

SITE NUMBER AND NAME: C065-I, -II, -III, and -IV East of Trochu Slide		HIGHWAY & KM: 585:02, 15.21 to 16.05	PREVIOUS INSPECTION DATE: July 11, 2019	INSPECTION DATE: June 9, 2020
LEGAL DESCRIPTION:	NAD 83 COORDINATES:		RISK ASSESSMENT:	
	UTM	Northing	Easting	PF: 13 CF: 8 TOTAL: 104
C065-I 15-22-33-22-W4M	12	5746278	359522	
C065-II 11/12/14-22-33-22-4WM	12	5746228	359147	
C065-III 12-22-33-22-W4M	12	5746079	358817	
C065-IV 12-22-33-22-W4M	12	5746031	358754	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 400 (east) (Ref No. 105290)			CONTRACT MAINTENANCE AREA (CMA): 517	

SUMMARY OF SITE INSTRUMENTATION:	INSPECTED BY:
Operational: Two slope inclinometers and four vibrating wire piezometers installed in October 2017.	Chris Gräpel (KCB)
Inoperable: SI17-C65-03 and vibrating wire piezometers VW45894 and VW45896 (installed in 2017) were covered during asphalt repairs between July 12, 2019 and September 17, 2019.	James Lyons (KCB)
LAST READING DATE: May 06, 2020.	Tony Penney (AT)
	Kristen Tappenden (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. Four geohazard sites are located at the C065 site:

- 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.

APPROXIMATE DIMENSIONS: The C065-I 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 C065-I slide area, are approximately 20 m wide, and the slope is approximately 20 m high. The pavement dips between the C065-I and -III sites are approximately 4 m wide in an area of undulating and uneven asphalt.

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

At the C065-I site:

- 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.
- 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 2020 inspection.
- 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.
- An asphalt repair was completed between July and September 2019.
- Slide movements accelerated with about 100 mm of vertical deflection in late August 2020.

At the C065-II site, the pavement was milled at various locations in 2018. Pavement dips appear to have worsened since the 2019 inspection.

At the C065-III Wasp Nest site:

- Erosion gully below the culvert outlet has expanded since the 2019 inspection. Ground cracking was observed between the guardrail and the edge of the gully.
- Guardrail does not appear to have settled further since the 2019 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.
- The bottom of the culvert is corroded, allowing surface water flow to infiltrate into the embankment near the slide.

At the C065-IV site:

- A slight increase in pavement deflection since the 2019 inspection was observed.
- The slope failure at C065-IV involves pavement cracking that extends across the westbound lane to centreline.

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 failed highway fill with a shear key, geogrid reinforced gravel and install perforated drainage pipes at the base of the fill.

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:

- Excavate and replace slide material with geogrid reinforced gravel. The culvert below the highway should be replaced and a riprap ramp installed to convey water downslope to the creek below the highway and away from the slide area. An energy dissipation structure should be constructed (requiring a hydrotechnical assessment) at the end of the slope drain.

C065-IV:

- Install a driven steel H-pile wall to stabilize the slide. A tender for multiple pile walls on four sites will be released in the fall of 2020 that will include the C065-IV site.

Photo 1 Horizontal deflection of the guardrail due to the toe-roll occurring at C065-I. Photo taken June 9, 2020 facing northeast.



Photo 2 Wooden guardrail posts have deflected horizontally due to the movement of the highway. Photograph taken June 9, 2020 facing north.



Photo 3 Close-up view showing the severity of pavement deflection in the westbound lane approximately 10 m east of C065-I. Photo taken June 6, 2020 facing south.



Photo 4 Toe roll in pavement (red circle) caused by heavy trucks braking at they approach the C065-I site. Photo taken June 9, 2020 facing east.



Photo 5 Erosion gully below the undermined culvert outlet at C065-III has increased in size since 2019. Photo taken June 9, 2020 facing east.



Photo 6 View of the highway surface at the C065-IV site. Pavement deflection appears to have increased slightly since 2019 inspection. Photo taken June 9, 2020 facing east.

