NORTH CENTRAL REGION GRMP
EDSON / STONY PLAIN
SITE INSPECTION FORM

SITE NUMBER AND NAME:	HIGHWAY AND KM:	PREVIOUS INSPECTION:	CURRENT INSPECTION:
NC014 – North of Fort Assiniboine	661:02, km 1.8	June 13, 2024	May 22, 2025
LEGAL DESCRIPTION:	**NAD83 COORDINATES:**		**RISK ASSESSMENT:**
NW-01-62-06-W5	UTM11U 6023391N, 644779E		PF: 8 CF: 10 Total: 80
AVERAGE ANNUAL DAILY TRAFFIC (AADT):		**CONTRACTOR MAINTENANCE AREA (CMA):**	
270 (2024)		508	

SUMMARY OF INSTRUMENTATION:	INSPECTED BY:
Six standpipes functional and being monitored. No land access agreement for 2 slope inclinometers and 7 standpipe piezometers. **LAST READING DATE:** May 7, 2025	Stantec: Leslie Cho, Sonja Pharand and Carrie Murray TEC: Kristen Tappenden

PRIMARY SITE ISSUE:

Slope creep movements causing pavement distress to a side hill alignment due to seasonal high groundwater levels; a localized active landslide causing a severe deterioration of the highway southbound lane (SBL) within the mid-hill slope section.

APPROXIMATE DIMENSIONS:

About 250 m long (midslope section)

DATE OF ANY REMEDIAL ACTION:

No remediation undertaken. Maintenance work includes spray patch and manhole cleaning in 2014; patching of mid hill slope section in 2017.

A dewatering pilot test was conducted in 2018 to assess the effectiveness of a gravity well to drain the upper sand aquifer to a lower sand and gravel aquifer. The pilot test was unsuccessful due to high clay and silt content in the upper aquifer as well as difficulty developing the well in the upper aquifer.

The entire site was milled and paved in Fall 2023, with deficiencies addressed in late Spring 2024. The guardrail on the downslope side of the highway was also extended further southeast. 50 km/hr sign placed near midslope for traffic travelling northwest.

The two sinkholes in the east ditch were backfilled between 2024 and 2025 inspections.

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICEABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Multiple cracks reflecting through pavement repair.	X	
Slope Movement	X		Mid-hill slope section: up to 10 mm wide reflective cracks. Creep movement with open cracks to the north and south of mid-hill slope section. Upper slope section of the hill (north of mid-hill slope section): uneven guardrail; head scarp crack and graben feature downslope of the highway. Reflective cracking. Small dormant slump along highway backslope.	X	
Erosion	X		Erosion along east highway shoulder.		X
Seepage		X			
Bridge/Culvert Distress		X			

Other	X		Two sinkholes in ravine, one increased in depth. Three sinkholes northwest of ravine. Two sinkholes in east ditch of highway backfilled.	X	

COMMENTS

- Cracks were observed to be reflecting through the milled and paved highway surface along the mid hill slope and upper slope sections where landslide activity is apparent (Photos 1, 3 and 4). Cracks are mostly 10 mm wide, though the crack near the top of the hill is now up to 20 mm wide in some sections.
- The water level in MH#1 was at ground surface. Water from the drainage channel adjacent to the MH appeared to be ponding and flowing into MH#1 (Photo 2). Siltation may be a problem at MH#1.
- The mid hill slope section (Photo 3) had a 10 mm wide reflective crack on the south end (observed in 2024) and a 0 to 5 mm wide crack near the north end that is just beginning to reflect. The dip towards the southwest observed during past inspections was not observed, similar to 2024.
- At the upper slope section, the guardrail appeared to be slightly sagging and shifting laterally. Pavement cracks upslope from the graben were up to 10 mm wide (Photo 4).
- The head scarp and graben were observed downslope of the guardrail (Photo 5).
- Both functional SIs are located above the highway backslope and outside the landslide area. Both instruments showed no movement. Readings of these SIs have stopped since land access permissions have not been agreed upon with the private landowner since Spring 2021.
- The piezometers show water levels have been relatively consistent with Spring 2025 readings ranging from 2.5 m bgs to 26.3 m bgs. A slight trend of decreasing water levels seems to be developing in most piezometers since Fall 2021.
- Numerous sand outcrops were observed downslope of the upper slope landslide graben. The depressions up to 0.5 m deep in the two small sand outcrops closest to the ravine were observed to be relatively unchanged since 2023. Additional vegetation was observed to be growing in the sand crops during this inspection.
- The gully with exposed sand starting south from the upper slope section near the sand outcrops, down to the bench was observed to be slightly more vegetated in comparison to the 2024 inspection (Photo 7).
- The two sinkholes in the ravine downslope of the highway between the upper and mid slope appear similar to 2024, with the south hole having increased 100 mm in depth. The north sinkhole was measured to be 500 mm deep by 600 mm in diameter, and the south sinkhole was measured at 500 mm deep by 1 m in diameter (Photo 6).
- The two sinkholes observed in the east ditch near the mid-hill landslide area during the 2023 inspection were observed to have been backfilled with soil (appears topsoil-like). It is possible that these sinkholes are related to the subdrains.
- Several homes exist near the base of the landslide representing a public safety issue along with potential loss of privately owned structures. As such, the Consequence Factor remains at 10.

RECOMMENDATIONS

- All pavement cracks should be sealed to reduce surface water infiltration into the landslide mass.
- All culverts and manholes should be inspected to reduce the risk of water seeping into the slope. This could consist of cleaning and flushing to promote water flow.
- The remaining sinkholes should be capped with clay to reduce further erosion and surface water infiltration into the slope.
- Slope inclinometers within the slide mass are no longer functioning. Slope movement can be monitored by installing replacement inclinometers and/or considering InSAR or LiDAR change detection methods.
- Preliminary remediation options may include:
  - Constructing a concrete pile wall from the upper slope section to the mid-hill section, approximately 160 m long. The high-level cost for a concrete pile wall is $3.2 million to $4.2 million, excluding engineering.
  - Reconstructing the highway with lightweight fill such as EPS geofoam or lightweight cellular concrete. The high-level cost for this option is $730,000 to $1.1 million excluding engineering.
  - Installing a new subdrain along the east ditch. The high-level cost for this option is $400,000 to $500,000 excluding engineering.
  - Maintenance, monitoring and surveillance approach: Given the low volume and low speed nature of this highway, it may be preferential for TEC to continue maintaining the highway by placing asphalt patches and sealing cracks as well as maintaining the existing manholes and subdrainage system. This approach carries some risk in that the rate of slope movement can suddenly increase. If this approach is adopted, increased monitoring of the site is recommended consisting of additional slope inclinometers below the

landslide headscarp, which can be fitted with near real-time monitoring using shape-accelerometer arrays (SAAs), and/or near real-time GPS monitoring (Geocubes) and/or InSAR satellite imagery to determine historical/present ground deformation rates. Adopting a surveillance and monitoring program to threshold values would provide asset protection of the site and allow suitable timing for remediation.

- The site inspection frequency could be reduced to once every 2 years.
- Instrumentation monitoring could be reduced to every 2 years in the spring and fall.

PREPARED BY: Sonja Pharand, P.Eng.	**REVIEWED BY:** Leslie Cho, M.Eng., P.Eng.	**PERMIT TO PRACTICE**
PROFESSIONAL ENGINEER ALBERTA SONJA A. PHARAND ID 286545 2025-10-11		PERMIT TO PRACTICE STANTEC CONSULTING LTD. Signature ID# 74389 Date 15 - Oct - 2025 PERMIT NUMBER: P 0258 The Association of Professional Engineers and Geoscientists of Alberta

Stantec

- Non-Operational Instrument
- Operational Instrument
- Photo and Direction
- Previous Observation/ Site Detail
- 2025 Observation
- Ground Elevation Contours (m AMSL)[4.]
- Quarter Section

N

0 25 50 metres

(At original document size of 11x17)
1:2,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 11N
2. Data Sources: Geogratis, ©Department of Natural Resources Canada, All rights reserved.
3. Background: Light Gray Base: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
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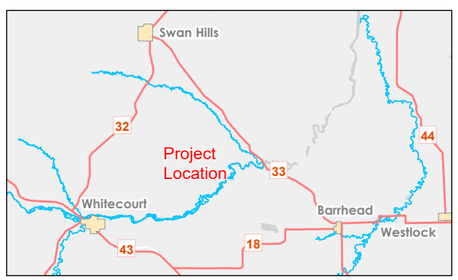
4. mASL - Meters Above Sea Level



Project Location
SW-28- and SE-29-056-08W5, Alberta

Prepared by MK on 2025-09-02
TR by SP on 2025-09-03
IR by LC on 2025-09-04

Client/Project 123315222
Transportation and Economic Corridors
Geohazard Monitoring Program
NC014-1: HWY 661:02 Fort Assiniboine (km 1.8)

Figure No.
1

Title
Site Plan

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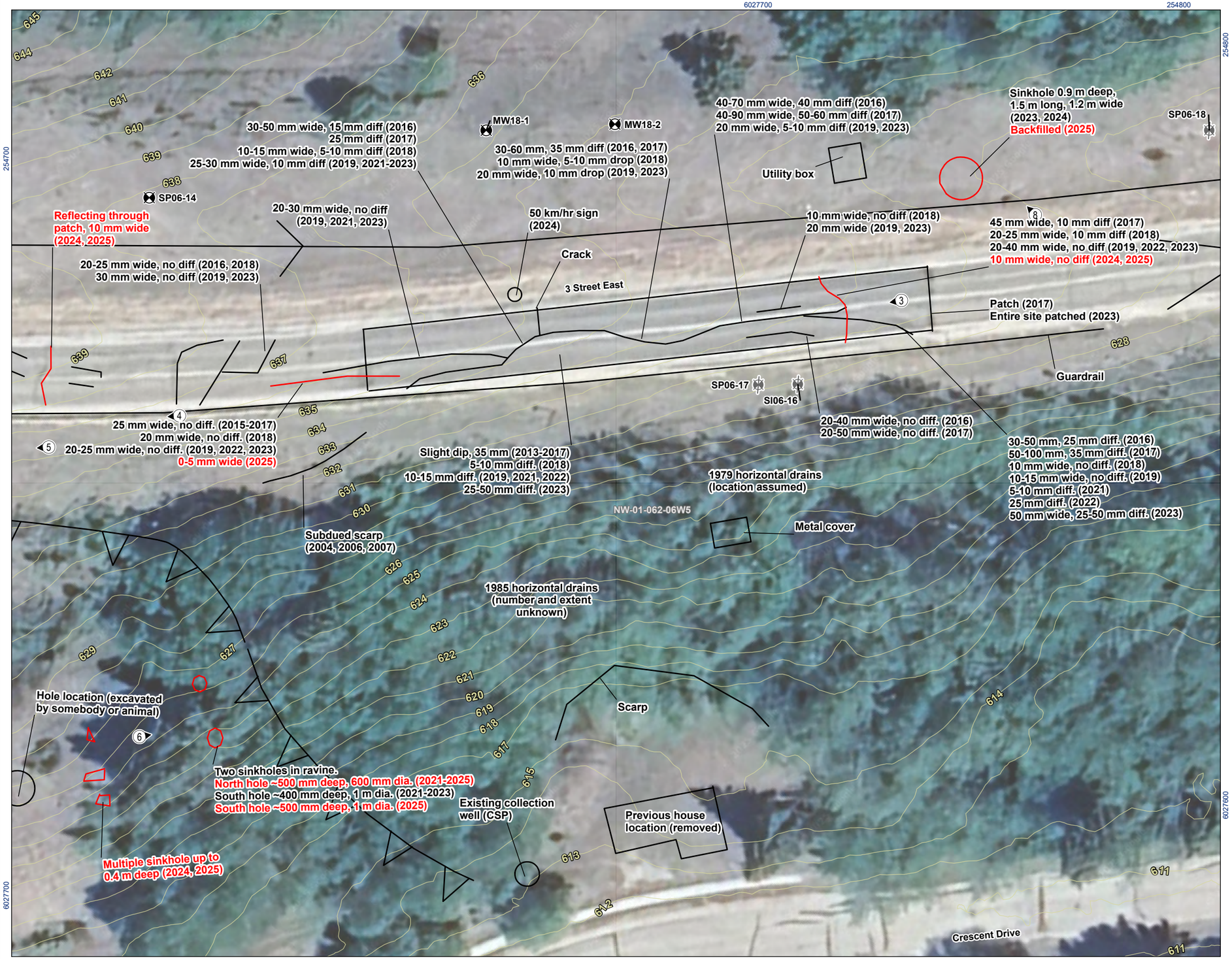

Stantec

- Operational Instrument
- Non-Operational Instrument
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- Quarter Section
- Previous Observation/ Site Detail
- 2025 Observation

N

0 10 20 metres

(At original document size of 11x17)
1:450

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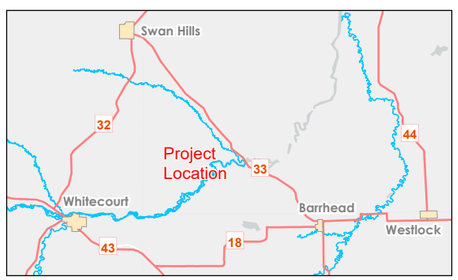

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Figure No.
2

Title
Site Detail

2025 Site Inspection Photos at NC014

Photo 1: Pavement condition southeast of mid-hill landslide. Looking northwest.

Photo 2: Pooling/flowing water adjacent to MH#1. Water entering culvert at ground surface. Looking northeast.

2025 Site Inspection Photos at NC014

Photo 3: Cracks reflecting through pavement repair at south extent of mid-slope landslide. Looking northwest.

Photo 4: Pavement cracking north of mid-slope landslide. Looking northwest.

2025 Site Inspection Photos at NC014

Photo 5: Landslide at uphill section. Looking northwest.

Photo 6: Two sinkholes in ravine. Looking southeast.

2025 Site Inspection Photos at NC014

Photo 7: Erosion channel heading downslope to the bench. Looking southwest.

Photo 8: Sinkhole backfilled with soil, southeast from the utility box in the east ditch near the mid-hill landslide area. Looking north.

2025 Site Inspection Photos at NC014

Photo 9: Overview of site, taken by drone. Looking northwest.

Photo 10: Overview of slide areas on highway embankment. Looking northwest.