

<b>SITE NUMBER AND NAME:</b> <b>GP034 Slide South of Kakwa River</b>	<b>HIGHWAY &amp; KM:</b> 40:38, 21.016	<b>PREVIOUS INSPECTION DATE:</b> June 13, 2023	<b>INSPECTION DATE:</b> <b>June 3, 2025</b>
<b>LEGAL DESCRIPTION:</b> NW 28-62-04-W6M	<b>NAD 83 COORDINATES:</b> UTM    Northing    Easting 11       6028755    399896	<b>RISK ASSESSMENT:</b> PF: 5    CF: 4    TOTAL: 20	
<b>AVERAGE ANNUAL DAILY TRAFFIC (AADT):</b> 1,040 (north) & 900 (south) (Reference No. 70000944, 2024)		<b>CONTRACT MAINTENANCE AREA (CMA):</b> 504	

<b>SUMMARY OF SITE INSTRUMENTATION:</b>  Operable: Two slope inclinometers (SIs) and four pneumatic piezometers (PNs) installed in 2017.  Inoperable: Two SIs and eight PN's installed in 2017.  LAST READING DATE: June 03, 2025	<b>INSPECTED BY:</b> Chris Gräpel (KCB) Courtney Mulhall (KCB) Babatunde Awokunle (TEC) Rocky Wang (TEC)
<b>PRIMARY SITE ISSUE:</b> Slide in highway embankment side-hill fill and foundation on west side of Hwy 40:38 approximately 500 m east of Kakwa River.	
<b>APPROXIMATE DIMENSIONS:</b> Highway embankment slope consists of an approximate 25-m high side-hill fill and toe berm, with the main embankment sloped at approximately 3H:1V and the toe berm sloped at approximately 4H:1V. Toe berm extends approximately 250 m to 300 m along highway.	
<b>DATE OF ANY REMEDIAL ACTION:</b> 1980s and 2020 – toe berm constructed/enlarged and drainage installed as described below. Ongoing pavement patching and overlays, including patch placed in west (southbound) lane after 2021 overlay.	

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Cracking and settlement in southbound lane that was not visible during 2023 inspection.	X	
Slope Movement	X		Recent pavement distress and SI data indicates ongoing slide movements. No obvious visual signs of movement on toe berm slope.	X	
Erosion		X	None observed at time of 2025 inspection.		X
Seepage	X		Seepage observed flowing from slope (on west side of highway, approximately 2 m below pavement. Some flow from middle drain at toe of toe berm.	X	
Culvert Distress		X	No culverts observed by KCB.		X

#### COMMENTS

Shortly after the highway was constructed in the early 1980's, a toe berm was constructed with a series of 300-mm diameter vertical corrugated-steel pipes (CSP), possibly intended to be dewatering wells, installed within the slope. In 2020, the toe berm was enlarged (approximately 3 m to 6 m of fill placed) with a series of finger drains and drain pipes installed within the slope perpendicular to the highway. Construction was halted when foundation movements and asphalt cracking occurred in response to toe berm construction. Asphalt cracking continued into the spring and fall of 2021. Due to the movement, the as-built toe berm was only built to design height from the north to the midpoint of the berm before gradually decreasing to a total reduction of approximately 3 m at the south end of the berm.

**SITE INSPECTION FORM**

In 2020, a groundwater interception trench consisting of non-woven geotextile surrounding granular filter materials and a perforated collection pipe was installed approximately 4 m below the east highway ditch. At the time of the 2025 inspection, some water was discharging from the collection pipe outlet (Photo 8) and the ditch channel was damp.

Slope upslope and downslope of the highway appears to be meta-stable landslide terrain with slide blocks located upslope and downslope of the highway.

Cracking (up to approximately 10 mm wide and 80 m long) and settlement differential along cracks (differential along cracks up to approximately 15 mm) observed in the southbound lane during the 2025 inspection (Photos 1 through 4) was not visible during the 2023 inspection.

Shallow movement recorded in SI17-3 is believed to be causing the pavement cracking observed on site and may be an extension upwards along a backscarp, associated with deeper movement. Otherwise, deep movements recorded in SI17-2 and SI17-3 have slowed since early 2021. Movements recorded in the SIs did not appear to increase in response to a 5.2 magnitude earthquake that occurred near the site in February 2025.

Highway shoulder is steep along west (southbound) lane of Hwy 40:38.

During the 2021 inspection, seepage was observed at numerous locations on the embankment slope and toe berm bench. TEC indicated these areas are typically wet. Conditions during the 2023 inspection were drier, with no visible seepage observed on the embankment slope or toe berm bench. While during the 2025 inspection, seepage was observed flowing on the west side of the highway, approximately 2 m below pavement (Photos 5, WP053). It is noted that seepage elevation is above recorded piezometer water level and bottom elevation of trench drain located below east highway ditch. Existing piezometers are not reflective of groundwater conditions across site.

Water was observed flowing from the middle drain at the toe of the toe berm (Photo 8) during the 2023 and 2025 inspections.

Toe area is not well drained due to slide blocks and uneven ground downslope of the toe berm.

Maintenance/Repair/Monitoring Recommendations:

- Continue to patch and pave this section of highway as needed.
- If movements continue and further repair/stabilization work is required, TEC should consider a mitigation method that improves the stability of the highway surface but does not change the state of stress of the slope and trigger more deep-seated movements. Possible repair options could include construction of deep cast-in-place piles through the toe berm and across the failure surface, or construction of a driven-steel wall or a soil nail-reinforced-earth-retaining wall below the edge of pavement to stabilize the small wedge of soil that is moving below the west (southbound) lane of the highway. Estimated cost: approximately \$2,000,000 to \$4,000,000 (deep cast-in-place piles), \$800,000 to \$1,500,000 (100-m-long driven-steel wall), and \$400,000 to \$600,000 (100 soil nails), respectively.

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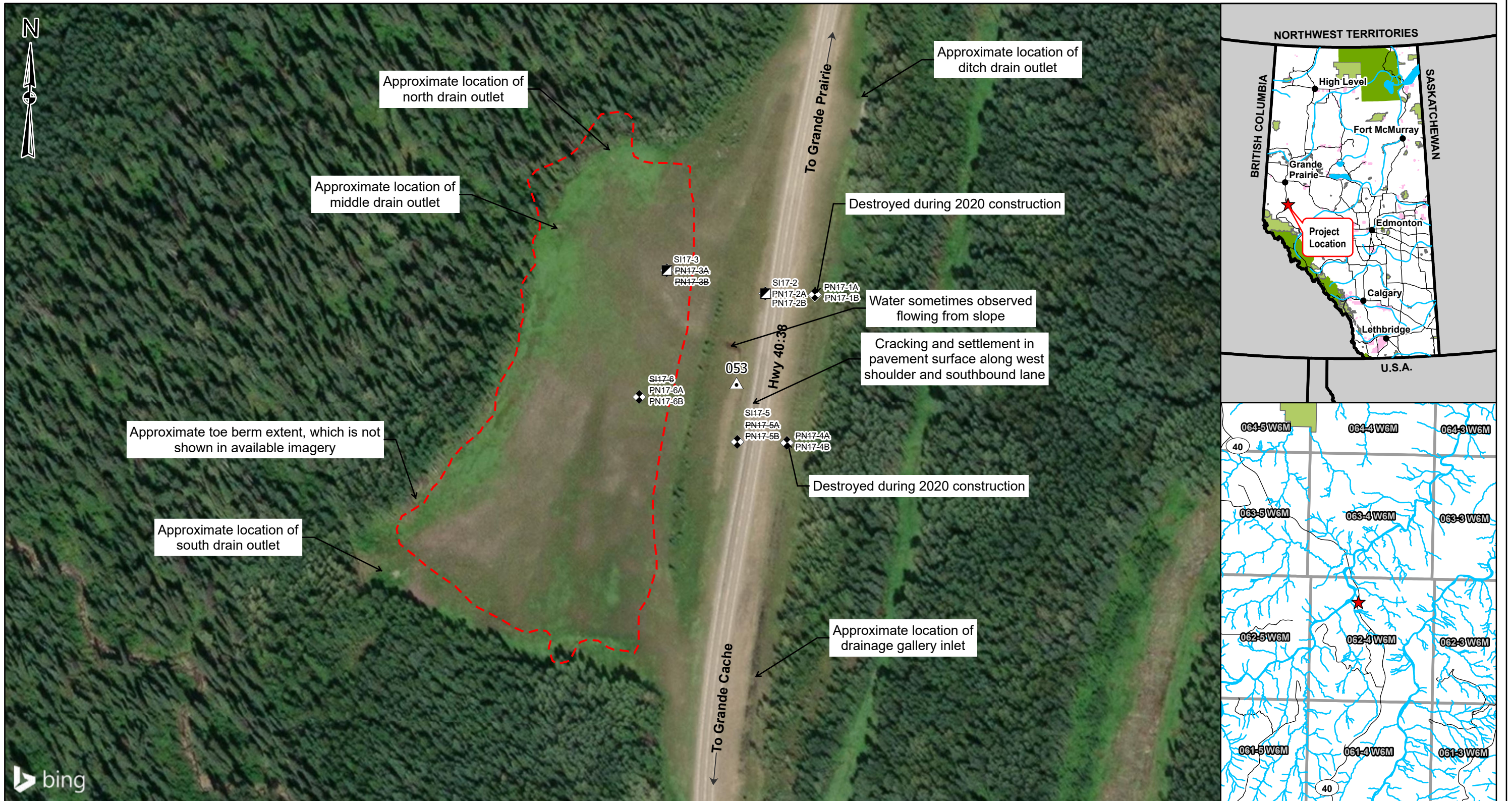
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Courtney Mulhall, M.Sc., P.Eng.  
Geotechnical Engineer



File: Z:\AEDM\A05116A01\ABT Grande Prairie South GRMP\400 Drawings\GIS\MXD\2025\Section BIG63\ABT\_GPSouth\_SectionB\_250703.aprx Date: Time: Creator: H.Maniandyan



### Legend

- GPS Waypoint (June 03, 2025)
- Pneumatic Piezometer (PN)
- Slope Inclinator (SI)
- Approximate Extent of Toe Berm

NOTES:  
1. HORIZONTAL DATUM: NAD83  
2. GRID ZONE: UTM ZONE 11N  
3. IMAGE SOURCE: 2025 MICROSOFT CORPORATION, 2025 MAXAR, CNES  
4. STRIKETHROUGH INDICATES INSTRUMENT IS INOPERABLE. INSTRUMENT LOCATIONS APPROXIMATE.

CLIENT

Alberta

Klohn Crippen Berger

PROJECT

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

TITLE

Site Plan  
GP034 - Slide South of Kakwa River  
Hwy 40:38, km 21.016

SCALE  
1:2,000

PROJECT No. A05116A01

FIG No. 1



## Inspection Photographs

**Photo 1**      **Cracking through pavement surface of Hwy 40:38. Photo taken June 2, 2025, facing northeast.**



**Photo 2**      **Cracking through pavement surface of Hwy 40:38. Photos taken June 2, 2025, facing southwest and northwest, respectively.**





**Photo 3**      **Cracking through pavement surface of Hwy 40:38. Photo taken June 2, 2025, facing north.**



**Photo 4**      **Cracking through pavement surface of Hwy 40:38. Photo taken June 2, 2025, facing southeast.**





**Photo 5** Wet area on south slope of Hwy 40:38. Photo taken June 2, 2025, facing southwest.



**Photo 6** South slope of Hwy 40:38. Photos taken June 2, 2025, northeast and southeast, respectively.





**Photo 7      Drain outlets. Photos taken June 2, 2025.**

West drain at toe of toe berm.



Middle drain at toe of toe berm.



East drain at toe of toe berm.



Drain in north highway ditch.





**Photo 8** Ditch on east side of Hwy 40:38. Photos taken June 2, 2025, facing northeast and southeast, respectively.



**Photo 9** Inlet of drainage galley in ditch on east side of Hwy 40:38. Photo taken June 2, 2025.

