THURBER ENGINEERING LTD.
GEOTECHNICAL ▪ ENVIRONMENTAL ▪ MATERIALS

August 11, 2006 File: 15-85-37

Alberta Infrastructure and Transportation
Room 301, Provincial Building
Bag 900, Box 29
9621 – 96 Avenue
Peace River, Alberta
T8S 1T4

Attention: Mr. Ed Szmata

PEACE REGION (PEACE RIVER – HIGH LEVEL AREA)
GEOHAZARD ASSESSMENT
HWY 35:20, SITE PH 49, INDIAN CABINS FROST HEAVES
2006 ANNUAL INSPECTION REPORT

Dear Sir:

This letter documents the 2006 annual site inspection of Indian Cabins Sites A and B, located on Hwy 35:20, approximately 0.5 and 8.7 km north of the north approach to Indian Cabins Camp, respectively. The inspection was undertaken by Thurber Engineering Ltd. (Thurber) in partial fulfillment of our Geotechnical Services for Geohazard Assessment, Instrumentation Monitoring and Related Work contract (CE049/2004) with Alberta Infrastructure and Transportation (AIT). The inspection was undertaken on May 9, 2006 by Mr. Don Proudfoot P. Eng., and Mr. Gustavo Padros, M. Sc., of Thurber along with Mr. Ed Szmata and Mr. Roger Skirrow, P.Eng of AIT.

1. BACKGROUND

Frost heaves have created an uneven highway surface at Sites A and B in previous years. In 2000, a 1 m to 1.5 m thick gravel wedge was placed to raise the highway at Site A. Site B is a typical location of frost heave activity along this highway where a gravel wedge has not been placed yet. Both sites have experienced cracks on the roadway and required patches in the past.

2. SITE OBSERVATIONS

2.1 Observations at Site A

Our observations of the site are shown on the attached site sketch plan Figure PH49-1 and photos. The site has a recent patch covering about 74 m of the highway. The highway has a relatively smooth profile with slight dips at the south and north ends of the site.

Recent transverse cracks 1 m to 2 m long were noticed on the pavement, at 2 m to 5 m intervals, over a distance of 52 m along the highway, as is illustrated on Figure PH49-1.

Many recently sealed cracks were noticed on the roadway. Several were beginning to open again. The same can be said about old longitudinal construction joints on the pavement, which appeared to be cracking open. The roadway along the northern 50 m of the site had a wavy surface.

Ponded water was observed on both sides of the highway embankment. A shallow creek flows under the highway through a 900 mm diameter, smooth-wall steel culvert. The culvert outlet was submerged and could not be inspected. However, settlement around the outlet was noticed.

A hole, measuring about 0.2 m by 0.2 m and 0.1 m deep was observed in the pavement, about 3.5 m south of the culvert. A transverse crack, 7 mm wide, extending from the hole towards the edges of the road, was present over a former grouted center line culvert.

2.2 Observations at Site B

A patch on the highway was noticed, placed over a dip approximately 55 m long. The roadway still shows a strong dip, ranging from 200 mm to 400 mm over the east and west shoulders, respectively, as is illustrated on Figure PH49-2. The thickness of the asphalt at that location was 200 mm.

A muskeg heave appeared to be present on the west side of the road. Standing water was observed on the east side of the road, over a slightly depressed area.

About 27 m further north, wet areas and ponded water were observed on both sides of the road, where an existing 900 mm diameter, CSP culvert crosses underneath the highway. Two longitudinal cracks with a 200 mm drop were observed on the roadway, over the above mentioned CSP culvert. One of them was previously patched but had cracked open again.

3. ASSESSMENT

Based on the observations made during the site reconnaissance, the highway appears to have experienced frost heave in the past. The cold weather and high water levels needed for frost heave are certainly present on site, but the existence of frost susceptible materials needs to be investigated. Long term secondary compression of peat that could be present under the highway is another possible source of observed settlement especially at Site B.

4. RECOMMENDATIONS

A return trip to the site should be carried out in winter to inspect the extent of frost heaving and to conduct test pits along the sides of the sides of the highway with a large track hoe to investigate subsurface conditions at each site. Three test pits should be excavated on each side of the highway at each site.

Potential solutions consist of improving drainage through the use of deep muskeg ditches and better definition of the creek bed channels. Consideration could also be given to excavating frost susceptible peat and soils from Site B and replacing them with a wedge of free draining granular fill, possibly placed over a geogrid and non-woven geotextile. Highway, ditch and creek profiles should be carried out extending at least 500 m in each direction from each site to assist in the assessments.

5. CLOSURE

We trust that the above information is sufficient for your present requirements. However, if you have any questions or require any additional input please do not hesitate to call us.

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

Gustavo Padros, M.Sc.,
Assistant Project Engineer
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Attachments

cc: Mr. Roger Skirrow, P. Eng.
Geotechnical Director, Alberta Infrastructure and Transportation

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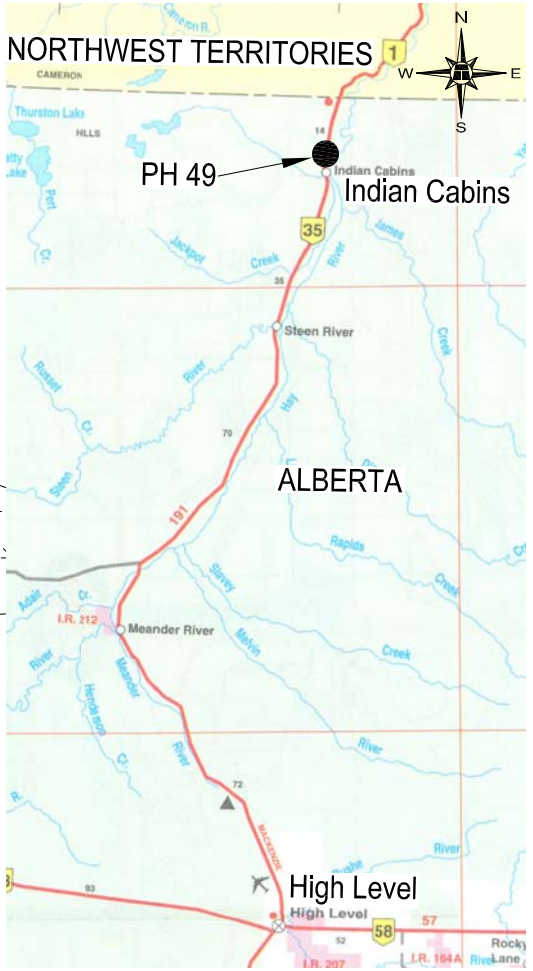

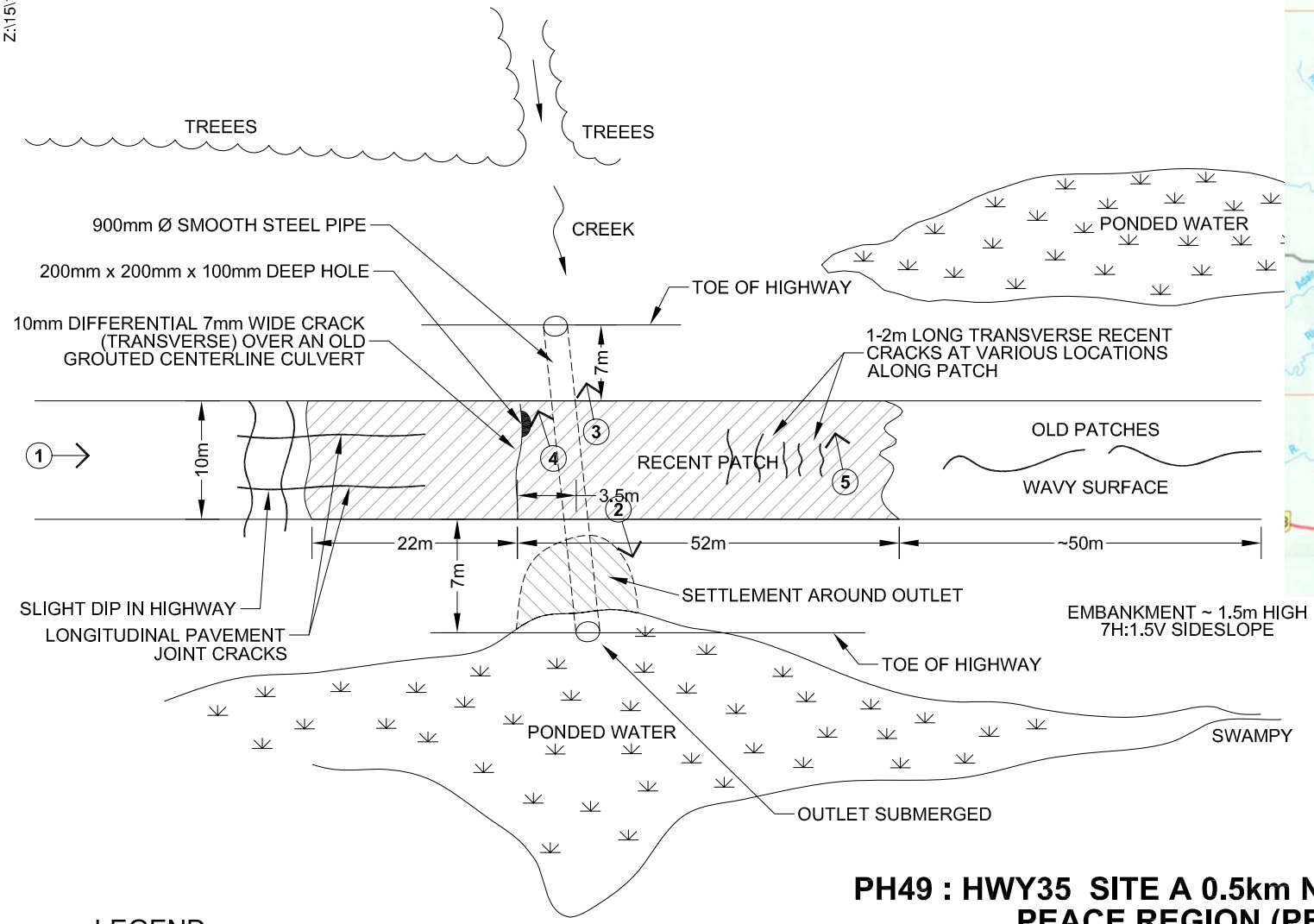

LEGEND

① → PHOTO AND DIRECTION

SITE A SKETCH PLAN

N.T.S.

FIGURE PH49-1

PH49 : HWY35 SITE A 0.5km NORTH OF INDIAN CABINS
PEACE REGION (PEACE RIVER / HIGH LEVEL)
GEOHAZARD ASSESSMENTS

DATE : MAY 2006

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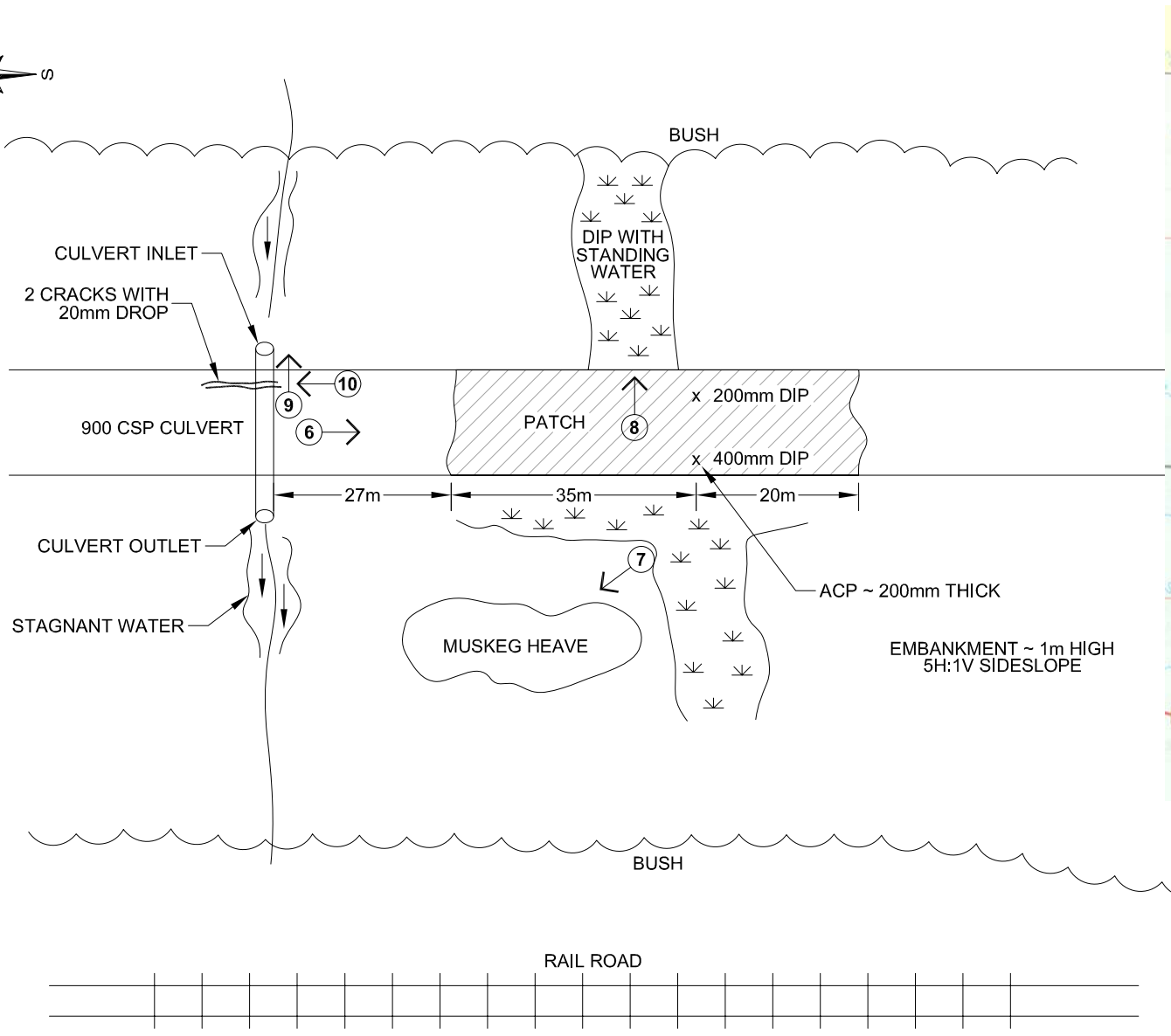

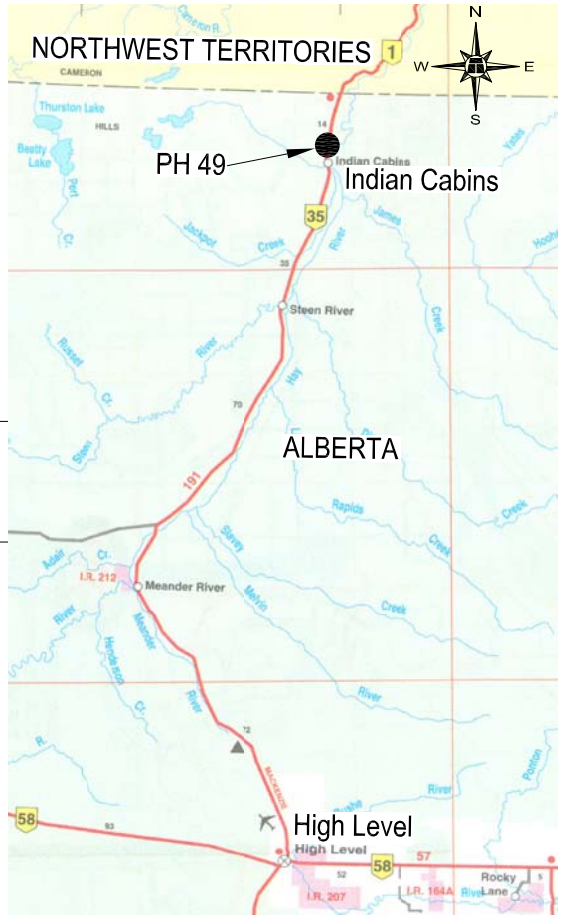

SITE B SKETCH PLAN

N.T.S.

LEGEND

(1) → PHOTO AND DIRECTION

FIGURE PH49-2

PH49 : HWY35 SITE B 8.7 km NORTH OF INDIAN CABINS
PEACE REGION (PEACE RIVER / HIGH LEVEL)
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PHOTO 1: View of Site A facing north. Reopening of cracks previously patched on the pavement.

PHOTO 2: Ponded area on east side of highway at Site A.

PHOTO 3: Creek and ponded area on west side of highway at Site A.

PHOTO 4: Hole on the roadway and transverse cracks at Site A.

PHOTO 5: New transverse cracks in pavement at Site A.

PHOTO 6: View of Site B facing south. Dip on the highway.

PHOTO 7: Muskeg heave and stagnant water on west side of the higway at Site B.

PHOTO 8: Ponded water and dip on right of way over the east side of the road at Site B.

PHOTO 9: Longitudinal cracks and incoming creek on east side of road at Site B.

PHOTO 10: New longitudinal crack and reopening of a crack previously patched at Site B.