

**ALBERTA TRANSPORTATION
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION – PEACE-HIGH LEVEL
2019 INSPECTION**



Site Number	Location	Name	Hwy	km
PH012	Judah Hill	Heart River Slides	744:04	57.114
Legal Description		UTM Co-ordinates		
SE¼ 20-083-21 W5M		11V E 483284		N 6229209

	Date	PF	CF	Total
Previous Inspection:	5-June-2019	13	4	52
Current Inspection:	6-August-2019	13	5	65
Road AADT:	660		Year:	2018
Inspected By:	Ed Szmata, TRANS		Don Proudfoot, Thurber	
Report Attachments:	<input checked="" type="checkbox"/> Photographs			
	<input type="checkbox"/> Plans		<input checked="" type="checkbox"/> Maintenance Items	

Primary Site Issues:	<p>Prior to 2014, there were four slide features on the east side of Hwy 744, adjacent to a layby (brake check lane).</p> <p>Slide 1 was previously repaired in March 1998.</p> <p>Slides 2, 3 and 4 were active and had retrogressed into the northbound layby lane. During the summer of 2011, the northbound layby lane was closed, and the guardrail was moved to the edge of the northbound lane (NBL). In 2013 and the Spring of 2014, Slides 2, 3 and 4 continued to retrogress, coalescing into a larger single landslide feature with the resulting backscarp encroaching into the southbound lane (SBL) of Hwy 744:04.</p> <p>Slides 2, 3 and 4 were repaired by excavation and reconstruction with a uniaxial geogrid reinforced crushed gravel backfill under Contract 15153 during the summer of 2014 (Photos 6 and 10).</p> <p>New landslide scarps have appeared between the location of Slide 1 and the former Slide 2 (Photos 1 through 5) and at the sheet pile repair at former Slide 2. The “Y” connector to the solid pipe below the sheet pile wall became disconnected between 2017/2018. The sheet pile wall has deflected from slide movement / earth flows and is no longer effectively retaining the slope at its north end (Photos 6 and 7). Mud flow scour channels have appeared and continue to grow at the bases of former slides 2, 3 and 4 (Photos 7, 8 and 9).</p>		
Dimensions:	See attached Figures		
Maintenance:	None since 2012.		
Observations:	Description	Worsened?	
<input checked="" type="checkbox"/> Pavement Distress	The backscarp of the new landslide at km 57+300 has retrogressed 0.3 m into the edge of the pavement	<input checked="" type="checkbox"/>	

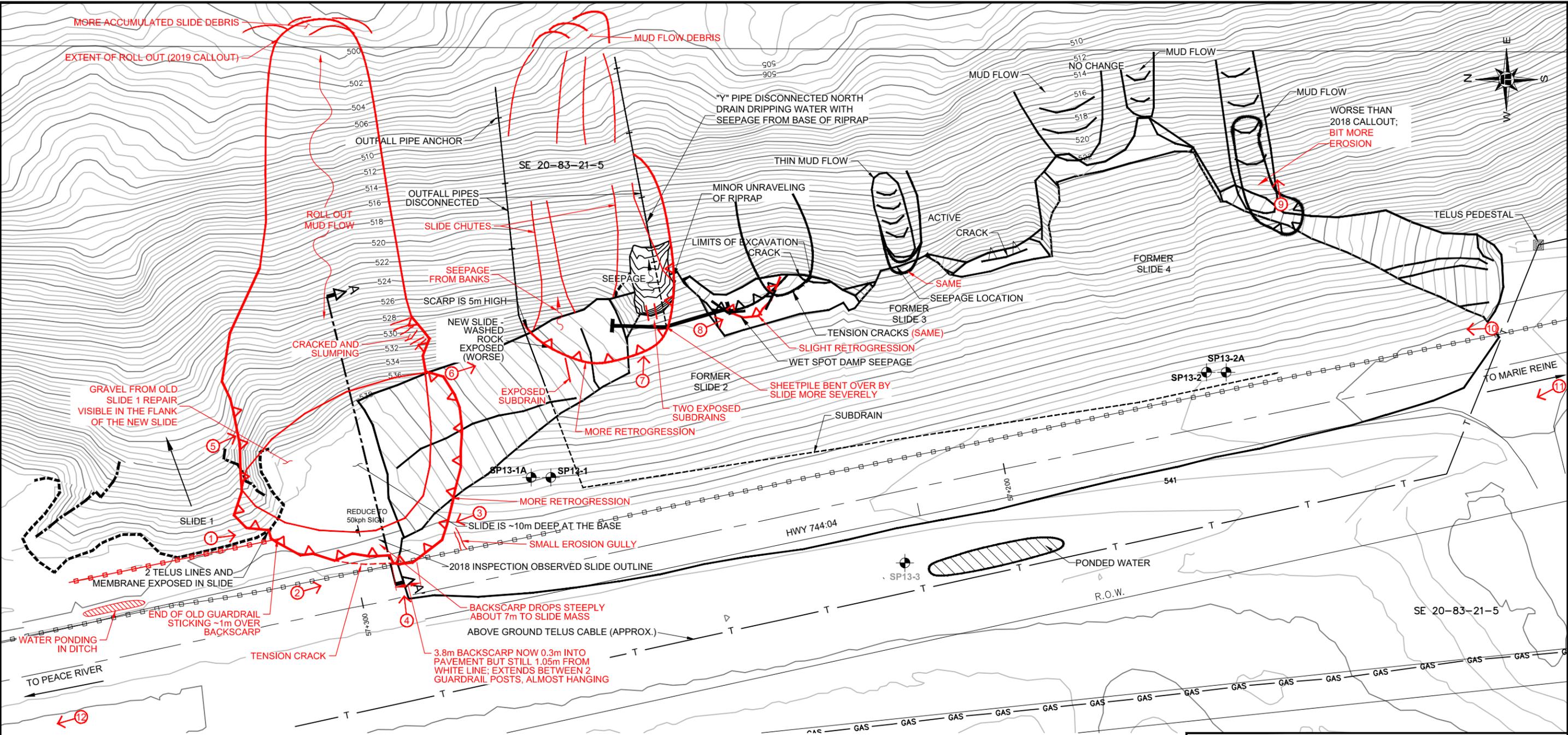
<input checked="" type="checkbox"/> Slope Movement	<p>The new landslide (located at km 57+300) that had formed south of Slide 1 in 2017 and coalesced with Slide 1 has grown and has active retrogression of the main scarp (Photos 1 to 5). The minimum offset from the guardrail has changed from 1.1 m east of the guardrail to 0.3 m west of the guardrail since June 5, 2019.</p> <p>Slide and earth flow movements have occurred around the sheet pile wall and the structure has become deflected and outflanked (Photo 6).</p>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	<p>Scouring was observed at the base of former Slide 2, which was repaired in 2015. Scouring is occurring below the disconnected "Y" connector pipe below the sheet pile wall. An active scour channel is getting progressively deeper and retrogressing towards the road at the south end of the site (Photo 9).</p> <p>Additional thin mud flows and seepage have occurred at several locations below the base of the previous repairs at former Slides 3 and 4 (Photo 8).</p>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Seepage	<p>From the base of the gravel fill at Slide 2 repair</p>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress		<input type="checkbox"/>
<input checked="" type="checkbox"/> Other	<p>The solid "Y" connector pipe is disconnected below the sheet pile wall.</p>	<input checked="" type="checkbox"/>
<p>Instrumentation:</p> <p>No instruments are currently installed at the site.</p> <p>As part of the preliminary engineering assessment for Contract 15153, Thurber had previously installed five (5) standpipe piezometers in June 2013 at locations shown on Figure 1. Some of these piezometers were destroyed by landslide movement and the remainder were removed as part of the excavation work for the landslide repair.</p> <p>Seepage was encountered in all of the test holes at about 5 m to 6 m below the existing ground surface during drilling in 2013.</p> <p>The last water level readings taken in the standpipe piezometers (Fall 2013) varied between 1.1 m to 4.9 m below ground surface in standpipes installed to 10 m depths (SP13-1A, SP13-2A and SP13-3) and from 23.3 m to 25.2 m in standpipes (SP13-1 and SP13-2), installed to depths of 26 m.</p>		
<p>Assessment:</p> <p>A combination of weathering, heavy precipitation, seepage beneath the old highway embankment fill, which was built through a slough, and surface water drainage in the ditch appears to have caused the retrogression of Slides 2, 3 and 4 before they were repaired.</p> <p>A new slide has formed between Slide 1 and the former Slide 2. The main scarp of slide had retrogressed 0.3 past the guardrail into the edge of pavement by August 6, 2019 and will likely continue to rapidly retrogress further into the highway within the next year if the current rate of retrogression continues. The new slide movement has now started to encroach into the previous repair at Slide 1. Photos taken by Erwin Kurz of AT on August 20, 2019 show additional retrogression of the backscarp after the August 6, 2019 callout inspection.</p>		

The sheet pile wall has been compromised from slope movements and is deflected and ineffective. Ongoing slide movement and loss of material upslope from the wall due to earth flows are expected in the following years. Loss of material here could begin to undermine the upslope repairs above former slide 2.

Scours in seepage zones in the till underlying the 2014-2015 repair from Contract CON0015153 continue to develop resulting in thin mud flows on the colluvium slope below the locations of the former slides 2, 3 and 4.

Recommendations:	Cost
<p><u>Immediate:</u> Warning signs (“Landslide zone” and “Sharp drop off”) and barricades should be erected to warn and protect the public of the landslide hazard. The landslide has the potential to retrogress quickly and hence routine inspections of the site should be conducted by the MCI and Maintenance Contractor to determine if a further movement has occurred that would warrant a partial road closure. TRANS should anticipate that a gravel detour might be required around the slide area soon until a more permanent solution can be completed.</p>	\$50,000
<p><u>Short Term:</u> The slide that has formed between Slide 1 and the 2014-2015 repairs needs to be addressed soon due to the recent rapid retrogression towards/into the highway. Short term repairs to try to slow the retrogression of the slide consist of removing the slide debris by pushing it over the bank, installing a subdrain and buttressing the backscarp of the slide with a wedge of gravel. Since the slide scarp has already extended past the guardrail a short re-alignment or road widening toward the west will also be required to maintain the same road width at this location</p>	\$300,000
<p><u>Longer Term:</u> A longer-term repair would consist of realigning the highway much further away from the new slide area to allow some slope flattening to occur. The re-alignment could start about 120 m south of former Slide 4 and tie back into the existing highway near the lookout recreation area parking lot. The total length of the re-alignment would be in the order of 500 m. This would require acquiring some land from the current landowner located to the west of the highway. The highway would need to be moved far enough from the landslides to allow some offloading and flattening of the side slope in the area of the new slide and at the failed sheet pile wall. Once these areas have been offloaded to create a bench between the flattened slope and the natural steep valley slope, the bench should be covered with a membrane and soil nails to reinforce it against future retrogression. Some repairs to the subdrains and downpipes would also be required. The sloughs in the field would be filled in with some of the excess grading material to improve surface drainage.</p>	\$1.5 million plus land acquisition costs
<p>A former gas line and a telus line run through the area and will need to be considered during the design of the re-alignment.</p>	

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LEGEND

- 150mm Ø PERFORATED SUBDRAIN
- 150mm Ø OUTFALL PIPE
- EXISTING GUARD RAIL
- T—T— APPROXIMATE LOCATION OF RELOCATED ABOVE GROUND TELUS CABLE
- TELUS PEDESTAL
- ⊕ 2013 TEST HOLE (INSTRUMENTS NO LONGER ACTIVE)
- ① → DIRECTION AND NUMBER OF PHOTO

NOTES:

- 1 LOCATION DATA RECORDED USING HAND HELD GPS RECEIVER. ALL LOCATIONS ARE APPROXIMATE AND ARE FOR ILLUSTRATIVE PURPOSES ONLY.
- 2 AUGUST 6, 2019 OBSERVATIONS SHOWN IN RED





**PEACE REGION (PEACE RIVER/HIGH LEVEL)
PH012-1 JUDAH HILL HEART RIVER SLIDES**

AUGUST 6, 2019 PH012-1 CALLOUT PLAN

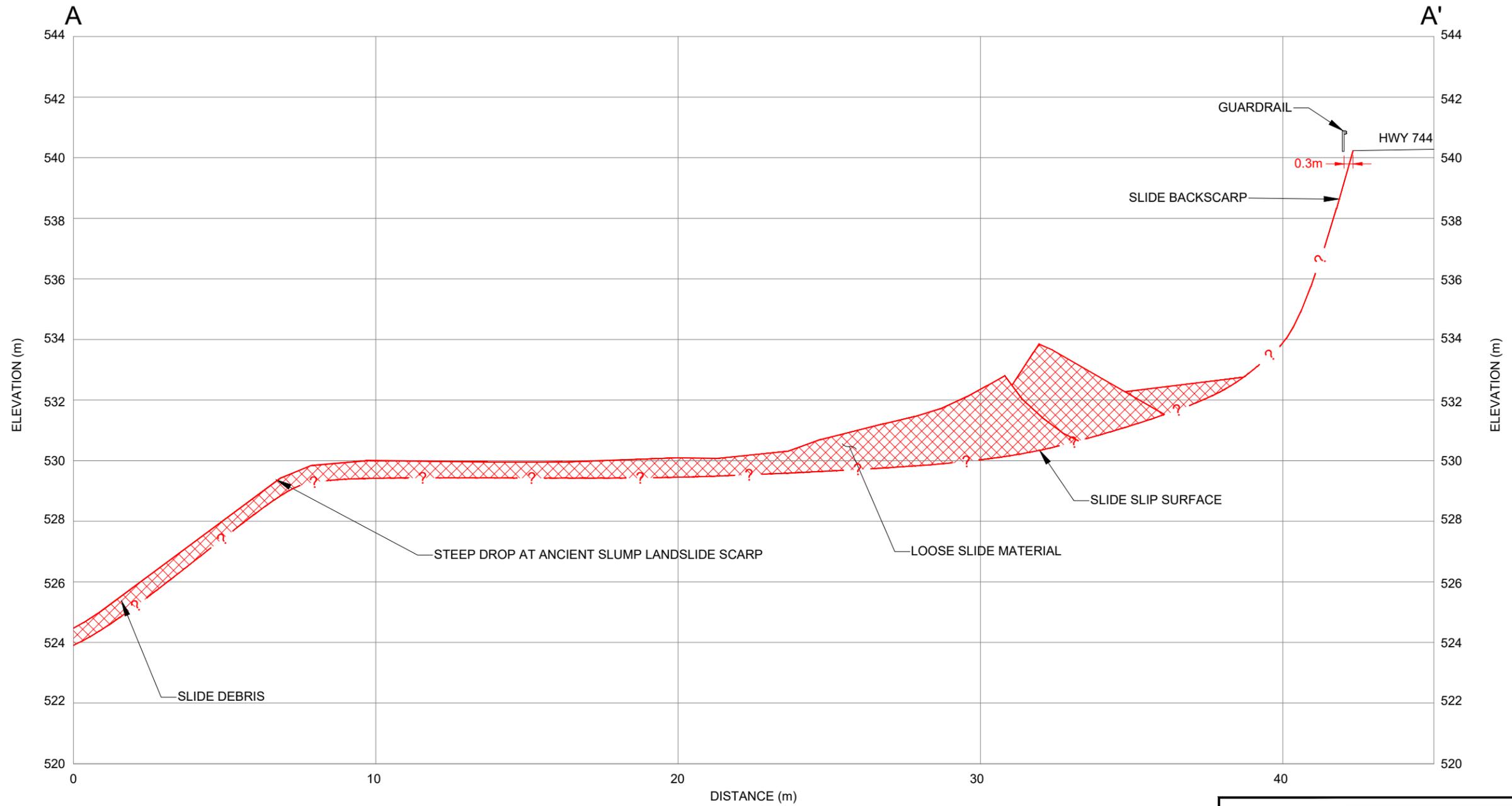
DWG No. 13351-PH012-1-1

DRAWN BY	ML
DESIGNED BY	DWP
APPROVED BY	DWP
SCALE	1:600
DATE	AUGUST 2019
FILE No.	13351



THURBER ENGINEERING LTD.

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**PEACE REGION (PEACE RIVER/HIGH LEVEL)
PH012-1 JUDAH HILL HEART RIVER SLIDES**

CROSS - SECTION A - A'

DWG No. 13351-PH012-1-2

DRAWN BY	ML
DESIGNED BY	DWP
APPROVED BY	DWP
SCALE	APPROX. 1:150
DATE	AUGUST 2019
FILE No.	13351





Photo 1. (Aug. 6/19)
Looking south
towards the top of the
'new' slide bowl
(57+300).



Photo 2. (Aug. 6/19)
Looking south
towards the new slide
which has grown and
retrogressed into the
edge of the
pavement.



Photo 3. (Aug. 6/19)
Looking south at the
'new' slide area.



Photo 4. (Aug. 6/19)
Looking east down
the centre of the new
landslide toward the
Heart River valley.



Photo 5. (Aug. 6/19)
Looking southeast at the mudflow and soil debris from the new slide sliding down into the Heart River valley.



Photo 6. (Aug. 6/19)
Looking south from north end of Heart River Landslide repair excavation (Former Slide 2). Slide movement has deflected and outflanked the sheet pile wall



Photo 7. (Aug. 6/19)
Looking east at the mudflow below the severed drainpipe at the sheet pile wall below former slide 2.



Photo 8. (Aug. 6/19)
Looking southeast at some recent shallow movement in the native slope south of the sheet pile wall, below former slide 2.



Photo 9. (Aug. 6/19)
Looking east at the erosion gully along the south end of former Slide 4.

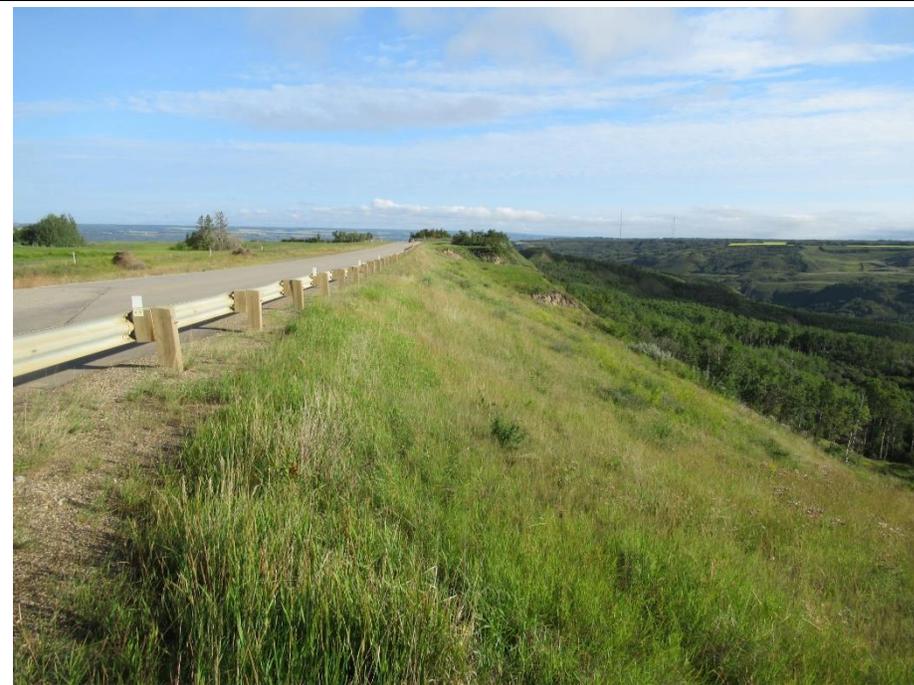


Photo 10.(Aug. 6/19)
Looking north from south of the location of former Slide 4. Overall repairs from 2014 are performing well. Overall slope is well vegetated and there are no apparent slumps in the granular backfill slope.



Photo 11.(Aug. 6/19)
Looking northwest at the field where the proposed re-alignment will be located.



Photo 12.(Aug. 6/19)
Looking toward the parking lot where the re-alignment will rejoin the existing alignment. Note the gas line marker sign in the forefront. A Telus cable is looped on the fence post.



Photo 13 (Aug20/19)

Taken by Erwin Kurz of TRANS, this photo shows that another piece of the backscarp (along the tension crack shown in Photo 2) has retrogressed and fallen into the landslide since our August 6, 2019 visit



Photo 14 (Aug20/19)

Taken by Erwin Kurz of TRANS, this photo shows indications of additional backscarp retrogression toward the highway (compare to Phot 3)