

# Appendix I

## Marine Navigation Effects Assessment Report

# Marine Navigation Effects Assessment

Runway End Safety Area, Billy Bishop Toronto City Airport

PortsToronto

60733457

October 2025

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**Marine Navigation Effects Assessment**

Runway End Safety Area, Billy Bishop Toronto City Airport

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Rev #	Revision Date	Revised By:	Revision Description
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1	May 2025	AECOM	Draft Marine Navigation Effects Assessment Report
2	October 2025	AECOM	Final Marine Navigation Effects Assessment Report

## Distribution List

# Hard Copies	PDF Required	Association / Company Name
	✓	PortsToronto
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# Land Acknowledgement

We acknowledge that Billy Bishop Toronto City Airport is located on the traditional territory of many nations including the Mississaugas of the Credit, the Anishinaabe, the Chippewa, the Haudenosaunee, and the Wendat peoples, and is now home to many diverse First Nations, Inuit, and Métis peoples. PortsToronto also recognizes that Toronto is covered by Treaty 13 signed with the Mississaugas of the Credit, and the Williams Treaties signed with multiple Mississaugas and Chippewa bands.

# Executive Summary

AECOM Canada ULC, herein after referred to as “AECOM”, has been retained by Avia NG to complete an Environmental Assessment for the implementation of Runway End Safety Area (RESA) for Runway 08/26 at Billy Bishop Toronto City Airport (the Project). The Billy Bishop Toronto City Airport is owned and operated by PortsToronto (the Project proponent) and is located in the City of Toronto on the Toronto Islands.

The purpose of the Project is to comply with the Canadian Aviation Regulations (CARs) Part III, Subpart 2, Division VI – Runway End Safety Area (RESA), published in January 2022, which mandate RESAs for airports serving over 325,000 commercial passengers annually. RESAs are designated open spaces at both ends of runways, designed to minimize damage if an aircraft overruns or undershoots the runway. At Billy Bishop Toronto City Airport, the RESA requirements apply only to the primary runway, Runway 08/26, which enables commercial aircraft use.

Although there are no regulatory requirements under the federal or the provincial acts that mandate the Environmental Assessment process for the Project, a Section 82 evaluation under the Impact Assessment Act is required for all Project components that fall on Transport Canada-owned land. A Section 82 evaluation is a requirement under the Impact Assessment Act for projects located on federal lands or being carried out by federal authorities. In the City of Toronto’s Official Plan (2024), policies exist that require projects where lakefilling in Lake Ontario is proposed to undertake an Environmental Assessment. As such, PortsToronto has undertaken a non-statutory Environmental Assessment process for the RESA project at Billy Bishop Toronto City Airport.

As part of the Environmental Assessment, PortsToronto has identified and evaluated alternatives for implementing a RESA at Billy Bishop Toronto City Airport. The Environmental Assessment also considers the opportunities to enhance airport operational safety. This includes minimizing regular non-airport and airport vehicular crossings on Runway 08/26, currently necessary for both airport operations and Toronto Islands access requiring co-ordination with the airport traffic control tower. This effort supports Transportation Safety Board of Canada’s objective to reduce the risk of runway incursions at airports. Additionally, the Environmental Assessment examined measures to reduce emissions and ground-based noise levels along the lakefront.

The purpose of this study was to assess the impact of the RESA Alternatives on marine navigation including commercial and recreational boating. The methodology assessed the effects on the commercial and recreational boating group and focused within the regional and local study areas shown in **Figure 1-1**. The effects assessment identified factors for the boating community in both construction and operational phases of the

Project including affecting the ability of boats to navigate the Western Channel and Inner Harbor during construction and potential changes in waves, currents, water depths and boater visibility after the construction has been completed. Most of the factors could be mitigated in some way including marine lighting at night and education of the boating community. The boating community will need to make adjustments to other factors that cannot be mitigated however these adjustments are likely within the ability of experienced boaters.

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# 1. Introduction

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The purpose of the Project is to comply with the Canadian Aviation Regulations Part III, Subpart 2, Division VI – Runway End Safety Area (RESA), published in January 2022, which mandate RESAs for airports serving over 325,000 commercial passengers annually. RESAs are designated open spaces at both ends of runways, designed to minimize damage if an aircraft overruns or undershoots the runway. At Billy Bishop Toronto City Airport, the RESA requirements apply only to the primary runway, Runway 08/26, which enables commercial aircraft use.

Although there are no regulatory requirements under the federal or the provincial acts that mandate the Environmental Assessment process for the Project, a Section 82 evaluation under the Impact Assessment Act is required for all Project components that fall on Transport Canada-owned land. A Section 82 evaluation is a requirement under the Impact Assessment Act for projects located on federal lands or being carried out by federal authorities. In the City of Toronto’s Official Plan (2024), policies exist that require projects where lakefilling in Lake Ontario is proposed to undertake an Environmental Assessment. As such, PortsToronto has undertaken a non-statutory Environmental Assessment process for the RESA project at Billy Bishop Toronto City Airport.

As part of the Environmental Assessment, PortsToronto has identified and evaluated various alternatives for implementing a RESA at Billy Bishop Toronto City Airport. The Environmental Assessment also considers the opportunities to enhance airport operational safety. This includes minimizing regular non-airport and airport vehicular crossings on Runway 08/26, currently necessary for both airport operations and Toronto Islands access requiring co-ordination with the airport traffic control tower. This effort supports Transportation Safety Board of Canada’s objective to reduce the risk of runway incursions at airports. Additionally, the Environmental Assessment examined measures to reduce emissions and ground-based noise levels along the lakefront.

The purpose of this Marine Navigation Effects Assessment Report is to analyze the factors that will affect the marine navigation in particular boating community and present methods to mitigate the factors, where possible.

## 1.1 Background

The Billy Bishop Toronto City Airport is located within the Toronto Islands with two harbours, the Inner and Outer Harbour. The Inner Harbour is accessed via the Western or Eastern Channel. The Outer Harbour is accessed by the Eastern Channel or from Lake Ontario. The Toronto Islands are a chain of 15 islands historically formed out of a series of sand bars and are a popular tourist and recreational destination. No cars are permitted in the islands and visitors/ residents get around by taxi ferries, private vessels, bicycles and walking. Canoes, kayaks, and stand-up paddle boards are available for rental during the summer months (Wikipedia, 2024).

## 1.2 Marine Navigation Study Area

The Project Study Area encompasses all Billy Bishop Toronto City Airport lands involved in the RESA implementation, including the Marine Exclusion Zone. The Marine Exclusion Zone is a buoy-marked area of the lake where vessel entry is prohibited without PortsToronto's authorization and is co-ordinated between Billy Bishop Toronto City Airport and the Harbour Master's office. This is done to ensure all safety precautions are taken and that there is no disruption to air or harbour operations.

**Figure 1-1** shows the marine navigation study area, consisting of Local and Regional Study Areas.

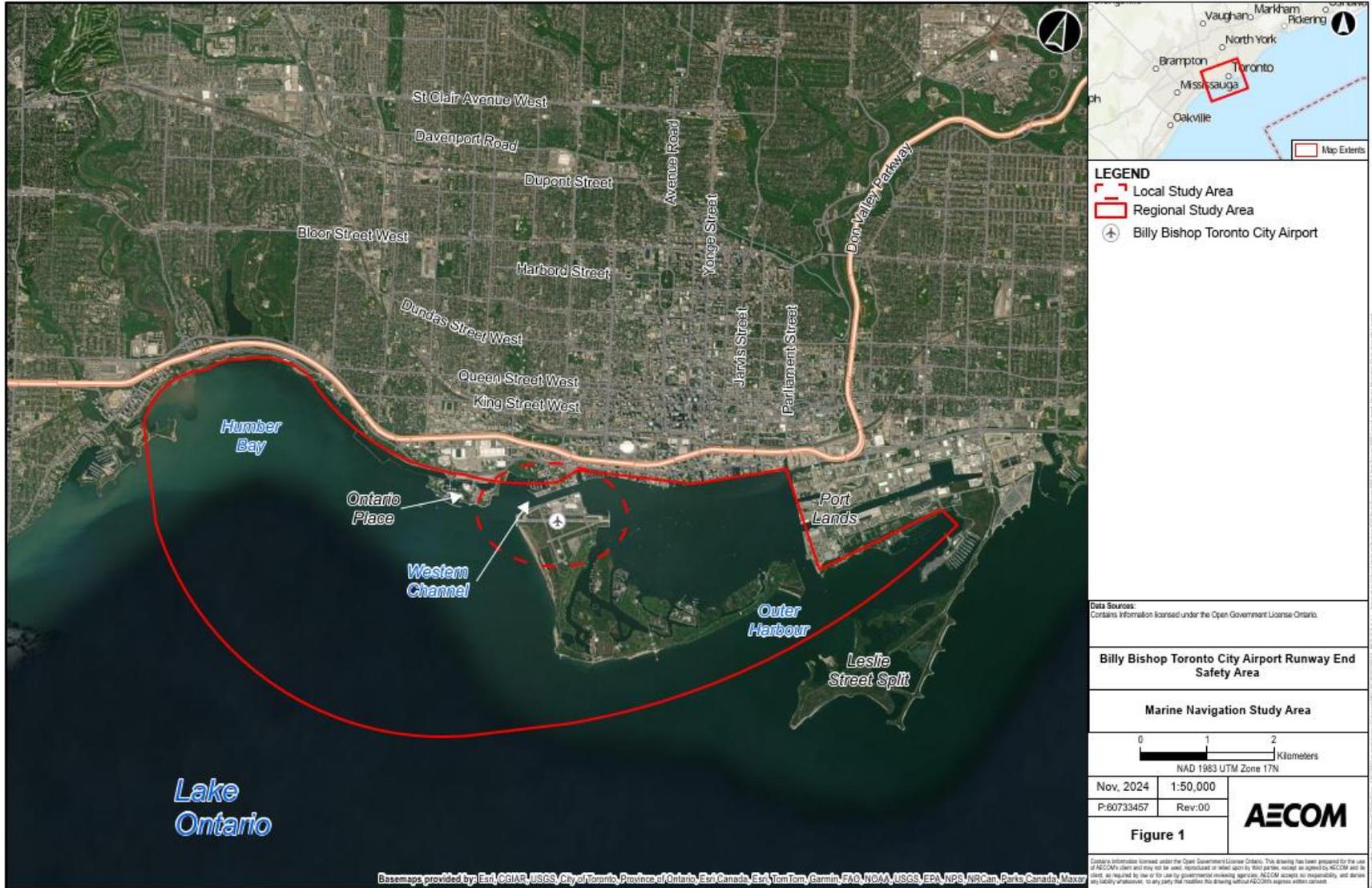
The Local Study Area for marine navigation includes the area around the two Marine Exclusion Zone and is used for the marine navigation effects.

The Regional Study Area for marine navigation extends into Inner Harbour, Outer Harbour and Humber Bay.

## 1.3 Data Collection

A desktop review of the existing conditions was conducted using the data from the WSP's Coastal Environment Study for the Preliminary Runway Design at the Billy Bishop Toronto City Airport (2015), the AECOM's 2017 Environmental Assessment Study for Runway Extension and Introduction of Jets at Billy Bishop Toronto City Airport, Ports Toronto's 2020 Marine Use Strategy Final Report, and online sources.

Figure 1-1: Marine Navigation Study Area



## 1.4 Regulatory Requirements

Billy Bishop Toronto City Airport and Toronto Islands are regulated under the Toronto Port Authority Practices and Procedures. Under Canada Marine Act Section 56, vessel speed limits within the Port & Harbour of Toronto area are 5 knots within 150 m of any shoreline or breakwater and otherwise 10 knots elsewhere within the Inner and Outer Harbours. No wake from vessels is permitted within the Toronto Island lagoons.

Small craft operating within the area are to comply with the Small Vessel Regulations of the Canada Shipping Act (SOR/2010-91) (Canada, 2024).

## 1.5 Existing Conditions

The existing conditions include the types of vessels that are typically present in the marine navigation study area, existing public marine transportation, the shoreline characteristics, boat users' visibility and factors such as waves, currents, and sedimentation trends that may affect marine navigation.

### 1.5.1 Types of Vessels

The types of vessels that frequent the area around the marine navigation study area are mainly recreational vessels including motorboaters, sailing vessels and paddleboaters including kayakers and canoers (**Figure 1-2**). Pleasure craft including motorboaters and sailing vessels range approximately from 11 to 16 m in length. Passenger ferries and tour boats also frequent the area with the Hanlan's Point ferry and water taxi docks approximately 220 m south of the east RESA. Ferries to the docks include the Ongiara<sup>1</sup> vessel which has a length of 20.4 m. Private ferry services are also provided by several yacht clubs and marinas that are located on the Toronto Islands (Wikipedia, 2024).

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1. The Ongiara is a ferry operated by the City of Toronto and services the route between downtown Toronto and the Toronto Islands, specifically Ward's Island. The other ferries operated by the City to Ward Island, Centre Island and Hanlan's Point include the Sam McBride, Thomas Rennie, William Inglis, and the Trillium.

**Figure 1-2: Boaters on the Inner Harbour, Toronto**



Source: Toronto Star, 2023.

The Toronto Islands south of the Billy Bishop Toronto City Airport are known for recreational boat trips with many narrow channels and scenic locations. This area is known as the Inner Harbour. Boaters to the Toronto Islands may pass by the east end of the airport (location of proposed east RESA). Boaters are typically local to Toronto or sail from other locations around Lake Ontario. Boat traffic has been increasing since 2018 (Waterfront Toronto, 2021).

Commercial traffic tends to use the wider and deeper Eastern Channel (called Eastern Gap in the navigation chart) closer to Toronto Harbour while recreational boaters use the Western Channel (called Western Gap in the navigation chart) to travel between the Inner Harbour and the greater Lake Ontario area.

Hanlan's Point Beach runs south of the west end of the airport (location of proposed west RESA) and paddleboaters may launch from this beach (**Figure 1-3**).

**Figure 1-3: Rowboat on Hanlan’s Point Beach, Toronto**



Source: Tripadvisor, 2024.

## **1.5.2 Existing Public Marine Transportation**

There are three different types of public marine transportation that operate in the Inner Harbour and Toronto Islands: the island ferries, the City airport ferry, and the water taxis. The island ferries sail to three destinations on the Toronto Islands while the airport ferry transports people from the mainland to the City airport. The water taxis sail to six locations on the Toronto Islands from four locations on the Toronto Waterfront. Additionally, two vehicle ferries operate in the area, the Ongiara which was mentioned in **Section 1.5.1** above, and the City airport ferry (Waterfront Toronto, 2021).

## **1.5.3 Shoreline Characteristics**

Physical shoreline characteristics range from concrete, timber or steel vertical seawalls to beaches, marshes and stone revetment slopes. Small craft moorings are plentiful in the Inner Harbour and several marinas exist adjacent to the Western Channel and in the Inner Harbour.

## **1.5.4 Waves and Currents**

The most severe winds tend to blow from the west to southwest (WSP, 2015). This makes the waves at the west end of the airport greater than waves at the east end. A wave rose from the western side of the Billy Bishop Toronto City Airport shows that the

largest waves come from the southwest and have maximum wave heights ( $H_{mo}^1$ ), between 2.0 to 2.5 m (WSP, 2015) using the wind record from Billy Bishop Toronto City Airport from 1971 to 2014. The 100-year return period wind wave produced at the western end of the runway has a significant wave height of 3.5 m with wave period of 8.3 seconds (AviaNG, 2024). The 100-year return period wind wave at the eastern end of the runway has a significant wave height of 1.2 m with wave period of 3.5 seconds (AviaNG, 2024).

More experienced boaters tend to use the water around the west end of the airport while novice boaters would stay within the Inner Harbour.

The Western Channel is bordered by concrete and steel seawalls that reflect the wakes produced by motorboaters. The Western Channel is known by kayakers as a location to test their rough water paddling skills (Paddling Magazine, 2024). More experienced paddleboaters may use the Western Channel and entrance to the Western Channel.

Flow circulation through the Inner Harbour is from the Western Channel to the Eastern Channel and maximum current velocities in the Western Channel were recorded at 0.52 m per second (AECOM, 2017).

Currents are stronger in the Western Channel where the channel narrows to approximately 120 m. The adjacent shoreline to the east of the airport is less restrictive for flow and there is likely minimal current in this area.

## 1.5.5 Sedimentation

Sediment transport on Hanlan's Point beach tends to flow to the north (TRCA, 2019). The sand may go offshore or form shoals in the west Marine Exclusion Zone area which then move into the Western Channel. The northern part of Hanlan's Point beach has a tendency to erode and has been sand nourished at least once if not regularly (City of Toronto, 2023).

Motorboaters would take care on the entrance to the Western Channel from the west, so they don't ground on the nearby sand shoals. There is a navigation buoy placed at the edge of the shoals, but it is unknown how often the area is dredged.

The Western Channel is maintained at a depth of 8.2 m Chart Datum (Low Water Datum which is 74.2 m above the International Great Lakes Datum) up to where the Billy Bishop Toronto City Airport's Taxiway Echo intersects the Channel.

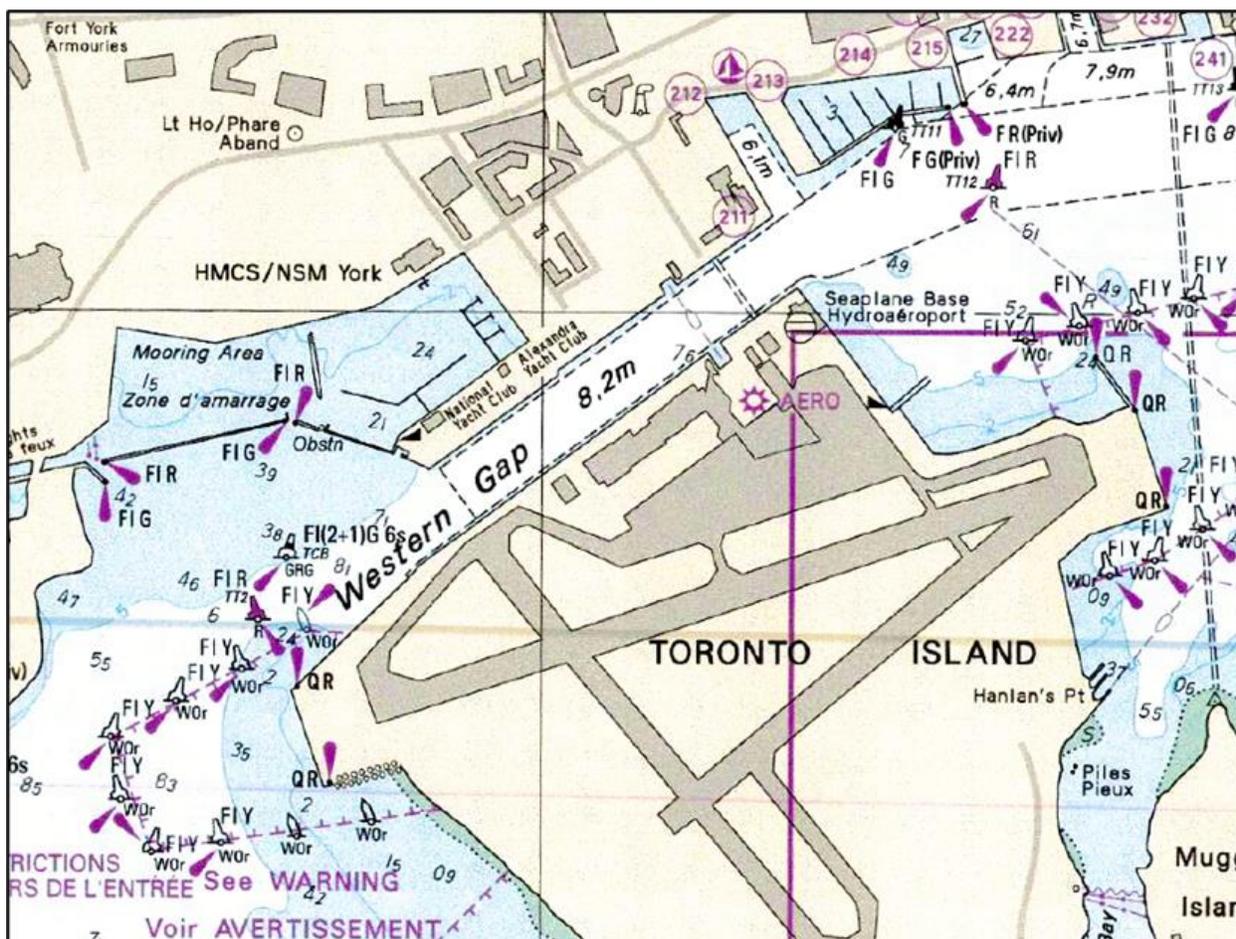
Depths in the entrance to the Western Channel from Lake Ontario are between 5 and 8 m Chart Datum.

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1.  $H_{mo}$  represents the average height of the highest one-third of waves observed during a given time period.

Figure 1-4, an excerpt from Nautical Chart CH2085 (Canadian Hydrographic Service, 2011, 2011) for Toronto Harbour, shows the depths maintained in the Western Gap and at its western entrance.

Figure 1-4: Nautical Chart CH2085



Source: Canadian Hydrographic Service, 2011.

## 1.5.6 Visibility

Paddleboaters are closer to the water and have a shorter range of view on the water to the motorboaters. Even though boaters are not allowed to go into the Marine Exclusion Zone, they will look across the Marine Exclusion Zone to waters beyond. A paddleboater on Hanlan's Point Beach will need to paddle approximately 30 m offshore from the beach to view the west entrance to the Western Channel past the west Marine Exclusion Zone. Paddleboaters paddling north from Mugg's Island in the Inner Harbour would need to paddle approximately 170 m into open water to view the City of Toronto and the east entrance to the Western Channel.

## 2. Effects Assessment

### 2.1 Project Description

The project involves the implementation of RESAs at Billy Bishop Toronto City Airport, which requires expanding the landmass at both the east and west ends of Runway 08/26. To meet the requirements for RESA implementation, three alternatives were developed, each progressively building on the previous one with increased landmass expansion and additional features. The following outlines the three RESA alternatives:

#### RESA 1 – Minimum Landmass

RESA 1 proposes the minimum landmass expansion to meet RESA requirements, extending 54 m from the seawall on the west end (7,850 m<sup>2</sup>), and 52 m on the east end (6,100 m<sup>2</sup>). On the west end, the breakwater structure will be raised to 81 m above sea level, about 4.5 m above the threshold at Runway 08/26, to prevent wave overtopping and water spray. The breakwater at the east end (Inner Harbour) will be raised to 77 m above sea levels, about 1 to 1.5 m above the threshold, since there is no need to control any waves or water spray.

The proposed layout includes perimeter airfield roads around the RESA ends, providing restricted access across the runway, similar to current access conditions. The road will be managed by the control tower to avoid conflicts with aircraft landing or taking off, as this landmass configuration does not provide sufficient airspace clearance for unrestricted vehicle passage (does not meet Obstacle Limitation Surface requirements). An Obstacle Limitation Surface is an imaginary surface or series of surfaces that define the limits to which objects may project into airspace, to protect the airspace for the safe operation of aircraft during takeoff, landing and emergency operations.

#### RESA 2 – Taxiway Improvements

This alternative builds on RESA 1 – Minimum Landmass by incorporating additional airfield improvements in conjunction with the RESA work at both runway ends. Specifically, it proposes upgrades to Taxiway B at the west end and Taxiway D at the east end to enhance operational efficiency and safety at the airport.

For Taxiway B, the relocation of the Localizer 26 antenna to the new western RESA increases the landmass expansion to the west, reaching 82 m from the seawall (11,800 m<sup>2</sup>). The relocation of Taxiway D requires additional landmass to the northeast, bringing the total landmass on the east end to 11,300 m<sup>2</sup>. This relocation enables the airport to upgrade its visual approach guidance system for aircraft landing on Runway 26, which is intended to improve aviation safety with a more precise system. All other features from RESA 1- Minimum Landmass remain the same in this alternative.

## RESA 3 – Noise Wall and East Utility Conduit

This alternative builds on RESA 2 – Taxiway Improvements by incorporating additional elements. The key new features of RESA 3 include: 1) unrestricted airfield perimeter roads connecting the north and south sides of the airport, 2) a noise wall at the east end along with an extension of the existing noise wall at the west end, and 3) a reserved utility conduit for future hydro, water, and telecommunication services to the Toronto Islands community.

To accommodate these new components and ensure aeronautical airspace clearances over the new roads, security fences, and noise walls, a landmass expansion is required; 73 m from the seawall (29,980 m<sup>2</sup>) on the east end and 82 m from the seawall (12,600 m<sup>2</sup>) on the west end. All other features from RESA 2 are included in this alternative.

## 2.2 Methodology

The methodology for assessing the potential effects of RESA 1, 2 and 3 on vessel navigation, safety and stability are summarized below:

- Review the existing conditions for marine navigation in the study area.
- Perform a high-level assessment of the likely changes to waves, currents and sedimentation in areas used by boaters around the Marine Exclusion Zone.
- Evaluate the potential effects to boater navigation, stability and safety during construction and operation.

**Figure 2-1, Figure 2-2 and Figure 2-3** show the local area on the navigation chart with RESA 1, 2 and 3 in red lines, respectively. This area was the focus of the Marine Navigation Effects Assessment. Implementation of RESA 1, 2 or 3 is not anticipated to affect boaters in the Regional Study Area.

Figure 2-1: Nautical Chart CH2085 for Toronto Harbour including RESA 1 Footprint in Red

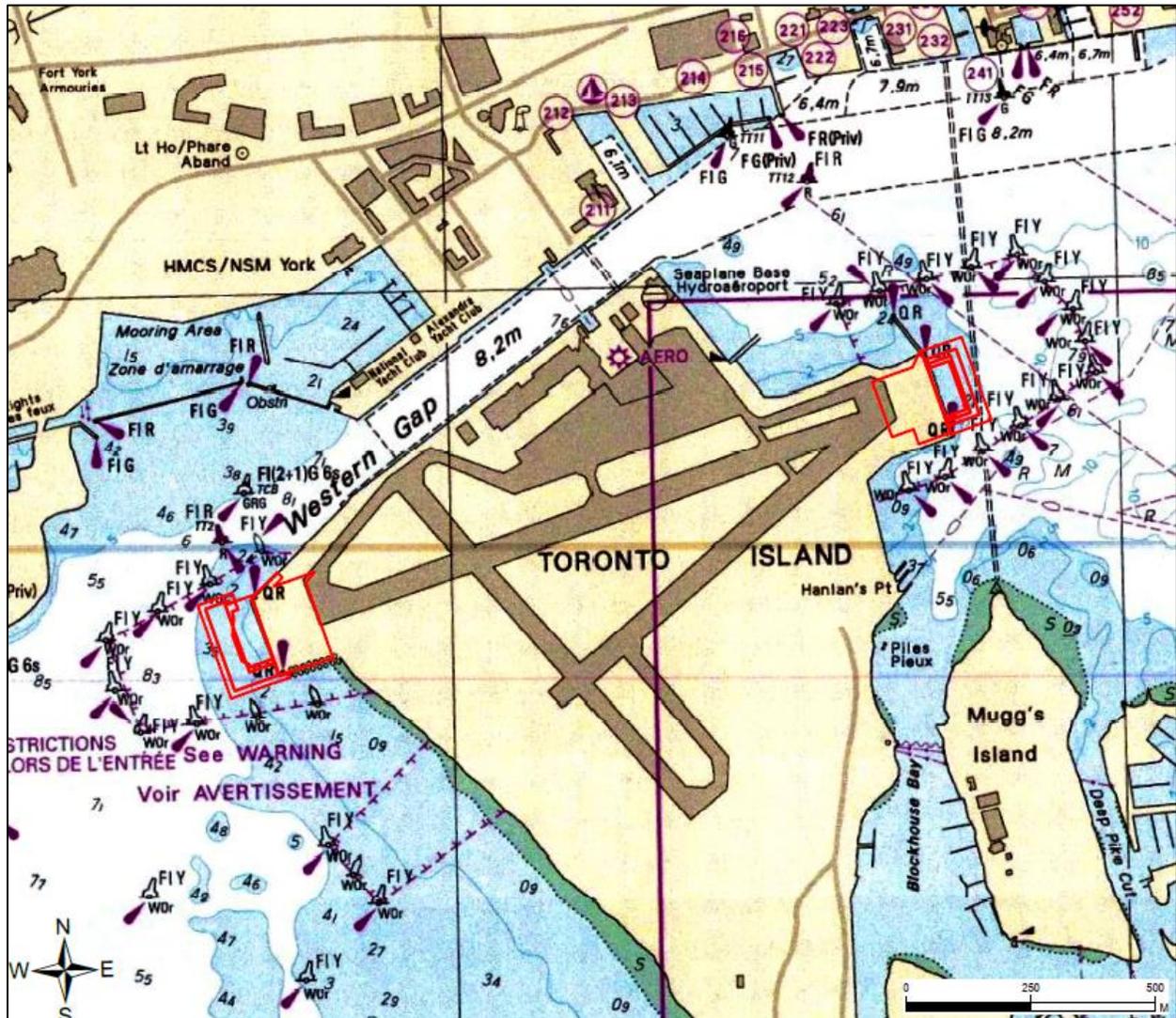
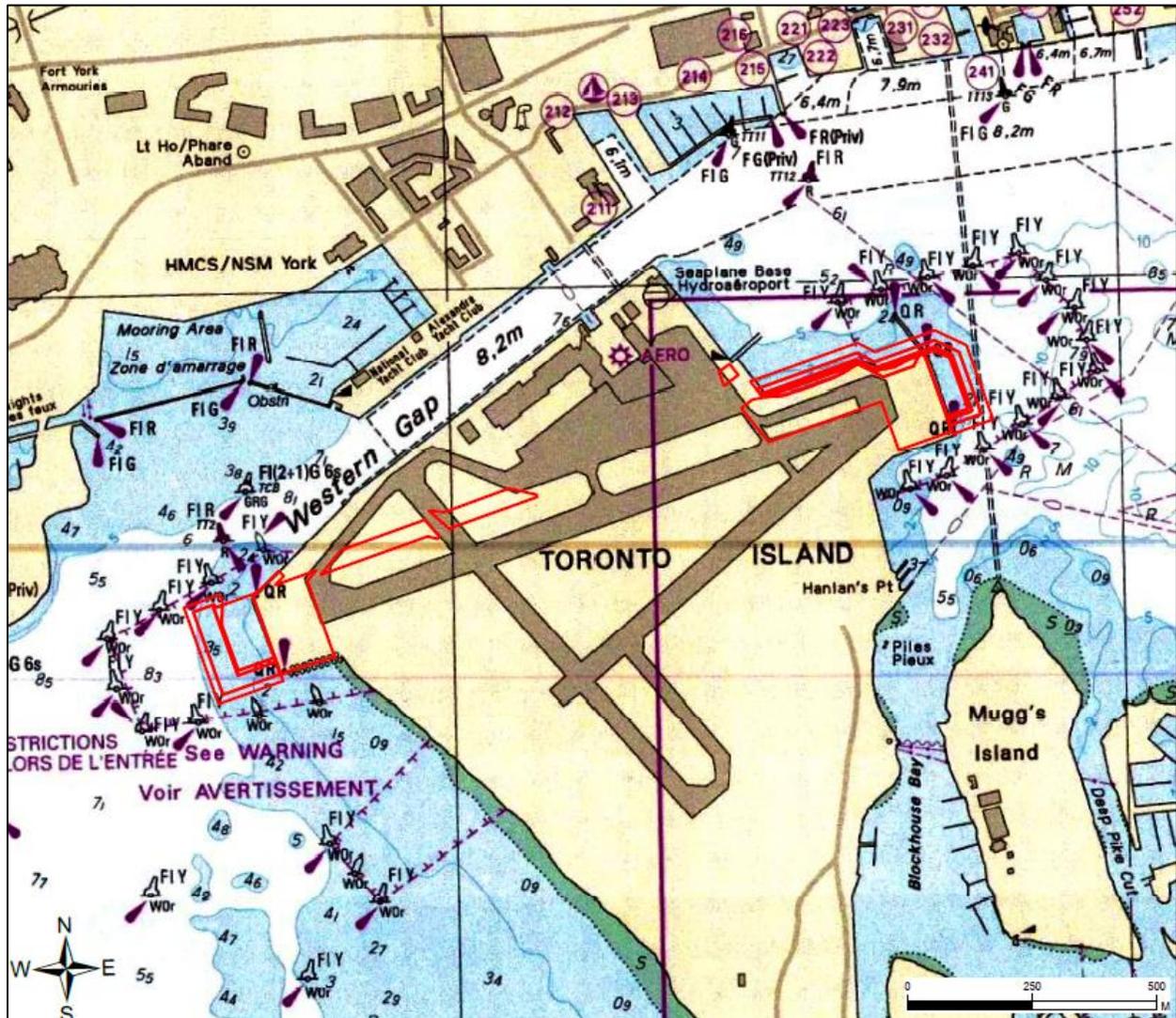
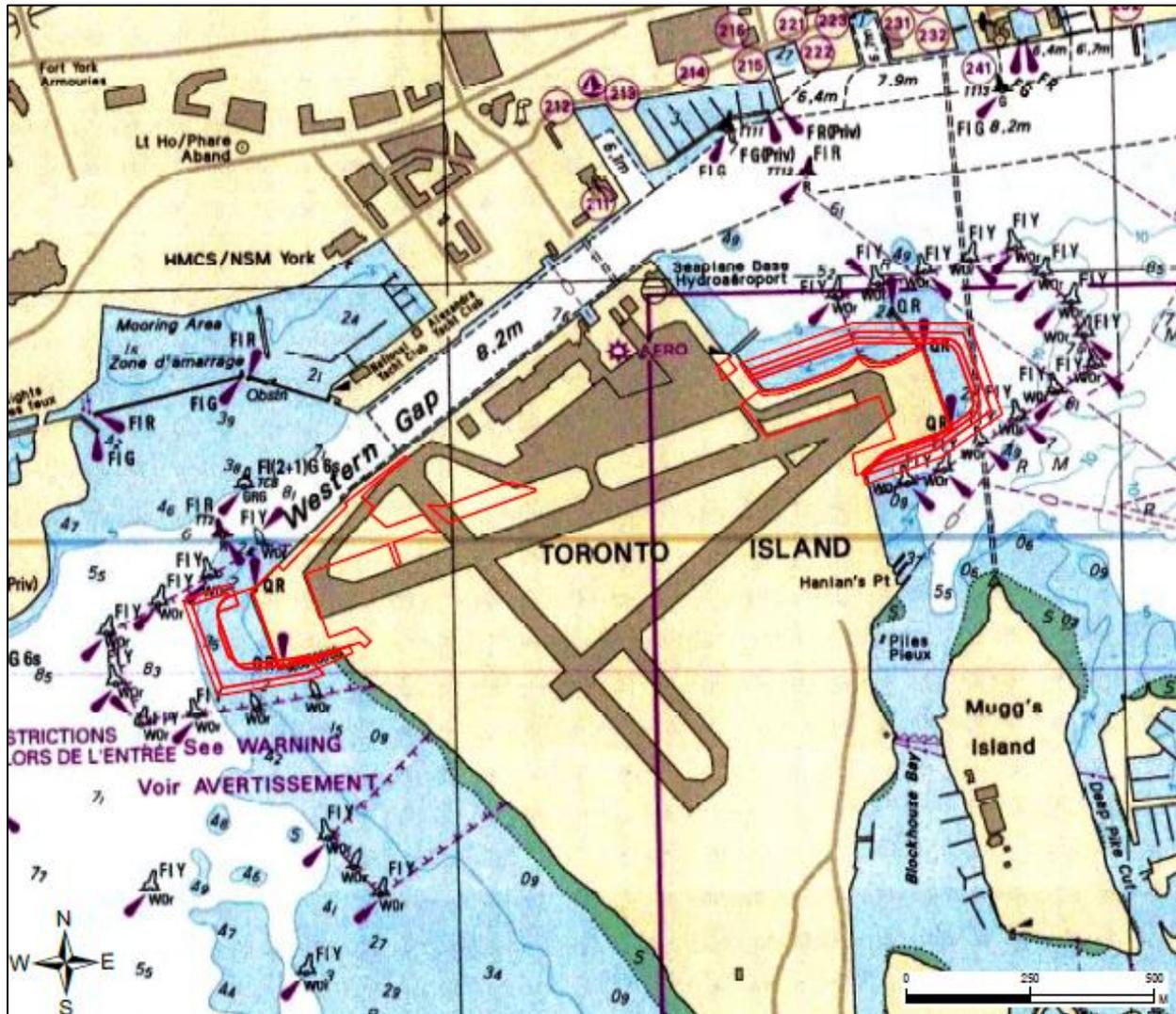


Figure 2-2: Nautical Chart CH2085 for Toronto Harbour including RESA 2 Footprint in Red



**Figure 2-3: Nautical Chart CH2085 for Toronto Harbour including RESA 3 Footprint in Red**



## 2.3 Net Effects Analysis

The net effects analysis for the three RESA alternatives 1, 2, and 3 was conducted considering the factors to marine navigation discussed in the following sections.

This analysis was completed based on the preliminary design of RESA alternatives 1, 2 and 3 available during the Environmental Assessment study, and identified key mitigation measures and effects management strategies to minimize or avoid potential impacts. The analysis summarizes the net effects remaining after the application of these measures.

### 2.3.1 Net Effects- Construction

**Table 2-1** outlines the potential effects, proposed mitigation measures, and net effects of RESA 1, RESA 2 and RESA 3 within the marine navigation study area, during construction.

Construction of the west and east RESA will be conducted from the water due to minimal upland area for staging and to not interrupt airport operations. Material storage, and rock placement equipment will be on barges and other floating platforms in the water. Considering that the construction is limited to night work, this equipment need to be lighted for visibility and safety of both the public and the construction workers. The following factors could affect marine navigation.

- Location of construction equipment in the Marine Exclusion Zone waters. Barges and floating platforms could temporarily focus or reflect waves to outside the Marine Exclusion Zone and impact boaters in the nearby waters.
- The path of the Hanlan's Point ferry and other vessels may need to be adjusted to avoid getting close to construction equipment as the existing sailing paths already are close to the east Marine Exclusion Zone and there has been a history of the Hanlan's Point ferry running aground in heavy fog (Toronto Star, 2024).
- Construction at night will use light plants for worker safety and visibility to the public. Since construction will be close to the airfield, lighting will also be used to distinguish construction lighting from airfield lighting. Lighting on and close to water needs to follow marine guidelines to avoid confusion with marine navigation lights. Some navigation lights used by paddleboaters may be blocked by construction equipment.
- There are navigation lights at each end of the east and west RESA. These lights mark the end of the landmass and will need to be kept updated as the land is extended. Even though no vessels enter the Marine Exclusion Zone, they may use the lights for navigation reference.

### 2.3.2 Net Effects - Operation

The RESA 3 extension of the east and west RESA will add approximately 106 m and 136 m of additional land (including the underwater footprint) in the water, respectively. RESA 1 and RESA 2 will add approximately 76 m (east) and 90 m (west), and 76 m (east) and 136 m (west) of additional land (including the underwater footprint), respectively. The additional landmass at the west RESA will reduce water width at the entrance to the Western Channel to by approximately 135 m (in RESA 3, RESA 2) or to

181 m (in RESA 1) making an entrance already difficult for some boaters to be more challenging. Though there is no change in the Marine Exclusion Zone, the additional landmass behind the Marine Exclusion Zone will change conditions in the entrance to the Western Channel. The following factors during operations and maintenance could affect marine navigation:

- As mentioned previously, the water width at the entrance to the Western Channel would be reduced by each west RESA extension. Waves, currents and sedimentation could change in the entrance according to the new landmass.
- The sheet pile wall at the end of the west RESA would be replaced with a rock revetment for RESA 1, 2 and 3 which reflects wave heights less than the vertical wall. The difference would be noticed by boaters familiar with the area.
- The landmass within the east RESA will be extended and lengthen the shoreline that is adjacent to the Marine Exclusion Zone boundary on the south. The ferry track that runs close to the east Marine Exclusion Zone may need to be adjusted with the new extension. RESA 1 and 2 east extensions are not as close to the Marine Exclusion Zone boundary as the RESA 3 east extension is; however; passing vessels may still make adjustments.
- The land extensions on both the west and east RESA increase the distance that boaters will need to navigate offshore to view around the RESAs. The greatest distance at the west RESA will be created by RESA 2 and 3. The greatest distance at the east RESA will be created by RESA 3. Some landmarks used by boaters could be blocked and new landmarks would be adopted.

**Table 2-1: Net Effects Analysis of RESA 1, RESA 2 and RESA 3 for Marine Navigation - Construction**

Factor	Criteria	Potential Effects	Mitigation Measures	Net Effects
<b>Maneuverability of vessels and Navigation Safety.</b>	<ul style="list-style-type: none"> <li>Changes in the ability of boats to navigate the Western Channel and Inner Harbour during construction.</li> </ul>	<p><b>RESA 1, RESA 2, RESA 3</b></p> <ul style="list-style-type: none"> <li>Construction equipment within the Marine Exclusion Zone (e.g., barges with vertical hulls) could temporarily affect the pattern and reflection of waves. This could affect the stability of some boaters around the Marine Exclusion Zone.</li> <li>Construction equipment could block some navigation markers or land markers that boaters and paddlers use.</li> <li>Reduced navigability during in-water construction activities including lakebed densification, and placement of in-water fill.</li> <li>Temporary construction lighting may cause confusion with navigation lights or block visibility to navigation lights. Each existing RESA has two navigation lights at the end of the landmass, which would need to be relocated during construction while maintaining the edge of the landmass. This could lead to confusion for boaters, as the navigation lights would no longer be in their usual location.</li> </ul>	<p><b>RESA 1, RESA 2, RESA 3</b></p> <ul style="list-style-type: none"> <li>Notifications should be sent out to boating communities in advance of the construction;</li> <li>Temporary signage should be installed during construction.</li> <li>Commercial ferries and private vessels may adjust their path to avoid getting close to the construction.</li> <li>Construction lighting should follow the guidance for lighting around waterways.</li> <li>Temporary navigation lights should be placed at the end of the construction area to mark the placement of new material.</li> </ul>	<p><b>RESA 1, RESA 2, RESA 3</b></p> <ul style="list-style-type: none"> <li>Negligible Net Negative Effect. Construction will temporarily restrict navigation in some areas, particularly around the Marine Exclusion Zone.</li> </ul>

**Table 2-2: Net Effects Analysis of RESA 1, RESA 2 and RESA 3 for Marine Navigation - Operation**

Factor	Criteria	Potential Effects	Mitigation Measures	Net Effects
<b>Maneuverability of Vessels and Navigation Safety.</b>	<ul style="list-style-type: none"> <li>Potential changes in waves, currents, and water depths.</li> </ul>	<p><b>RESA 1, RESA 2, RESA 3</b></p> <ul style="list-style-type: none"> <li>No changes to Marine Exclusion Zone are anticipated.</li> <li>The land expansion from the west RESA would reduce the water width between the west RESA and Ontario Place East Island to 135 m (RESA 2 and 3) or 181 m (RESA 1), which could potentially affect waves and current within the Western Channel and its approach.</li> <li>Slight impact to large recreational boats is anticipated.</li> <li>Operators of small boats including paddle boats, kayaks and small motorboats may need to adjust to changed wave conditions and the new entrance width.</li> <li>Replacement of the vertical sheet pile wall with the stone revetment will potentially reduce wave reflection, reducing negative impacts on vessels.</li> <li>The creation of the east RESA closer to the Hanlan Ferry route may require the ferry and other vessels that use this moorage to adjust their path to avoid the proximity to the landmass.</li> </ul>	<p><b>RESA 1, RESA 2, RESA 3</b></p> <ul style="list-style-type: none"> <li>Notifications regarding the land expansion should be sent to boating communities.</li> <li>Navigation markers should be moved to indicate the narrower entrance.</li> <li>New navigation lights should be installed to mark the edge of the landmass within the East and West Marine Exclusion Zone. Navigation markers and navigation lights will need to be more numerous or brighter with the larger landmass expansion for RESA 2 and even more so for RESA 3.</li> </ul>	<p><b>RESA 1, RESA 2, RESA 3</b></p> <ul style="list-style-type: none"> <li>Negligible Net Negative Effect.</li> <li>No changes to Marine Exclusion Zone are anticipated.</li> <li>The implementation of the RESA in the Marine Exclusion Zone will change wave conditions/patterns outside of the Marine Exclusion Zone.</li> <li>Temporary instability of boaters is anticipated as they make minor adjustments to their navigational routes in and out of the Western Channel from the west. Change in the wave conditions outside of the Marine Exclusion Zone will be greater with the larger landmass expansion in RESA 2 and even more so in RESA 3. Adjustments by boaters would likely be greater with the larger landmasses in the water.</li> </ul>
<b>Maneuverability of Vessels and Navigation Safety.</b>	<ul style="list-style-type: none"> <li>Visibility of Boaters on the Water.</li> </ul>	<p><b>RESA 1, RESA 2, RESA 3</b></p> <ul style="list-style-type: none"> <li>The west and east RESA extensions lengthen the peninsula formed by each RESA. Boaters would need to navigate further offshore to see beyond RESA 2 and 3 and to a lesser extent offshore for RESA 1.</li> </ul>	<p><b>RESA 1, RESA 2, RESA 3</b></p> <ul style="list-style-type: none"> <li>Notifications regarding the land expansion should be sent to the boating communities.</li> </ul>	<p><b>RESA 1, RESA 2, RESA 3</b></p> <ul style="list-style-type: none"> <li>Negligible Net Negative Effect. The boaters are expected to adjust to the new landmass in the area. Minimal negative effects are anticipated.</li> </ul>

### 3. Conclusion and Recommendations

The conclusions and recommendations of this marine navigation assessment study are summarised as follows:

- In-water construction will affect boaters; however, notifying the boating community and adding signs/lighting will help mitigate the factors.
- The addition of the landmass at the western and eastern ends, RESA 1, 2 and 3 will make changes in the waves, currents and sedimentation (water depths) as the coastal environment adjusts to the new landmass. The greatest landmass addition at the west is created by RESA 2 and 3. The greatest landmass addition at the east is created by RESA 3. Recreational and commercial boaters will need to adjust their approach to the Western Channel or around the eastern Marine Exclusion Zone.
- The west and east RESA 1, 2 and 3 extensions create a longer peninsula in the water. The longest western peninsula is created by RESA 2 and 3. The longest eastern peninsula is created by RESA 3. Boaters will need to travel further from the shoreline to view the waters beyond. This is an adjustment that boaters will need to make.

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