



THURBER ENGINEERING LTD.

November 22, 2022

File No.: 32123

Alberta Transportation
Provincial Building
9621-96 Avenue
Peace River, Alberta
T8S 1T4

Attention: Mr. Ed Szmata

**ALBERTA TRANSPORTATION GRMP (CON0022165)
PEACE REGION (GRANDE PRAIRIE DISTRICT – NORTH)
INSTRUMENTATION MONITORING RESULTS – FALL 2022**

SECTION C

SITE PH026: HWY 726:02, EUREKA RIVER (SITES 3, 5 AND 6)

Dear Mr. Szmata:

This report provides the results of the bi-annual geotechnical instrumentation monitoring for the above-mentioned site as part of Alberta Transportation's Geohazard Risk Management Program for Peace Region Grande Prairie District – North (CON0022165).

It is a condition of this letter report that Thurber's performance of its professional services will be subject to the attached Statement of Limitations and Conditions.

1. FIELD PROGRAM AND INSTRUMENTATION STATUS

The following instruments were read at Hwy 726:02 Eureka River Sites 3, 5 and 6 on October 2, 2022, by Mr. Niraj Regmi, G.I.T. and Mr. Kyle Croymans, both of Thurber Engineering Ltd.: Eight slope inclinometers (SI11-3 and SI11-4 at Sites 5 and 6; SI12-P9U, SI12-P17U and SI12-P26U at Site 3 in the upper wall; SI12-P3L, SI12-P9L and SI12-P14L at Site 3 in the lower wall); one pneumatic piezometer near Site 5 (PN11-3); one vibrating wire piezometer at Site 5 (VW11-7); two standpipe piezometers (SP19-1 and SP19-2) at Site 3; and six load cells at Site 3 in the upper pile wall (VC1759, VC1760, VC1761, VC1762, VC1763 and VC1764).

The SIs were read using two RST Digital Inclinometer probes with 2 ft. wheelbases and RST Pocket PC readouts. Inclinometer reading depths were defined as per cable markings with respect to the top of the inclinometer casing. The pneumatic piezometers were read using an RST C108 pneumatic piezometer readout. The vibrating wire piezometers were read using an RST PNC108 vibrating wire readout. The standpipe piezometers were read using a DGSI dipmeter. The load cell data files were uploaded to a laptop using RST Multichannel DTLINK software.



2. DATA PRESENTATION

2.1 General

SI plots for A and B directions are included in Appendix A. Where movement has been recorded, the resultant plot (X direction, if applicable) and rate of movement have also been provided. Piezometer and load cell reading plots are also included in Appendix A.

Slope inclinometer and piezometer reading summary tables are provided below. These tables also include instruments deleted from the GRMP program, for reference.

2.2 Zones of Movement

Zones of new movement were not observed in the SIs since the previous readings in the spring of 2022.

A zone of movement was previously tracked in SI11-4 over 0.1 m to 9.8 m depth. However, this zone has not shown a consistent movement trend for several years and is also showing an apparent movement in the upslope direction, which is likely related to frost movement. Because of these factors, this movement zone will no longer be reported for this instrument.

Zones of movements are summarized in Table PH026-1 below. Table PH026-1 also provides a historical account of the total movement, the depth of movement and the maximum rate of movement that has occurred in the SIs since initialization.



**TABLE PH026-1
FALL 2022 – HWY 726:02 EUREKA RIVER (SITES 3, 5 AND 6)
SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: October 2, 2022

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)
SI08-1	Jan. 20, 2008	51.4 mm over 3.9 m to 5.1 m depth in 219° direction	102.6 mm/yr between May and Oct. 2008	Sheared off at 4.9 m	May 27, 2008	N/A	N/A	N/A
		22.8 mm over 5.1 m to 8.1 m depth in 219° direction	42.4 mm/yr between May and Oct. 2008			N/A	N/A	N/A
SI08-2	Jan. 20, 2008	7.4 mm over 8.1 m to 10.0 m depth in 270° direction	28.2 mm/yr between Jan and Feb. 2008	Sheared off at 9.8 m	Jan. 20, 2008	N/A	N/A	N/A
		17.7 mm over 11.8 m to 13.6 m depth in 270° direction	65.4 mm/yr between Jan. and Feb. 2008			N/A	N/A	N/A
SI08-3	Jan. 20, 2008	70.0 mm over 6.9 m to 10.0 m depth in 230° direction	142.5 mm/yr between May and Oct. 2008	Sheared off at 7.9 m	May 27, 2008	N/A	N/A	N/A
		43.7 mm over 8.1 m to 10.0 m depth in 260° direction	74.8 mm/yr between May and Oct. 2008			N/A	N/A	N/A
SI11-3	March 28, 2011	50.1 mm over 0.5 m to 3.5 m depth in 232° direction	42.3 mm/yr in October 2012	Active	June 22, 2022	5.5	19.7	15.6
SI11-4	March 27, 2011	No discernible movement	N/A	Active	June 22, 2022	N/A	N/A	N/A

Drawing 32123-PH026-1~2 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site



**TABLE PH026-1 – CONTINUED...
FALL 2022 – HWY 726:02 EUREKA RIVER (SITES 3, 5 AND 6)
SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: October 2, 2022

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)
SI11-5	March 27, 2011	40.4 mm over 8.2 m to 10.1 m depth in 216° direction	21.8 mm/yr in October 2012	Sheared at 8.7 m depth	September 25, 2013	N/A	N/A	N/A
SI11-6	March 25, 2011	48.3 mm over 16.2 m to 18.6 m depth in 256° direction	25.3 mm/yr In April 2011	Sheared at 17.1 m depth	September 25, 2013	N/A	N/A	N/A
SI11-7	March 24, 2011	35.9 mm over 17.4 m to 18.6 m depth in 246° direction	23.5 mm/yr In October 2012	Sheared off at 16.7 m	June 2, 2013	N/A	N/A	N/A
UPPER WALL								
SI12-P9U	October 2, 2012	-28.0 mm over 2.7 m to 29.5 m depth in 292° direction	-1040.4 mm/yr on August 8, 2013 *	Active	June 22, 2022	1.4	5.0	5.6
		-15.1 mm over 5.1 m to 29.5 m depth in 292° direction	-668.8 mm/yr on August 8, 2013 *			1.1	4.0	4.2
SI12-P17U	October 2, 2012	24.5 mm over 2.8 m to 29.0 m depth in 278° direction	-1920.7 mm/yr on August 10, 2013 *	Active	June 22, 2022	1.6	5.5	10.1
		-19.0 mm over 5.2 m to 29.0 m depth in 278° direction	-1189.1 mm/yr on August 10, 2013 *			1.2	4.5	9.5

Drawing 32123-PH026-1~2 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site



**TABLE PH026-1 – CONTINUED...
FALL 2022 – HWY 726:02 EUREKA RIVER (SITES 3, 5 AND 6)
SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: October 2, 2022

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)
UPPER WALL								
SI12-P26U	October 2, 2012	-6.4 mm over 2.5 m to 26.3 m depth in 37° direction	-679.6 mm/yr on August 12, 2013 *	Active	June 22, 2021	-0.8	-3.0	-0.3
		-18.1 mm over 4.9 m to 26.3 m depth in 37° direction	-465.6 mm/yr on August 12, 2013			-1.0	-3.5	-2.4
LOWER WALL								
SI12-P3L	September 20, 2012	14.9 mm over 0.1 m to 19.6 m depth in 204° direction	10.6 mm/yr on September 20, 2014	Active	June 22, 2022	1.2	4.4	4.0
SI12-P9L	September 20, 2012	20.3 mm over 0.7 m to 21.4 m depth in 229° direction	85.1 mm/yr on August 14, 2013	Active	June 22, 2022	<0.1	0.2	-0.8
SI12-P14L	September 20, 2012	6.1 mm over 0.7 m to 20.2 m depth in 255° direction	4.8 mm/yr on October 22, 2021	Active	June 22, 2022	0.2	0.8	0.5

Drawing 32123-PH026-1~2 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site



**TABLE PH026-2
FALL 2022 – HWY 726:02 EUREKA RIVER (SITES 3, 5 AND 6)
PNEUMATIC PIEZOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: October 2, 2022

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)
<i>PN08-1</i>	<i>January 20, 2008</i>	<i>10.0</i>	<i>N/A</i>	<i>Removed</i>	<i>9.71 on Oct. 13, 2008</i>	<i>N/A</i>	<i>N/A</i>	<i>9.79 (Sep 24, 2011)</i>	<i>N/A</i>
<i>PN08-2</i>	<i>January 20, 2008</i>	<i>10.0</i>	<i>N/A</i>	<i>Removed</i>	<i>9.31 on Oct. 13, 2008</i>	<i>N/A</i>	<i>N/A</i>	<i>9.55 (Sep 24, 2011)</i>	<i>N/A</i>
<i>PN08-3</i>	<i>January 20, 2008</i>	<i>10.2</i>	<i>N/A</i>	<i>Removed</i>	<i>9.84 on Oct. 13, 2008</i>	<i>N/A</i>	<i>N/A</i>	<i>10.02 (Sep 24, 2011)</i>	<i>N/A</i>
<i>PN11-3</i>	<i>March 27, 2011</i>	<i>23.5</i>	<i>N/A</i>	<i>Active</i>	<i>6.97 on March 28, 2011</i>	<i>100.8</i>	<i>13.22</i>	<i>13.13</i>	<i>-0.09</i>
<i>PN11-4</i>	<i>March 26, 2011</i>	<i>24.1</i>	<i>N/A</i>	<i>Damaged</i>	<i>12.15 on March 28, 2011</i>	<i>N/A</i>	<i>N/A</i>	<i>16.36 (Oct 2, 2012)</i>	<i>N/A</i>
<i>PN11-6</i>	<i>March 25, 2011</i>	<i>18.8</i>	<i>N/A</i>	<i>Damaged</i>	<i>10.83 on Sept. 25, 2013</i>	<i>N/A</i>	<i>N/A</i>	<i>12.41 (Oct 3, 2017)</i>	<i>N/A</i>

Drawing 32123-PH026-1~2 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

Notes:

PN - pneumatic piezometer.

BGS- below ground surface.



**TABLE PH026-3
FALL 2022 – HWY 726:02 EUREKA RIVER (SITES 3, 5 AND 6)
VIBRATING WIRE PIEZOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: October 2, 2022

INSTRUMENT	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER LEVEL BGS (m)	CURRENT GROUNDWATER DEPTH (mBGS)	PREVIOUS GROUNDWATER DEPTH (mBGS)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
VW11-1U	March 28, 2011	N/A	N/A	Removed	5.23 mBGS on September 24, 2011	N/A	5.23 (Sep 24, 2011)	N/A
VW11-1L	March 28, 2011	N/A	N/A	Removed	8.98 mBGS on March 28, 2011	N/A	10.62 (Sep 24, 2011)	N/A
VW11-2U	March 27, 2011	N/A	N/A	Destroyed	6.34 mBGS on June 4, 2011	N/A	8.38 (Oct. 2, 2012)	N/A
VW11-2L	March 27, 2011	N/A	N/A	Damaged	12.14 mBGS on March 27, 2011	N/A	13.68 (June 13, 2012)	N/A
VW11-5	March 25, 2011	N/A	N/A	Removed	10.63 mBGS on March 25, 2011	N/A	19.61 (October 2, 2018)	N/A
VW11-7	March 25, 2011	N/A	N/A	Active	14.93 mBGS on June 3, 2014	16.01	15.96	-0.05

Drawing 32123-PH026-1~2 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site



**TABLE PH026-4
FALL 2022 – HWY 726:02 EUREKA RIVER (SITES 3, 5 AND 6)
STANDPIPE PIEZOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: October 2, 2022

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV.* (m)	CURRENT STATUS	MAXIMUM MEASURED WATER LEVEL BGS (m)	MEASURED WATER LEVEL BGS (m)	PREVIOUS READING BGS (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
SP19-1	March 26, 2019	8.8	604.30	Active	1.72 on June 22, 2022	2.93	1.72	-1.21
SP19-2	March 26, 2019	19.1	613.30	Active	10.37 on June 19, 2020	11.48	10.56	-0.92

Drawing 32123-PH026-1~2 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

*Note: Elevations obtained from ARA in 2019. A different survey datum was used (~12.5 m high than previous datum)



**TABLE PH026-5
FALL 2022 – HWY 726:02 EUREKA RIVER (SITES 3, 5 AND 6)
LOAD CELLS INSTRUMENTATION READING SUMMARY (UPPER PILE WALL)**

Date Monitored: October 2, 2022

ANCHOR NUMBER/ROW	PILE # AND POSITION	SERIAL #	DESIGN LOAD / LOCK-OFF LOAD (kN)	MAXIMUM RECORDED LOAD (kN)	MEASURED LOAD ⁽¹⁾ (OCT. 2, 2022) (kN)	PREVIOUS RECORDED LOAD ⁽¹⁾ (JUNE 22, 2022) (kN)	CHANGE IN LOAD SINCE PREVIOUS READING (kN)
26L	P9/center	VC1763	300 / 240	255.06 on August 24, 2013	209.35	204.91	4.44
27U	P9/south	VC1764	300 / 240	258.68 on August 28, 2013	225.62	220.29	5.33
50U	P17/center	VC1759	300 / 240	250.13 on August 28, 2013	207.76	204.58	3.18
50L	P17/center	VC1760	300 / 240	252.88 on August 28, 2013	188.70	188.22	0.48
76L	P26/north	VC1761	300 / 240	264.72 on August 15, 2013	187.09	185.11	1.98
77U	P26/center	VC1762	300 / 240	261.41 on August 16, 2013	173.93 ⁽²⁾	174.36 ⁽²⁾	-0.43

Drawing 32123-PH026-1~2 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

Notes:

1. Load cell data is recorded twice daily with dataloggers on site. Dataloggers are downloaded twice annually during instrumentation readings. See Figures PH026-3 and PH026-4 Appendix A for complete historical instrument readings.
2. As of October 16, 2013, at 9:59 one of the vibrating wires in VC1762 (anchor 77U) has stopped working. The measured force is an average of two vibrating wires instead of three
3. The battery for the datalogger for load cells VC1759 and VC1760 was dead between September 18, 2019 and June 19, 2020. No data was collected between those dates.
4. U designates upper row anchors. L designates lower row anchors.



3. INTERPRETATION OF MONITORING RESULTS

The current rate of movement in SI11-3 is 19.7 mm/yr over 0.5 m to 3.5 m depth since the spring of 2022 readings. SI11-4 continued to show no discernible movement.

Slope inclinometers SI12-P9U, SI12-P17U, SI12-P26U were installed in the upper wall to monitor the pile movements. The initial readings during construction were read below the top of pile. Later, the SIs were extended up through the waler concrete when it was poured and through the backfill placed behind the retaining wall when it was constructed over the waler. For each SI, deflections were determined at the top of the pile and at the top of the waler. Prior to stressing the anchors, pile movements were typically toward the river in the downslope (positive) direction. However, upon stressing, the piles and waler were pulled into the hillside in the negative direction. Since the completion of construction, however, the upper pile wall SIs have shown that the pile wall has remained stable, with relatively little displacement overall for the past several years.

Since the fall of 2021, SI12-P9U showed a rate of movement of 5.0 mm/yr over the length of the waler and pile from 2.7 m to 29.5 m depth, and a rate of movement of 4.0 mm/yr over the length of the pile only from 5.1 m to 29.5 m depth. The total pile head movement to date has been 15.1 mm in the upslope direction.

SI12-P17U showed a rate of movement of 5.5 mm/yr over the length of the pile and waler from 2.8 m to 29.0 m, and a rate of movement of 4.5 mm/yr over the length of the pile only from 5.2 m to 29.0 m depth. The total pile head movement to date has been 19.0 mm in the upslope direction.

SI12-P26U showed a rate of movement of 3.0 mm/yr of uphill movement over the length of the pile and waler from 2.5 m to 26.3 m depth, and 3.5 mm/yr of uphill movement over the length of the pile only from 4.9 m to 26.3 m depth. The total pile head movement to date has been 18.1 mm in the upslope direction.

Slope inclinometers SI12-P3L, SI12-P9L and SI12-P14L were installed in the lower wall to monitor pile movements. SI12-P3L has shown a total pile head movement of 14.9 mm towards the river since installation, with a rate of movement of 4.4 mm/yr the length of the pile since the spring of 2022 readings. SI12-P9L has shown a total pile head movement of 20.3 mm in the downslope direction since installation, with a rate of movement of 0.2 mm/yr over the length of the pile since the spring of 2022 readings. SI12-P14L has shown a total pile head movement of 6.1 mm in the downslope direction since installation, with a rate of movement of 0.8 mm/yr since the spring of 2022.

The deflections of the piles in the lower pile wall were somewhat affected by the installation and backfilling of sheet piling on the downslope side of the piles between September 25 and October 30, 2013, after the inclinometers had been installed.

Since the previous readings in the spring of 2022, the groundwater level decreased in pneumatic piezometer PN11-3 by 0.09 m. The groundwater level decreased in vibrating wire piezometer VW11-7 by 0.05 m since the spring of 2022 readings.



The groundwater levels decreased in standpipe piezometers SP19-1 and SP19-2 by 1.21 m and 0.92 m, respectively, since the spring of 2022 readings.

The piezometer reading results are presented in Tables PH026-2, PH026-3, and PH026-4 and are plotted on Figures PH026-1 (by elevation) and PH026-2 (by depth) in Appendix A.

The six load cells were installed during construction to monitor the mobilized loads in six of the pile anchors (3 upper row anchors and 3 lower row anchors), using three dataloggers that were set up to record load and temperature readings every twelve hours starting in August 2013. The load cell serial numbers that were assigned to the various pile anchors and the corresponding pile numbers are summarized in Table PH026-5 above and their locations are shown on Drawing 32123-PH026-1 in Appendix A.

Since the spring of 2022, all of the load cells except VC1762 (77U) showed increases in the measured load, ranging from 0.48 kN in VC1760 (anchor 50L) to 5.33 kN in VC1764 (anchor 27U). Load cell VC1762 (77U) showed a decrease in measured load of 0.43 kN since the spring of 2022 readings. The current readings on the load cells varied from 173.93 kN in VC1762 (anchor 77U) to 225.62 kN in VC1764 (anchor 27U). The anchor design load was 300 kN and the anchors were locked off at 240 kN. It should be noted that as of October 16, 2013 at 9:59 AM one of the vibrating wires in VC1762 (anchor 77U) has stopped working. The measured force in VC1762 is an average of two vibrating wires instead of three.

Initially, the load cells showed a gradual decrease in measured load since they were locked off. However, over the past several readings cycles, the load cell readings have been levelling off, indicating the pile wall may be reaching a point of equilibrium. Table PH026-5 summarizes the load cell readings. Plots of load cell load and temperature readings are plotted in Figures PH026-3 and PH026-4 in Appendix A.

The instrument readings at this site indicate that the landslide repairs at this site have been successful in stabilizing the slope movements.

4. RECOMMENDATIONS

4.1 Future Work

The instruments should be read again in the spring of 2023.

4.2 Instrumentation Repairs

No instrument repairs are required at this time.



5. CLOSURE

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.
Don Proudfoot, M.Eng., P.Eng.
Principal | Senior Geotechnical Engineer

Bruce Nestor, P.Eng.
Geotechnical Engineer
/jf

Attachments:

- Statement of Limitations and Conditions
- Appendix A
 - Field Inspector's report
 - Site Plan Showing Approximate Instrument Locations (Drawings No. 32123-PH026-1 and 32123-PH026-2)
 - SI Reading Plots
 - Figure PH026-1 (Piezometric Elevations)
 - Figure PH026-2 (Piezometric Depths)
 - Figure PH026-3 (Load Cell Readings)
 - Figure PH026-4 (Load Cell Temperatures)



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.



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

FALL 2022

**APPENDIX A
DATA PRESENTATION**

SITE PH026: HWY 726:02, EUREKA RIVER (SITES 3, 5 AND 6)

**ALBERTA TRANSPORTATION
PEACE REGION (GRANDE PRAIRIE - NORTH DISTRICT)
INSTRUMENTATION MONITORING FIELD SUMMARY (PH026)
FALL 2022**

Location: North Eureka River Slide (HWY 726:02 C1 9.911)	Readout: RST PN C108 Unit 1/VW2106 Unit 2/DGSI Dipmeter
File Number: 32123	Casing size: 2.75
Probe: RST SI Set 8R/5R	Temp: 8
Cable: RST SI Set 8R/5R	Read by: KTC/NKR

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location (UTM 11)		Date	Stickup (m)	Depth from top of casing (ft)	Azimuth of A+ Groove	Current Bottom Depth Readings				Probe/ Reel #	Remarks
	Easting (m)	Northing (m)					A+	A-	B+	B-		
SI11-3	368433	6258811	02-Oct-22	1.05	88 to 2	218	1635	-1615	-754	769	8R/8R	
SI11-4	368446.63	6258834.32	02-Oct-22	0.85	98 to 2	198	252	-238	1982	-1974	8R/8R	
Upper Wall												
SI12-P9U	368400.67	6258635.59	02-Oct-22	0.7	2 to 98	250	125	-110	-306	285	5R/5R	
SI12-P17U	368400.98	6258605.62	02-Oct-22	1.2	2 to 98	286	-548	563	329	-359	5R/5R	
SI12-P26U	368401.31	6258572.75	02-Oct-22	0.85	2 to 90	10	-400	413	-48	31	5R/5R	
Lower Wall												
SI12-P3L	368360	6258629	02-Oct-22	1.42	2 to 68	204	499	-483	254	-275	5R/5R	
SI12-P9L	368371.87	6258609.86	02-Oct-22	-0.4	2 to 63	200	428	-414	-223	204	5R/5R	*
SI12-P14L	368371.25	6258589.95	02-Oct-22	0.8	2 to 68	268	112	-95	-725	702	5R/5R	

PNEUMATIC PIEZOMETER READINGS

PN#	GPS Location (UTM 11)		Date	Reading (kPa)	Identification Number
	Easting (m)	Northing (m)			
PN11-3	368433.82	6258811.21	02-Oct-22	100.8	33812

VIBRATING WIRE PIEZOMETER (VW) READINGS

VW #	GPS Location (UTM 11)		Date	Reading (Dg/°C)	Identification Number
	Easting (m)	Northing (m)			
VW11-7	368402.00	6258729.78	02-Oct-22	8283.4/4.4	16449

VIBRATING WIRE LOAD CELL (VC) READINGS

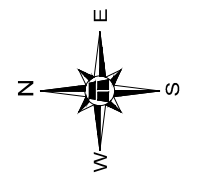
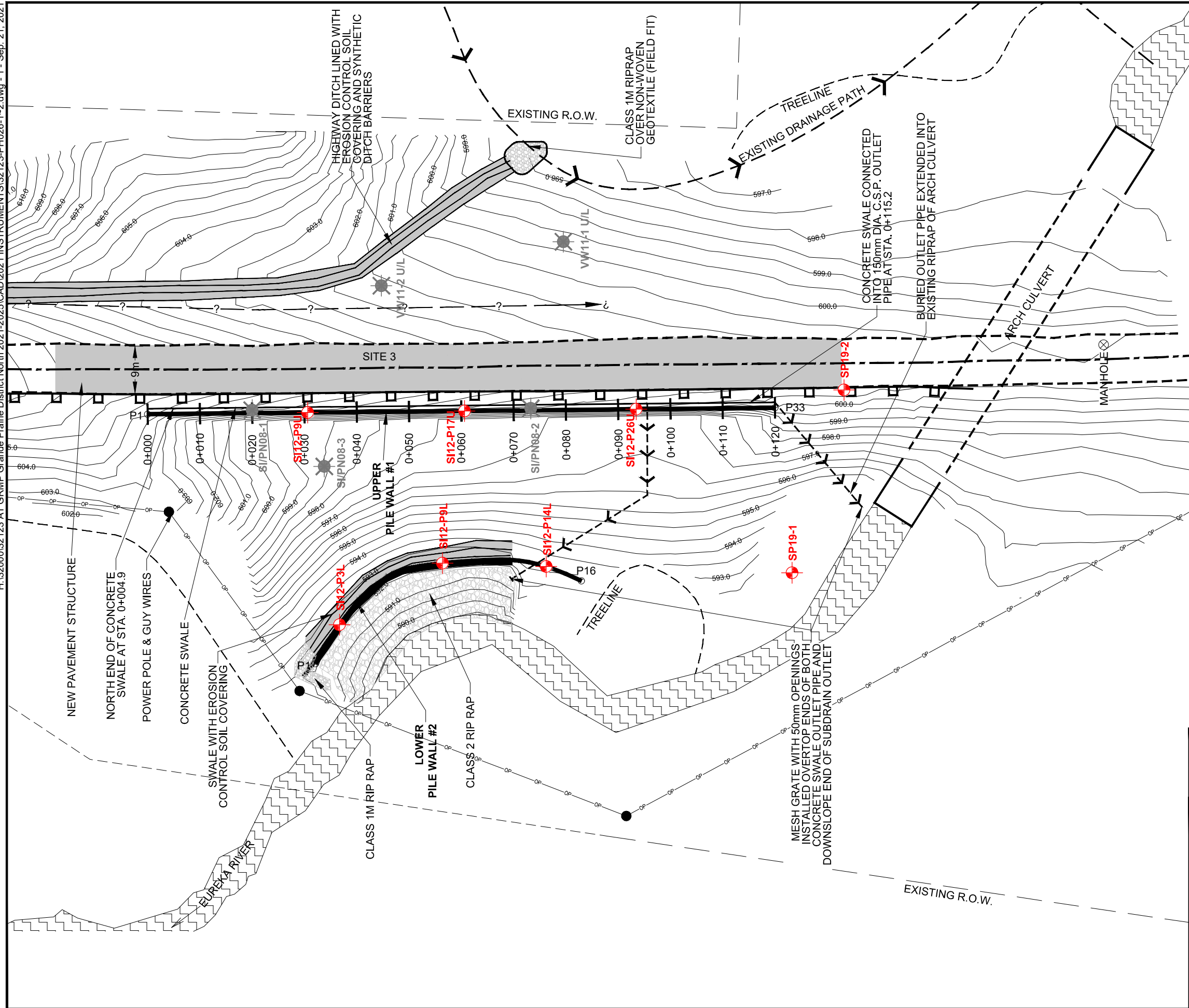
VC #	GPS Location (UTM 11)		Datalogger Serial #	Date	Comment
	Easting (m)	Northing (m)			
VC1759			RST 2699	02-Oct-22	Downloaded
VC1760					Downloaded
VC1761			RST 2700		Downloaded
VC1762					Downloaded
VC1763			RST 2701		Downloaded
VC1764					Downloaded

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)				
SP19-1	368370	6258543	02-Oct-22	0.8	3.73	8.8
SP19-2**	368405	6258533	02-Oct-22	-0.4	11.08	19.2

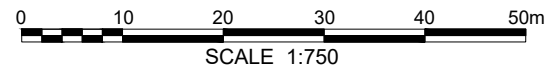
INSPECTOR REPORT


* SI12-P9L is -.040m from ground surface inside Metal box
**SP19-2 is flushmounted in southbound highway lane



LEGEND

-  INSTRUMENTS LOCATED IN THE PILE WALLS
-  INSTRUMENT NOT IN USE






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

**PH026: HWY 726:02 S. OF WORSLEY, SITE #3
SITE PLAN SHOWING INSTRUMENT LOCATIONS**

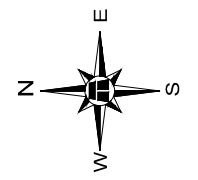
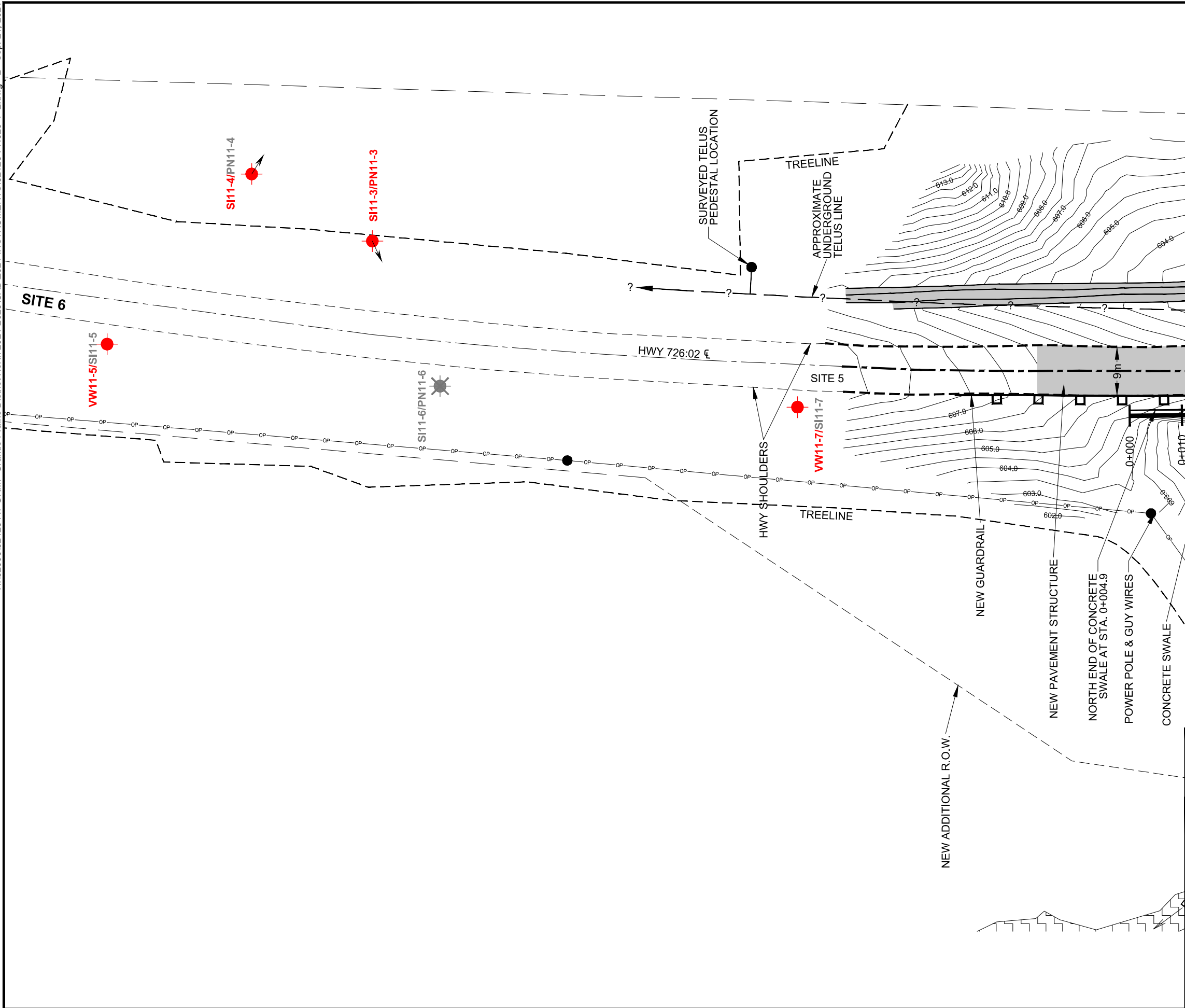
DWG No. 32123-PH026-1

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	DWP
SCALE	1:750
DATE	AUGUST 2021
FILE No.	32123



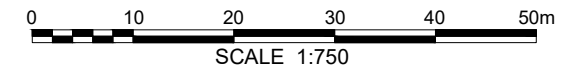
THURBER ENGINEERING LTD.


H:\32000\32123 AT GRMP Grande Prairie District North 2021-2025\CAD\2021 INSTRUMENTS\32123-PH026-1~2.dwg - 2 - Sep. 21, 2021



LEGEND

- INSTRUMENT LOCATIONS (NOT SURVEYED)
- DIRECTION OF MOVEMENT IN SLOPE INCLINOMETER
- INSTRUMENT NOT IN USE






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

**PH026: HWY 726:02 S. OF WORSLEY, SITES #5 & #6
SITE PLAN SHOWING INSTRUMENT LOCATIONS**

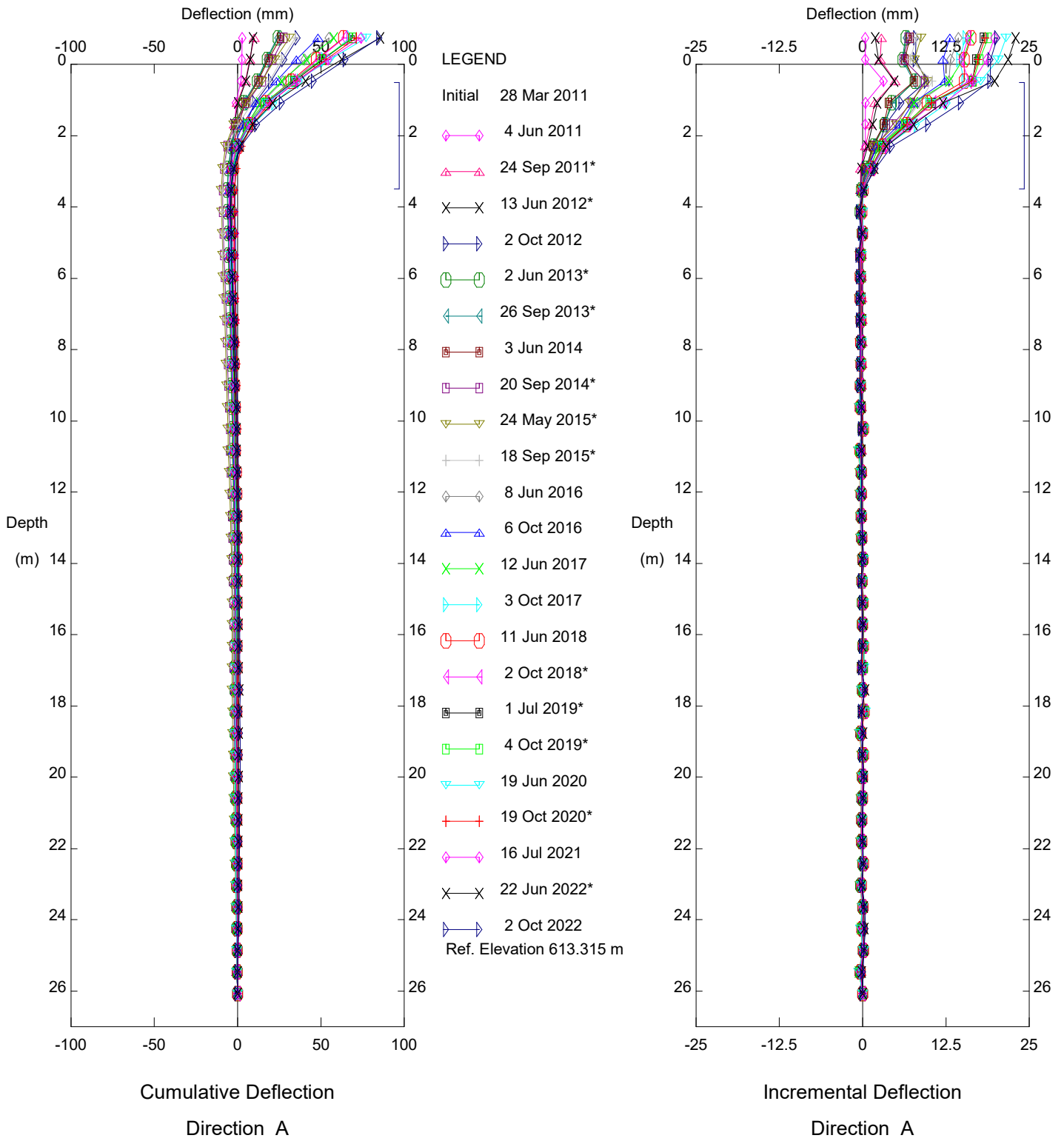
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DRAWN BY	ML
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APPROVED BY	DWP
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DATE	AUGUST 2021
FILE No.	32123



THURBER ENGINEERING LTD.

Thurber Engineering Ltd.

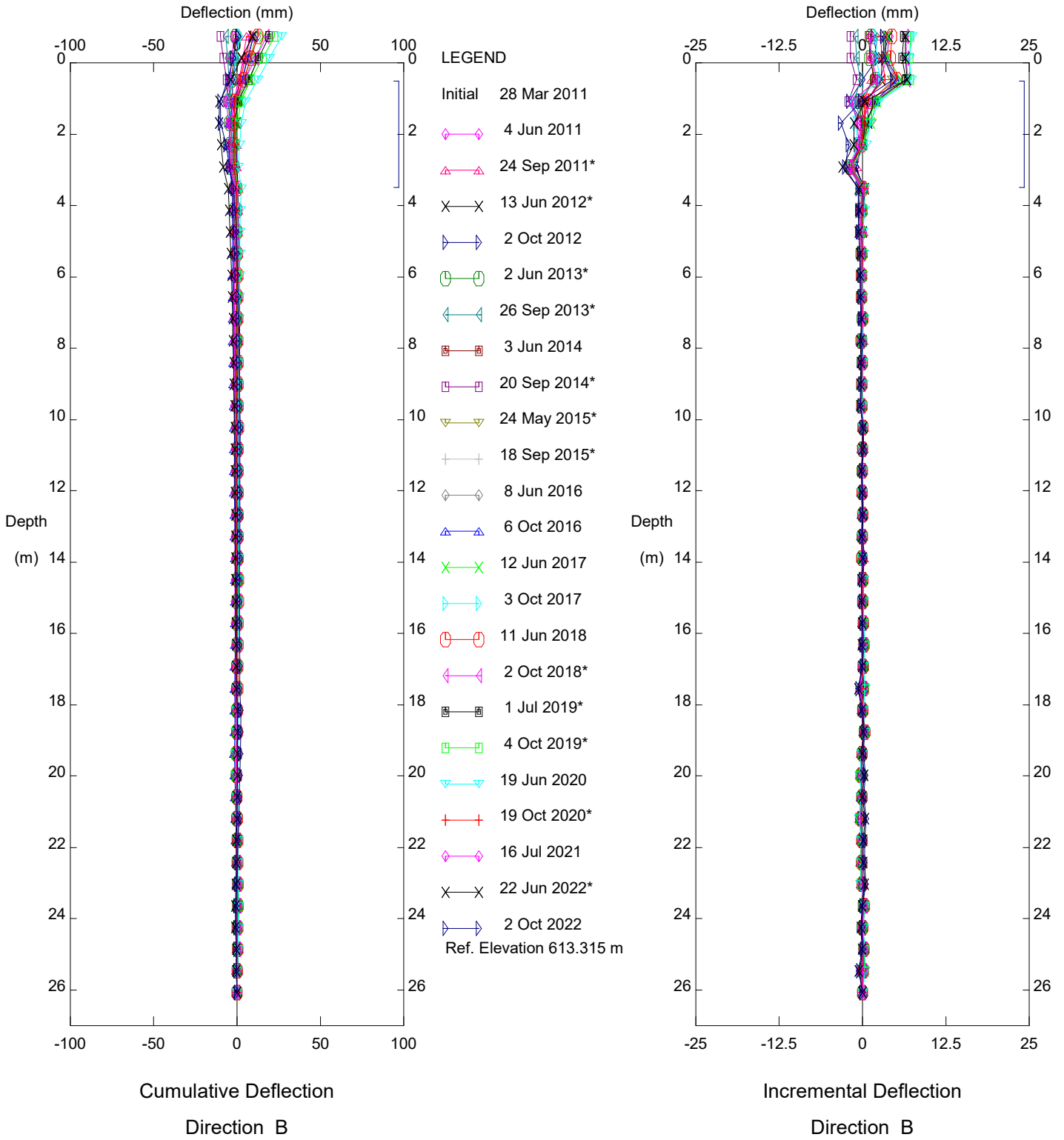


Hwy 726:02 Eureka River, PH026, Inclinometer SI11-3

Alberta Transportation

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

Thurber Engineering Ltd.

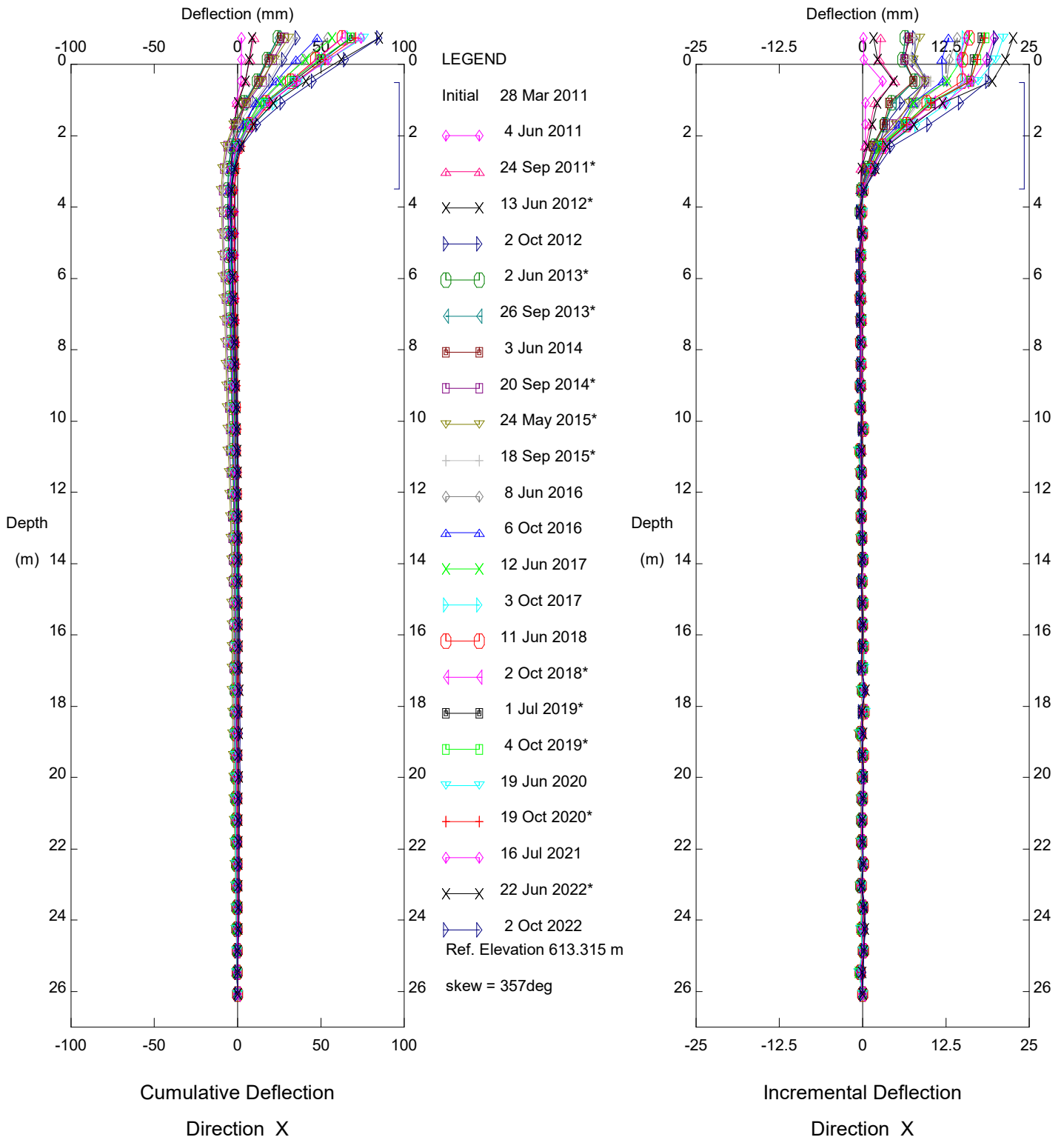


Hwy 726:02 Eureka River, PH026, Inclinometer SI11-3

Alberta Transportation

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

Thurber Engineering Ltd.

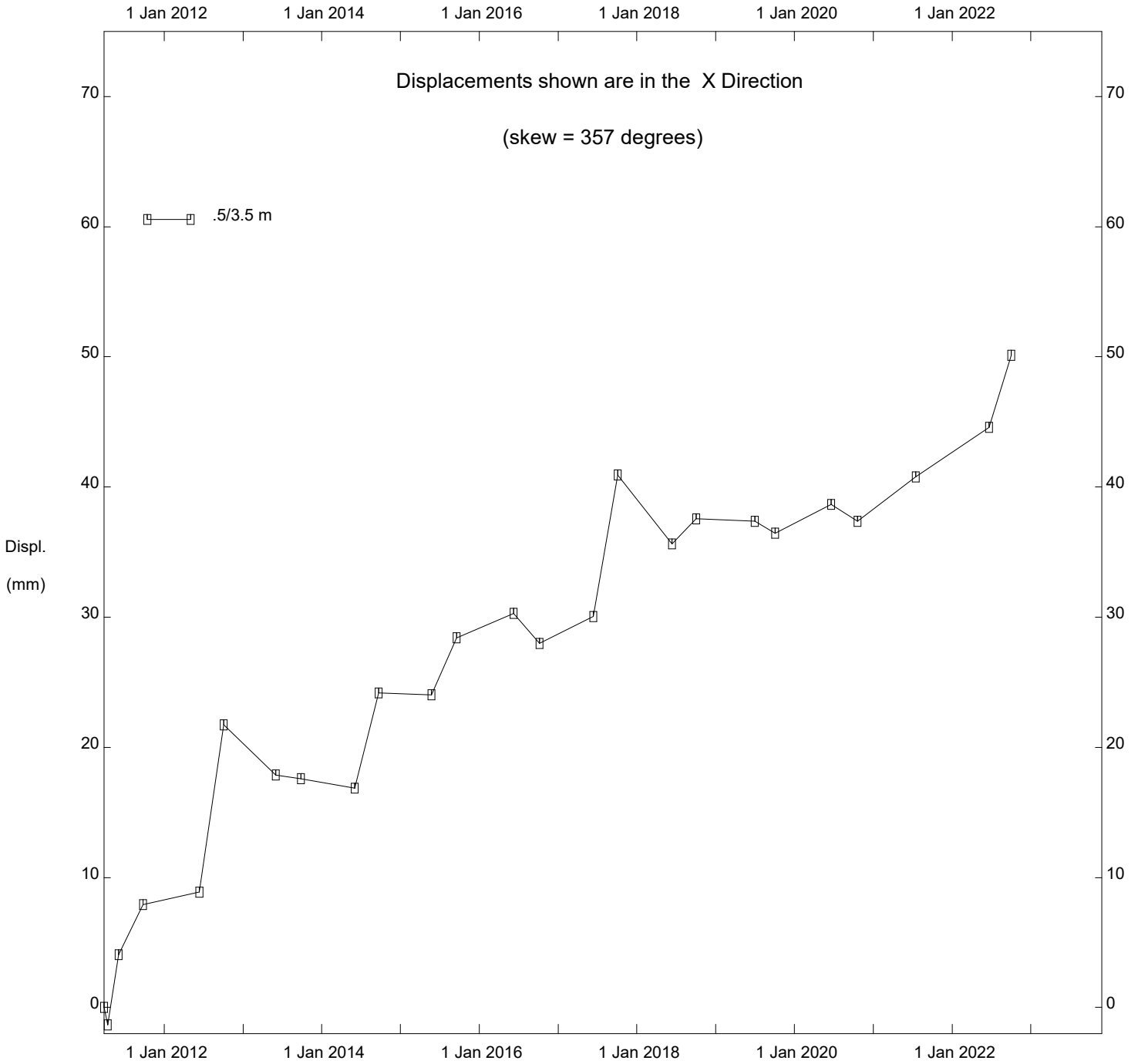


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Alberta Transportation

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

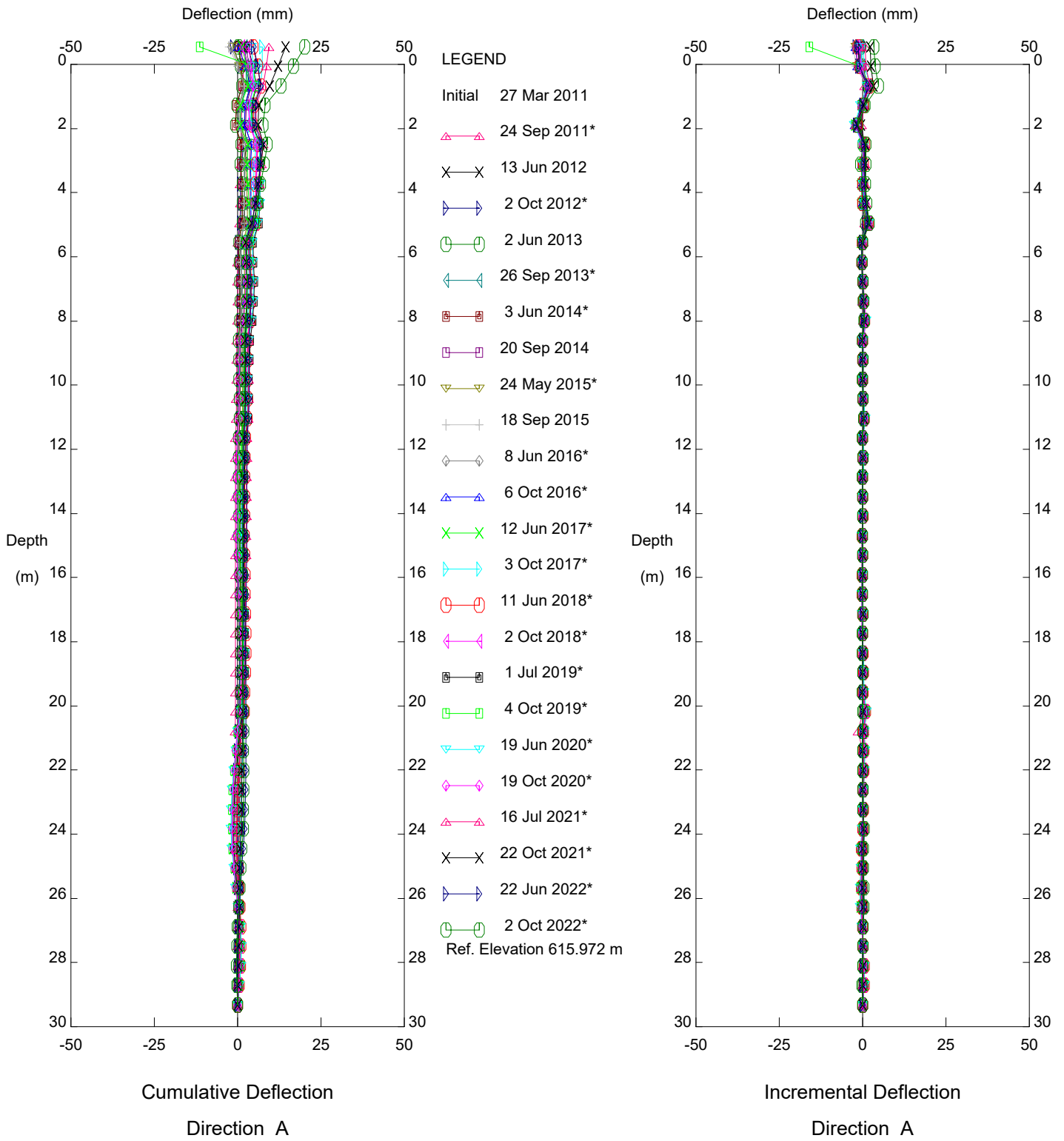
Thurber Engineering Ltd.



Hwy 726:02 Eureka River, PH026, Inclinometer SI11-3

Alberta Transportation

Thurber Engineering Ltd

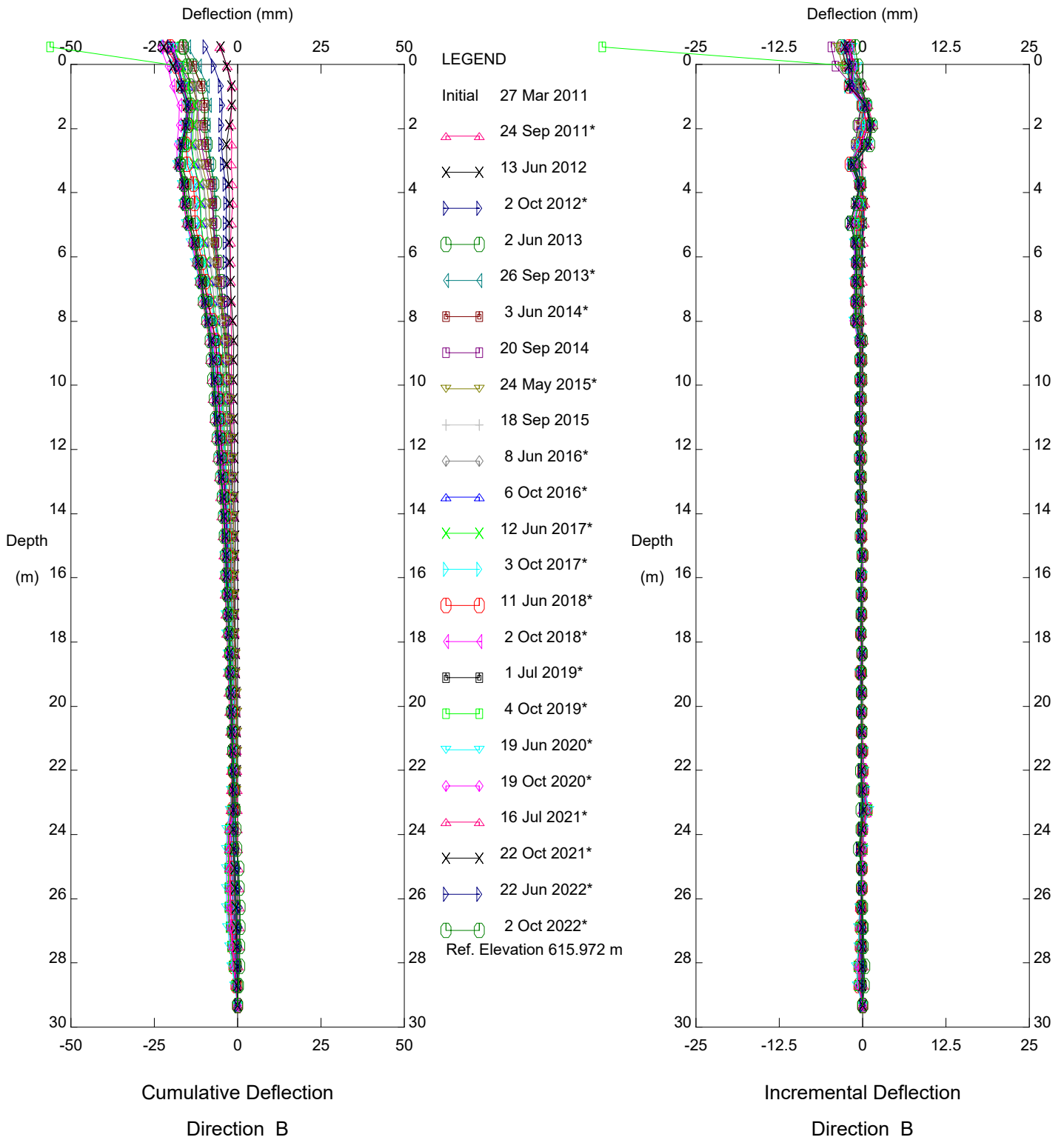


Hwy 726:02 Eureka River, PH026, Inclinometer SI11-4

Alberta Transportation

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

Thurber Engineering Ltd

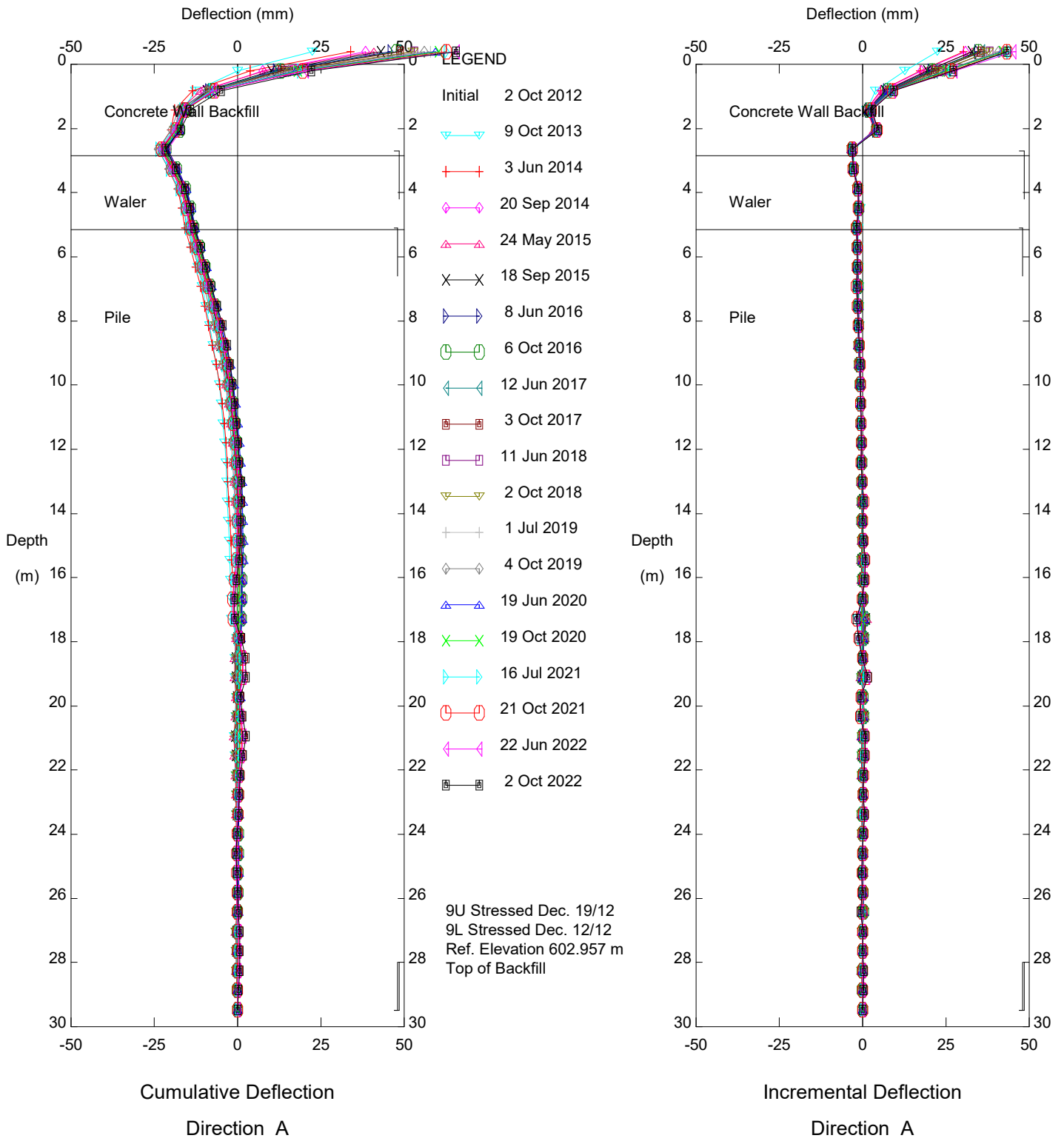


Hwy 726:02 Eureka River, PH026, Inclinometer SI11-4

Alberta Transportation

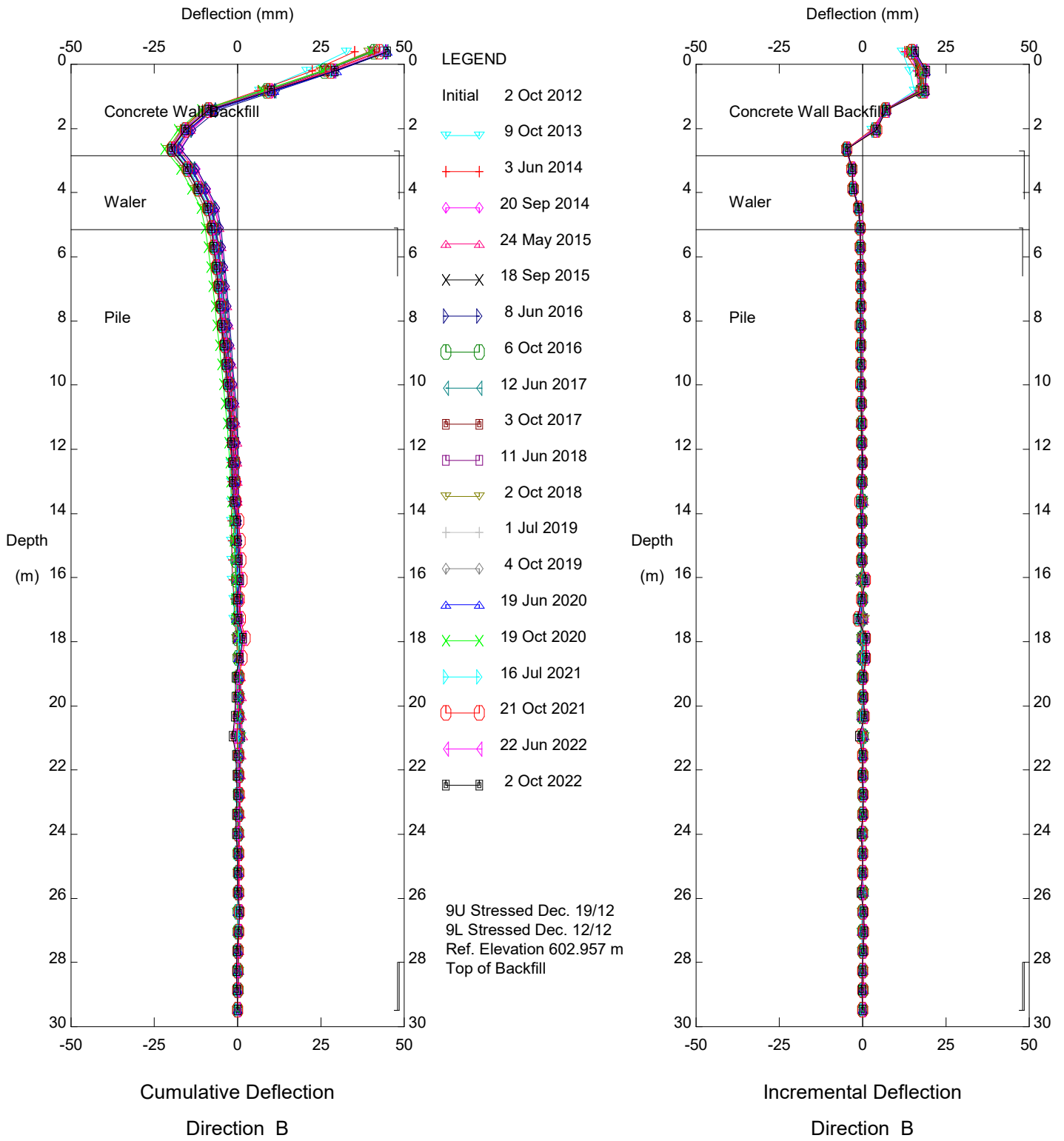
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Thurber Engineering Ltd.



PH026 Eureka River Upper Wall, Inclinator SI12-P9U

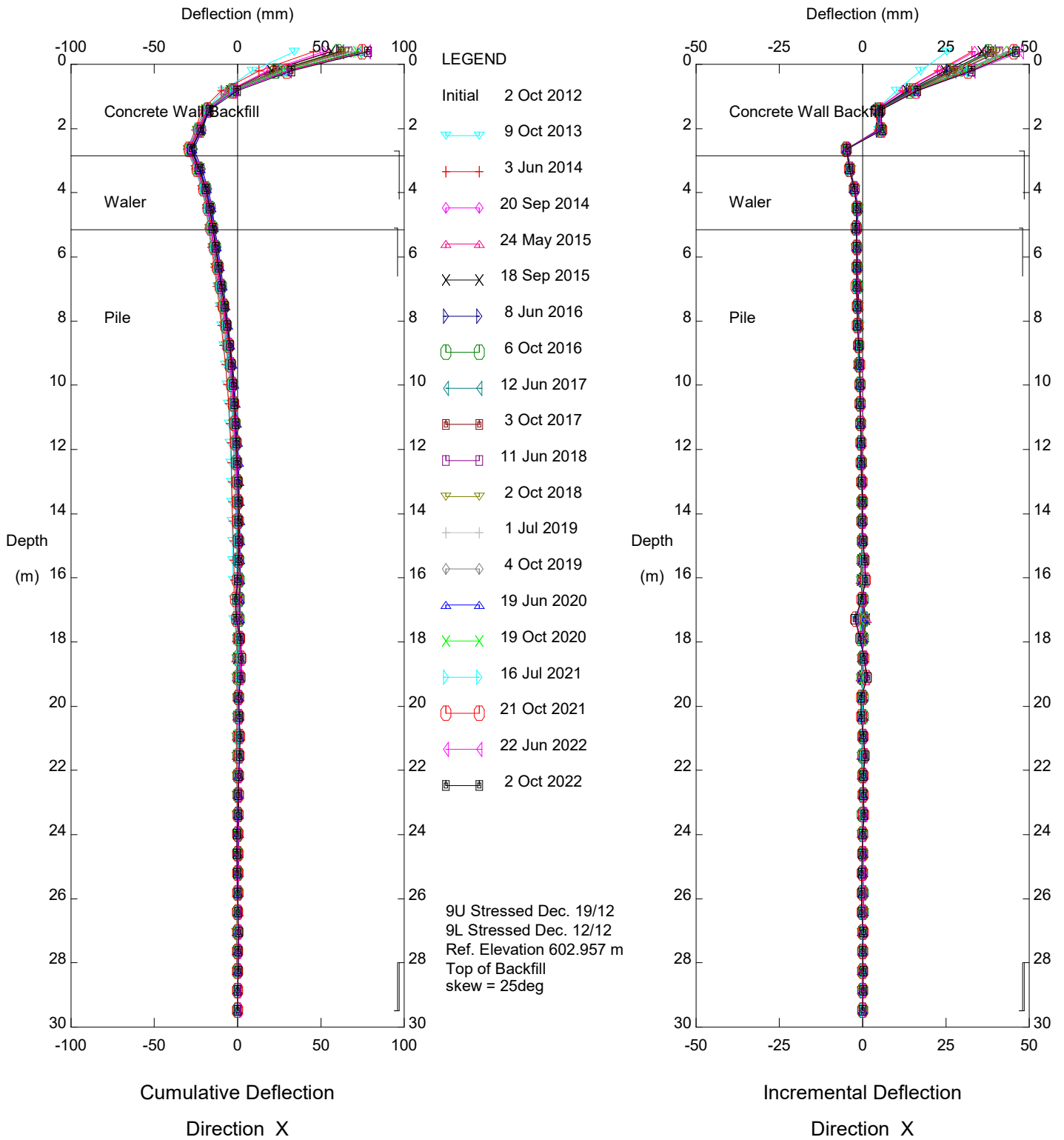
Alberta Transportation



PH026 Eureka River Upper Wall, Inclinometer SI12-P9U

Alberta Transportation

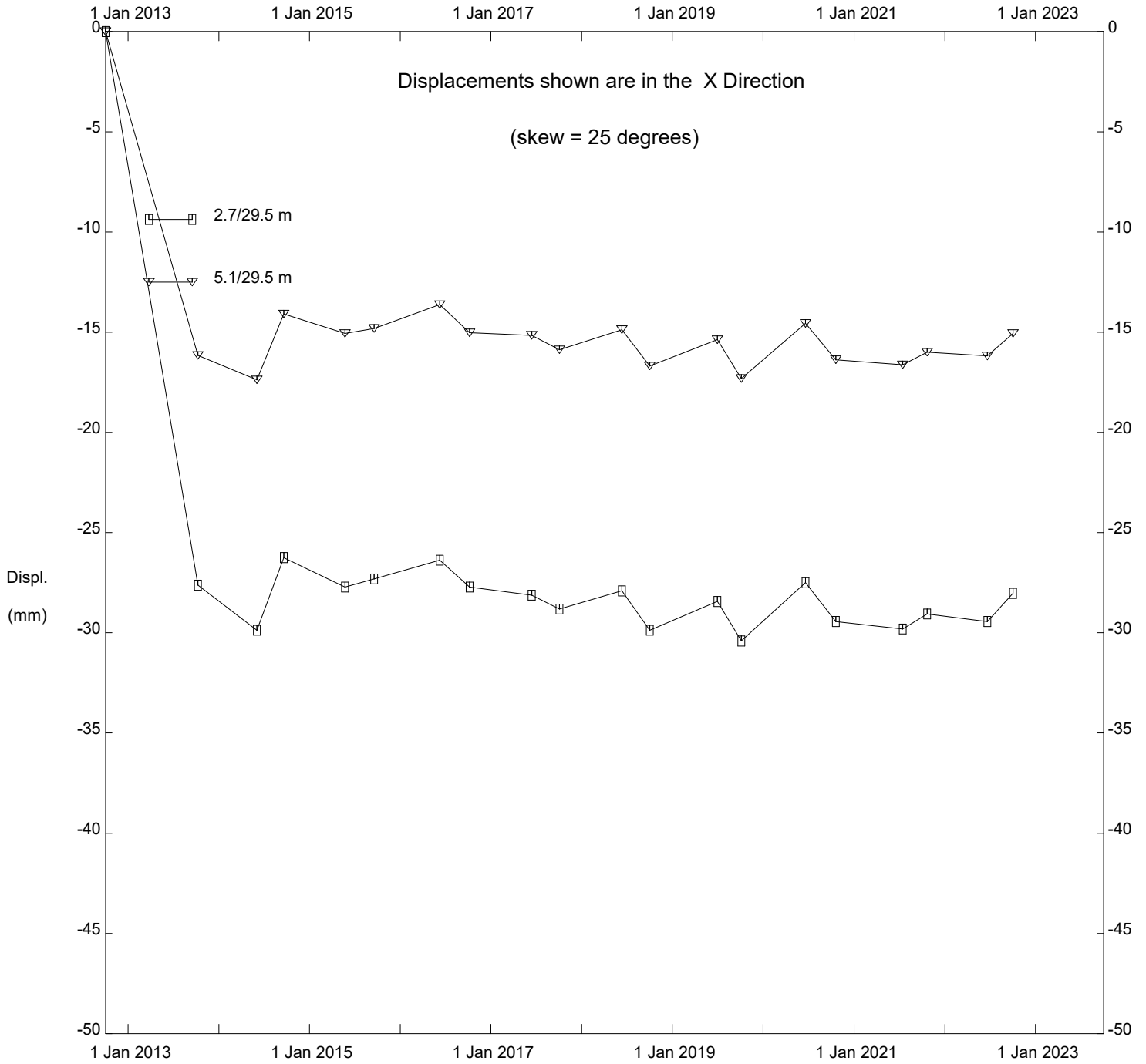
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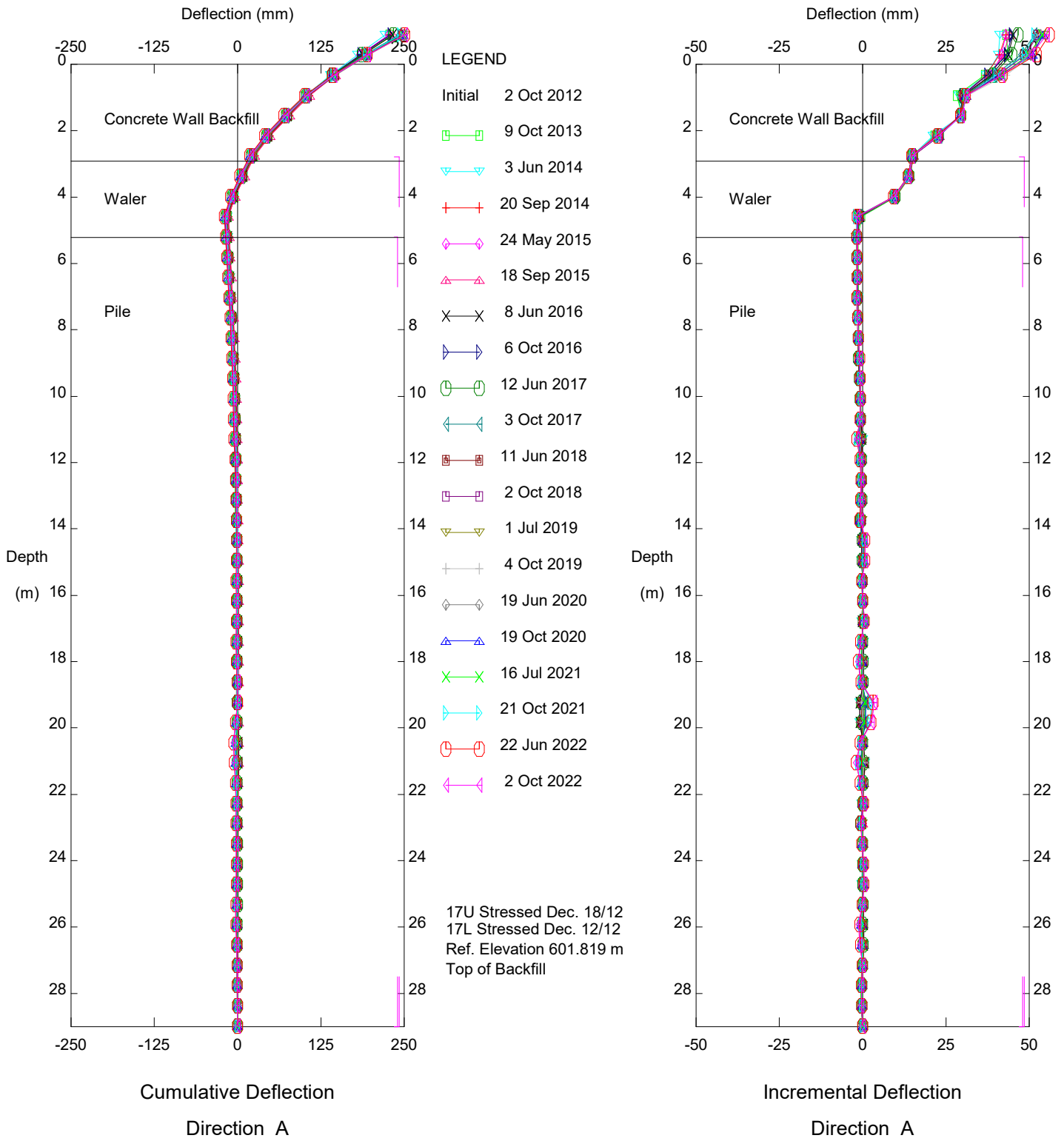
Alberta Transportation

Thurber Engineering Ltd.



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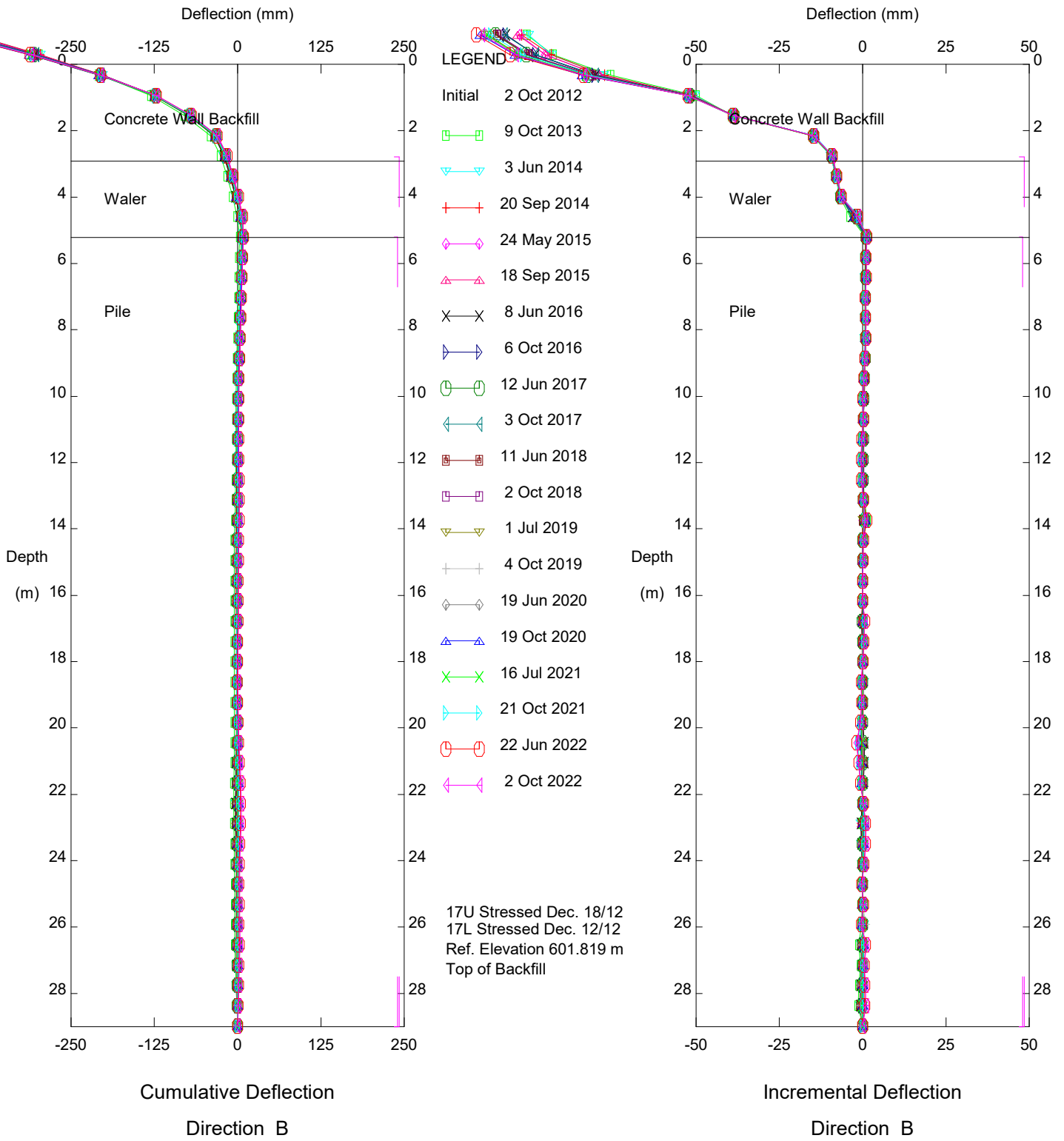
Alberta Transportation



PH026 Eureka River Upper Wall, Inclinator SI12-P17U

Alberta Transportation

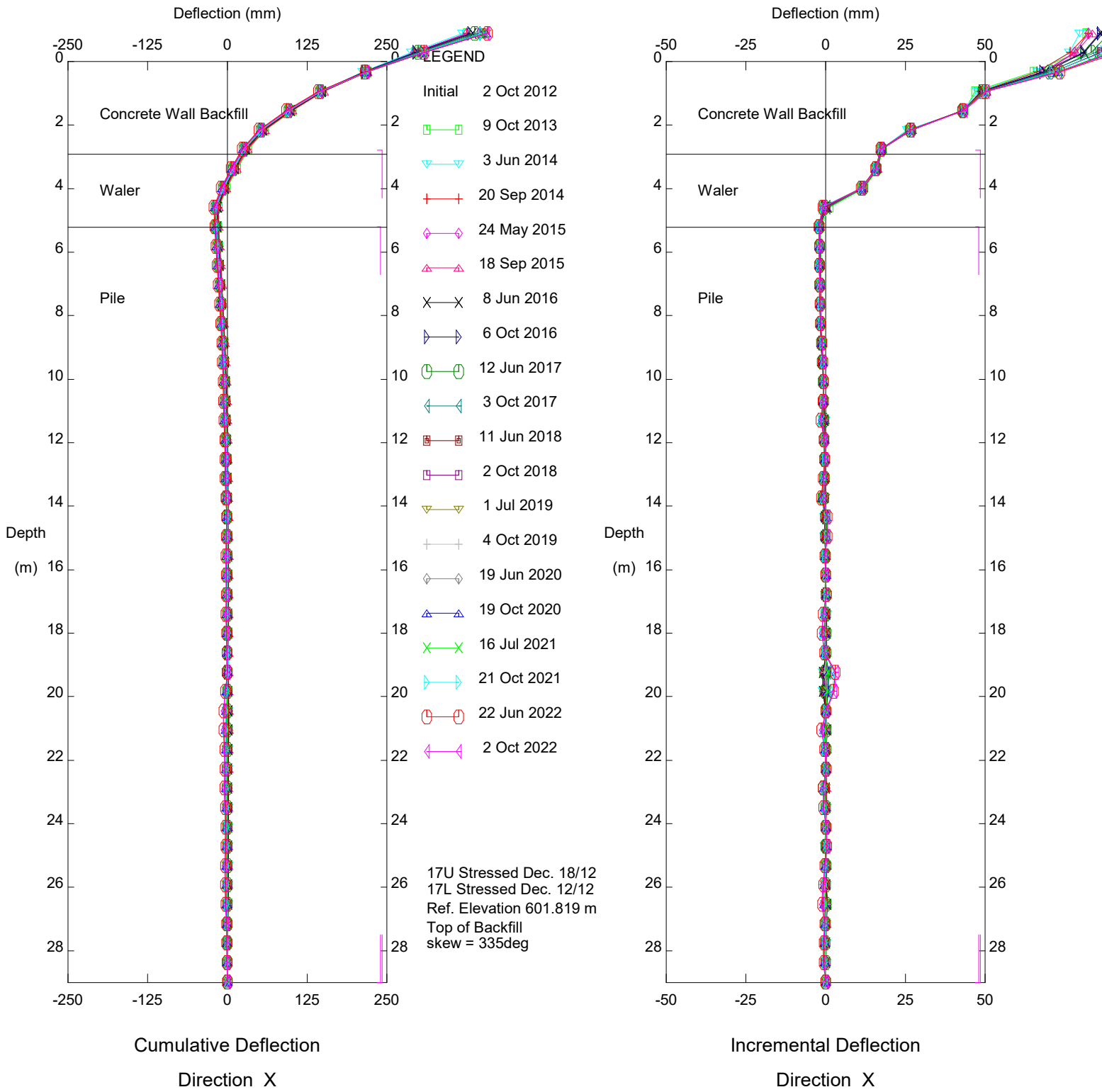
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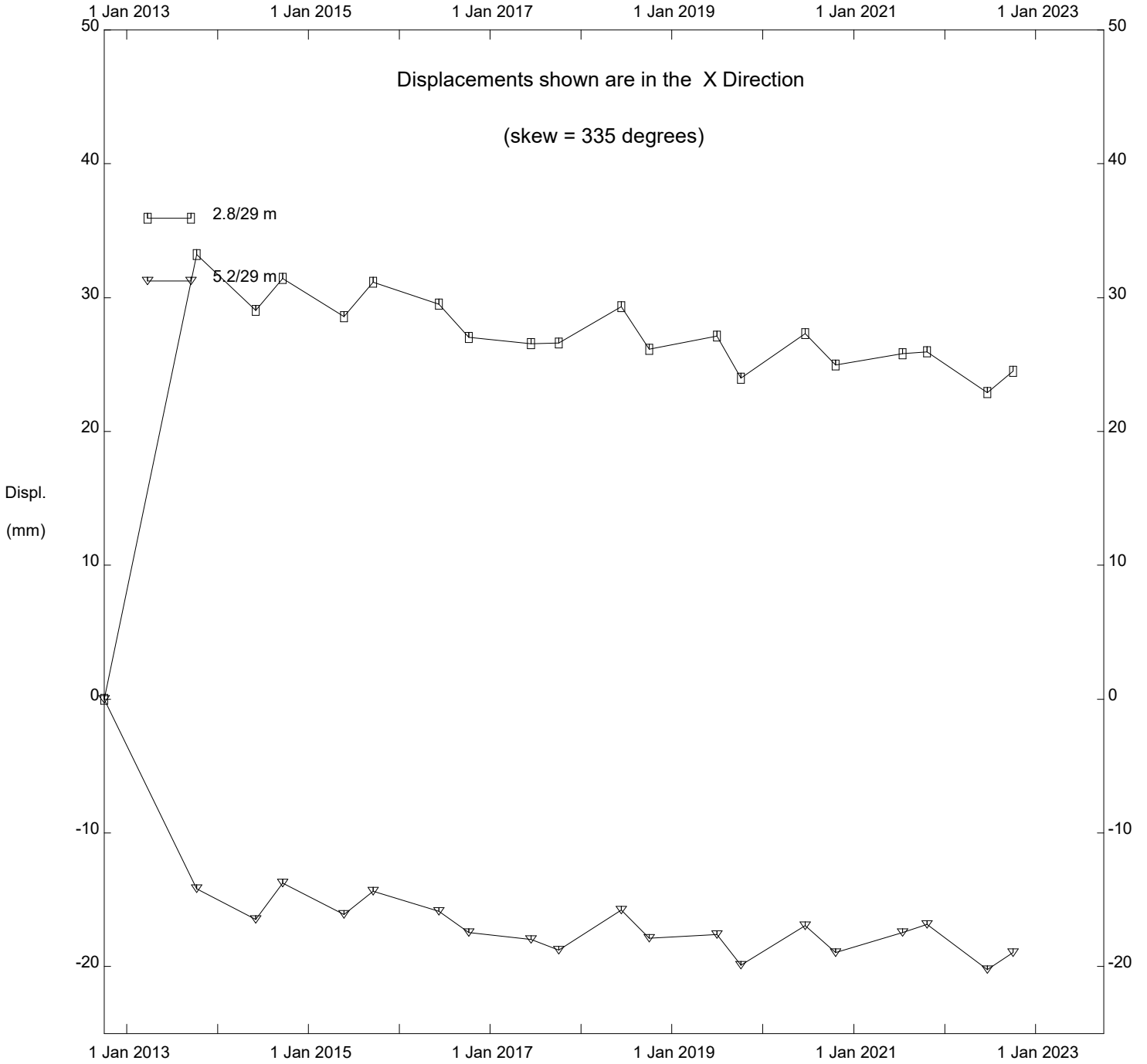
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Alberta Transportation

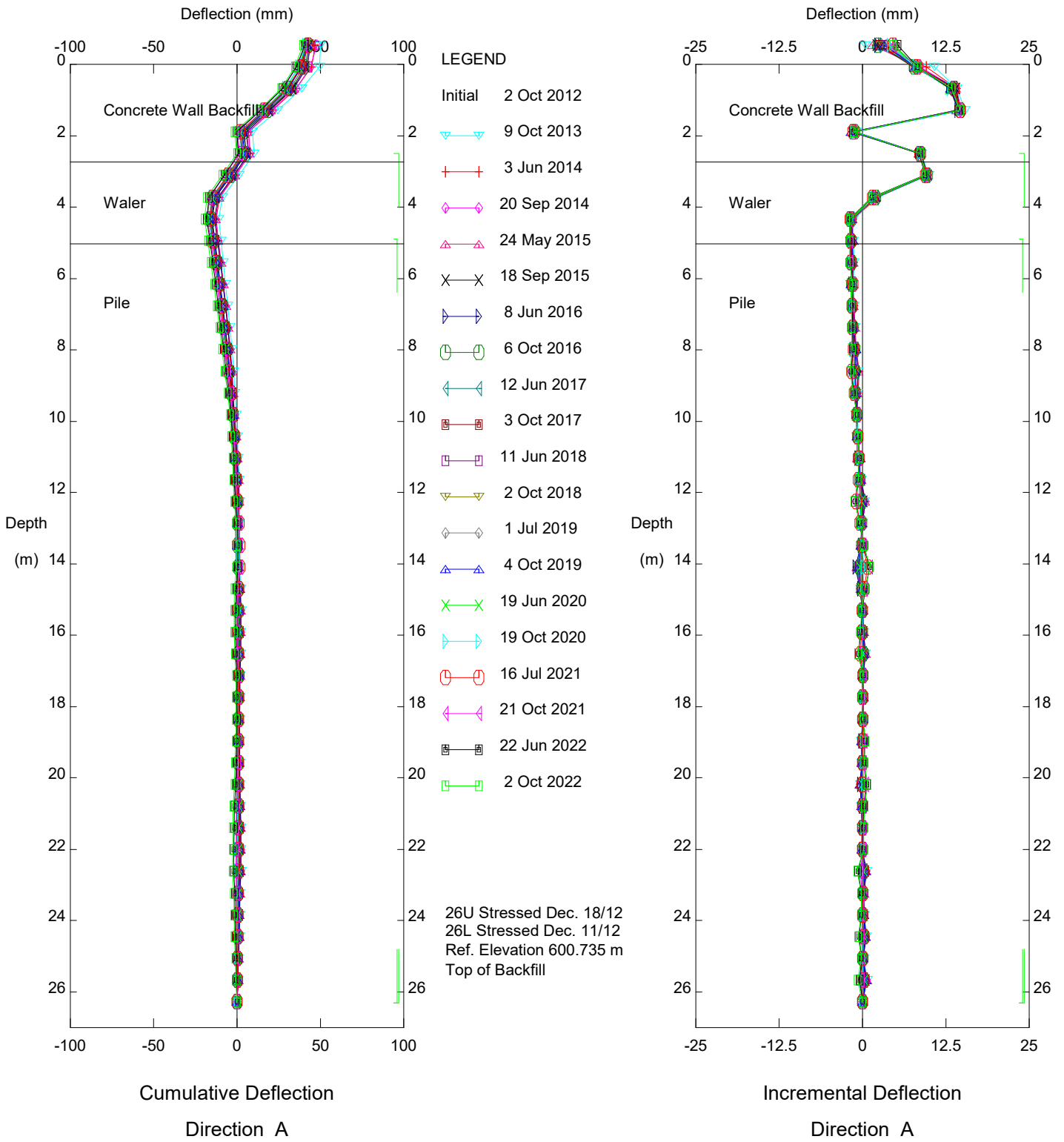
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Alberta Transportation

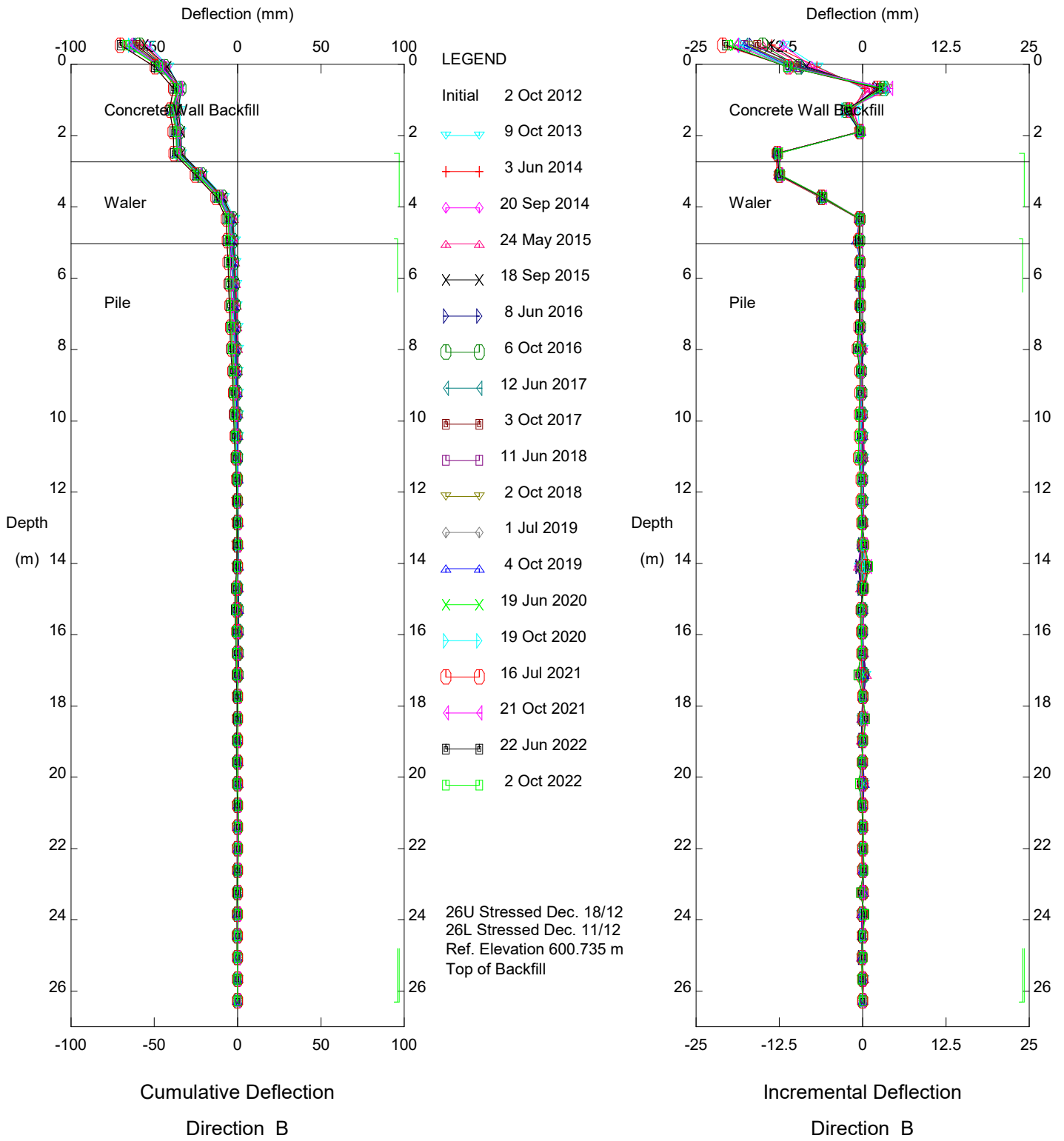
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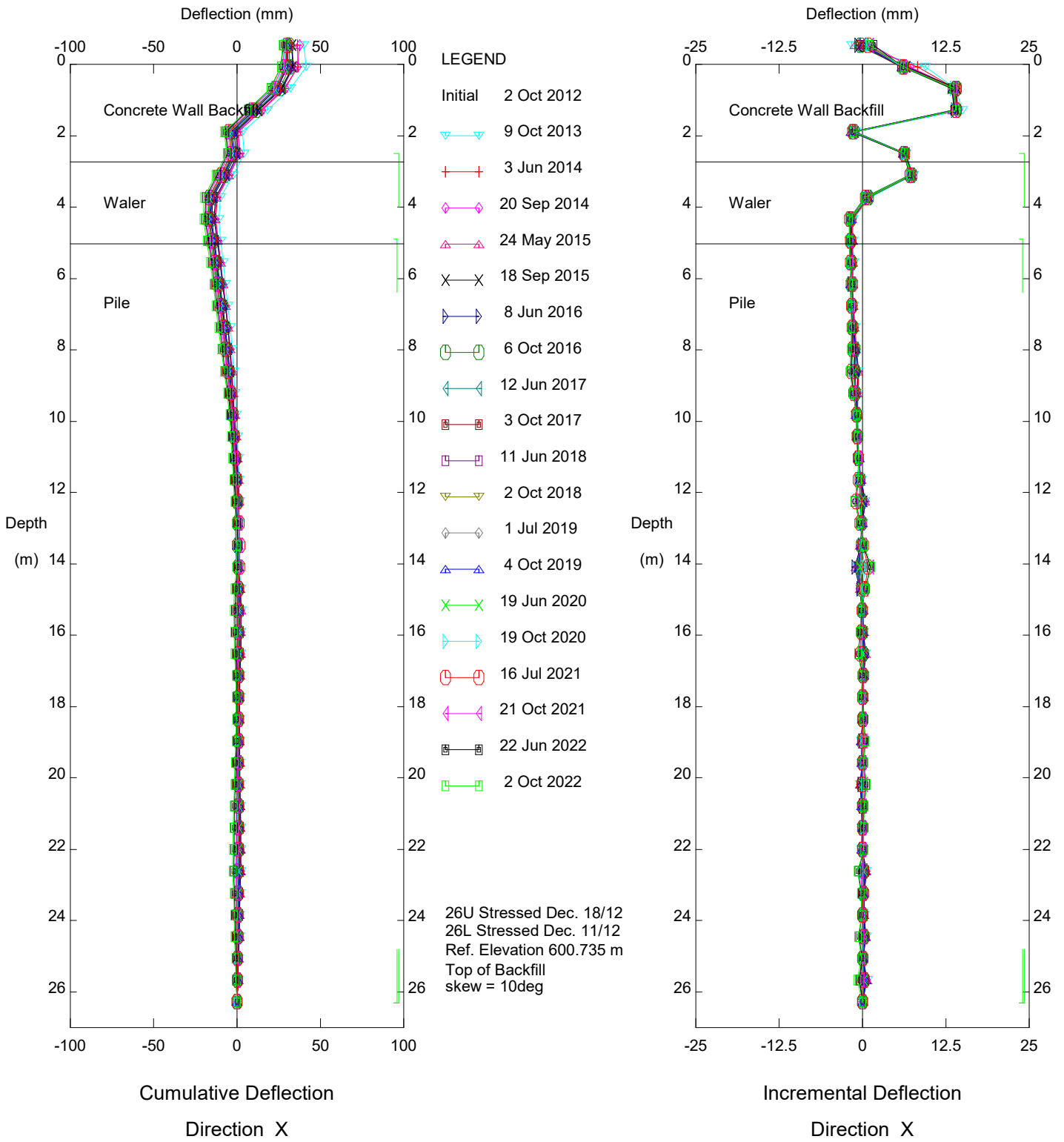
Alberta Transportation

Thurber Engineering Ltd.



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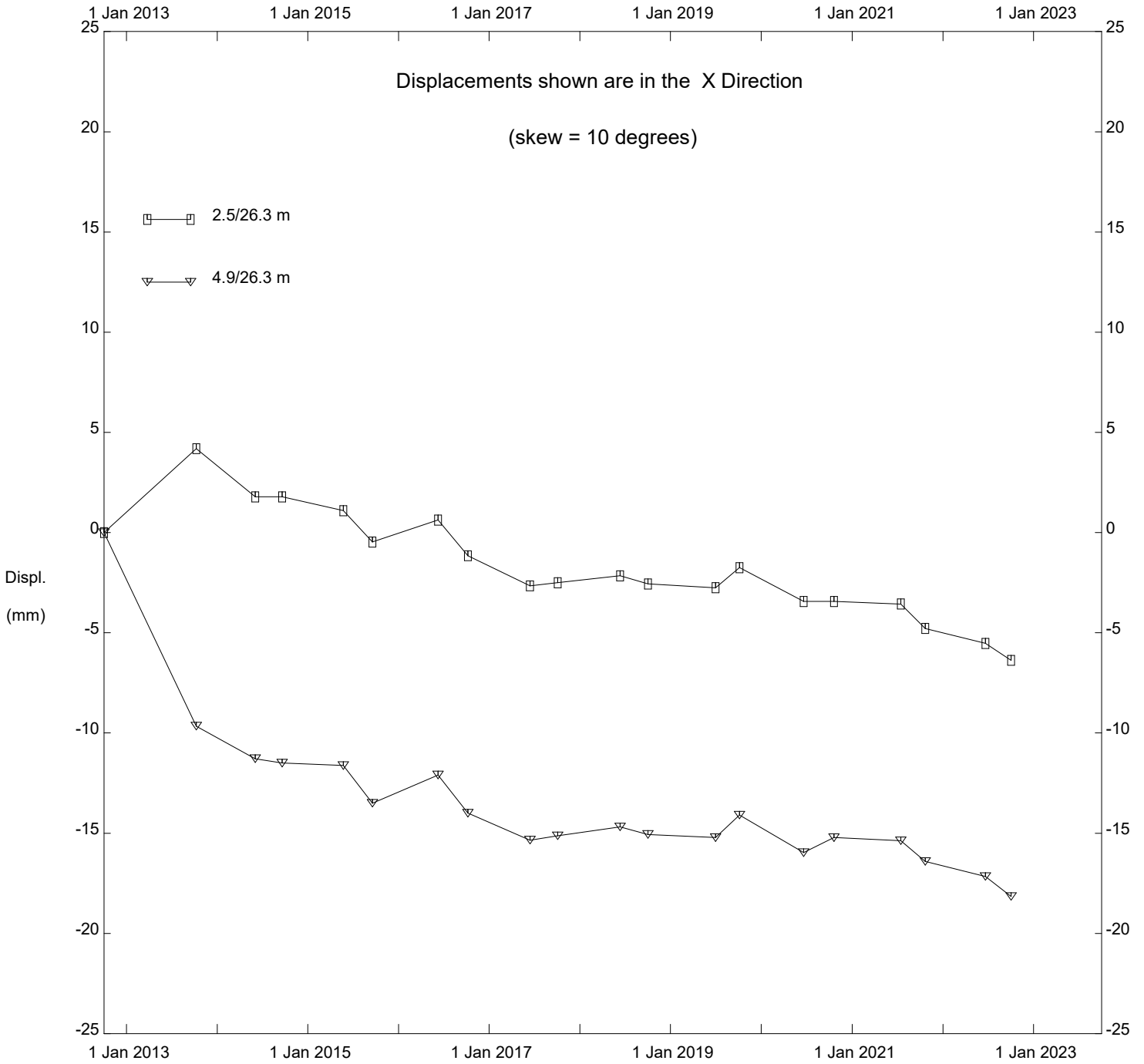
Alberta Transportation



PH026 Eureka River Upper Wall, Inclinator SI12-P26U

Alberta Transportation

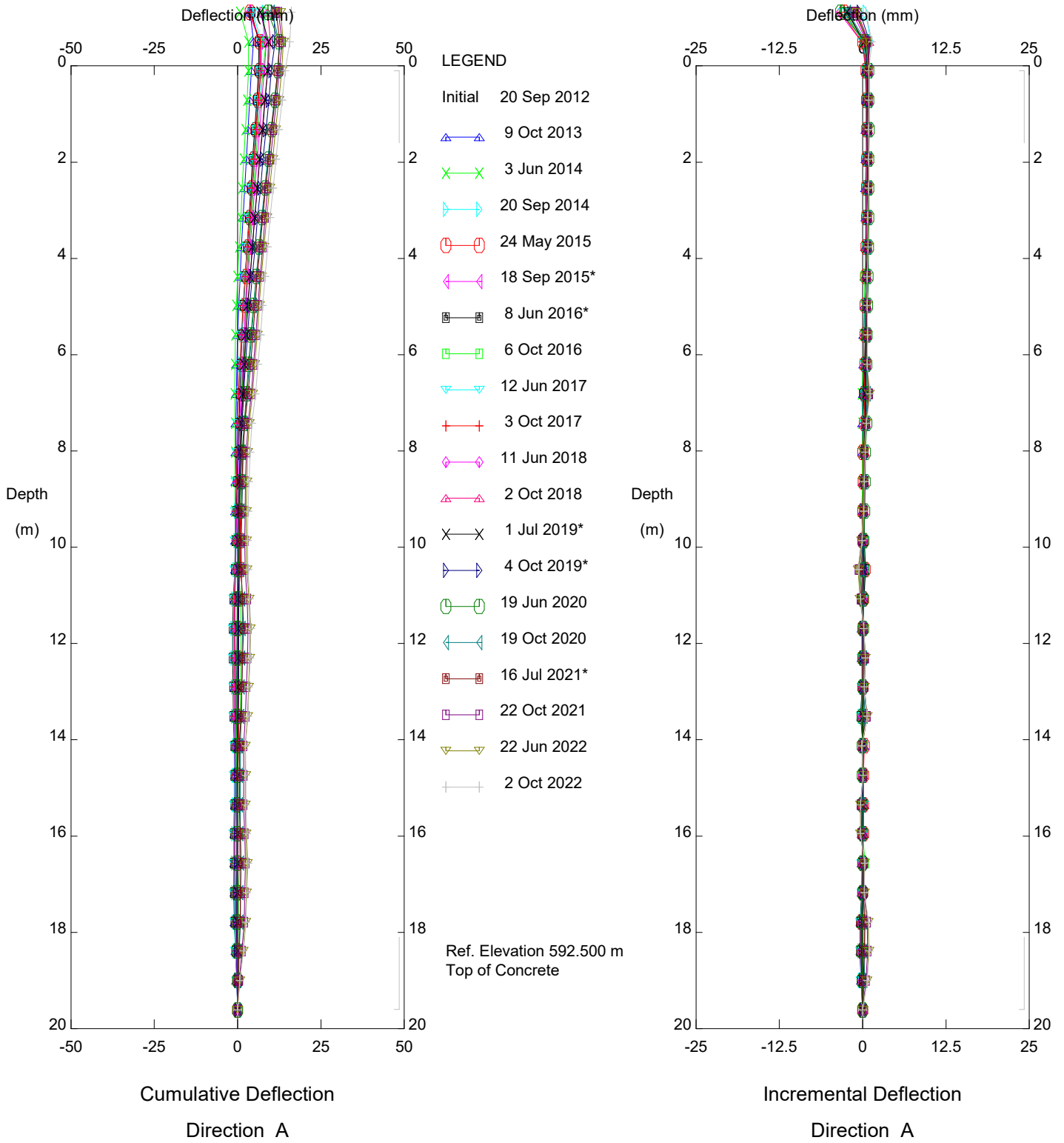
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Alberta Transportation

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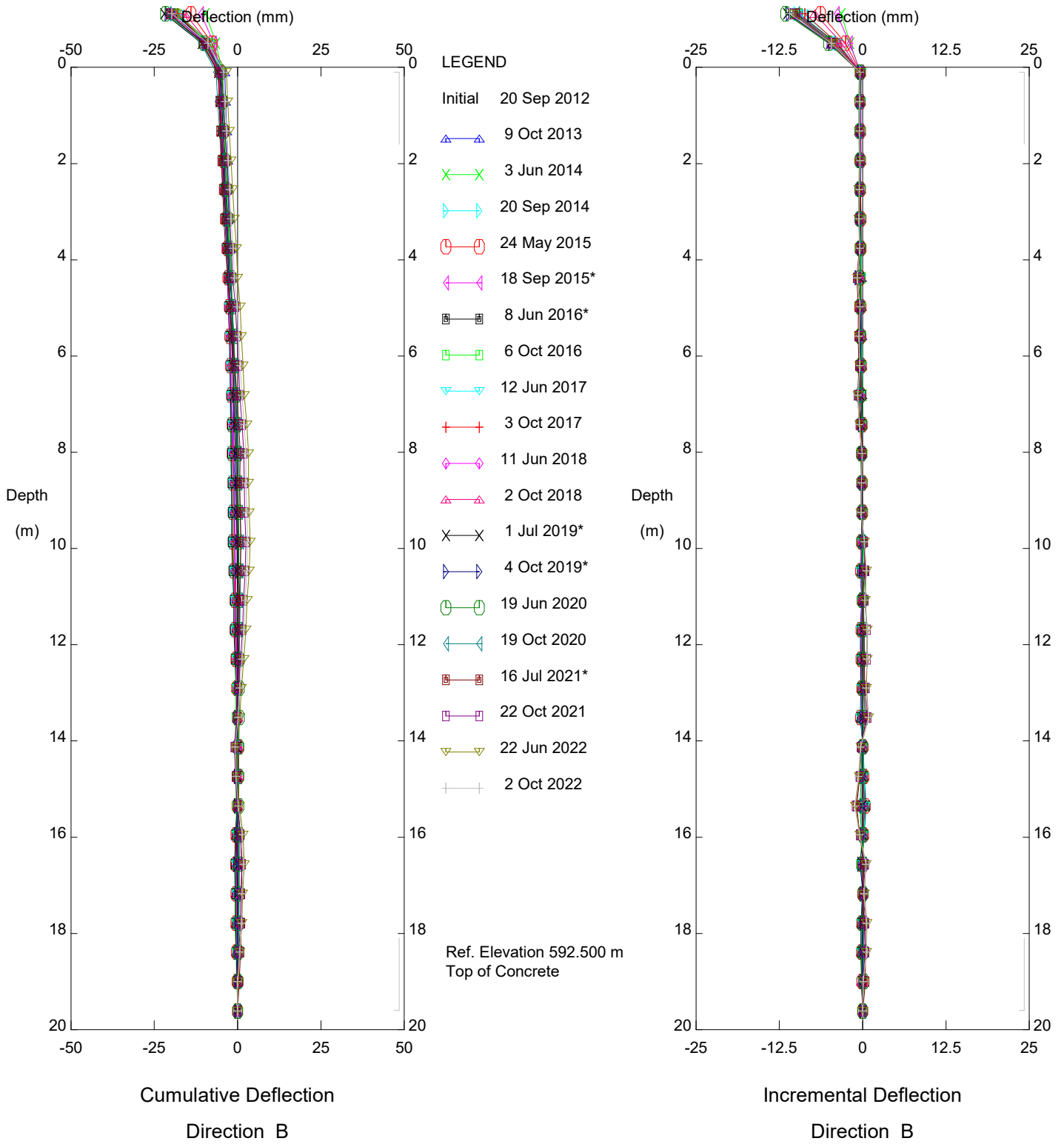


PH026 Eureka River Lower Wall, Inclinometer SI12-P3L

Alberta Transportation

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

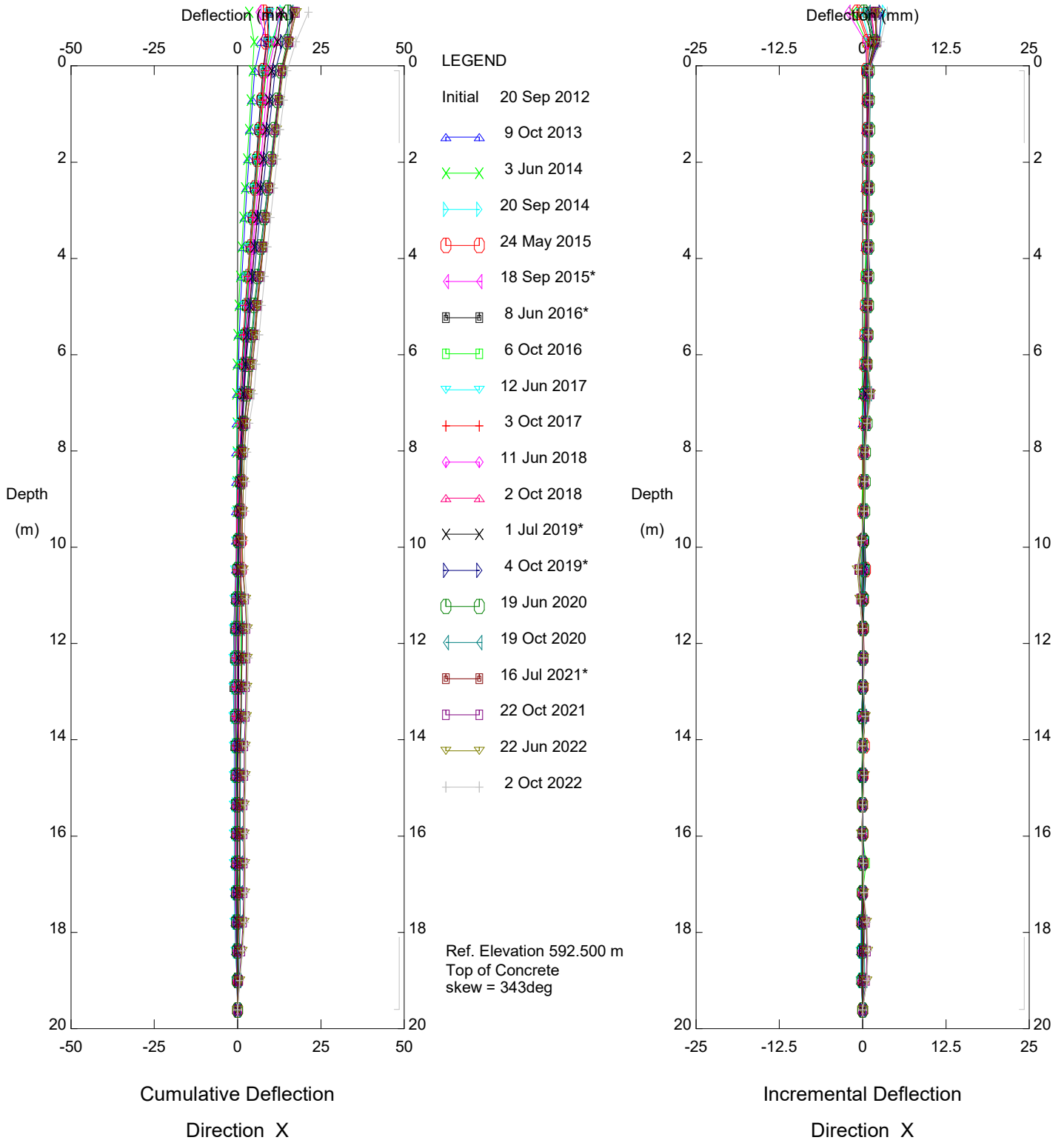
Thurber Engineering Ltd.



PH026 Eureka River Lower Wall, Inclinometer SI12-P3L

Alberta Transportation

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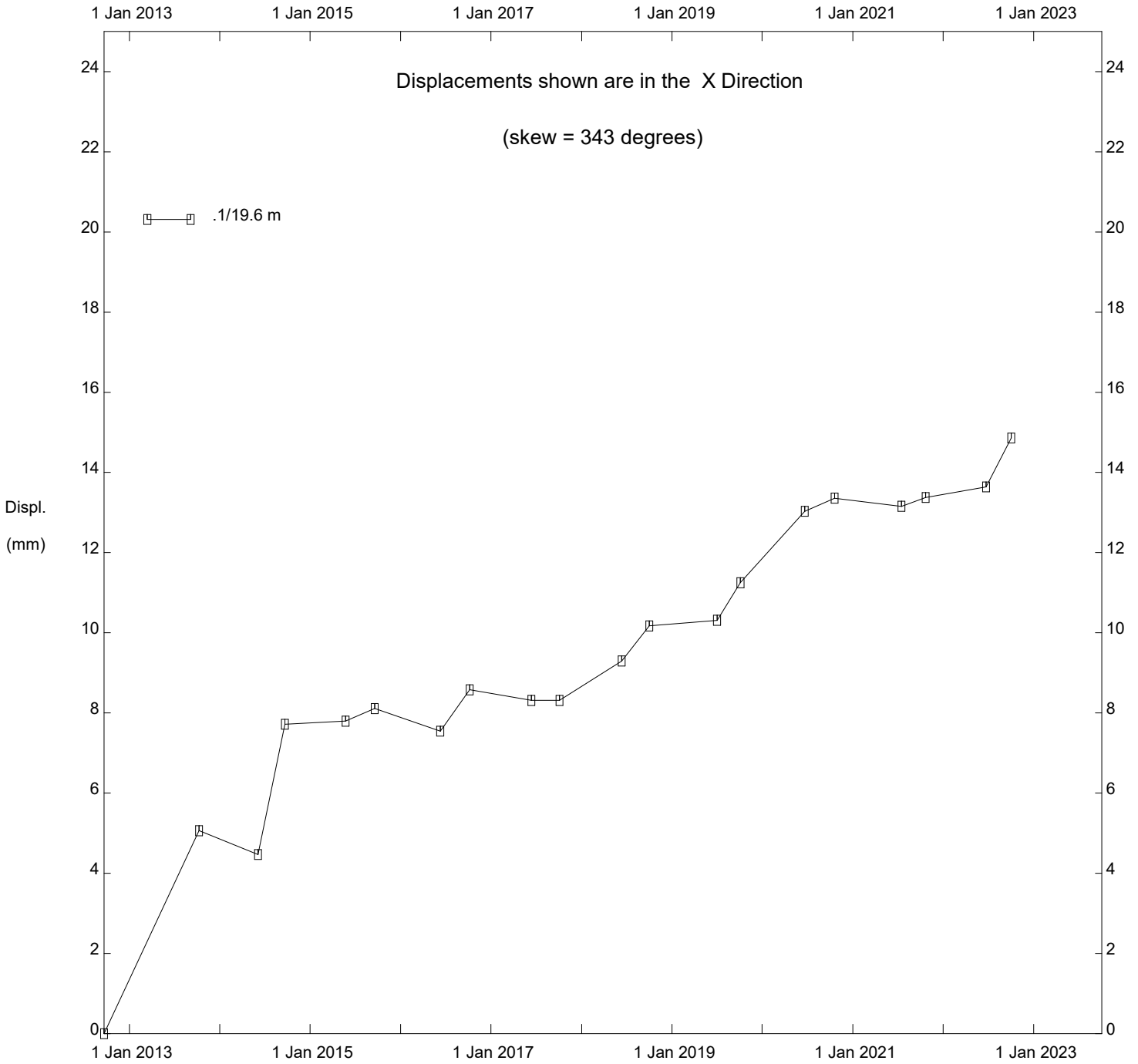


PH026 Eureka River Lower Wall, Inclinometer SI12-P3L

Alberta Transportation

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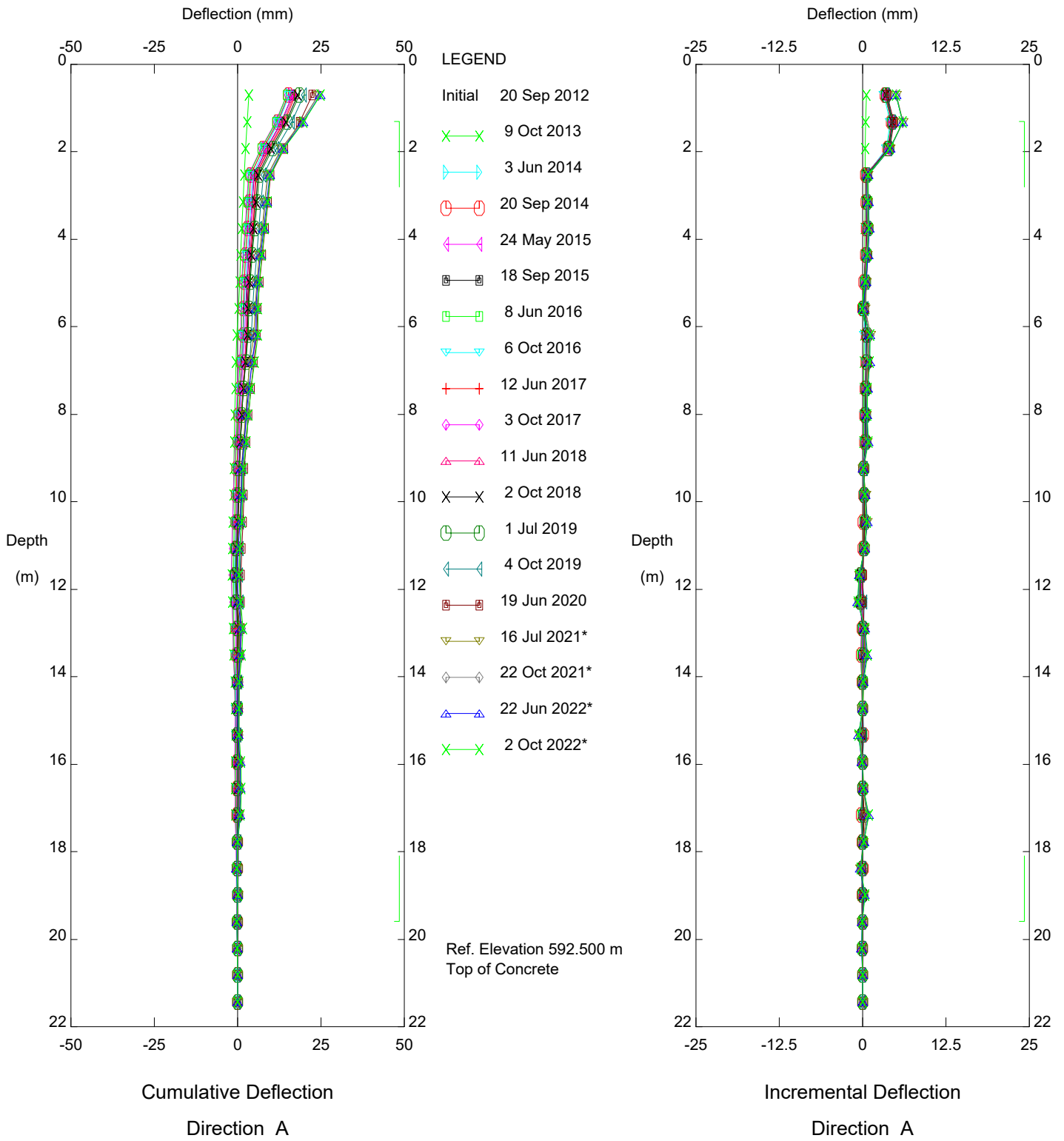
Thurber Engineering Ltd.



PH026 Eureka River Lower Wall, Inclinator SI12-P3L

Alberta Transportation

Thurber Engineering Ltd

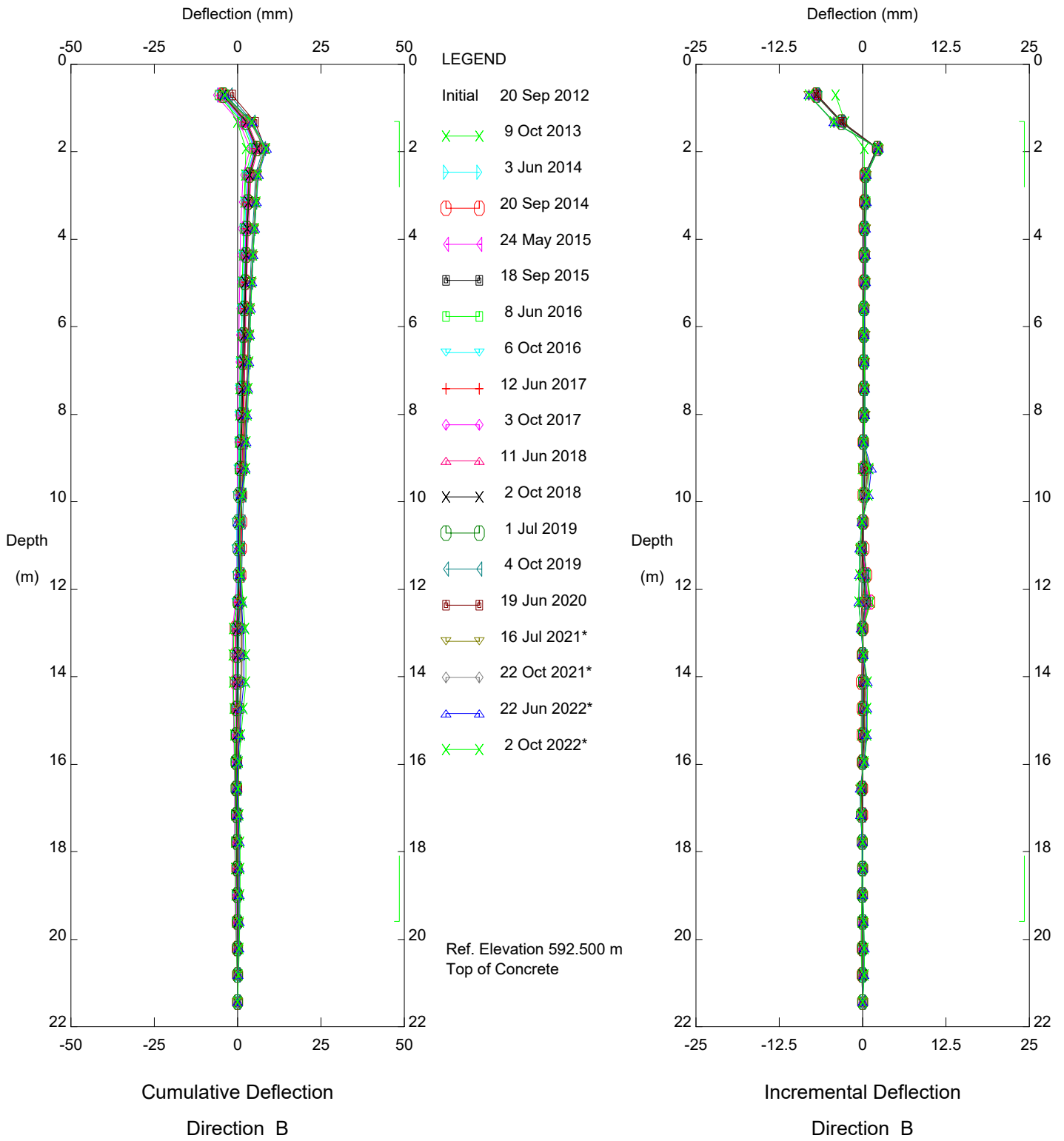


PH026 Eureka River Lower Wall, Inclinometer SI12-P9L

Alberta Transportation

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

Thurber Engineering Ltd

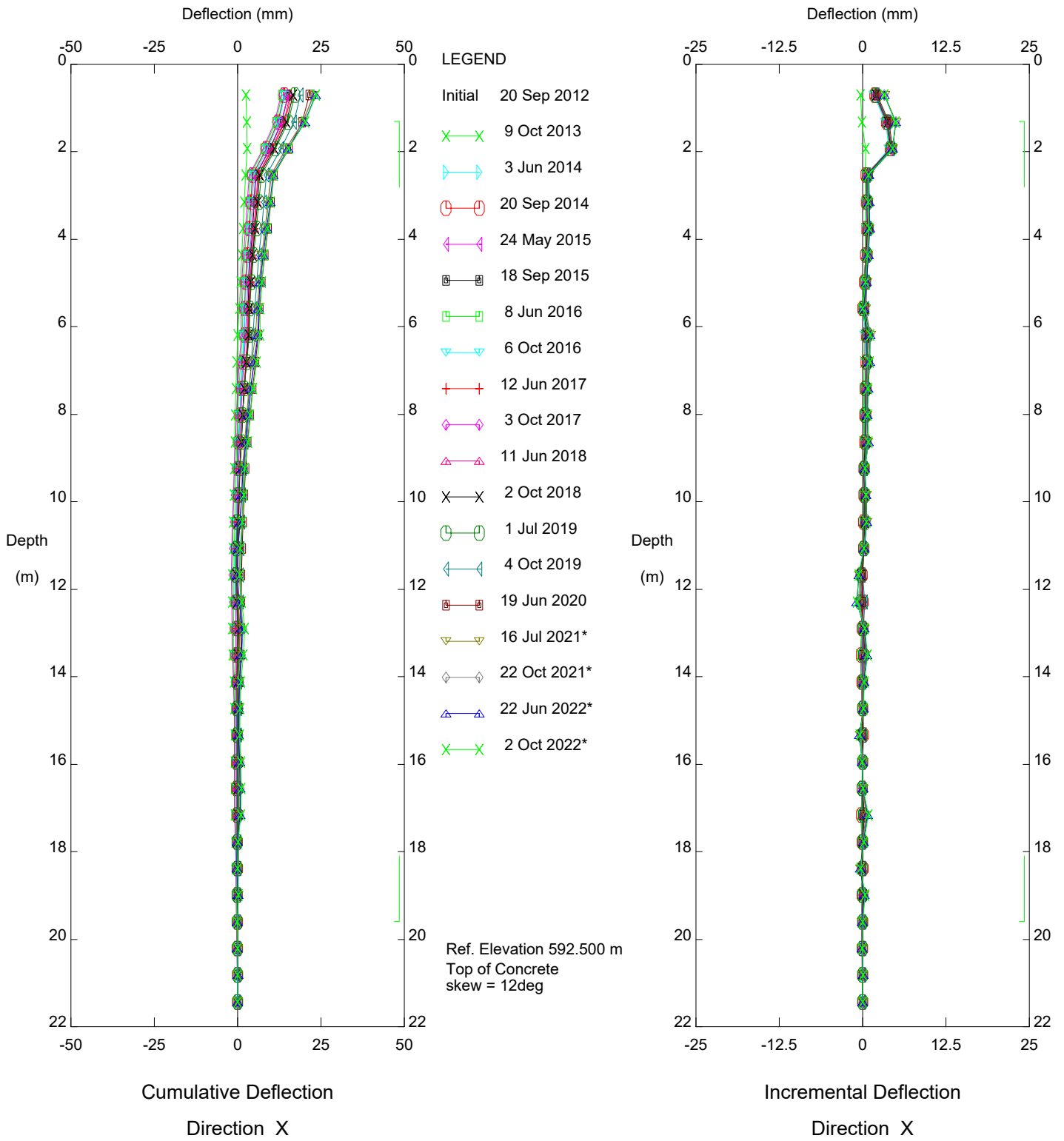


PH026 Eureka River Lower Wall, Inclinometer SI12-P9L

Alberta Transportation

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

Thurber Engineering Ltd

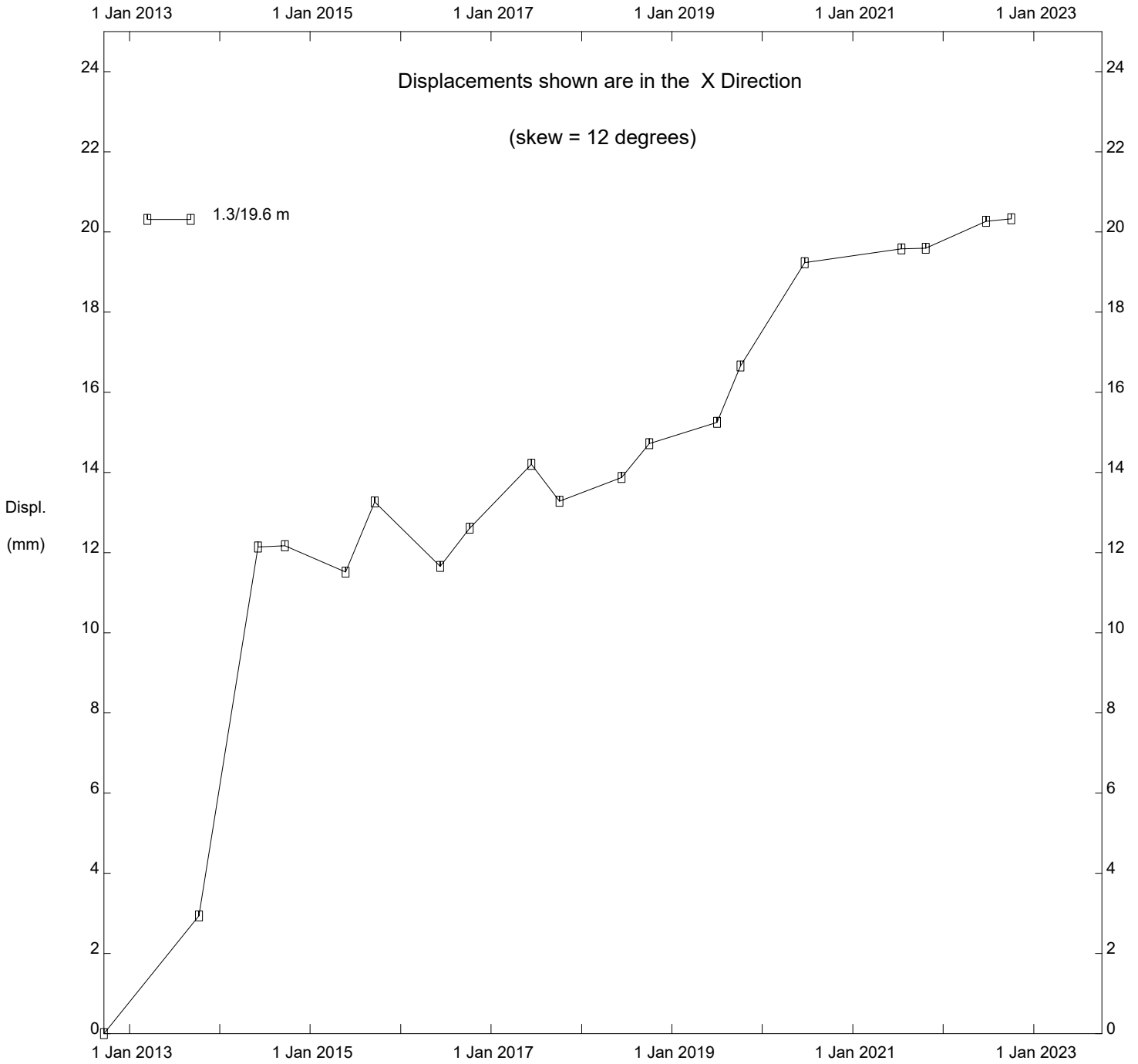


PH026 Eureka River Lower Wall, Inclinometer SI12-P9L

Alberta Transportation

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

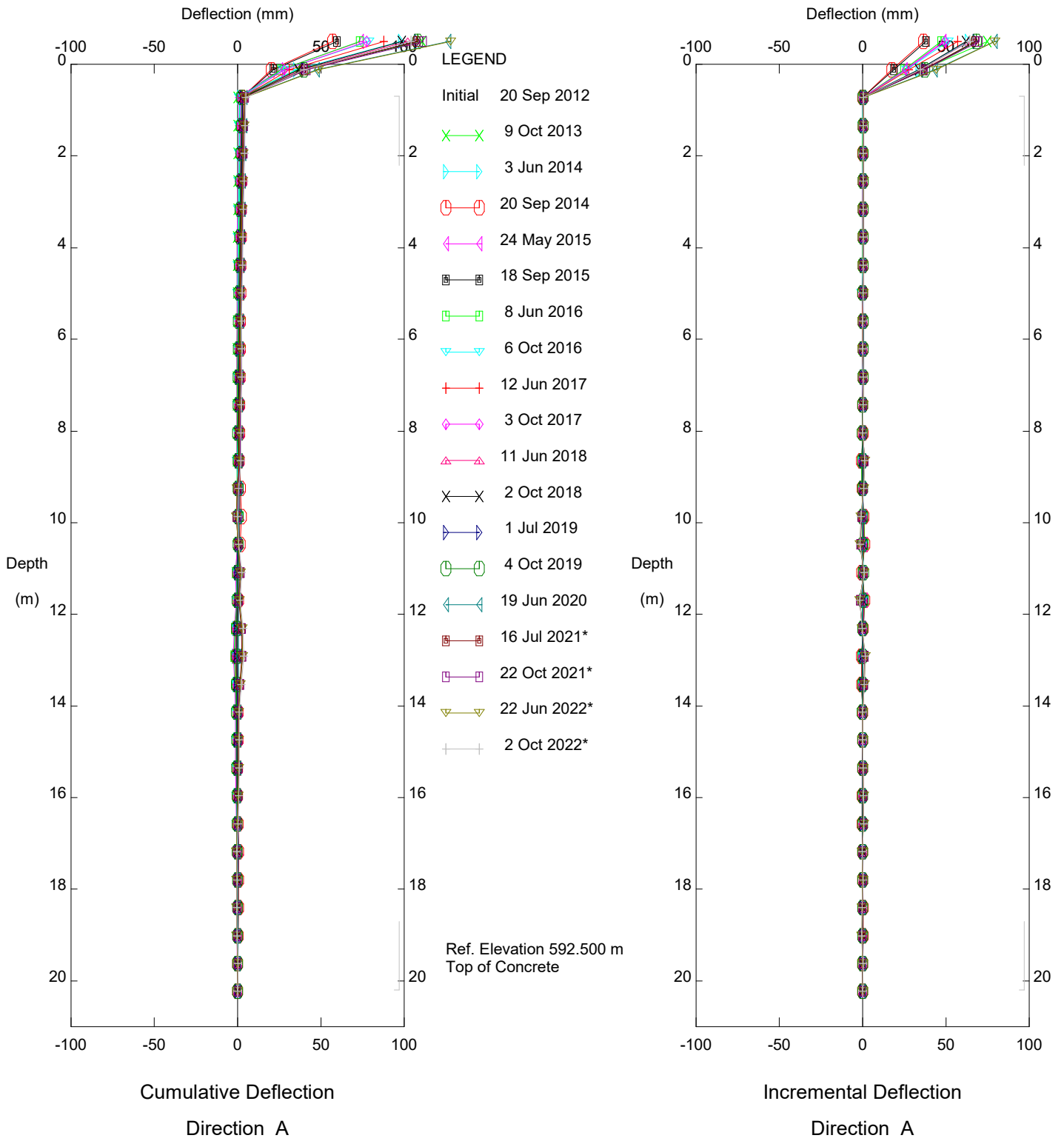
Thurber Engineering Ltd



PH026 Eureka River Lower Wall, Inclinator SI12-P9L

Alberta Transportation

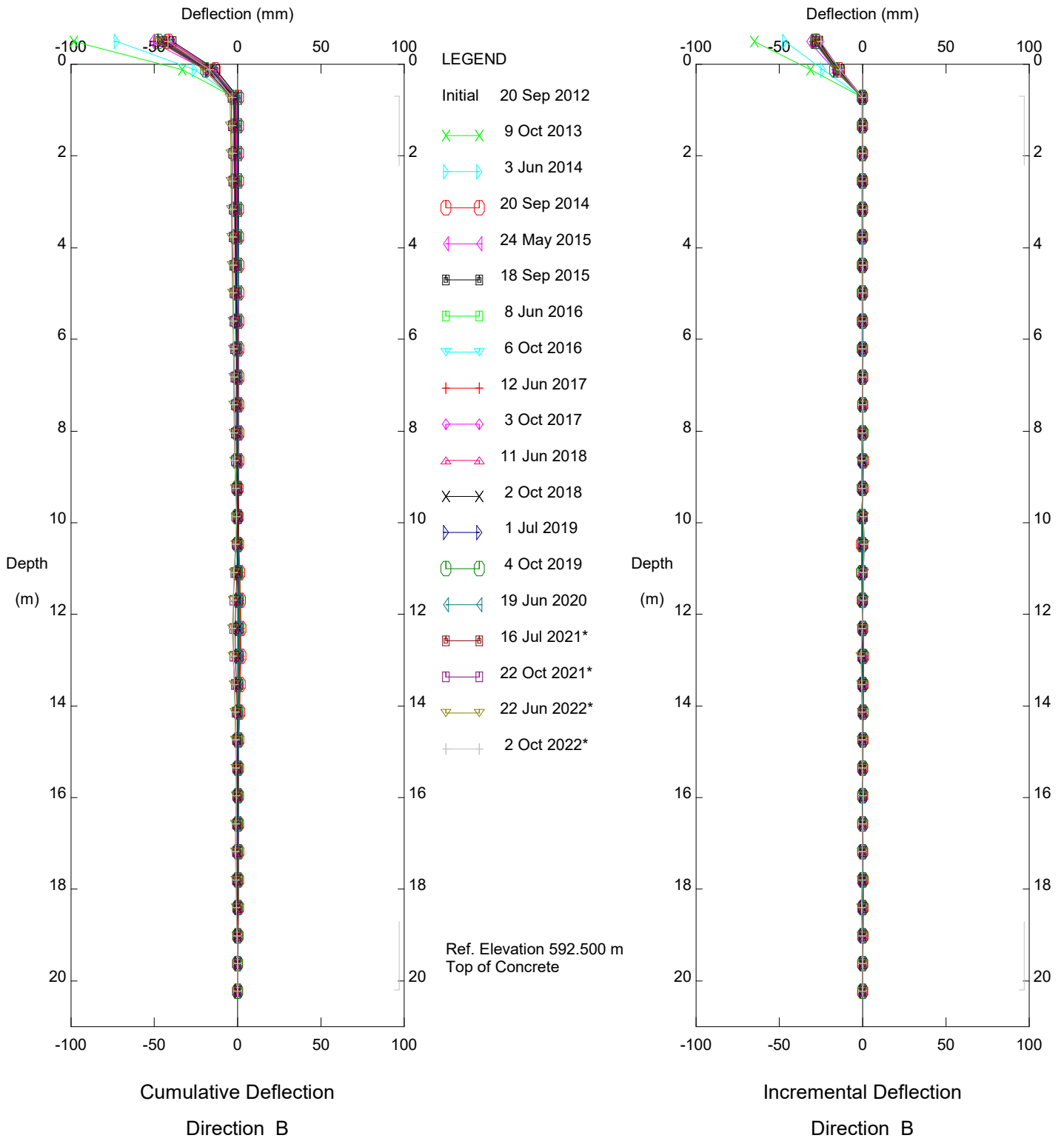
Thurber Engineering Ltd.



PH026 Eureka River Lower Wall, Inclinator SI12-P14L

Alberta Transportation

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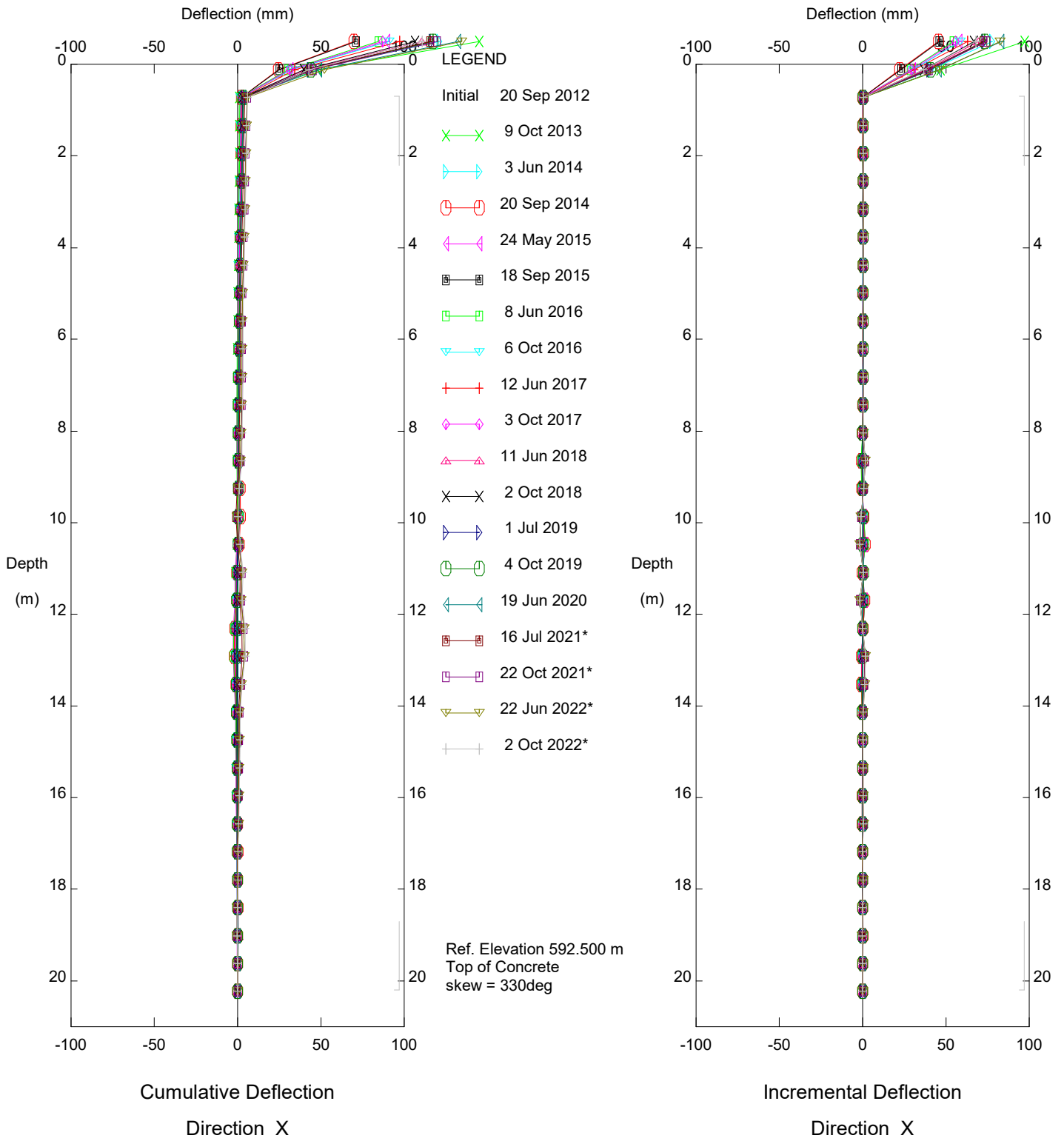


PH026 Eureka River Lower Wall, Inclinator SI12-P14L

Alberta Transportation

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

Thurber Engineering Ltd.

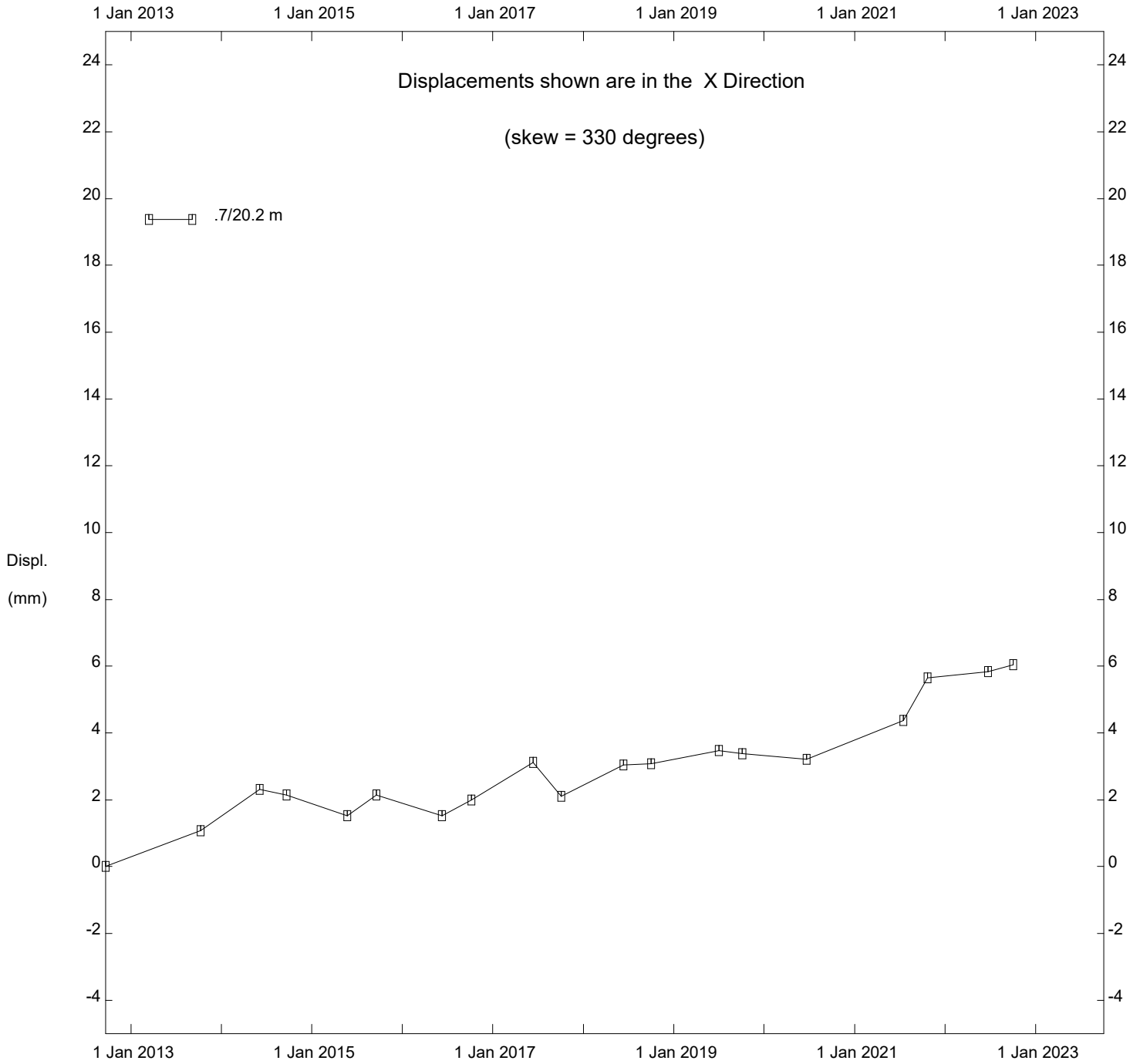


PH026 Eureka River Lower Wall, Inclinator SI12-P14L

Alberta Transportation

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

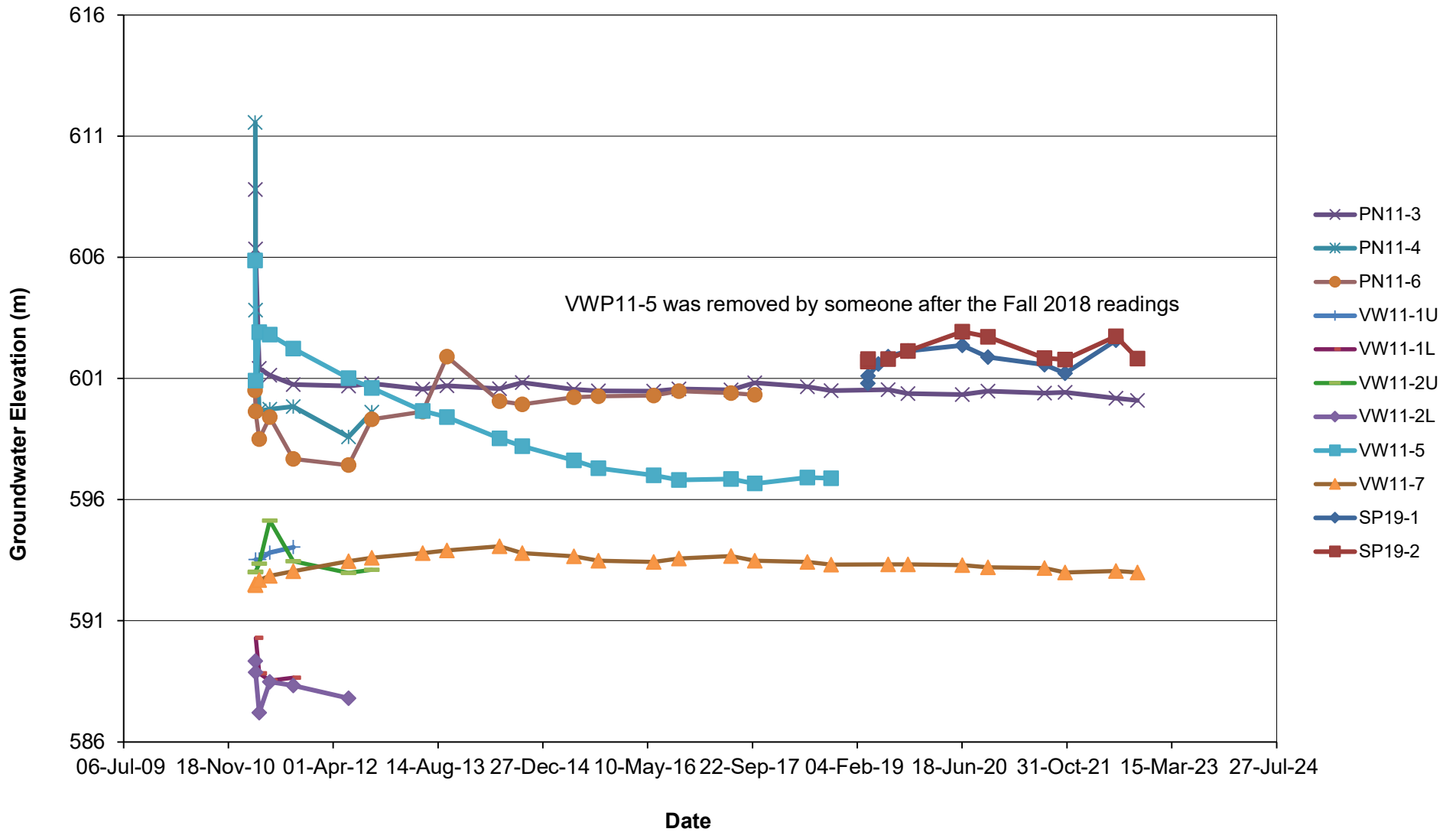
Thurber Engineering Ltd.



PH026 Eureka River Lower Wall, Inclinator SI12-P14L

Alberta Transportation

**FIGURE PH026-1
PIEZOMETRIC ELEVATIONS FOR HWY 726:02 EUREKA RIVER (SITE 3, 5 AND 6)**



**FIGURE PH026-2
PIEZOMETRIC DEPTHS FOR HWY 726:02 EUREKA RIVER (SITE 3, 5 AND 6)**

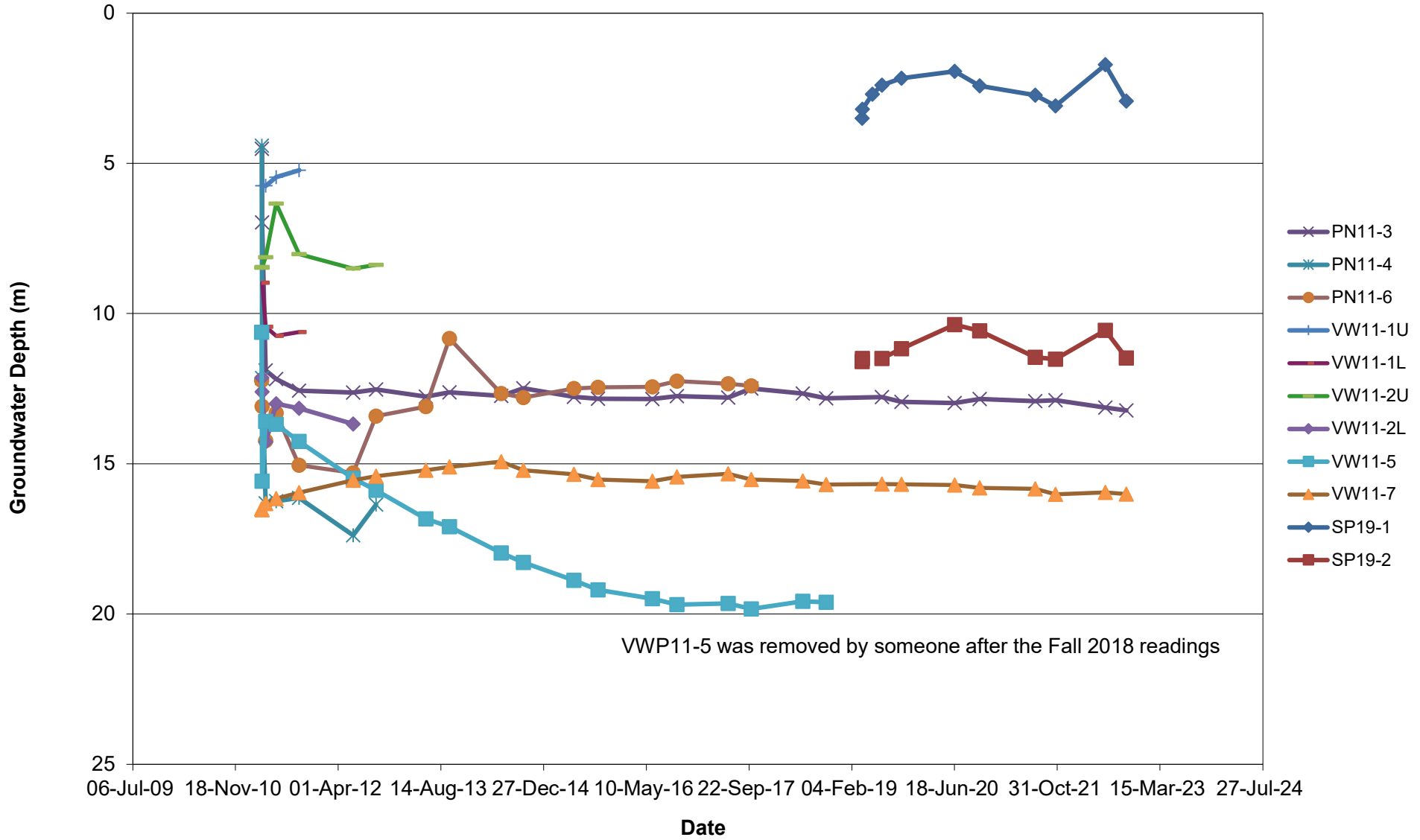


FIGURE PH026-3
LOAD CELL DATA FOR HWY 726:02 UPPER PILE WALL ANCHORS

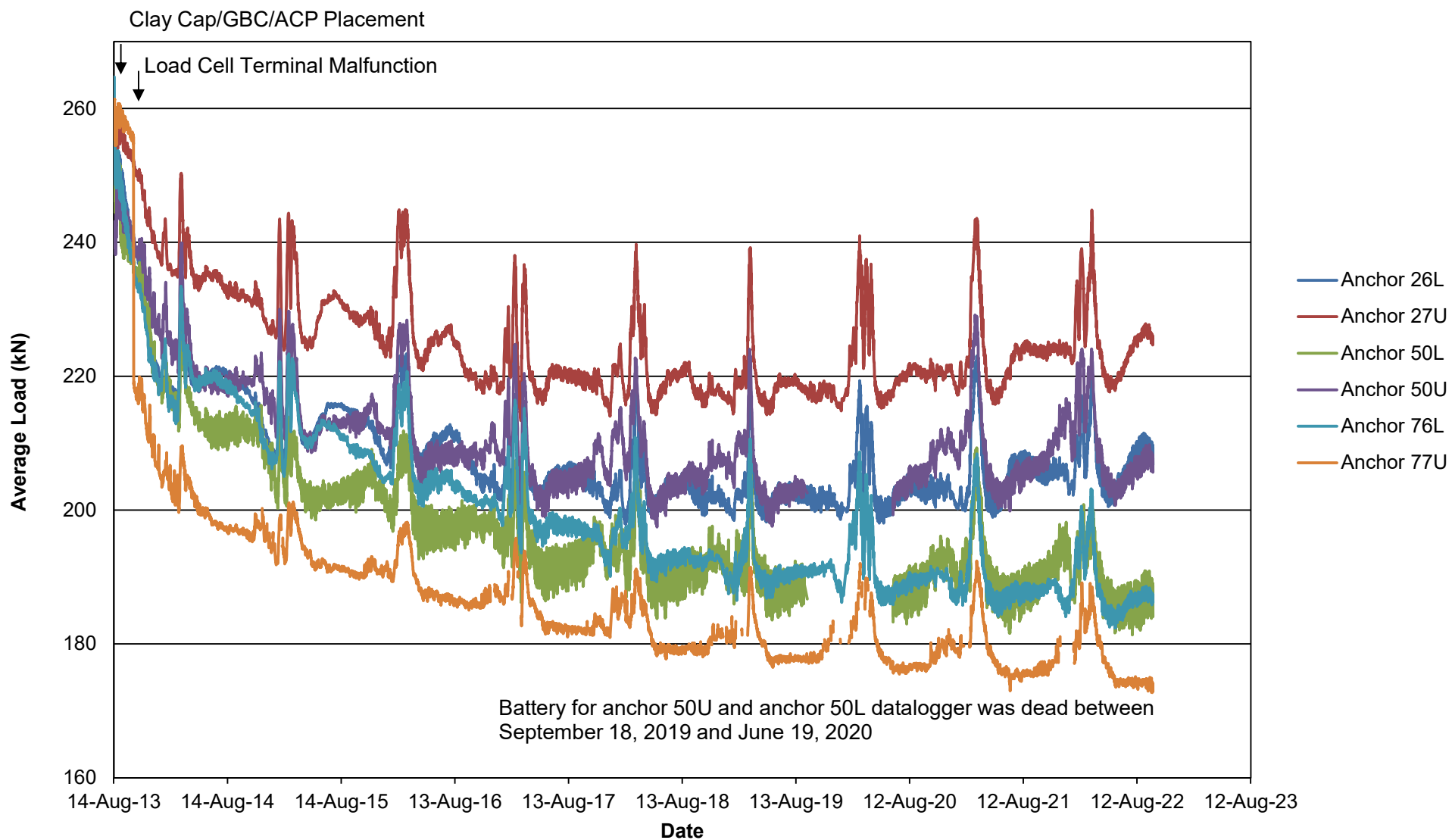


FIGURE PH026-4
LOAD CELL TEMPERATURES FOR HWY 726:02 UPPER PILE WALL ANCHORS

