



**Centennial Park and Grace Point
Boardwalk Structural Assessment**

115602240

March 17, 2021

Prepared for:

Capital Regional District
Salt Spring Electoral District

Prepared by:

Stantec Consulting Ltd.
400-655 Tye Road
Victoria, BC V9A 6X5

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CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

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1.0 INTRODUCTION

1.1 BACKGROUND

The Centennial Park and Grace Point boardwalks were constructed in the 1980's and are still in use today. The project was a collaborative effort between public agencies and community volunteers. Records of the boardwalk construction or maintenance are not available for either section. A geotechnical investigation was completed in 2009 for the Centennial Park portion of the boardwalk. In 2015, a portion of the Grace Point boardwalk, underwent a guardrail replacement and repairs to supports.

The purpose of this assessment is to provide an updated condition assessment of the Centennial Park and Grace Point boardwalks. The assessment will also include an opinion of cost for the recommended remediations.

1.2 SITE REVIEW

On January 21st – 22nd, 2021 Bryan Gallagher (Structural Engineer) and Adrienne Leech (Structural EIT) conducted a site review of the accessible sections of the Centennial Park and Grace Point boardwalk on Salt Spring Island.

The accessible sections of boardwalk were visually reviewed, and hammer sounded. Stantec timed the site review to correspond with a relative low tide and was able to assess the majority of each boardwalk's substructure using hip waders.

1.3 SITE DESCRIPTION

The Centennial Park and Grace Point boardwalk was assessed in 8 sections for the purposes of this report, as shown in the site map provided in **Figure 1**. There are four over-water, piled timber boardwalk sections (section 1, 3, 6, 7). Section 1 includes a timber approach that supports a timber gazebo. Section 2 consists of a timber gazebo located on grade in Centennial Park. Two of these boardwalk sections (section 4, 5) are located at grade supported by concrete foundations. Section 8 consists of a concrete constructed walkway. The timber boardwalk construction was found to be generally uniform with minimal changes to the structural framing between sections.

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Figure 1 - Site Layout (CRD Maps)

1.4 SCOPE OF INSPECTION

Figure 1 above shows the Capital Park and Grace Point boardwalk and the relevant sections that are part of this assessment.

The scope of work consists of:

- 1) An assessment of the completed boardwalk sections and a technical evaluation of existing structural competence and likely life span of the following components:
 - a. Existing superstructure elements: pile caps, stringers, decking and guardrails.
 - b. Existing substructure elements: concrete foundations, timber piles and timber bracing.
 - c. Existing gazebo structures (2 total) constructed of wood (located in Centennial Park).
- 2) Opinion of probable cost for recommended repairs.

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1.5 CONDITION RATINGS

Components have been rated according to the following condition states:

- Excellent:** New condition
- Good:** Normal wear and deterioration generally not requiring maintenance or repair.
- Fair:** Minor defects, deterioration or collision damage; generally requires maintenance or repair.
- Poor:** Advanced deterioration, significant defects or collision damage; repairs required
- Very Poor:** Serious defects, deterioration or collision damage, imminent failure of component requiring immediate repair or replacement and/ or load restrictions.

2.0 PREVIOUS GEOTECHNICAL ASSESSMENT RESULTS

The previous assessment was conducted by Ryzuk and Associates Ltd. (Ryzuk) in September 2009. Ryzuk conducted a review of a portion of the Centennial Park boardwalk foundations and provided a report. Ryzuk found that, on the west side, the boardwalk is supported by concrete strip footings cast directly on grade which have been severely undermined in many locations. The report notes that the concrete footings were mainly founded on fine grained soil on top of rip rap and that undermining was likely due to storm wave action eroding the fine grain soils. Ryzuk recommended that the foundations be underpinned to re-establish support for the boardwalk. The Ryzuk report included a hand-sketch of the general boardwalk framing for the portions of the Centennial boardwalk supported by piles over the water. The sketch repair details included the addition of braces between piles.

3.0 ASSESSMENT RESULTS

The boardwalk superstructure construction appears to follow typical “light-duty” marine construction. The age of the boardwalk is estimated to be about 30 years old. It appears that all piles and substructure are original and have not been replaced. Record drawings and maintenance records were not available. It appears that the boardwalk sections have been generally maintained throughout the life of the structure. There is evidence of repairs visible along the Centennial Park boardwalk, recommended by Ryzuk in 2009.

Timber construction typically utilizes some form of preservative treatment in marine environments to prevent rot and damage by marine organisms. All of the piles assessed were found to be creosote-treated and the remaining timber components appear to be pressure-treated.

If installed and maintained properly, creosote-treated timber piles can last as long as 50-years in a marine environment, while pressure-treated timber has a typical life-span of 30-years if properly maintained. If not installed or maintained properly, the life span can be considerably less.

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Wood components were tested using a non-destructive technique called sounding. A hammer is used to hit the wood component and the resulting sound is representative of the condition of the wood. A dull or hollow sound will indicate decay or a hollow cavity inside the wood. This method of testing will diagnose significant damage where considerable decay is present near the surface of the wood.

Select timber components were also tested by drilling and collecting wood samples. If the timber is in poor condition, there is less resistance while drilling. If the sawdust sample taken is damp it is indicative of decay due to moisture penetration. Where drilled samples were taken, borate rods were hammered into the holes to protect and prevent the timber from further decay.

3.1 CENTENNIAL PARK BOARDWALK

3.1.1 Section 1 – Boardwalk Approach and Over Water Gazebo

This portion of boardwalk is located furthest to the south-west and is generally open to the public; however, the boardwalk gazebo is currently blocked off due to safety concerns. Ryzuk reviewed this section of the Centennial boardwalk as part of the 2009 assessment but the gazebo superstructure was not included in their review. Currently the gazebo is listing to the north due to a failing member.

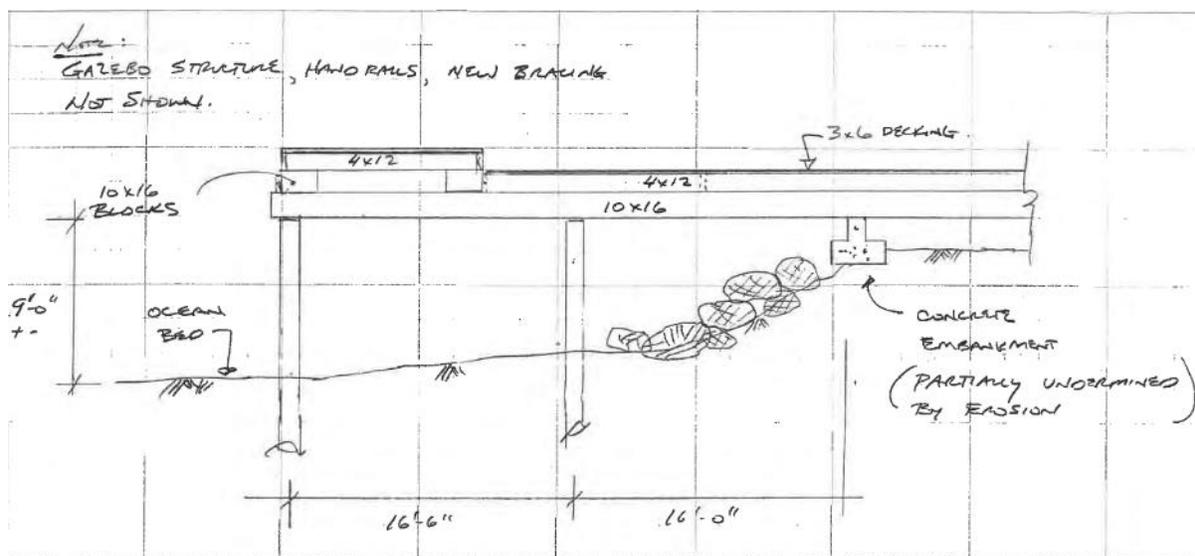


Figure 2 – Section 1: General construction of boardwalk approach (2009 Ryzuk assessment)

3.1.1.1 Decking

The approach decking is comprised of 3x6 rough sawn, pressure-treated boards, spanning approximately 4', supported by stringers. A considerable amount of the deck was found to have rot pockets and splitting and appeared to be in generally poor to fair condition as seen in **Image 5 of Appendix A**. Based on site observations, the current

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decking is approaching end of life; therefore, Stantec recommends that the deck boards be replaced within the next year.

3.1.1.2 Stringers

The stringers are typically 4x12 rough sawn, pressure treated members. The outside stringers sit directly parallel on top of the pile caps. The central stringers span approximately 10' supported with joist hangers by perpendicular 4x10 members. Minor organic growth is present on the stringers. Accessible stringers were sounded with a hammer and were found to be in fair condition as seen in **Image 2 of Appendix A**.

3.1.1.3 Pile Caps

The pile caps are 2-span, 10x16 rough sawn, pressure treated members spanning approximately 16' between the piles and the concrete foundations, as seen in **Image 3 of Appendix A**. The pile caps appear to have been reused from a previous structure. Remnants of old drift pins were visible at the underside of the pile caps. Organic growth is present along the members and rot pockets were found in several locations under the approach section.

There are 10x16 blocks bearing directly on the pile caps supporting the gazebo structure. The blocks are in fair condition; however, it appears that the blocks may not be adequately anchored to the pile caps below.

Stantec recommends that both pile caps and the supported blocks are replaced. It is recommended that this work be completed at the same time as the deck and guard rail replacement to provide access for the replacement. It may be necessary/ cost effective to disassemble the gazebo structure in order to complete this replacement and the end beam replacement recommended in **Section 3.1.1.8**.

3.1.1.4 Concrete Foundation

A concrete abutment is located at the south end of the approach. The concrete appears to have been cast directly on the existing soil and rock. This foundation has significant undermining as seen in **Image 2 of Appendix A**. This may be a result of wave action, at high tide, eroding the soil from below the footing. It does not appear that any remediations have been attempted for this foundation. Stantec recommends the extent of the concrete foundation is underpinned with cast-in-place, reinforced concrete. If possible, the concrete should be dowelled into the existing underlying rock.

3.1.1.5 Piles

There are two rows of piles spaced at approximately 16' in this section, the size of the piles varies from approximately 9" to 12" in diameter. The piles were visually assessed from below during low tide. The piles were sounded with a hammer and visually inspected. The piles were found to generally be in good condition. The tops of the piles have a metal cap that protects the pile from weather and separates the pile from the pile cap. These metal caps were found to generally be in fair condition.

3.1.1.6 Braces

The cross-braces are creosote-treated 4x8 sections bracing the piles in each direction, as seen in **Image 3 of Appendix A**. The braces are connected to the piles with a single thru-bolt connection at each end. The braces were

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indicated as new members on the repair sketches prepared by Ryzuk as part of their 2009 assessment. The braces appear to be in good conditions suggesting they were installed sometime after 2009.

3.1.1.7 Guardrails

The guardrail consists of three 2x6 horizontal members and one 2x8 top rail spanning between 4x4 posts spaced at approximately 8' on center. The posts are connected with a standard two-bolt assembly to the 4x12 stringer supporting the deck boards. There are vertical pickets fastened to the horizontal members spaced evenly for the extent of the guardrail. The guardrail components appear to be pressure-treated. It does not appear that components of the guardrail assembly have been replaced recently, refer to **Image 5 of Appendix A**. Several components appear to have minor splitting, rot pockets and heavy organic growth. The majority of the guardrail components are approaching end of life and are recommended to be replaced within the next few years.

3.1.1.8 Over Water Gazebo Superstructure

The over water gazebo consists of a cedar shake roof supported by 1x6 strapping at 8" on center. The strapping spans between 2x6 joists spaced at approximately 3' on center. The joists are supported by 4x10 beams spanning approximately 12', supported each end by 4x4 posts. All of the superstructure components appear to be rough sawn, pressure treated timber. The 2x6 ridge members extend past the soffit and are exposed to the weather. This has resulted in accelerated decay as seen in **Image 6 of Appendix A**. It is recommended that the outrigger portion of these ridge members are cut back to reduce any further decay. The cedar shake roof was found to be in poor condition, as seen in **Image 1 of Appendix A** and should be replaced.

The gazebo floor consists of 3x8 deck boards spanning approximately 4' supported by 4x12 stringers. The stringers are supported by perpendicular 4x12 beams. The stringers appear to be connected to the beams with a minimum of two lag bolts. The beams span approximately 12', supported by 10x16 blocks bearing on the 10x16 pile caps below. All of the substructure components appeared to be rough sawn, pressure treated timber. The beam on the east side is in very poor condition and appears to be severely rotten where it bears on the block below (visible in **Image 6 of Appendix A**). This failing beam has caused the entire gazebo structure to list to the north as seen in **Image 4 of Appendix A**. Due to the construction of the gazebo floor, failure of this beam will likely cause a partial or complete collapse of the gazebo structure. Stantec recommends that this beam be replaced immediately.

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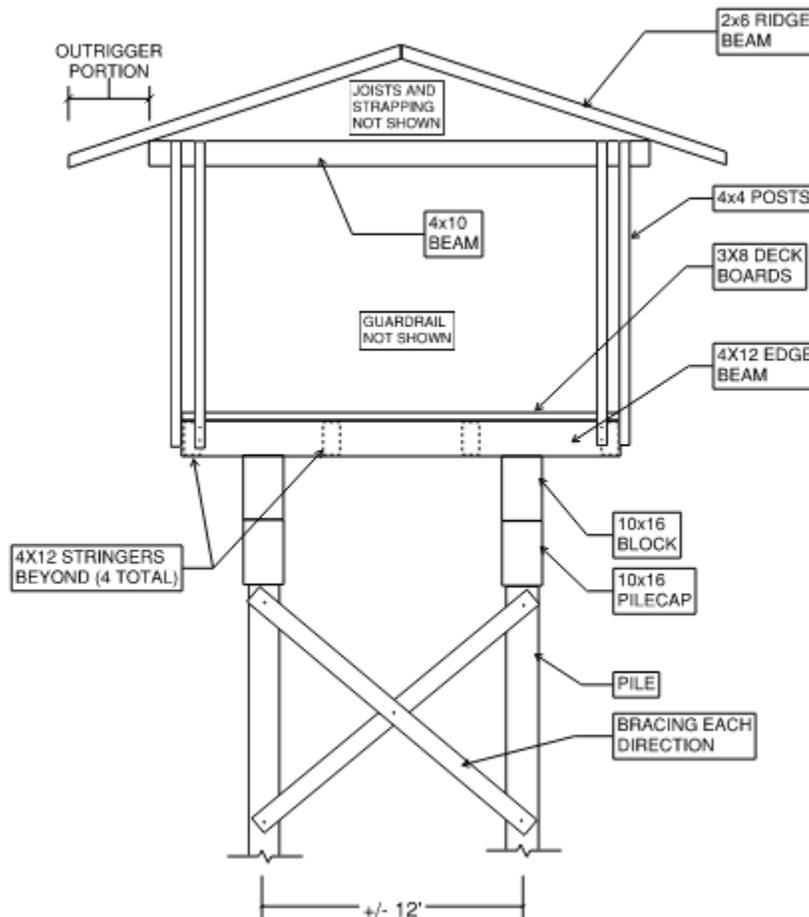


Figure 3 – East Elevation of Gazebo and General Framing

3.1.2 Section 2 – Park Gazebo

A larger wood framed gazebo is located on grade in Centennial Park as seen in **Image 7** in **Appendix A**. The gazebo consists of a cedar shake roof supported by 2x4 strapping. The strapping spans between 2x6 joists at approximately 30" on center. The joists are supported by 6x6 upper beams and 6x10 lower beams. The beams are supported by 6x6 posts. The posts are braced to the beams each direction with minimum 4x4 knee braces. All of the superstructure components appeared to be rough sawn, pressure treated timber.

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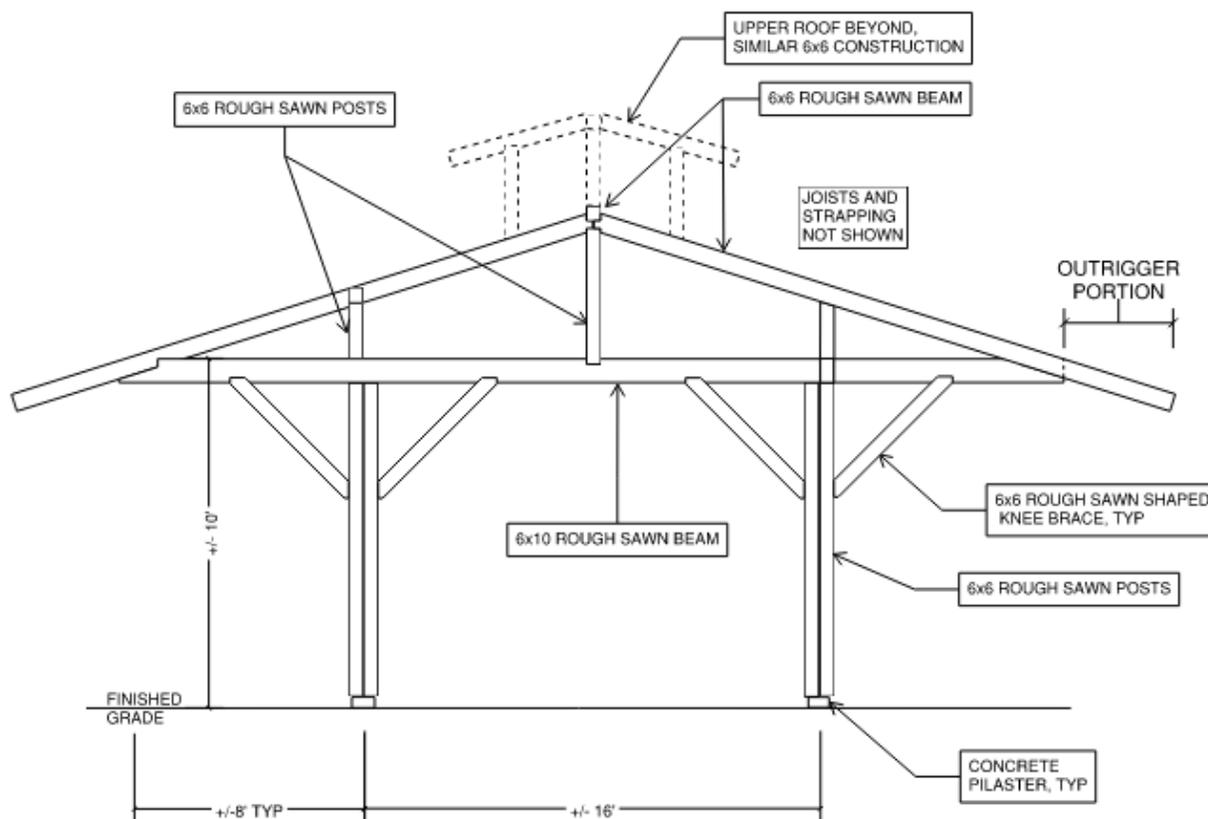


Figure 4 - Park Gazebo Typical Elevation and General Framing

The cedar shakes on the lower and upper roof are in poor condition and are recommended to be replaced. The upper 6x6 beams extend past the roof and are exposed to the weather. The outrigger portion is showing signs of heavy organic growth and rot as seen in **Image 8** in **Appendix A**. The outriggers were sounded with a hammer which indicated soft spots in the wood. Two samples were taken from the outriggers to determine the extent of the rot. The samples were taken with an impact drill. In both locations the wood was soft and damp indicating rot.

The outriggers are extensions of the 6x6 upper beams and are not supporting any structure. However, during the site review it was found that moisture is being drawn up the beam from the exposed outrigger. If this condition is left to continue the portions of the beams supporting the structure will begin to decay at an accelerated rate. In order to avoid any further deterioration, Stantec recommends that the outriggers be cut back flush with the roof. The ends of the 6x6 beams are recommended to be protected with flashing to avoid any further water damage.

The remaining timber components were found to be in generally good condition.

3.1.3 Section 3 – Over Water Boardwalk

This portion of boardwalk is located in Centennial Park and is open to the public. Ryzuk reviewed this portion of the boardwalk as part of the 2009 assessment. During the site review, evidence of previous repairs to this portion of the boardwalk were visible.

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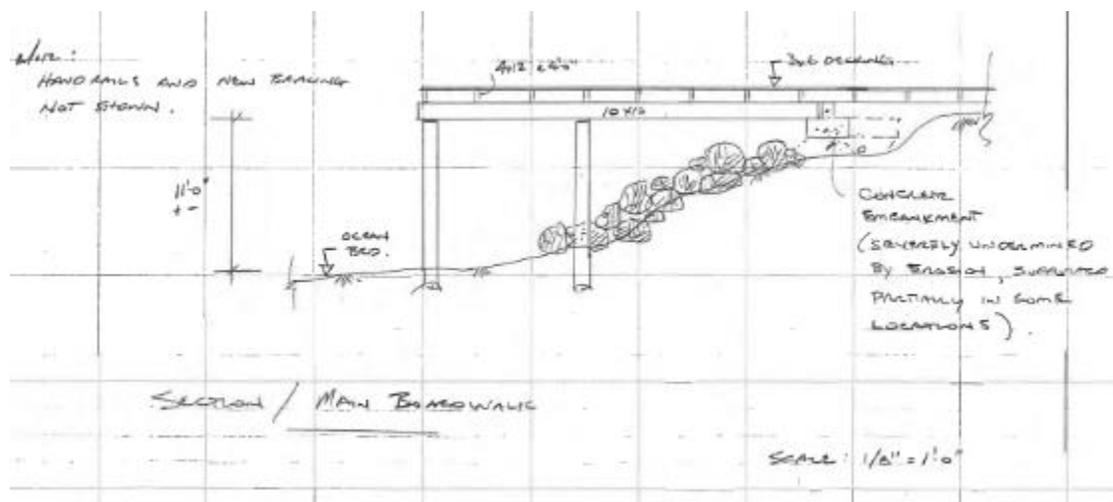


Figure 5 - General construction of boardwalk (2009 Ryzuk assessment)

3.1.3.1 Decking

The decking is comprised of 3x6 rough sawn, pressure-treated boards, spanning approximately 4', supported by timber stringers. The decking was found to generally be in fair condition. Several boards are in very poor condition having major splitting and rot pockets as seen in **Image 10** in **Appendix A**. Stantec estimates that approximately 20% of the deck boards will require replacing within the next year, with the remainder requiring replacement in the next five years. The decking should be inspected annually, as part of regular maintenance, and any boards found to have major splits or rot pockets should be replaced. Nails that are found to be proud should be sunk down to reduce tripping hazards.

3.1.3.2 Stringers

The stringers are typically rough sawn, pressure treated 4x10 members spaced at approximately 4' on center. The stringers span a maximum of 17.5', supported by the pile caps. Minor presence of organic growth was found on the stringers. Accessible stringers were sounded with a hammer and were found to be in generally good condition.

3.1.3.3 Pile Caps

The pile caps are typically rough sawn, pressure treated 10x16 members spanning a maximum of approximately 17' between the piles and concrete strip footings as seen in **Image 11** of **Appendix A**. The pile caps appear to have been reused from a previous structure. Remnants of old drift pins were visible at the underside of the pile caps. There is minor organic growth on the pile caps. In accessible locations, the pile caps were sounded with a hammer and appeared to be in fair condition.

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3.1.3.4 Concrete Foundations

The pile caps are supported on the west side by a continuous concrete strip footing. The pile caps are connected to the footing with structural steel brackets anchored to the concrete. The concrete footing appears to have been directly cast on the existing soil and underlying rip rap. During the site review, it was found that the concrete footing is being significantly undermined as seen in **Image 12** in **Appendix A**. This may be a result from wave action at high tide eroding the soil from below the footing.

During the review, it was observed that recommended measures to mitigate the undermining were completed since the 2009 Ryzuk review as seen in **Image 13** in **Appendix A**. However, undermining has continued in several locations. Stantec recommends that further underpinning of the foundations be completed by installing cast-in-place, reinforced concrete. If possible, this concrete should be dowelled into the underlying rock. In order to avoid any future undermining, Stantec recommends that additional rip rap be added below the boardwalk structure to reduce wave action against the foundation.

3.1.3.5 Piles

There are two rows of piles spaced at approximately 13' in this section, the size of the piles varies from approximately 9" to 12" in diameter. The piles were visually inspected from below during low tide. Stantec noted minor marine growth on the piles below the water line. Accessible piles were sounded with a hammer. Sounding of the piles suggest that the piles are in good condition. The top of the piles have a metal cap that protects the pile from weather and separates the pile from the pile cap. These metal caps appear to generally be in fair condition.

3.1.3.6 Braces

The cross-braces are creosote-treated 4x8 sections bracing the piles in each direction. The braces are connected to the piles with a single thru-bolt connection at each end. The braces were indicated as new members on the repair sketches prepared by Ryzuk as part of their 2009 assessment. The braces appear to be in good conditions suggesting they were installed sometime after 2009.

3.1.3.7 Guardrails

The guardrail consists of three 2x6 horizontal members and one 2x8 top rail spanning between 4x4 posts spaced at approximately 8' on center. The posts are connected with a standard two-bolt assembly to the 4x12 edge stringer supporting the deck boards. There are vertical pickets fastened to the horizontal members spaced evenly for the extent of the guardrail. All of the guardrail components appear to be pressure-treated timber. It does not appear that components of the guardrail assembly have been replaced recently. A large section of the guardrail was found to be leaning outwards as seen in **Image 10** of **Appendix A**. Several components appear to have minor splitting, rot pockets and heavy organic growth. The majority of the guardrail components are approaching end of life and are recommended to be replaced within the next three years.

3.1.4 Section 4 & 5 –Boardwalk on Grade

Two sections of the boardwalk have been constructed on grade. The boardwalk construction consists of 3x6 rough sawn, pressure-treated deck boards spanning approximately 8'. The deck boards appear to be supported on the east

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side by a pressure treated wood member bearing directly on a continuous concrete strip footing. The support condition on the west side was not accessible to view during the site review. It is likely that the condition is similar to the east side, where the deck boards are supported on a wood member bearing directly on a concrete strip footing.

The deck boards in this section appear to be in generally fair condition; however, several boards appear to be in very poor condition.

During the site review, Stantec assessed the visible portion of the east concrete strip footing. It was found that the footing is severely undermined in several locations, as shown in **Image 15** and **Image 18** of **Appendix A**. The footings have likely been undermined by erosion. It is suspected that the high tide line is below the underside of these foundations.

Due to the current condition of the deck boards and the undermined concrete foundations, it is Stantec's opinion that a full replacement of these portions of boardwalk on grade is preferable to repair. Undermining of the foundation in these sections is very severe and the condition of the concrete looks to be poor. New reinforced, concrete foundations should be constructed at the appropriate depth to avoid undermining in the future. Where possible, these foundations should be concrete pier foundations drilled and dowelled to the existing bedrock.

3.2 GRACE POINT BOARDWALK

3.2.1 Section 6 – Storefront Boardwalk

This section of boardwalk is located in front of the Grace Point Square business development. The stores and businesses use a portion of the boardwalk for patio space. Partial height walls and posts are supported on the boardwalk as seen in **Image 20** in **Appendix A**. There does not appear to be any additional support (such as a concrete footings, or timber beams) located below the deck to support the partial height walls or posts. The wood posts supported by the boardwalk may be decorative and therefore would not impose a significant load on the boardwalk structure. However, the deck boards appear to be in worse condition surrounding the post locations. This condition will pose some difficulties when replacing deck boards, as the partial height walls and posts have been constructed directly on top of the boards. For a full deck replacement, portions of the walls will likely need to be removed and replaced.

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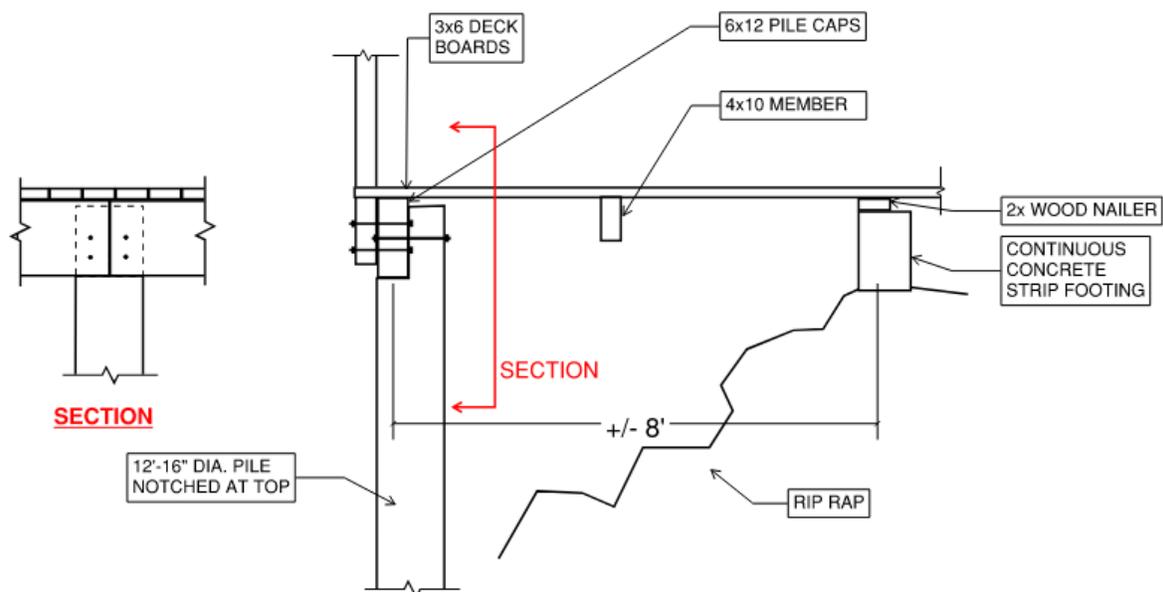


Figure 6 - General construction of Section 6 boardwalk

3.2.1.1 Decking

The decking is comprised of 3x6 rough sawn, pressure-treated boards, spanning a maximum of approximately 8'. At the western end of the boardwalk the deck boards are supported by timber stringers. For the remaining portion, the deck boards span between the pile caps and a continuous concrete strip footing. At approximately midspan, a 4x10 timber member is fastened to the underside of the deck boards. These members do not provide significant structural support at the midspan but may have been installed to assist in load sharing between the deck boards.

The decking was found to be in generally fair condition; however, several boards appear to be in poor condition as seen in **Image 21** of **Appendix A**. Stantec estimates that approximately 10% of the decking will need to be replaced within the next year, with the remainder recommended for replacement in the next 5 years. Due to the deck supporting the partial height walls above, the walls will likely need to be removed for the full deck replacement. The decking should be inspected annually, as part of regular maintenance, and any boards found to have major splits or rot pockets should be replaced. Nails that are found to be proud should be sunk down to reduce tripping hazards.

3.2.1.2 Stringers

At the western end of this portion of boardwalk, the deck boards are supported by timber stringers. The stringers are typically full dimensional pressure treated 6x12 members spaced at approximately 5' on center. The stringers are simply supported by the pile caps and the concrete strip foundation with structural steel hangers. Minor presence of organic growth is present on the stringers. Accessible stringers were sounded with a hammer and were found to be in generally good condition.

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3.2.1.3 Pile Caps

The pile caps are full dimensional pressure treated 6x12 members spanning approximately 10' between the piles, as seen in **Image 23** in **Appendix A**. The piles are notched to support the pile caps. At the west end of this portion of boardwalk, the timber stringers are supported by the pile caps with structural steel hangers. There is minor organic growth on the pile caps. At several locations the pile caps were sounded with a hammer were found to be in good condition.

3.2.1.4 Concrete Foundations

At the eastern side of this portion of the boardwalk, the timber stringers are supported by a concrete strip footing with structural steel hangers. For the remaining portion of section 6, the concrete strip footing supports the timber deck boards as seen in **Image 23** in **Appendix A**. The deck boards bear on a continuous nailer plate bearing on top of the concrete foundation. The anchorage of the nailer plate to the concrete strip footing was not visible. The concrete footing appears to have been directly cast on the existing soil and underlying rip rap. It appears that minor erosion is taking place at the east end of this strip footing which has caused minor undermining. The remainder of the concrete strip footing appears to be adequately protected by the existing rip rap. Stantec recommends that additional rip rap is added below the boardwalk at the south end to protect the existing subgrade from further erosion.

3.2.1.5 Piles

There is one row of piles spaced at approximately 10' on center supporting the pile caps. The piles are minimum 12" diameter and are notched at the top to support the pile caps. The pile caps bear on the notched surface and are thru bolted to the side of the pile as seen in **Image 24** of **Appendix A**. Roofing felt (or a similar product) has been installed between the notched pile and pile cap to protect the cut ends of the pile. The piles were visually inspected from below during low tide. There is minor marine growth on the pile below the water line. Accessible piles were sounded with a hammer. Sounding of the pile suggest that the piles are generally in good condition.

There is no bracing located in this section of the boardwalk.

3.2.1.6 Guardrails

The guardrail consists of three horizontal members and one 2x8 top rail spanning between 4x4 posts spaced at approximately 8' on center. The posts are connected with a standard two-bolt assembly to the pile cap below. It appears that the guardrails have been well maintained in recent years and components of the guardrail assembly have been replaced recently. The guardrail has been damaged in one location, as seen in **Image 21** in **Appendix A** and should be repaired. Annual inspections of the guardrails should be completed as part of regular maintenance and members found to have major splits or rot pockets should be replaced.

3.2.2 Section 7 – Over-Water Boardwalk

This portion of boardwalk is mainly located in front of the Grace Point private residences. The majority of the boardwalk construction appears to be similar to Section 6. A rock retaining wall was observed along the north side of the boardwalk, as seen in **Image 28** in **Appendix A**. It is unclear how this retaining wall was constructed; however, it

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appears it is not connected to the boardwalk structure. It is assumed that this wall is the property of the residential development and review of this retaining wall has not been included in the scope of this assessment.

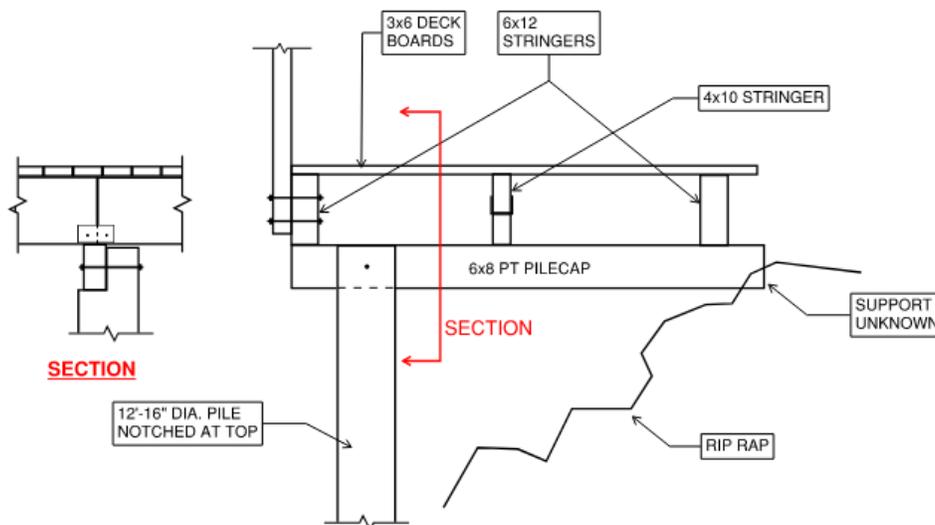


Figure 7 - Section 7 General Framing

3.2.2.1 Decking

The decking is comprised of 3x6 pressure-treated boards, spanning a maximum of approximately 4'. The deck boards are supported by 6x12 timber stringers. At approximately midspan, a 4x10 timber member is fastened to the underside of the deck boards. The member is supported by 4x4 timber blocking bearing on the pile cap, as seen in **Image 30** in **Appendix A**.

The decking appears to generally be in fair condition; however, Stantec estimates that approximately 10% of the deck boards are in very poor condition and require immediate replacement (as seen in **Image 26** of **Appendix A**). The decking should be inspected annually, as part of regular maintenance, and any boards found to have major splits or rot pockets should be replaced. Nails that are found to be proud should be sunk down to reduce tripping hazards.

3.2.2.2 Stringers

The stringers consist of 6x12 rough sawn, pressure-treated members spanning approximately 8'. The stringers are supported by pile caps below. The stringers were found to be in generally fair condition having heavy organic growth, however some stringers were found to be in poor condition due to rot as seen in **Image 30** in **Appendix A**. The north stringers (land side) are in constant contact with wet soil, a condition which will reduce the service life of these members. It is estimated that the north stringers only have a residual lifespan of approximately 5 years. Stantec recommends that the replacement of the north stringers should coincide with a full deck replacement. The remaining central and south stringers appear to be in fair to good condition with the minor presence of organic growth. These members should be reevaluated as part of a full deck replacement, as it is anticipated that a portion (estimate 25%)

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of the remaining stringers and pile cap members will need to be replaced at the time of the deck replacement (approximately 5 years).

3.2.2.3 Pile Caps

The pile caps are full dimensional pressure treated 6x8 members spanning approximately 7'. The pile caps are supported on the southern side by notched piles. The pile caps were found to be in generally fair condition with minor presence of organic growth. During the site visit, Stantec was unable to confirm how the pile caps are supported on the northern end. This support condition was obscured by debris and rip rap. Stantec recommends that further investigation of the pile caps be completed during the replacement of the north stringers and deck. It is likely that some of the pile cap members will need replacement during the deck replacement, as the north end of the pile caps are surrounded by the subgrade.

3.2.2.4 Piles

There is one row of piles spaced at approximately 10' on center supporting the pile caps. The piles are minimum 12" diameter. The piles are notched at the top where the pile caps bear. The pile caps are thru bolted to the side of the pile, as seen in **Image 29** in **Appendix A**. Roofing felt (or a similar product) has been installed between the notched pile and pile cap to protect the cut ends of the pile. The piles were visually inspected from below during low tide. There is minor marine growth on the pile below the water line. Accessible piles were sounded with a hammer. Sounding of the pile suggest that the piles are in good condition.

There is no bracing located in this section of the boardwalk.

3.2.2.5 Guardrails

The guardrail consists of three horizontal members and one 2x8 top rail spanning between 4x4 posts spaced at approximately 8' on center. The posts are connected with a standard two-bolt assembly to the pile cap below. It appears that the guardrails have been maintained in recent years and components of the guardrail assembly have been replaced recently, as seen in **Image 28** in **Appendix A**. Annual inspections of the guardrails should be completed as part of regular maintenance and members found to have major splits or rot pockets should be replaced.

3.2.3 Section 8 – Concrete Boardwalk

The furthest east portion of the Grace Point boardwalk is constructed from concrete. There were also no record drawings for this portion of the walkway and the general construction is unknown. The concrete deck slab appears to be in good condition; however, Stantec was unable to confirm if the deck slab is suspended or poured on grade. The visible portions of the concrete foundation wall appeared to be cast on existing bedrock; however, Stantec was unable to confirm if the wall is dowelled into the rock. The base of the foundation is located below the water line. Based on observation made onsite, the wall is experiencing minor undermining due to wave action. It is recommended that more detailed review of the wall be conducted to determine the extent of the damage and required remediations.

CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

Assessment Results
March 17, 2021

3.3 SUMMARY OF FINDINGS

The table below summarizes the finding of the Centennial Park and Grace Point boardwalk condition assessment. Member sizes noted are the typical minimum member size for each section (actual member sizes were found to vary slightly).

The residual life estimates provided are a conservative estimate. If properly maintain, it can be expected that many of the components will have a longer service life than presented in the table. Residual life estimates should be updated with each detailed inspection (recommended at 5-year intervals for marine structures).

Table 1 - Summary of Findings

Item	Component Description	Condition	Damage/ Comments	Residual Life	Recommendation
Centennial Park Boardwalk					
Section 1 – Timber Approach					
Concrete Footing	Continuous Concrete Strip Footing	Poor	-Severe undermining	1 year	Underpin concrete foundations -Detailed Inspection at 5-year cycle
Piles	9"-16" dia. Creosote-Treated Timber	Fair to Good		10 years	-Detailed Inspection at 5-year cycle
Braces	4x8 Creosote-Treated Timber	Good		15 years	-Detailed Inspection at 5-year cycle
Pile Caps	10x16 Pressure-Treated Timber	Poor	- Appear to be repurposed timber - Significant rot found on site	2 years	Replace pile caps and 10x16 timber blocking
Decking	3x6 Pressure-Treated Timber	Poor to Fair	- Several deck boards with rot pockets and severe checking	2 years	-Replace all deck boards -Maintenance Inspection annually -Detailed Inspection at 5-year cycle
Guardrails	Pressure-Treated	Fair		2 years	-Maintenance Inspection annually -Detailed Inspection at 5-year cycle
Section 1 – Above Water Gazebo Superstructure					
Floor Beams	4x10 Pressure-Treated Rough Sawn	Very Poor	-East edge beam has severe rot and is failing causing gazebo structure to list	0 years	-Replace beam immediately. -Detailed Inspection at 5-year cycle
Stringers	4x10 Pressure-Treated Rough Sawn	Fair	-Supported by beams with lag bolts	5 years	-Install steel hangers each end of stringers. This work should be completed at the same time the failing floor beam is replaced.

CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

Assessment Results

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Item	Component Description	Condition	Damage/ Comments	Residual Life	Recommendation
					-Detailed Inspection at 5-year cycle
Decking	3x8 Pressure-Treated	Fair	-Several deck boards with rot pockets and checking	2 years	-Maintenance Inspection annually -Detailed Inspection at 5-year cycle
Posts	4x4 Pressure-Treated	Fair to Good		10 years	-Detailed Inspection at 5-year cycle
Roof Beams	4x10 Pressure-Treated Rough Sawn	Fair to Good		10 years	-Detailed Inspection at 5-year cycle
Roof Joists	2x8 Pressure-Treated Rough Sawn	Poor to Fair	-Outrigger portions of ridge beams have moderate to severe rot	2 years	-Cut outriggers flush with roof (4 total) and flash beam ends -Detailed Inspection at 5-year cycle
Cedar Shakes		Poor		2 years	-Replace cedar shakes
Section 2 – Park Gazebo					
Posts	6x6 Pressure-Treated	Good		10 years	-Detailed Inspection at 5-year cycle
Lower Roof Beams	6x10 Pressure-Treated Rough Sawn	Good		10 years	-Detailed Inspection at 5-year cycle
Upper Roof Beams	6x6 Pressure-Treated Rough Sawn	Fair (Outrigger Very Poor)	-Outrigger portion of upper roof beams have severe rot	2 years	-Cut outriggers flush with edge of roof (12 total) and flash beam ends -Detailed Inspection at 5-year cycle
Roof Joists	2x8 Pressure-Treated Rough Sawn	Good		10 years	-Detailed Inspection at 5-year cycle
Cedar Shakes		Poor		2 years	-Replace cedar shakes
Section 3 – Over-Water Boardwalk					
Concrete Footing	Continuous Concrete Strip Footing	Fair	-Severe undermining	1 year	-Underpin concrete footings -Add rip rap below boardwalk to protect concrete -Detailed Inspection at 5-year cycle
Piles	9"-16" dia. Creosote-Treated Timber	Fair to Good		10 years	-Detailed Inspection at 5-year cycle
Braces	4x8 Creosote-Treated Timber	Good		15 years	-Detailed Inspection at 5-year cycle
Pile Caps	10x16 Pressure-Treated Timber	Fair	- Appear to be repurposed timber. - Areas of minor rot	10 years	-Detailed Inspection at 5-year cycle
Stringers	4x10 Pressure-Treated Timber	Good		10 years	-Detailed Inspection at 5-year cycle

CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

Assessment Results
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Item	Component Description	Condition	Damage/ Comments	Residual Life	Recommendation
Decking	3x6 Pressure-Treated Timber	Poor to Fair	-Several deck boards with severe rot pockets and severe checking	5 years	-Replace damaged deck boards (approx. 20%) within 1 year. Full deck replacement within 5 years -Maintenance Inspection annually -Detailed Inspection at 5-year cycle
Guardrails	Pressure-Treated	Fair		3 years	-Maintenance Inspection annually -Detailed Inspection at 5-year cycle
Section 4 & 5 – Boardwalk on Grade					
Concrete Footing	Continuous Concrete Strip Footing	Poor	-Severe undermining	2 years	-Demolish and replace concrete footings -Detailed Inspection at 5-year cycle
Decking	3x6 Pressure-Treated Rough Sawn	Poor to Fair	-Several deck boards with rot pockets and severe checking	2 years	-Replace damaged deck boards (approx. 10%) within 1 year -Full deck replacement to coincide with footing replacement -Detailed Inspection at 5-year cycle
Guardrails	Pressure-Treated	Fair		2 years	-Full guardrail replacement to coincide with footing replacement -Detailed Inspection at 5-year cycle
Grace Point Boardwalk					
Section 6 – Storefront Over-Water Boardwalk					
Concrete Footing	Continuous Concrete Strip Footing	Fair	-Minor undermining	5 years	-Add rip rap to protect concrete foundation within 2 years -Remove brush/debris from below boardwalk -Detailed Inspection at 5-year cycle
Piles	Nom. 12" dia. Creosote-Treated Timber	Fair to Good		10 years	-Detailed Inspection at 5-year cycle
Pile Caps	6x12 Pressure-Treated Timber	Fair to Good		10 years	-Detailed Inspection at 5-year cycle
Stringers	6x12 Pressure-Treated Timber	Fair to Good		10 years	Detailed Inspection at 5-year cycle
Decking	3x6 Pressure-Treated Timber	Poor to Fair	-Several deck boards with severe rot pockets and checking	5 years	-Replace damaged deck boards (approx. 10%) immediately

CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

Assessment Results

March 17, 2021

Item	Component Description	Condition	Damage/ Comments	Residual Life	Recommendation
					-Maintenance Inspection annually -Detailed Inspection at 5-year cycle
Guardrails	Pressure-Treated	Fair		5 years	-Maintenance Inspection annually -Detailed Inspection at 5-year cycle
Section 7 – Over-Water Boardwalk					
Piles	Nom. 12" dia. Creosote-Treated Timber	Fair to Good		10 years	-Detailed Inspection at 5-year cycle
Pile Caps	6x8 Pressure-Treated Timber	Fair	-North support condition of pile cap unknown	5 years	-Assess condition of pile cap during full deck replacement (5 years) -Detailed Inspection at 5-year cycle
Stringers	6x12 Pressure-Treated Timber	Fair to Good	-North stringer in fair condition	5 years	-replace north stringers during full deck replacement (5 years) -Detailed Inspection at 5-year cycle
Decking	3x6 Pressure-Treated Timber	Poor to Fair	-Several deck boards with rot pockets and severe checking	5 years	-Replace damaged deck boards (approx. 10%) -Replace all deck boards in 5 years -Maintenance Inspection annually -Detailed Inspection at 5-year cycle
Guardrails	Pressure-Treated	Fair		5 years	-Maintenance Inspection annually -Detailed Inspection at 5-year cycle
Section 8 – Concrete Walkway					
Concrete Foundation Wall	Unknown	Fair to Good	-Foundation is scouring at base below water line -Only visible portion reviewed -Further investigation required to confirm structural system	2 year	-Underpin foundation -Detailed Inspection at 5-year cycle
Concrete Slab	Unknown	Good	-Only visible portion reviewed -Further investigation required to confirm structural system	10 years	-Detailed Inspection at 5-year cycle
Guardrails	Timber	Good		5 Years	-Maintenance Inspection annually

CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

Opinion of Cost
March 17, 2021

Item	Component Description	Condition	Damage/ Comments	Residual Life	Recommendation
					-Detailed Inspection at 5-year cycle

4.0 OPINION OF COST

Stantec has provided an 'Opinion of Cost' estimate for the recommended remediation to the Centennial Park and Grace Point boardwalks. A complete breakdown of the cost estimate has been included in **Appendix B**.

5.0 PERMITS/ ACCESS RIGHTS

Stantec conducted a cursory review of the permits and access rights required to conduct the recommended remediations to the boardwalk structures. The boardwalks are located on several different land parcels, as seen in the figure below. The Centennial boardwalk is located on Regional Government land and provincial crown land. The Grace Point boardwalk appears to be located on provincial crown land and an existing right-of-way.

The remedial work for the boardwalks includes topside work which is considered to be maintenance and is not anticipated to require any permits. The recommended below deck work may also be considered as maintenance work and may not require any permits; however, Stantec recommends that the following regulatory bodies are consulted with once engineered repair drawings have been created to determine if permits/ authorization is required:

- Crown Land Authorization
- DFO permit/ authorization
- Development Permit for DPA3 (Shoreline)
 - The Islands Trust Community Official Plan Bylaw notes that shore stabilization requires a development permit for the shoreline work. Stantec is recommending that rip rap be added in areas in order to prevent further erosion and damage to foundations. The addition of rip rap may require a development permit.

CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

Permits/ Access Rights
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Figure 8 - Crown Land boundaries (CRD maps)

5.1 ENVIRONMENTAL AND ARCHAEOLOGICAL DISCUSSION

Centennial Park is an artificially constructed waterfront area. The original shoreline was located along Fulford-Ganges Road. The land boundary was extended up to 75m from where the original shoreline was located and consists of approximately 3m of fill on top of the existing beach sands. The figure below is an aerial view of Ganges Harbour taken in 1932. The image is part of an archeological investigation report of the Ganges area completed in 2018 (AOA Study of CRD's Centennial Park Master Plan's Phase I-V Implementation, Ganges, Salt Spring Island, B.C., 2018). The yellow line indicates the present-day location of Centennial Park, located entirely within the artificially constructed shoreline. The red line on the image indicates the current archaeological site boundary; the boundary excludes all of the Centennial Park Boardwalk and at least part of the Grace Point boardwalk.

The work required to be completed along the north-eastern end of Grace Point boardwalk (location that may fall within archaeological boundary), is minimal and mostly consists of work considered as "maintenance". The one exception may be the underpinning work for the existing concrete boardwalk (east end of Grace Point).

For the remedial phase of this project, Stantec recommends that an environmental engineer assess the site to confirm that there are no concerns with the proposed work. At this point, an environmental engineer can provide further guidance on regulations and restrictions that need to be followed for construction within the shoreline area.

CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

Recommendations

March 17, 2021



Figure 9 - Aerial Photo of Ganges Harbour (AOA Study of CRD's Centennial Park Master Plan's Phase I-V Implementation, Ganges, Salt Spring Island, B.C., 2018)

6.0 RECOMMENDATIONS

Stantec completed a condition assessment of the existing Centennial Park and Grace Point boardwalks. Stantec recommends that subsequent condition assessments take place at 5-year intervals.

The boardwalks are currently in use by the public. There is limited information available regarding the construction and age of the structures. Stantec did not complete a load rating of the boardwalk structures; however, it should be noted that these boardwalks have been constructed for "light-duty" pedestrian loading due to the relatively long-spans used for the deck board construction. Vehicle and assembly loading is not recommended for these structures. Stantec reviewed the structures and estimated the residual life of the structural members (refer to **Table 1**). Stantec has also provided an 'Opinion of Cost' estimate for boardwalk elements requiring repair or replacement within the next 5 years, a cost breakdown is included in **Appendix B**.

Stantec is recommending that several boardwalk elements be repaired or replaced immediately or within the next year, as discussed below. It is recommended that topside work and below deck brush clearing work is completed by CRD maintenance staff. The below deck work (timber replacements and foundation underpinning) is recommended to be completed under the guidance of a structural/ marine consultant.

CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

Recommendations

March 17, 2021

6.1 CENTENNIAL PARK BOARDWALK

For the purpose of this assessment, the Centennial Park boardwalk has been considered in five sections (1,2,3,4,5), as seen in **Figure 1**. In 2009, Ryzuk assessed portions of the Centennial Park boardwalk and provided remedial recommendations. During the site review, Stantec observed that some of the Ryzuk recommendation had been completed. However, Stantec found that some of the issues have persisted and require further remediation. Excluding the over water gazebo (section 1) which is currently blocked off from the public, the boardwalk assessed was in-use at the time of the assessment.

Section 1 of the boardwalk, including the timber approach and over water gazebo had several issues that are recommended to be addressed as soon as possible:

- Immediately replace the east 4x12 timber beam that is currently failing.
- Replace pile caps and 10x16 timber blocking.
- Replace approach deck boards.
- Cut the 2x6 outrigger ridge members flush with the edge of the roof, provide flashing at the member ends to avoid further moisture damage.
- Replace the gazebo cedar shake roof.

Section 2 consists of the park gazebo and was found to be in good condition; however, Stantec recommends the following issues are addressed within the next two years:

- Cut the 6x6 outrigger members from the lower and upper roof (12 total) flush with the edge of the roof. Provide flashing at the member ends to avoid further moisture damage.
- Replace the upper and lower gazebo cedar shake roof.

Section 3 of the boardwalk consists of the over-water portion east of the park gazebo. This portion of the boardwalk appears to be in generally fair condition; however, the concrete foundations are in poor condition due to undermining. Stantec recommends that the following issues be addressed within the next year:

- Replace approximately 20% of deck boards in poor condition.
- Underpin the concrete strip footings for the extent of Section 3.
- Add rip rap below the boardwalk to provide protection for underpinned footings.

Sections 4 and 5 of the boardwalk are located at grade, supported by concrete strip footings. The footings are severely undermined, and the deck boards are nearing end of life. Stantec recommends that these portions of boardwalk be removed and replaced within the next two years.

CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

Recommendations

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6.2 GRACE POINT BOARDWALK

For the purpose of this assessment, the Grace Point boardwalk has been considered in three sections (sections 6,7,8), as seen in **Figure 1**. There is no record of these portions of boardwalk being reviewed in the past.

Section 6 of the boardwalk is the furthest west portion of the Grace Point boardwalk. The boardwalk is used by the adjacent businesses. Stantec recommends that the following issues be addressed within the next year:

- Immediately replace approximately 10% of deck boards in poor condition.
- Add rip rap below the boardwalk to provide protection for the small portion of foundation requiring underpinning.
- Remove ferns, tree roots and bramble from below the structure prior to adding new rip rap.

Section 7 of the boardwalk is the eastern, timber portion of the Grace Point boardwalk, located adjacent to private properties. Stantec recommends that the following issues be addressed within the next year:

- Immediately replace approximately 10% of deck boards in poor condition. Stantec recommends a full deck replacement in the next 5 years, including replacement of the north stringers and further review of the remaining below deck timber components.

Section 8 is the concrete portion of the walkway located furthest east. Stantec recommends that the following issues be addressed within the next year:

- Underpin the concrete foundation for the extent of section 8.

**APPENDIX A:
PICTURE APPENDIX**

Appendix A ASSESSMENT PHOTOS



Image 1 – Section 1: General view of Boardwalk approach and gazebo



Image 2 – Section 1: (a) Concrete abutment and (b) rotten member



CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

Appendix A Assessment Photos

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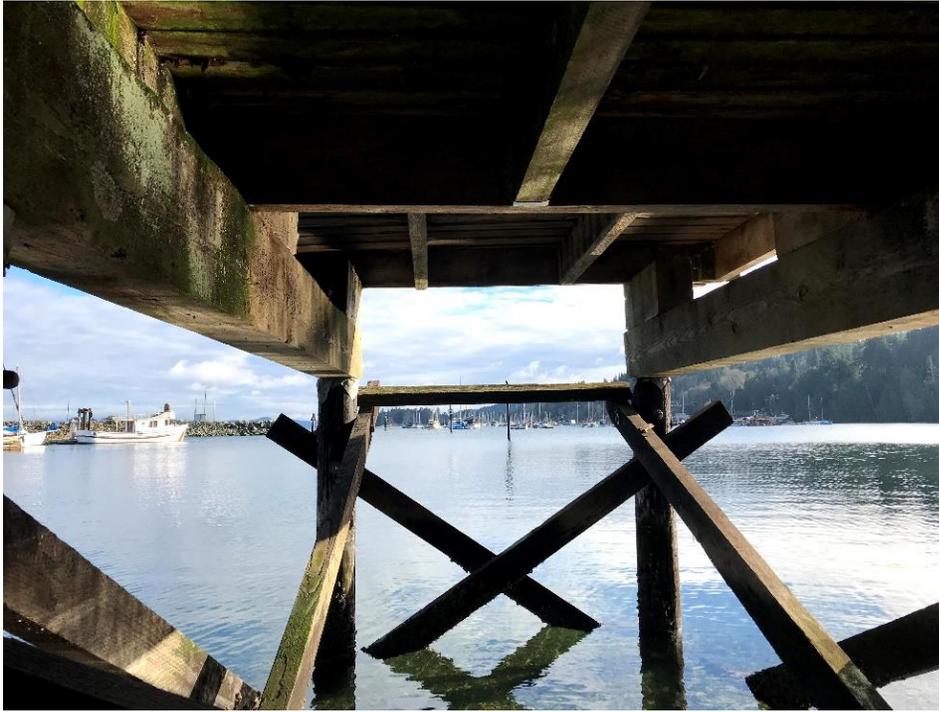


Image 3 – Section 1: General view of framing from underside of approach



Image 4 -Section 1: General view of gazebo structure listing to the left



CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

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Image 5 – Section 1: (a) General view of gazebo superstructure (b) General view of decking and guardrail



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Image 6 - Section 1: (a) Failing edge beam in very poor condition (b) General view of 2x6 outrigger in poor condition.



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Image 7 - Section 2: (a) General view of park gazebo (b) General view of gazebo framing



CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

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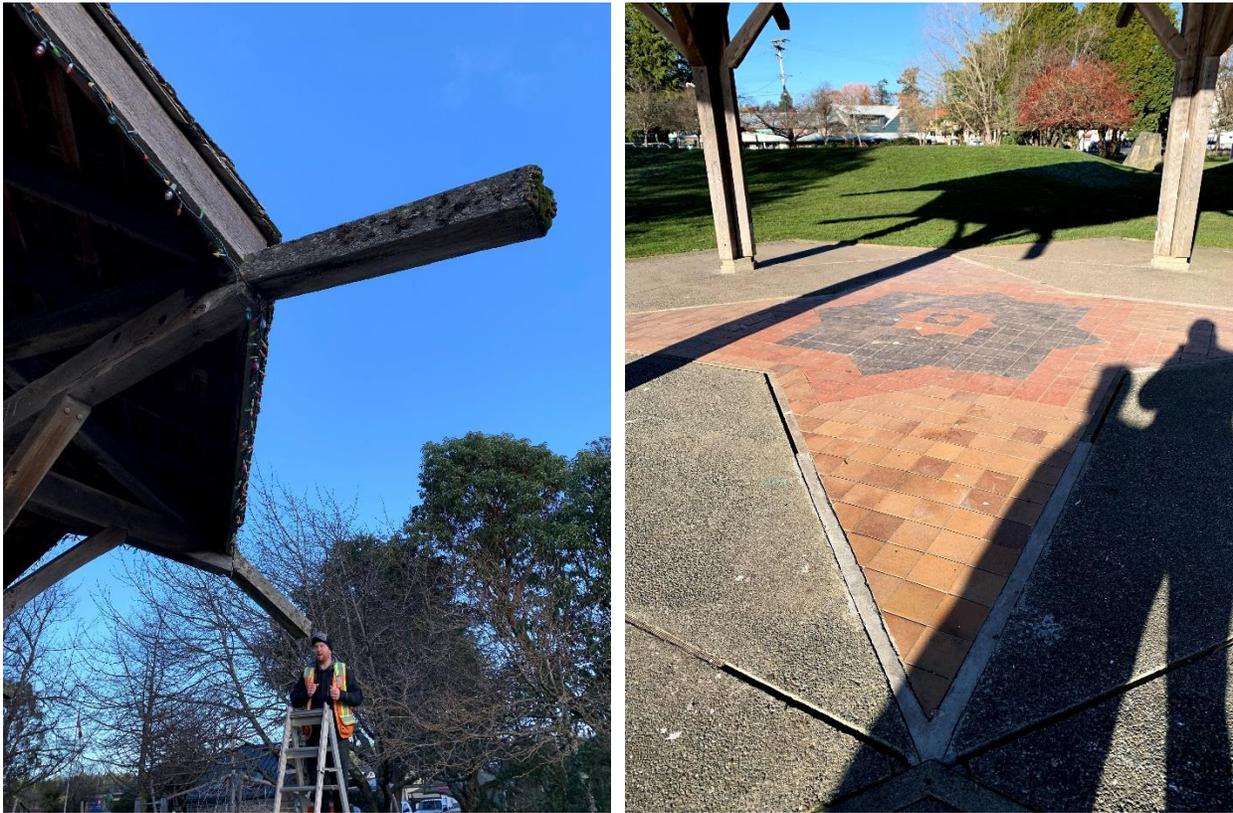


Image 8 - Section 2: (a) General view of outrigger in poor condition (b) General view of concrete slab

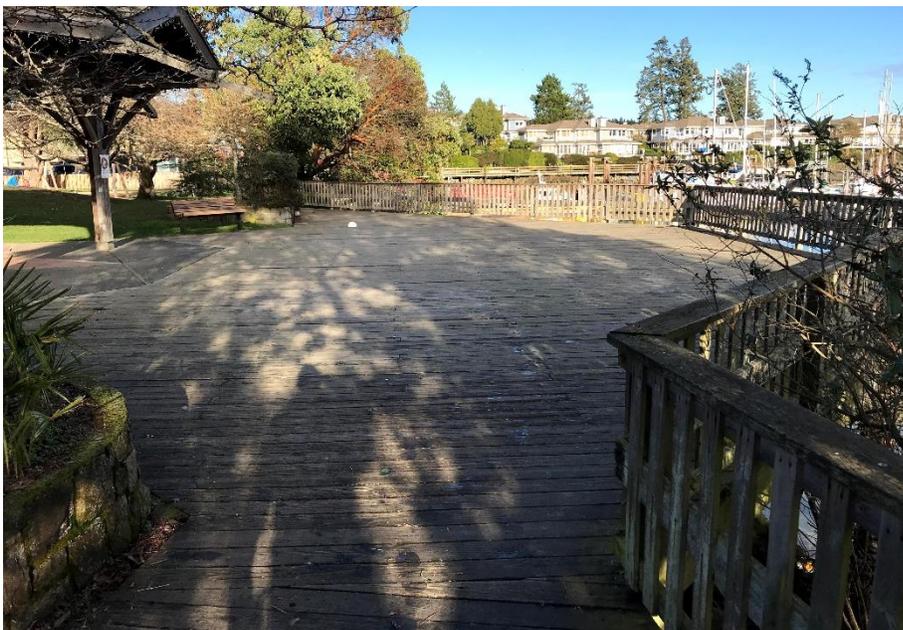


Image 9 - Section 3: General view of pile supported boardwalk



CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

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Image 10 - Section 3: (a) Typical condition of boardwalk deck (b) General view of guardrail (note: guardrail leans outwards)



Image 11 - Section 3: General view at underside of pile supported boardwalk



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Image 12 - Section 3: (a) View of 10x16 pile cap with areas of rot at underside (b) Typical view of undermined footing



Image 13 - Section 3: General view of previous foundation underpinning and formwork still in place



CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

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Image 14 - Section 4: (a) General view of boardwalk at grade (b) Typical condition of decking



Image 15 - Section 4: General view of undermined foundation



CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

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Image 16 - Section 5: (a) General view of boardwalk at grade (b) Typical condition of boardwalk decking



CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

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Image 17 - Section 5: (a) Uneven deck due to unstable concrete footings below (b) General view of guardrail



Image 18 - Section 5: Significant undermining of concrete strip footing



CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

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Image 19 - Section 6: General view of pile supported boardwalk



Image 20 - Section 6: General view of partial height walls and post supported on decking



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Image 21 - Section 6: (a) Deck board in very poor condition (b) Guardrail, typical for extent of boardwalk (note: repair required at corner)



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Image 22 - Section 6: Wood column, no support below deck (b) Concrete pile footing (2 total)



Image 23 – Section 6: General view of boardwalk framing from underside



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Image 24 – Section 6: Notched pile supporting pile cap



Image 25 – Section 6: Cantilevered deck over pile cap



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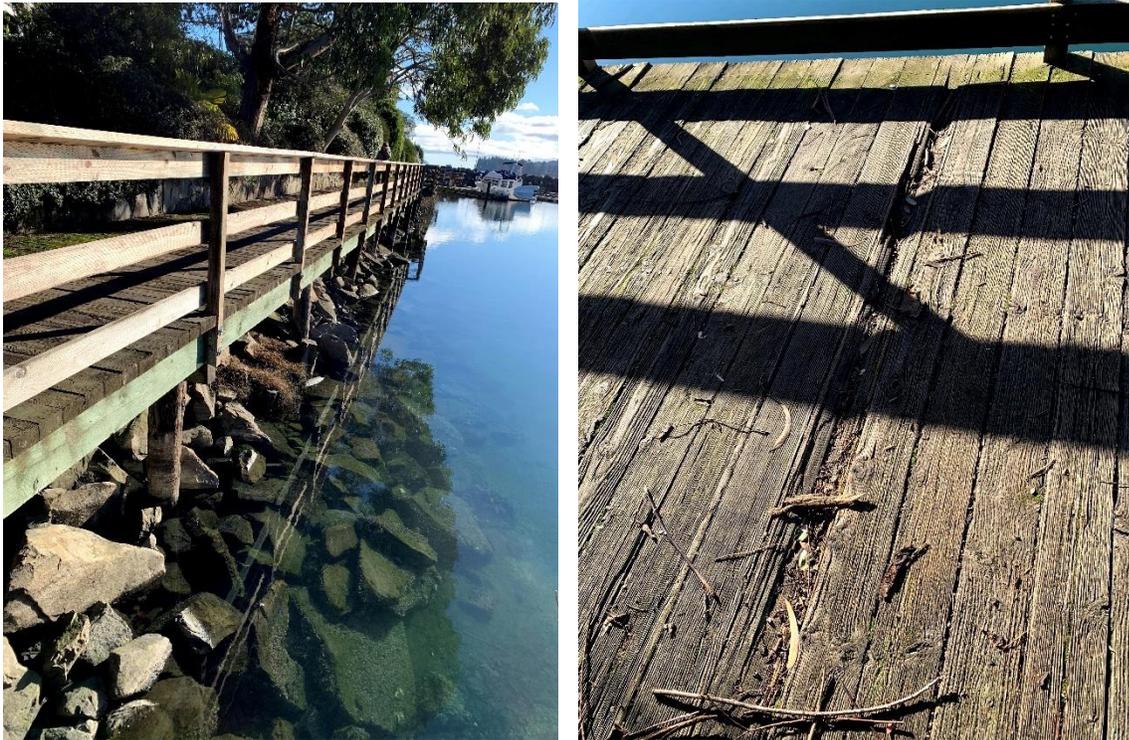


Image 26 - Section 7: (a) General view of boardwalk (b) Deck boards in very poor condition

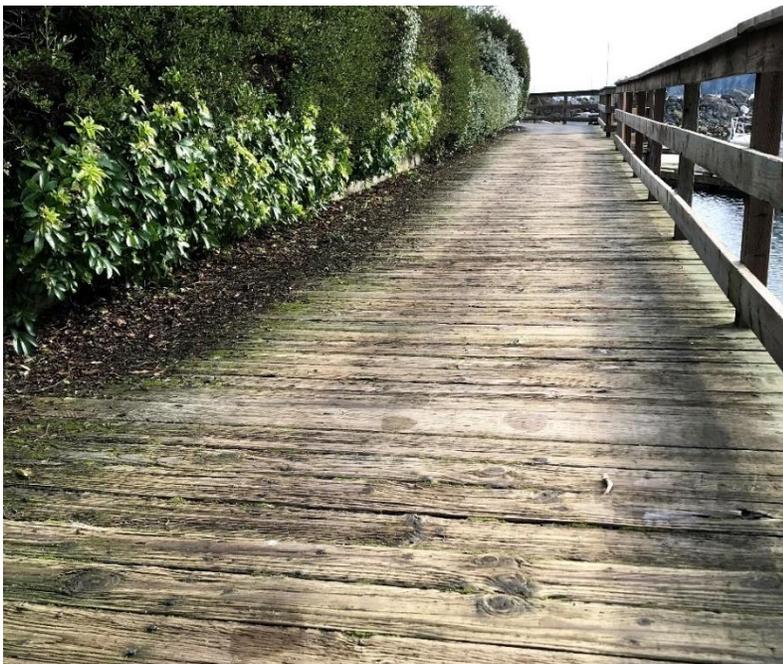


Image 27 - Section 7: Bushes overhanging deck, fallen organic matter is contributing to accelerated decay of the deck boards



CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

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Image 28 - section 7: (a) General view of guardrail (b) General view of rock retaining wall at north side of boardwalk



Image 29 - Section 7: General view from underside of boardwalk



CENTENNIAL PARK AND GRACE POINT BOARDWALK STRUCTURAL ASSESSMENT

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Image 30 - Section 7: View of central support, Stringer support condition unknown at north end

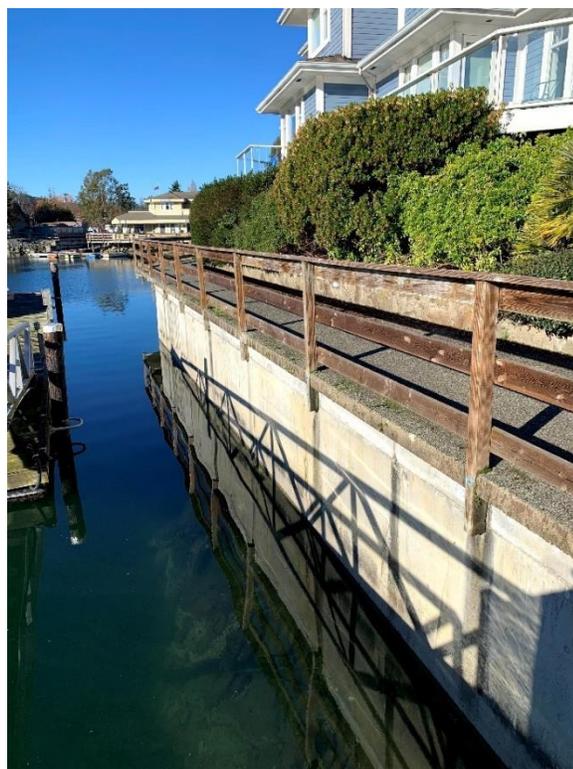


Image 31 - Section 8: (a) General view of concrete walkway deck (b) General view of concrete foundation wall



OPINION OF COST (STANTEC)

Appendix B OPINION OF COST

Opinion of Probable Cost – Capital Regional District

Project Name: Centennial and Grace Point Boardwalks
 Estimate Type: Class D: Opinion of Probable Cost
 Prepared For: Capital Regional District
 Date: 9-Mar-21

Remediation	Component Description	Component Condition	Residual Life	Quantity	Unit	Rate	Cost (2021 \$)	Comments	Image Reference (Appendix A)
Centennial Park Boardwalk									
Section 1 - Timber Approach and Above Water Gazebo Structure									
Underpin Concrete Foundations	CIP Concrete	Poor	1 Year	4	m	\$ 2,500.00	\$ 10,000.00		2
Replace Deck	3x6 PT	Poor to Fair	2 year	28	m ²	\$ 200.00	\$ 5,600.00		5
Replace End Beam add steel hangers for stringers	4x12 PT	Very Poor	Immediate	1	per	\$ 10,000.00	\$ 10,000.00	Existing beam has failed, causing listing in the gazebo structure. Temporary support and leveling deck included in cost	4,6
Replace Pile Caps and 10x16 timber blocking	10x16 PT	Fair	2 year	2	per	\$ 5,000.00	\$ 10,000.00	Significant rot found in both pile caps and 4x12 cross member	2, 3
Replace Guardrails	Pressure-Treated	Fair	2 years	15	m	\$ 250.00	\$ 3,750.00		5
Replace Roof	Cedar Shake	Poor	2 years	20	m ²	\$ 160.00	\$ 3,200.00		1,6
Cut Back and Flash Outriggers		Fair	2 years	4	per	\$ 300.00	\$ 1,200.00	Cut back outriggers and protect exposed timbers with flashing	6
Section 2 - Park Gazebo									
Replace Roof	Cedar Shake	Fair	2 years	75	m ²	\$ 160.00	\$ 12,000.00		7
Cut Back and Flash Outriggers		Fair	2 years	12	per	\$ 300.00	\$ 3,600.00	Cut back outriggers and protect exposed timbers with flashing	7,8
Section 3 - Over-Water Boardwalk (East of Park Gazebo)									
Underpin Concrete Foundations	CIP Concrete	Poor	1 Year	25	m	\$ 2,500.00	\$ 62,500.00		12,13
Add Rip Rap	0.5m x 0.5m min	Fair	1 Year	25	m ³	\$ 300.00	\$ 7,500.00	To protect concrete repairs	
Replace Deck Boards	3x6 PT	Fair to Poor	1 year	26	m ²	\$ 200.00	\$ 5,200.00	20% of boards to be replaced now	10
Replace Entire Deck	3x6 PT	Fair to Poor	5 years	104	m ²	\$ 200.00	\$ 20,800.00	80% of boards to be replaced within 5 years	10
Replace Guardrails	Pressure-Treated	Fair	3 years	25	m	\$ 250.00	\$ 6,250.00		10
Section 4 & 5 - Boardwalk on Grade									
Replace Boardwalk	PT Timber supported by concrete piers	Fair to Poor	2 years	140	m ²	\$ 1,500.00	\$ 210,000.00	Existing foundations are undermined for large portions. Replacement is preferable to repairing. Deck is in poor condition	14,15,16,17,18
Centennial Park Subtotal							\$ 371,600.00		
Grace Point Boardwalk									
Section 6 -Storefront Over-Water Boardwalk									
Clear brambles, ferns, and tree roots		Fair	1 Year	1	per	\$ 5,000.00	\$ 5,000.00		23
Add Rip Rap	0.5m x 0.5m min	Fair	2 Years	4	m ³	\$ 300.00	\$ 1,200.00	To protect south-west corner	
Replace Failed Deck Members	3x6 PT	Poor	Immediate	19	m ²	\$ 200.00	\$ 3,800.00	10% deck members need immediate replacement	21
Full Deck Replacement	3x6 PT	Fair	5 years	57	m ²	\$ 250.00	\$ 14,250.00	Partial height walls to be removed and replaced	21
Section 7 - Over -Water Boardwalk									
Replace 6x12 Stringers		Fair	5 years	106	m	\$ 150.00	\$ 15,900.00	Existing member needs to be replaced due to continuous contact with subgrade	29,30
Replace Failed Deck Members	3x6 PT	Poor	Immediate	19	m ²	\$ 200.00	\$ 3,800.00	10% deck members need immediate replacement	26
Full Deck Replacement	3x6 PT	Fair	5 years	133	m ²	\$ 200.00	\$ 26,600.00		26, 27
Section 8 - Concrete Walkway									
Underpin Concrete Foundations	CIP Concrete	Poor	3 Years	30	m	\$ 2,500.00	\$ 75,000.00	To protect east end wall foundation from scouring	31
Grace Point Subtotal							\$ 145,550.00		
Additional Costs									
Engineering (10%)							\$ 51,715.00		
Contractor Overhead, Mob./ Demob. Profit (20%)							\$ 103,430.00		
Contingency (30%)							\$ 155,145.00		
Total Cost							\$827,440.00		

Notes:

Limits of Commission: Stantec does not guarantee the accuracy of these opinions of probable cost and shall have no liability where the probable costs are exceeded.