ANNEX 'A'

GEOTECHNICAL REPORT

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Public Services and Procurement Canada
1045 Main Street, Unit 100
Moncton, New Brunswick
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Attention: Jean Girouard, P.Eng.

Re: Pile Recommendations
Harbour Revitalization, MacEachern's Point Wharf, Tabusintac, New Brunswick

INTRODUCTION

As requested by Public Services and Procurement Canada (PSPC), this letter summarizes our geotechnical recommendations for the proposed boat ramp replacement as part of the Harbour Revitalization project at the MacEachern's Point Wharf, in Tabusintac, New Brunswick.

Based on email correspondence and preliminary drawings provided by Valron Engineering (Structural Engineer), it is understood that the existing boat ramp will be removed and replaced with a new reinforced concrete slab-on-grade boat ramp. The new boat ramp will occupy a footprint of 6 metres wide by 38.3 metres long, approximately 18.3 metres longer than the existing boat ramp. Geotechnical recommendations for the design and construction of the new ramp are summarized in this letter.

All elevations referenced to in this letter are based on chart datum.

SUMMARY OF SUBSURFACE CONDITIONS

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) submitted a factual geotechnical report to PSPC on September 14, 2018 (GEMTEC File No. 10456.81) for the MacEachern's Point Wharf site located in Tabusintac, New Brunswick. Our investigation consisted of seven (7) boreholes, with three (3) of the boreholes (18-1, 18-2, and 18-7) advanced through the existing boat ramp and the remaining four (4) boreholes (18-3, 18-4, 18-5, and 18-6) advanced in the harbour, on the west side of the existing wharf structure, using a geotechnical drill rig mounted on a barge.

The land boreholes show that about 2 to 3 metres of overburden soil consisting of fill underlain by very loose to compact gravel and sand overlies sandstone bedrock. Sandstone bedrock was encountered at elevations ranging from 0.4 (18-7) to -0.2 (18-2) at the land borehole locations.

The harbour boreholes show that the harbour bottom is at approximate elevation -1.3 metres, chart datum, and is covered with 0.6 (18-3) to 3.6 (18-6) metres of overburden soils consisting of very loose to loose silt with organics (marine sediments) underlain by loose to very dense sand. Sandstone bedrock was encountered at elevations ranging from -1.8 (18-3) to -4.8 (18-6) metres.

The upper 1 metre ± of sandstone bedrock encountered in the boreholes is highly weathered, but becomes less weathered with depth.

RECOMMENDATIONS

1.1 Excavation

Excavation for the new wharf structure will involve the removal of the existing structure and extend through the existing fill, loose gravelly sand (land boreholes), organics, loose silt (harbor boreholes) and potentially down into the native sand. Safe excavation slopes should not be steeper than 1 horizontal to 1 vertical (1H:1V) above the waterline. The safe excavation slope may need to be flattened below the water elevation.

Heavy groundwater seepage is expected within the gravelly sand and below the tidal water elevation.

1.2 Backfilling

We provide the following backfilling recommendations for the proposed new boat ramp:

- The boat ramp structure should be backfilled using NBDTI 75 mm minus crushed rock or gravel subbase placed in 300 mm thick lifts and compacted to 95% of the maximum dry density as determined by ASTM D698 (Standard Proctor). A Geotechnical Engineer should approve the subbase material before being place on the site.
- The boat ramp slab-on-grade should consist of at least 450 mm of NBDTI 75 mm minus crushed rock or gravel subbase.
- The subbase placement limits should extend beyond the edge of the boat ramp a minimum distance of 0.5 metres before sloping down at 1H:1V to suitable bearing soils.
- A 150 mm thick layer of NBDTI 31.5 mm minus crushed rock or gravel base should be placed directly below the boat ramp slab-on-grade. This layer should be compacted to 95% of standard proctor.
- Backfilling and compaction should be undertaken in dry conditions. Therefore, fill placed below the tidal zone should be dewatered using a coffer dam and pumps. It may be possible to time the backfilling operations during low tide events to minimize dewatering efforts.

1.3 Concrete Slab-on-Grade (Boat Ramp)

The concrete slab-on-grade area should be excavated down to the native, undisturbed sand or sandstone bedrock, removing any demolition debris from the existing boat ramp, existing fill, organics, loose silt (harbor boreholes), and otherwise deleterious material. The existing gravelly sand (land boreholes) may remain in place, provided the subgrade is proof-rolled with an eight (8) tonne or larger smooth drum vibratory roller during dry weather in the presence of a Geotechnical Engineer, or their representative. Any soft areas detected shall be repaired as per the Engineer's recommendations. All fill required to raise the grade within the concrete slab-on-grade area should be NBDTI 75 mm crushed rock subbase as per Subsection 1.2.

The concrete slab-on-grade boat ramp make-up should be as follows:

- Concrete slab
- 150 mm thick layer of NBDTI 31.5 mm crushed rock base
- Minimum 450 mm thick layer of NBDTI 75 mm crushed rock subbase
- Approved subgrade (i.e. compact existing fill, native sand, or sandstone bedrock)

1.4 Pavement Structure

If modifications to the existing pavement structure are incurred, the parking lot and driveway areas should be cut down to the underside of pavement structure elevation or raised to subgrade using approved granular fill as outlined in Subsection 1.2.

The subgrade elevation should be proof-rolled using an eight (8) tonne or larger vibratory smooth drummed roller in the presence of a Geotechnical Engineer, or their representative. Soft areas should be repaired as per the recommendation of the Engineer.

Table 1 presents pavement structure options based on typical parking, roadway and entrance areas. GEMTEC Limited would be pleased to reassess our recommendation if the anticipated traffic type and volumes can be provided.

Table 1: Summary of Pavement Structure Options

Material	Heavy Duty[1]	Light Duty[2]
Asphalt Surface Course (Type D)	40 mm	75 mm
Asphalt Base Course (Type B)	60 mm	--
Base Course (NBDTI 31.5 mm crushed rock)	150 mm	150 mm
Subbase Course (NBDTI 75 mm crushed rock)	450 mm	300 mm

Notes: 1. Delivery Truck and Heavy Traffic areas
2. Typical Commuter Vehicle Parking areas

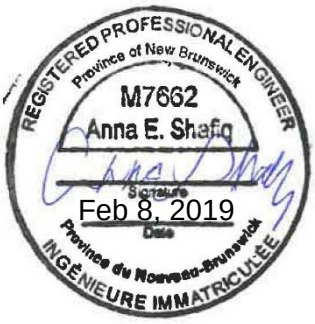
All aggregate and asphalt concrete materials should meet the NBDTI Standard Specifications. The pavement structure base and subbase materials should be compacted to 98% of Standard Proctor maximum dry density. Asphalt concrete should be compacted to 92% of Maximum Theoretical Relative Density.

CLOSURE

We trust that this letter is sufficient for your current purposes. As the design progresses, GEMTEC would be pleased to provide additional geotechnical support as required.

If you have any questions do not hesitate the contact the undersigned.

Anna Shafiq, M.A.Sc., P.Eng.
Senior Engineer



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Aes/sm