ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION – GRANDE PRAIRIE DISTRICT NORTH
2024 INSPECTION

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
PH083	6.1 km W Cleardale	Golf Course Slides	64:02	29.0
Legal Description		**UTM Co-ordinates (NAD 83)**		
SE1-85-11-W6		11V N 6246600 E 340300		

	Date	PF	CF	Total
Previous Call Out:	July 14, 2021	10 10	3 4	30 [East Slide 1] 40 [West Slide 2]
Current Inspection:	May 8, 2024	4	4	16 [Both Slides]
Road AADT:	560		**Year:**	2023
Inspected By:	Don Proudfoot, Nicole Wilder (Thurber) Robert Senior, Rocky Wang (TEC)			
Report Attachments:	☑ Photographs ☐ Plans ☑ Maintenance Items ☑ Statement of Limitations and Conditions			

Primary Site Issue:	Two Landslides – one on each of the north (PH083-1 or East Slide) and south (PH083-2 or West Slide) highway sideslope embankments, both associated with separate SWSP cross-culverts.	
Dimensions:	The East Slide (downstream ~5H:1V embankment) was 20 m wide by 30 m long; and West Slide (upstream ~4H:1V embankment) was 15 m wide by 30 m long.	
Date of any remediation:	In 2017 at the East Slide, a 900 mm diameter SWSP was bored alongside the previously existing 1.2 m diameter CSP culvert which had separated. In 2022 under Contract #22505, both the east and west slides were remediated by excavation, extending the culverts as required, and backfilling with 6-80 gravel (see Assessment Section for more remediation details).	
Maintenance:	Gravel fill was placed over the slide scarps in 2018 prior to slide remediation for safety reasons.	
Observations:	**Description**	**Worse?**
☑ Pavement Distress	At the East Slide, three longitudinal and one transverse cracks were observed along the EB (south) driving lane.	
☐ Slope Movement		☐
☐ Erosion		☐
☐ Seepage		☐
☐ Bridge/Culvert Distress		☐
☐ Other		☐
Instrumentation: None		

Assessment:

The 900 mm diameter SWSP culvert at the West Slide appeared to drain south highway ditch runoff, as well as a swale draining from the golf course. Both the inlet and the outlet of the 900 SWSP West Slide had been previously dug out to partially expose the pipe and allow flow (the inlet had been covered from previous slide debris, and the outlet appeared to be too low and was below ground).

Information from the MCI indicated there used to be a 1.2 m diameter CSP culvert located under the East Slide area, which had apparently separated and created a sink hole. This culvert was attempted to be lined, but debris infill prevented success. Subsequently, a bored 900 mm SWSP was installed (located on the east side of the slide). There were a few cracks observed on the steeper sloping ground around the inlet to this new SWSP (a longer inlet would have allowed flatter sloping ground to be formed around the inlet).

The scarp heights measured through the previously placed gravel was 1.8 m at the East Slide and was about 1.1 m at the West Slide. The scarp at the West Slide had enlarged into the edge of the pavement with time (extended 0.8 m from the white shoulder line), while the scarp of the East slide appeared to be just outside of the pavement edge.

Both landslides appeared to have been based in high plastic clay. It is postulated that the failures were due to a gradual loss of cohesion due to weathering, combined with high groundwater conditions, which had dropped the resistive forces below what is needed to maintain stability.

The West Slide repairs consisted of excavation of the entire slide mass up to the Hwy C/Line, removing and then extending a 19 m length of the inlet section of the 900 SWSP and surrounding it and lining a portion of the ditch channel with Class 1 riprap, re-constructing the south hwy. embankment slope with 6-80 gravel that included a 2 m wide bottom shear key, before re-constructing the highway surface, and also placing Class 2 riprap around the outlet and forming an extended channel downstream of it.

The East Slide repairs consisted of excavation of the entire slide mass up to the Hwy C/Line, removing and then extending a 4 m length of the outlet section of the 900 SWSP and surrounding it with Class 2 riprap, re-constructing the north hwy. embankment slope with 6-80 gravel that included a 2 m wide bottom shear key, before re-constructing the highway surface, and also extending the 900 SWSP outlet by 3 m and placing Class 1 riprap around it.

Based on the post-construction inspections, the remedial measures appear to have successfully stabilized the landslide issues.

Recommendations

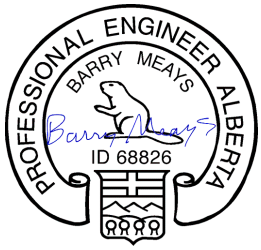
Maintenance:
Monitor any crack enlargements at the East Slide location.

This site could be removed from the geohazard monitoring program.

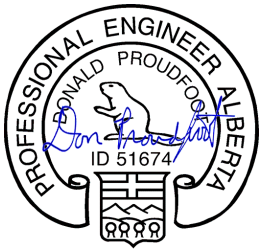
CLOSURE

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



September 30, 2024



September 30, 2024

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
RM SIGNATURE: _____
RM APEGA ID #: 51674
DATE: September 30, 2024
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Barry Meays, P.Eng.
Senior Geotechnical Engineer

THURBER

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.

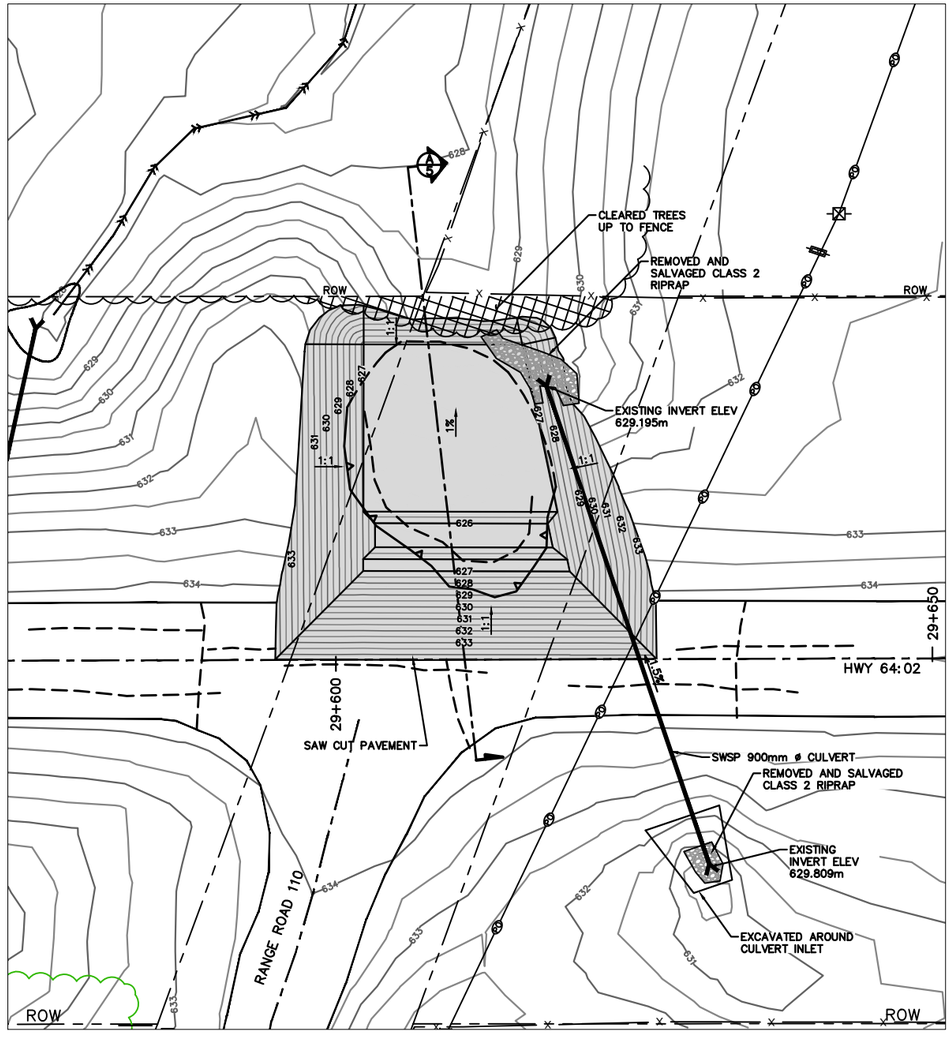
d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted 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

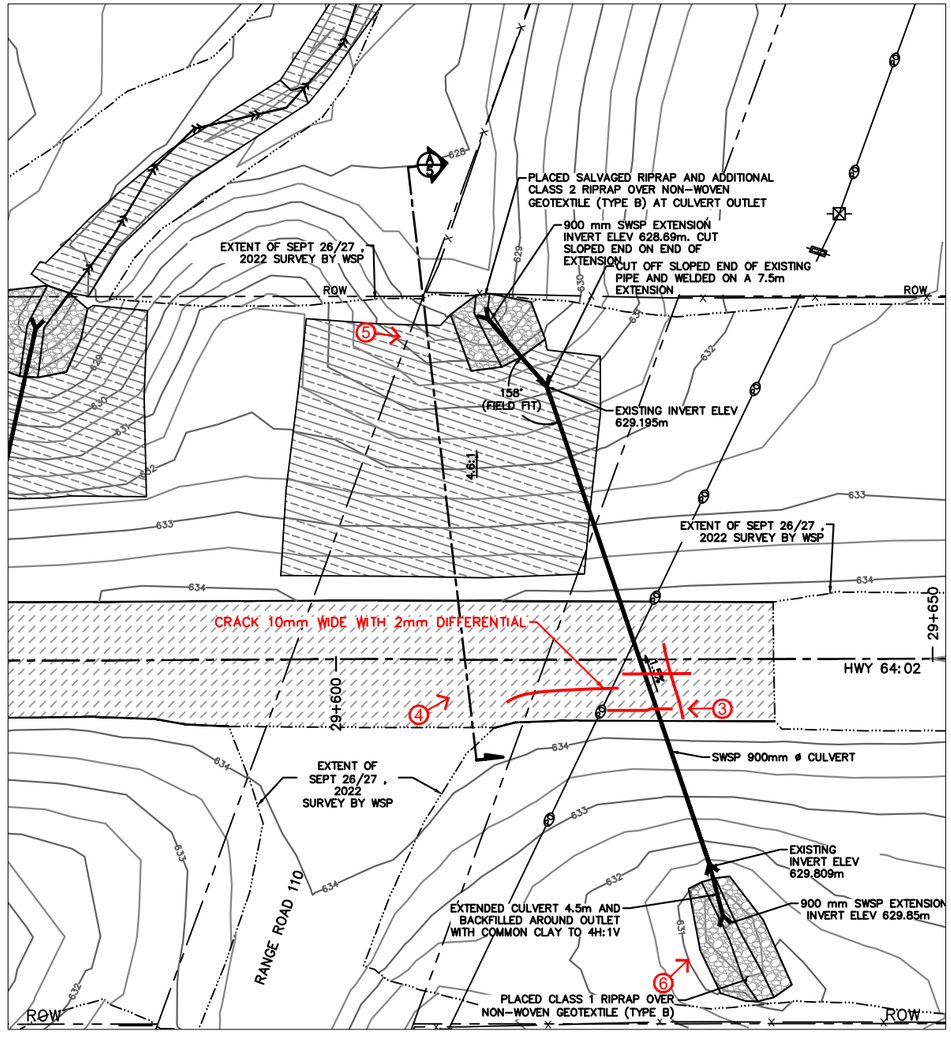
Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, 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.



EAST SLIDE 1 EXCAVATION PLAN
1:250



EAST SLIDE 1 FINAL GRADE PLAN
1:250

LEGEND

- SCARP CRACK
- CRACK
- TREE LINE
- DRAINAGE FLOW DIRECTION
- CULVERT
- OVERHEAD POWER LINE
- POWER POLE
- GUY WIRE SUPPORT
- FENCE LINE
- ECB (TYPE B) EXTENTS
- ACP OVERLAY EXTENTS
- DIRECTION AND NUMBER OF PHOTO

NOTES:

1. FEATURE LOCATIONS ARE APPROXIMATE
2. PREVIOUS OBSERVATIONS SHOWN IN BLACK
3. MAY 8, 2024 OBSERVATIONS SHOWN IN RED

0 5 10 15 20 25m

Alberta

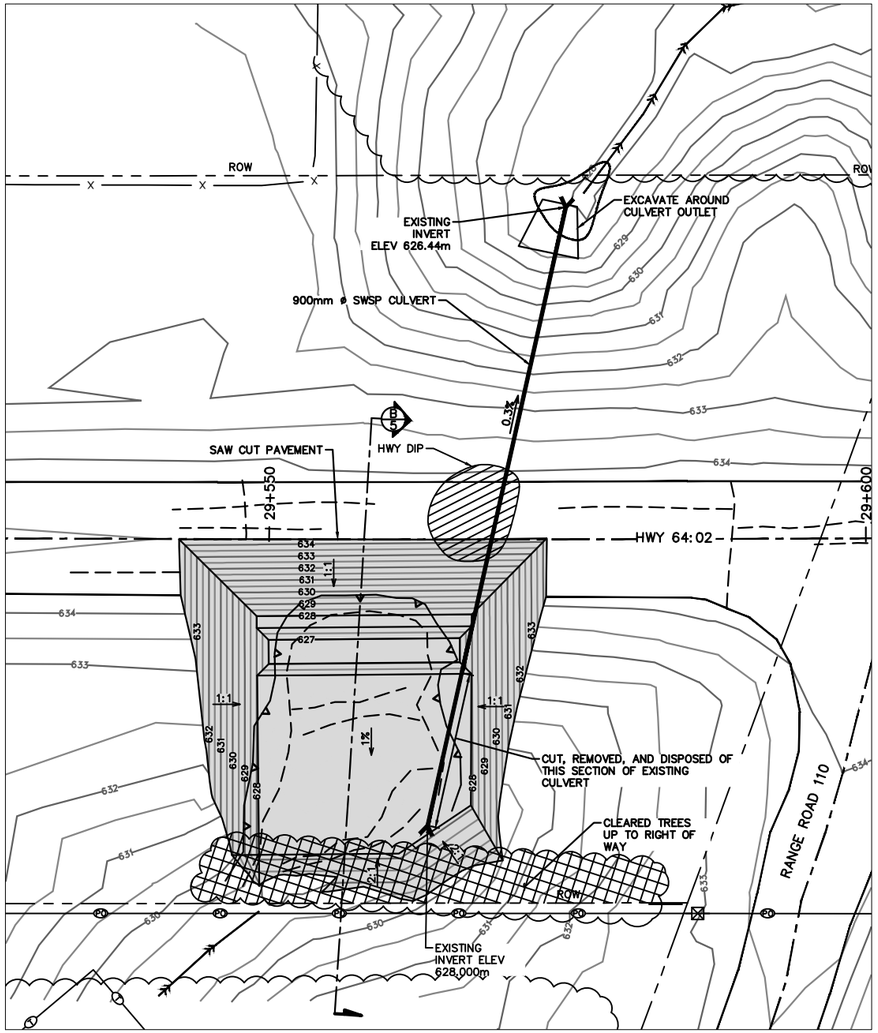
PEACE REGION (GRANDE PRAIRIE DISTRICT - NORTH)

HWY 64:02 km 29.500 TO 29.650
PH083 INSPECTION PLAN

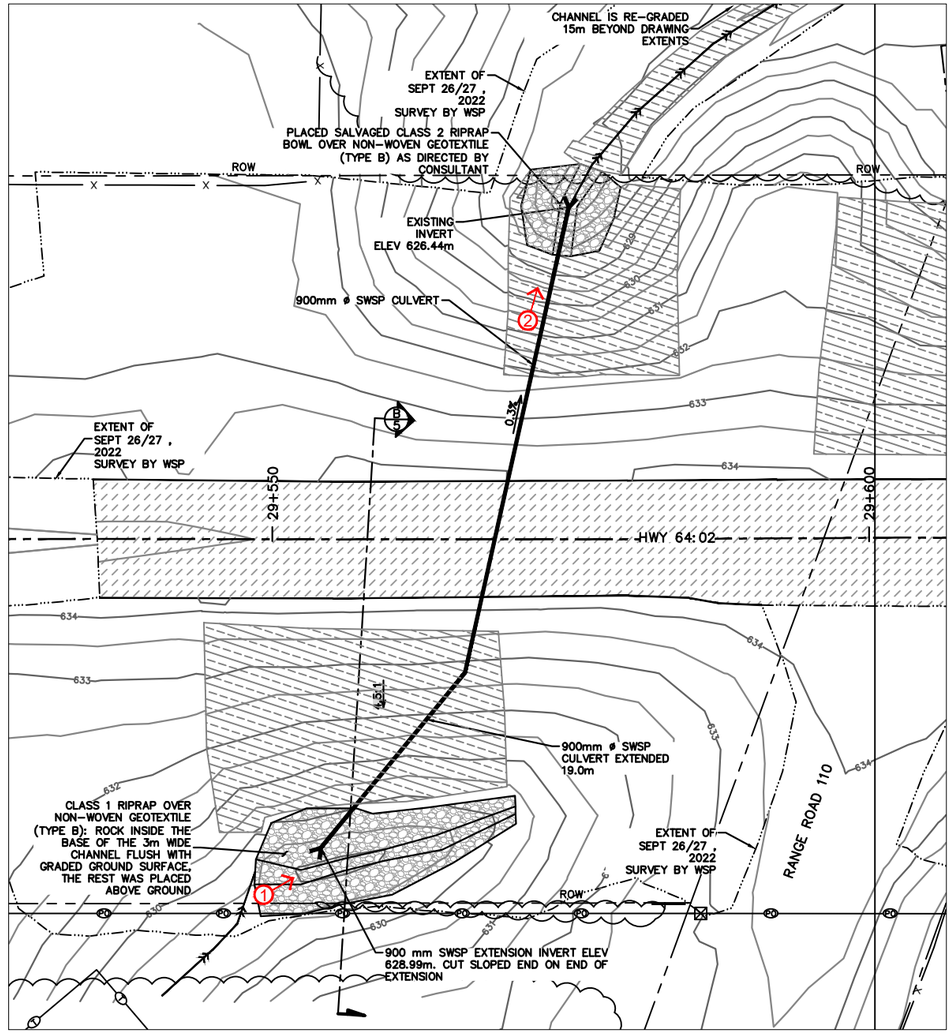
DWG No. 32123-PH083-1

DRAWN BY	ML
DESIGNED BY	BDM
APPROVED BY	DWP
SCALE	1:250
DATE	JULY 2024
FILE No.	32123

THURBER ENGINEERING LTD.



WEST SLIDE 2 EXCAVATION PLAN
1:250



WEST SLIDE 2 FINAL GRADE PLAN
1:250

LEGEND

- SCARP CRACK
- CRACK
- TREE LINE
- DRAINAGE FLOW DIRECTION
- CULVERT
- OVERHEAD POWER LINE
- POWER POLE
- GUY WIRE SUPPORT
- FENCE LINE
- TELUS CABLE (RELOCATED DECEMBER 30, 2021)
- ECB (TYPE B) EXTENTS
- ACP OVERLAY EXTENTS
- DIRECTION AND NUMBER OF PHOTO

NOTES:

1. FEATURE LOCATIONS ARE APPROXIMATE
2. PREVIOUS OBSERVATIONS SHOWN IN BLACK
3. MAY 8, 2024 OBSERVATIONS SHOWN IN RED

0 5 10 15 20 25m

Alberta

PEACE REGION (GRANDE PRAIRIE DISTRICT - NORTH)

HWY 64:02 km 29.500 TO 29.650
PH083 INSPECTION PLAN

DWG No. 32123-PH083-2

DRAWN BY	ML
DESIGNED BY	BDM
APPROVED BY	DWP
SCALE	1:250
DATE	JULY 2024
FILE No.	32123

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PHOTOS

Photo 1 – Looking northeast across the culvert inlet area and channel riprap of the West Slide.

Photo 2 – Looking northeast at the highway embankment, culvert outlet and extended channel over/beyond the West Slide.

Photo 3 – Looking west along the highway from the 900 mm SWSP culvert crossing the highway of the East Slide. A few cracks have formed through the new pavement surface placed in 2022, west of and overtop of this culvert.

Photo 4 – Looking northeast along the highway at the cracks west of and over the culvert adjacent to the East Slide.

Photo 5 – Looking east at the 900 mm dia. SWSP outlet and north downstream embankment of the East Slide.

Photo 6 – Looking southeast across the 900 mm SWSP inlet of the East Slide.