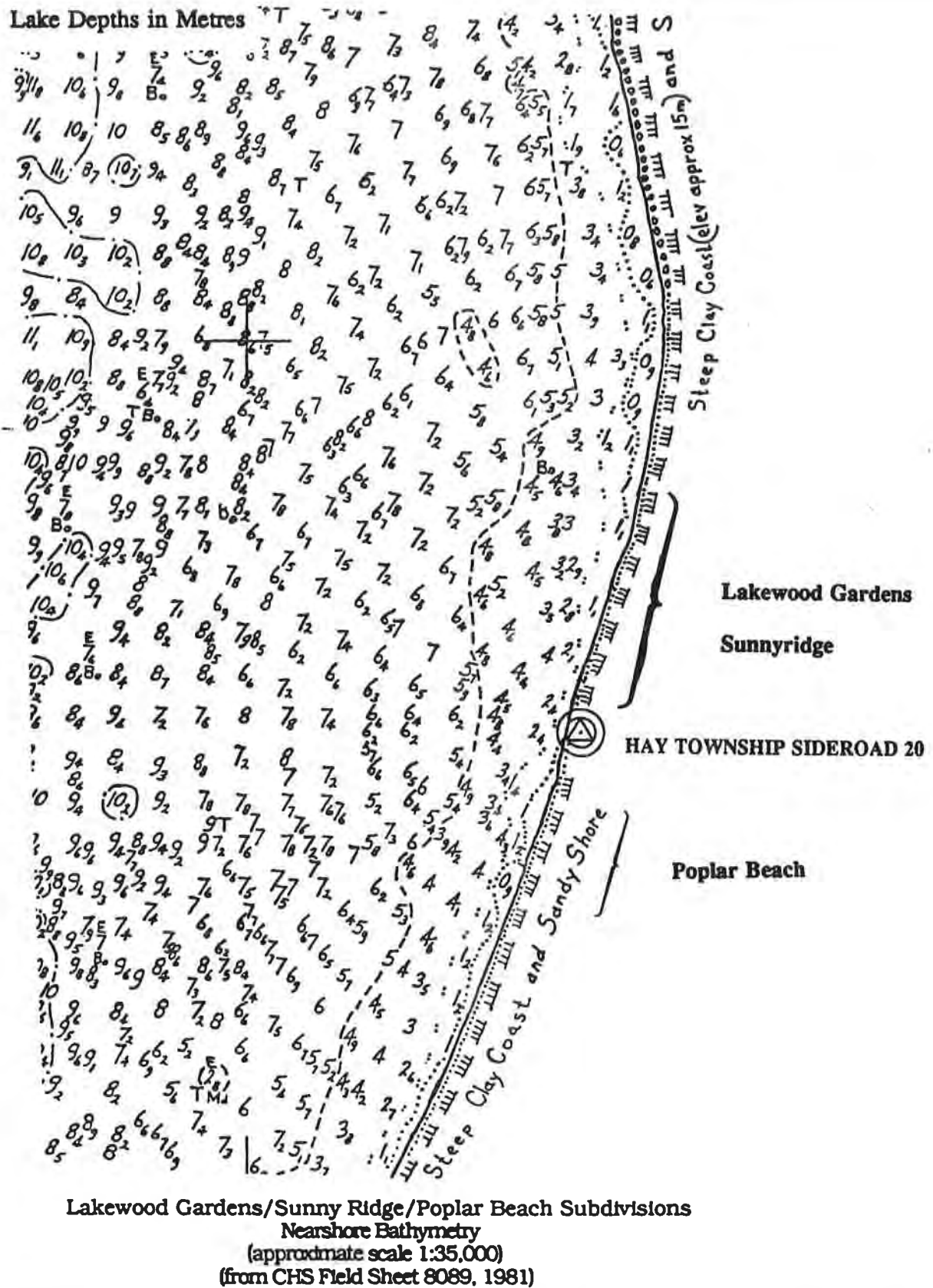


Figure 16: Poplar Beach - Bathymetric Chart

the existing cottage strip along the lakeshore. Long-term erosion (the 100-year erosion line) was accommodated in this development by the developer designating that area lakeward of the setback line as open space or park.

Lakewood Gardens is an existing developed subdivision with few vacant lots remaining. The long-term erosion rates in this area range from 0.6 to 1.2 m/yr, and management options will need to consider these rates. The Lakeshore Area 1 (slope stability risk) includes three cottages and the caution zone (long-term erosion area) incorporates 28 cottages (see Section 3.3 for zone definitions). Vacant lakeshore property makes up almost 1.5 kilometres along this reach, vacant primarily due to high erosion rates. New development will need to regard the long-term erosion rates in their plans.

Other

Poplar Beach is the site of an erosion monitoring station (#H-90-40).

REACH 10 POPLAR BEACH, HAY TWP. TO MAPLE GROVE, STEPHEN TWP.

Shoreline Map Numbers: 25, 24, 23, 22, 21 and 20

General

This reach includes the Hay Township cottage areas of Cedarbanks, Schadeview, Ridgeway, Norman Heights, Windy Hill, Turnbull's Grove, Elmwood and Highlands I, II, and III. In Stephen Township the reach includes Kingsmere and Maple Grove cottage areas and the Port Blake Conservation Area and Lake Huron Water Supply facility. Reach 10 is the most southerly location where till bluffs are found and contains the transition region from the bluffs to a shoreline dominated by sand dunes. Although partly due to shoreline orientation, the availability of sand supply by littoral drift will also affect the stability of this transition region. Lake Huron water levels will also affect the overall extent of this transition zone, varying north and south with higher and lower lake levels.

South of Poplar Beach, the six- to 10-metre high bluffs reduce in height until they disappear into the sand at Maple Grove. The bluffs are relatively stable and contain good vegetative cover. The historical erosion rate is less than 0.3 m/yr, and areas such as Ridgeway, Norman Heights and Turnbull's Grove have experienced no significant erosion. Along approximately 44 percent of this reach, protective structures have been built

Erosion

Localized erosion occurred at the base of the bluffs during the 1986 high lake levels. The Ridgeway/Schadeview/Cedarbank areas have been the subject of additional investigation on the localized erosive effects of groynes on the shoreline as a result of a legal case initiated in 1986, and yet unresolved.

Access

Beach access is provided at Port Blake Conservation Area and the adjacent township road allowance along the north side of the Lake Huron Water Supply facility. Neither Hay Sideroad 25 nor 30 have improved access to the beach.

Environment

The Highlands II cottage area has a history of poor surface drainage which has resulted in problems with the operation of individual septic systems, most recently during the summer of 1991.

Drainage

The Luther-Miller Municipal Drain forms the boundary between Highlands II and III and was the subject of a drain improvement in 1987. However, when a drain deepening was proposed to improve agricultural outlet for the rural lands to the east, it was found that the cottage development had encroached too close to the drain to allow the widening that would be required. As a result, a pump was incorporated into the maintenance at Highway 21 to raise the water from the deepened drain east of the highway up into the existing channel. Surface drainage remains a problem in most of the subdivisions within this reach. A municipal drain is proposed for Highlands II to improve

drainage.

Planning Issues

Both Norman Heights and Windy Hill are the locations of two large residential subdivision proposals (29 lots and 25 lots, respectively). Schadeview is also the site of a 3-lot development along the gully.

SUBCELL 4 MAPLE GROVE, STEPHEN TWP. TO KETTLE POINT INDIAN RESERVE

This subcell forms the deposition area (or littoral "sink") for the sediment transported along the shoreline from the north. This area is a vast dune/beach complex which has important environmental qualities as well as an important role in protecting the extensive residential development which has occurred along the shore. The term "dynamic beach" is the regulatory term which defines the inland extent of this shoreline zone and provides direction on how best to manage the dune environment (see Section 3.3, Lakeshore Development Policy). This subcell is further divided into two reaches labelled Reaches 11 and 12.

REACH 11 MAPLE GROVE, STEPHEN TWP. TO GRAND BEND HARBOUR

Shoreline Map Numbers: 20 and 19

General

This reach includes the cottage area of Oakwood Subdivision, Stephen Township and the remainder is within the Village of Grand Bend. The reach within Stephen Township is quite homogeneous, with a wide sand beach (30 to 50 metres wide), often including a 1.5-metre high terrace fronting a three- to five-metre high sand dune. The face of this dune typically has a 70 percent cover of beach grass, and shows some evidence of having been disturbed in the past, likely by pedestrian traffic or storm wave runup. Most of the houses are located on top of the ridge dune.

North of the harbour, the 0.7-kilometre length of shoreline within Grand Bend consists of a 70- to 100-metre wide, stable beach. The residences are all located close to beach level, but well back from the water's edge.

Erosion

This section of shoreline has been stabilized by the extensive sand beach that has developed following construction of the Grand Bend harbour structures. The stability of this shoreline is partially dependent on the continuing maintenance of these structures. One residential site in Oakwood Park has a "break" in the foredune, lakeward of the house to permit easy access and visual sight to the water. This break may need to be managed to ensure wind scour does not enlarge the hole and affect the overall stability of the dune.

Access

The public beach at Grand Bend provides beach access both on the north and south side of the harbour. A recent court case has cast some doubt on the ownership of a portion of the beach north of the harbour (see Section 4.2.5).

Environment

This reach is the northern limit of an area which has an abundance of sand-forming dunes when the supply and conditions are satisfactory. As the dunes provide protection from lakeshore processes, they need to be carefully maintained (see Section 3.5, Environmental Overview). A beach management plan (ABCA, 1993) has been provided to Grand Bend to provide options on how best to keep sand where it is most needed.

Planning Issues

Beach Place Condominiums is a seven-storey structure located on the beach directly north of the site of the former casino building which burned down in the 1970s. The condo structure has an armourstone revetment and

concrete retaining wall located approximately 60 metres from the shoreline, and the condominium structure is set back an additional five metres.

Gibb's Beach is located between Main Street of Grand Bend and the Ausable River. This beach was the subject of a court case over ownership between Archie Gibbs and the Village and Province. In a landmark decision, Mr. Justice Chilcott handed down his decision (under appeal by the Province) that the reservation of beds and banks of Lake Huron for public (or Crown) use was "void for uncertainty". Pending the outcome of the appeal, the property is in Mr. Gibb's ownership.

REACH 12 GRAND BEND HARBOUR TO STONY POINT, BOSANQUET TWP. (IPPERWASH MILITARY RESERVE)

Shoreline Map Numbers: 19, 18, 17, 15, 14, 13 and 12 (sheet #16 is not shoreline)

General

This 19.2-kilometre length of shoreline includes 0.5 kilometres of shoreline within the Village of Grand Bend, six kilometres of shoreline within Bosanquet Township, and a total of 12.7 kilometres of shoreline within Pinery Provincial Park and Ipperwash Military Reserve. Although the Pinery and Ipperwash shorelines are not under ABCA jurisdiction, the management of these areas should reflect the overall concepts presented in this Plan.

The shoreline in this area generally consists of a sand beach backed by 4.5-metre high sand dunes with a poor-to-fair cover of grasses. Comparisons of shoreline features in 1935 and 1988 indicate that the dune face has been relatively stable over this 53-year period, but that the beach width has decreased substantially. As noted earlier, this recession of the waterline is likely the result of different beach profiles at the time of the two surveys (in response to different water level and wave conditions in the periods preceding the two surveys), as well as a net loss of material from the beach (i.e. due to a negative sediment budget). This loss may be due in part to the reduced supply of sand to this area as a result of harbour construction at Goderich, Bayfield and Grand Bend. Losses from the beach also occur as a result of wind-blown transport to the dunes and offshore transport to deep water during storms. Due to limitations in the available data, it is not possible to quantify the role of these different processes in the observed recession of the waterline between 1935 and 1988. Further investigations are recommended in this area in order to accurately establish the sediment budget for this reach, and to assess the long-term stability of the beach.

Extensive shore protection structures have been built along some of the shoreline. For example, immediately to the south of Grand Bend harbour, 98 percent of the shoreline is protected by various structures, including groynes, seawalls and the armour stone revetment in front of Southcott Pines. Further to the southwest, in Bosanquet Township and northeast of Pinery Park, 60 percent of the shoreline is altered by armour stone revetments, gabion walls and groynes.

Erosion

The north section of this reach (near Southcott Pines) is subjected to an increased erosional stress compared to the adjacent shoreline to the southwest due to the presence of the Grand Bend harbour structures, which divert sand offshore; this material bypasses the Southcott Pines area as it slowly returns to the shoreline.

Access

South Beach provides public access to the beach in Grand Bend, and the Mud Creek area provides private beach access in Port Franks. In addition, Pinery Provincial Park provides approximately 10 kilometres of public beach in the dune area of the shoreline.

Environment

Refer to Section 3.5 "Environmental Overview" for a detailed account of the Grand Bend to Kettle Point dune area.

Planning Issues

Both the cottage areas of Armstrong East and Peninsula #2 (or 'Chicken Island') are remote locations relying on water access for transportation to the sites. This can prove difficult in severe weather and the limited access will need to be considered in any plans to develop or redevelop the areas. The shifting sand has caused some cottage owners to relocate structures because of the effects of past storms and floods involving the Ausable River.

The shoreline between Stony Point and Kettle Point completes the littoral cell which has its northern limit at Goderich Harbour. This six-kilometre reach of shoreline is considered a stable beach zone due to the natural headland boundaries — or "points" — which contain it. Kettle Point forms a complete barrier to littoral transport whereas Stony Point is only a partial barrier. Alongshore movement of sand is minimal and cross-shore movement predominates.

Ipperwash Provincial Park provides public access to almost one kilometre of the shoreline and the remaining length is divided between cottage development and the Kettle Point Indian Reserve. Recently the Stony Point and Kettle Point Tribal Councils have laid claim to portions of this cottage area. Considerable shoreline damage occurred during storms in the 1973 high lake level period. Ice piling occurred, causing damage to property and structures.

Environmentally, the backshore region of the beach is designated as an ESA by Lambton County and as a provincially significant wetland, named the Ipperwash Inner-Dunal Wetland, by MNR due to the significant dune swale and wetland features found within the successive dune ridges. These ridges extend inland from the shoreline, showing evidence of past shoreline locations and dune migration.

Section 3.3 LAKESHORE DEVELOPMENT GUIDELINES

3.3.1 INTRODUCTION

In February of 1988, the ABCA was designated as lead commenting government agency with regards to plan input and review matters as they relate to flooding and erosion hazards along the shoreline. In order to provide effective direction on the topic of land use and land development to the seven lakeshore municipalities which comprise the ABCA shoreline, the ABCA Lakeshore Development Guidelines are proposed. The following guidelines are intended to meet this requirement and to provide the necessary direction.

3.3.2 LAKESHORE GOALS AND OBJECTIVES

These ABCA guidelines are compiled from a number of existing regulations and policies which pertain to the shoreline. They complement the existing MNR Great Lakes - St. Lawrence River Shoreline Policy which is also being prepared as a joint policy statement with MMA (in draft stage) under Section 3 of the Planning Act. This joint policy statement introduces the Regulatory Shoreline concept and outlines the three hazards of flooding, erosion and dynamic beaches found along the Great Lakes shorelines. It also presents the criteria used to define these hazards being the

- Regulatory Flooding Standard
- Regulatory Erosion Standard
- Regulatory Dynamic Beach Standard
- and the Regulatory Shoreline, being the region defined by the furthest landward limit of the three regulatory standards

(see Appendix B for details of the Policy). If changes occur to the draft policy statement after the adoption of this SMP, the necessary amendments will be made to this document to ensure consistency with the provincial directive.

For the purposes of implementing this SMP, the Regulatory Shoreline from the provincial policy has been

described as being the Regulatory Lakeshore to allow further specific application to the lakeshore within the ABCA jurisdiction. Similarly, all criteria used in the SMP refers to Lakeshore rather than Shoreline which is reserved for provincial policy definition.

It is the intent of the ABCA to utilize the Shoreline Policy as the foundation of the Lakeshore Development Guidelines used by this Authority to effectively direct land use and development in order to prevent or minimize lakeshore flood and erosion damages. It is believed that the proactive approach to the lakeshore hazard situation outlined in these guidelines will enable the ABCA and lakeshore municipalities to focus on prevention of the hazard as opposed to relying on the reactive approach of protection and emergency response.

It is also recognized that the lakeshore is valuable resource and part of a complex natural system which requires consideration. By prohibiting and/or restricting development in certain areas of the lakeshore, degradation of this important lakeshore resource is prevented and the natural processes associated with the shoreline (i.e. sediment transportation along the shoreline: littoral drift) are preserved.

The Fill, Construction and Alteration to Waterways Regulation which is administered by Conservation Authorities under Section 28 of the Conservation Authorities Act will have regard for this policy in relation to areas presently under regulation, as will all other programs of the Conservation Authority. These Lakeshore Development Guidelines shall recognize other lakeshore jurisdictions (i.e. Public Lands Act, Aggregate Resources Act, Fisheries Act) if conflicts in policy are encountered.

3.3.3 LAKESHORE HAZARD STANDARDS

The three hazard standards of flooding, erosion, and the dynamic nature of the dune/beach system when combined describe the Regulatory Lakeshore. These three hazards are described in detail in the following section and are based on the standards identified by provincial policy for each hazard and listed in Appendix B.

The Regulatory Lakeshore has been divided into 2 areas in order to recognize the application of these standards to existing residential development (see Section 3.3.5). The most landward location of either of the three hazard criteria is referred to as the landward extent of the Regulatory Lakeshore. The lakeward boundary is generally regarded as the 6 metre lake depth contour although, administratively, it matches the municipal border which is the international boundary. Mapping has been provided which shows the landward extent of this Regulatory Lakeshore (see Appendix D).

A) FLOOD STANDARD

The flooding standard is defined as that area of the shoreline which is affected by a flooding event with has a probability of occurrence of one percent each year, or once every 100 years. Based on historical records, this flood level has been calculated for Lake Huron by MNR. This level plus a horizontal allowance for wave uprush and other related hazards, defines the flooding standard used by this SMP and in the provincial criteria (see Appendix B).

Due to the change in offshore slope and shore orientation of the ABCA shoreline from Bayfield to Grand Bend, a resultant change in the flood level and wind setup occurs from Bayfield to Grand Bend. The township line between Stanley and Hay Townships is the location used for implementation purposes to indicate where this change occurs. The shorelines north and south of this line have a 100-Year Flood Level equal to 177.8 metres G.S.C and 177.9 metres G.S.C., respectively.

A minimum allowance for wave uprush and other water related hazards is considered to be 15 metres measured horizontally from the 100 year flood level where no specific studies have determined otherwise (see Figure 15). Studies should be undertaken to determine wave uprush extent where lake banks or protective works may be overtopped and ponding occurs.

Flood levels for river mouth areas of Bayfield, Grand Bend, and Port Franks are determined by considering the Lake Huron 100-year flood level plus wave uprush and other water related hazards or the specific riverine flood level criteria, whichever is GREATER. For further information refer to "Riverine Areas Affected by Flood Levels on Lake Huron," contained in Appendix D of the Policy and Procedures Manual for the Administration of Ontario Regulation 142/90, ABCA.

B) EROSION STANDARD

The Erosion Standard is described by using the calculated annual rate which is determined and described in Section 3.1.2. The erosion rate can be used to describe the dune region south of Maple Grove subdivision, however, care is needed to ensure that the normal annual changes to the beach location are considered (e.g. a beach can recede or accrete over time). It is for this reason that the shoreline comparison methodology is best for calculating the long-term erosion of the bluff shoreline north of Maple Grove (e.g. bluffs will erode over time, not accrete).

The erosion standard used by this SMP and in the provincial criteria (see Appendix B) is the combination of two factors: stable slope and long-term erosion rate. Combined, the two criteria describe an area of the shoreline where new development is restricted and existing development is controlled (see Figure 16).

Slope stability is related to the inherent strength of the till materials which comprises the lakebank and is related to its composition, the presence of groundwater, and the management of the slope. Geotechnical studies conducted on undisturbed, Ontario glacial tills have documented their threshold slope inclination, which includes an appropriate factor of safety for residential development, to be 2.75 to 1 or 20 degrees (Tanos, 1994). For ease of reference and analysis, this criteria has been approximated to a 3 to 1 slope and is used locally by this Plan and provincially by the Policy on Shorelines. Site specific geotechnical analysis can be completed to provide more detailed information on a parcel of land. It should be noted that this analysis may be limited in areas where erosion rates are high. Specifically, the use of geotechnical information to apply to the siting of new residences on vacant lakeshore lots will be carefully reviewed. In areas subject to high erosion rates, the long term erosion rate has a greater impact on the siting requirements than the slope stability considerations.

Erosion has been calculated using the methodology described in Section 3.1.2. It should be noted that the erosion rate is a long-term average which will not necessarily reflect what occurs on a yearly basis. Rather, the erosion most commonly occurs sporadically in large sections, depending upon specific site conditions such as drainage, offshore lake depths and vegetation cover. The calculated average annual erosion rate is multiplied by 100 and added to the stable slope allowance to provide a site specific setback from top of bluff. Development guidelines within these areas are summarized in Section 3.3.7. Further information on erosion can be found in the general description of the cohesive bluff shoreline (Section 2.1.3).

Due to the many forces which act upon the lake banks and cause erosion, a minimum distance of 30 metres from top of bank is proposed to indicate this potentially hazardous area and to safeguard lake banks from unsafe practices (e.g. related to drainage, vegetation cover and bank overloading) (see Figure 16). This setback is consistent with existing setbacks as established in individual municipal zoning bylaws and provincial hazard land criteria. The following section provides criteria to be used to identify both the forces of flooding and erosion acting on a sandy shoreline.

C) DYNAMIC BEACH STANDARD

In this highly dynamic type of area, the combined forces of flooding, erosion by water and erosion by wind need to be considered. For purpose of identifying development guidelines, this area is defined by this plan as the limit of the flood standard plus a horizontal setback to account for potential recession and accumulation of sand within the beach zone. This horizontal setback inland from the flood standard includes the embryo dunes, foredunes, and the dune ridge as seen in profile (see Figure 17). The landward extent was determined by analysis of dune topography and characteristics to identify these key dune features, referred to as the **dune model approach**. From this identification and the analysis of historical shoreline records, the landward extent of the dynamic beach was determined. This identification was complicated by the affect of residential and roadway construction into this dune environment. The landward boundary is therefore often coincidental with the shoreline parallel access road common to many of the shoreline subdivisions.

Areas susceptible to all three criteria can be found along the shoreline under the ABCA jurisdiction. The erosion standard applies to all bluffs north of Grand Bend, albeit with varying bluff erosion rates. The flooding standard applies to the beach areas, including Port Franks and Grand Bend, and development below top of bank at the beach level such as those areas near Dewey and Rocky Points and Bayfield. The dynamic beach standard applies to the dune areas and low-lying bluffs where sand accumulation predominates over lakeshore bluff erosion. Such areas include the Grand Bend, Port Franks and Ipperwash beach areas of Bosanquet Township and the Kingsmere, Oakwood, Maple Grove Subdivision areas of Stephen Township. The fillet beaches located north of the harbour structures in the Villages of Bayfield and Grand Bend also create dynamic beach zones. Further

investigation is needed to refine the precise location of the dynamic beach standard at these two locations due to the unnatural circumstances of beach formation caused by the harbour structures.

3.3.4 LAKESHORE AREA DESIGNATIONS FOR NEW DEVELOPMENT

The Regulatory Lakeshore defines that area consisting of the furthest landward limit of the three lakeshore standards being flooding, erosion or dynamic beach. This definition applies to the siting of new development proposed along the lakeshore and recommends they be located landward of this area. Changes proposed to existing development will follow the criteria described below.

3.3.5 LAKESHORE AREA DESIGNATIONS FOR EXISTING DEVELOPMENT

It is recognized that prohibiting or restricting development within the Regulatory Lakeshore will protect new and existing development from the shoreline hazards and will protect the shoreline resource from inappropriately located and/or expanded development. Implementation of this basic goal is straightforward when dealing with new development. However, incorporating guidelines which reflect the hazardous nature of the lakeshore is more complex when applying them to existing developments or existing undeveloped lots (i.e. areas of redevelopment, or infilling proposals on existing lots). For this reason, the shoreline is further classified into Lakeshore Area 1 and Lakeshore Area 2 within the overall Regulatory Lakeshore, in order to assist in implementation of the guidelines as they relate to existing development. Generally speaking, Lakeshore Area 1 and Lakeshore Area 2 reflect shorter and longer term lakeshore concerns, respectively. They are defined with specific reference to the ABCA shoreline in the following discussion.

A) LAKESHORE AREA 1

Flood Standard - That area of the shoreline landward from the water's edge, including the 100-year flood plus wave uprush level, which is the Regulatory Flood Standard (see Figure 15).

Erosion Standard - That area of the shoreline lakeward of the stable slope line, including the slope and toe of the lakebank (see Figure 16).

Dynamic Beach Standard- That area of the dune complex being the active beach zone which would be affected by wave action during the 100-year flood plus wave uprush event (or historical storm event causing dune cliffing or erosion)(see Figure 17).

B) LAKESHORE AREA 2

Flood Standard - (not applicable due to the inland location of the area where erosion or dynamic beach considerations take priority)

Erosion Standard - That area of the shoreline located landward of the stable slope line and extending to the 100-year erosion setback line, **OR** that area landward from the top of the unaltered lake bluff measured a distance of 30 metres, **WHICHEVER IS GREATER** (see Figure 16).

Dynamic Beach Standard- That area landward of the Flooding Standard where water erosion ceases to influence the dune morphology and wind erosion creates embryo and foredunes with sparse vegetation cover established (i.e. most of the area between the Ausable River outlet at Port Franks and the Pinery Provincial Park). (See Figure 17). It includes an area measured 15 m

horizontally landward from the Flood Standard, potentially subject to erosion due to reduction in sand supply (littoral transport).

C) LAKESHORE REGION

This region is defined as the area landward from the Lakeshore Area 2 which may still have direct peripheral influences on the shoreline environment (i.e. drainage, lakebank seepage, overall lakebank weight and loading). The "Lakeshore Region" designation allows for both new development and redevelopment of existing houses to occur. It is defined by a physical feature along the shoreline rather than a setback distance. North of Grand Bend, the lakeshore region is defined as that area west of Highway #21. South of Grand Bend, the region varies dependent on the topography however generally bordered by the lakeshore parallel road system (e.g. Huron Place - Beach O'Pines and Lakeshore Drive - Southcott Pines). These roadways effectively limit the landward extent of dynamic beach profile adjustment. Where it is easily identified, the dune ridge is used. Because of the existing urban development controls in place, this region does not extend into the Villages of Bayfield or Grand Bend. This region is suggested to require further research (Section 5.3, item f) and consideration should be given to the use of the Wyoming Moraine as the boundary instead of Highway #21.

3.3.6 LAKESHORE DEVELOPMENT GUIDELINES

In an attempt to provide clear direction to lakeshore municipalities and lakeshore residents, guidelines are proposed to assist in the wise management of the existing residential development. These guidelines consist of criteria for such structures as additions, accessory buildings, infilling of residences on existing lots, decks, pools and septic systems. It also provides direction on such activities as relocating buildings landward, rebuilding residences, severing new lots, rezoning and changes in land use designations. The information is summarized in table form in the following section (see Section 3.3.7)

These guidelines are all related to the potential impacts from flooding, erosion, or the dynamic nature of sand dunes along the shoreline. They are provided within the context of requirements which largely exist, in some form or another, however, have not specifically been articulated for the lakeshore region.

For example, much of the existing development within the bluff portion of the lakeshore is contained within an existing 30 metre construction setback requirement from top of bank as described within municipal comprehensive zoning by-laws. This fact creates legally existing, non-complying residential structures along much of the lake bluff and require approval by minor variance from the local municipal committee of adjustment for any substantial change to these buildings. The criteria to assist in the review of such applications for minor variance are provided in a consistent manner by these guidelines.

As a second example, individual sewage disposal systems, or septic systems, have historically been installed along the lakeshore based on a minimum top of bank setback which varied dependent upon the condition of the lakebank at the time of inspection. However, wherever possible, the system was suggested to be located landward of the house for slope stability reasons. This statement is also supported by Recommendation #37 in the Rural Servicing Study (Huron County, 1993) which gave specific consideration to lakeshore development. This SMP provides lakebank descriptions more detailed than previously available, thereby improving the lifespan and reducing the adverse effects of new systems in the lakeshore area by suggesting siting criteria which reflect the stability conditions of the lakebank. Where lot size is inadequate and restricts proper system siting, such alternative options as using adjacent vacant property or communal systems should be investigated. In both cases, the registration on title of the septic system is required to ensure clear ownership and future maintenance.

As a third and last example, the issues of the relocation of residences landward and the rebuilding of residences which have been demolished for various reasons are included in this policy. In both cases, these actions can be beneficial to the safety and lifespan of the buildings when the maximum lot depth landward is utilized to avoid a potentially hazardous building site nearer to the lakeshore.

In order to clarify the term, the word "movable" is used to describe buildings which can be transported landward to a new site on the existing lot, or to a new lot, thereby increasing long term safety and building lifespan. Such factors as size and type of foundation, clearance along roadways, and location of a suitable site

nearby need consideration.

The major limitations to relocating or rebuilding structures are the size and construction style of the building (and therefore, actual feasibility of moving) and the availability of a site for relocation. The actual moving costs themselves for typical single family dwellings can be relatively small in comparison to providing protection works. Generally the width and height of the house are the limiting factors. The width must be less than the clearance along the roadways (i.e., between trees, hydro poles) and the height lower than the overhead clearance (i.e., under overhead wires, bridges). Those houses with slab foundations, concrete block walls, extensive brick or stone work, or large unusual shapes are often impracticable to move. The greatest costs associated with relocation may be in acquiring an additional parcel of land if setbacks do not permit relocating on the same property. Even when moving a structure is impossible, complete rebuilding may be less expensive than long term coastal protection (Griggs, 1986).

Relocation, as a form of prevention, is an effective practice to mitigating flood, erosion and dynamic beach hazards for existing buildings. Prevention often proves to be less costly than protection, especially in areas of high to severe erosion. Many owners invest such large amounts in protection (including materials, construction and future maintenance) that they essentially "re-buy" their house and land every 20 years, and in most cases their land continues to erode (Robbins et al, 1981). In many instances a benefit-cost analysis may suggest that acquisition and/or removal/relocation of buildings from flood and/or erosion susceptible shorelines is more appropriate than the implementation of protective works. Any such acquisition should be undertaken on a willing buyer/willing seller arrangement.

When development or rebuilding is contemplated, the hazards must be effectively considered. This may include, but not be limited to, the following considerations.

BLUFFS

- ▶ a site specific geotechnical investigation to determine the stable slope plus a setback for 100 years of erosion in areas subject to low erosion. Conversely, those areas experiencing long-term calculated erosion rates greater than 0.3 m/yr should use the 3:1 stable slope criteria plus the 100-year erosion rate to safely consider any development changes.
- ▶ an assessment of the effectiveness of structural protection which exists at the site and including monitoring results, where available
- ▶ an assessment of the mobility of the residential or accessory building (i.e. size of building and type of foundation, available room on the existing lot landward of the hazard, and consideration for the road layout of the subdivision allowing relocation of the building)
- ▶ an assessment of drainage (existing and effectiveness of improvements) and include an assessment of the existing or proposed siting of sewage treatment facilities

BEACH LEVEL

- ▶ assessment of lot area above and below the bluff (e.g. alternate siting)
- ▶ a site specific geotechnical investigation for slopes adjacent to the site
- ▶ an assessment of the flooding hazard and ice damage potential
- ▶ an assessment of the existing or proposed siting of the sewage treatment facility

SAND DUNES

- ▶ assessment of the impact to the dunes (e.g. degree of alteration)
- ▶ the revegetation of the sand dune area disturbed
- ▶ assessment of the stability of the dune slopes
- ▶ the feasibility of nourishment of the beach region
- ▶ the location and sensitivity of the affected dune feature

3.3.7 LAKESHORE DEVELOPMENT GUIDELINES SUMMARY

Development Activity	Lakeshore Area 1 ♣	Lakeshore Area 2 ♣
Existing Developed Lots		
Repairs/maintenance	✓	✓
Interior alterations	✓	✓
Minor additions *	(conditional) ¹	✓ provided no encroachment into Lakeshore Area 1
Major additions *	X	(conditional) ² — moveable
Unattached garages	X	(conditional) ³ — opposite me
Rebuilding of dwelling destroyed by forces other than flooding and erosion	✓ if same size and utilizes maximum lot depth	✓ bluff - if structure is movable * ✓ dune - if design minimizes dune impact
Rebuilding of dwelling destroyed by forces of flooding and/or erosion	X	X
Relocation of dwelling away from shoreline	Optional on the part of the owner. However, recommended.	Owner should consider this as a future option dependent on the severity of the hazard.
Minor Structures *	(conditional) ⁴	✓
Swimming pools	X	✓ Provided drainage is addressed
New septic systems	X	(conditional) ⁵
Decks (existing)		
Repair and maintenance	✓	✓
Decks (new) Bluff region	No closer than 3 m to top of bank and not connected to dwelling.	✓
Dune region	X	If landward of the foredune (see Figure 17)
Existing Vacant Lots (infilling)		
New dwellings	X	(conditional) ⁶
Septic systems	X	(conditional) ⁶
New Development		
Creation of New Lot(s) (i.e. severances, subdivisions)	X	X
Technical Severance	✓	✓
Lot Consolidation	✓	✓
Land use designation/zone changes	Support changes to planning documents to Hazard, Natural Environment or Open Space designations	Support changes to planning documents to a lakeshore overlay (subscript "L") designation
Do not support proposed zoning, land use designation or official plan changes which further intensify the land use, i.e. seasonal residential to multi-unit dwelling.		

LEGEND

✓ allowed

X not allowed

♣ on a site specific basis/study, where calculated erosion rates are low (less than 0.3 m/yr.) these zone boundaries may be adjusted.

* refer to Glossary (Appendix A) for full definition

- ▶ a minor addition is equal to less than 30% of total existing foundation area
- ▶ a major addition is equal to or greater than 30% of total existing foundation area
- ▶ a minor structure is a portable building (storage sheds, gazebos) with no utilities and maximum size 14 sq. m.
Does not include shore protection devices.

▶ a technical severance is a boundary adjustment where no new lot is created

* moveable design considerations are only necessary where long term erosion rate calculations apply

Conditional¹ - yes, provided the calculated erosion rate is less than 0.3 m/yr., slope stability is addressed, and not within the Flood Standard

Conditional² - yes, provided the structure is inland from the primary dwelling if calculated erosion rates are greater than 0.3 m/yr.

Conditional³ - yes, provided the design is movable (bluff region) and not located lakeward of the foredune (dune region) (see Figure 17)

Conditional⁴ - yes, and it is recommended to be landward of the primary dwelling and conforms to setbacks as required under EPA, Section VIII

Conditional⁵ - yes, provided that the building is moveable by design, impact to dunes is minimized, and provided that more than 50% of existing lots/parcels in the residential/cottage area are developed

NOTE: Please refer to the text in the previous section (3.3.6) for a complete description. All of the above is subject to appropriate setbacks and maximum lot coverage requirements as listed in municipal zoning by-laws.

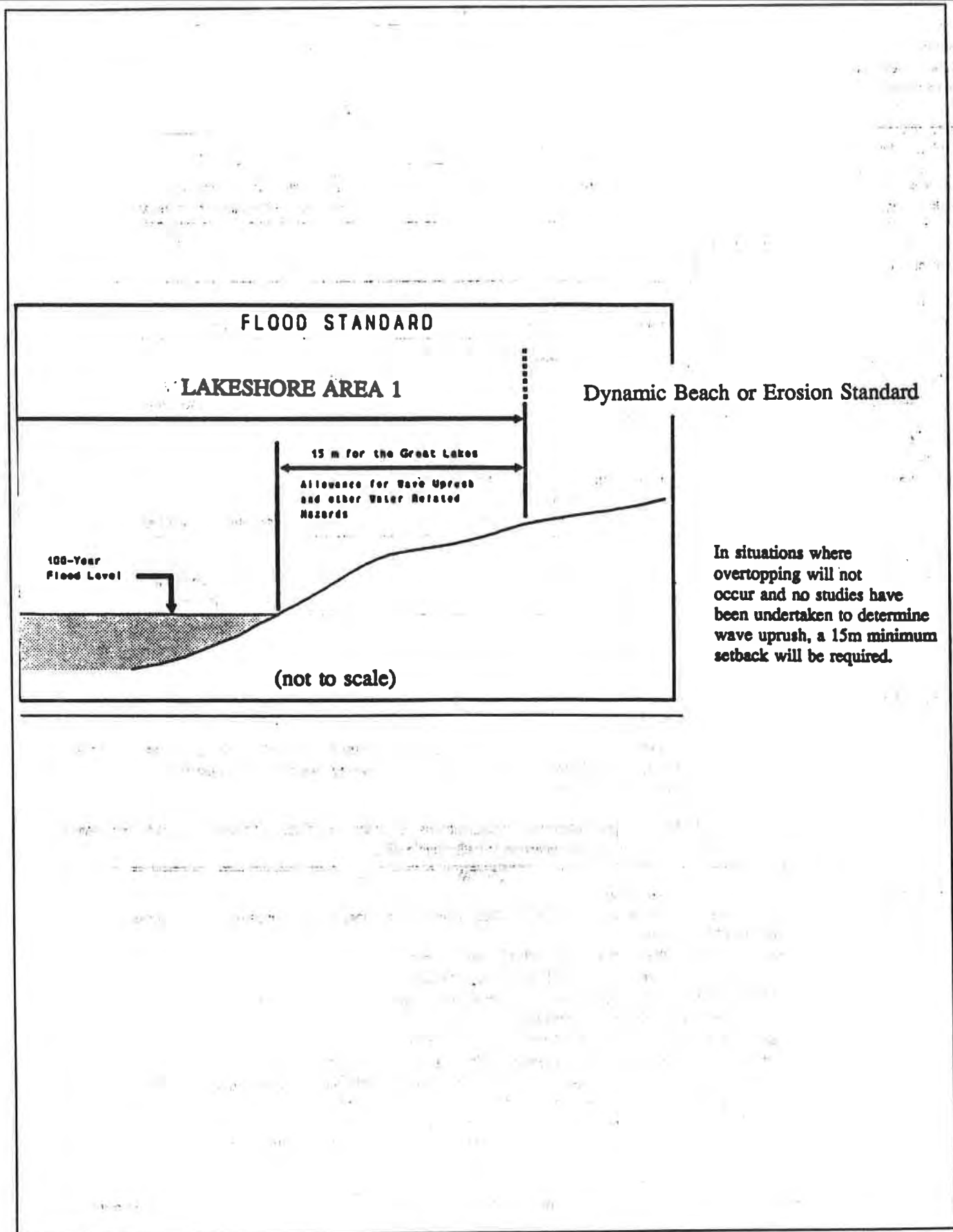
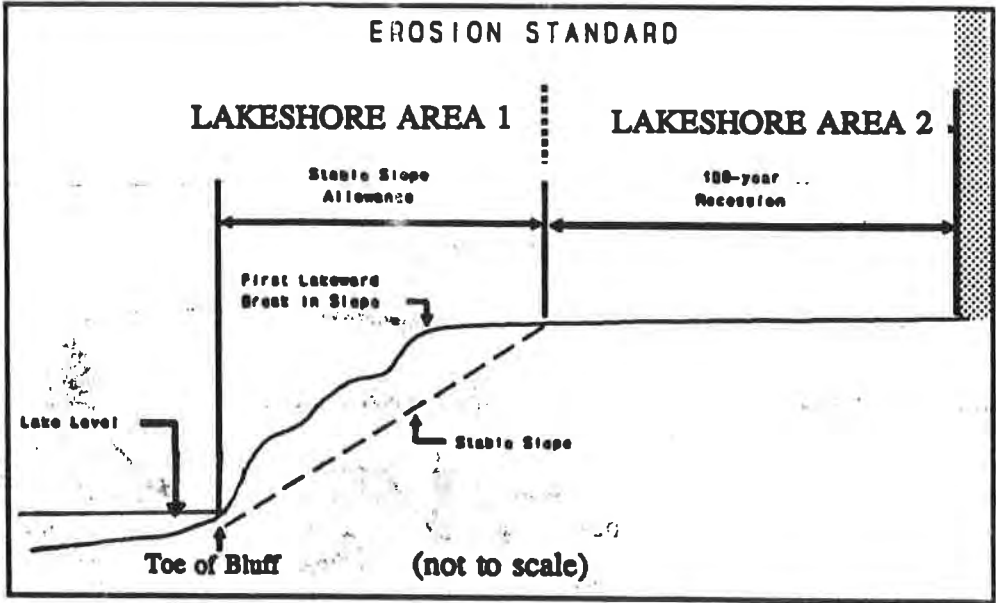
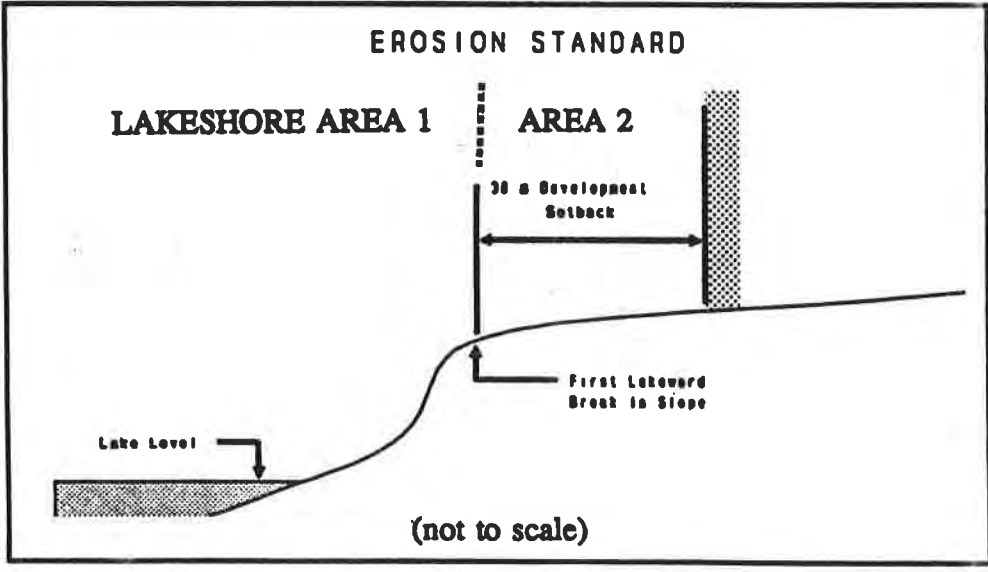


Figure 17: Flood Standard



... OR ...



... WHICHEVER IS GREATER ...

1st 3:1 slope
100yr. erosion rate = 0.0
inland line = 30m + 0.6 setback

 INLAND BOUNDARY OF THE REGULATORY LAKESHORE

Figure 18: Erosion Standard

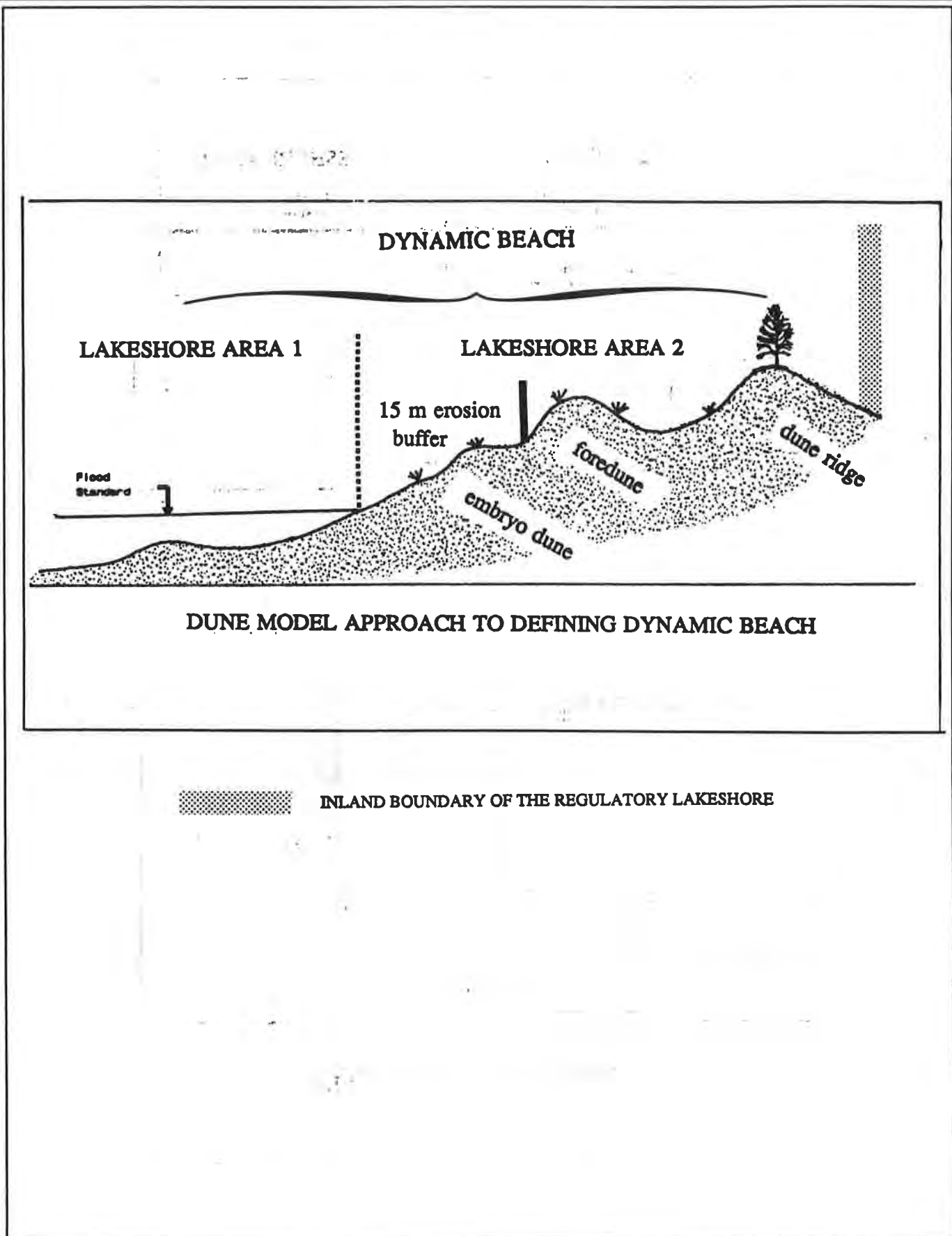


Figure 19: Dynamic Beach Standard

Section 3.4 SHORE PROTECTION

3.4.1 INTRODUCTION

Recommendations addressing shore protection along the shoreline over which the ABCA has jurisdiction have been developed. One objective of these recommendations is to balance the desire to maintain (and enhance if possible) the existing sand beaches along the shoreline with the increasing pressure for shoreline protection. Maintaining the beaches requires that the natural shoreline processes continue, including the erosion of the bluffs which supply sand to the shoreline, the longshore transport of sand to the south, and the deposition of sand in the Grand Bend/Pinery/Ipperwash beach system. A second objective is to develop specific recommendations with respect to the selection, design and implementation of shore protection methods and structures along the ABCA shoreline.

These recommendations are summarized below and include both structural and non-structural approaches. The recommendations address structures that are intended to stabilize the shoreline in areas that are eroding (i.e. erosion protection), as opposed to structures built along a relatively stable shoreline that are intended to protect a building or the bluff from wave run-up during periods of high water levels (i.e. wave damage protection). The following discussion is summarized from the "Considerations for Shore Protection Structures", (Baird, 1994).

3.4.2 STRUCTURAL VERSUS NON-STRUCTURAL PROTECTION

Methods exist which provide protection to existing development along the shoreline. These methods are grouped into those requiring the construction of structural devices to limit shore flooding and erosion (e.g. groynes, revetments, seawalls), and those which improve the inherent characteristics of the shore without structural measures (e.g. drainage, regrading, beach nourishment and vegetation).

Prior to any work being initiated for structural protection, it should be clearly demonstrated that the following additional options cannot be feasibly undertaken or obtained:

- a) relocation of existing building,
- b) consolidation of adjacent properties to provide additional area, and
- c) the use of appropriate setbacks for existing vacant lots

3.4.2.1 Structural Protection

Various forms of structural protection works exist and have been used historically along this shoreline region. An inventory was completed in 1990 and documents the various methods. Generally summarized, structural works can be described as one of three types: revetment/seawalls, groynes and offshore breakwaters.

These types of protection will vary on their applicability to a specific shoreline reach, however, considerations specific to this SMP are listed where appropriate by reach in Section 3.2.6. A summary of six recommendations taken from the protection background report follows.

- a) In areas subject to moderate to severe long-term erosion (average calculated erosion rate greater than 0.3 m/yr.), an engineered rubblemound revetment is the recommended erosion protection structure. The design of any revetment should consider the long-term erosion (or downcutting) of the nearshore lake bottom.
- b) In areas subject to less severe long-term erosion (average calculated erosion rate less than 0.3 m/yr.), a rubblemound revetment is the preferred approach, but groynes may be another option. However, groynes remain a topic of much debate with regard to the downdrift impact on adjacent shorelines. The Ministry of Natural Resources policy on the approval of groynes states that the Ministry will generally "refrain from granting authority to place groynes on Crown lakebed.

"Until this science becomes more precise, it is considered that the more prudent course for the Ministry to follow is to generally say 'No' to applicants," (MNR, November 17, 1986). No revision to this approach has been made. If a future change in this policy by MNR were to occur, this SMP would suggest that proponents of groyne

construction must prefill the groynes with suitable material (clean sand and gravel, $D_{50} > 0.3$ mm) in order to minimize downdrift impacts. However, according to available information, it should be noted that groynes may not provide full protection to the shoreline during extreme conditions such as severe storms at higher water levels.

c) Offshore breakwater design containing imported beach fill should be considered by the Village of Bayfield for the area to the south of the harbour. This type of approach is relatively expensive, but can provide significant recreational benefits as well as effective erosion protection. This approach is not recommended elsewhere along the ABCA shoreline due to potentially adverse impacts on the longshore transport of sand. The potential impacts of such a project located immediately south of Bayfield harbour would be limited due to the presence of the harbour structures.

d) Solid vertical seawalls parallel to the shoreline (commonly constructed using steel sheet pile) are not recommended for erosion protection anywhere along the ABCA shoreline due to the fact that they reflect the majority of wave energy hitting them, thus magnifying the effect of the waves on the lakebed and are subject to severe scouring of the toe of the structure.

e) Any number of structures may be considered for wave damage protection. These include revetments and groynes, as discussed above, and retaining walls of various construction (gabion baskets, steel sheet piling, concrete). Retaining walls should be constructed behind the active beach zone (i.e. not exposed to direct wave action, and only exposed to wave runup during extreme conditions such as storms at high water levels) in order to minimize impacts on the beach and shoreline processes. Information on the many different types of structures designed to resist wave runup are available in other reports and are not discussed in this document. (Refer to MNR (1986) and USACOE (1977, 1981).

f) With respect to improving the performance of existing shore protection structures, beach nourishment should be considered in areas where there are groynes in good repair but not full of sand. Consideration should also be given to replacing reflective seawalls with rubblemound revetments or, at a minimum, providing toe protection when maintenance operations are being considered by the landowner.

3.4.2.2 Non-structural Protection

a) From a theoretical perspective, regional beach nourishment would be a desirable protection alternative with respect to maintaining/enhancing coastal processes. However, from a practical perspective, it is unlikely that a regional beach nourishment scheme could be implemented. A nourishment scheme would involve placing approximately 30,000 to 60,000 cubic metres of sand on the shoreline each year. This would require establishing a guaranteed supply of an adequate grade of sand and transporting it to the desired location and, therefore, may not be a viable alternative.

b) Regrading of the lakebank to a more gradual slope has been done at some locations within the study area with variable success (e.g. St. Joseph Shores, Wildwood, Bayfield). Although limited research has been done along the Great Lakes on effective means of slope stabilization, it is generally accepted that bank regrading requires site specific investigation and should attempt to achieve a 3 horizontal to 1 vertical slope, use a shore parallel structure outside of the active beach zone for bluff toe protection, and utilize drainage improvements to contain surface water and outlet it at the bluff toe. Care is required to ensure that the sides of the regraded area are gradually shaped to provide a transition zone from the new to the old lakebank slopes.

Due to the scale of the work required, the property needs a substantial frontage (e.g. minimum 200 m) with a low erosion rate (less than 0.3 m/yr.) to be considered feasible. Special attention to the subsurface drainage is critical as groundwater seepage zones may be interrupted by the work. The timing of establishing the vegetative cover is also crucial to the success of the project.

c) Drainage improvements — both for the surface and subsurface — will enhance bank stability, especially where groundwater seepage is a concern (e.g. Bayfield area, Snowden Acres). When water is artificially collected,

the outlet needs to be taken to an appropriate location where erosion protection is provided (e.g. toe of lakebank, bottom of gully).

Subsurface drainage improvements should de-water the bluff area and help to reduce bank movement during extreme precipitation and soil moisture occurrences. "French drains" (also called blind drains) or perforated subsurface drains covered by pea-sized stone have been used extensively along the top of bluffs as a technique to improve drainage.

Improvements to road ditching on the east side of roads parallel to the shore and to the most westerly edge of agricultural fields for the prevention of surface water flow over the lots and roadway to the lakebank will provide additional benefit for existing development. It is suggested that subdivision-scale drainage improvements should be undertaken and a suitable protected outlet provided for the area as a whole. A variety of approaches could be utilized using informal agreement, or mutual agreement drains or petition drains under the Drainage Act. The ABCA has been active in recent discussions on two such proposed municipal drains at Lakewood Gardens South and Highlands II subdivisions.

The existing gullies are the logical location for water outlet, however, a site-by-site analysis will be necessary. (Refer to Conclusion #12 and #13 in Section 5.2). All subsurface drainage improvements will need to carefully consider the existence of individual septic fields and not interfere with their operation. New developments will need to complete storm water management investigations which consider both surface and subsurface water quantity and quality. This is especially important where existing groundwater seepage occurs along the lakebank, threatening existing development.

d) Vegetative growth on both dune areas and lakebanks is encouraged to promote stabilization and reduce the effects of rain impact and surface water erosion. In dune locations, beachgrass will reduce the impact of wind erosion and promote dune evolution. Grasses and shrubs are best suited to lakebank slopes where bank movement is likely to continue due to lake effects (e.g. offshore wave climate, beach width) and runoff. Seepage zones along bluff slopes can be planted using more moisture-tolerant species. The publication "The Role of Vegetation in Shoreline Management" (Environment Canada and US Corps of Army Engineers), is a good reference for more information.

3.4.3 IMPLEMENTATION

a) A co-ordinated approach for shore protection (by community or subdivision) is recommended. Protection recommendations are included in Section 3.2.6 and described on a reach by reach basis.

b) Shoreline protection structures are only to be considered for development which currently exists along the shoreline (i.e. not for new development such as subdivisions, multi-lot severances, multi-unit/condominium developments).

c) The purpose or objective of the proposed works (i.e. to prevent storm wave damage uprush, overtopping, or other water related hazards or to stabilize the shore over the long term) must be clearly outlined.

d) Prior to design, the ownership of the land on which the structure is to be built should be clearly established by the proponent. The costs associated with the design, installation and future maintenance of shore protection is the responsibility of the proponent and/or landowner.

e) The design of structures located above the 100-year flood level that are intended to provide protection from wave runup and storm damage should follow guidance presented in MNR (1986) and/or USACOE (1978, 1981).

f) The design of structures which extend below the 100-year flood level and wave uprush, and/or that are intended to stabilize the shoreline against continuing erosion, should be prepared using accepted engineering and geotechnical principles.

g) Any application to construct shore protection must be accompanied by a detailed description of the site and proposed work, and an impact assessment based on current engineering and scientific principles which demonstrates the following points:

- ▶ The proposed works will not increase the long-term shoreline erosion rate at adjacent properties,
- ▶ The proposed works will not adversely affect longshore sand transport rates,
- ▶ The proposed works will not adversely affect adjacent structures, and
- ▶ The proposed works will not adversely affect the terrestrial and aquatic shoreline ecosystem.
- ▶ The proposed works will maintain pedestrian access along the beach.

h) Any application for shore protection, including the impact assessment, should be circulated by the applicant to all property owners within an appropriate distance (i.e. 300 m) of the property boundaries in question and to any applicable cottage association to solicit their written comments and/or participation in the project prior to the approving authority responding to the applicant.

i) Quality control during construction is an essential component of a successful project, and construction monitoring services should be provided by the designer.

j) Monitoring of completed projects should be undertaken annually, and following severe storms, by the proponent of the project so that potential problems can be identified and required maintenance can be completed before excessive and irreparable damage occurs. It is the responsibility of the proponent to ensure that long-term maintenance of the structures occurs and could be ensured by a registered agreement binding on the landowner.

k) At the present time, subdivision scale projects to protect existing developments from ongoing erosion, may be eligible for a 50 percent grant through the ABCA Capital Projects program. Such projects can be initiated by landowners, with the formal request for a project being made through the local municipality. Once a project is initiated, it would proceed in two phases:

Phase One would involve a preliminary engineering study and review to comply with the requirements of the Class Environmental Assessment for Remedial Flood and Erosion Control Projects (1993). Based on technical information and public review of alternative solutions to resolve the flooding or erosion problem, a preferred solution would be selected giving consideration to costs, anticipated benefits and environmental concerns.

Phase Two would involve the construction or implementation of the preferred solution.

It should be noted that the availability of grant funding to initiate such projects is contingent upon funding from the Ministry of Natural Resources and the anticipated benefits of undertaking a project.

Section 3.5 ENVIRONMENTAL OVERVIEW

3.5.1 INTRODUCTION

As previously discussed in Section 2.1.1, the Goderich to Kettle Point shoreline is a closed littoral cell with respect to sand transport (Reinders, 1989). Kettle Point and the breakwaters at Goderich Harbour each extend far enough into Lake Huron to trap any sand from the shoreline to the north. The bluff region of the shoreline, from Goderich to just north of Grand Bend, provides sediment to the shoreline sediment budget. Conversely, the dune/beach area from Grand Bend to Kettle Point acts as a sediment "sink" where the sand is deposited. These two shoreline characteristics (bluff versus dune), generally separate the shoreline into two distinct regions.

The closed cell concept defines the shore zone in a north/south direction. In reviewing the terrestrial data, it soon became apparent that the inland boundary of the shore zone was not as easy to define. The shoreline and the water quality of the shore waters are affected not only by lake and shoreline processes but also by other processes and activities throughout the watersheds of all the streams and rivers that flow into the shore zone. To effectively manage the shoreline environment this entire ecosystem — of which the shoreline is a part — must be considered.

The shore zone can be defined on the basis of its features and the processes affecting it. The immediate shore zone is strongly affected by the lake processes. However, it may also be influenced, especially for water

quality issues, by land use practices in the headwater areas of the inland watersheds. Thus, optimum management of the shore zone has implications on management throughout the watershed.

The environmental discussion which follows is divided into the land-based (terrestrial) and water-based (aquatic) environments. The significant features in each region are described (see Figure 6), and management criteria are proposed in relation to their sensitivity to the overall system. The terrestrial component is based on an overview report by Snell and Cecile (1991) prepared for the SMP. The aquatic component is based on input by MNR Fisheries specialists and CA staff.

3.5.2 ENVIRONMENTAL ECOSYSTEMS

3.5.2.1 Terrestrial Features

The majority of environmentally significant features found along the shoreline are the remnants of past native woodlands which formerly covered this region. The one exception is the Pinery to Kettle Point area which possesses significant environmental qualities more related to physical land form, flora and fauna attributes.

i) Pinery to Kettle Point Dunes

By far the most significant area along the shoreline or within the entire ABCA watershed is the Pinery to Kettle Point sand plain and dunes. The area's unique, extensive, relatively undisturbed and diverse wet and dry sand habitat, numerous rare species and rich diversity of species, dune successional sequence, marsh and shale at Kettle Point are cited as reasons for a very high rating (Lindsay, 1984 and Lambton County Preliminary ESA Survey). The area is also cited as being near the northern limit of the Carolinian zone which is itself a provincially and nationally significant region. This site is one of 38 sites designated under the Carolinian Canada Program which strives to protect a variety of habitat types through stewardship and acquisition. The area also has a low agricultural capability and the area has remained extensively wooded. This area is also referenced by the Federation of Ontario Naturalists as being one of 32 "Ecological Hot Spots" where unique and rare habitats and wildlife can be experienced (Seasons magazine, Special Great Lakes Issue, Vol. 27, No. 3, 1987).

The foredune area supports such flora as sprout sand cherry, little bluestem grass, puccoon, ground juniper and balsam poplar. The dune forests located further inland support seven species of oak, and the wet meadows shelter their own distinctive flora, including Bluehearts, grass pink and ladies' tresses, and wild lupine. Significant fauna species include prairie warbler, Karner blue butterfly, fox snakes and hog-nosed snakes. Located within the Huron fringe physiographic region, this area is described as being "one of southern Ontario's ecological jewels" (Seasons, 1987). Endangered species include the Karner blue butterfly and the Heart-leafed plantain.

Significant natural areas have been recognized by ANSI designations in this area. The Port Franks Wetlands and Forested Dunes Complex is a Class I wetland located in Port Franks adjacent to the Mud Creek channel and the small lakes near Richmond Park and Outer Drive. The second site is the Ipperwash Inner-Dunal Wetland Complex located inland from Ipperwash Beach. Both sites possess significant natural attributes derived from their formation and evolution of successional dune ridges. In contrast, Kettle Point and Stoney Point are recognized as provincially significant Earth Science ANSI due to their geologic and cultural history (see Figure 6).

ii) Bayfield Region

Two significant natural areas occur near the shoreline in the Bayfield area (both designated by MNR as Areas of Natural and Scientific Interest - ANSI). The first is the Bayfield River Valley (for 10 km upstream of Bayfield) which has a diversity of habitat and vegetation communities, as well as being relatively undisturbed.

Second, the nearby Bayfield North woodlots are representative of the upland woodlot types of this area of the province, as well as being relatively large and undisturbed (Hanna, 1984). Both sites include cold water streams.

iii) Gully and Lakeshore Corridors

North of Grand Bend, very prominent features of the shoreline landscape are the numerous gullies leading to the lake. They represent the most obvious land form (besides the shore bluffs), valuable aesthetic potential, the location of all the stream habitat, much of the remaining natural vegetation remnants and potential corridors for

wildlife.

The gully of greatest significance is Gully Creek in Goderich Township which is a cold water stream (one of only two such streams along the shoreline, both in Goderich Township) and is designated an Environmentally Significant Area by the ABCA due to its length, natural vegetation, and fisheries potential. Other gully systems have the potential of being environmental linkages to interior woodlots which are commonly located within the first and second Concessions inland. The woodlots are most extensive in Goderich and Hay Townships.

The linear shape of the lakeshore provides the potential for a wooded corridor joining some of the more significant vegetated areas. The Pinery in the south and the Bayfield ANSI and Barron de Tuyl ESA in the north provide the large, existing wooded areas to attempt to join using linages. This could be accomplished by promoting vegetation planting along the lakebank and encouraging building setbacks from the lakeshore. Mention of this existing, interrupted wooded corridor is made in Snell and Cecile (1991) and is referenced regarding the waterfowl flyway which may be enhanced by promoting the re-establishment of the corridor.

3.5.2.2 Aquatic Features

These features relate to the various aspects of Lake Huron, the gullies, the former channel of the Ausable River where it parallels the shoreline through Pinery Provincial Park and where it forms relic lakes in the Port Franks area, and the Klondyke Marsh area.

i) Lake Huron

The lake shoreline is characterized by long narrow sand beaches at the base of the shore bluffs over much of the shoreline length. Offshore features can be grouped into erosion-resistant stratigraphy forming headlands, and shoals. They are (from south to north):

- 1) Kettle Point - a major bedrock outcrop which forms a shallow offshore shelf and is the southerly boundary of this shoreline littoral cell.
- 2) Stony Point - an offshore shelf located north of the headland feature also known as Stony Point, located adjacent to the Ipperwash Military Camp. This feature may be associated with a former outlet of the Ausable River.
- 3) Cantin Shoal - a shallow submerged "island" located 1 km offshore in the vicinity of Norman Heights Cottage area, Hay Township (approximately 3.4 m higher relative to surrounding lake depths).
- 4) Unnamed shoal - a shallow submerged "island" located 1 km offshore in the vicinity of Hay Township Sideroad 15 (Bayview Subdivision approximately 1.7 m higher relative to surrounding lake depths).
- 5) Shallows offshore of Dewey Point, Hay Township and Rocky Point, Stanley Township - shallow water depths extend out into the lake in these areas due to the presence of erosion-resistant material.

Fish spawning locations match those offshore features previously discussed (i.e. shallow water areas). In addition, areas offshore from Pinery Provincial Park and Port Franks within the sand beach deposition zone are recognized for fish spawning. Fish species in the offshore waters include rainbow, brown and lake trout, coho, chinook and pink salmon, freshwater cod, lake whitefish, chub, smelt and alewife. Near-shore waters contain yellow perch, walleye, small mouth bass, northern pike and various pan fish.

Commercial fisheries depend primarily on lake whitefish and yellow perch (with less emphasis on walleye, lake trout and chub) and operate based on the issuance of 10 commercial fishing licences for Huron County and 11 for Lambton County. The number of licences will remain unchanged as no new licences are permitted. These licensed fishermen harbour at Grand Bend and Bayfield, as well as one individual at St. Joseph. Whitefish is the commercial fishermen's staple catch. Recently, yields have been higher than the theoretical MNR estimates due to the decline of predator species such as trout following the invasion of the sea lamprey into the lakes system in the 1930s.

Sport fisheries focus on yellow perch, rainbow trout, brown trout and chinook salmon in Lake Huron waters. The three harbours of Bayfield, Grand Bend and Port Franks are utilized by the fisherman for docking and launching facilities. Some of the larger gully systems (i.e. Gully Creek, Stanley Township) also provide opportunities for sport fishing.

The introduction of zebra mussels to the lower Great Lakes through the improper discharge of ship ballast water has the potential to affect facilities along Lake Huron. Although they are not suspected to become a major problem due to the colder temperature of Lake Huron water, the Water Supply Plant at Port Blake did complete the installation of a chlorine feed system in 1992 to control zebra mussel development. The mussels are a threat to some aquatic life because they are prolific and compete with fish for plankton. They can also encrust and eventually affect water intake and outlet pipes. The application of chlorine inhibits mussel development and is one of the major forms of treatment currently known. Other exotic species are also suspected of being brought to the Great Lakes Basin through ship ballast water; their effects on the ecosystem are still being investigated.

ii) Gully Systems

As previously discussed, the gully corridors add significant environmental value to the shoreline ecosystem. From a hydrologic perspective, they represent a separate group of subwatersheds within the ABCA watershed jurisdiction. The Lake Huron Shore Processes Study (Reinders, 1989) also recognized the importance of gullies in the estimate that sediment eroded from gullies represents 12% of the total supply of sand which maintains the southern dune/beach area.

iii) Relic River Channels and Lakebeds

The former channel of the Ausable River south of Port Franks is evidenced by a series of small lakes (Richmond Park, "L", Moon, Bio, Perch and Hidden lakes). The combination of these lakes forms the majority of the area described as the Port Franks Wetland Complex, which is listed as a provincially significant, Class 1 wetland complex (Crabe, 1983). The remainder of the complex extends into the current channel of the river. North of Port Franks, the Old Channel (of the Ausable River) parallels the shoreline and extends through Pinery Provincial Park and north, through the Huron Woods and Southcott Pines residential areas. The sensitivity of this channel is significant as there is limited flow of water through the channel due to its small drainage area.

The region directly inland from the Pinery Provincial Park is a former lakebed of Lakes Smith, George and Burwell which, in the past 100 years, have been drained for agriculture. This area, now known as the Klondyke Marsh, is a stopover for migratory birds, the most notable being Tundra Swans. Although records are sparse, it is reasonable to assume that the former wetland area was used by many other bird species for habitat.

3.5.3 ECOSYSTEM MANAGEMENT

3.5.3.1 Dune/Beach Region

This region, including the Kettle Point to Pinery sand plain and dune area, is maintained by sand contributed from the north and transported along the shore. The current beach sand budget includes a portion that is blown inland (Reinders, 1989). To maintain the beach and the associated successional vegetative sequence, a continuous supply of sand is required. This supply should not be threatened by adverse impacts of development such as a longer breakwater or offshore marinas at existing harbours, nor by extensive erosion control efforts along the bluffs. An overall strategy of preserving this area and managing the northern bluff shoreline, as well as the watersheds flowing into this area, is needed to preserve the dune environment.

It is recognized that the dune region falls under the jurisdiction of many groups: Pinery and Ipperwash Provincial Parks, Ipperwash Military Camp, Kettle and Stoney Point Indian Bands, Lambton County, Stephen and Bosanquet Townships, and the Village of Grand Bend. The formation of a stakeholder committee with representation from all bodies would allow a consistent approach to protecting and managing the dune region. Suggestions should be made to the Military Camp on dune management (specifically for that area lakeward of Moon Lake, where a blow-out in the dunes has occurred) and contact maintained as to future management plans for the Camp. Mention is also made of the ridge and trough landscape inland from Ipperwash Beach which is the only non-government or non-reserve portion of this sand plain unit. As it too is rated a significant site (Lindsay, 1984), options for long term management should be considered by the stakeholder committee.

Proper dune management should include limiting development on the beach area. An ecosystem approach to defining "dynamic beach" (see Policy and Implementation, Section 4) would best identify the dune features which need to be considered due to their sensitivity to the whole dune evolution process. It is possible that

increased beach development may reduce beach area for public use (e.g. Grand Bend), and subsequently may increase the pressure to use more sensitive dune areas. Pinery Park staff should be utilized for input into dune management decisions in the surrounding region.

Development pressure within this region is primarily focused along the Highway #21 corridor between Grand Bend and Port Franks, which is inland from the present shoreline. However, developments and proposals have occurred within the backdune areas, close to the Port Franks Dune ANSI and the Class I wetland areas of Port Franks (i.e. Florida North Estates and Seven Winds proposal for high-density developments). Due to the sensitivity of these areas, consideration regarding the need for buffer areas around these significant sites and the cumulative impact of such proposals is necessary to ensure adverse impacts do not occur.

3.5.3.2 Bluff/Gully Region

Sediment generated from the erosion of bluffs and gullies north of Grand Bend contributes to the maintenance of the Pinery to Kettle Point dune complex and the narrow strip of sand beach found at the bluff toe north of Grand Bend. It is recognized that this process is in direct conflict with the welfare of existing cottage areas located near these eroding bluffs. However, in an ecosystem context, the maintenance of the dune environment is of high environmental value. New development should be restricted to locate landward of the 100-year erosion setback and limitations on scale of erosion protection of the bluffs should be considered to ensure a continued supply of littoral sediment.

Other current problems within this region include:

- ▶ erosion accelerated over natural rates by increased development or more intensive agricultural use directing water to unstable areas of bluffs and gullies
- ▶ possible inadequate septic fields contributing to water quality problems
- ▶ agricultural contaminants contributing to water quality problems
- ▶ agriculture and development removing most of the natural bluff top vegetation and wildlife habitat
- ▶ increased land development pressure due to increased servicing of the cottage areas (i.e. water pipeline) and increased land values
- ▶ the lack of environmental features within this region (i.e. many woodlots have been cleared and vegetation along gullies has been denuded related to agricultural practices)
- ▶ the lack of environmental protection which currently exists with many designated significant areas (i.e. areas designated ESA by the ABCA)

General gully management should include protection of the existing limited vegetation and replanting or regeneration of native vegetation as a condition of any development proposals. This will maintain or improve the capability of the gully to perform as a corridor and act as an environmental link to the wooded areas inland. Goderich Township has the best examples, where wooded gully corridors extend inland to large woodlots. Through two of these gully corridors exist the only cold water streams in the ABCA shoreline watershed. Gully corridors should only be used for pedestrian access to the beach if the trail minimizes impact to the vegetation and does not increase the natural erosion of the watercourse.

Where the opportunity exists to re-organize the layout of existing cottage areas threatened by bluff recession, a design should be used which avoids the linear arrangement parallel to the lakeshore composed of multiple tiers, or rows of lots. This arrangement could focus on a stable gully rather than the eroding lakebank, similar to the concept illustrated in the St. Joseph Shores development, Hay Twp. Any redevelopment plans for existing older cottage areas should include a comprehensive surface drainage plan and stormwater management plan prepared on a subdivision scale, to provide an overall approach to the problem of inadequate drainage. Stability of the existing lakebank and adverse impacts to adjacent cottage areas should be considerations of all proposed residential developments.

3.5.3.3 Overall Water Quality

Due to the overriding and recurring concern which has been raised by almost all cottage representatives, a separate discussion on the topic of water quality is presented. This discussion is linked to many past and present

lakeshore issues.

Development concerns — both in the dune/beach region and the bluff region — have been discussed but not in the context of impact on water quality. This issue has been studied locally by Huron County and provincially by the Ontario Commission on Planning and Development Reform. The previous practice of relying on private septic systems for disposal of residential sewage in new developments is now under study. The cumulative impact of these systems in a relatively impervious clay soil (commonly found along the lakeshore) is the primary concern. The MOEE has been focusing on this issue along the shoreline as a result of "beach closings" and "warnings to bathers" which periodically are issued for public beach areas. A recent funding program by MOEE, to assist landowners in the repair of faulty sewage handling systems, is currently being administered by the ABCA. This program targets the farming community and their septic and manure handling practices, as well as the cottage communities and the inadequacy of their septic systems (CURB program, 1991).

The Rural Servicing Study (Huron County, 1993) provided recommendations for proper sewage treatment along the shoreline in the characteristically heavy clay soils. Specifically, recommendations provide direction including such things as individual septic systems to be located landward of the residence and communal treatment facilities, where feasible. The SMP supports the recommendations of the Rural Servicing Study.

Best Management Practices should be encouraged for the agricultural region within the coastal watershed. This watershed has its inland boundary coincident with the Wyoming Moraine, a linear ridge which parallels the lakeshore and is located as far inland as Zurich and Dashwood (see Figure 6).

Such management practices as proper manure handling, soil conservation, and pesticide management are an example of areas where improved water quality can result. Such programs as Environmental Farm Plans should be encouraged in this specific region.

Groundwater quality remains an environmental concern despite the increased use of a piped water supply along Highway #21. The pipeline extends from the water supply facility at Port Blake north to Bayfield and south to the Pinery, and is proposed to continue south to Port Franks and other areas of Bosanquet Township. The sandy soils within the dune/beach region possess a high percolation rate which results in a greater concern for groundwater contamination than the northern bluff region. Conversely, the bluff region may experience surface water contamination related to shallow water table problems that allow seepage laterally through the soil, emerging at gully or lakebank slopes. Both situations warrant careful consideration for existing and future land uses.

3.5.4 SUMMARY

The shoreline environment possesses a complex and unique ecosystem which must be recognized, understood and preserved. Due to the nature of this recreational region, development pressures will continue to be exerted along this ecosystem which may system adversely affect the system. Only if the development can preserve — or preferably enhance — the existing ecosystem (for example, through revegetation of the shoreline or the preservation of existing gully corridors), should additional development be considered. Since the Pinery to Kettle Point dune/beach region is so significant on a provincial and national scale, an intensive review of the development policies within this region should be completed (i.e. as part of the routine Official Plan review which is underway for Bosanquet Twp. in 1992/93).

The two regions discussed in the previous section, when combined, form a closed cell with respect to sediment transport along the shoreline. For this reason, the entire shoreline ecosystem must be considered when management decisions are being made. In this way, the few remaining areas of environmental significance which exist along the shoreline will be preserved and possibly enhanced.

Section 3.6 EMERGENCY RESPONSE

3.6.1 INTRODUCTION

The ABCA has the mandate to take measures to prevent loss of life and property damage from the hazards of flooding and erosion. This is accomplished through a variety of programs and regulations undertaken by the

Authority, including the implementation of an Emergency Flood Contingency Plan. The current emergency plan focuses on the existing riverine development which was built without the benefit of present-day standards for flood hazard mitigation.

The nature of the shoreline and the desire to inhabit the lakefront with cottages as close as possible to the shoreline have created hazardous situations due to the effects of bluff instability and possible flooding. High, steep bluffs and the extensive development which has occurred nearby is generally the most common hazard, although a few flood-prone sites also exist. Section 3.3.3 describes the criteria used to identify these hazards specifically for the lakeshore region.

This chapter describes the existing emergency response mechanism based primarily on the riverine environment. The lakeshore hazards are described from the results shown on the shoreline mapping (see Section 3.1), and recommendations are made with respect to the most efficient deployment of resources. This report also discusses the necessary data needed for the municipalities to update or create their own Emergency Contingency Plans.

3.6.2 ABCA EMERGENCY (FLOOD) CONTINGENCY PLAN

This plan is maintained by the ABCA and is used primarily for riverine flooding situations. It combines local watershed information with general data obtained from the MNR Stream Forecast Centre. Copies of the plan are kept in every municipal office and an up-to-date list of municipal contacts is maintained.

In summary, the ABCA monitors local watershed conditions and provides advisories and warnings of potential flooding situations, when appropriate, to municipalities. It is then the responsibility of the municipality to advise local residents who may be at risk. During the record high lake levels of 1986, Environment Canada provided "Lake Level Advisories" to the Conservation Authorities by way of the existing relay system through the Stream Forecast Centre. The ABCA then passed the information on to the affected municipalities for use in implementing their own emergency plans.

3.6.3 HAZARD DELINEATION RESULTS

Lake-related flooding is most predominant during periods of above-normal lake levels on Lake Huron. This condition — plus the occurrence of strong west, southwest, or northwesterly winds — will cause flooding in low-lying areas. The existing ABCA Contingency Plan identifies the harbour and river mouth areas of Port Franks (Mud Creek and Ausable River Cut), Grand Bend, and Bayfield as being the most susceptible to flooding.

Slope instability and bluff failure are considered to be site-specific problems without the need for an overall emergency plan. However, broad-scale slope failures have occurred along the ABCA shoreline and should be given consideration in any municipal lakeshore emergency response plan. Areas of known high erosion or those with development within the stable slope allowance should be monitored during high lake level periods or during high rainfall periods. It should be noted that severe storms and rainfall events are common after the cottage season has ended, when monitoring by individual owners may be difficult.

The results of the shoreline mapping and hazard identification (see Section 3.3.3) have provided the following criteria for sites considered to be in a hazardous situation:

A) EROSION RISK

Development which may be at risk due to the location of the building (residence) with respect to the bluff slope are included here. This risk is based on the premise that erosion will cause the slope to become unstable and assumes that a typical bluff undergoing erosion will eventually reach a stable slope of 3 horizontal to 1 vertical or 18° slope (see Section 3.3.3). A list documenting the number and location of buildings located within both the stable slope allowance and an area of high erosion has been prepared from the mapping analysis (see Table 3). This list should be carefully reviewed by all affected municipalities.

B) FLOODING RISK

The properties which could be susceptible to flooding risk can be classified into three site descriptions;

- i) development at the toe of the bluff on a beach terrace
- ii) development near the river mouths of the Bayfield, Ausable, Ausable Cut and Mud Creek watercourses
- iii) development on a mature beach which could be undermined by wind action and subsequently affected by flood waters

The listing of those properties which are included in the three site descriptions will be provided to the municipalities for their reference and inclusion into their specific Emergency Contingency Plans (see Table 3).

C) DYNAMIC BEACH RISK

Related to discussion above (B iii), the Regulatory Dynamic Beach criteria (see Section 3.3.3) will affect a number of properties within the Village of Grand Bend, Bosanquet Twp. and Stephen Twp. The criteria currently proposed within the Lakeshore Development Section (see Section 3.3) would not put any of the sites within the risk zone. By the nature of the dynamic beaches hazard, the risk involved is generally not an emergency occurrence. However, such isolated storms as the March 17, 1973 storm — which caused much destruction along Ipperwash Beach — may be cited as exceptions to this statement.

3.6.4 SUMMARY

ABCA FLOOD CONTINGENCY PLAN

It is recommended that the ABCA Emergency Contingency Plan be amended to include the erosion hazards component for the lakeshore. This amendment will identify the potential problem areas and recommend to the municipalities the tasks needed to adequately address the hazard. This may include provisions to facilitate the relocation of structures that must be moved on existing roadways, as well as an inventory of local companies who can undertake such moving operations. Special consideration will be given to Lakewood Gardens subdivision (Hay Twp.) and Melena Heights area (Goderich Twp.) which exhibit the greatest potential for existing cottage development to be affected by large-scale slope instability problems.

Procedures for forecasting lake effect flooding and disseminating the information to the ABCA will need to be formalized by discussions with MNR and Environment Canada. The lakeshore flooding component of the ABCA plan should be expanded to include identification of the problem areas.

MUNICIPAL EMERGENCY PLAN

The municipalities will be encouraged to investigate evacuation routes in the event of both flooding and slope instability situations. In addition, options need to be investigated regarding limited access to the area immediately south of Pinery Provincial Park referred to as Armstrong East and "Chicken Island". Marine emergency support such as Coast Guard and Ontario Provincial Police (OPP) will be investigated. Where development exists in gully channels (i.e. Cedarbanks, Schadeview and Sunset Cove - Hay Twp.), recommendations need to be made on possible methods of reducing the hazard (i.e. upgrading culvert size in access road, structure relocation on or off site). Those sites located at beach level which could be affected by ice damage related to flooding hazards and storm effects should also be identified for municipal consideration.

The responsibilities of the ABCA, as explained within the existing Emergency Contingency Plan, are to notify the municipality of pending hazardous conditions. Municipal, cottage association, county and individual landowner responsibilities need to be determined by the municipalities and clearly outlined. However, the Emergency Contingency Plan may provide advice on such matters. The potential damage centres or "hot spots" will be identified by the ABCA for the municipalities to include in their municipal emergency contingency plans.

OTHER INITIATIVES

The ABCA may also be able to inform the municipalities and cottage associations of available programs and funding sources for upgrading emergency measure planning for the areas. Use of such programs offered through the Emergency Measures Organization (EMO) and local OPP stations to improve house-numbering systems for emergency use should be encouraged. As part of the 911 program, better definition of residential addresses and street identification is proposed for areas such as Bosanquet Township. Cottage associations should also be encouraged to identify and maintain lake-viewing sites for emergency use during marine emergencies (i.e. boating accidents) and maintain a listing of these sites in a central registry for the appropriate authorities.

TABLE 3: Regulatory Lakeshore Residences

Municipality	LAKESHORE AREA 1		LAKESHORE AREA 2		Total
	flooding and wave related concerns	slope stability concern	long term erosion concern	30 m or dynamic beach	
Goderich Township	0	79	46	21	146
Village of Bayfield	0	15	13	17	45
Stanley Township	0	72	84	98	254
Hay Township	20	24	192	146	382
Stephen Township	0	1	1	52	54
Village of Grand Bend	0	0	10	37	47
Bosanquet Township	3	0	57	113	173
Total	23	191	403	484	1,101
	214			887	

Note: This information is based on the 1988 shoreline mapping and does not preclude the use of additional site specific data from being used which may alter the zone locations.

The Shoreline Management Plan provides detailed information on the possible hazards along the shoreline. This information, when incorporated into an Emergency Contingency Plan which includes the lakeshore, should provide a detailed supplement to the existing Plan already in place at the ABCA. In this way, the Authority can expand its warning and advisory service to the municipalities to effectively include the shoreline and its inherent hazards. The hazards of erosion, flooding and the dynamic nature of beaches and dunes must first be explained and fully understood by the lakeshore residents in order to provide the necessary warning during emergency events.

Section 3.7 FUTURE MONITORING

3.7.1 EROSION

In the past, monitoring of the erosion along the ABCA shoreline has consisted of repeat profile surveys at approximately 35 locations. These surveys have clearly identified the recession of the top of the bluff and have provided limited information on the profile change. Interpretation of these profiles in terms of average long-term bluff recession is limited because of the relatively short period over which the profiles have been taken with respect to the erratic rate at which some bluffs recede. The bluff may be relatively stable for a number of years and then experience sudden and dramatic recession during a period of high water levels as a result of major movement of the bank.

It appears that some of the locations for the profile stations were established based on ease of access, and consequently are located at road ends. Unfortunately, at some of these locations, shoreline erosion and bluff recession are not representative of the adjacent reach of shoreline because of the existence of shore protection structures, unique shoreline features or gullies.

The development of some details of this shoreline management plan has depended on a comparison of a detailed shoreline survey undertaken in 1935 with 1:2000 scale photogrammetric mapping undertaken in 1988. The 1988 photogrammetric mapping provides an excellent data base, defining the shoreline and topography above the water line (including the toe and top of bluff) in detail. The 1935 survey provided extremely useful information, documenting the shoreline, toe of bluff and top of bluff locations. However, the data do not provide complete information on the topography above the water line, and interpretation of the available data was difficult in several areas. In addition, it was apparent that these data included at least one specific error between St. Joseph and Bayfield; this error could not be identified, and limits the accuracy of the 1935-1988 comparison in this area.

Accurate and reliable bathymetric surveys of the nearshore lake bottom generally do not exist, although limited profiles are available at some locations. The best available information for the area offshore of the ABCA shoreline is a 1981 bathymetric survey of Lake Huron at a scale of 1:50,000. Information on the composition of the nearshore lake bottom is also limited. Rukavina (1988) has compiled some information (including cores, jet probes and samples) on the lake bottom composition between Sarnia and McRae Point. However, the data coverage is relatively sparse, and is located in depths of two to 20 metres, with the majority in depths greater than 10 metres. Thus, these data are of limited use in defining the composition of the very nearshore lake bottom (depths less than two metres), which is the section of the profile that controls shoreline and bluff erosion. An estimate of the shoreline stratigraphy has been developed from available onshore well records and borehole logs, but this data will not accurately reflect the stratigraphy in the nearshore area, and cannot be used with complete confidence to define the composition of the nearshore lake bottom.

It has been established that the bluff recession — and therefore development setbacks — are controlled by the erosion of the nearshore lake bottom. Further, the design of structures to stabilize the shoreline and eliminate bluff recession depends on the rate of downcutting of the nearshore lake bottom, and/or on the elevation of a wave-resistant material. Consequently, it is recommended that future monitoring of the ABCA shoreline should emphasize monitoring of the nearshore lake bottom.

Ideally, this monitoring would have two phases. First, a regional bathymetric survey of the shoreline would be undertaken, covering the nearshore area from the shoreline to a depth of about five metres. Associated with this survey, sampling of this area would be undertaken with the objective of mapping the lake bottom material characteristics.

Second, the monitoring station profiles would be expanded in coverage along the shoreline to include more

representative locations, and the surveying procedures would be modified as follows:

- ▶ Profiles to extend to -5 m depth or greater,
- ▶ Vertical accuracy of the profile measurements to ± 1 cm,
- ▶ Horizontal accuracy of the profile measurements to ± 10 cm,
- ▶ Identification of bottom characteristics,
- ▶ Samples of sand to be taken to establish gradation,
- ▶ At selected locations, iron bars would be driven into the exposed till on the lake bottom; this would allow direct measurement of lake bottom erosion over time.

It is recommended that monitoring at the existing profile stations continue in order to provide long-term data on bluff recession. Consideration should be given to the vertical and horizontal accuracy and control of these surveys. In some areas, new stations should be established to represent reaches of shoreline having similar characteristics.

Areas that should be given priority in any monitoring program — particularly of the nearshore lake bottom — include the Melena Heights area, the Bayfield Village shoreline south of the harbour, the Lakewood Gardens/Sunny Ridge/Poplar Beach area, the shoreline to the south of Grand Bend, and the shoreline between Pinery Provincial Park and the Ipperwash Military Reserve.

3.7.2 SETBACKS

Recession rates and setbacks should be revised at intervals in the order of 10 years. Ideally, this would be undertaken by completing 1:2,000 scale photogrammetric mapping of the shoreline every 10 years and comparing the results to the base case established by the 1988 FDRP shoreline mapping. Recognizing the cost associated with this work and the difficulty in obtaining the necessary funding, the alternative is to revise the recession rates and setbacks based on ground measurements taken at the erosion monitoring stations.

These site specific (localized) results, in conjunction with observations along the shoreline and a review of the detailed information available from the 1935-1988 shoreline comparison, would likely provide sufficient information to define areas where the originally established setbacks should be revised. However, this approach would not be as accurate as detailed photogrammetric mapping of the shoreline and comparison to the 1988 shoreline mapping. Possible applications of the Global Positioning System should be investigated as to their applicability in this task.

3.7.3 EROSION CONTROL STRUCTURES

It is further recommended that selected shoreline structures which represent particular designs and are located along shorelines experiencing different rates of erosion should be carefully monitored. The monitoring would consist of limited surveying and developing a photographic record of the structure. This could be undertaken as a joint venture between the landowner and the Conservation Authority.

3.7.4 LAND USE

The Steering Committees recognized that increased development pressure and land use change (primarily from agriculture to recreational use) have occurred along the shoreline. The direction given through the Lambton and Huron County Official Plans and the Municipal Secondary Plans are guiding documents for land use change decisions; however, it can also be economically and politically driven. This change can be monitored by an analysis of zoning and official plan amendments for a particular township.

The number of minor variances approved by local councils to enable lakeshore owners to build closer to the top of lakebank is an indication of the confidence level or short term consideration for the longterm hazards of bluff erosion. This criterion needs to be carefully reviewed to ensure that the necessary setbacks are being utilized

for the appropriate shoreline locations (refer to Figure 8: 1988 Shoreline Mapping) and amendments made, if appropriate, to rectify improper setback criteria. These exercises can be incorporated into the regular five-year review required for municipal official plan documents.

Some type of procedure is needed to survey the number of residents who utilize their lakeshore residence on a full-time versus seasonal basis. Much of the issue regarding this residency question is the need for a consistent definition of the term "seasonal residence". Some may argue that the definition is not used for describing the nature of the occupancy of the building, but is more related to the degree of servicing which the township has agreed to provide the area. This issue will need to be further investigated.

3.7.5 WATER QUALITY

An increased awareness of water quality issues along the shoreline will likely promote a lower tolerance level of lakeshore residents to poor water quality. The MOEE and ABCA should promote community participation in sampling programs to monitor the water quality along the shoreline, possibly as part of the CURB Program initiated for the shoreline in 1991 (ABCA, 1991). This will be contingent upon the necessary funding being made available and is commonly a reflection of the degree of public concern voiced to local politicians.

3.7.6 WATER QUANTITY

Where new municipal drains are being planned along the shoreline region, their outlets need to extend to an outlet at the base of the bluff or slope which is properly designed to prevent erosion problems. This is in contrast to the past occurrence of ending the drain at Highway #21, using the highway culvert as sufficient outlet, or ending at the head of a lakeshore gully. A coordinated approach to surface drainage within residential areas will also assist in wise stormwater management. At present, overall drainage schemes are not usually present in typical lakeshore residential areas.

Section 3.8 COMMUNICATION STRATEGY

During the development of the SMP, the public was involved in many ways (see Section 2.5). However, as this plan is not static and will require future review and analyses to respond to changing demands on the shoreline resource, a continued strategy for communication with lakeshore residents is necessary. This section outlines the communication strategy to be used upon the finalization and adoption of the SMP.

1. Input and direction will be needed to provide for the continued application of the SMP and management of the shoreline. A committee composed of representatives from the lakeshore community (possibly a subgroup of the Steering Committee for the SMP) should continue to provide direction and advice on shoreline management topics.
2. The SMP should encourage the cottage/ratepayer associations to strengthen their organizational basis. Better communication between lakeshore residents and the ABCA (being the agency mandated to implement shoreline management) can occur with the assistance of such lakeshore resident associations. The ability to efficiently and effectively transfer information between association contacts and the lakeshore management agency (e.g. ABCA) will assist in the delivery of various programs. This could be as simple as maintaining up-to-date membership and mailing lists. Such groups may benefit from being able to request services (e.g. tree planting program - ABCA; municipal drainage applications - municipality; or lakeshore hazard assessment - ABCA) on a group basis that may not be available or as effective to the individual.
3. There is a need to produce and distribute an annual lakeshore bulletin to provide relevant information to the lakeshore community on relevant topics. These may include lake level forecasts, land use issues, new technologies for septic systems and/or shore protection. It could also be a vehicle for informing residents of new programs for assistance or new regulations which may affect aspects of the lakeshore environment (e.g. river mouth

dredging and open lake dumping practises, zebra mussel abatement programs, etc.).

4. Communication among lakeshore personnel of CAs, government agencies and academic researchers involved in coastal issues should be maintained (e.g. with the Canada Centre for Inland Waters and the International Joint Commission) to enable the most current information and recent findings to be applied to the study area of this SMP. Management decisions can be more soundly based if they evolve with a better understanding and knowledge of coastal processes, issues and relationships.

5. Ongoing communication among other interest groups and municipal councils will continue to promote a better understanding of the shoreline resource at the local level.

Chapter 4

POLICY AND IMPLEMENTATION

- 4.1 Introduction
- 4.2 Legislation
- 4.3 Conclusions



THEORY AND PRACTICE OF THE TEACHING OF ENGLISH



Section 4.1 INTRODUCTION

The Shoreline Management Plan in isolation has no status. The strength of a Plan is contingent upon the consensus of the various interest groups which form the Steering Committee, the approval of the seven municipalities, agreement of the various provincial and federal government agencies, and acceptance by those it affects and the general public.

The Plan is intended to be referenced as background information for changes to the planning documents of the lakeshore municipalities (comprehensive zoning bylaws, Official Plans and Secondary Plans). It is also written to be of assistance to other government agencies who, by nature of their work, focus on the lakeshore and the inherent physical limitations and hazards which it possesses.

Section 4.2 LEGISLATION

This section outlines the various interest groups and the methods available for these groups to utilize the results of the Plan. At the time of writing this Plan, the lakeshore issues of proper land use management are being debated by all levels of government, be it municipal, county, provincial or federal. For this reason, some of the methods and policies discussed in the following discussion are in draft or preliminary form.

4.2.1 PROVINCIAL GREAT LAKES-ST. LAWRENCE RIVER SHORELINE POLICY STATEMENT

This policy statement is approved by MNR as a policy; however it is currently in draft form under Section 3 of the Planning Act. Once adopted by Cabinet, this document will have a similar status to other resource-based policy statements under the Planning Act (such as the Provincial Flood Plain Planning Policy Statement, August 11, 1988, and the Wetlands Policy Statement, June 27, 1992). The document sets out the criteria for determining the hazard or regulatory shorelands to which development restrictions will apply (for details, see Section 3.3 "Lakeshore Development Policy").

The draft policy statement provides direction as to what topics need to be addressed by municipalities in their planning documents to address new development which may be affected by lakeshore hazards. These policies include ensuring that:

- i) uses permitted within the regulatory shorelands are cognizant of flood and/or erosion susceptibility and/or risk;
- ii) no new development is permitted which is susceptible to flood, erosion and other shoreline-related damages or which will have an adverse impact on existing adjacent development or lands;
- iii) redevelopment of existing development (additions, rebuilding or replacement) are done with reference to the hazards of the regulatory shorelands; and
- iv) consideration is given to public and private works which, by the nature of their use, must be located within the regulatory shorelands.

The policy statement also specifies that all provincial ministries must have regard for the policy statement, including such boards and agencies as the Ontario Municipal Board and Ontario Hydro.

4.2.2 PLANNING ACT

Irrespective of the status of the draft policy statement (discussed in 4.2.1 above), the relevant information from the SMP can be incorporated into the municipal official plans or zoning bylaws, wherever appropriate. Many of the municipalities are undergoing the mandatory review of their respective secondary plans. The county Official Plan and associated municipal Secondary Plans identifies the existing use of land; guides and directs potential land

uses and establishes implementation policies within the municipal boundaries. The Comprehensive Zoning By-laws, by comparison, establish the detailed boundaries of the land uses, the specific site requirements of the land uses, and the specific policies with which the land uses will be permitted under. General planning statements, recognizing the lakeshore as a unique area which warrants special consideration regarding the inherent hazards which exist, are needed as the basis of further discussion. These basic statements, in addition to stating the need for such policies as outlined in the previous section, are the minimum requirements for inclusion in the secondary plans. This provides the foundation and justification for more details being included within the zoning bylaw at the appropriate time (possibly upon the completion and adoption of this Plan).

Mapping changes to planning documents may be necessary to reflect the data showing the erosion hazard along the shoreline. This will especially apply to Huron County municipalities which currently have a 1,000-foot wide "Recreational" designation paralleling the shoreline top of bank. This designation appears in both the secondary plans and zoning bylaws for all four rural municipalities within the ABCA's jurisdiction (being Goderich, Stanley, Hay and Stephen Townships). The erosion mapping information (discussed in Section 3.1) indicates areas where new development will need to be set back from the top of bank. Using the most extreme of erosion rates, an appropriate setback may very well include one-third of this 1,000-foot zone, and therefore the location of this line may need review.

Regarding setbacks, the zoning bylaws have commonly made use of a term "top of bank" in describing a feature from which a certain building setback applied. This feature is relatively easy to identify where gully and lakeshore slopes or "banks" are predominant. However, the definition is inadequate in describing the type of environment found in a beach/dune system. The confusion of the use of this term is most applicable to the dune areas of Bosanquet and Stephen Townships, and the Village of Grand Bend. The term "dynamic beach" and the description used to define it (see Section 3.3) may prove useful as a substitute.

4.2.3 CONSERVATION AUTHORITIES ACT

Under Section 28 of this Act, an Authority may make regulations applicable to the area under its jurisdiction restricting, prohibiting or requiring the permission of the Authority for development activities such as building construction and filling. As the legislation was originally intended for the riverine situations, some clarification may be required to incorporate the lakeshore. Terminology such as "regional storm" will need to be reviewed to ensure it's application to Lake Huron. In addition, the use of the existing term, "conservation of land" will need to be clarified as to its application to erosional concerns (McKeen and Law, 1991). At present, the existing regulation enforced by the Conservation Authority (Ontario Regulation 142/90) pertains to the lakeshore region only where watercourses such as gullies outlet into Lake Huron.

Also within the mandate of the Conservation Authority is the function of lead commenting agency on planning matters involving lakeshore flooding and erosion. This function will be more vigorously undertaken once the draft Provincial Policy on Great Lakes shorelines is formally adopted by Cabinet. To provide direction to staff when reviewing planning matters and to maintain consistency, it is proposed that the ABCA and lakeshore municipalities approve of a lakeshore development policy as part of this SMP. This policy (see Section 3.3) would provide implementation criteria for the provincial policy statement.

4.2.4 LAKES AND RIVERS IMPROVEMENT ACT

Administered by the Ministry of Natural Resources (MNR), this Act provides the powers "to provide for the use of waters of the lakes and rivers of Ontario and to regulate improvements in them" (sec.2). As discussed in McKeen and Law (1991), the legislation was intended to reflect the interests of the government in the 1920s related to dam construction, timber driving, protection of public interest (riparian rights) and water power privileges, to name only a few. The Act does apply to any shoreline work extending into the water and requires the issuance of a Work Permit.

Table 4: MNR Guidelines for Reviewing Shoreline Projects

Project	Hard ¹ Shoreline	Soft ² Shoreline	Sensitive or ³ Critical Areas
FILL			
a) Conversion to dry land			
minor (generally < 3 ft.)	-----may be acceptable with conditions-----		not allowed
major (generally > 3 ft.)		-----not allowed-----	
b) reclaim land previously lost to erosion		-----allowed with conditions-----	
RETAINING WALL		-----allowed with conditions-----	
BEACH NOURISHMENT	-----allowed with conditions-----		generally not allowed
DREDGING			
a) to allow water access to property	-----may be allowed with conditions-----		not allowed
b) navigational for Great Lakes shipping purposes		-----allowed with conditions-----	
DOCKS AND BOAT HOUSES	-----allowed with conditions-----		generally not allowed
GROYNES	-----generally not allowed-----		not allowed
BREAKWALLS	-----allowed with conditions-----		not allowed
BOAT LAUNCHES	-----allowed with conditions-----		not allowed
MARINAS	-----allowed with conditions-----		not allowed
OPEN LAKE DUMPING⁴		-----generally not allowed-----	
LITTORAL ZONE DUMPING⁴		-----generally not allowed-----	

NOTE:

These guidelines are presented for information purposes only and are based on compliance with the Public Lands Act, Lakes and Rivers Improvement Act, and Section 35 of the Fisheries Act. The guidelines do not account for project review based on the potential adverse impacts to littoral drift and other environmental factors.

¹ hard shoreline is defined as shoreline or substrate comprised of rock, boulder, rubble, or gravel and includes shorelines artificially hardened with protection.

² soft shoreline is defined as shoreline or substrate comprised of sand, silt, clay, muck, or detritus.

³ sensitive or critical areas includes documented site specific spawning or nursery habitat. This may include wetlands and marshes hydrologically linked to the Great Lakes.

⁴ dumping will need to comply with the MOEE guidelines for such work.

4.2.5 PUBLIC LANDS ACT

Also administered by MNR, this legislation directs the Ministry to "have charge of the management, sale and disposition of the public lands and forests" (sec.2). Crown land and resources are therefore regulated with regards to development on, management and use of, and rehabilitation to the said lands. Although the Act authorizes MNR to define "shore lands" for the purpose of the legislation, the terminology needs to be carefully regarded. The inaccuracies of the use of such terms as beds and banks were recently debated in a trial over ownership of the beach in the Village of Grand Bend. This celebrated case provided insight into the limitations of surveying terminology and revealed the difficulty of accurately defining property boundaries based on historical data in a dynamic beach environment (Chilcott decision, 1990).

Specific to shoreline environments, two sections of the Act do provide direction for activities involving the sale of public lands covered by water (sec.39) and beach management agreements (sec.42). As suggested by McKeen and Law (1991) however, the legislation and regulatory controls need to be strengthened in order to provide assistance to provincial shoreline management interests. Some limited applications may apply to the study area where undisputed Crown ownership exists. Work proposed for areas under Crown ownership or "shore lands" will need to be supported by the issuance of a Work Permit possibly with the additional requirements of tenure document and indemnity agreement. Section 14 of the Act applies to lands under Crown ownership and "shore lands."

Canada Company beaches have been specifically dealt with in an MNR interim beach management policy (#LM 7.09.02, dated June 29, 1990) created as a result of the uncertainty which resulted regarding beach ownership after the Grand Bend beach ownership trial. This policy encourages the status quo until a final decision has been reached regarding the court decision and subsequent appeal made by the Province.

4.2.6 FISHERIES ACT

Although this Act is federal legislation, its powers have been delegated to MNR. The wording of the Act is sufficiently broad to control almost any activity which is planned in the water or in areas covered by waters of Lake Huron. Unfortunately, the legislation is reactive rather than proactive and there is no pre-approval process in place. However, since the punitive fines are in the range of \$50,000 to \$100,000 and an offender may also be charged to rehabilitate the site at his/her cost, discussion of a proposed project prior to initiation should not be too difficult to obtain once the repercussions are widely known. In an effort to improve the understanding of the various factors which are considered when approached with a project within shorelands, the two local MNR District Offices within the study area have drafted guidelines for reviewing various shoreline projects (see Table 4). Fisheries concerns are also being included through the current review process established under the Public Lands Act.

4.2.7 ENVIRONMENTAL PROTECTION ACT

Under Section 7 of this Act, requirements are stipulated for the proper and controlled emission of any contaminant into the environment. This includes the disposal of sewage using sewage disposal systems, including the most common method used along the Lake Huron shoreline: septic tank systems. The only exception to this method in the study area is within the Village of Grand Bend, which has sanitary service provided.

Delegation of this responsibility can be passed to the county level and has occurred in Huron County where the Public Health Department implements the policy. This agency reviews all plans for private sewage disposal system installation prior to the issuance of building permits. In Bosanquet Township, this function is being reviewed.

In 1991, Huron County was affected by a development moratorium, or "slow-down" issued by the MOEE in response to long-term concerns about using individual septic systems to service new residential development (including the lakeshore). This concern is based on several factors including the following:

- i) The soil of the lakeshore region of Huron County is typically composed of a heavy clay soil which requires

special considerations for septic system installations (i.e. raised tile beds using imported fill due to slow percolation rates in the native soil which may create surface drainage problems).

ii) The lakeshore between Grand Bend and Bayfield has recently been provided with a reliable source of potable water. The extension of the Lake Huron Water Supply by way of a water pipeline along Hwy #21 has initiated a concern that existing residential septic systems, which may be under-maintained or faulty, will be overworked by this uninterrupted water supply.

iii) Residential development along the lakeshore was originally built as "cottage style" development and justified the zoning designation "seasonal residential". Present trends in development and re-development (i.e. expansions, rebuilding) of these areas have changed to construction of, or conversion to, more permanent residences for year-round use. Part of this upgrading and conversion trend to residences may be due to limitations in the Building Code not allowing a "simple cottage" to be constructed (i.e. stipulations on foundations, minimum standards of insulation).

4.2.8 DRAINAGE ACT

This Act has been used commonly to fairly and equitably apportion costs related to the creation and maintenance of drainage systems in agricultural areas. These systems ensure that drained agricultural land has sufficient outlet to ensure adequate drainage for agricultural purposes. However, this Act has increasingly been used to provide the mechanism for surface drainage systems in residential areas where no overall drainage scheme exists. Examples can be found in Section 3.2.6.

Lakeshore examples are described under the heading of drainage in Section 3.2.6. As discussed under non-structural protection (see Section 3.4.2.2), a variety of approaches are available. The key issue is to establish a communal arrangement which is legally binding and provides a protected outlet to the lakeshore. Unfortunately, many of the existing municipal drains ended at Highway #21 where "safe and sufficient outlet" (Section 15, Drainage Act 1989) was deemed to be. This sometimes led to erosion problems related to outletting channeled water into a natural ravine which was compounded by the elevation difference the water needed to transcend from tableland to lakeshore. The sensitivity of these lakeshore watercourses and their environmental importance is described under the title, "Environmental Ecosystems" (Section 3.5.2.1).

Section 4.3 CONCLUSIONS

In some Great Lakes shoreline jurisdictions there is an over-riding legislative document which provides clear and concise direction regarding shoreline management and the necessary powers to enforce them. An example is the State of Michigan which has a Dune Protection and Management Act. The Province of Ontario has none. It is therefore only through the cooperation and consensus of a variety of government legislation, user groups and an understanding by the public that the principles of shoreline management can succeed.

Implementation of this SMP can be achieved primarily by use of the Planning Act and/or Conservation Authorities Act. Based on the public and municipal response to this issue of implementation, we recommend that the Planning Act be used as the sole implementing mechanism unless regulations under the Conservation Authorities Act are requested by the municipality.

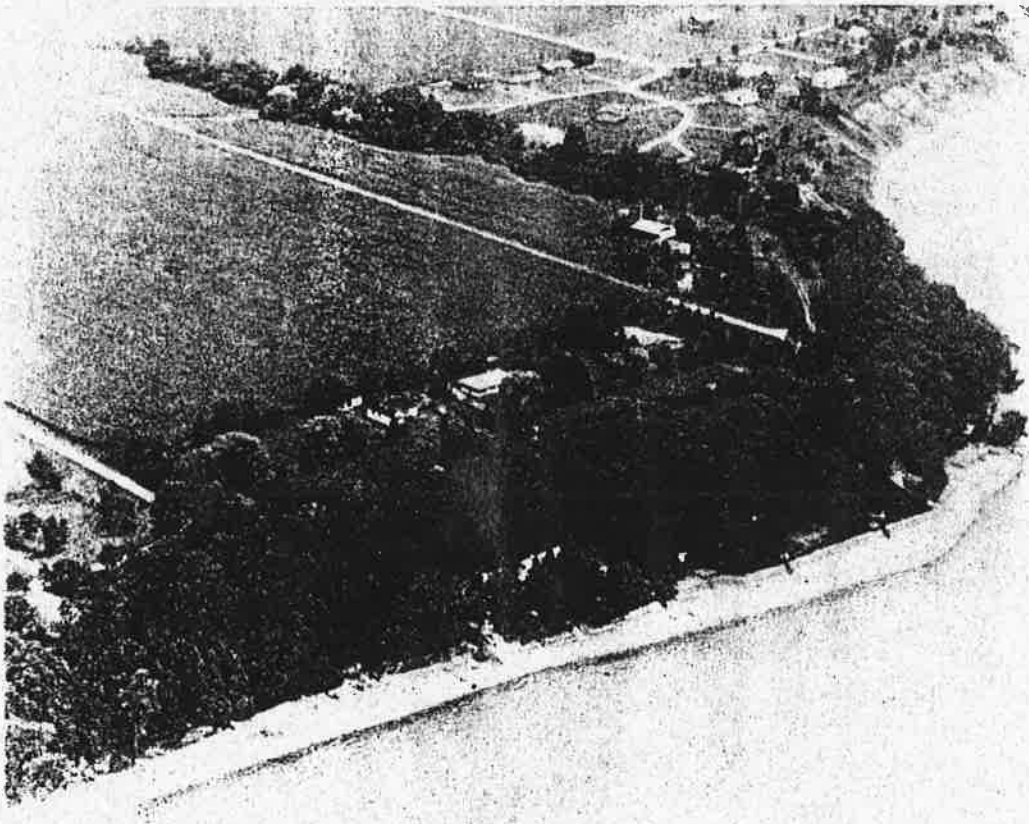
In the short term, implementation of the SMP will be completed by the ABCA through comments submitted to municipalities regarding land use matters (e.g. zoning amendments, minor variances). Implementation in the long term will occur through incorporation of this document into the municipal planning documents (e.g. zoning bylaw, secondary plans). Completion of the provincial policy statement (see Section 4.2.1) will also assist in the inclusion into local planning documents.

It should be stressed that much of the SMP is considered the best and most detailed information currently available regarding the shoreline and related hazards. Use of the data will therefore be encouraged. As research and monitoring results reveal new data, they will be incorporated into the SMP.

Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

- 5.1 Introduction
- 5.2 Conclusions
- 5.3 Recommendations



CHAPTER 2
THEORY OF THE EARTH AND ITS HISTORY

THEORY OF THE EARTH
AND ITS HISTORY



Section 5.1 INTRODUCTION

The ABCA Shoreline Management Plan (SMP) is a long-range planning, reference document intended to direct land use planning along the shoreline. It is designed to support new regulations or policy regarding development restrictions within areas where lakeshore hazards create avoidable risks. It is also intended to suggest and recommend approaches and means to achieve the common goal of wise shoreline management through existing legislation and policies. The following conclusions were developed through consensus of the committees.

Section 5.2 CONCLUSIONS

DAMAGE MITIGATION

Conclusion #1 THE MOST EFFECTIVE RESPONSE TO MITIGATING SHORELINE DAMAGES IS PREVENTION THROUGH LAND USE MANAGEMENT (New Development) OR THE RELOCATION OF THE THREATENED STRUCTURES (EXISTING DEVELOPMENT) AWAY FROM THE SHORELINE HAZARD).

Wise land use management which achieves the result of locating development outside of lands susceptible to flooding and erosion is the preferred response to proposals for new development. In areas of existing development, this option is not available and measures are required to minimize the potential of structural damage and injury. In areas where flooding and erosion is considered to be a risk, the only viable alternative may be the relocation of the building away from the affected lands. The feasibility of this approach is evident from a cost/benefit approach when the total costs of protection (including materials, installation, and future maintenance) are considered.

An additional consideration is the impact that increased protection may have on the reduction of sand supply to the sediment budget. It is generally accepted that downdrift impacts should not be allowed to occur, therefore the interruption of littoral drift should also not be allowed. This supply and continuance of the sediment budget is important for maintaining the shoreline beaches. Proper setbacks, relocating buildings and the redesignation of lots for open space instead of residential use if they become non-buildable sites due to erosion are the preferred strategies.

NEW LAKESHORE DEVELOPMENT

Conclusion #2 NEW DEVELOPMENT PROPOSED ALONG THE SHORELINE WILL BE PERMITTED OUTSIDE OF THE REGULATORY LAKESHORE

As stated in the Lakeshore Development Guidelines (see Section 3.3), new development is defined as plans of subdivision, multi-lot severances, multi-unit/condominium developments and existing subdivisions which are primarily vacant of development (fewer than 50 percent of lots are developed).

Surface water drainage plans will be reviewed with respect to the lakeshore impacts through stormwater drainage and hydrogeologic reports. It is recognized that improvements to water quality need to focus on septic systems along the lakeshore and agricultural practices inland. The cumulative impact to the quality of the groundwater must be considered when considering the impacts of each new development (both in the dune environment and in the bluff regions).

Specifically related to the potential for development within the areas of Sunnyridge and north of Poplar Beach, Hay Township, this region experiences the greatest rates of bluff erosion compared to the remainder of the shoreline under consideration within this study. For this reason, shoreline stabilization methods would not be feasible as discussed in Conclusion #7.

EXISTING LAKESHORE DEVELOPMENT

Conclusion #3 **EXISTING DEVELOPMENT ALONG THE SHORELINE WILL NEED TO CONSIDER THE LAKESHORE DEVELOPMENT GUIDELINES (SECTION 3.3) WHEN CONTEMPLATING CHANGES**

Existing development along the shoreline will need to consider the degree of hazard which is present at the particular site when contemplating further development (i.e. additions, new accessory buildings). These potential hazards have been defined in Section 3.3 "Lakeshore Development Guidelines" and are described as being within the "LAKESHORE AREA 1" or "LAKESHORE AREA 2" designations.

Where erosion of the shoreline is threatening existing development, residence relocation is still considered the most effective protection in many cases along the shoreline. Owners need to be made aware of opportunities to acquire adjacent inland properties to provide "run-away lots" for threatened sites. This situation can best be seen in the Poplar Beach area where the most northerly existing cottages are threatened by bluff erosion and a new plan of subdivision has been approved inland, supplying 26 vacant lots for purchase. A mechanism to give these lakefront cottage owners "first right of refusal" for these new lots would allow for the establishment of "run-away lots" nearby.

Wherever long term erosion rates are high and cottage development has not yet occurred, lot lay-out should be redesigned to avoid the linear arrangement of lots parallel to the lakeshore.

SHORELINE PROTECTION

Conclusion #4 **SHORELINE PROTECTION (BOTH STRUCTURAL AND NON-STRUCTURAL) MAY BE PERMITTED FOR DEVELOPMENT WHICH CURRENTLY EXISTS ALONG THE SHORELINE.**

This will involve the use of a minimum engineering criteria (see Section 3.4.3) and an assessment of the proposed structural protection and how it may impact adjacent sites (see Section 3.4.2 and Conclusion #6). Existing protection will be reviewed and managed using existing legislation.

New development planned for the shoreline region should not require shoreline protection since all necessary precautions will be taken at the planning stage using appropriate setbacks to ensure that it is not proposed in an area susceptible to flooding or erosion.

Conclusion #5 **SHORELINE PROTECTION STRUCTURES HAVE TWO OBJECTIVES: STORM DAMAGE PROTECTION WHICH IS DESIGNED TO PROTECT PROPERTY FROM STORM WAVES, AND SHORE STABILIZATION WHICH IS DESIGNED TO STABILIZE THE SHORELINE FOR A LONG TIME PERIOD.**

Clarification of these two objectives is important to clearly outline the intent of the various structures so proper design can be achieved and structure limitations can be understood. Both types of protection need to be considered. On a regional scale, however, shore stabilization is a much larger and more costly project.

Conclusion #6 **SHORELINE PROTECTION STRUCTURES ARE AN ACCEPTABLE RESPONSE TO STORM DAMAGE PROTECTION WHEN PROPERLY DESIGNED AND ENGINEERED AS TO NOT ADVERSELY AFFECT ADJACENT AREAS AND THE OVERALL SEDIMENT BUDGET**

Areas with average erosion rates of less than 0.3 m/yr should use a rubblemound revetment as the preferred regional protection approach, where deemed necessary by the landowner. However, other protection methods are also recognized as alternatives dependent upon the specific reach characteristics. Other methods include:

- a) seawalls: (commonly constructed using steel sheet pile walls) are not recommended erosion protection structures anywhere along the shoreline. This is due to the resultant wave action commonly causing deflection of the wave energy downward toward the structure toe, either undermining the structure and causing failure of the protection, or overtopping and suffering wave erosion by splash effects.
- b) retaining walls: by definition, these structures need to be behind (landward of) the active beach zone.

Designed to avoid having water acting at the base of the structure, these walls provide bank stability by securing the bank toe from movement. Due to the nature of the bluff shoreline between Grand Bend and Goderich, these structures will have limited usefulness — based on the fact that high lake levels in 1986 did reach the toe of the bluffs in most areas.

c) groynes: improved design data for groynes should be developed prior to their use as an alternative for shoreline erosion control. Due to the inability to predict the effects of their use, the MNR has effectively put a moratorium on new structures proposed within the beach zone where the Public Lands Act has jurisdiction (effectively all beach area covered by water). If a design process is used that permits effective assessment review, then their use should also be considered on a subdivision scale approach.

Conclusion #7 **SHORELINE PROTECTION STRUCTURES MAY BE BUILT IN AN ATTEMPT TO STABILIZE THE SHORELINE. HOWEVER, DEPENDING ON STRUCTURAL DESIGN, THEY MAY BE INEFFECTIVE OVER THE LONG TERM IN AREAS WHERE SIGNIFICANT EROSION OCCURS**

Protection is only recommended for those areas which are eroding at rates less than 0.3 m/yr. Again this approach should be considered on a regional scale to be effective, both environmentally and economically.

An example is the Village of Bayfield south of the harbour where shoreline stabilization may be considered using offshore breakwaters. However, they are not likely suited for any other location along this shoreline. This is partly due to the unique local conditions of a bluff environment located immediately downdrift of a littoral drift partial barrier (harbour protection). The protection structure would need to include complete design and coastal engineering considerations; however, this is considered to be a feasible site due to the minimal impact to the littoral drift pattern already disrupted by the harbour protection.

Conclusion #8 **NEW SHORELINE PROTECTION STRUCTURES MUST SATISFY A NUMBER OF CONDITIONS**

The report titled, "Considerations for Shore Protection Structures - ABCA SMP" by Baird (1994), describes in more detail the primary conditions. They are summarized as follows:

- a) They are to be part of a coordinated approach (multi-lot or subdivision scale) for an existing development.
- b) Land ownership should be clearly established.
- c) The design of structures above the 100-year flood level to prevent storm damage should follow the recommendations of existing guidelines and reports prepared by the various implementing agencies (MNR, US Corps of Army Engineers).
- d) Structures proposed below the 100-year flood to stabilize the shoreline should be designed by a coastal engineer.
- e) An impact assessment needs to accompany any application for protection approval to demonstrate that: adjacent erosion will not increase, alongshore sand transport rates will not be reduced, adjacent structures have been considered, and the structure will not adversely affect the shoreline ecosystem or associated cultural heritage resources.
- f) Adjacent property owners are to be given the opportunity to comment on application.
- g) There is to be quality control during construction.
- h) Monitoring of structures and regular maintenance are to be undertaken as part of an agreement with the proponent.
- i) Consideration must be given for maintaining pedestrian access along the beach.

Regional-scale beach nourishment is not practical as an effective alternative for new protection structures. It does, however, have some applications to improving the effectiveness of existing structures. Other applicable Acts and legislations referred to in Baird (1994) may also apply.

Conclusion #9 **IMPROVEMENTS OR MAINTENANCE TO EXISTING PROTECTION STRUCTURES MUST CONSIDER WAYS TO REDUCE SHORELINE IMPACTS**

Beach nourishment should be considered for groynes which are being upgraded and are in good condition. Reflective seawalls should be replaced with rubblemound revetments or, at minimum, toe protection should be

provided.

INCORPORATION INTO PLANNING DOCUMENTS

Conclusion #10 **THE LAKESHORE DEVELOPMENT GUIDELINES (SECTION 3.3) NEEDS TO BE RECOGNIZED IN MUNICIPAL PLANNING DOCUMENTS TO PROVIDE CONSISTENCY AMONG THE LAKESHORE MUNICIPALITIES**

As part of the continued update of municipal planning documents, the lakeshore should be specifically referred to and general statements need to be incorporated into the Huron County Secondary Plans, Lambton County Municipal Official Plans and zoning bylaws to recognize the inherent hazards found along the shoreline. Mapping changes to the planning documents that reflect the lakeshore areas should also be undertaken. These may include investigating the suitability of the existing location of the recreational zone in the Huron County Secondary Plans along the shoreline.

Specific to the zoning bylaws for Stephen, Bosanquet and Grand Bend, replacement of the term "top of bank" with a more suitable description (i.e. dynamic beach) is required where it refers to beach areas. Other municipal zoning bylaws need to be reviewed with the shoreline mapping (see Section 3.1) to investigate whether site specific setbacks are necessary in the extreme erosion areas (Sunnyridge to Poplar Beach areas, Hay Twp.).

Related to general planning issues, the ABCA will assist municipalities and County Planning Offices with the definition of the term "seasonal use" and how it applies along the shoreline. Further investigation is also needed regarding the land ownership situation. Using available deeds, the determination of where lakeward lot lines are clearly understood and where problems in interpretation will likely occur should be undertaken.

Advice will be sought from the MNR on such issues as definition of toe of slope, and on the specific requirements of a geotechnical report to satisfy slope stability concerns.

WATER QUALITY

Conclusion #11 **THE ABCA SHOULD ASSIST AND SUPPORT EFFORTS TO IMPROVE SURFACE WATER AND GROUNDWATER (POTABLE) QUALITY ALONG THE LAKESHORE, SPECIFICALLY IN THE SUBWATERSHED BORDERED BY THE WYOMING MORaine.**

The Wyoming Moraine, a linear geographic feature which is parallel to the shoreline as an elevated ridge or watershed, forms the inland drainage boundary for the majority of the lakeshore. All efforts to improve agricultural land management practices in this subwatershed through existing or new programs will be supported.

Wherever possible, the ABCA will assist the MOEE in their efforts to provide the lakeshore community (cottagers and municipalities) with options for rural sewage disposal which will maintain or improve lakeshore environmental quality. This will pertain to both new and existing development and may include both individual sewage treatment and communal facilities.

DRAINAGE

Conclusion #12 **MASTER DRAINAGE PLANS NEED TO BE IMPLEMENTED FOR EXISTING DEVELOPMENT ALONG THE SHORELINE TO IMPROVE THE SURFACE WATER DRAINAGE**

Due to the large number of existing cottage areas which do not benefit from the existence of an overall surface drainage plan for their area, cottage area plans need to be prepared. This fact is most apparent in cottage communities where surface water ponding has impaired the effective operation of septic fields. The problem, however, is widespread and covers almost all areas adjacent to bluffs (north of Grand Bend). To achieve this goal, cooperation will be required between the townships and residential owners, and will likely require the services of a

drainage engineer. Conservation Authority staff will be able to provide assistance through background information and recommendations for each site. As cooperation among the residents will likely be the key to the success of this initiative, unified cottage associations, or ratepayers' associations will be beneficial. Eventually, all municipal drains should be taken to properly designed and protected outlet structures, not at the gully head or at Highway #21 which is currently the common occurrence. In the sand dune environment, consideration should be given to the problem of inadequate outlet due to sand blocking the outlet.

GULLIES

Conclusion #13 **THE GULLIES WHICH BISECT THE SHORELINE REQUIRE PRESERVATION AND AESTHETIC IMPROVEMENT IN ORDER TO ENSURE THAT FURTHER DEGRADATION DOES NOT OCCUR**

The gully channels which typically provide the boundaries of the cottage areas are often the only natural regions remaining for aesthetic values to lakeshore residents. For this reason, care is needed in order to protect and enhance these areas from inappropriate use. Uses such as surface water outlets and pedestrian access to the beach need to be carefully evaluated to ensure that gully regions are not adversely affected. They do, however, provide the most logical location for improved access to the beach areas and a natural location for the outlet of drainage water, if properly undertaken. A review of existing gully features and the ownership of them may be required in order to achieve Conclusion #12.

SAND DUNES

Conclusion #14 **SAND DUNES NEED TO BE CONSIDERED AS A NATURAL RESOURCE CRUCIAL FOR THE CONTINUED PROTECTION OF EXISTING DEVELOPMENT WITHIN THE DUNE REGION**

Development projects proposed on beach areas will be assessed with regards to the dynamic beach criteria described in Section 3.3. In addition, consideration for the cumulative impact of such developments on beach use changes toward the more sensitive beach areas, that is where dune formation actively occurs. Grand Bend, in particular, will need to assess this impact since the beach within the village is not considered to be environmentally sensitive, primarily due to the historic practice of grading the beach when dune formation begins to occur. This practice needs to be evaluated in the context of any change in use of the beach from recreational for example, sun bathers to commercial/residential (i.e. condominiums and tourist commercial use). Beach management practices need to be reviewed.

Ipperwash Military Camp authorities should be contacted with suggestions for dune preservation and management, possibly as part of an overall strategy for the dune area. Some consideration for the long-term plans for the dune area inland from Ipperwash Beach, Bosanquet Township should also be given.

As outlined in the Environmental Overview (Section 3.5), the dune environment requires an overall strategy in order to ensure that sand supply is not interrupted as part of the littoral drift concept. As outlined in Section 3.2.4, evidence suggests that a narrowing in the overall width of the beach south of Grand Bend has occurred since 1935. This could indicate a reduction in the sand supply which, if it continues, may eventually affect the residential areas along the shoreline. For this reason, a stakeholder committee should be formed (comprised of representatives from Ipperwash Military Camp, Kettle and Stony Point Indian Bands, Bosanquet Twp., Pinery Provincial Park, Port Franks and Grand Bend) to provide a joint management approach to the dune region.

Existing shore protection along the bluff shoreline is largely limited to small-scale protection works with limited life span. As such, the threat to effectively reducing the sediment sand supply from the northern shoreline area to the southern dune complex is considered to be minimal. However, the continued upgrading of existing protection in combination with new small scale protection schemes may result in a reduction of sand supply and in increased erosion of beach areas. An assessment will need to be carried out, however, when considering large-scale projects for erosion protection or harbour expansions. The potential effects of sand mining should also be assessed in the context of overall dune management and sediment budgets.

GREEN SPACE

Conclusion #15 GREEN SPACE, A VALUABLE ASSET TO THE SHORELINE, HAS BEEN REDUCED IN EXTENT. ALL OPPORTUNITIES TO PROTECT AND PROMOTE EXPANSION OF EXISTING WOODED AREAS SHOULD BE ACTED UPON.

Gully corridors connecting inland woodlots to the shoreline should be protected and enhanced, where possible, through the inclusion of open space areas in planning documents, new plans of subdivisions, multi-lot severances, and any changes to existing drainage courses possibly through the Drainage Act.

Existing ESAs should be recognized in the municipal planning documents to provide some level of protection for this area of (native) tree cover. Available means should be investigated by the municipalities and counties to provide more lakefront park space/green space for public use and enjoyment. Where lots become unbuildable and funds are available, land purchase should be investigated on a willing buyer/ willing seller basis by the cottage associations, townships, counties or Conservation Authority to create new opportunities for green space.

GODERICH HARBOUR

Conclusion #16 THE ABCA AND OTHER LAKESHORE INTEREST GROUPS SHOULD CONTINUE EFFORTS TO SEEK APPROPRIATE MANAGEMENT OPTIONS REGARDING THE OPERATION OF GODERICH HARBOUR AREA

Despite the continued efforts of the Steering Committee, this project has not received a response from the Coast Guard to the report prepared by W.F. Baird and Associates (Baird, 1992) pertaining to the impact of Goderich Harbour on the sediment budget of the shoreline. The Committee diligently approached Coast Guard with options which may be incorporated into normal operating procedures of the harbour but with no official response. The Baird report referenced the findings of the Lake Huron Shore Processes Study (1989) which provided detailed analysis of the shoreline using state of the art technology and a variety of coastal engineering experts as advisors.

REVIEW OF DEVELOPMENT GUIDELINES

Conclusion #17 THE SMP AND THE DEVELOPMENT GUIDELINES NEED TO BE REVIEWED AS NEW DATA AND RESEARCH BECOME AVAILABLE AND AT LEAST EVERY 10 YEARS TO ENSURE THEIR APPLICABILITY

The long term erosion rates are largely based on the comparison of the 1935 historic survey with recent 1988 shoreline mapping. However, this data is five years old; changes to the shoreline have likely occurred and will undoubtedly continue to occur. As discussed in Section 3.7 "Future Monitoring", the erosion rates and setbacks need to be reviewed every 10 years to ensure their appropriateness. This should be undertaken using erosion monitoring data and site specific data as major erosion events occur and Lakeshore Area boundaries should be revised accordingly.

Future monitoring of the shoreline to assess the erosion should also emphasize the nearshore lake bottom and provide more detailed and accurate data with regards to bathymetric surveys and offshore/onshore soils determination. This monitoring should focus on the areas of Melena Heights, Bayfield (south of harbour), Lakewood Gardens to Poplar Beach, shoreline south of Grand Bend, and the shoreline between the Pinery and Ipperwash Military Camp.

As an additional opportunity to improve the accuracy of the 1935 survey data, consideration should be given to re-establishing ground control points and separating the survey into smaller segments. This would enable a more accurate rate of shoreline change to be determined within the general area of Stanley Township between Crystal Springs and Rocky Point.

After completion of the mandatory review, a supplementary document may be required to replace the original SMP. This will be assessed on an as-required basis, dependent upon the amount of revision required.

EMERGENCY RESPONSE**Conclusion #18 EMERGENCY CONTINGENCY PLANS NEED TO BE REVISED TO INCORPORATE THE LAKESHORE AREAS**

Those areas of known high erosion or those having development within Lakeshore Area #1 need to be monitored during high lake levels and periods of high rainfall. In addition, amendments to the ABCA Emergency Contingency Plan will be needed to include a lakeshore erosion component and hazard mitigation options for each specific municipality to consider. Further, the flooding criteria should be expanded to include consideration for evacuation routes from flood-prone areas and for those areas with limited access, e.g. Port Franks north of the Ausable River outlet.

A list of all residences threatened by lakeshore hazards needs to be provided to municipalities (both slope stability concerns and flooding hazards). In addition, the ABCA will identify lakeshore hazard "hot spots" for the municipality to address in their emergency plans. Options to minimize the hazard should be suggested to those who have developed their properties in gully channels or have removed the protective foredunes.

Cottage associations should be encouraged to maintain look-out points and emergency access points for rescue authorities to use during marine emergencies.

Section 5.3 RECOMMENDATIONS

The following recommendations are intended to provide the direction needed to carry out the intent of the conclusions discussed above. These recommendations can also be viewed as short-term goals to assist in the implementation of the Shoreline Management Plan.

- 1) A shoreline committee should be created to provide direction and input into the continuing application and management of the shoreline. This could be a sub-group of the existing Project and/or Technical Committees.
- 2) The SMP should be distributed to the lakeshore stakeholders, cottage communities, municipalities and other interested groups and persons to promote a better understanding of our shoreline environment and the need to properly manage it in a sustainable manner.
- 3) Information should be periodically provided to educate the general public on the shoreline, specifically to expand landowner knowledge to include the littoral cell concept and an ecosystem approach to shoreline management. In this way, the lakeshore population will become more aware of the overall impact that specific actions will have or may have on the shoreline as a natural system.
- 4) The preservation approach of the shoreline resource should be emphasized in the ABCA's public relations work and it should be stressed that continued development of the shoreline, whether it be multi-lot subdivisions or subdivision-scale cottage expansions, cannot continue unchecked without further deterioration to the environment.
- 5) Input and comments from the general public should be solicited on a draft version of the SMP to ensure that the final product is one which has had the full opportunity of public involvement and scrutiny before approval of the Plan and formal adoption by municipalities and the ABCA.
- 6) The preferred approach for implementation of the SMP should be through the incorporation of the SMP into municipal planning documents under the Planning Act.
- 7) The items listed for further investigation should be considered when funding becomes available and/or the

Chapter 5 CONCLUSIONS AND RECOMMENDATIONS

need dictates their completion. This list should be discussed with appropriate university and college academic researchers to take full advantage of potential research opportunities.

AREAS OF FURTHER INVESTIGATION INCLUDE THE FOLLOWING:

- a) A specific sediment budget should be determined for the dynamic beach shoreline, to assess long-term change effects as discussed under the topic of Goderich Harbour (Section 3.2.5).
- b) Methods to overcome the hazard in dynamic beach areas need to be determined.
- c) Ways of providing shoreline protection by increased sand build-up in regional or site specific applications should be researched.
- d) Nearshore lakebottom erosion needs to be analyzed.
- e) Sand dune stabilization methods using native vegetation species need to be researched.
- f) The inland extent of the "Shoreline Region" needs to be clarified.
- g) Methods need to be researched to differentiate seasonal and permanent residential use through legislation such as the Building Code Act (see Section 9.36 of the Building Code).
- h) A geologic investigation is needed to assist in verifying the long term erosion rates by determining the extent and location of glacial tills in the cross-shore direction, inland from the shoreline.
- i) The lakeward extent of private lot ownership should be confirmed along the shoreline to recognize local variations. This could be accomplished utilizing the results of the appeal to the Chilcott (1989) decision and other available sources to determine lakeshore ownership.
- j) The use and effectiveness of groynes as a structural protection device needs to be further researched.
- k) The stable slope criteria for the Lake Huron bluffs should be verified specifically for the ABCA region.
- l) Ongoing monitoring of the lakeshore should be carried out to provide information needed for the 10 year review of the SMP.

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Appendix A

GLOSSARY OF TERMS

**Ausable Bayfield Conservation Authority
Shoreline Management Plan**

REPORT
ON THE
PROGRESS OF THE
WORK DURING THE
YEAR 1900

THE
REPORT OF THE
COMMISSIONER OF THE
BUREAU OF THE CENSUS
FOR THE YEAR 1900

Appendix A - GLOSSARY OF TERMS

Note: These glossary items are specific to this Shoreline Management Plan and Lake Huron.

Accepted Engineering Principles - those principles, methods and procedures involving wave uprush and other wave related hazards which are used and applied in current hydrotechnical engineering practice and have been approved by the local Conservation Authority and/or MNR

Accepted Geotechnical Principles - those principles, methods and procedures involving slope stability analysis which are used and applied in current geotechnical practice and have been approved by the local Conservation Authority and/or the MNR

Accepted Scientific Principles - those principles, methods, and procedures which are used by scientists in disciplines such as geology, geomorphology, botany, and zoology and applied to the study of coastal processes, vegetation, wildlife and fisheries.

Accretion - the slow and imperceptible addition of shoreland by natural deposition

Adverse Possession - the legal expression for the rights of someone who has enjoyed the continuous, open, notorious, and adverse use of land by a person or a continuous line of persons, none of whom have registered claim or paper title to the land in question.

Aeolian - the process of material (usually sand) being eroded, transported and deposited by wind action

Ambulatory Property Line - a property line which changes location dependant upon the fluctuations of a natural feature on which the line is based (such as the fluctuations of the waterline caused by varying water levels on a lake)

Average Annual High Water Level - the average of the highest monthly mean level of each year over a period of time

Average Annual Low Water Level - the average of the lowest monthly mean level of each year over a period of time

Average Annual Water Level - the average of monthly mean water levels over the year

Backfill - the material used to refill a ditch or other excavation, or the process of doing so

Backrush - the lakeward return of the water following the uprush of waves

Backshore - the part of the shore or beach that is usually dry extending from the limit of wave uprush at the average annual high water level to either the place where there is marked change in material or physiographic form; or the line of permanent vegetation (usually the effective limit of storm waves); or the high water mark

Bar - or submerged or emerged embankment of sand, gravel, or other unconsolidated material built in the nearshore zone by waves and currents

Bathometry - the topography of the lake bottom

Beach - the zone of unconsolidated material that extends landward from the average annual low water level to either the place where there is marked change in material or physiographic form; the line of permanent vegetation (usually the effective limit of storm waves); or the high water mark. A beach includes foreshore and backshore.

Beach Nourishment - supplementing the naturally occurring supply of sand to the shoreline by importing suitable material from other sources

Beach Starvation - the loss of beach building materials due to updrift changes in littoral transport conditions.

Beach Terrace - an erosional feature formed from a higher lake level allowing waves to interact upon a shoreline at a higher elevation which is now exposed due to lower lake levels (also see "berm")

Benthic Region - the bottom of a body of water, supporting the benthos

Benthos - the plant and animal life whose habitat is the bottom of a sea, lake, or river

Berm - a bench or a terrace between two slopes

Blind Inlet - (or French drain) is a surface drainage inlet which is constructed by placing stone over a buried perforated drain pipe.

Blow-out - a term used to describe that portion of a dune which has become mobile, or active due to the absence of vegetation to stabilize it; this can be induced by natural processes but commonly is as a result of human intervention.

Bluff Toe - the intersection of the bluff with the beach (or the nearshore bottom, if underwater) as shown on the 1988

Borehole Logs - a stratigraphic record, or "log" of the material which forms the subsurface obtained through drilling or boring a hole

Breaker - wave broken on the crest because of shoaling

Breaking Point - the point at which a wave begins to break or deform

Breakwater - a structure protecting a shore area, harbour anchorage, or basin from wave action

Bulkhead - a steep or vertical structure supporting natural or artificial embankment

By-Passing of Sand - physically removing sand from one side of a structure (i.e. harbour structure) and placing it on the other side

Carolinian Zone - the vegetative zone found in S.W. Ontario which contains flora and fauna species typical of the southern U.S. states (i.e. tulip trees and possums)

Celerity - velocity of a moving wave

Closed Littoral Cell - a cell which does not receive or deposit littoral material from outside the cell limits

Closed Municipal Drain - drain under the Municipal Drainage Act which is buried or "closed" to the surface of the ground

Consensus Plan - a plan which relies on the consensus or agreement of the group in order to achieve success

Coast - a strip of land that extends from the shoreline to the first major change in terrain features

Coastal Ecosystem - an ecosystem which is found specifically within the coast or shoreline region

Coastal Processes - natural processes (i.e. littoral drift) which are specific to the coastal environment

Coastal Watershed - a drainage area comprising all land surfaces that drain directly to lake waters, rather than watercourses, extending from the coastal watershed divide to the average annual lake level

Coastal Zone - is both the below and above water regions adjacent to the waterline which interacts with some aspects of the shoreline

Cold Water Stream - a stream designated by the MNR as

having characteristics that support coldwater fish species, such as trout, whitefish, ciscoe.

Comprehensive Zoning By-law - a document adopted by a municipal council pursuant to the provisions of the Planning Act or the Municipal Act to control and direct the use and development of property within the boundaries of the municipality

Control Points - related to land surveys; points of known or fixed locations either regarding horizontal or vertical distances, or both

Contour - a line drawn connecting points of the same elevation

Crown Land - all land (including land under water) held by the Province, both land which has never been sold and land which has been reacquired

Current, Longshore - the current in the breaker zone moving essentially parallel to the shore generated by waves breaking at an angle to the shoreline and by the normal movement of water through the lake to its outlet

D 50 - a measurement of sand grain size

Development - means the construction, erection or placing of a building or structure (as opposed to rebuilding)

Dissipate - expend or scatter harmlessly, as of energy of moving waves

Downdrift - the direction of the predominant movement of littoral materials

Dredgate - the material removed from the lake/river bed during a dredge operation

Dry bank - or also referred to as the high water mark

Dunes - ridges or mounds of loose, wind-blown material, usually sand

Dune Morphology - refers to the creation and evolution of a sand dune

Dune Ridge - the most stable and well vegetated feature of the Dynamic Beach region which may receive sand deposition by wind transport

Duration - in wave forecasting, the length of time the wind blows in the same or nearly the same direction over the fetch (generating area)

Duration, Minimum - the minimum time necessary for a

steady wave condition to develop for a given wind velocity over a given fetch length

Dyke - a wall or earth mound built around a low lying area to prevent flooding

Dynamic Beach - refers to the zone of accumulated unconsolidated sediment that is acted upon by waves and wind action

Ecosystem - a community, including all the component organisms, together with the environment, forming a life maintaining, interactive system

Embankment - an artificial bank such as a mound or dyke, generally built to hold back water or to carry a roadway

Embayment - an indentation in the shoreline forming an open bay

Embryo Dune - the most unstable, fragile feature of the Dynamic Beach region which will change location seasonally responding to both wind and wave transport

Environment - air, land or water, plant and animal life including humans, and the social, economic, cultural, physical, biological and other conditions that may act on an organism or community to influence its development or existence

Environmentally Significant Areas - areas identified for their environmental value related to their hydrologic, biologic, or geomorphologic characteristics, as in wetlands, woodlots, or sites which possess rare and endangered species of flora and/or fauna

Erosion - a volumetric reduction of shoreland by natural or human influenced processes

Erosion Rate - the net loss of shorelands normally located above the lake surface elevation over a specific period of time

Escheat - a legal term which refers to property ownership reverting back to the Crown due to the absence of any other arrangement for ownership being established

Failure Plane (slip surface) - the plane or surface along which an unstable soil mass moves at failure; in bluff areas a curved line extending from the horizontal top of bluff a distance away from the crest and extending through the vertical face of the bluff usually in the vicinity of the toe of the bluff (also see "slump")

Flora and Fauna - refers to the plant and animal species

Fetch - the distance over water which waves are generated by a wind having a generally constant direction and speed

Filet Beach - an accretional beach which exists due to the occurrence of an artificial structure (i.e. harbour structure) which interrupts the littoral drift. Refer to discussion on Grand Bend and Bayfield (Section 3.2.6).

Filter - a layer of well graded rock or a synthetic material between protection works and backfill soil to prevent escape of the soil through the protection works

Foredune - the first dune feature landward from embryo dunes which exhibits some stabilization due to vegetation growth. Storm wave action may reach inland to erode this feature.

Foreshore - the part of the shore or beach ordinarily traversed by the uprush of waves extending to the limit of wave uprush at the average annual high water level

French Drain - (see "blind inlet")

Frequency Curve - a graphical representation of the frequency of occurrence of specific events

Gabion - an erosion control method using wire baskets filled with rock; commonly used for retaining walls and revetments

Geodetic Referencing - describing a feature using known geographical coordinates (commonly using latitude and longitude, or UTM grid coordinates)

G.S.C. - Geodetic Survey of Canada (GSC = IGLD (1985) = IGLD (1955) plus 0.19 m)

Geomorphologic - based on the physical shape or landform which exists

Groundwater - subsurface water occupying the zone of saturation. In a strict sense, the term is applied only to water below the water table.

Gully Erosion - the erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from this narrow area to considerable depths, ranging from 0.5 metres to as much as 30 metres

Groyne - a shore protection structure built at an angle from the shore to trap sediment drift and to protect the shore from erosion by currents and waves by making a beach

Groyne Field (groyne system) - a series of groynes acting together to protect a section of shoreline

Habitat - the place or site where an animal or plant community naturally or normally lives

Habitable Space - means rooms or spaces required and intended for overnight occupancy, and includes facilities for storage, heating, air-conditioning, electrical, hot water supplies, plumbing, waste connections, etc. with are necessary to maintain the habitable condition.

Hard Points - refers to areas where relative shoreline erosion is reduced or eliminated in comparison with adjacent shorelines (see headlands)

Hazard Land - land which, because of its physical characteristics in combination with its location, presents a risk for its occupants including loss of life, property damage and social disruption (i.e. flooding, erosion)

Headland - an erosion resistant promontory, either natural or man made, extending into the lake; embayments often form between adjacent headlands (e.g. Kettle, Rocky, and Dewey Points)

High Water Mark - the upper most extent that water levels range, also associated with a break in slope or vegetation

Hindcasting - the act of predicting future wave climate using past records

Historical Storm Event - a storm which due to its magnitude of hazard (i.e. flooding or erosion) is an event which is referred to for historical reference

Hydrographic Survey - a survey of the lake bottom

Ice Damage - damage related to the build-up and movement of ice along the shoreline during the winter and spring months

Improved Public Access - public access which has been developed either for pedestrian or vehicular traffic (as opposed to legal public access)

Infilling - with regards to construction; development on previously undeveloped lots, generally bounded by existing development on adjacent sides

I.G.L.D. - the International Great Lakes Datum (1985), referenced to mean water level at Father Point in the St. Lawrence River. Elevations referenced to datum are dynamic elevations which take into account not only the measured linear height above the reference zero, but also the force of gravity at that particular locality. The resulting elevation differs by varying amounts depending on location from the standard orthometric elevation published by

the Geodetic Survey of Canada (IGLD 1985 = G.S.C. = IGLD 1955 plus 0.19 m)

Inundation - the temporary submergence of shorelands normally located above lake levels

Jetty - an elongated artificial obstruction projecting into the lake from the shore to control shoaling and scour by deflection of strength of currents and waves

Lag Deposits - residual accumulations of coarser particles from which the finer material has been carried away

Lake Bank Overloading - creating a potentially unstable bank by adding additional weight to the upper area

Lake-side effects - the processes originating on the lake which act upon the shoreline and cause changes (e.g. storm wave action, high lake levels)

Lakeward - the direction toward the lake when measuring distances over land

Land-side effects - the processes originating on the land which act upon the shoreline and cause changes (commonly related to human actions of drainage, construction, and earth moving).

Landward - the direction toward the land when measuring distances over water

Lakeshore Area 1 - the region directly adjacent to Lake Huron where existing development may be subject to short term hazards of flooding and erosion (refer to Section 3.3.5)

Lakeshore Area 2 - the region landward from Lakeshore Area 1 where existing development may be subject to long term hazards and other related considerations to flooding and erosion (refer to Section 3.3.5)

Leeward - the direction toward which the wind is blowing, and the direction toward which waves are travelling

Legal Public Access - access which has been assured through the legal designation of land for access purposes but not necessarily developed for such a purpose (see improved public access)

Limnology - the study of physical, chemical, geological, biological, hydrological or other aspects of lakes

Linear Development - development which exists in a linear alignment parallel to the lakeshore, typically with each lot having lakeshore frontage

Littoral - pertaining to or along the shore, particularly to describe currents, deposits and drift

Littoral Cell - areas under the continuous influence of specific longshore currents

Littoral Sink - areas where the littoral materials are deposited and sand accumulates

Littoral Transport - or littoral drift; the movement of littoral material in the littoral zone by currents, including movement parallel to the shore (longshore transport) and perpendicular to the shore (onshore-offshore transport); movement is due to the prevailing current and oblique wave direction

Longshore - parallel to and near the shore, usually within the littoral zone

Major Addition - the size of the addition being added to a building being equal to or greater than 30% of the total existing foundation area (calculated once per building)

Mature Beach - a beach which has undergone the development of sand dunes

Minor Addition - the size of the addition being added to a building being less than 30% of the total existing foundation area (calculated once per building)

Minor Structure - is defined as portable structures including: wooden decks and supports; portable storage sheds with no utilities with a maximum size of 14 square metres (150 square feet) with no permanent foundation or floor slab; and above ground pools

Monthly Mean Level - the average water level occurring during month computed from the hourly readings in each month

Moveable - refers to design and site considerations which will allow a structure to be moved away from a hazardous area, and includes such factors as size of building in relation to the road system, type of foundation, and available space adjacent for building relocation and space for moving equipment to manoeuvre.

Natural Area - a site or area in its natural state, undisturbed by man's activities; an area set aside indefinitely to preserve a representative unit of a major forest, or range of wetland, primarily for the purposes of science, research or education

Nearshore - an indefinite zone extending lakeward from the average annual water level to beyond the breaker zone defining the area of nearshore currents formed primarily

by wave action

Net Loss of Sand - the situation which results when inputs to the sediment budget are less than the losses to the budget, therefore a net loss

New Development - refers to development which typically requires the assemblance of property (land severance, subdivision) and/or the change of zoning or land use designations to an appropriate use which permits the proposed development (multi-unit, condominium).

Official Plan - a document adopted by a Municipal council pursuant to the provisions of the Planning Act which identifies the existing use of land, guides and directs potential land uses and established implementation policies within the boundaries of the Municipality

Offset Measurements - measurement taken perpendicular to, or at an angle to a baseline or traverse line

Offshore - the area extending lakeward of the breaker zone

Offshore Breakwaters - a structure located in the offshore area which is designed to protect a shore area, harbour, anchorage, or basin from waves

Onshore - the area extending landward of the normal high water mark

Onshore Wind - a wind blowing toward the shore

Outfall - a structure extending into a body of water for the purpose of discharging sewage, storm runoff or cooling water

Overtopping - passage of water over the top of a structure as a result of wave run-up or wind set-up

Percolation Rate - a description of soil which describes the time necessary for water to percolate through a representative sample of soil; used in the assessment of a site for individual sewage disposal systems

Pier - a structure, usually of open construction, extending out into the water from the shore to serve as a landing place, a recreational facility or other use

Pile - a long, heavy timber or section of concrete or metal to be driven into the ground or lake bed to provide support or protection

Post-Glacial Lakes - lakes formed as a result of the retreat and melting of the glaciers which formerly covered the Great Lakes basin (also refer to relic lakes)

Public Land - any land owned or administered by a public body or agency. It includes Federal, Provincial and Municipally-owned lands and lands held by agencies such as parks commissions and conservation authorities.

Raised Tile Beds - a type of weeping bed associated with private sewage disposal systems which requires a substantial amount of imported fill material as a base; both percolation and evaporation occurs within this system

Reach - portions of the shoreline containing similar physiographic or biological characteristics and shore dynamics, such as like erosion rates, similar flood elevations, etc., and include shore alignment, offshore bathymetry, fetch characteristics, sediment transport rates, flood susceptibility, land use suitability, and environmental similarity

Recession - a landward retreat of the shoreline by shore processes

Rebuilding - means the reconstruction, or replacement of a building or structure

Relic Dune - sand dunes which are remnants of much higher lake levels

Relic Lakes - lakes which are remnants of much larger lakes which once covered the area

Remedial Works - structural measures intended to provide a remedy specifically aimed at problems of erosion and inundation for the purposes of shore management

Retaining Walls - walls designed to provide support to an adjacent feature or structure

Revetment - a facing of stone, concrete, etc., built to protect an embankment or shore structure against erosion and failure by wave action or currents. Its principle is to allow for the dispersion of energy through friction and gravity.

Riparian Owner - the owner of land containing or directly abutting a natural lake or watercourse

Riparian Rights - the rights of a person owning land containing or bordering on a watercourse or other body of water in or to its banks, bed or water

Riprap - a layer, facing, or protective mound of stones randomly placed to prevent erosion, scour, or sloughing of a structure or embankment; also, the stone so used

and random-placed stones protected with a cover layer of selected stones or specially shaped concrete units

Sand - granular soil or detritus coarser than silt and finer than gravel, ranging in diameter from 2 mm to 0.06 mm

Scarp - a near-vertical slope commonly associated with instability

Scour - removal of material by waves and currents, especially at the toe of a shore structure or bluff

Seawalls - a structure separating land and water areas primarily designed to prevent erosion and other damage due to wave action

Sediment Budget - gives an estimate of material entering the littoral zone from each source and the amount of sediment deposited at each sink or barrier along the shore. The sediment budget must balance. That is, the total amount of supply must equal the total amount deposited plus the amount still in transport

Sediment Source Area - that area of the sediment budget which contributes a large quantity of material to the overall budget. It is typically located where bluff erosion rates are high (greater than 0.9 m/yr.).

Seepage - water escaping through or emerging along an extensive line or surface; the slow movement of water through soil by gravity

Seiche - an oscillatory motion resulting in alternate high and low water levels at each end of a lake that continues after the originating force has ceased

Setback Requirement - a distance measured inland from an edge of a feature, such as a bluff, where construction is prohibited

Sheet Pile - a pile with a generally slender flat cross section to be driven into the ground or lake bed and linked or interlocked with like members to form a vertical wall or bulkhead

Shingle - commonly, any beach material coarser than ordinary gravel, especially any having flat or flattish pebbles

Shoals - offshore areas which have lesser depths of water than the surrounding depths

Shore - the area of interface between land and water

Shorelands - those lands extending from the average annual water level which have potential and direct significant impact on nearshore waters and the shore ecosystem through runoff, and where land use activity is primarily water-oriented

Shore Zone - the landward and lakeward extent of the shoreline management unit

Silt - inorganic particles carried in suspension or deposited by currents, ranging in diameter from 0.05 mm to 0.005 mm

Slump - a failure of a bluff slope with a mass movement along a failure plane

Stakeholders - individuals or groups which have an interest or an investment in the topic

Stillwater Level - the elevation of a water surface would assume if all wave action were absent

Stratigraphy - is the description of the rock layers or units of a physical feature (also known as lithographic units) commonly determined by borehole analysis

Storm Wave Runup - see WAVE UPRUSH

Storm Surge - See WIND SET-UP

Surf Zone - the area between the outermost breaker or where wave characteristics significantly alter due to decreased depth of water and the limit of wave uprush

Tableland - that area above the lakebank slope which is relatively flat

Technical Severance - the severing of land which does not create a new lot, as in a boundary adjustment

Terrestrial - derived from the earth (or from the land)

Threshold Slope Inclination - the slope angle which, if exceeded, will result in an unstable condition. It is determined by the inherent strength of the material which comprises the slope.

Till - unsorted, unlayered consolidated glacial debris which commonly forms the bluffs along the southern Great Lakes

Traverse Line - the survey route or line commonly used as a baseline for measuring distances to adjacent features

Toe Erosion - the erosion which occurs at the bottom of bluffs largely as a result of the continuous removal of

earthen material by waves and currents

Topography - the configuration of a surface including its relief, the position of its streams, roads, buildings, etc.

Turbidity - reduced water clarity resulting from the presence of suspended matter

Undercut - undermining, erosion of the lower part of a steep bank so as to reduce to stability of the upper part

Updrift - the direction opposite that of the predominant movement of littoral materials

Water Table - the upper surface of the zone of soil saturation

Wave - a ridge, deformation, or undulation of the surface of the water

Wave Crest - the highest part of the wave

Wave Diffraction - the restructuring and redirecting of waves by underwater structures

Wave Direction - the direction from which a wave approaches

Wave Forecasting - the theoretical determination of future wave characteristics, usually from observed meteorological phenomena

Wave Height - the vertical distance between a wave crest and the preceding wave trough

Wave Hindcasting - the use of historic synoptic wind charts to calculate wave characteristics that probably occurred in the past

Wavelength - the horizontal distance between similar points on two successive waves measured perpendicular to the wave crest

Wave Offset Zone - the landward limit of wave action measured from the shoreline and delineated by the limit of wave uprush

Wave Period - the time for two successive wave crests to pass a fixed point

Wave Train - a series of waves from the same direction

Wave Trough - the lowest part of a wave between successive wave crests

Wave Uprush - (or wave run-up) the rush of water up

onto the beach or shore following the breaking of a wave; for any given water level the limit of uprush is the point of farthest uprush

Wet Bank - also referred to as normal water's edge

Wetlands - land where the water table is at, near, or above the land surface enough to promote the formation of hydric soils, or to support the growth of hydrophytes. Included are wetland forests (swamps), wetland thickets, marshes, fens and bogs

Wetland Complex - an inter-related hydrologic system which is composed of wetland features

Wharf - a structure built on the shore of a harbour, river, or canal, so that vessels may be brought alongside to receive and discharge cargo and passengers

Wind Set-Up - the vertical rise above normal water level on the leeward side of a body of water caused by wind stresses on the surface of the water

Windward - the direction from which the wind is blowing

Work Plan - a plan prepared annually which defines what management activities are to be undertaken for that year

Zoning By-law - (see Comprehensive Zoning By-law)

GLOSSARY OF ACRONYMS

ABCA	Ausable-Bayfield Conservation Authority
ANSI	Area of Natural or Scientific Interest
CA	Conservation Authority
CHS	Canadian Hydrographic Service
EPA	Environmental Protection Act
ESA	Environmentally Significant Area
G.S.C.	Geodetic Survey of Canada
HWM	High Water Mark
I.G.L.D.	International Great Lakes Datum
IJC	International Joint Commission
MMA	Ministry of Municipal Affairs
MNR	Ministry of Natural Resources
MOEE	Ministry of the Environment and Energy
SMP	Shoreline Management Plan
UTM	Universal Transverse Mercator

Appendix B

GREAT LAKES-ST. LAWRENCE RIVER SHORELINE POLICY MNR, SEPTEMBER 1994

**Ausable Bayfield Conservation Authority
Shoreline Management Plan**

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PROVINCIAL GREAT LAKES - ST. LAWRENCE RIVER

SHORELINE POLICY STATEMENT

DRAFT

September 1993

PROVINCIAL GREAT LAKES - ST. LAWRENCE RIVER
SHORELINE POLICY STATEMENT

PURPOSE

This document is prepared under the authority of section 3 of the Planning Act, 1990, and is the Province of Ontario's policy statement on the planning and management of flooding, erosion and dynamic beaches on the shorelines of the Great Lakes - St. Lawrence River system.

INTERPRETATION

This provincial policy statement:

is issued jointly by the Minister of Natural Resources and the Minister of Municipal Affairs under the Planning Act, 1990; and

does not supersede or take priority over other policy statements issued under section 3 of the Planning Act, 1990, or any other policy approved by the Lieutenant Governor in Council.

BACKGROUND

More than half of Ontario's population lives within the shoreline communities of the Great Lakes - St. Lawrence River Basin. Competition for use of the shoreline, by a diverse range of shoreline interests, has exerted considerable strain on this fragile and limited resource.

Increasing pressure to develop within shoreline areas susceptible to flooding, erosion, and dynamic beaches, particularly over the last forty years, has resulted in extensive and mounting property damages, risk to public safety and detrimental impacts to shore ecosystems.

In the early seventies, high lake levels in combination with major storm events, resulted in approximately \$30 million in flood and erosion damages and land losses, and immeasurable impacts to environmental ecosystems along the shorelines of the lower Great Lakes. Between 1985 and 1987, a return to high lake levels resulted in a marked increase in flood and erosion damages to approximately \$60 million. Fortunately there were uncharacteristically a minimal storm events during this period otherwise flood and erosion damages would have been significantly higher than the observed \$60 million in losses. Most damages having been sustained in the same areas which had previously experienced losses.

Over one hundred years of lake level records demonstrate the variable nature of the Great Lakes. By far, the greatest magnitude of lake level change is caused by natural influences, including precipitation, evaporation, ice and wind, whose influence is frequently measured in terms of metres of change. In comparison, human intraventions including diversions, hydroelectric control structures and navigational works, can cause magnitudes of lake level fluctuations measured only in centimetres of change.

Human responses to shoreline flooding, erosion and dynamic beach concerns have primarily involved the construction of various forms of flood and erosion protection works. Unfortunately, these responses have often included works which were incompatible with neighbouring installations, works which were installed in an ad hoc fashion or works which largely ignored coastal processes and environmental impacts. In a significant majority of cases, rather than protecting against flood or erosion damages, the failure or improper selection, design or installation of the selected protection work has often resulted in marked increases in property damages, losses of land, social disruption and environmental degradation.

The government role in the planning and management of Great Lakes - St. Lawrence River shorelines can be summarized as follows:

- *to provide order and equity in the use and/or non-use of Great Lakes - St. Lawrence River shorelines; and*
- *to protect society, including all levels of government, from being forced to bear unreasonable social and economic burdens of unwise individual choices.*

In Ontario, management of shorelines susceptible to the influences of flooding, erosion and dynamic beach involves a combination of 3 main program components:

- **prevention**
 - land use planning and regulation of development
- **protection**
 - non-structural/structural measures and acquisition
- **emergency response**
 - flood forecasting/warning and flood/erosion disaster relief

a) Prevention

Prevention of flood, erosion and dynamic beach related damages in the Great Lakes - St. Lawrence River system, through the orderly planning of land use and the regulation of development flood/erosion/dynamic beach susceptible shorelines, provides the primary focus for this policy statement. Preventative approaches are the most cost-effective means of ensuring that new buildings and structures are developed in an environmentally sound manner, are not susceptible to flooding, erosion and/or dynamic beaches influences and that adjacent properties and existing developments do not sustain damages as a result of new development.

The Ministry of Municipal Affairs, and the municipalities of Ontario, through the Planning Act, are responsible for land use planning in the Province. The Ministry of Natural Resources and the Conservation Authorities of Ontario act in an advisory capacity to the Ministry of Municipal Affairs and the municipalities on land use matters related to Great Lakes - St. Lawrence River shorelines susceptible to flooding, erosion and dynamic beaches.

The Ministry of Natural Resources, through the administration of the Lakes and Rivers Improvement Act, the Public Lands Act, the federal Fisheries Act, and other Ministry policies together with the Conservation Authorities, through the administration of the Conservation Authorities Act, provide leadership in the management of shorelines susceptible to flooding, erosion and dynamic beaches and in the protection, management and enhancement of the Great Lakes - St. Lawrence River shoreline ecosystems. Conservation Authorities, through regulations, review development proposals from the technical viewpoint of flood, erosion and/or dynamic beach susceptibility and potential updrift/downdrift impacts. Where Conservation Authorities do not exist, the Ministry of Natural Resources is responsible for the implementation of shoreline management policies and practices.

The preventative approach may include the acquisition of undeveloped shorelines in certain situations. Acquisition, however, is usually considered only where other resource management goals are to be achieved.

— D R A F T —

b) Protection

Protection involves the implementation of non-structural and structural works intended to minimize flood, erosion and/or dynamic beach related damages. Non-structural works may include controlled access to beaches and bluffs, planting of stabilizing vegetation, controlled drainage and dune management. Structural works may include revetments, breakwaters, beach nourishment and the elevation of buildings and structures. These works are designed to provide protection to development located within flood, erosion and/or dynamic beach susceptible shorelines. Regardless of the type of structural protection works selected, crucial to the selection process is the need to ensure that the structure is environmentally sound and that the viability and structural integrity of the protection works is assured through long-term maintenance of the structure.

In some instances, though, a benefit-cost analysis may suggest that acquisition and/or the removal of buildings from flood, erosion and/or dynamic beach susceptible shorelines is more appropriate than the installation of protective works.

c) Emergency Response

The Ministry of Natural Resources, in co-operation with Conservation Authorities of Ontario, relays federally generated lake level information and forecasts potentially damaging storm events to shoreline municipalities. During periods of high lake levels, advance warning of impending storm events enables shoreline municipalities and other government agencies to put into operation their emergency action plans for their flood, erosion and dynamic beach susceptible shorelines. This may include the evacuation of people and the removal of personal property from flood, erosion and dynamic beach susceptible shorelines.

Various levels of government have provided relief and assistance, to varying degrees, to shoreline property owners who have sustained extreme flood and erosion damages. Government subsidies, however, do not cover all losses. They specifically exclude such items as landscaping, docks, boathouses, recreational vehicles, non-essential furniture and household appliances.

Although emergency response assists in reducing the threat to life and some property losses, it does not eliminate these losses nor does it prevent flood, erosion and/or dynamic beach related damages from recurring.

Prevention, protection and emergency response are each designed to address different aspects of shoreline management. Over the long-term, however, prevention is the preferred approach for the management of Great Lakes - St. Lawrence River shorelines. By effective land use planning and regulation of development, shoreline flood, erosion and/or dynamic beach damages can be prevented or minimized before they occur and shoreline ecosystems properly protected, managed and/or enhanced. It is in this context that this policy

BASIS OF POLICY

The provincial policies contained in this document have been developed based on the following objectives and principles:

Objectives

- 1) to minimize risks to life, property damage, social disruption and adverse environmental impacts; and
- 2) to encourage a coordinated and environmentally sound approach in the wise use and management of lands susceptible to *flooding, erosion and/or dynamic beaches* in a manner integrated with land use planning.

Principles

- 1) proper shoreline management requires the simultaneous recognition and addressing of *flooding, erosion and dynamic beach hazards* and environmental ecosystem integrity in a manner integrated with land use planning;
- 2) effective shoreline management can only occur on a comprehensive stretch of shoreline basis (*littoral cell or shoreline sediment compartment*) with due consideration given to shore processes, updrift/downdrift effects of development and associated environmental impacts;
- 3) *local conditions* (geophysical, hydrophysical, environmental, economic and social characteristics) vary from one stretch of shoreline (*reach*) to another and, accordingly, must be taken into account in the planning and managing of shorelines susceptible to *flooding, erosion and/or dynamic beaches*;
- 4) the degree of risk (threat to life and property damage) can vary from shoreline to shoreline; the potential for development to safely occur may exist in some shoreline locations and may be too hazardous in other shoreline locations;
- 5) new development susceptible to *flood, erosion, and/or other water related hazards* or which will cause or aggravate *flood, erosion and/or other water related hazards* to existing and/or approved uses and shorelines or which will cause adverse environmental impacts must not be permitted to occur unless the *flood, erosion, other water related hazards* and/or environmental impacts have been addressed;
- 6) where new development may be permitted, the development shall be directed to the least hazardous portions of the shoreline to minimize the potential risks to life and property damages and to reduce costs associated with hazard mitigation and emergency response;
- 7) where new development may be permitted within *flood and/or erosion* susceptible shorelines such developments will be undertaken in an *environmentally sound manner* in recognition of other resource values;
- 8) shoreline management and land use planning are distinct yet related activities that require overall coordination on the part of municipalities, Conservation Authorities, the Ministry of Natural Resources and the Ministry of Municipal Affairs.

POLICIES

(1) General Policies

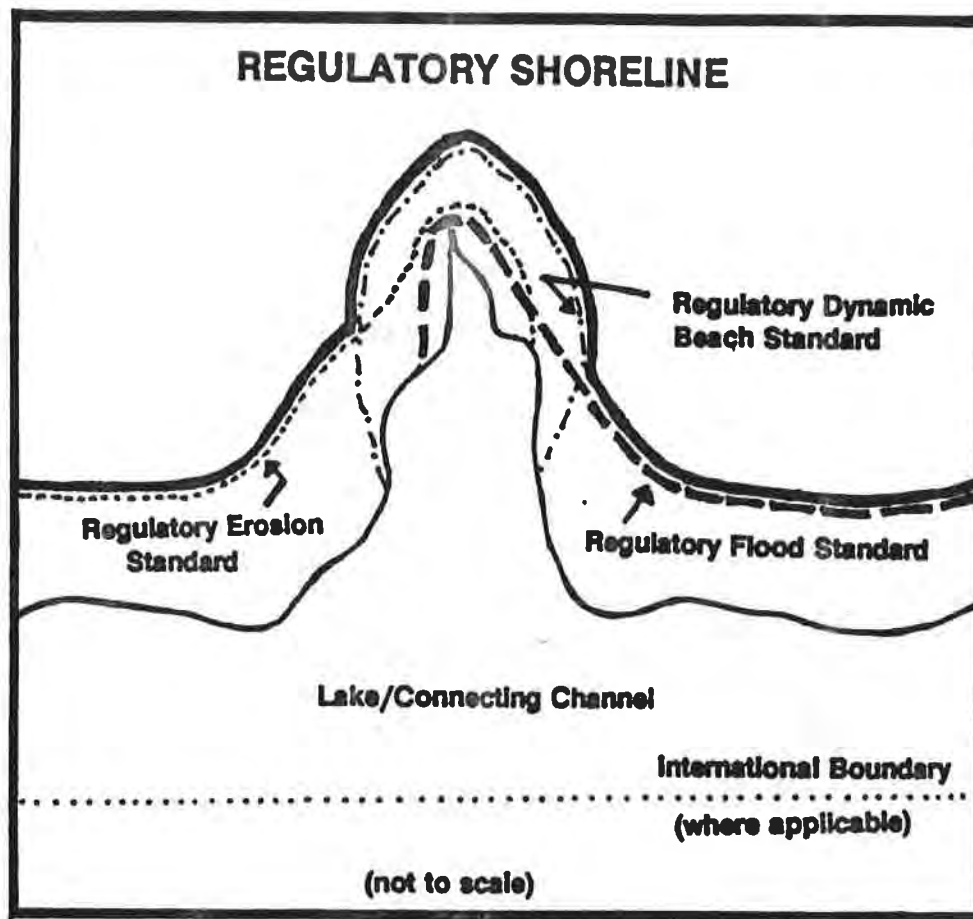
It is the policy of the Province of Ontario that:

- 1.1 All land use planning and resource management bodies within the Province have regard to the implications of their actions respecting the creation of new or the aggravation of existing shoreline management problems.
- 1.2 Municipalities and planning boards¹ recognize the *flood, erosion and dynamic beach* susceptibility and environmental integrity of shorelines at the various stages of the land use planning process for which they have jurisdiction.
- 1.3 Municipalities and planning boards will direct new development to areas outside of the *Regulatory Shoreline* (recognized *flood, erosion and dynamic beach* susceptible shorelines).
- 1.4 A combination of three policy standards shall be used to define the *Regulatory Shoreline* for the Great Lakes - St. Lawrence River system:
 - *Regulatory Flood Standard* based on the combined influence of *lake levels, wave uprush, and other water related hazards* (section 2.1);
 - *Regulatory Erosion Standard* based on the combined influence of *stable slope, recession and/or an erosion allowance* (section 2.2); and
 - *Regulatory Dynamic Beach Standard* based on the combined influence of *flooding and a dynamic beach allowance* (section 2.3).
- 1.5 The *Regulatory Shoreline* (Figure 1) shall consist of the furthest *landward* limit of:
 - (a) the *Regulatory Flood Standard*;
 - (b) the *Regulatory Erosion Standard*;

AND

 - (c) the *Regulatory Dynamic Beach Standard*.

¹"planning board" refers to those planning boards established by the Minister of Municipal Affairs, in accordance with Section (9), or (10) of the Planning Act, 1983.



- 1.6 New development within the *Regulatory Shoreline* shall not be permitted where:
- the *hazards* cannot safely be addressed;
 - new or existing *hazards* are created or aggravated;
 - updrift and/or downdrift impacts would result;
 - major adverse environmental impacts would result; or
 - the development cannot be undertaken in an *environmentally sound manner*.
- 1.7 New development shall not be permitted within the *Regulatory Dynamic Beach Standard*.
- 1.8 New development along the *connecting channels* shall not be permitted within those portions of the *Regulatory Flood Standard* which are critical to the conveyance of the flow associated with the *100 year flood level*.
- 1.9 For portions of the *Regulatory Shoreline* where new development is not prohibited by Policy 1.6, such development shall meet the policy standards governing:
- *floodproofing* (Policy 2.4.1)
 - *protection works* (Policies 2.5.1, 2.5.2, 2.5.3)
 - *access* (Ingress/egress) (Policy 2.6.1)
- 1.10 Where *floodproofing*, *protection works* and *access* (Ingress/egress) policy standards (Policy 1.9) cannot be met, the new development shall not be permitted.

- 1.11 Where there are public safety concerns, new development shall not be permitted to locate within *Regulatory Shoreline* if the new development is:
- a) associated with the manufacture, collection storage, disposal and/or consumption of *hazardous substances* or the treatment, collection or disposal of sewage, which would pose an unacceptable threat to public safety if they were to escape their normal containment and/or use as a result of flooding, *other water related hazards*, failure of *floodproofing* and/or *protection works*, and/or erosion;
 - b) associated with institutional uses, such as hospitals, nursing homes and schools, which would pose a significant threat to the safety of the inhabitants (e.g. the sick, the elderly, the physically challenged or the young), if involved in an emergency evacuation situation as a result of *flooding*, *other water related hazards*, failure of *floodproofing* and/or *protection works*, and/or erosion; and
 - c) associated with services such as those provided by fire, police and ambulance stations and electrical substations, which would be impaired during an emergency situation as a result of *flooding*, *other water related hazards*, failure of *floodproofing* and/or *protection works*, and/or erosion.
- 1.12 Municipalities and planning boards identify areas that are susceptible to *flooding*, *erosion* and *dynamic beach hazards* in their official plans, zoning by-laws and other development decisions under the *Planning Act* and incorporate policies to ensure that new development is consistent with the policies of this policy statement including:
- (a) policies whereby uses permitted in the *Regulatory Shoreline* are environmentally sound and cognizant of *flood*, *erosion* and *dynamic beach* susceptibility and associated risks;
 - (b) policies whereby no new development is permitted in the *Regulatory Shoreline* where *flood*, *erosion* and *dynamic beach hazards* cannot safely be addressed; where new or existing *hazards* are created or aggravated; where updrift and/or downdrift impacts would result; where environmental impacts would result; and/or where new development cannot be undertaken in an *environmentally sound manner*.
 - (c) policies whereby no new development is permitted in the *Regulatory Dynamic Beach Standard* or along the *connecting channels* within those portions of the *Regulatory Flood Standard* which are critical to the conveyance of the flow associated with the *100 year flood level*;
 - (d) policies addressing additions or alterations to existing development and the replacement of development located in the *Regulatory Shoreline*; and
 - (e) policies addressing such public and private works that must locate in the *Regulatory Shoreline* by nature of their use.

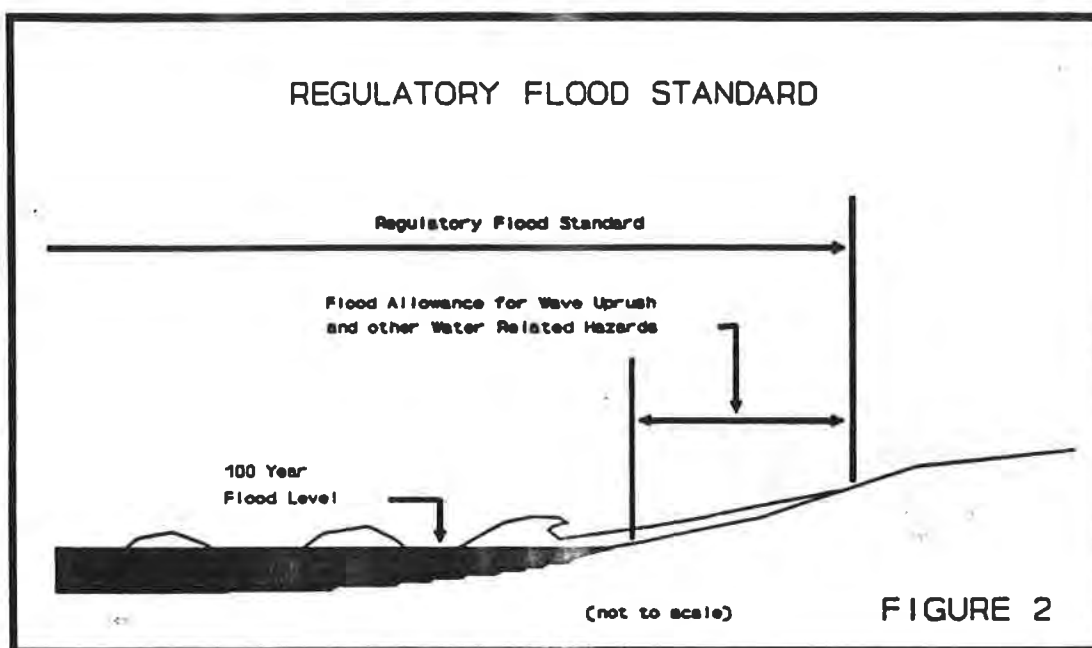
(2) Policy Standards

It is the policy of the Province of Ontario that:

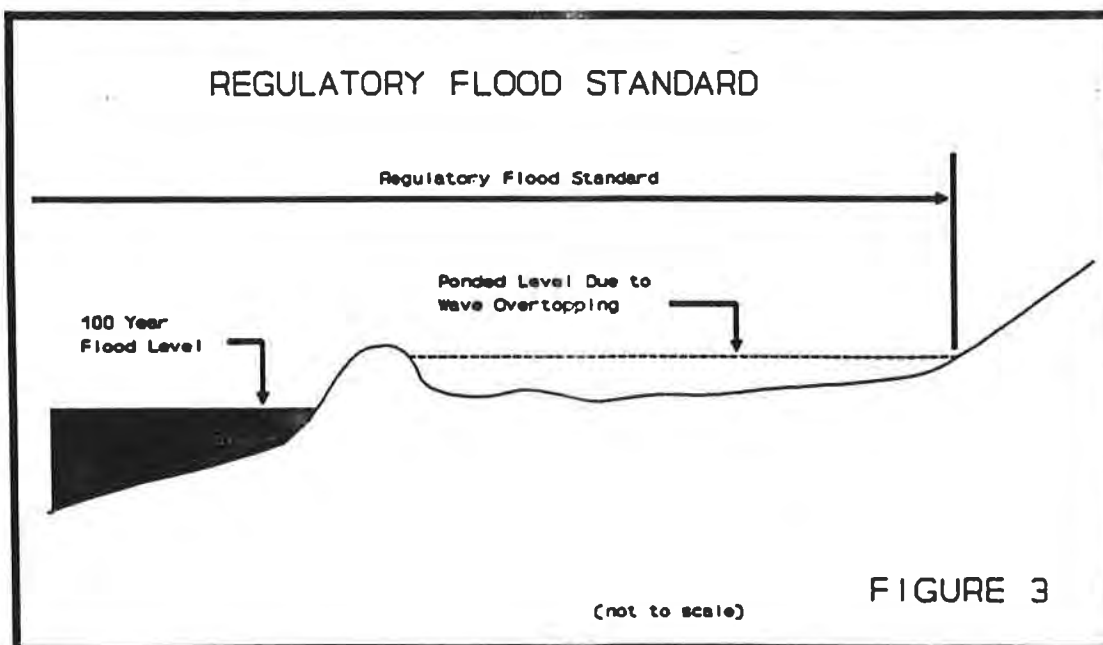
2.1 Regulatory Flood Standard

It is the policy of the Province of Ontario that:

- 2.1.1 The flood standard used to define the flood limit on the Great Lakes -St. Lawrence River system is the **100 year flood level plus a flood allowance for wave uprush and other water related hazards** (see Figure 2).

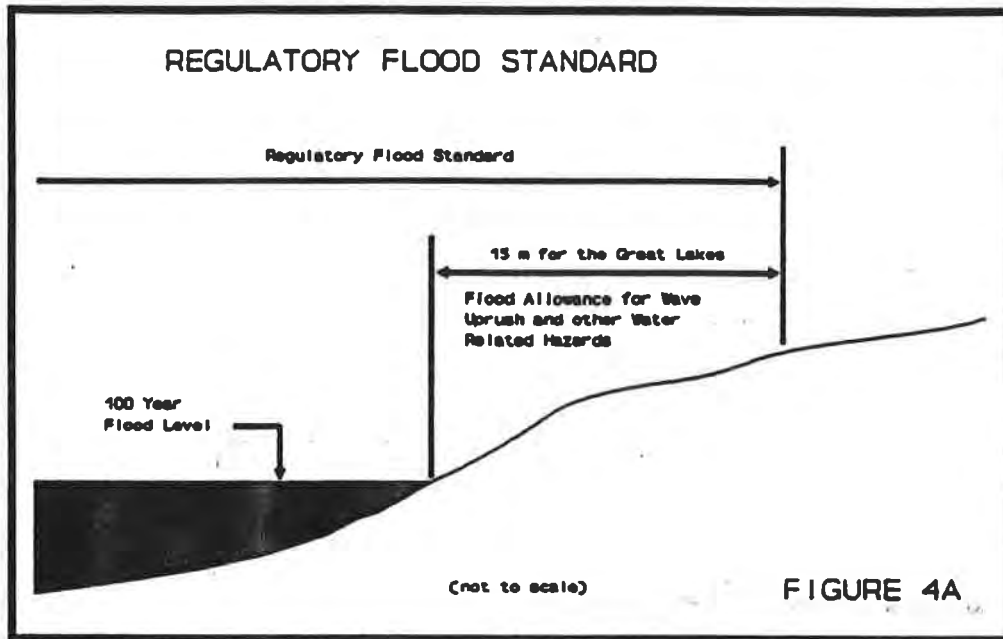


- 2.1.2 Where *wave uprush* may overtop a bank or a *protection work* causing ponding *landward* of the 100 year flood line, the *flood allowance for wave uprush and other water related hazards* shall be determined by a study using *accepted engineering principles* (see Figure 3).



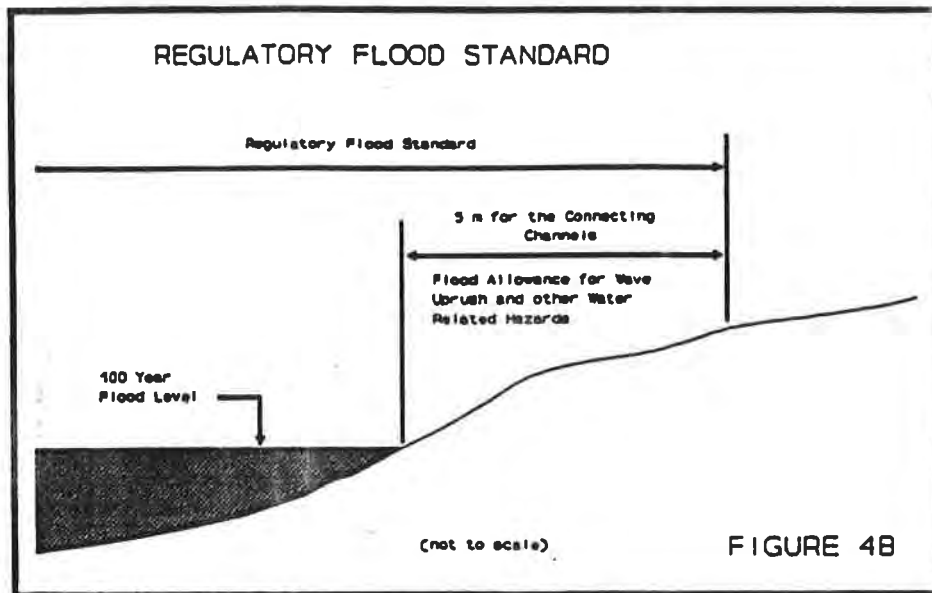
2.1.3 Where wave uprush will not overtop a bank or a protection work causing ponding, studies may not be required. At such sites, in the absence of studies using accepted engineering principles, the flood allowance for wave uprush and other water related hazards, for the Great Lakes - St. Lawrence River System, shall be defined as:

- (a) 15 metres measured horizontally from the 100 year flood level on lakes Superior, Huron, St. Clair, Erie and Ontario (see Figure 4A);



OR

- (b) 5 metres measured *landward* horizontally from the 100 year flood level on the *connecting channels* (see Figure 4B).



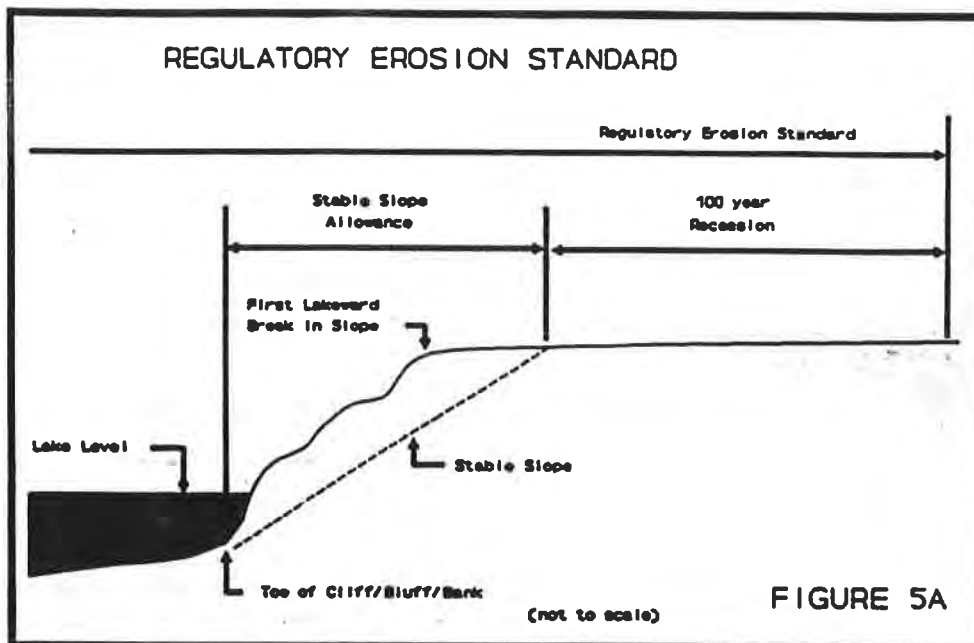
- 2.1.4 That Conservation Authorities in Ontario, or where no Conservation Authority exists the Ministry of Natural Resources, and municipalities and planning boards may permit or require the undertaking of studies using *accepted engineering principles* to determine the *flood allowance for wave uprush and other water related hazards*. Where studies using *accepted engineering principles* are approved by the Conservation Authorities, or where no Conservation Authority exists the Ministry of Natural Resources, and the municipalities and planning boards, the *100 year flood level plus the engineered flood allowance for wave uprush and other water related hazards* shall be accepted as the *Regulatory Flood Standard* for the area studied.
- 2.1.5 That along the *connecting channels*, Conservation Authorities in Ontario, or where no Conservation Authorities exists the Ministry of Natural Resources, and municipalities and planning boards may permit or require the undertaking of studies using *accepted engineering principles* to determine the critical portions of the *Regulatory Flood Standard* to convey the flow associated with the *100 year flood level*. Where studies using *accepted engineering principles* are approved by the Conservation Authorities, or where no Conservation Authority exists the Ministry of Natural Resources, and the municipalities and planning boards, the engineered limit of the critical portions of the flow associated with the *100 year flood level* shall be accepted for the area studied.

2.2 Regulatory Erosion Standard

It is the policy of the Province of Ontario that:

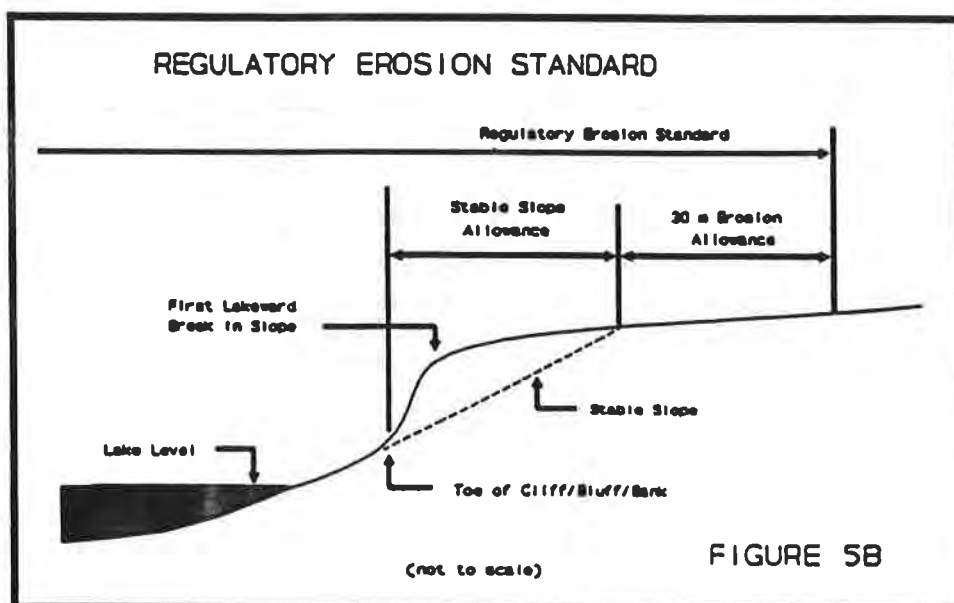
2.2.1 The *erosion* standard used to define the *erosion* limit on the Great Lakes - St. Lawrence River system, including the *connecting channels*, is the *greater* of:

- (a) (i) The sum of the *stable slope* allowance *plus* 100 times the *average annual recession rate* measured *landward* from the toe of the cliff/bluff/bank (Figure 5A);



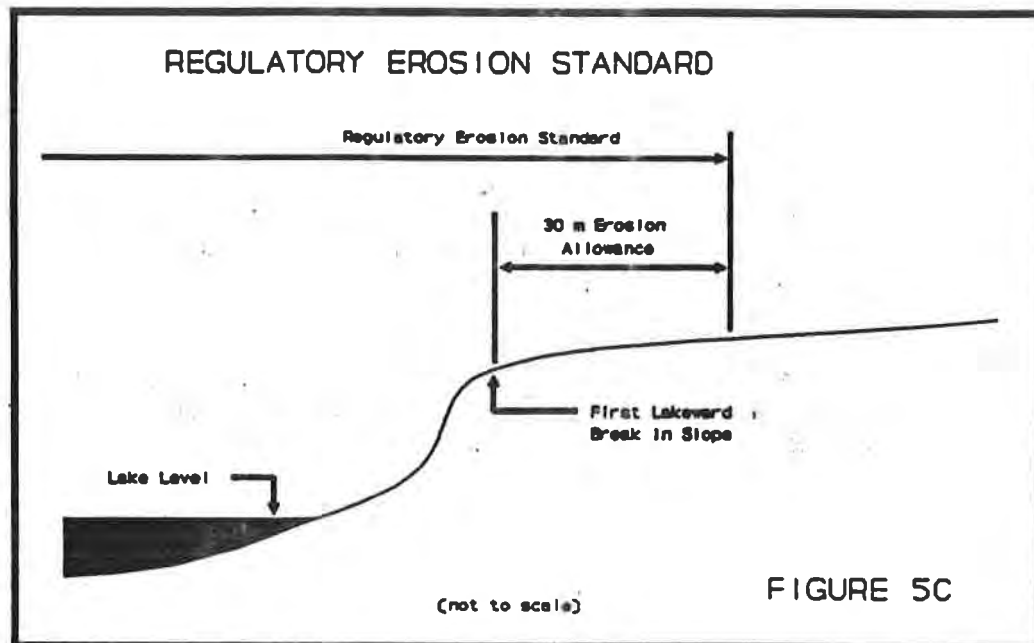
OR

- (ii) The sum of the *stable slope* allowance *plus* a 30 metre *erosion allowance* measured *landward* from the toe of the cliff/bluff/bank in the absence of *average annual recession rates* (Figure 5B);

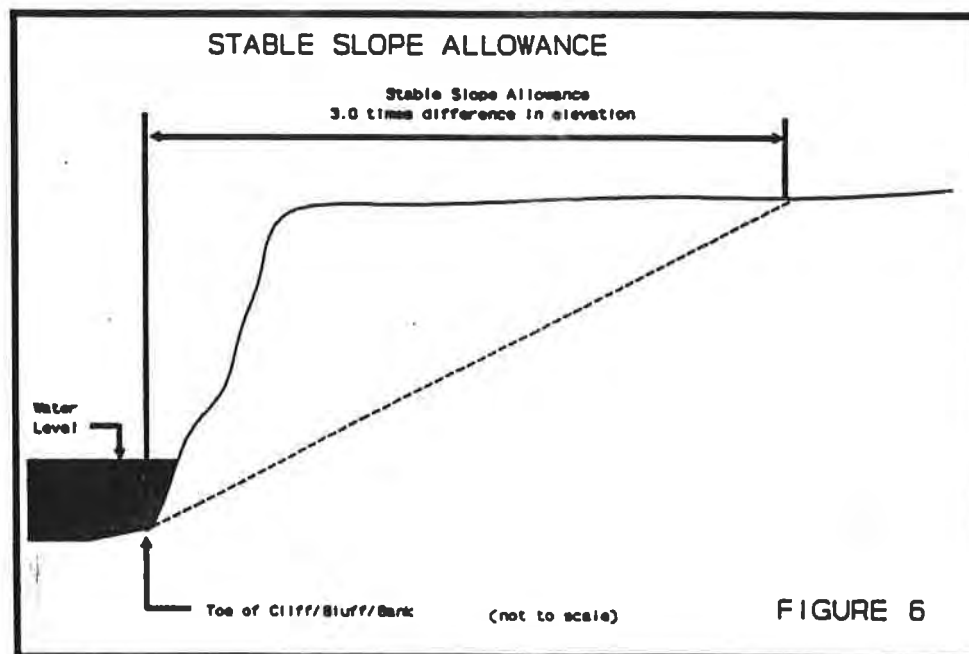


OR

- (b) 30 metre *erosion allowance* measured *landward* from the top of the cliff/bluff/bank or the first *lakeward* break in slope (Figure 5C);



- 2.2.2 In the absence of studies using *accepted geotechnical principles*, the allowance to achieve *stable slope* shall be defined as a horizontal setback measured *landward* from the toe of the cliff/bluff/bank equivalent to 3.0 times the difference in elevation between the first *lakeward* break in slope and the toe of the cliff/bluff/bank whether above or below the water level (Figure 6).

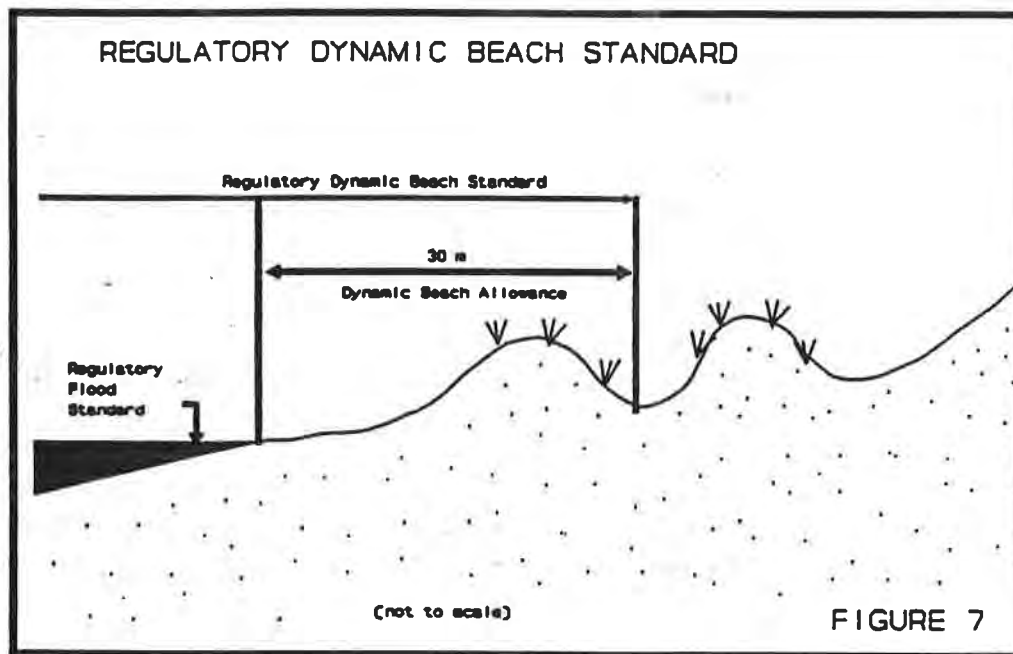


- 2.2.3 That Conservation Authorities in Ontario, or where no Conservation Authority exists the Ministry of Natural Resources, and municipalities and planning boards may permit or require the undertaking of studies using *accepted geotechnical principles* to determine the *stable slope allowance*. Where studies using *accepted geotechnical principles* are approved by the Conservation Authorities, or where no Conservation Authority exists the Ministry of Natural Resources, and the municipalities and planning boards, the *geotechnical stable slope allowance* shall be accepted for the area studied.
- 2.2.4 That on bedrock shorelines, along *connecting channels* and along the Lake St. Clair shoreline, Conservation Authorities of Ontario, or where no Conservation Authority exists the Ministry of Natural Resources, and municipalities and planning boards may permit or require the undertaking of studies using *accepted scientific and engineering principles* to determine the *erosion allowance*. Where studies using *accepted scientific and engineering principles* are approved by the Conservation Authorities, or where no Conservation Authority exists the Ministry of Natural Resources, and the municipalities and planning boards, the *scientific/engineered erosion allowance* shall be accepted for the area studied.

2.3 Regulatory Dynamic Beach Standard

It is the policy of the Province of Ontario that:

- 2.3.1 The *dynamic beach* standard used to define the *dynamic beach* limit is the *landward* limit of the *Regulatory Flood Standard* plus a 30 metre *dynamic beach allowance* (Figure 7).



- 2.3.2 That Conservation Authorities of Ontario, or where no Conservation Authority exists the Ministry of Natural Resources, and municipalities and planning boards may permit or require the undertaking of studies using *accepted scientific and engineering principles* to determine the *dynamic beach* limit. Where studies using *accepted scientific and engineering principles* are approved by the Conservation Authorities, or where no Conservation Authority exists the Ministry of Natural Resources, and the municipalities and planning boards, the *scientific/engineered dynamic beach* limit shall be accepted for the area studied.

2.4 Floodproofing Standard

It is the policy of the Province of Ontario that:

- 2.4.1 New development that may be permitted within the *Regulatory Shoreline*;
- (a) on lakes Superior, Huron, St. Clair, Erie or Ontario, is to be protected from *flooding*, as a minimum, to an elevation equal to the sum of the *100 year monthly mean lake level* plus the *100 year wind setup* plus a *flood allowance* for wave uprush and other water related hazards.
 - (b) along the *connecting channels*, is to be protected from *flooding*, as a minimum, to the *Regulatory Flood Standard*.

2.5 **Protection Works Standard**

It is the policy of the Province of Ontario that:

- 2.5.1 New development that may be permitted within the *Regulatory Shoreline* will be protected by *protection works* that appropriately addresses the *flood, erosion and/or other water related hazards* plus an allowance for *stable slope* plus a 30 metre *flood/erosion allowance*.
- 2.5.2 That Conservation Authorities of Ontario, or where no Conservation Authority exists, the Ministry of Natural Resources, and municipalities and planning boards may permit or require the undertaking of studies using *accepted scientific and engineering principles* to determine the *flood/erosion allowance*. Where studies using *accepted scientific and engineering principles* are approved by the Conservation Authorities, or where no Conservation Authority exists the Ministry of Natural Resources, and the municipalities and planning boards, the *stable slope allowance* plus the *scientific/engineered flood/erosion allowance* shall be accepted for the area studied.
- 2.5.3 Design and installation of *protection works* must be undertaken in an *environmentally sound manner* and be such that access to the *protection works* by heavy machinery for regular maintenance purposes and/or to repair the *protection works* should failure occur is not prevented.

2.6 **Access (Ingress/Egress) Standard**

It is the policy of the Province of Ontario that:

- 2.6.1 *Access (Ingress/egress)* for new development that may be permitted within the *Regulatory Shoreline* be such that the movement of vehicles and people is not prevented during times of *flooding, erosion and other water related hazards*.

IMPLEMENTATION

For the purpose of implementation of this policy statement:

In exercising any authority that affects any planning matter, the council of every municipality, every local board, every Minister of the Crown and every ministry, board, commission or agency of the government, including the Ontario Municipal Board and Ontario Hydro, shall have regard to this policy statement as required under section 3 of the Planning Act, 1990.

The Ministry of Natural Resources and the Ministry of Municipal Affairs will develop guidelines for the implementation of this policy statement, including the administration of the Planning Act, 1990, as it relates to shorelines.

The Ministry of Natural Resources will develop technical guidelines for the calculation and mapping of *flood, erosion and dynamic beach hazard* limits for shorelines.

The Ministry of Natural Resources, in co-operation with other appropriate agencies, may identify for information purposes, a range of acceptable types of *floodproofing* and acceptable forms of *protection works* and their application to different types of land use and local shoreline characteristics.

The Conservation Authorities, or the Ministry of Natural Resources where Conservation Authorities do not exist, are responsible for plan input and review related to shorelines and in this regard will:

make available any existing mapping, *flood* and *erosion* data or studies and provide technical assistance to any government body or planning authority, in particular municipalities and planning boards, and assist municipalities and planning boards, to incorporate the intent of this policy statement for the management of shorelines susceptible to *flood, erosion, dynamic beaches* and/or *other water related hazards* into the land use planning process and appropriate planning documents;

provide comments to review and approval agencies on proposed planning actions that may have implications for the management of shorelines susceptible to *flood, erosion, dynamic beaches* and/or *other water related hazards*;

make representation or provide technical expertise to the Ontario Municipal Board or other appeal bodies, where a matter related to this policy statement may be an issue;

consult with ministries, public agencies, boards, authorities and municipalities on matters pertaining to the management of shorelines susceptible to *flood, erosion, dynamic beaches* and/or *other water related hazards* as may be appropriate; and

inform and educate the general public on the principles and practices of shoreline management and provide information on the characteristics and consequences of *flood, erosion, dynamic beaches* and/or *other water related hazards* in shorelines.

— D R A F T —

The Conservation Authorities or the Ministry of Natural Resources, where Conservation Authorities do not exist, will refer to the applicable Shoreline Management Plan(s) and mapping approved under the Canada/Ontario Flood Damage Reduction Program for assistance and direction related to the implementation of this policy statement.

The Conservation Authorities will administer the provisions of the Conservation Authorities Act, R.S.O. 1990, and Fill, Construction and Alteration to Waterways Regulations passed pursuant to Section 28(1) of the Act, or successors thereto, to assist in the implementation of this policy statement.

The Ministry of Natural Resources will administer the provisions of the Lakes and Rivers Improvement Act, R.S.O., 1990, the Public Lands Act, R.S.O., 1990, and the Federal Fisheries Act, or successors thereto, to assist in the implementation of this policy statement.

The Ministry of Natural Resources, in conjunction with Environment Canada will continue to administer the Canada-Ontario Flood Damage Reduction Program through the Conservation Authorities and the municipalities. This includes the pursuance of *flood and erosion hazard* mapping and studies, and the preparation of information maps geared to the general public depicting flood and erosion susceptible shorelines.

The Ministry of Municipal Affairs and municipalities with delegated approval from the Minister will ensure that all municipal planning documents to be reviewed or approved, have had regard to this policy statement.

When an existing official plan or zoning by-law/order comes up for review, regard will be had for this policy statement.

Municipalities, with input from Conservation Authorities, or the Ministry of Natural Resources where Conservation Authorities do not exist, will put in place planning controls necessary to implement shoreline management provisions in official plans (such as zoning, site plan control).

The Ministry of Natural Resources and the Ministry of Municipal Affairs will undertake periodic

DEFINITIONS

For the purpose of this policy statement:

Accepted Engineering Principles refers to those principles, methods and procedures which are used and applied in current coastal and hydraulic engineering practice and have been reviewed and approved by the local Conservation Authority and/or the Ministry of Natural Resources.

Accepted Geotechnical Principles refers to those principles, methods and procedures involving slope stability analysis which are used and applied in current geotechnical practice and have been reviewed and approved by the local Conservation Authority and/or the Ministry of Natural Resources.

Accepted Scientific Principles refers to those principles, methods and procedures which are used and applied in disciplines such as geology, geomorphology, botany and zoology and applied to the study of coastal processes, vegetation, wildlife and aquatic habitat and have been reviewed and approved by the local Conservation Authority and/or the Ministry of Natural Resources.

Access (Ingress/Egress) refers to the standards and procedures currently applied in engineering practice associated with providing safe passage for vehicles and people to and from a shoreline property during an emergency situation as a result of flooding, other water related hazards, the failure of floodproofing and/or protection works, and/or erosion that have been reviewed and approved by the Conservation Authority and/or the Ministry of Natural Resources.

Address refers to those standards and procedures intended to alleviate or reduce the impacts associated with flooding, erosion and other water related hazards which are used and applied in current coastal and hydraulic engineering, geotechnical and scientific practices and have been reviewed and approved by the local Conservation Authority and/or the Ministry of Natural Resources.

Average Annual Recession Rate refers to the average annual linear landward retreat of shoreline.

Bank refers to those sections of shoreline formed in bedrock, sand or cohesive sediments where the land rises steeply away from the water such that the elevation of the top of the slope above the base (toe) of the slope is less than 2 metres and the average slope angle exceeds 1:2 (30 degrees).

Bluff refers to those sections of shoreline formed in sand or cohesive sediments where the land rises steeply away from the water such that the elevation of the top of the slope above the base (toe) of the slope is greater than 2 metres and the average slope angle exceeds 1:2 (30 degrees).

Cliff refers to those sections of bedrock shorelines where the land rises steeply away from the water such that the elevation of the top of the slope above the base (toe) of the slope is greater than 2 metres and the average slope angle exceeds 1:2 (30 degrees).

Connecting Channels refers to the rivers (St. Mary's, St. Clair, Detroit, and Niagara Rivers) which convey water flows between Lakes Superior, Huron, St. Clair, Erie and Ontario. This also includes the St. Lawrence River.

— D R A F T —

Critical portion of the flow associated with the 100 year flood level refers to that portion of the connecting channels within the limits of the 100 year flood level which are hydraulically essential to the conveyance of the significant flood flows and where physical intrusions of any size, shape or configuration will create new flood hazards, aggravate existing flood hazards, cause updrift/downdrift impacts, and/or cause environmental impacts.

Development means the construction, erection or placing of a building or structure of any kind or the making of an addition or alteration to a building or structure that has the effect of increasing the size or usability thereof, and includes such related activities as site grading and the placing or dumping of fill.

Dynamic Beach Allowance refers to a defined portion of shoreline intended to address the uncertainties inherent in the determination of recession rates on beach environments, arising from spatial and temporal variability, and/or to address the dynamic range within the zone of unconsolidated sediment that is acted upon by waves and wind.

Dynamic Beach refers to the zone of accumulated unconsolidated sediment that is acted upon by waves and wind action.

Environmentally Sound Manner refers to those principles, methods and procedures involved in addressing the protection, management and enhancement of the shoreline ecosystem which are used in disciplines such as geology, geomorphology, botany and zoology and applied in the study of coastal processes, vegetation, wildlife and aquatic habitat resource management and have been reviewed and approved by the local Conservation Authority and/or the Ministry of Natural Resources.

Erosion means a volumetric reduction of shoreline by natural processes.

Erosion Allowance refers to a defined portion of shoreline intended to address the uncertainties inherent in the determination of recession rates and/or erosion, arising from spatial and temporal variability, and/or a margin of safety related to the potential failure of protection works, and/or to allow for safe ingress and egress during emergencies.

Fill, Construction and Alteration to Waterways Regulation means a regulation passed pursuant to section 28(1) of the Conservation Authorities Act, R.S.O. 1990, or its successors, whereby a Conservation Authority may, among other matters, regulate:

- the straightening, changing, diverting or interfering in any way with the existing channel of a river, creek, stream or watercourse;

- the construction of any building or structure in or on a pond or swamp or in any area susceptible to flooding; and

- the placing or dumping of fill of any kind in any defined part of the area over which the Conservation Authority has jurisdiction in which, in the opinion of the Conservation Authority, the control of flooding or pollution or the conservation of land may be affected.

Flood means a rise in the water level resulting in the inundation of areas adjacent to a lake or connecting channel not ordinarily covered by water.

Flood Allowance refers to a defined portion of shoreline intended to address the uncertainties inherent in determining flood and other water related hazards, arising from spatial and temporal variability, and/or a margin of safety related to the potential failure of protection works, and/or to allow for safe ingress and egress during emergencies.

Floodproofing means a combination of structural changes and/or adjustments incorporated into the basic design and/or construction or alteration of individual buildings, structures or properties subject to flooding so as to reduce or eliminate flood damages.

Great Lakes-St. Lawrence River System refers to the major water system consisting of Lakes Superior, Huron, St. Clair, Erie and Ontario and their connecting channels, and the St. Lawrence River within the boundaries of the Province of Ontario.

Hazards refers to the naturally occurring phenomena and processes associated with flooding, erosion and dynamic beaches.

Hazardous Substances means substances which individually, or in combination with other substances, are normally considered to pose a danger to public health, safety and the environment. These substances generally include a wide range of materials that are toxic, ignitable, corrosive, reactive, radioactive or pathological.

Lake level refers to the elevation of the surface of a lake or connecting channel.

Lakeward refers to a perspective from the land towards the lake or river.

Landward refers to a perspective from the lake or river toward the land.

Littoral Cell refers to a self-contained coastal sediment system that has no movement of sediment across its boundaries. The alongshore limits are defined by natural formations or artificial barriers where the net sediment movement changes direction or becomes zero.

Local Conditions refers to the geophysical, hydrophysical, environmental, economic and social characteristics of reaches which may affect shoreline management.

Major Adverse Environmental Impact refers to those physical, biological and environmental changes which are of long-term duration, where the rate of recovery is low, where there is a high potential for direct and/or indirect effects and/or where the area is considered to be critical habitat or of critical significance to the protection, management and enhancement of the shoreline ecosystem.

100 Year Flood Level means the peak stillwater level due to the combined occurrences of mean monthly lake levels and wind setup that is equalled or exceeded in 1% of all years. In connecting channels and the St. Lawrence River the 100 year flood level is the peak instantaneous stillwater level that is equalled or exceeded in 1% of all years.

100 Year Monthly Mean Lake Level is defined as the monthly mean lake level having a total probability of being equalled or exceeded during any year of 1%. Monthly mean level refers to the average water level occurring during a month computed from the hourly readings in each month.

— DRAFT —

100 Year Wind Setup is defined as the wind setup having a total probability of being equalled or exceeded during any year of 1%. Wind setup refers to the vertical rise above the normal static water level on the leeward side of a body of water caused by wind stresses on the surface of the water.

Other Water Related Hazards refers to water associated phenomena acting on shorelines other than flooding and wave uprush. This includes, but is not limited to, wave spray, ponding due to wave overtopping, ice accumulation, and ice forces.

Protection Works refers to non-structural/structural works which are intended to appropriately address damages caused by flooding, erosion and/or other water related hazards.

Beach refers to a stretch of shoreline having similar physiography, geologic composition, average annual recession rate, flooding characteristics and orientation or aspect to waves.

Regulatory Dynamic Beach Standard means the approved standard(s) used to define shoreline dynamic beach limits for regulatory purposes.

Regulatory Erosion Standard means the approved standard(s) used to define shoreline erosion limits, based on recession rates and erosion forces, for regulatory purposes.

Regulatory Flood Standard means the approved standard(s) used to define shoreline flood limits for regulatory purposes.

Regulatory Shoreline refers to the land, including that covered by water, between the international boundary, where applicable, and the furthest landward limit of the Regulatory Flood Standard, the Regulatory Erosion Standard and the Regulatory Dynamic Beach Standard.

Shoreline Sediment Compartment refers to a coastal sediment system which encompasses two littoral cells supplying depositional material to a common sink zone.

Stable Slope refers to the angle a slope would achieve when toe erosion is absent.

Wave Uprush means the rush of water up onto the beach, bluff or structure following the breaking of a wave; the limit of uprush is the point of farthest uprush.

Appendix C
PUBLIC REVIEW DATA

**Ausable Bayfield Conservation Authority
Shoreline Management Plan**

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ITEMS INCLUDED IN APPENDIX C - PUBLIC REVIEW DATA

- chronology of events for the SMP project
- sample comment sheet distributed with the initial SMP draft
- Lakeshore Bulletin (#1) dated May, 1992
- Lakeshore Bulletin (#2) dated February, 1993
- Lakeshore Bulletin (#3) dated May, 1993
- Notice of SMP Cottage Assoc. Meeting, May 21, 1993



Table 1

Technica

1992 continued

Apr 6/92	staff attendance at Hay council mtg Re: update council
Apr 22, 24/92	SMP Steering Comm Mtg #9
May 8/92	SMP Steering Comm Mtg #10
May/92	Lakeshore Bulletin #1 is sent out (3,000 residences)
June/92	1st draft of the SMP submitted to MP/MPP's for review
June 11/92	Media Tour of Shoreline - 3 papers attended
June 15/92	1st DRAFT OF THE SMP IS RELEASED FOR PUBLIC REVIEW
Jun 16, 18/92	SMP Steering Comm Mtg #11
June 20/92	Open House (Bayfield) to discuss Draft 1 (attendance = 30)
July 4/92	Open House (Port Franks) to discuss Draft 1 (attendance = 91)
July 11/92	Open House (Bayfield) to discuss Draft 1 (attendance = 64)
Aug 8/92	Open House (Zurich) to discuss Draft 1 (attendance = 200)
Aug 18/92	Meeting at of L.Huron Pres. Assoc (LHPA) reps and ABCA staff
Aug 22/92	Open House (Grand Bend) to discuss Draft 1 (attendance = 125)
Sept 15/92	DEADLINE FOR PUBLIC COMMENTS ON DRAFT 1
Sept 24/92	LHPA Delegation (=76) attended ABCA Board of Directors Mtg
Oct 9/92	SMP Steering Comm Mtg #12
Oct 28/92	ABCA sends letters of response to over 300 landowners
Nov 19, 20/92	SMP Steering Comm Mtg #13
Dec 11/92	SMP Steering Comm Mtg #14

1993

Jan 27, 29/93	SMP Steering Comm Mtg #15
Feb/93	Lakeshore Bulletin #2 is sent out (3,000 residences)
Feb 24, 26/93	SMP Steering Comm Mtg #16 (attended by a LHPA representative)
Mar 24, 26/93	SMP Steering Comm Mtg #17
Apr 28, 30/93	SMP Steering Comm Mtg #18
May 21/93	SECOND DRAFT OF THE SMP IS RELEASED FOR PUBLIC REVIEW
May 21/93	Shoreline Cottagers Assoc. Info Meeting (attendance = 60)
May 26, 28/93	SMP Steering Comm Mtg #19
May/93	Lakeshore Bulletin #3 is sent out (3,000 residences)
Jun 23/93	SMP Steering Comm Mtg #20 - 2 landowners made presentations to the comm
June/93	2nd Draft of the SMP submitted to MP/MPP's for review
June 25/93	Public Meeting (Varna) to discuss Draft 2 (atten=84)
June 26/93	Public Meeting (Thedford) to discuss Draft 2 (atten=33)
July 23/93	LHPA Reps meet with ABCA staff RE: communication
Aug 19/93	Joint municipal council meet with ABCA staff
Aug 25, 27/93	SMP Steering Comm Mtg #21
Sept 1/93	DEADLINE FOR PUBLIC COMMENTS ON DRAFT 2
Sept 16/93	Joint municipal council meet with ABCA staff
Sept 17, 22/93	SMP Steering Comm Mtg #22

NOTE: Indented dates indicate SMP Steering Committee Meetings (Project and Technical Committees)

1993 continued

Oct 27, 29/93	SMP Steering Comm Mtg #23
Nov 10/93	ABCA meets with Aurora MNR (&MMA) staff regarding responses
Nov 19/93	ABCA responds to comments submitted (approx 30)
Nov 22/93	staff attendance at Hay council mtg Re: update council & OP discussions
Nov 24, 26/93	SMP Steering Comm Mtg #24
Nov 29/93	Bosanquet Twp hosts dune stakeholder's meeting (Pinery P.P., Kettle Pt., Ipperwash Be., & Military Camp)
Dec 7/93	staff attendance at Grand Bend Re: update council & OP discussions

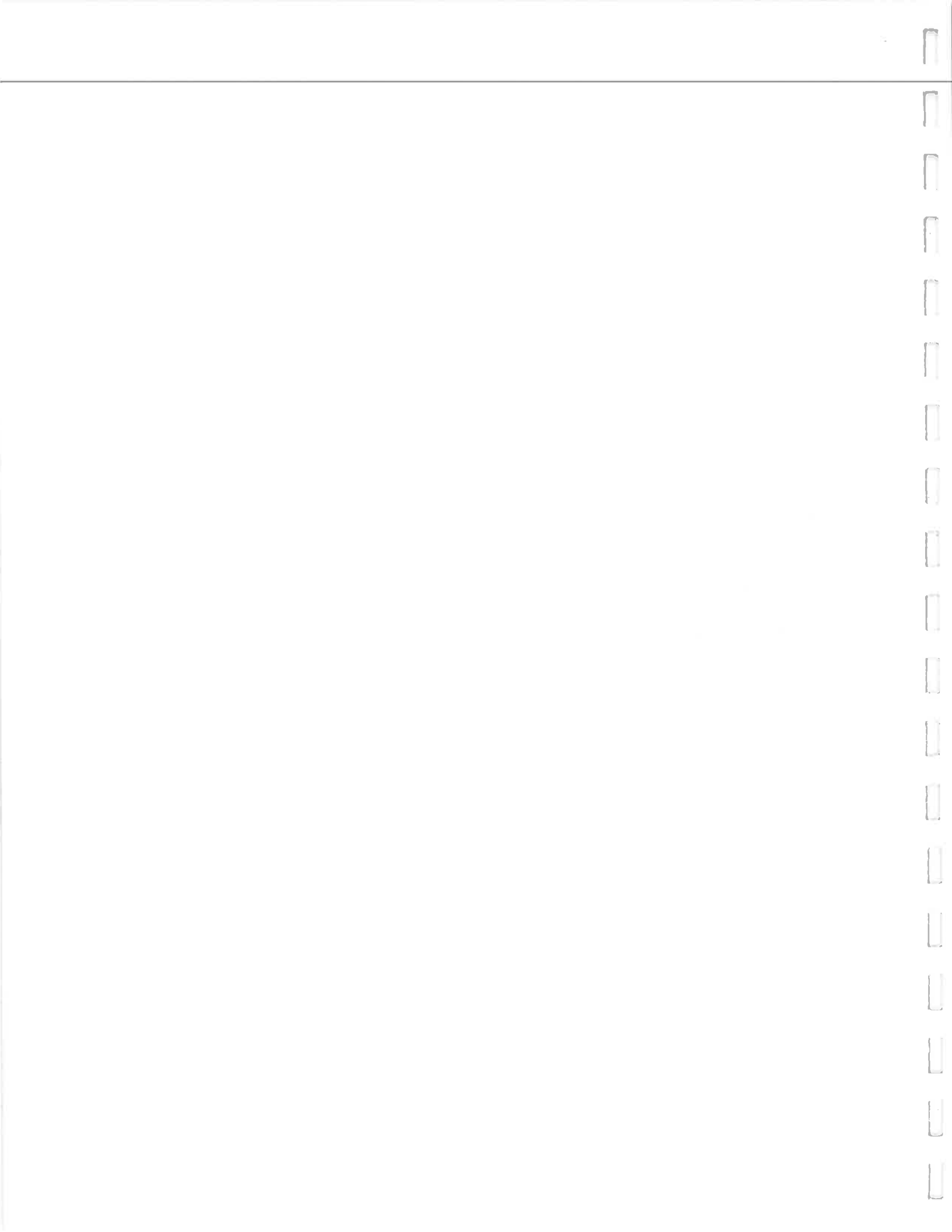
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Jan 17/94	staff attendance at Goderich Twp Re: update council
Jan 19/94	SMP Steering Comm Mtg #25 (wrap-up mtg)
Feb 17/94	ABCA Board of Directors discusses SMP report
April 21/94	ABCA Board of Directors approves SMP report

TOTALS

Public Meetings/ Open Houses	= 10
attendance	= 1,187
SMP Committee Meetings	= 25
Lakeshore Bulletin Mailings	= 3 issues (over 3,000 sent per issue)
Letters of Response to Landowners	= 330

NOTE: Indented dates indicate SMP Steering Committee Meetings (Project and Technical Committees)



COMMENT SHEET

Shoreline Management Plan (Draft)

We want your comments

Open House date I attended:

☐ June 20, 1992

☐ July 11, 1992

☐ August 22, 1992

☐ July 4, 1992

☐ August 8, 1992

Name _____

Phone _____

Address _____

Property Description _____

Cottage Association _____

Did you receive a copy of the Lakeshore Bulletin by mail?

☐ Yes ☐ No

Would your cottage association like
more information on this topic?

☐ Yes ☐ No

After reviewing the Shoreline Management Plan and material, what are your
comments?

Deadline for comments on the Draft Shoreline Management Plan is Sept. 15/92.
Ausable-Bayfield Conservation Authority • R.R. #3, Exeter, N0M 1S5

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lakeshore bulletin

A NEWSLETTER FOR LAKE HURON SHORELINE LANDOWNERS

Ausable-Bayfield Conservation Authority • R. R. 3, Exeter, On N0M 1S5 • 519-235-2610
May, 1992

SHORELINE MANAGEMENT PLAN

AN UPDATE TO LAKESHORE LANDOWNERS

The Ausable Bayfield Conservation Authority (ABCA) has been active in Lake Huron shoreline management since February, 1988 when we were given the mandate as the lead implementing agency for commenting on flooding and erosion of the shoreline. Over the last four years, we have been involved in studies leading up to the creation of a Shoreline Management Plan (SMP). It is this "Plan" which we now wish to discuss with you and solicit your comments. A first draft has been completed by the project Steering Committee and public input is now being requested. The Steering Committee is composed of representatives from the major user groups including cottage associations, municipalities, Pinery Provincial Park and other lakeshore agencies.

INSIDE THIS BULLETIN...

Answers to commonly asked shoreline questions:

What is shoreline management and why do we need it?

Why is the lakeshore eroding in some areas while forming beaches in others?

How do the terms "prevention" and "protection" relate to the Shoreline Management Plan (SMP)?

Where does my property fit into this discussion of hazards?

How do I find out more about this SMP?

When will this SMP be completed and how will it be used?

SCHEDULE OF OPEN HOUSES Each Open House is scheduled for 10 a.m. to 2 p.m.

<u>Date</u>	<u>Municipalities</u>	<u>Location</u>
June 20	Bayfield & Goderich Twp.	Bayfield Community Centre Upper Hall
July 4	Bosanquet Twp.	Port Franks Optimist Hall
July 11	Stanley Twp.	Bayfield Community Centre Upper Hall
August 8	Hay Twp.	Zurich Community Centre Auditorium
August 22	Grand Bend & Stephen Twp.	St. John's by the Lake Church, Grand Bend

WHAT IS SHORELINE MANAGEMENT AND WHY DO WE NEED IT?

The shoreline, or lakeshore, is a limited resource which is physically different from the rest of the rural landscape which surrounds it. Proper management of this special area is necessary to respond to the unique characteristics found there (land use conflicts with the adjacent agricultural uses and the perils of the lakeshore processes which affect lakefront properties). The shoreline, regardless if it is realized or not, is a hazardous region by nature of the extreme conditions which can, and do occur there.

This is not to say that all lakeshore areas have problems, nor is it to imply that these problems are solely the result of actions by the landowners. However a more complete understanding of the shoreline and a respect for the natural processes which occur within it, will

enable all users to better respond to the needs of the shoreline system and act accordingly.

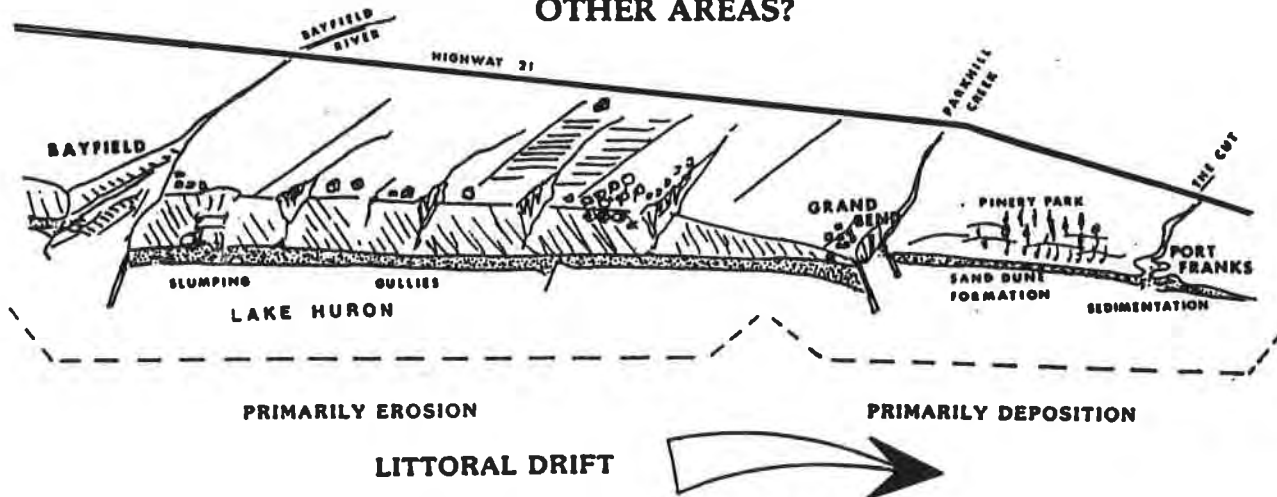
In the past, we have organized two Public Meetings which you may have attended, at the Stanley Township Community Centre in Varna (just east of Bayfield), on July 20, 1990 and July 26, 1991. Shoreline processes and management approaches were discussed as well as many of the issues which are of concern to landowners (i.e. bluff erosion, shore protection, inadequate drainage). It was clearly pointed out to us that these issues are of concern to the shoreline community and should be included in any overall shoreline management plan.

These issues, plus the overriding objective of minimizing danger to life and property damage from flooding, erosion, and

The Shoreline Management Plan is intended to provide direction to municipalities and give recommendations to landowners to minimize the threat to life and property damage.

associated lakeshore hazards are the main topics within this Shoreline Management Plan. It is intended to provide direction to municipalities and give recommendations to landowners so to minimize threat to life and property damage. The plan can also be used to increase the enjoyment and value of lakeshore property.

WHY IS THE LAKESHORE ERODING IN SOME AREAS WHILE FORMING BEACHES IN OTHER AREAS?

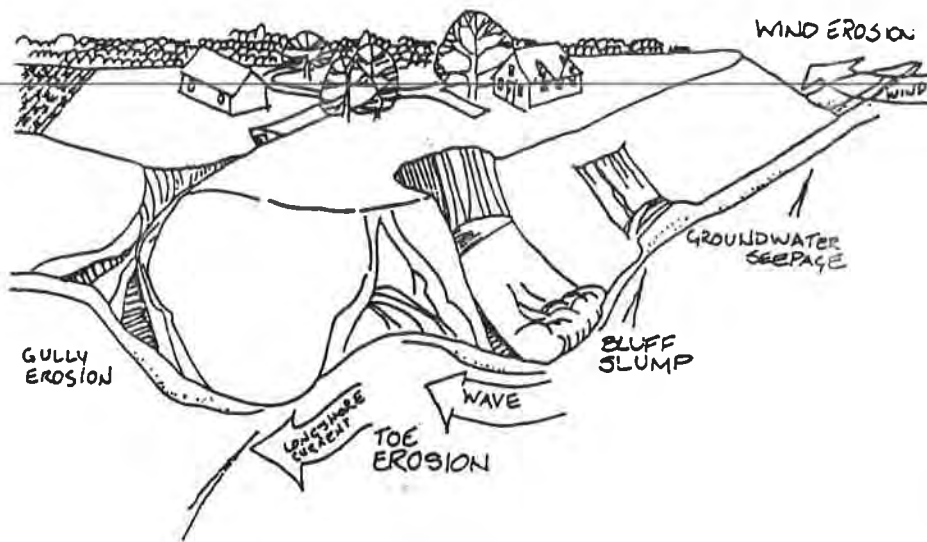


Stylized diagram of Lake Huron Shoreline: Bayfield to Port Franks

The answers to this and other questions are closely linked to the processes which are occurring. Questions such as these can be more easily understood when the shoreline is looked upon and understood as a system. This system is made up of different shoreline areas, called "reaches" which have different characteristics. Such factors as depth of water offshore, type of material

which makes up the bluff composition, the orientation of the shore with respect to prevailing winds, and the proximity to man-made shore structures, all play an important role in explaining why the shoreline reacts the way it does. The concept of sand movement along the shoreline (also called "littoral drift") is the natural process of transporting sand which is eroded from the

bluffs and is deposited along the narrow beaches below the bluffs and the beaches of Grand Bend, Pinery, and Ipperwash regions. The importance of this "process" is now becoming apparent through the research completed within the SMP. As shoreline users and managers, we must ensure that we understand this process and realize the consequences if we interfere with it.



WHERE DOES MY PROPERTY FIT INTO THIS DISCUSSION OF HAZARDS?

Detailed mapping of the shoreline has been completed for the entire ABCA jurisdiction (from Port Franks, Bosanquet Township to Lot 30, Concession 1, Goderich Township). This mapping has been compared to a detailed shore survey completed by a Ontario Land Surveyor in 1935. From this comparison, long term trends in shoreline change have been calculated and zones have been placed along the shore. These zones and the implications these zones have on existing and proposed development, are outlined in the SMP. They follow a provincial policy which has been adopted to recognize the shoreline hazards and risks.

WHEN WILL THIS SMP BE COMPLETED AND HOW WILL IT BE USED?

After we have reviewed the input expected from the landowners and other lakeshore user groups, we will finalize the document by November 15, 1992. It is anticipated that the document will then be used to make necessary amendments to municipal planning documents and used by the ABCA and other agencies in reviewing planning proposals and development applications. At some future time, the ABCA may apply to extend the Regulation which we now administer along the watercourse and gully regions, to include the lakeshore. This Regulation would include such activities as filling, construction, and any altering of the shoreline bank or sand dune area.

HOW DO THE TERMS "PREVENTION" AND "PROTECTION" RELATE TO THE SMP?

With the primary objective being to minimize threat to life and property damage, the SMP provides recommended alternatives to achieve this.

Prevention involves the proper placement of new development along the shoreline so that safety of the development and preservation of the environment will not be jeopardized.

This may involve proper building setbacks from lakebanks, siting buildings away from areas which may be subject to flooding, or locating structures to minimize dune damage. Existing development along the shoreline may also be affected in that future expansion plans may need to be "scaled down" or reconsidered if the existing site may not be appropriate, given existing concerns for the lakeshore hazards.

Protection involves various means and methods used to protect the site from the hazards. This topic is difficult to discuss in detail since each site has specific site conditions. However, enough is known about

the beneficial and adverse affects of some of the existing protection attempts to be able to recommend general principles and technical design criteria to those who wish to investigate these options.

Both structural techniques (i.e. groynes, revetments, seawalls, and offshore breakwaters) and non-structural approaches (i.e. resloping the lakebank, drainage improvements, and cottage relocation) are discussed and recommendations given.

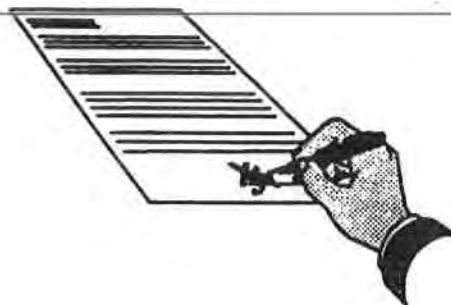
The structural protection discussion is further divided into those works intended to "stabilize" the lakeshore (being large scale and expensive structures), and those works intended to protect property from storm damage (smaller scale and cost structures). The plan suggests that our attempts to stabilize the shoreline are insignificant in most cases unless large scale works are planned.



HOW DO I FIND OUT MORE ABOUT THIS SMP?

The ABCA has scheduled "Open Houses" throughout the summer to display the draft SMP and associated mapping to obtain public input. Copies of the SMP will be available at that time for a nominal charge, on a cost recovery basis (to cover printing costs). These open houses are scheduled on a municipal basis to enable you to attend the one which applies to your cottage location.

If you are not able to attend the open house scheduled for your township, then you're welcome to visit one of the other sessions. As another option, the material and draft plan will be available to cottage associations and your municipal office, or you can always view the material at the ABCA office just east of Exeter next to the Morrison Dam.

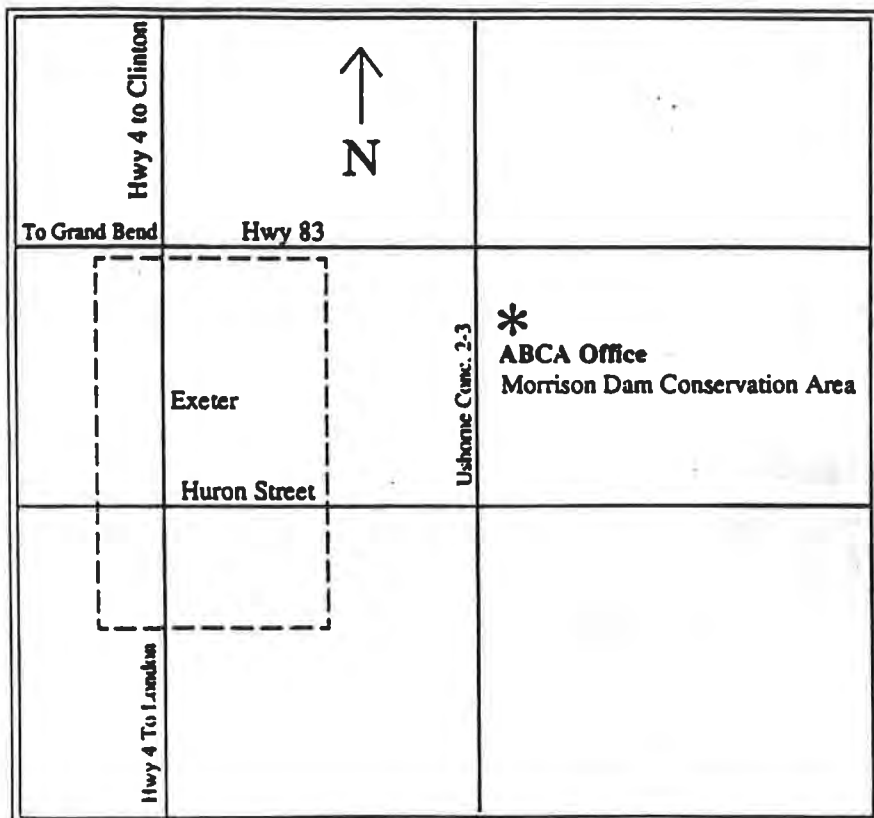


Due to the number of properties along the shoreline and the anticipated interest in this plan, we are requesting that any comments you wish to make regarding the SMP be submitted to the Authority Office in written form, by September 15, 1992. If you are the former owner of lakeshore property and are no longer a shoreline resident, please inform our office of the change that we may send the new owner this information.

Your comments and input are most important as this plan will provide the future for the shoreline and how it is utilized.

Please feel free to utilize your cottage association to provide combined comments from your lakeshore area.

Upon receipt of comments, we will respond to the comments and consider appropriate changes, as deemed necessary.



The Ausable-Bayfield Conservation Authority provides leadership and management, in cooperation with the community, to maintain and enhance the watershed resources now and in the future.



MEMBER OF THE
ASSOCIATION OF CONSERVATION
AUTHORITIES OF ONTARIO



lakeshore bulletin

February, 1993

A NEWSLETTER FOR LAKE HURON SHORELINE LANDOWNERS

Ausable-Bayfield Conservation Authority • R. R. 3, Exeter, On N0M 1S5 • 519-235-2610

SHORELINE MANAGEMENT PLAN: AN UPDATE TO LAKESHORE LANDOWNERS

Since early 1991, the Ausable-Bayfield Conservation Authority (ABCA) has been developing a plan for the management of the Lake Huron Shoreline within its area of jurisdiction with the direction of a steering committee of representatives from the shoreline's major user groups including cottage associations, municipalities, Pinery Provincial Park and other lakeshore agencies.

The main goal of the Shoreline Management Plan (SMP) is to protect lives and property from the hazards of Lake Huron flooding and erosion. The Plan also addresses environmental quality, improper drainage, water quality, lakeshore use and shoreline ownership. It will provide land use planning direction to municipalities and give recommendations to landowners.

The first draft was released on June 15, 1992 with several opportunities for public input including five "open houses" in the summer of 1992.

The SMP's steering committee is currently preparing a second draft of the Plan, based on the comments and concerns raised by the 500 people who attended 1992's open houses and the 300 written responses received by the ABCA. Completion of the second draft is anticipated by April 1, 1993.

In this newsletter, we hope to clear up some of the misinformation which has been circulating about the Plan, provide answers to some of the most commonly asked questions, and give you an indication of the future path of the Plan.



WHY A SHORELINE MANAGEMENT PLAN IS NEEDED

Historically, when cottage development first occurred, a non-restrictive land use approach was used to guide development along the shoreline. Since that time, land use restrictions have been implemented along the shoreline in some form or another.

The SMP presents the natural processes and physical conditions which exist along the shoreline in a logical fashion to enable landowners, developers, and municipalities to know 'what to expect' and 'what questions to ask' when land use changes or building expansions are considered.

The SMP is an attempt to combine all the requirements which need consideration for safe use and occupation of shoreline property in one document. These include land use restrictions related to municipal zoning bylaws, areas adjacent to watercourses, environmental guidelines related to the approval of septic systems, or requirements for a work permit for activities planned on or near the beach. Through information explained in the SMP, the lakeshore hazards are explained and management suggestions are presented.

INSIDE THIS BULLETIN...

- ▶ Plan update
- ▶ Why a Plan is needed
- ▶ Answers to commonly asked questions
- ▶ Five issues of concern
- ▶ How you can find out more

Answers to commonly asked questions

1) No, the SMP did not come into effect on January 1, 1993

As it is presently proposed, the SMP would not be completed until the end of 1993 with implementation to follow. We anticipate implementation to take some time to be incorporated into municipal documents.

2) Yes, we are encouraging the Municipal Councils to support the completed SMP.

A revised SMP will be presented to Municipal Councils after further public input, for their support. At that time, implementation would be suggested through the municipal planning documents.

3) Yes, we are proposing that a residence located in the Risk Zone would not be rebuilt at that same location if destroyed by flooding or erosion forces related to the lakeshore (not including fire).

This relates to the concern that wave and ice damage and lakebank stability along the shoreline are natural occurrences which need to be recognized. A small number of

existing residences could be subject to this criteria as the present mapping exists. Residences in the Risk Zone destroyed by fire would be allowed to rebuild.

4) No, it is not the intent of the SMP to devalue lakeshore properties and then expropriate the shoreline for a large park.

The intent of the document is to confirm the degree of risk which exists along the shoreline and provide ways to ensure wise use and future development of the area. Many of the criteria in the SMP are already in place in existing documents (i.e. 30 metre setback from top of bank in Huron County zoning bylaws) but are not fully realized by lakeshore landowners.

Residences in Risk Zone (December, 1992)	
Goderich Twp.	79
Bayfield	15
Stanley Twp	72
Hay Twp.	44
Stephen Twp.	1
Grand Bend	0
Bosanquet Twp.	3

Goderich Twp.	79
Bayfield	15
Stanley Twp	72
Hay Twp.	44
Stephen Twp.	1
Grand Bend	0
Bosanquet Twp.	3

Shoreline Management Plan Issues

These five issues have been expressed by landowners as areas of concern. In response, we provide the following.

Issue #1

The ABCA should not implement a draft Provincial Policy Statement (being the Great Lakes-St. Lawrence River Flood and Erosion Policy Statement prepared by the Ministry of Natural Resources).

The Draft Great Lakes-St. Lawrence River Flood and Erosion Policy Statement is only draft as it pertains to the adoption of the document by Provincial Cabinet. The document is an approved Ministry of Natural Resources policy. It should

also be noted that the Draft Policy Statement presents minimum standards only to defining the three lakeshore hazards of flooding, erosion, and dynamic beach. It is not intended to be used as the sole background document in the creation of a SMP.

The ABCA SMP is an ambitious endeavour to create a plan which goes beyond merely the identification of hazard areas. The SMP recognizes local concerns and issues by addressing such matters as environmental quality, improper drainage, water quality, lakeshore use and shoreline ownership while following the guidelines for the creation of SMP's which were provided by the Ministry of Natural Resources.

Many comments which we

have received suggest that the Shoreline Management Plan is not premature, rather it is long overdue.

Issue #2

The plan is not a true "management" plan which will respect the rights of individuals and which will protect the public interest and the environment. This plan simply imposes blanket restrictions on everyone without regard to their particular site specific circumstances.

The SMP is directed by a Steering Committee consisting of representatives from municipalities and cottage communities. The reason the Committee provided a draft document for public input and review was to ensure the end result was a true management plan. In 1988, the

Provincial Government decided that it is in the public interest to provide shoreline management to minimize risks to life, property damage and social disruption attributed to the associated lakeshore hazards. The SMP has been created taking into account specific local concerns and issues.

The application of a 'hazard' designation parallel to the lake which includes those lands severely affected by the hazards of flooding and erosion, is similar to the concept of a floodplain along the course of a river. Specific site information would be considered to provide flexibility in the proposed development restrictions.

Funding sources may be available on a cost-sharing bases with affected landowners where subdivision scale remedial works to protect existing development from erosion is found to be environmentally acceptable and cost beneficial.

Issue #3

There should be an independent right of appeal to the information presented in the SMP. Lakeshore residents should be given an opportunity to retain, if they wish, an independent Coastal Engineer to review the technical data and information contained in the SMP and the draft Provincial Policy. Funding to retain expert advice should be provided either by the Conservation Authority or by the MNR.

Appeal mechanisms are provided dependant upon the implementation procedure used for the SMP. Implementation can be accomplished through either the Planning Act or the Conservation Authorities Act, or a combination of both. Both methods are viable means to implement the SMP and are presently considered as options.

The overall concepts and criteria included in the SMP are those which have been developed using the expertise of many coastal experts from both academic and private consulting fields. They are not based on the opinion of one individual. As in any science, the technology is not static and evolves, and for this reason we have built in a requirement that the SMP undergo a mandatory review every 10 years to update and change any sections as required.

At the present time our office has no funding available for individual lot assessments by an independent coastal engineer. We would, however, welcome any additional coastal engineering input into the technical data of the plan for review and consideration. Any suitable detailed information provided by the landowner for a specific site (see Issue #2, previously discussed) will be implemented immediately for that site and considered for use in the general area of the site.

Issue #4

There is no mandate in the Policy Statement for the onerous definitions of 'hazard' lands contained in the SMP. Compensation should be provided to any property owner who has significant land use restrictions imposed on them as a result of implementation of this Plan (i.e. owner of a vacant lot is no longer permitted to build because of the policies of the SMP).

The first principle stated in the Policy Statement is that ... "proper shore land management requires the simultaneous recognition and addressing of flooding, erosion, and dynamic beach hazards in a manner integrated with land use planning." The term *hazard land* has long been a term used in land use planning documents to identify natural areas severely limited for new residential development.

Compensation to the landowner who has a site affected by the lakeshore hazard is not proposed because the SMP is not creating the hazard. The SMP is attempting to define the lakeshore hazards in an understandable fashion. In a small number of areas of the shoreline, the property is no longer a viable building lot due to the historic erosion forces of Lake Huron.

Issue #5

There has been no meaningful consultation with the public and there has been no fair presentation to the public of how this document will be used. Implementation of this Plan is premature and should be reconsidered.

The ABCA began discussing the concepts of shoreline processes and shoreline management with the public by holding public meetings during the summer months of 1990 and 1991. Each of these meetings was attended by approximately 200 people.

The present draft SMP document has been presented for public input and review prior to making revisions in order to create a second draft. This will be accomplished by considering the response of over 500 people who attended our Open Houses (held over the summer months) and the written comments of over 300 people.

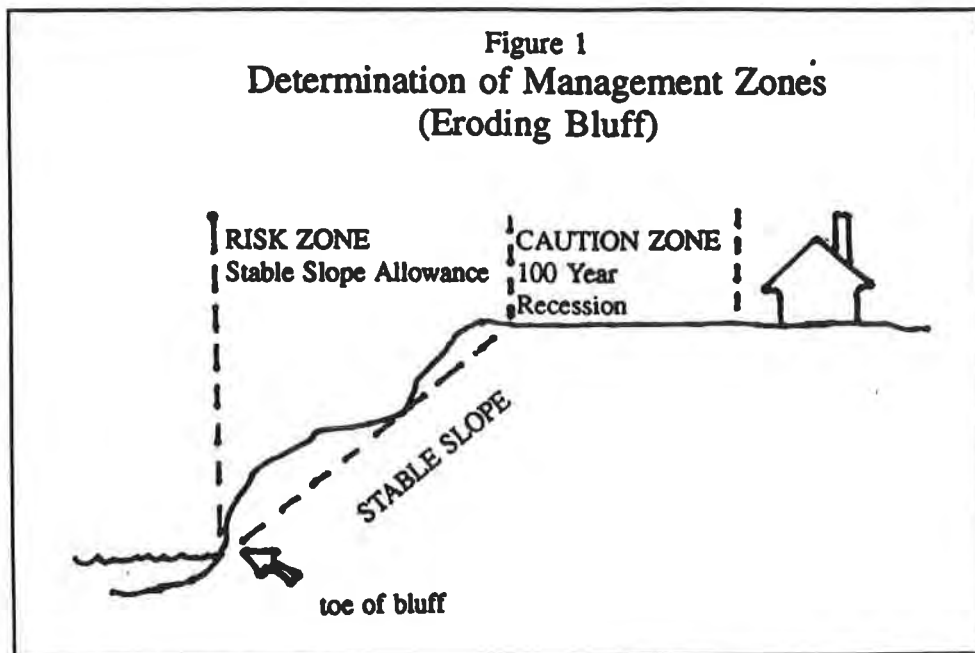
The table in Section 3.3.5 titled, Development Restrictions was presented as a summary of how the SMP proposes to apply to existing development. We anticipate major changes to this table to clarify the terminology used and to assist in interpretation of it.

Technical Facts: Risk and Caution Zones in the bluff region of the shoreline (north of the Lake Huron Water Supply Plant)

The data used to determine the risk and caution zones in the bluff region of the shoreline is shown on Figure 1.

1. The Risk Zone is determined by the calculation of a stable slope. Geotechnical investigations completed along this shoreline suggest a range in stable slopes from 22° (or 2 horizontal to 1 vertical) to 18° (or 3 horizontal to 1 vertical). Without site specific information to indicate otherwise, an 18° (3:1 slope) is used to calculate a stable slope.

2. The Caution Zone is a projection of the effects of erosion inland based on historic erosion. Rates of erosion have been calculated for the shoreline using a comparison of two data sources: a 1935 OLS survey of the shore and recent shoreline mapping completed for this SMP project.



This information provides a comparison of data spanning 53 years which is used to then project where the shoreline will be in 100 years time.

As we know that erosion can be influenced by land-side effects

(e.g. drainage and bank loading), a minimum distance of 30 metres is suggested to determine the inland boundary of the Caution Zone. New development is permitted to locate outside of both the Risk and Caution Zones.

How can you find out more about the SMP?

The Second Draft Plan and associated material will be available to cottage associations and your municipal office, or you can view the material at the ABCA office just east of Exeter at the Morrison Dam Conservation Area. To ensure that staff will be available to meet you, you are advised to phone ahead to make an appointment.

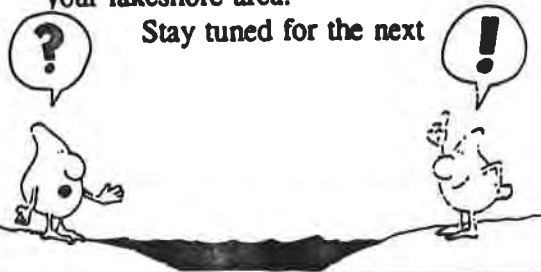
Your comments and input are most important as this plan will

provide the future for the shoreline and how it is utilized. Once the second draft is available, please feel free to use your cottage association to provide combined comments from your lakeshore area.

Stay tuned for the next

Lakeshore Bulletin with details of the second draft.

If you are the former owner of lakeshore property, please inform our office of the change so that we may send the new owner this information.





lakeshore bulletin

May, 1993

A NEWSLETTER FOR LAKE HURON SHORELINE LANDOWNERS

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Second Draft of the Shoreline Management Plan

The Steering Committees of the Shoreline Management Plan (SMP) have been actively rewriting the document to include many of the considerations which were brought to our attention during last summer's discussions. For this reason, an earlier projected due date was not feasible. The Second Draft will be ready by June 1, 1993.

The document will be distributed free of charge to all the cottage/ratepayers associations, and municipal offices. As was the case with the First Draft, copies will be sold on a cost-recovery basis (projected costs will be less than \$20.00) to individuals who wish to obtain a personal copy.

Changes to the document from the First Draft

- ▶ a more comprehensive and clearer table listing proposed lakeshore development standards
- ▶ more options to landowners on protection approaches
- ▶ stronger emphasis on the potential adverse effects of inadequate surface drainage
- ▶ a new section which more descriptively explains the different shoreline types
- ▶ an updated reach description section
- ▶ an improved document format for easier reading and cross-referencing

Public and Association Meetings

After considerable discussion concerning the format of future public meetings, the Steering Committee has decided upon a meeting style versus an open house style. At the present time, we anticipate two meetings, one at Varna and the second at Thedford, to provide a forum for discussion of the second draft of the Plan. Meeting details are on page 4 of this bulletin. As well, they will be advertised through the local media and notices will be sent to your cottage/ratepayers association.

In addition, we hope to add to the list of associations who allowed us to attend association meetings last summer to provide information and answer questions. This is often the best way to specifically deal with local issues and suggest solutions.

In an effort to improve communication, we have established a short list of contact people who are official or informal representatives of the various regions of the shoreline. They are listed on pages 2 and 3 of this bulletin for your information and confirmation.

However, if your group is not included in this listing, please have your contact person notify our office. Individual residences or farms not associated with a cottage area should note the municipal representative on the Steering Committee who is their liason contact. Municipal involvement will be encouraged at all meetings.

INSIDE THIS BULLETIN...

- ▶ Summary of Changes to 1st Draft
- ▶▶ 1993 Meeting Schedule
- ▶▶▶ Cottage/Ratepayer Association Contacts
- ▶▶▶▶ Technical Facts: The Sand Dune Region

Cottage/Ratepayer Association Contacts

ARMSTRONG EAST COTTAGE ASSOC
BAYFIELD RATEPAYERS ASSOC
BAYFIELD HIGHLANDS ASSOC
BAYVIEW COTTAGE ASSOC
BEACH O PINES ASSOC
BEDARD COURT
BIRCHCLIFF
BLUEHAVEN COTTAGE OWNERS ASSOC
BURLEY ROAD RESIDENTS ASSOC
CAMP CANBAY
CEDARBANKS COTTAGE ASSOC
CEDARCREST (SUNSET LANE)
COVENTRY HEIGHTS ASSOC
CREST BEACH COTTAGE OWNERS
CRYSTAL SPRINGS BEACH
DENODARD ASSOC
DENOMME NORTH (SHANGRI-LA)
DRIFTWOOD TRAILER PARK
DRYSDALE SUBDIVISION
DRYSDALE BEACH
DUCHARME BEACH
DURAND-HURONVIEW BEACH ASSOC
ELLIOT'S GROVE
EGERTON BEACH ASSOC INC.
ELMSLIE DRIVE COTTAGE ASSOC
ELMWOOD ESTATES
GLEN HURON CAMP
GLITTER BAY
GRAND BEND RESIDENTS ASSOC
GREEN ACRES PROPERTY OWNERS
GREYSTONE BEACH ASSOC
HARVEY DENOMME LANE ASSOC
HIGHLANDS I COTTAGE ASSOC
HIGHLANDS II COTTAGE ASSOC
HIGHLANDS III
HOMESTEAD HEIGHTS
HOUSTON HEIGHTS SOUTH
HOUSTON HEIGHTS NORTH
HURON CHURCH CAMP
JOWATT'S GROVE NORTH
KINGSMERE SYNDICATE
LA VRANGUE COTTAGE ASSOC
LAKE HURON PRESERVATION ASSOC
LAKEWOOD GARDENS COTTAGE ASSOC
LAKEWOOD BEACH
LANE O' PINES

C/O GLYNN LEYSHEN
C/O ANN TILLMAN
C/O MRS. MARTY DALTON
C/O W. R. MICHAEL
C/O ADRIANNE JONCKHEERE, PRES
C/O PERRY WHITE
C/O RALPH SMITH
C/O DOROTHY HAY/JOHN DENOMME
C/O MR. REFFEL

C/O BILL BUSTON
C/O TONY OLIVE
C/O TOM DEVEREAUX
C/O EDWIN COVE
C/O RANDY LYTTLE
C/O JOE DZIUDA
C/O ROLF SCHLICHTING
C/O DIETER BOECK
C/O BRUCE HEIGHWAY
C/O FRED M. CROKE
C/O HENRY PEROLA
C/O CEC SOUTHWARD
C/O BILL FALCONER
C/O DR. DERICK BOUGHNER
C/O ROBERT HONEYCOMBE, PRES
C/O STEVE ZARANIK

C/O BEV EARLY
C/O JOHN NEWBERRY, PRESIDENT
C/O MARJORIE MILLSON
C/O ART GOLDING
C/O BERNIE DENOMME
C/O CHUCK DOYLE OR ALLAN RALPH
C/O NORMA O'BRIEN
C/O JERRY WEBB
C/O FRED NUGENT
C/O DOUG BANKS
C/O BOB CAMPBELL

C/O JEAN/GRAEME CAMERON
C/O D. S. RUDD
C/O FRANK KUNC/MR. SOPER
C/O DOUG BANKS
C/O DON MINZEN
C/O DON BRAZIER
C/O MRS. JOYCE KANE

LAPORTE BEACH

LIGHTHOUSE COVE TRAILER PARK
MAPLE GROVE SYNDICATE LTD.
MELENA HEIGHTS
NORMAN HEIGHTS BEACH ASSOC
OAKWOOD PARK ASSOC
PARADISE VISTA COTTAGERS ASSOC
PAUL BUNYAN CAMPGROUND
POPE'S BEACH ASSOC
POPLAR BEACH ASSOC
PT FRANKS BEACH & HOMEOWNERS ASSOC
RICHMOND PARK ASSOC
RIDGEWAY COTTAGERS ASSOC
ROCKY POINT
SCHADEVIEW ASSOC
SNOWDEN ACRES SOUTH
SNOWDEN ACRES NORTH
SOUTHCOTT PINES PARK ASSOC
ST. JOSEPH
ST JOSEPH SHORES
STANLEY TOWNSHIP COTTAGERS ASSOC
SUGARBUSH CAMPGROUND
SUNNYRIDGE
SUNSET ESTATES
TURNBULL'S GROVE
VISTA BEACH COTTAGE ASSOC
WESTDELL BEACH ASSOC
WILDWOOD SOUTH COTTAGE ASSOC
WILDWOOD NORTH COTTAGE ASSOC
WINDSOR PARK ASSOC LTD
WINDY HILL COTTAGE ASSOC

C/O JOHN ORCHARD

C/O JAMES HOWARD
C/O ALLAN SUTHERLAND
C/O CAROL FAZAKAS
C/O BARBARA ELLIOT
C/O T. W. JOHNSTONE
C/O CATHERINE FOSTER

C/O SANDY WALKER
C/O ROBERT MAASS
C/O ALEX MCCLAREN, PRES
C/O JIM RYCKMAN, PRES
C/O SAM WAKEAM
C/O ALAN SHORT
C/O KAREN HEYWOOD
C/O D. M. JENKINS
C/O JOE PEIRONE
C/O EDNA FRAMPTON, COORDINATOR
C/O CAMILLE MIRANTI/VIC BRISSON
C/O WILLIAM McMICHAEL
C/O DOUG BANKS
C/O DAVID NELMS
C/O RON WILKINSON
C/O BOB WORTHY
C/O DOUG SHEPHERD
C/O JAMES CAREY
C/O FRANK MAY
C/O JOE HOUSER
C/O BRUCE BJORKQUIST
C/O ERIC KERNOHAN
C/O JOHN MURCH

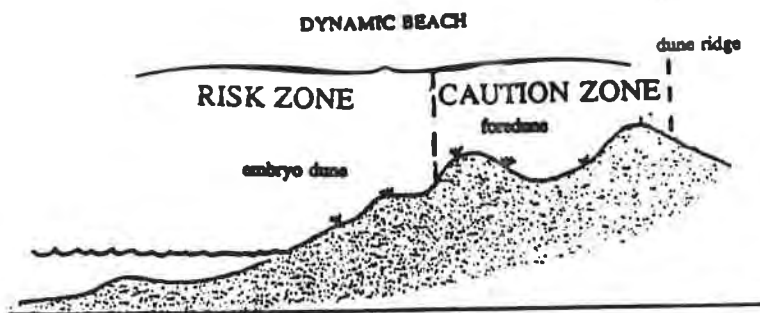
Technical Facts: Risk and Caution Zones in the sand dune region of the shoreline (south of the Lake Huron Water Supply Plant)

The sandy shore (dune region) located between Kettle Point and the Grand Bend area relies on the transport of sand southerly along the shoreline. Changes

in this rate will have an effect on the beach size, width, and ability to absorb storm energy.

Recent shoreline studies have indicated that past events may have had an effect on the sandy shoreline. (see Goderich Harbour discussion in Section 3.2.5 of the SMP). For this reason, the active beach zone or dynamic beach zone, is identified and subdivided into the RISK and CAUTION Zones (as per the figure). These zones are based on the area of the beach normally affected by water and that by wind.

However, during high lake levels and severe storms, these boundaries may vary substantially. For this reason a beach profile is used to assist in determining the landward extent of these zones.



SHORELINE MANAGEMENT PLAN: An Update to Lakeshore Landowners

Since early 1991, the Ausable-Bayfield Conservation Authority (ABCA) has been developing a plan for the management of the Lake Huron Shoreline within its area of jurisdiction with the direction of a steering committee of representatives from the shoreline's major user groups including cottage associations, municipalities, Pinery Provincial Park and other lakeshore agencies.

The main goal of the Shoreline Management Plan (SMP) is to identify the hazards of Lake Huron related to flooding and erosion. The Plan proposes planning and management scenarios which will protect property and lives from the hazards. The Plan also addresses environmental quality, improper drainage, water quality, lakeshore use and shoreline ownership. It will provide land use planning direction to municipalities and give recommendations to



landowners.

The first draft was released on June 15, 1992 with several opportunities for public input including five "open houses" in the summer of 1992.

The SMP's steering committee is currently preparing a second draft of the Plan, based on the comments and concerns raised by approximately 500 people who attended 1992's open houses and the 300 written responses received by the ABCA. Completion of the second draft is anticipated by June 1, 1993.

Public Meetings

June 25 @ 7 p.m. at Stanley Township
Complex, Varna
Displays open at 7:00 p.m.
Presentation at 8:00 p.m.

June 26 @ 1 p.m. at Thedford Bosanquet
Community Centre, Thedford
Displays open at 1:00 p.m.
Presentation at 2:00 p.m.

Why a Shoreline Management Plan is Needed

Historically, when cottage development first occurred, a less restrictive land use approach was used to guide development along the shoreline. Since that time, land use planning principals have been implemented along the shoreline in some form or another.

The SMP presents the natural processes and physical conditions which exist along the shoreline in a logical fashion to enable landowners, developers, and municipalities to know 'what to expect' and 'what questions to ask' when land use changes or building expansions are considered.

The SMP is an attempt to combine all the requirements which need consideration for safe use and occupation of shoreline property in one document. These include land use restrictions related to municipal zoning bylaws, areas adjacent to watercourses, environmental guidelines related to the approval of septic systems, or requirements for a work permit for activities planned on or near the beach. Through information explained in the SMP, the lakeshore hazards are explained and management suggestions are presented.

How can you find out more about the SMP?

The Second Draft Plan and associated material will be available to cottage associations and your municipal office, or you can view the material at the ABCA office just east of Exeter at the Morrison Dam Conservation Area. To ensure that staff will be available to meet you, you are advised to phone ahead to make an appointment.

Your comments and input are most important as this plan will provide the future for the shoreline and how it is utilized. Once the second draft is available, please feel free to use your cottage association to provide combined comments from your lakeshore area.

If you have recently sold your lakeshore property, please inform our office of the change so that we may send the new owner information on the Shoreline Management Plan.

The deadline for comments on the Second Draft is August 1, 1993.



ESTABLISHED 1946

AUSABLE BAYFIELD CONSERVATION AUTHORITY

Chairman: Joe W. Gibson
Vice-chairman: David McClure
General Manager/Secretary Treasurer:
Tom B. Prout, P. Ag.

R.R. #3
EXETER, ONTARIO N0M 1S5
(519) 235-2610
FAX (519) 235-1963

SHORELINE MANAGEMENT PLAN

SHORELINE COTTAGE ASSOCIATIONS

INFORMATION MEETING - MAY 21, 1993

* AGENDA *

- | | |
|------|---|
| 7:30 | Welcome and Introductory Comments
(Fred Lewis - ABCA Director and Past Chairman) |
| 7:35 | Brief History of the ABCA Shoreline Management Plan (SMP)
(Pat Donnelly - SMP Project Manager) |
| 7:45 | Review of the 2nd Draft of the SMP
(Pat Donnelly - SMP Project Manager) |
| 8:15 | Question and Answer Session |
| 8:45 | Closing Remarks
(Fred Lewis) |



MEMBER OF THE
ASSOCIATION OF CONSERVATION
AUTHORITIES OF ONTARIO

NOTICE OF MEETING

INFORMATION MEETING

SHORELINE MANAGEMENT PLAN

DATE: Friday, May 21, 1993

TIME: 7:30 p.m. to 9:00 p.m.

PLACE: Exeter Legion Hall
William St., (behind Darling's Food Market)
(see map)

WHO: Two representatives from each cottage group ratepayers association located within the Ausable Bayfield Conservation Authority shoreline jurisdiction.

WHY:

- To receive a copy of the 2nd draft of the SMP
- To provide updated information on the SMP project
- To provide the schedule of summer public meetings for the project which lakeshore residents are invited to attend
- To provide an opportunity for cottage groups to familiarize themselves with the lakeshore issues of their neighbours along the shoreline
- To collect information for further discussion with their groups

NOTE: Due to limited space in the hall and resources, we ask that you confirm a maximum number of two representatives from your group/association who will be attending the meeting and notify our office prior to May 19, 1993. Seating is limited.

Appendix D

SHORELINE MAPPING

**Ausable Bayfield Conservation Authority
Shoreline Management Plan**

10-10-1918

10-10-1918

10-10-1918

10-10-1918

Appendix D - SHORELINE MAPPING

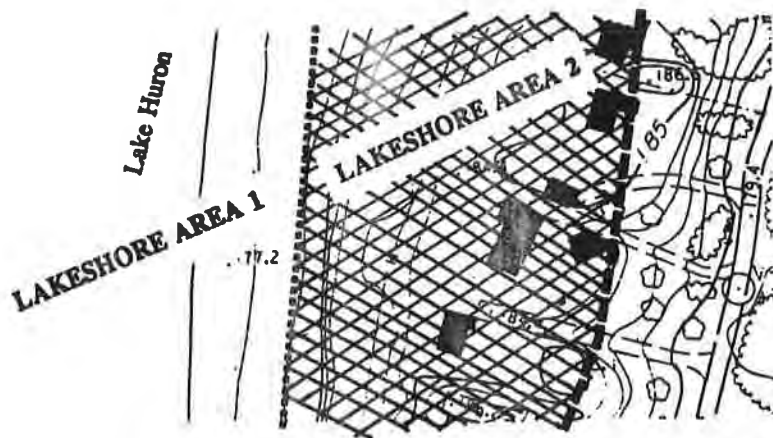
The maps contained within this appendix illustrate the extent of shore land affected by the Lakeshore Area 1 and Lakeshore Area 2 designations in the Shoreline Management Plan. This area is also referred to as the, "Regulatory Lakeshore" as stated in the Lakeshore Development Guidelines (Section 3.3).

The maps on the following pages are a reduction of the full scale map sheets (see examples below) which are available for viewing from the appropriate municipal office or the A.B.C.A. office. The map sheet numbers are indicated on the reduced copies and range from map # 12 at the most southerly extent of the study area, adjacent to Camp Ipperwash, to map # 44 which shows the northerly border of the study area at Sideroad 30, Goderich Township. Map detail includes buildings, roads, watercourses, top of lakeshore bank and cottage subdivision names.

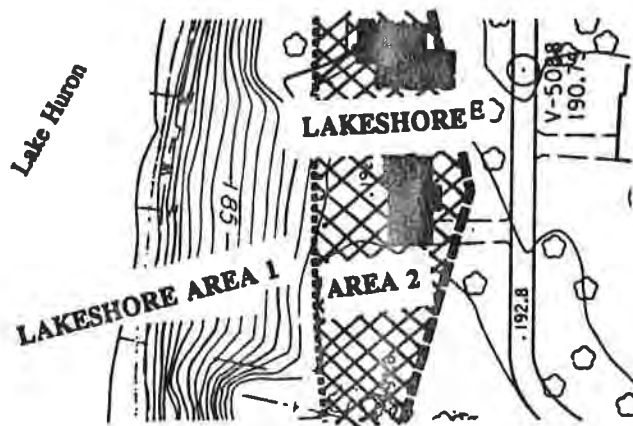
Specifically, the reduced maps show the extent of the Lakeshore Areas 1 and 2. This affected area includes the three hazard criteria discussed in Section 3.3 Lakeshore Development Guidelines, being the hazards of flooding, erosion, and dynamic beaches. Please refer to the previously referenced section for a more complete explanation of the hazard criteria.

Examples of Full Scale Map Sheets

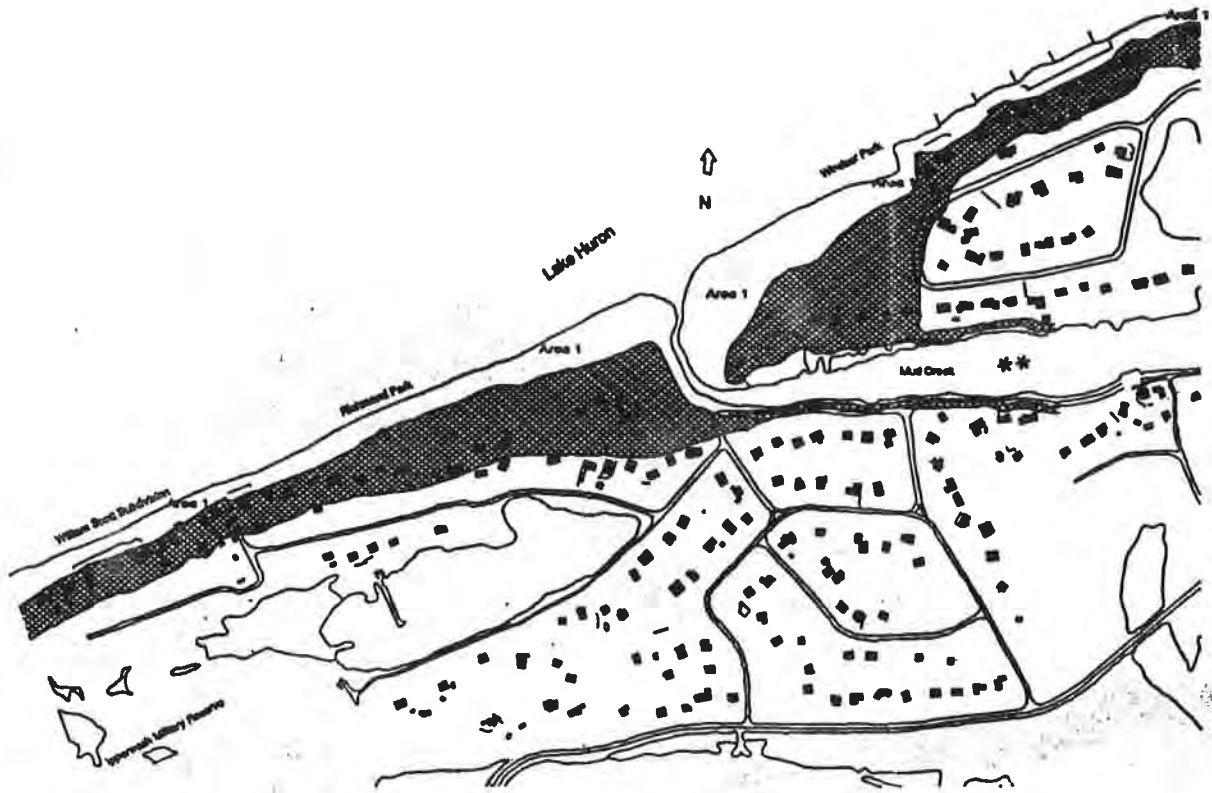
A) Dune Region



B) Bluff Region



SHEET NUMBER	AREA	PAGE
12, 13	Port Franks	1
14	Port Franks	2
15	Ausable River	2
17	Beach O'Pines	3
18	Southcott Pines	3
19	Grand Bend	4
20	Oakwood Maple Grove	4
21	Kingsmere Highlands I and II	5
22	Highlands III Turnbull's Grove	5
23	Shadeview Norman Heights	6
24	Cedarbanks Shadeview	6
25	Poplar Beach Sunnyridge	7
26	Lakewood Gardens	7
27	Bayview Estates	8
28	St. Joseph Shores	8
29	Vista Beach/Dewey Pt	9
30	Harvey Dennome	9
31	Drysdale	10
32	Durand Huronview	10
33	Vodden-Bedard	11
34	Homestead Heights	11
35	Westdell Beach Egerton Beach	12
36	Houston Heights Huron Church Camp	12
37	Lakewood Beach	13
38	Wildwood Crystal Springs	13
39	Paul Bunyan Camp Bayfield	14
40	Bayfield	14
41	Bayfield Highlands Camp Canbay	15
42	Melena Heights Salvation Army Camp	15
43	Lane O'Pines Sunset Lane	16
44	Elliott's Grove Pope's Beach	16

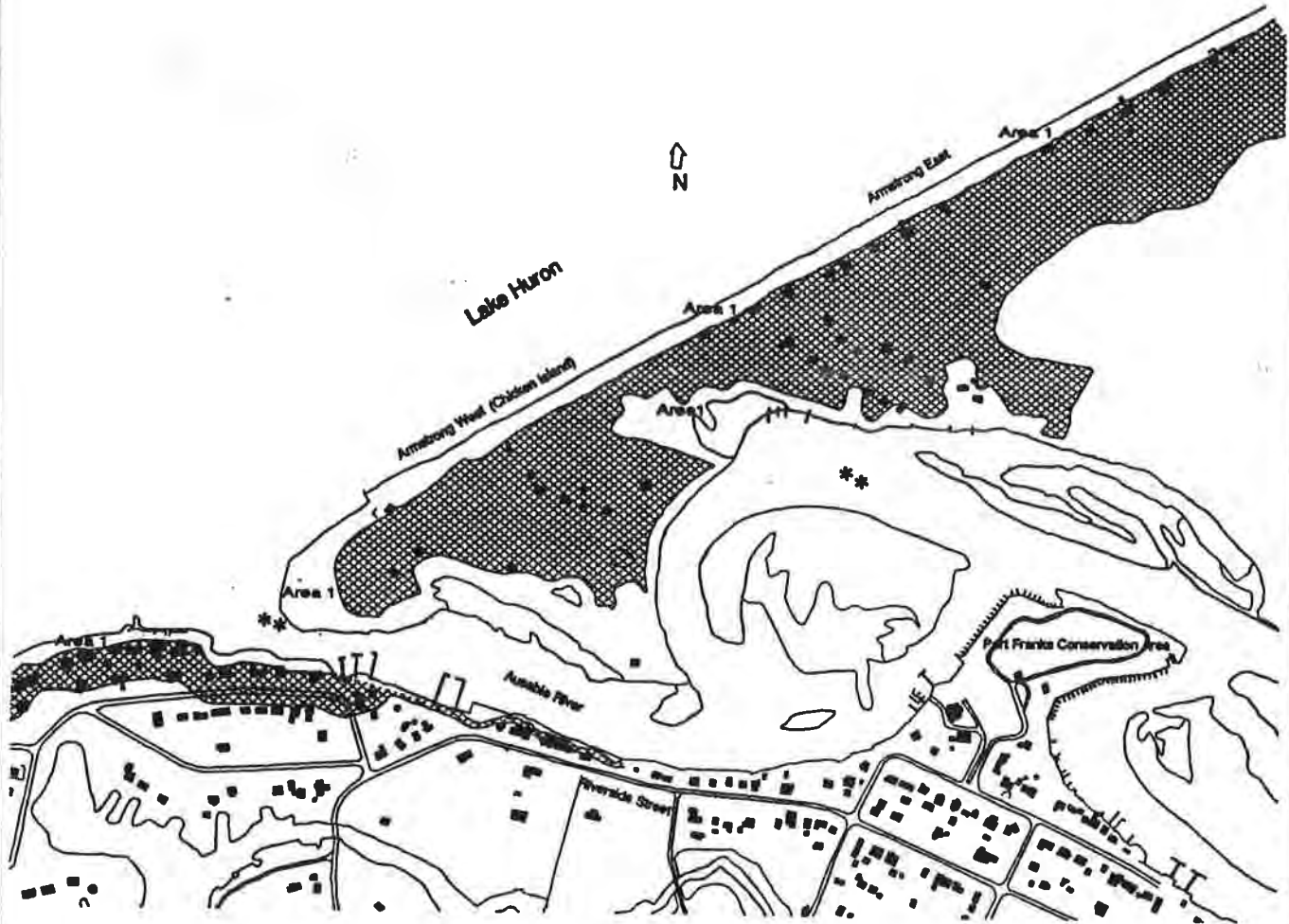


LEGEND

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Area 1 Lakeshore Area 1
 Lakeshore Area 2

** Existing Regulation on Gully/Watercourses.
 Refer to Section 4.2.3 of SMP for discussion
 of Ontario Regulation 142/90.



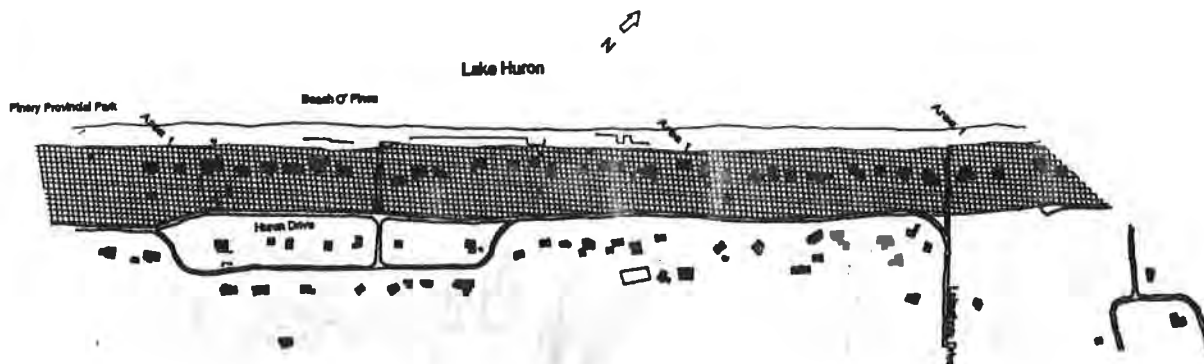
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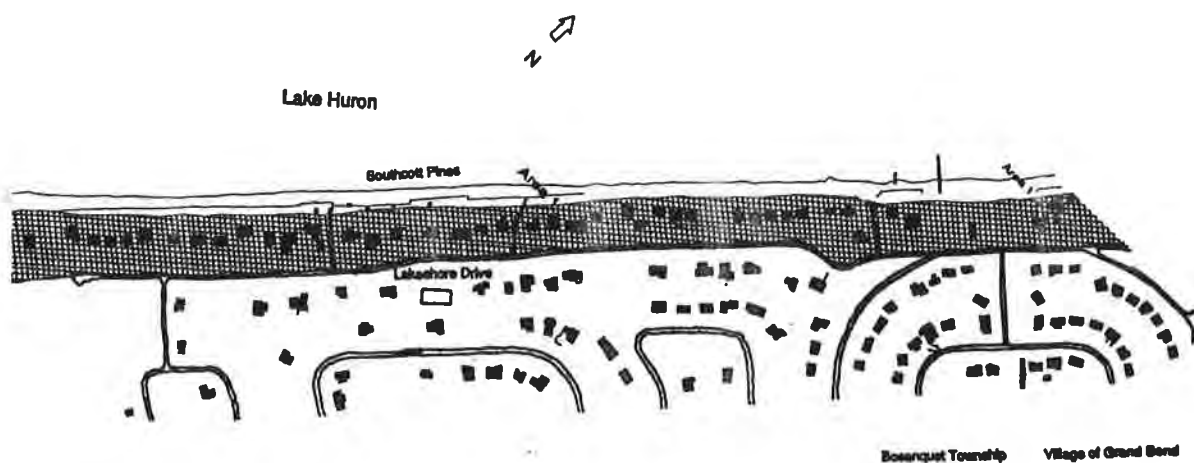
Lakeshore Area 1
 Lakeshore Area 2

** Existing Regulation on Gully/Watercourses.
 Refer to Section 4.2.3 of SMP for discussion
 of Ontario Regulation 142/90.

Sheet 17



Sheet 18



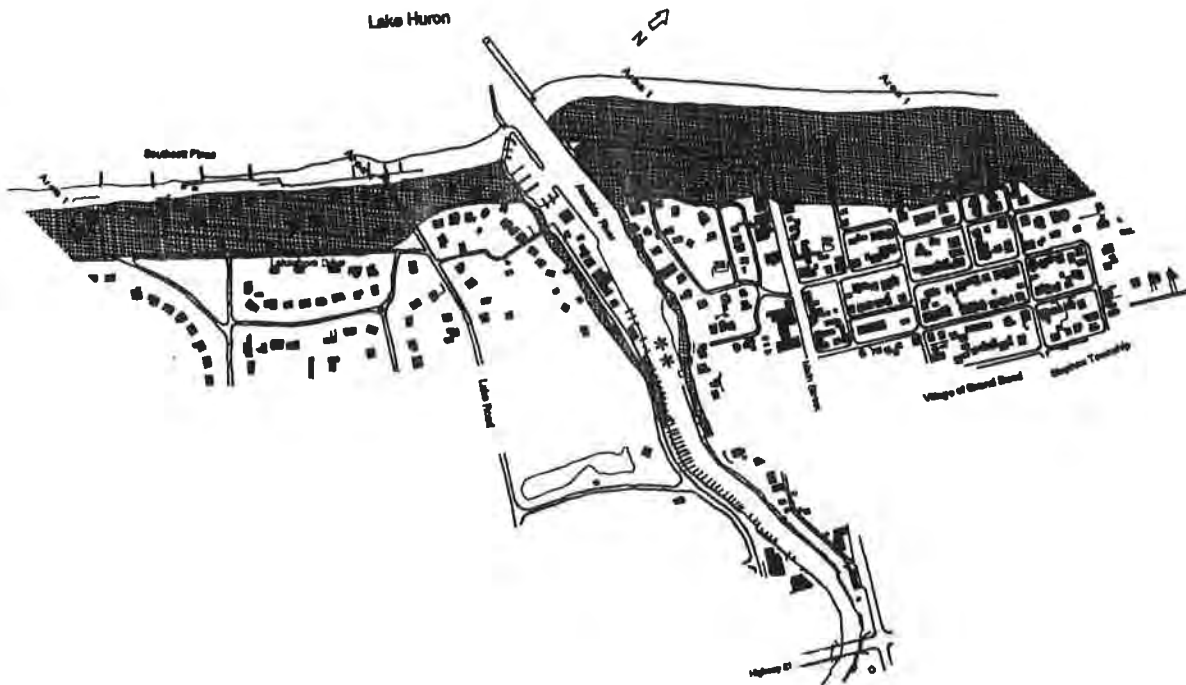
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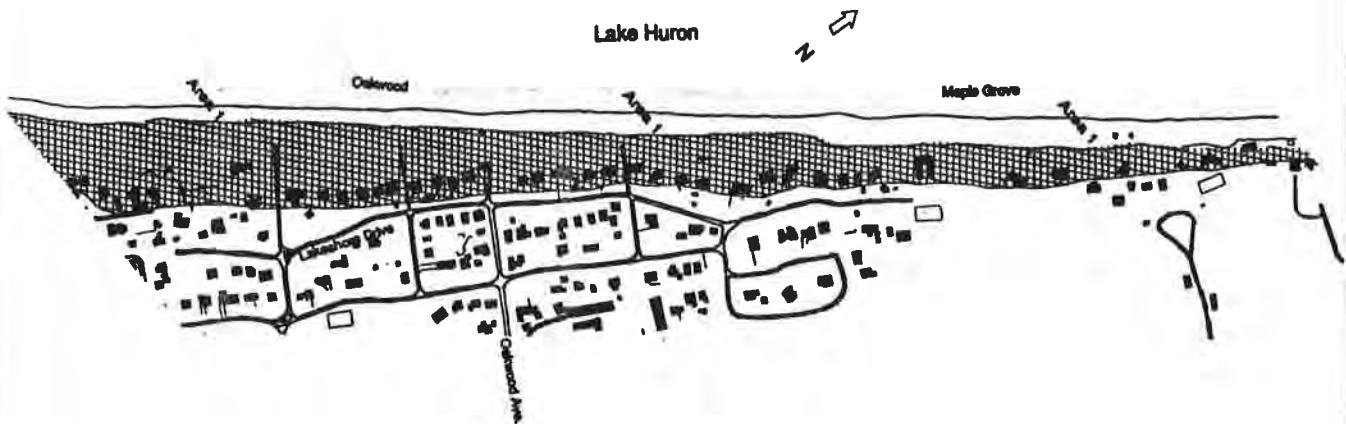
- Area 1 Lakeshore Area 1
- Area 2 Lakeshore Area 2

** Existing Regulation on Gully/Watercourses.
Refer to Section 4.2.3 of SMP for discussion
of Ontario Regulation 142/90.

Sheet 19



Sheet 20



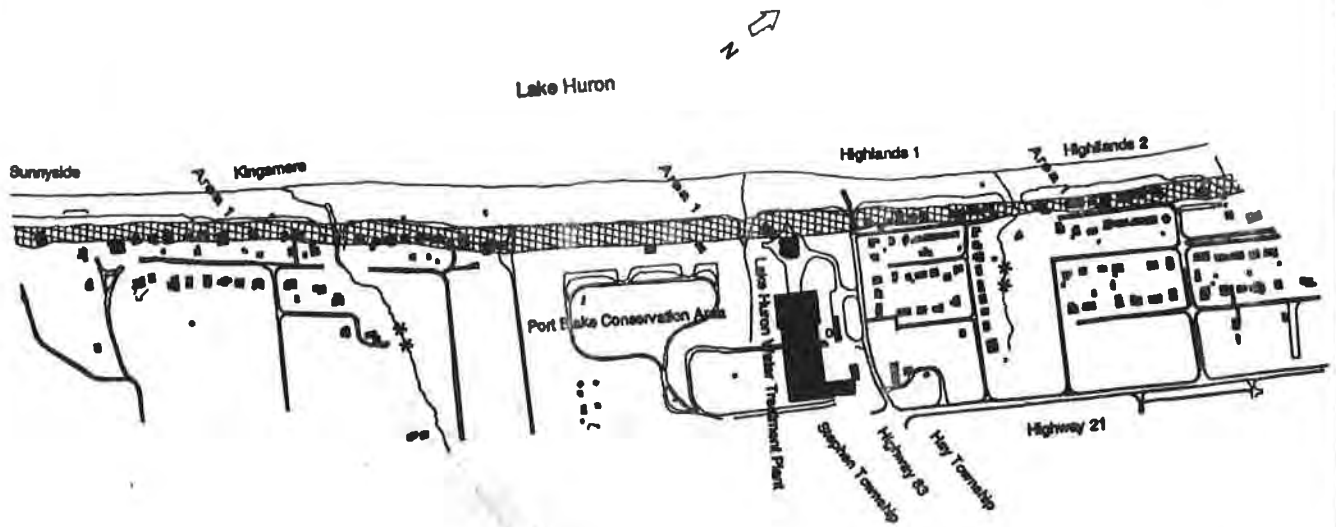
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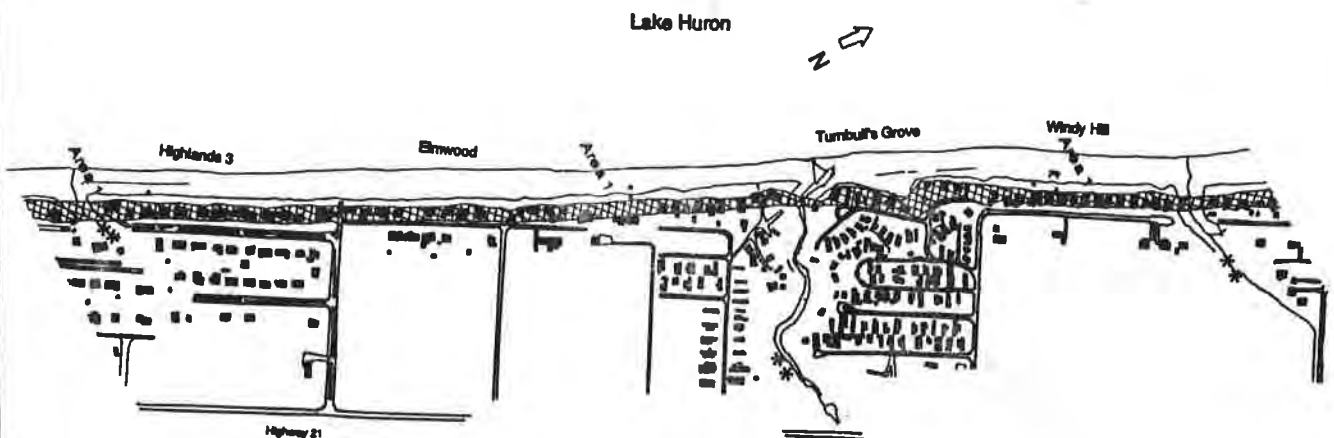
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- Area 2 Lakeshore Area 2

** Existing Regulation on Gully/Watercourses.
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of Ontario Regulation 142/90.

Sheet 21



Sheet 22

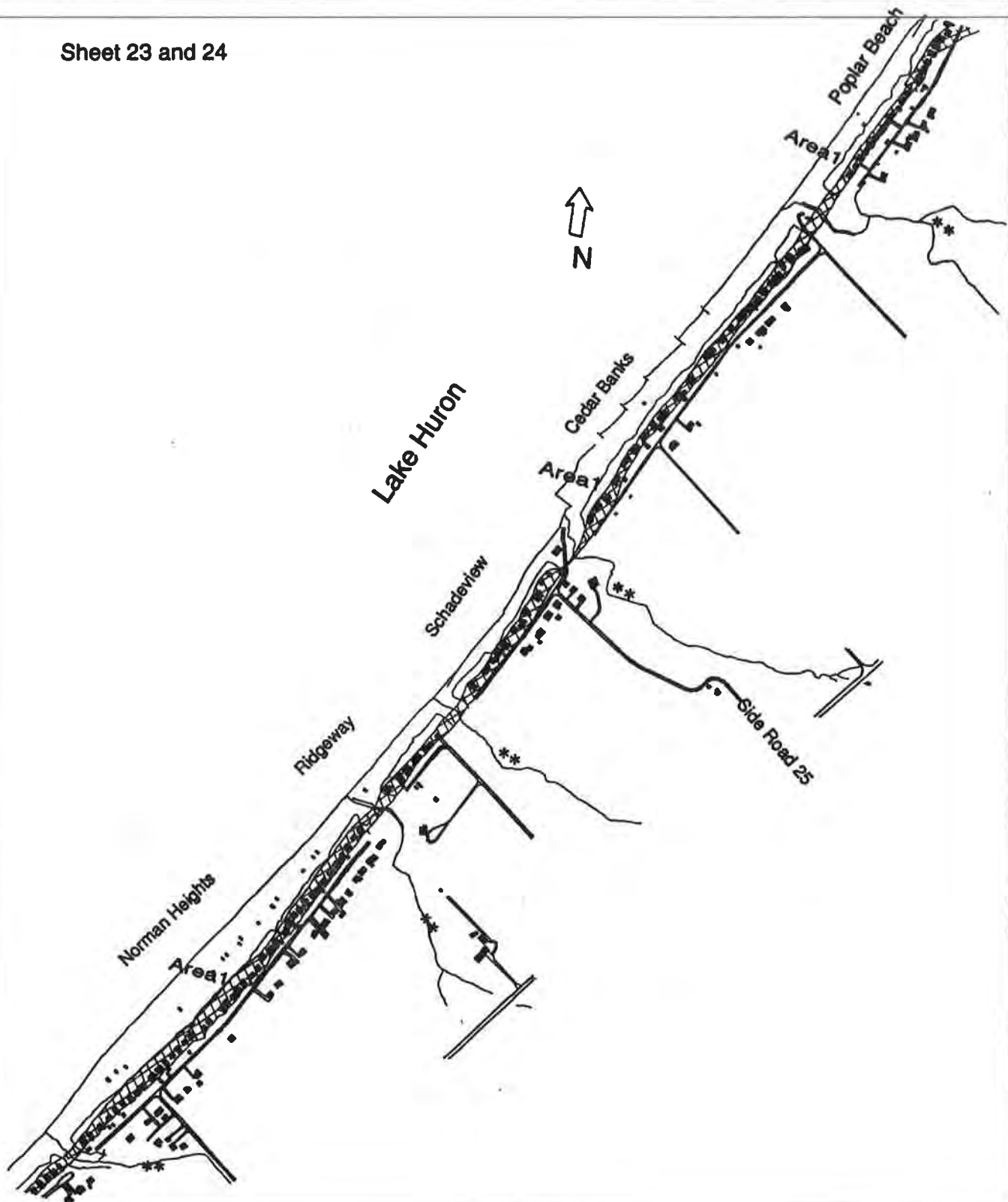


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- Area 1 Lakeshore Area 1
- Lakeshore Area 2

** Existing Regulation on Gully/Watercourses.
Refer to Section 4.2.3 of SMP for discussion
of Ontario Regulation 142/90.



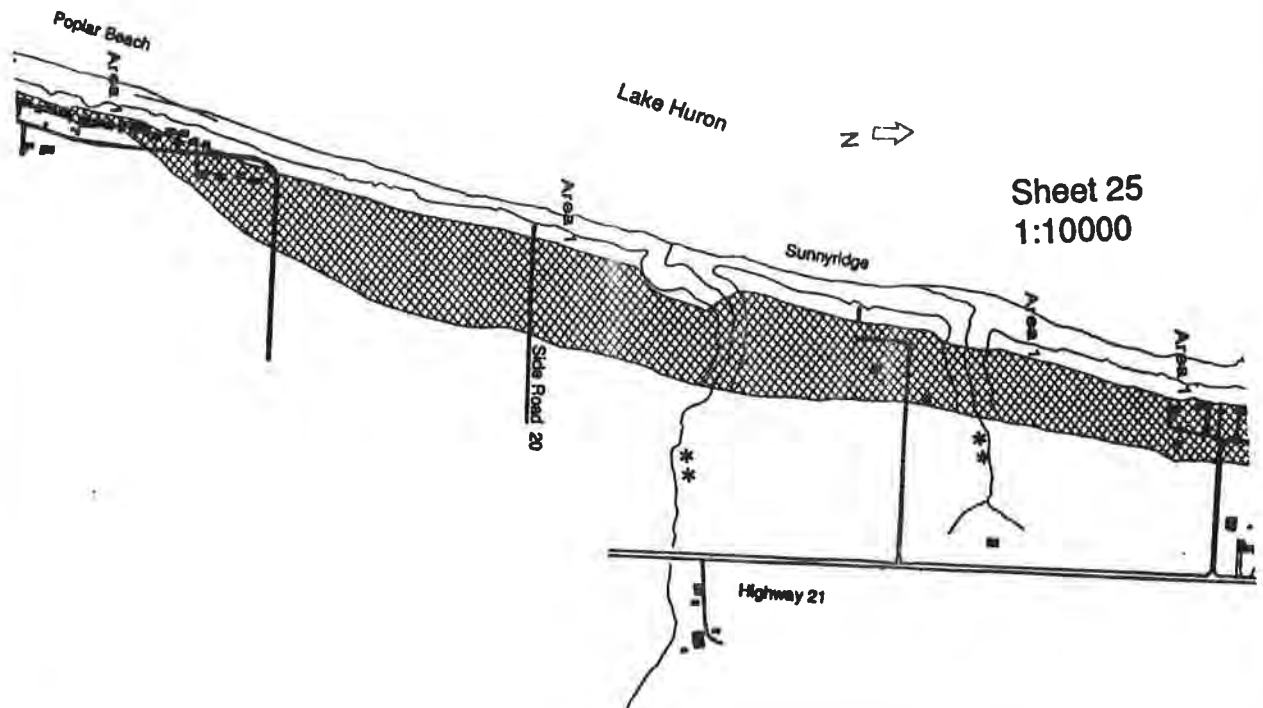
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- Area 1 Lakeshore Area 1
- Lakeshore Area 2

** Existing Regulation on Gully/Watercourses.
Refer to Section 4.2.3 of SMP for discussion
of Ontario Regulation 142/90.

Sheet 25



Sheet 26



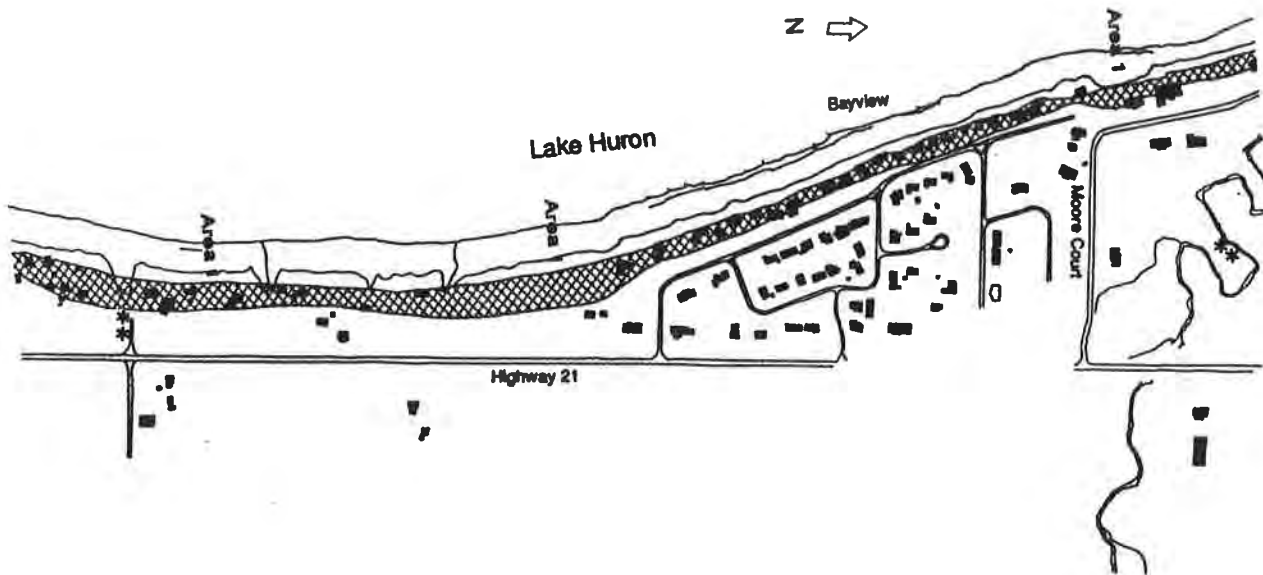
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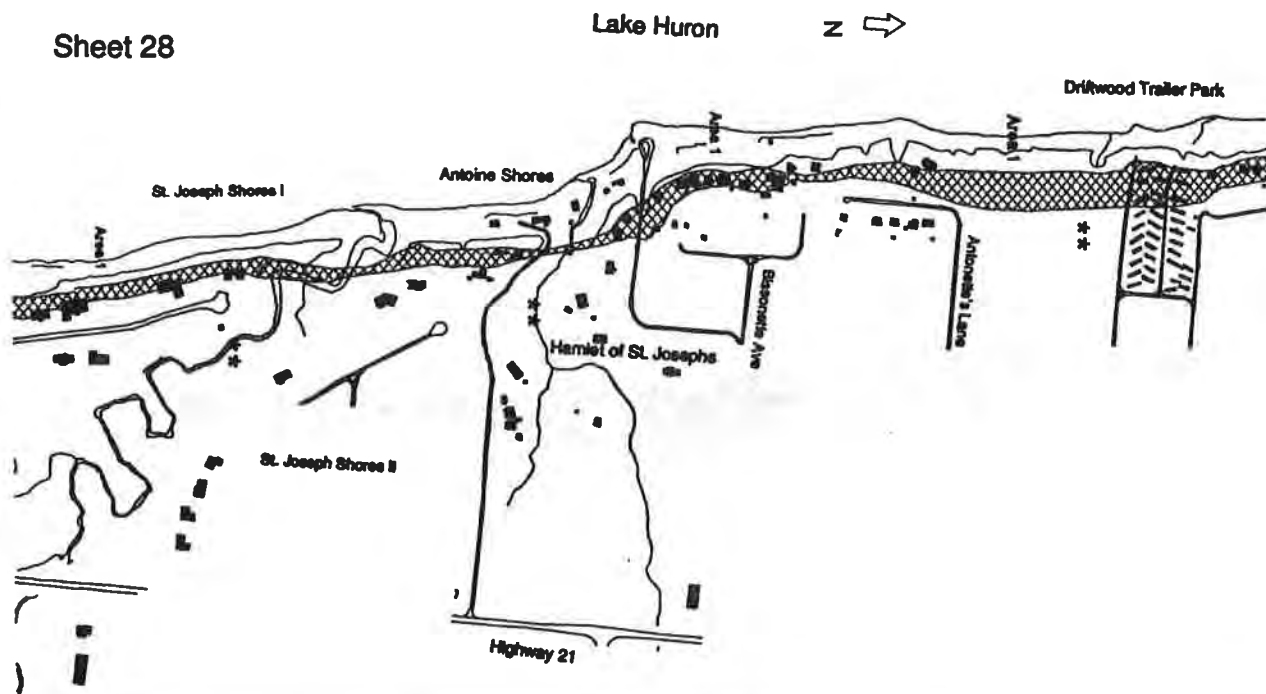
- Lakeshore Area 1
- Lakeshore Area 2

** Existing Regulation on Gully/Watercourses.
Refer to Section 4.2.3 of SMP for discussion
of Ontario Regulation 142/90.

Sheet 27



Sheet 28



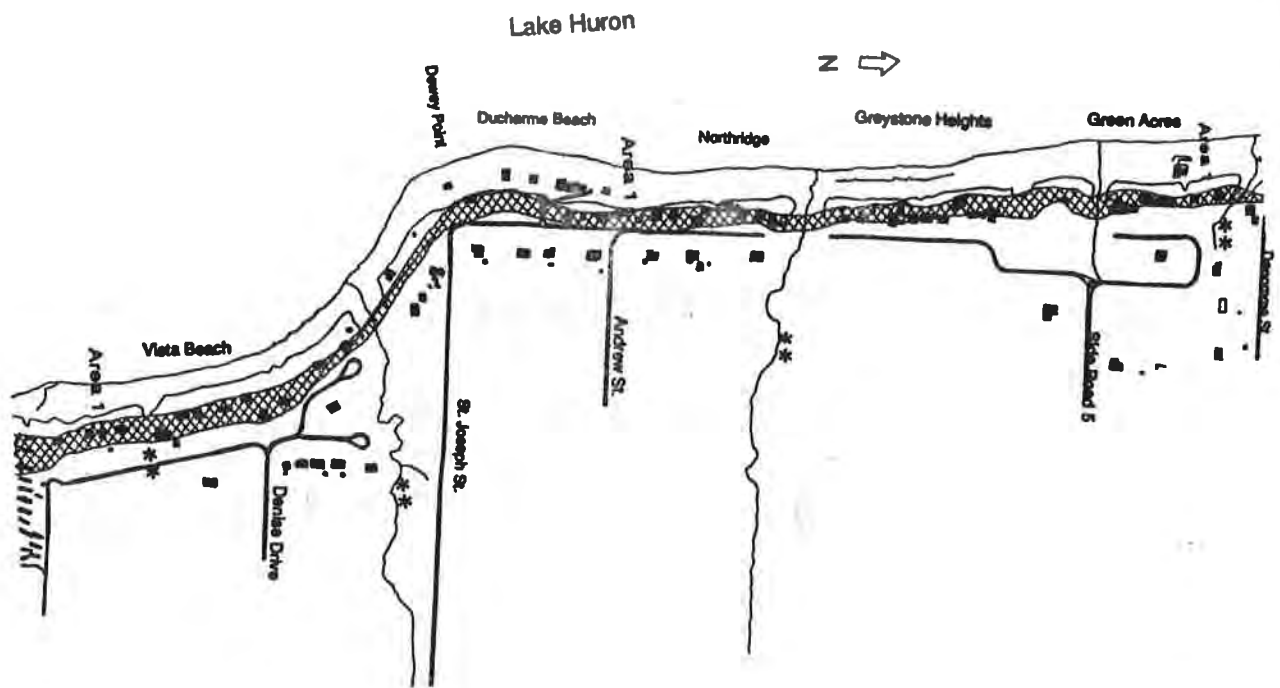
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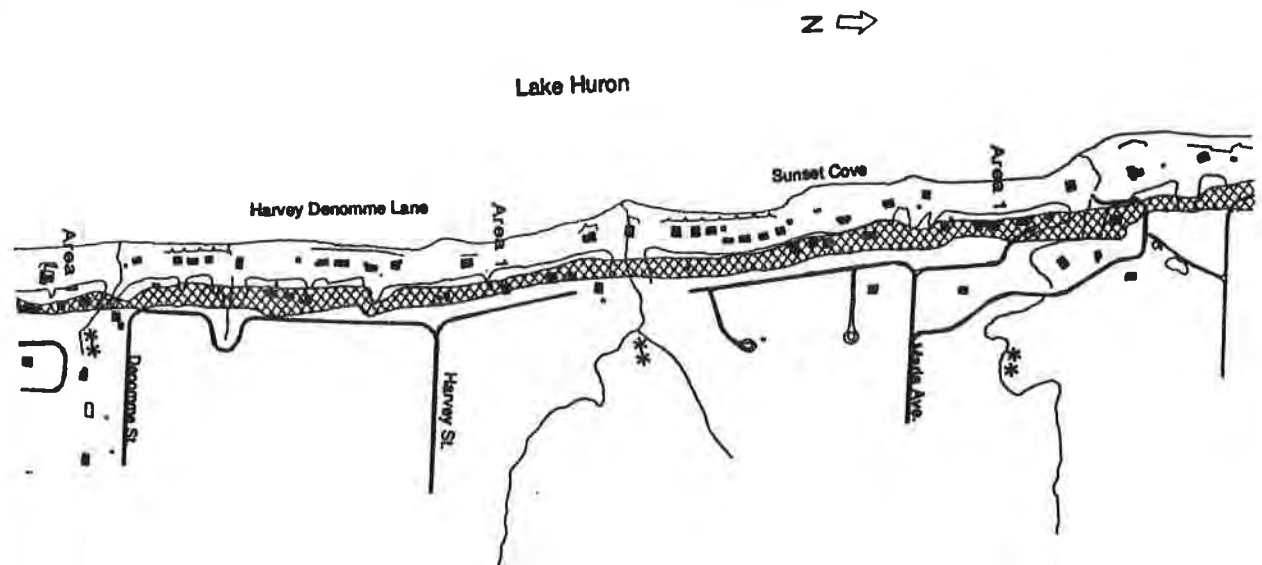
- Area 1 Lakeshore Area 1
- Area 2 Lakeshore Area 2

** Existing Regulation on Gully/Watercourses.
Refer to Section 4.2.3 of SMP for discussion
of Ontario Regulation 142/90.

Sheet 29



Sheet 30



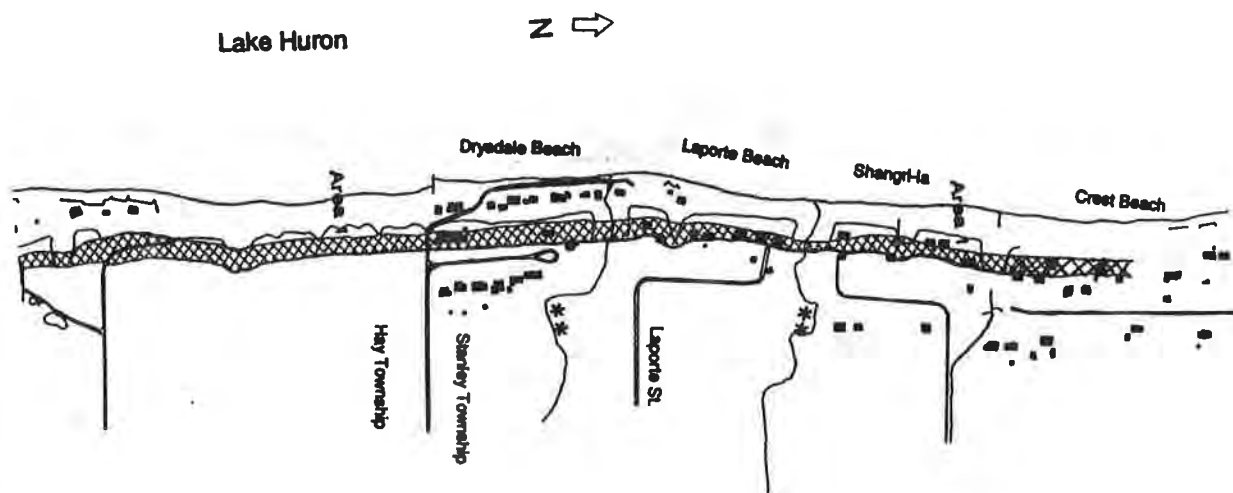
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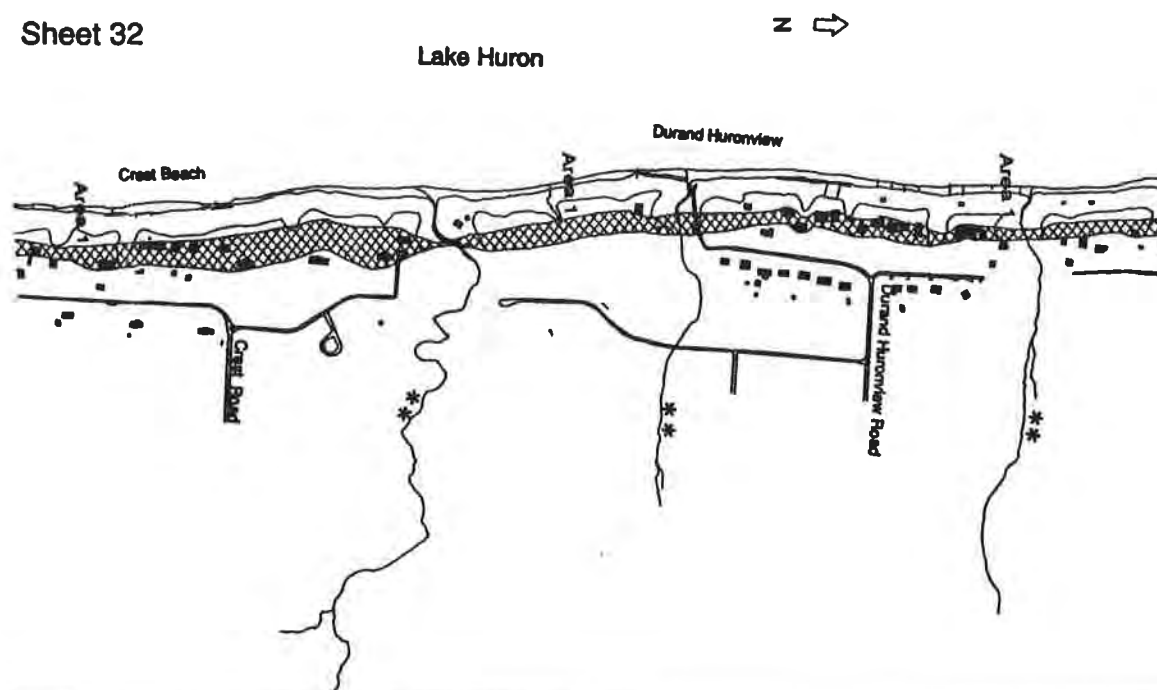
- Area 1 Lakeshore Area 1
- Area 2 Lakeshore Area 2

** Existing Regulation on Gully/Watercourses.
Refer to Section 4.2.3 of SMP for discussion
of Ontario Regulation 142/90.

Sheet 31



Sheet 32



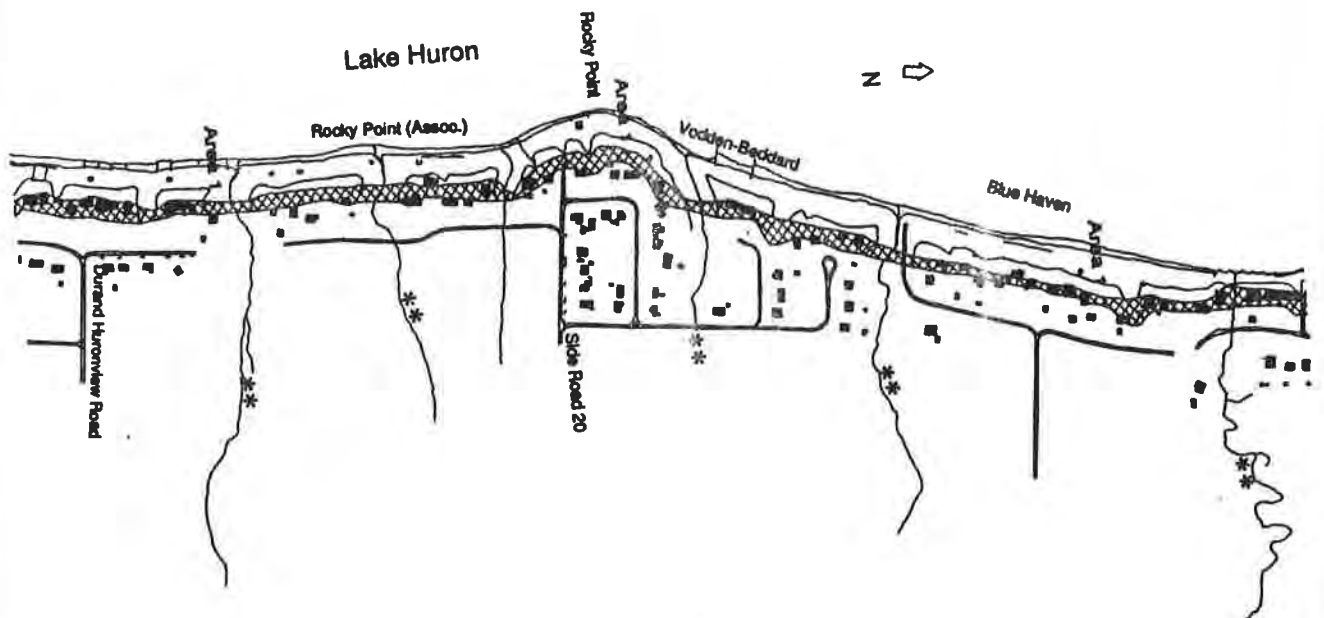
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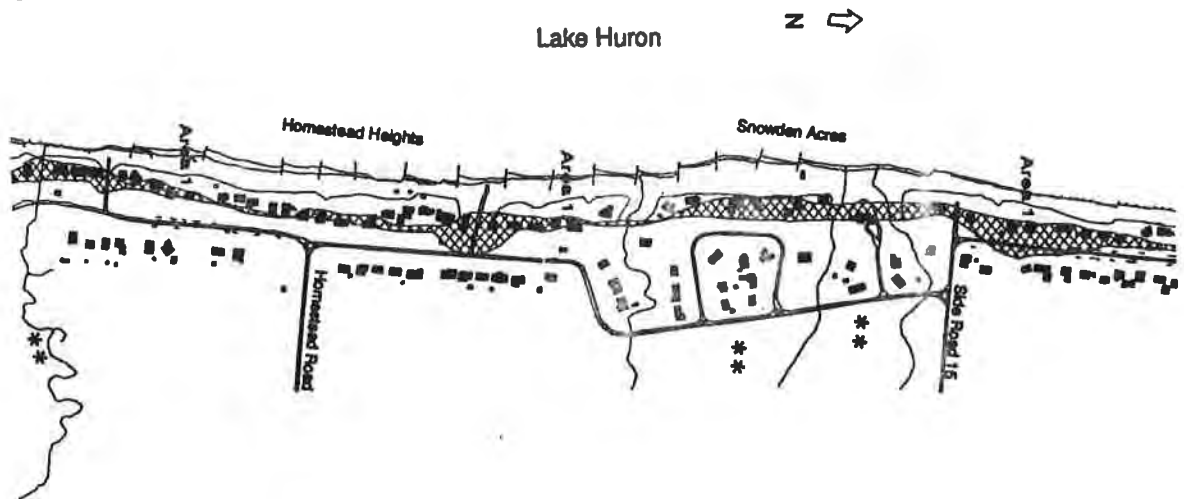
- Area 1 Lakeshore Area 1
- Lakeshore Area 2

** Existing Regulation on Gully/Watercourses.
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Sheet 33



Sheet 34



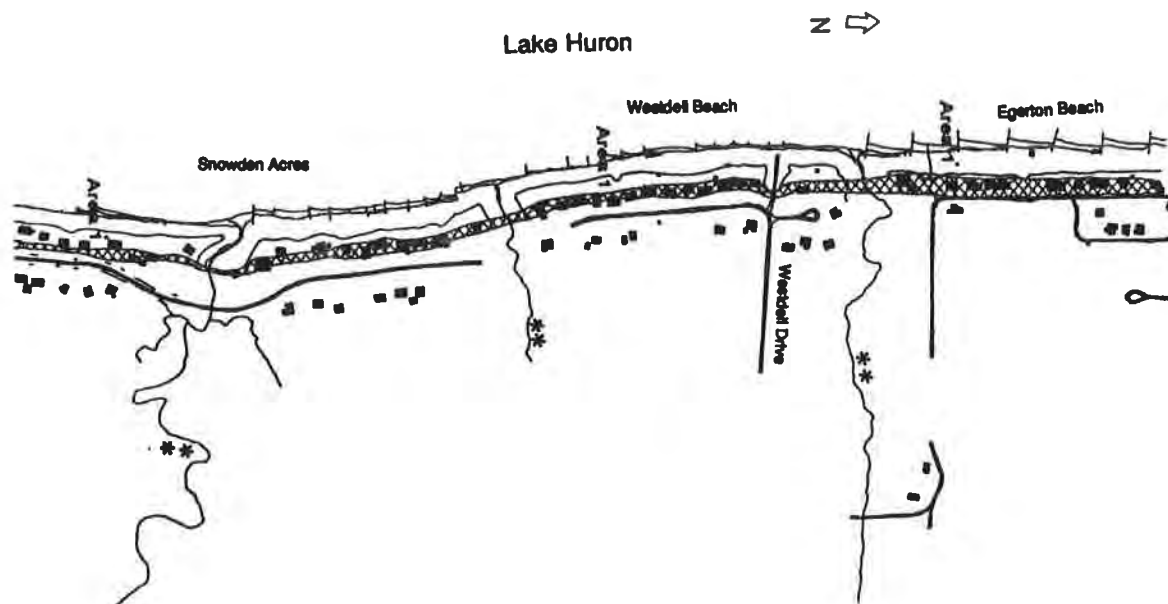
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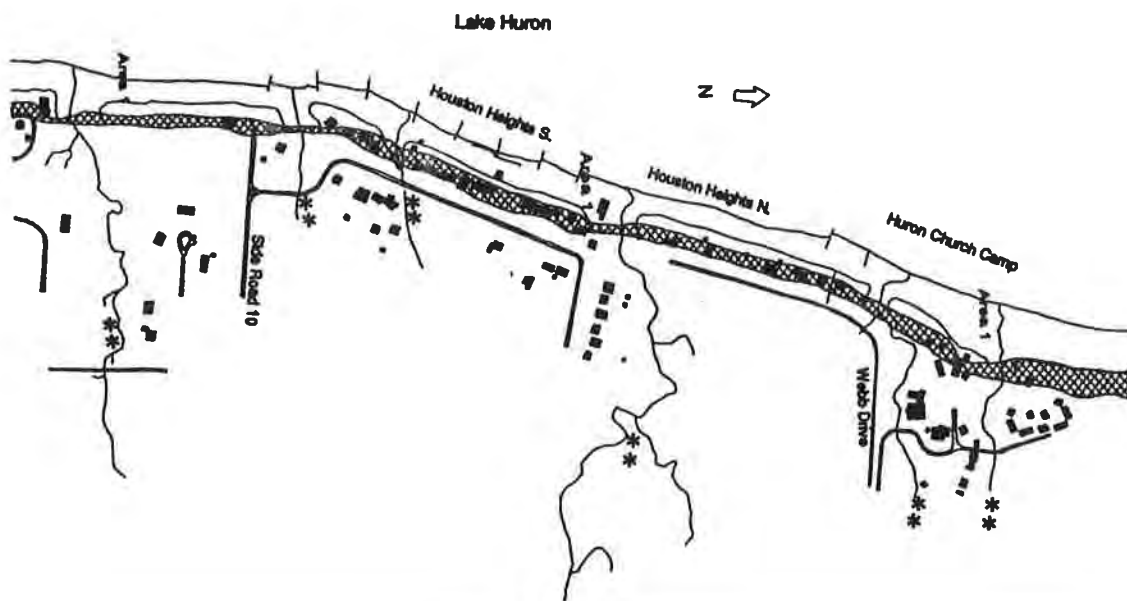
- Area 1 Lakeshore Area 1
- Lakeshore Area 2

** Existing Regulation on Gully/Watercourses.
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Sheet 35



Sheet 36



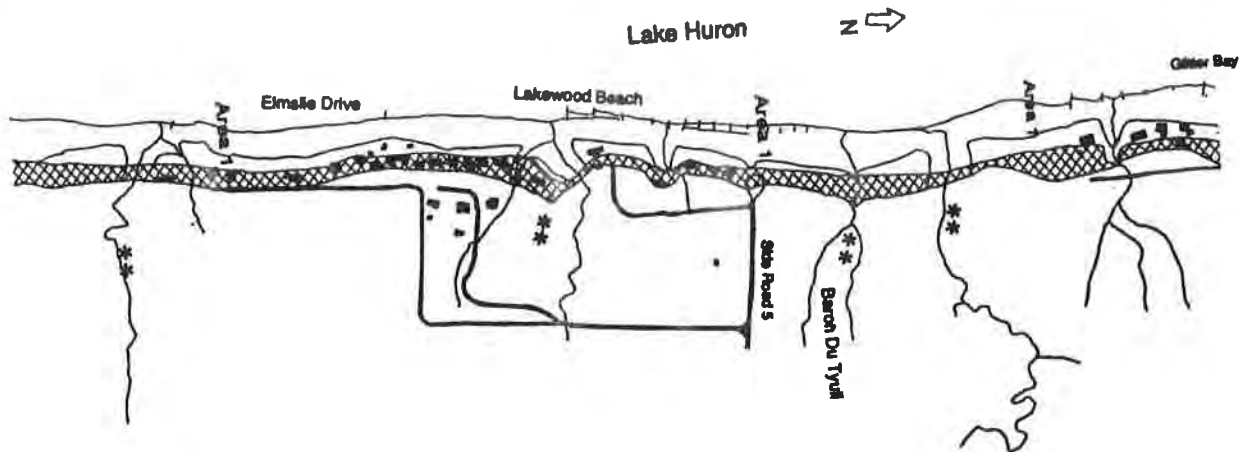
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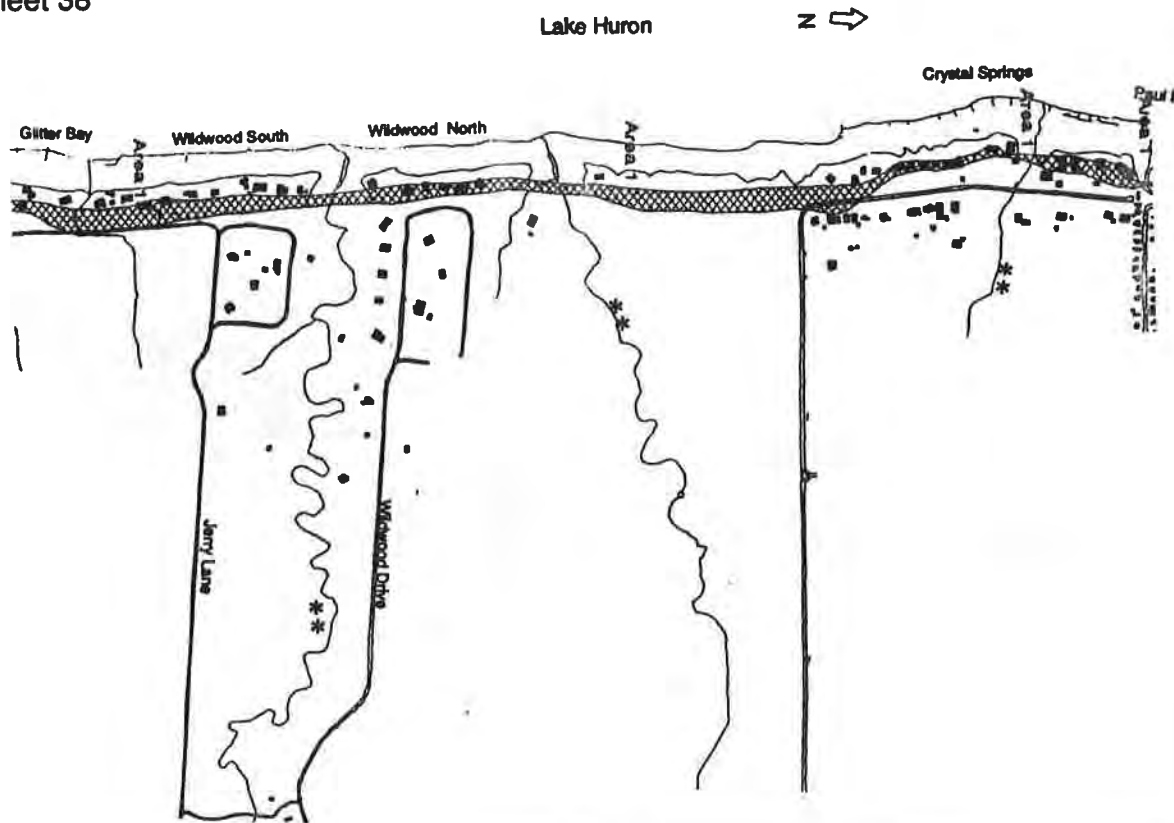
- Area 1 Lakeshore Area 1
- Area 2 Lakeshore Area 2

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Sheet 37



Sheet 38



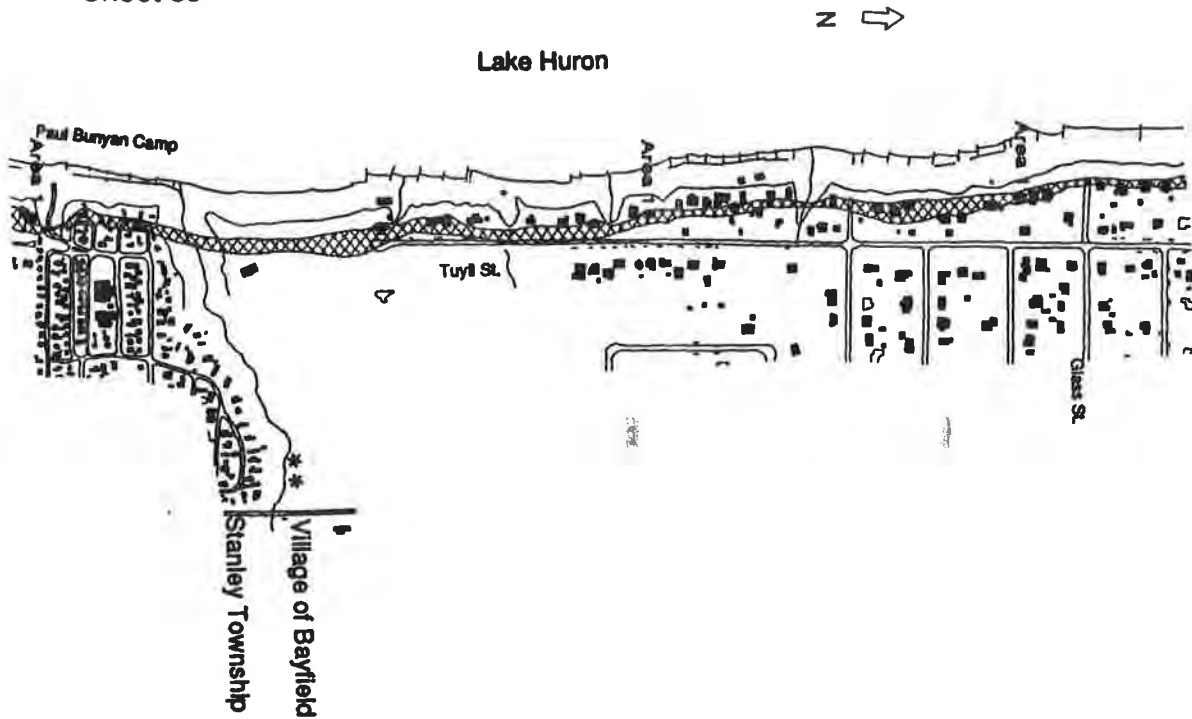
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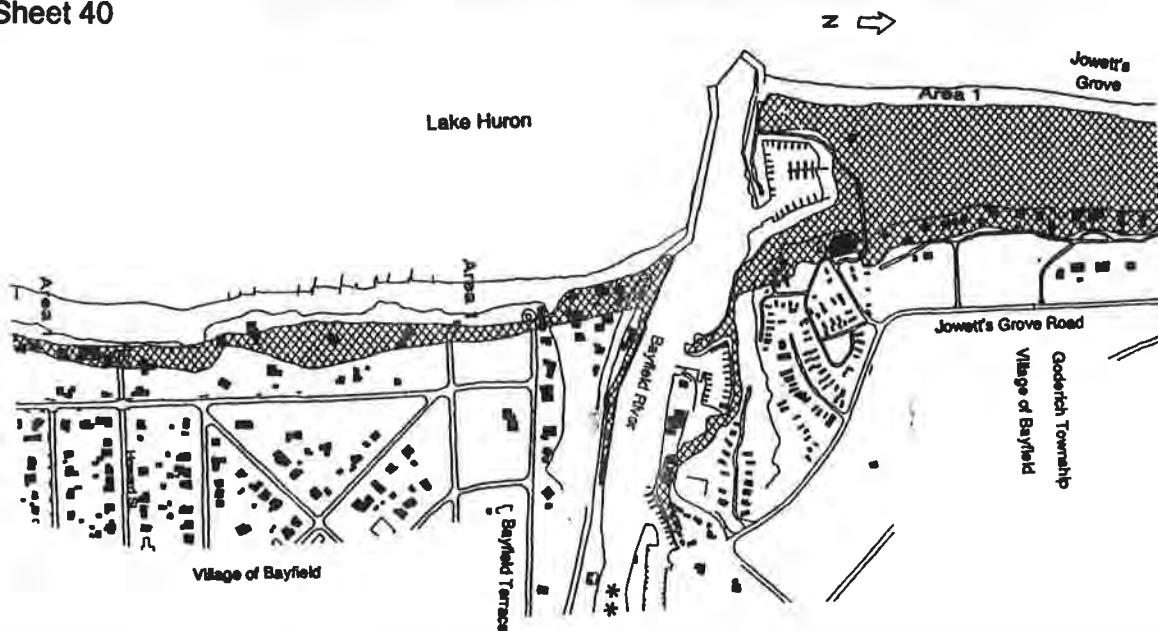
- Area 1 Lakeshore Area 1
- Area 2 Lakeshore Area 2

** Existing Regulation on Gully/Watercourses.
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of Ontario Regulation 142/90.

Sheet 39



Sheet 40



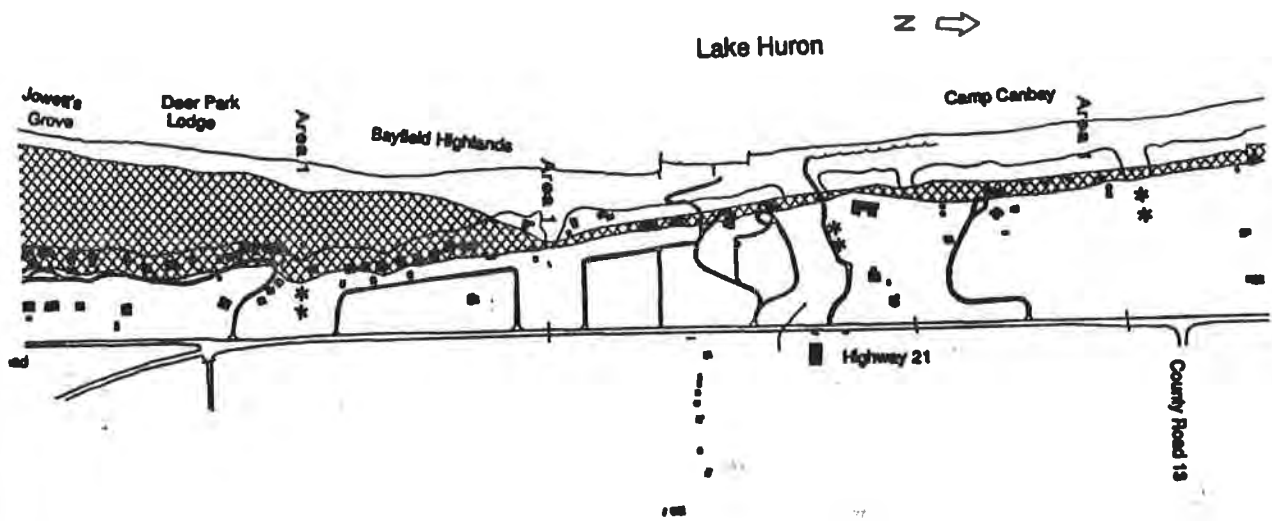
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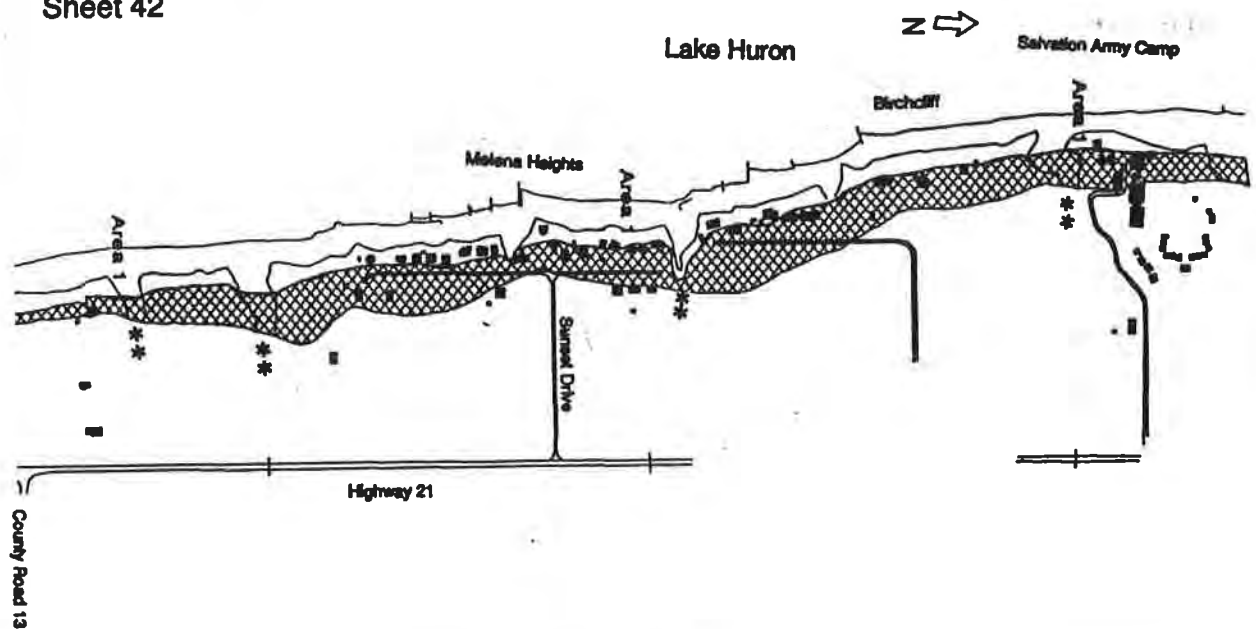
- Area 1 Lakeshore Area 1
- Lakeshore Area 2

- ** Existing Regulation on Gully/Watercourses.
Refer to Section 4.2.3 of SMP for discussion
of Ontario Regulation 142/90.

Sheet 41



Sheet 42



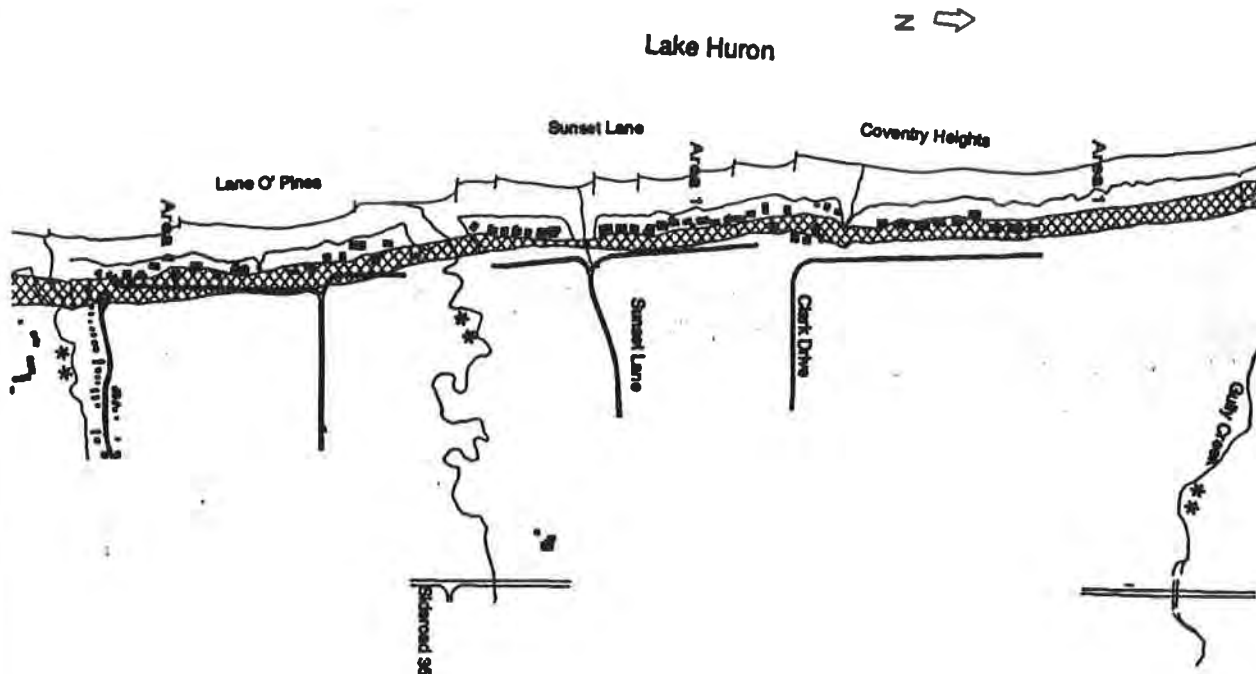
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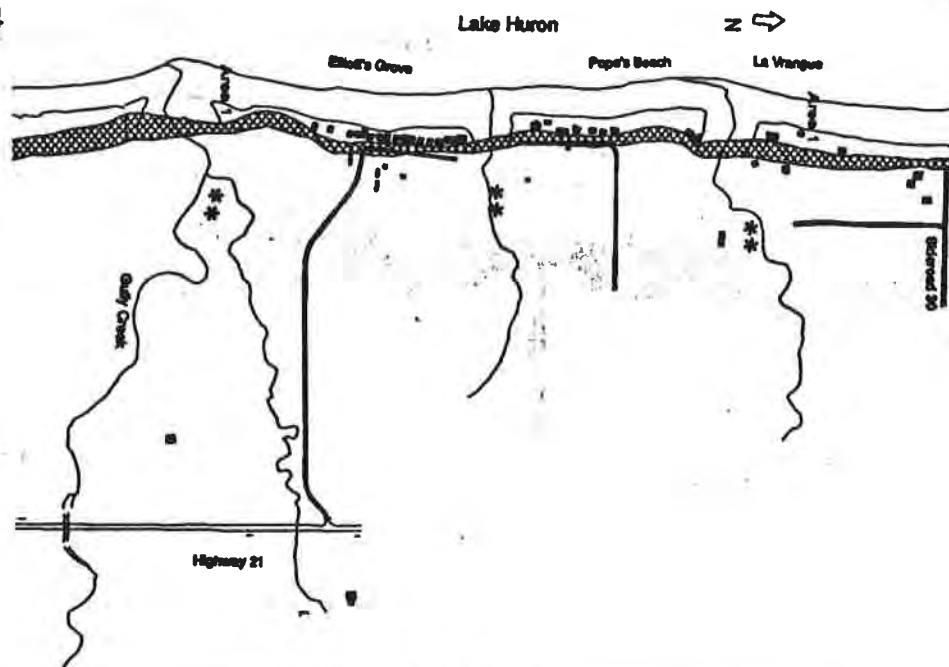
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- Lakeshore Area 2

** Existing Regulation on Gully/Watercourses.
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Sheet 43



Sheet 44



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Scale 1:10000

- Area 1 Lakeshore Area 1
- Lakeshore Area 2

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