Stantec

# Memo

| | | | |
|---|---|---|---|
| To: | Doug Lowther<br>District of Fort St James | From: | Tom Rowe, P.Eng.<br>Vancouver |
| Project/File: | 115823074 | Date: | October 16, 2023 |

**Reference: Cottonwood Marina**

## 1 Project Overview

The District of Fort St James (the "District") would like to rehabilitate and upgrade Cottonwood Marina. The over 60-year-old marina is heavily used by the public to moor pleasure crafts and provides access to Stuart Lake in the summer. The condition of the marina is deteriorating, and the existing log boom breakwater has recently failed, no longer protecting the marina from waves from the southwest. The District is interested in rehabilitating and expanding the marina to allow for an approximate doubling in the pleasure craft berthing capacity. Stantec has developed options for conceptual design comparison along with a Class 5 cost estimates to support the District of Fort St James' grant funding application. The concept design sketches of each option are presented in Appendix A and the Class 5 cost estimates are provided in Appendix B.

The cost estimates cover a range of options that range from rehabilitation of existing at the same berth capacity as existing, to a doubling of existing marina capacity. As a matter of immediate importance, cost estimates have been provided for the supply and installation of a new floating breakwater.

## 2 Background

Cottonwood Marina is located on the east side of Stuart Lake near Fort Saint James. No existing construction drawings are available, but it is estimated that it was built between 1960-1970. The marina is currently used by the public for mooring pleasure crafts in the summer.

The original/existing cottonwood marina consists of:

- A rubble bund breakwater (protecting the marina from the NE)
- A log boom breakwater (four timber pile clusters supporting three floating log booms -which have recently failed/been washed away)
- Four (approximately 50m long) piers made up of floating timber docks and timber piles.
- A timber platform picnic area supported by timber piles.
- A boat ramp with an adjacent floating dock (<10m long) supported by two steel pipe piles.
- A car park / turn around area.

Figures 1 and 2 below show satellite images of the Cottonwood Marina before and after the log boom breakwater failure:

**Reference: Cottonwood Marina**

*Figure 1: Cottonwood Marina (source: Google Earth, June 2021)*

*Figure 2: Cottonwood Marina (source: Google Earth, July 2023)*

# 3 Assessment of the Existing Marina

Due to schedule constraints for the District of Fort St James' grant funding application, a detailed structural site inspection has not been performed to date. The conceptual design options and Class 5 cost estimate prepared in this memo are based on a desktop assessment to support the District of Fort St James' grant funding application.

Assumptions regarding the condition of the existing structures are based on photos of marina taken by staff from the Prince George office in May 2023 and July 2023. It is recommended that a site inspection/condition assessment is performed by a structural engineer at a later stage of the design to verify these assumptions and to identify any potential cost savings.

The marina's timber floats have been replaced since the original construction, which should allow them to be reused if in fair condition. However, all the timber piles are from the original construction in the 1960s with visible wear and some breakages/loose piles. These are shown in the photos below. For the cost estimate it was assumed that all the existing timber piles will need to be replaced.

*Figure 3: General photo of Cottonwood marina, May 2023*

**Reference: Cottonwood Marina**

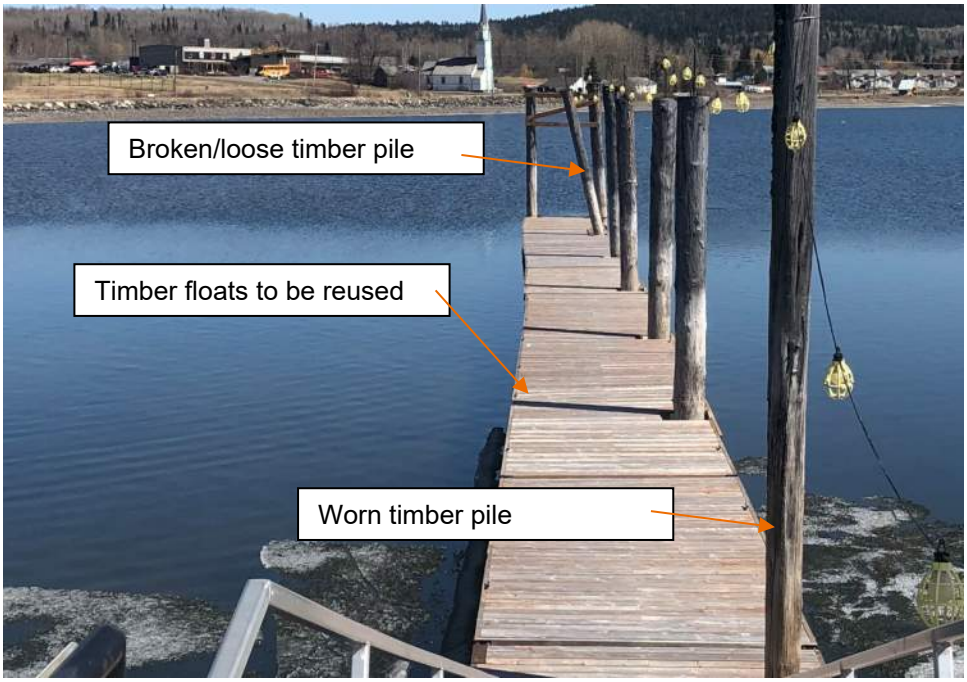


*Figure 4: General photo of Cottonwood marina, May 2023*

*Figure 5: Photo of the existing failed log boom breakwater, July 2023*

The following key assumptions were made regarding the condition of the existing structures.

A) The existing rubble bund breakwater cannot be extended or built up.

B) The failed breakwater (log boom) will need to be replaced. Accelerated deterioration of the floating timber docks should be expected until the breakwater is replaced.

C) The existing timber floats have been replaced and are in good condition which should allow them to be reused. The future use of the marina is not expected to change from current use (no increase in vessel sizes). Therefore, a replace in kind (like for like) approach is appropriate for dock extensions and any replacements.

D) All the existing timber piles are from the original construction and will need replacement due to their condition, and some have been dislodged/broken at the lakebed.

E) The timber platform picnic area supported by timber piles needs to be refurbished/replaced.

F) The boat ramp with an adjacent floating dock (<10m long) supported by two steel pipe piles is in fair/good condition and does not need replacing.

# 4 Basis of Design

This section describes the marine-related Basis of Design (BoD) for the Cottonwood marina. It is intended to serve as a basis for documenting the functional requirements, technical inputs and criteria, and design standards to be used for the design. The general arrangements and criteria given in this section are intended to define the minimum requirements necessary to achieve a functional layout. The basis of design is expected to be updated once the conceptual design option is selected and developed during the design phases.

The design life of the Cottonwood marina rehabilitation shall extend the marinas design life for 50 years.

## 4.1 Expected Geotechnical Conditions

The existing timber piles suggests that the lakebed overburden is silty/sediment and should be sufficiently deep for either driven timber piles or steel piles. This geotechnical assumption will be used to develop the concept design options and approximate the pile lengths. However, a geotechnical investigation would be needed for the detailed design phase to confirm the soil conditions and to determine required embedment depths of the piles. We recommend that a detailed geotechnical investigation is conducted prior to detailed design of the marina rehabilitation/expansion.

## 4.2 Reference Standards and Codes

The documents listed in the following table shall be used as reference standards and guidelines. The documents are listed in order of precedence.

*Table 1: Reference Standards*

| Project Reference | Standard |
|---|---|
| British Columbia Building Code, 2018 (BCBC) | Canadian Code |
| National Building Code of Canada, 2020 (NBCC) | Canadian Code |
| CSA S16-19 - Design of Steel Structures, including all reference standards within S16 | Canadian Standard |
| PIANC Guidelines for Marina Design 2017 | International Guideline |
| UFC-4-152-07- Design of Small Craft Berthing Facilities | American Standard |

| Project Reference | Standard |
|---|---|
| DFO Harbour Authority Manual, Operations 2021 | Canadian Manual |
| Canadian Foundation Engineering Manual – Canadian Geotechnical Society (2006) 4th edition including errata to March 18, 2013 | Canadian Manual |
| BS 6349-7:1991 - Maritime Structures - Part 7: Guide to the design and construction of floating breakwaters | British Standard |
| BS 6349-1-1:2013 - Maritime Works - Part 1-1: General - Code of Practice for Planning and Design for Operations | British Standard |
| BS EN 1993-5:2007 - Eurocode 3 - Design of steel structures - Part 5: Piling (for corrosion rates on piles only) | British Standard |
| UFC 4-152-01 - Design of Piers and Wharves | American Standard |
| Development of a Manual for the Design of Floating Breakwaters - Report No. 1629 - Government of Canada Fisheries and Oceans Small craft Harbours Branch, 1981 | Report |

## 4.3 Project References

The design criteria in this document were developed from analyses based on information described in the following references:

1. Canadian Hydrographic Service raster and vector charts (Chart 3080 – Stuart Lake, 1992)
2. Topographic & Bathymetric Survey Completed on May 24, 2023 by HBH Land Surveying.
3. Floodplain Mapping Program, Stuart Lake and River for Environment Canada Inland Waters Directorate but Hay and Company Consultants Inc., 1990
4. Real-Time Hydrometric Data Graph for Stuart River Near Fort St. James (08JE001) [BC], Environment and natural resources, Canada

# 4.4 Site Specific Environmental Data

## 4.4.1 WATER LEVELS

Table 2 provides the lake levels used in the concept design. Both the 200-year flood and the High Water Level (HWL) are based on the Floodplain Mapping Program, Stuart Lake and River. The High Water Level is the average annual maximum water level. The Low Water Level (LWL) is based on the nautical Chart 3080 – Stuart Lake, 1992. The Low Water Level (zero Chart Datum) is the approximate low water level reached during the navigational season (May-October). The water survey of Canada (WSC) gauge zero elevation is also provided for reference which is used by the Real-Time Hydrometric Data Graph for Stuart River Near Fort St. James (08JE001).

*Table 2: Water Levels at Cottonwood Marina*

| Water Level | Elevation (m) (Geodetic Datum) |
|---|---|
| 200-year flood level | +682.3 |
| H.W.L. High water level (AVG. ANNUAL MAX.) | + 680.81 |
| L.W.L. Low Water Level (APPROX. LOW WATER REACHED DURING NAVIGATIONAL SEASON) | + 679.37 (0mCD) |
| WSC GAUGE ZERO | + 677.50 |
| Approximate lakebed elevation at the marina | + 677.50 |

## 4.4.2 BATHYMETRY

The source of existing bathymetry is survey data:

- Topographic & Bathymetric Survey Completed on May 24, 2023 by HBH Land Surveying.

### 4.4.3 WINDS

For wind loads on structures, use relevant parameters from BCBC, 2018 for Cottonwood marina as follows:

*Table 3: Design Wind Values for Prince George from BCBC 2018*

| Return Period | Wind Pressure, q (kPa) |
|---|---|
| 10 Year | 0.29 |
| 50 Year | 0.37 |

### 4.4.4 WAVES AND ICE LOADS

Cottonwood Marina is located on the east side of Stuart Lake near Fort Saint James. The existing rubble bund breakwater protects the marina from waves from the northeast which has the largest fetch (approximately 40km). The Floodplain Mapping Program, Stuart Lake and River, 1990 estimated a 25-year wave height to be 2.2m from this direction.

The next largest fetch is from the southwest (6.7km). Log boom floating breakwaters have been used to protect Cottonwood marina from waves in this direction in the past. Log breakwaters are typically only used for very short choppy seas, generated over short fetches of 1.5km or less. They are low cost to install and have a relatively short life expectancy anywhere from 6months to 15years. The log boom breakwaters have needed replacing multiple times at Cottonwood marina since it was constructed in the 1960s.

For the concept design of a breakwater with a 50-year design life, the design wave height was calculated to be 1.45m, with a peak wave period of 3.8s from the southwest. This is assuming a windspeed of 46knots, 4hr duration with a 6.7km fetch. It is recommended that a detailed wave analysis is performed by a coastal engineer to provide a wave height used for the detailed design of the breakwater. It is also recommended that an ice loading assessment is conducted for the detailed design.

### 4.4.5 SNOW

Snow loading was not considered as part of the concept design options but should be checked during detailed design as it may influence the design of elements such as the timber floats.

For reference the following snow loading parameters from BCBC, 2018 for Prince George are as follows:

- Snow load (1 in 50 year) Ss = 3.4 kPa
- Associated rain load Sr = 0.2 kPa

### 4.4.6 SEISMIC HAZARD

Seismic loads were not considered as part of the concept design options and are not expected to govern the design of the timber floats or breakwater. A geotechnical investigation is recommended to determine the site class and geotechnical conditions before the Seismic hazard can be checked during the detail design.

## 4.5 Functional Requirements

### 4.5.1 GENERAL

This section addresses the functional and performance requirements of the Cottonwood marina and its components as required by District of Fort St James.

### 4.5.2 SAFETY ASPECTS

The existing picnic area platform and timber floats have a raised timber bullrail around the edges, the same will be assumed for any replacement or extensions at the marina. Anti-slip strips should also be considered for surfaces of the floats/gangways.

No ladders nor life rings were observed in the photos of the existing Cottonwood marina. It is recommended the addition of ladders are considered if the marina is extended and that life rings/ floatation devices are added for emergency use.

### 4.5.3 NAVIGATION LIGHTS

It is assumed that the existing navigational lights are sufficient for the expanded Cottonwood marina.

### 4.5.4 LIGHTING

The existing string lighting (currently attached to the timber piles) is not a commercially grade product and it is recommended that it be replaced with a commercial product. Similar string lighting can be added to any marina extension.

### 4.5.5 POWER

It is assumed that the 200A main power supply is sufficient for the expanded marina, as shore power is not planned to be provided to marina customers. An upgraded service panel may be required to provide additional lighting beyond the existing string lighting on the docks.

### 4.5.6 WATER DEPTH AND DREDGING

No dredging is expected to be required. The Bathymetric Survey Completed on May 24, 2023 shows that the water depth at the marina exceeds the minimum depth of 2ft (0.61m) for a soft harbour bottom as per the UFC-4-152-07 Design of Small craft harbour berthing facilities.

### 4.5.7 BOLLARDS

Small mooring cleats shall be provided both sides of the floating docks to match the existing float cleats, to suit the mooring requirements of all design vessels.

### 4.5.8 FENDERS

The existing timber floats at cottonwood do not have any fenders as boats provide their own when mooring at the marina. It is assumed that the new timber floats shall also be fender-less to match the existing floats and that boat owners will continue to provide their own boat bumpers.

### 4.5.9 DESIGN VESSELS

The future use of the marina is not expected to change from current use (no increase in vessel sizes). The existing moorage lease layout shows a range of moorage sizes from 21ft to 34ft at Cottonwood marina. The marina extension will be assumed to accommodate a similar range of vessel sizes. The design vessel assumed for the Cottonwood marina is a 34ft pleasure craft as 34ft is the largest allocated moorage lease. The following specifications for a C&C 34+ Sailboat are below for reference:

**Table 1 Design Vessel Parameters**

| Description | The C&C 34+ Sailboat |
|---|---|
| | Max |
| Deadweight (dwt) | 5.5 |
| Displacement (t) | 5.5 |
| Length Overall (m) | 10.8 |
| Beam (m) | 3.5 |
| Laden Draft (m) | 1.8 |
| Lightship Draft (m) | 1.5 |

# 4.6 Land-Based Facilities

## 4.6.1 SITE / BOAT LAUNCH ACCESS

The existing site access functions poorly due to topographic and space limitations. The existing access driveway is 4.6m wide, which is insufficient for two-way traffic. The access road ends in a tight radius curve near the marina, which requires users utilize a portion of the marina parking area in order to back up to the boat launch and avoid navigating the tight curve at the end of the access. Options for improvements to the site access will be limited due to the topographic and space constraints of the site, but may include:

- Construction of a second access / egress from the site to lakeshore drive.
- Removal / relocation of the existing caretaker building and shed to provide additional space for truck turning movements to / from the boat launch. (Installation of a lock block retaining wall adjacent the existing caretaker building may be required to avoid damage to vehicles due to rockfall).

## 4.6.2 PARKING

Existing marina parking is limited with respect to function and capacity. The lack of space can lead to conflicts between parked vehicles and boaters arriving and attempting to utilize the boat launch. A lack of well-defined parking may contribute to boaters haphazardly parking vehicles and trailers on the exposed shoreline to the east of the boat launch, or along the shoulder of Lakeshore Drive.

Site parking / boat launch function may be improved with the proposed second site access / exit as well as with the relocation of the existing caretaker building and shed. There will still be a limited amount of space on site for parking: additional offsite parking may be required to meet the anticipated parking needs of the marina. Widening of Lakeshore Drive in the proximity of the marina may provide opportunities for improved parallel parking along the east shoulder of the road.

## 4.6.3 CARETAKER BUILDING / CONCESSION

The existing care-taker building is planned to be relocated to an underutilized area of the site. The building is planned to be converted into a small concession building with an accessible public washroom. This would increase the space available for vehicle loading / unloading / parking and improving the level of service / user experience at the marina.

## 4.6.4 UTILITIES / SANITARY FACILITIES

Underground water and sewer infrastructure is not available to the site; extension of municipal services to the site is outside the scope of this project. In the short term, existing facilities will remain in service or be improved as follows:

- The marina currently has two pit toilets available to the users, these can remain in service.
- A portable sewage storage tank is available to marina users to pump out the on-board holding tanks, this can remain in service.
- New on-site water and sewage holding tanks will be required if the caretaker building is re-located / re-purposed.

### 4.6.5 ON-SITE MARINE FUEL SALES

Onsite fueling is planned to be added to the marina. There is sufficient space for storage tanks near the boat launch ramp. Fuel storage and dispensing equipment can be provided and maintained under a lease agreement with a local fuel supplier. The fueling facilities would need to follow all applicable environmental and fire safety regulations as well as the guidance for fuel-dispensing services in the operations section of the DFO Harbour Authority Manual.

# 5 Concept Options

Three options for a 50-year design life were developed for Cottonwood marina and are presented in the concept design sketches (Appendix A).

## Option R (Rehabilitation – with new Breakwater)

This option involves a rehabilitation of the existing marina, replacing elements from the original marina construction with a replace in kind approach. The marina is over 60 years old and the future use of the marina is not expected to change from current use (i.e. no increase in vessel sizes). Therefore, a replace in kind (like for like) approach is appropriate.

- All existing timber piles supporting the four docks replaced with new 16” timber piles, reusing the existing timber floats.
- The existing timber piles supporting the picnic area replaced with new 16” timber piles.
- The entire picnic area replaced with new timber elements.
- A new 60m long floating steel breakwater to replace the failed log boom breakwater that has been replaced multiple times in the past. The new breakwater will have a design life of 50 years and be anchored to the lakebed with concrete anchors which is typical for lakes that freeze over in the winter.

## Option R-E-Timber (Rehabilitation and Expansion – Timber Piles)

This option involves a rehabilitation and expansion of the existing marina allowing for the approximate doubling in mooring capacity of the marina.

- All existing timber piles supporting the four docks replaced with new 16” timber piles, reusing the existing timber floats.
- Install additional new 16” timber piles and new timber floats installed to extend (double) the length of each dock.
- The existing timber piles supporting the picnic area replaced with new 16” timber piles.
- The entire picnic area replaced with new timber elements.
- A new 100m long floating steel breakwater installed to protect the marina from the southwest.

## Option R-E-Steel (Rehabilitation and Expansion – Steel Piles)

This option involves a rehabilitation and expansion of the existing marina allowing for the approximate doubling in mooring capacity of the marina – but replacing all the old timber piles with steel pipe piles.

- All existing timber piles supporting the four docks replaced with new 406mm steel pipe piles, reusing the existing timber floats.
- Install additional new 406mm steel pipe piles and new timber floats installed to extend (double) the length of each dock.
- The existing timber piles supporting the picnic area replaced with new 406mm steel pipe piles.
- The entire picnic area above the piles is replaced with new timber elements.
- A new 100m long floating steel breakwater installed to protect the marina from the southwest.

# 6 Class 5 Cost Estimate

The summary tables below show the total Class 5 cost estimate for each concept design option. A detailed breakdown for each cost estimate is also presented in Appendix B. The quantities shown in Appendix B are preliminary estimates and assumptions only, based on the information available to date and would be subject to change following further investigation and design.

**Table 2: Concept Option Cost Estimate Summary**

| Repair Option | Brief Description | Class 5 Cost Estimate CAD$ |
|---|---|---|
| Option R (Rehabilitation – with new Breakwater) | Reuse the existing timber floats, replace the timber piles and install a new steel floating breakwater | $ 2,620,000 |
| Option R-E-Timber (Rehabilitation and Expansion – Timber Piles) | Reuse the existing timber floats, replace the timber piles and install new timber floats and timber piles to extend each of the docks. Install a new steel floating breakwater. | $ 4,230,000 |
| Option R-E-Steel (Rehabilitation and Expansion – Steel Piles) | Reuse the existing timber floats, replace the timber piles with steel pipe piles and install new timber floats and steel piles to extend each of the docks. Install a new steel floating breakwater. | $ 5,335,000 |

Opinions of the Probable Construction Costs for Cottonwood marina were prepared for the concept options as shown in Appendix B. This Opinion of Cost includes all anticipated costs for the capital construction and equipment. The costs also include allowances for engineering, project and construction management, environmental monitoring, permitting, plus a contingency allowance.

This opinion of cost and the associated quantity take-offs are for the scope of work based on conceptual repair schemes and should be considered as a Class 5 Estimate. As a result, these opinions of cost include a contingency amount to cover undefined items due to the level of engineering carried out at this time. The contingency is not a reflection of the accuracy of the estimate but covers items of work which may have to be incurred following further investigation, detailed engineering and construction. A contingency allowance of 30% is included to account for these undefined or indeterminate items. The opinion of cost, including contingency, is considered accurate to -50/+100%. For budgeting purposes, the accuracy of the cost estimate should be considered in addition to the contingency allowance when developing a conservative construction budget.

**Exclusions:**

- Any dredging (No dredging is expected to be required for any of the concept options)
- Handling of any contaminated materials regarding the demolition and disposal
- Living out allowance if any required for workers and site staff
- Cost associated with – Indigenous Nations, Stakeholders, Community notification
- All taxes
- Insurance-all risk for Overall Project
- Allowance Cost to date

## Floating Breakwater Options

The preliminary project cost estimates illustrate that a program of rehabilitation, upgrade and expansion of the Cottonwood Marina may cost as much as several million dollars, depending on the final scope of work and any design refinements that may be considered to reduce cost. The cost of any of the current options may be higher than available funding thresholds. Proceeding with the proposed marina upgrades may require a phased approach.

In the short term, the District has clarified that it's most immediate need is replacement of the floating breakwater. Replacement of the breakwater is imperative; the recent failure of the existing breakwater will expedite wear and damage to the existing piles and floats. Replacement of the failed floating breakwater has been identified as a first phase. It is understood the District intends to apply for funding for a new breakwater under the Province of B.C. Rural Economic Diversification and Infrastructure Program – Forrest Impact Transition Category (REDIP – FIT). The level of funding available under the desired grant is limited to $500,000.

In evaluating the project cost estimates, the cost of a new floating steel breakwater is estimated to be $0.9 million - $1.4 million, depending on the length (60 meters – 100 meters). In order to fit within the available grant funding limit, the cost estimates suggest that the scope of installation of a steel floating pontoon breakwater would need to be reduced. For example, the cost to install 30m of new welded steel floating pontoon breakwater and concrete anchors has been estimated to be $500,000.

In order to optimally protect the existing marina, the required breakwater length is estimated to be approximately 60m. Given the high cost of steel, alternative breakwater systems have been investigated in order to maximize the amount of breakwater that can be constructed with the available funding.

Floating log boom breakwaters are still available on the market but are considered a shorter-term solution that will require greater investment in maintenance on an ongoing basis. (Log boom breakwaters are typically used for very short choppy seas, generated over short fetches of 1.5km or less and have a short life expectancy). Proprietary breakwaters fabricated from High Density Polyethylene Plastics (HDPE) are available in the marine structures market. HDPE breakwaters are expected to be more durable than floating log breakwaters and less expensive than fabricated steel structures.

**Reference: Cottonwood Marina**

In 2020, the Village of Nakusp, completed the installation of a 100m long floating wave attenuator / breakwater at a cost of approximately $3,300 per linear meter. Adjusting to 2023 dollars with an allowance of 15% inflation per year, the same system might now cost approximately $5,000 per linear meter, supplied and installed. It is possible, however, that the impact of inflation on the cost of steel, concrete, and HDPE has been higher than the impact of inflation on other products.

Preliminary inquiries to an HDPE breakwater supplier have placed the supply cost at approximately $3,700 / meter, in 2023 dollars, not including allowances for shipping, installation, or anchorage. Including allowances for these items, approximately 50 lineal meters of floating HDPE breakwater system could be installed within a $500,000 project budget, as shown below.

**Table 3: Breakwater Cost Estimate**

| **Description** | **Class 5 Cost Estimate CAD$** |
|---|---|
| Mobilization / demobilization | $25,000 |
| Supply floating breakwater | $185,000 |
| Concrete anchors for floating breakwater | $75,000 |
| Install floating breakwater | $60,000 |
| Engineering / environmental permitting | $55,000 |
| Contingency allowance (25%) | $100,000 |
| **Total including Contingency** | **$500,000** |

Pacific Netting Products Inc. supplied the floating breakwater to the Village of Nakusp. Photos of the project are including on the following page. Further investigation to confirm an HDPE design specific to the Fort St. James project is required prior to construction.

*Figure 6: HDPE wave attenuator installed at the Nakusp Municipal Marina in 2020*

*Figure 7: HDPE wave attenuator supplied by Pacific Netting Products Inc.*

# 7 Summary & Recommendations

The condition of the 60+ year old Cottonwood marina is deteriorating and needs repair / rehabilitation. The existing log boom breakwater has recently failed, no longer protecting the marina from waves from the southwest. Accelerated deterioration of the floating timber docks should be expected until the breakwater is replaced. The existing timber piles of the marina are in poor condition, and some have dislodged/broken at the lakebed. The district has expressed interested in rehabilitating and expanding the marina to allow for an approximate doubling in the pleasure craft berthing capacity.

Stantec has developed options for conceptual designs to upgrade and increase capacity of the marina. The concept design sketches of each option are presented in Appendix A; Class 5 cost estimates are provided in Appendix B. The concept designs and cost estimates are preliminary and require refinement to align the scope of work and design criteria with funding availability. Prior to detailed design of the marina rehabilitation/expansion, we recommend that a geotechnical investigation is conducted to confirm and optimize the embedment depth of the piles. Phasing of the project is expected to be required.

In discussions with District staff, a first phase of the project is proposed to include the supply and installation of a new floating breakwater. An HDPE breakwater may be an alternative to the high cost of steel and the low performance of timber. Based upon comparison to a similar project and discussions with suppliers, a project cost estimate has been developed for the supply and installation of an HDPE floating breakwater. Prior to detailed design of the breakwater, a desktop wave analysis and ice loading assessment may provide an optimized(reduced) wave height, which may further reduce supply and installation cost.

We look forward to continuing to work with the District to review and refine the scope of work for the supply and installation of a new breakwater at the Cottonwood Marina.

Regards,

**STANTEC CONSULTING LTD.**

Prepared by

Digitally signed by Tom Rowe
Date: 2023.10.16 17:49:36-07'00'

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Attachment: [Appendix A – Concept Design Sketches; Appendix B – Class 5 Cost Estimates]

NOTE:
1. TOPOGRAPHIC & BATHYMETRIC SURVEY COMPLETED ON MAY 24, 2023 BY HBH LAND SURVEYING.

LOT B 3180
RANGE 5 COAST
DISTRICT
PLAN PRP7972

EDGE OF PAVEMENT
LAKESHORE DR
ROAD
PLAN PRP11467
GRAVEL SHOULDER
ACCESS ROAD
PP1
STAIRS
POWERLINE
PP2 (2m HIGH POWER POLE WITH ELECTRICAL PLUGS)
BUILDINGS
BOLLARD (0.2m Ø)
COMS TOWER
CONCRETE BENCH PAD
CONCRETE BARRIER
CONCRETE CURBS
SIGN
GATE POST
UNDERWATER BEAM
FENCE LADDER
#2000
EXISTING SEPTIC TANK
TWO POST SIGN
RIP RAP
PARK
PLAN PRP14467
SIGN
STAIRS
(EL. 681.59 AT CONCRETE PAD)
BENCH
#2001
EXISTING STEEL PIPE PILES AT BOAT RAMP DOCK TO REMAIN
DOCK
APPROX. WATERLINE (UNABLE TO SURVEY)
STUART LAKE
STUART LAKE
680.5
680.0
679.5
679.0
678.5
678.0
677.5
677.0
676.5
DOCK A
38.17
EXISTING TIMBER PILES TO BE REPLACED WITH 16"Ø TIMBER PILES, TYP.
DOCK B
54.99
EXISTING TIMBER FLOATS TO REMAIN (REUSED), TYP.
GATE
A
102
DOCK C
47.50
DL 6670
RANGE 5 COAST
DISTRICT
PLAN 15TR7_COAST
EXISTING TIMBER PICNIC AREA. TIMBER DECK TO BE REPLACED IN KIND (LIKE FOR LIKE). EXISTING TIMBER PILES TO BE REPLACED WITH 16"Ø TIMBER PILES, TYP.
CANADIAN FLAG
DOCK D
44.07
LAMP STANDARD
RIP RAP
EXISTING LOG BOOM TO BE REMOVED
CONCRETE ANCHOR, TYP.
NEW STEEL FLOATING BREAKWATER 60m LONG (3 - 3.4m x 20m SECTIONS)
POSSIBLE NAVIGATION SIGN
59.93
CONCRETE ANCHOR, TYP.

1:500 0 5 15 25m

| Revision | By | Appd | YYYY.MM.DD |
|---|---|---|---|
| - CONCEPTUAL SKETCH | - | - | - |

| Issued | By | Appd | YYYY.MM.DD |
|---|---|---|---|
| FOR CONCEPTUAL DESIGN REVIEW | TR | LM | 2023.09.29 |
| FOR PERMIT APPLICATION | - | - | 2023.03.17 |

Permit/Seal

Consultant

STANTEC PERMIT #1002862

STANTEC PERMIT

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Client/Project Logo

Client/Project
DISTRICT OF FORT ST JAMES

MARINA UPGRADES

DISTRICT OF FORT ST JAMES, BC

| File Name: 115823074_S100 | CN | TR | LM | 2023.09.29 |
|---|---|---|---|---|
| | Dwn. | Dsgn. | Chkd. | YYYY.MM.DD |

Title
SITE PLAN

REHABILITATION WITH NEW BREAKWATER (OPTION R)

| Project No. | Scale |
|---|---|
| 115823074 | 1:500 |
| Revision: A | Sheet: 1 of 4 |
| Drawing No. | S100 |

\\cd0029-pafil01\shared_projects\115823074\06_drawing\02_sheets\115823074_s100
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ORIGINAL SHEET - ANSI D

NOTE:
1. TOPOGRAPHIC & BATHYMETRIC SURVEY COMPLETED ON MAY 24, 2023 BY HBH LAND SURVEYING.

LOT B 3180
RANGE 5 COAST
DISTRICT
PLAN PRP7972

EDGE OF PAVEMENT
LAKESHORE DR
ROAD
PLAN PRP11467
GRAVEL SHOULDER
ACCESS ROAD
PP1
STAIRS
POWERLINE
PP2 (2m HIGH POWER POLE WITH ELECTRICAL PLUGS)
BUILDINGS
BOLLARD (0.2m Ø)
COMS TOWER
CONCRETE BENCH PAD
CONCRETE BARRIER
CONCRETE CURBS
SIGN
GATE POST
UNDERWATER BEAM
TWO POST SIGN
RIP RAP
PARK
PLAN PRP14467
FENCE LADDER
#2000
EXISTING SEPTIC TANK
APPROX. WATERLINE (UNABLE TO SURVEY)
DOCK
EXISTING STEEL PIPE PILES AT BOAT RAMP DOCK TO REMAIN
SIGN
STAIRS (EL. 681.59 AT CONCRETE PAD)
BENCH
#2001
STUART LAKE
STUART LAKE
DOCK A
NEW 406Ø x 12.7 STEEL PIPE PILE OR 16"Ø TIMBER PILE, TYP.
EXISTING TIMBER PILES TO BE REPLACED WITH 406Ø x 12.7 STEEL PIPE PILES OR 16"Ø TIMBER PILES, TYP.
DOCK B
EXISTING TIMBER FLOATS TO REMAIN (REUSED), TYP.
NEW 2.4m x 18m TIMBER FLOATS INSTALLED TO MATCH EXISTING, TYP.
GATE
A
102
DL 6670
RANGE 5 COAST
DISTRICT
PLAN 15TR7_COAST
DOCK C
EXISTING TIMBER PICNIC AREA. TIMBER DECK TO BE REPLACED IN KIND (LIKE FOR LIKE). EXISTING TIMBER PILES TO BE REPLACED WITH 406Ø x 12.7 STEEL PIPE PILES OR 16"Ø TIMBER PILES, TYP.
CANADIAN FLAG
DOCK D
LAMP STANDARD
RIP RAP
EXISTING LOG BOOM TO BE REMOVED
CONCRETE ANCHOR, TYP.
POSSIBLE NAVIGATION SIGN
CONCRETE ANCHOR, TYP.
NEW STEEL FLOATING BREAKWATER 100m LONG (5 - 3.4m x 20m SECTIONS)

680.5 680.0 679.5 679.0 678.5 678.0 677.5 677.0 676.5

0 5 15 25m
1:500

| Revision | By | Appd | YYYY.MM.DD |
|---|---|---|---|
| - CONCEPTUAL SKETCH | - | - | - |

| Issued | By | Appd | YYYY.MM.DD |
|---|---|---|---|
| FOR CONCEPTUAL DESIGN REVIEW | TR | LM | 2023.09.29 |
| FOR PERMIT APPLICATION | - | - | 2023.03.17 |

Permit/Seal

Consultant

STANTEC PERMIT #1002862

STANTEC PERMIT

Stantec
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PRINCE GEORGE, B.C.
Tel: (250) 596-9422
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MARINA UPGRADES

DISTRICT OF FORT ST JAMES, BC

| File Name: 115823074_S101-S103 | CN | TR | LM | 2023.09.29 |
|---|---|---|---|---|
| | Dwn. | Dsgn. | Chkd. | YYYY.MM.DD |

Title
SITE PLAN
REHABILITATION AND EXPANSION (OPTION R-E-TIMBER AND OPTION R-E-STEEL)

Project No.
115823074

Scale
1:500

Revision
A

Sheet
2 of 4

Drawing No.
**S101**

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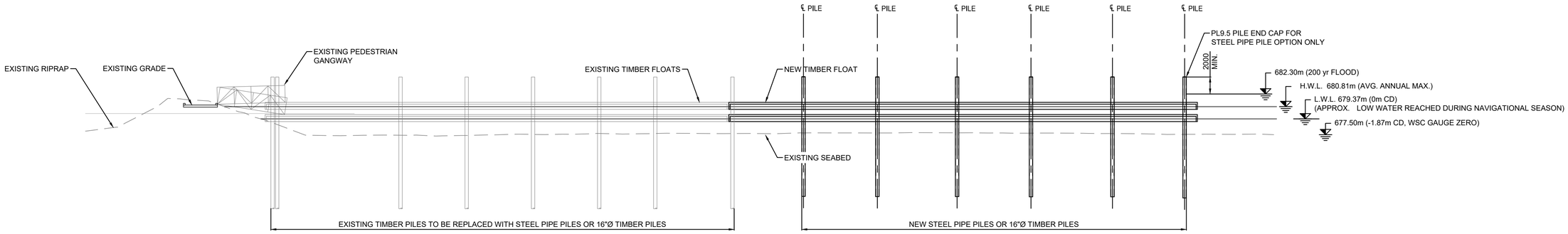
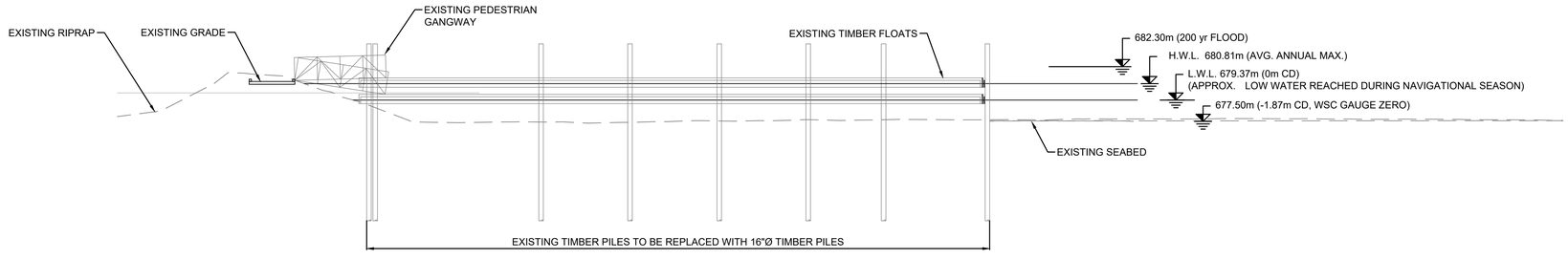
ORIGINAL SHEET - ANSI D

NOTE:
1. TOPOGRAPHIC & BATHYMETRIC SURVEY COMPLETED ON MAY 24, 2023 BY HBH LAND SURVEYING.




A/101 VIEW - OPTION R-E-TIMBER & OPTION R-E-STEEL
SCALE: 1:250




A/100 VIEW - OPTION R (REHABILITATION - WITH NEW BREAKWATER)
SCALE: 1:250

0 2.5 7.5 12.5m
1:250

| Revision | By | Appd | YYYY.MM.DD |
|---|---|---|---|
| CONCEPTUAL SKETCH | - | - | - |

| Issued | By | Appd | YYYY.MM.DD |
|---|---|---|---|
| FOR CONCEPTUAL DESIGN REVIEW | TR | LM | 2023.09.29 |
| FOR PERMIT APPLICATION | - | - | 2023.03.17 |

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MARINA UPGRADES

DISTRICT OF FORT ST JAMES, BC

| File Name: 115823074_S101 | CN | TR | LM | 2023.09.29 |
|---|---|---|---|---|
| | Dwn. | Dsgn. | Chkd. | YYYY.MM.DD |

Title
ELEVATION

Project No. 115823074
Scale 1:250
Revision A
Sheet 3 of 4
Drawing No. S102

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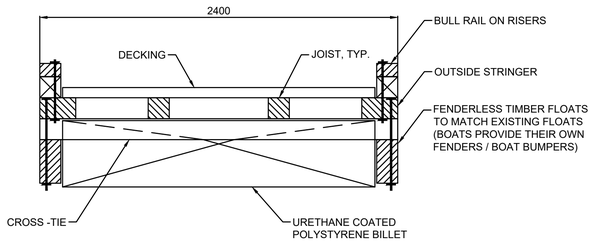
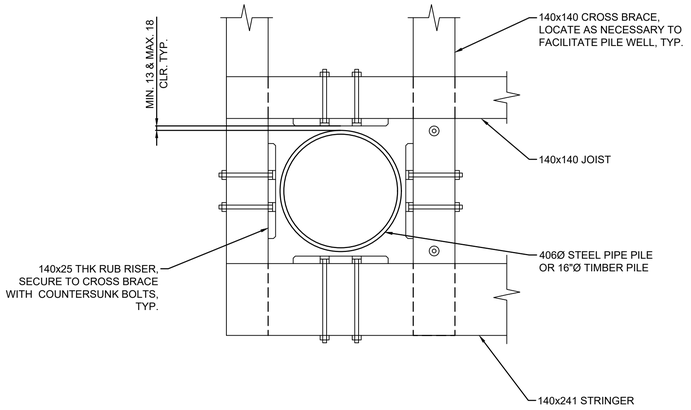
ORIGINAL SHEET - ANSI D



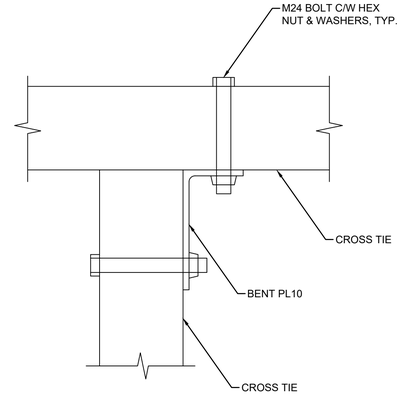

TYPICAL SECTION - NEW TIMBER FLOAT

SCALE: 1:20



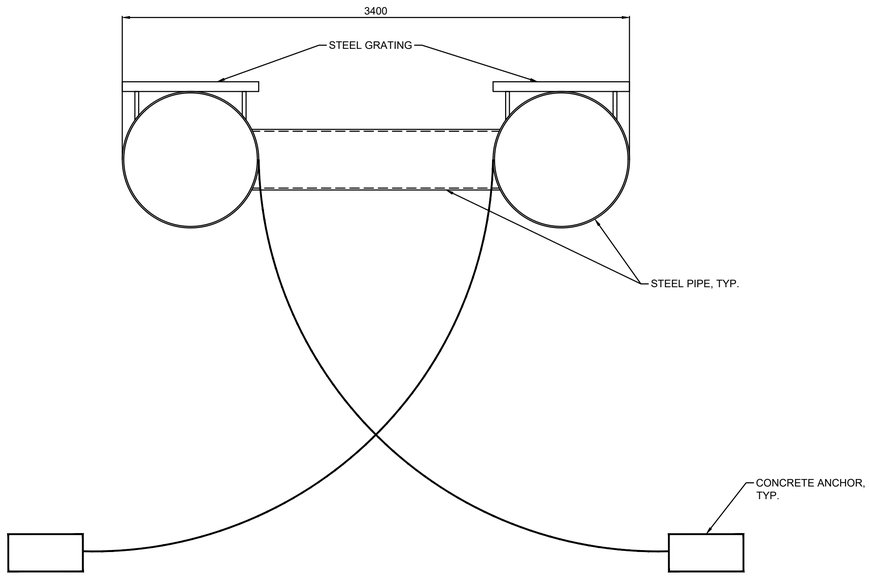

TIMBER FLOAT MOORING WELL, TYP.

SCALE: 1:10




TIMBER FLOAT CONNECTION, TYP.

SCALE: 1:5




TYPICAL SECTION - NEW STEEL FLOATING BREAKWATER

SCALE: 1:20

NOTE:
1. TOPOGRAPHIC & BATHYMETRIC SURVEY COMPLETED ON MAY 24, 2023 BY HBH LAND SURVEYING.

1:5 0 50 150 250mm

1:10 0 100 300 500mm

1:25 0 250 750 1250mm

| Revision | By | Appd | YYYY.MM.DD |
|---|---|---|---|
| - CONCEPTUAL SKETCH | - | - | - |

| Issued | By | Appd | YYYY.MM.DD |
|---|---|---|---|
| FOR CONCEPTUAL DESIGN (5%) REVIEW | TR | LM | 2023.09.29 |
| FOR PERMIT APPLICATION | - | - | 2023.03.17 |

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Client/Project
DISTRICT OF FORT ST JAMES

MARINA UPGRADES

DISTRICT OF FORT ST JAMES, BC

| File Name: 115823074_S101 | CN | TR | LM | 2023.09.29 |
|---|---|---|---|---|
| | Dwn. | Dsgn. | Chkd. | YYYY.MM.DD |

Title
TYPICAL SECTIONS AND DETAILS

Project No.
115823074

Scale
AS SHOWN

Revision
A

Sheet
4 of 4

Drawing No.
**S103**

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ORIGINAL SHEET - ANSI D

Stantec

**Rev A**

**October 3, 2023**

## *COST ESTIMATE APPROVAL SHEET*

**STANTEC PROJECT# 115823074**

***CLIENT:*** District of Fort St James, BC

***LOCATION*** BC

***PROJECT:*** Cottonwood Marina Rehabilitation

***ESTIMATE CLASS :*** AACE Class 5 Cost Estimate (-50%/+100%)

***COST ESTIMATE:*** IFR

| Options | Construction Cost | Indirect Cost | General Costs | Owner's Cost | Contingency | Total C$ (-50/+100%) |
|---|---|---|---|---|---|---|
| REHABILITATION - WITH NEW BREAKWATER | $1,840,779 | Included | $355,238 | $0 | $426,286 | **$2,622,303** |
| REHABILITATION AND EXPANSION - TIMBER PILES | $2,991,043 | Included | $562,313 | $0 | $674,776 | **$4,228,131** |
| REHABILITATION AND EXPANSION - STEEL PILES | $3,783,403 | Included | $705,380 | $0 | $846,456 | **$5,335,239** |

| | | |
|---|---|---|
| ***Prepared By:*** | Tom Rowe/Mahesh Motwani | October 3, 2023 |
| ***Reviewed By:*** | Project Team | October 3, 2023 |
| ***Project Manager:*** | Scott Bilbrough | October 3, 2023 |

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a) The accuracy and completeness of information upon which it may reasonably rely,
b) Schedule constraints or scope limitations,
c) Unknown or variable site or other conditions,
d) Other factors beyond Stantec's control.

Any estimates of construction costs or quantities are limited by a lack of control over financial and market conditions, including the future price of labour, materials, and prospective bidding environments and procedures. The consultant does not warrant or guarantee the accuracy or completeness of its Services to the extent impacted by these limitations. The Client should limit its reliance on the Services in like manner.
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| | | | |
|---|---|---|---|
| **Project Number** | 115823074 | Date: | Rev A |
| **Project** | Cottonwood Marina | Prepared by: | Stantec |
| **Client** | District of Fort St James, BC | Project Number: | 115823074 |
| **Estimate** | Class 5 Cost Estimate (-50% / +100%) | | |
| | **OPTION: R (REHABILITATION - WITH NEW BREAKWATER)** | | |

| ITEM | DESCRIPTION | | UNITS | ESTIMATED | UNIT RATE | SUB -DIRECT COST | INDIRECT COST (Contractor) $ | ESTIMATE UNCERTAINITY % | TOTAL CONSTRUCTION COST |
|---|---|---|---|---|---|---|---|---|---|
| **1** | **MOBILIZATION/DEMOBILIZATION** | | | | | | **25%** | **10%** | |
| 1.1 | Mobilization/Demobilization | Including Barge | L.S. | 5% | $1,291,775 | $64,589 | | | $64,589 |
| | **SUB-TOTAL FOR MOBILIZATION / DEMOBILIZATION** | | | | | **$64,589** | | | **$64,589** |
| **2** | **MARINA REHABILITATION AND EXPANSION** | | | | | | | | |
| 2.1 | FLOATING DOCK | | | | | | | | |
| a | Supply and Install 16" timber pile. (35No.x14m) @ $550/m | Assume timber piles | m | 490 | $550.00 | $269,500 | $67,375 | $33,688 | $370,563 |
| b | Removal and disposal of existing timber piles (35No. 16" diameter x 14m long) | | m | 490.0 | $125.00 | $61,250 | $15,313 | $7,656 | $84,219 |
| c | Misc. Works | | Allowance | 5% | $330,750.00 | $16,538 | $4,134 | $2,067 | $22,739 |
| | **SUB-TOTAL FOR FLOATING DOCK** | | | | | **$347,288** | **$86,822** | **$43,411** | **$477,520** |
| 2.2 | PICNIC AREA | | | | | | | | |
| a | Supply and Install 16" timber pile (15No.x10m) @ $550/m | Assume timber piles | m | 150 | $550.00 | $82,500 | $20,625 | $10,313 | $113,438 |
| b | Removal and disposal of existing timber piles (15No. 16" diameter x 10m long) | | m | 150.0 | $125.00 | $18,750 | $4,688 | $2,344 | $25,781 |
| c | Removal and disposal of existing 12"x12" Timber Pile caps 10No.*6m | | m | 60 | $90.00 | $5,400 | $1,350 | $675 | $7,425 |
| d | Supply and install new 12"x12" Timber Pile caps 10No.*6m | | m | 60 | $315.00 | $18,900 | $4,725 | $2,363 | $25,988 |
| e | Removal and disposal of existing timber stringers (assumed 102 x 305mm @ 305mm C/C) | | m | 236 | $46.67 | $11,016 | $2,754 | $1,377 | $15,147 |
| f | Supply and install new timber stringers (assumed 102 x 305mm @ 305mm C/C) | | m | 236 | $155.55 | $36,720 | $9,180 | $4,590 | $50,490 |
| g | Removal and disposal of existing timber decking planks (assumed 102 x 305mm) | | m | 236 | $46.67 | $11,013 | $2,753 | $1,377 | $15,143 |
| h | Supply and install new timber decking planks (assumed 102 x 305mm) | | m | 236 | $155.55 | $36,710 | $9,177 | $4,589 | $50,476 |
| i | Removal and disposal of existing timber bull rail 6" x 6" Timber bull rail | | m | 24 | $50.00 | $1,200 | $300 | $150 | $1,650 |
| j | Supply and install 6" x 6" Timber bull rail | | m | 24 | $112.50 | $2,700 | $675 | $338 | $3,713 |
| k | Supply and install Bull rail connections @ 1500c/c : 2"x 6" timber spacers | | m | 0.81 | $500.00 | $406 | $102 | $51 | $559 |
| l | Supply and install 25DIA.x 1000 Long. Drift pin, Galv. connections (at each pile) | Allowance | ea. | 15 | $550.00 | $8,250 | $2,063 | $1,031 | $11,344 |
| m | Assume existing flagpole, seating can be re-used. | | ea. | 0 | | $0 | $0 | $0 | $0 |
| n | Misc. Works | | Allowance | 5% | $233,565.14 | $11,678 | $2,920 | $1,460 | $16,058 |
| | **SUB-TOTAL FOR PICNIC AREA** | | | | | **$245,243** | **$61,311** | **$30,655** | **$337,210** |
| 2.3 | NEW FLOATING BREAKWATER | | | | | | | | |
| a | Removal and disposal of existing timber piles and log boom (3No. 16" diameter x 14m long) | | m | 42.0 | $125.00 | $5,250 | $1,313 | $656 | $7,219 |
| a | Supply and Install primary 914mmØ x9.5mm thk PIPE. (3x2No. x20m) x 211.9kg/m | | kg | 25,428 | $8.75 | $222,495 | $55,624 | $27,812 | $305,931 |
| b | Supply and Install PL9.5 end plate. (3x4No. 876 dia. @ 78.5kg/m2) | | kg | 568 | $15.50 | $8,800 | $2,200 | $1,100 | $12,100 |
| c | Supply and Install secondary 406mmØ x12.7mm thk STEEL PIPE. (3x9No.x1.5m) x 123.2kg/m | | kg | 4,989.6 | $8.75 | $43,659 | $10,915 | $5,457 | $60,031 |
| d | Supply and install Grating- assume 30W102 TYPE with 25x5 MAIN BARS (3*2*20)m2*34.7kg/m2 | Assume grating only above primary pipes | kg | 4,164 | $15.00 | $62,460 | $15,615 | $7,808 | $85,883 |
| e | Misc. Works | | Allowance | 5% | $342,663.96 | $17,133 | $4,283 | $2,142 | $23,558 |
| | **SUB-TOTAL FOR NEW FLOATING BREAKWATER** | | | | | **$359,797** | **$89,949** | **$44,975** | **$494,721** |

| | | | |
|---|---|---|---|
| **Project Number** | 115823074 | Date: | Rev A |
| **Project** | Cottonwood Marina | Prepared by: | Stantec |
| **Client** | District of Fort St James, BC | Project Number: | 115823074 |
| **Estimate** | Class 5 Cost Estimate (-50% / +100%) | | |
| | **OPTION: R (REHABILITATION - WITH NEW BREAKWATER)** | | |

| ITEM | | DESCRIPTION | | UNITS | ESTIMATED | UNIT RATE | SUB -DIRECT COST | INDIRECT COST (Contractor) $ | ESTIMATE UNCERTAINITY % | TOTAL CONSTRUCTION COST |
|---|---|---|---|---|---|---|---|---|---|---|
| 2.4 | | OPTION A - CONCRETE ANCHORS TO SUPPORT FLOATING BREAKWATER | | | | | | | | |
| | a | Precast Concrete anchors (7No. 1/2m3 & 15No. 1/4m3) | | m3 | 7.25 | $5,000.00 | $36,250 | $9,063 | $4,531 | $49,844 |
| | b | Chain -assume 5/8" Galv. (7*15m+15*7.5m) | | m | 217.5 | $225.00 | $48,938 | $12,234 | $6,117 | $67,289 |
| | c | Misc. Works | | Allowance | 5% | $85,187.50 | $4,259 | $1,065 | $532 | $5,857 |
| | **SUB-TOTAL FOR CONCRETE ANCHORS** | | | | | | **$89,447** | **$22,362** | **$11,181** | **$122,989** |
| 2.5 | | LAND BASED UPGRADES | | | | | | | | |
| | a | Land based upgrade to the parking area as described in memo | | lot | 1 | $250,000.00 | $250,000 | $62,500 | $31,250 | $343,750 |
| | **SUB-TOTAL FOR LAND BASED UPGRADE** | | | | | | **$250,000** | **$62,500** | **$31,250** | **$343,750** |
| | **SUB-TOTAL FOR MARINA REHABILITATION AND EXPANSION** | | | | | **SUB-TOTAL** | **$1,291,775** | **$322,944** | **$161,472** | **$1,776,191** |
| **3** | **OTHER GENERAL COSTS** | | | | | | | | | |
| 3.1 | Engineering and Project/Construction Management | | | Allowance | 15% | $1,776,191 | $266,429 | | | $266,429 |
| 3.2 | Geotechnical Investigation | | | Allowance | 2% | $1,776,191 | $35,524 | | | $35,524 |
| 3.3 | Environmental Approval, Permitting and Monitoring | | | Allowance | 3% | $1,776,191 | $53,286 | | | $53,286 |
| | **SUB-TOTAL FOR PERMITTING, ENGINEERING, CONTRACT ADMINISTRATION** | | | | | **SUB-TOTAL** | **$355,238** | | | **$355,238** |
| **4** | **CONTINGENCIES** | | | | | | | | | |
| 4.1 | Unallocated Contingency (Risk) | | Client to confirm | Allowance | 20% | $2,131,429 | $426,286 | | | $426,286 |
| | **SUB-TOTAL FOR CONTINGENCIES** | | | | | **SUB-TOTAL** | **$426,286** | | | **$426,286** |
| | **TOTAL INCLUDING CONTINGENCY** | | | | | | | | | **$2,622,303** |

| | | | |
|---|---|---|---|
| **Project Number** | 115823074 | Date: | 3-Oct-23 |
| **Project** | Cottonwood Marina | Prepared by: | Stantec |
| **Client** | District of Fort St James, BC | Project Number: | 115823074 |
| **Estimate** | Class 5 Cost Estimate (-50% / +100%) | | |
| | **OPTION: R-E-TIMBER (REHABILITATION AND EXPANSION - TIMBER PILES)** | | |

| ITEM | DESCRIPTION | | UNITS | ESTIMATED | UNIT RATE | SUB -DIRECT COST | INDIRECT COST (Contractor) $ | ESTIMATE UNCERTAINITY % | TOTAL CONSTRUCTION COST |
|---|---|---|---|---|---|---|---|---|---|
| **1** | **MOBILIZATION/DEMOBILIZATION** | | | | | | **25%** | **10%** | |
| 1.1 | Mobilization/Demobilization | Including Barge | L.S. | 5% | $3,589,549 | $179,477 | | | $179,477 |
| | **SUB-TOTAL FOR MOBILIZATION / DEMOBILIZATION** | | | | | **$179,477** | | | **$179,477** |
| **2** | **MARINA REHABILITATION AND EXPANSION** | | | | | | | | |
| 2.1 | FLOATING DOCK | | | | | | | | |
| a | Supply and Install 16" timber pile. (55No.x14m) @ $550/m | Assume timber piles | m | 770 | $550.00 | $423,500 | $105,875 | $52,938 | $582,313 |
| b | Removal and disposal of existing timber piles (35No. 16" diameter x 14m long) | | m | 490.0 | $125.00 | $61,250 | $15,313 | $7,656 | $84,219 |
| c | Supply and install new timber floats (10No. x 2.4*18m) | | ea. | 10 | $20,580.00 | $205,800 | $51,450 | $25,725 | $282,975 |
| d | Supply and install 8" original galv. Molded steel mooring cleat (every 3m_both sides of new floats) | | ea. | 120 | $150.00 | $18,000 | $4,500 | $2,250 | $24,750 |
| e | Supply and install additional string lighting to match existing (assume supported by piles, no light poles required) | Allowance | m | 180 | $250.00 | $45,000 | $11,250 | $5,625 | $61,875 |
| f | Supply and install UHMWPE Rub Riser 140x25mm Thk. (20No. Piles*4 per pile 0.4m*0.14m) | Allowance | m2 | 4.48 | $5,000.00 | $22,400 | $5,600 | $2,800 | $30,800 |
| g | Misc. Works | | Allowance | 5% | $775,950.00 | $38,798 | $9,699 | $4,850 | $53,347 |
| | **SUB-TOTAL FOR FLOATING DOCK** | | | | | **$814,748** | **$203,687** | **$101,843** | **$1,120,278** |
| 2.2 | PICNIC AREA | | | | | | | | |
| a | Supply and Install 16" timber pile (15No.x10m) @ $550/m | Assume timber piles | m | 150 | $550.00 | $82,500 | $20,625 | $10,313 | $113,438 |
| b | Removal and disposal of existing timber piles (15No. 16" diameter x 10m long) | | m | 150.0 | $125.00 | $18,750 | $4,688 | $2,344 | $25,781 |
| c | Removal and disposal of existing 12"x12" Timber Pile caps 10No.*6m | | m | 60 | $90.00 | $5,400 | $1,350 | $675 | $7,425 |
| d | Supply and install new 12"x12" Timber Pile caps 10No.*6m | | m | 60 | $315.00 | $18,900 | $4,725 | $2,363 | $25,988 |
| e | Removal and disposal of existing timber stringers (assumed 102 x 305mm @ 305mm C/C) | | m | 236 | $46.67 | $11,016 | $2,754 | $1,377 | $15,147 |
| f | Supply and install new timber stringers (assumed 102 x 305mm @ 305mm C/C) | | m | 236 | $155.55 | $36,720 | $9,180 | $4,590 | $50,490 |
| g | Removal and disposal of existing timber decking planks (assumed 102 x 305mm) | | m | 236 | $46.67 | $11,013 | $2,753 | $1,377 | $15,143 |
| h | Supply and install new timber decking planks (assumed 102 x 305mm) | | m | 236 | $155.55 | $36,710 | $9,177 | $4,589 | $50,476 |
| i | Removal and disposal of existing timber bull rail 6" x 6" Timber bull rail | | m | 24 | $50.00 | $1,200 | $300 | $150 | $1,650 |
| j | Supply and install 6" x 6" Timber bull rail | | m | 24 | $112.50 | $2,700 | $675 | $338 | $3,713 |
| k | Supply and install Bull rail connections @ 1500c/c : 2"x 6" timber spacers | | m | 0.81 | $500.00 | $406 | $102 | $51 | $559 |
| l | Supply and install 25DIA.x 1000 Long. Drift pin, Galv. connections (at each pile) | Allowance | ea. | 15 | $550.00 | $8,250 | $2,063 | $1,031 | $11,344 |
| m | Assume existing flagpole, seating can be re-used. | | ea. | 0 | | $0 | $0 | $0 | $0 |
| n | Misc. Works | | Allowance | 5% | $233,565.14 | $11,678 | $2,920 | $1,460 | $16,058 |
| | **SUB-TOTAL FOR PICNIC AREA** | | | | | **$245,243** | **$61,311** | **$30,655** | **$337,210** |
| 2.3 | NEW FLOATING BREAKWATER | | | | | | | | |
| a | Removal and disposal of existing timber piles and log boom (3No. 16" diameter x 14m long) | | m | 42.0 | $125.00 | $5,250 | $1,313 | $656 | $7,219 |
| b | Supply and Install primary 914mmØ x9.5mm thk PIPE. (5x2No. x20m) x 211.9kg/m | | kg | 42,380 | $8.75 | $370,825 | $92,706 | $46,353 | $509,884 |
| c | Supply and Install PL9.5 end plate. (5x4No. 876 dia. @ 78.5kg/m2) | | kg | 946 | $15.50 | $14,667 | $3,667 | $1,833 | $20,167 |
| d | Supply and Install secondary 406mmØ x12.7mm thk STEEL PIPE. (5x9No.x1.5m) x 123.2kg/m | | kg | 8,316.0 | $8.75 | $72,765 | $18,191 | $9,096 | $100,052 |
| e | Supply and install Grating- assume 30W102 TYPE with 25x5 MAIN BARS (2*20*5)m2*34.7kg/m2 | Assume grating only above primary pipes | kg | 6,940 | $15.00 | $104,100 | $26,025 | $13,013 | $143,138 |
| f | Misc. Works | | Allowance | 5% | $567,606.60 | $28,380 | $7,095 | $3,548 | $39,023 |

| | | | |
|---|---|---|---|
| **Project Number** | 115823074 | Date: | 3-Oct-23 |
| **Project** | Cottonwood Marina | Prepared by: | Stantec |
| **Client** | District of Fort St James, BC | Project Number: | 115823074 |
| **Estimate** | Class 5 Cost Estimate (-50% / +100%) | | |
| | **OPTION: R-E-TIMBER (REHABILITATION AND EXPANSION - TIMBER PILES)** | | |

| ITEM | DESCRIPTION | | UNITS | ESTIMATED | UNIT RATE | SUB -DIRECT COST | INDIRECT COST (Contractor) $ | ESTIMATE UNCERTAINITY % | TOTAL CONSTRUCTION COST |
|---|---|---|---|---|---|---|---|---|---|
| | **SUB-TOTAL FOR NEW FLOATING BREAKWATER** | | | | | **$595,987** | **$148,997** | **$74,498** | **$819,482** |
| 2.4 | OPTION A - CONCRETE ANCHORS TO SUPPORT FLOATING BREAKWATER | | | | | | | | |
| a | Precast Concrete anchors (11No. 1/2m3 & 23No. 1/4m3) | | m3 | 11.25 | $5,000.00 | $56,250 | $14,063 | $7,031 | $77,344 |
| b | Chain -assume 5/8" Galv. (11*15m+23*7.5m) | | m | 337.5 | $225.00 | $75,938 | $18,984 | $9,492 | $104,414 |
| c | Misc. Works | | Allowance | 5% | $132,187.50 | $6,609 | $1,652 | $826 | $9,088 |
| | **SUB-TOTAL FOR CONCRETE ANCHORS** | | | | | **$138,797** | **$34,699** | **$17,350** | **$190,846** |
| 2.5 | LAND BASED UPGRADES | | | | | | | | |
| a | Land based upgrade to the parking area as described in memo | | lot | 1 | $250,000.00 | $250,000 | $62,500 | $31,250 | $343,750 |
| | **SUB-TOTAL FOR LAND BASED UPGRADE** | | | | | **$250,000** | **$62,500** | **$31,250** | **$343,750** |
| | **SUB-TOTAL FOR MARINA REHABILITATION AND EXPANSION** | | | | **SUB-TOTAL** | **$2,044,775** | **$511,194** | **$255,597** | **$2,811,565** |
| **3** | **OTHER GENERAL COSTS** | | | | | | | | |
| 3.1 | Engineering and Project/Construction Management | | Allowance | 15% | $2,811,565 | $421,735 | | | $421,735 |
| 3.2 | Geotechnical Investigation | | Allowance | 2% | $2,811,565 | $56,231 | | | $56,231 |
| 3.3 | Environmental Approval, Permitting and Monitoring | | Allowance | 3% | $2,811,565 | $84,347 | | | $84,347 |
| | **SUB-TOTAL FOR PERMITTING, ENGINEERING, CONTRACT ADMINISTRATION** | | | | **SUB-TOTAL** | **$562,313** | | | **$562,313** |
| **4** | **CONTINGENCIES** | | | | | | | | |
| 4.1 | Unallocated Contingency (Risk) | Client to confirm | Allowance | 20% | $3,373,878 | $674,776 | | | $674,776 |
| | **SUB-TOTAL FOR CONTINGENCIES** | | | | **SUB-TOTAL** | **$674,776** | | | **$674,776** |
| | **TOTAL INCLUDING CONTINGENCY** | | | | | | | | **$4,228,131** |

ALTERNATIVE FOR 2.4:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **2.4** | **OPTION B - PILE RESTRAINED BREAKWATER (instead of concrete anchors)** | | | | | | | | |
| a | Supply and Install primary 914mmØ x12.7mm thk PIPE. (6No. X16.5m) x 282.3kg/m | | kg | 27,948 | $8.75 | $244,542 | $61,136 | $30,568 | $336,246 |
| b | Supply and Install PL9.5 end plate. (6No. 876 dia. @ 78.5kg/m2) | | kg | 284 | $15.50 | $4,400 | $1,100 | $550 | $6,050 |
| c | Supply and install UHMWPE Rub Riser 400x25mm Thk. (6No. Piles*4 per pile 0.9m*0.4m) | Allowance | m2 | 3.46 | $5,000.00 | $17,280 | $4,320 | $2,160 | $23,760 |
| d | Misc. Works | | Allowance | 5% | $266,222.35 | $13,311 | $3,328 | $1,664 | $18,303 |
| **SUB-TOTAL** | | | | | **SUB-TOTAL** | **$279,533** | **$69,883** | **$34,942** | **$384,359** |

| | | | |
|---|---|---|---|
| **Project Number** | 115823074 | Date: | 3-Oct-23 |
| **Project** | Cottonwood Marina | Prepared by: | Stantec |
| **Client** | District of Fort St James, BC | Project Number: | 115823074 |
| **Estimate** | Class 5 Cost Estimate (-50% / +100%) | | |
| | **OPTION: R-E-STEEL (REHABILITATION AND EXPANSION - STEEL PILES)** | | |

| ITEM | | DESCRIPTION | | UNITS | ESTIMATED | UNIT RATE | SUB -DIRECT COST | INDIRECT COST (Contractor) $ | ESTIMATE UNCERTAINITY % | TOTAL CONSTRUCTION COST |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | | **MOBILIZATION/DEMOBILIZATION** | | | | | | **25%** | **10%** | |
| 1.1 | | Mobilization/Demobilization | Including Barge | L.S. | 5% | $5,130,037 | $256,502 | | | $256,502 |
| | | **SUB-TOTAL FOR MOBILIZATION / DEMOBILIZATION** | | | | | **$256,502** | | | **$256,502** |
| **2** | | **MARINA REHABILITATION AND EXPANSION** | | | | | | | | |
| 2.1 | | FLOATING DOCK | | | | | | | | |
| | a | Supply and Install 406mmØ x12.7mm thk STEEL PIPE pile. (55No.x14m) x 123.2kg/m | | kg | 94,864 | $8.75 | $830,060 | $207,515 | $103,758 | $1,141,333 |
| | b | Supply and Install PL9.5 pile cap plate . (55No. 381dia. @ 78.5kg/m2) | | kg | 492 | $15.50 | $7,630 | $1,907 | $954 | $10,491 |
| | c | Removal and disposal of existing timber piles (35No. 16" diameter x 14m long) | | m | 490.0 | $125.00 | $61,250 | $15,313 | $7,656 | $84,219 |
| | d | Supply and install new timber floats (10No. x 2.4*18m) | | ea. | 10 | $20,580.00 | $205,800 | $51,450 | $25,725 | $282,975 |
| | e | Supply and install 8" original galv. Molded steel mooring cleat (every 3m_both sides of new floats) | | ea. | 120 | $150.00 | $18,000 | $4,500 | $2,250 | $24,750 |
| | f | Supply and install additional string lighting to match existing (assume supported by piles, no light poles required) | Allowance | m | 180 | $250.00 | $45,000 | $11,250 | $5,625 | $61,875 |
| | g | Supply and install UHMWPE Rub Riser 140x25mm Thk. (20No. Piles*4 per pile 0.4m*0.14m) | Allowance | m2 | 4.48 | $5,000.00 | $22,400 | $5,600 | $2,800 | $30,800 |
| | h | Misc. Works | | Allowance | 5% | $1,190,139.64 | $59,507 | $14,877 | $7,438 | $81,822 |
| | | **SUB-TOTAL FOR FLOATING DOCK** | | | | | **$1,249,647** | **$312,412** | **$156,206** | **$1,718,264** |
| 2.2 | | PICNIC AREA | | | | | | | | |
| | a | Supply and Install 406mmØ x12.7mm thk STEEL PIPE pile. (15No.x10m) x 123.2kg/m | | kg | 18,480 | $8.75 | $161,700 | $40,425 | $20,213 | $222,338 |
| | b | Supply and Install PL9.5 pilecap plate . (15No. 381dia. @ 78.5kg/m2) | | kg | 134 | $15.50 | $2,081 | $520 | $260 | $2,861 |
| | c | Removal and disposal of existing timber piles (15No. 16" diameter x 10m long) | | m | 150.0 | $125.00 | $18,750 | $4,688 | $2,344 | $25,781 |
| | d | Removal and disposal of existing 12"x12" Timber Pile caps 10No.*6m | | m | 60 | $90.00 | $5,400 | $1,350 | $675 | $7,425 |
| | e | Supply and install new 12"x12" Timber Pile caps 10No.*6m | | m | 60 | $315.00 | $18,900 | $4,725 | $2,363 | $25,988 |
| | f | Removal and disposal of existing timber stringers (assumed 102 x 305mm @ 305mm C/C) | | m | 236 | $46.67 | $11,016 | $2,754 | $1,377 | $15,147 |
| | g | Supply and install new timber stringers (assumed 102 x 305mm @ 305mm C/C) | | m | 236 | $155.55 | $36,720 | $9,180 | $4,590 | $50,490 |
| | h | Removal and disposal of existing timber decking planks (assumed 102 x 305mm) | | m | 236 | $46.67 | $11,013 | $2,753 | $1,377 | $15,143 |
| | i | Supply and install new timber decking planks (assumed 102 x 305mm) | | m | 236 | $155.55 | $36,710 | $9,177 | $4,589 | $50,476 |
| | j | Removal and disposal of existing timber bull rail 6" x 6" Timber bull rail | | m | 24 | $50.00 | $1,200 | $300 | $150 | $1,650 |
| | k | Supply and install 6" x 6" Timber bull rail | | m | 24 | $112.50 | $2,700 | $675 | $338 | $3,713 |
| | l | Supply and install Bull rail connections @ 1500c/c : 2"x 6" timber spacers | | m | 0.81 | $500.00 | $406 | $102 | $51 | $559 |
| | m | Supply and install 25DIA.x 1000 Long. Drift pin, Galv. connections (at each pile) | Allowance | ea. | 15 | $550.00 | $8,250 | $2,063 | $1,031 | $11,344 |
| | n | Assume existing flagpole, seating can be re-used. | | ea. | 0 | | $0 | $0 | $0 | $0 |
| | o | Misc. Works | | Allowance | 5% | $314,845.95 | $15,742 | $3,936 | $1,968 | $21,646 |
| | | **SUB-TOTAL FOR PICNIC AREA** | | | | | **$330,588** | **$82,647** | **$41,324** | **$454,559** |
| 2.3 | | NEW FLOATING BREAKWATER | | | | | | | | |
| | a | Removal and disposal of existing timber piles and log boom (3No. 16" diameter x 14m long) | | m | 42.0 | $125.00 | $5,250 | $1,313 | $656 | $7,219 |
| | b | Supply and Install primary 914mmØ x9.5mm thk PIPE. (5x2No. x20m) x 211.9kg/m | | kg | 42,380 | $8.75 | $370,825 | $92,706 | $46,353 | $509,884 |
| | c | Supply and Install PL9.5 end plate. (5x4No. 876 dia. @ 78.5kg/m2) | | kg | 946 | $15.50 | $14,667 | $3,667 | $1,833 | $20,167 |

| | | | |
|---|---|---|---|
| **Project Number** | 115823074 | Date: | 3-Oct-23 |
| **Project** | Cottonwood Marina | Prepared by: | Stantec |
| **Client** | District of Fort St James, BC | Project Number: | 115823074 |
| **Estimate** | Class 5 Cost Estimate (-50% / +100%) | | |
| | **OPTION: R-E-STEEL (REHABILITATION AND EXPANSION - STEEL PILES)** | | |

| ITEM | | DESCRIPTION | | UNITS | ESTIMATED | UNIT RATE | SUB -DIRECT COST | INDIRECT COST (Contractor) $ | ESTIMATE UNCERTAINITY % | TOTAL CONSTRUCTION COST |
|---|---|---|---|---|---|---|---|---|---|---|
| | d | Supply and Install secondary 406mmØ x12.7mm thk STEEL PIPE. (5x9No.x1.5m) x 123.2kg/m | | kg | 8,316.0 | $8.75 | $72,765 | $18,191 | $9,096 | $100,052 |
| | e | Supply and install Grating- assume 30W102 TYPE with 25x5 MAIN BARS (2*20*5)m2*34.7kg/m2 | Assume grating only above primary pipes | kg | 6,940 | $15.00 | $104,100 | $26,025 | $13,013 | $143,138 |
| | f | Misc. Works | | Allowance | 5% | $567,606.60 | $28,380 | $7,095 | $3,548 | $39,023 |
| | **SUB-TOTAL FOR NEW FLOATING BREAKWATER** | | | | | | **$595,987** | **$148,997** | **$74,498** | **$819,482** |
| 2.4 | OPTION A - CONCRETE ANCHORS TO SUPPORT FLOATING BREAKWATER | | | | | | | | | |
| | a | Precast Concrete anchors (11No. 1/2m3 & 23No. 1/4m3) | | m3 | 11.25 | $5,000.00 | $56,250 | $14,063 | $7,031 | $77,344 |
| | b | Chain -assume 5/8" Galv. (11*15m+23*7.5m) | | m | 337.5 | $225.00 | $75,938 | $18,984 | $9,492 | $104,414 |
| | c | Misc. Works | | Allowance | 5% | $132,187.50 | $6,609 | $1,652 | $826 | $9,088 |
| | **SUB-TOTAL FOR CONCRETE ANCHORS** | | | | | | **$138,797** | **$34,699** | **$17,350** | **$190,846** |
| 2.5 | LAND BASED UPGRADES | | | | | | | | | |
| | a | Land based upgrade to the parking area as described in memo | | lot | 1 | $250,000.00 | $250,000 | $62,500 | $31,250 | $343,750 |
| | **SUB-TOTAL FOR LAND BASED UPGRADE** | | | | | | **$250,000** | **$62,500** | **$31,250** | **$343,750** |
| | **SUB-TOTAL FOR MARINA REHABILITATION AND EXPANSION** | | | | | **SUB-TOTAL** | **$2,565,019** | **$641,255** | **$320,627** | **$3,526,901** |
| **3** | **OTHER GENERAL COSTS** | | | | | | | | | |
| 3.1 | Engineering and Project/Construction Management | | | Allowance | 15% | $3,526,901 | $529,035 | | | $529,035 |
| 3.2 | Geotechnical Investigation | | | Allowance | 2% | $3,526,901 | $70,538 | | | $70,538 |
| 3.3 | Environmental Approval, Permitting and Monitoring | | | Allowance | 3% | $3,526,901 | $105,807 | | | $105,807 |
| | **SUB-TOTAL FOR PERMITTING, ENGINEERING, CONTRACT ADMINISTRATION** | | | | | **SUB-TOTAL** | **$705,380** | | | **$705,380** |
| **4** | **CONTINGENCIES** | | | | | | | | | |
| 4.1 | Unallocated Contingency (Risk) | | Client to confirm | Allowance | 20% | $4,232,281 | $846,456 | | | $846,456 |
| | **SUB-TOTAL FOR CONTINGENCIES** | | | | | **SUB-TOTAL** | **$846,456** | | | **$846,456** |
| | **TOTAL INCLUDING CONTINGENCY** | | | | | | | | | **$5,335,239** |

ALTERNATIVE FOR 2.4:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **2.4** | **OPTION B - PILE RESTRAINED BREAKWATER (instead of concrete anchors)** | | | | | | | | | |
| | a | Supply and Install primary 914mmØ x12.7mm thk PIPE. (6No. X16.5m) x 282.3kg/m | | kg | 27,948 | $8.75 | $244,542 | $61,136 | $30,568 | $336,246 |
| | b | Supply and Install PL9.5 end plate. (6No. 876 dia. @ 78.5kg/m2) | | kg | 284 | $15.50 | $4,400 | $1,100 | $550 | $6,050 |
| | c | Supply and install UHMWPE Rub Riser 400x25mm Thk. (6No. Piles*4 per pile 0.9m*0.4m) | Allowance | m2 | 3.46 | $5,000.00 | $17,280 | $4,320 | $2,160 | $23,760 |
| | d | Misc. Works | | Allowance | 5% | $266,222.35 | $13,311 | $3,328 | $1,664 | $18,303 |
| | **SUB-TOTAL** | | | | | **SUB-TOTAL** | **$279,533** | **$69,883** | **$34,942** | **$384,359** |

| | | |
|---|---|---|
| **Project Number** | **115823074** | |
| **Project** | **Cottonwood Marina** | |
| **Client** | **District of Fort St James, BC** | |
| **Estimate** | **Class 5 Cost Estimate (-50% / +100%)** | |
| **Project Scope** | **Description of Scope of Work** | |
| | The scope of work for this project in concept study to upgrade existing Marina | |
| | Remove existing timber piles and replace with either new steel piles or timber piles | |
| | Remove and replace existing picnic area: timber pile caps, stringers, decking planks, bull rails etc. | |
| | Supply and install string lighting, cleats, concrete anchors. | |
| | It is assumed main power supply available within 200 ft. | |
| | Does not include any site work, ground improvement, power back up etc. | |
| | Does not include any concrete infill and/or pile cap etc. | |
| | Environmental permitting/regulatory services not included. | |
| | Land based upgrade to the parking area as described in memo | |
| **Quantities** | Estimate is MTO (Material take-off) driven. All quantities provided by Engineering | |
| **Direct Cost** | Includes Current Material, Equipment and Labour rates | |
| **Indirect Cost** | Includes Contractor's- Temporary construction facilities, Supervision, Survey etc. and contractor O/H & Profit | |
| **General Costs** | Design and Construction Services | 15% |
| | Geotechnical Investigation Cost | 2% |
| | Environmental permit and Compliance Monitoring | 3% |
| **Contingencies** | Project Contingency (Estimate Uncertainty) | 10% |
| | Unallocated Contingency (Risk) - | 20% |
| **Escalation** | Escalation not included in Estimate | |
| **Owner's Costs** | Not included | |
| **Exclusions** | Any additional scope not included in estimate | |
| | Handling any contaminated demolition and disposal. | |
| | Living out allowance if any required for workers and site staff | |
| | GST/PST not included. | |
| | Cost associated with – Indigenous Nations, Stakeholders, Community notification | |
| | Insurance-all risk for Overall Project | |
| | Cost to date<br>Other various | |

**Disclaimer: Stantec's opinions, recommendations and assessments are limited by:**

a) The accuracy and completeness of information upon which it may reasonably rely,

b) Schedule constraints or scope limitations,

c) Unknown or variable site or other conditions,

d) Other factors beyond Stantec's control.

Any estimates of construction costs or quantities are limited by a lack of control over financial and market conditions, including the future price of labour, materials, and prospective bidding environments and procedures. The consultant does not warrant or guarantee the accuracy or completeness of its Services to the extent impacted by these limitations. The Client should limit its reliance on the Services in like manner.

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