

**ALBERTA TRANSPORTATION  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION (PEACE RIVER DISTRICT)  
2021 INSPECTION**



Site Number	Location	Name	Hwy	km
PH065	44+700 to 45+200	Trib. to Heart River	744:04	45.0
Legal Description		UTM Co-ordinates		
NE12-82-22 W5M SE13-82-22 W5M NW7-82-21 W5M SW18-82-21 W5M		11V E 481975 N 6217485		

	Date	PF	CF	Total
<b>Previous Inspection:</b>	10-Jun-2020	13	5	65
<b>Current Inspection:</b>	06-Jul-2021	13	5	65
<b>Road WAADT:</b>	340		<b>Year:</b>	2020
<b>Inspected By:</b>	Tyler Clay, TEL Ed Szmata, TRANS Max Shannon, TRANS		Don Proudfoot, TEL Kristen Tappenden, TRANS Erwin Kurz, TRANS	
<b>Report Attachments:</b>	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input checked="" type="checkbox"/> Maintenance Items			

<b>Primary Site Issue:</b>	<p>Widespread, mostly shallow, slumping extending close to roadway on both sides of embankment and cutslope.</p> <p>WEST EMBANKMENT (44+810):</p> <ul style="list-style-type: none"> <li>Shallow slide above culvert</li> <li>Active shallow slide on upper portion of slope extending to pavement</li> <li>Deeper sliding at toe of slope due to creek erosion</li> </ul> <p>EAST EMBANKMENT (45+020):</p> <ul style="list-style-type: none"> <li>Multiple shallow slides coalescing above culvert to within 10 m of roadway.</li> <li>Culvert outlet flow compromised due to jammed secondary culvert and wood debris (44+990)</li> <li>Active landslide within pavement shoulder above culvert outlet (45+000)</li> </ul> <p>EAST EMBANKMENT (45+200):</p> <ul style="list-style-type: none"> <li>Sliding downstream of northernmost culvert due to erosion</li> </ul> <p>WEST CUTSLOPE (45+100):</p> <ul style="list-style-type: none"> <li>Area regraded in 2016 to fix two slumps (2012)</li> </ul>		
<b>Dimensions:</b>	<p>West Embankment Slides at 44+810: 75 m wide; 65 m from roadway to creek (intermittently active), active slide at 44+840: 11 m wide and 27 m from roadway</p> <p>East Embankment Slides: at 45+200 gully erosion at culvert 10 m wide and 15 m from road, slide at 45+030: 13 m wide; 11 m from roadway, multiple slides at 45+020 around culvert: 50 m wide; 65 m from roadway to creek, recently active 2016 slide at km 45+000: 32 m wide, 0.7 m into road pavement.</p>		
<b>Maintenance:</b>	No maintenance activity since 2011.		
<b>Observations:</b>	<b>Description</b>	<b>Worsened?</b>	
<input checked="" type="checkbox"/> Pavement Distress	Roadway settlement and rutting up to 100 mm; has been patched and cracks filled several times	<input checked="" type="checkbox"/>	

	<p>in vicinity of 44+850. Longitudinal cracks (about 15 mm to 50 mm wide in average) near the centre lines and shoulders of both northbound and southbound lanes. Arc-shaped cracking near active slide area (Photo 65-2) has retrogressed a bit further into the pavement.</p> <p>Wheel rutting and longitudinal cracking at south end of site within southbound lane between 44+750 to 44+840.</p>	
<input checked="" type="checkbox"/> Slope Movement	<p>West cutslope repair is performing well, no change from 2020 (45+100). Slumping on east side, downstream of culvert at 45+200 has expanded with increased sliding at the flanks (Photo 65-1). Active slide at 45+000 (Photos 65-2 to 65-4) appears more defined with increased downdrop and minor retrogression into the road shoulder with a 1.7 m high scarp located 0.7 m from the guardrail. Very active sliding around and above culvert outlet at 45+020 (Photos 65-5 and 65-7).</p> <p>West side of the embankment between 44+775 to 44+830 appears similar to 2020 condition (Photo 65-10) with overgrown scarps around the culvert. Active slope movement above culvert inlet (44+830) offset approximately 27 m from highway and at culvert inlet headwall (Photo 65-9 and 65-10). Inactive slide scarp at the west embankment was offset 2.6 m from guardrail Photo 65-8).</p>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	<p>Erosion at northernmost culvert outlet 45+200 has increased.</p> <p>At Bridge File culvert outlet (45+000) ongoing decrease of toe support on both sides of the embankment due to erosion and localized slumping (Photos 65-5 and 65-6).</p> <p>Scour near the culvert inlet has not significantly worsened since previous inspection condition (Photo 65-11).</p>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input checked="" type="checkbox"/> Bridge/Culvert Distress	<p>A section of an abandoned culvert (buried upstream of the inlet) has been washed through the main culvert beneath the road in a 2017/2018 high-flow event. The old culvert is still jammed against the displaced rip-rap creating a blockage of woody debris near the outlet opening, increasing erosion, scour and reducing flow capacity (Photo 65-7).</p>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Other	<p>Slumping on east side of roadway is affecting power transmission pole anchor wires (Photo 65-6) but flanks have not significantly expanded from 2020 condition.</p> <p>Damaged guardrail posts along the northbound side of highway near 44+800 and three unsupported posts near active slide scarp at 45+000 (Photo 65-2).</p>	<input checked="" type="checkbox"/>

**Instrumentation:**

No instrumentation installed at this site.

**Assessment:**

The area experienced a high-flow event between the 2017/2018 inspections that caused scour and debris buildup at the main functioning culvert beneath the road embankment. The partially blocked culvert outlet should be cleared immediately by maintenance crews to prevent further blockage, scour and potential culvert damage in the next high-flow event. Additional scour and bank loss around the culvert inlet/outlets will reduce toe support for the embankment slope.

Widespread shallow slumping is attributed to the loss of soil strength in high plastic soils, particularly on fill/embankment slopes. Deeper instability upstream and downstream of culverts is attributed to erosion of toe of slope by creek. The slide scarp at 45+000 has continued to retrogress into the pavement of the road shoulder. Further movement and retrogression in this area is expected to cause damage to the road structure and eventual closure of the northbound lane if localized landslide mitigation repairs are not carried out within the next few years (understood repairs are planned for 2023). The slide affecting the road is currently expected to be shallow but could be related due a deeper instability mechanism in the lower half of the embankment. Thurber completed a site investigation and slope stability assessment in July 2020 to determine conceptual repair options (refer to Thurber's April 2021 report File No. 29199).

Other slide areas identified at this site are expected to retrogress closer to the road in the next 5-10 years and are expected to continue unless mitigation at the culvert outlets is implemented. The rate of movement is difficult to assess without instrumentation installed at this site.

The longitudinal cracking on the pavement appear to be caused mainly by fatigue failure caused by repeated traffic loading and has not become significantly worse since 2016.

Repaired of the cutslope at 45+100 appears to be in stable condition and has revegetated well. There is minor ditch erosion occurring.

**Recommendations:****Cost**

Immediate maintenance at the culvert outlet required to clear debris and restore full flow capacity.	Maintenance
Continue to undertake annual inspections.	-
Conceptual repair options for stabilizing the east embankment were determined from Thurber's site investigation and preliminary engineering assessment. The option included the following (alternative for an increased extent of the repair is provided for some options):	-
<ul style="list-style-type: none"> <li>▪ Pile Wall (40 m - \$457k, 70 m – \$742k)</li> <li>▪ Soil Nails (40 m - \$402k, 70 m – \$621k)</li> <li>▪ Granular Fill (70 m - \$593k)</li> </ul>	
Additional geotechnical investigation with piezometers and a series of test pits may be required (pending initial investigation results) to support long-term site stabilization design.	\$ 30,000
Long-term stabilization measures would likely consist of extensive erosion control measures and bank armouring of the creek, coupled with shallow stabilization measures such as granular blankets, soil nails or granular trenches. Alternatively, extension of the culvert on both sides with slope flattening should be considered especially for the landslide developing at 45+000.	\$ 3,000,000

## **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

Tyler Clay, P.Eng.  
Geological 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.

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### 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.

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### 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.

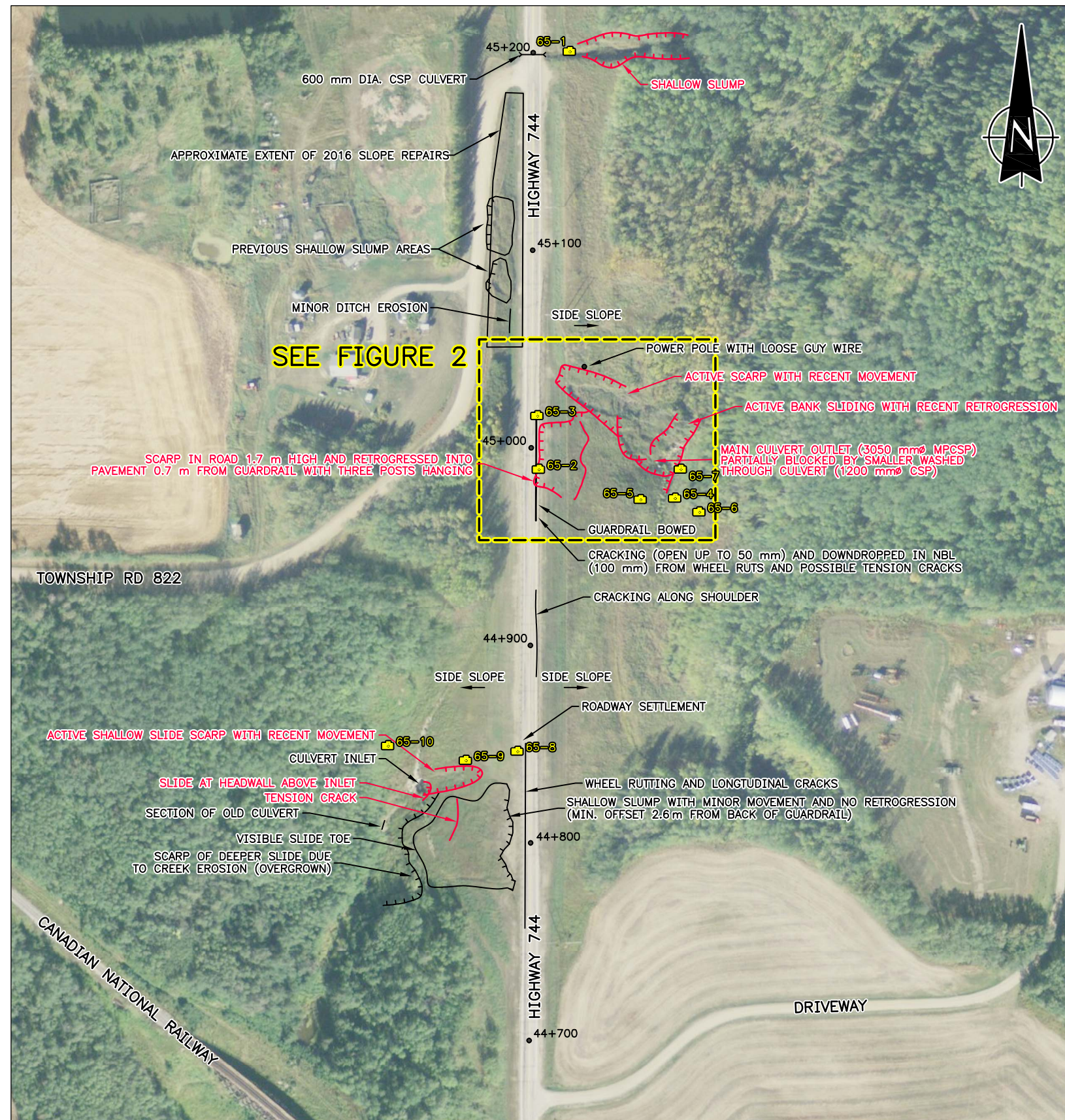
### 6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

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

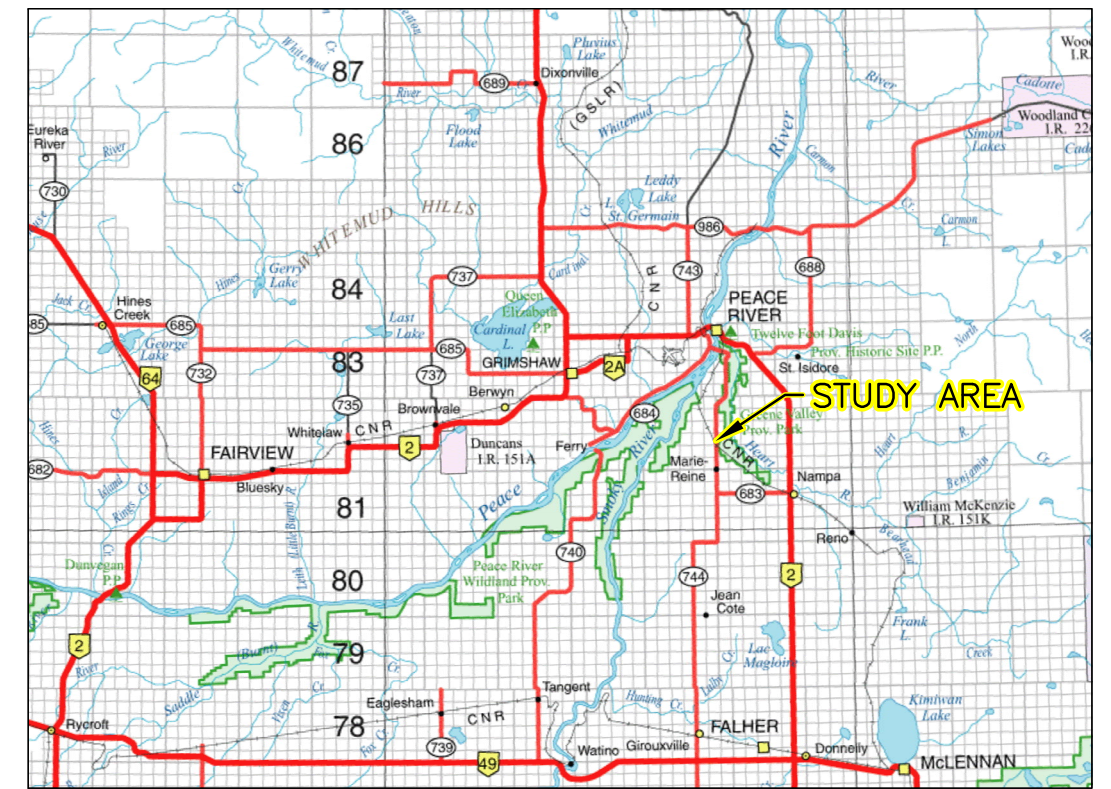
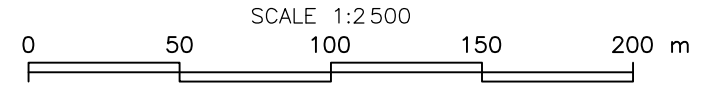
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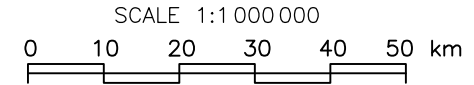


SEE FIGURE 2

DETAIL MAP

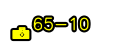


KEY MAP



LEGEND:

PHOTOGRAPH LOCATION



NOTES:

- DRAWING MUST BE USED IN CONJUNCTION WITH THE ATTACHED REPORT REFERENCE 32121 DATED OCTOBER 2021 AND IS SUBJECT TO THE STATEMENT OF LIMITATIONS AND CONDITIONS INCLUDED IN THE REPORT.
- AIR PHOTO BASE FROM TARIN RESOURCE SERVICES LTD. 0.4 m/PIXEL (2012).
- SLIDE FEATURES, PHOTOGRAPHS AND CHAINAGE ARE SHOWN APPROXIMATE ONLY.
- SITE FEATURES SHOWN IN RED ARE FROM JULY 6, 2021 SITE VISIT.



PEACE REGION (PEACE RIVER DISTRICT)

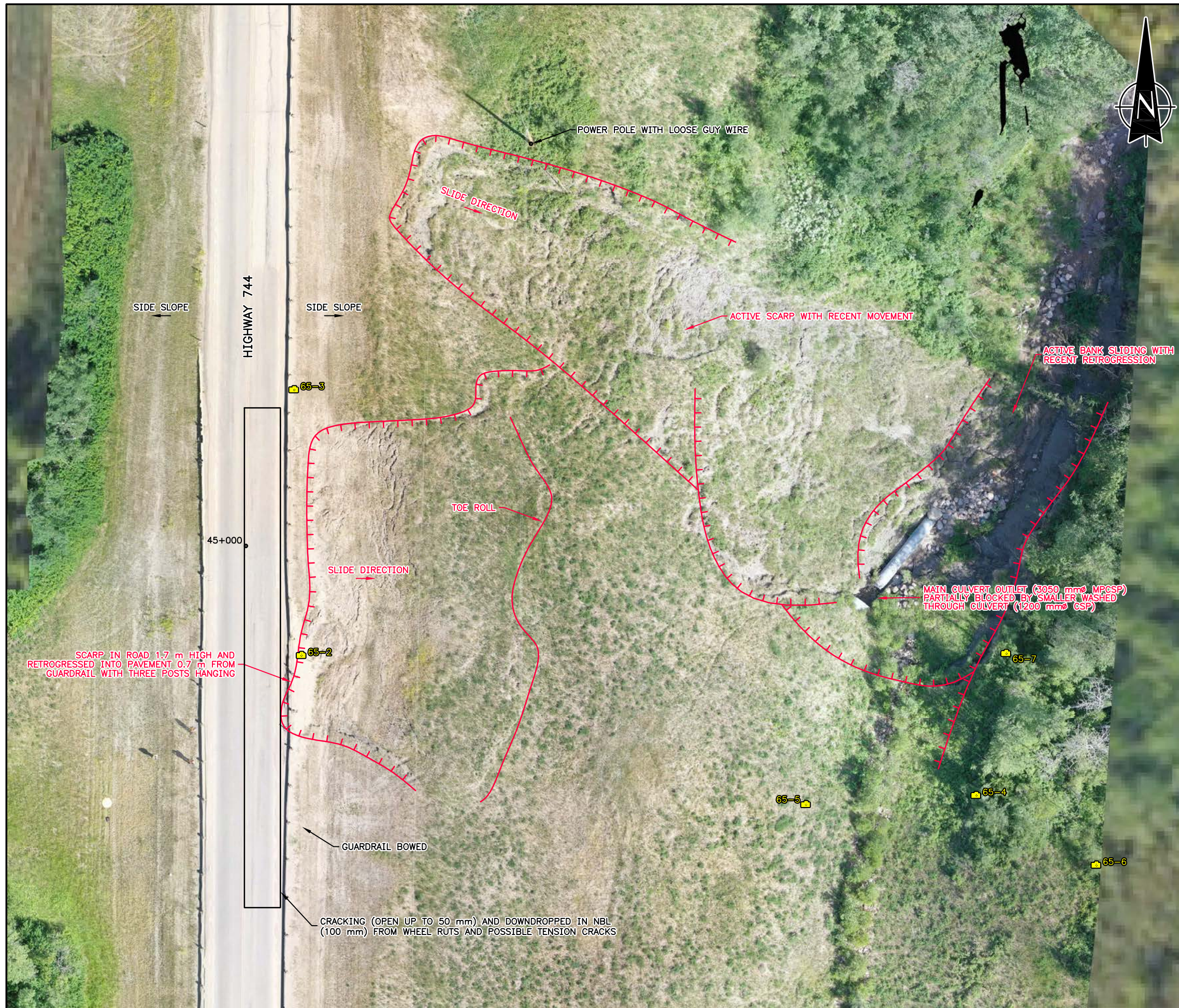
TRIB TO HEART RIVER  
HWY 744:04 (PH065)  
LOCATION PLAN


FIGURE PH065-1

DRAWN BY	ICB
DESIGNED BY	TTC
APPROVED BY	DWP
SCALE	AS SHOWN
DATE	SEPTEMBER 29, 2021
FILE No.	32121-A0D

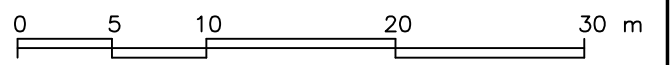






LEGEND:  
 PHOTOGRAPH LOCATION  65-10

- NOTES:
- 1 DRAWING MUST BE USED IN CONJUNCTION WITH THE ATTACHED REPORT REFERENCE 32121 DATED OCTOBER 2021 AND IS SUBJECT TO THE STATEMENT OF LIMITATIONS AND CONDITIONS INCLUDED IN THE REPORT.
  - 2 AIR PHOTO BASE FROM THURBER DRONE 0.01 m/PIXEL (2021).
  - 3 SLIDE FEATURES, PHOTOGRAPHS AND CHAINAGE ARE SHOWN APPROXIMATE ONLY.
  - 4 SITE FEATURES SHOWN IN RED ARE FROM JULY 6, 2021 SITE VISIT.



*Alberta* Transportation

PEACE REGION (PEACE RIVER DISTRICT)

**TRIB TO HEART RIVER  
 HWY 744:04 (PH065)  
 DETAILED PLAN**

FIGURE PH065-2

DRAWN BY	ICB
DESIGNED BY	TTC
APPROVED BY	DWP
SCALE	1:400
DATE	SEPTEMBER 29, 2021
FILE No.	32121-A0D







**Photo 65-1.**  
Erosion gully at the culvert outlet (45+200) had increased sliding along the flanks.



**Photo 65-2.**  
Looking south towards the scarp retrogressing into the road pavement (45+00). Slide scarp was first noted in 2016 and is now approximately 1.7 m high at the pavement and retrogressed 0.7 m from the guardrail into the pavement with three posts hanging freely.





**Photo 65-3.**  
Looking south along the east side of the highway embankment towards an active main slide scarp (45+015) first identified in 2016. Increased dropdown since 2020.



**Photo 65-4.**  
View towards recently active slide area above culvert outlet that has retrogressed to the pavement on the east embankment (44+975). Note visible toe roll.





**Photo 65-5.**  
Active bank sliding and erosion area around the culvert outlet (44+975). Worse since 2020.



**Photo 65-6.**  
Looking northwest towards multiple active, shallow slides coalescing above the culvert outlet. Area has ongoing movement, especially near the toe where there is active bank erosion (44+975) but no significant retrogression of the headscarp towards the highway.





**Photo 65-7.**  
Active sliding and erosion area around the headwall of the culvert outlet (45+000). Movement has pinched the outlet area of an armoured swale to the south of the outlet. Note old washed through culvert section causing debris jam.



**Photo 65-8.**  
Looking south along the upper slope of the west side of the road embankment. No major changes noted since previous inspection.





**Photo 65-9.**  
Looking southeast towards a recently active shallow earth slide above the culvert inlet (44+830). Slide is offset approximately 27 m west of the highway edge.



**Photo 65-10.**  
Looking east towards the road embankment with active shallow slide activity immediately above the culvert inlet (near inspectors) and near the headwall.