Site 3 – Barrier Bluffs Through-Cut

This site is located approximately 3.8 km south of the junction between Highway 40 and Highway 68 and consists of rock cut slopes along both sides of the highway. The cut slopes extend for approximately 200 m along the highway. There are rockfall hazards along both cut slopes. There are warning signs ("Watch For Fallen Rock") posted for traffic approaching the site from both directions.

The rockfall hazard conditions along both cut slopes are summarized as follows.

East Cut Slope (Photos 1 to 3)

- The cut slope along the east side of the highway is near-vertical with a maximum height of approximately 14 m.
- The bedrock exposed in the cut slope is jointed, faulted and highly fractured. The south segment of the cut slope is particularly rough and fractured.
- The bedrock is steeply dipping with the dip direction roughly parallel to the highway, i.e. favorable from a stability perspective.
- Rockfalls along this slope are the result of erosion of the exposed rock. The erodibility of the exposed rock is exacerbated in places by the numerous discontinuities. The rockfall debris is typically gravel to cobble-sized although occasional boulder-sized rocks were noted.
- The east ditch along the highway is typically 7 to 8 m wide and 1.25 m deep. The ditch sizing criteria shown on Figure B1 in Appendix B indicate that for a near-vertical slope at the maximum height of 14 m, the ditch width should be at least 5.3 m and the ditch depth should be at least 1.4 m. The existing ditch exceeds the minimum width criteria but does not meet the minimum depth criteria.
- As shown in Photo 2, there is an accumulation of rockfall debris along the toe of the cut slope that extends into the central portion of the ditch. At the time of the inspection in October 2005, the rockfall debris was entirely contained within the ditch and there were no signs of damage to the pavement from previous rockfall.

West Cut Slope (Photo 4)

- The maximum height of the near-vertical cut slope along the west side of the highway varied between 4 and 6 m. The width and depth of the ditch are typically in the order of 5 m and 1.5 m, respectively. According to the ditch sizing criteria shown on Figure B1 in Appendix B, for a near-vertical cut slope of this maximum height the ditch width should be at least 3.7 m and the ditch depth should be at least 1.1 m. The existing ditch exceeds both of these criteria.
- Similar to the east cut slope, there are relatively large volumes of gravel to cobble sized rocks that ravel off the cut slope and accumulate within the ditch without rolling onto the road.

AMEC recommends the following Risk Level factors for this site using the rock fall frequency-severity matrix:

- Probability Factor of 13 based on the appearance of the debris that suggests that several rockfalls occur each year.

- Consequence Factor of 1 based on no visual evidence of past rockfalls reaching the paved surface of the road.

Therefore, the recommended Risk Level for this site is 13.

It is recommended that the rockfall debris be cleaned from the ditches as a proactive measure in order to restore the maximum ditch capacity. The ditch also should be cleaned in the future as an ongoing maintenance task in order to reduce the hazard of rockfall debris rolling onto the road.

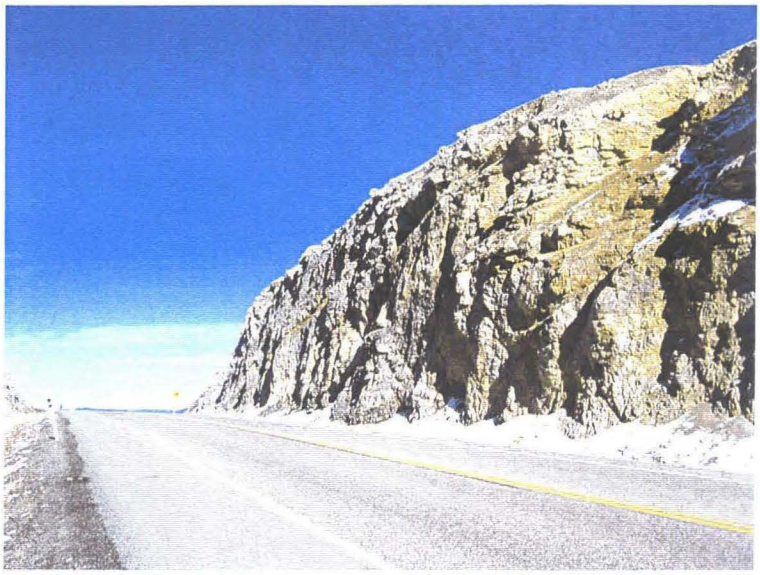

Photo 1 (top) – Rock cut slope along the east side of the highway. The cut slope is near-vertical, with a maximum height of approximately 14 m. The bedrock is steeply dipping with the dip direction roughly parallel to the highway (which is favorable from a stability perspective). The bedrock is highly fractured, jointed and faulted, with the south end of the east cut slope particularly fractured and rough.

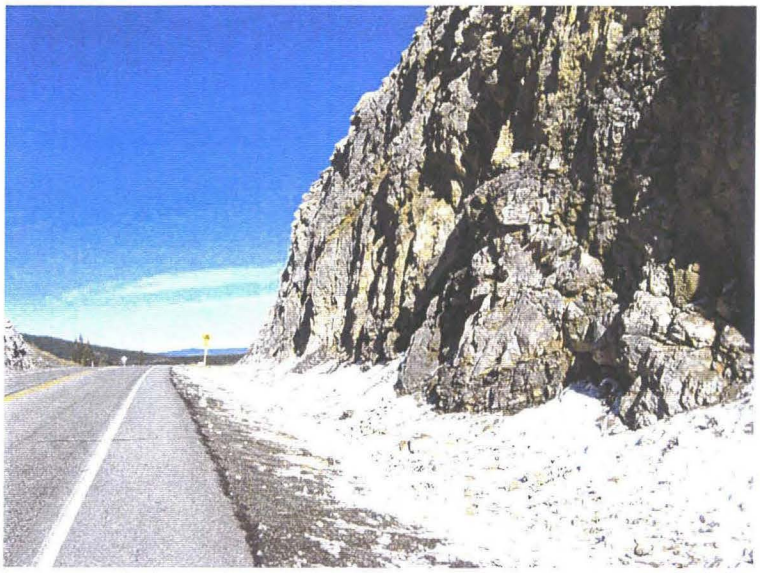

Photo 2 (middle) – Typical view along the east ditch showing the accumulation of rockfall debris along the toe of the cut slope and extending into the central portion of the ditch. The ditch was typically 7 to 8 m wide and 1.25 m deep. There were no rocks on the road or signs of pavement damage due to previous rockfall. The rockfall debris in this area was typically gravel to cobble-sized, however occasional boulder sized rocks were noted. The rockfall debris should be cleaned out of the ditch.

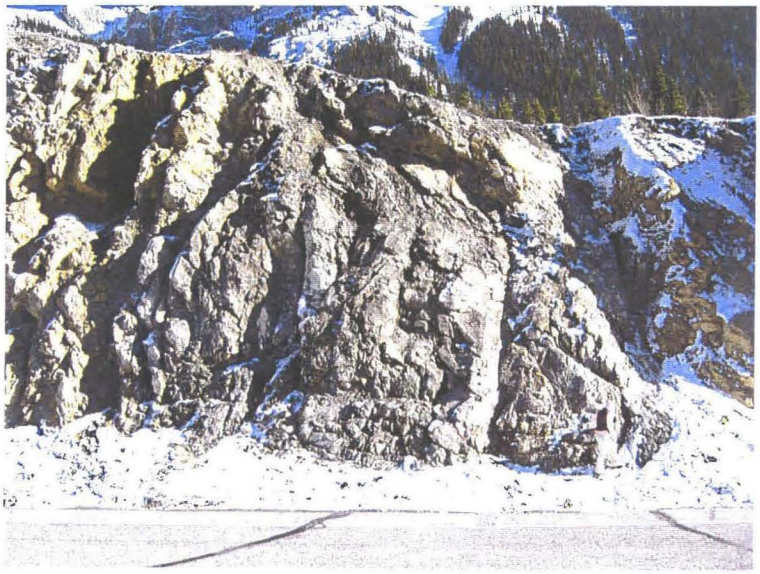

Photo 3 (bottom) – Typical view of the southern end of the east cut slope showing the fractured and rough cut face. Relatively large volumes of gravel sized rocks ravel off of these areas and accumulate at the toe of the cut slope.

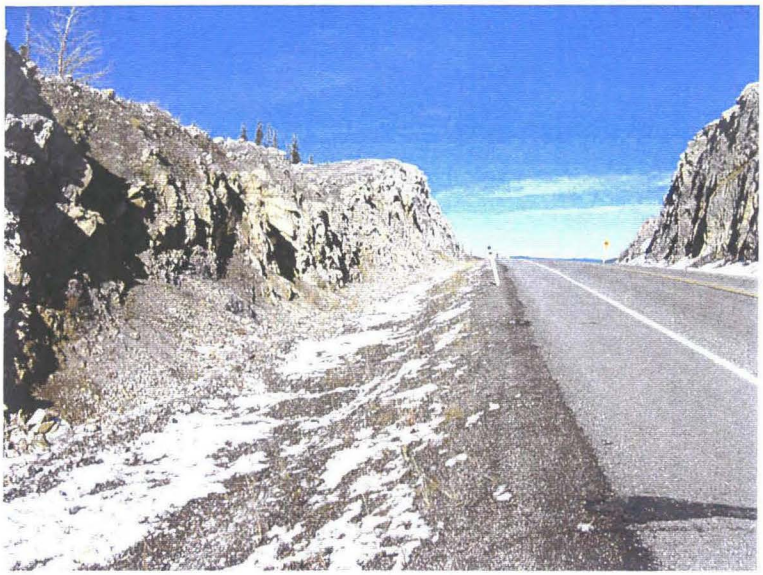

Photo 4 (top) – Facing north along the west cut slope. The maximum height of the near-vertical cut slope varies between 4 and 6 m. The width and depth of the ditch are typically in the order of 5 m and 1.5 m, respectively. Similar to the east cut slope, there are relatively large volumes of gravel to cobble sized rocks that ravel off the cut slope and accumulate within the ditch. The rockfall debris should be cleaned out of the ditch.