

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



Site Number	Location	Name	Hwy	Bridge
NC099	HWY 63:10, BF75907	Hangingstone River Bridges	63:10	BF75907
Legal Description: 13-33-85-9 W4		UTM Co-ordinates		
		12U E 476931	N	6252664

Current Monitoring:	10-Jun-2024	Previous Monitoring	03-Oct-2023
Instruments Read By:	Mr. Niraj Regmi, G.I.T and Mr. Nixon Mationg, of Thurber		

Instruments Read During This Site Visit			
Slope Inclinerometers (SIs): SI14-01 to SI14-02, SI15-05 to SI15-10, N-SI-01, N-SI-02, S-SI-01 and S-SI-02	Pneumatic Piezometers (PN): N/A	Vibration Wire Piezometers (VW): PZ14-01 to PZ14-04, PZ15-01 to PZ15-12, PZ133647, PZ133682, PZ133638 and PZ133683	Standpipe Piezometers (SP): N/A
Load Cell (LC): N/A	Strain Gauges: N/A	SAA's: N/A	Settlement Cells: SG14 01, SG14-02, and SG1421034

Readout Equipment Used			
Slope Inclinerometers: Two RST Digital Inclinerometer probes with 2 ft. wheelbases and RST Pocket PC readouts	Pneumatic Piezometers: N/A	Vibration Wire Piezometers: onsite dataloggers (PZ133647, PZ133682, and PZ133683) RST VW2106 readout (remaining piezometers)	Standpipe Piezometers: N/A
Load Cell: N/A	Strain Gauges: N/A	SAA's: N/A	Settlement Cells: Onsite dataloggers (SG1421034) RST VW2106 readout (remaining settlement cells)

Notes:

- Site plans showing instrument locations are included in Appendix A.
- SIs plots with A and B directions are presented in Appendix A and summarized in Table NC099-1, attached. Where movement was recorded, the resultant (plot X) and the rate of movement plot are also included.
- The Vibrating wire piezometers and settlement gauge plots are included in Appendix A.
- Vibrating wire piezometer readings are summarized in Table NC099-2, attached.
- Settlement gauge readings are summarized in Table NC099-3, attached.

Discussion	
Zones of New Movement:	None
Interpretation of Monitoring Results:	3.1. Northbound Lane Instruments Slope inclinometers SI15-05 through SI15-08 have shown no discernible movement since initialization. Slope inclinometer SI15-09 showed rates of movement of 1.5 mm/yr, 2.3 mm/yr and 1.8 mm/yr over 2.7 m to 4.0 m depth, 6.4 m to 7.6 m depth, and 10.1 m to 11.9 m depth, respectively, since the fall of 2023 readings. SI15-10 showed a rate of movement of 0.3 mm/yr over 11.9 m to 13.1 m depth and 0.3 mm/yr over 16.2 m to 17.4 m depth since the fall of 2023 readings. SI14-01, located in the pile wall of the bridge north approach fill, showed a rate of movement of 5.1 mm/yr over the length of the pile from 6.1 m to 30.5 m depth, corresponding to an incremental movement of 3.5 mm since the fall of 2023 readings. SI14-02, located in the pile wall of the bridge south approach fill, showed a rate of movement of 4.0 mm/yr over the length of the pile from 5.5 m to 31.7 m depth. The rate of movement in SI14 02 increased by 9.8 mm/yr since the fall of 2023 readings. The current pile head movements in SI14 01 and SI14-02 are 257.1 mm and 169.5 mm, respectively. Vibrating wire piezometers PZ15-01 to -04, and -07 to -10, installed within the cut slope, showed groundwater level decreases ranging from 0.10 m in PZ15-02 to 1.94 m in PZ15-10 since the fall of 2023 readings. The groundwater level increased in PZ15-05, PZ15-06, PZ15-11, and PZ15-12, installed in the cut slope, by 0.11 m, 0.05 m, 0.33 m, and 0.14 m, respectively since the fall of 2023 readings. PZ14-01 and PZ14-02 installed in the north approach fill, showed an increase in groundwater level of 0.10 m, and a decrease in groundwater level of 0.06, respectively, since the fall of 2023 readings. PZ14-03 and PZ14-04, installed in the south approach fill, showed increases in groundwater level of 0.18 m and 0.32 m, respectively, since the fall of 2023 readings. SG14-01 and SG14-02 showed increases in ground settlement of 14.12 mm and 6.62 mm, respectively, since the fall of 2023 readings. 3.2. Southbound Lane Instruments Slope inclinometer N-SI-01, located in the pile wall of the bridge north approach fill, showed a rate of movement of 5.7 mm/yr over 1.5 m to 22.3 m depth, since the fall of 2023 readings. Slope inclinometer N-SI 02, installed through the north abutment fill into the underlying bedrock, showed a rate of movement of 3.1 mm/yr over 3.4 m to 22.3 m depth and 2.0 mm/yr over 11.3 m to 13.1 m depth since the fall of 2023 readings. Slope inclinometer S-SI-01, located in the pile wall of the bridge south approach fill, showed a rate of movement of 3.6 mm/yr over 2.1 m to 22.3 m depth, corresponding to a decrease in the rate of movement of 15.0 mm/yr since the fall of 2023 readings. Slope inclinometer S-SI 02, installed through the south abutment fill and into the underlying bedrock, showed no discernible movement over 0.9 m to 22.3 m and a rate of movement of 1.4 mm/yr over 11.9 m to 13.1 m depth since the fall of 2023 readings. The current pile head movements in N-SI-01 and S-SI-01 are 152.8 mm and 92.9 mm, respectively. PZ133682 and PZ133647 showed increases in groundwater level of 0.19 m and 0.07 m, respectively, since the fall of 2023 readings.

	PZ133638, which began functioning again in April 2024, showed an increase in groundwater level of 0.15 m, since it was last functioning in August 2022. PZ133683 showed an increase in groundwater level of 0.12 m since the fall of 2023 readings. SG1421034, installed below the south abutment fill, showed an increase in ground settlement of 12.60 mm since the fall of 2023 readings.
Future Work:	The instruments should be read again in the fall of 2024. The instrumentation data should be compared to the design criteria to confirm that the bridges are performing as intended.
Instrumentation Repairs:	No instrument repairs are required at this time.
Additional Comments:	

Attachments:	• Table NC099-1 Spring 2024 – HWY 63:10 Hangingstone River Bridge, Slope Inclinator Instrumentation Reading Summary • Table NC099-2 Spring 2024 – HWY 63:10 Hangingstone River Bridge, Vibrating Wire Instrumentation Reading Summary • Table NC099-3 Spring 2024 – HWY 63:10 Hangingstone River Bridge, Settlement Gauge Instrumentation Reading Summary • Statement of Limitations and Conditions • APPENDIX A – NC099-1 SPRING 2024 ○ Field Inspector's reports ○ Site Plans Showing Approximate Instrument Locations (Drawing No. 32122-NC099-1 to 32122-NC099-3) ○ SI Reading Plots ○ Piezometric and Settlement Cell Reading Plots
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We trust this report meets your requirements at present. If you have any questions, please contact the undersigned at your convenience.

Yours very truly,
Thurber Engineering Ltd.
Tarek Abdelaziz, Ph.D., P. Eng.
Partner | Senior Geotechnical Engineer

Lucas Green, P.Eng.
Geotechnical Engineer

Table NC099-1: Spring 2024– Hwy 63:10 Hangingstone River Bridge Slope Inclinator Instrumentation Reading Summary

Date Monitored: June 10, 2024

INSTRUMENT #	DATE INITIALIZED	TOTAL CUMULATIVE RESULTANT MOVEMENT AND DEPTH OF MOVEMENT TO DATE (mm)	MAXIMUM RATE OF MOVEMENT (mm/yr)	CURRENT STATUS	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)
Cut Slope – Northbound Lane								
SI15-05	April 6, 2015	No discernible movement	N/A	Operational	October 3, 2023	N/A	N/A	N/A
SI15-06	March 4, 2015	No discernible movement	N/A	Operational	October 3, 2023	N/A	N/A	N/A
SI15-07	March 4 2015	No discernible movement	N/A	Operational	October 3, 2023	N/A	N/A	N/A
SI15-08	March 4 2015	No discernible movement	N/A	Operational	October 3, 2023	N/A	N/A	N/A
SI15-09	March 4, 2015	32.0 mm over 2.7 m to 4.0 m in 23° direction	13.0 on June 9, 2015	Operational	October 3, 2023	1.0	1.5	-6.9
		16.7 mm over 6.4 m to 7.6 m in 308° direction	4.9 on September 22, 2022			1.6	2.3	-4.1
		39.9 mm over 10.1 m to 11.9 m in 331° direction	46.9 on March 16, 2015			1.0	1.8	-0.4
SI15-10	March 4, 2015	3.6 mm over 11.9 m to 13.1 m in 302° direction	4.3 on March 16, 2015	Operational	October 3, 2023	0.2	0.3	-0.7
		6.2 mm over 16.2 m to 17.4 m in 347° direction	11.9 on March 16, 2015			0.2	0.3	-2.3

Drawings 32122-NC099-1 to 32122-NC099-3 in Appendix A provide sketches of the approximate location of the monitoring instrumentation for this site.

Table NC099-1– Continued: Spring 2024– Hwy 63:10 Hangingstone River Bridge Slope Inclinometer Instrumentation Reading Summary

Date Monitored: June 10, 2024

INSTRUMENT #	DATE INITIALIZED	TOTAL CUMULATIVE RESULTANT MOVEMENT AND DEPTH OF MOVEMENT TO DATE (mm)	MAXIMUM RATE OF MOVEMENT (mm/yr)	CURRENT STATUS	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)
Hangingstone River Bridge Abutments – Northbound Lane								
SI14-01	September 4, 2014	257.1 mm over 6.1 m to 30.5 m in 228° direction	1447.1 on November 17, 2014	Operational	October 3, 2023	3.5	5.1	-2.0
SI14-02	August 29, 2014	169.5 mm over 5.5 m to 31.7 m in 54° direction	2686.7 on November 17, 2014	Operational	October 3, 2023	2.8	4.0	9.8
SI14-03	September 17, 2014	42.1 mm over 15.2 m to 17.7 m in 165° direction	99.9 on November 17, 2014	Sheared at 18.9 m depth	September 14, 2018	N/A	N/A	N/A
		79.1 mm 17.7 m to 20.7 m in 220° direction	391.2 on November 17, 2014			N/A	N/A	N/A
SI14-04	September 19, 2014	89.2 mm over 13.7 m to 17.4 m in 30° direction	1919.2 on November 17, 2014	Sheared at 15.8 m depth	September 14, 2018	N/A	N/A	N/A
		23.5 mm over 18.6 m to 20.4 m in 50° direction	297.0 on November 17, 2014			N/A	N/A	N/A

Drawings 32122-NC099-1 to 32122-NC099-3 in Appendix A provide sketches of the approximate location of the monitoring instrumentation for this site.

Table Nc099-1– Continued: Spring 2024– Hwy 63:10 Hangingstone River Bridge Slope Inclinator Instrumentation Reading Summary

Date Monitored: June 10, 2024

INSTRUMENT #	DATE REINITIALIZED	TOTAL CUMULATIVE RESULTANT MOVEMENT AND DEPTH OF MOVEMENT TO DATE (mm)	MAXIMUM RATE OF MOVEMENT (mm/yr)	CURRENT STATUS	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)
Hangingstone River Bridge - Southbound Lane								
N-SI-01	May 29, 2023	152.8 over 1.5 m to 22.3 m in 179° direction	1146.4 on July 22, 2021	Operational	October 3, 2023	3.9	5.7	14.1
N-SI-02	May 29, 2023	117.2 over 3.4 m to 22.3 m in 115° direction	886.7 on July 22, 2021	Operational	October 3, 2023	2.2	3.1	5.0
		48.7 over 11.3 to 13.1 m in 115° direction	377.6 on July 22, 2021			1.4	2.0	-1.2
S-SI-01	May 29, 2023	92.9 over 2.1 m to 22.3 m in 4° direction	726.1 on July 15, 2021	Operational	October 3, 2023	2.5	3.6	-15.0
S-SI-02	May 29, 2023	83.4 over 0.9 m to 22.3 m in 26° direction	1596.4 on June 22, 2021	Operational	October 3, 2023	No discernible movement	N/A	-4.1
		25.1 over 11.9 m to 13.1 m in 26° direction	138.44 on July 15, 2021			1.0	1.4	>-0.1

Drawings 32122-NC099-1 to 32122-NC099-3 in Appendix A provide sketches of the approximate location of the monitoring instrumentation for this site.

Table NC099-2: Spring 2024 – Hwy 63:10 Hangingstone River Bridge Vibrating Wire Piezometer Instrumentation Reading Summary

Date Monitored: June 10, 2024

INSTRUMENT #	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM GROUNDWATER ELEV. (m)	CURRENT GROUNDWATER ELEV. (m)	PREVIOUS GROUNDWATER ELEV. (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
Cut Slope – Northbound Lane								
PZ15-01 (31269)	March 4, 2015	512.86	533.27	Operational	516.71 on June 27, 2021	515.97	516.63	-0.66
PZ15-02 (31268)	March 4, 2015	504.63	533.27	Operational	518.13 on March 16, 2015	515.65	515.75	-0.10
PZ15-03 (31267)	March 4, 2015	514.10	533.99	Operational	519.34 on March 4, 2015	517.53	517.97	-0.44
PZ15-04 (31266)	March 4, 2015	505.10	533.99	Operational	519.03 on March 4, 2015	516.03	516.15	-0.12
PZ15-05 (31261)	March 4, 2015	514.19	524.62	Operational	516.83 on March 4, 2015	514.42	514.31	0.11
PZ15-06 (31260)	March 4, 2015	505.08	524.62	Operational	516.63 on March 4, 2015	508.84	508.79	0.05
PZ15-07 (31259)	March 4, 2015	517.88	528.88	Operational	520.20 on March 4, 2015	517.91	518.30	-0.39
PZ15-08 (31258)	March 4, 2015	508.89	528.88	Operational	518.50 on March 4, 2015	515.85	516.20	-0.35
PZ15-09 (31265)	March 4, 2015	514.32	516.62	Operational	516.37 on September 2, 2016	513.82	514.40	-0.58

Drawings 32122-NC099-1 to 32122-NC099-3 in Appendix A provide sketches of the approximate location of the monitoring instrumentation for this site.

Table NC099-2– Continued: Spring 2024– Hwy 63:10 Hangingstone River Bridge Vibrating Wire Piezometer Instrumentation Reading Summary

Date Monitored: June 10, 2024

INSTRUMENT #	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM GROUNDWATER ELEV. (m)	CURRENT GROUNDWATER ELEV. (m)	PREVIOUS GROUNDWATER ELEV. (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
Cut Slope – Northbound Lane– Continued								
PZ15-10 (31264)	March 4, 2015	505.33	516.62	Operational	513.62 on September 2, 2016	507.53	509.47	-1.94
PZ15-11 (31263)	March 4, 2015	516.88	520.83	Operational	519.40 on March 16, 2015	518.73	518.40	0.33
PZ15-12 (31262)	March 4, 2015	509.87	520.83	Operational	518.69 on March 16, 2015	517.39	517.25	0.14
Hangingstone River Bridge Abutments – Northbound Lane								
PZ14-01 (30106)	September 17, 2014	482.17	504.00	Operational	497.31 on November 8, 2014	495.48	495.38	0.10
PZ14-02 (30107)	September 17, 2014	487.17	504.00	Operational	497.65 on September 17, 2014	491.90	491.96	-0.06
PZ14-03 (30109)	September 19, 2014	481.92	502.80	Operational	502.14 on November 11, 2014	495.34	495.16	0.18
PZ14-04 (30108)	September 19, 2014	486.92	502.80	Operational	500.82 on November 11, 2014	494.46	494.14	0.32

Drawings 32122-NC099-1 to 32122-NC099-3 in Appendix A provide sketches of the approximate location of the monitoring instrumentation for this site.

Table NC099-2– Continued: Spring 2024– Hwy 63:10 Hangingstone River Bridge Vibrating Wire Piezometer Instrumentation Reading Summary

Date Monitored: June 10, 2024

INSTRUMENT #	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM GROUNDWATER ELEV. (m)	CURRENT GROUNDWATER ELEV. (m)	PREVIOUS GROUNDWATER ELEV. (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
Hangingstone River Bridge – Southbound Lane								
PZ133682	May 23, 2021	486.23	503.00	Operational	499.57 on July 21, 2021	499.15	498.96	0.19
PZ133647	May 23, 2021	482.23	503.00	Operational	489.80 on July 21, 2021	488.88	488.81	0.07
PZ133638	May 21, 2021	487.25	501.80	Operational	502.14 on November 11, 2014	492.38	492.23 (Aug. 28, 2022)	0.15
PZ133683	May 21, 2021	482.30	501.80	Operational	495.32 on July 13, 2021	493.57	493.45	0.12

Drawings 32122-NC099-1 to 32122-NC099-3 in Appendix A provide sketches of the approximate location of the monitoring instrumentation for this site.

Table NC099-3: Spring 2024 – Hwy 63:10 Hangingstone River Bridge Settlement Gauge Instrumentation Reading Summary

Date Monitored: June 10, 2024

INSTRUMENT #	DATE INITIALIZED	CURRENT STATUS	CURRENT SETTLEMENT (mm)	PREVIOUS SETTLEMENT (mm)	CHANGE IN SETTLEMENT (mm) ⁽¹⁾
Hangingstone River Bridge Abutments – Northbound Lane					
SG14-01	September 17, 2014	Operational	-239.04	-224.92	14.12
SG14-02	September 19, 2014	Operational	-364.02	-357.40	6.62
Hangingstone River Bridge Abutments – Southbound Lane					
SG1421049	May 23, 2021	Malfunctioning	N/A	151.43 (Oct. 5, 2023)	N/A
SG1421034	May 21, 2021	Operational	-181.23	-168.63	12.60

Drawings 32122-NC099-1 to 32122-NC099-3 in Appendix A provide sketches of the approximate location of the monitoring instrumentation for this site.

(1) Negative (-) change in settlement indicates an upward movement (heave) of the ground surface and positive (+) change in settlement indicates a downward movement (settlement) of the ground surface.

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.

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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.

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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

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7. INDEPENDENT JUDGEMENTS OF CLIENT

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**ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP (CON0022163)
NORTH CENTRAL (ATHABASCA AND FORT McMURRAY DISTRICTS)
INSTRUMENTATION MONITORING RESULTS**

SPRING 2024

**APPENDIX A
DATA PRESENTATION AND SITE PLANS**

SITE NC099: HWY 63:10 HANGINGSTONE RIVER BRIDGE

**ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
NORTH CENTRAL REGION - ATHABASCA AND FORT McMURRAY DISTRICTS
INSTRUMENTATION MONITORING FIELD SUMMARY (NC099)
SPRING 2024**

Location: Hwy 63:10 over Hangingstone River (BF75907)	Readout: RST VW 2106 Unit 3
File Number: 32122	Casing Diameter 2.75"/3.34"
Probe: RST Set 5R & 8R	Temp (deg C): 15
Cable: RST Set 5R & 8R	Read by: NKR/NRM

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location UTM 12 V		Date	Stickup (m)	Depth from top of Casing (ft)	Azimuth of A+ Groove	Current Bottom Depth Readings				Probe/ Reel #	Size (")	Remarks
	Northing	Easting					A+	A-	B+	B-			
SI14-01	6252664	476931	10-Jun-24	1.27	99 to 5	222	-69	85	224	-224	5R/5R	2.75	
SI14-02	6252634	476895	10-Jun-24	1.28	103 to 3	60	72	-60	295	-300	5R/5R	2.75	
SI15-05	6252255	476637	10-Jun-24	0.52	118 to 4	308	-626	632	2	-25	5R/5R	3.34	
SI15-06	6252220	476535	10-Jun-24	0.61	118 to 2	308	-539	554	121	-119	8R/8R	3.34	
SI15-07	6252299	476609	10-Jun-24	0.48	88 to 4	318	-208	221	247	-268	5R/5R	3.34	
SI15-08	6252246	476520	10-Jun-24	0.47	88 to 2	306	-307	325	40	-38	8R/8R	3.34	
SI15-09	6252336	476583	10-Jun-24	0.52	58 to 4	295	-325	336	49	-70	5R/5R	3.34	
SI15-10	6252283	476495	10-Jun-24	0.55	58 to 2	304	-266	283	437	-440	8R/8R	3.34	

VIBRATING WIRE PIEZOMETER (VW) READINGS

VW#	Date	Reading		Identification Number	Monitoring Station	Datalogger Serial	UTM 12 V		Comment
		B Unit	Temp.				Northing	Easting	
PZ14-01	10-Jun-24	7873.6	4.5	30106	MS-01	3906	6252624	476955	Manual Reading
PZ14-02	10-Jun-24	8528.2	5.1	30107	MS-01	3906	6252624	476955	Manual Reading
PZ14-03	10-Jun-24	7706.9	4.9	30108	MS-02	3905	6252660	476918	Manual Reading
PZ14-04	10-Jun-24	8179.1	4.7	30109	MS-02	3905	6255572	-23127	Manual Reading
PZ15-01	10-Jun-24	8690.4	4.5	31269	-	-	6252255	476637	Attached to SI15-05
PZ15-02	10-Jun-24	8067.3	4.2	31268	-	-	6252255	476637	Attached to SI15-05
PZ15-03	10-Jun-24	8635.9	3.8	31267	-	-	6252220	476535	Attached to SI15-06
PZ15-04	10-Jun-24	8076.4	3.8	31266	-	-	6252220	476535	Attached to SI15-06
PZ15-05	10-Jun-24	8892	4.3	31261	-	-	6252299	476609	Attached to SI15-07
PZ15-06	10-Jun-24	8667.4	4.3	31260	-	-	6252299	476609	Attached to SI15-07
PZ15-07	10-Jun-24	8882.1	4.2	31259	-	-	6252246	476520	Attached to SI15-08
PZ15-08	10-Jun-24	8407.8	3.8	31258	-	-	6252246	476520	Attached to SI15-08
PZ15-09	10-Jun-24	8951.6	1.3	31265	-	-	6252336	476583	Attached to SI15-09
PZ15-10	10-Jun-24	8745	4.2	31264	-	-	6252336	476583	Attached to SI15-09
PZ15-11	10-Jun-24	8872.8	2.8	31263	-	-	6252283	476495	Attached to SI15-10
PZ15-12	10-Jun-24	8266.5	4.5	31262	-	-	6252283	476495	Attached to SI15-10

SETTLEMENT CELL READINGS

SC#	Date	Reading		Identification Number	Monitoring Station	Datalogger Serial	3TM EBA Scaled		Comment
		B Unit	Temp.				Northing	Easting	
SG14-01	10-Jun-24	5475	4.2	1428194	MS-01	3906	6255616	-23070	Manual Reading
SG14-02	10-Jun-24	6163	4.2	1428195	MS-02	3905	6255572	-23127	Manual Reading

INSPECTOR REPORT

MS-01 and MS-02 take manual readings

**ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
NORTH CENTRAL REGION - ATHABASCA AND FORT McMURRAY DISTRICTS
INSTRUMENTATION MONITORING FIELD SUMMARY (NC099)
SPRING 2024**

Location: Hwy 63:10 over Hangingstone River (BF75907) - South Bridge	Readout:
File Number: 32122	Casing Diameter 2.75"/3.34"
Probe: RST Set 8R	Temp (deg C): 10
Cable: RST Set 8R	Read by: NKR/NRM

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location UTM 12 V		Date	Stickup (m)	Depth from top of Casing (ft)	Azimuth of A+ Groove	Current Bottom Depth Readings				Probe/ Reel #	Remarks
	Northing	Easting					A+	A-	B+	B-		
N-SI-01	6252711	476897	10-Jun-24	0.96	98 to 2	143	-623	640	-336	335	8R	
N-SI-02	6252718	476901	10-Jun-24	0.92	112 to 2	103	22	-7	-210	207	8R	
S-SI-01	6252692	476862	10-Jun-24	0.63	98 to 2	10	102	-85	-211	208	8R	
S-SI-02	6252681	476858	10-Jun-24	1.2	108 to 2	32	-441	445	-119	116	8R	

VIBRATING WIRE PIEZOMETER (VW) READINGS

VW#	Date	Reading		Identification Number	Monitoring Station	Datalogger Serial	UTM 12 V		Comment
		B Unit	Temp.				Northing	Easting	
PZ133682	10-Jun-24	-	-	-	North	-	6252758	476875	Downloaded
PZ133647	10-Jun-24	-	-	-	North	-	6252758	476875	"
PZ133683	10-Jun-24	-	-	-	South	-	6252716	476828	"

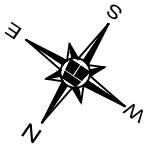
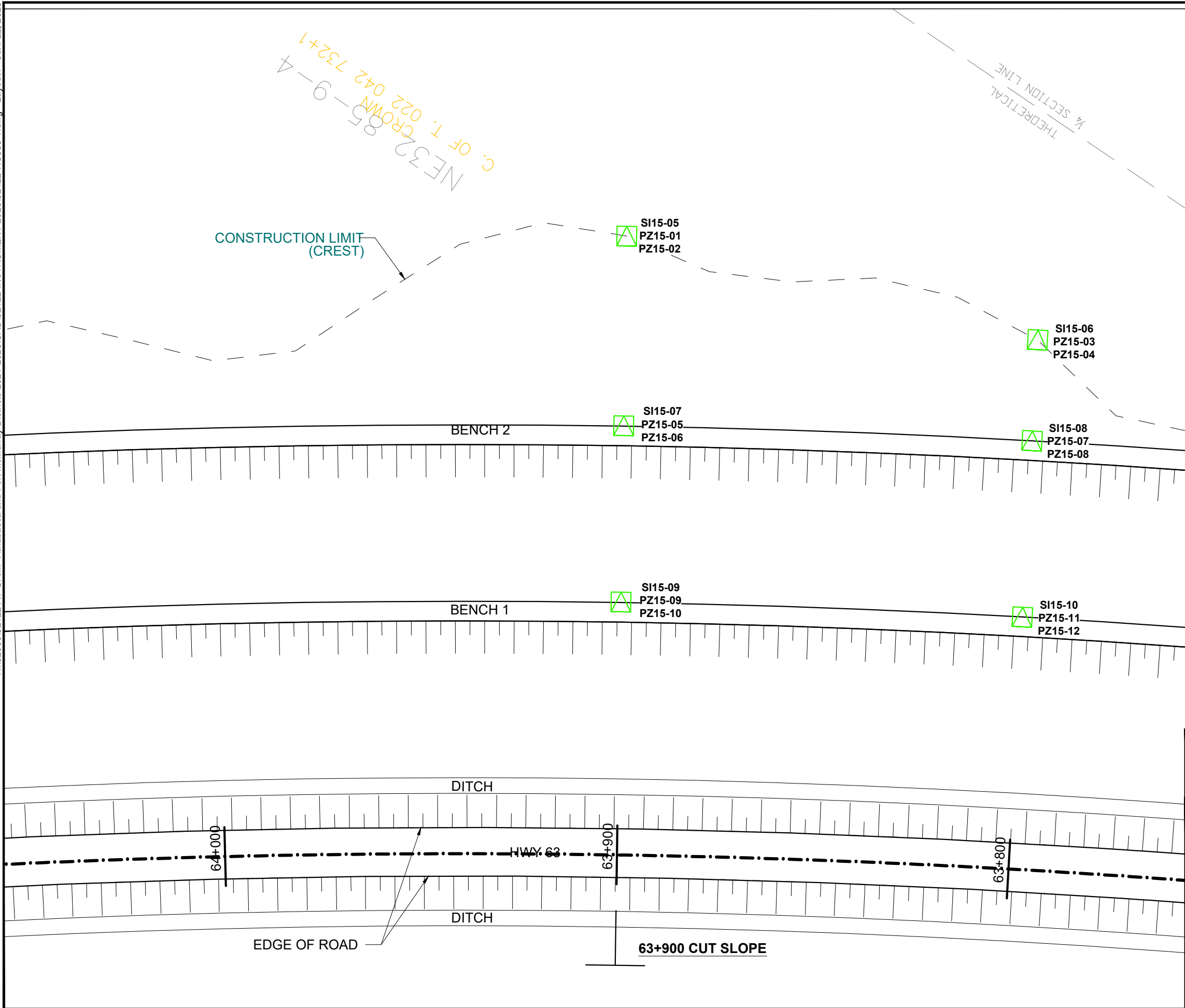
SETTLEMENT CELL READINGS

SC#	Date	Reading		Identification Number	Monitoring Station	Datalogger Serial	3TM EBA Scaled		Comment
		B Unit	Temp.				Northing	Easting	
SG1421034	10-Jun-24	-	-	-	South	DT2055 12463	6252716	476828	MS-2, Downloaded

INSPECTOR REPORT

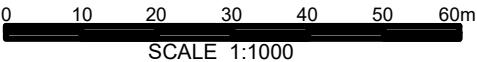
- Measure stickups, azimuths and coordinates for SIs, coordinates for datalogger stations.
MS-1 SG142049 sensor is damaged recently, took manual readings as well no date only thermal sensor working.

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\CAD\32122 INSTRUMENT 2023\32122-NC099-1.dwg - Layout1 - Jun. 22, 2023



LEGEND

- VIBRATING WIRE PIEZOMETERS
- INCLINOMETER



BASE PLAN PROVIDED BY TETRA TECH



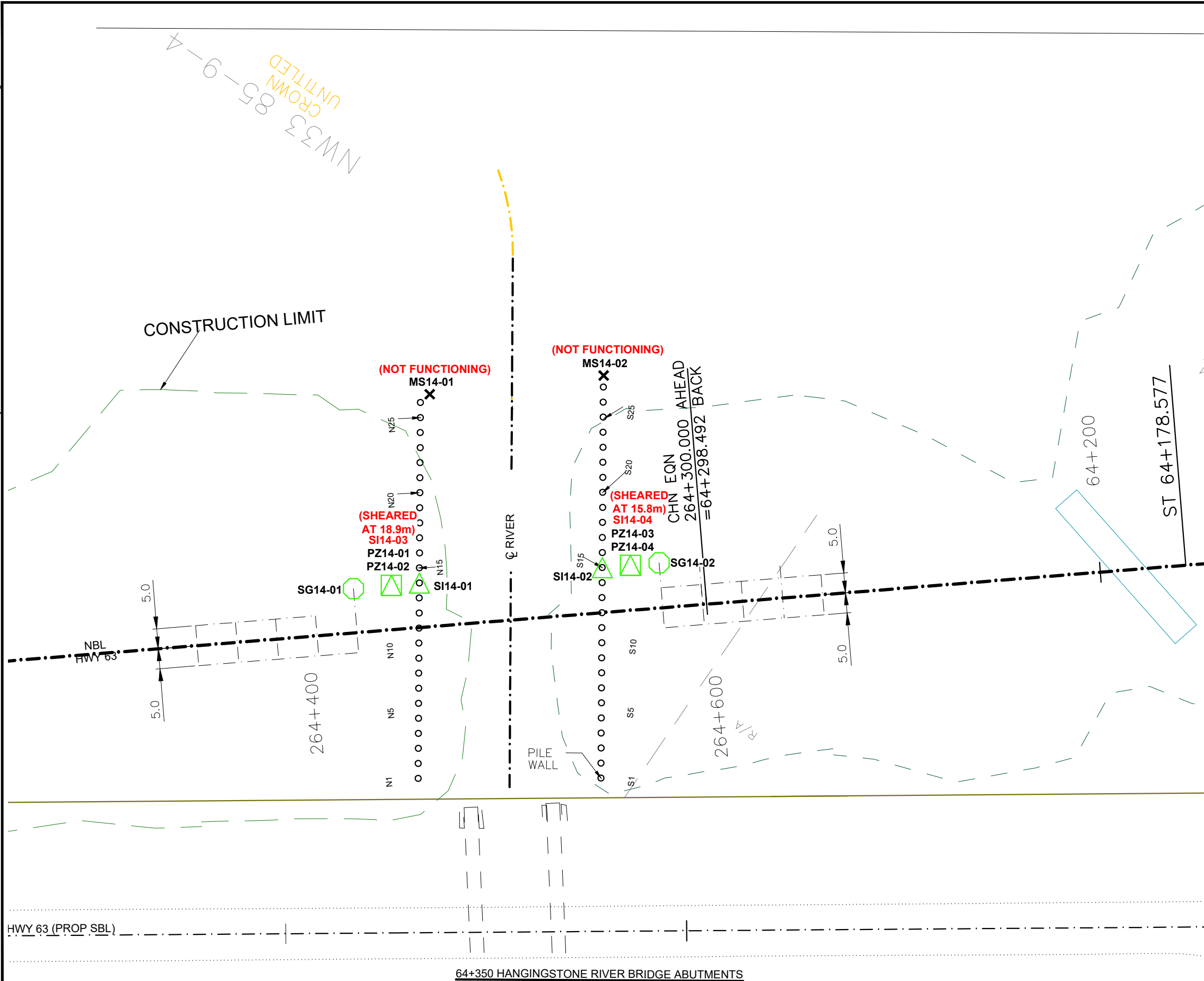
NORTH CENTRAL
(ATHABASCA AND FORT MCMURRAY DISTRICTS)
NC099: HWY 63:08 HANGINGSTONE RIVER BRIDGE
STA. 63+900 CUT SLOPE
SITE PLAN SHOWING APPROXIMATE
INSTRUMENT LOCATIONS (NORTHBOUND LANE)
DWG No. 32122-NC099-1

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



THURBER ENGINEERING LTD.

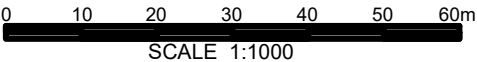
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LEGEND

- VIBRATING WIRE PIEZOMETERS
- INCLINOMETER
- SETTLEMENT GAUGE
- MONITORING STATION

NOTE:
DRAWING DOES NOT SHOW FINAL ALIGNMENT
AND HIGHWAY BRIDGE FOR FOR SOUTHBOUND
LANE, CONSTRUCTED 2022



BASE PLAN PROVIDED BY TETRA TECH

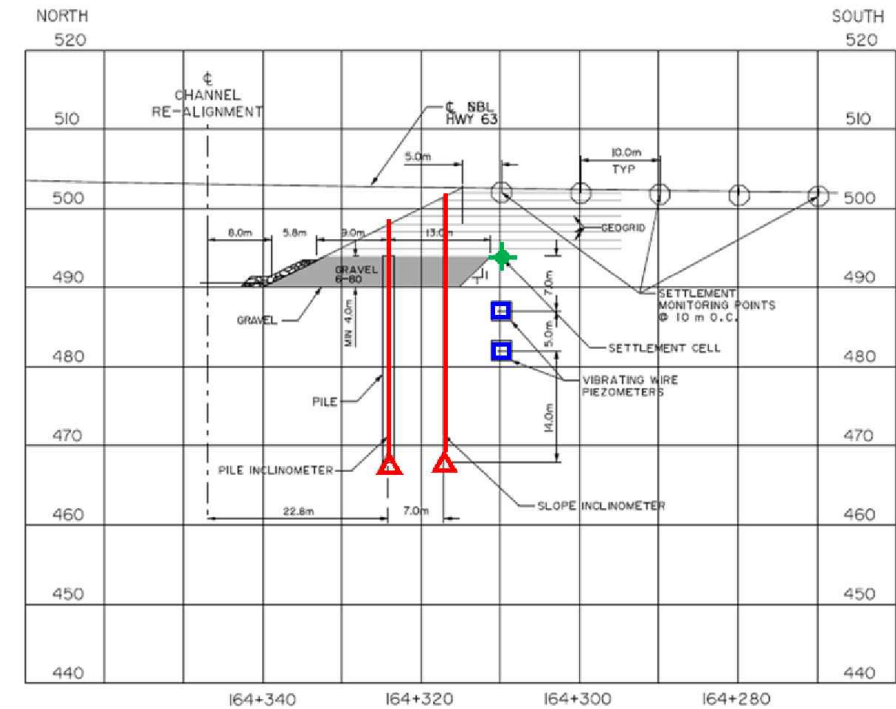
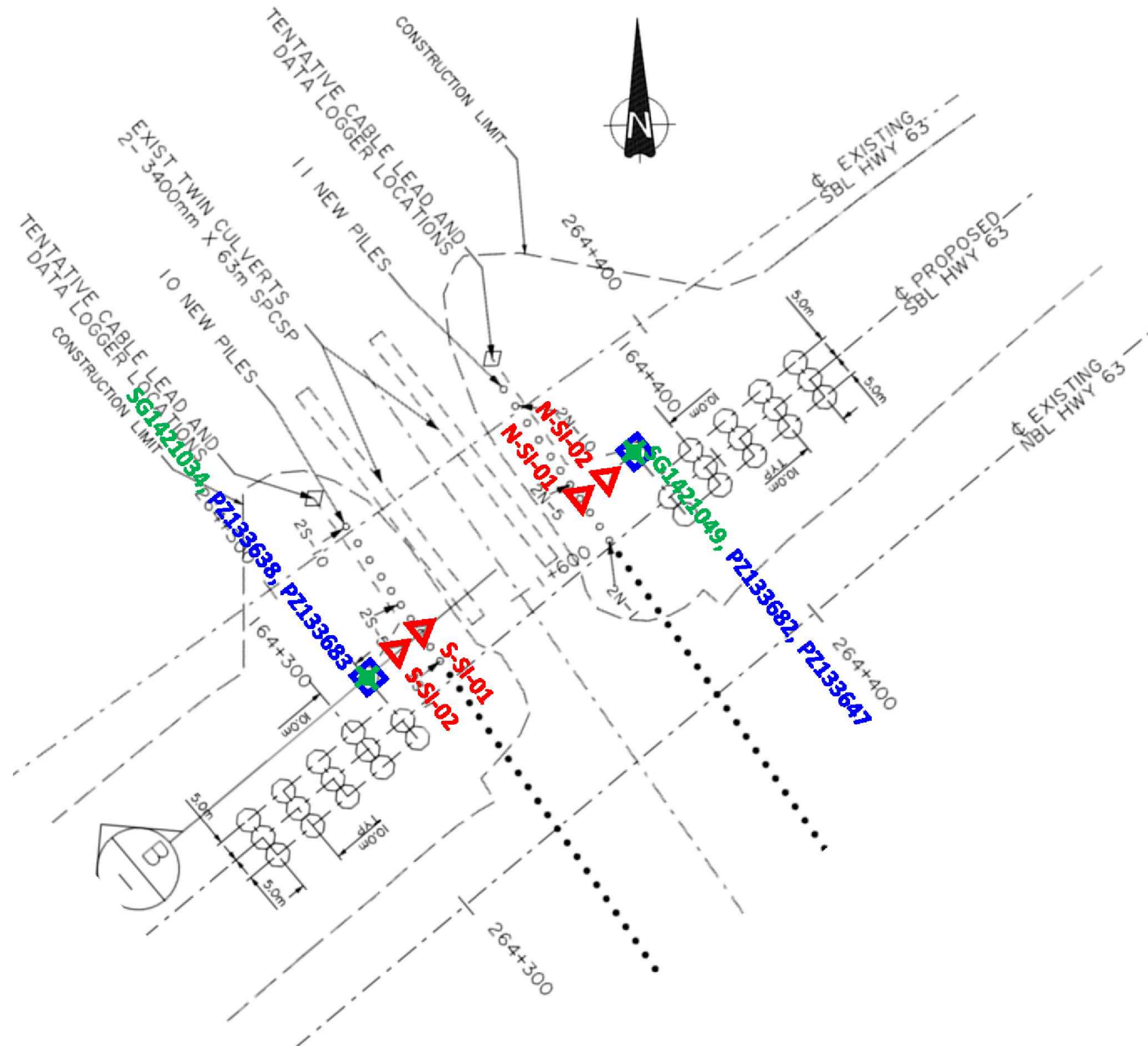


**NORTH CENTRAL
(ATHABASCA AND FORT MCMURRAY DISTRICTS)
NC099: HWY 63:08 HANGINGSTONE RIVER BRIDGE
STA. 64+350 ABUTMENTS
SITE PLAN SHOWING APPROXIMATE
INSTRUMENT LOCATIONS (NORTHBOUND LANE)
DWG No. 32122-NC099-2**

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DESIGNED BY	BWN
APPROVED BY	TSA
SCALE	1:1000
DATE	JUNE 2023
FILE No.	32122

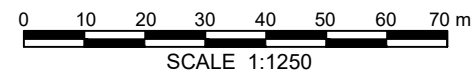


THURBER ENGINEERING LTD.



SECTION 'B'
SCALE 1:500
SEE DWG# 44746-P
FOR PILE WALL DRAWING

- LEGEND
- VIBRATING WIRE PIEZOMETERS
 - INCLINOMETER
 - SETTLEMENT MONITORING POINT
 - SETTLEMENT CELL
 - DATA LOGGER
 - CABLE LEAD



BASE PLAN PROVIDED BY TETRA TECH



**NORTH CENTRAL
(ATHABASCA AND FORT MCMURRAY DISTRICTS)
NC099: HWY 63:08 HANGINGSTONE RIVER BRIDGE**

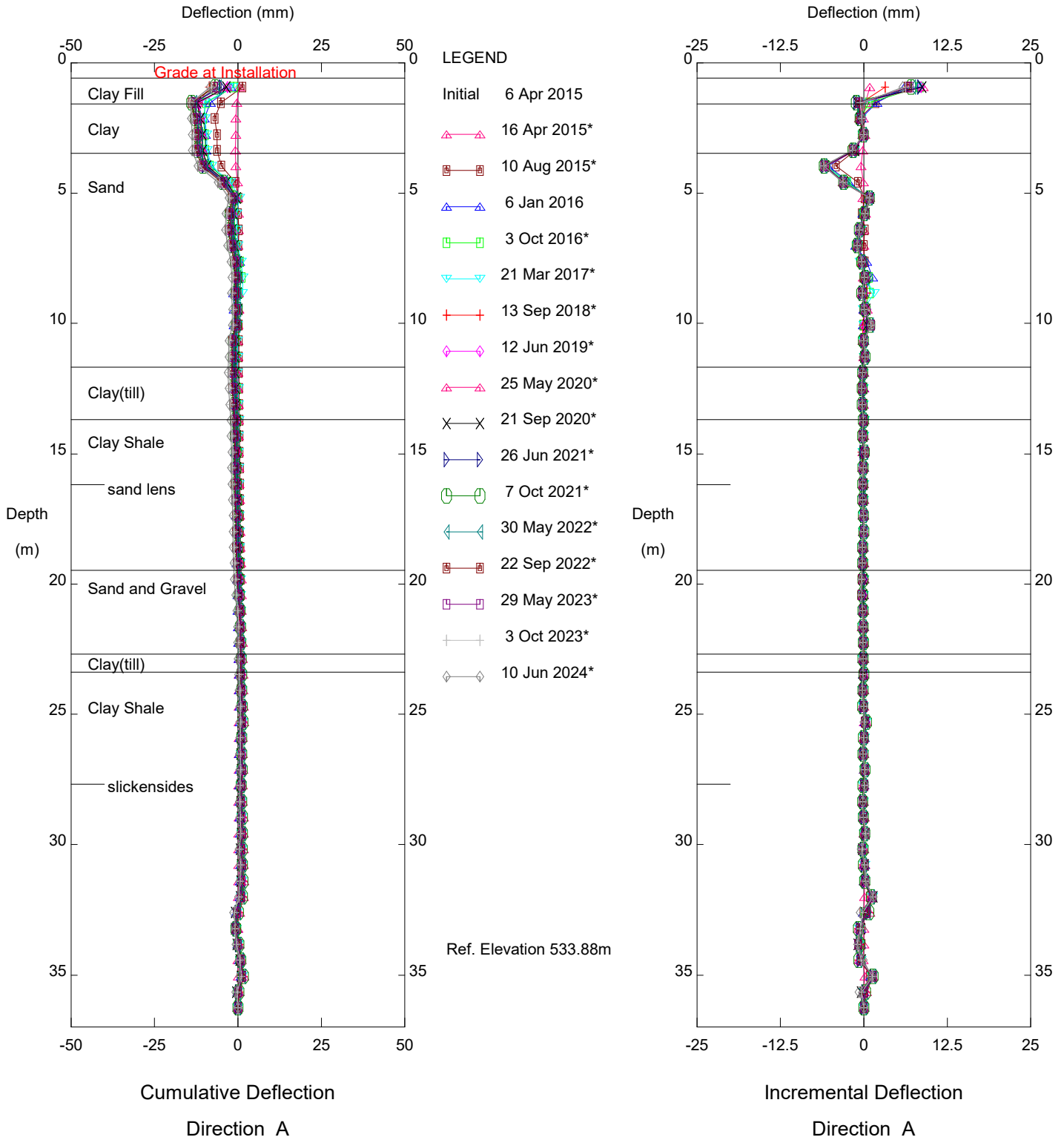
**SITE PLAN SHOWING APPROXIMATE
INSTRUMENT LOCATIONS (SOUTHBOUND LANE)**

DWG No. 32122-NC099-3

DRAWN BY	ML
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APPROVED BY	TSA
SCALE	1:1250
DATE	JUNE 2023
FILE No.	32122



Thurber Engineering Ltd.

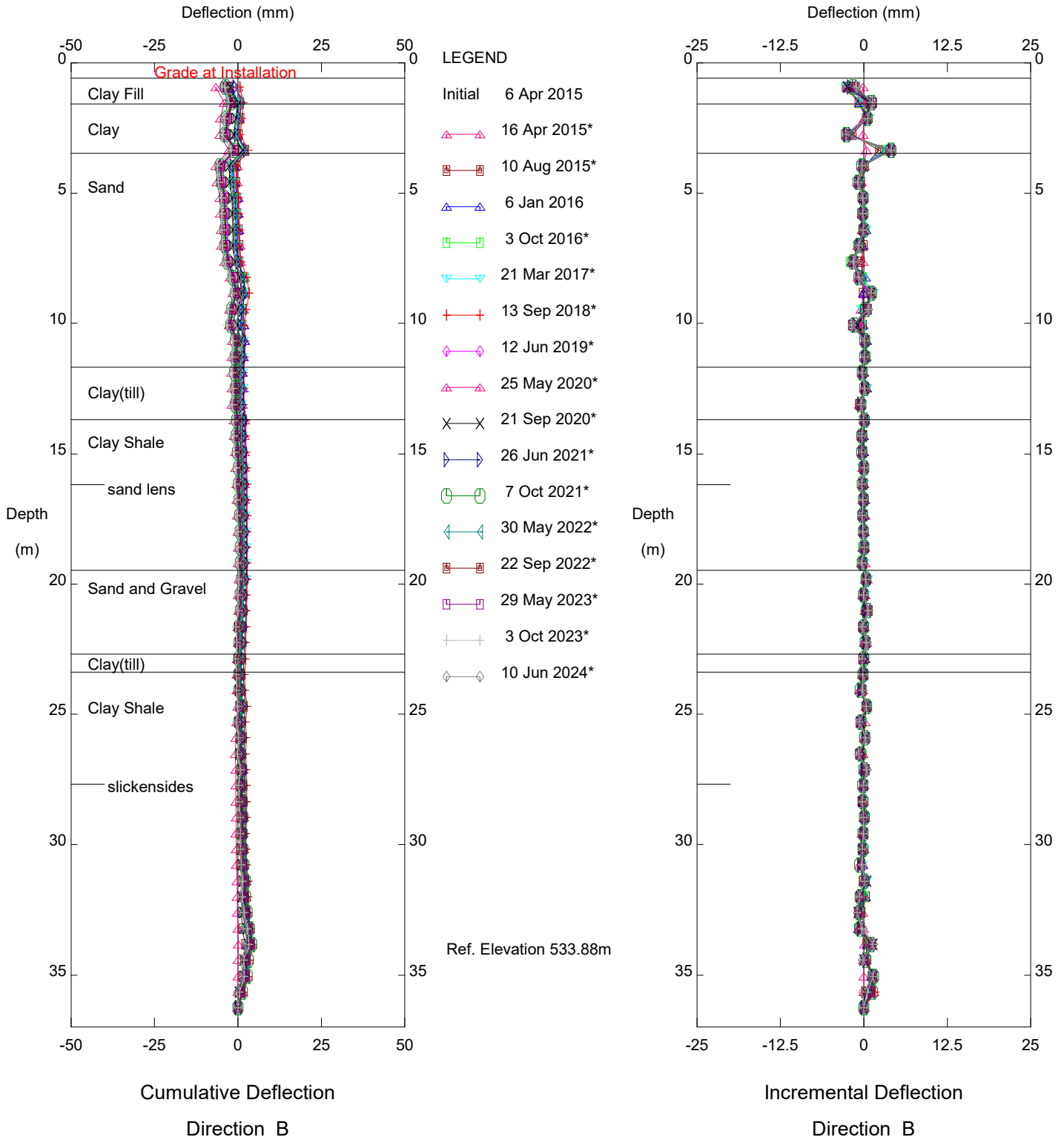


NC099 Cut Slope - Crest, Inclinator 15-05

Alberta Transportation

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

Thurber Engineering Ltd.

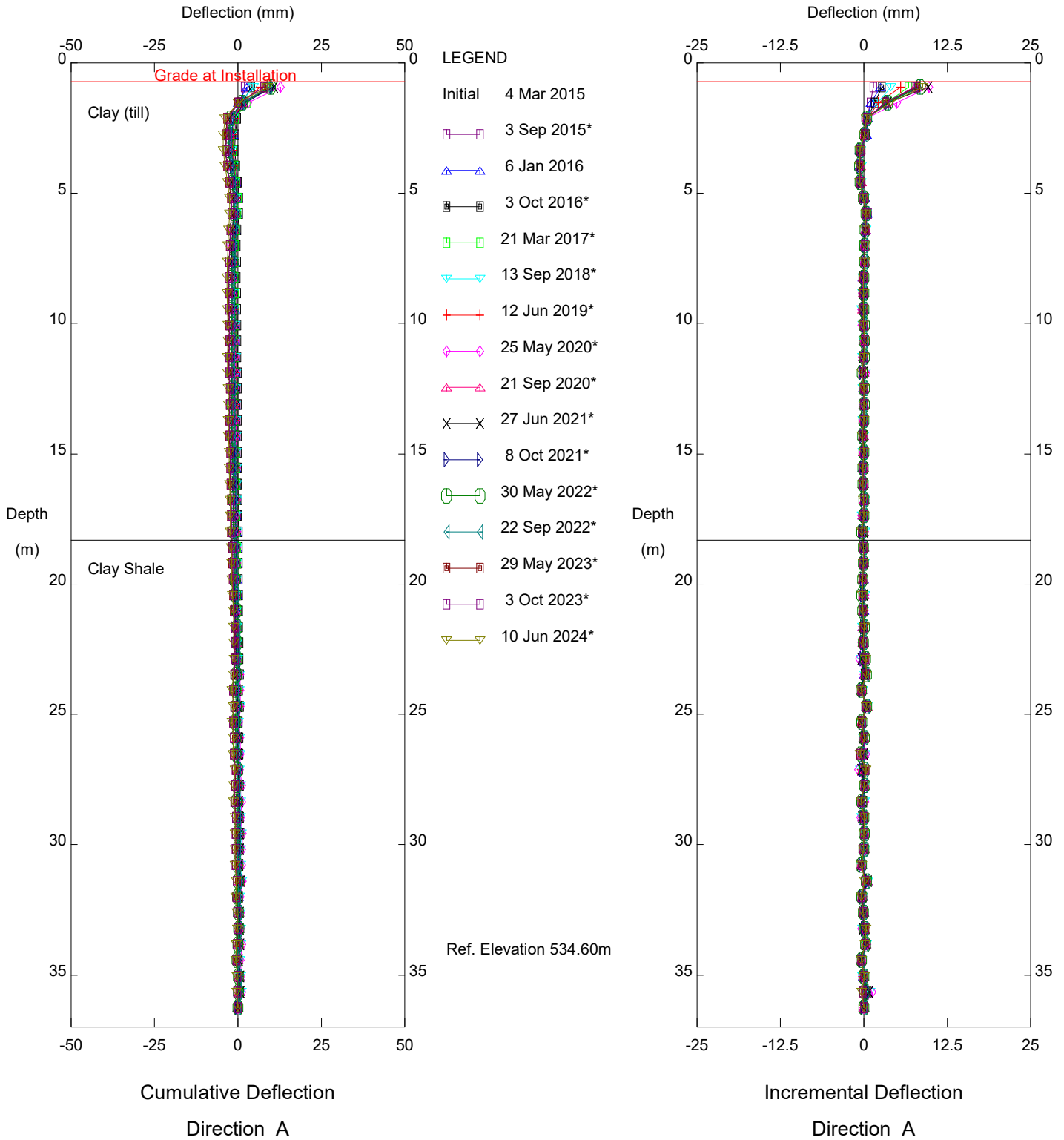


NC099 Cut Slope - Crest, Inclinometer 15-05

Alberta Transportation

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

Thurber Engineering Ltd.

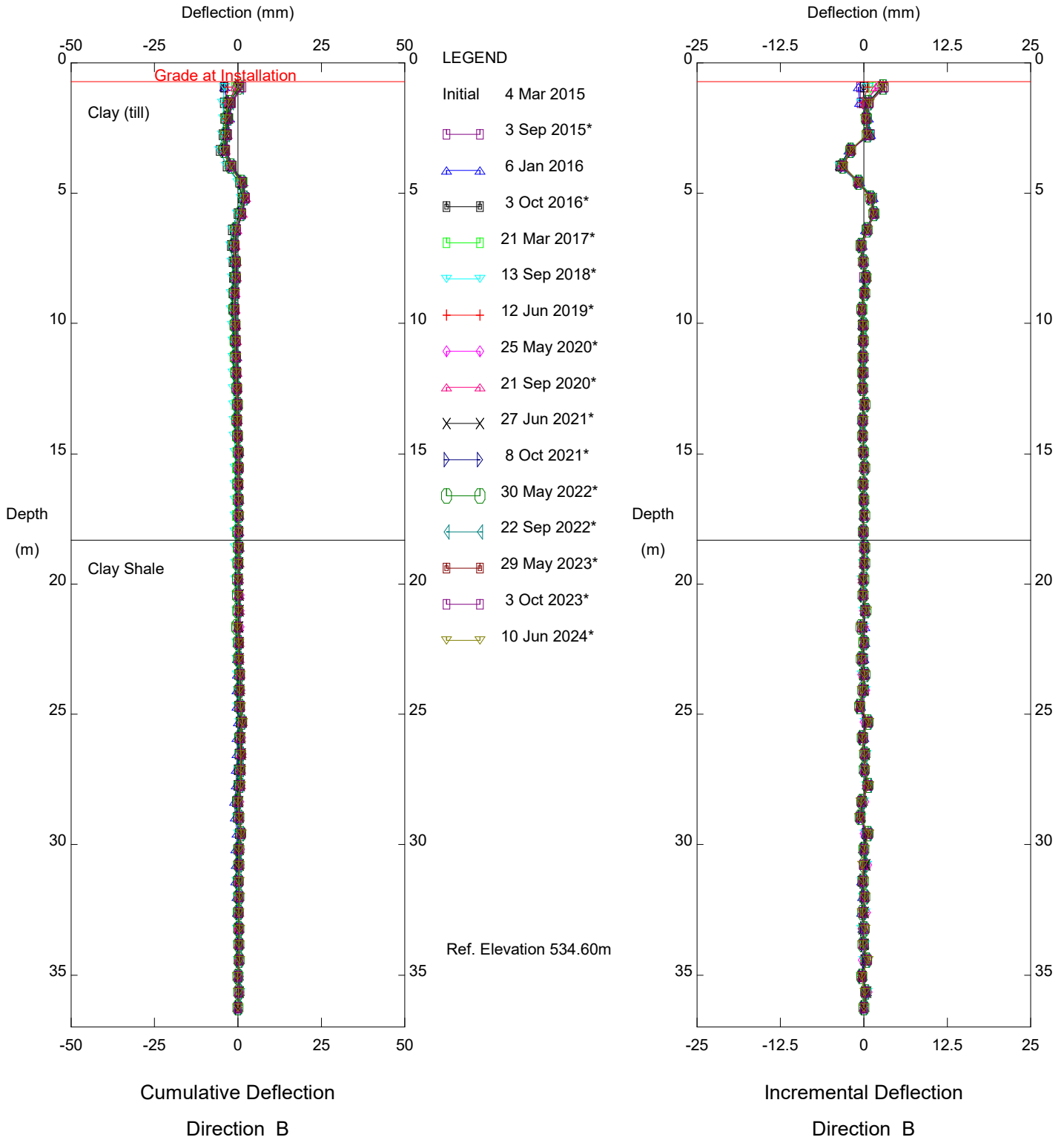


NC099 Cut Slope - Crest, Inclinometer 15-06

Alberta Transportation

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

Thurber Engineering Ltd.

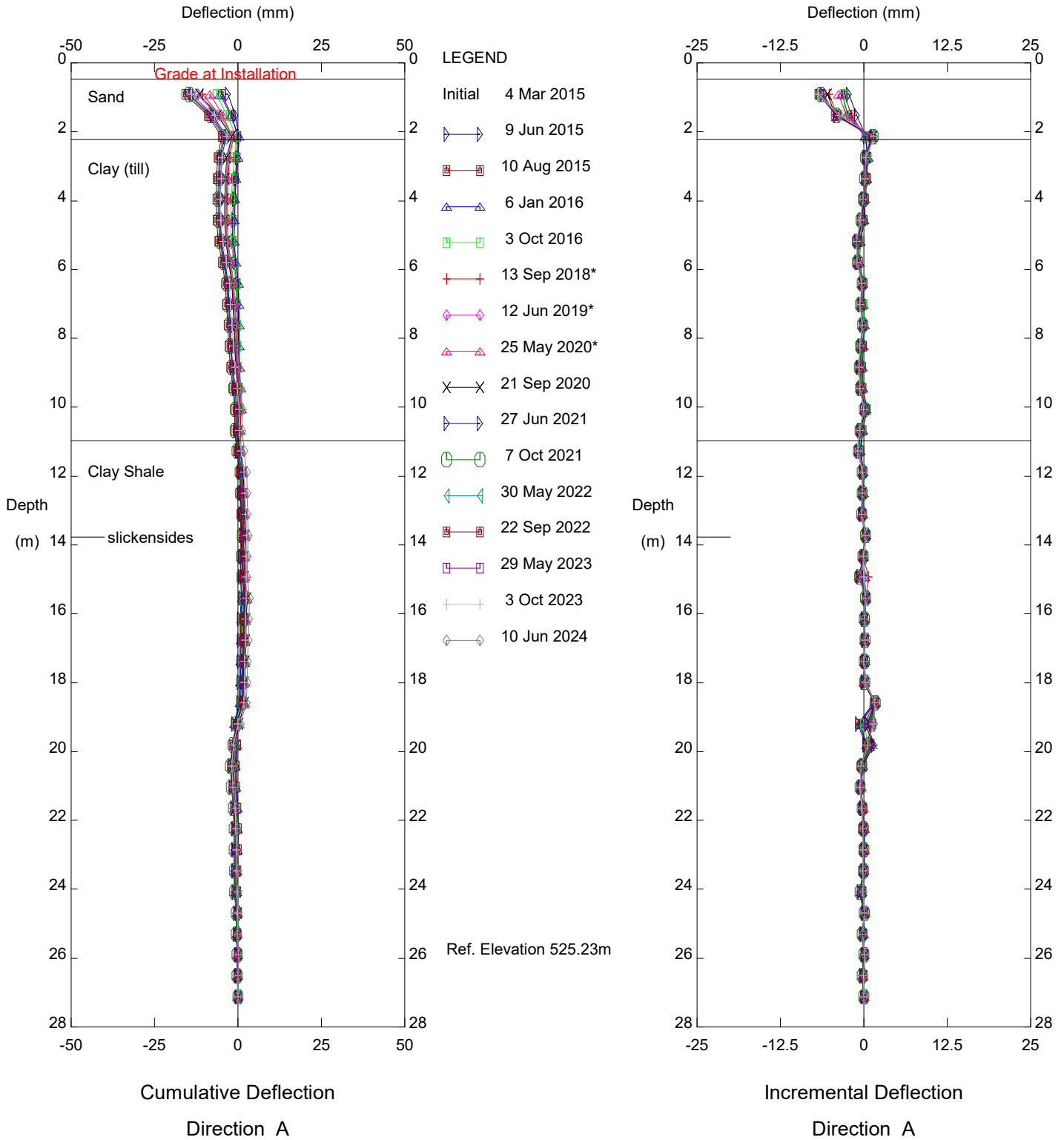


NC099 Cut Slope - Crest, Inclinometer 15-06

Alberta Transportation

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

Thurber Engineering Ltd.

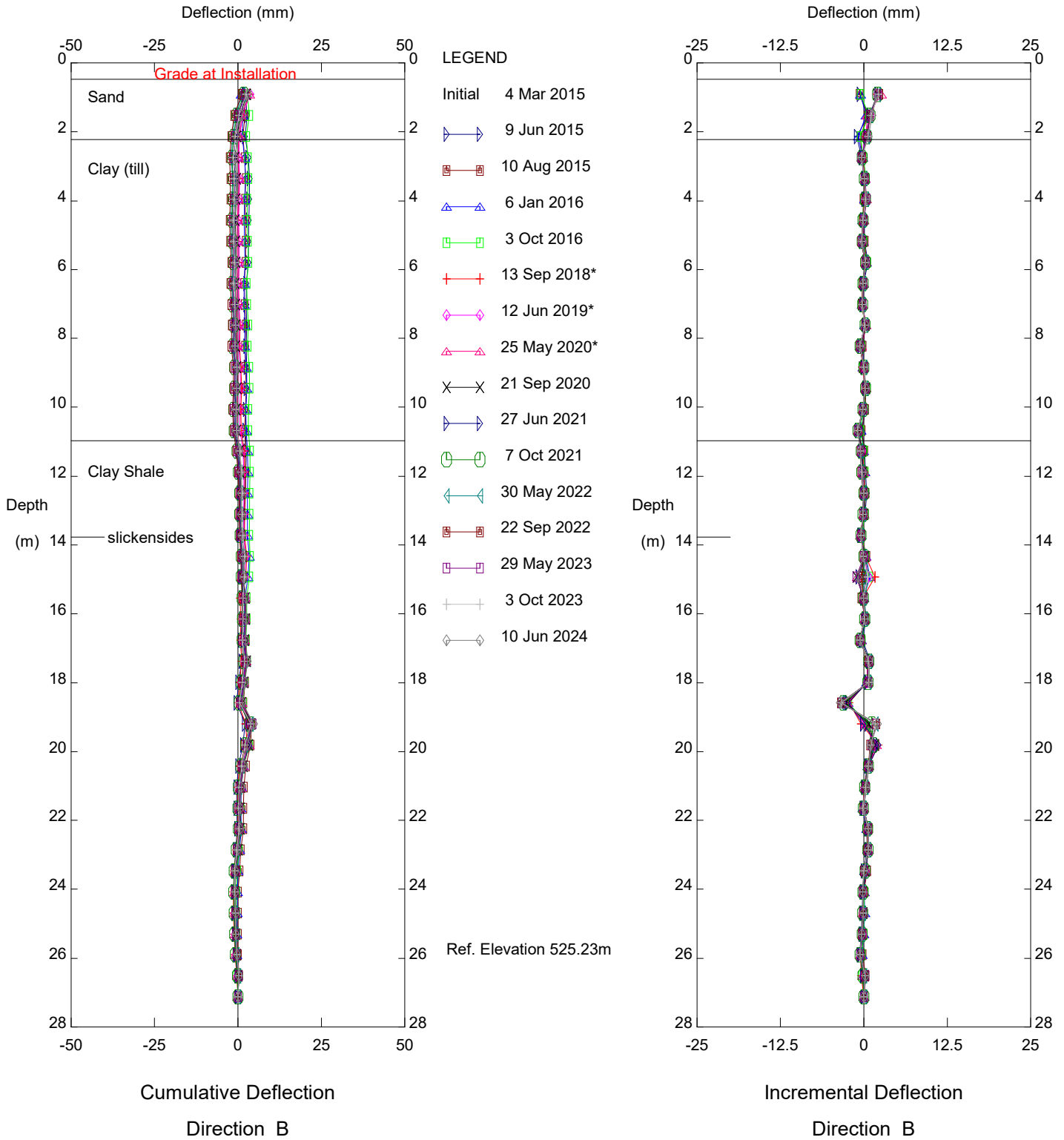


NC099 Cut Slope - Bench 2, Inclinometer 15-07

Alberta Transportation

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

Thurber Engineering Ltd.

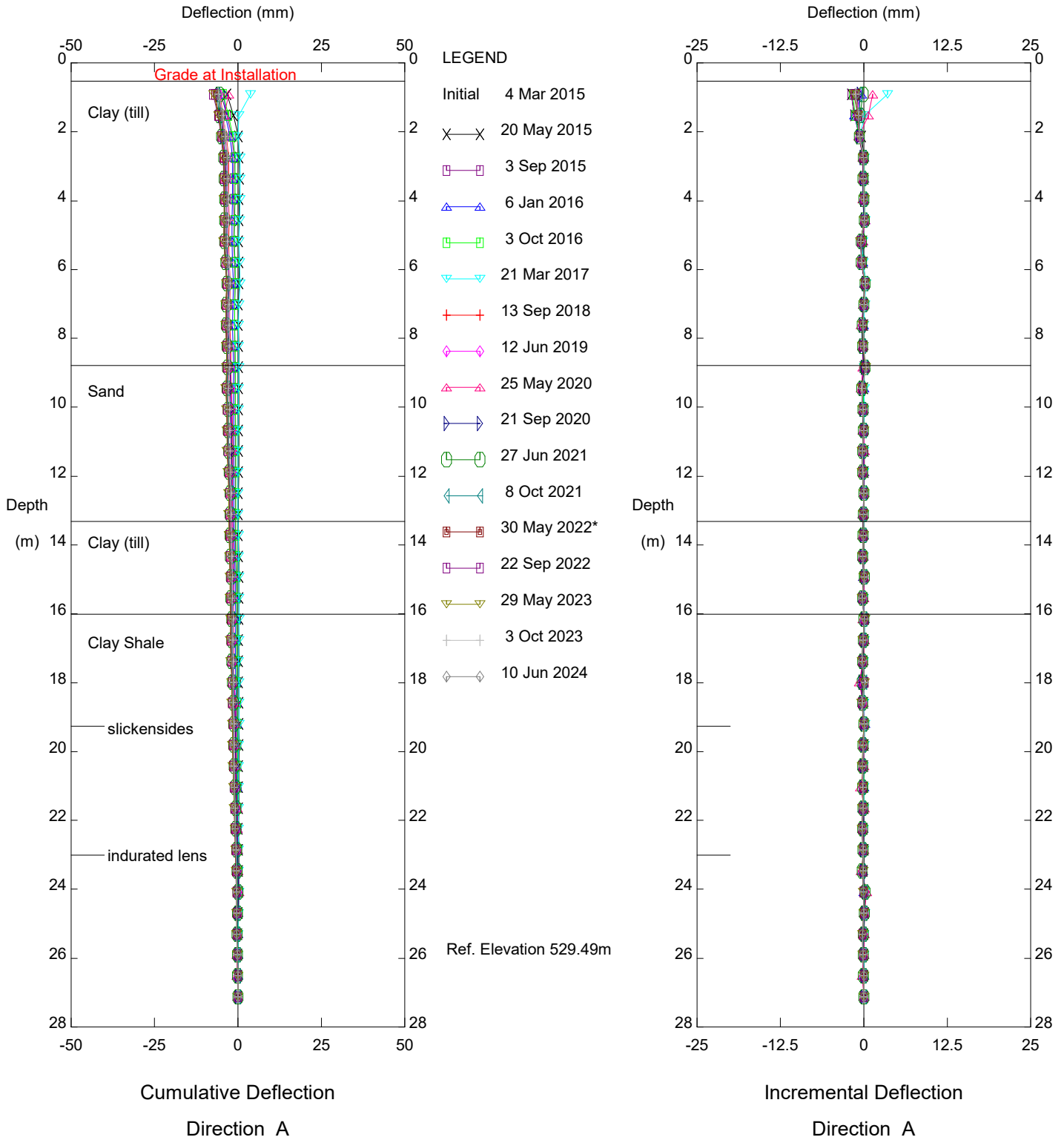


NC099 Cut Slope - Bench 2, Inclinometer 15-07

Alberta Transportation

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

Thurber Engineering Ltd.

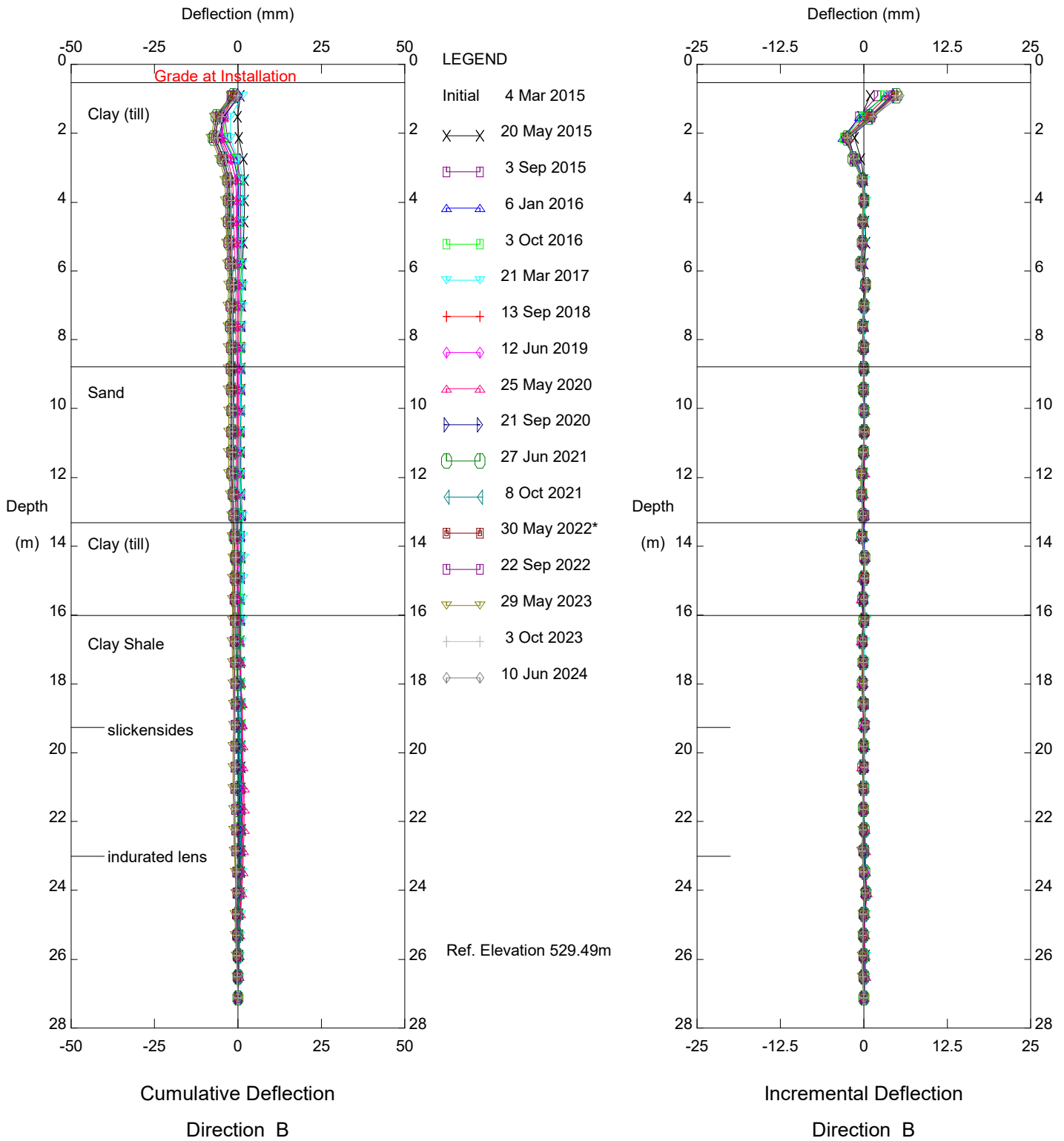


NC099 Cut Slope - Bench 2, Inclinometer 15-08

Alberta Transportation

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

Thurber Engineering Ltd.

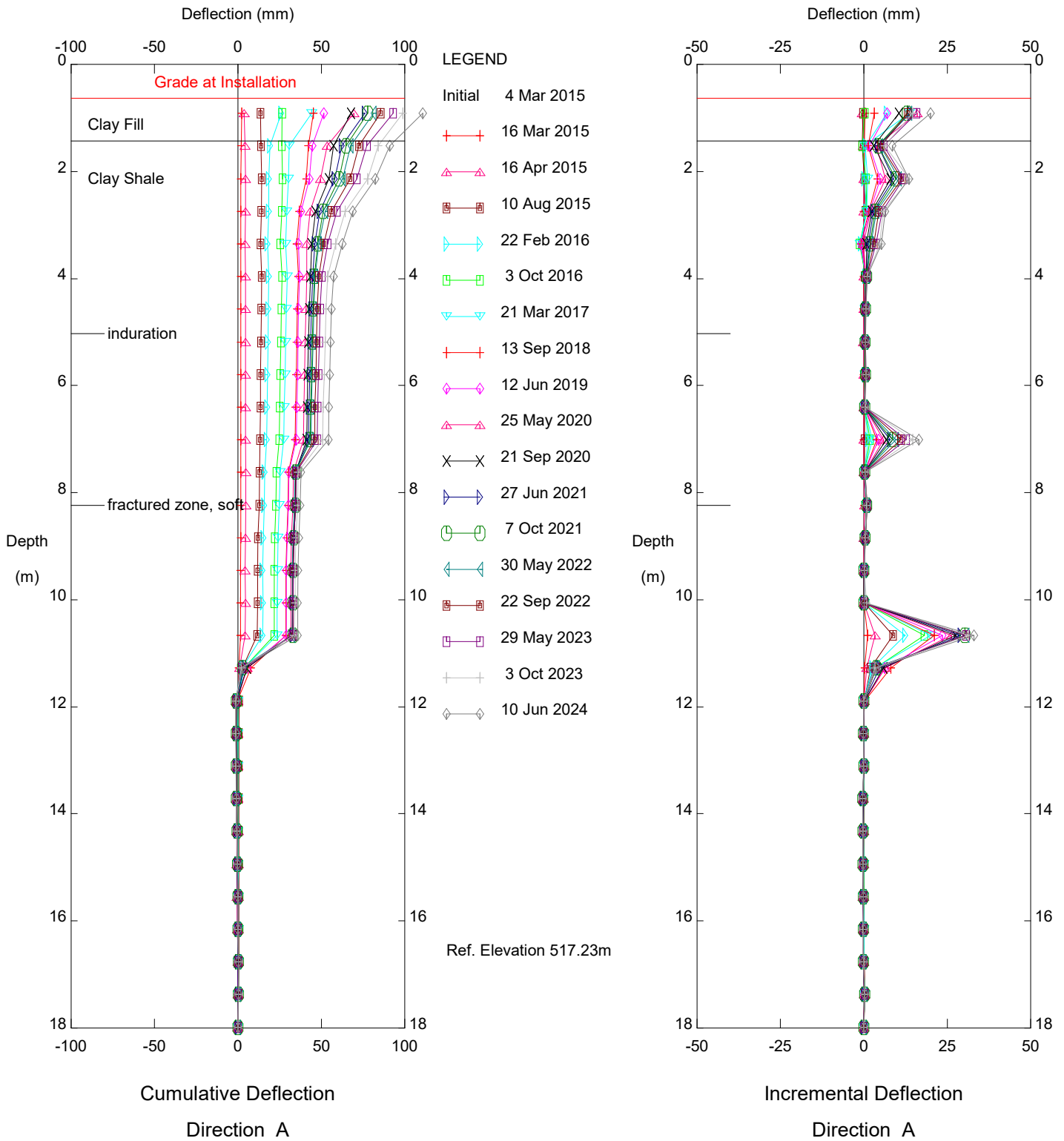


NC099 Cut Slope - Bench 2, Inclinometer 15-08

Alberta Transportation

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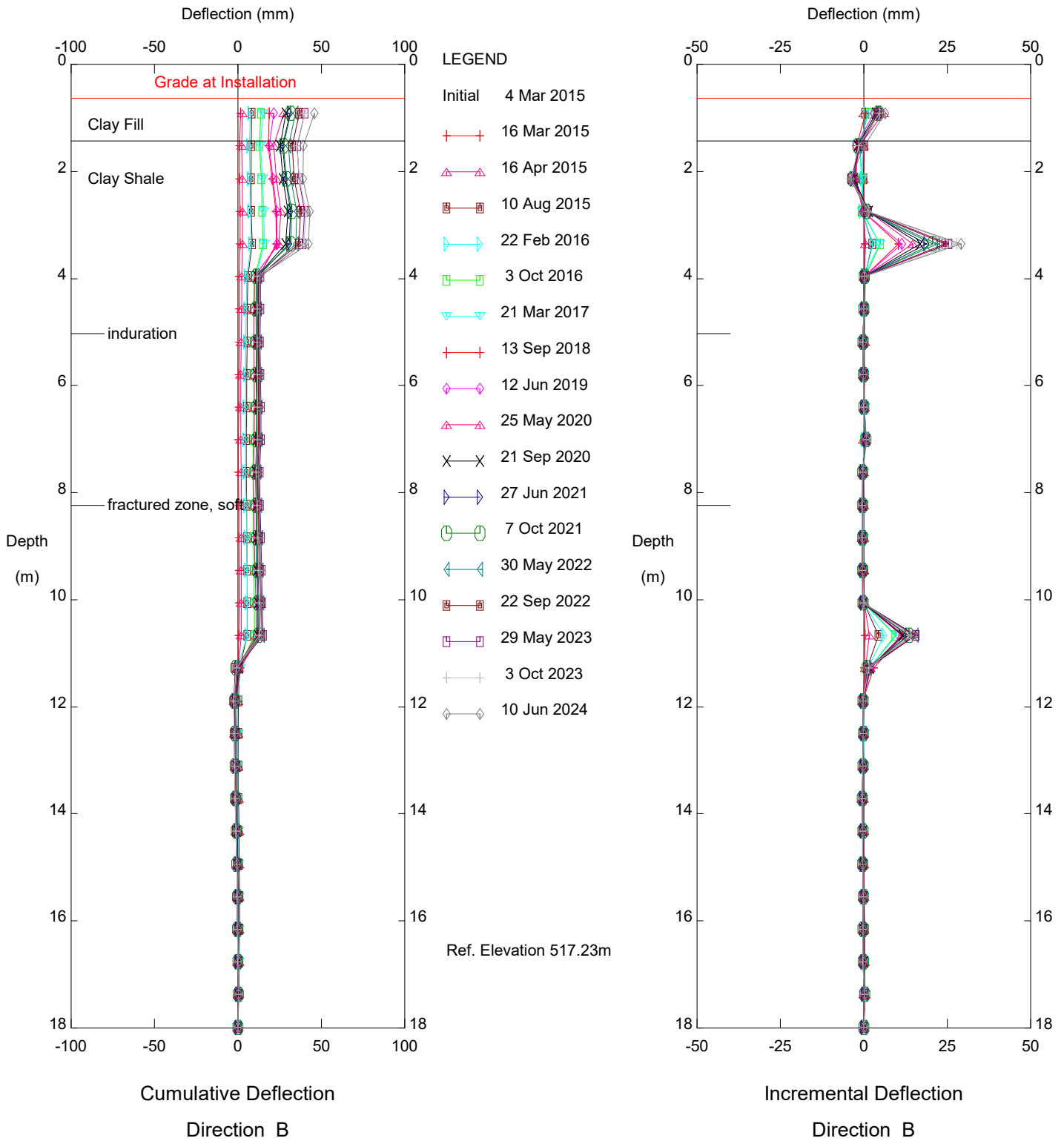
Thurber Engineering Ltd.



NC099 Cut Slope - Bench 1, Inclinometer 15-09

Alberta Transportation

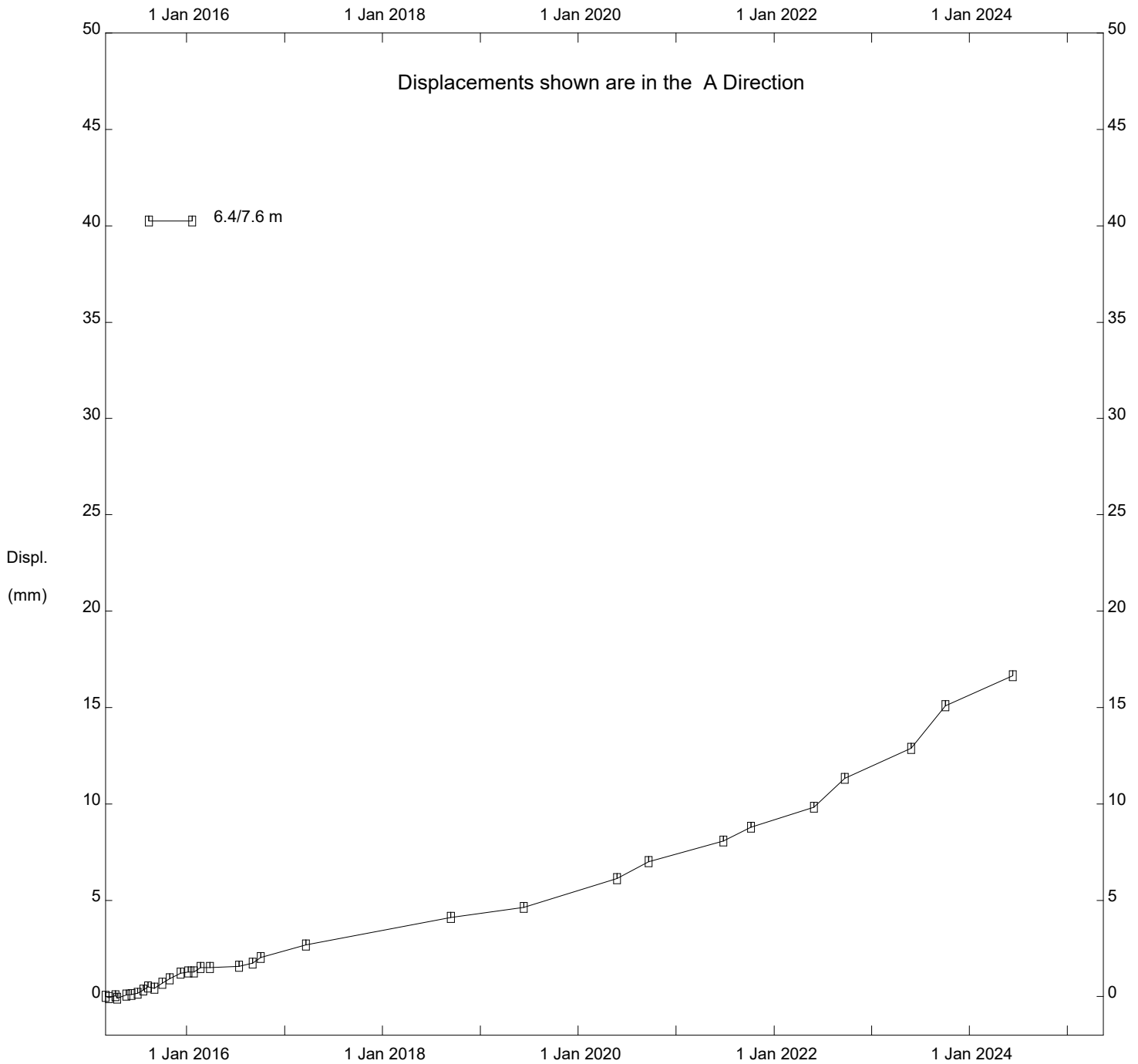
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NC099 Cut Slope - Bench 1, Inclinometer 15-09

Alberta Transportation

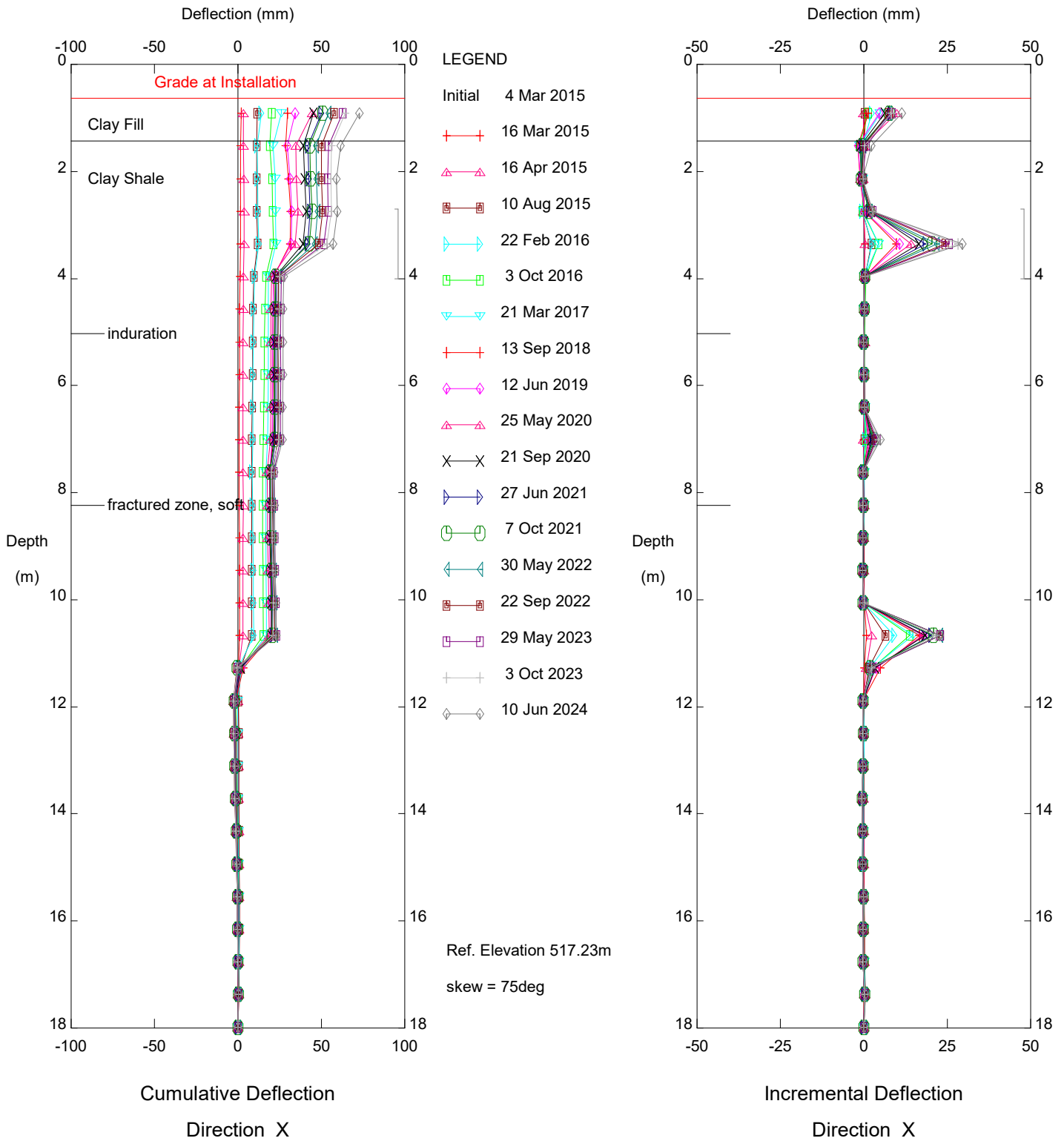
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NC099 Cut Slope - Bench 1, Inclinometer 15-09

Alberta Transportation

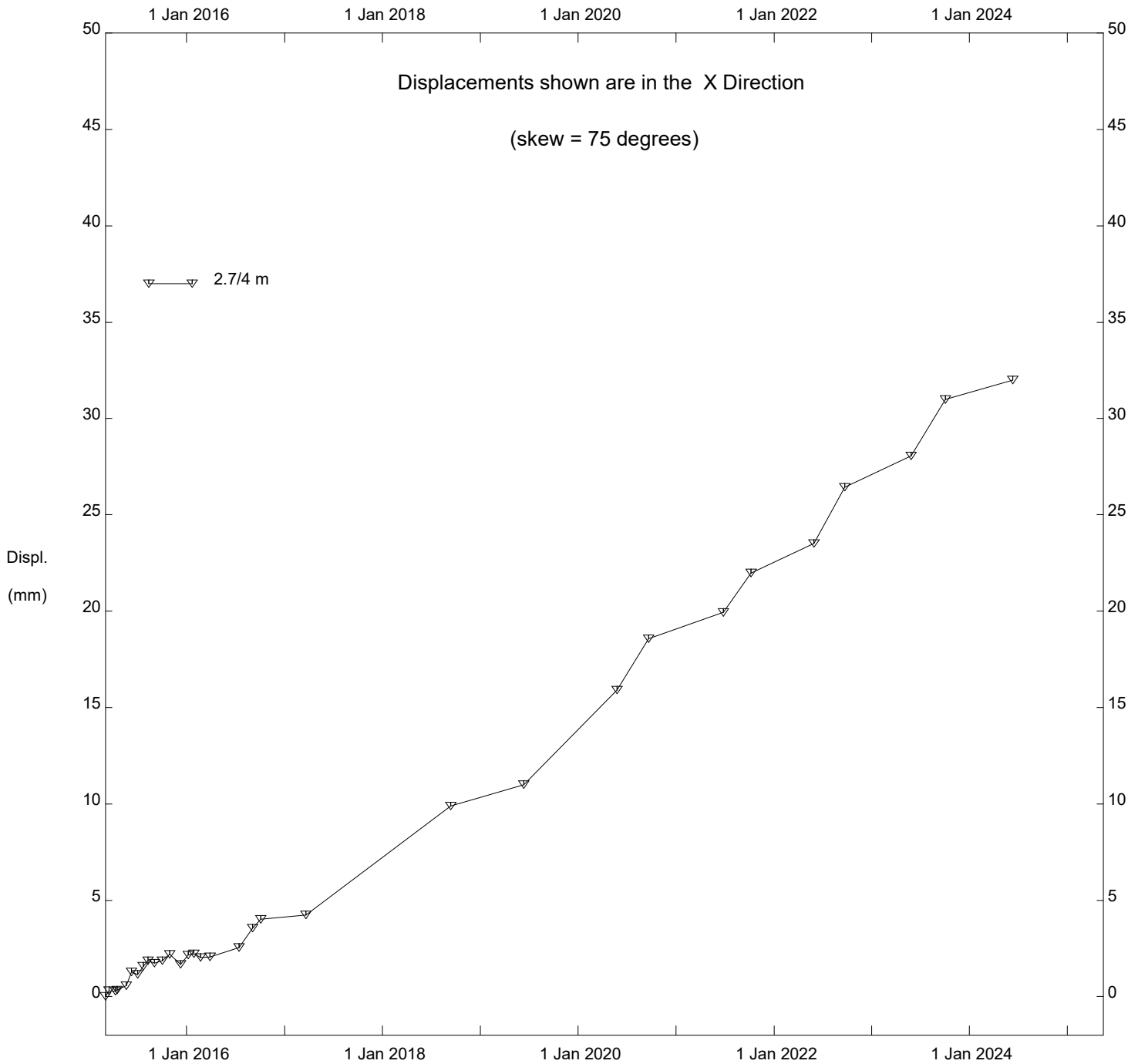
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NC099 Cut Slope - Bench 1, Inclinometer 15-09

Alberta Transportation

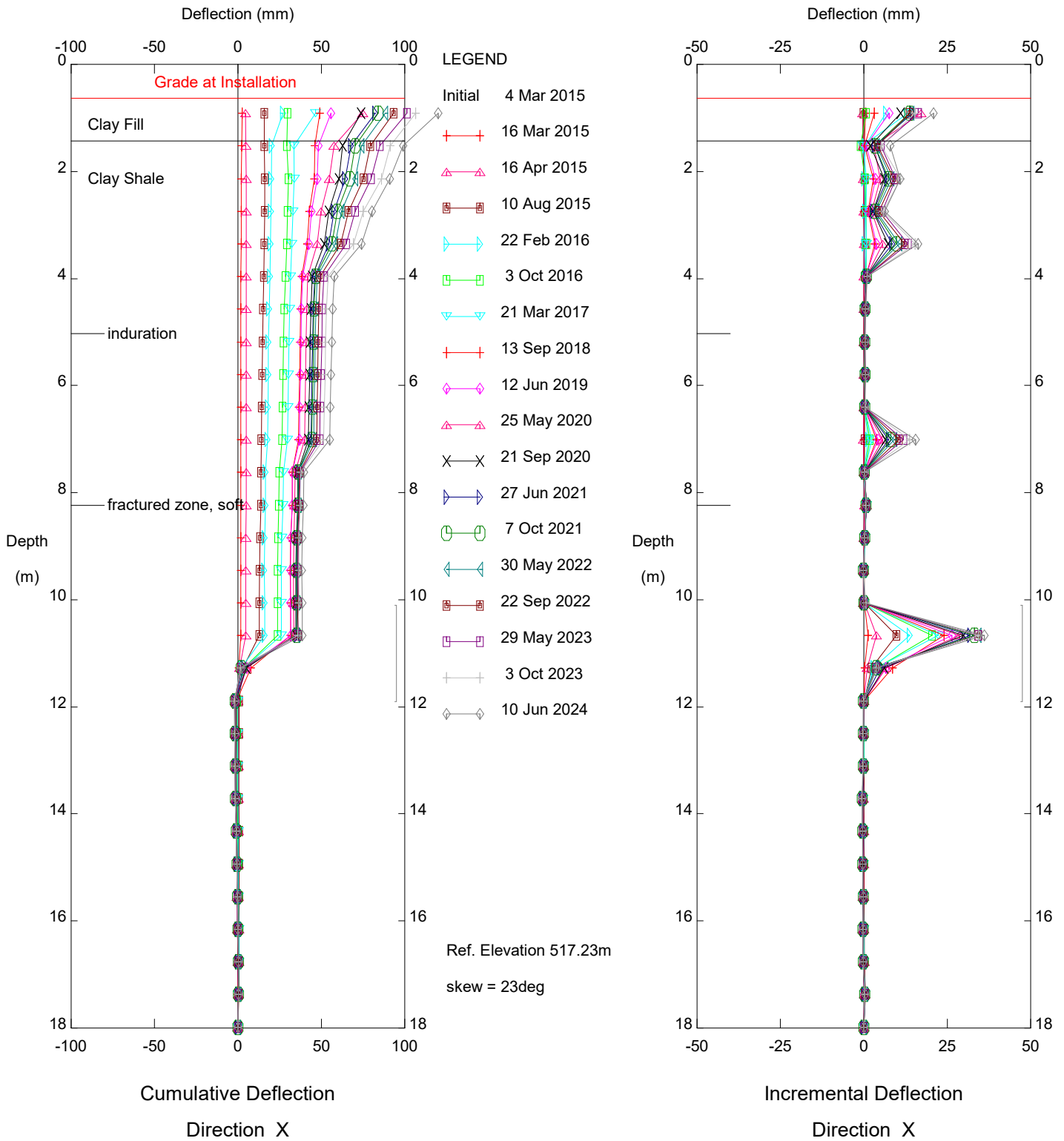
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NC099 Cut Slope - Bench 1, Inclinator 15-09

Alberta Transportation

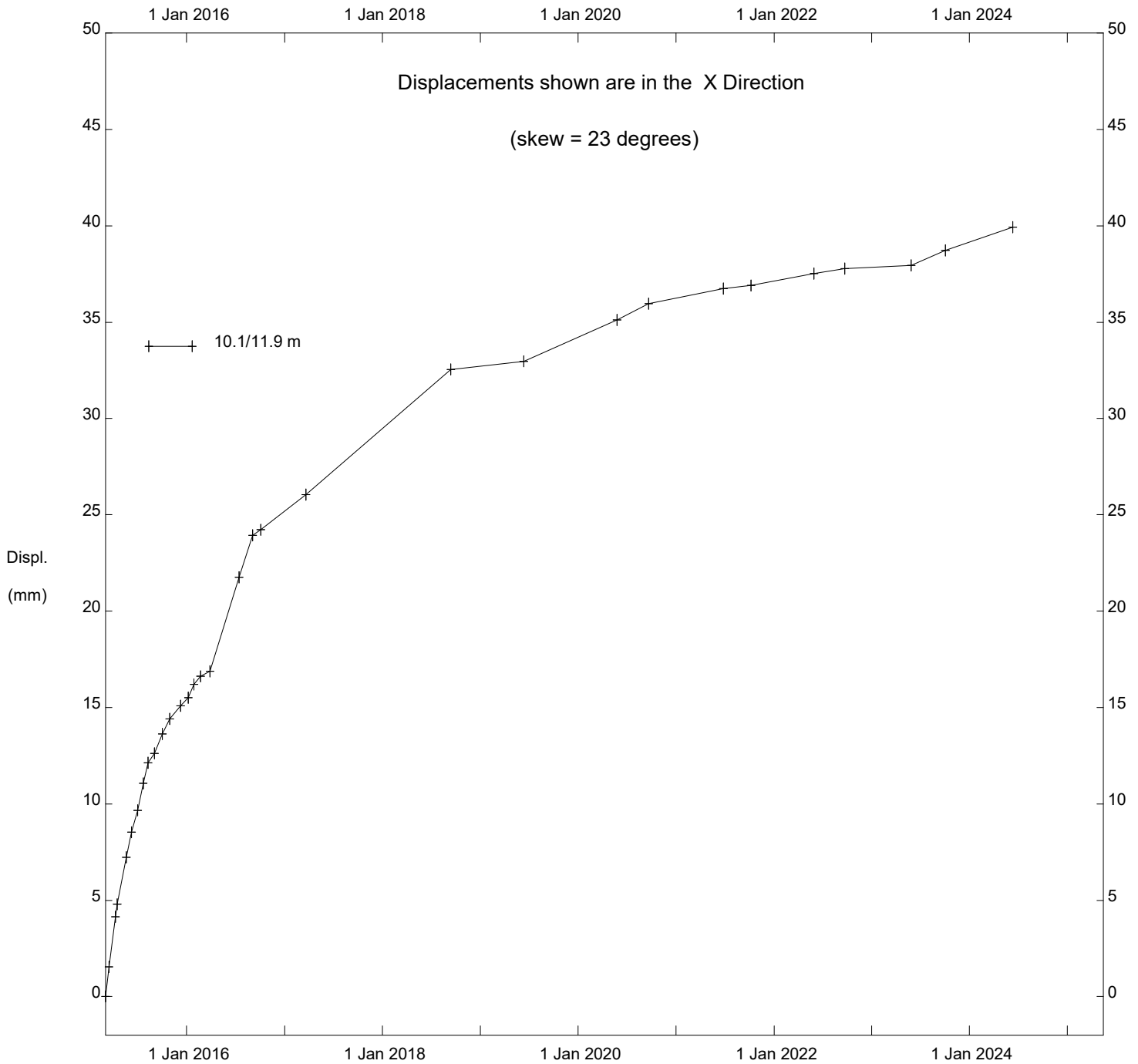
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NC099 Cut Slope - Bench 1, Inclinometer 15-09

Alberta Transportation

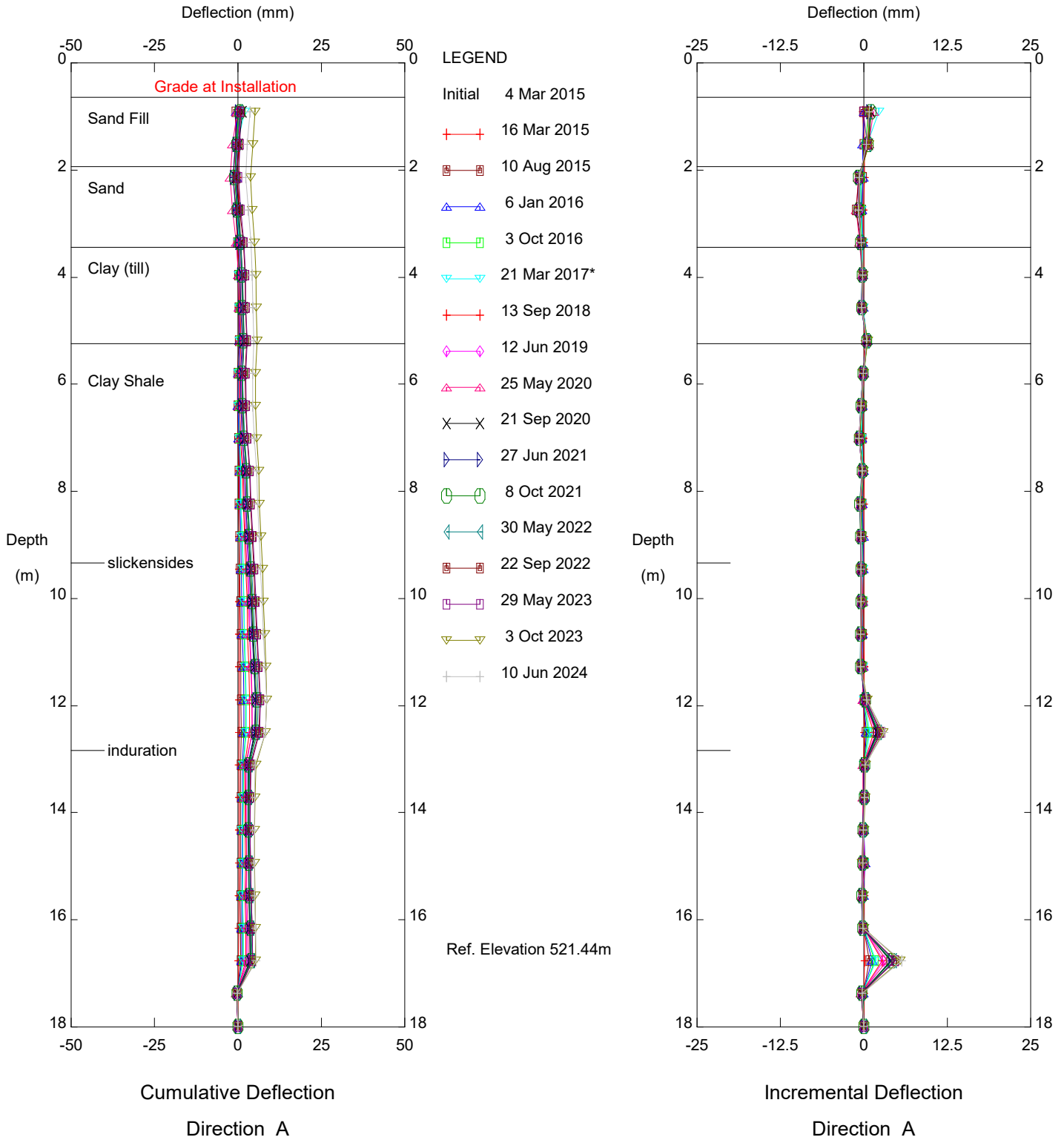
Thurber Engineering Ltd.



NC099 Cut Slope - Bench 1, Inclinator 15-09

Alberta Transportation

Thurber Engineering Ltd.

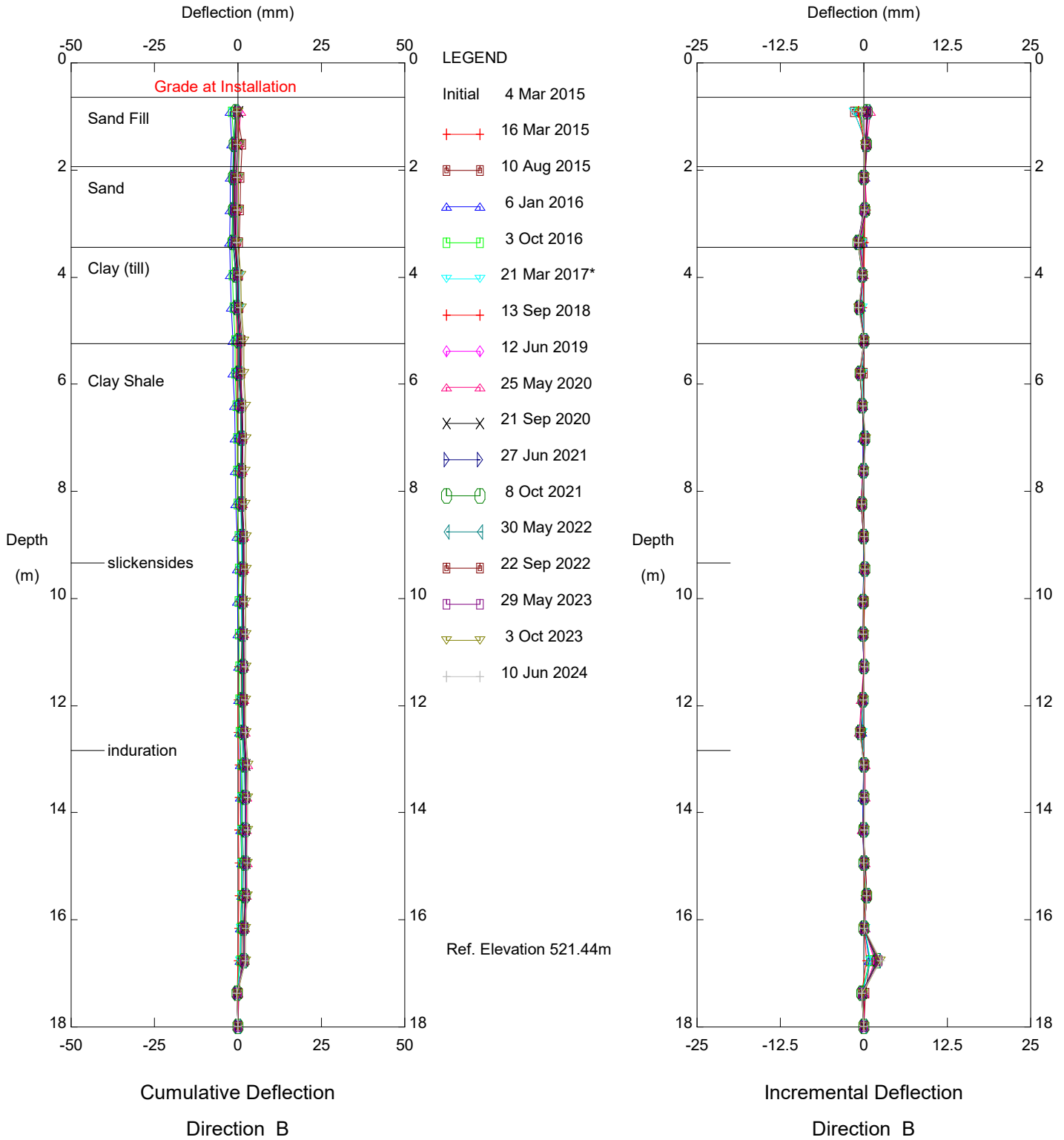


NC099 Cut Slope - Bench 1, Inclinometer 15-10

Alberta Transportation

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

Thurber Engineering Ltd.

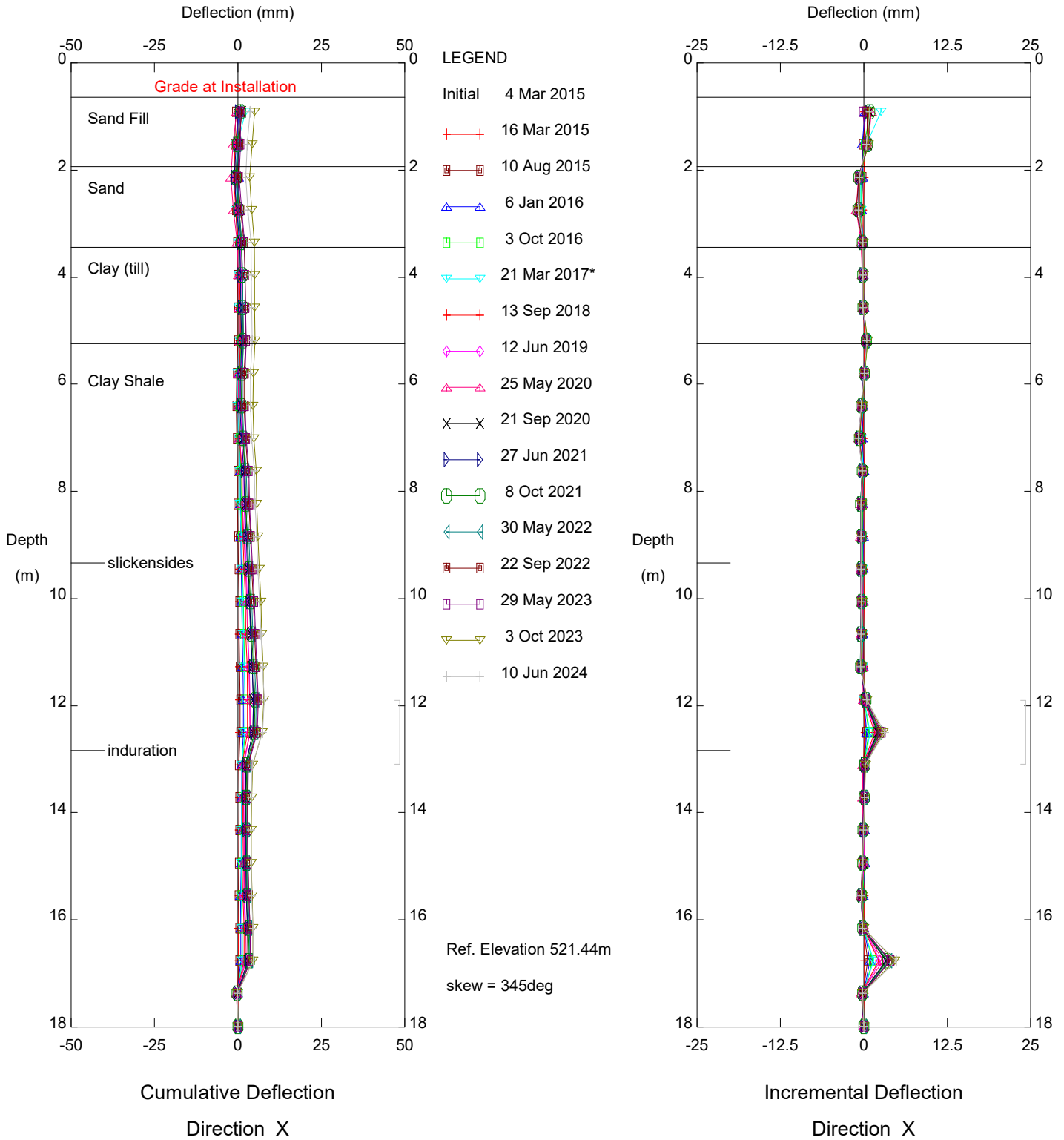


NC099 Cut Slope - Bench 1, Inclinometer 15-10

Alberta Transportation

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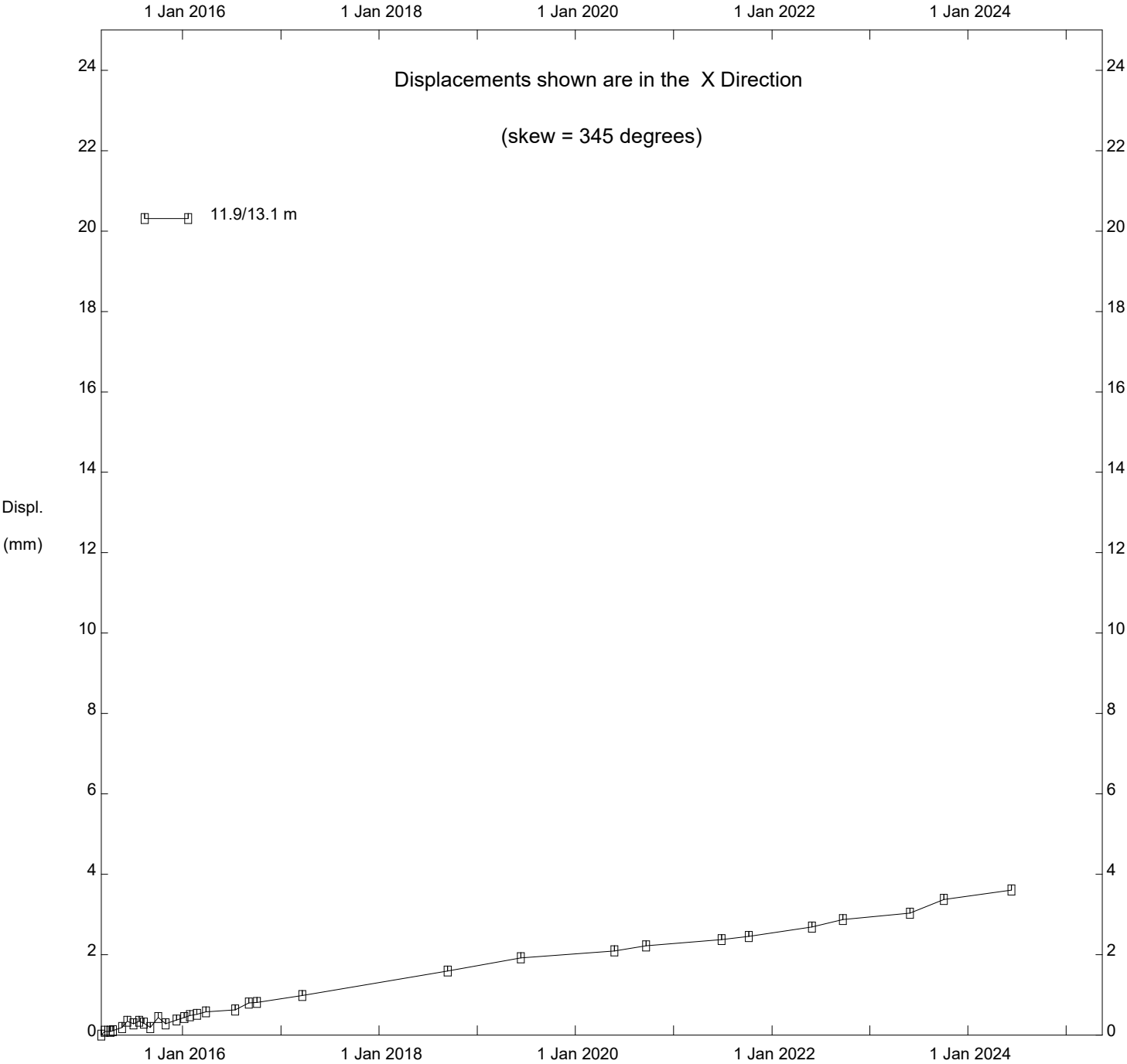
Thurber Engineering Ltd.



NC099 Cut Slope - Bench 1, Inclinometer 15-10

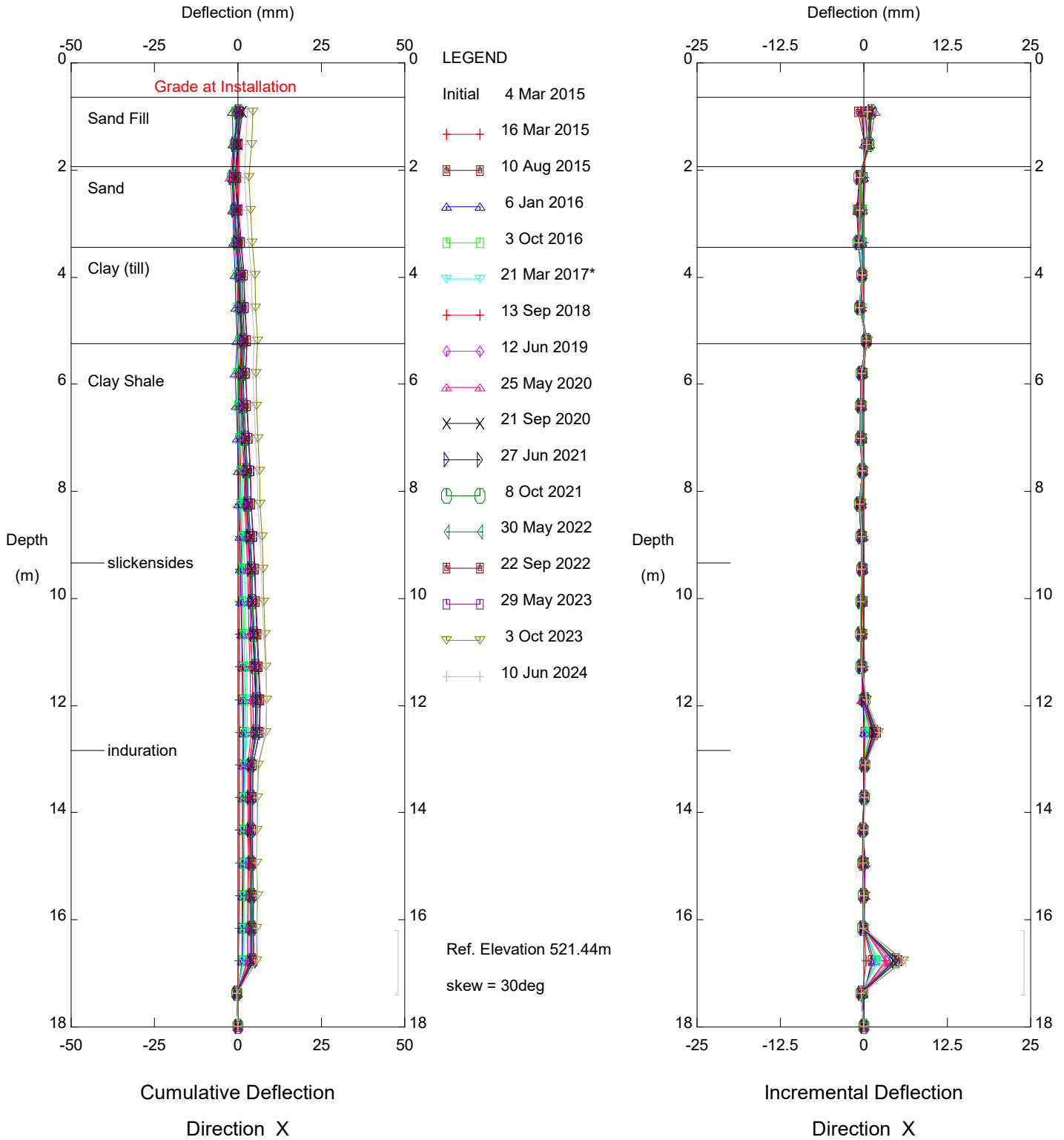
Alberta Transportation

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NC099 Cut Slope - Bench 1, Inclinator 15-10

Thurber Engineering Ltd.

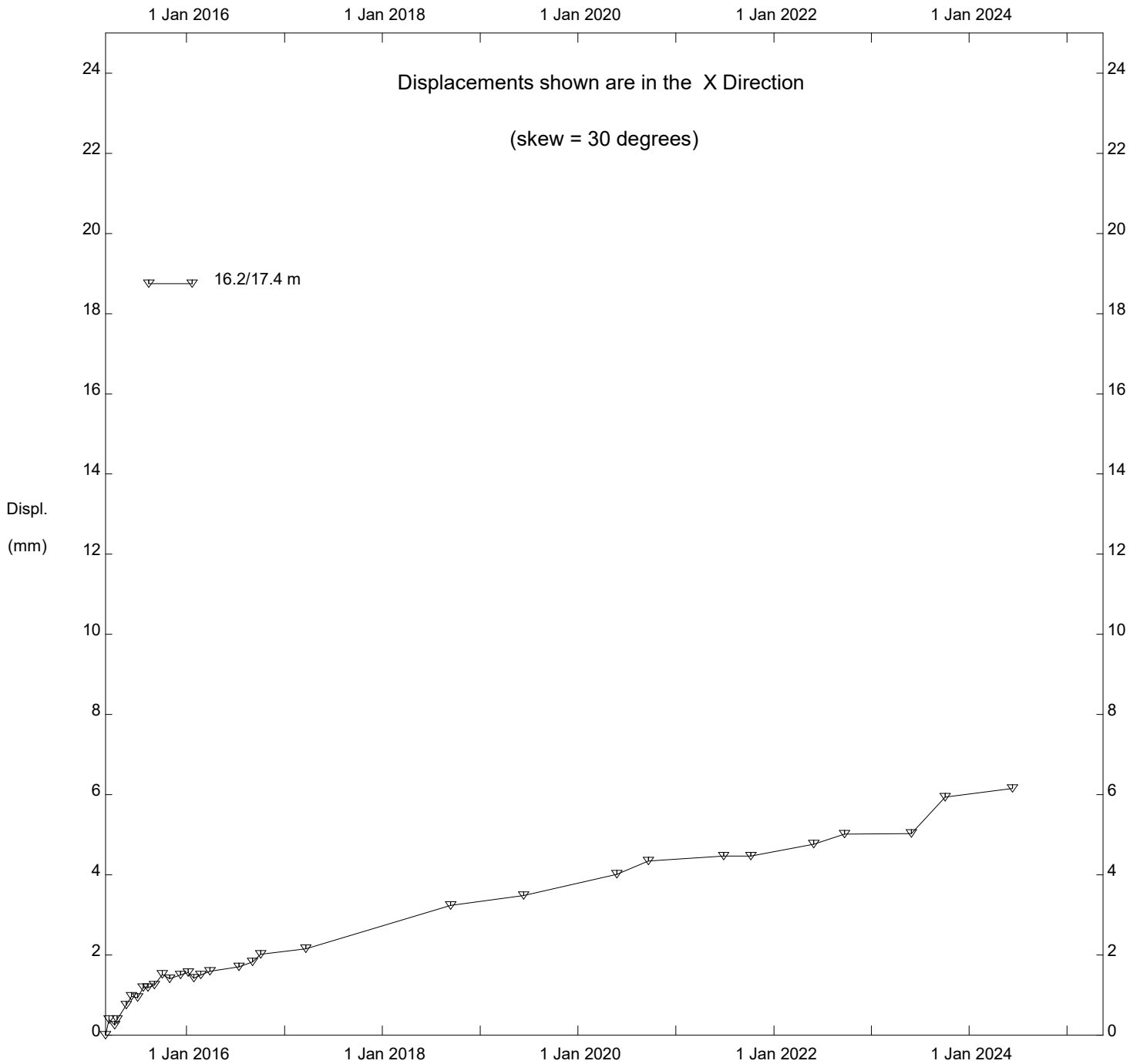


NC099 Cut Slope - Bench 1, Inclinometer 15-10

Alberta Transportation

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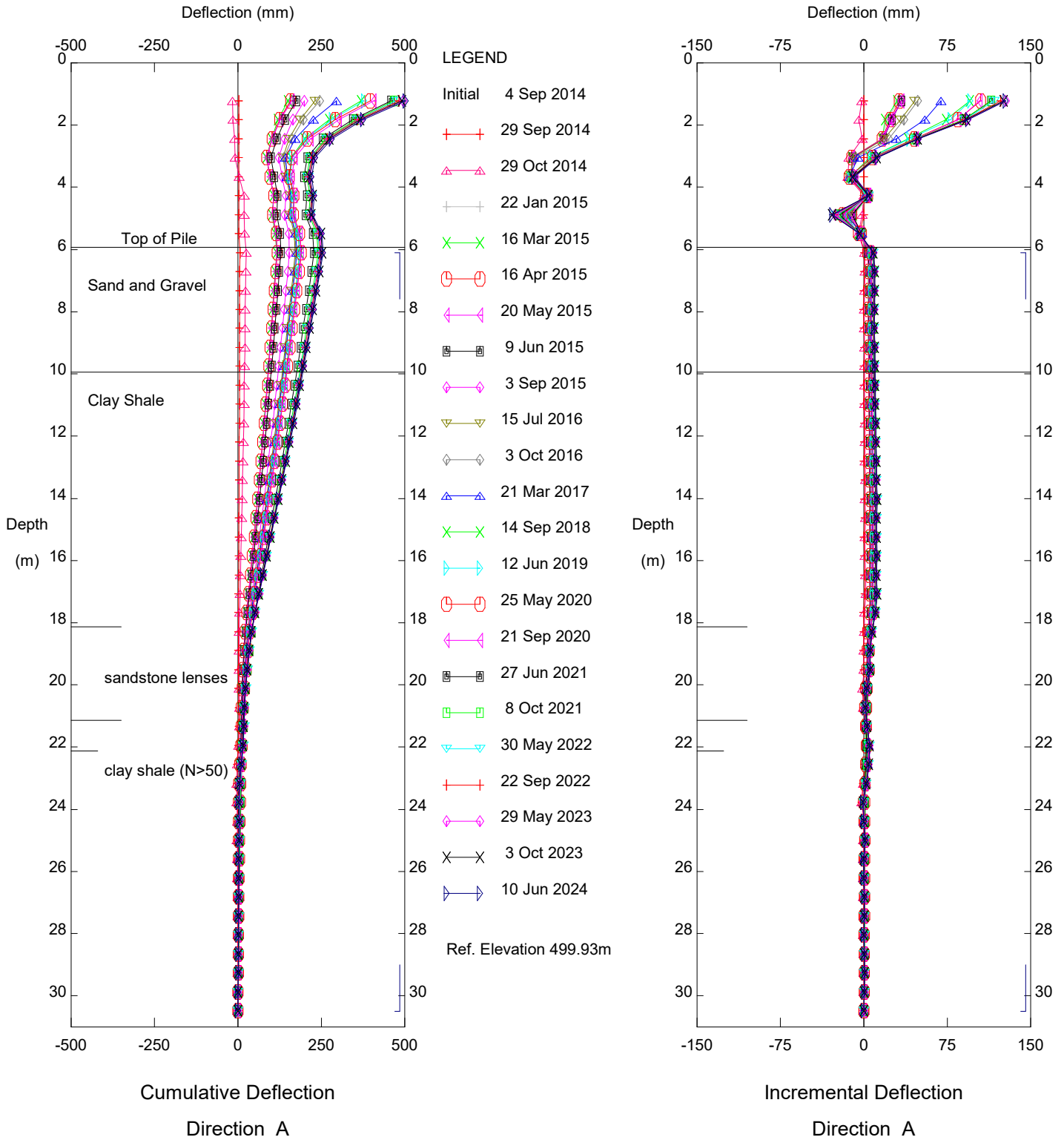
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NC099 Cut Slope - Bench 1, Inclinator 15-10

Alberta Transportation

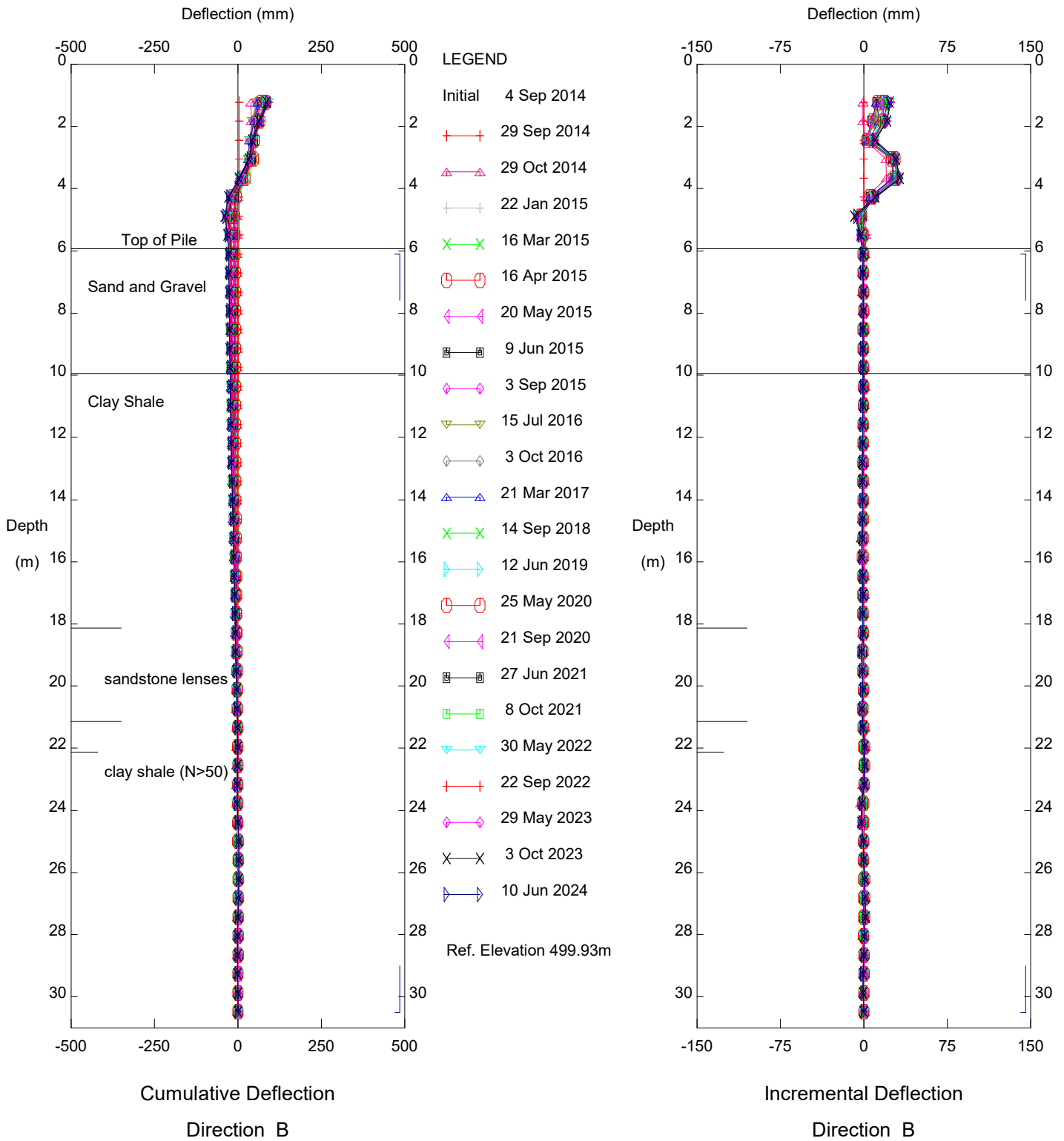
Thurber Engineering Ltd.



NC099 North Slope Stability Pile Wall, Inclinometer 14-01

Alberta Transportation

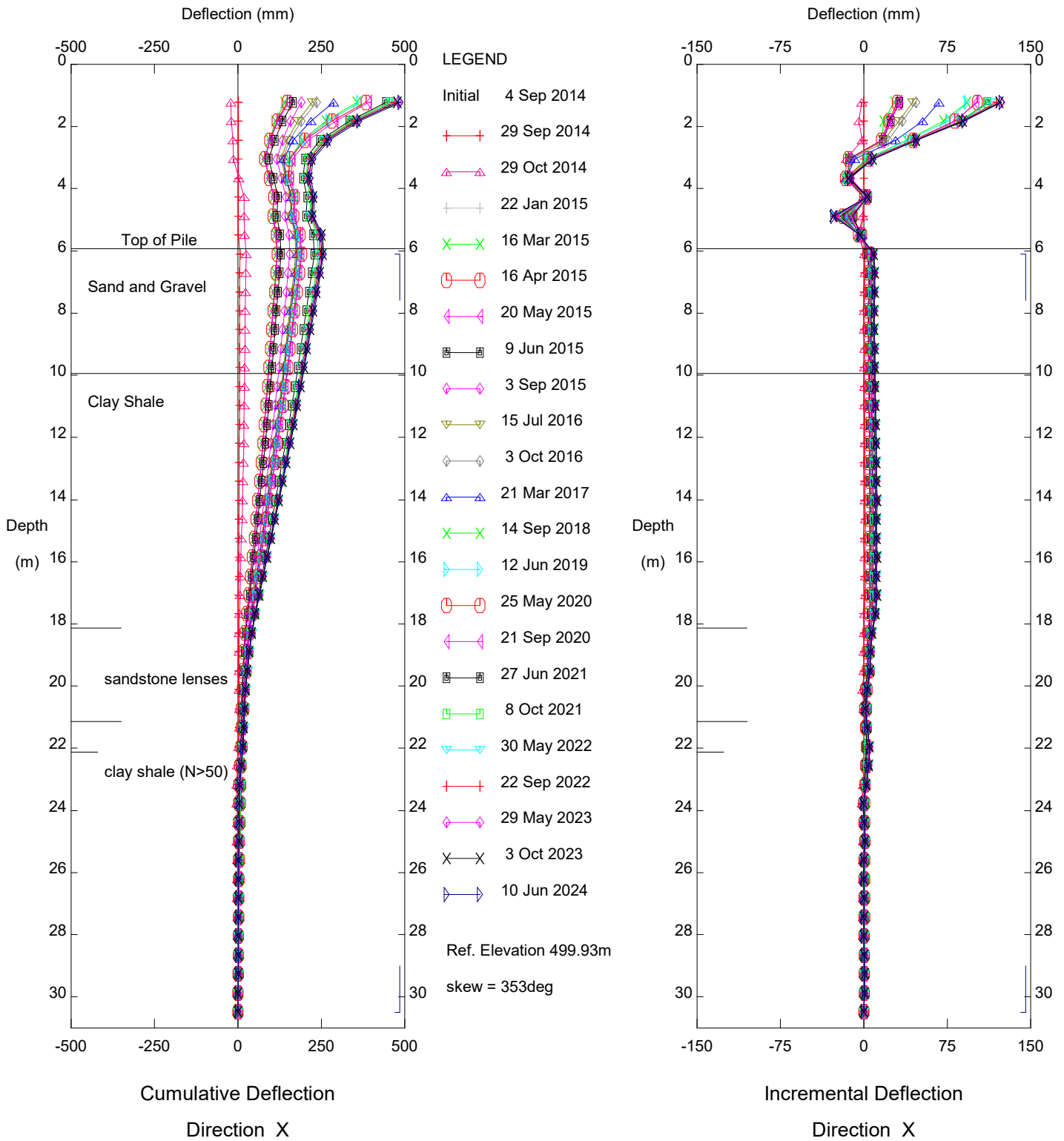
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NC099 North Slope Stability Pile Wall, Inclinator 14-01

Alberta Transportation

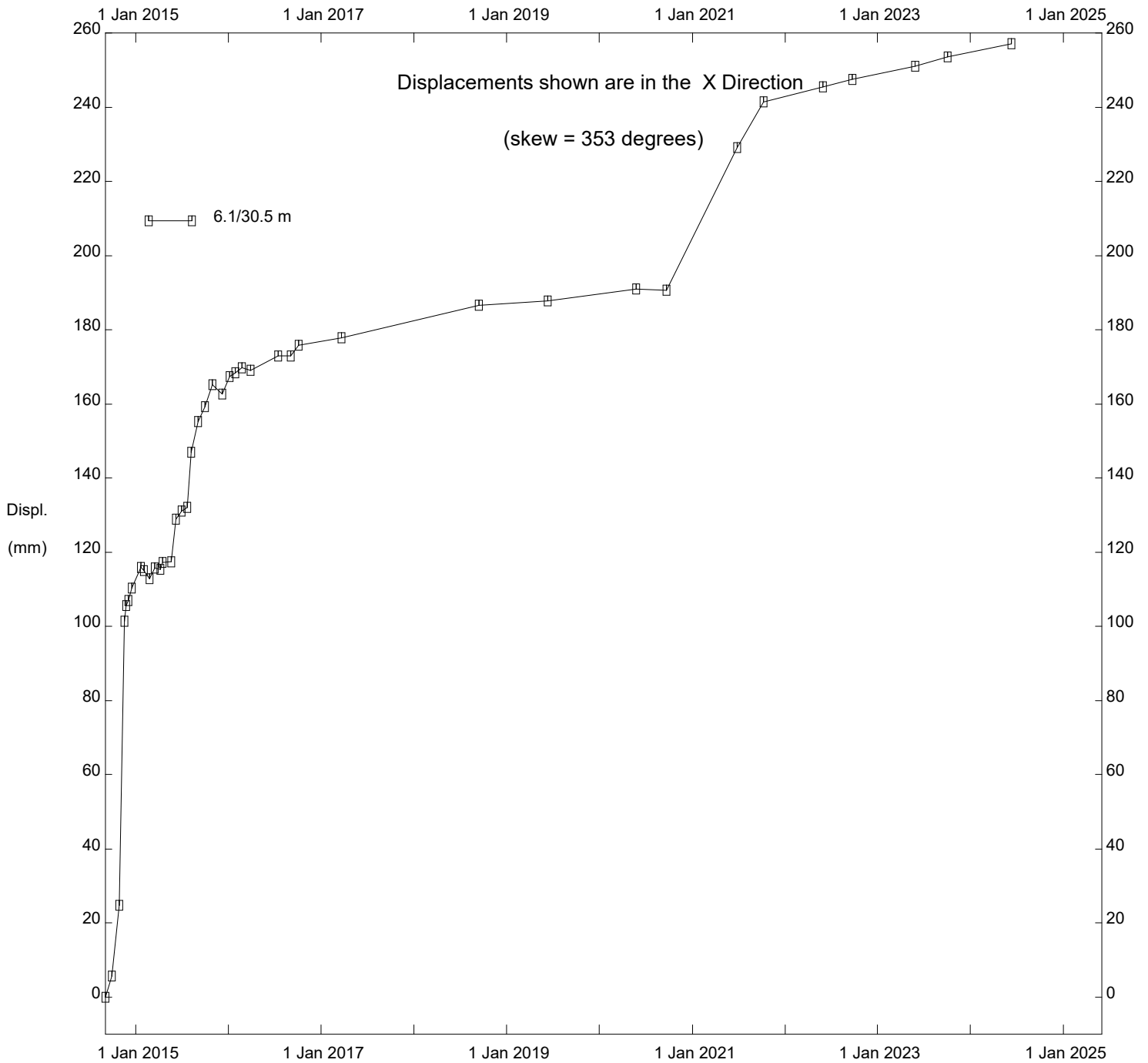
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NC099 North Slope Stability Pile Wall, Inclinator 14-01

Alberta Transportation

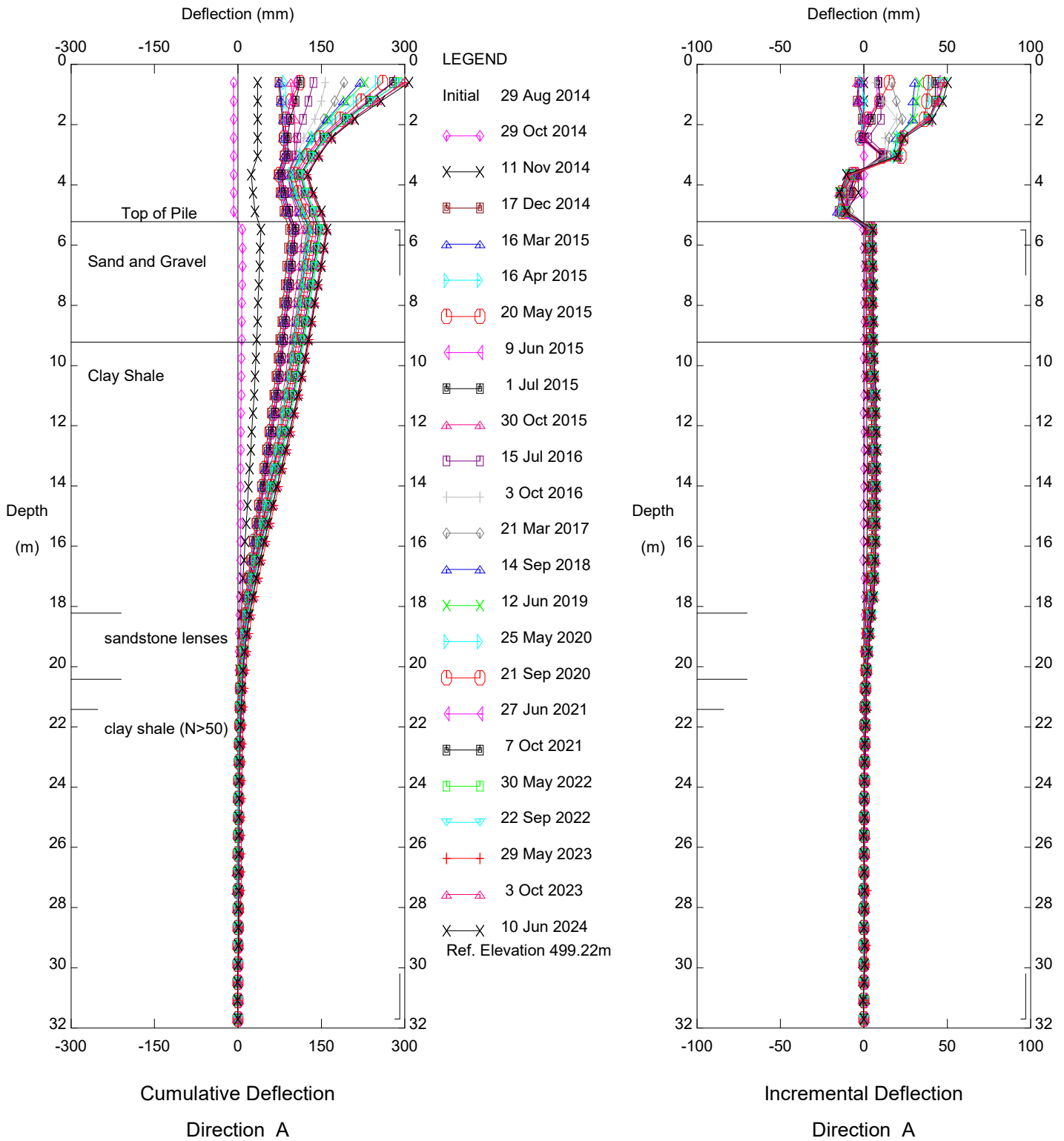
Thurber Engineering Ltd.



NC099 North Slope Stability Pile Wall, Inclinator 14-01

Alberta Transportation

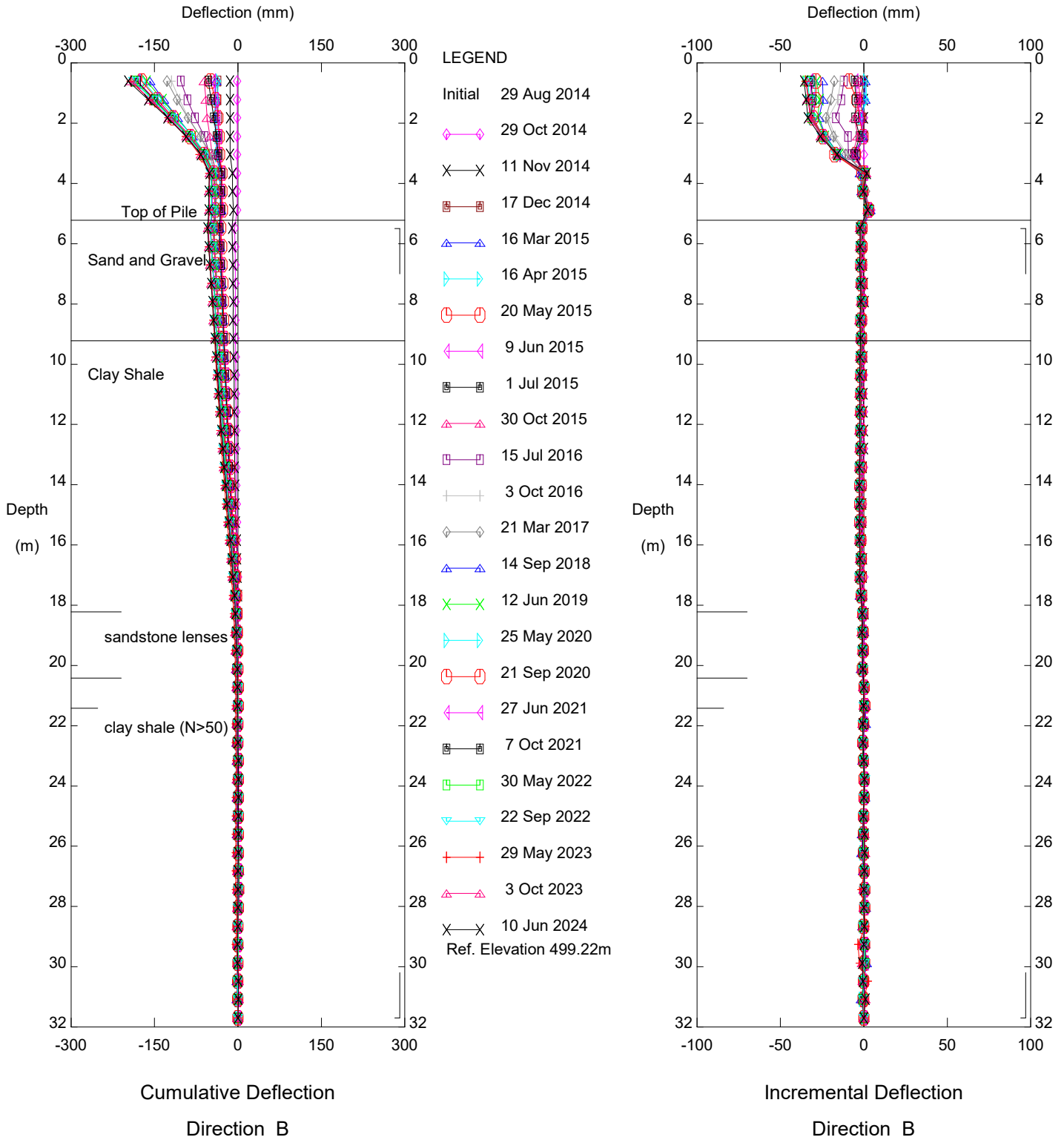
Thurber Engineering Ltd.



NC099 South Slope Stability Pile Wall, Inclinator 14-02

Alberta Transportation

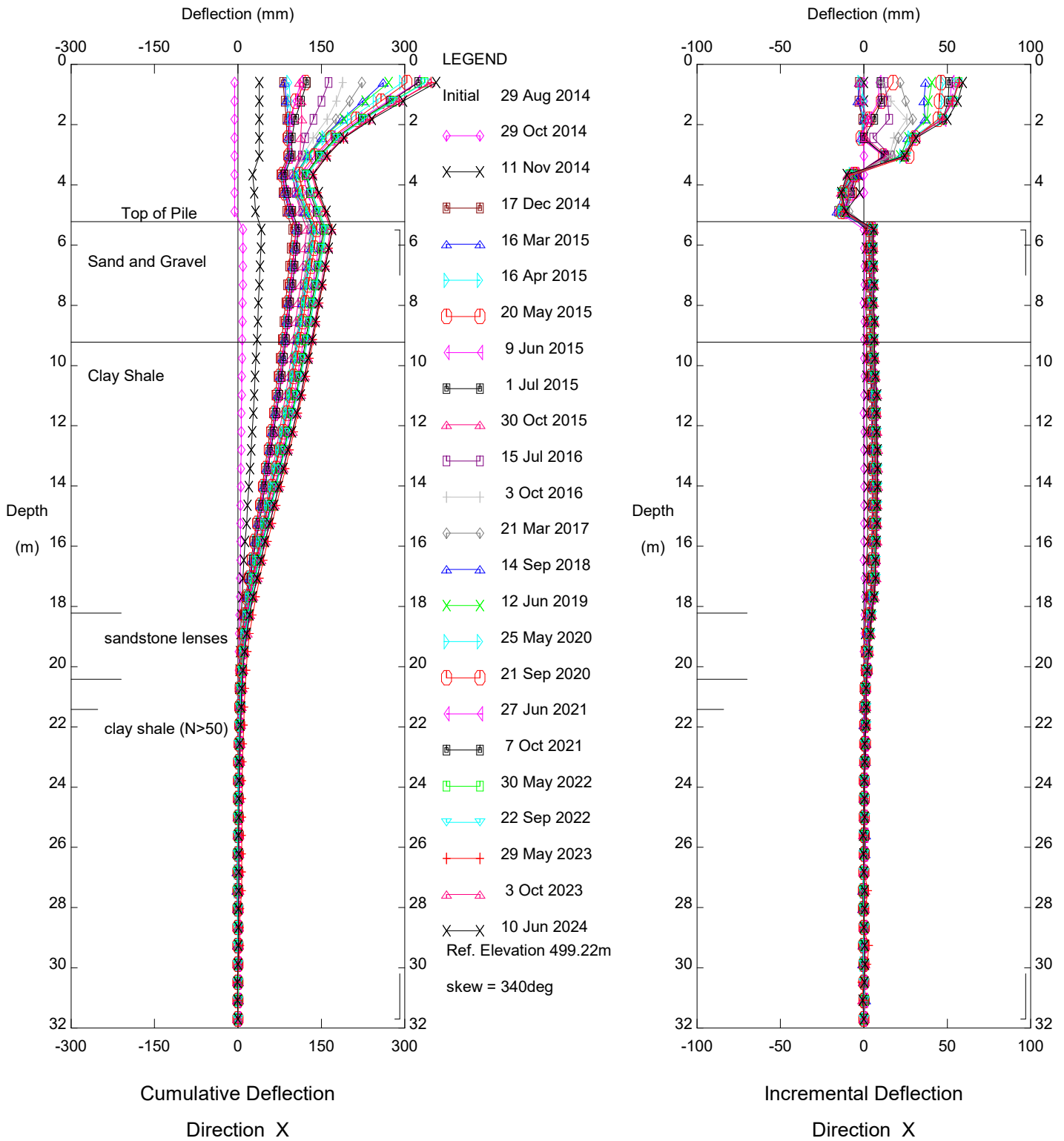
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NC099 South Slope Stability Pile Wall, Inclinator 14-02

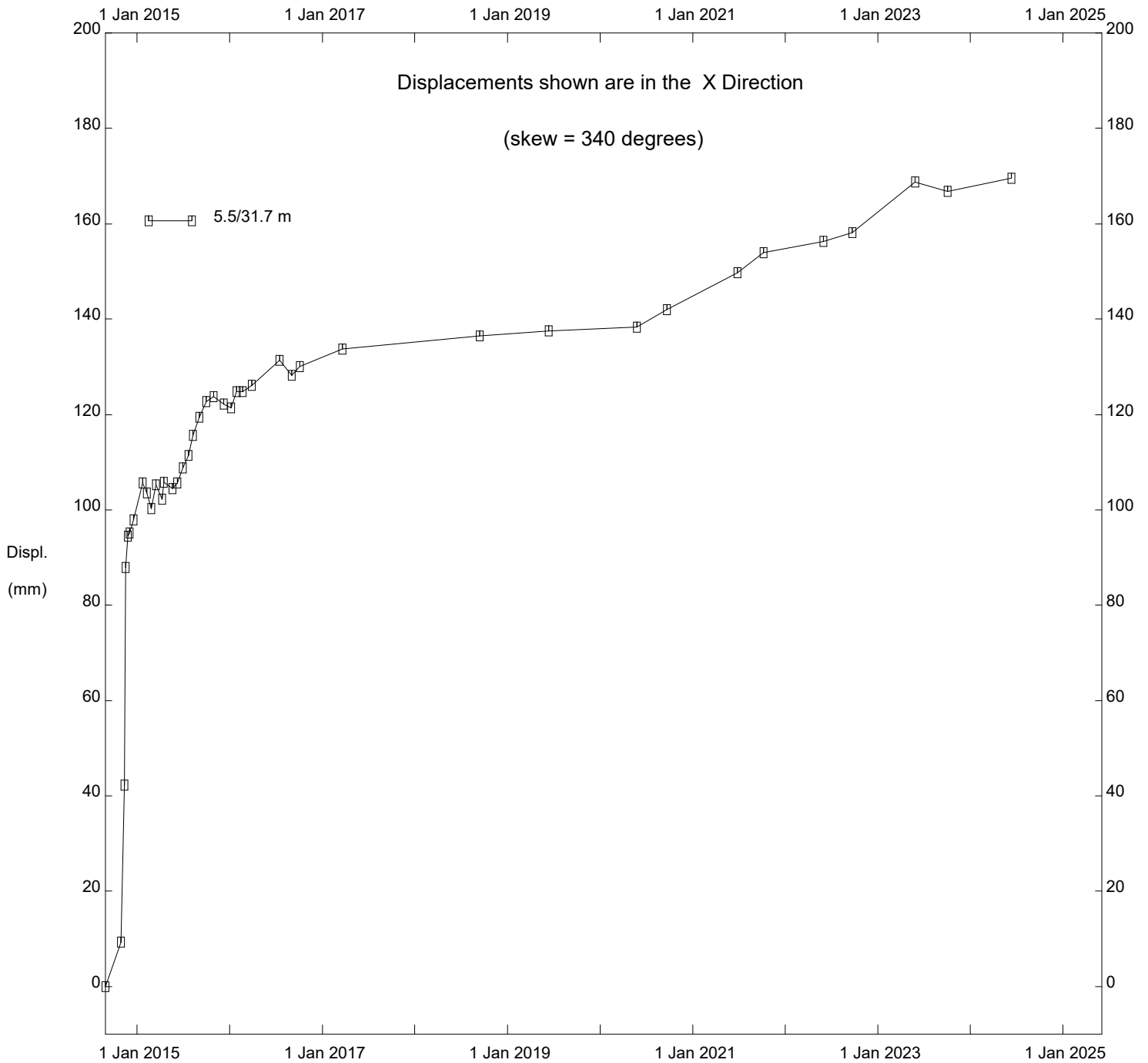
Alberta Transportation

Thurber Engineering Ltd.



NC099 South Slope Stability Pile Wall, Inclinator 14-02

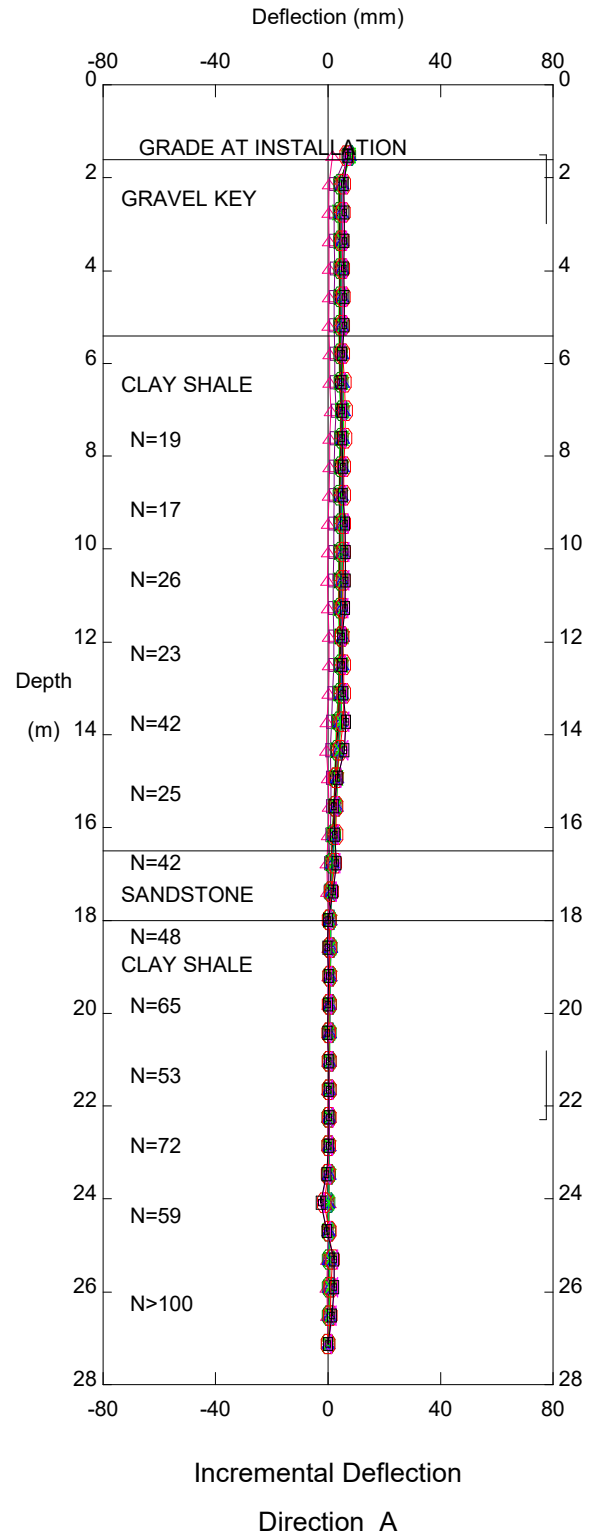
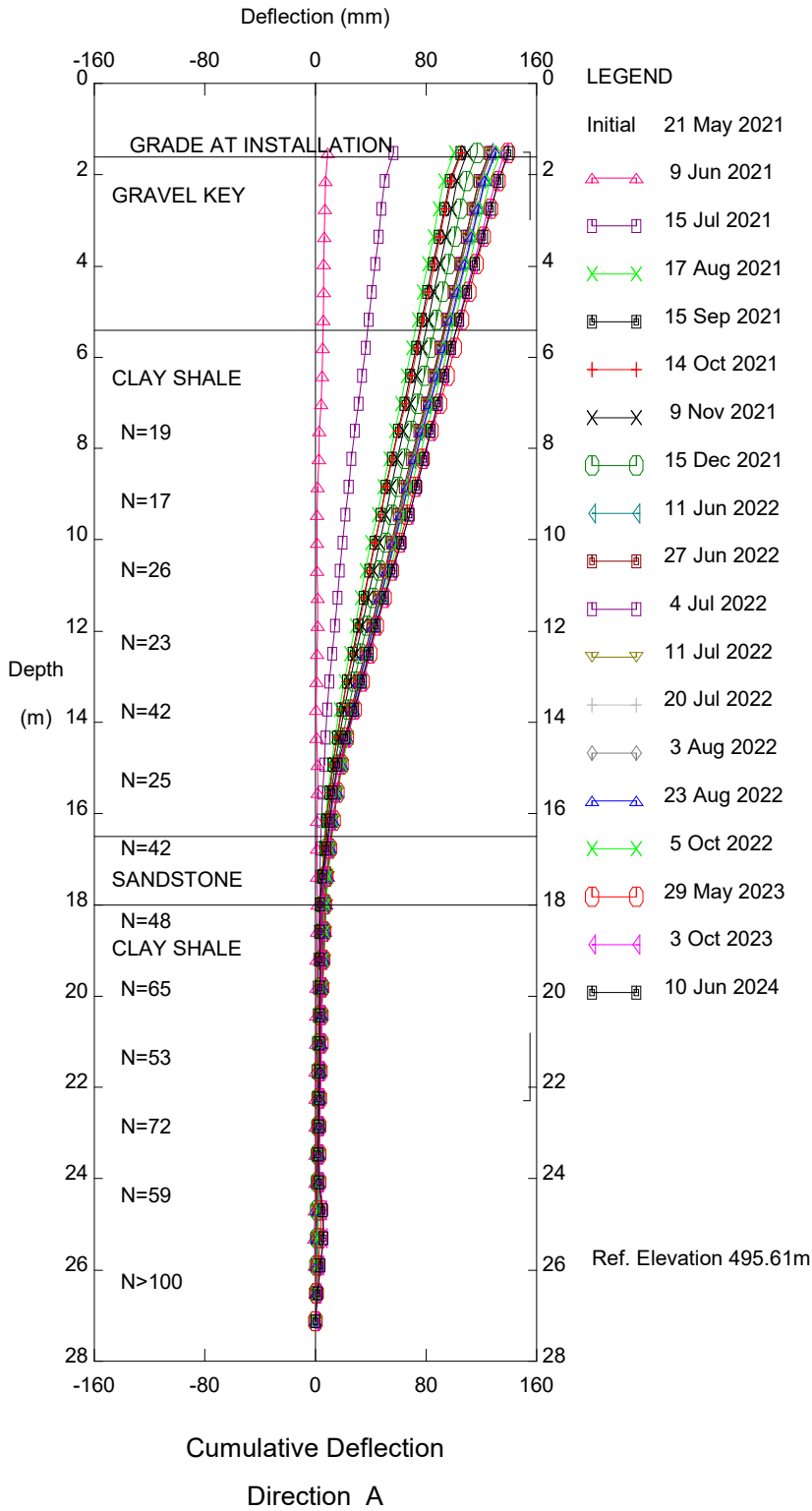
Alberta Transportation



NC099 South Slope Stability Pile Wall, Inclinator 14-02

Alberta Transportation

Thurber Engineering Ltd.



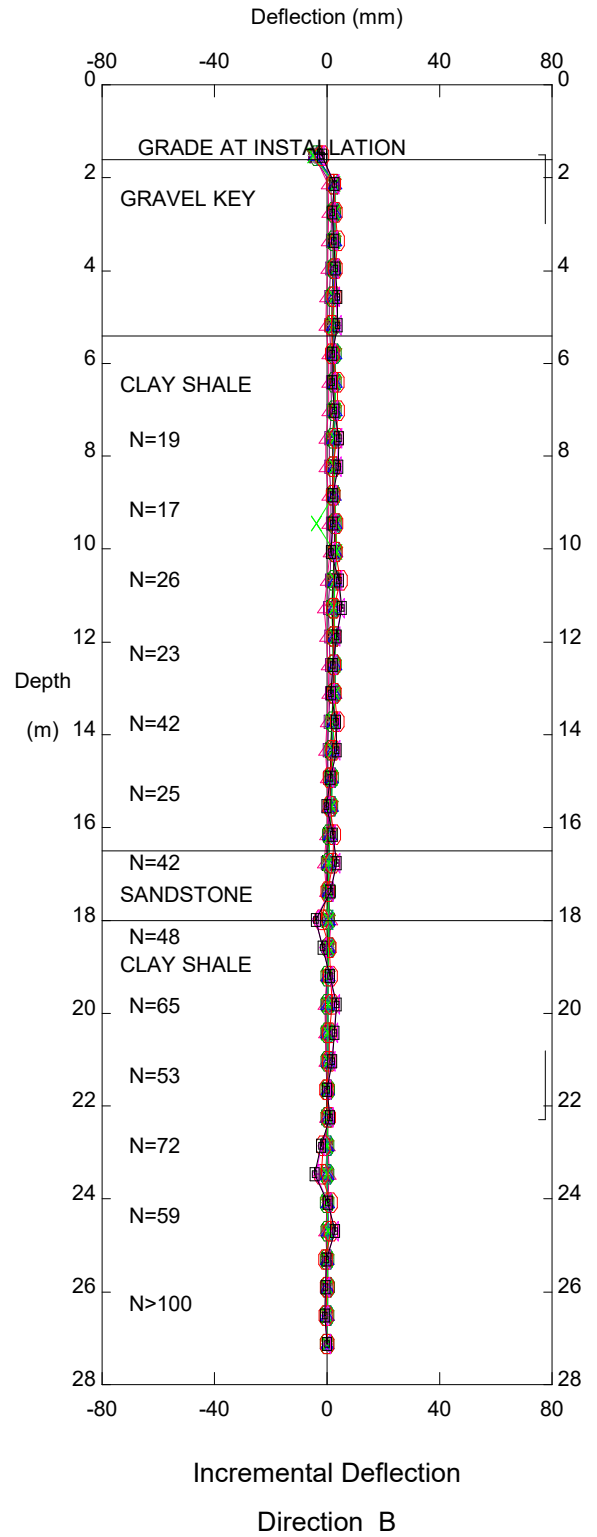
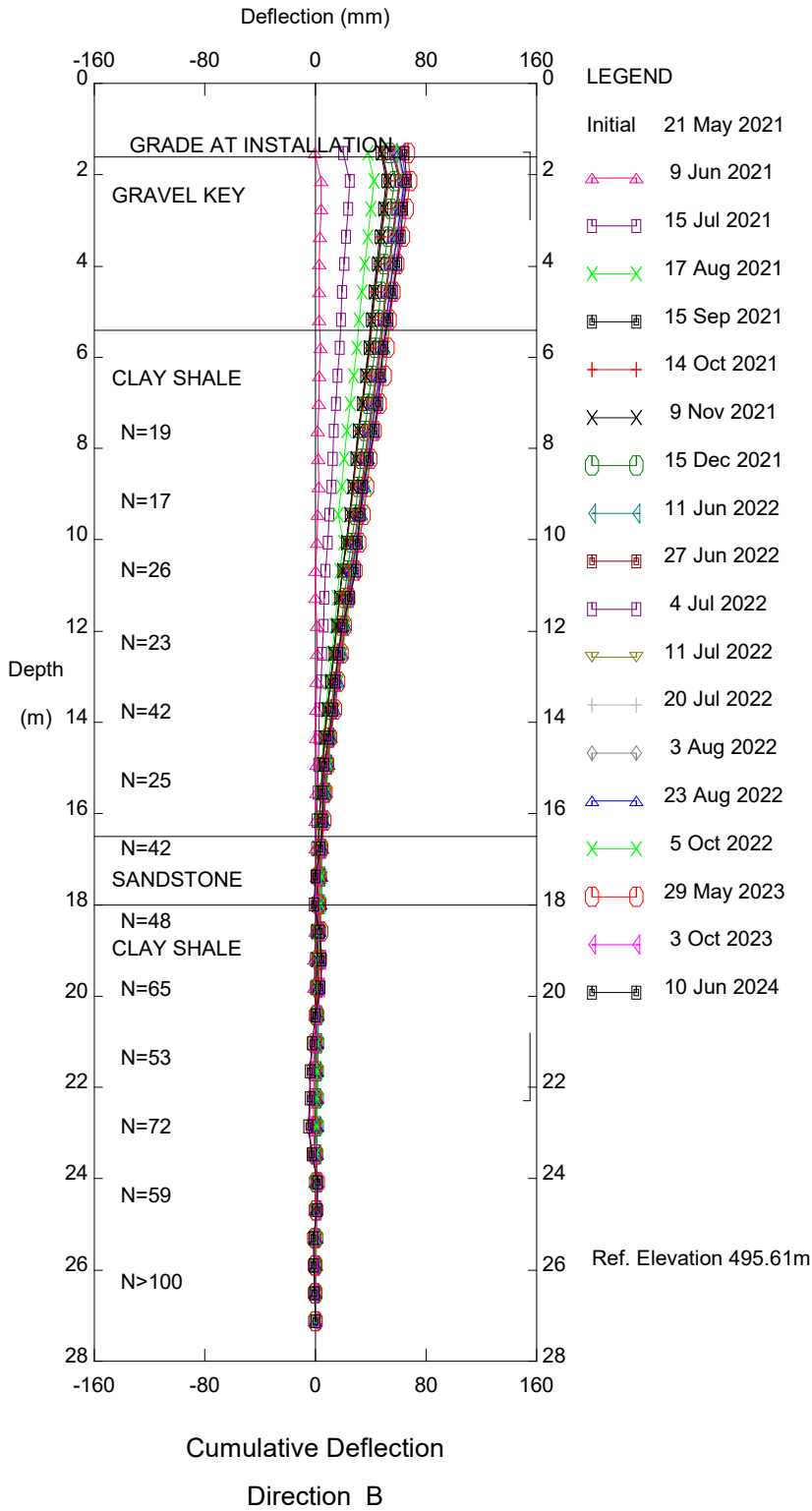
Pile Wall, Inclinator N-SI-01

STRATIGRAPHY INFERRED FROM N-SI-02

Hangstone Bridge North Abutment

STRATIGRAPHY INFERRED FROM N-SI-02

Thurber Engineering Ltd.



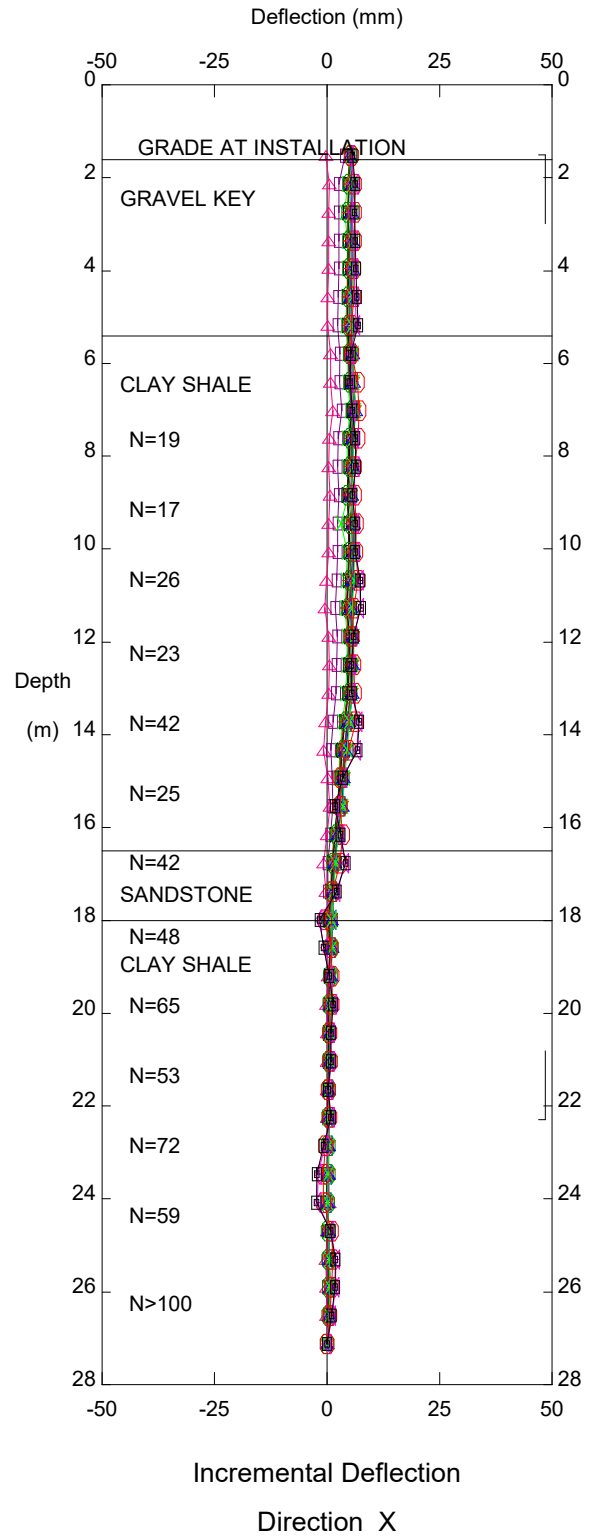
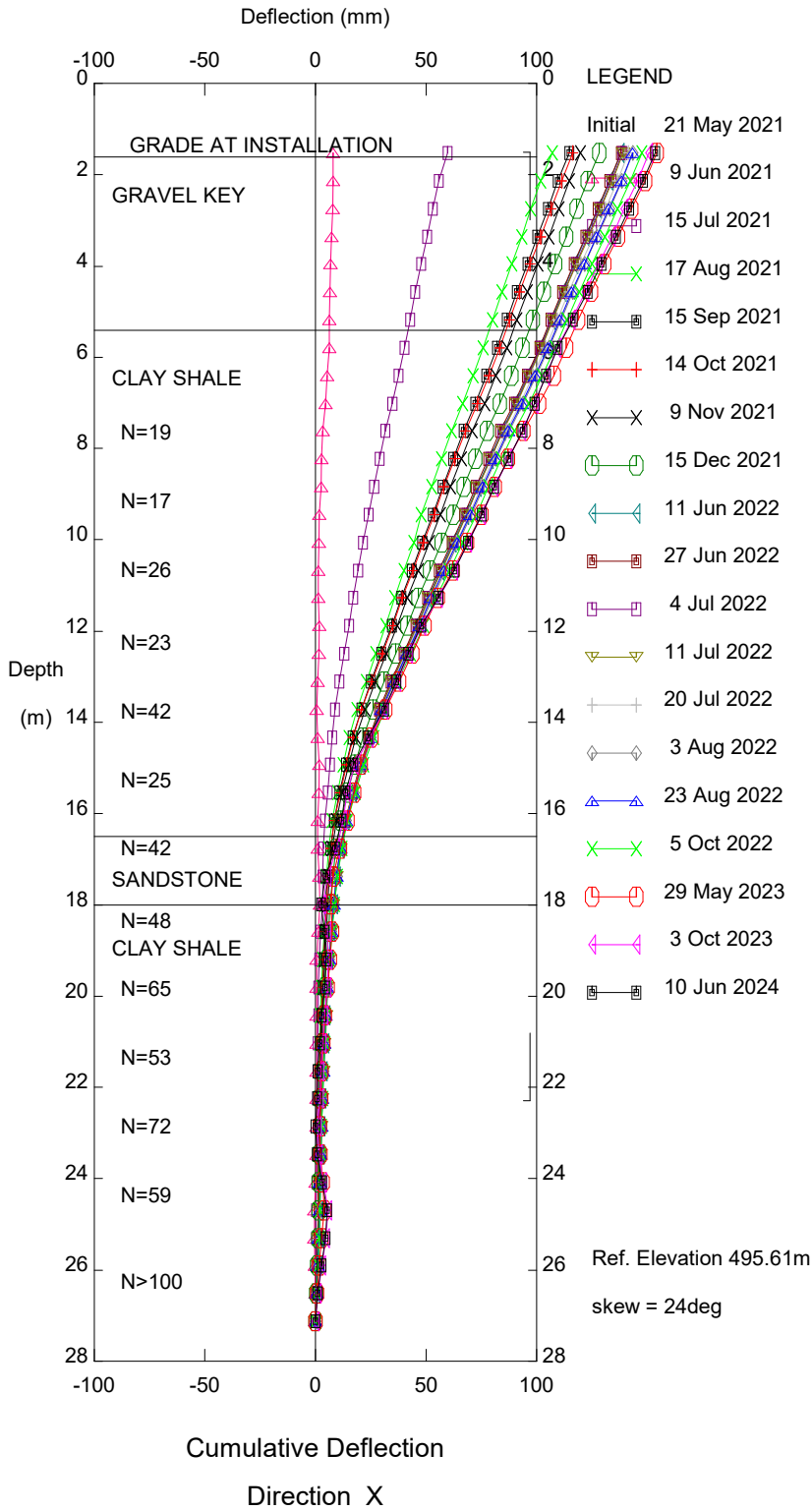
Pile Wall, Inclinator N-SI-01

STRATIGRAPHY INFERRED FROM N-SI-02

Hangstone Bridge North Abutment

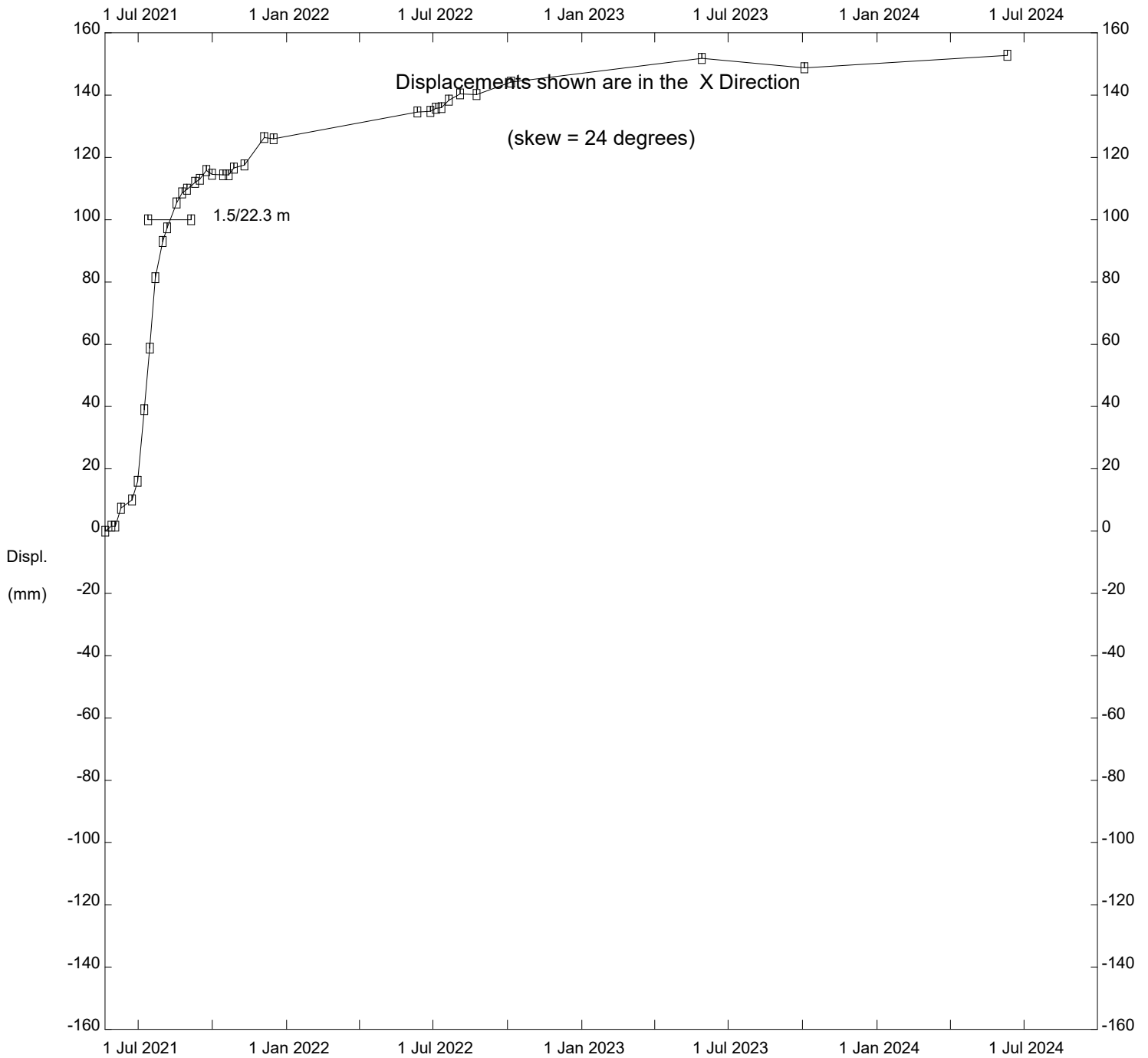
STRATIGRAPHY INFERRED FROM N-SI-02

Thurber Engineering Ltd.



Pile Wall, Inclinometer N-SI-01
Hangingstone Bridge North Abutment

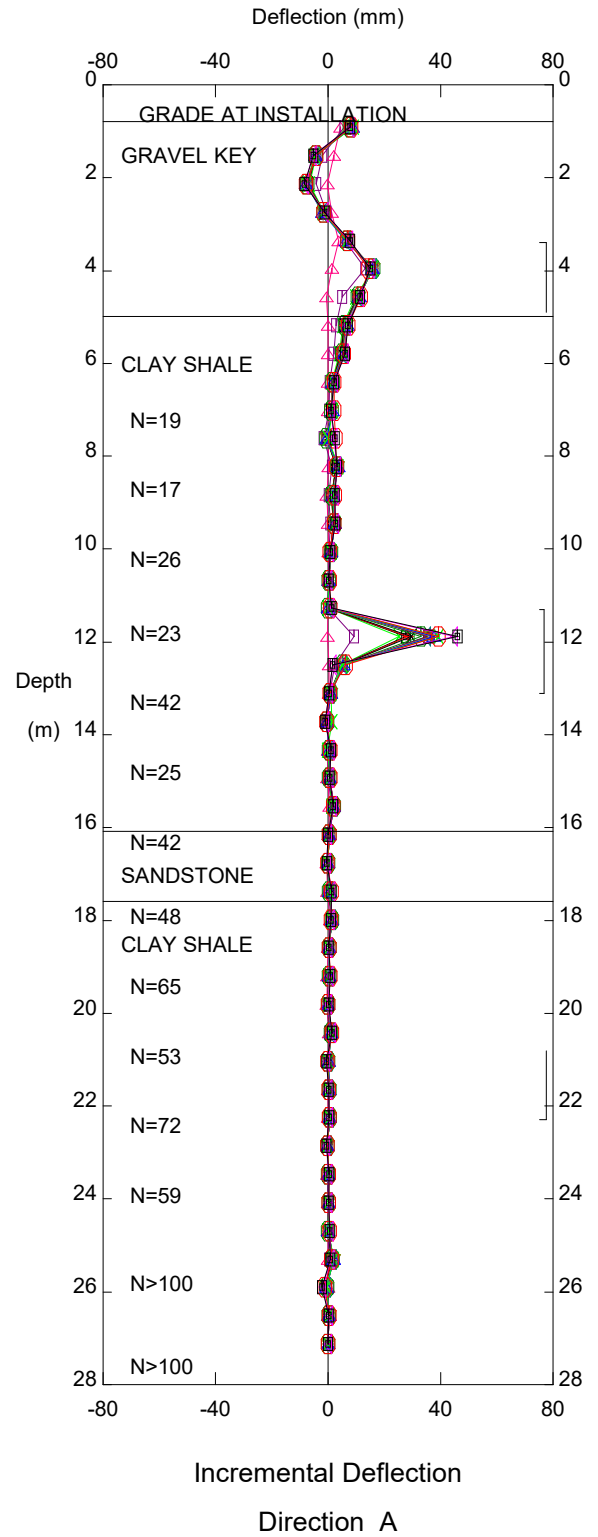
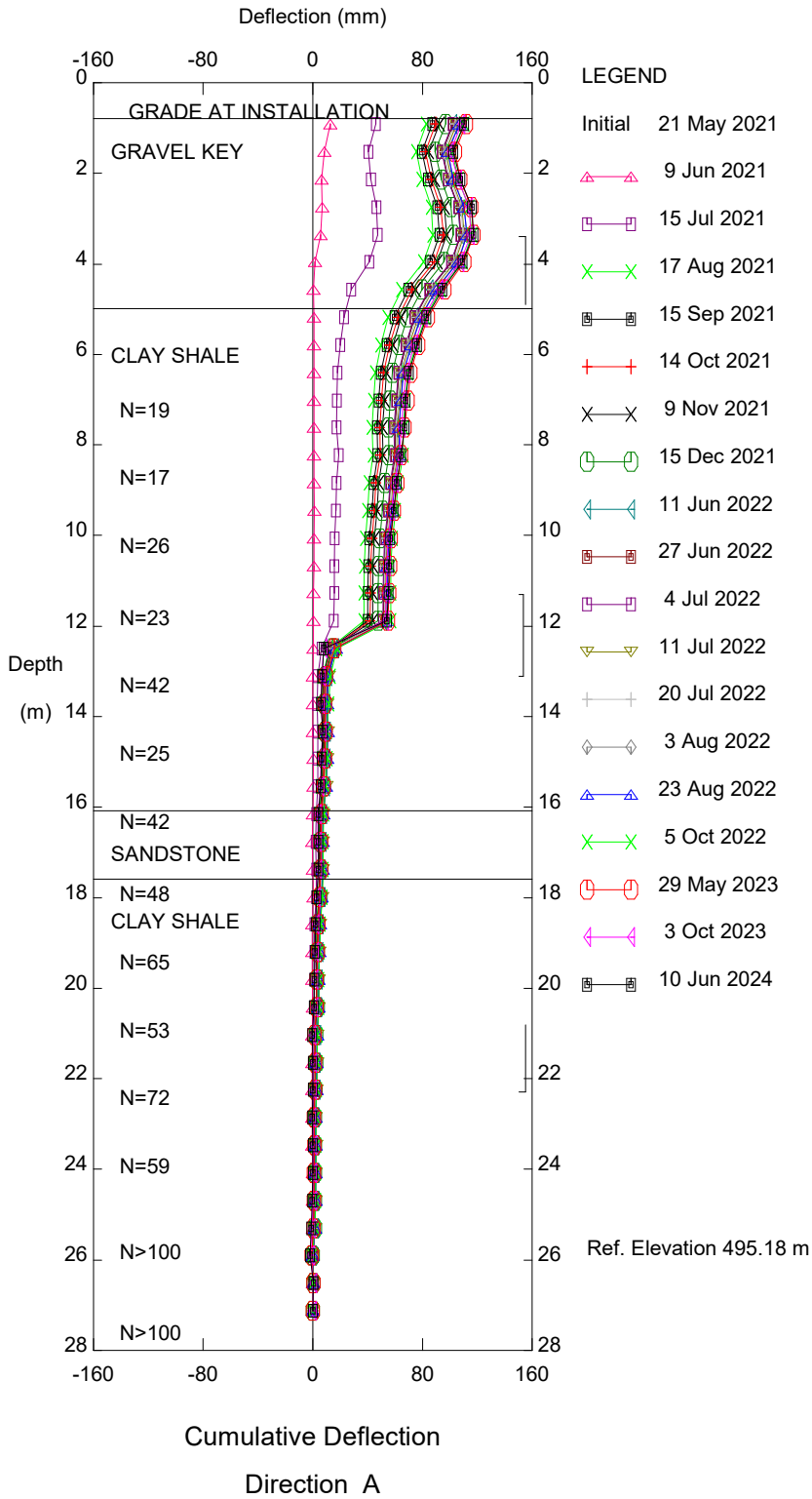
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Pile Wall, Inclinator N-SI-01

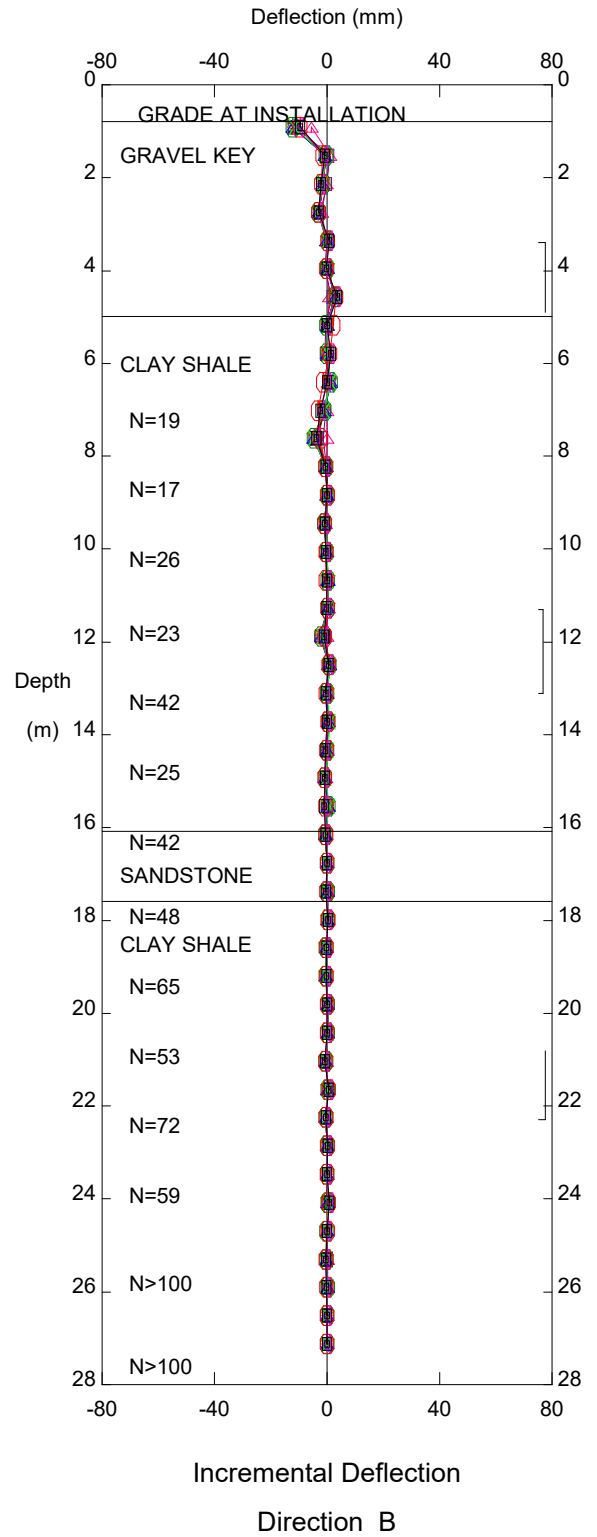
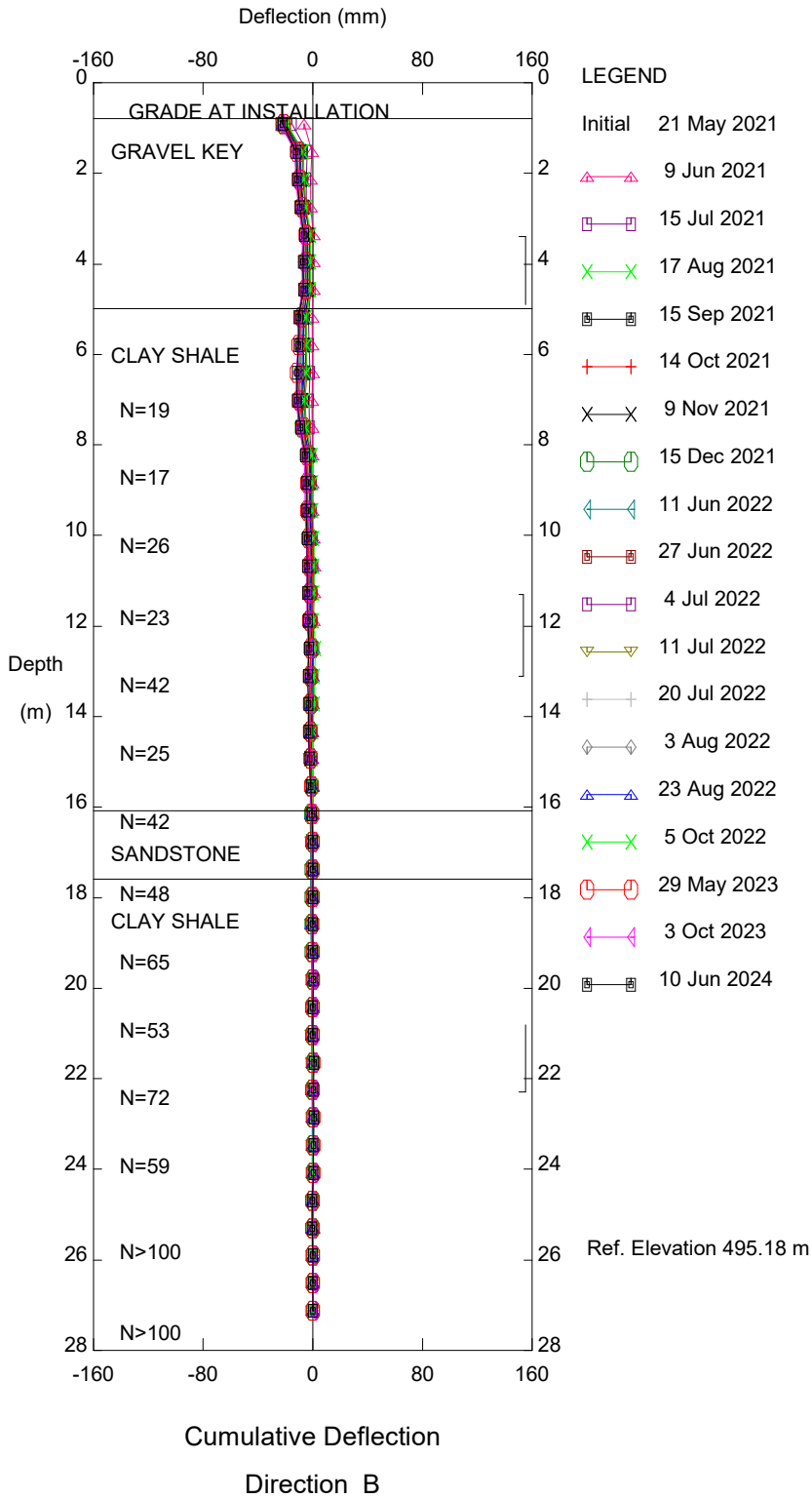
Hangstone Bridge North Abutment

Thurber Engineering Ltd.



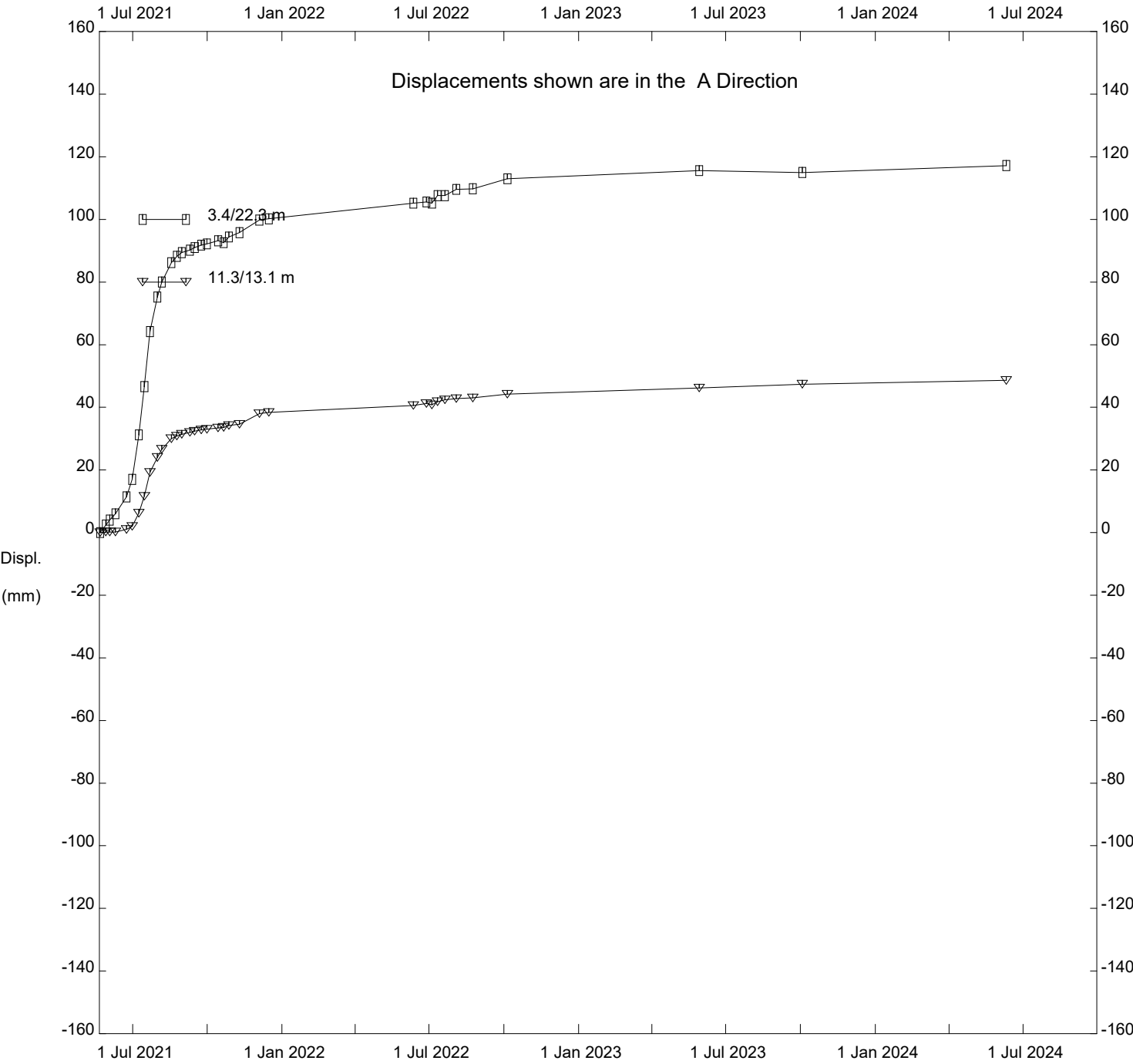
In Ground, Inclinator N-SI-02
 Hangingstone Bridge North Abutment

Thurber Engineering Ltd.



In Ground, Inclinator N-SI-02

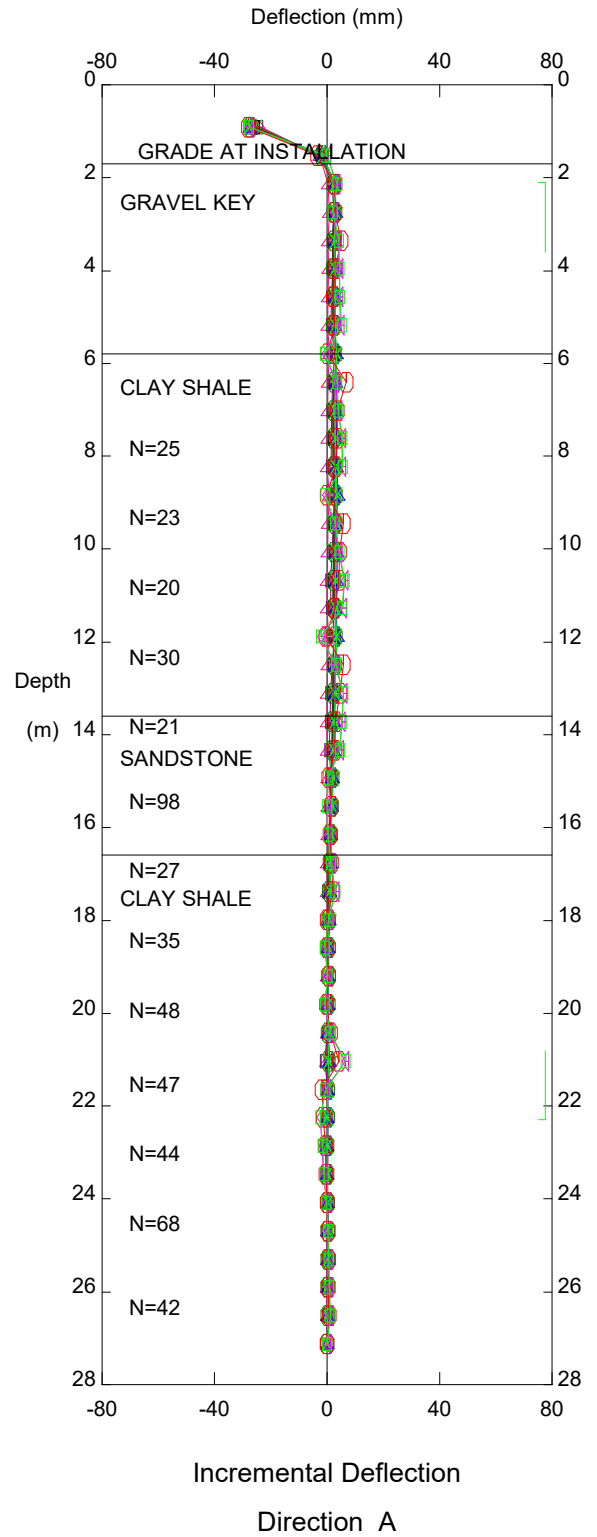
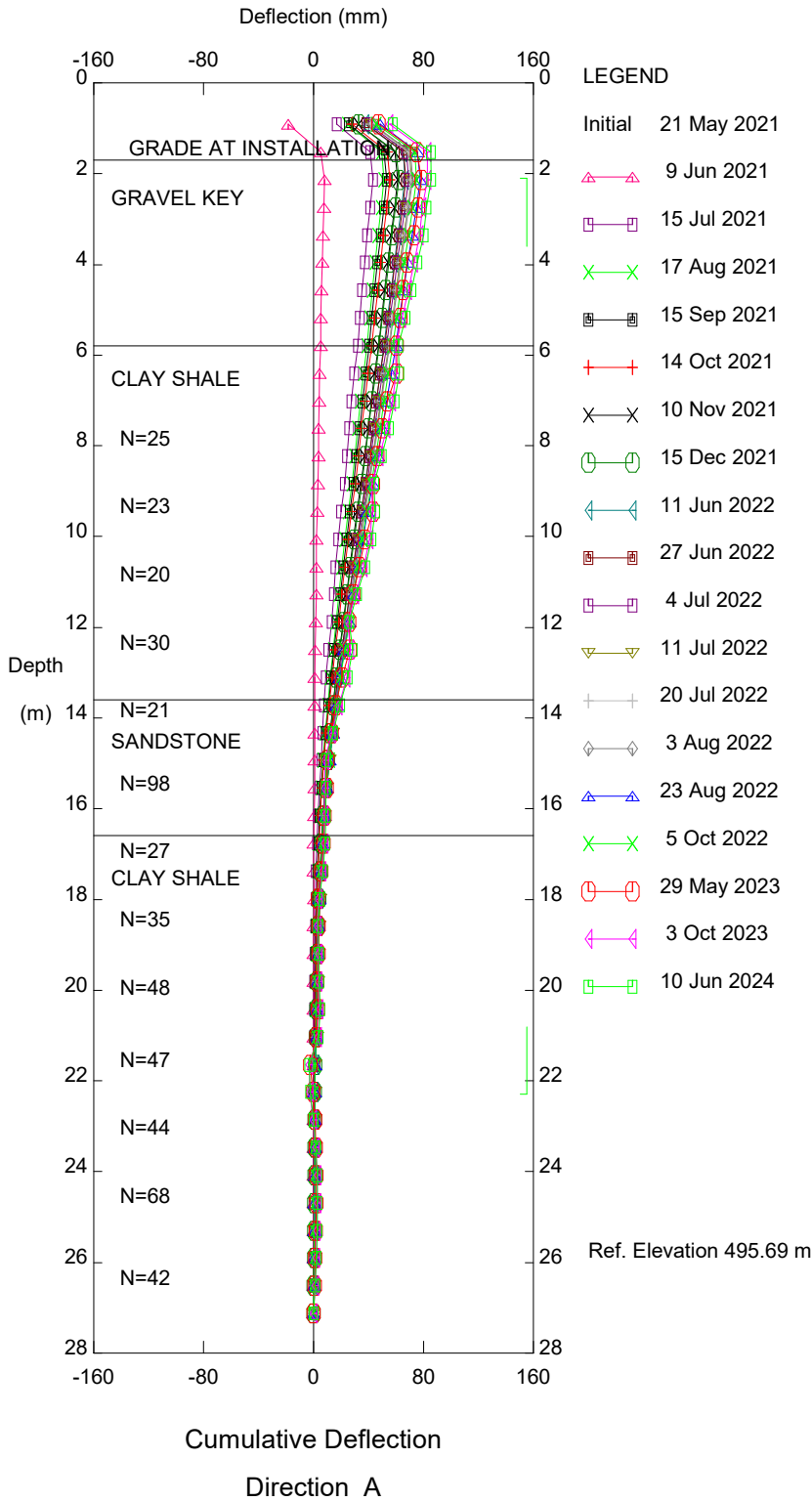
Hangingstone Bridge North Abutment



In Ground, Inclinator N-SI-02

Hangstone Bridge North Abutment

Thurber Engineering Ltd.



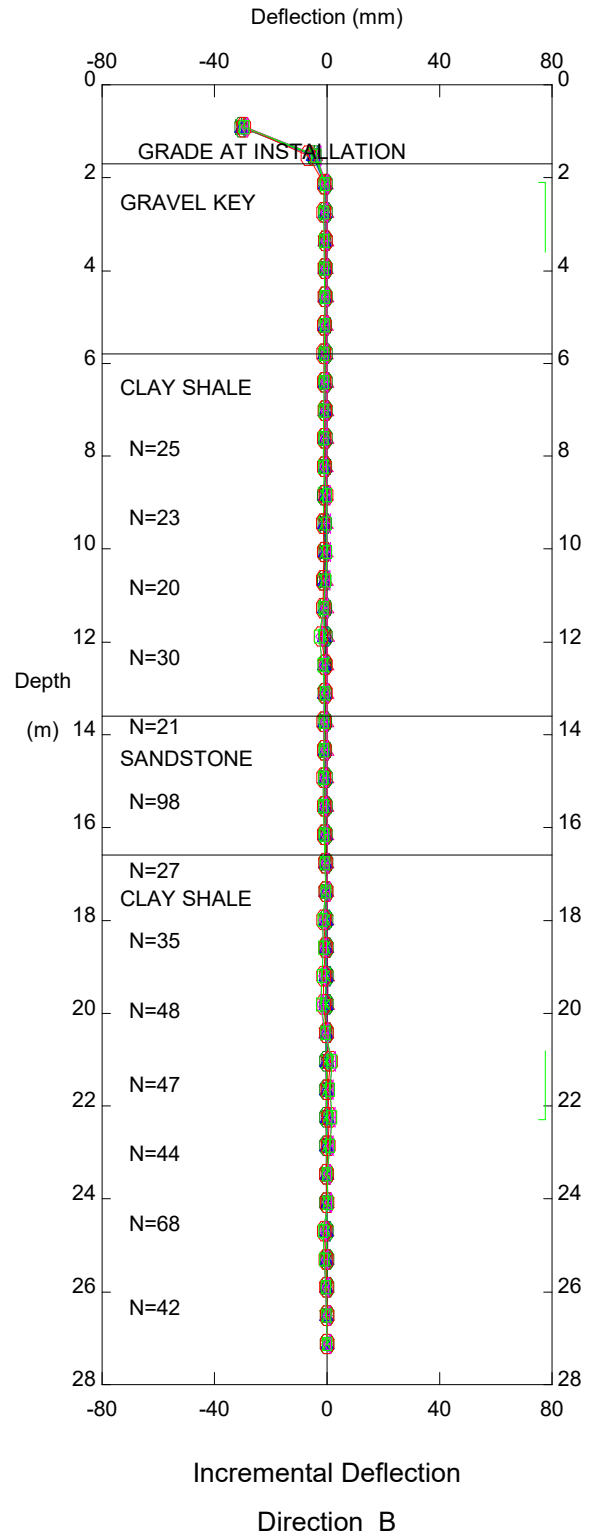
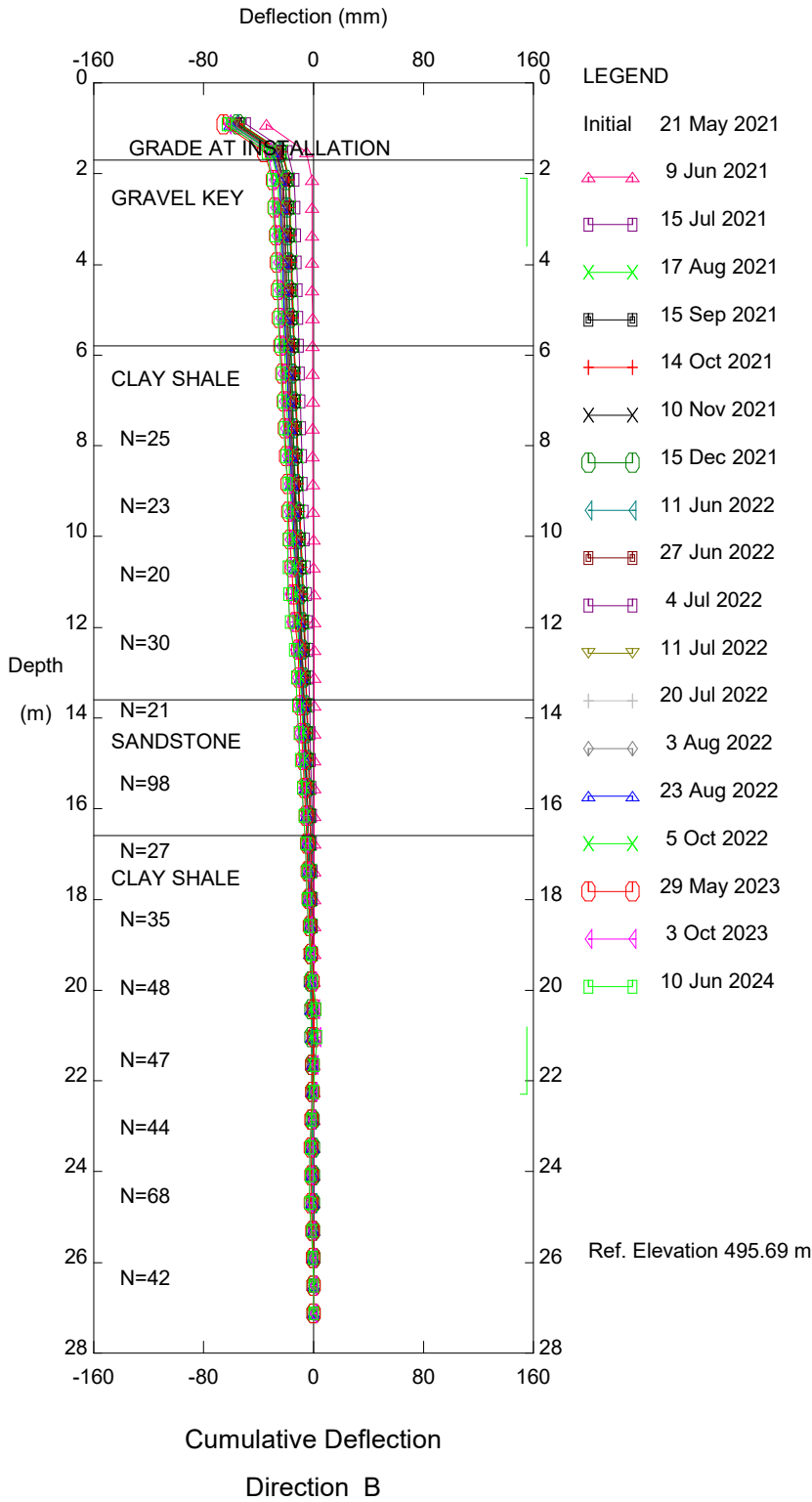
Pile Wall, Inclinator S-SI-01

STRATIGRAPHY INFERRED FROM S-SI-02

Hangingstone Bridge South Abutment

STRATIGRAPHY INFERRED FROM S-SI-02

Thurber Engineering Ltd.



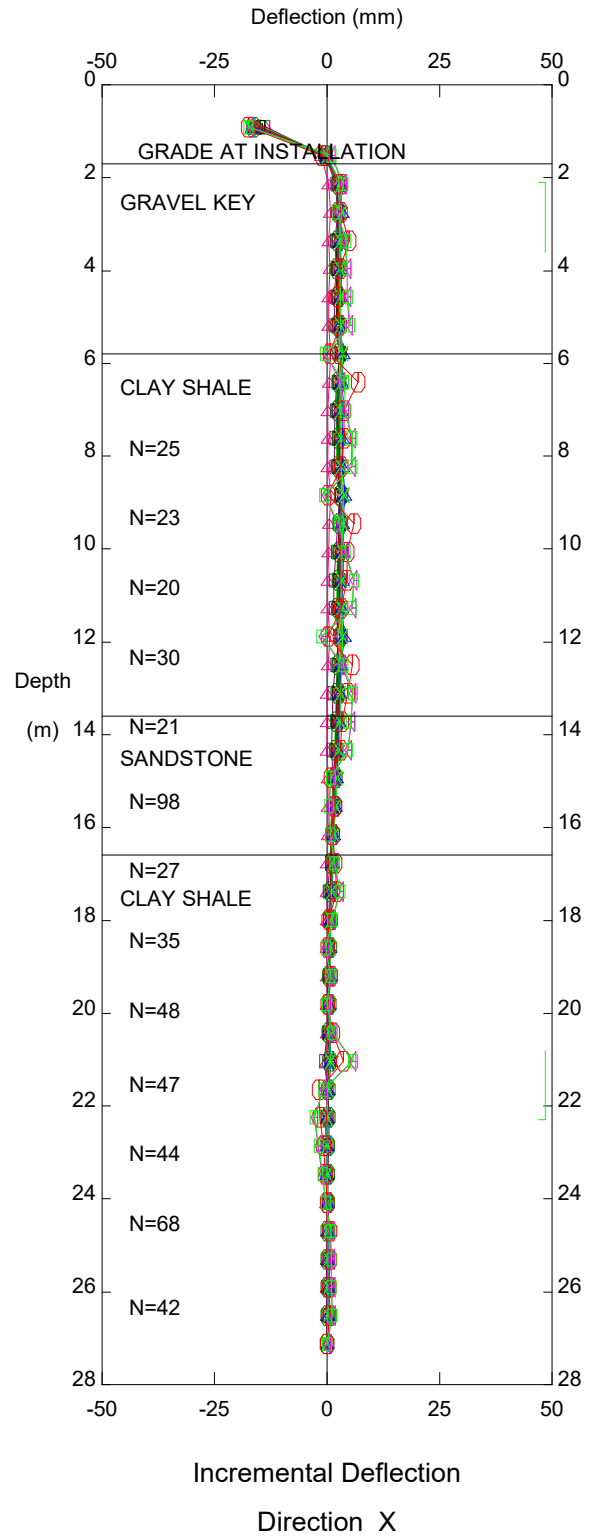
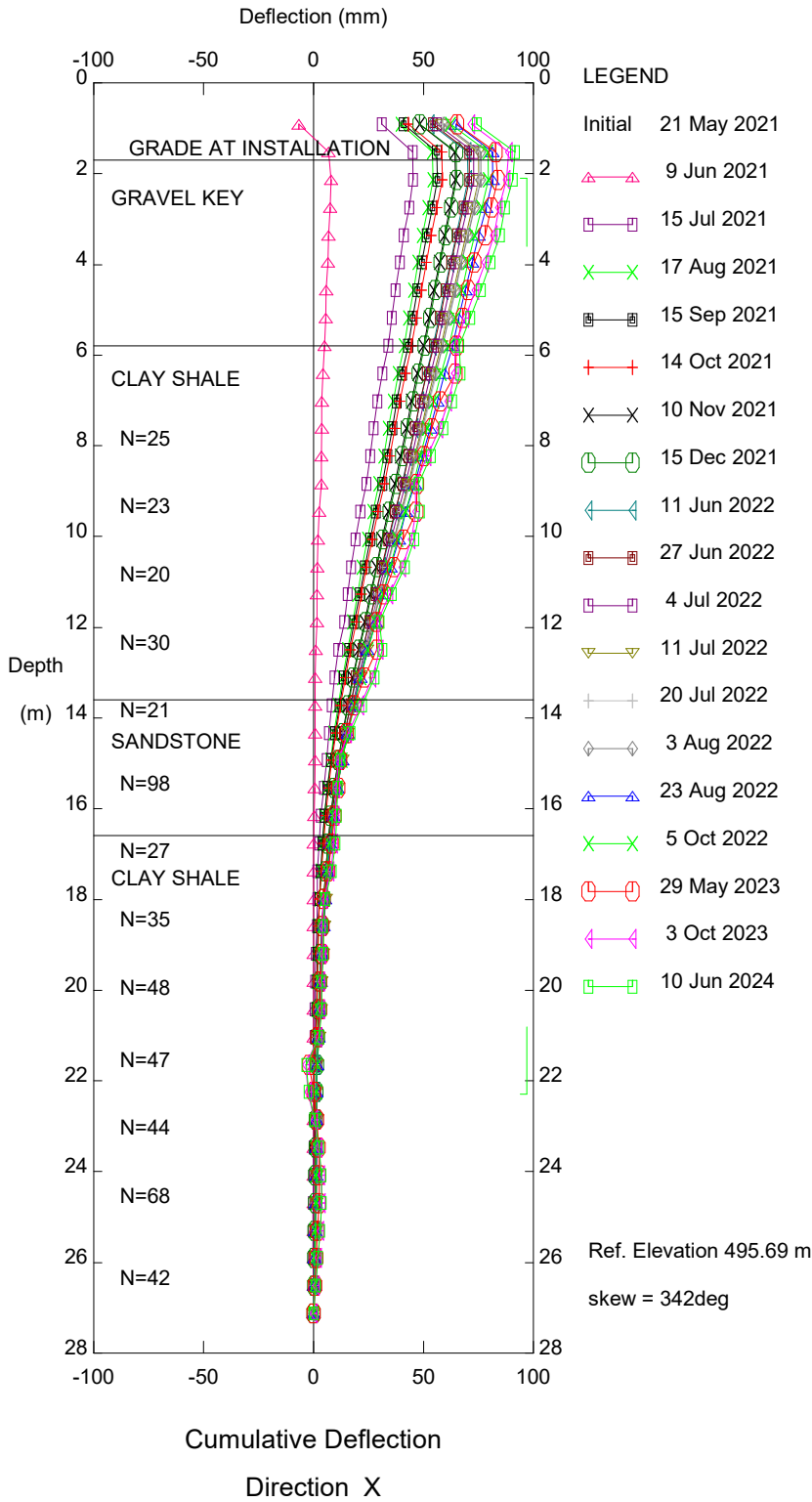
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STRATIGRAPHY INFERRED FROM S-SI-02

Hangstone Bridge South Abutment

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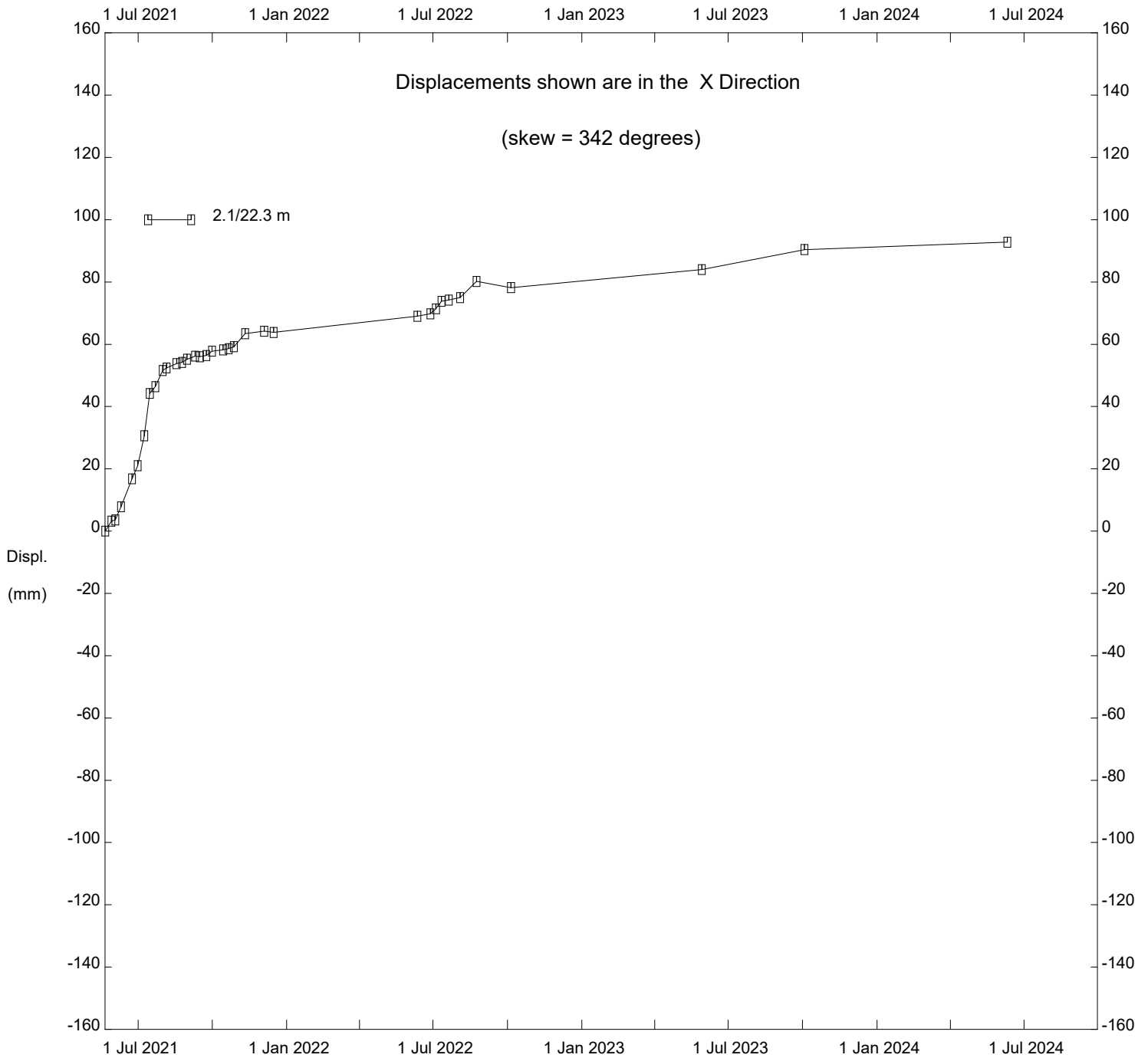
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Pile Wall, Inclinator S-SI-01

Hangingstone Bridge South Abutment

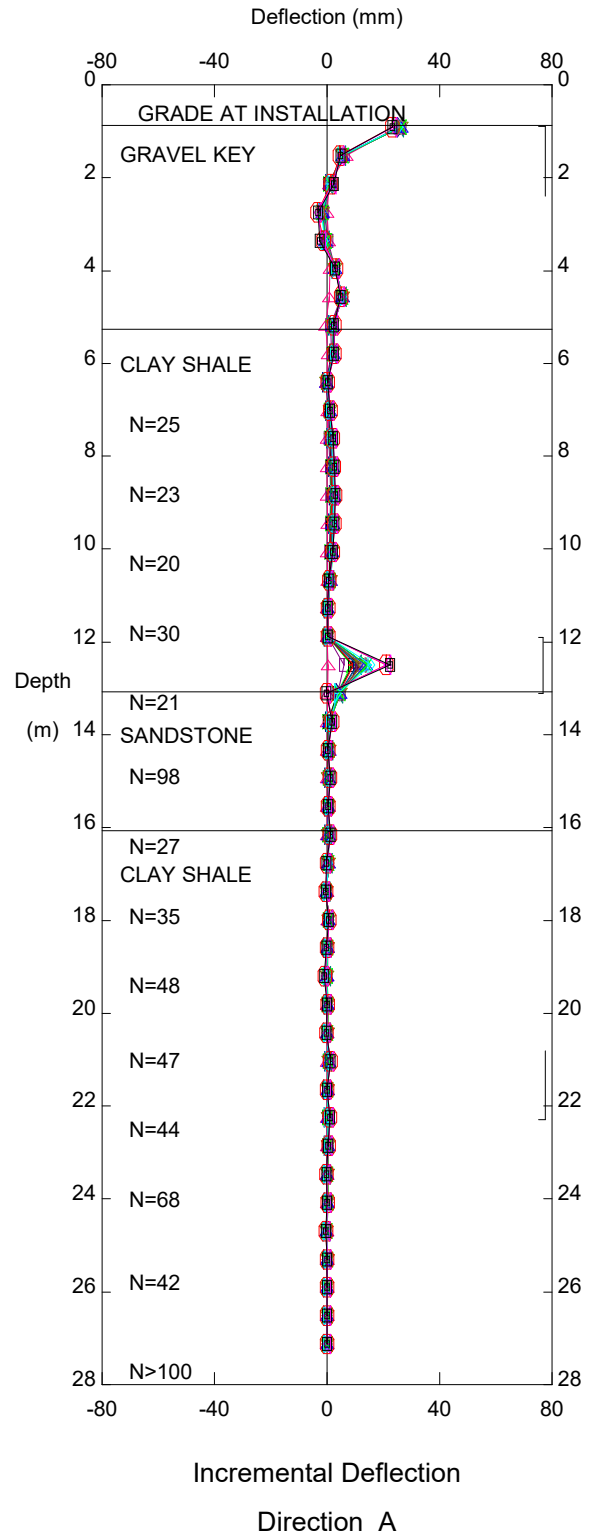
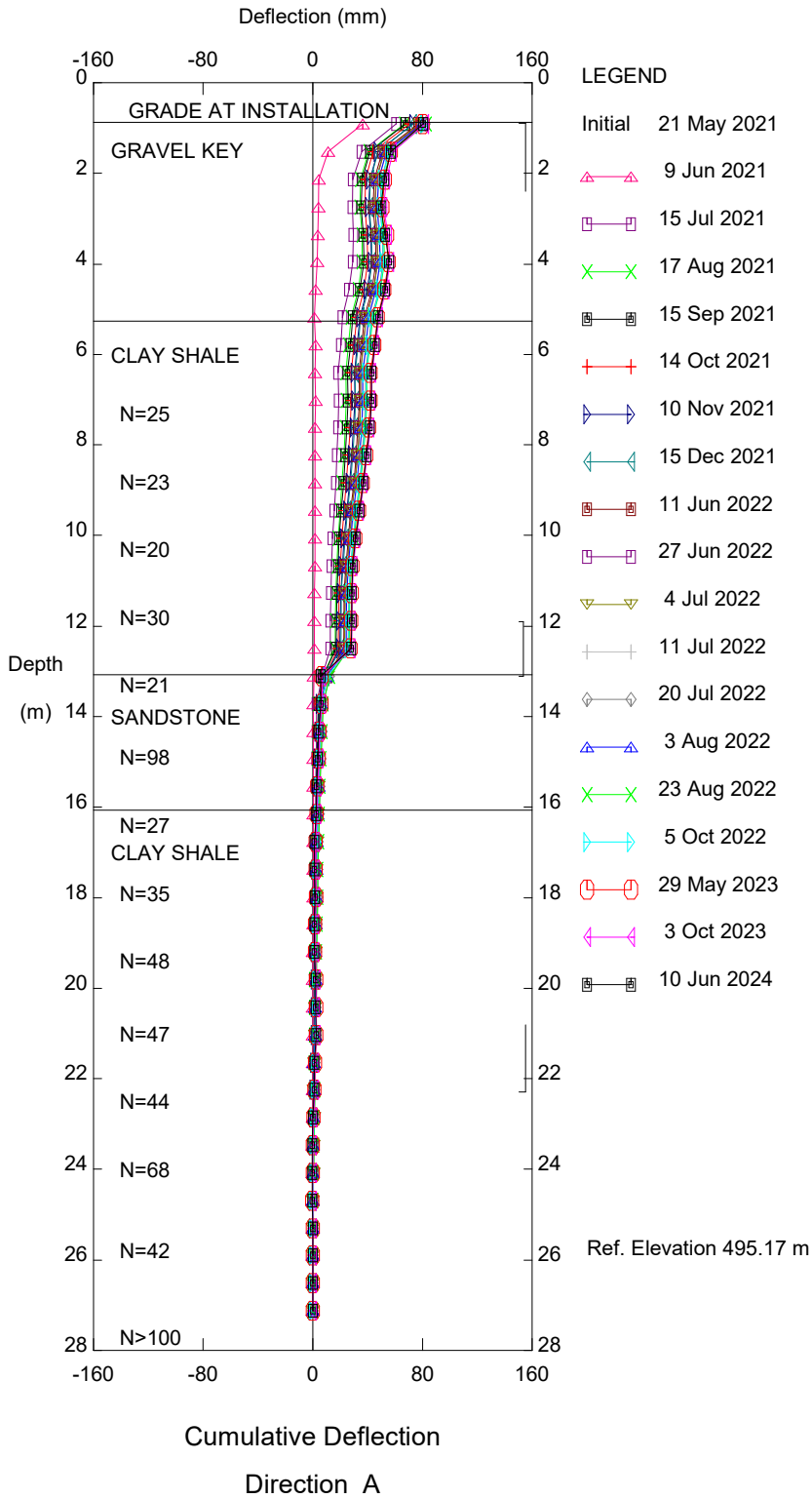
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Pile Wall, Inclinator S-SI-01

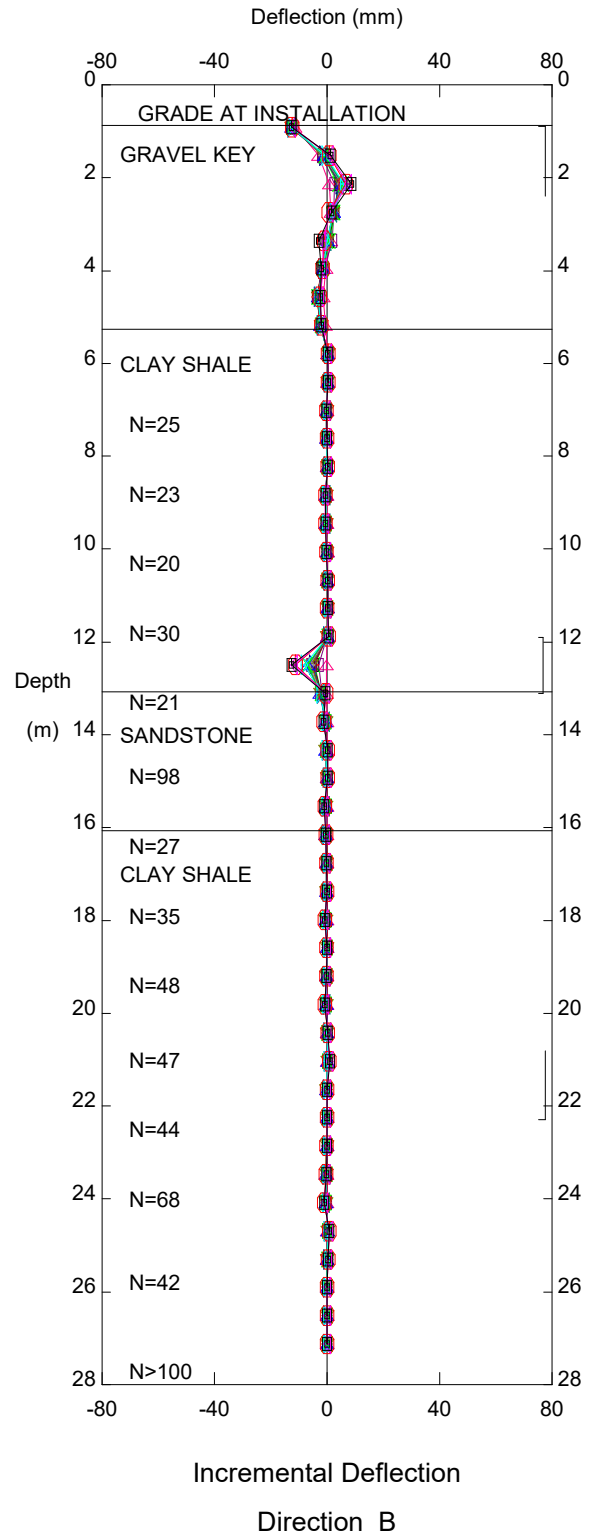
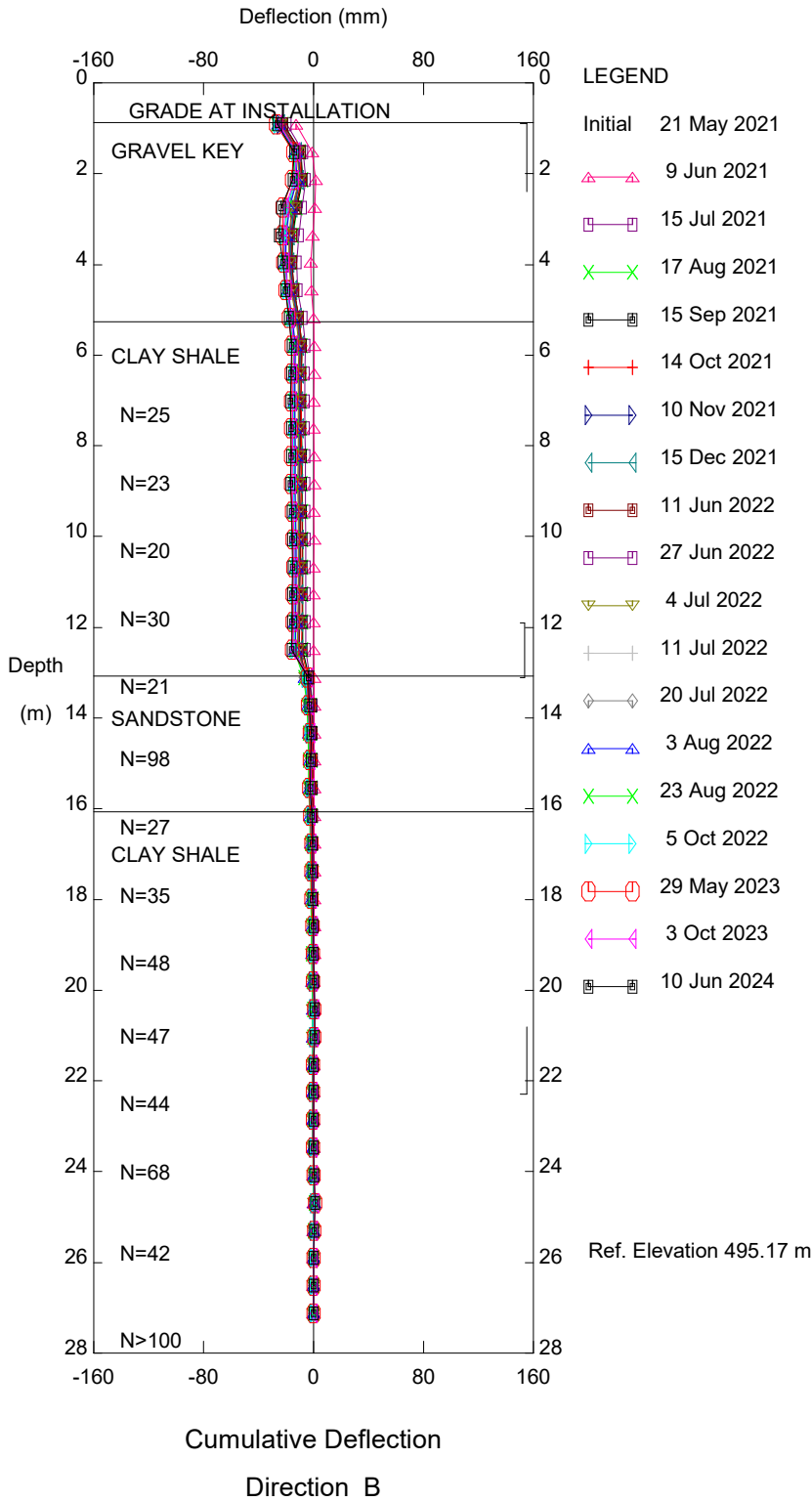
Hangstone Bridge South Abutment

Thurber Engineering Ltd.



In Ground, Inclinator S-SI-02
Hangingstone Bridge South Abutment

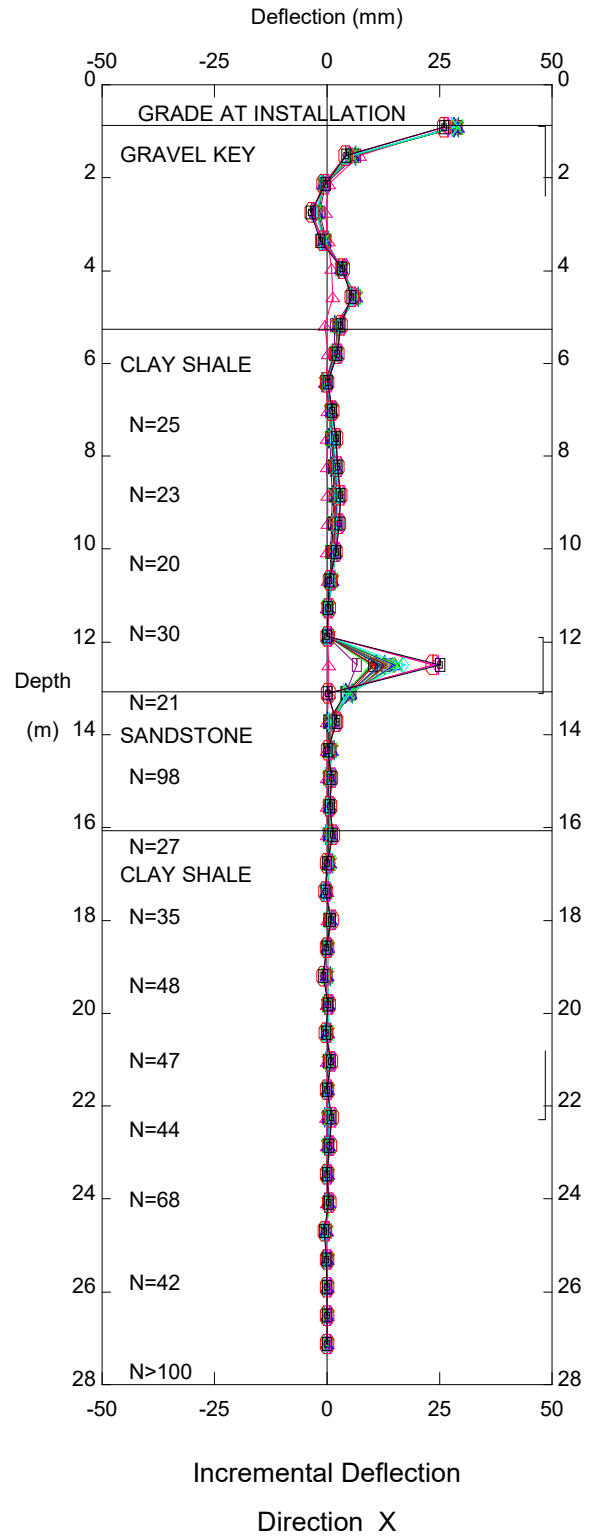
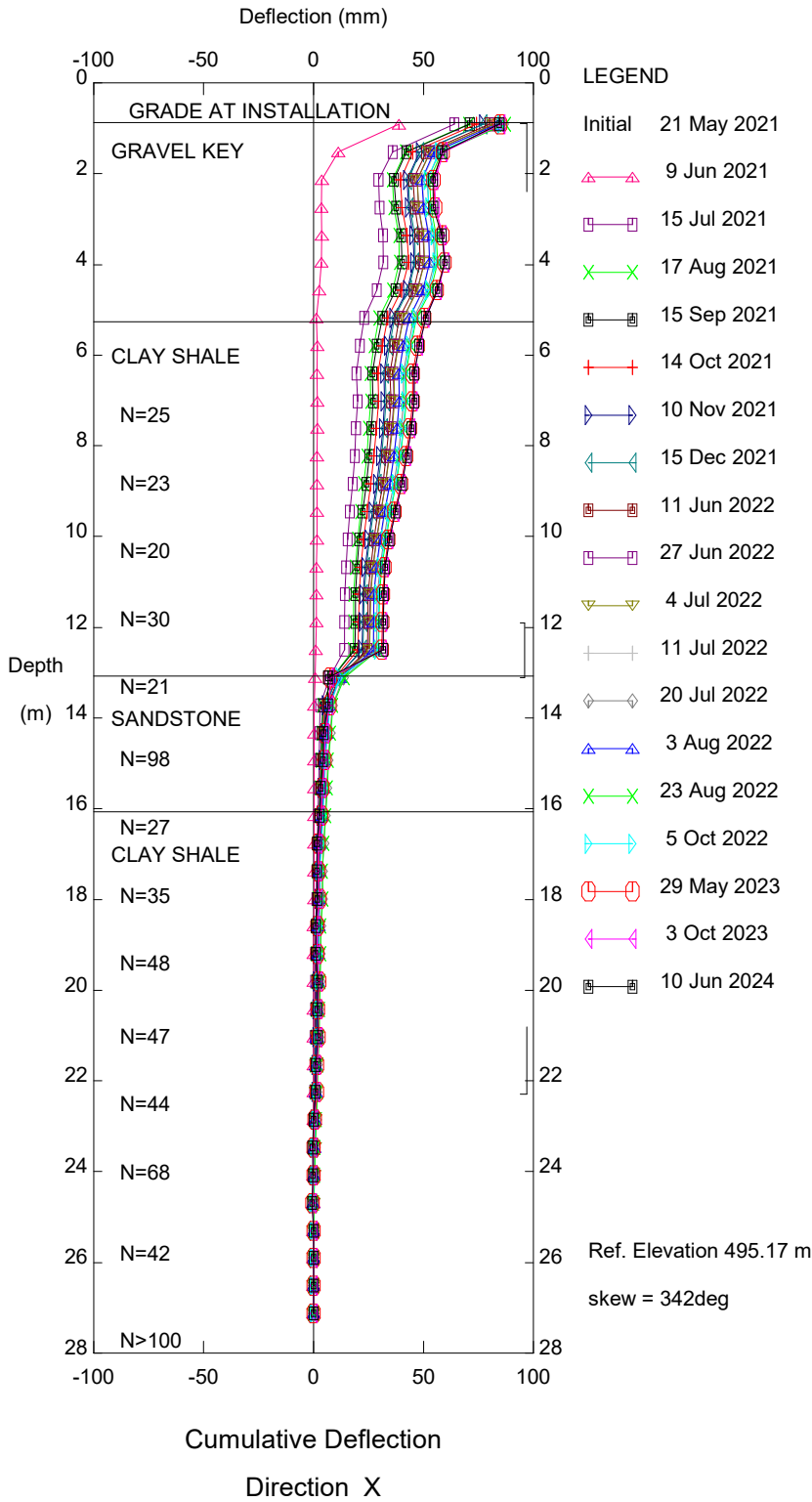
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In Ground, Inclinator S-SI-02

Hangingstone Bridge South Abutment

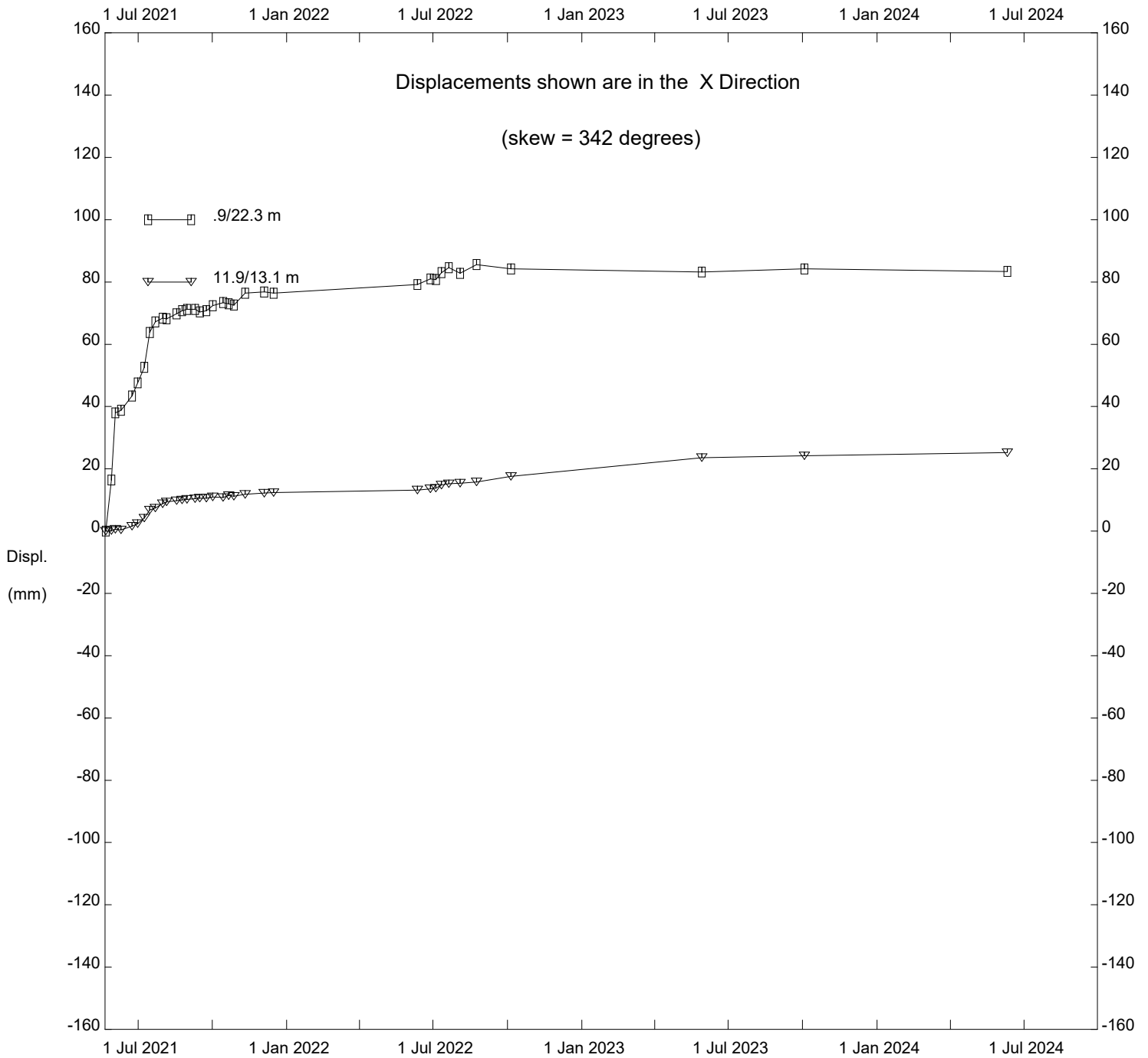
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In Ground, Inclinator S-SI-02

Hangingstone Bridge South Abutment

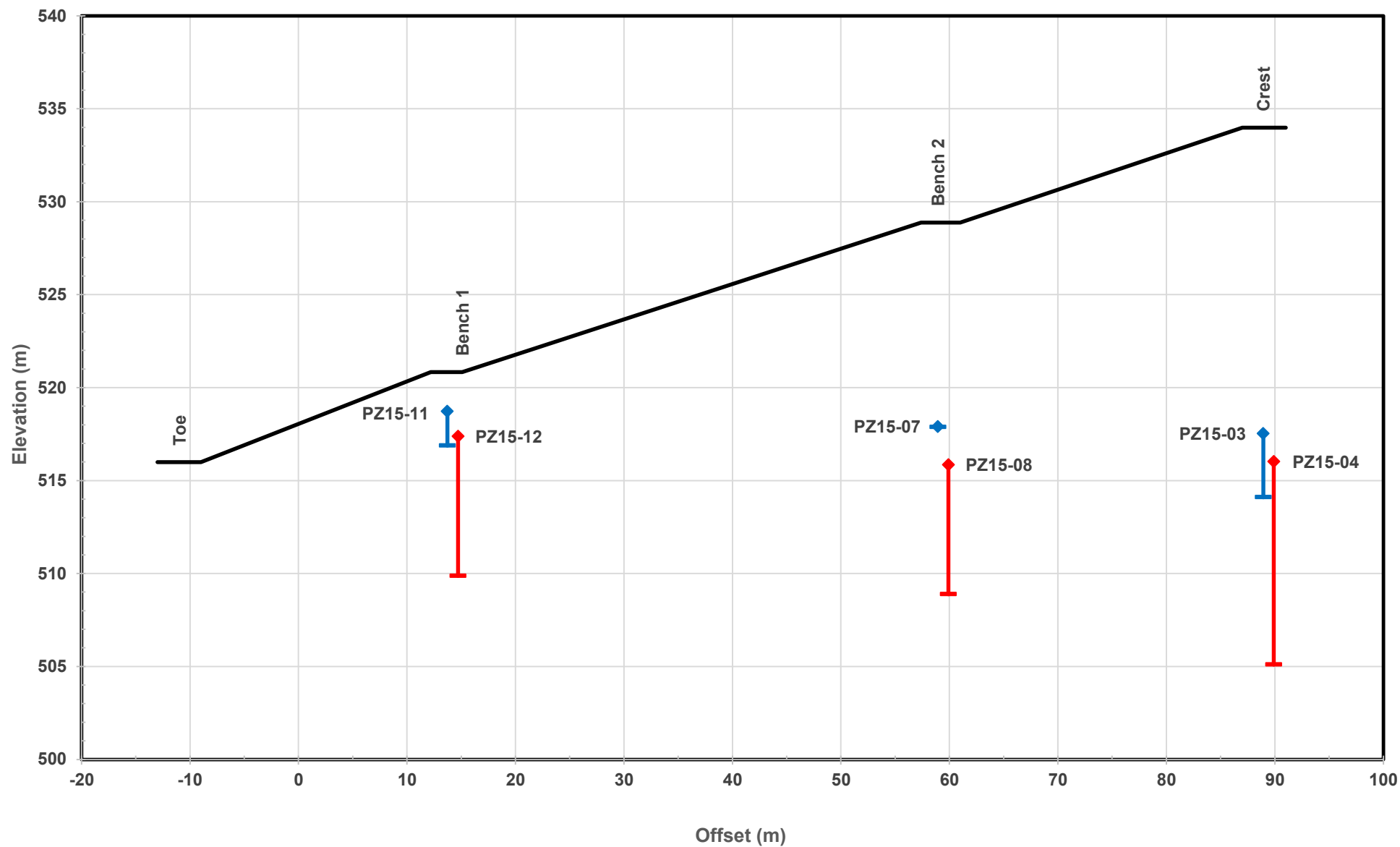
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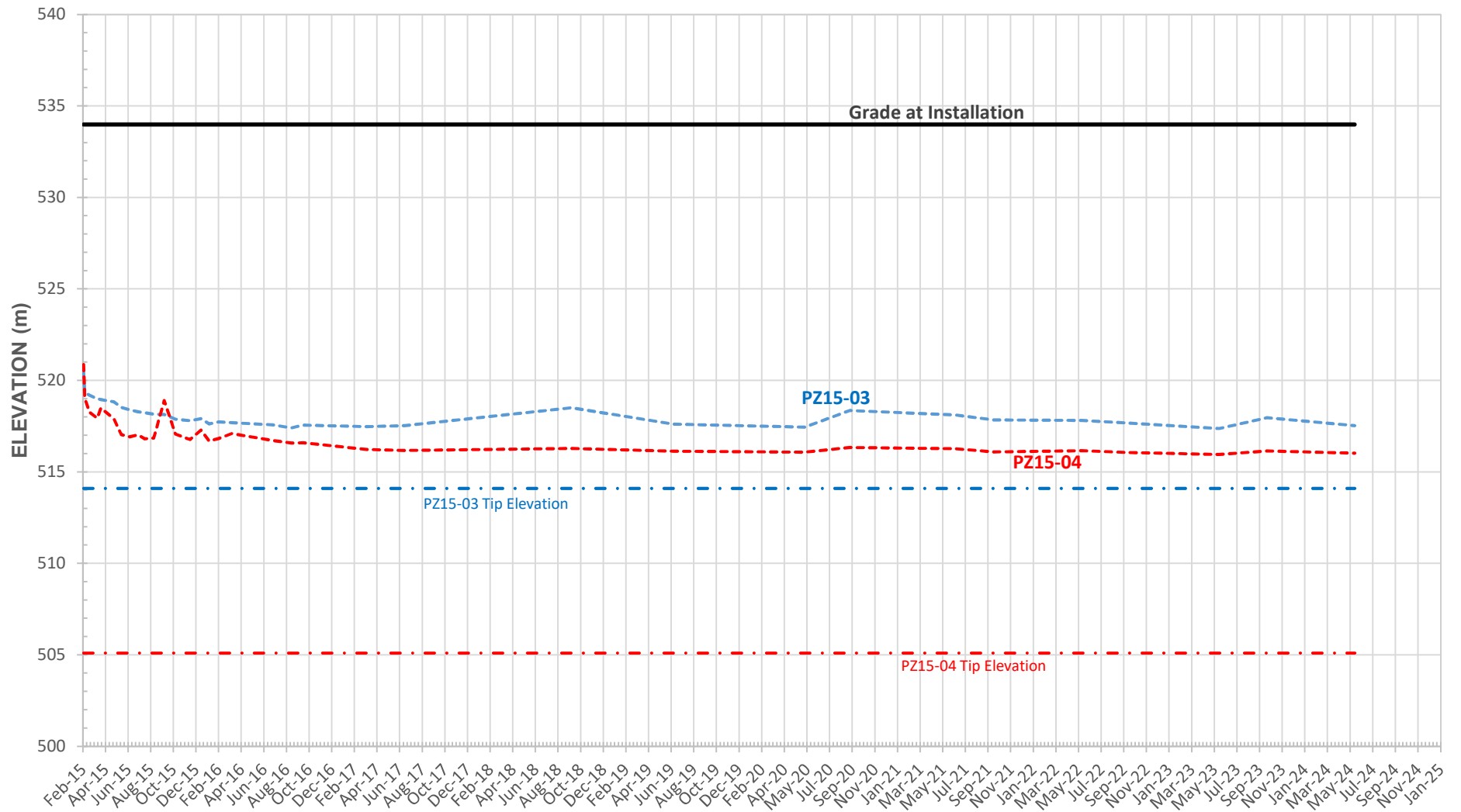
In Ground, Inclinator S-SI-02

Hangingstone Bridge South Abutment

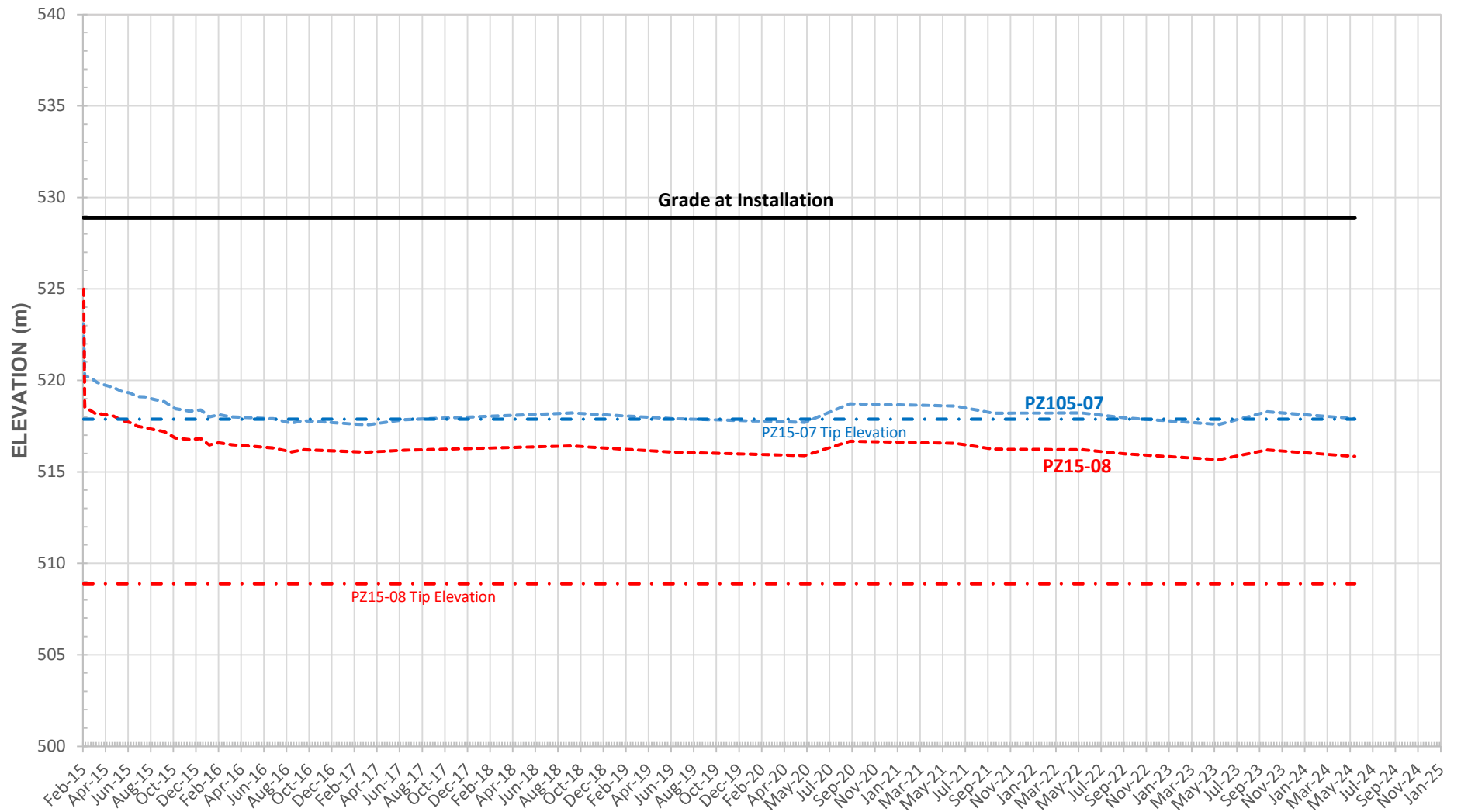
PIEZOMETER PLOT 63+800



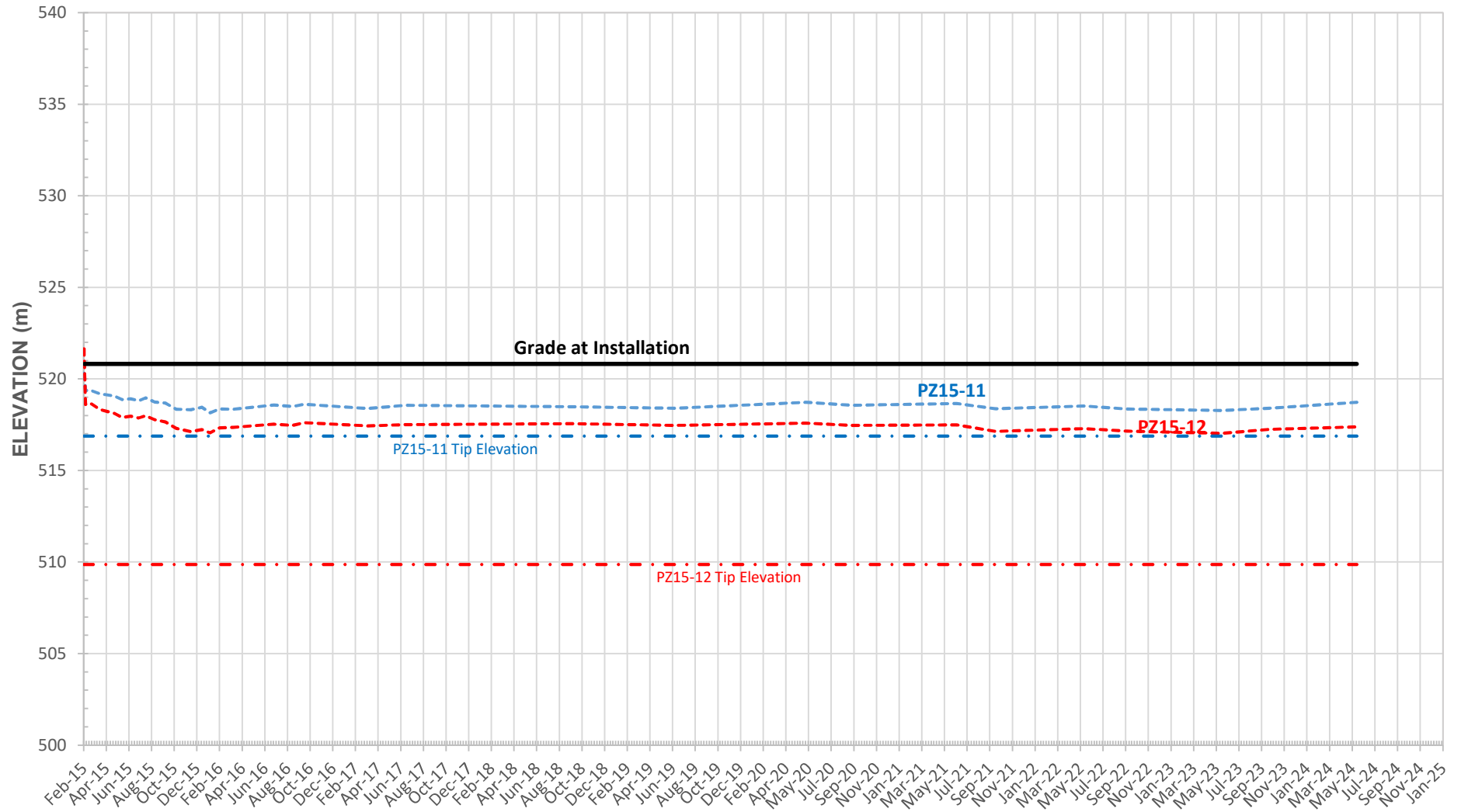
CUT SLOPE
63+802 o/s 88.9 m
Piezometer Plots



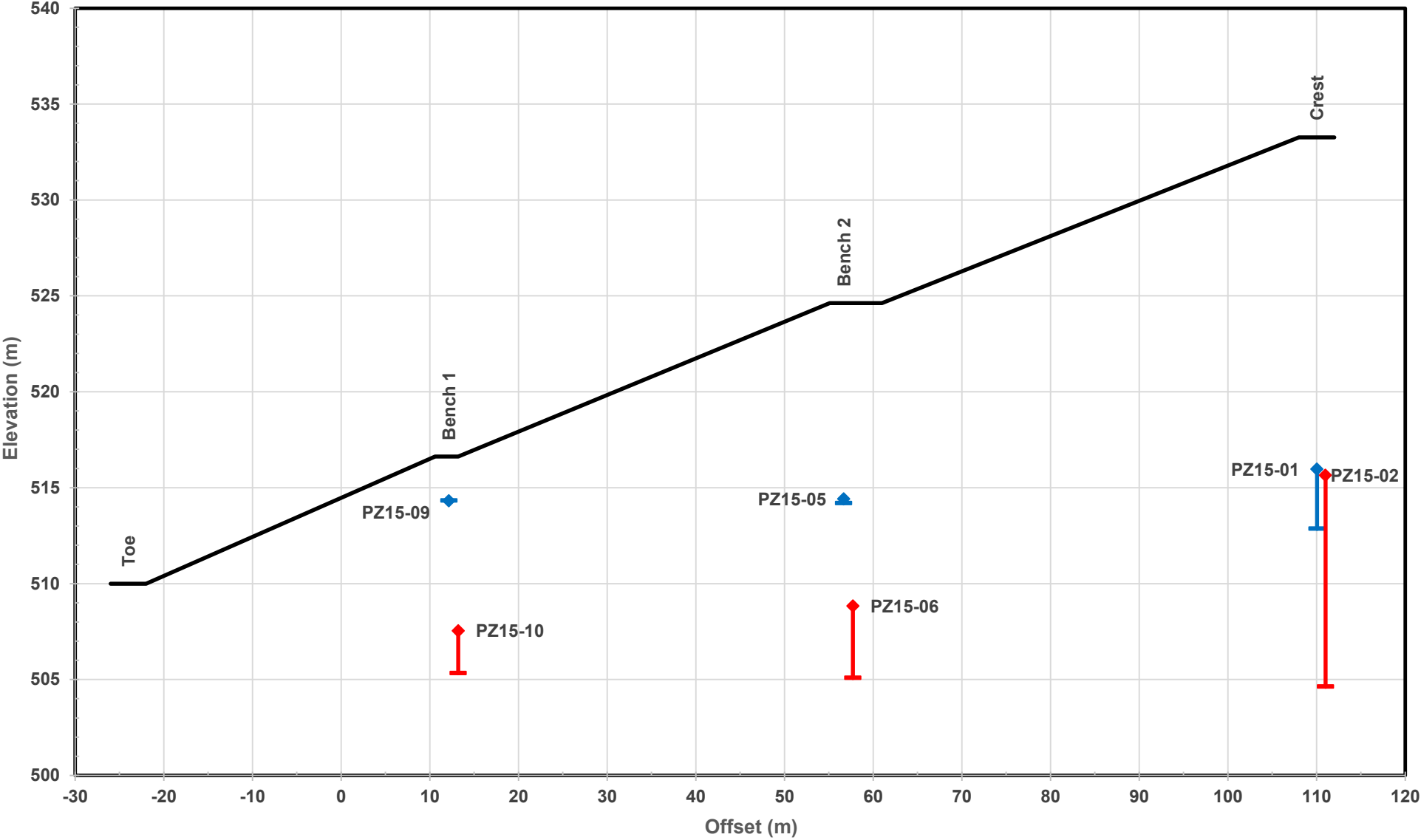
CUT SLOPE
63+802 o/s 58.9 m
Piezometer Plots



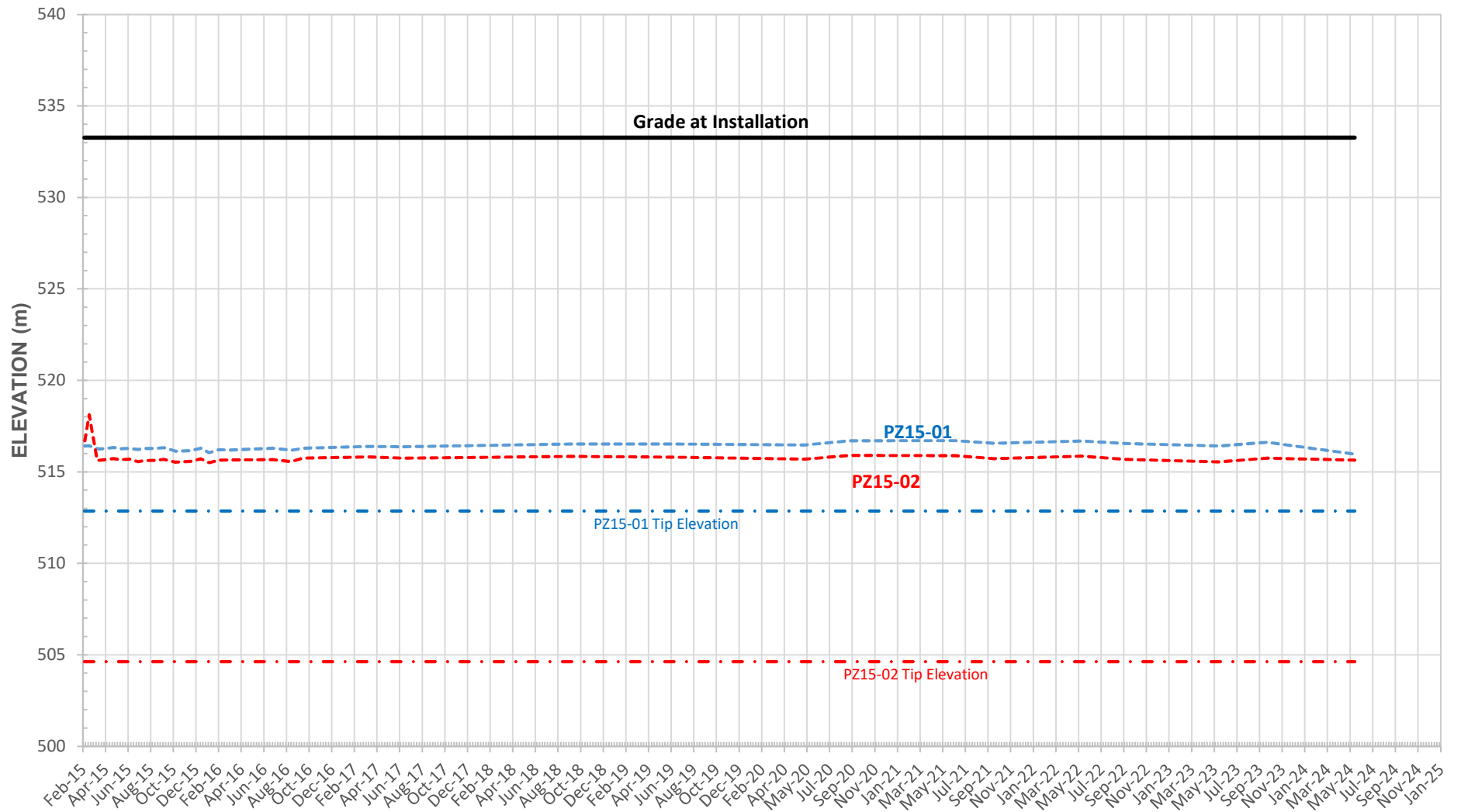
CUT SLOPE
63+802 o/s 13.7 m
Piezometer Plots



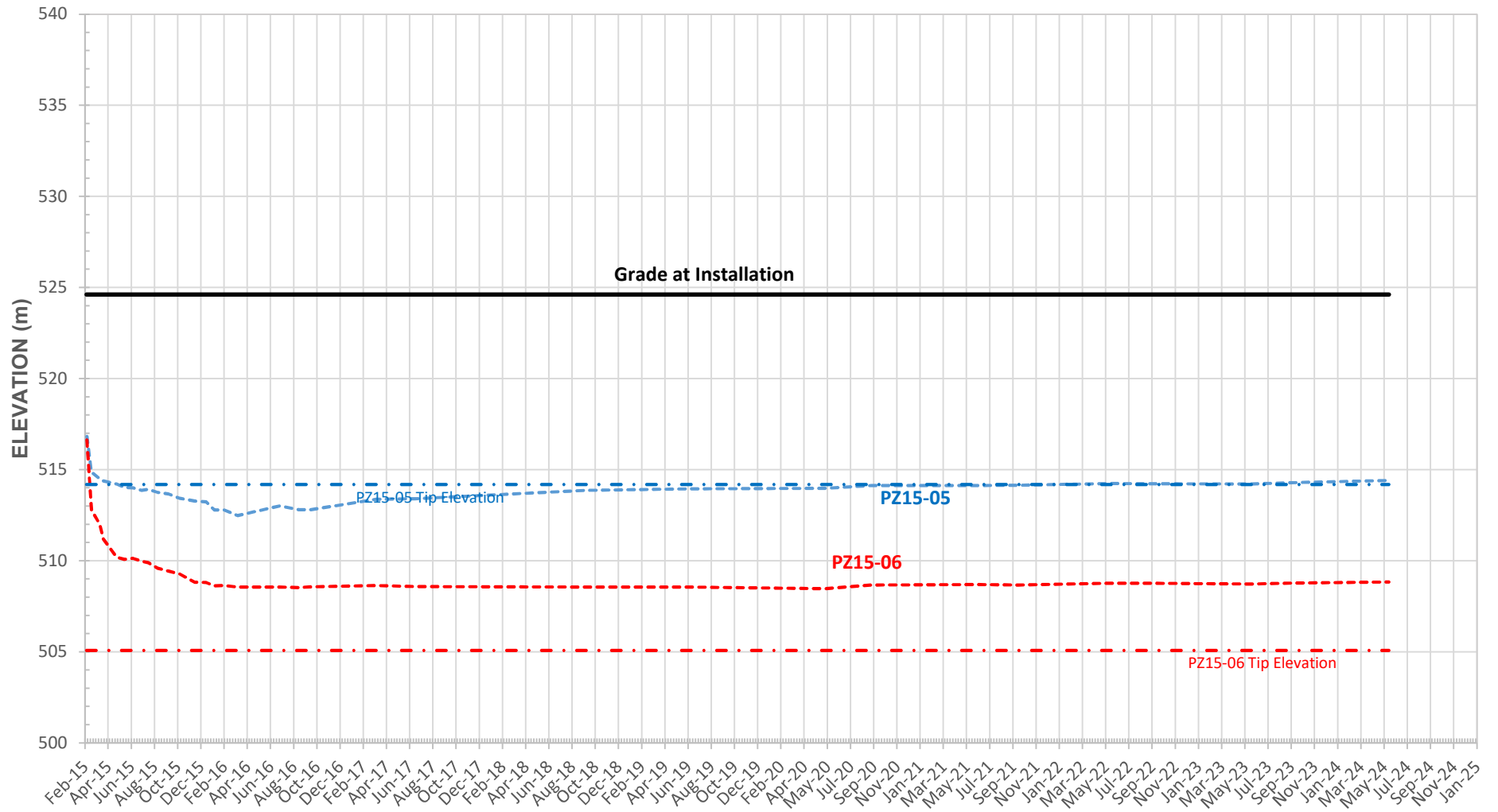
PIEZOMETER PLOT
63+900



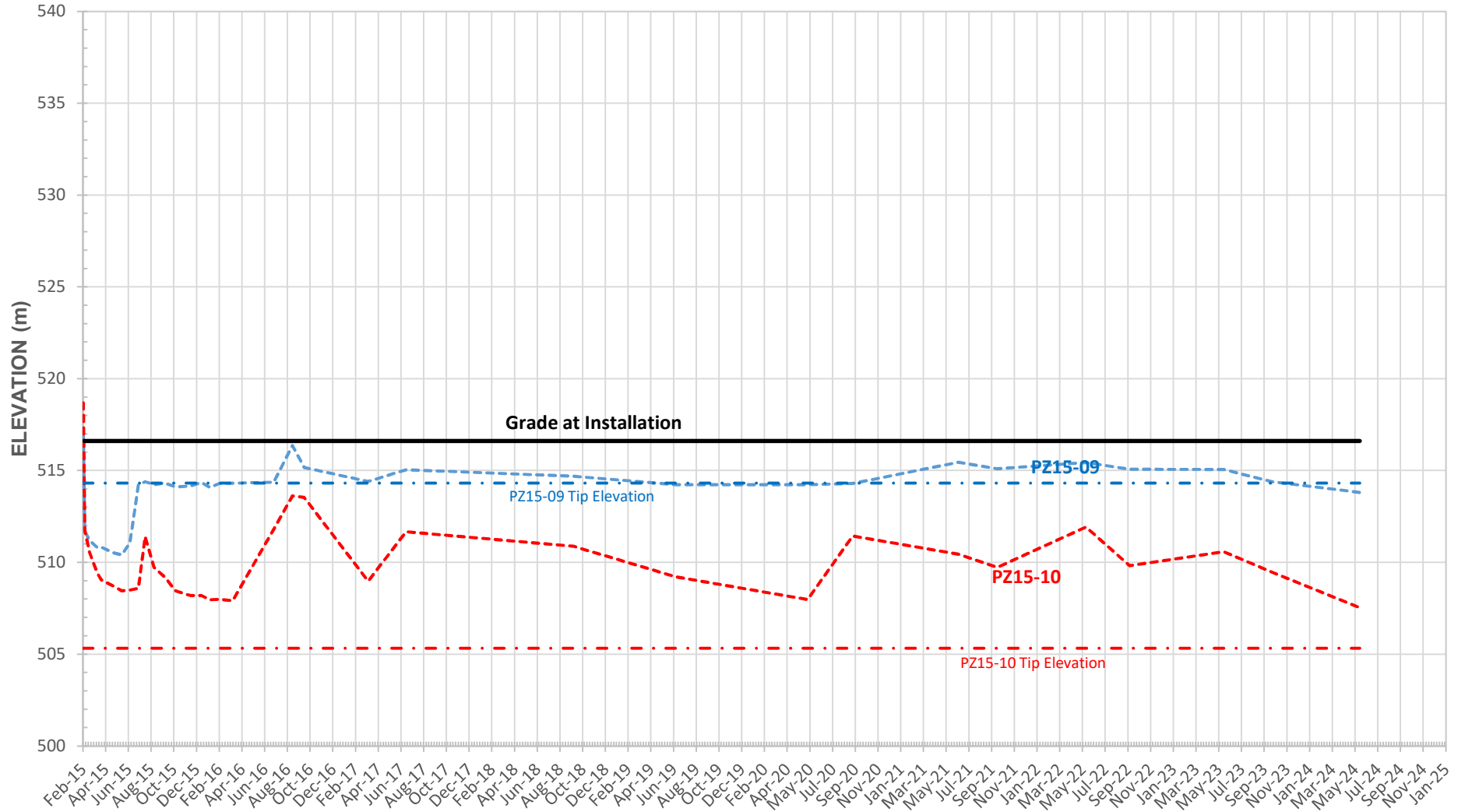
CUT SLOPE
63+904 o/s 110.0 m
Piezometer Plots



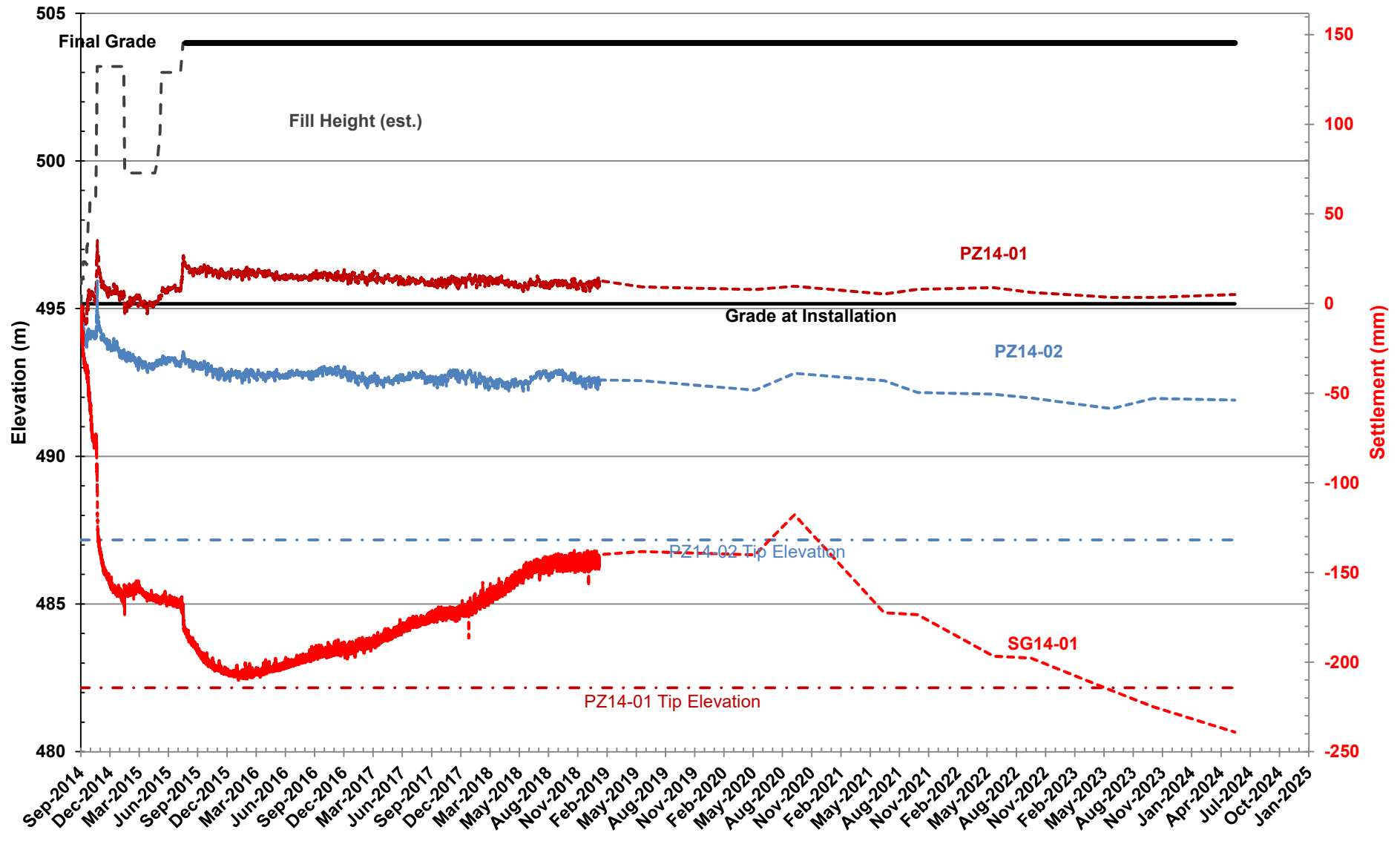
CUT SLOPE
63+904 o/s 56.7 m
Piezometer Plots



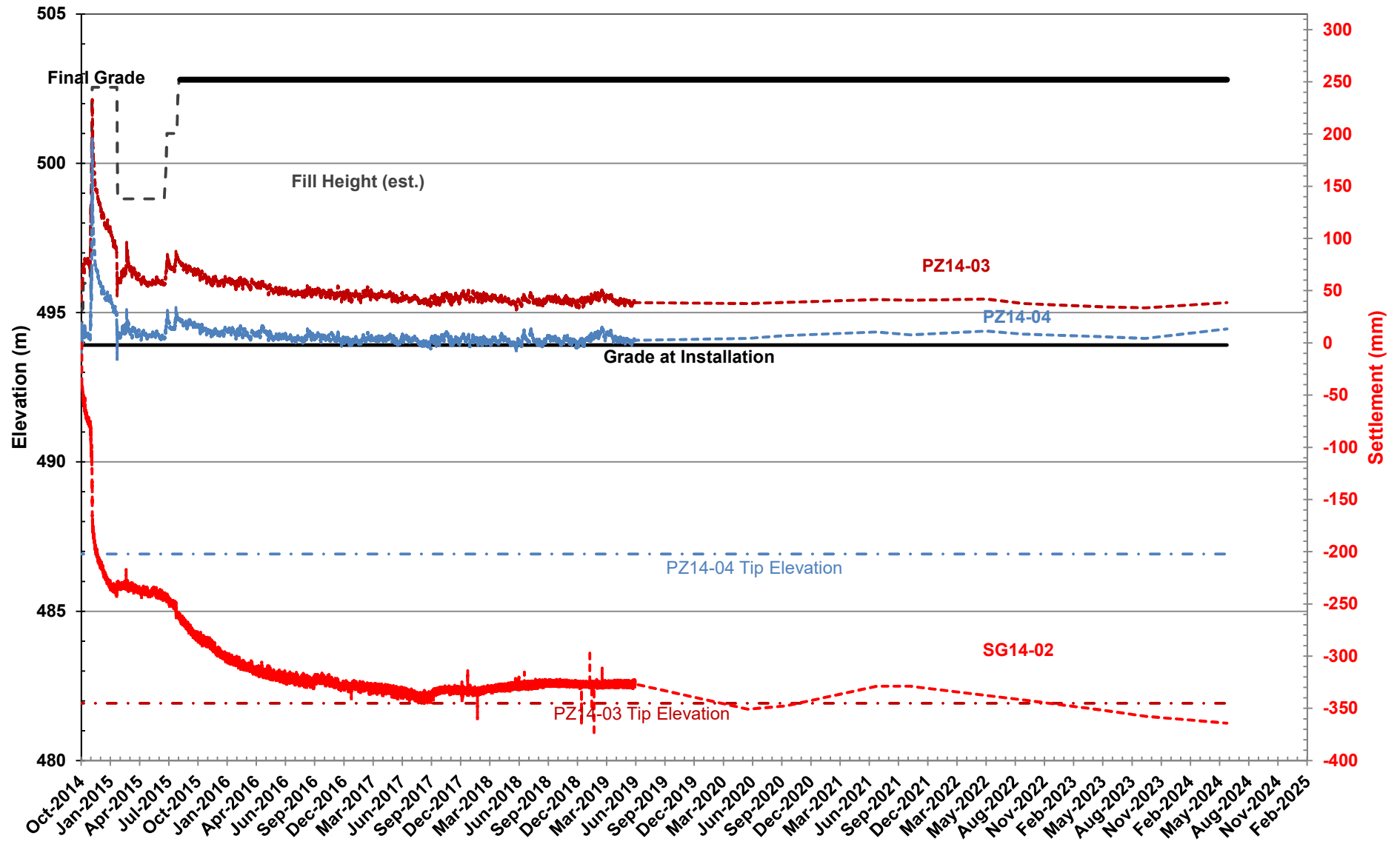
CUT SLOPE
63+903 o/s 13.2 m
Piezometer Plots



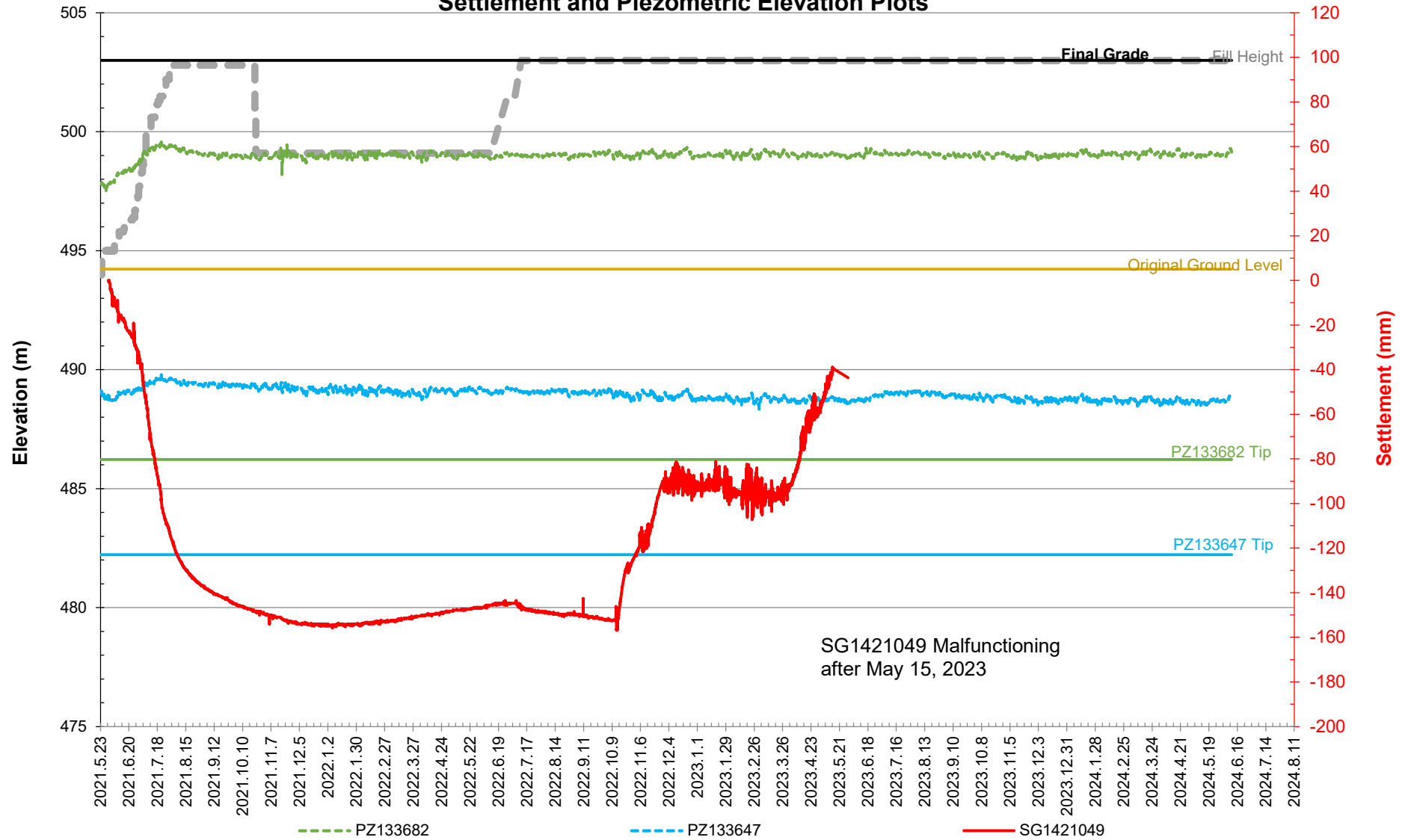
NORTH ABUTMENT
STATION 264+086 o/s +14 m
Settlement and Piezometric Elevation Plots



SOUTH ABUTMENT
STATION 264+010 o/s +9.5 m
Settlement and Piezometric Elevation Plots



Hangingsstone River Bridge North Abutment Settlement and Piezometric Elevation Plots



Hangingsstone River Bridge South Abutment Settlement and Piezometric Elevation Plots

