

SOUTHERN GULF ISLANDS HARBOURS COMMISSION
Notice of a meeting on **Friday, January 27, 2017** at 9 am
Saanich Peninsula Health Unit, 2170 Mt. Newton X Road, Saanichton, BC

D. Hargreaves, N. Pender Island
D. Maude, Mayne Island
B. Young, Piers Island
B. Mabberley, Galiano Island

L. Peck, Saturna Island
R. Fenton, S. Pender Island
D. Howe, SGI EA Director

AGENDA

1. Approval of the Agenda
2. Adoption of the Minutes of the Meeting held October 28, 2016.....1
3. Chair's Remarks
4. Presentations/Delegations
 - No one has registered to speak.
5. Miners Bay Dock Facility – Vessel Wake Assessment and Conceptual Dock Layout
(Report # SGIHC 2017-01).....5
6. Southern Gulf Islands Harbours Service – Amended 2017 Operating and Capital Budget
(Report #SGIHC 2017-02).....57
7. Piers Island Dock Facility - Float Geometry Review (Report #SGIHC 2017-03).....88
8. Dock Capital Upgrade Project Status Update
9. Status of Wharfinger Service Agreements (Verbal Report)
10. Commissioner and Wharfinger Contact Information.....113
11. Status of Dock Operations Coordinator Services Agreement (Verbal Report)
12. Adjournment



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Minutes of a Meeting of the Southern Gulf Islands Harbour Commission
Held October 28, 2016 at the Saanich Peninsula Health Unit, Mt. Newton X Road,
Victoria, BC

PRESENT: Commission: B. Mabberley, Galiano Island; Carl Bunnin, Mayne Island B. Young, Piers Is.; D. Howe, Regional Director; Paul LeBlond, Alternate Director
 Staff: Ted Robbins, General Manager, Integrated Water Services; Peggy Dayton, Sr. Financial Analyst; Ian Sander, Capital Projects Manager; Dan Robson, Manager, Saanich Peninsula and Gulf Islands Operations; M. Brown (recorder); Al Cannon

ABSENT: Robert Fenton, D. Hargreaves, L. Peck

PUBLIC: 4

The meeting was called to order at 9:00 am. B. Mabberley, Chair.

1. Approval of Agenda

MOVED by Director Howe, **SECONDED** by Bryce Young, that the agenda be approved with the following additions: add Small Craft Harbours court case; chain at Miners Bay float; and Miners Bay wharfinger agreement.

CARRIED

2. Adoption of Minutes

MOVED by Dave Hargreaves **SECONDED** by Bryce Young, that the minutes of the August 26, 2016 meeting be adopted.

CARRIED

3. Chair's Remarks - None.

4. Presentations/Delegations - None

5. Correspondence – Re Miners Bay (dealt with in item 8)

6. Piers Island Dock Facility Float Geometry Review

Ian Sander reviewed the staff report for the Piers Island Dock Facility Float Geometry Review Project. It was noted that the Moffatt & Nichol fee budget for this project is \$800 above the \$5,000 approved for this project. The work is to be completed by the end of the year.

MOVED by David Howe, **SECONDED** by Bryce Young, That the Southern Gulf Islands Harbours Commission approve an increased budget of \$5,800 from the Capital Reserve Fund for the CRD Piers Island Dock Facility Float Geometry Review Project.

CARRIED

7. Southern Gulf Islands Harbours Commission – Float Ladder Installation Project Update

Ian Sander reviewed the staff report re the awarding of the Float Ladder Installation Project addition to the Dock Infrastructure 2016 Improvements Contracts. Commission members discussed the budget and bids for the 30 float ladders.

MOVED by Carl Bunnin, **SECONDED** by Bryce Young,
 That the Southern Gulf Islands Harbours Commission:

1. Direct staff to award the fabrication and delivery of the float ladders to JR Manufacturing Ltd.; and
2. Direct staff to competitively tender the Float Ladder Project and manage as a separate project to the 2016 Improvements Project.

CARRIED

8. Dock Infrastructure 2016 Improvements Project (Verbal Update & Attachment)

Ian Sander reported that work is proposed for Piers Island and Swartz Bay next week but is weather dependant. Work is to be completed by mid December.

Correspondence re Miners Bay

Ian noted that on the website there are drawings for each facility. The approaches to Miners Bay were not painted but will be included in the future; lights are all working; rotten planks will be replaced; repairs to the decking will be replaced; float #2 will be pressure washed and will be replacing boards; floats B and C transition plate was replaced this summer but is showing wear.

Carl reported on his experience with a severe ferry wash from two combined ferry wakes. When the tide is low the chains securing the floats are slack and he recommends the use of kelleys on the chains. Carl agreed to send information to Ian in this regard. Commission members expressed concern that any dangerous situation should be a priority and further noted unease regarding the use of Miners Bay as the gateway to the Experience the Gulf Islands project.

It was agreed to move agenda Item #15 to be included here. Director Howe agreed to arrange a meeting with BC Ferries wherein Ben, Director Howe and Ted will attend.

Ian questioned if the cleats on the west and south faces of the Miners Bay wharfhead should be kept. The boards they are mounted on are rotten. Commission members agreed that any larger vessels could fasten to the tie-rails instead and that the cleats be removed.

9. Lyall Harbour and Horton Bay Repair Work by Small Craft Harbours

Dan reported that work will commence next week. It was suggested that while there is a contractor working there, perhaps they could install the ladder on the float. Dan agreed to talk to them in this regard.

10. Lyall Harbour Dock Divesture Opportunity (Verbal Update)

Ben and Ted attended the meeting the goal of which was to see if an agreement could be in place by this spring. It was noted:

- wharfhead is fee simple and some small buildings extend into it;
- may be necessary to apply for a new water lot lease;
- a contribution agreement gives more flexibility;
- First Nation consultation is required; and
- Interest was expressed by Salt Spring Island.

Director Howe left the meeting, 10:15 am.

11. Horton Dock-Management Agreement Renewal

Ted reviewed the staff report.

Moved by Carl Bunnin, seconded by Bryce Young, that the Southern Gulf Island Harbour Commission recommends to the CRD Board that the CAO be authorized to negotiate and execute the management agreement on the following terms.

- i For a term from July 1, 2016 – March 31, 2018.
- ii. The CRD shall pay \$10.00 + GST annually to the Receiver General for Canada.

12. CBSA – Bedwell Harbour Redesign/Refit

This item was deferred to the next SGIHC meeting agenda.

13. Dock Operations Coordinator Services Agreement (Discussion)

The Chair acknowledged Al Cannon's contribution and expressed appreciation for his work during the past year. Commission members discussed the desire to find a replacement for Al and continue with the current model. There is a need to define the scope of service and skill sets required.

MOVED by Paul LeBlond, **SECONDED** by Carl Bunnin, that the Southern Gulf Islands Harbour Commission directs staff to proceed with an RFEOI for the position of dock coordinator.

CARRIED

14. Applications/Nominations – Southern Gulf Islands Harbours Commission

Ted reported that four commissioners' terms are expiring. Advertisements are running in the local media with a deadline of November 2 in order that names may be forwarded to the Regional Board meeting in November. Bryce noted the Piers Island/Swartz Bay issue.

15. Miners Bay Dock – Meeting with BC Ferries

This item was dealt with under item #8.

16. Operating Budget Update

Peggy Dayton reviewed the October Revenue and Expenditure Budget Summary YTD and noted that any transfers to the Capital Reserve Fund would wait until year end.

Carl advised that expenses for the Horton Bay dinghy float will be under budget.

17. Dock Reports

Galiano Island – signs are up

Saturna Island – No report but Ted reported that Larry wants a “T” on the existing float for planes and emergency boats on the inside. Water lease could be an issue with this request.

Swartz Bay – AI passed on to Dan the issue of the platform for BC Ambulance.

Lyll Harbour – The oil spill kit was used for a private dock. Larry is looking into this. Dan reported that it was replaced.

Mayne Island – Carl spoke with regard to the Anson Road dock project and reported that the rezoning is completed and is now in the hands of the BC government; questioned if it would be reasonable to begin some engineering research. Ted noted that Stage 1 is included in the budget.

MOVED by Carl, **SECONDED** by Bryce that the Southern Gulf Islands Harbour Commission directs staff to proceed with a RFP for design services for the Anson Road project and to bring back the results of the RFP to the commission prior to awarding of a contract.

CARRIED

Commission members discussed the issue of having a separate wharfinger for the Miners Bay dock.

MOVED by Carl, **SECONDED** by Paul LeBlond that the Southern Gulf Islands Harbours Commission directs staff to undertake a recruitment for a wharfinger at Miners Bay dock, effective January 17, 2017.

CARRIED

Pender Island – AI noted some welding on the apron at Port Browning. A Change Order was required. Signs are up.

18. Next Meeting – December 9, 2016

19. Adjournment - The meeting adjourned, 11:48 am.



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Agenda Item 5
REPORT #SGIHC 2017-01

REPORT TO THE SOUTHERN GULF ISLANDS HARBOURS COMMISSION MEETING OF FRIDAY, JANUARY 27, 2017

SUBJECT **MINERS BAY DOCK FACILITY – VESSEL WAKE ASSESSMENT AND CONCEPTUAL DOCK LAYOUT**

ISSUE

The purpose of this staff report is to present the results of the Miners Bay Dock Vessel Wake Assessment and conceptual Dock Layout Project (Project).

BACKGROUND

The Miners bay Dock is exposed to Active Pass and subject to wake from a combination of BC Ferries, Commercial, and recreational vessels. The most frequent large scale vessel traffic is generated by BC Ferries vessels which produce the majority of the severe vessel wakes experienced at the Miners Bay Facility. The vessel wake waves create significant motion on the existing floats (Floats B, C, and D) located on the north side of the Miners Bay approach trestle and is causing severe wear and tear on the gangway transition plate, the floats, and mooring system. In addition, the float movement due to the wave action is a cause of concern for public safety.

In December 2016, the Capital Regional District (CRD) Board approved funding of \$15,000 from the Community Works Fund (CWF) to assess the Miners Bay Dock. The goals of the assessment were to document and understand the factors in wake development, define the associated impact to the facility, and to provide recommendations for mitigation and to develop associated cost estimates. The assessment was awarded to Moffatt & Nichol (M&N). The draft assessment is included as **Attachment 1**, Miners Bay Vessel Wake Assessment and Conceptual Dock Layout, Revision 01, January 17, 2017.

The Southern Gulf Islands Harbours Commission (Commission) approved a project in the 2015 capital budget to undertake an engineering review and condition assessment of the 11 dock facilities under the Southern Gulf Islands Harbours Service responsibility. The resulting Moffatt & Nichol (M&N) December 11, 2015 Summary Report and Optimized Multi-Year Funding Plan included recommended capital programs for years 2016 through 2020, and anticipated budgetary spending for years 2021 to 2025 necessary to maintain the current level of service. In summary, the 2015 Summary Report recommended the following works for Miners Bay:

- 2015 – Approximately \$82,000: Repair of electrical works, miscellaneous approach, and Gangway A, and B repairs.
- 2020 – Approximately \$384,000: Replacement of 9 approach piles, miscellaneous repairs to approach bracing, miscellaneous repairs to floats A, B, C, and D, and new LED light fixtures.
- 2021 to 2026: Approximately \$525,000 in undefined works.

Southern Gulf Islands Harbours Commission – January 27, 2017
Miners Bay Dock Facility – Vessel Wake Assessment And Conceptual Dock Layout **2**

Prior to undertaking future phases of improvements noted above, the Commission can consider the recommendations and implications outlined in the M&N report to determine if, in addition to the planned major maintenance work, modifications to the Miners Bay Dock are a capital priority, to address recent concerns raised by the Mayne Island community.

Report Findings

The M&N assessment identifies BC Ferries vessel traffic as the main source of vessel wakes due to the magnitude and frequency of wakes produced by ferries transiting Active Pass. The results of the metocean analysis show the 50-year wind event will result in a wave height of 0.4 metres and period of 4.7 seconds. These wind generated wave parameters are similar to the wake characteristics produced by the 'Spirit' class of ferry vessels (wave height of 0.3 metres and period of 4.3 seconds).

While it is unlikely for ferries to reduce speed transiting Active Pass, the possible mitigations to reduce or eliminate the wake wave effects at the utility float are to provide some type of breakwater to form a protective barrier for the float or to relocate the float to a calmer area such as the south side of the approach trestle.

Four conceptual layout options were developed to mitigate vessel wake waves originating from ferry and ship traffic transiting Active Pass. A rubble mound breakwater, floating breakwater, piled panel breakwater and relocating the existing float on the south side of the approach trestle with wave baffles installed along the perimeter of the approach wharf. The four options and associated costs are summarized in the table below:

	Rubble Mound Breakwater	Floating Breakwater	Pile Panel Breakwater	Wave Baffles and Relocated Float
	\$4,595,000	\$1,991,000	\$2,617,000	\$676,000
Advantages	<ul style="list-style-type: none"> • Excellent protection from wind and waves; • Very robust construction; and • Low maintenance. 	<ul style="list-style-type: none"> • Allows circulation of current into the protected area • Low footprint on seabed for anchoring system; • Could provide additional moorage • Permitting may be easier to obtain; • Robust construction • Low maintenance depending on materials used 	<ul style="list-style-type: none"> • Good protection from wind and waves; • Allows some circulation of current into the protected area; • Low footprint on seabed for anchoring system; • Could provide additional moorage ; • Permitting may be easier to obtain; • Robust construction; • Low maintenance depending on materials used 	<ul style="list-style-type: none"> • Very good protection from wind and waves; • Allows some circulation of current into the protected area • Low footprint on seabed for new pile supports for access platform and floats; • No modification of the existing water lot is required and • Lowest cost option to construct.
Disadvantages	<ul style="list-style-type: none"> • Very expensive to construct; • May obstruct ocean views from shore; • Occupies a large footprint on the sea bed and will exceed existing water lot limits; • Permitting may be difficult to obtain 	<ul style="list-style-type: none"> • Expensive to construct; • Existing water lot will have to be expanded • May not be effective at wave attenuation with longer wave length incident waves. 	<ul style="list-style-type: none"> • Expensive to construct; • Existing water lot will have to be expanded and, • May obstruct ocean views from shore. 	<ul style="list-style-type: none"> • May have some conflict activities at the wharf head with nearby existing float access.

- Estimates costs include 30% construction contingency but do not include project contingency or project management.

The rubble mound breakwater and the piled panel breakwater provided the best protection from the vessel wake waves, however, these two options were the most expensive. A floating breakwater would provide some protection from the wake waves, but would allow some transmission of the incident waves through the structure. Relocating the existing float to the south side of the existing approach trestle and installing wave baffles around the perimeter of the dock to improve wave attenuation is the lowest cost of the four concepts.

ALTERNATIVES

Alternative 1

That the Southern Gulf Islands Harbours Commission receive the report for information and direct staff to meet with BC Ferries to discuss the impacts of the BC Ferries vessel traffic on the Miners Bay Dock and proposed solutions to mitigate vessel wakes to improve the function and safety of the dock infrastructure.

Alternative 2

That the Southern Gulf Islands Harbours Commission receive the report for information and direct staff to provide more information, or explore other alternatives.

IMPLICATIONS

Alternative 1 – The report will be received by the Commission and used as a foundation for discussion with BC Ferries. The goal of this discussion will be to explore options with BC Ferries and determine if BC Ferries is willing or obligated to participate in a solution.

Alternative 2 – The facility will continue to operate in its current condition. The commission can request that CRD staff explore other options.

CONCLUSION

The M&N assessment identifies BC Ferries vessel traffic as the main source of vessel wakes due to the magnitude and frequency of wakes produced by ferries transiting Active Pass. While it is unlikely for ferries to reduce speed transiting Active Pass, the possible mitigations to reduce or eliminate the wake wave effects at the utility float are to provide some type of breakwater to form a protective barrier for the float or to relocate the float to a calmer area such as the south side of the approach trestle.

Floats B, C, D, and the gangway will continue to be a safety concern and will require considerable ongoing maintenance unless recommended works are undertaken or the vessels slow down through Active Pass. The most cost effective solution is relocation of the existing float to the inside of the structure and installing a wave baffle. The cost estimate for this solution is in the order of \$700,000. This \$384,000 proposed in 2017 includes work on the floats and gangways, and will need to be completed in addition to the recommend solution. It should be noted that the life expectancy of the repairs to the floats will be shortened if repairs are undertaken in advance of installation of a protective barrier.

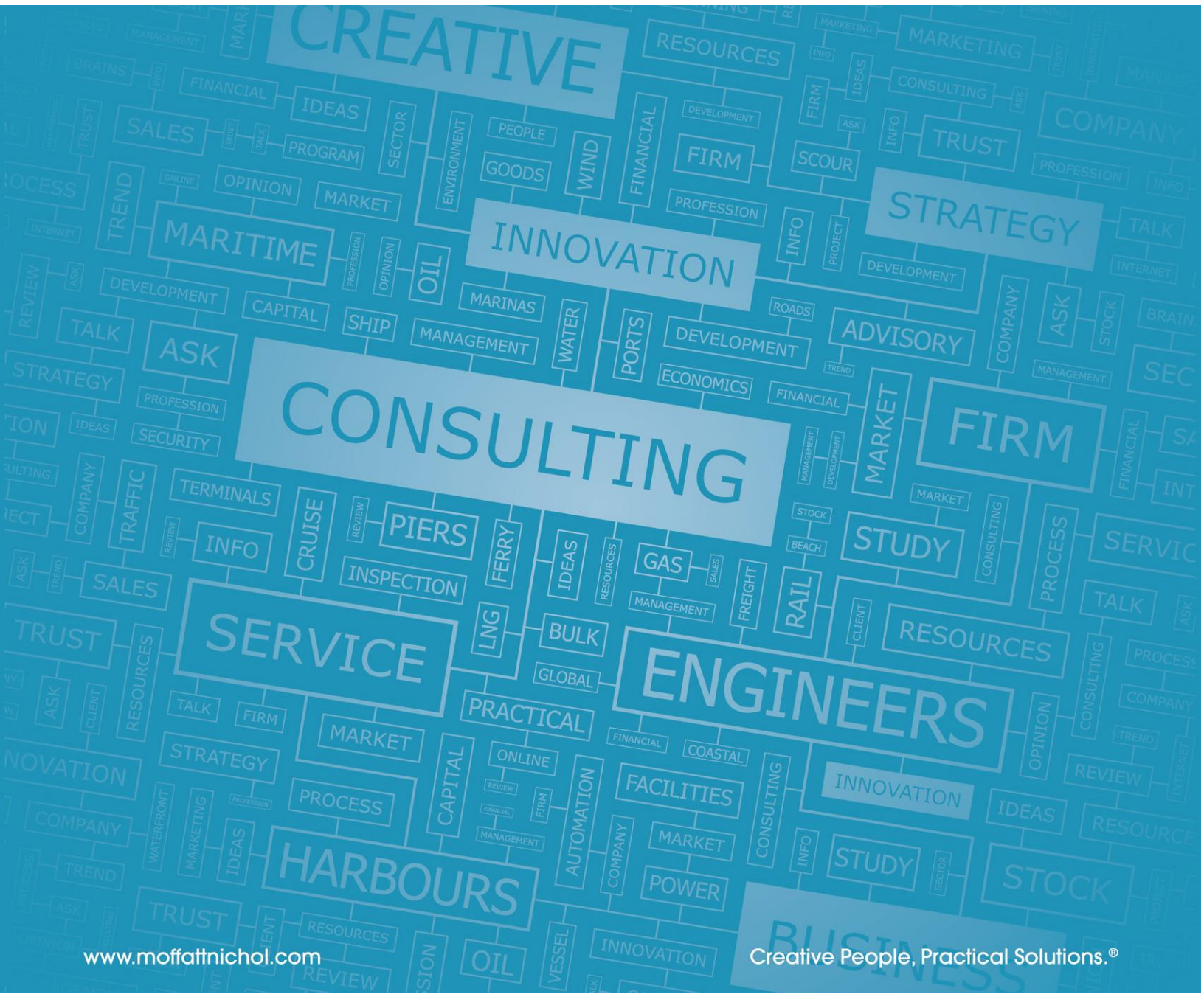
RECOMMENDATION

That the Southern Gulf Islands Harbours Commission accept the staff report and direct staff to meet with BC Ferries to determine if they are willing to assist in a solution to mitigate vessel wakes.

Submitted by:	Ian Sander, P.Eng., Manager, Capital Projects
Concurrence:	Ian Jesney, P.Eng., Senior Manager, Infrastructure Engineering
Concurrence:	Ted Robbins, B.Sc., C.Tech., General Manager, Integrated Water Services

SI/TR:mm

Attachment: 1



Document Verification

Client	Capital Regional District (CRD)
Project name	Miners Bay Dock
Document title	Miners Bay Vessel Wake Assessment and Conceptual Dock Layout
Document subtitle	
Status	Report
Date	January 17, 2017
Project number	9369-02
File reference	9369-02-50-55

Revision	Description	Issued by	Date	Checked
01	Draft Report	CT/AJ/PH	17-Jan-2017	MJ/PH

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Executive Summary

Moffatt & Nichol has been retained by the Capital Regional District (CRD) to aid in the development of remedial alternatives for improvement of the existing CRD dock facility in Miners Bay, including the addition of a guest dock.

The present report builds upon prior preliminary assessments, site visits, and structural inspection of the existing dock facility in Miners Bay. The scope of the work is to develop an assessment of vessel wakes within Miners Bay, which is provided herein.

This report is divided into three parts. The first part provides an assessment of meteorological and oceanographic (metocean) conditions at Miners Bay. These include tides, sea level rise, winds, currents, and waves. The second portion of the report addresses wake waves associated with vessels transiting Active Pass. The third part of this report provides conceptual layouts of potential solutions to mitigate vessel wake waves and opinions of cost estimates.

This study identifies BC Ferries as the main source of vessel wakes due to the magnitude and frequency of wakes produced by ferries transiting Active Pass. Preliminary estimates of vessel wake heights are on the order of 0.1 to 0.3 metres, but with fairly long wave periods on the order of 3 to 4 seconds. Associated wave lengths are on the order of 16 to 30 metres. As a rule-of-thumb, the response of a vessel to wave action is limited when the wave length is shorter than the overall dimensions of the vessel. As the wave length approaches the dimensions of the vessel, its response (in terms of surge, sway, heave, roll, pitch, and yaw) will become more pronounced. If the length of incident waves is more than two times the vessel dimensions, the motion of the vessel will generally be on the same order as the wave motion. Because the wave lengths of incident wakes are comparable to the lengthwise dimensions of recreational vessels and dock floats, these will exhibit a pronounced response when exposed to the vessel wake. If the wakes arrive quarter or beam to vessels and floats, their motion response will be exacerbated because their characteristic beam dimensions are substantially shorter than the wave lengths of incident wakes. A preliminary assessment of vessel wake propagation patterns within Miners Bay provides the indication that westbound transits may produce wake waves that arrives quarter to the dock and moored vessels, while wake stemming from northbound transits may arrive more head-on at the dock.

Four conceptual layout options were developed to mitigate vessel wake waves originating from ferry and ship traffic transiting Active Pass. A rubble mound breakwater, floating breakwater, piled panel breakwater and relocating the existing float on the south side of the approach trestle with wave baffles installed along the perimeter of the approach wharf. The rubble mound breakwater and the piled panel breakwater provided the best protection from the vessel wake waves, however, these two options were the most expensive. A floating breakwater would provide some protection from the wake waves, but would allow some transmission of the incident waves through the structure. Relocating the existing float to the south side of the existing approach trestle, where there is some sheltering from the wharf structure. Wave baffles could be installed around the perimeter of the dock to improve wave attenuation. This option was lowest cost of the four concepts.

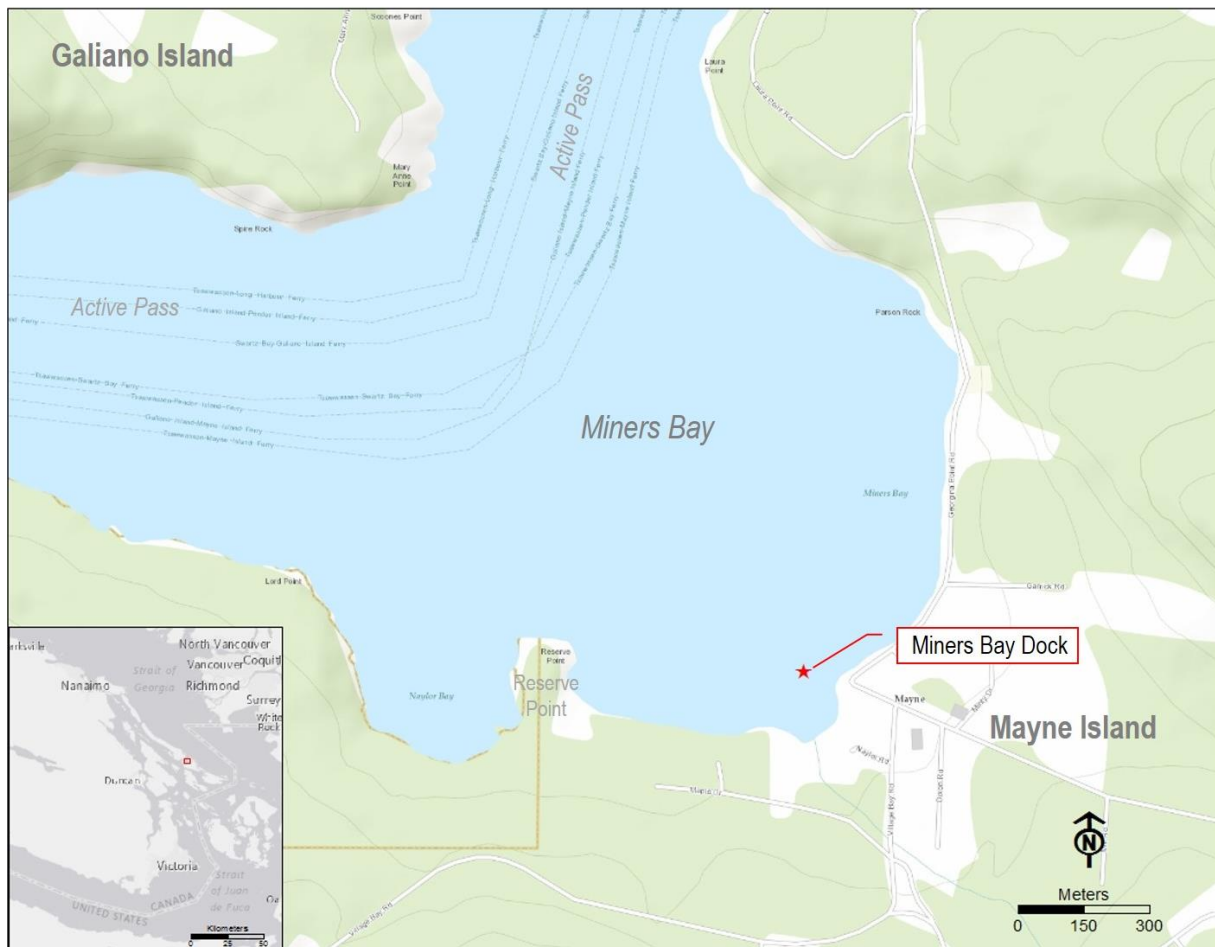
Glossary

BC	British Columbia
CD	Chart Datum
CHS	Canadian Hydrographic Service
CRD	Capital Regional District
DHI	Danish Hydraulic Institute
IPCC	Intergovernmental Panel on Climate Change
LOA	Length Overall
m	metres
M&N	Moffatt & Nichol
MSL	Mean Sea Level
NGA	U.S. National Geospatial-Intelligence Agency
SLR	Sea Level Rise

1. Introduction

The Capital Regional District (CRD) has retained Moffatt & Nichol (M&N) to examine alternate alignments and improvements for their facility in Miners Bay. Miners Bay is located in the narrow passage between Mayne Island and Galiano Island referred to as Active Pass. The facility is located along the north side of Mayne Island approximately half a kilometre from Reserve Point.

FIGURE 1.1: PROJECT LOCATION

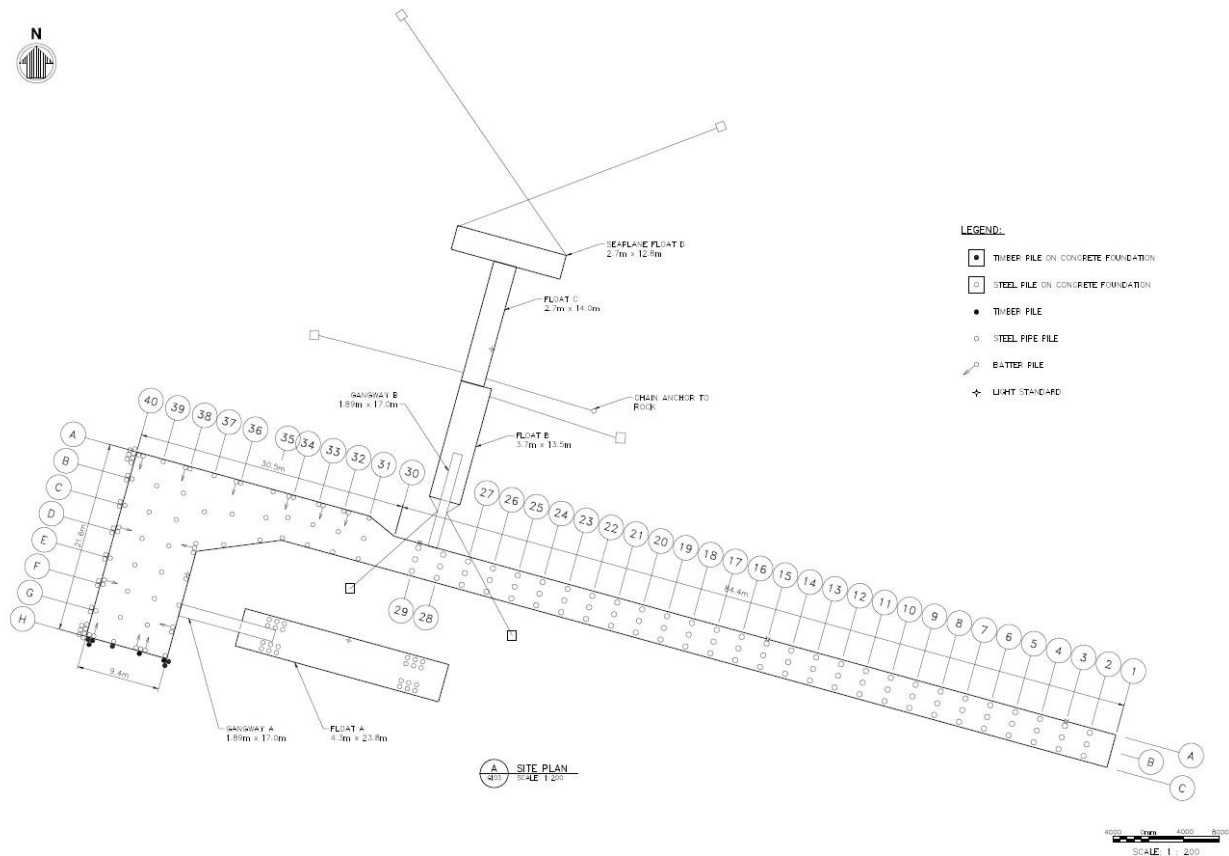


(Source: M&N)

1.1. Background

The Miners Bay facility consists of two sets of floats on either side of an 85 metre timbered approach and a 10x20 metre wharf head. Approximately 75 square metres are available for vessel berthing with some float space reserved for emergency vessels, loading vessels, water taxis, and float planes. The layout of the dock facility is shown in Figure 1.2.

FIGURE 1.2: LAYOUT OF CRD DOCK FACILITY



(Source: M&N)

Active Pass serves as a main shipping route for trade between South Vancouver Island and the mainland. Though the CRD dock facility is located within the widest section of Active Pass, waves from passing vessels are known to create hazardous conditions such as extensive rolling of floats. These conditions worsen in combination with wind-waves associated with Northerly winds.

1.2. Purpose and Scope

Scope of Work for Schematic Layouts for float relocation at Miners Bay is summarized as follows:

1. Data Gathering – M&N will gather data related to the types, speeds and other characteristics of the vessel which transit Active Pass in the vicinity of Miner's Bay. We will focus on the larger vessel types, specifically tugs, ferries and container ships. This information will be used to develop three typical vessels to be used in vessel wake analysis. Additionally we will conduct a brief review of available literature related to the winds, waves and currents of Miner's Bay. This literature will include navigation charts, tide and current tables, sailing directions and prior studies conducted for the Capital Regional District.
2. Meteorological and Oceanographic (Metocean) – Wind wave information developed in prior studies for Capital Regional District will be used to provide a comparison of wind wave periods

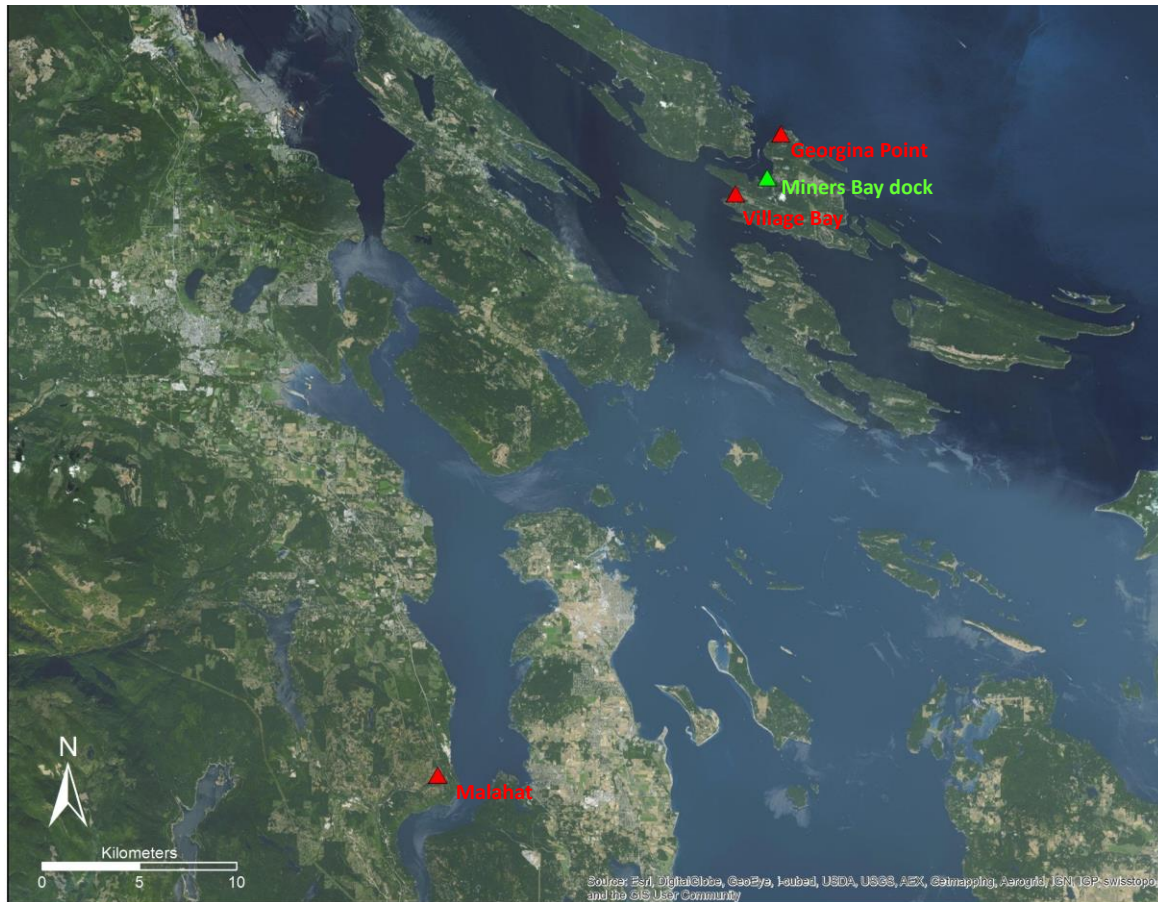
for design level wind wave events. Based on the information developed in Task 1 the vessel generated wave period and wave direction approaching the vicinity of the Miners Bay guest dock will be developed for the three typical vessels transiting through Active Pass.

3. Prepare summary memorandum of analysis findings for the ferry wakes and literature review of other Metocean conditions relevant to schematic layout of the existing dock.
4. M&N will assess and identify alternate solutions for the float orientation, float structural system, and anchoring or possible relocation of the Miners Bay Facility desired to improve safety and reduce wear and tear from the ferry wake analysis.
5. Prepare summary memorandum of analysis findings, layout, and prepare Class D Order of Magnitude cost estimate for the reconfigured float layout.
6. Perform Quality Assurance/ Quality Control checks on analysis and memorandum.
7. Project management and project team communications.

2. Metocean Conditions

This section summarizes the general metocean conditions in the vicinity of Miners Bay. Figure 2.1 provides the location of the project site and regional metocean gauges used in this study.

FIGURE 2.1: REGIONAL METOCEAN GAUGES



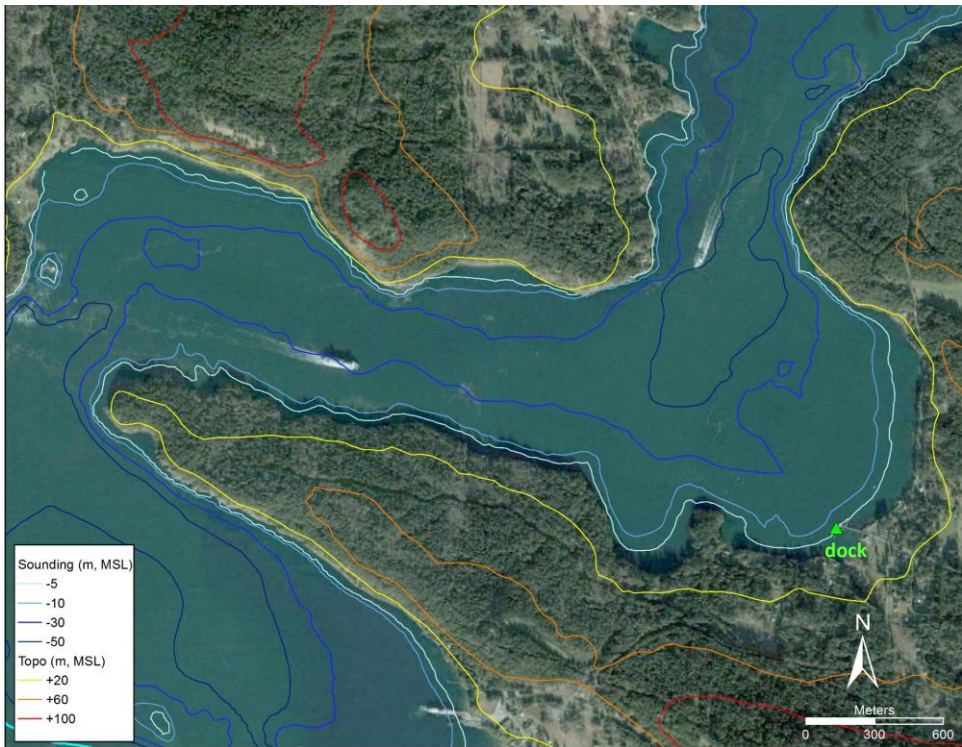
(Source: M&N)

2.1. Bathymetry and Topography

Bathymetry at Active Pass was extracted from the C-Map Software of DHI, which incorporates Jeppesen Norway's electronic database of global nautical charts (DHI, 2008). The water depth at the dock is about 5 metres at mean sea level (MSL). Land topography surrounding Active Pass was obtained from Natural Resources Canada and was included to an elevation of approximately 200 metres above MSL.

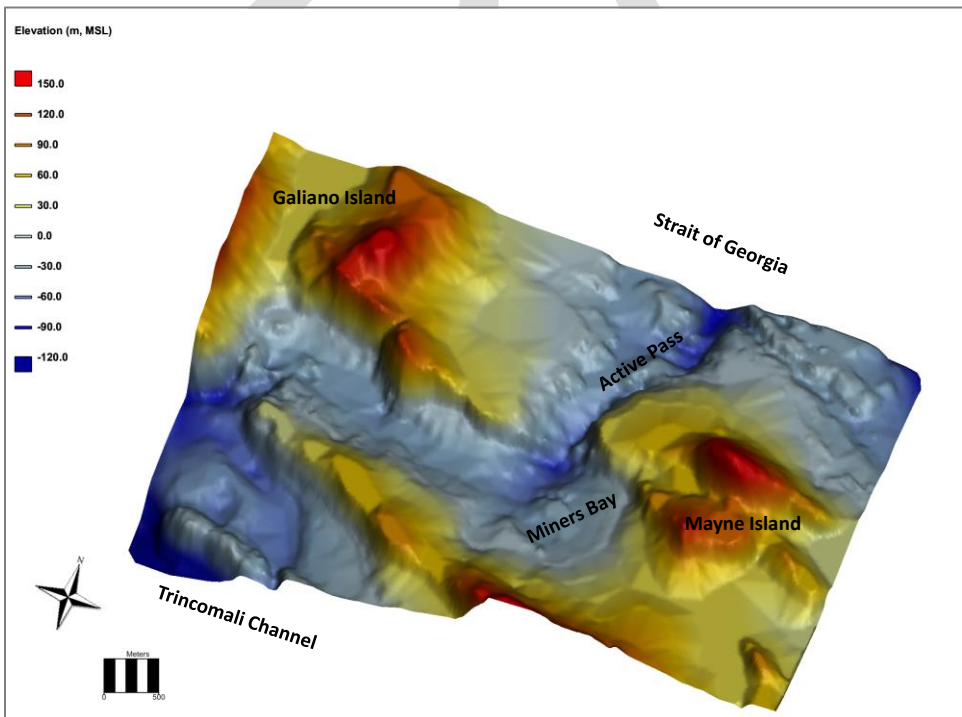
Figure 2.2 shows contours in the vicinity of Miners Bay with depth contours indicated in blue and height contours in yellow, orange, and red. Figure 2.3 presents a three-dimensional elevation profile compiled in the study.

FIGURE 2.2: CONTOURS OF BATHYMETRIC SOUNDINGS AND TOPOGRAPHY



(Source: M&N)

FIGURE 2.3: ILLUSTRATION OF THREE-DIMENSIONAL GROUND ELEVATIONS IN THE VICINITY OF MINERS BAY



2.2. Water Levels

There are no active tide gauges in the region. Therefore, tidal datum in the vicinity of Miners Bay were taken from the Canadian Hydrographic Service (CHS) nautical charts at nearby Georgina Point and Village Bay (see Figure 2.1). Tide levels at Miners Bay are expected to be similar to tidal levels at Georgina Point.

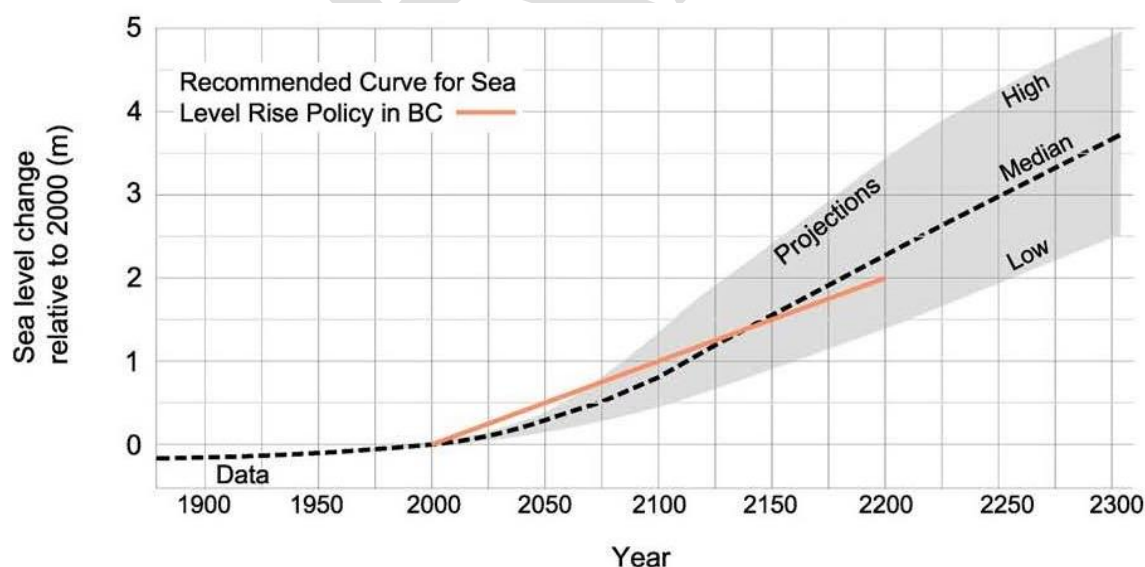
TABLE 2.1: TIDAL DATUMS

Tidal Datum	Georgina Point (48.8725°N, 123.2923°W) m, Chart Datum	Village Bay (48.8445°N, 123.3241°W) m, Chart Datum
Higher High Water Large Tide (HHWLT)	4.5	3.9
Higher High Water Mean Tide (HHWMT)	3.8	3.2
Mean Water Level (MWL)	2.7	2.3
Lower Low Water Mean Tide (LLWMT)	1.0	0.8
Lower Low Water Large Tide (LLWLT)	0.0	0.0

2.3. Sea Level Rise

Rising sea levels can be attributed to both global and local effects. The BC Ministry of Environment recommends using a value of 0.5 metres of sea level rise (SLR) for a project life spanning 25-50 years. For longer term projects, a global SLR value of 1.0 metres by 2100 is recommended (BC Ministry of Environment, 2011). Figure 2.4 presents the SLR recommendations for BC.

FIGURE 2.4: GLOBAL SEA LEVEL RISE PROJECTIONS FOR BRITISH COLUMBIA



(Source: BC Ministry of Environment)

These global rates are then adjusted for local effects. A detailed examination of local factors was conducted by Thomson, Bornhold, and Mazzotti (2008). The study accounted for local effects, including geodynamic processes (plate tectonics, land subsidence, and glacial isostatic which defined as land deformation associated with changes in ice mass distribution), steric effect (addition of water due to melting of continental ice sheets and glaciers), and changes in atmospheric and oceanic circulation. The study provided SLR estimates for multiple regions within BC. The two scenarios were analysed for Victoria based on a mean global SLR of 30 cm (IPCC, 2007) and extreme global SLR of 100 cm.

TABLE 2.2: SLR ESTIMATES FOR VICTORIA BY 2100

Scenario	5% Confidence Interval (cm)	Expected (cm)	95% Confidence Interval (cm)
Mean	7	19	31
Extreme	58	89	119

2.4. Winds

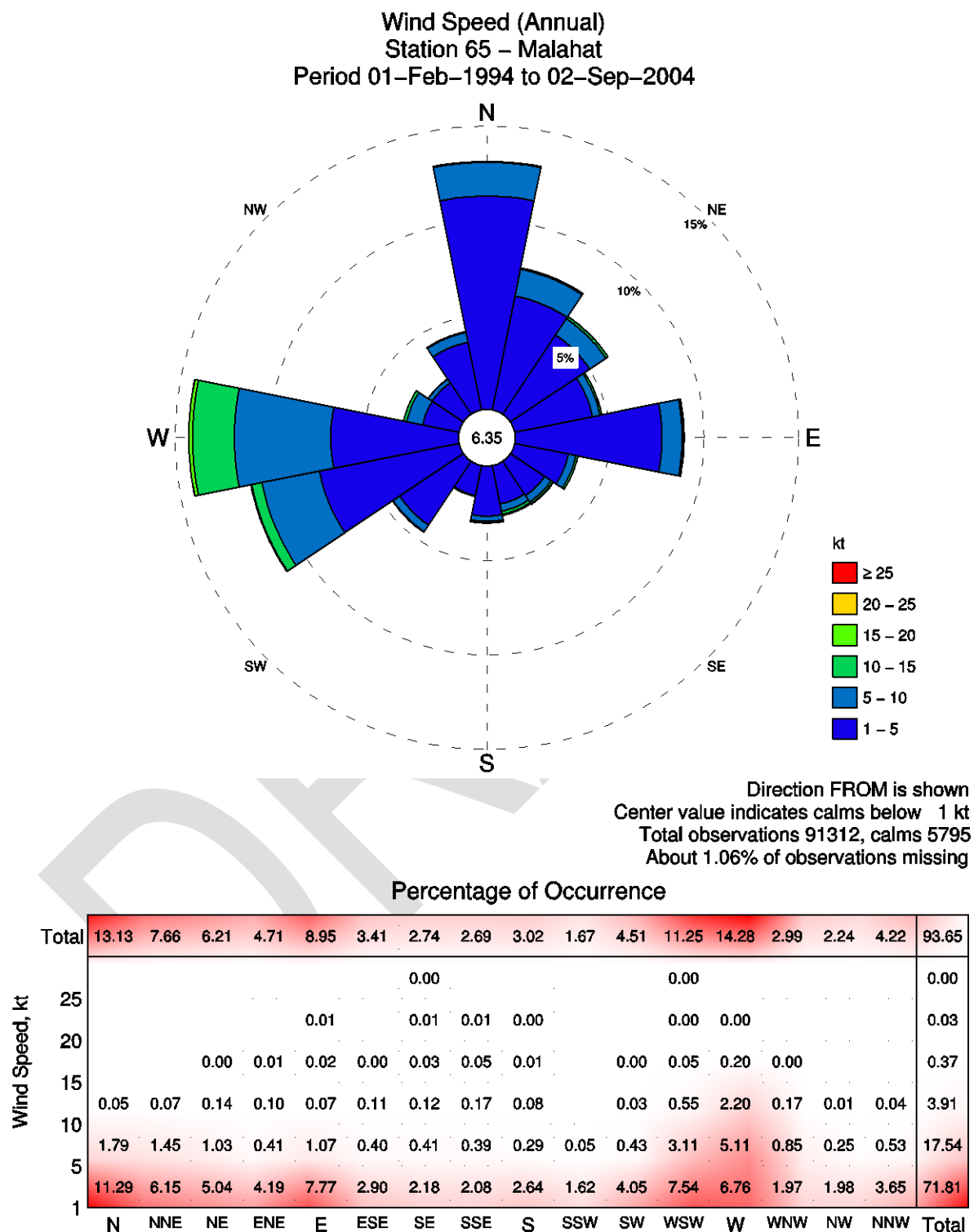
Archived wind data was obtained from the Environment Canada website (http://climate.weather.gc.ca/index_e.html). The data was typically sampled at a 2-minute duration and at a standard 10-m anemometer height. Based on a preliminary screening of waterway configuration and land topography, the wind gauge at Malahat (48.5751°N, 123.5300°W, see Figure 2.1 for location) is considered to be representative of the project site. Figure 2.5 presents the annual wind rose at Malahat. The strongest and most frequent winds are from the west sector. However, frequent but less intense winds can also be expected from the north.

Extreme winds were analysed at Malahat using the Peak-Over-Threshold Method (Goda, 2010) based on a 10-year length of wind records. Table 2.3 summarizes varying return period wind speeds. Due to the short-term wind records at Malahat, the 95% non-exceedance value was used in the subsequent wind-wave analysis.

TABLE 2.3: EXTREME WIND SPEEDS AT MALAHAT

Return Period	Expected Wind Speed (knots)	95% Non-Exceedance Wind Speed (knots)
1	18.8	19.4
2	20.5	21.6
5	22.7	24.6
10	24.5	26.9
25	26.7	30.0
50	28.4	32.3
100	30.1	34.6

FIGURE 2.5: ANNUAL WIND ROSE AT MALAHAT



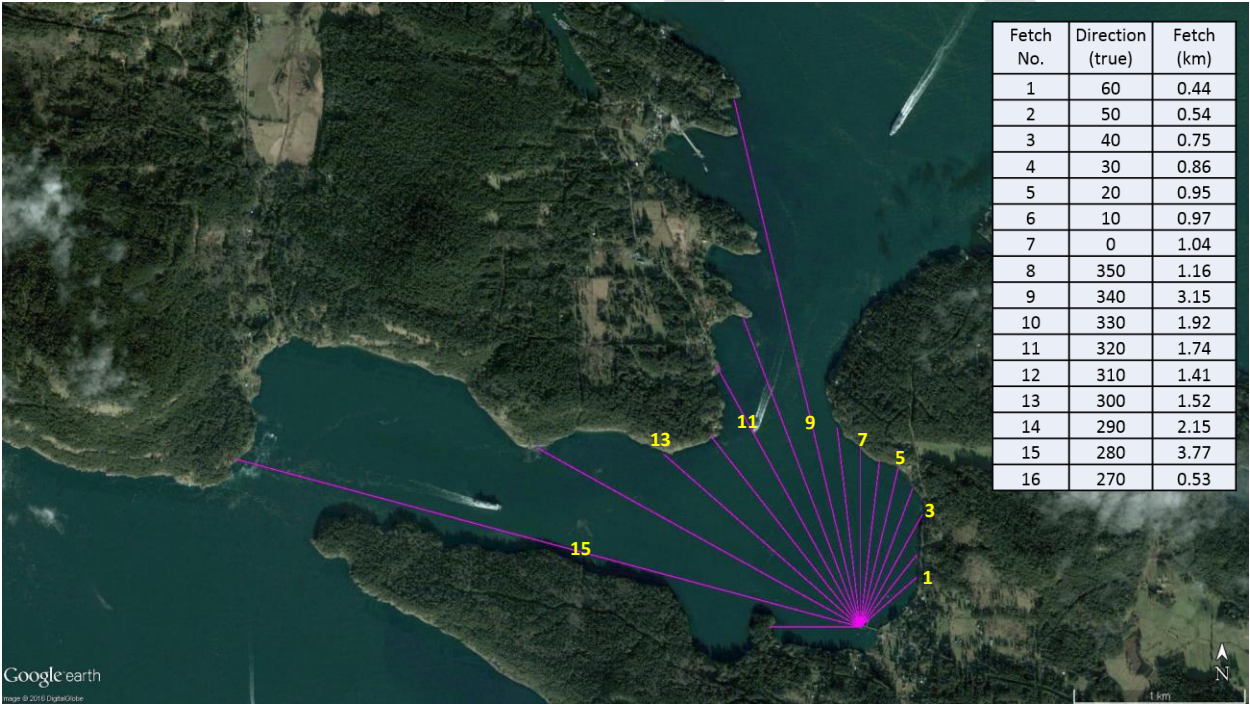
(Source: M&N)

2.5. Wind-Waves

Based on the 50-year extreme wind speed of 32.3 knots (see Table 2.3), combined with the estimated over-water fetch distances illustrated in Figure 2.6, an assessment of local wind-generated waves was conducted using the Automated Coastal Engineering System (ACES) program. The ACES program has been applied and tested extensively around the world (Leenknecht et al, 1992).

The wind-wave growth was evaluated for westerly through north-easterly directions. The significant wave height at the dock was estimated at about 0.4 metres with a peak period of about 4.7 seconds (50-year return period).

FIGURE 2.6: ILLUSTRATION OF OVER-WATER FETCH DISTANCES AT MINERS BAY DOCK



(Source: Google Earth)

2.6. Tidal Currents

According to the *Sailing Directions*, a counter clockwise eddy appears off the dock in Miners Bay during ebb tides and may reach a velocity of 2 knots. In addition, a larger, clockwise eddy can form during flood tides and reach a velocity of 2.5 knots (NGA, 2007).

3. Vessel Wake Analysis

Because Active Pass is one of only three passes between the lower mainland of British Columbia and southern Vancouver Island, it is actively used by BC passenger and vehicle ferries, coastal tankers, freighters, tugs towing barges, pleasure craft, and fishing boats. Vessel wakes produced by passing vessels can propagate across Miners Bay and impact dock operations. While the focus of the present study is the CRD Dock, there is a wide range of activities in and around Miners Bay that may be affected by passing vessel wakes, including recreational boating, fishing activities, whale watching, swimming, diving, beachgoers, and the vessels of visitors and residents of Mayne Island.

The following subsections discuss the analysis of wakes from passing vessels.

3.1. Routes and Ports using Active Pass

Active Pass connects multiple ports in the Southern Gulf Islands to the British Columbia mainland port of Tsawwassen. Additionally, it also serves as a shipping route for BC Ferries traveling within the Southern Gulf Islands. Figure 3.1 depicts the ports and routes used by BC ferries travelling to and from the Southern Gulf Islands and across the Strait of Georgia.

FIGURE 3.1: BC FERRY ROUTES



(Source: BC Ferries)

Table 3.1 lists the ferry routes passing through Active Pass and the number of weekday departures and returns for each route.

TABLE 3.1: ROUTES AND VESSELS PASSING THROUGH ACTIVE PASS

Route	No. of Daily Departures	No. of Daily Returns
Swartz Bay – Galiano Island	4	4
Swartz Bay - Tsawwassen	8	8
Galiano Island – Mayne Island	4	4
Galiano Island – Pender Island	3	3
Mayne Island - Tsawwassen	2	2
Salt Spring Island - Tsawwassen	2	2




3.2. Vessels in Active Pass

Because Active Pass is a main shipping route for coastal trade between the mainland and south Vancouver Island, large and fast ferries may be encountered within this pass, as well as freighters, coastal tankers, and tugs towing barges (NGA, 2007).

Table 3.2 compiles a list of vessels making transits through Active Pass. The vessel outlines were scaled to the same referenced length based on the vessel's length overall (LOA).

TABLE 3.2: VESSEL IN ACTIVE PASS

Vessel Type/Name	LOA (metres)	General Vessel Outline
Coastal Tanker	205	Coastal Tanker (205 m)
BC Ferries/Spirit of British Columbia, Spirit of Vancouver Island	167	
BC Ferries/Coastal Celebration, Coastal Renaissance	160	
BC Ferries/Queen of Nanaimo, Queen of New Westminster	130	

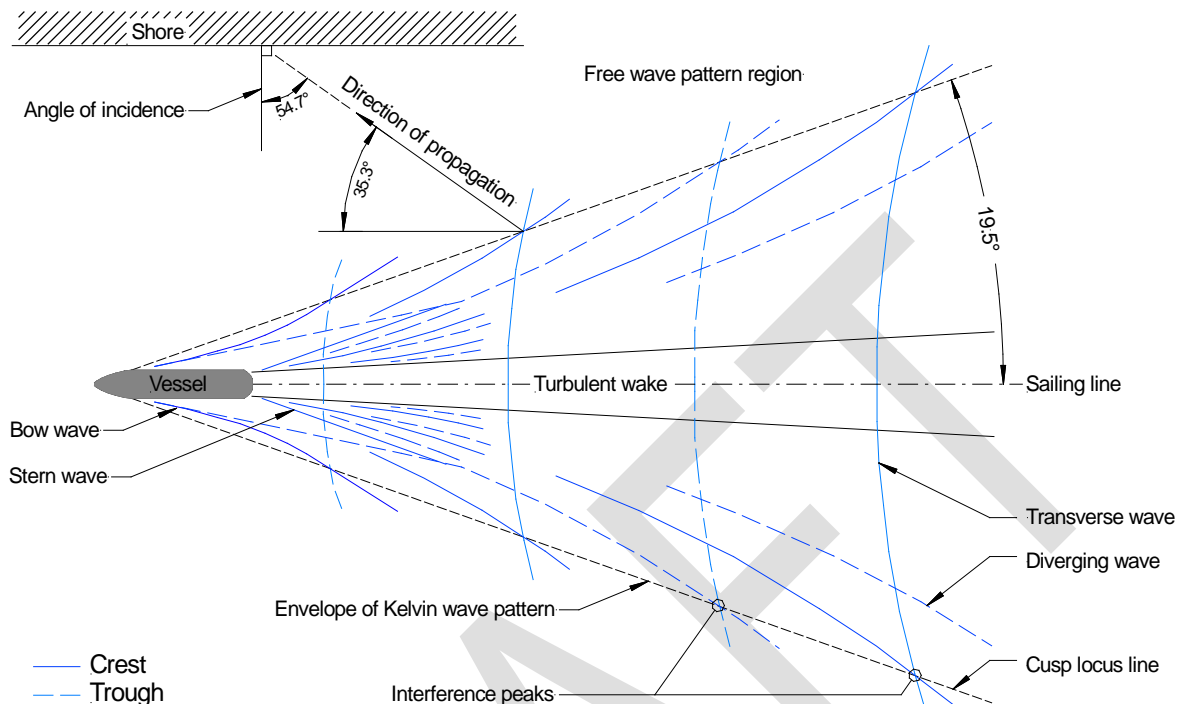
Vessel Type/Name	LOA (metres)	General Vessel Outline
BC Ferries/Queen of Cumberland	96	
BC Ferries/Bowen Queen, Mayne Queen	85	
Recreational 30-ft Sailboat	9	

(Source: M&N)

3.3. Wake Analysis

Wake patterns, such as those shown in Figure 3.2, are produced by a vessel in transit. During a vessel's passage, water is displaced and a varying pressure distribution develops along the hull of the vessel. An increased pressure is produced at the bow and stern and a pressure drop is experienced along the midsection. The associated pressure gradients produce waves that propagate out from the bow and the stern of the vessel. As a vessel makes its transit along a sailing line, it will produce a system of waves conventionally termed *vessel wake*. The narrow band along the sailing line is also termed wake, and refers to the trail of disturbed water left by the passage of the vessel.

FIGURE 3.2: VESSEL WAKE PATTERN



(Source: M&N)

At the head of the vessel, a bow wave forms and a second wave system radiates out from the stern. Both the bow wave and the stern wave produce a pattern of diverging waves which propagate away from the sailing line at an angle of approximately 35.3° . The envelope of the diverging and transverse waves is known as a Kelvin wave pattern. In Figure 3.2, wave crests are indicated with solid blue lines, while the trough of waves are denoted by dashed blue lines. Where the crests of diverging waves intersect with the crests of transverse waves, the two wave systems interfere by superposition to produce a higher wave crest. Likewise, a deeper trough occurs where the troughs of diverging and transverse waves intersect. These interference peaks propagate along a line termed the cusp locus line, which forms an angle of approximately 19.5° relative to the sailing line.

A detailed derivation of vessel wake is highly complex as it depends on the particular hull shape of the vessel and its frictional resistance during transit. It is only with modern computational methods that solutions of the underlying equations of physics are starting to develop, although the mathematics involved are extensive and computationally very intensive. The bulk of the present research has focused on developing semi-empirical relationships to describe the overall characteristics of vessel wakes. The main parameters governing vessel wake formation are identified to be:

- The speed of the vessel, with increasing speed producing an increase in wave heights.
- The water depth, with decreasing water depth producing an increase in wave heights.
- The Froude Number, which relates the above parameters to the celerity (travel speed) of a shallow-water wave, and, in the case of deep water, to the overall dimension of the vessel.

Additionally, other parameters that affect wake formation include the vessel's hull shape, draft, under keel clearance, and the confinement of the water body surrounding the vessel. However, their influence on wake formation is less understood.

In the following sections, two methods adopted in the present study are described. For consistency, the symbols used in each method are unified to represent the same input parameters.

3.3.1. Kriebel and Seelig Method (2005)

Kriebel and Seelig (2005) propose an empirical model, approximating the variation of wake heights H with distance y as:

$$H = \frac{\beta V_s^2}{g} (F^* - 0.1)^2 \left(\frac{y}{L}\right)^{-\frac{1}{3}}$$

Where V_s is the vessel speed, g the acceleration due to gravity, y is the distance from the sailing line, L is the length of the vessel, F^* is an empirically modified Froude number, and β an empirical coefficient based on the hull shape of the vessel.

Kriebel and Seelig state that the Froude number F is defined by the water depth-to-draft ratio h/D . They further state that vessels transiting deep water ($h/D > 5$) produce a wake size that depends on the length-based Froude number F_L , and vessels transiting shallow water ($h/D < 1.5$) produce a wake size that depends on the depth-based Froude number F_d . Between these two water depths, Kriebel and Seelig determined that a modified Froude number F^* is more appropriate.

$$F^* = F_L \exp(\alpha D/h)$$

$$\alpha = 2.35(1 - C_b)$$

Where D is the vessel draft, h the water depth, and α an empirical coefficient dependent on the vessel block coefficient C_b , defined as:

$$C_b = \frac{\nabla}{LBD}$$

Where ∇ is the volume displacement and L , B , and D is the length, beam, and draft of the vessel.

The coefficient β is defined as:

$$\beta = 1 + 8 \cdot \tanh\left(0.45\left(\frac{L}{L_e}\right) - 2\right)^3$$

Where L_e is the entrance length defined as the distance from the vessel's bow to the beginning of the parallel midbody section.

3.3.2. PIANC Method (1987)

PIANC (1987) has adopted the approach by Verhey *et al.* (1989). The variation of wave height with distance can be described by:

$$\frac{H_i}{h} = \alpha_1 \left(\frac{S}{h}\right)^{-1/3} F_s^{\alpha_3}$$

Where H_i is the wave height, h is the water depth, s is the distance from the sailing line and F_s is the Froude number given by:

$$F_s = \frac{V_s}{\sqrt{gh}}$$

Where V_s is the vessel speed and g is the acceleration due to gravity.

The parameter α_1 has been found to vary by vessel type and loading state. Research by Verhey and Bogaerts relates α_1 , the parameter which scales the magnitude of the wake relative to the vessel hull shape as: $\alpha_1 = \alpha_2 D/L_e$, where D is the vessel draft and L_e the entrance length. The coefficient α_2 ranges from 1.5 to 4.0 and is based on the type of ship applied in the research by Verhey and Bogaerts. A value of $\alpha_3 = 4.0$ has been confirmed in several field studies. For the ferries examined passing through Miners Bay, a conservative value of $\alpha_1 = 0.75$ was estimated.

Additional characteristic proportions of the wake characteristics can be determined as follows per CEM (2006). The speed of wake propagation (celerity) is given by:

$$C = V_s \cos(\theta)$$

Where C is the celerity, V_s is the vessel speed, and θ is the angle of wave propagation with respect to the sailing line as defined in the equation above. The angle of wave propagation has been found to relate to the Froude Number as follows:

$$\theta = 35.27^\circ (1 - e^{12(F_s - 1)})$$

Where F_s is the Froude Number and e is the exponential function.

The wave length is determined from the dispersion relation given by:

$$C^2 = \frac{gL}{2\pi} \tanh\left(\frac{2\pi h}{L}\right)$$

Where C is the celerity, h is the water depth, L is the wave length, and g the acceleration due to gravity. The wave period, T , can be resolved from:

$$T = \frac{L}{C}$$

In deep water where the propagation of waves is unaffected by the bottom topography, as is mostly the case for vessel wake propagation within Miners Bay, the wave length and wave period terms reduce to:

$$L = \frac{2\pi}{g} C^2$$

And

$$T = \frac{2\pi}{g} C$$

3.3.3. Wake Propagation in Miners Bay

Outside of the envelope of the Kelvin wave pattern is the region of free wave propagation (Figure 3.2), where the vessel wake will continue to advance. As waves propagate out from the sailing line, the wave height attenuates with distance traveled and the wake become less prominent. The approximate average distance of vessels passing the dock in Miners Bay is around 1000 metres.

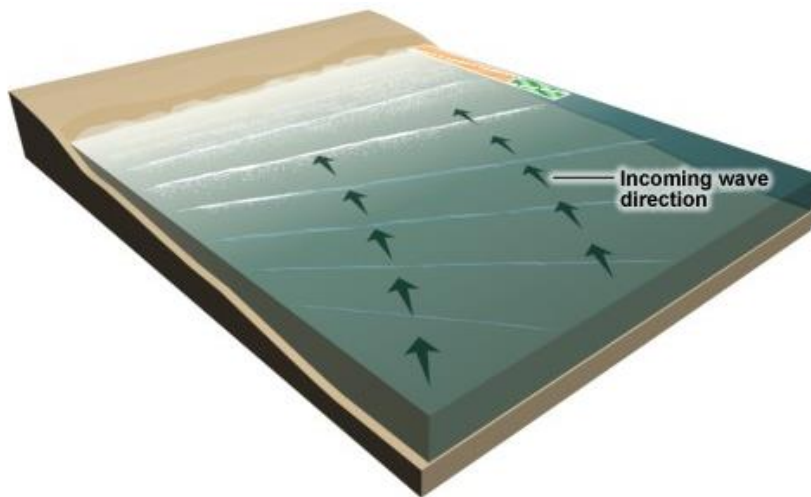
FIGURE 3.3: APPROXIMATE PASSING VESSEL DISTANCE TO MINERS BAY DOCK



(Source: M&N)

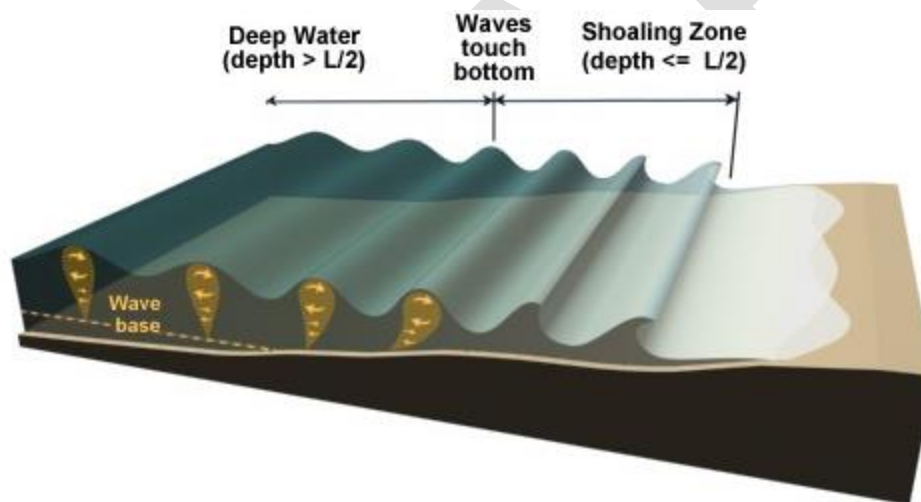
In coastal areas, the propagation of wake waves is typically shaped by a number of effects that can come into play. These can include interaction with ocean and tidal currents, and interaction with other wave systems present such as wind-generated waves or swell waves (long-period waves produced by distant storm systems). As the wake waves propagate into shallow water, they may be subject to refraction, shown in Figure 3.4, diffraction, shoaling, and wave breaking effects shown in Figure 3.5. These processes of transformation may lead to focusing of waves in some areas, typically around points on the coast; or dispersion of waves in areas where the water deepens. Because these wave transformation effects depend chiefly on water depth, nuances in the propagation of wake waves may exist depending on the tide stage, noting that the mean tidal range at Miners Bay is around 2.9 m.

FIGURE 3.4: WAVE REFRACTION APPROACHING A SHORELINE (FROM THE COMET PROGRAM)



(Source: University Corporation of Atmospheric Research's)

FIGURE 3.5: APPROXIMATE PASSING VESSEL DISTANCE TO MINERS BAY DOCK



(Source: University Corporation of Atmospheric Research's)

3.3.4. Wake Characteristics at Miners Bay Dock

Based on the analysis described in the previous paragraphs, wakes from passing vessels affecting the Miners Bay dock were determined. Vessels entering Active Pass were tracked between the dates of January 3 – January 6, 2017. Their sailing distance from the dock and speed while passing the dock were noted. The following vessels were tracked during this period.

TABLE 3.3: VESSELS ADOPTED FOR WAKE ANALYSIS

IMO	MMSI	Vessel Name	Vessel Type	Length (m)	Beam (m)	Draft (m)
9332779	316011409	Coastal Celebration	Ro-Ro/Passenger	160	28.2	5.5
6522567	316001238	Mayne Queen	Ro-Ro/Passenger	85	18.6	3.8
9015668	316001268	Spirit of British Columbia	Ro-Ro/Passenger	167	28.0	5.0
9030682	316001269	Spirit of Vancouver Island	Ro-Ro/Passenger	167	32.9	5.0
6404375	316001254	Queen of Nanaimo	Ro-Ro/Passenger	130	23.9	4.0
9009360	316001252	Queen of Cumberland	Ro-Ro/Passenger	96	21.2	3.7
9332755	316011407	Coastal Renaissance	Ro-Ro/Passenger	160	28.2	5.3
6600967	316001232	Bowen Queen	Ro-Ro/Passenger	85	18.7	4.0
9764221	316033419	Seaspan Swift	Cargo	149	26.0	4.2
7343669	316003289	Princess Superior	Rail/Vehicles Carrier	118	20.2	4.9

The following parameters were used to determine the wake characteristics at the Miners Bay dock.

TABLE 3.4: WAKES AT MINERS BAY DOCK

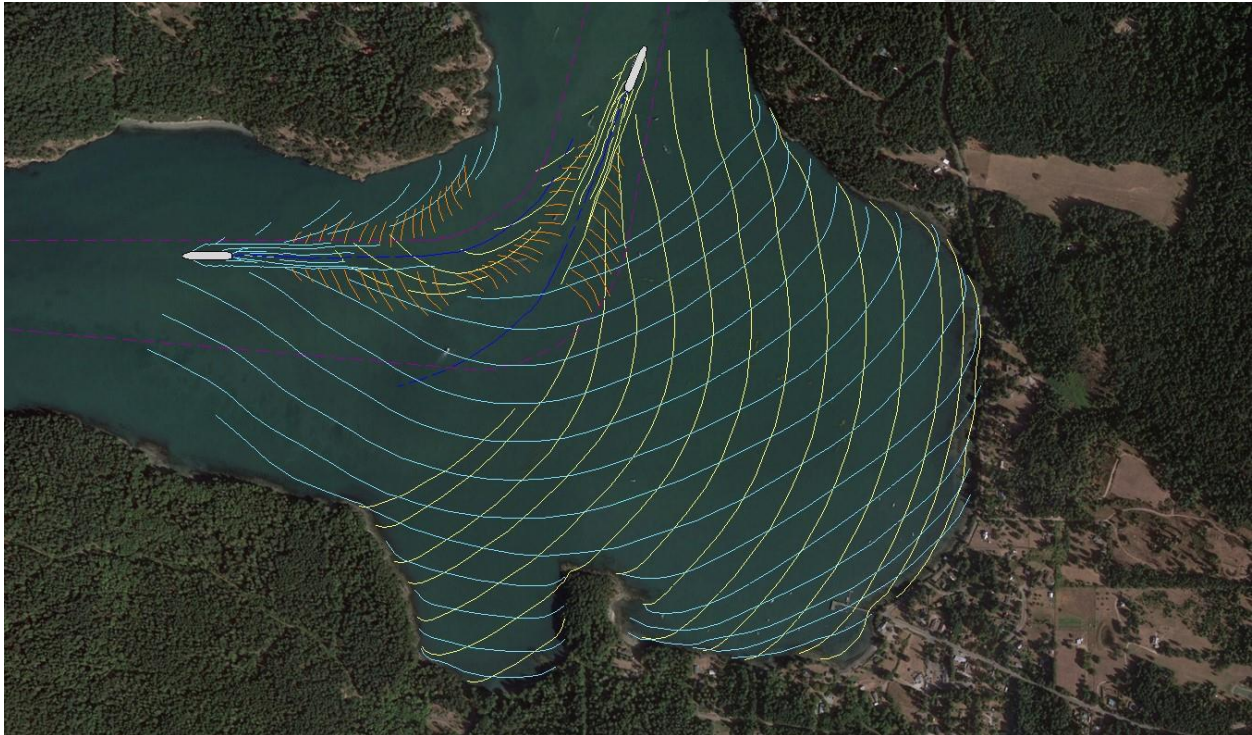
Vessel Name	Sailing Speed (knots)	Distance to Dock (m)	Wake Height (m)	Wake Period (s)	Wake Length (m)
Coastal Celebration	12.8	1350	0.1	3.4	18.5
Mayne Queen	10.9	1200	0.1	2.9	13.4
Spirit of British Columbia	16.1	1300	0.3	4.3	29.3
Spirit of Vancouver Island	16.1	1300	0.3	4.3	29.3
Queen of Nanaimo	13.8	1200	0.2	3.7	21.5
Queen of Cumberland	14.7	1250	0.3	4.0	24.4
Coastal Renaissance	14.5	1275	0.2	3.9	23.8
Bowen Queen	10.6	1500	0.1	2.9	12.7
Seaspan Swift	13.5	1250	0.1	3.6	20.6
Princess Superior	11.9	1160	0.1	3.2	16.0

Patterns of wave propagation through Miners Bay from passing vessels are shown in Figure 3.6. These wave propagation patterns have been inferred based on vessel transits captured in aerial imagery. Because the wave lengths of wake waves (Table 3.4) are small compared to the scale of the map shown in Figure 3.6 only select wave crests are shown in the figure. The yellow lines indicate wake waves associated with vessels travelling through Active Pass from the west, making a turn at Miners Bay and leaving the bay travelling north. Likewise, the blue lines are representative of vessels entering the pass from the north, making their turn and travelling west. The yellow and blue wave

crests are representative of the primary wave systems. The secondary wave systems are indicated with orange lines, and are generally less discernible in aerial photography.

The yellow and blue wave crest patterns indicate primary wake wave propagation into Miners Bay. The curvature of the wave crests arises as vessels make their turn. It can be seen that the propagation of wake waves towards shore is generally unobstructed. Near shore, where the wake waves arrive at the Miners Bay Dock, the analysis suggests that wakes associated with northbound transits and westbound transits may produce waves with differing angles of incidence at the dock. The indication is that westbound transits may produce wake that arrives quarter to the dock, while wake from northbound transits may arrive more head-on at the dock. It is recommended that these findings be verified or moderated by field observation if possible.

FIGURE 3.6: VESSEL WAKE PATTERNS TRAVELING THROUGH MINERS BAY



(Source: M&N)

4. Conceptual Solutions for Utility Float Location

The results of the metocean analysis show the 50-year wind event will result in a wave height of 0.4 metres and period of 4.7 seconds. These wind generated wave parameters are similar to the wake characteristics produced by the 'Spirit' class of ferry vessels (wave height of 0.3 metres and period of 4.3 seconds).

The vessel wake waves create significant motion on the existing utility float located on the north side of the approach trestle and is causing severe wear and tear on the gangway transition plate on the float and float mooring system. In addition, the float movement due to the wave action is a cause of concern for public safety.

While it is unlikely for ferries to reduce speed transiting Active Pass, the possible mitigations to reduce or eliminate the wake wave effects at the utility float are to provide some type of breakwater to form a protective barrier for the float or to relocate the float to a calmer area such as the south side of the approach trestle.

4.1. Rubble Mound Breakwater

A rubble mound breakwater would form a physical barrier preventing vessel and wind generated wave from impacting the public float and wharf and trestle areas of the Miners Bay facility. An example of this type of breakwater is shown in Figure 4.1 of the South Harbour in Powell River. They are typically constructed using varying size of quarry mined rocks arranged in three to four layers comprising of a core, a filter layer and armour outer layer. The core material is usually the smaller rock sized, and the filter layer is gradation of varying sized rocks sized to prevent migration of the core materials and the outer layer has the larger heavier protective rocks to resist and remain stable when subjected to wave action.

The advantages and disadvantages of a rubble mound breakwater are as follows:

Advantages:

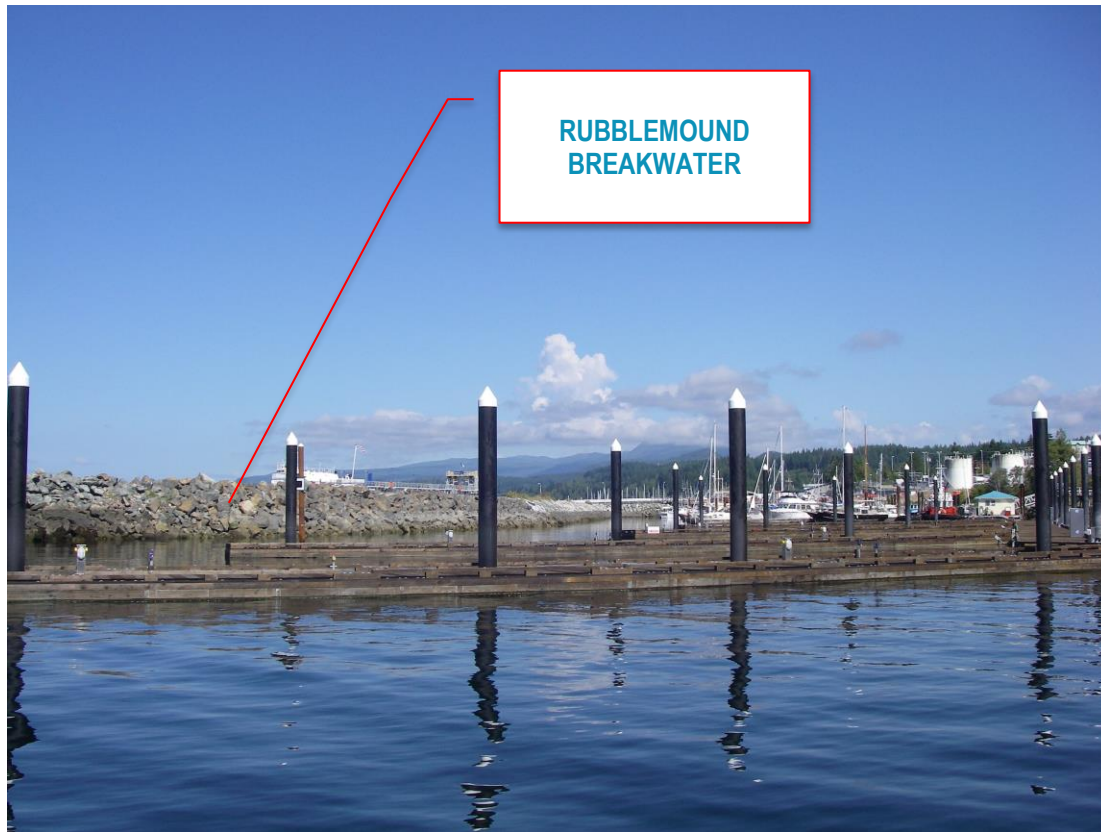
- Excellent protection from wind and waves;
- Very robust construction; and
- Low maintenance.

Disadvantages:

- Very expensive to construct;
- May obstruct ocean views from shore;
- Existing water lot will likely have to be expanded;
- Occupies a large footprint on the sea bed and will exceed existing water lot limits; and
- Permitting may be difficult to obtain if other viable options are available.

The proposed conceptual layout for the rubble mound breakwater (Option 1) is shown in SK-001 in Appendix A.

FIGURE 4.1: RUBBLEMOUND BREAKWATER – SOUTH HARBOUR POWELL RIVER



(Source: M&N)

4.2. Floating Breakwater

A floating breakwater performs similarly to a rubble mound break water as it forms a physical barrier to wave action. However, unlike the impervious characteristic of a rubble mound breakwater, a floating breakwater attenuates waves as there is portion of transmitted waves through the structure.

Floating breakwaters can be made out of concrete as shown in Figure 4-2 where old T-shaped concrete pontoons from the Hood Canal floating bridge was refurbished and installed at Port Alberni to serve as a floating breakwater. Floating breakwaters are held in place by mooring chains or piles depending on the soil and water depth conditions.

The advantages and disadvantages of a floating breakwater are as follows:

Advantages:

- Good protection from wind and waves;

- Allows some circulation of current into the protected area which may mitigate potential water quality in some harbours;
- Low footprint on seabed for anchoring system;
- Could provide additional moorage on the inside face of the breakwater if harbour configuration permits;
- Permitting may be easier to obtain;
- Robust construction; and
- Low maintenance depending on materials used for construction.

Disadvantages:

- Expensive to construct;
- Existing water lot will have to be expanded and,
- May not be effective at wave attenuation with longer wave length incident waves.

The conceptual layout of the floating breakwater (Option 2) is shown on SK-002 in Appendix A.

FIGURE 4.2: FLOATING CONCRETE BREAKWATER – PORT ALBERNI



(Source: M&N)

4.3. Piled Panel Breakwater

Another type of breakwater is a piled supported panel breakwater as shown in Figure 4.3. This impervious breakwater is comprised of a row braced H-piles with precast reinforced concrete panels spanning between the pile flanges and cast-in-place reinforced concrete cope beam at the top. Scour protection is placed at the pile footings to ensure sea bed erosion is mitigated.

The advantages and disadvantages of a piled panel breakwater are as follows:

Advantages:

- Very good protection from wind and waves;
- Allows some circulation of current into the protected area which may mitigate potential water quality in some harbours;
- Low footprint on seabed for anchoring system;
- Robust construction; and
- Low maintenance depending on materials used for construction.

Disadvantages:

- Expensive to construct;
- Existing water lot will have to be expanded and,
- May obstruct ocean views from shore.

The conceptual layout for a piled panel breakwater (Option 3) is shown on SK-003 in Appendix A.

FIGURE 4.3: PANEL BREAKWATER – NEAH BAY, WASHINGTON, USA



(Source: M&N)

4.4. Wave Baffles and Relocated Float

Option 4 considers relocating the existing utility float and gangway access to the south side of the existing wharf head as shown on SK-004 in Appendix 4. In order to accomplish the float relocation, a new access platform extension will be needed, and to install timber wave baffles around the perimeter of the wharf head to the exiting timber fender and wharf piles.

We have assumed that the timber waved baffles will require additional timber piles for supporting the timber support frame for the wave baffle wall. The extension to the wharf deck is assumed to be supported on steel piles with timber pile caps, stringers and timber deck planking to match the existing wharf decking. New steel guide piles are assumed to fix the relocated float. Existing gangway will also be relocated.

The advantages and disadvantages of Option 4 are as follows:

Advantages:

- Very good protection from wind and waves;

- Allows some circulation of current into the protected area which may mitigate potential water quality in some harbours;
- Low footprint on seabed for new pile supports for access platform and floats;
- No modification of the existing water lot is required and
- Lowest cost option to construct.

Disadvantages:

- May have some conflict activities at the wharf head with nearby existing float access.

5. Opinion of Probable Cost

For the estimate of the opinion of probable cost for Options 1, 2, 3 and 4 we have made the following assumptions for the conceptual design:

- For Option 1, the rubble mound breakwater is constructed from a core layer, filter and armour layers similar to the rubble mound breakwater extension at Powell River South Harbour;
- Concrete floating breakwater with steel chain moorage system in Option 2;
- New steel piles and precast concrete panels for panel breakwater in Option 3;
- All new guide piles for floats and wharf reconstruction will be steel pipe piles as per Department of Fisheries and Oceans (DFO) current requirements except for wharf strengthening to accommodate timber wave baffle wall in Option 4 and;
- Reuse of existing gangway and timber floats for Option 4.

It is important to note that the conceptual layout and Order of Magnitude cost estimate has been developed based on:

- M&N preliminary analysis of wind waves and vessel wake waves; and
- Information gathered for the above and below water 2015 Condition Inspection of the existing facility.
- Quotes provided by contractors and suppliers.

We wish to emphasize that preparation of an accurate construction budget (e.g., within +/- 10% to 15%) cannot be completed until more detailed site investigations, engineering and analysis are completed. Even then, it is important to note that the final costs may vary significantly from the estimate due to fluctuations in currency, materials and labour costs that are beyond our control.

Contractor bid prices can also vary widely even after detailed engineering plans are prepared. Such variability is a function of market conditions which exist at the time of bidding and are difficult to predict in advance.

In view of the above uncertainties and the importance of not under-estimating the costs, we have included a contingency amount of 30% to reflect the fact that these are indicative estimates. However, until actual detailed engineering is carried out, these estimates will necessarily be subject to change. For the cost estimation, we have assumed that the replacement floats will be timber construction and steel guide piles will be used to support the proposed float system.

Tables 5.1, 5.2, 5.3, and 5.4 summarize the Order of Magnitude Cost Estimate of Options 1, 2, 3 and 4 respectively. Totals for each option include a 30% contingency. The Order of Magnitude cost estimate excludes design engineering costs, CRD's project management and administrative costs, permit applications costs, and any environmental habitat compensation costs.

Details of the Order of Magnitude Cost Estimate is included in Appendix B.

TABLE 5.1: ORDER OF MAGNITUDE COST ESTIMATE – OPTION 1 – RUBBLE MOUND BREAKWATER

Task Description	Amounts
Mobilization and Demobilization	\$321,000
Core Rock	\$1,320,000
Filter Layer	\$518,000
Armour Layer	\$1,376,000
30% Contingency	\$1,060,000
TOTAL	\$4,595,000

TABLE 5.2: ORDER OF MAGNITUDE COST ESTIMATE – OPTION 2 – FLOATING BREAKWATER

Task Description	Amounts
Mobilization and Demobilization	\$139,000
Floating Concrete Breakwater	\$892,000
Replacement Marina Floats	\$500,000
30% Contingency	\$460,000
TOTAL	\$1,991,000

TABLE 5.3: ORDER OF MAGNITUDE COST ESTIMATE – OPTION 3 – PILED PANEL BREAKWATER

Task Description	Amounts
Mobilization and Demobilization	\$146,000
Piles Supply	\$406,000
Pile Install	\$684,000
Concrete Pile Cap	\$588,000
Scour Protection	\$189,000
30% Contingency	\$604,000
TOTAL	\$2,617,000

TABLE 5.4: ORDER OF MAGNITUDE COST ESTIMATE – OPTION 4 – WAVE BAFFLES AND FLOAT RELOCATION

Task Description	Amounts
Mobilization and Demobilization	\$50,000
Supply & Install timber wave baffles	\$194,000
Pile supports for deck extension	\$90,000
New deck expansion	\$36,000

Task Description	Amounts
New pile supports for float relocation	\$120,000
Relocation of floats and gangway	\$30,000
30% contingency	\$156,000
TOTAL	\$676,000

6. Conclusions and Recommendations

The results of the metocean analysis show that the 50-year wind event will result in a wave height of 0.4 metres and period of 4.7 seconds. These wave parameters are similar to the wake characteristics produced by the 'Spirit' class of ferry vessels (wave height of 0.3 metres and period of 4.3 seconds) indicating that the utility float at Miners Bay experiences serious vessel wake wave conditions on a daily basis and is evident by the unusually high wear and tear on the transition plates between floats and the gangway. The utility float is also subjected to incident broadside waves that make causes the float to roll and yaw and can make transiting float unsafe if surface conditions are slippery.

Four conceptual options were considered for mitigating vessel wake waves. Option 1 – Rubble mound breakwater, is the most expensive and has the largest environmental impact on the seabed. The next highest cost option is Option 3 – the piled panel breakwater. This option also has some environmental impact on the seabed with a scour protection area around the piles. Option 2 the concrete floating breakwater is third highest option and provides lower protection barrier than the previous two options. Option 4 is the lowest cost options that provides some protection from vessel wake waves.

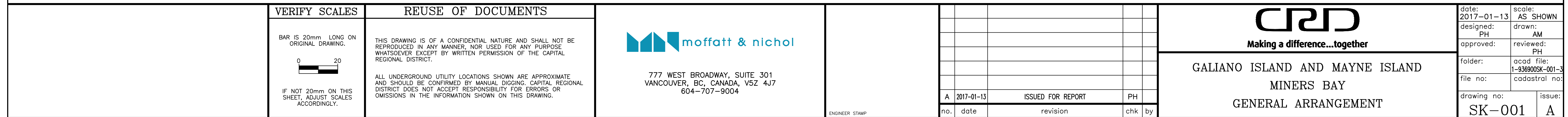
If Option 4 is to be investigated further, a bathymetry survey is required to confirm if suitable water depths are available to accommodate the relocated float and geotechnical investigations to determine soil parameters for the piling/foundation designs.

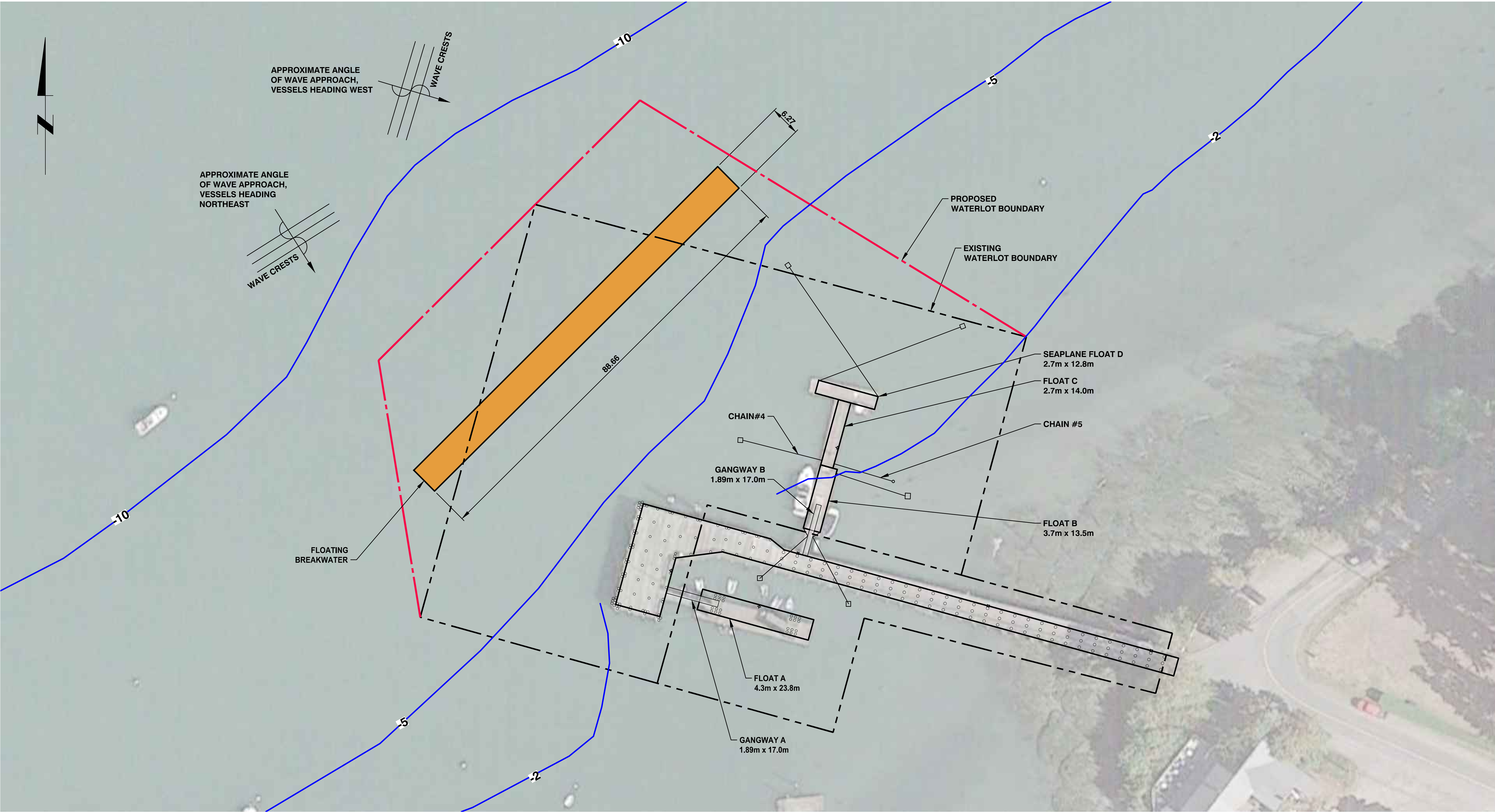
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Appendix A: Conceptual Layout Drawings

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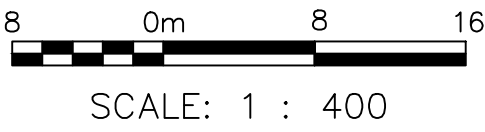




FLOATING BREAKWATER – OPTION 2
SCALE: 1:400

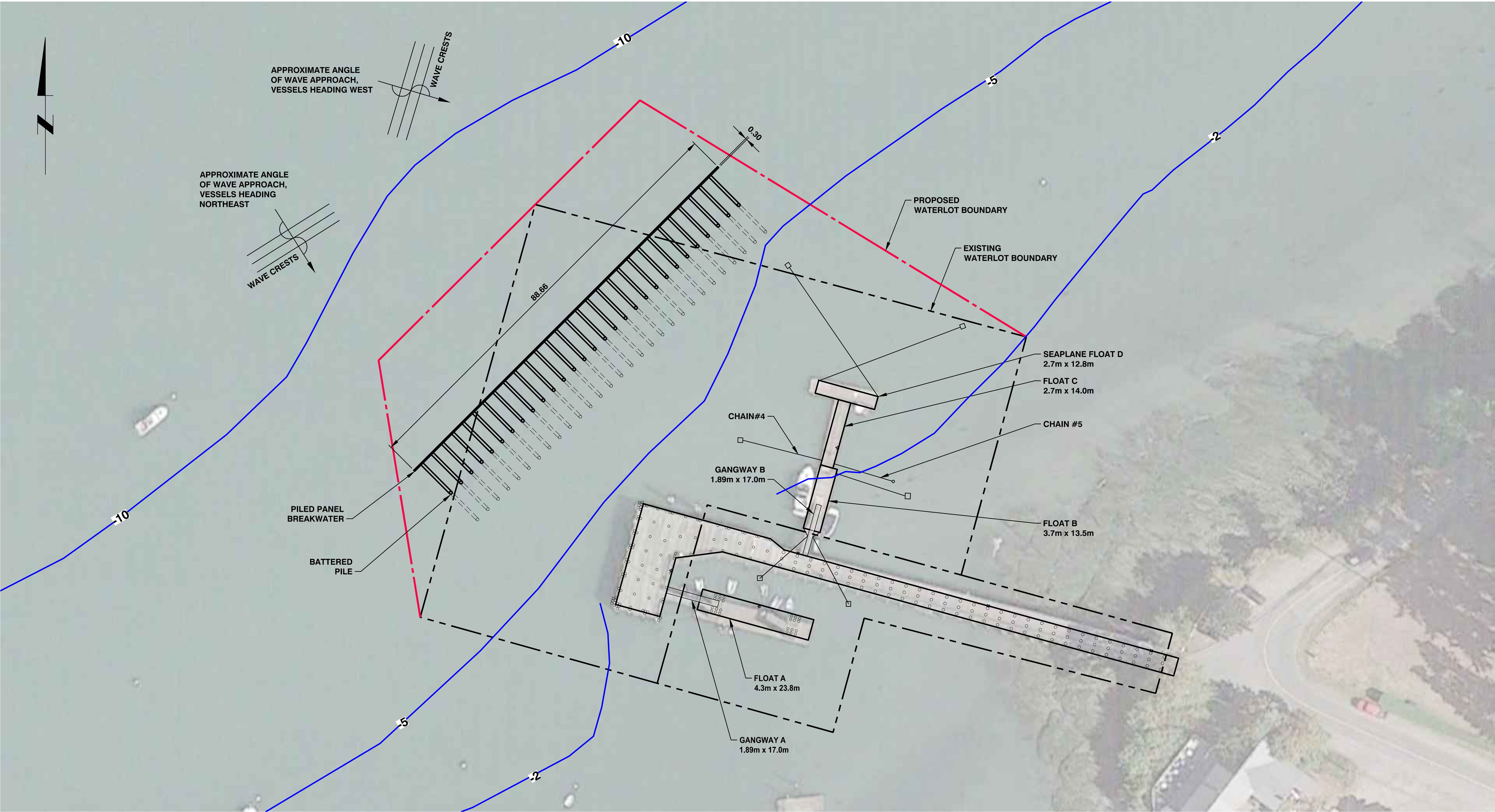
NOTES:

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2. ALL DIMENSIONS IN METERS U.N.O.
3. BATHYMETRIC BACKGROUND CONTOURS WITH RESPECT TO CHART DATUM APPROXIMATED FROM NAVIONICS WEBSITE.



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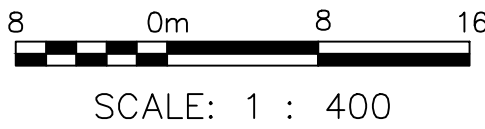
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PILED PANEL BREAKWATER – OPTION 3
SCALE: 1:400

NOTES:




1. GENERAL ARRANGEMENT IMAGE COURTESY OF GOOGLE EARTH.
2. ALL DIMENSIONS IN METERS U.N.O.
3. BATHYMETRIC BACKGROUND CONTOURS WITH RESPECT TO CHART DATUM APPROXIMATED FROM NAVIONICS WEBSITE.



PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION


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Appendix B: Order of Magnitude Cost Estimates

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OPINION OF PROBABLE COST					DATE PREPARED 03-Jan-17		SHEET OF		
OWNER AND LOCATION Capital Regional District Vancouver Island, British Columbia			CONSTRUCTION CONTRACT NO.			<div> moffatt & nichol</div>			
			ESTIMATED BY Moffatt & Nichol						
PROJECT TITLE Miners Bay Float			STATUS OF DESIGN Draft			M&N JOB ORDER NUMBER 9369			
ITEM DESCRIPTION		QUANTITY		MATERIAL & EQUIPMENT COST		LABOR COST		ENGINEERING ESTIMATE	
		NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL

1

5

SUMMARY - Miners Bay - Float Improvements
Option 1 - Rubble Mound Breakwater

Mobilization/Demobilization	\$321,000
Core Rock	\$1,320,000
Filter Layer	\$518,000
Armour Layer	\$1,376,000
30% Contingency	\$1,060,000
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Option 2 - Floating Breakwater


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Piles Panel Breakwater supply	\$406,000
Pile install	\$684,000
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Scour protection	\$189,000
30% Contingency	\$604,000
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Option 4 - Wave Baffle-Float relocation

Mobilization/Demobilization	\$50,000
Supply and install wave baffles	\$194,000
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New deck expansion	\$36,000
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30% Contingency	\$156,000
Sub-TOTAL	\$676,000

OPINION OF PROBABLE COST					DATE PREPARED 03-Jan-17		SHEET OF 2 5	
OWNER AND LOCATION Capital Regional District Vancouver Island, British Columbia				CONSTRUCTION CONTRACT NO.			 moffatt & nichol	
PROJECT TITLE Miners Bay Float				ESTIMATED BY Moffatt & Nichol				
				STATUS OF DESIGN Draft				
							M&N JOB ORDER NUMBER 9369	
ITEM DESCRIPTION	QUANTITY		LABOUR, MATERIAL & EQUIPMENT COST		LABOUR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
<u>Option 1 - Rubble Mound Breakwater</u>								
<u>Mobilization/Demobilization</u>								
Mobilization/Demobilization of Marine Equipment	1	Lump Sum					\$321,000.00	\$321,000
Core Rock	30381	tonne					\$43.43	\$1,319,326
Filter Layer	8369	tonne					\$61.85	\$517,639
Armour Layer	19354	tonne					\$71.06	\$1,375,313
Sub-Total Estimated Construction Cost								\$3,533,277
30% Contingency								\$1,059,983
<u>Total Estimated Construction Cost</u>								\$4,593,261
TOTAL OPINION OF PROBABLE COST								SAY: \$4,594,000

OPINION OF PROBABLE COST					SHEET OF	
OWNER AND LOCATION Capital Regional District Vancouver Island, British Columbia			CONSTRUCTION CONTRACT NO.		 moffatt & nichol	
PROJECT TITLE Miners Bay Float			ESTIMATED BY Moffatt & Nichol			
			STATUS OF DESIGN Draft			
					M&N JOB ORDER NUMBER 9369	
ITEM DESCRIPTION	QUANTITY		LABOUR, MATERIAL & EQUIPMENT COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL
<u>Option 3 - Piled Panel Breakwater</u>						
Mobilization/Demobilization						\$146,000
Piles Panel Breakwater supply	267,000	kgs			\$1.52	\$405,306
Pile install	72	No.			\$9,500.00	\$684,000
Concrete pile cap	294	cu metres			\$2,000.00	\$588,000
Scour protection	4,013	tonnes			\$47.00	\$188,602
Sub-Total Estimated Construction Cost						\$2,011,908
30% Contingency						\$603,572
<u>Total Estimated Construction Cost</u>						<u>\$2,615,480</u>
TOTAL OPINION OF PROBABLE COST						SAY: \$2,616,000

OPINION OF PROBABLE COST					SHEET OF	
OWNER AND LOCATION Capital Regional District Vancouver Island, British Columbia			CONSTRUCTION CONTRACT NO.		 moffatt & nichol	
PROJECT TITLE Miners Bay Float			ESTIMATED BY Moffatt & Nichol			
			STATUS OF DESIGN Draft			
			M&N JOB ORDER NUMBER 9369			
ITEM DESCRIPTION	QUANTITY		LABOUR, MATERIAL & EQUIPMENT COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL
<u>Option 4 - Wave Baffle-Float relocation</u>						
Mobilization/Demobilization	1	No.			\$50,000	\$50,000
Supply and install wave baffles	241.3	sq.m			\$800	\$193,040
Pile supports for deck expansion	6	No.			\$14,895	\$89,370
New deck expansion	24	sq.m			\$1,500	\$36,000
New pile supports for float relocation	8	No.			\$14,895	\$119,160
Relocation of floats & gangway	1	No.			\$30,000	\$30,000
Sub-Total Estimated Construction Cost					\$517,570	
30% Contingency					\$155,271	
<u>Total Estimated Construction Cost</u>					<u>\$672,841</u>	
TOTAL OPINION OF PROBABLE COST					SAY:	\$673,000

**REPORT TO SOUTHERN GULF ISLANDS HARBOURS COMMISSION
MEETING OF FRIDAY, JANUARY 27, 2017**

**SUBJECT SOUTHERN GULF ISLANDS HARBOURS SERVICE – AMENDED 2017
OPERATING AND CAPITAL BUDGET**

ISSUE

This report provides an overview of the **amended** draft Southern Gulf Islands (SGI) Small Craft Harbours 2017 Budget – operating and capital budget and five year capital and financial plan. This overview highlights proposed changes related to the operational expenditures, debt charges, capital expenditures and revenue, and summarizes the funding context.

The initial draft 2017 Budget and overview was developed for the Commission's consideration at their December 9, 2016 meeting, which was cancelled due to weather conditions. However, following the public release of the budget documents, many members of the public, primarily Mayne Island residents, expressed concern with the capital project priorities. As a result, the budget was amended in consideration of the public feedback received.

The amended budget document is attached as **Attachment 1**, which supersedes the budget report and documents prepared for the December Commission meeting, which are attached as **Attachment 3**.

Amendments to the draft 2017 budget are primarily limited to the re-prioritizing of projects within the Capital plan. There was one new project added to evaluate the Miners Bay Facility (funded through the Community Workers Fund). The proposed requisition increase remains at 25% but implementation has been shifted from 2017 to a two year implementation over 2018 - 2019, and borrowing from the MFA remains unchanged but implementation has been shifted to 2019 - 2020.

BACKGROUND

Under the Southern Gulf Islands Harbour Service, there are 11 dock facilities on 6 islands. Nine of the facilities are owned by the Capital Regional District (CRD) and two facilities (Horton Bay and Lyall Harbour) remain under Department of Fisheries and Oceans Canada (DFO) ownership, but operated by the CRD under a Management Agreement. A new facility is planned on Mayne Island at Anson Road. It is expected that the Anson Road facility will be operational by the end of 2019.

These facilities provide a vital link to island community residents and visitors by providing moorage, access points for supplies and mail delivery, water taxi points, ambulance service, Royal Canadian Search and Rescue, and refuge in case of inclement weather or emergency.

In accordance with Bylaw 2972, the Southern Gulf Islands Harbours Commission (Commission) shall prepare an annual budget which shall include estimates of the cost of planning, acquisition, development, maintenance and operation of the harbours, together with any estimates of expected revenues, and shall submit such expenditures and revenue estimates for the approval of the CRD Board and for inclusion in the CRD Board's provisional and annual budgets.

Southern Gulf Islands Harbours Commission – January 27, 2017
Southern Gulf Islands Harbours Service – Amended 2017 Operating
and Capital Budget

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2016 BUDGET

2016 Operating Expenditures and Revenue Projections

The actual 2016 operating expense for the harbours management and dock operations is projected to be \$43,730 under budget at year end, primarily due to lower insurance cost, travel costs, and repair and maintenance costs.

The actual 2016 operating revenue, which includes moorage and licensing revenue, is projected to be \$5,530 under budget primarily due to lower moorage fees revenue.

This results in a 2016 net budget surplus of \$38,200. In order to balance the 2016 budget, the transfer to the capital reserve fund (CRF) was increased from the planned amount of \$150,590 to \$188,790. At 2016 year end, the CRF fund balance is projected to be \$1,148,694.

2016 Capital Projects

The approved 2016 Capital Budget was \$926,150; \$526,150 of which was approved for the 2016 Upgrade Program, and \$400,000 was approved for the Anson Road Facility (Phase 1) project. During the 2016 budget year the following additional projects were approved by the Commission to be funded from the CRF:

- Float Ladder Installation Project (\$45,000)
- Piers Island Geometry Review (\$5,800)
- Horton Bay Dinghy Dock (\$2,500), reduced from \$6,800 with the approval of the Commission

The 2016 Upgrade Program, Horton Bay Dinghy Dock, and Piers Island Geometry Review are complete and the Float Ladder Installation project is scheduled for completion in early 2017.

The Anson Road Project was initiated but has been postponed until 2018 in the amended 2017 Budget. Postponing of the Anson Road Project will allow for the acceleration of other works that were defined in the Moffatt & Nichol December 11, 2015 Summary Report and Optimized Multi-Year Funding Plan. Postponement will also allow time to resolve litigation with respect to the Horton Bay dock. Depending on the outcome of the current court decision appeal, the Commission may consider a revision/expansion of the Horton Bay facility and a revised Anson Road facility design.

2017 BUDGET

2017 Operating Revenue and Expense Budget

Expense Budget

The total operating expense budget has been increased by \$6,670 for 2017, primarily as a result of increases in the repair and maintenance budgets and a budget allowance for the dock operations coordinator expense.

Southern Gulf Islands Harbours Commission – January 27, 2017
Southern Gulf Islands Harbours Service – Amended 2017 Operating
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Revenue Budget

Moorage and Licensing Revenue

CRD Bylaw 3814 provides the authority to charge moorage fees to customers for the use of CRD docks in the Southern Gulf Islands. Moorage fees may be adjusted by bylaw amendment with direction from the Commission.

Moorage fees contribute approximately 23% (approximately \$80,000) of annual revenue to the Southern Gulf Islands Harbours Service. The moorage and licensing revenue budget has been held at the 2016 level of \$79,070.

Requisition Revenue

At present, the Southern Gulf Islands Harbours Service is at the maximum level of the current requisition (Property Tax Levy) allowable under the service Bylaw No. 2614. The current Property Tax Levy is the greater of \$112,878 or \$0.10/\$1,000 of actual assessed value to a maximum of \$258,570 (2017 Tax Assessment). Currently 6,155 parcels contribute to the Southern Gulf Islands Harbours Service with an average parcel tax of \$41.36/parcel. The property tax levy will be unchanged in 2017 and held at the 2016 level.

2017 Capital Plan and Forecast 2018 to 2021

The Commission approved a project in the 2015 capital budget to undertake an engineering review and condition assessment of the 11 dock facilities under the Southern Gulf Islands Harbours Service responsibility. The resulting Moffatt & Nichol (M&N) December 11, 2015 Summary Report and Optimized Multi-Year Funding Plan included recommended capital programs for years 2016 through 2020 (with prioritized and detailed work assignments) necessary to maintain the current level of service.

Budgetary capital values for years 2021 through 2025 were also provided, as continued spending is required to maintain the current level of service or for facility replacement. Detailed projects for years 2021 through 2025, and planning for replacement, will be identified through the ongoing capital and maintenance programs and through the scheduled facility inspections.

The 2017 Capital Plan includes work at Piers Islands, Montague Harbour and Miners Bay. All projects were identified in the M&N Report, however, Montague Harbor and Miners Bay have been accelerated from their initially proposed year (2018 and 2020 respectively).

The currently projected revenue is sufficient to fund the 2017 Program, however, it is not sufficient to support the proposed 2018 to 2021 forecast, and long term capital and operating expenditures. Staff have developed three funding options to balance the 2018-2021 forecast. Long term reserve balance summaries for the options can be found in **Attachment 2**. The table below summarizes the options and capital implications. Option 2 is presented in detail in **Attachment 1 – 2017 Harbours Budget** and is the basis for the proposed 2017 budget.

It should be noted that, while the 2017 to 2021 years have been balanced, additional borrowing, tax increase, or deferral of works, will be required for long term financial sustainability for all options.

Southern Gulf Islands Harbours Commission – January 27, 2017
Southern Gulf Islands Harbours Service – Amended 2017 Operating
and Capital Budget

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	Description	2017 - 2021* Remaining CRF	*2022-2026* Funding Deficit	Capital Implications and Comments
1	No Tax Increase or Borrowing	\$33,000	-\$1,960,000)	Deferral of planned Sturdies Bay, Miners Bay works, (originally scheduled for 2020), and \$360,000 of proposed 2021 undefined works to years 2022-26.
2	Tax Increase (25% in 2017) and Borrowing \$694,000 from MFA in 2018/ 2019***	\$6,000	-\$1,300,000) and 400,000** remaining debt	This option accelerates the Capital Program and balances 5 year plan but creates debt servicing of approximately \$72,000/year for 10 years (reducing the yearly transfer to the CRF). Deferral of \$205,000 of proposed 2021 undefined works to years 2022-26.
3	Tax Increase (25% in 2017 and 25% in 2022	-\$18,459)	-\$850,000)	Deferral of planned Sturdies Bay work (originally scheduled for 2020), 2021 inspection and \$360,000 of proposed undefined 2021 works to years 2022-26.

* Budgetary values for capital works are provided for years 2021 to 2026. Detailed works will be defined through inspection projects scheduled for 2018 and 2021.

** Remaining debt has been calculated using a 5% interest rate and a 15 year amortization. Remaining debt will be confirmed in year 2028, at the 10 year anniversary of the debt, and may be less than shown.

*** See MFA borrowing information below.

Service Funding Options

Additional funding mechanisms available to the Southern Gulf Islands Harbours Service include moorage fees, a requisition revenue increase (tax increase), and borrowing from the Municipal Finance Authority (MFA).

Moorage Fees Increase

While increasing moorage fees would add to overall revenue, it is likely that an increase in moorage fees alone, at a magnitude required to fully fund the Southern Gulf Islands Harbours Service, would be unacceptable to the public and would not provide a stable revenue source. An increase to moorage fees could be considered together with other revenues sources.

Maximum Requisition Increase

The maximum requisition may be increased by 25% or less every 5 years with approval of the Electoral Area Services Committee (EASC) and CRD Board but without the need for approval of the Inspector of Municipalities (Province). To increase the maximum requisition, the Commission can recommend an increase to the EASC and the CRD Board for their approval. This process usually takes approximately 2-3 months and needs to be approved by February of the proposed increase budget year to take effect. Public referendum or Alternate Approval Process (AAP) is not required unless an increase greater than 25% is desired.

The attached draft 2017 Budget includes an increase of 12.5% in 2018 and 12.5% in 2019. A 25% increase would equate to \$0.125/\$1,000 of assessed value or \$302,325, and provide

Southern Gulf Islands Harbours Commission – January 27, 2017
Southern Gulf Islands Harbours Service – Amended 2017 Operating
and Capital Budget

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approximately \$50,000 in additional yearly tax revenue for the service. This would equate to an increase in the average parcel tax of \$41.36/parcel in 2016 to \$46.53 in 2018 and \$51.70 in 2019 (subject to change based on assessed values).

For an increase greater than 25%, support of the taxpayers of the Southern Gulf Islands Harbours Service would need to be confirmed through a successful referendum or AAP. A referendum or AAP process can take 3 to 6 months to complete and will require funds from the Capital Reserve Fund to support the process. It should be noted that the referendum process costs can be in excess of \$10,000.

Borrowing from the Municipal Finance Authority (MFA)

Capital works can be financed with long term loans through the MFA. Taxpayer approval of a loan authorization bylaw is required either through an AAP or referendum to allow the CRD to borrow funds. Both processes can be expected to take several months.

MFA's long term interest rate is currently 2.75% and a repayment term of 15 years is typically used by the CRD for long term debt financing. When the CRD estimates debt repayment, an interest rate of 5% is used to be conservative. The interest rate is locked in for the first 10 years of the debt. After 10 years, the amount outstanding may be paid back in part or in full. Any remaining amount would be repaid over 5 years at the interest rate in effect in the first of the 5 years.

The attached draft 2017 Budget includes a borrowing referendum in 2017 and debt of \$694,000 in 2019/2020. The following table summarizes the proposed \$694,000 loan repayment values and the maximum debt the Southern Gulf Islands Harbours Service can currently undertake.

	Loan Value	Interest *	Principal *	Re-Payment*
Proposed Loan	\$694,000	\$34,700	\$37,314	\$72,014
Maximum Loan**	\$1,852,960	\$60,960	\$99,630	\$150,590

*assumes a 5% interest rate

** maximum debt the Southern Gulf Islands Harbours Service could undertake assuming that the entire current annual transfer to the CRF is used for annual debt servicing

CONCLUSION

The proposed 2017 operating budget has been adjusted to reflect minor shifts in revenues and expenditures, including a planned transfer to the CRF.

The facilities managed under the Southern Gulf Islands Harbours Service are aging and ongoing repairs and maintenance can be expected to continue into the foreseeable future. The current Southern Gulf Islands Harbours Service financial model is not sufficient to fund the proposed 2017 to 2021 capital and operating expenditures, or the expected long term plan (to maintain the current level of service) and fund new projects.

Additional revenue to maintain the current level of service, or reduced level of service, will be required to maintain financial viability. It is recommended that the Commission consider a combination of tax increase, moorage rate increase and debt to fund the service over time.

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Dock inspection, repair and maintenance is an iterative process that requires periodic review of the facilities and re-evaluation of proposed work plans and residual life estimates. Residual life estimates and budgetary values for years 2021 through 2026 are rough estimate values based on subjective judgment of the current deterioration and observed damages in the structural elements.

Assuming that the facilities will be routinely inspected and scheduled maintenance and repairs are undertaken, the service life of the structures may be extended beyond their design life as seen in many of the facilities. However, at some point in time, depending on the rate of deterioration, a business case may be made to do full replacement and planning and should take this aspect into consideration.

RECOMMENDATION

That the Southern Gulf Islands Harbours Commission recommend to the CRD Board that:

1. The 2017 Southern Gulf Islands Harbours Service Operating and Capital Budget be approved, and
2. The 2016 actual revenue and expense be balanced on the transfer to the Capital Reserve Fund.

Submitted by:	Ian Sander, P.Eng., Manager, Capital Projects
Submitted by:	Dan Robson, A.Sc.T., Manager, Saanich Peninsula & Gulf Island Operations
Concurrence:	Peggy Dayton, CPA, Senior Financial Advisor, Finance and Technology
Concurrence:	Ian Jesney, P.Eng., Senior Manager, Infrastructure Engineering
Concurrence:	Ted Robbins, B.Sc., C.Tech., General Manager, Integrated Water Services

IS/TR/DR:mm

Attachments:

- Attachment 1 - 2017 Southern Gulf Island Harbours Budget
- Attachment 2 – Funding Options
- Attachment 3 – December 9, 2016 staff report to the Southern Gulf Islands Harbours Commission, with attachments

CAPITAL REGIONAL DISTRICT

2017 Budget

SGI Small Craft Harbours

Committee Review

Service:	1.235 SGI Small Craft Harbour Facilities	Committee: Electoral Area Services
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DEFINITION:

A local service, established by Bylaw No. 2614, October 6, 1998, in the Southern Gulf Islands Electoral Area to establish, acquire and operate a service of small craft harbour facilities.

SERVICE DESCRIPTION:

The SGI Small Craft Harbour Facilities service funds and operates 11 small craft harbour facilities in the Southern Gulf Islands. 9 docks are owned by the CRD and 2 are leased. The docks are located on Mayne, Galiano, North and South Pender, Saturna, Piers and Vancouver Islands. The service was undertaken by the CRD upon the Federal Government of Canada's divestiture of ownership and operation of small craft harbour facilities. The Federal Government provided 1-tim funding of \$1.6million to the CRD for dock rehabilitation. The service is administered by the Southern Gulf Islands Harbour Commission.

MAXIMUM LEVY:

Greater of \$112,878 or \$0.10 / \$1,000 of actual assessed value of land and improvements, to a maximum of \$258,570

COMMISSION:

Southern Gulf Islands Harbour Commission as established by Bylaw #2972 in 2002.

FUNDING:

Parcel Tax

<div>1.235 SGI Harbours</div> <div>Levy Statistics</div>
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<u>Year</u>	<u>Parcel Tax</u>	<u>Parcels</u>	<u>Cost/Parcel</u>
2012	\$271,930	5,889	\$48.60
2013	\$260,470	6,141	\$44.64
2014	\$242,680	6,146	\$41.56
2015	\$240,570	6,163	\$41.08
2016	\$241,860	6,155	\$41.36
2017	\$241,860	6,155	\$41.36

SGI Small Craft Harbours			BUDGET REQUEST				FUTURE PROJECTIONS			
	2016 BOARD BUDGET	2016 ESTIMATED ACTUAL	2017 CORE BUDGET	2017 ONGOING	2017 ONE-TIME	2017 TOTAL	2018	2019	2020	2021
<u>OPERATING COSTS:</u>										
<u>Management Expenditures</u>										
Contracted Services	14,000	14,720	14,210	-	-	14,210	14,490	14,780	15,070	15,370
Supplies, Advertising	1,810	2,010	1,830	-	-	1,830	1,870	1,910	1,950	1,990
Travel and Training	8,100	2,290	8,210	-	-	8,210	8,370	8,540	8,710	8,880
Internal Allocations	12,290	17,440	16,880	-	-	16,880	17,220	17,560	17,910	18,260
Other Operating Expenses	6,560	6,250	6,460	-	-	6,460	6,590	6,720	6,850	6,980
Total Management Expenditures	42,760	42,710	47,590	-	-	47,590	48,540	49,510	50,490	51,480
*Percentage Increase over prior year						11.3%	2.0%	2.0%	2.0%	2.0%
<u>Dock Expenditures</u>										
Repairs and Maintenance	38,260	20,640	48,880	-	-	48,880	49,770	50,680	56,150	57,180
Wharfinger Compensation and Travel	40,240	33,300	40,410	-	-	40,410	40,630	40,850	45,880	46,200
Allocations - Operations / Vehicle	11,000	450	1,550	-	-	1,550	1,580	1,610	1,640	1,670
Insurance	27,900	22,880	28,340	-	-	28,340	28,910	29,480	32,620	33,240
Electricity	2,860	2,210	2,900	-	-	2,900	2,960	3,020	3,580	3,650
Supplies	3,750	1,420	3,750	-	-	3,750	3,860	3,970	4,440	4,560
Operating - Other	3,570	3,000	3,590	-	-	3,590	3,700	3,810	4,230	4,350
Total Dock Expenditures	127,580	83,900	129,420	-	-	129,420	131,410	133,420	148,540	150,850
*Percentage Increase over prior year						1.4%	1.5%	1.5%	11.3%	1.6%
<u>CAPITAL / RESERVES</u>										
Transfer to Capital Reserve Fund	150,590	188,790	143,920	-	-	143,920	176,050	166,390	139,320	139,060
MFA Debt	-	-	-	-	-	-	-	42,450	68,670	72,010
TOTAL CAPITAL / RESERVES	150,590	188,790	143,920	-	-	143,920	176,050	208,840	207,990	211,070
TOTAL COSTS	320,930	315,400	320,930	-	-	320,930	356,000	391,770	407,020	413,400
<u>FUNDING SOURCES (REVENUE)</u>										
Revenue- Fees	(76,400)	(68,670)	(76,400)	-	-	(76,400)	(76,400)	(76,400)	(85,400)	(85,400)
Other Income	(2,670)	(4,870)	(2,670)	-	-	(2,670)	(2,670)	(2,670)	(2,670)	(2,670)
TOTAL REVENUE	(79,070)	(73,540)	(79,070)	-	-	(79,070)	(79,070)	(79,070)	(88,070)	(88,070)
REQUISITION - PARCEL TAX	(241,860)	(241,860)	(241,860)	-	-	(241,860)	(276,930)	(312,700)	(318,950)	(325,330)
*Percentage increase over prior year requisition						0.0%	14.5%	12.9%	2.0%	2.0%

CAPITAL REGIONAL DISTRICT CAPITAL PLAN

CAPITAL BUDGET FORM
2017 & Forecast 2018 to 2021

Service #:

1.235

Service Name:

SGI Small Craft Harbour Facilities

Project No.

The first two digits represent first year the project was in the capital plan.

Capital Expenditure Type

New Construction/ Project: Expenditure for new asset only

Renewal: Expenditure replaces an existing asset and extends the service ability or enhances technology in delivering that service

Replacement: Expenditure replaces an existing asset

Proj. No.	Capital Exp.Type	Capital Project Description	Total Project Budget	Asset Class	Funding Source	Carry Forward from 2016	2017	2018	2019	2020	2021	5 - Year Total
16-04	Renewal	Miners Bay	15,000	S	Grant	15,000						15,000
16-10	New	Anson Road Phase 1	400,000	S	Res			40,000				40,000
					Res/Debt				360,000			360,000
16-11	New	Dock ladders	45,000	S	Cap	45,000						45,000
17-01	Renewal	Piers Island Upgrade	228,500	S	Res		228,500					228,500
17-02	Renewal	Montague Harbour Upgrade	277,400	S	Res		277,400					277,400
17-03	Renewal	Alternative Approval Process	10,000	S	Res		10,000					10,000
17-04	Renewal	Miners Bay	384,000	S	Res		384,000					384,000
18-01	Renewal	Inspections	82,000	S	Res			82,000				82,000
18-02	Renewal	Port Washington Upgrade	322,500	S	Res			322,500				322,500
18-03	Renewal	Port Browning Upgrade	115,500	S	Res			115,500				115,500
19-01	New	Anson Road Phase 2	90,000	S	Res/Debt				90,000			90,000
19-02	Renewal	Retreat Cove	269,000	S	Res/Debt				269,000			269,000
20-01	Renewal	Sturdies Bay	143,000	S	Res/Debt					143,000		143,000
21-01	Renewal	Dock Improvements	350,000	S	Res/Debt						155,000	155,000
21-02	Renewal	Inspections		S	Res/Debt						125,000	125,000
Total			2,716,900			60,000	899,900	560,000	719,000	143,000	280,000	2,661,900

Funding Source Codes

Debt = Debenture Debt (new debt only)
 ERF = Equipment Replacement Fund
 Grant = Grants (Federal, Provincial)
 Cap = Capital Funds on Hand
 Other = Donations / Third Party Funding
 Res = Reserve Fund
 STLoan = Short Term Loans

Asset Class

L - Land
 S - Engineering Structure
 B - Buildings
 V - Vehicles
 E - Equipment

Service: 1.235 SGI Small Craft Harbour Facilities

16-04	Miners Bay Assessment	15,000
	<p>Miners Bay is exposed to Active Pass and subject to frequent ferry wake and other significant weather conditions. These conditions create significant movement to Miners Bay Floats B, C and D. Due to this movement the CRD is required to frequently repair damage to the float system and has received concerns from users with respect to safety. Options for an alternate solution/arrangement for the orientation Miners Bay Facility floats is desired to improve safety and reduce wear and tear.</p>	
16-10	Anson Road Phase 1	\$400,000
	<p>Over the past four years Mayne Island has seen a significant increase in active boaters. To provide additional moorage space the Commission approved a capital project to construct a new dock facility, and associated upland improvements, on Mayne Island at Anson Road.</p> <p>The CRD holds a water lease off Anson Road, and access to the new facility will be through a Ministry of Transportation road allowance.</p> <p>The first phase will be constructed in 2017 and include the walkway, ramp, main float and three fingers, providing 460 feet of moorage, and improvements to the highways frontage upland area, including an all-weather gravel road, turn around and vaulted toilet and pump out system.</p>	
16-11	Dock Ladders	\$45,000
	<p>New float ladders are desired for each of the CRD owned Dock facilities. Approximately 30 ladders will be fabricated and installed in accordance with Department and Fisheries and Oceans (DFO) Canada.</p>	
17-01	Piers Island Upgrade	\$228,500
	<p>This project includes works to maintain the current level of service as recommended in the Moffatt & Nichol <i>Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015</i>. Recommended works include improvements to the approach abutment, 3 approach piles, and repairs to the three floats. Moffatt & Nichol are currently assessing the current float configuration to determine if improved float geometry can be achieved with this project.</p>	
17-02	Montague Harbour Upgrade	\$277,400
	<p>This project includes works to maintain the current level of service as recommended in the Moffatt & Nichol <i>Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015</i>. Recommended works include improvements to the approach timber decking, repairs to pile shims, various repairs to Float A, Float B, and Float D, and upgrade of the light standards with LED fixtures.</p>	
17-03	Alternative Approval Process	\$10,000
	<p>Capital works can be financed with long term loans through the MFA. Taxpayer approval of a loan authorization bylaw is required either through an AAP or referendum to allow the CRD to borrow funds.</p> <p>Additional funding, through borrowing, is required to undertake recommended works, on a number of the SGIHS facilities, as defined in the Moffatt & Nichol <i>Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015</i>. This budget will fund the AAP process.</p>	
17-04	Miners Bay Upgrade	\$384,000

This project includes work to maintain the current level of service as recommended in the Moffatt & Nichol Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015. Recommended works include repairs and replacement of various approach piles, repairs to Float A, Float B, Float C, and Float D, and upgrade of light standards to include LED fixtures.

18-01	Inspections	\$82,000.00
	Dock inspection, repair and maintenance is an iterative process that requires periodic review of the facilities and re-evaluation of proposed work plans and residual life estimates. This budget is for a "Top Side" inspection and will be used to re-evaluate the 5 Year capital Program.	
18-02	Port Washington Upgrade	\$322,500
	This project includes works to maintain the current level of service as recommended in the Moffatt & Nichol Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015 . Recommended works include improvements to the approach timber decking, replacement and upgrades to the approach piles, repairs to Float B and Float C and repairs to the gangway. .	
18-03	Port Browning Upgrade	\$115,500
	This project includes works to maintain the current level of service as recommended in the Moffatt & Nichol Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015 . Recommended works include improvements to the approach timber decking and bull rail spacer, upgrades to the abutment, repairs to various approach piles, and repair to the gangway.	
19-01	Anson Road Phase 2	\$90,000
	The second phase of the Anson Road Facility will be constructed in 2018 and will include the installation of three additional fingers to achieve the docks ultimate capacity of 720 feet.	
19-02	Retreat Cove Upgrade	\$269,000
	This project includes works to maintain the current level of service as recommended in the Moffatt & Nichol Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015 . Recommended works include repairs to the approach piles, and repairs to the floats.	
20-01	Sturdies Bay Upgrade	\$143,000
	This project includes works to maintain the current level of service as recommended in the Moffatt & Nichol Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015 . Recommended works include repair of the approach timber hand rails, repair of the float, repair of the beak water, and upgrades of the light standards to include LED fixtures.	
21-01	Dock Improvements	\$225,000
	This project will fund currently undefined works to maintain the current level of service as recommended in the Moffatt & Nichol Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015.	
	Budgetary values were provide for years 6 through 10 as it can be expected that continued spending will be required to maintain the current level of service. Detailed work assignments will be defined through the 2018 Inspection Project	
21-02	Inspections	\$125,000
	Dock inspection, repair and maintenance is an iterative process that requires periodic review of the facilities and re-evaluation of proposed work plans and residual life estimates. This budget is for a "Top Side and Underwater " inspection and will be used to re-evaluate the 5 Year capital Program.	

Capital Reserve Fund Schedule

Reserve Fund: 1.235 SGI Small Craft Harbour Facilities Capital Reserve Fund (Bylaw No. 2719)

Capital Reserve Fund Cash Flow

Fund:1054 Fund Center: 101467

	Estimate	Budget				
	2016	2017	2018	2019	2020	2021
Beginning Balance	1,535,904	1,148,694	392,714	8,764	44,784	146,474
Transfer to Cap Fund	(588,600)	(899,900)	(560,000)	(719,000)	(143,000)	(280,000)
Transfer from Operating Budget	188,790	143,920	176,050	166,390	139,320	139,060
MFA Borrowing	-	-	-	588,630	105,370	-
Interest Income*	12,600	-	-	-	-	-
Ending Balance \$	1,148,694	392,714	8,764	44,784	146,474	5,534

* Interest should be included in determining the estimated ending balance for the current year. Interest in planning years nets against inflation which is not included.

Attachment 2

Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11	Column12	Column13	Total	Column14										
Option 1 - No Tax Increase or Borrowing													\$	-										
		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		
																							\$	-
Beginning Balance	\$	1,535,904	\$	748,694	\$	660,114	\$	350,534	\$	60,304	-\$	59,916	-\$	33,036	-\$	418,556	-\$	804,076	-\$	1,189,596	-\$	1,575,116	\$	1,535,904.23
																							\$	-
Transfer from Operations	\$	188,790	\$	143,920	\$	145,820	\$	147,770	\$	149,780	\$	151,880	\$	151,880	\$	151,880	\$	151,880	\$	151,880	\$	151,880	\$	1,687,360.00
																							\$	-
Federal Grant	\$	-	\$	-	\$	-	\$	-	\$	-													\$	-
																							\$	-
Transfer from/(to) Gen Cap Fund	-\$	988,600	-\$	232,500	-\$	455,400	-\$	438,000	-\$	270,000	-\$	125,000	(537,400)	(537,400)	(537,400)	(537,400)	(537,400)	(537,400)	(537,400)	(537,400)	(537,400)	(537,400)	-\$	5,196,500
																							\$	-
Interest Income	\$	12,600	\$	-	\$	-	\$	-															\$	12,600.00
																							\$	-
Ending Balance	\$	748,694	\$	660,114	\$	350,534	\$	60,304	-\$	59,916	-\$	33,036	-\$	418,556	-\$	804,076	-\$	1,189,596	-\$	1,575,116	-\$	1,960,636	-\$	1,960,636
																							\$	-
																							\$	-
																							\$	-
																							\$	-
Option 2 - Tax Increase (12.5% in 2018 and 12.5% in 2019) and Borrowing \$694,000 from MFA in 2019/2020.													\$	-										
		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		
																							\$	-
Beginning Balance	\$	1,535,904	\$	1,148,694	\$	392,714	\$	8,764	\$	44,784	\$	146,474	\$	5,534	-\$	256,406	-\$	518,346	-\$	780,286	-\$	1,042,226	\$	1,535,904.23
																							\$	-
Transfer from Operations	\$	188,790	\$	143,920	\$	176,050	\$	166,390	\$	139,320	\$	139,060	\$	139,060	\$	139,060	\$	139,060	\$	139,060	\$	139,060	\$	1,648,830.00
																							\$	-
Federal Grant / MFA Debt	\$	-	\$	-	\$	-	\$	588,630	\$	105,370	\$	-	\$	-									\$	694,000.00
																							\$	-
Transfer from/(to) Gen Cap Fund	-\$	588,600	-\$	899,900	-\$	560,000	-\$	719,000	-\$	143,000	-\$	280,000	(401,000)	(401,000)	(401,000)	(401,000)	(401,000)	(401,000)	(401,000)	(401,000)	(401,000)	(401,000)	-\$	5,195,500
																							\$	-
Interest Income	\$	12,600	\$	-	\$	-	\$	-															\$	12,600.00
																							\$	-
Ending Balance	\$	1,148,694	\$	392,714	\$	8,764	\$	44,784	\$	146,474	\$	5,534	-\$	256,406	-\$	518,346	-\$	780,286	-\$	1,042,226	-\$	1,304,166	-\$	1,304,166
																							\$	-
																							\$	-
																							\$	-
																							\$	-
Option 3 - Tax Increase (25% in 2017 and 25% in 2022)													\$	-										
		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		
																							\$	-
Beginning Balance	\$	1,535,904	\$	748,694	\$	720,579	\$	472,669	\$	245,349	\$	189,299	\$	22,639	-\$	163,831	-\$	344,318	-\$	518,703	-\$	686,864	\$	1,535,904.23
																							\$	-
Transfer from Operations	\$	188,790	\$	204,385	\$	207,490	\$	210,680	\$	213,950	\$	217,340	\$	299,130	\$	305,113	\$	311,215	\$	317,439	\$	323,788	\$	2,799,319.53
																							\$	-
Federal Grant	\$	-	\$	-	\$	-	\$	-	\$	-													\$	-
																							\$	-
Transfer from/(to) Gen Cap Fund	-\$	988,600	-\$	232,500	-\$	455,400	-\$	438,000	-\$	270,000	-\$	384,000	(485,600)	(485,600)	(485,600)	(485,600)	(485,600)	(485,600)	(485,600)	(485,600)	(485,600)	(485,600)	-\$	5,196,500
																							\$	-
Interest Income	\$	12,600	\$	-	\$	-	\$	-															\$	12,600.00
																							\$	-
Ending Balance	\$	748,694	\$	720,579	\$	472,669	\$	245,349	\$	189,299	\$	22,639	-\$	163,831	-\$	344,318	-\$	518,703	-\$	686,864	-\$	848,676	-\$	848,676

**REPORT TO SOUTHERN GULF ISLANDS HARBOURS COMMISSION
MEETING OF FRIDAY, DECEMBER 9, 2016**

**SUBJECT SOUTHERN GULF ISLANDS HARBOURS SERVICE – 2017 OPERATING
AND CAPITAL BUDGET**

ISSUE

This report provides an overview of the draft 2017 Southern Gulf Islands (SGI) Harbours Service Operating and Capital Budget and Five Year Capital and Financial Plan. This overview highlights proposed changes related to the operational expenditures, debt charges, capital expenditures and revenue and summarizes the funding context.

This report is intended to be reviewed in conjunction with Appendix #1 – 2017 Southern Gulf Island Harbours Budget.

BACKGROUND

Under the Southern Gulf Islands Harbours Service (SGIHS), there are 11 dock facilities on 6 islands. Nine of the facilities are owned by the Capital Regional District (CRD) and two facilities (Horton Bay and Lyall Harbour) remain under Department of Fisheries and Oceans Canada (DFO) ownership, but operated by the CRD under a Management Agreement. A new facility is planned on Mayne Island at Anson Road. It is expected that the Anson Road facility will be operational by the end of 2017.

These facilities provide a vital link to island community residents and visitors by providing moorage, access points for supplies and mail delivery, water taxi points, ambulance service, Royal Canadian Search and Rescue, and refuge in case of inclement weather or emergency.

In accordance with Bylaw 2972, the Southern Gulf Islands Harbours Commission shall prepare an annual budget which shall include estimates of the cost of planning, acquisition, development, maintenance and operation of the harbours, together with any estimates of expected revenues, and shall submit such expenditures and revenue estimates for the approval of the CRD Board and for inclusion in the CRD Board's provisional and annual budgets.

2016 BUDGET

2016 Operating Expenditures and Revenue Projections

The actual 2016 operating expense for the harbours management and dock operations is projected to be \$43,730 under budget at year end, primarily due to lower insurance cost, travel costs, and repair and maintenance costs.

The actual 2016 operating revenue, which includes moorage and licensing revenue, is projected to be \$5,530 under budget primarily due to lower moorage fees revenue.

This results in a 2016 net budget surplus of \$38,200. In order to balance the 2016 budget, the transfer to the capital reserve fund (CRF) was increased from the planned amount of \$150,590 to \$188,790. At 2016 year end the CRF fund balance is projected to be \$744,510.

2016 Capital Projects

The approved 2016 Capital Budget is \$926,150, \$526,150 of which was approved for the 2016 Upgrade Program, and \$400,000 was approved for the Anson Road Facility (Phase 1) project. During the 2016 budget year the following additional projects were approved by the Commission to be funded from the CRF:

- Float Ladder Installation Project (\$45,000)
- Piers Island Geometry Review (\$5,800)
- Horton Bay Dingy Dock (\$2,500), reduced from \$6,800 with the approval of the Commission

All projects, with the exception of the Float Ladder Installation Project and new Anson Road Facility, are scheduled to be completed within budget by year end. The Anson Road Project has been initiated.

2017 BUDGET

2017 Operating Revenue and Expense Budget

Expense Budget

The total operating expense budget has been increased by \$6,670 for 2017, primarily as a result of increases in the repair and maintenance budgets and a budget allowance for the dock operations coordinator expense.

Revenue Budget

Moorage and Licensing Revenue

CRD Bylaw 3814 provides the authority to charge moorage fees to customers for the use of CRD docks in the Southern Gulf Islands. Moorage fees may be adjusted by Bylaw amendment with direction from the Commission.

Moorage fees contribute approximately 23% (or \$76,000) of annual revenue to the SGIHS. While increasing moorage fees would add to overall revenue, it is likely that an increase in moorage fees alone, at a magnitude required to fully fund the SGIHS, would be unacceptable to the public and would not provide a stable revenue source. An increase to moorage fees could be considered together with other revenues sources.

The moorage and licensing revenue budget has been held at the 2016 level of \$79,070.

Requisition Revenue

At present, the SGIHS is at the maximum level of the current requisition (Property Tax Levy) allowable under the service Bylaw No. 2614. The current Property Tax Levy is the greater of \$112,878 or \$0.10/\$1,000 of actual assessed value to a maximum of \$240,964). Currently 6,155 parcels contribute to the SGIHS with an average parcel tax of \$41.36/parcel in 2016.

The maximum requisition may be increased by 25% or less every 5 years with approval of the Electoral Area Services Committee (EASC) and CRD Board but without the need for approval of the Inspector of Municipalities (Province). To increase the maximum requisition, the Commission can recommend an increase to the EASC and the CRD Board for their approval. This process usually takes approximately 2-3 months and needs to be approved by February of the proposed

increase budget year to take effect. Public referendum or Alternate Approval Process (AAP) is not required unless an increase greater than 25% is desired.

A 25% increase would work out to \$0.125/\$1,000 of assessed value or \$302,325, and provide approximately \$50,000 in additional yearly tax revenue for the Service. This will equate to an increase in the average parcel tax of \$41.36/parcel in 2016 to \$51.70. It should be noted that, if assessed values are predicted to increase over the next 5 – 10 years, then the maximum levy would increase as well.

For an increase greater than 25%, support of the taxpayers of the SGIHS would need to be confirmed through a successful referendum or AAP. A referendum or AAP process can take 3 to 6 months to complete and will require funds from the Capital Reserve Fund to support the process. It should be noted that the referendum process costs can be in excess of \$10,000.

The requisition revenue budget is recommended to increase by 25% to \$302,330. This is subject to Commission and CRD Board approval. In summary, the requisition increase is necessary to maintain the existing and invest in new dock infrastructure. Further detail is provided below.

2017 Capital Plan

The Southern Gulf Islands Harbours Commission approved a project in the 2015 capital budget to undertake an engineering review and condition assessment of the 11 dock facilities under the SGIHS responsibility.

The resulting December 11, 2015 Summary Report and Optimized Multi-Year Funding Plan included recommended capital programs for years 2016 through 2020 (with prioritized and detailed work assignments) necessary to maintain the current level of service.

Budgetary capital values for years 2021 through 2025 were also provided, as continued spending is required to maintain the current level of service or for facility replacement. Detailed projects for years 2021 through 2025, and planning for replacement, will be developed through the ongoing capital and maintenance programs and through the scheduled facility inspections.

The currently projected revenue is not sufficient to support the proposed 2017 to 2021, and long term capital and operating expenditures. Staff have developed three funding options, each with the five year plan implications. Details of the options can be found in Appendix #2. The table below summarizes the options and capital implications:

	Description	2017 - 2021* Remaining CRF	*2022-2026* Funding Deficit	Capital Implications and Comments
1	No Tax Increase or Borrowing	-(\$37,216)	-(\$1,930,000)	<p>Deferral of planned Sturdies Bay, Miners Bay works, (originally scheduled for 2020) to 2022/23.</p> <p>Deferral of proposed 2021 inspection and \$325,000 of proposed undefined 2021 works.</p> <p>Additional borrowing, tax increase, or deferral of works, will be required for long term financial sustainability.</p>
2	Tax Increase (25% in 2017) and Borrowing \$694,000 from MFA in 2018/ 2019***	\$2,194	-(\$1,158,000) and 265,000** remaining debt	<p>This option is presented in detail in Appendix #1 – 2017 Harbours Budget as the basis for the proposed 2017 budget.</p> <p>This option accelerates the Capital Program and balances 5 year plan but creates debt servicing of approximately \$82,000/year for 10 years (reducing the yearly transfer to the CRF).</p>

	Description	2017 - 2021* Remaining CRF	*2022-2026* Funding Deficit	Capital Implications and Comments
				Deferral of \$100,000 of proposed 2021 undefined works Additional borrowing, tax increase, or deferral of works, will be required for long term financial sustainability.
3	Tax Increase (25% in 2017 and 25% in 2022)	-\$18,459	-\$820,000	Deferral of planned Sturdies Bay work (originally scheduled for 2020) to 2022. Deferral of proposed 2021 inspection and \$325,000 of proposed undefined 2021 works. Additional borrowing or tax increase, or deferral of works, will be required for long term financial sustainability.

* Budgetary values for capital works are provided for years 2021 to 2026. Detailed works will be defined through inspection projects scheduled for 2018 and 2021.

** Remaining debt has been calculated using a 5% interest rate and a 15 year amortization. Remaining debt will be confirmed in year 2028, at the 10 year anniversary of the debt, and may be less than shown.

*** See MFA borrowing information below.

Borrowing from the Municipal Finance Authority (MFA)

Capital works can be financed with long term loans through the MFA. Taxpayer approval of a loan authorization bylaw is required either through an AAP or referendum to allow the CRD to borrow funds. Both processes can be expected to take several months.

MFA's long term interest rate is currently 2.75% and a repayment term of 15 years is typically used by the CRD for long term debt financing. When the CRD estimates debt repayment, an interest rate of 5% is used to be conservative. The interest rate is locked in for the first 10 years of the debt. After 10 years, the amount outstanding may be paid back in part or in full. Any remaining amount would be repaid over 5 years at the interest rate in effect in the first of the 5 years.

The chart below summarizes the maximum debt the SGIHS could undertake assuming that the entire current annual transfer to the CRF is used for annual debt servicing. A \$1,852,960 loan would require \$150,590 per year (2016 budgeted transfer amount) in principal and interest payments.

Interest Rate	Max. Loan Amount Using Entire CRF Transfer	Interest	Principal	2016 Re-Payment
2.75%	\$1,852,960	\$60,960	\$99,630	\$150,590

CONCLUSION

The proposed 2017 operating budget has been adjusted to reflect minor shifts in revenues and expenditures, including a planned transfer to the CRF.

The facilities managed under the SGIHS are aging and ongoing repairs and maintenance can be expected to continue into the foreseeable future. The current SGIHS financial model is not sufficient to fund the proposed 2017 to 2021 capital and operating expenditures, or the expected long term plan (to maintain the current level of service) and fund new projects, such as the Anson Road facility.

Additional revenue, or reduced level of service will be required to maintain financial viability and service levels. The Commission should consider a combination of tax increase, moorage rate increase and debt to fund the Service.

Dock inspection, repair and maintenance is an iterative process that requires periodic review of the facilities and re-evaluation of proposed work plans and residual life estimates. Residual life estimates and budgetary values for years 2021 through 2026 are rough estimate values based on subjective judgment of the current deterioration and observed damages in the structural elements.

Assuming that the facilities will be routinely inspected and scheduled maintenance and repairs are undertaken, the service life of the structures may be extended beyond their design life as seen in many of the facilities. However, at some point in time, depending on the rate of deterioration, a business case may be made to do full replacement and planning and should take this aspect into consideration.

RECOMMENDATION

That the Southern Gulf Islands Harbours Commission recommend to the CRD Board:

1. That the 2017 Southern Gulf Islands Harbours Service Operating and Capital Budget be approved, and that the 2016 actual revenue and expense be balanced on the transfer to the Capital Reserve Fund; and
2. That a 25% increase to the Property Tax Levy from 0.10/\$1,000 to \$0.125/\$1,000 of actual assessed value to a maximum value that will be determined based on 2017 property assessments in 2017, be approved and that staff be directed to amend Bylaw No. 2614, "Small Craft Harbour Facilities Local Service Establishment Bylaw No. 1, 1998" accordingly.

Submitted by:	Ian Sander, P.Eng., Manager, Capital Projects
Concurrence:	Dan Robson, AScT, Manager, Saanich Peninsula & Gulf Island Operations
Concurrence:	Peggy Dayton, CPA, Senior Financial Advisor, Finance and Technology
Concurrence:	Ian Jesney, P.Eng., Senior Manager, Infrastructure Engineering
Concurrence:	Ted Robbins, B.Sc., C.Tech., General Manager, Integrated Water Services

IS/TR:mm

Attachments:

- Appendix 1 - 2017 Southern Gulf Island Harbours Budget
- Appendix 2 – Funding Options

CAPITAL REGIONAL DISTRICT

2017 Budget

SGI Small Craft Harbours

Committee Review

Service: **1.235 SGI Small Craft Harbour Facilities**

Committee: **Electoral Area Services**

DEFINITION:

A local service, established by Bylaw No. 2614, October 6, 1998, in the Southern Gulf Islands Electoral Area to establish, acquire and operate a service of small craft harbour facilities.

SERVICE DESCRIPTION:

The SGI Small Craft Harbour Facilities service funds and operates 11 small craft harbour facilities in the Southern Gulf Islands. 9 docks are owned by the CRD and 2 are leased. The docks are located on Mayne, Galiano, North and South Pender, Saturna, Piers and Vancouver Islands. The service was undertaken by the CRD upon the Federal Government of Canada's divestiture of ownership and operation of small craft harbour facilities. The Federal Government provided 1-time funding of \$1.6million to the CRD for dock rehabilitation. The service is administered by the Southern Gulf Islands Harbour Commission.

MAXIMUM LEVY:

Greater of \$112,878 or \$0.10 / \$1,000 of actual assessed value of land and improvements, to a maximum of \$241,860

COMMISSION:

Southern Gulf Islands Harbour Commission as established by Bylaw #2972 in 2002.

FUNDING:

Parcel Tax

1.235 SGI Harbours**Levy Statistics**

<u>Year</u>	<u>Parcel Tax</u>	<u>Parcels</u>	<u>Cost/Parcel</u>
2012	\$271,930	5,889	\$48.60
2013	\$260,470	6,141	\$44.64
2014	\$242,680	6,146	\$41.56
2015	\$240,570	6,163	\$41.08
2016	\$241,860	6,155	\$41.36
2017	\$302,330	6,155	\$51.70

SGI Small Craft Harbours	2016		BUDGET REQUEST				FUTURE PROJECTIONS			
	BOARD BUDGET	ESTIMATED ACTUAL	2017 CORE BUDGET	2017 ONGOING	2017 ONE-TIME	2017 TOTAL	2018	2019	2020	2021
<u>OPERATING COSTS:</u>										
<u>Management Expenditures</u>										
Contracted Services	14,000	14,720	14,210	-	-	14,210	14,490	14,780	15,070	15,370
Supplies, Advertising	1,810	2,010	1,830	-	-	1,830	1,870	1,910	1,950	1,990
Travel and Training	8,100	2,290	8,210	-	-	8,210	8,370	8,540	8,710	8,880
Internal Allocations	12,290	17,440	16,880	-	-	16,880	17,220	17,560	17,910	18,260
Other Operating Expenses	6,560	6,250	6,460	-	-	6,460	6,590	6,720	6,850	6,980
Total Management Expenditures	42,760	42,710	47,590	-	-	47,590	48,540	49,510	50,490	51,480
*Percentage Increase over prior year						11.3%	2.0%	2.0%	2.0%	2.0%
<u>Dock Expenditures</u>										
Repairs and Maintenance	38,260	20,640	48,880	-	-	48,880	54,300	55,300	56,330	57,360
Wharfinger Compensation and Travel	40,240	33,300	40,410	-	-	40,410	45,440	45,670	45,900	46,130
Allocations - Operations / Vehicle	11,000	450	1,550	-	-	1,550	1,580	1,610	1,640	1,670
Insurance	27,900	22,880	28,340	-	-	28,340	31,480	32,100	32,720	33,340
Electricity	2,860	2,210	2,900	-	-	2,900	3,460	3,530	3,600	3,670
Supplies	3,750	1,420	3,750	-	-	3,750	4,220	4,340	4,460	4,580
Operating - Other	3,570	3,000	3,590	-	-	3,590	4,010	4,130	4,250	4,370
Total Dock Expenditures	127,580	83,900	129,420	-	-	129,420	144,490	146,680	148,900	151,120
*Percentage Increase over prior year						1.4%	11.6%	1.5%	1.5%	1.5%
<u>CAPITAL / RESERVES</u>										
Transfer to Capital Reserve Fund	150,590	188,790	204,390	-	-	204,390	183,330	154,930	144,860	148,070
MFA Debt	-	-	-	-	-	-	20,090	51,500	64,660	64,660
TOTAL CAPITAL / RESERVES	150,590	188,790	204,390	-	-	204,390	203,420	206,430	209,520	212,730
TOTAL COSTS	320,930	315,400	381,400	-	-	381,400	396,450	402,620	408,910	415,330
<u>FUNDING SOURCES (REVENUE)</u>										
Revenue- Fees	(76,400)	(68,670)	(76,400)	-	-	(76,400)	(85,400)	(85,400)	(85,400)	(85,400)
Other Income	(2,670)	(4,870)	(2,670)	-	-	(2,670)	(2,670)	(2,670)	(2,670)	(2,670)
TOTAL REVENUE	(79,070)	(73,540)	(79,070)	-	-	(79,070)	(88,070)	(88,070)	(88,070)	(88,070)
REQUISITION - PARCEL TAX	(241,860)	(241,860)	(302,330)	-	-	(302,330)	(308,380)	(314,550)	(320,840)	(327,260)
*Percentage increase over prior year requisition						25.0%	2.0%	2.0%	2.0%	2.0%

CAPITAL REGIONAL DISTRICT CAPITAL PLAN

CAPITAL BUDGET FORM
2017 & Forecast 2018 to 2021

Service #: 1.235
Service Name: SGI Small Craft Harbour Facilities

Project No.
The first two digits represent first year the project was in the capital plan.

Capital Expenditure Type
New Construction/ Project: Expenditure for new asset only
Renewal: Expenditure replaces an existing asset and extends the service ability or enhances technology in delivering that service
Replacement: Expenditure replaces an existing asset

Proj. No.	Capital Exp.Type	Capital Project Description	Total Project Budget	Asset Class	Funding Source	Carry Forward from 2016	2017	2018	2019	2020	2021	5 - Year Total
16-10	New	Anson Road Phase 1	400,000	S	Cap	400,000						400,000
16-11	New	Dock ladders	45,000	S	Cap	45,000						45,000
17-01	Renewal	Piers Island Upgrade	228,500	S	Res		228,500					228,500
17-02	Renewal	Montague Harbour Upgrade	277,400	S	Res		277,400					277,400
17-03	Renewal	Alternative Approval Process	10,000	S	Res		10,000					10,000
17-04	New	Anson Road Phase 2	90,000	S	Res		90,000					90,000
18-01	Renewal	Inspections	82,000	S	Res			82,000				82,000
18-02	Renewal	Port Washington Upgrade	322,500	S	Debt			205,110				205,110
					Res			117,390				117,390
18-03	Renewal	Port Browning Upgrade	115,500	S	Debt			73,458				73,458
					Res			42,042				42,042
19-01	Renewal	Retreat Cove	269,000	S	Debt				171,084			171,084
					Res			97,916				97,916
19-02	Renewal	Miners Bay	384,000	S	Debt				244,224			244,224
					Res			139,776				139,776
20-01	Renewal	Sturdies Bay	143,000	S	Res					143,000		143,000
21-01	Renewal	Dock Improvements	350,000	S	Res						225,000	225,000
21-02	Renewal	Inspections		S	Res						125,000	125,000
Total			2,716,900			445,000	605,900	520,000	653,000	143,000	350,000	2,716,900

Funding Source Codes	
Debt	= Debenture Debt (new debt only)
ERF	= Equipment Replacement Fund
Grant	= Grants (Federal, Provincial)
Cap	= Capital Funds on Hand
Other	= Donations / Third Party Funding
Res	= Reserve Fund
STLoan	= Short Term Loans

Asset Class	
L	- Land
S	- Engineering Structure
B	- Buildings
V	- Vehicles
E	- Equipment

Service: 1.235 SGI Small Craft Harbour Facilities

- | | | |
|-------|--|-----------|
| 16-10 | Anson Road Phase 1 (Carry Forward)

<p>Over the past four years Mayne Island has seen a significant increase in active boaters. To provide additional moorage space the Commission approved a capital project to construct a new dock facility, and associated upland improvements, on Mayne Island at Anson Road.</p> <p>The CRD holds a water lease off Anson Road, and access to the new facility will be through a Ministry of Transportation road allowance.</p> <p>The first phase will be constructed in 2017 and include the walkway, ramp, main float and three fingers, providing 460 feet of moorage, and improvements to the highways frontage upland area, including an all-weather gravel road, turn around and vaulted toilet and pump out system.</p> | \$400,000 |
| 16-11 | Dock Ladders

<p>New float ladders are desired for each of the CRD owned Dock facilities. Approximately 30 ladders will be fabricated and installed in accordance with Department and Fisheries and Oceans (DFO) Canada.</p> | \$45,000 |
| 17-01 | Piers Island Upgrade

<p>This project includes works to maintain the current level of service as recommended in the Moffatt & Nichol <i>Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015</i>. Recommended works include improvements to the approach abutment, 3 approach piles, and repairs to the three floats. Moffatt & Nichol are currently assessing the current float configuration to determine if improved float geometry can be achieved with this project.</p> | \$228,500 |
| 17-02 | Montague Harbour Upgrade

<p>This project includes works to maintain the current level of service as recommended in the Moffatt & Nichol <i>Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015</i>. Recommended works include improvements to the approach timber decking, repairs to pile shims, various repairs to Float A, Float B, and Float D, and upgrade of the light standards with LED fixtures.</p> | \$277,400 |

17-03	Alternative Approval Process	\$10,000
	Capital works can be financed with long term loans through the MFA. Taxpayer approval of a loan authorization bylaw is required either through an AAP or referendum to allow the CRD to borrow funds.	
	Additional funding, through borrowing, is required to undertake recommended works, on a number of the SGIHS facilities, as defined in the Moffatt & Nichol Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015. This budget will fund the AAP process.	
17-04	Anson Road Phase 2	\$90,000
	The second phase of the Anson Road Facility will be constructed in 2018 and will include the installation of three additional fingers to achieve the docks ultimate capacity of 720 feet.	
18-01	Inspections	\$82,000
	Dock inspection, repair and maintenance is an iterative process that requires periodic review of the facilities and re-evaluation of proposed work plans and residual life estimates. This budget is for a "Top Side" inspection and will be used to re-evaluate the 5 Year capital Program.	
18-02	Port Washington Upgrade	\$322,500
	This project includes works to maintain the current level of service as recommended in the Moffatt & Nichol <i>Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015</i> . Recommended works include improvements to the approach timber decking, replacement and upgrades to the approach piles, repairs to Float B and Float C and repairs to the gangway. .	
18-03	Port Browning Upgrade	\$115,500
	This project includes works to maintain the current level of service as recommended in the Moffatt & Nichol <i>Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015</i> . Recommended works include improvements to the approach timber decking and bull rail spacer, upgrades to the abutment, repairs to various approach piles, and repair to the gangway.	
19-01	Retreat Cove Upgrade	\$269,000
	This project includes works to maintain the current level of service as recommended in the Moffatt & Nichol <i>Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015</i> . Recommended works include repairs to the approach piles, and repairs to the floats.	

19-02	Miners Bay Upgrade	\$384,000
	<p>This project includes works to maintain the current level of service as recommended in the Moffatt & Nichol Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015 . Recommended works include repairs and replacement of various approach piles, repairs to Float A, Float B, Float C, and Float D, and upgrade of light standards to include LED fixtures.</p>	
20-01	Sturdies Bay Upgrade	\$143,000
	<p>This project includes works to maintain the current level of service as recommended in the Moffatt & Nichol Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015 . Recommended works include repair of the approach timber hand rails, repair of the float, repair of the beak water, and upgrades of the light standards to include LED fixtures.</p>	
21-01	Dock Improvements	\$225,000
	<p>This project will fund currently undefined works to maintain the current level of service as recommended in the Moffatt & Nichol Summary Report for Southern Gulf Islands Harbour Commission (SGIHC) Facilities December 11, 2015.</p> <p>Budgetary values were provide for years 6 through 10 as it can be expected that continued spending will be required to maintain the current level of service. Detailed work assignments will be defined through the 2018 Inspection Project</p>	
21-02	Inspections	\$125,000
	<p>Dock inspection, repair and maintenance is an iterative process that requires periodic review of the facilities and re-evaluation of proposed work plans and residual life estimates. This budget is for a "Top Side and Underwater " inspection and will be used to re-evaluate the 5 Year capital Program.</p>	

Capital Reserve Fund Schedule

Reserve Fund: 1.235 SGI Small Craft Harbour Facilities Capital Reserve Fund (Bylaw No. 2719)

Capital Reserve Fund Cash Flow

Fund:1054 Fund Center: 101467	Estimate	Budget				
	2016	2017	2018	2019	2020	2021
Beginning Balance	1,535,904	744,514	343,004	284,964	202,264	204,124
Transfer to Cap Fund	(988,600)	(605,900)	(520,000)	(653,000)	(143,000)	(350,000)
Transfer from Operating Budget	188,790	204,390	183,330	154,930	144,860	148,070
MFA Borrowing			278,630	415,370	-	-
Interest Income*	8,420					
Ending Balance \$	744,514	343,004	284,964	202,264	204,124	2,194

* Interest should be included in determining the estimated ending balance for the current year. Interest in planning years nets against inflation which is not included.

Appendix 2

Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11	Column12	Column13
Option 1 - No Tax Increase or Borrowing												
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	
Beginning Balance	\$ 1,535,904	\$ 744,514	\$ 655,934	\$ 346,354	\$ 56,124	-\$ 64,096	-\$ 37,216	-\$ 415,536	-\$ 793,856	-\$ 1,172,176	-\$ 1,550,496	
Transfer from Operations	\$ 188,790	\$ 143,920	\$ 145,820	\$ 147,770	\$ 149,780	\$ 151,880	\$ 151,880	\$ 151,880	\$ 151,880	\$ 151,880	\$ 151,880	
Federal Grant	\$ -	\$ -	\$ -	\$ -	\$ -							
Transfer from/(to) Gen Cap Fund	-\$ 988,600	-\$ 232,500	-\$ 455,400	-\$ 438,000	-\$ 270,000	-\$ 125,000	-\$ 530,200	-\$ 530,200	-\$ 530,200	-\$ 530,200	-\$ 530,200	
Interest Income	\$ 8,420	\$ -	\$ -	\$ -								
Ending Balance	\$ 744,514	\$ 655,934	\$ 346,354	\$ 56,124	-\$ 64,096	-\$ 37,216	-\$ 415,536	-\$ 793,856	-\$ 1,172,176	-\$ 1,550,496	-\$ 1,928,816	
Option 2 - Tax Increase (25% in 2017) and Borrowing \$694,000 from MFA in 2018/2019.												
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	
Beginning Balance	\$ 1,535,904	\$ 744,514	\$ 343,004	\$ 284,964	\$ 202,264	\$ 204,124	\$ 2,194	-\$ 229,736	-\$ 461,666	-\$ 693,596	-\$ 925,526	
Transfer from Operations	\$ 188,790	\$ 204,390	\$ 183,330	\$ 154,930	\$ 144,860	\$ 148,070	\$ 148,070	\$ 148,070	\$ 148,070	\$ 148,070	\$ 148,070	
Federal Grant / MFA Debt	\$ -	\$ -	\$ 278,630	\$ 415,370	\$ -	\$ -	\$ -					
Transfer from/(to) Gen Cap Fund	-\$ 988,600	-\$ 605,900	-\$ 520,000	-\$ 653,000	-\$ 143,000	-\$ 350,000	-\$ 380,000	-\$ 380,000	-\$ 380,000	-\$ 380,000	-\$ 380,000	
Interest Income	\$ 8,420	\$ -	\$ -	\$ -								
Ending Balance	\$ 744,514	\$ 343,004	\$ 284,964	\$ 202,264	\$ 204,124	\$ 2,194	-\$ 229,736	-\$ 461,666	-\$ 693,596	-\$ 925,526	-\$ 1,157,456	
Option 3 - Tax Increase (25% in 2017 and 25% in 2022)												
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	
Beginning Balance	\$ 1,535,904	\$ 744,514	\$ 716,399	\$ 468,489	\$ 241,169	\$ 185,119	\$ 18,459	-\$ 160,811	-\$ 334,098	-\$ 501,283	-\$ 662,244	
Transfer from Operations	\$ 188,790	\$ 204,385	\$ 207,490	\$ 210,680	\$ 213,950	\$ 217,340	\$ 299,130	\$ 305,113	\$ 311,215	\$ 317,439	\$ 323,788	
Federal Grant	\$ -	\$ -	\$ -	\$ -	\$ -							
Transfer from/(to) Gen Cap Fund	-\$ 988,600	-\$ 232,500	-\$ 455,400	-\$ 438,000	-\$ 270,000	-\$ 384,000	-\$ 478,400	-\$ 478,400	-\$ 478,400	-\$ 478,400	-\$ 478,400	
Interest Income	\$ 8,420	\$ -	\$ -	\$ -								
Ending Balance	\$ 744,514	\$ 716,399	\$ 468,489	\$ 241,169	\$ 185,119	\$ 18,459	-\$ 160,811	-\$ 334,098	-\$ 501,283	-\$ 662,244	-\$ 816,856	



Making a difference...together

Agenda Item 7
REPORT #SGIHC 2017-03

REPORT TO THE SOUTHERN GULF ISLANDS HARBOURS COMMISSION MEETING OF FRIDAY, JANUARY 27, 2017

SUBJECT PIERS ISLAND DOCK FACILITY - FLOAT GEOMETRY REVIEW

ISSUE

The purpose of this staff report is to present the results of the Piers Island Dock Facility Float Geometry Review Project (Project).

BACKGROUND

The 5-Year Capital Plan includes approximately \$228,500 (including engineering and contingencies) of improvements to the Piers Island Facility in 2017. These improvements were defined in the Moffatt & Nichol (M&N) December 11, 2015 Piers Island Dock Facility Condition Assessment. The 2017 improvements include repairs to the approach and gangway, however, the majority of scheduled work will be float repair, and pile repair and replacement.

The Piers Island Dock floats are currently arranged in a closed triangle, limiting available space for berthing. At their April 22, 2016 meeting, the Southern Gulf Islands Harbours Commission directed staff to review the Piers Island float geometry prior to undertaking the scheduled 2017 works to determine if the float layout could be improved to provide additional berthing space. The review was awarded to M&N and the general scope was as follows:

1. To determine if additional moorage can be created (potentially a more open arrangement).
2. Use preliminary metocean study information to estimate wave conditions at the site including wind generated waves and vessel generated wake from passing ferries serving Swartz Bay.
3. Develop proposed geometry for the reconfiguration of floats. Input from user groups may be required to further define the vessel mix and expected vessel capacity for the reconfigured floats.
4. Prepare a memorandum summarizing analysis and findings, illustrate layout and prepare Class D Order of Magnitude cost estimate.

Results of Review

M&N completed their review and have summarized their findings in **Attachment 1**, Conceptual Layouts for Piers Island Float, January 12, 2017. In summary, the metocean conditions and water lot boundary allow for a revised float arrangement and/or and expansion of the facility. Two arrangements are practical and include T and U shaped configurations allowing for berthing length of 60.4m and 115.3m respectively. The existing triangle arrangement provides a berthing length of 51.1m.

While revised float arrangement and/or and expansion of the facility is feasible, the cost of the revised arrangement/expansion is significant. The proposed 2017 budget for Piers Island work is \$228,500 (based on the M&N December 11, 2015 Piers Island Dock Facility Condition

Assessment) and includes engineering and contingencies. Approximately \$150,000 of this budget is intended for repairs to the float system, which includes replacement of timber decking, rub boards, anchor chains, replacement of floatation, repair of pile wells, removal and replacement of five wooden piles.

The estimate for an alternate arrangement is in the order of \$400,000 to \$700,000 depending on the overall length of the upgraded facility, and amount of existing float that could be reused. The costs for revised geometry are significant as new piles, in different locations would be required. Piles would most likely need to be steel and installed to current DFO standards. The M&N estimate includes an allowance for rock socketed piles. If soils are granular and have sufficient depth for pile fixity, piling costs will likely be lower.

Cost savings for re-use of the existing float system would be limited. The existing floats were purpose built (for a triangle configuration) and would require repair (as defined in the 2015 M&N report) to be useful.

ALTERNATIVES

Alternative 1

That the Southern Gulf Islands Harbours Commission direct staff to continue with the current work plan for repair of the Piers Island Facility in the current triangle configuration (defined in the M&N December 11, 2015 Piers Island Dock Facility Condition Assessment).

Alternative 2

That the Southern Gulf Islands Harbours Commission direct staff to develop a design to reconfigure/replace the current Piers Island float system.

Alternative 3

That the Southern Gulf Islands Harbours Commission direct staff to provide more information, or explore other alternatives.

IMPLICATIONS

Alternative 1 – Work will be completed in accordance with the proposed work plan for repair of the Piers Island Facility and maintain the current triangle configuration (defined in the M&N December 11, 2015 Piers Island Dock Facility Condition Assessment). No additional berthing length will be created.

If a reconfiguration or expansion of the facility is desired in the near future, these improvements and associated costs will be redundant and not be beneficial to the new facility.

Work at Piers Island will be scheduled for this year and the proposed budget will be respected.

Alternative 2 - A new design for the Piers Islands Float geometry will need to be developed. Stakeholder input for vessel mix, preferred arrangement, desired berthing length and use will need to be undertaken.

The Piers Island project will need to extend into 2018 to allow for the design and approval process.

Float reconfiguration/expansion was not planned and the additional costs will reduce the current Capital Reserve Fund balance and impact the 5-Year Capital Plan presented in the January 27, 2017 Budget Summary Report. In summary, remaining capital reserves will not be sufficient to complete all works defined in the 5-Year Capital Plan and projects will need to be reprioritized. Additional funding over the 5 year forecast will be required.

Alternative 3 - Additional time will be required to deliver the project which may affect the 2017 Capital Improvements Project delivery schedule.

CONCLUSION

The 5-Year Capital Plan includes approximately \$228,500 for improvements to the Piers Island Facility in 2017. Approximately \$150,000 of this budget is intended for repairs to the float system which includes replacement of timber decking, rub boards, anchor chains, replacement of floatation, repair of pile wells, and removal and replacement of five wooden piles.

The estimate for an alternate arrangement is in the order of \$400,000 to \$700,000, depending on the overall length of the upgraded facility and amount of existing float that could be reused. Float reconfiguration/expansion was not planned and will reduce the current CRF balance and will impact the 5-Year Capital Plan presented in the January 27, 2017 Budget Summary report. In summary, remaining capital reserves will not be sufficient to complete all works defined in the 5-Year Capital Plan and projects will need to be reprioritized. Additional funding over the 5 year forecast will be required.

If expansion of the facility is desired, the Commission should consider postponing the scheduled 2017 Piers Island repair works. The funds would be applied towards a larger reconfiguration/expansion project effectively reducing the cost.

RECOMMENDATION

That the Southern Gulf Islands Harbours Commission direct staff to continue with the current work plan for repair of the Piers Island Facility in the current triangle configuration (defined in the M&N December 11, 2015 Piers Island Dock Facility Condition Assessment).

Submitted by:	Ian Sander, P.Eng., Manager, Capital Projects
Concurrence:	Ian Jesney, P.Eng., Senior Manager, Infrastructure Engineering
Concurrence:	Ted Robbins, B.Sc., C.Tech., General Manager, Integrated Water Services

SI/TR:mm

Attachment: 1



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Attachment 1

MEMORANDUM

To: Ian Sander, P.Eng. – Manager, Capital Projects Infrastructure Engineering, Capital Regional District

From: Paul Hoo, P.Eng. – Project Manager, Moffatt & Nichol

Date: January 12, 2017

Subject: Conceptual Layouts for Piers Island Float

M&N Job No.: 9369-55

1. Purpose

The purpose of the memorandum is to prepare concept level float layouts and order of magnitude cost estimates for the existing Southern Gulf Islands Harbour Services (SGIHS) facility at Piers Island.

The scope of work, as described in our e-mail proposal dated September 30, 2016 for the Piers Island Conceptual Float Layout is as follows:

- Task 1 involves a review of prior work conducted for the Capital Regional District as a part of the Dock Inspection and Assessment project;
- Task 2 included a preliminary metocean analysis, conducted to determine wind-generated waves as well as wake waves generated from passing ferry and cargo vessels transiting to and from the terminal in Swartz Bay;
- Task 3 is to prepare reconfiguration of floats. CRD will provide M&N with a drawing of the existing water lot boundary, input from user group for required vessel mix, expected vessel capacity at the reconfigured float. M&N will provide no more than two conceptual layouts to increase vessel moorage within the existing water lot;
- Task 4 is to prepare summary memorandum of analysis findings, layout and prepare Class D Order of Magnitude cost estimate for the reconfigured float layout;
- Task 5 is to perform Quality Assurance/ Quality Control checks on analysis and memorandum; and,
- Task 6 is to conduct project management and project team communications for the assignment.

Section 2 of this memorandum summarizes the work completed for the data gathering and meteorological and oceanographic (metocean) analysis, and vessel wake analysis for Tasks 1 and 2 as described in our e-mail proposal.

Section 3 describes the conceptual layout of the float reconfiguration and Section 4 presents the Order of Magnitude cost estimate for the various float layouts. Section 5 describes the next steps.

2. Metocean Analysis

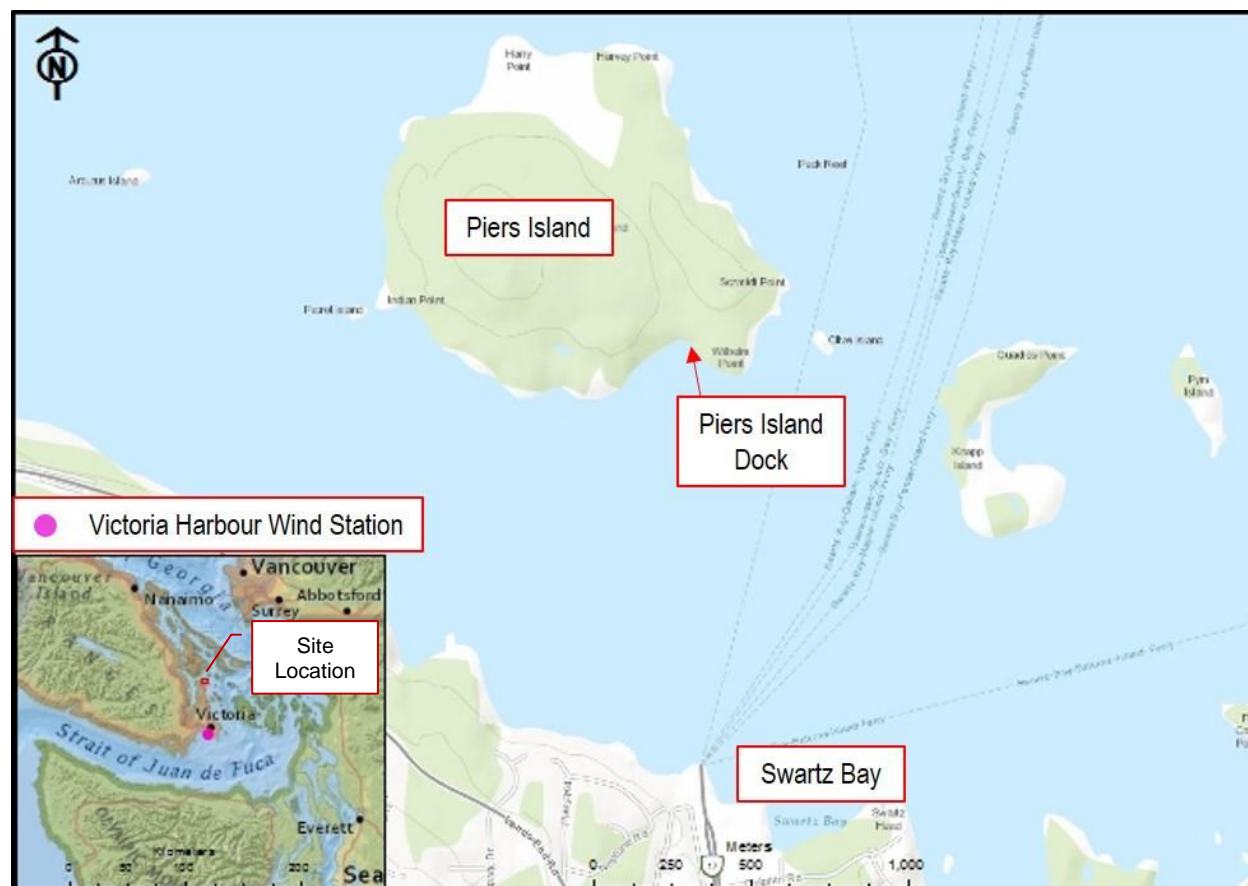
2.1. Project Location

Piers Island facility is located approximately 1.4 km north of the Swartz Bay Ferry Terminal on Vancouver Island as shown in Figure 2.1.

There are several ferry routes to the east and south of the facility location which makes the location susceptible to vessel wake effects. Vessel wake analysis was conducted for the site and is described further in this section.

The Victoria Harbour wind station is located approximately 30km south of Piers Island, and wind data was obtained from this wind station for the metocean analysis as further described in this section.

FIGURE 2.1: PROJECT LOCATION MAP

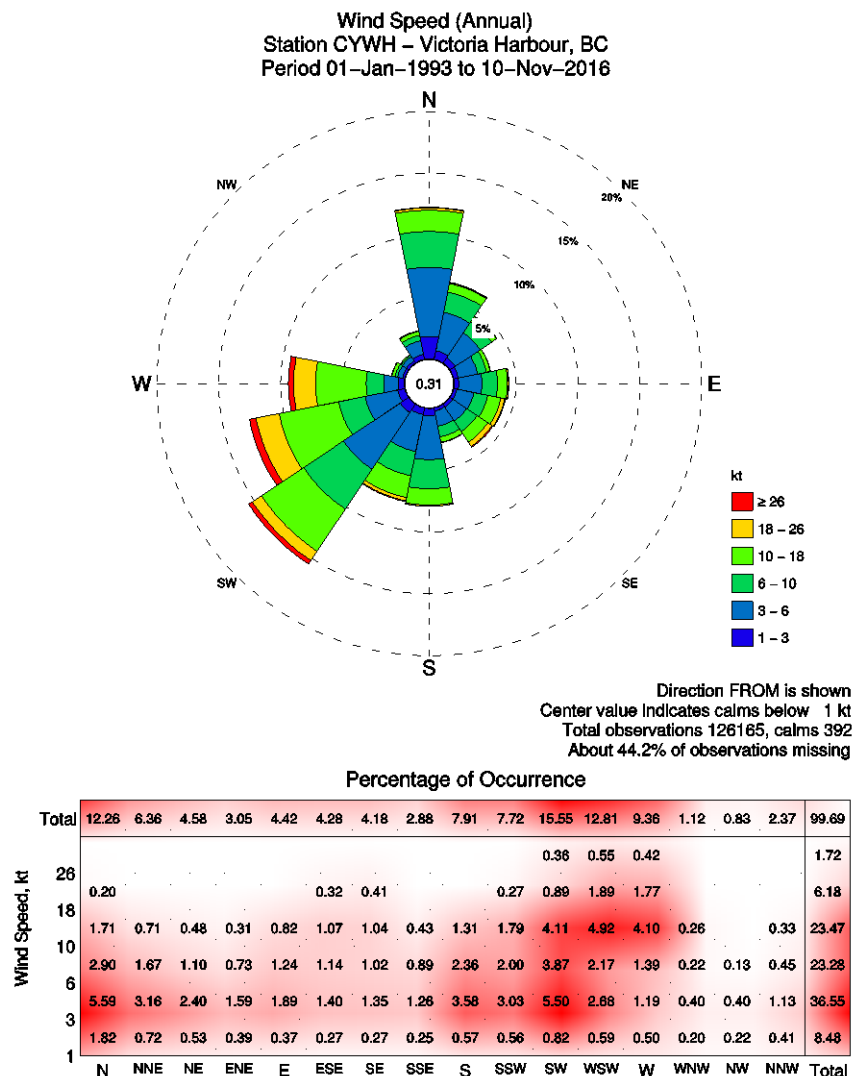


Source

2.2. Wind Analysis

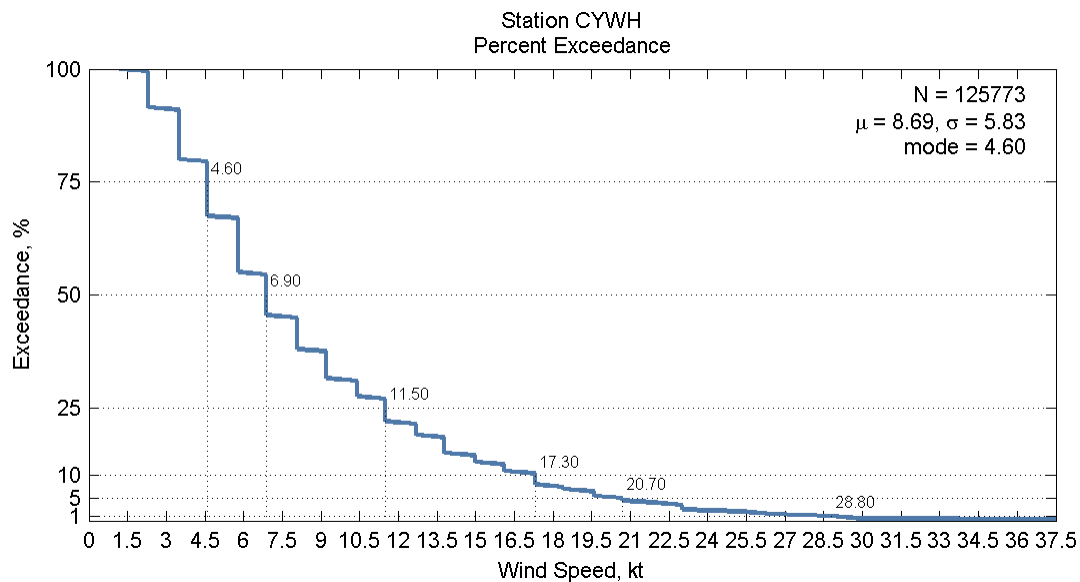
Wind data was obtained from Victoria Harbour between 1993 and 2016. Figure 2.2 depicts the annual average wind statistics at this station, located approximately 30 kilometres from the project site. Winds predominately arrive from the West to Southwest, accounting for approximately 40% of the annual measurements. The strongest winds are also generated from these directions with approximately 8% of annual wind speeds exceeding 18 knots, as shown in the annual percent exceedance curve presented in Figure 2.3.

FIGURE 2.2: WIND ROSE FOR VICTORIA HARBOUR



Source Moffatt & Nichol

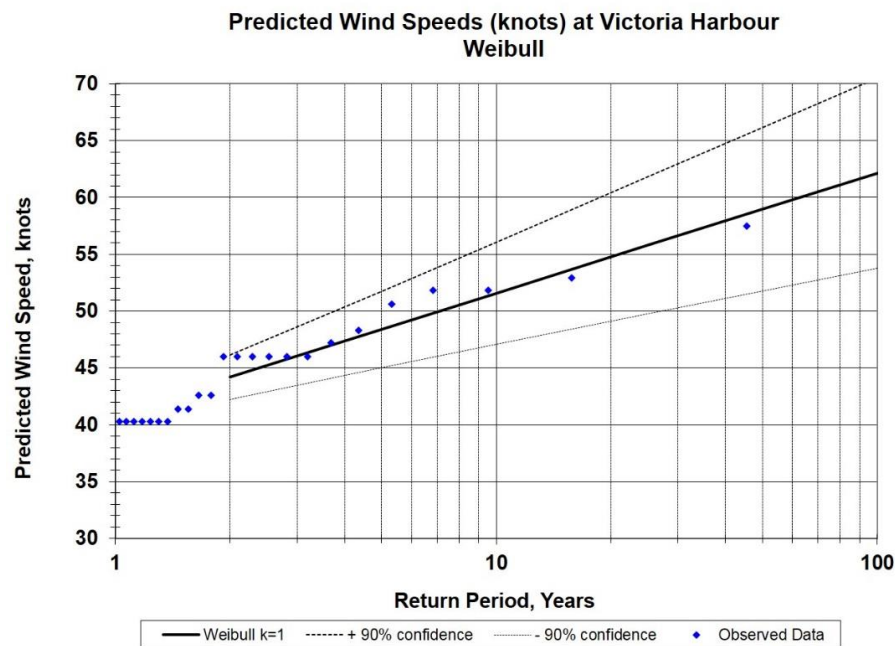
FIGURE 2.3: WIND SPEED PERCENT EXCEEDANCE CURVE



Source Moffatt & Nichol

An extreme value analysis for the Victoria Harbour wind station was conducted using the peak-over-threshold method. For the approximate 24 years of measurements available, a threshold value of 28.8 knots results in 256 extreme wind events. The highest 40 events were fitted to a Weibull distribution, as depicted in Figure 2.4. The return period wind speeds are presented in Table 2.1.

FIGURE 2.4: EXTREME VALUE DISTRIBUTION OF WIND SPEEDS (KNOTS) AT VICTORIA HARBOUR



Source Moffatt & Nichol

TABLE 2.1: RETURN PERIOD WIND SPEED AT VICTORIA HARBOUR

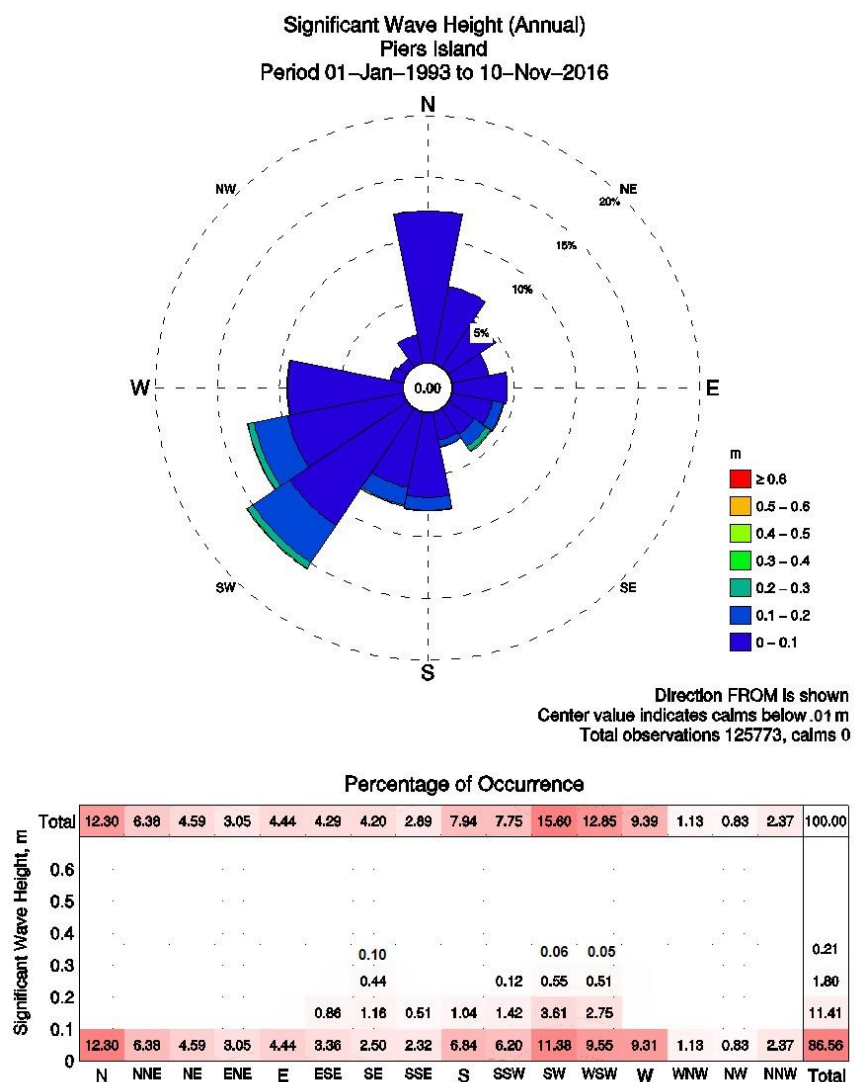
Return Period (years)	Wind speed (knots)
1	41.0
2	44.2
5	48.4
10	51.6
25	55.8
50	59.0
100	62.1

2.3. Wave Analysis

Wind-generated waves were determined using the Coastal Engineering Design and Analysis System – Automated Coastal Engineering System (CEDAS-ACES). This program determines waves generated by winds blowing over a given fetch, or open water length. Wave transformation effects, such as wave diffraction and refraction, are not considered.

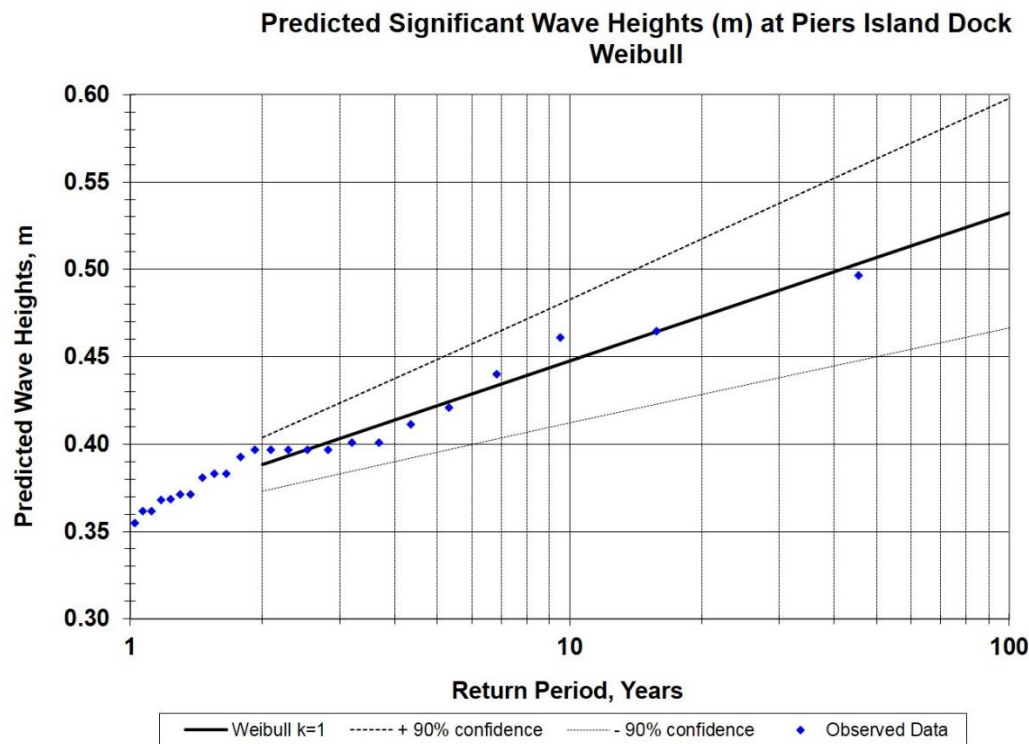
Using the wind speed and direction data presented in the prior section, wind-generated waves were estimated for the corresponding measurement record at Victoria Harbour Station. The wave rose is presented in Figure 2.5. Due to the short fetch surrounding the project area, wind-generated waves are small. An extreme value analysis, similar to the one conducted for the wind data, was performed on the estimated wave heights and results are shown in Figure 2.6. Applying a threshold value of 0.24 meters, 310 extreme wave events were estimated. Fitting the highest 40 events to a Weibull distribution gives the return period wave heights and wave periods presented in Table 2.2.

FIGURE 2.5: ESTIMATED WAVE ROSE AT PIERS ISLAND



Source Moffatt & Nichol

FIGURE 2.6: ESTIMATED EXTREME VALUE DISTRIBUTION OF SIGNIFICANT WAVE HEIGHT AT PIERS ISLAND



Source Moffatt & Nichol

TABLE 2.2: ESTIMATED RETURN PERIOD WAVE HEIGHTS AND CORRESPONDING PEAK PERIODS (SEC)

Return Period (years)	Significant Wave Height (m)	Corresponding Wave Period (s) ¹
1	0.36	1.5
2	0.39	1.5
5	0.42	1.6
10	0.45	1.6
25	0.48	1.7
50	0.51	1.7
100	0.53	1.8

¹ Estimated using Goda (2000): $Tp = 1.1 * (2.21 * \sqrt{H_{m0}})$

2.4. Vessel Generated Waves

Due to the frequency of passenger ferry vessels and cargo vessels passing near the project area, vessel-generated wakes are evaluated in the following section. Table 2.3 lists a few of the passenger ferries and cargo vessels passing near Piers Island and their dimensions and location of the sailing route with respect to the Piers Island site.

TABLE 2.3: VESSELS PASSING NEAR PIERS ISLAND

Vessel Name	Length (m)	Beam (m)	Draft (m)	Sailing Route	Proximity of the sailing route to site
Spirit of British Columbia	167.5	28	5.0	Tsawwassen < > Swartz	South
Spirit of Vancouver Island	167.5	33	5.0	Tsawwassen < > Swartz	South
Skeena Queen	110.0	24	3.3	Fulford < > Swartz	East
Mayne Queen	85.0	19	3.8	Southern Gulf Islands < > Swartz	East
Princess Superior	118.0	20	5.4	Tilbury < > Swartz	East
Queen of Cumberland	100.0	21	3.8	Southern Gulf Islands < > Swartz	East

Using the methodology presented by Delft Hydraulics (1989)², vessel wakes can be estimated using the vessel sailing speed (v_s), sailing distance to the project site (s) and water depth (h) as presented in the relation:

$$H = \alpha_1 * \left(\frac{s}{h} \right)^{-0.33} F_s^4$$

where: $F_s = \frac{v_s}{\sqrt{gh}}$ (Froude Number)

The coefficient α_1 described vessel characteristics such as the vessel's shape, draught, and entrance length. Recommended values for α_1 are:

$\alpha_1 = 1.0$ for tugs, patrol boats, and loaded conventional inland motor vessels;

$\alpha_1 = 0.5$ for empty European barges;

$\alpha_1 = 0.35$ for empty conventional motor vessels.

For this analysis, a value of $\alpha_1 = 0.75$ was utilized for the passenger ferry and cargo vessels.

The angle between the sailing line and the direction of wave propagation can be estimated from the individual wave celerity and vessel sailing speed (CEM 2002)³. The relevant terms for estimation of vessel wake for each of the vessels listed in Table 2.3 are presented in Table 2.4.

² Verhey, H.J. and Bogaerts, M.P.(1989). "Ship Waves and the Stability of Armour Layers Protecting Slopes." Proceedings of the 9th International Harbor Congress, Antwerp, Belgium.

³ USACE (2002). Coastal Engineering Manual. Part II- Chapter 7: Harbor Hydrodynamics.

TABLE 2.4: VESSEL NAVIGATION PARAMETERS

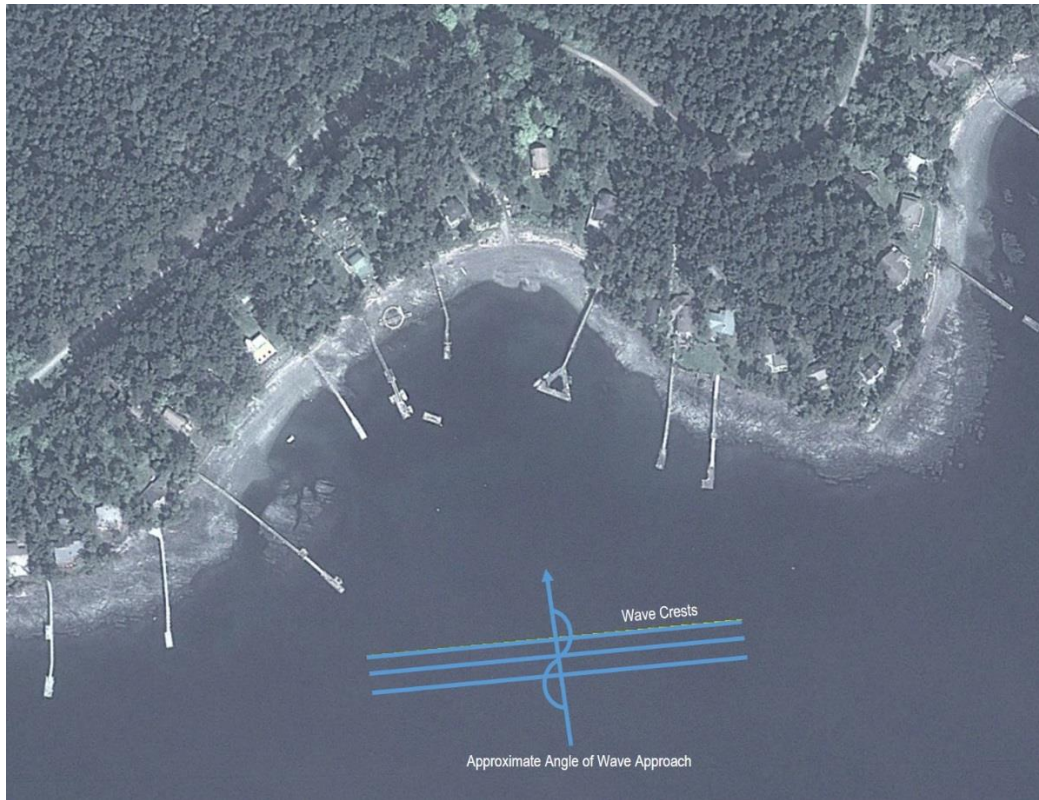
Vessel Name	Ave. Vessel Speed (knots)	Sailing Direction	Water Depth (m)	Distance to Piers Island (m)
Spirit of British Columbia	16.0	320°	15	750
Spirit of Vancouver Island	16.5	320°	15	750
Skeena Queen	11.5	25°/200°	15	450
Mayne Queen	12.5	30°/170°	15	450
Princess Superior	11.0	48°	15	450
Queen of Cumberland	12.5	42°/180°	15	450

Based on these characteristics, vessel wakes that can be expected at the Piers Island dock are presented in Table 2.5.

TABLE 2.5: VESSEL WAKE AT PIERS ISLAND DOCK

Vessel Name	Wave Height (m)	Wave Period (s)	Angle of Wave Approach
Spirit of British Columbia	0.7	4.3	355°
Spirit of Vancouver Island	0.7	4.5	355°
Skeena Queen	0.2	3.1	350°/235°
Mayne Queen	0.3	3.4	355°/205°
Princess Superior	0.2	3.0	13°
Queen of Cumberland	0.3	3.4	7°/215°

Figure 2.7 graphically depicts the approximate angle of wave approach for the worst case vessel (Spirit of British Columbia and Spirit of Vancouver Island) wakes as represented in Table 2.5.

FIGURE 2.7: APPROXIMATE ANGLE OF WAVE APPROACH AT PIERS ISLAND DOCK

Source Image by Google Earth

3. Conceptual Layouts for Float Reconfiguration

The existing triangular shaped timber float at Piers Island is considered by Capital Regional District (CRD) to be an inefficient layout for accommodating boats due to wasted berthing area in the middle of the float. Currently, the approximate total berth length of the existing triangular float is 55.1 metres.

The CRD atlas was used to provide the location and layout of the water lot boundary for the site. The water lot boundary constraints the layout of the reconfigured floats to be sited within that area. Also, from site observations and anecdotal information, there is (are) rock outcrop(s) to the east of the existing float, so concept float layout will be oriented as far as possible from the east side to avoid potential conflict.

Option 1 is a T- shaped linear float layout as shown on Drawing Sk-001 in Appendix A. The total berthing length is approximately 60.4 metres. This alternative layout provides approximately a 5.3m increase in berth length over the original float configuration with very little improvement on berth capacity over the original triangular float configuration.

Option 2 is a U-shaped float configuration as shown on drawing SK-002 in Appendix A. The total berthing length for this alternative is 115.3m, an increase of 60.2m on the original float. Each of the two legs of the floats were oriented parallel to the estimated main vessel wake wave direction, and

has a T-shaped end to provide some wave sheltering and attenuation for vessel wake waves incident to the dock.

The proposed float width is assumed to be 3.0m overall and is similar to the 2.74m width of the original float.

4. Opinion of Probable Cost

For the estimate of the opinion of probable cost for Options 1 and 2, we have made the following assumptions for the conceptual design:

- Existing triangular shaped timber float and timber piled dolphins will be removed and disposed of;
- New structures will be designed to current codes of practice and standards;
- New replacement timber framed floats installed;
- Guide piles will be steel pipe piles as per Department of Fisheries and Oceans (DFO) current requirements; and
- Steel guides piles are conservatively assumed to be rock socketed based on close proximity of bedrock outcrop. If soils are granular and have sufficient depth for pile fixity, piling costs will likely to lower.

It is important to note that the conceptual layout and Order of Magnitude cost estimate has been developed based on:

- M&N preliminary analysis of wind waves and vessel wake waves; and
- Information gathered for the above and below water 2015 Condition Inspection of the existing facility.
- Quotes provided by contractors and suppliers.

We wish to emphasize that preparation of an accurate construction budget (e.g., within +/- 10% to 15%) cannot be completed until more detailed site investigations, engineering and analysis are completed. Even then, it is important to note that the final costs may vary significantly from the estimate due to fluctuations in currency, materials and labour costs that are beyond our control.

Contractor bid prices can also vary widely even after detailed engineering plans are prepared. Such variability is a function of market conditions which exist at the time of bidding and are difficult to predict in advance.

In view of the above uncertainties and the importance of not under-estimating the costs, we have included a contingency amount of 30% to reflect the fact that these are indicative estimates.

However, until actual detailed engineering is carried out, these estimates will necessarily be subject to change.

For the cost estimation, we have assumed that the replacement floats will be timber construction and steel guide piles will be used to support the proposed float system.

Tables 4.1 and 4.2 summarizes the Order of Magnitude Cost Estimate of Options 1 and 2 respectively.

Totals for each option include a 30% contingency.

The Order of Magnitude cost estimate excludes design engineering costs, CRD's project management and administrative costs, permit applications costs, and any environmental habitat compensation costs.

Details of the Order of Magnitude Cost Estimate is included in Appendix B.

TABLE 4.1: ORDER OF MAGNITUDE COST ESTIMATE – OPTION 1

Task Description	Amounts
Mobilization and Demobilization	\$33,000
Demolish Floats and Piles	\$29,000
Replacement Marina Floats	\$340,000
TOTAL	\$402,000

TABLE 4.2: ORDER OF MAGNITUDE COST ESTIMATE – OPTION 2

Task Description	Amounts
Mobilization and Demobilization	\$33,000
Demolish Floats and Piles	\$29,000
Replacement Marina Floats	\$650,000
TOTAL	\$712,000

5. Next Steps

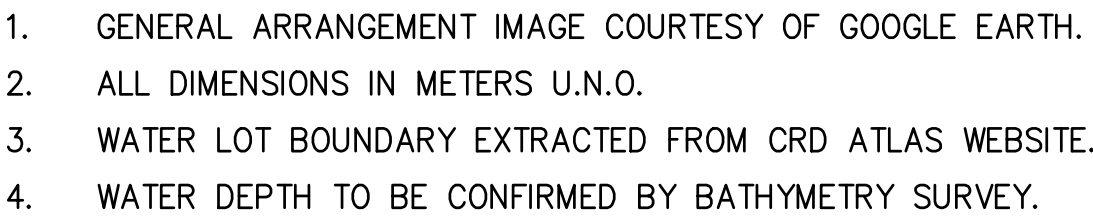
If CRD intends to move forward with a preferred float concept, the next steps for the preliminary and detailed design of the float replacement are:

- Get input from stakeholders for preferred float arrangement;
- Obtain any previous geotechnical reports or pile driving data to guide pile design;

- Conduct localized bathymetry and water lot check for the area to confirm adequate water depth is available and to ensure that floats are positioned to avoid dredging;
- Perform detailed vessel wake wave numerical analysis to determine wave direction, height and loadings on the float system;
- Design guide piles and float system;
- Prepare new cost estimates to establish project budget and;
- Complete and submit permit applications to Navigable Water Protection Division, Transport Canada, and Department of Fisheries and Oceans.




Attachments: Appendix A: Conceptual Layout Drawings
 Appendix B: Order of Magnitude Cost Estimates

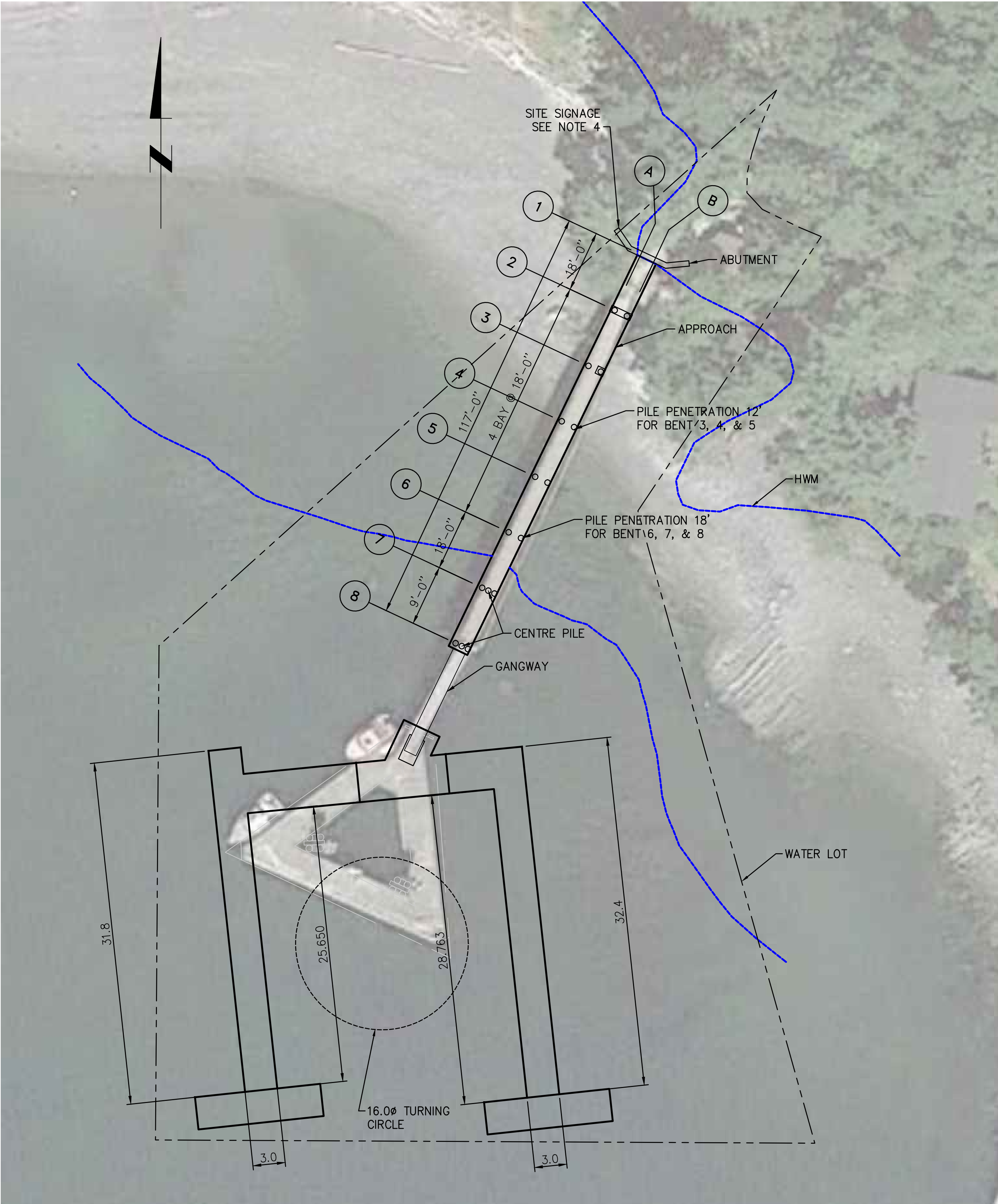
Appendix A: Conceptual Layout Drawings



SCALE: 1:250

NOT TO BE USED FOR CONSTRUCTION

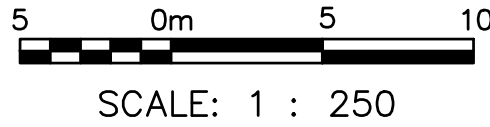
	<div>VERIFY SCALES</div> <div>BAR IS 20mm LONG ON ORIGINAL DRAWING.  IF NOT 20mm ON THIS SHEET, ADJUST SCALES ACCORDINGLY.</div>	<div>REUSE OF DOCUMENTS</div> <div>THIS DRAWING IS OF A CONFIDENTIAL NATURE AND SHALL NOT BE REPRODUCED IN ANY MANNER, NOR USED FOR ANY PURPOSE WHATSOEVER EXCEPT BY WRITTEN PERMISSION OF THE CAPITAL REGIONAL DISTRICT. ALL UNDERGROUND UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHOULD BE CONFIRMED BY MANUAL DIGGING. CAPITAL REGIONAL DISTRICT DOES NOT ACCEPT RESPONSIBILITY FOR ERRORS OR OMISSIONS IN THE INFORMATION SHOWN ON THIS DRAWING.</div>	<div> 777 WEST BROADWAY, SUITE 301 VANCOUVER, BC, CANADA, V5Z 4J7 604-707-9004</div>	ENGINEER STAMP	<table><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>A</td><td>2016-12-29</td><td>ISSUED FOR REVIEW</td><td>PH</td><td>PC</td><td></td></tr><tr><td>no.</td><td>date</td><td>revision</td><td>chk</td><td>by</td><td></td></tr></table>																																					A	2016-12-29	ISSUED FOR REVIEW	PH	PC		no.	date	revision	chk	by		<div> Making a difference...together</div> <div>PIERS ISLAND AND SWARTZ BAY PIERS ISLAND NEW FLOAT OPTION 1</div>	<table><tr><td>date: 2016-12-28</td><td>scale: AS SHOWN</td></tr><tr><td>designed: PH</td><td>drawn: PC</td></tr><tr><td>approved: PH</td><td>reviewed: PH</td></tr><tr><td>folder: 3-9369006-SK001</td><td>acad file: 3-9369006-SK001</td></tr><tr><td>file no:</td><td>cadastral no:</td></tr><tr><td>drawing no: SK001</td><td>issue: A</td></tr></table>	date: 2016-12-28	scale: AS SHOWN	designed: PH	drawn: PC	approved: PH	reviewed: PH	folder: 3-9369006-SK001	acad file: 3-9369006-SK001	file no:	cadastral no:	drawing no: SK001	issue: A
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drawing no: SK001	issue: A																																																																		





OPTION 2 GENERAL ARRANGEMENT – PIERS ISLAND
SCALE: 1:250

NOTES:


1. GENERAL ARRANGEMENT IMAGE COURTESY OF GOOGLE EARTH.
2. ALL DIMENSIONS IN METERS U.N.O.
3. WATER LOT BOUNDARY EXTRACTED FROM CRD ATLAS WEBSITE.
4. WATER DEPTH TO BE CONFIRMED BY BATHYMETRY SURVEY.



PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

VERIFY SCALES BAR IS 20mm LONG ON ORIGINAL DRAWING. 0 20 IF NOT 20mm ON THIS SHEET, ADJUST SCALES ACCORDINGLY.		REUSE OF DOCUMENTS THIS DRAWING IS OF A CONFIDENTIAL NATURE AND SHALL NOT BE REPRODUCED IN ANY MANNER, NOR USED FOR ANY PURPOSE WHATSOEVER EXCEPT BY WRITTEN PERMISSION OF THE CAPITAL REGIONAL DISTRICT. ALL UNDERGROUND UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHOULD BE CONFIRMED BY MANUAL DIGGING. CAPITAL REGIONAL DISTRICT DOES NOT ACCEPT RESPONSIBILITY FOR ERRORS OR OMISSIONS IN THE INFORMATION SHOWN ON THIS DRAWING.		 777 WEST BROADWAY, SUITE 301 VANCOUVER, BC, CANADA, V5Z 4J7 604-707-9004		 Making a difference...together		date: 2016-12-28 designed: PH approved: PH folder: file no:		scale: AS SHOWN drawn: PC reviewed: PH acad file: 3-9369006-SK002 cadastral no:	
						PIERS ISLAND AND SWARTZ BAY PIERS ISLAND NEW FLOAT OPTION 2		drawing no: SK002		issue: A	
						A 2016-12-29 ISSUED FOR REVIEW PH PC		no. date revision chk by			

Appendix B: Order of Magnitude Cost Estimates


OPINION OF PROBABLE COST				DATE PREPARED 03-Jan-17		SHEET 1 OF 5		
OWNER AND LOCATION Capital Regional District Vancouver Island, British Columbia			CONSTRUCTION CONTRACT NO.			 moffatt & nichol		
			ESTIMATED BY Moffatt & Nichol					
PROJECT TITLE Piers Island			STATUS OF DESIGN Draft					M&N JOB ORDER NUMBER 9369
ITEM DESCRIPTION	QUANTITY		MATERIAL & EQUIPMENT COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL

SUMMARY - Float Replacement
Option 1

Mobilization/Demobilization	\$33,000
Demolish Floats	\$29,000
Marina Floats - Option 1	\$340,000
Sub-TOTAL	\$402,000

Option 2


Mobilization/Demobilization	\$33,000
Demolish Floats	\$29,000
Marina Floats - Option 2	\$650,000
Sub-TOTAL	\$712,000

OPINION OF PROBABLE COST						DATE PREPARED 03-Jan-17		SHEET OF 2 5	
OWNER AND LOCATION Capital Regional District Vancouver Island, British Columbia			CONSTRUCTION CONTRACT NO.				<div> moffatt & nichol</div>		
			ESTIMATED BY Moffatt & Nichol						
PROJECT TITLE Piers Island			STATUS OF DESIGN Draft				M&N JOB ORDER NUMBER 9369		
ITEM DESCRIPTION	QUANTITY		LABOUR, MATERIAL & EQUIPMENT COST		LABOUR COST		ENGINEERING ESTIMATE		
	NUMBER	UNIT	UNIT COST	TOTAL	NIT CO	TOTAL	UNIT COST	TOTAL	
<u>Mobilization/Demobilization</u>									
Mobilization/Demobilization of Marine Equipment	1	Lump Sum					\$25,000.00	\$25,000	
								\$25,000	
Sub-Total Estimated Construction Cost								\$25,000	
30% Contingency								\$7,500	
<u>Total Estimated Construction Cost</u>								\$32,500	

TOTAL OPINION OF PROBABLE COST

SAY:


\$33,000

OPINION OF PROBABLE COST					DATE PREPARED 03-Jan-17		SHEET OF	
OWNER AND LOCATION Capital Regional District Vancouver Island, British Columbia			CONSTRUCTION CONTRACT NO.				 moffatt & nichol	
			ESTIMATED BY Moffatt & Nichol					
PROJECT TITLE Piers Island			STATUS OF DESIGN Draft					
ITEM DESCRIPTION	QUANTITY		LABOUR, MATERIAL & EQUIPMENT COST		LABOUR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
Demolish Floats								
Remove and demolish floats	159.7	sq.m					\$50.00	\$7,987
Remove and demolish timber dolphins	127.68	m					\$50.00	\$6,384
Remove and dispose of piles	8	No.					\$950.00	\$7,600
								\$21,971
Total Estimated Construction Cost								\$21,971
30% Contingency								\$6,591
Total Estimated Construction Cost								\$28,562

TOTAL OPINION OF PROBABLE COST

SAY:


\$29,000

OPINION OF PROBABLE COST					SHEET		OF	
OWNER AND LOCATION Capital Regional District Vancouver Island, British Columbia			CONSTRUCTION CONTRACT NO.		<div> moffatt & nichol</div>			
			ESTIMATED BY Moffatt & Nichol					
PROJECT TITLE Piers Island			STATUS OF DESIGN Draft					
ITEM DESCRIPTION	QUANTITY		LABOUR, MATERIAL & EQUIPMENT COST		ENGINEERING ESTIMATE			
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL		
Marina Floats - Option 2								
Timber framed floats with timber decking	358	sq.m.				\$500	\$179,000	
Pile Hoops	12	No.				\$750	\$9,000	
Guide piles - 20" (508mm) dia.	12	No.				\$14,225	\$170,700	
Pile hats	12	No.				\$500	\$6,000	
Mooring Cleats	32	No.				\$111	\$3,536	
Fender System	32	No.				\$210	\$6,720	
Float assembly and installation	1	sum				\$125,000.00	\$125,000	
Sub-Total Estimated Construction Cost								\$499,956
30% Contingency								\$149,987
<u>Total Estimated Construction Cost</u>								\$649,943

TOTAL OPINION OF PROBABLE COST

SAY:

\$650,000

OPINION OF PROBABLE COST					SHEET		OF	
OWNER AND LOCATION Capital Regional District Vancouver Island, British Columbia			CONSTRUCTION CONTRACT NO.		<div> moffatt & nichol</div>			
			ESTIMATED BY Moffatt & Nichol					
PROJECT TITLE Piers Island			STATUS OF DESIGN Draft					
ITEM DESCRIPTION	QUANTITY		LABOUR, MATERIAL & EQUIPMENT COST		ENGINEERING ESTIMATE			
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL		
<u>Marina Floats - Option 1</u>								
Timber framed floats with timber/composite deckin	138	sq.m.				\$500	\$69,000	
Pile Hoops	4	No.				\$750	\$3,000	
Guide piles - 20" (508mm) dia.	4	No.				\$14,225	\$56,900	
Pile hats	4	No.				\$500	\$2,000	
Mooring Cleats	16	No.				\$111	\$1,768	
Fender System	16	No.				\$210	\$3,360	
Float assembly and installation	1	sum				\$125,000.00	\$125,000	
Sub-Total Estimated Construction Cost							\$261,028	
30% Contingency							\$78,308	
<u>Total Estimated Construction Cost</u>							\$339,336	

TOTAL OPINION OF PROBABLE COST

SAY:

\$340,000

**SOUTHERN GULF ISLANDS HARBOURS COMMISSION
MEMBERSHIP LIST 2017**

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2017

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