THURBER ENGINEERING LTD.

July 5, 2022 File No.: 32122

Alberta Transportation
Construction and Maintenance Division
North Central Region
Box 4596, 4513 – 62 Avenue
Barrhead, Alberta
T7N 1A5

Attention: Ms. Amy Driessen, P.Eng.

ALBERTA TRANSPORTATION GRMP (CON0022163)
NORTH CENTRAL (ATHABASCA AND FORT McMURRAY DISTRICTS)
INSTRUMENTATION MONITORING RESULTS – SPRING 2022

SECTION C

SITE NC097: HWY 63:12 PARSONS CREEK INTERCHANGE

Dear Ms. Driessen:

This report provides the results of the annual geotechnical instrumentation monitoring for the above-mentioned site as part of Alberta Transportation's Geohazard Risk Management Program for North Central – Athabasca and Fort McMurray Districts (CON0022163).

It is a condition of this letter report that Thurber's performance of its professional services will be subject to the attached Statement of Limitations and Conditions.

1. OBSERVATIONS

1.1 Field Program and Instrumentation Status

Eight slope inclinometers (SI14-05, SI14-09A, SI14-11, SI14-13, SI14-14, SI14-18, SI14-19, and SI15-14), thirty two vibrating wire piezometers (PZ14-15, PZ14-19, PZ14-20, PZ14-28A, PZ14-29A, PZ14-30A, PZ14-31 to PZ14-50, PZ15-03, PZ15-04, PZ15-05, PZ15-06, PZ15-07, PZ15-09 and PZ15-10) and four vibrating wire settlement cells (SC14-09, SC14-12, SC15-04 and SC15-06) were read at the Hwy 63:12 Parsons Creek Interchange site on May 29, 2022 by Mr. Niraj Regmi, G.I.T. and Mr. Jayden Del Cid, both of Thurber Engineering Ltd. SI14-11 and SI14-18 were found to be sheared at 4.9 m and 2.7 m below the top of the casing, respectively, since the spring of 2021 readings. Vibrating wire piezometer PZ14-31, PZ14-32 and PZ14-45 were all found to be malfunctioning during the current readings.

The SIs were read using an RST Digital Inclinometer probe with a 2 ft. wheelbase and an RST Pocket PC readout. Inclinometer reading depths were defined as per cable markings with respect to the top of the inclinometer casing. The vibrating wire piezometers and settlement cells were read using an RST VW2106 and a GEOKON GK-404 vibrating wire readout.

2. DATA PRESENTATION

2.1 General

SI plots for A and B directions are presented in Section D and are summarized below. Where movement has been recorded the resultant plot (X direction, if applicable) and rate of movement have also been provided.

2.2 Zones of Movement

Zones of new movement were not observed in the SIs since the previous readings in the spring of 2021.

Zones of movement are summarized in Table NC097-1 below. This table also provides a historical account of the total movement, the depth of movement and the maximum rate of movement that has occurred at this site since the initialization of the slope inclinometers.

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TABLE NC097-1
SPRING 2022 – HWY 63:12 PARSONS CREEK INTERCHANGE
SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: May 29, 2022

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)
Parsons Interchange								
SI14-05	August 27, 2014	68.9 mm over 1.5 m to 4.6 m in 99° direction	99.0 on May 28, 2015	Operational	June 26, 2021	3.1	3.4	-0.6
		98.6 mm over 4.6 m to 9.4 m in 99° direction	66.2 on October 15, 2014			3.0	3.3	-1.0
SI15-14	May 16, 2015	86.3 over 3.4 m to 12.5 m in 355° direction	877.9 June 22, 2015	Operational	June 26, 2021	2.2	2.4	5.6
HWY 686 Cut Slope								
SI14-09A	May 6, 2014	18.4 over 19.5 m to 22.6 m in 131° direction	26.9 on October 27, 2014	Operational	June 26, 2021	No discernible movement	N/A	-2.5
SI14-11	*August 27, 2014*	*41.9 over 4.6 m to 5.8 m in 145° direction*	*34.4 on September 19, 2014*	*Sheared at 4.9 m below top of casing*	*June 26, 2021*	*N/A*	*N/A*	*N/A*
SI14-13	August 24, 2014	37.6 over 10.1 m to 11.3 m in 29° direction	25.4 on October 9, 2014	Operational	June 26, 2021	3.4	3.7	0.7

Drawing 32122-NC097 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

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TABLE NC097-1 – CONTINUED…
SPRING 2022 – HWY 63:12 PARSONS CREEK INTERCHANGE
SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: May 29, 2022

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)
HWY 686 Cut Slope - Continued								
SI14-14	August 24, 2014	39.8 over 4.0 m to 5.8 m in 355° direction	35.6 on September 19, 2014	Operational	June 26, 2021	4.6	5.0	-2.1
		21.4 over 9.4 m to 11.3 m in 355° direction	12.1 on September 19, 2014			1.5	1.6	-0.7
SI14-16	*August 25, 2014*	*48.8 over 11.9 m to 13.7 m in 138° direction*	*46.9 on September 19, 2014*	*Sheared at 12.8 m below top of casing*	*September 24, 2020*	*N/A*	*N/A*	*N/A*
SI14-18	*April 4, 2014*	*16.2 over 13.1 m to 14.3 m in 26° direction*	*13.0 on September 24, 2020*	*Sheared at 2.7 m below top of casing*	*June 26, 2021*	*N/A*	*N/A*	*N/A*
		13.0 over 27.7 m to 29.6 m in 26° direction	*14.3 on July 16, 2015*			*N/A*	*N/A*	*N/A*
SI14-19	April 2, 2014	58.0 over 5.8 m to 7.6 m in 33° direction	32.0 on August 24, 2014	Operational	June 26, 2021	4.9	5.3	0.3

Drawing 32122-NC097 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

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TABLE NC097-1 – CONTINUED…
SPRING 2022 – HWY 63:12 PARSONS CREEK INTERCHANGE
SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: May 29, 2022

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)
HWY 686 Cut Slope - Continued								
SI15-21	*October 1, 2015*	*87.9 over 2.7 m to 5.2 m in 12° direction*	*82.5 on September 25, 2020*	*Sheared at 3.0 m below top of casing*	*September 25, 2020*	*N/A*	*N/A*	*N/A*
		21.3 over 6.4 m to 8.2 m in 12° direction	*30.9 on October 9, 2015*			*N/A*	*N/A*	*N/A*
		3.6 over 9.4 m to 11.3 m in 12° direction	*8.0 on October 9, 2015*			*N/A*	*N/A*	*N/A*

Drawing 32122-NC097 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

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TABLE NC097-2
SPRING 2022 – HWY 63:12 PARSONS CREEK INTERCHANGE
VIBRATING WIRE PIEZOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: May 29, 2022

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)
Parsons Interchange								
PZ14-15 (30825)	December 1, 2014	247.78	258.75	Operational	260.92 on June 28, 2015	254.81	253.92	0.89
PZ14-19 (30827)	November 27, 2014	246.35	258.24	Operational	260.97 on June 28, 2015	252.50	252.85	-0.35
PZ14-20 (30828)	November 27, 2014	253.67	258.24	Operational	262.41 on August 15, 2015	253.61	253.90	-0.29
PZ15-03 (31641)	February 6, 2015	256.83	259.35	Operational	261.31 on June 29, 2015	DRY	DRY	N/A
PZ15-04 (31642)	February 6, 2015	247.08	259.35	Operational	260.58 on June 29, 2015	251.75	252.09	-0.34
PZ15-05 (30959)	January 25,2015	258.61	262.27	Operational	268.65 on August 28, 2015	262.11	262.18	-0.07
PZ15-06 (30960)	January 25, 2015	251.60	262.27	Operational	267.25 on August 28, 2015	259.29	259.42	-0.13
PZ15-07 (30961)	January 22, 2015	257.73	262.30	Operational	269.68 on August 23, 2015	261.07	262.14	-1.07
PZ15-09 (30855)	January 21, 2015	257.72	260.16	Operational	269.03 on June 28, 2015	DRY	DRY	N/A
PZ15-10 (30956)	January 21, 2017	254.06	260.16	Operational	272.21 on August 18, 2015	255.64	255.92	-0.28

Drawing 32122-NC097 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

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TABLE NC097-2 – CONTINUED…
SPRING 2022 – HWY 63:12 PARSONS CREEK INTERCHANGE
VIBRATING WIRE PIEZOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: May 29, 2022

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)
HWY 686 Cut Slope								
PZ14-28a (28239)	April 29, 2014	323.28	333.43	Operational	325.05 on November 11, 2014	323.88	323.88	0
PZ14-29a (28240)	April 29, 2014	313.62	333.43	Operational	315.24 on August 29, 2014	DRY	DRY	N/A
PZ14-30a (28241)	April 29, 2014	307.06	333.43	Operational	310.66 on May 29, 2020	310.69	310.70	-0.01
PZ14-31 (29840)	*August 25, 2014*	*307.96*	*324.11*	*Damaged*	*315.24 on February 15, 2015*	*N/A*	*309.57 (June 26, 2021)*	*N/A*
PZ14-32 (29847)	*August 25, 2014*	*314.06*	*324.11*	*Damaged*	*316.44 on October 8, 2014*	*N/A*	*313.98 (June 26, 2021)*	*N/A*
PZ14-33 (29841)	August 25, 2014	307.03	314.03	Operational	310.42 on May 29, 2022	310.42	309.89	0.53
PZ14-34 (21878)	April 2, 2014	326.35	335.86	Operational	328.43 on October 8, 2014	328.25	326.44	1.81
PZ14-35 (21879)	April 2, 2014	316.23	335.86	Operational	321.44 on May 29, 2022	321.44	319.12	2.32
PZ14-36 (28235)	April 2, 2014	306.78	335.86	Operational	321.37 on May 29, 2022	321.37	318.62	2.75
PZ14-37 (29842)	August 23, 2014	314.33	324.33	Operational	318.17 on September 25, 2020	316.57	314.55	2.02

Drawing 32122-NC097 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

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TABLE NC097-2 – CONTINUED…
SPRING 2022 – HWY 63:12 PARSONS CREEK INTERCHANGE
VIBRATING WIRE PIEZOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: May 29, 2022

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)
HWY 686 Cut Slope - Continued								
PZ14-38 (29848)	August 23, 2014	308.23	324.33	Operational	311.62 on May 29, 2020	309.81	DRY	N/A
PZ14-39 (29843)	August 24, 2014	304.29	314.29	Operational	308.30 on October 8, 2014	304.41	308.67	-4.26
PZ14-40 (18140)	April 3, 2014	321.72	331.90	Operational	330.17 on June 26, 2021	328.18	330.17	-1.99
PZ14-41 (21880)	April 3, 2014	314.10	331.90	Operational	322.24 on June 28, 2015	314.28	313.46	0.82
PZ14-42 (28244)	April 3, 2014	296.42	331.90	Operational	296.35 on March 16, 2017	DRY	DRY	N/A
PZ14-43 (29844)	August 25, 2014	303.99	313.99	Operational	304.48 on September 25, 2020	DRY	DRY	N/A
PZ14-45 (29845)	*August 25, 2014*	*296.03*	*304.03*	*Damaged*	*296.82 on September 25, 2020*	*N/A*	*296.82 (September 25, 2020)*	*N/A*
PZ14-46 (28236)	April 3, 2014	317.46	330.67	Operational	318.83 on September 24, 2020	DRY	318.53	N/A
PZ14-47 (28237)	April 3, 2014	311.36	330.67	Operational	313.26 on September 24, 2020	312.19	313.47	-1.28
PZ14-48 (28238)	April 3, 2014	295.81	330.67	Operational	300.15 on August 29, 2014	DRY	DRY	N/A

Drawing 32122-NC097 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

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TABLE NC097-2 – CONTINUED…
SPRING 2022 – HWY 63:12 PARSONS CREEK INTERCHANGE
VIBRATING WIRE PIEZOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: May 29, 2022

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)
HWY 686 Cut Slope - Continued								
PZ14-49 (17575)	April 1, 2014	300.40	308.45	Operational	305.42 on May 29, 2022	305.42	301.62	3.80
PZ14-50 (18817)	April 1, 2014	294.61	308.45	Operational	294.82 on February 23, 2015	295.51	295.35	0.16

Drawing 32122-NC097 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

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TABLE NC097-3
SPRING 2022 – HWY 63:12 PARSONS CREEK INTERCHANGE
SETTLEMENT GAUGE INSTRUMENTATION READING SUMMARY

Date Monitored: May 29, 2022

INSTRUMENT #	DATE INITIALIZED	CURRENT STATUS	CURRENT SETTLEMENT (mm)	PREVIOUS SETTLEMENT (mm)	CHANGE IN SETTLEMENT (mm) [1]
Parsons Interchange					
SC14-09	November 27, 2014	Operational	-822.76	-782.20	40.56
SC14-12	November 27, 2014	Operational	-951.71	-865.23	86.48
SC15-04	January 25, 2015	Operational	-912.48	-899.65	12.83
SC15-06	January 22, 2015	Operational	-1388.48	-1380.44	8.04

Drawing 32122-NC097 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

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

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3. INTERPRETATION OF MONITORING RESULTS

3.1.1 Parsons Creek Interchange

Slope inclinometer SI14-05 showed rates of movement of 3.4 mm/yr and 3.3 mm/yr over 1.5 m to 4.6 m depth and 4.6 m to 9.4 m depth, respectively, since the spring of 2021 readings. SI15-14 showed a rate of movement of 2.4 mm/yr over 3.4 m to 12.5 m depth since the spring of 2021 readings.

The groundwater levels decreased in the majority in the vibrating wire piezometers installed within the Parsons Creek Interchange compared to the spring of 2021 readings. The groundwater level decreases ranged from of 0.07 m in PZ15-05 to a decrease of 1.07 m in PZ15-07. The groundwater level in piezometer PZ14-15 showed an increase of 0.89 m since the spring of 2021 readings. Piezometers PZ15-03 and PZ15-09 continued to be dry. The vibrating wire piezometer readings are summarized in Table NC097-2 and are plotted on Figures PZ1 through PZ6 in Appendix A.

The settlement cells all showed increases in settlement compared to the spring of 2021 readings. The increases in settlement ranged from 8.04 mm in SC15-06 to 86.48 mm in SC14-12. The settlement cells are summarized in Table NC097-3 above and are plotted on Figures SC1 through SC4 in Appendix A.

3.1.2 HWY 686 Cut Slope

SI14-09A showed no discernible movement over 19.5 m to 22.6 m depth since the spring of 2021 readings. SI14-13 showed a rate of movement of 3.7 mm/yr over 10.1 m to 11.3 m depth since the spring of 2021 readings. SI14-14 showed rates of movement of 5.0 mm/yr and 1.6 mm/yr over 4.0 m to 5.8 m depth and 9.4 m to 11.3 m depth, respectively, since the spring of 2021 readings. SI14-19 showed a rate of movement of 5.3 mm/yr over 5.8 m to 7.6 m depth since the spring of 2021 readings.

Vibrating wire piezometers PZ14-28a showed no change in groundwater level since the spring of 2021 readings. Vibrating wire piezometers PZ14-30a, PZ14-39, PZ14-40, and PZ14-47, showed decreases in groundwater level of 0.01 m, 4.26 m, 1.99 m, and 1.28 m, respectively, since the spring of 2021 readings. Vibrating wire piezometers PZ14-33, PZ14-34, PZ14-35, PZ14-36, PZ14-37, PZ14-41, PZ14-49, PZ14-50 showed increases in groundwater level of 0.53, 1.81 m, 2.32 m, 2.75 m, 2.02 m, 0.82 m, 3.80 m, and 0.16 m, respectively, since the spring of 2021 readings. PZ14-33, PZ14-35, PZ14-36, and PZ14-49 showed the highest groundwater levels measured in their respective instruments since initialization. PZ14-29a, PZ14-42, PZ14-43, PZ14-46 and PZ14-48 were dry. PZ14-38, which was previously dry, showed a groundwater elevation of 309.81 m during the current readings, corresponding to an increase of groundwater level of at least 1.58 m.

Vibrating wire piezometer readings for the HWY 686 Cut Slope are plotted on Figures 686-1 to 686-13 in Appendix A.

4. RECOMMENDATIONS

4.1 Future Work

The instruments should be read again in the spring of 2023 (the instruments at this site are scheduled to be read once annually). Another attempt will be made to read PZ14-31 and PZ14-32 at that time. If they are still malfunctional, they should be removed from the readings program. PZ14-45 has malfunctioned for two consecutive readings cycles and will be discontinued from the instrumentation program.

4.2 Instrumentation Repairs

No instrument repairs are required at this time.

5. CLOSURE

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.
Principal | Senior Geotechnical Engineer

PROFESSIONAL ENGINEER ALBERTA
BRUCE W. NESTOR
ID 161284
July 6, 2022

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
RM SIGNATURE:
RM APEGA ID #: 91085
DATE: July 7, 2022
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Bruce Nestor, P.Eng.
Geotechnical Engineer
/jf

Attachments

- Statement of Limitations and Conditions
- Appendix A
  - Field Inspector's report
  - Site Plan Showing Approximate Instrument Locations (Drawing No. 32122-NC097)
  - Parsons Interchange Instruments
    - SI Reading Plots
    - Vibrating Wire Piezometer Plots (Figures PZ1 through PZ5)
    - Vibrating Wire Settlement Cell Plots (Figures SC1 through SC4)
  - Parsons Interchange Instruments
    - SI Reading Plots
    - Vibrating Wire Piezometer Plots (Figures 686-1 through 686-13)

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STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

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

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.

d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

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

SPRING 2022

APPENDIX A
DATA PRESENTATION

SITE NC097: HWY 63:12 PARSONS CREEK INTERCHANGE

ALBERTA TRANSPORTATION
NORTH CENTRAL REGION - ATHABASCA AND FORT McMURRAY DISTRICTS
INSTRUMENTATION MONITORING FIELD SUMMARY (NC097)
SPRING 2022

Location:	Parsons Creek Interchange (Hwy 63:12 L1 0.093)	**Readout:**	
File Number:	32122	**Casing Diameter**	2.75"/3.34"
Probe:	RST set 8R	**Temp:**	18
Cable:	RST set 8R	**Read by:**	NKR/JD

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location 3TM EBA Scaled		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-		
Parsons Interchange												
SI14-05	6296408	-26266	29-May-22	1.10	30 to 6	85	-80	101	-493	498	8R/8R	Casing Size 3.34"
SI15-14	6296510	-26349	29-May-22	1.15	46 to 4	322	1695	-1674	-315	319	8R/8R	Casing Size 2.75"
HWY 686 Cut Slope												
SI14-09A	6296436	-27145	29-May-22	0.91	89 to 5	132	-142	165	294	-290	8R/8R	Casing Size 3.34"
SI14-11	6296338	-27090	29-May-22	1.09	24 to 6	136	17	5	-534	536	8R/8R	Casing Size 3.34"
SI14-13	6296181	-27073	29-May-22	1.04	54 to 6	30	-407	429	491	-488	8R/8R	Casing Size 3.34"
SI14-14	6296236	-27082	29-May-22	1.00	36 to 6	356	820	-808	-192	206	8R/8R	Casing Size 3.34"
SI14-18	6296077	-26851	29-May-22	0.60	118 to 4	337	-375	395	-32	36	8R/8R	Casing Size 3.34"
SI14-19	6296200	-26857	29-May-22	2.23	52 to 6	349	11	12	101	-95	8R/8R	Casing Size 3.34"

INSPECTOR REPORT

SI14-11 Sheared at 16 ft.
SI14-18 Guessing breaking off at 9 ft, probe won't go further down.

ALBERTA TRANSPORTATION
NORTH CENTRAL REGION - ATHABASCA AND FORT McMURRAY DISTRICTS
INSTRUMENTATION MONITORING FIELD SUMMARY (NC097)
SPRING 2022

Location: Parsons Creek Interchange (Hwy 63:12 L1 0.093)
File Number: 32122

Readout: GK404 SN 364/ VW 2106 Unit 3
Temp: 18
Read by: NKR/JD

VIBRATING WIRE PIEZOMETER (VW) READINGS

VW#	Date	Reading		Identification	Monitoring	Datalogger	3TM EBA Scaled		Comment
		B Unit	Temp.	Number	Station	Serial	Northing	Easting	
Parsons Interchange									
PZ14-15	29-May-22	8295.3	7.8	30825	MS-09	4123	6296421	-26343	
PZ14-19	29-May-22	8441.6	-	30827	MS-09	4123	6296421	-26343	
PZ14-20	29-May-22	8905.5	4.6	30828	MS-09	4123	6296421	-26343	
PZ15-03	29-May-22	8908.1	5.8	31641	MS-08	3881	6296343	-26371	
PZ15-04	29-May-22	8442.5	5.2	31642	MS-08	3881	6296343	-26371	
PZ15-05	29-May-22	8531.3	5.5	30959	MS-08	3881	6296365	-26435	
PZ15-06	29-May-22	8205.8	4.9	30960	MS-08	3882	6296365	-36435	
PZ15-07	29-May-22	8526.6	4.9	30961	MS-08	3882	6296365	-26435	
PZ15-09	29-May-22	8899.7	4.1	30955	MS-09	4002	6296443	-26415	
PZ15-10	29-May-22	8847.1	-	30956	MS-09	4002	6296443	-26415	

INSPECTOR REPORT

ALBERTA TRANSPORTATION
NORTH CENTRAL REGION - ATHABASCA AND FORT McMURRAY DISTRICTS
INSTRUMENTATION MONITORING FIELD SUMMARY (NC097)
SPRING 2022

Location: Parsons Creek Interchange (Hwy 63:12 L1 0.093)
File Number: 32122
Readout: GK 404 SN 364/ VW 2106 Unit 3
Temp (deg C): 18
Read by: NKR/JD

VIBRATING WIRE PIEZOMETER (VW) READINGS

VW#	Date	Reading		Identification	3TM EBA Scaled		Comment
		B Unit	Temp.	Number	Northing	Easting	
HWY 686 Cut Slope							
PZ14-28a	29-May-22	8964.9	3.9	28239	6296436	-27145	
PZ14-29a	29-May-22	8917.8	3.3	28240	6296436	-27145	
PZ14-30a	29-May-22	8757.4	3.2	28241	6296436	-27145	
PZ14-31	29-May-22	No readings	No readings	29840	6296390	-27110	Used both readouts (read Twice)
PZ14-32	29-May-22	No readings	No readings	29847	6296390	-27110	Used both readouts (read Twice)
PZ14-33	29-May-22	8722.2	4.7	29841	6296338	-27090	
PZ14-34	29-May-22	8610	4	21878	6296113	-27056	
PZ14-35	29-May-22	8327	4.3	21879	6296113	-27056	
PZ14-36	29-May-22	7647.1	3.8	28235	6296113	-27056	
PZ14-37	29-May-22	8691	3.8	29842	6296181	-27073	
PZ14-38	29-May-22	8743.1	4.2	29848	6296181	-27073	
PZ14-39	29-May-22	9008.5	3.9	29843	6296236	-27082	
PZ14-40	29-May-22	8488	4.6	18140	6296538	-26935	
PZ14-41	29-May-22	8603.1	3.8	21880	6296538	-26935	
PZ14-42	29-May-22	8858.3	3.4	28244	6296538	-26935	
PZ14-43	29-May-22	8927.2	4.8	29844	6296434	-26914	
PZ14-45	29-May-22	None	None	29845	6296379	-26905	Used both readouts (read Twice)
PZ14-46	29-May-22	8988	3.8	28236	6296077	-26851	
PZ14-47	29-May-22	8662.8	3.4	28237	6296077	-26851	
PZ14-48	29-May-22	9148.4	3.3	28238	6296077	-26851	
PZ14-49	29-May-22	8324.6	4.1	17575	6296200	-26857	
PZ14-50	29-May-22	8656.9	3.9	18817	6296200	-26857	

INSPECTOR REPORT

*No Reading - attempt to read again in Spring 2022

ALBERTA TRANSPORTATION
NORTH CENTRAL REGION - ATHABASCA AND FORT McMURRAY DISTRICTS
INSTRUMENTATION MONITORING FIELD SUMMARY (NC097)
SPRING 2022

Location: Parsons Creek Interchange (Hwy 63:12 L1 0.093)
File Number: 32122

Readout: GK 404 SN 364/ VW 2106 Unit 3
Temp: 18
Read by: NKR/JD

SETTLEMENT CELL READINGS

SC#	Date	Reading		Identification	Monitoring	Datalogger	3TM EBA Scaled		Comment
		B Unit	Temp.	Number	Station	Serial	Northing	Easting	
Parsons Interchange									
SC14-09	29-May-22	7625.3	5.1	1426083	MS-09	4002	6296382	-26336	
SC14-12	29-May-22	7386.5	5.3	1426084	MS-09	4001	6296421	-26343	
SC15-04	29-May-22	7490.4	4.7	1426091	MS-08	3881	6296365	-26435	
SC15-06	29-May-22	7376.6	4.1	1426092	MS-08	3882	6296404	-26442	

INSPECTOR REPORT

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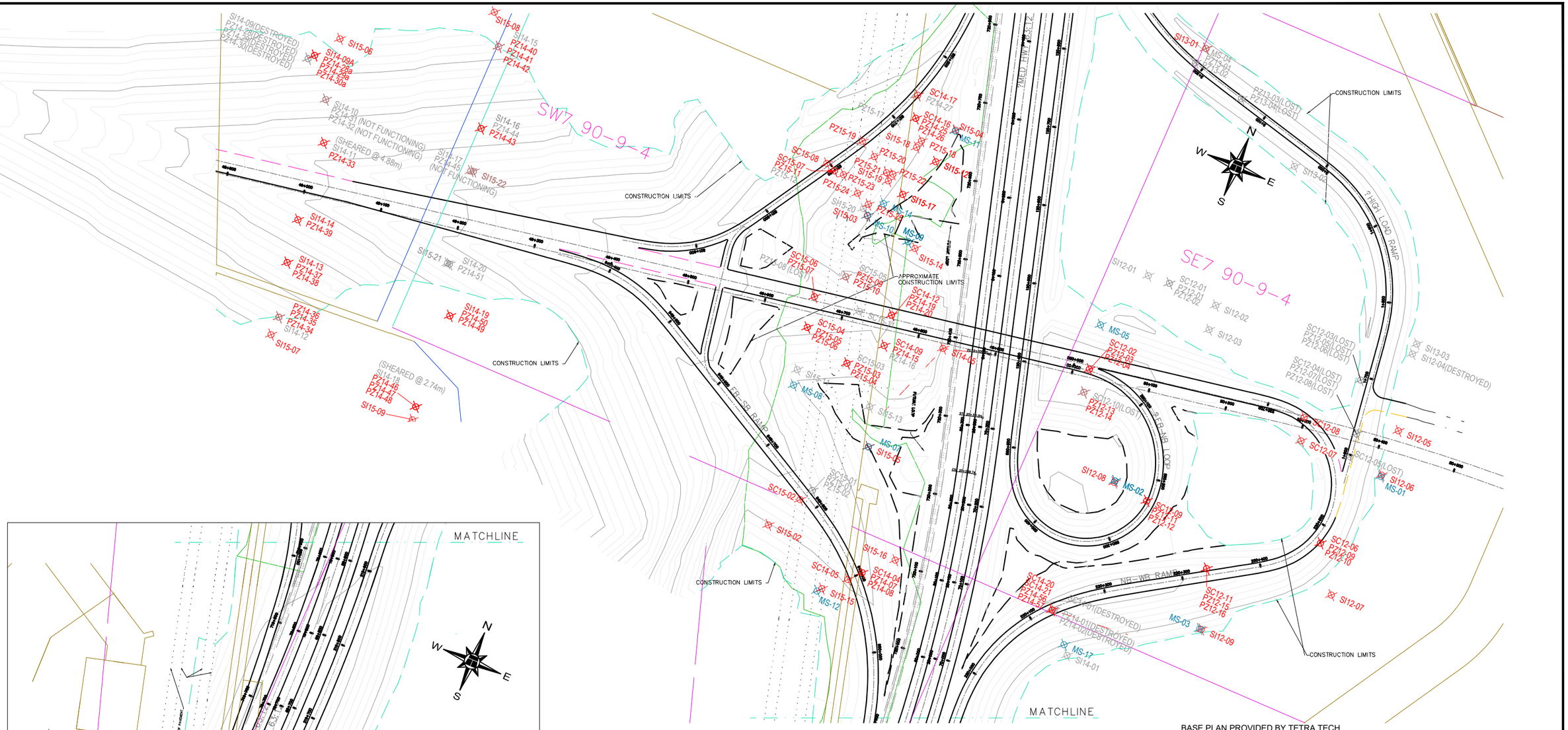


LEGEND

⊠	APPROXIMATE INSTRUMENT LOCATION
SI	STANDPIPE PIEZOMETER
SC	SETTLEMENT CELL
PZ	VIBRATING WIRE PIEZOMETER
MS	MONITORING STATION

0 50 100 150 200 250 300m

SCALE 1:5000

BASE PLAN PROVIDED BY TETRA TECH

Alberta

NORTH CENTRAL
(ATHABASCA AND FORT MCMURRAY DISTRICTS)

NC097: HWY 63:12 PARSONS CREEK INTERCHANGE
SITE PLAN SHOWING INSTRUMENT LOCATIONS

DWG No. 32122-NC097

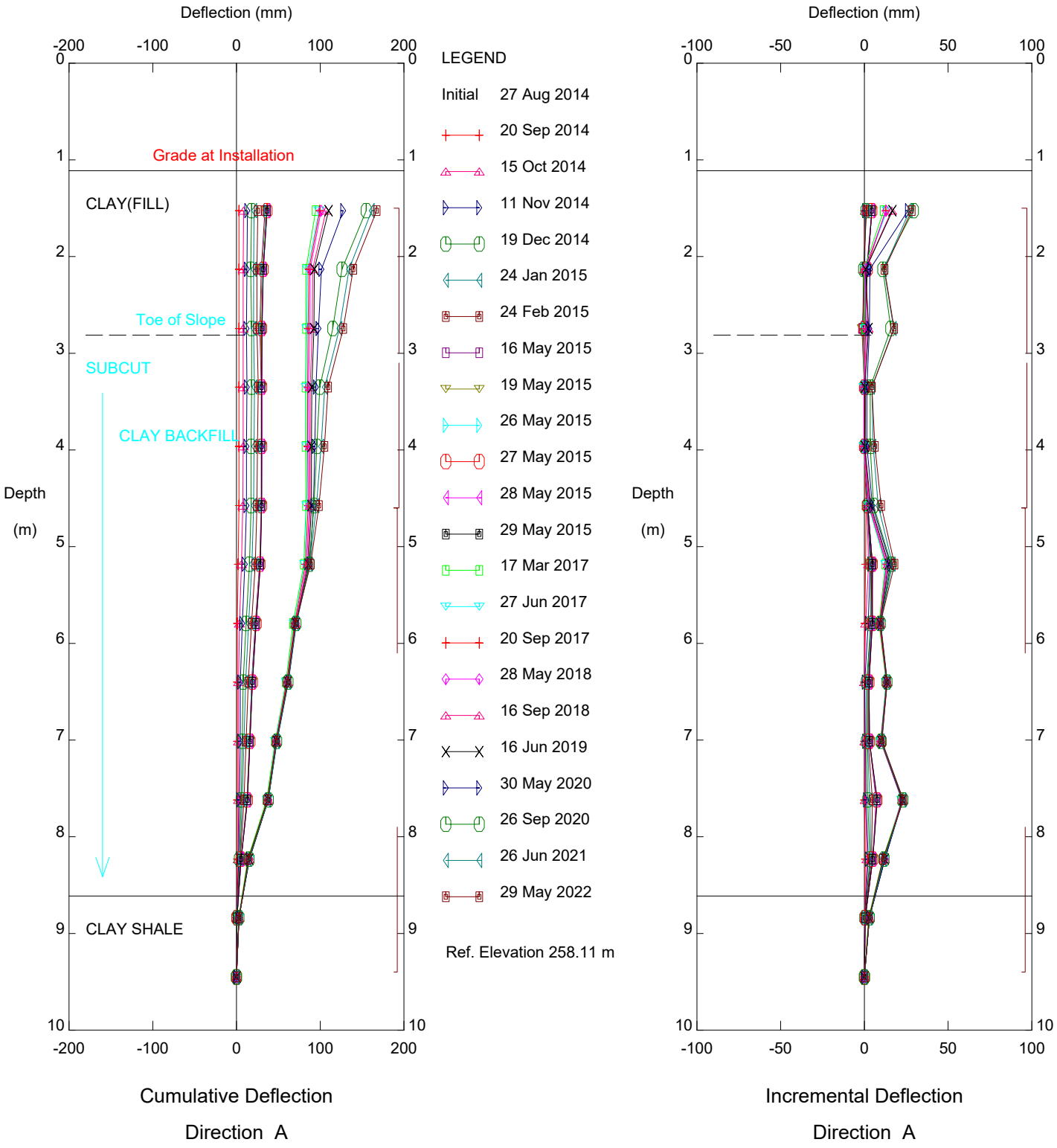
DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	TSA
SCALE	1:5000
DATE	JUNE 2022
FILE No.	32122

THURBER ENGINEERING LTD.

THURBER

Parsons Interchange Instruments

Thurber Engineering Ltd



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

Hwy 686, 49+833.7 o/s +6.6m, Inclinometer SI14-05

Alberta Transportation

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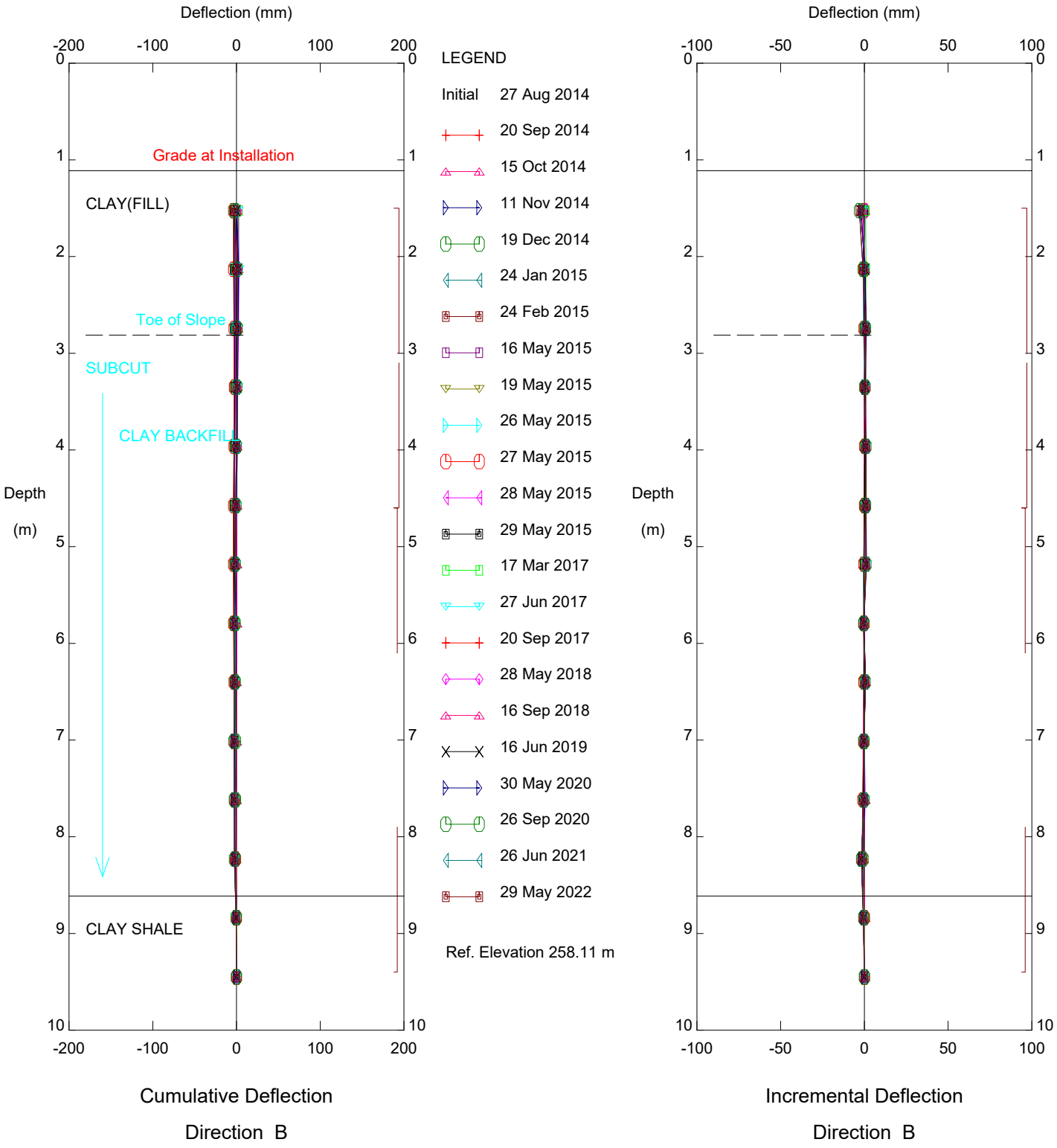
Thurber Engineering Ltd



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

Hwy 686, 49+833.7 o/s +6.6m, Inclinometer SI14-05

Alberta Transportation

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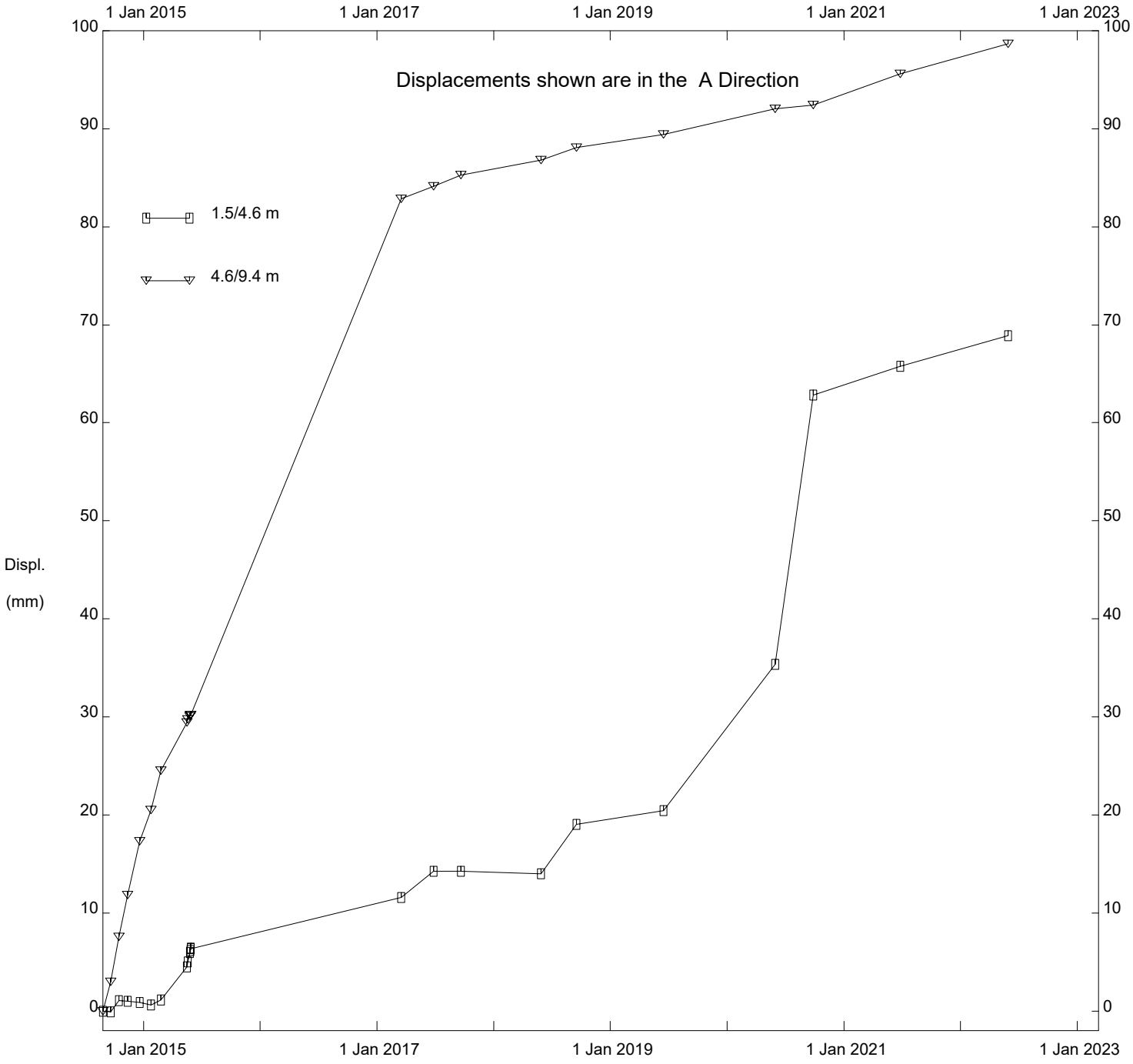
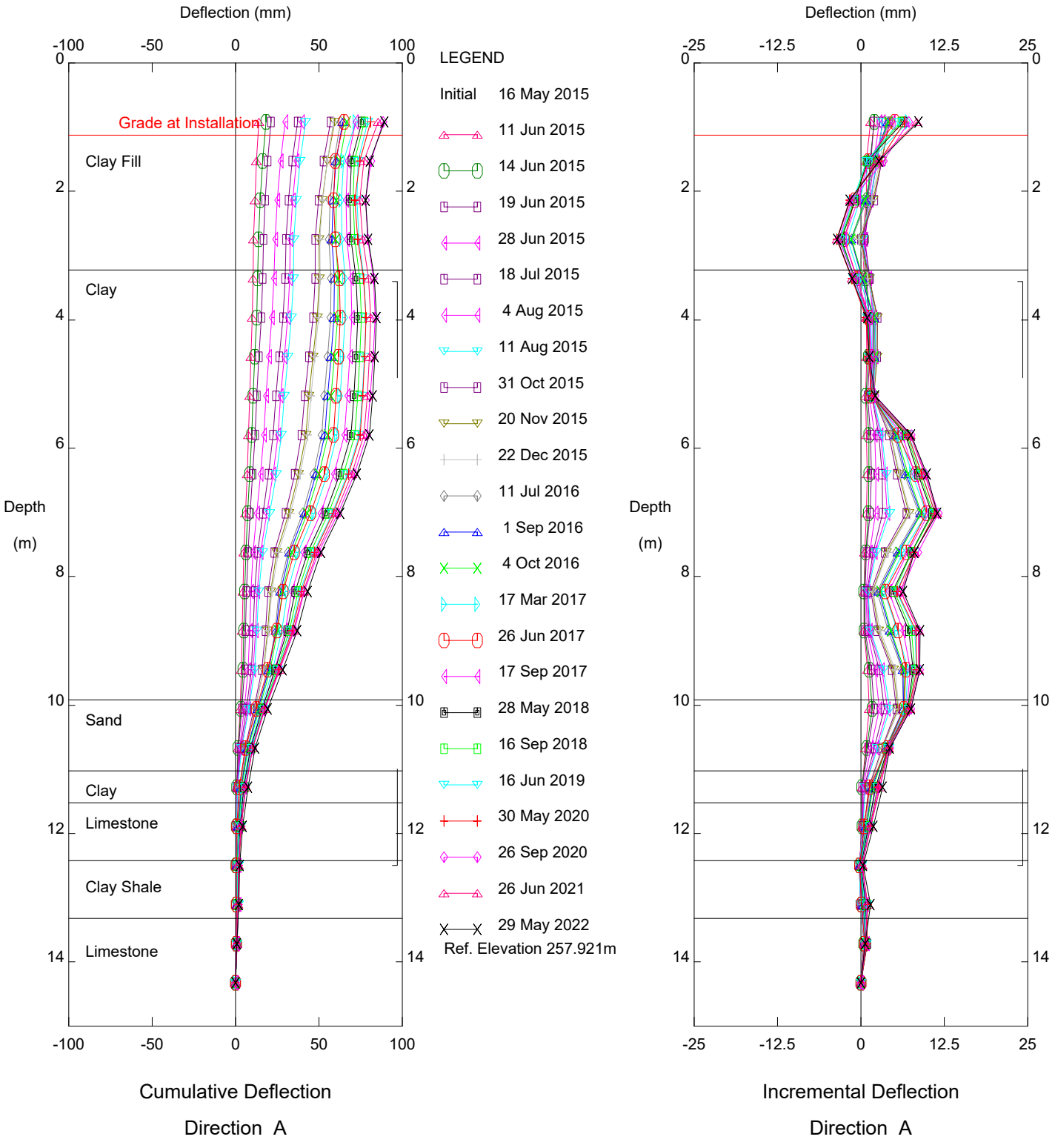
Thurber Engineering Ltd



Hwy 686, 49+833.7 o/s +6.6m, Inclinometer SI14-05

Alberta Transportation

Thurber Engineering Ltd



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

Hwy 686, 49+760 o/s -110m, Inclinometer SI15-14

Alberta Transportation

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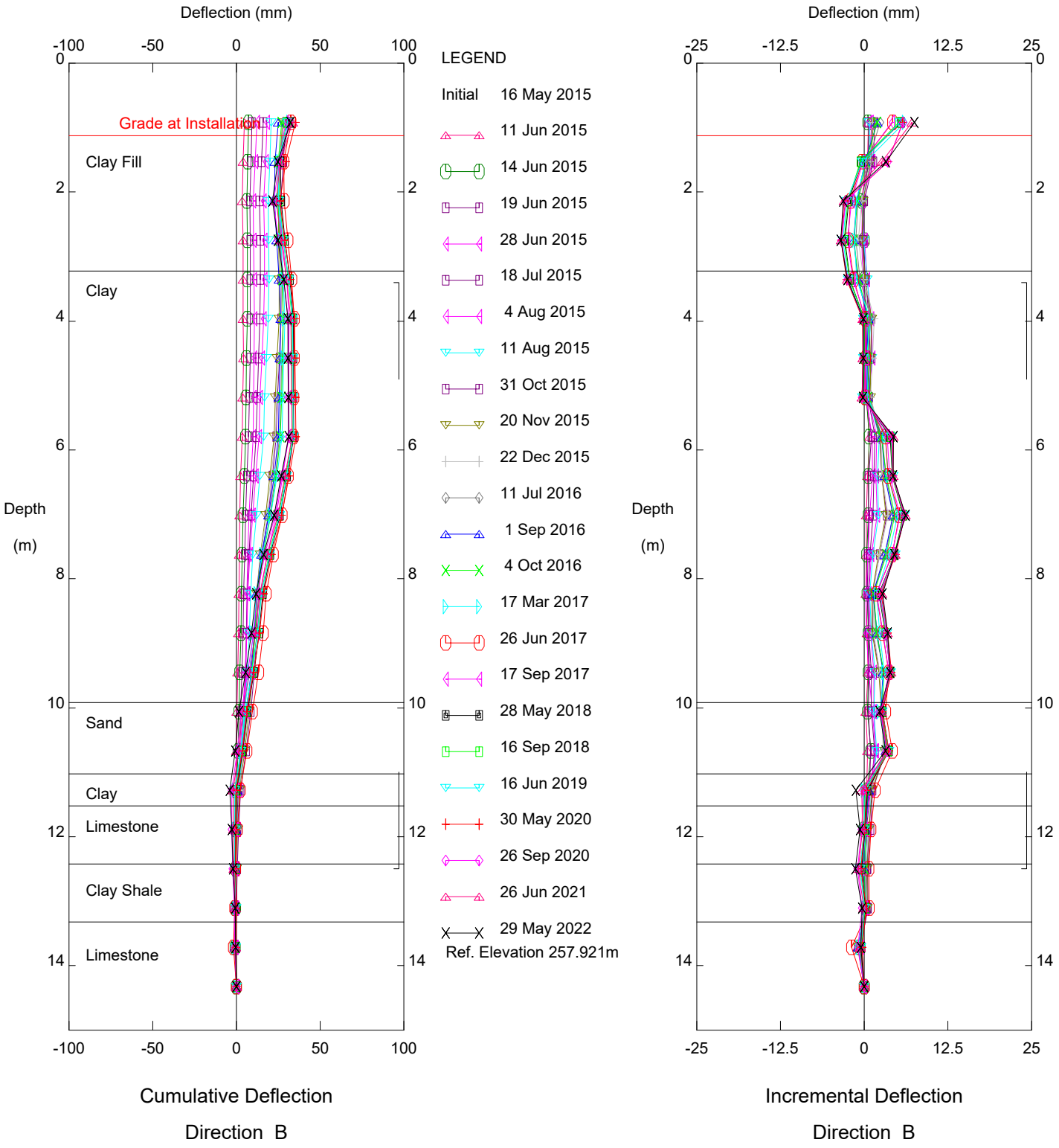

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

Hwy 686, 49+760 o/s -110m, Inclinometer SI15-14

Alberta Transportation

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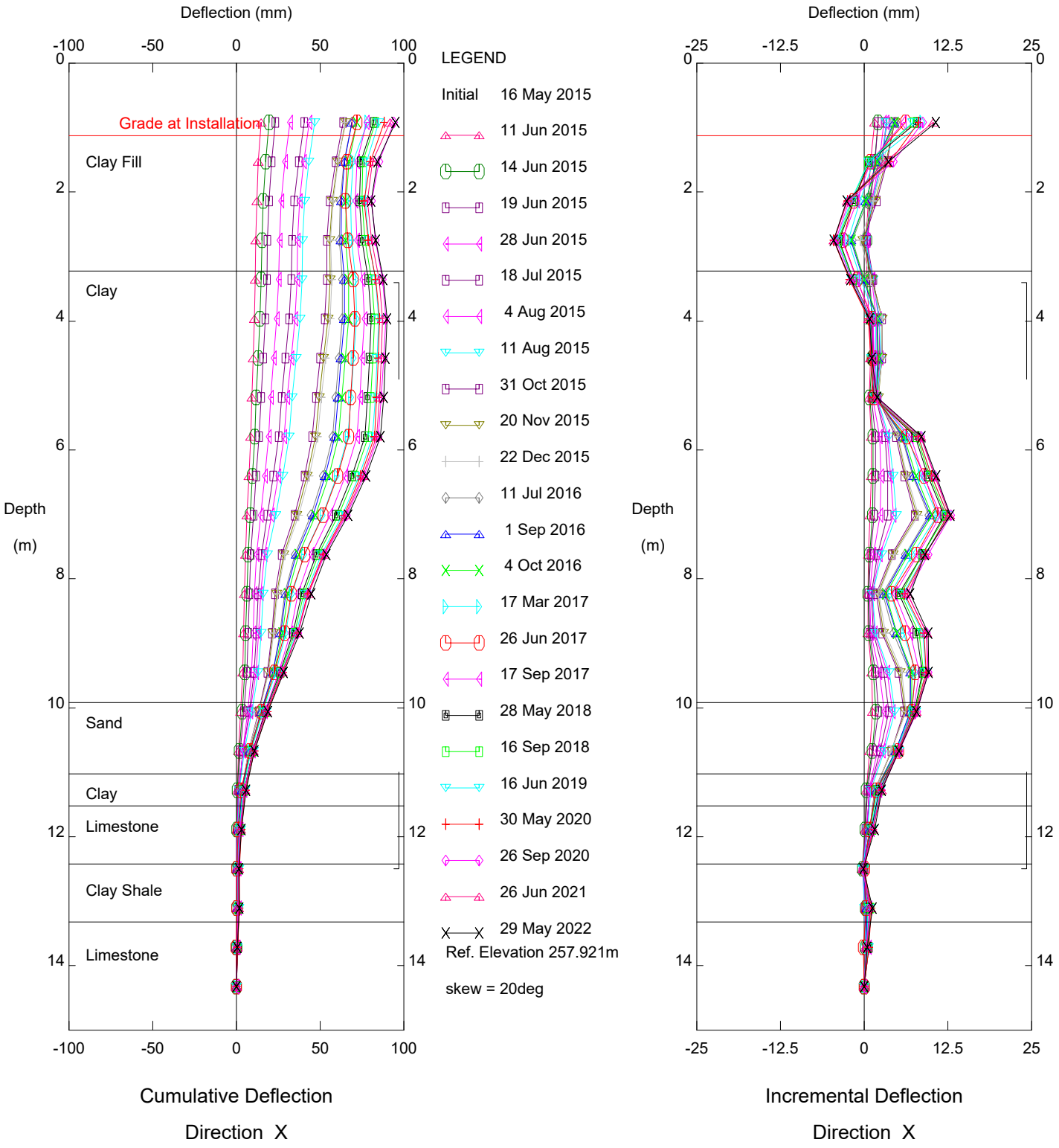

Cumulative Deflection

Direction X

Incremental Deflection

Direction X

Hwy 686, 49+760 o/s -110m, Inclinometer SI15-14

Alberta Transportation

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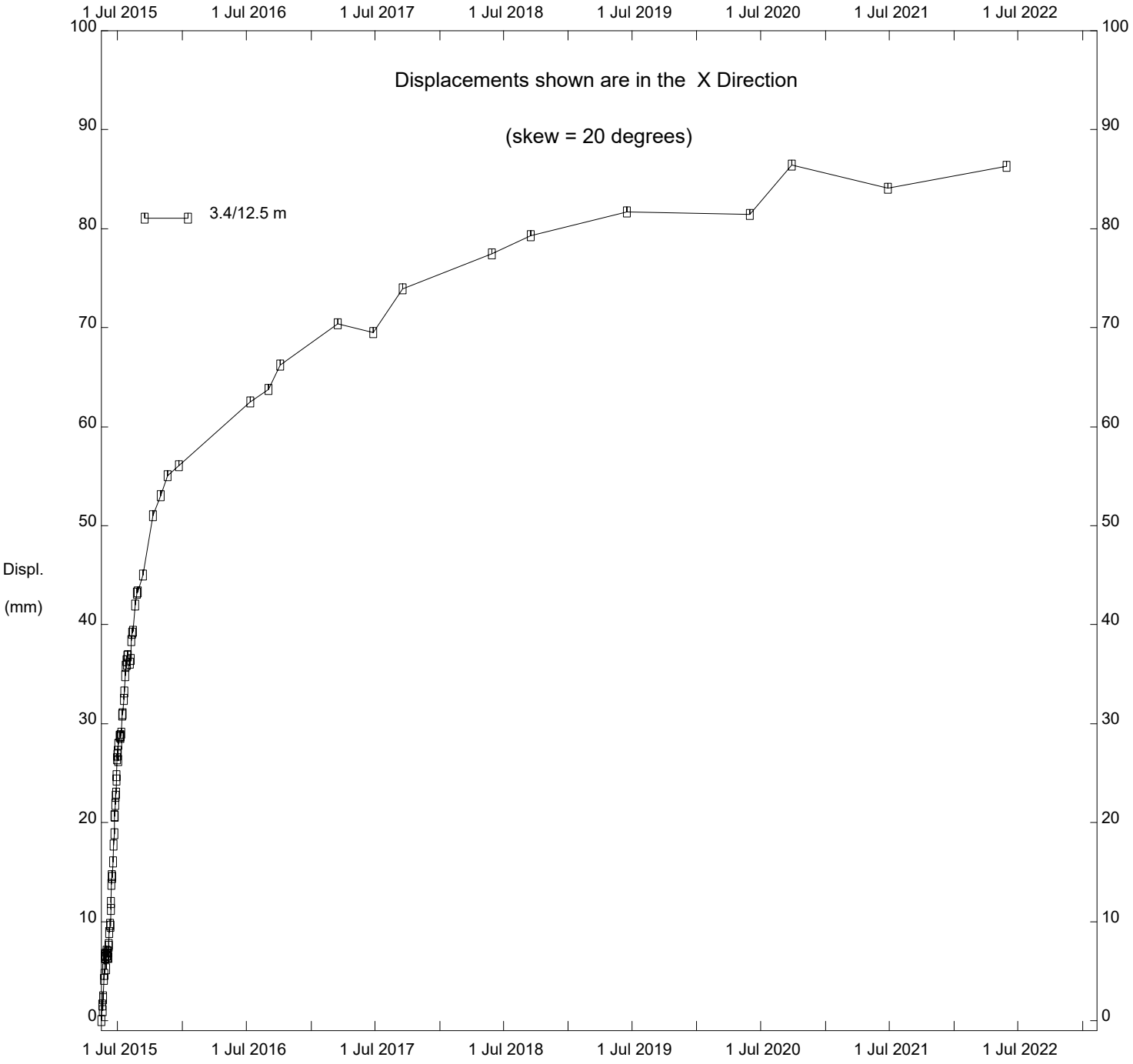
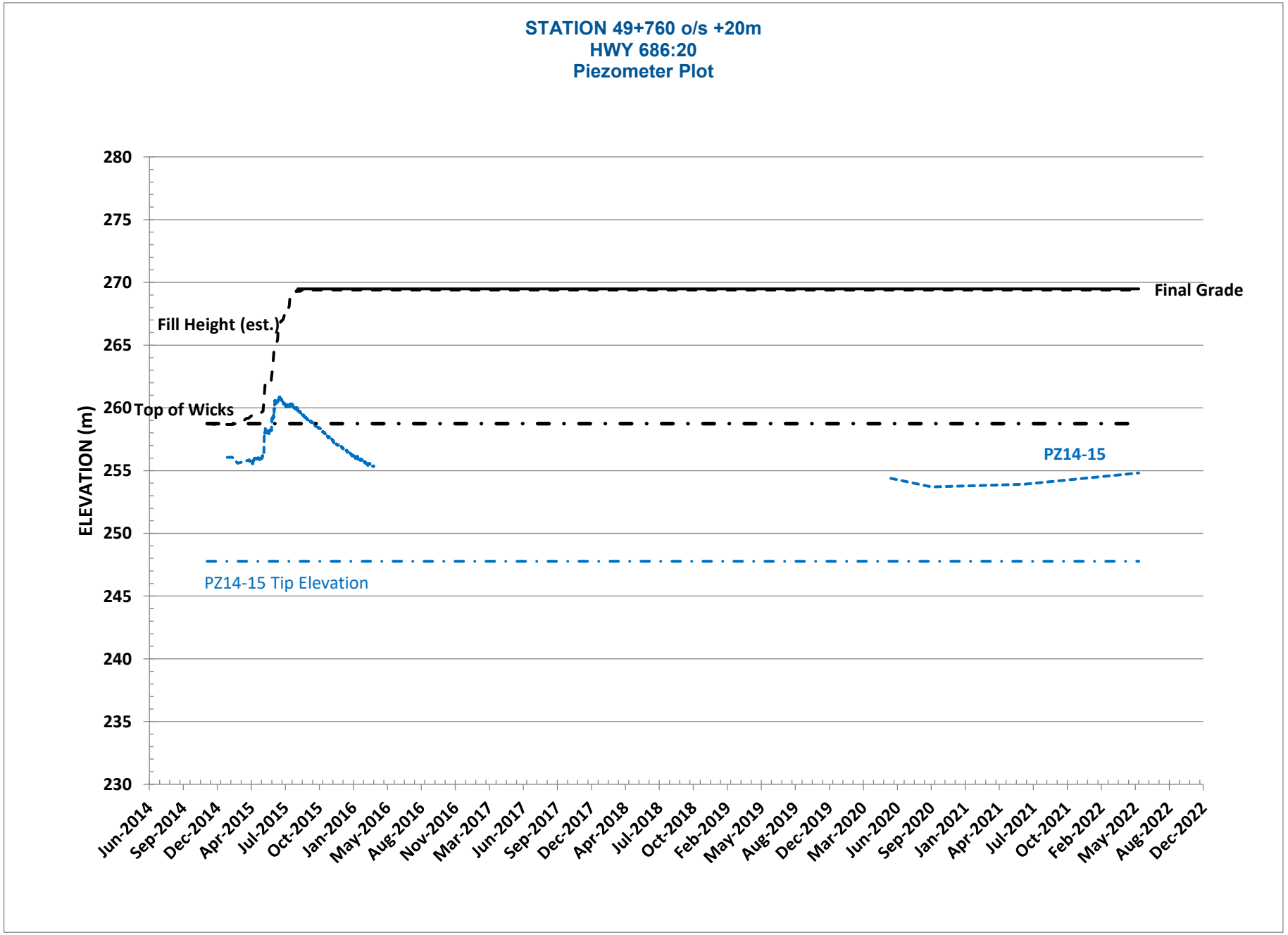
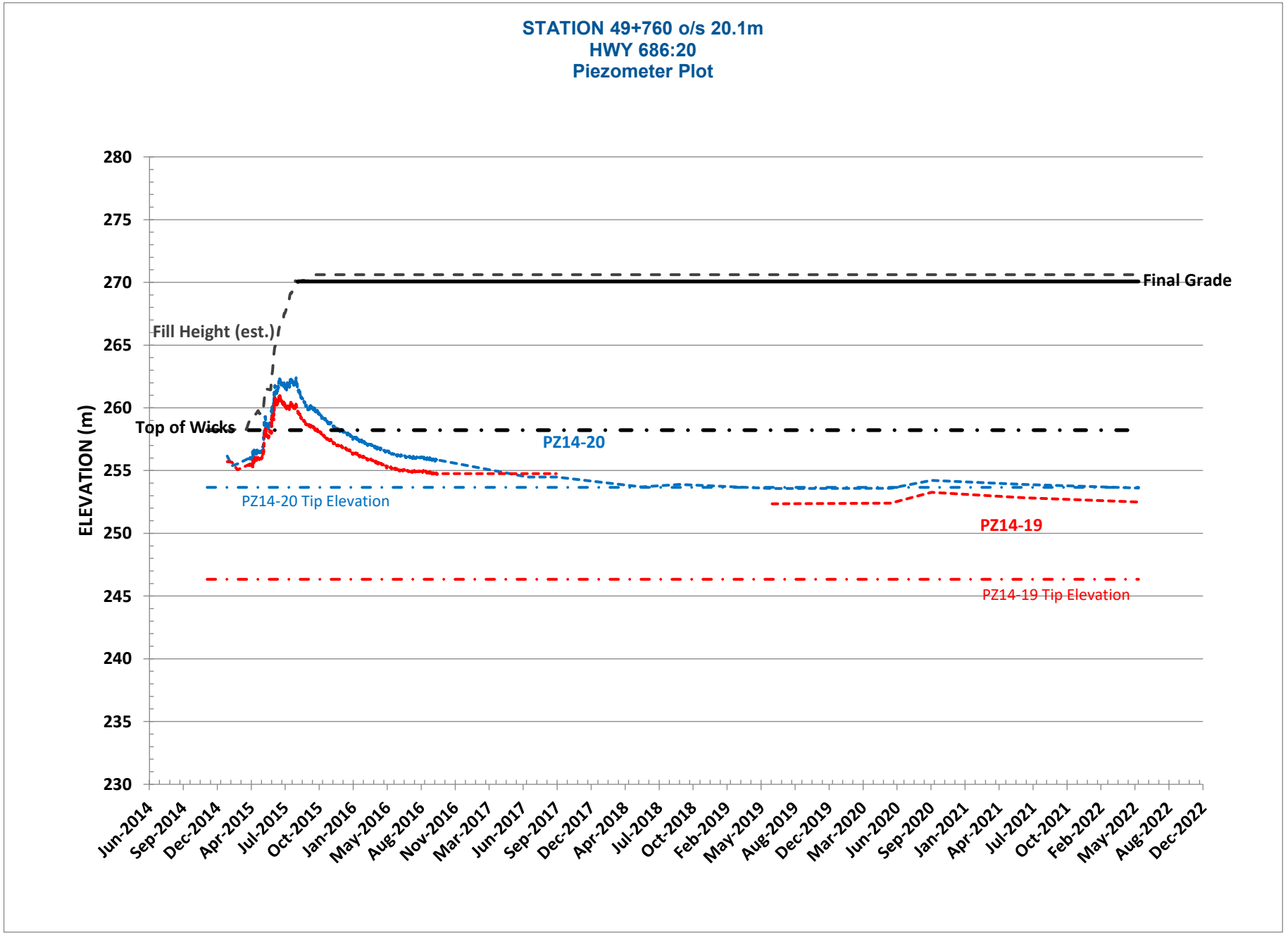


Hwy 686, 49+760 o/s -110m, Inclinometer SI15-14

Alberta Transportation


STATION 49+760 o/s +20m
HWY 686:20
Piezometer Plot
ELEVATION (m)
280
275
270
265
260
255
250
245
240
235
230
Final Grade
Fill Height (est.)
Top of Wicks
PZ14-15
PZ14-15 Tip Elevation
Jun-2014
Sep-2014
Dec-2014
Apr-2015
Jul-2015
Oct-2015
Jan-2016
May-2016
Aug-2016
Nov-2016
Mar-2017
Jun-2017
Sep-2017
Dec-2017
Apr-2018
Jul-2018
Oct-2018
Feb-2019
May-2019
Aug-2019
Dec-2019
Mar-2020
Jun-2020
Sep-2020
Jan-2021
Apr-2021
Jul-2021
Oct-2021
Feb-2022
May-2022
Aug-2022
Dec-2022


STATION 49+760 o/s 20.1m
HWY 686:20
Piezometer Plot
ELEVATION (m)
280
275
270
265
260
255
250
245
240
235
230
Final Grade
Fill Height (est.)
Top of Wicks
PZ14-20
PZ14-20 Tip Elevation
PZ14-19
PZ14-19 Tip Elevation
Jun-2014
Sep-2014
Dec-2014
Apr-2015
Jul-2015
Oct-2015
Jan-2016
May-2016
Aug-2016
Nov-2016
Mar-2017
Jun-2017
Sep-2017
Dec-2017
Apr-2018
Jul-2018
Oct-2018
Feb-2019
May-2019
Aug-2019
Dec-2019
Mar-2020
Jun-2020
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Jul-2021
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May-2022
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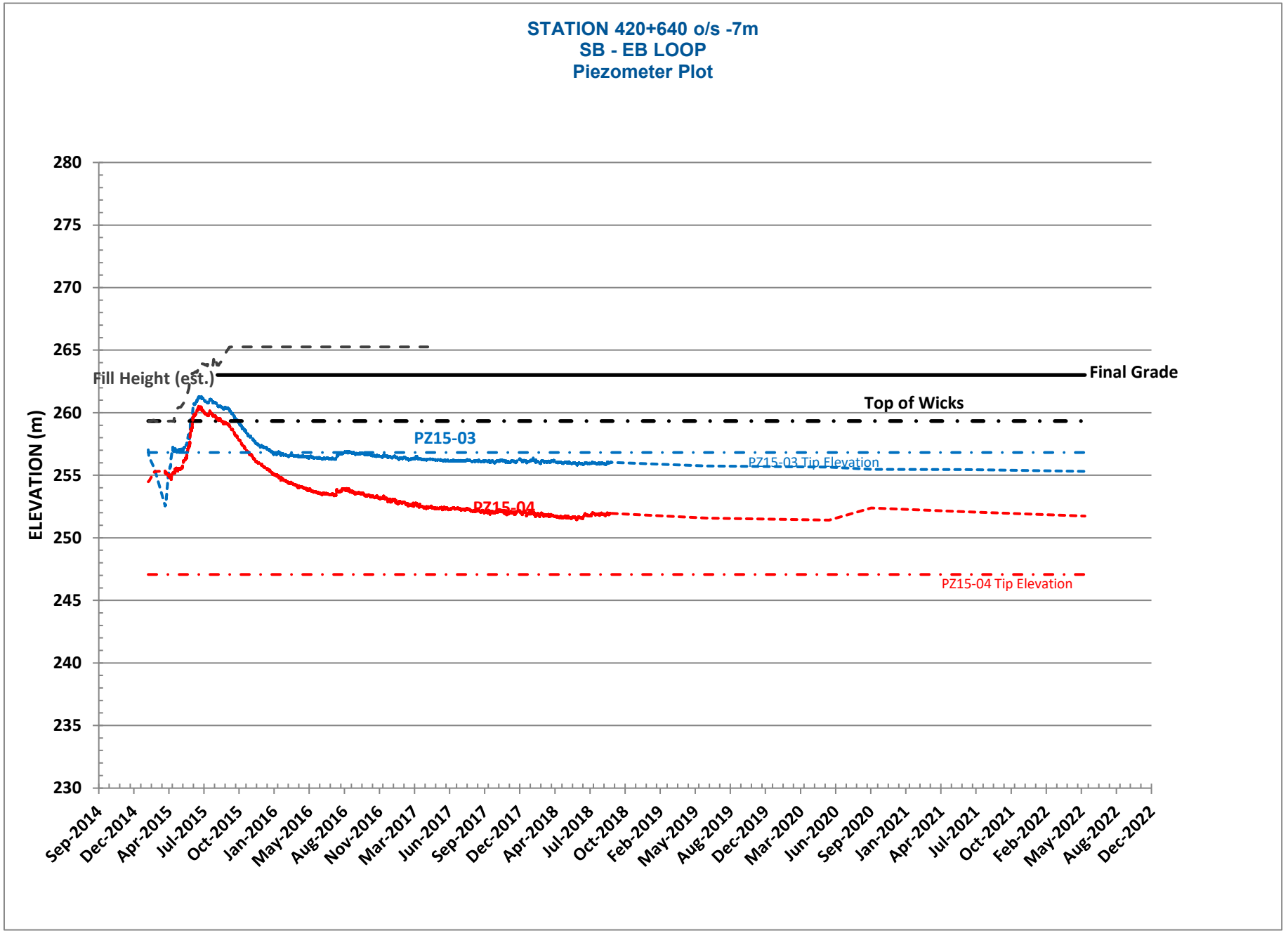
Dec-2022


STATION 420+640 o/s -7m
SB - EB LOOP
Piezometer Plot
ELEVATION (m)
280
275
270
265
260
255
250
245
240
235
230
Fill Height (est.)
Final Grade
Top of Wicks
PZ15-03
PZ15-03 Tip Elevation
PZ15-04
PZ15-04 Tip Elevation
Sep-2014
Dec-2014
Apr-2015
Jul-2015
Oct-2015
Jan-2016
May-2016
Aug-2016
Nov-2016
Mar-2017
Jun-2017
Sep-2017
Dec-2017
Apr-2018
Jul-2018
Oct-2018
Feb-2019
May-2019
Aug-2019
Dec-2019
Mar-2020
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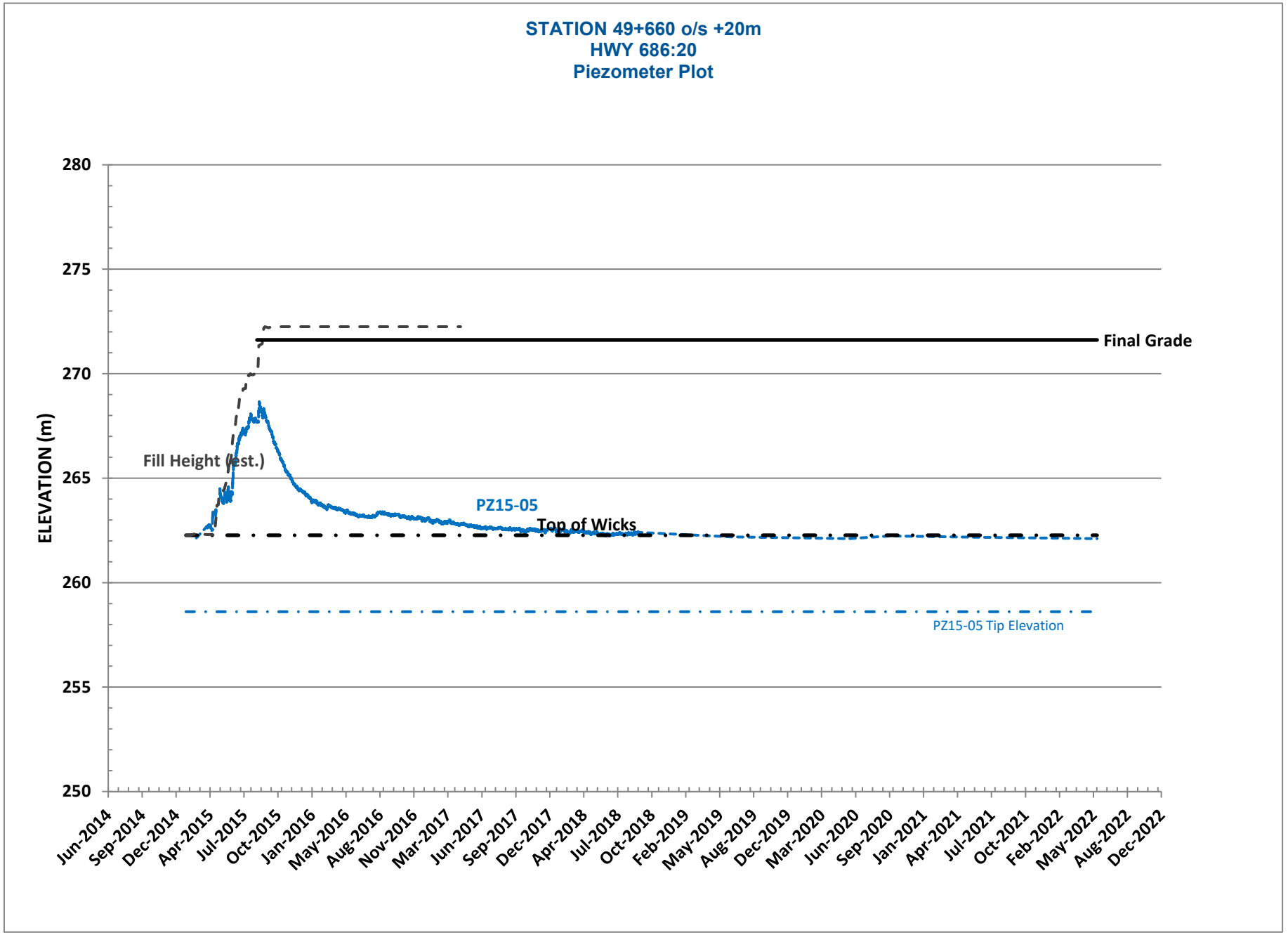
Feb-2022
May-2022
Aug-2022
Dec-2022


STATION 49+660 o/s +20m
HWY 686:20
Piezometer Plot
ELEVATION (m)
280
275
270
265
260
255
250
Final Grade
Fill Height (est.)
PZ15-05
Top of Wicks
PZ15-05 Tip Elevation
Jun-2014
Sep-2014
Dec-2014
Apr-2015
Jul-2015
Oct-2015
Jan-2016
May-2016
Aug-2016
Nov-2016
Mar-2017
Jun-2017
Sep-2017
Dec-2017
Apr-2018
Jul-2018
Oct-2018
Feb-2019
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Aug-2019
Dec-2019
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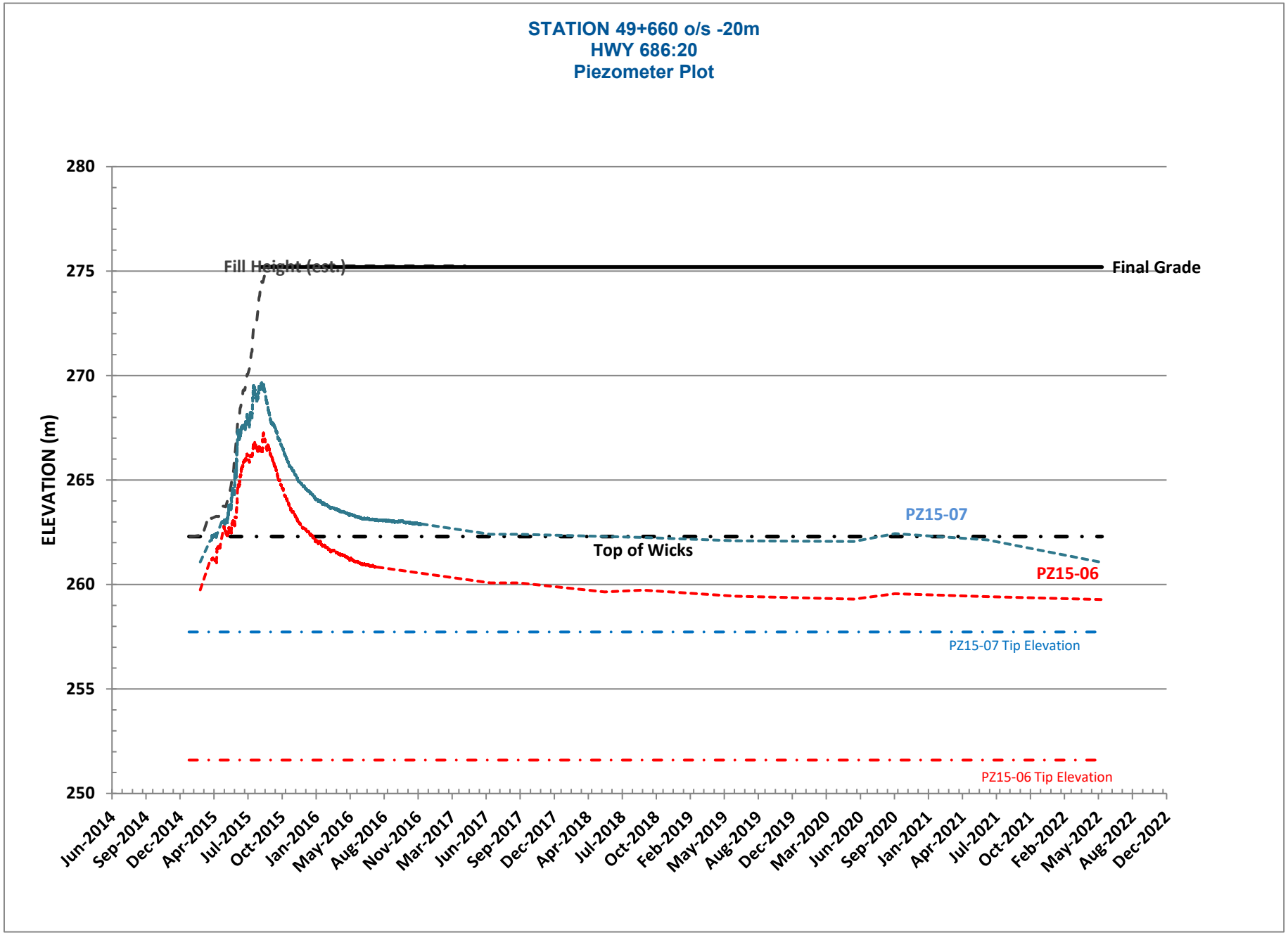
Aug-2022
Dec-2022


STATION 49+660 o/s -20m
HWY 686:20
Piezometer Plot
ELEVATION (m)
280
275
270
265
260
255
250
Fill Height (est.)
Final Grade
PZ15-07
Top of Wicks
PZ15-06
PZ15-07 Tip Elevation
PZ15-06 Tip Elevation
Jun-2014
Sep-2014
Dec-2014
Apr-2015
Jul-2015
Oct-2015
Jan-2016
May-2016
Aug-2016
Nov-2016
Mar-2017
Jun-2017
Sep-2017
Dec-2017
Apr-2018
Jul-2018
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May-2019
Aug-2019
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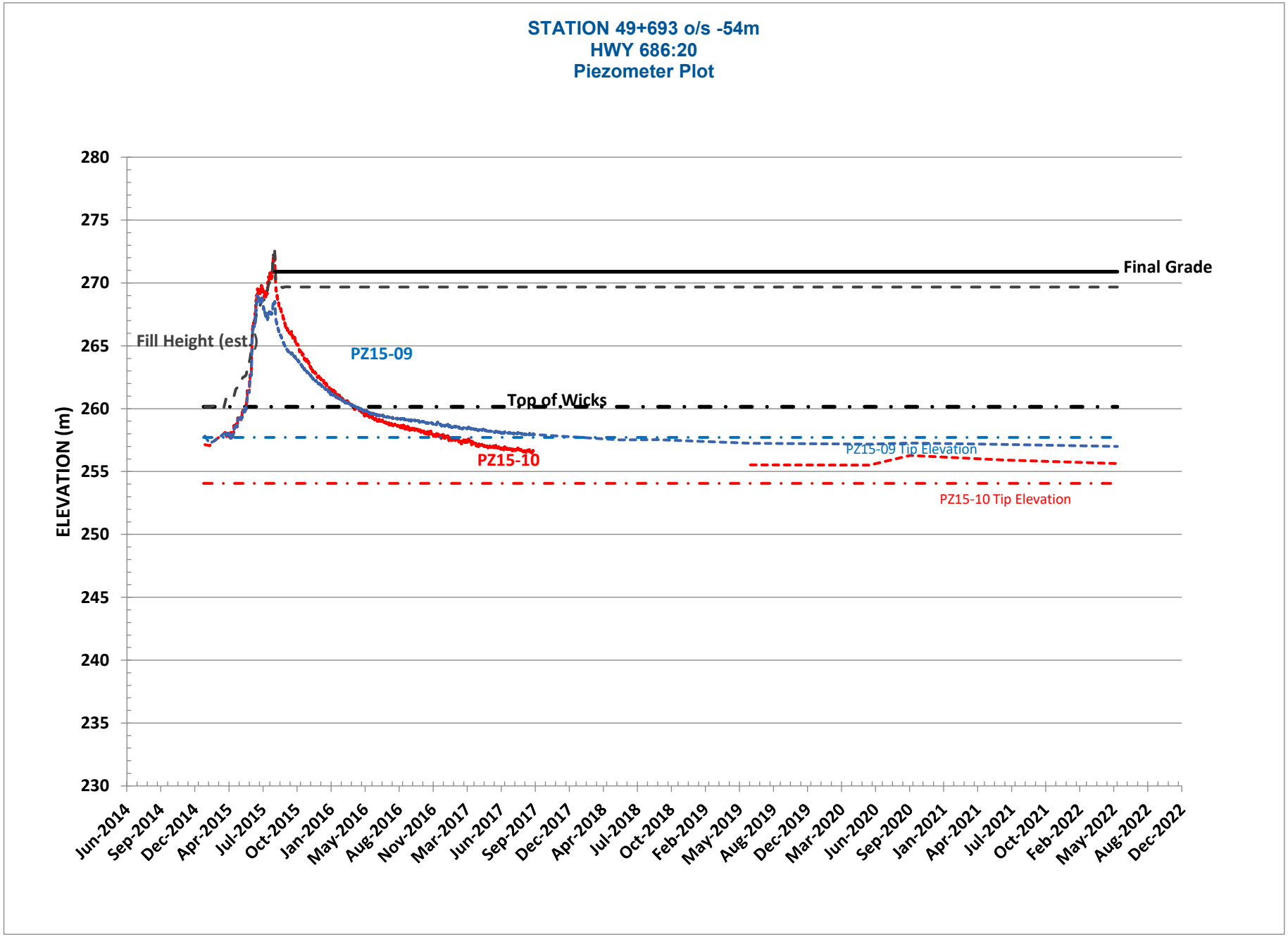
Dec-2022


STATION 49+693 o/s -54m
HWY 686:20
Piezometer Plot
ELEVATION (m)
280
275
270
265
260
255
250
245
240
235
230
Final Grade
Fill Height (est.)
PZ15-09
Top of Wicks
PZ15-10
PZ15-09 Tip Elevation
PZ15-10 Tip Elevation
Jun-2014
Sep-2014
Dec-2014
Apr-2015
Jul-2015
Oct-2015
Jan-2016
May-2016
Aug-2016
Nov-2016
Mar-2017
Jun-2017
Sep-2017
Dec-2017
Apr-2018
Jul-2018
Oct-2018
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May-2019
Aug-2019
Dec-2019
Mar-2020
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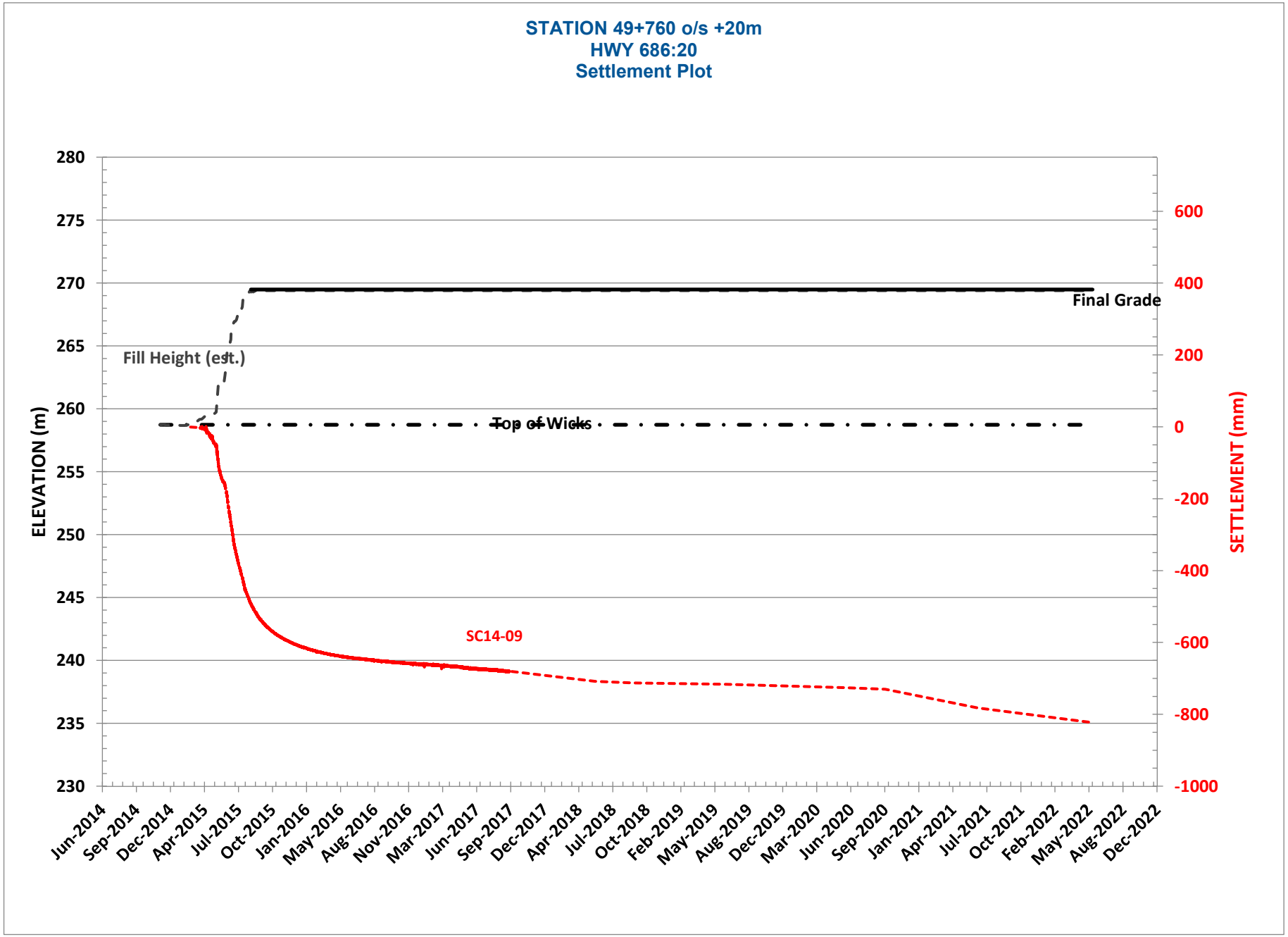
Dec-2022


STATION 49+760 o/s +20m
HWY 686:20
Settlement Plot
ELEVATION (m)
SETTLEMENT (mm)
280
275
270
265
260
255
250
245
240
235
230
600
400
200
0
-200
-400
-600
-800
-1000
Final Grade
Fill Height (est.)
Top of Wicks
SC14-09
Jun-2014
Sep-2014
Dec-2014
Apr-2015
Jul-2015
Oct-2015
Jan-2016
May-2016
Aug-2016
Nov-2016
Mar-2017
Jun-2017
Sep-2017
Dec-2017
Apr-2018
Jul-2018
Oct-2018
Feb-2019
May-2019
Aug-2019
Dec-2019
Mar-2020
Jun-2020
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Jan-2021
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Jul-2021
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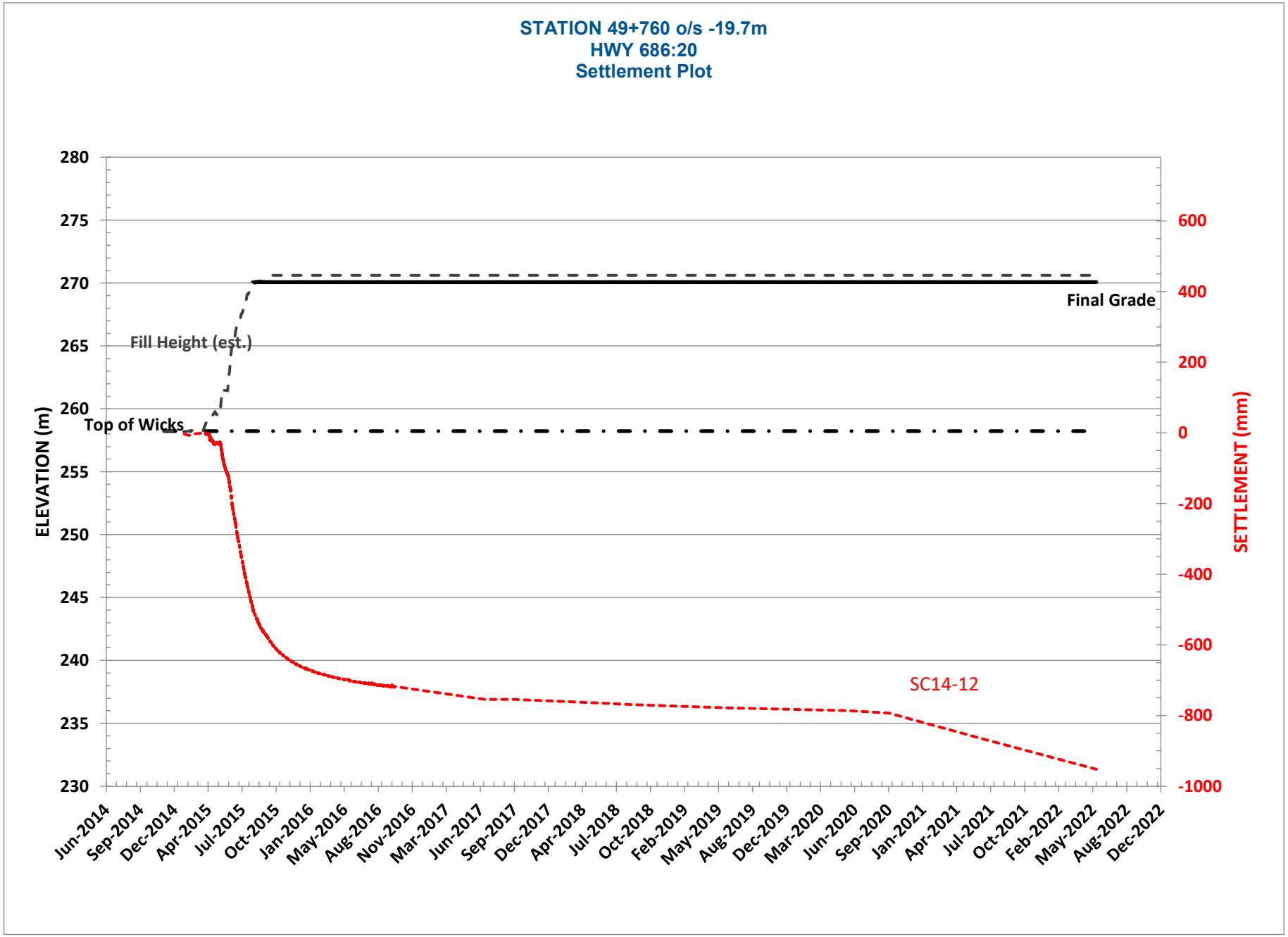
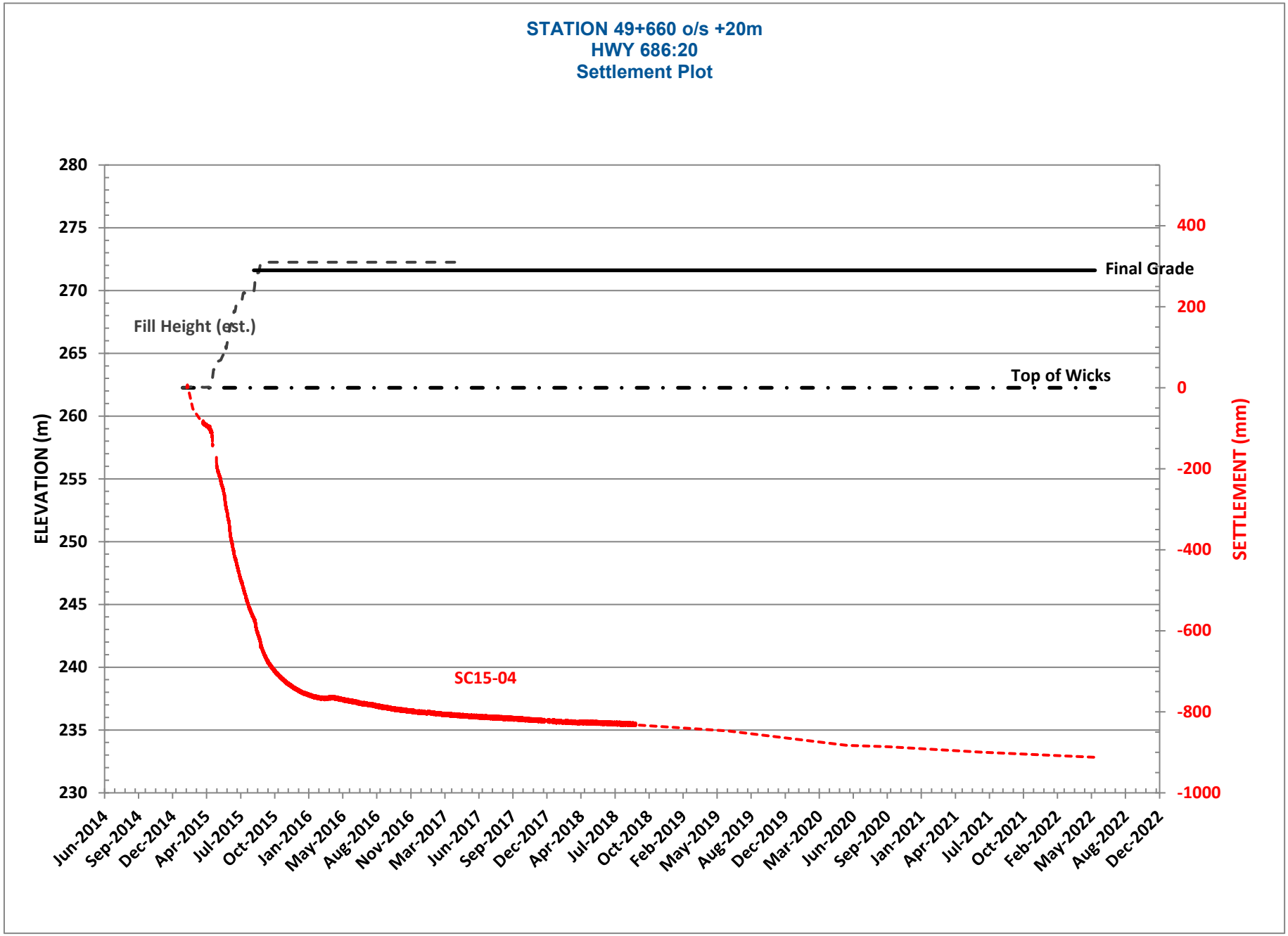
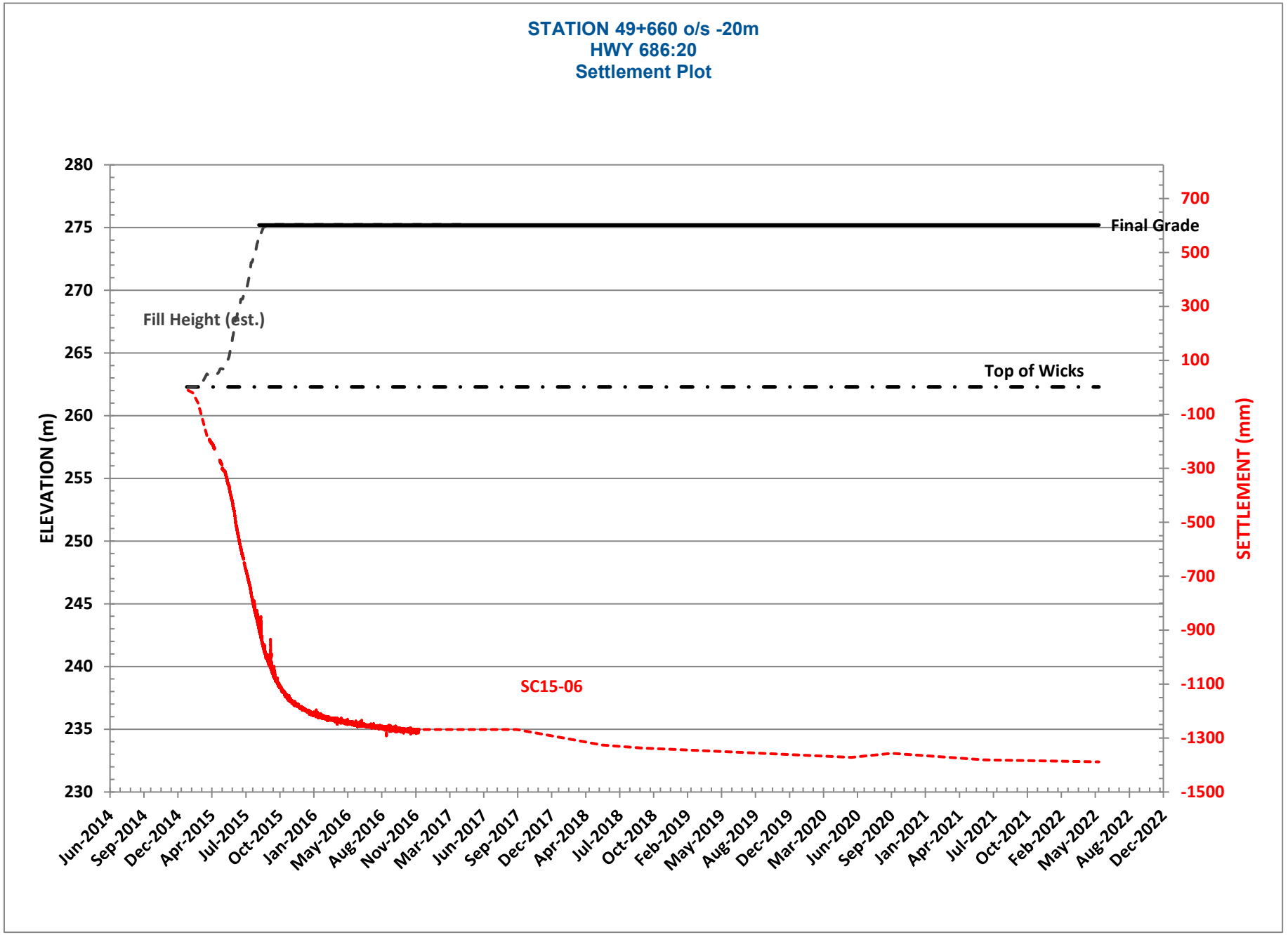
Feb-2022
May-2022
Aug-2022
Dec-2022


STATION 49+760 o/s -19.7m
HWY 686:20
Settlement Plot
ELEVATION (m)
SETTLEMENT (mm)
280
275
270
265
260
255
250
245
240
235
230
600
400
200
0
-200
-400
-600
-800
-1000
Final Grade
Fill Height (est.)
Top of Wicks
SC14-12
Jun-2014
Sep-2014
Dec-2014
Apr-2015
Jul-2015
Oct-2015
Jan-2016
May-2016
Aug-2016
Nov-2016
Mar-2017
Jun-2017
Sep-2017
Dec-2017
Apr-2018
Jul-2018
Oct-2018
Feb-2019
May-2019
Aug-2019
Dec-2019
Mar-2020
Jun-2020
Sep-2020
Jan-2021
Apr-2021
Jul-2021
Oct-2021
Feb-2022
May-2022
Aug-2022
Dec-2022

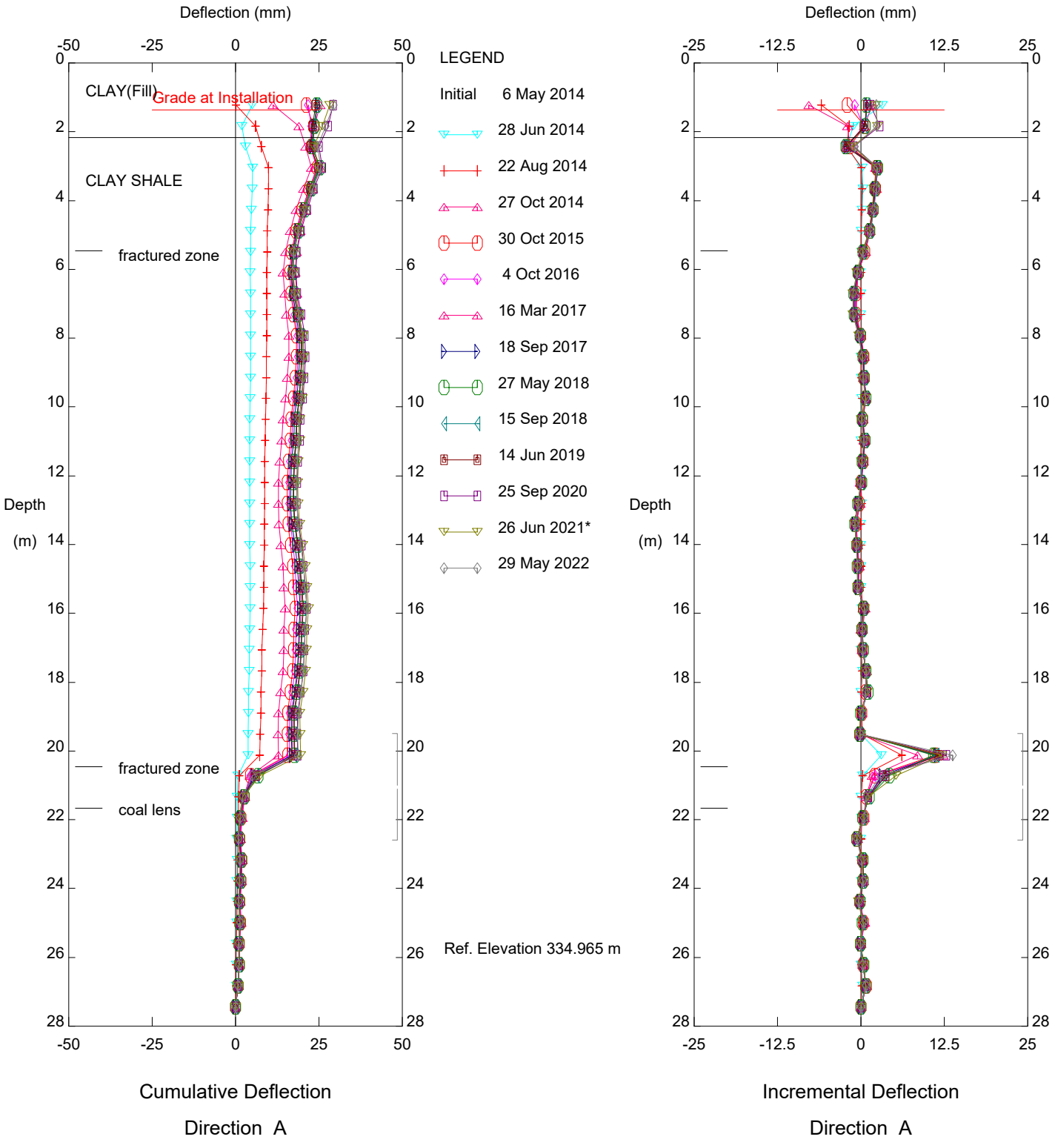

STATION 49+660 o/s +20m
HWY 686:20
Settlement Plot
ELEVATION (m)
SETTLEMENT (mm)
280
275
270
265
260
255
250
245
240
235
230
400
200
0
-200
-400
-600
-800
-1000
Final Grade
Top of Wicks
Fill Height (est.)
SC15-04
Jun-2014
Sep-2014
Dec-2014
Apr-2015
Jul-2015
Oct-2015
Jan-2016
May-2016
Aug-2016
Nov-2016
Mar-2017
Jun-2017
Sep-2017
Dec-2017
Apr-2018
Jul-2018
Oct-2018
Feb-2019
May-2019
Aug-2019
Dec-2019
Mar-2020
Jun-2020
Sep-2020
Jan-2021
Apr-2021
Jul-2021
Oct-2021
Feb-2022
May-2022
Aug-2022
Dec-2022


STATION 49+660 o/s -20m
HWY 686:20
Settlement Plot
ELEVATION (m)
SETTLEMENT (mm)
280
275
270
265
260
255
250
245
240
235
230
700
500
300
100
-100
-300
-500
-700
-900
-1100
-1300
-1500
Final Grade
Fill Height (est.)
Top of Wicks
SC15-06
Jun-2014
Sep-2014
Dec-2014
Apr-2015
Jul-2015
Oct-2015
Jan-2016
May-2016
Aug-2016
Nov-2016
Mar-2017
Jun-2017
Sep-2017
Dec-2017
Apr-2018
Jul-2018
Oct-2018
Feb-2019
May-2019
Aug-2019
Dec-2019
Mar-2020
Jun-2020
Sep-2020
Jan-2021
Apr-2021
Jul-2021
Oct-2021
Feb-2022
May-2022
Aug-2022
Dec-2022

THURBER

HWY 686 Cut Slope Instruments

Thurber Engineering Ltd



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

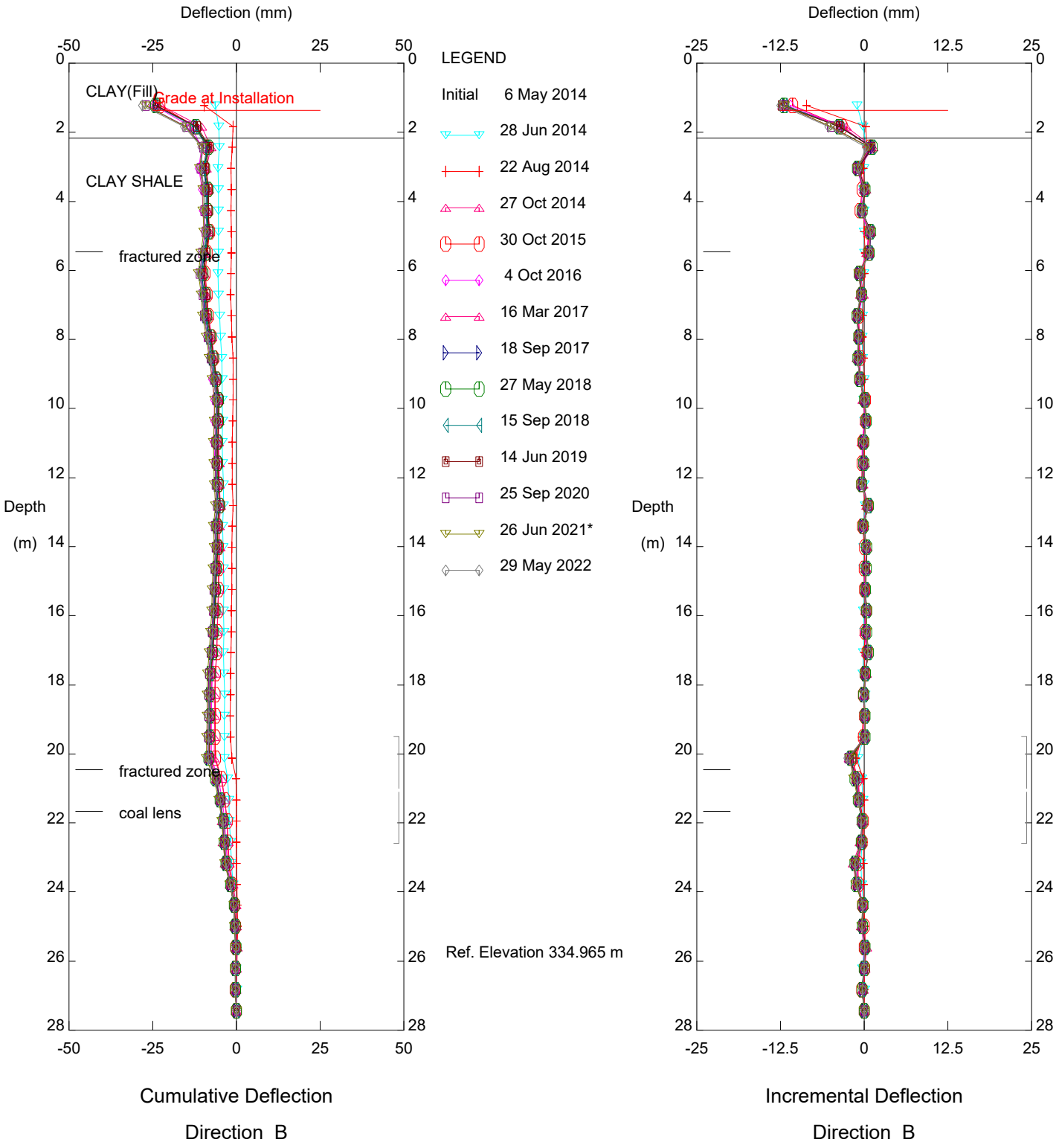
HWY 686, 48+973 o/s -173m, Inclinometer SI14-09A

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2022A-Spring\SI Readings\NC97\SI14-09a.gtl

Thurber Engineering Ltd



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

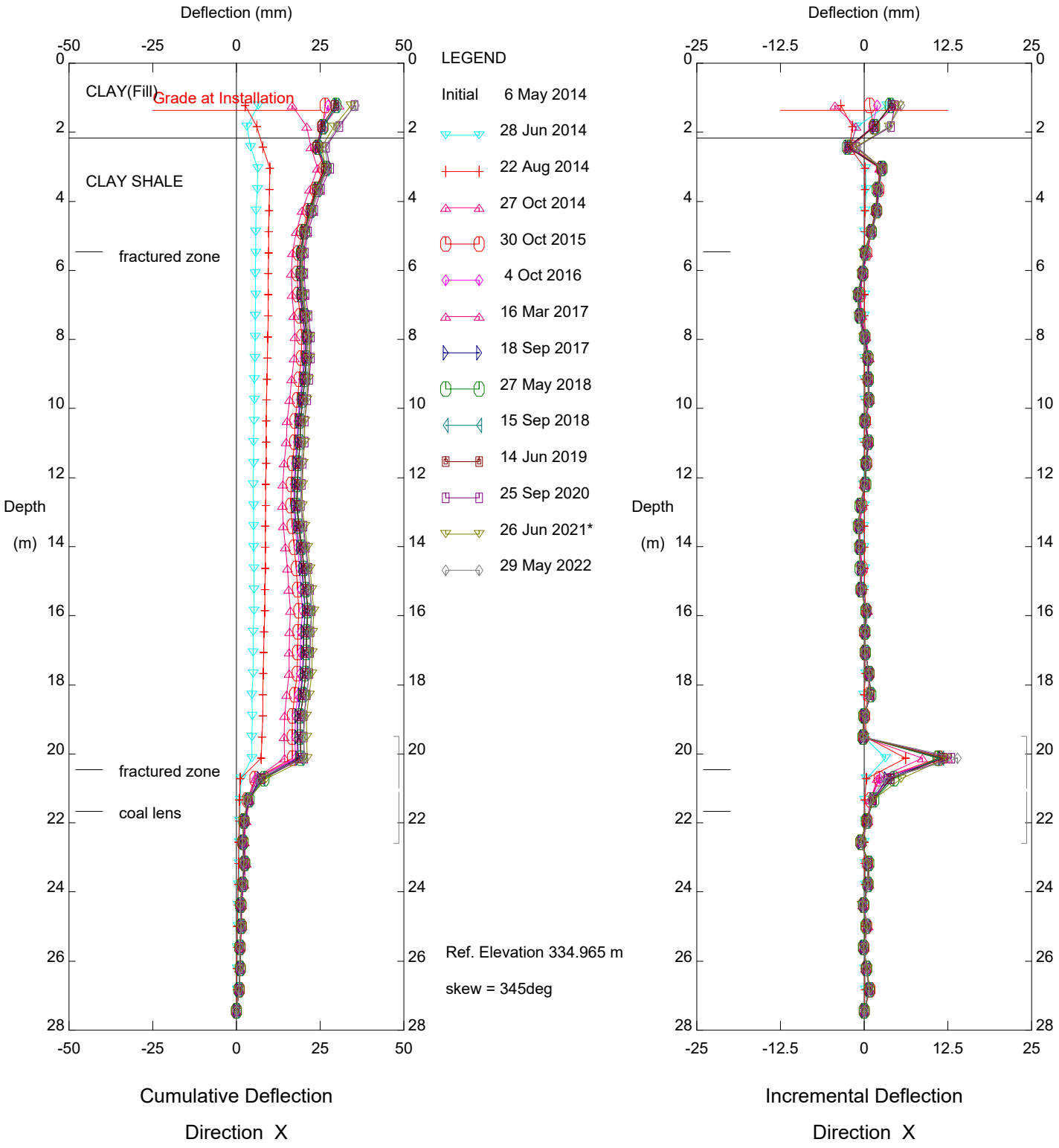
HWY 686, 48+973 o/s -173m, Inclinometer SI14-09A

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2022A-Spring\SI Readings\NC97\SI14-09a.gtl

Thurber Engineering Ltd



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

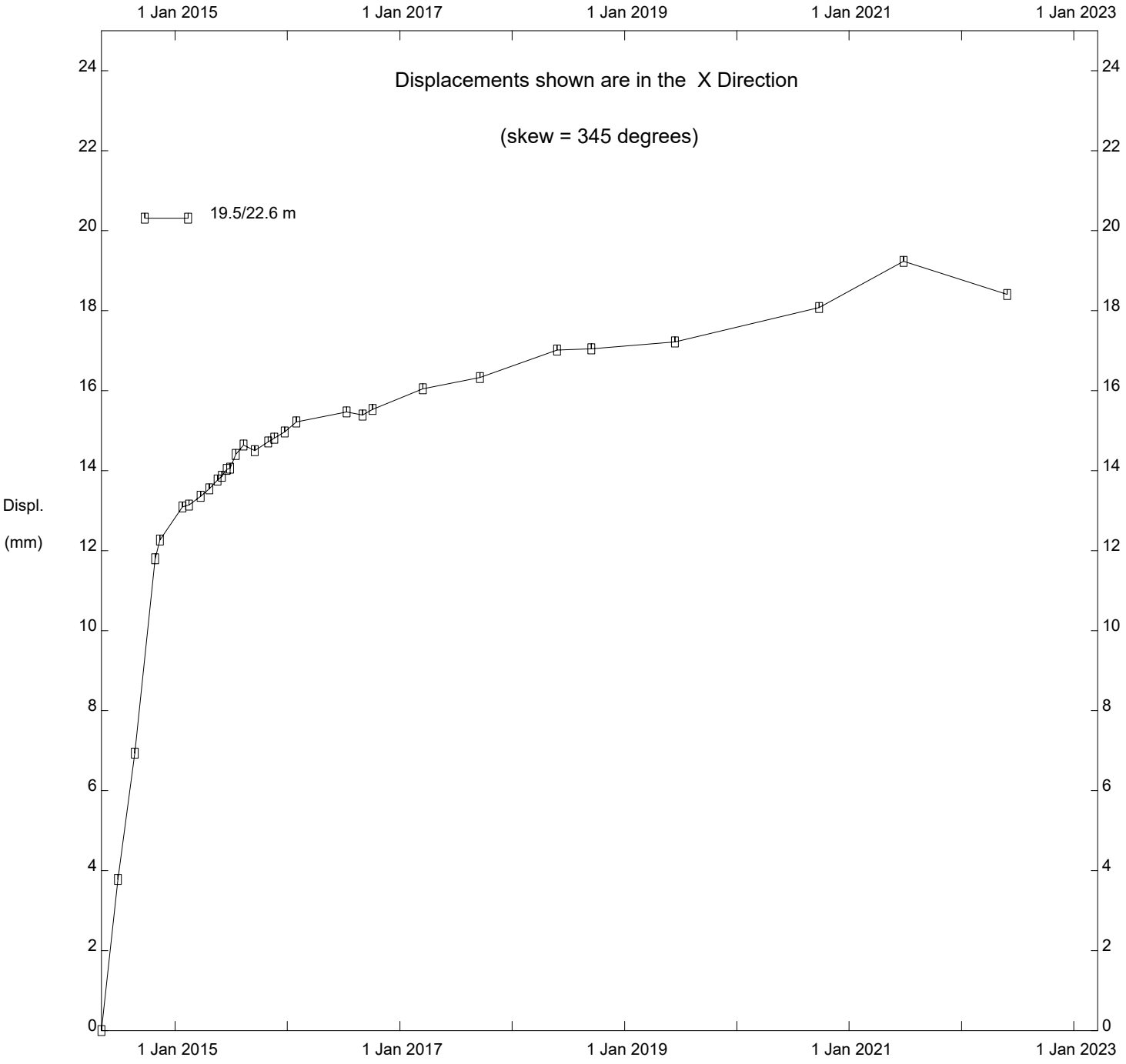
HWY 686, 48+973 o/s -173m, Inclinometer SI14-09A

Alberta Transportation

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

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2022A-Spring\SI Readings\NC97\SI14-09a.gtl

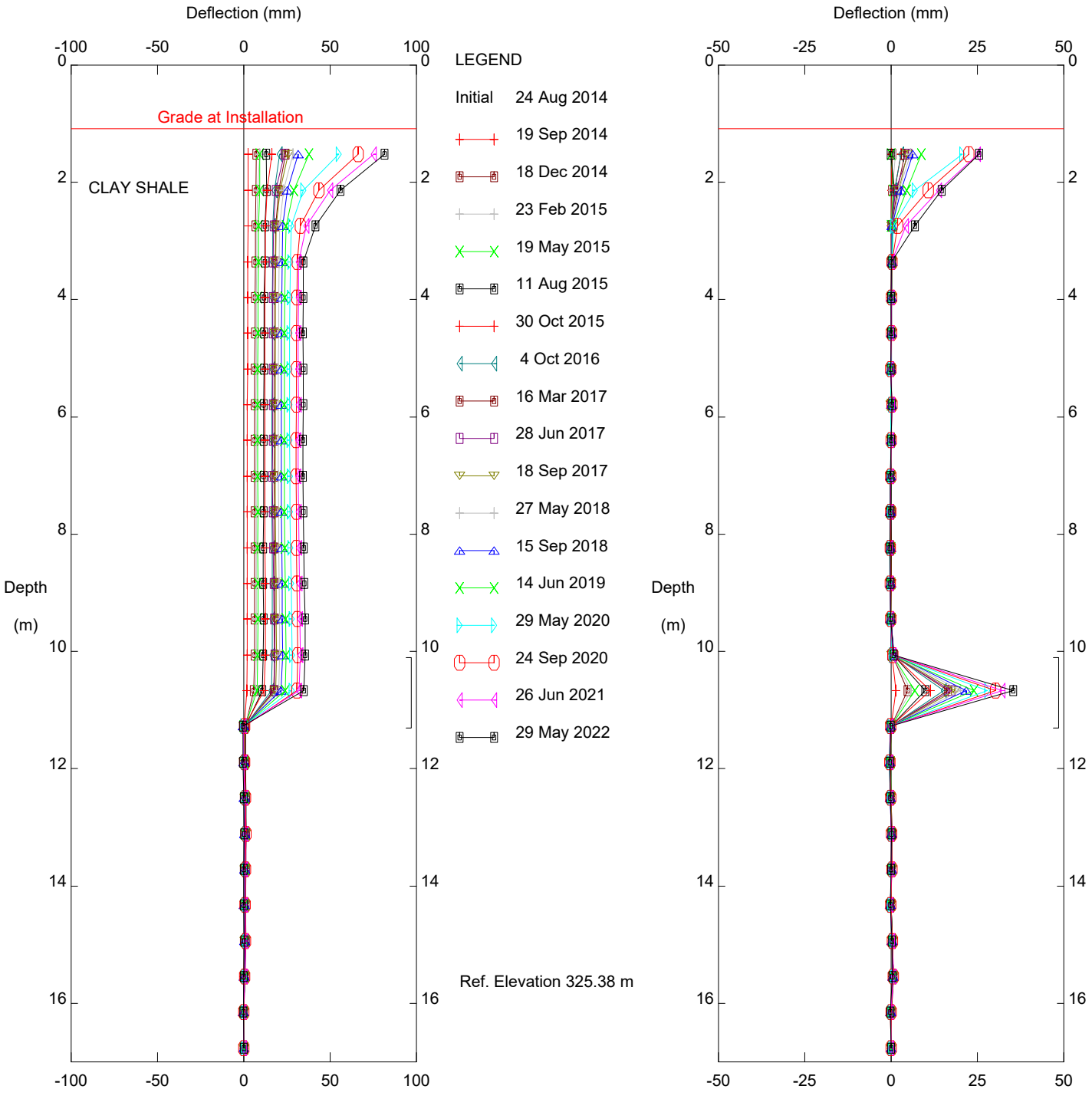
Thurber Engineering Ltd



HWY 686, 48+973 o/s -173m, Inclinometer SI14-09A

Alberta Transportation

Thurber Engineering Ltd



Cumulative Deflection

Direction A

Incremental Deflection

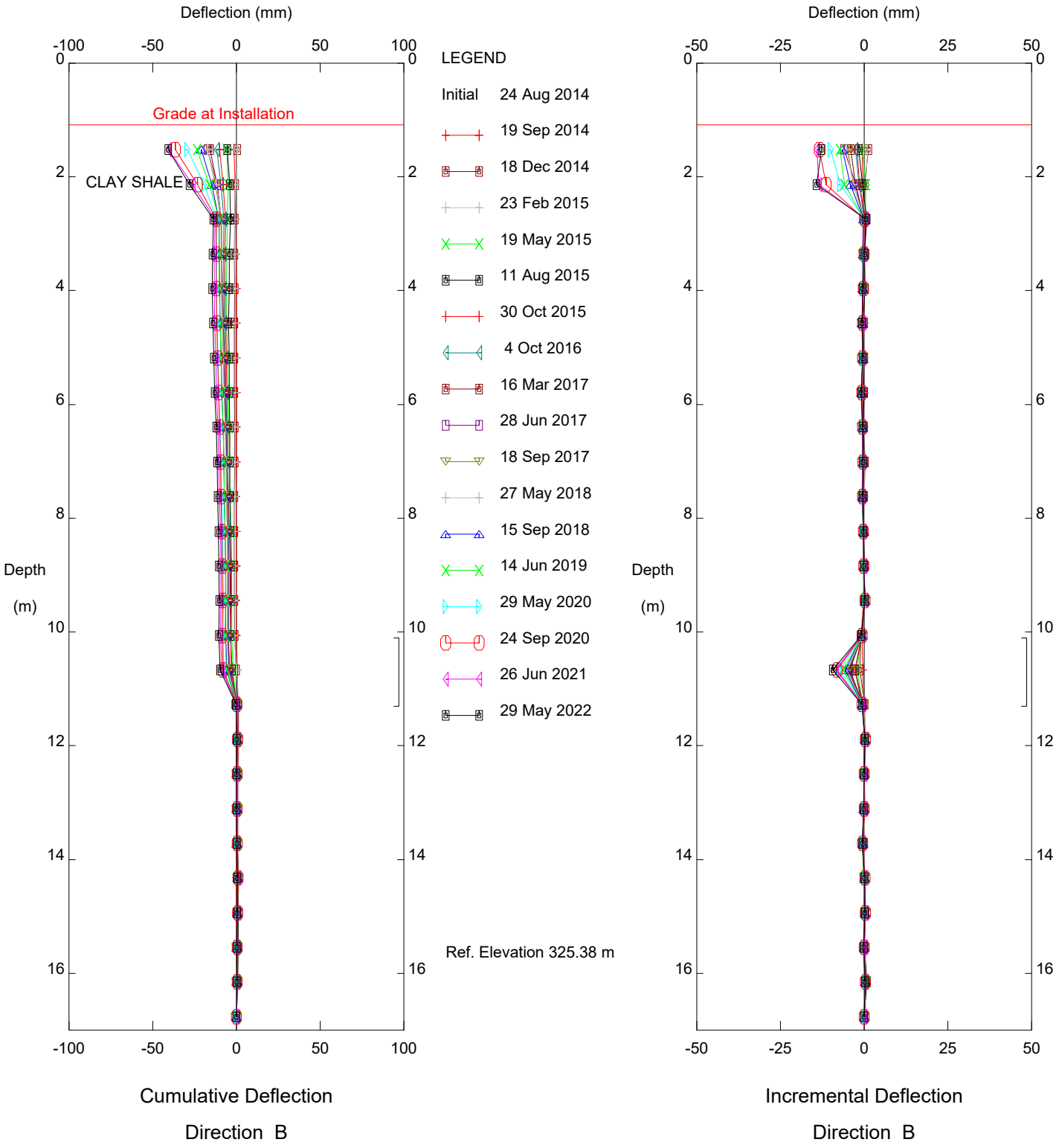
Direction A

Hwy 686, 49+000 o/s +90.8m, Inclinometer SI14-13

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2022A-Spring\SI Readings\NC97\SI14-13.gtl

Thurber Engineering Ltd



Cumulative Deflection

Direction B

Incremental Deflection

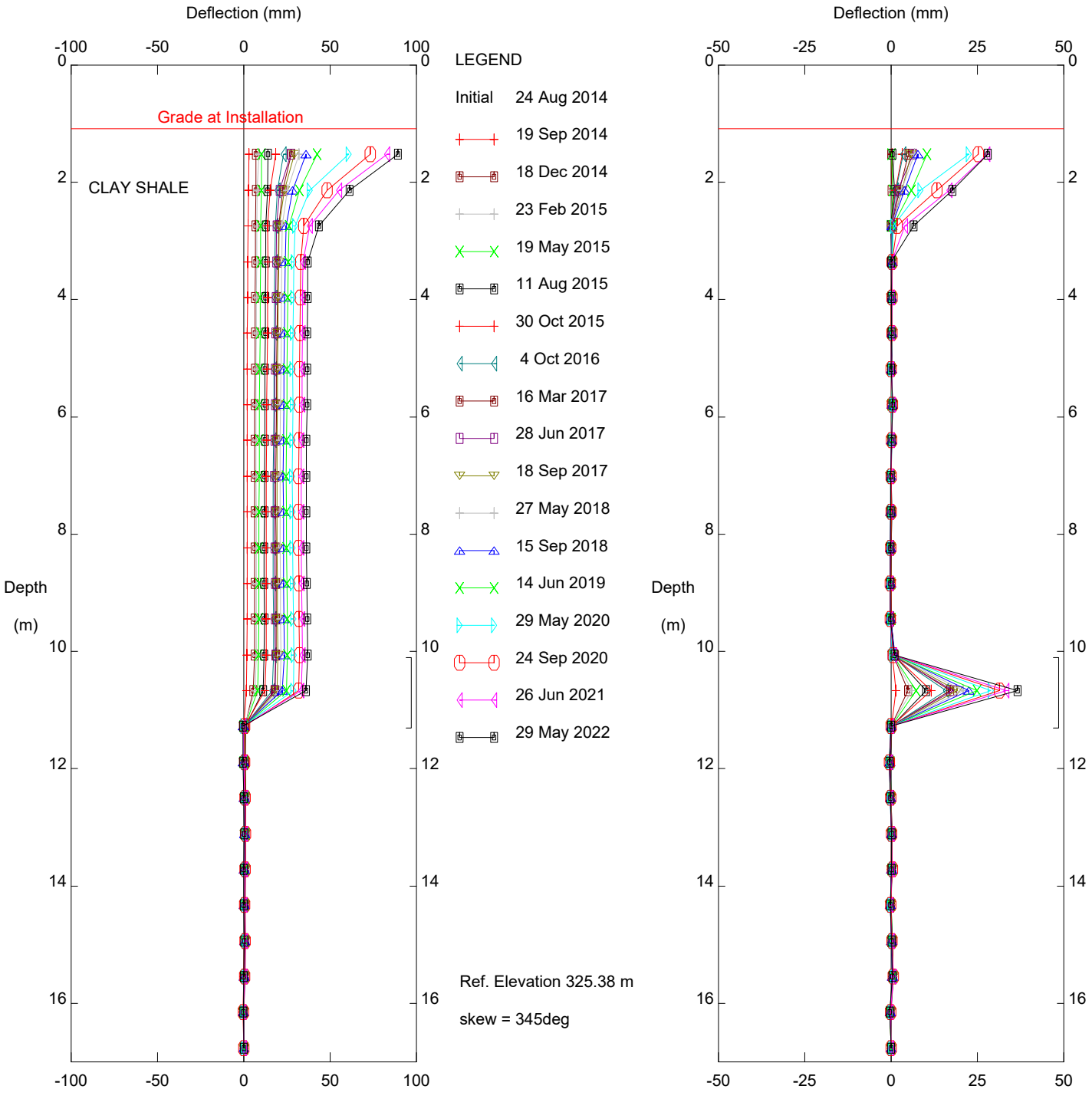
Direction B

Hwy 686, 49+000 o/s +90.8m, Inclinometer SI14-13

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2022A-Spring\SI Readings\NC97\SI14-13.gtl

Thurber Engineering Ltd



Cumulative Deflection

Direction X

Incremental Deflection

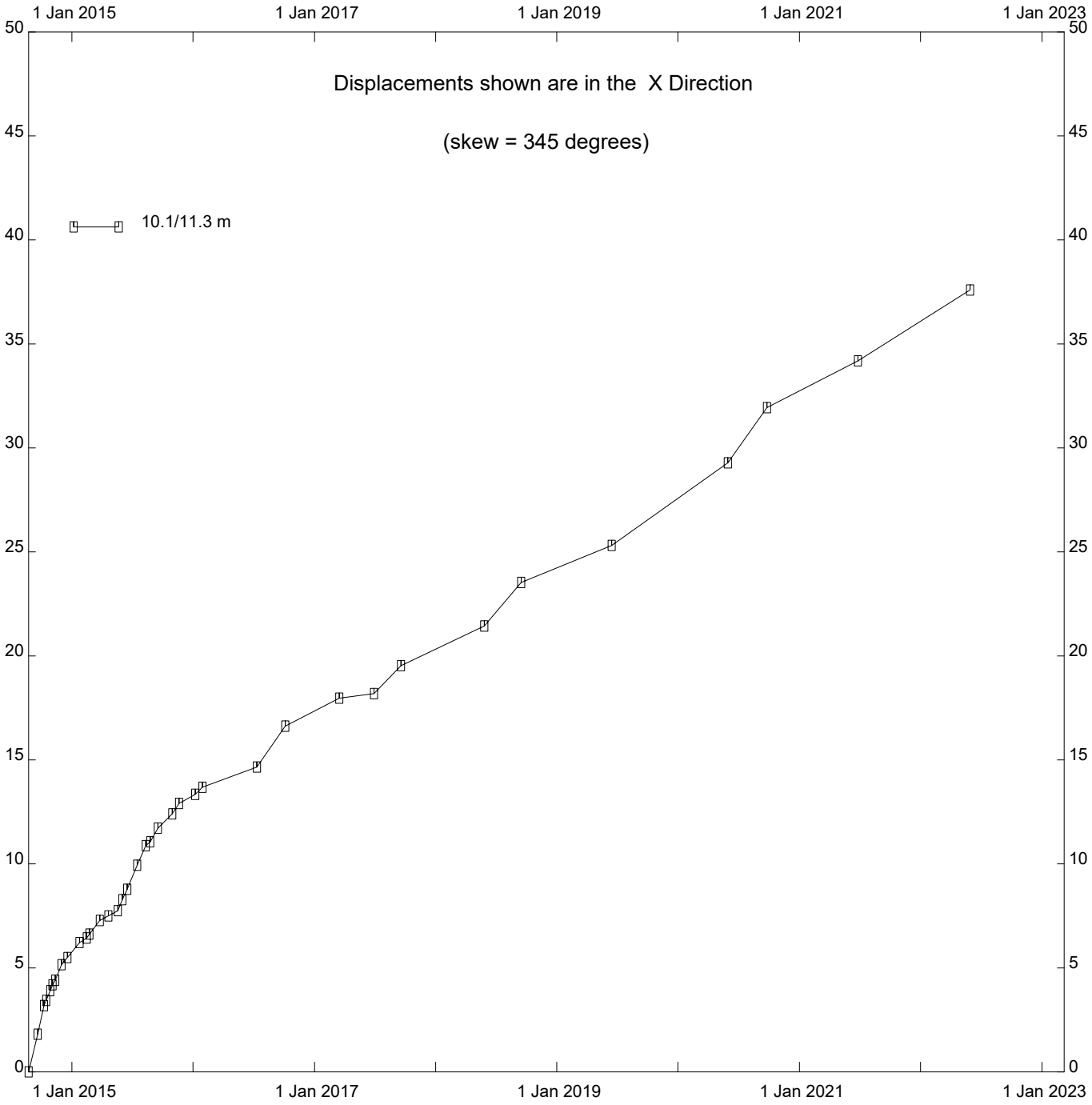
Direction X

Hwy 686, 49+000 o/s +90.8m, Inclinometer SI14-13

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2022A-Spring\SI Readings\NC97\SI14-13.gtl

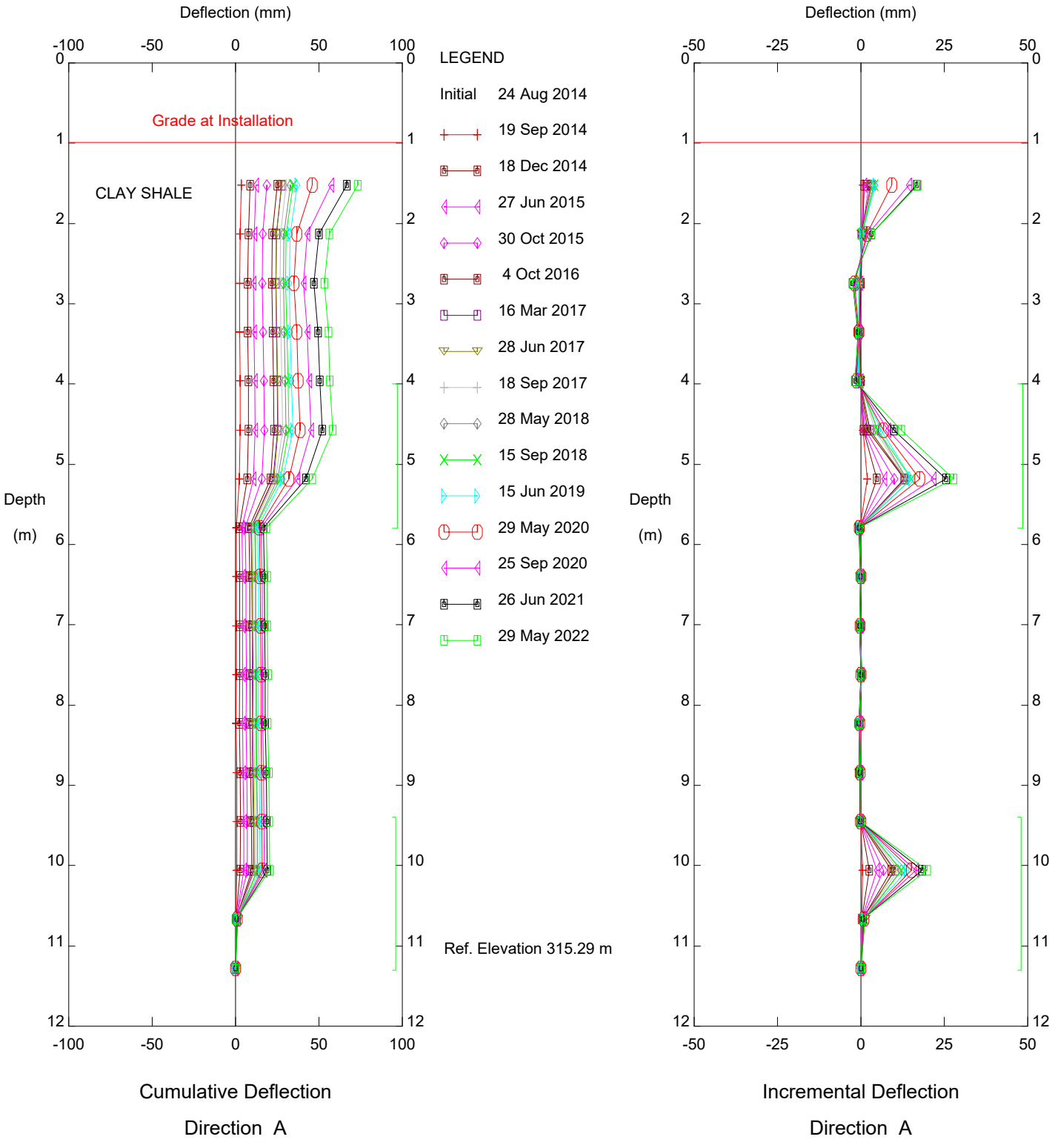
Thurber Engineering Ltd



Hwy 686, 49+000 o/s +90.8m, Inclinometer SI14-13

Alberta Transportation

Thurber Engineering Ltd



Cumulative Deflection

Direction A

Incremental Deflection

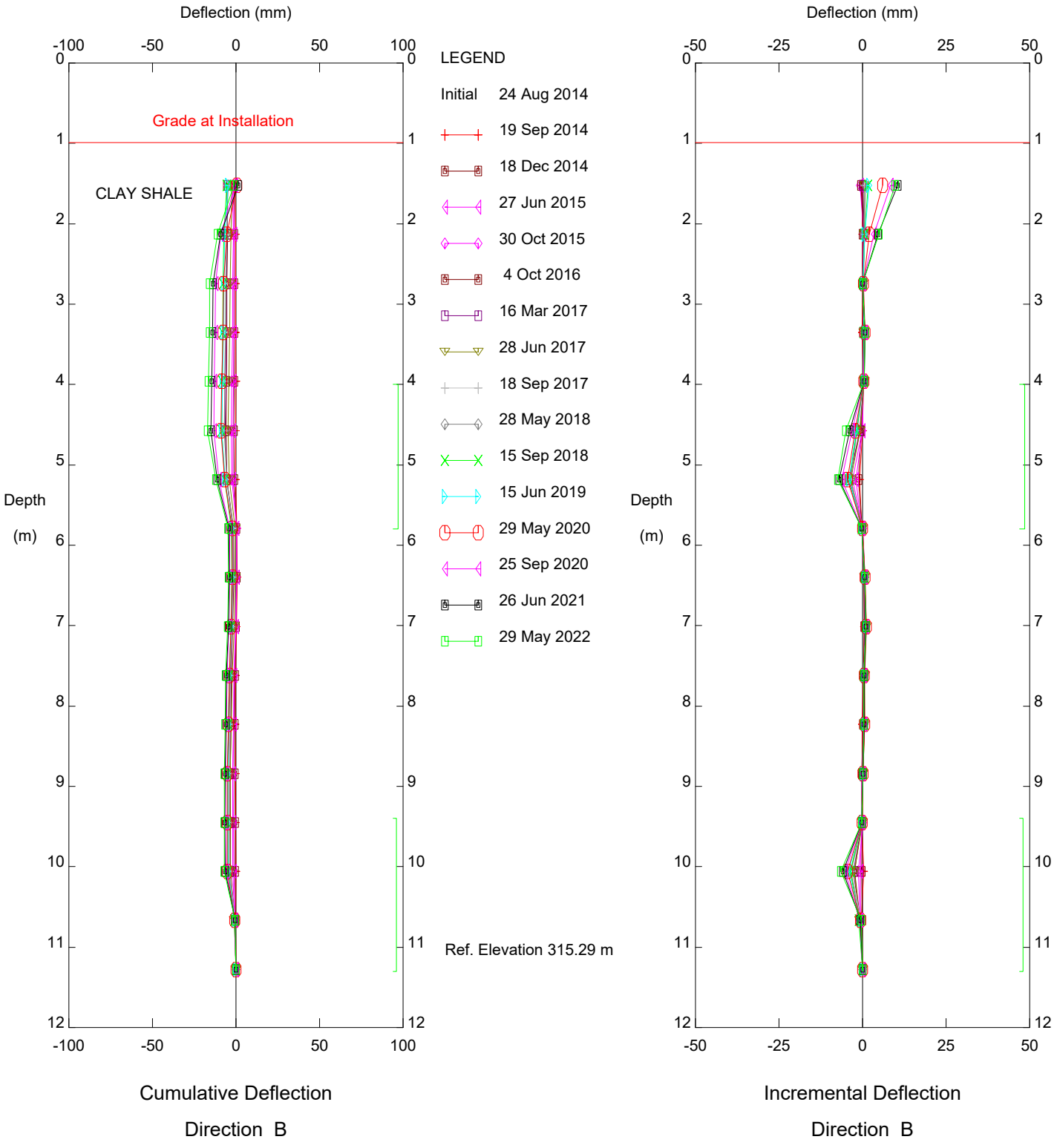
Direction A

Hwy 686, 49+000 o/s +34.9m, Inclinometer SI14-14

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2022A-Spring\SI Readings\NC97\SI14-14.gtl

Thurber Engineering Ltd



Cumulative Deflection

Direction B

Incremental Deflection

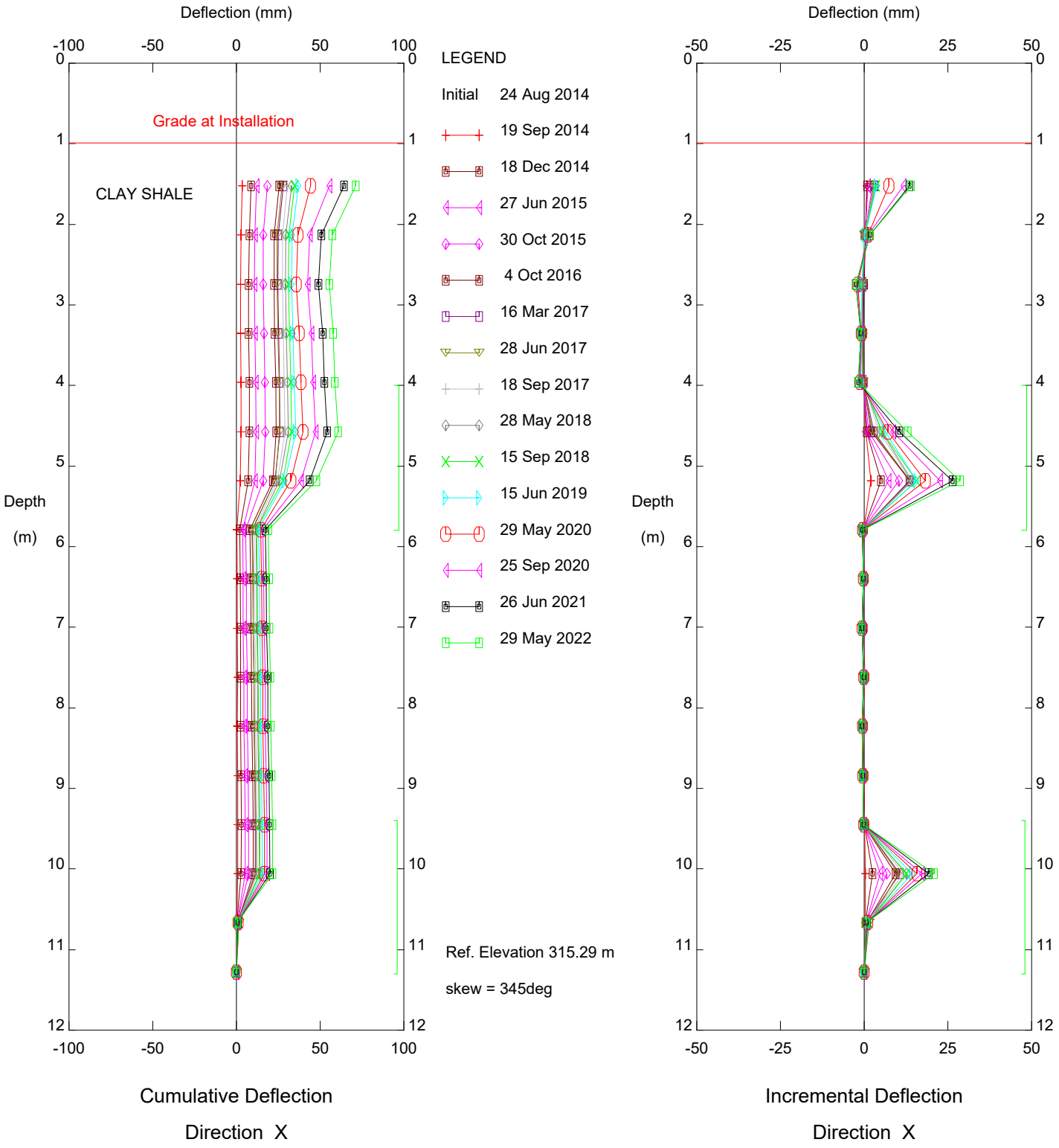
Direction B

Hwy 686, 49+000 o/s +34.9m, Inclinometer SI14-14

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2022A-Spring\SI Readings\NC97\SI14-14.gtl

Thurber Engineering Ltd



Cumulative Deflection

Direction X

Incremental Deflection

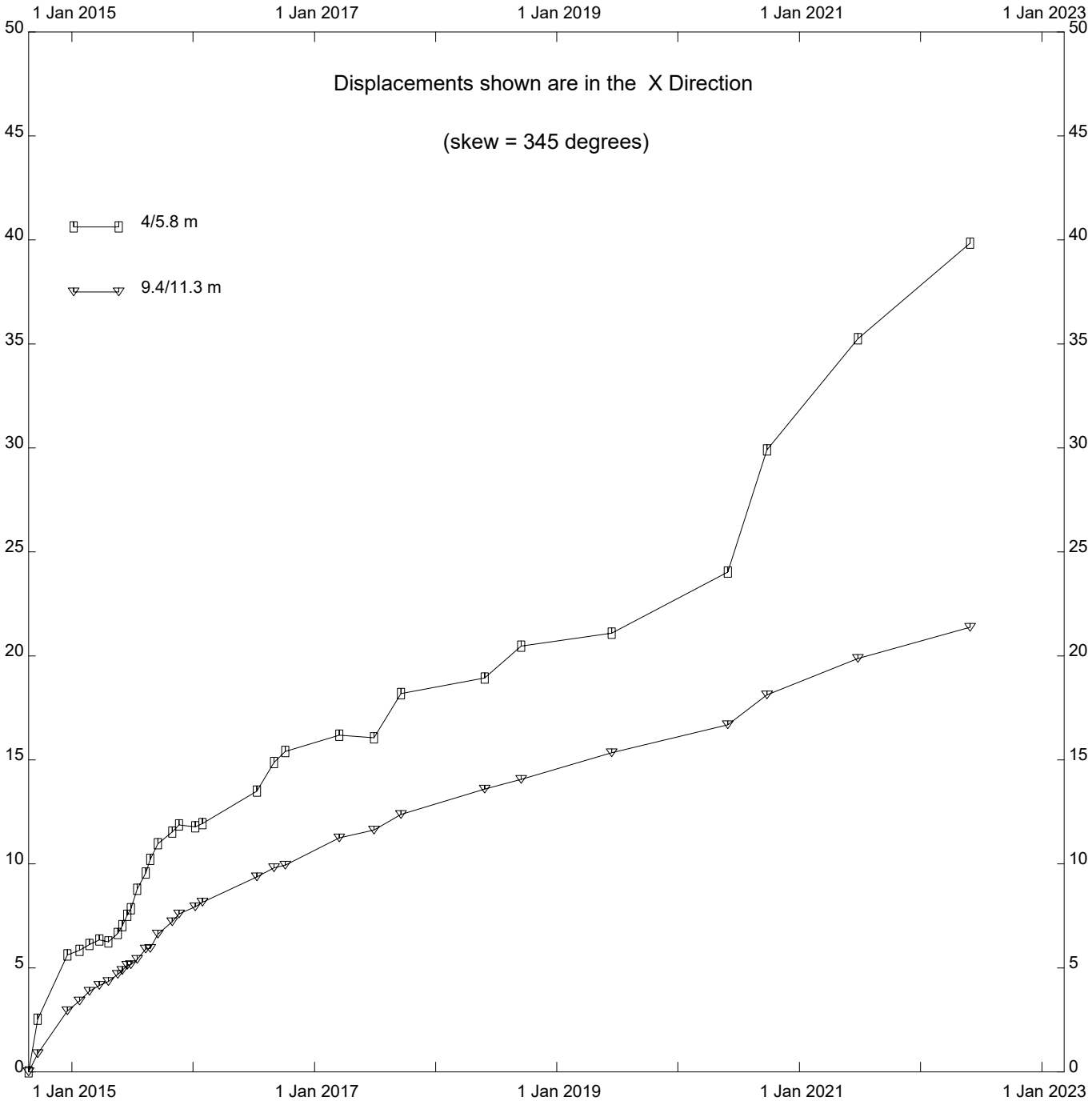
Direction X

Hwy 686, 49+000 o/s +34.9m, Inclinometer SI14-14

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2022A-Spring\SI Readings\NC97\SI14-14.gtl

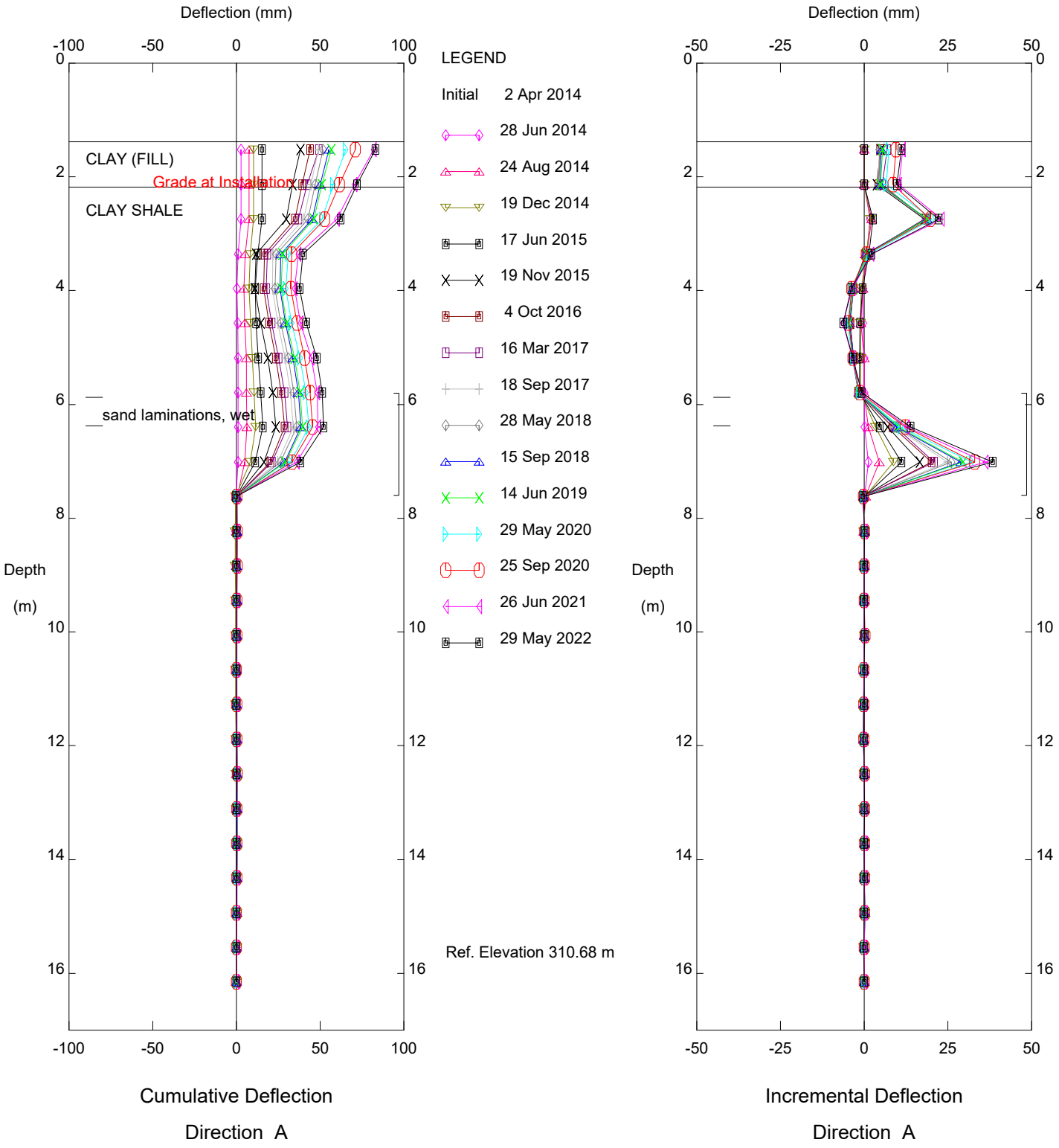
Thurber Engineering Ltd



Hwy 686, 49+000 o/s +34.9m, Inclinometer SI14-14

Alberta Transportation

Thurber Engineering Ltd



Cumulative Deflection

Direction A

Incremental Deflection

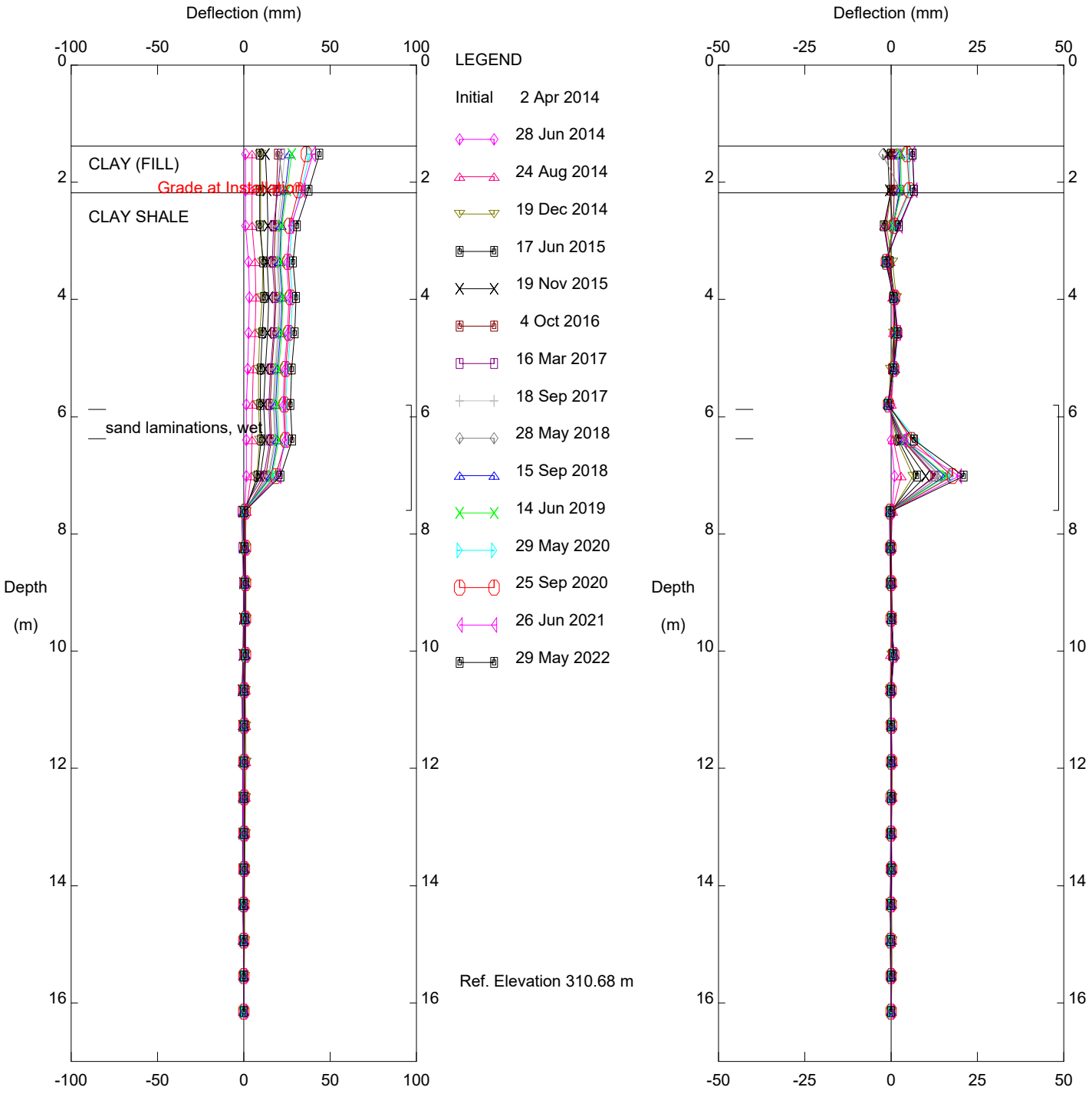
Direction A

Hwy 686, 49+216 o/s +109m, Inclinometer SI14-19

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2022A-Spring\SI Readings\NC97\SI14-19.gtl

Thurber Engineering Ltd



Cumulative Deflection

Direction B

Incremental Deflection

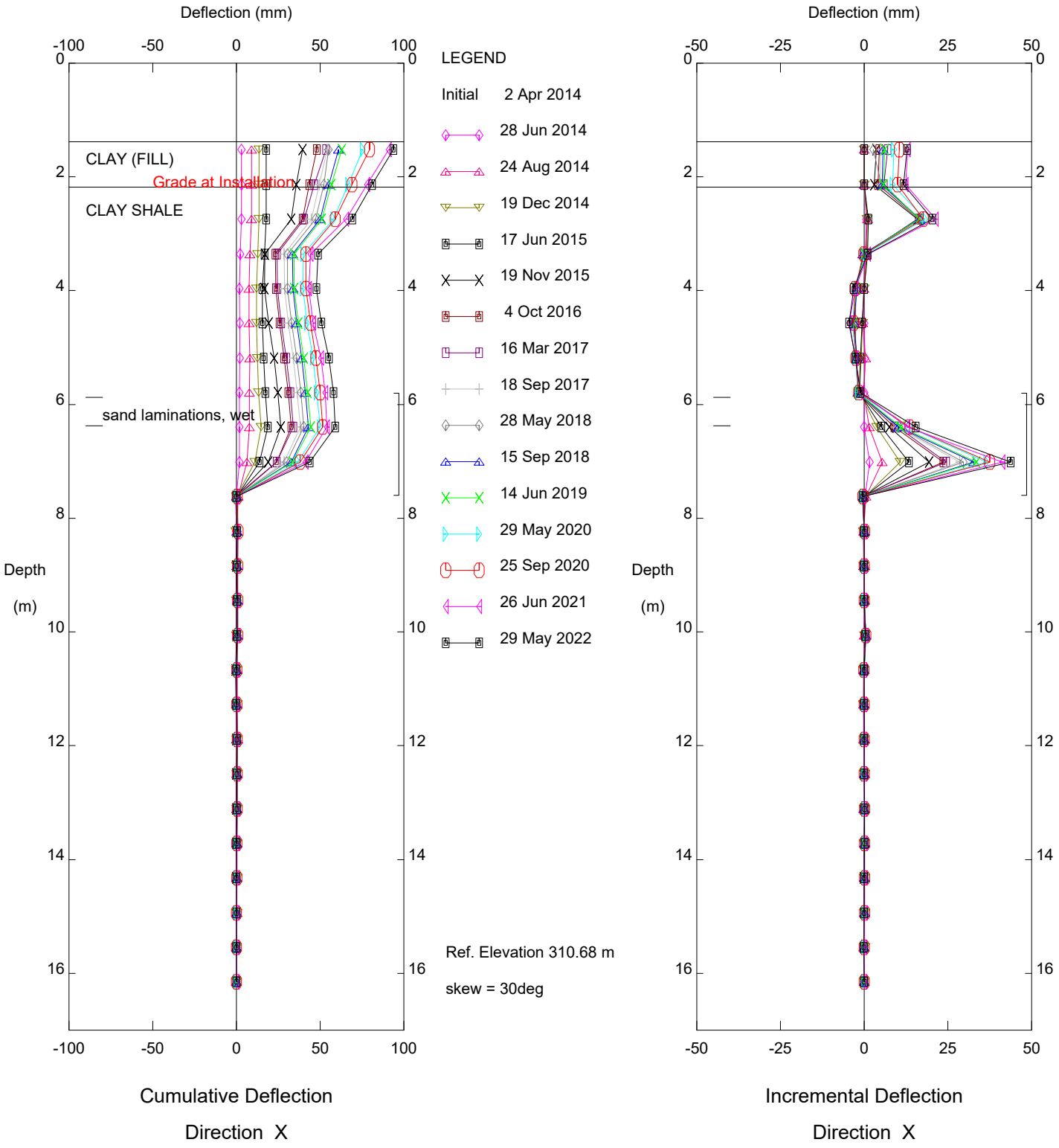
Direction B

Hwy 686, 49+216 o/s +109m, Inclinometer SI14-19

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2022A-Spring\SI Readings\NC97\SI14-19.gtl

Thurber Engineering Ltd



Cumulative Deflection

Direction X

Incremental Deflection

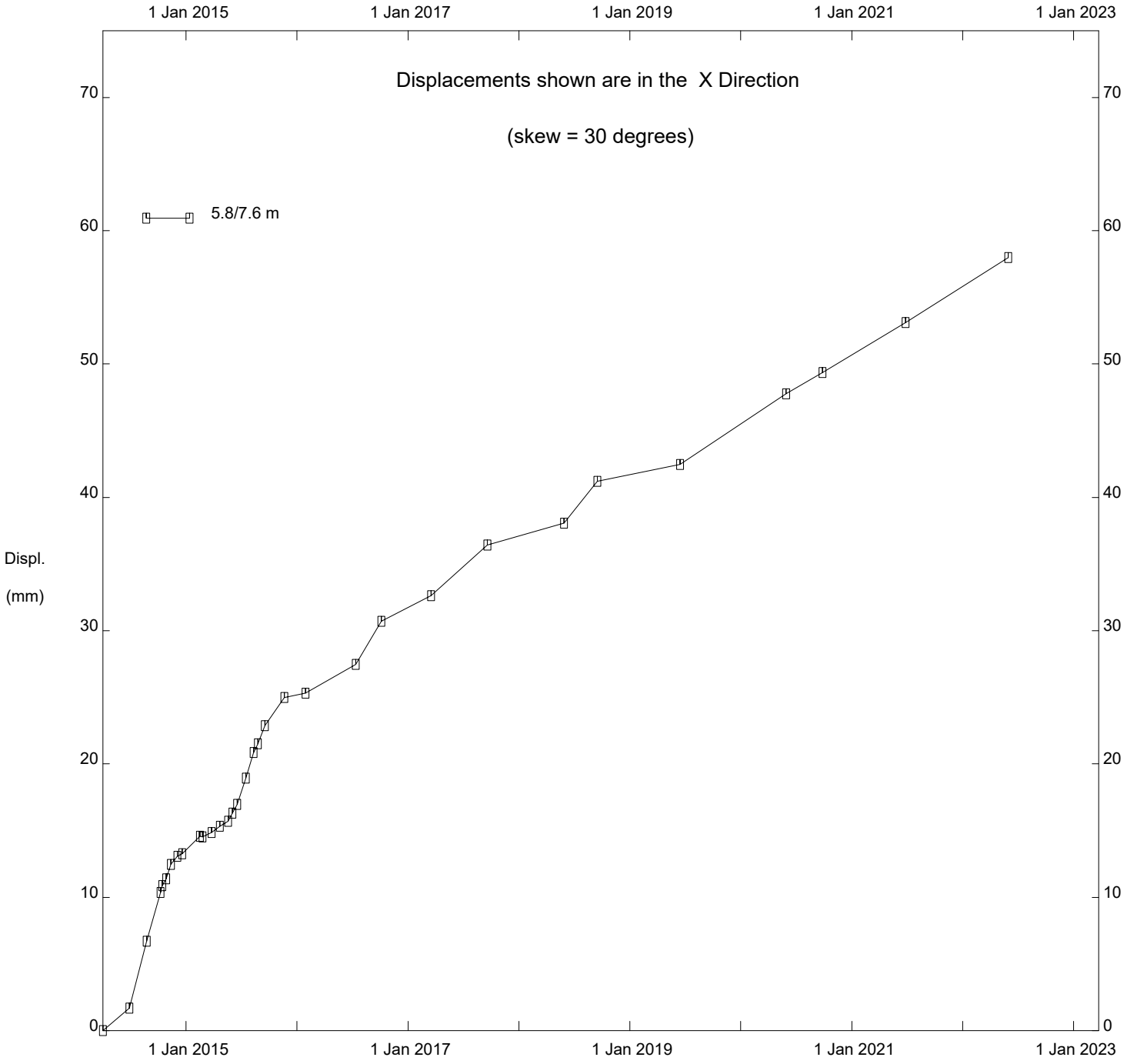
Direction X

Hwy 686, 49+216 o/s +109m, Inclinometer SI14-19

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2022A-Spring\SI Readings\NC97\SI14-19.gtl

Thurber Engineering Ltd



Hwy 686, 49+216 o/s +109m, Inclinometer SI14-19

Alberta Transportation

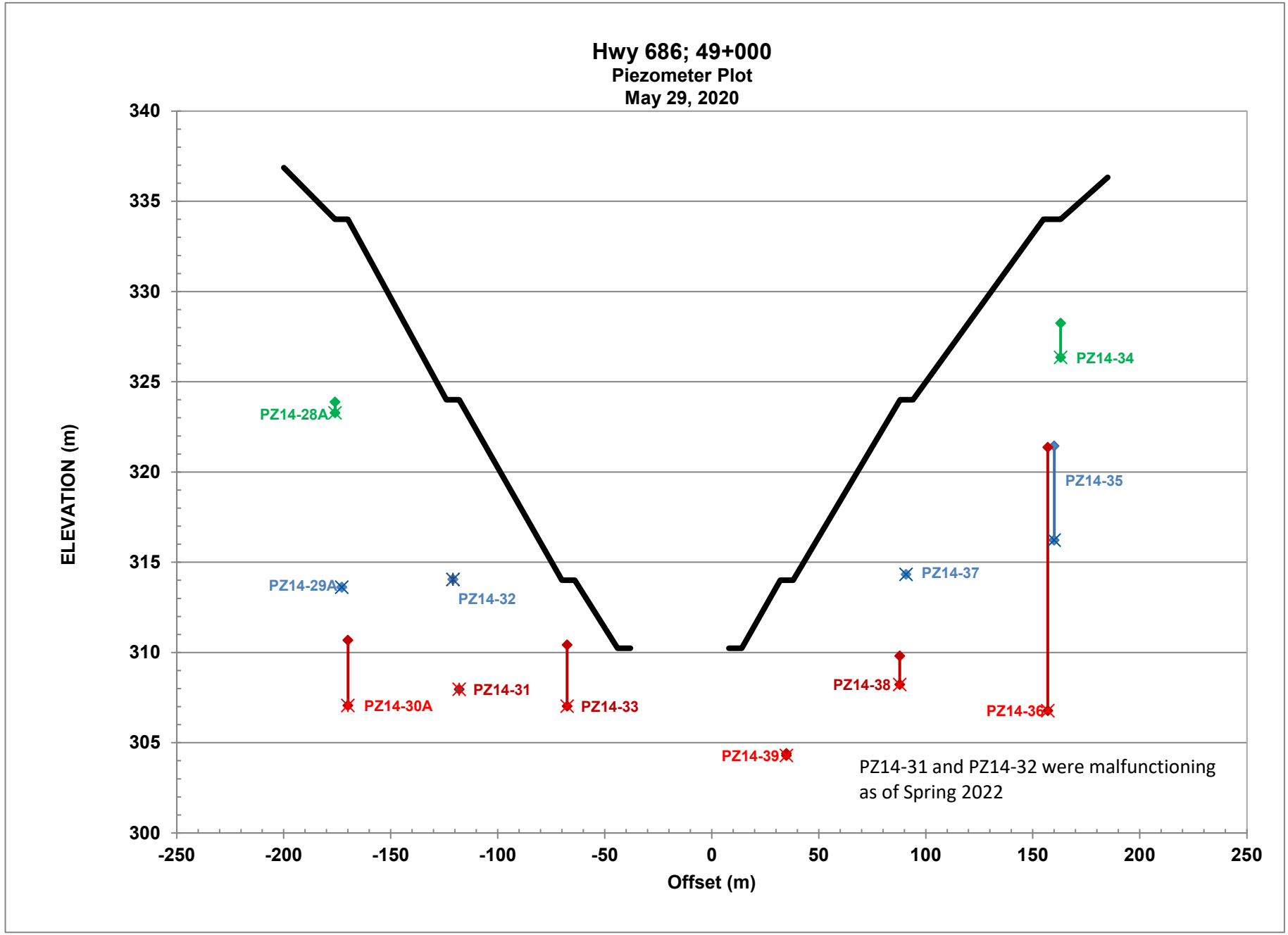

Hwy 686; 49+000
Piezometer Plot
May 29, 2020
ELEVATION (m)
340
335
330
325
320
315
310
305
300
-250
-200
-150
-100
-50
0
50
100
150
200
250
Offset (m)
PZ14-28A
PZ14-34
PZ14-35
PZ14-29A
PZ14-32
PZ14-37
PZ14-30A
PZ14-31
PZ14-33
PZ14-38
PZ14-36
PZ14-39
PZ14-31 and PZ14-32 were malfunctioning
as of Spring 2022

Figure 686-1

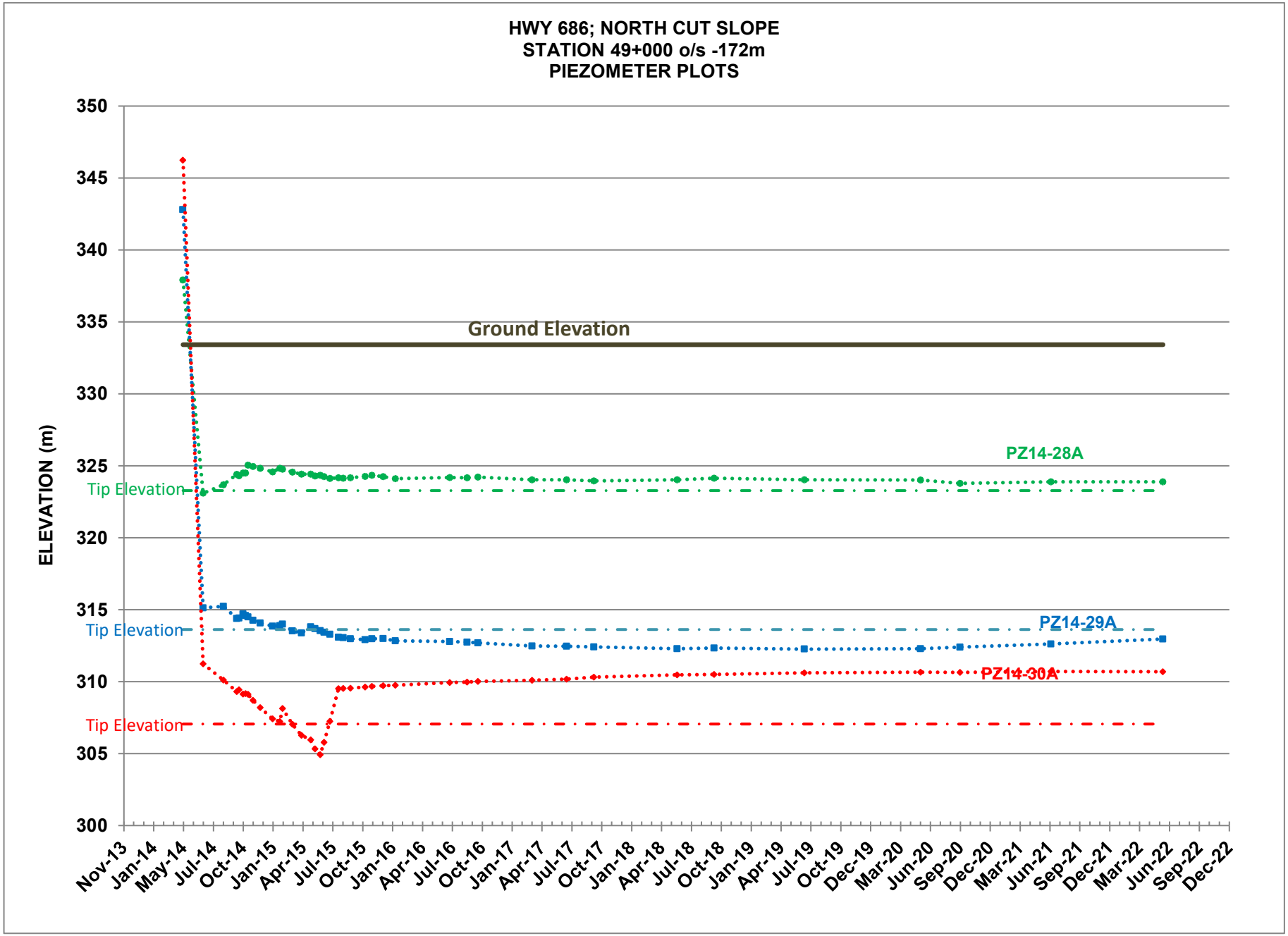

HWY 686; NORTH CUT SLOPE
STATION 49+000 o/s -172m
PIEZOMETER PLOTS
ELEVATION (m)
350
345
340
335
330
325
320
315
310
305
300
Ground Elevation
PZ14-28A
Tip Elevation
PZ14-29A
Tip Elevation
PZ14-30A
Tip Elevation
Nov-13
Jan-14
May-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Dec-19
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22

Figure 686-2

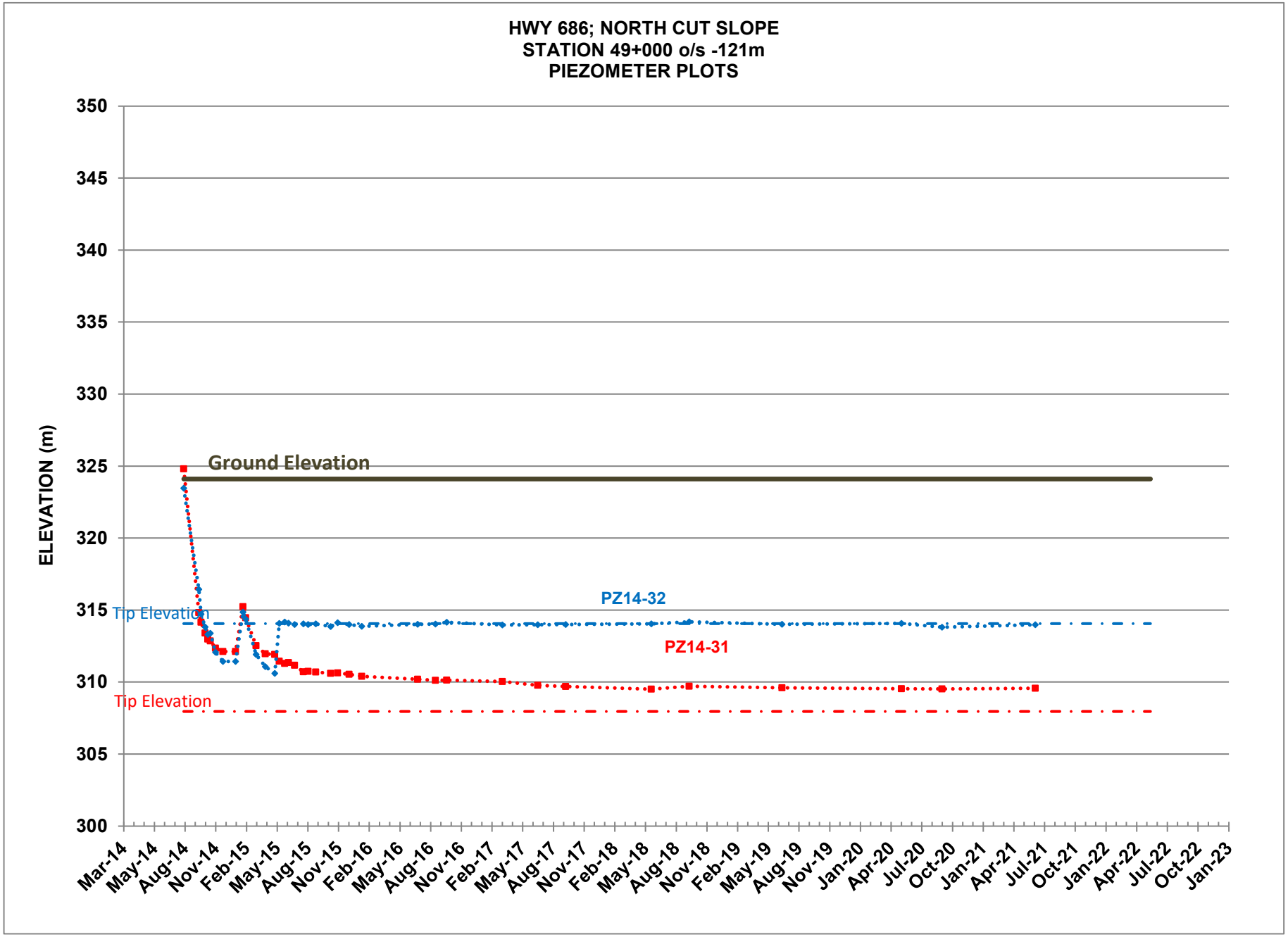

HWY 686; NORTH CUT SLOPE
STATION 49+000 o/s -121m
PIEZOMETER PLOTS
ELEVATION (m)
350
345
340
335
330
325
320
315
310
305
300
Ground Elevation
PZ14-32
Tip Elevation
PZ14-31
Tip Elevation
Mar-14
May-14
Aug-14
Nov-14
Feb-15
May-15
Aug-15
Nov-15
Feb-16
May-16
Aug-16
Nov-16
Feb-17
May-17
Aug-17
Nov-17
Feb-18
May-18
Aug-18
Nov-18
Feb-19
May-19
Aug-19
Nov-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23

Figure 686-3

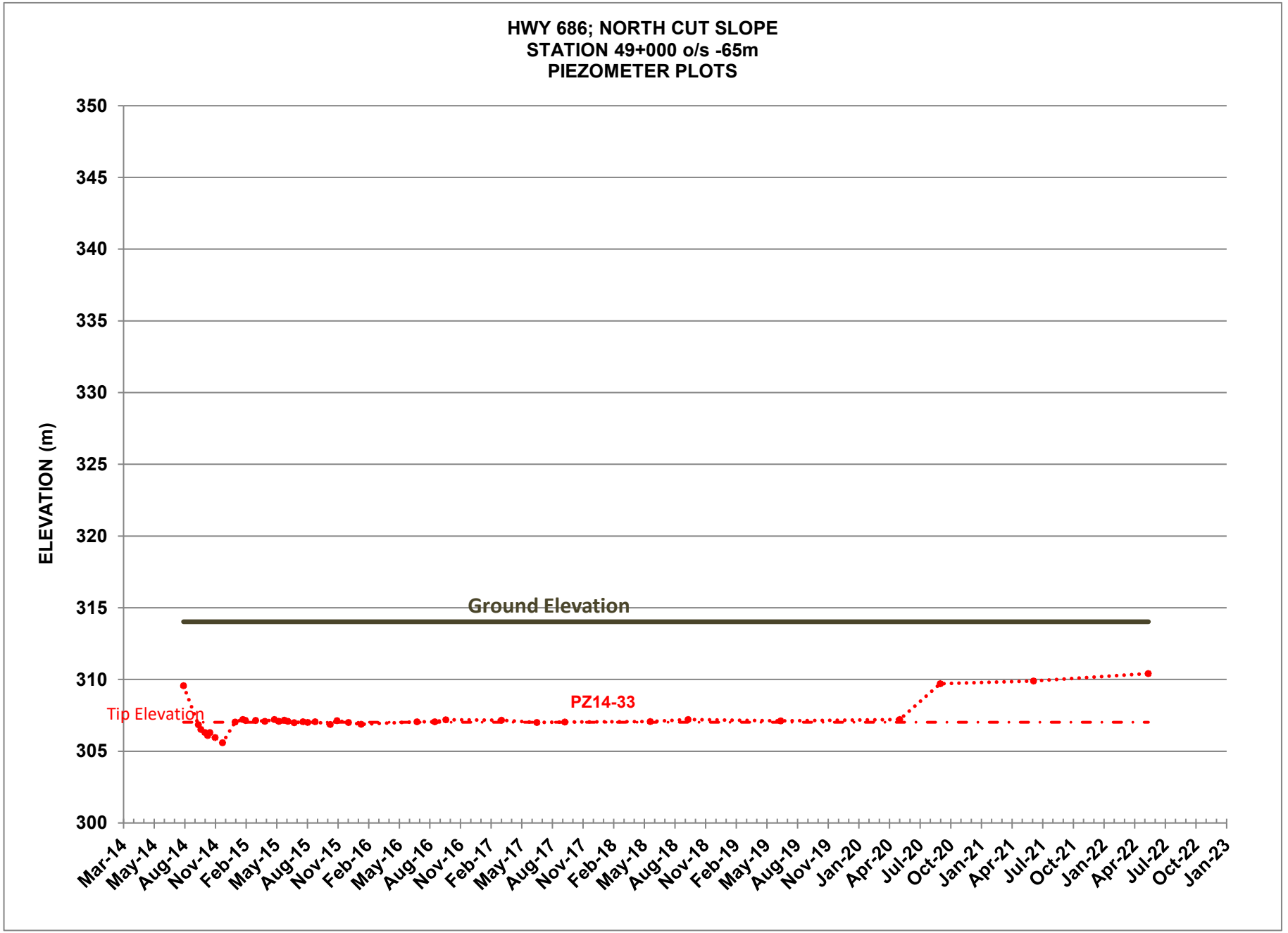

HWY 686; NORTH CUT SLOPE
STATION 49+000 o/s -65m
PIEZOMETER PLOTS
ELEVATION (m)
350
345
340
335
330
325
320
315
310
305
300
Ground Elevation
PZ14-33
Tip Elevation
Mar-14
May-14
Aug-14
Nov-14
Feb-15
May-15
Aug-15
Nov-15
Feb-16
May-16
Aug-16
Nov-16
Feb-17
May-17
Aug-17
Nov-17
Feb-18
May-18
Aug-18
Nov-18
Feb-19
May-19
Aug-19
Nov-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23

Figure 686-4

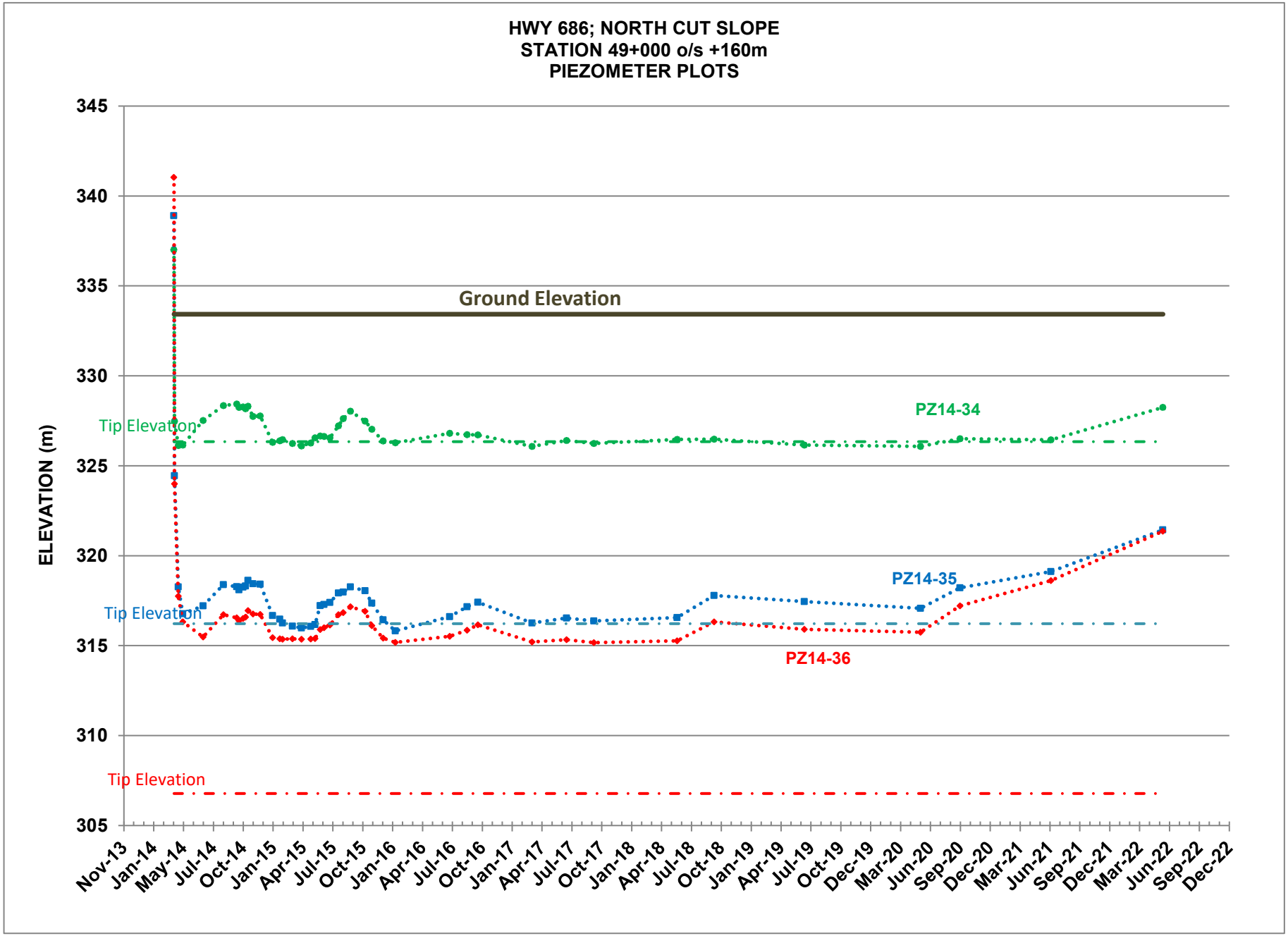

HWY 686; NORTH CUT SLOPE
STATION 49+000 o/s +160m
PIEZOMETER PLOTS
ELEVATION (m)
345
340
335
330
325
320
315
310
305
Ground Elevation
PZ14-34
Tip Elevation
PZ14-35
Tip Elevation
PZ14-36
Tip Elevation
Nov-13
Jan-14
May-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Dec-19
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22

Figure 686-5

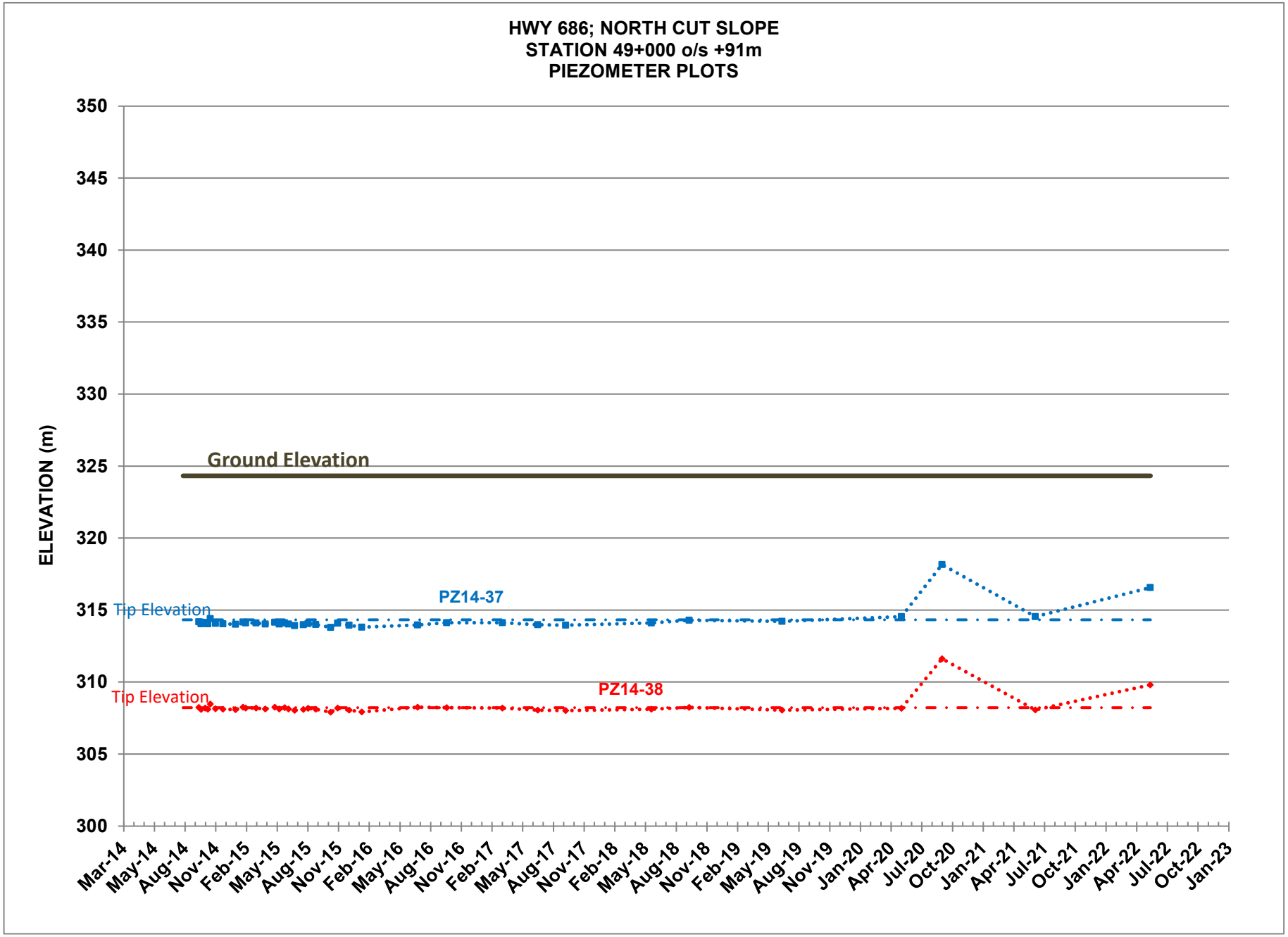

HWY 686; NORTH CUT SLOPE
STATION 49+000 o/s +91m
PIEZOMETER PLOTS
ELEVATION (m)
350
345
340
335
330
325
320
315
310
305
300
Ground Elevation
PZ14-37
Tip Elevation
PZ14-38
Tip Elevation
Mar-14
May-14
Aug-14
Nov-14
Feb-15
May-15
Aug-15
Nov-15
Feb-16
May-16
Aug-16
Nov-16
Feb-17
May-17
Aug-17
Nov-17
Feb-18
May-18
Aug-18
Nov-18
Feb-19
May-19
Aug-19
Nov-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23

Figure 686-6

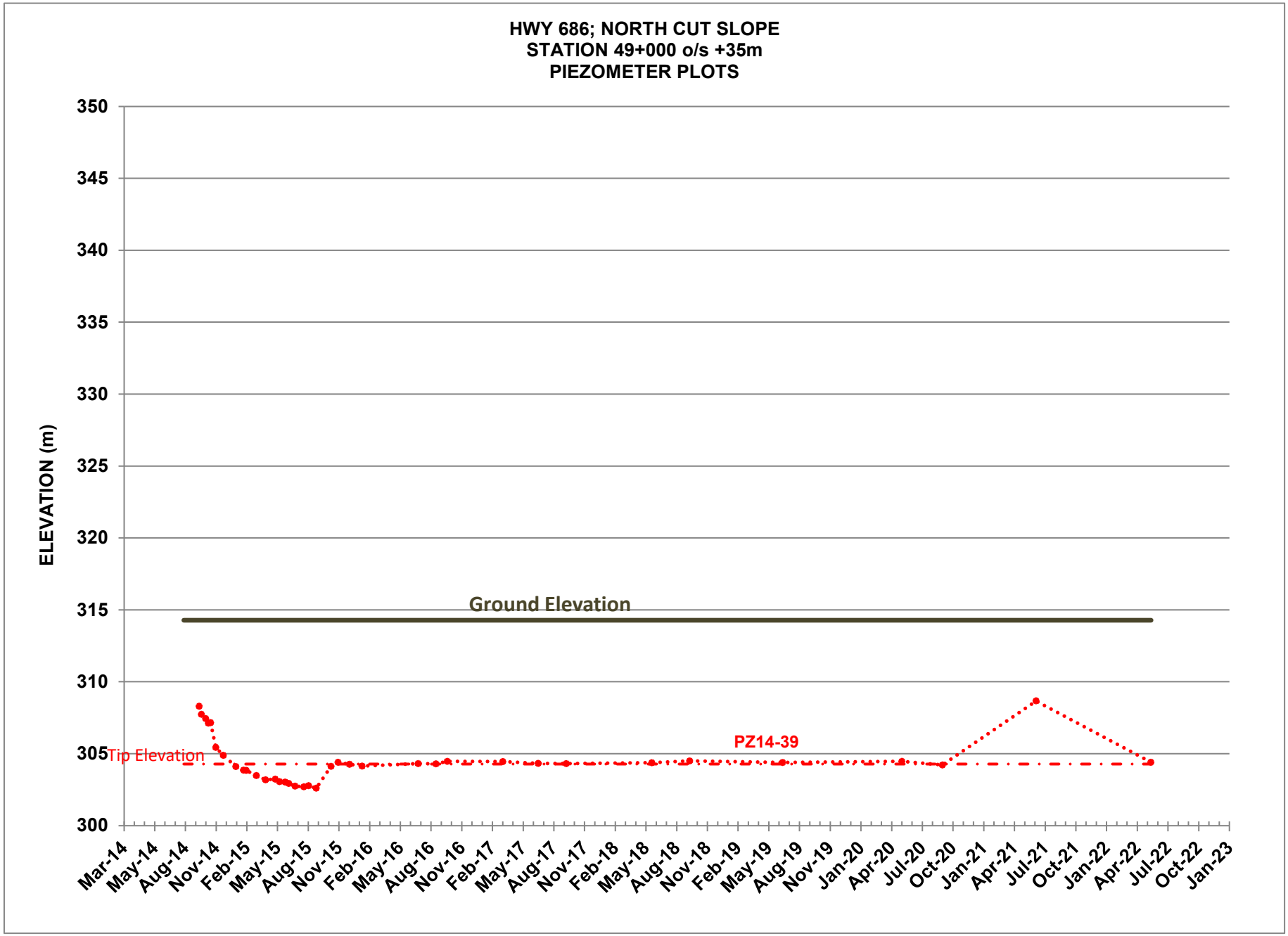

HWY 686; NORTH CUT SLOPE
STATION 49+000 o/s +35m
PIEZOMETER PLOTS
ELEVATION (m)
350
345
340
335
330
325
320
315
310
305
300
Ground Elevation
PZ14-39
Tip Elevation
Mar-14
May-14
Aug-14
Nov-14
Feb-15
May-15
Aug-15
Nov-15
Feb-16
May-16
Aug-16
Nov-16
Feb-17
May-17
Aug-17
Nov-17
Feb-18
May-18
Aug-18
Nov-18
Feb-19
May-19
Aug-19
Nov-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23

Figure 686-7

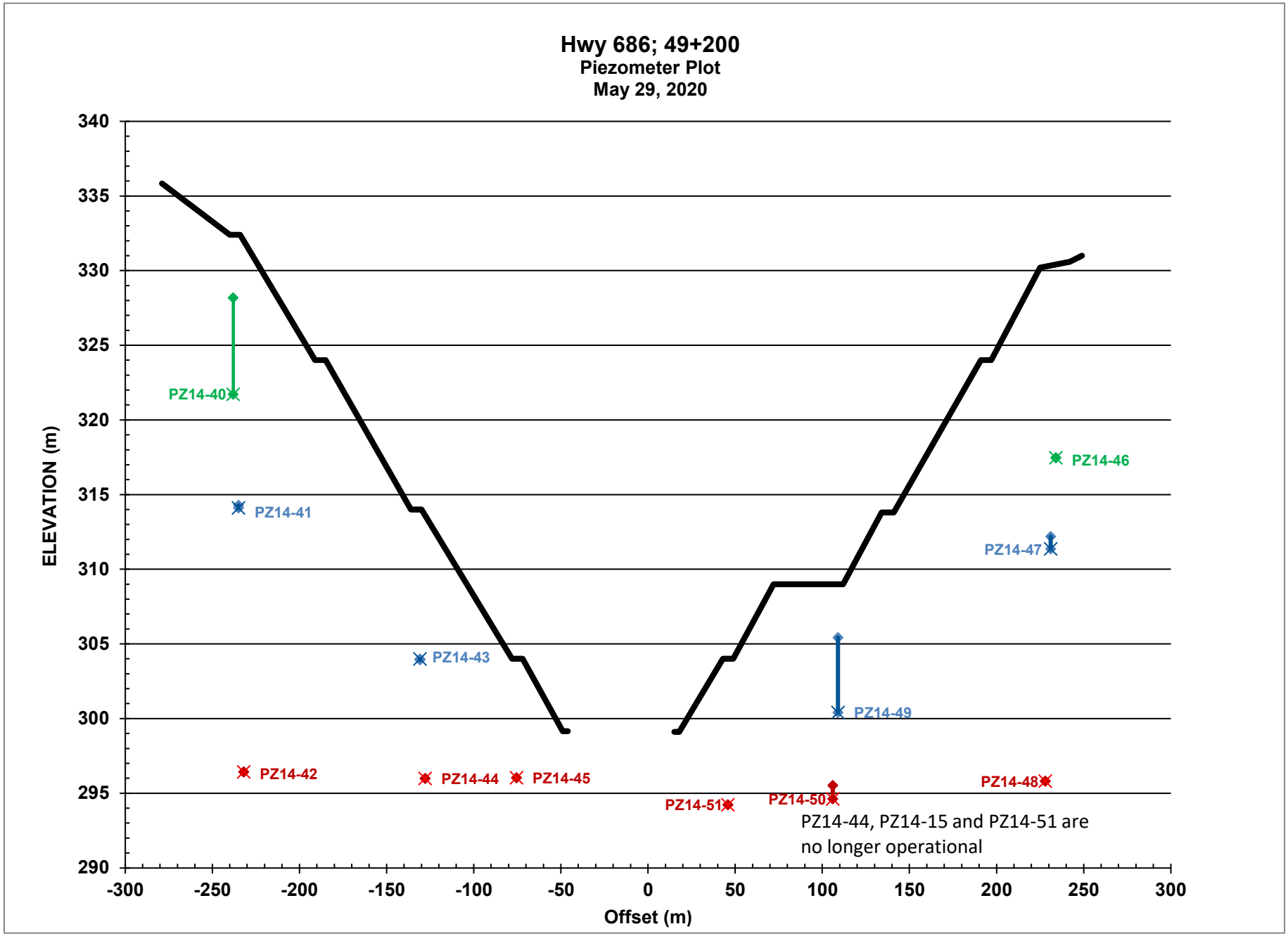

Hwy 686; 49+200
Piezometer Plot
May 29, 2020
ELEVATION (m)
340
335
330
325
320
315
310
305
300
295
290
-300
-250
-200
-150
-100
-50
0
50
100
150
200
250
300
Offset (m)
PZ14-40
PZ14-41
PZ14-42
PZ14-43
PZ14-44
PZ14-45
PZ14-46
PZ14-47
PZ14-48
PZ14-49
PZ14-50
PZ14-51
PZ14-44, PZ14-15 and PZ14-51 are
no longer operational

Figure 686-8

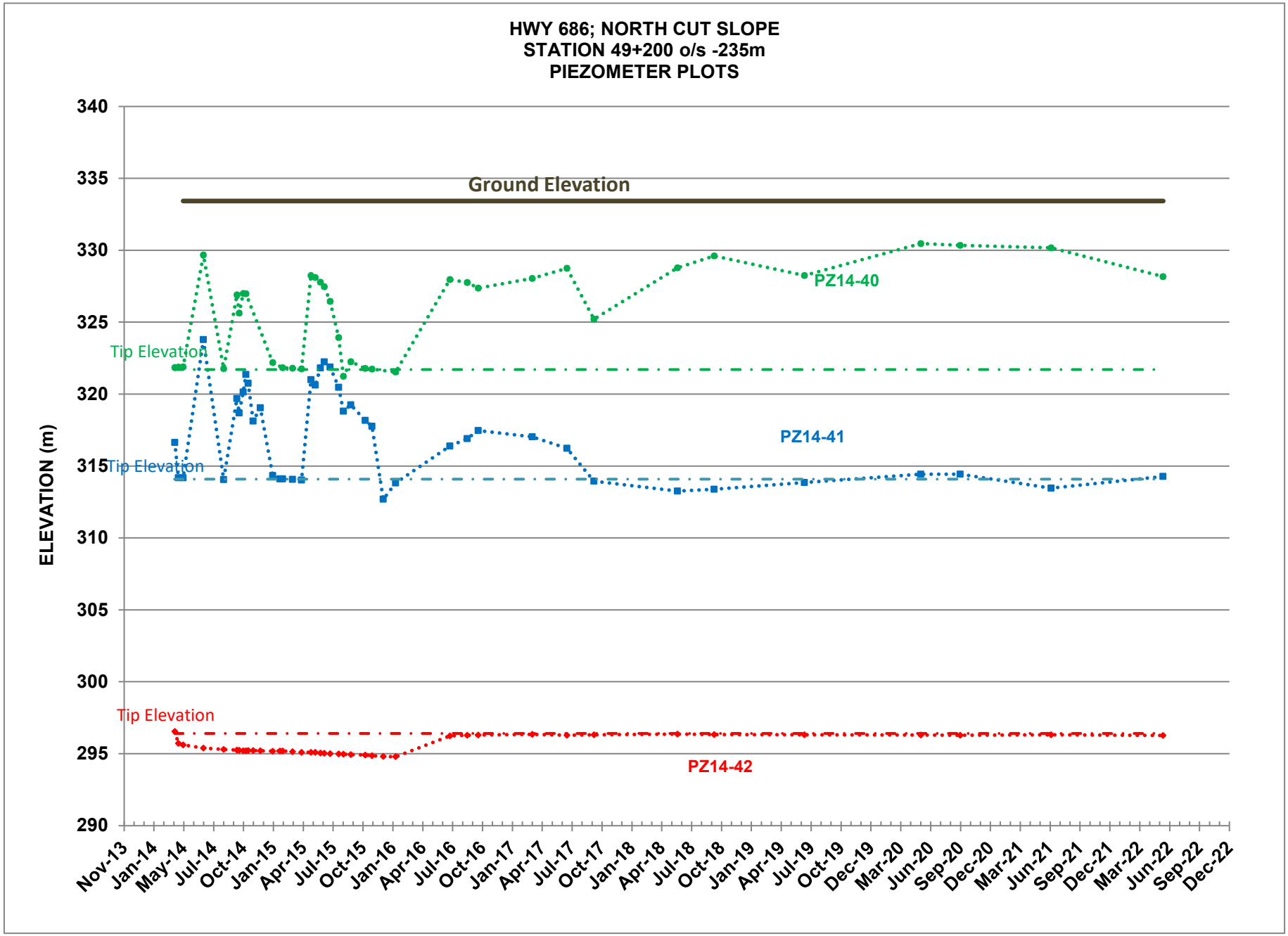

HWY 686; NORTH CUT SLOPE
STATION 49+200 o/s -235m
PIEZOMETER PLOTS
ELEVATION (m)
340
335
330
325
320
315
310
305
300
295
290
Ground Elevation
PZ14-40
Tip Elevation
PZ14-41
Tip Elevation
Tip Elevation
PZ14-42
Nov-13
Jan-14
May-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Dec-19
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22

Figure 686-9

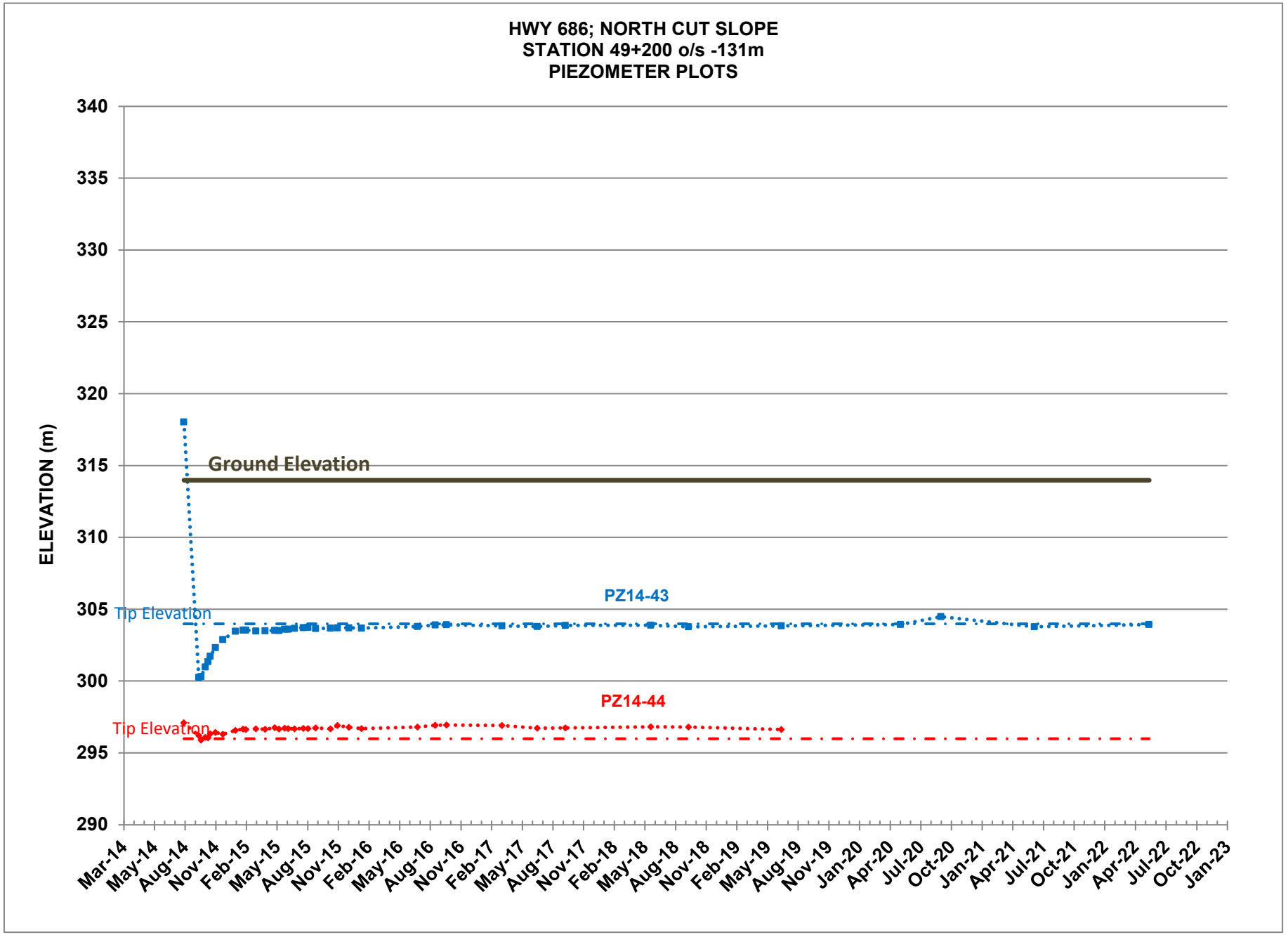


Figure 686-10

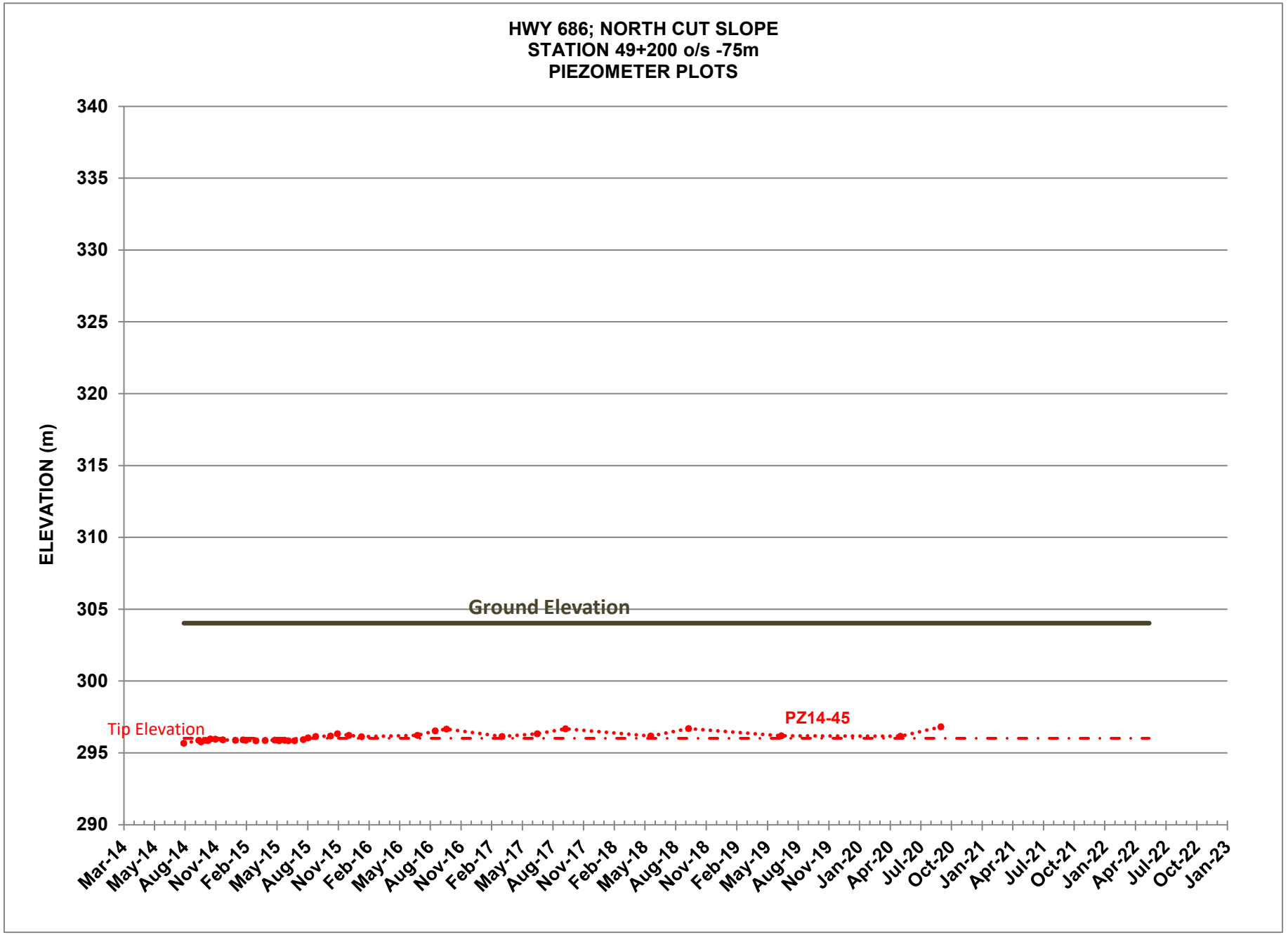


Figure 686-11

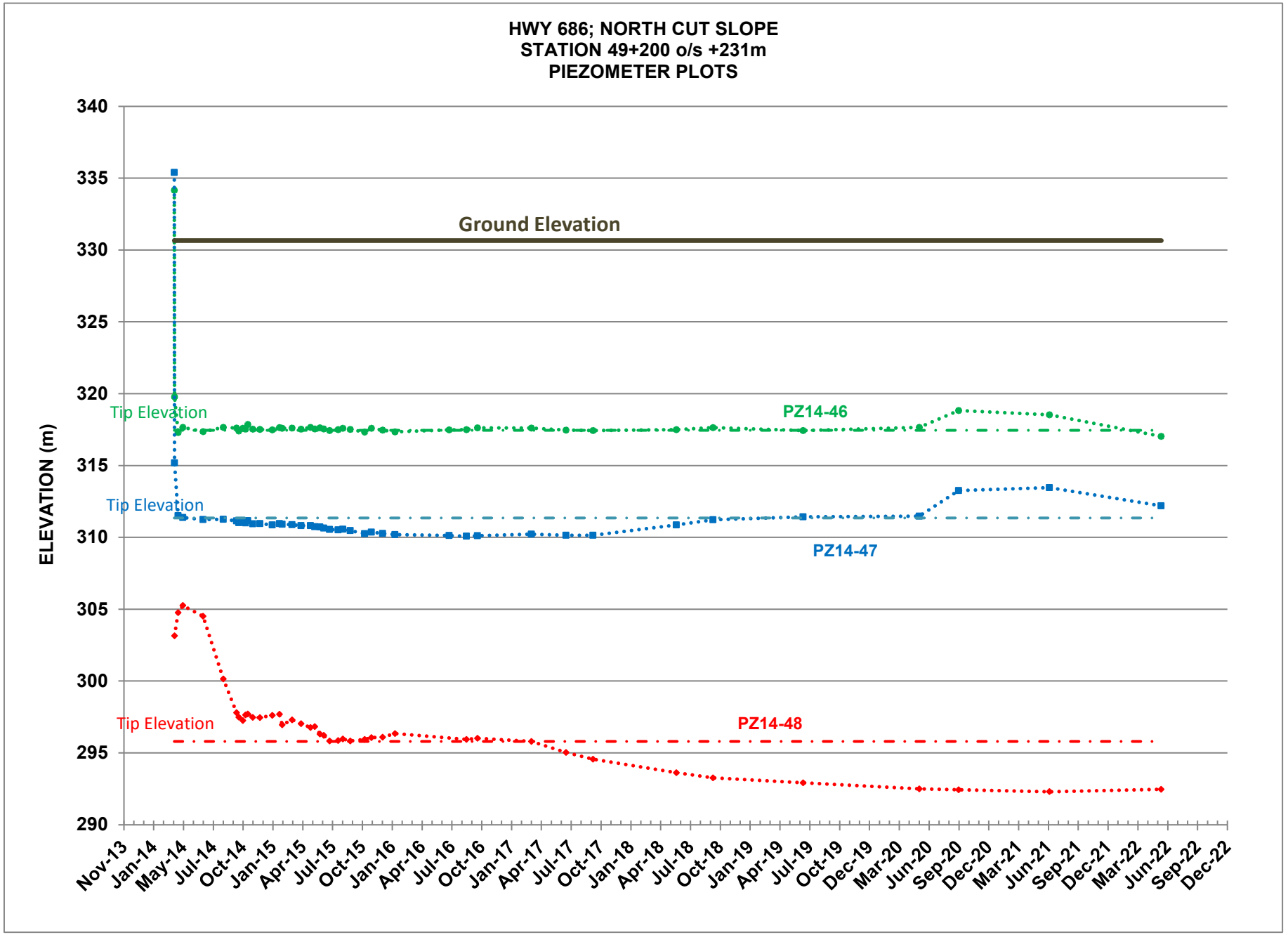


Figure 686-12

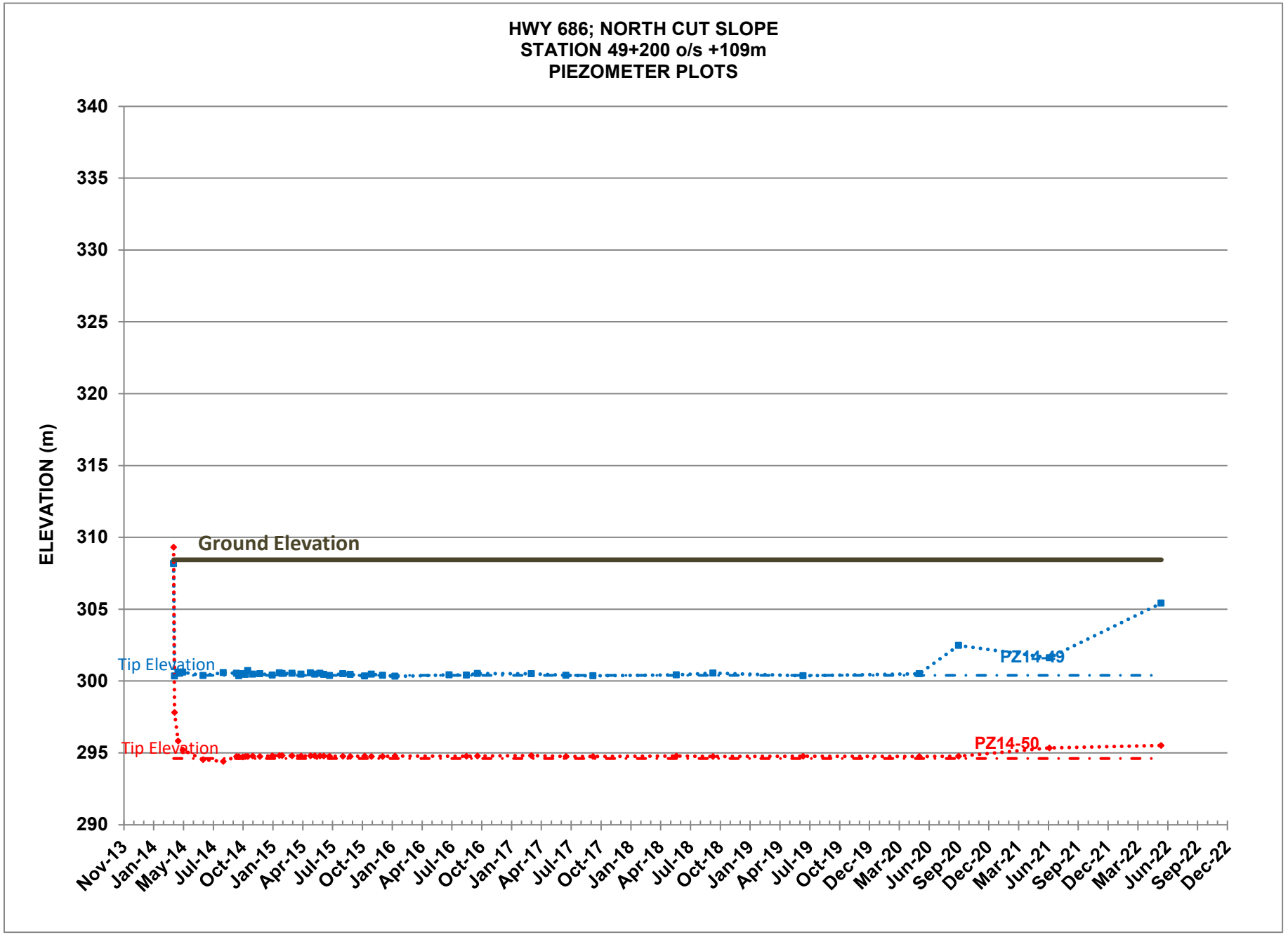


Figure 686-13