

**ALBERTA TRANSPORTATION AND
ECONOMIC CORRIDORS GRMP
PEACE REGION
(GRANDE PRAIRIE DISTRICT - NORTH)
INSTRUMENTATION MONITORING - FALL 2024**



Site Number	Location	Name	Hwy	km
PH037	Station 1+250 to 2+000	Dunvegan South	2:68	Km 15.7
Legal Description: 4-7-80-4 W6		UTM Co-ordinates		
		11U E 398593.62	N	6197597.09

Current Monitoring:	28-May-2024	Previous Monitoring	28-May-2024
Instruments Read By:	Mr. Neil McDonald and Mr. Nixson Mationg of Thurber		

Instruments Read During This Site Visit			
Slope Inclinometers (SIs): SI54 SI56 SI59 SI09 1 SI18-4 SI18-7 SI18-9	Pneumatic Piezometers (PN): SI55* SI58 SI61 SI09-7 SI18-5 SI18-8 SI18-10	Vibration Wire Piezometers (VW): PN18-1, PN18-2, PN18-3, PN18-4, PN18-5B, PN18-6A, PN18-7A, PN18-7B, PN18-7C, PN18-8A, PN18-8B, PN18-9A, PN18-9B, PN18-9C, PN18-10A, PN18-10B, PN18-12B, PN18-13A, PN18-13B, PN18-14A and PN18-14B	Standpipe Piezometers (SP): SP09-6 SP09-8
Load Cell (LC):	Strain Gauges:	SAA:	Others:

Readout Equipment Used			
Slope Inclinometers: Two RST Digital Inclinometer probes with 2 ft wheelbases and RST Pocket PC readouts	Pneumatic Piezometers: RST C108 pneumatic piezometer readout	Vibration Wire Piezometers:	Standpipe Piezometers: Heron dipmeter
Load Cell:	Strain Gauges:	SAA:	Others:
Note *SI-55 was found to have been damaged and bent near the surface since the spring of 2024 readings.			

Discussion	
Zones of New Movement:	None
Interpretation of Monitoring Results:	<p>The site is very large. To assist with interpretation the slope indicator results have been grouped into three zones: South, Central and North. Slope indicators are listed moving from south to north within each zone; offsets to the west represent SIs downslope of the highway while east offsets represent SIs upslope of the highway.</p> <p>South third of site:</p> <p>Slope indicator SI18-7 is just west of the highway and showed a rate of movement of 12.5 mm/yr along a distinct shear plane over 9.1 m to 11.6 m depth in a clay till layer. This movement rate has been steady since the SI was installed in 2018.</p>

SI18-4 is in the cut slope above the highway and shows no discernible movement throughout the 28 m length of the slope indicator pipe.

SI18-5 is just east of the highway and shows a rate of movement of 5.2 mm/yr over a distinct shear zone between 17.2 m to 20.3 m depth within a clay layer. This movement rate has been steady since the SI was installed in 2018.

SI09-7 is about 90 m west of the highway and has several zones of movement. A rate of movement of 0.4 mm/yr was measured over the past two years over the shear zone between 3.9 m to 6.3 m depth and the total movement since 2009 is about 8.1 mm. A rate of movement of 0.7 mm/yr was measured over 18.5 m to 20.3 m depth. This rate of movement has been steady since 2009 and total recorded movements are about 5.5 mm.

SI-59 is in the highway east ditch near the assumed backscarp north flank of the landslide that is affecting the highway. It showed a rate of movement of 0.4 mm/yr over 1.0 m to 7.1 m depth. This SI has moved 177.7 mm over this depth zone, since it was first installed in 1994. A slower moving, subtle shear zone at 13 m depth may be present.

Middle third of site:

SI18-8 is just west of the highway and showed a rate of movement of 3.9 mm/yr along a distinct shear plane over 14.5 m to 16.3 m depth in a clay layer. This movement rate has held steady since 2018 and total movement to date is about 23 mm.

SI-58 is about 100 m east of the highway and showed a rate of movement of 17 mm/yr over 0.5 m to 3.6 m depth. The movement pattern at SI-58 is bending with no well-defined shear zone.

SI-56 is just east of the highway and showed a rate of movement of 11.4 mm/yr over 0 m to 2.7 m depth. There are several subtle zones of movement deeper in SI-56 with movement rates less than 0.5 mm/yr. The overall movement pattern is bending in the upper 2 m and tilting below that depth.

SI18-9 is about 35 m west of the highway and showed a rate of movement of 3.5 mm/yr along a well-defined shear plane over 20.1 m to 22.0 m depth in a clay till layer.

North third of site:

SI18-10 is just west of the highway and showed a rate of movement of 9.0 mm/yr over 0 m to 3.0 m depth and a rate of movement of 1.8 mm/yr over 21.3 m to 23.2 m depth. The upper shear zone is tilting within a clay layer while the lower zone is a slowly developing distinct shear within a different clay layer.

Slope inclinometer SI-54 is about 70 m east of the highway and showed no discernible new movement over 0 m to 1.7 m depth since the spring of 2024 readings, which corresponds to a decrease in rate of movement of 61.1 mm/yr. Of more significance with this slope indicator is the lack of observed shear zones below the near ground surface movement zone.

SI09-1 is just west of the highway and showed a rate of movement of 1.1 mm/yr over 0.3 m to 7.0 m, and rates of movement of 0.7 mm/yr, and less than 0.1 mm/yr at depths between 7.0 m to 13.1 m, and 13.1 m to 14.9 m, respectively, since the spring of 2024 readings.

SI-61 is just west of the highway and just north of SI09-1; it showed a rate of movement of 2.9 mm/yr over 3.6 m to 10.3 m depth. The pattern of movement at SI-61 is best described as a bulge which is unusual for this site.

	Standpipe piezometers SP09-6 and SP09-8 continued to be dry. Most of the pneumatic piezometers except for PN18-6A generally showed relatively small changes in groundwater level compared to the spring of 2024, ranging from a decrease of 0.89 m in PN18-6A to an increase of 0.28 m in PN18-1. PN18-1 showed a groundwater elevation of 485.96 m, the highest measured in the instrument since it was initialized.
Future Work:	The instruments should be read again in the spring of 2025.
Instrumentation Repairs:	SI-55 should be checked to see if repairs are feasible and can be done by hand, or if mechanical excavation would be required.
Additional Comments:	

Attachments:	<ul style="list-style-type: none"> • Table PH037-1 Fall 2024 – HWY 2:68 Dunvegan South, Slope Inclinometer Reading Summary • Table PH037-2 Fall 2024 – HWY 2:68 Dunvegan South, Standpipe Piezometer Reading Summary • Table PH037-3 Fall 2024 – HWY 2:68 Dunvegan South, Pneumatic Piezometer Reading Summary • Statement of Limitations and Conditions • APPENDIX A - PH037-1 FALL 2024 <ul style="list-style-type: none"> ○ Field Inspector's Report ○ Site Plan Showing Approximate Instrument Locations (Drawing No. 32123-PH037-1 and 32123-PH037-2) ○ SI Reading Plots ○ Figure PH037-1 (Standpipe Piezometric Elevations) ○ Figure PH037-2 (Standpipe Piezometric Depths) ○ Figure PH037-3 (Pneumatic Piezometric Elevations) ○ Figure PH037-4 (Pneumatic Piezometric Depths)
---------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

We trust this report meets your requirements at present. If you have any questions, please contact the undersigned at your convenience.

Yours very truly,
Thurber Engineering Ltd.
Roger Skirrow, M.Sc., P. Eng.
Senior Geotechnical Engineer

Lucas Green, P.Eng.
Geotechnical Engineer

Table PH037-1: Fall 2024 – HWY 2:68 Dunvegan South Slope Inclinometer Instrumentation Reading Summary

Date Monitored: September 26, 2024

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)
South Third of Site								
SI18-7	February 21, 2018	81.0 mm over 9.1 m to 11.6 m depth in 269° direction	17.2 mm/yr in April 2018	Operational	May 28, 2024	4.1	12.5	-0.8
SI-66	Jan. 21, 1993	54.7 mm over 0.6 m to 6.7 m depth in 330° direction	10.4 mm/yr In June 1994	Sheared at 4.3 m	September 25, 2011	N/A	N/A	N/A
SI18-4	February 12, 2018	No discernible movement	N/A	Operational	May 28, 2024	N/A	N/A	N/A
SI09-9	Sept. 30, 2009	34.2 mm over 12.0 m to 15.1 m depth in 240° direction	8.7 mm/yr in May 2010	Sheared at 13.3 mBGS	May 25, 2015	N/A	N/A	N/A
SI18-5	February 16, 2018	45.8 mm over 17.2 m to 20.3 m depth in 303° direction	10.5 mm/yr in April 2018	Operational	May 28, 2024	1.7	5.2	-2.2
SI09-5	Sept. 30, 2009	40.3 mm over 24.9 m to 27.3 m depth in 270° direction	10.3 mm/yr in June 2011	Sheared at 26.1 m	September 19, 2014	N/A	N/A	N/A
SI09-7	Sept. 30, 2009	8.1 mm over 3.9 m to 6.3 m depth in 311° direction	5.3 mm/yr in September 2011	Operational	May 28, 2024	0.1	0.4	0.7
		5.5 mm over 18.5 m to 20.3 m depth in 286° direction	1.1 mm/y in October 2017			<0.1	<0.1	-0.5
SI-59	Aug. 26, 1992	177.7 mm over 1.0 m to 7.1 m depth in 300° direction	16.4 mm/yr in March 1995	Operational	October 16, 2023	0.1	0.4	-5.9

Drawings 32123-PH037-1 and 32123-PH037-2 in Appendix A provide sketches of the approximate locations of the monitoring instrumentation for this site.

Table PH037-1 – Continued... Fall 2024 – HWY 2:68 Dunvegan South Slope Inclinometer Instrumentation Reading Summary

Date Monitored: September 26, 2024

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)
South Third of Site Continued								
SI18-6	February 15, 2018	42.6 mm over 32.1 m to 35.1 m depth in 307° direction	12.6 mm/yr in October 2020	Sheared off at 34.7 m depth	October 5, 2022	N/A	N/A	N/A
SI09-4	Sept. 30, 2009	33.3 mm over 23.8 m to 26.3 m depth in 250° direction.	10.6 mm/yr in November 2009	Sheared at 24.4 m	September 19, 2014	N/A	N/A	N/A

Drawings 32123-PH037-1 and 32123-PH037-2 in Appendix A provide sketches of the approximate locations of the monitoring instrumentation for this site.

Table PH037-1 – Continued... Fall 2024 – HWY 2:68 Dunvegan South Slope Inclinometer Instrumentation Reading Summary

Date Monitored: September 26, 2024

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)
Middle Third of Site								
SI18-8	February 12, 2018	23.0 mm over 14.5 m to 16.3 m depth in 266° direction	5.1 mm/yr in April 2018	Operational	May 28, 2024	1.3	3.9	0.4
SI-58	Aug. 26, 1992	159.9 mm over 0.5 m to 3.6 m depth in 270° direction	41.7 mm/yr in October 1998	Operational	October 16, 2023	5.7	17.0	15.0
SI-57	Aug. 26, 1992	193.3 mm over 0.0 m to 2.3 m depth in 283° direction	44.2 mm/yr in October 1998	Sheared at 3.7 m	September 19, 2015	N/A	N/A	N/A
SI-56	Aug. 26 1992	73.8 mm over 0.0 m to 2.7 m depth in 12° direction	21.5 mm/yr in October 1998	Operational	October 16, 2023	3.8	11.4	6.4
SI-55	Aug. 27, 1992	57.6 mm over 1.3 m to 4.3 m depth in 281° direction	17.4 mm/yr in October 2021	Damaged	October 16, 2023	N/A	N/A	N/A
SI18-9	April 25, 2018	18.2 mm over 20.1 m to 22.0 m depth in 287° direction	3.2 mm/yr in October 2018	Operational	May 28, 2024	1.2	3.5	0.9

Drawings 32123-PH037-1 and 32123-PH037-2 in Appendix A provide sketches of the approximate locations of the monitoring instrumentation for this site.

Table PH037-1 – Continued... Fall 2024 – HWY 2:68 Dunvegan South Slope Inclinometer Instrumentation Reading Summary

Date Monitored: September 26, 2024

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)
North Third of Site								
SI18-10	March 14, 2018	183.5 mm over 0.0 m to 3.0 m depth in 344° direction	675.3 mm/yr in June 2018	Operational	May 28, 2024	3.1	9.0	-8.2
		11.2 mm over 21.3 m to 23.2 m depth in 319° direction	3.1 mm/yr in October 2021			0.6	1.8	0.2
SI-54	Mar. 6 1995	120.96 mm over 0.0 m to 1.7 m depth in 291° direction	36.1 mm/yr in March 1995	Operational	October 16, 2023	-10.6	-32.1	-61.1
SI-62	Mar. 2, 1995	98.4 mm over 4.1 m to 10.8 m depth in 321° direction	43.8 mm/yr in October 2017	Sheared at 10.8 m below ground surface	July 4, 2019	N/A	N/A	N/A
		82.7 mm over 7.8 m to 10.8 m depth in 321° direction	38.7 mm/yr in October 2017			N/A	N/A	N/A
SI09-2	Sept. 30, 2009	No discernible movement	No discernible movement	Broken at 0.3 mBGS	May 25, 2015	N/A	N/A	N/A

Drawings 32123-PH037-1 and 32123-PH037-2 in Appendix A provide sketches of the approximate locations of the monitoring instrumentation for this site.

Table PH037-1 – Continued... Fall 2024 – HWY 2:68 Dunvegan South Slope Inclinator Instrumentation Reading Summary

Date Monitored: September 26, 2024

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)
North Third of Site Continued								
SI09-1	Sept. 30, 2009	48.9 mm over 0.3 m to 7.0 m depth in 216° direction	15.7 mm/yr in November 2009	Operational	May 28, 2024	0.4	1.1	-2.5
		21.7 mm over 7.0 m to 13.1 m depth in 216° direction	4.0 mm/yr in September 2015			0.2	0.7	0.1
		5.2 mm over 13.1 m to 14.9 m depth in 216° direction	1.0 mm/yr in September 2014			<0.1	<0.1	-0.2
SI18-11	February 21, 2018	41.4 mm over 0.1 m to 6.2 m depth in 332° direction	280.1 mm/yr in April 2018	Sheared at 2.4 m depth	April 25, 2018	N/A	N/A	N/A
SI-61	Mar. 2, 1995	25.2 mm over 3.6 m to 10.3 m depth in 185° direction	7.2 mm/yr in October 1997	Operational	May 28, 2024	1.0	2.9	2.2

Drawings 32123-PH037-1 and 32123-PH037-2 in Appendix A provide sketches of the approximate locations of the monitoring instrumentation for this site.

Table PH037-2: Fall 2024 – HWY 2:68 Dunvegan South Standpipe Piezometer Instrumentation Reading Summary

Date Monitored: September 26, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER LEVEL BGS (m)	MEASURED WATER LEVEL BGS (m)	PREVIOUS READING (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
SP09-6	September 30, 2009	26.56	N/A	Active	26.21 on June 22, 2022	Dry	Dry	N/A
SP09-8	September 30, 2009	11.61	N/A	Active	N/A	Dry	Dry	N/A

Drawings 32123-PH037-1 and 32123-PH037-2 in Appendix A provide sketches of the approximate locations of the monitoring instrumentation for this site.

Table PH037-3: Fall 2024 – HWY 2:68 Dunvegan South Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: September 26, 2024

INSTRUMENT #	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER ELEVATION (m)	MEASURED PORE PRESSURE (kPa)	CURRENT WATER ELEVATION (m)	PREVIOUS WATER ELEVATION (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN18-1	February 9, 2018	485.20	517.20	Operational	485.96 on September 26, 2024	7.5	485.96	485.68	0.28
PN18-2	February 11, 2018	485.01	503.30	Operational	485.58 on June 9, 2018	5.1	485.53	485.50	0.03
PN18-3	February 11, 2018	461.96	490.00	Operational	462.56 on June 21, 2022	3.5	462.32	462.32	0
PN18-4	February 11, 2018	453.41	480.00	Operational	453.89 on June 21, 2020	3.1	453.73	453.77	-0.04
PN18-5A	February 17, 2018	450.55	460.30	Malfunctioning	452.21 on July 4, 2019	N/A	N/A	452.21 (July 4, 2019)	N/A
PN18-5B	February 17, 2018	432.26	460.30	Operational	432.65 on June 9, 2018	2.6	432.53	432.45	0.08
PN18-6A	February 19, 2018	436.96	446.10	Operational	437.95 on May 28, 2024	1.0	437.06	437.95	-0.89
PN18-6B	February 19, 2018	388.19	446.10	Malfunctioning	389.03 on March 14, 2018	N/A	N/A	388.31 (Oct. 22, 2021)	N/A
PN18-7A	February 23, 2018	454.35	464.10	Operational	454.78 on June 9, 2018	2.9	454.65	454.65	0
PN18-7B	February 23, 2018	447.64	464.10	Operational	448.13 on June 9, 2018	3.1	447.96	447.98	-0.02
PN18-7C	February 23, 2018	438.19	464.10	Operational	438.60 on June 21, 2020	2.9	438.49	438.50	-0.01
PN18-8A	February 22, 2018	444.50	450.60	Operational	445.16 on June 18, 2022	3.9	444.90	444.94	-0.04

Drawings 32123-PH037-1 and 32123-PH037-2 in Appendix A provide sketches of the approximate locations of the monitoring instrumentation for this site.

Table PH037-3 – Continued... Fall 2024 – HWY 2:68 Dunvegan South Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: September 26, 2024

INSTRUMENT #	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER ELEVATION (m)	MEASURED PORE PRESSURE (kPa)	CURRENT WATER ELEVATION (m)	PREVIOUS WATER ELEVATION (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN18-8B	February 22, 2018	429.26	450.60	Operational	429.70 on Oct. 22, 2021	0.4	429.30	429.50	-0.20
PN18-9A	February 19, 2018	433.18	440.80	Operational	440.88* on June 21, 2020	1.4	433.32	433.66	-0.34
PN18-9B	February 19, 2018	418.24	440.80	Operational	419.65 on June 21, 2020	2.8	418.53	418.55	-0.02
PN18-9C	February 19, 2018	383.19	440.80	Operational	383.72 on June 9, 2018	1.7	383.36	383.30	0.06
PN18-10A	February 21, 2018	433.56	442.70	Operational	434.06 on June 9, 2018	2.7	433.84	433.85	-0.01
PN18-10B	February 21, 2018	410.54	442.70	Operational	410.96 on June 9, 2018	3.3	410.88	410.81	0.07
PN18-11A	March 14, 2018	412.85	425.80	Destroyed	413.20 on April 25, 2018	N/A	N/A	413.20 (Apr. 25, 2018)	N/A
PN18-11B	March 14, 2018	392.73	425.80	Destroyed	393.78 on April 25, 2018	N/A	N/A	393.78 (Apr. 25, 2018)	N/A
PN18-12A	February 17, 2018	435.90	442.00	Malfunctioning	438.15 on June 9, 2018	N/A	N/A	435.95 (July 2, 2019)	N/A
PN18-12B	February 17, 2018	422.19	442.00	Operational	422.68 on June 9, 2018	3.7	422.57	422.54	0.03
PN18-13A	February 15, 2018	430.36	439.50	Operational	430.92 on June 9, 2018	3.0	430.67	430.60	0.07
PN18-13B	February 15, 2018	413.59	439.50	Operational	414.08 on June 9, 2018	2.7	413.87	413.84	0.03

Drawings 32123-PH037-1 and 32123-PH037-2 in Appendix A provide sketches of the approximate locations of the monitoring instrumentation for this site.

* Indicates above-ground (artesian) groundwater level

Table PH037-3– Continued...Fall 2024 – HWY 2:68 Dunvegan South Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: September 26, 2024

INSTRUMENT #	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER ELEVATION (m)	MEASURED PORE PRESSURE (kPa)	CURRENT WATER ELEVATION (m)	PREVIOUS WATER ELEVATION (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN18-14A	February 15, 2018	424.29	434.50	Operational	425.77 on March 14, 2018	4.0	424.70	424.62	0.08
PN18-14B	February 15, 2018	407.98	434.50	Operational	408.37 on October 4, 2018	3.3	408.32	408.20	0.12

Drawings 32123-PH037-1 and 32123-PH037-2 in Appendix A provide sketches of the approximate locations of the monitoring instrumentation for this site.



STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.



THURBER ENGINEERING LTD.

**ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP (CON0022165)
PEACE REGION (GRANDE PRAIRIE DISTRICT – NORTH)
INSTRUMENTATION MONITORING RESULTS**

FALL 2024

**APPENDIX A
DATA PRESENTATION**

SITE PH037: HWY 2:68, DUNVEGAN SOUTH

**ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
PEACE REGION (GRANDE PRAIRIE - NORTH DISTRICT)
INSTRUMENTATION MONITORING FIELD SUMMARY (PH037)
FALL 2024**

Location: Dunvegan South (HWY 2:68 C1 15.674) File Number: 32123 Probe: RST SI Sets 5R & 8R Cable: RST SI Sets 5R & 8R	Readout: RST Extension: 3.34"/2.75" \emptyset Temp: 12C Read by: NNM/NRM
-------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location (UTM 11)		Date	Stickup (m)	Depth from top of casing (ft)	Magn. North A+ Groove degree	Current Bottom Depth Readings				Probe/ Reel #	Size (")	Remarks
	Easting (m)	Northing (m)					A+	A-	B+	B-			
SI-54	398593.62	6197597.09	26-Sep-24	0.73	62 to 2	5	231	-219	-590	578	5R/5R	FILL	***
SI-55	398503.91	6197504.55	26-Sep-24	0.56	66 to 2	15					8R/8R	FILL	***
SI-56	398540.17	6197496.24	26-Sep-24	0.91	76 to 2	350	1349	-1336	-956	970	8R/8R	FILL	***
SI-58	398626.26	6197479.42	26-Sep-24	0.71	64 to 2	0	392	-379	456	-473	5R/5R	FILL	***
SI-59	398528.72	6197362.90	26-Sep-24	0.87	76 to 2	40	173	-160	-799	803	8R/8R	FILL	
SI-61	398521.45	6197719.36	26-Sep-24	0.67	62 to 2	345	97	-85	-942	-926	5R/5R	FILL	*
SI09-1	398520.28	6197714.60	26-Sep-24	0.92	108 to 2	235	-130	136	477	-493	5R/5R	FILL	
SI09-7	398423.87	6197337.20	26-Sep-24	1.00	108 to 2	270	-318	325	-75	55	5R/5R	FILL	
SI18-4	398582.00	6197288.00	26-Sep-24	0.89	94 to 2	302	434	-421	-39	42	8R/8R	FILL	
SI18-5	398525.00	6197321.00	26-Sep-24	0.76	98 to 2	280	166	-157	378	-392	5R/5R	FILL	
SI18-7	398495.00	6197264.00	26-Sep-24	0.91	132 to 2	238	502	-514	-748	745	8R/8R	FILL	
SI18-8	398509.00	6197461.00	26-Sep-24	1.06	110 to 2	260	-1694	1647	1166	-1176	8R/8R	FILL	
SI18-9	398491.00	6197515.00	26-Sep-24	0.90	188 to 2	266	186	-168	218	-214	8R/8R	FILL	
SI18-10	398518.00	6197582.00	26-Sep-24	0.92	110 to 2	268	247	-241	270	-291	5R/5R	FILL	

INSPECTOR REPORT

*SI-61 Hard to pull from 26-24 ft, use dummy probe
*** Slope Direction is 270 degree
SI-55 DAMAGED

**ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
PEACE REGION (GRANDE PRAIRIE - NORTH DISTRICT)
INSTRUMENTATION MONITORING FIELD SUMMARY (PH037)
FALL 2024**

Location: Dunvegan South (HWY 2:68 C1 15.674)	Readout: RST PN C108 Unit 4
File Number: 32123	Temp: 12C
	Read by: NNM/NRM

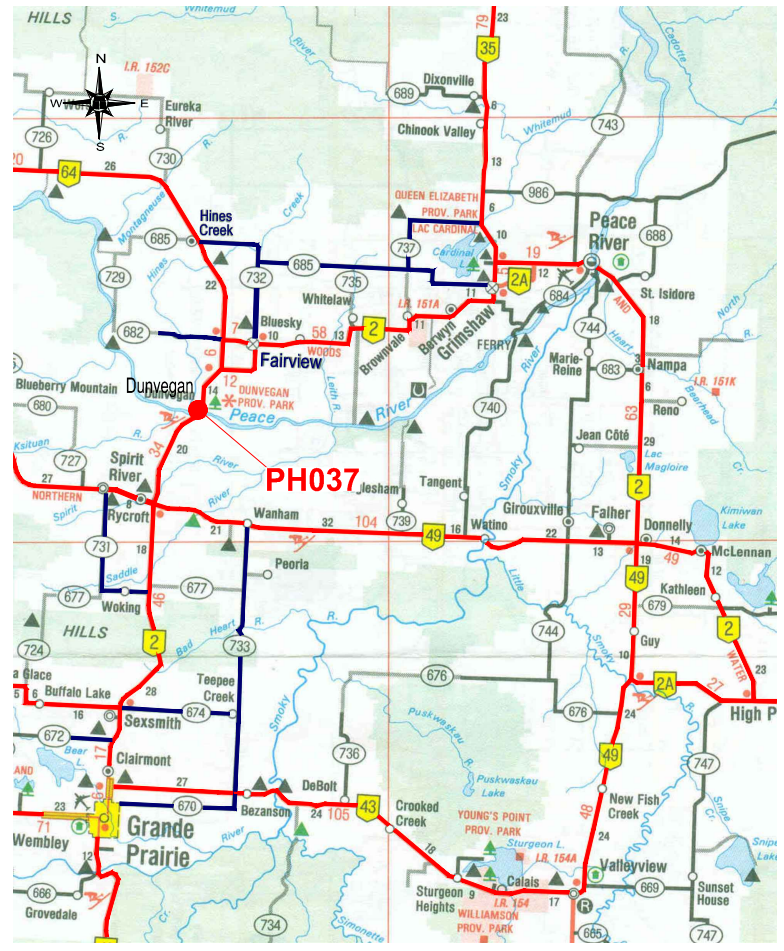
STANDPIPE PIEZOMETER READINGS

SP#	GPS Location (UTM 11)		Date	Stick-up (m)	Reading below top of casing (m)	Bottom Pipe Depth (below top of casing (m))
	Easting (m)	Northing (m)				
SP09-6	398501.99	6197268.45	26-Sep-24	1.04	DRY	27.60
SP09-8	398461.37	6197336.32	26-Sep-24	0.69	DRY	12.30

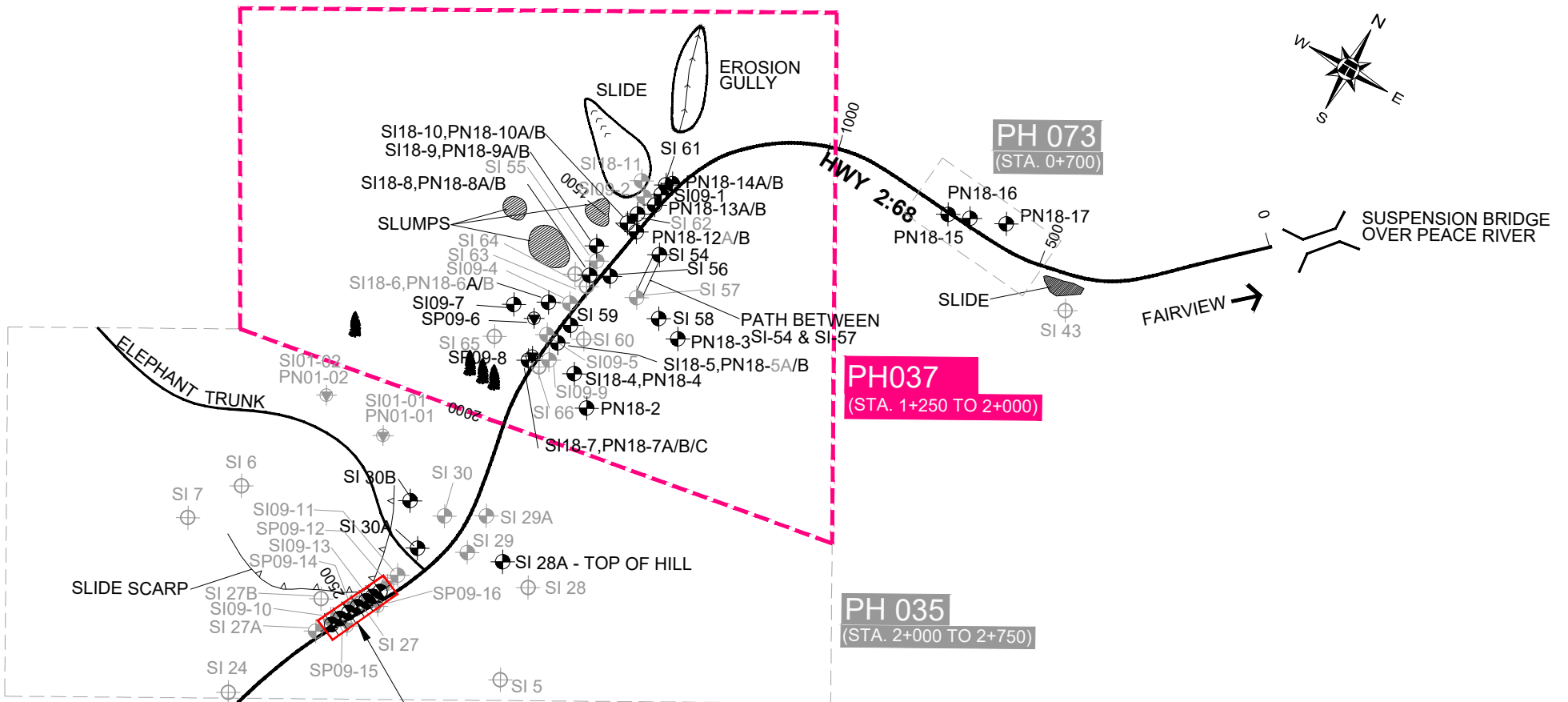
PNEUMATIC PIEZOMETER READINGS

PN#	GPS Location (UTM 11)		Date	Reading (kPa)	Identification Number
	Easting (m)	Northing (m)			
PN18-1	398691	6196979	26-Sep-24	7.5	37810
PN18-2	398636	6197245	26-Sep-24	5.1	37818
PN18-3	398661	6197458	26-Sep-24	3.5	37815
PN18-4	398582	6197288	26-Sep-24	3.1	37821
PN18-5B	398525	6197321	26-Sep-24	2.6	37817
PN18-6A	398470	6197377	26-Sep-24	1	37819
PN18-7A	398495	6197264	26-Sep-24	2.9	37826
PN18-7B	398495	6197264	26-Sep-24	3.1	37813
PN18-7C	398495	6197264	26-Sep-24	2.9	37807
PN18-8A	398509	6197461	26-Sep-24	3.9	37830
PN18-8B	398509	6197461	26-Sep-24	0.4	37811
PN18-9A	398491	6197515	26-Sep-24	1.4	37825
PN18-9B	398491	6197515	26-Sep-24	2.8	37808
PN18-9C	398491	6197515	26-Sep-24	1.7	37805
PN18-10A	398518	6197582	26-Sep-24	2.7	37827
PN18-10B	398518	6197582	26-Sep-24	3.3	37812
PN18-12B	398541	6197577	26-Sep-24	3.7	37820
PN18-13A	398544	6197638	26-Sep-24	3	37828
PN18-13B	398544	6197638	26-Sep-24	2.7	37814
PN18-14A	398551	6197690	26-Sep-24	4	37822
PN18-14B	398551	6197690	26-Sep-24	3.3	37816




INSPECTOR REPORT



SITE MAP
NOT TO SCALE

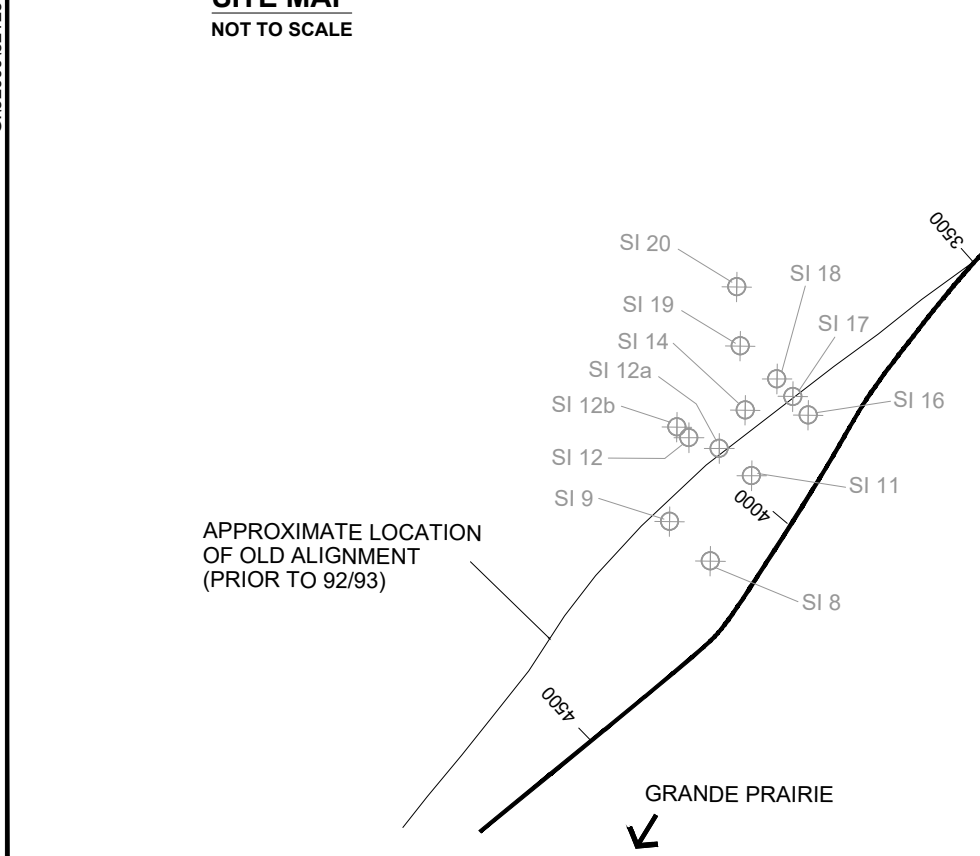


LEGEND :

-  **STANDPIPE PIEZOMETER**
-  **SLOPE INCLINOMETER CURRENTLY WORKING**
-  **SLOPE INCLINOMETER NOT IN USE**

NOTES :


1. BASE PLAN WAS TAKEN FROM GAEA ENGINEERING REPORT
2. FEATURE LOCATIONS ARE APPROXIMATE.
3. PREVIOUS OBSERVATIONS SHOWN IN BLACK



APPROXIMATE LOCATION
OF OLD ALIGNMENT
(PRIOR TO 92/93)

GRANDE PRAIRIE
↓

FOR PH035-1 PILE WALL INSTRUMENTS
(SI11-1, SI11-2, SI11-3, SI11-4, SI18-P24, SI18-P39,
SI18-P53, SI18-P71, SI18-P89, SI18-P107,
VC1722-VC1724, VC2022, VC2031-2043 AND
VC2072) REFER TO DWG NO. 32123-PH035-2




**PEACE REGION
(GRANDE PRAIRIE DISTRICT NORTH)**

**PH037: DUNVEGAN SOUTH
INSTRUMENTATION LOCATIONS**

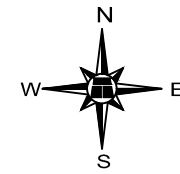
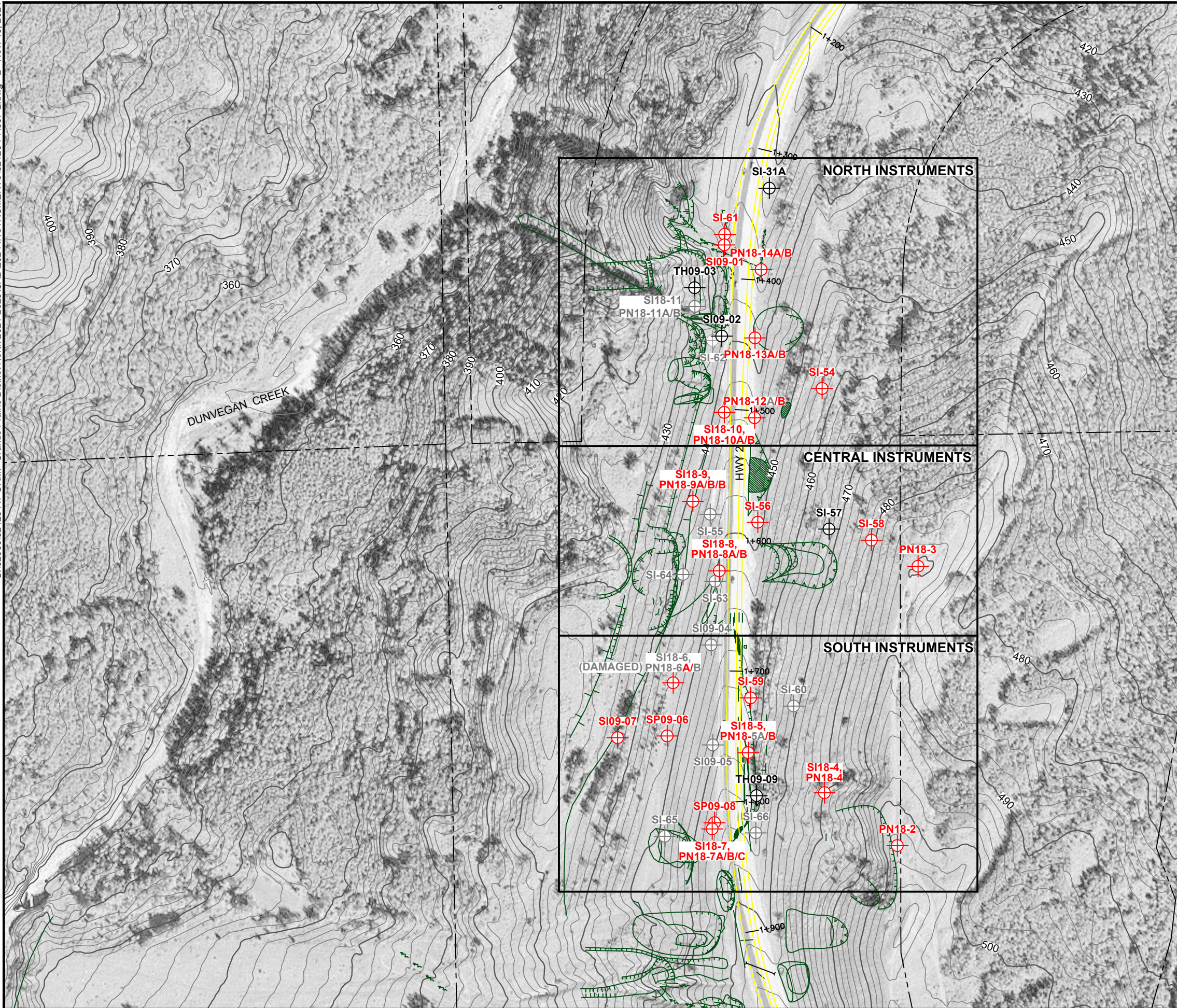
DWG No. 32123-PH037-1

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	DWP
SCALE	N. T. S.
DATE	NOVEMBER 2024
FILE No.	32123



THURBER ENGINEERING LTD.

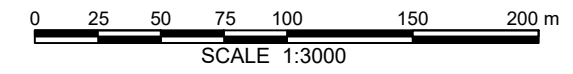
G:\32000\32123 AT GRMP Grande Prairie District North 2021-2025\CAD\2024 INSTRUMENTS\32123-PH037-2.dwg - 2 - Nov. 18, 2024



LEGEND

- INSTRUMENT LOCATIONS
- INSTRUMENT NOT IN USE
- SI SLOPE INCLINOMETER
- PN PNEUMATIC PIEZOMETER
- SP STANDPIPE PIEZOMETER

NOTE:
PN18-1 IS SHOWN ON DRAWING PH037-1-1.



BASE PLAN PROVIDED BY



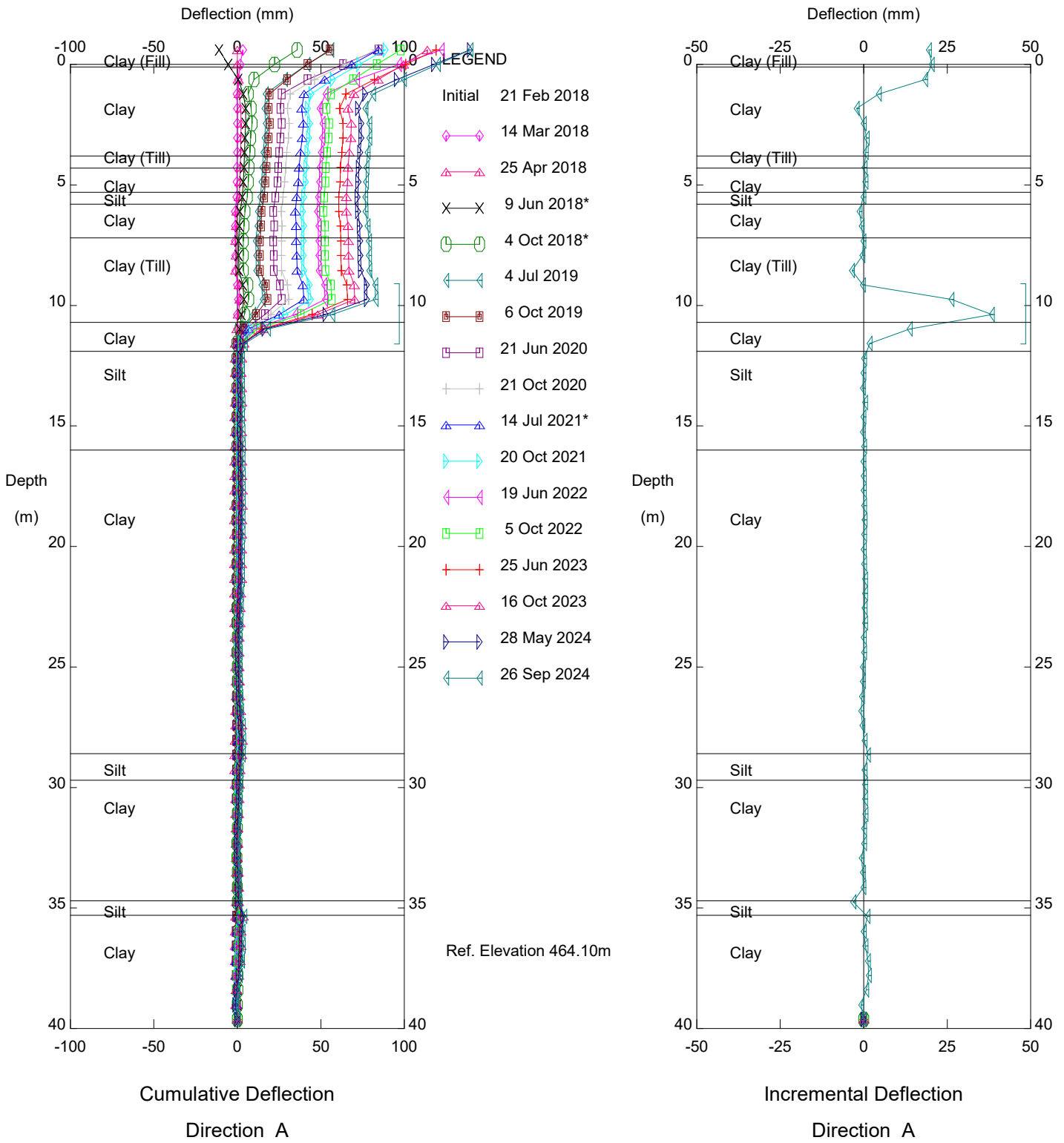
**PEACE REGION
(GRANDE PRAIRIE DISTRICT NORTH)**
**PH037: DUNVEGAN SOUTH
INSTRUMENTATION LOCATIONS**

DWG No. 32123-PH037-2

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	DWP
SCALE	1:3000
DATE	NOVEMBER 2024
FILE No.	32123



Thurber Engineering Ltd.

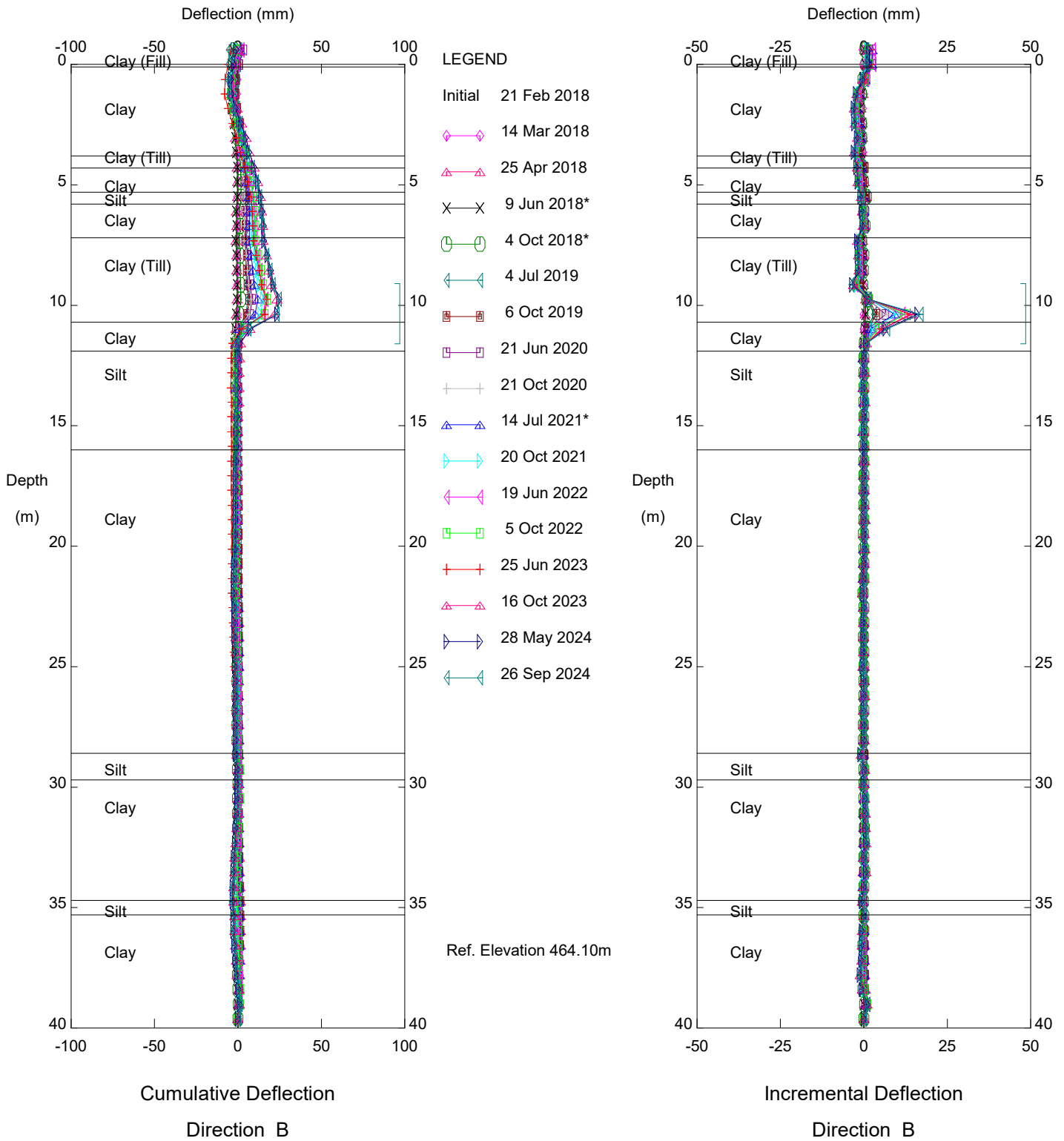


HWY 2:68 (PH037), Inclinometer SI18-7

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

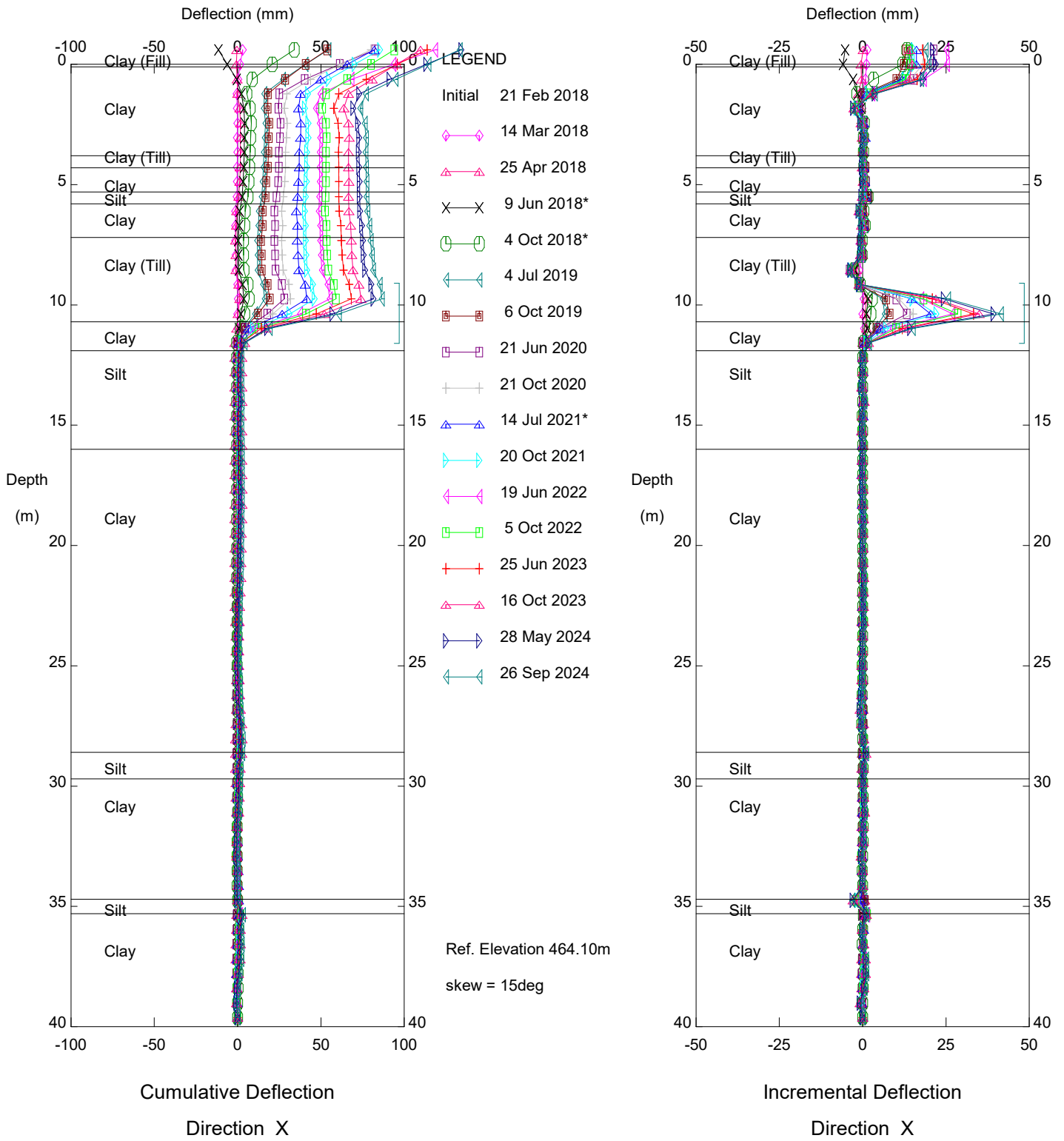


HWY 2:68 (PH037), Inclinometer SI18-7

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

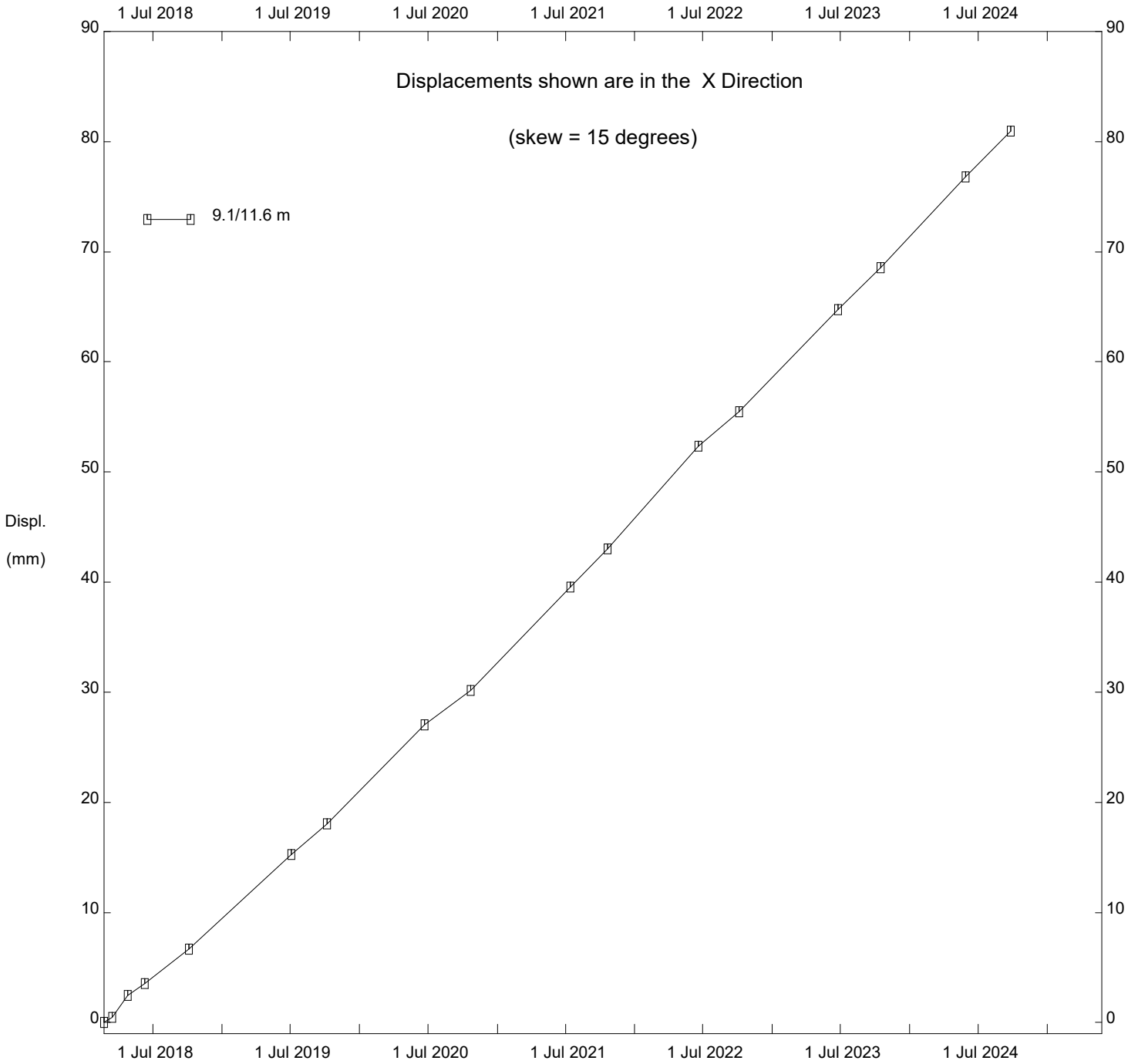


HWY 2:68 (PH037), Inclinometer SI18-7

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

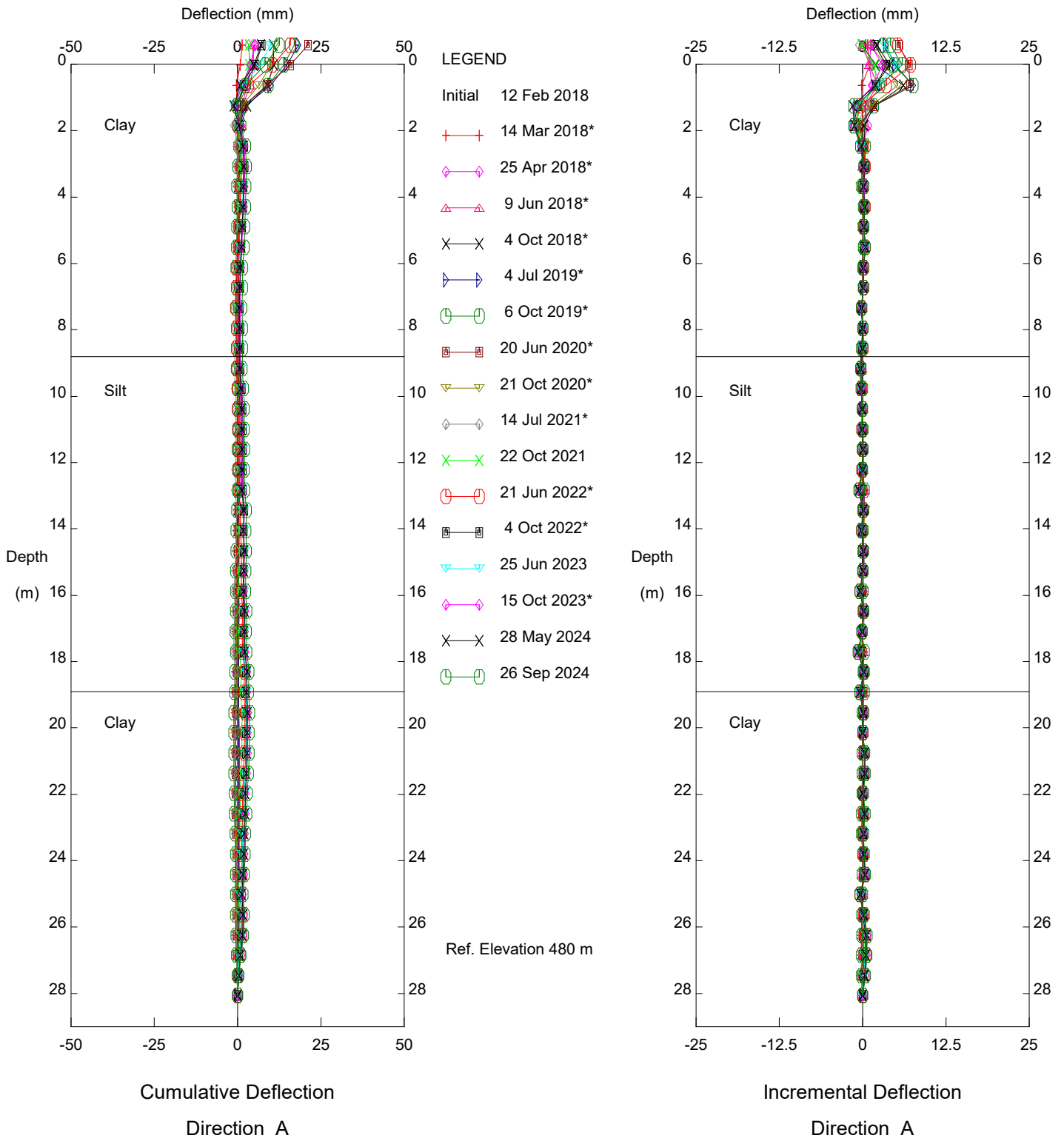
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinator SI18-7

Alberta Transportation

Thurber Engineering Ltd.

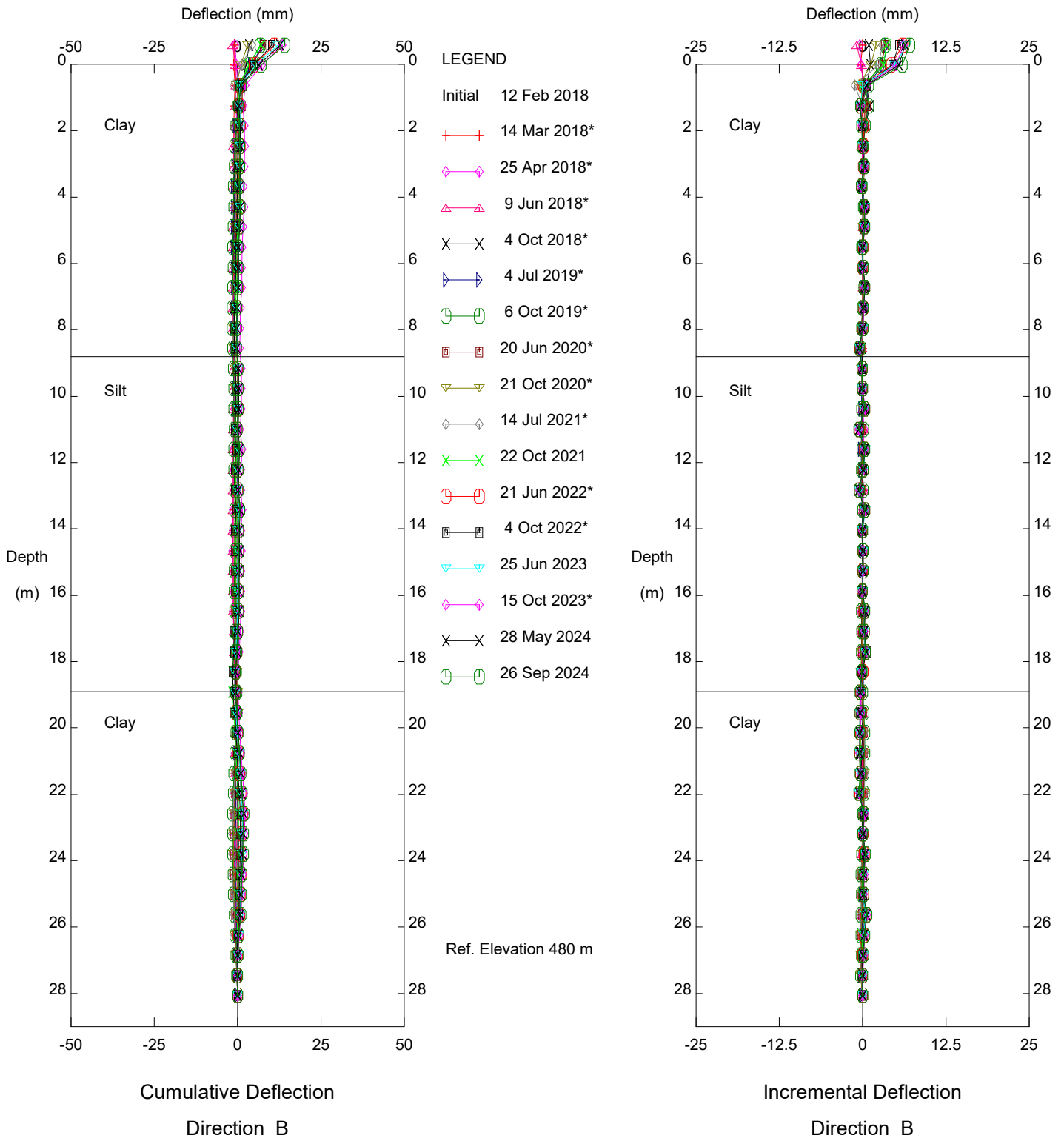


HWY 2:68 (PH037), Inclinometer SI18-4

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

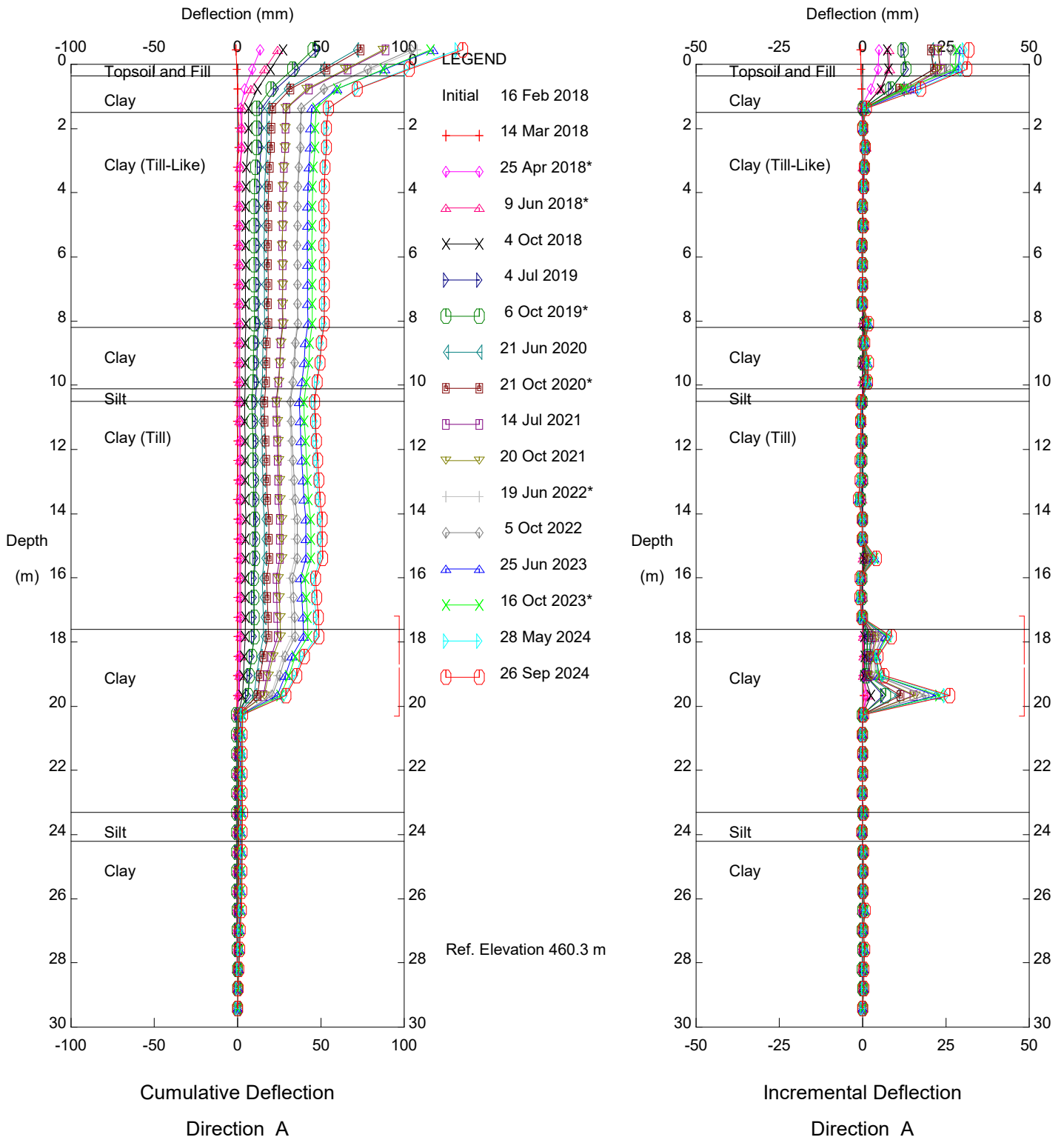


HWY 2:68 (PH037), Inclinometer SI18-4

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

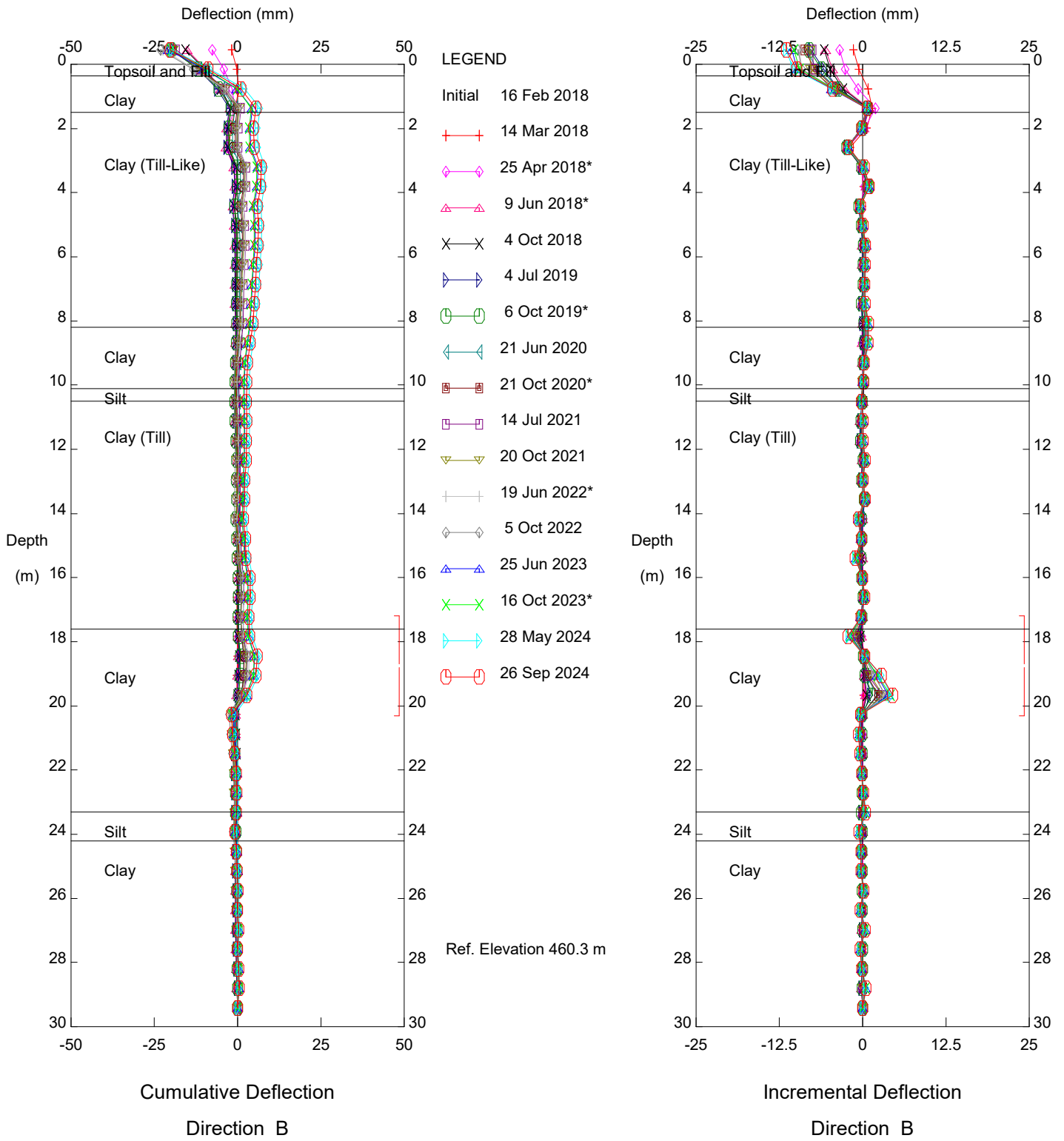


HWY 2:68 (PH037), Inclinometer SI18-5

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

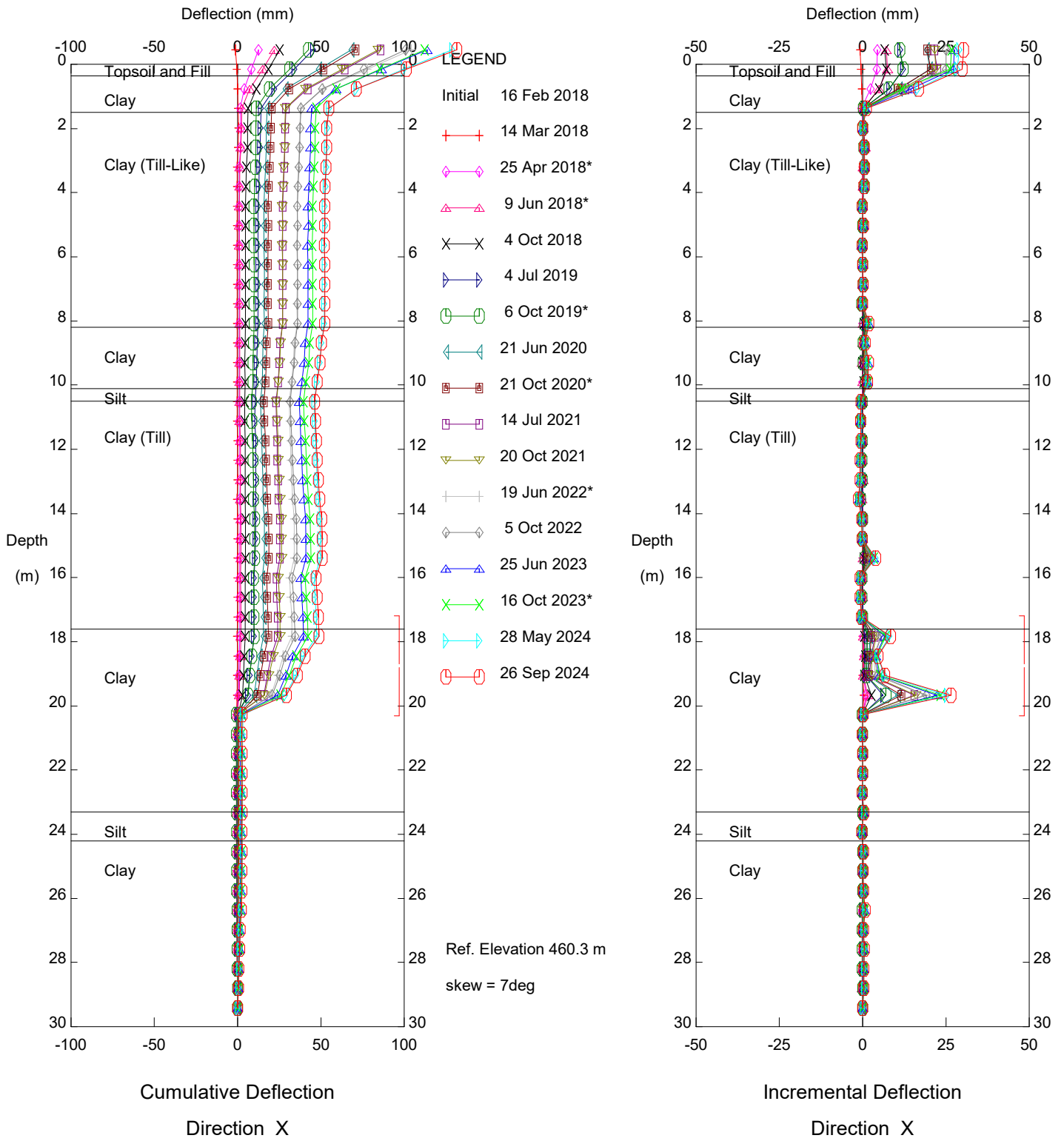


HWY 2:68 (PH037), Inclinometer SI18-5

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

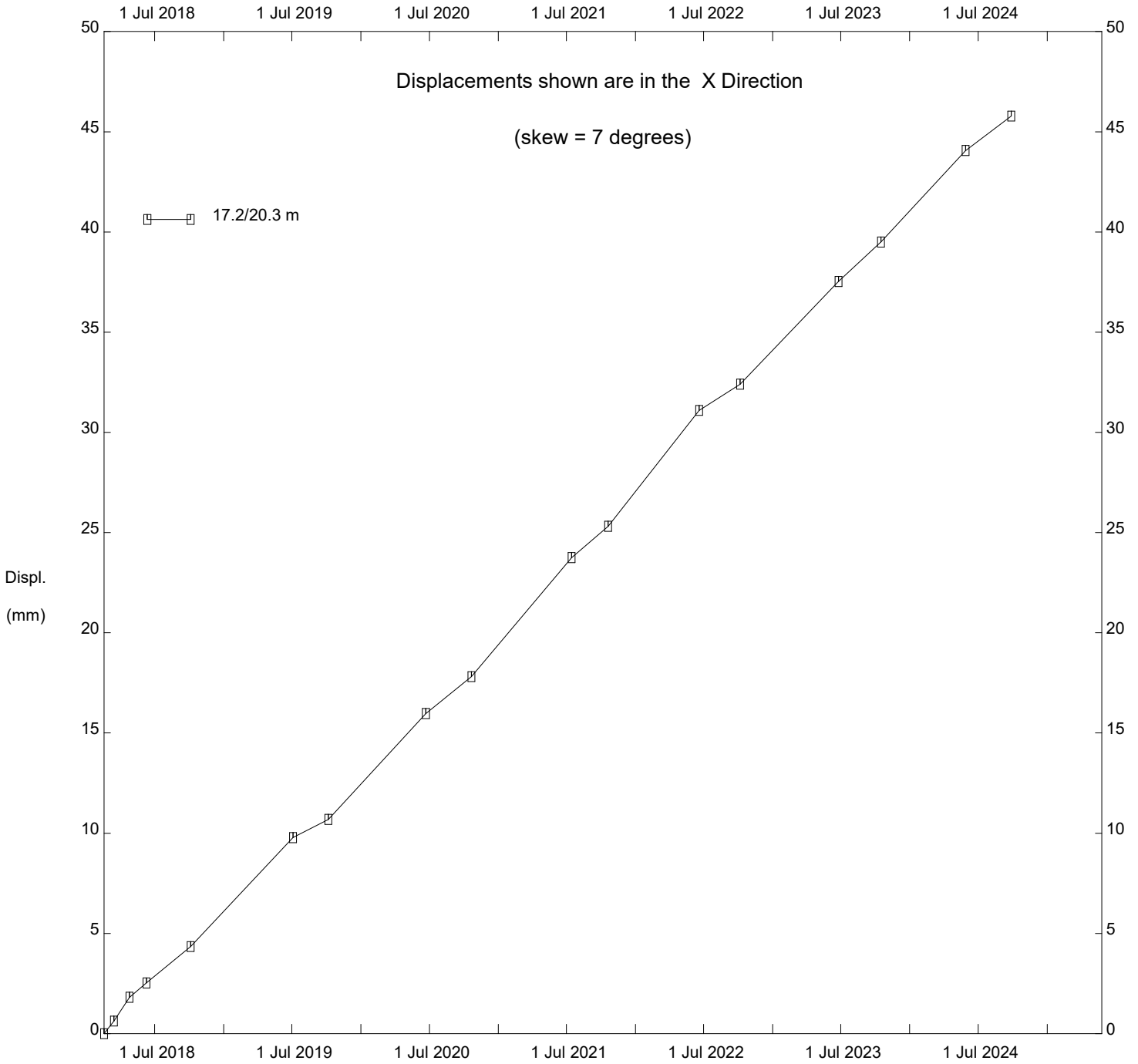


HWY 2:68 (PH037), Inclinometer SI18-5

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

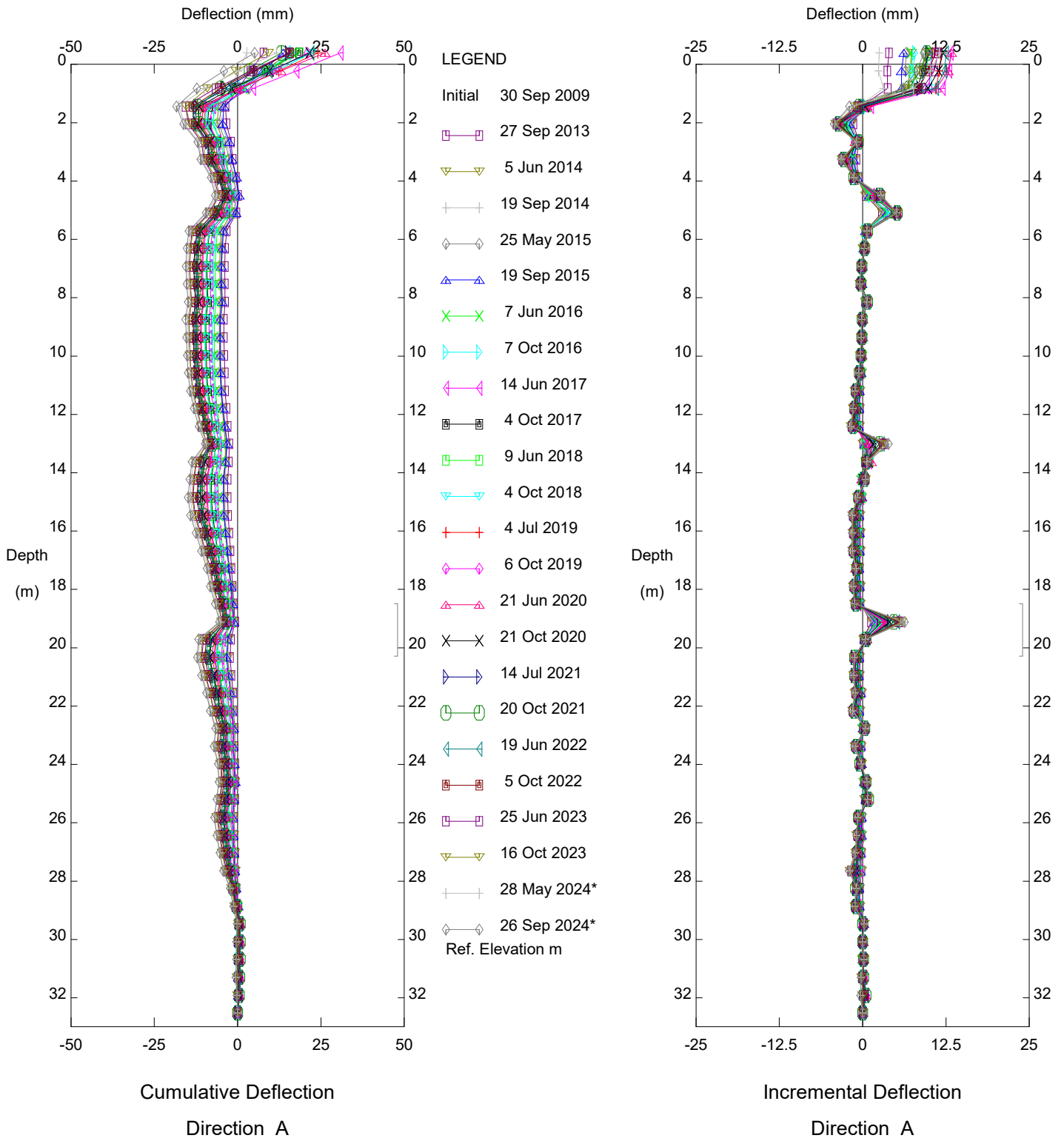
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinator SI18-5

Alberta Transportation

Thurber Engineering Ltd.

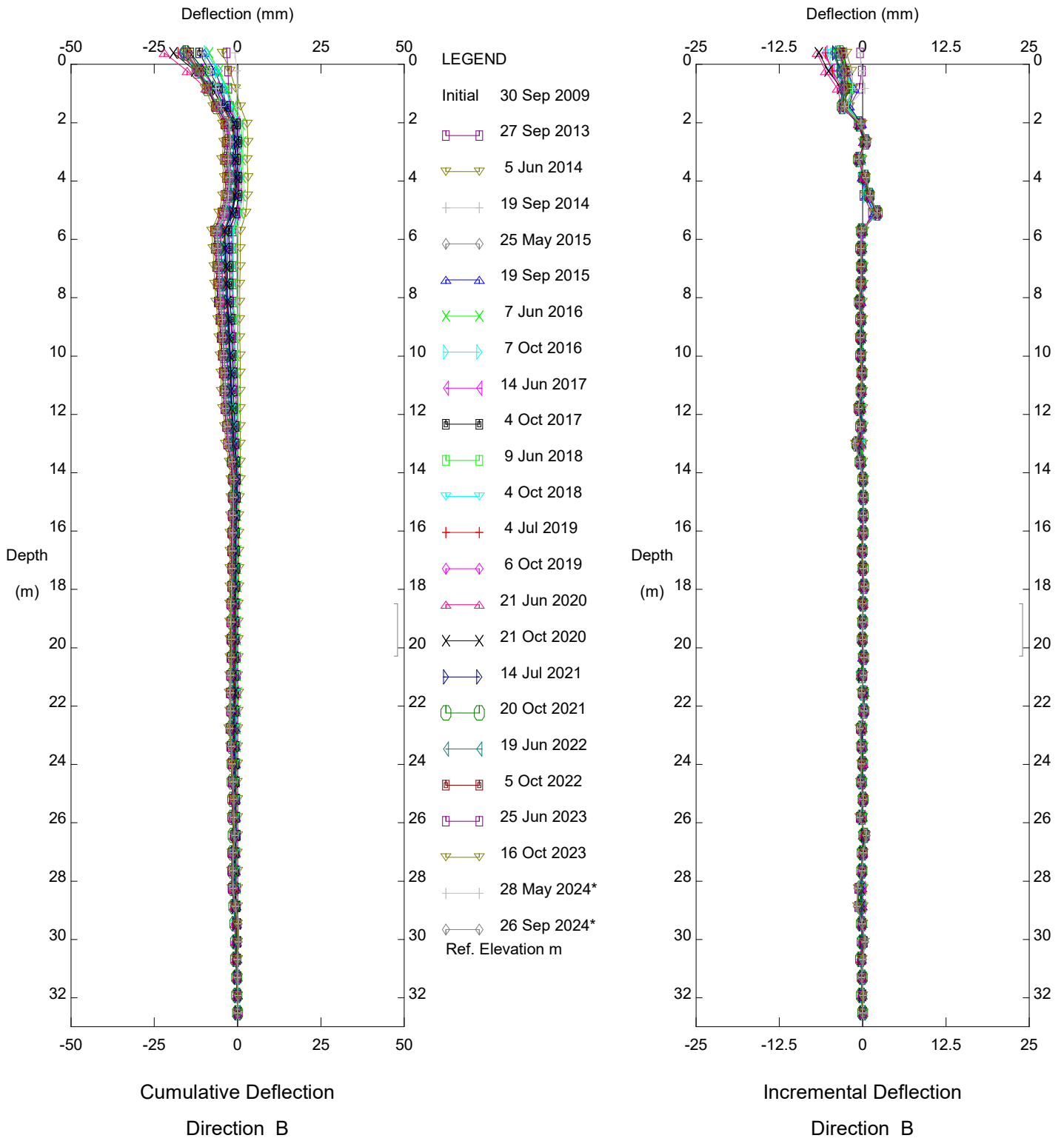


HWY 2:68 (PH037), Inclinometer SI09-7

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

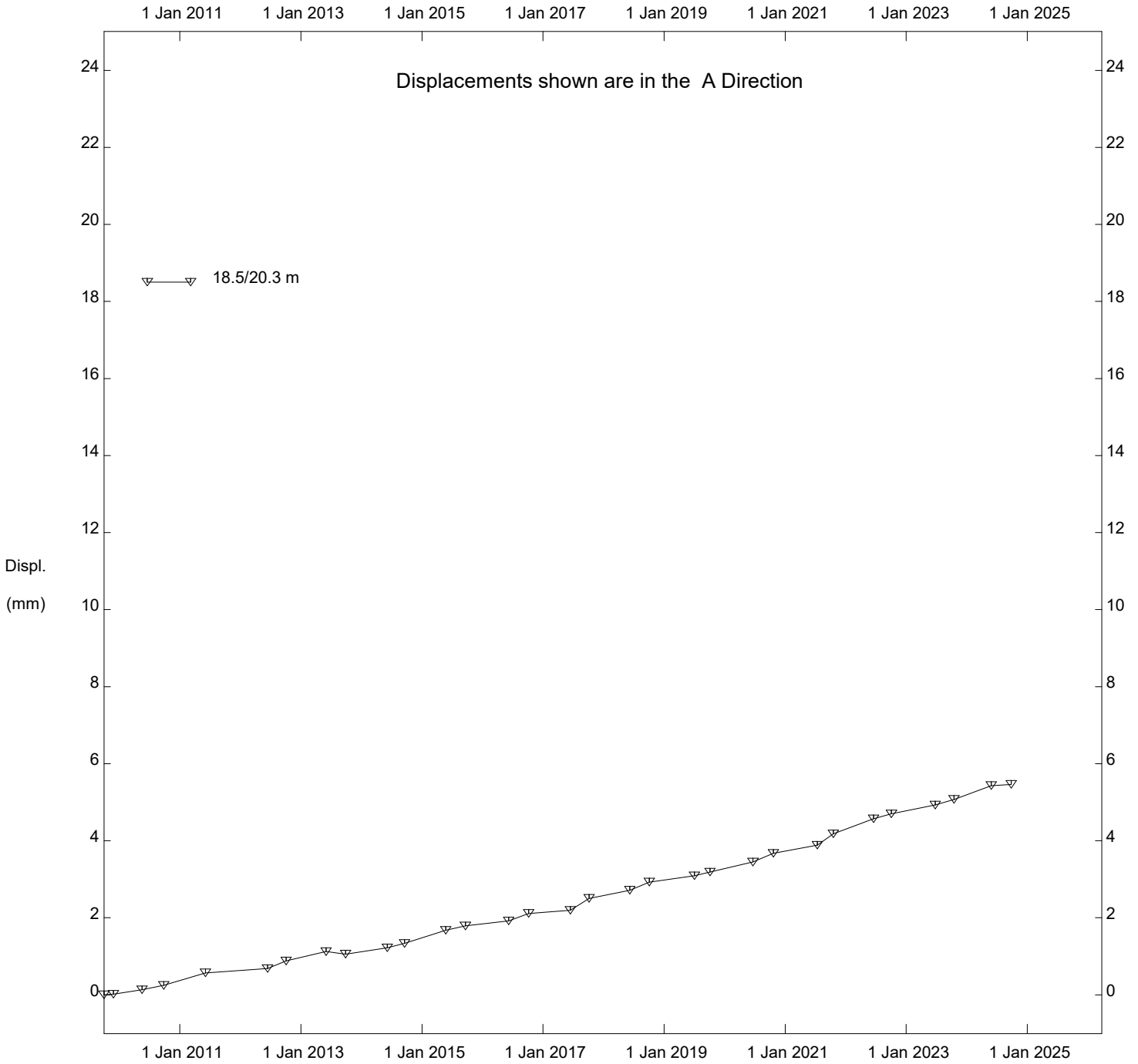


HWY 2:68 (PH037), Inclinometer SI09-7

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

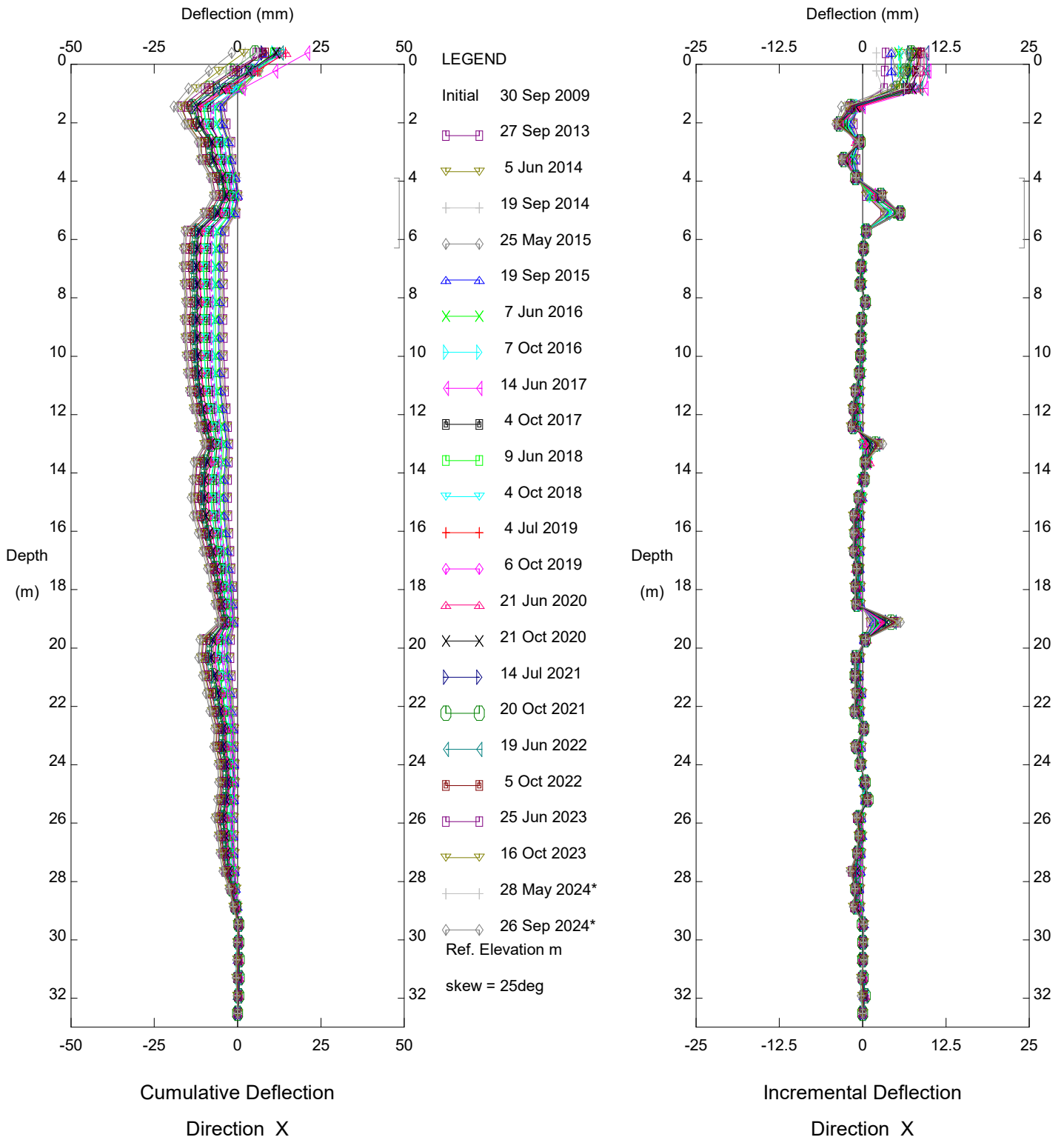
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinator SI09-7

Alberta Transportation

Thurber Engineering Ltd.

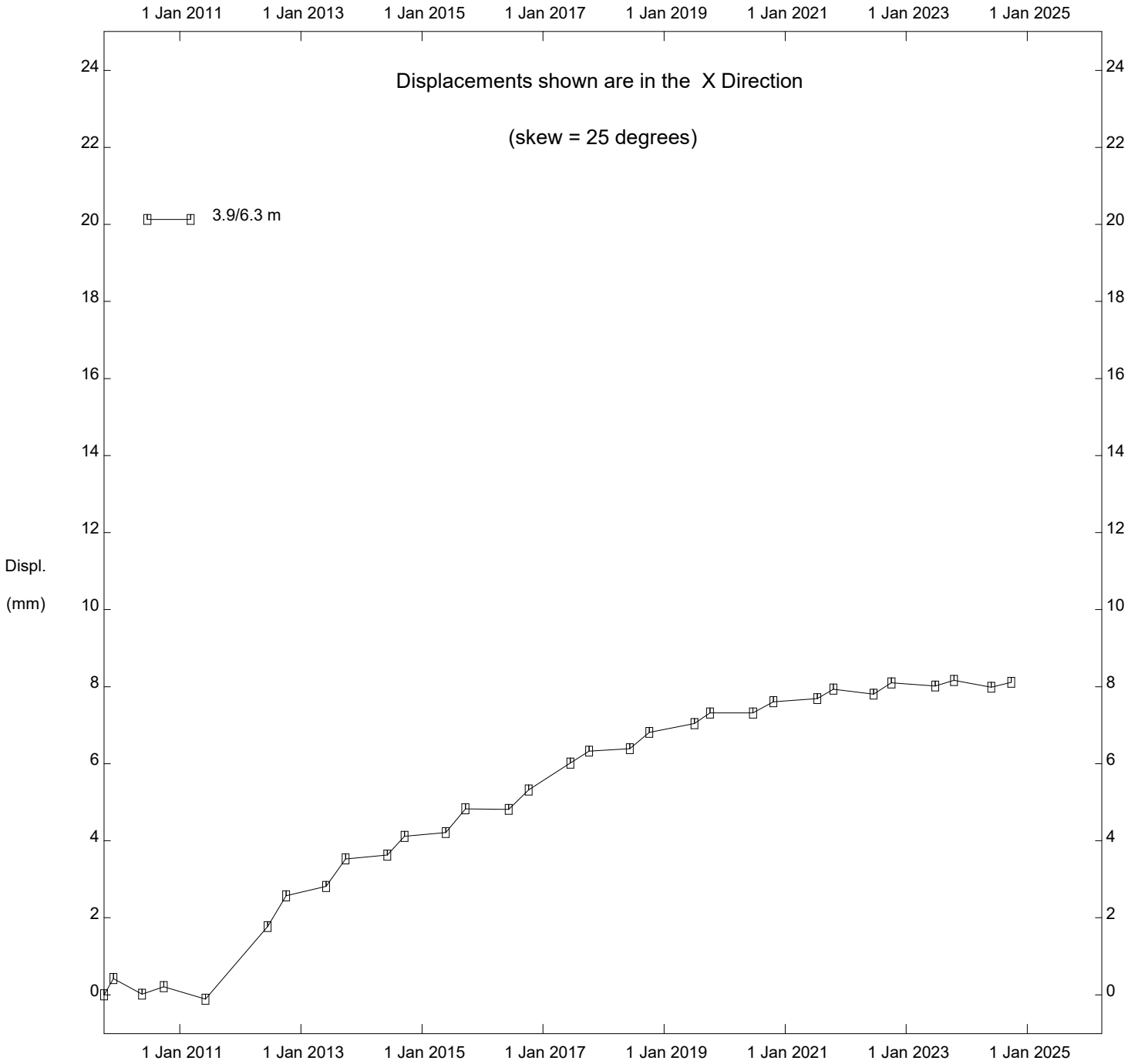


HWY 2:68 (PH037), Inclinator SI09-7

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

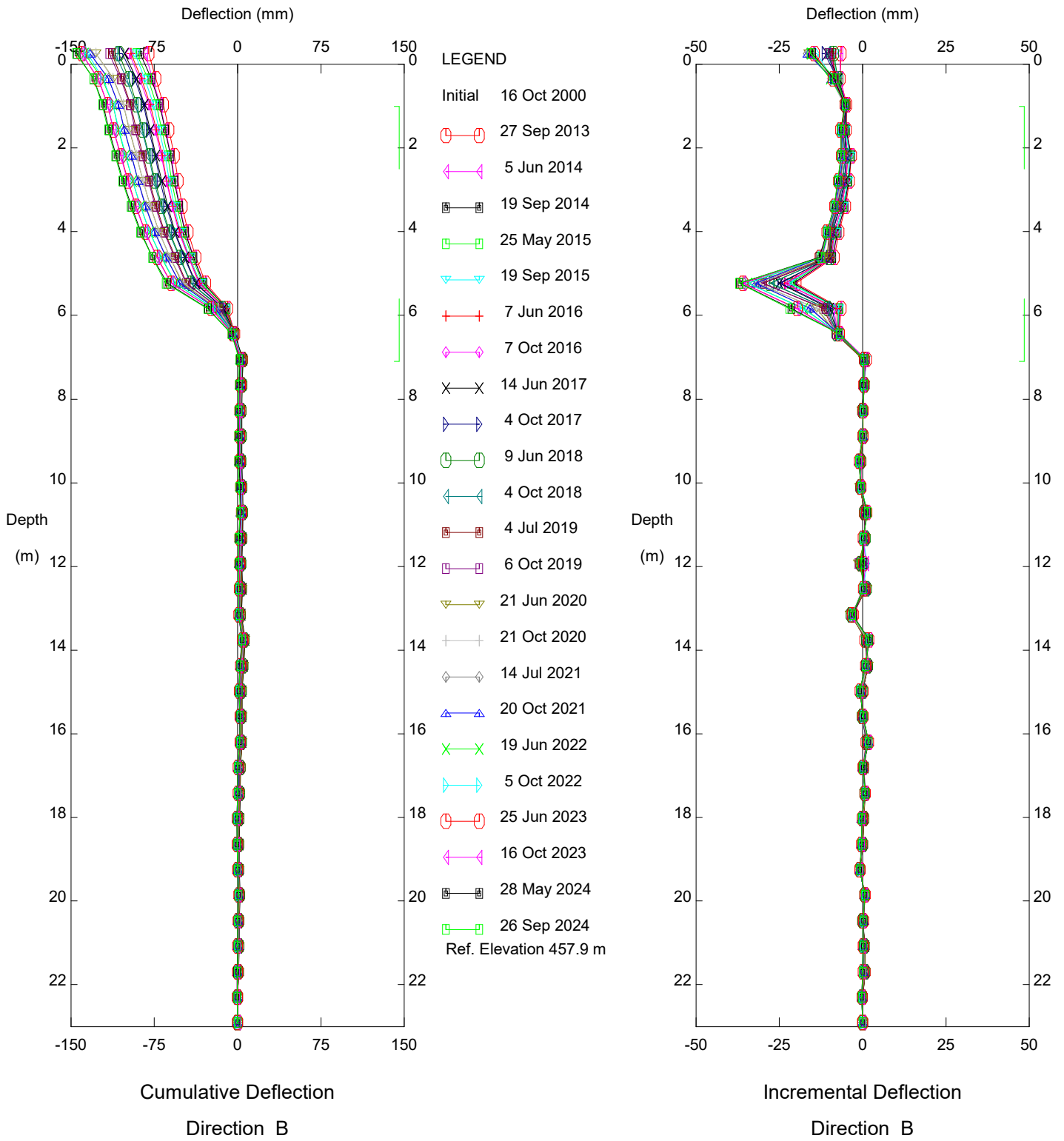
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinometer SI09-7

Alberta Transportation

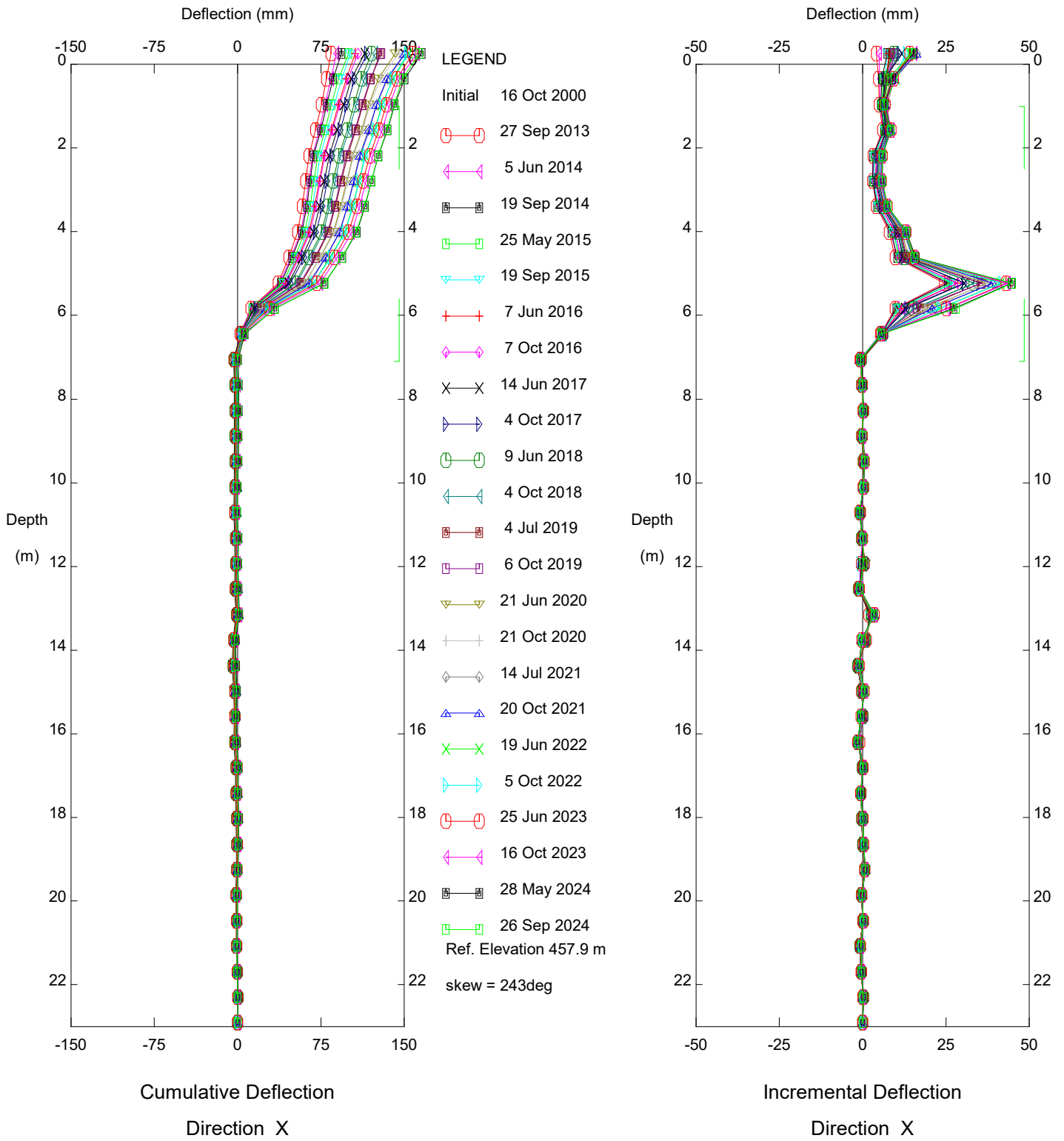
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinometer SI-59

Alberta Transportation

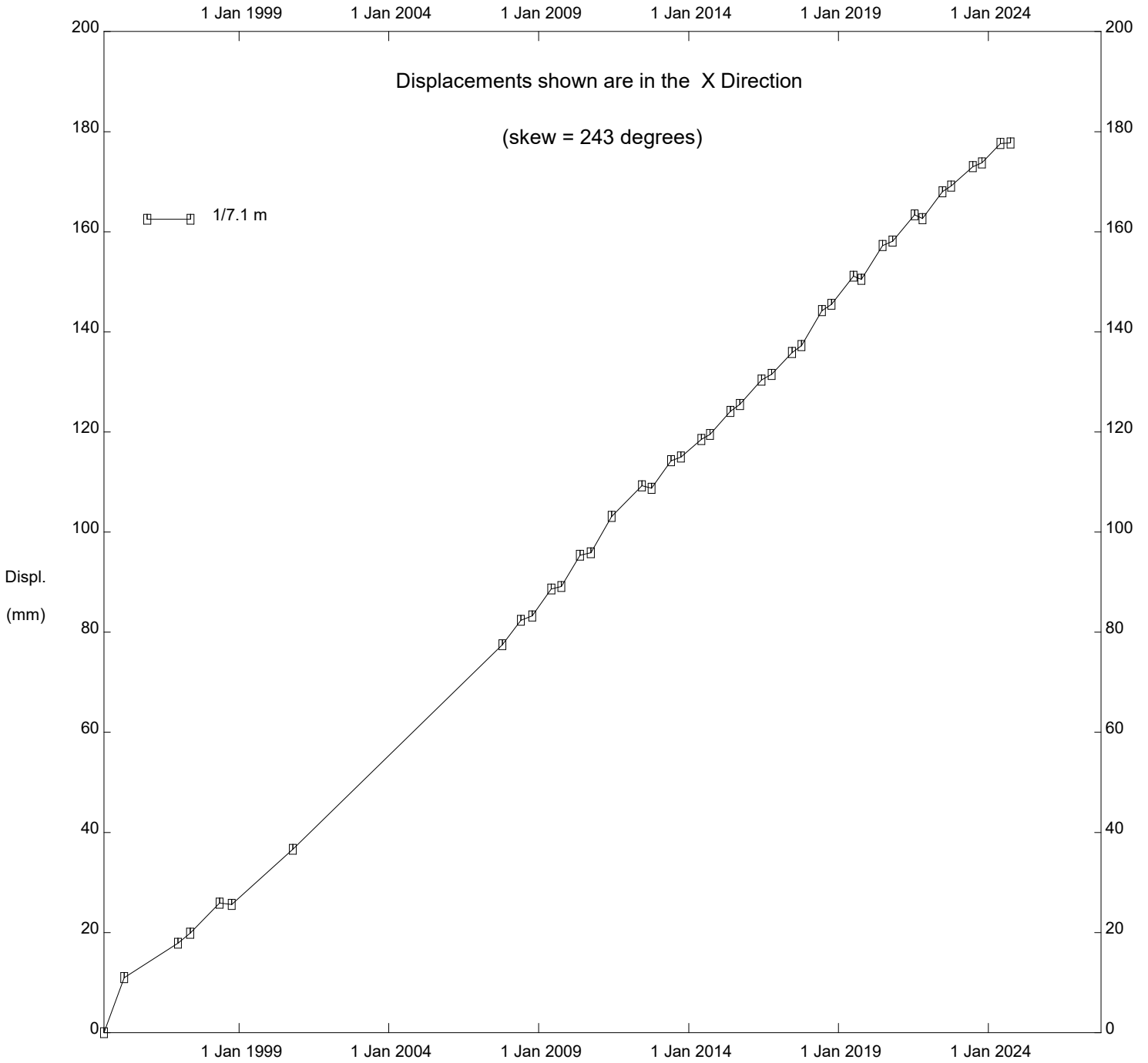
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinometer SI-59

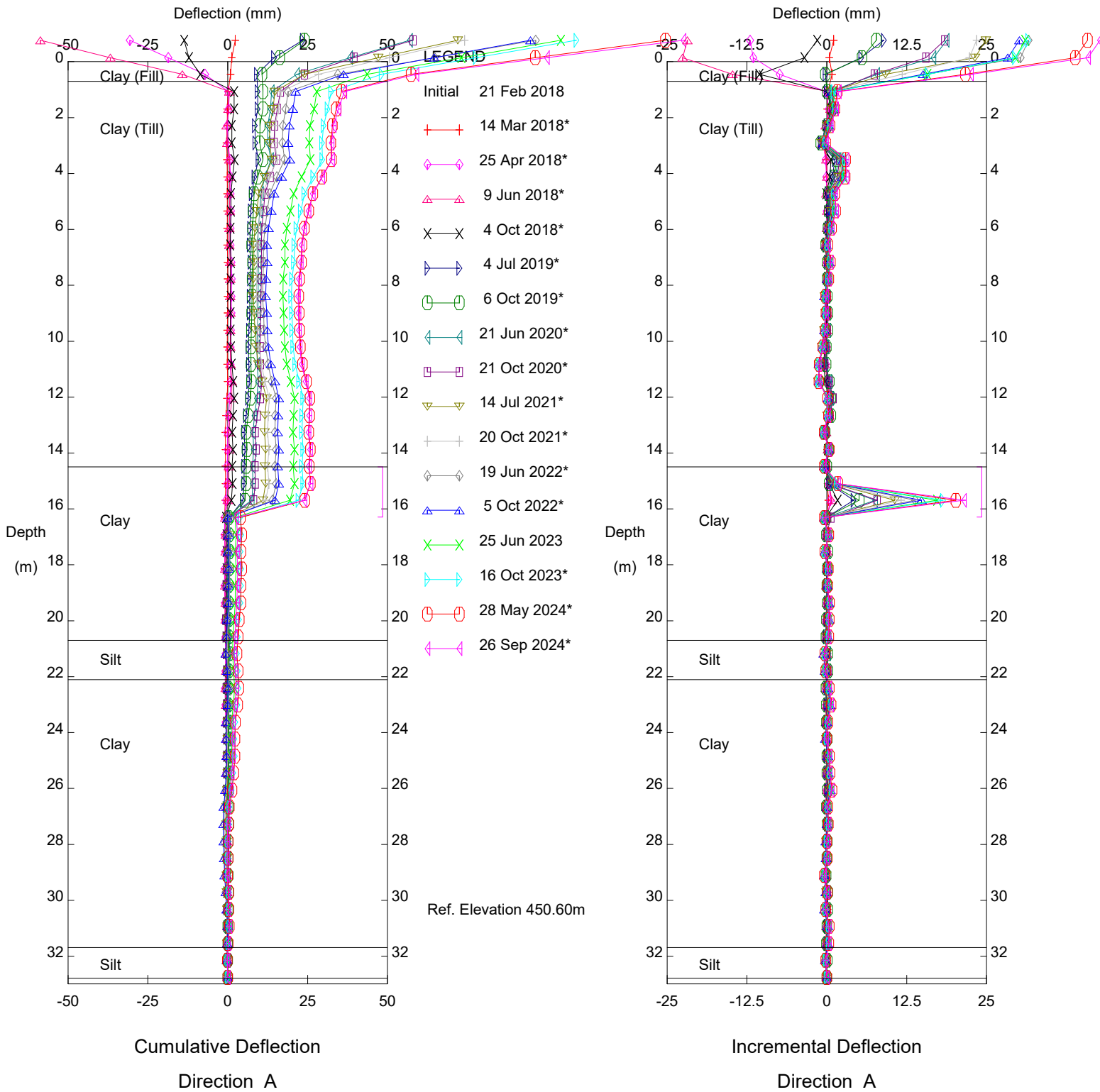
Alberta Transportation

Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinator SI-59

Alberta Transportation

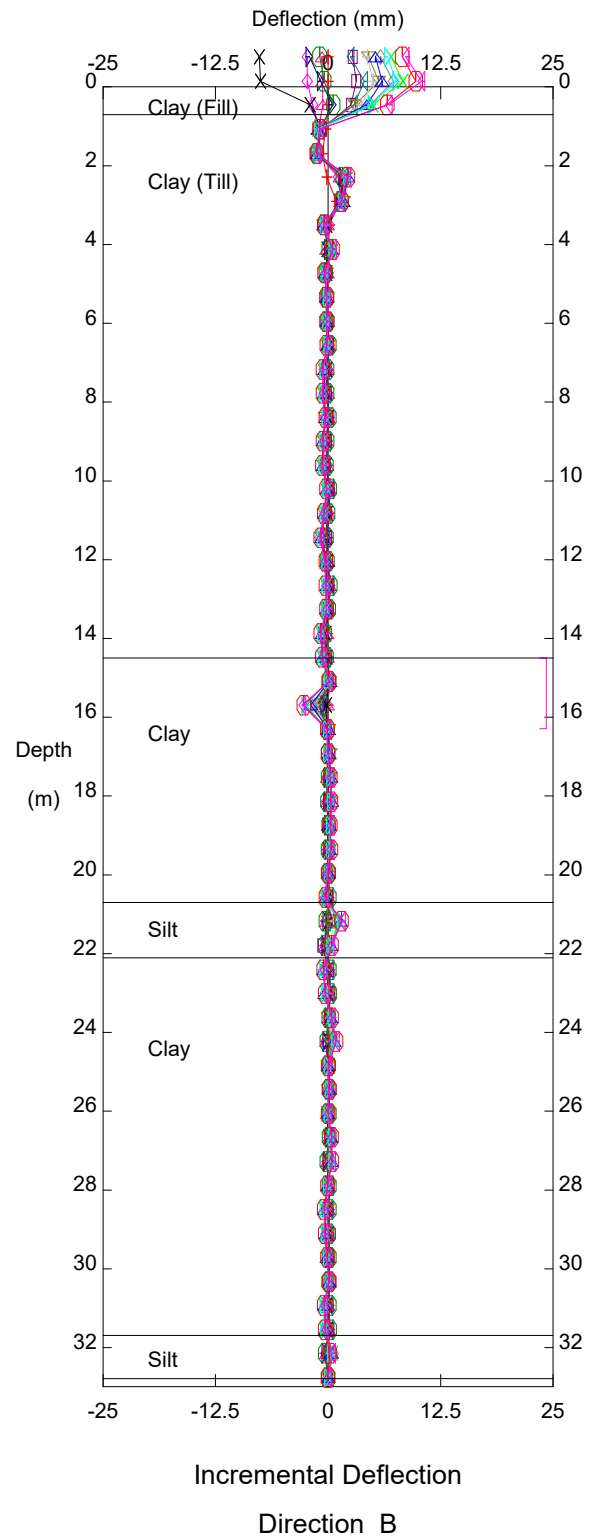
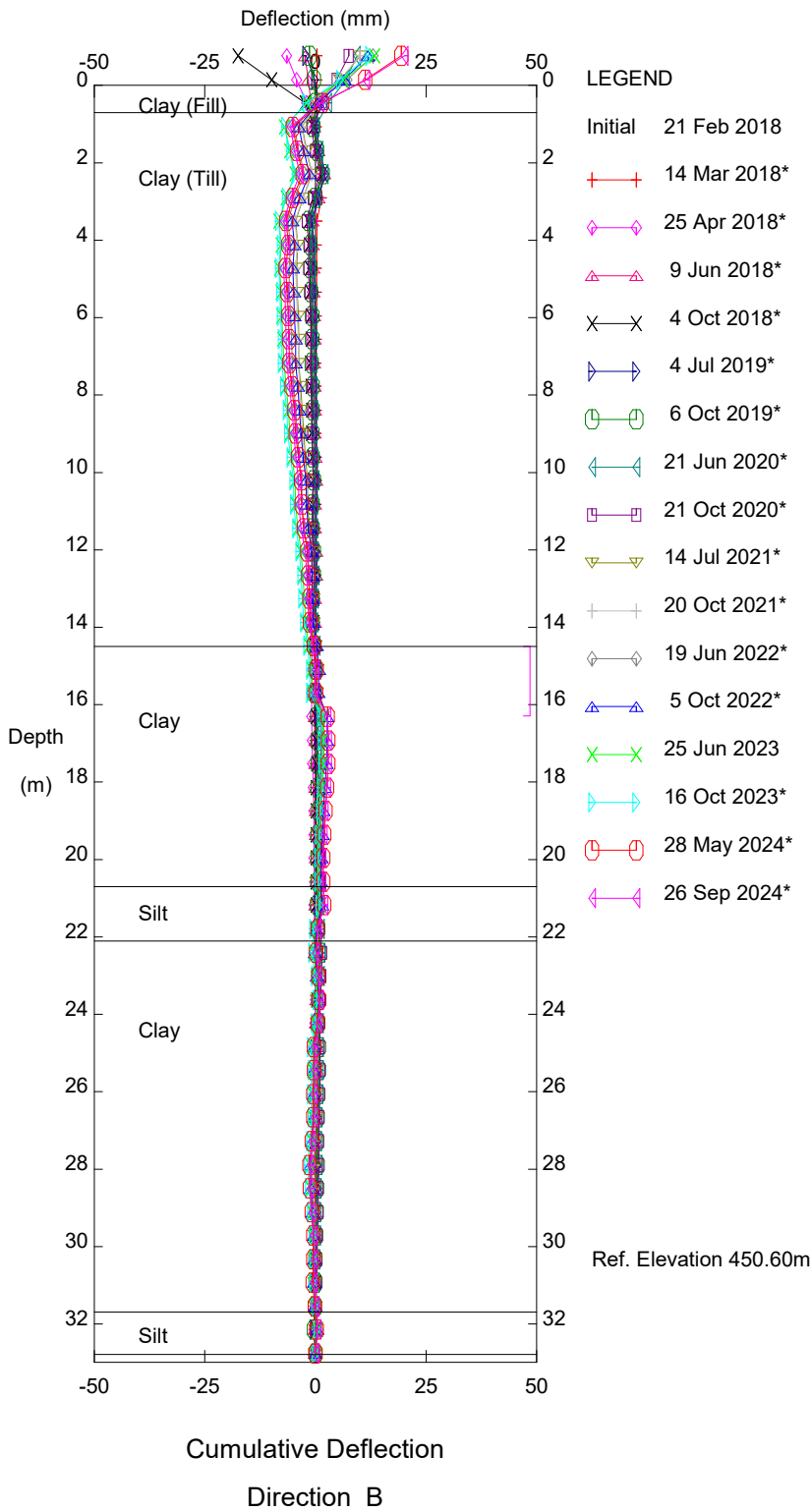


HWY 2:68 (PH037), Inclinometer SI18-8

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

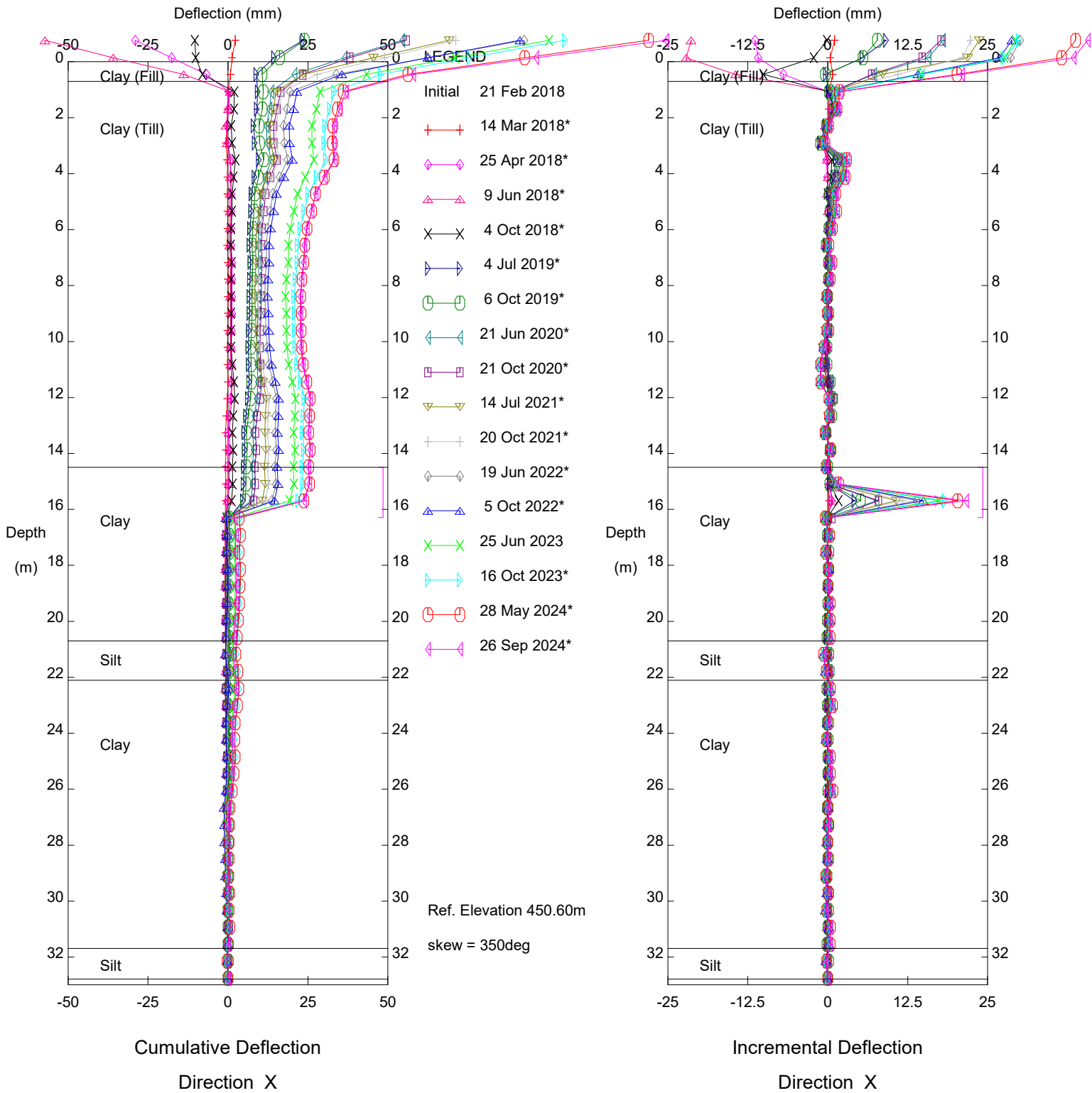
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinator SI18-8

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

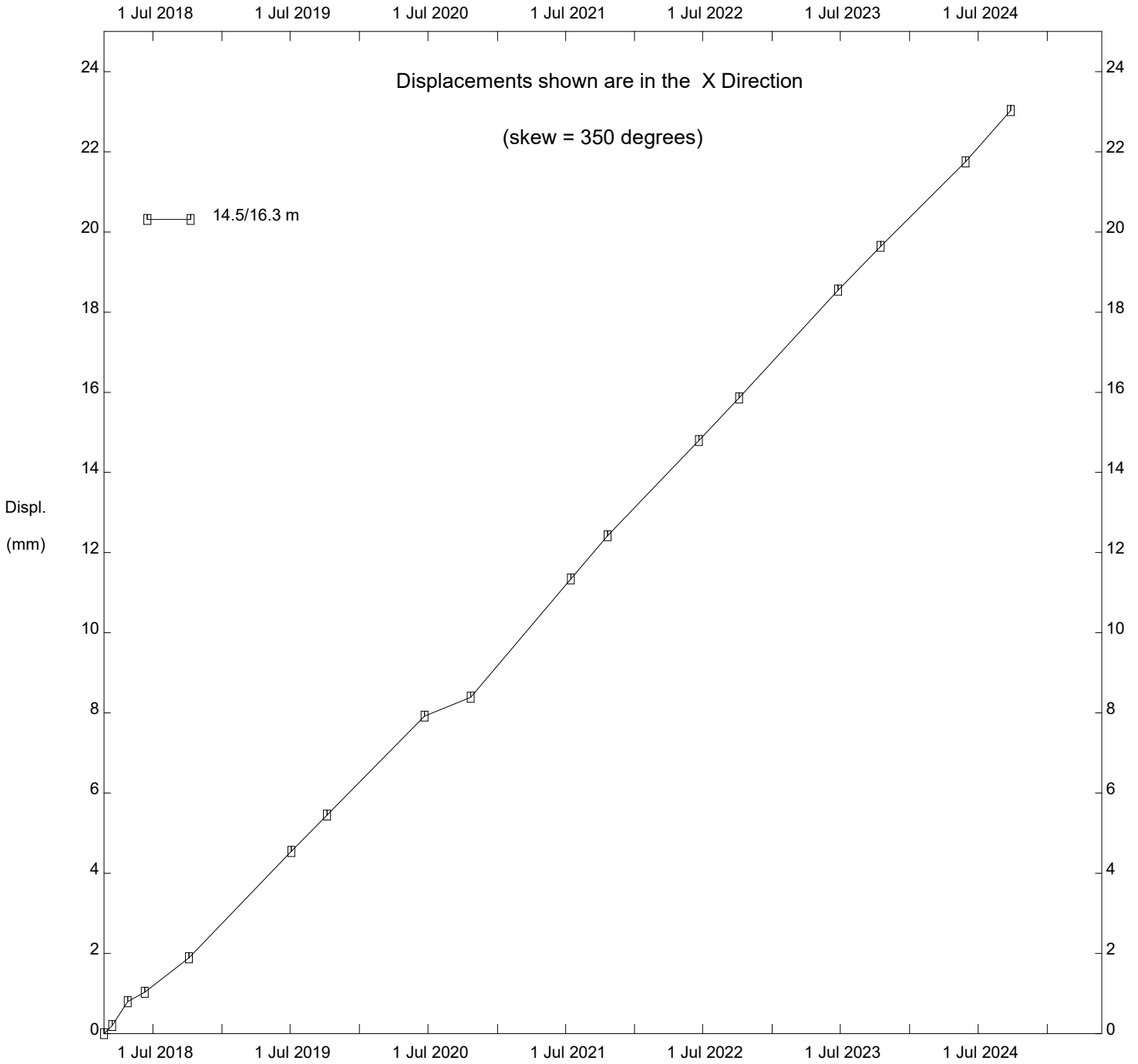


HWY 2:68 (PH037), Inclinometer SI18-8

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

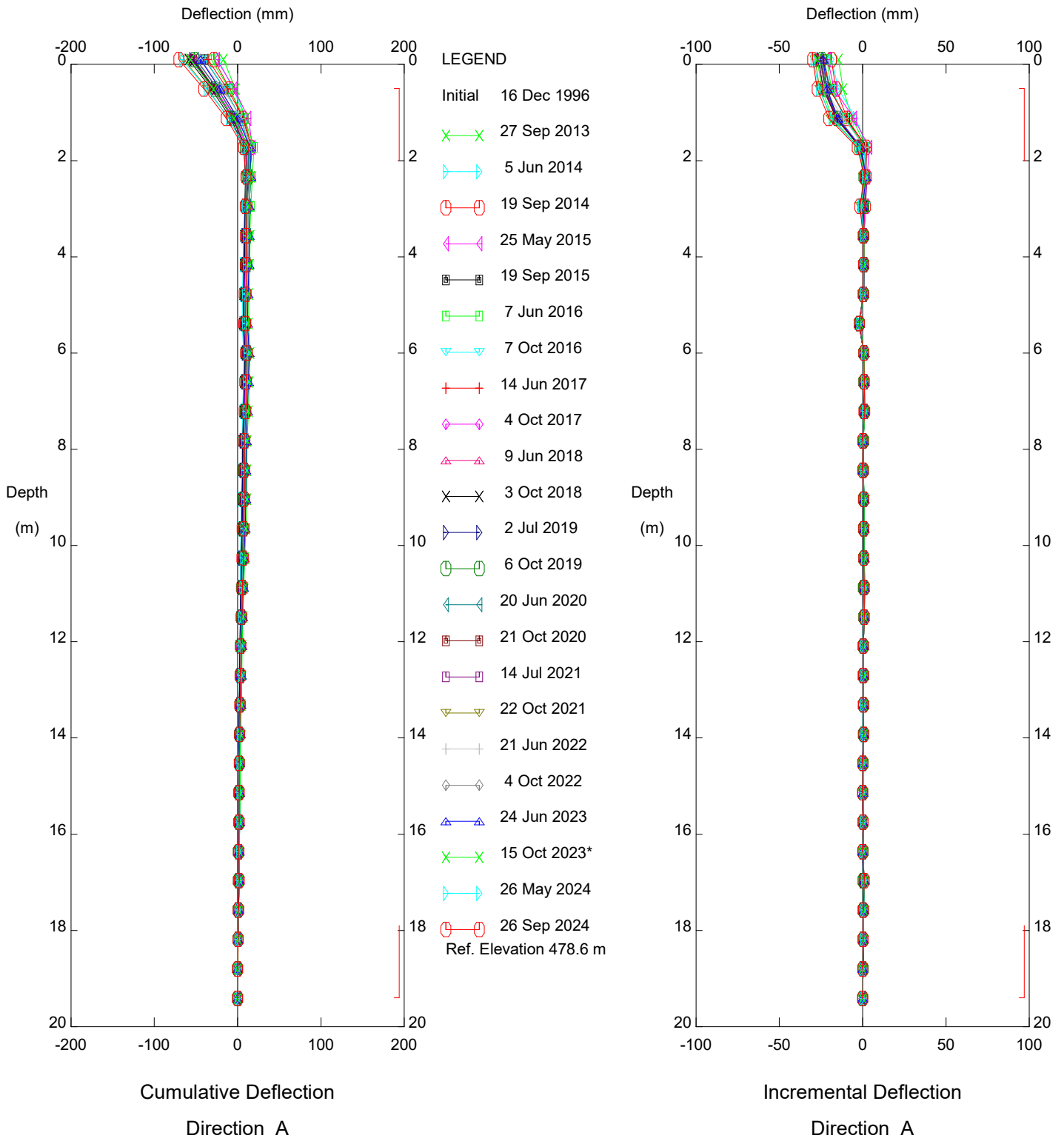
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinator SI18-8

Alberta Transportation

Thurber Engineering Ltd.

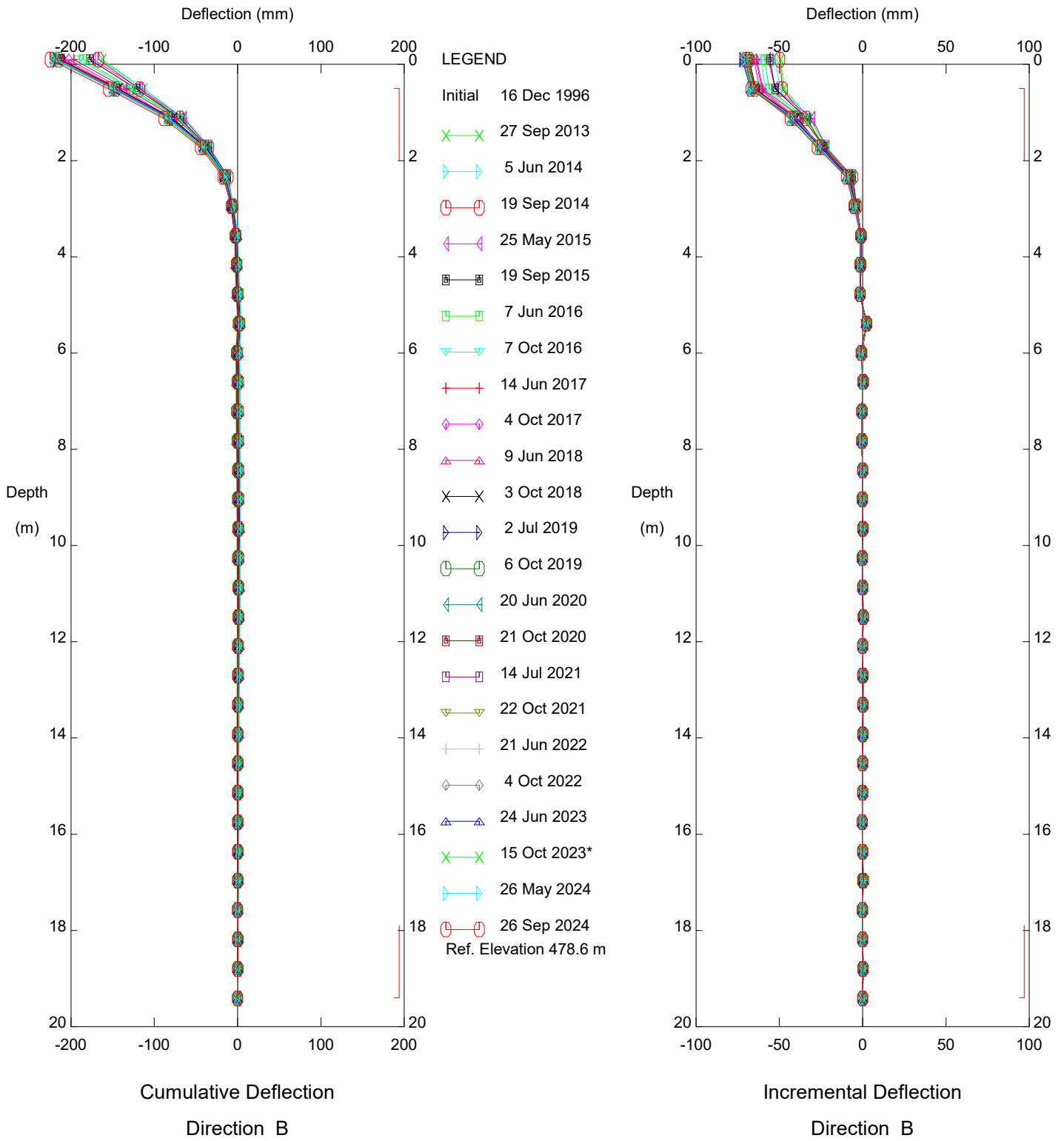


HWY 2:68 (PH037), Inclinometer SI-58

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

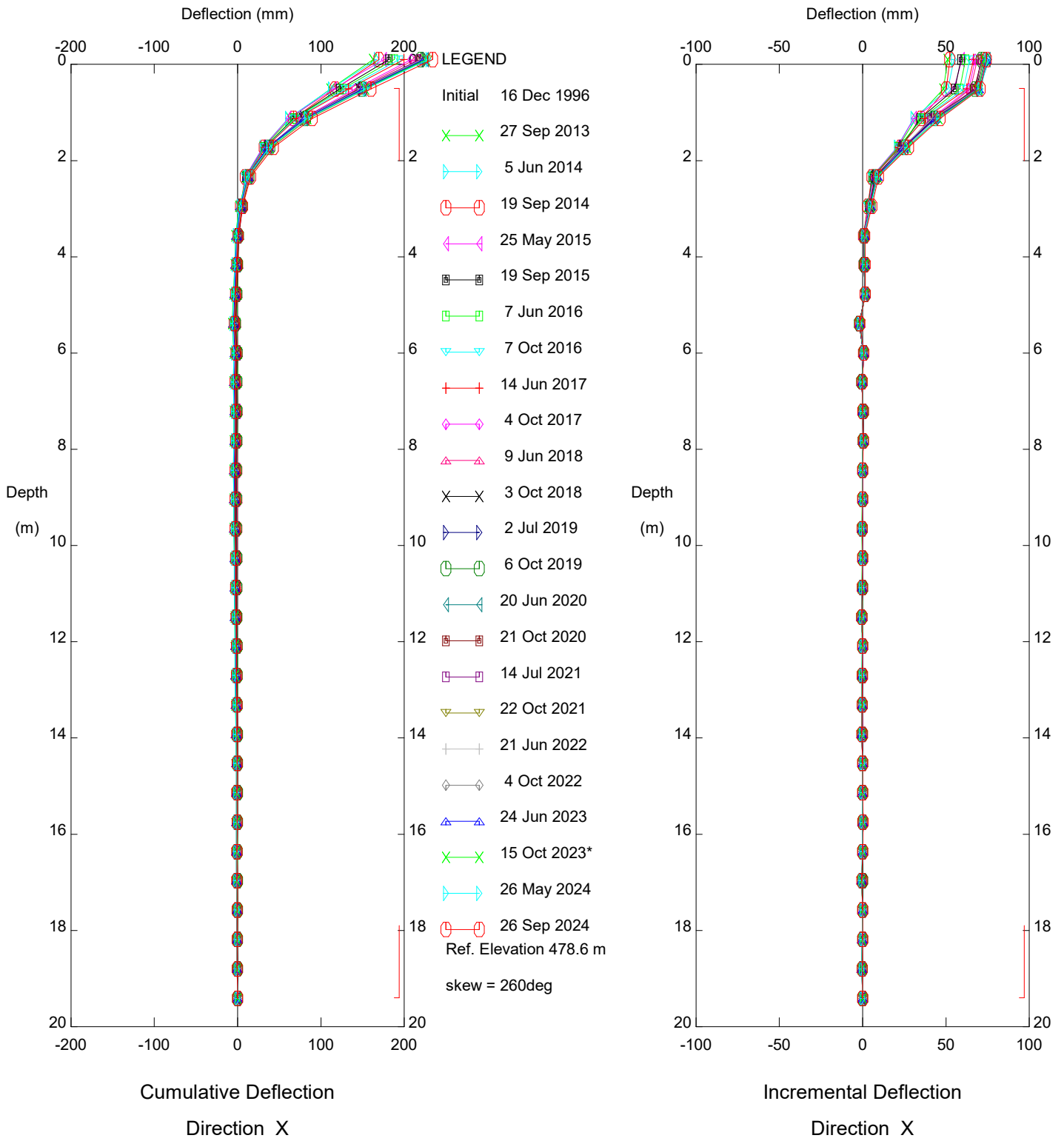


HWY 2:68 (PH037), Inclinometer SI-58

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

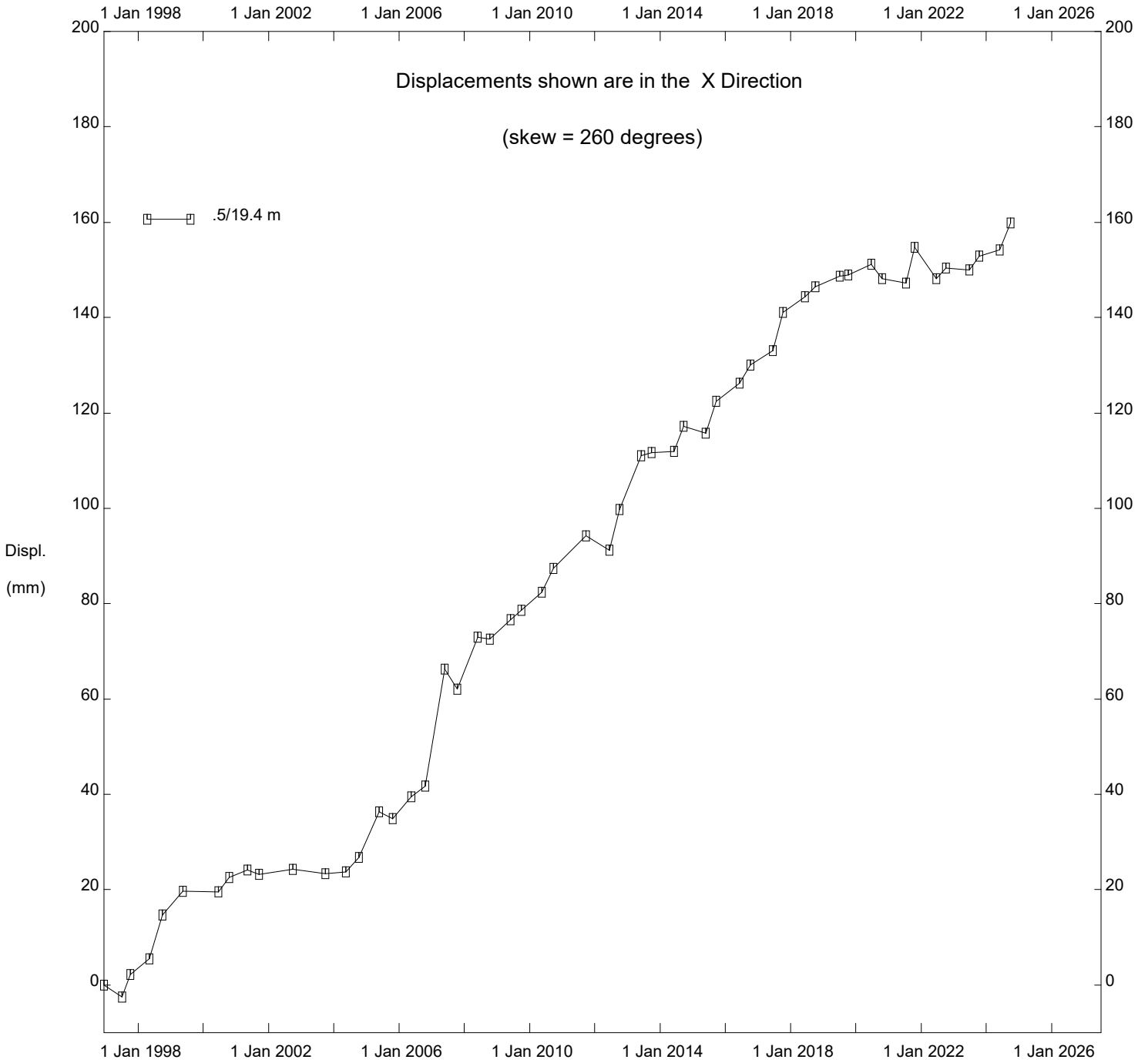


HWY 2:68 (PH037), Inclinometer SI-58

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

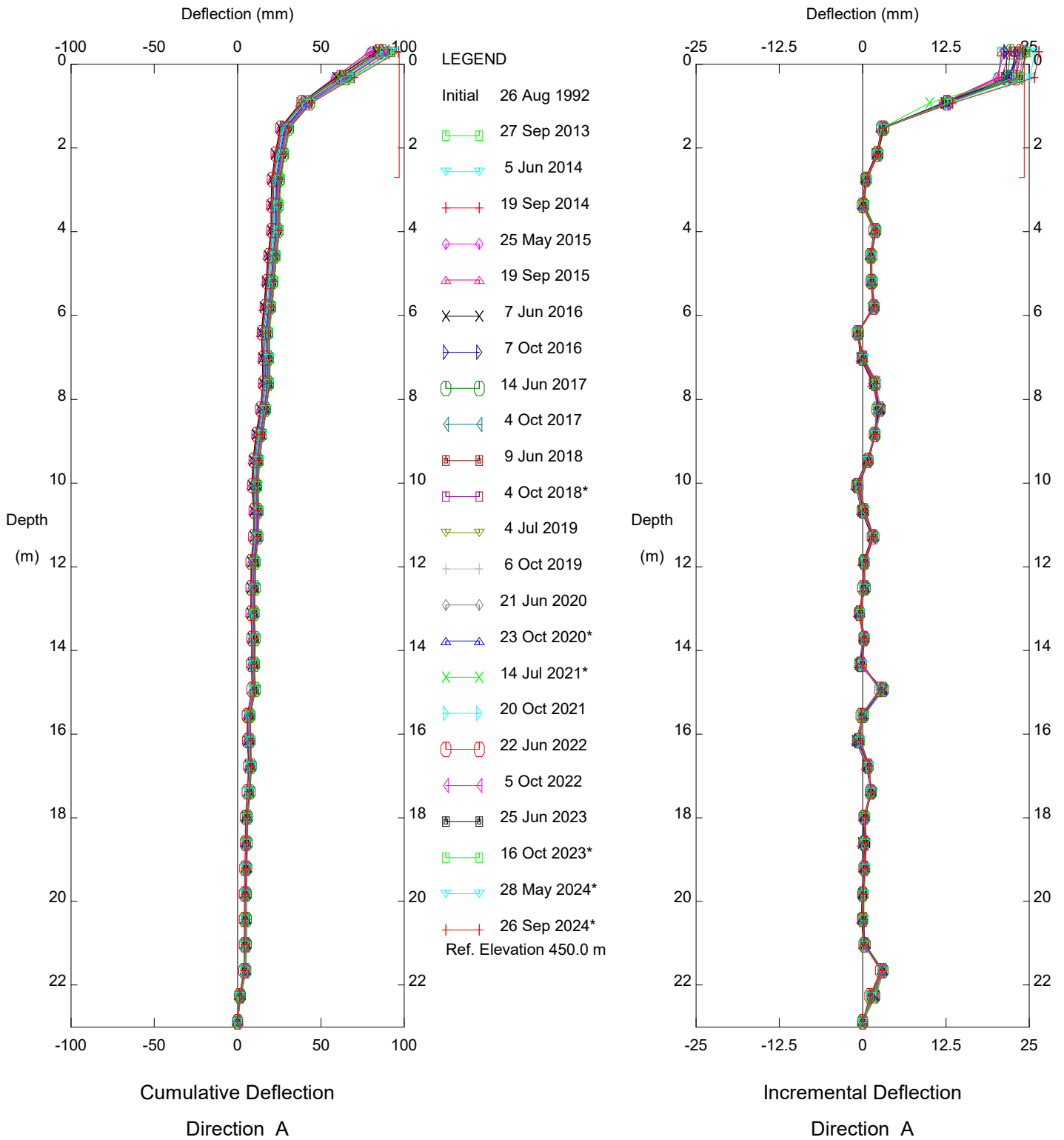
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinator SI-58

Alberta Transportation

Thurber Engineering Ltd.

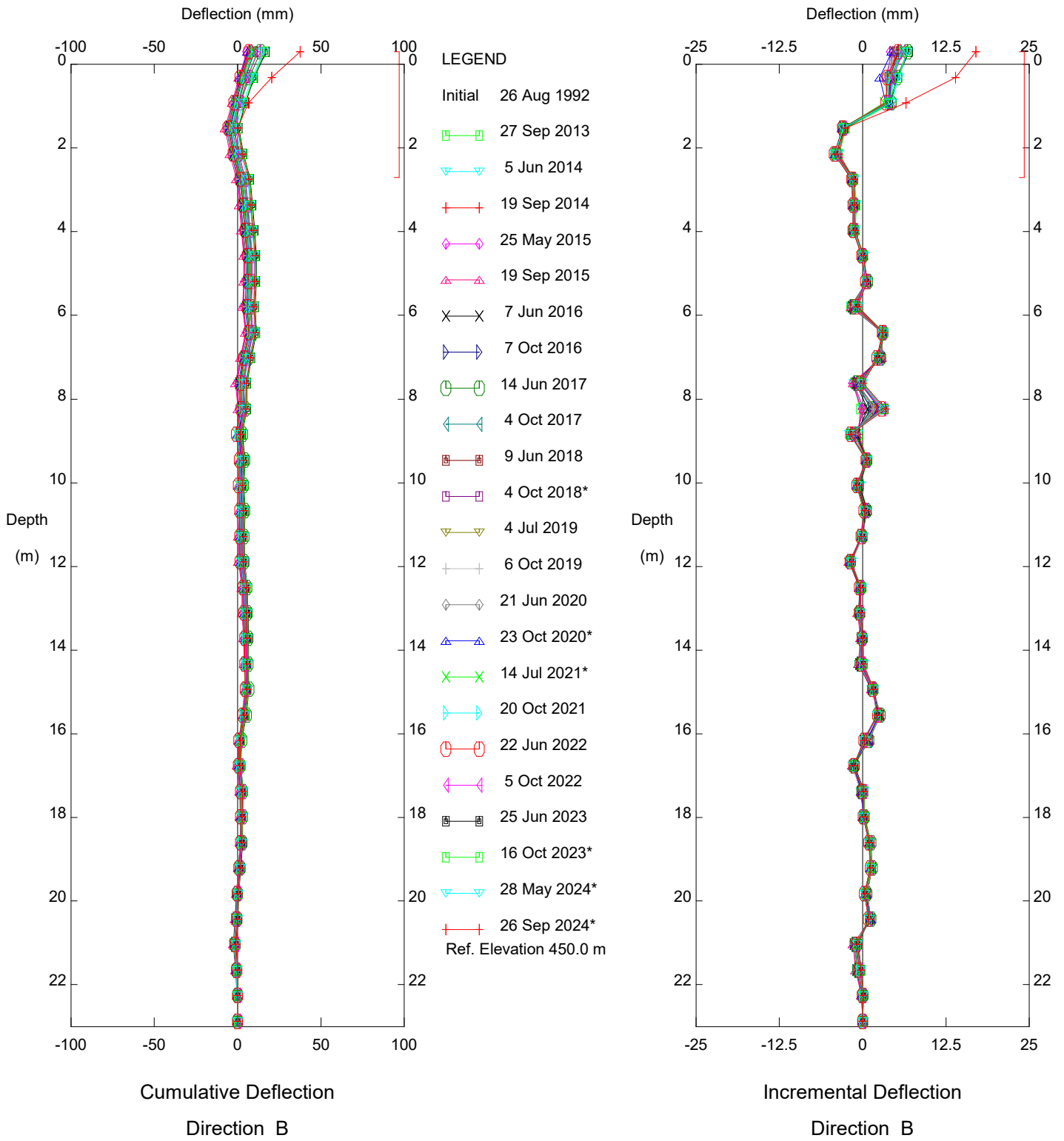


HWY 2:68 (PH037), Inclinometer SI-56

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

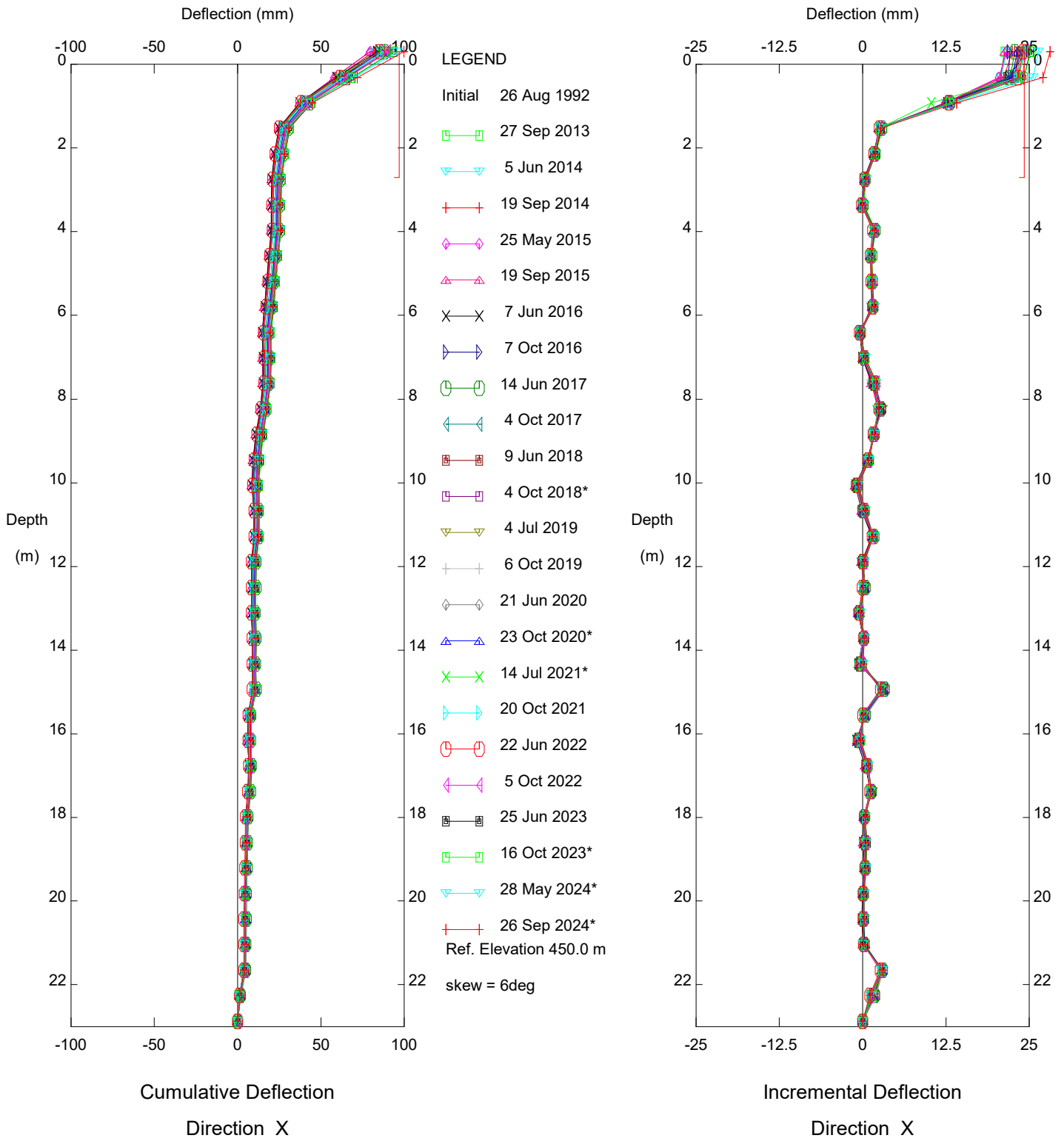


HWY 2:68 (PH037), Inclinometer SI-56

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

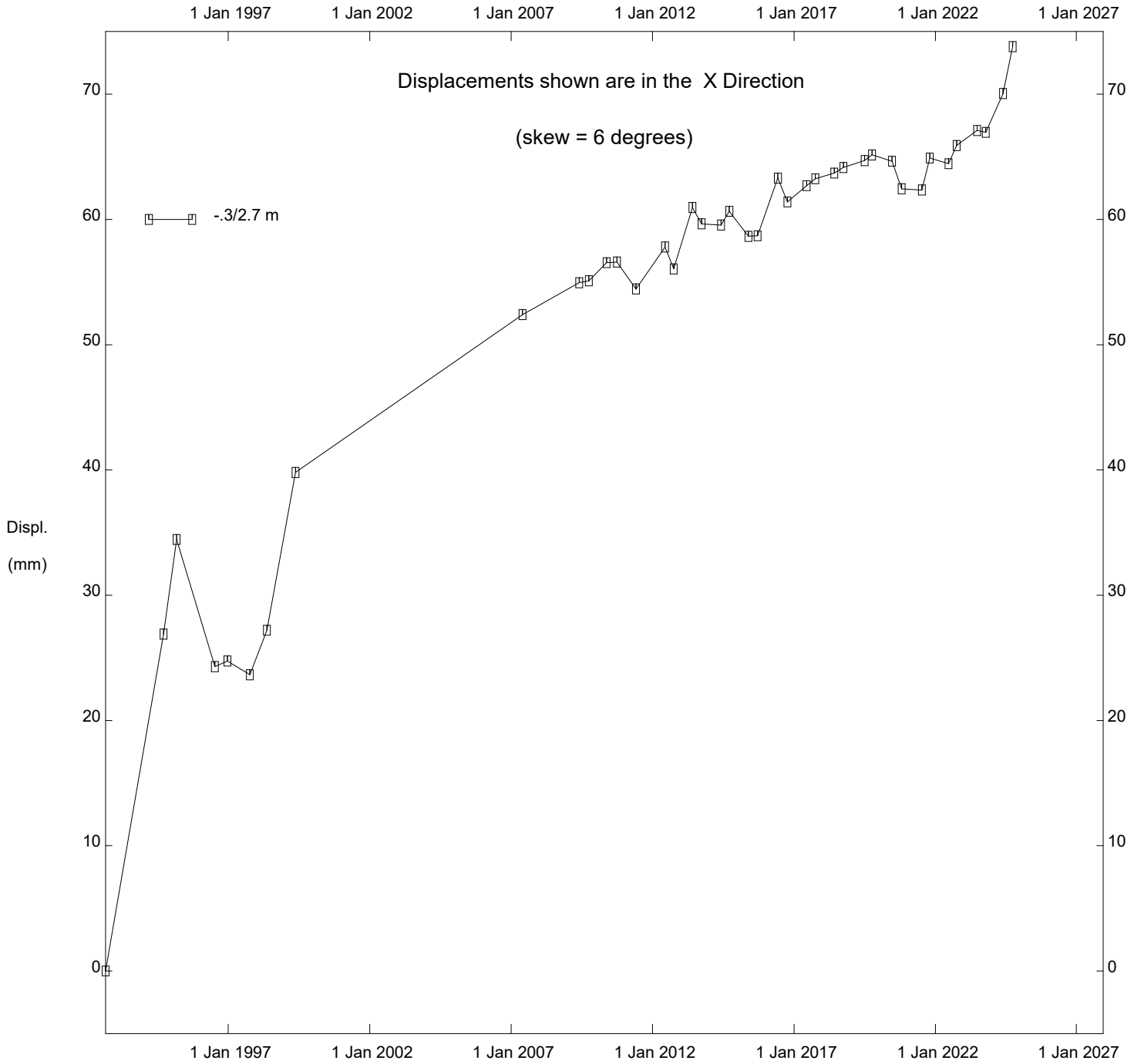


HWY 2:68 (PH037), Inclinometer SI-56

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

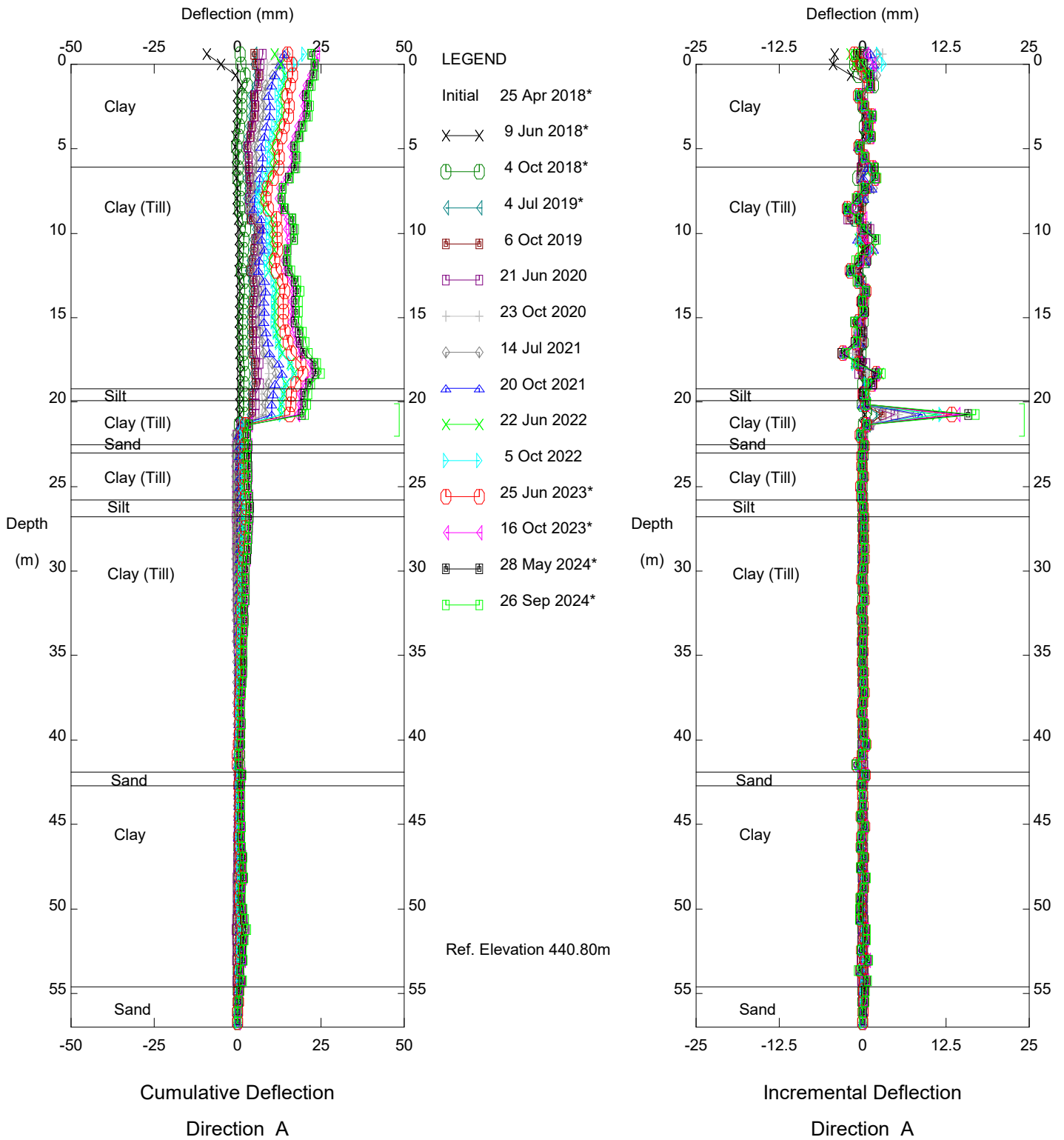
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinator SI-56

Alberta Transportation

Thurber Engineering Ltd.

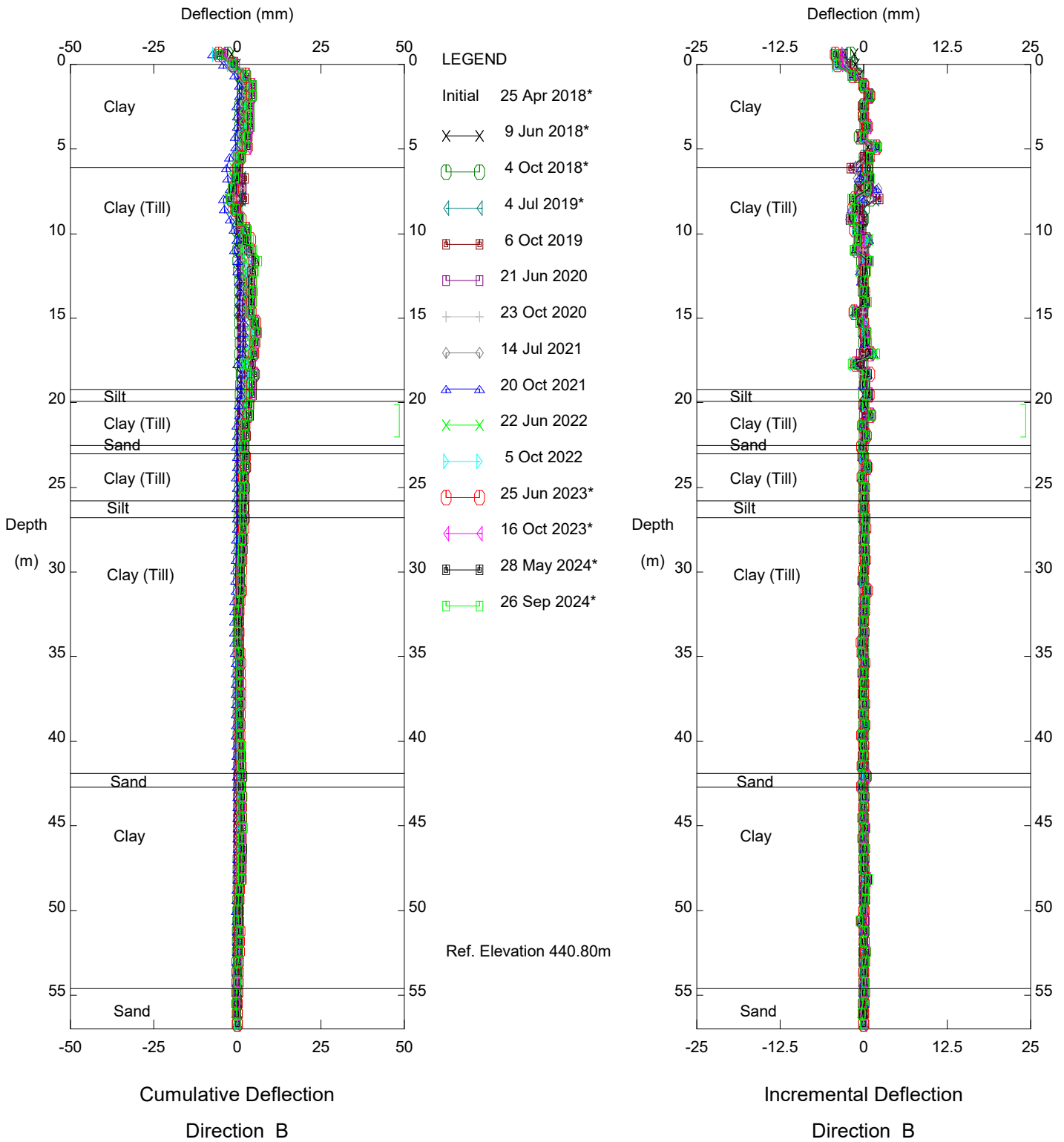


HWY 2:68 (PH037), Inclinometer SI18-9

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

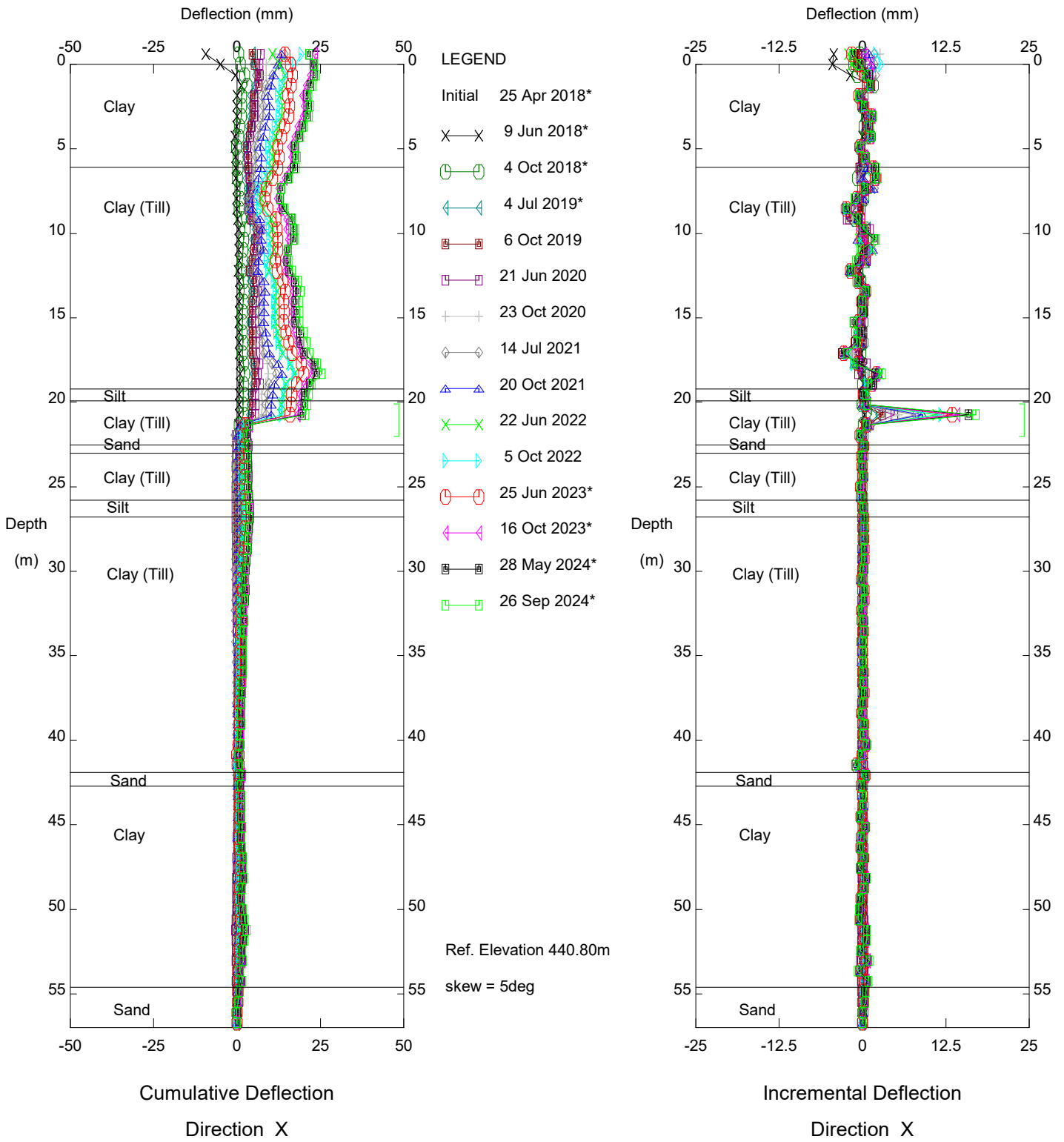


HWY 2:68 (PH037), Inclinometer SI18-9

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

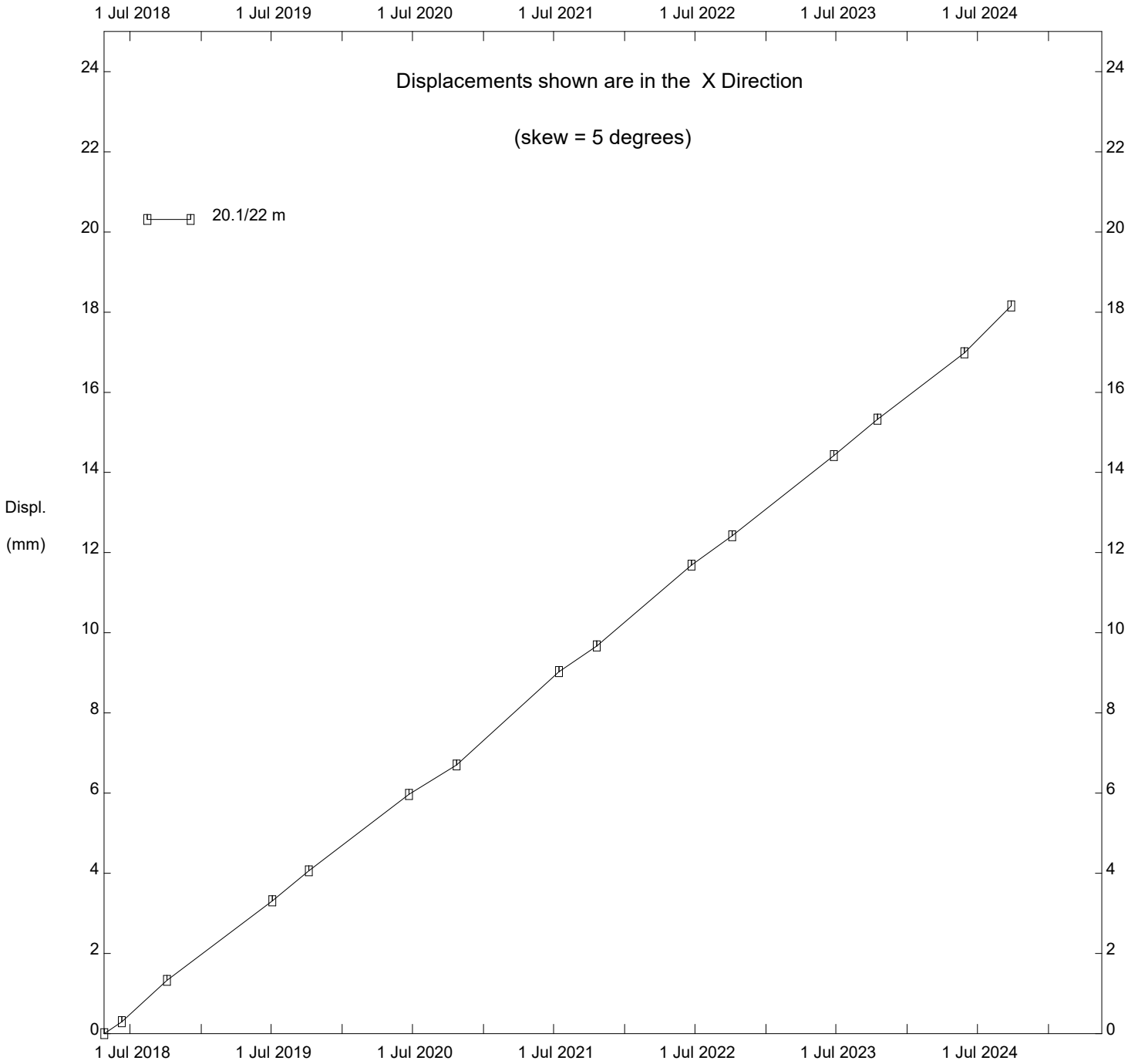


HWY 2:68 (PH037), Inclinometer SI18-9

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

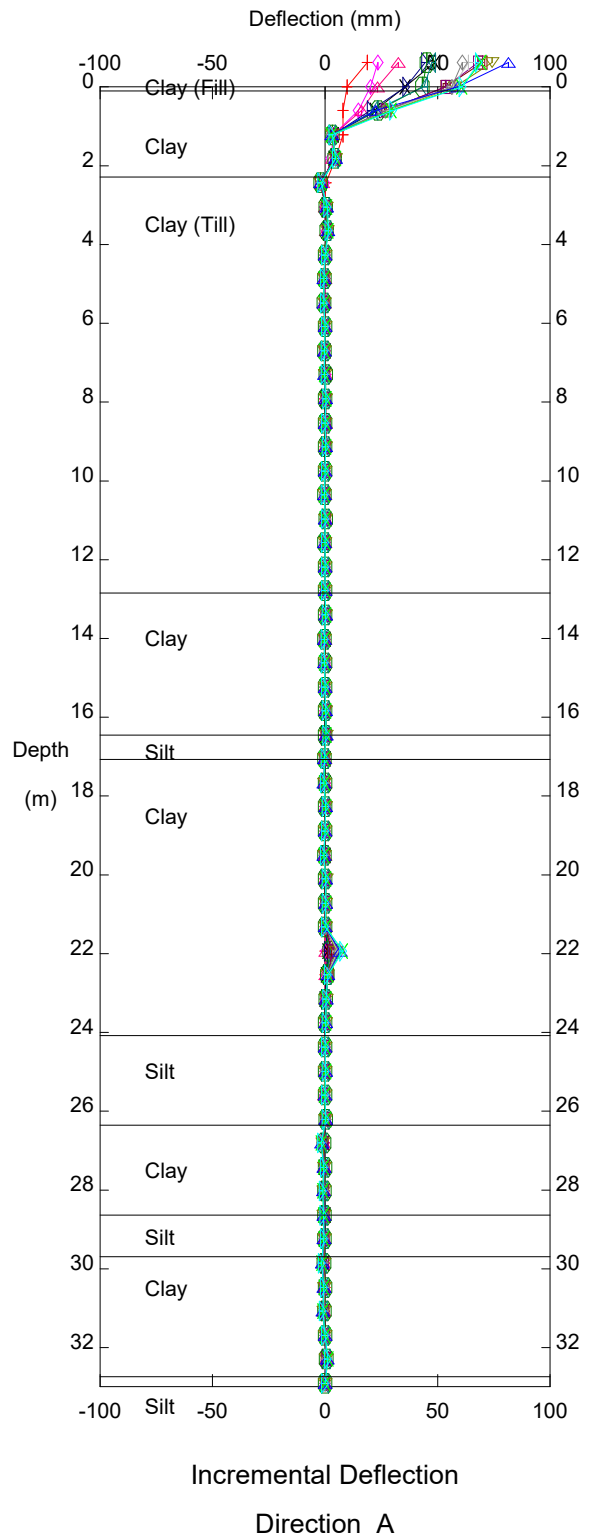
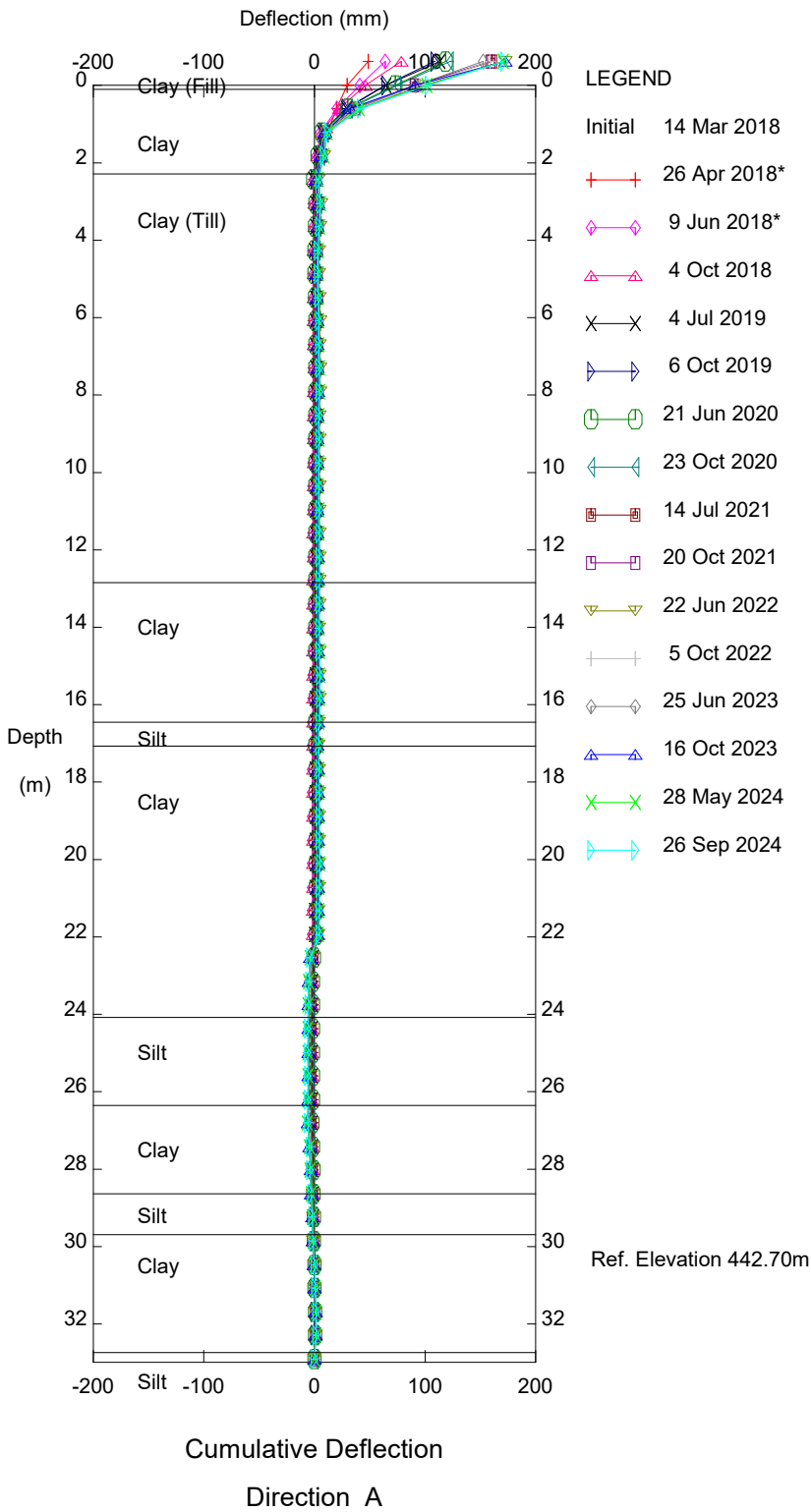
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinator SI18-9

Alberta Transportation

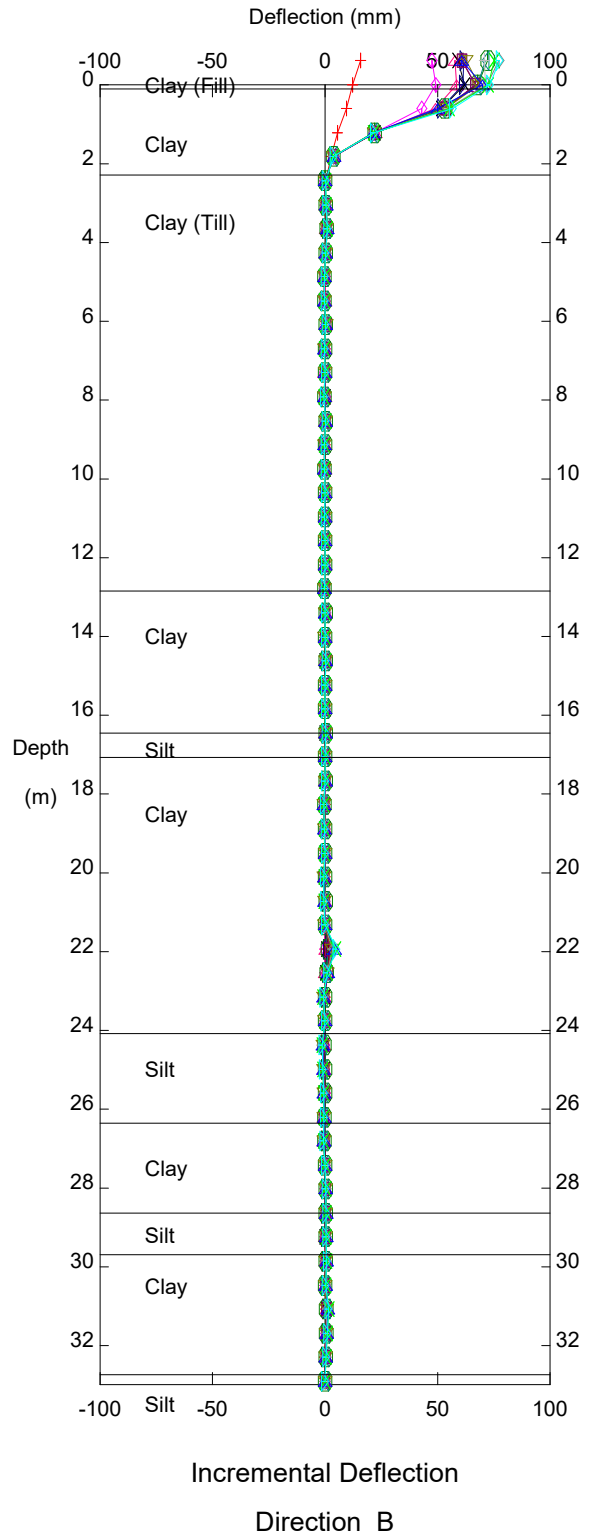
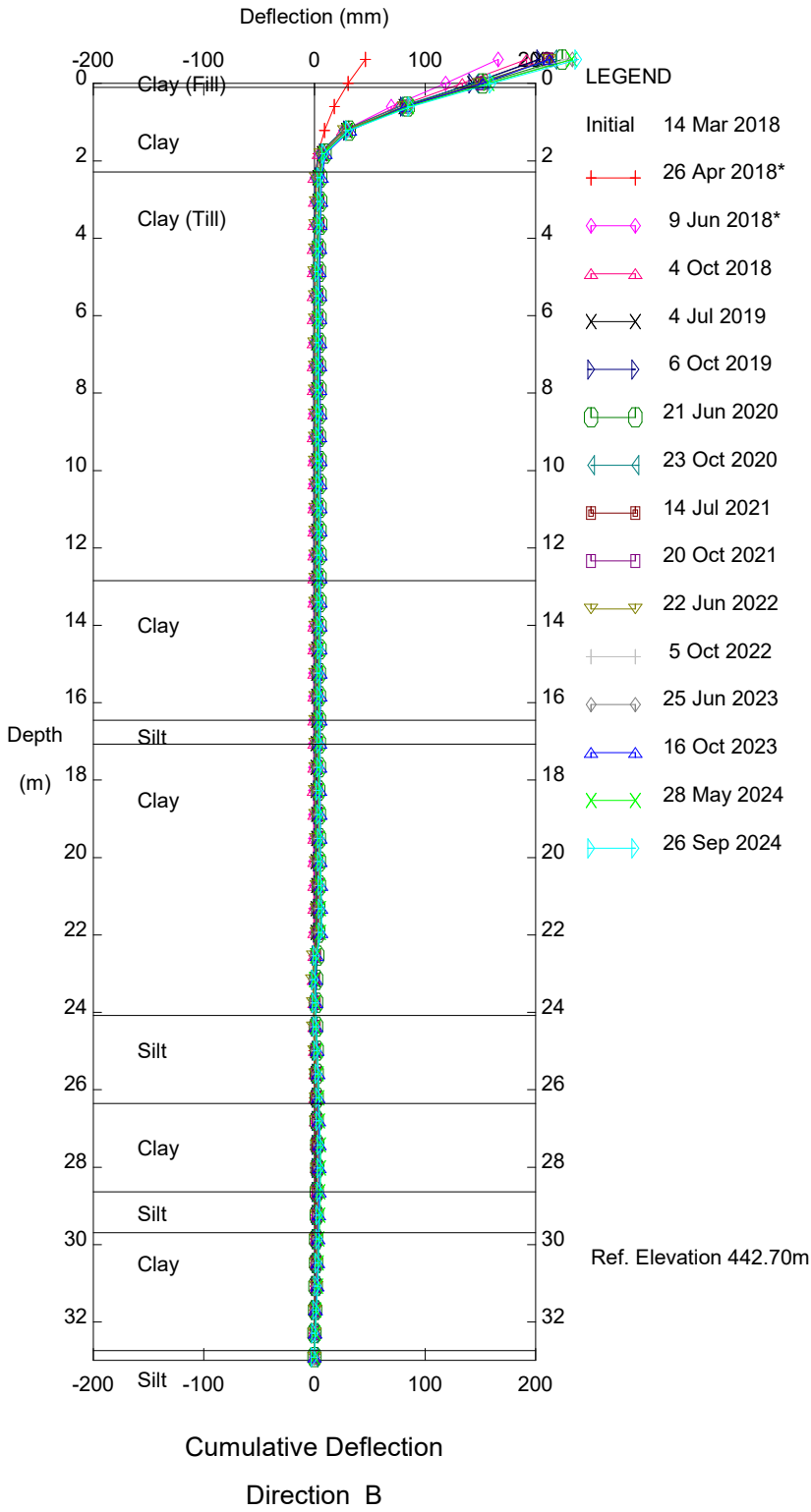
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinator S118-10

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

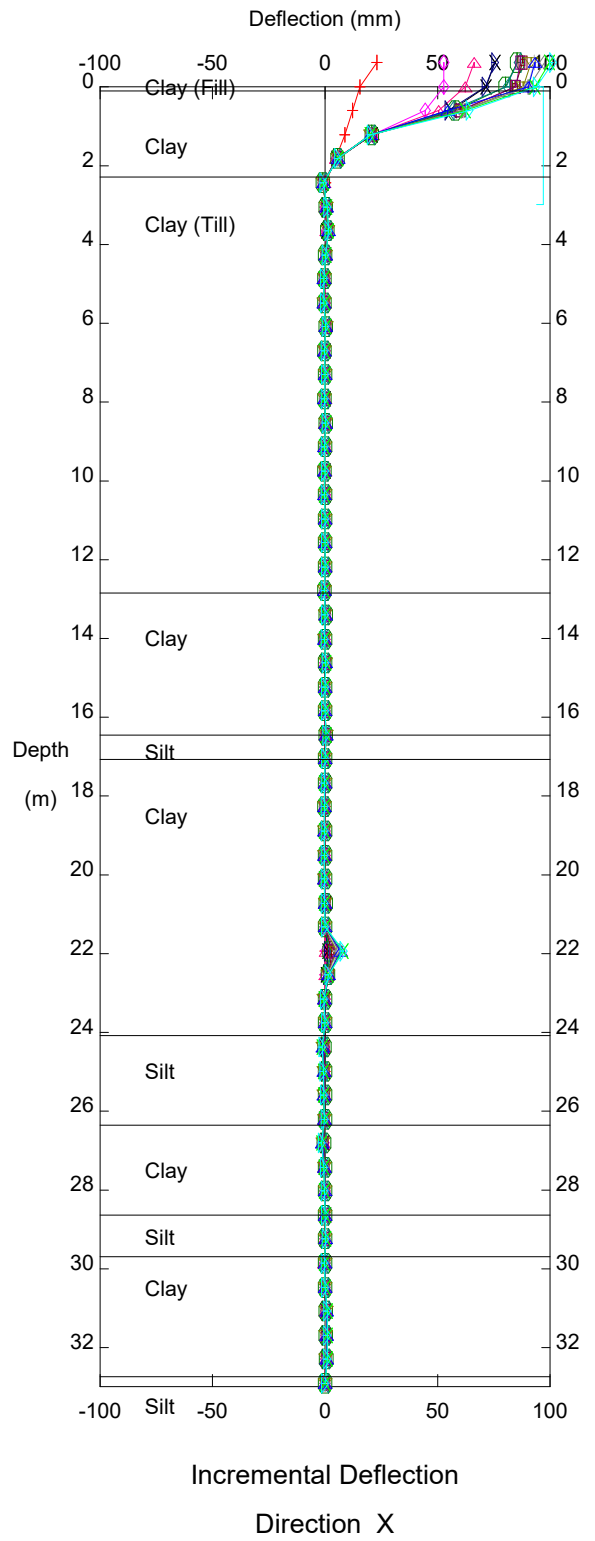
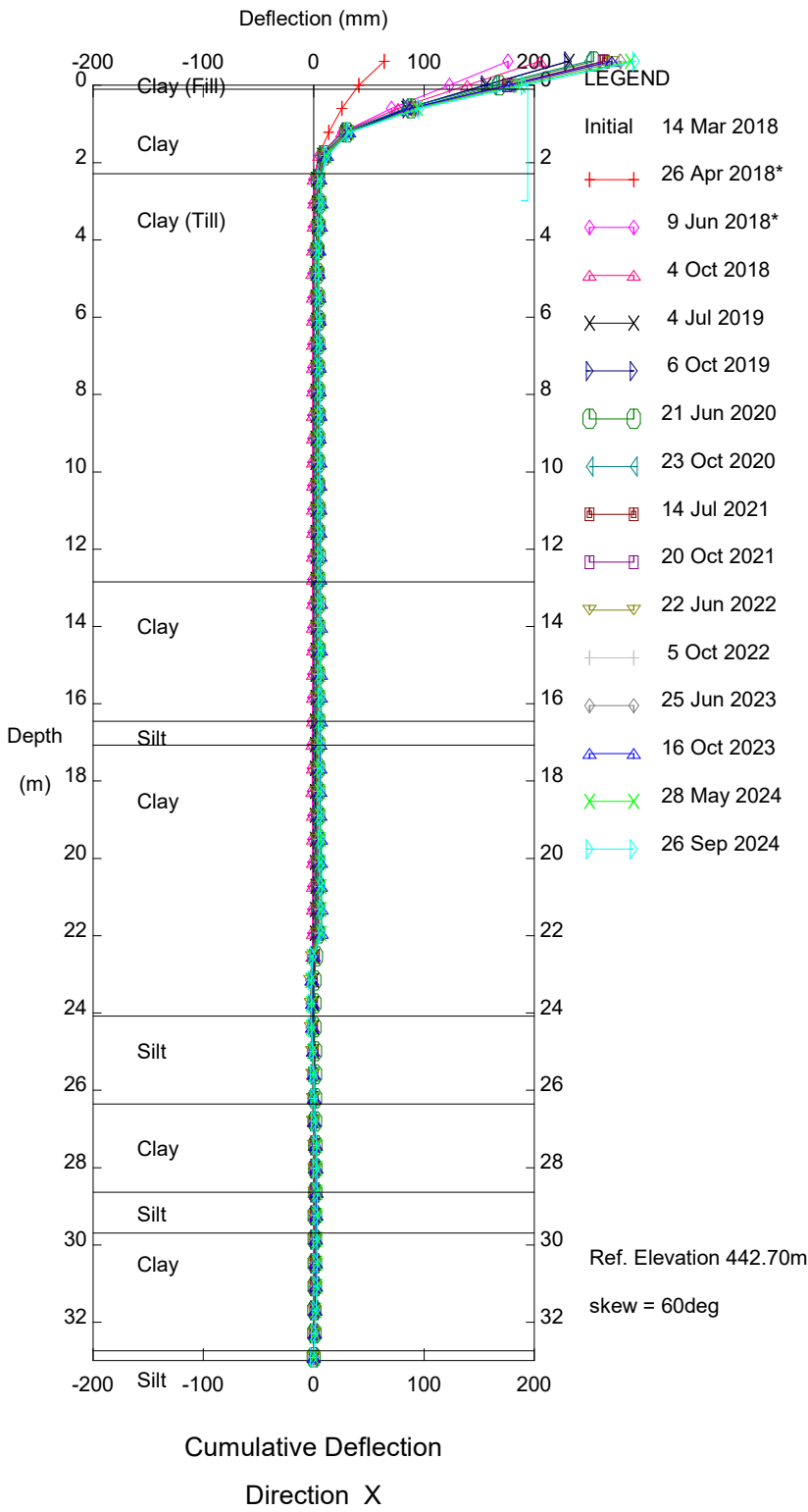


HWY 2:68 (PH037), Inclinator S118-10

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

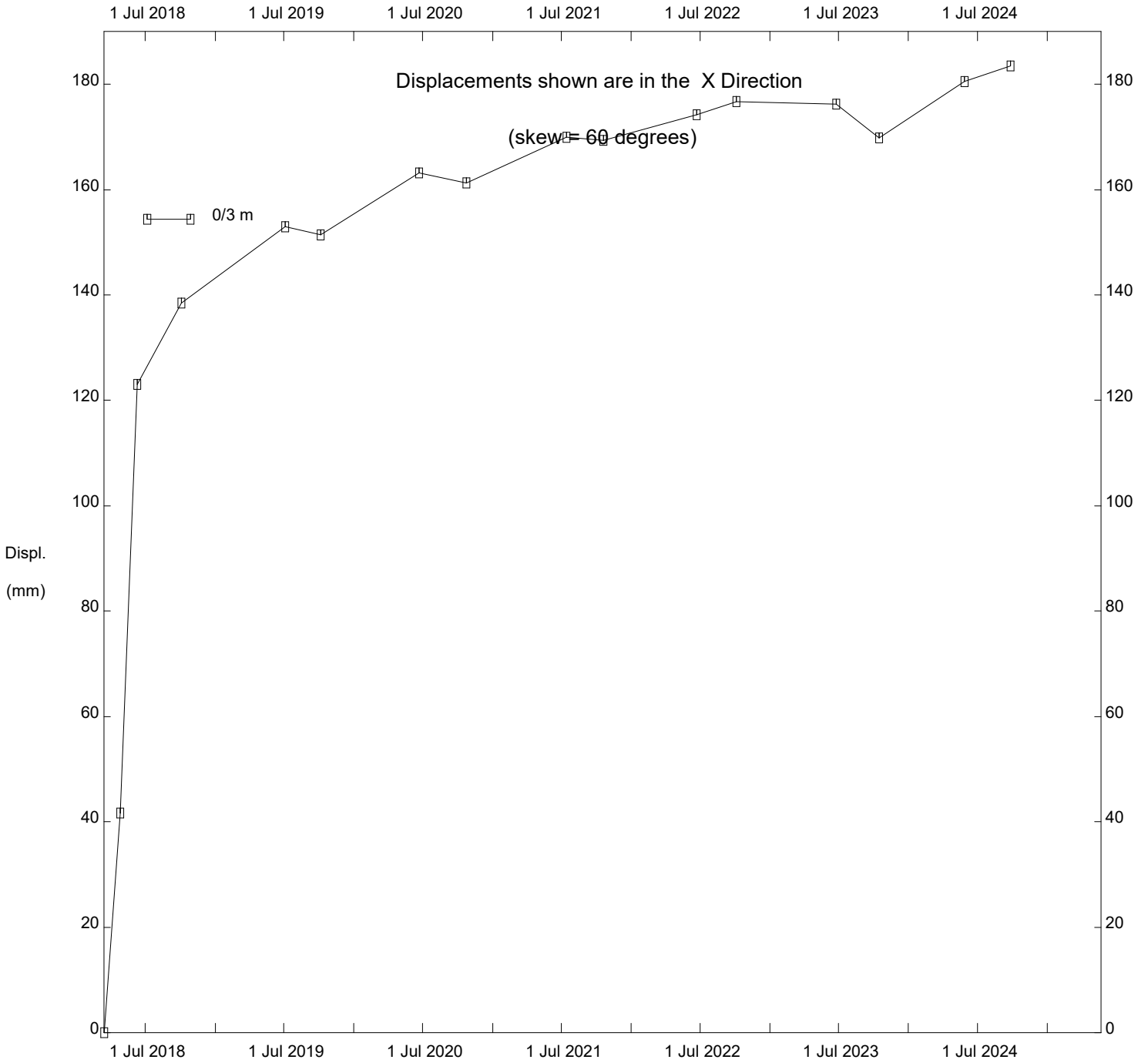


HWY 2:68 (PH037), Inclinator S118-10

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

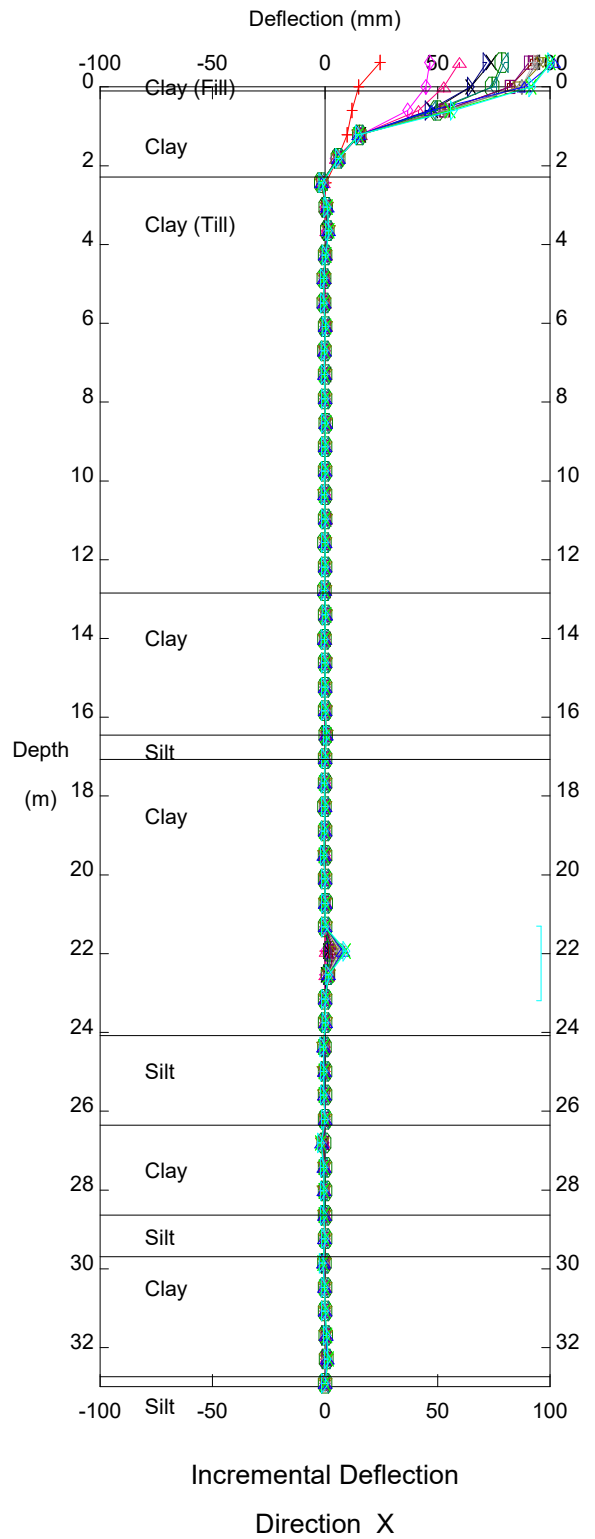
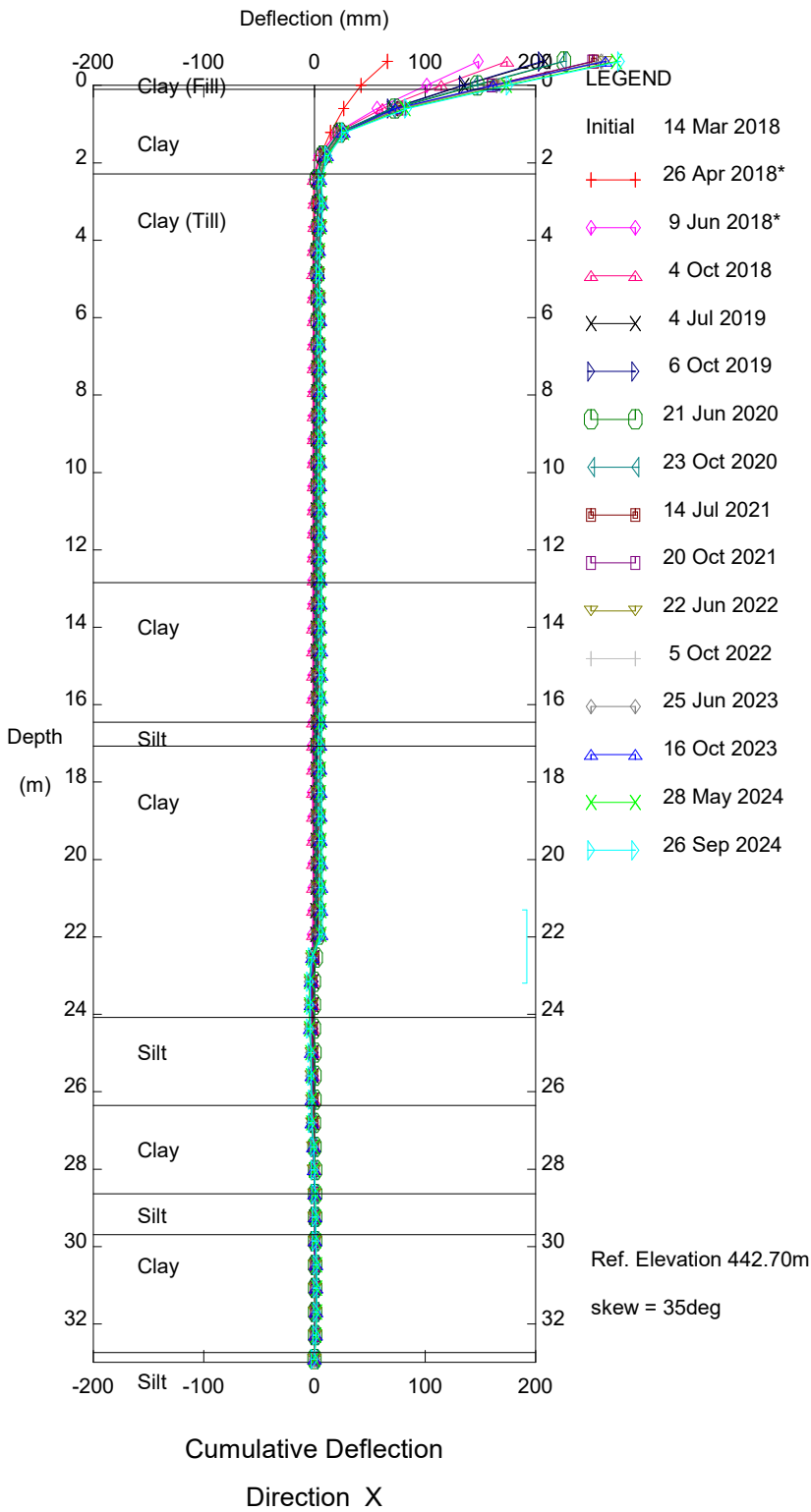
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinator SI18-10

Alberta Transportation

Thurber Engineering Ltd.

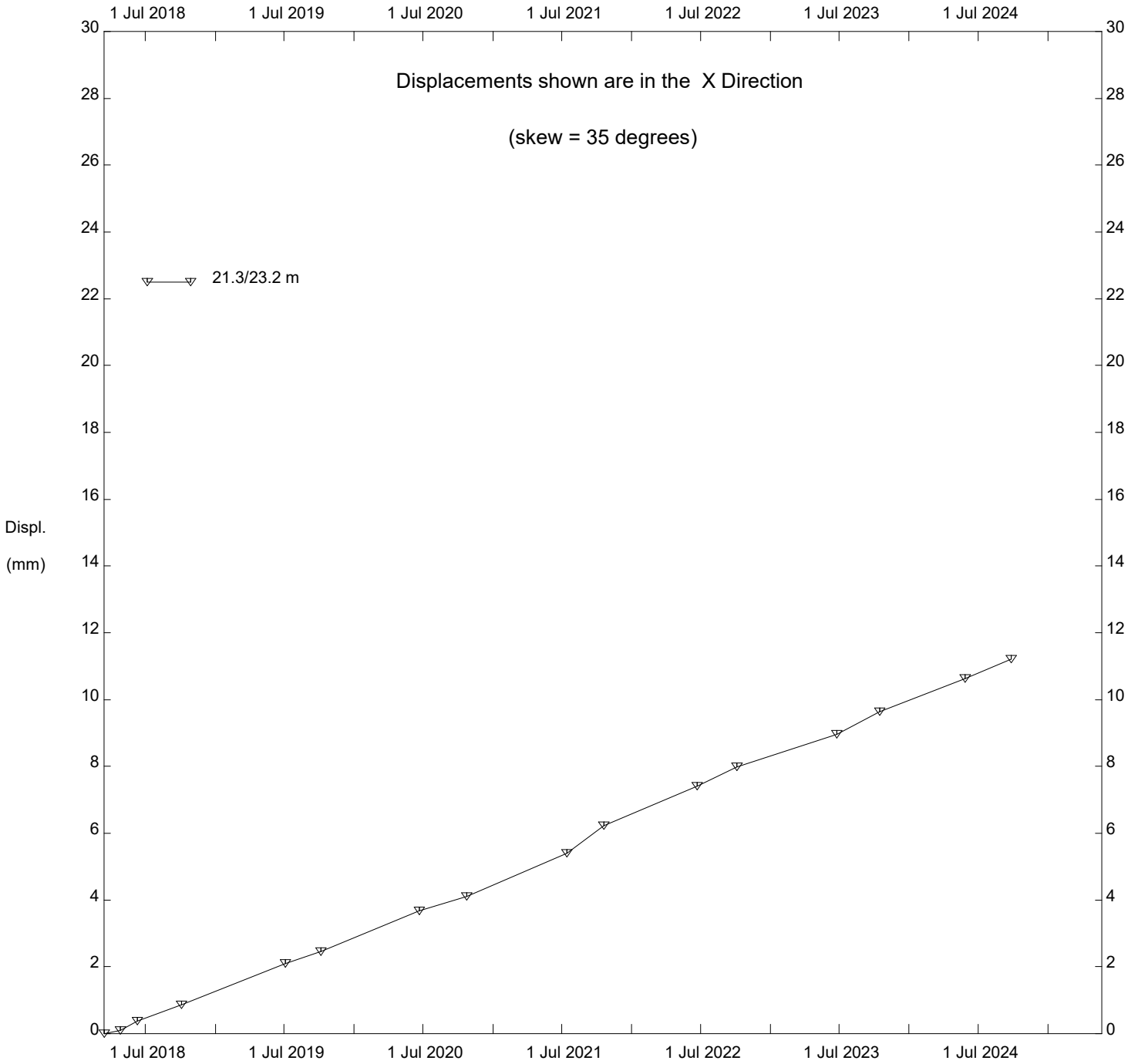


HWY 2:68 (PH037), Inclinator SI18-10

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

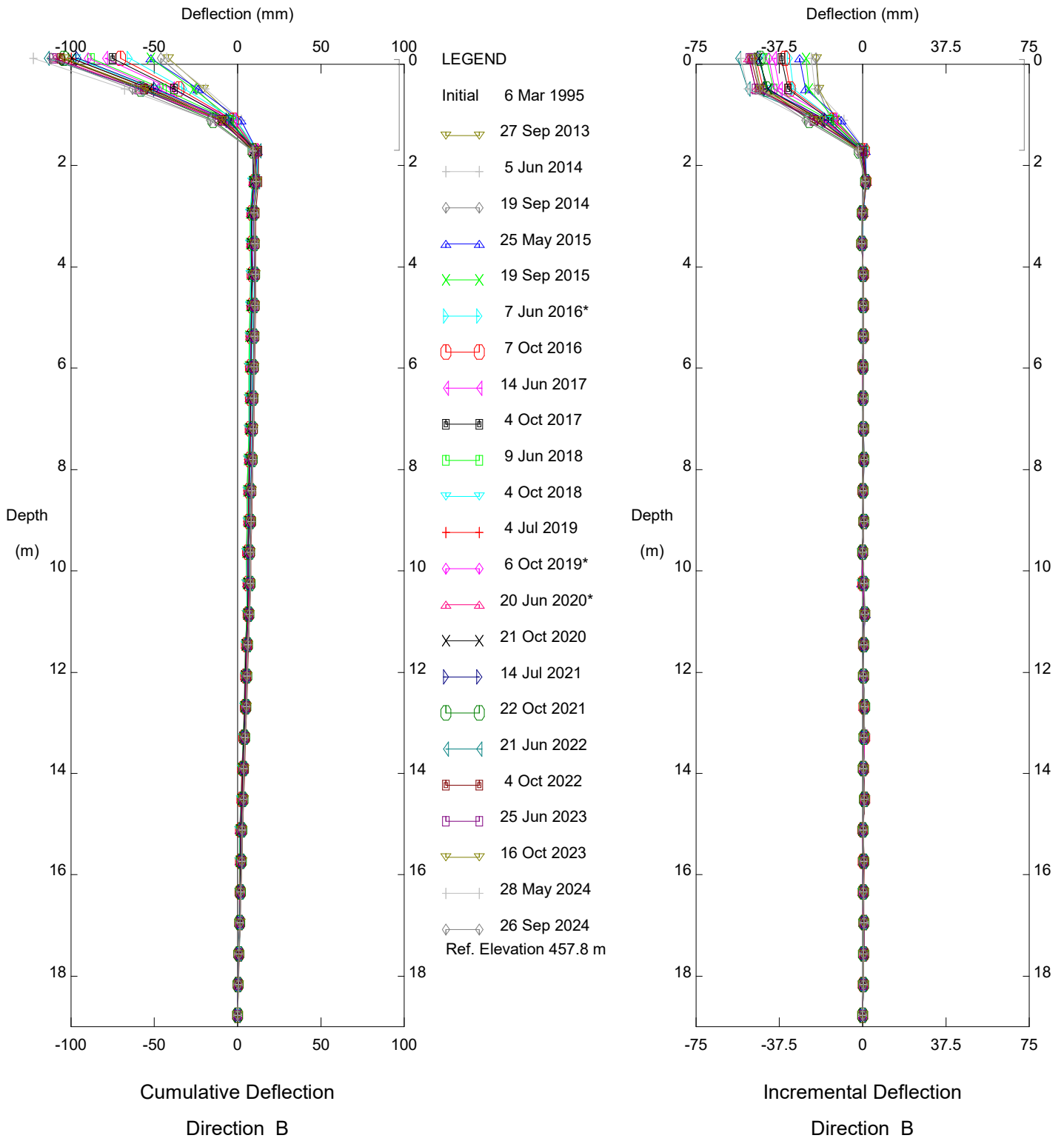
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinometer SI18-10

Alberta Transportation

Thurber Engineering Ltd.

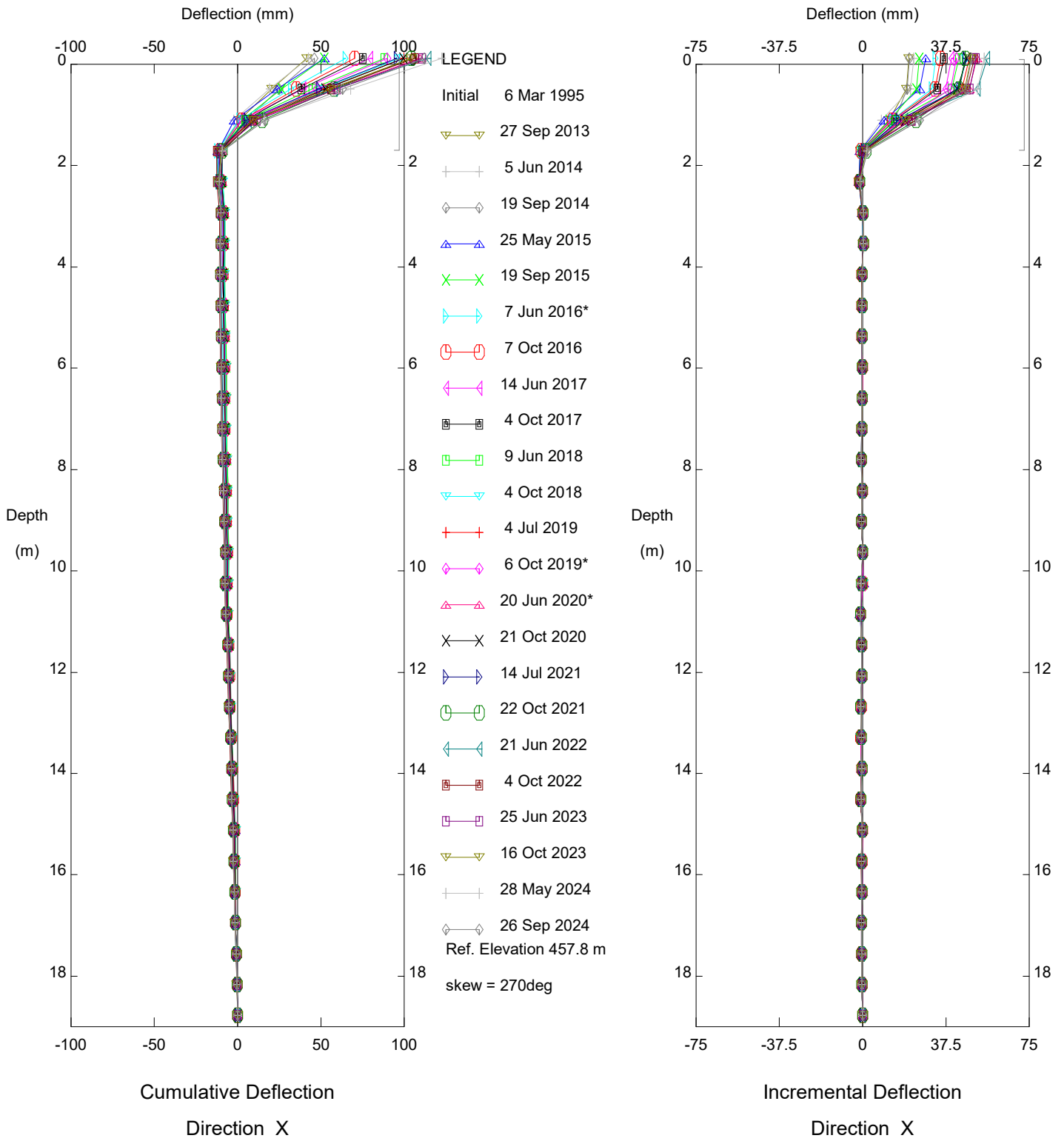


HWY 2:68 (PH037), Inclinometer SI-54

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

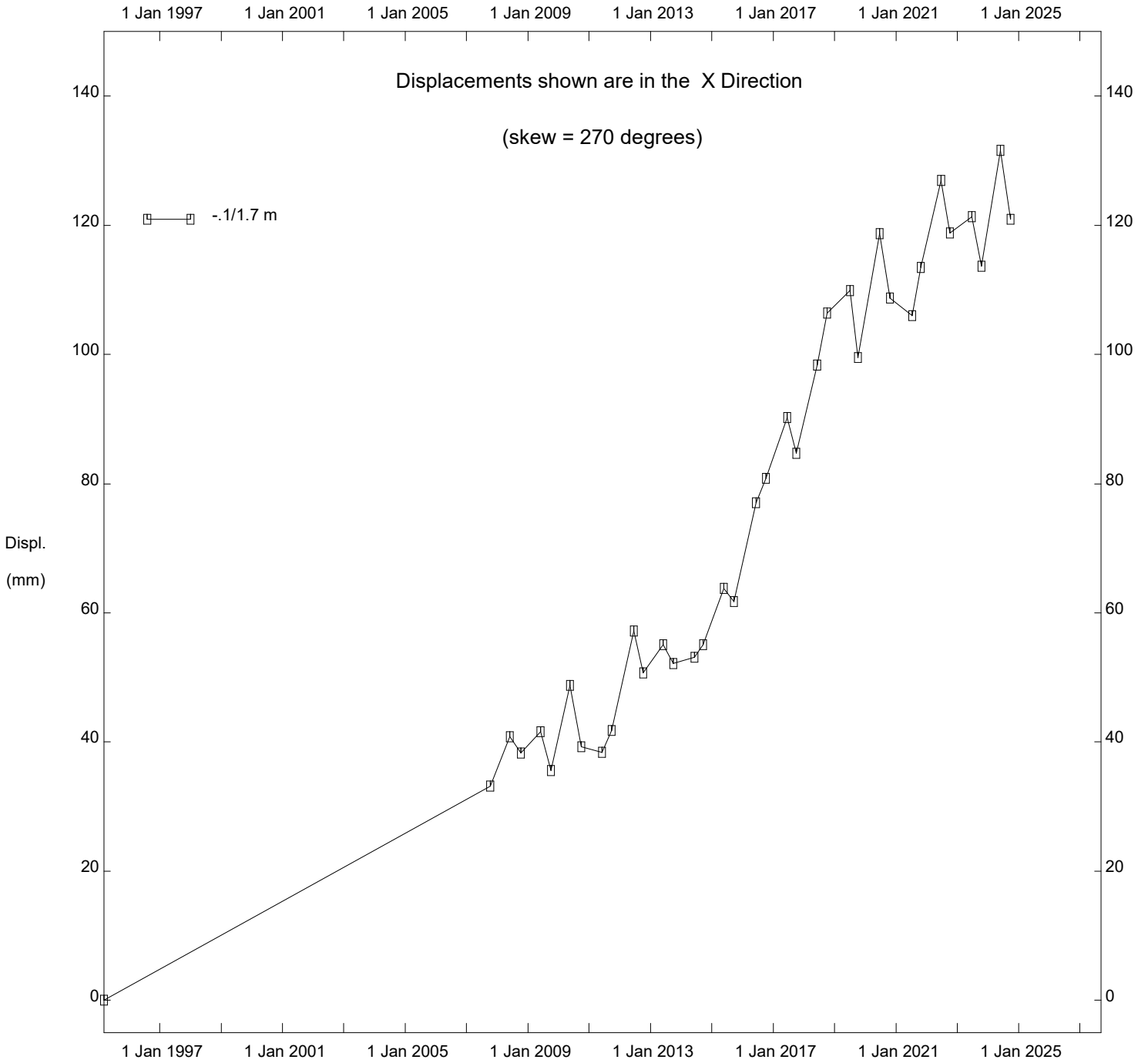


HWY 2:68 (PH037), Inclinometer SI-54

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

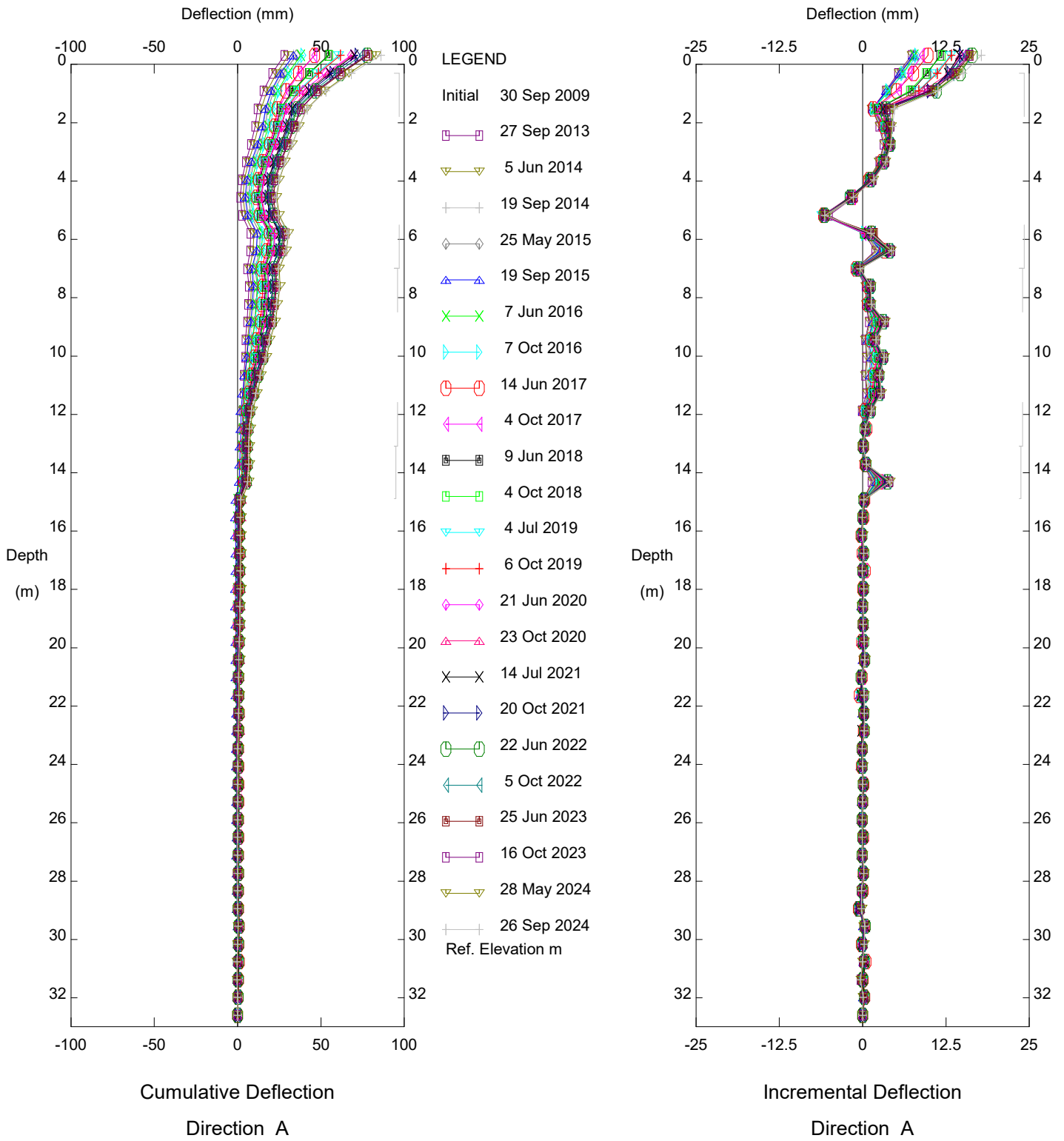
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinator SI-54

Alberta Transportation

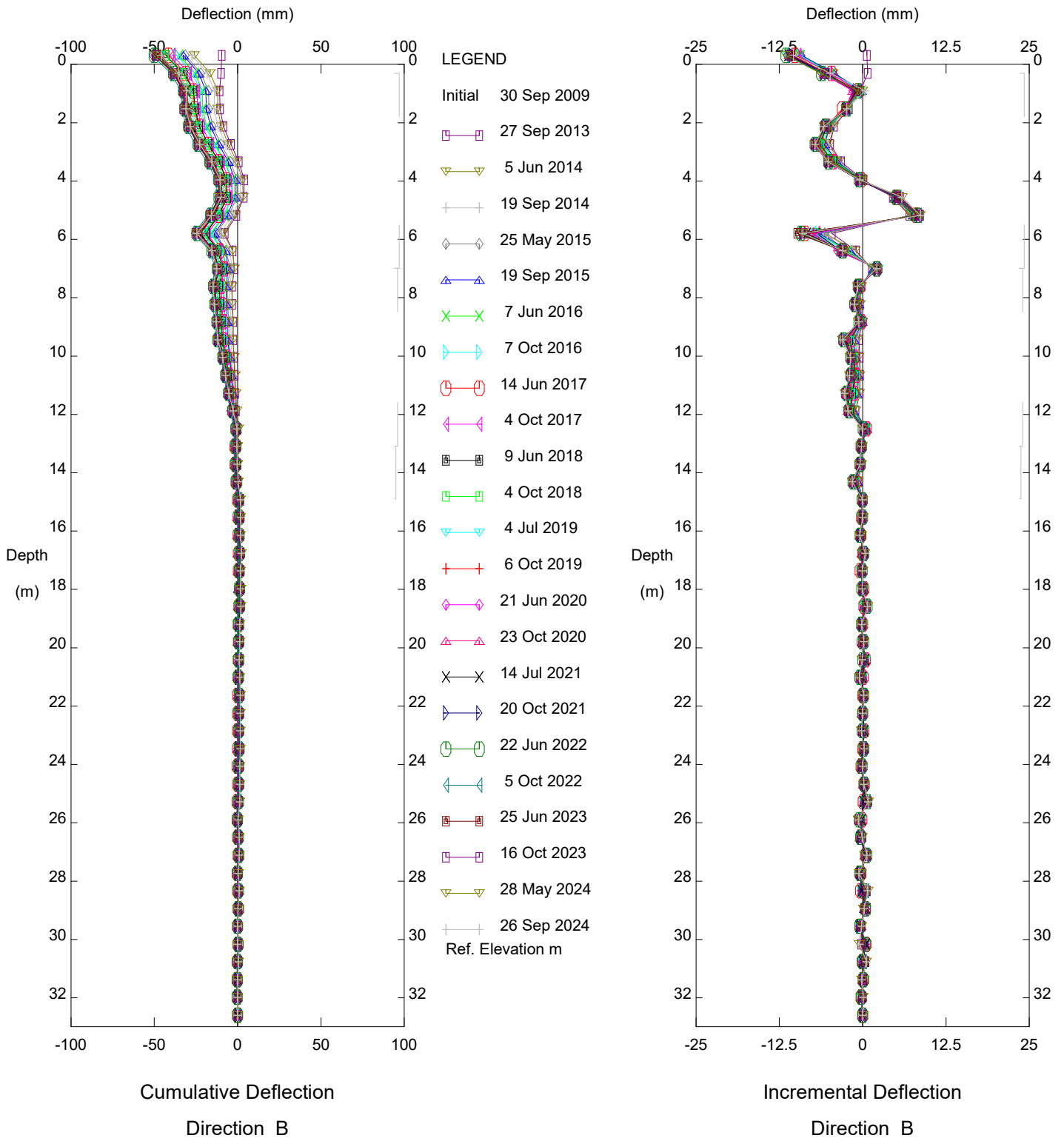
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinometer SI09-1

Alberta Transportation

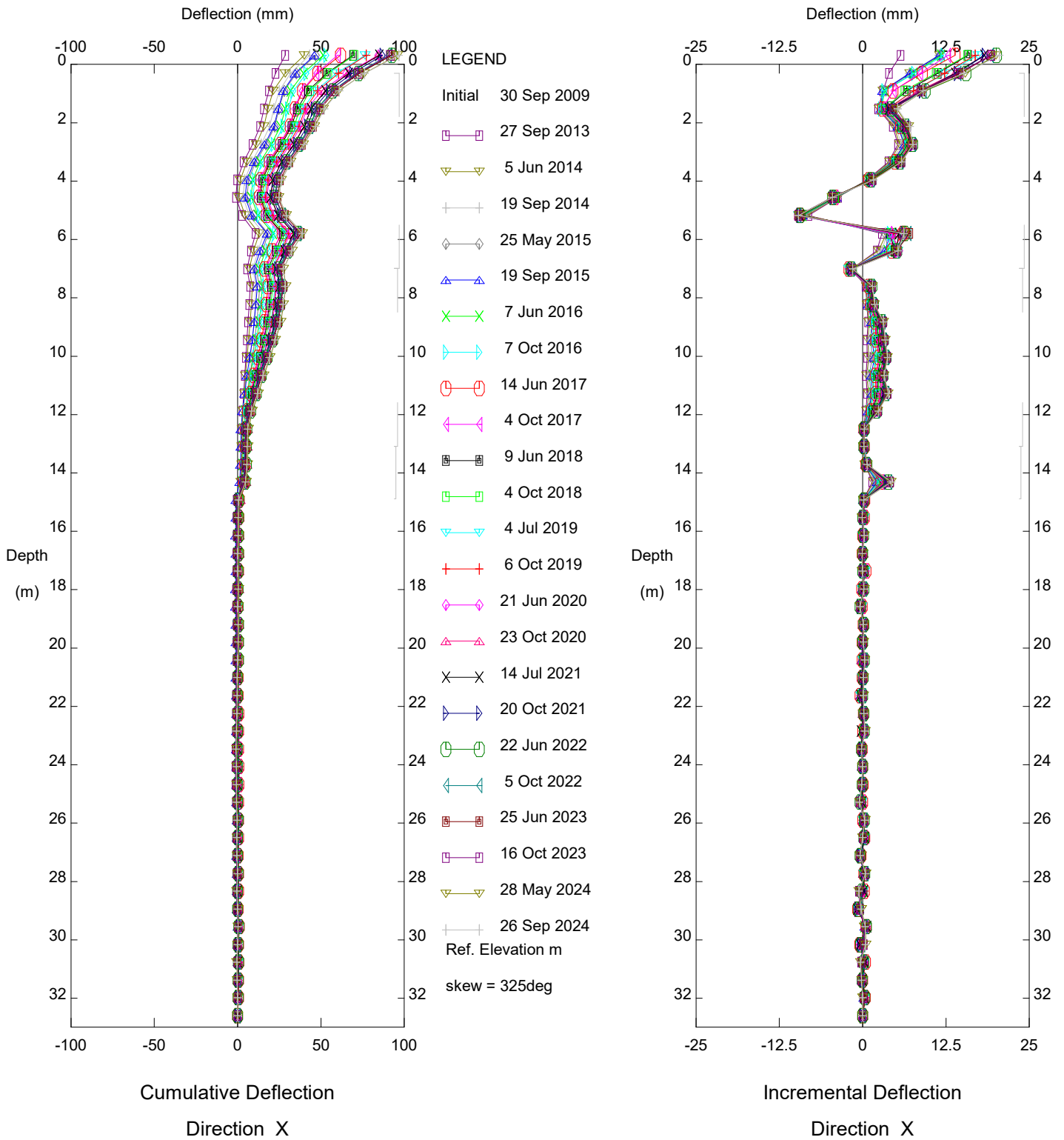
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinometer SI09-1

Alberta Transportation

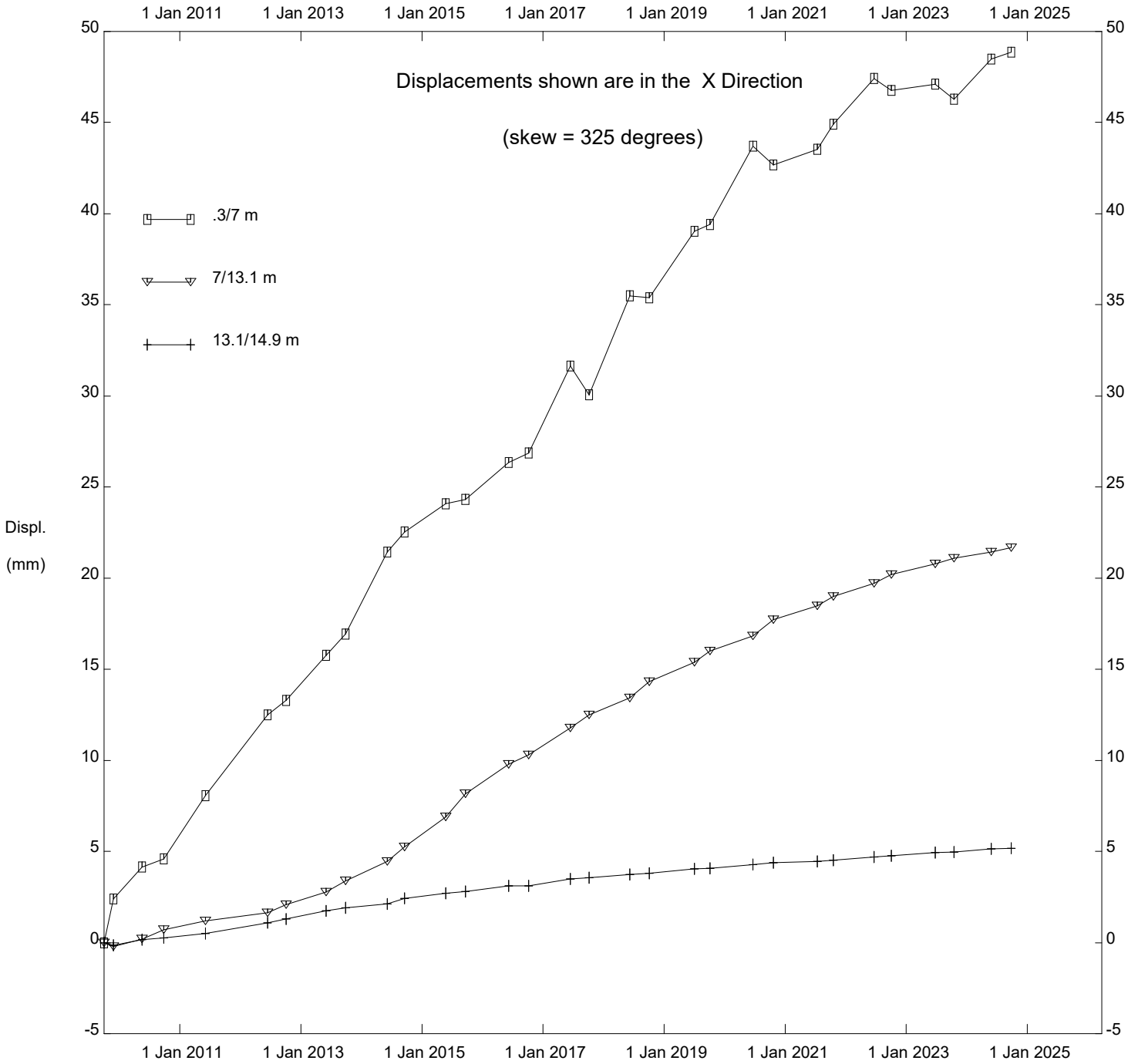
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinometer SI09-1

Alberta Transportation

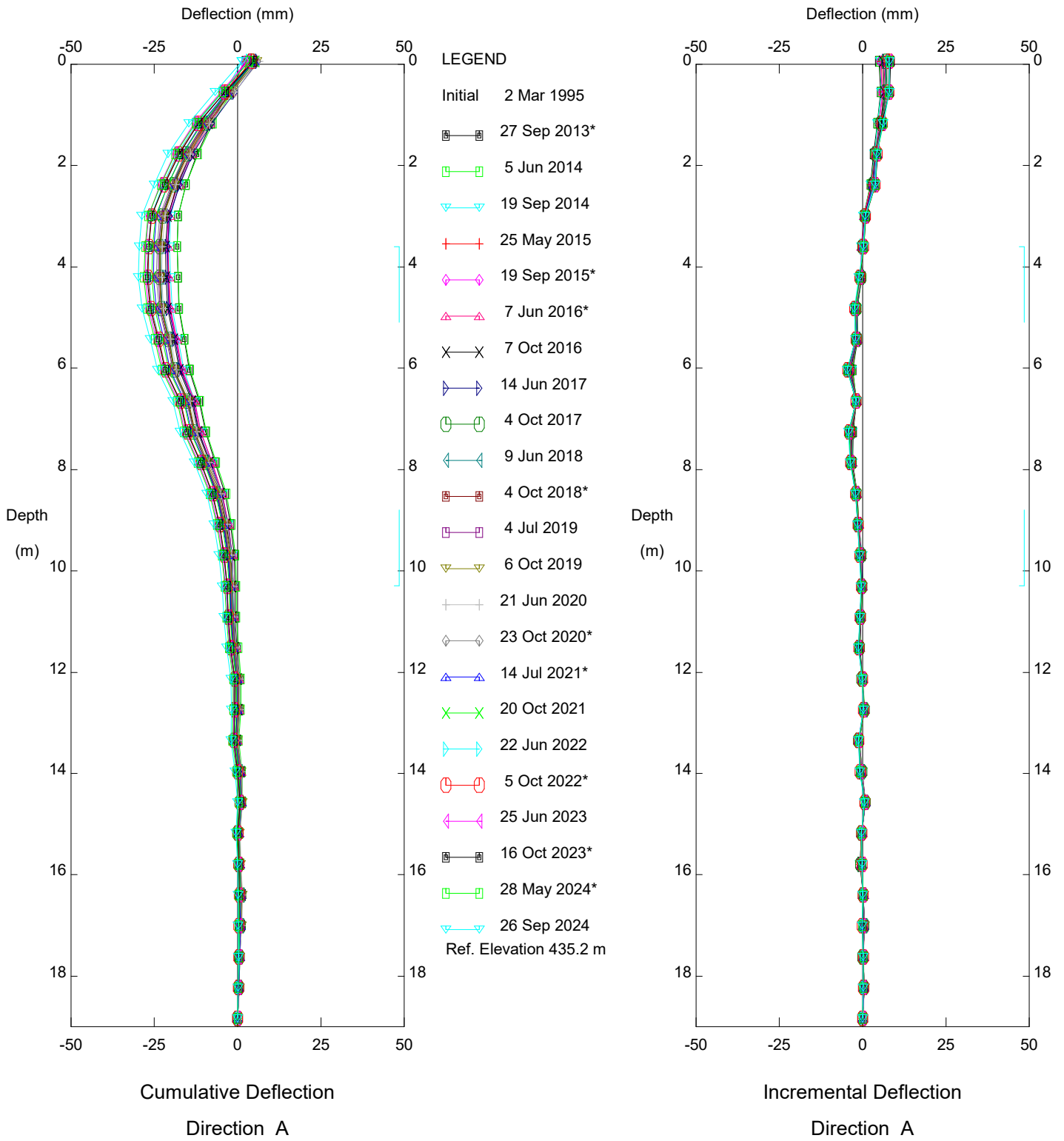
Thurber Engineering Ltd.



HWY 2:68 (PH037), Inclinator SI09-1

Alberta Transportation

Thurber Engineering Ltd.

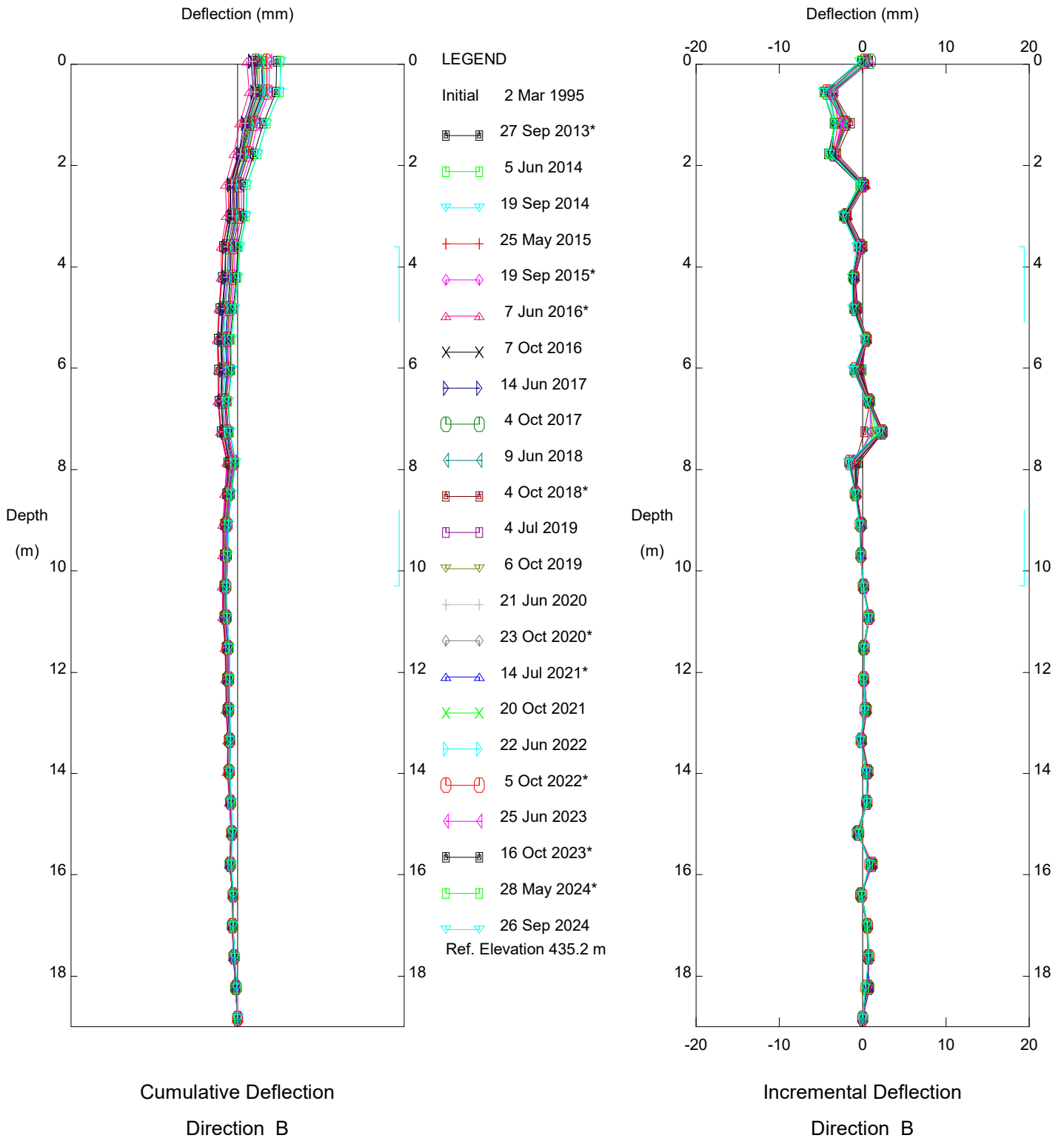


HWY 2:68 (PH037), Inclinometer SI-61

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

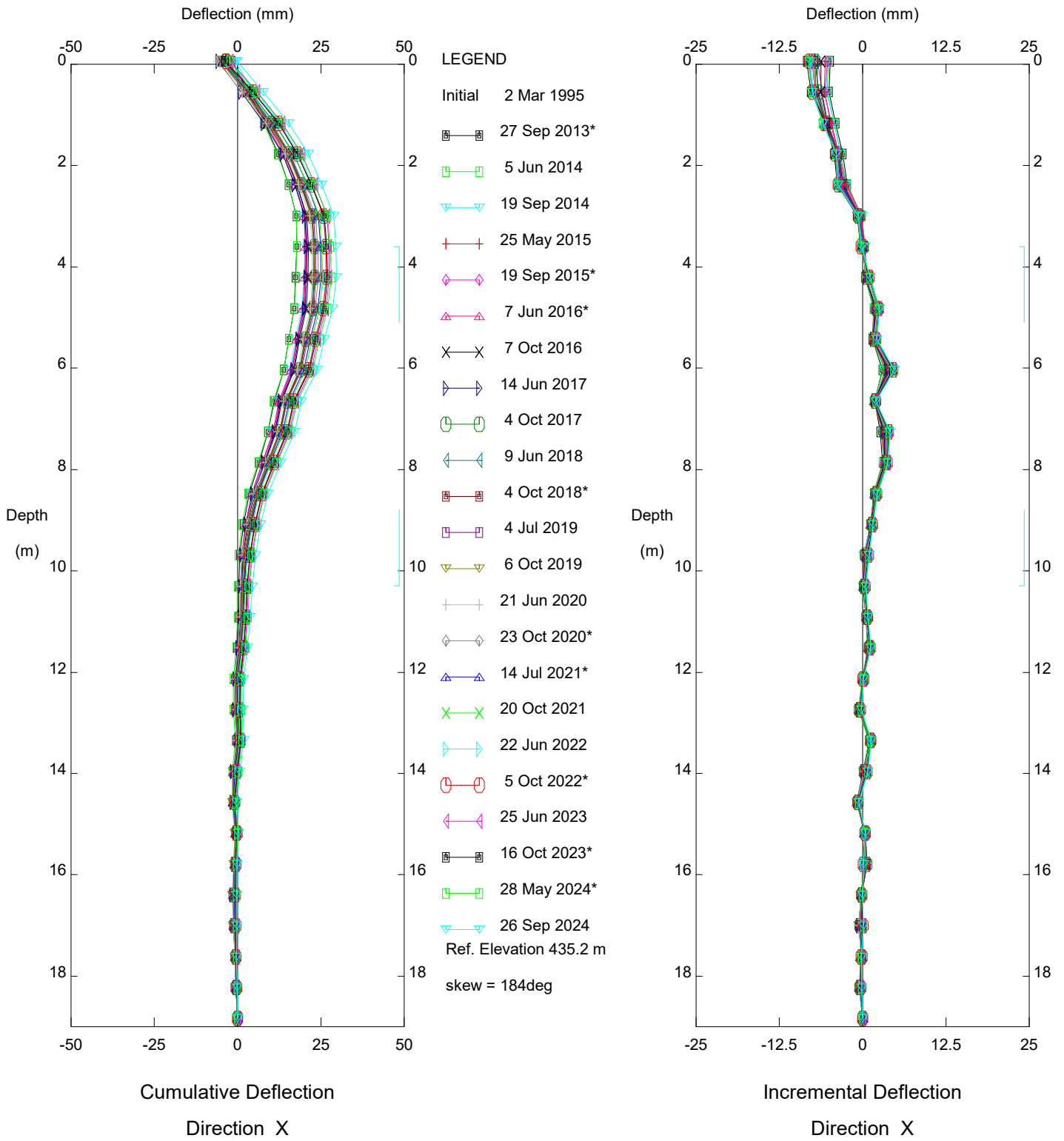


HWY 2:68 (PH037), Inclinometer SI-61

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

Thurber Engineering Ltd.

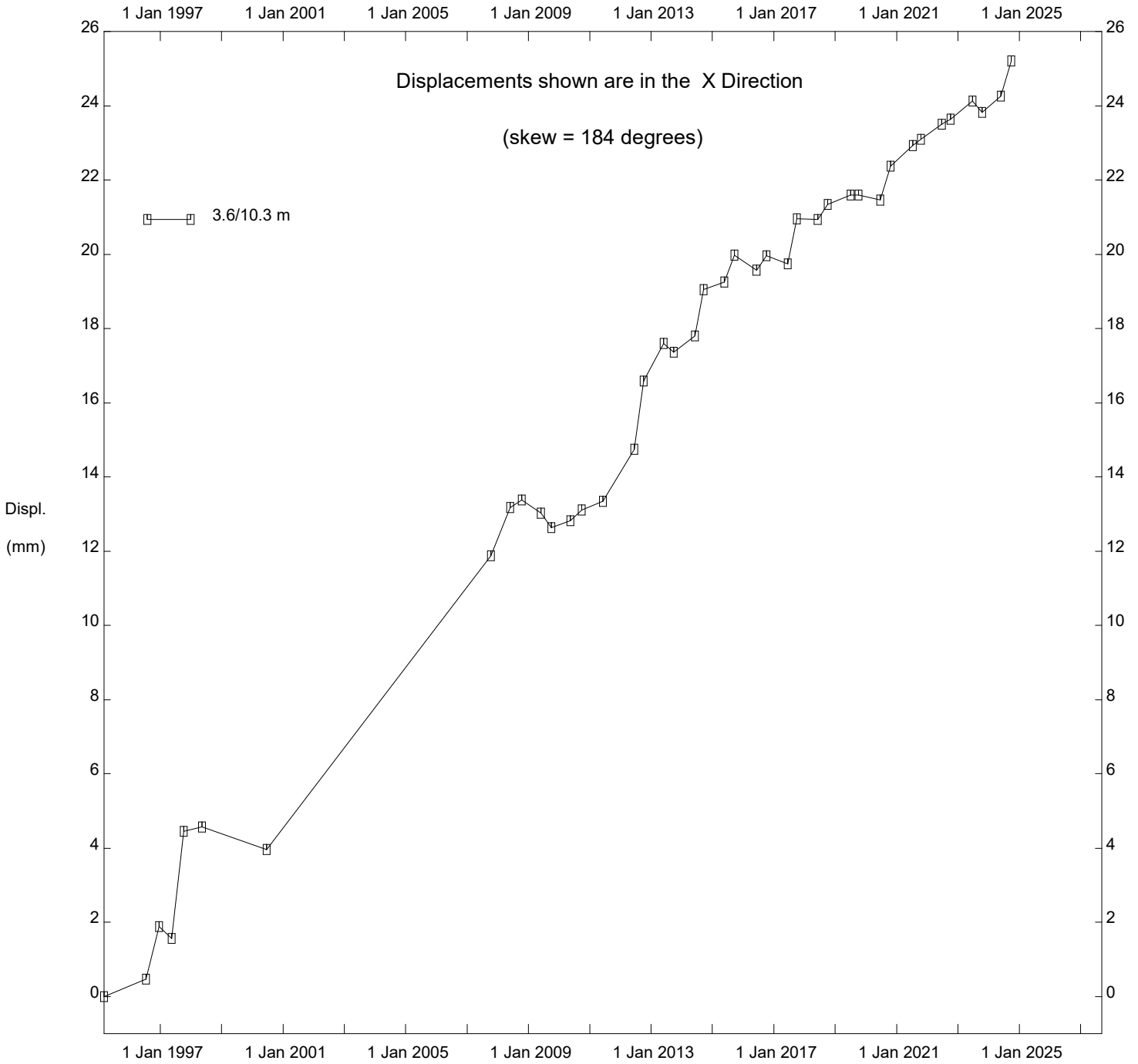


HWY 2:68 (PH037), Inclinometer SI-61

Alberta Transportation

Sets marked * include zero shift and/or rotation corrections.

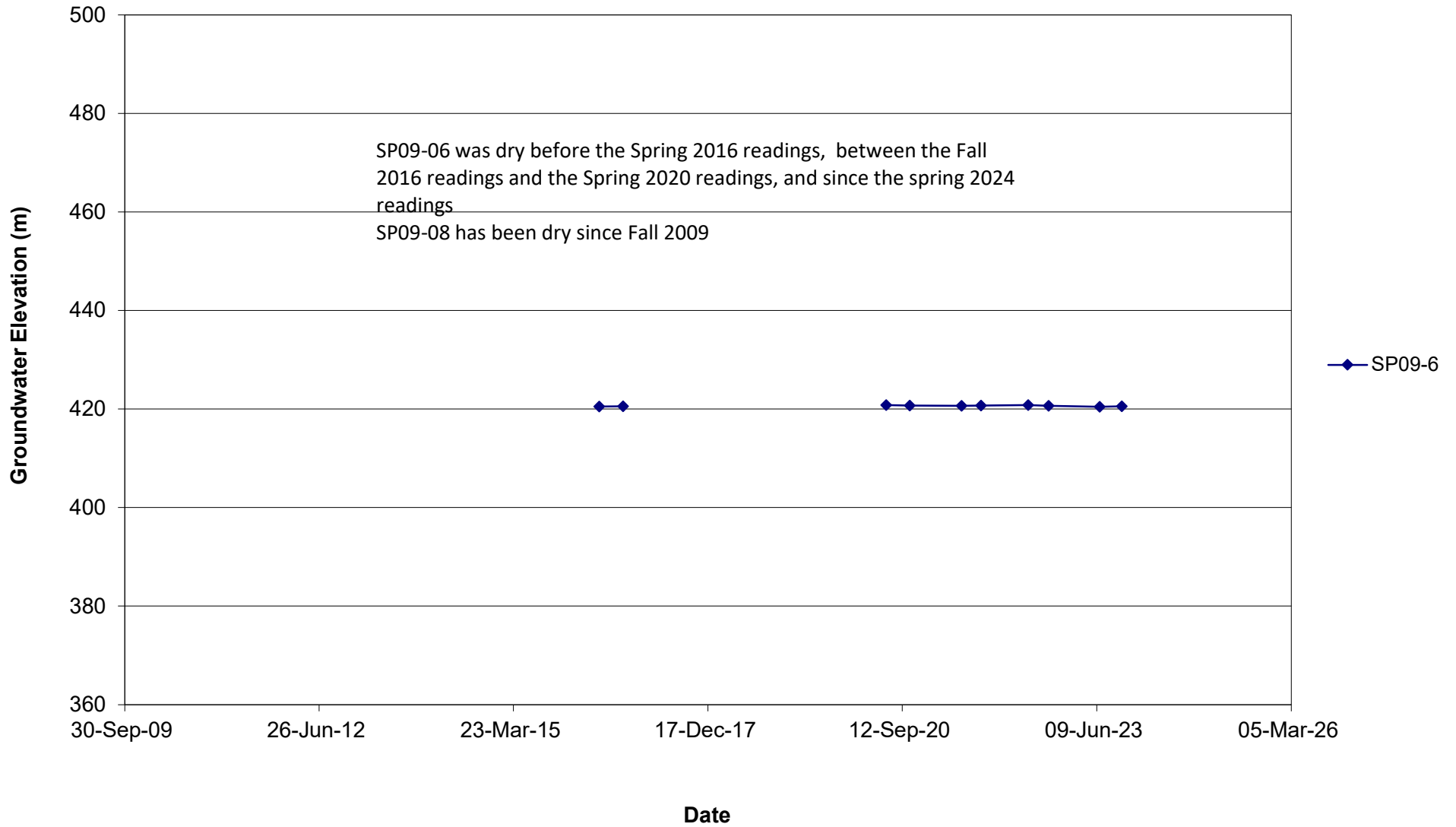
Thurber Engineering Ltd.



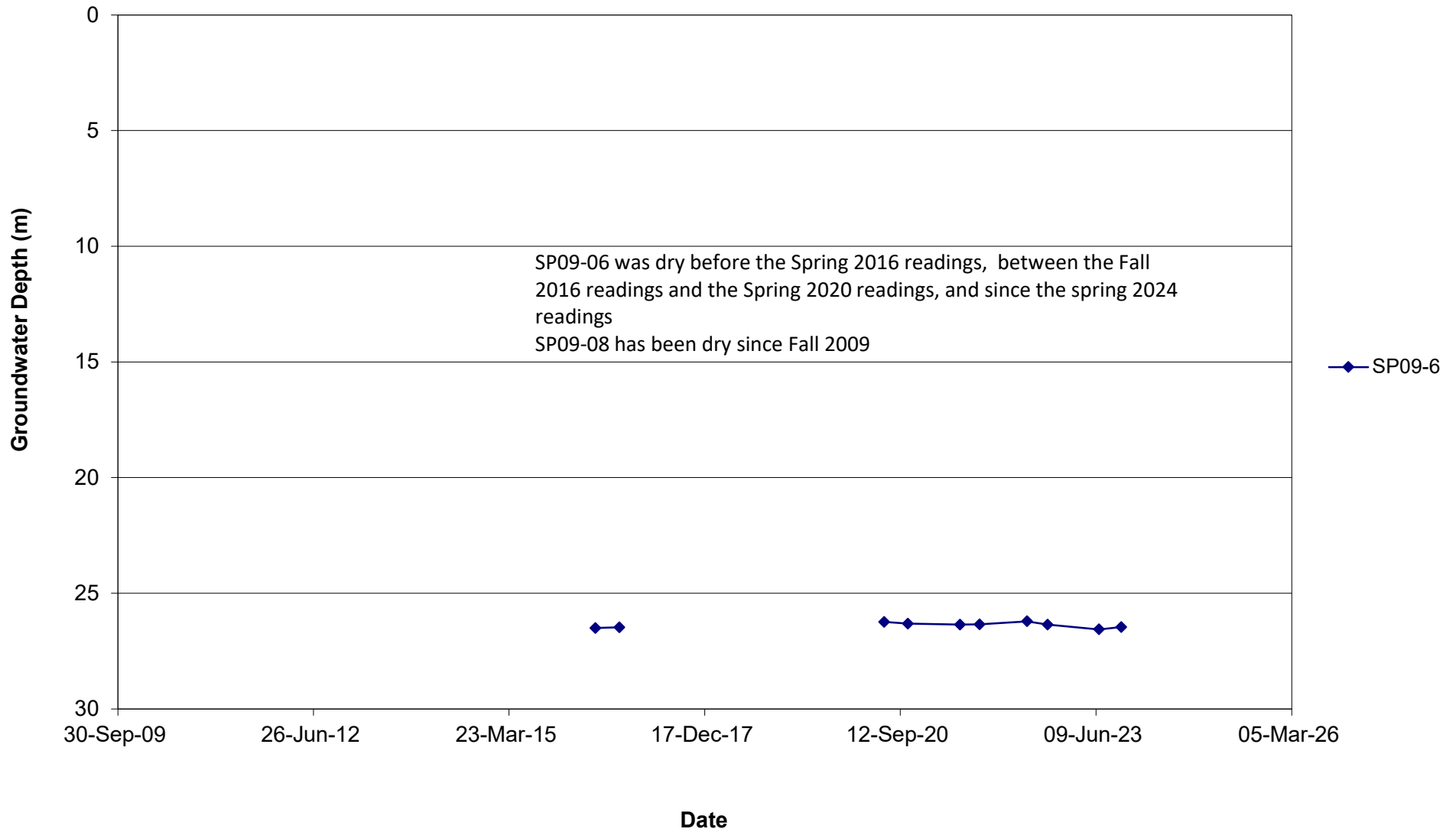
HWY 2:68 (PH037), Inclinator SI-61

Alberta Transportation

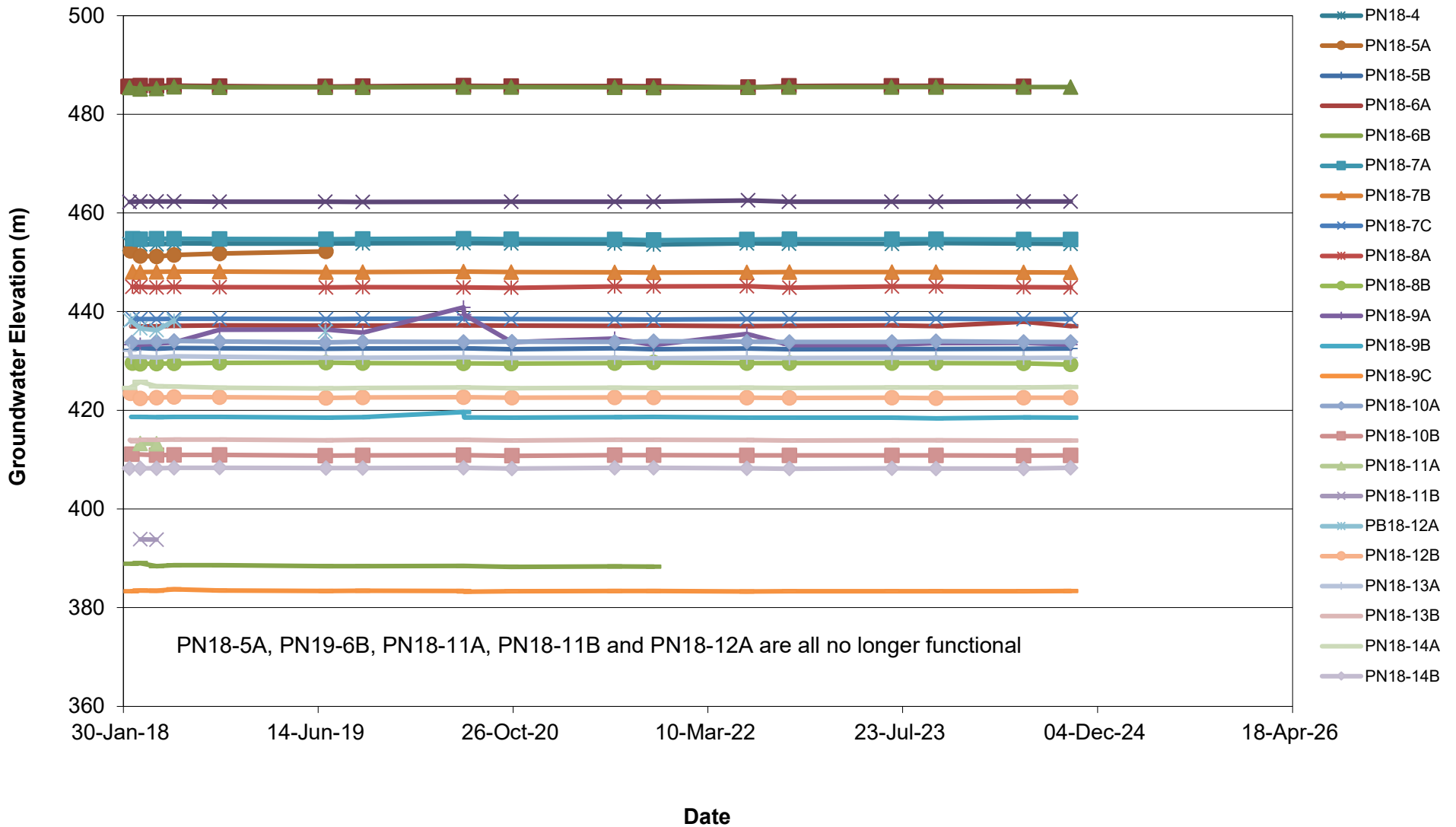
**FIGURE PH037-1
PIEZOMETRIC ELEVATIONS FOR HWY 2:68, DUNVEGAN SOUTH
2009 INSTRUMENTS**



**FIGURE PH037-2
PIEZOMETRIC DEPTHS FOR HWY 2:68, DUNVEGAN SOUTH
2009 INSTRUMENTS**



**FIGURE PH037-3
PIEZOMETRIC ELEVATIONS FOR HWY 2:68, DUNVEGAN SOUTH
2018 INSTRUMENTS**



**FIGURE PH037-4
PIEZOMETRIC DEPTHS FOR HWY 2:68, DUNVEGAN SOUTH
2018 INSTRUMENTS**

