

SITE NUMBER AND NAME: S040 Dorothy Sinkholes		HIGHWAY & KM: 848:02, 11.507	PREVIOUS INSPECTION DATE: June 12, 2018	INSPECTION DATE: July 10, 2019
LEGAL DESCRIPTION: 06-04-027-17 W4M	NAD 83 COORDINATES: UTM Northing Easting 12 5681315 406434		RISK ASSESSMENT: PF: 8 CF: 4 TOTAL: 32	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 60 (north), 120 (south), (Reference No. 116220, 114210)			CONTRACT MAINTENANCE AREA (CMA): 21	

SUMMARY OF SITE INSTRUMENTATION: None LAST READING DATE: n/a	INSPECTED BY: Chris Gräpel (KCB) Ryan Gazley (KCB) Rishi Adhikari (AT) Tony Penney (AT)
PRIMARY SITE ISSUE: Voids/sinkholes forming in dispersive soils and/or bedrock beneath the highway surface.	
APPROXIMATE DIMENSIONS: An approximate 500 m long section of the highway is being affected.	
DATE OF ANY REMEDIAL ACTION: Ongoing – sinkholes close to the highway are backfilled with gravel containing fines; no recent repairs.	

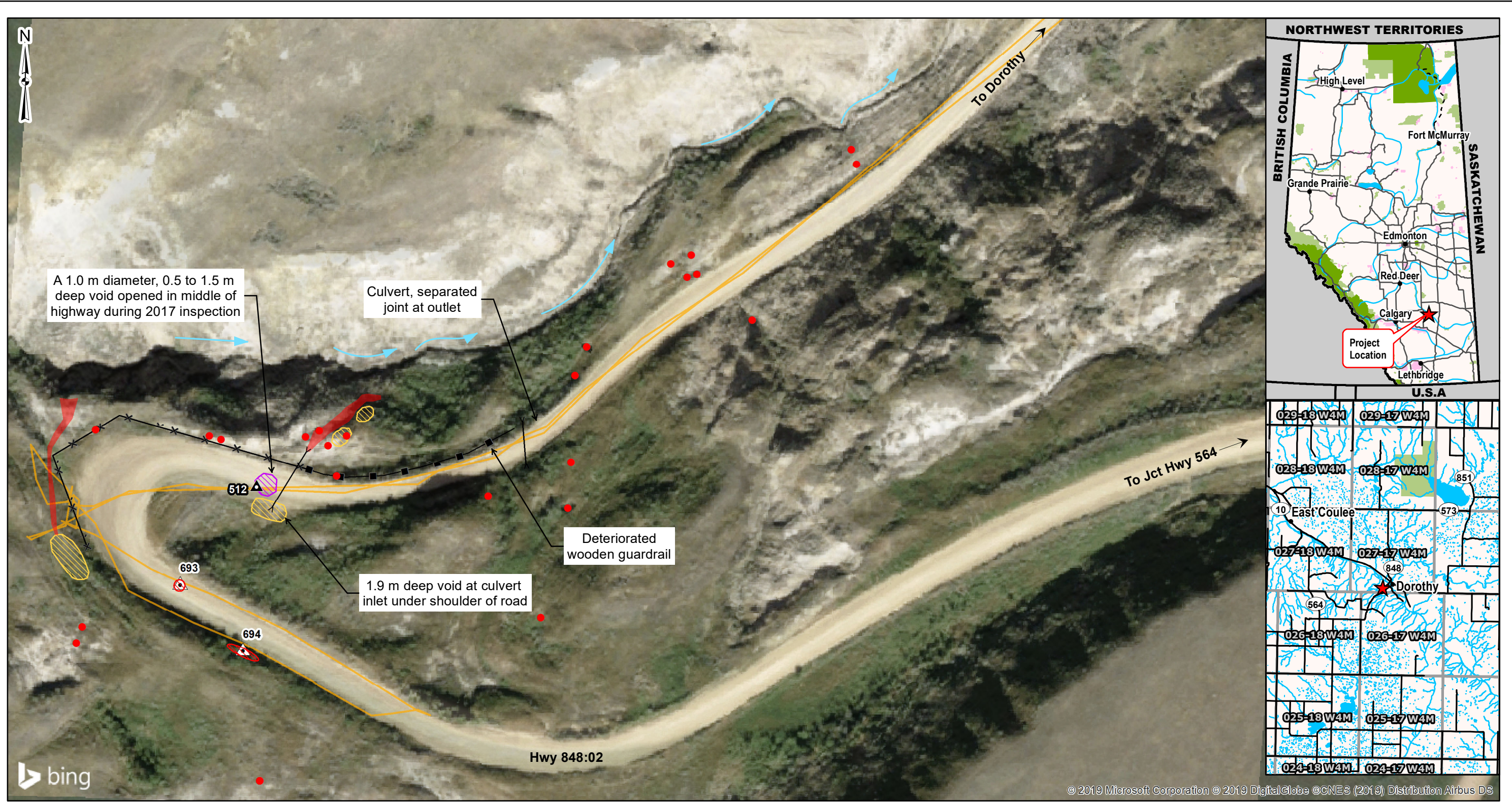
ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Road Surface Distress		X	No sinkholes observed on or near road surface. Gravel surfaced road recently graded.	X	
Slope Movement		X	None observed		X
Erosion	X		Ongoing erosion of dispersive soils creating voids and gullies		X
Seepage	X		Groundwater seepage		X
Culvert Distress	X		Joint at culvert outlet separated		X

COMMENTS
No new sinkholes on the road surface, near the edge of the road, or on the highway embankment were observed during the 2019 inspection. KCB recommends that the site be inspected every two years.
During the 2018 inspection, a 15 cm diameter, 10 cm deep sinkhole was discovered near the north shoulder of the highway (waypoint 693). The AT MCI marked the location with a survey stake and flagging to warn motorists. A long, shallow sinkhole was discovered along the south shoulder (waypoint 694) approximately 100 m from the sinkhole at waypoint 693.
During the 2017 inspection, a 1.0 m diameter, 0.5 m to 1.5 m deep void opened in the middle of the highway (waypoint 512) after KCB's vehicle drove over the site. A temporary barricade was constructed, and the AT MCI was informed.
Previous assessments have identified natural groundwater seepage and surface water flow as triggers for void/sinkhole formation. Voids previously observed near the highway are in areas of concentrated drainage (e.g., ditches, and rills and gullies on natural slopes).
It is understood that the ditch capacity is insufficient for regular rainfall events, and that surface water flows onto and across the highway.
A void that is approximately 2 m away from the culvert inlet is partially undermining the shoulder of the highway (south of waypoint 512).
A risk assessment guideline for dispersive soil sites should be developed.
Discussed remedial actions: install signage (e.g., speed reduction and hazard markers) to warn motorists of hazard

(e.g., potential washouts and collapse features); improve drainage (e.g., increase ditch drainage capacity) to reduce infiltration into underlying dispersive soils and erosion of steep natural slopes; backfill sinkholes and voids as needed; conduct a geotechnical site investigation that includes:

- conducting a detailed topographic survey of the area (e.g., a LiDAR survey or an unmanned aerial vehicle [UAV] photogrammetry survey), so previous, current and future locations of sinkholes and voids can be plotted relative to the survey data to assess if they correspond to areas with concentrated drainage

Time: 10:44:13 AM
 Date: September 06, 2019
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Legend

- GPS Track (July 10, 2019)
- Approximate Location of Previously Identified Sinkholes (AMEC 2016, Figure 1)
- Culvert
- Sinkhole (Observed 2018)
- Sinkhole (Observed 2017)
- Sinkhole (Observed 2016)
- ✕ Fence
- Guardrail
- ✂ Erosion Gully

NOTES:
 1. HORIZONTAL DATUM: NAD83
 2. GRID ZONE: UTM Zone 12N
 3. IMAGE SOURCE:
 Abacus Datagraphics Ltd. Image dated October 2011.
 Bing Maps, Microsoft Corporation 2019

CLIENT

Alberta

Klohn Crippen Berger

PROJECT SOUTHERN REGION GEOHAZARD RISK MANAGEMENT PROGRAM		
TITLE Site Plan S040 - Dorothy Sinkholes Hwy 848:02, km 11.507		
SCALE 1:1,250	PROJECT No. A05115A03	FIG No. 1



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Photo 1 No new sinkholes observed on or near road surface during 2019 inspection. Photo taken July 10, 2019 looking northwest.



Photo 2 Existing erosion gully and void directly west of hairpin curve. Photo taken July 10, 2019 looking south.

