SOUTHERN REGION GRMP
SITE INSPECTION FORM

SITE NUMBER AND NAME: **S020 Highwood House Rockfall Hazard**	HIGHWAY & KM: 541:02, 0.817	PREVIOUS INSPECTION DATE: July 9, 2021	INSPECTION DATE: **May 9, 2023**
LEGAL DESCRIPTION: 04-33-016-05 W5M	NAD 83 COORDINATES: UTM 11 Northing 5584038 Easting 667795	RISK ASSESMENT: PF: 14 CF: 5 TOTAL: 70	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 260 (west), 240 (east), (Ref. No. 59130)		CONTRACTOR MAINTENANCE AREA (CMA): 27	

SUMMARY OF SITE INSTRUMENTATION:	INSPECTED BY:
None LAST READING DATE: N/A	Chris Grapel (KCB) Peter Roy (KCB) Renato Macciotta (U of A) Roger Skirrow (AT) Alex Frotten (AT)

PRIMARY SITE ISSUE: Rockfall from the rock cutting, large rock block potentially unstable (west end), and soil debris flows due to surface water runoff erosion (gullying) from the brow of the slope.

APPROXIMATE DIMENSIONS: Approximately 150 m length and over 20 m high.

DATE OF ANY REMEDIAL ACTION: Ditches cleaned periodically. Ditch has accumulated rockfall debris and appears that it has not been cleaned out this year.

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Rock strike marks on pavement indicates rockfall of 0.1 - 0.3 m diameter (estimate), track marks from heavy equipment on pavement from rockfall removal.		X
Slope Movement	X		Rockfall debris is accumulating in the ditch. Ditch has not been cleaned out recently	X	
Erosion	X		Weathering coal and shale sub-vertical beds interlayers with less weathered mudstone and sandstone, runoff erosion from brow (gullying). No significant changes.		X
Seepage		X			X
Culvert Distress		X			X

COMMENTS

Overall, no significant changes to the site when compared to 2021. Ongoing rockfalls at the site, the majority of which are retained in the ditch, but some rocks are falling onto and across the highway.

Rockfall debris observed in the ditch during the 2023 inspection. MCI reports that ditch needs cleaning out at least once per year. The MCI noted that during 2021, ten tabular blocks of approximately 0.3 m x 0.3 m, and a boulder (approximately 1 m x 1 m x 1 m) had fallen into the ditch.

Loose blocks and boulders up to 0.5 m x 0.5 m x 0.5 m present along the top of the rock slope. Some blocks of rock are within the soil at the brow of slope and are being eroded out and will eventually fall. One large boulder at the brow of western end of the slope, and one smaller boulder midslope are both perched at the crest of the exposed bedrock.

No significant change in extent of soil erosion at brow of hill since 2021 was observed during the site inspection. Surface runoff down the slope is leading to erosion and washout of material, which is being deposited in fans at the base of the slope.

Pine trees are present above the rock slope and adjacent to the slope. The trees appear to be Limber Pine or Whitebark Pine.

Recommended Mitigation Measures:

Short-Term

- Continue to monitor site and clean out ditch regularly to maintain storage capacity for future rockfalls;
- Continue annual photogrammetric survey and 3D surface modelling to monitor potential changes in slope performance and inform existing estimates of annual failure volumes and relative frequency of rockfall events.
- Confirm hazard assessment at the site based on the ongoing UAV photogrammetry change detection work being completed by the U of A.

Long-Term

- Rock face scaling, including check scaling of loose blocks (for safety), clearance of trees and loose debris from the brow of the slope, and removal of the large potentially unstable rock blocks on the upper portion of the rock slope (possibly requiring drilling and blasting);
- Place rock slope mesh in critical areas to protect road users, leaving gaps for sheep passage; and
- Increase the ditch depth/width and evaluate the addition of HTCB or possible barrier wall at the toe of the rock slope (between rock slope and highway).
- Jersey barriers could be installed as an alternative to HTCB or rockfall barrier.

PROFESSIONAL ENGINEER ALBERTA
PETER J. ROY

13 Oct. 2023
ID 141695

Peter Roy, P.Eng.
Civil Engineer

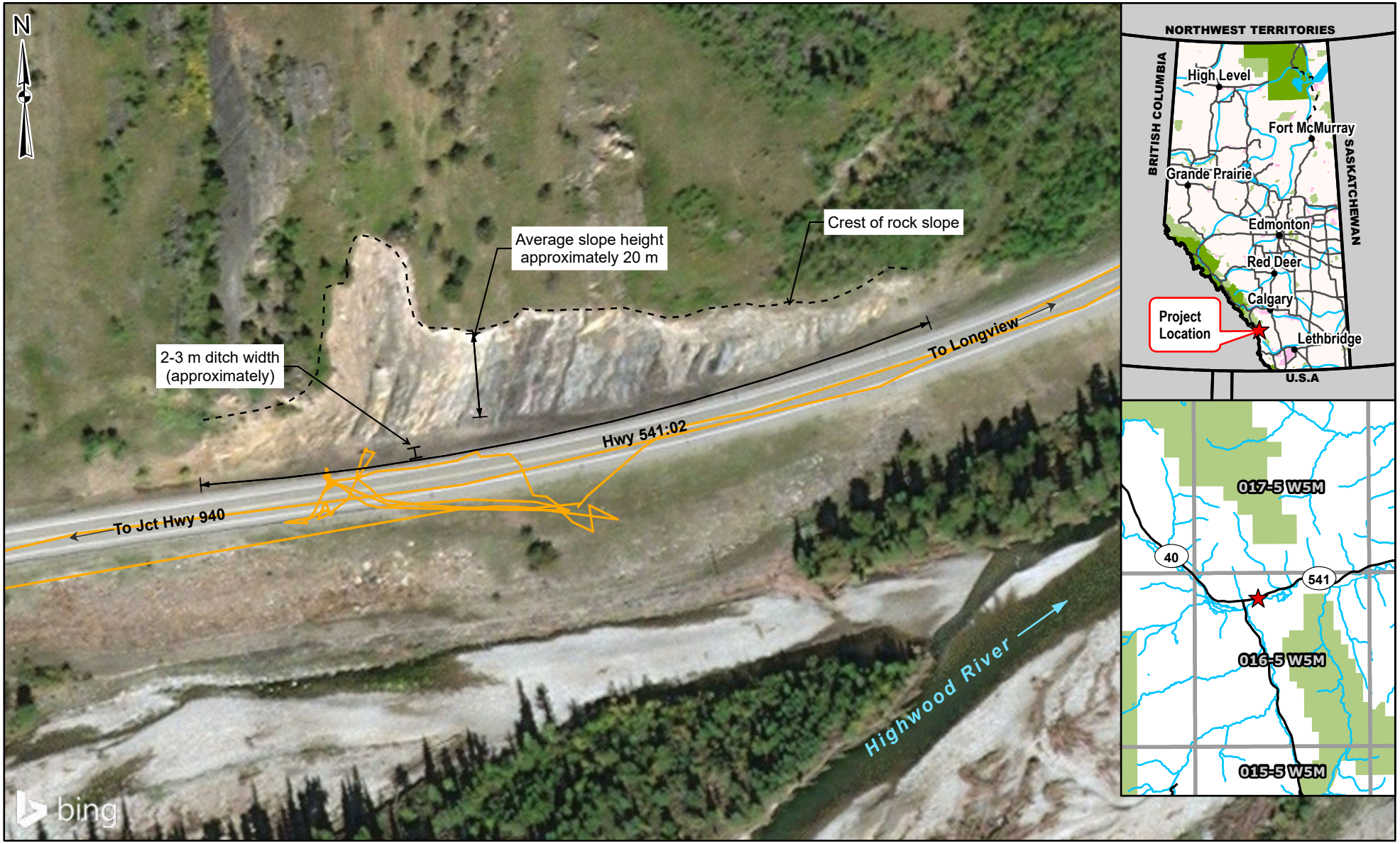
PERMIT TO PRACTICE
KLOHN CRIPPEN BERGER LTD.

RM SIGNATURE: _____

RM APEGA ID #: 187607

DATE: 13 Oct. 2023

PERMIT NUMBER: P009196
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)



Legend

- Top of Slope
- GPS Track (May 9, 2023)
- Flow Direction

0 50 Metres

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

CLIENT: Alberta

Klohn Crippen Berger

PROJECT: SOUTHERN REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
S020 - Highwood House Rockfall Hazard
Hwy 541:02, km 0.817

SCALE	PROJECT No.	FIG No.
1:1,500	A05116A03	1

File: Z:\AC\GY\Alberta\A05116A03 ABT Southern Region GRMP\400 Drawings\2023\01_ProFile\Section B\ABT_Southern_SectionB_230713\ABT_Southern_SectionB_230713.aprx Creator: : aharrison

Photo 1 **Rock slope has a maximum height of approximately 20 m, with continuous joints in an adverse orientation. Photo was taken facing north on May 9, 2023.**

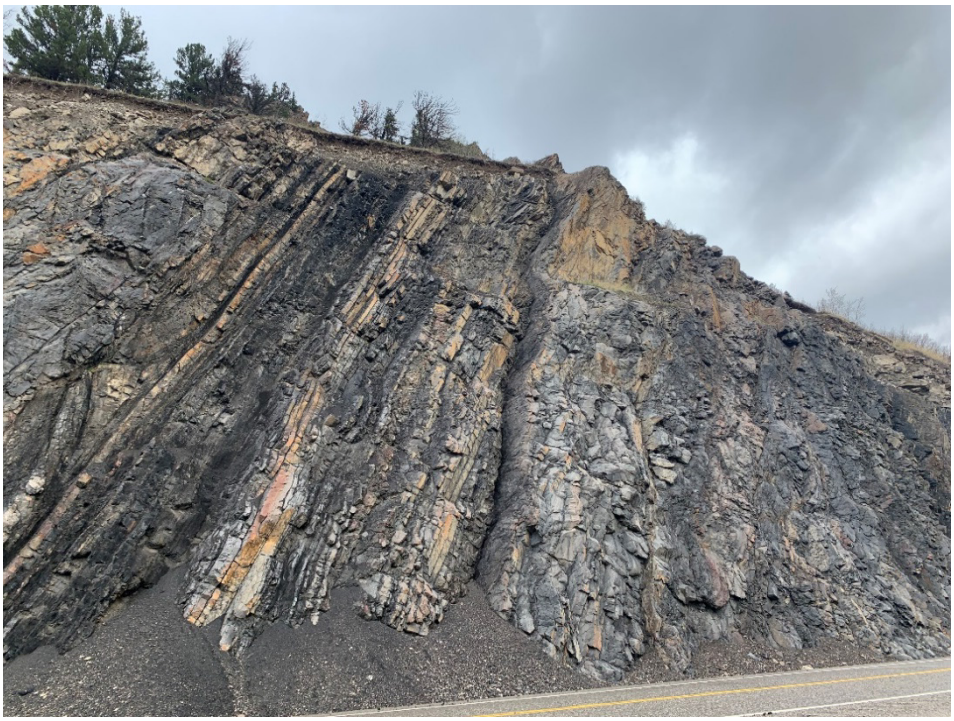


Photo 2 **Erosion of soil at brow of slope leading to rockfalls and debris fans in the ditch. Note large boulders at crest of slope. Photo was taken facing northwest on May 9, 2023.**

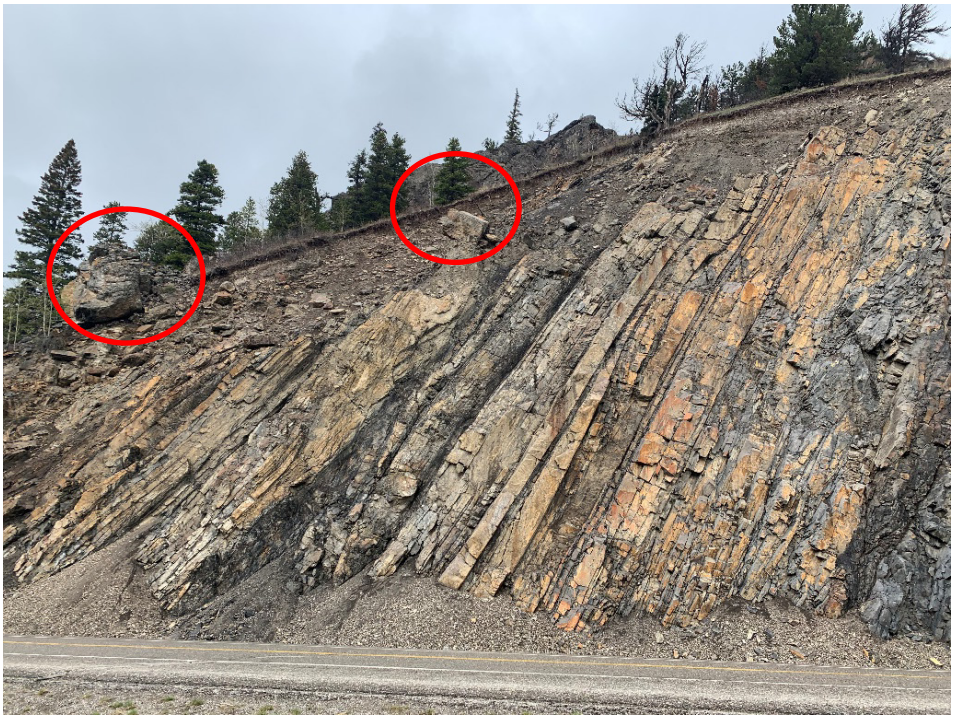


Photo 3 **Active rockfall - debris fans and large rocks in ditch. The ditch should be regularly cleaned of debris. Photo taken facing east on May 9, 2023.**

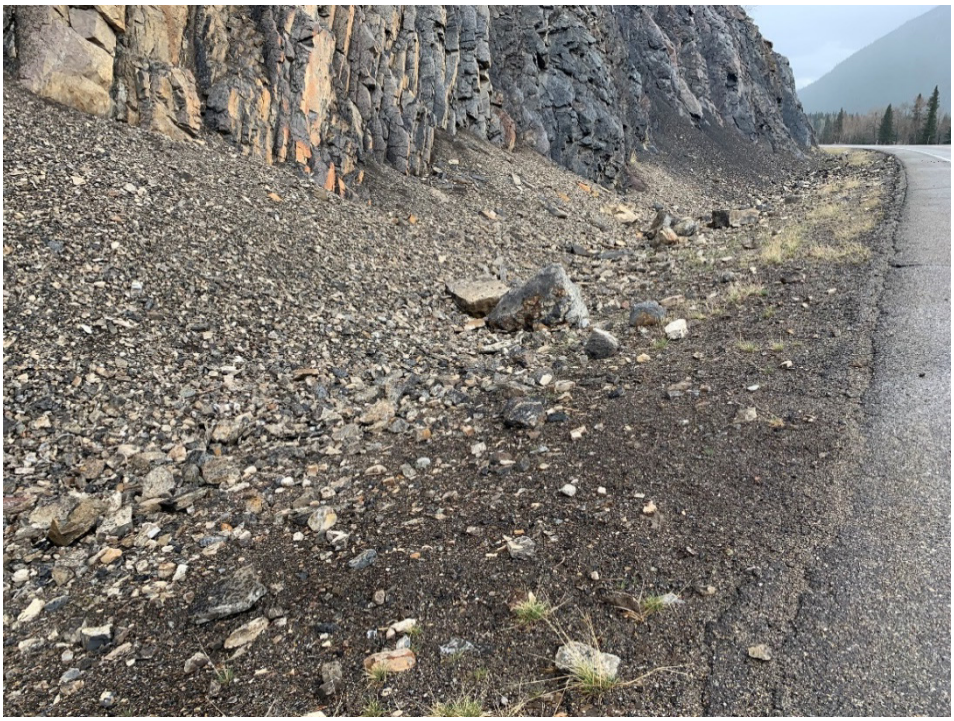


Photo 4 **Large rock perched on top of cliff. Photo taken facing northwest on May 9, 2023.**