
TO
Doug DeMarzo, MCIP RPP
Manager of Parks
Community Services Branch

FROM
Graham Forsyth, E.I.T.
Matthew Friderichs, P.Eng.

COMPANY
Comox Valley Regional District

MCSL BRANCH
2211 – Courtenay

RE
Structural Inspection of Shingle Spit Boat Launch.

DATE
October 29, 2018

MCSL FILE NUMBER: 2211 - 70571

1. Background

McElhanney Consulting Services Ltd. (McElhanney) was retained by the Comox Valley Regional District (CVRD) to provide engineering services for a structural inspection and survey of the Shingle Spit boat launch.

The intent of the inspection is to complete a condition assessment of the boat ramp, survey the surrounding area, and provide recommendations for returning the boat ramp to a functional state.



Figure 1 – View of Ramp Towards Ferry

The boat launch is located south of the Shingle Spit B.C Ferry Terminal (Figure 1) and consists of a reinforced cast-in-place concrete slab supported on structural fill, confined by two reinforced cast-in-place walls. It is the only public access boat ramp on Hornby Island.

2. Inspection Findings

2.1 Approach Area

The approach area appears to be in fair condition. Typical inspection findings are as follows:

- The road is in fair condition, without any large potholes or collapsing sides (Figure 2).
- The parking lot has room for up to 6 small trailers but would be insufficient for multiple larger trailers (Figure 3).
- The beach generally consists of cobbles, 75-100 mm in diameter, with some larger rocks.
- The beach becomes more sandy and silty as you approach the low tide level at the bottom end of the ramp.
- There is a steady flow of water from the approach area, which runs beneath the ramp and into the ocean.
- The seabed from the end of the ramp is in good condition, as there are no major rocks or debris.



Figure 2 – Access Road



Figure 3 – Parking Lot South of Boat Launch

2.2 Concrete Ramp Surface

The surface of the boat launch is in very poor condition with significant deterioration below the high-water mark. Inspection findings are as follows:

- Cracks run both longitudinally and laterally across the surface, with many extending entirely through the slab.
- Large portions of the lower ramp have delaminated (Figure 4).
- On the north side of the ramp, portions of concrete are spalled, and cracks range up to 115 mm wide.
- Concrete reinforcement has been exposed from surface deterioration. More than 24 scattered ends are protruding out of the topside, to 10mm in height (Figure 5 and 6). Approximately 11 longitudinal lengths of reinforcement are exposed on the surface.
- The portion of the ramp above the tideline is in fair condition, with minor to moderate cracking (Figure 7).



Figure 4 – View of Lower Ramp with Water Damage



Figure 5 – Rebar Out of Surface



Figure 6 – Bottom End Exposed Rebar and Loose Concrete



Figure 7 – Top End, Looking Down Ramp

2.3 Side Walls

The side walls of the ramp are in poor condition. Typical inspection findings are as follows:

- Along both side walls, approximately 150 mm down from the top edge, a longitudinal crack runs down the entire length of the launch. Several vertical cracks also exist along these walls (Figure 9).
- Spalled concrete lies on either side of lower ramp (Figure 10).
- Erosion is occurring along the bottom edges of the side walls along the entire length of the boat launch. A 50 mm gap can be seen below the wall in a number of locations (Figure 11).



Figure 8 – Longitudinal and Vertical Cracks



Figure 9 – South Side of Ramp



Figure 10 – View of Lower Ramp Spalled Concrete and Reinforcement



Figure 11 – View of Gap Beneath Wall

2.4 End of Ramp

The condition of the ramp bottom end is poor. Typical inspection findings are as follows:

- There is steel reinforcement exposed at the bottom end of the ramp due to severe spalling (Figure 12).
- The end of the ramp drops off 146 mm to the cobbles (Figure 12).
- Water is flowing from under the slab and out the bottom end, visible at low tide (Figure 13).



Figure 12 – View of Bottom End



Figure 13 – View of Bottom End Right Side and Water Flow

3. Discussion

The boat ramp is severely deteriorated and poses a hazard to users. The uneven surface and exposed reinforcement could damage trailers or vehicles. Additionally, the deterioration presents a tripping hazard to users on foot.

It appears that there is a significant drainage beneath the boat ramp. This drainage has washed away fines from beneath the ramp, causing the structural fill to settle (Figure 14). As the fill settled, the slab had to span between the supporting walls, carrying its own weight as well as the weight of vehicles on the ramp. The concrete slab has likely surpassed its capacity and fractured at the centre of its span. This resulted in the longitudinal crack running down the centre of the slab, as well as the cracks running along the length of the supporting walls. As the drainage continues to wash away more of the structural fill, the slab will deteriorate further, resulting in progressive damage and collapse.

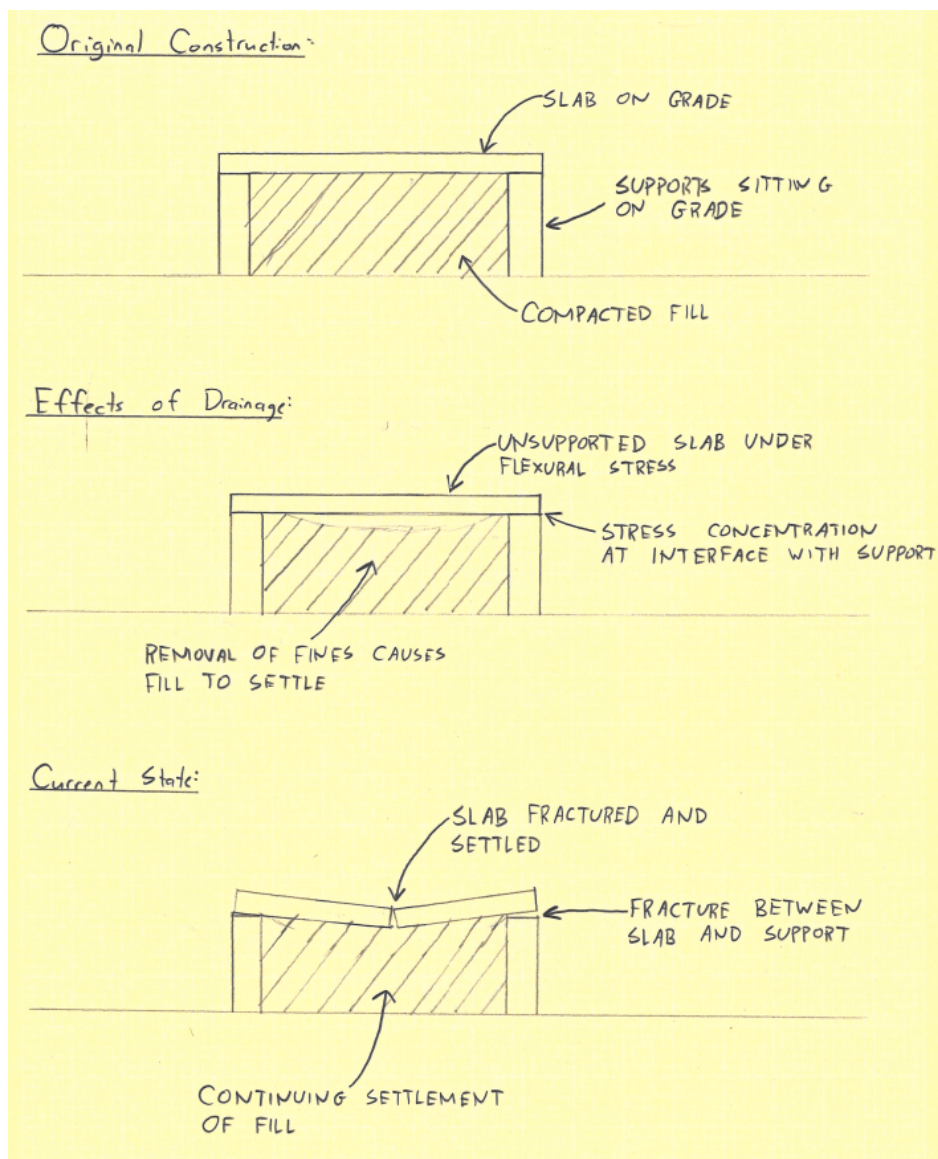


Figure 14 – Diagram of Boat Ramp Deterioration

Due to the extent of repairs/rehabilitation that would be required, McElhanney recommends replacing the entirety of the boat ramp.

In the interim, McElhanney strongly recommends that the CVRD install signage which alerts boat ramp users to the conditions and potential risks of accessing the ramp.

4. Replacement Ramp

The new boat ramp would be constructed mostly within the footprint of the existing ramp, to reduce its environmental impact. The current boat ramp slopes at a grade of 15%, which is appropriate for a boat ramp of this size and would be retained in the new ramp. The current ramp stops short of the low tide line, McElhanney recommends extending the new ramp below this line. Curbs could also be added along the length of the ramp to make it safer for users. This proposal has been overlaid on the site plan found in Appendix A.

Two construction options have been identified to replace the boat ramp, as detailed below.

4.1 Option 1: Cast-in-place

Construction Methodology

- Demolition of existing structure
- Pour reinforced cast-in-place concrete side walls
- Place structural fill, including non-woven geotextile to prevent future migration of fines
- Cast slab-on-grade

Benefits/Drawbacks

- More work onsite and likely longer construction duration.
- Greater environmental impact with cast-in place concrete in the intertidal zone.
- Likely cheapest option.

Estimated construction cost: \$200,000

4.2 Option 2: Precast

Construction Methodology

- Demolition of existing structure
- Place precast wall segments and pour wall joints between adjacent segments.
- Place structural fill, including non-woven geotextile to prevent future migration of fines.
- De-water area as required and pave

Benefits/Drawbacks

- More expensive
- Less time spent onsite and faster construction.
- No requirement for future concrete repairs. It should be noted that the asphalt overlay may not have the same service life as the concrete slab-on-grade.
- Less environmental impact

Estimated construction cost: \$280,000

5. Summary

The Shingle Spit boat launch has experienced extensive deterioration, to the point where it has become unusable for many users. Erosion has caused the slab to fracture and collapse, and large portions of the ramp have spalled off. This has resulted in large spalling, cracking, and exposed reinforcement along the surface of the ramp.

Due to the fracture of the slab, and the irreversible loss of structural fill, any remediation work would be costly and largely ineffective. Therefore, McElhanney recommends removing the existing boat launch and constructing a new ramp in its place.

6. Closure

This document is for the sole use and reliance of the Comox Valley Regional District and McElhanney Consulting Services Ltd. The material in this report reflects McElhanney's best judgment based on the information available to it at the time of preparation. Any use of this report by a third party or any reliance on or decisions made based on it are the responsibility of such third parties. McElhanney accepts no responsibility for damages suffered by any third party as a result of decisions made or actions based on this report.

McElhanney Consulting Services Ltd.

Report Prepared by:



Graham Forsyth, E.I.T.

Structural Engineer

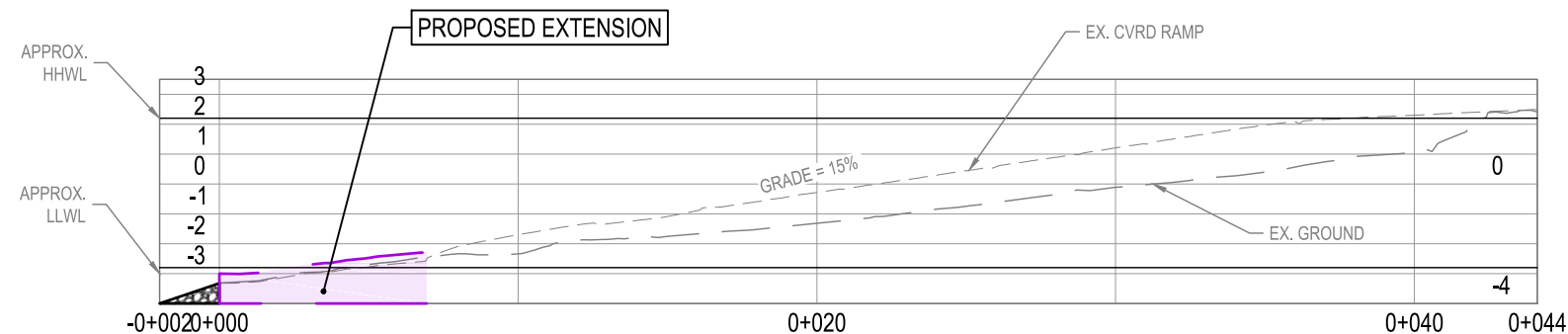
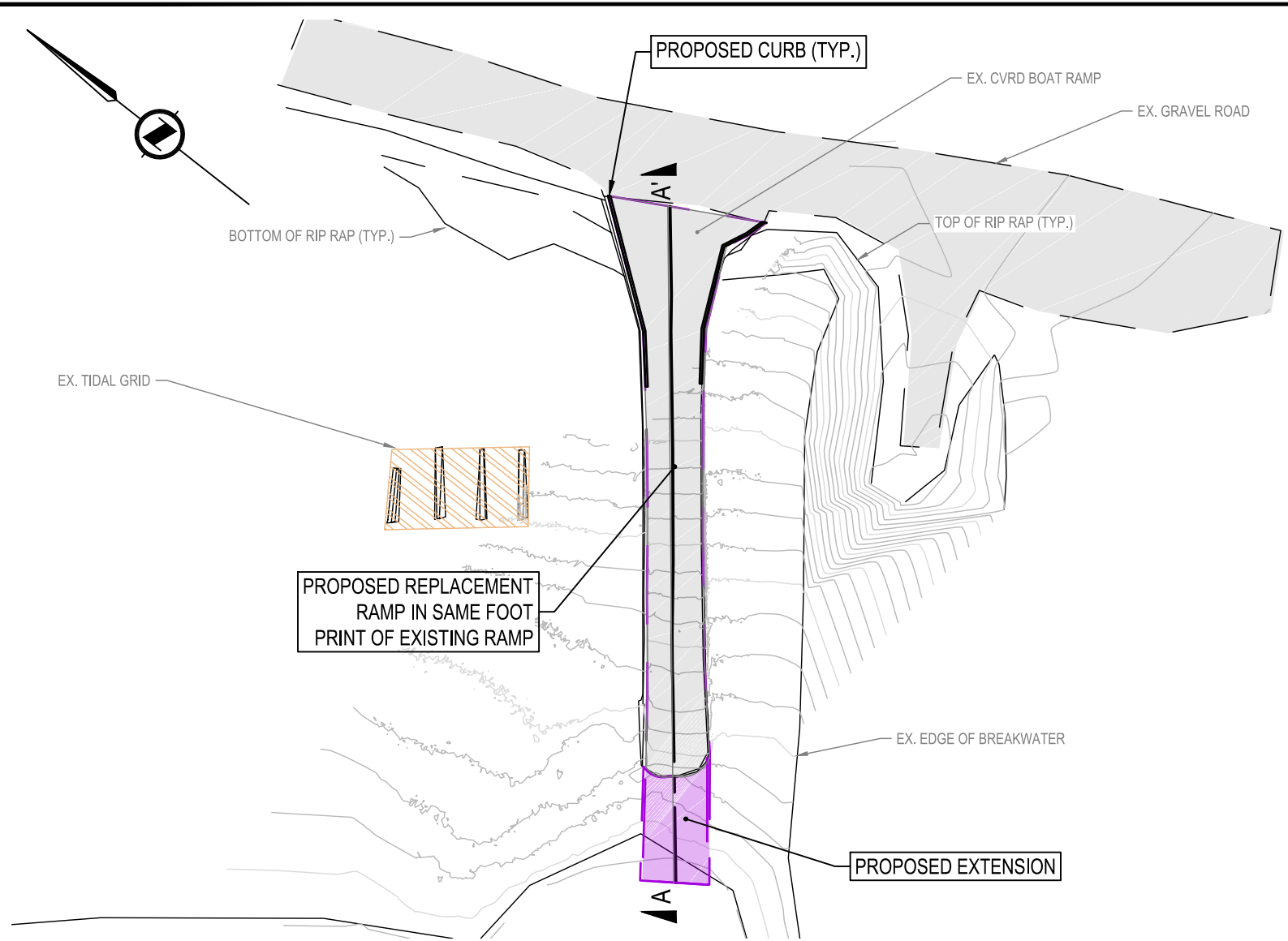
Report Reviewed by:



Matthew Friderichs, P.Eng.

Marine Structures Lead

Appendix A
Site Plan



A-A' CVRD BOAT RAMP CROSS SECTION
 SCALE H 1:100
 V 1:100



BOAT RAMP LOOKING NORTH



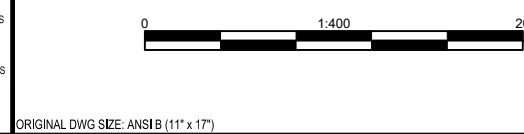
LOWER RAMP WITH SEVERE DETERIORATION TO CONCRETE



SEVERE OVERSTRESSING ON TOP SLAB OF RAMP

Rev	Date	Description	Drawn	Design	App'd
0	2018-09-28	ISSUED FOR REVIEW	AJF	AJF	MF

THIS DRAWING AND DESIGN IS THE PROPERTY OF McELHANNEY CONSULTING SERVICES LTD. (McELHANNEY) AND SHALL NOT BE USED, REUSED OR REPRODUCED WITHOUT THE CONSENT OF McELHANNEY. McELHANNEY WILL NOT BE HELD RESPONSIBLE FOR THE IMPROPER OR UNAUTHORIZED USE OF THIS DRAWING AND DESIGN. THIS DRAWING AND DESIGN HAS BEEN PREPARED FOR THE CLIENT IDENTIFIED, TO MEET THE STANDARDS AND REQUIREMENTS OF THE APPLICABLE PUBLIC AGENCIES AT THE TIME OF PREPARATION. McELHANNEY, ITS EMPLOYEES, SUBCONSULTANTS AND AGENTS WILL NOT BE LIABLE FOR ANY LOSSES OR OTHER CONSEQUENCES RESULTING FROM THE USE OR RELIANCE UPON, OR ANY CHANGES MADE TO, THIS DRAWING, BY ANY THIRD PARTY, INCLUDING CONTRACTORS, SUPPLIERS, CONSULTANTS AND STAKEHOLDERS, OR THEIR EMPLOYEES OR AGENTS, WITHOUT McELHANNEY'S PRIOR WRITTEN CONSENT. INFORMATION ON EXISTING UNDERGROUND FACILITIES MAY NOT BE COMPLETE OR ACCURATE. McELHANNEY, ITS EMPLOYEES AND DIRECTORS ARE NOT RESPONSIBLE NOR LIABLE FOR THE LOCATION OF ANY UNDERGROUND CONDUITS, PIPES, CABLES OR OTHER FACILITIES WHETHER SHOWN OR OMITTED FROM THIS PLAN. PRIOR TO CONSTRUCTION CONTRACTOR SHALL EXPOSE LOCATIONS OF ALL EXISTING FACILITIES BY HAND DIGGING OR HYDROVAC AND ADVISE THE ENGINEER OF POTENTIAL CONFLICTS.



McElhanney
 McElhanney Resource Services Ltd.
 1211 Ryan Road
 Courtenay BC
 Canada V9N 3R6
 Tel 250 338 5495

COMOX VALLEY REGIONAL DISTRICT
 COURTENAY, BC
SHINGLE SPIT BOAT RAMP
 SITE PLAN
 PROPOSED BOAT RAMP IMPROVMENTS
 HORNBY ISLAND, BC

Drawing No.	SK-01
Project Number	2211-70571-00
Rev.	0