Understanding the Coastal Processes Around the Graham Creek Jetties and Revitalization of Bond Head Park Beach

Public Information Centre

10 February 2026

Agenda

1. Project Objectives
2. Metocean Conditions
3. Wave Modelling
4. Sediment Transport
5. Concept Design Options
6. Next Steps

Technical Team

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1

Project Objectives

Objectives

- Understanding the coastal processes that caused accumulation of sediments on the West side of Graham Creek Jetties and erosion on Bond Head Park Beach
- Prepare conceptual designs to reduce erosion at Bond Head Park Beach with focus on addressing shoreline erosion, reestablishing the longshore sediment transport and minimizing effects on neighboring private properties
- Consider alternatives that include features to improve coastal and aquatic ecosystem and habitat and public use of this key waterfront assets

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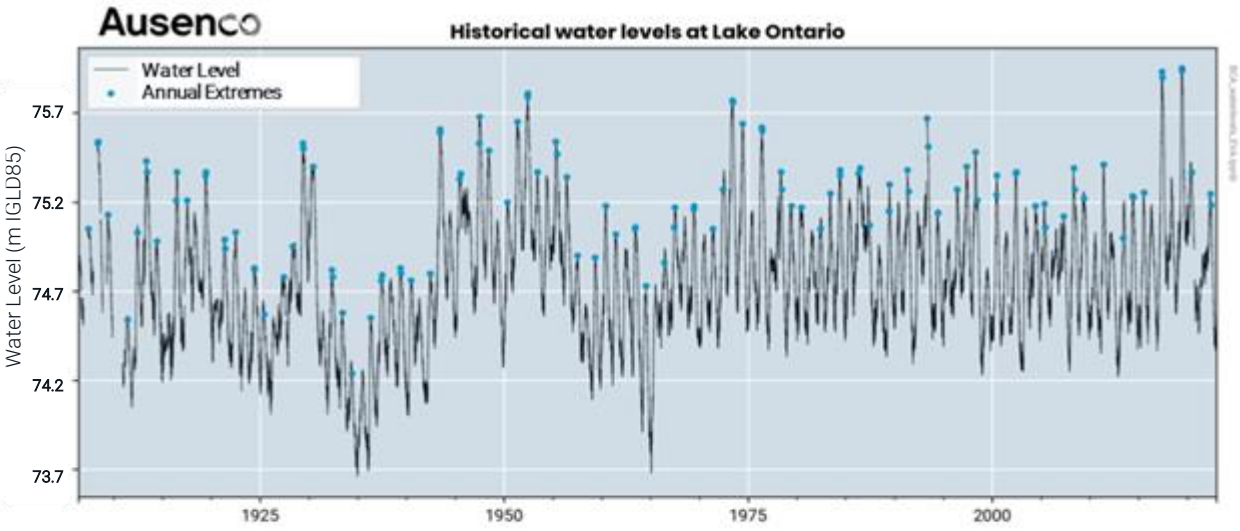
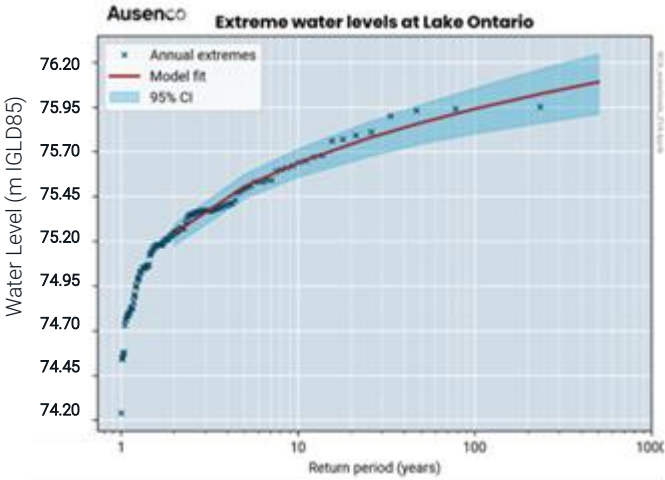
Metocean Conditions

Water Level



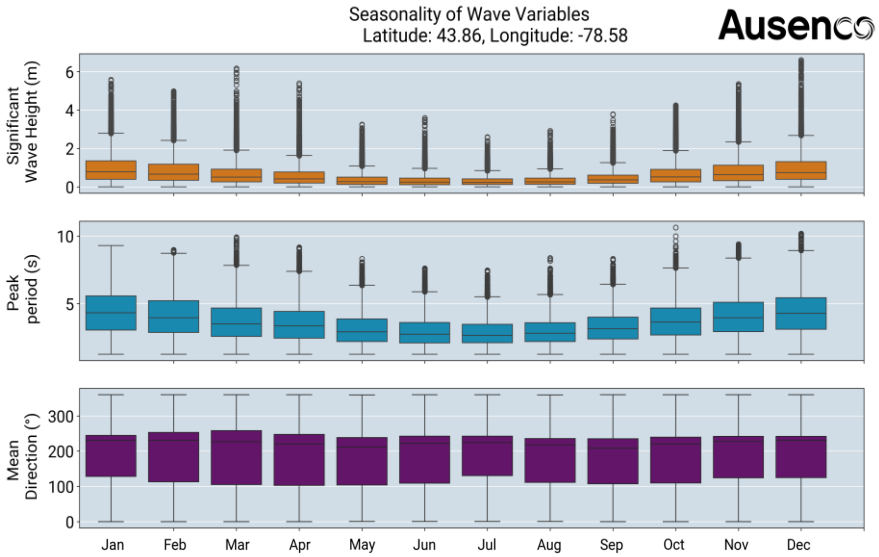


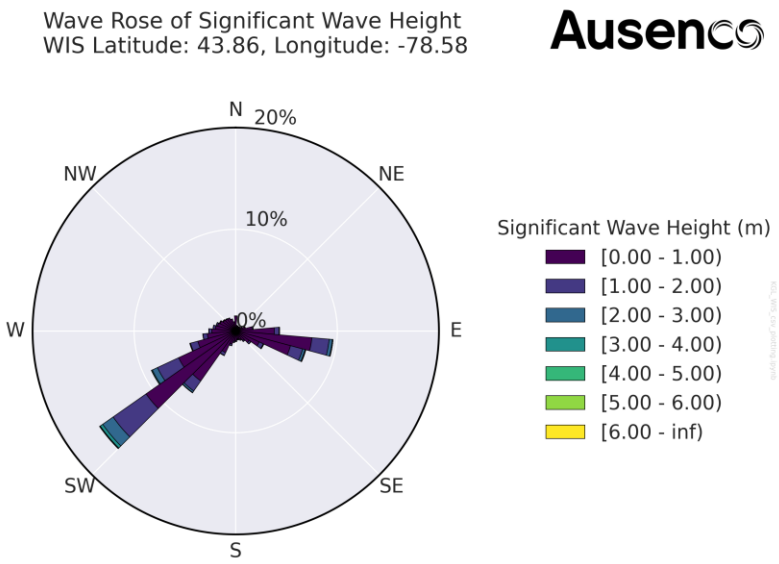
- Water level data from 1906 to 2025
- The water level is being regulated since mid 1950's
- Extreme water levels/flood occurred in 2017 and 2019 reaching 75.9 m IGLD85
- Event with Return Period of 100 yr has water level at 75.95 m IGLD85 (±0.1 m)

Offshore Waves

- Offshore wave data from 1979 to present (WIS)
- Approximately 4 km from the shoreline
- Strong correlation between wind and waves as the waves are created by the local winds

Offshore Waves





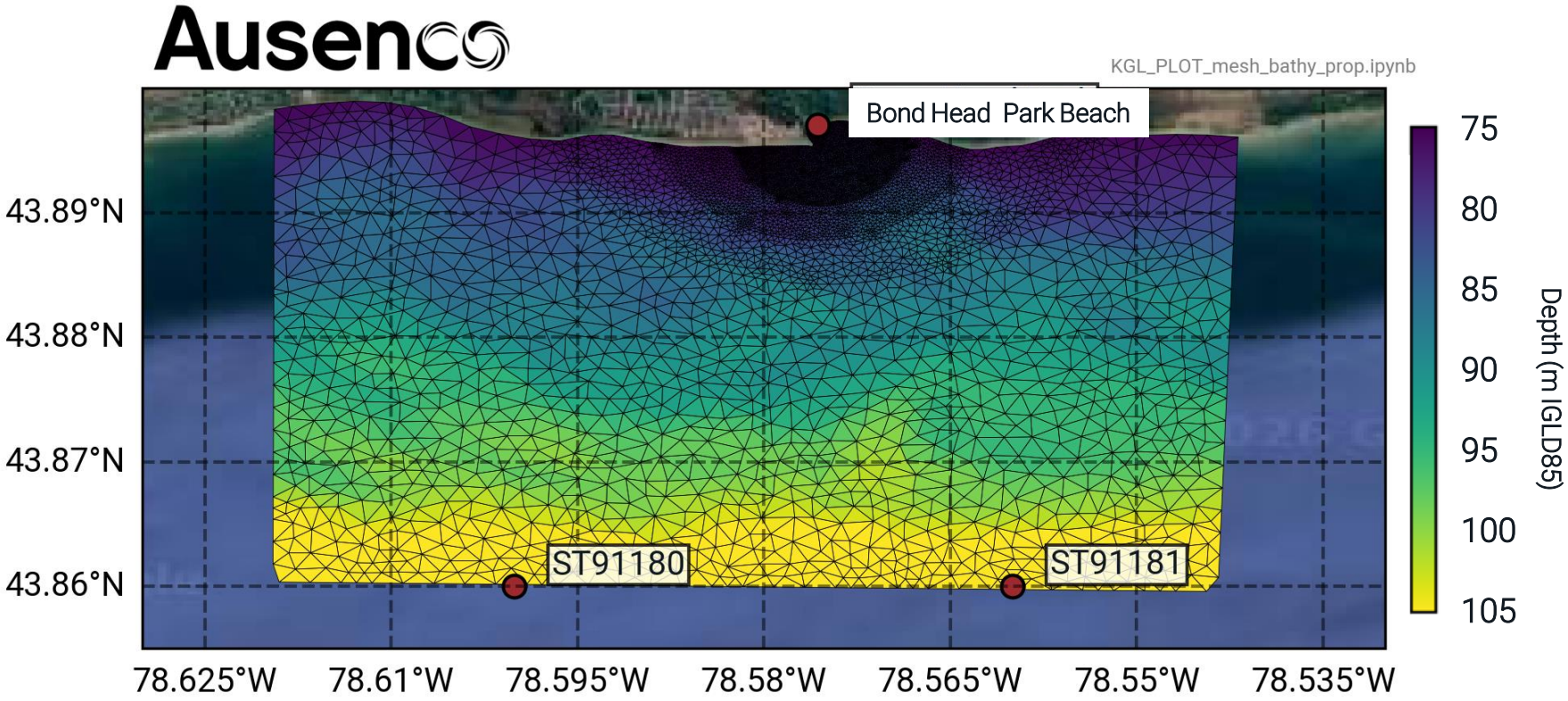
- Seasonal variation with higher wave heights and periods from November to February
- Most of the waves are below 1.0 m, but extremes can reach more than 6 m
- Majority of waves coming from Southwest with second component from East

Offshore Waves

3

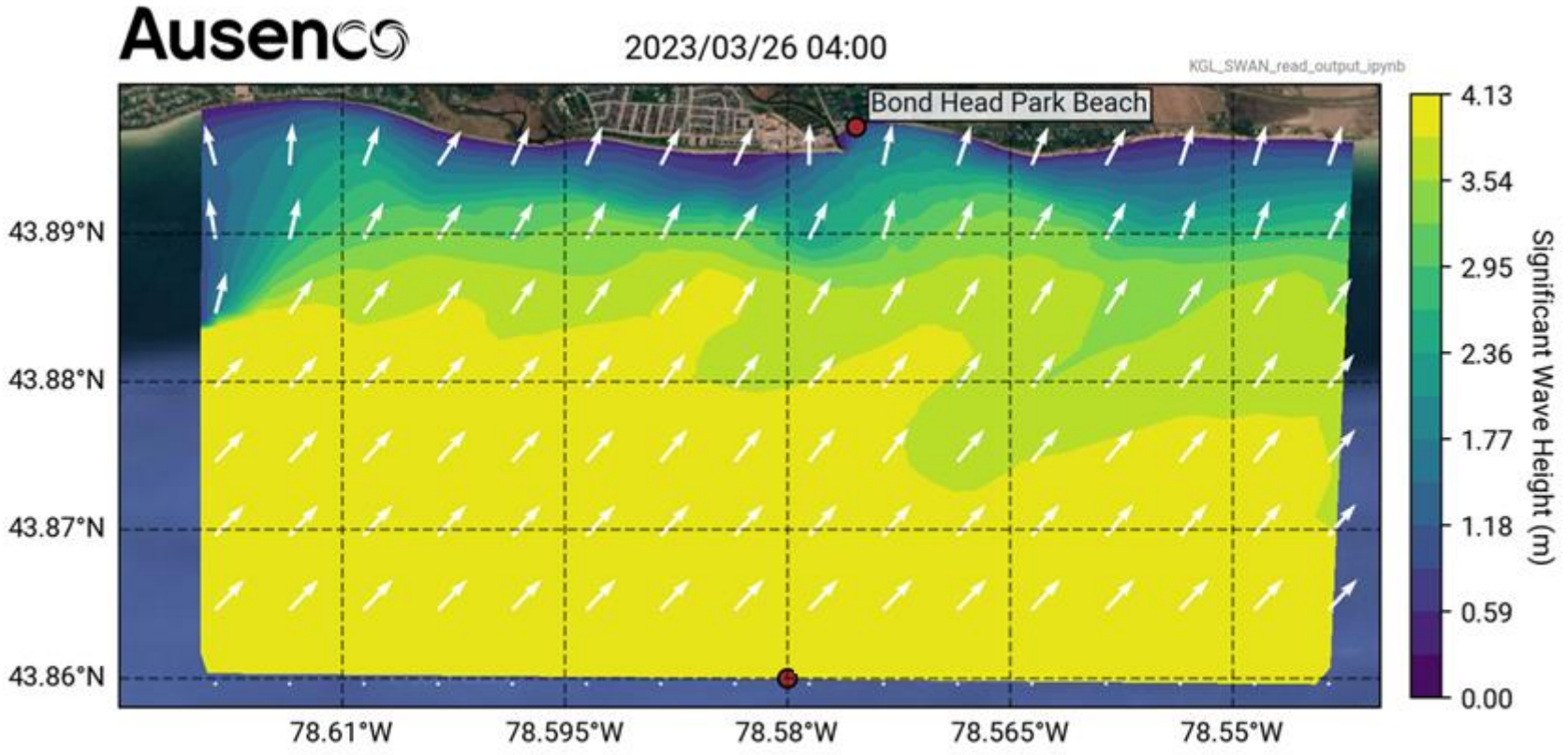
Wave Modelling

Wave Modelling - Grid



- Simulated the conditions described previously using Delft3D-Wave software
- More focus was on the extreme/highest waves as they have the potential to transport more sediments and will be used in the design of the selected alternative

Wave Modelling – Wave Results



- Example of wave characteristics when moving towards shallower waters
- Wave height decease from 4.1 m to ~1m at the beach

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Sediment Transport

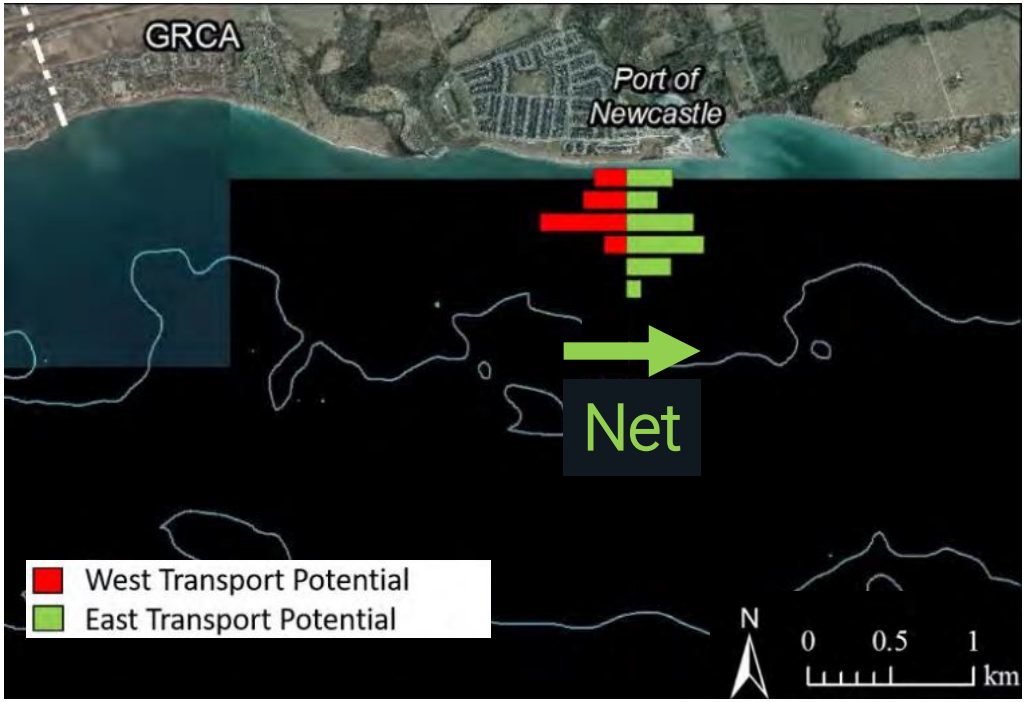
Littoral Cells

- Lake Ontario Shoreline Management Plan* divided the shoreline in 12 reaches
- Graham Creek Jetties divide Reaches 5 and 6 and Bond Head Park Beach is in the West Side of Reach 6

*Lake Ontario Shoreline Management Plan (Zuzek, 2020)

Sources/Sinks

Longshore Sediment Transport



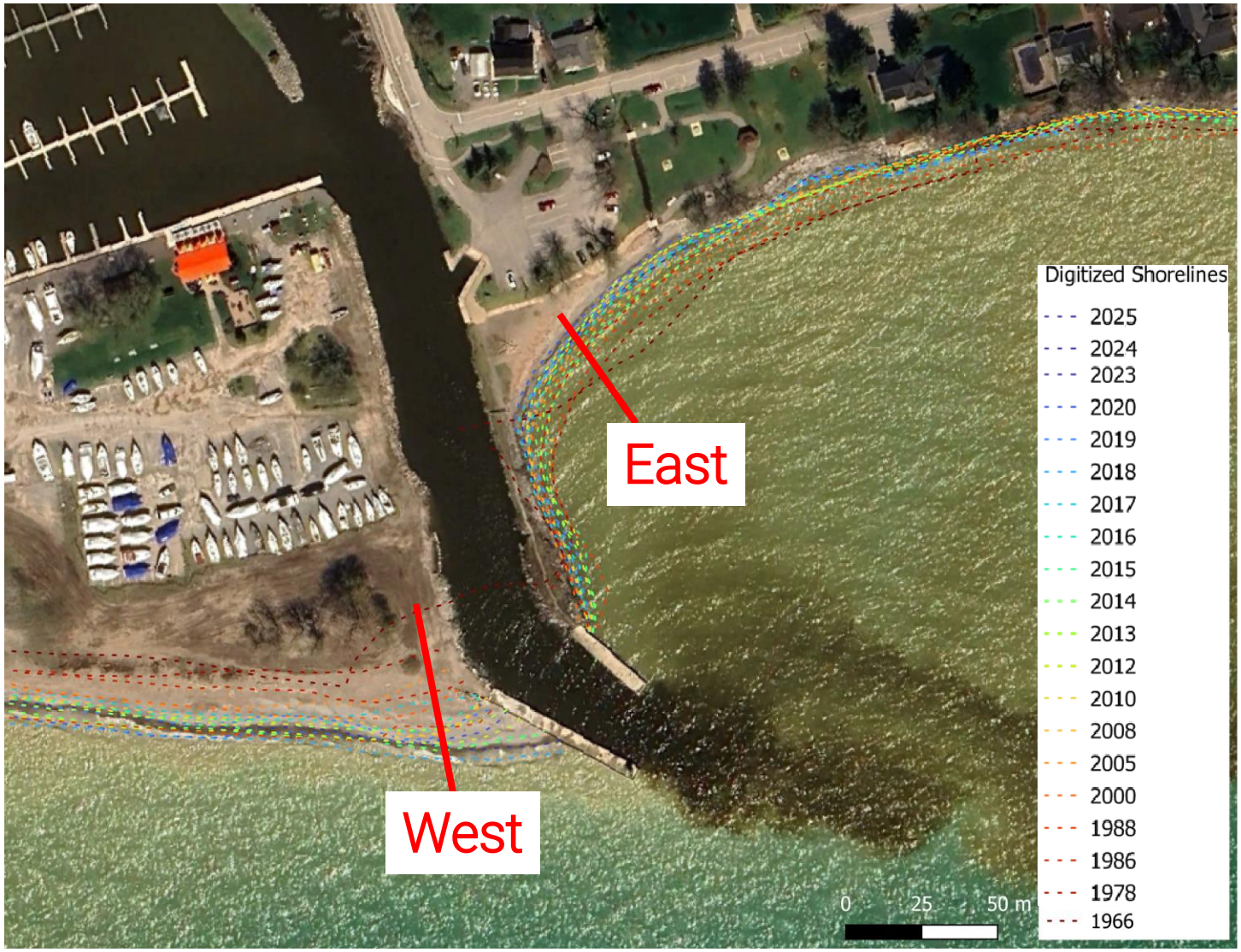
- The potential longshore sediment transport follows the two main wave directions
- There is sediment transport towards East and West, but the predominant transport (net) is towards East

*Lake Ontario Shoreline Management Plan (Zuzek, 2020)

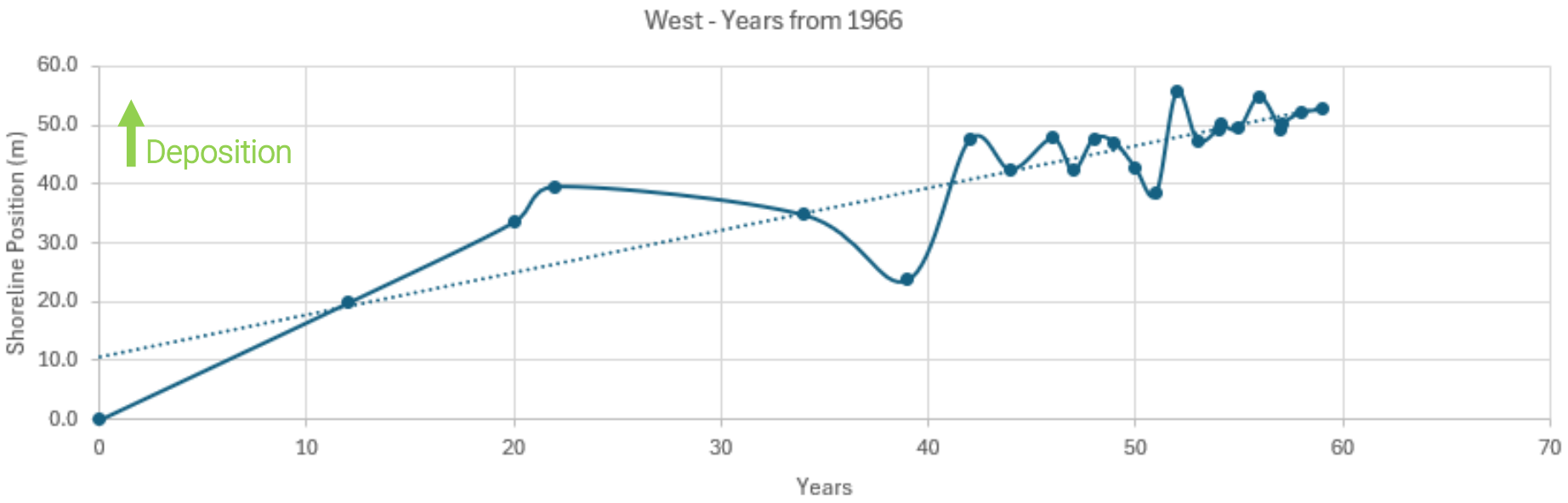
Graham Creek Jetties

- The jetties were constructed in 1971
- Maintain a fixed and reliable location for the channel
- Partially blocks the longshore sediment transport, with a net transport towards East, contributing to the accumulation on the West Side of the jetties and erosion on the East side, until bypass occurs
- Removing the jetties would be costly and would cause fluctuation of the channel's entrance location

Shoreline Change



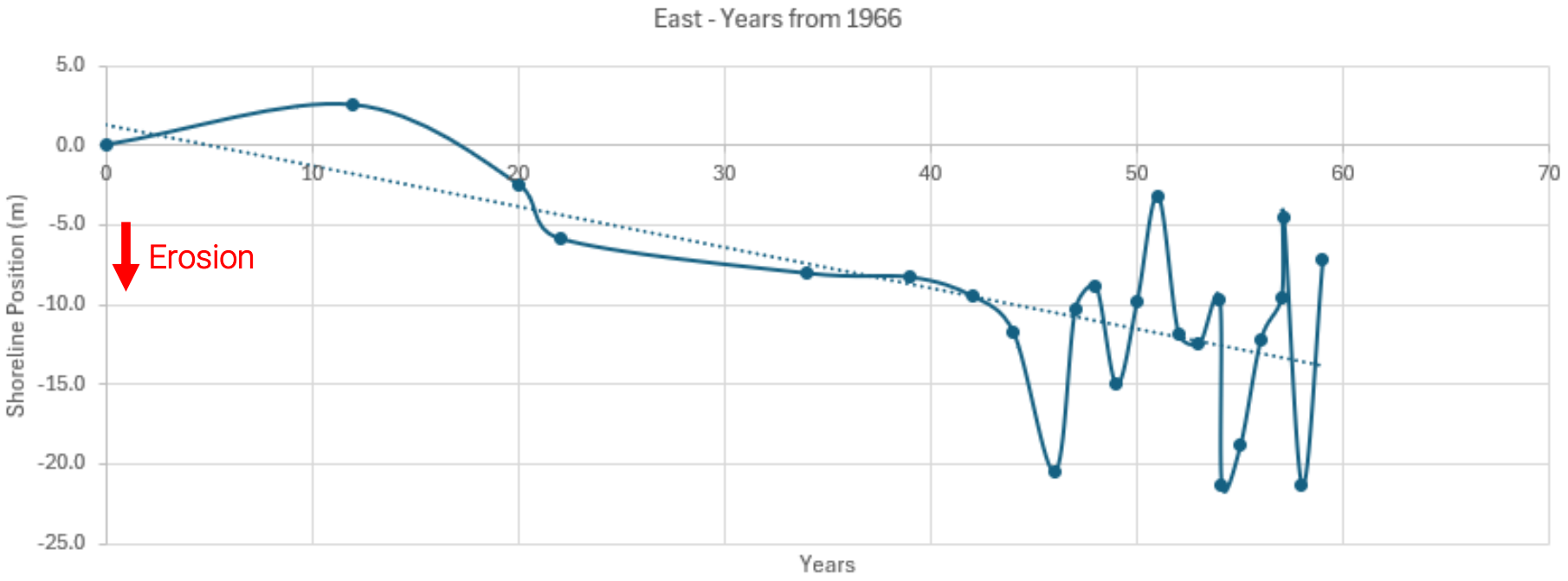
West Section – Shoreline Deposition



Starting at	Rate of Change (m/yr)
1966	0.93
1978	0.70
1986	0.44
2000	0.73

Average	0.70
Minimum	0.44
Maximum	0.93

East Section – Shoreline Erosion



Starting at	Rate of Change (m/yr)
1966	-0.23
1978	-0.37
1986	-0.3
2000	-0.21

Average	-0.28
Minimum	-0.37
Maximum	-0.21

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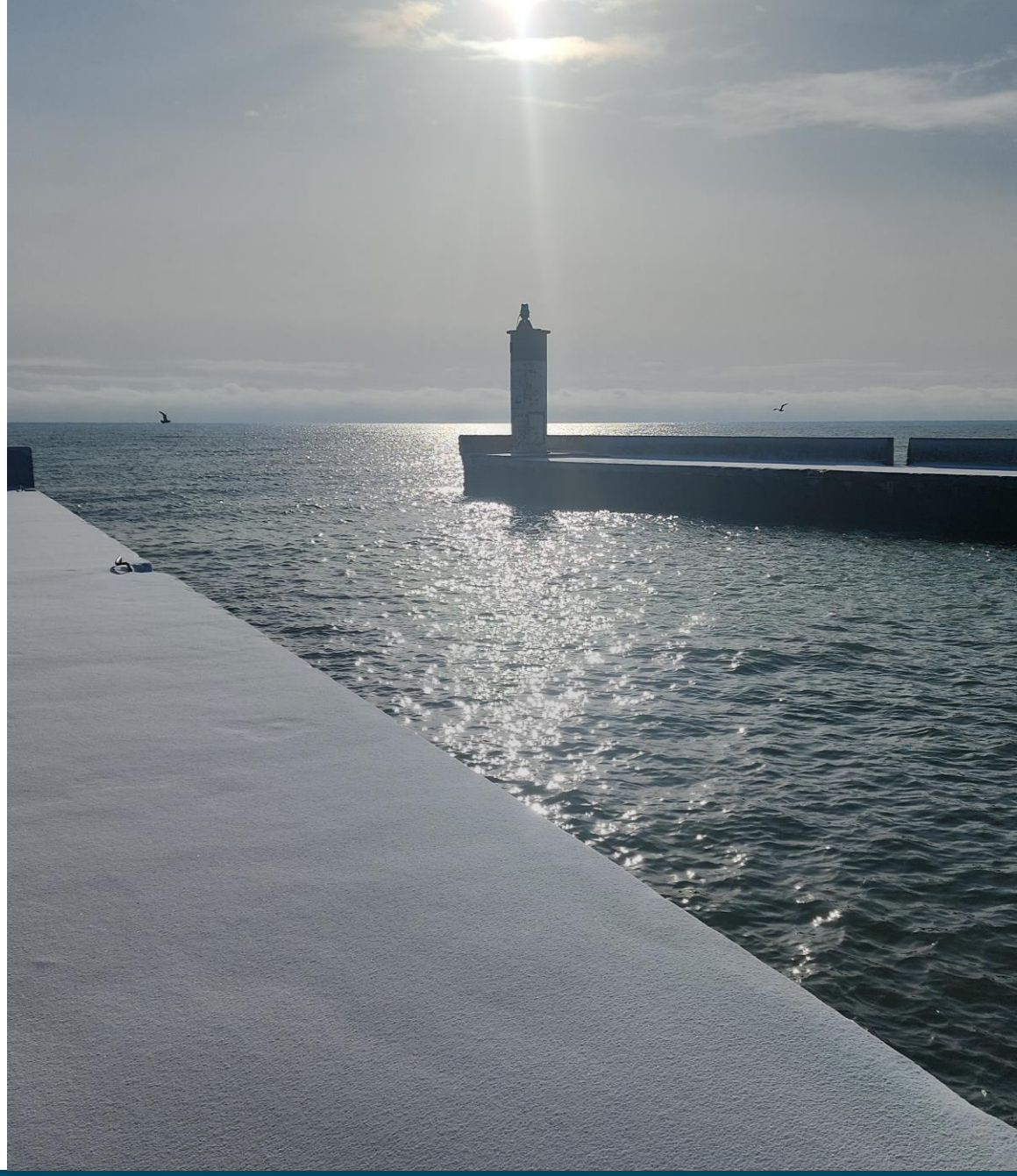
Concept Design Options

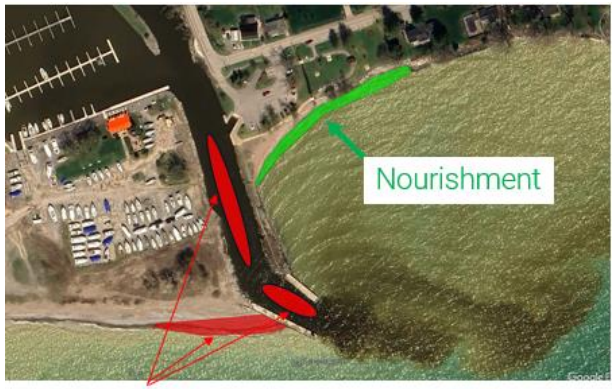


Criteria

The table below was used to evaluate the concept designs

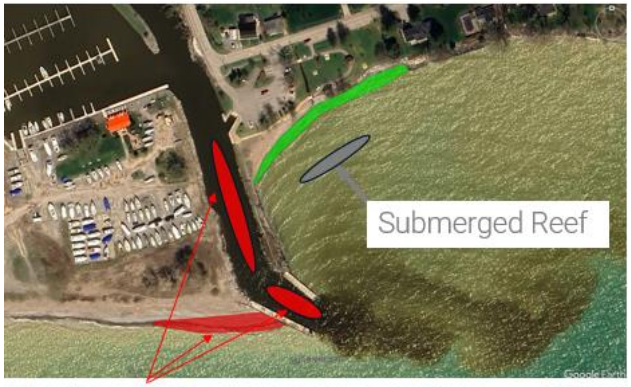
Criteria Table	
Number	Description
1	Coastal Processes / Sediment Transport
2	Recreational / Community
3	Environment / Permit
4	Construction / Maintenance Costs

Option 1



Option 2

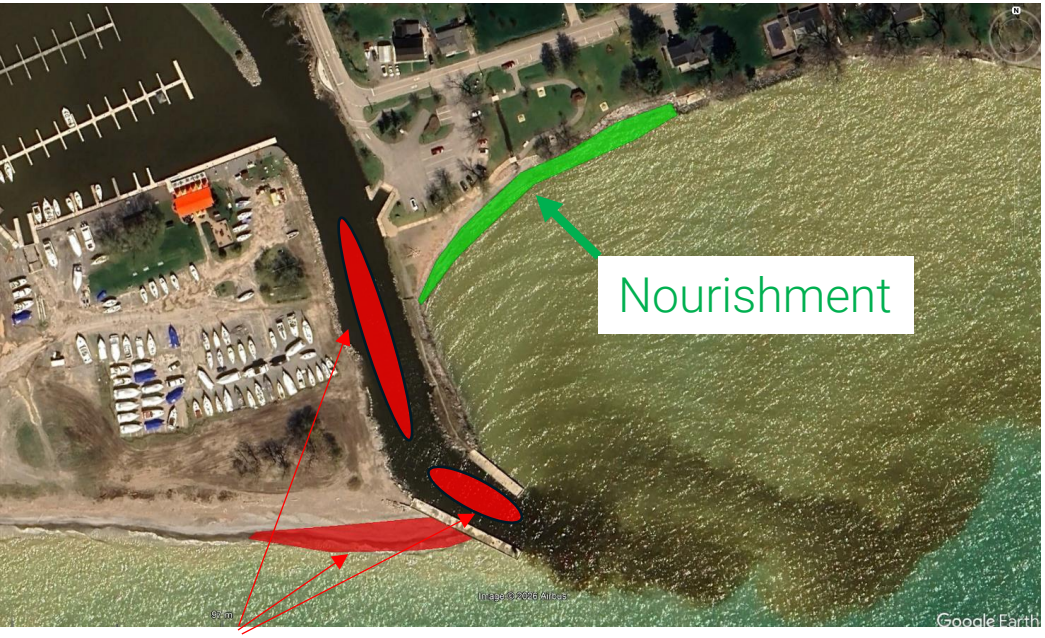
Option 3



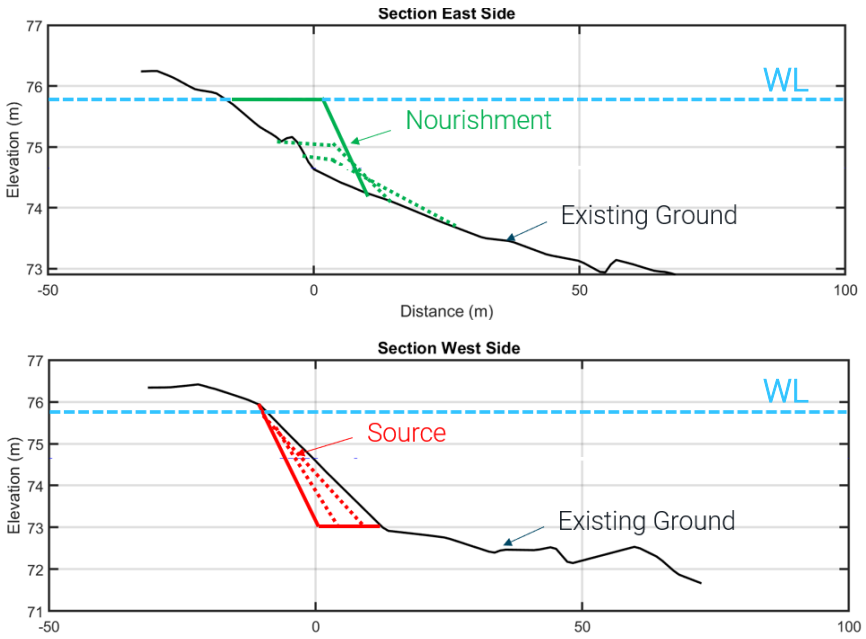
Option 1 – Beach Nourishment

Concept:

Use the sediments that are accumulating on the West side of Graham Creek Jetties or inside the channel to fill (nourish) the beach that is experiencing erosion

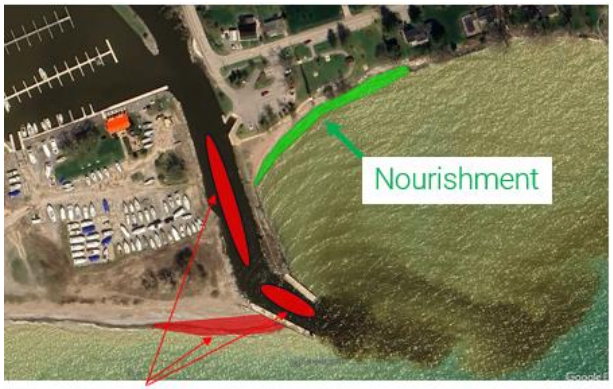


Potential Sources for Nourishment



Option 1 – Beach Nourishment

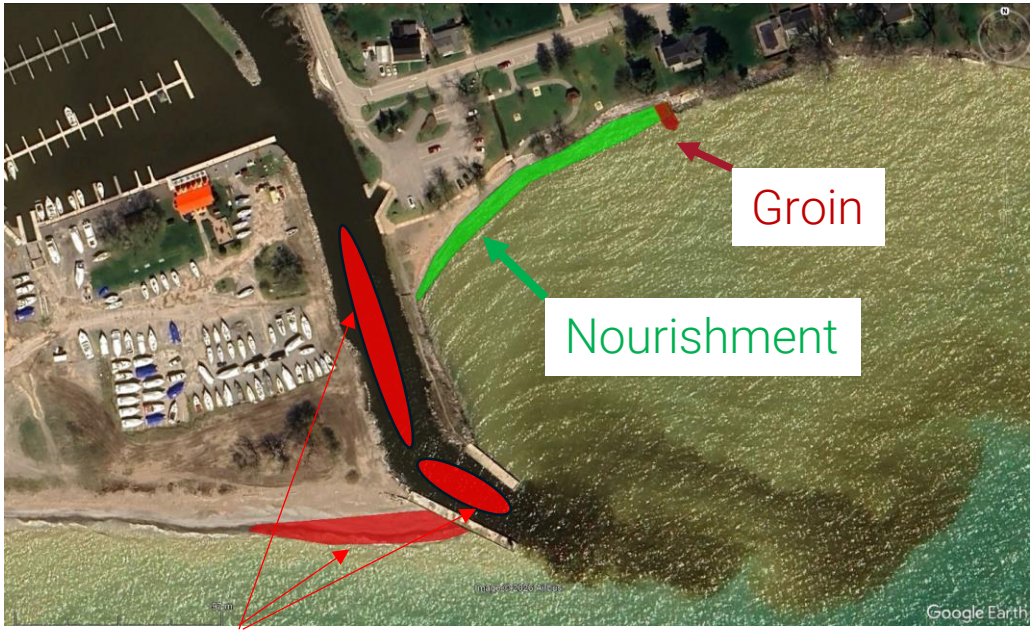
Criteria	Pros	Cons
Coastal Processes / Sediment Transport	Partially restore the longshore sediment transport Decrease the sedimentation at Graham Creek channel until natural bypass is restored	Requires periodic maintenance (renourishment) as the sediments will be transported away from the beach. The frequency is being evaluated and depends on the initial volume of sediments placed on the beach
Recreational / Community	Maintain the recreational use at the beach	The waves will be breaking closer to the beach until the profile reaches an equilibrium
Environment / Permit	Provide additional habitat for coastal and aquatic organisms Likely fastest process to obtain permits	Verify potential contaminants from sources (especially if considering sediments from the channel)
Construction / Maintenance Cost	Easy construction with possibility to use equipment from Town of Cobourg	Renourishment is required after sediments are transported away from the beach



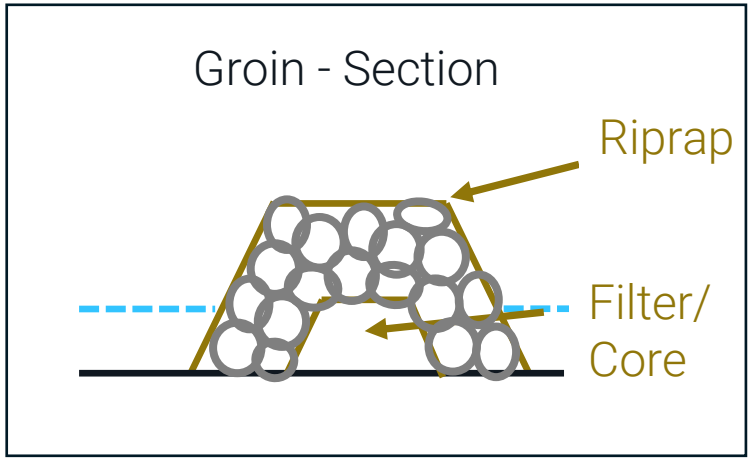
Option 2 – Beach Nourishment + Groin

Concept:

Construction of a small groin perpendicular to the beach on the East corner of the Park. This option is considered together with the beach nourishment



Potential Sources



Option 2 – Beach Nourishment + Groin

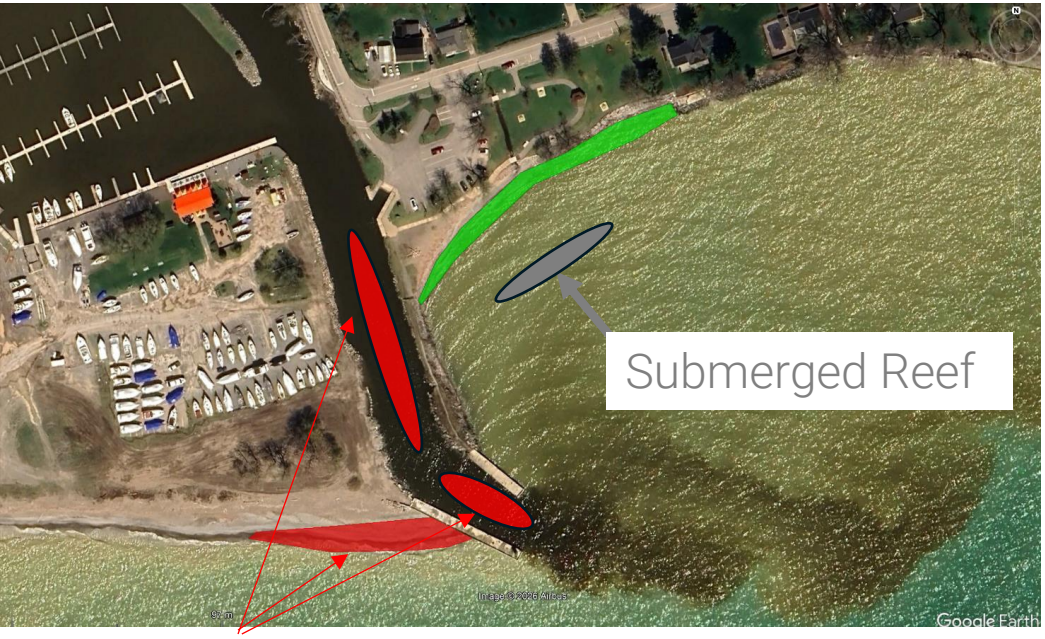
Criteria	Pros	Cons
Coastal Processes / Sediment Transport	Partially restore the longshore sediment transport The groin increases the longevity of the beach nourishment	The groin adds a barrier that will partially block the longshore sediment transport and decrease the source of sediments East of the Park's limit
Recreational / Community	Maintain the recreational use at the beach	The community, especially residents East of the Park, may be opposed to the construction of the groin
Environment / Permit	Provide additional habitat for coastal and aquatic organisms (from the beach nourishment)	Permits for hard structures may be more difficult to obtain
Construction / Maintenance Cost	Decrease maintenance cost associated with renourishments (frequency will be confirmed)	Additional construction and maintenance cost

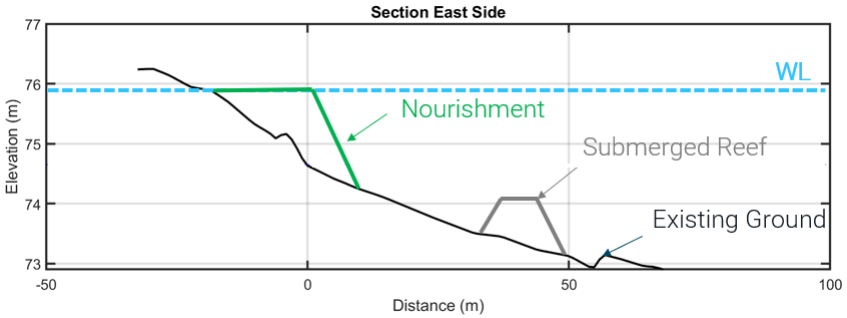
Potential Sources

Option 3 – Nourishment + Submerged Reef

Concept:

Construct an offshore submerged reef at the beach with minimum of 1 m of water above

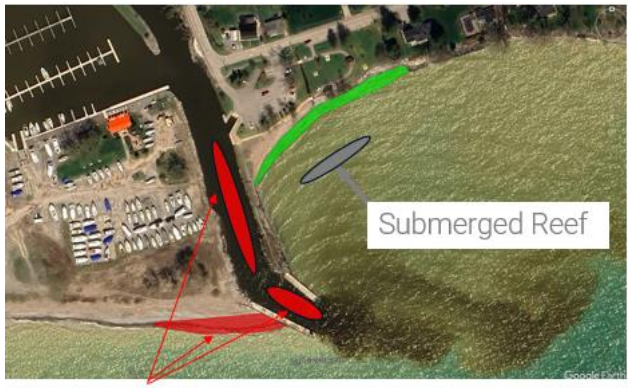




Potential Sources

Option 3 – Nourishment + Submerged Reef

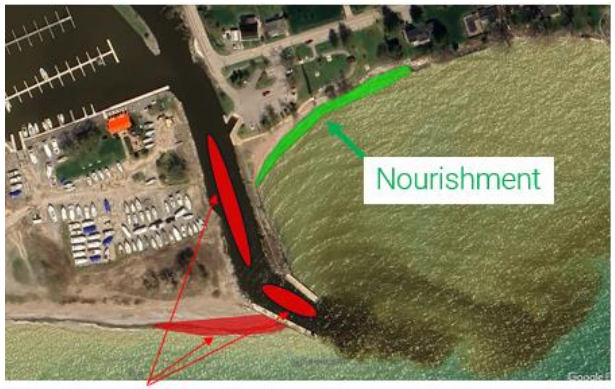
Criteria	Pros	Cons
Coastal Processes / Sediment Transport	Decrease the wave energy during storms minimizing erosion at the beach (efficiency and results to be verified)	Requires maintenance as the sediments will be transported away from the beach (frequency is being evaluated and depends on the initial volume of sediments placed at the beach)
Recreational / Community	Increase the area for fishing	May create hazards to boats or beach users close to the reef
Environment / Permit	Provide additional habitat for coastal and aquatic organisms (nourishment and reef)	Permits for submerged structures may be more difficult to obtain as it is still a hard structure; however, minimized based on potential advantages
Construction / Maintenance Cost	Decrease maintenance cost associated with renourishments	Additional construction cost



Potential Sources

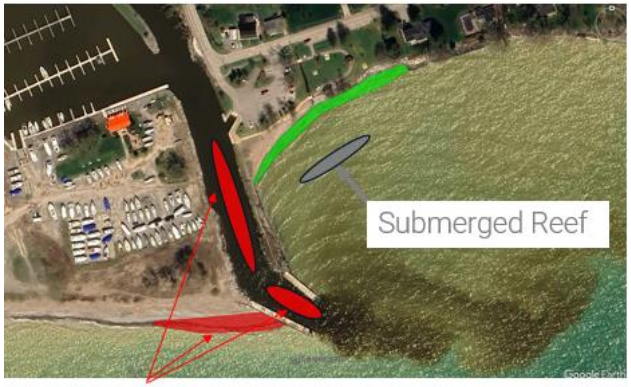
Preferred Option – Preliminary

Option 1



Option 2

Option 3



Criteria	Option 1	Option 2	Option 3
Coastal Processes / Sediment Transport	1	3	2
Recreational / Community	3	2	1
Environment / Permit	1	3	2
Construction / Maintenance Cost	1	2	3

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Next Steps

Next Steps

- Estimate the initial beach nourishment volume and frequency of nourishment
- Evaluate the different methodologies for the beach nourishment
- Prepare the high-level cost estimate for the concept designs
- Advance the selected concept design to detail design
- Use the sediment transport model to test the selected design
- Prepare the tender drawing package and technical specifications

Resources

- CWA Grant - Great Lakes Freshwater Ecosystem Initiative (2024)

Questions?

Questions After Presentation

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