Alberta Transportation
Site S34– Hwy 742:02
Highway 742:02, kms 4.45 to 6.65, 4.95, 4.63 to 5.54, 14.17, 16.61 to 17.00, and 27.82 to 31.89 southwest of Canmore
Site Data – Summary Binder

Section A
File Review

1 SITE LOCATION

There are four different geohazards and six geohazard sites in total, within Site S34 (the site) along highway 742:02 (H742:02). The geohazard sites include a rockfall area, debris flow, three avalanche areas, and a fluvial fan. The geohazard sites are along H742:02, southwest of the Town of Canmore, Alberta. Each geohazard site is assigned a distance, in km along H742:02, referenced from the Highway 742/Three Sisters Parkway Junction in Canmore (the Junction). The locations of each site are summarized in the table below:

Table 1.1 Location of Geohazard Sites on H742:02

Geohazard	Location (km)	Latitude	Longitude	LSD	NTS Mapsheet
Rockfall Area	4.45 to 6.65	51° 4.977’ N to 51° 4.040’ N	115° 24.216’ W to 115° 24.959’ W	SE 36-24-11 W5, 25-24-11 W5, NW 24-24-11 W5	82O03
Debris Flow	4.95	51° 4.800’N	115° 24.458’ W	NE 25-24-11 W5	82O03
East End of Rundle Avalanche Area	4.63 to 5.54	51° 4.920’ N to 51° 4.475’ N	115° 24.348’ W to 115° 24.545’ W	E 25-24-11 W5	82O03
Goat Pond, South Fan	14.17	51° 0.588’ N	115° 23.433’ W	SW 6-24-10 W5	82O03
Back of Big Sister Avalanche Area	16.61 to 17.00	50° 59.814’ N to 50° 59.671’ N	115° 21.923’ W to 115° 21.693’ W	S 32-23-10 W5	82J14
Buller Corner Avalanche Area	27.82 to 31.89	50° 54.840’ N to 50° 52.936’ N	115° 19.471’ W to 115° 20.913’W	33-22-10 W5, NW 28-22-10 W5, SE 29-22-10 W5, E 20-22-10 W5	82J14

2 SITE DESCRIPTION

Highway 742:02 is a two lane undivided highway that is paved for about 3.2 km from the Junction, after which, it is a gravel road. According to the Alberta Transportation Provincial Highway Map (AT, 2016), H742:02 ends at the about 3.2 km from the Junction. Beyond the end of H742:02, the road is referred to as Three Sisters Parkway (from km 3.2 to 7.39) and Smith Dorrien Trail (from km 7.39 to

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south of km 31.89 – the Bull Corner Avalanche Area site). For this report, the highway will be referred to as H742:02.

The rockfall area is an approximately 2.2 km section of H742:02, between km 4.45 to 6.65. At this location, H742:02 is orientated in the north-south direction. There is a potential risk from rockfalls from the cut slopes and natural slopes above the highway. On the upslope side of the road, the catchment ditch is undersized, or not present (AMEC 2009a) which makes the associated risk to motorists relatively high.

The debris flow is located at approximately km 4.95 on H742:02. At this location, H742:02 is orientated in the north-south direction. This is in the same area as the rockfall area. Therefore, the catchment ditch on the upslope side of the road is undersized, or not present (AMEC 2009b).

The east end of the Rundle avalanche area is located at approximately km 5.06 on H742:02. At this location, H742:02 is orientated in the north-south direction. This is in the same area as the rockfall area. The avalanche source areas are generally in the upper to uppermost slopes above the road; and some point source avalanches are dispersed throughout the treed area below rock bands (AMEC 2009c and 2009d).

The Goat Pond, south fan is located at approximately km 14.17 on H742:02. At this location, H742:02 is orientated in the northwest-southeast direction. At this geohazard site, H742:02 crosses the lowermost portion of a fluvial fan around an unnamed creek. During times of peak flow, there is a risk of debris being deposited on the road (AMEC 2009e).

The Back of Big Sister avalanche area is located between km 16.61 and 17.00 on H742:02. At this location, H742:02 is orientated in the northwest-southeast direction. This geohazard site is approximately 870 m southeast of the Three Sisters Dam. The avalanche source areas are located throughout the steep slopes on the back side of Big Sister Mountain, and the runout paths reach the highway (AMEC 2009c and 2009f).

The Buller Corner avalanche area is located between km 27.82 and 31.89 on H742:02. At this location, H742:02 is orientated in the northeast-southwest direction. The avalanche source zones are on the upper slopes of Mount Buller, and the runout paths reach the highway (AMEC 2009c and 2009g).

3 CHRONOLOGICAL BACKGROUND

The table below provides a brief chronological background of each site, based on the reports available to KCB. The sites were not inspected in the 2016 annual Southern Region GRMP inspection tour. The only reports available to KCB were the 2009 AMEC reports.

Table 3.1 Chronological Background of Site S34 – Hwy 742:02

Date	Description
June 2009	An annual inspection was completed by AMEC Earth & Environmental (AMEC), AT, and Parks Division personnel. The six sites were inspected. The reports for all sites reference 2007 and 2008 inspection reports, which were not available to KCB. The rockfall area was inspected in 2009 and there were no significant changes in the rockfall conditions noted since the 2007 and 2008 corridor review. Parks Division personnel indicated that in 2006 a rockfall event, originating at the uppermost slopes above the highway, deposited several boulder-sized rocks on the road surface around km 4.9. AMEC noted three types of rockfall should be considered along this section of H742:02: ▪ High frequency, relatively low magnitude rockfall originating from the highway cut slopes or the natural slopes a short distance above the highway; ▪ Low frequency, high magnitude rockfalls around km 5.6 where large blocks of rock may break off and slide down a joint plane and onto the road; and ▪ Low frequency, high magnitude rockfalls originating from the uppermost slopes above the highway, similar to the 2006 event that deposited boulders onto the road around km 4.9. AMEC recommended installing draped netting at select locations along the cut slopes and natural slopes above the road to direct rock falls into the upslope road ditch or along the toe of the cut slope, posting reduced speed signs to increase time to avoid rocks on the road, establishing a maximum vehicle length on this section of highway to allow vehicles to have sufficient manoeuvrability to avoid rockfalls, and scaling rock blocks on the cut slope around km 5.6. The debris flow site was inspected in 2009 and the 2009 report indicates an assessment of the site was completed in 2004 because a debris flow crossed the highway approximately at approximately km 4.9, causing a complete closure of the road. In the 2009 inspection report, AMEC recommended completing a field inspection of the drainage course above the August 2004 debris flow site and other drainage courses crossing the highway in the area to assess the potential for further debris flows impacting the highway. The east end of Rundle avalanche area was inspected in 2009. AMEC noted that Parks Division personnel assess the avalanche conditions in three avalanche areas, including the east end of Rundle avalanche area, as an extension of their avalanche forecasting and control work for the Kananaskis Country. The Goat Pond, south fan was inspected in 2009 and the previous assessment in 2008 recommended that the site be inspected in the spring of 2009 to see how the site looks during peak or near-peak flow conditions and to check if the amount and distribution of debris upstream of the highway changes during the spring runoff. At the time of the 2009 inspection, there was no surface flow along the creek channel for at least 200 m to 300 m upstream of the highway crossing. AMEC noted there were little to no apparent changes at the site between the June 2009 and October 2008 site inspection. The Parks Division personnel indicated they were not aware of any issues with debris being deposited onto the highway at the site, but stated there is typically water running across the road each spring. AMEC did not recommend any repair measures at the time of the 2009 site inspection. The Back of Big Sister avalanche area was inspected in 2009 and AMEC noted that Parks Division personnel assess the avalanche conditions in three avalanche areas, including the Back of Big Sister avalanche area, as an extension of their avalanche forecasting and control work for the Kananaskis Country.

	The Buller Corner avalanche area was not inspected as part of the 2009 field inspection. AMEC noted that Parks Division personnel assess the avalanche conditions in three avalanche areas, including the Buller Corner avalanche area, as an extension of their avalanche forecasting and control work for the Kananaskis Country.

4 SITE GEOLOGY, HYDROGEOLOGY, AND GEOMORPHIC SETTING

The ground surface elevation for each of the geohazard sites, in meters above mean sea level (m a.m.s.l.), based on maps from the Canada Centre for Mapping (1996a and 1996b), are shown in Table 4.1.

Table 4.1 Approximate Ground Surface Elevation

Geohazard	Approximate Elevation (m a.m.s.l.).	Source
Rockfall Area	1600 to 1640	Canada Centre for Mapping (1996a)
Debris Flow	1620	Canada Centre for Mapping (1996a)
East End of Rundle Avalanche Area	1600 to 1620	Canada Centre for Mapping (1996a)
Goat Pond, South Fan	1680	Canada Centre for Mapping (1996a)
Back of Big Sister Avalanche Area	1720	Canada Centre for Mapping (1996b)
Buller Corner Avalanche Area	1740 to 1760	Canada Centre for Mapping (1996b)

Alberta Geological Survey (AGS) have maps showing sediment thickness, expected geology and soils, bedrock topography and geology, and hydrogeologic conditions. AGS(2015a) sediment thickness maps show there is approximately 0 m to 5 m of sediment in the areas near the geohazard sites. This agrees with the AGS interactive soil maps, which show there is exposed bedrock near the site. The soils expected, according the AGS interactive soil maps, at each geohazard site are shown in the table below.

Table 4.2 Expected Soil at each Geohazard Site

Geohazard	Expected Soil
Rockfall Area	Moraine – Consisting of a till mixture of clay, silt, sand and minor pebbles, cobbles and boulders. Locally, there may be blocks of bedrock, pre-existing stratified sediment and till, and/or lenses of glaciolacustrine and/or glaciofluvial sediment. Fluvial Deposits – Consisting of poorly- to well-sorted, stratified-to-massive sand, gravel, silt, clay and organic sediments occurring in channel and overbank deposits. In places, it includes a significant component of colluvial deposits. Colluvial Deposits – May contain pre-existing bedrock, till, glaciolacustrine, glaciofluvial and/or eolian sediments, generally poorly sorted. In places, it includes a significant component of fluvial deposits.
Debris Flow	Fluvial Deposits – Consisting of poorly- to well-sorted, stratified-to-massive sand, gravel, silt, clay and organic sediments occurring in channel and overbank deposits. In places, it includes a significant component of colluvial deposits.
East End of Rundle Avalanche Area	Fluvial Deposits – Consisting of poorly- to well-sorted, stratified-to-massive sand, gravel, silt, clay and organic sediments occurring in channel and overbank deposits. In places, it includes a significant component of colluvial deposits.

	Colluvial Deposits – May contain pre-existing bedrock, till, glaciolacustrine, glaciofluvial and/or eolian sediments, generally poorly sorted. In places, it includes a significant component of fluvial deposits.
Goat Pond, South Fan	Fluvial Deposits – Consisting of poorly- to well-sorted, stratified-to-massive sand, gravel, silt, clay and organic sediments occurring in channel and overbank deposits. In places, it includes a significant component of colluvial deposits.
Back of Big Sister Avalanche Area	Fluvial Deposits – Consisting of poorly- to well-sorted, stratified-to-massive sand, gravel, silt, clay and organic sediments occurring in channel and overbank deposits. In places, it includes a significant component of colluvial deposits. Colluvial Deposits – May contain pre-existing bedrock, till, glaciolacustrine, glaciofluvial and/or eolian sediments, generally poorly sorted. In places, it includes a significant component of fluvial deposits.
Buller Corner Avalanche Area	Moraine – Consisting of a till mixture of clay, silt, sand and minor pebbles, cobbles and boulders. Locally, there may be blocks of bedrock, pre-existing stratified sediment and till, and/or lenses of glaciolacustrine and/or glaciofluvial sediment. Fluvial Deposits – Consisting of poorly- to well-sorted, stratified-to-massive sand, gravel, silt, clay and organic sediments occurring in channel and overbank deposits. In places, it includes a significant component of colluvial deposits. Colluvial Deposits – May contain pre-existing bedrock, till, glaciolacustrine, glaciofluvial and/or eolian sediments, generally poorly sorted. In places, it includes a significant component of fluvial deposits. Bedrock – Consisting of clastic rocks, limestone, and dolostone.

Bedrock topography maps from AGS (2015b) show the bedrock is at approximately the same elevation as the ground surface at the site. The expected bedrock formations, according to AGS (2013), at each geohazard site are shown in Table 4.3.

Table 4.3 Expected Bedrock Formations at each Geohazard Site

Geohazard	Expected Bedrock Formation
Rockfall Area	Till, alluvium, colluvium, landslide, debris of nearby bedrock. Banff Formation – Consists of grey and black, cherty and argillaceous limestone; siltstone; shale; dolostone black; and banded chert. Exshaw Formation – Consists of grey and brownish grey shale; calcareous, dolomitic shale; argillaceous siltstone; and silty dolostone. The Rundle Group which includes the Etherington Formation, Mount Head Formation, Turner Valley Formation, Shunda Formation, and Pekisko Formation. Etherington Formation – Consists of light grey limestone; cherty limestone and calcarenitic limestone; dolostone and cherty dolostone; green and red shale; siltstone; limestone and dolostone breccia. Mount Head Formation – Consists of dense, grey to light brown dolostone; argillaceous, silty or cherty dolostone; micritic to medium grained, grey limestone; and anhydrite. Turner Valley Formation – Consists of medium to coarse grained, light grey, crinoidal, dolostone and limestone; and dense, cherty limestone. Shunda Formation – Consists of light to dark grey, dense, limestone; silty and argillaceous dolostone; calcarenitic, cherty argillaceous limestone; and minor breccia. Pekisko Formation – Consists of medium to coarse grained, light grey, thickly bedded, crinoidal, limestone; and subordinate cherry limestone and dolostone. Palliser Formation – Consists of thick bedded to massive, mottled, dolomitic limestone; dense, grey, micritic limestone; and greyish brown fossiliferous dolostone. Alexo Formation – Consists of thinly to medium bedded silty dolostone; laminated, grey and greenish grey argillaceous siltstone; dolomitic sandstone; light grey, vuggy, dolostone; and dolostone and limestone breccia. The Fairholme Group which includes the Southesk Formation, Cairn Formation, Mount Hawk Formation, Perdrix Formation, Maligne Formation, and Flume Formation. Southesk Formation – Arcs Member consists of thick bedded, light grey, granular, limestone; vuggy, coarse grained dolostone. Grotto Member consists of brown dolostone with corals, crinoids and Amphipora. Peechee Member consists of light grey, coarsely crystalline, vuggy with some corals and Amphipora dolomite. Cairn Formation – Consists of medium crystalline, thick bedded to massive, dark brownish grey with Amphipora, stromatoporoids dolostone; dark grey, limestone, dolostone in lower part; and minor chert and breccia. Mount Hawk Formation – Consists of grey to brown calcareous mudstone with limestone nodules; and argillaceous limestone. Perdrix Formation – Consists of bituminous, calcareous, pyritic shale with black with calcareous nodules; and thinly bedded dark grey, argillaceous limestone. Maligne Formation – Consists of dark grey, micritic argillaceous limestone that is thinly bedded with brachiopods. Flume Formation – Consists of grey to brown, micritic, partly dolomitic, cherty limestone with Amphipora and stromatoporoids.
Debris Flow	Till, alluvium, colluvium, landslide, debris of nearby bedrock. Banff Formation – Consists of grey and black, cherty and argillaceous limestone; siltstone; shale; dolostone black; and banded chert. Exshaw Formation – Consists of grey and brownish grey shale; calcareous, dolomitic shale; argillaceous siltstone; and silty dolostone. The Rundle Group which includes the Etherington Formation, Mount Head Formation, Turner Valley Formation, Shunda Formation, and Pekisko Formation. Etherington Formation – Consists of light grey limestone; cherty limestone and calcarenitic limestone; dolostone and cherty dolostone; green and red shale; siltstone; limestone and dolostone breccia. Mount Head Formation – Consists of dense, grey to light brown dolostone; argillaceous, silty or cherty dolostone; micritic to medium grained, grey limestone; and anhydrite. Turner Valley Formation – Consists of medium to coarse grained, light grey, crinoidal, dolostone and limestone; and dense, cherty limestone. Shunda Formation – Consists of light to dark grey, dense, limestone; silty and argillaceous dolostone; calcarenitic, cherty argillaceous limestone; and minor breccia. Pekisko Formation – Consists of medium to coarse grained, light grey, thickly bedded, crinoidal, limestone; and subordinate cherry limestone and dolostone.
East End of Rundle Avalanche Area	Till, alluvium, colluvium, landslide, debris of nearby bedrock. Banff Formation – Consists of grey and black, cherty and argillaceous limestone; siltstone; shale; dolostone black; and banded chert. Exshaw Formation – Consists of grey and brownish grey shale; calcareous, dolomitic shale; argillaceous siltstone; and silty dolostone. The Rundle Group which includes the Etherington Formation, Mount Head Formation, Turner Valley Formation, Shunda Formation, and Pekisko Formation. Etherington Formation – Consists of light grey limestone; cherty limestone and calcarenitic limestone; dolostone and cherty dolostone; green and red shale; siltstone; limestone and dolostone breccia. Mount Head Formation – Consists of dense, grey to light brown dolostone; argillaceous, silty or cherty dolostone; micritic to medium grained, grey limestone; and anhydrite. Turner Valley Formation – Consists of medium to coarse grained, light grey, crinoidal, dolostone and limestone; and dense, cherty limestone. Shunda Formation – Consists of light to dark grey, dense, limestone; silty and argillaceous dolostone; calcarenitic, cherty argillaceous limestone; and minor breccia. Pekisko Formation – Consists of medium to coarse grained, light grey, thickly bedded, crinoidal, limestone; and subordinate cherry limestone and dolostone.
Goat Pond, South Fan	Till, alluvium, colluvium, landslide, debris of nearby bedrock. The Rundle Group which includes the Etherington Formation, Mount Head Formation, Turner Valley Formation, Shunda Formation, and Pekisko Formation. Etherington Formation – Consists of light grey limestone; cherty limestone and calcarenitic limestone; dolostone and cherty dolostone; green and red shale; siltstone; limestone and dolostone breccia. Mount Head Formation – Consists of dense, grey to light brown dolostone; argillaceous, silty or cherty dolostone; micritic to medium grained, grey limestone; and anhydrite. Turner Valley Formation – Consists of medium to coarse grained, light grey, crinoidal, dolostone and limestone; and dense, cherty limestone. Shunda Formation – Consists of light to dark grey, dense, limestone; silty and argillaceous dolostone; calcarenitic, cherty argillaceous limestone; and minor breccia. Pekisko Formation – Consists of medium to coarse grained, light grey, thickly bedded, crinoidal, limestone; and subordinate cherry limestone and dolostone.
Back of Big Sister Avalanche Area	Till, alluvium, colluvium, landslide, debris of nearby bedrock. The Rundle Group which includes the Etherington Formation, Mount Head Formation, Turner Valley Formation, Shunda Formation, and Pekisko Formation. Etherington Formation – Consists of light grey limestone; cherty limestone and calcarenitic limestone; dolostone and cherty dolostone; green and red shale; siltstone; limestone and dolostone breccia. Mount Head Formation – Consists of dense, grey to light brown dolostone; argillaceous, silty or cherty dolostone; micritic to medium grained, grey limestone; and anhydrite. Turner Valley Formation – Consists of medium to coarse grained, light grey, crinoidal, dolostone and limestone; and dense, cherty limestone. Shunda Formation – Consists of light to dark grey, dense, limestone; silty and argillaceous dolostone; calcarenitic, cherty argillaceous limestone; and minor breccia. Pekisko Formation – Consists of medium to coarse grained, light grey, thickly bedded, crinoidal, limestone; and subordinate cherry limestone and dolostone.

Buller Corner Avalanche Area	Till, alluvium, colluvium, landslide, debris of nearby bedrock. The Rundle Group which includes the Etherington Formation, Mount Head Formation, Turner Valley Formation, Shunda Formation, and Pekisko Formation. Etherington Formation – Consists of light grey limestone; cherty limestone and calcarenitic limestone; dolostone and cherty dolostone; green and red shale; siltstone; limestone and dolostone breccia. Mount Head Formation – Consists of dense, grey to light brown dolostone; argillaceous, silty or cherty dolostone; micritic to medium grained, grey limestone; and anhydrite. Turner Valley Formation – Consists of medium to coarse grained, light grey, crinoidal, dolostone and limestone; and dense, cherty limestone. Shunda Formation – Consists of light to dark grey, dense, limestone; silty and argillaceous dolostone; calcarenitic, cherty argillaceous limestone; and minor breccia. Pekisko Formation – Consists of medium to coarse grained, light grey, thickly bedded, crinoidal, limestone; and subordinate cherry limestone and dolostone. Palliser Formation – Consists of thick bedded to massive, mottled, dolomitic limestone; dense, grey, micritic limestone; and greyish brown fossiliferous dolostone. Alexo Formation – Consists of thinly to medium bedded silty dolostone; laminated, grey and greenish grey argillaceous siltstone; dolomitic sandstone; light grey, vuggy, dolostone; and dolostone and limestone breccia. The Fairholme Group which includes the Southesk Formation, Cairn Formation, Mount Hawk Formation, Perdrix Formation, Maligne Formation, and Flume Formation. Southesk Formation – Arcs Member consists of thick bedded, light grey, granular, limestone; vuggy, coarse grained dolostone. Grotto Member consists of brown dolostone with corals, crinoids and Amphipora. Peechee Member consists of light grey, coarsely crystalline, vuggy with some corals and Amphipora dolomite. Cairn Formation – Consists of medium crystalline, thick bedded to massive, dark brownish grey with Amphipora, stromatoporoids dolostone; dark grey, limestone, dolostone in lower part; and minor chert and breccia. Mount Hawk Formation – Consists of grey to brown calcareous mudstone with limestone nodules; and argillaceous limestone. Perdrix Formation – Consists of bituminous, calcareous, pyritic shale with black with calcareous nodules; and thinly bedded dark grey, argillaceous limestone. Maligne Formation – Consists of dark grey, micritic argillaceous limestone that is thinly bedded with brachiopods. Flume Formation – Consists of grey to brown, micritic, partly dolomitic, cherty limestone with Amphipora and stromatoporoids.

Hydrogeological maps from AGS (2005a and 2005b) show there are groundwater springs near all six geohazard sites. This is expected as all sites are near lakes and reservoirs. The AGS maps show groundwater flows from areas of higher elevations, near mountain peaks, to areas of lower elevations in valleys.

5 CURRENT SITE PROBLEMS

The record of site problems is provided in Table 3.1. All sites were inspected in 2007, 2008, and 2009. Although, the 2007 and 2008 reports are not available to KCB. The current site problems are provided in the Table 5.1.

Table 5.1 Current Site Problems

Geohazard	Current Problems
Rockfall Area	The steep cut and natural rock slopes generate rockfalls and the catchment ditch on the upslope side of the road is undersized or non-existent. There are three types of rockfall risk along this section of the highway: 1) High frequency, relatively low magnitude rockfalls originating from the highway cut slopes or the natural slopes a short distance above the highway. 2) Low frequency, high magnitude rockfalls around km 5.6 where large blocks of rock may break off and slide down a joint plane and onto the road. 3) Low frequency, high magnitude rockfalls originating from the uppermost slopes above the highway, similar to the 2006 event that deposited boulders onto the road around km 4.9.
Debris Flow	Drainage courses in the area need to be assessed to the potential for further debris flows impacting the highway.
East End of Rundle Avalanche Area	This is the most active of the three avalanche areas. Annual avalanche control work is completed in this area by the Parks Division. The Parks Division requires AT to commit annual funding towards the avalanche control work to allow for "pre-avalanche control" work to be completed to maintain a lower risk to the highway and reduce the number of temporary closures per season.
Goat Pond, South Fan	There is a hazard of debris being deposited onto the highway, or the creek channel shifting and depositing debris on the highway at a nearby location.
Back of Big Sister Avalanche Area	This is the least active of the three avalanche areas. The avalanche hazard at this site is relatively low for most of each winter season. However, monitoring the snowpack conditions by Parks Division personnel and avalanche control work if required is warranted.
Buller Corner Avalanche Area	This is the second most active of the three avalanche areas. There are typically avalanches throughout each winter season, but the avalanche runout rarely reaches the highway.

The probability factor, consequence factor, and risk rating for each geohazard site, from the 2009 reports, are shown in Table 5.2.

Table 5.2 Probability Factors, Consequence Factors, and Risk Rating

Geohazard	Probability Factor	Consequence Factor	Risk Rating
Rockfall Area – Risk #1	12	4	48
Risk #2	4	6	24
Risk #3	7	6	42
Debris Flow	7	6	42
East End of Rundle Avalanche Area	13	2	26
Goat Pond, South Fan	6	5	30
Back of Big Sister Avalanche Area	7	2	14
Buller Corner Avalanche Area	7	3	21

6 PREVIOUS SITE INVESTIGATIONS

All sites were inspected by AMEC in 2007, 2008, and 2009. However, reports from 2007 and 2008 were not available.

There are no documented instruments at the sites.

7 REPAIR WORK AND MITIGATIVE MEASURES IMPLEMENTED

The repair work completed at each site is given in the table below.

Table 7.1 Repair Work and Mitigative Measures Implemented

Geohazard	Year	Repair Work and Mitigative Measures Implemented.
Rockfall Area	2006	A rockfall event deposited several boulder-sized rocks on the road surface that had to be removed.
Debris Flow	2004	Debris flow crossed the highway leaving debris on the highway and causing a complete closure of the road.
East End of Rundle Avalanche Area	Annually from 2001 to 2009	Avalanche conditions, avalanche forecasting, and control work are completed annually by Parks Division personnel. Avalanche control work includes heli-bombing avalanche source zones to trigger avalanches. The maintenance contractor temporarily closes the highway and clears snow from the highway after the area is heli-bombed.
	1991	A naturally occurring avalanche swept away a parked car on the road.
Goat Pond, South Fan	None	None – the site is judged to be at risk of debris being deposited on the highway. However, the AMEC (2009e) report does not indicate that it has happened in the past.
Back of Big Sister Avalanche Area	Annually	Avalanche conditions, avalanche forecasting, and control work are completed annually by Parks Division personnel.
Buller Corner Avalanche Area	Annually	Avalanche conditions, avalanche forecasting, and control work are completed annually by Parks Division personnel. In the past 20 years, avalanche runout has come close to the highway, but has not reached the road surface.

8 MONITORING OVERVIEW

The only instrument at any of the geohazard sites is a weather station near the east end of Mount Rundle. The weather station reports temperature and wind data. The monitoring of the sites is based on visual inspection. Parks Division personnel visually inspect the avalanche areas throughout the avalanche season.

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