



MEMORANDUM

Date: December 15, 2015

To: Matthew Leavitt, P.Eng.
Project Soils Engineer
Northwestern Region

Cc: A. DeSira, M.Eng., P.Eng.
Foundation Engineer
and
Ken Ahmed, P.Eng.
Senior Foundation Engineer
MERO-Pavement and Foundations Section

From: Stan E. Gonsalves, P.Eng.
Principal Engineer
Designated MTO Foundation Contact
exp Services Inc.

Re: Addresses on Comments on the Draft Foundation Investigation and Design Report
Gagne Lake Timber Culvert Replacement, Highway 11, Site No. 45-275/C,
Township of Farrington, District of Rainy River

Agreement No. 6014-E-0017, Assignment # 6
GWP 6322-14-00
MTO Geocres No. 52C-047

We are pleased to submit the Final Foundation Investigation and Design Report of the above noted project. The final report addresses all comments on the Draft Foundation Investigation and Design Report noted in the MTO letter of November 30, 2015. In particular, **exp's** responses to these comments are:

1. Exp's response to MTO Comment No. 1: *MTO GEOCRES No. 52C-047 is assigned to the Final Report and Foundation Drawings.*

FUNDATION INVESTIGATION REPORT

2. Exp's response to MTO Comment No. 2: *The sentence referring to the lack of testing for cobbles and boulders and bedrock is removed from section 1.4.6 and 1.4.7 (pg. 6 and 7) of Foundation Investigation and Design Report.*



3. Exp's response to MTO Comment No. 3: *The paragraphs 2 and 3 of Section 1.6 are moved to Section 2.11, pg. 27 of Foundation Investigation and Design Report.*

FUNDATION DESIGN REPORT

4. Exp's response to MTO Comment No. 4: *The advantages, disadvantages and risk associated with the founding options available for the proposed culvert are tabulated in Table 2.1 (see pg.11) and the preferred option is recommended from a foundation perspective.*
5. Exp's response to MTO Comment No. 5: *The paragraph is added in Section 2.3.1, pg. 12 and 13 of final report to clarify how construction of footings could be carried out on bedrock if the exposed surface was uneven. In addition, the paragraph added in Section 2.3.1.2, pg. 13 to clarify that dowels could be used for additional lateral support for a footing founded on bedrock. Appendix I with NSSPs addressing these issues is added to the final report*
6. Exp's response to MTO Comment No. 6: *Agreed, Bearing capacity and resistance at ULS and SLS for the rigid frame box culvert is modified as shown below to reflect updated strength results.*

Culvert Type	Founding Elevation (m)	Assumed Footing Size (m)	Founding Soil Type	Factored Geotechnical Resistance at ULS (kPa)	Geotechnical Reaction at SLS** (kPa)
Rigid frame box culvert and CSP pipe culvert	~362.6 or below	3.0	Minimum 500 mm compacted granular material (Granular A or Granular B Type II) over native firm clayey silt	225	150

7. Exp's response to MTO Comment No. 7: *The word "closer" is replaced with "closure" in bullet "1" of section 2.4 and the the first paragraph of section 2.4.2, pg. 18 of final report.*
8. Exp's response to MTO Comment No. 8: *The paragraphs addressing the difficulties associated with installing roadway protection through the cobbles and boulders layer and meeting shallow refusal on bedrock have been added in Section 2.5, pg. 19 and 20 of the final report.*
9. Exp's response to MTO Comment No. 9: *The following sentence is added in paragraph 3 of section 2.9.2, pg. 24 of the final report: "A peat layer interbedded with clayey silt layer was encountered in BH 404. However no peat layer was encountered in boreholes 401 and 402; the peat layer beneath some portion of embankment slope was considered*



for completeness of soil layer boundary in slope stability model of south embankment slope."

10. Exp's response to MTO Comment No. 10: *The following sentence is added in Paragraph 5 of Section 2.9.2, pg. 25 of the final report: However new embankment constructed with properly compacted granular material having side slopes 2H:1V and/or embankment constructed with rockfills having side slopes 1.25H:1V should be stable.*
11. Exp's response to MTO Comment No. 11: *Two Professional Engineers, Silvana Micic and Stan Gonsalves, who is exp's Designated Principal Contact identified for MTO Foundation Engineering Projects, signed and stamped the Final Foundation Investigation Report and the Final Foundation Investigation and Design Report.*

We trust these responses satisfactory address the items raised after the MTO review. Should you have any questions, please do not hesitate to contact this office.

Yours truly,

A handwritten signature in blue ink, appearing to read 'Silvana Micic', written over a horizontal line.

Silvana Micic, Ph.D., P.Eng.
Senior Geotechnical Engineer
Project Manager

A handwritten signature in blue ink, appearing to read 'Stan Gonsalves', written over a horizontal line.

Stan Gonsalves, M.Eng., P.Eng.
Principal Engineer
MTO Designated Contact