

**ALBERTA TRANSPORTATION AND
ECONOMIC CORRIDORS GRMP
NORTH CENTRAL (ATHABASCA AND FORT
McMURRAY DISTRICTS)
2024 SITE INSPECTION**



Site Number	Location	Name	Hwy	km
NC097	Fort McMurray	Parsons Road Overpass/Hwy 63	686:20	
Legal Description		UTM Co-ordinates (NAD 83)		
SW7-90-9-W4		12V N 6,293,600	E 473,700	

	Date	PF	CF	Total
Previous Inspection:	May 18, 2023	11	4	44 (Landslide basis)
Current Inspection:	June 5, 2024	11	5	55 (Landslide basis)
Road WAADT:	4,780		Year:	2023
Inspected By:	José Pineda, Tarek Abdelaziz (Thurber) Rocky Wang (TEC)			
Report Attachments:	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			

Primary Site Issue:	A crack formed across both traffic directions along the top of the Parsons Road overpass (BF85178), ~6 m west of the west abutment (along the western edge of the approach slab); settlement of west approach slab causing a dip behind the west abutment (possibly due to bridge west headslope movement).
Dimensions:	The cracks are across eastbound and westbound lanes (26 m long), dip is within the boundaries of the approach slab (26 m wide x 6 m long).
Site History:	<p>Based on information provided by TEC and an examination of the as-built drawings, weak soil overlying limestone bedrock existed at this overpass location. An instrumented test fill was built at the east headslope, supported on a wick drain perforated foundation soil. Based on the performance of that test fill it was determined that in order to meet the construction schedule demands the weak soils had to be completely excavated from the west headslope area (up to 7 m in depth), and the portion of the east headslope not covered by the instrumented test fill (up to 5 m in depth). Engineered fill, mainly consisting of clay shale, was placed to restore the grades, and then the headslope fills were constructed overtop original grade level (up to 13 m in height). The west headslope fill was built with geogrid reinforcement clay shale.</p> <p>An extensive instrumentation program consisting of slope inclinometers, piezometers and settlement cells were installed to monitor construction activities, control fill placement rates, and provide post construction information. Thurber is currently monitoring these instruments as part of the GRMP geohazards contract.</p>
Maintenance:	ACP Patch was placed in 2020 and 2022 on eastbound and westbound lanes. Between 2023 and 2024: Milled and patched the highway within the impacted area, placed a flexible filler to seal the gaps between the wing walls and the drain troughs, filled the void under the abutment seat with grout.

Observations:	Description	Worse?
<input checked="" type="checkbox"/> Pavement Distress	Up to 60 mm wide x 90 mm deep x 26 m long crack reflected through the patch along the western edge of the west approach slab, about 6 m west of the west abutment; previously noted dip on the eastbound and westbound lanes west of the Finger Plate Joint were not visible in the 2024 site inspection.	<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	Bridge head slope was noted to have moved laterally and vertically by up to 300 in 2023. In 2024, additional movements of about 10 mm (lateral) and about 20 mm (vertical) were noted.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	Rutting at the toe of the headslope	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Seepage	Ponding water at the toe of the headslope	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Bridge/Culvert Distress	200 to 300 mm of head slope movement; no visible cracks on abutment walls, wing walls, and abutment slope concrete facing; bridge bearing plates movement maxed out	<input checked="" type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>

Instrumentation: (6 SIs, 28 VWs, 4SCs)

The following is a summary of the readings of the closest instruments to the bridge west headslope (between spring 2023 and spring of 2024):

SI14-05 located at the toe of the headslope is moving at 7.7 mm/yr over 1.5 and 4.6 m depth and at 0.5 mm/yr over 4.6 m to 9.4 m; The total lateral movement recorded in SI14-05 since 2014 is 102 mm; the increases in settlement values since the spring of 2023 in operational settlement cells are: SC14-09= 25 mm, SC14-12=22 mm, SC15-04= 11mm, and SC15-06= 7 mm.

Assessment (Refer to attached Figure):

The site observations and instrumentation monitoring results indicate “excessive” vertical and lateral movements of the west approach fill. The cracks and the dips noted on the driving lanes are reflections of the ongoing slope movement of the approach fill. The movement of the fill appears to have created voids below the approach slab.

The repair work completed by TEC between 2023 and 2024 improved the situation temporarily. The voids below the approach slab and the abutment seat will likely get bigger in size and additional movement of the head slope may impact the integrity of the highway and the bridge. Furthermore, surface water infiltration into open cracks on the road will likely saturate and soften the high plastic approach fill, and may result in an accelerated slope movement.

The Consequence Factor was increased from 4 to 5 since either a significant detour and/or road closure may have to take place in response to an accelerated slope movement.

The accumulated water at the bottom of the west headslope is likely a reflection of poor surface drainage in this area. The toe is also bare of vegetation and the water accumulating at the toe has created a soft zone with multiple rutting as a result of off terrain vehicle traffic in this area.

Recommendations:

It is recommended to visit the site again in 2025.

It is recommended to install at least two slope inclinometers at this site (one at the top of the slope and another one at the bottom of the slope) to assess the potential depth and the extent of headslope

movement. Consideration should also be given to installing extensometers/settlement cells within the severely impacted areas of the approach fill to fully characterize the bridge headslope movement.

A structural engineer should be consulted in the near future to (a) examine the condition of the bridge and assess whether the structure is performing as per the original design, and (b) provide recommendations for rehabilitation/repairs (if needed) and instrumentation monitoring of structural elements (if required).

Short Term:

The local MCI should periodically monitor existing cracks and dips (if developed on the highway surface due to excessive movement). The bridge abutment walls and seat; and bridge approach fill slopes should also be monitored for any signs of additional movements.

The cracks on the highway should be sealed, and ACP patch should also be placed if a significant dip occurs on the highway surface. As recommended in the past it is ideal to drill holes within the slab to and inject grout in the holes to fill any voids below the slab. This may lessen the frequency of milling and patching on the highway.

Existing and future gaps (if developed) under drain troughs, between drain troughs and wingwalls, and below the abutment seat under the bridge should be filled with low strength fillcrete.

The ground surface at the toe the headslope should be slightly regraded to avoid ponding of water and the re-graded surface should be topsoiled, seeded, and covered with a heavy-duty erosion control product.

Medium to Long Term:

Preliminary engineering is recommended to assess the cause of the observed movements and provide potential remedial measures and associated "A" estimates. New geotechnical instrumentation should be installed and monitored to complete this assessment.

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.

Tarek Abdelaziz, Ph.D., P.Eng.
Partner | Senior Geotechnical Engineer

José Pineda, M.Eng., P.Eng.
Associate | Senior Geotechnical Engineer



STATEMENT OF LIMITATIONS AND CONDITIONS

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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.

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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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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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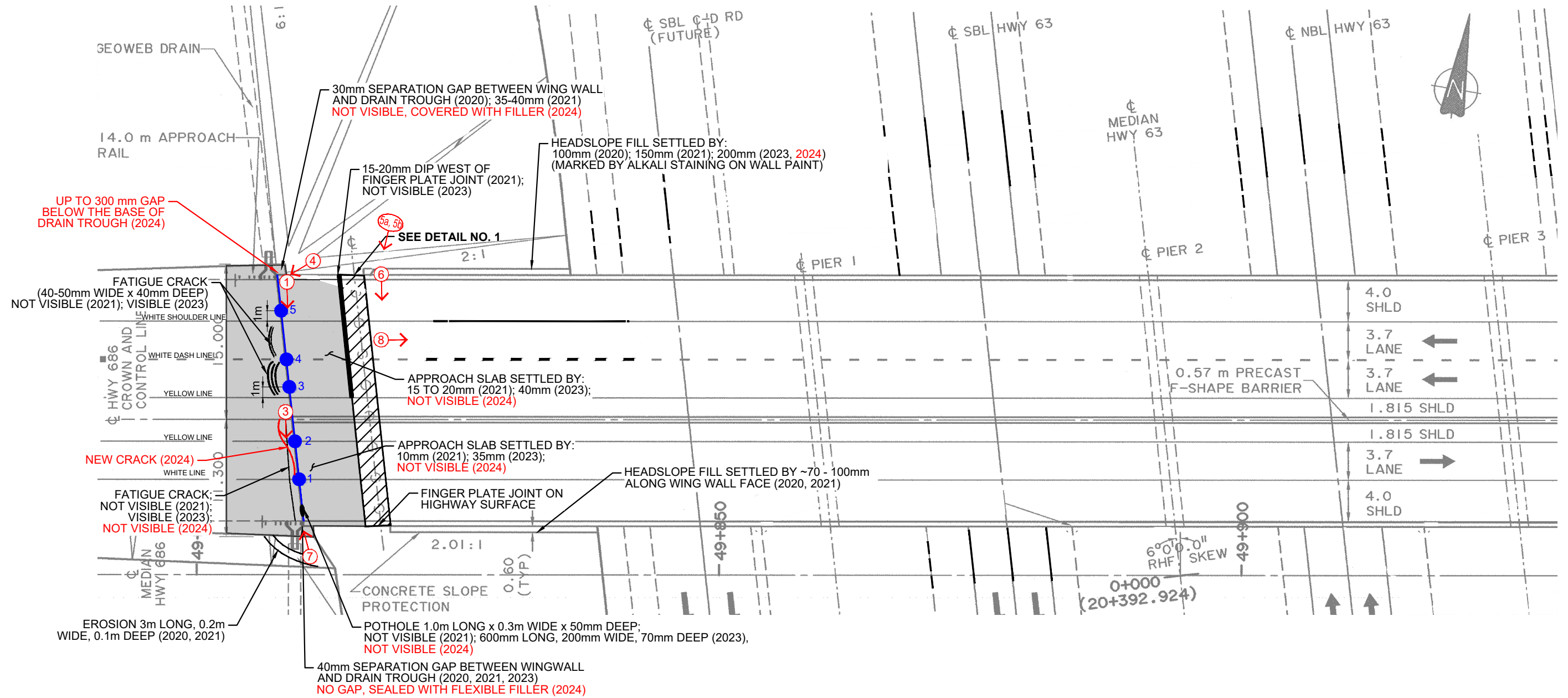
- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification 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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LEGEND

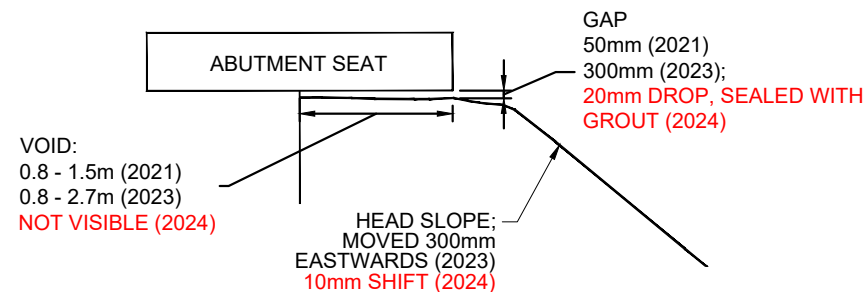
- CRACK MEASUREMENT LOCATION
- CRACK LOCATION
- ① PHOTOGRAPH NUMBER, AND APPROXIMATE DIRECTION AND LOCATION
- ACP PATCH PLACED IN 2022

NOTE:

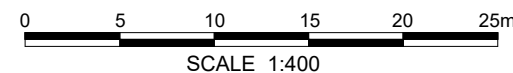
JUNE 5, 2024 SITE OBSERVATIONS ARE SHOWN IN RED.

CRACK LOCATION	MAY 17, 2023			JUNE 5, 2024		
	WIDTH (mm)	DEPTH * (mm)	DROP (mm)	WIDTH (mm)	DEPTH * (mm)	DROP (mm)
1	30	70	20	60	90	0
2	140	150	40	60	90	0
3	40	100	30	20	10	0
4	100	100	20	40	40	0
5	30	70	20	30	20	0

* SAND AND SALT WERE NOTED WITHIN BOTTOM OF CRACK.



DETAIL NO. 1
(NTS)



BASE PLAN 37507-C FROM ALBERTA TRANSPORTATION



**NORTH CENTRAL REGION
(ATHABASCA AND FORT McMURRAY DISTRICTS)
2024 GEOHAZARD ASSESSMENT**

**NC097: HWY 686 (PARSONS ROAD OVERPASS) / HWY 63
SITE INSPECTION PLAN**

FIGURE 1

DRAWN BY	ML
DESIGNED BY	JGP
APPROVED BY	TSA
SCALE	1:400
DATE	JULY 2024
FILE No.	32122





Photo No. 1 – Looking south at the crack developed across the westbound lanes towards the median. The main crack is 20 to 40 mm wide x 10 to 40 mm deep. The cracks are across both traffic lane directions and have formed between the approach slab and the pavement, about 6 m west of the west abutment fingerplate; a new ACP patch was noted in 2024.



Photo No. 2 – Looking east at east bound lane. Cracks up to 60 mm wide and 90 mm deep



Photo No. 3 – Looking south at east bound lane. Cracks up to 60 mm wide and 90 mm deep



Photo No. 4 – A Flexible filler placed in 2024 to seal the 50 mm wide separation gap between the northwest wing wall and the drain trough. However, up to 300 mm deep gap was noted below the drain trough in response to fill settlement



Photo No. 5a – (Taken in Spring of 2023) Looking south at head slope movement (300 mm vertical drop x 300 mm lateral shift towards east); Void under abutment seat ranges from 0.8 m to 2.7 m.



Photo No. 5b – (Taken in Spring of 2024) Void under the abutment seat shown in photo 5a was filled with grout; However, ground appears to have dropped by 20 mm and displaced laterally by 10 mm at this location



Photo No. 6 – Bridge bearings appear to have maxed out.



Photo 7 – South drain trough. The gap between the drain trough and wingwall was sealed with a flexible filler.



Photo 8 – Water ponding and rutting at the toe of the bridge west headslope