



**PEACE REGION  
(GRANDE PRAIRIE DISTRICT – SOUTH) GRMP**



**SITE INSPECTION FORM**

|   |  |   |  |   |
|---|--|---|--|---|
| <b>SITE NUMBER AND NAME:</b><br>GP007 Wanyandie Road Slide  |  | <b>HIGHWAY &amp; KM:</b><br>40:36, 29.339 | <b>PREVIOUS INSPECTION DATE:</b><br>July 20, 2021          | <b>INSPECTION DATE:</b><br><b>June 14, 2022</b> |
| <b>LEGAL DESCRIPTION:</b><br>NW 02-59-07-W6M<br>NE 02-59-07-W6M   | <b>NAD 83 COORDINATES:</b><br>UTM    Northing    Easting<br>11       5993890    372875 |   | <b>RISK ASSESSMENT:</b><br><br>PF: 9    CF: 8    TOTAL: 72 |   |
| <b>AVERAGE ANNUAL DAILY TRAFFIC (AADT):</b><br>396 (north) & 409 (south) (Reference No. 60403650, 2021) |  |   | <b>CONTRACT MAINTENANCE AREA (CMA):</b><br>504             |   |

|  |  |
|--|--|
| <b>SUMMARY OF SITE INSTRUMENTATION:</b><br><br>Operable: Eleven slope inclinometer (SIs), ten pneumatic piezometers (PNs), nineteen vibrating wire piezometers (VWPs), and three standpipe piezometers (SPs) installed between 1998 and 2022. All VWPs connected to data loggers in spring of 2022.<br><br>Inoperable: Seven SIs and two PNs installed between 1998 and 2020.<br><br>LAST READING DATE: June 21 and 22, 2022 | <b>INSPECTED BY:</b><br>Chris Gräpel (KCB)<br>Courtney Mulhall (KCB)<br>Ed Szmata (AT)<br>Kristen Tappenden (AT)<br>Max Shannon (AT) |
|--|--|

**PRIMARY SITE ISSUE:** Deep-seated landslide (or nested slides) along north valley slope of Smoky River. Hwy 40:36 fill placed in a cut and side-hill arrangement across slide area. Slide movement affecting both lanes of highway.

**APPROXIMATE DIMENSIONS:** Entire site is approximately 2.5 km long. An approximate 300-m and 150-m length of highway primarily being affected at western and eastern site limits, respectively.

**DATE OF ANY REMEDIAL ACTION:** 2018 and 2019 – asphalt overlay. Summer/Fall/Winter 2020 and 2021 – highway surface returned to gravel in summer/fall then paved for winter. Ongoing pavement patching, and sub-excavation and backfilling of voids with granular fill.

| ITEM              | CONDITION EXISTS |    | DESCRIPTION AND LOCATION  | NOTICABLE CHANGE FROM LAST INSPECTION |    |
|-------------------|------------------|----|---|---------------------------------------|----|
|                   | YES              | NO |   | YES                                   | NO |
| Pavement Distress | X                |    | Cracking and depression in pavement surface as described below.   | X                                     |    |
| Slope Movement    | X                |    | Cracking in recent pavement patches and SI data indicates ongoing slide movements.  |                                       | X  |
| Erosion           |                  | X  | None observed at time of 2022 inspection.   |                                       | X  |
| Seepage           | X                |    | At western site limit: upslope/north ditch is wet and poorly drained. Pondered water and seepage also observed downslope/south of Hwy 40:36 as described below.<br>At eastern site limit: seepage spot observed in (southbound) lane. |                                       | X  |
| Culvert Distress  |                  | X  | Culverts appear in good condition based on site visits completed earlier in 2022.   |                                       | X  |

**COMMENTS**

Slope upslope and downslope of highway is landslide terrain.

Highway crosses deep gully/ravine and bridge sized culvert at eastern site limit.

High fills located at western and eastern flanks of slide with lower side-hill fills in middle of slide area.

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Cracking observed in pavement surface at western and eastern site extents as follows:

- At western site limit: cracking extends across both lanes through recent pavement patch into upslope/north ditch. Long linear depression (approximately 100 m deep, 5 m long) in pavement surface appears to indicate there is a void forming below pavement surface.
- At eastern site limit: cracking across both lanes through recent pavement patch to north shoulder at WP209. Depression along backscarp crack. Some skid marks in northbound lane before depression. Seepage spot in pavement surface of southbound lane. SI20-06 downslope of this sheared between the fall of 2021 and spring of 2022 readings.

Portions of landslide that appear most active coincide with areas of high fill (below/adjacent to Wanyandie Road intersection and deep gully at eastern site limit). Slide relatively inactive near middle of site and above highway.

Less active portions of slide above/north of highway may not be as influenced by fill placement or water infiltration into backscarp at highway level. However, without any changes to the slide or highway geometry, continued movement of the lower portions of the slide or prolonged periods of wet weather causing groundwater levels to rise could eventually result in movements further upslope.

AT survey monument located at WP200.

Sinkholes observed at WP206 and WP208 along fiber optics line.

Guardrail has been raised above top of pavement since 2021 inspection. The wooden posts appear to be embedded less than 0.3 m but the metal posts are understood to be installed deeper.

KCB completed a site reconnaissance of the GP007 site on March 25, 2022, which included hiking downslope of the intersection of Wanyandie Road and Hwy 40:36 to former Wanyandie Road. During the spring 2022 tour, KCB and AT completed a similar hike. Key observations include:

- A series of ridges and troughs on the slope, which are visible in historic air photos and the bare-earth LiDAR data. It was discussed that the ridges and troughs could be the result of blocks sliding and eroding overtime becoming more dome shaped. Possible toe located at WP201, but generally no pattern to ridges and troughs. One big ridge to east of WP205.
- A pond of water located on the mid-slope at WP202. As well as other wet spots on the slope, and ponded and flowing water on former Wanyandie Road at WP203 and 204. Note pore pressures/water levels recorded in PN-3, located along former Wanyandie Road near WP204, were above ground surface before the instrument became inoperable in 2011.

Several geotechnical site investigations completed by others between 1998 and 2020, which included installing 14 SIs and 21 piezometers.

- Several of these piezometers have been dry or near dry (i.e., recording water levels below or near their tip elevations) since installation with a water level/porewater pressure above tip elevation only being recorded in the spring of 2020 and/or 2021. A sustained water level/porewater pressure has only been recorded in PN98-1, PN98-3, and the piezometers (VW20 02A/B, -03A/B, and 06A/B, and SP20-4) at the eastern site limit.
- Several of these SIs were either not installed deep enough (e.g., SI98-4 and -6, SI02-11 and -12, and TH20-2, -3, and -6) or did not record clear movement patterns before they became inoperable (e.g., SI98-1).

KCB subsequently completed a geotechnical site investigation in May 2022, which included installing 4 deep SIs and 13 deep VWP. In the spring of 2022, KCB also installed data loggers on all 19 VWPs to record year-round groundwater-fluctuations to improve our understanding of groundwater conditions below Hwy 40:36 at the GP007 site.

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Highway re-alignment to north/upslope previously studied and designed by others. The re-alignment design involved:

- large excavations of the mountain slope and high backslopes above/north of Hwy 40:36, which was judged by KCB and AT to have a high risk of exacerbating existing movements or triggering other movements further upslope above/north of Hwy 40:36; and
- extension of the existing 1980's bridge-sized culvert at the eastern site limit.

Subsequent discussions with AT indicated that they would like to see additional preliminary engineering assessments from KCB for re-alignment/lowering downslope/south and drainage/dewatering.

KCB presented our preliminary engineering work to AT on March 18 and April 21, 2022. The main conclusions of the April 21, 2022 meeting were that:

- AT will no longer be considering realignment and lowering/unloading of Hwy 40:36 to address slides movements; and
- There was insufficient piezometric and groundwater level data to full assess the feasibility of a dewatering solution.

A subsequent drilling investigation completed in May 2022 (see above) indicated dewatering would be challenging due to the fine-grained materials (soils and bedrock) present and the depth to bedrock (30 m to 40 m versus the 10 m to 20 m expected based on previous geotechnical site investigations).

Maintenance/Repair/Monitoring Recommendations:

- Upslope/north ditch is wet and poorly drained. Tire tracks also left in bottom of ditch by drill rig in spring of 2022. Ditching improvements needed in upslope/north ditch to improve drainage to west and divert water from slide area. KCB requested by AT to prepare a proposal for a "sketch" design package for a highway maintenance contractor (HMC) repair. Drainage improvements could include ditch grading, ditch deepening, and/or construction of a subdrain. Work will likely require relocation of fiber optics line. Design will be completed using survey data obtained by Roads West in April 2022. Estimated cost: \$50,000 to \$100,000.

This report is an instrument of service of Klohn Crippen Berger (KCB). The report has been prepared for the exclusive use of Alberta Transportation (Client) for the specific application to the Peace Region (Grande Prairie District – South) Geohazard Risk Management Program (Contract No. CON0022166) and it may not be relied upon by any other party without KCB's written consent.

KCB has prepared this report in a manner consistent with the level of care, skill and diligence ordinarily provided by members of the same profession for projects of a similar nature at the time and place the services were rendered. KCB makes no warranty, express or implied.

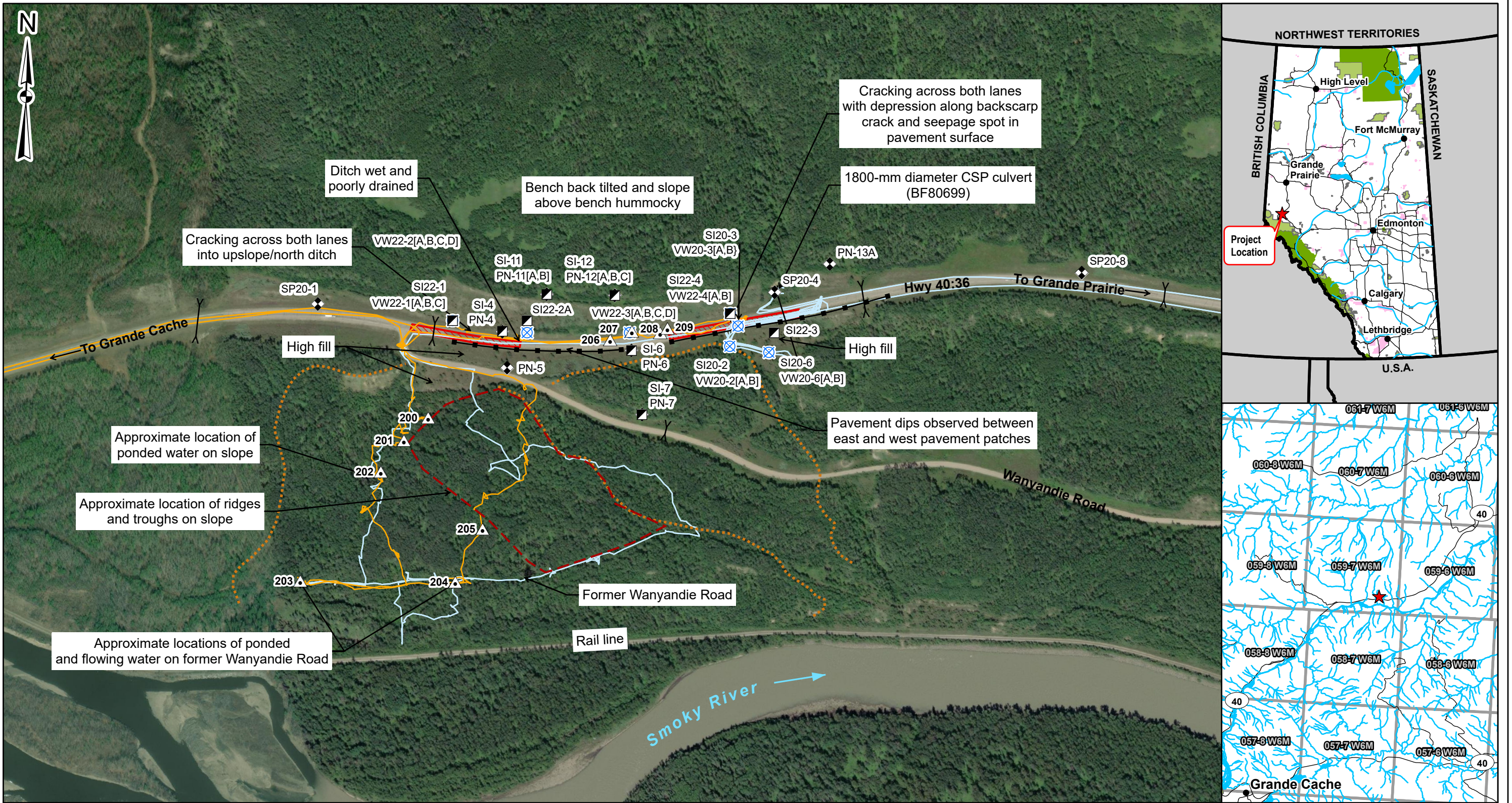
Use of or reliance upon this instrument of service by the Client is subject to the following conditions:

- (i) The report is to be read in full, with sections or parts of the report relied upon in the context of the whole report.
- (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.
- (iii) The report is based on information provided to KCB by the Client or by other parties on behalf of the client (Client-supplied information). KCB has not verified the correctness or accuracy of such information and makes no representations regarding its correctness or accuracy. KCB shall not be responsible to the Client for the consequences of any error or omission contained in Client-supplied information.
- (iv) KCB should be consulted regarding the interpretation or application of the findings and recommendations in the report.

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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.

Chris Gräpel, M.Eng., P.Eng.  
Senior Civil Engineer, Associate



**Legend**

- ◆ Approximate Pneumatic Piezometer Location
- ▣ Approximate Slope Inclinometer Location
- ⊠ Approximate Vibrating Wire Piezometer Location
- ▲ GPS Waypoint (June 14, 2022)
- GPS Track (June 14, 2022)
- GPS Track (March 25, 2022)
- Flow Direction
- Culvert
- Guardrail
- ⋯ Active Slide Zone
- ▭ Ridges and Troughs
- ▨ Pavement Patch

NOTES:  
 1. HORIZONTAL DATUM: NAD83  
 2. GRID ZONE: UTM ZONE 11N  
 3. IMAGE SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

CLIENT




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

TITLE  
 Site Plan  
 GP007 - Wanyandie Road Slide  
 Hwy 40:36, km 29.339

SCALE 1:6,000 PROJECT No. A05116A01 FIG No. 1

File: Z:\A\EDM\A05116A01\ABT Grande Prairie South GRMP\400 Drawings\GIS\MXD\2022\Section BIGP007\_220714\GP007\_220714.aprx Date: Time: Creator: aharrison

## Inspection Photographs

**Photo 1** Cracking in recent pavement patch of Hwy 40:36 near western site limit. Photo taken June 14, 2022, facing northwest.



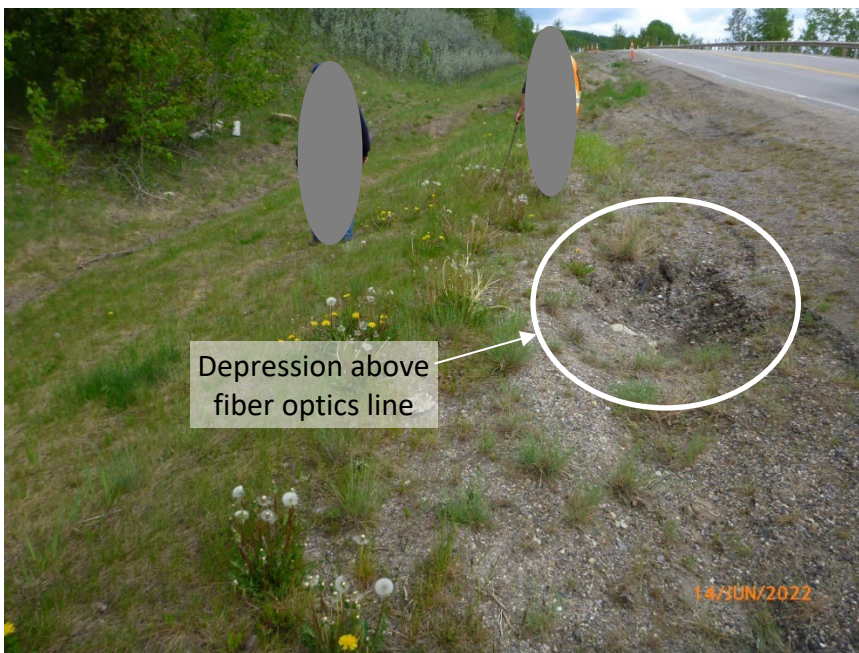
**Photo 2** Cracking in recent pavement patch of Hwy 40:36 near western site limit. Photo taken June 14, 2022, facing southwest towards intersection with Wanyandie Road.



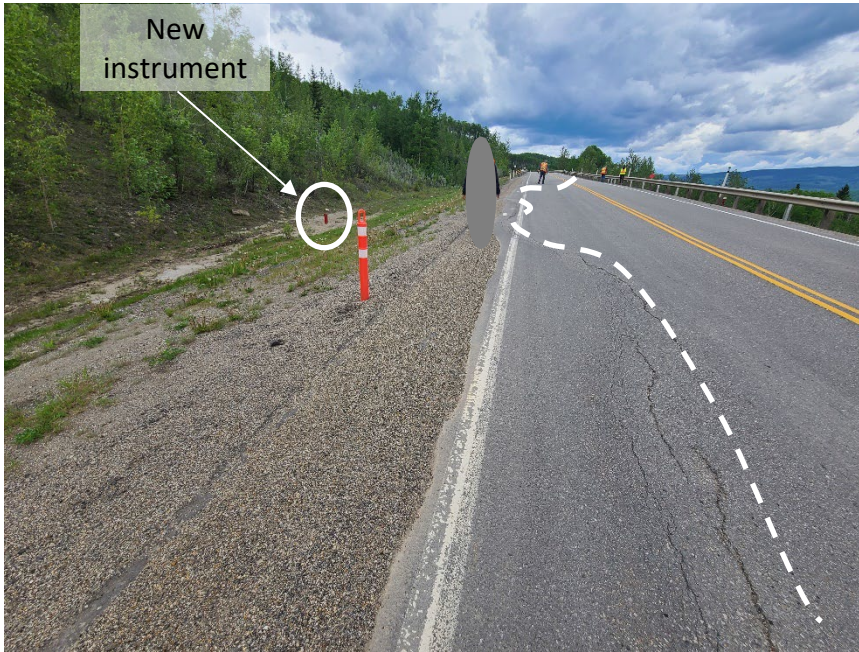
**Photo 3** New instrument (circled in white) installed in upslope/north ditch of Hwy 40:36. Photo taken June 14, 2022, facing east.



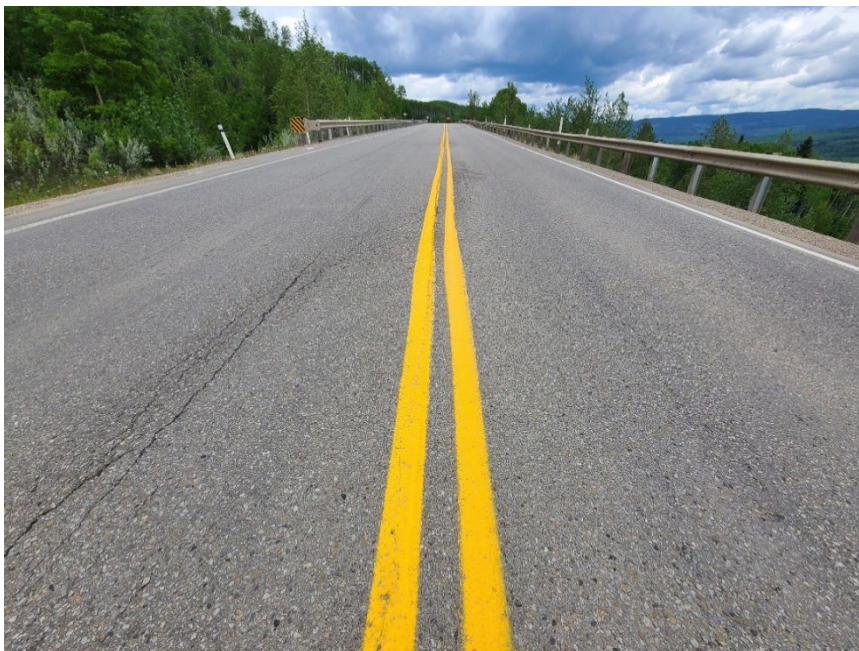
**Photo 4** Sinkhole along fiber optics line (circled in white) in upslope/north ditch of Hwy 40:36 at WP208. Photo taken June 14, 2022, facing east.



**Photo 5** Cracking, and depression (indicated with dotted white line) along backscarp crack in recent pavement patch of Hwy 40:36 near eastern site limit. New instrument (circled in white) installed in upslope/north highway ditch. Photo taken June 14, 2022, facing east



**Photo 6** Cracking, and depression along backscarp crack in recent pavement patch of Hwy 40:36 near eastern site limit. Photo taken June 14, 2022, facing east.

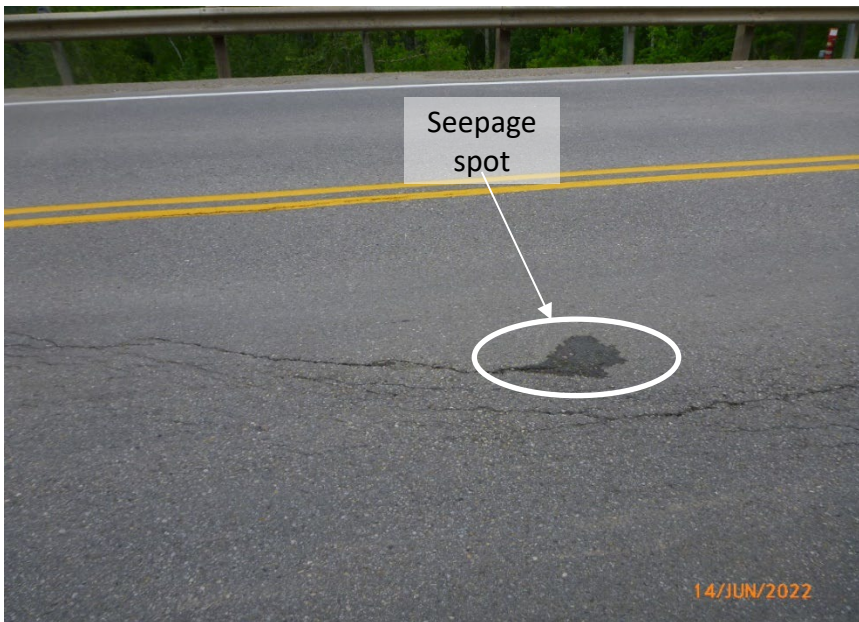




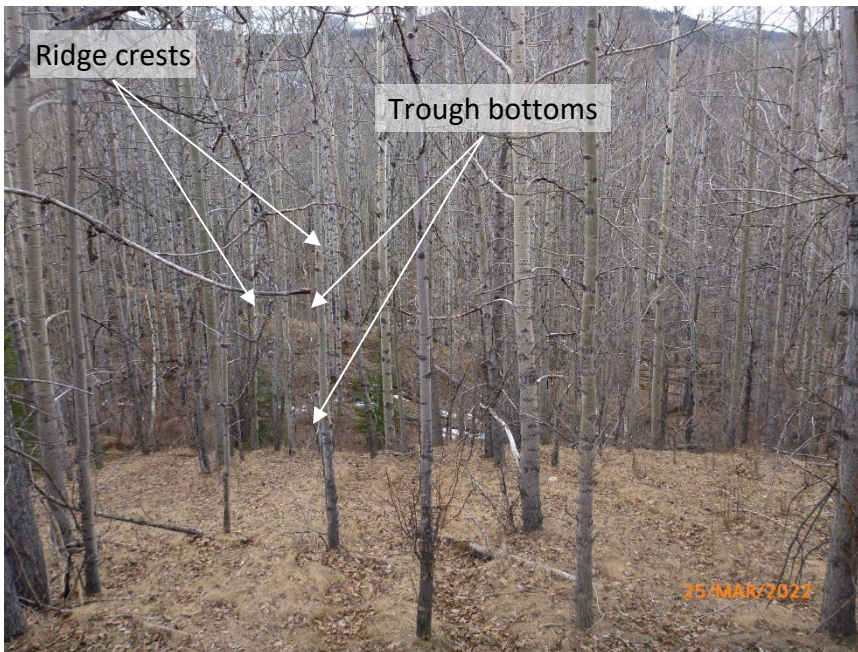
**Photo 7** Skid marks in northbound lane of Hwy 40:36 before depression in pavement surface at eastern site limit. New instrument (circled in white) installed in upslope/north highway ditch. Photo taken June 14, 2022, facing west.



**Photo 8** Seepage spot (circled in white) in southbound lane of Hwy 40:36 at eastern site limit. Photo taken June 14, 2022, facing south.



**Photo 9** Ridges and trough between Hwy 40:36 and former Wanyandie Road. Photo taken March 25, 2022, facing south.



**Photo 10** Ridges and troughs between Hwy 40:36 and former Wanyandie Road. Photo taken March 25, 2022, facing south.



**Photo 11** Ridges and trough between Hwy 40:36 and former Wanyandie Road. Photo taken March 25, 2022, facing east.



**Photo 12** Ridge and trough between Hwy 40:36 and former Wanyandie Road. Photo taken March 25, 2022.



**Photo 13** Ridges and troughs between Hwy 40:36 and former Wanyandie Road. Photo taken March 25, 2022, facing south.



**Photo 14** Pond of water on mid-slope between Hwy 40:36 and former Wanyandie Road at WP202. Photo taken June 14, 2022, facing south.



**Photo 15** Ponded water on former Wanyandie Road near western slide flank at WP203. Photo taken June 14, 2022, facing west.



**Photo 16** Ponded and flowing water on former Wanyandie Road near SI/PN-3 (inoperable) (circled in white) at WP204. Photo taken June 14, 2022, facing east.

