

SITE NUMBER AND NAME: C035 Ditch Erosion		HIGHWAY & KM: 590:04, 20.104	PREVIOUS INSPECTION DATE: July 11, 2019	INSPECTION DATE: June 9, 2020
LEGAL DESCRIPTION: 04-28-035-21 W4M 13/14/15/16-21-035-21 W4M 01-28-035-21 W4M	NAD 83 COORDINATES: UTM Northing Easting 12 5765903 365774 12 5765738 367296		RISK ASSESSMENT: PF: 10 CF: 4 TOTAL: 40	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 670 (west) (Ref No. 997156)			CONTRACT MAINTENANCE AREA (CMA): 517	

SUMMARY OF SITE INSTRUMENTATION: There is no instrumentation at the C035 site. LAST READING DATE: N/A	INSPECTED BY: Chris Gräpel (KCB) James Lyons (KCB) Tony Penney (AT) Kristen Tappenden (AT)
PRIMARY SITE ISSUE: Numerous erosion features located along Hwy 590, mainly in the ditches, on either side of the Red Deer River.	
APPROXIMATE DIMENSIONS: The site is approximately 2 km long.	
DATE OF ANY REMEDIAL ACTION: None recently.	

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Various locations, but unrelated to erosion or drainage.		X
Slope Movement	X		Backslope instability on east side of river causing partial blockage of westbound ditch.		X
Erosion	X		Numerous erosion features along highway due to presence of dispersive soils.	X	
Seepage		X	None observed.		X
Culvert Distress	X		Culverts require repair or replacement, see below.		X

<p>COMMENTS</p> <p>West of the bridge:</p> <ul style="list-style-type: none"> The existing 6-m deep erosion gully on the valley slope approximately 600 m west of the bridge has expanded since the 2019 inspection (Photo 1). Riprap placed at the head of the gully is being bypassed south of the riprap by surface flows. The CSP culvert downslope of the erosion gully continues to corrode since last the last culvert inspection completed in 2018 (Photo 2). The culvert was observed flowing to be and the bottom of the culvert was corroded. Rill erosion and voids associated with the erosion of dispersive materials were observed in the exposed bedrock along the backslopes. The backslopes are sporadically vegetated. Both ditches are gullied to a depth of 1 m with near-vertical gully slopes. The ditch channels outside of the gullies are well vegetated with grass. The 1200 mm diameter CSP culvert at Waypoint 518 is corroded (corrosion holes in crown of culvert) and requires replacement or repair. The culvert outlet is undermined by ditch flow from further upslope and culvert discharge onto unarmored soil. In the short term, the ditch downstream of the culvert outlet should

be armored with riprap.

East of the bridge:

- The extent of ditch erosion east of the bridge appeared to be the same or slightly worse than 2019.
- The inlet of a culvert at Waypoint 519 is partially buried by sediments eroded from further up the ditch.
- A wider section of the ditch appears to act as a sediment trap. The downstream limit of the wider section of the ditch is at Waypoint 520.
- Riprap was placed in an erosion gully before 2016 at Waypoint 521. This area looks stable, but sediment deposition from further upstream is probably contributing to the favorable performance at this site.
- Ditch flows have bypassed riprap placed in a former gully at Waypoint 522
- In some areas, ditch flows have bypassed and eroded around the riprap armoring, erosion in the ditch is causing instability of the backslope, and bentonitic materials are exposed on the backslope.
- Erosion gullies beneath the bridge have expanded and retrogressed toward the bridge abutments.

The colluvial soil and bedrock exposed at the C035 site (both sides of the river) are dispersive. Erosion control of dispersive soils should be approached differently than for non-dispersive soils, as per KCB's 2017 report on the C035 site. KCB proposes that AT conduct a series of field tests on the west and east sides of the river to assess erosion control measures in dispersive soils, similar to what AT conducted at the Diashowa site in the Peace River valley. Trial sections should be 100 m long and hydrologically similar (e.g., similar slope and runoff characteristics) so that the effectiveness of different erosion control measures and construction methods can be compared. Candidate repair methods for field testing could include geocell, riprap (with and without granular filter layers and cross-ditch sand filters), lime treatment, and vegetation. Some areas of the C035 site are well vegetated, while others are not. It is recommended that the field test includes a vegetation assessment of soil nutrients and chemistry to assess which types of vegetation could grow well in the dispersive soils in various locations of the C035 site.

Repair options for the erosion gully on the west side of the site:

- Extend the guardrail and end-dump backfill the gully with gravel and armour with riprap (AT's preferred option, this may not completely address erosion of dispersive soils beneath the riprap, but it will slow the rate of gully enlargement);
- Install an inlet structure and divert ditch flow into an HDPE pipe that extends downslope;
- Reconstruct the channel and armour it with riprap with adequate bedding/transition material; and
- Construct a ditch to redirect surface flow into the creek.

Repair options for the erosion gully below bridge abutment:

- In the short term, riprap should be placed in the erosion gully to minimize the potential for enlargement and continued retrogression.

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 Date: September 10, 2020
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Legend

- GPS Waypoint (June 14, 2017)
- Culvert
- Guardrail
- Erosion
- Riprap



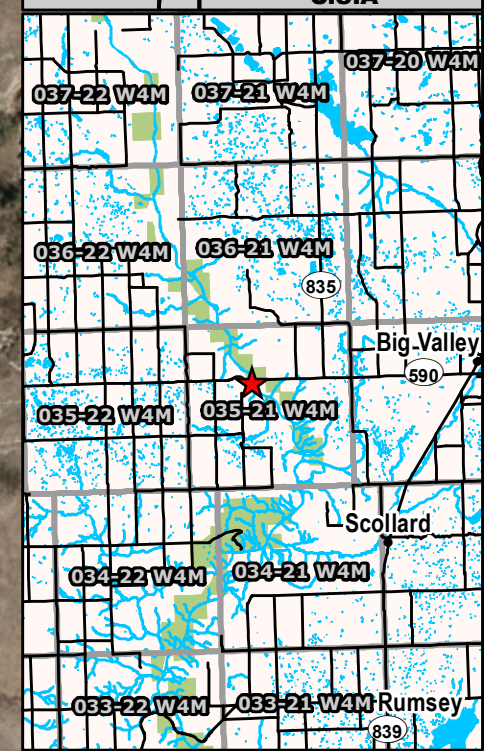
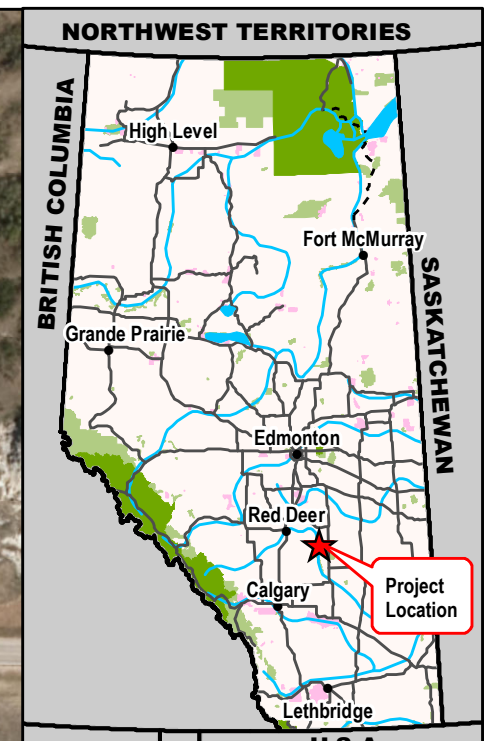
NOTES:
 1. HORIZONTAL DATUM: NAD83
 2. GRID ZONE: UTM Zone 12N
 3. IMAGE SOURCE: World Imagery, ESRI ArcGIS Online
 Source date January 15, 2018 (Red Deer County 2018)

CLIENT

PROJECT
 CENTRAL REGION GEOHAZARD RISK MANAGEMENT PROGRAM

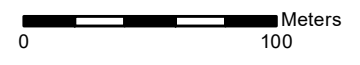
TITLE
 Site Plan
 C035 - Ditch Erosion
 Hwy 590:04, km 20.104

SCALE 1:3,000 PROJECT No. A05115A02 FIG No. 1



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

- Legend**
- GPS Waypoint (June 14, 2017)
 - Guardrail
 - Culvert
 - Sinkhole
 - Erosion
 - Riprap



NOTES: 1. HORIZONTAL DATUM: NAD83 2. GRID ZONE: UTM Zone 12N 3. IMAGE SOURCE: World Imagery, ESRI ArcGIS Online Source date January 15, 2018 (Red Deer County 2018)	CLIENT	PROJECT
		CENTRAL REGION GEOHAZARD RISK MANAGEMENT PROGRAM
	TITLE	Site Plan C035 - Ditch Erosion Hwy 590:04, km 20.104
	SCALE	PROJECT No. A05115A02
	1:3,000	FIG No. 2

Time: 15:09:35 PM
 Date: July 30, 2020
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Photo 1 Comparison photo of the existing erosion gully on the south side (eastbound lane) of the highway, approximately 600 m west of the bridge. Gully appears to have expanded since 2019. Photos taken looking south.



Photo 2 Continued erosion in the ditch south of Highway 590, upstream of the 1200 mm diameter CSP culvert. Photo taken June 9, 2020 facing west.



Photo 3 The outlet of the 1200 mm diameter CSP to the west of the bridge. Photo taken June 9, 2020 looking west.



Photo 4 Photo showing location of ditch area that appears to act as a sediment trap (Waypoint 520) and location where riprap was placed prior to 2016 (Waypoint 521). Photo taken June 9, 2020 looking west.

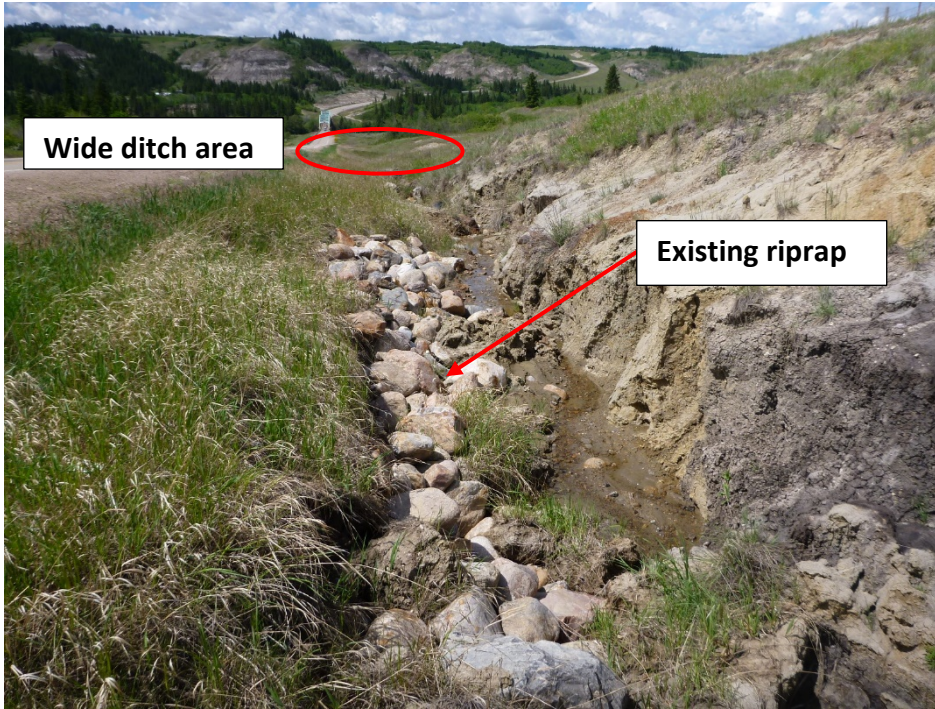


Photo 6 Erosion gully below east bridge abutment continues to expand. Photo taken June 9, 2020 looking west.

