

SECTION A – FILE REVIEW

Site Location

- ▶ Highway 40 approximately 200m north of the junction between Highway 40 and Highway 742, which is also the winter gate at the northern end of the segment of Highway 40 that is closed between December 1 and June 15th every year
- ▶ UTM Coordinates: Easting 633441, Northing 5620168 (NAD 83, Zone 11)
- ▶ 1-25-020-09W5
- ▶ NTS mapsheet 82J/11

Chronological Background

Table 1A provides a chronological background for this site.

Site Geology, Hydrogeologic and Geomorphologic Setting

Highway 40 crosses King Creek via a fill embankment over a large, multi-plate culvert. The embankment sideslopes are at 20° inclination. The height of the upstream face of the embankment is approximately 16 to 18m. The height of the downstream face of the embankment is approximately 20 to 22m. The King Creek Channel has been divided into three general segments listed below:

- The Upper portion of the channel: This segment of the channel flows through a narrow bedrock canyon that is oriented perpendicular to the strike of the near-vertical dipping bedrock in this area. Numerous slide gullies along this segment of the channel have eroded down into the relatively weaker and erodible beds in the rock. These gullies are extremely steep sided and generate a significant volume of rock debris that is washed down the canyon along the King Creek channel by surface run off as well as avalanches.
- Floodplain between outlet of the bedrock canyon and the highway culvert: This segment of the channel lies in a floodplain that consists of several braided channels. These channels often contain wood debris and fresh sand/gravel deposits indicating that they carry significant volumes of water, likely fluctuating in seasonal conditions.
- Downstream of the Highway: extending to the confluence with the Kananaskis River approximately 1km downstream of the highway. A past levee may have been constructed to prevent the channel from shifting into a former gravel pit to the south.

There is a debris flow hazard along the King Creek channel with the potential to impact the highway. There are widespread areas on the slopes above the bedrock canyon where rockfalls occur. The colluvium from the rockfalls is transported down to the King Creek channel by avalanches and debris flows along tributary channels and provides source material for debris flows along the King Creek channel.

Alberta Transportation
Site S19 – King Creek
Highway 40:10, Kananaskis River Valley
Site Data – Summary Binder

The canyon walls are subject to toppling failures due to the orientation of the jointing and fracturing of the exposed rock. The debris from these toppling failures accumulates in the creek channel. Due to the accumulation of debris from these sources, debris flows can occur and may be triggered by heavy precipitation events and by melting of relatively heavy annual snowpacks in the spring.

Description of Past Site Problems

No record of reported problems since the present highway was constructed.

Description of Past Investigations

No records of previous site investigations were noted during the documentation review for this site.

This site was first inspected by AMEC in July 2005 as part of the Highway 40 / 541 corridor geohazard review. Annual site inspections have been performed in 2007 and 2009 following which they were discontinued.

Following the heavy precipitation event in June 2013, significant water flow caused erosion of the upstream embankment around the culvert and shallow slumping was evident. Some boulders were observed in the culvert bottom with an estimated loss of capacity of 20%. A large debris load was also observed around the culvert outlet. This site became part of the ‘Southern Region High Water Related Mitigation Project’. Preliminary design options are included in section G of this binder.

Description of Mitigative Measures Implemented

No mitigative measures implemented to date. AT previously has not wanted to pursue design recommendations based on the following: relatively low probability of a “worst-case” magnitude debris flow and given that any such construction would be along and within the creek channel within a provincial park and would therefore likely have very stringent regulatory requirements with respect to site disturbance.

**Table A1 – S19 – King Creek
 Chronological Background**

Date	Description
1985	Site assessment completed by Cruden and Eaton.
July 2005	<p>First inspection by AMEC as part of the Highway 40 / 541 corridor geohazards review. Recommended risk level set to 50.</p> <p>Recommendations included installation of “trash racks” in the creek floodplain upstream of the culvert inlet. Alternately, installation of a second culvert through the highway embankment was recommended. AT anticipates construction of “trash racks” would not be permitted for environmental reasons.</p>
June 2007	<p>Site inspection by AT and AMEC personnel. Minimal change was observed since the 2005 inspection. The recommended Risk Level was set to 10 and 50, for ‘typical’ years and the worst-case (but lower probability) scenario, respectively. Recommendations for “trash racks” remain valid however AT Anticipated that construction of “trash racks” would not be permitted for environmental reasons. A second culvert through the highway embankment was recommended</p>
June 2009	<p>Site inspection by AT and AMEC personnel. No change to the recommended risk level (45). It is understood that AT does not want to pursue the proactive measures previously recommended therefore no further work is recommended for this site. Inspections should be discontinued unless significant debris accumulation is noted. .</p>
July 2013	<p>Site inspection by Thurber Engineering following the significant precipitation event in June 2013. At time of inspection, embankment around the culvert was eroded, shallow slumping was evident, boulders were present in the culvert bottom with an estimated 20% loss of capacity and a large debris load was present around the culvert outlet.</p>
October 2014-January 2016	<p>This site was studied under the ‘Southern Region High Water Related Mitigation’ Project. Preliminary design plans are included in Section G of this binder.</p>