ALBERTA TRANSPORTATION
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION (PEACE RIVER DISTRICT)
2023 INSPECTION

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
PH007	Daishowa East Hill	Gabion Channel & Erosion Control Section	986:01	12.55
Legal Description		**UTM Co-ordinates**		
NE7-85-20 W5M		11V E 490505	N 6246235	

	Date	PF	CF	Total
Previous Inspection:	11-Jun-2020	3	2	6
Current Inspection:	18-May-2023	5	2	10
Road WAADT:	890		**Year:**	2022
Inspected By:	Tyler Clay, TEL Max Shannon, TRANS		Don Proudfoot, TEL Rocky Wang, TRANS Pramaya Kannel, TRANS	
Report Attachments:	☑ Photographs ☑ Plans		☑ Maintenance Items	

Primary Site Issue:	This area is located at a historic landslide site where erosion on both sides of the highway had been of ongoing concern. Primarily with respect to erosion along the creek on the north side of the road which was mitigated in 2003 with an armored gabion basket channel and drop structures. Erosion in the south ditch and at the culvert outlet (32+050) was mitigated in late 2007. Local mitigation repairs were completed in 2018/19 that included local erosion repairs of the riprap lined channel (i.e., North Channel), torn gabion baskets, side slope erosion rills, geomembrane damaged (Coletanche membrane), and removal of cable concrete tripping hazards.	
Dimensions:	South ditch: 800 m long North channel: 580 m long Slide at 32+500: Shallow	
Maintenance:		
Observations:	**Description**	**Worsened?**
☑ Pavement Distress	Bump in road (32+050) may be a result of frost heave or swelling conditions in the subgrade (no change from 2020).	☐
☐ Slope Movement		☐

☑ Erosion	Erosion / washout around culvert intake at the west end of the erosion control test ditch (32+050) has slightly filled in since 2020 (Photo 7-08). South Ditch Test Section Summary: TRM Section (32+100) – previous channelized erosion damage on the north side of the ditch has vegetated over the rolled erosion control product (Photo 7-9). Channel Sock Section (32+150) - good vegetation growth within previous channelized erosion areas at the top of the section near the boundary of the geomembrane section (Photo 7-10). Coletanche Geomembrane Section (32+250) – Membrane was in a good condition with no new damage observed. Repaired area was holding well (Photo 7-11). Geoweb Section (32+400) - Section had vegetation growth and some cells were only partially filled with sediment and broken. Some minor rill damage was noted on the north side of the ditch (Photo 7-12). Gabion Mattress Section (32+500) - Section had vegetation growth and was performing well (Photo 7-13). Minor rill damage was noted on the north side of the ditch. Paving Stones Section (32+600) - Blocks have deteriorated and broken up in numerous locations and have been undermined by erosion exposing geotextile fabric beneath (Photo 7-14). Deterioration worse relative to other test sections but no significant change from 2020. Cabled Concrete Section (32+700) – Minor erosion/rill damage was noted on the north side of the ditch (Photo 7-15). Section performing well with no major change from the 2020 condition. Pillow Concrete Section (32+750) - Minor concrete deterioration was noted in select areas, but erosion mitigation function was not impacted (Photo 7-16). Rebar pins protruding in some areas. North Channel Summary:	☐

	The maintenance contractor excavated a drain slot through the beaver dam near the inlet to drain water into the channel near km 32+825. (Photo 7-02) The gabion inlet structure had cat tail growth within the centre, but flow capacity appeared to be unaffected, and condition was generally comparable to the previous inspection (Photo 7-06). Channel downstream of the inlet had significant alder and willow growth (Photo 7-03). Previous areas of bank erosion and breach of armour have been repaired with additional riprap placement. The two gabion drop structures (32+490 and 32+540) were in good condition except for some bagging and broken wire within the centre of the channel (Photo 7-04). Previous channel erosion and breach of armour (including geotextile exposure) compromising the foundation of the protective gabion wall (32+310) has been repaired with additional riprap placement and was in good condition (Photo 7-01). The upper segment of the gabion channel bend and drop structure near 31+800 had some gabions within the middle of the channel showing some bagging and wire damage. Overall structure was intact and functioning as intended. (Photo 7-07).	
☐ Seepage		☐
☐ Bridge/Culvert Distress		☐
☑ Other	Wetland area near km 31+950 was flooded due to 2 m high beaver dam. (Photo 7-05)	☐
Instrumentation: No instrumentation installed in this area.		

Assessment:

Major erosion and gullying appear to have been mitigated along both the north and south sides of the highway. The localized damage in the north channel (bank slumping and breach of the rip rap) has been repaired with additional riprap placement as part of the PH42 Daishowa East Hill repair work.

The majority of the exposed cables in the concrete section have been cut; however, there is still some protruding rebar pins in the pillow concrete section that should be cut flush or preferably driven back in the ground and capped with concrete.

The north channel is functioning well, and the recent rip rap additions are effective. Some maintenance of gabion baskets within the centre of the channels at the drop structures is required to prevent further damage and rock loss.

The large erosion runnels noted on the north highway fill slope that were repaired by filling and covering with TRM appear to be holding up well. TRM installation should be considered for the south side of the highway where erosion rills are developing between the roadway and erosion test sections.

The previously noted shallow slide or settlement noted at 32+500 is not considered a threat to the highway at this time and has not visibly changed over several years but should continue to be monitored.

The willow and alder growth noted within the upper portion of the North Channel may reduce the hydraulic capacity of the inlet, and this should be checked by a hydraulic engineer.

The bump in the road at 32+050 should be checked on a regular basis by maintenance personnel to check for pavement damage and traffic rideability safety and repaired if the condition worsens.

Recommendations:	**Cost Estimate**
The erosion around the culvert inlet (32+050) should be backfilled and riprap reconfigured.	Maintenance
Continue to monitor the site and undertake annual inspections.	-
Gabion baskets in the north channel within the drop structure should be rewired and shaped where they have come apart.	-
Consideration should be given to installing TRM along select sections where erosion rills are developing on the south side of the highway ditch between the road shoulder and where the erosion control test section material starts.	$ 7,500
If it is determined that the hydraulic capacity of the north channel inlet is being adversely affected by willow growth, they should be cut flush to the channel bottom with the roots left in place.	$ 5,000
Consideration should be given to a permanent curb constructed along the guard rail with all flow directed to controlled discharge points, such as a split culvert, that carries the flow to the lined channel at the toe of the slope. “Geocell” would be one possible option to construct the curb. The curb would have to be on the north side of the guard rail to avoid conflict with snow clearing equipment. If such an option were to be implemented, about 150 m of curb would be required. Two controlled discharges, likely 300 m length would be required. Damage noted at 32+850 not significant yet but may need similar type of repair if left unchecked.	$ 60,000
The paving stones section of the south ditch lining will continue to deteriorate and will eventually need to be repaired. Gabion mattress would be a good replacement strategy.	$ 30,000

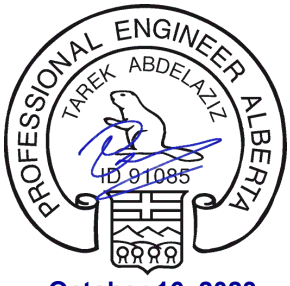
Closure:

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.

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

ID: 120965
October 16, 2023

Tyler Clay, P.Eng.
Geological Engineer



October 16, 2023

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.

RM SIGNATURE: _____

RM APEGA ID #: 91085

DATE: October 16, 2023

PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

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

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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.

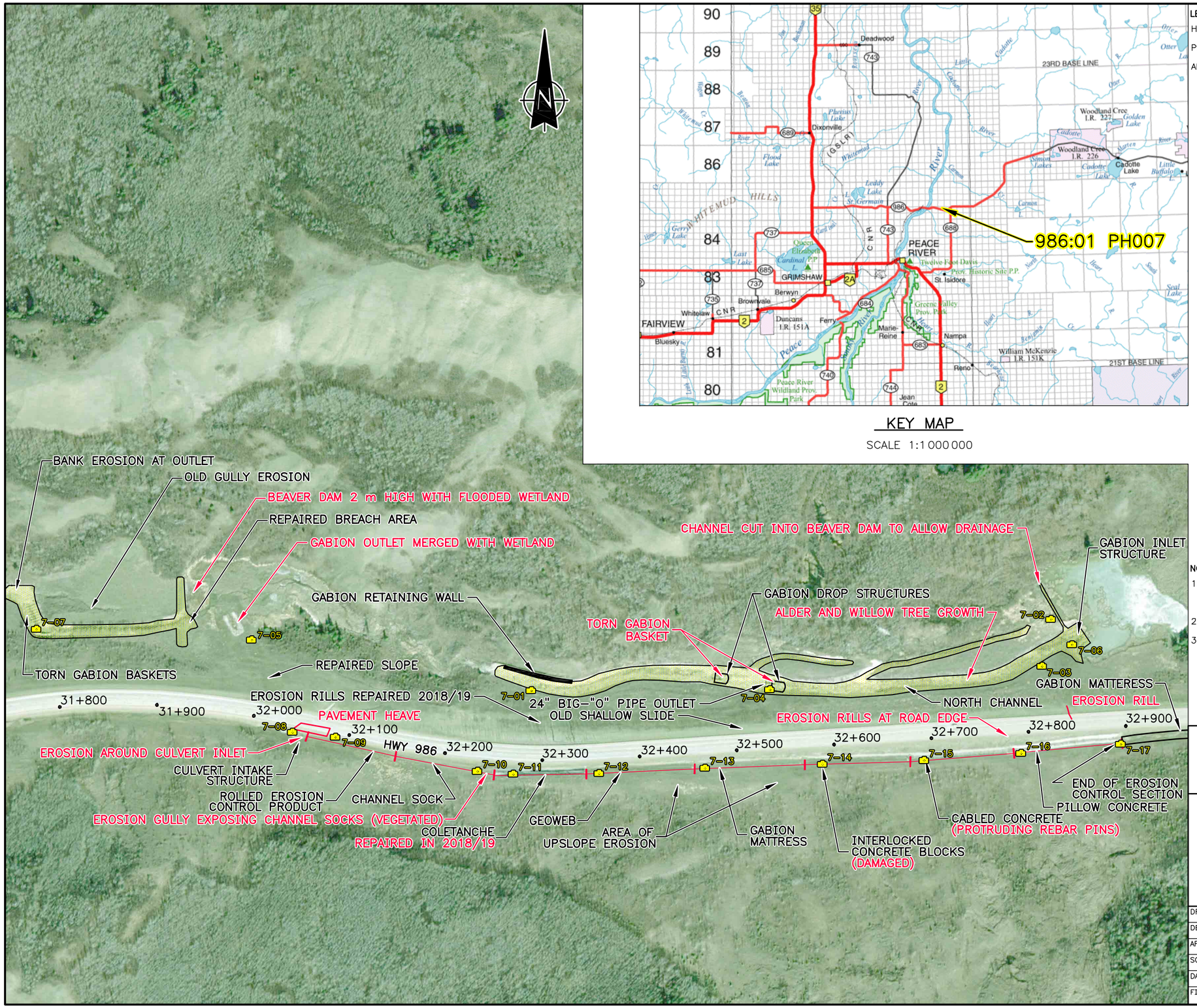
d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted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

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.



KEY MAP

SCALE 1:1 000 000

LEGEND:

HORIZONTAL CHAINAGE 32+100

PHOTOGRAPH LOCATION 7-01

ARMOURED CHANNEL

NOTES:

1 DRAWING MUST BE USED IN CONJUNCTION WITH THE ATTACHED REPORT REFERENCE 32121 DATED MAY 2023 AND IS SUBJECT TO THE STATEMENT OF LIMITATIONS AND CONDITIONS INCLUDED IN THE REPORT.

2 AIR PHOTO BASE FROM ESRI (DIGITAL GLOBE, 2016).

3 SLIDE FEATURES, PHOTOGRAPHS AND CHAINAGE ARE SHOWN APPROXIMATE ONLY.

0 50 100 200 300 m

Alberta Transportation

PEACE REGION (PEACE RIVER DISTRICT)

DAISHOWA
HWY 986:01 (PH007)
LOCATION PLAN

FIGURE PH007-1

DRAWN BY	ICB
DESIGNED BY	TTC
APPROVED BY	TSA
SCALE	1:4 000
DATE	SEPTEMBER 11, 2023
FILE No.	32121-A5B

THURBER ENGINEERING LTD.

	**Photo 7-01.** Gabion retaining wall and armoured channel observed in good condition (32+310).
	**Photo 7-02.** Maintenance contractor excavated a drain slot through beaver dam to drain water into the channel near km 32+825.

Photo 7-03.
Alder and willow tree growth within the riprap downstream of the armoured channel inlet near km 32+800.

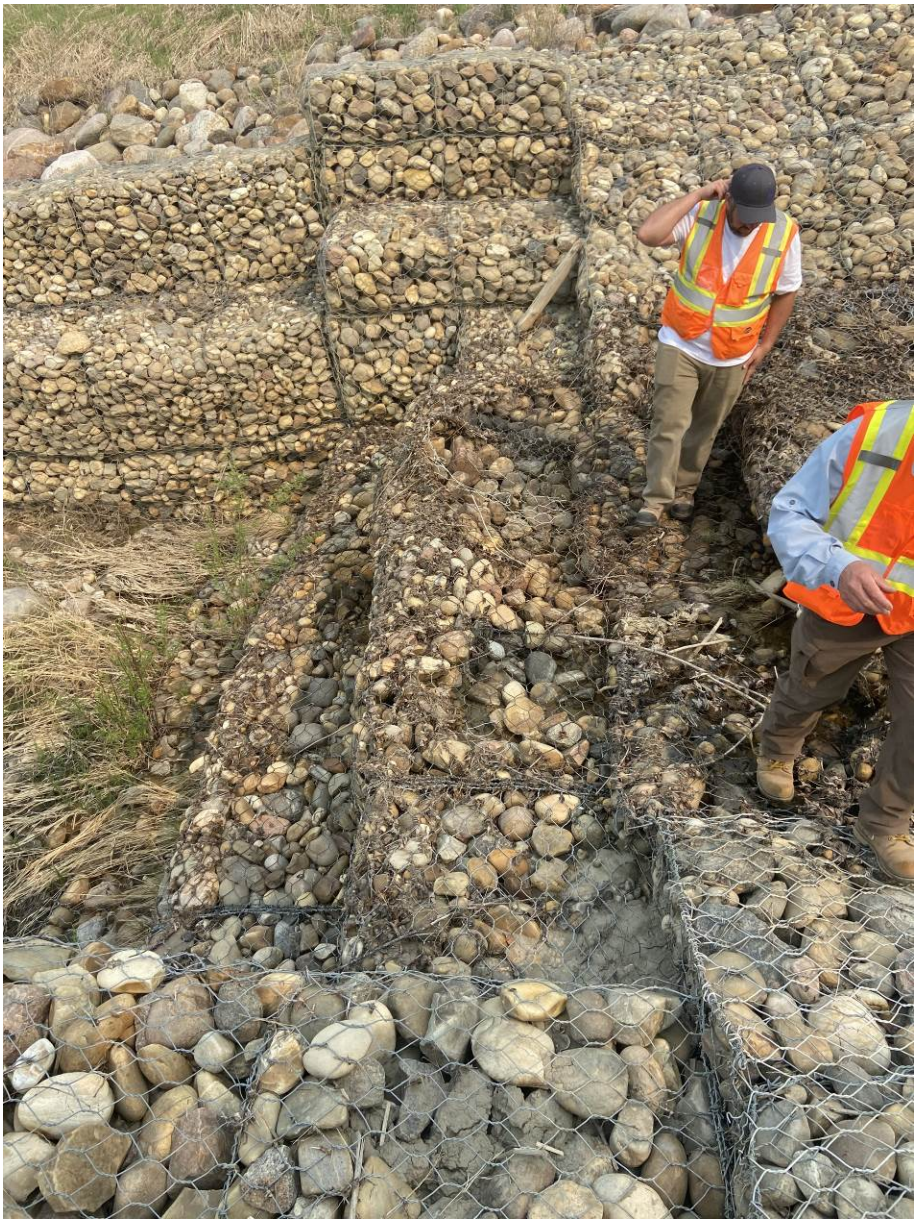


Photo 7-04.
Close-up view of the internal upper gabion drop structure (32+540). Baskets in the channel centre have some bagging and broken wire. Maintenance is recommended to prevent further damage / loss of gabion rock. Overall, the structure is intact and functioning as intended.

	**Photo 7-05.** Wetland area near km 31+950 with higher water level due to beaver dam approximately 2 m high.
	**Photo 7-06.** North channel gabion inlet structure. Cat tails growing within centre of channel, but flow capacity is still ok. Condition was generally comparable to previous inspections (32+855).

Photo 7-07.
View of the upper segment of the gabion channel bend and drop structure (31+800). Gabions within the middle of the channel showing some bagging and wire damage that will require eventual maintenance to prevent further basket damage. Overall structure was intact and functioning as intended.

Photo 7-08.
Erosion around the culvert intake structure at the west end of the erosion control test ditch (32+050). Erosion has slightly filled in since the 2020 condition but area still needs to be graded and riprap adjusted to ensure water flow enters the culvert.

	**Photo 7-09.** Previously observed channelized erosion has since revegetated on the north side of the ditch within the rolled erosion control product (turf reinforced matting) test section (32+100).
	**Photo 7-10.** Looking east towards 300 m diameter channel sock erosion control section (32+150). Section had good vegetation growth through area of previous channelized erosion near the downstream boundary of the geomembrane section.

	**Photo 7-11.** Looking upslope (east) at the Coletanche geomembrane erosion control section (32+250). Was in good condition with no new damage observed in previous patch repair area.
	**Photo 7-12.** Looking upslope the ditch (east) at the geoweb control section (32+400). No major change since the 2020 condition; Section had vegetation growth and some cells were only partially filled and broken. Some minor rill damage was noted on the north side of the ditch.

	**Photo 7-13.** Looking upslope the ditch (east) at the gabion mattress section (32+500). Section had vegetation growth and was performing well. Minor rill damage was noted on the north side of the ditch.
	**Photo 7-14.** View of the damage within the interlocked concrete block (i.e. Lafarge paving stones) paving stone section (32+600). Blocks have deteriorated and broken up in numerous locations and have been undermined by erosion exposing geotextile fabric beneath. Overall section is worse relative to the other test sections.

	**Photo 7-15.** Looking east towards cabled concrete section (32+700). Section was performing well. Minor erosion damage was noted on the north side of the ditch. No major change from the 2020 condition.
	**Photo 7-16.** Looking east towards pillow concrete section (32+800). Section was performing well. Minor concrete deterioration was noted in select areas, but erosion mitigation function was not impacted.

Photo 7-17.
Looking east (upslope) at the top of the erosion control test ditch (32+900). Ditch upslope of the test section has been lined with gabion mattress as part of the 2018/2019 East Daishowa (PH42) mitigation work. The ditch and new mitigation works were in good condition with no observable change from the 2020 condition.