

J. North West Marine Drive at Wesbrook Crescent

The cliffs immediately to the north of North West Marine Drive at Wesbrook Crescent have eroded to within 6 meters of the road in this area. A sanitary sewer line (installed 1993-94) runs parallel to the road on the cliff side at this point; a storm sewer line is situated on the opposite side of the road. Both the road and the sewer lines face threats if there is ongoing erosion of the cliffs in this area. The main actual and potential causes of the erosion appear to be seepage of ground water emerging from the face of the cliff, trees on the face of the cliff and insufficient protection to the toe of the cliff from waves. It is also possible that storm water could accumulate in the fill material of the sanitary sewer line, contributing to the ground water seepage on the cliff face however tests done to date indicate that this is not likely a serious threat.

Possible actions to reduce groundwater erosion threats to North West Marine Drive at Wesbrook Crescent include:

1. Conduct hydrogeological survey of this area to determine the actual extent of groundwater and the underground location(s) where this water accumulates
2. Take action to divert ground water currently seeping out of the cliff face using one of the following options:
 - OPTION 1* - Drill 1-3 wells to intercept ground water that is currently draining on the cliff face and drain this to a lower level that emerges below the cliff toe
 - OPTION 2* - Drill an inclined bore hole from the beach level to the mid cliff clay strata to drain ground water before it reaches the cliff face
3. Capture and divert storm water which accumulates in the bedding material of the sanitary sewer trenches into the storm water system on the far side of road to eliminate potential build up of water in trench (contribution to groundwater and possible overflowing over the cliff edge)

Possible actions to take to protect the cliff face at North West Marine Drive and Wesbrook Crescent include:

4. Initiate a tree management program to protect from uprooting; perhaps use "stumps" as natural mechanical anchors for new cribbing system
5. Where appropriate for slope stability, re-vegetate the slope

Possible actions to take to protect the cliff toe at North West Marine Drive and Wesbrook Crescent include:

6. Carry out berm and/or sill work on the beach to protect the toe of the cliff

Possible actions to take to reduce human causes of erosion at North West Marine Drive and Wesbrook Crescent include:

7. Address issue of shortcut trails with fencing and/or vegetation barriers such as blackberry

Other possible actions to take to address erosion threats to North West Marine Drive and Wesbrook Crescent include:

8. *IF the above measures to protect this area are not feasible or sustainable, relocate Marine Drive and the sanitary sewer lines from this area*