

**ALBERTA TRANSPORTATION AND
ECONOMIC CORRIDORS GRMP
NORTH CENTRAL (ATHABASCA AND FORT
McMURRAY DISTRICTS)
2025 SITE INSPECTION**



Site Number	Location	Name	Hwy	km
NC093	22 Km north of Calling Lake	Rock Island Bridge (79692) Landslide	813:06	4.70
Legal Description		UTM Co-ordinates (NAD 83)		
NE 5-74-22-W4		12U	6139937.91 E	351682.46

	Date	PF	CF	Total
Previous Inspection:	June 3, 2024	10	6	60
Current Inspection	May 13, 2025	10	6	60
Road WAADT:	770		Year:	2024
Inspected By:	José Pineda, Bruce Nestor (Thurber) Arthur Kavulok, Rishi Adhikari (TEC)			
Report Attachments:	☒ Photographs ☒ Plans ☐ Maintenance Items			

Primary Site Issue	Landslide within the NW approach fill of Bridge File (BF) 79692, impacting NW wing wall, highway and abutment supports
Dimensions:	The slide is approximately 25 m long (parallel to bridge alignment) and 40 m wide (perpendicular to bridge alignment)
Site History / Available Information:	The existing bridge structure was first in service since 1989 to replace an older bridge structure that was located about 3 m west of the existing NW wing wall. The old bridge was a three-span structure also supported on steel H piles, which were cut off and left in place. The new structure consists of a 38 m single span concrete girder bridge with the abutments and the wing walls supported on driven steel H piles. The abutments are supported on 15 m deep piles and the wing walls are supported on 10 m deep piles. The approach fill head slope is inclined at 2H:1V. The side slopes of the approach fill are approximately 3H:1V on both sides of the river. Approximately 3 m and 6 m of fill was placed on the north and south of the river alignment, respectively to accommodate the construction of the new bridge. Records indicate that an instability/slump occurred within the north head slope as early as January 2016 when the headslope fill dropped to 0.5 m below the north abutment seat. We understand that repairs have not been completed since the drop was first noticed in 2016. A geotechnical investigation was conducted in 1987 for the design of the existing bridge. Available records show that the soil at the landslide area (Test hole # 3) prior to the construction of approximately 3 m of fill embankment consist of 9 m of saturated fine to medium grained loose to compact silty sand. A 2 m thick layer of medium to high plastic clay was interbedded within the sand between elevations 634 and 636 m. The sand clay in turn is underlaid by very still to hard clay till to the termination depth of the test hole. Similar soil conditions were encountered in Test Hole # 1 and # 2 drilled on the south side of the river with the exception of the high plastic clay layer noted within the sand formation.

	A geotechnical investigation, consisting of drilling two test holes along with the installation of a slope inclinometer and vibrating wire piezometers, was completed by Thurber in 2020. The test holes mainly indicated 2 to 4 m of clay fill over high plastic clay over sand and clay till. A layer of peat was noted below the clay fill in the test hole drilled neat the base of the bridge headslope.	
Maintenance/ Repairs:	As per Emcon's work order provided to Thurber by TEC, we understand that maintenance contractor conducted the following repairs in 2020: 1) Filled voids below the slab above the NW wingwall with expanding foam or grout as approved by TEC, 2) Removed loose/desiccated materials from the north headslope surface and filled any open cracks in this are, 3) Slightly graded the north head slope and backfilled existing dips and gaps with gravel to provide at least 600 mm of cover above the underside of the abutment seat/NW wing wall, 4) Placed Class 1 riprap on the north headslope under the bridge, and 5) Filled potholes/voids on the highway/bridge deck with instant patch. Crack sealing and ACP patches were carried out in 2021, 2022 and 2024.	
Observations:	Description	Worse?
☒ Pavement Distress	Up to 30 mm dip on the highway surface near the east side of the northbound lane approach slab. Cracks and potholes within the bridge deck have been repaired by the recent ACP patching placed in 2024. Alligator cracking 10-30 mm wide visible within northbound lane north of ACP patch over approach slab. Reflective cracks 5-40 mm wide visible through the 2024 ACP patch on either side of the north bridge expansion finger joint.	☐
☒ Slope Movement	The landslide exposed the upper 1.8 m of four of the old bridge piles; riprap placed on the bridge headslope dropped and shifted laterally towards the river; 2.7 m long crack along the face of the abutment seat (crack is about 2.7 m long (parallel to the abutment seat, 200 mm wide, and up to 350 mm deep below the abutment seat).	☒
☒ Erosion	The erosion gully (up to 1 m wide x 150 to 500 mm deep x 8 m long) developed within the granular fill regraded zone west of the NW wing wall was filled with ACP in 2024; active erosion slumps above the river channel within the landslide toe roll.	☐
☐ Seepage		☐
☐ Bridge/Culvert Distress		☐
☒ Other	Well vegetated drilling pad bench settlement crack was noted during the 2025 inspection.	☐
Instrumentation Readings (2 VW Piezometers): The following provides a summary of the readings collected in the spring of 2025: SI20-1 was noted to have sheared off or blocked at a depth of 0.9 m below ground surface during the fall of 2023 readings. The groundwater levels in the operational vibrating wire piezometers are about 2.6-2.8 m below ground surface with an increase in groundwater level of between 0.1 m to 0.2 m since the fall of 2024 readings.		

Assessment (Refer to attached Figures and Photos):

The site condition did not change significantly since the 2024 site inspection, with the exception of the ACP patch completed on the bridge deck and approach slabs. The drop within the landslide measured by the old bridge piles has also increased by 0.2 m to 1.8 m overall.

The presence of native high plastic clay and peat below the NW approach fill, ongoing toe erosion by the river appear to be the main triggering factors for the observed landslide movement. Elevated ground water levels within the approach fill may have also been another contributing factor to the landslide movement. It is suspected that high groundwater levels in the river may have been higher than the design elevation.

The settlement of the approach slab created a low spot at the north edge of the NW wing wall (on highway side) and hence surface drainage from the highway is currently directed towards the NW approach fill side slope rather than to the south side of the bridge as per the original design. The erosion gully developed within the recently placed gravel fill is a direct consequence of concentrated surface water runoff along the face of the NW wing wall. The erosion gully will likely continue to grow bigger in size, and this may result in future exposure of the underside of the wing wall.

The temporary repairs completed by TEC have performed relatively well to date. However, the landslide is still active as evidenced from the existing vertical and lateral movements of the riprap within the bridge headslope, and the existing drop along the approach slab. The gap formed along and below the abutment seat will continue to get bigger unless repaired and may result in the exposure of a few of the abutment supports.

The ongoing landslide movement will eventually expose the underside of the NW wing and abutment seat and/or piles and this may impact the integrity/performance of the highway and the bridge.

Ongoing toe erosion by the river resulted in the development of two distinct slumps immediately above the stream level. These slumps may get bigger in size and result in a significant loss of toe support at the base of the slope and hence an accelerated movement of the landslide.

If an accelerated landslide movement occurs, a major detour will likely be required.

Recommendations:

This site should be visited again in the spring of 2026.

Short-Term Measures

The local MCI should monitor the site periodically to assess the ongoing effectiveness of the temporary repair measures.

In the short term, consideration should be given to the following:

- Place additional gravel or low strength fillcrete to fill the gap formed along the face of the abutment seat.
- Consider placing sandbags or extending the NW concrete curb further north to ensure that runoff is diverted away from the landslide area. Consideration may also be given to installing a half CSP pipe along the highway NW side slope to direct surface water away from the landslide area and the northern edge of the wingwall.
- Add granular fill or riprap to backfill the erosion gully developed near the NW wing wall.
- Place riprap within eroded areas at the toe of the slope.

Due to the implications of a major failure in response to ongoing landslide movement, it is recommended to repair this site as soon as funds become available.

Long-Term Repair Measures

Various long-term repair options were presented in the preliminary engineering report prepared by Thurber in February 2023 to deal with the landslide movement. The repair options included the installation of soil nails or sheet pile walls.

The ballpark cost to complete the repairs was estimated to range between \$1.5 and \$2.5 million (including engineering and contingencies) for the installation of soil nails and sheet pile walls, respectively.

Closure:

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

Yours very truly,
Thurber Engineering Ltd.
José Pineda, M.Eng., P.Eng.
Associate | Senior Geotechnical Engineer

Bruce Nestor, M.Eng., P.Eng.
Geotechnical Engineer

STATEMENT FOR USE AND INTERPRETATION OF REPORT

1. STANDARD OF CARE

This Report has been prepared in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances at the same time and in the same or similar locality and in compliance with all applicable laws.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment, including this Statement For Use and Interpretation of Report, 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, AS DESCRIBED ABOVE. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE OF THE 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 for the development, design objectives, and/or purposes described to Thurber by the Client. **NO OTHER PARTY MAY USE OR RELY ON THE REPORT OR ANY PORTION THEREOF FOR OTHER THAN THE CLIENT'S BENEFIT IN CONNECTION WITH THE PURPOSES DESCRIBED IN THE REPORT.** Any use which a third party makes of the Report is the sole responsibility of such third party and is always subject to this Statement for Use and Interpretation of Report. Thurber accepts no liability or responsibility for damages suffered by any third party resulting from use of the Report for purposes outside the reasonable contemplation of Thurber at the time it was prepared or in any manner unintended by Thurber.

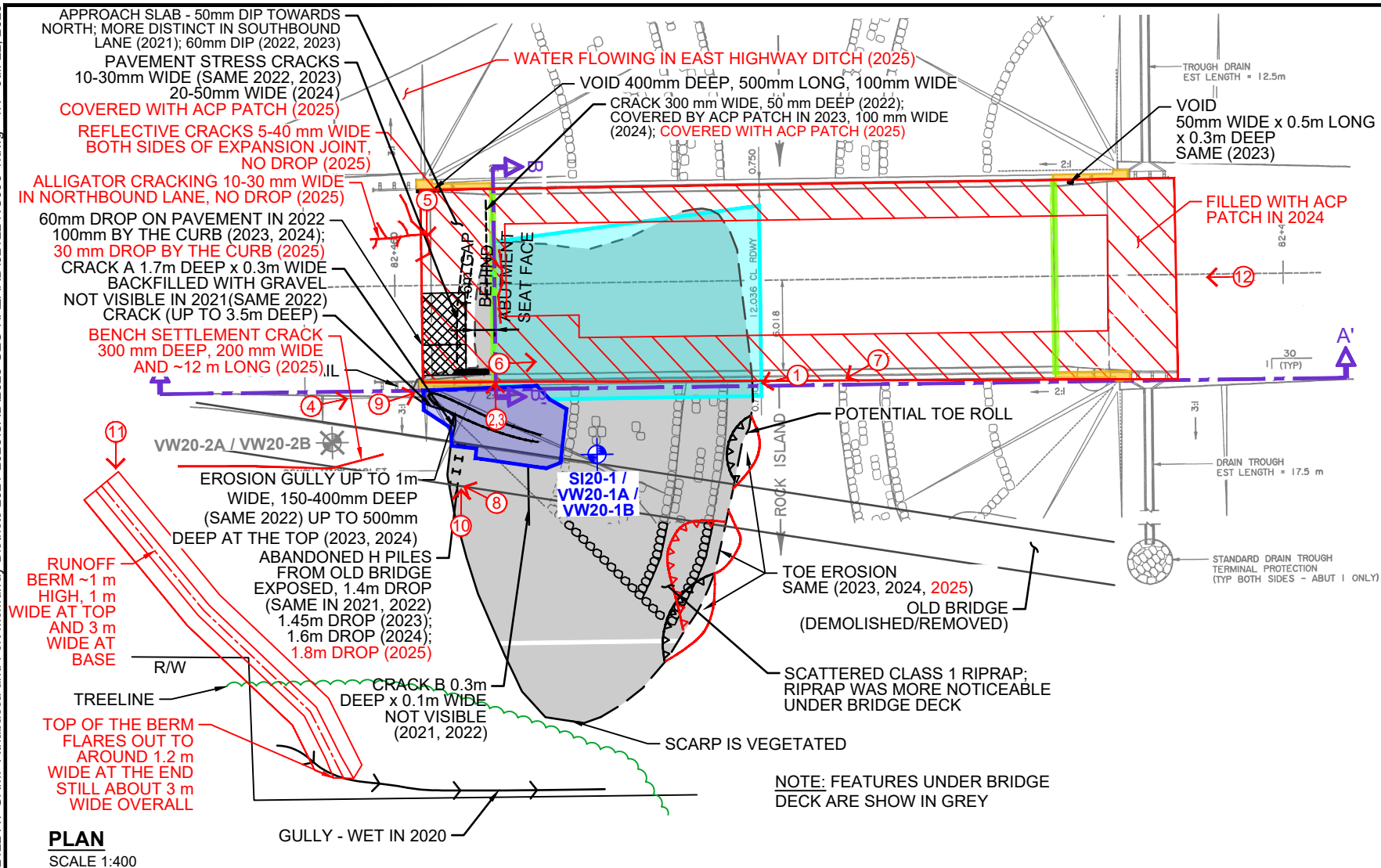
5. INTERPRETATION OF THE REPORT

- 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 is inherently judgement-based. 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 parties making use of such documents or records with or without our express written consent need to 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 parties. Some conditions are subject to change over time and those making use of the Report need to be aware of this possibility and understand that the Report only presents the interpreted conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client must 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 based on conditions in evidence at the time of site inspections and based on 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 resulting from misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other parties 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 is recommended to 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 need to 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 to confirm and document that the site conditions do not materially differ from those 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.

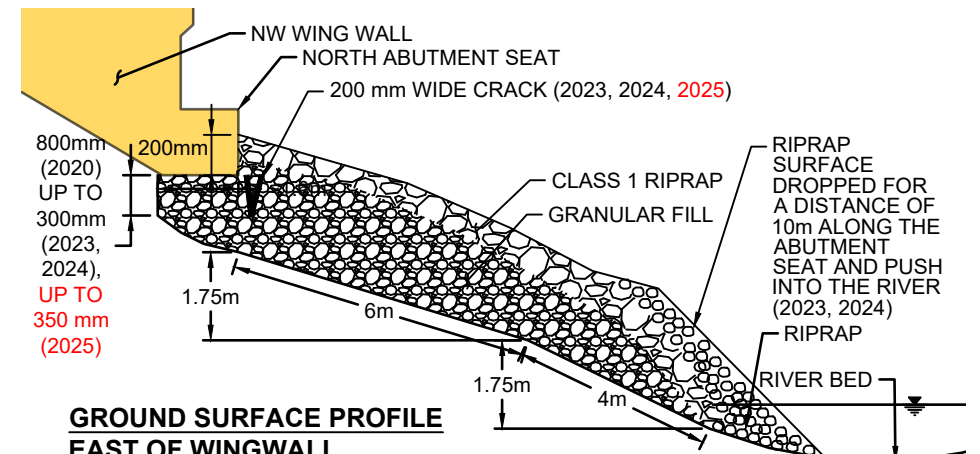
6. INDEPENDENT JUDGEMENTS OF CLIENT

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 other parties 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, unless such decisions expressly form part of the stated purpose of the Report as described in Paragraph 3.

G:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\CAD\2025 GEO HAZARD\32122 NC093-1.dwg - 1N - Jul. 22, 2025



PLAN
SCALE 1:400



GROUND SURFACE PROFILE
EAST OF WINGWALL
NTS

LEGEND

- APPROXIMATE INSTRUMENT LOCATION
- DAMAGED INSTRUMENT LOCATION
- HEADSCARP CRACK
- WING WALL
- GULLY/DITCH
- EXISTING RIPRAP
- BRIDGE EXPANSION JOINT
- POTENTIAL EXTENT OF LANDSLIDE
- SI SLOPE INCLINOMETER
- VW VIBRATING WIRE PIEZOMETER
- DEPTH (m) OF VIBRATING WIRE PIEZOMETER OR SLOPE INCLINOMETER
- EXTENT OF CLASS 1 RIPRAP AND GRANULAR FILL UNDER THE BRIDGE PLACED IN 2020
- PLACED AGAINST THE NW WING WALL IN 2020
- PHOTOGRAPH NUMBER, AND APPROXIMATE DIRECTION AND LOCATION
- WATER LEVEL
- PAVEMENT DISTRESS

NOTES:

- MAY 13, 2025 OBSERVATIONS ARE SHOWN IN RED.
- IN 2020, ALBERTA TRANSPORTATION PLACED GRAVEL AGAINST THE NW WING WALL AND UNDER THE BRIDGE AGAINST THE NORTH BRIDGE ABUTMENT.

0 5 10 15 20 25m
SCALE APPROX. 1:400

Alberta

NORTH CENTRAL REGION
(ATHABASCA AND FORT McMURRAY DISTRICTS)
2025 GEOHAZARD ASSESSMENT

NC093: HWY 813:06 ROCK ISLAND BRIDGE
HEADSLOPE (km 4.7)

DWG NO. 32122-NC093-1

DRAWN BY	ML
DESIGNED BY	JGP / BWN
APPROVED BY	TSA
SCALE	AS SHOWN
DATE	JULY 2025
FILE No.	32122

THURBER

SECTION A-A'
SCALE 1:400

GAP BETWEEN BOTTOM OF WINGWALL AND GROUND SURFACE:
A: 300mm
B: 200mm
C: 800mm



Photo 1. Landslide area viewed from bridge (looking north).



Photo 2. North Abutment (looking east) showing riprap placed by TEC in 2021; The riprap top surface appears to have dropped for a distance of about 10 m along the face of the abutment seat and the riprap along this zone shifted laterally towards the river.



Photo 3. A closer look at the NW corner of the abutment seat. There is a 2.9 m long gap formed along the face of the abutment seat.



Photo 4. Bridge deck and highway surface condition (looking north at the south expansion joint). The previously distressed pavement area has been patched since the 2024 inspection.



Photo 5. Looking at the north expansion joint. The area of distressed pavement area around the expansion joint has been patched since the 2024 inspection.



Photo 6. Patched area of previously failed pavement on bridge deck (looking south)



Photo 7. Toe of NW head slope and river channel.



Photo 8. Exposed old bridge H piles within the active landslide mass. The landslide has a 1.8 m drop at this location.



Photo 9. Void that had formed between the highway side slope and the top edge of the NE wingwall has been filled with ACP since the 2024 inspection.



Photo 10. Northwest wingwall: soil staining on the wall face shows original design elevation of fill; approximately 1 m of gravel was placed in 2020 to buttress/cover the gap formed below the wing wall; vegetation has grown within the backfilled area since 2020; erosion up to 500 mm at the top developed within new fill placed against the wing wall (area with erosion had been filled with ACP).



Photo 11. Ditch Runoff Berm – Well vegetated, no flow noted in 2025.



Photo 12. Looking north at the overall bridge deck surface condition. Note new ACP patch placed in 2024.