

**ALBERTA TRANSPORTATION  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION – GRANDE PRAIRIE DISTRICT  
2020 INSPECTION**



<b>Site Number</b>	<b>Location</b>	<b>Name</b>	<b>Hwy</b>	<b>km</b>
GP32	E of Grande Cache	S Curves	40:34	16.4
<b>Legal Description</b>		<b>UTM Co-ordinates (NAD 83)</b>		
W1/2-13-57-7-W6		11U N 5,976,985	E 374,415	

	<b>Date</b>	<b>PF</b>	<b>CF</b>	<b>Total</b>
<b>Previous Inspection:</b>	May 27, 2019	9	2	18
<b>Current Inspection:</b>	May 25, 2020	9	2	18
<b>Road AADT:</b>	1,380	<b>Year:</b>	2019	
<b>Inspected By:</b>	Don Proudfoot, Nicole Wilder (Thurber) Ed Szmata, Rishi Adhikari (AT)			
<b>Report Attachments:</b>	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			

<b>Primary Site Issue:</b>	<p>South Side of Highway: The original issues were severe creek erosion and gulying of the east cut slope. Site construction has been completed however, erosion has occurred adjacent to the pond and 1200 mm diameter SWSP culvert inlet and has eroded down past the bench towards the main channel. In several areas the erosion control soil covering has been lifted off by the wind and these areas are now prone to erosion as hydroseeding was not observed. A 25 m wide slump has occurred about 20 m east of the main channel. There is another shallow ~25 m slump that has occurred in the east slope and a tiny slump closer to the 1200 mm diameter culvert outlet on the east slope both of which appeared to have seepage. The east crotch ditch was not U shaped, and erosion is developing along the sides.</p> <p>North Side of Highway: The original issue was severe and extensive erosion. Since construction erosion is moderate. Erosion is evident along the north side of the east crotch ditch which gets slightly worse each year.</p>	
<b>Dimensions:</b>	Main channel ~200 m x 20 m. Tributary channel ~150 m x 10 m.	
<b>Date of any remediation:</b>	Construction was completed in summer 2018.	
<b>Maintenance:</b>		
<b>Observations:</b>	<b>Description</b>	<b>Worse?</b>
<input type="checkbox"/> Pavement Distress		<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	East side of the main channel (~20 m east upslope) was slumping. Approximately 25 m wide which looks a bit worse with additional cracks in 2020. There was an additional slump that is now ~ 25 m wide just northeast of the existing slump that has formed as well as a small slump southwest of the existing 25 m wide slump. The north side of the highway there is an area that has been eroded at the bend in the NE crotch ditch and could soon turn into a slump. There has also been some debris flows on the west side of the gabion mattresses that have brought down some trees.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	East of Main channel (moderate); South slope east crotch ditch on south side (minor); South slope east of the culvert inlet there was some erosion and rilling	<input checked="" type="checkbox"/>

	(minor); North slope east ditch (moderate), North slope erosion near middle (moderate)	
<input checked="" type="checkbox"/> Seepage	There was seepage from the ground and flow towards the pond. Ground seepage was noted within the slumped areas on the east slope of the south main channel in several areas and on the bench above the slumped areas. Ground seepage was observed on the west side of the main channel from possible springs in multiple areas as seen where the erosion control matting is wet. (Photos 14 & 19). There were also several areas of seepage on the slope north of the highway and water flowing in the west crotch ditch.	<input checked="" type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress	BF76751 beneath the highway is OK and did not contain ice this year during our inspection.	<input type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>

### Background and Assessment:

Thurber prepared a preliminary engineering report (#15-16-319 dated Sept. 2, 2014) as part of high water related mitigation work, which focused on remedial design alternatives to mitigate erosion/degradation for the main creek channel, the east tributary, the ditches, the north embankment fill surface, and other site areas. That report contains a detailed account of the site history and other information for the site, and details are not reproduced herein.

The original highway culvert structure was installed in 1968, and reportedly consisted of a 155 m long x 1.8 m dia. SPCSP plus a 900 mm dia. CSP. The original highway embankment had 3H:1V sideslopes and was 25 m high.

During construction of the highway re-alignment in 2004, landslide movements were experienced (~100 m x 100 m) upon excavation of the old highway fill due to wet granular soils and flowing groundwater. This required staged excavation and dewatering along with slope flattening, construction of a gravel toe berm, and finger drain stabilization measures to enable construction to progress (assumed to be on the west side of the main channel upstream of the new culvert inlet south of the highway).

After construction of the 2004 remedial measures (described above and under Remediation), erosion on the lower 1/3 of the north (downslope) highway embankment fill continually became worse. Some erosion scour was observed along the west side of the culvert inlet headwall collar resulting from an erosion gully further upslope.

In August 2012, the flood event destroyed the random riprap liner and the A-Jacks lined section upstream of the inlet in the main channel, exposing an old 900 mm dia. CSP along the west channel sidewall which had not been removed. Subsequent to this flood event, erosion gradually became worse in the main channel, in the east tributary channel, on the north embankment fill, and three small landslides also developed on the east side of the main channel nearer the culvert inlet. None of these issues were affecting the highway but would continue to get worse and could affect embankment stability in the future but would be a source of silt/sediment deposition into the main tributary channel.

The main erosion repair measures are working well to date. The 1200 mm diameter culvert is conveying upland flow to the main creek and the grouted rip rap is controlling continuous flow in the main channel very well.

After the repair construction was completed in 2017-2018 erosion was noted in three locations on both the south and north slopes. Ground seepage was also noted in several locations including within the slumped area east of the main channel. Erosion control soil coverings were not adequately pinned down and had been swept off the slope from the wind in some locations. This may be contributing to the erosion below the pond and culvert inlet. The primary cause of this erosion appears to be attributed to the inlet being frozen, the water backing up and overflowing over the slope. Erosion along the edge of the ditches

appears to be taking place due to the rip rap being mounded instead of a u-shaped swale. Areas that have been broadcast seeded are showing some signs of grass growth; however, the areas that were supposedly hydroseeded did not show any signs of grass growth.

The first slump observed on the east side slope above the main channel had seepage flowing out of the middle, this may be due to a spring or potential buried subdrain outlet.

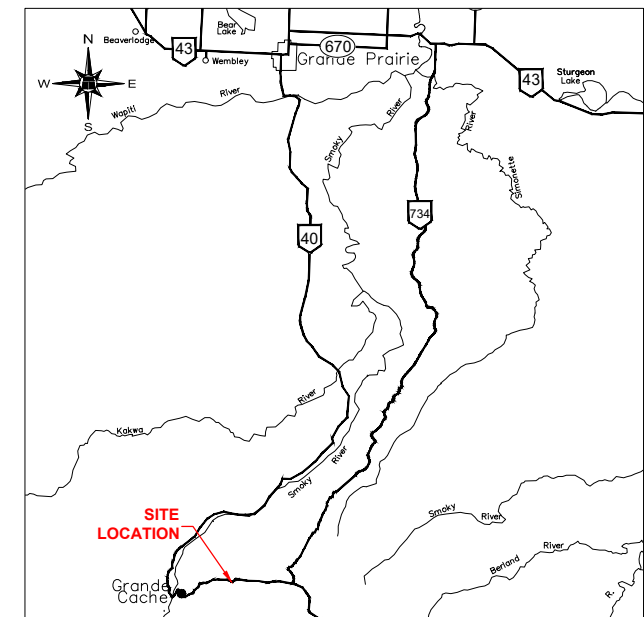
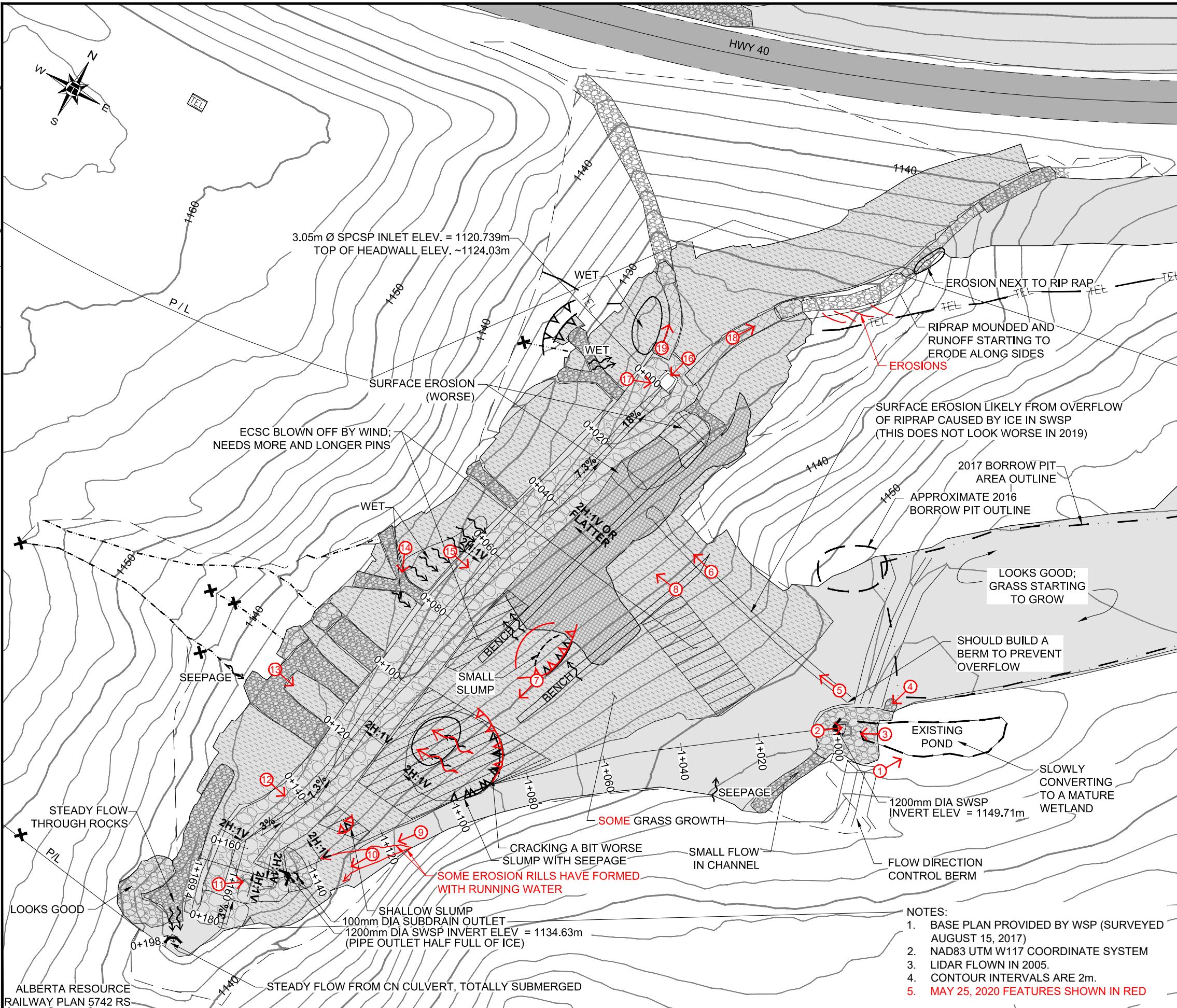
**Recommendations:**

Post construction methods to remedy the minor erosion and slumping, briefly consists of:

1. Investigate whether the seepage in the slump is due to ground water or the subdrain outlet by digging a test pit. Repair the slumps along the east sidewall of the main channel by removing the slumped material and replacing it with granular fill. Add an armoured swale to allow seepage to flow to main channel and prevent future erosion.
2. Repair the erosion in the east slope of the main channel with compacted clay fill prior to doing step 3.
3. Replace the erosion control matting back onto the slope and properly pin in place, after re-seeding the slopes.
4. Repair the erosion along the east crotch ditch on the north side of the highway by filling the gully with compacted clay and add more riprap.
5. Repair the shape of the east crotch ditch on the south side of highway to u-shaped and repair erosion with compacted clay and additional riprap.
6. Complete regular inspections of the 1200 SWSP in the winter by the maintenance contractor to determine when ice build up needs to be removed from the upstream pond and/or when ice in the pipe needs to be cleaned by steaming.

**Ball Park Costs: \$120,000 (excluding annual inspections/steaming of SWSP)**

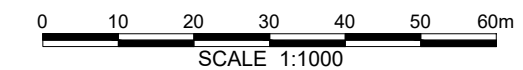
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**KEY PLAN**  
SCALE: 1:200 000

**LEGEND**

- NEW CLASS 1M RIPRAP
- NEW CLASS 2 RIPRAP
- NEW GABION MATTRESS
- NEW T.R.M. / ECSC
- AREAS WHERE GRADING REQUIRED OUTSIDE CHANNELS AND SWALES
- END OF 1200mm DIA. SWSP
- LANDSLIDE / SLUMP SCARP
- DISTURBED ECSC
- SEEPAGE
- DIRECTION AND NUMBER OF PHOTO



**Alberta**  
Transportation

**PEACE REGION (GRANDE PRAIRIE)**  
**GP32-1: HWY 40:34 km 16.2 TO 16.6**  
**S-CURVE REALIGNMENT**

**2020 INSPECTION PLAN (SOUTH)**

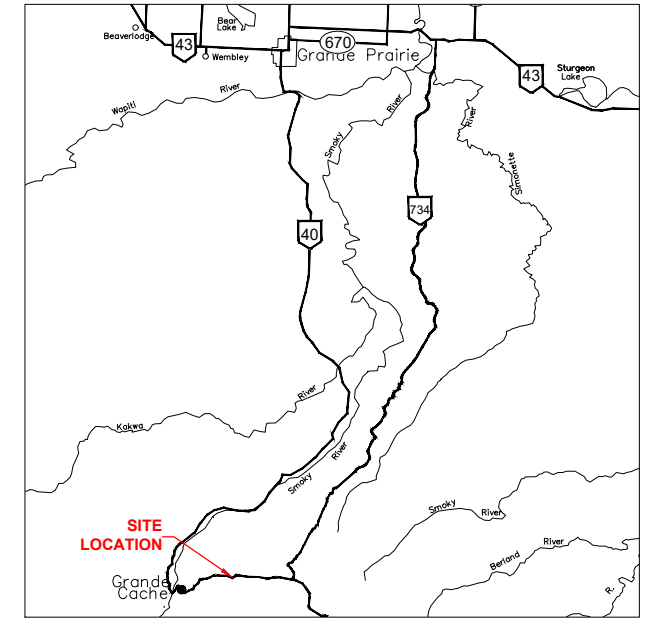
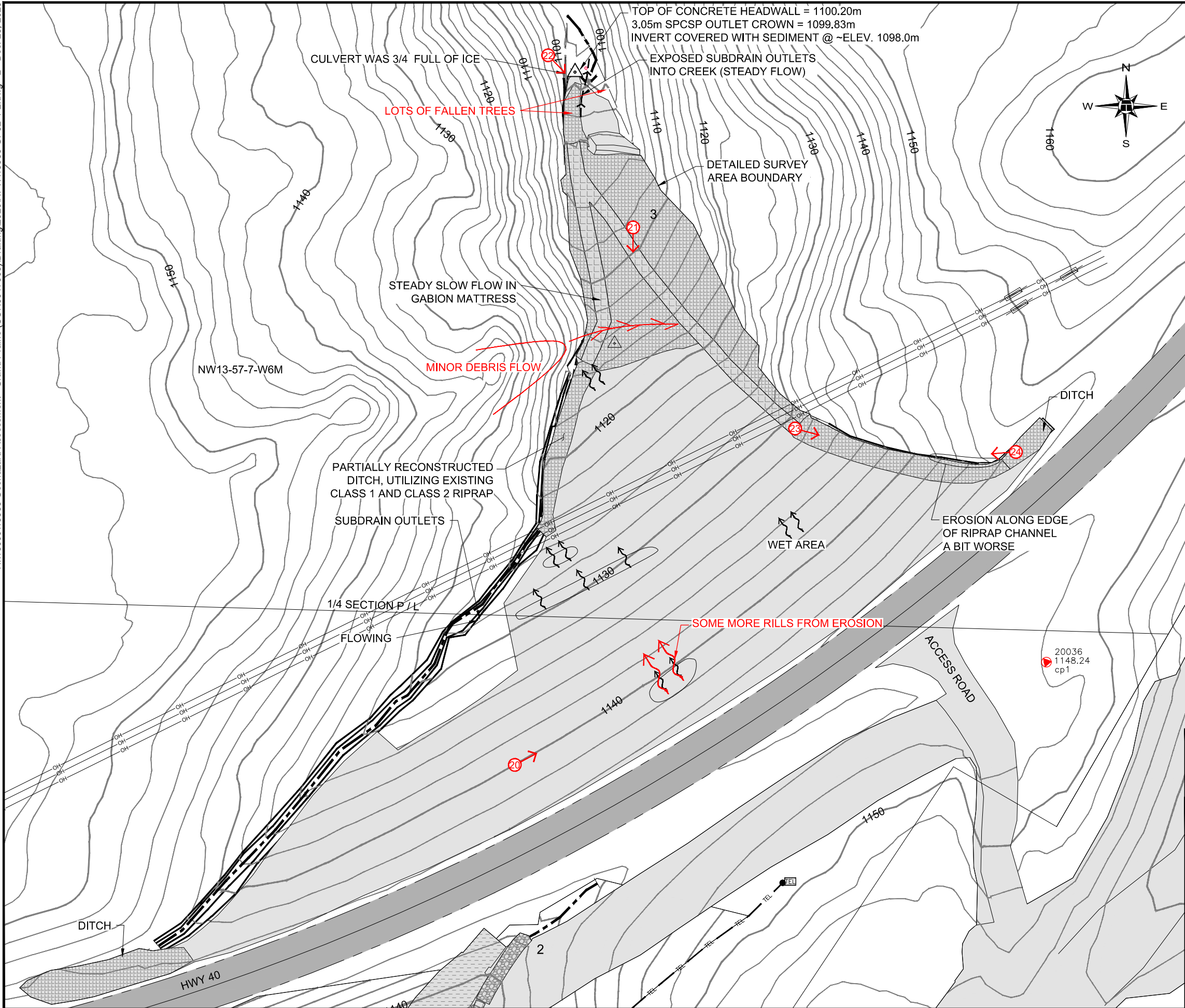
**DWG No. 13353-GP32-1-1**

DRAWN BY	ML
DESIGNED BY	NPW
APPROVED BY	DWP
SCALE	1:1000
DATE	OCTOBER 2020
FILE No.	13353

**THURBER ENGINEERING LTD.**

- NOTES:**
1. BASE PLAN PROVIDED BY WSP (SURVEYED AUGUST 15, 2017)
  2. NAD83 UTM W117 COORDINATE SYSTEM
  3. LIDAR FLOWN IN 2005.
  4. CONTOUR INTERVALS ARE 2m.
  5. MAY 25, 2020 FEATURES SHOWN IN RED

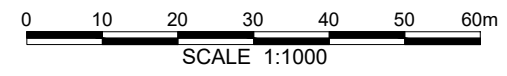
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**KEY PLAN**  
SCALE: 1:2 000 000

- LEGEND**
- NEW GABION MATTRESS
  - NEW GABION STONE / RIPRAP
  - SEEPAGE
  - DIRECTION AND NUMBER OF PHOTO

- NOTES:**
1. BASE PLAN PROVIDED BY WSP (SURVEYED AUGUST 15, 2017)
  2. NAD83 UTM W117 COORDINATE SYSTEM
  3. LIDAR FLOWN IN 2005.
  4. CONTOUR INTERVALS ARE 2m.
  5. **MAY 25, 2020 FEATURES SHOWN IN RED**



**PEACE REGION (GRANDE PRAIRIE)**  
**GP32-1: HWY 40:34 km 16.2 TO 16.6**  
**S-CURVE REALIGNMENT**

**2020 INSPECTION PLAN (NORTH)**

**DWG No. 13353-GP32-1-2**

DRAWN BY	ML
DESIGNED BY	NPW
APPROVED BY	DWP
SCALE	1:1000
DATE	OCTOBER 2020
FILE No.	13353

**THURBER ENGINEERING LTD.**



**Photo 1.**  
Looking east at small  
trickling creek and  
ground water  
seepage area  
upslope of pond.



**Photo 2.**  
Looking east at the  
pond area above the  
culvert inlet.



**Photo 3.**  
Looking southwest at  
1200 mm Diam.  
SWSP inlet and  
surrounding rip rap.



**Photo 4.**  
Looking southwest at  
the added swale  
adjacent and  
downslope of the  
culvert inlet.



**Photo 5.**  
Looking west at area eroded by surface water which appears to have been from an overflow over the rip rap due to the culvert being frozen/blocked.



**Photo 6.**  
Looking south at slope east of main channel where erosion control covering had been swept off from wind.





**Photo 7.**  
Looking south at slumped area. Note ground seepage.



**Photo 8.**  
Looking west towards slope on west side of main channel.



**Photo 9.**  
Looking southwest at  
the buried SWSP  
culvert path.



**Photo 10.**  
Looking southwest  
towards dissipation  
bowl, some slight  
surficial erosion.



**Photo 11.**  
Looking at outlet of  
1200 mm diam.  
SWSP culvert into  
dissipation bowl.



**Photo 12.**  
Looking east at small  
slump.



**Photo 13.**  
Looking east at the slumped areas on the east side slope of the main channel.



**Photo 14.**  
Looking southeast at the main channel.



**Photo 15.**  
Looking east at a slump on the east slope.



**Photo 16.**  
Looking south at the main channel standing on top of the culvert inlet.



**Photo 17.**  
Looking northeast at the main channel culvert inlet and east crotch ditch.



**Photo 18.**  
Looking northeast at the east crotch ditch that has some erosion along its sides.



**Photo 19.**  
Looking northwest at  
west crotch ditch.



**Photo 20.**  
Looking northeast at  
slope north of the  
highway. Some grass  
is growing from  
broadcast seeding.



**Photo 21.**  
Looking south at beginning of crotch ditches and gabion mattresses on the north side of the highway.



**Photo 22.**  
Looking southeast at the culvert outlet covered by fallen trees.





**Photo 23.**  
Looking southeast at  
the east crotch ditch.



**Photo 24.**  
Looking northwest at  
erosion occurring on  
the north side of the  
east crotch ditch.