

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



Site Number	Location	Name	Hwy	km
NC088	62 Km N of Wandering River	Km 108 Settlement	63:06	6.0
Legal Description		UTM Co-ordinates (NAD 83)		
S-30-77-14-W4M		12	6172629	E 426672

	Date	PF	CF	Total
Previous Inspection:	June 24, 2020	9	5	45 (Highway 63 NBL)
		7	4	28 (Highway 63 SBL)
Current Inspection:	June 4, 2024	9	5	45 (Highway 63 NBL)
		7	4	28 (Highway 63 SBL)
Road AADT:	3,900	Year:		2023
Inspected By:	Tarek Abdelaziz and José Pineda (Thurber) Rocky Wang (TEC)			
Report Attachments:	<input checked="" type="checkbox"/> Photographs <input type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			
Primary Site Issue	<p>NBL: A landslide above the original pipe causing a severe pavement distress on the highway north bound lanes and east embankment slope; localized slump above the inlet of the culvert.</p> <p>SBL: A localized slump in the west embankment around and above the outlet of the smooth wall steel pipe installed in 2018, resulted in the formation of multiple tension cracks within the entire embankment and failure of a 12 m section of the pipe at the outlet location.</p>			
Dimensions:	<p>NBL: The pavement distress section is about 25 to 30 m long. The landslide is about 30 m wide parallel to the highway and 40 m long perpendicular to the highway alignment.</p> <p>SBL: Local sinkhole at the toe of the embankment was approximately 5 m wide, 15 m long, and 3 to 4 m deep; cracking near the top of the embankment used to be 150 m long.</p>			
Site History:	<p>The NBL embankment was constructed during the Hwy 63 twinning project. Up to 14 m of fill was placed to construct the NBL at the subject location to cross the valley of an existing creek. A 1,200 mm CSP pipe was connected to an existing 1,200 mm concrete pipe to convey the creek flow below the new embankment. It is understood that the highway was built in 2014 and paved in October 2016.</p> <p>In the fall of 2017, the CSP pipe collapsed at about 30 m from the inlet location (as per the information provided by AT). Slumping and erosion were also noted at the outlet of the concrete pipe (west side of SBL embankment). Recommendations were provided in the fall 2017 callout report to install a new pipe and to grout the old pipe. The proposed alignment of the new pipe was provided in the callout report. The recommended alignment of the replacement pipe was selected to avoid areas of potential instability on the east and west sides of the highway. ACP patch was placed in 2017 and the guardrail was severely distorted and had to be replaced in 2017.</p> <p>In the winter of 2018, a new 170 m long 1.2 m dia. SWSP culvert was installed through the embankment using the pilot tube micro-tunneling technology. The new pipe was installed immediately to the north of the</p>			

	<p>existing culvert (installed from the outlet location on the west side towards the inlet location on the east side), and the old culvert was grouted and abandoned. As per the information provided by AT, the construction involved excavating a pit at the toe of the west embankment, where an old, localized slump existed. During the May 2018 site inspection, a large cavity was noted at the toe of the west embankment and the flow bypassed the new pipe to wash out the old slump. A CCTV inspection conducted on the new pipe indicated a rupture at 12 m from the outlet location.</p> <p>Additional repairs were conducted between December 2018 and June 2019 consisting of (a) benched excavation of east and west slopes to replace damaged pipe section at culvert outlet location and repair localized slump around culvert inlet location, (b) backfilling excavations using compacted granular fill, (c) grading median ditch to promote surface drainage, (d) placement of Type C blanket, riprap and rock check dams for erosion protection, and (e) topsoil and seeding of all disturbed areas. A 62 m long ACP patch was placed on the NBLs in June 2020. The NBLs guardrail was also replaced in June 2020.</p> <p>In 2024, a fresh ACP patch was noted on the surface of the highway Northbound lanes and the guardrail appeared to have been reset or replaced. However, it was unknown when this work took place between 2020 and 2024.</p>	
Observations:	Description	Worse?
<input checked="" type="checkbox"/> Pavement Distress	NBL: No visible dip noted on the highway after recent ACP patch SBL: N/A	<input type="checkbox"/>
<input type="checkbox"/> Slope Movement	SBL: Not visible. Side slope well vegetated NBL: Minor tension crack 50 mm wide by 50 mm deep. Guardrail is bent and showing signs of distress.	<input type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	NBL: Local erosion along the south facing riprap channel (north of the SWSP culvert inlet) SBL: Water ponding to the west of the SWSP culvert outlet location before it flows into the creek channel, resulting in slight bank erosion to the west of SWSP culvert outlet	<input checked="" type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress		<input type="checkbox"/>
<input checked="" type="checkbox"/> Other	Side slopes on both east and west embankment developed well vegetated slopes; water is still ponding in the median ditch before it flows into the CSP culvert; water is flowing into the 1.2 m diameter SWSP culvert and in the 800 mm CSP median culvert	<input type="checkbox"/>
<p>Instrumentation (1SI and 4 PNs):</p> <p>Slope inclinometer SI18-3, installed on the east highway embankment, was sheared off at 11.6 m below top of casing and had a maximum rate of movement of 218 mm/yr on January 16, 2019. SI18-4, installed in the west highway embankment, showed a rate movement of 8.7 mm/year at a depth of 2.1 m, corresponding to an increase of rate of movement of 7.6 mm since the previous readings.</p> <p>The groundwater levels ranged between 5.1 m to 7.5 m below ground surface. Since the of fall of 2023, the groundwater levels decreased in the pneumatic piezometers by up to 0.3 m.</p>		

Assessment (Refer to attached Figures and Photos):

The interim repairs completed between 2018 and 2019 have performed relatively well to date.

The interim repairs appear to be more effective on the west side of the highway southbound lanes.

The northbound lanes had an ACP patch recently placed. Therefore, cracks and dips noted in the past in response to the slope movement/highway settlement were not visible on the highway surface. A minor tension crack was however noted near the top of the east slope, and the guardrail was a bit bent and showed signs of distress. It appears that the interim repairs were not sufficient to reduce the settlement and/or the movement of the east side slope.

Localized erosion gullies along the south facing riprap channel of the east slope are expected to keep getting larger until suitable erosion control measures are in place.

Recommendations:

It is recommended that the northbound lanes and the east side slope be inspected every two years. The inspection of the southbound lane and the west side slope can be discontinued.

Short Term Measures:

The MCI should periodically monitor the highway lanes and the slopes for signs of movement. If the dip re-appears on the highway NBLs, additional ACP patch should be placed to eliminate the dip and provide a smooth ride to motorists. In addition, the MCI should attempt to backfill the minor crack developed on the top of the east slope to reduce the likelihood of surface water infiltration into the slope.

The median ditch should be slightly graded to prevent ponding of water in the ditch.

Erosion gullies within the south facing channel of the east slope will need to be repaired. This will require salvaging existing riprap, excavating eroded areas, reshaping the channel to have well defined sides and bottom, placement of salvaged riprap and additional riprap (as needed) over non-woven geotextile fabric (to be keyed in at least 300 mm at the top of the channel) along the sides and the bottom of the channel.

Long Term Measures:

If the east slope continues to move in the future, the following provides potential long-term remedial options:

Option 1: Offload the top of the slope and backfill excavated mass using light weight fill (i.e. cellular concrete or EPS blocks). This option may require partial closure of the highway (i.e. alternating lane traffic). The ballpark cost of this option is in the range of \$1,200,000 (excluding engineering), depending on the depth of replacement.

Option 2: Construct a 35 to 40 m long tied-back tangent pile wall along the east side of the highway along with slope flattening above the culvert location. This option does not require closure of the highway. The ballpark cost of this option is in the range of \$1,500,000 to 2,000,000 (excluding engineering).

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.

Yours very truly,
Thurber Engineering Ltd.
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

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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- 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.

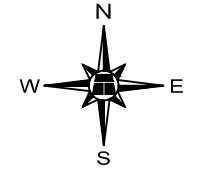
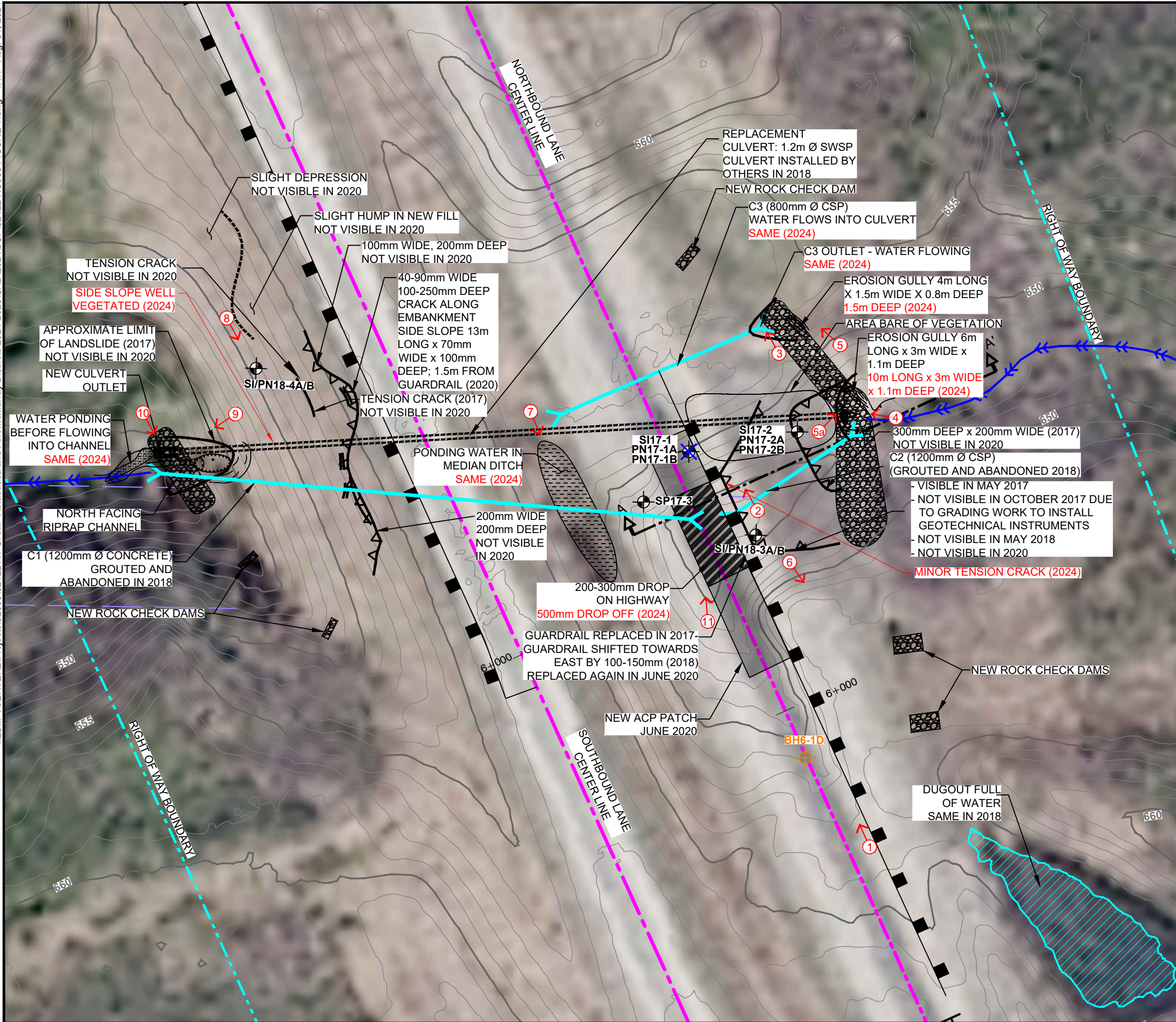
6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

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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\\EDM-VSERVER2\Projects\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\CAD\2024\JGP\32122 NC088 FIGURE 1.dwg - 11N - Aug. 01, 2024

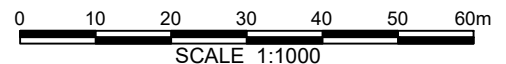


LEGEND

-  APPROXIMATE THURBER TEST HOLE LOCATION
-  SI SLOPE INCLINOMETER
-  PN PNEUMATIC PIEZOMETER
-  SP STANDPIPE PIEZOMETER
-  APPROXIMATE AMEC TEST HOLE LOCATION
-  PAVED OVER INSTRUMENT
-  CULVERT NUMBER AND DIAMETER (AS OF 2017)
-  HIGHWAY CENTER LINE
-  GUARD RAIL
-  OLD CRACK / SCARP
-  EXTENT OF DIP IN MAY 2018
-  CREEK
-  PHOTOGRAPH NUMBER, AND APPROXIMATE DIRECTION AND LOCATION

NOTES:

1. LIDAR FLOWN BEFORE NORTHBOUND LANE WAS CONSTRUCTED. CONTOURS ARE BASED ON 2007 LIDAR DATA.
2. FEATURE LOCATIONS ARE APPROXIMATE.
3. PREVIOUS OBSERVATIONS SHOWN IN BLACK.
4. JUNE 4, 2024 FEATURES SHOWN IN RED.



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

**NC088: HWY 63:06 NBL (km 4.9) PAVEMENT DISTRESS
SKETCH SHOWING SITE FEATURES**

FIGURE 1

DRAWN BY	ML
DESIGNED BY	JGP
APPROVED BY	TSA
SCALE	1:1000
DATE	JUNE 2024
FILE No.	32122





Photo No. 1 – Looking north at ACP patch recently placed along the north bound lanes (NBLs)



Photo No. 2 – Looking north at NBL embankment side slope. Note minor tension crack 50 mm wide and 50 mm deep



Photo No. 3 – CSP culvert C3 outlet showing heavy flow. Lower photo showing the condition inside the CSP culvert



Photo No. 4 – SWSP Culvert Inlet inner condition



Photo No. 5 – Severe erosion within the riprap channel located downslope of the C3 culvert outlet



Photo No. 5a – Riprap channel erosion and debris accumulation near the 1.2 m SWSP culvert inlet



Photo No. 6 – Rock check dams located along NBL southeast ditch



Photo No. 7 – Median ponding water



Photo No. 8 – Looking south at SBL west side slope; note good vegetation growth within repaired area



Photo No. 9 – SWSP outlet; note heavy water flow in 2024



Photo No. 10 – North facing riprap channel along the SBL west side slope



Photo No. 11 – Sharp Drop off 500 mm high on the NBL; significant thickness of ACP has been placed on the highway NBLs to remove the dip developed in response to slope movement