ALBERTA TRANSPORTATION
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION – GRANDE PRAIRIE DISTRICT
2016 INSPECTION

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
Callout by GP38	NW of Grande Cache	1.6 km N of Kakwa River Bridge	40:38	25.5
Legal Description		**UTM Co-ordinates (NAD 83)**		
SE8-63-4-W6		11U N 6,032,885	E 398,710	

	Date	PF	CF	Total
Previous Inspection:				
Current Inspection:	May 31, 2016	9	4	36
Road AADT:	1,460		**Year:**	2015
Inspected By:	Barry Meays, Don Proudfoot (Thurber) Ed Szmata, Rocky Wang, Dwayne Lowen (AT)			
Report Attachments:	☑ Photographs ☑ Plans ☐ Maintenance Items			

Primary Site Issue:	Landslide in an 8 m high sidehill highway embankment fill	
Dimensions:	About 20 m long by ~10 m wide	
Date of any remediation:		
Maintenance:		
Observations:	**Description**	**Worse?**
☑ Pavement Distress	A dip in the eastbound driving lane and shoulder, and a developing headscarp crack is appearing and affecting an approximate 20 m length of pavement. This area is also exhibiting a heavy alligator crack pattern.	☐
☑ Slope Movement	The east embankment fill is bulged below the dip in the pavement.	☐
☐ Erosion		☐
☑ Seepage	Slight seepage noted near the toe of the downstream embankment fill.	☐
☐ Bridge/Culvert Distress		☐
☐ Other		☐

Instrumentation: None

Assessment:

A dip exists in the northbound driving lane/shoulder, and along the perimeter of the dip some slight cracking can be observed. The east highway fill embankment, which is inclined at ~21^0, is also bulged partway down the slope. This appears to signify the early stages of development of a landslide in the highway embankment fill at this location, which may not enable accurate delineation of the slide extent at this time.

Distortion of the pavement was first noticed in April, 2016. Recent heavy truck traffic is causing alligator cracking in the pavement surface through this area. The alligator cracking appears to extend beyond the area of the discernible slump outline area. Some slight seepage was observed near the lower portion of the east embankment, therefore the subgrade could also be wet.

A 3 m diameter SPCSP culvert exists adjacent to the north side of the alligator cracked area. This culvert did not have any identifiable distress at the time, however a small slump was observed in the south channel bank downstream of the culvert riprap plunge pool.

It is anticipated that this slide was caused by potential wet subgrade materials (possibly from groundwater seepage or a naturally high water table), and which was aggravated by the recent high frequency of heavy truck traffic traversing the area. The embankment fill slope of about 21^0 (~2.6H:1V), may be too steep for the subgrade materials it is composed of (especially if it is clay).

This section of the highway is to be paved by Ledcor (full depth reclamation) in the coming year. After the contract was awarded, problems with the road were noticed, and road bans were implemented. Therefore it is desired to repair this cracked/slumped area prior to ACP placement.

Recommendations:

Investigation:
Drill 1 test hole complete with a piezometer on the downslope edge of the highway (as shown on Figure Callout-1) to a depth of about 12 m to provide information on the soil and groundwater conditions at this location, and to confirm slope stabilization design measures.

Maintenance:
Crack filling and/or patching may be required until remedial repair measures are undertaken.

Short Term:
In the short term, the slide should be regularly monitored for progression of slide movements, which could necessitate adequate signage and traffic control marking one lane driving lane closure.

Medium to Long Term:
The recommended repair (especially considering a rush time frame) is to subexcavate the failed slide mass down to intact foundation soil, and rebuild the slope with imported 6-80 gravel to a slightly flatter 3H:1V inclination. The new fill material should be placed and compacted in thin horizontal lifts, benched into the intact slope surface, utilizing a gravel shear key (if required) to stabilize the slide area. Some of the more suitable excavated material could be used to provide a covering layer overtop the gravel as the finished slope surface to shed runoff, with any excess removed from site. A subdrain should be installed along the base of the slide excavation to drain any subsurface water that may enter the new fill zone. A temporary detour will likely have to be constructed on the west side of existing highway to allow two-way traffic. If a portion of the repair area intersects near the riprap bowl and culvert outlet, any existing Class 2/3 riprap should be salvaged and re-instated over non-woven geotextile along a new contoured channel beyond the new slope. Some additional riprap should be added to the south side of the plunge pool.

Expected Cost ~$0.4 Million

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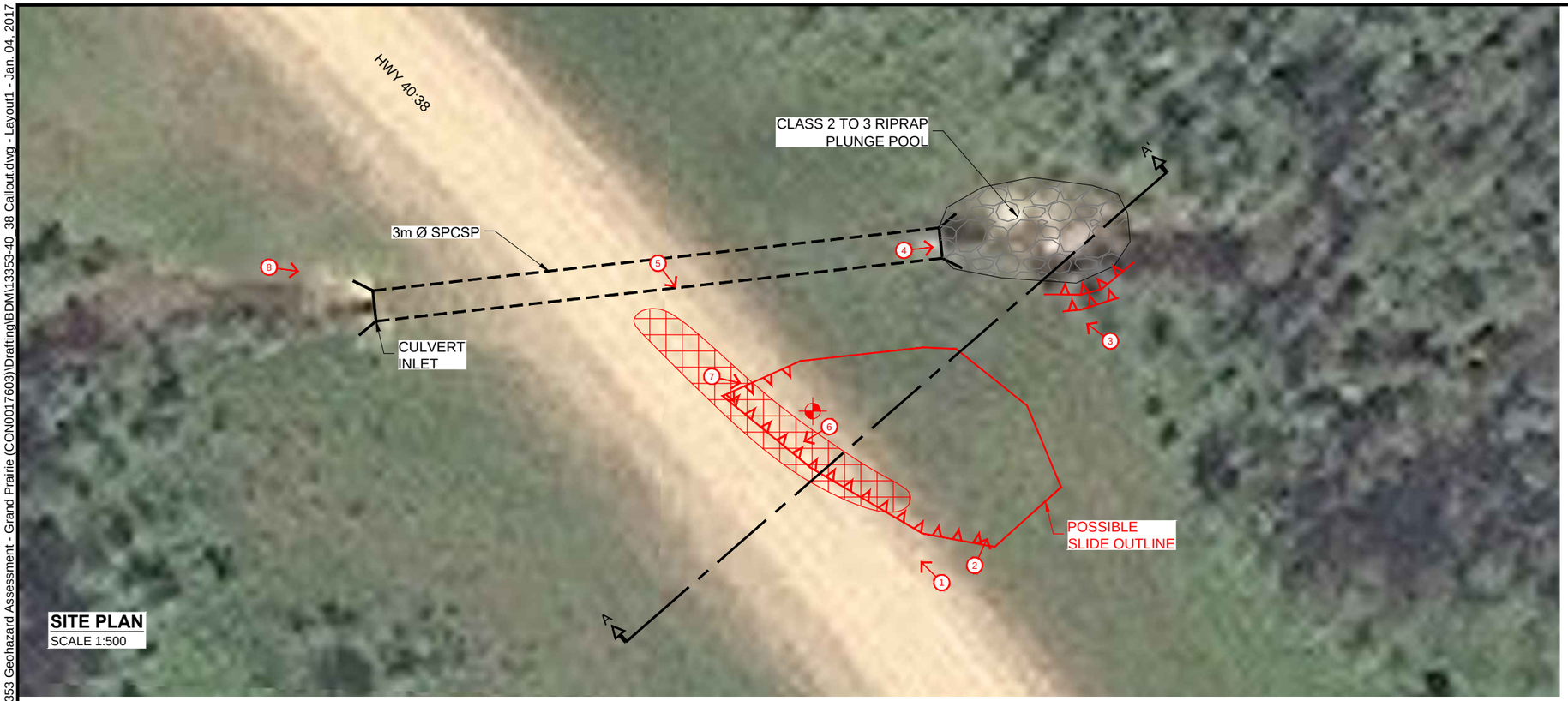
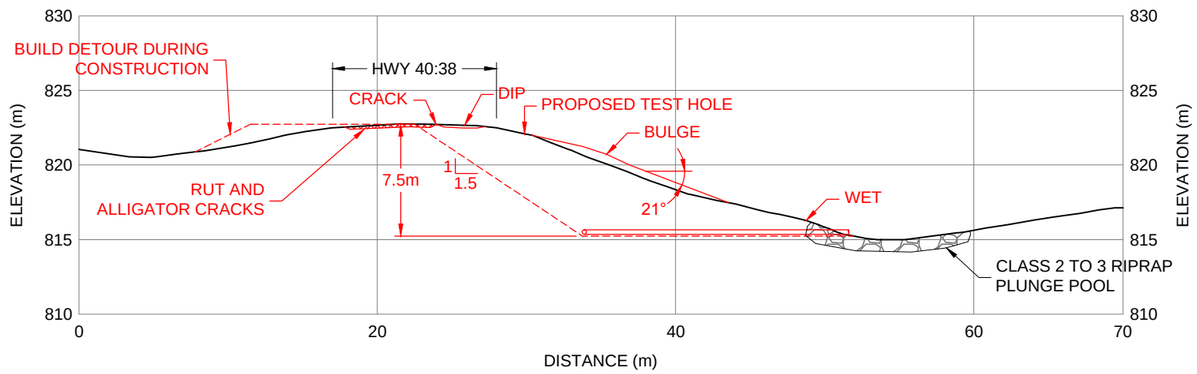
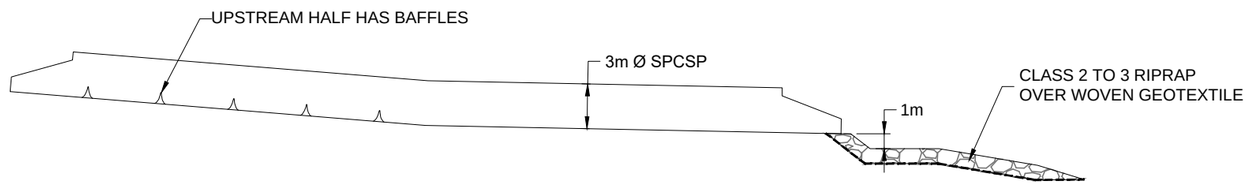


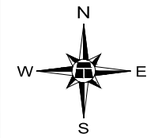
SITE PLAN
SCALE 1:500



CROSS-SECTION A-A'
SCALE 1:400



APPROXIMATE SPCSP PROFILE
SCALE 1:400



LEGEND

- SCARP CRACK
- ALLIGATOR CRACKED / DIPPED AREA
- PROPOSED TEST HOLE LOCATION
- 8 DIRECTION AND NUMBER OF PHOTO

NOTES :

1. FEATURE LOCATIONS ARE APPROXIMATE
2. MAY 31, 2016 FEATURES SHOWN IN RED

0 5 10 15 20 25 30m
SCALE 1:500

SATELLITE IMAGERY FROM ESRI WORLD IMAGERY (DOWNLOADED 2016-12-14)

Alberta Transportation

PEACE REGION (GRANDE PRAIRIE) 2016
CALLOUT: HWY 40:38, 1.6km NORTH OF KAKWA RIVER BRIDGE

MAY 31, 2016 INSPECTION PLAN

DWG No. 13353-40:38 CALLOUT-1

DRAWN BY	KLW
DESIGNED BY	BDM
APPROVED BY	DWP
SCALE	AS SHOWN
DATE	MAY 31, 2016
FILE No.	13353

THURBER ENGINEERING LTD.

Photo 1 – Looking north along the east edge of the highway, at the dipped area. A slide scarp appears to be developing at this location.

Photo 2 – Looking northeast across the east highway embankment, with the culvert outlet in the background.

Photo 3 – Looking west at the 3 m diameter SPCSP outlet, plunge pool, and east highway embankment. Note the exposed woven geotextile adjacent to the slumped channel.

Photo 4 – Looking east at the culvert outlet and the riprap plunge pool. Note the slump scarp alongside the south channel edge.

Photo 5 – Looking south along the east highway shoulder at the dip and scarp crack.

Photo 6 – Looking west across the alligator cracked pavement.

Photo 7 – Looking southeast at the alligator cracked pavement, and the dip in the east highway shoulder.

Photo 8 – Looking east at the 3 m SPCSP inlet.