ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP PEACE REGION – (GRANDE PRAIRIE DISTRICT - NORTH) INSTRUMENTATION MONITORING - SPRING 2025

THURBER

Site Number	Location	Name	Hwy	km
GP012B	HWY 49:04 C1 2.398	Ksituan Pile Wall	49.04	Km 2.4
Legal Description: 12-10-79-8 W6		**UTM Co-ordinates**		
		11U E 364166.28	N 6189642.38	

Current Monitoring:	13-Jun-2025	**Previous Monitoring**	29-May-2024
Instruments Read By:	Mr. Niraj Regmi, G.I.T and Mr. Godfred Etiendem, of Thurber		

Instruments Read During This Site Visit			
Slope Inclinometers (SIs): SI-1, SI-3, SI-6, and SI-8	**Pneumatic Piezometers (PN):** PN-5B	**Vibration Wire Piezometers (VW):** N/A	**Standpipe Piezometers (SP):** N/A
Load Cell (LC): N/A	**Strain Gauges:** N/A	**SAAs:** N/A	**Others:** N/A

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 readout	**Vibration Wire Piezometers:** N/A	**Standpipe Piezometers:** N/A
Load Cell: N/A	**Strain Gauges:** N/A	**SAAs:** N/A	**Others:** N/A
Note:			

Discussion	
Zones of New Movement:	None
Interpretation of Monitoring Results:	Slope inclinometer SI-1 showed a rate of movement of 0.7 mm/yr over 9.2 to 12.2 m since the spring of 2024 readings. SI-3 showed no discernible movement over 11.2 m to 14.3 m since the spring of 2024 readings. SI-6 showed no discernible movement over 1.1 m to 2.3 m depth since the spring of 2024 readings. SI-8 showed no discernible movement of over 0.9 m to 19.2 m depth since the spring of 2024 readings. This rate of movement has been more or less consistent since 2008. SI-8 has shown a total pile head movement of 58.8 mm to date. PN 5B showed an increase in groundwater level of 0.27 m compared to the spring of 2024 readings.
Future Work:	The instruments should be read again in the spring of 2026.
Instrumentation Repairs:	No instrument repairs are required at this time.
Additional Comments:	A review of the pile wall design could be undertaken to determine how the measured pile head deflection compares to the design.

Attachments:	• Table GP012B-1 Spring 2025 – HWY 49:04 Ksituan Pile Wall, Slope Inclinometer Reading Summary
	• Table GP012B-2 Spring 2025 – HWY 49:04 Ksituan Pile Wall, Pneumatic Piezometer Reading Summary
	• Statement for Use and Interpretation of Report
	• APPENDIX A – GP012B-1 SPRING 2025
	  ○ Field Inspector's report
	  ○ Site Plan Showing Approximate Instrument Locations (Drawing No. 32123-GP012B)
	  ○ SI Reading Plots
	  ○ Figure GP012B-1 (Piezometric Elevations)
	  ○ Figure GP012B-2 (Piezometric Depths)

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.
Renato Clementino, Ph.D., P. Eng.
Principal | Senior Geotechnical Engineer

July 13, 2025

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
RM SIGNATURE:
RM APEGA ID #: 72376
DATE: July 14, 2025
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Lucas Green, P.Eng.
Geotechnical Engineer

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Table GP012B-1 Spring 2025 – Hwy 49:04, Ksituan Pile Wall Slope Inclinometer Instrumentation Reading Summary

Date Monitored: June 13, 2025

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)
SI-1	January 26, 2002	64.7 over 9.2 m to 12.2 m depth in 49° direction	*99.3 in February 2002	Operational	May 29, 2024	0.7	0.7	1.0
SI-2	*January 26, 2002*	*298.7 over 1.1 m to 5.9 m depth in 52° direction*	*84.8 in October 2017*	*Damaged*	*October 22, 2020*	*N/A*	*N/A*	*N/A*
		45.2 over 10.8 m to 15.7 m depth in 43° direction	*45.6 in February 2002*			*N/A*	*N/A*	*N/A*
SI-3	January 26, 2002	19.8 over 11.2 m to 14.3 m depth in 64° direction	*59.1 in November 2002	Operational	May 29, 2024	No discernible movement	N/A	-0.7
SI-4	*January 26, 2002*	*18.0 over 3.8 m to 5.7 m depth in 41° direction*	*22.4 in February 2002*	*Damaged*	*October 7, 2019*	*N/A*	*N/A*	*N/A*
SI-6	January 26, 2002	4.8 over 1.1 m to 2.3 m depth in 67° direction	*2.9 in May 2002	Operational	May 29, 2024	No discernible movement	N/A	0
SI-8	November 29, 2002	58.8 over 0.9 m to 19.2 m depth in 61° direction	*31.6 in March 2003	Operational	May 29, 2024	No discernible movement	N/A	-2.1

Drawing 32123-GP012B in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

*Due to the significantly large amount of readings taken for this instrument, this date may have been removed from the SI plot to make the plot less busy.

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Table GP012B-2 Spring 2025 – Hwy 49:04, Ksituan Pile Wall Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: June 13, 2025

INSTRUMENT #	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER ELEVATION (m)	MEASURED PORE PRESSURE (kPa)	CURRENT WATER ELEVATION (m)	PREVIOUS WATER ELEVATION (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN-4A	*January 13, 1998*	*650.40*	*653.40*	*Destroyed*	*652.09 in January 1998*	*N/A*	*N/A*	*651.86 (June 22, 2020)*	*N/A*
PN-4B	*January 13, 1998*	*646.40*	*653.40*	*Damaged*	*651.08 in June 2020*	*N/A*	*N/A*	*650.58 (Oct. 22, 2020)*	*N/A*
PN-5A	*January 13, 1998*	*650.20*	*653.20*	*Destroyed*	*651.90 in May 2012*	*N/A*	*N/A*	*651.82 (October 2016)*	*N/A*
PN-5B	January 13, 1998	646.20	653.20	Operational	652.10 in May 1998	37.4	650.01	649.74	0.27

Drawing 32123-GP012B in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

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STATEMENT FOR USE AND INTERPRETATION OF REPORT

1. STANDARD OF CARE

This Report has been prepared in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances at the same time and in the same or similar locality and in compliance with all applicable laws.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment, including this Statement For Use and Interpretation of Report, 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, AS DESCRIBED ABOVE. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TOTHE WHOLE OF THE 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 for the development, design objectives, and/or purposes described to Thurber by the Client. **NO OTHER PARTY MAY USE OR RELY ON THE REPORT OR ANY PORTION THEREOF FOR OTHER THAN THE CLIENT'S BENEFIT IN CONNECTION WITH THE PURPOSES DESCRIBED IN THE REPORT**. Any use which a third party makes of the Report is the sole responsibility of such third party and is always subject to this Statement for Use and Interpretation of Report. Thurber accepts no liability or responsibility for damages suffered by any third party resulting from use of the Report for purposes outside the reasonable contemplation of Thurber at the time it was prepared or in any manner unintended by Thurber.

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 is inherently judgement-based. 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 parties making use of such documents or records with or without our express written consent need to 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 parties. Some conditions are subject to change over time and those making use of the Report need to be aware of this possibility and understand that the Report only presents the interpreted conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client must 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 based on conditions in evidence at the time of site inspections and based on 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 resulting from misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other parties 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 is recommended to 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 need to 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 to confirm and document that the site conditions do not materially differ from those 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. 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 other parties 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, unless such decisions expressly form part of the stated purpose of the Report as described in Paragraph 3.

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

SPRING 2025

APPENDIX A
DATA PRESENTATION

SITE GP012B: HWY 49:04, KSITUAN PILE WALL

ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
PEACE REGION (GRANDE PRAIRIE - NORTH DISTRICT)
INSTRUMENTATION MONITORING FIELD SUMMARY (GP012B)
SPRING 2025

Location:	Ksituan Pile Wall (HWY 49:04 C1 2.398)	**Readout:**	RST PN C108 Uit 8
File Number:	32123	**Extension:**	2.75" except SI#8 - 3.34"
Probe:	RST SET 5R and 8R	**Temp:**	11/Rain
Cable:	RST SET 5R and 8R	**Read by:**	NKR/GE

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location (UTM 11)		Date	Stickup (m)	Depth from top of casing (ft)	Azimuth of A+ Groove degree	Current Bottom Depth Readings				Probe/ Reel #	Size (")	Remarks
	Easting (m)	Northing (m)					A+	A-	B+	B-			
SI-1	364166.28	6189642.38	13-Jun-25	0.86	90 to 4	58	831	-865	-502	504	8R/8R	2.75	
SI-3	364131.21	6189689.89	13-Jun-25	0.65	86 to 4	42	539	-530	28	-51	5R/5R	2.75	
SI-6	364197.31	6189687.82	13-Jun-25	0.45	48 to 4	10	-830	843	12	-116	8R/8R	2.75	
SI-8	364160.87	6189636.36	13-Jun-25	0.61	70 to 4	30	112	-131	698	-721	5R/5R	3.34	

PNEUMATIC PIEZOMETER (PN) READINGS

PN#	GPS Location (UTM 11)		Date	Reading (kPa)	Identification Number
	Easting (m)	Northing (m)			
PN-5B	364180.27	6189679.54	13-Jun-25	37.4	27765

INSPECTOR REPORT

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N
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LEGEND

- APPROXIMATE INSTRUMENT LOCATION
- SI SLOPE INCLINOMETER
- PN PNEUMATIC PIEZOMETER
- NON-OPERATIONAL

0 10 20 30 40 50 60m
SCALE 1:1000

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PEACE REGION
(GRANDE PRAIRIE DISTRICT NORTH)

GP012B: HWY 49:04 KSITUAN PILE WALL
INSTRUMENT LOCATIONS

DWG No. 32123-GP012B

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	RVC
SCALE	1:1000
DATE	JULY 2025
FILE No.	32123

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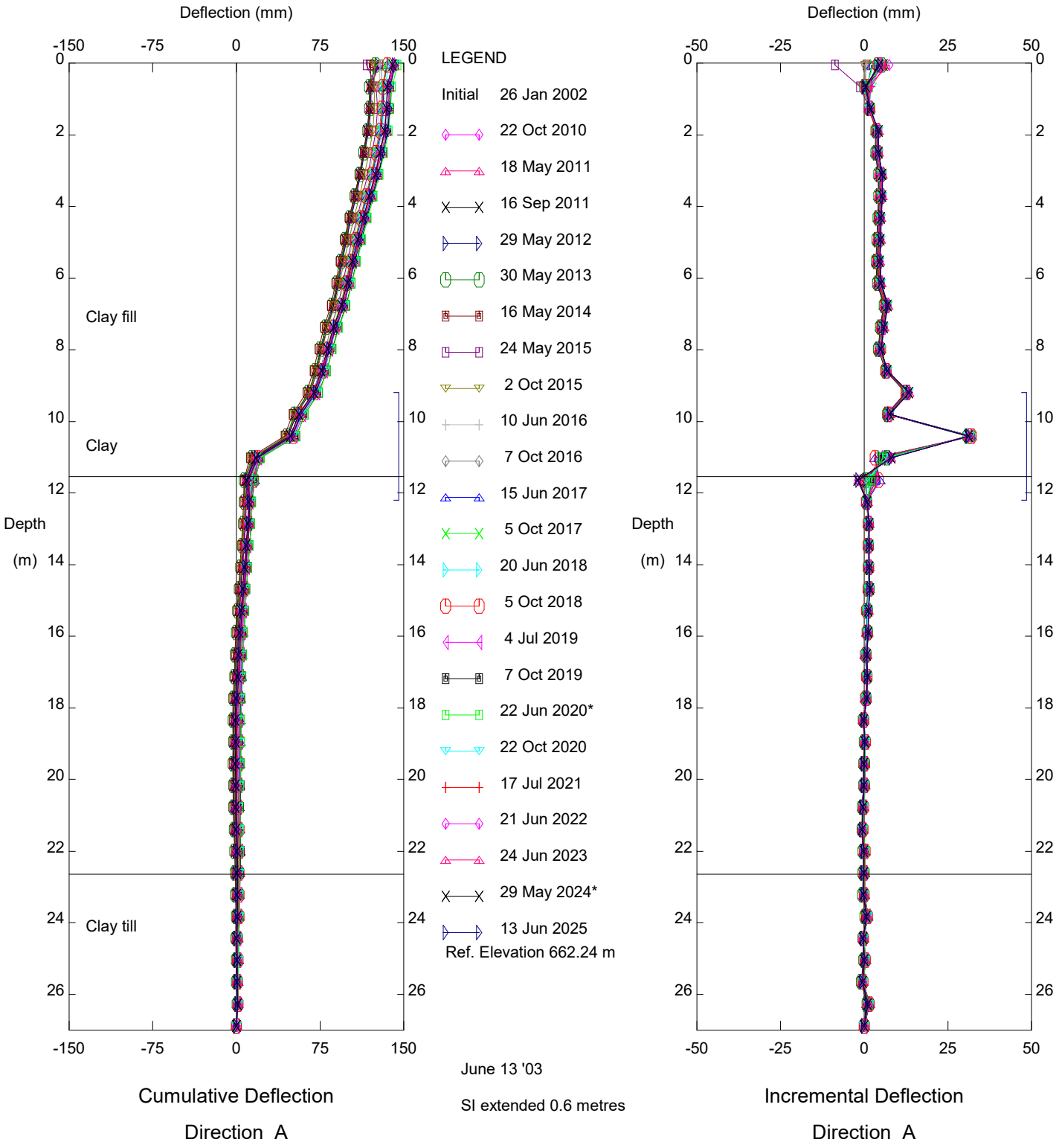

June 13 '03

SI extended 0.6 metres

Cumulative Deflection

Direction A

Incremental Deflection

Direction A

GP012B Ksituan River Crossing, Inclinometer SI-1

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

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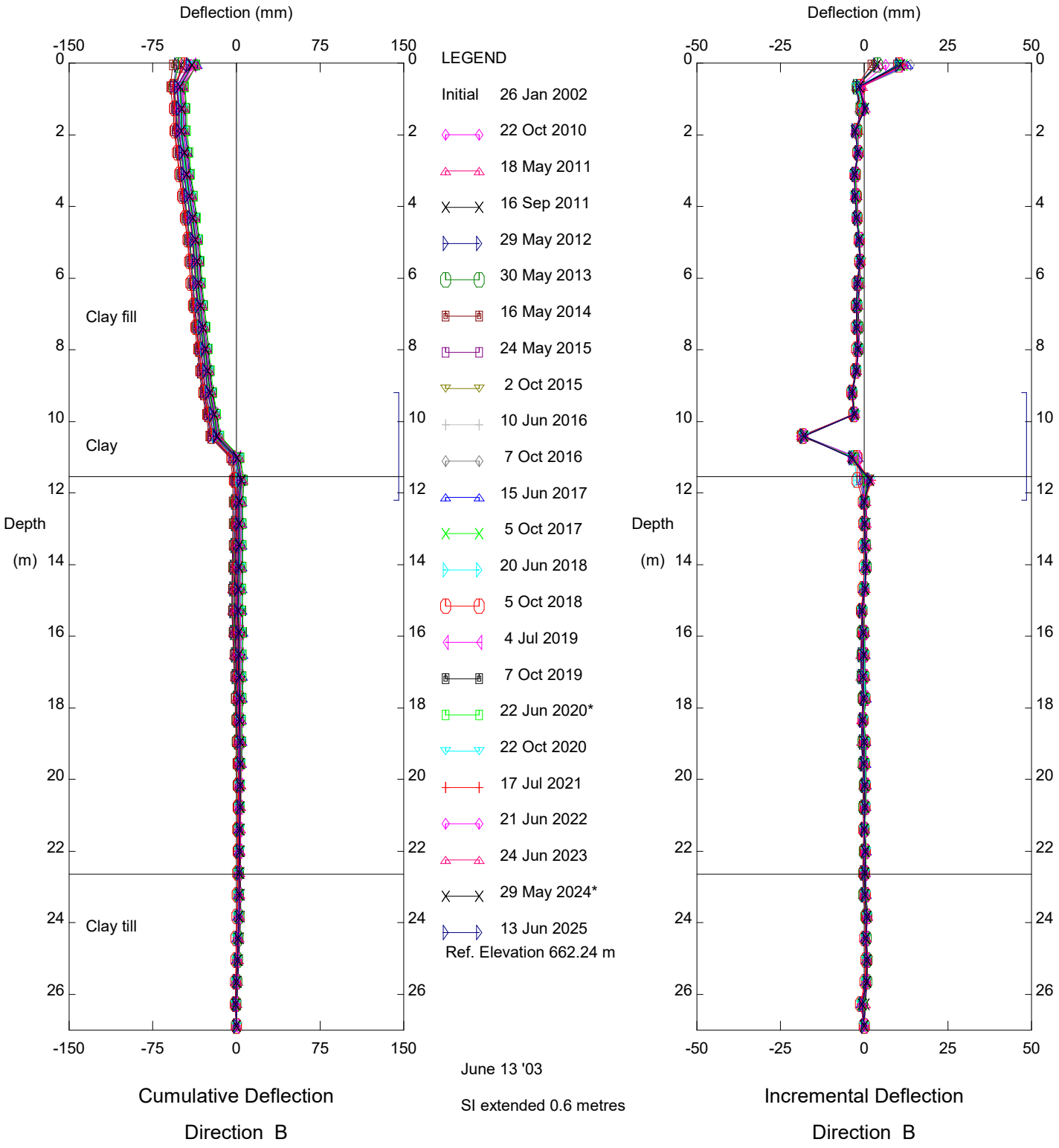

June 13 '03

SI extended 0.6 metres

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

GP012B Ksituan River Crossing, Inclinometer SI-1

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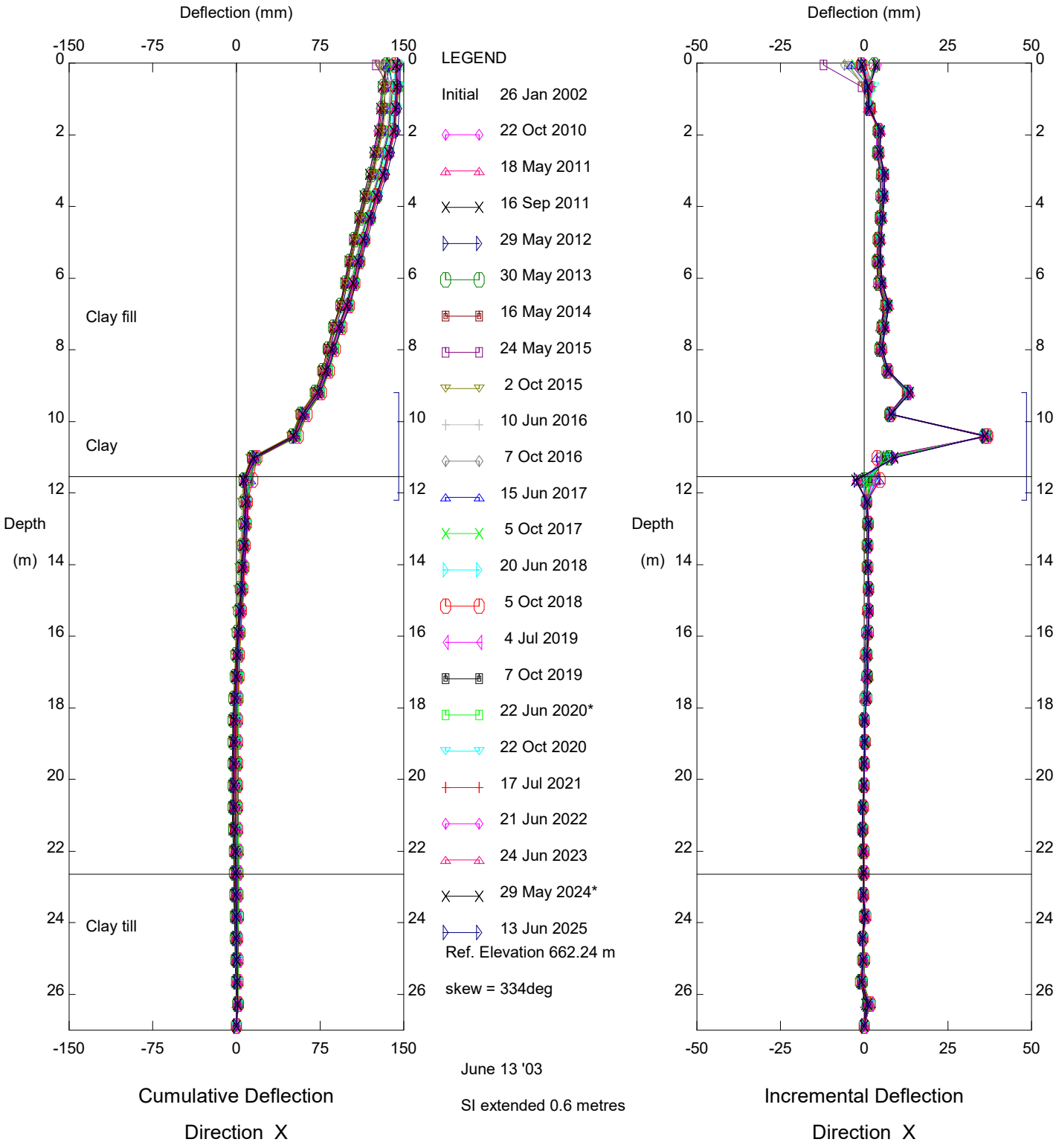

Cumulative Deflection

Direction X

Incremental Deflection

Direction X

GP012B Ksituan River Crossing, Inclinometer SI-1

Alberta Transportation

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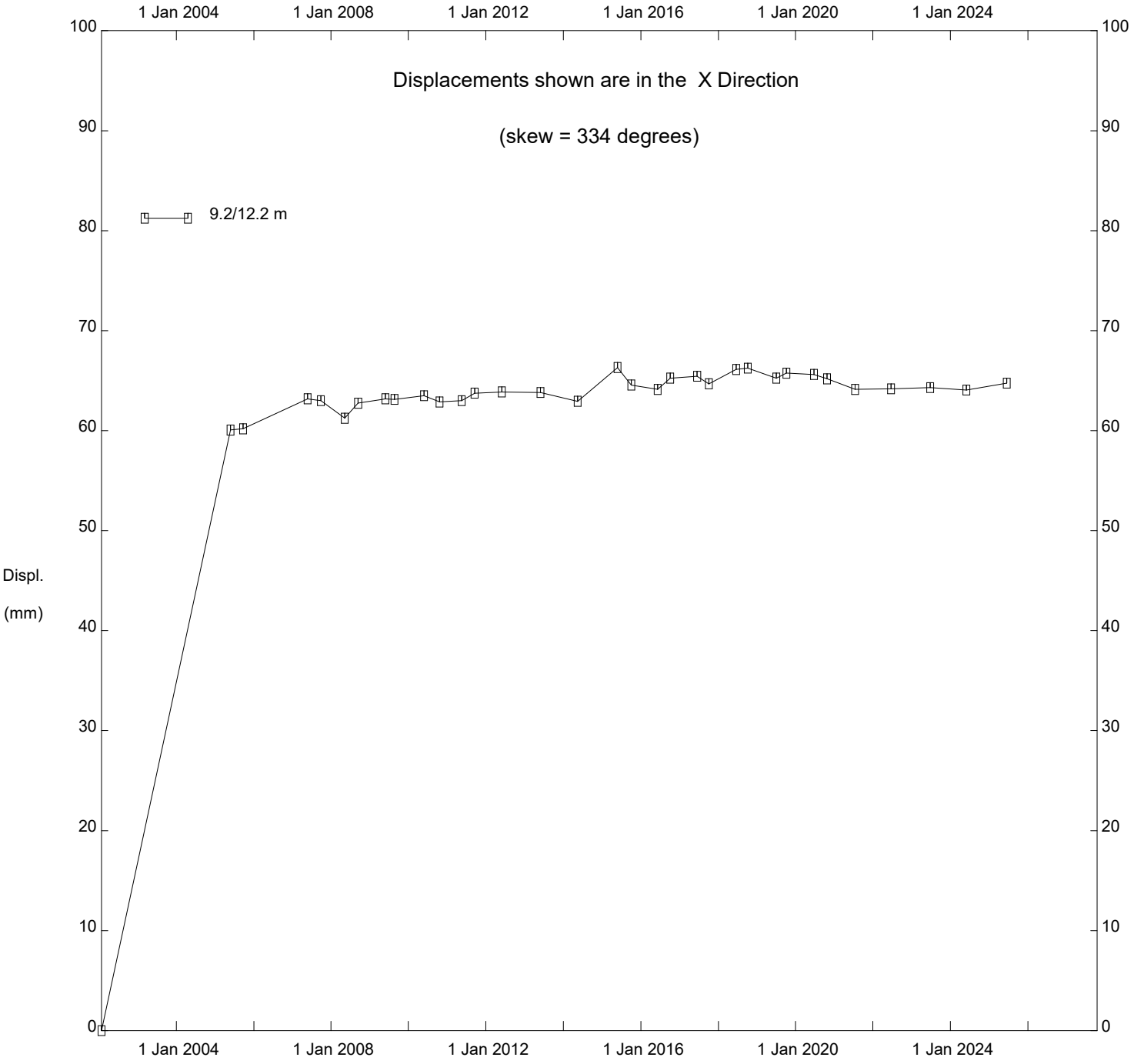

GP012B Ksituan River Crossing, Inclinometer SI-1

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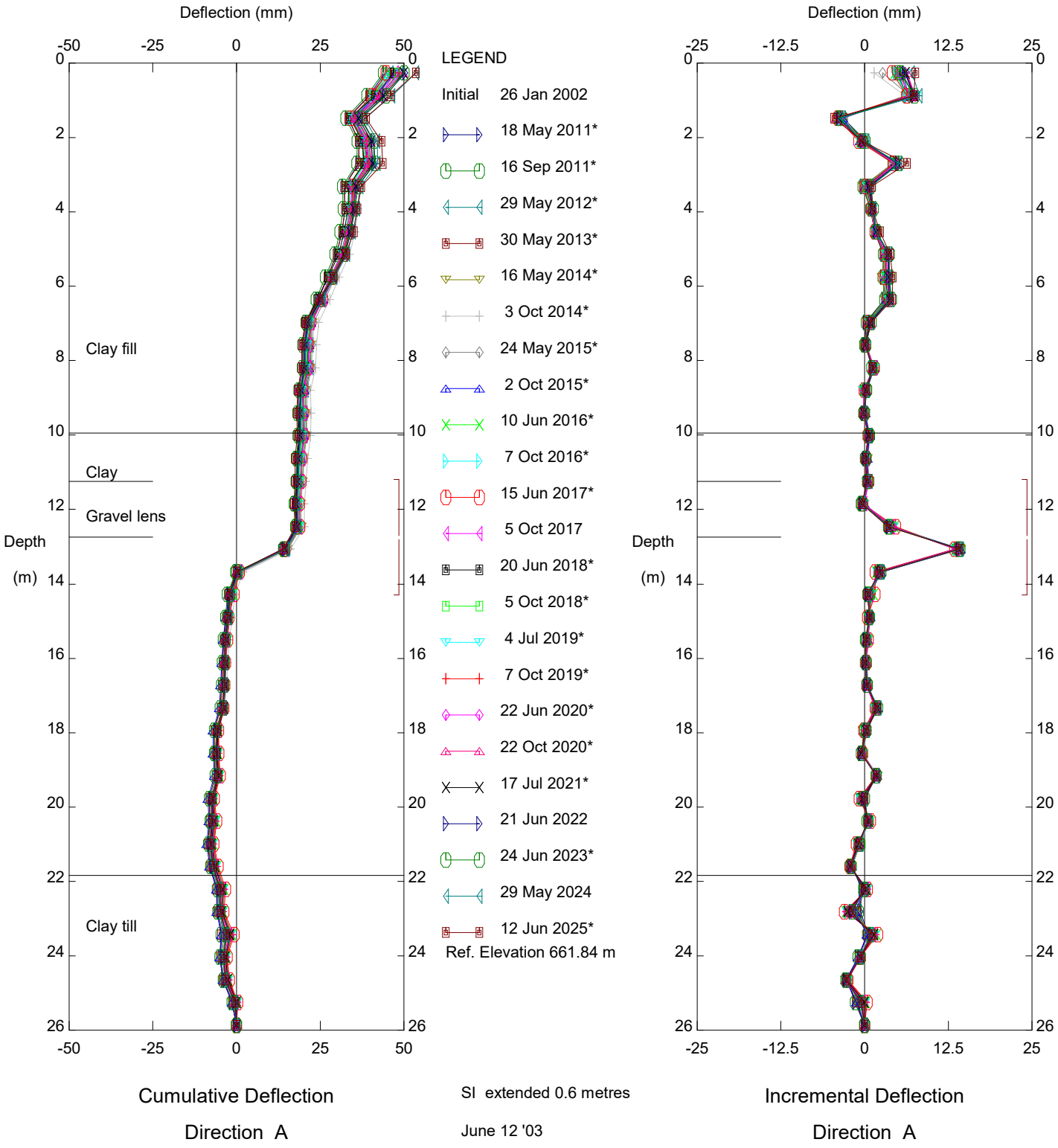

Cumulative Deflection

Direction A

SI extended 0.6 metres

June 12 '03

Incremental Deflection

Direction A

GP012B Ksituan River Crossing, Inclinometer SI-3

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

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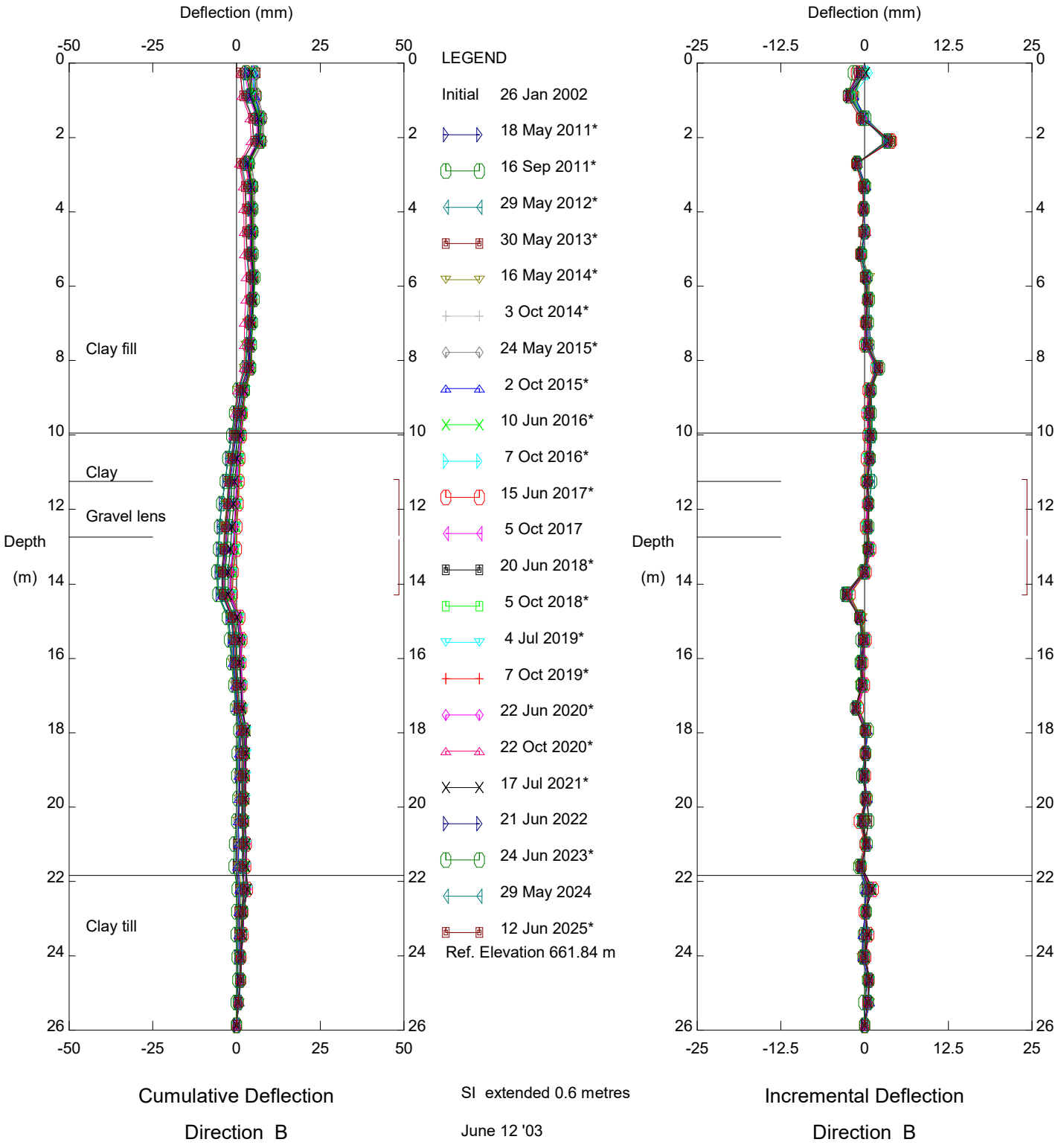

Cumulative Deflection

Direction B

SI extended 0.6 metres

June 12 '03

Incremental Deflection

Direction B

GP012B Ksituan River Crossing, Inclinometer SI-3

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

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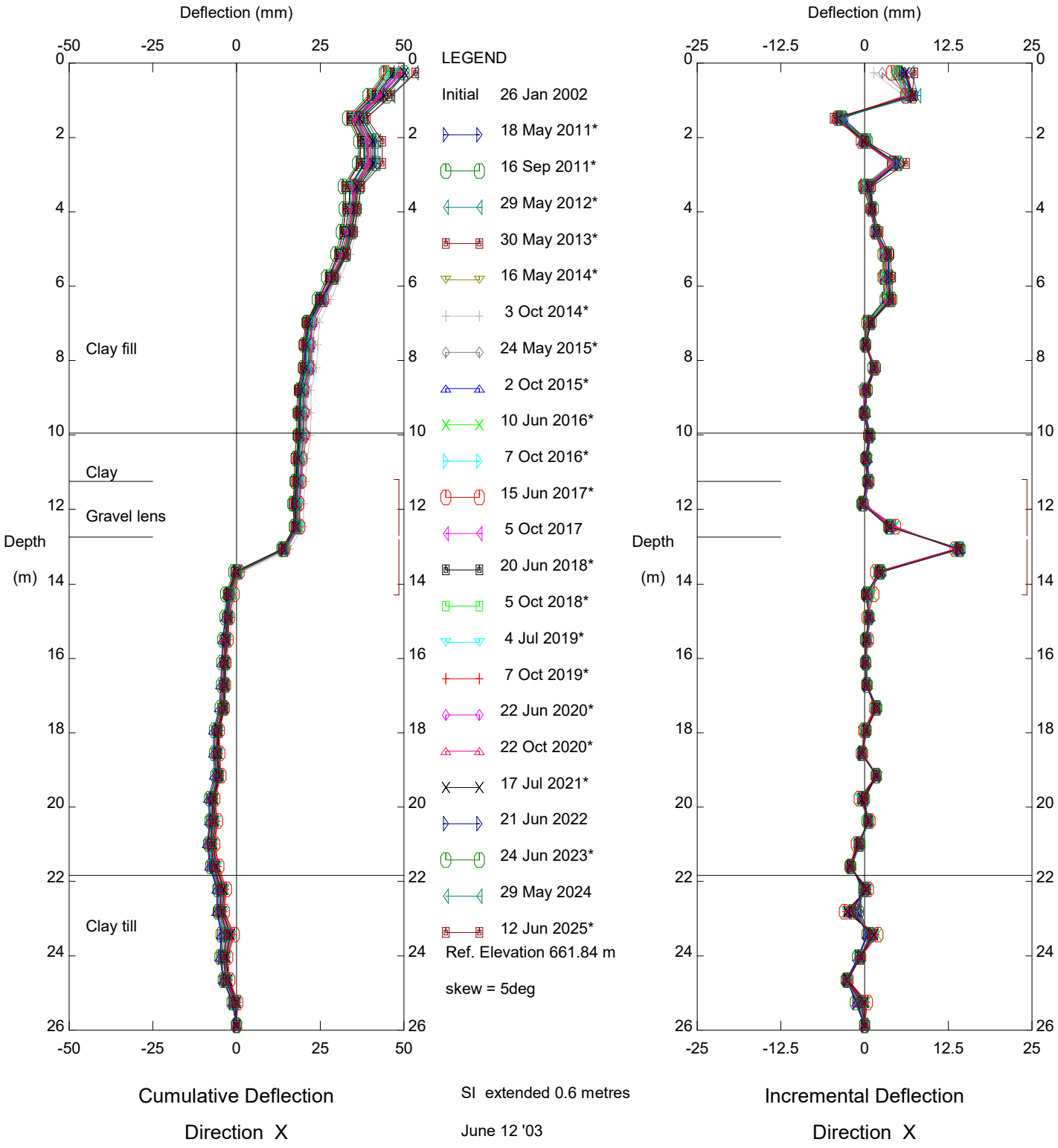

Cumulative Deflection

Direction X

SI extended 0.6 metres

June 12 '03

Incremental Deflection

Direction X

GP012B Ksituan River Crossing, Inclinometer SI-3

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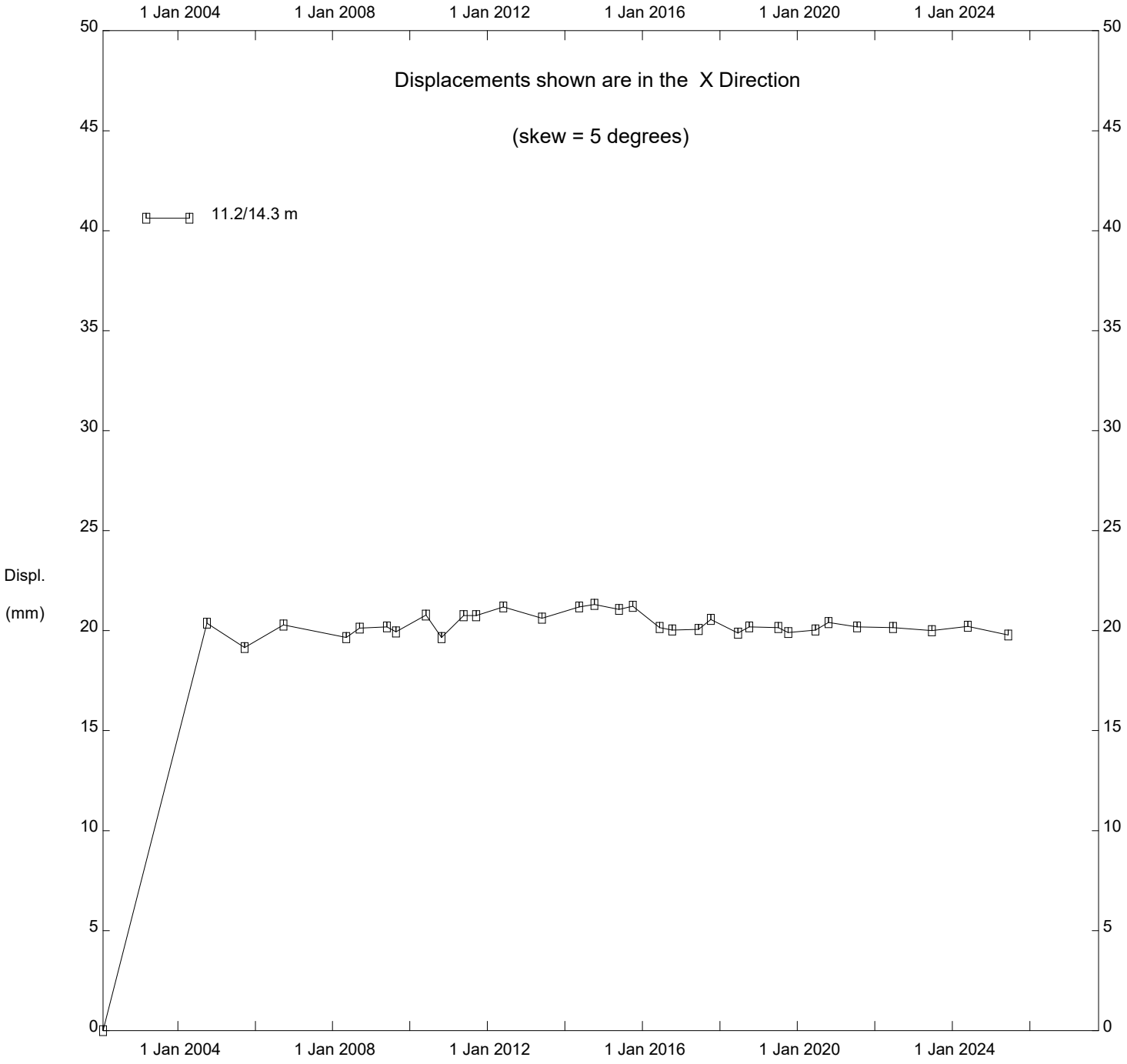

GP012B Ksituan River Crossing, Inclinometer SI-3

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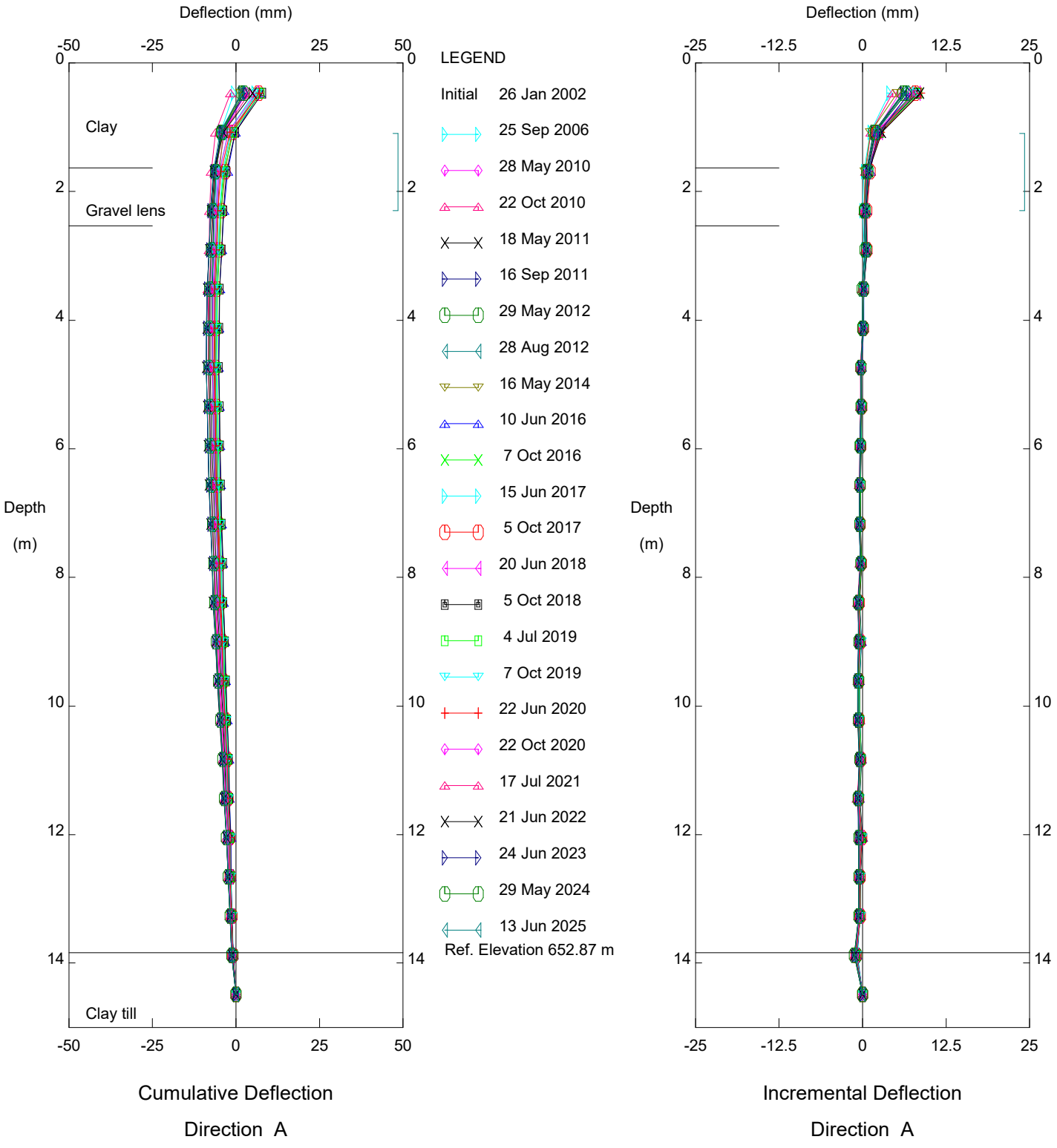

Cumulative Deflection

Direction A

Incremental Deflection

Direction A

GP012B Ksituan River Crossing, Inclinometer SI-6

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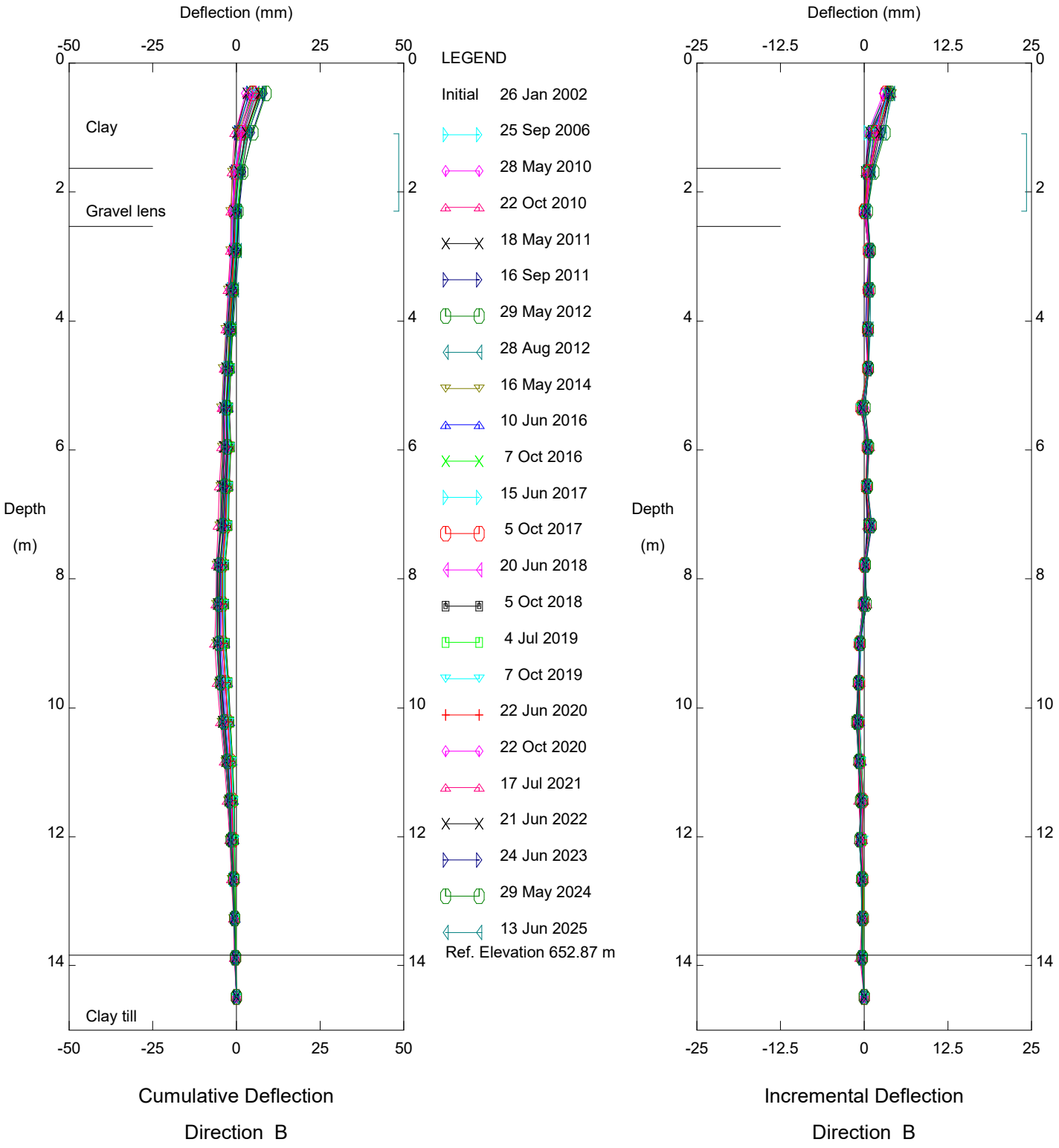

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

GP012B Ksituan River Crossing, Inclinometer SI-6

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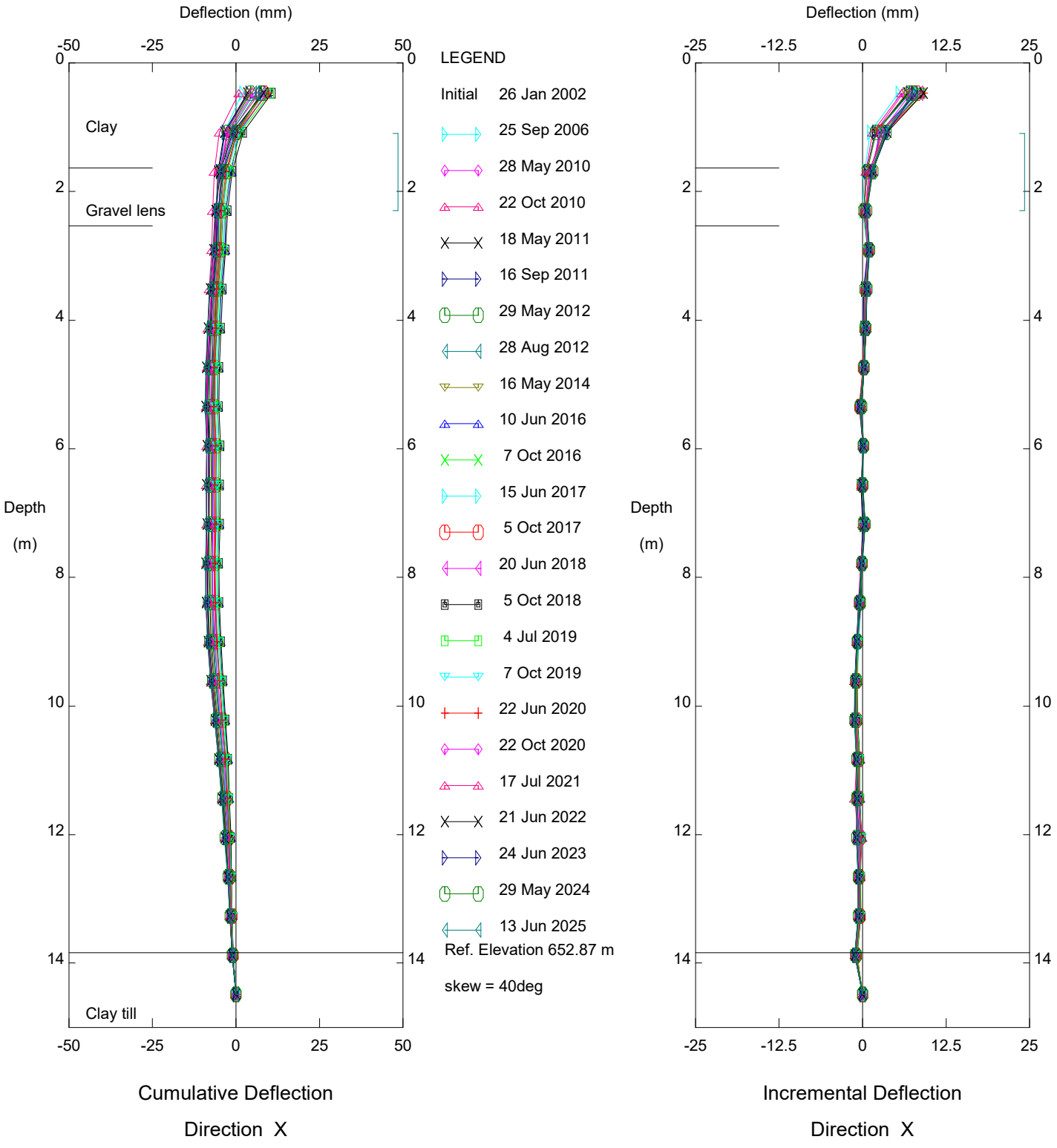

Cumulative Deflection

Direction X

Incremental Deflection

Direction X

GP012B Ksituan River Crossing, Inclinometer SI-6

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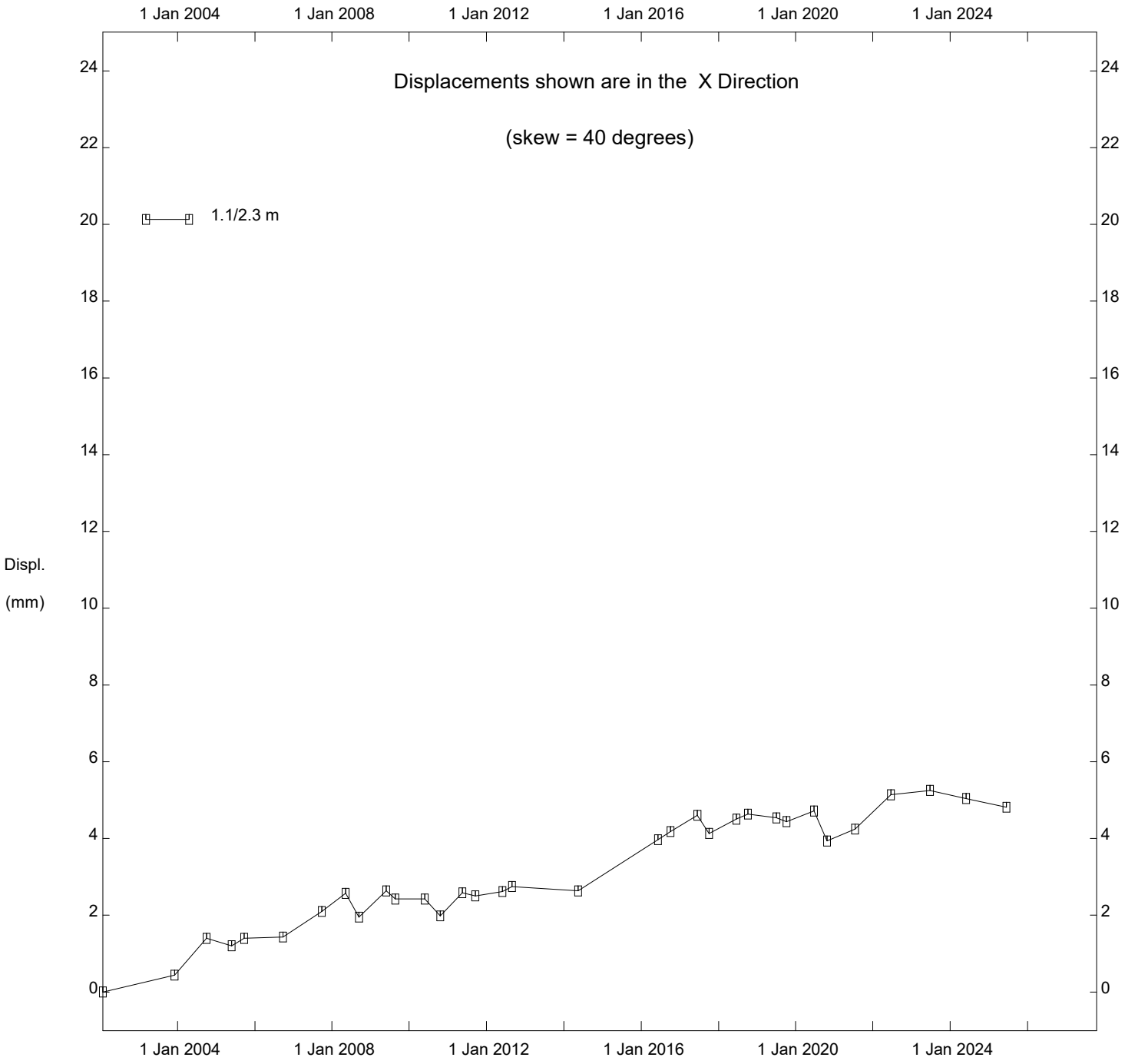

GP012B Ksituan River Crossing, Inclinometer SI-6

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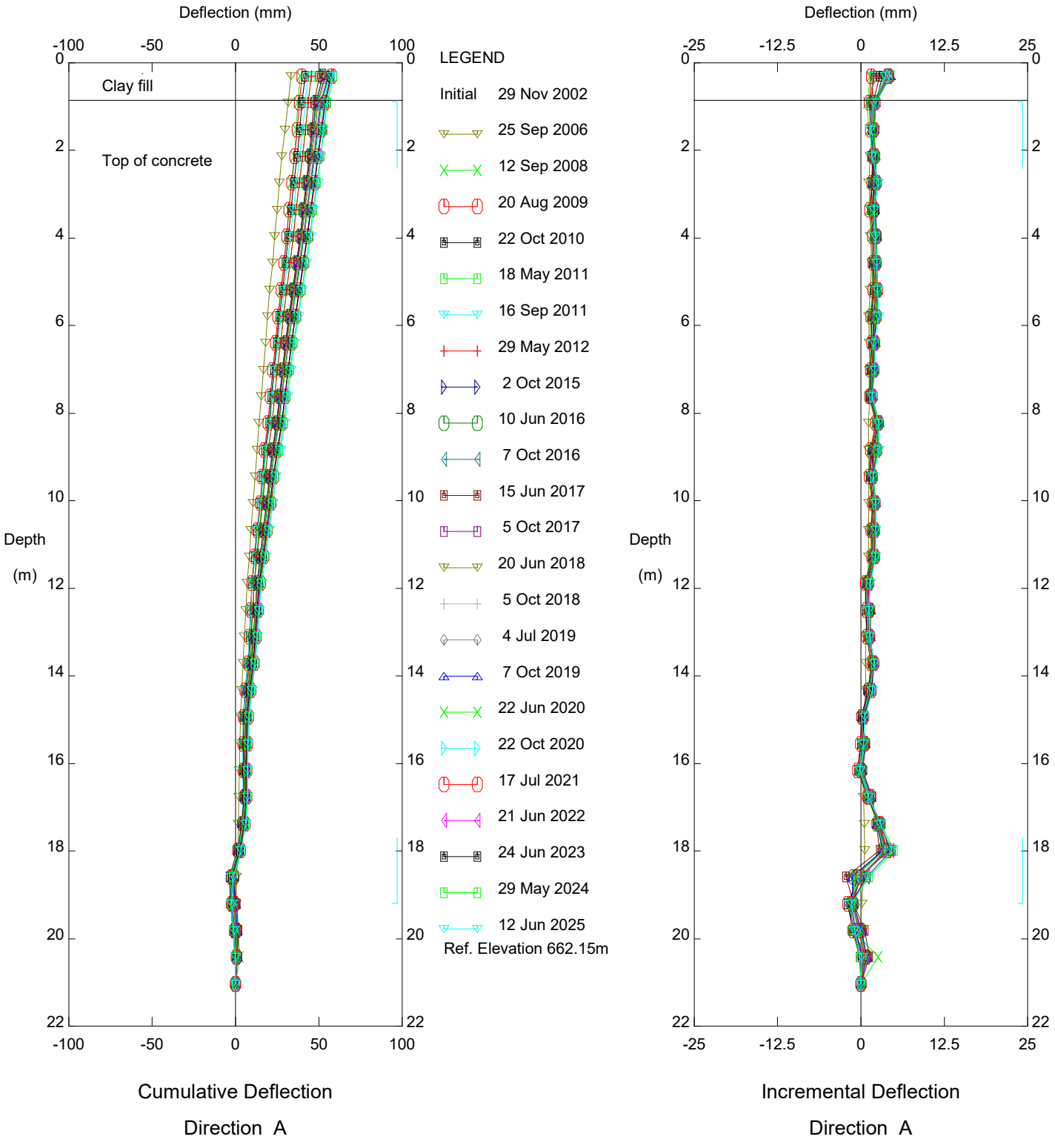

Cumulative Deflection

Direction A

Incremental Deflection

Direction A

GP012B Ksituan River Crossing, Inclinometer SI-8

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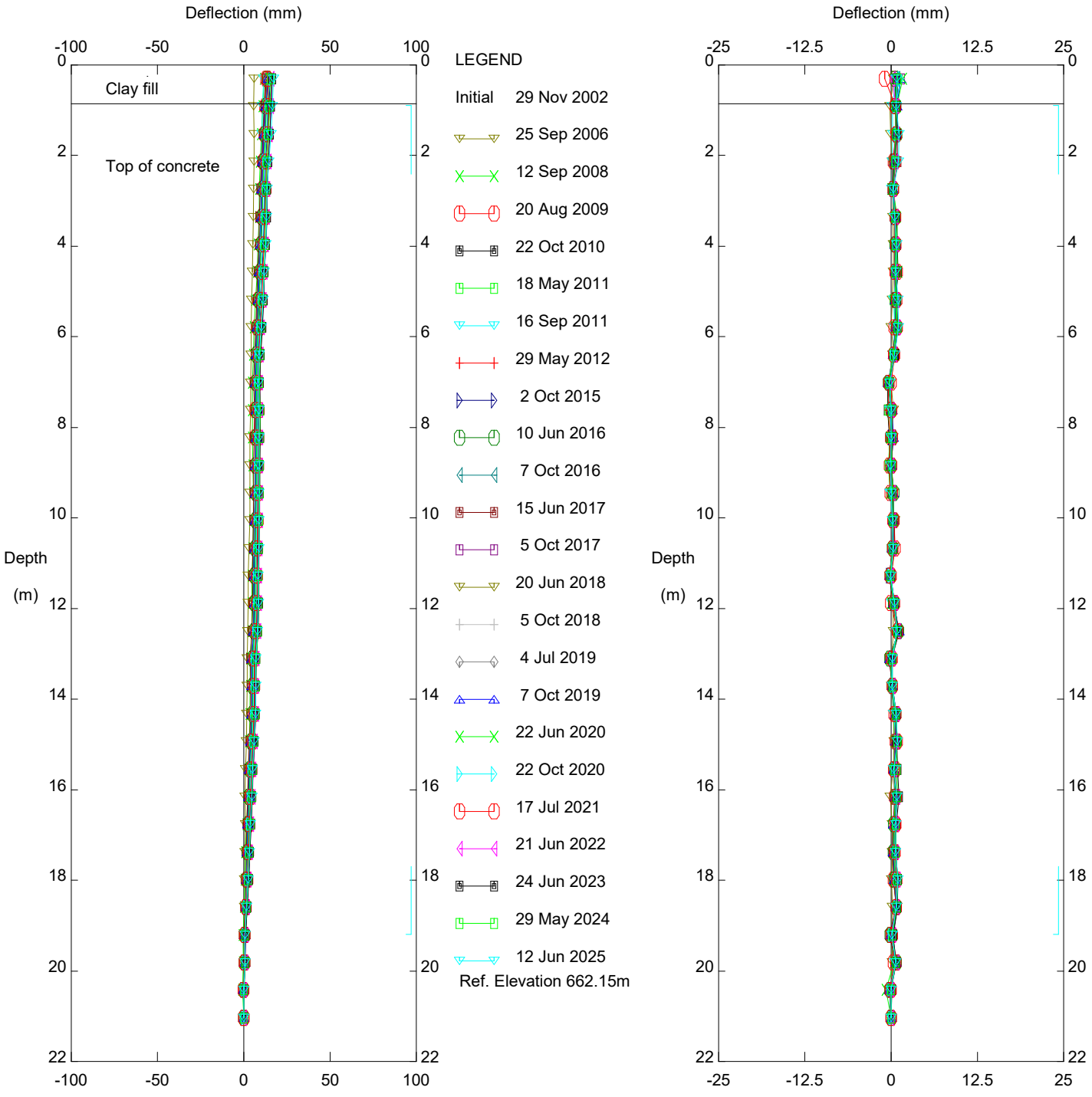

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

GP012B Ksituan River Crossing, Inclinometer SI-8

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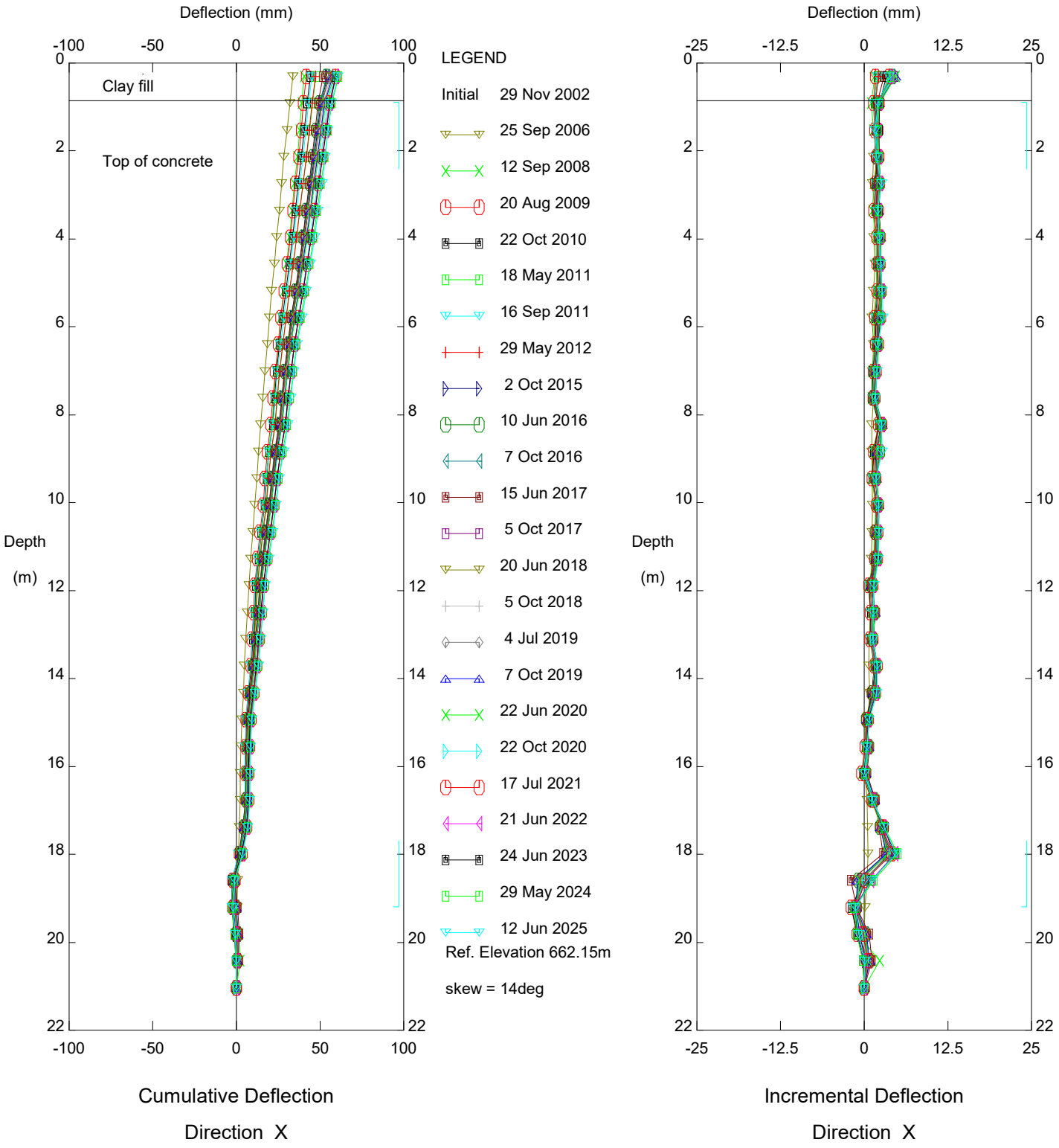

Cumulative Deflection

Direction X

Incremental Deflection

Direction X

GP012B Ksituan River Crossing, Inclinometer SI-8

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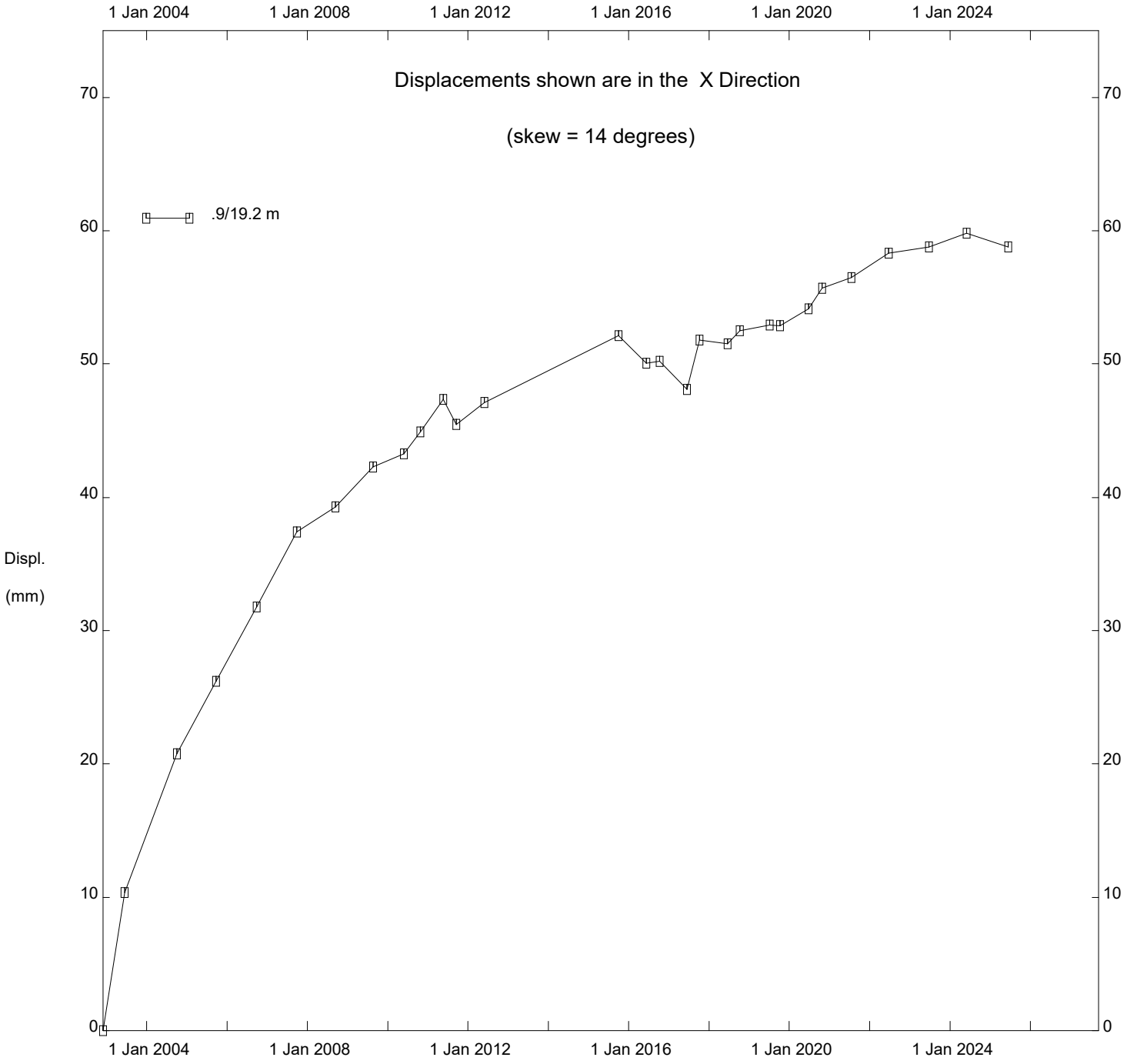

GP012B Ksituan River Crossing, Inclinometer SI-8

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FIGURE GP012B-1
PIEZOMETRIC ELEVATIONS FOR HWY 49:04, KSITUAN PILE WALL

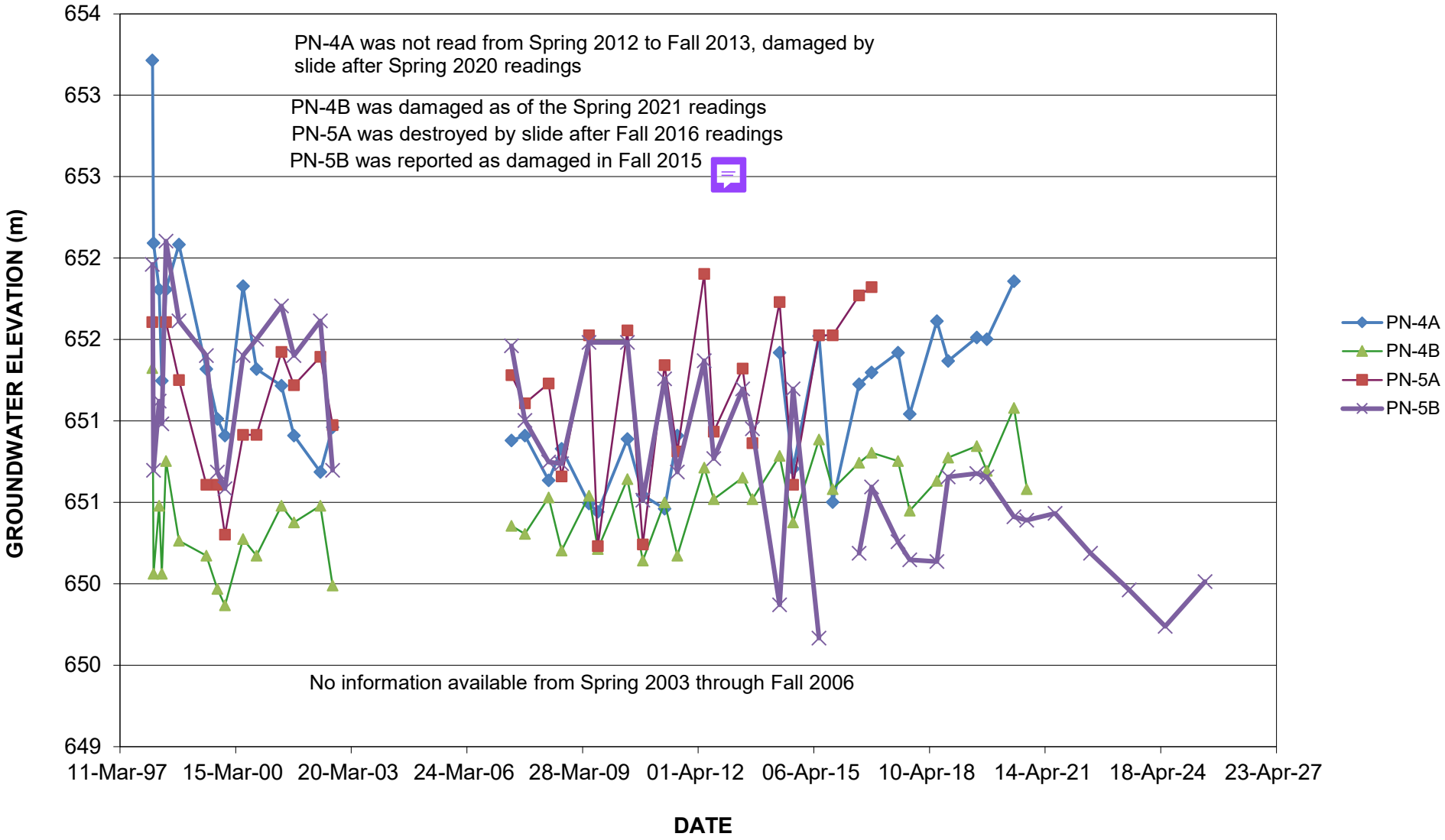

FIGURE GP012B-2
PIEZOMETRIC DEPTHS FOR HWY 49:04, KSITUAN PILE WALL