

**ALBERTA TRANSPORTATION  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION – PEACE RIVER/HIGH LEVEL  
2020 INSPECTION**



<b>Site Number</b>	<b>Location</b>	<b>Name</b>	<b>Hwy</b>	<b>km</b>
PH8	Clear River West Hill	Old Site 7	64:02	19.4-20.1
<b>Legal Description</b>		<b>UTM Co-ordinates (NAD 83)</b>		
SW32-84-11-W6		11 N 6245420	E 332480	

	<b>Date</b>	<b>PF</b>	<b>CF</b>	<b>Total</b>
<b>Call Out Visit:</b>	July 16, 2017	13	4	52
<b>Previous Inspection:</b>	May 13, 2019	14	4	56
<b>Current Inspection:</b>	June 16, 2020	14	4	56
<b>Road AADT:</b>	320		<b>Year:</b>	2019
<b>Inspected By:</b>	Barry Meays (Thurber), Pete Vandelight (MC LaPrairie Group) Ed Szmata, Roger Skirrow (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>	Ditch Erosion, Shallow Backslope Slumping, Highway Embankment Slumping, and Deep Gullies at culvert outlets.	
<b>Dimensions:</b>	About 700 m long by 200 m wide	
<b>Date of any remediation:</b>	2008 – South Ditch grading, RECP lining, and Georidge Barriers. 2017 – North Guardrail, Pitrun Gravel Shoulder, Ditch Grading.	
<b>Maintenance:</b>	Ditch lining, backslope grading, & asphalt overlay August 2008. Chip Seal (2017). Intermittent partial overlays & patching since 2008 (latest July 2019).	
<b>Observations:</b>	<b>Description</b>	<b>Worse?</b>
<input checked="" type="checkbox"/> Pavement Distress	Overlaid 2008, Chip Sealed 2017. A 200m long alligator cracked outside wheel path of EBL that is rutted in places and patched in spots. Two slumps extend into pavement edge; July 2017 slump movements cracked and distorted the new ACP patch - movements continue steadily making conditions worse.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	Some continued movement in cut backslopes, along both north and south highway embankments, & along large erosion gullies.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	Large gullies have grown in size & depth. Erosion is worse downslope of the north ditch culvert outlet, and also in both the south and north ditches.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Seepage	From south backslope.	<input type="checkbox"/>
<input checked="" type="checkbox"/> Bridge/Culvert Distress	North ditch culvert outlet is suspended in air and is separated further west of outlet due to a slide. Hwy cross-culvert outlet is now exposed due to erosion.	<input checked="" type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>

**Instrumentation:** None

**ASSESSMENT** (Refer to Figure 1):

The average ditch gradient was estimated to be in the order of 7 to 8 percent, with a steeper lower portion (the sign at the top of the hill indicates 10 percent grade). The cutslope angles measured at the west end of the site were about 22° (~2.5H:1V), and were ~10 m high.

Along the 2008 RECP lining, the base of the ditch is soft and was likely not compacted well before lining installation. Continued erosion occurred under, or around the edges of, the silted-up, georidge barriers along the center of the ditch, and they were all damaged or non-functional, and were removed/destroyed

during the 2017 highway embankment gravelling/ditch grading repairs. The riprap sections have performed well (except for one noted location of undermining). The gradient was likely too steep for the 2008 RECP lining.

The cutslope slumping on both sides of the highway has generally worsened again this year (enlarged/freshened), and the toe pushes slump into the ditch restricting/re-routing ditch drainage, which manifests erosion and is causing enlarged areas of highway embankment slumping. The backslope inclinations are too steep for the strength of the clay, after loss of cohesion due to weathering.

The 140 m long 2017 patched/overlayed area from ~Sta 2+690 to 2+830 (and the previous rutted, sunken, alligator crack-sealed segments further west), along the eastbound lane and south highway shoulder of the highway adjacent to the south ditch, is thought to be attributed to a soft/wet subgrade. The worst 40 m long segment (centered at Sta 2+850) contains a crack along the center of the EBDL and a slump into the south edge of the pavement & embankment, but the pavement and embankment are quite soft and contain shoulder slumped areas over a 130 m length extending between ~Sta 2+800 to 2+930. Cracks and shoulder slumps have since formed over intermittent segments extending 130 m further west of this area (~Sta 2+930 to 3+060) along the center or edge of the eastbound driving lane/shoulder (shown on Drawing 13351-PH8-1 and Photos 5 to 10).

In 2017 or early 2018, during the north guardrail and pitrun gravel embankment installation, some grading and/or clay was placed by the Maintenance Contractor into the south and north ditches as a temporary repair to the ditch erosion hazard. Severe ditch rutting and unevenness was and still is evident, and both the north highway pitrun gravel embankment and the clay ditch grading did not appear to be well compacted.

During the 2018 inspection, prior north ditch runoff flow caused a new sinkhole to form overtop of the buried 1200 mm dia. CSP culvert upstream of the outlet, which separated it. The culvert is half full of debris at this separated opening.

The large erosion ravine and culvert outlet gully have gotten worse again this year. The concentrated runoff flows in the ravine are too fast for the unprotected clay soils.

## **RECOMMENDATIONS:**

### **INVESTIGATION:**

Perform Lidar (TRANS does have older 2005 coverage of this site), hydrology and geotechnical studies to assess flows, & prepare a design to control and stabilize the severe erosion of the culvert outlet gully and the north ravine.

The site and gullies should also be flown with a drone to get up to date information on the current state of erosion and slumping, prior to design (considering that the site changes significantly from year to year).

Before beginning remediation repairs, it will also be important to obtain information to delineate the existing ROW limits, and to see if the land to the north is Crown or privately owned.

### **MAINTENANCE:**

Check the highway cross culvert (at Station 2+580) to see if cleaning it of mud/debris is still required to allow more unrestricted flow. In 2016 the culvert outlet was 1/3 full, but gully erosion has encroached back behind the outlet and it appears to have self-cleaned itself.

Ditch grading to smooth out the ruts and unevenness in both ditches may be required to reduce additional erosion and highway embankment slumping.

### **SHORT TERM:**

Extend the riprap swale further up the south backslope (near the west end ~ Sta 2+950).

Add some more riprap (sized to suit the condition) along the south ditch where it is required, and at the cross culvert inlet and outlet, and the north ditch culvert outlet (after re-establishing the eroded grades

with compacted clay, (all underlain with non-woven geotextile).

Extend the west end of the north ditch culvert (~Sta 2+800) about 40 m west (upslope of the active backslope slump) to sit on gabions, then mound or berm compacted soil to funnel flow into the pipe and line the inlet area with riprap over non-woven geotextile. Repair the separated culvert area (~2+750) by excavating, cleaning the debris inside it, adding a new length of culvert to join the separated ends, and then neatly backfilling clay around and overtop the excavation and sinkhole area.

**MEDIUM TERM:**

Reconstruct the slumping south embankment sideslope of the highway and ditch by: Excavating to a depth of about 1.5 m below the pavement surface just north of the crack and extending into the south ditch (~12 m horizontally); Install non-woven geotextile over the entire base and sides of the excavation; Place and compact well graded pitrun gravel in the excavation (adding a layer of geogrid over non-woven geotextile near the base); Re-instate the GBC and ACP pavement structure; Line the ditch with Class 1 riprap over non-woven geotextile. AT requested that Thurber prepare detailed design sketches, instructions, and quantity estimates for the areas requiring repairs.

**Ballpark Cost: for worst 130 m Length ~\$400,000.  
For additional 130 m Length further west an EXTRA ~\$400,000.**

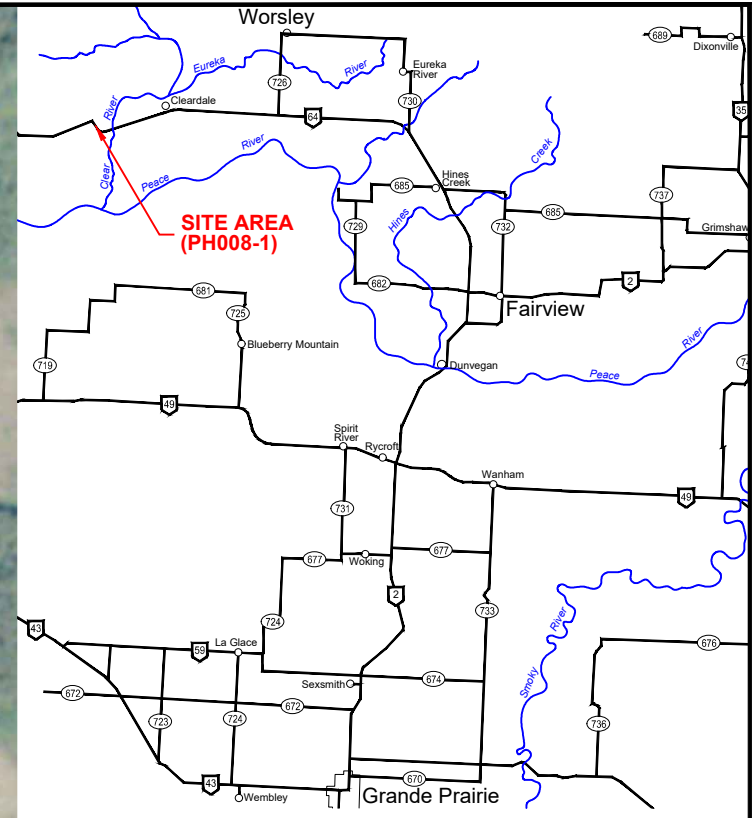
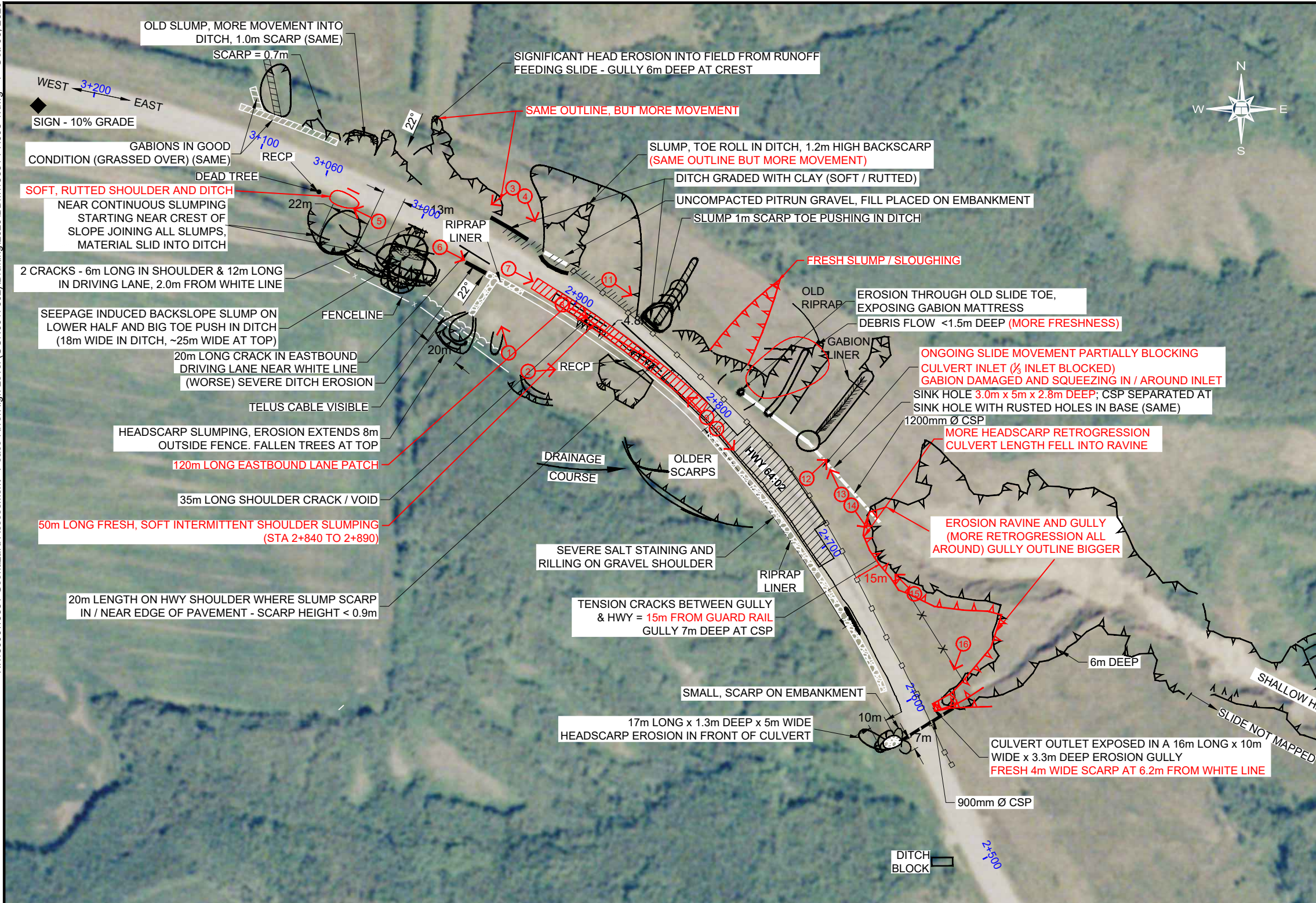
**LONG TERM:**

Flatten the backslopes to gentler angles (preliminary estimate ~4H:1V), seed, cover with ECSC, and plant trees on the slopes, installing subdrains where seepage is noted. Material excavated from the backslopes could be used to backfill the erosion gullies, and then the backfilled gullies could be shaped and lined with suitable erosion liner protection. This work could be staged, with Stage 1 tending to fill in the immediate outlet areas of the culverts, and then protecting them with properly sized riprap dissipation bowls. If remediation plans are contemplated for the large gully/channel beyond the highway centerline culvert outlet (Stage 2), the repair measures should also be extended along there. It is surmised the land ownership is privately owned south of the highway, and crown owned to the north.

**Ballpark Cost ~\$8 million.**



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KEY PLAN  
SCALE 1:1 500 000

BASE AIRPHOTO TAKEN IN JULY 16, 1999



**PEACE REGION (PEACE RIVER/HIGH LEVEL)  
PH008-1 CLEAR RIVER WEST**

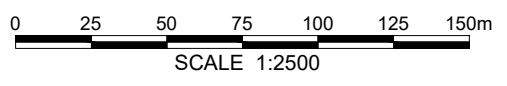
**2020 PH008-1 INSPECTION PLAN**

**DWG No. 13351-PH008-1**

DRAWN BY	ML
DESIGNED BY	BDM
APPROVED BY	DWP
SCALE	1:2500
DATE	JUNE 16, 2020
FILE No.	13351



- LEGEND**
- DIRECTION AND NUMBER OF PHOTO
  - SLUMP SCARP
  - RIPRAP
  - ACP PATCH
  - BUSH LINE
  - GUARD RAIL (INSTALLED IN 2017)
  - FENCE



- NOTES:
1. LOCATION DATA RECORDED USING HAND HELD GPS RECEIVER. ALL LOCATIONS ARE APPROXIMATE AND ARE FOR ILLUSTRATIVE PURPOSES ONLY.
  2. JUNE 16, 2020 OBSERVATIONS SHOWN IN RED.
  3. ALL GEORIDGE EROSION CONTROL BARRIERS ARE DESTROYED IN SOUTH DITCH.
  4. HIGHWAY WAS CHIP SEALED IN 2017
  5. PITRUN GRAVEL ON HIGHWAY EMBANKMENT AND DITCH GRADING DONE IN 2017.
  6. BACKSLOPE SLUMPING, DITCH EROSION, AND SOUTH SHOULDER SLUMPING ALL WORSE IN 2020.





Photo 1 - Looking northwest at the west end of the north cut backslope.



Photo 2 – Looking northeast at the east end of the north backslope erosion and slumps. Also note the south highway embankment slumping and ditch erosion formed from concentrated surface runoff.



Photo 3 – Looking south at the slumping in the west end of the south highway cut backslope. Note the north guardrail, shoulder pitrun, and ditch grading that took place in 2017.



Photo 4 – Looking southeast at the east end of the south cut backslope.





Photo 5 – Looking west along the south ditch from ~STA 3+020. Note the wet, soft, rilled shoulder and slumping highway embankment adjacent to the ditch which was graded in 2017. The tall dead tree beside the south ditch marks the start of the proposed repair (~STA 3+060).



Photo 6 – Looking east along the south soft embankment and ditch from ~STA 2+980. The georidge ditch barriers installed as part of 2008 repairs are now gone.



Photo 7 – Looking east along the south edge of the highway at the west end of the patched, cracked and slumping south highway surface and embankment (~STA 2+930).



Photo 8 – Looking east along the highway from ~STA 2+900 at the area of the 20 m long slump in the edge of the eastbound driving lane pavement and a crack along the center of the EB driving lane pavement spanning beyond this slump.





Photo 9 - Looking west along the soft south highway embankment and ditch at ~STA 2+790, showing the patched EB lane and the south embankment slumps in the background.



Photo 10 – Looking east at the riprap lined portion of south ditch, and the soft, distorted shoulder/highway embankment above it (~STA 2+790).



Photo 11 – Looking east along the cracked pavement and soft north shoulder and embankment (~STA 2+880). Note the slide debris that has pushed into the north ditch.



Photo 12 – Looking north at the damaged gabions squeezing in around the culvert inlet caused by slide movement from above (~STA 2+740).





Photo 13 – Looking west along the north ditch at the 3m x 5m x 2.8m deep sinkhole overtop the culvert a short distance east of the inlet (~STA 2+730).



Photo 14 - Looking east along the large erosion ravine and fence line from the north ditch culvert outlet. Note the slide blocks that have slid down and broken off pieces of culvert.



Photo 15 - Looking west parallel to the highway at the 7 m deep erosion ravine headscarp caused by runoff from the north ditch culvert outlet. The erosion/slumping has again encroached closer to the pavement white line.



Photo 16 – Looking south along the erosion gully formed downstream of the cross-culvert outlet. The headscarp of this erosion has encroached to 6.2m from the white line.