

<b>SITE NUMBER AND NAME:</b> C075-I and -II Hwy 609 and Hwy 56 Ditch Erosion		<b>HIGHWAY &amp; KM:</b> 609:02, 16.42	<b>PREVIOUS INSPECTION DATE:</b> May 31, 2022	<b>INSPECTION DATE:</b> <b>June 17, 2024</b>
<b>LEGAL DESCRIPTION:</b> NW 08-44-19-W4M & SW 17-44-19-W4M	<b>NAD 83 COORDINATES:</b> UTM    Northing    Easting 12      5849463    383508		<b>RISK ASSESSMENT:</b> C075-I: PF: 9    CF: 2    TOTAL: 18 C075-II: PF: 11    CF: 2    TOTAL: 22	
<b>AVERAGE ANNUAL DAILY TRAFFIC (AADT):</b> 540 (east) & 440 (west) (Reference No. 107370 & 110370)			<b>CONTRACT MAINTENANCE AREA (CMA):</b> 517	

<b>SUMMARY OF SITE INSTRUMENTATION:</b>  There is no instrumentation at the C075 site.  LAST READING DATE: N/A	<b>INSPECTED BY:</b> Chris Gräpel (KCB) James Lyons (KCB) Tony Penney (TEC) Rocky Wang (TEC) Vince Vandale (MCI) Kris Oberg (FST)
<b>PRIMARY SITE ISSUE:</b> Erosion features (ditch erosion and gullies) located along Hwy 609 and a corroding culvert underlying Hwy 609. On Hwy 56 (expired C054 site) there is a large erosion gully that is approaching the highway at the outlet of a centerline culvert.	
<b>APPROXIMATE DIMENSIONS:</b> The erosion is impacting approximately 600 m of the north (westbound) ditch and short sections of the south (eastbound) ditch.	
<b>DATE OF ANY REMEDIAL ACTION:</b> March 2021 – The CSP culverts underlying Hwy 609 and Hwy 56 were sleeved with a smooth walled steep pipe culvert and riprap aprons were built at the culvert inlets and outlets. 2023 – The north (westbound) ditch was backfilled, armoured with a rolled erosion control product, straw wattles and riprap check dams were installed regularly along the repair. Additional riprap was also placed upstream and downstream of the culvert underlying H609:02.	

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress		X	N/A – none observed during 2024 inspection.		X
Slope Movement		X	N/A – none observed during 2024 inspection.		X
Erosion	X		Ongoing ditch erosion is the north (westbound) ditch	X	
Seepage		X	N/A – none observed during 2024 inspection.		X
Culvert Distress		X	The bottom of the smooth walled steel culvert is corroding at the C075-II site.	X	

<b>COMMENTS</b>
The site was first inspected by KCB and TEC on June 24, 2020, when KCB conducted a call-out report (final report issued to TEC on January 27, 2021).
<u>C075-I:</u> <u>North (westbound) ditch erosion:</u> <ul style="list-style-type: none"> <li>The 1200 mm diameter CSP culvert was corroding at the base and corrosion was previously observed at the culvert inlet and outlet. In March 2021, the culvert was sleeved with a smaller-diameter smooth walled culvert and riprap aprons were built at the culvert inlet and outlet. KCB noted that non-woven geotextile was not placed beneath the riprap aprons. A length of the barbed wire fence near the culvert outlet was also replaced during the work. TEC informed KCB the work was completed by Inline Group Inc. (Inline).</li> </ul>

- In 2023, most of the north (westbound) ditch was backfilled with well graded material, armoured with a rolled erosion control product (RECP), and straw wattle and riprap check dams were installed regularly along the repair (Photos 1 through 5). At the culvert outlet, additional riprap (angular, estimated to be Class 1M) was placed upstream and downstream of the culvert outlet (overtop of the rounded riprap placed in 2021) (Photo 7 and 8). TEC informed KCB that the repair work was completed by Inline.
  - TEC informed KCB that the material for the ditch backfill was sourced from a local farmer's property close to the site, as well as imported pit run gravel.
- The riprap check dams are approximately 0.5 m in height, 1.5 m long, and 3 m wide (Photo 4 and 5). The riprap is angular, appears to be Class 1M, and likely sourced from near Nordegg, Alberta. The check dams are quite steep and do not span the full width of the ditch. KCB suspects they were not placed closer to the edge of the north (westbound) lane since then they may be within the highway clearance zone. Flows are likely bypassing the check dams since they do not provide sufficient height during heavy precipitation events (Photo 5).
- Straw wattles were installed regularly along the repair. During the 2024 inspection, some of the straw wattles were breached, likely during high flow events, reducing their effectiveness (Photo 3). Sediment is also accumulating behind the straw wattles (Photo 4)
- There was some undermining of the RECP along the repair in the ditch center (Photo 1 and 2). KCB confirmed with TEC's MCI that no check trenches were completed during the repair. The undermined areas are worse the further downstream (east) towards the culvert outlet.
- A small amount of grass was observed growing in the ditch bottom and side slopes.
- The RECP was not placed to achieve equal/adequate freeboard on both the north and south slopes of the ditch (more freeboard was achieved on the south ditch slope/highway embankment slope). Erosion was observed on the north (left) slope of the ditch from flow bypassing the RECP, where there was not adequate freeboard.
- The erosion gullies downstream (northeast) of the culvert outlet and north of the barbed wire fence appear similar as during the 2022 inspection. Trees along the erosion gully walls are leaning and/or have fallen into the erosion gully, and there is vegetation (grass and shrubs) growing at the base of the erosion gully (Photo 9).

South (eastbound) ditch erosion:

- In 2022, a soft and wet area was observed in the ditch upstream of the CSP culvert inlet. This area appeared drier during the 2024 inspection (likely attributed to improved vegetation cover). The culvert inlet appears to be in good condition (Photo 10).
- There's minor ditch erosion along the south (westbound) ditch (0.5 m to 1.0 m deep and not impacting the highway embankment) (Photo 11 and 12). The ditch is well vegetated, and the degree of erosion does not appear to have noticeably changes since the 2022 inspection.
- There is an exposed fibre-optic line (first observed during the 2020 call-out inspection) near the west extent of the site.
- A fence is being impacted by the ditch erosion.

During the site inspection, KCB and TEC also visited the expired C054 site (now referred to as C075-II, southeast of C075, on Hwy 56:16).

- In March 2021, the CSP culvert underlying Hwy 56:16 (oriented east to west) was sleeved with a steel smooth walled culvert and riprap aprons were built at the culvert inlet and outlet (Photo 13 and 14). TEC informed KCB the work was completed by Inline.
- The repair appears to be in good condition and no discernible erosion/movement was observed between the 2022 and 2024 inspections.
- The base of the smooth walled steel culvert appears to be corroding (Photo 15).

- The sinkhole (approximately 0.5 m to 1.0 m in diameter and 0.3 m deep) was observed above the culvert, on the east side of the highway near the culvert outlet (Photo 16). The sinkhole has not expanded since the 2022 inspection but should be backfilled with sand and gravel.

During the site inspection, an erosion feature north of the C075-II site, in the west (southbound) ditch of Hwy 56 was inspected:

- An erosion feature was inspected in the west (southbound) ditch of Hwy 56, north of the C075-II site (approximately 200 south of the Hwy 609-Hwy 56 intersection) (Photos 17 through 20).
- The erosion gully is up to approximately 5 m wide, 5 m deep, and 40 m to 50 m long. There is a short section near the midpoint of the erosion gully that flatter, relatively intact, and well vegetated. The erosion gully is impacting the toe of the highway embankment and a private fence.
  - Two stakes were installed (one at the upstream end of the erosion gully and one further downstream along the east edge) to monitor the rate of gully expansion. Both stakes were installed approximately 1 m from the eroding face (Photo 18).
  - Geogrid was installed by the private landowner perpendicular to the erosion gully, at the location of the private fence crossing, likely to stop cattle passing through the erosion gully off private land (Photo 19).
  - Pieces of a CSP culvert were observed at the base of the erosion gully. There may be a damaged CSP culvert underlying the highway that requires repair (Photo 21).
- Eagle Engineering (Eagle) is completing a highway overlay project in 2025 and repair work will be in their scope of work. TEC will likely need to purchase additional land to facilitate repair of the erosion gully.

Maintenance/Repair/Monitoring Recommendations:

General:

- The site should be regularly inspected by TEC's MCI, particularly after precipitation events (spring freshet or heavy or prolonged rainfall).
- The site should continue to be inspected every two years as part of the Central Region GRMP Section B Inspections.

C075-I (north ditch):

- The riprap check dams should be expanded laterally to span the entire width of the ditch. The side slopes of the check dams (i.e., parallel with the ditch orientation) should be flattened from approximately 2H:1V to 4H:1V.
- Where the RECP is being undermined, the RECP should be cut, erosion backfilled with compacted granular fill, and new RECP placed.
- In areas where there is insufficient freeboard (particularly near the east extent of the repair, upstream of the culvert outlet) the RECP should be removed and replaced to have at least 0.5 m of freeboard on both ditch side slopes.

C075-I (south ditch):

- The fibre-optic line should be relocated.
- Where the fence has fallen, the ditch should be graded and the fence be repaired.

C075-II:

- The sinkhole near the culvert outlet should be backfilled with sand and gravel by TEC's HMC.
- KCB should prepare a proposal for the repair of the erosion gully along the west (southbound) ditch. The repair should be completed by TEC's HMC and could include:

- A repair similar to the C073-II site (riprap armoured channel) could be completed at the site. An alternative repair could be a gabion basket drop structure if the grade of the ditch is too steep for a riprap repair. Repair options will be assessed by KCB as part of our engineering scope.

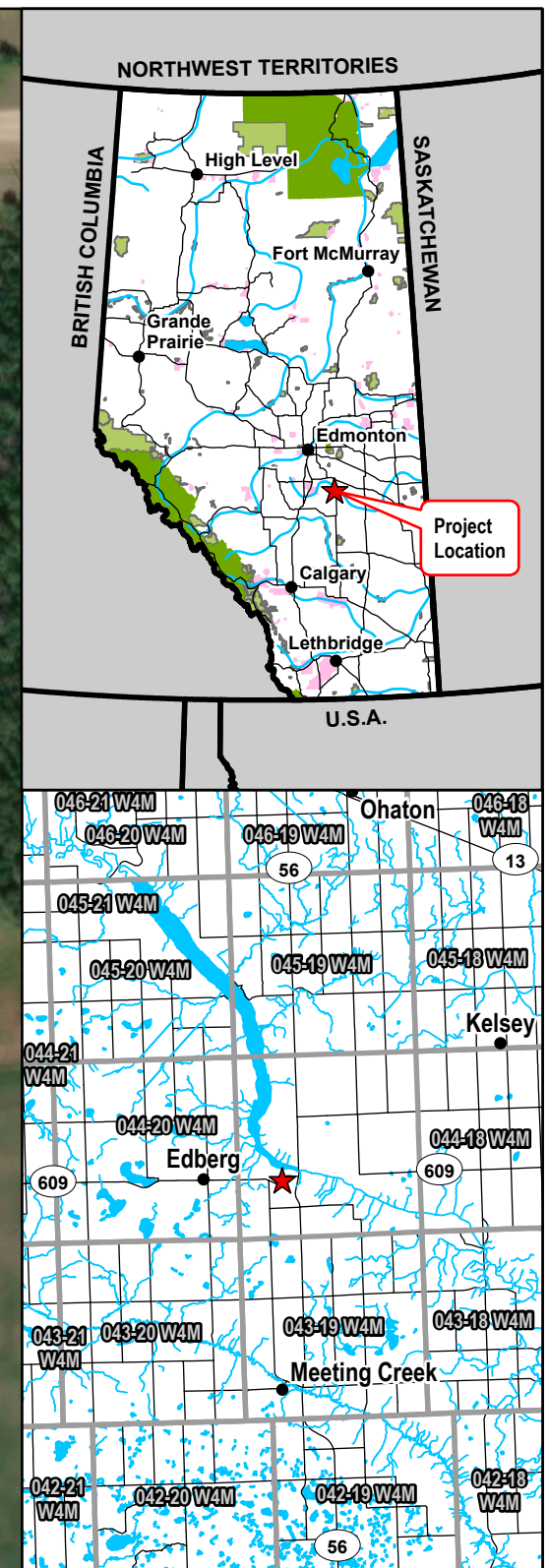
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James Lyons, P.Eng.  
Civil Engineer



**Legend**

- Armoured with RECP, including riprap check dams
- Armoured with Class 1M riprap
- Erosion gully
- Culvert
- Flow Direction
- Site Feature



NOTES:  
 1. HORIZONTAL DATUM: NAD83  
 2. GRID ZONE: UTM ZONE 12N  
 3. IMAGE SOURCE: 2024 MICROSOFT CORPORATION, MAXAR, CNES DISTRIBUTION AIRBUS DS.  
 4. THE LOCATIONS OF FEATURES WERE ESTIMATED BASED ON SITE OBSERVATIONS

CLIENT

Alberta

Klohn Crippen Berger

PROJECT  
CENTRAL REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE  
 Site Plan  
 C075 - Hwy 609 Ditch Erosion  
 Hwy 609:02, km 16.420

SCALE 1:2,500 PROJECT No. A05116A02 FIG No. 1

**Photo 1** The ditch erosion along the north (westbound) ditch of Hwy 609 was backfilled, armoured with RECP, and riprap check dams and straw wattles were installed in 2023. Photo taken June 17, 2024, facing west-northwest.



**Photo 2** The RECP along portions of the repair is being undermined. Photo taken June 17, 2024, facing north.



**Photo 3** Several of the straw wattles were breached after installation, reducing their effectiveness. Photo taken June 17, 2024, facing west.



**Photo 4** Sediment is accumulating behind the straw wattles. Photo taken June 17, 2024, facing west.



**Photo 5** Due to some of the riprap check dams not spanning the entire width of the ditch with adequate freeboard, flows have bypassed the check dams and are causing erosion gullies to reform. Photo taken June 17, 2024, facing east.



**Photo 6** Plastic check dams were installed along the ditch repair, upstream (west) of the culvert outlet. Photo taken June 17, 2024, facing west.





**Photo 7** A large riprap apron (Class 1M) was installed in 2023. The riprap apron was built over the previous apron and filled the large erosion gully downstream of the culvert outlet. Photo taken June 17, 2024, facing east.



**Photo 8** A large riprap apron (Class 1M) was installed in 2023. The riprap apron is over the previous apron and filled the large erosion gully downstream of the culvert outlet. Photo taken June 17, 2024, facing west.



**Photo 9** Erosion gully downstream of the culvert outlet appears to be in similar condition as during the 2022 inspection. Photo taken June 17, 2024, facing northeast.



**Photo 10** The culvert inlet appears to be in good condition. Photo taken June 17, 2024, facing northeast.



**Photo 11** The south highway embankment slope and ditch are well vegetated and appears to be in good condition. Photo taken June 17, 2024, facing east-southeast.



**Photo 12** The south highway embankment slope and ditch is well vegetated and appears to be in good condition. Minor ditch erosion in ongoing but is not impacting the highway embankment. Photo taken June 17, 2024, facing west.



**Photo 13** Inlet of culvert and riprap apron at the C075-2 site appears to be in good condition.  
Photo taken June 17, 2024, facing north.



**Photo 14** Outlet of culvert and riprap apron at the C075-2 site appears to be in good condition.  
Photo taken June 17, 2024, facing north.



**Photo 15** Corrosion was observed along the base of the smooth walled steel culvert. Erosion appears to be ongoing since the 2022 inspection. Photo taken June 17, 2024, facing southeast.



**Photo 16** Sinkhole above the culvert in the should of the east (northbound) lane appears similar as during the 2022 inspection. Photo taken June 17, 2024, facing south.



**Photo 17** Erosion gully in the west (southbound) ditch along Hwy 56 (indicated by red arrow) as viewed from Hwy 609. Photo taken June 17, 2024, facing south.



**Photo 18** Erosion gully in the west (southbound) ditch along Hwy 56, north of the C075-2 site. Stake installed at upstream end indicated by red circle. Photo taken June 17, 2024, facing south.



**Photo 19** Geogrid below hanging fence installed by private landowner to stop cattle from crossing the highway. Photo taken June 17, 2024, facing northwest.



**Photo 20** Erosion gully along the toe of the highway embankment (Hwy 609 and Driedmeat Lake in the background). Photo taken June 17, 2024, facing north.



**Photo 21**      **Damaged culvert or metal debris observed at the base of the erosion gully.**  
**Photo taken June 17, 2024.**

