

SITE NUMBER AND NAME: C065 East of Trochu Slide		HIGHWAY & KM: 585:02, 16.136	PREVIOUS INSPECTION DATE: June 13, 2018	INSPECTION DATE: July 11, 2019
LEGAL DESCRIPTION: 11/12/14/15-22-033-22 W4M	NAD 83 COORDINATES: UTM Northing Easting 12 5746288 359329		RISK ASSESSMENT: PF: 13 CF: 8 TOTAL: 104	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 400 (east) (Ref No. 105290)			CONTRACT MAINTENANCE AREA (CMA): 20	

SUMMARY OF SITE INSTRUMENTATION: Operational: Three slope inclinometers and six vibrating wire piezometers installed in October 2017. LAST READING DATE: May 15, 2019.	INSPECTED BY: Chris Gräpel (KCB) Ryan Gazley (KCB) Rishi Adhikari (AT) Tony Penney (AT)
PRIMARY SITE ISSUE: Several geohazard sites along a 1 km section of Hwy 585, on the west valley slope of the Red Deer River, that are causing pavement distress. The sites are located within a creek valley; and include valley slope and embankment fill slides, and potential dispersive soil voids beneath the highway.	
APPROXIMATE DIMENSIONS: The initial slide area is approximately 20 m wide, and the slope is approximately 4 m high. The two other slides, located to the west of the initial slide area, are approximately 20 m wide, and the slope is approximately 20 m high. The pavement dips are approximately 4 m wide.	
DATE OF ANY REMEDIAL ACTION: Ongoing asphalt patching and paving; speed reduction signs installed	

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		C065-I: continued pavement deflection from slide movement and heavy truck traffic.	X	
Slope Movement	X		C065-I: ground cracking at toe of slide	X	
Erosion	X		C065-III: further degradation of erosion gully downstream of slope failure	X	
Seepage	X		Water ponded in south (upslope) ditch		X
Culvert Distress	X		West culvert outlet undermined and detached; insufficient soil coverage above west culvert		X

COMMENTS
Four geohazard sites are located at the C065 site: <ul style="list-style-type: none"> • C065-I: Original Slide: area described in the 2015 call-out report • C065-II Pavement Dips • C065-III Wasp Nest Slide: slide located on the north slope of the highway which includes a 2-3 m deep erosion gully below a failed culvert outlet • C065-IV Upper Slide
At the C065-I site: <ul style="list-style-type: none"> • The pavement in the eastbound and westbound lanes continue to deflect vertically and laterally from slide movements and heavy trucks braking. Pavement has deflected up to 4" in the westbound lane. A toe roll has formed in the pavement of the eastbound lane from heavy trucks braking due to the distortion of the road caused by the slide movements. The pavement in the eastbound lane may also be settling under

traffic load due to a weak subgrade.

- The south ditch adjacent to the pavement toe roll appears to have been recently cleaned out.
- New signage with reduced speed limit was installed above the slide site on the east approach in 2018.
- Ground cracks, toe roll, and seepage were observed at the toe of slide during the 2018 inspection (waypoint 709 and 710).
- The repair work conducted in the fall of 2017 has been disrupted by ongoing slope movements, returning this site to conditions similar to what was present when the highway was temporarily closed to conduct emergency maintenance.

At the C065-II site, the pavement was milled at various locations in 2018. Pavement dips appear to have worsened since the 2018 inspection.

At the C065-III Wasp Nest site:

- Erosion gully below the culvert outlet has expanded since the 2018 inspection. Ground cracking was observed between the guardrail and the edge of the gully.
- Guardrail does not appear to have settled further since the 2018 inspection.
- Pavement cracking on the west flank of the slide looks unchanged. No cracking observed on east side.
- Guardrail posts are leaning towards the west along the pavement patch.

At the C065-IV site, a slight increase in pavement deflection since the 2018 inspection was observed. The slope failure at C065-IV involves pavement cracking that extends across the westbound lane to centreline. The bottom of the culvert is corroded, allowing surface water flow to infiltrate into the embankment near the slide.

Voids have been observed in the bedrock slope across the creek valley. This observation indicates that dispersive soils are likely present at the C065 sites; and that the observed subsidence and cracking could be indicative of subsurface voids forming beneath the highway.

AT should develop geohazard-risk-level factors (e.g., probability and consequence factors) for subsurface-void geohazards (KCB submitted a draft for AT review in early 2019).

Discussed remedial actions:

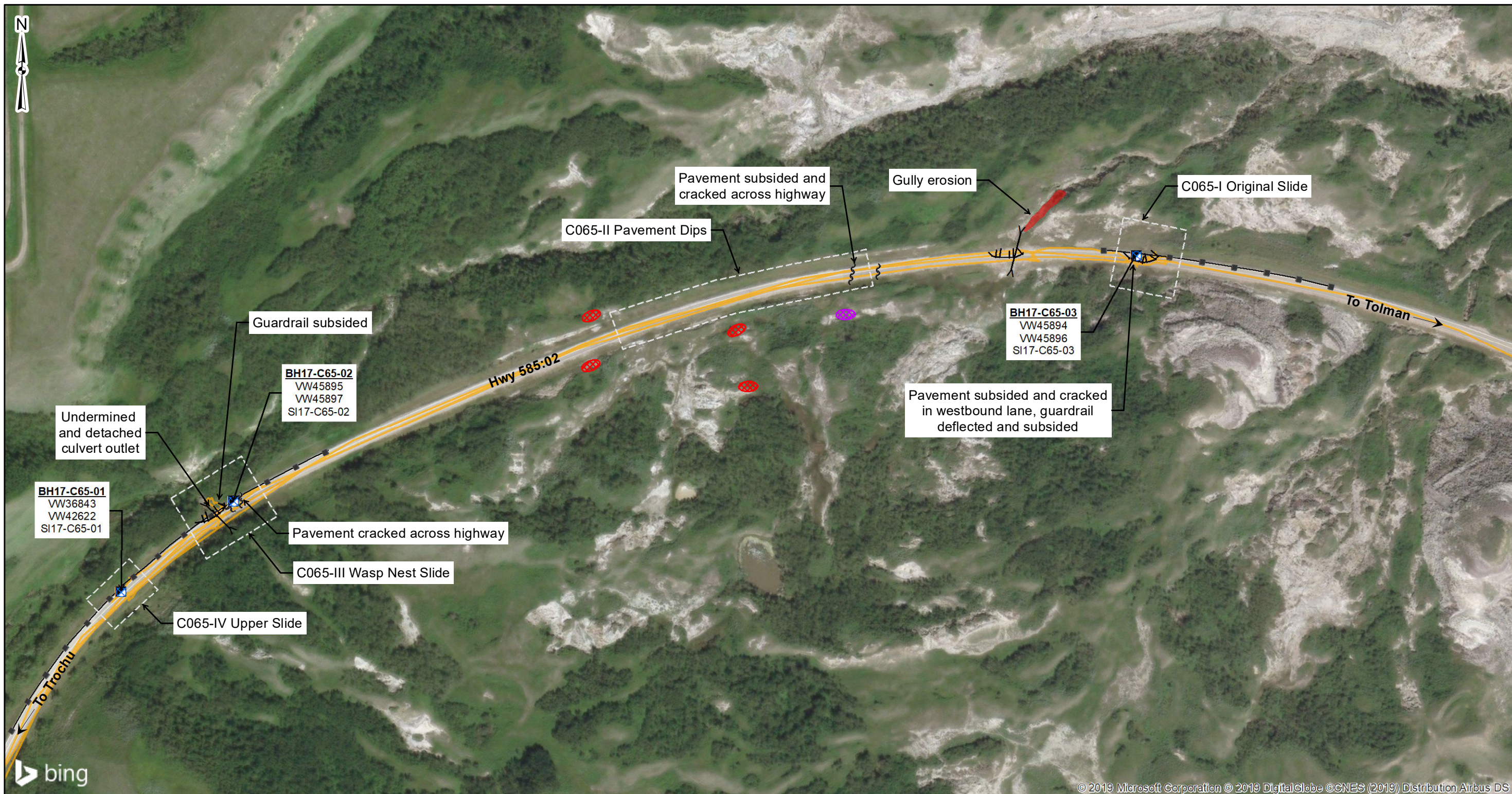
C065-I: Excavate and replace highway fill with free-draining gravel and install perforated drainage pipes at the base of the fill. AT has been offered shredded tire material as backfill at a price that could be lower than the cost of gravel. The use of shredded tire backfill should be reviewed further as it may offer cost savings to AT. AT has repaired other sites elsewhere in Alberta with shredded tire backfill.

C065-II: The highway surface could be excavated at each dip location to expose and backfill voids with sand and gravel. Drainage pipes should be installed at the base of each excavation.

C065-III: Culvert below the highway should be replaced and a slope drain installed to convey water downslope to the creek below the highway and away from the slide area. Site could be repaired with either soil-nailing or a driven steel pile wall, with culvert repairs and a slope drain to drain water away from the slide area.

C065-IV: Install a driven steel H-pile wall to stabilize the slide.

KCB submitted a proposal to AT for design repairs at the C065-I, -II, -III, and -IV sites on July 25, 2019.



Legend

- Vibrating Wire Piezometer (VW)
- Slope Inclinator (SI)
- GPS Track (July 11, 2019)
- Scarp
- Culvert
- Crack
- Guardrail
- Erosion
- Dispersive soil void
- Possible dispersive soil void

NOTES:
 1. HORIZONTAL DATUM: NAD83
 2. GRID ZONE: UTM Zone 12N
 3. IMAGE SOURCE: Bing Maps 2018, Microsoft Corporation.
 Image dated Aug 1 2013

CLIENT

PROJECT CENTRAL REGION GEOHAZARD RISK MANAGEMENT PROGRAM		
TITLE Site Plan C065 - East of Trochu Slides Hwy 585:02, km 16.136		
SCALE 1:3,000	PROJECT No. A05115A02	FIG No. 1

Time: 10:45:03 AM
 Date: August 01, 2019
 File: Z:\AEDM\A05115A02\ABT Central Region GRM\PI\00 Drawings\2019\2. Section B12. 2019 Site Inspections\MXD\C065_190801.mxd

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Photo 1 Pavement at the C065-I site continues to deflect and subside from slide movements and heavy truck traffic. A toe roll in the pavement has formed from heavy trucks braking in the eastbound lane (red arrow; photo 3). Photo taken July 11, 2019 looking west.



Photo 2 Close-up view showing the severity of pavement deflection in the westbound lane at C065-I. Pavement has deflected up to 4". Photo taken July 11, 2019 looking east.



Photo 3 Close-up view of toe roll in pavement (red circle) caused by heavy trucks braking in the eastbound lane as they approach the C065-I site. Photo taken July 11, 2019 looking northwest.



Photo 4 Photo showing the pavement dips at the C065-II site in 2018 and 2019 from opposite directions. Pavement dips appear to have worsened since 2018.



Photo 5 View of C065-III slide area showing the extent of guardrail settlement along the westbound lane. Photo taken July 11, 2019 looking northeast.



Photo 6 Erosion gully below the undermined culvert outlet at C065-III appears to have increased in size since 2018. Photo taken July 11, 2019 looking north.



Photo 7 View of the highway surface at the C065-IV site. Pavement deflection appears to have increased slightly since 2018 inspection. Photo taken July 11, 2019 looking southwest.

