









NALCOR has incorporated the usual slope stabilization techniques into the re-shaped North Spur. They were based on analysing the existing slopes to obtain a benchmark for the LEM calculations, as follows -

- *Calculations are based on slope geometry, soil properties, groundwater properties.*
- *Calculations are calibrated locally with an existing slope.*
- *Rotational, flowslide, spread stability is calculated with a first movement at the toe.*
- *There is no evidence of downhill progressive failure landslide along the Churchill River valley.*
- *Counter measure will be in place to control "Human triggering."*

Source – North Spur Stabilization works, presentation 21 July 2014, slide 9.

NALCOR has used all the common measures to enhance slope stability, including flattening of the slopes, adding a toe berm, adding two cut-off walls, and improving drainage with wells and finger drains. All sound measures which will result in a stable slopes and a safe dam.

However, there is still the issue of toe erosion resulting in loss of rip-rap placed at the toe. The erodible material, silt and clay, extends down far below water level, but the rip-rap is placed only on the above-water soil, and perhaps for about a meter below water. It needs to be extended much further below water level to provide added protection. Also it would be prudent to place a large stockpile of suitable rip-rap somewhere on site, where it can be used by a maintenance crew, to replace lost toe rip-rap.

Finally, there is one unexplained issue, and that is the statement by a driller that the drill casing dropped 40ft. overnight, from 20ft. above ground to 20ft. below ground, indicating very soft material. Sonic (vibrating) drill hole locations and logs are included in the AMEC Appendix A for the FINAL – Geotechnical investigations Report, dated November 2013. A total of 4 sonic drill holes were undertaken. For drill hole NS 2-13, located on the Spur crest near the south end, there is a note that at El. 23.0m, *"the core barrel dropped from 3.35m"*. And again at El. 7.7m *"Core barrel dropped from 4.88m"*. Drilling continued down to El. -53.7m. Again for hole NS-05-13 at El. 48 - *"casing and drill rods settling into clay. Free weight. Driller not vibrating."* Unfortunately, there is no statement as to when the barrel stopped dropping. Presumably, these are the incidents described by the driller.

In both cases, the drill head was in *"Clay – some silt to silty, soft, medium to low plasticity, brown, saturated"*.

No doubt, this analysis will not convince skeptics in Goose Bay and Happy Valley that the dam is safe. NALCOR needs to provide further assurance.

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