

**SITE INSPECTION FORM**

<b>SITE NUMBER AND NAME:</b> GP053 Rock Slope North of McIntyre Mine		<b>HIGHWAY &amp; KM:</b> 40:36, 16.295 to 17.161	<b>PREVIOUS INSPECTION DATE:</b> June 14, 2022	<b>INSPECTION DATE:</b> <b>June 12, 2023</b>
<b>LEGAL DESCRIPTION:</b> West SE 15-58-08-W6M East NW-14-58-08-W6M	<b>NAD 83 COORDINATES:</b> UTM Northing Easting 11 5986971 362772 11 5987248 363835		<b>RISK ASSESSMENT:</b> PF: 12 CF: 5 TOTAL: 60	
<b>AVERAGE ANNUAL DAILY TRAFFIC (AADT):</b> 840 (north) & 840 (south) (Reference No. 70000788, 2022)			<b>CONTRACT MAINTENANCE AREA (CMA):</b> 504	

<b>SUMMARY OF SITE INSTRUMENTATION:</b>  There is no instrumentation at the GP053 site, but instruments are installed at the GP008A slide site within the limits of the rockfall corridor.  LAST READING DATE: N/A	<b>INSPECTED BY:</b> Chris Gräpel (KCB) Courtney Mulhall (KCB) Roger Skirrow (TEC) Max Shannon (TEC) Renato Macciotta (UofA)
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**PRIMARY SITE ISSUE:** Series of rockfall hazards from rock slope along/above west side of Hwy 40:36. Talus deposits and rockfall particles from rock slope constrict north highway ditch and falling rocks are a traffic hazard. The site is located along the west valley slope of the Smoky River. This site is the rockfall component of the former GP008A site that has been made into a separate site with three subsites in 2022 for rockfalls only. GP008 site is now for road surface slumping and slides only.

**APPROXIMATE DIMENSIONS:** Corridor is approximately 1.0 km long.

GP053-I: Rock slope is approximately 200 m long and 39 m high above pavement surface with an approximate cut angle of 50° from horizontal with a mid-slope ledge/bench.

GP053-II: Rock slope is approximately 500 m long and 5 m to 20 m high above pavement surface with an approximate cut angle of 35° to 50° from horizontal.

GP053-III: Rock slope is approximately 100 m long and 4 m to 10 m high above pavement surfaces with an approximate cut angle of 22° from horizontal.

Ditch geometry varies from v-notched up to 4 m wide, up to 1.5 m deep with 2H:1V to 3H:1V side slopes.

**DATE OF ANY REMEDIAL ACTION:** Ongoing ditch cleaning and removal of rockfall particles from pavement surface. As well as patching and paving (more so due to GP008A slides along the same section of highway).

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Majority of pavement distress along corridor due to GP008A slide movements. No change in pavement distress from rockfall hazards observed.		X
Slope Movement	X		Previously fallen rockfall particles (up to 1.0 m x 1.0 m x 1.0 m) and talus materials between toe of slope and pavement edge.	X	
Erosion	X		Differential weathering, freeze thaw, ice jacking, and seepage eroding rock mass. Some erosion along crest of slope.		X
Seepage		X	None observed at time of 2022 inspection.		X
Culvert Distress		X	Culvert inlet crushed in north (westbound) highway ditch.		X

<b>COMMENTS</b>
Review of air photos from the early 1980s indicates the GP053 rock slope and highway were constructed downslope/south of a pre-existing mine access road which is still present.
In 1998, gradeline improvements were made along this section of highway which resulted in some of the original rock slopes being excavated further with drill-and-blast methods while other sections were not.
Brow of rock slope has minimal to no soil and some trees.
Rock mass consists of beaded and sheared sedimentary rocks, with coal seams which are weathering faster. Faster weathering of the coal results in the undermining of more competent rocks, which results in overhanging blocks and particles with little support that eventually fall, and the deposition of talus cones/slopes at the toe of the coal seams with occasional adjacent lateral rock block piles/cones. Cubical shaped rockfall particles appear to be rolling and bouncing down the talus cones bringing them closer to the highway (i.e., the talus cones act like chutes for rockfall particles). Whereas flat platy shaped rockfall particles appear to get hung up in the talus.
<p><u>GP053-I:</u></p> <ul style="list-style-type: none"> <li>▪ Bedrock structure consists of bedding planes dipping to the south to southwest (dip estimated between 59° to 86°). The rock mass appears to have relatively tight bedding planes, but the rock mass is fractured perpendicular to the bedding planes which generates rockfall events. The bedrock structure changes in the east part of the slope to a gentle fold with dip of approximately 20°, dipping to the southeast towards the highway.</li> <li>▪ Mid-slope bench that has talus cones/slopes, which could potentially bounce/launch/roll rockfall particles out onto the highway. A pile of rock blocks was also observed along this bench.</li> </ul>
<p><u>GP053-II:</u></p> <ul style="list-style-type: none"> <li>• Bedrock structure consists of bedding planes dipping into the slope towards the north (dip estimated between 39° to 80°). The rock mass appears to be of similar quality to the GP053-I site, with one location showing more intact and massive bedrock that still shows drill-and-blast-hole “barrels”.</li> </ul>
<p><u>GP053-III:</u></p> <ul style="list-style-type: none"> <li>• Bedrock structure is different at this site from the previous sites with bedding planes dipping from the east to the southwest (dip estimated between 55° to 60°). The bedding planes vary from a few centimeters thick to over 1 m thick. More fractured or possibly blast damaged zones appear to have been removed, likely during construction, leaving an uneven slope surface.</li> </ul>
Several hanging rock blocks observed at the subsites with some close to falling.
TEC says that some rock particles make it to the highway, and some are large enough to require a front-end loader to remove. TEC also reported that there has been more rockfall from the rock slope in recent years. Mine development upslope/north of the rock slope could be influencing the performance of the slope.
<p><u>Maintenance/Repair/Monitoring Recommendations:</u></p> <ul style="list-style-type: none"> <li>• Short-term:               <ul style="list-style-type: none"> <li>○ “Watch for fallen rock” signs already installed on either side of site, on the east shoulder before the site for northbound traffic and on the west shoulder before the site for southbound traffic. Additional signage (e.g., “watch for fallen rock, no parking) should be installed along the site to further warn motorists of rockfall hazards.</li> <li>○ Clean highway ditch regularly to maintain rockfall storage volume (i.e., keep the ditch as wide and deep as possible to retain material within the ditch) and reduce the potential for material reaching the highway. TEC reported that there are no utilities below the ditch at this site, but AbaData indicates there may be a pipeline (depth unknown) that crosses the highway from south to north near the GP053-I site. Estimated cost: approximately \$25,000 to \$40,000.</li> <li>○ Inlet of culvert which is crushed should also be repaired to maintain ditch flow.</li> </ul> </li> </ul>

- Long-term:
  - The rockfall hazards should be further studied to assess the effectiveness of rock slope stabilization mitigations such as bolting, trim blasting, shotcrete, and attenuation mesh, which should be completed with scaling. This work is underway, and a site investigation was completed by KCB in May 2023 to support design work. Estimated cost: approximately \$800,000 to \$900,000 for 100% mesh on GP053-I and II sites and approximately \$100,000 to \$200,000 for scaling.
  - The environmental aspects of the proposed rock slope scaling and stabilization mitigation will need to be assessed, including whether wildlife (e.g., sheep) use the bench at the GP053-I site.

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

## Inspection Photographs

- Photo 1** Rock slope along north side of Hwy 40:36 at GP053-I site. Note change in orientation of bedrock structure at fold (circled in white) and talus material mainly from coal seams in highway ditch. Photo taken June 12, 2023, facing northwest.



- Photo 2** Rock slope along north side of Hwy 40:36 at GP053-I site. Note change in orientation of bedrock structure at fold (circled in white). Photo taken June 12, 2023, facing northeast.



**Photo 3** Rock slope along north side of Hwy 40:36 at GP053-I site. Note near-vertical bedding orientation of bedrock, bench which could launch rockfall particles from upper slope, rock blocks on mid-slope ledge/bench (circled in white, see photo below). Photo taken June 12, 2023, facing north.



**Photo 4** Rock blocks on mid-slope ledge/bench shown in previous photo. Photo taken June 12, 2023, facing north.



**Photo 5** Rock slope along north side of Hwy 40:36 at GP053-I site. Note near-vertical bedding orientation of bedrock, hanging and jointed rock blocks (one circled in white), and talus material mainly from coal seams in highway ditch. Photo taken June 12, 2023, facing northeast.



**Photo 6** Fault/fold in bedrock along north side of Hwy 40:36 at GP053-I site. Note erosion and hanging rock blocks at crest of slope (some circled in white, see photo below). Photo taken June 12, 2023, facing north.



**Photo 7** Erosion and hanging rock blocks at crest of slope shown in previous photo. Photo taken June 12, 2023, facing northeast.



**Photo 8** Crushed culvert inlet in north ditch of Hwy 40:36 at GP053-I site. Photo taken June 12, 2023, facing west.



**Photo 9** Rock slope along north side of Hwy 40:36 at GP053-II site. Note talus material mainly from coal seams and rockfall particles in highway ditch, and overhanging rock blocks (circled in white, see photo below). Photo taken June 12, 2023, facing north.

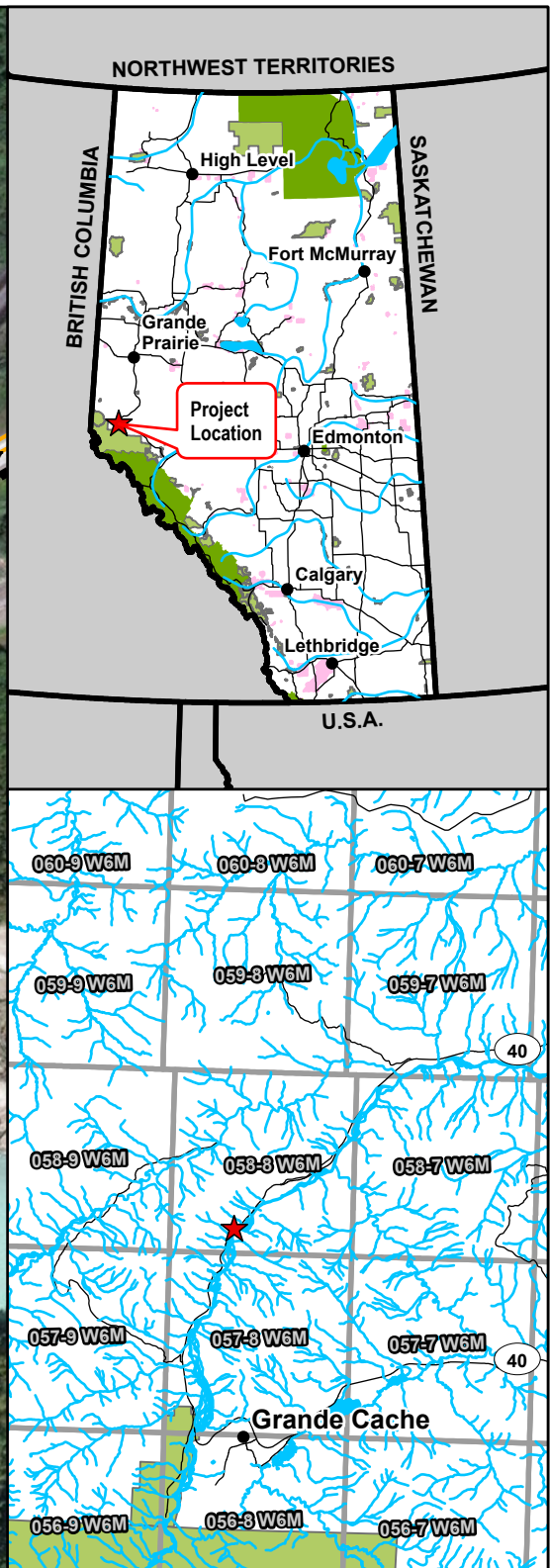
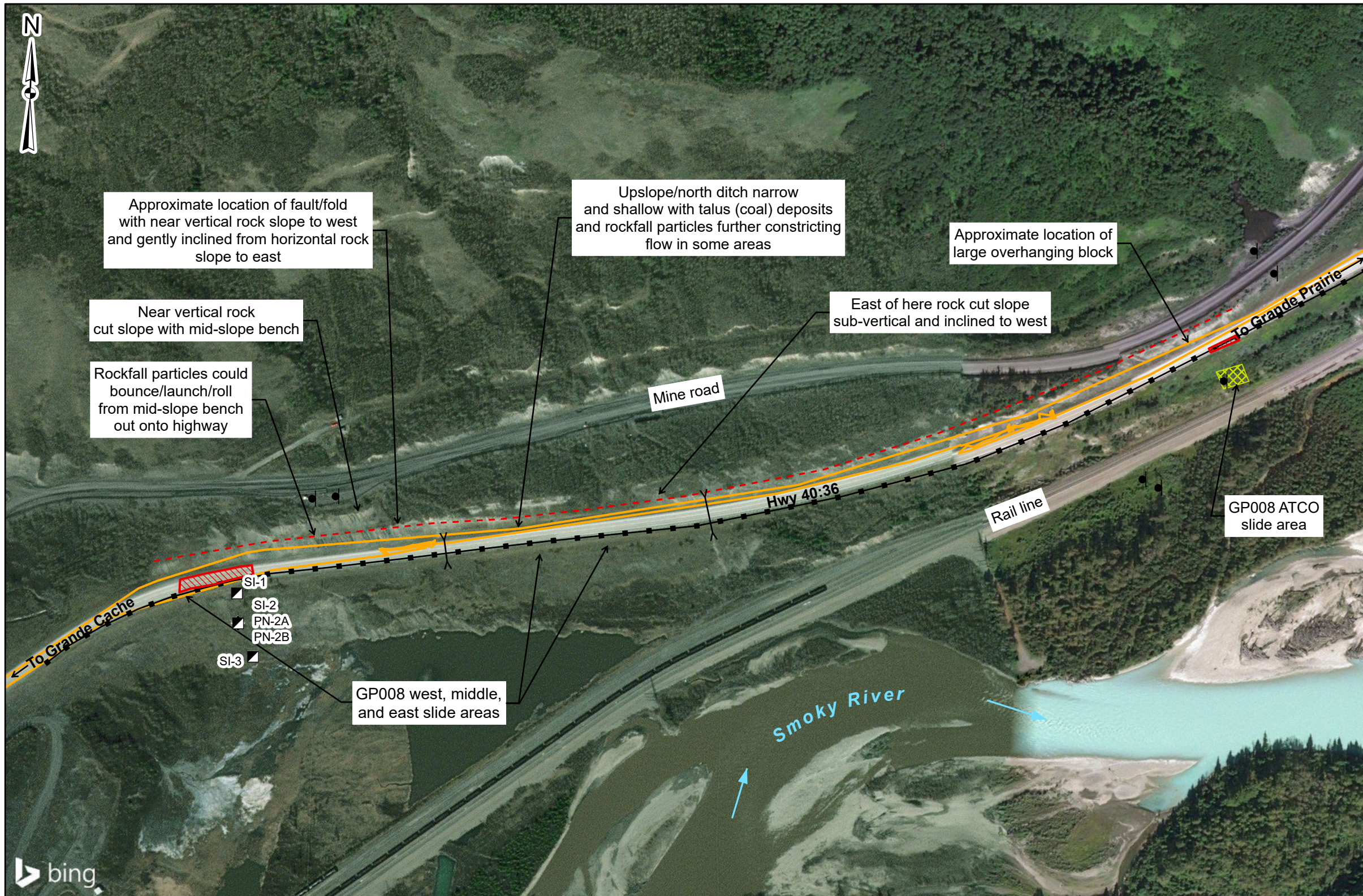


**Photo 10** Hanging rock blocks shown in previous photo. Photo taken June 12, 2023, facing north.





File: \\int.kohn.com\ProjData\A\EDM\A05116A01\ABT Grande Prairie South GRMP\401 Drawings\GIS\WXD\2023\Section B\ABT\_GPSouth\_SectionB\_230619.aprx Date: Time: Creator: aharrison



**Legend**

- Powerpole
- ◆ Approximate Pneumatic Piezometer Location
- ▣ Approximate Slope Inclinometer Location
- GPS Track (June 12, 2023)
- Flow Direction
- > Culvert
- - - Rockfall Corridor
- Guardrail
- ▣ ATCO Excavation
- ▨ Pavement Patch



NOTES:  
 1. HORIZONTAL DATUM: NAD83  
 2. GRID ZONE: UTM ZONE 11N  
 3. IMAGE SOURCE: 2022 MICROSOFT CORPORATION, 2022 MAXAR CNES, DISTRIBUTION AIRBUS DS  
 4. INSTRUMENTS BEING MONITORED AS PART OF GP008A SITE.  
 5. INSTRUMENTS INOPERABLE PRIOR TO 2021 NOT SHOWN.

CLIENT

*Alberta*

**Klohn Crippen Berger**

PROJECT	PEACE REGION (GRANDE PRAIRIE DISTRICT-SOUTH) GEOHAZARD RISK MANAGEMENT PROGRAM	
TITLE	Site Plan GP053 - Rock Slope North of McIntyre Mine Hwy 40:36, km 16.295 to 17.161	
SCALE	PROJECT No.	FIG No.
1:4,000	A05116A01	1