GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION – PEACE-HIGH LEVEL
CALL-OUT INSPECTION (SEPT. 8, 2015)

Alberta Transportation
THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
PH40	Shaftsbury	Bricks Hill Slide	684:02	53.5
Legal Description		**UTM Co-ordinates**		
SE¼ 21-082-23 W5M		11U E 467287	N 6219688	

	Date	PF	CF	Total
Previous Inspection:	13-Jun-2006	5	2	10
Current Inspection:	8-Sep-2015	11	4	44
Road AADT:	280		**Year:**	2014
Inspected By:	Ed Szmata, TRANS Jesse Kasouf, TRANS		Shawn Russell, Thurber	
Report Attachments:	☑ Photographs ☑ Plans		☐ Maintenance Items	

Primary Site Issue:	On September 4, 2015, Alberta Transportation was alerted by the maintenance contractor that a crack appeared west of the Toe Berm constructed in 2004 in the pavement of the SBL lane of Hwy 684:02. The previously monitored Bricks Hill wash-out feature was not visited as part of this call-out inspection.	
Dimensions:	Cracking in pavement and sideslope defines a landslide that is extending into and affects approximately 20 m to 30 m of the SBL. (Photos 1 to 6).	
Maintenance:		
Observations:	**Description**	**Worsened?**
☑ Pavement Distress	Cracks have up to 200 mm drops with openings as wide as 100 mm.	☑
☑ Slope Movement	New cracks, likely the backscarp of a new landslide, have appeared in the roadway to the west of the previous failure (Photos 1 to 5).	☑
☑ Erosion	Some scouring is still occurring in the bottom of the NBL ditch.	☑
☐ Seepage		☐
☐ Bridge/Culvert Distress		☐
☐ Other		☐

Instrumentation:

The slope inclinometer (SI-SB1) installed along the shoulder off the SBL to the east of the toe berm repair has since been destroyed and is no longer visible at ground surface.

Assessment:

A previous landslide at the site was repaired towards the end of 2004. Thurber continued to visit the site until 2006 after which it was removed from the annual Geohazard inspection tour due to favourable overall performance of the toe berm repair and drainage measures.

Landslide cracking in the road has occurred to the west/upslope of the previous repair from 2004, beyond the effect of the toe berm.

Recent landslide movement warrants that the affected southbound lane asphalt be patched in order to maintain a smooth enough surface for traffic at the current posted highway speed of 80 km/hr.

Some scouring was observed in the upslope NBL ditch bottom.

Recommendations:	**Cost**
In the short term, it sis recommended that the cracks in the pavement be sealed or overlain with an asphalt patch and that the area be closely monitored for future signs of movement.	Maintenance
A geotechnical investigation is required to assess the mechanism of failure and to design repair measures for this slide. Proposed test hole locations (3) with (2) slope inclinometers and (5) piezometers are shown on Figure 1. Due to the recent activity at the site, it is recommended that the geotechnical investigation be implemented as soon as possible.	$ 65,000
Based on term in-situ performance of the existing toe berm repair and drainage measures, a potential medium term (8 to 10 years) landslide repair option could consist of excavation and removal of the failed material and the construction of a toe berm similar to the previous repair. The failure depth will need to be established from the geotechnical investigation and instrument readings over a period of time. Drainage could be directed through a welded HDPE down-drain extending to the valley floor.	$1,000,000
Alternatively, the section of the roadway affected by the previous and current landslide features could be realigned future into the backslope, which would require a substantial backslope cut generating a large amount of surplus material for disposal. The initial estimated length of highway to be realigned would be in the order of about 2 km's. This solution only circumvents the landslide issue by diversion away from it and it is possible that the landslide feature could grow and encroach into the realigned highway as early as 10 years following the realignment.	$2,000,000
A more permanent longer term repair option might consist of a cantilever cast in-place concrete pile wall constructed with a cap beam/waler. If the landslide continues to move downslope of the pile wall the passive support to the piles will diminish and tie-back anchors might be needed at a later date. Instrumentation could be installed in the cantilever wall and monitored to assess the rate of wall movement due to the progressive passive soil resistance loss below the wall indicating the required time to install tie-back soils capable to compensate for the soil loss.	$1,000,000 (Cantilever Wall) Allow Additional $1,000,000 for future soil anchors
These recommendations are based on a backscarp width of about 40 m and a potential landslide slip surface with a depth of less than about 5 m. Should the actual dimensions of the assumed failure be greater than these estimates, the cost of the potential long-term repairs will increase. It is important that the geotechnical investigation work be completed as soon as possible to ensure that mechanism of failure is properly assessed and that a reliable depth to the failure surface/landslide backscarp dimensions are determined.	

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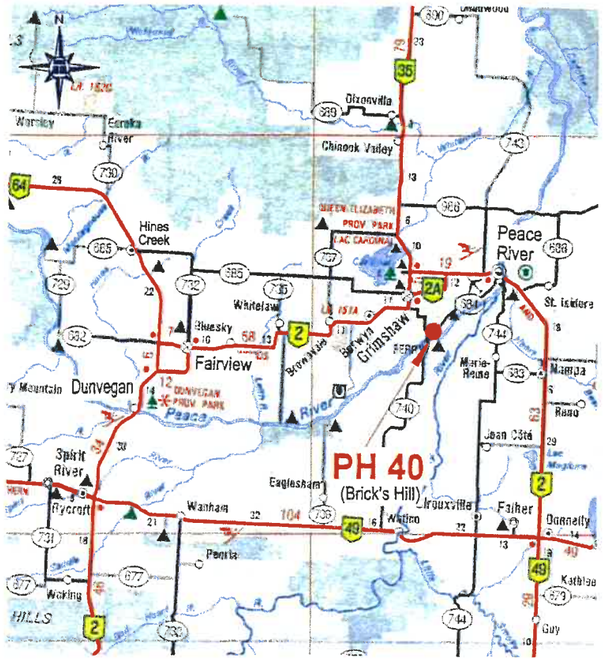
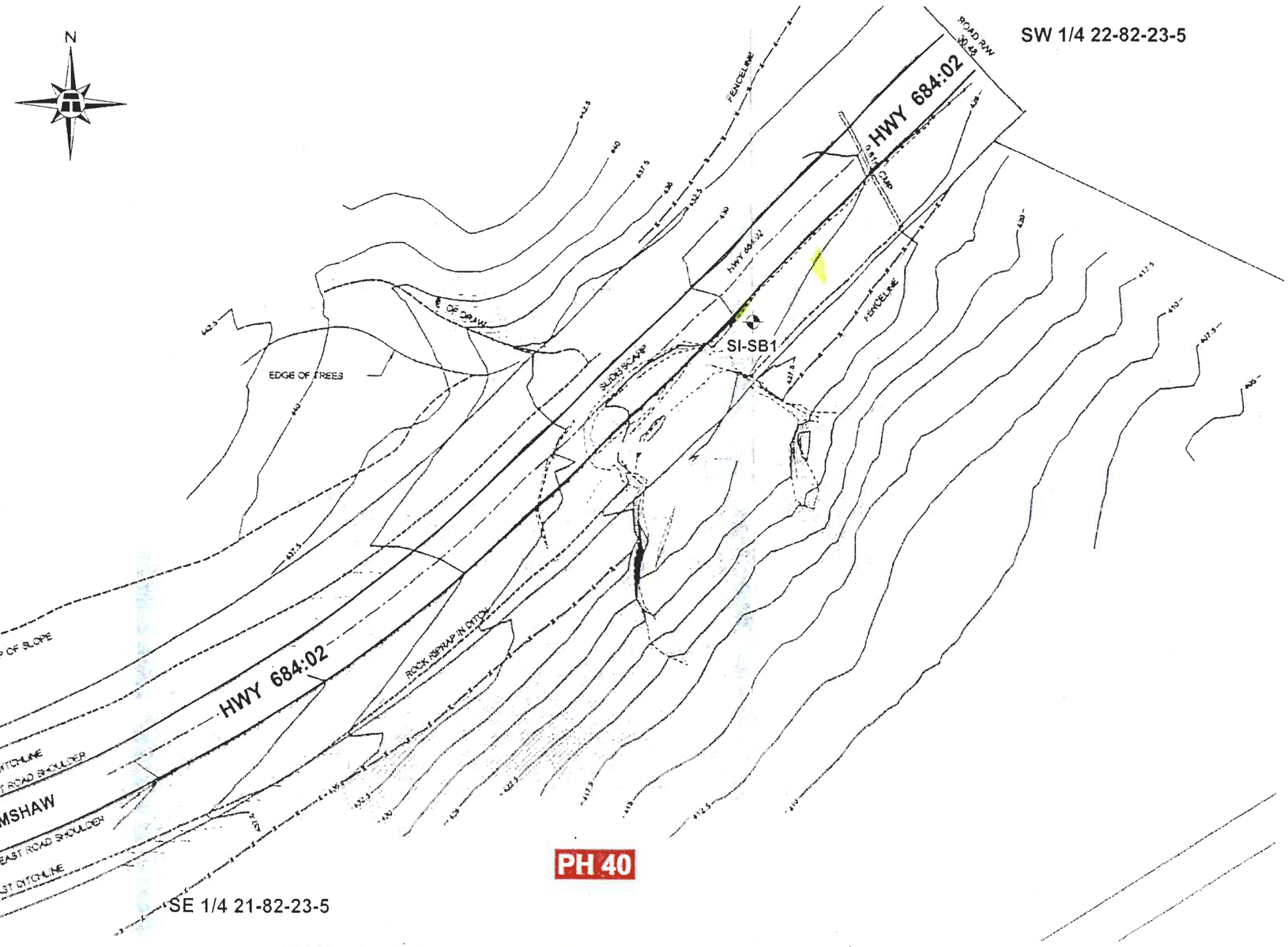


SITE MAP
NOT TO SCALE



LEGEND :

- SLOPE INCLINOMETERS *(currently using)*
- SLOPE INCLINOMETER *(not in use)*

NOTES :

1. DRAWING REFERENCE : HWY 684:02 BHS DWG BY AMEC INFRASTRUCTURE

PH40 - SITE PLAN - SHAFTSBURY TRAIL (BRICK'S HILL SLIDE)
1:400 (APPROX.)

FIGURE PH40-1

PH40 : HWY 684:02 - SHAFTSBURY TRAIL (BRICK HILL SLIDE)
SITE PLAN SHOWING EXISTING INSTRUMENT LOCATIONS
PEACE REGION (PEACE RIVER / HIGH LEVEL) INSTRUMENTATION READINGS - C
DATE : OCTOBER, 2007
THURBER PROJECT #15-85-79

THURBER ENGINEERING LTD.
GEOTECHNICAL• ENVIRONMENTAL• MATERIALS

	**Photo 1.** Looking NE from SBL shoulder towards new landslide cracks.
	**Photo 2.** Looking south from NBL ditch towards new cracks. Dip in guardrail is also noticeable.

Photo 3.
Looking SW at new cracks in SBL.

	**Photo 4.** Looking NE at new cracks in SBL, shoulder and embankment sideslope.
	**Photo 5.** Looking north at cracks in SBL embankment sideslope. Cracks are open to 100 mm and drop is as much as 200 mm.

Photo 6.
Looking NW upslope from the approximate center of the bulge in highway embankment sideslope below bows in guardrail and fence and the cracks in the roadway.

	**Photo 7.** Looking.SW along the SBL rip rap lined ditch. Bow in barbed wire fence extends 1.5 m past fence alignment. A bow in the guardrail along the SBL shoulder is also noticeable.
	**Photo 8.** Looking.SE from SBL ditch at toe berm constructed in 2004. No visible signs of movement or changes since last visit in June 2006.