ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP NORTH CENTRAL (ATHABASCA AND FORT McMURRAY DISTRICTS) INSTRUMENTATION MONITORING- SPRING 2024

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
NC102 (NC024-2)	HWY 41:23 C1 8.88	Kehiwin Lake	41:23	Km 8.8
Legal Description: 3-31-58-6 W4		**UTM Co-ordinates**		
		12U E 507287.34	N 5989236.19	

Current Monitoring:	05-June-2024	**Previous Monitoring**	24-May-2023
Instruments Read By:	Mr. Niraj Regmi, G.I.T and Mr. Nixson Mationg, of Thurber		

Instruments Read During This Site Visit

Slope Inclinometers (SIs): SI10-1, SI10-3, SI11-1 to SI11-3, SI15-1 to SI15-4, SI16-1 and SI16 2	**Pneumatic Piezometers (PN):** PN10-1, PN10-3, PN10-5, PN10-6 and PN15 1 to PN15 4	**Vibration Wire Piezometers (VW):** N/A	**Standpipe Piezometers (SP):** PB10-1 and PB10-3 to PB10-4
Load Cell (LC): N/A	**Strain Gauges:** N/A	**SAAs:** N/A	**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 reader	**Vibration Wire Piezometers:**	**Standpipe Piezometers:** DGSI dipmeter
Load Cell:	**Strain Gauges:**	**SAAs:**	**Others:**

Notes:

- A site plan showing instrument locations is included in Appendix A.
- SIs plots with A and B directions are presented in Appendix A and summarized in Table NC102-1, attached. Where movement was recorded, the resultant (plot X) and the rate of movement plot are also included.
- Pneumatic and standpipe piezometer plots are included in Appendix A.
- Pneumatic Piezometer readings are summarized in Table NC008-2, attached.
- Standpipe Piezometer readings are summarized in Table NC008-3, attached.

Discussion

Zones of New Movement:	None
Interpretation of Monitoring Results:	Slope inclinometer SI10-1, installed in the highway east ditch upslope of the NC24B pile wall, continued to show no discernible movement. SI10-3 installed downslope of the NC24B pile wall, showed a rate of movement of 2.2 mm/yr over 0.0 m to 2.4 m of depth since the spring of 2023 readings. SI11-1 through SI11-3 were installed in piles P7, P16 and P24, respectively, of the NC24B pile wall. SI11-1 showed a rate of movement 0.7 mm/yr over 0.1 m to 9.3 m depth since the spring of 2023 readings.

	Slope inclinometer SI11-2 showed a rate of movement of 1.2 mm/yr over 0.1 to 9.9 m depth since the spring of 2023 readings. SI11-3 showed a rate of movement of 1.2 mm/yr over 0.4 m to 9.6 m depth since the spring of 2023 readings. SI11-1, SI11-2 and SI11-3 have shown total pile head movements of 2.4 mm, 2.9 mm, and 1.2 mm, respectively, since installation. Slope inclinometer SI15-1, installed in the highway east ditch upslope of the NC24D pile wall, has shown no discernible movement since initialization. SI15-2, installed immediately downslope of the NC24D pile wall, showed a rate of movement of 0.1 mm/yr over 3.0 m to 4.8 m depth since the spring of 2023 readings. SI15-4, installed near the west edge of the highway to the south of the NC24D pile wall, showed no discernible movement over 1.6 m to 3.4 m depth and a rate of movement of 0.3 mm/yr over 3.4 m to 4.7 m depth since the spring of 2023. SI16-1, installed in the 2016 pile wall (NC24D), showed no discernible movement over the length of the pile from 0.0 m to 12.2 m depth since the spring of 2023 readings. SI16-1 has shown a total pile head movement of 4.4 mm to date. SI16-2, also installed in the 2016 pile wall, showed no discernible movement over the length of the pile from 0.0 m to 12.2 m depth since the spring of 2023 readings. SI16-2 has shown a total pile head movement of 4.6 mm to date. In general, the pile wall appears to have performed well since the completion of construction. Pneumatic piezometers PN10-1, PN10-5, and PN15-2 showed increases in groundwater level of 0.16 m, 0.42 m, and 0.06 m, respectively, since the spring of 2023 readings. PN10-3, PN10-6, PN15-1, PN15-3, and PN15-4 showed decreases in groundwater levels of 0.06 m, 0.22 m, 0.58 m, 0.14 m, and 0.09 m, respectively since the spring of 2023 readings. Standpipe piezometers PB10-1 showed a decrease in groundwater level of 1.21 m since the spring of 2023 readings. Standpipe piezometers PB10-3 and PB10-4 showed increases in groundwater level of 0.59 m and 0.23 m, respectively, since the spring of 2023 readings.
Future Work:	The instruments should be read again in the spring of 2025.
Instrumentation Repairs:	No instrument repairs are required at this time.
Additional Comments:	

Attachments:	• Table NC102-1 Spring 2024 – HWY 41:23 Kehiwin Lake (Km 8.8), Slope Inclinometer Instrumentation Reading Summary
	• Table NC102-2 Spring 2024 – HWY 41:23 Kehiwin Lake (Km 8.8), Pneumatic Piezometer Instrumentation Reading Summary
	• Table NC102-3 Spring 2024 – HWY 41:23 Kehiwin Lake (Km 8.8), Standpipe Piezometer Instrumentation Reading Summary
	• Statement of Limitations and Conditions
	• APPENDIX A – NC102-1 SPRING 2024
	  ○ Field Inspector's report
	  ○ Site Plan Showing Approximate Instrument Locations (Drawing No. 32122-NC102)
	  ○ SI Reading Plots
	  ○ Figure NC102-1 (Piezometer Depths, 2010 Instruments)
	  ○ Figure NC102-2 (Piezometer Depths, 2015 Instruments)

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.
Tarek Abdelaziz, Ph.D., P. Eng.
Partner | Senior Geotechnical Engineer

PROFESSIONAL ENGINEER ALBERTA
LUCAS R.M. GREEN
ID 206714

2024-07-15
Lucas Green, P.Eng.
Geotechnical Engineer

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
RM SIGNATURE: _____
RM APEGA ID #: 91085
DATE: July 15, 2024
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

THURBER ENGINEERING LTD.

Table NC102-1: Spring 2024– Hwy 41:23 Kehiwin Lake (Km 8.8) Slope Inclinometer Instrumentation Reading Summary

Date Monitored: June 5, 2024

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)
SI10-1	October 13, 2010	No discernible movement	No discernible movement	Operational	May 24, 2023	No discernible movement	N/A	N/A
SI10-3	October 13, 2010	135.1 over 0.0 m to 2.4 m depth in 323° direction	30.3 in May 2011	Operational	May 24, 2023	2.2	2.2	-3.9
SI11-1 (P7)	June 21, 2011	2.4 over 0.1 m to 9.3 m depth in 275° direction	5.1 in August 2011	Operational	May 24, 2023	0.8	0.7	0.7
SI11-2 (P16)	June 21, 2011	2.9 over 0.1 m to 9.9 m depth in 346° direction	11.0 in August 2011	Operational	May 24, 2023	1.2	1.2	2.4
SI11-3 (P24)	June 21, 2011	1.2 over 0.4 m to 9.6 m depth in 358° direction	4.5 in September 2018	Operational	May 24, 2023	1.3	1.2	0.7
SI15-1	August 20, 2015	No discernible movement	No discernible movement	Operational	May 24, 2023	N/A	N/A	N/A
SI15-2	August 20, 2015	16.5 over 3.0 m to 4.8 m depth in 328° direction	15.4 in September 2020	Operational	May 24, 2023	0.2	0.1	-2.2
SI15-3	*August 20, 2015*	*87.3 over 1.7 to 3.5 m depth in 337° direction*	*233.8 in September 2020*	*Sheared off at 3.7 m below top of casing*	*May 27, 2022*	*N/A*	*N/A*	*N/A*

Figure 32122-NC102 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

Table NC102-1 – Continued: Spring 2024 – Hwy 41:23 Kehiwin Lake (Km 8.8) Slope Inclinometer Instrumentation Reading Summary

Date Monitored: June 5, 2024

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)
SI15-4	August 20, 2015	12.3 over 1.6 to 3.4 m depth in 328° direction	19.6 in September 2020	Operational	May 24, 2023	No discernible movement	N/A	-2.6
		13.3 over 3.4 to 4.7 m depth in 328° direction	9.3 in September 2020			0.4	0.3	-2.5
SI16-1 (P04)	October 19, 2016	4.4 over 0.0 to 12.2 m depth in 308° direction	9.2 in March 2017	Operational	May 24, 2023	No discernible movement	N/A	-0.1
SI16-2 (P08)	October 19, 2016	4.6 over 0.0 to 12.2 m depth in 323° direction	8.9 in November 2016	Operational	May 24, 2023	No discernible movement	N/A	-0.2

Figure 32122-NC102 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

THURBER ENGINEERING LTD.

Table NC102-2: Spring 2024 – Hwy 41:23 Kehiwin Lake (Km 8.8) Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: June 5, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED GROUNDWATER LEVEL BGS (m)	MEASURED PORE PRESSURE (kPa)	CURRENT GROUNDWATER LEVEL BGS (m)	PREVIOUS GROUNDWATER LEVEL BGS (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN10-1	October 7, 2010	5.9	-	Active	2.76 on October 8, 2010	21.5	3.12	3.28	0.16
PN10-2A	*October 8, 2010*	*3.9*	-	*Non-Operational*	*0.90 on May 31, 2012*	*N/A*	*N/A*	*N/A*	*N/A*
PN10-2B	*October 8, 2010*	*11.9*	-	*Not Functioning*	*1.39 on May 31, 2012*	*N/A*	*N/A*	*N/A*	*N/A*
PN10-3	October 10, 2010	10.0	-	Active	2.48 on September 24, 2012	50.5	4.86	4.80	-0.06
PN10-5	October 9, 2010	4.8	-	Active	0.41 on May 26, 2016	33.2	1.38	1.80	0.42
PN10-6	October 9, 2010	9.9	-	Active	1.48 on September 12, 2013	58.5	3.94	3.72	-0.22

Figure 32122-NC102 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

THURBER ENGINEERING LTD.

Table NC102-2 – Continued: Spring 2024 – Hwy 41:23 Kehiwin Lake (Km 8.8) Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: June 5, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED GROUNDWATER LEVEL BGS (m)	MEASURED PORE PRESSURE (kPa)	CURRENT GROUNDWATER LEVEL BGS (m)	PREVIOUS GROUNDWATER LEVEL BGS (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN15-2	August 20, 2015	9.1	-	Active	0.96 on May 25, 2017	74.5	1.55	1.61	0.06
PN15-1	August 20, 2015	8.4	-	Active	1.14 on May 25, 2017	56.5	2.62	2.04	-0.58
PN15-3	August 20, 2015	3.8	-	Active	1.07 on May 27, 2022	24.2	1.34	1.20	-0.14
PN15-4	August 20, 2015	6.1	-	Active	1.23 on May 25, 2017	33.2	2.72	2.63	-0.09

Figure 32122-NC102 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

THURBER ENGINEERING LTD.

Table NC102-3: Spring 2024 – Hwy 41:23 Kehiwin Lake (Km 8.8)Standpipe Piezometer Instrumentation Reading Summary

Date Monitored: June 5, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS		MAXIMUM GROUNDWATER LEVEL BGS (m)	MEASURED GROUNDWATER DEPTH BGS (m)	PREVIOUS READING BGS (m)	CHANGE IN GROUNDWATER LEVEL SINCE PREVIOUS READING (m)
PB10-1	October 7, 2010	19.7	-	Operational		0.63 on May 25, 2017	3.18	1.97	-1.21
PB10-2	*October 7, 2010*	*20.0*	-	*Blocked*		*3.03 on May 12, 2011*	*N/A*	*3.60 (June 22, 2021)*	*N/A*
PB10-3	October 10, 2010	20.0	-	Operational		0.62 on May 25, 2017	1.15	1.74	0.59
PB10-4	October 10, 2010	19.6	-	Operational (blocked at 1.59 m BGS)		0.98 on June 22, 2021	1.13	1.36	0.23

Drawing 32122-NC102 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

THURBER

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 (CON0022163)
NORTH CENTRAL (ATHABASCA AND FORT McMURRAY DISTRICTS)
INSTRUMENTATION MONITORING RESULTS

SPRING 2024

APPENDIX A
DATA PRESENTATION AND SITE PLANS

SITE NC102 (NC024-2): HWY 41:23 KEHIWIN LAKE (km 8.8)

ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
NORTH CENTRAL REGION - ATHABASCA AND FORT McMURRAY DISTRICTS
INSTRUMENTATION MONITORING FIELD SUMMARY (NC102)
SPRING 2024

Location:	Kehiwin Lake (HWY 41:23 C1 8.888)	**Readout:**	RST PN C108 Unit 4/DGSI Dipmeter
File Number:	32122	**Casing Diameter:**	2.75"
Probe:	RST SI Set 5Rand 8R	**Temp:**	20
Cable:	RST SI Set 5Rand 8R	**Read by:**	NKR/NRM

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location (UTM 12)		Date	Stickup m	Depth from top of **CASING** (ft)	Azimuth of A+ Groove	Current Bottom Depth Readings				Probe/ Reel #	Size (")	Remarks
	Easting (m)	Northing (m)					A+	A-	B+	B-			
SI10-1	507287.34	5989236.19	05-Jun-24	0.89	66 to 4	275	-666	677	359	-379	5R/5R	2.75"	
SI10-3	507262.45	5989246.17	05-Jun-24	0.95	64 to 4	305	81	-73	337	-338	8R/8R	2.75"	
SI11-1	507254.65	5989210.55	05-Jun-24	0.77	32 to 2	282	-386	400	-13	8	8R/8R	2.75"	Pile Wall NC24B
SI11-2	507268.34	5989246.18	05-Jun-24	0.81	34 to 2	308	234	-228	-695	688	8R/8R	2.75"	Pile Wall NC24B
SI11-3	507279.42	5989276.23	05-Jun-24	1.10	34 to 2	315	-524	530	610	-614	8R/8R	2.75"	Pile Wall NC24B
SI15-1	507254.71	5989170.50	05-Jun-24	0.93	32 to 2	297	419	-413	410	-421	5R/5R	2.75"	
SI15-2	507236.37	5989178.26	05-Jun-24	1.00	48 to 2	300	405	-390	682	-668	8R/8R	2.75"	
SI15-4	507242.28	5989168.25	05-Jun-24	1.13	48 to 2	310	423	-412	553	-571	5R/5R	2.75"	
SI16-1	507238.05	5990972.19	05-Jun-24	0.95	42 to 2	290	293	-279	132	-138	8R/8R	2.75"	Pile Wall NC24D (SIP04)
SI16-2	507238.82	5990957.80	05-Jun-24	0.97	42 to 2	285	-40	54	119	-123	8R/8R	2.75"	Pile Wall NC24D (SIP08)

PNEUMATIC PIEZOMETER (PN) READINGS

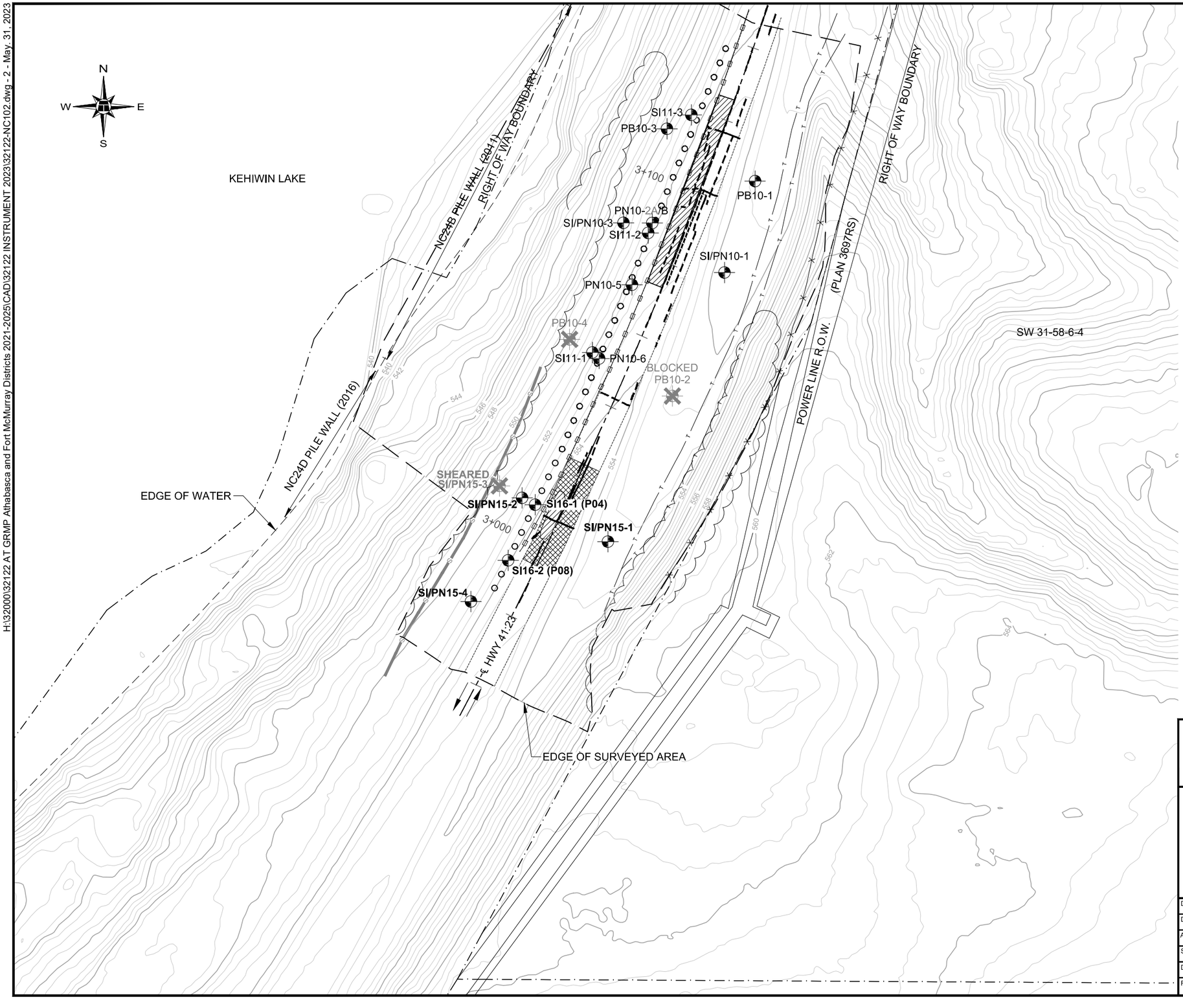
PN #	GPS Location (UTM 12)		Date	Reading (kPa)	Identification Number
	Easting (m)	Northing (m)			
PN10-1	Attached to SI10-1		05-Jun-24	21.5	33669
PN10-3	Attached to SI10-3		05-Jun-24	50.5	33666
PN10-5	Attached to SI10-5		05-Jun-24	33.2	32863
PN10-6	Attached to SI10-6		05-Jun-24	58.5	33664
PN15-1	Attached to SI15-1		05-Jun-24	56.5	36682
PN15-2	Attached to SI15-2		05-Jun-24	74.5	36689
PN15-3	Attached to SI15-3		05-Jun-24	24.2	36688
PN15-4	Attached to SI15-4		05-Jun-24	33.2	36685

STANDPIPE PIEZOMETER (SP) READINGS

PB#	GPS Location (UTM 12)		Date	Stick-up (m)	Water level below top of pipe (m)	Total length of pipe (m)	Poor Boy Probe Depth below top of pipe to bottom of probe (m)			
	Easting (m)	Northing (m)					4'	3'	2'	1'
PB10-1	507293.20	5989259.57	05-Jun-24	0.76	3.94	20.46	-	-	-	-
PB10-3	507270.27	5989271.77	05-Jun-24	0.76	1.91	21.04	-	-	-	-
PB10-4	507247.00	5989219.00	05-Jun-24	0.76	1.89	2.35**	-	-	-	-

INSPECTOR REPORT

Only water levels recorded in the poor boys.
** Blocked at 2.35m, Original pipe depth was 6.19m



LEGEND

- km 8.8 PILE WALL
- FENCE LINE
- BUSH LINE
- ACTIVE SLIDE CRACKS ON HIGHWAY
- INACTIVE SLIDE CRACKS ON HIGHWAY
- TEST HOLE LOCATION
- SI — SLOPE INCLINOMETER
- PN — PNEUMATIC PIEZOMETER
- PB — POORBOY / STANDPIPE
- DAMAGED/BLOCKED INSTRUMENT
- 550 — GROUND SURFACE CONTOUR
- P — OVERHEAD POWER LINE (APPROXIMATE)
- T — TELUS LINE (APPROXIMATE)
- S — SILT FENCE
- GUARD RAIL
- HIGHWAY DIP AREA
- ACP PATCH
- (P04) — PILE NUMBER

NOTES:

1. CONTOUR INTERVAL IS 0.5m.
2. CONTOURS INSIDE SURVEYED AREA WERE SURVEYED BY WSP. ELEVATION CONTOURS OUTSIDE SURVEYED AREA WERE DERIVED FROM LiDAR DATA.
3. NC24D PILE WALL IS AN EXTENSION TO THE ORIGINAL NC24B PILE WALL CONSTRUCTED IN 2011.

0 10 20 30 40 50 60m
SCALE 1:1000

Alberta

NORTH CENTRAL
(ATHABASCA AND FORT MCMURRAY DISTRICTS)

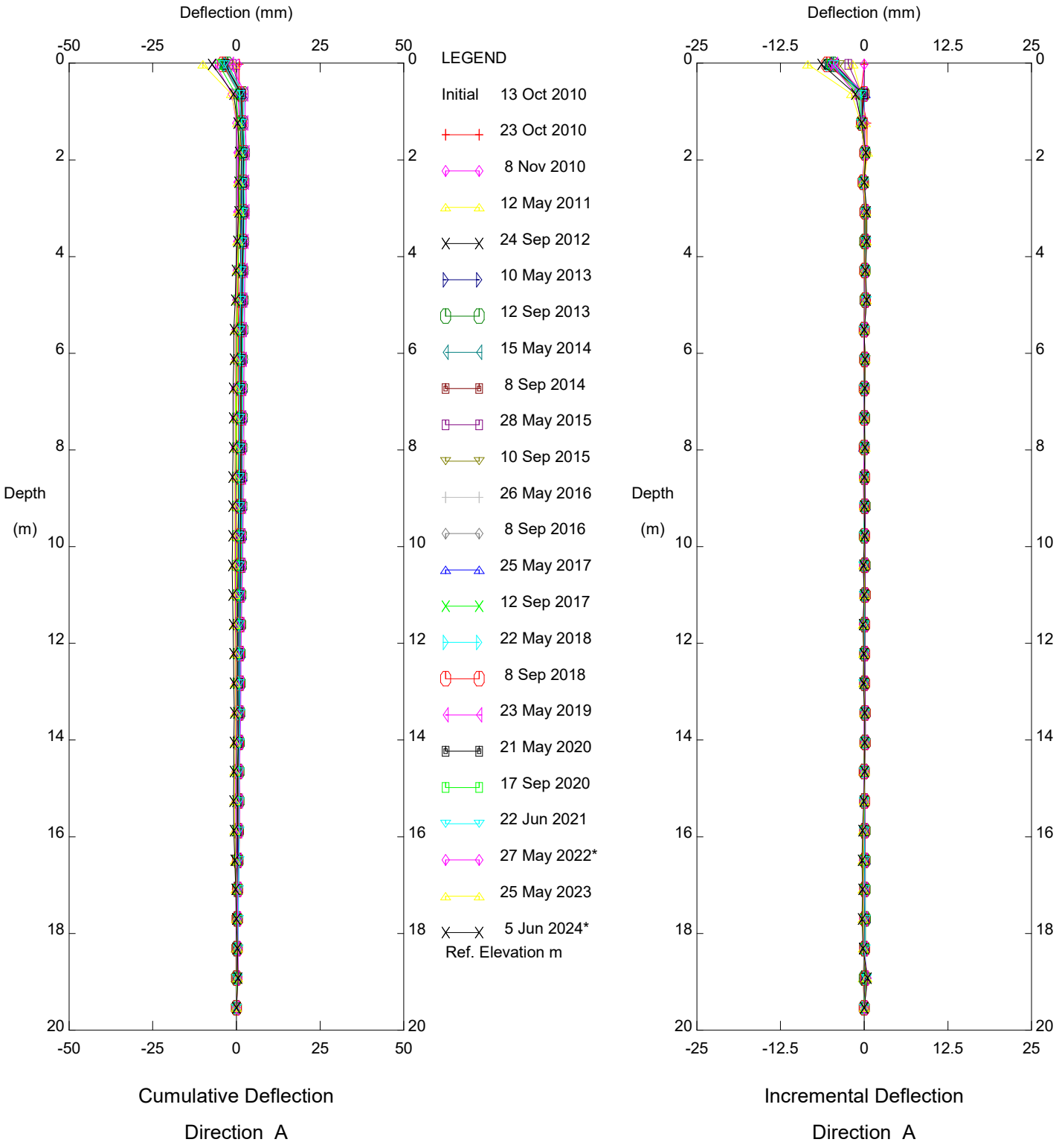
NC102: HWY 41:23 SLIDE (km8.8)
SITE PLAN SHOWING APPROXIMATE INSTRUMENT LOCATIONS

DWG NO. 32122-NC102

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	TSA
SCALE	1:1000
DATE	MAY 2023
FILE No.	32122

THURBER ENGINEERING LTD.

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

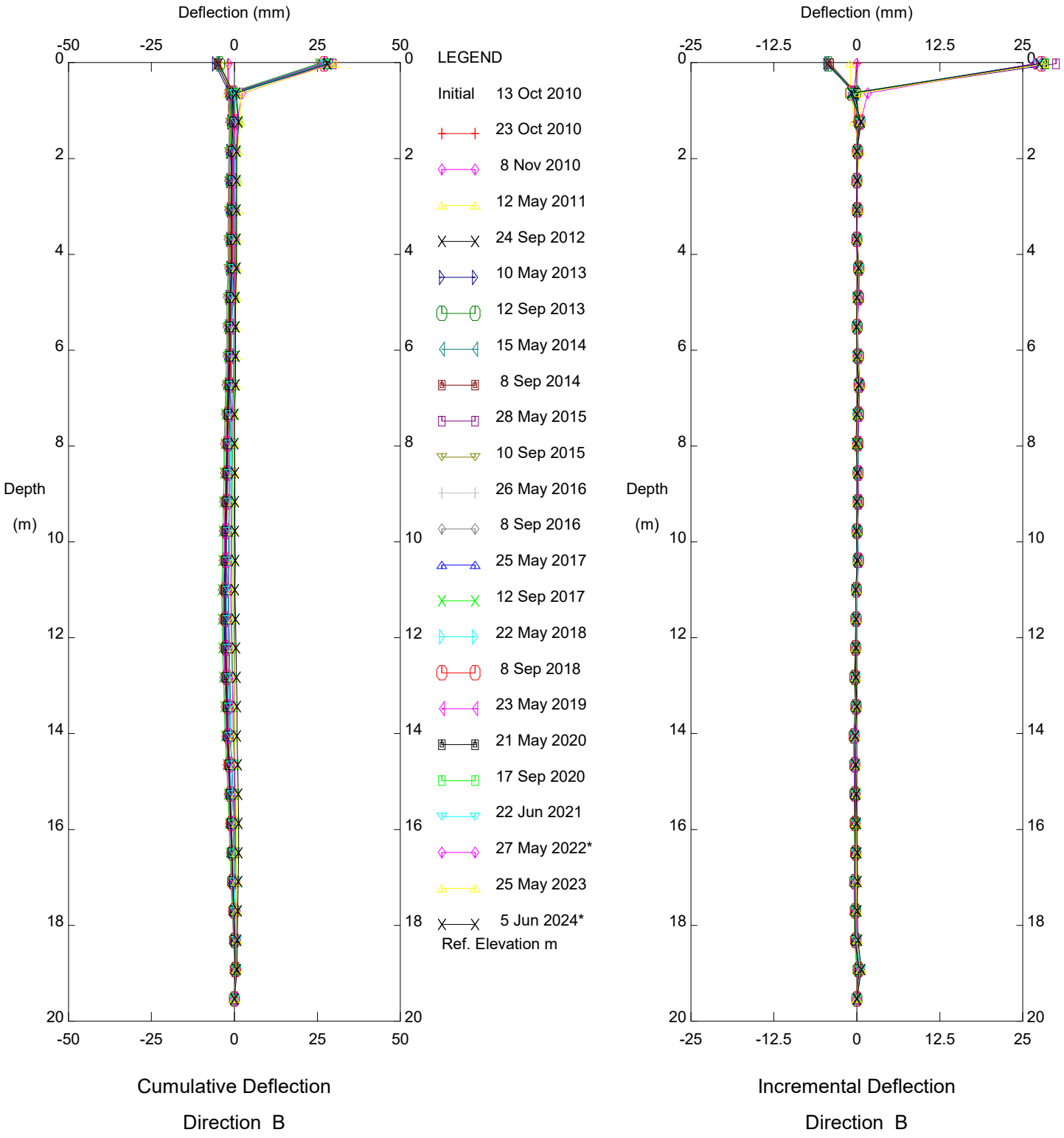
Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI10-1

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI10-1.gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

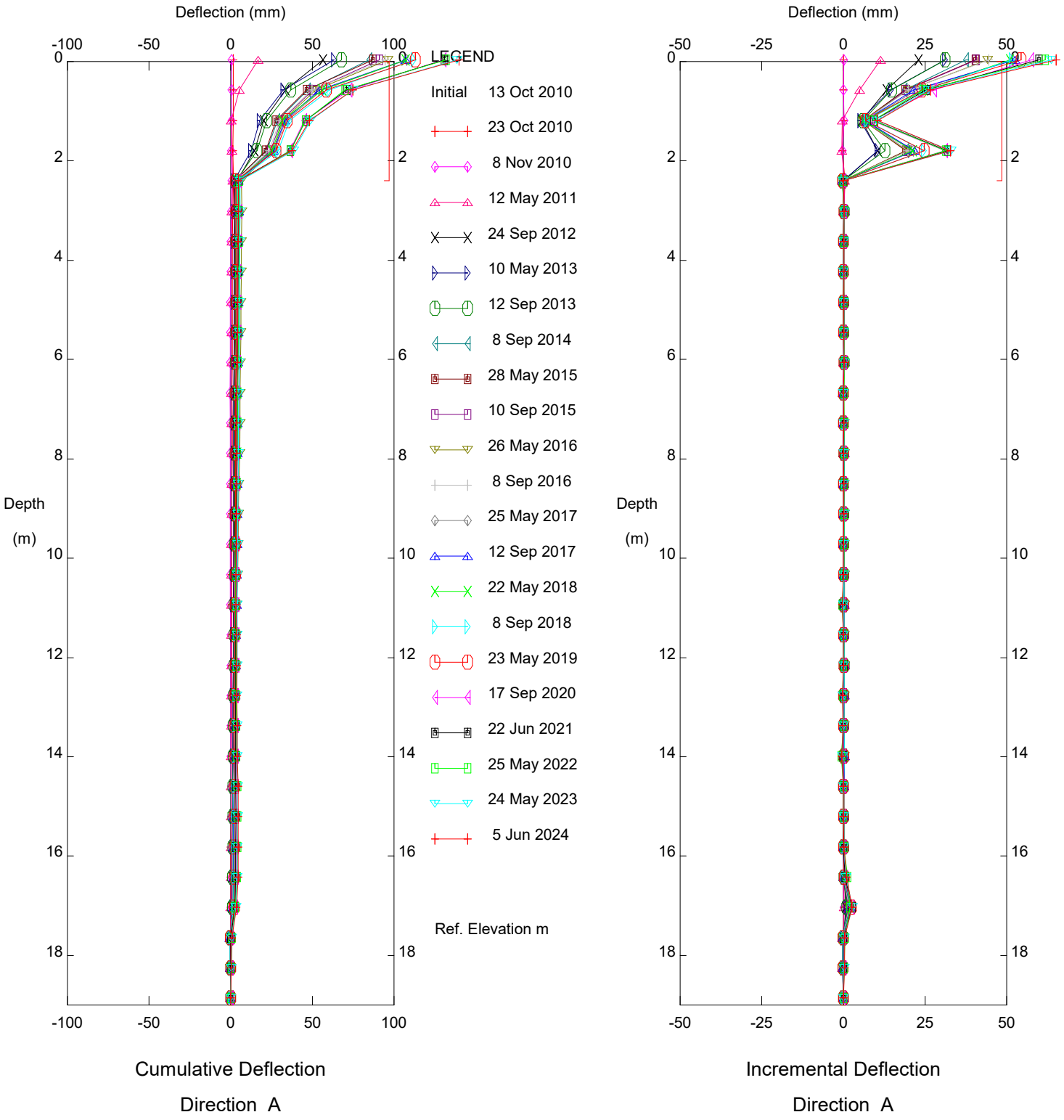
Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI10-1

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI10-1.gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

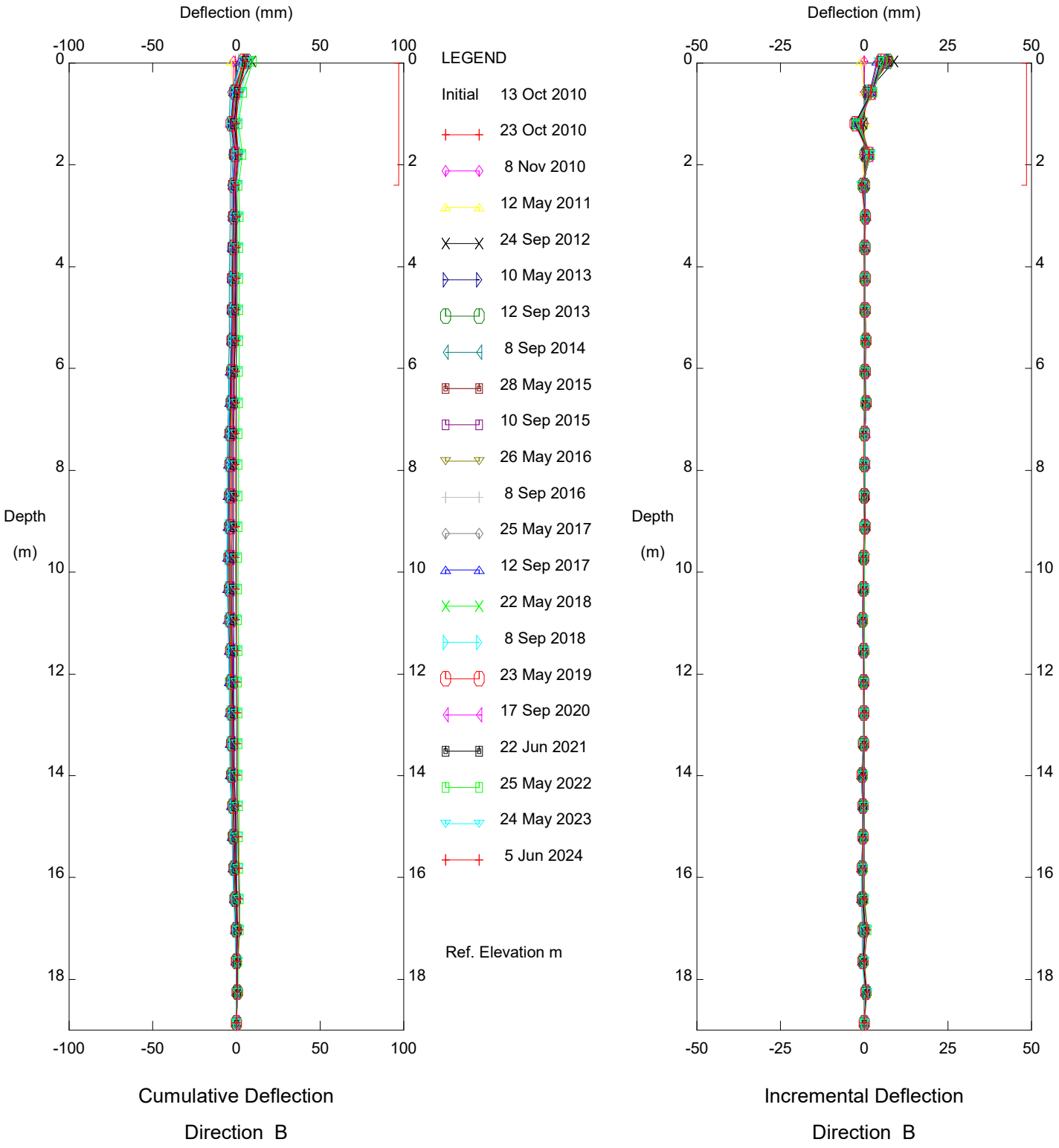
Direction A

Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI10-3

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI10-3.gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

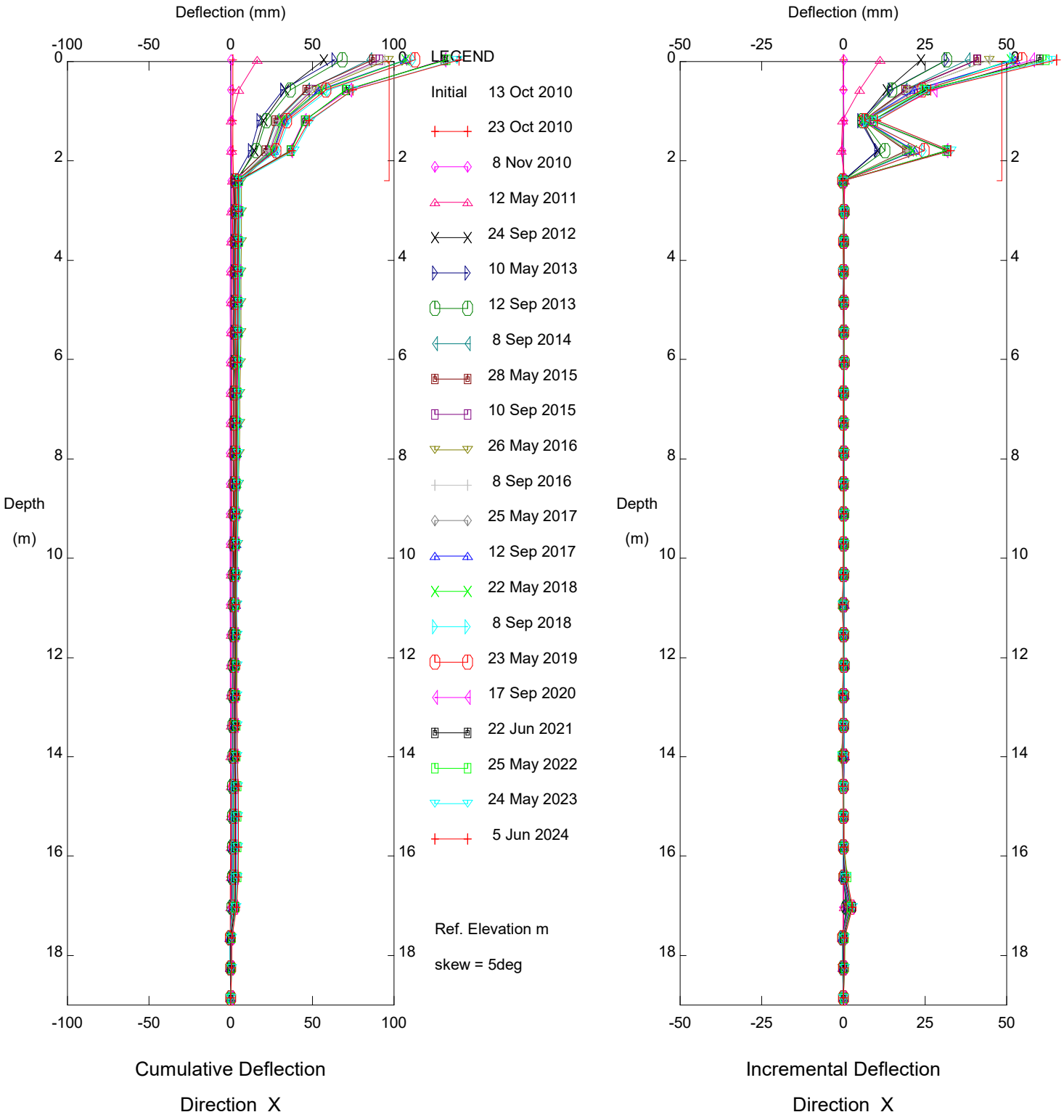
Direction B

Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI10-3

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI10-3.gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

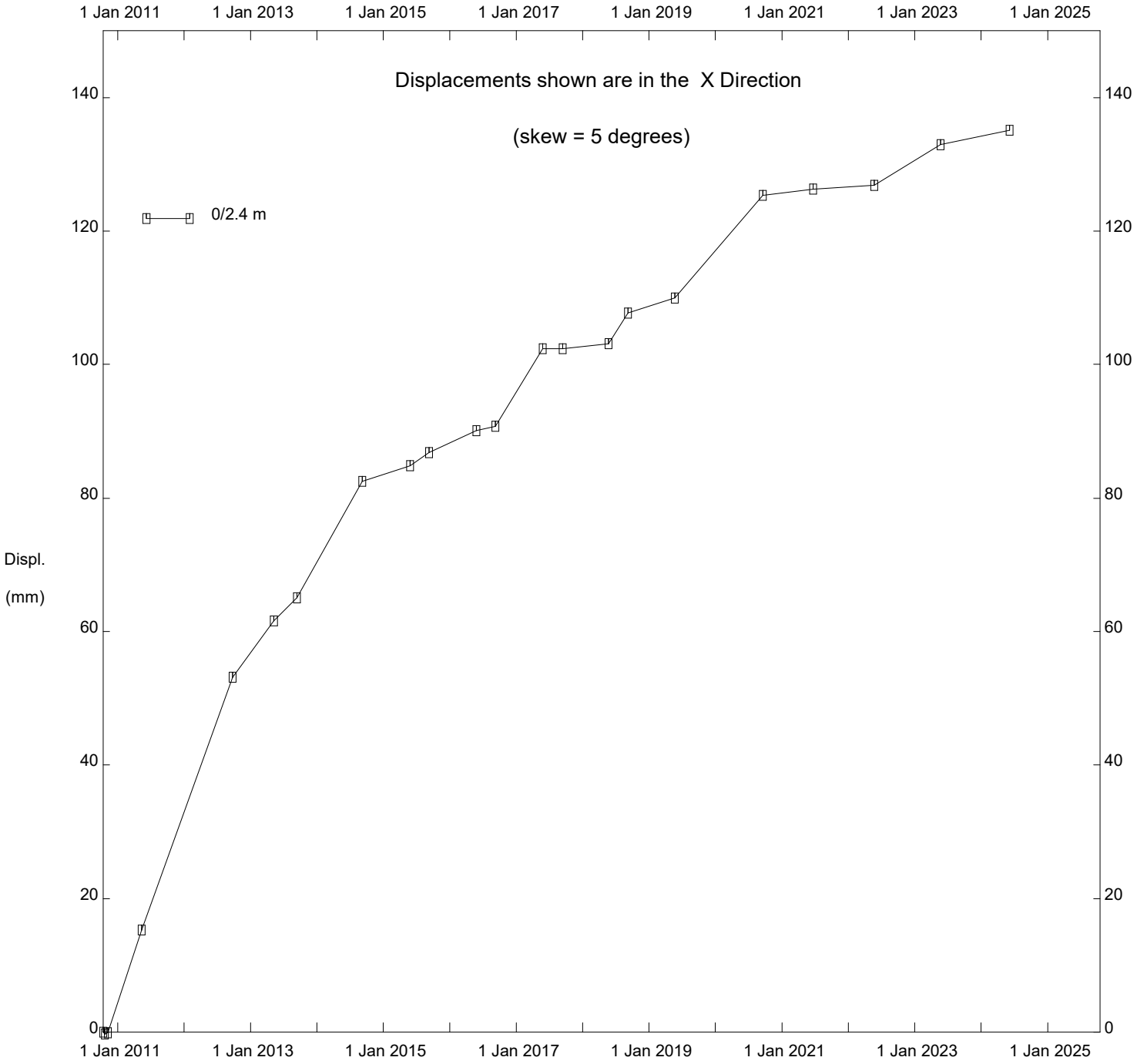
Direction X

Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI10-3

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI10-3.gtl

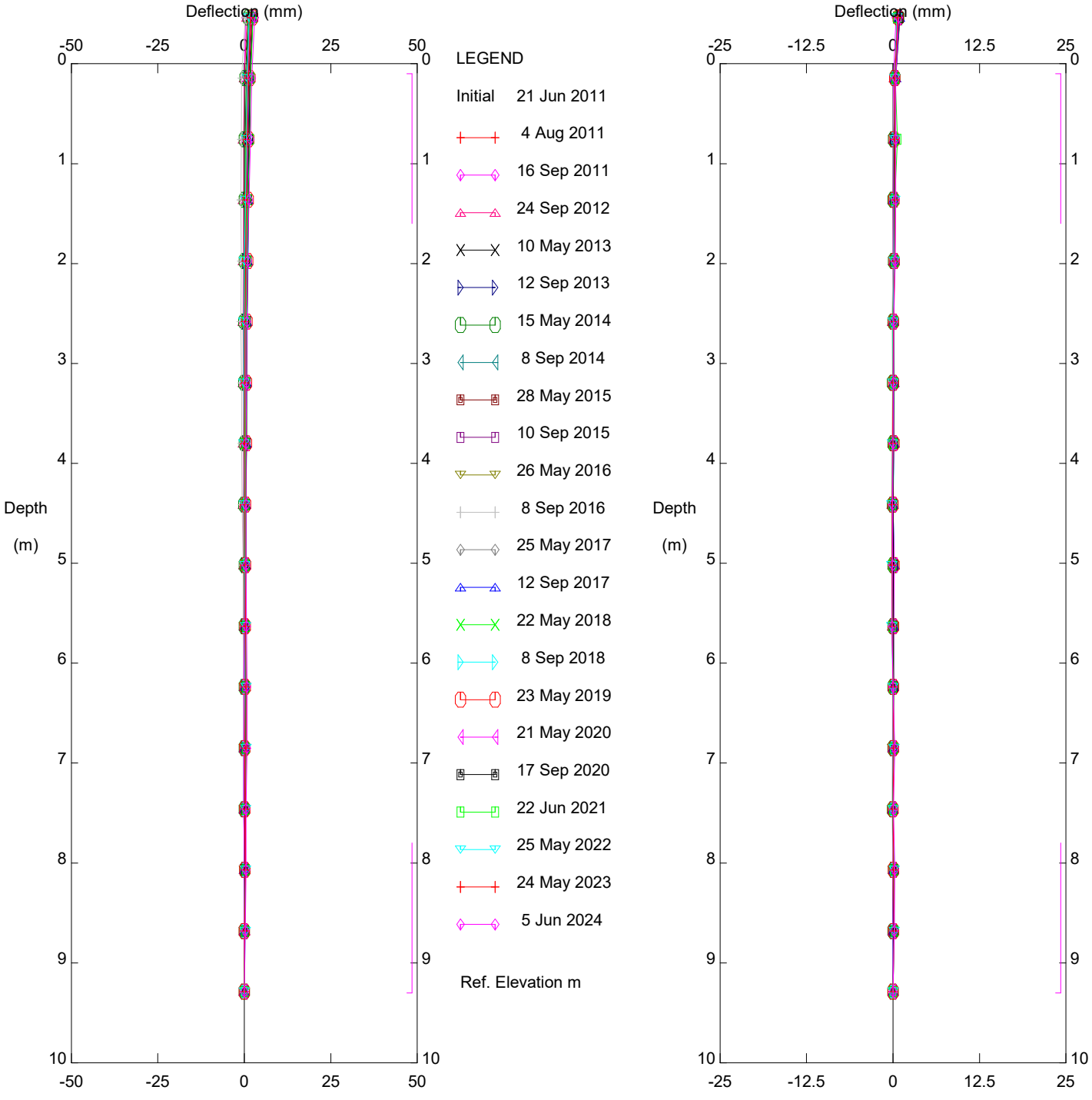
Thurber Engineering Ltd.



Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI10-3

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

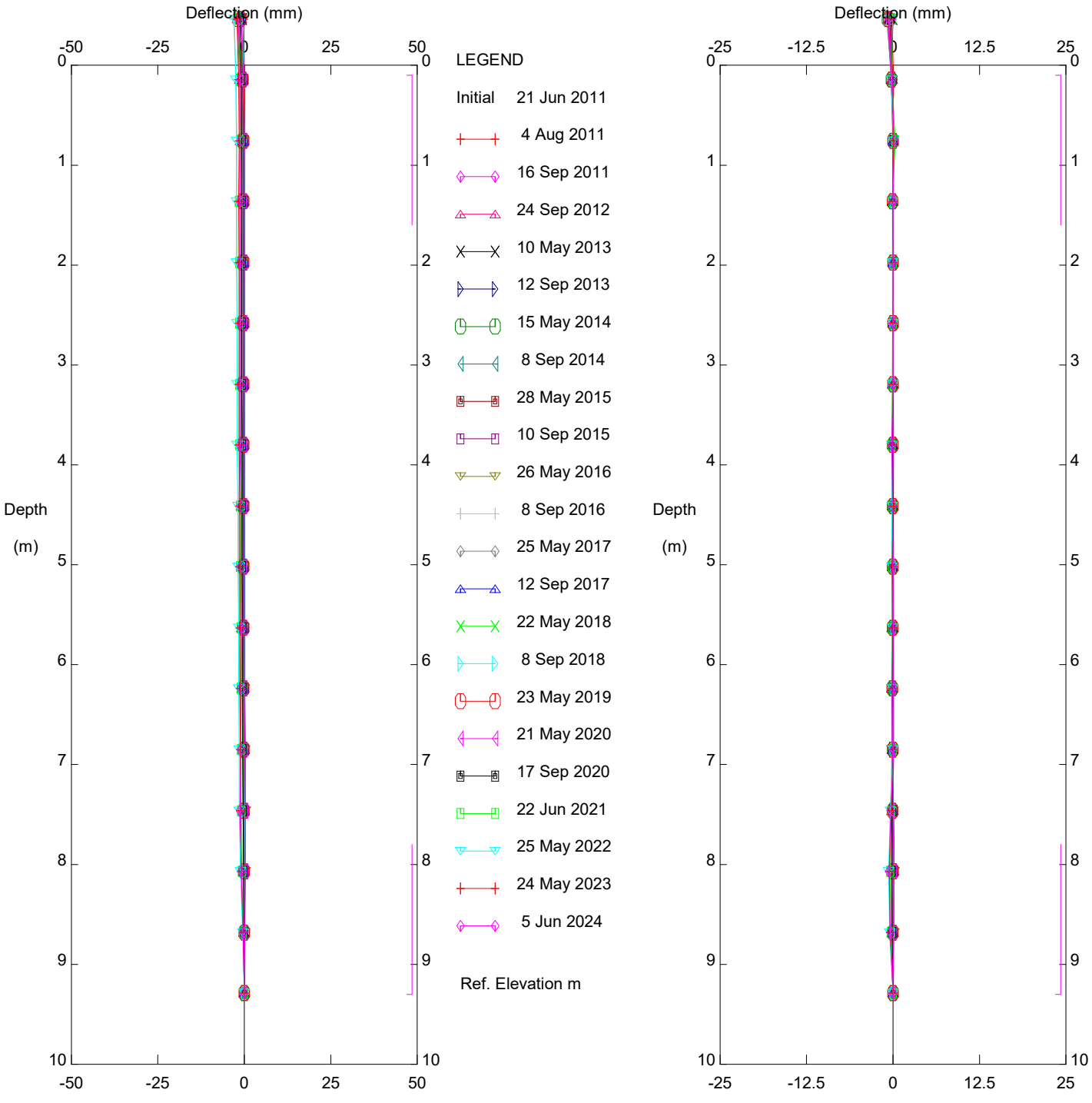
Direction A

Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI11-1 (P7)

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI11-1(km 8.8).gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

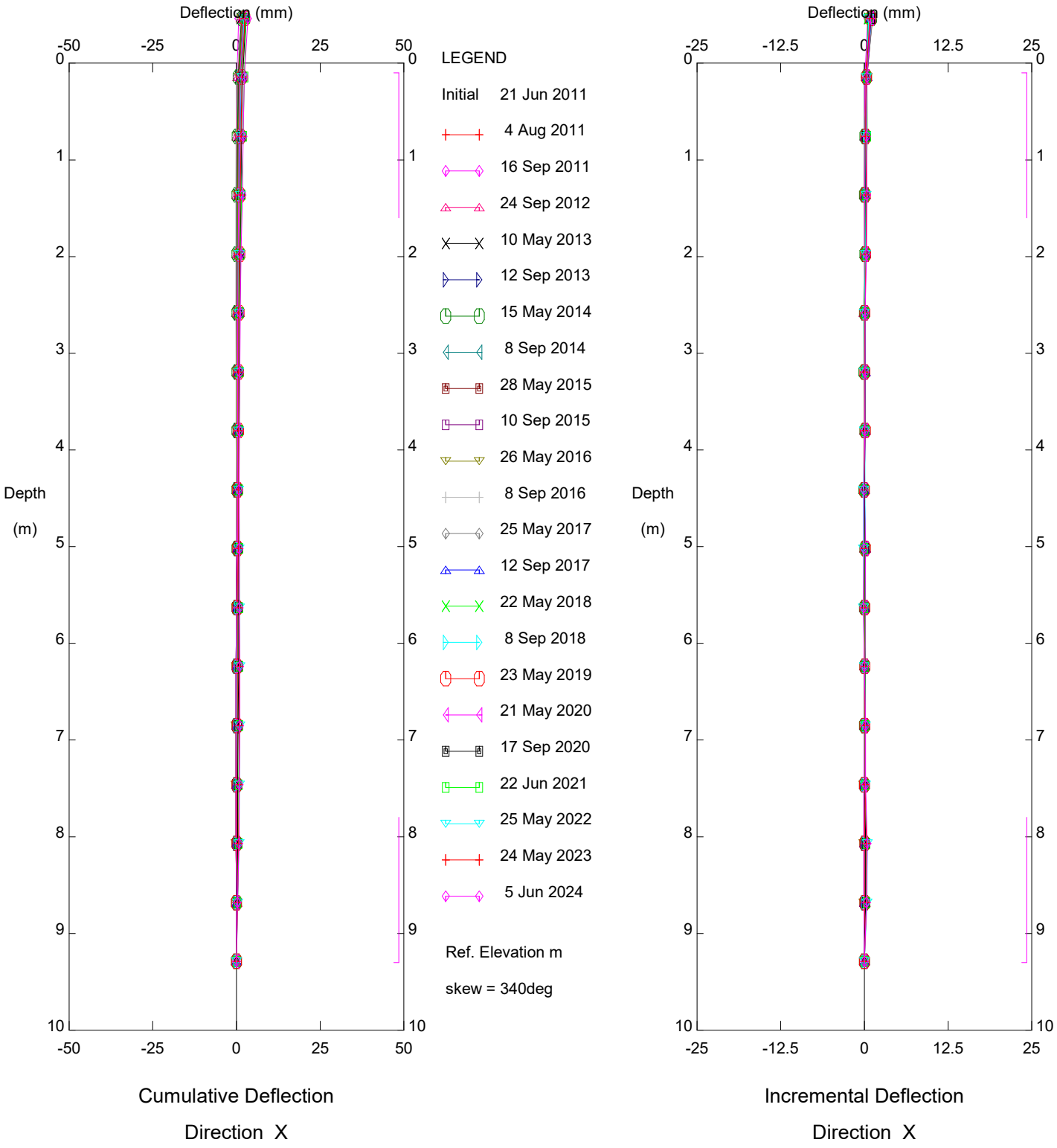
Direction B

Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI11-1 (P7)

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI11-1(km 8.8).gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

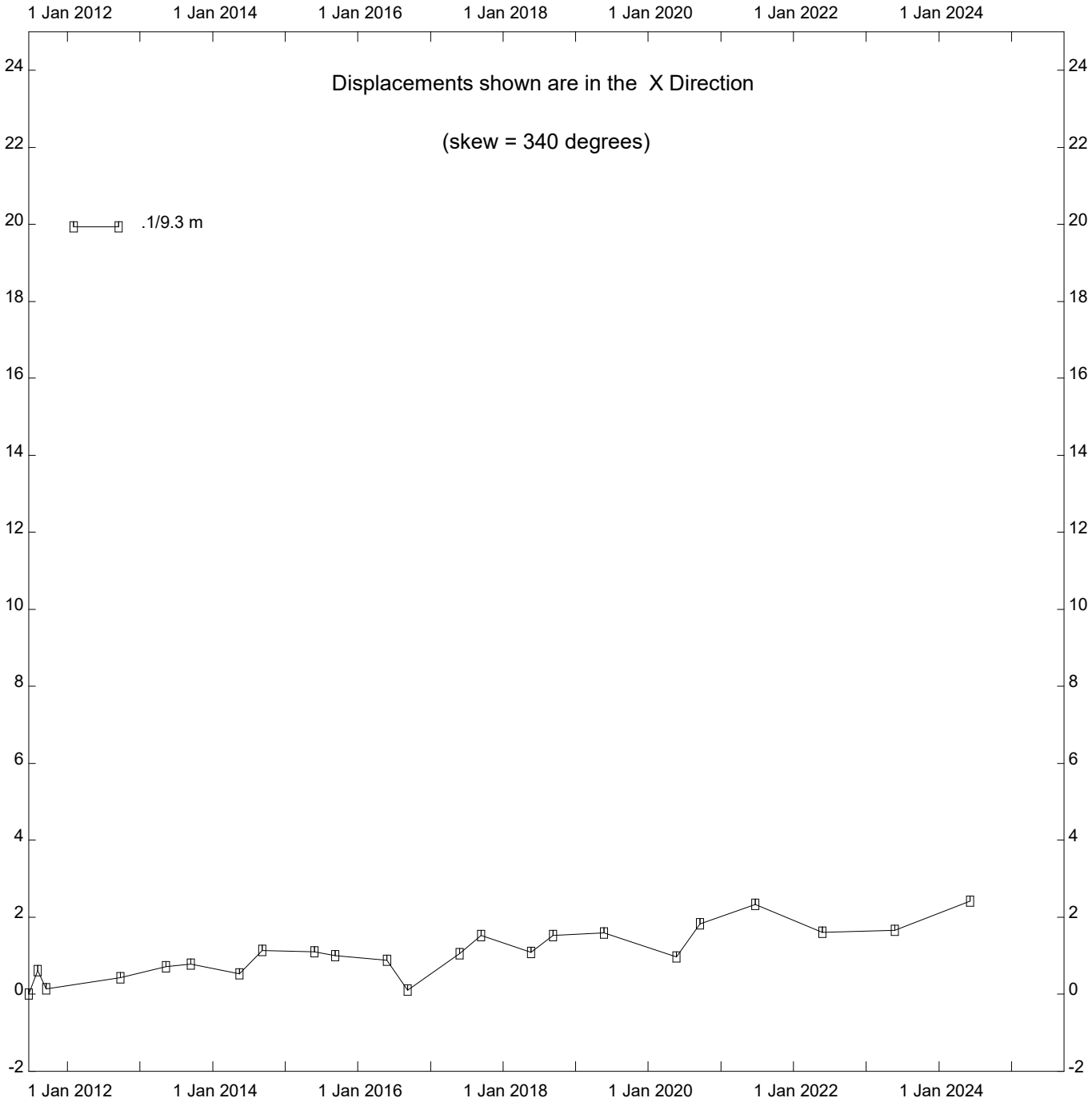
Direction X

Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI11-1 (P7)

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI11-1(km 8.8).gtl

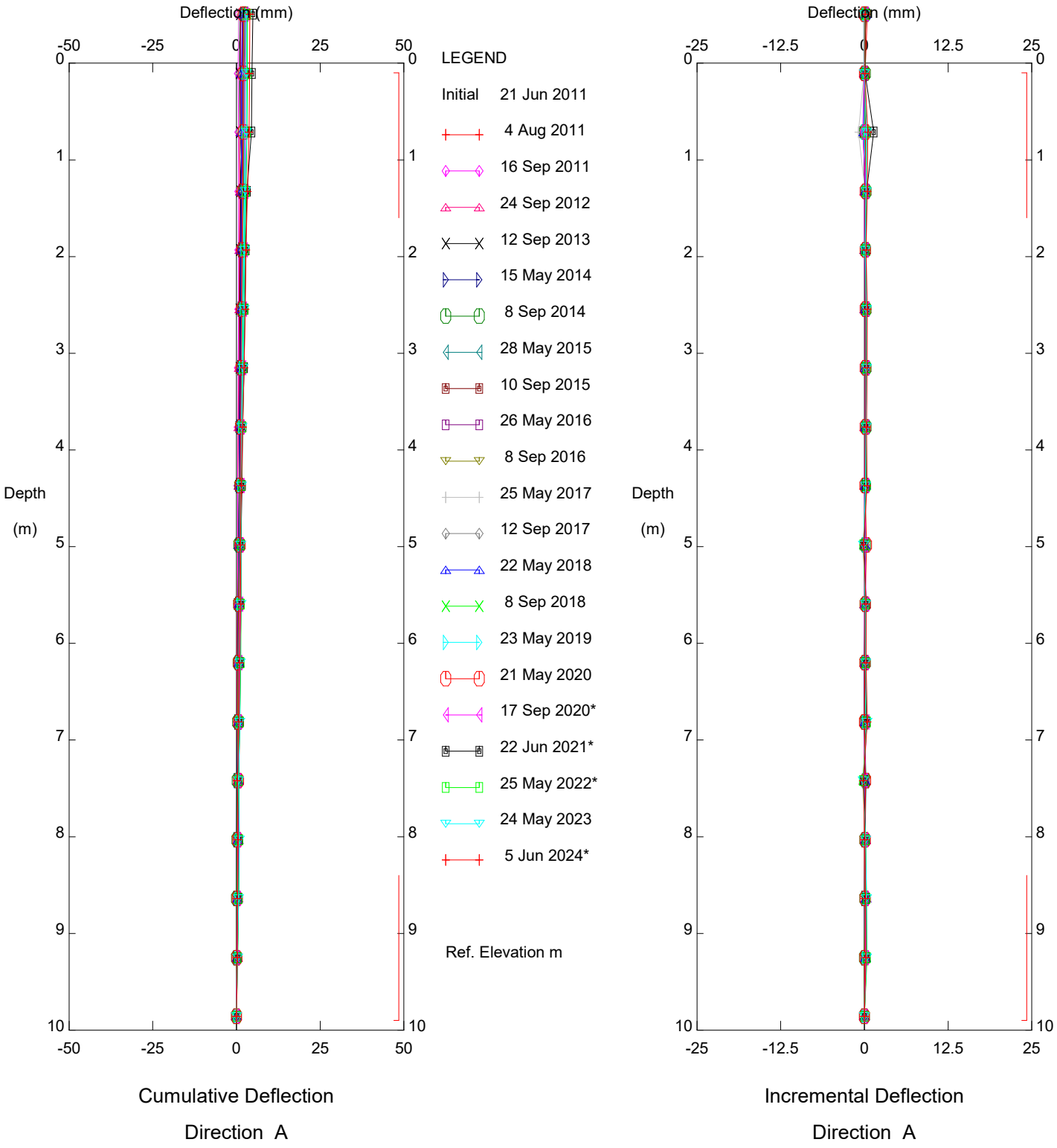
Thurber Engineering Ltd.



Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI11-1 (P7)

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

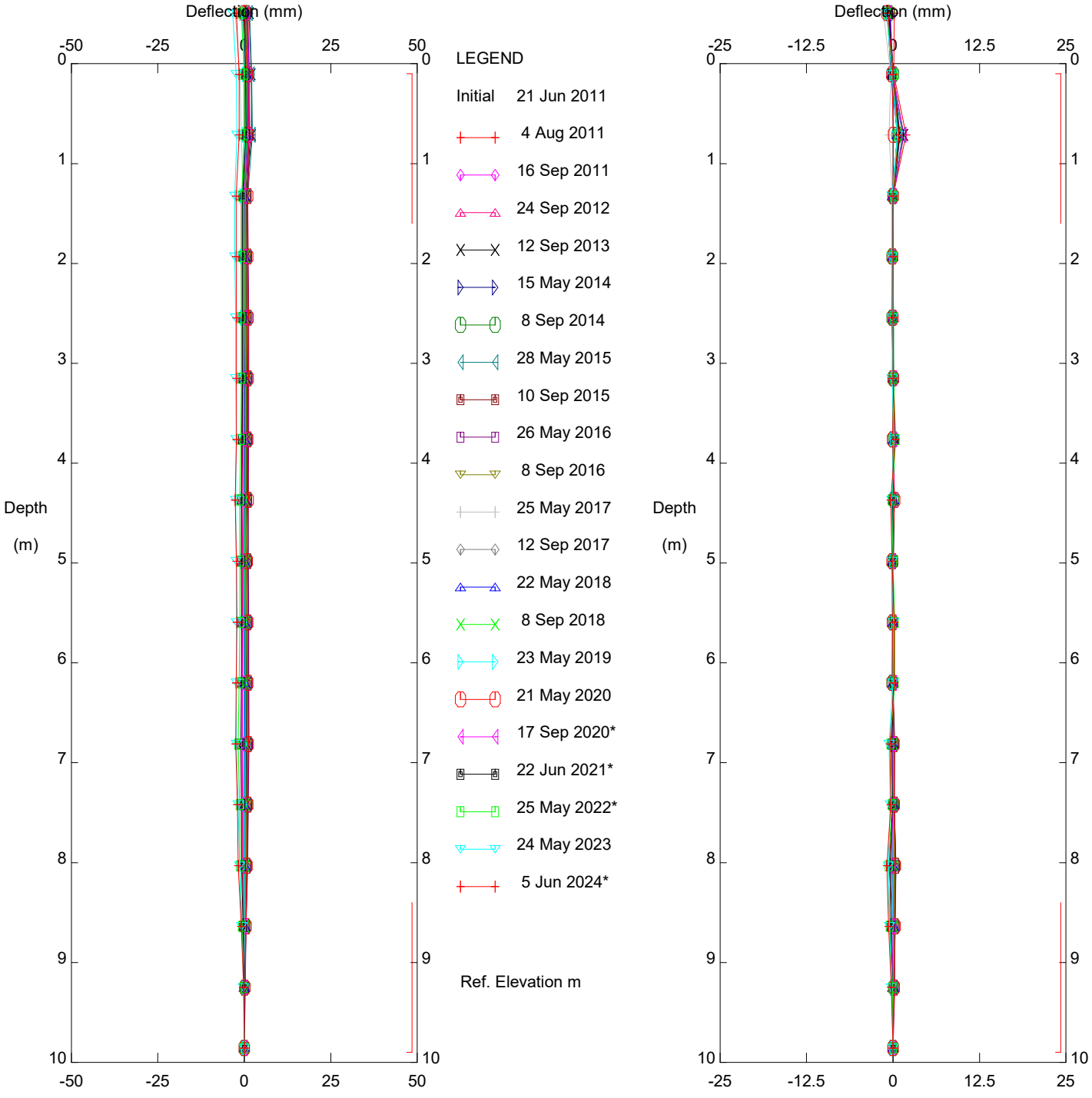
Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI11-2 (P16)

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI11-2(km 8.8).gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

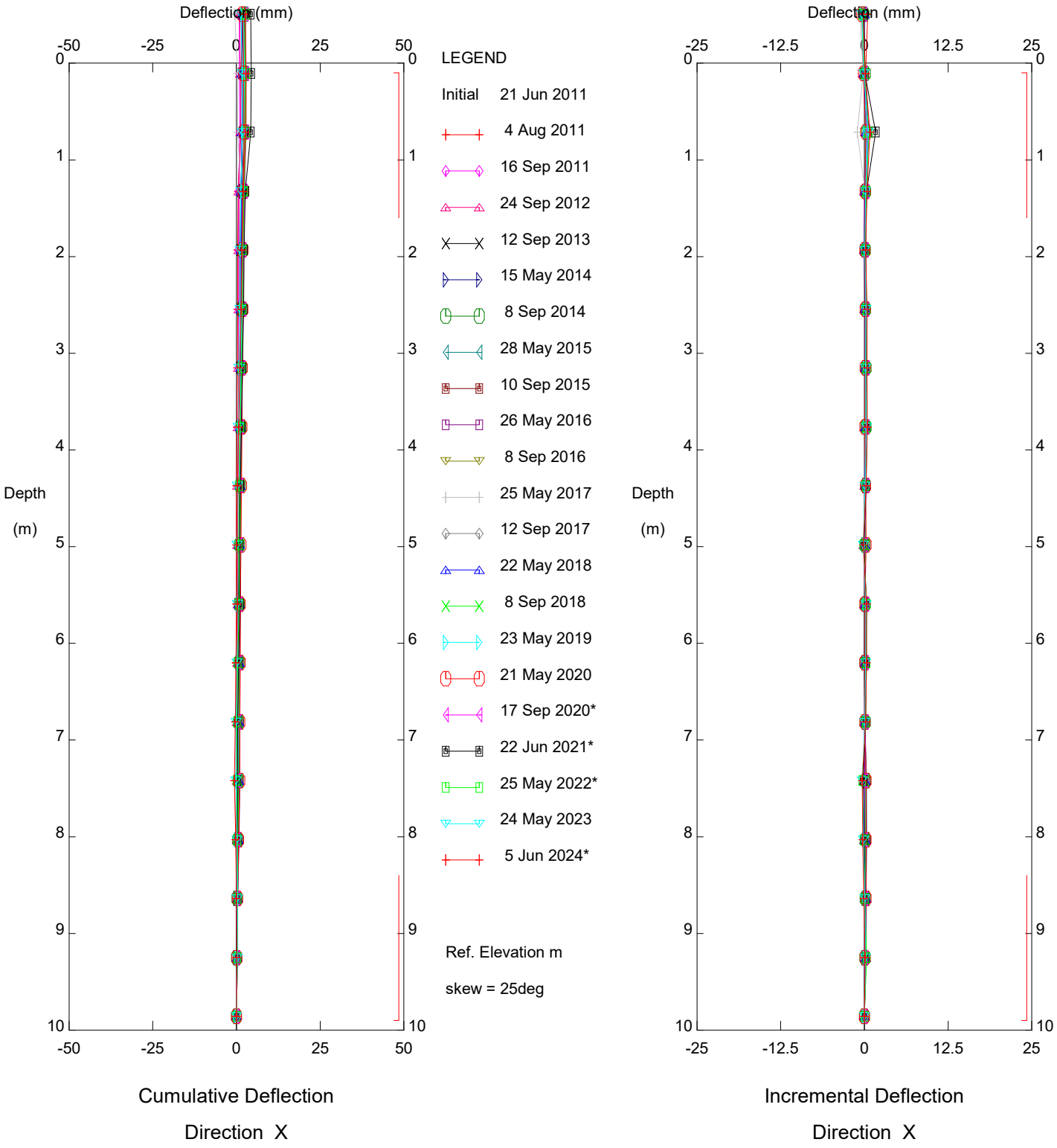
Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI11-2 (P16)

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI11-2(km 8.8).gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

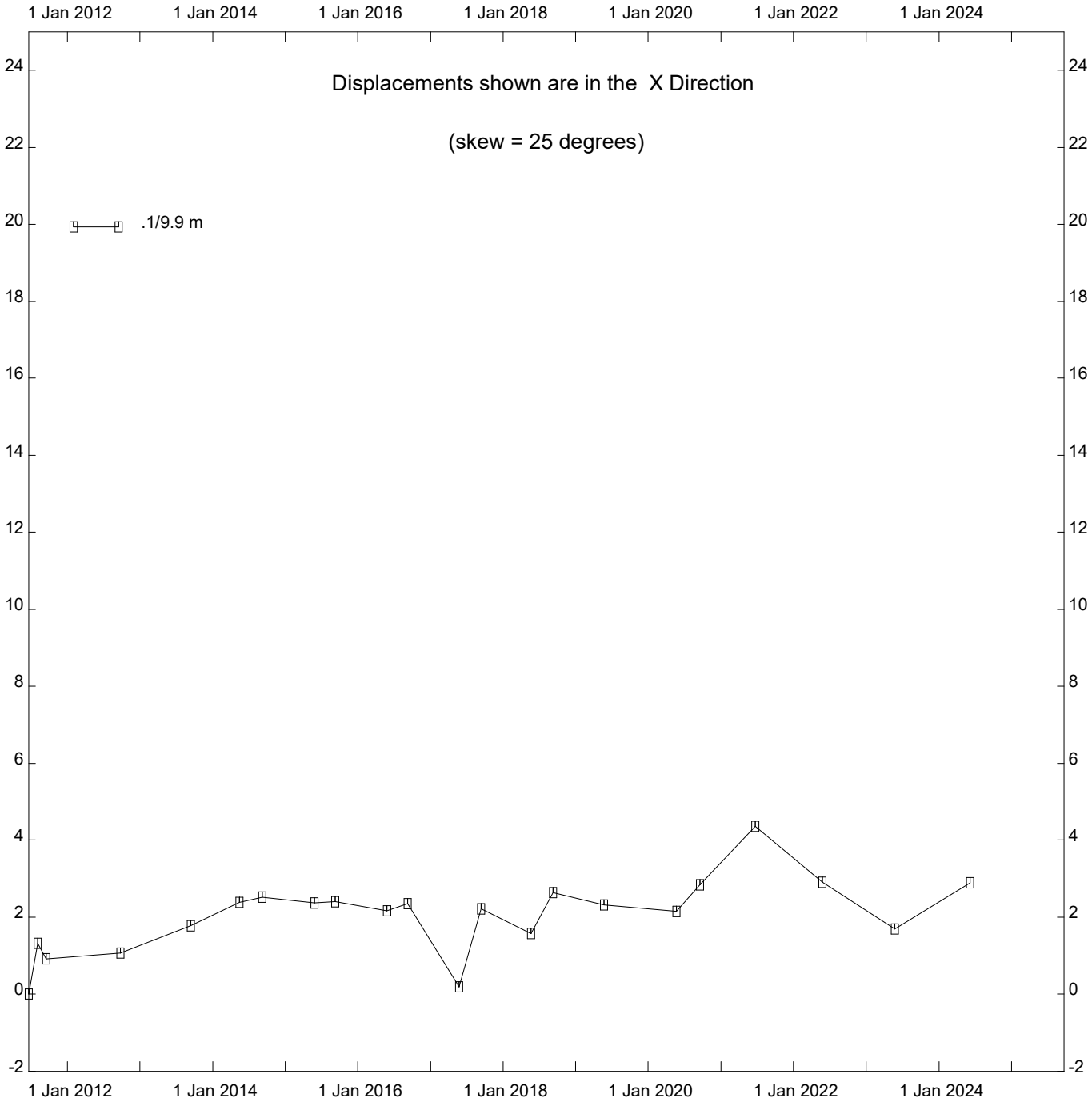
Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI11-2 (P16)

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI11-2(km 8.8).gtl

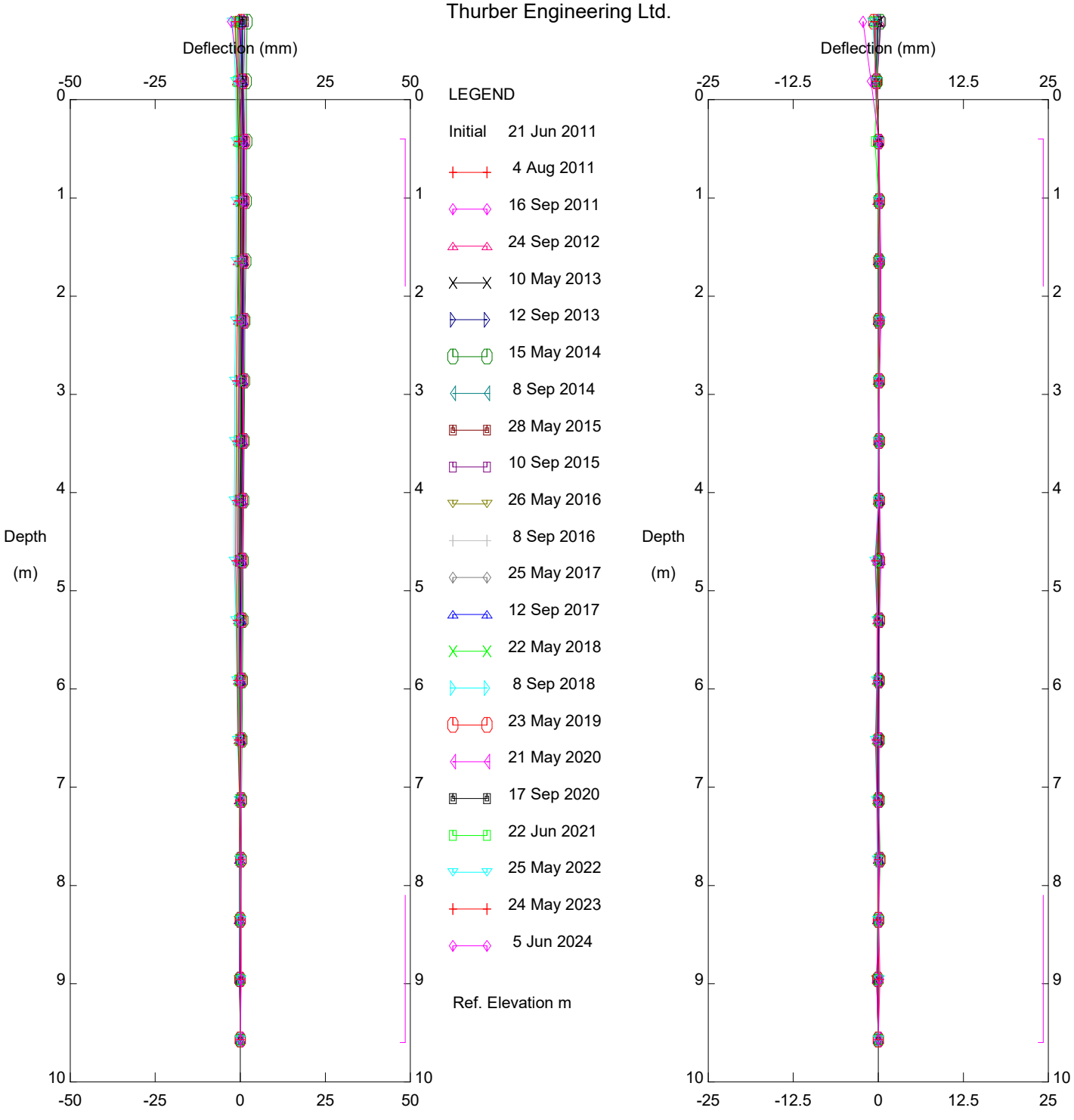
Thurber Engineering Ltd.



Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI11-2 (P16)

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

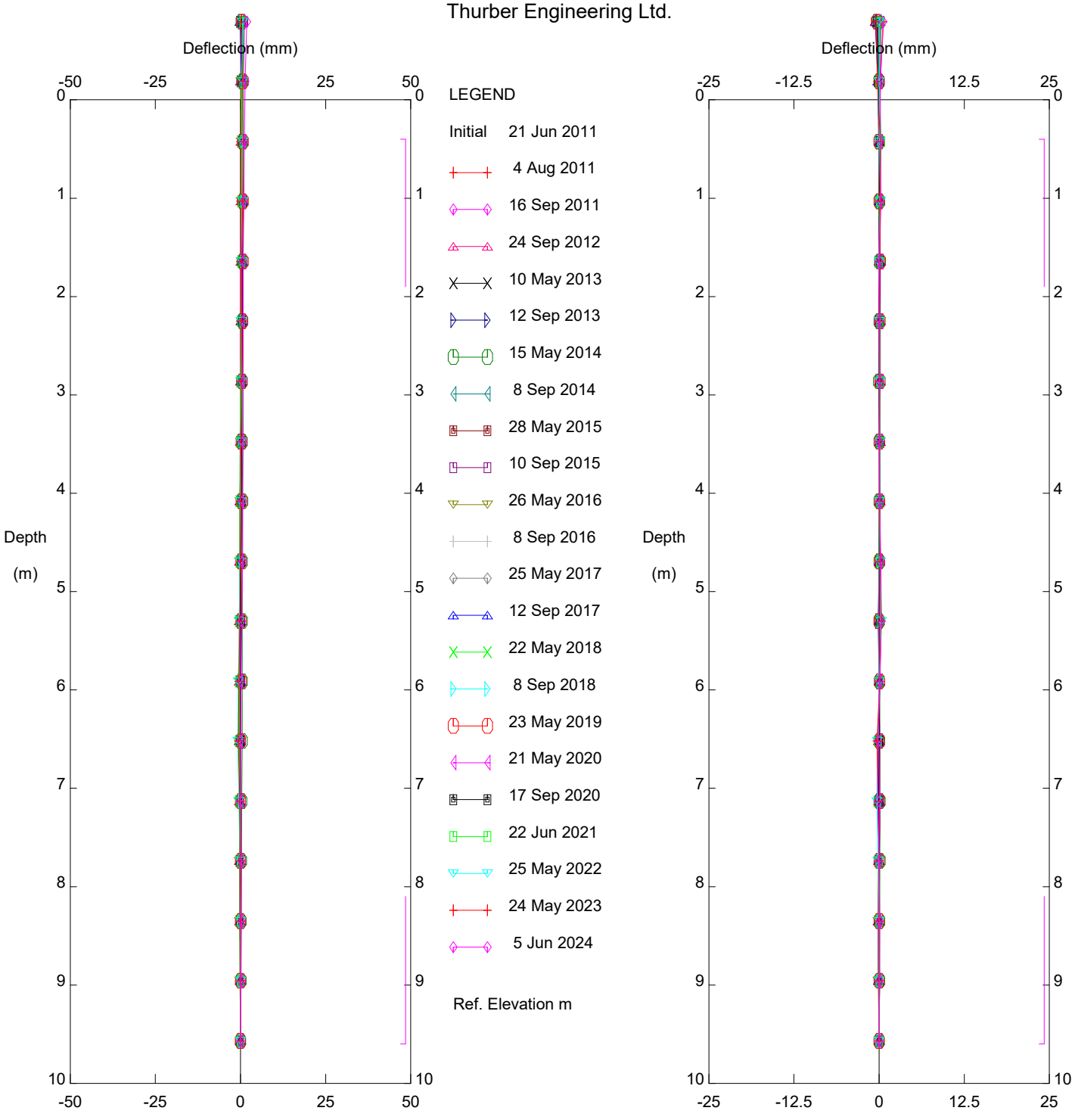
Direction A

Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI11-3 (P24)

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI11-3(km 8.8).gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction B

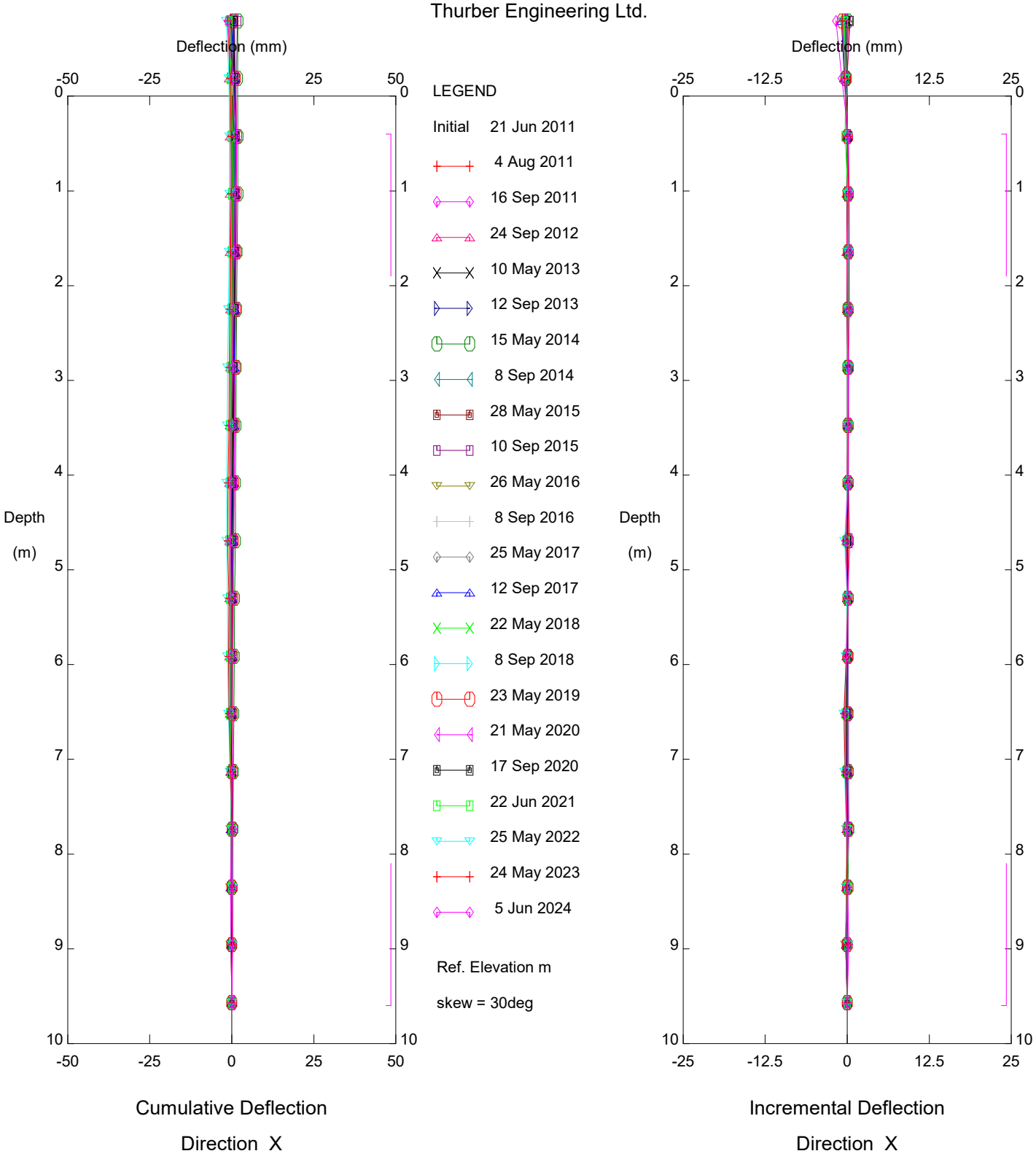
Incremental Deflection

Direction B

Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI11-3 (P24)

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

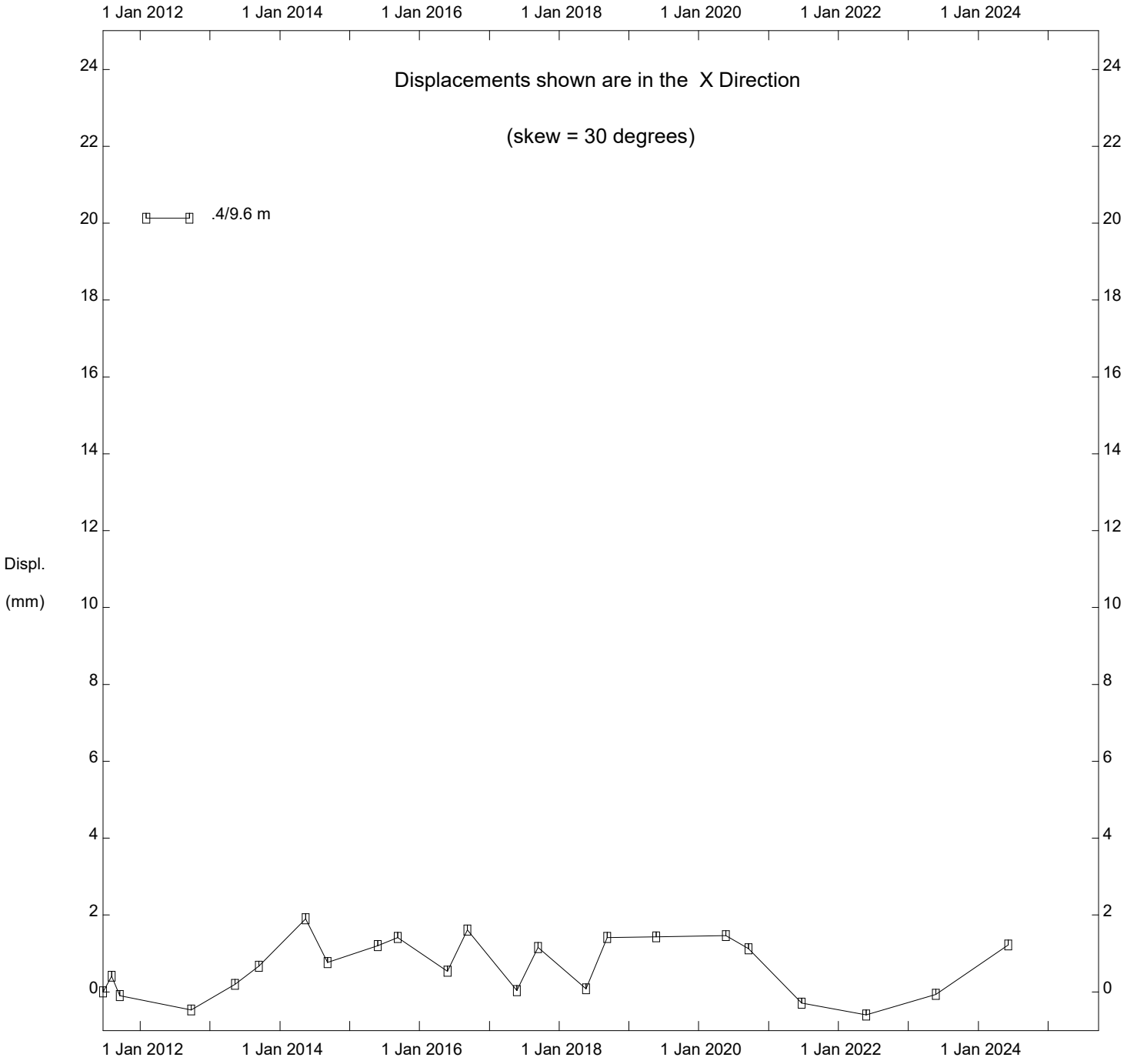
Direction X

Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI11-3 (P24)

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI11-3(km 8.8).gtl

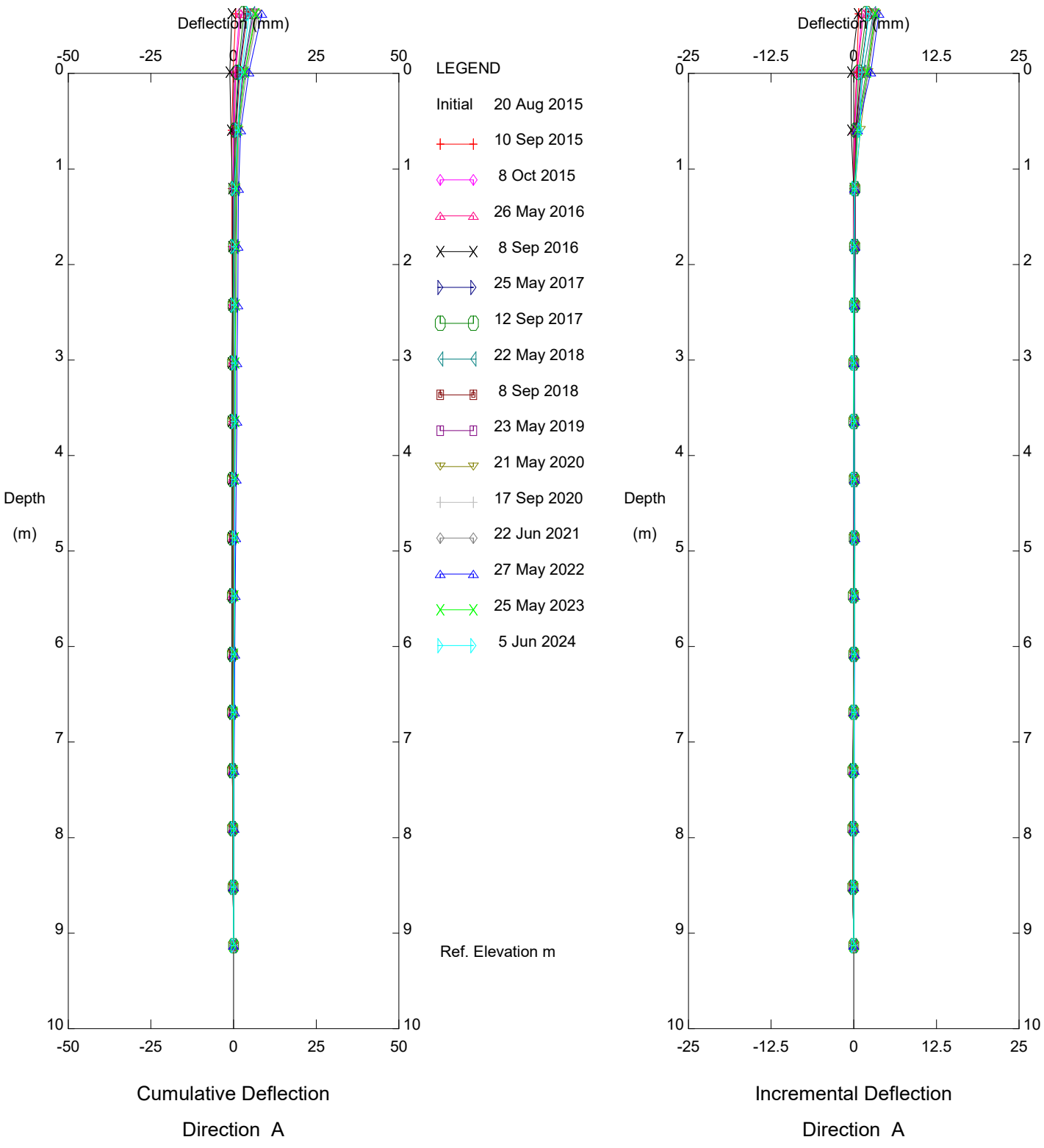
Thurber Engineering Ltd.



Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI11-3 (P24)

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

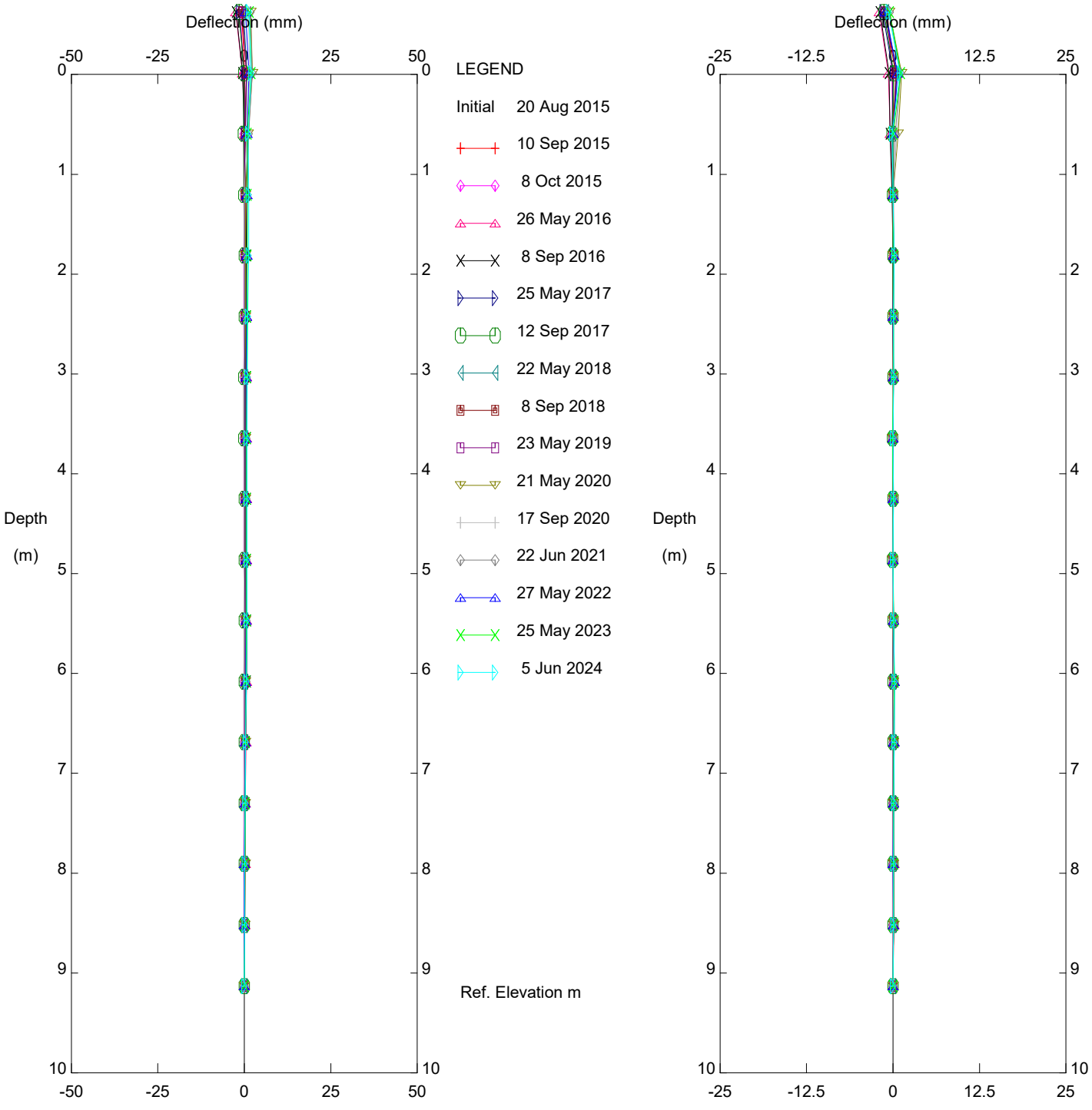
Incremental Deflection

Direction A

Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI15-1

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction B

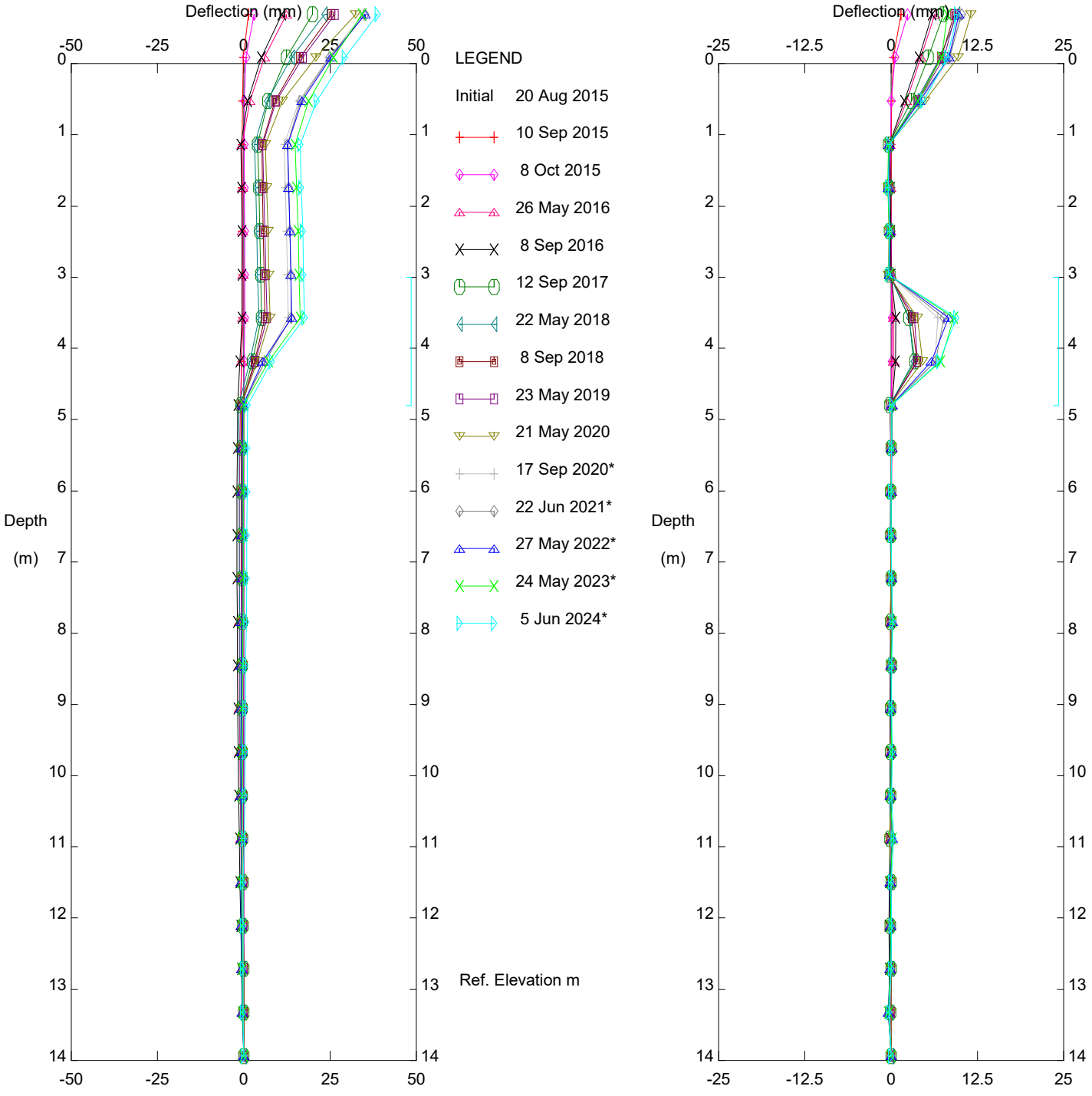
Incremental Deflection

Direction B

Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI15-1

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

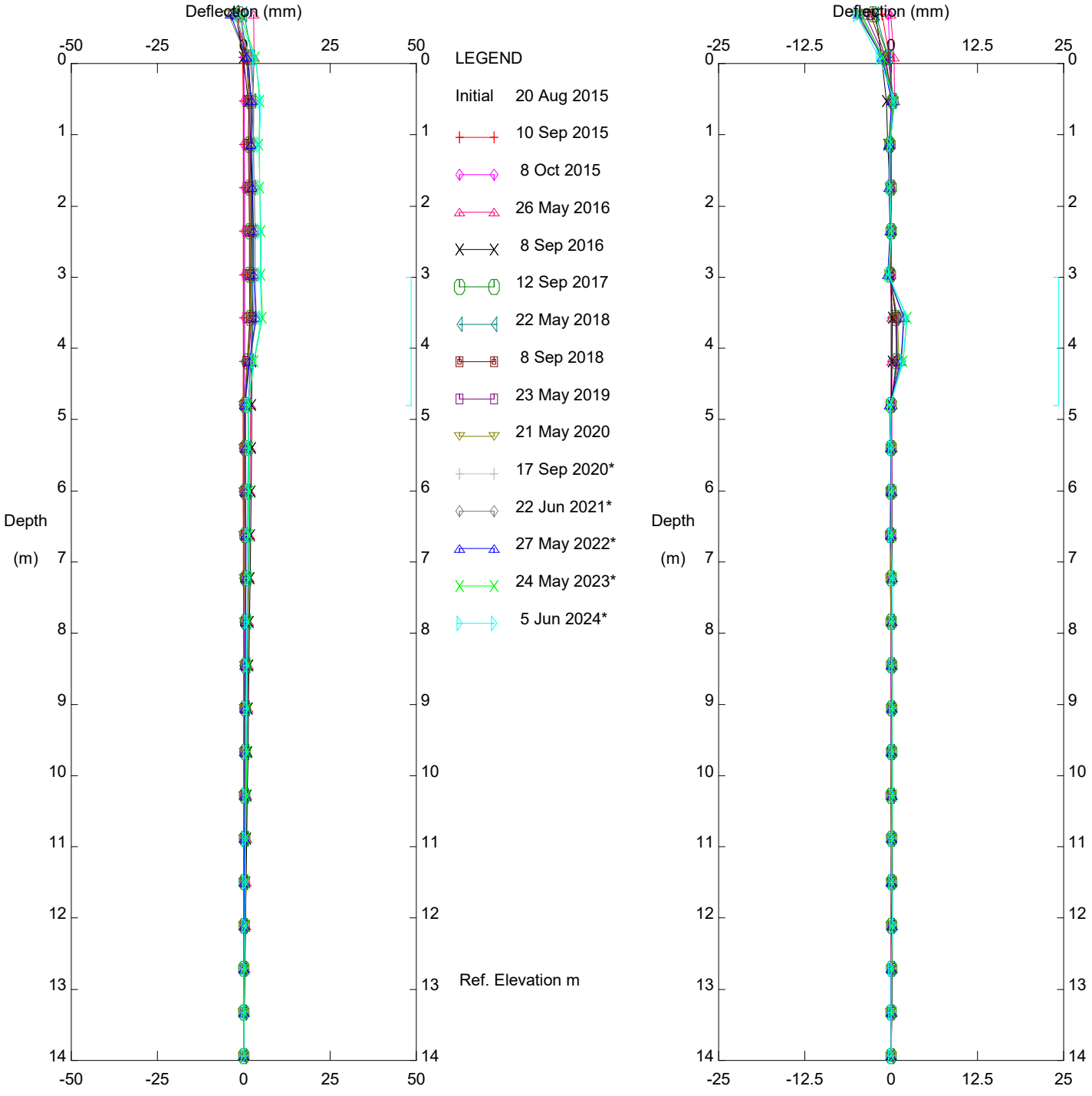
Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI15-2

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI15-2.gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

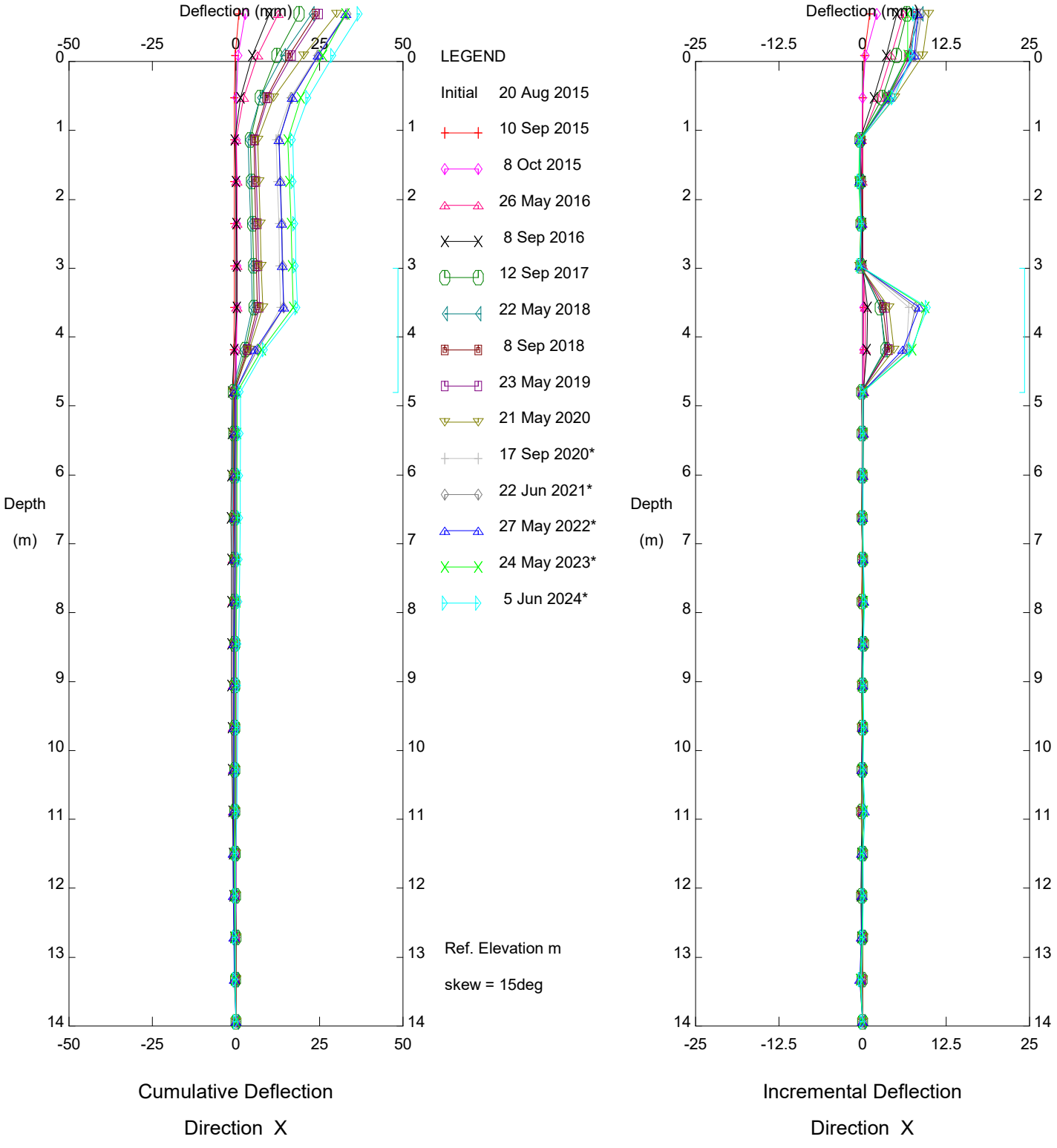
Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI15-2

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI15-2.gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

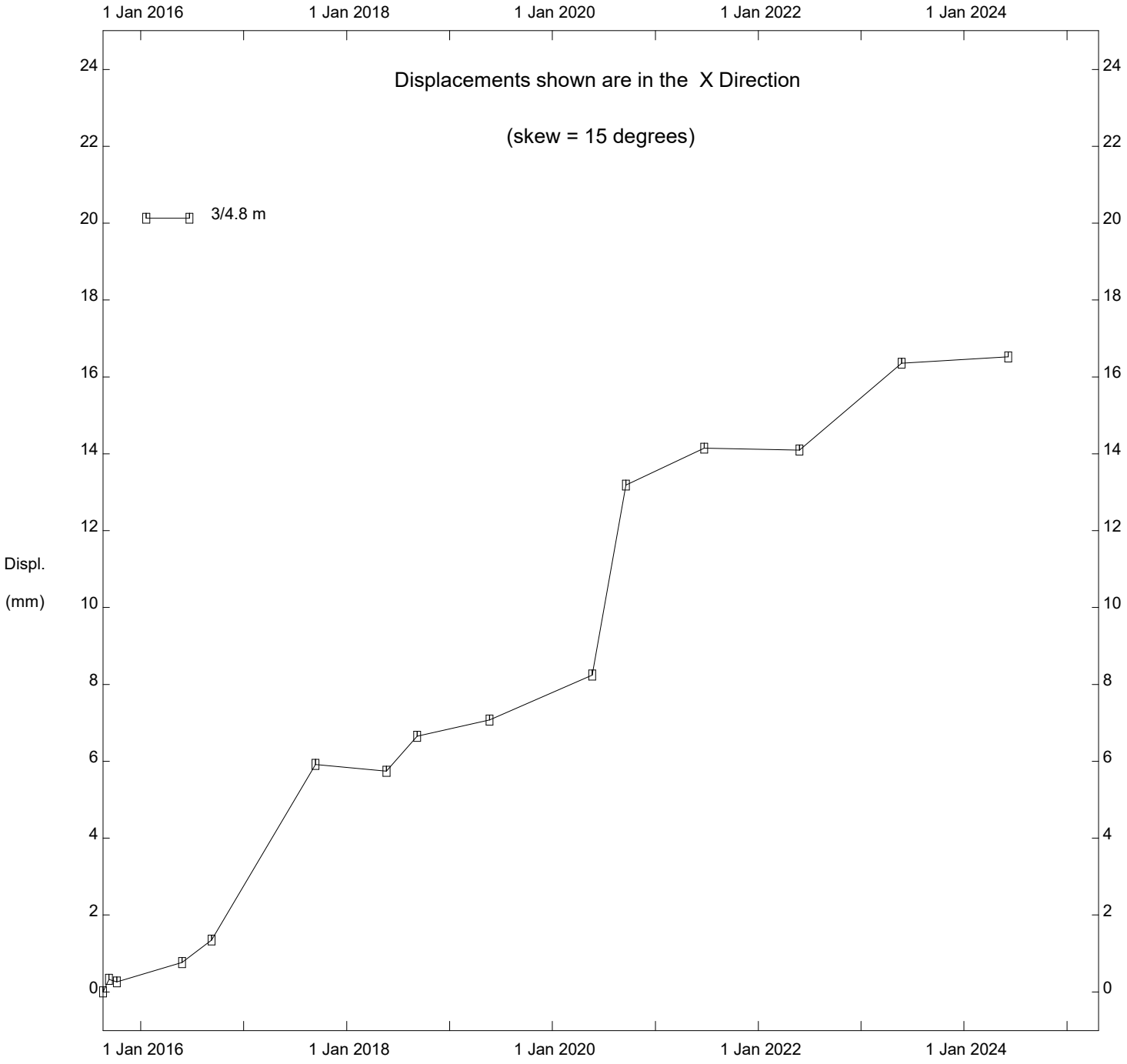
Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI15-2

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI15-2.gtl

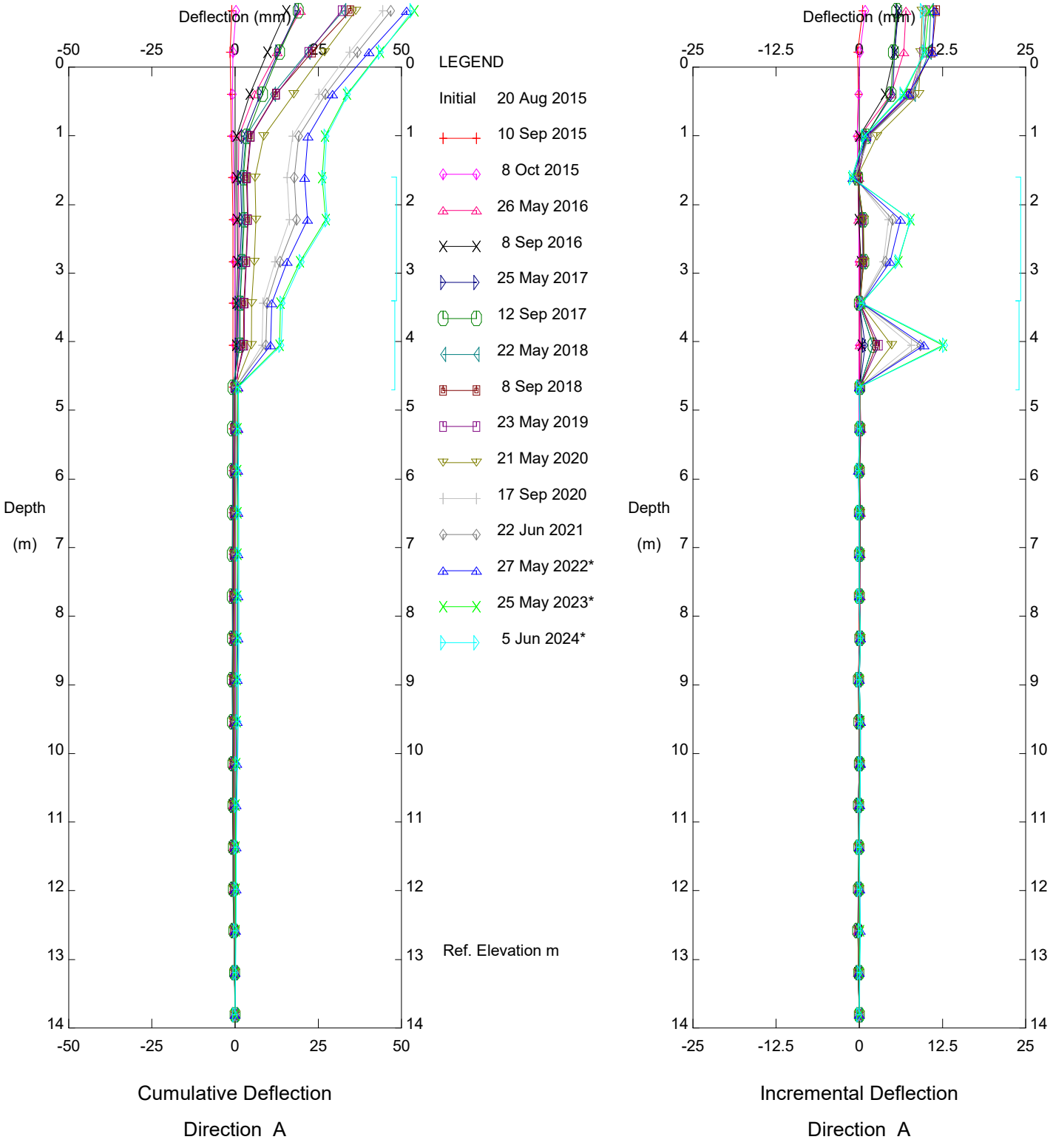
Thurber Engineering Ltd.



Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI15-2

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

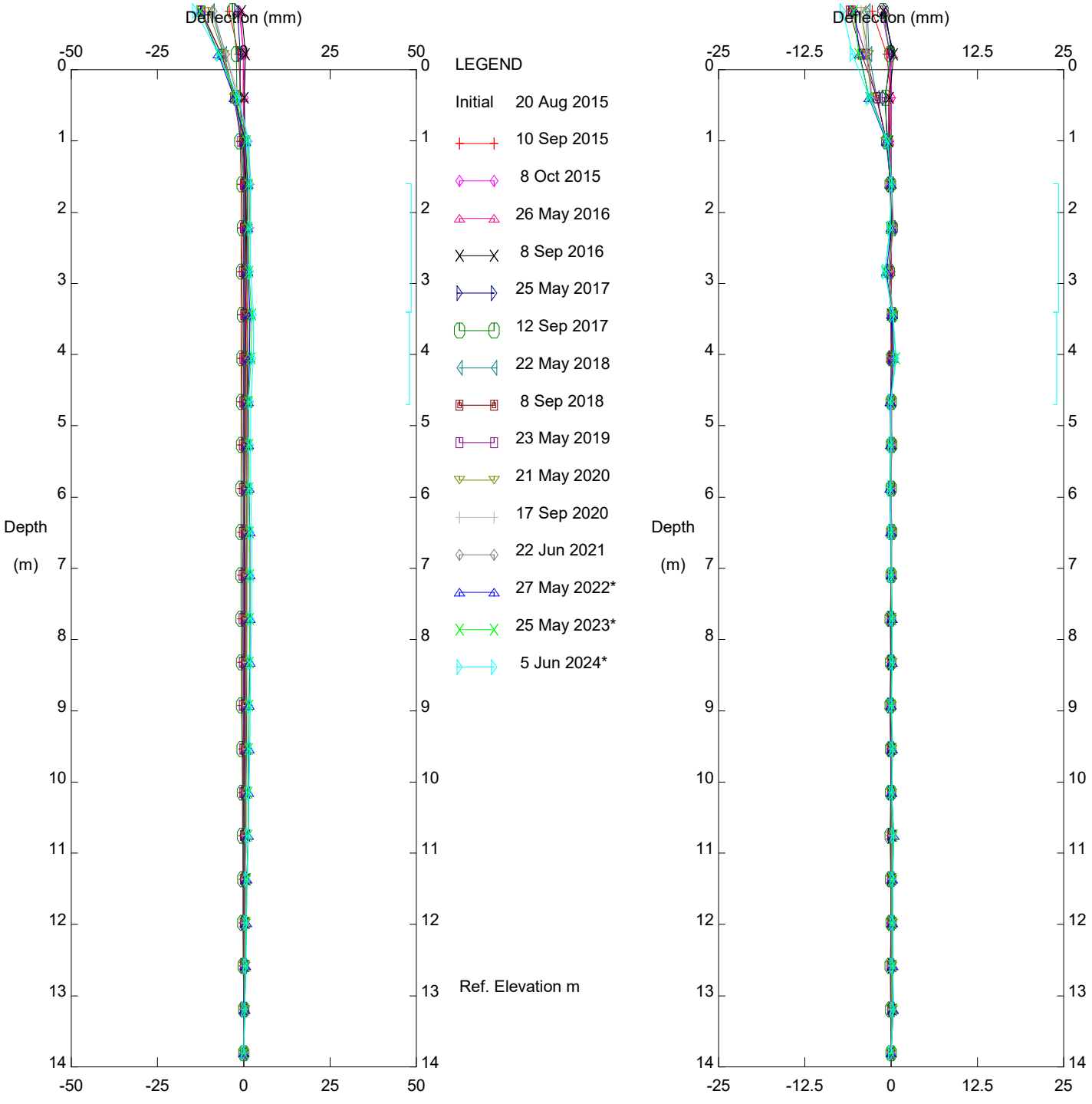
Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI15-4

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI15-4.gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

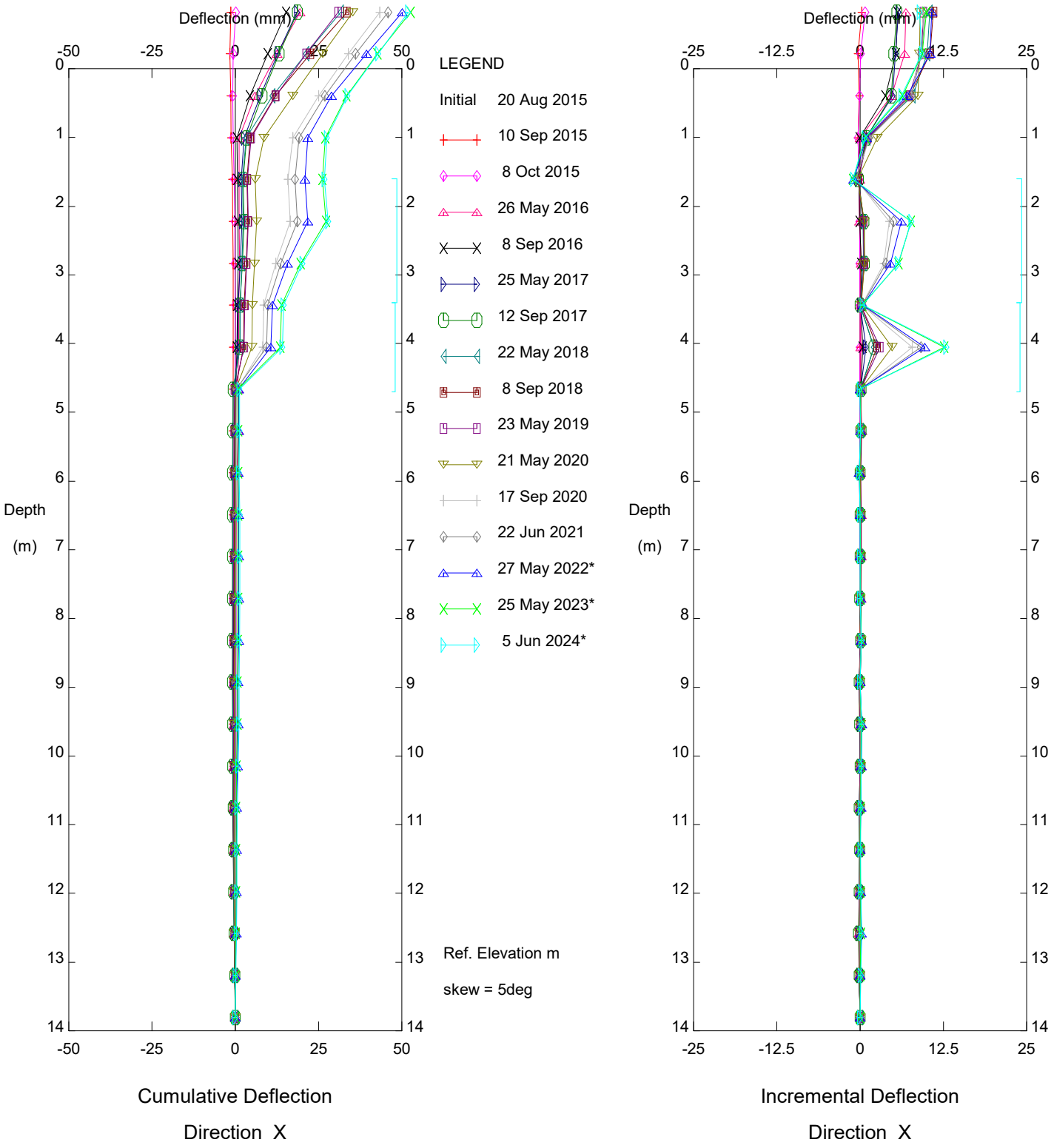
Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI15-4

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI15-4.gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

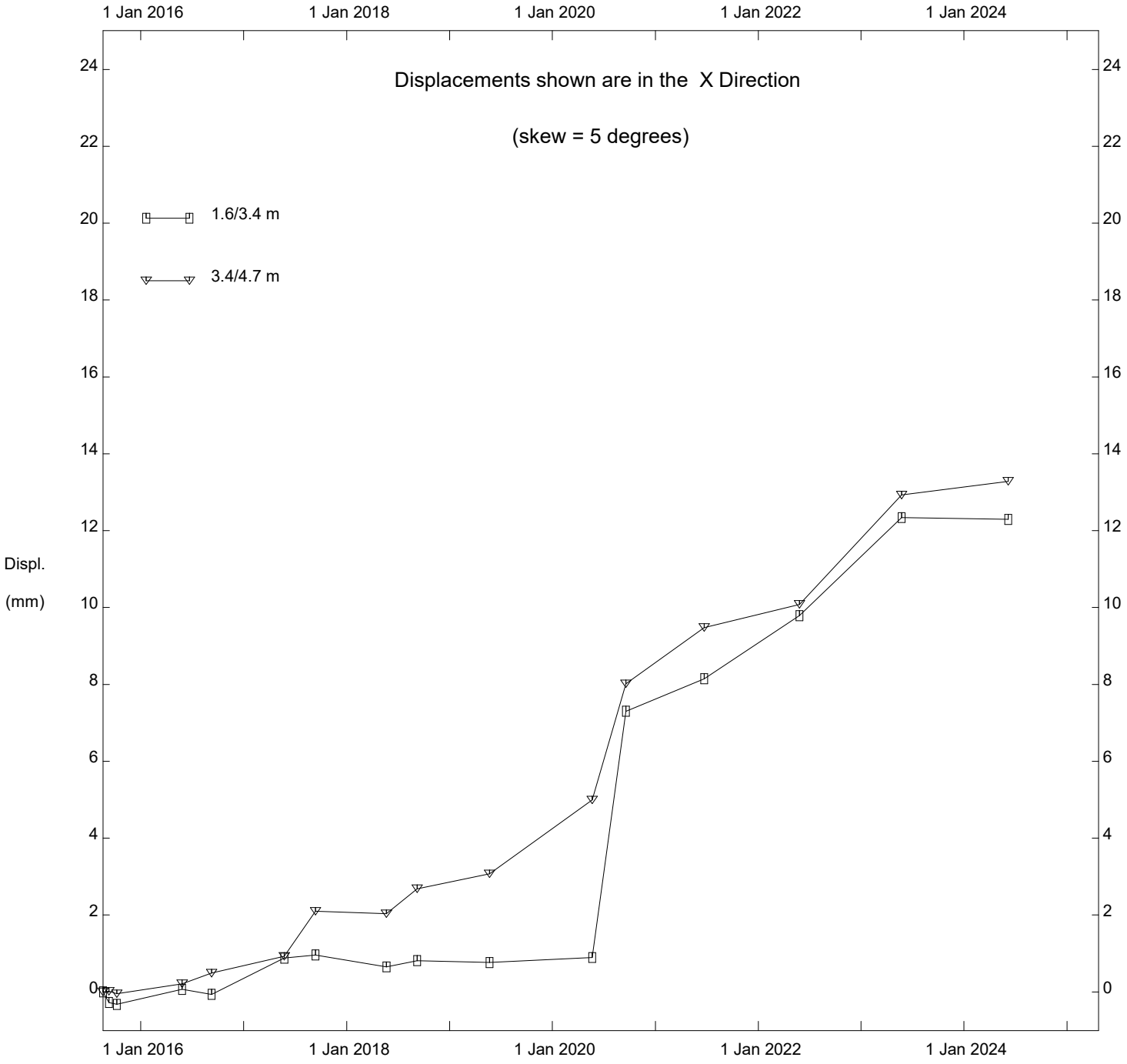
Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI15-4

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI15-4.gtl

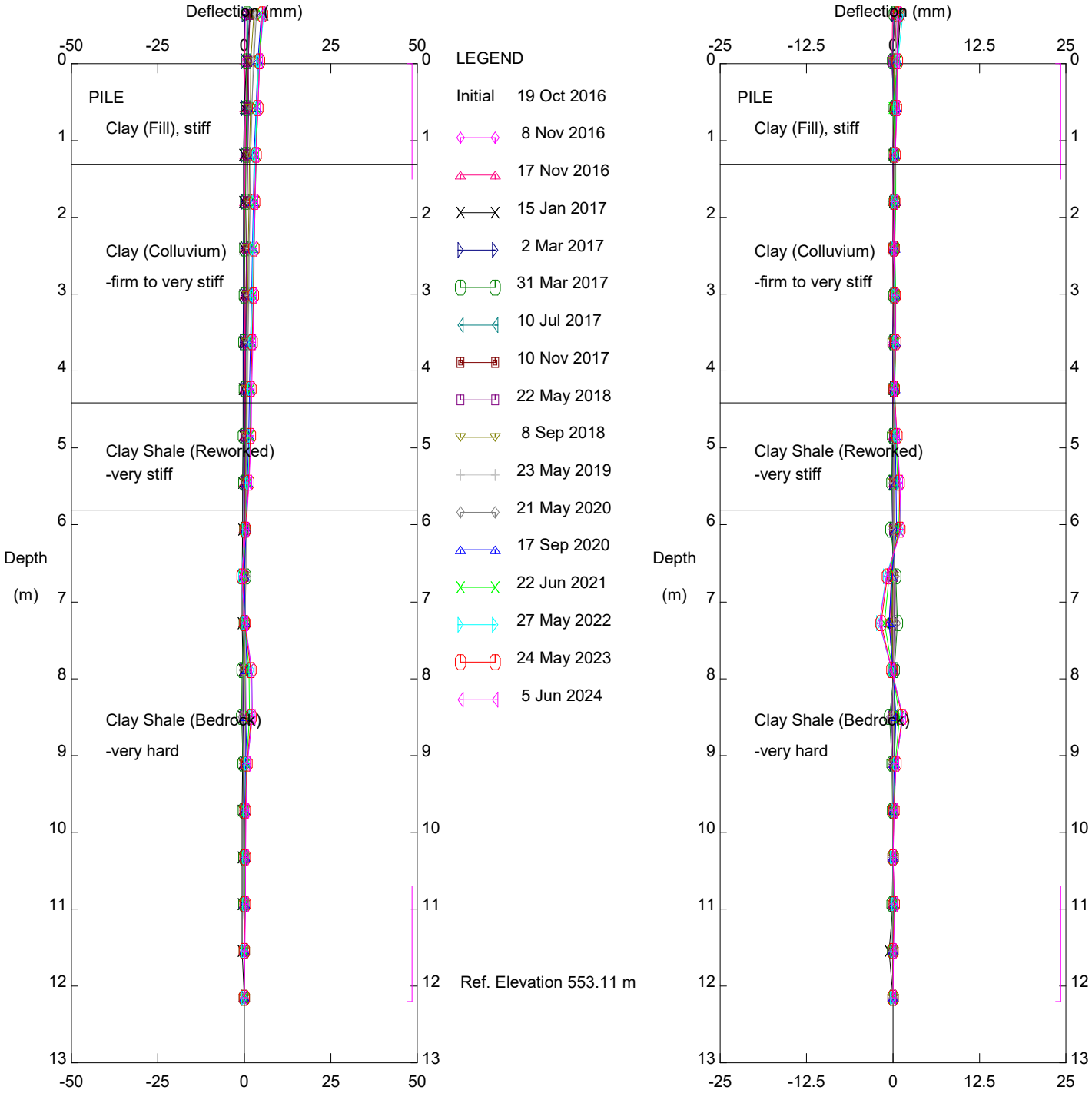
Thurber Engineering Ltd.



Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI15-4

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

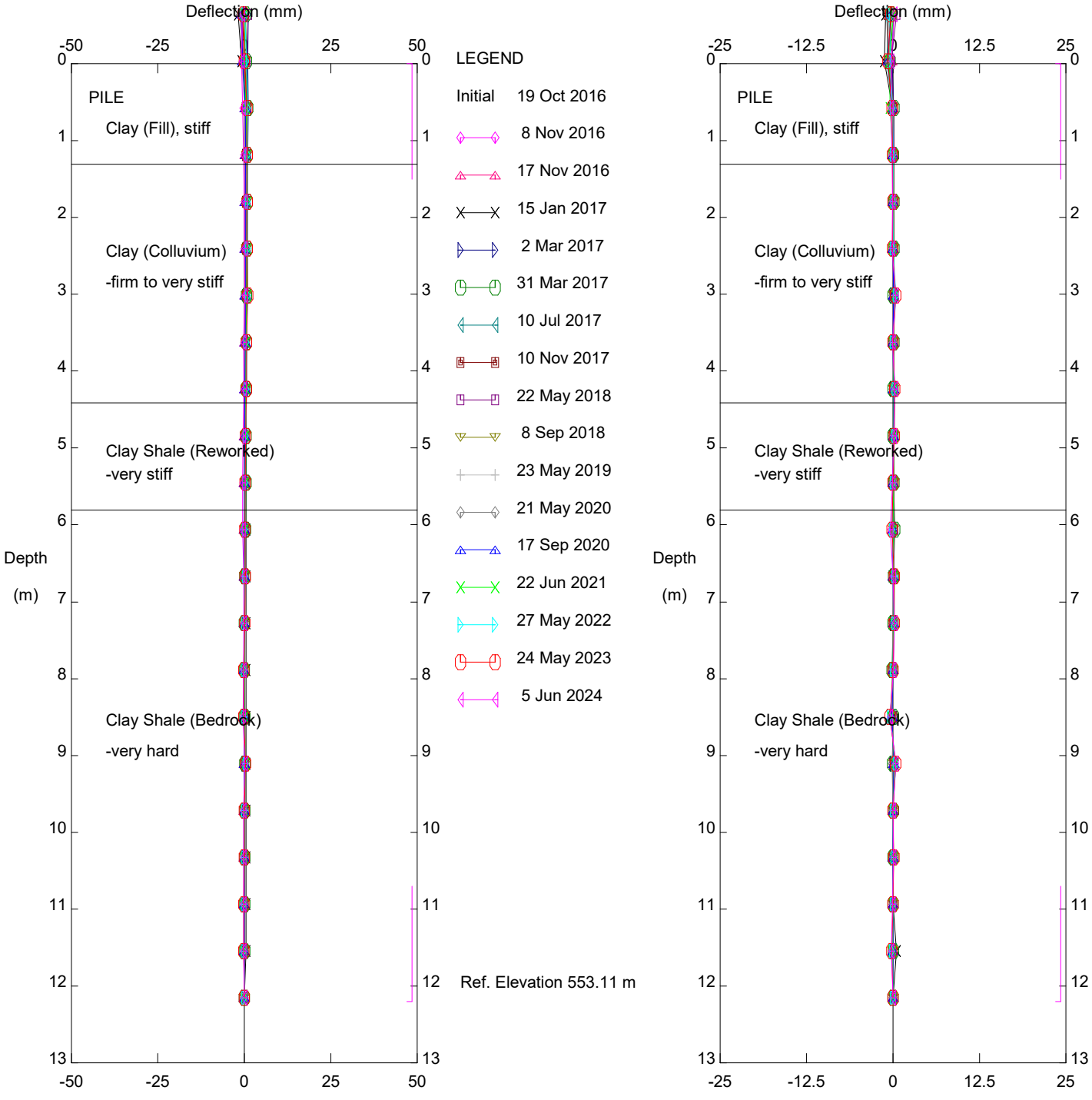
Direction A

Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI16-1 (P04)

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI16-1 (P04).gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

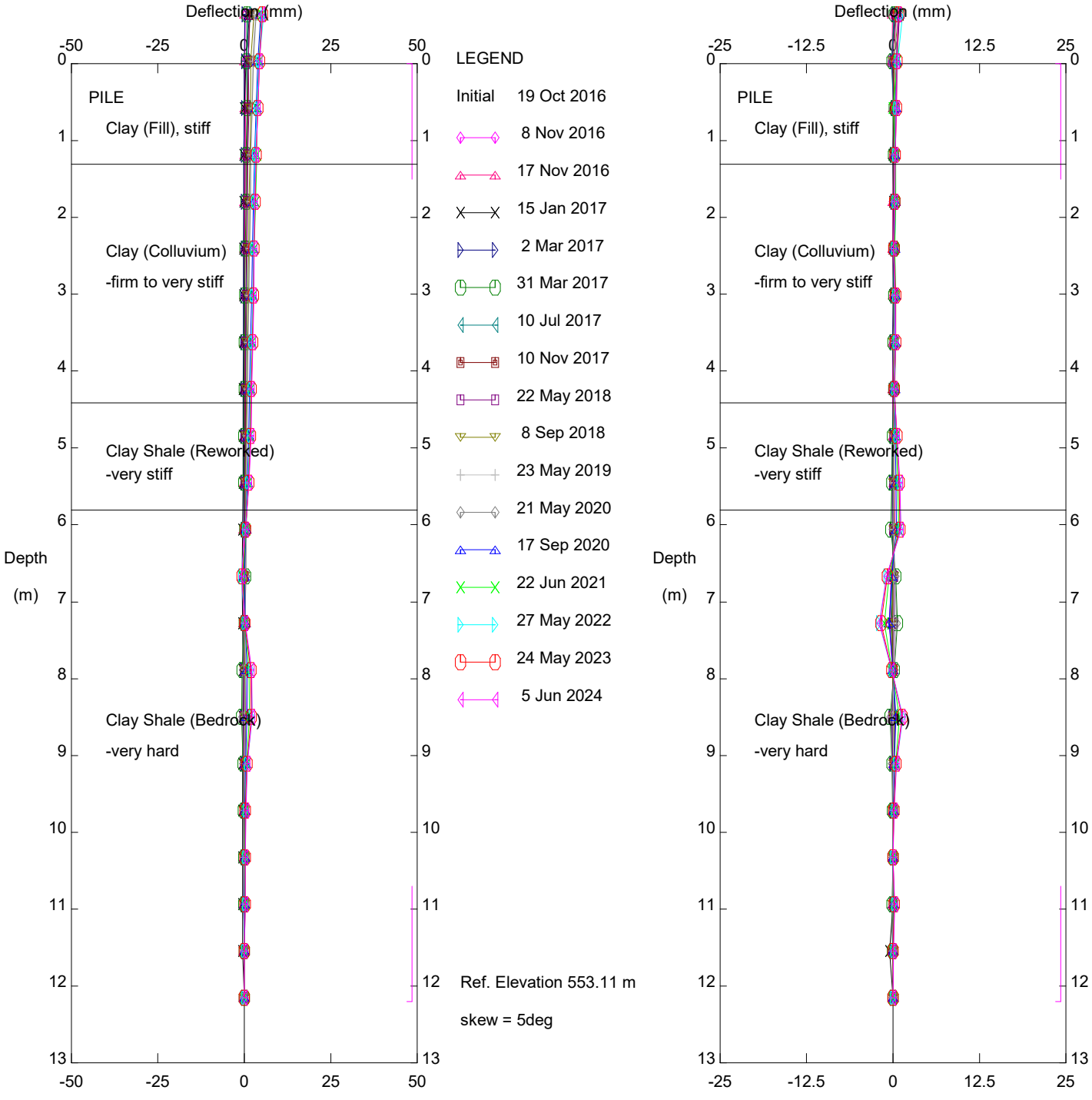
Direction B

Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI16-1 (P04)

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI16-1 (P04).gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

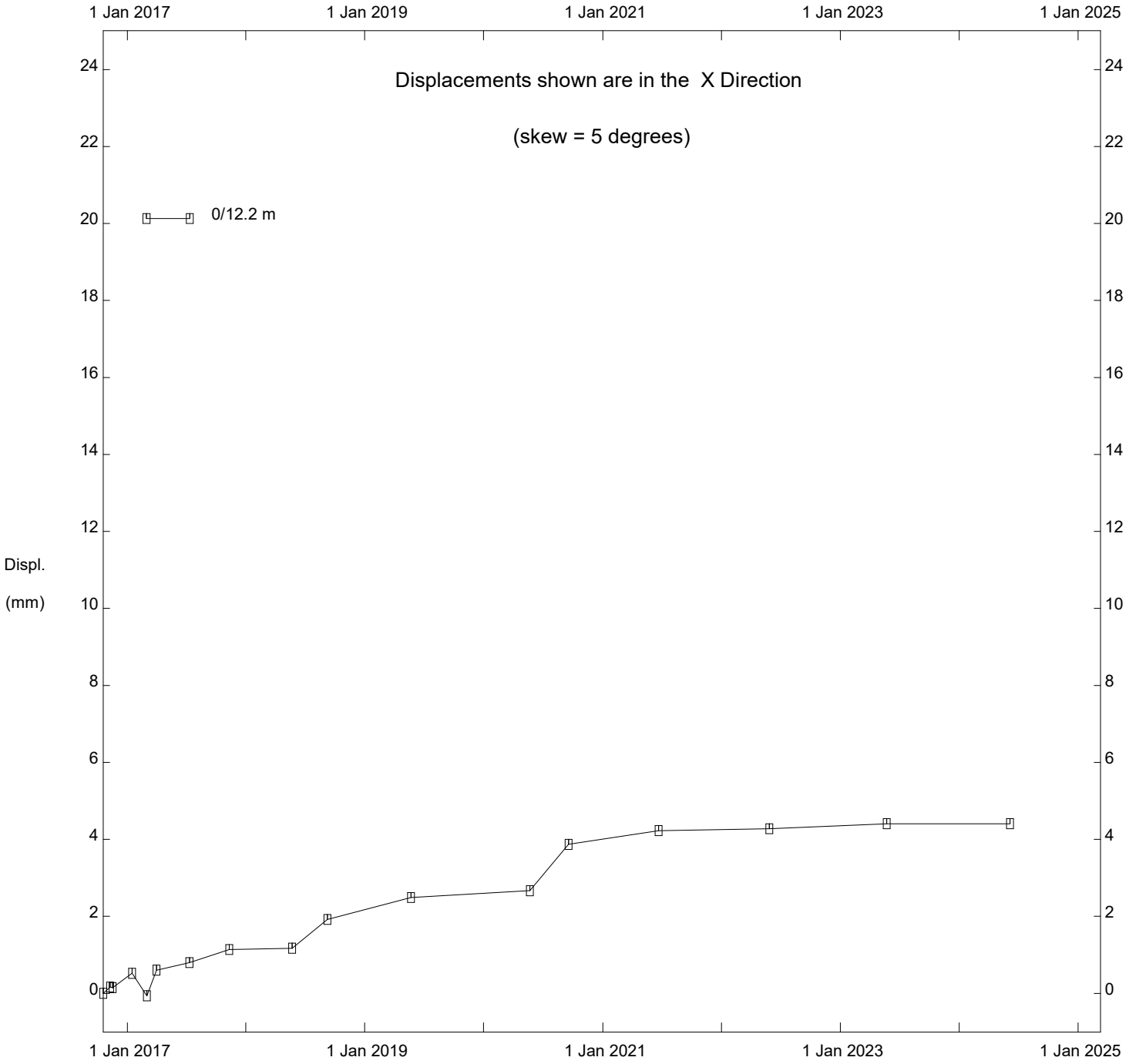
Direction X

Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI16-1 (P04)

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI16-1 (P04).gtl

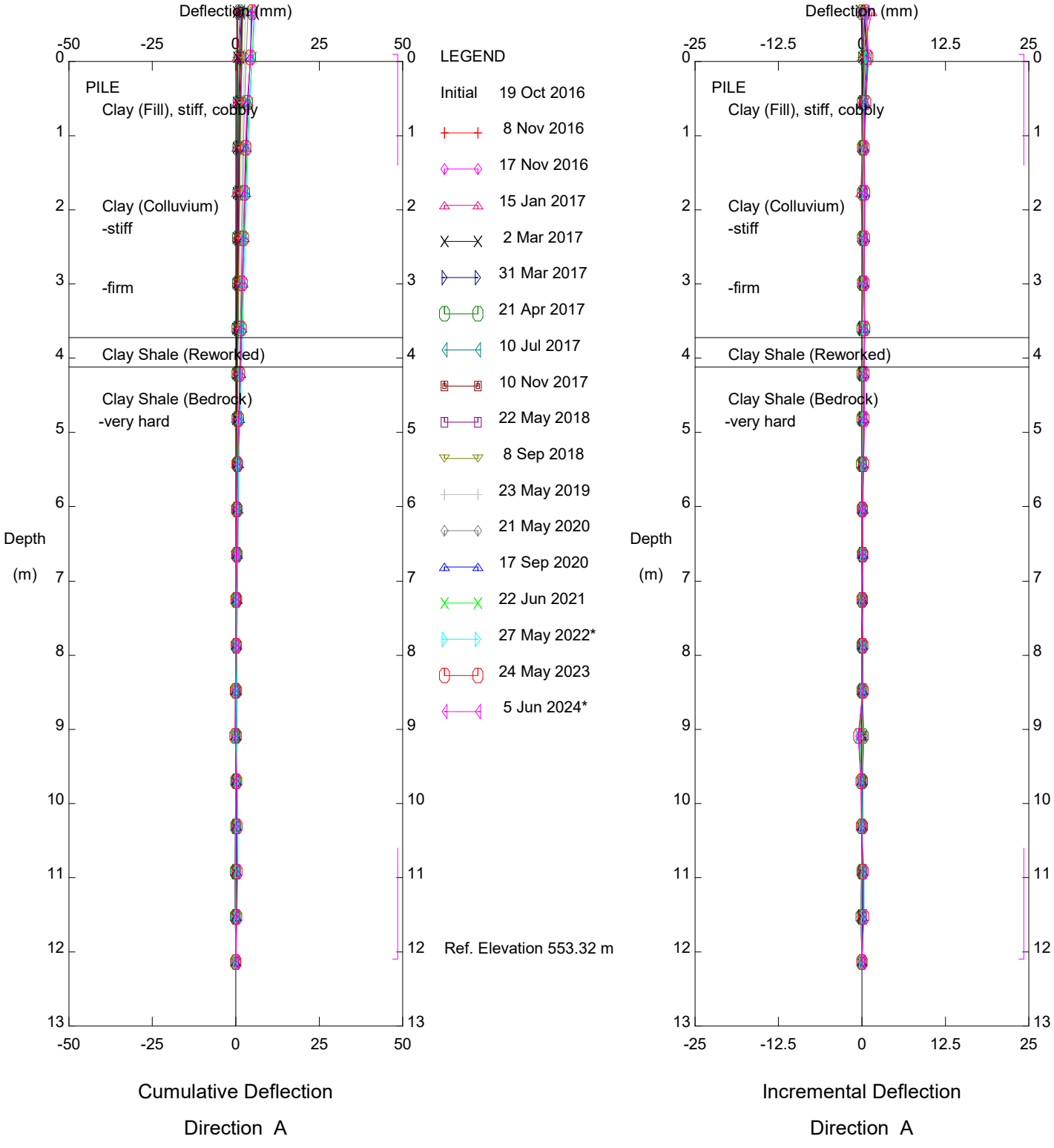
Thurber Engineering Ltd.



Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI16-1 (P04)

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

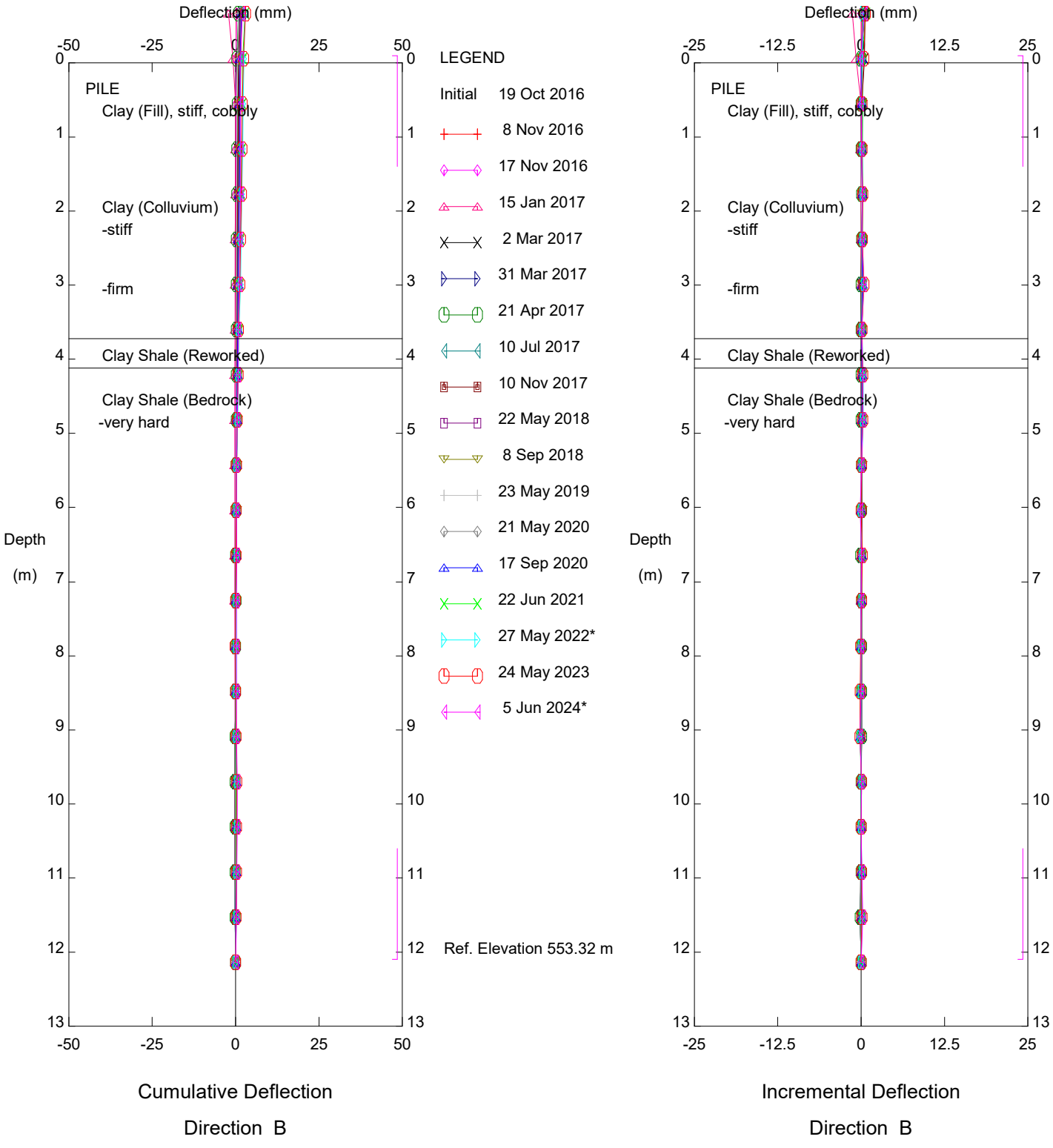
Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI16-2 (P08)

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI16-2 (P08).gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

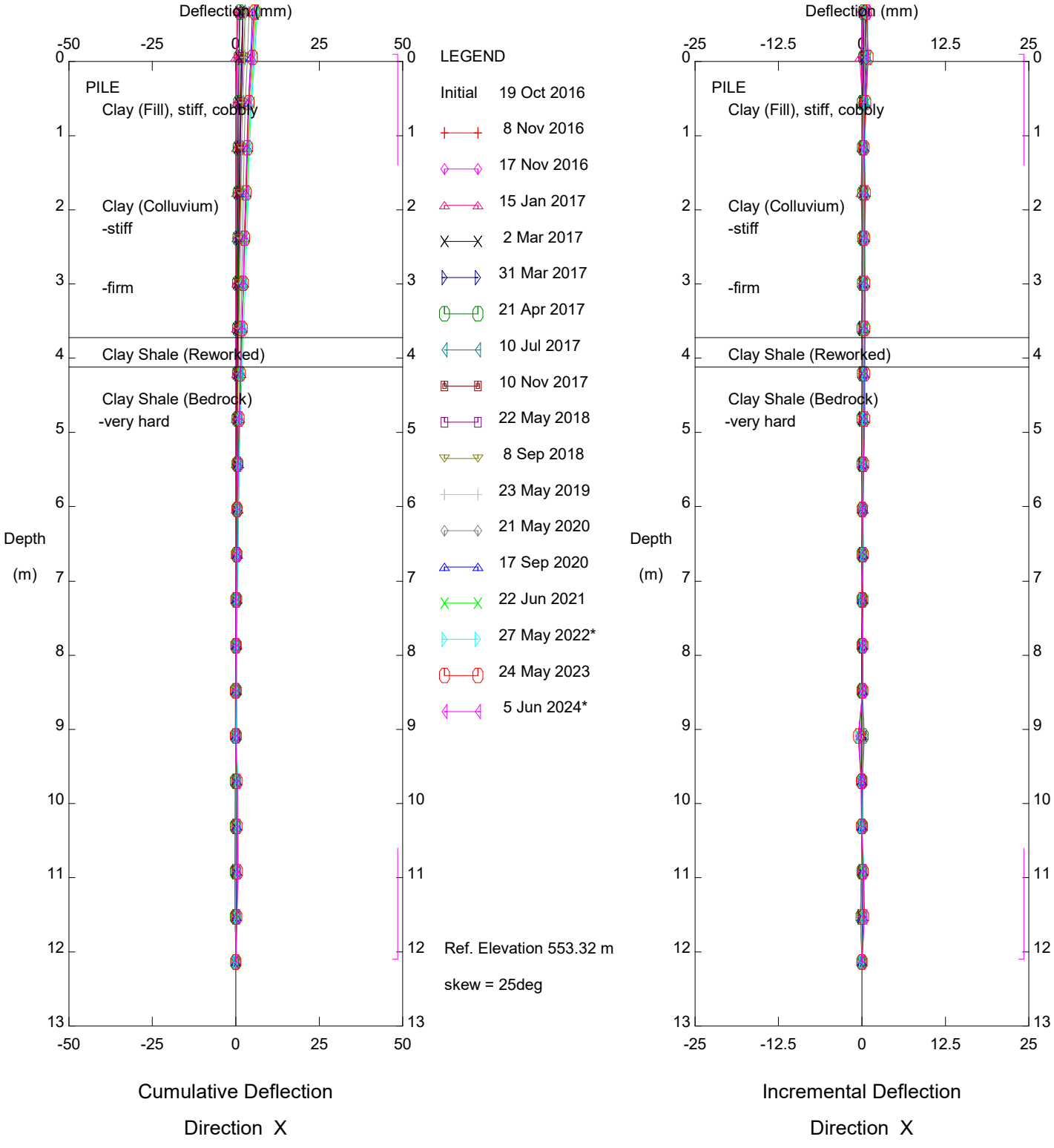
Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI16-2 (P08)

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI16-2 (P08).gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

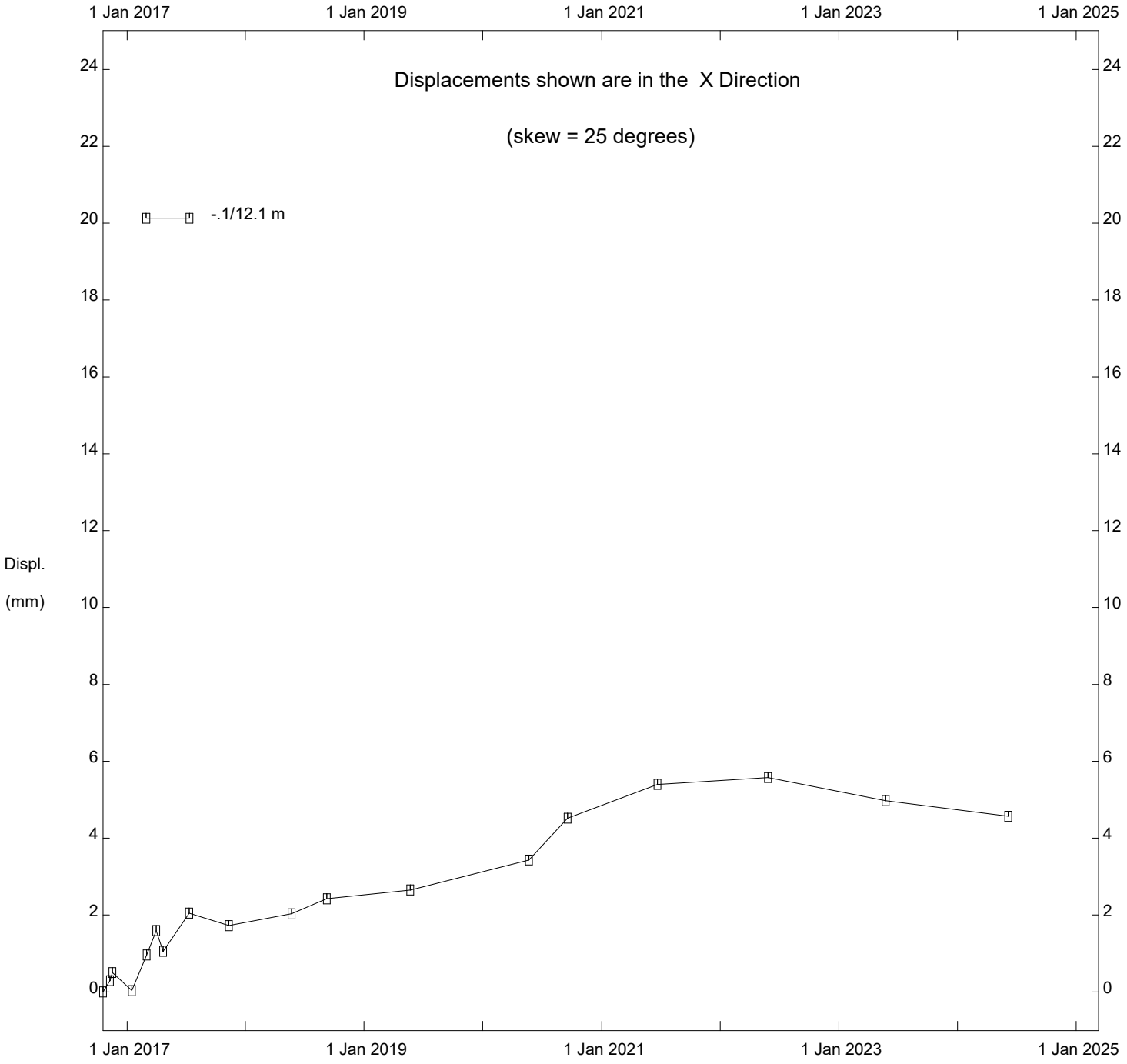
Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI16-2 (P08)

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC102\SI16-2 (P08).gtl

Thurber Engineering Ltd.



Hwy 41:23 Kehiwin Lake (NC102), Inclinometer SI16-2 (P08)

Alberta Transportation

FIGURE NC102-1
PIEZOMETER DATA (2010 INSTRUMENTS) FOR NC024-2, KEHIWIN LAKE, km 8.89

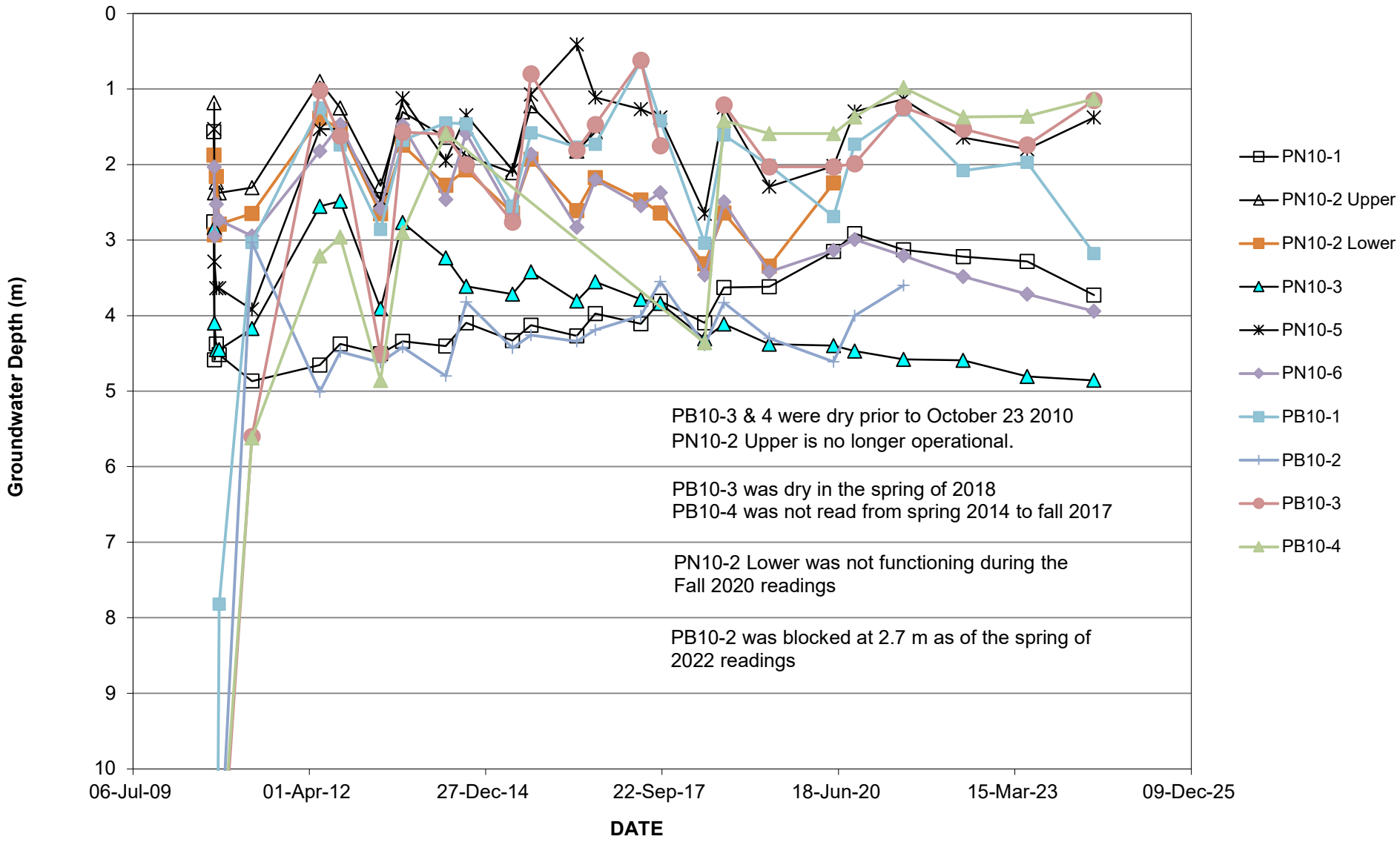


FIGURE NC102-2
PIEZOMETER DATA (2015 INSTRUMENTS) FOR NC024-2, KEHIWIN LAKE, km 8.89