

**ALBERTA TRANSPORTATION  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION – GRANDE PRAIRIE NORTH  
2021 INSPECTION**



<b>Site Number</b>	<b>Location</b>	<b>Name</b>	<b>Hwy</b>	<b>km</b>
PH008	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>Previous Inspection:</b>	June 16, 2020	14	4	56
<b>Current Inspection:</b>	July 14, 2021	12	4	48 (Road/Ditch only)
<b>Road AADT:</b>	260	<b>Year:</b>		2020
<b>Inspected By:</b>	Don Proudfoot, Barry Meays (Thurber), Ed Szmata, Roger Skirrow, Rocky Wang, Ken Szmata (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> The inspection this year was confined to the road and adjacent ditch instability	<b>Description</b>	<b>Worse?</b>
<input type="checkbox"/> Pavement Distress	Overlaid 2008, Chip Sealed 2017. Distress in form of rutting, distortion, cracking, subsidence exists sporadically in both lanes over 430m length. 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 [NOT LOOKED AT IN 2021].	<input 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. [ALL NOT LOOKED AT IN 2021].	<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"/>
<b>Instrumentation:</b> None		

**ASSESSMENT** (Refer to Drawings 1 to 3):

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). 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, geotextile barriers along the center of the ditch, damaging or rendering them non-functional, and then were removed/destroyed during the 2017 highway embankment graveling/ditch grading repairs. The riprap sections (nominal Class 1 size) have performed well, except for one noted location of undermining. The gradient was likely too steep for the 2008 RECP lining.

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 shoulder of the highway adjacent to the south ditch, is thought to be attributed to a soft/wet subgrade. This has now enlarged to include semi-continuous areas over an approximate 420 m length of highway, in both the eastbound and westbound driving surfaces. 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 160 m further west of this area (~Sta 2+930 to 3+090) along the center or edge of the eastbound driving lane/shoulder, along with rutting/cracking/patching and a soft east embankment/ditch extending further east up to ~Sta 2+670, spanning a total highway length of about 420 m (shown on Drawing 32123-PH008-1 and the Photos).

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.

The cutslope angles measured at the west end of the site were about 22° (~2.5H:1V) and were ~10 m high. The cutslope slumping on both sides of the highway has generally worsened over the years (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, caused by loss of cohesion due to weathering.

**RECOMMENDATIONS:****MEDIUM TERM:**

As an interim measure to control and stabilize only the ~420 m length of pavement deterioration and ditch erosion at this site (as shown on Drawings 1 and 3): Reconstruct the slumping south (eastbound) embankment sideslope of the highway and ditch, and the north (westbound driving lane) by: Excavating to a depth of 1.0 m below the pavement surface from hwy centerline northwards up to near the guardrail (where it exists), and 1.5 m below the pavement surface from hwy centerline and extending southwards into the ditch (~14 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 (0.5m north of centerline and 1.0m south of centerline), adding a layer of geogrid overtop the non-woven geotextile near the base); Re-instate the GBC and ACP pavement structure; Line the south ditch with Class 1 riprap over non-woven geotextile. AT is currently considering preparation of a detailed design and tender for these specific areas requiring repairs, and also to address/include the local repair of the cross-culvert outlet erosion north of the highway (which would likely include rebuilding the sideslopes with compacted clay, reshaping the channel, and placing riprap armour to the fence or property line).

**Ballpark Cost: ~420 m Length ~\$3 million.**

**LONG TERM:**

Flatten the backslopes to gentler angles (preliminary estimate ~4 or 5H: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 outside of the highway ROW near the westerly-most 100 m of the proposed project limits, and crown owned outside of the existing ROW east of that.

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

Alternatively, it is understood that AT are planning to carry out a Functional Planning Study to assess alternate alignments for the Hwy 64 crossing of the Clear River Valley to jointly address the issues at this and several other geohazard sites that are affecting the highway. If a new alignment is selected, remedial measures for this site would be aimed mainly at reclaiming the abandoned sections of this site to a condition that maintains future erosion in check.

**CLOSURE**

It is a condition of this letter report that Thurber's performance of its professional services will be subject to the attached Statement of Limitations and Conditions.

Don Proudfoot, P.Eng.  
Principal | Senior Geotechnical Engineer

Barry Meays, P.Eng.  
Senior Geotechnical Engineer



## STATEMENT OF LIMITATIONS AND CONDITIONS

### 1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

### 2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

### 3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

### 4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

### 5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

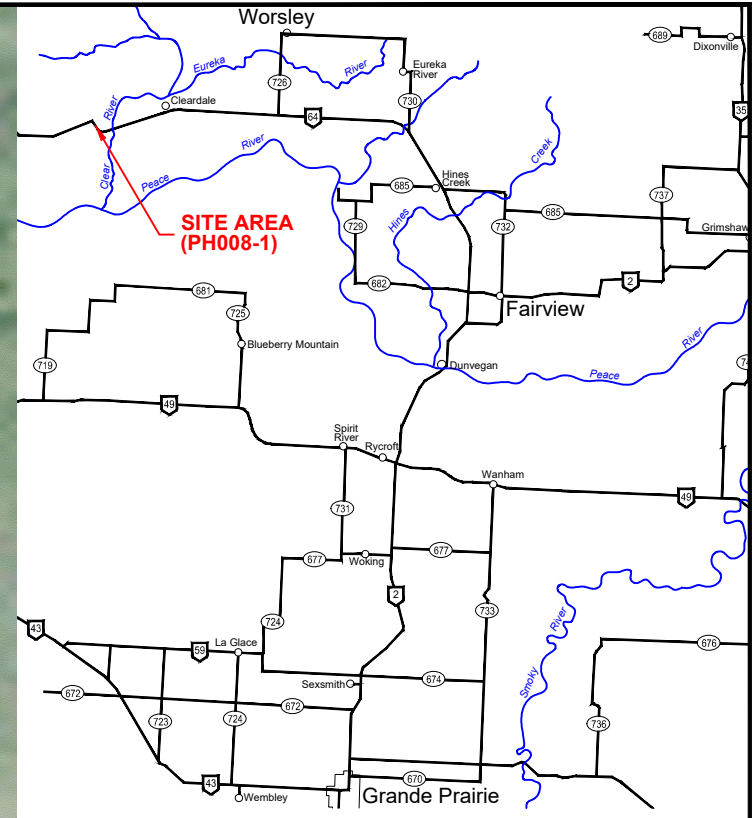
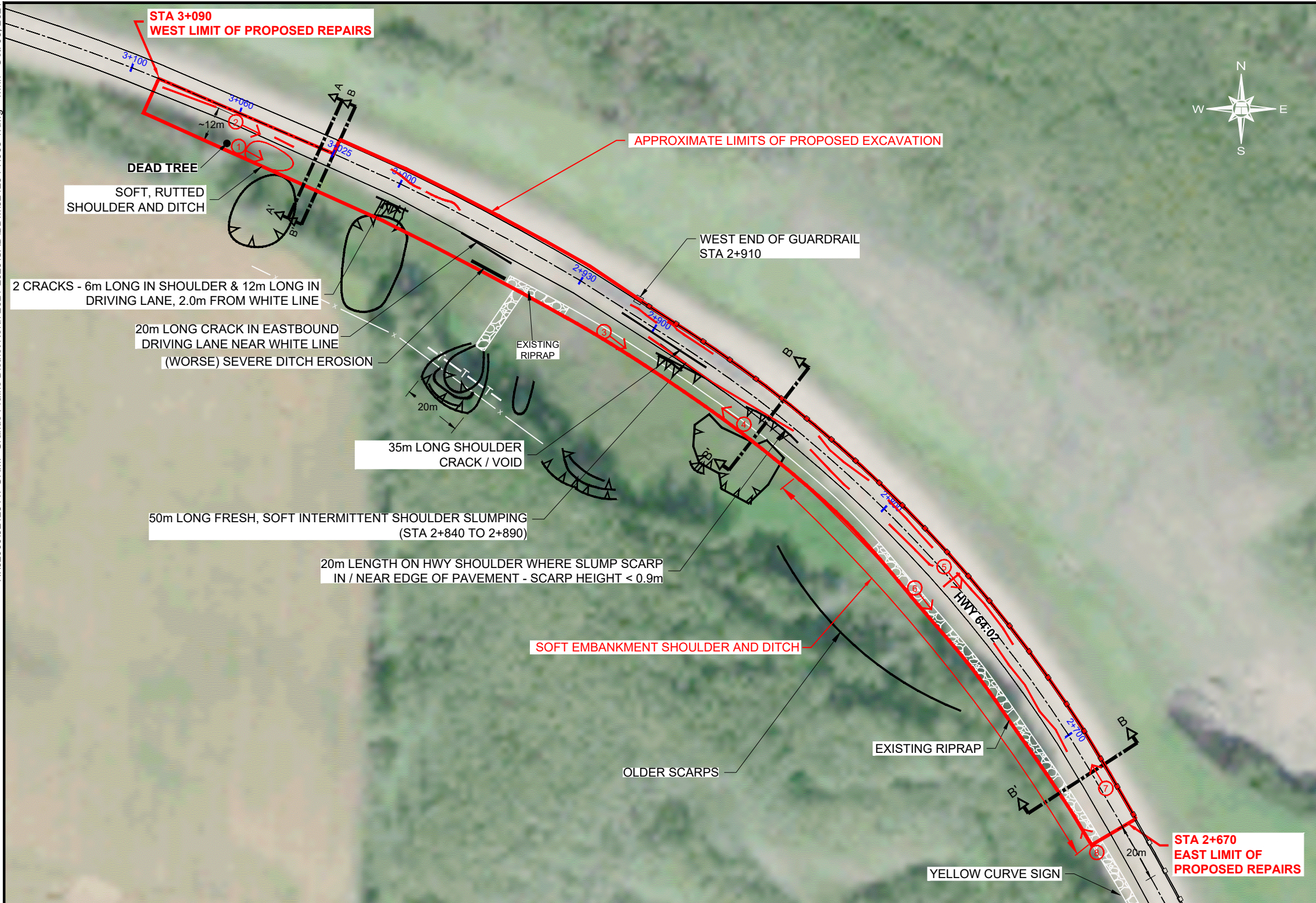
### 6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

### 7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

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**KEY PLAN**  
SCALE 1:1 500 000

BASE AIRPHOTO TAKEN IN JULY 16, 1999



**PEACE REGION (GRANDE PRAIRIE DISTRICT - NORTH)**  
**HWY 64:02, km 20**  
**CLEAR RIVER WEST HILL (PH008)**  
**DETAILED SITE PLAN SHOWING PROPOSED**  
**HIGHWAY AND DITCH REPAIRS**

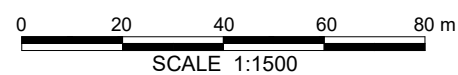
DWG NO. 32123-PH008-1

DRAWN BY	ML
DESIGNED BY	BDM
APPROVED BY	DWP
SCALE	1:1500
DATE	JULY 14, 2021
FILE No.	32123



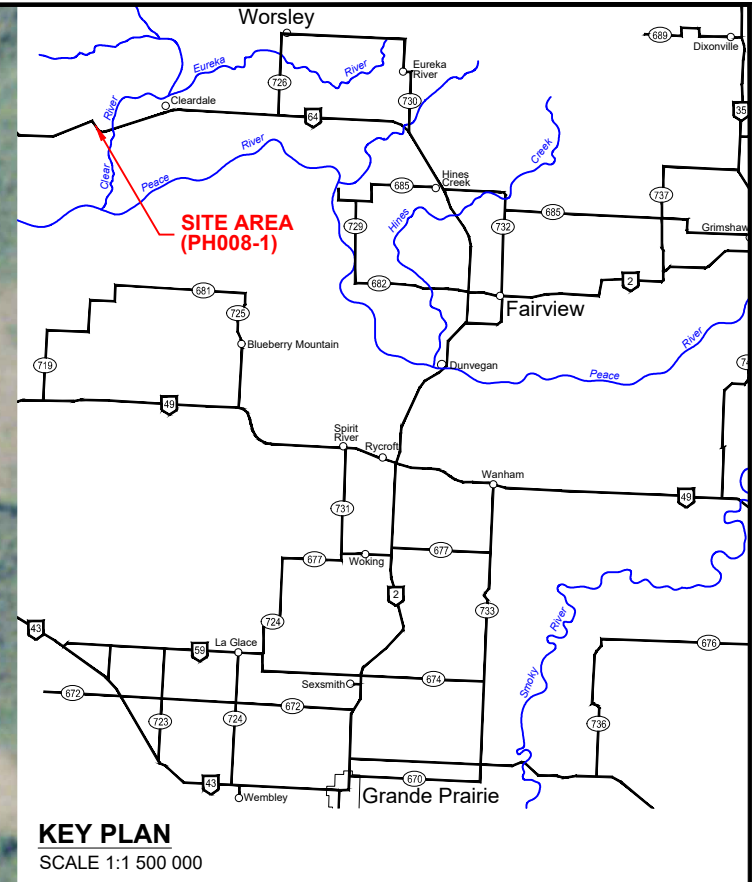
**LEGEND**

	SLUMP SCARP
	RIPRAP
	GUARD RAIL (INSTALLED IN 2017)
	DIRECTION AND NUMBER OF PHOTO
	CRACKS / DISTRESSED PAVEMENT



- NOTES:
1. LOCATION DATA RECORDED USING HAND HELD GPS RECEIVER. ALL LOCATIONS ARE APPROXIMATE AND ARE FOR ILLUSTRATIVE PURPOSES ONLY.
  2. JULY 14, 2021 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 BIT WORSE IN 2021.

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**KEY PLAN**  
SCALE 1:1 500 000

BASE AIRPHOTO TAKEN IN JULY 16, 1999



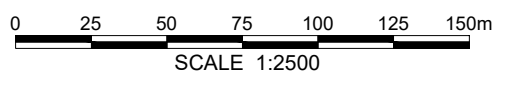
**PEACE REGION (GRANDE PRAIRIE DISTRICT - NORTH)**  
**HWY 64:02, km 20**  
**CLEAR RIVER WEST HILL (PH008)**  
**2021 INSPECTION PLAN**

**DWG No. 32123-PH008-2**

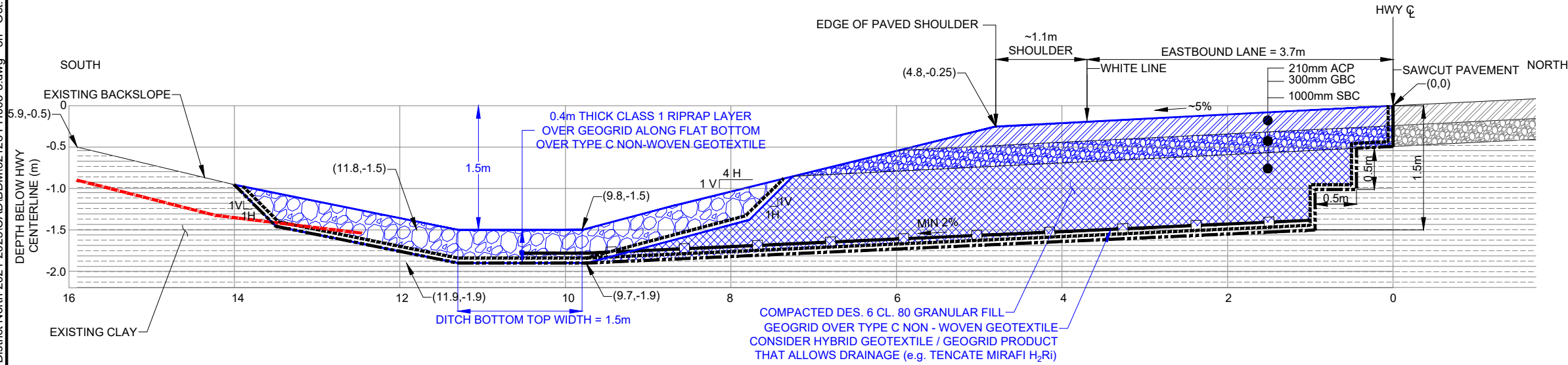
DRAWN BY	ML
DESIGNED BY	BDM
APPROVED BY	DWP
SCALE	1:2500
DATE	JULY 14, 2021
FILE No.	32123



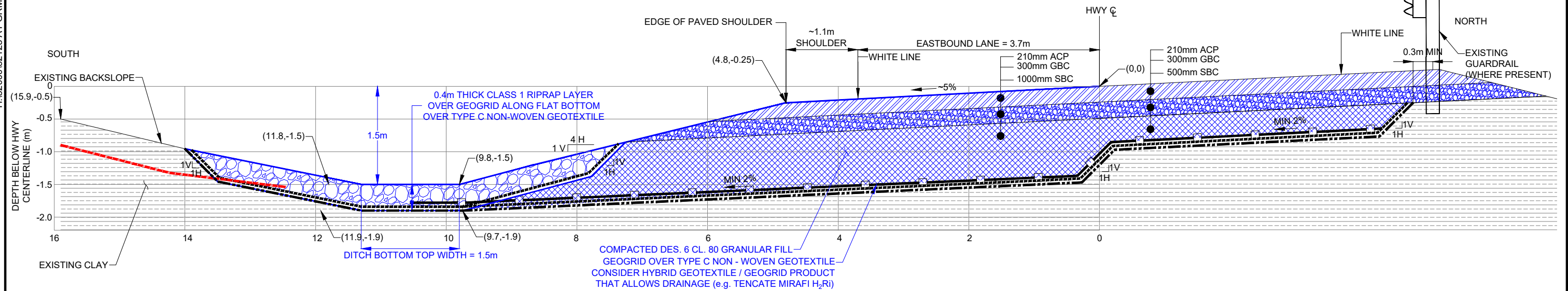
- LEGEND**
- DIRECTION AND NUMBER OF PHOTO
  - SLUMP SCARP
  - RIPRAP
  - ACP PATCH
  - BUSH LINE
  - GUARD RAIL (INSTALLED IN 2017)
  - FENCE



- NOTES:**
1. LOCATION DATA RECORDED USING HAND HELD GPS RECEIVER. ALL LOCATIONS ARE APPROXIMATE AND ARE FOR ILLUSTRATIVE PURPOSES ONLY.
  2. ALL GEORIDGE EROSION CONTROL BARRIERS ARE DESTROYED IN SOUTH DITCH.
  3. HIGHWAY WAS CHIP SEALED IN 2017
  4. PITRUN GRAVEL ON HIGHWAY EMBANKMENT AND DITCH GRADING DONE IN 2017.
  5. BACKSLOPE SLUMPING, DITCH EROSION, AND SOUTH SHOULDER SLUMPING ALL WORSE IN 2020.
  6. JULY 14, 2021 OBSERVATIONS SHOWN IN RED.
  7. OVERALL SITE NOT INSPECTED IN 2021.



**TYPICAL DESIGN CROSS - SECTION A - A'**  
**EASTBOUND SLOPE AND DITCH REPAIR**



**TYPICAL DESIGN CROSS - SECTION B - B'**  
**FULL WIDTH HIGHWAY AND EASTBOUND DITCH REPAIR**

**LEGEND**

- ORIGINAL CONSTRUCTION SURFACE (ASSUMED)
- EXISTING SURFACE (APPROXIMATE; VARIES)
- - - SLIP SURFACE (INFERRED)
- - - LIMITS OF EXCAVATION
- FINAL REPAIRED SURFACE
- TRIAXIAL GEOGRID (CTX 160 OR EQUIVALENT)
- TYPE C NON - WOVEN GEOTEXTILE

**NOTES:**

1. EXCAVATION SHOULD BE COMPLETED IN SECTIONS NOT MORE THAN 50m LONG, BEGINNING AT EAST END AND PROGRESSING UPHILL. EACH SECTION SHOULD BE BACKFILLED PRIOR TO EXCAVATING THE NEXT SECTION.
2. IF FINAL REPAIRED EMBANKMENT SIDESLOPE SURFACE IS STEEPER THAN 4H:1V, THEN A GUARDRAIL WILL BE REQUIRED.



**PEACE REGION (GRANDE PRAIRIE DISTRICT - NORTH)**  
**HWY 64:02, km 20**  
**CLEAR RIVER WEST HILL (PH008)**  
**PROPOSED HIGHWAY AND DITCH REPAIRS**  
**TYPICAL DESIGN CROSS - SECTIONS**

**DWG NO. 32123-PH008-3**

DRAWN BY	ML
DESIGNED BY	BDM
APPROVED BY	TME
SCALE	1:60
DATE	JULY 14, 2021
FILE No.	29476





Photo 1 – Looking east along the south ditch from the tall dead tree landmark (~STA 3+060). Note the wet, soft, rilled shoulder and slumping highway embankment adjacent to the ditch which was graded in 2017. Also note the toe of a backslope slump encroaching into the ditch on this side of the vehicles.



Photo 2 – Looking east along the center of the hwy from ~STA 3+060. The north half of the hwy (WB lane) was deemed to not require repairs at this location. Note the rutted outside wheel path in the EB lane.





Photo 3 – Looking east along the south highway ditch from the west end of the guardrail (~STA 2+910). Note the patched, cracked and slumping south highway shoulder and embankment.



Photo 4 – Looking west along the south edge of the highway from ~STA 2+860 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 5 - Looking east along the center of the highway at ~STA 2+760, showing the cracking and rutting occurring in this previously patched area.



Photo 6 – Looking east along the riprap lined portion of south ditch, and the soft, distorted shoulder/highway embankment above it (~STA 2+760).



Photo 7 – Looking west along the cracked and deformed pavement from the east end of the proposed repair area (~STA 2+670, ~ 20 m west of the yellow curve sign). Note this area was also previously patched.



Photo 8 – Looking west along the south edge of the highway from the west end of the proposed repair area (~STA 2+670).



Photo 9 - 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 10 – Looking northeast along the large erosion ravine where the cross-culvert outlet erosion merges into it.



Photo 11 - Looking north from 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 12 – Looking southeast at the erosion gully formed downstream of the cross-culvert outlet. The headscarp of this erosion has encroached to 5.3 m from the white line (from 6.2 m last year).