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West Ipperwash Dynamic Beach Assessment

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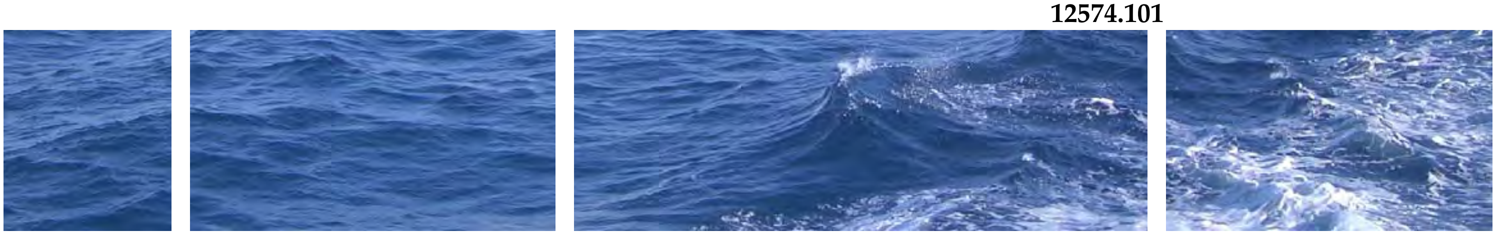

Innovation, Excellence & Service

West Ipperwash Dynamic Beach Assessment

Prepared for

St. Clair Region Conservation Authority

Prepared by

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1.0 INTRODUCTION

This report provides an assessment of the dynamic beach hazard limit for West Ipperwash Beach, between Centre Sideroad and West Ipperwash Road in Lambton Shores, Lambton County. The site is located on the east shore of Lake Huron as shown in Figure 1.1.

1.1 Background

In 1996 the St. Clair Region Conservation Authority (SCRCA) developed the *Lake Huron Shoreline Management Plan* (SMP) for Point Edward, Sarnia and Plympton-Wyoming. The SMP was updated in 2011 (Baird, 2011) to the current technical standards identified in the *MNR Technical Guide for the Great Lakes – St. Lawrence River System and Large Inland Lakes* (MNR, 2001), and to include Lambton Shores.

The Shoreline Management Plan Update - 2011 (Baird, 2011) identifies the West Ipperwash Beach study area, Centre Side Road to West Ipperwash Road as a dynamic beach. The *Provincial Policy Statement* (PPS) (Ministry of Municipal Affairs and Housing, 2014) states that development shall be directed away from natural hazards where there is unacceptable risk to public health, safety or property damage, and not create new or aggravate existing hazards. It further directs that development and site alteration shall not be permitted within the dynamic beach hazard. In accordance with the *Technical Guide* (MNR, 2001) published in support of the *PPS*, the dynamic beach hazard limit was mapped at the standard 30 m from the flood hazard, extending to the landward side of the first main foredune. An adjustment of the beach profile to compensate for an extended period of low water levels was included. The shoreline does not appear to be recessional and no erosion allowance was therefore applied.

The Natural Hazards Training Manual (MNR, 1997) states that mechanisms should be incorporated into the planning process to provide the flexibility to undertake a study using accepted scientific and engineering principles, to determine the landward limit of the dynamic beach hazard. The SCRCA retained Baird & Associates to further evaluate the dynamic beach hazard for West Ipperwash Beach. This report presents the methodologies used and results of the study, along with recommendations for the dynamic beach hazard limit.

1.2 Study Scope

The scope of work included the following key tasks:

- Site reconnaissance including use of an Unoccupied Aerial Vehicle (UAV) to collect imagery of the shoreline, establish control points, beach profile surveys, assess shore protection, and sediment sampling;

- Data review including the 1:2000 topographic mapping, Canadian Hydrographic Services Field Sheet (offshore bottom elevations), historical water levels and MNR wave climate database, as well as previous reports;
- Numerical modelling of the beach profile response to extreme wave and water level events for delineation of the dynamic beach hazard limit;
- Assessment of wave uprush for delineation of the dynamic beach hazard limit;
- Assessment of shore protection in the study area, in relation to the dynamic beach hazard limit.
- Recommendations for dynamic beach hazard delineation;
- Public consultation process and meeting with Kettle and Stony Point First Nation;
- Input to Development Guidelines through discussion with SCRCA (provided under separate cover); and
- Preparation of a Best Management Practices fact sheet (brochure) addressing good beach management, to inform and assist property owners (provided under separate cover).

Figure 1.1 Site Location

2.0 DYNAMIC BEACH HAZARD

As outlined in the *Provincial Policy Statement* (Ministry of Municipal Affairs and Housing, 2014),

> *"Hazardous lands adjacent to the shorelines of the Great Lakes - St. Lawrence River System are those lands, which are impacted by flooding, erosion, and/or dynamic beach hazards."*

The dynamic beach hazard limit is defined in Figure 2.1 based on MNR (2001). The "Flood Level" and the "Flooding Allowance" represent the flooding hazard. The flood level is the sum of the mean lake level and storm surge with a combined probability of a 100-year return period (i.e., on average, has a one percent probability of occurring in any given year). For the study area, the MNR 100-year flood level is 177.9 m (IGLD 1985). Further discussion on water levels is provided in Section 3.5.

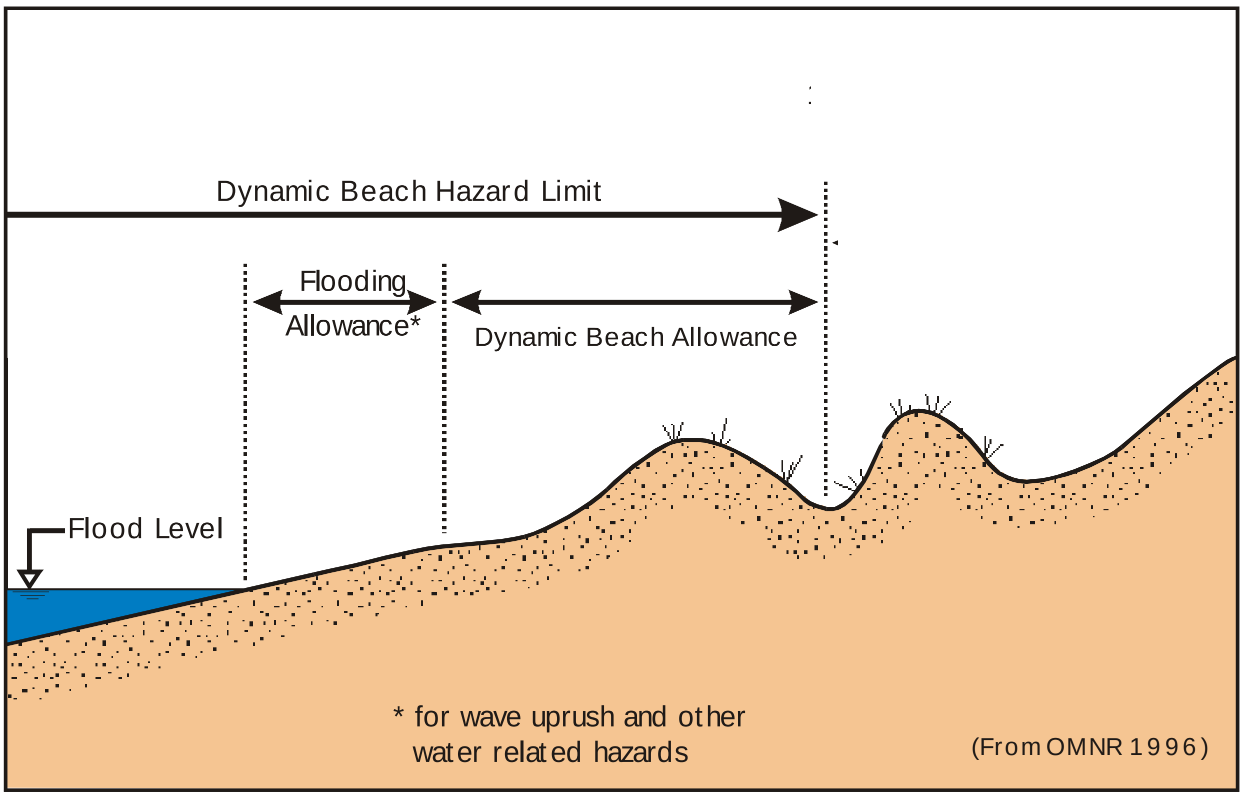


Figure 2.1 Dynamic Beach Hazard Limit

The flooding allowance accommodates wave uprush on the shoreline beyond the water level. The Technical Guide (MNR, 2001) requires a flooding allowance of 15 m, measured horizontally from the location of the flood level, if a study using accepted engineering and scientific principles is not undertaken.

The dynamic beach allowance is intended to permit the natural erosion and accretion of the beach/dune system in response to variable lake levels and storm events. The Technical Guide requires a dynamic beach allowance of 30 m if no study using accepted engineering and scientific principles is undertaken. The sum of the combined flooding and dynamic beach hazard allowances is 45 m measured horizontally from the position of the 100-year flood level. In addition to the flooding and dynamic beach hazard allowances, an erosion allowance must also be considered where appropriate. The erosion allowance is intended to accommodate long-term recession of the shoreline.

This approach was used to delineate the dynamic beach hazard at West Ipperwash for the Shoreline Management Plan Update (Baird, 2011). The shoreline does not appear to be recessional and no erosion allowance was therefore applied. An adjustment of the beach profile to compensate for an extended period of low water levels was included.

Where it is determined that a scientific study using accepted engineering principles would be a more appropriate method for determining the landward limit of the dynamic beach hazard, the Technical Guide allows for this. The following sections outline the approach used in the study to delineate the dynamic beach at West Ipperwash.

3.0 DATA

This section provides a description of data used in the study including: topography, bathymetry, sediment, wave and water level data. Field work undertaken for this study included a UAV survey and sediment sampling on July 28, 2016.

3.1 UAV

To support the mapping of the dynamic beach hazard limit, Baird deployed a UAV to collect low altitude, high resolution digital oblique aerial photography of the study shoreline. The aerial photography was geo-referenced to provide up-to-date images of the site conditions and beach features, including current waterline, structures, vegetation, shore protection and locations of buildings. A registered OLS (Ontario Land Surveyor) conducted a survey of reference precision targets using the Can-Net GPS Virtual Reference Station Network to provide accurate geo-referencing. Property based aerial oblique photos from the UAV are provided in Appendix A.

3.2 Beach Profiles and Bathymetry

Beach profile data at representative locations were extracted from the 2010 Digital Elevation Model (DEM) provided by SCRCA. The DEM has a 0.5-metre resolution. The profile locations are shown in Figure 3.1. Bathymetry data from Canadian Hydrographic Services Field Sheet 8088 surveyed in 1981 with a 1:50,000 scale were used to extend the profiles offshore. Continuous beach profiles extending from the dune to approximately 3.5 km offshore were extracted from the compiled bathymetry and beach profile data.

3.3 Sediment

Sediment samples were collected on July 28, 2016 at 6 locations along the beach. The sample locations are shown in Figure 3.2. Sample IP-S4 was not sent for analysis as it contained a large quantity of organic material. A particle size distribution (PSD) analysis was completed and the results including D_{10}, D_{50}, and D_{90} are summarized in Table 3.1. The beach material is classified as fine sand with D_{50} in the range of 0.14 to 0.20 mm. Complete results of the PSD analysis are provided in Appendix B.

Table 3.1 D10, D50, D90 for Sediment Samples

Sample	D_{10} (mm)	D_{50} (mm)	D_{90} (mm)
IP-S1	0.11	0.16	0.20
IP-S2	0.10	0.14	0.20
IP-S3	0.13	0.20	0.20
IP-S5	0.13	0.18	0.18
IP-S6	0.12	0.18	0.18

Figure 3.1 Profiles Locations for COSMOS Beach Profile Modeling

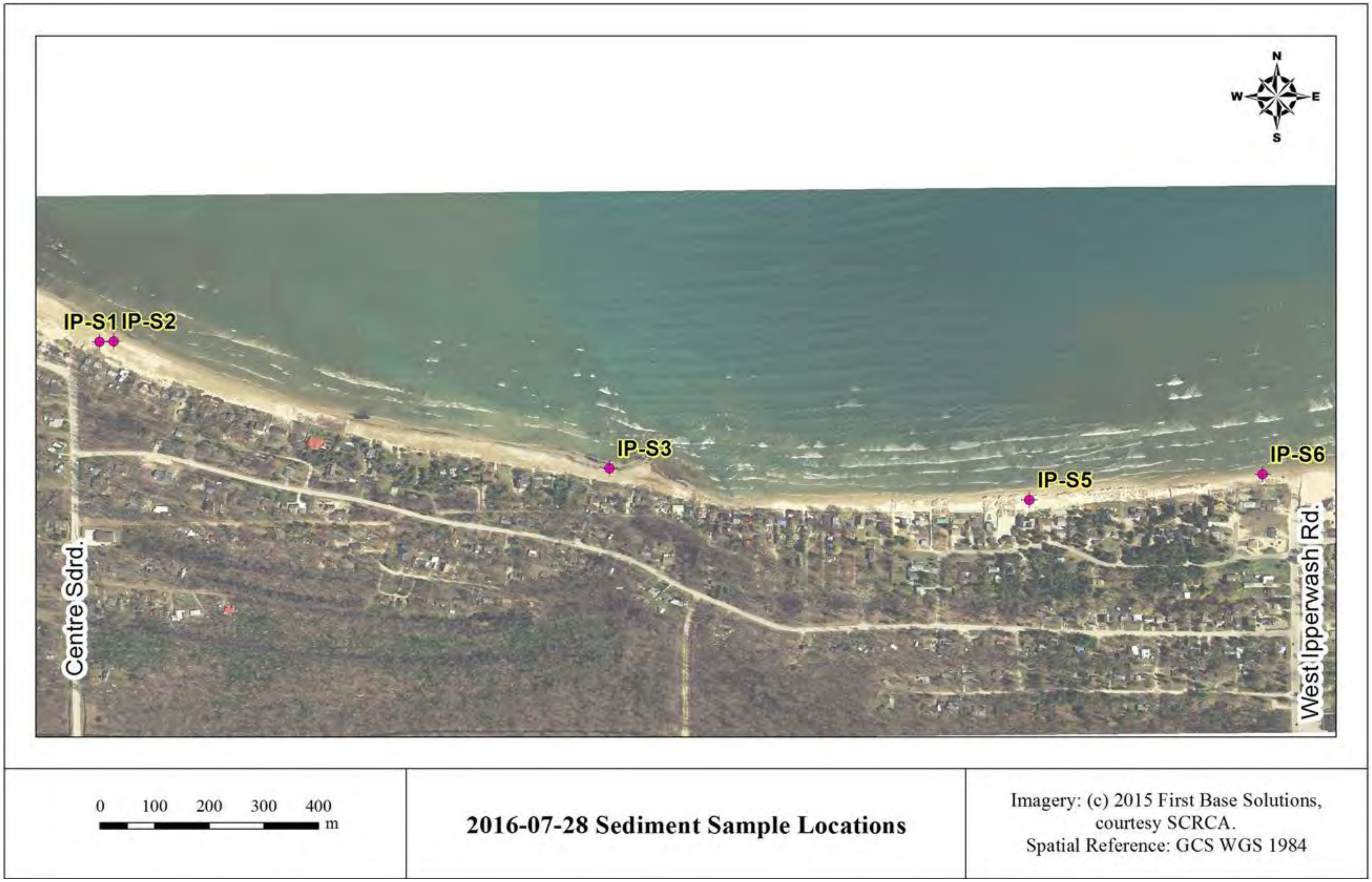


Figure 3.2 Locations of Beach Sediment Samples Collected July 28, 2016

3.4 Waves

Deep water waves from the MNR wave hindcast database (Philpott, 1988) for the period 1953 to 1987 were used to define the wave climate and extreme events. Data were extracted for the hindcast location nearest to the project site; Station H02 - Kettle Point. The deep water waves were transformed to a nearshore depth of 15 m considering the effects of wave refraction and shoaling. A peak over threshold (POT) extreme value analysis (EVA) was performed on the transformed waves to establish extreme events. Table 3.2 lists significant wave heights and corresponding return periods for the transformed nearshore waves.

Table 3.2 Significant Wave Heights with Return Period for Nearshore Waves (15 m depth)

Return Period (Years)	Significant Wave Height (m)
1	3.9
2	4.0
5	4.4
10	4.6
20	4.8
50	5.1
100	5.3

The largest nearshore wave event (15 m depth), had a significant wave height (Hs) of 4.9 m with peak wave period (Tp) of 9.9 s from 17 degrees (NNE); this has a return period between 20 and 50 years. The storm event was scaled to a 20 year event as shown in Figure 3.3, for input to the COSMOS model (discussed in Section 4).

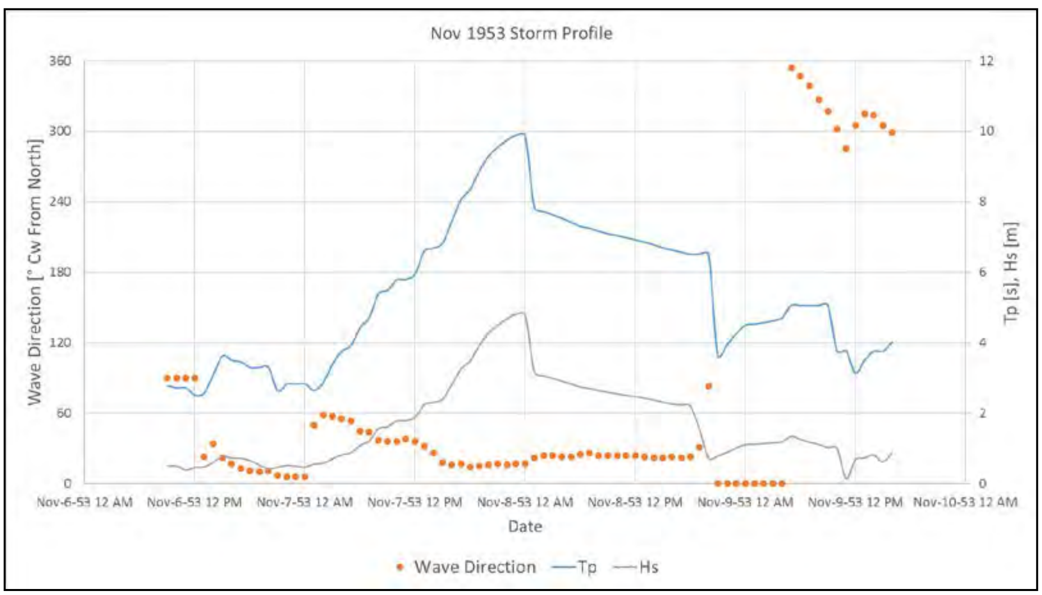


Figure 3.3 Wave Height, Period and Direction Nov 1953 Storm (Philpott, 1988)

3.5 Water Levels

Unless otherwise noted, all elevations in this report are referenced to International Great Lakes Datum (IGLD 1985). Lake Huron Chart Datum is 176.0 m IGLD 1985.

Water levels on Lake Huron vary in the long-term and seasonally in response to climatic conditions, and in the short term due to the passage of individual storm events. Figure 3.4 shows the long term variations in water level on Lake Huron.

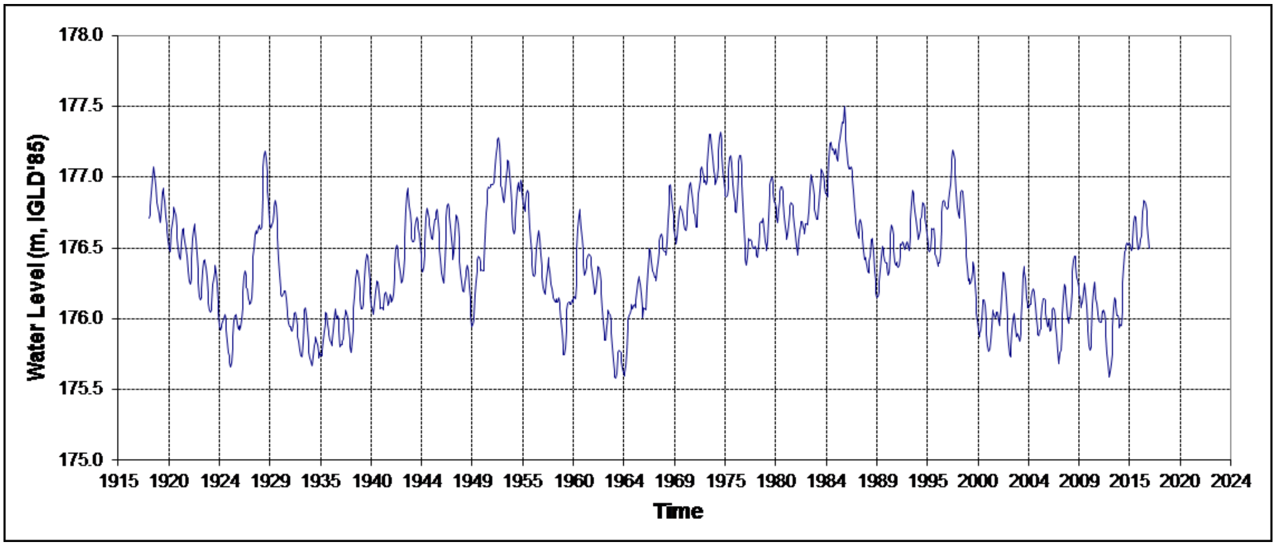


Figure 3.4 Lake Huron Monthly Mean Water Levels (1917 to 2016)

The typical seasonal variation on Lake Huron is approximately 0.3 m, with the average low monthly mean (176.3 m IGLD 1985) occurring in February and the average high monthly mean (176.6 m IGLD 1985) occurring in July. The highest recorded monthly mean water level was 177.5 m in October 1986 (see Figure 3.5), and the lowest recorded monthly mean water level was 175.6 m in January 2013, a difference of almost 2 m. The fluctuation over any given year will vary due to longer-term variations in precipitation, evaporation, runoff, inflow from Lake Superior and outlet at the St. Clair River.

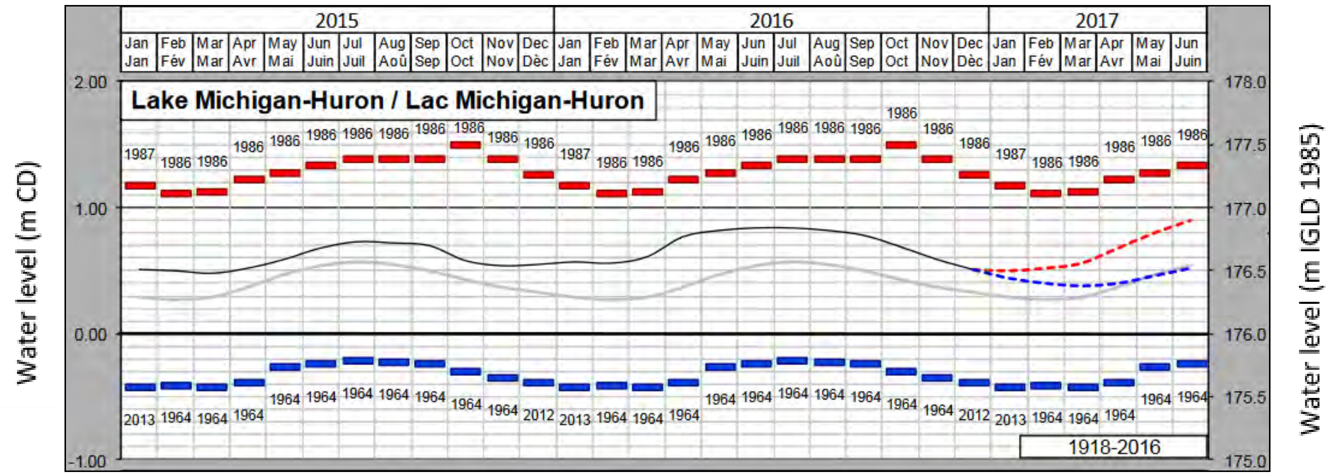


Figure 3.5 Monthly Mean Water Levels on Lake Huron (from Canadian Hydrographic Service)

Short term changes occur in response to storm events (over a period of hours). When winds continue to blow over the lake surface in one direction for several hours, an increase in the water level against the downwind shoreline is produced, this is referred to as “wind setup” or “storm surge”.

The peak instantaneous water level is the sum of the mean lake level and storm surge. The flood level used to define the flood hazard and the dynamic beach hazard (as discussed in Section 2), is the peak instantaneous water level with a combined probability of a 100-year return period (i.e., on average, has a one percent probability of occurring in any given year). The flood level and peak instantaneous water levels for varying return period are defined in the *Great Lakes System Flood Levels and Water Related Hazards* report (MNR, 1989). Table 3.3 lists peak instantaneous water levels at Kettle Point, which is the closest station to the project site.

Table 3.3 Kettle Point Peak Instantaneous Water Levels for Varying Return Periods (MNR,1989)

Return Period (Years)	Water Level (m IGLD’85)
2	177.1
5	177.4
10	177.6
25	177.7
50	177.8
100	177.9
200	178.0

For the purposes of this study, it was assumed that the statistical evaluation of historic water level records provides a suitable basis for establishing the dynamic beach limit in accordance with the *Provincial Policy Statement*. However, it should be noted that other factors such as tectonic uplift, climate change, and erosion of the St. Clair river bed may influence future water levels.

3.6 Shoreline Recession

No evidence of significant shoreline recession was identified from available studies including the shoreline comparison undertaken by SCRCA for the *Lake Huron Shoreline Management Plan Update – 2011*. As there is no distinct top of bluff, and the beach is a dynamic feature, it is difficult to assess shoreline erosion from historical air photo comparison. However, long term accretional ridges are visible in the air photos, indicating the beach is an accretional feature.

4.0 BEACH PROFILE MODELING

4.1 COSMOS Model

The COSMOS model was used to estimate the beach profile response to storm conditions and the wave uprush elevation on the profile. COSMOS is a two-dimensional (2D) profile model that consists of several predictive modules that evaluate the following processes across a shore-perpendicular profile:

- Random wave transformation (including refraction, bottom friction, shoaling, breaking, wave decay, run-up, and overwash);
- Steady currents (including undertow, and wave and tide-induced cross-shore and longshore currents);
- Orbital velocities (linear and non-linear);
- Suspended sediment distribution through the vertical;
- Bed and suspended load sediment transport in cross-shore and longshore directions; and
- 2D profile response due to gradients in cross-shore sand transport.

The model has been applied in over 100 engineering projects throughout the world. For a detailed description of the model, refer to Nairn and Southgate (1993) and Southgate and Nairn (1993). The COSMOS model is based on accepted scientific and engineering principles.

4.2 Model Input

The COSMOS model requires four key inputs: beach profile, waves, water levels and sediment grain size. Beach profiles were developed from the bathymetry and topographic data as described in Section 3.2. The profiles extend from the dune, offshore to a depth of 15 m.

The model was run for selected extreme water levels as defined in Table 3.3. Hourly waves from the deepwater hindcast transformed to the nearshore were used to define the wave conditions at the offshore limit of the profile as described in Section 3.4. The November 1953 storm profile was used as the base storm profile. This event had a significant wave height (H_s) of 4.9 m with peak wave period (T_P) of 9.9 s from 17 degrees (NNE (Figure 3.3). The peak wave height was scaled to match the 20-year return period wave height for the base case scenario. This same process was used to develop the wave input file for other return periods.

Sediment Grain size was defined based on the samples discussed in Section 3.3. A D_{50} of 0.18 mm was used as the base case, this was the median D_{50} from samples. Sensitivity testing was also completed, using different grain sizes, both larger (0.5 mm) and smaller (0.09 mm) than 0.18 mm to assess the effect of grain size on beach profile response.

4.3 Model Runs

The COSMOS model was used to evaluate the beach profile response at each of the profile locations shown in Figure 3.1. A sensitivity analysis was completed to assess the effects of varying water level, wave height and sediment grain size.

4.3.1 Base Case

The COSMOS model was run for the four representative profile locations shown in Figure 3.1. The model was run at the 100-year peak instantaneous water level; 177.9 m with the 20 year return period wave event. This is consistent with the return periods recommended in the Technical Guide, for assessing the dynamic beach hazard. A representative D_{50} of 0.18 mm was used. The results of the model runs showing the initial profile and the profile after the storm are provided in Appendix C.

For the base case, the COSMOS model predicted the limit of wave uprush resulting in a beach profile response, in the range of elevation 178.9 m (Profile 1) to 179.5 m (Profile 2). The notable difference between these two profiles, which are in close proximity, is the presence of the foredune at Profile 1. Although the foredune at Profile 1 was eroded when exposed to the storm event, it provided a level of natural protection, as demonstrated by the lower uprush elevation.

At Profiles 3 and 4, the nearshore depths are shallower due to the shale outcrop. Wave energy is reduced, resulting in lower wave uprush elevations, in the range of 178.5 m. The corresponding profile adjustment is also reduced when compared with Profiles 1 and 2, as shown in Appendix C.

4.3.2 Sensitivity Analysis

Water Level and Wave Height

A sensitivity analysis was completed, to assess the effects of varying water level and wave height on beach profile response to extreme events. The COSMOS model was run for the water levels and peak wave heights listed in Table 4.1. The November 1953 storm profile was used and peak wave heights were scaled for the appropriate return period. Output from the COSMOS model is provided in Appendix C.

Table 4.1 COSMOS Runs to Evaluate Sensitivity to Water Level and Wave Height

Run	Profile	Water Level Return Period	Water Level (m IGLD'85)	Wave Height Return Period	Wave Height (m)[1]
1	1	100-year	177.9	20-year (2 storms)	4.8
2	1	10-year	177.7	20-year	4.8
3	1	10-year	177.7	2-year	4.0

[1] Hs transformed to 15 m depth

The COSMOS model predicted higher uprush and significantly more erosion of the beach profiles when the profile was exposed to two 20-year return period wave events at the 100 year water level (Run 1). At Profile 1 for example, wave uprush extended to elevation 179.0 m. This is representative of the beach response when exposed to two consecutive storms, with no time for the profile to recover between the storm events.

When the water level was reduced to the 10-year return period water level combined with the 20 year return period waves (Run 2), the wave uprush reduced. For Run 3 (10-year return period water level and 2 year return period waves), wave uprush reduced further and the profile erosion was less. In general, the profile response is more sensitive to changes in water level. During high water levels, it is not unreasonable to expect that the profile may be exposed to two storm events, over the fall or winter, without time for recovery.

<u>Sediment Grain Size</u>

A sensitivity analysis was also completed to assess the effects of varying sediment grain size. The COSMOS model was run for the base case (100 year return period water level with 20 year return period waves), with grain sizes of 0.10 mm and 0.50 mm for comparison with the base case (0.18 mm). Output from the COSMOS model is provided in Appendix C. Both wave uprush and beach profile response are sensitive to grain size. When the grain size was reduced to 0.10 mm, uprush extended to higher elevations with increased erosion. When the grain size was increased to 0.50 mm, erosion was significantly reduced.

5.0 DYNAMIC BEACH HAZARD LIMIT

The results of the COSMOS modeling were used to develop recommendations for the beach hazard limit. The results from the base case event, 100-year return period water level and 20 year return period wave presented in Section 4.3.1 were used to define an elevation representing the limit for wave uprush and beach profile response. Consideration was given to the sensitivity analysis presented in Section 4.3.2, in selecting the elevation. This elevation varies along the length of the study site as demonstrated by the results for the representative profiles modelled. The wave uprush and beach profile response elevations are listed in Table 5.1 for the profiles modeled, and the wave uprush limit for the study area is plotted in Appendix D. In areas where the dune has been removed and the backshore regraded, such as the lot immediately east of Profile 1, elevations are lower and the setback is further landward.

Table 5.1 Recommended Elevation for Wave Uprush and Beach Profile Response

Profile	Recommended Elevation for Wave Uprush and Beach Profile Response (m IGLD 1985)
1	179.5
2	179.5
3	179.0
4	179.0

A low water level adjustment of 15 m measured horizontally inland from the elevation for wave uprush and beach profile adjustment is recommended; this is consistent with the 2011 Shoreline Management Plan Update (Baird, 2011). The topography data used to develop the beach profiles and mapping was the 2010 DEM provided by SCRCA. The data were collected during an extended period of low water levels.

Changes in beach profile elevation occur in response to lake level variations. During periods of higher lake levels, the beach profile erodes, and during periods of lower lake levels, the beach profile accretes. This can have an impact on the horizontal position of the 100-year flood elevation and in turn, on the location of the flood and dynamic beach hazard limits. Lake Huron water levels were below average from approximately 1998 to 2014, and this resulted in significant accretion at Ipperwash Beach. Based on analyses of beach profiles, presented in Baird (2011), a 15 m horizontal adjustment to the dynamic beach hazard limit was recommended.

An additional setback of 10 m from the elevation for wave uprush and beach profile response, plus the low water level adjustment (15 m) is recommended, for a total setback of 25 m from the elevation for wave uprush and beach profile response. This is considered a safety buffer based on variability as indicated in the sensitivity analysis.

At the west end of the study area, near Centre Sideroad, elevations are below the wave uprush elevation. The setback defined in the 2011 Shoreline Management Plan Update (Baird, 2011) is recommended in this area, as shown on the mapping in Appendix D. Additional measures may be required to address the flood hazard.

The recommended dynamic beach hazard limit is plotted in Appendix D.

6.0 SHORE PROTECTION

Seawalls have been constructed along much of the shoreline of West Ipperwash Beach. The seawalls are generally constructed of stone, concrete or steel sheet pile; examples are shown in Figure 6.1.

Figure 6.1 Examples of Stone and Concrete Seawall and Steel Sheet Pile Seawall in the Study Area

The effectiveness of the existing structures was assessed through a review of their performance during storm conditions and an assessment of wave overtopping. During wave overtopping, water passes over the structure. If there is sufficient overtopping, the inland areas behind the structure are flooded, and in extreme cases, exposed to wave action. This can result in scour and a loss of the back-fill material inshore of the structure. Examples of the seawalls along West Ipperwash Beach, following storm events in March 1973, when the monthly mean water level was 177.0 m, are shown in Figures 6.2a and b.

The EurOtop Overtopping Manual indicates that for urban settings, where there are buildings, houses or cottages immediately shoreward of the coastal structure, mean overtopping discharge should be limited to 0.001 $m^3/s/m$ (EurOtop, 2016).

Overtopping was calculated for some typical structures along West Ipperwash Beach using Ahrens and Heimbaugh (1988) . The inputs required include: the depth at the toe of the structure; wave height, which is depth limited at the toe of the structure; and freeboard. Overtopping rates were calculated for the 100-year flood level (177.9 m).

Figure 6.1a March 1973 Scour behind Seawall from Overtopping after Storm Event

Figure 6.2b March 1973 Scour behind Seawall from Overtopping after Storm Event

Table 6.1 Calculated Overtopping Rates for Selected Seawalls on West Ipperwash Beach

Location	Structure Crest Elevation (m IGLD'85)	Depth at Toe of Structure during 100-year Water Level (m)	Depth Limited Wave Height (m)	Freeboard (m)	Vertical Wave Uprush (m)	Overtopping ($m^3/s/m$)
6164 Jane St	177.98	0.20	0.16	0.08	0.89	1.087
6268 Spruce St	178.81	0.67	0.54	0.91	1.34	0.004
Cedar Dr 6230	179.20	0.24	0.19	1.30	10.91	0
Juniper Lane 6210	179.35	0.27	0.22	1.45	0.99	0

The results of the overtopping analysis indicate that structures with a crest elevation below 179.2 m are not sufficient to reduce the risk of flooding. The sensitivity of the walls to overtopping, considering scour in front of the wall was also assessed. With 1 m of scour in front of the wall, overtopping exceeded the recommended limit in all cases.

Some of the most common mechanisms for seawall failure include: overtopping and scour of the backfill, scour and undermining at the toe of the seawall, and flanking around the ends of the seawall when the adjacent property is not adequately protected.

In general, seawalls are not recommended on dynamic beaches. A beach offers natural protection against flood and erosion damage. Dunes absorb wave energy during large storms, protecting inland areas. They also provide a reservoir of sand to replace beach material that is carried offshore during a storm. The construction of seawalls prevents the beach from behaving dynamically. Seawalls restrict the natural beach response. When seawalls are constructed on the dynamic beach, wave reflection and scour occur when the wall is exposed to wave action. This may lead to ultimate failure of the wall and a reduction in beach width.

7.0 CONSULTATION AND ENGAGEMENT

7.1 Kettle and Stony Point First Nation

The Supreme Court of Canada determined that First Nations have use of the foreshore beach, but that lot parcels are privately owned. The following motion was passed by the SCRCA Board of Directors in 2012.

"That the board of Directors acknowledges the discussion paper on the SCRCA jurisdiction on West Ipperwash Beach area dated September 7th, 2012 and further concurs that their understanding, at this time, is that the St. Clair Conservation Authority does not have regulatory jurisdiction over First Nations activity described under Section 28 of the Conservation Authorities Act."

An information letter about the project and request for feedback was provided to Chippewas of Kettle and Stony Point First Nation. KSPFN's Consultation Coordinator contacted the SCRCA project coordinator to discuss the project. The consultant and conservation authority was invited to attend KSPFN council on August 15, 2016 to discuss the project and answer questions. Baird provided a presentation on the project for band council. KSPFN provided their current Beach Management Strategy (see attached in Appendix E).

The final draft assessment will be emailed to KSPFN. Additional consultation will be determined based on feedback received and municipal support.

7.2 West Ipperwash Landowners and Associated Members

An open house community meeting was held on August 30, 2016 at the Indian Hills Golf Club, to inform the shoreline community about the West Ipperwash Dynamic Beach Assessment and to provide an opportunity for feedback. The notice was mailed and hand delivered to the residences within the reach (Approximately 68 residences). The notice was also emailed to Guy Riopelle, President of West Ipperwash Beach Property Owners Association, who further distributed the notice to the email contact list. The notice was also posted on the Conservation Authority's website. A frequently asked questions and answers sheet was also posted on the website and distributed at the community meeting. The meeting was attended by approximately 50 people in the afternoon session and approximately 8 people in the evening session . A summary of comments received by the Conservation Authority and responses can be found in Appendix E.

The final draft assessment will be emailed to all in attendance and the Conservation Authority contact list. The assessment will be posted on the Authority's website for comment by all parties. Additional consultation will be determined based on feedback received and municipal support.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The *SCRCA Lake Huron Shoreline Management Plan Update – 2011* includes mapping for the erosion, flood and dynamic beach hazards. In the Shoreline Management Plan, the dynamic beach hazard limit was delineated in accordance with the Technical Guide (MNR 2001), which includes a flooding allowance of 15 m measured horizontally from the 100-year flood level plus a dynamic beach allowance of 30 m. A 15 m horizontal adjustment landward, was added to account for low water levels profile adjustment.

This study provides a site-specific assessment of the dynamic beach hazard at West Ipperwash Beach, between Centre Sideroad and West Ipperwash Road. The methodologies used in this study, to estimate the dynamic beach hazard limit are based on accepted engineering and scientific principles and are consistent with the requirements of the Provincial Policy Statement (2005) and the Technical Guideline (MNR, 2001).

8.1 Dynamic Beach Hazard Recommendations

1. The limit of the dynamic beach hazard limit can reasonably be established based on the limit for wave uprush and beach profile response to the 100 year return period water level and the 20 year return period wave event. This elevation varies along the study area. Recommendations have been made based on the COSMOS beach profile modeling, and considering sensitivity to water level, wave height and sediment grain size. A low water level adjustment of 15 m measured horizontally inland from the elevation for wave uprush and beach profile adjustment is recommended; this is consistent with the 2011 Shoreline Management Plan Update (Baird, 2011). An additional setback of 10 m measured horizontally inland, from the low water level adjustment is recommended, for a total setback of 25 m from the elevation for wave uprush and beach profile response. This is considered a safety buffer based on variability as indicated in the sensitivity analysis.

2. The recommended dynamic beach hazard limit is plotted in Appendix D. The beach profile modeling supports an adjustment approximately 0 to 30 metres lakeward (dependent on location), to the dynamic beach hazard limit recommended in the Lake Huron Shoreline Management Plan Update - 2011.

3. It should be noted that the recommended dynamic beach hazard limit is the minimum allowance in accordance with the provisions of the *Provincial Policy Statement* and supporting *Technical Guide.* The dynamic beach hazard is determined at the 100-year flood level and with a 20-year return period wave. There is a risk that water levels and wave heights could exceed these values and that the beach could erode further inland over a period of 100 years. Shore owners must recognize that there are inherent risks associated with flooding, erosion and dynamic beach hazards along the shorelines of the Great Lakes and that these hazards cannot be eliminated.

8.2 General Recommendations

1. Dunes provide natural protection. In areas where the dune is undisturbed, the dune should be retained. Where the natural dune height has been lowered, the dune should be restored with native or comparable sand and beach access should be controlled (e.g. dune walkovers) to minimize disturbances to the dune profile and vegetation.

2. Although the shoreline contains specialized vegetation and habitat, these natural features are not specifically addressed in this report. Important ecological elements should not be disregarded when new development is proposed. Within the dynamic beach hazard limit, natural heritage features (e.g. existing vegetation and dunes) should be retained. Where natural vegetation has been removed, regenerating native vegetation and encouraging dune development will improve the level of natural protection and provide ecological enhancement.

3. Construction of seawalls on the natural dune should be discouraged.

9.0 REFERENCES

Ahrens, J. P., and Heimbaugh, M. S., 1988, Seawall Overtopping Model, Coastal Engineering Proceedings, 1(21).

Baird & Associates, 2011. Lake Huron Shoreline Management Plan Update – 2011. Report prepared for the St. Clair Region Conservation Authority dated 5 December 2011.

EurOtop, 2016. Manual on wave overtopping of sea defences and related structures. An overtopping manual largely based on European research, but for worldwide application.

Ministry of Municipal Affairs and Housing, 2014. Provincial Policy Statement dated April 30, 2014 under Section 3 of the Planning Act.

Ministry of Natural Resources, 2001. Technical Guide for Great Lakes – St. Lawrence River Shorelines, Flooding, Erosion and Dynamic Beaches.

Ministry of Natural Resources, 1997. Natural Hazards Training Manual: Provincial Policy Statement. Public Health and Safety Policies 3.1. Version 1.0

Ministry of Natural Resources, 1989. Great Lakes System Flood Levels and Water Related Hazards.

Nairn, R.B. and Southgate, H.N., 1993. Deterministic Profile Modelling of Nearshore Processes. Part 2. Sediment Transport and Beach Profile Development. Coastal Engineering, Elsevier. Vol. 19. p. 57-96.

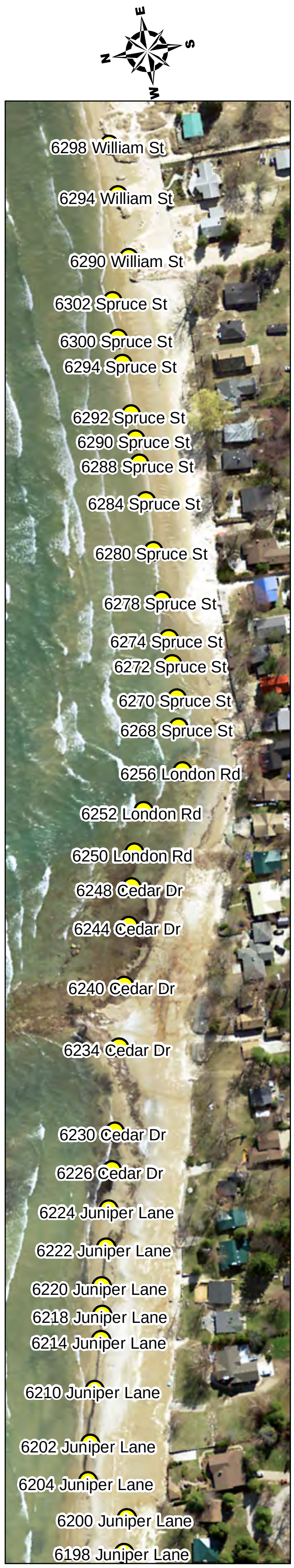
Philpott, 1988. Lake Huron Wave Database, report prepared for the Ministry of Natural Resources.

Southgate, H.N. and Nairn, R.B., 1993. Deterministic Profile Modelling of Nearshore Processes. Part 1. Sediment Transport and Beach Profile Development. Coastal Engineering, Elsevier. Vol. 19. p. 27-56.

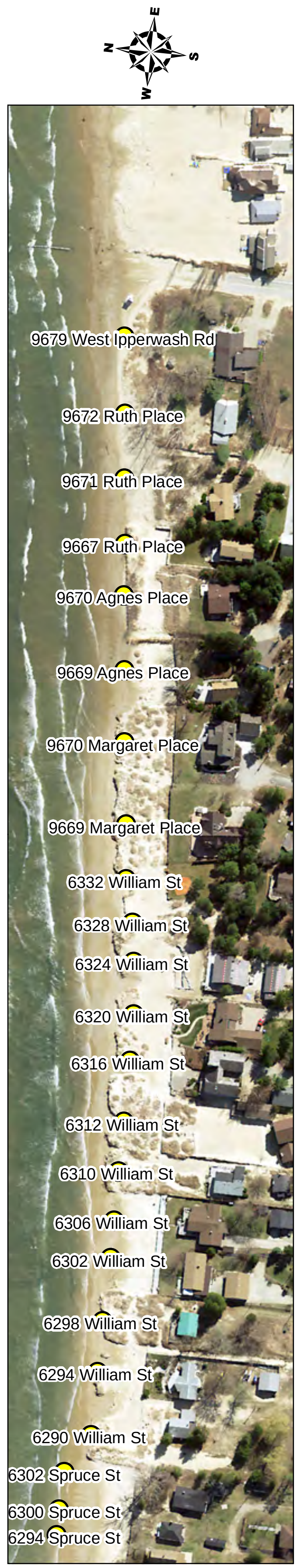
APPENDIX A

PROPERTY BASED AERIAL OBLIQUE PHOTOS

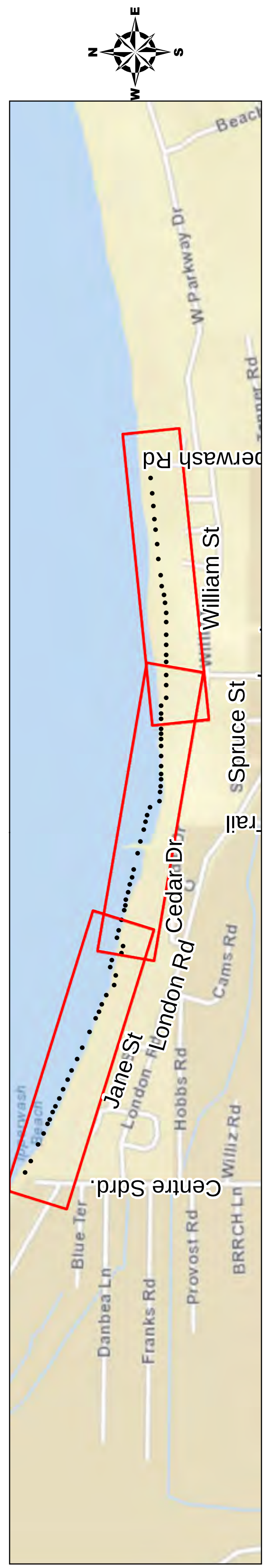
West



Central



East

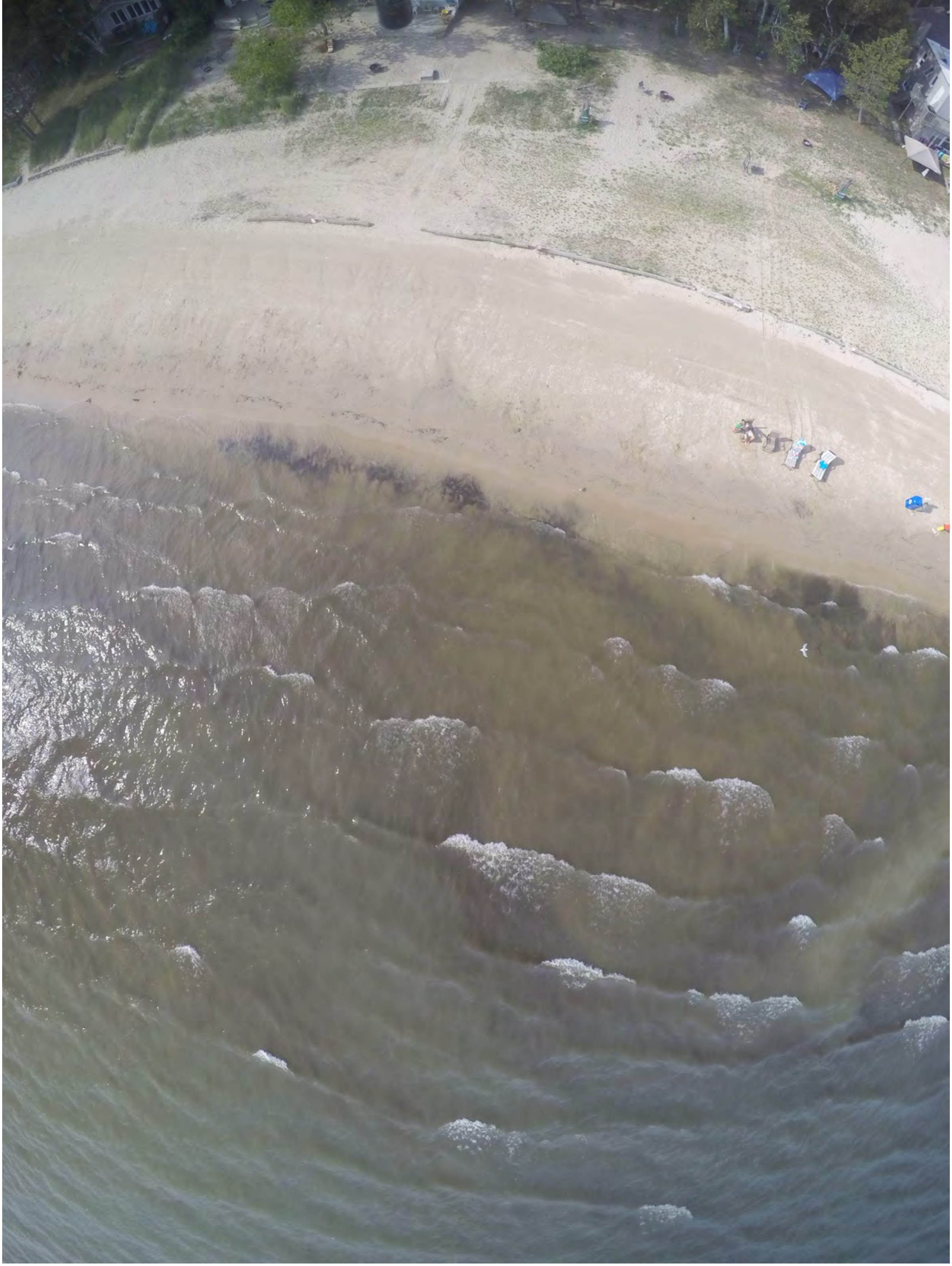


Overview

Centre Rd 9712

Centre Rd 9702 West

Centre Rd 9702 East



Tobias Lane 9708

Tobias Lane 9706

Tobias Lane 9704

Tobias Lane 9702

Tobias Lane 9700

Tobias Lane 9698

Jane St 6144

Jane St 6146

Jane St 6150

Jane St 6154

Jane St 6158

Jane St 6160

Jane St 6164

London Rd 6176

London Rd 6178

London Rd 6182

London Rd 6188

London Rd 6190

London Rd 6194

Juniper Lane 6196

Juniper Lane 6198

Juniper Lane 6200

Juniper Lane 6202

Juniper Lane 6204

Juniper Lane 6210

Juniper Lane 6214

Juniper Lane 6218

Juniper Lane 6220

Juniper Lane 6222

Juniper Lane 6224

Cedar Dr 6226

Cedar Dr 6230

Cedar Dr 6234

Cedar Dr 6240

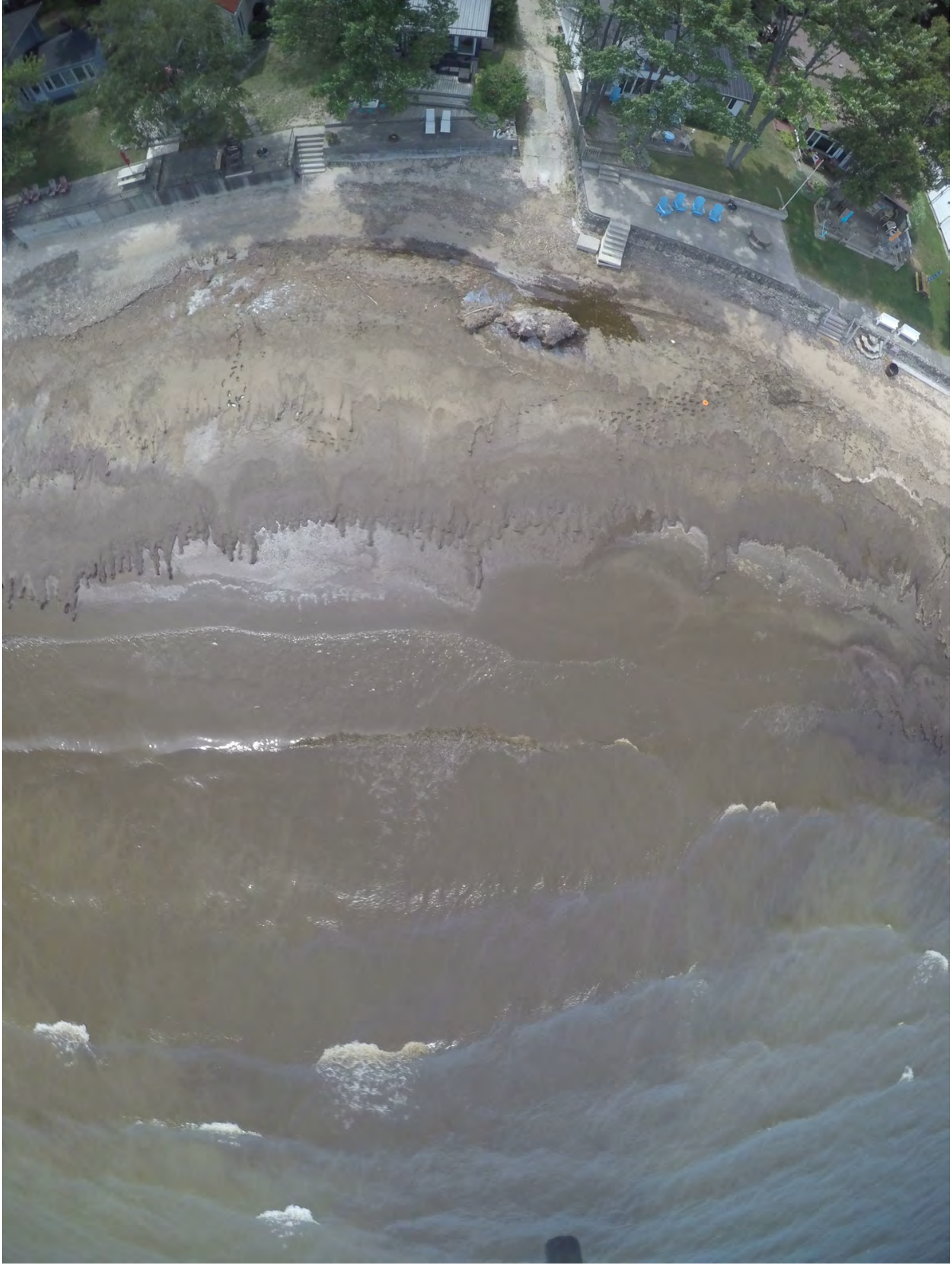
Cedar Dr 6244

Cedar Dr 6248

London Rd 6250

London Rd 6252

London Rd 6256



Spruce St 6268

Spruce St 6270

Spruce St 6272

Spruce St 6274

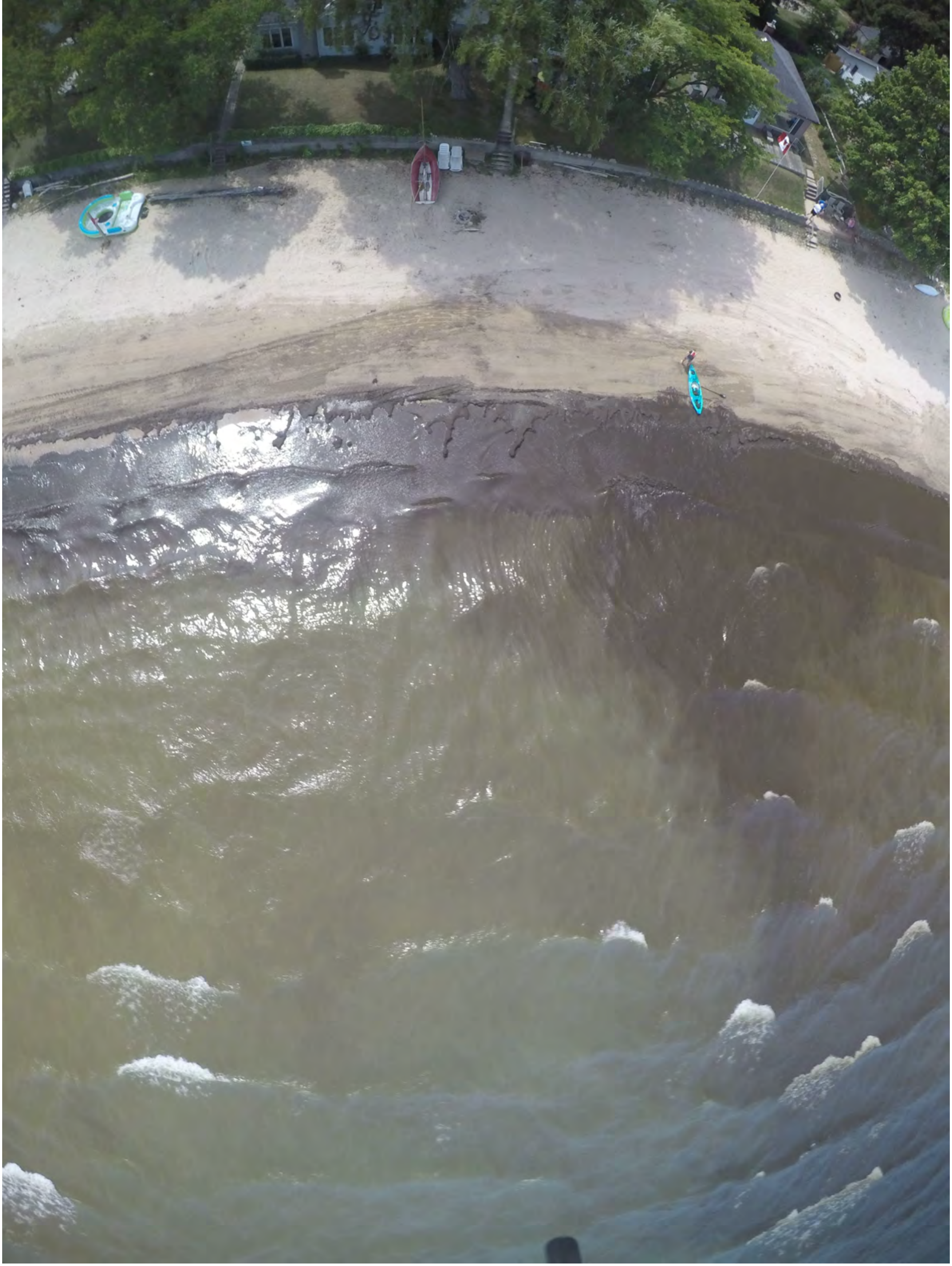
Spruce St 6278

Spruce St 6280

Spruce St 6284

Spruce St 6288

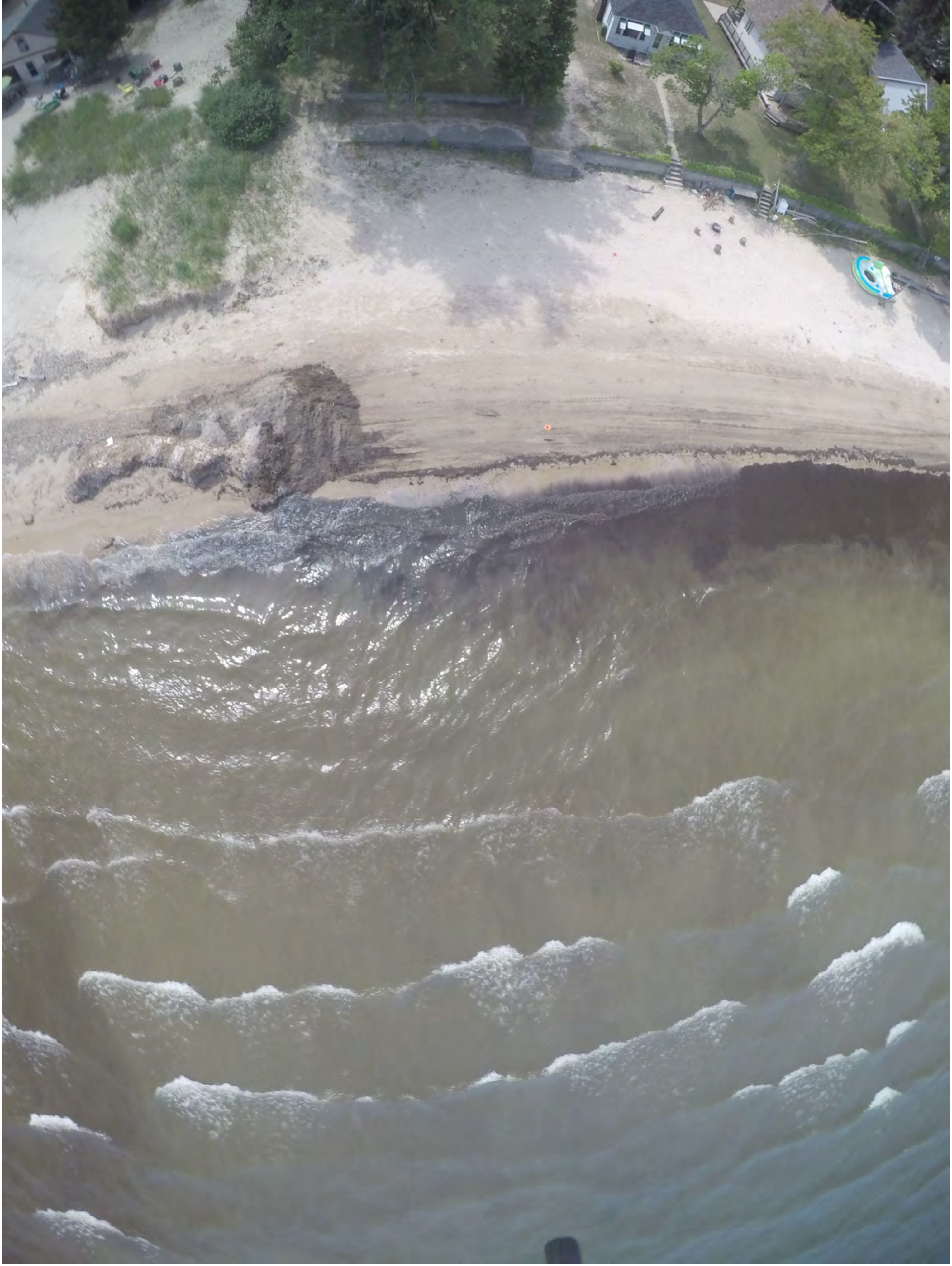
Spruce St 6290



Spruce St 6292

Spruce St 6294

Spruce St 6300



Spruce St 6302

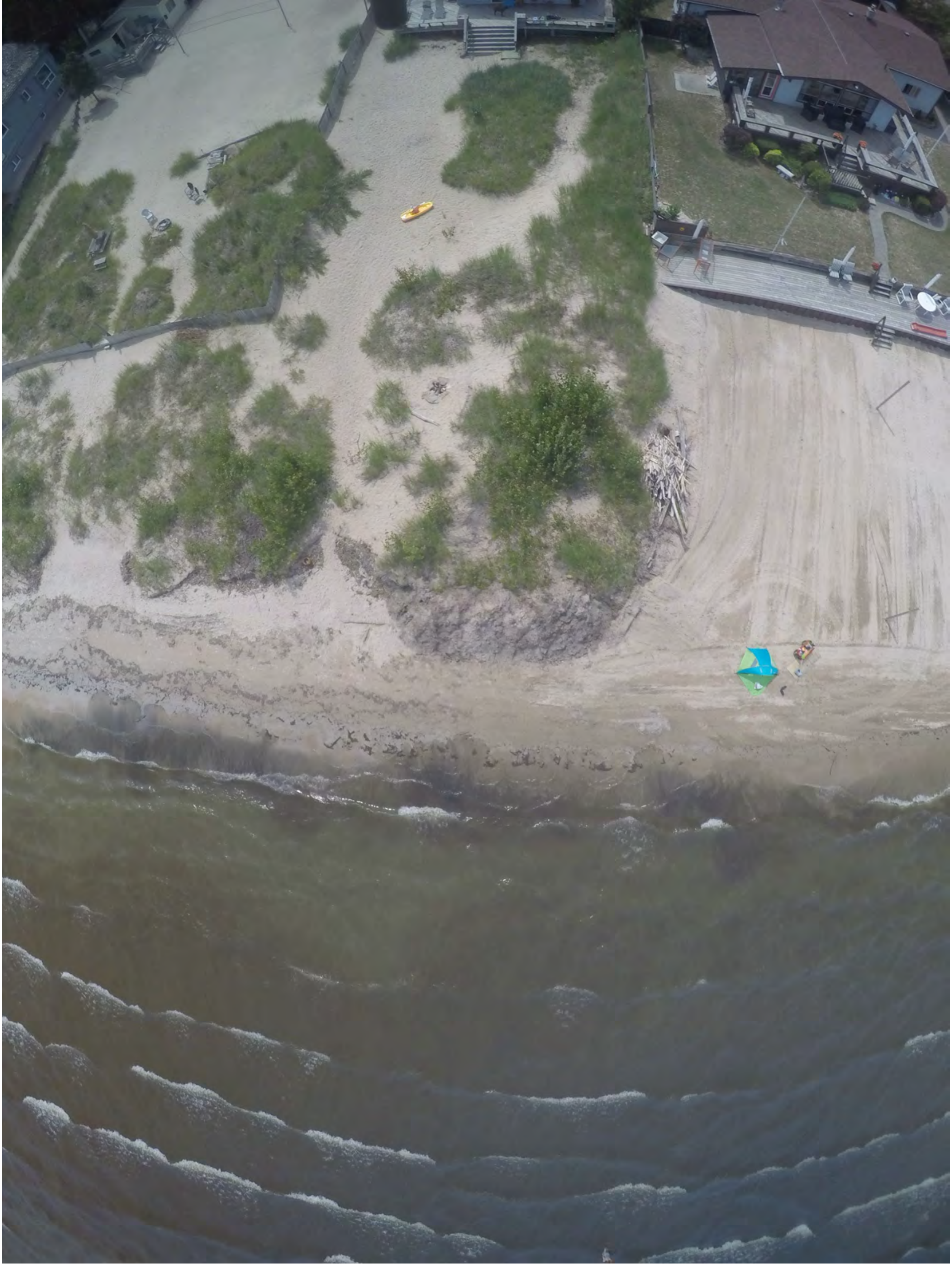
William St 6290

William St 6294

William St 6298

William St 6302

William St 6306

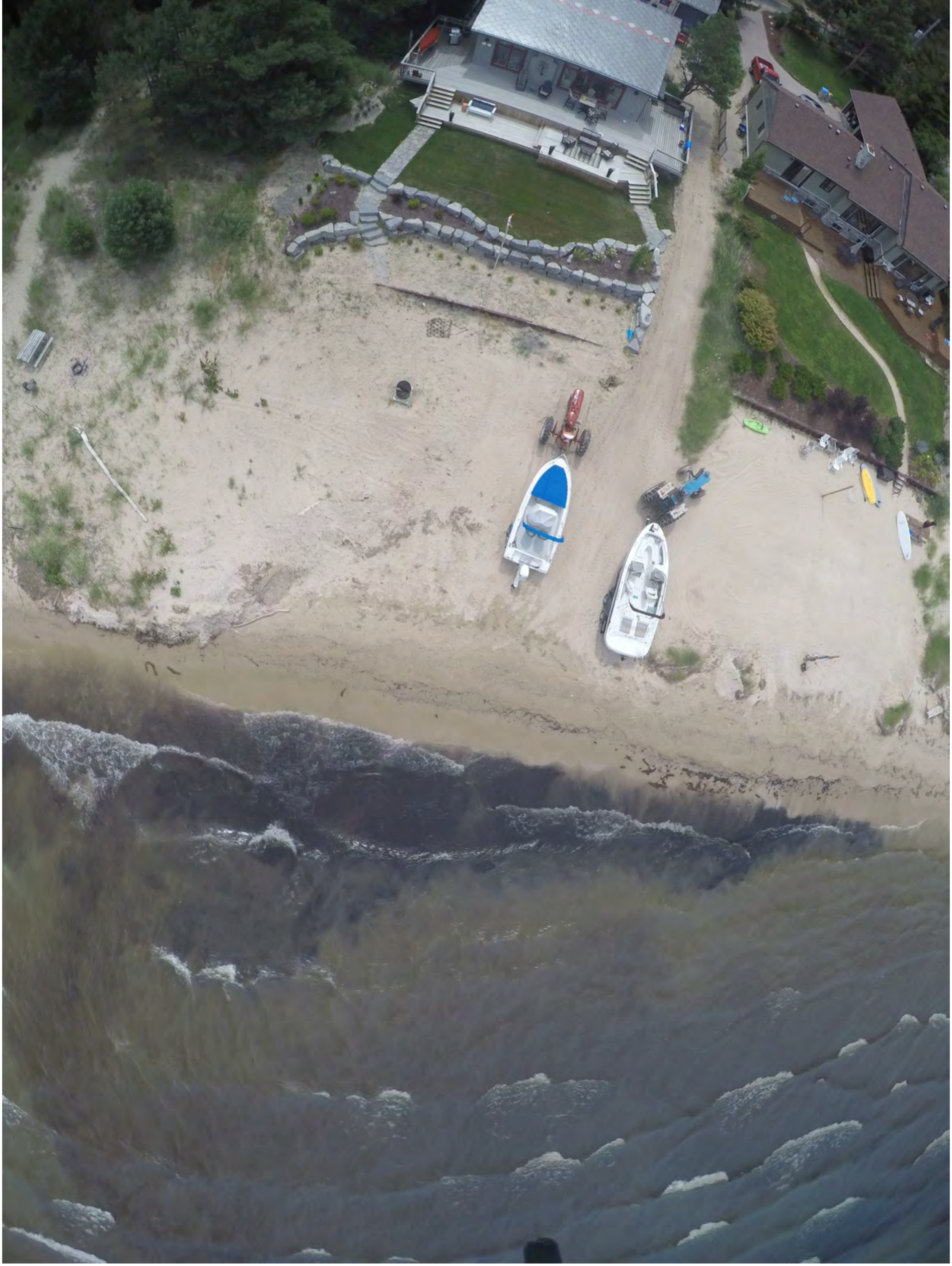


William St 6310

William St 6312

William St 6316

William St 6320



William St 6324

William St 6328

William St 6332

Margaret Place 9669

Margaret Place 9670

Agnes Place 9669

Agnes Place 9670

Ruth Place 9667

Ruth Place 9671

Ruth Place 9672

West Ipperwash Rd 9679

APPENDIX B

PARTICLE SIZE DISTRIBUTION

Terraprobe

SIEVE GRADATION ANALYSIS TEST FORM

PROJECT: **Ipperwash area on Lake Huron**
LOCATION: **Lampton Shores, On.**
CLIENT: **Baird & Associates**
MATERIAL DESCRIPTION: **Sand and Gravel**
SAMPLE LOCATION: **IP-S1**
SAMPLE SUPPLIER:

FILE NO.: **1-16-0497**
SAMPLE DATE: **Aug 10, 2016**
SAMPLED BY: **Client**
TEST DATE: **Aug 11, 2016**
TESTED BY: **S.R.**
LAB NO.: **1178A**

COARSE SIEVES

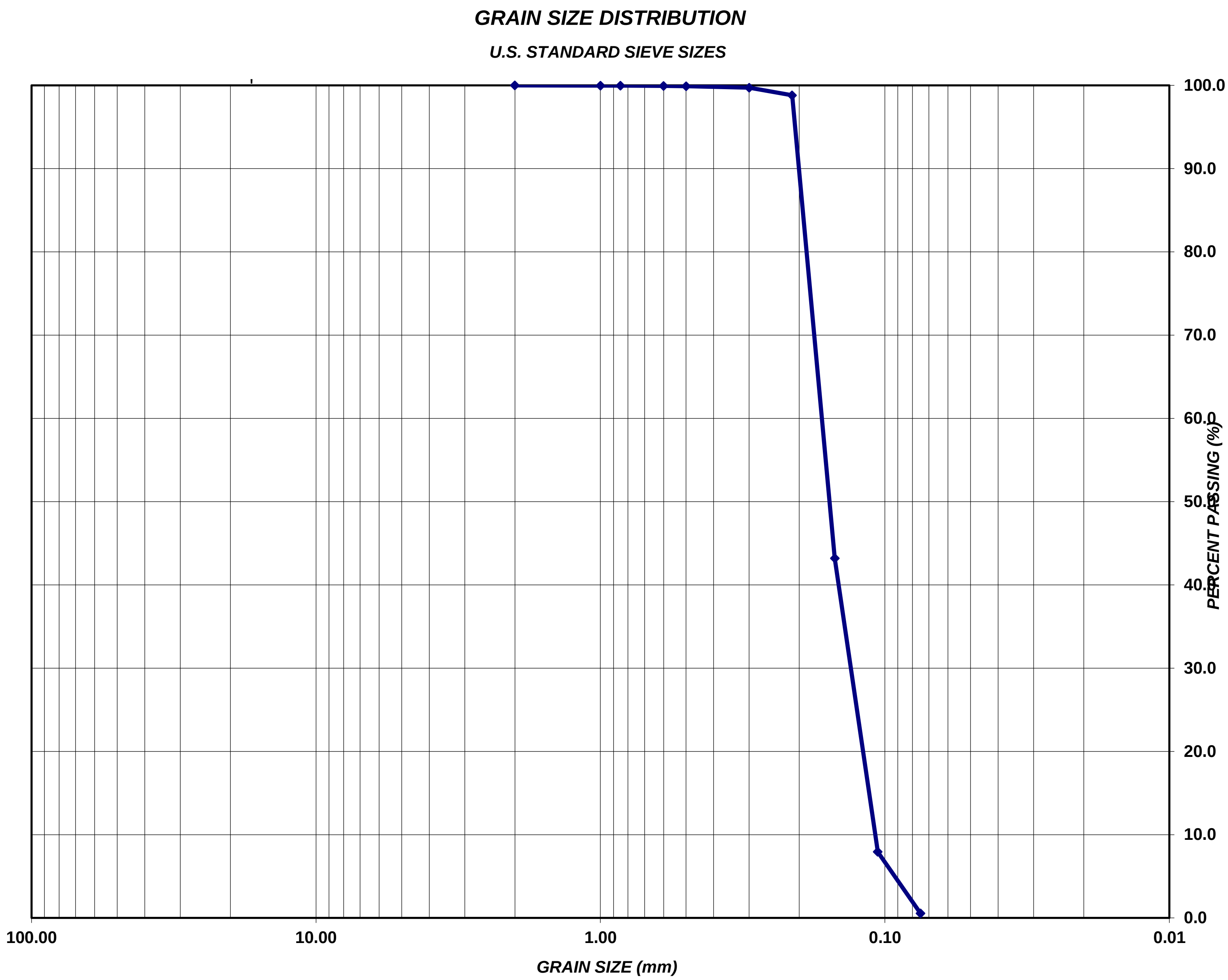
Dry Weight (g)		268.6				
SIEVE SIZE		**CUM. WT.**	**PERCENT**	**PERCENT**	**Weight of Fractions**	
Standard	(mm)	**RET.**	**RET.**	**PASSING**	**Fraction Weight**	
No. 10	2.00	0.00	0.0	100.0	0.00	
No . 18	1.00	0.09	0.0	100.0	3.49	
No. 20	0.850	0.12	0.0	100.0	5.44	
No. 30	0.600	0.19	0.1	99.9	0.07	
No. 35	0.500	0.29	0.1	99.9	0.10	
No. 50	0.300	0.77	0.3	99.7	0.48	
No. 70	0.212	3.20	1.2	98.8	2.43	
No. 100	0.150	152.59	56.8	43.2	149.39	
No. 140	0.106	247.32	92.1	7.9	94.73	
No. 200	0.075	267.11	99.4	0.6	19.79	
PAN		268.54				
Dry Weight After Sieving (g)		268.5				
Percent Loss After Sieving		0.02				

Terraprobe

SIEVE GRADATION ANALYSIS TEST REPORT

PROJECT: **Ipperwash area on Lake Huron**
LOCATION: **Lampton Shores, On.**
CLIENT: **Baird & Associates**
MATERIAL DESCRIPTION: **Sand and Gravel**
SAMPLE LOCATION: **IP-S1**
SAMPLE SUPPLIER:

FILE NO.: **1-16-0497**
LAB NO.: **1178A**
SAMPLE DATE: **Aug 10, 2016**
SAMPLED BY: **Client**



SIEVE SIZE		PERCENT PASSING	GENERAL GRADATION
Standard	(mm)	Sample	
No. 10	2.00	**100.0**	
No . 18	1.00	**100.0**	
No. 20	0.85	**100.0**	
No. 30	0.60	**99.9**	
No. 35	0.50	**99.9**	
No. 50	0.30	**99.7**	
No. 70	0.21	**98.8**	
No. 100	0.15	**43.2**	
No. 140	0.11	**7.9**	
No. 200	0.08	**0.6**	

Terraprobe

SIEVE GRADATION ANALYSIS TEST FORM

PROJECT: Ipperwash area on Lake Huron
LOCATION: Lampton Shores, On.
CLIENT: Baird & Associates
MATERIAL DESCRIPTION: Sand and Gravel
SAMPLE LOCATION: IP-S2
SAMPLE SUPPLIER:

FILE NO.: 1-16-0497
SAMPLE DATE: Aug 10, 2016
SAMPLED BY: Client
TEST DATE: Aug 11, 2016
TESTED BY: S.R.
LAB NO.: 1178B

COARSE SIEVES

Dry Weight (g)		408.5				
SIEVE SIZE		**CUM. WT.**	**PERCENT**	**PERCENT**	**Weight of Fractions**	
Standard	(mm)	**RET.**	**RET.**	**PASSING**	**Fraction Weight**	
No. 10	2.00	0.75	0.2	99.8	0.00	
No . 18	1.00	1.00	0.2	99.8	3.49	
No. 20	0.850	1.12	0.3	99.7	5.44	
No. 30	0.600	1.30	0.3	99.7	0.18	
No. 35	0.500	1.48	0.4	99.6	0.18	
No. 50	0.300	2.22	0.5	99.5	0.74	
No. 70	0.212	6.83	1.7	98.3	4.61	
No. 100	0.150	136.33	33.4	66.6	129.50	
No. 140	0.106	362.44	88.7	11.3	226.11	
No. 200	0.075	404.14	98.9	1.1	41.70	
PAN		408.34				
Dry Weight After Sieving (g)		408.3				
Percent Loss After Sieving		0.04				

Terraprobe

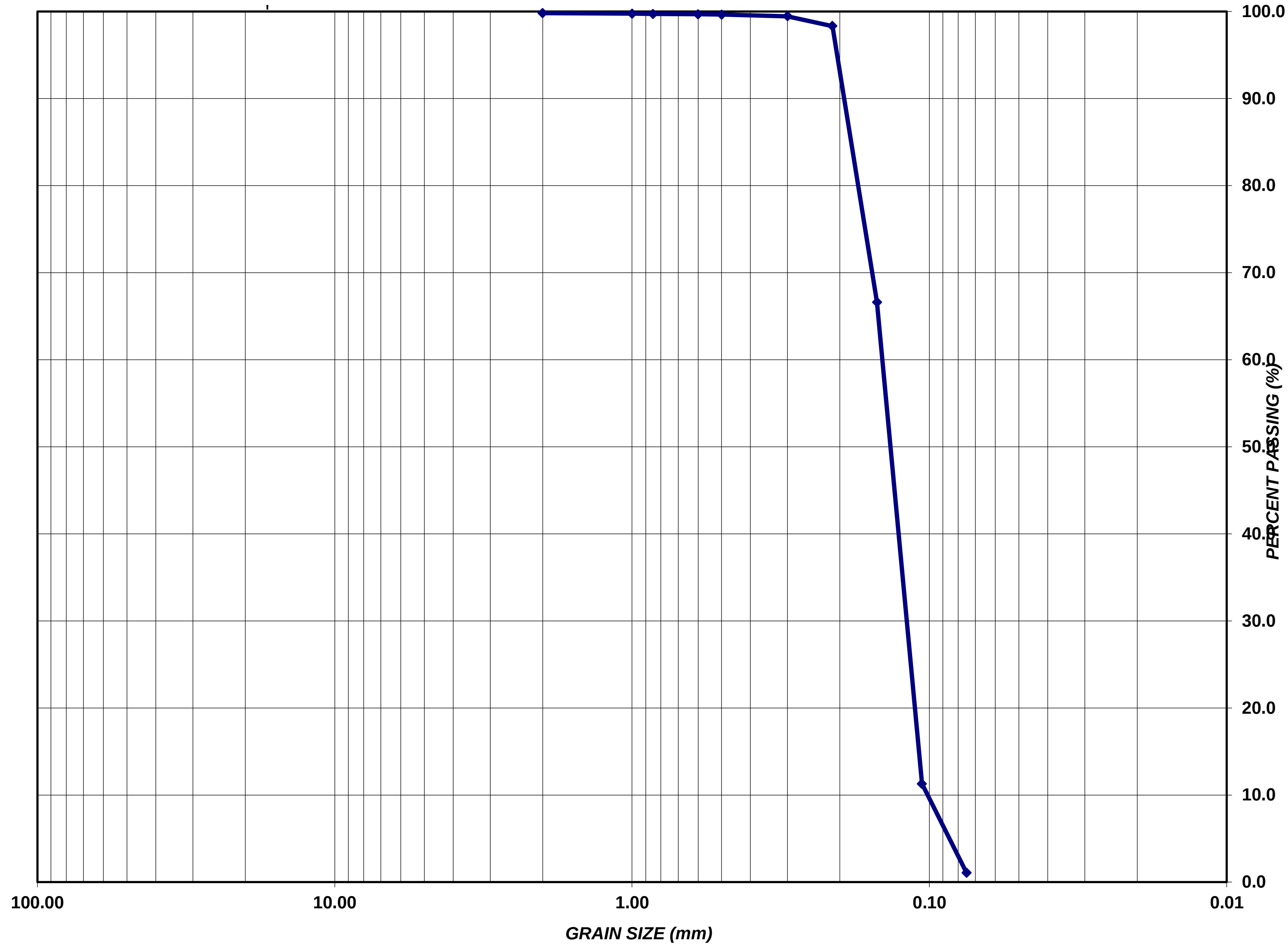
SIEVE GRADATION ANALYSIS TEST REPORT

PROJECT: **Ipperwash area on Lake Huron**
LOCATION: **Lampton Shores, On.**
CLIENT: **Baird & Associates**
MATERIAL DESCRIPTION: **Sand and Gravel**
SAMPLE LOCATION: **IP-S2**
SAMPLE SUPPLIER:

FILE NO.: **1-16-0497**
LAB NO.: **1178B**
SAMPLE DATE: **Aug 10, 2016**
SAMPLED BY: **Client**

GRAIN SIZE DISTRIBUTION

U.S. STANDARD SIEVE SIZES



SIEVE SIZE		PERCENT PASSING	GENERAL GRADATION
Standard	(mm)	Sample	
No. 10	2.00	**99.8**	
No . 18	1.00	**99.8**	
No. 20	0.85	**99.7**	
No. 30	0.60	**99.7**	
No. 35	0.50	**99.6**	
No. 50	0.30	**99.5**	
No. 70	0.21	**98.3**	
No. 100	0.15	**66.6**	
No. 140	0.11	**11.3**	
No. 200	0.08	**1.1**	

Terraprobe

SIEVE GRADATION ANALYSIS TEST FORM

PROJECT: **Ipperwash area on Lake Huron**
LOCATION: **Lampton Shores, On.**
CLIENT: **Baird & Associates**
MATERIAL DESCRIPTION: **Sand and Gravel**
SAMPLE LOCATION: **IP-S3**
SAMPLE SUPPLIER:

FILE NO.: **1-16-0497**
SAMPLE DATE: **Aug 10, 2016**
SAMPLED BY: **Client**
TEST DATE: **Aug 11, 2016**
TESTED BY: **S.R.**
LAB NO.: **1178C**

COARSE SIEVES

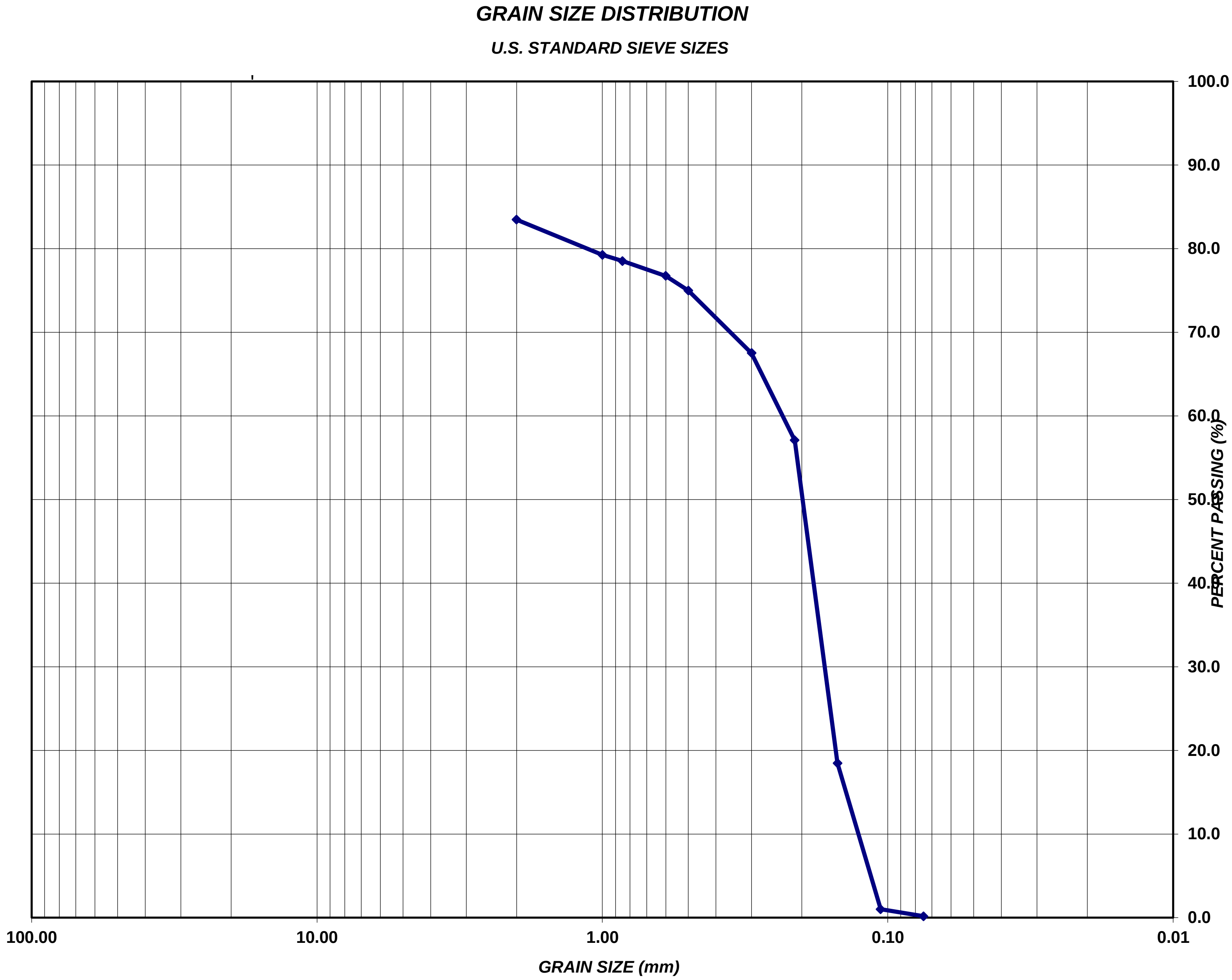
Dry Weight (g)		420.1				
SIEVE SIZE		**CUM. WT.**	**PERCENT**	**PERCENT**	**Weight of Fractions**	
Standard	(mm)	**RET.**	**RET.**	**PASSING**	**Fraction Weight**	
No. 10	2.00	69.44	16.5	83.5	0.00	
No . 18	1.00	87.12	20.7	79.3	3.49	
No. 20	0.850	90.27	21.5	78.5	5.44	
No. 30	0.600	97.74	23.3	76.7	7.47	
No. 35	0.500	105.08	25.0	75.0	7.34	
No. 50	0.300	136.48	32.5	67.5	31.40	
No. 70	0.212	180.27	42.9	57.1	43.79	
No. 100	0.150	342.56	81.5	18.5	162.29	
No. 140	0.106	415.96	99.0	1.0	73.40	
No. 200	0.075	419.42	99.8	0.2	3.46	
PAN		419.97				
Dry Weight After Sieving (g)		420.0				
Percent Loss After Sieving		0.04				

Terraprobe

SIEVE GRADATION ANALYSIS TEST REPORT

PROJECT: **Ipperwash area on Lake Huron**
LOCATION: **Lampton Shores, On.**
CLIENT: **Baird & Associates**
MATERIAL DESCRIPTION: **Sand and Gravel**
SAMPLE LOCATION: **IP-S3**
SAMPLE SUPPLIER:

FILE NO.: **1-16-0497**
LAB NO.: **1178C**
SAMPLE DATE: **Aug 10, 2016**
SAMPLED BY: **Client**



SIEVE SIZE		PERCENT PASSING	GENERAL GRADATION
Standard	(mm)	Sample	
No. 10	2.00	**83.5**	
No . 18	1.00	**79.3**	
No. 20	0.85	**78.5**	
No. 30	0.60	**76.7**	
No. 35	0.50	**75.0**	
No. 50	0.30	**67.5**	
No. 70	0.21	**57.1**	
No. 100	0.15	**18.5**	
No. 140	0.11	**1.0**	
No. 200	0.08	**0.2**	

Terraprobe

SIEVE GRADATION ANALYSIS TEST FORM

PROJECT: **Ipperwash area on Lake Huron**
LOCATION: **Lampton Shores, On.**
CLIENT: **Baird & Associates**
MATERIAL DESCRIPTION: **Sand and Gravel**
SAMPLE LOCATION: **IP-S5**
SAMPLE SUPPLIER:

FILE NO.: **1-16-0497**
SAMPLE DATE: **Aug 10, 2016**
SAMPLED BY: **Client**
TEST DATE: **Aug 11, 2016**
TESTED BY: **S.R.**
LAB NO.: **1178D**

COARSE SIEVES

Dry Weight (g)		458.5				
SIEVE SIZE		**CUM. WT.**	**PERCENT**	**PERCENT**	**Weight of Fractions**	
Standard	(mm)	**RET.**	**RET.**	**PASSING**	**Fraction Weight**	
No. 10	2.00	12.60	2.7	97.3	0.00	
No . 18	1.00	14.09	3.1	96.9	3.49	
No. 20	0.850	14.56	3.2	96.8	5.44	
No. 30	0.600	15.93	3.5	96.5	1.37	
No. 35	0.500	17.47	3.8	96.2	1.54	
No. 50	0.300	29.90	6.5	93.5	12.43	
No. 70	0.212	71.22	15.5	84.5	41.32	
No. 100	0.150	360.07	78.5	21.5	288.85	
No. 140	0.106	454.71	99.2	0.8	94.64	
No. 200	0.075	457.95	99.9	0.1	3.24	
PAN		458.30				
Dry Weight After Sieving (g)		458.3				
Percent Loss After Sieving		0.04				

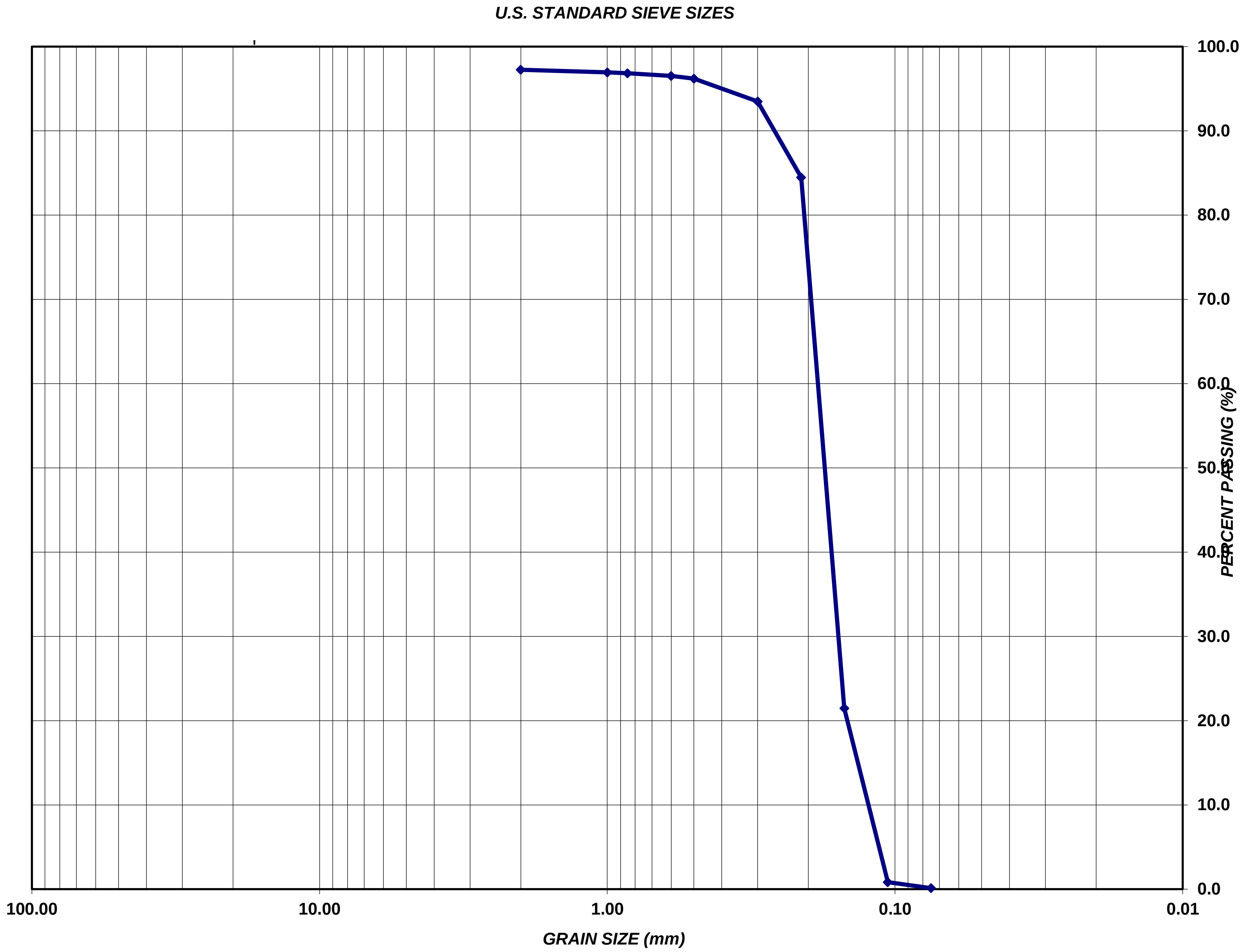
Terraprobe

SIEVE GRADATION ANALYSIS TEST REPORT

PROJECT: **Ipperwash area on Lake Huron**
LOCATION: **Lampton Shores, On.**
CLIENT: **Baird & Associates**
MATERIAL DESCRIPTION: **Sand and Gravel**
SAMPLE LOCATION: **IP-S5**
SAMPLE SUPPLIER:

FILE NO.: **1-16-0497**
LAB NO.: **1178D**
SAMPLE DATE: **Aug 10, 2016**
SAMPLED BY: **Client**

GRAIN SIZE DISTRIBUTION



SIEVE SIZE		PERCENT PASSING	GENERAL GRADATION
Standard	(mm)	Sample	
No. 10	2.00	**97.3**	
No . 18	1.00	**96.9**	
No. 20	0.85	**96.8**	
No. 30	0.60	**96.5**	
No. 35	0.50	**96.2**	
No. 50	0.30	**93.5**	
No. 70	0.21	**84.5**	
No. 100	0.15	**21.5**	
No. 140	0.11	**0.8**	
No. 200	0.08	**0.1**	

Terraprobe

SIEVE GRADATION ANALYSIS TEST FORM

PROJECT: **Ipperwash area on Lake Huron**
LOCATION: **Lampton Shores, On.**
CLIENT: **Baird & Associates**
MATERIAL DESCRIPTION: **Sand and Gravel**
SAMPLE LOCATION: **IP-S6**
SAMPLE SUPPLIER:

FILE NO.: **1-16-0497**
SAMPLE DATE: **Aug 10, 2016**
SAMPLED BY: **Client**
TEST DATE: **Aug 11, 2016**
TESTED BY: **S.R.**
LAB NO.: **1178E**

COARSE SIEVES

Dry Weight (g)		436.5				
SIEVE SIZE		**CUM. WT. RET.**	**PERCENT RET.**	**PERCENT PASSING**	**Weight of Fractions**	
Standard	(mm)				**Fraction Weight**	
No. 10	2.00	1.88	0.4	99.6	0.00	
No . 18	1.00	2.19	0.5	99.5	3.49	
No. 20	0.850	2.32	0.5	99.5	5.44	
No. 30	0.600	2.60	0.6	99.4	0.28	
No. 35	0.500	2.98	0.7	99.3	0.38	
No. 50	0.300	8.76	2.0	98.0	5.78	
No. 70	0.212	47.88	11.0	89.0	39.12	
No. 100	0.150	335.89	76.9	23.1	288.01	
No. 140	0.106	432.31	99.0	1.0	96.42	
No. 200	0.075	436.11	99.9	0.1	3.80	
PAN		436.30				
Dry Weight After Sieving (g)		436.3				
Percent Loss After Sieving		0.05				

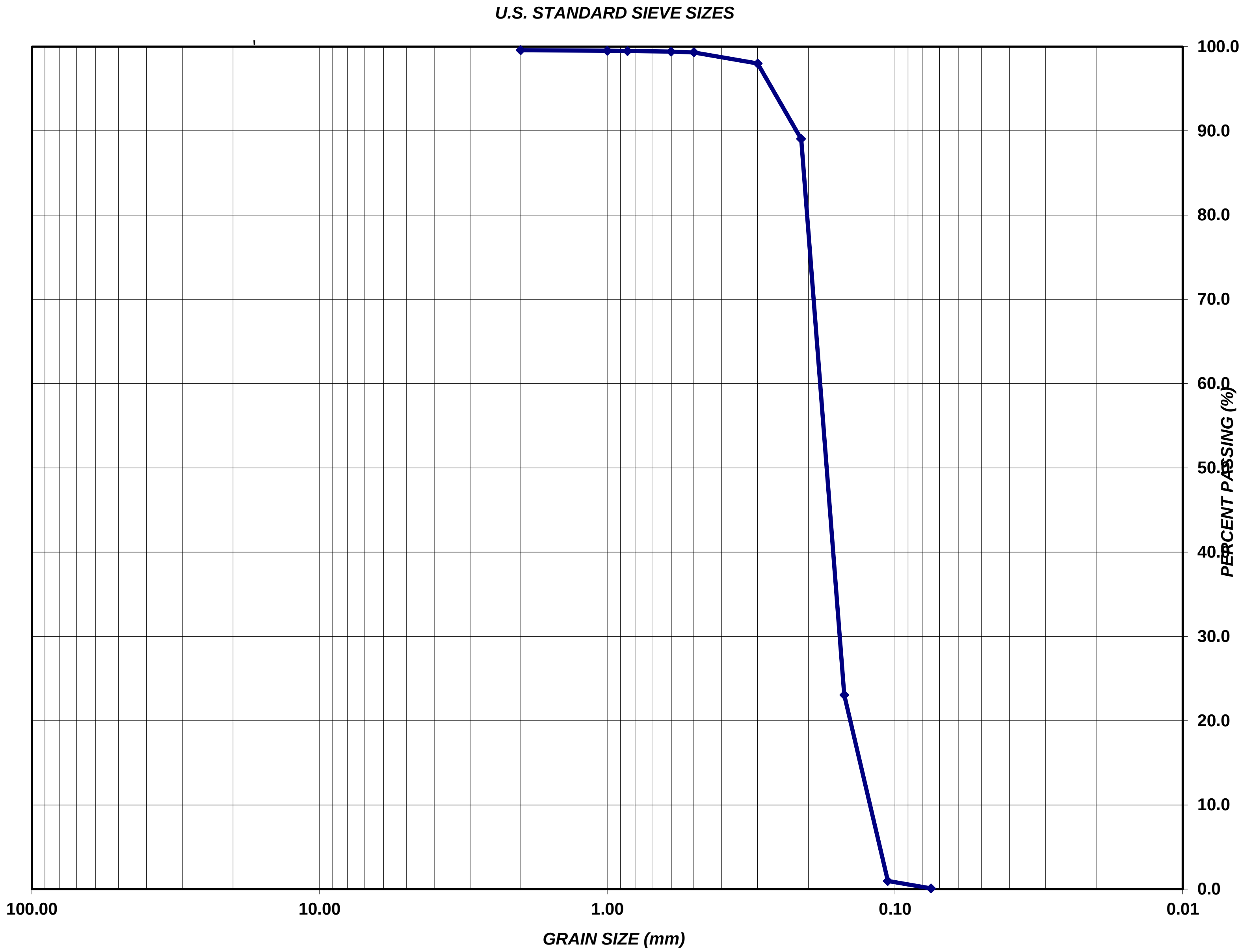
Terraprobe

SIEVE GRADATION ANALYSIS TEST REPORT

PROJECT: **Ipperwash area on Lake Huron**
LOCATION: **Lampton Shores, On.**
CLIENT: **Baird & Associates**
MATERIAL DESCRIPTION: **Sand and Gravel**
SAMPLE LOCATION: **IP-S6**
SAMPLE SUPPLIER:

FILE NO.: **1-16-0497**
LAB NO.: **1178E**
SAMPLE DATE: **Aug 10, 2016**
SAMPLED BY: **Client**

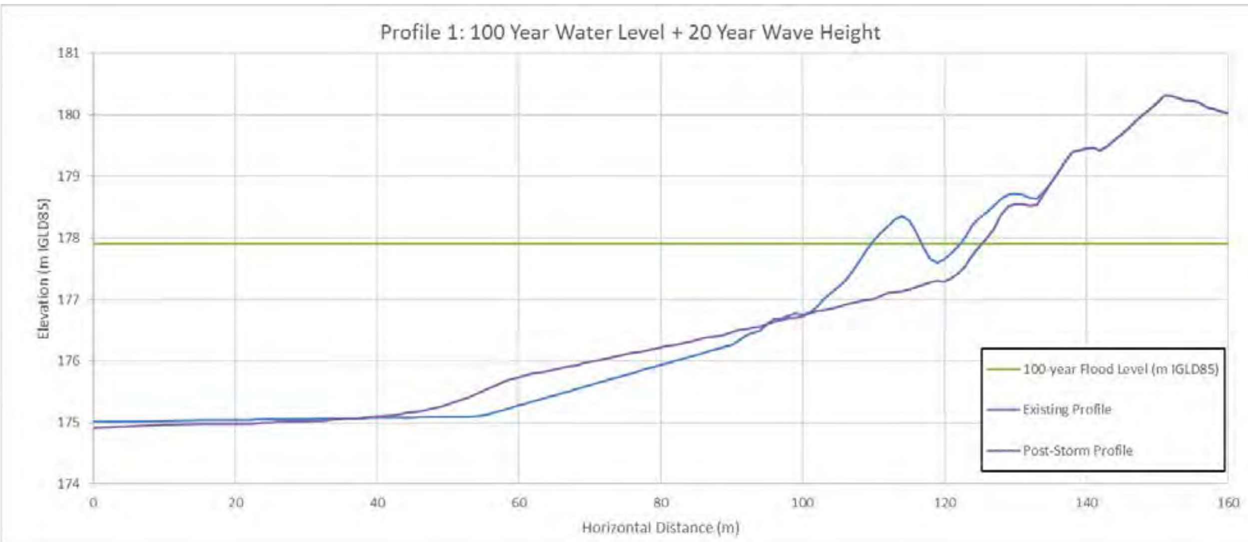
GRAIN SIZE DISTRIBUTION

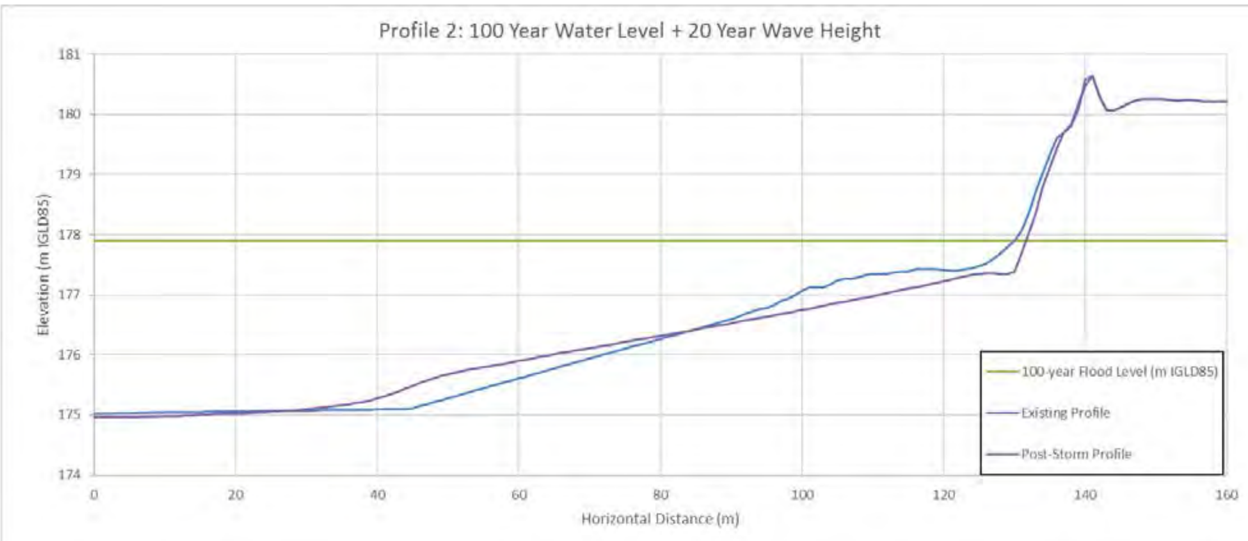


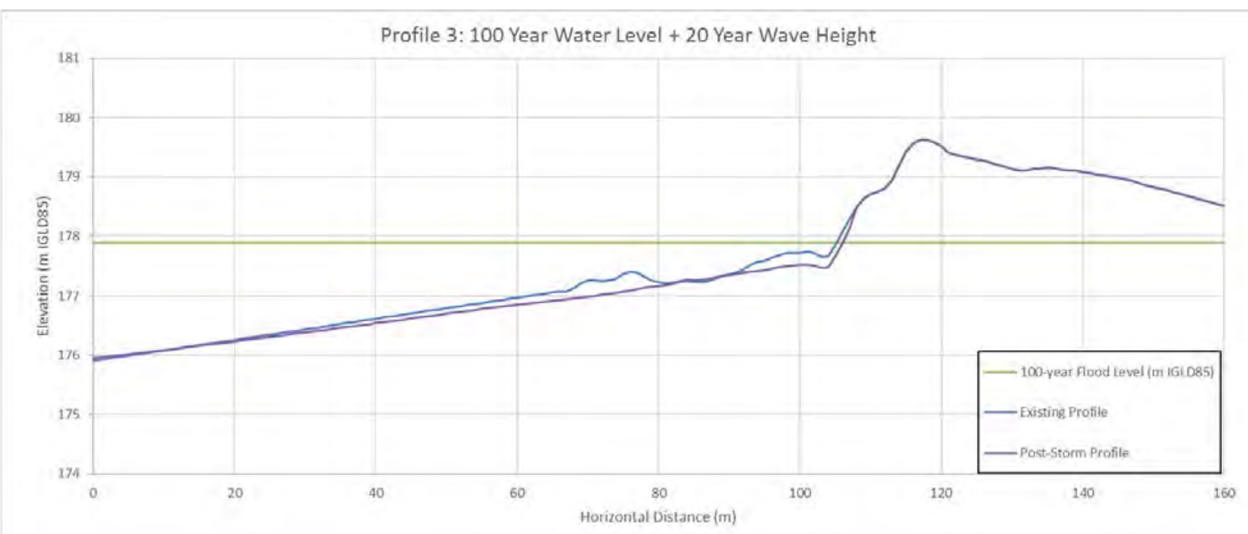
SIEVE SIZE		PERCENT PASSING	GENERAL GRADATION
Standard	(mm)	Sample	
No. 10	2.00	**99.6**	
No . 18	1.00	**99.5**	
No. 20	0.85	**99.5**	
No. 30	0.60	**99.4**	
No. 35	0.50	**99.3**	
No. 50	0.30	**98.0**	
No. 70	0.21	**89.0**	
No. 100	0.15	**23.1**	
No. 140	0.11	**1.0**	
No. 200	0.08	**0.1**	

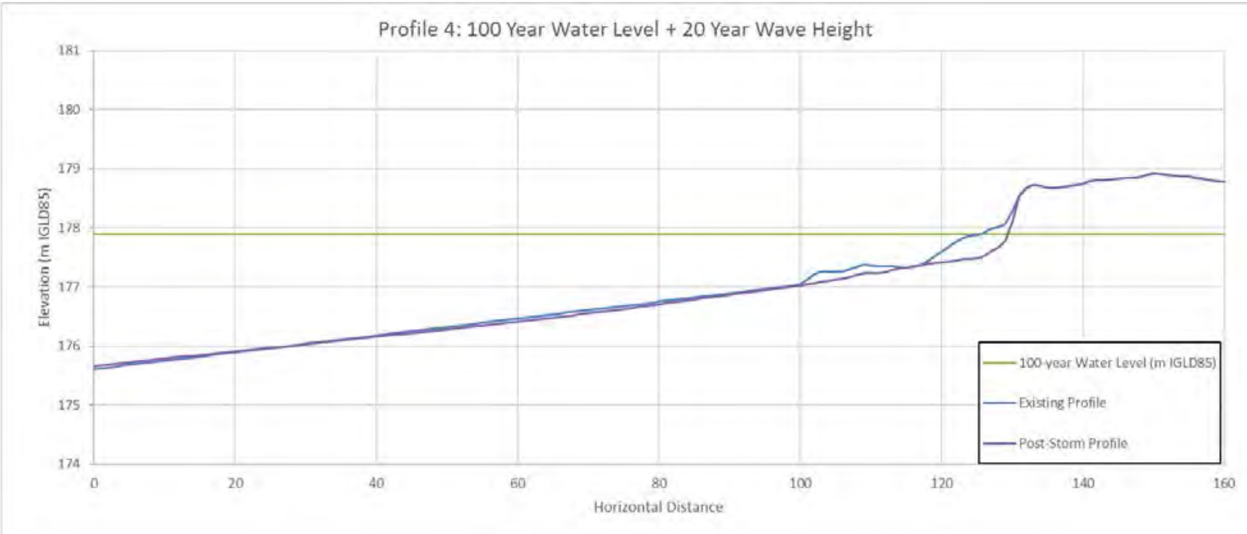
APPENDIX C

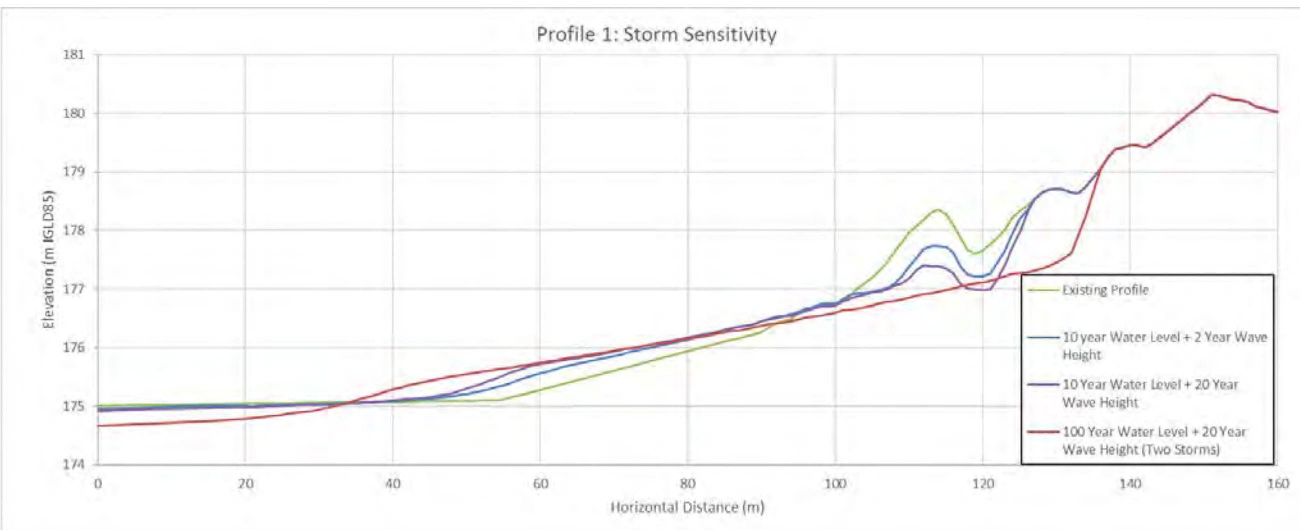
COSMOS MODEL RESULTS

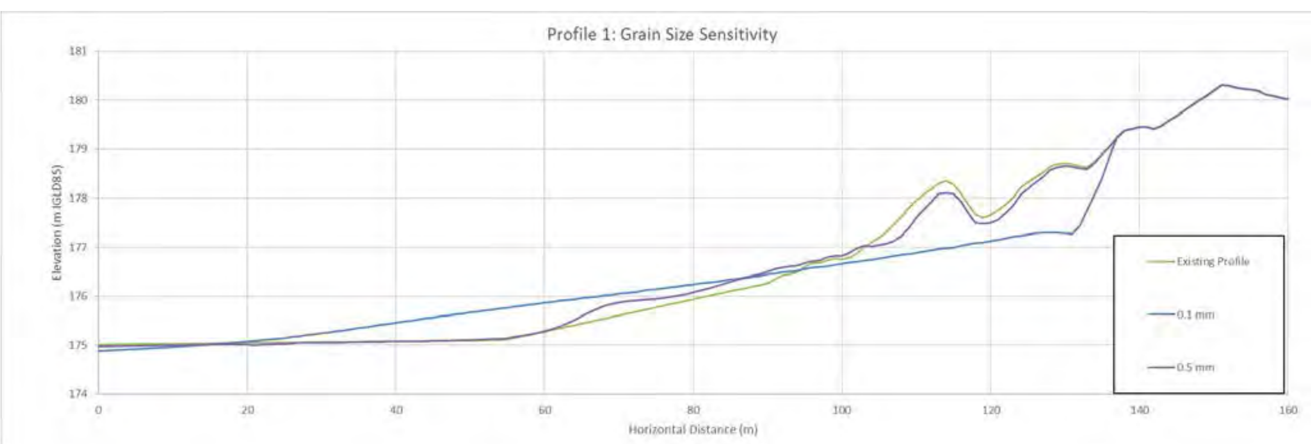

Profile 1: 100 Year Water Level + 20 Year Wave Height
Elevation (m IGLD85)
Horizontal Distance (m)
100-year Flood Level (m IGLD85)
Existing Profile
Post-Storm Profile

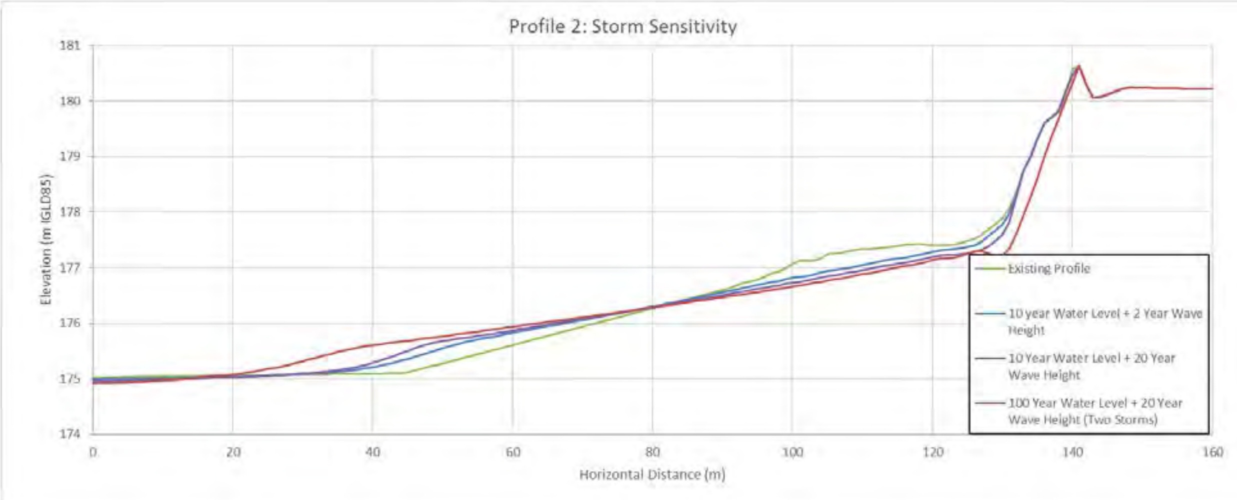

Profile 2: 100 Year Water Level + 20 Year Wave Height
Elevation (m IGLD85)
Horizontal Distance (m)
100-year Flood Level (m IGLD85)
Existing Profile
Post-Storm Profile

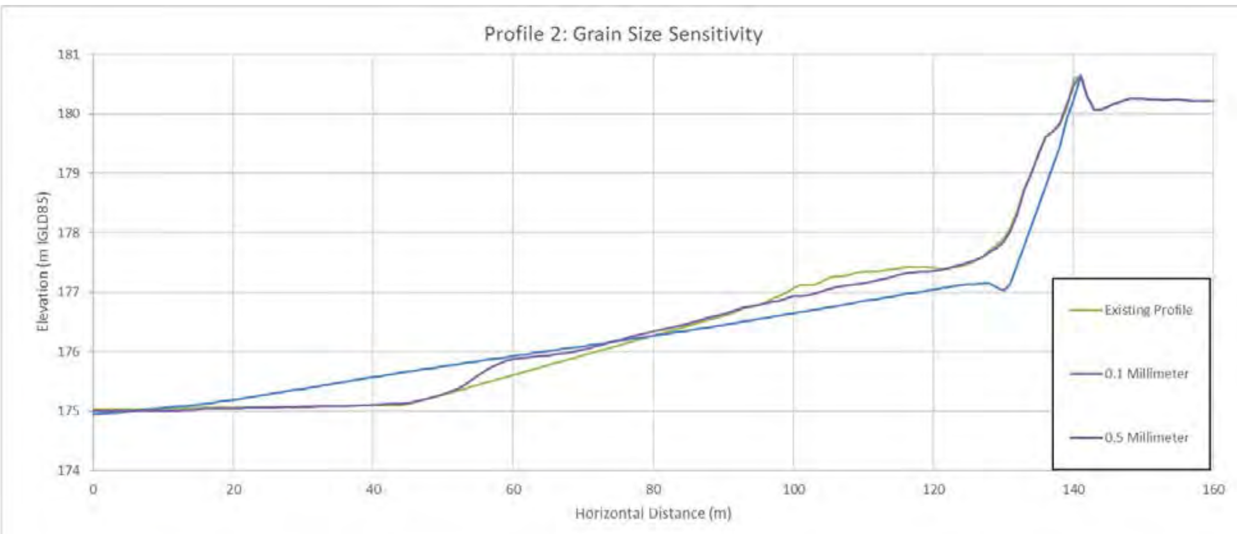

Profile 3: 100 Year Water Level + 20 Year Wave Height
Elevation (m IGLD85)
Horizontal Distance (m)
100-year Flood Level (m IGLD85)
Existing Profile
Post-Storm Profile

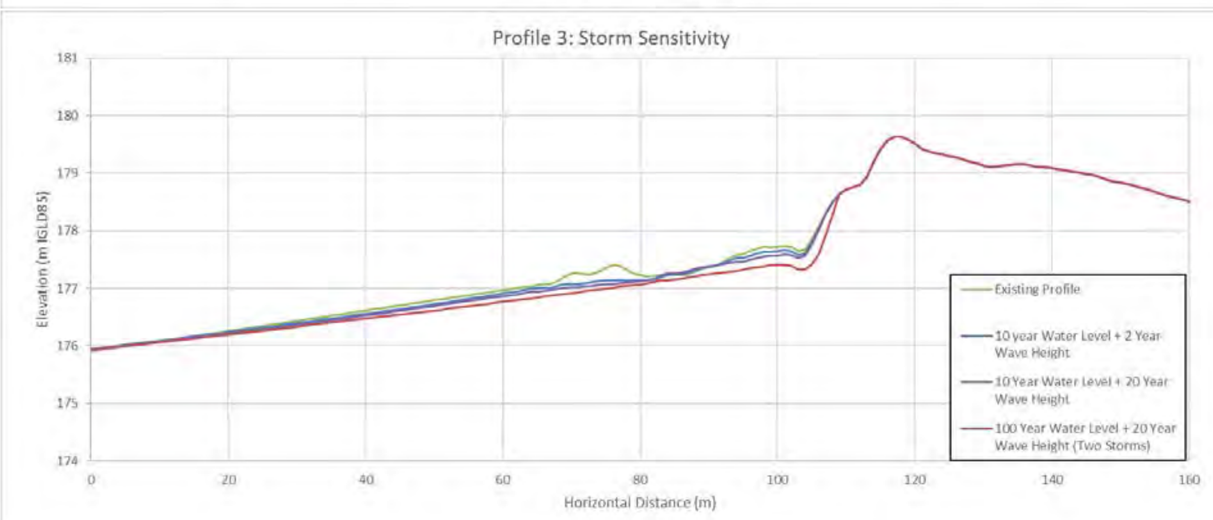

Profile 4: 100 Year Water Level + 20 Year Wave Height
Elevation (m IGLD85)
Horizontal Distance
100-year Water Level (m IGLD85)
Existing Profile
Post-Storm Profile

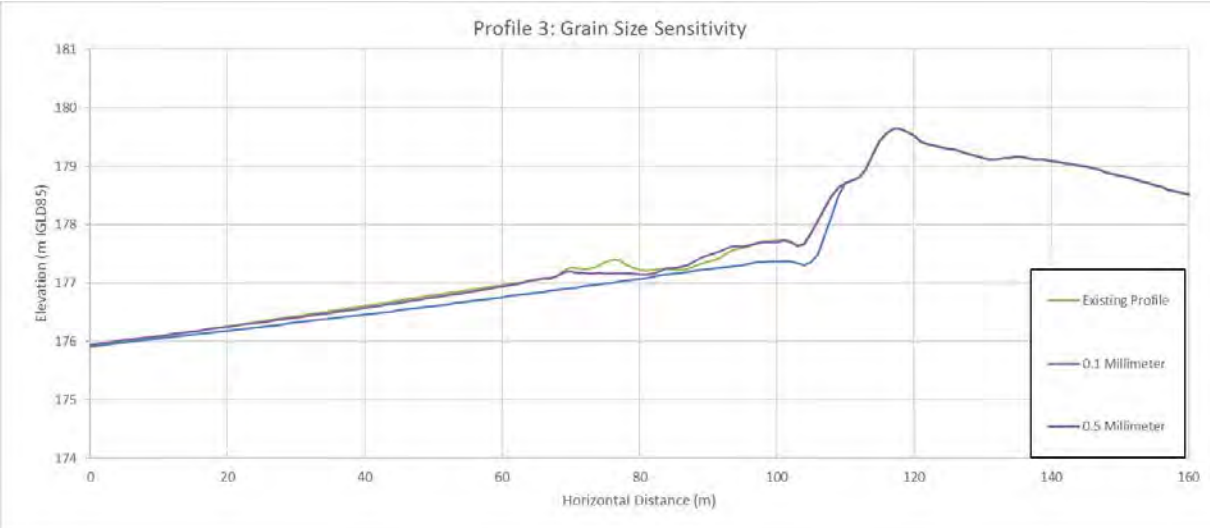

Profile 1: Storm Sensitivity
Elevation (m IGLD85)
Horizontal Distance (m)
Existing Profile
10 year Water Level + 2 Year Wave Height
10 Year Water Level + 20 Year Wave Height
100 Year Water Level + 20 Year Wave Height (Two Storms)

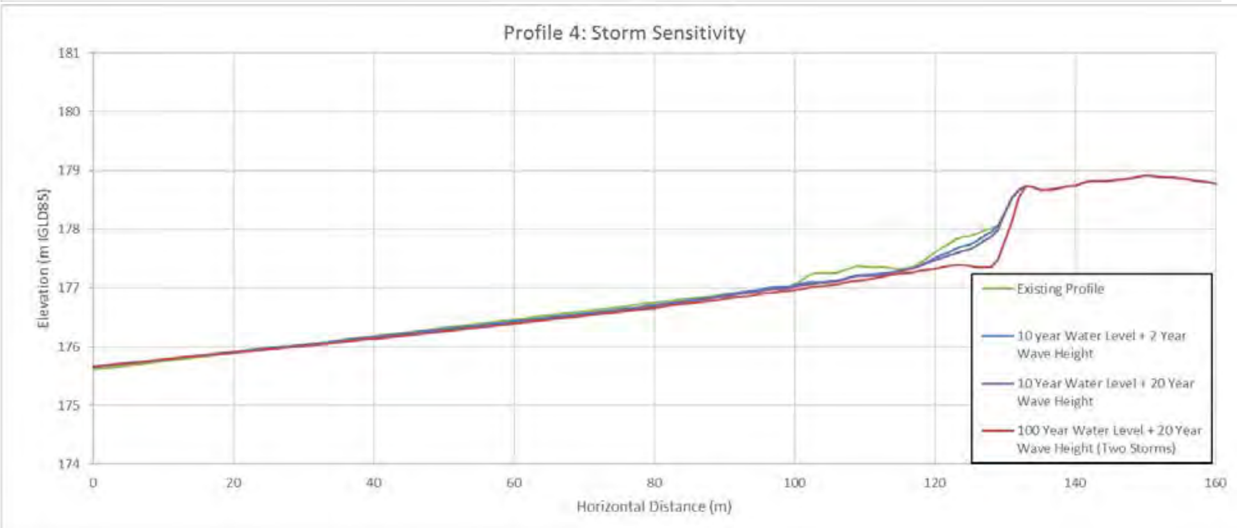

Profile 1: Grain Size Sensitivity
Elevation (m IGLD85)
Horizontal Distance (m)
Existing Profile
0.1 mm
0.5 mm

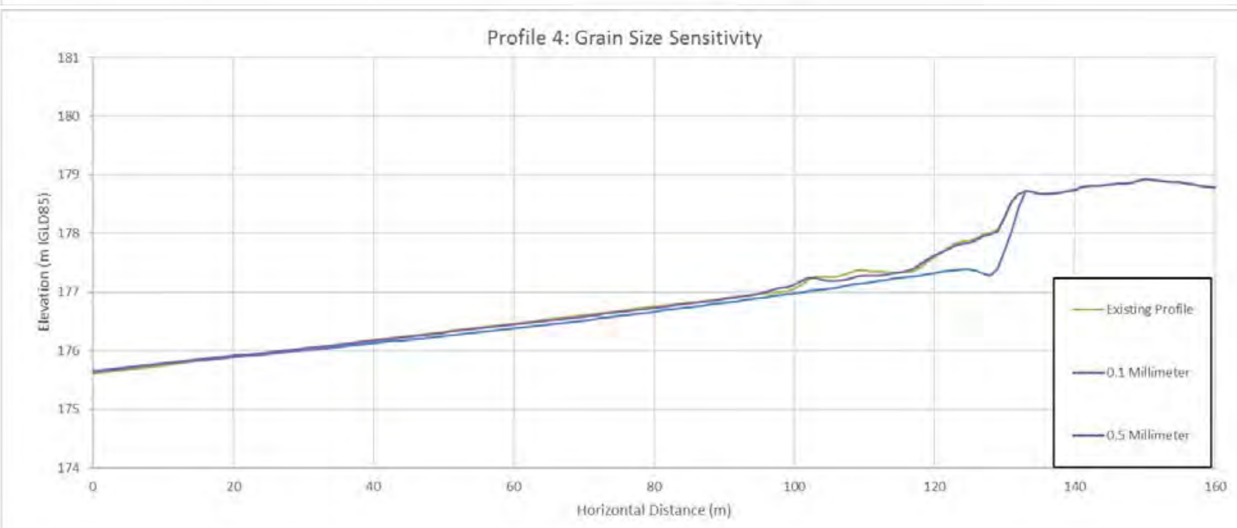

Profile 2: Storm Sensitivity
Elevation (m IGLD85)
Horizontal Distance (m)
Existing Profile
10 year Water Level + 2 Year Wave Height
10 Year Water Level + 20 Year Wave Height
100 Year Water Level + 20 Year Wave Height (Two Storms)


Profile 2: Grain Size Sensitivity
Elevation (m IGLD85)
Horizontal Distance (m)
Existing Profile
0.1 Millimeter
0.5 Millimeter


Profile 3: Storm Sensitivity
Elevation (m IGLD85)
Horizontal Distance (m)
Existing Profile
10 year Water Level + 2 Year Wave Height
10 Year Water Level + 20 Year Wave Height
100 Year Water Level + 20 Year Wave Height (Two Storms)


Profile 3: Grain Size Sensitivity
Elevation (m IGLD85)
Horizontal Distance (m)
Existing Profile
0.1 Millimeter
0.5 Millimeter


Profile 4: Storm Sensitivity
Elevation (m IGLD85)
Horizontal Distance (m)
Existing Profile
10 year Water Level + 2 Year Wave Height
10 Year Water Level + 20 Year Wave Height
100 Year Water Level + 20 Year Wave Height (Two Storms)


Profile 4: Grain Size Sensitivity
Elevation (m IGLD85)
Horizontal Distance (m)
Existing Profile
0.1 Millimeter
0.5 Millimeter

APPENDIX D

RECOMMENDED DYNAMIC BEACH HAZARD LIMIT MAPPING

1:1,000

0 10 20 30 40
Meters

West Ipperwash Beach - Dynamic Beach Limit Assessment
2010 Bare Earth Elevation (SCRCA DEM), Spring 2015 Aerial Photograph

Base Aerial Photo: 2015, SCRCA
Elevation: 2010 Bare Earth, SCRCA
Spatial Reference: NAD 1983 UTM Zone 17N
Map Published: 2017-04-07

Baird
www.baird.com

APPENDIX E

PUBLIC MEETINGS

Comments and Responses from the Public Open Houses held on August 30, 2016
St. Clair Region Conservation Authority
West Ipperwash Dynamic Beach Assessment

Comment	**Response**
General	
Question regarding the definition of a dynamic beach and in particular, if the West Ipperwash Beach meets the criteria in terms of sand particle size.	The sand at West Ipperwash is classified as fine sand and the beach meets the Technical Guide (MNR, 2001) criteria for a dynamic beach.
Will a similar study be completed for Central Ipperwash?	The scope and priority of a study for Centre Ipperwash beach hazards needs to be discussed with involved additional parties (ie. MNRF)
Development	
Why is development not permitted on the footprint of the existing structure?	See Table 6.1 of the Board approved Shoreline Mgt Plan Development guidelines. This may be permitted dependent on site and the location of the hazard.
Why is there a restriction on home improvements, inside renovations?	See Table 6.1 of the Board approved Shoreline Mgt Plan Development guidelines. It is permitted
The guidelines must be fair and reasonable for existing buildings.	SCRCA acknowledges. CA Regulations Committee decisions for development can be appealed to the CA Board of Directors
Is there any regulation that prohibits dune removal.	Yes, O. Regulation 171/06 on non-first nation lands/rights applies. The Conservation Authority must administer and enforce for the purposes of protection from flooding and erosion.
Environment	
Can SCRCA provide information on dune and beach management?	A Best Management Brochure will be produced for this study, with links to additional resources.
Concern was expressed regarding the use of vehicular traffic on the beach and its impacts on dunes and dune plantings.	Vehicular traffic is not generally recommended on beaches for the reasons given, and others. This however is outside the scope of the study.
Can we bring in sand as part of the beach management process.	Beach nourishment is one approach that could be considered.

Comment	Response
	Beach nourishment should be designed by a coastal engineer, considering wave exposure, sediment processes, beach nourishment profile, sand sourcing, possible structures to retain sand and maintenance requirements, costing, permitting, etc.
Wondering about the black mud on Ipperwash Beach. What is the source and can it be removed? Removal of the organic material is removing sand also, and adding to erosion of the beach.	Management of the organic material that deposits on the beach is outside the project scope. However, this material appears to be comprised of vegetation, possibly from updrift beach erosion in response to recent higher water levels. The bathymetric feature (shelf) at Kettle Point traps alongshore transport. Methods of separating the organics from the sand can be reviewed. A concern with removal of the black organic material, is the removal of sand with the organic material. Sand removal causes beach erosion. The beach protects the backshore during storm events. There are also environmental concerns with its removal.
Can you provide a list of plants that are suitable for the dunes.	Information is provided in the Best Management Practices brochure, available on the SCRCA web site.
Dunes and vegetation are natural and they should not be removed.	SCRCA agrees. Dunes protect the backshore, vegetation stabilizes the dunes and provides habitat for a large number of species.
Shore Protection	
Can we replace seawalls that are in need of repair?	As stated in Baird's 2017 W. Ipperwash dynamic beach assessment report, "in general, seawalls are not recommended on dynamic beaches". Depending on the location of seawall, wave reflection and scour can ultimately lead to failure of the wall and negatively impact beach width. Table 6.1 of the 2006 Board approved Shoreline Mgt Plan Development guidelines states that seawalls can be replaced, provided the wall will not have a negative impact on beach processes.. There are methods to mitigate negative impacts which can be reviewed.

Comment	Response
Do you recommend gabion baskets for shore protection?	Gabion baskets are not recommended at this site. They cannot withstand the wave conditions on the Great Lakes. Seawalls in general are not recommended on dynamic beaches. Additional information is provided in the report and the Shoreline Management Plan Update.
Other	
Why were water levels low for an extended period of time in recent years?	Lake levels are largely controlled by precipitation and evaporation. Variations in water level are natural.
Who is funding the project?	SCRCA shoreline municipalities as an update to the Shoreline Management Plan.
Are you aware of funding sources that could be applied for, to pay for beach maintenance?	SCRCA Planning Department staff would direct you to Jessica Van Zwol, Healthy Watershed Specialist, Ext. 241 jvanzwol@scrca.on.ca for information as funding sources change frequently.

A number of enquiries were made regarding specific properties and SCRCA has responded to them individually.