ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP
PEACE REGION – (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING - FALL 2024

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
PH009-3	Hwy 684:02 km 30.99, Town of Peace River	Shaftesbury Trail - Shop Slide	684:02	30.9-31.1
			Old 2:02	0.0-0.4
Legal Description:		**UTM Co-ordinates**		
4-31-83-21 W5		11V E 480321	N 6232126	

Current Monitoring:	19 & 20-Sep-2024	**Previous Monitoring**	22-May-2024
Instruments Read By:	Mr. Niraj Regmi, G.I.T., and Mr. Nixson Mationg, of Thurber		

Instruments Read During This Site Visit			
Slope Inclinometers (SIs): SI05-1, SI09-3, SI09-4, SI11-1, and SI19-5	**Pneumatic Piezometers (PN):** PN19-5A and PN19-5B	**Vibration Wire Piezometers (VW):** VW09-3 and VW09-4	**Standpipe Piezometers (SP):** SP11-06, SP05-1, SP05-4, SP05-5, SP09-8 to SP09-10 and SP19 3
Load Cell (LC): Load Cells A19, A34, A51, A67, A77,	**Strain Gauges:** Pile P34, P77 and P113 strain Gauges	**SAAs:** SAA-P34, SAA-P77, and SAA-P113	**Others:**

Readout Equipment Used			
Slope Inclinometers: RST Digital Inclinometer probe with 2 ft wheelbases and RST pocket readout.	**Pneumatic Piezometers:** RST C108 pneumatic piezometer readout	**Vibrating Wire Piezometers:** GEOKON GK-404 vibrating wire readout	**Standpipe Piezometers:** DGSi Dipmeter
Load Cell: Downloaded from datalogger	**Strain Gauges:** Downloaded from datalogger	**SAAs:** Downloaded from datalogger	**Others:**
Note:			

Discussion	
Zones of New Movement:	A potential zone of movement was observed in SI11-01, between 23.0 m and 25.4 m depth. Although visible in the recent previous readings, the zone had remained relatively constant with a cumulative displacement of approximately 3.5 mm.
Interpretation of Monitoring Results:	SLOPE INDICATOR Slope inclinometer SI05-1 is located upslope of the highway and not within the main area of movement. It showed no discernible movement over 0.0 m to 3.0 m depth since the spring of 2024 readings. SI09-3 is located on the east side of the rail tracks. If continues to show no discernible movement. SI09-4 is located immediately east (downslope) of the newly installed pile wall. It showed a rate of movement of 0.5 mm/yr over 8.6 m to 10.5 m depth and 0.8 mm/yr over 11.7 m to 13.5 m depth, respectively, since the spring of 2024 readings. These movement zones were first observed in 2021 during construction and the movement rate had been gradually

	decreasing off with each subsequent set of readings but have increased slightly over the last year. SI11-01 is located about 7 m north of the north end of the pile wall and has a movement zone between 13.9 m to 16.3 m depth shortly after construction started and the maximum rate of movement of 34.3 mm/yr occurred in June 14, 2022, near the end of construction. The movement in this zone has continued be high since construction, though at a lower rate; however, the reading this cycle indicated negative movement and is likely erroneous and should be confirmed with a reading in Spring 2025. Continued readings of this inclinometer and inspection of this area should be done to confirm if additional stabilization measures are required. This erroneous set of readings is also likely the reason for a perceived new movement zone between 23.0 m and 25.4 m depth which needs further readings to confirm as the 220° skew angle from the upper zone seems geometrically unlikely. The displacement plot is included for completeness where it can be seen that there has not been a historical coherent pattern in this zone. SI19-5 is located in the lower portion of the slide, near the centerline of the slide. It showed a rate of movement of 1.1 mm/yr over 8.2 m to 11.2 m depth and a rate of movement of less than 0.4 mm/yr over 17.9 m to 19.7 m depth. The overall movement in SI19-5 has slowed significantly since slope offloading and the completion of construction although, like SI09-4, there has been a slight increase in the movement in the last year. It is anticipated that the landslide movements are now constrainted by the concrete pile wall and associated lower slope offloading and flattening. Over time a new equilibrium will establish, so there should be a further reduction in movement rates at this site. It appears that there have been some periods of accelerating and decelerating movement of the slope below the wall. In the absence of observed visual distress of the slope or the wall, this is assumed to be part of the equilibrium process. SAA Surface accelerometer arrays (SAA) were installed in three concrete piles during construction. SAA-P34 has shown an average rate of movement of 2.2 mm/yr in the downslope direction since the spring of 2024 readings, with a current pile head deflection of 8.0 mm since datalogger readings began for this instrument on May 27, 2022. SAA-P34 shows seasonal trends of greater pile deflection through winter months and a relaxation in summer months in response to the seasonal behaviour of anchors. The maximum pile head deflection of 10.2 mm was measured in March 2024. The gap in data noted on the plot is due to theft of the datalogger battery. SAA-P77 showed a rate of movement of 3.4 mm/yr since the spring of 2024 readings. SAA-P77 has shown a total pile head movement of 3.6 mm since datalogger readings began on May 27, 2022. The currently recorded pile head movement of 3.6 mm is the maximum pile head deflection recorded in the instrument. There seasonal movement trend at SAA-P77 is less pronounced compared to SAA-P34 which is due to the lower height of the wall at this location (roughly 3 m compared to 6 m to 7 m at P34). SAA-P113 has shown an average rate of movement of 7.3 mm/yr in the downslope direction since the spring of 2024 readings, with a total pile head deflection of 15.3 mm since datalogger readings began on May 27, 2022. The higher observed movement in SAA-P113 can be attributed to the fact that the pile wall at this location is cantilevered rather than tied-back like the other portions of the wall. The movement rate measured in the instrument has increased since the spring of 2024 readings by 4.6 mm/yr. SAAP-113 does not show clear seasonal movement trends as

SAA-P34 or SAA-P77 since there are no anchors in this portion of the wall.

STRAIN GAUGE

Strain gauge arrays were installed in pile P34, P77 and P113. The strain profiles along all three piles are well below the established threshold for implementation of remedial measures and show strain rate profiles consistent with anticipated trends. The strain gauges in P34 (Figures PH009-1 and -2) show their maximum positive (tension) strain (143.1 microstrain) on the upslope pile face at 9.3 m depth, with a corresponding trend of negative (compression) strain (-216.3 microstrain) on the downslope pile face at the same depth. This seems to correspond to the observed deflection of the pile in the downslope direction noted in SAA-P34 above 9 m depth. The strains measured at this depth are plotted against time in Figure PH009-3.Th

The strain gauges on the downslope side of P77 (Figure PH009-5) indicate a maximum negative strain of -143.8 microstrain at a depth of 8.95 m. P77 does not show as clear of a trend of strain in the upslope pile strain gauges (Figure PH009-4) compared to P34: the maximum positive strain was 18.4 microstrain at 8.95 m (which corresponds with the maximum negative strain on the downslope side) and the maximum negative strain was -29.8 microstrain at 12.9 m. The strains measured at 9.0 m (rounded up from 8.95 m) and 12.9 m are plotted against time in Figure PH009-6 and -7, respectively.

The maximum negative strain for P113, of -127.3 microstrain, was measured on the downslope side at 19.0 m depth (Figure PH009-9). On the upslope side (Figure PH009-8), the maximum negative strain was -67.7 microstrain measured at a depth of 21.2 m and the maximum positive strain was 93.4 microstrain measured at a depth of 15.3 m. The depth of the main slip surface of the deep-seated landslide at this location, as indicated by former SI05-3, was at 17.5 m below original ground prior to wall construction. The strains measured at 15.3 m, 19.0 m, and 21.2 m are plotted against time in Figure PH009-10, -11, and -12, respectively.

LOAD CELL

The load cell readings are summarized in Table PH009-4. Anchors A19 (VC2340), A51 (VC2342), and A67 (VC2343) showed decreases in measured load of 1.58 kN, 4.84 kN, and 1.72 kN, respectively, compared to the spring of 2024 readings. Anchors A34 (VC2341) and A77 (VC2344) showed increases in measured load of 0.07 kN and 1.30 kN, respectively.

Anchor A77(Load cell VC2344) registered the highest maximum recorded load of 231.20 kN on September 20, 2024, after a battery was used to power up the datalogger for the readings.

The pattern of movements is attributed to frost pressures on the back of the wall. Anchor A19 (Load cell VC2340A19) measured its highest load after the spring thaw in July 2023, before relaxing slightly. Anchor A77 (Load cell VC2344) has continued showing an overall trend of increasing load with a smaller post-winter relaxation than seen in the other anchors. Overall, the anchor loads have risen significantly since they were locked off, and anchors A19, A34, and anchor A77 are currently above their SLS design loads but have not exceeded the 270 kN load that would require remedial measures. The load cells will need to be closely monitored to see if the increased movement trend continues. The load cell readings are plotted on Figure PH009-13 in Appendix A.

Pile head deflections measured by the SAA are within an acceptable range (below the estimated SLS Design Values, measured since anchor lock-off: of 18 mm for SAA-P34, 7 mm for SAA-P77, and 39 mm for SAA-P113). More deflection is noted, as expected, in the cantilever section of

	the wall (SAA-P113). The additional deflection in SAA-P34 may be due to the deeper amount of cut as compared to the slope below SAA-P77. This will require additional readings and analysis to interpret and will be considered as part of the ongoing development of threshold criteria for this pile wall. PIEZOMETER Standpipe piezometers SP05-1 and SP05-5 showed decreases in groundwater level of 0.51 and 0.54 m respectively, since the spring of 2024 readings. Standpipe piezometers SP05-4, SP09-10, and SP19-3 showed increases in groundwater level of 1.11 m, 1.69 m, and 1.04 m, respectively, since the spring of 2024 readings. SP11-06, SP09 8, and SP09-9 continued to be dry (SP09-8 and SP09-9 have been dry since installation). The water levels measured in the standpipes have not demonstrated a trend. The results of the standpipe piezometers are summarized in Table PH009-5, and are plotted in Figure PH009-14 in Appendix A. Historical standpipe piezometer readings are presented in Figure PH009-15. VW09-4 showed a slight decrease in ground water level of 0.11 m since the spring of 2024 readings; the groundwater levels have been trending downward since 2012. VW09-3 has been dry since August 2009. The vibrating wire piezometer results are summarized in Table PH009-6, and are plotted in Figure PH009-16 in Appendix A. Pneumatic piezometer PN15-5A showed a decrease in groundwater level of 0.02 m since the previous reading in spring of 2024. PN19-5B showed an increase in groundwater level of 0.02 m since the spring of 2024 readings and has had a slight increasing trend overall since installation (February 2019). Pneumatic piezometer results are summarized in Table PH009-7, and are plotted in Figure PH009-16 in Appendix A.
Future Work:	The instruments should be read again in the spring of 2024. The movement rate in SI11-01 should be monitored carefully as it is beyond the north extent of the wall and has been slow to respond to completion of the pile wall which slowed movements significantly in the other inclinometers. The instruments at the pile wall, particularly for the load cells, will need to be frequently monitored to see if the loads increase. At present, the loads, strain, and deflections are within acceptable limits based on the modeling done during detailed design of the wall.
Instrumentation Repairs:	Some time after the fall of 2023 readings, the datalogger enclosure was broken into and the batteries were stolen. A temporary battery was used to power the datalogger and download readings on May 22 and September 20, 2024. The battery inside the datalogger enclosure should be replaced, and the lock modified to prevent future break ins. Some of the conduit connecting to the enclosure also needs to be repaired. This work is planned for later in fall of 2024.
Additional Comments:	Slope inclinometer SI09-4 was reinitialized June 13, 2020. SI09-4 was slightly damaged during construction but was repaired at the completion of grading.

Attachments:	▪ Table PH009-1 Fall 2024 – Shop Slide Slope Inclinometer Instrumentation Reading Summary ▪ Table PH009-1A Fall 2024 – Shop Slide Slope Inclinometer Instrumentation Reading Summary (Inactive Instruments) ▪ Table PH009-2: Fall 2024– Shop Slide Shape Accelerometer Array Instrumentation Reading Summary ▪ Table PH009-3: Fall 2024 – Shop Slide Vibrating Wire Strain Gauge Instrumentation Reading Summary ▪ Table PH009-4: Fall 2024 – Shop Slide Vibrating Wire Load Cell Instrumentation Reading Summary ▪ Table PH009-5 Fall 2024 – Shop Slide Standpipe Piezometer Instrumentation Reading Summary ▪ Table PH009-6: Fall 2024 – Shop Slide Vibrating Wire Piezometer Instrumentation Reading Summary ▪ Table PH009-7: Fall 2024 – Shop Slide Pneumatic Piezometer Instrumentation Reading Summary ▪ Statement of Limitations and Conditions ▪ Appendix A □ Field Inspector's report □ Site Plan Showing Approximate Instrument Locations (Drawings No. 32121 PH009 1, 32121-PH009-2, and 32121-PH009-3) □ SI Reading Plots □ SAA Reading Plots □ Figures PH009-1 through PH009-12 (Vibrating Wire Strain Gauge Readings) □ Figure PH009-13 (Vibrating Wire Load Cell Readings) □ Figure PH009-14 (Active Standpipe Piezometer Readings) □ Figure PH009-15 (Historical Standpipe Piezometer Readings) □ Figure PH009-16 (Vibrating Wire Piezometer Readings) o Figure PH009-17 (Pneumatic Piezometer Readings)

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

Yours very truly,
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THURBER ENGINEERING LTD.
RM SIGNATURE: _____
RM APEGA ID #: 91085
DATE: November 21, 2024
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Lucas Green, P.Eng.
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Table PH009-1A: Fall 2024 – Old Hwy 2:02 Shop Slide Slope Inclinometer Instrumentation Reading Summary

Date Monitored: September 20, 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	CURRENT RATE OF MOVEMENT (mm/yr)	CHANGE IN RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr)
SI05-1	Jun.6, 2005	31.3 over 0.0 m to 3.0 m depth in 56° direction	21.0 between Sept. 2010 and May 2011	Operational	May 22, 2024	No Discernible Movement	N/A	-4.3
SI09-3	August 20, 2009	No discernible movement	N/A	Operational	May 22, 2024	N/A	N/A	N/A
SI09-4	June 13, 2020 (Reinitialized)	6.3 over 8.6 m to 10.5 m depth in 54° direction	6.9 in October 2021	Operational	May 22, 2024	0.2	0.5	0.3
		4.1 over 11.7 m to 13.5 m depth in 54° direction	13.0 in October 2021			0.3	0.8	0.3
SI11-01	May 21, 2015	17.4 over 13.9 m to 16.3 m depth in 81° direction	34.3 in June 14, 2022	Operational	May 22, 2024	No Discernible Movement	N/A	-5.5
		6.9 over 23.0 to 25.4 m depth in the 301° direction	21.9 in March 9, 2022			3.3	10.1	10.4

Drawings 32121-PH009-1 through 32121-PH009-3 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site

Table PH009-1A: Continued… Fall 2024 – Old Hwy 2:02 Shop Slide Slope Inclinometer Instrumentation Reading Summary

Date Monitored: September 20, 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	CURRENT RATE OF MOVEMENT (mm/yr)	CHANGE IN RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr)
SI19-5	June 25, 2019	8.7 over 8.2 m to 11.2 m depth in 111° direction	8.8 in September 2023	Operational	May 22, 2024	0.4	1.1	0.5
		9.8 over 17.9 m to 19.7 m depth in 111° direction	12.4 in July 2021			0.1	0.4	0.4

Table PH009-1A: Fall 2024 – Old Hwy 2:02 Shop Slide Slope Inclinometer Instrumentation Reading Summary (Inactive Instruments)

Date Monitored: Not monitored

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	CURRENT RATE OF MOVEMENT (mm/yr)	CHANGE IN RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr)
SI05-2	*Jun. 6, 2005*	*70.6 mm over 0.2 m to 11.8 m depth in 20° direction*	*33.9 mm/yr between Oct. 2007 and May 2008*	*Sheared at 10.7 m depth*	*May 27, 2009*	*N/A*	*N/A*	*N/A*
		73.0 mm over 8.7 m to 11.8 m depth in 20° direction	*36.4 mm/yr between May and Oct. 2007*			*N/A*	*N/A*	*N/A*
SI05-3	*Jun. 6, 2005*	*3.8 mm over 0.2 m to 2 m depth in 15° direction*	*9.2 mm/yr between May 2009 and Sept. 2009*	*Sheared at 17.5 m depth*	*September 23, 2009*	*N/A*	*N/A*	*N/A*
		8.0 mm over 8.1m to 10 m depth in 15° direction	*6.1 mm/yr between May and Oct. 2007*			*N/A*	*N/A*	*N/A*
		11.2 mm over 11.8 m to 14.2 m depth in 15° direction	*9.1 mm/yr between May and Oct. 2007*			*N/A*	*N/A*	*N/A*
		23.8 mm over 15.5 m to 17.9 m depth in 15° direction	*11.6 mm/yr between May and Oct. 2007*			*N/A*	*N/A*	*N/A*
		4.2 mm over 19.7 m to 22.2 m depth in 15° direction	*2.7 mm/yr between Jun. and Aug. 2005*			*N/A*	*N/A*	*N/A*

Drawings 32121-PH009-1 through 32121-PH009-3 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site

Table PH009-1A – Continued… Fall 2024 – Old Hwy 2:02 Shop Slide Slope Inclinometer Instrumentation Reading Summary (Inactive Instruments)

Date Monitored: Not monitored

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	CURRENT RATE OF MOVEMENT (mm/yr)	CHANGE IN RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr)
SI05-4	*Jun. 6, 2005*	*53.8 mm over 5.2 m to 8.3 m depth in 47° direction*	*21 mm/yr between May and Oct. 2007*	*Sheared at 6.7 m depth*	*June 9, 2012*	*N/A*	*N/A*	*N/A*
SI09-1	*August 20, 2009*	*152.1 mm over 0.3 m to 2.2 m depth in 50° direction*	*215.6 mm/yr in May 2011*	*Sheared at 1.8 m depth*	*June 1, 2011*	*N/A*	*N/A*	*N/A*
		3.4 mm over 7.1 m to 8.3 m depth in 50° direction	*5.8 mm/yr in September 2009*			*N/A*	*N/A*	*N/A*
		10.6 mm over 11.9 m to 13.8 m depth in 50° direction	*29.0 mm/yr in September 2009*			*N/A*	*N/A*	*N/A*
SI09-2	*August 20, 2009*	*156.4 mm over 0.1 m to 3.8 m depth in 25° direction*	*270.4 mm between May 2009 and September 2010*	*Destroyed*	*September 21, 2010*	*N/A*	*N/A*	*N/A*

Drawings 32121-PH009-1 through 32121-PH009-3 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site

Table PH009-2: Fall 2024 – Old Hwy 2:02 Shop Slide Shape Accelerometer Array Instrumentation Reading Summary

Date Monitored: September 20, 2024

INSTRUMENT #	DATE INITIALIZED	TOTAL CUMULATIVE RESULTANT MOVEMENT AT NOTED DEPTH SINCE INITIAL READING (mm)	CURRENT STATUS	DATE OF PREVIOUS READING	INCREMENTAL MOVEMENT SINCE PREVIOUS READING (mm)	AVERAGE RATE OF MOVEMENT (1, 2) (mm/yr)	CHANGE IN AVERAGE RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr)
Manual Readings November 24, 2021 – April 13, 2022(1)							
SAA-P34	November 24, 2021	13.0 over 1.8 m to 20.8 m depth	Operational	April 13, 2022	N/A	33.8	N/A
SAA-P77	November 24, 2021	18.4 over 1.8 m to 20.8 m depth	Operational	January 19, 2022(2)	N/A	119.7	N/A
SAA-P113	February 2, 2022	3.9 over 1.4 m to 25.9 m depth	Operational	April 13, 2022	N/A	20.1	N/A
Datalogger Readings May 27, 2022 - Current(2)							
SAA-P34	May 27, 2022	8.0 over 1.8 m to 20.8 m depth	Operational	May 22, 2024	0.7	2.2	16.2
SAA-P77	May 27, 2022	3.6 over 1.8 m to 20.8 m depth	Operational	May 22, 2024	1.1	3.4	5.4
SAA-P113	May 27, 2022	15.3 over 1.4 m to 25.9 m depth	Operational	May 22, 2024	2.4	7.3	4.6

Drawings 32121-PH009-1 through 32121-PH009-3 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site

Notes:

1) Average rate of movement for manual readings is the average movement rate for entire monitoring period from November 24, 2021 to April 13, 2022.
2) The average movement rate for the data logger readings is the average movement rate between May 22, 2024, and September 20, 2024.

Table PH009-3: Fall 2024 – Old Hwy 2:02 Shop Slide Vibrating Wire Strain Gauge Instrumentation Reading Summary

Date Monitored: September 20, 2024

DEPTH FROM TOP OF PILE (m)	GAUGE #	TOTAL MICROSTRAIN (με)	CHANGE IN MICROSTRAIN SINCE PREVIOUS READINGS* (με)	MEASURED TEMPERATURE (°C)	GAUGE #	TOTAL MICROSTRAIN (με)	CHANGE IN MICROSTRAIN SINCE PREVIOUS READINGS* (με)	MEASURED TEMPERATURE (°C)
PILE P34								
UPSLOPE PILE FACE					**DOWNSLOPE PILE FACE**			
1.2	SR1854	-36.8	14.1	13.0	SR1853	5.1	-10.9	11.3
2.0	SE1017 (2 Tapes)**	47.7	17.3	11.6	SE1017 (3 Tapes)**	-84.1	14.7	12.2
3.3	SR1851	-70.7	15.1	10.9	SR1849	31.5	25.2	11.2
4.1	SE1017 (0 Tapes)**	-83.1	15.7	9.9	SE1017 (1 Tape)**	-1.6	24.2	10.4
5.1	SR1846	-48.6	15.1	8.5	SR1845	1.0	27.8	8.9
7.2	SR1843	66.5	11.0	7.1	SR1842	-120.4	8.2	7.2
9.3	SR1841	143.1	7.0	6.8	SR1840	-216.3	-1.1	6.8
11.1	SR1839	126.5	5.6	7.0	SR1838	-138.5	-2.0	6.9
13.2	SR1837	60.1	3.3	7.2	SR1835	-63.9	-0.6	7.1
15.0	SR1834	19.9	2.1	7.3	SR1832	-40.5	-0.1	7.3
17.2	SR1831	6.4	2.2	7.3	SR1829	-7.3	2.0	7.3

Drawings 32121-PH009-1 through 32121-PH009-3 in Appendix A provide a sketch of the approximate locations of the monitoring instrumentation for this site.

***** Previous readings on May 22, 2024

**Tapes were used to identify separate strain gauges with same serial number

Table PH009-3 – Continued… Fall 2024 – Old Hwy 2:02 Shop Slide Vibrating Wire Strain Gauge Instrumentation Reading Summary

Date Monitored: September 20, 2024

DEPTH FROM TOP OF PILE (m)	GAUGE #	TOTAL MICROSTRAIN (με)	CHANGE IN MICROSTRAIN SINCE PREVIOUS READINGS* (με)	MEASURED TEMPERATURE (°C)	GAUGE #	TOTAL MICROSTRAIN (με)	CHANGE IN MICROSTRAIN SINCE PREVIOUS READINGS* (με)	MEASURED TEMPERATURE (°C)
PILE P77								
UPSLOPE PILE FACE					DOWNSLOPE PILE FACE			
1.00	SR1865	-3.3	23.6	11.5	SR1861	-32.9	26.3	11.7
2.85	SR1857	-4.6	17.1	9.2	SR1856	-26.6	31.7	9.7
5.00	SR1855	-26.2	9.4	7.5	SR1852	-85.3	12.7	7.7
7.10	SR1850	12.5	12.0	6.8	SR1848	-143.7	-5.6	6.8
8.95	SR1847	18.4	11.3	6.8	SR1844	-143.8	-11.1	6.8
11.05	SR1836	-15.6	6.6	7.1	SR1833	-107.3	-7.1	7.1
12.90	SR1830	-29.8	4.4	7.3	SR1828	-84.9	-4.4	7.2
15.00	SR1827	-20.6	2.7	7.3	SR1826	-51.8	-1.4	7.2
17.10	SR1825	-27.8	1.7	7.2	SR1824	-43.2	0.4	7.3

Drawings 32121-PH009-1 through 32121-PH009-3 in Appendix A provide a sketch of the approximate locations of the monitoring instrumentation for this site.

***** Previous readings on May 22, 2024

Table PH009-3 – Continued… Fall 2024 – Old Hwy 2:02 Shop Slide Vibrating Wire Strain Gauge Instrumentation Reading Summary

Date Monitored: September 20, 2024

DEPTH FROM TOP OF PILE (m)	GAUGE #	TOTAL MICROSTRAIN (με)	CHANGE IN MICROSTRAIN SINCE PREVIOUS READINGS* (με)	MEASURED TEMPERATURE (°c)	GAUGE #	TOTAL MICROSTRAIN (με)	CHANGE IN MICROSTRAIN SINCE PREVIOUS READINGS* (με)	MEASURED TEMPERATURE (°c)
PILE P113								
UPSLOPE PILE FACE					**DOWNSLOPE PILE FACE**			
1.0	SR1820	*Not functioning*	*N/A*	*N/A*	SR1821	-53.6	23.1	11.1
2.8	SR1822	-1.0	0.0	8.9	SR1823	-76.9	17.1	8.9
4.9	SR1806	-20.9	19.8	7.2	SR1807	-67.2	6.4	7.3
6.9	SR1808	-17.4	8.9	4.7	SR1809	-60.1	-1.9	6.8
9.0	SR1810	-19.1	5.4	7.1	SR1811	*Not functioning*	*N/A*	*N/A*
11.2	SR1812	0.6	5.5	7.3	SR1813	-69.9	-3.6	7.2
13.3	SR1814	47.5	6.3	7.4	SR1815	-64.9	-4.0	7.4
15.3	SR1816	93.4	8.5	7.4	SR1817	-82.0	-3.2	7.4
17.0	SR1818	19.8	13.9	7.4	SR1819	-98.7	-2.6	7.4
19.0	SR1858	-12.2	5.7	5.7	SR1859	-127.3	-3.7	7.2
21.2	SR1860	-67.7	5.3	7.2	SR1862	-108.9	-3.3	7.2
23.2	SR1863	64.0	-0.2	7.0	SR1864	-2.6	2.3	7.0

Drawings 32121-PH009-1 through 32121-PH009-3 in Appendix A provide a sketch of the approximate locations of the monitoring instrumentation for this site.

***** Previous readings on May 22, 2024

Table PH009-4: Fall 2024 – Old Hwy 2:02 Shop Slide Vibrating Wire Load Cell Instrumentation Reading Summary

Date Monitored: September 20, 2024

ANCHOR NUMBER	LOAD CELL SERIAL #	WALL SECTION	SLS DESIGN LOAD / LOCK-OFF LOAD (kN)	MAXIMUM RECORDED LOAD (kN)	RECORDED LOAD (Sep. 20, 2024) (kN)	PREVIOUS RECORDED LOAD (May 22, 2024) (kN)	CHANGE IN LOAD SINCE PREVIOUS READING (kN)
A19	VC2340	1	202/100	232.51 on May 22, 2024	230.93	232.51	-1.58
A34	VC2341	1	202/100	230.84 on February 23, 2024	211.74	211.67	0.07
A51	VC2342	1	202/100	214.80 on February 23, 2024	172.99	177.83	-4.84
A67	VC2343	2	160/100	134.22 on April 1, 2023	128.81	130.53	-1.72
A77	VC2344	2	160/100	231.20 on Sep 20, 2024	231.20	229.90	1.30

Drawings 32121-PH009-1 through 32121-PH009-3 in Appendix A provide a sketch of the approximate locations of the monitoring instrumentation for this site.

Table PH009-5: Fall 2024 – Old Hwy 2:02 Shop Slide Standpipe Piezometer Instrumentation Reading Summary

Date Monitored: September 19, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM MEASURED WATER LEVEL BGS (m)	MEASURED WATER LEVEL BGS (m)	PREVIOUS READING (MAY 22, 2024) BGS (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
SP11-06	May 21, 2015	12.98	-	Active	8.31 on June 15, 2018	DRY	DRY	N/A
SP05-1	Jun. 6, 2005	9.91	N/A	Active	1.56 on June 9, 2012	8.23	7.72	-0.51
SP05-4	Jun. 6, 2005	9.91	N/A	Active	4.80 on May 18, 2008	6.41	7.52	1.11
SP05-5	Jun. 6, 2005	12.04	N/A	Active	2.55 on May 18, 2007	3.63	3.09	-0.54
SP09-8	August 20, 2009	23.77	393.778	Active	N/A	DRY	DRY	N/A
SP09-9	August 20, 2009	11.28	361.294	Active	N/A	DRY	DRY	N/A
SP09-10	August 17, 2009	21.03	379.506	Active	7.05 on June 15, 2018	8.29	9.98	1.69
SP19-3	February 7, 2019	9.25	393.650	Active	3.44 on June 13, 2020	3.69	4.73	1.04

Drawings 32121-PH009-1 through 32121-PH009-3 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site

Table PH009-6: Fall 2024 – Old Hwy 2:02 Shop Slide Vibrating Wire Piezometer Instrumentation Reading Summary

Date Monitored: September 20, 2024

INSTRUMENT	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER LEVEL ELEVATION (DEPTH, mBGS)	CURRENT GROUNDWATER ELEVATION (m) (DEPTH, mBGS)	PREVIOUS (MAY 22, 2024) GROUNDWATER ELEVATION (m) (DEPTH, mBGS)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
VW09-3 (10022)	August 18, 2009	356.40	361.73	Operational	359.86 m on August 18, 2009 (1.87)	DRY	DRY	N/A
VW09-4 (10021)	August 17, 2009	361.19	379.58	Operational	373.29 m on August 17, 2009 (7.26)	365.54 (14.04)	365.65 (13.93)	-0.11

Drawings 32121-PH009-1 through 32121-PH009-3 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site

Note: BGS = Below Ground Surface

Table PH009-7: Fall 2024 – Old Hwy 2:02 Shop Slide Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: September 20, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER LEVEL BGS (m)	MEASURED PORE PRESSURE (kPa)	CURRENT GROUNDWATER ELEVATION (m) (DEPTH, mBGS)	PREVIOUS (MAY 22, 2024) GROUNDWATER ELEVATION (m) (DEPTH, mBGS)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN19-5A	February 14, 2019	9.30	372.11	Repaired	365.55 on February 14, 2019	0.6	362.87 (9.24)	362.89 (9.22)	-0.02
PN19-5B	February 14, 2019	19.25	372.11	Active	367.41 on August 18, 2021	137.5	366.88 (5.23)	366.86 (5.25)	0.02

Drawings 32121-PH009-1 through 32121-PH009-3 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site

* PN19-5A not functioning during 2023

Note: BGS = Below Ground Surface

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.

ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP (CON0022164)
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING RESULTS

FALL 2024

APPENDIX A
DATA PRESENTATION

SITE PH009: OLD HWY 2:02 SHOP SLIDE

ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING FIELD SUMMARY (PH009)
FALL 2024

Location: Shop Slide (Old Hwy 2:02 km 0.000 to 0.365)
File Number: 32121
Probe: RST SI SET 8R
Cable: RST SI SET 8R
Readout: RST PN C 108 Unit 4, GK 404,S/N 364, DGSi Dipmeter
Casing size: 3.34/2.75
Temp degree C: 14
Read by: NKR/NRM

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location (UTM 11)		Date	Stickup (m)	Depth from top of Casing (ft)	Azimuth of A+ Groove (Mag N)	Current Bottom Depth Readings				Probe/ Reel #	Size (")	Remarks
	Easting (m)	Northing (m)					A+	A-	B+	B-			
SI05-1	480320.97	6232126.34	19-Sep-24	0.65	69 to 3	20°	-272	256	380	-370	8R/8R	2.75	
SI09-3	480391.11	6232279.95	19-Sep-24	1.10	53 to 3	355°	-483	494	197	-191	8R/8R	2.75	
SI09-4	480373.71	6232136.12	19-Sep-24	0.20	72 to 2	23°	-924	938	234	-237	8R/8R		Casing size 2.27" inside 3.34"
SI11-1	480200.11	6232265.25	19-Sep-24	1.08	98 to 2	75°	-359	373	108	-109	8R/8R	2.75	
SI19-5	480323.02	6232243.91	19-Sep-24	0.68	82 to 2	75°	357	-346	-581	581	8R/8R		

STANDPIPE PIEZOMETER (SP) 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)				
SP11-06	480372.32	6232387.56	19-Sep-24	1.02	Dry	13.05
SP05-1	480320.97	6232126.34	19-Sep-24	0.94	9.17	11.05
SP05-4	480345.06	6232200.36	19-Sep-24	0.97	7.38	9.70
SP05-5	480425.01	6232237.50	19-Sep-24	0.81	4.44	12.94
SP09-8	480224.19	6232191.23	19-Sep-24	0.96	Dry	24.73
SP09-9	480375.12	6232308.07	19-Sep-24	0.83	Dry	12.11
SP09-10	480402.11	6232110.94	19-Sep-24	1.13	9.42	21.78
SP19-3	480211	6232232	19-Sep-24	0.89	4.58	10.14

PNEUMATIC PIEZOMETER (PN) READINGS

PN#	GPS Location (UTM 11)		Date	Reading (kPa)	Identification Number
	Easting (m)	Northing (m)			
PN19-5A	Attached to SI19-5		19-Sep-24	0.6	38168
PN19-5B	Attached to SI19-5		19-Sep-24	137.5	38157

VIBRATING WIRE PIEZOMETER (VW) READINGS

VW #	GPS Location (UTM 11)		Date	Reading (Dg/^{0}C)	Identification
	Easting (m)	Northing (m)			
VW09-3	480391.11	6232279.95	19-Sep-24	9006.1/6.9	10022
VW09-4	480373.71	6232136.12	19-Sep-24	8791.6/6.6C	10021

ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING FIELD SUMMARY (PH009)
FALL 2024

Location:	Shop Slide (Old Hwy 2:02 km 0.000 to 0.365)	**Readout:**	Downloaded from Datalogger
File Number:	32121	**Casing size:**	3.34/2.75
Probe:		**Temp degree C:**	14
Cable:		**Read by:**	NKR

SHAPE ACCELEROMETER ARRAY (SAA) READINGS

SAA#	GPS Location (UTM 11)		Date	Download Reading from Datalogger	Identification Number
	Easting (m)	Northing (m)			
SAA-P34	Attached to Pile P34				401460
SAA-P77	Attached to Pile P77				401455
SAA-P113	Attached to Pile P113		20-Sep-24		401452

VIBRATING WIRE STRAIN GAUGE READINGS

PILE#	GPS Location (UTM 11)		Date	Download Reading from Datalogger	Strain Gauges
	Easting (m)	Northing (m)			
Pile P34	Attached to Pile P34				11 Upslope Face, 11 Downslope Face
Pile P77	Attached to Pile P77				9 Upslope Face, 9 Downslope Face
Pile 113*	Attached to Pile P113		20-Sep-24		12 Upslope Face, 12 Downslope Face*

VIBRATING WIRE LOAD CELL READINGS

Anchor #	GPS Location (UTM 11)		Date	Download Reading from Datalogger	Load Cells
	Easting (m)	Northing (m)			
A19	Attached to Pile P19				VC2340
A34	Attached to Pile P34				VC2341
A51	Attached to Pile P51		20-Sep-24		VC2342
A67	Attached to Pile P67				VC2343
A77	Attached to Pile P77				VC2344

* Vibrating Wire Strain Gauge SR1820 (Upslope) and SR1811 (Downslope) not functioning

*Download readings from Datalogger cabinet, requires key

H:\32000\32121 AT GRMP Peace River District 2021-2025\CAD\2023 INSTRUMENT\32121-PH009-1.dwg - 1N - Jul. 10, 2023

SP09-8
OLD HWY 2 R/W
SI05-1
TH05-1
REMOVED AND REINSTATED SIGN POST
800 mm Ø CSP
SP19-3
300 mm DIA 1/2 CULVERT
TH19-4
INSTALLED W-BEAM TERMINAL AS PER RDG-BI-5
REPLACED ASPHALT PAVEMENT
CONSTRUCTED CONCRETE DRAIN TROUGH
INSTALLED SALVAGED AND NEW W BEAM GUARDRAIL
SP19-2 (DAMAGED)
SP19-1
HIGHWAY 2 OFFRAMP
SEWER MAIN
WATERMAIN
OLD HWY 2
DATALOGGER
SAA-P113
SI11-01
W-BEAM GUARDRAIL
(DAMAGED) BH13/SP09-11
SP09-10
SI09-4/VW09-4
SI05-3 (SHEARED)
SP05-3
SP05-2/SI05-2 (SHEARED)
VC2344 SAA-P77
VC2343
VC2342
VC2341 SAA-P34
VC2340
SP09-7 (DAMAGED)
INSTALLED 14 m LONG 600 mm Ø CSP UNDER PATH
CONCRETE SWALE
SI09-2/VW09-2 (DESTROYED)
≈21%
≈26%
OLD HWY 2 R/W
S.W. 1/4 SEC. 31-83-21-5
≈25%
TRM
CLASS 1M RIPRAP
SP09-6 (DAMAGED)
CLASS 1M RIPRAP
INSTALLED NEW PATH ALIGNMENT (SEE SHEET 22 FOR DETAILS)
CONSTRUCTED DRAINAGE SWALE
TRM
RIPRAP LINED DISSIPATION BOWL
SI19-5/PN19-5A/B
SI09-1/VW09-1 (SHEARED)
INSTALLED 150 mm DIA PERFORATED SUBDRAINS (SURROUNDED BY FILTER MATERIAL ENVELOPED IN NON-WOVEN GEOTEXTILE) TO DRAIN GRAVEL LAYER INTO DRAINAGE CHANNEL. SHOWN LOCATION IS APPROXIMATE AND TO BE FIELD FIT TO PLACE DRAINS IN AREA OF HIGHEST SEEPAGE AS DIRECTED BY THE CONSULTANT
SP05-4/SI05-4
SP09-5
CNR R/W
ECSB TYPE B (TYP)
DRAINAGE CHANNEL
600 mm Ø CSP
CLASS 1 RIPRAP
800 mm Ø CSP
SP05-5
760 STEEL CASING (1979)
400 STEEL CASING (1979)
SI09-3/VW09-3
SP09-9
SI8

N
E
S
W

0 10 20 30 40 50 60m
SCALE 1:500

LEGEND

- ASPHALT CEMENT PAVEMENT
- ASPHALT CEMENT SLOPE PROTECTION (40 mm THICK)
- EROSION CONTROL SOIL COVERING (TYPE B)
- PERMANENT RECP (TRM TYPE B, COMPLETE WITH SYNTHETIC PERMEABLE DITCH BARRIERS AT 15 m INTERVALS ALONG SWALE)
- CLASS 1M RIPRAP (0.4 m THICK)
- CLASS 1 RIPRAP (0.8 m THICK)
- FIBRE ROLL
- GUARDRAIL
- TELUS LINE (BURIED)
- GAS LINE
- POWER LINE AND POWER POLE
- GUY WIRE
- RAIL LINE
- ROW BOUNDARY
- SIGN POST
- TELUS UNDERGROUND VAULT
- DATALOGGER ENCLOSURE
- INSTRUMENT LOCATION
- NON-OPERATIONAL
- SI SLOPE INCLINOMETER
- VW VIBRATING WIRE PIEZOMETER
- SP STANDPIPE PIEZOMETER
- PN PNEUMATIC PIEZOMETER

Alberta

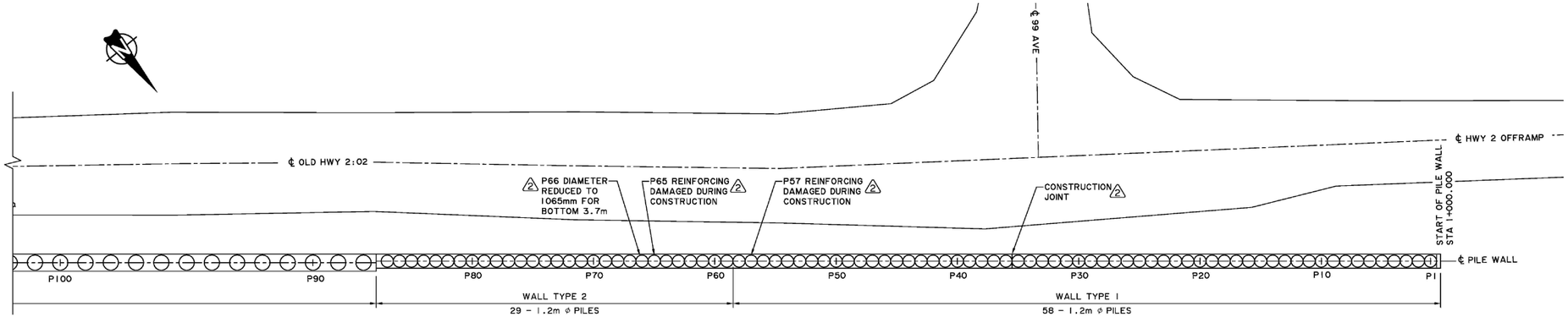
PEACE REGION (PEACE RIVER DISTRICT)

PH009: SHOP SLIDE
SITE PLAN SHOWING INSTRUMENT LOCATIONS

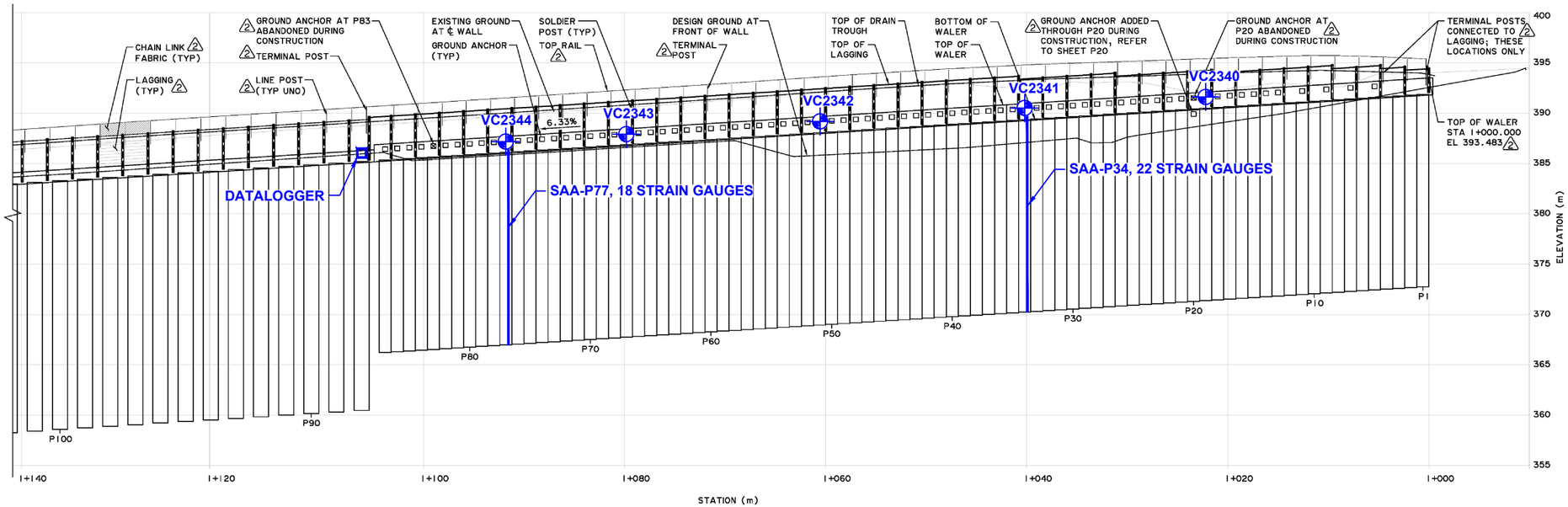
DWG No. 32121-PH009-1

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	DWP
SCALE	1:1500
DATE	JUNE 2023
FILE No.	3212

THURBER ENGINEERING LTD.



SITE PLAN
1:200



ELEVATION – PILE WALL

LEGEND

- INSTRUMENT LOCATION
- DATALOGGER ENCLOSURE

0 5 10 15 20 25 30m
SCALE 1:500

Alberta

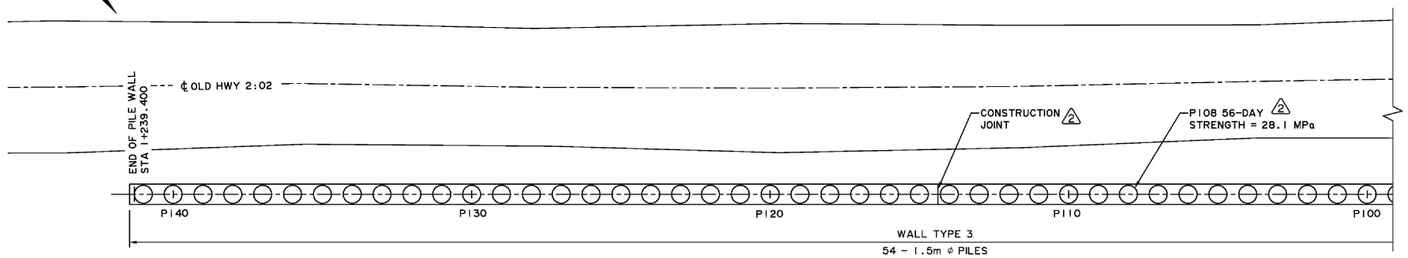
PEACE REGION (PEACE RIVER DISTRICT)

PH009: SHOP SLIDE
PILE WALL GENERAL LAYOUT 2

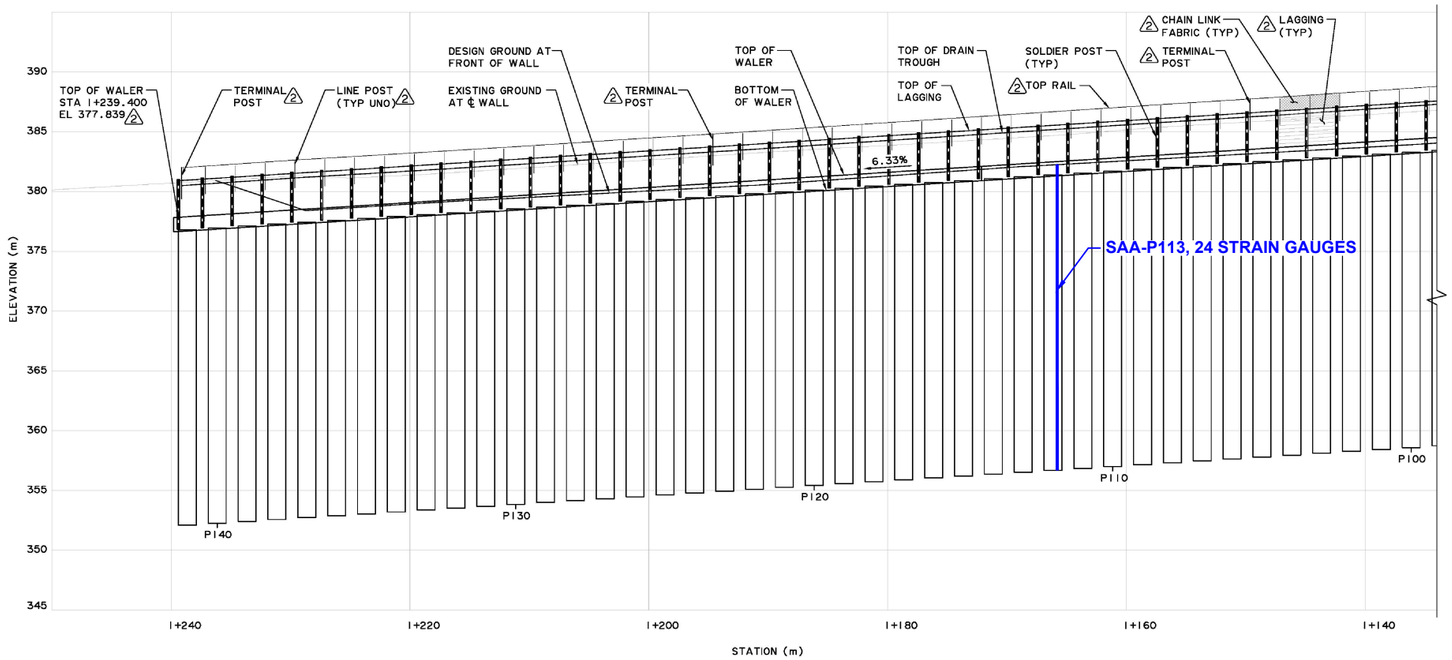
DWG No. 32121-PH009-2

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	DWP
SCALE	1:500
DATE	JUNE 2023
FILE No.	32121

THURBER ENGINEERING LTD.



SITE PLAN
1:200



ELEVATION – PILE WALL

0 5 10 15 20 25 30m
SCALE 1:500

Alberta

PEACE REGION (PEACE RIVER DISTRICT)

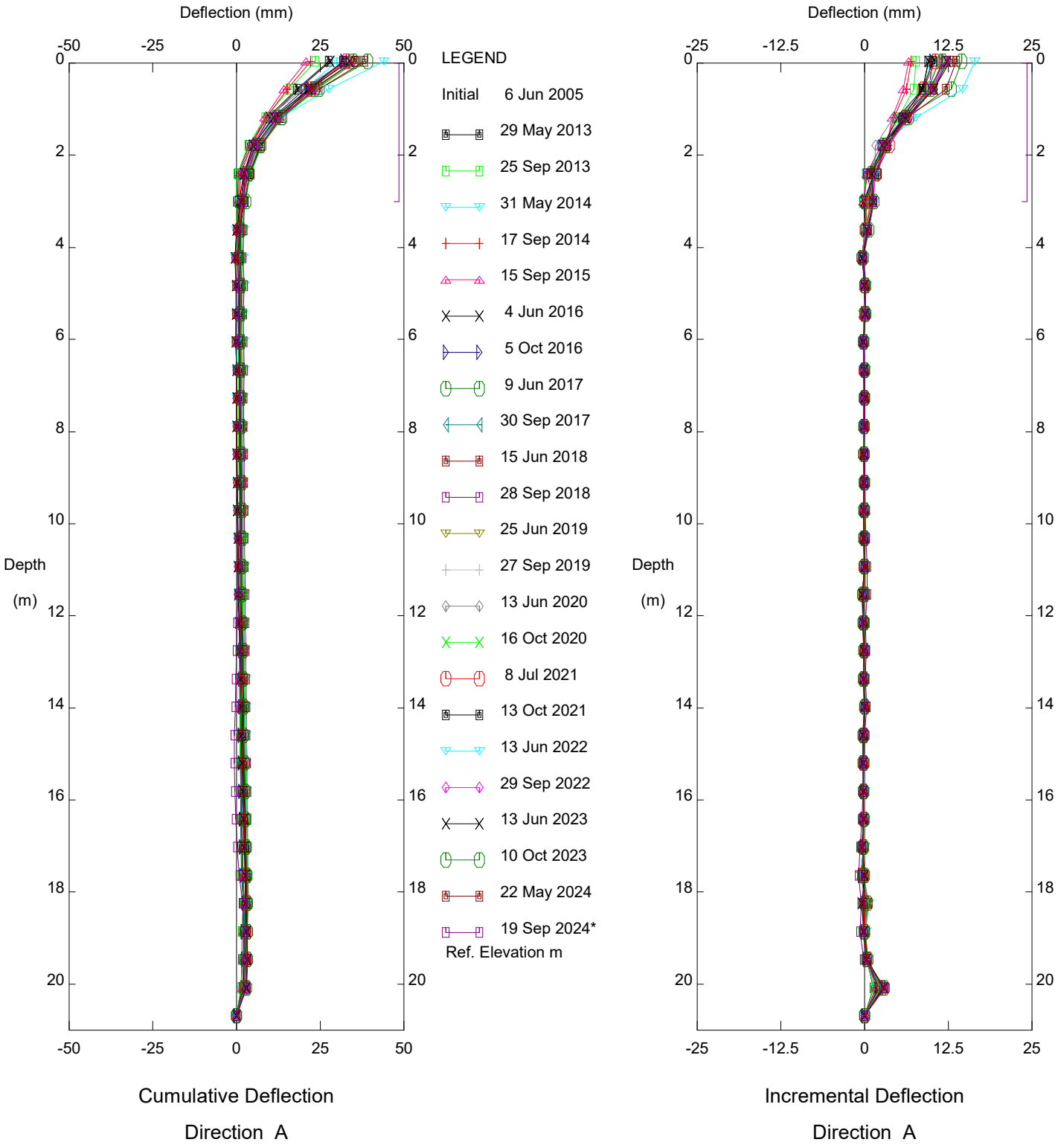
PH009: SHOP SLIDE
PILE WALL GENERAL LAYOUT 1

DWG No. 32121-PH009-3

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	DWP
SCALE	1:500
DATE	JUNE 2023
FILE No.	32121

THURBER ENGINEERING LTD.

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI05-1

Alberta Transportation

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

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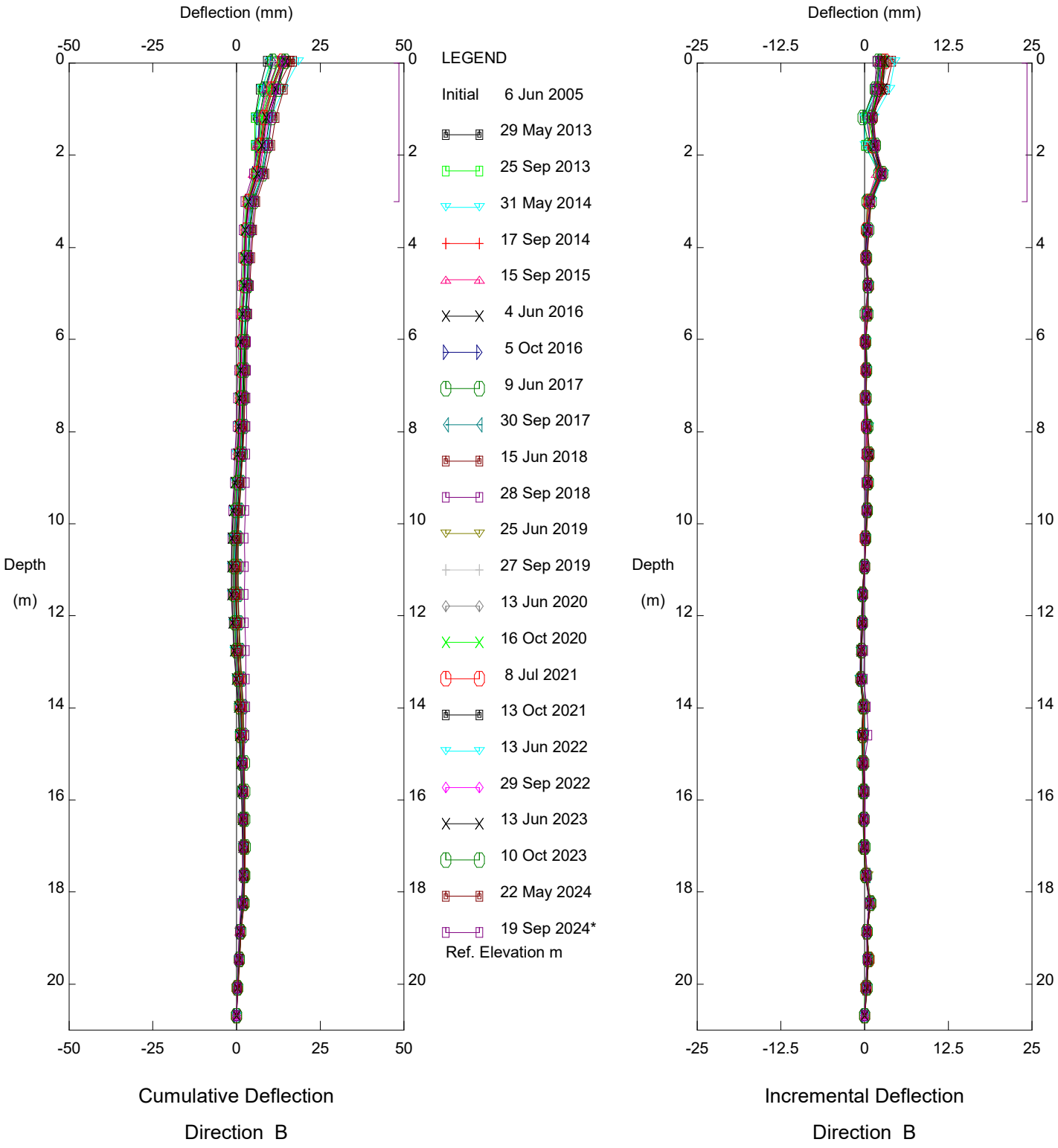
Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI05-1

Alberta Transportation

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

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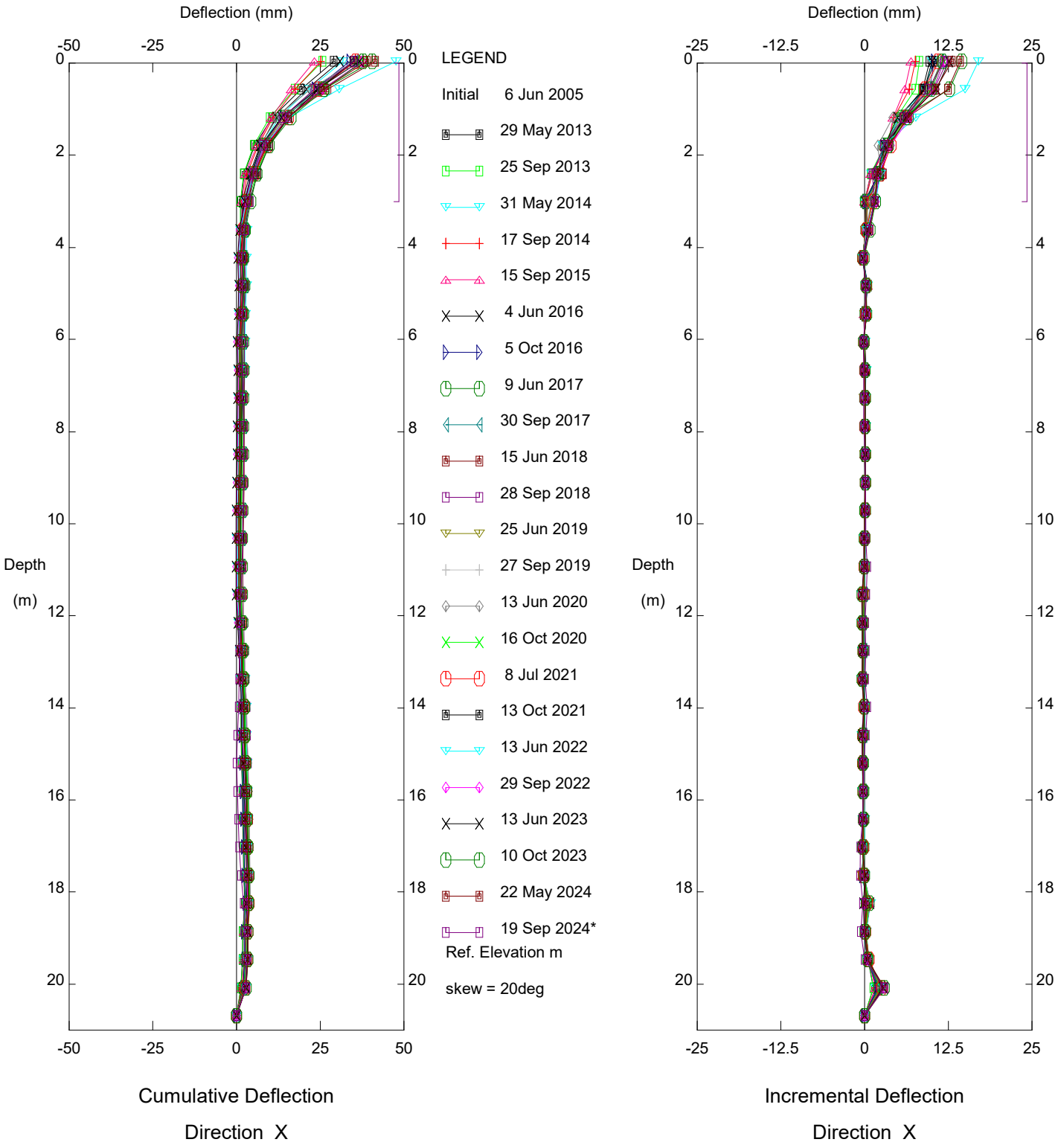
Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI05-1

Alberta Transportation

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

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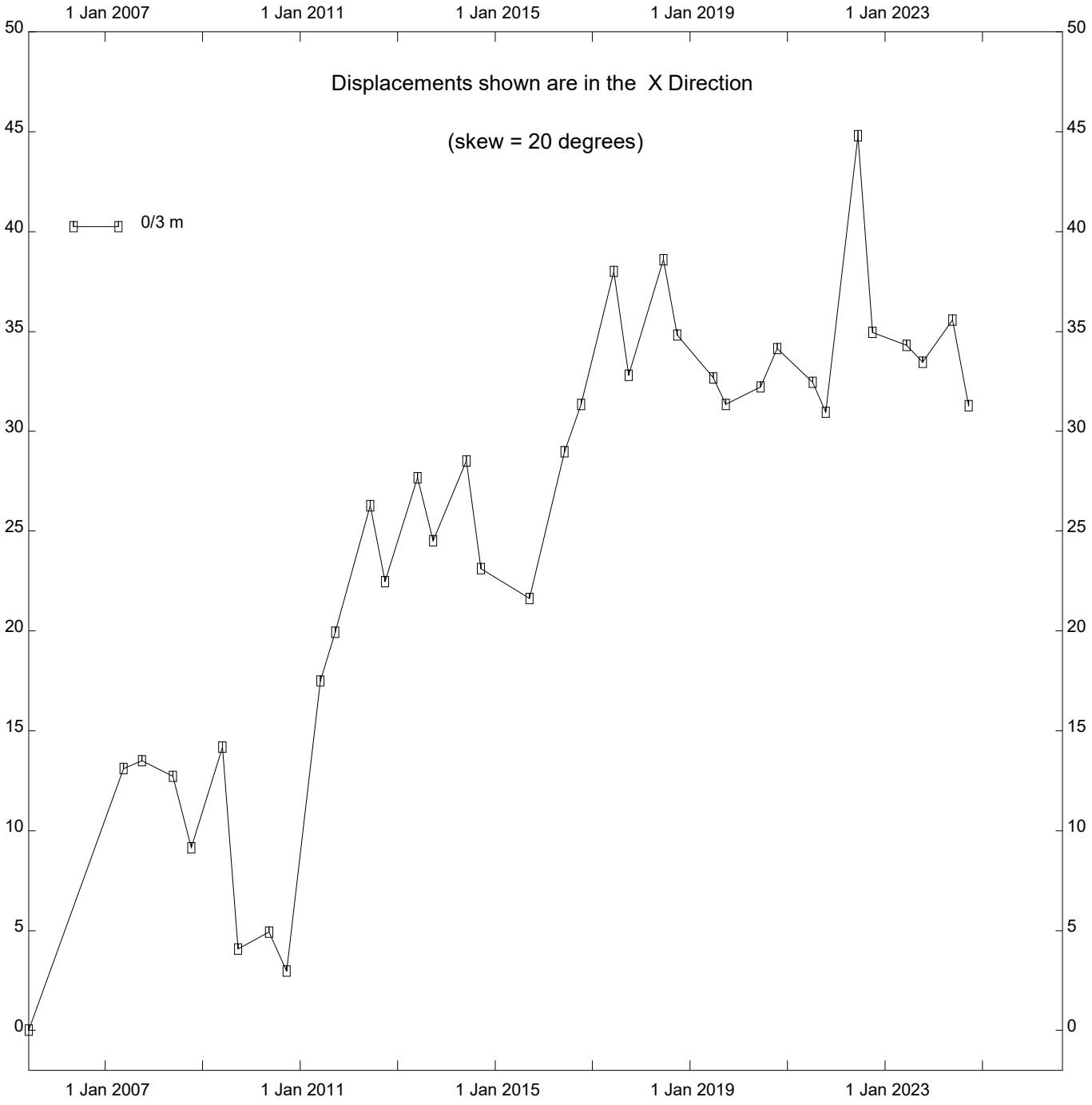
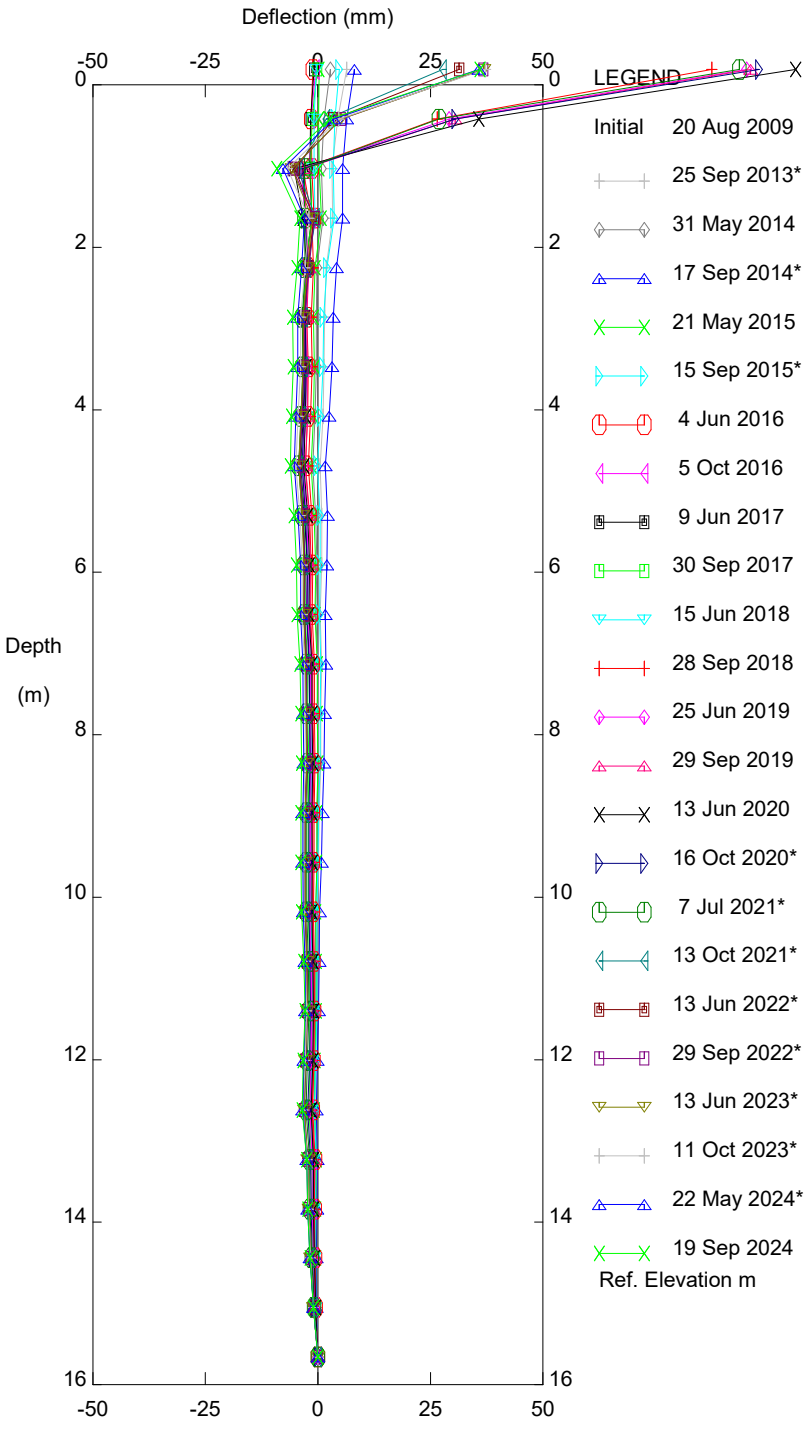
Thurber Engineering Ltd.



PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI05-1

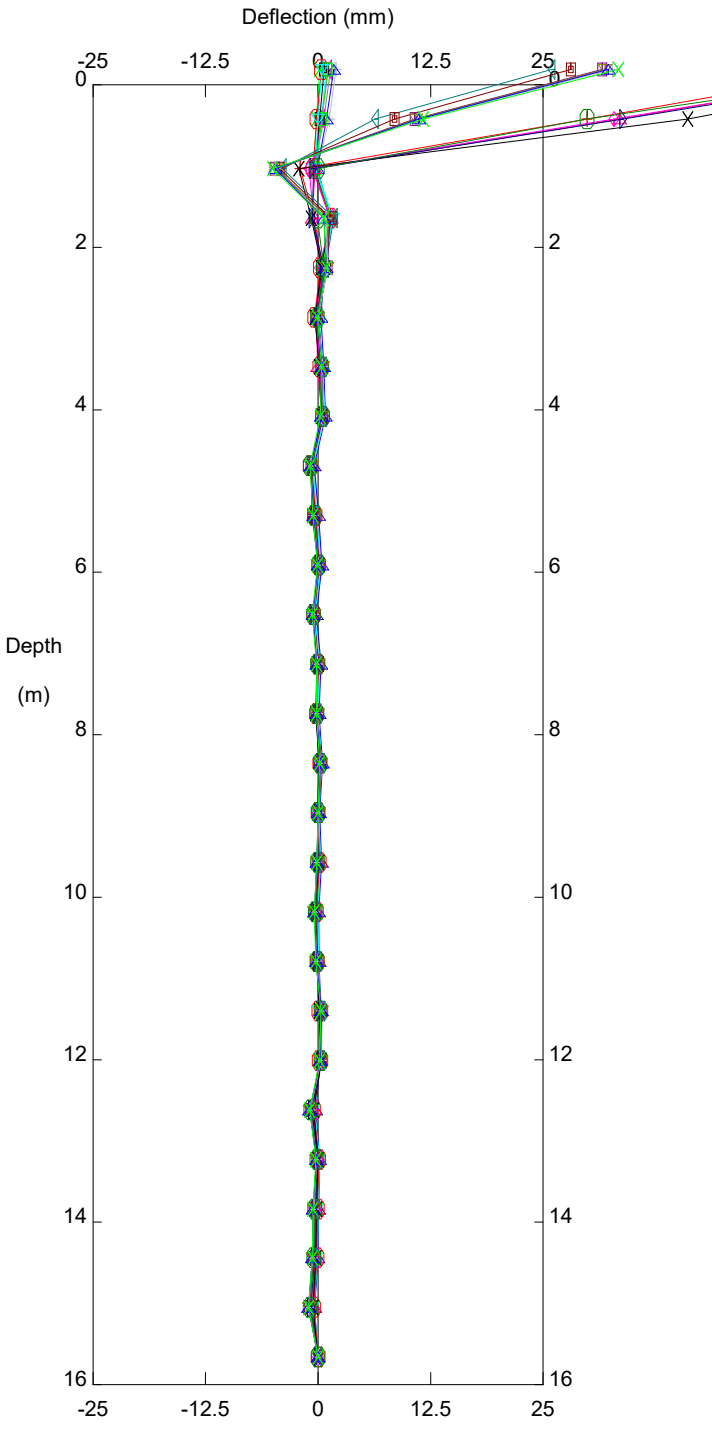
Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A



Incremental Deflection

Direction A

PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI09-3

Alberta Transportation

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

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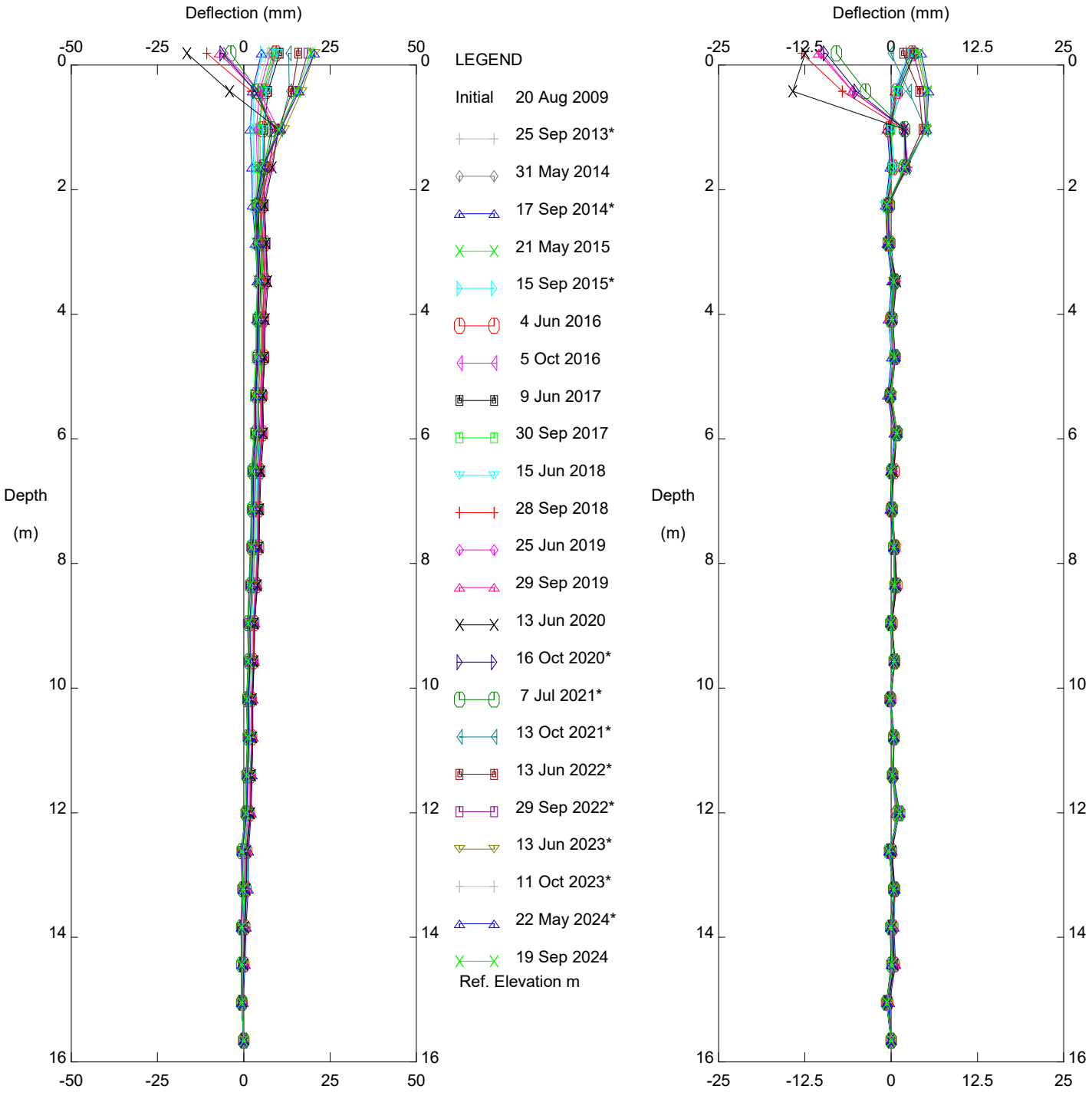
Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI09-3

Alberta Transportation

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

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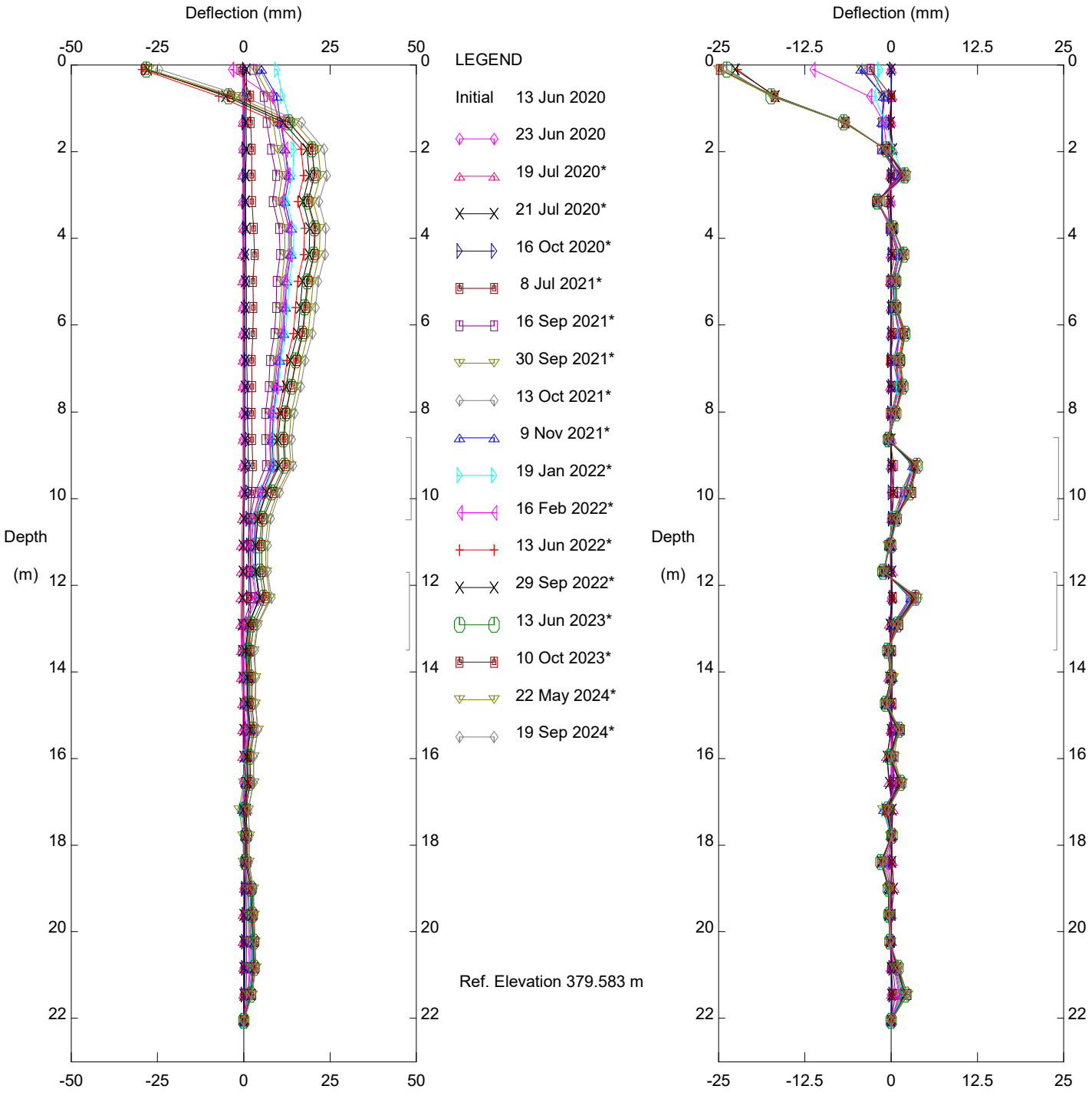
Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI09-4

Alberta Transportation

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

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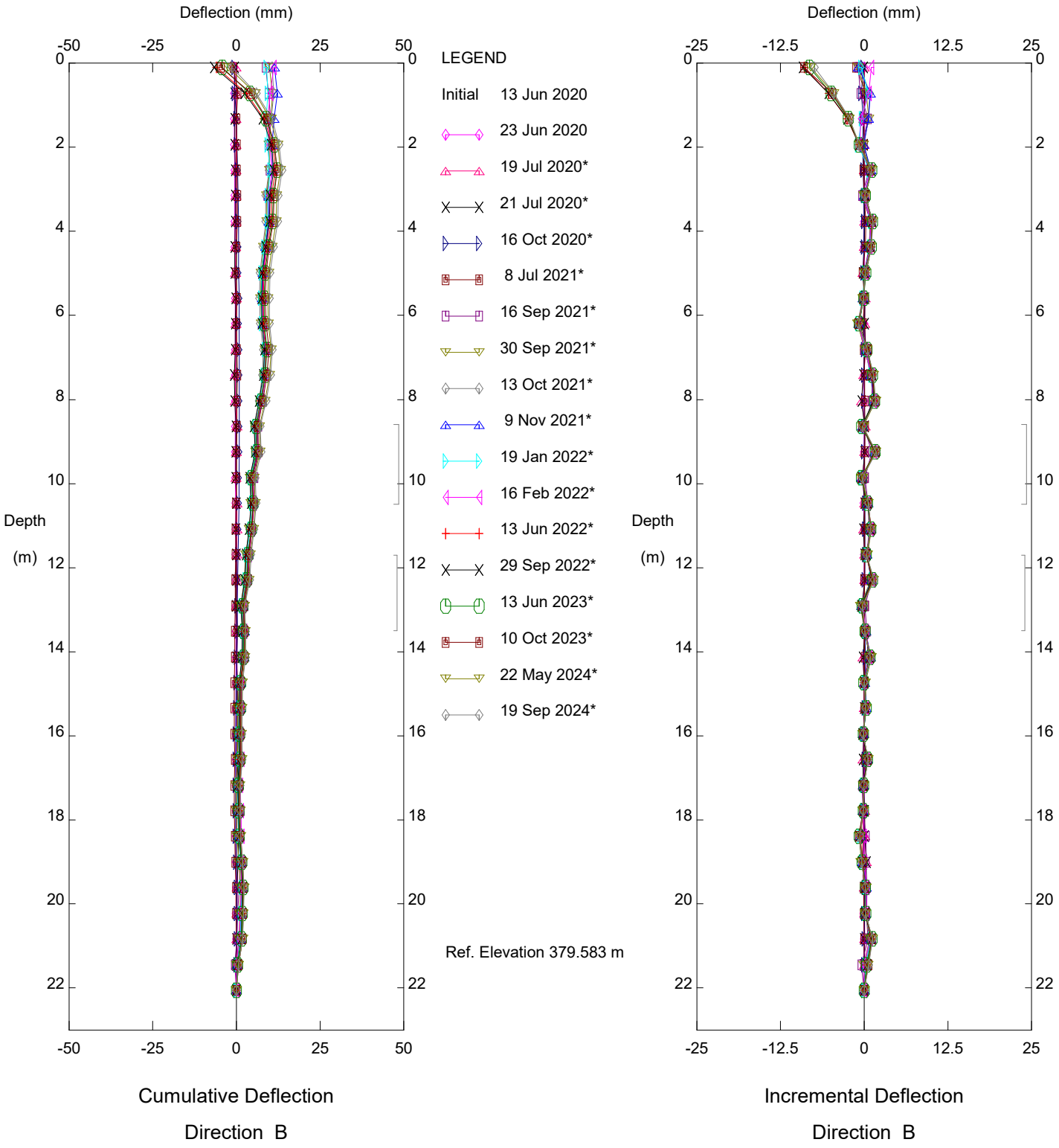
Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI09-4

Alberta Transportation

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

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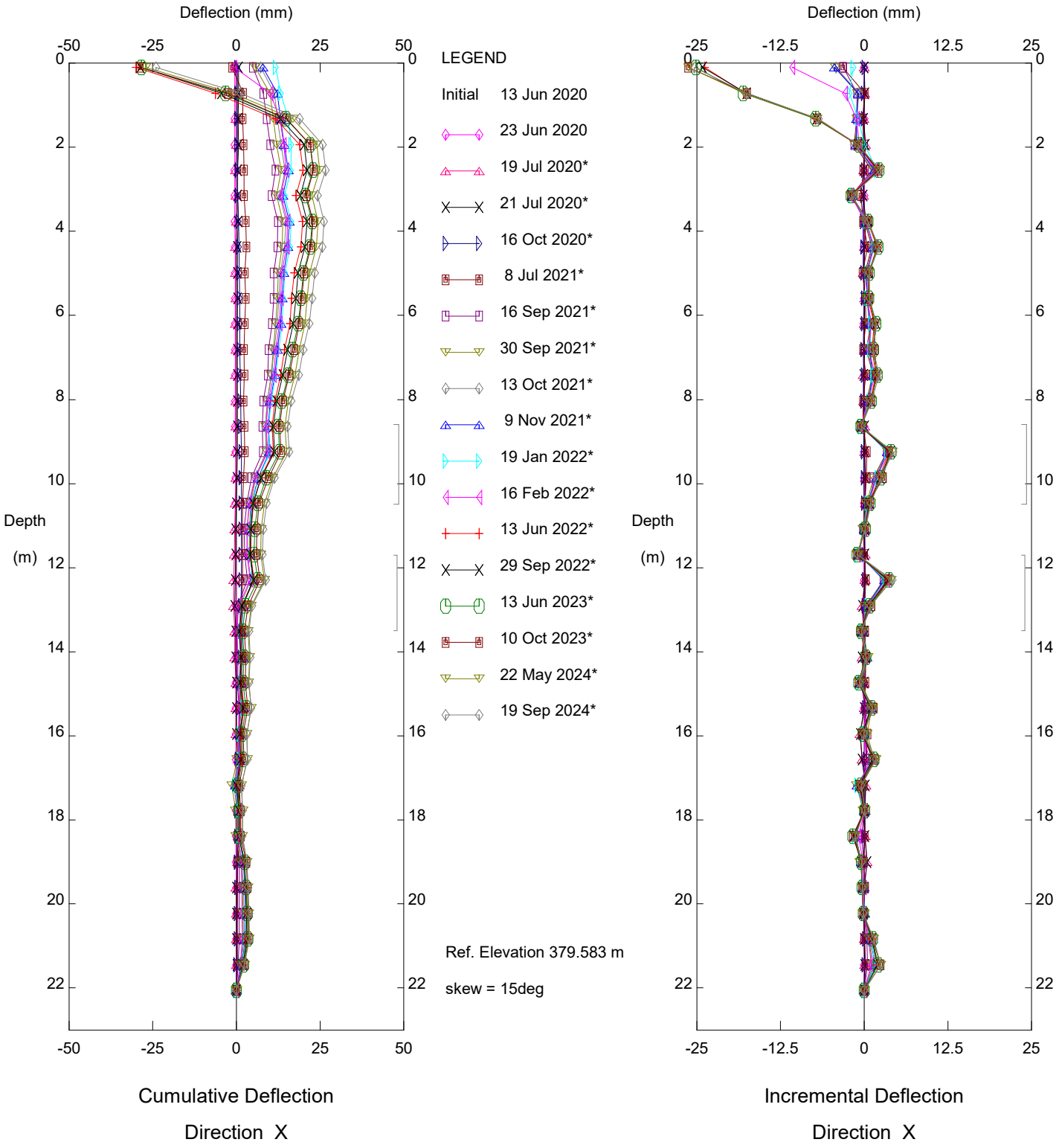
Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI09-4

Alberta Transportation

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

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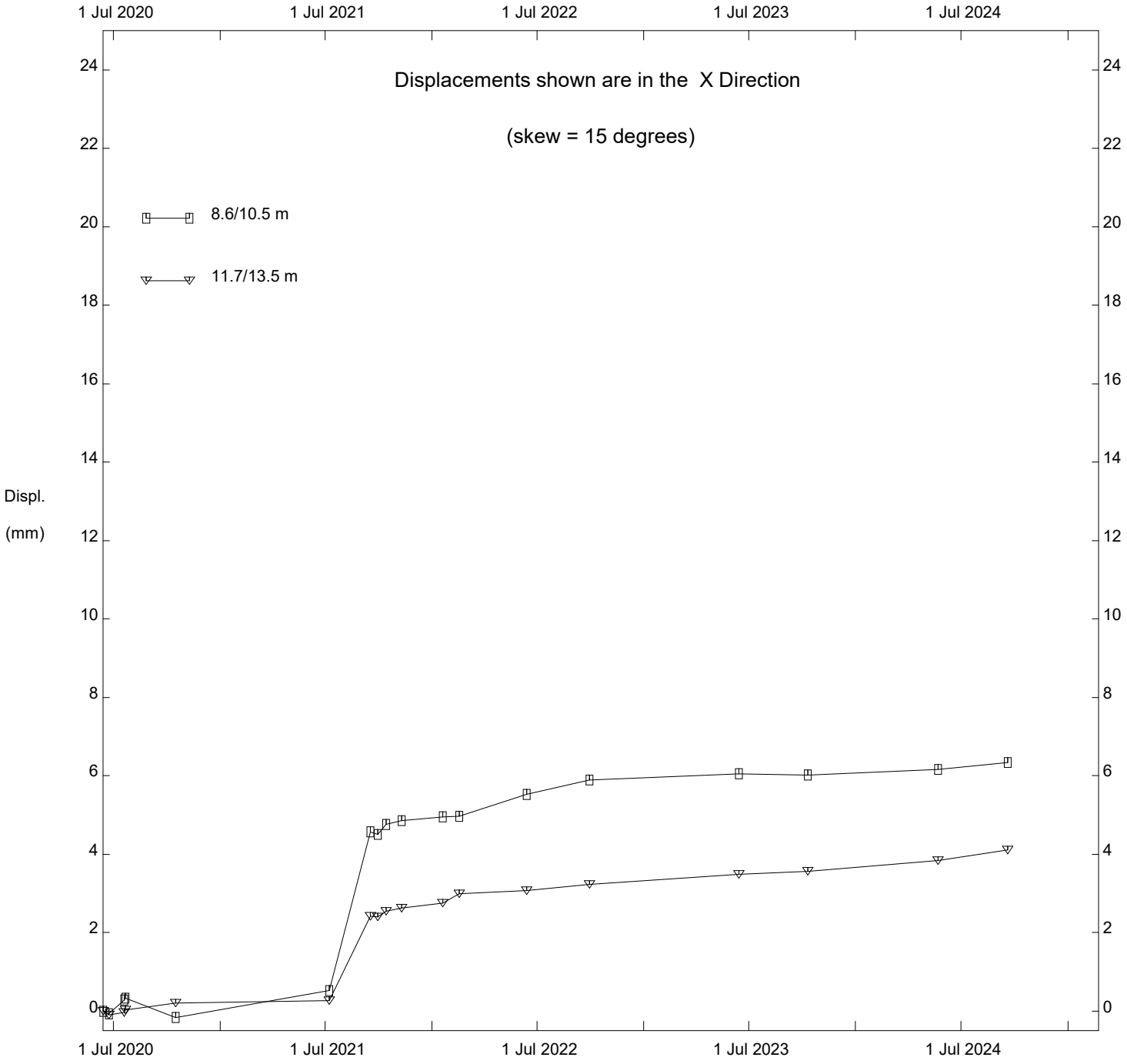
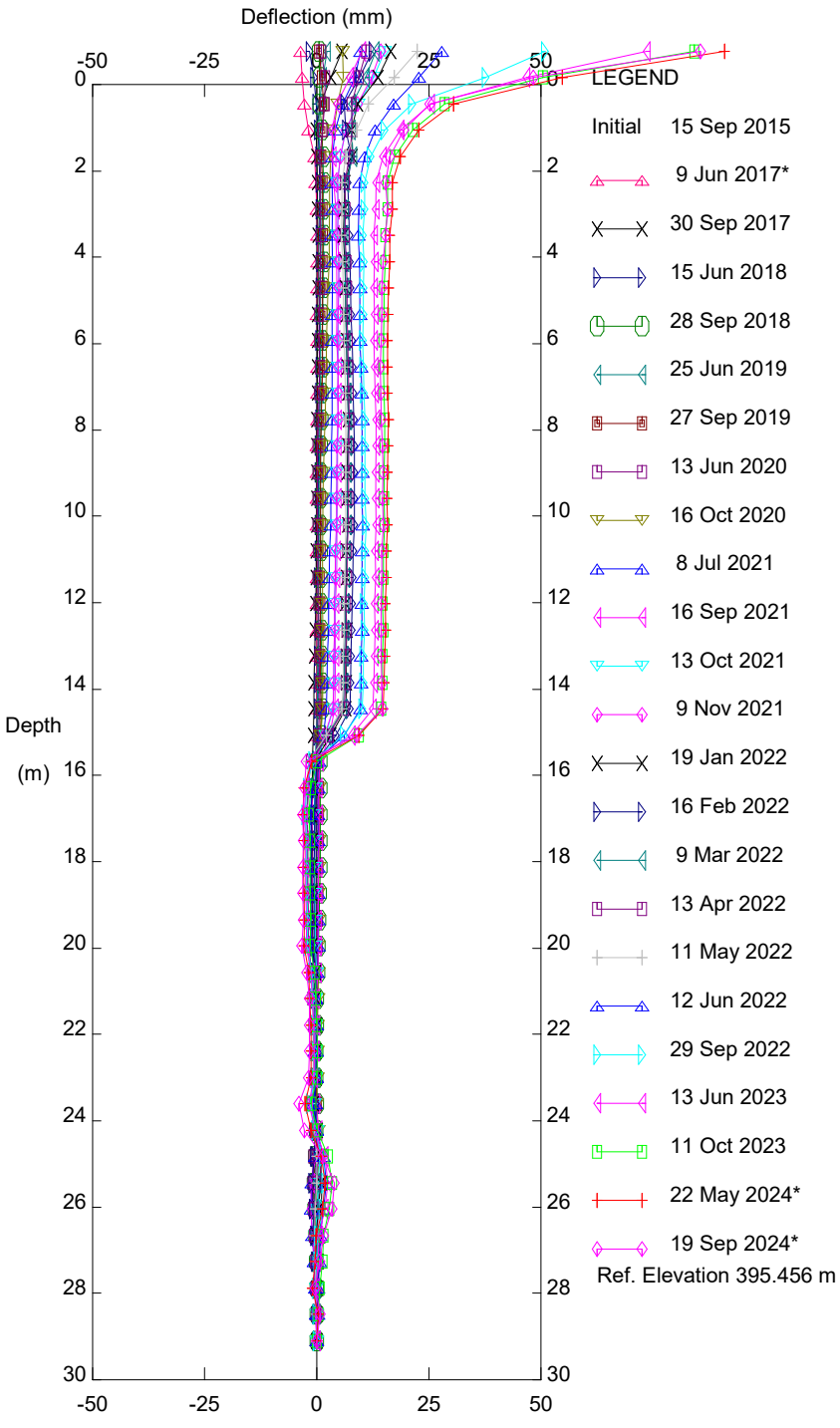
Thurber Engineering Ltd.



PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI09-4

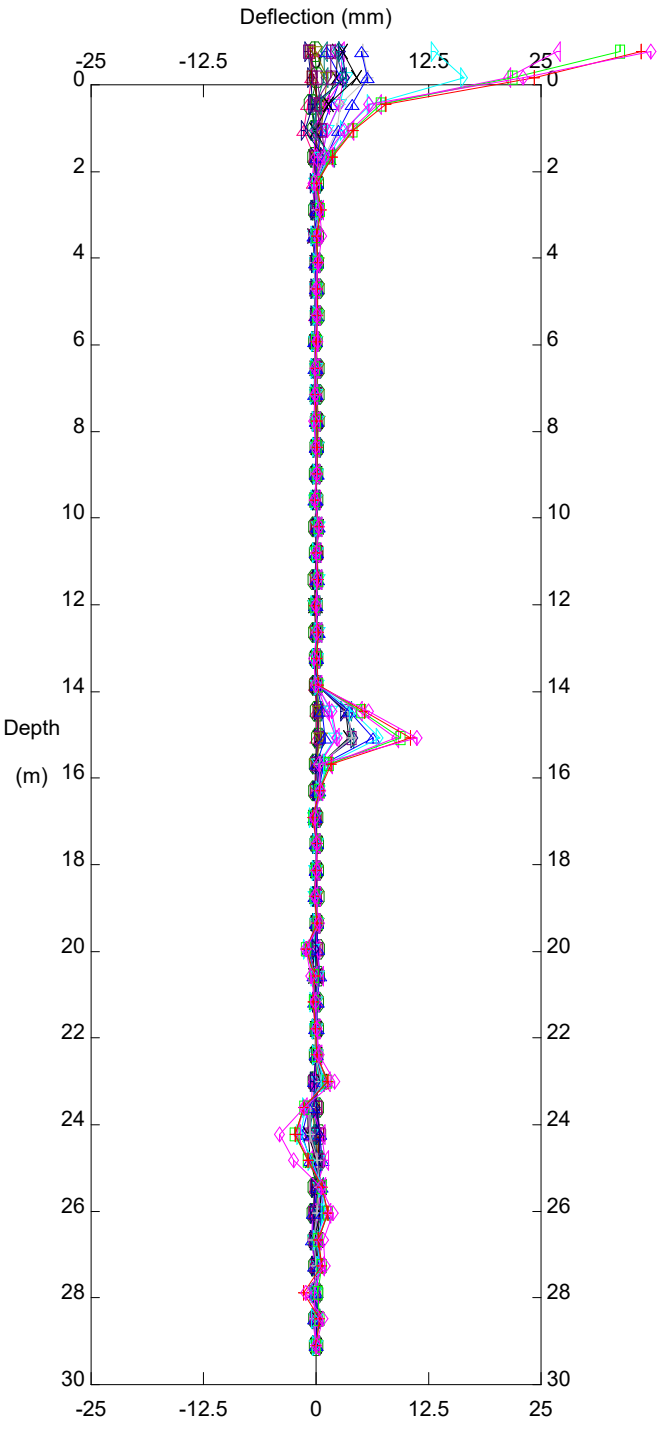
Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A



Incremental Deflection

Direction A

PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI11-01

Alberta Transportation

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

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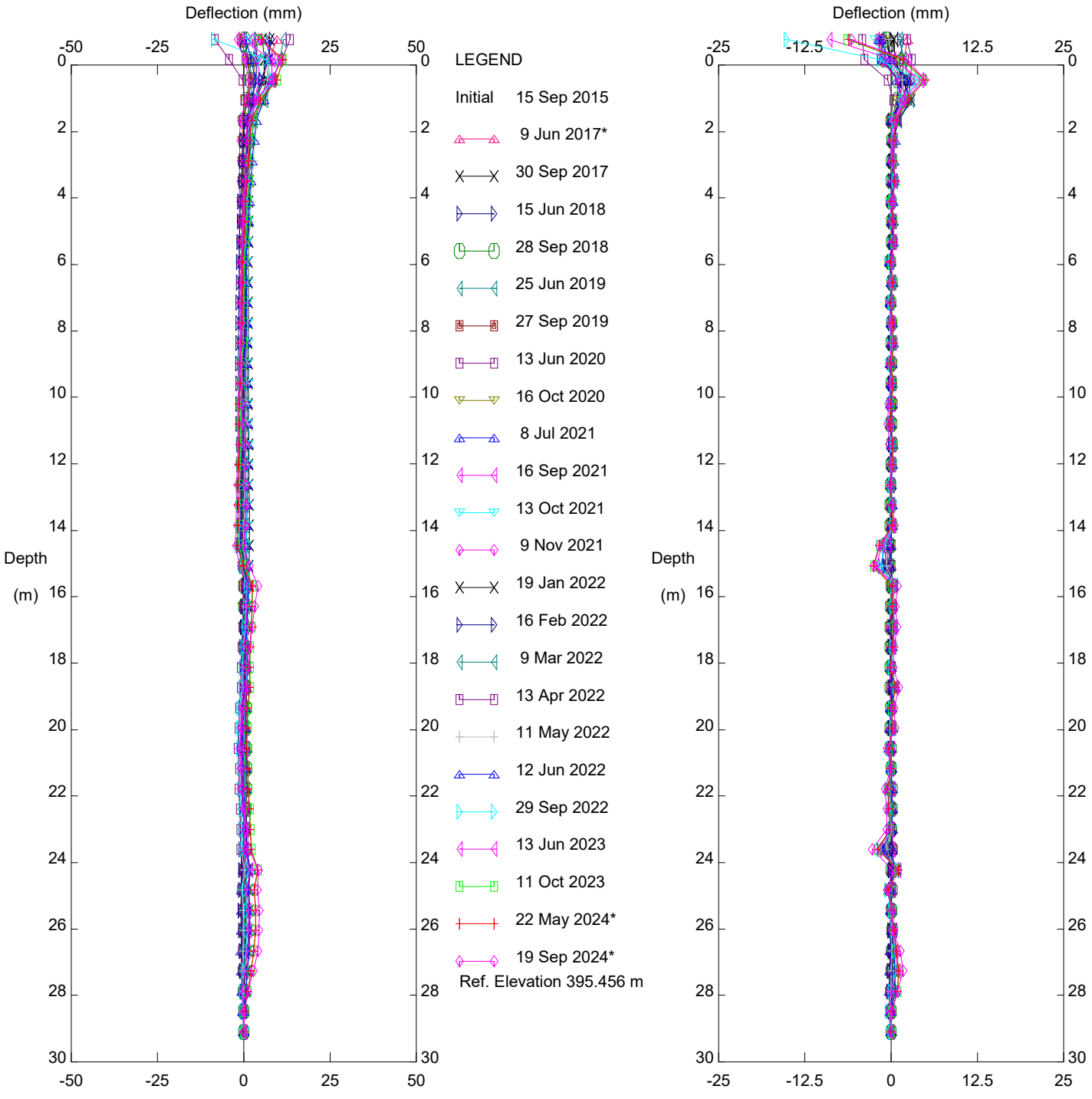
Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

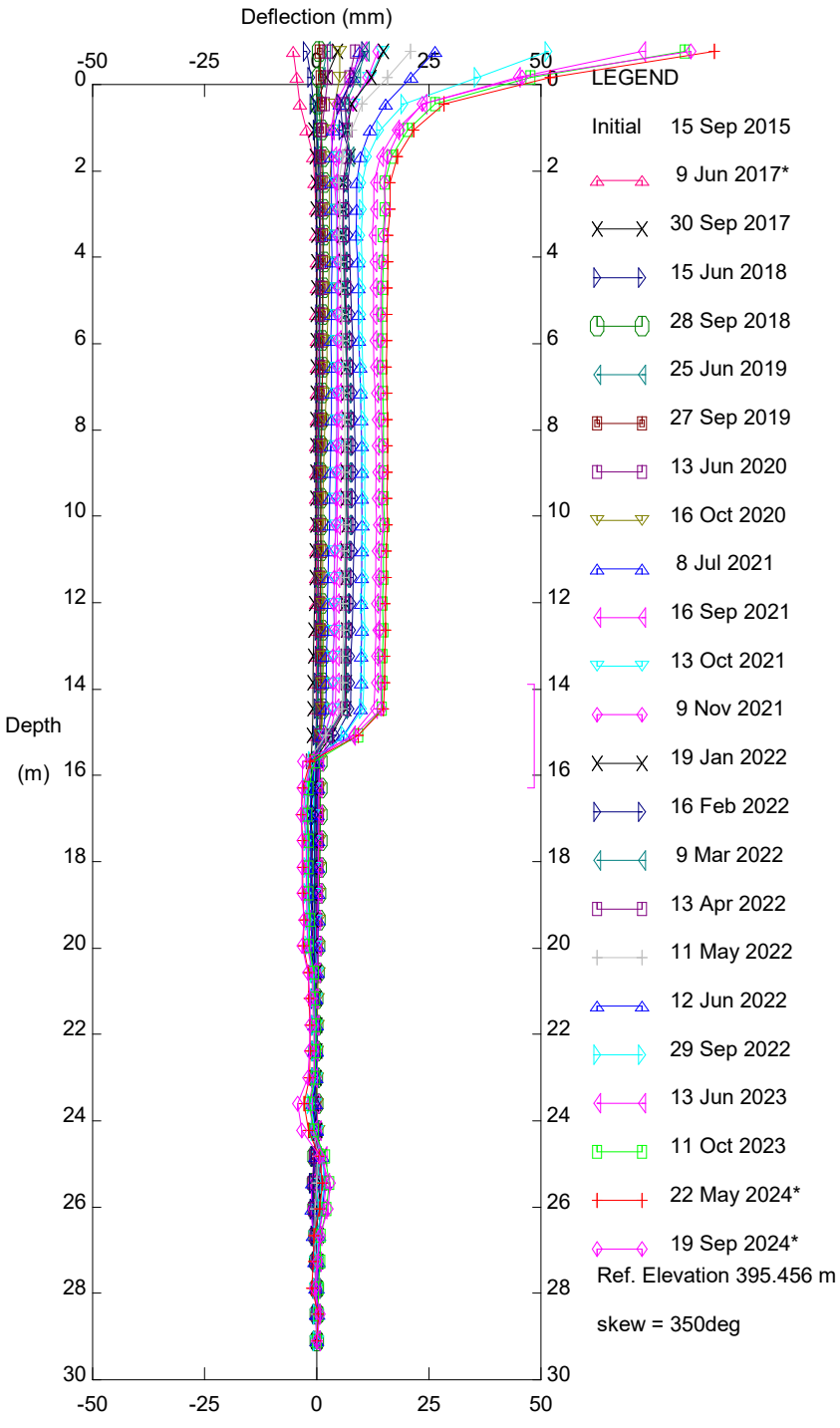
PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI11-01

Alberta Transportation

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

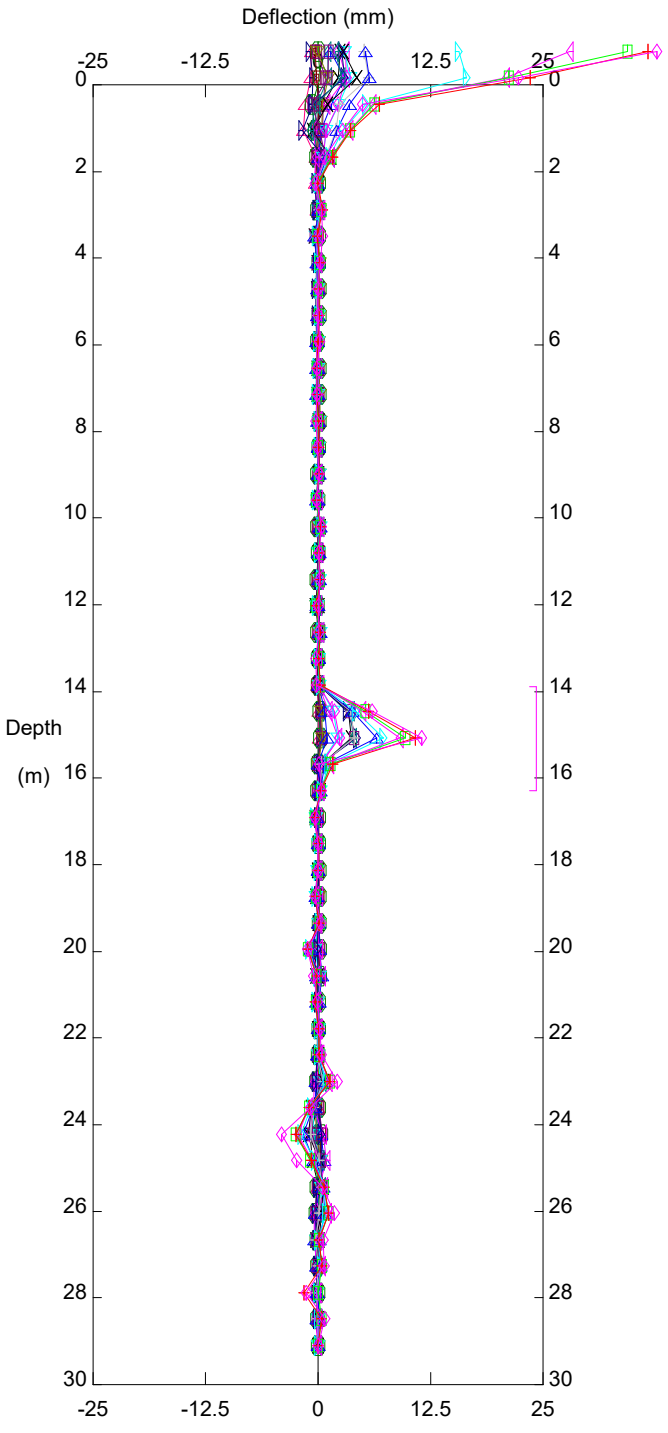
G:\32000\32121 AT GRMP Peace River District 2021-2025\Section C\2024B-Fall\SI Readings\PH009\SI11-01.gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction X



Incremental Deflection

Direction X

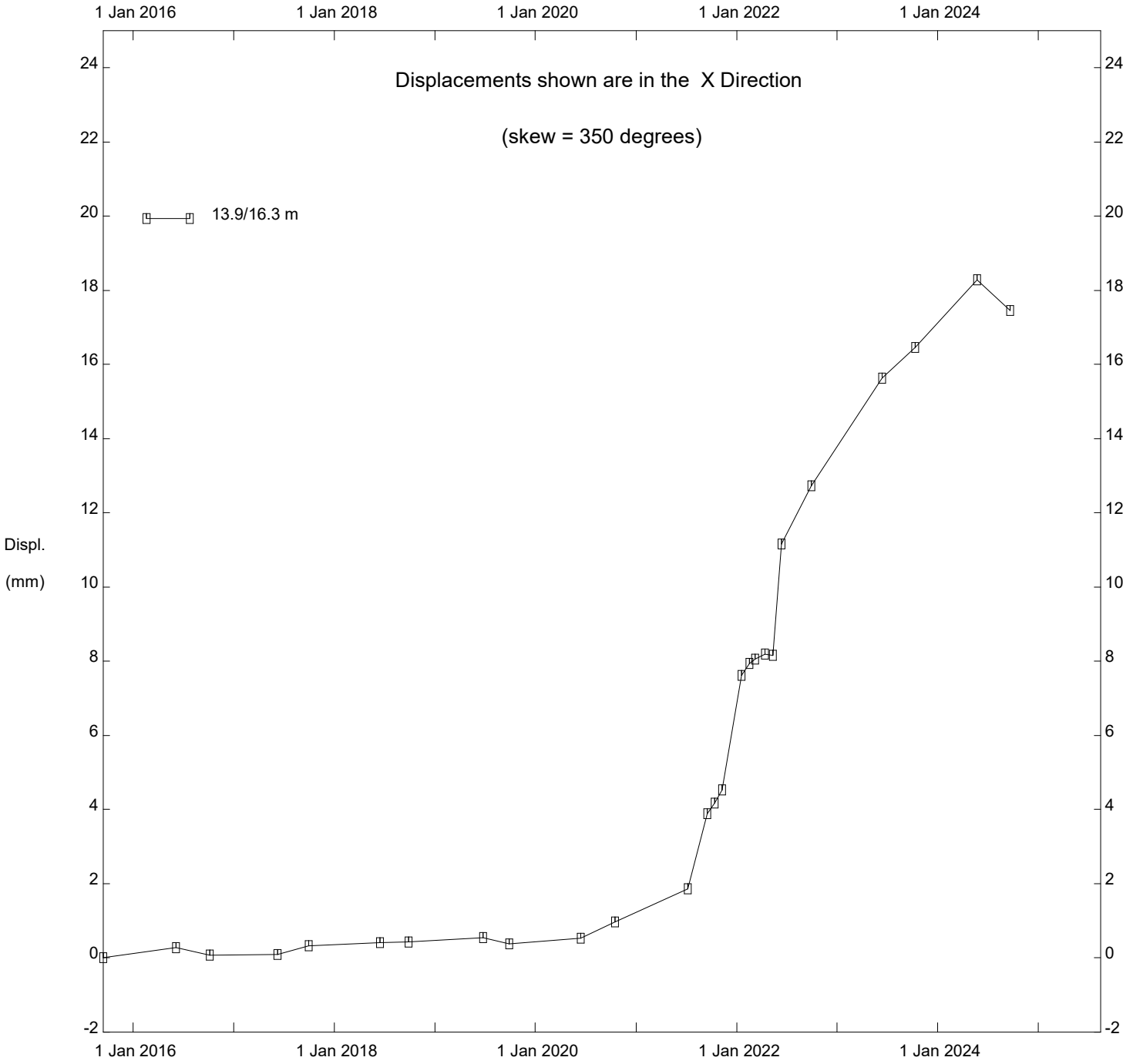
PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI11-01

Alberta Transportation

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

G:\32000\32121 AT GRMP Peace River District 2021-2025\Section C\2024B-Fall\SI Readings\PH009\SI11-01.gtl

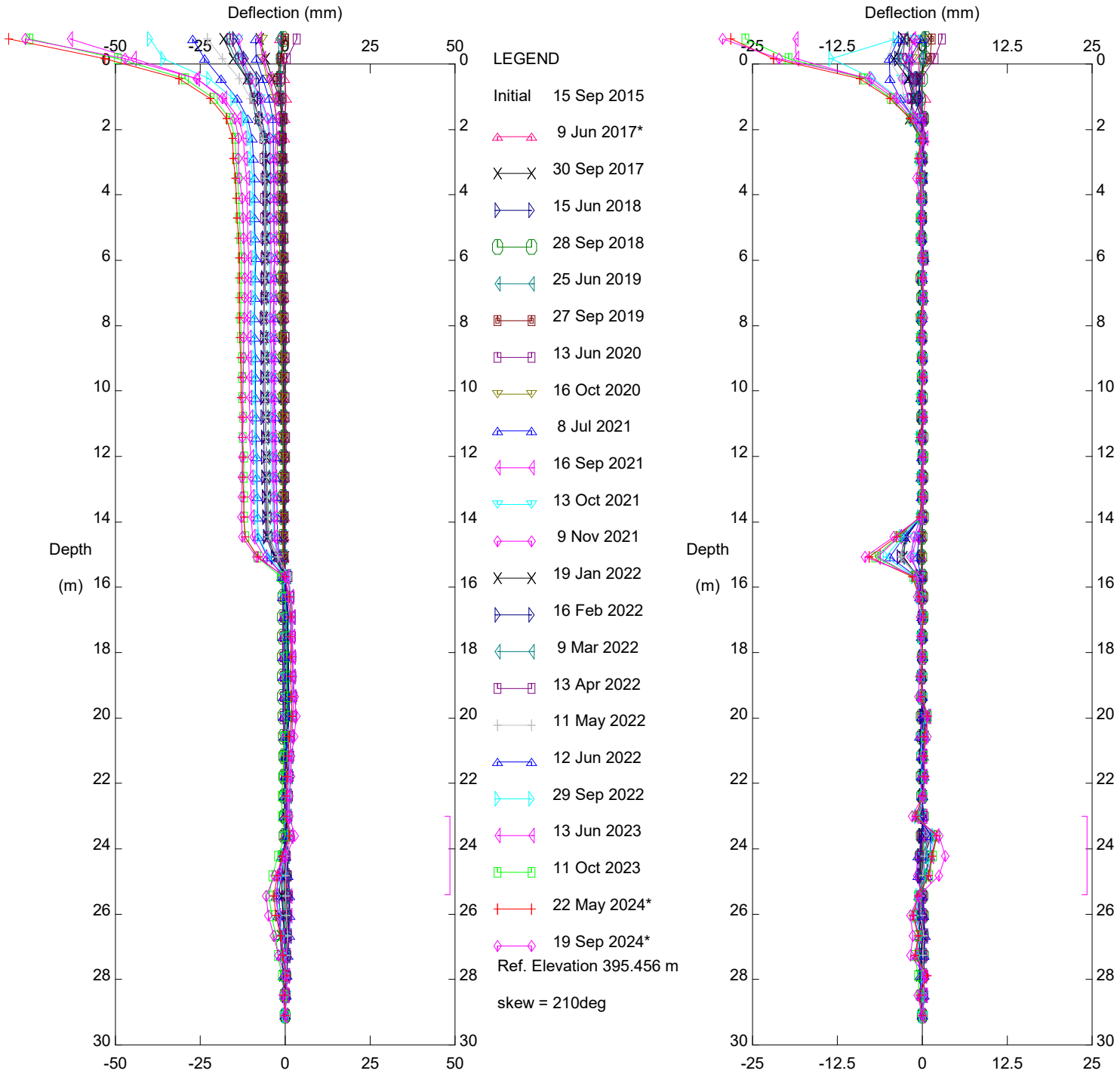
Thurber Engineering Ltd.



PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI11-01

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

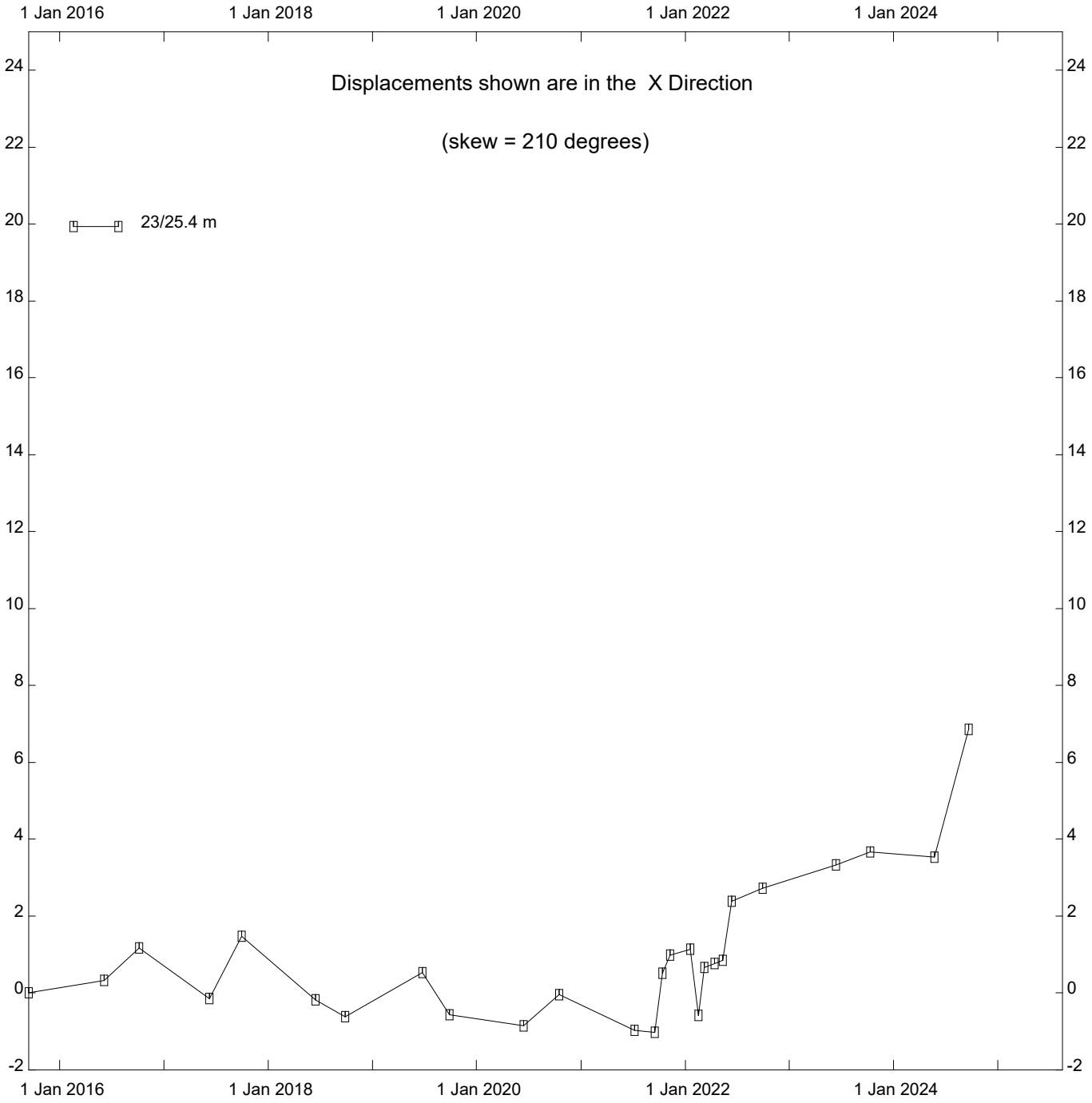
PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI11-01

Alberta Transportation

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

G:\32000\32121 AT GRMP Peace River District 2021-2025\Section C\2024B-Fall\SI Readings\PH009\SI11-01.gtl

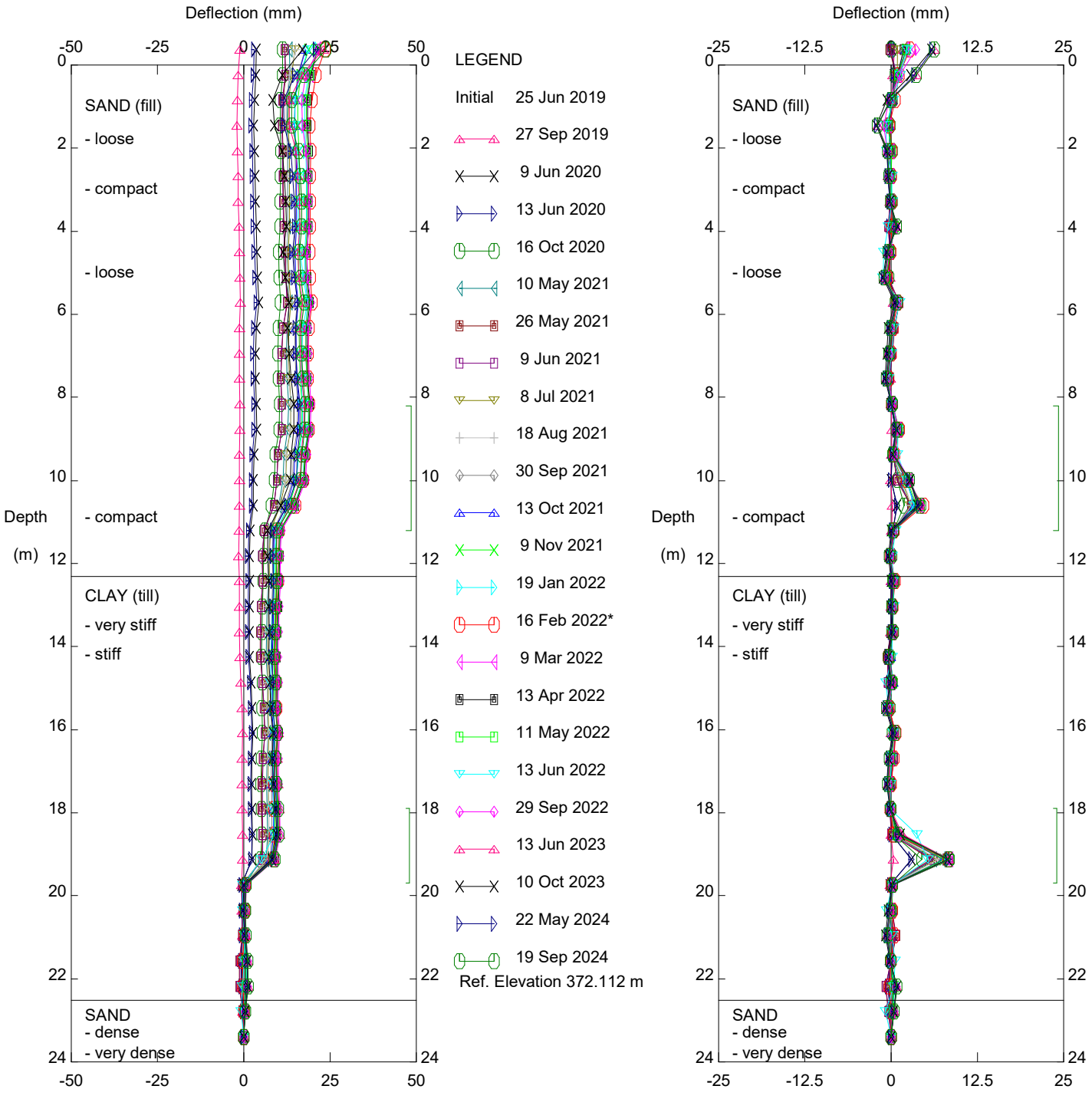
Thurber Engineering Ltd.



PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI11-01

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

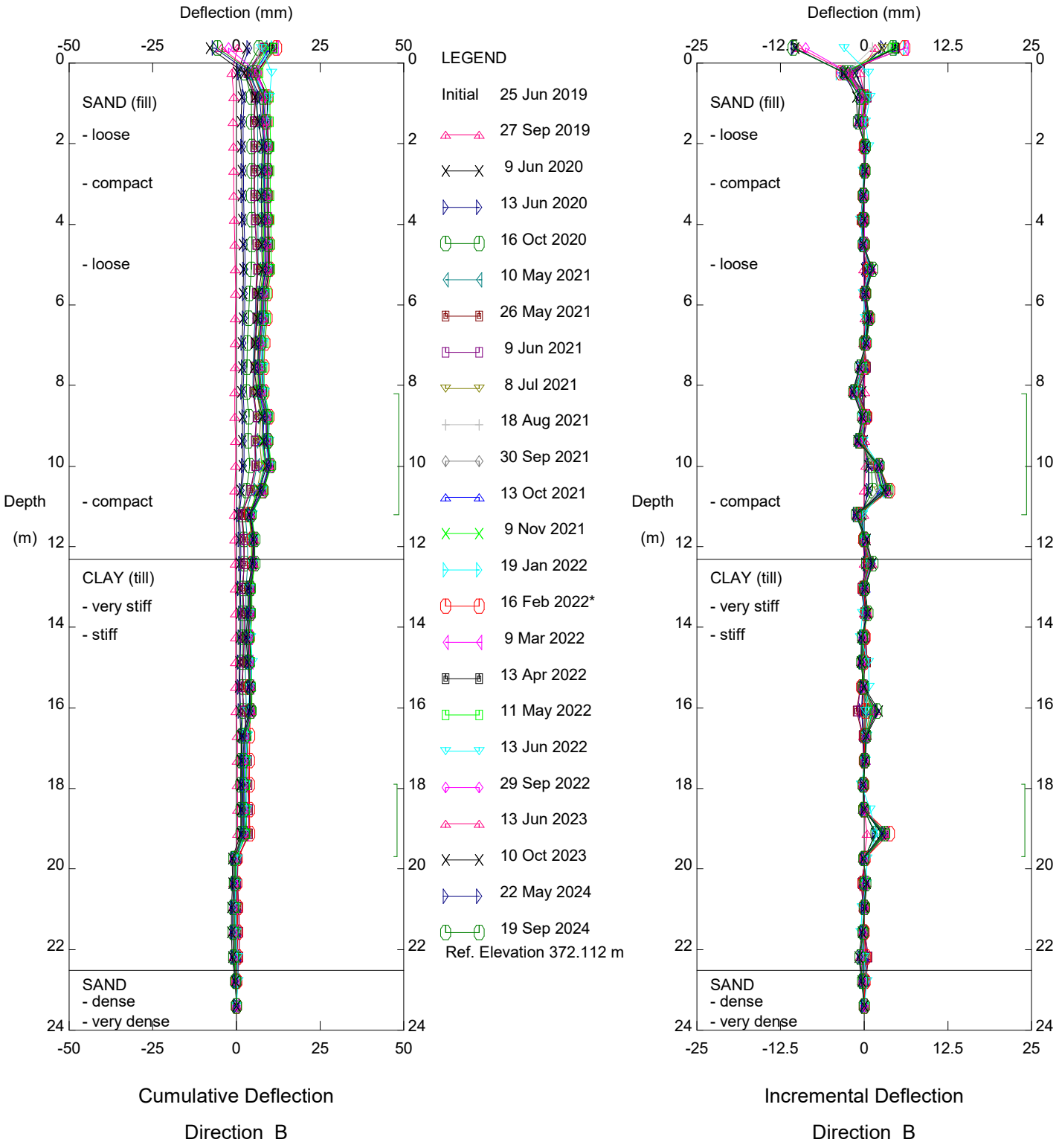
PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI19-5

Alberta Transportation

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

G:\32000\32121 AT GRMP Peace River District 2021-2025\Section C\2024B-Fall\SI Readings\PH009\SI19-5_48 mm casing_shortened 4'.gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

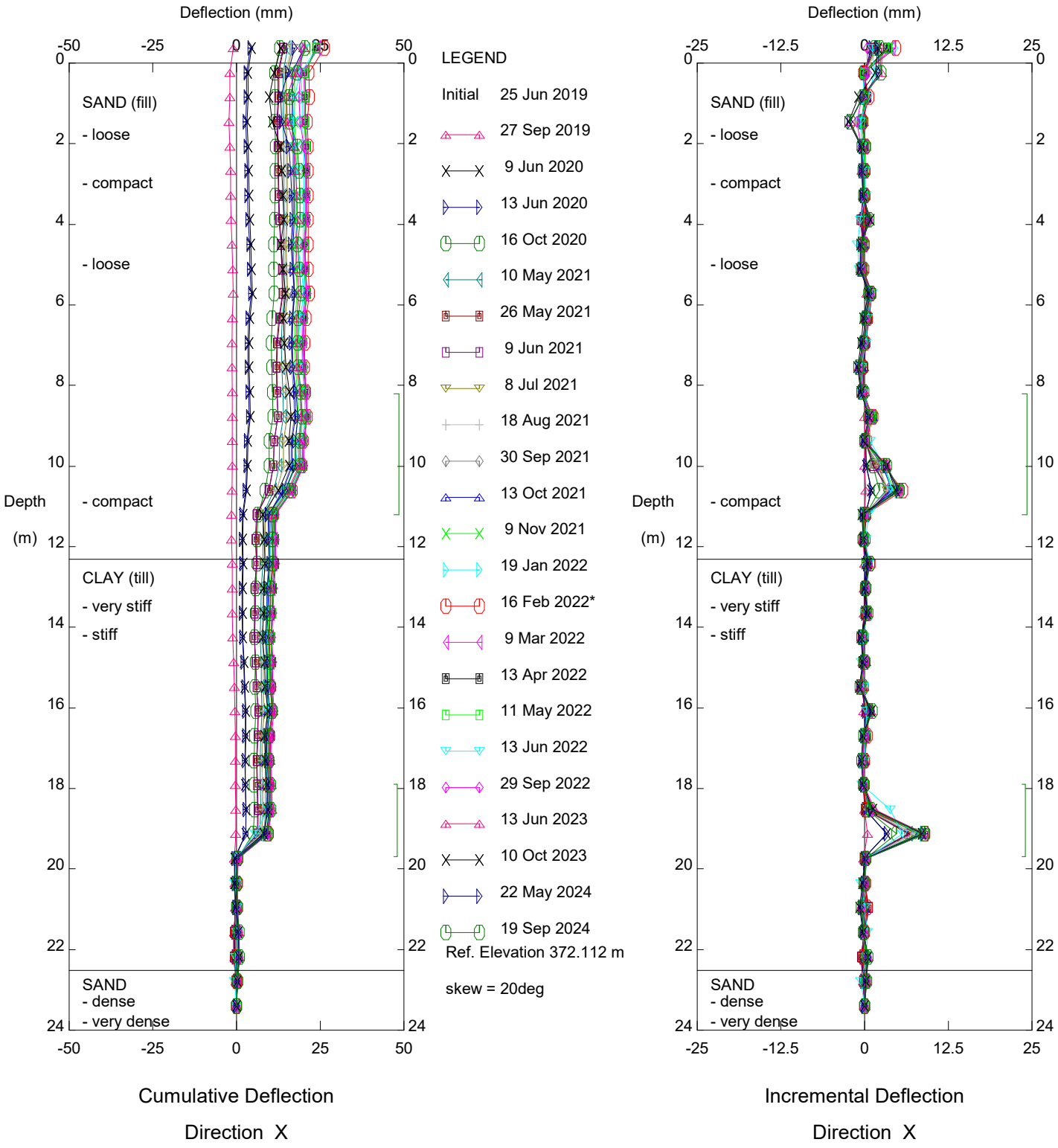
PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI19-5

Alberta Transportation

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

G:\32000\32121 AT GRMP Peace River District 2021-2025\Section C\2024B-Fall\SI Readings\PH009\SI19-5_48 mm casing_shortened 4'.gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

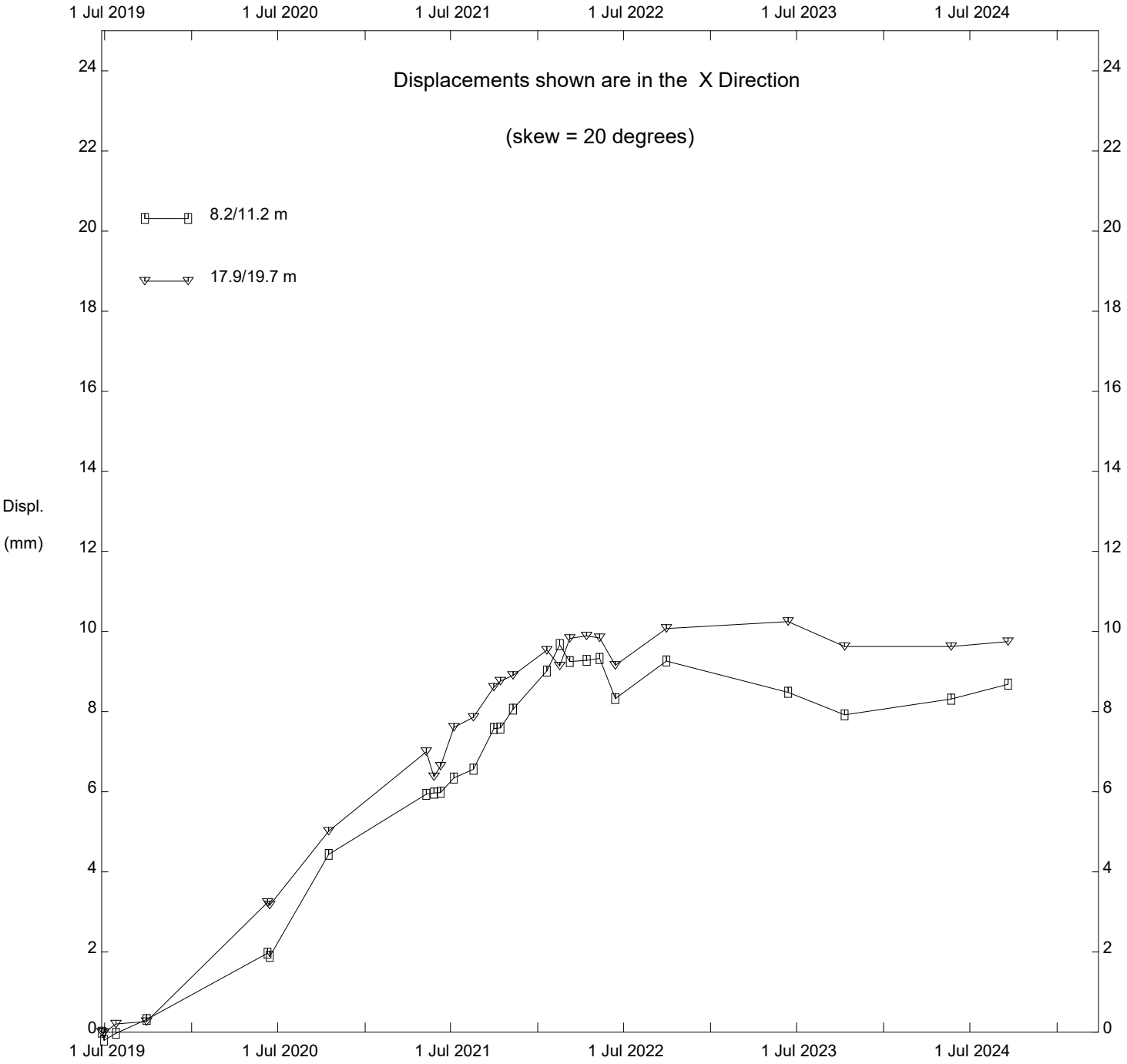
PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI19-5

Alberta Transportation

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

G:\32000\32121 AT GRMP Peace River District 2021-2025\Section C\2024B-Fall\SI Readings\PH009\SI19-5_48 mm casing_shortened 4'.gtl

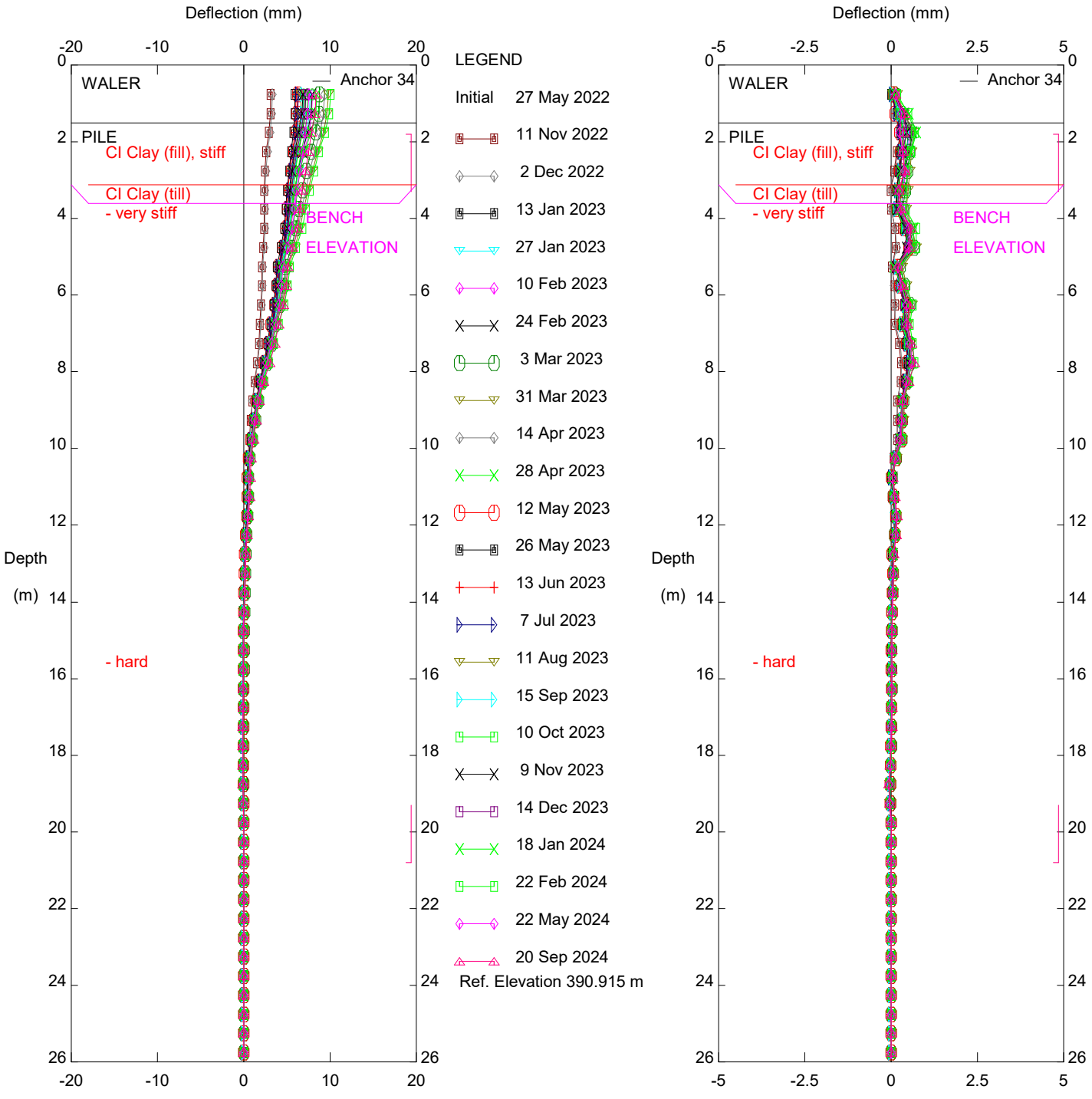
Thurber Engineering Ltd.



PH009 Old Hwy 2:02 Shop Slide, Inclinometer SI19-5

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

Dates of Note:
July 31, 2021 - P34 poured, SAA installed
February 8-April 20, 2022 - wall backfilled to top of waler
April 20, 2022 - Anchor A34 locked off
April 20-May 31, 2022 - wall backfilled to top of lagging and road level
May 3-June 27, 2022 - Grading downslope of pile wall

Shop Slide Type 1 Wall Section, Inclinometer SAA-P34

Alberta Transportation

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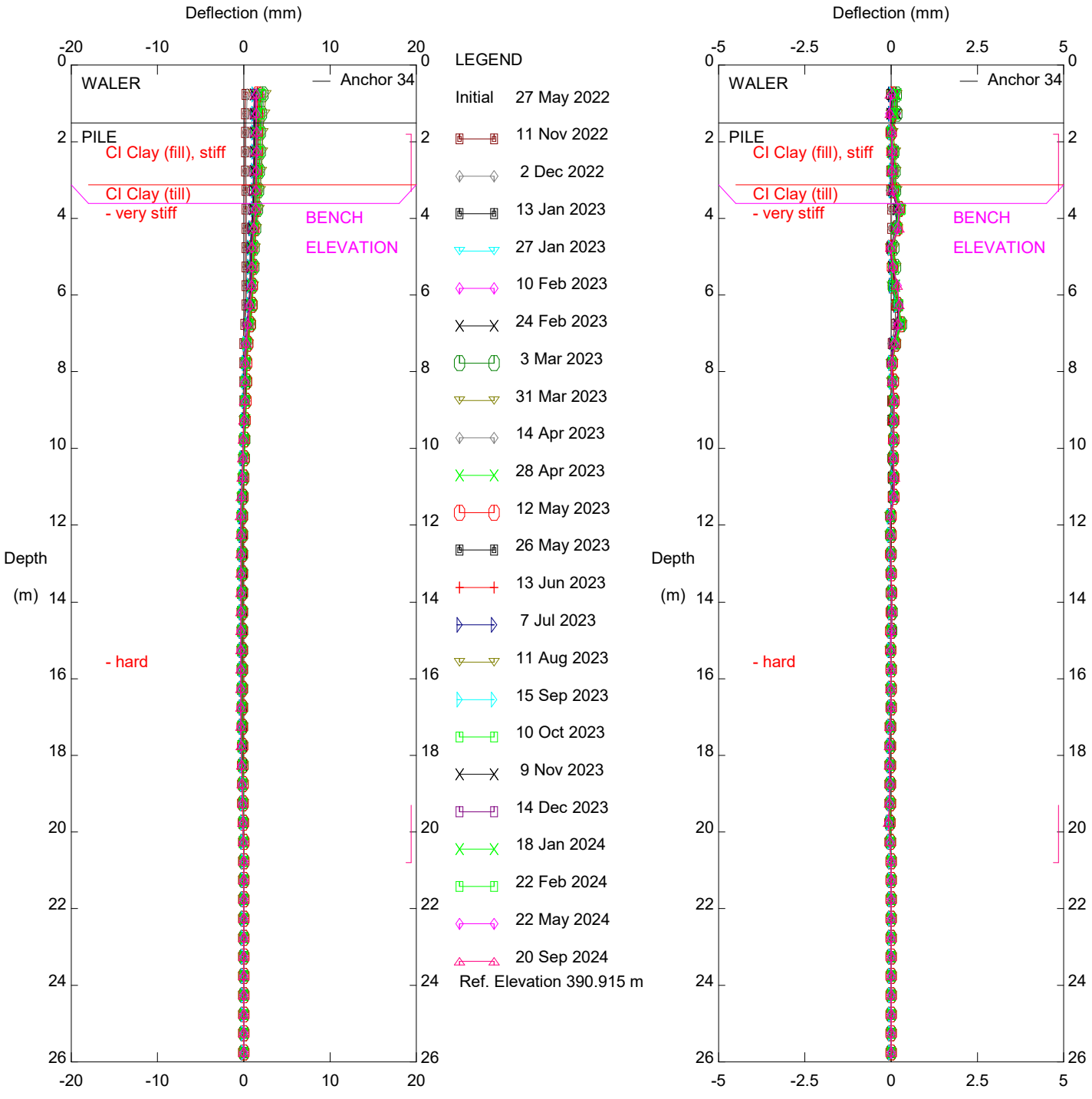
Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

Dates of Note:
July 31, 2021 - P34 poured, SAA installed
February 8-April 20, 2022 - wall backfilled to top of waler
April 20, 2022 - Anchor A34 locked off
April 20-May 31, 2022 - wall backfilled to top of lagging and road level
May 3-June 27, 2022 - Grading downslope of pile wall

Shop Slide Type 1 Wall Section, Inclinometer SAA-P34

Alberta Transportation

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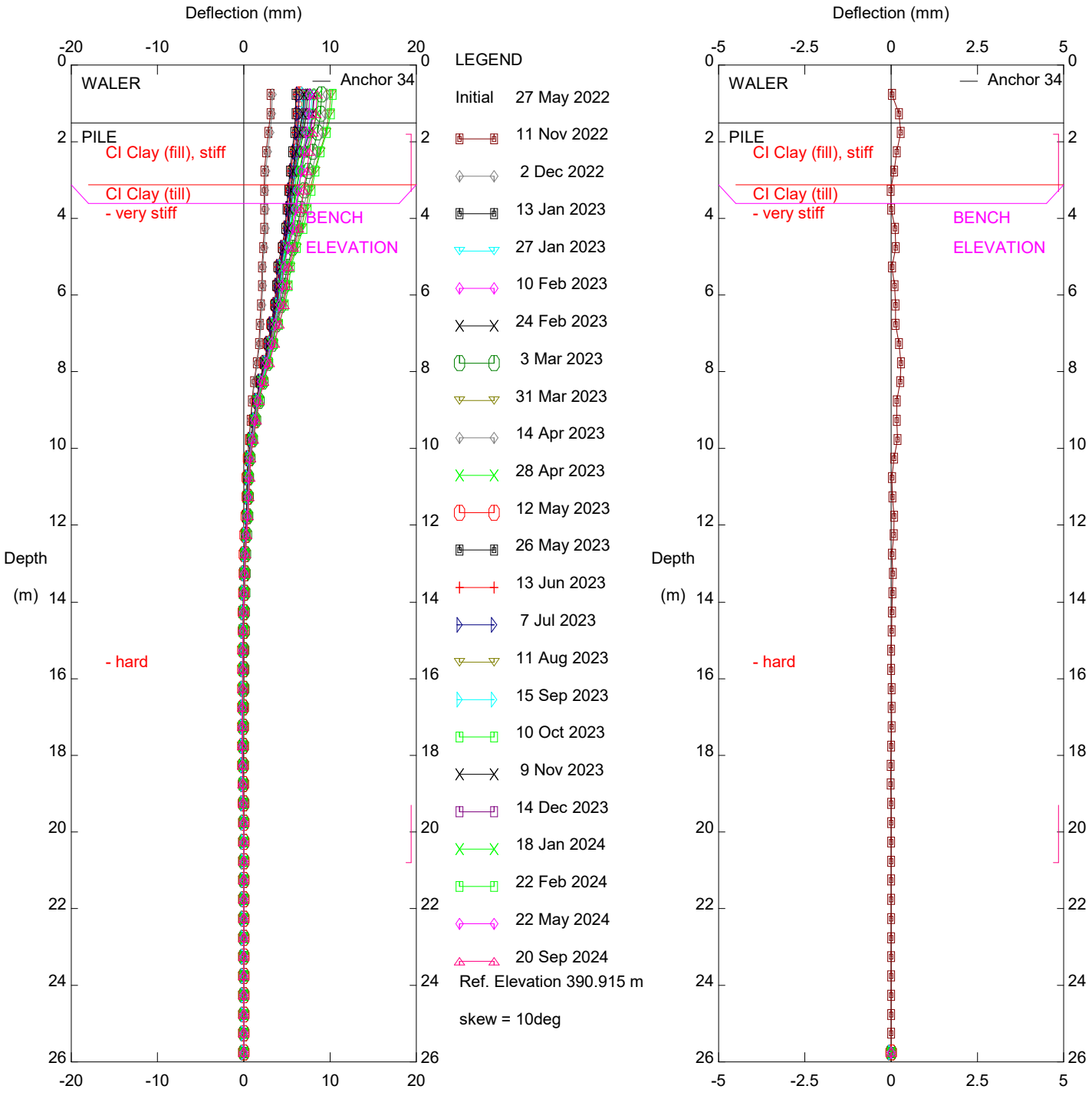
Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

Dates of Note:
July 31, 2021 - P34 poured, SAA installed
February 8-April 20, 2022 - wall backfilled to top of waler
April 20, 2022 - Anchor A34 locked off
April 20-May 31, 2022 - wall backfilled to top of lagging and road level
May 3-June 27, 2022 - Grading downslope of pile wall

Shop Slide Type 1 Wall Section, Inclinometer SAA-P34

Alberta Transportation

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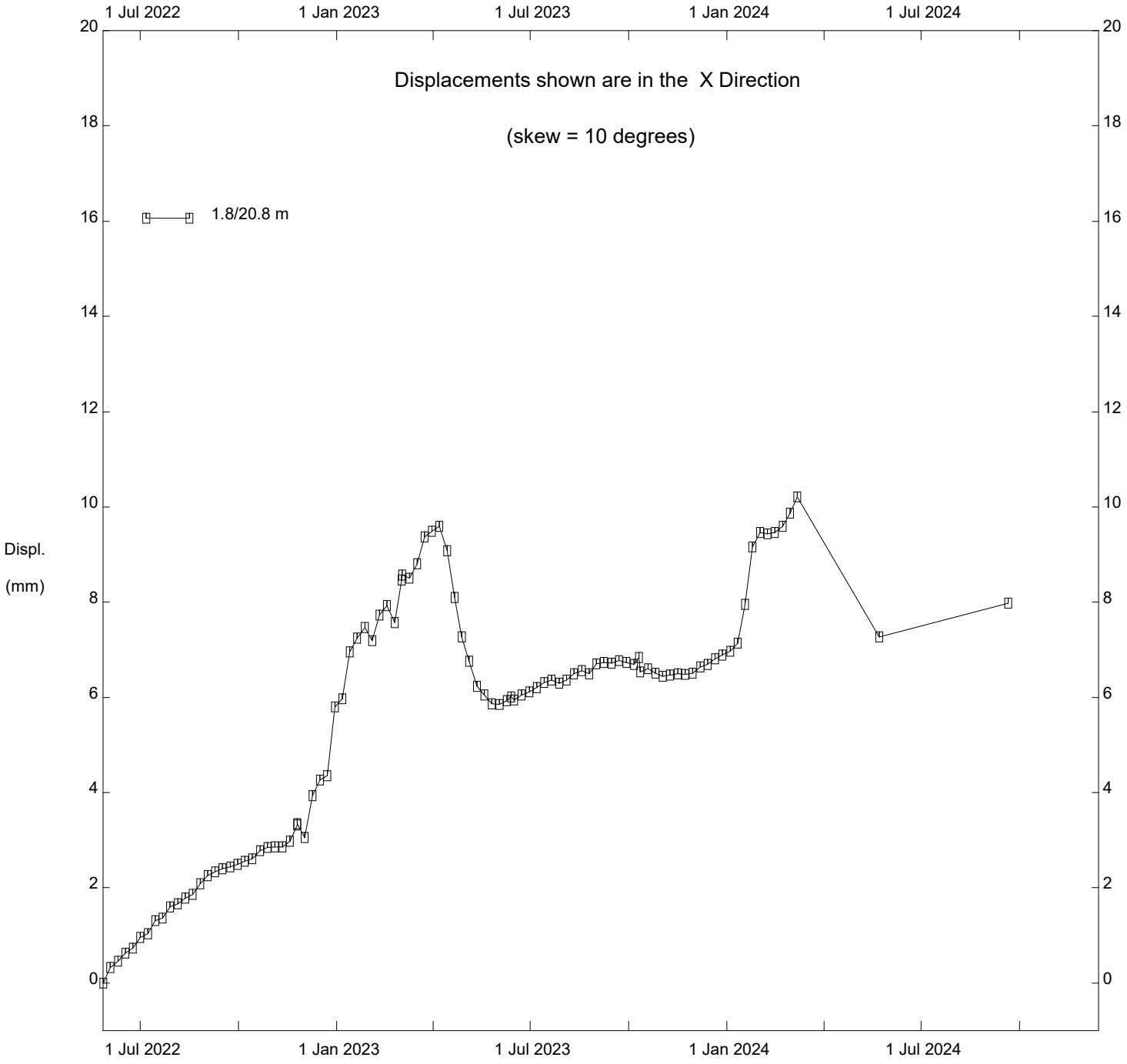
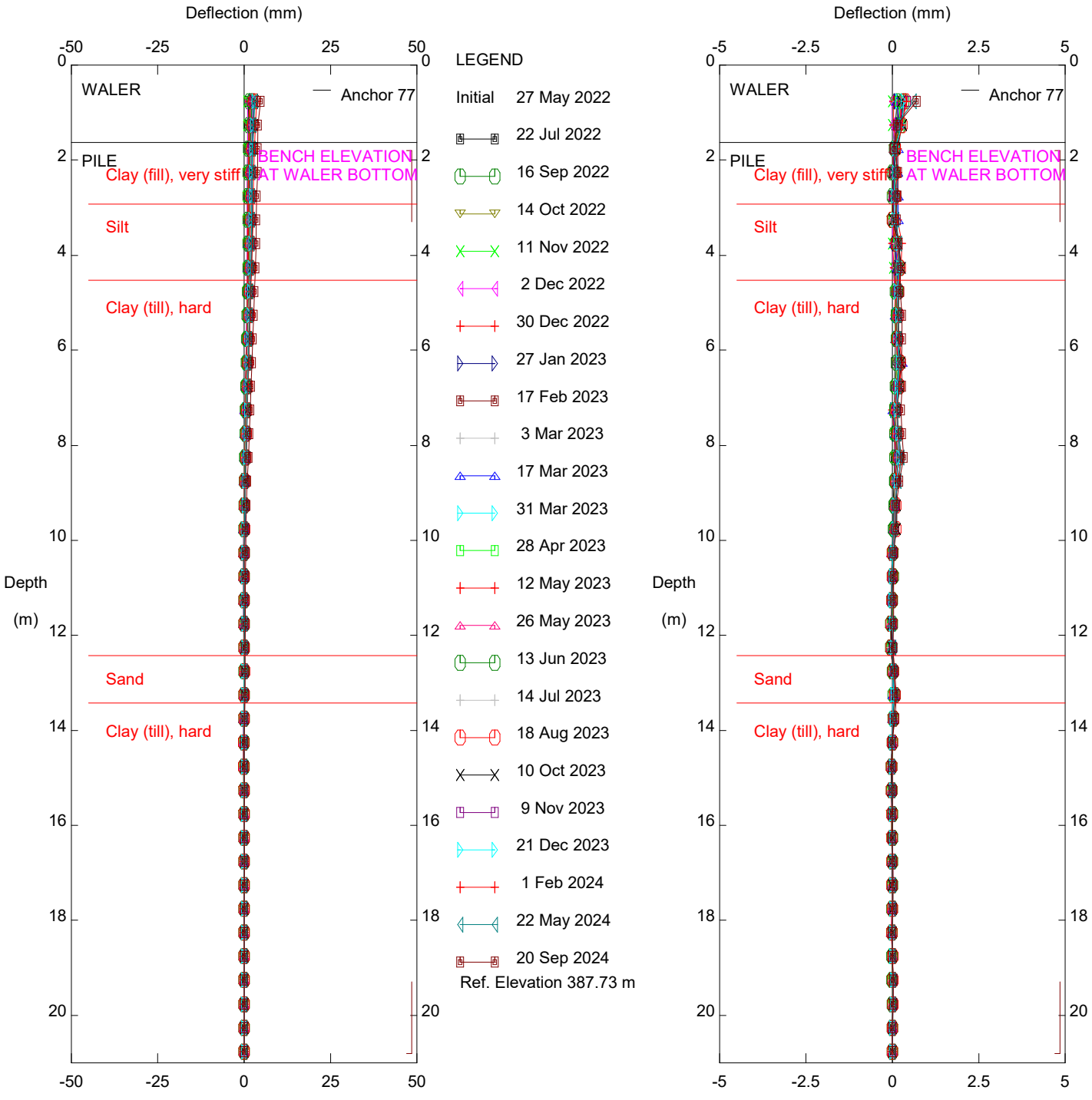
Thurber Engineering Ltd.



Shop Slide Type 1 Wall Section, Inclinometer SAA-P34

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

Dates of Note:

July 15, 2021 - P77 poured, SAA installed
February 8-April 1, 2022 - wall backfilled to top of waler
April 1, 2022 - Anchor A77 locked off
April 1-May 31, 2022 - wall backfilled to top of lagging and road level
May 3-June 27, 2022 - Grading downslope of pile wall

Shop Slide Wall Type 2 Section, Inclinometer SAA-P77

Alberta Transportation

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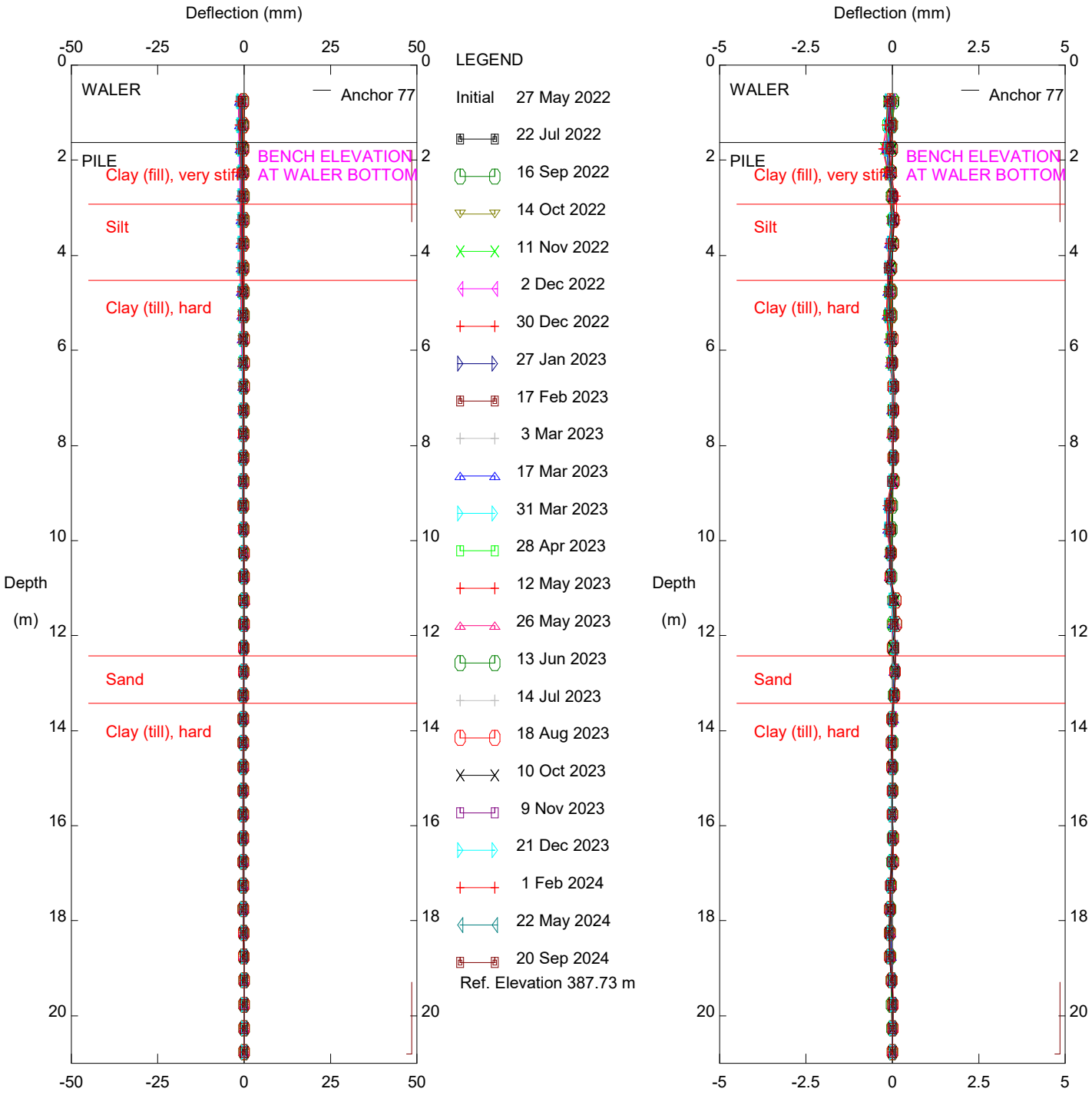
Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

Dates of Note:

July 15, 2021 - P77 poured, SAA installed
February 8-April 1, 2022 - wall backfilled to top of waler
April 1, 2022 - Anchor A77 locked off
April 1-May 31, 2022 - wall backfilled to top of lagging and road level
May 3-June 27, 2022 - Grading downslope of pile wall

Shop Slide Wall Type 2 Section, Inclinometer SAA-P77

Alberta Transportation

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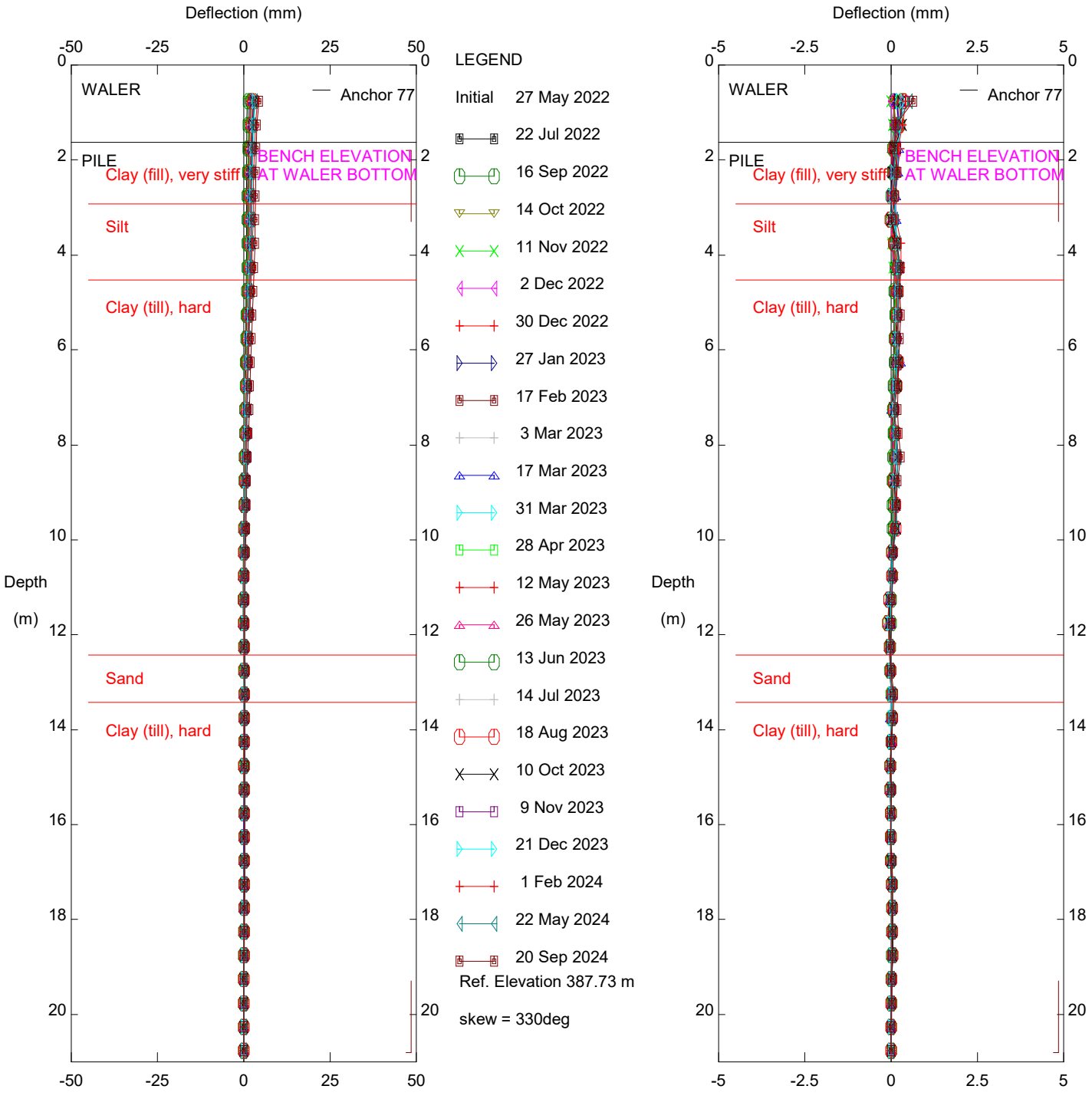
Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

Dates of Note:

July 15, 2021 - P77 poured, SAA installed
February 8-April 1, 2022 - wall backfilled to top of waler
April 1, 2022 - Anchor A77 locked off
April 1-May 31, 2022 - wall backfilled to top of lagging and road level
May 3-June 27, 2022 - Grading downslope of pile wall

Shop Slide Wall Type 2 Section, Inclinometer SAA-P77

Alberta Transportation

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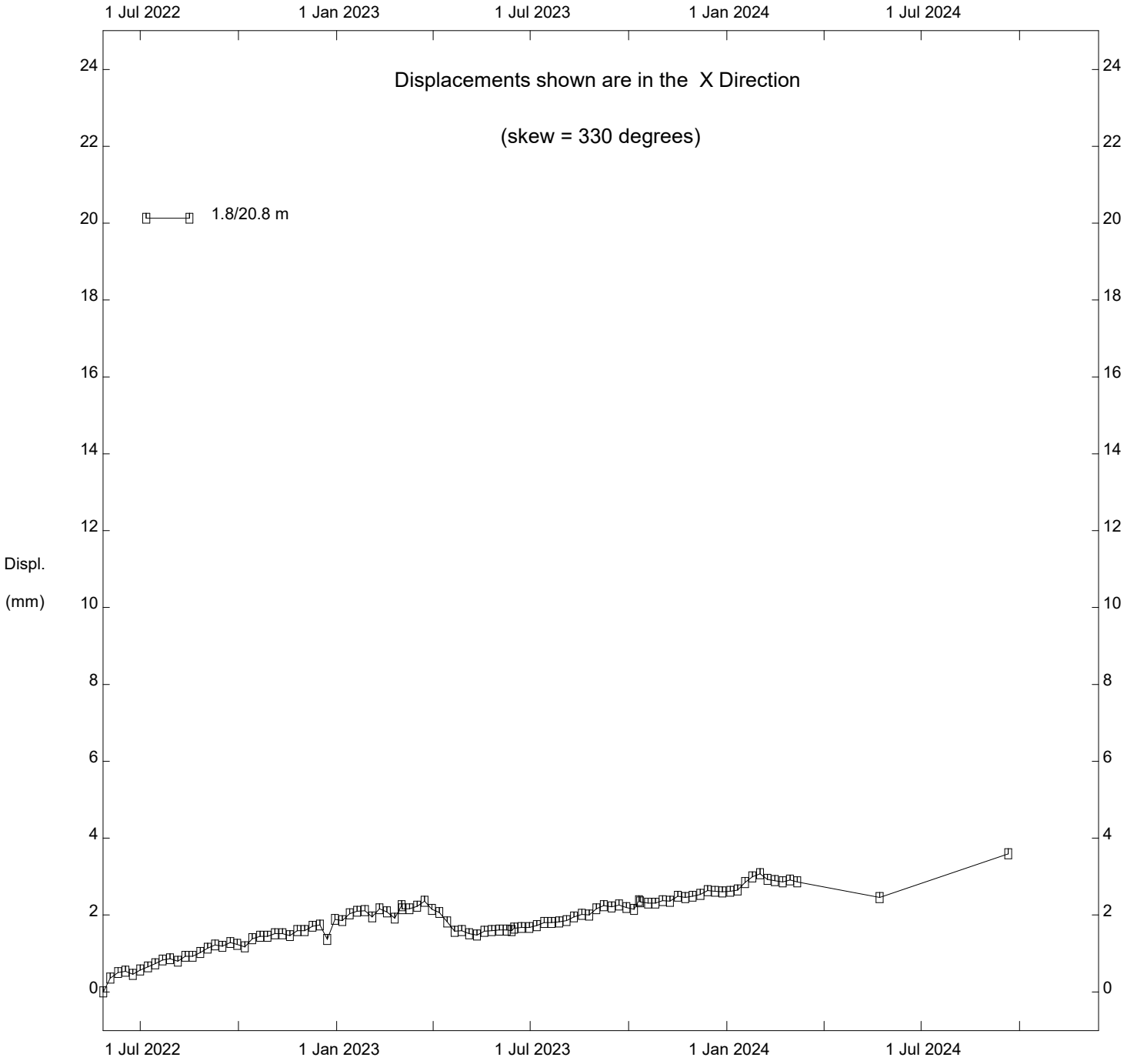
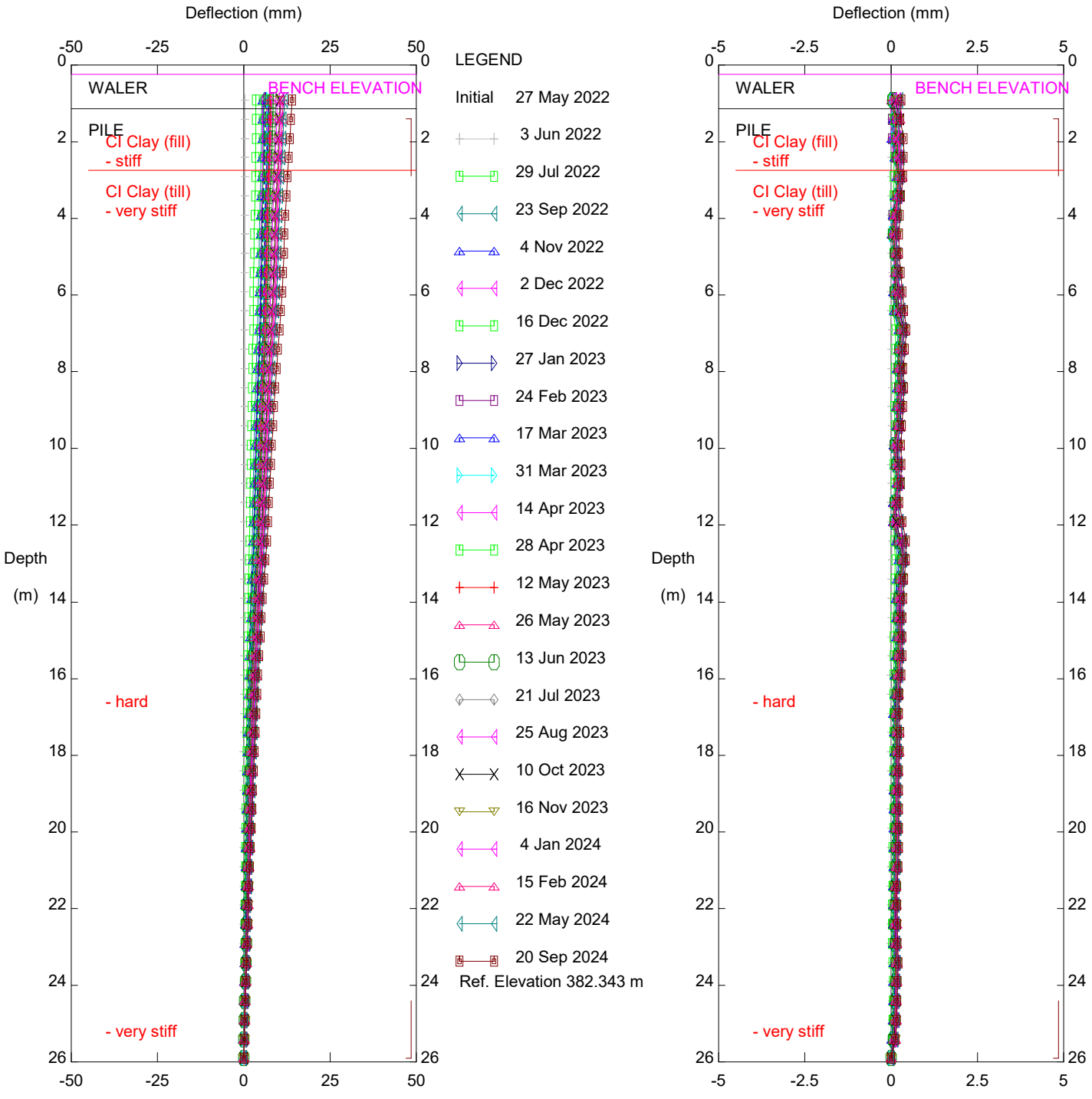
Thurber Engineering Ltd.



Shop Slide Wall Type 2 Section, Inclinometer SAA-P77

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

Dates of Note:
Sep. 23, 2022 - P113 poured, SAA installed
February 8-May 31, 2022 - backfill completed above waler
May 3-June 27, 2022 - grading downslope of pile wall

Shop Slide Wall Type 3, Inclinometer SAA-P113

Alberta Transportation

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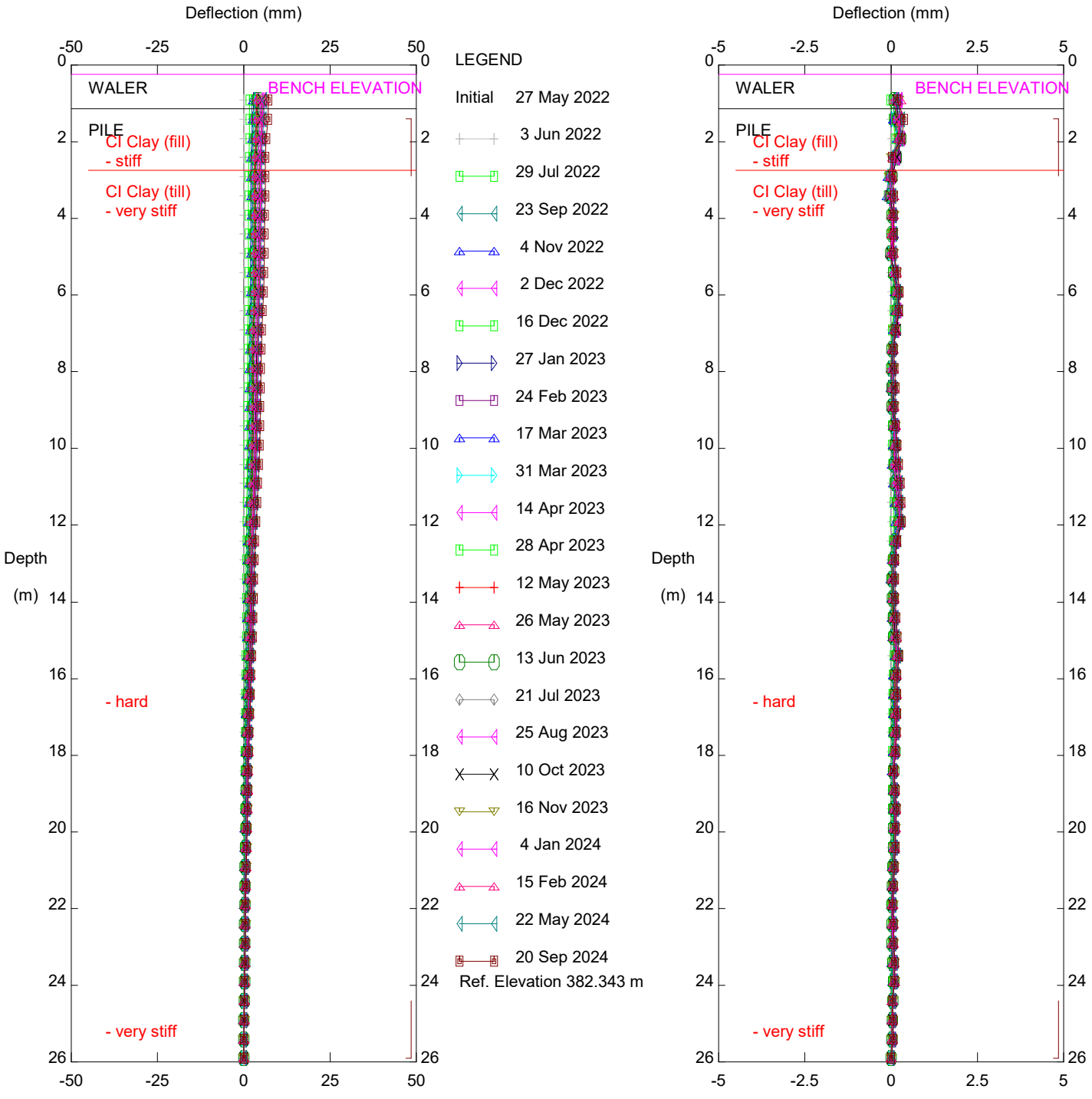

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

Dates of Note:
Sep. 23, 2022 - P113 poured, SAA installed
February 8-May 31, 2022 - backfill completed above waler
May 3-June 27, 2022 - grading downslope of pile wall

Shop Slide Wall Type 3, Inclinometer SAA-P113

Alberta Transportation

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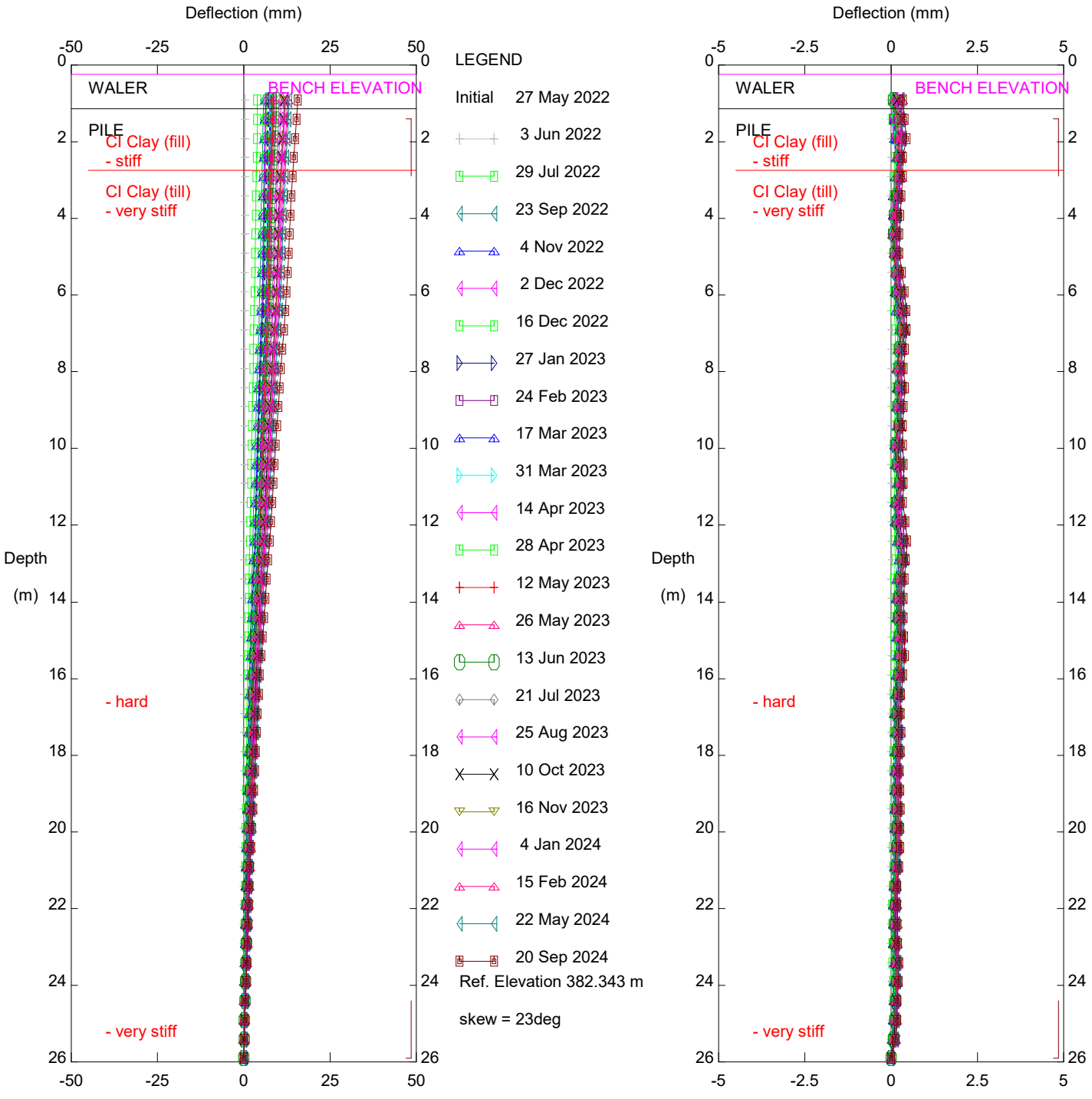
Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

Dates of Note:
Sep. 23, 2022 - P113 poured, SAA installed
February 8-May 31, 2022 - backfill completed above waler
May 3-June 27, 2022 - grading downslope of pile wall

Shop Slide Wall Type 3, Inclinometer SAA-P113

Alberta Transportation

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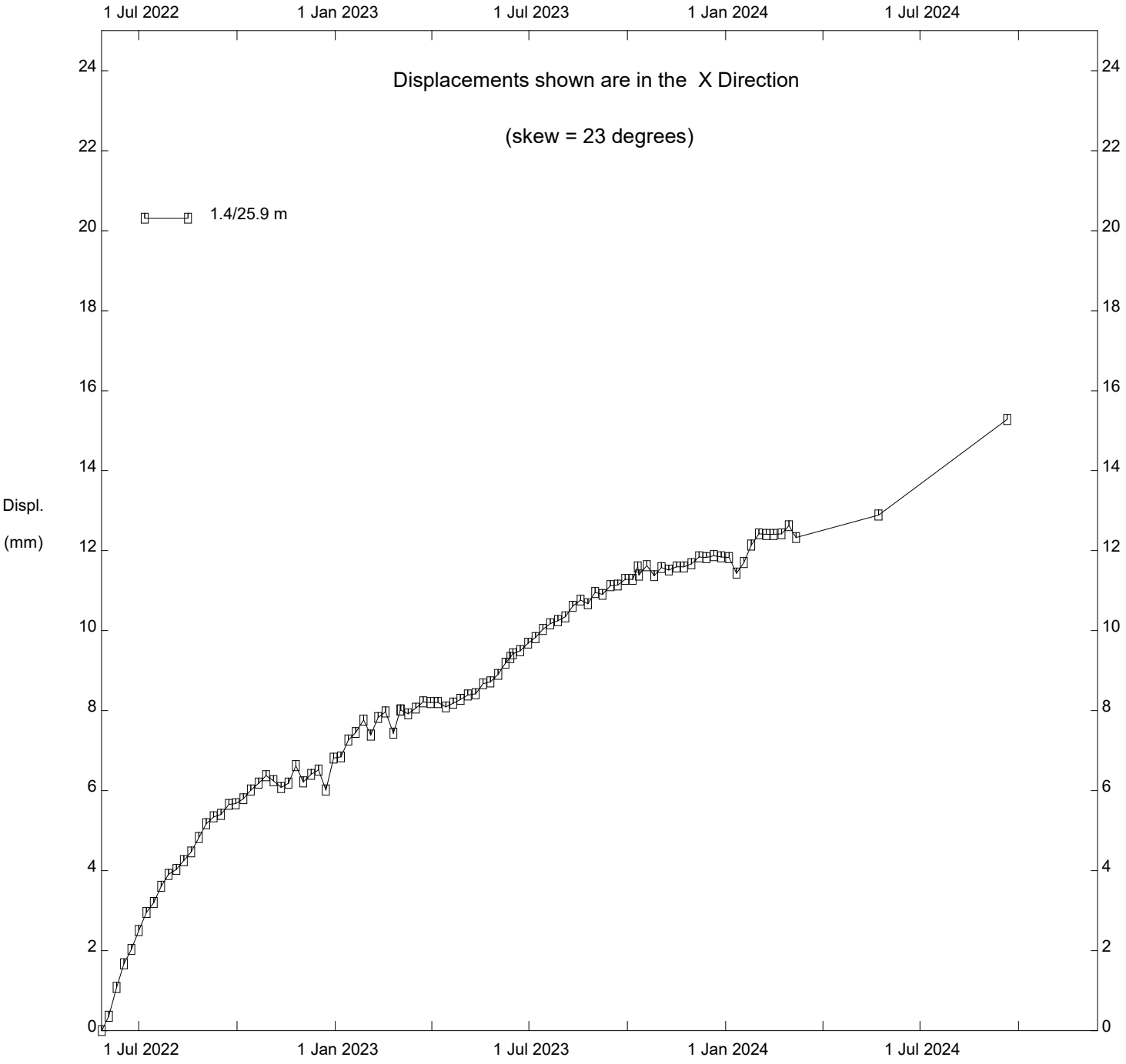
Thurber Engineering Ltd.



Shop Slide Wall Type 3, Inclinometer SAA-P113

Alberta Transportation

FIGURE PH009-1: PEACE RIVER SHOP SLIDE
P34 UPSLOPE SIDE STRAIN GAUGE VALUES VS DEPTH

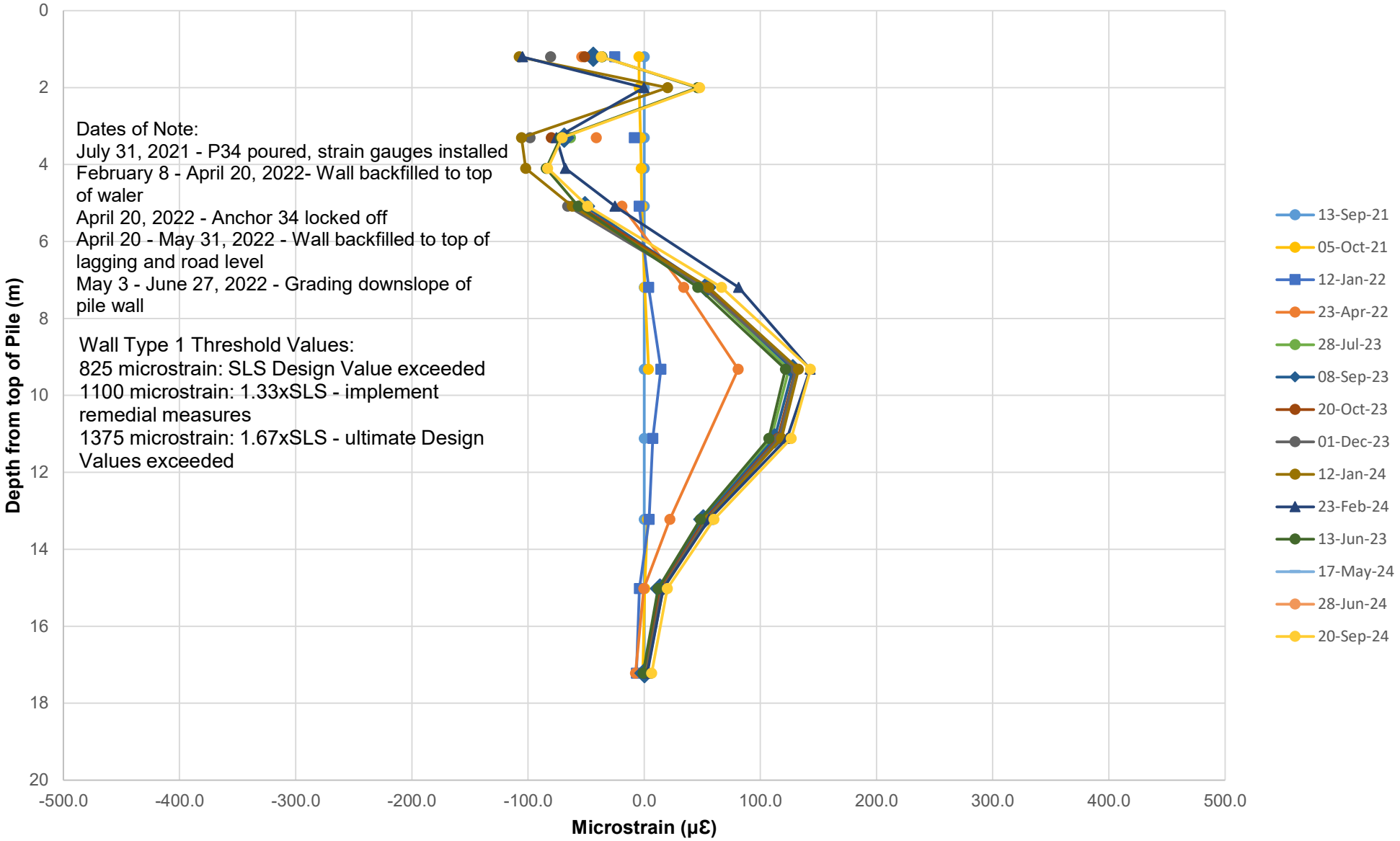


FIGURE PH009-2: PEACE RIVER SHOP SLIDE
P34 DOWNSLOPE SIDE STRAIN GAUGE VALUES VS DEPTH

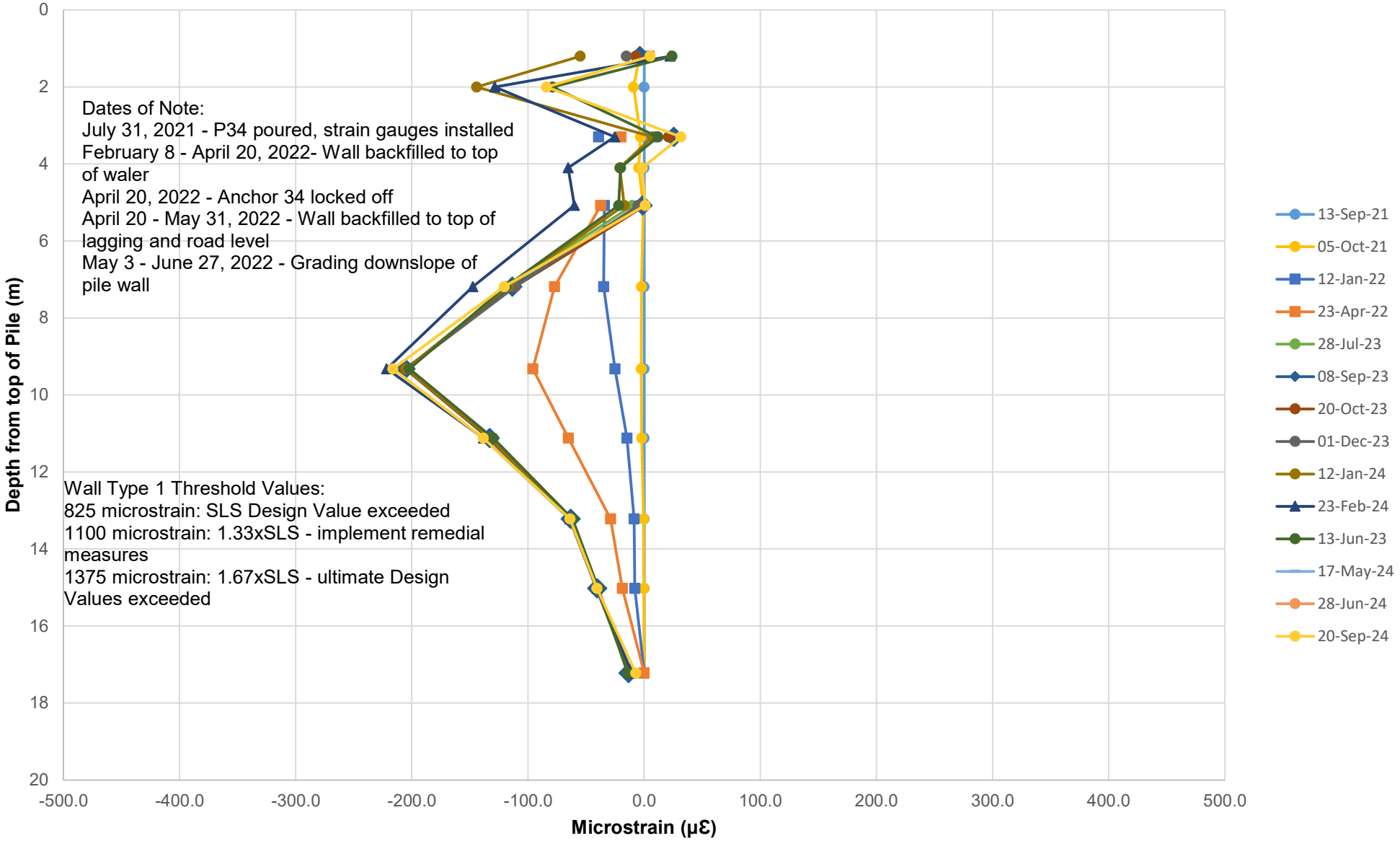


FIGURE PH009-3: PEACE RIVER SHOP SLIDE
P34 MAXIMUM STRAIN VS TIME (9.3 m DEPTH)

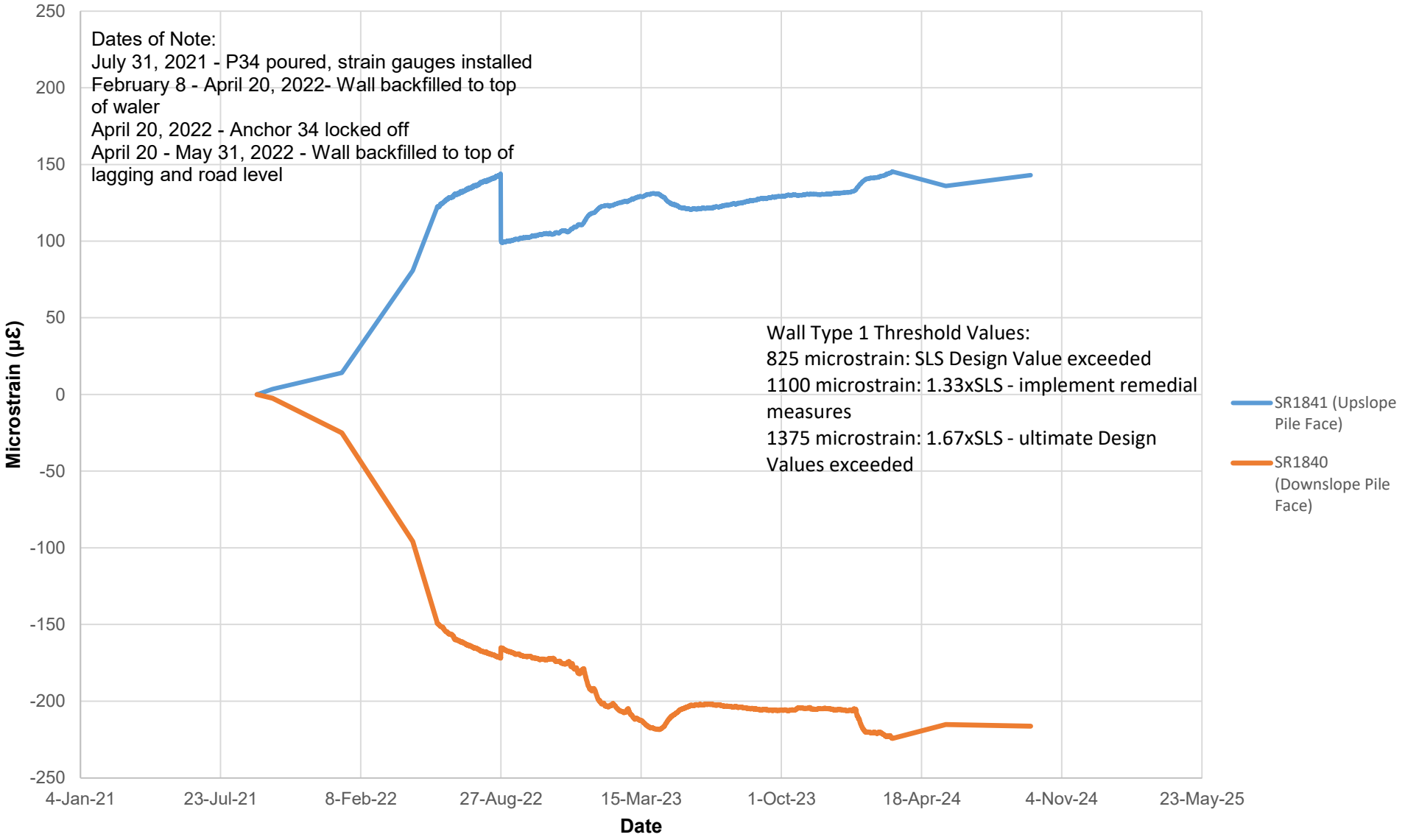


FIGURE PH009-4: PEACE RIVER SHOP SLIDE
P77 UPSLOPE SIDE STRAIN GAUGE VALUES VS DEPTH

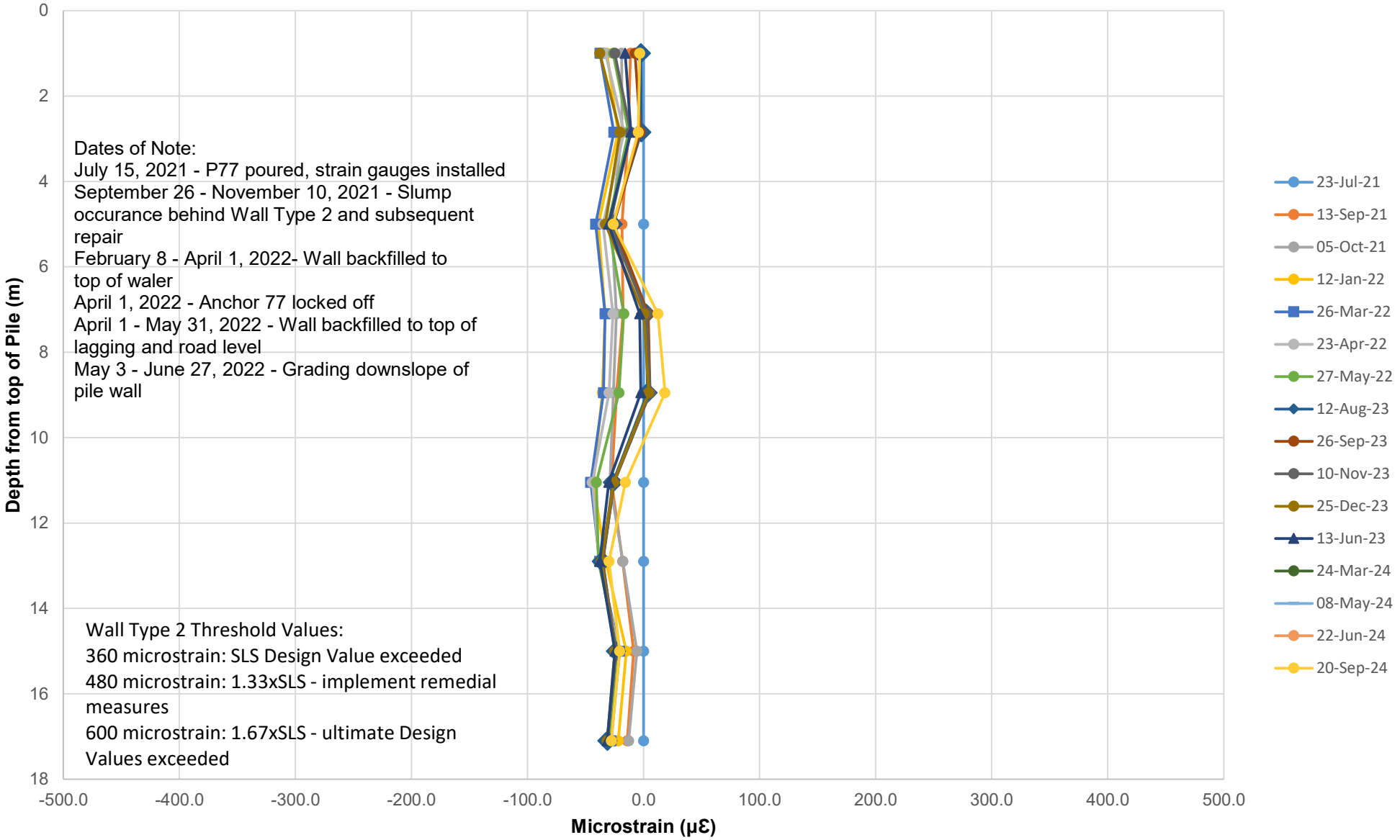


FIGURE PH009-5: PEACE RIVER SHOP SLIDE
P77 DOWNSLOPE SIDE STRAIN GAUGE VALUES VS DEPTH

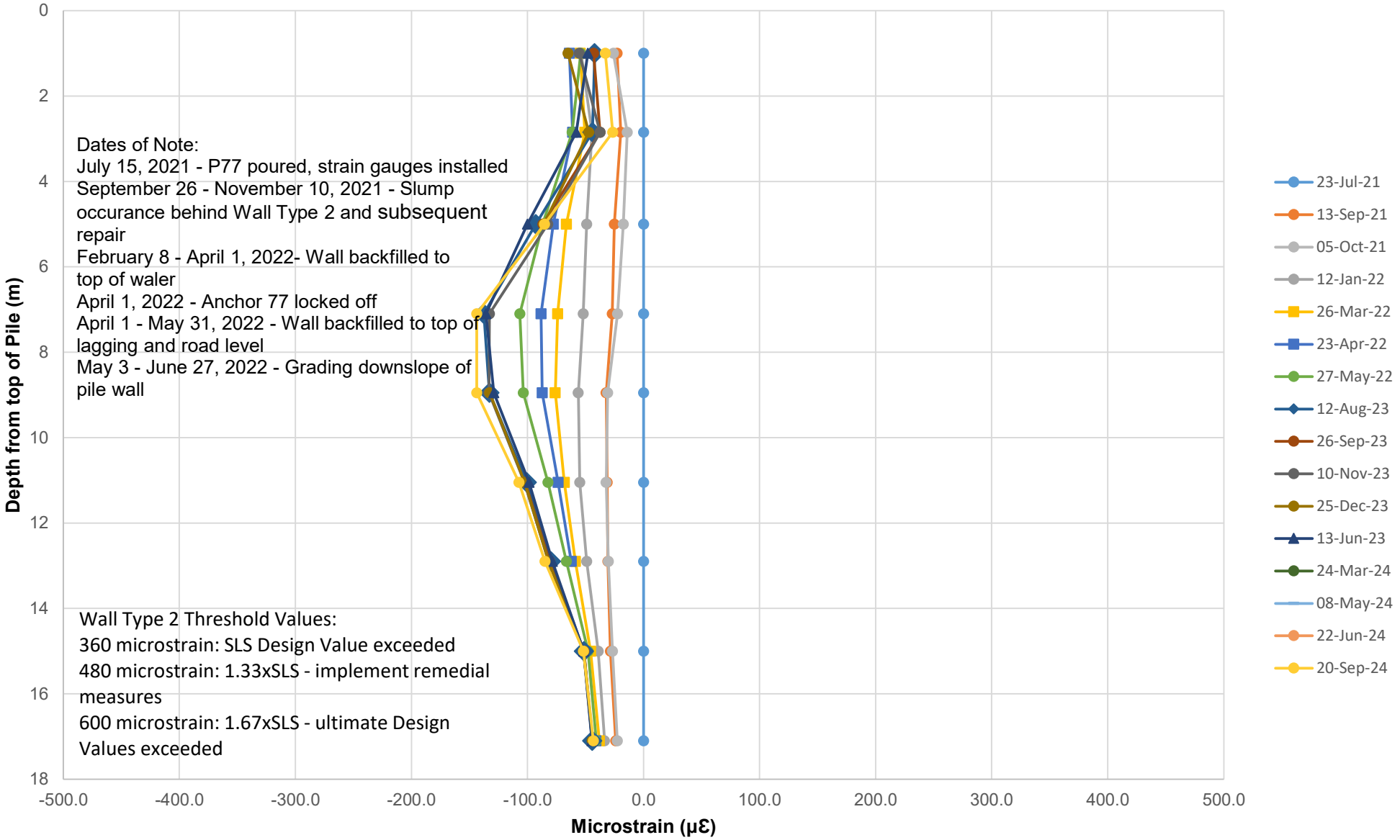


FIGURE PH009-6: PEACE RIVER SHOP SLIDE
P77 MAXIMUM STRAIN VS TIME (9.0 m DEPTH)

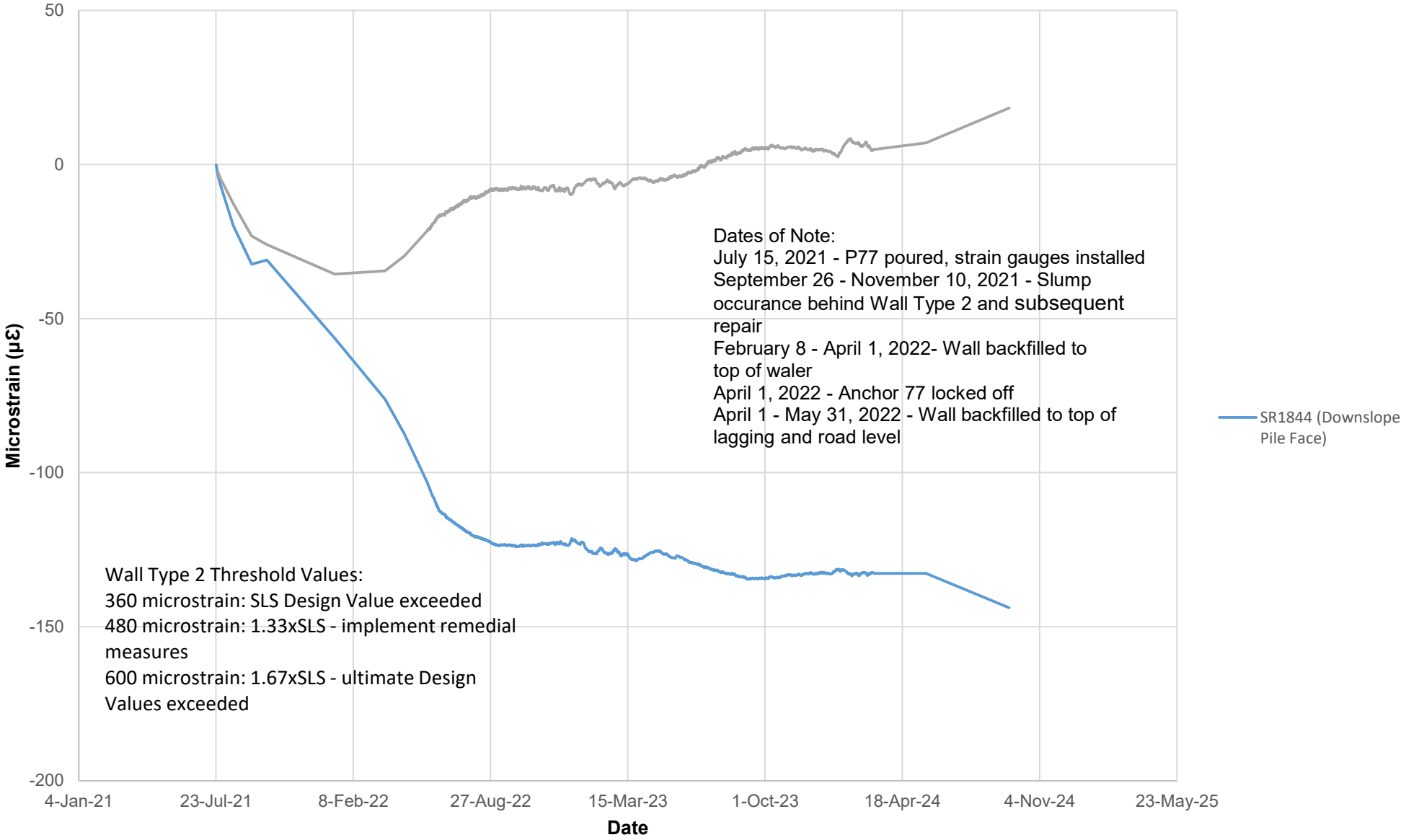


FIGURE PH009-7: PEACE RIVER SHOP SLIDE
P77 MAXIMUM STRAIN VS TIME (12.9 m DEPTH)

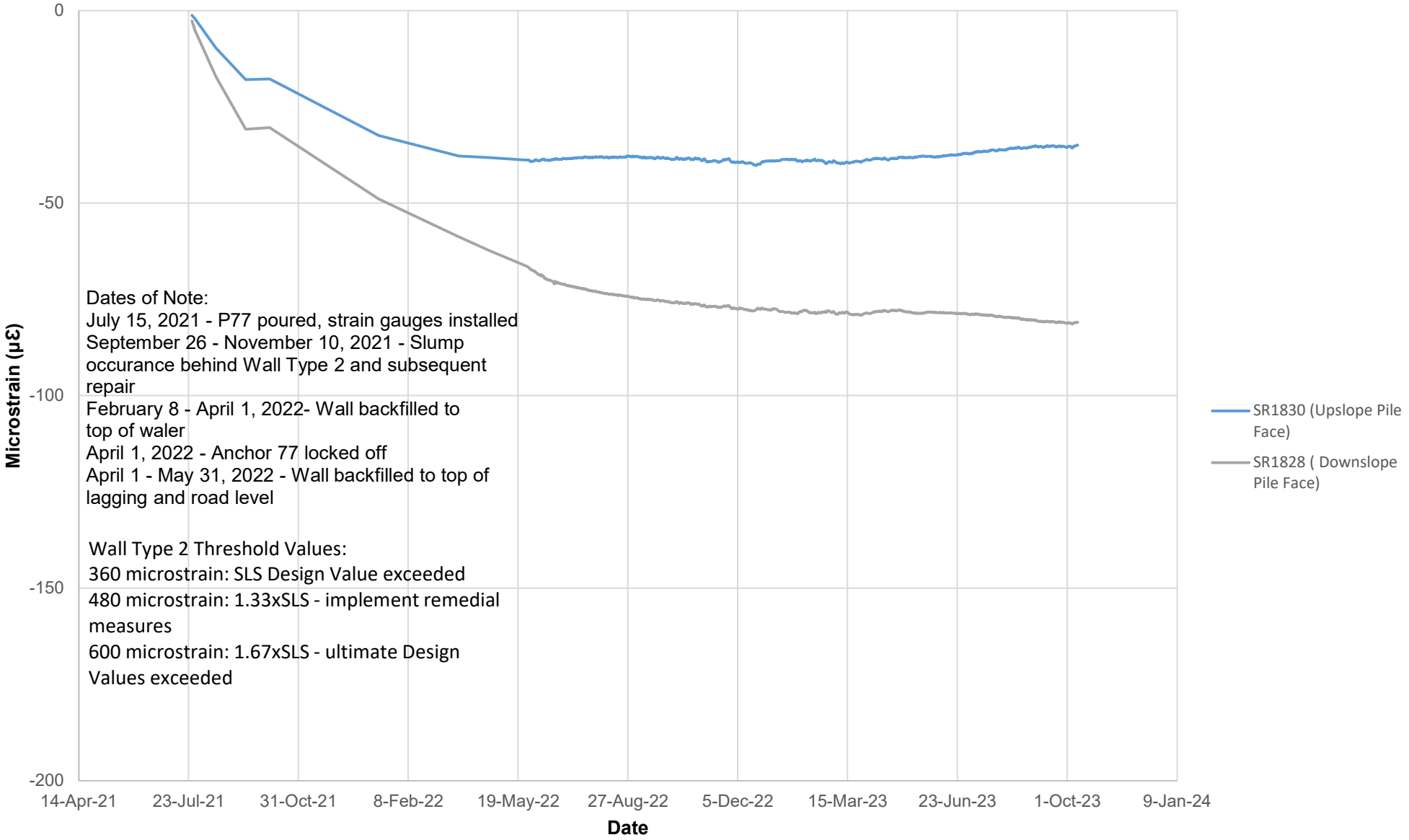


FIGURE PH009-8: PEACE RIVER SHOP SLIDE
P113 UPSLOPE SIDE STRAIN GAUGE VALUES VS DEPTH

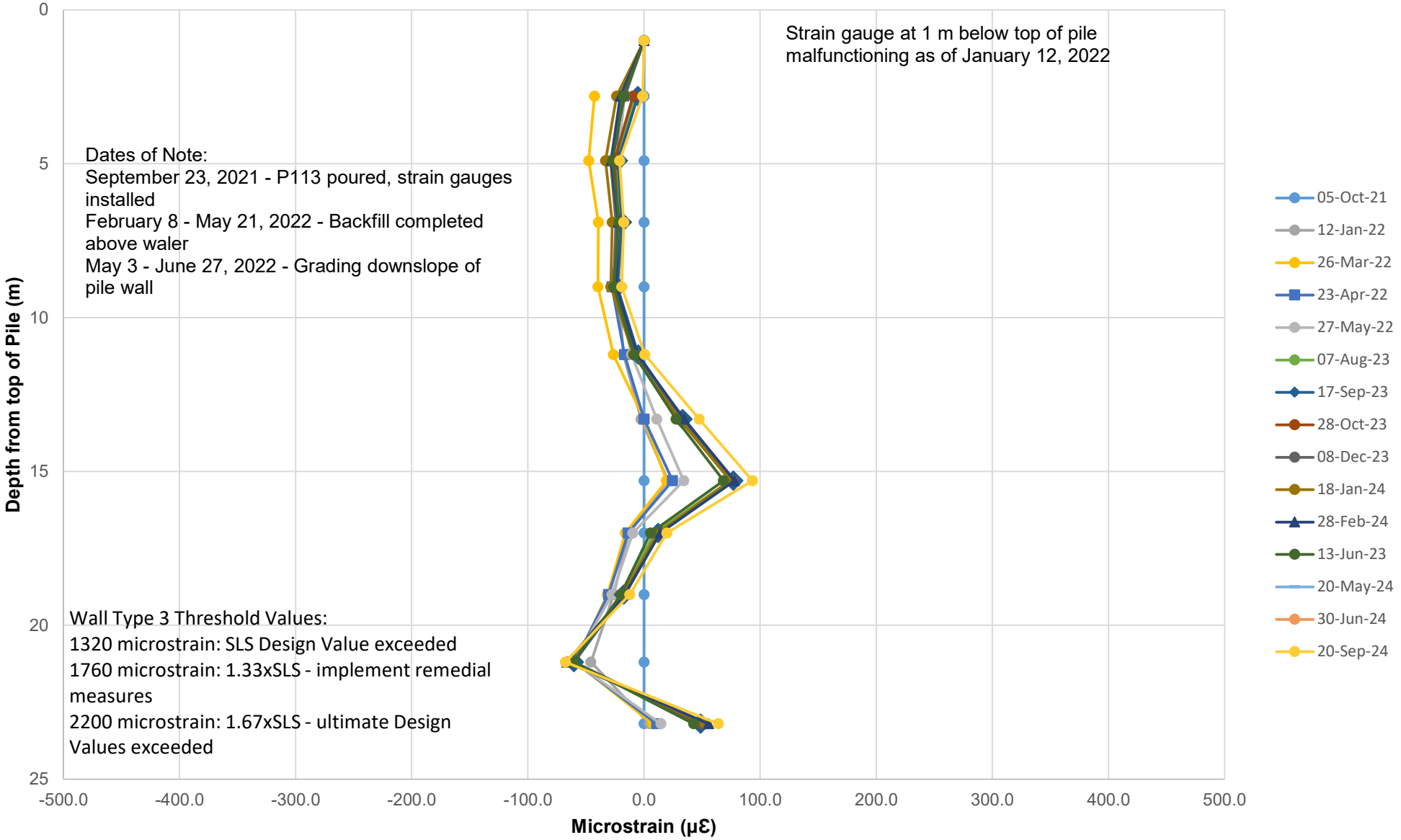


FIGURE PH009-9: PEACE RIVER SHOP SLIDE
P113 DOWNSLOPE SIDE STRAIN GAUGE VALUES VS DEPTH

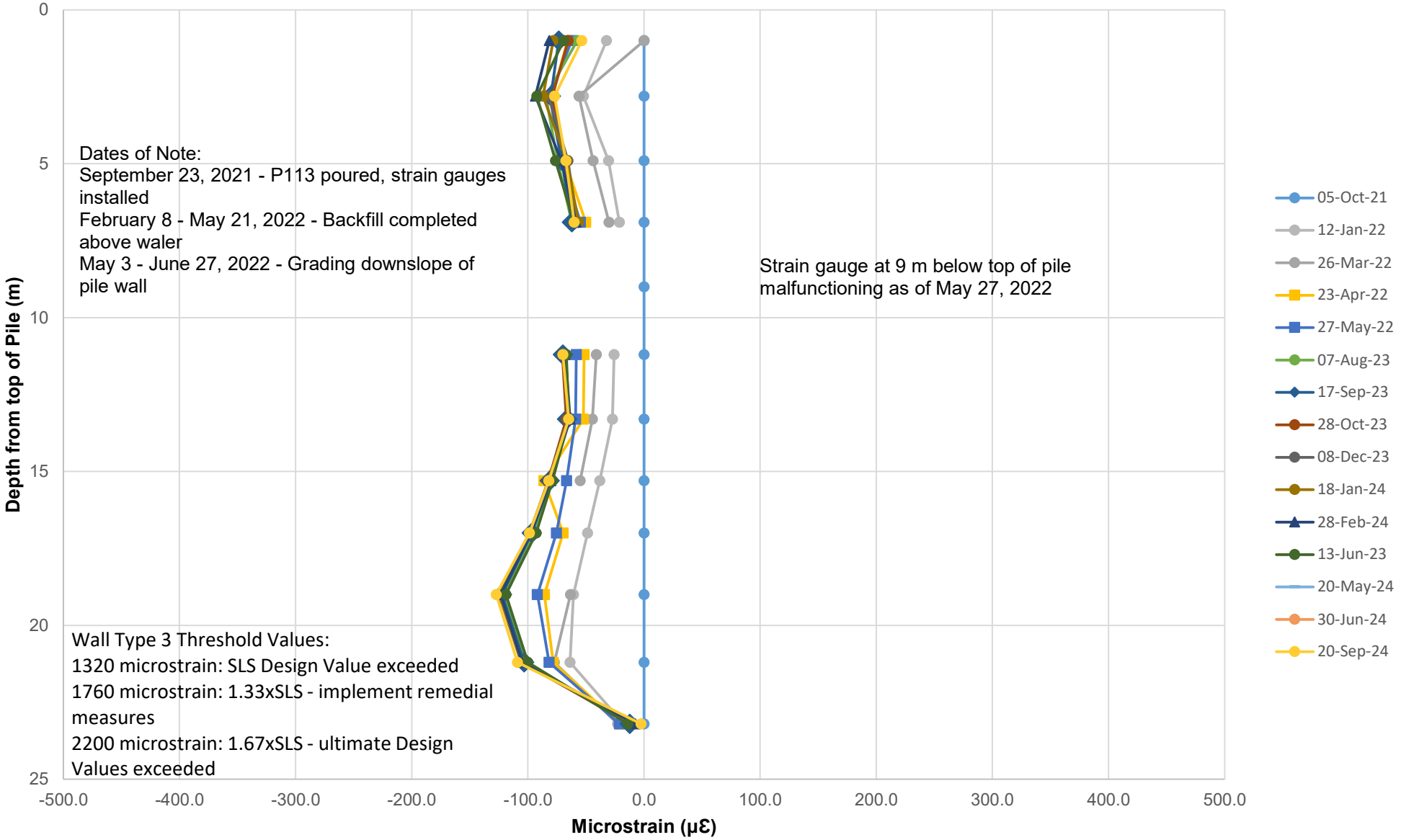


FIGURE PH009-10: PEACE RIVER SHOP SLIDE
P113 MAXIMUM STRAIN VS TIME (15.3 m DEPTH)

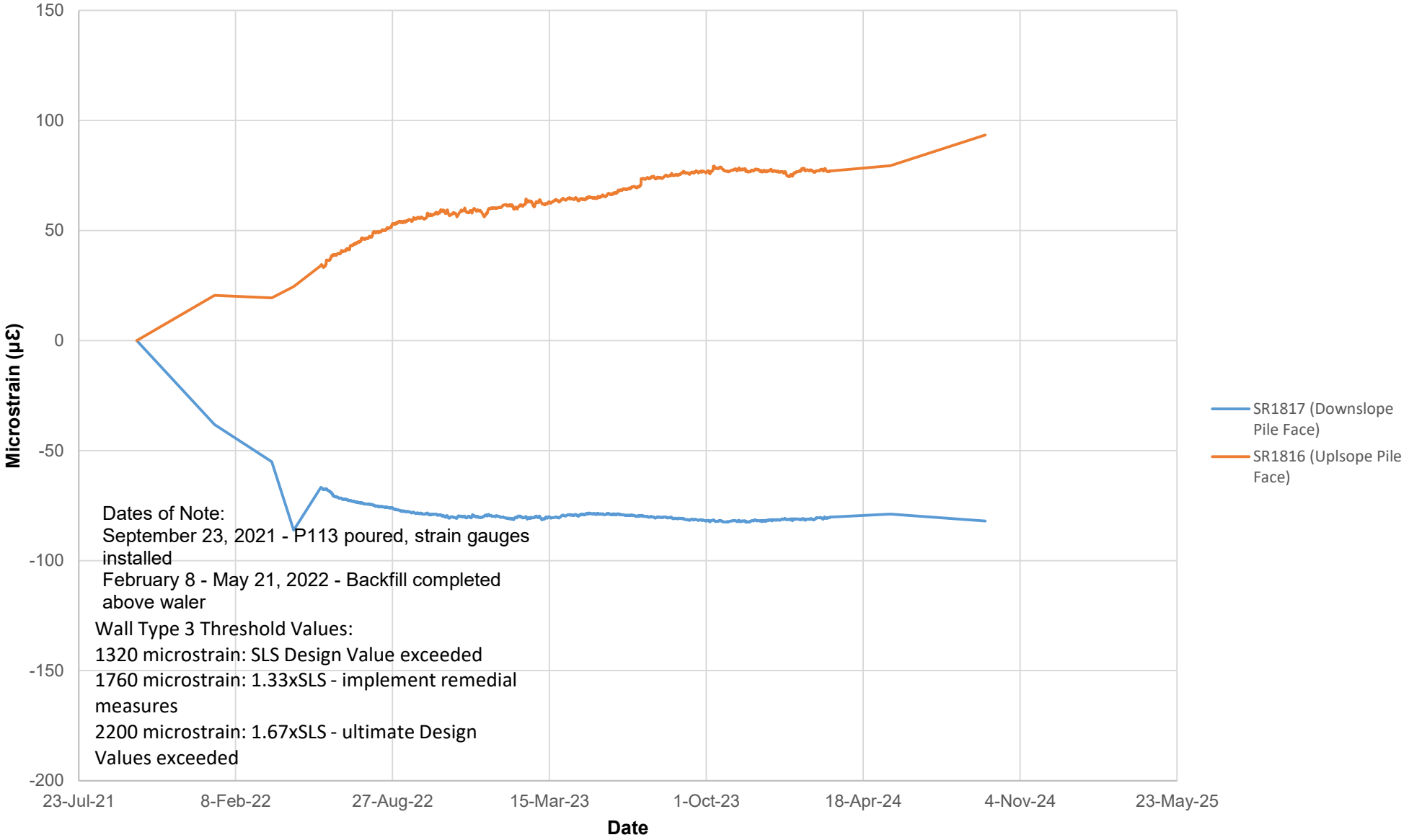


FIGURE PH009-11: PEACE RIVER SHOP SLIDE
P113 MAXIMUM STRAIN VS TIME (19.0 m DEPTH)

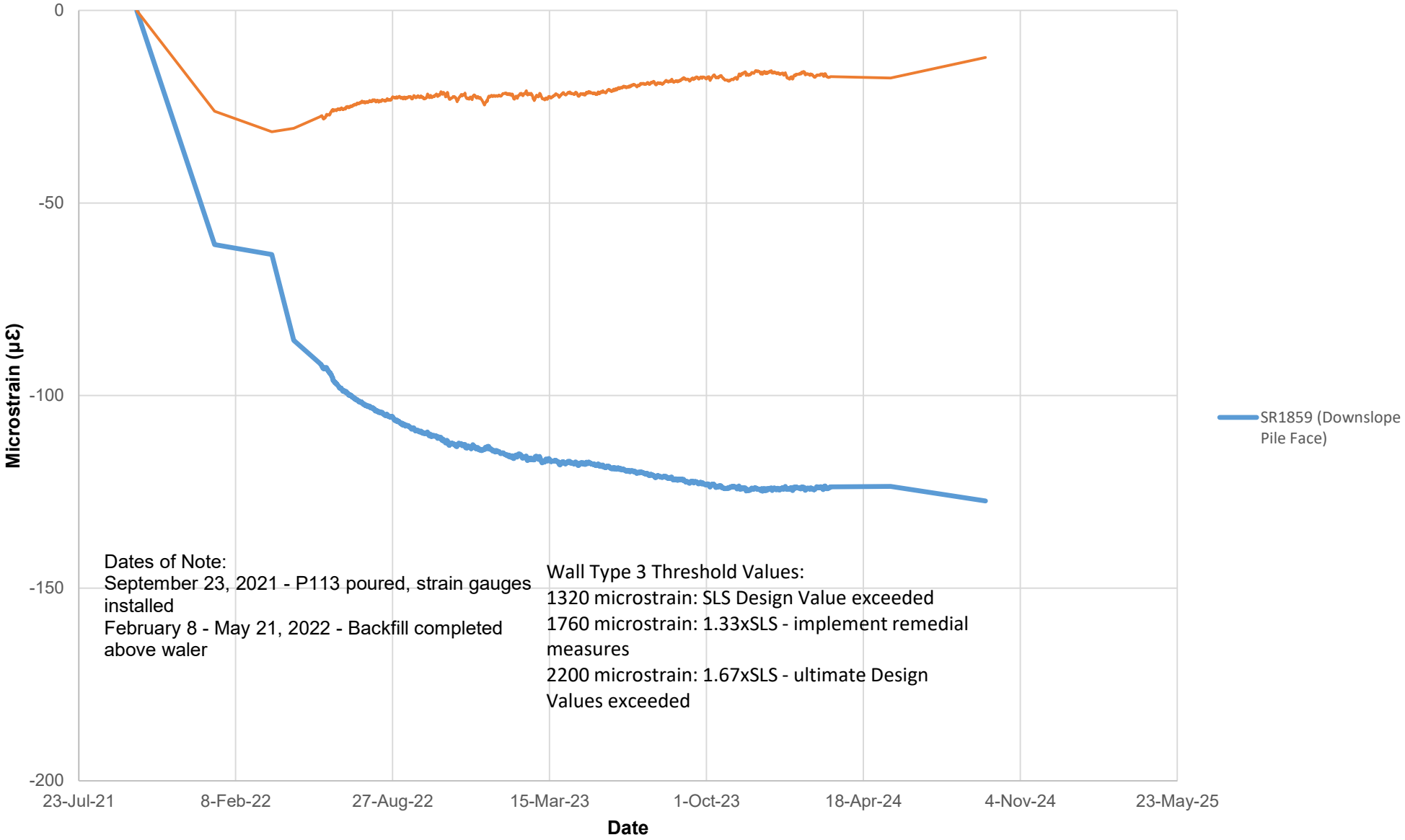


FIGURE PH009-12: PEACE RIVER SHOP SLIDE
P113 MAXIMUM STRAIN VS TIME (21.2 m DEPTH)

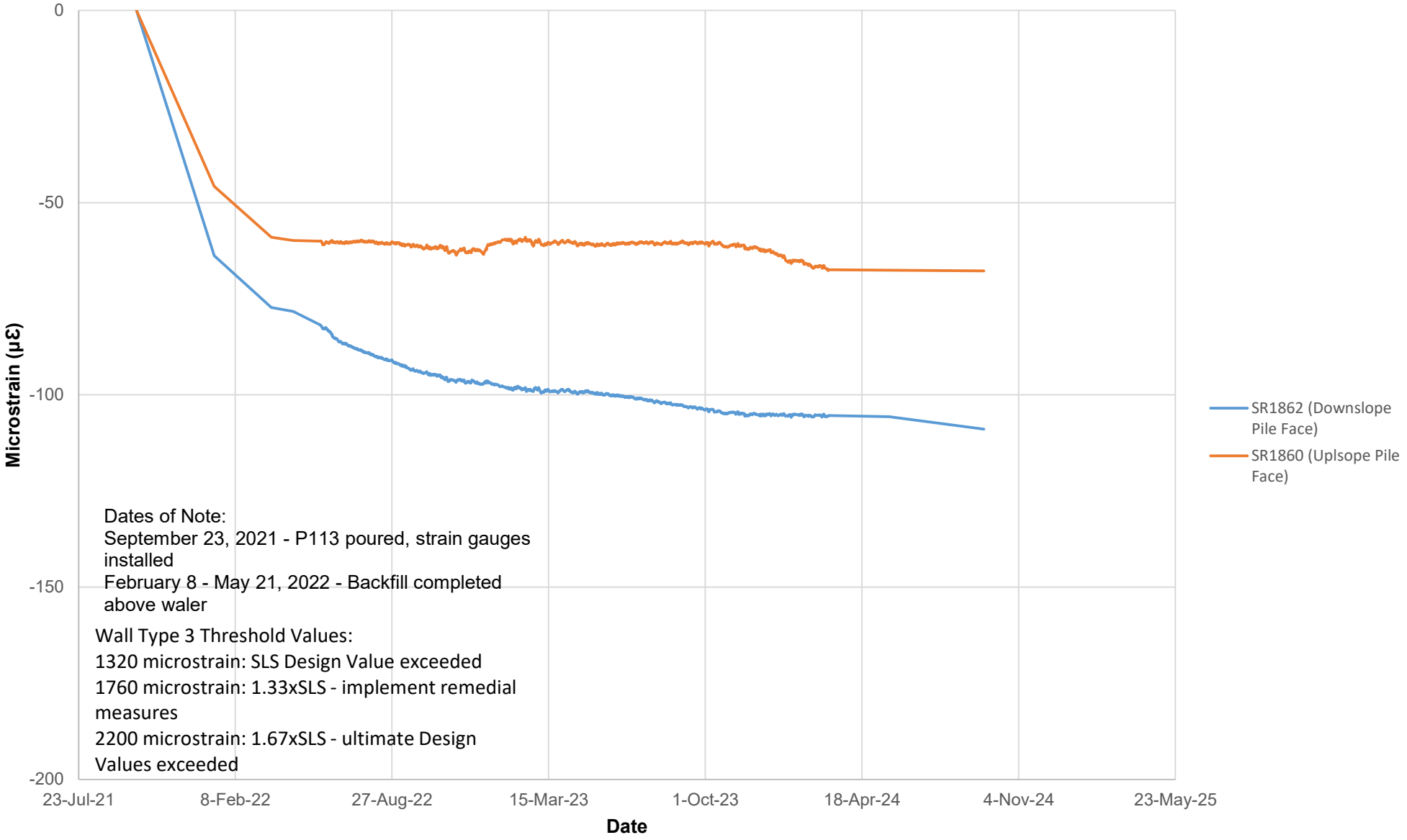


FIGURE PH009-13
OLD HWY 2:02 SHOP SLIDE LOAD CELL READINGS

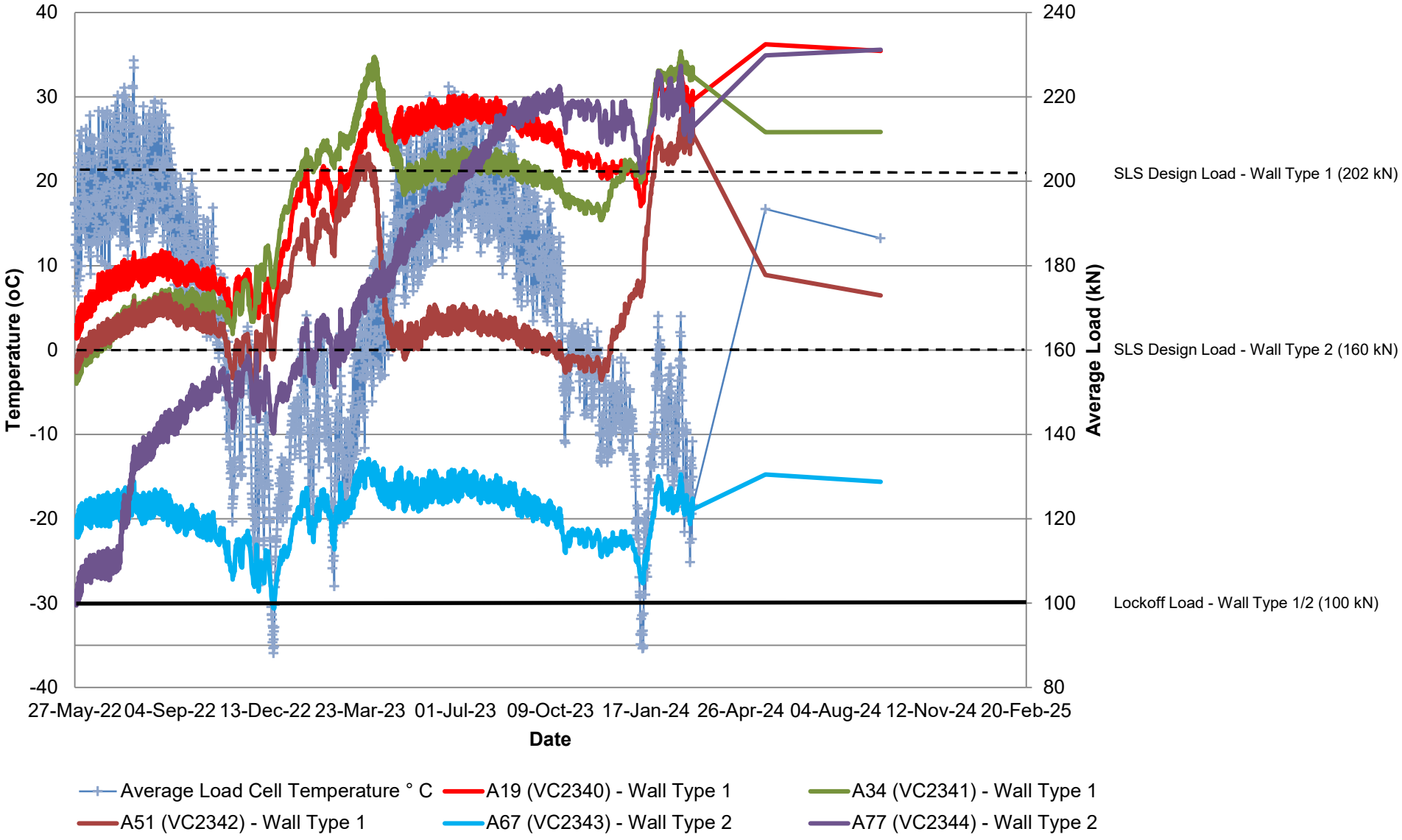


FIGURE PH009-14
ACTIVE STANDPIPE PIEZOMETER READINGS:
SHOP SLIDE

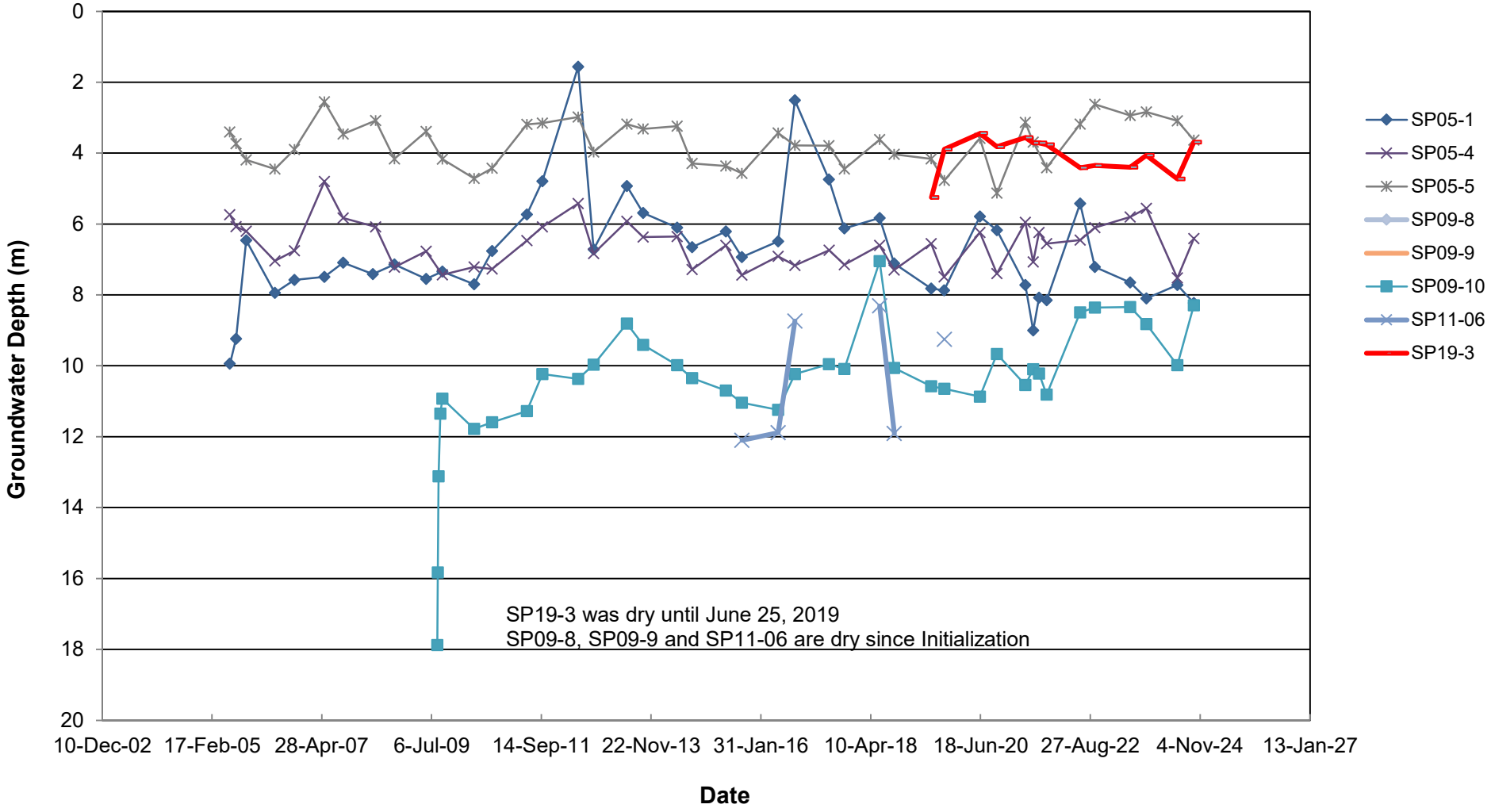


FIGURE PH009-15
HISTORICAL STANDPIPE PIEZOMETER READINGS:
SHOP SLIDE

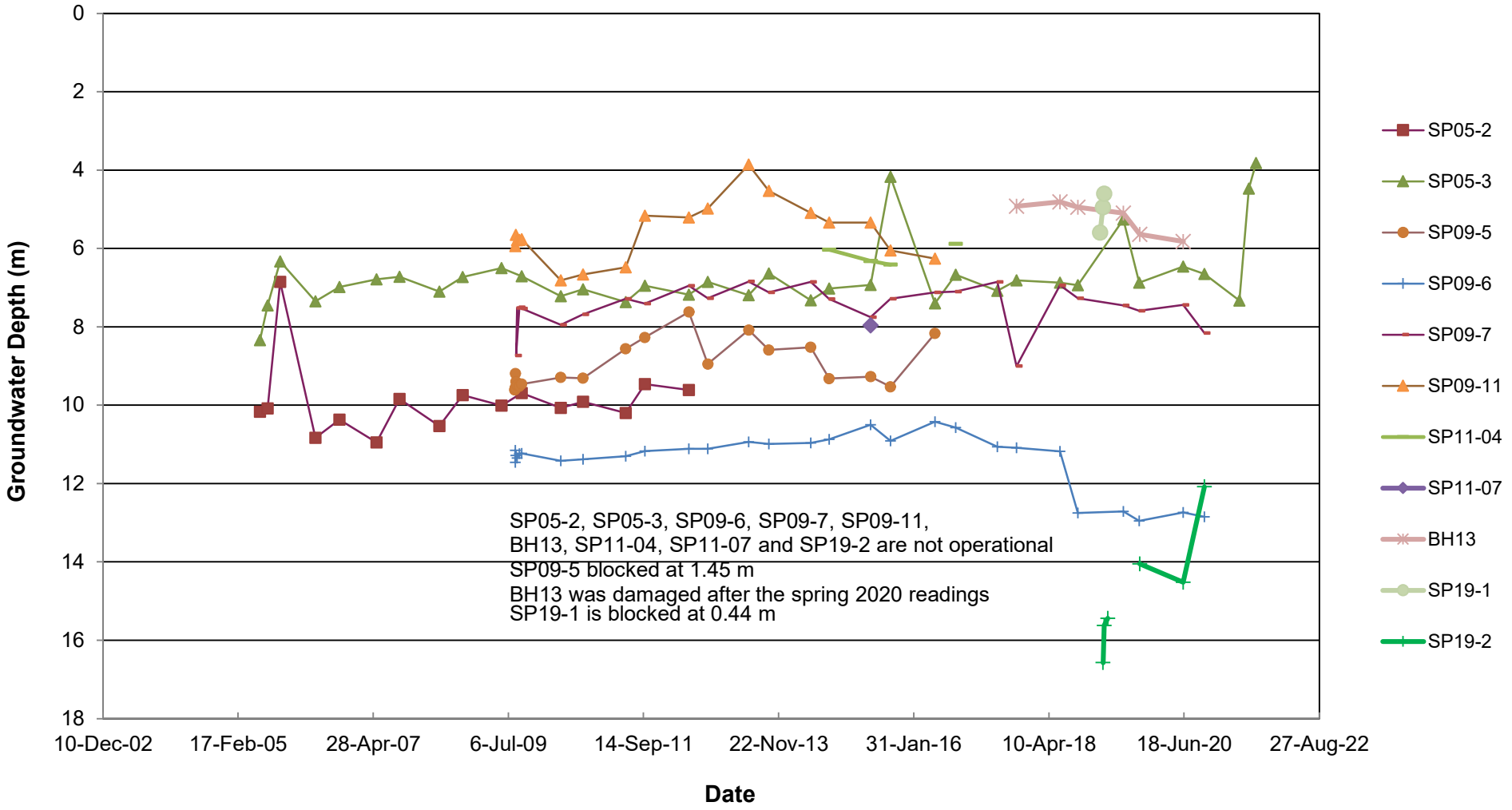


FIGURE PH009-16
VIBRATING WIRE PIEZOMETER DATA
SHOP SLIDE

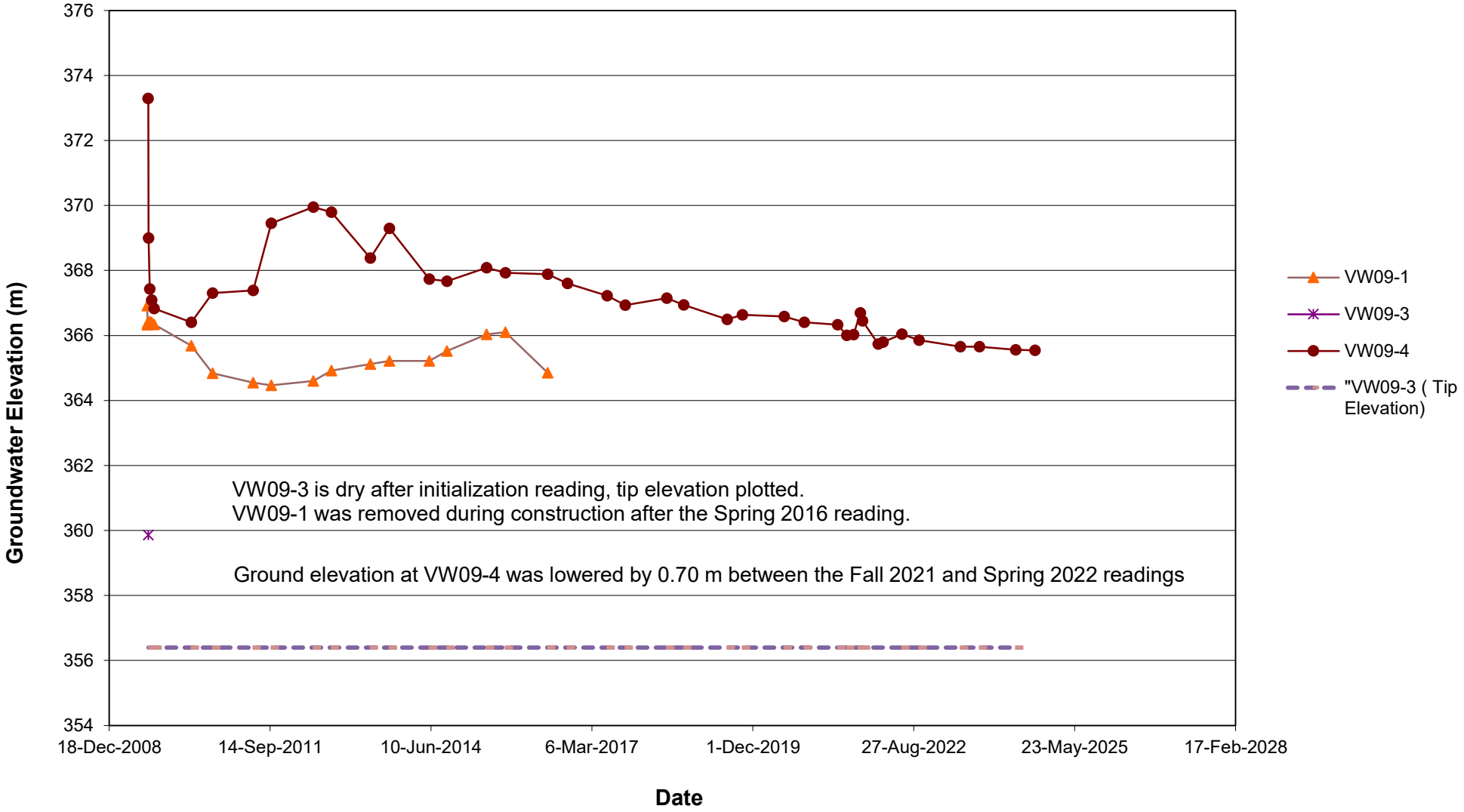


FIGURE PH009-17
PNEUMATIC PIEZOMETER READINGS: SHOP SLIDE