



THURBER ENGINEERING LTD.

**ALBERTA TRANSPORTATION
PEACE REGION (PEACE RIVER / HIGH LEVEL)
INSTRUMENTATION MONITORING RESULTS**

FALL 2016

SECTION C

SITE PH047-1: HWY 690:02, DEADWOOD SLIDE

1. OBSERVATIONS

1.1 Field Program and Instrumentation Status

Two slope inclinometers (SI15-01 and SI15-02) were installed (by others) at the Hwy 690:02 Deadwood Slide site during construction in the fall of 2015. The majority of construction work was completed by the end of November 2015. The two SIs were read on October 4, 2016 by Mr. Niraj Regmi, G.I.T. and Mr. Chris McCarthy, 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 casings.

2. INTERPRETATION

2.1 General

SI plots with A and B directions are presented in Section D and are summarized below. Where movement has been recorded, the resultant plot (X direction, if applicable) and a rate of movement have also been provided.



2.2 Zones of Movement

Zones of new movement were not observed in slope inclinometers SI15-01 and SI15-02 since the spring of 2016 readings.

Zones of movement are summarized in Table PH047-1-1 at the end of this report. This table also provides a historical account of the total movement, the depth of movement, and the maximum rate of movement that has occurred at this site since the initialization of the slope inclinometers.

2.3 Interpretation of Monitoring Results

Slope indicator SI15-01 showed a rate of movement of 2.3 mm/yr over 5.7 m to 7.5 m depth. SI15-02 showed a rate of movement of 3.0 mm/yr over 4.7 m to 6.0 m depth.

Historical groundwater levels recorded in the piezometers are summarized in Tables PH047-1-2 and PH047-1-3 at the end of this report. There are no piezometers left at this site.

3. RECOMMENDATIONS

3.1 Future Work

The instruments should be read again during the spring of 2017.

3.2 Instrumentation Repairs

No instrumentation repairs are required at this time.



**TABLE PH047-1-1
FALL 2016 – DEADWOOD SLIDE
SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: October 4, 2016

INSTRUMENT #	DATE INITIALIZED	TOTAL CUMULATIVE RESULTANT MOVEMENT AT NOTED DEPTH SINCE INITIAL READING (mm)	MAXIMUM RATE OF MOVEMENT (mm/yr)	CURRENT STATUS	DATE OF PREVIOUS READING	INCREMENTAL MOVEMENT SINCE PREVIOUS READING (mm)	RATE OF MOVEMENT (mm/yr)	CHANGE IN RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr)
SI15-01	October 14, 2015	43.7 mm over 5.7 m to 7.5 m depth in 166° direction	650 in October 2015	Operational	May 26, 2016	0.8	2.3	-7.0
SI15-02	October 14, 2015	57.1 mm over 4.7 m to 6.0 m depth in 157° direction	971 in October 2015	Operational	May 26, 2016	1.1	3.0	0.1

Drawing 13351-PH047-1-1 in Section D provides a sketch of the approximate locations of the monitoring instrumentation for this site.



**TABLE PH047-1-2
FALL 2016 – DEADWOOD SLIDE
STANDPIPE PIEZOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: October 4, 2016

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM WATER LEVEL BGS (m)	MEASURED WATER LEVEL BGS (m)	PREVIOUS READING (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
SP10-1	November 4, 2010	9.66	559.54	Blocked at 1.7 mBGS	4.60 on November 4, 2010	N/A	N/A	N/A
SP10-3	November 4, 2010	8.90	565.44	Destroyed	1.14 on May 27, 2011	N/A	N/A	N/A
SP10-5	April 27, 2010	2.92	561.27	Damaged	0.63 on July 27, 2011	N/A	N/A	N/A

Drawing 13351-PH047-1-1 in Section D provides a sketch of the approximate locations of the monitoring instrumentation for this site.

**TABLE PH047-1-3
FALL 2016 – DEADWOOD SLIDE
VIBRATING WIRE PIEZOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: October 4, 2016

INSTRUMENT	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM GROUNDWATER ELEVATION (m)	CURRENT GROUNDWATER ELEV. (m)	PREVIOUS GROUNDWATER ELEV. (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
VW10-1 (100D10918)	April 27, 2011	553.50	562.00	Non-operational	560.59 m on June 2, 2014 (1.41 mBGS)	N/A	N/A	N/A
VW10-2 (100D10917)	April 27, 2011	555.17	560.96	Non-operational	558.96 m on June 2, 2014 (2.00 mBGS)	N/A	N/A	N/A

Drawing 13351-PH047-1-1 in Section D provides a sketch of the approximate locations of the monitoring instrumentation for this site.



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FALL 2016

**SECTION D
DATA PRESENTATION**

SITE PH047-1: HWY 690:02, DEADWOOD SLIDE

ALBERTA TRANSPORTATION
 PEACE REGION (PEACE RIVER / HIGH LEVEL)
 INSTRUMENTATION MONITORING FIELD SUMMARY (PH047-1)
 FALL 2016

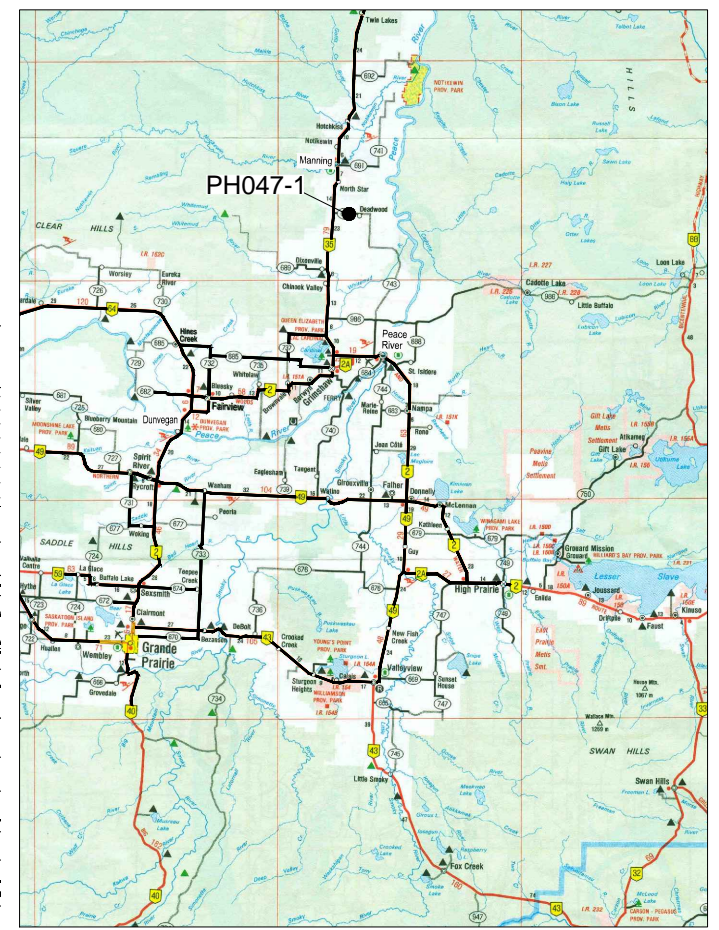
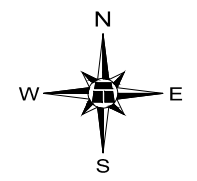
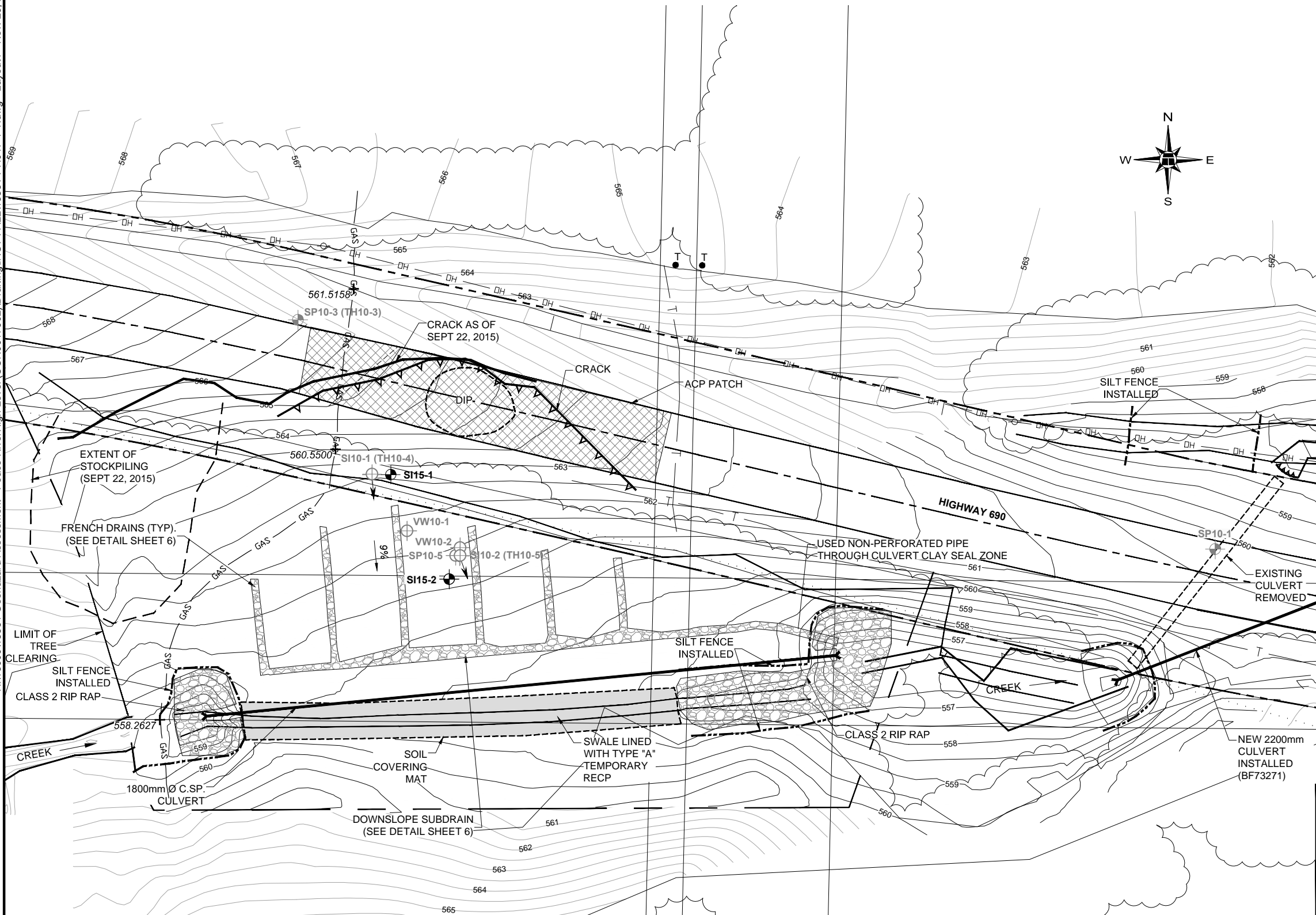
Location: Deadwood Slide (HWY 690:02 C1 2.431) File Number: 13351 Probe: RST #5R Cable: RST #5R	Readout: RST #5R Extension: 3.34 Temp: 1C Read by: CPM
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SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location (UTM 11)		Date	Stickup (m)	Depth from top of casing (ft)	Magn. North A+ Groove	Current Bottom Depth Readings				Remarks
	Easting (m)	Northing (m)					A+	A-	B+	B-	
SI15-01	462963.71	6288741.66	4-Oct-16	0.75	52 to 2	168	-17	25	-765	754	
SI15-02	462975.78	6288730.45	4-Oct-16	1.05	52 to 2	176	200	-195	529	516	*

INSPECTOR REPORT

* Hard to pull at 22 ft almost shear. Use dummy probe for next reading



LEGEND:

- INSTRUMENT LOCATION
- INSTRUMENT NOT IN USE
- SI** SLOPE INCLINOMETER

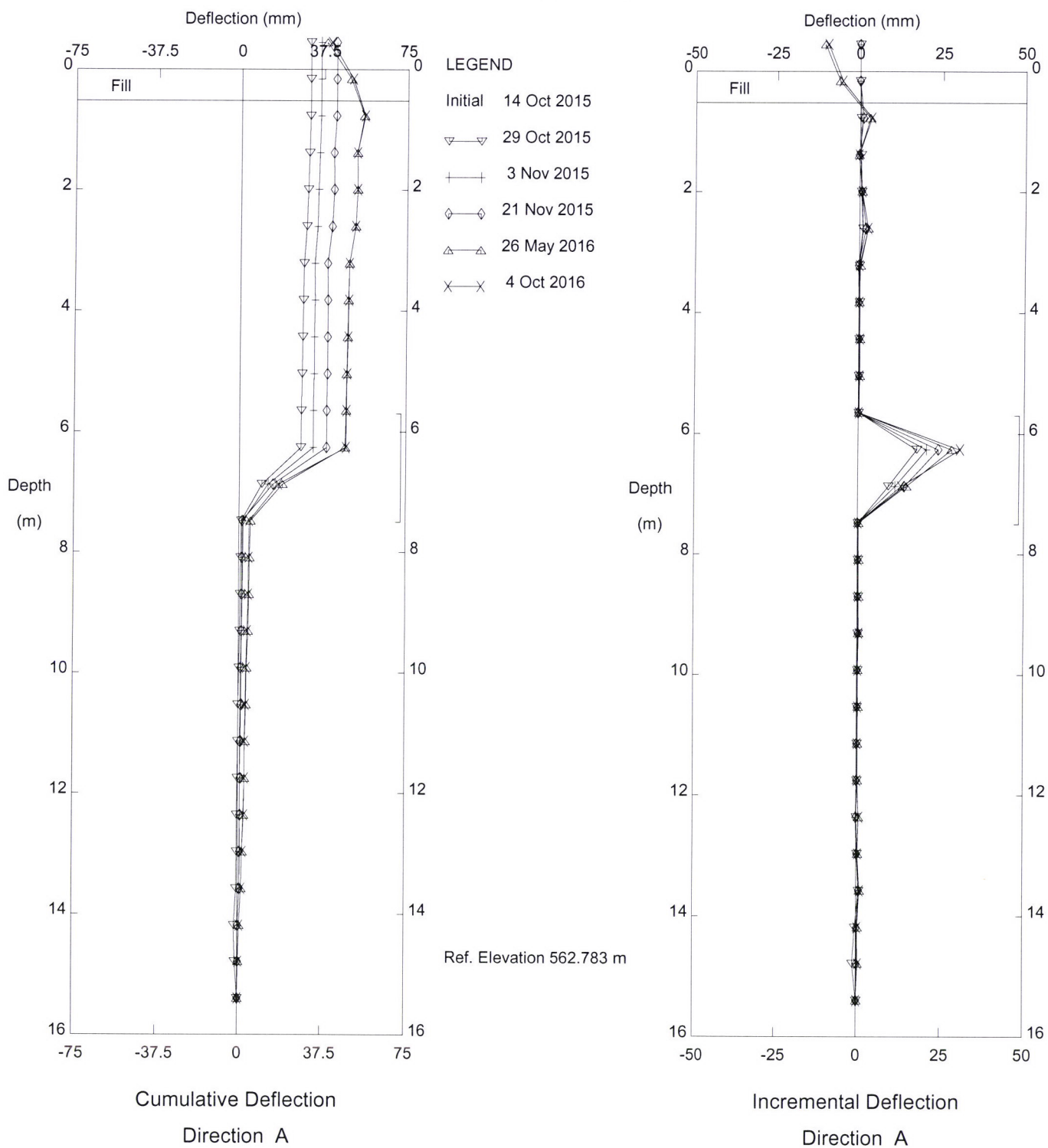
PEACE REGION (PEACE RIVER/ HIGH LEVEL) 2016

PH047-1: HWY 690:02 - DEADWOOD SLIDE INSTRUMENT LOCATIONS

DWG No. 13351-PH047-1-1

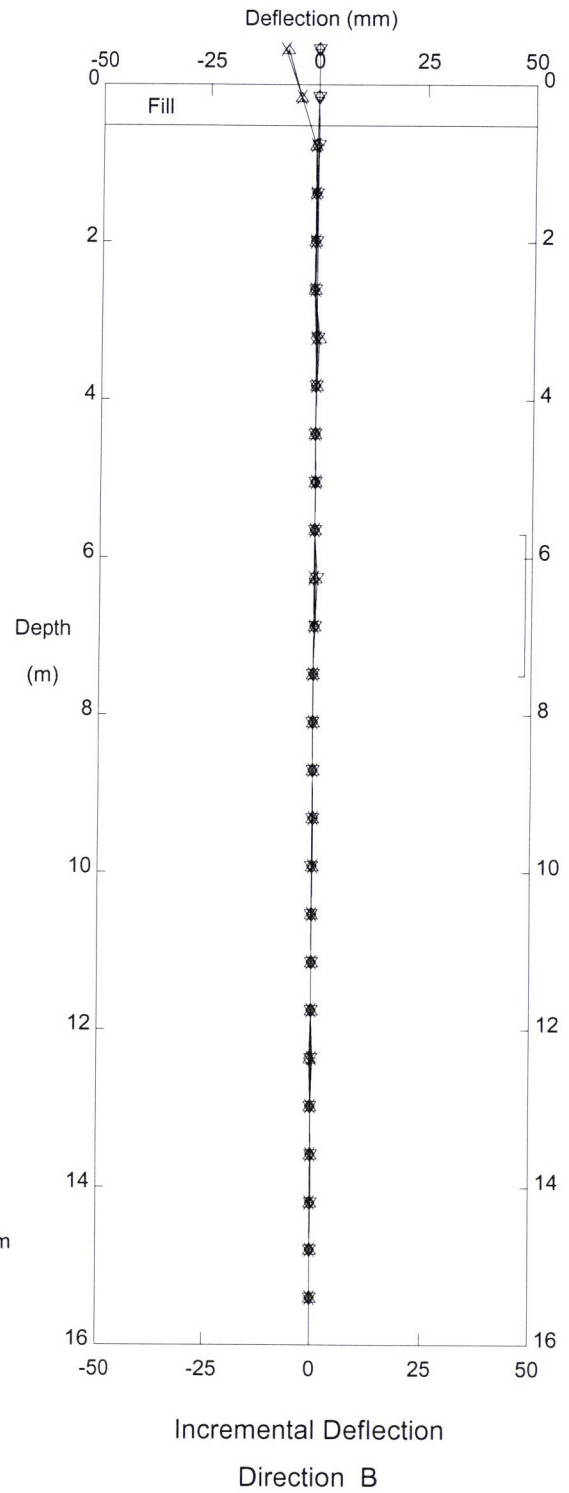
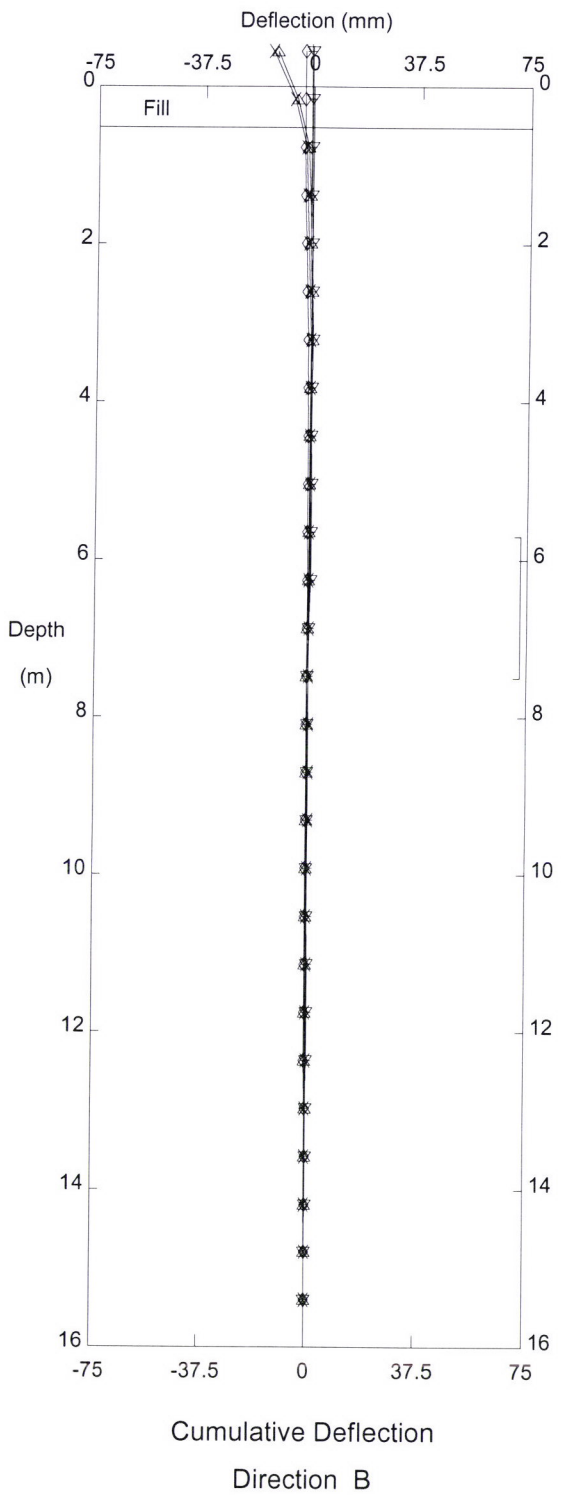
DRAWN BY	ML
DESIGNED BY	NFR
APPROVED BY	DWP
SCALE	1:600
DATE	NOVEMBER 2016
FILE No.	13351

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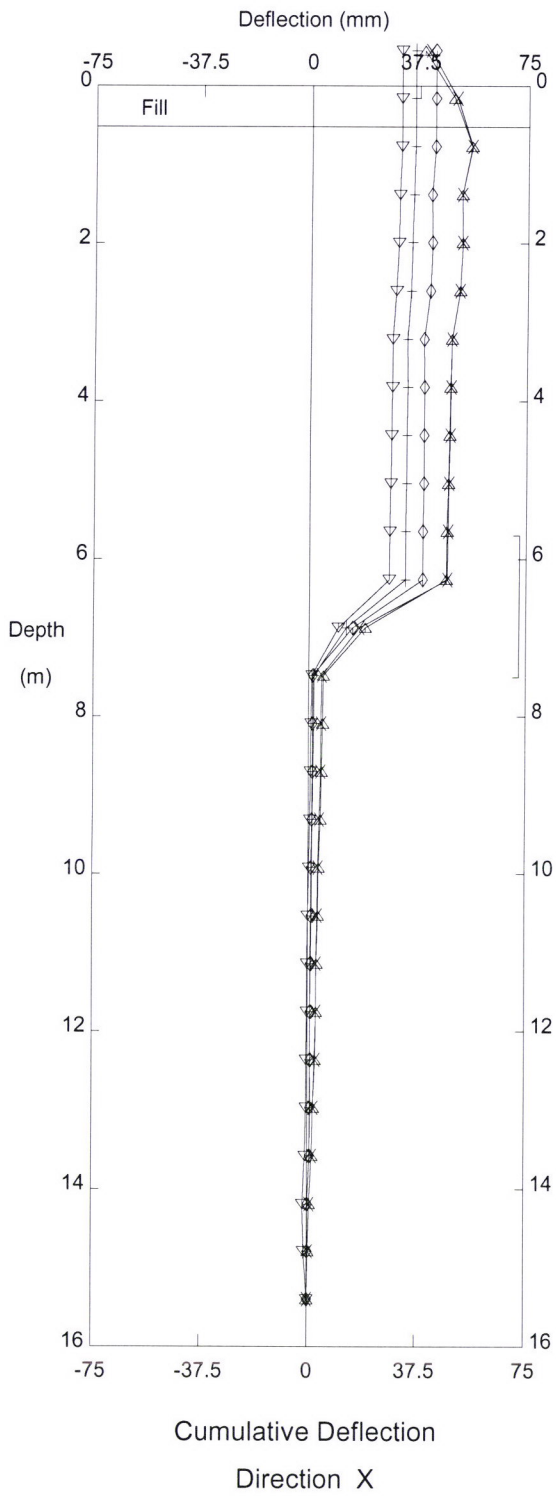
PH47-Deadwood, Inclinometer SI15-01

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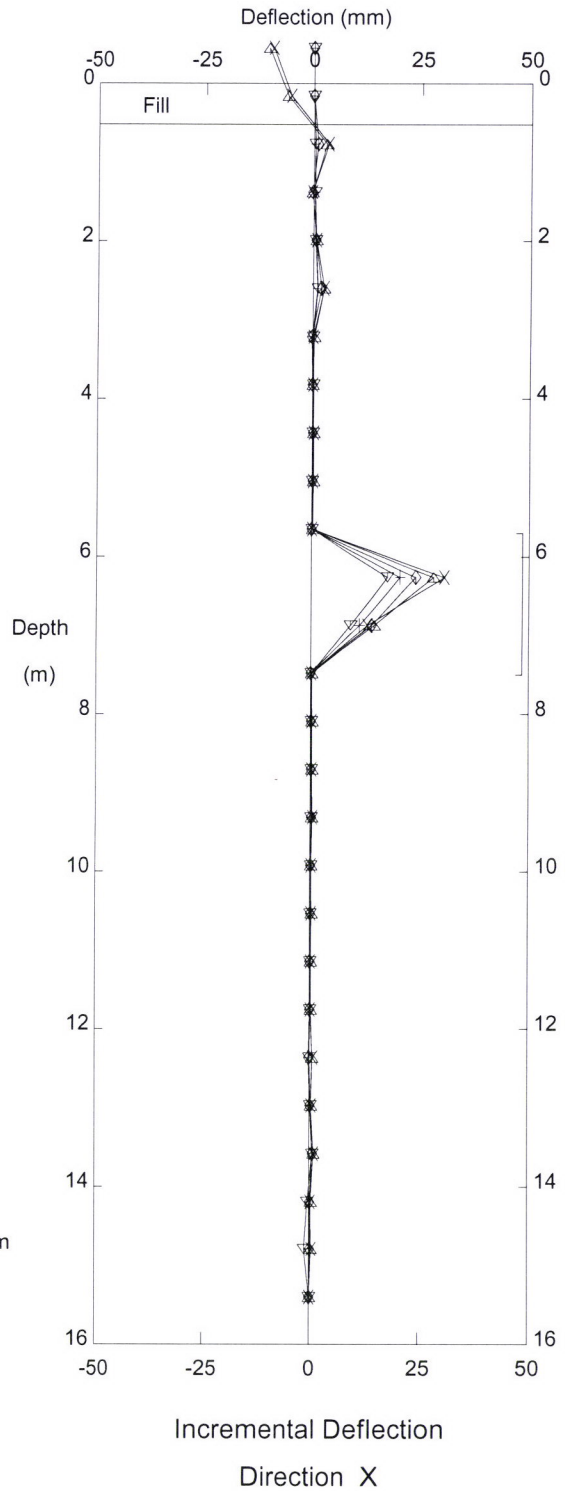
PH47-Deadwood, Inclinometer SI15-01

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- LEGEND
- Initial 14 Oct 2015
 - ▽ 29 Oct 2015
 - + 3 Nov 2015
 - ◇ 21 Nov 2015
 - △ 26 May 2016
 - × 4 Oct 2016

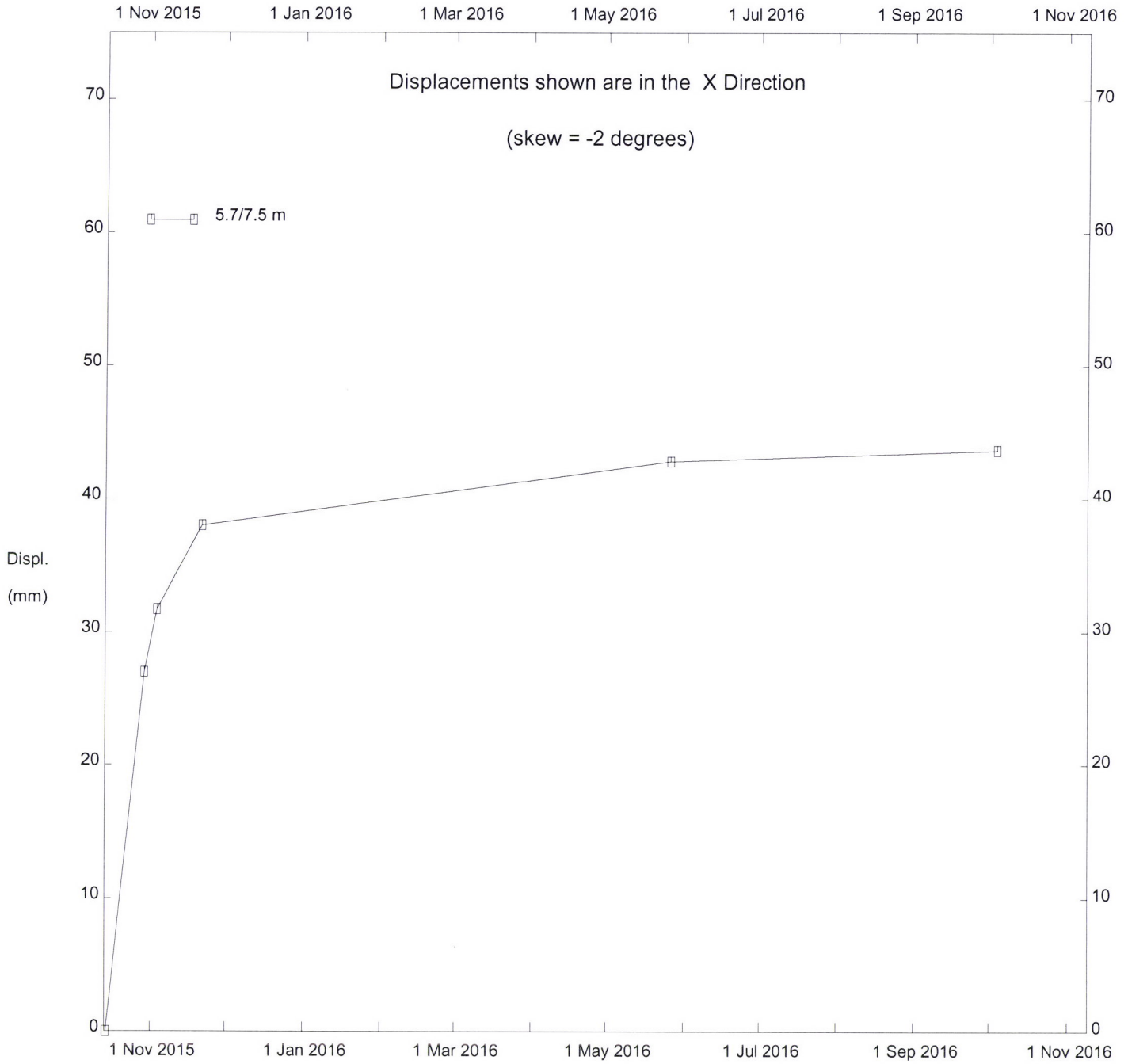
Ref. Elevation 562.783 m
skew = -2deg



PH47-Deadwood, Inclinator SI15-01

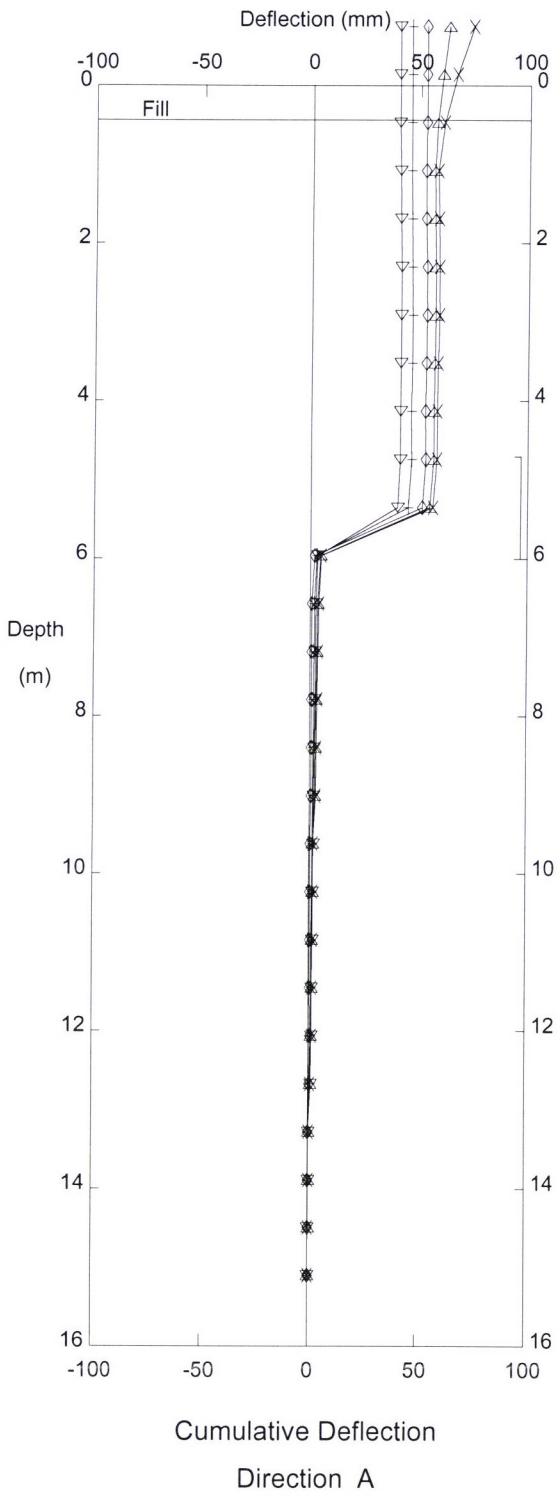
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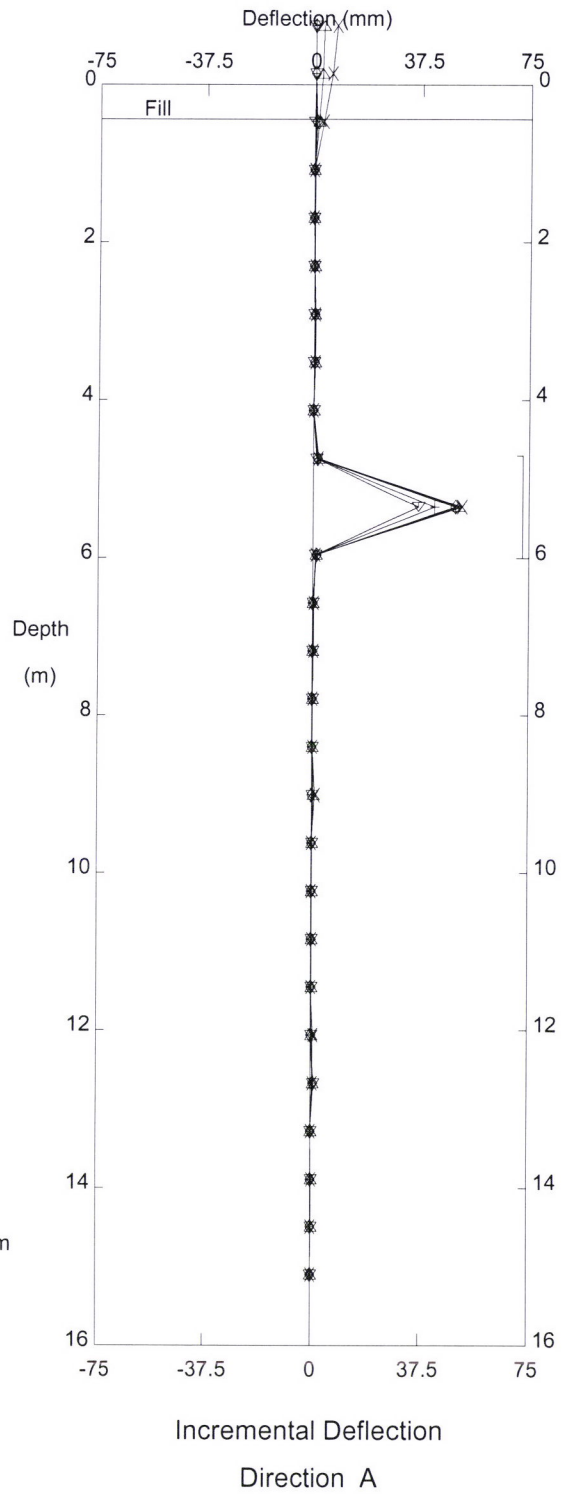


PH47-Deadwood, Inclinator SI15-01

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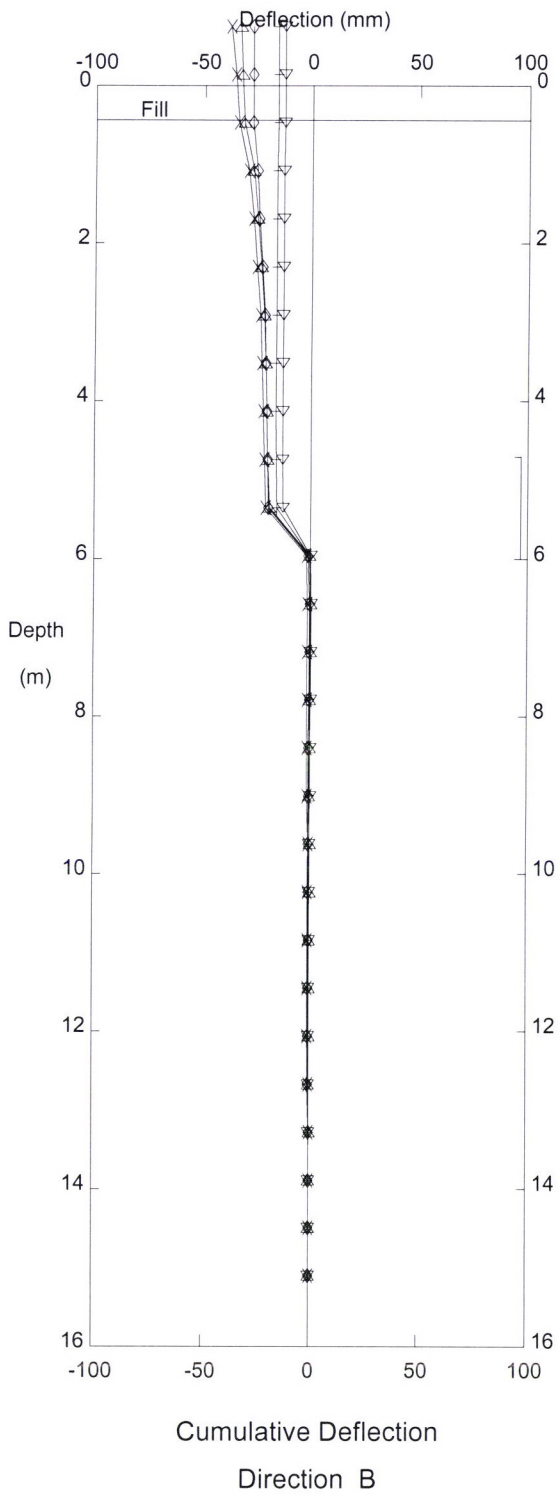
- LEGEND
- Initial 14 Oct 2015
 - ▽ 29 Oct 2015
 - + 3 Nov 2015
 - ◇ 21 Nov 2015
 - △ 26 May 2016
 - X 4 Oct 2016



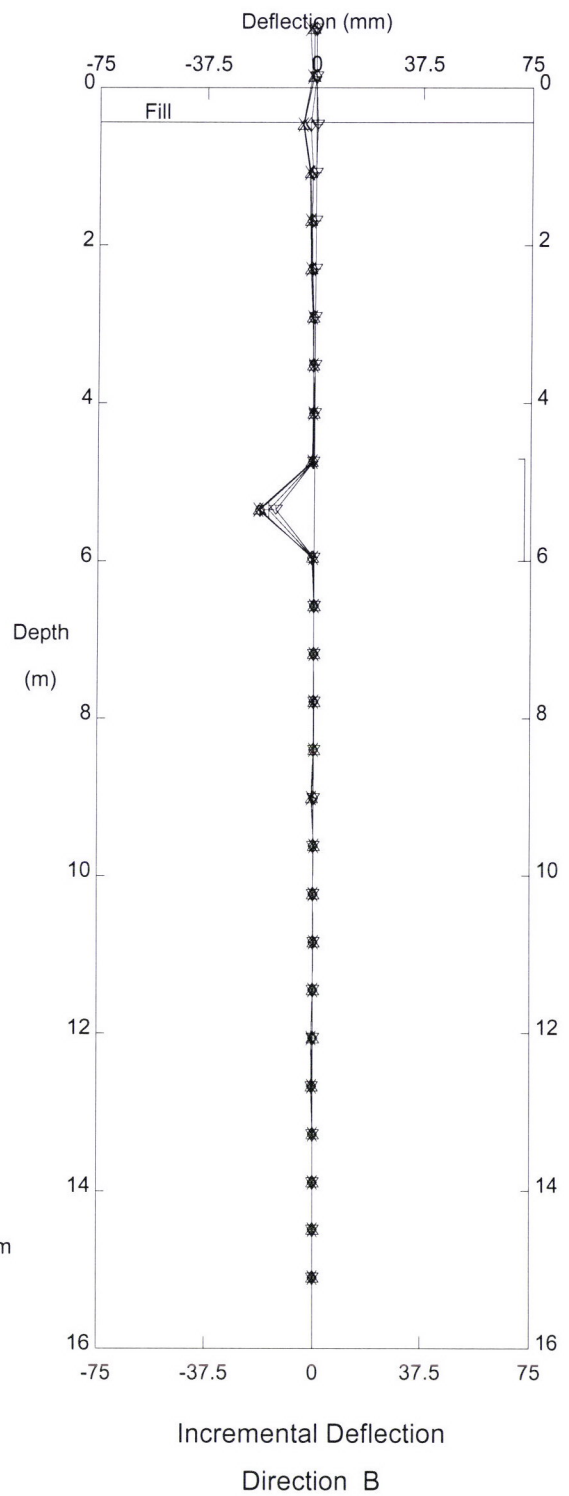
Ref. Elevation 561.400 m

PH47-Deadwood, Inclinator SI15-02

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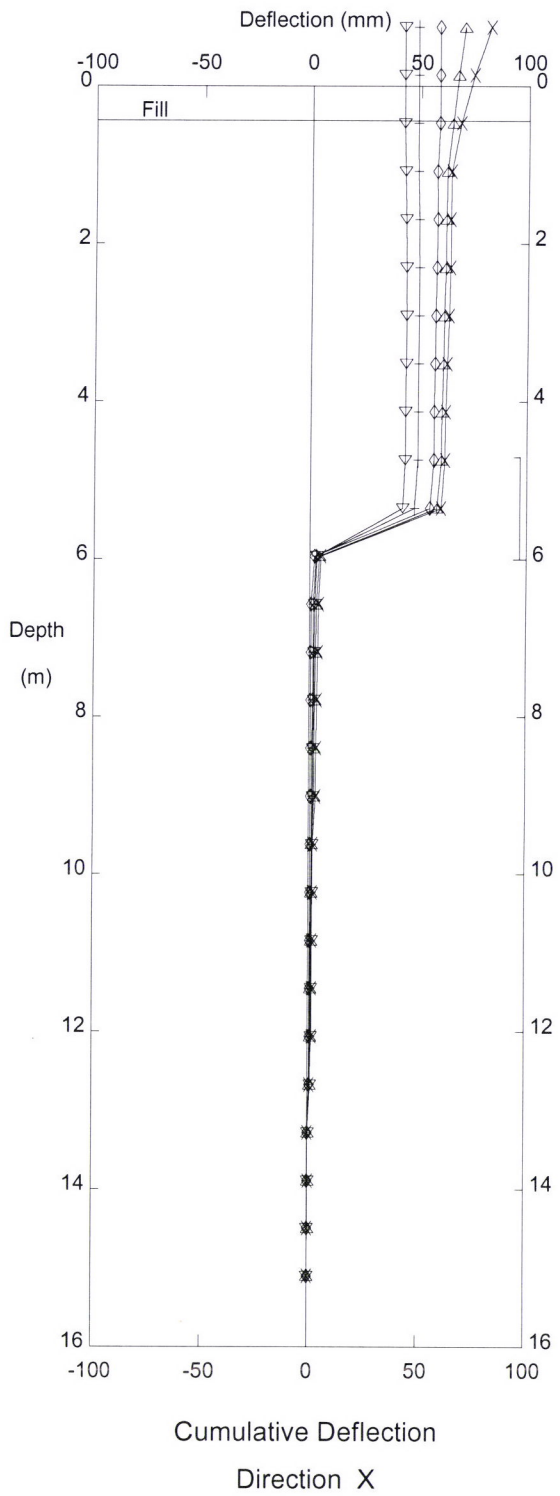


- LEGEND
- Initial 14 Oct 2015
 - ▽ 29 Oct 2015
 - + 3 Nov 2015
 - ◇ 21 Nov 2015
 - △ 26 May 2016
 - × 4 Oct 2016



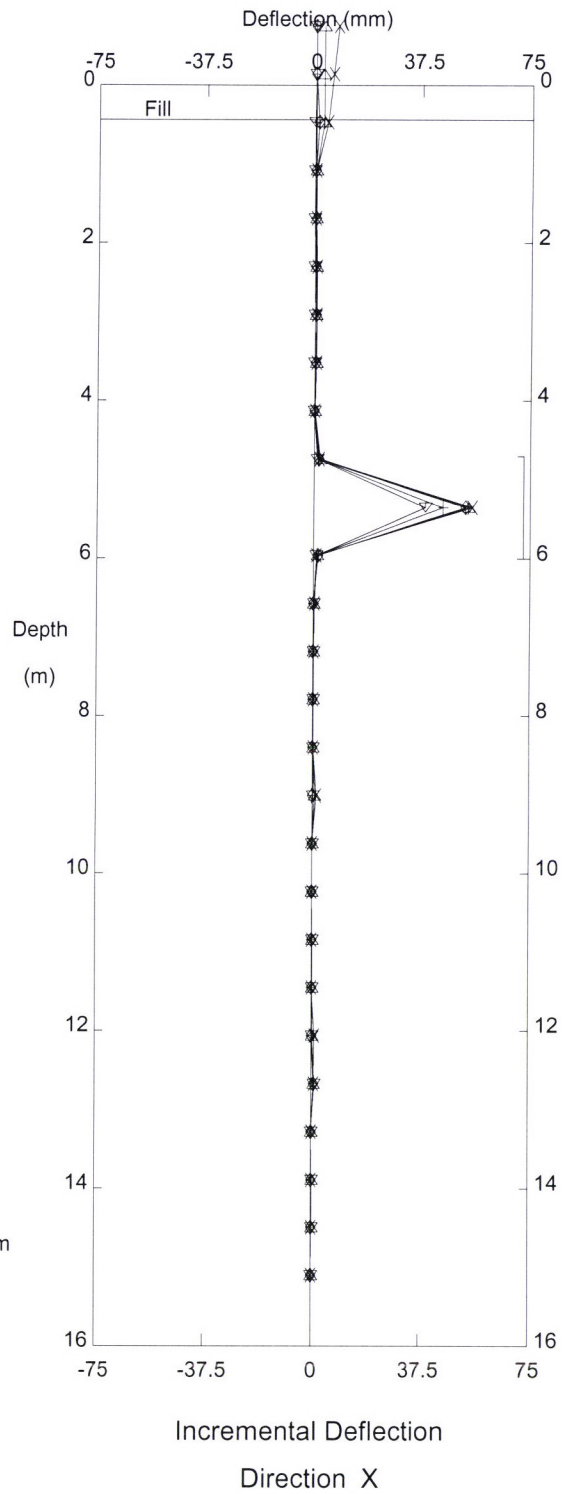
PH47-Deadwood, Inclinator SI15-02

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- LEGEND
- Initial 14 Oct 2015
 - ▽ 29 Oct 2015
 - ⊢ 3 Nov 2015
 - ◇ 21 Nov 2015
 - △ 26 May 2016
 - × 4 Oct 2016

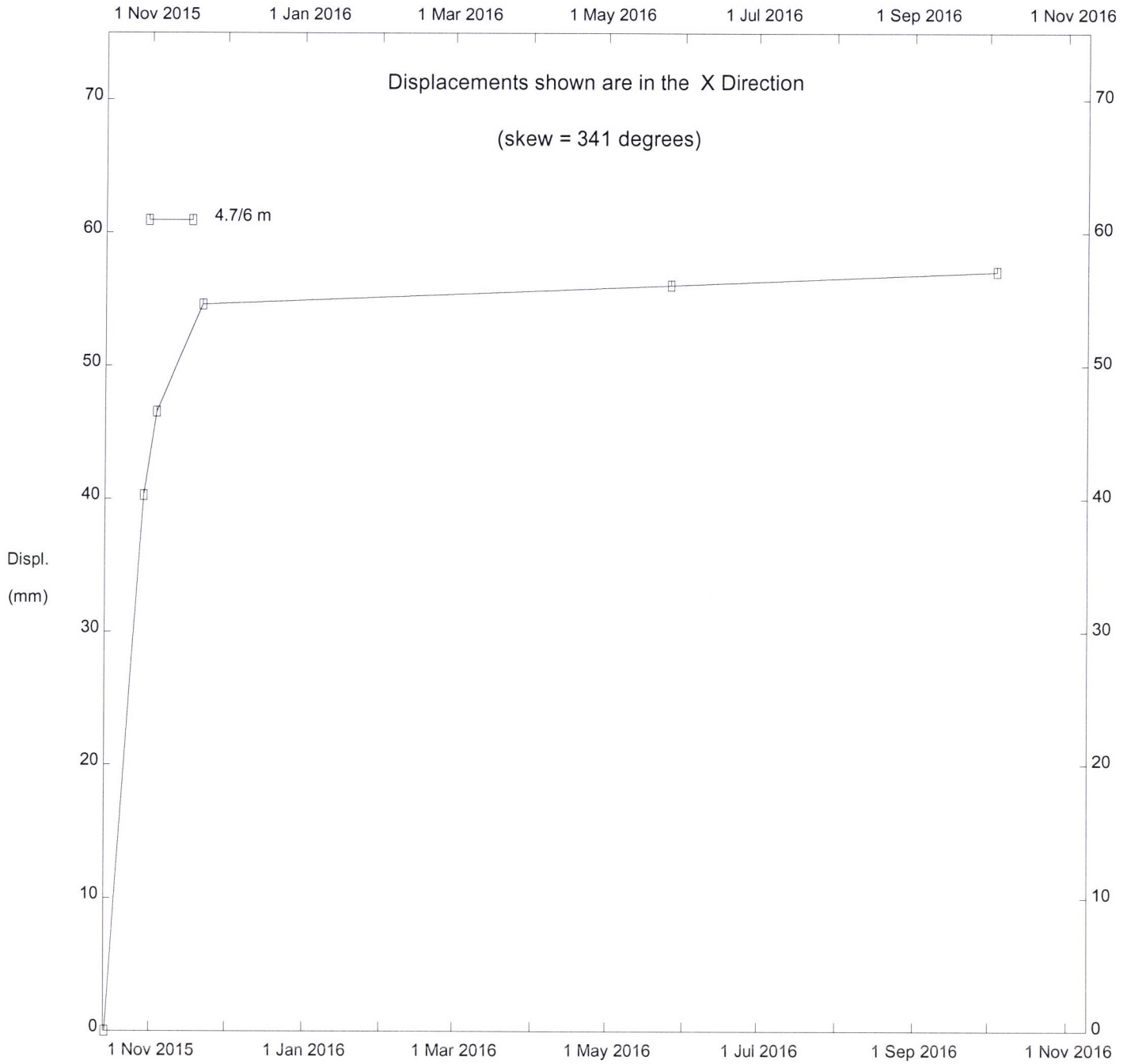
Ref. Elevation 561.400 m
skew = 341deg



PH47-Deadwood, Inclinator SI15-02

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PH47-Deadwood, Inclinator SI15-02

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