

**SITE INSPECTION FORM**

<b>SITE NUMBER AND NAME:</b> GP002 Candle Road Slide		<b>HIGHWAY &amp; KM:</b> 40:38, 7.439	<b>PREVIOUS INSPECTION DATE:</b> July 20, 2021	<b>INSPECTION DATE:</b> <b>June 13, 2023</b>
<b>LEGAL DESCRIPTION:</b> NE 20-61-04-W6M	<b>NAD 83 COORDINATES:</b> UTM Northing Easting 11 6017104 39852		<b>RISK ASSESSMENT:</b> PF: 7 CF: 2 TOTAL: 14	
<b>AVERAGE ANNUAL DAILY TRAFFIC (AADT):</b> 840 (north) & 800 (south) (Reference No. 70000673, 2022)			<b>CONTRACT MAINTENANCE AREA (CMA):</b> 504	

<b>SUMMARY OF SITE INSTRUMENTATION:</b>  Inoperable: Two slope inclinometers installed in 1997. In 2023, a reference/survey stake was placed approximately 1 m upslope of the slide scarp to monitor retrogression.  LAST READING DATE: N/A	<b>INSPECTED BY:</b> Chris Gräpel (KCB) Courtney Mulhall (KCB) Roger Skirrow (TEC) Max Shannon (TEC)
<b>PRIMARY SITE ISSUE:</b> Slide in highway embankment side-hill fill and foundation on east side of Hwy 40:38 due to a high groundwater table. Site is a repeat failure at a previous repair site completed in 2004 as described below.	
<b>APPROXIMATE DIMENSIONS:</b> Slide approximately 20 m to 40 m wide, and 25 m to 30 m high.	
<b>DATE OF ANY REMEDIAL ACTION:</b> Repaired in 2004 as described below.	

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress		X	None observed at time of 2023 inspection, except where guardrail struck as discussed below.		X
Slope Movement	X		Extents of slide area appeared similar to 2021 inspection. Slide backscarp approximately 2.7 m east/downslope of guardrail with slide extending approximately 25 m to 30 m vertically below highway.		X
Erosion	X		Some erosion of exposed soils along slide scarps.		X
Seepage	X		Seepage previously observed in lower slide area during 2021 inspection. Conditions during 2023 inspection were drier at ground surface (some cracks appeared damp, but no visible seepage or ponded water observed).	X	
Culvert Distress		X	No culverts observed by KCB.		X

<b>COMMENTS</b>
Slide is on an embankment side-hill fill with a shear key excavated into a subsurface bedrock ledge that was previously repaired in 2004 with granular fill and subsurface drains (perforated pipe). TEC recalls that the bedrock ledge was at the same elevation below the slope as it was below the highway (based on borehole logs). Two drain outlets were installed (upper and lower) in case the lower drain became blocked with sediment which was happening in 2004.
Silt fencing observed at mid-slope (e.g., at WP303) and near tree line at toe of slide area, likely extent of previous repairs.
Seems to be more rounded gravel and cobbles visible in upper slide area than lower slide area. Seems like lower slide area may have been previously graded with native material and upper slide area was previously reconstructed with gravelly/granular fill.
Upper slide area west/upslope of WP302 has settled and lower slide area east/downslope of WP302 appears more active/worse than upper slide area, especially along left/north side where several scarps were observed.
Slope appears to have failed again due to plugged drains resulting in rising water level and saturation of repair fill and/or shearing through the bedrock ledge.
Gully near north side of slide.
Section of guardrail along northbound lane of Hwy 40:38, south of site, was struck and damaged. Pavement damaged around posts which were shifted by the impact.
<p><u>Maintenance/Repair/Monitoring Recommendations:</u></p> <ul style="list-style-type: none"> <li>• A geotechnical site investigation, including installation of geotechnical instruments and possible geophysical surveying, is recommended so repair options can be assessed. Possible repair options could include construction of a deep cast-in-place piles, construction of a driven-steel wall, or reconstructing the slope with drainage. Estimated cost: approximately \$2,000,000 to \$4,000,000 (deep cast-in-place piles), \$800,000 to \$1,500,000 (driven-steel wall), and \$400,000 to \$600,000 (slope reconstruction and drainage), respectively.</li> <li>• Falling down and/or damaged silt fencing should be removed and disposed.</li> </ul>



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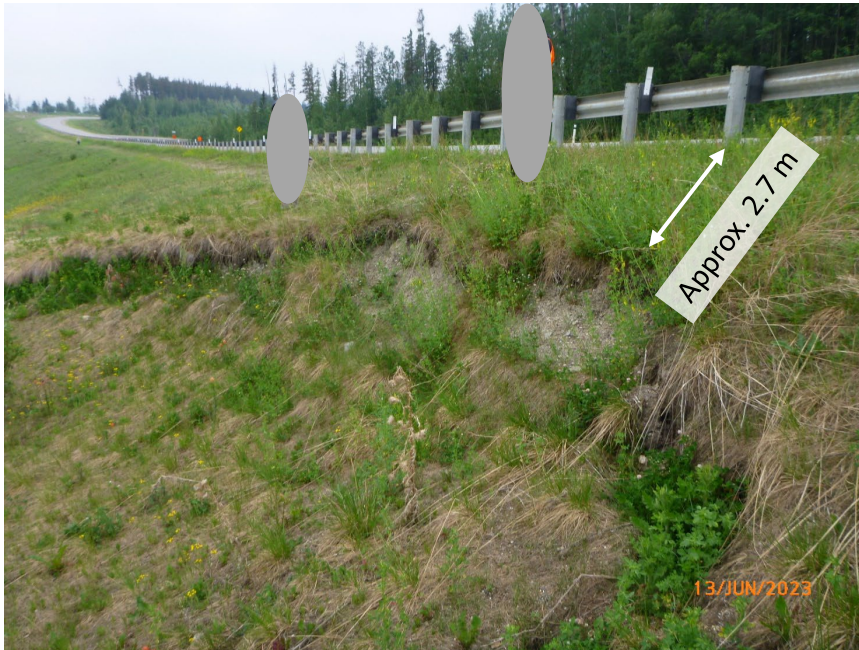
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- (ii) The observations, findings and conclusions in this report are based on observed factual data and conditions that existed at the time of the work and should not be relied upon to precisely represent conditions at any other time.
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- (v) This report is electronically signed and sealed and its electronic form is considered the original. A printed version of the original can be relied upon as a true copy when supplied by the author or when printed from its original electronic file.

<p>Courtney Mulhall, M.Sc., P.Eng. Geotechnical Engineer</p>	
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## Inspection Photographs

**Photo 1** Slide backscarp on east side of Hwy 40:38 approximately 2.7 m away from guardrail. Photo taken June 13, 2023, facing southwest.



**Photo 2** Slide viewed from crest of slope. Photo taken June 13, 2023, facing east.



**Photo 3** Looking across top of slide from south/right flank. Photo taken June 13, 2023, facing north.



**Photo 4** Looking across middle of slide from south/right flank near WP303. Note subrounded to rounded gravel and cobbles exposed on slope. Photo taken June 13, 2023, facing north.



**Photo 5** Looking across middle of slide from north/left flank. Photo taken June 13, 2023, facing southwest.



**Photo 6** Exposed silt fencing near toe of slide at north/left flank. Photo taken June 13, 2023, facing southeast.



**Photo 7** Cracking within lower slide area. Photo taken June 13, 2023, facing down.



**Photo 8** Gully near north side of slide. Photo taken June 13, 2023, facing east.



**Photo 9** Section of guardrail which was struck and damaged south of site. Note guardrail posts shifted damaging pavement around posts. Photo taken June 13, 2023, facing southeast.

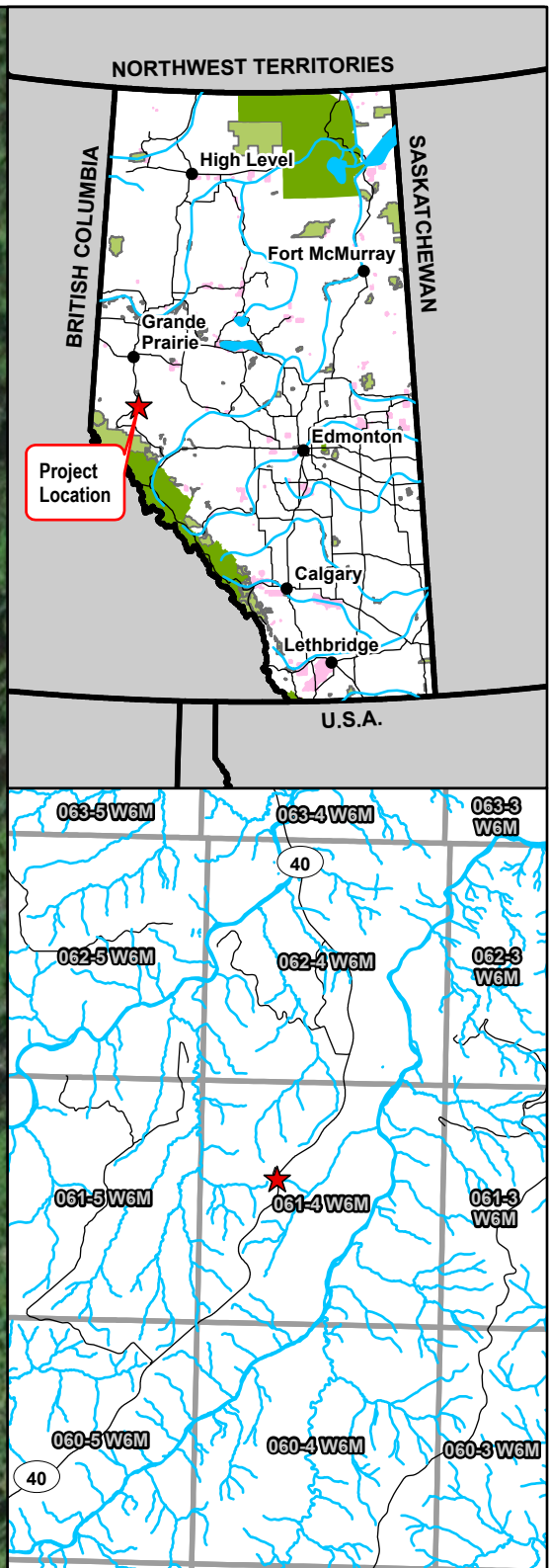


**Photo 10** Section of guardrail which was struck and damaged south of site. Photo taken June 13, 2023, facing south.





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- Legend**
- ▲ GPS Waypoint (June 13, 2023)
  - GPS Track (June 13, 2023)
  - - Slide Extent
  - Guardrail



NOTES:  
 1. HORIZONTAL DATUM: NAD83  
 2. GRID ZONE: UTM ZONE 11N  
 3. IMAGE SOURCE: 2023 MICROSOFT CORPORATION  
 2023 MAXAR CNES, DISTRIBUTION AIRBUS DS

CLIENT

PROJECT  
 PEACE REGION (GRANDE PRAIRIE DISTRICT-SOUTH)  
 GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE  
 Site Plan  
 GP002 - Candle Road Slide  
 Hwy 40:38 km, 7.439

SCALE 1:2,000 PROJECT No. A05116A01 FIG No. 1