

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



Site Number	Location	Name	Hwy	km
NC069	HWY 63:02 L1 32.020	South of Wandering River	63:02	Km 32
Legal Description: 3-27-70-17 W4		UTM Co-ordinates		
		12U E 403599	N	6105301

Current Monitoring:	13-June-2024	Previous Monitoring	Between 27-May-2023 and 02-Jun-2023
Instruments Read By:	Mr. Niraj Regmi, G.I.T and Mr. Nixon Mationg, of Thurber		

Instruments Read During This Site Visit			
Slope Inclinometers (SIs): SI09-4, SI10 1 and SI13-14	Pneumatic Piezometers (PN): PN09 1m PN09 3, and PN10-1	Vibration Wire Piezometers (VW): VW13-11 and VW13-12	Standpipe Piezometers (SP): N/A
Load Cell (LC): N/A	Strain Gauges: N/A	SAA's: N/A	Others:

Readout Equipment Used			
Slope Inclinometers: Two RST Digital Inclinometer probes with 2 ft wheelbases and RST Pocket PC readouts	Pneumatic Piezometers: RST C108 pneumatic piezometer reader	Vibration Wire Piezometers: GEOKON GK-404 vibrating wire readout	Standpipe Piezometers:
Load Cell:	Strain Gauges:	SAA's:	Others:

Notes:
<ul style="list-style-type: none"> - A site plan showing instrument locations is included in Appendix A. - SIs plots with A and B directions are presented in Appendix A and summarized in Table NC069-1, attached. Where movement was recorded, the resultant (plot X) and the rate of movement plot are also included. - Pneumatic and vibrating wire piezometer plots are included in Appendix A. - Pneumatic Piezometer readings are summarized in Table NC069-2, attached. - Vibrating Wire Piezometer readings are summarized in Table NC069-3, attached.

Discussion	
Zones of New Movement:	None
Interpretation of Monitoring Results:	<p>SI09-4, installed in the vicinity of the crest of the west landslide area, showed a rate of movement of 1.4 mm/yr since the spring of 2023 readings. SI10-1, installed near the northern limit of the east landslide on the highway surface, showed no discernible movement since the spring of 2023 readings. SI13-14, installed within the footprint of the toe berm constructed in 2013 to stabilize the west landslide area, showed a rate of movement of 0.5 mm/yr since the spring of 2023 readings. Overall, the SIs have shown creep rates of movement over their respective movement zones over the past several years.</p> <p>The groundwater level increased in PN09-3 by 0.23 m since the spring of 2023 readings.</p>

	Vibrating wire piezometers VW13-11 and VW13-12 showed increases in groundwater level of 0.15 m and 0.08 m, respectively, since the spring of 2023 readings.
Future Work:	The instruments should be read again in the spring of 2025. Pneumatic Piezometer PN09-1 has malfunctioned for two reading cycles in a row and should be removed from future readings.
Instrumentation Repairs:	Pneumatic piezometer PN10-1 could be repaired during the spring of 2025 readings. However, this instrument will require mechanical or hydrovac excavation to repair, as it is placed inside a steel flush mount protector. Additionally, traffic accommodation would be required to complete this instrument repair.
Additional Comments:	

<p>Attachments:</p>	<ul style="list-style-type: none"> • Table NC069-1 Spring 2024 – HWY 63:02 Slope Repair South of Wandering River, Slope Inclinator Instrumentation Reading Summary • Table NC069-2 Spring 2024 – HWY 63:02 Slope Repair South of Wandering River, Pneumatic Piezometer Instrumentation Reading Summary • Table NC069-3 Spring 2024 – HWY 63:02 Slope Repair South of Wandering River, Vibrating Wire Piezometer Instrumentation Reading Summary • Statement of Limitations and Conditions • APPENDIX A – NC069-1 SPRING 2024 <ul style="list-style-type: none"> ○ Field Inspector’s report ○ Site Plan Showing Approximate Instrument Locations (Drawing No. 32122-NC069) ○ SI Reading Plots ○ Figure NC069-1 (Piezometric Elevations) ○ Figure NC069-2 (Piezometric Depths)
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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 NC069-1 Spring 2024 – Hwy 63:02 Slope Repair South of Wandering River Slope Inclinometer Instrumentation Reading Summary

Date Monitored: June 13, 2024

INSTRUMENT #	DATE INITIALIZED	TOTAL CUMULATIVE RESULTANT MOVEMENT AND DEPTH OF MOVEMENT TO DATE (mm)	MAXIMUM RATE OF MOVEMENT (mm/yr)	CURRENT STATUS OF SI	DATE OF PREVIOUS READING	INCREMENTAL MOVEMENT SINCE PREVIOUS READING (mm)	CURRENT RATE OF MOVEMENT (mm/yr)	CHANGE IN RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr)
SI09-1	October 4, 2009	9.0 over 10.2 m to 12.6 m depth in 88° direction	25.1 on May 24, 2013	Sheared at 3.0 m	June 29, 2021	N/A	N/A	N/A
SI09-4	November 19, 2009	57.7 over 10.3 m to 12.1 m depth in 331° direction	1505.1 on November 21, 2009	Operational	June 2, 2023	1.4	1.4	2.4
SI10-1	April 12, 2010	10.8 over 3.3 m to 6.4 m depth in 91° direction	7.3 on April 4, 2011	Operational	June 2, 2023	No discernible movement	N/A	-0.8
SI13-14	September 3, 2013	16.6 over 7.5 m to 10.5 m depth in 333° direction	284.3 on September 10, 2013	Operational	June 2, 2023	0.5	0.5	0.5

Drawing 32122-NC069 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.



Table NC069-2 Spring 2024 – Hwy 63:02 Slope Repair South of Wandering River Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: June 13, 2024

INSTRUMENT #	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED GROUNDWATER ELEVATION (m)	MEASURED PORE PRESSURE (kPa)	CURRENT GROUNDWATER ELEVATION (m)	PREVIOUS GROUNDWATER ELAVATION (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
<i>PN09-1</i>	<i>October 4, 2009</i>	<i>536.80</i>	<i>548.80</i>	<i>Malfunctioning</i>	<i>545.40 on September 10, 2018</i>	<i>No reading</i>	<i>No reading</i>	<i>544.56 (June 4, 2022)</i>	<i>N/A</i>
<i>PN09-3</i>	<i>October 4, 2009</i>	<i>538.07</i>	<i>546.07</i>	<i>Active</i>	<i>543.27 on September 3, 2009</i>	<i>44.9</i>	<i>542.65</i>	<i>542.42</i>	<i>0.23</i>
<i>PN10-1</i>	<i>April 12, 2010</i>	<i>538.90</i>	<i>548.65</i>	<i>Damaged</i>	<i>544.37 on September 20, 2020</i>	<i>No reading</i>	<i>No reading</i>	<i>543.88 (June 4, 2022)</i>	<i>N/A</i>

Drawing 32122-NC069 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.



Table NC069-3 Spring 2024 – Hwy 63:02 Slope Repair South of Wandering River Vibrating Wire Piezometer Instrumentation Reading Summary

Date Monitored: June 13, 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)
VW13-11 (25325)	May 6, 2013	539.51	547.74	Operational	540.66 on September 4, 2013	540.41	540.26	0.15
VW13-12 (25323)	May 6, 2013	539.04	547.69	Operational	542.89 on September 4, 2013	541.73	541.65	0.08
VW13-13 (25324)	May 6, 2013	539.59	544.88	Damaged	541.01 on August 28, 2013	No reading	538.74 (May 24, 2020)	N/A

Drawing 32122-NC069 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.



STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

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

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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.

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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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- 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.
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THURBER ENGINEERING LTD.

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

SPRING 2024

**APPENDIX A
DATA PRESENTATION AND SITE PLANS**

SITE NC069: HWY 63:02 SLOPE REPAIR SOUTH OF WANDERING RIVER

**ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
NORTH CENTRAL REGION - ATHABASCA AND FORT McMURRAY DISTRICTS
INSTRUMENTATION MONITORING FIELD SUMMARY (NC069)
SPRING 2024**

Location: South of Wandering River (HWY 63:02 L1 32.020)	Readout: GK 404/SN 364, RST PN C108 Unit 4
File Number: 32122	Casing Diameter: 2.75/3.34
Probe: RST Set 8R & 5R	Temp (deg C): 12
Cable: RST Set 8R & 5R	Read by: NKR/NRM

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location (UTM 12)		Date	Stickup (m)	Depth from top of casing (ft)	Azimuth of A+ Groove degree	Current Bottom Depth Readings				Probe/ Reel #	Size (")	Remarks
	Easting	Northing					A+	A-	B+	B-			
SI09-4	403599	6105301	13-Jun-24	1.00	55 to 3	322	221	-208	-517	57	5R/5R	FILL	
SI10-1	403626	6105316	13-Jun-24	0.04	60 to 2	122	-64	78	55	-66	8R/8R	FILL	
SI13-14	403566	6105294	13-Jun-24	0.76	38 to 2	329	-255	270	69	-68	5R/5R	FILL	

PNEUMATIC PIEZOMETER (PN) READINGS

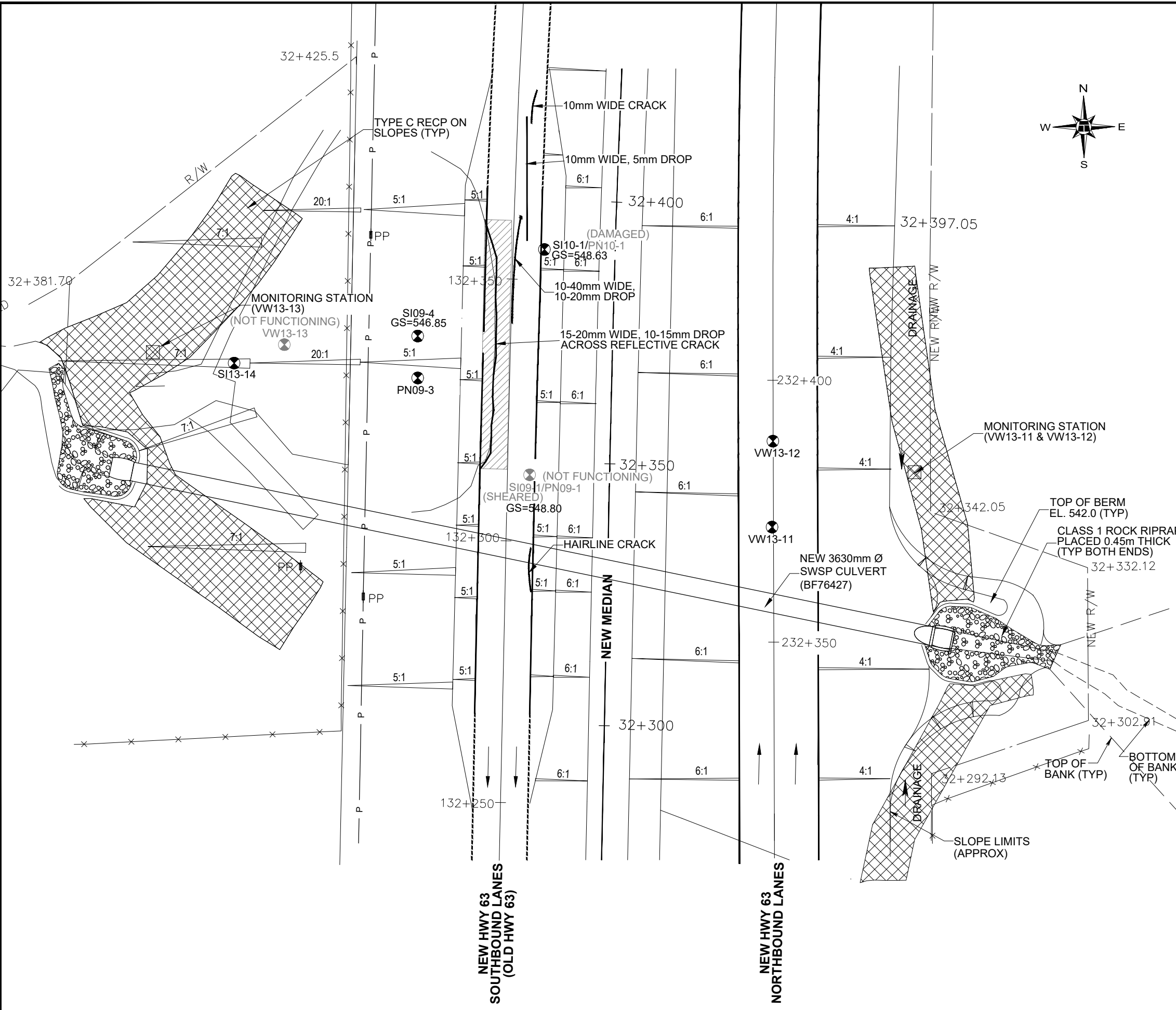
PN#	GPS Location (UTM 12)		Date	Reading kPa	Depth Below Ground Surface (m)	Identification Number
	Easting	Northing				
PN09-1	403622	6105274	13-Jun-24	Fluctuating, Damaged	12	032441
PN09-3	403602	6105296	13-Jun-24	44.9	8	032440
PN10-1	403626	6105316	13-Jun-24	Damaged	9.8	033249

VIBRATING WIRE PIEZOMETER (VW) READINGS

VW#	GPS (UTM 12)		Date	Identification Number	Reading		Remarks
	Easting	Northing			B Unit	Temp (°C)	
VW13-11	6105263	403669	13-Jun-24	25325	8796	4.8	
VW13-12	6105279	403669	13-Jun-24	25323	8625.7	5.1	

INSPECTOR REPORT

SI09-4 was installed on November 17, 2009 to replace SI09-3. It has a red stick-up protector in the west ditch.
SI10-1 casing breaking apart @ 10 ft. use dummy probe/ camera for next reading.
Confirm if PN09-1 functioning
PN10-1 cut off damaged, requires mechanical excavation

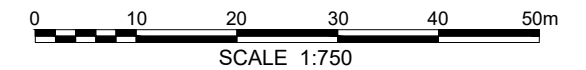


LEGEND

- INSTRUMENT LOCATION
- MONITORING STATION
- ACP PATCH
- SI SLOPE INCLINOMETER
- PN PNEUMATIC PIEZOMETER
- VW VIBRATING WIRE PIEZOMETER
- P — OVERHEAD POWERLINE
- × × FENCE LINE
- ↑ PP POWER POLE

NOTE:

1. OLD CULVERTS WERE GROUTED IN 2013.
2. FUTURE HIGHWAY NORTHBOUND LANES AND THE NEW CULVERT WERE CONSTRUCTED IN 2013.



**NORTH CENTRAL
(ATHABASCA AND FORT MCMURRAY DISTRICTS)**

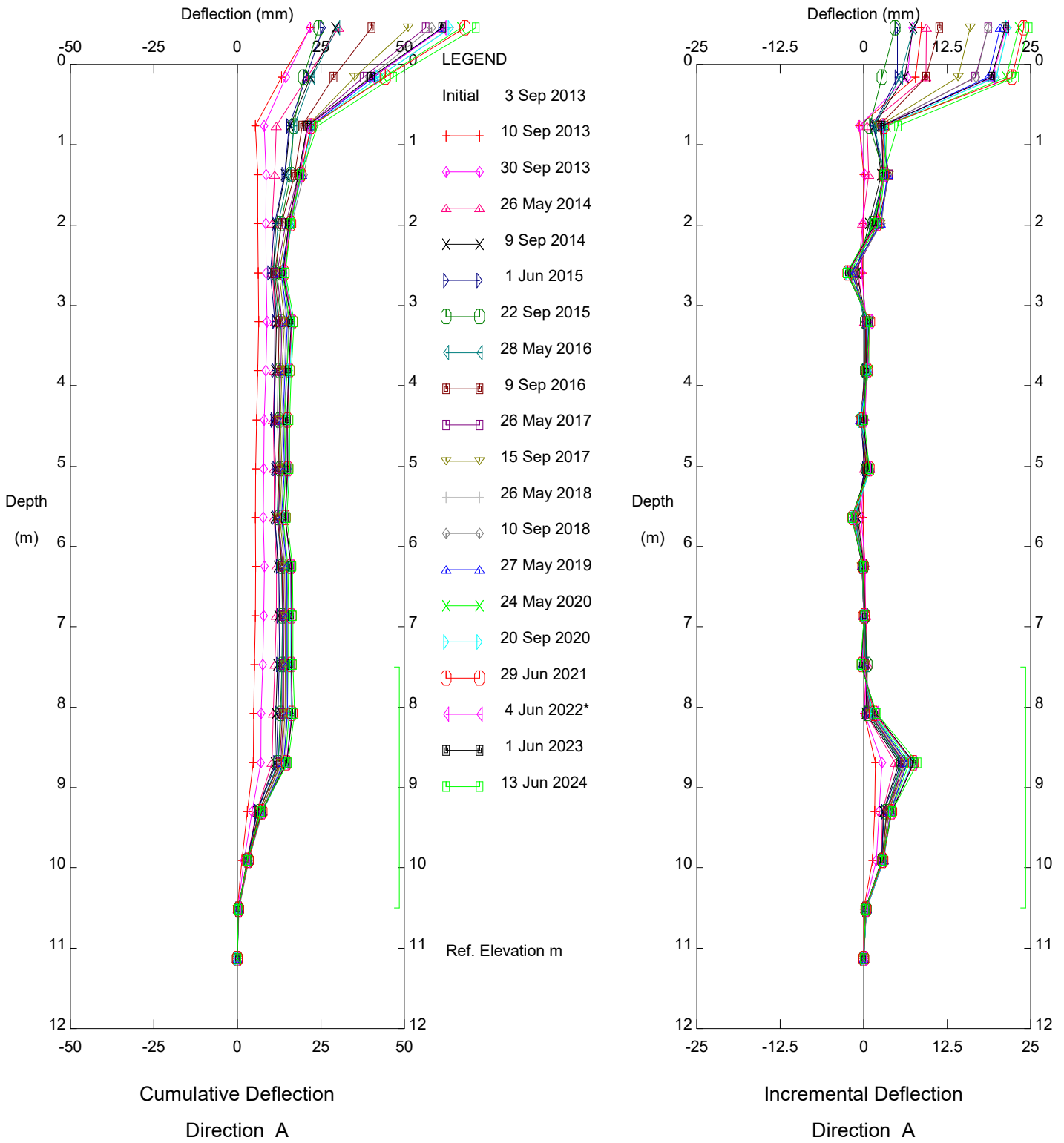
**NC069: HWY 63:02 (km 13) SOUTH OF
WANDERING RIVER SLIDE REPAIR**

DWG No. 32122-NC069

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	TSA
SCALE	1:750
DATE	JUNE 2023
FILE No.	32122



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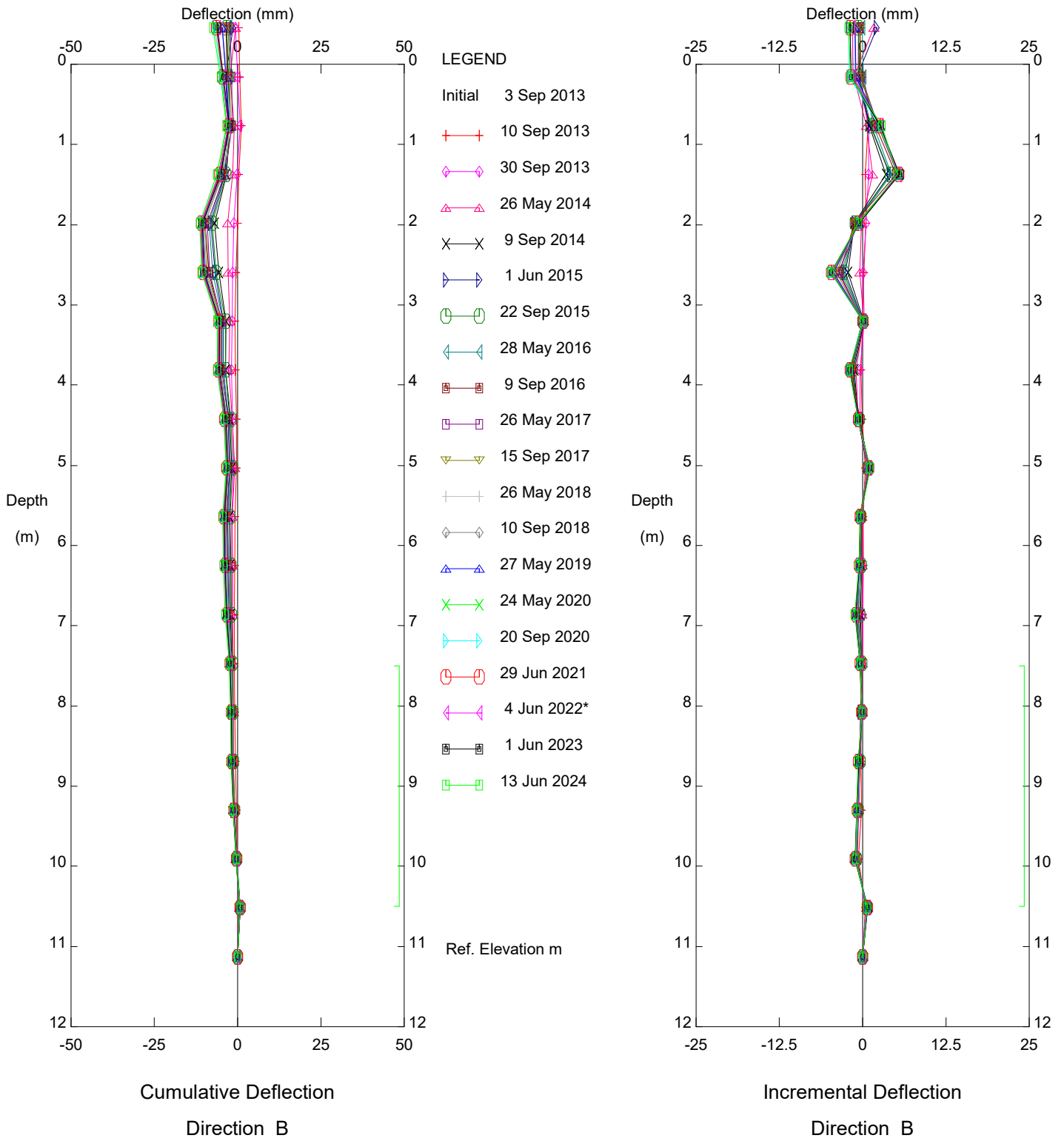


HWY 63:02 South of Wandering River, Inclinometer SI13-14

Alberta Transportation

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

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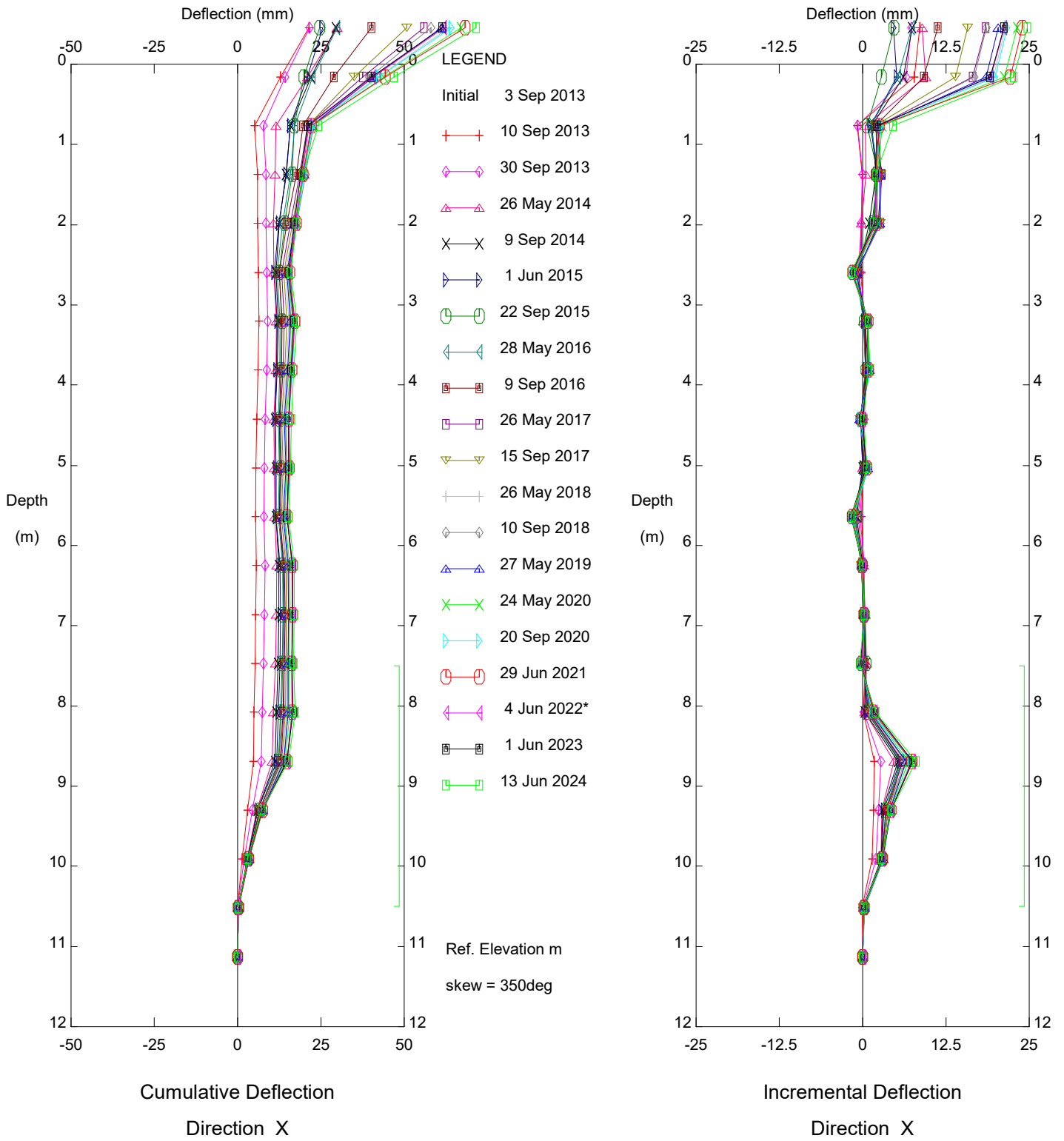


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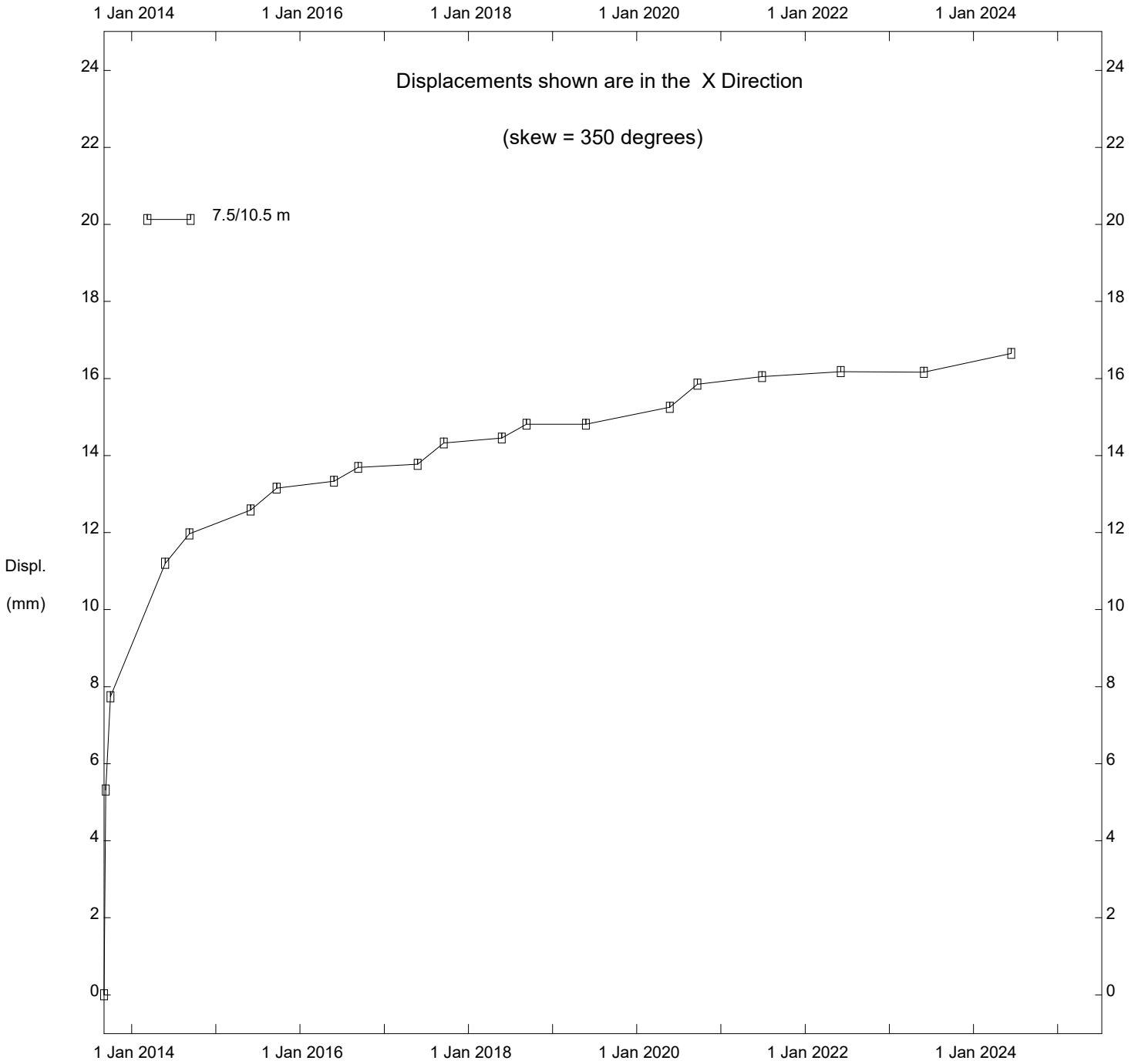


HWY 63:02 South of Wandering River, Inclinometer SI13-14

Alberta Transportation

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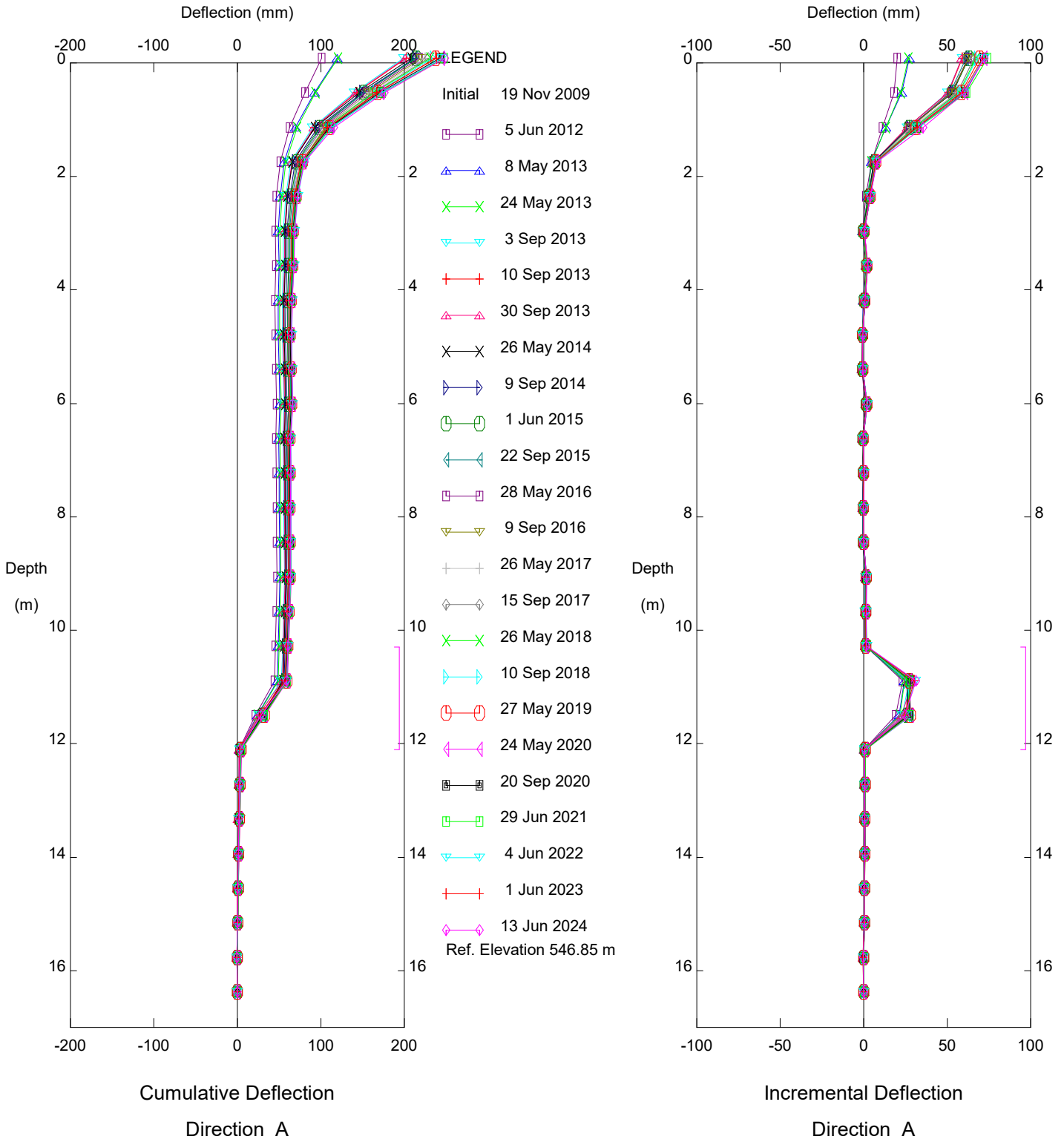
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HWY 63:02 South of Wandering River, Inclinometer SI13-14

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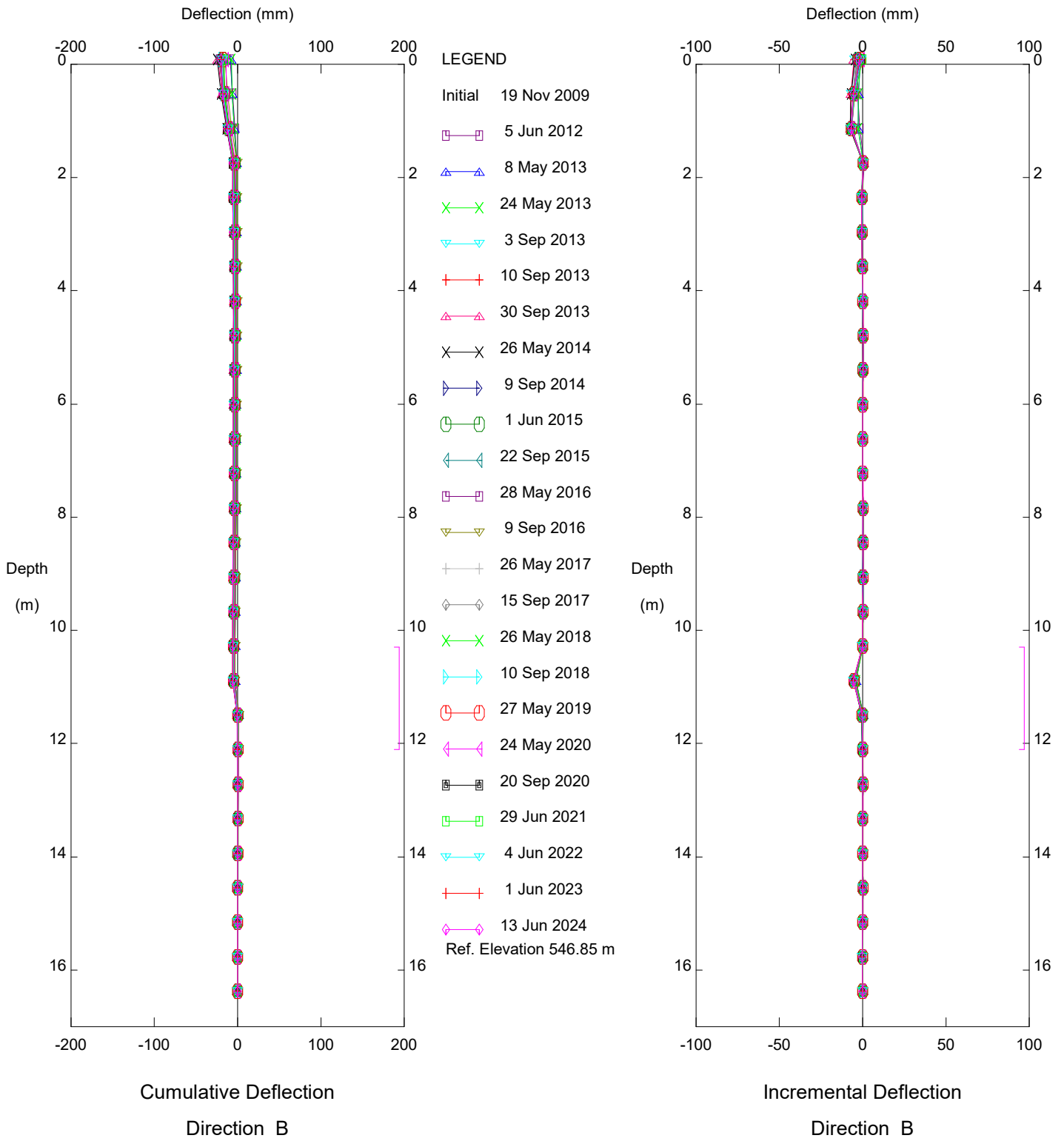
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HWY 63:02 South of Wandering River, Inclinometer SI09-4

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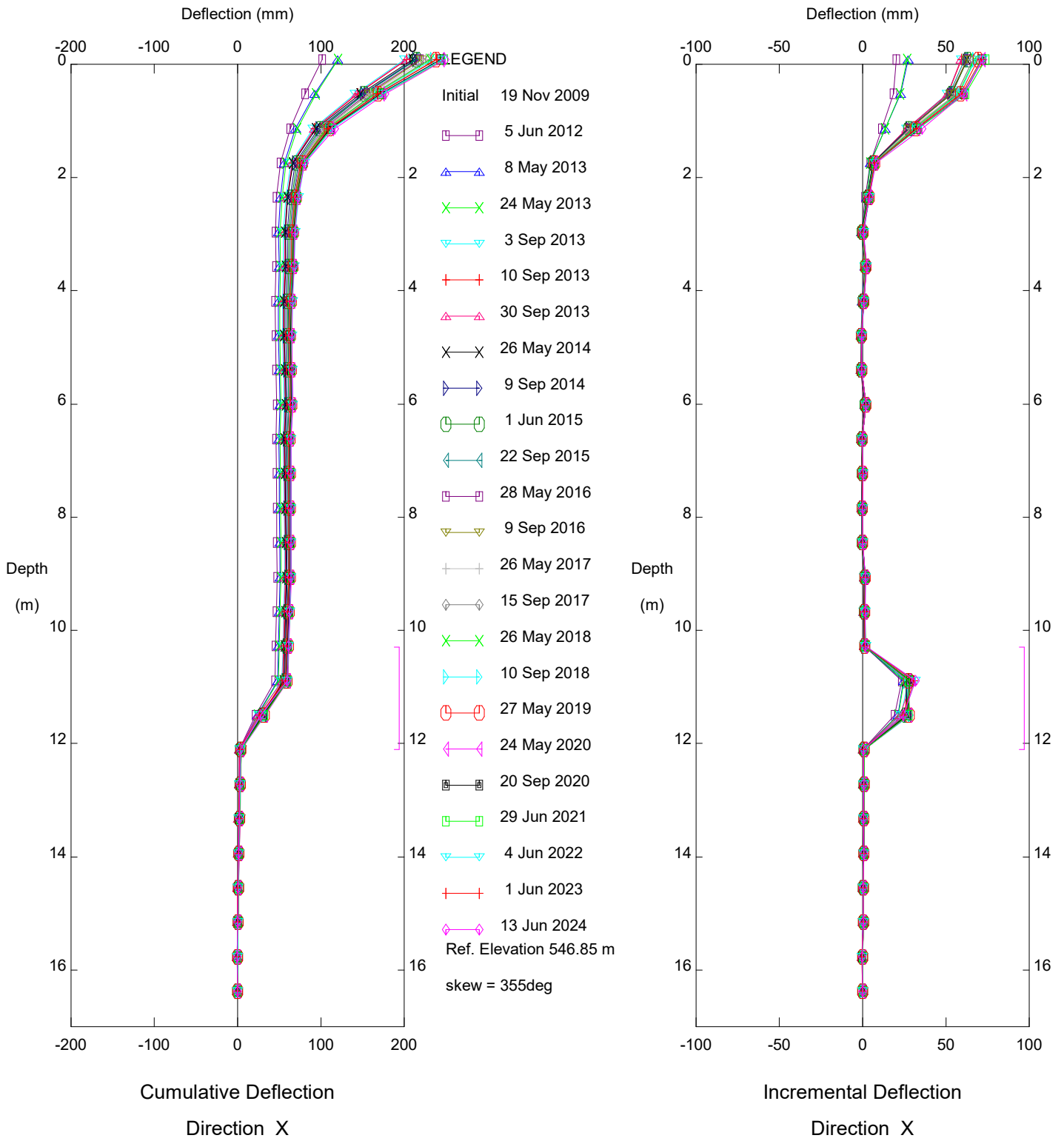
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HWY 63:02 South of Wandering River, Inclinometer SI09-4

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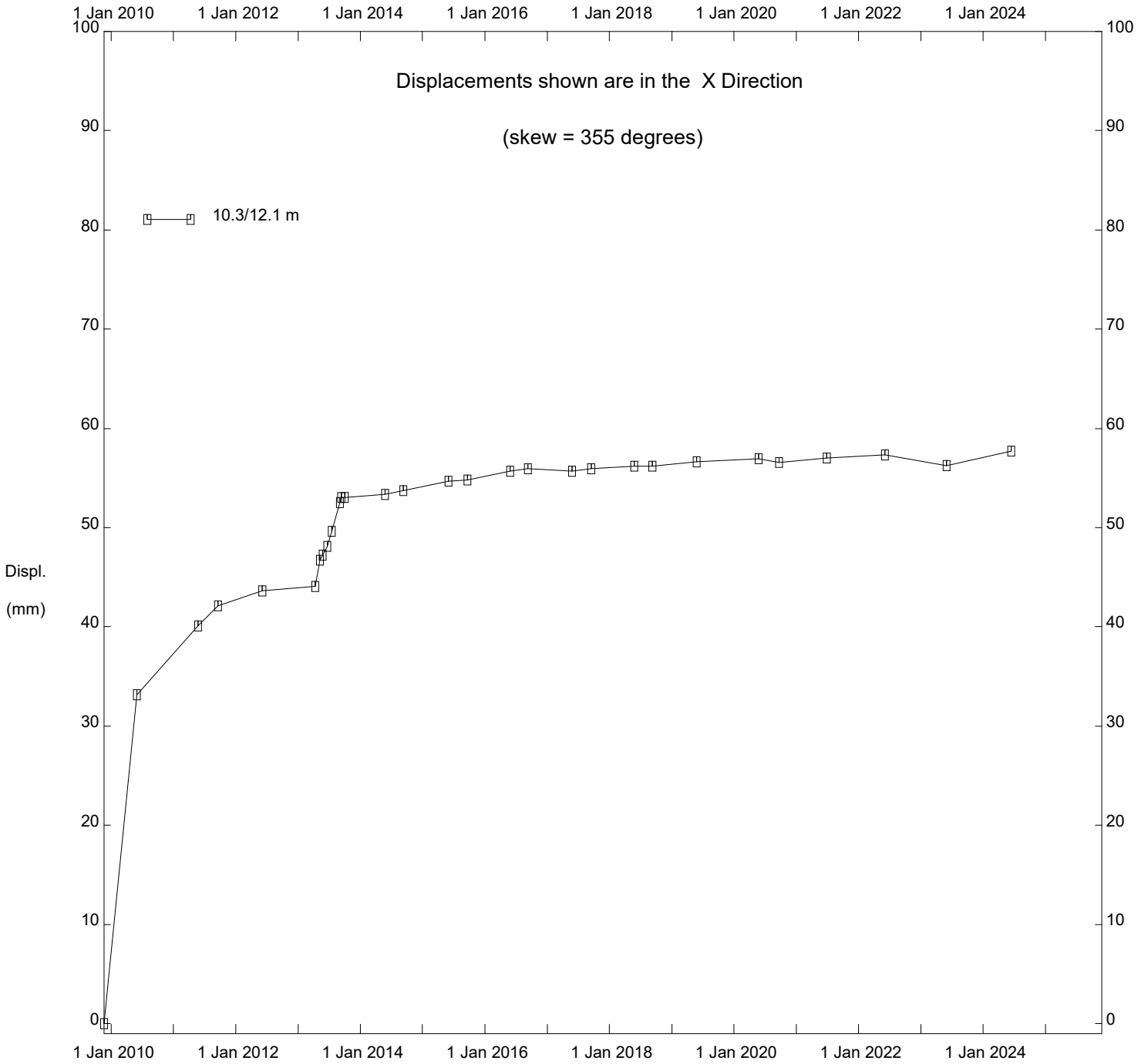
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HWY 63:02 South of Wandering River, Inclinometer SI09-4

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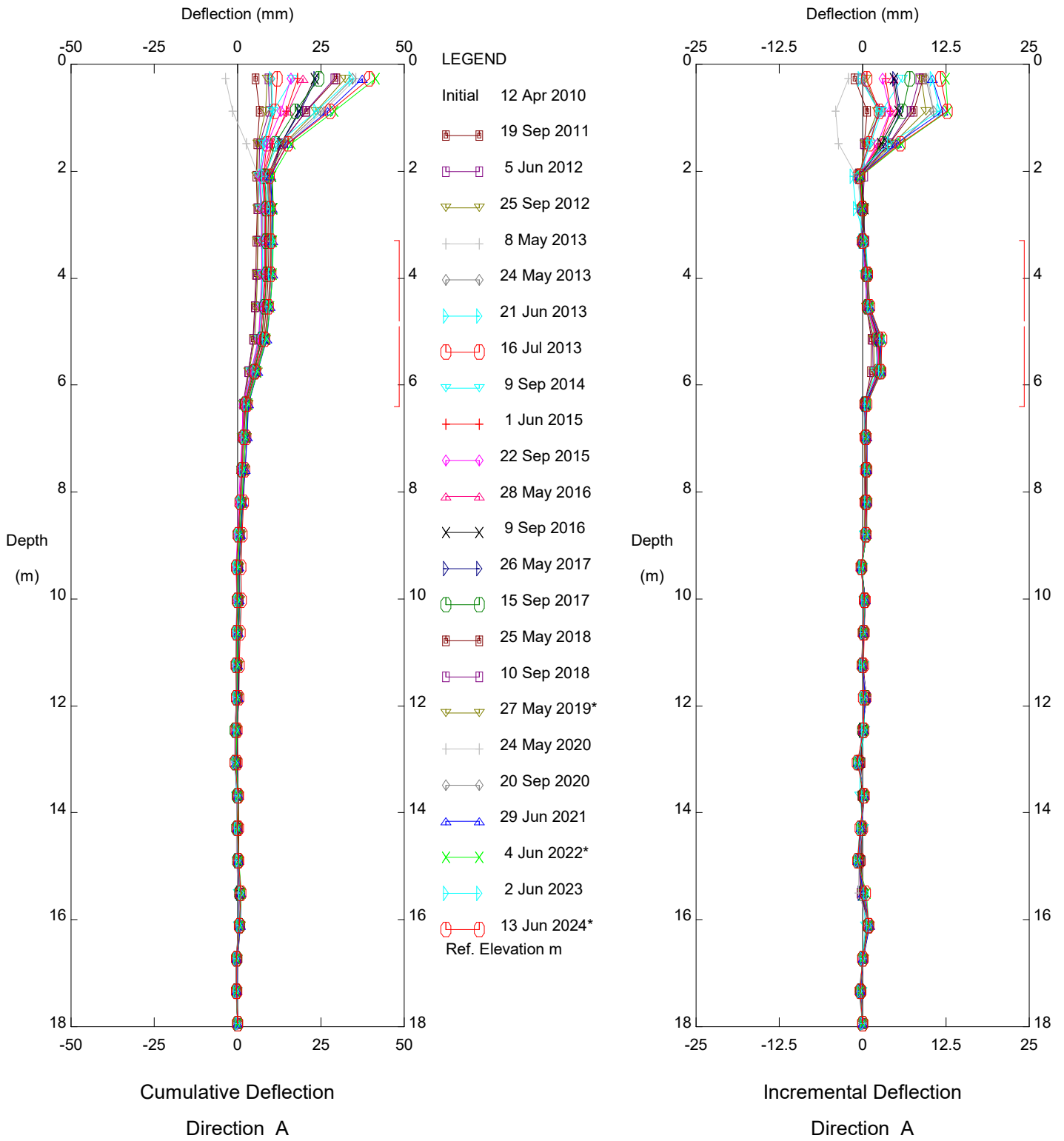
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HWY 63:02 South of Wandering River, Inclinator SI09-4

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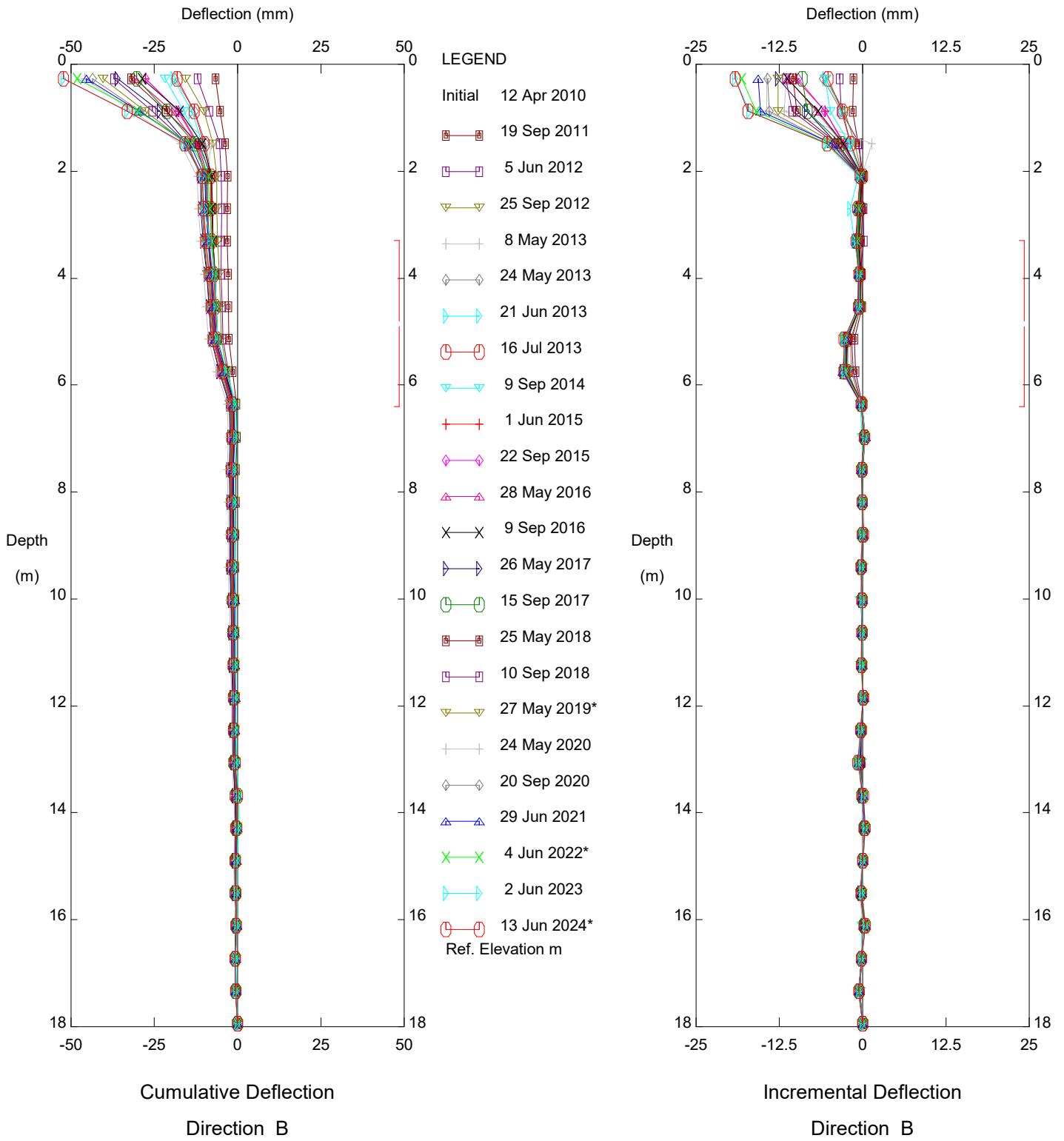


HWY 63:02 South of Wandering River, Inclinometer SI10-1

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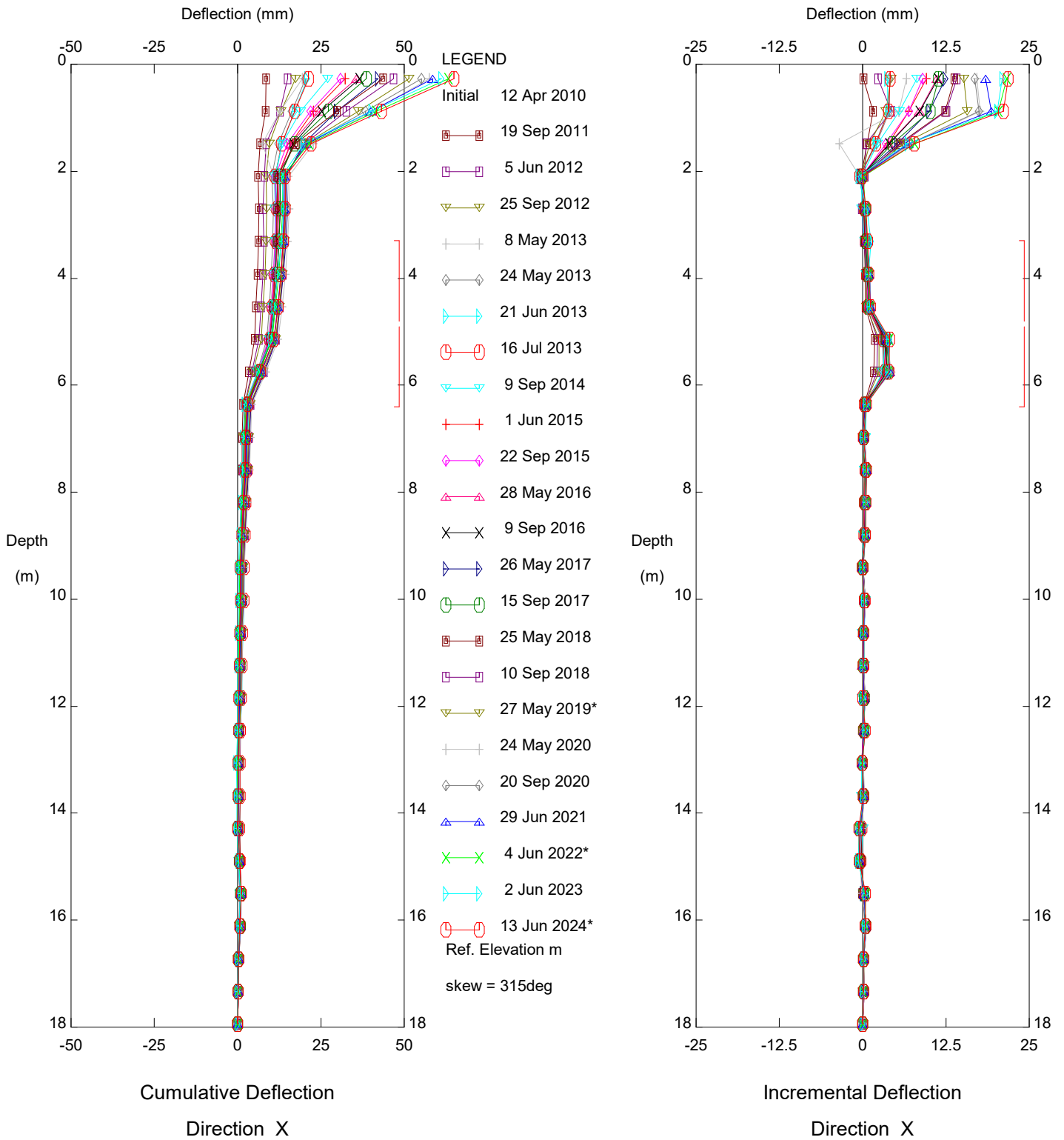


HWY 63:02 South of Wandering River, Inclinator SI10-1

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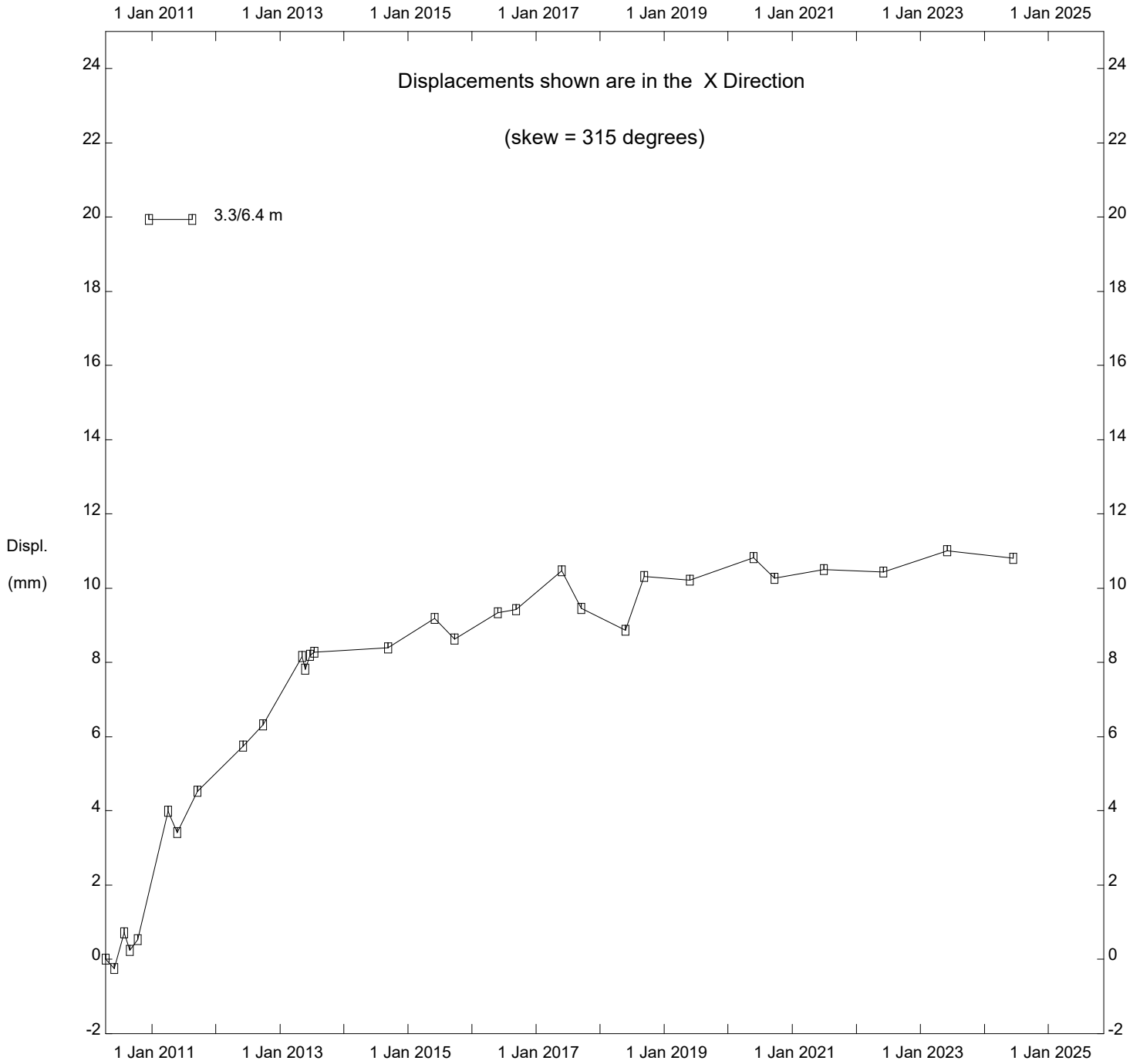


HWY 63:02 South of Wandering River, Inclinometer SI10-1

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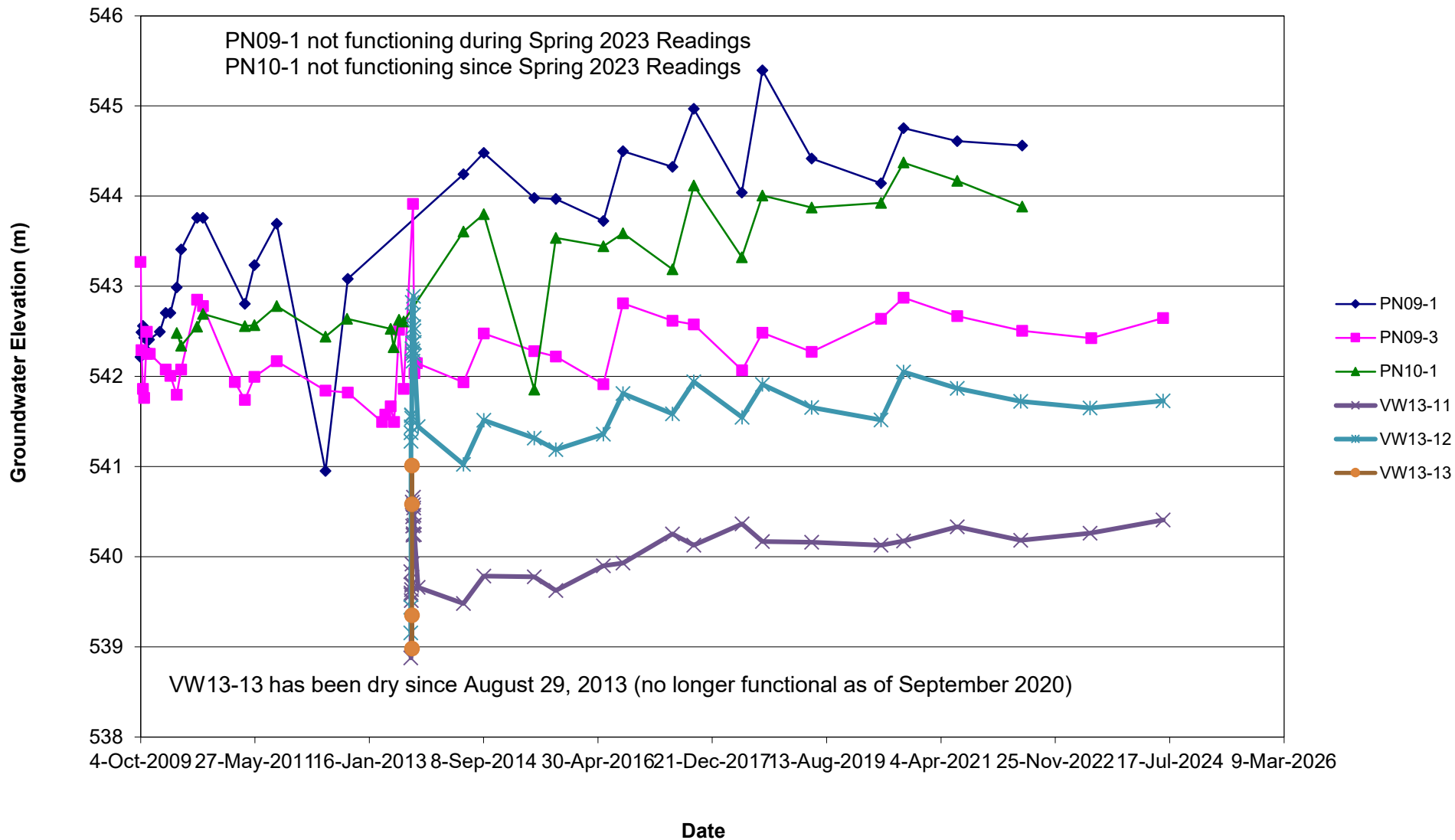
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HWY 63:02 South of Wandering River, Inclinometer SI10-1

Alberta Transportation

**FIGURE NC069-1
PIEZOMETRIC ELEVATIONS FOR HWY 63:02 SLOPE REPAIR**



**FIGURE NC069-2
PIEZOMETRIC DEPTHS FOR HWY 63:02 SLOPE REPAIR**

