Stantec Consulting Ltd.
10160 112 Street, Edmonton AB T5K 2L6

ALBERTA TRANSPORTATION
LANDSLIDE RISK ASSESSMENT

SECTION A: GEOTECHNICAL FILE REVIEW

NORTH CENTRAL REGION – Edson/Stony Plain Area

SITE NC82: Morinville Slide

LEGAL LOCATION:	SW 4-56-25-W4M and NW 33-55-25-W4M
NEAREST LANDMARK:	NORTHBOUND ON-RAMP FROM HIGHWAY 642 TO HIGHWAY 2
Highway Control Section:	HWY 2:36 km~10
Date of Initial Observation:	2015
Date of Last Inspection:	May 26, 2017
Last Inspected By:	Stantec Consulting Ltd. (Stantec)
Instruments Installed:	None
Instruments Operational:	N/A
Risk Assessment:	PF(9) · CF(3) = RL (27)
Last Updated:	August 27, 2018 – Stantec Consulting Ltd.

1. LOCATION

The site is located on the east slope of the northbound on-ramp to Highway 2 along the west outskirts of Morinville, Alberta.

2. GENERAL DESCRIPTION OF SLOPE INSTABILITY

In August 2015, Alberta Transportation (AT) performed a site inspection of the slope failures along the Highway 2 embankment in response to the maintenance contractors report. Two failures were observed: a larger slide to the north and a smaller slide to the south. The larger slide had a length of approximately 40 m with a back scarp reaching the pavement and the toe of the slide surfacing at the ditch. The smaller slide had a length of approximately 15 m long and 9 m wide with approximately 1 m of vertical difference from about midway downslope.

During Stantec's annual site inspection in June 2016, the larger slide (north slide) was observed to be retrogressing causing the back scarp to encroach on the roadway. Two cracks both approximately 1.8 m long and 100 mm deep were observed immediately north of the larger slope at the toe. Furthermore, undermining of the pavement was observed with an erosion gully approximately 0.3 m wide and 0.3 m deep.

For the south slide, some slumping and erosion was observed as well as ponded water in the ditch. Little change in the south slide was observed as compared to AT's 2015 Site Inspection but it has the potential to retrogress upslope and reach the road surface in the future.

Historical photos show some history of slope failures to the south of Highway 2 which was constructed in the mid-1960s. Slumping and erosional failure occurred near the south slope in 1969. No slump/erosion was observed in 2001 but a faint outline of the south slide was observed again in 2011.

No instrumentation was installed to measure ground movement and groundwater levels. Based on Stantec's annual site inspection in June 2016 and the investigation program, the cause of failures appears to be triggered by locally high groundwater table within the embankment fill and underlying clay.

Remediation of the landslide started on November 22, 2017 and consisted of removal of the slide mass and replacement with Alberta Transportation Designation 6, Class 80 pit run. During excavations of the shear key, a rotational slide occurred within the benches excavated in the north slide limits. The slide was stabilized by quickly backfilling the shear key with approximately 1 m of pit run instead of placing in 150 mm lifts. An additional 0.5 m of material was excavated from each bench to remove the new slide mass. Subsequent lifts were placed in compacted lifts 150 mm thick. The majority of pit run backfill was placed in November/December 2017 prior to Winter Shutdown. Construction resumed on May 23, 2018 when the final lift of pit run was placed followed by clap cap, topsoil and seed. The existing ditch was also dredged and de-vegetated to promote drainage.

3. GEOLOGICAL/GEOTECHNICAL CONDITIONS

PHYSIOGRAPHIC REGION

Alberta East-Central Plains

BEDROCK GEOLOGY

Bedrock is believed to be local sandy bedrock. Bedrock was not encountered from three tests pits excavated to depths of approximately 4 m.

SURFICIAL GEOLOGY

The Morinville area is generally a large, lowland area containing poorly drained soils with undulating to gently rolling upland knolls. The lowland soils near the site generally consist of glaciolacustrine material. The upload areas are comprised of glacial till that often contains high sand content due to the underlying sandy bedrock.

HYDROGEOLOGY

No instrumentation was installed to monitor groundwater. Ponded water was observed in the ditches to an elevation of approximately 669.5 m during Stantec's 2016 Inspection. During test pit excavation, frozen water was observed in the ditch at about the same elevation. Furthermore, seepage was not observed during the excavation of the test pits. Groundwater levels are expected to fluctuate throughout the year depending on weather, site use, and adjacent land use, with the highest groundwater levels being observed in the spring and summer.

STRATIGRAPHY

Site stratigraphy is based on the three test pit excavations which consisted of a surface layer of topsoil with underlying clay fill overlying native clay. Bedrock was not encountered. The topsoil had thicknesses ranging from 50 mm to 100 mm and the clay fill had thicknesses ranging from 3.0 m to 3.8 m. All test pits were terminated in the native clay so the total thickness was not determined but it has sufficient depth as required for stability analysis.

4. CHRONOLOGY

August 2015

In response to the maintenance contractors report, AT completed a site inspection of the two slope failures: a large slide failure to the north and a smaller slide to the south.

June 2016

Stantec conducted its annual site inspection and observed the north slide retrogressing and beginning to encroach on the road way. The two cracks were observed just north of the north slide. Little change was observed in the south slide.

November 2017

Remediation of the site started late November 2017 and was completed in June 2018. The remedial design consisted of removal of the slide mass and replacement with AT 6-80 pit run. The ditch along the toe of the slides were also dredged and de-vegetated to promote ditch drainage.

REFERENCES

1. Alberta Transportation, August 7, 2016. "Site Visit: Slide at HWY 2 Morinville 100m North of HWY642" Memorandum

2. Stantec, June 27, 2016. "2016 Inspection Report"