THURBER ENGINEERING LTD.
GEOTECHNICAL ▪ ENVIRONMENTAL ▪ MATERIALS

August 15, 2008 File: 15-16-218

Alberta Infrastructure and Transportation
2nd Floor, Provincial Building
111 – 54 Street
Edson, Alberta
T7E 1T2

Attention: Mr. Cliff Corner

NORTH CENTRAL REGION GEOHAZARD ASSESSMENT
HWY 16:08 km 11 PAVEMENT DISTRESS (NC68)
2008 ANNUAL INSPECTION REPORT

Dear Sir:

This letter documents the 2008 annual site inspection of the Hwy 16:08 pavement distress site located about 2.3 km west of Niton Junction at legal land description SE35-53-13-W6M (Figure NC68-1, Section F) between km 11.015 to km 11.048. Thurber Engineering Ltd. (Thurber) undertook this inspection in partial fulfillment of our Geotechnical Services for Geohazard Assessment, Instrumentation Monitoring and Related Work contract (CE103/2008) with Alberta Transportation (TRANS).

Mr. Don Law, P.Eng. and Mr. Ken Froese, P.Eng., of Thurber undertook the inspection on June 11, 2008, in the presence of Mr. Roger Skirrow, P. Eng., Mr. Cliff Corner, and Mr. Reg Faulkner of TRANS.

1. BACKGROUND AND RECENT WORK

This is the first annual site inspection for this site. Thurber conducted a call-out at this site as summarized in an April 14, 2008, letter to TRANS included in Section E of the binder. Based on information provided in the April 14 letter, there was a history of pavement distress since the 1970's. A repair of the distressed area was completed in September 2002 and involved the installation of 150 mm of styrofoam installation below the granular base course. The insulation was placed in three layers over a distance of 32.5 m beneath both westbound lanes with transition zones spanning a distance of about 7.3 m at both ends of the repair.

During placement of the insulation, an abandoned concrete-filled culvert was encountered within the depth of excavation and left in place.

Ride quality had again deteriorated by 2004 when EXH began measuring survey profiles through the area. A patch was placed in 2006 to address ride quality. At the time of the call-out (February 28, 2008), the vertical differential between the distress area and the surrounding pavement was about 70 mm.

2. SITE OBSERVATIONS

2.1 Overview

The site features and observed changes in condition are shown on Figure NC68-1 (attached in Section F). Details regarding the observations are provided in the following sections.

Selected photographs taken during the site reconnaissance are also attached.

2.2 Pavement Distress

The area of pavement distress is located across both of the westbound lanes. The surrounding terrain is forested with an overall slope from south to north. There is a pond surrounded by muskeg terrain located to the south of the highway. Both of the westbound lane ditches had standing water at the time of the site visit. The cracks observed during the February 2008 call-out inspection were still present. However, the east crack widths had reduced in width to typically between 5 mm to 10 mm with portions up to 80 mm where the asphalt has broken out. The west crack widths had also reduced to typically between 10 mm to 20 mm with portions up to 70 mm in width. There was no differential height observed across the cracks and the overall height differential observed between the distress section and the adjacent areas was significantly reduced from about 70 mm at the time of the call-out to nearly level during this inspection.

3. ASSESSMENT

Previous assessments of the pavement distress at this site had indicated that ongoing consolidation of the underlying organic soils was the likely cause. However, based on the observations made during the GeoHazard assessment in June, it is considered likely that the distress is a result of heaving of the adjacent areas due to frost. The roughness of ride quality appears to be due to the relatively short transition zones at the ends of the insulated section leading to an abrupt change in pavement elevation between areas with frozen subgrade and the unfrozen, insulated section. It is expected that settlement of organic soils, if

occurring, would be a small contributing factor and is not consistent with the overall pattern of observed movement of the highway surface.

4. RISK LEVEL

The risk level for this site has been assessed as follows:

PF(9) * CF(2) = 18

A Probability Factor of 9 is considered appropriate since the pavement distress is active, although on a seasonal basis, and continued freeze-thaw cycles will lead to greater pavement degradation at the cracks. A Consequence Factor of 2 is applicable since the potential for a significant reduction in ride quality on a primary transportation corridor exists that has (and may in the future) require seasonal speed reductions. This risk level is the same as that applied in the 2008 callout report.

5. RECOMMENDATIONS

5.1 Investigation and Repair

It is recommended that a geotechnical investigation be undertaken at this site. The purpose of the drilling program will be to determine and compare the quality and quantity of fill and organic soils between the treated and untreated sections. Water levels will also be determined. A total of seven test holes are recommended to be drilled in the highway shoulder to a depth of approximately 6 m. Standpipe piezometers should be installed in five of the test holes. As part of the investigation, it is recommended that a permanent geodetic benchmark be established to avoid potential problems with the current survey benchmark (nail in the highway shoulder) being located within the heaving area. Surveying should be continued after the benchmark is installed to confirm the distress is heave related.

The pavement distress appears to be a result of insufficient transition length at the ends of the insulated section. Accordingly, the recommended repair is to excavate and remove the styrofoam insulation within the transition zones and replace with a layer of cellular concrete over a longer transition zone. As part of the geotechnical assessment, the thickness and extent of the layer of cellular concrete required will be determined. This repair method will require alternating lane closures of the westbound lanes of Highway 16 during construction. Consideration should be given to removing the concrete-filled abandoned culvert during the repair. The cost for this work is estimated to be between $300,000 and $350,000.

5.2 Maintenance

It is recommended that crack sealing be undertaken regularly to reduce water flow into the cracks and minimize degradation of the pavement structure. Until a full repair is undertaken, patching may be required to improve ride quality during the winter season; however, the amount of asphaltic concrete placed should be kept to a minimum as it may lead to ride quality problems once the frost has come out of the subgrade.

It is recommended to continue semi-annual geotechnical inspections as currently programmed.

6. CLOSURE

We trust this assessment and recommendations meet with your needs at this time. Please contact the undersigned should questions arise or if the slide condition worsens.

Yours very truly,
Thurber Engineering Ltd.
Don Law, P.Eng.
Review Principal

Ken Froese, P.Eng.
Project Engineer
/dw

Attachments
- Photographs 1 to 4

cc: Mr. Roger Skirrow, P.Eng., Director of Geotechnical Services, TRANS

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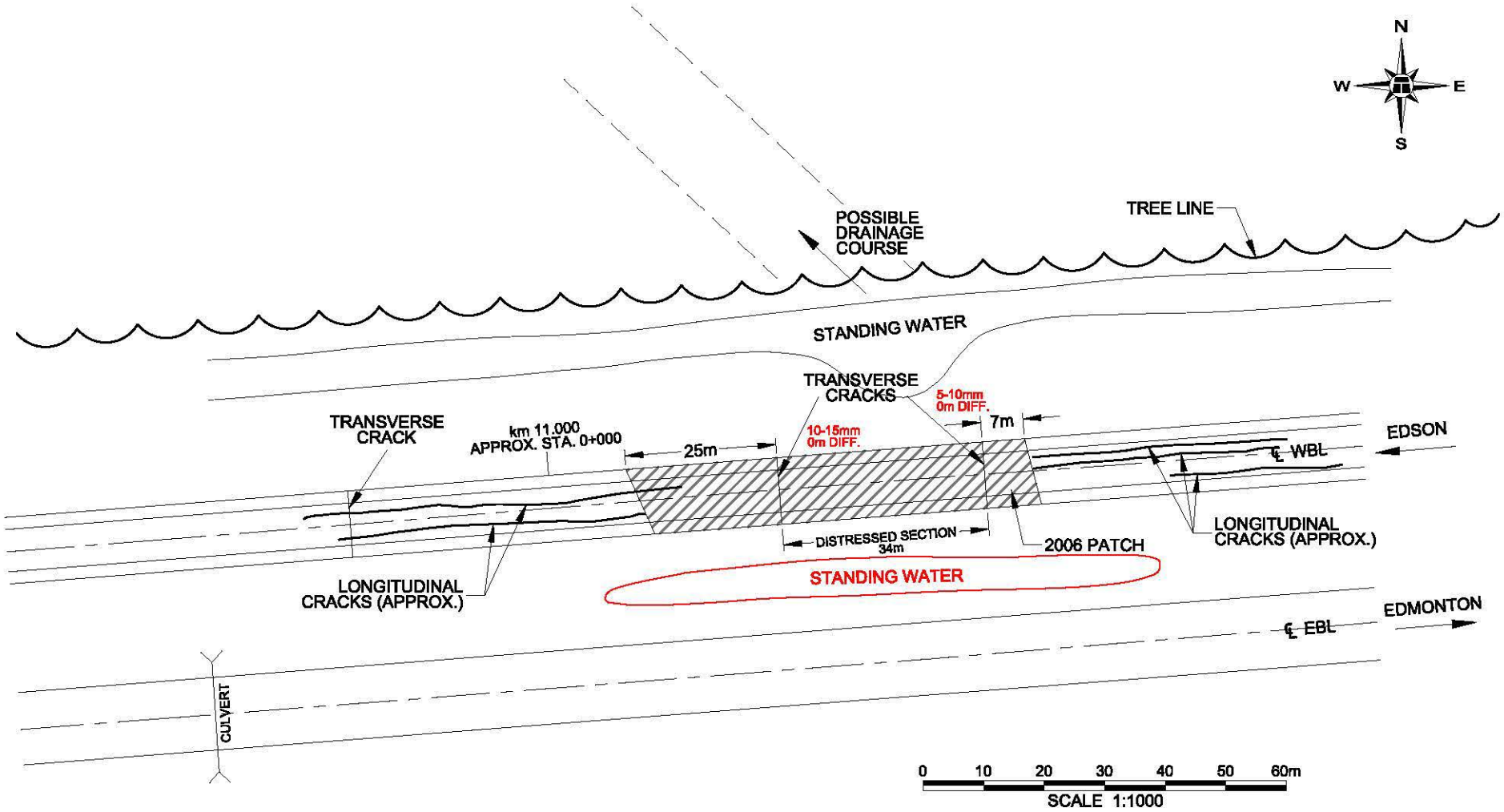

THURBER PROJECT #15-16-218

2008 OBSERVATIONS SHOWN IN RED

ALBERTA TRANSPORTATION

SITE PLAN SHOWING SETTLEMENT NEAR NITON JUNCTION

NORTH CENTRAL 2008
GEOHAZARD ASSESSMENT

SE 35-53-13 W6M
HWY 16:08 Km 11.015 TO 11.048
WEST OF NITON JUNCTION, AB

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ENGINEER:	DRAWN:	APPROVED:
KEF	CMH	DJL
DATE:	SCALE:	DRAWING No.
JULY, 2008	1:1,000	FIGURE NC68-1

Photo 1 – Looking west toward distressed section, June 11, 2008.

Photo 2 – Looking south at east crack, June 11, 2008.

Photo 3 – Looking south at west crack, June 11, 2008.

Photo 4 – Looking southeast at distressed section. Note lack of obvious displacement compared to surrounding pavement, June 11, 2008.