



## 5. Summary and Recommendations

### 5.1 Summary

The Ocean Boulevard Pump Station is exposed to three different flooding hazards from the sea:

- “Blue water” flooding in which the station is below the mean sea level and is inundated. Blue water flooding to 2.45 m CGVD is currently not probable; however based on sea level rise predictions; blue water flooding is expected to occur every 56 years by the end of the station’s expected life.
- Storm wave or “white water” flooding in which the station is periodically flooded by waves as they run-up the beach but in general, the ground does not have standing water. Storm wave flooding to 2.45 m CGVD is currently expected to occur every 5 years and increase in frequency due to sea level rise to become an annual occurrence by the end of the station’s expected life (2065).
- Tsunami wave flooding which, for planning purposes, should be expected to completely destroy the building and render the station inoperable. There is estimated to be a 9% chance that the pump station will be impacted by a CSZ tsunami before the service life of the pump station is reached.

Several options have been developed to mitigate these flood hazards as follows:

1. Construction of a protection berm and flood-proofing the station;
2. Emergency planning;
3. Moving the pump station.

If the City wishes to implement a “lower cost, higher risk” mitigation strategy, wet flood-proofing vulnerable equipment is considered to be the best near-term mitigation strategy to manage the “blue water” flooding hazard. In the long-term, moving the pump station at the end of its remaining service life is considered to be the best mitigation strategy. Construction of a berm seaward of the station in a phased approach is considered to be the best strategy to manage the storm wave flooding hazard. The tsunami wave flooding hazard is considered to be best managed through emergency planning.

Specific flood hazard mitigation components recommended to be implemented in the near-term include:

- Construction of a berm on the seaward side of the station with a crest elevation of 4.2 m CGVD;
- Flood-proofing the ventilation/odour control kiosk by raising it; and
- Preparation of an emergency management plan for tsunami and procuring the necessary equipment for the plan.

Specific flood hazard mitigation components recommended to be implemented in the longer-term include:

- Moving the station outside the flood hazard areas for sea level rise and tsunami after the end of its service life, currently estimated to be 2065.
- Raising the berm on the seaward side of the station to a crest elevation of 4.8 m CGVD. It is currently estimated that the berm will need to be raised in 2025 but if sea level rise is less than expected (less than 0.25 m) the berm raising can be deferred; and,
- Flood-proofing the wet well hatches and electrical room doors concurrently with raising the berm.



If the City is not tolerant of the risk associated with construction of a berm and flood-proofing or construction of a berm and flood-proofing is found to be not feasible due to the associated aesthetic impact and potential environmental impact (which would require further study and potential mitigation), then moving the pump station to higher ground is considered to be the best option.

## 5.2 Recommendations

The City should consider the aesthetic impacts of constructing a berm and flood-proofing and their risk tolerance and decide whether to construct a berm and flood-proof the station or move the station.

If constructing a berm and flood-proofing is preferred, then it is recommended that:

- A detailed topographic survey of the road should be performed to confirm that water the overtops the beach north and south of the berm will not flood the station;
- The area surrounding the Ocean Boulevard Pump Station is a known archaeological site therefore an archaeological impact assessment should be performed;
- An aquatic effects assessment should be performed to support a DFO application;
- The land tenure in the area of the proposed berm should be investigated;
- Appropriate stakeholders should be consulted with regard to the proposed works;
- An emergency management plan for tsunami should be prepared;
- The City should consider procuring land for the relocated pump station when it becomes available;
- The flood hazard assessment performed as part of this assignment should be periodically revisited based on updated sea level rise projections and tsunami risk assessments; and
- The erosion of the Coburg Peninsula should be monitored; particularly in the area of the pump station.

If moving the pump station is preferred, then it is recommended that the City commission a study to develop options for moving the station and prepare a refined conceptual design and cost estimate for the preferred option. This study should use the latest sea level rise projections available at the time of the study and consider land availability and cost, neighbourhood plans and master planning for sewer servicing.



### 5.3 Report Submission

Prepared by:

**KERR WOOD LEIDAL ASSOCIATES LTD.**

---

Eric Morris, M.A.Sc., P.Eng.  
Project Manager

Reviewed by:

A handwritten signature in blue ink, appearing to read 'Dave Murray', is positioned above a horizontal line.

---

Dave Murray, A.Sc.T., CPESC., P.Eng.  
Project Reviewer



## Statement of Limitations

This document has been prepared by Kerr Wood Leidal Associates Ltd. (KWL) for the exclusive use and benefit of the CITY OF COLWOOD for the Ocean Boulevard Pump Station Protection Plan. No other party is entitled to rely on any of the conclusions, data, opinions, or any other information contained in this document.

This document represents KWL's best professional judgement based on the information available at the time of its completion and as appropriate for the project scope of work. Services performed in developing the content of this document have been conducted in a manner consistent with that level and skill ordinarily exercised by members of the engineering profession currently practising under similar conditions. No warranty, express or implied, is made.

## Copyright Notice

These materials (text, tables, figures and drawings included herein) are copyright of Kerr Wood Leidal Associates Ltd. (KWL). The CITY OF COLWOOD is permitted to reproduce the materials for archiving and for distribution to third parties only as required to conduct business specifically relating to Ocean Boulevard Pump Station Protection Plan. Any other use of these materials without the written permission of KWL is prohibited.

## Revision History

Revision #	Date	Status	Revision	Author
A	October 4, 2015	Draft		EM
0	June 29, 2016	Final	Revised based on Client Comments	EM
1	July 4, 2016	Revision 1	Revised based on Client Comments	EM