

SITE NUMBER AND NAME: <b>S042-1 Spray Lakes Rockfall Barrier</b>		HIGHWAY & KM: 25291:02, 30.434	PREVIOUS INSPECTION DATE: May 27, 2024	INSPECTION DATE: <b>May 26, 2025</b>
LEGAL DESCRIPTION: SW-25-024-11 M5	NAD 83 COORDINATES: UTM    Northing    Easting 11       5658604    611006		RISK ASSESSMENT: 2013 Rockfall event: PF: 7   CF: 7   TOTAL: 49 Rockfall: PF: 13   CF: 5   TOTAL: 65	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 980 (west) & 1840 (east) (Reference No. 70000698)			CONTRACTOR MAINTENANCE AREA (CMA): 28	

SUMMARY OF SITE INSTRUMENTATION:  None  LAST READING DATE: N/A	INSPECTED BY: Chris Gräpel (KCB) Jorge Rodriguez (KCB) Rishi Adhikari (ATEC) Karen Masterson (KCB) Alex Frotten (ATEC)
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PRIMARY SITE ISSUE: Rockfall from steep, high rock slope, large rockfall in 2013, dilated rock mass, active processes. Large rockfalls are defined as generally greater than 1 m <sup>3</sup> in size.
APPROXIMATE DIMENSIONS: Slope height at Site I is approximately 125 m on the north side and 155 m on the south side.
DATE OF ANY REMEDIAL ACTION: A short rockfall fence was installed by others between 2016 and 2017 inspections at the south side of the S042-I site. TransAlta, between 2024 and 2025, has installed rockfall fences across the site and upslope of the Spray Canal.

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress		X	N/A – gravel road		X
Slope Movement		X	Previously fallen rocks (small and large) are visible and have been pushed off the roadway.		X
Erosion		X	Differential weathering, freeze thaw, ice jacking, and seepage eroding rock mass.		X
Seepage		X	Evidence of seepage out of cracks and below the overhang.		X
Culvert Distress		X	N/A – none observed		X
Rockfall	X		Mainly single rockfalls and ongoing raveling. Possible signs of rock mass failures above the narrowest section of road, and at the north end of S042-I.  Debris accumulation behind the rockfall fence toward the south side of the site was not cleared at the time of the site inspection in 2025, and the fence is bulging toward the highway		X



**COMMENTS**

There is a documented history of rockfalls being initiated by precipitation and ice jacking during the thawing period in late winter. Additionally, minor rockfalls have been associated with rock climbers or wildlife activity on the slope, as observed on one or two occasions during monitoring activities. Although climbers dislodged rocks from the talus, these did not reach the road.

Kinematic analysis of the bedrock structure indicated that large rockfalls are possible, including in areas with visible disaggregated rock at the north end of S042-I. Rockfalls are potentially triggered by deep-seated water buildup in cracks and ice damming during the freezing trend (early winter).

Previous site inspections have identified the presence of pre-sheared jointed sets near the south side of the site (Photo 5).

**S042-I:**

- The largest known rockfall event occurred in 2013 on the north side with an estimated volume of 15 m<sup>3</sup> that narrowly missed a passing vehicle and a group of people.
- Alberta Environment and Parks (AEP) have established an improved parking area for cars and buses at the north limit of the site in addition to various park improvements along the Smith Dorrien Trail. Additionally, several climbing routes are established on the north side of the slope. These public facilities are expected to increase the risk exposure to rockfall hazards. During the 2025 inspection, it was noticeable that the parking lot was full, with tourists stopping, hikers and bikers on the road, and multiple climbers on the slope or preparing. Remediation action for rockfall hazards needs to consider the additional traffic exposure to rockfalls.
- On May 6, 2019, a rockfall event with a total volume estimated to be between 0.3 m<sup>3</sup> and 0.5 m<sup>3</sup> was reported to TEC. Afterwards, small rockfalls appeared to be ongoing, as fresh, unweathered rockfall debris with sharp edges was observed in the ditch, indicating recent detachment from the slope.
- There have not been significant changes visually identified to the rock slope during the 2025 inspection. From the change detection analysis completed by the University of Alberta between 2021 and 2023, only one (1) relatively large rockfall of approximately 2 m<sup>3</sup> was identified between 2021 and 2022 on the south slope. It is unclear if that material reached the road or was retained on the talus slope.
- An updated change detection analysis completed in 2025 by KCB showed that:
  - between 2022 and 2024, there have been minimal changes to the volume-frequency relationship, as most newly identified rockfalls (23 out of 26) had volumes smaller than 0.1 m<sup>3</sup>.
  - rockfall activity has originated from blocks accumulated on the talus deposit. The largest identified rockfall from the change detection analysis originated from the talus of the South slope, with a maximum volume of 0.38 m<sup>3</sup>. In contrast, the largest rockfall from the North Slope was 0.07 m<sup>3</sup>, also identified from the talus.

**S042-II (not visited in 2025):**

- Work on this site is not included in KCB's work scope for repair/mitigation design.

**Maintenance/Repair/Monitoring Recommendations:**

**Short-term:**

- Continue to monitor the site and clean out rockfall accumulated behind rockfall fence to maintain storage capacity for future rockfalls.
- Additional road signage is recommended to warn road users of risk of fallen rocks on highway.
- Continue annual survey and update of change detection analysis to monitor potential changes in slope performance and inform existing estimates of annual failure volumes and relative frequency of rockfall events. A LiDAR/radar survey should continue to be done every 1-2 years (as part of the KCB-TEC-U of A research project) to monitor the location and frequency of rockfalls, as well as any potential continued



dilation of larger volumes of rock.

Long term:

- Install a continuous rockfall fence near the toe of the slope on both the north and south sides and install two hybrid rockfall fences upslope on the “nose” section of the site. The “nose” area, which is the closest point to an overhead powerline, is approximately 3 to 5 meters away from the rock slope. This distance should be taken into account during the installation of the upper fences. KCB is currently working on the detailed design of the rockfall mitigation work for the site.
- Rock face scaling, including check scaling of loose blocks (for safety), and removal of the large potentially unstable rock blocks on the upper portion of the rock slope.
- Continue monitoring the slope using remote sensing techniques and install survey prism of critical blocks.

The long-term mitigation construction planned for 2025 has been postponed until a revised rockfall mitigation design is available. The design revision is meant to update the site's risk profile and offer alternative solutions to installing a large drapery mesh, while also considering additional environmental restrictions and considerations.

During the 2025 inspection, KCB and TEC reviewed the draft results of the updated rockfall analysis and mitigation strategy. Access for construction and regular maintenance of any rockfall fences upslope will be a key factor in the design, which aims to minimize the rockfall hazard to the highway.

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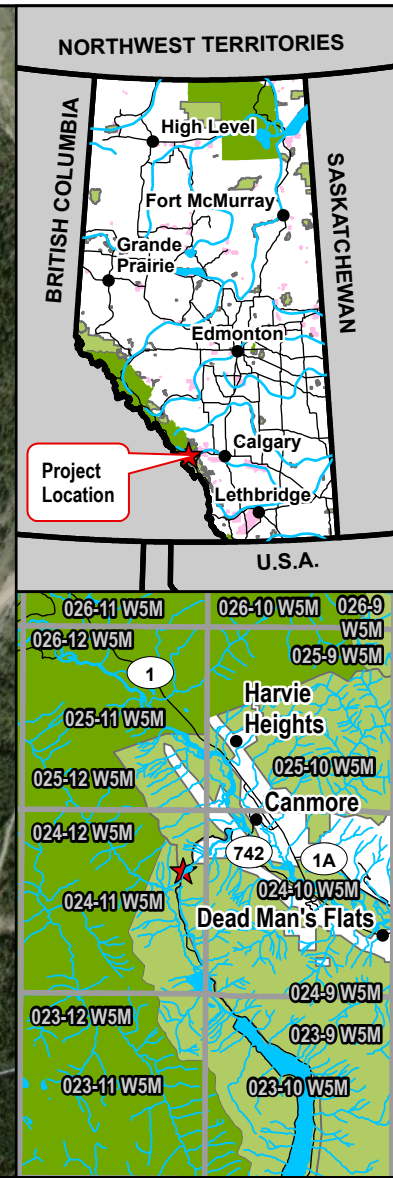
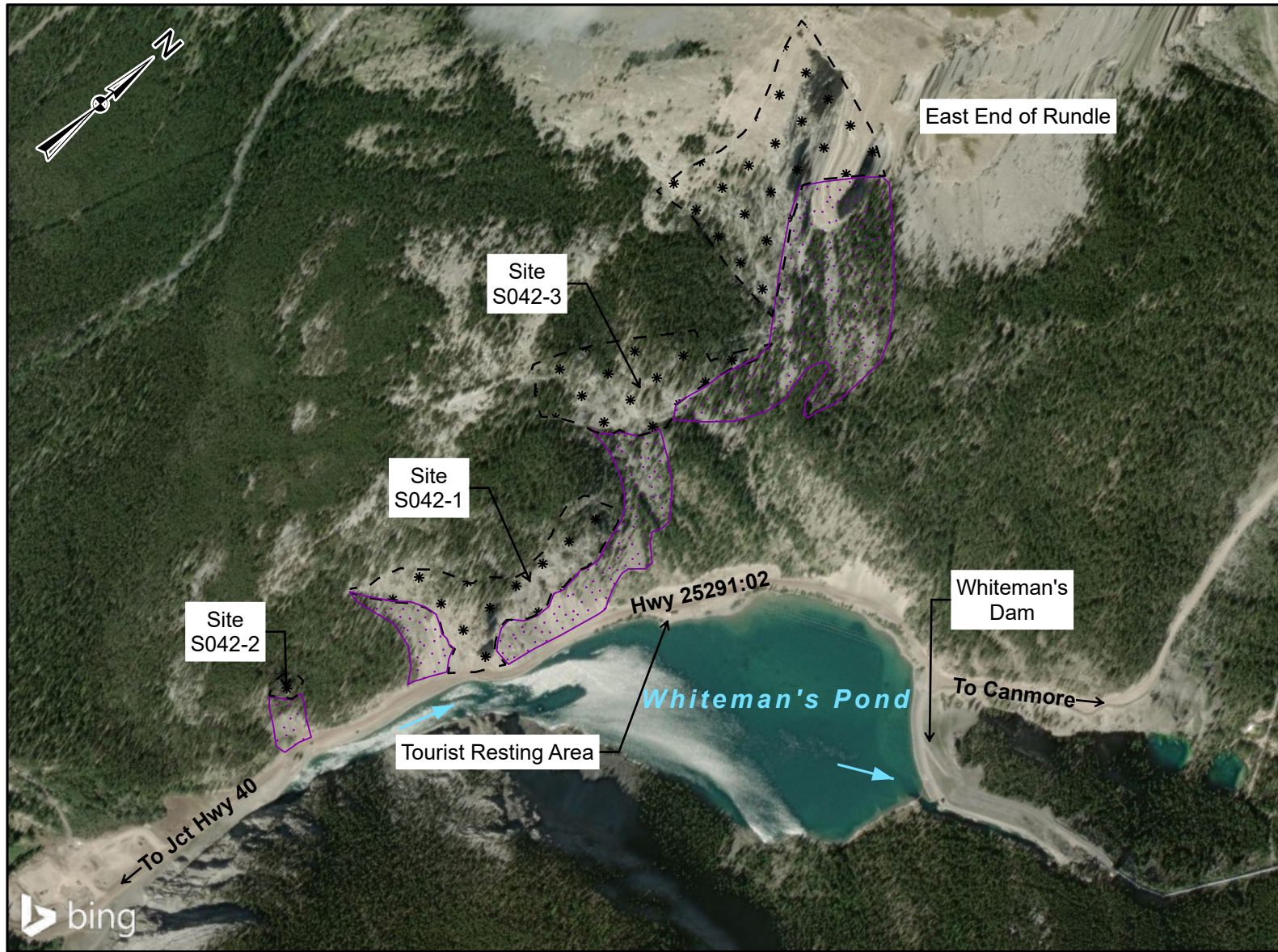
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Jorge Rodriguez, Ph.D., M.Sc., P.Eng.  
Geotechnical Engineer





# **Legend**

- Flow Direction
- Active Talus
- Potential Rockfall Sources

NOTES:  
 1. HORIZONTAL DATUM: NAD83  
 2. GRID ZONE: UTM ZONE 11N  
 3. IMAGE SOURCE: MAXAR 2025

CLIENT

*Alberta*

Klohn Crippen Berger

PROJECT

SOUTHERN REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE

Site Plan  
 S042 - Spray Lakes Rockfall Barrier  
 Hwy 25291:02, km 30.434

SCALE

1:8,000

PROJECT No.

A05116A03

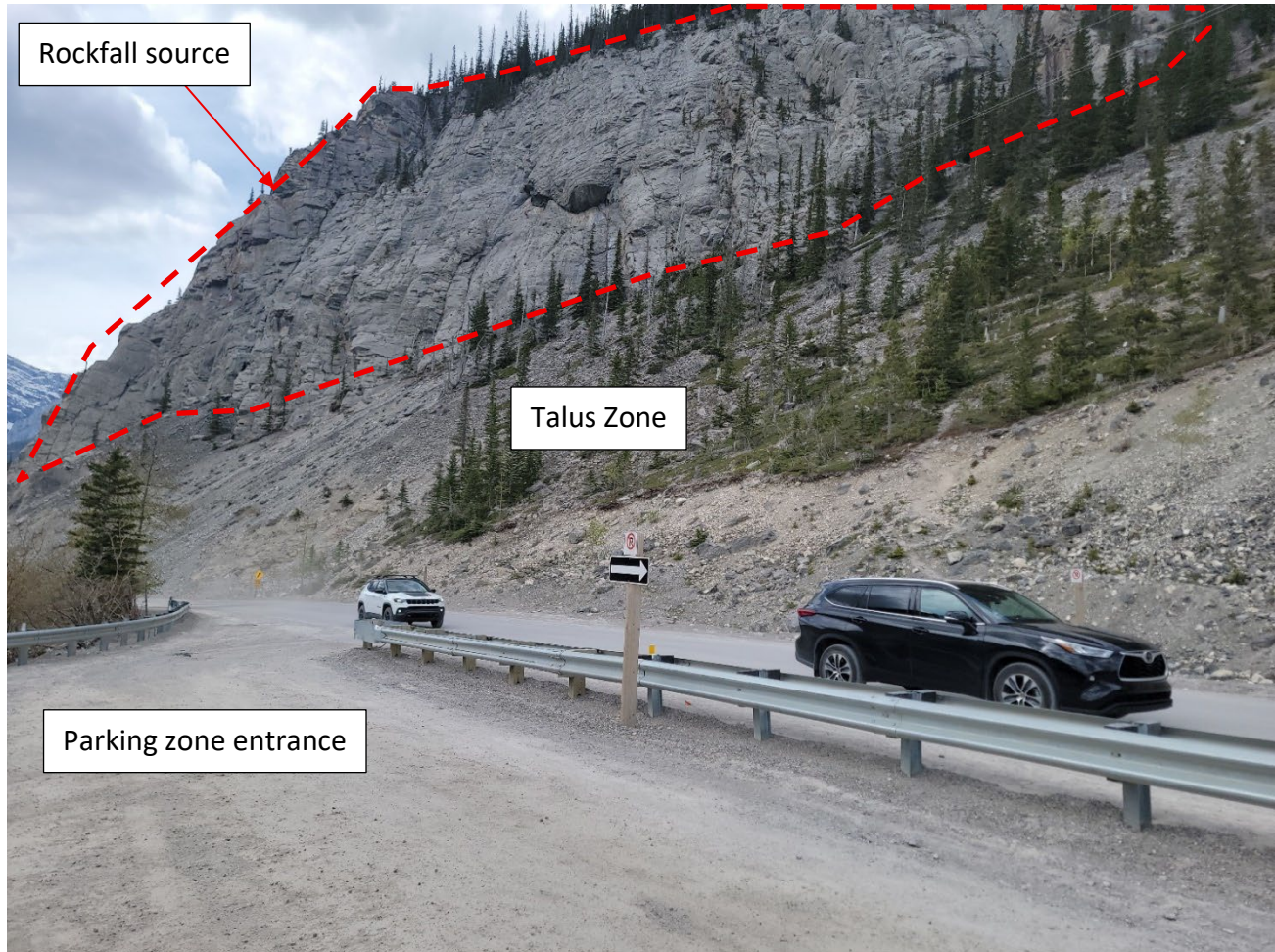
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**Photo 1** Source area for rockfall, talus deposit, and entrance to parking zone, on the north side of the site. Photo taken May 26, 2025, facing southwest.



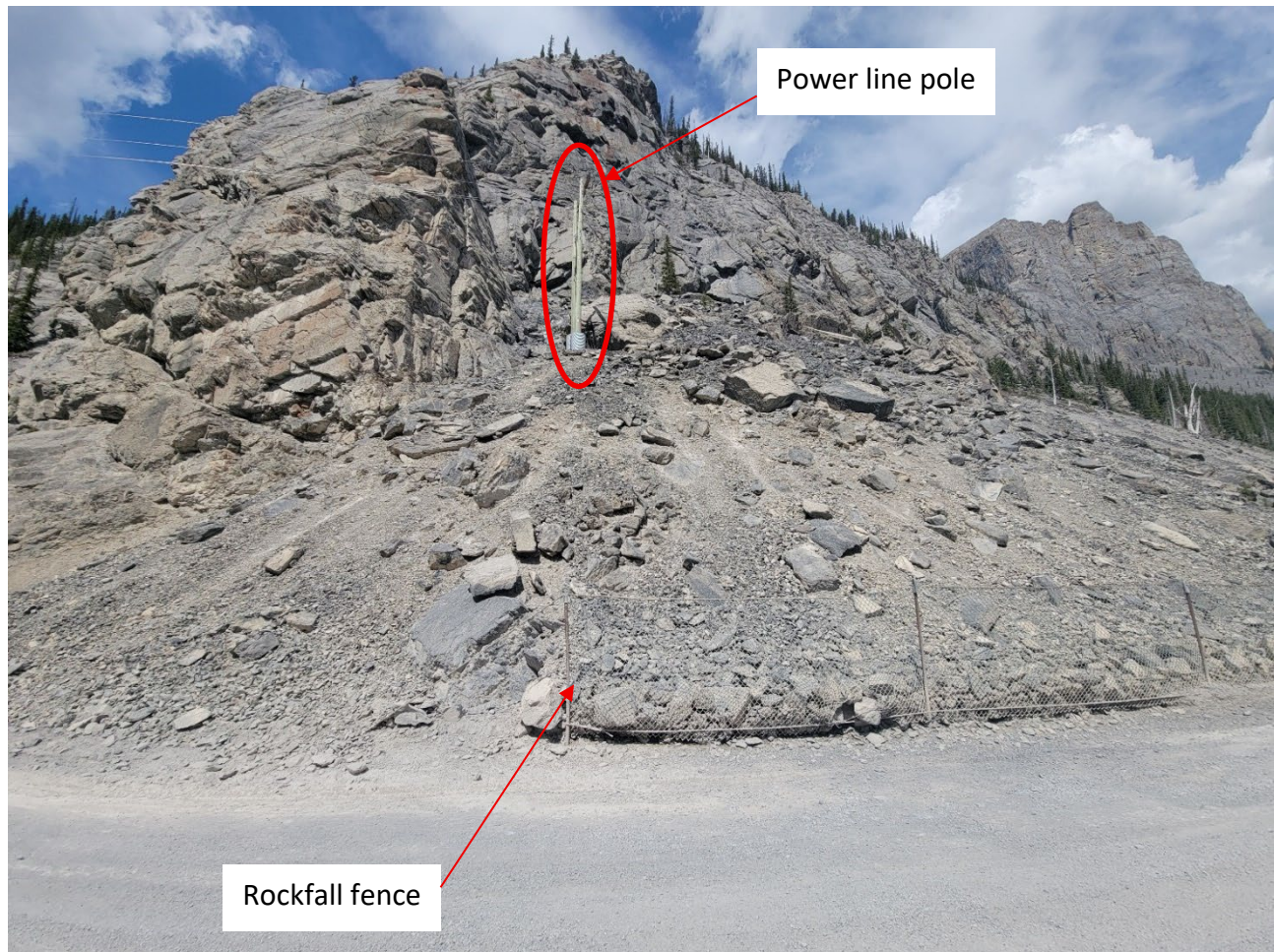


**Photo 2**      **Rock slope and talus deposit up to the toe of the slope on the north side of the site.**  
**Photo taken May 26, 2025, facing west.**



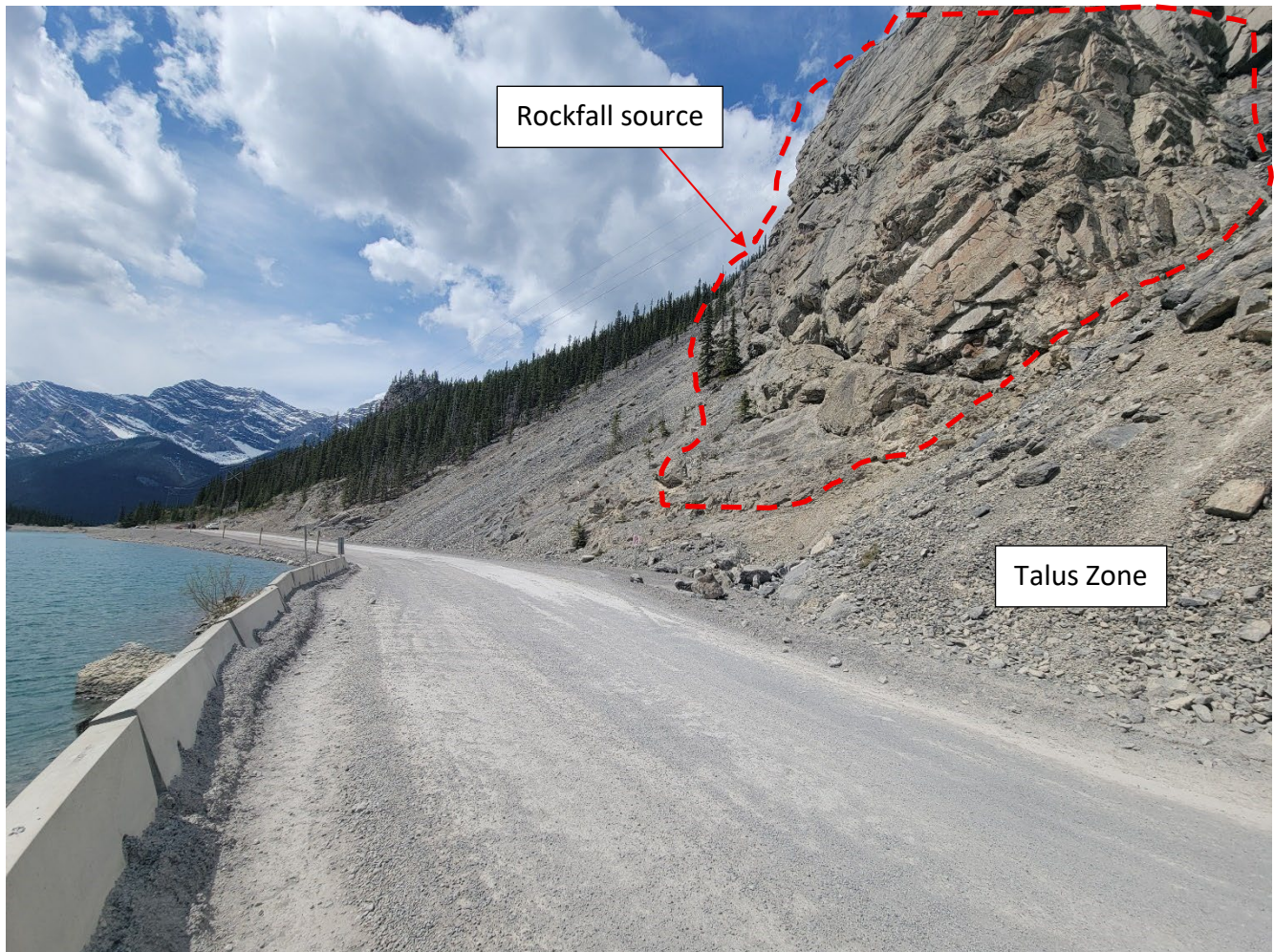


**Photo 3**      **Rock slope, overhead power line, and rock block accumulation on the rockfall fence at the edge of the highway. Photo taken May 26, 2025, facing west.**





**Photo 4**      **Source area for rockfall and talus deposit on the south side of the site. Photo taken May 26, 2025, facing south.**





**Photo 5**      **Pre-sheared joint set (red dashed line) located between the north and south side of the site. Photo taken May 26, 2025, facing south.**

