

## Site 16 – Grizzly Creek

The Grizzly Creek crossing on Highway 40 is located approximately 2.5 km south of the Fortress Junction service station and at the south boundary of Spray Valley Provincial Park. The creek is carried below the highway via a culvert of greater than 1 m diameter.

The following key observations were noted during the site inspection in September 2005:

- The culvert was clear of debris at the time of the inspection. There was an accumulation of gravel to boulder-sized material along the channel immediately upstream of the culvert inlet. This buildup of material had deflected the creek flow a few metres to the south. As shown in Photo 1, this has resulted in erosion of the highway embankment sideslope immediately south of the culvert inlet.
- There was a deposit of gravel to cobble-sized debris in the ditch and on the highway embankment sideslope to the north of the culvert inlet (on the right hand side of Photo 1) that appeared to have been deposited earlier in 2005.
- The creek channel was traversed over a distance of approximately 200 m upstream of the highway. The creek channel is well-defined and lined with boulders (Photos 2 and 3). There were numerous areas and pockets along the channel where sand and gravel debris had been deposited on the upstream side of trees and boulders above the main flow channel. It appeared that these deposits occurred during peak flows earlier in 2005.
- As shown on Photo 4, there is an approximately 1.5 m drop at the culvert outlet on the west side of the highway. The channel below the outlet is naturally well-armored with boulders and the discharge from the culvert has not caused any erosion that could undermine the culvert outlet.

The airphotos of this site showed that the highway is located roughly at the apex of a large, long-term alluvial fan along the lower portion of the Grizzly Creek channel. The creek channel is currently flowing along the north flank of the fan and will likely gradually shift its position along the fan in the future but without hazard to the highway crossing.

The airphotos also showed that the segment of the creek channel upstream of the highway is oriented roughly perpendicular to the strike of the near-vertically bedded bedrock. Therefore, there are numerous, steep tributary gullies along this segment of the creek channel, however it does not appear on the airphotos that significant volumes of debris are being transported down into the Grizzly Creek channel. The gradient of the creek channel above the highway is approximately 17°, which would likely be sufficient to allow transport of debris flows down to the highway. However, based on the appearance on the airphotos, the probability of debris flows along the Grizzly Creek channel is judged to be relatively low.

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

- Probability Factor of 3 based on the minor buildups of debris along the creek channel upstream of the highway and the debris deposits in the channel immediately upstream and to the north of the culvert inlet.
- Consequence Factor of 2 based on the potential for debris flow events to block the inlet of the culvert.

Therefore, the recommended Risk Level for this site is 6.

The following work is recommended for this site:

1. The accumulated debris in the creek channel immediately upstream of the culvert inlet should be removed so that the creek channel flows directly into the culvert.
2. The eroded area on the highway sideslope immediately south of the culvert inlet should be armored to prevent further erosion of the exposed soils. The boulders in the debris to be removed from upstream of the culvert inlet could be used for this purpose.



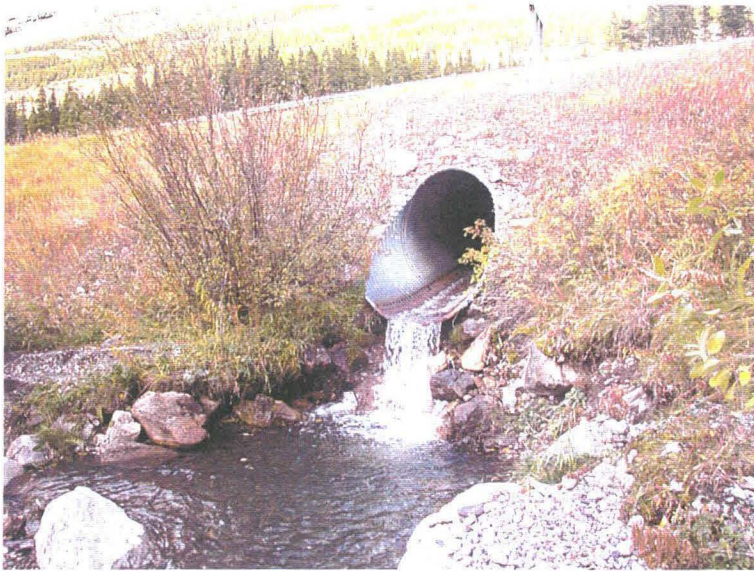
**Photo 1** (top) – Facing west towards the culvert inlet at the Grizzly Creek crossing. The culvert itself was clear of debris at the time of the inspection, however a buildup of gravel to boulder-sized deposits along the channel immediately upstream of the inlet had raised the elevation of the base of the creek channel above the culvert base and deflected the creek flow a few metres to the south. This has resulted in erosion of the highway embankment sideslope immediately south of the culvert inlet. Note also the granular debris in the ditch and on the highway embankment sideslope to the north of the inlet (on the right hand side of the photo) – this debris appeared to have been deposited earlier in 2005.



**Photo 2** (middle) – Typical view of the Grizzly Creek channel, facing upstream approximately 30 m from the highway crossing. The channel is well-defined and the creek flows across/around boulders. Gravel to cobble-sized particles as well as wood debris was noted along the channel. There were numerous areas along the channel where sand to gravel sized debris had been deposited on the upstream side of trees and boulders above the main flow channel – indicating peak flows earlier in 2005.



**Photo 3** (bottom) – Typical view of the Grizzly Creek channel, facing upstream approximately 100 m from the highway crossing.



**Photo 4** (bottom) – The outlet of the Grizzly Creek culvert on the west side of the highway. There is an approximately 1.5 m drop at the culvert outlet, however there does not appear to have been problematic erosion below the culvert outlet to date.