

ALBERTA TRANSPORTATION NORTH CENTRAL REGION – ATHABASCA AREA INSTRUMENTATION MONITORING RESULTS

SPRING 2016

SECTION C

SITE NC014-1: HWY 661:02 FORT ASSINIBOINE

1. OBSERVATIONS

1.1 Field Program and Instrumentation Status

Two slope inclinometers (SI06-6 and 06-11) and eleven standpipe piezometers (SP06-1 to 06-5, 06-9, 06-10, 06-13, 06-14, 06-18, and 06-19) were read at the HWY 661:02 Fort Assiniboine site on May 30, 2016 Mr. Niraj Regmi, G.I.T., and Mr. Mahinder Dhillon, P.Geo., both of Thurber Engineering Ltd. (Thurber).

The SIs were read using a RST Digital Inclinometer probe with a 2 ft. wheelbase and a RST Pocket PC readout. Inclinometer reading depths were defined as per cable markings with respect to the top of the inclinometer casing. The standpipe piezometers were read using a SINCO dipmeter.

2. INTERPRETATION

2.1 General

SI plots for A and B directions are presented in Section D and are summarized below. Where movement has been recorded the resultant plot (X direction) and rate of movement have also been provided. Standpipe piezometer results are also provided in Section D.

2.2 Zones of Movement

No new zones of movement were observed since the last set of readings recorded in the fall of 2015.

Historical zones of movement are summarized on Table NC014-1-1 at the end of this report. Table NC014-1-1 also provides a historical account of the total movement that has occurred at this site since the initialization of the slope inclinometers, the depth of movement, and the maximum rate of movement.



2.3 Interpretation of Monitoring Results

Slope inclinometers SI06-6 and SI06-11 have recorded no discernible movements since initialization.

The majority of standpipes did not display a significant variation in groundwater levels. The groundwater levels varied by \pm 0.18 m or less in all of the standpipes. The large spike in groundwater level in SP06-18 recorded in the fall 2015 readings was confirmed during this monitoring event. SP06-19 continued to be dry. Table NC014-1-2 provides a summary of standpipe piezometer readings.

3. RECOMMENDATIONS

3.1 Future Work

The instruments should be read again in the fall of 2016.

3.2 Instrumentation Repairs

No instrument repairs are needed at this time.

Client: Alberta Transportation Date: June 24, 2016

File: 13357

E-file: \\H13357 rpt NC014-1 Page 2 of 5



TABLE NC014-1-1 SPRING 2016 – FORT ASSINIBOINE SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: May 30, 2016

INSTRUMENT#	DATE INITIALIZED	TOTAL CUMULATIVE RESULTANT MOVEMENT AND DEPTH OF MOVEMENT TO DATE (mm)	MAXIMUM RATE OF MOVEMENT (mm/yr)	CURRENT STATUS OF SI	DATE OF PREVIOUS READING	INCREMENTAL MOVEMENT SINCE PREVIOUS READING (mm)	CURRENT RATE OF MOVEMENT (mm/yr)	CHANGE IN RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr)
SI06-6	Mar. 31, 2006	No discernable movement	N/A	Operational	September 20, 2015	No discernible movement	N/A	N/A
SI06-11	Apr. 1, 2006	No discernable movement	N/A	Operational	September 20, 2015	No discernible movement	N/A	N/A
SI06-12	Mar. 30, 2006	4.3 over 6.4 m depth to 6.8 m depth in 193° direction	1.5 mm/yr between September 2010 and May 2011	Blocked/ Destroyed	May 13, 2011	N/A	N/A	N/A
SI06-15	Mar. 28, 2006	No discernable movement	N/A	Blocked	May 22, 2007	N/A	N/A	N/A
SI06-16	Mar. 29, 2006	4.0 over 4.6 m depth to 8.2 m depth in 183° direction	2.6 mm/yr between May 2007 and May 2008	Sheared off at 7.8 m	Sept. 28, 2009	N/A	N/A	N/A

Drawing 13357-NC014-1 in section D provides a sketch of the approximate location of the monitoring instrumentation for this site.

Client: Alberta Transportation

File: 13357

E-file: \\H\13357 rpt NC014-1 Page 3 of 5

Date: June 24, 2016



TABLE NC014-1-2 SPRING 2016 – FORT ASSINIBOINE STANDPIPE PIEZOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: May 30, 2016

INSTRUMENT#	DATE INITIALIZED	TIP DEPTH (mBGS)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM GROUNDWATER LEVEL (mBGS)	MEASURED GROUNDWATER LEVEL (mBGS)	PREVIOUS READING (mBGS)	CHANGE IN GROUNDWATER LEVEL SINCE PREVIOUS READING (m)
SP06-1	Apr. 2, 2006	9.13	N/A	Active	Oct. 5, 2007 (2.35)	2.76	2.58	-0.18
SP06-2	Apr. 2, 2006	9.12	N/A	Active	May 28, 2006 (5.51)	5.81	5.84	0.03
SP06-3	Apr. 2, 2006	25.00	N/A	Active	May 27, 2015 (3.72)	5.80	5.85	0.05
SP06-4	Mar. 31, 2006	15.21	N/A	Active	Oct. 5, 2007 (8.72)	8.95	8.98	0.03
SP06-5	Mar. 31, 2006	25.00	N/A	Active	Apr. 2, 2006 (9.46)	14.53	14.53	0.00
SP06-9	Apr. 1, 2006	15.24	N/A	Active	Apr. 2, 2006 (4.46)	6.57	6.59	0.02
SP06-10	Apr. 2, 2006	25.00	N/A	Active	Apr. 2, 2006 (6.72)	7.36	7.41	0.05
SP06-13	Apr. 2, 2006	9.95	N/A	Active	Sept. 11, 2013 (7.04)	7.15	7.08	-0.07
SP06-14	Mar. 28, 2006	9.16	N/A	Active	Oct. 5, 2007 (7.03)	7.41	7.30	-0.11

Drawing 13357-NC014-1 in section D provides a sketch of the approximate location of the monitoring instrumentation for this site.

Client: Alberta Transportation

File:

\\H\13357 rpt NC014-1 Page 4 of 5 E-file:

Date: June 24, 2016



TABLE NC014-1-2 - CONTINUED... SPRING 2016 - FORT ASSINIBOINE STANDPIPE PIEZOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: May 30, 2016

INSTRUMENT#	DATE INITIALIZED	TIP DEPTH (mBGS)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM GROUNDWATER LEVEL (m)	MEASURED GROUNDWATER LEVEL (mBGS)	PREVIOUS READING (mBGS)	CHANGE IN GROUNDWATER LEVEL SINCE PREVIOUS READING (m)
SP06-17	Apr. 2 2006	8.83	N/A	Destroyed	27 September 2011 (6.12)	N/A	N/A	N/A
SP06-18	Apr. 2, 2006	9.43	N/A	Active	30 May 2012 (2.32)	2.35	2.35	0.00
SP06-19	Apr. 2, 2006	7.95	N/A	Active	10 October 2006 (7.01)	Dry	Dry	N/A
A11	N/A	N/A	N/A	Destroyed	28 May 2006 (6.70)	N/A	N/A	N/A

Drawing 13357-NC014-1 in section D provides a sketch of the approximate location of the monitoring instrumentation for this site.

Client: Alberta Transportation

File: 13357

E-file: \\H\13357 rpt NC014-1 Page 5 of 5

Date: June 24, 2016



ALBERTA TRANSPORTATION NORTH CENTRAL REGION – ATHABASCA AREA INSTRUMENTATION MONITORING RESULTS

SPRING 2016

SECTION D
DATA PRESENTATION

SITE NC014-1: HWY 661:02 FORT ASSINIBOINE

ALBERTA TRANSPORTATION NORTH CENTRAL REGION - ATHABASCA AREA INSTRUMENTATION MONITORING FIELD SUMMARY (NC014-1) SPRING 2016

Location: North of Fort Assiniboine (HWY 661:02 C1 1.690)

File Number: 13357 Probe: RST #8 Readout: RST #8 Extension: 2.75" Temp: 16°C

Cable: RST #8

Read by: MSD/NKR

SLOPE INCLINOMETER (SI) READINGS

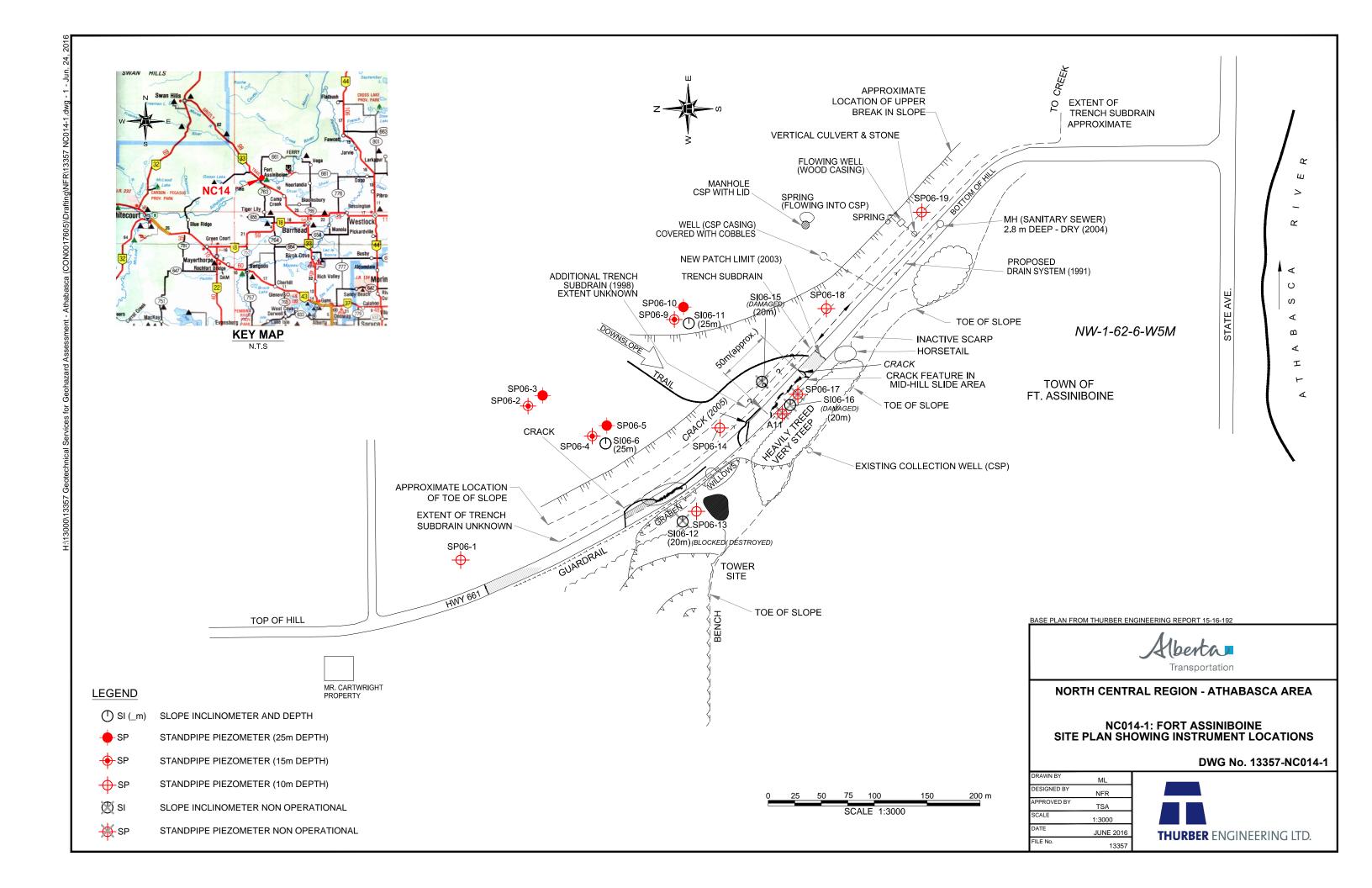
SI#		ocation D83)	Date	Stickup	Depth from top	Azimuth of	Current Bottom			Remarks	
1				(ft)	of casing (ft)	A+ Groove		Depth F	Readings		
	Latitude (N)	Longitude (W)			*		A+	A-	B+	B-	
06-6	54.3388890	114.7741670	30-May-16	3	83 to 5	170°	554	-553	410	-409	
06-11	54.3390330	114.7719000	30-May-16	3	81 to 3	181°	370	-369	-672	669	

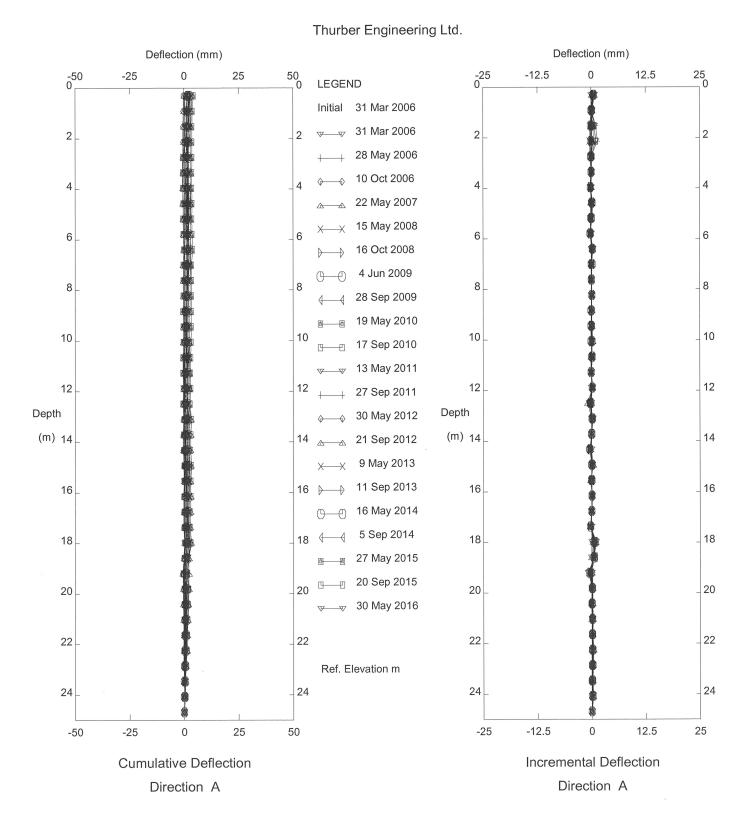
STANDPIPE PIEZOMETER (SP) READINGS

SP#	GPS Location (NAD83)		Date	Stick-up	Reading below	Bottom Pipe Depth
	Latitude (N)	Longitude (W)		(m)	top of casing (m)	(below top of casing (m)
06-1	54.340556	114.775833	30-May-16	1.05	3.81	9.13
06-2	54.339500	114.773383	30-May-16	0.95	6.76	9.12
06-3	54.339500	114.773367	30-May-16	0.78	6.58	25.00
06-4	54.338889	114.774167	30-May-16	0.78	9.73	15.21
06-5	54.338889	114.774167	30-May-16	0.93	15.46	25.00
06-9	55.339033	114.771900	30-May-16	0.72	7.29	15.24
06-10	54.339033	114.771900	30-May-16	0.80	8.16	25.00
06-13	54.338611	114.774444	30-May-16	0.90	8.05	9.95
06-14	54.338333	114.773611	30-May-16	0.97	8.38	9.16
06-18	54.336111	114.770000	30-May-16	1.20	3.55	9.43
06-19	54.336111	114.770000	30-May-16	0.99	DRY	7.95

INSPECTOR REPORT

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Hwy 661:02 Ft Assiniboine, Inclinometer SI06-6
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Thurber Engineering Ltd. Deflection (mm) Deflection (mm) -50 0 ___ 25 __0 25 -25 0__ -12.5 0 12.5 -25 0 LEGEND Initial 31 Mar 2006 31 Mar 2006 2 2 28 May 2006 10 Oct 2006 4 22 May 2007 15 May 2008 6 6 6 16 Oct 2008 4 Jun 2009 8 8 8 28 Sep 2009 19 May 2010 10 10 10 17 Sep 2010 13 May 2011 12 12 12 27 Sep 2011 Depth Depth → 30 May 2012 (m) 14 (m) 14 14 🚊 21 Sep 2012 14 9 May 2013 11 Sep 2013 16 16 16 16 May 2014 5 Sep 2014 18 18 18 27 May 2015 20 Sep 2015 20 20 20 ⊸ 30 May 2016 22 22 _ 22 22 Ref. Elevation m 24 24 24 24 -12.5 12.5 25 -50 -25 25 -25 Incremental Deflection

Hwy 661:02 Ft Assiniboine, Inclinometer SI06-6 Alberta Transportation

Cumulative Deflection

Direction B

Direction B

Thurber Engineering Ltd. Deflection (mm) Deflection (mm) 25 __0 -12.5 -50 0__ -25 -25 0__ 12.5 LEGEND 1 Apr 2006 Initial 1 Apr 2006 2 2 2 28 May 2006 10 Oct 2006 4 4 4 22 May 2007 15 May 2008 6 6 6 16 Oct 2008 4 Jun 2009 8 8 8 28 Sep 2009 19 May 2010 10 10 10 10 17 Sep 2010 13 May 2011 12 12 12 12 27 Sep 2011 Depth Depth 30 May 2012 (m) 14 (m) 14 14 21 Sep 2012 9 May 2013 11 Sep 2013 16 16 16 16 May 2014 5 Sep 2014 18 18 18 27 May 2015 20 Sep 2015 20 20 20 30 May 2016 22 22 22 22 Ref. Elevation m 24 24 24 24 0 12.5 25 -25 25 -12.5 -50 50 -25 Incremental Deflection **Cumulative Deflection**

Hwy 661:02 Ft Assiniboine, Inclinometer SI-11

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Direction A

Direction A

Thurber Engineering Ltd. Deflection (mm) Deflection (mm) 25 ___0 -50 0__ -25 25 -25 0__ -12.5 12.5 LEGEND 1 Apr 2006 Initial 1 Apr 2006 2 2 2 28 May 2006 10 Oct 2006 4 4 4 22 May 2007 15 May 2008 6 6 6 16 Oct 2008 4 Jun 2009 8 8 8 28 Sep 2009 19 May 2010 10 10 10 17 Sep 2010 13 May 2011 12 12 12 Depth Depth △ 30 May 2012 (m) 14 (m) 14 14 ____ 21 Sep 2012 9 May 2013 ___ 11 Sep 2013 16 16 16 16 May 2014 5 Sep 2014 18 18 18 ___ 27 May 2015 20 Sep 2015 20 20 20 30 May 2016 22 22 22 22 Ref. Elevation m 24 24 24 24 -25 25 -12.5 0 12.5 -50 50 -25 25 **Cumulative Deflection** Incremental Deflection

Hwy 661:02 Ft Assiniboine, Inclinometer SI-11

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Direction B

Direction B

HWY661:02 FORT ASSINIBOINE (NC014-1) - STANDPIPE DATA WATER TABLE DEPTH

