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

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
NC110	HWY 754:06 C1 32.94	Wabasca Lake Slip 'n Slide	754:06	Km 32.94
Legal Description: NW-27-80-25 W4		**UTM Co-ordinates**		
		12U E 321468	N 6207205	

Current Monitoring:	13-Jun-2024	**Previous Monitoring**	01-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): SI24-2 and SI24-3	**Pneumatic Piezometers (PN):** N/A	**Vibration Wire Piezometers (VW):** VW24-2A, VW24-2B, VW24-3A and VW24-3B	**Standpipe Piezometers (SP):** SP24-1 and SP24-4
Load Cell (LC): N/A	**Strain Gauges:** N/A	**SAAs:** N/A	**Others:**

Readout Equipment Used			
Slope Inclinometers: RST Digital Inclinometer probe with a 2 ft. wheelbase and a RST Pocket PC readout.	**Pneumatic Piezometers:**	**Vibration Wire Piezometers:** Geokon GK404 digital readout	**Standpipe Piezometers:** DGSI dipmeter
Load Cell:	**Strain Gauges:**	**SAAs:**	**Others:**

Notes:

- A site plan showing instrument locations is included in Appendix A.
- SIs plots with A and B directions are presented in Appendix A and summarized in Table NC110-1, attached. Where movement was recorded, the resultant (plot X) and the rate of movement plot are also included.
- Standpipe and vibrating wire piezometer plots are included in Appendix A.
- Standpipe Piezometer readings are summarized in Table NC110-2, attached.
- Vibrating Wire Piezometer readings are summarized in Table NC110-3, attached.

Discussion	
Zones of New Movement:	A zone of movement was observed in slope Inclinometer SI24-3, over 0.6 to 3.7 m depth.
Interpretation of Monitoring Results:	SI24-2 showed a rate of movement of 56.6 mm/yr over 1.8 m to 3.6 m since the previous readings on May 1, 2024. This corresponds to an increase in rate of movement of 60.6 mm/yr. SI24-3 showed a rate of movement of 16.5 mm/yr over 0.6 m to 3.7 m depth since the last readings on February 20, 2024. This corresponds to an increase in the rate of movement by 10.0 mm/yr. The movement zones in both SIs are within the native high plastic clay below the highway embankment fill. Standpipe piezometer SP24-1 and SP24-4 showed increases in groundwater level of 0.86 m and 0.35 m, respectively compared to the last reading on May 1, 2024. The groundwater level in both instruments is the highest since they were initialized.

	Vibrating wire piezometer VW24-2A was found to be malfunctioning during the spring 2024 readings. Vibrating wire piezometers VW24-2B and VW24-3A showed increases in groundwater level of 0.19 m and 1.60 m, respectively, since they were last read on May 1, 2024. The groundwater level recorded in both instruments is the highest since they were initialized. VW24-2B showed a decrease in groundwater level of 0.06 m since the last reading on May 1, 2024.
Future Work:	The instruments should be read again in the fall of 2024.
Instrumentation Repairs:	Vibrating Wire Piezometer VW24-2A should be read again to confirm if it is still malfunctioning. If it continues to malfunction, it should be removed from future readings.
Additional Comments:	

Attachments:	• Table NC110-1 Spring 2024 – HWY 754:06 Wabasca Lake Slip 'n Slide, Slope Inclinometer Instrumentation Reading Summary
	• Table NC110-2 Spring 2024 – HWY 754:06 Wabasca Lake Slip 'n Slide, Standpipe Piezometer Instrumentation Reading Summary
	• Table NC110-3 Spring 2024 – HWY 754:06 Wabasca Lake Slip 'n Slide, Vibrating Wire Piezometer Instrumentation Reading Summary
	
	• Statement of Limitations and Conditions
	
	• APPENDIX A – NC110-1 SPRING 2024
	  ○ Field Inspector's report
	  ○ Site Plan Showing Approximate Instrument Locations (Drawing No. 32122-NC110)
	  ○ SI Reading Plots
	  ○ Figure NC110-1 (Piezometric Depths)
	  ○ Figure NC110-2 (Piezometric Elevations)

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

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

PROFESSIONAL ENGINEER ALBERTA
LUCAS R.M. GREEN
ID 206714

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

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

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Table NC110-1: Spring 2024 – Hwy 754:06 Wabasca Lake Slip n' Slide 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)
SI24-2	February 1, 2024	8.6 over 1.8 m to 3.6 m depth in 236° direction	56.6 in June 2024	Operational	May 1, 2024	6.7	56.6	60.6
SI24-3	February 1, 2024	5.5 over 0.6 m to 3.7 m depth in 228° direction	16.5 in June 2024	Operational	February 20, 2024	5.1	16.5	10.0

Drawing 32122-NC110 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

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Table NC110-2: Spring 2024 – Hwy 754:06 Wabasca Lake Slip n' Slide Standpipe Piezometer Instrumentation Reading Summary

Date Monitored: June 13, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED GROUNDWATER LEVEL BGS (m)	CURRENT GROUNDWATER DEPTH BGS (m)	PREVIOUS GROUNDWATER DEPTH BGS (May 1, 2024) (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
SP24-1	Jan. 29, 2024	19.40	-	Operational	1.71 on June 13, 2024	1.71	2.57	0.86
SP24-4	Feb. 1, 2024	17.34	-	Operational	3.61 on June 13, 2024	3.61	3.96	0.35

Drawing 32122-NC110 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

Table NC110-3: Spring 2024 – Hwy 754:06 Wabasca Lake Slip n' Slide Vibrating Wire Piezometer Instrumentation Reading Summary

Date Monitored: June 13, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED GROUNDWATER LEVEL BGS (m)	CURRENT GROUNDWATER DEPTH BGS (m)	PREVIOUS GROUNDWATER DEPTH BGS (MAY 1, 2024) (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
VW24-2A (171163)	*February 2, 2024*	*3.6*	-	*Not Functioning*	*2.64 on May 1, 2024*	*N/A*	*2.64*	-
VW24-2B (163823)	February 2, 2024	15.0	-	Operational	8.96 on June 13, 2024	8.96	9.15	0.19
VW24-3A (171177)	February 2, 2024	3.7	-	Operational	1.58 on June 13, 2024	1.58	3.18	1.60
VW24-3B (163840)	February 2, 2024	12.1	-	Operational	3.29 on May 1, 2024	3.35	3.29	-0.06

Drawing 32122-NC110 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

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STATEMENT OF LIMITATIONS AND CONDITIONS

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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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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.

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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

SITE NC110: HWY 754:06 WABASCA LAKE SLIP N' SLIDE

ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
NORTH CENTRAL REGION - ATHABASCA AND FORT McMURRAY DISTRICTS
Hwy 754:06 WABASCA LAKE (NC110)
SPRING 2024

Location:	Hwy 754:06 WABASCA LAKE	**Readout:**	RST Set 8R
File Number:	45363	**Casing Diameter:**	2.75"
Probe:	RST Set 8R	**Temp:**	16
Cable:	RST Set 8R	**Read by:**	NKR/NRM

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location (UTM 12)		Date	Stickup (m)	Readings Depth from top of **casing** (ft)	Azimuth of A+ Groove degree	Current Bottom Depth Readings					Remarks
	Northing	Easting					A+	A-	B+	B-	Size (")	
SI24-2	6206049	323068	13-Jun-24	-0.31	-60 to -2	225	0.001	-0.004	0.0244	-0.025	2.75	8 mm Allen Key Needed
SI24-3	6219684	467056	13-Jun-24	-0.23	-58 to -2	225	0.0712	0.0215	0.021	-0.0704	2.75	8 mm Allen Key Needed

VIBRATING WIRE PIEZOMETER (VW) READINGS

PN #	Serial	GPS Location (UTM 12)		Location	Date	Reading		Comments
		Northing	Easting			B Unit	°C	
VW24-2A	171163	6206049	323068	Attached to TH24-2	13-Jun-24	No Reading**	4.7	8 mm Allen Key Needed
VW24-2B	163823	6206049	323068	Attached to TH24-2	13-Jun-24	8631.9	3.4	8 mm Allen Key Needed
VW24-3A	171177	6219684	467056	Attached to TH24-3	13-Jun-24	8787.4	3.6	8 mm Allen Key Needed
VW24-3B	163840	6219736	467059	Attached to TH24-3	13-Jun-24	8601.2	4.7	8 mm Allen Key Needed

SP#	GPS Location (UTM 12)		Date	Stick-up (m)	Water level below top of pipe (m)	Comments
	Northing	Easting				
SP24-1	6219669	467009	13-Jun-24	-0.13	1.71	1/2" Socket Needed to Open
SP24-4	6215664	467132	13-Jun-24	-0.13	3.48	Allen key

INSPECTOR REPORT

8 mm Allen Key and 1/2" Socket needed to open flushmounts

** No Reading

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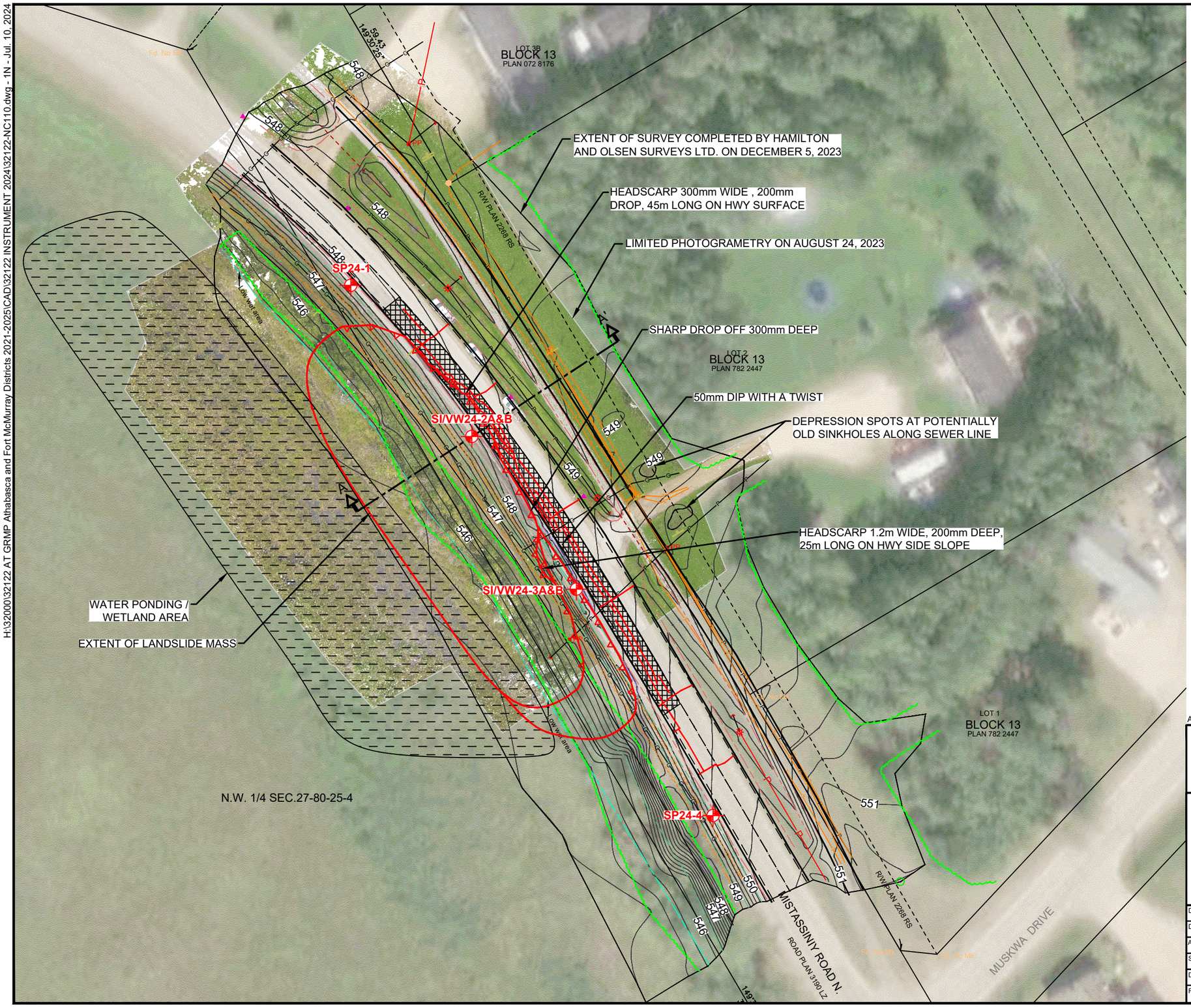

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W E

S

LEGEND

- APPROXIMATE TEST HOLE LOCATION
- CRACK
- ACTIVE HEADSCARP
- TREE LINE
- POWER LINE
- GAS LINE
- FIBRE CABLE
- TELEPHONE LINE
- ASPHALT PATCH
- SI — SLOPE INCLINOMETER
- SP — STANDPIPE PIEZOMETER
- VW — VIBRATING WIRE PIEZOMETER

0 10 20 30 40 50m

SCALE 1:750

AIR PHOTO FROM ESRI WORLD IMAGERY EXPORTED ON FEBRUARY 21, 2024

Alberta

NORTH CENTRAL
(ATHABASCA AND FORT MCMURRAY DISTRICTS)

NC110 - WABASCA LAKE SLIP N' SLIDE
HWY 754:06 WABASCA, ALBERTA
SITE PLAN

DWG No. 32122-NC110

DRAWN BY	ML
DESIGNED BY	JGP
APPROVED BY	TSA
SCALE	1:750
DATE	JULY 2024
FILE No.	32122

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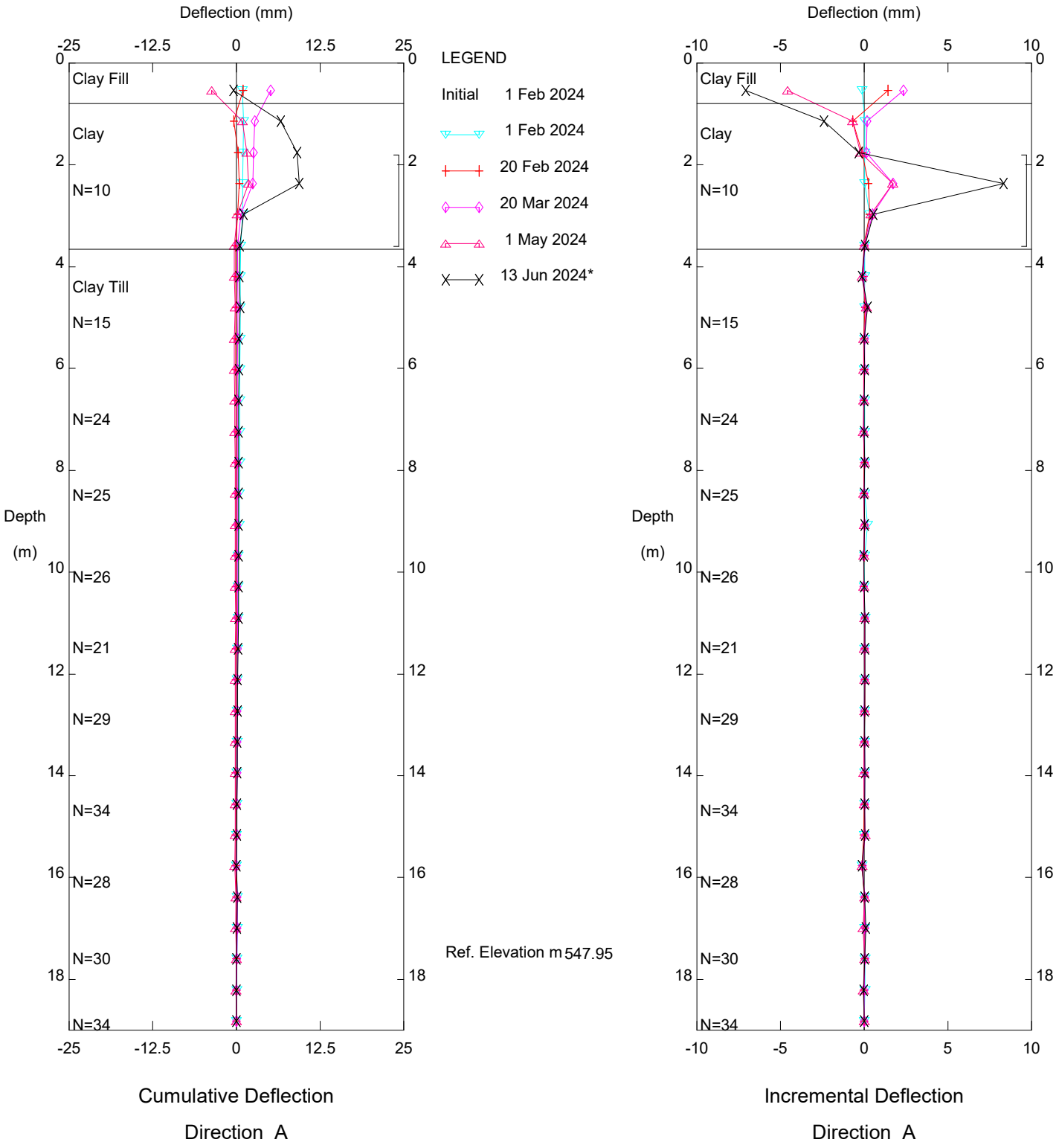

Cumulative Deflection

Direction A

Incremental Deflection

Direction A

SI24-2, NC110 Wabasca Lake, Inclinometer 24-2

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

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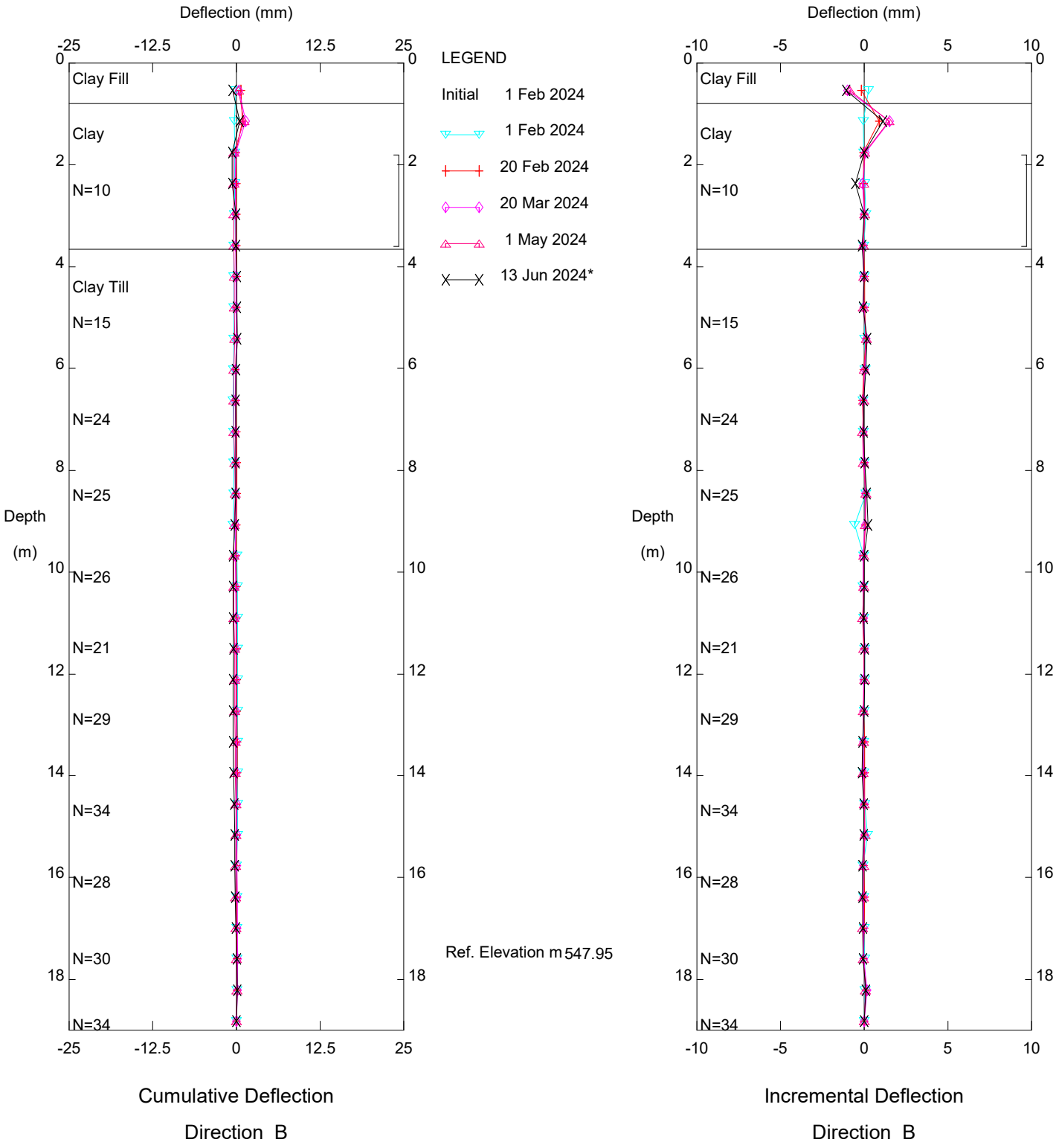

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

SI24-2, NC110 Wabasca Lake, Inclinometer 24-2

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

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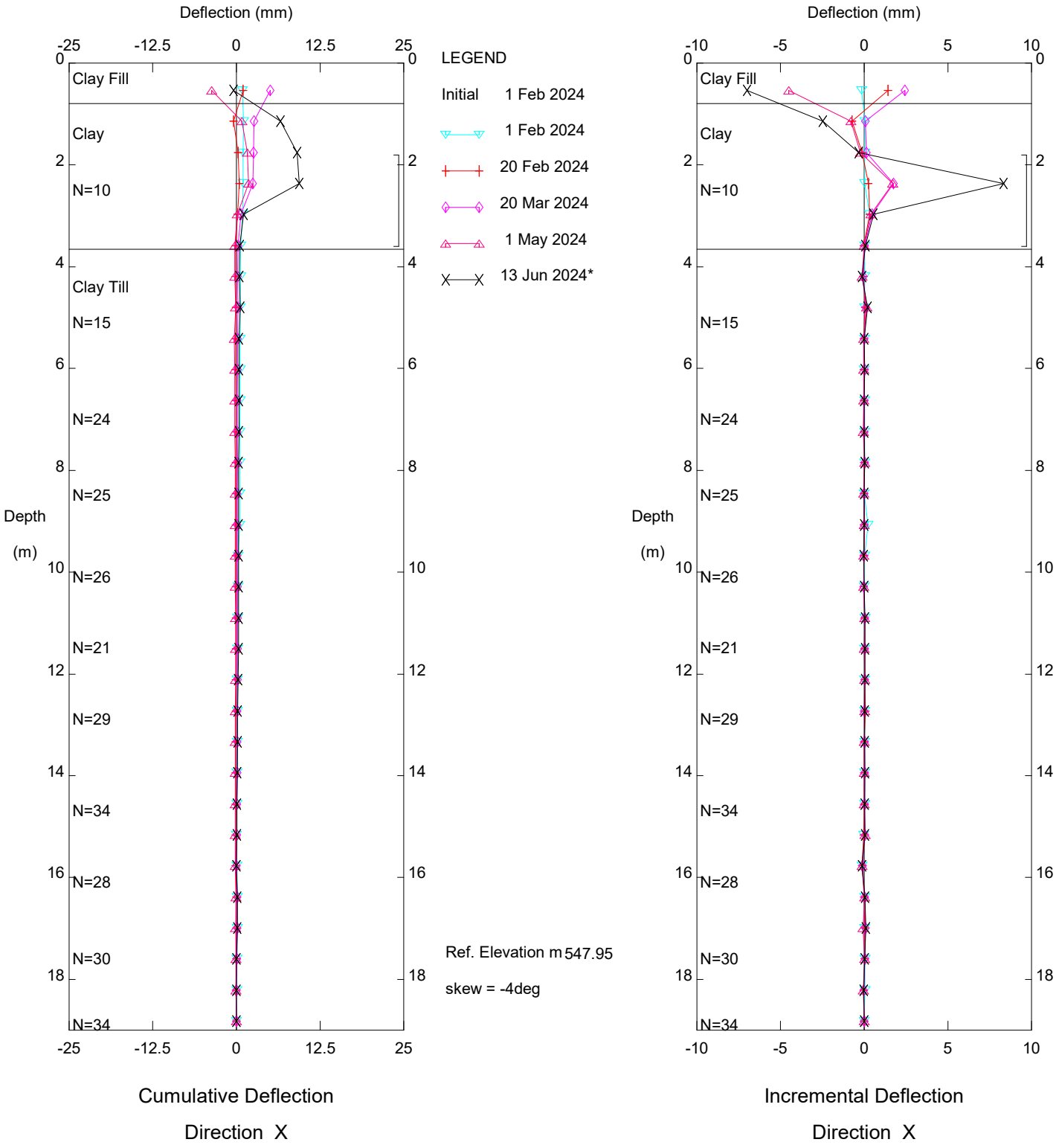

Cumulative Deflection

Direction X

Incremental Deflection

Direction X

SI24-2, NC110 Wabasca Lake, Inclinometer 24-2

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

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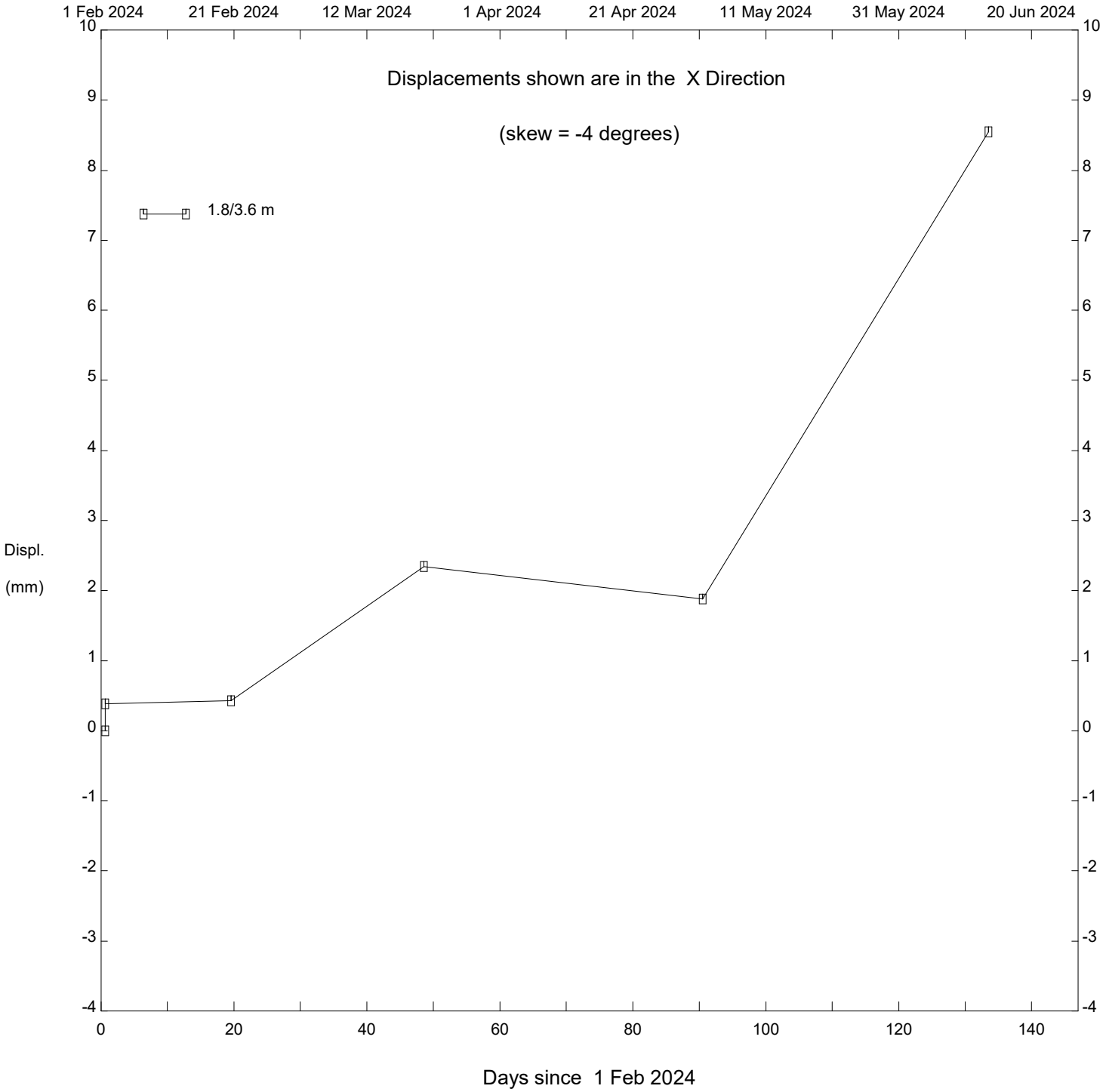

SI24-2, NC110 Wabasca Lake, Inclinometer 24-2

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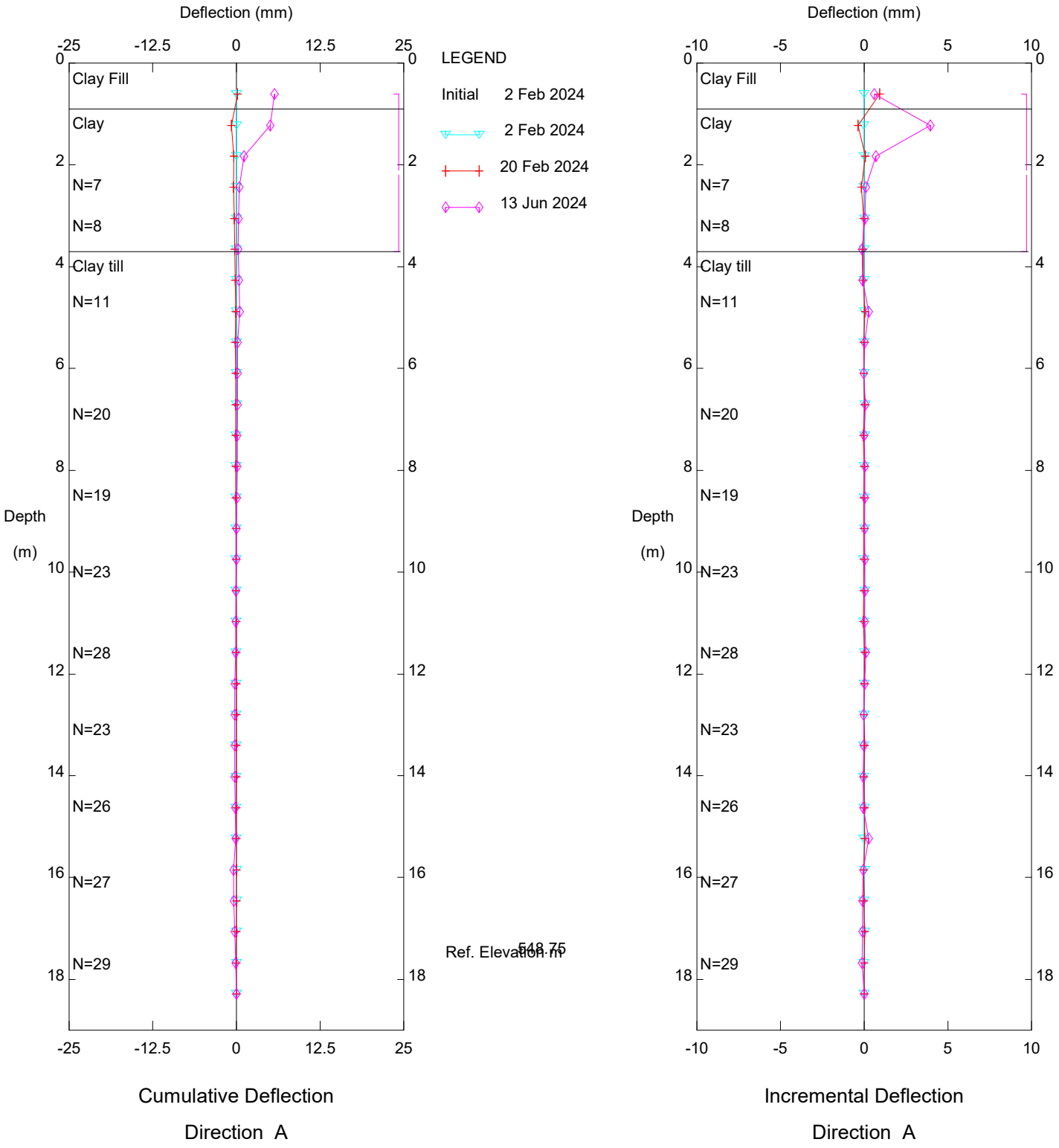

SI24-3, NC110 Wabasca Lake, Inclinometer 24-3

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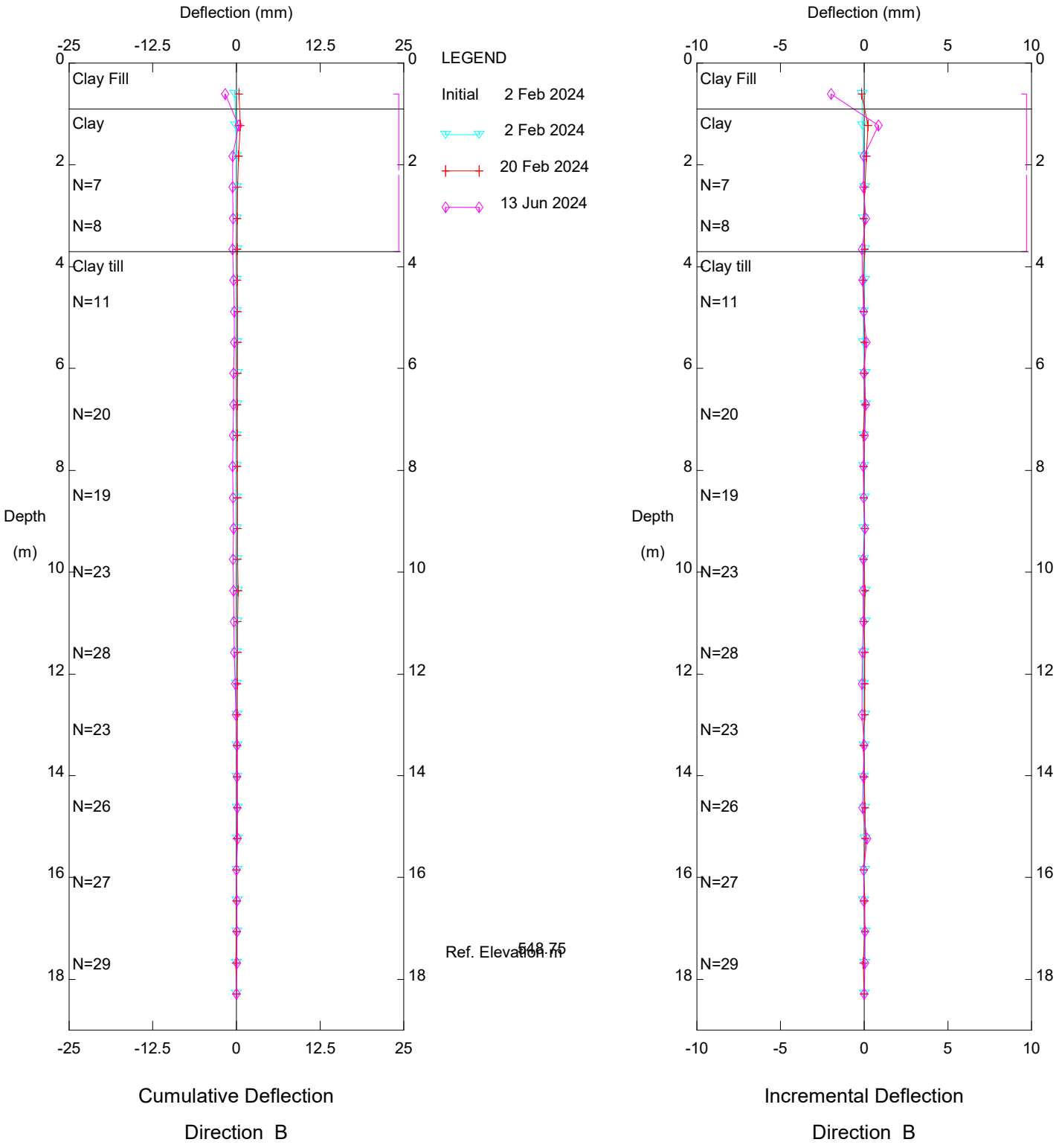

SI24-3, NC110 Wabasca Lake, Inclinometer 24-3

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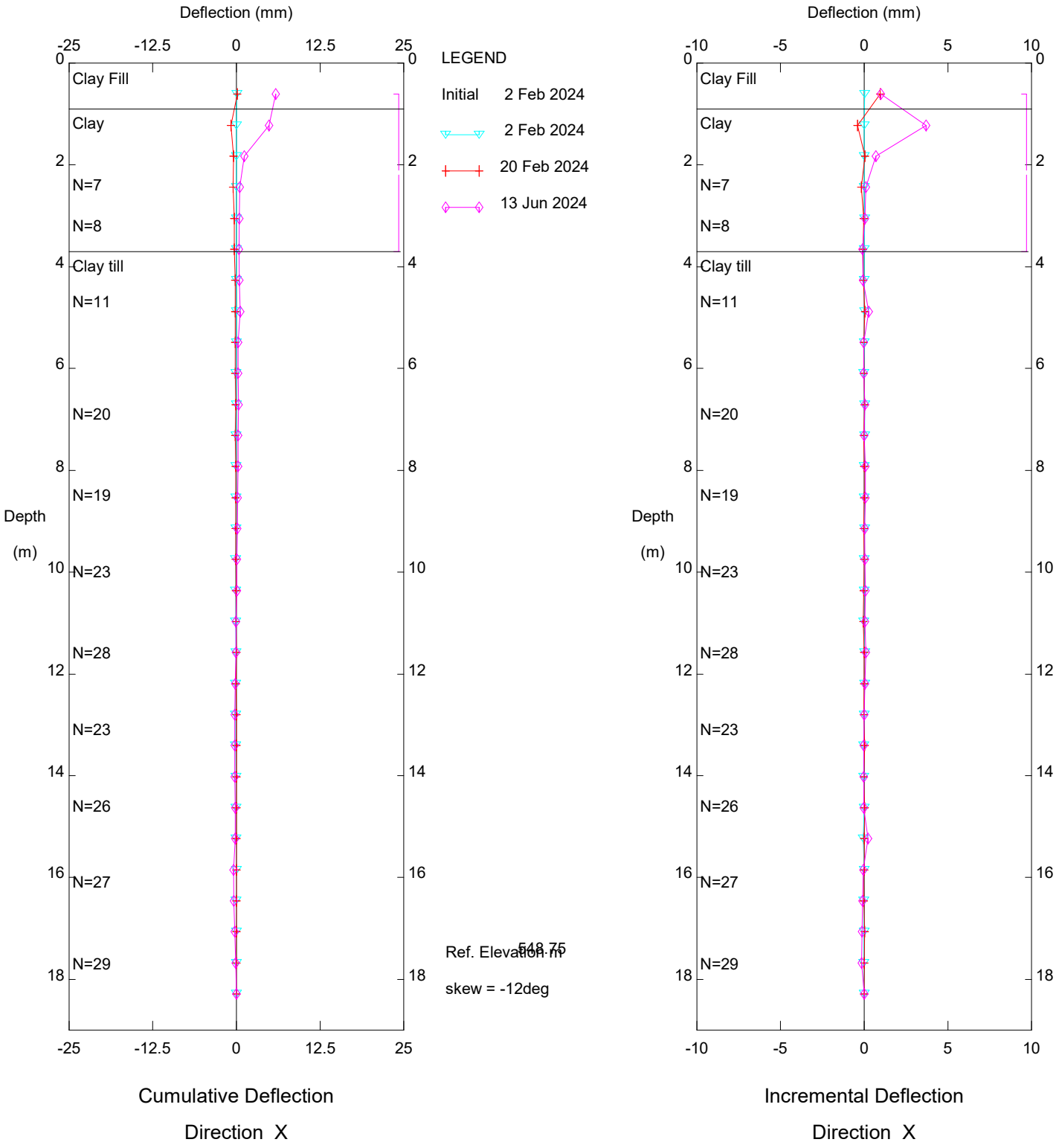

SI24-3, NC110 Wabasca Lake, Inclinometer 24-3

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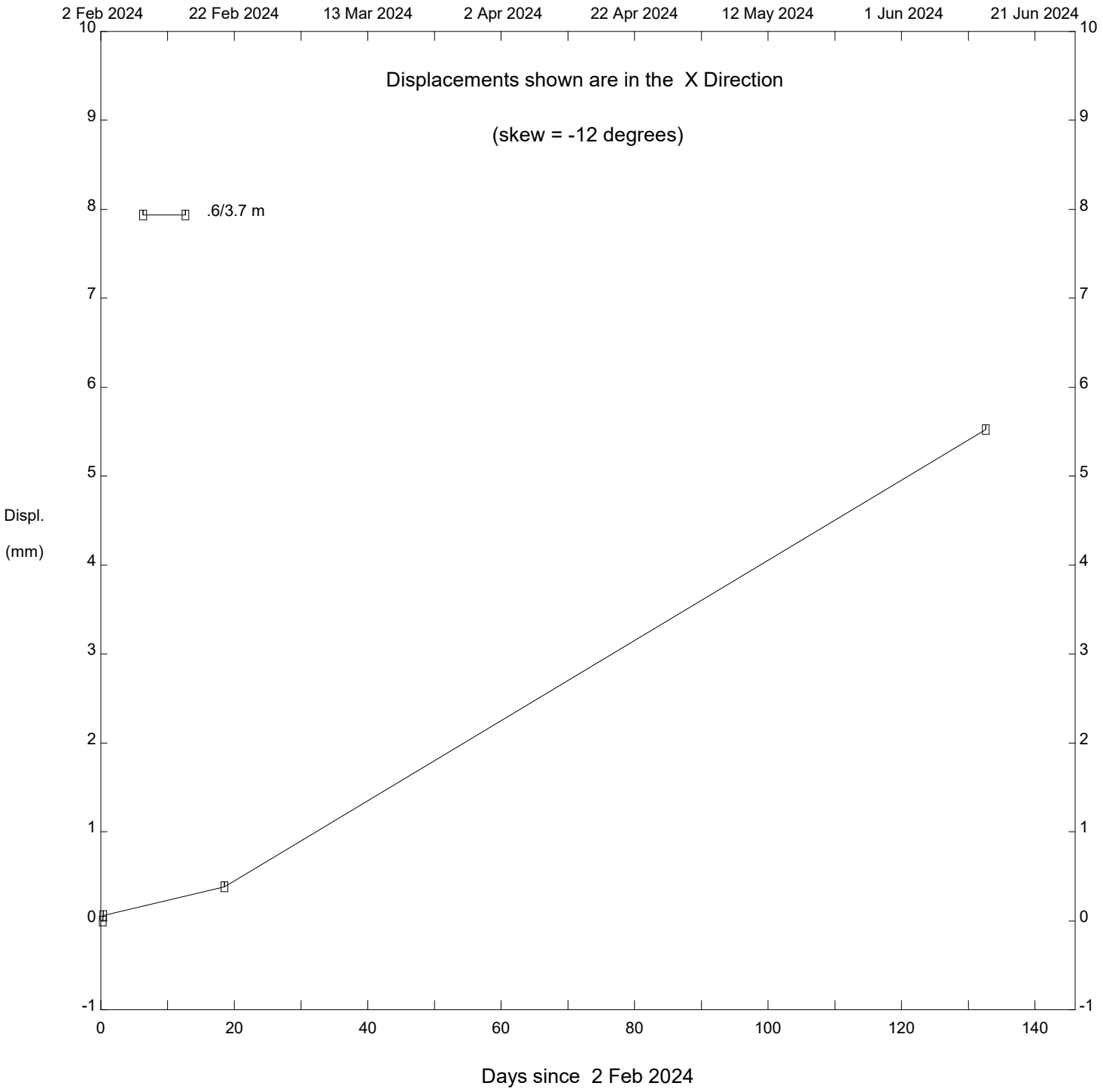

SI24-3, NC110 Wabasca Lake, Inclinometer 24-3

FIGURE NC110 -1
HWY 754:06 (NC110) - WABASCA LAKE PIEZOMETER DEPTHS

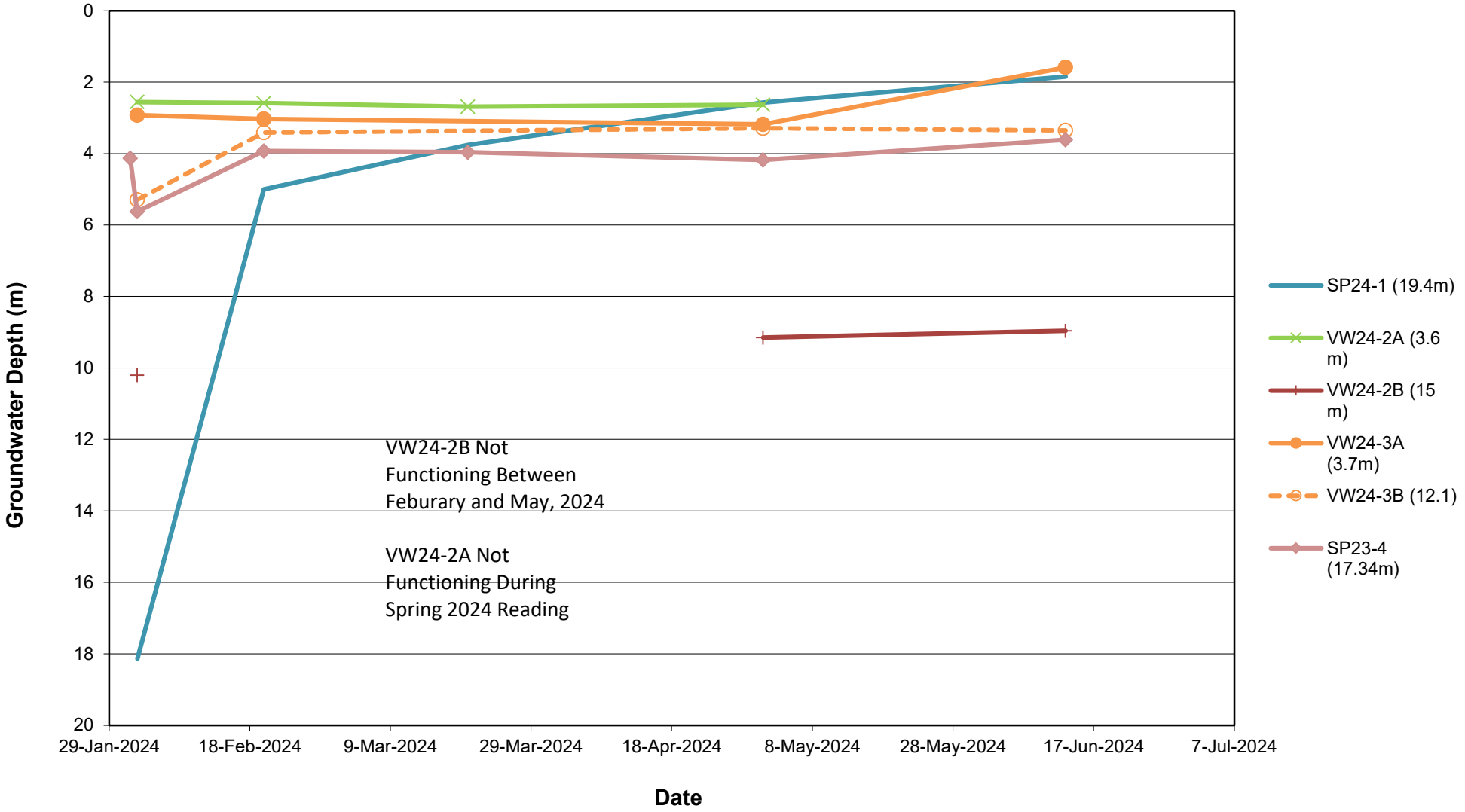

FIGURE NC110-2
HWY 754:06 (NC110) - WABASCA LAKE PIEZOMETER ELEVATIONS