



THURBER ENGINEERING LTD.

July 26, 2022

File No.: 32121

Alberta Transportation
Provincial Building
9621-96 Avenue
Peace River, Alberta
T8S 1T4

Attention: Mr. Max Shannon

**ALBERTA TRANSPORTATION GRMP (CON0022164)
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING RESULTS – SPRING 2022**

SECTION C

SITE SH001/SH001A: HWY 33:12 (SWAN HILLS RETAINING WALL)

Dear Mr. Shannon:

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 (GRMP) for Peace Region – Peace River District (CON0022164).

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. FIELD PROGRAM AND INSTRUMENTATION STATUS

Five slope inclinometers (SI-16, SI-18, SI-20, SI18-5, and SI18-6) and thirteen pneumatic piezometers (PN-1 to PN-4, PN01-2, PN18-4A, PN18-4B, PN18-5A, PN18-5B, PN18-6A, PN18-6B, PN18-7A, and PN18-7B) were read at the SH001-1 Hwy 33:12 Swan Hills Retaining Wall sites on June 9, 2022, by Mr. Niraj Regmi, G.I.T., and Mr. Jayden Del Cid, both of Thurber Engineering Ltd.

The SIs were read using two RST Digital Inclinometer probes with 2 ft. wheelbases and RST Pocket PC readouts. Inclinometer reading depths were defined as per cable markings with respect to the top of the inclinometer casing. The pneumatic piezometers were read using an RST C108 pneumatic piezometer readout.

2. DATA PRESENTATION

2.1 General

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



Slope inclinometer and piezometer reading summary tables are provided below. These tables also include instruments deleted from the GRMP program, for reference.

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 movements are summarized in Table SH001-1 below. Table SH001-1 below also provides a historical account of the total movement, the depth of movement and the maximum rate of movement that has occurred in the SIs since initialization.



**TABLE SH001-1
 SPRING 2022 – HWY 33:12 SWAN HILLS RETAINING WALL
 SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: June 9, 2022

INSTRUMENT #	DATE INITIALIZED	TOTAL CUMULATIVE RESULTANT MOVEMENT AT NOTED DEPTH SINCE INITIAL READING (mm)	MAXIMUM RATE OF MOVEMENT (mm/yr)	CURRENT STATUS	DATE OF PREVIOUS READING	INCREMENTAL MOVEMENT SINCE PREVIOUS READING (mm)	CURRENT RATE OF MOVEMENT (mm/yr)	CHANGE IN RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr)
SI-16	September 20, 1994	No discernible movement	N/A	Operational	July 5, 2021	No discernible movement	N/A	N/A
SI-18	September 20, 1994	No discernible movement	N/A	Operational	July 5, 2021	No discernible movement	N/A	N/A
SI-20	September 20, 1994	No discernible movement	N/A	Operational	July 5, 2021	No discernible movement	N/A	N/A
SI-21	September 20, 1994	24.0 mm over 4.2 m to 6.7 m in 14° direction	3.2 mm/yr between Sep 2001 and Oct 2001	Damaged	October 23, 2010	N/A	N/A	N/A

Drawings 32121-SH001-1 and 32121-SH001A-1 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.



**TABLE SH001-1 - CONTINUED
 SPRING 2022 – HWY 33:12 SWAN HILLS RETAINING WALL
 SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: June 9, 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)
SH001								
<i>SI18-4</i>	<i>March 20, 2018</i>	<i>36.5 mm over 15.8 to 17.0 m depth in 346° direction</i>	<i>51.1 on September 25, 2019</i>	<i>Sheared at 17.7 m below top of casing</i>	<i>September 25, 2020</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
SI18-5	March 20, 2018	10.6 mm over 7.9 to 9.2 m depth in 329° direction	4.1 on September 25, 2019	Operational	July 5, 2021	1.7	1.8	-0.6
SI18-6	April 23, 2018	No discernible movement	N/A	Operational	July 5, 2021	N/A	N/A	N/A
SH001A								
<i>SI18-7</i>	<i>April 23, 2018</i>	<i>50.1 mm over 6.1 to 7.9 m depth in 316° direction</i>	<i>79.2 on June 3, 2018</i>	<i>Sheared at 8.5 m depth</i>	<i>June 18, 2019</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>

Drawings 32121-SH001-1 and 32121-SH001A-1 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.



TABLE SH001-2
SPRING 2022 – HWY 33:12 SWAN HILLS RETAINING WALL
PNEUMATIC PIEZOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: June 9, 2022

INSTRUMENT #	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM GROUNDWATER ELEVATION (m)	MEASURED PORE PRESSURE (kPa)	CURRENT GROUNDWATER ELEVATION (m)	PREVIOUS GROUNDWATER ELEVATION (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
SH001									
PN-1	May 22, 1990	1135.56	1149.56	Operational	1136.78 in November 1993	2.1	1135.77	1135.80	-0.03
PN-2	May 22, 1990	1146.06	1149.56	Operational	1148.21 in October 1997	8.2	1146.90	1146.91	-0.01
PN-3	May 22, 1990	1136.15	1139.20	Operational	1137.56 in September 1991	0.4	1136.19	1136.20	-0.01
PN-4	May 22, 1990	1132.20	1139.20	Operational	1137.61 in October 1991	28.7	1135.13	1135.09	0.04
PN01-1	June 20, 2001	1145.42	1159.10	<i>Not Operational (Spring 2018)</i>	1154.19 in May 2013	N/A	N/A	N/A	N/A
PN01-2	June 20, 2001	1145.82	1156.50	Operational	1154.50 in September 2008	82.2	1154.20	1153.98	0.22

Drawings 32121-SH001-1 and 32121-SH001A-1 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

Notes:

PN - pneumatic piezometer.



**TABLE SH001-3
 SPRING 2022 – HWY 33:12 SWAN HILLS RETAINING WALL
 PNEUMATIC PIEZOMETER INSTRUMENTATION READING SUMMARY (2018 INSTRUMENTS)**

Date Monitored: June 9, 2022

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	CURRENT STATUS	MAXIMUM GROUNDWATER LEVEL (mBGS)	MEASURED PORE PRESSURE (kPa)	CURRENT GROUNDWATER DEPTH (mBGS)	PREVIOUS GROUNDWATER DEPTH (mBGS)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
SH001								
PN18-4A (37838)	March 20, 2018	8.5	Operational	4.00 on March 20, 2018	39.9	4.43	4.80	0.37
PN18-4B (37832)	March 20, 2018	15.0	Operational	7.60 on June 9, 2022	72.6	7.60	7.96	0.36
PN18-5A (37836)	March 20, 2018	9.9	Operational	7.96 on Sep. 25, 2019	14.0	8.47	9.45	0.98
PN18-5B (37834)	March 20, 2018	17.7	Operational	15.17 on March 20, 2018	22.1	15.45	15.53	0.08
PN18-6A (37835)	March 20, 2018	5.3	Operational	2.96 on June 2, 2020	19.6	3.30	3.31	0.01
PN18-6B (37833)	March 20, 2018	12.2	Operational	8.33 on September 30, 2020	37.1	8.42	8.55	0.13
SH001A								
PN18-7A (37837)	March 20, 2018	6.0	Operational	-2.21* on June 9, 2022	80.5	-2.21*	-1.88*	0.33
PN18-7B (37831)	March 20, 2018	12.0	Operational	10.44 on September 19, 2018	8.1	11.17	11.32	0.15

Drawings 32121-SH001-1 and 32121-SH001A-1 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

* Negative (-) values indicate an above ground (artesian) groundwater level. BGS = Below Ground Surface



3. INTERPRETATION OF MONITORING RESULTS

Slope inclinometers SI-16, SI-18 and SI-20 continued to show no discernible movement.

SI18-5, installed behind the retaining wall, showed a rate of movement of 1.8 mm/yr over 7.9 m to 9.2 m depth since the spring of 2021 readings. The rate of movement in SI18-5 is similar to movement rates shown during previous readings cycles as the overall rate (since initialization) was 2.5 mm/year.

SI18-6, also installed behind the retaining wall, has shown no discernible movement since installation other than some scatter in the upper 2 m.

Pneumatic piezometers PN-1, PN-2, and PN-3 showed decreases in groundwater level of 0.03 m, 0.01 m, and 0.01 m, respectively, since the spring of 2021 readings. PN-4, and PN01-2 showed increases in groundwater level of 0.04 m and 0.22 m, respectively, since the spring of 2021 readings. There does not appear to be a clear trend at these instruments; however, the water levels are all within their respective historical ranges.

Pneumatic piezometers PN18-4A, PN18-4B, PN18-5A, PN18-5B, PN18-6A, and PN18-6B showed increases in groundwater level of 0.37 m, 0.36 m, 0.98 m, 0.08 m, 0.01 m, and 0.13 m, respectively, since the spring of 2021 readings. Other than PN18-4B where the water level has been trending upward and the current level is the highest recorded in the instrument since initialization, there is no apparent trend to the water levels, and all are within their respective historical ranges.

Pneumatic piezometer PN18-7A, located west of the pavement distress at site SH001A, showed an increase in groundwater level of 0.33 m since the spring of 2021 readings. PN18-7A currently shows an above-ground (flowing artesian) groundwater level of 2.21 m, which is the highest water level since the instrument was initialized. This instrument has been showing artesian pressures since the spring of 2019 (about one year after installation). PN18-7B, also at the SH001A site, showed an increase in groundwater level of 0.15 m compared to the spring of 2021 readings.

Tables SH001-2 and SH001-3 summarize the pneumatic piezometer readings. The pneumatic piezometer results are plotted on Figures SH001-1, SH001-2, SH001-3, and SH001-4 in Appendix A.

4. RECOMMENDATIONS

4.1 Future Work

The instruments should be read again in the spring of 2023.

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

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 (Drawings No. 32121-SH001-1 and 32121-SH001A-1)
 - SI Reading Plots
 - Figure SH001-1 (Pneumatic Piezometer Elevations)
 - Figure SH001-2 (Pneumatic Piezometer Depths)
 - Figure SH001-3 (Pneumatic Piezometer Depths – 2018 Instruments – SH001)
 - Figure SH001-4 (Pneumatic Piezometer Depths – 2018 Instruments – SH001A)



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.



**ALBERTA TRANSPORTATION GRMP (CON0022164)
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING RESULTS**

SPRING 2022

**APPENDIX A
DATA PRESENTATION**

SITE SH001/SH001A: HWY 33:12 (SWAN HILLS RETAINING WALL)

**ALBERTA TRANSPORTATION
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING FIELD SUMMARY (SH001)
SPRING 2022**

Location: Swan Hills Retaining Wall (HWY 33:12 C1 9.432) File Number: 32121 Probe: RST Set 8R Cable: RST Set 8R	Readout: RST PN C108 Unit 4 Casing Size: 2.75", SI 16,18 and 20 3.34" Temp: 18 Read by: NKR/JD
--	---

SLOPE INCLINOMETER (SI) READINGS

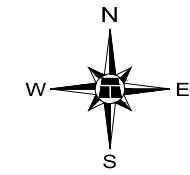
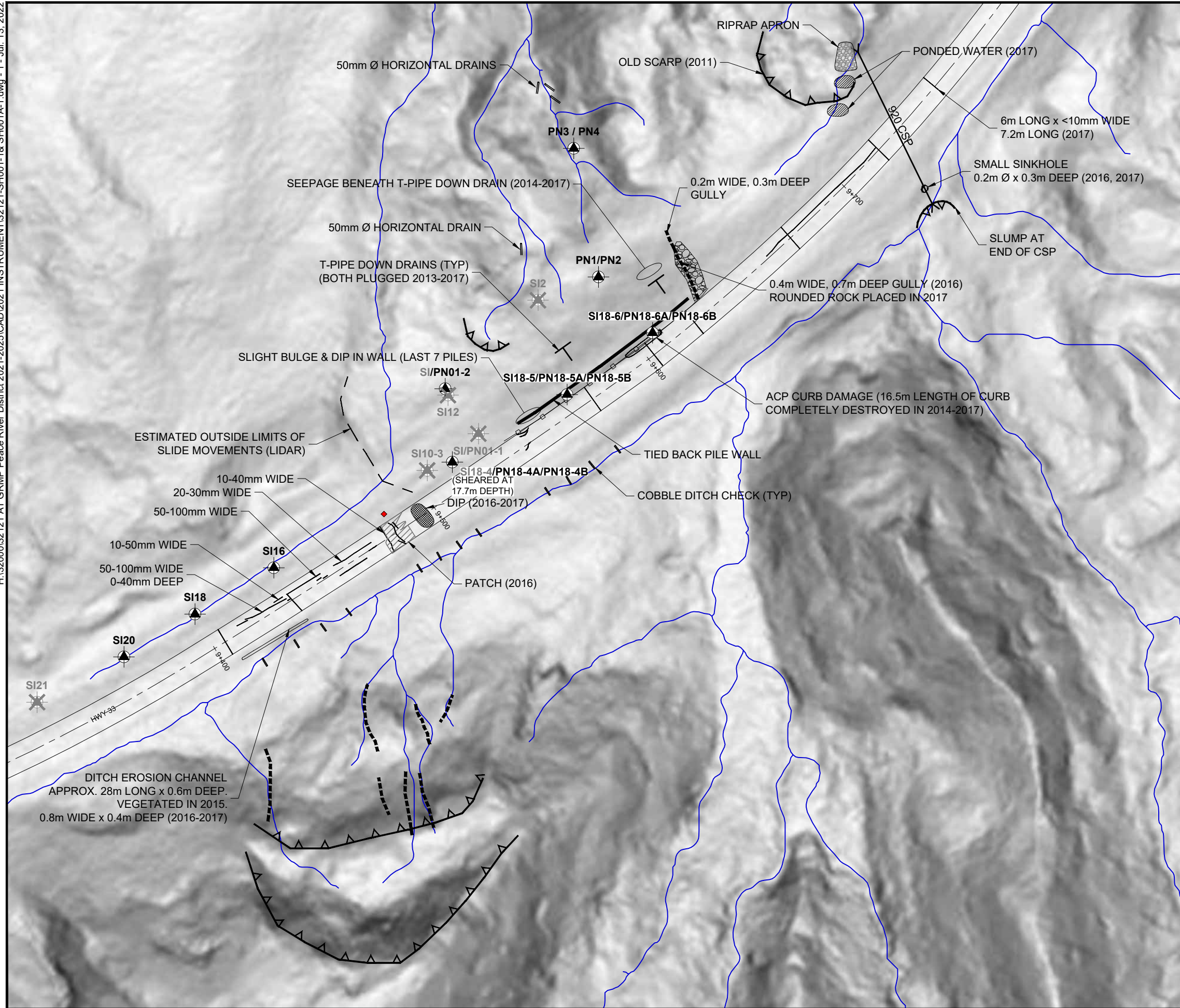
SI#	GPS Location (UTM 11)		Date	Stickup (m)	Depth from top of casing (ft)	Magn. North A+ Groove degree	Current Bottom Depth Readings				Probe/ Reel #	Remarks
	Easting	Northing					A+	A-	B+	B-		
SI-16	607430	6070455	9-Jun-22	0.45	96 to 4	345	-50	63	-130	141	8R	
SI-18	607398	6070436	9-Jun-22	1.05	96 to 4	320	328	-311	-61	67	8R	
SI-20	607371	6070420	9-Jun-22	0.72	96 to 4	345	484	-466	656	-648	8R	
SI18-5	607536	6070521	9-Jun-22	0.90	82 to 2	301	-142	162	-9	7	5R	
SI18-6	607554	6070532	9-Jun-22	1.07	52 to 2	265	1286	-1264	-274	250	5R	

PNEUMATIC PIEZOMETER (PN) READINGS

PN#	GPS Location (UTM 11)		Date	Reading (kPa)	Identification Number
	Easting	Northing			
PN-1	607556	6070560	9-Jun-22	2.1	12871
PN-2	607556	6070560	9-Jun-22	8.2	12872
PN-3	607542	6070600	9-Jun-22	0.4	12291
PN-4	607542	6070600	9-Jun-22	28.7	12305
PN01-2	607494	6070525	9-Jun-22	82.2	25973
PN18-4A	607498	6070498	9-Jun-22	39.9	37838
PN18-4B	607498	6070498	9-Jun-22	72.6	37832
PN18-5A	607536	6070521	9-Jun-22	14	37836
PN18-5B	607536	6070521	9-Jun-22	22.1	37834
PN18-6A	607554	6070532	9-Jun-22	19.6	37835
PN18-6B	607554	6070532	9-Jun-22	37.1	37833
PN18-7A	607829	6070861	9-Jun-22	80.5	37837
PN18-7B	607829	6070861	9-Jun-22	8.1	37831

DAILY INSPECTOR REPORT

H:\32000\32121 AT GRMP Peace River District 2021-2025\CAD\2021 INSTRUMENT\32121-SH001-1& SH001A-1.dwg - 1 - Jul. 13. 2022



LEGEND

- SCARP (INTERPRETED FROM LIDAR)
- APPROXIMATE INSTRUMENT LOCATION
- NON - OPERATIONAL INSTRUMENT
- PNEUMATIC PIEZOMETER
- SLOPE INCLINOMETER
- GULLY
- DRAINAGE PATHS (INTERPRETED FROM LIDAR)
- GUARDRAIL
- RED TEMPORARY HAZARD SIGN

NOTES

1. FEATURE LOCATIONS ARE APPROXIMATE.
2. LIDAR SHADED ACCORDING TO SLOPE FROM WHITE AT 0° TO BLACK AT 35° AND STEEPER.
3. 2021 INSPECTION OBSERVATIONS SHOWN IN BLACK.
4. DRAWING UPDATED IN 2017 USING LIDAR, SATELLITE IMAGERY, AND A MEASURING WHEEL.

LIDAR PROVIDED BY ALBERTA TRANSPORTATION (FLOWN 2007)



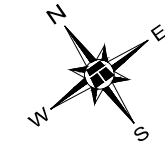
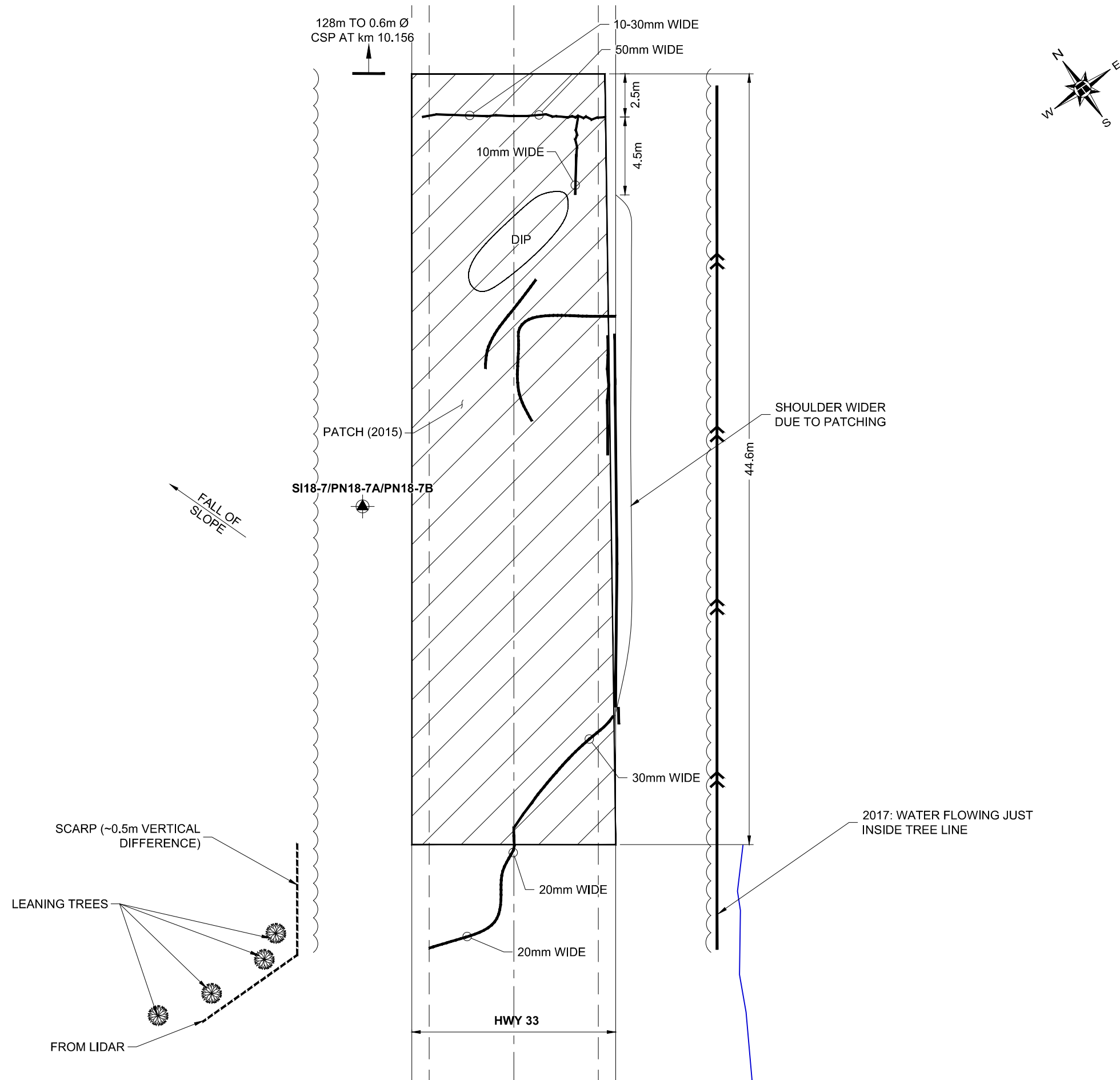
PEACE REGION (PEACE RIVER DISTRICT)

SH001: HWY 33:12 SWAN HILLS RETAINING SITE PLAN SHOWING APPROXIMATE INSTRUMENT LOCATIONS

DWG No. 32121-SH001-1

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	DWP
SCALE	1:1500
LAST UPDATED	SEPTEMBER 2021
FILE No.	32121



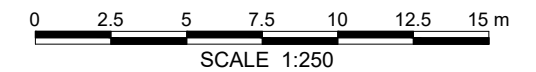


LEGEND

- CRACK
- WATER COURSE
- APPROXIMATE INSTRUMENT LOCATION
- PN PNEUMATIC PIEZOMETER
- SI SLOPE INCLINOMETER
- APPROXIMATE TREE LINE

NOTES

1. FEATURE LOCATIONS ARE APPROXIMATE.
2. 2021 INSPECTION OBSERVATIONS SHOWN IN BLACK (2013-2015 FROM AMEC FIGURE 1, PROJECT EG10030, PROVIDED BY ALBERTA TRANSPORTATION).
3. CRACK PATTERN REMEASURED IN 2017 USING MEASURING WHEEL. PREVIOUS PATTERN REMOVED. DRAWING UPDATED USING HIGH RESOLUTION SATELLITE IMAGERY AND LIDAR (FLOWN 2007)





PEACE REGION (PEACE RIVER DISTRICT)

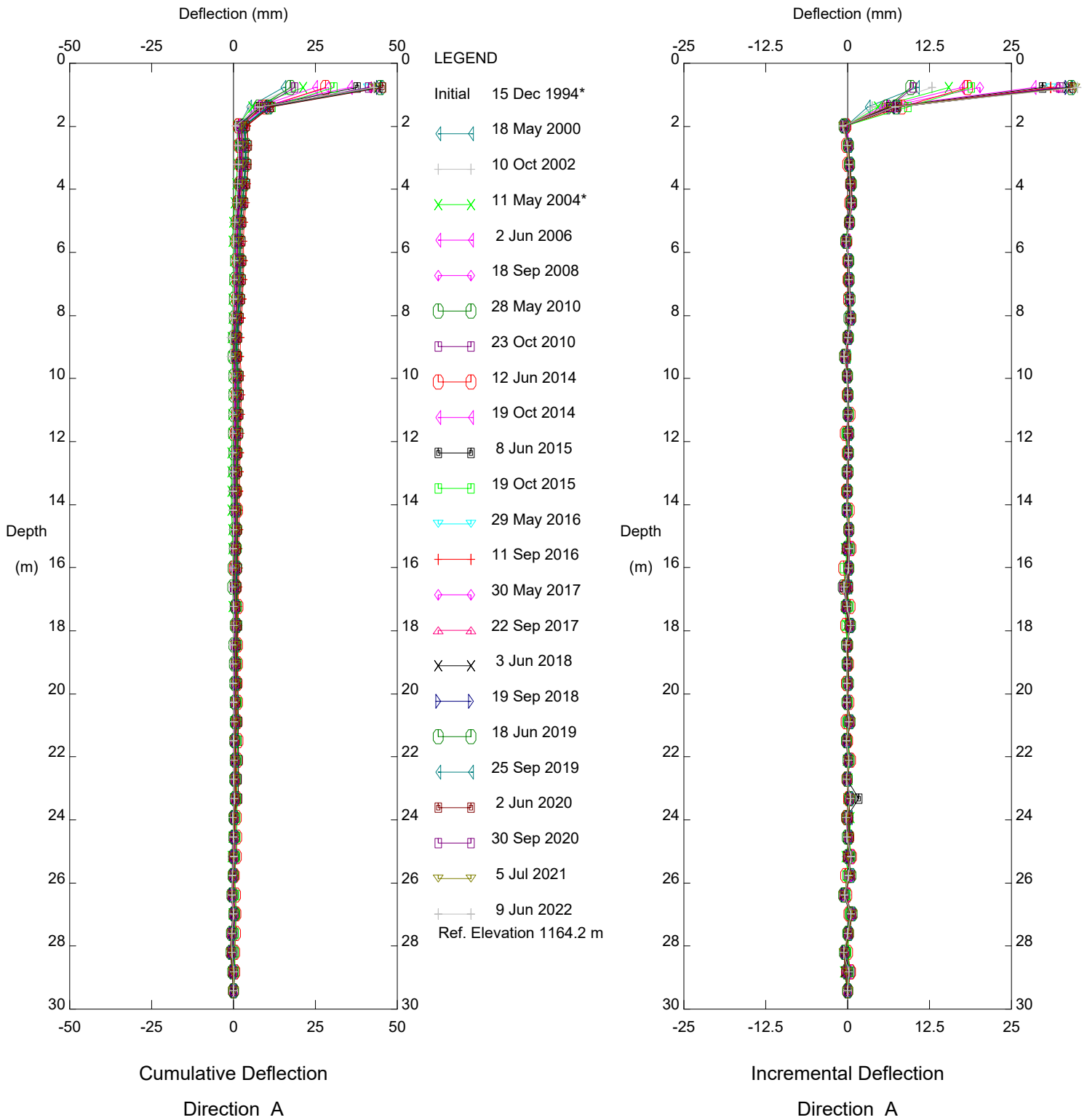
SH001A: HWY 33:12
SITE PLAN SHOWING APPROXIMATE INSTRUMENT LOCATIONS

DWG No. 32121-SH001A-1

DRAWN BY	ML
DESIGNED BY	NFR
APPROVED BY	DWP
SCALE	1:250
LAST UPDATED	SEPTEMBER 2021
FILE No.	32121



Thurber Engineering Ltd

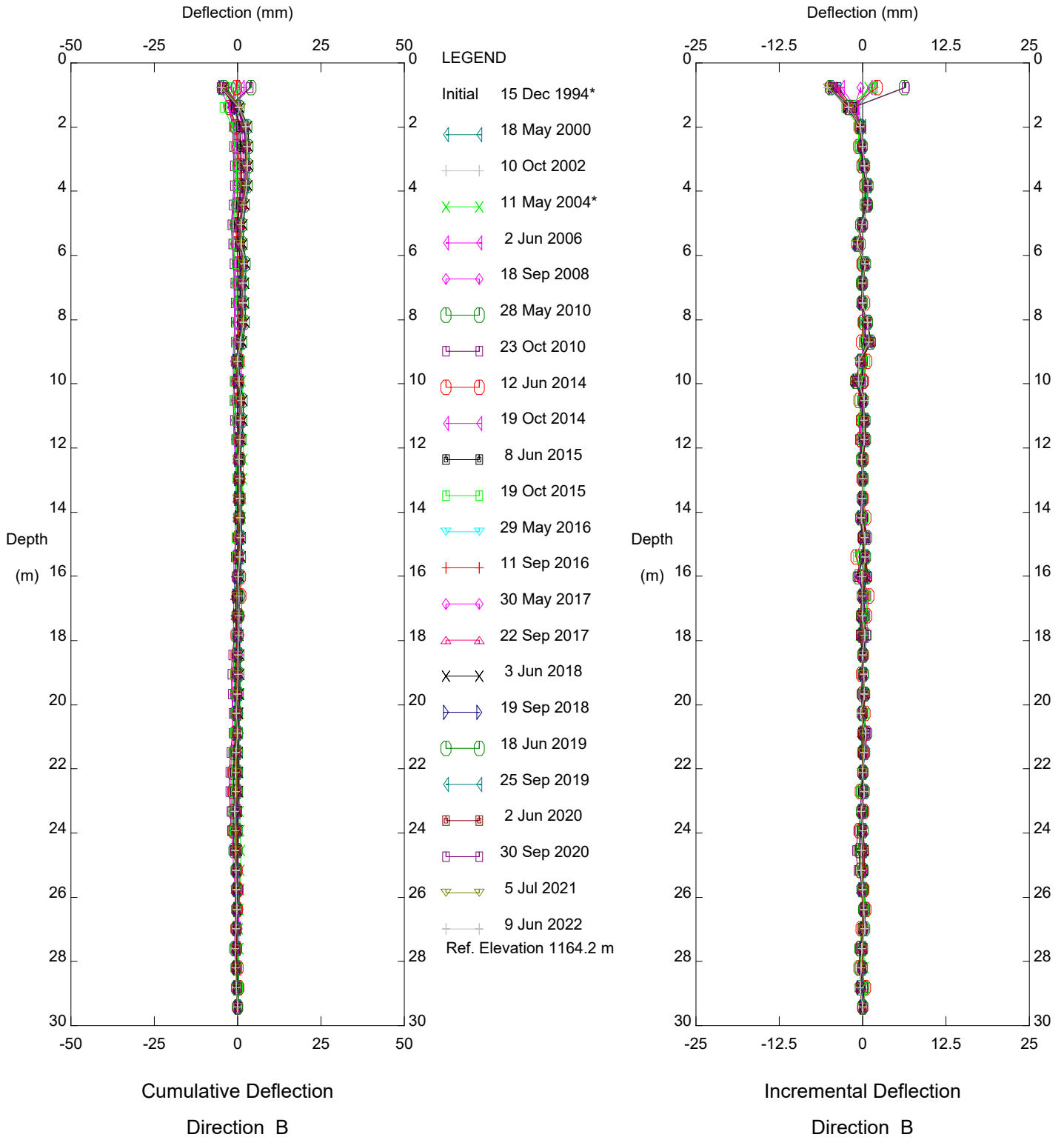


SH001 - Swan Hills Retaining Wall, Inclinometer SI 16

Alberta Transportation

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

Thurber Engineering Ltd

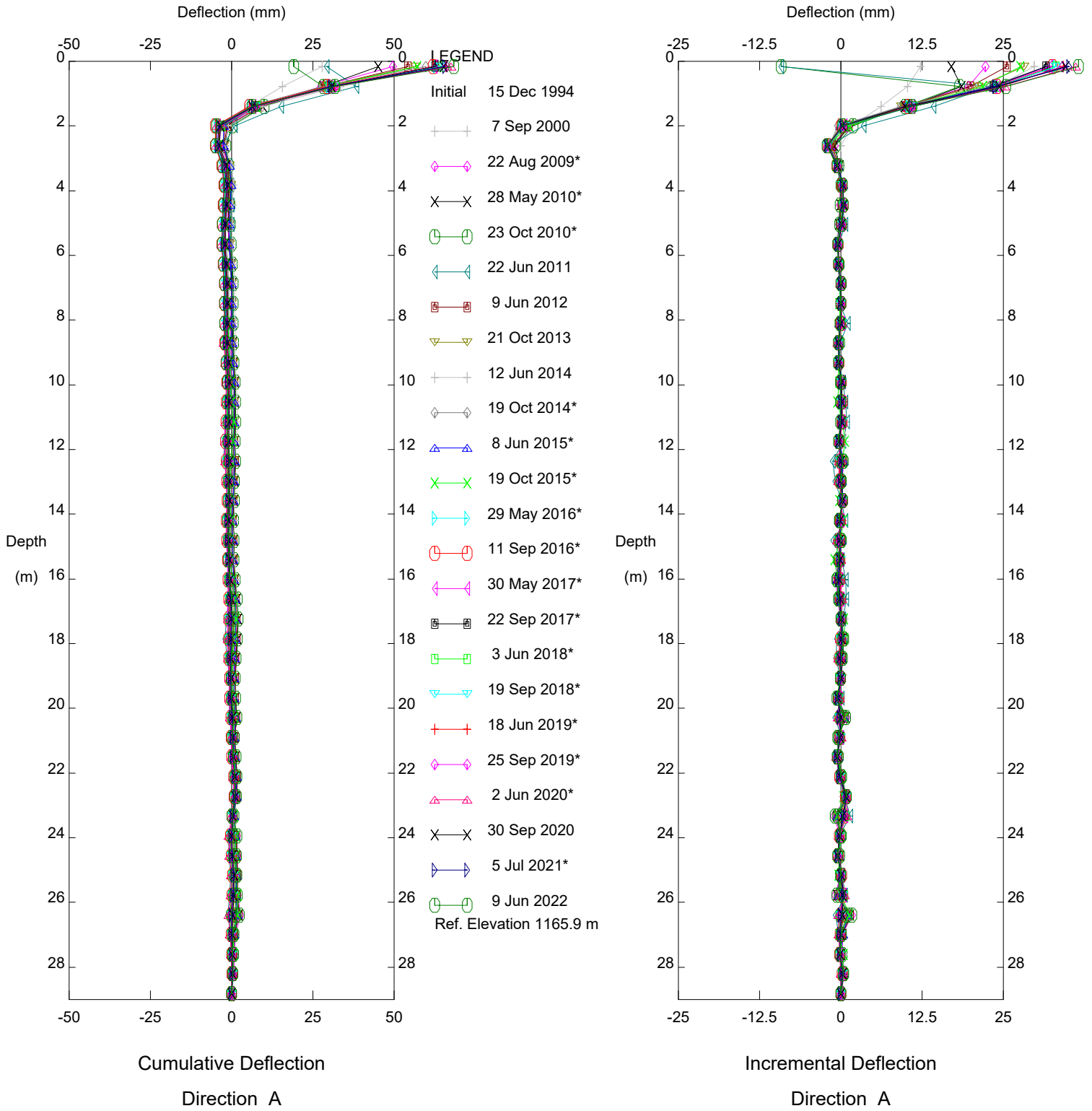


SH001 - Swan Hills Retaining Wall, Inclinometer SI 16

Alberta Transportation

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

Thurber Engineering Ltd

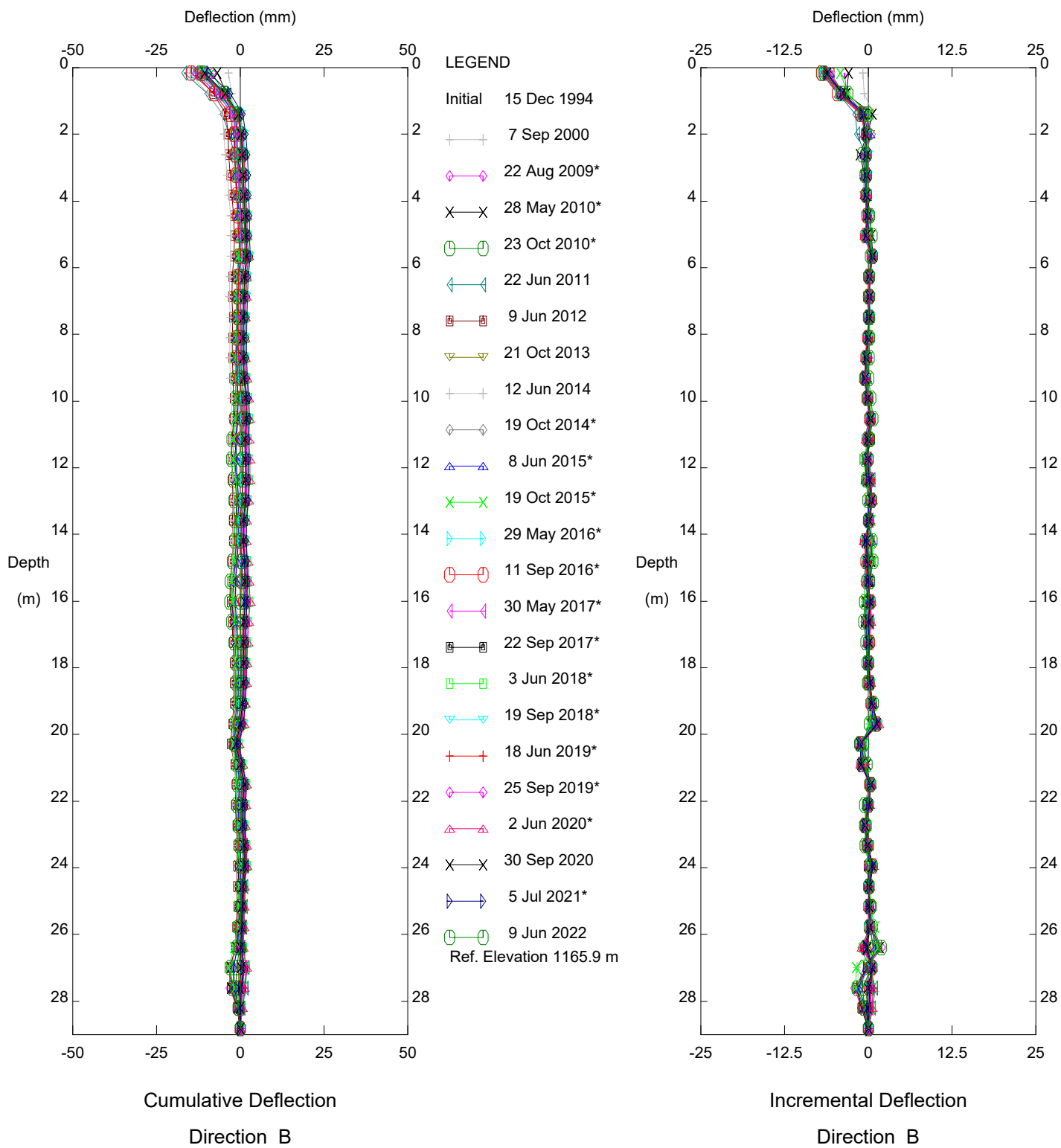


SH001, Swan Hills Retaining Wall, Inclinometer SI 18

Alberta Transportation

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

Thurber Engineering Ltd

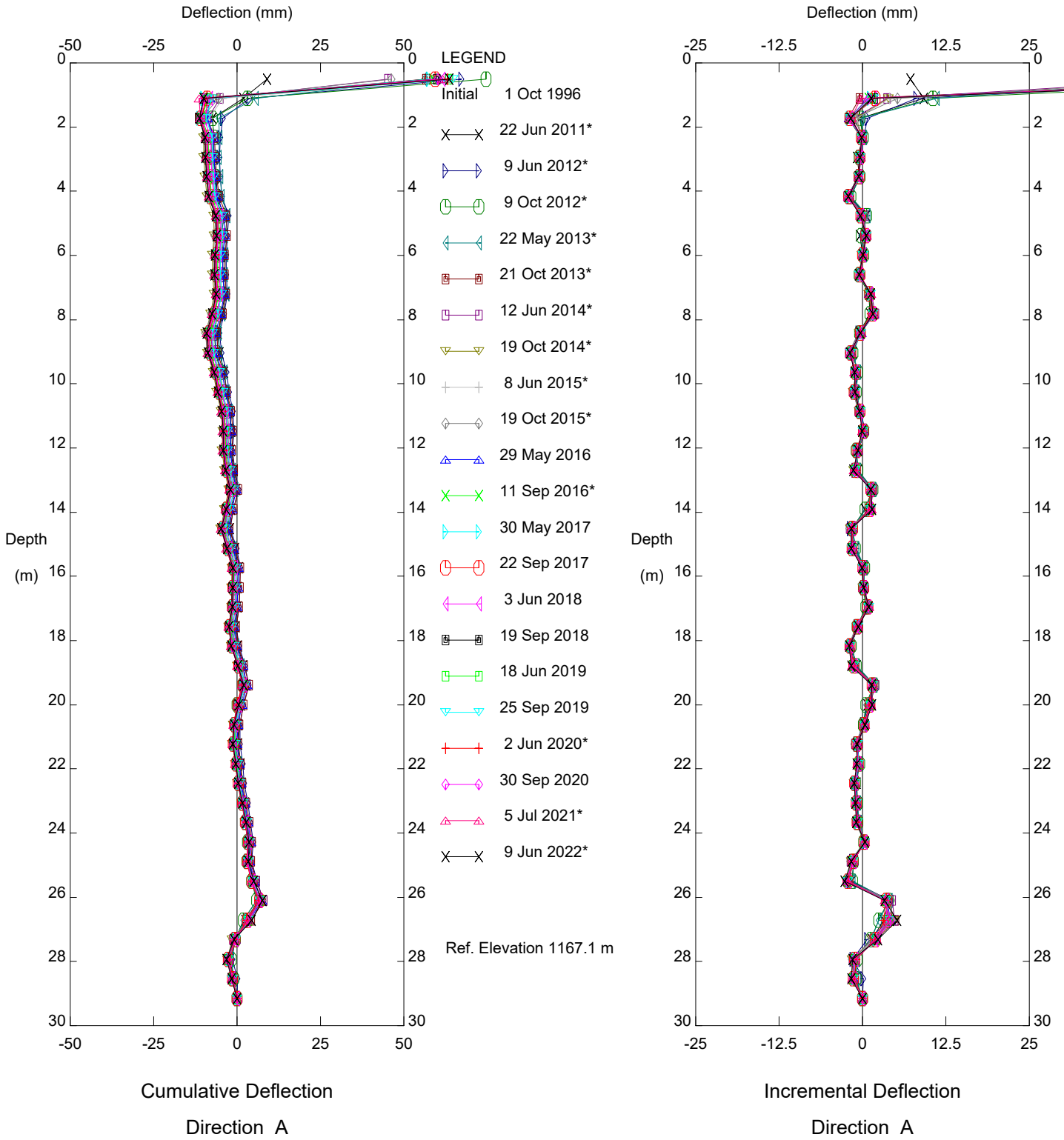


SH001, Swan Hills Retaining Wall, Inclinometer SI 18

Alberta Transportation

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

Thurber Engineering Ltd

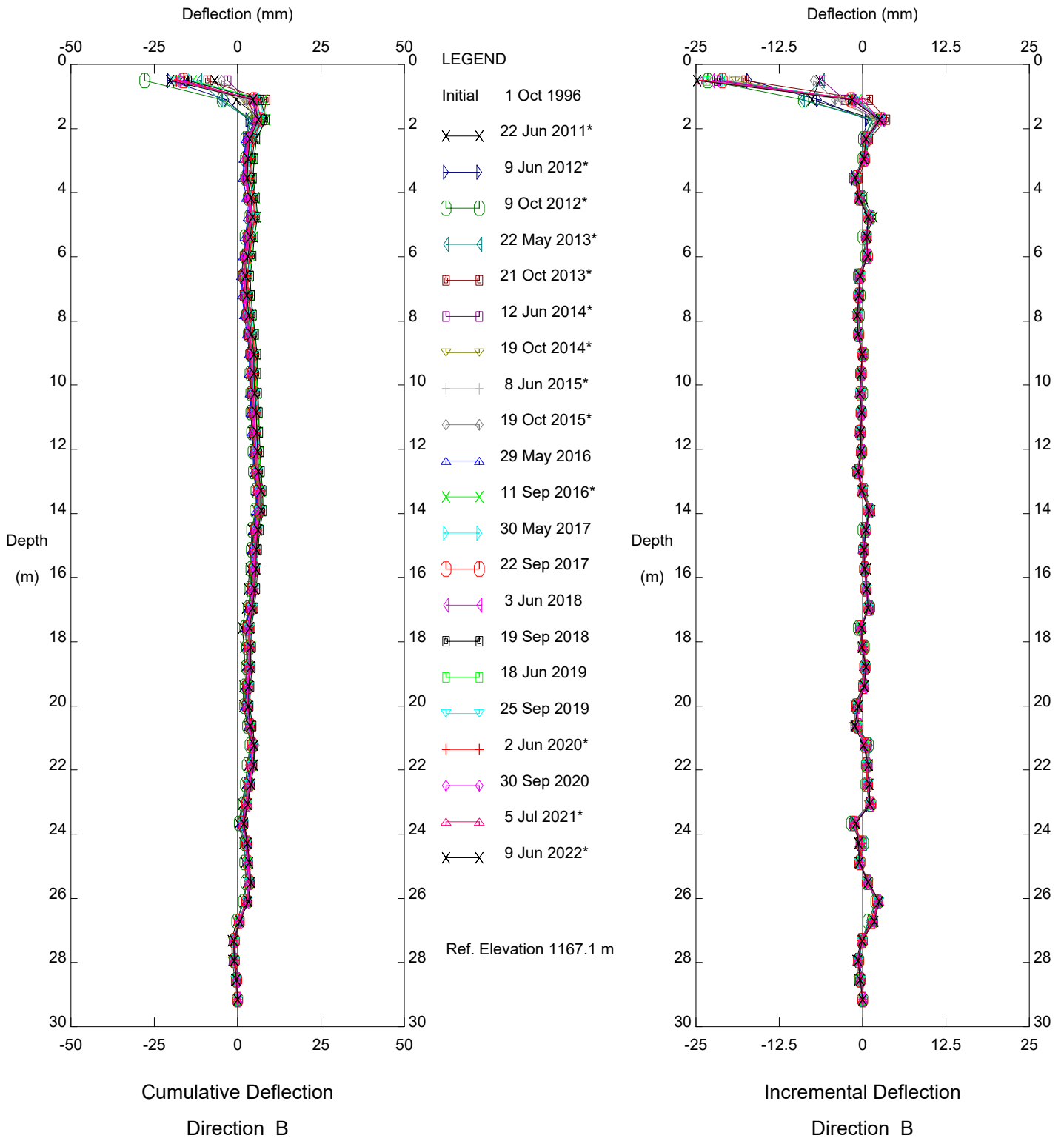


Swan Hills - SH001 Retaining Wall, Inclinometer SI 20

Alberta Transportation

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

Thurber Engineering Ltd

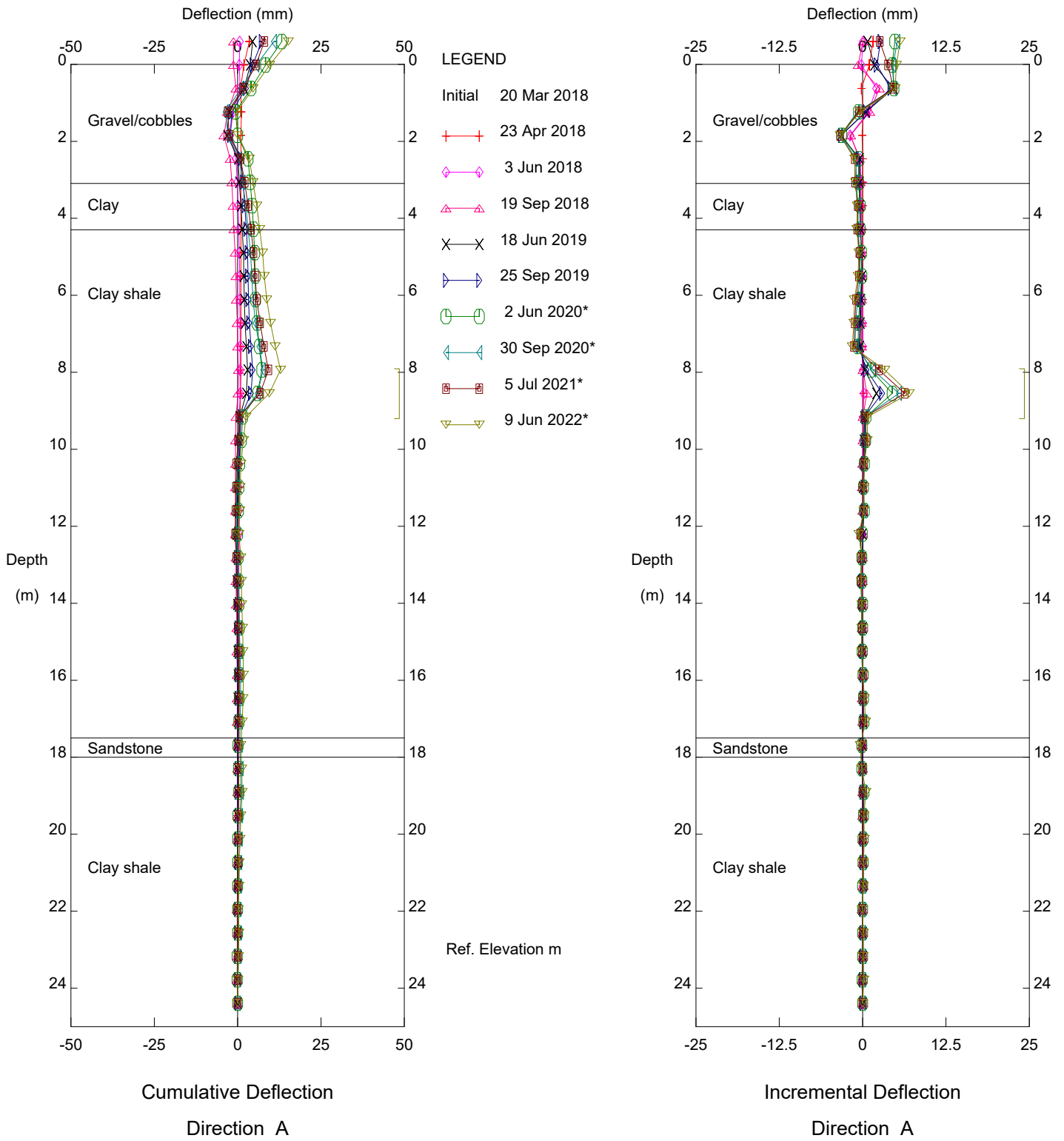


Swan Hills - SH001 Retaining Wall, Inclinometer SI 20

Alberta Transportation

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

Thurber Engineering Ltd

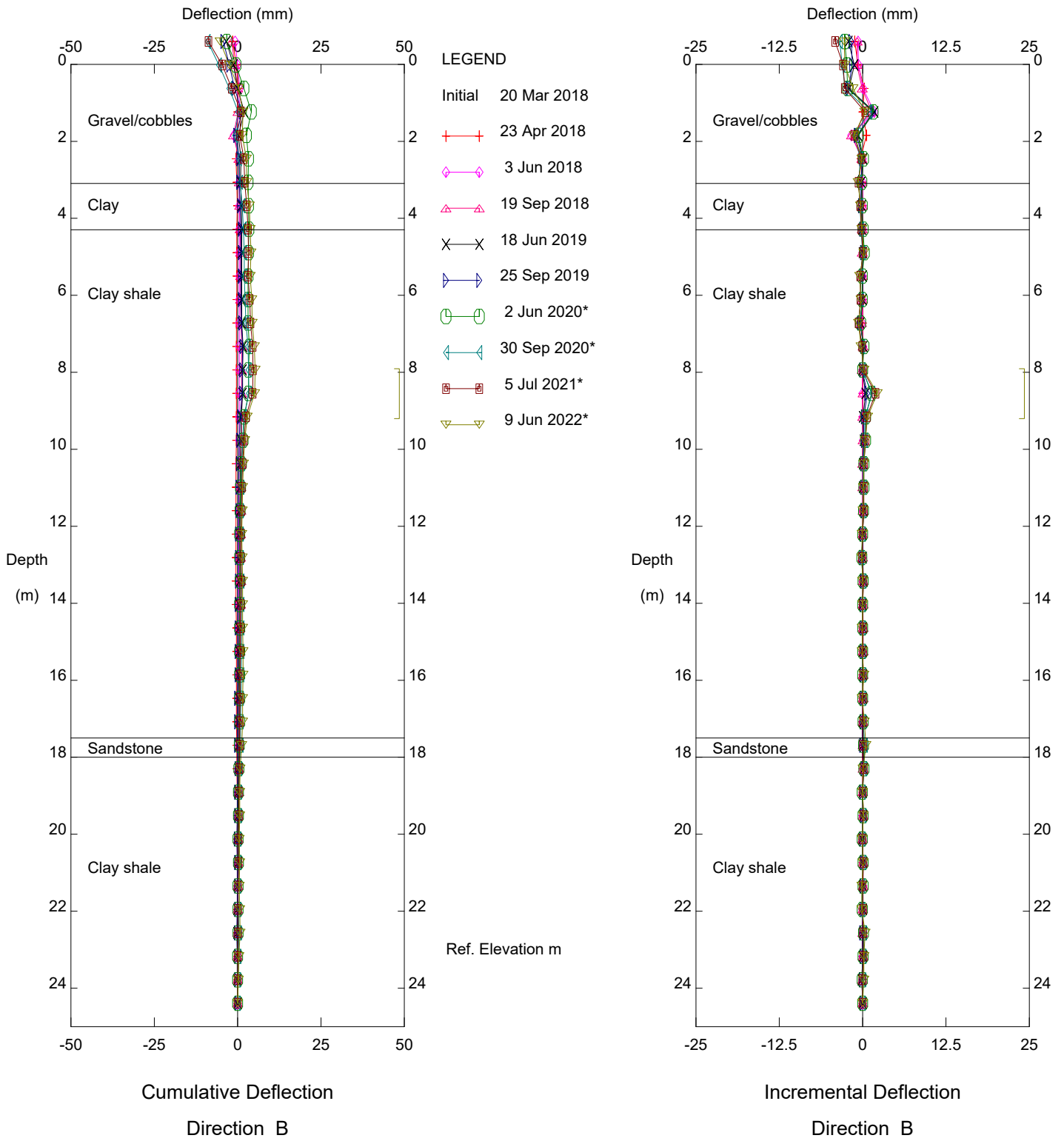


SH001 Retaining Wall, Inclinometer SI18-5

Alberta Transportation

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

Thurber Engineering Ltd

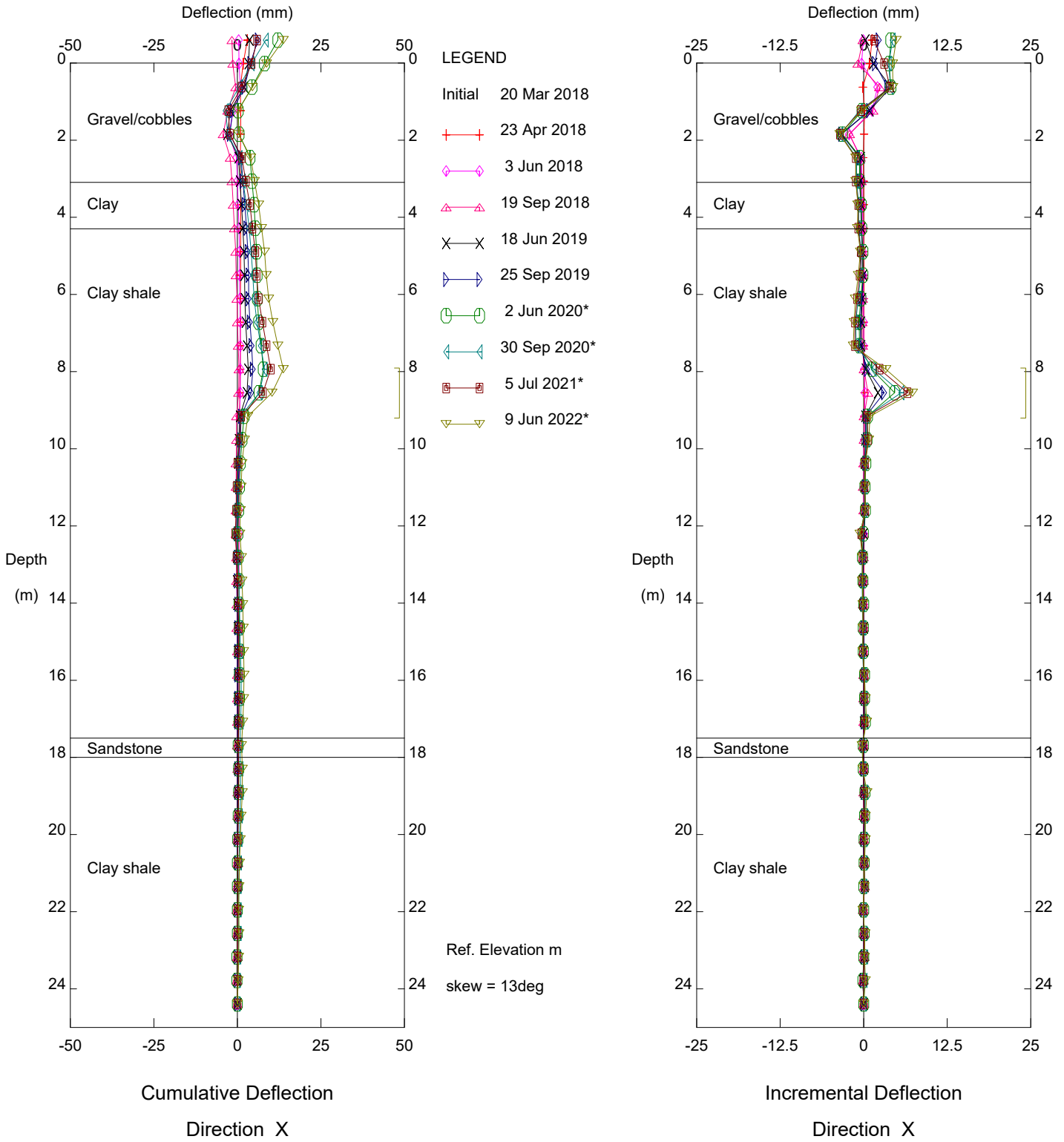


SH001 Retaining Wall, Inclinometer SI18-5

Alberta Transportation

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

Thurber Engineering Ltd

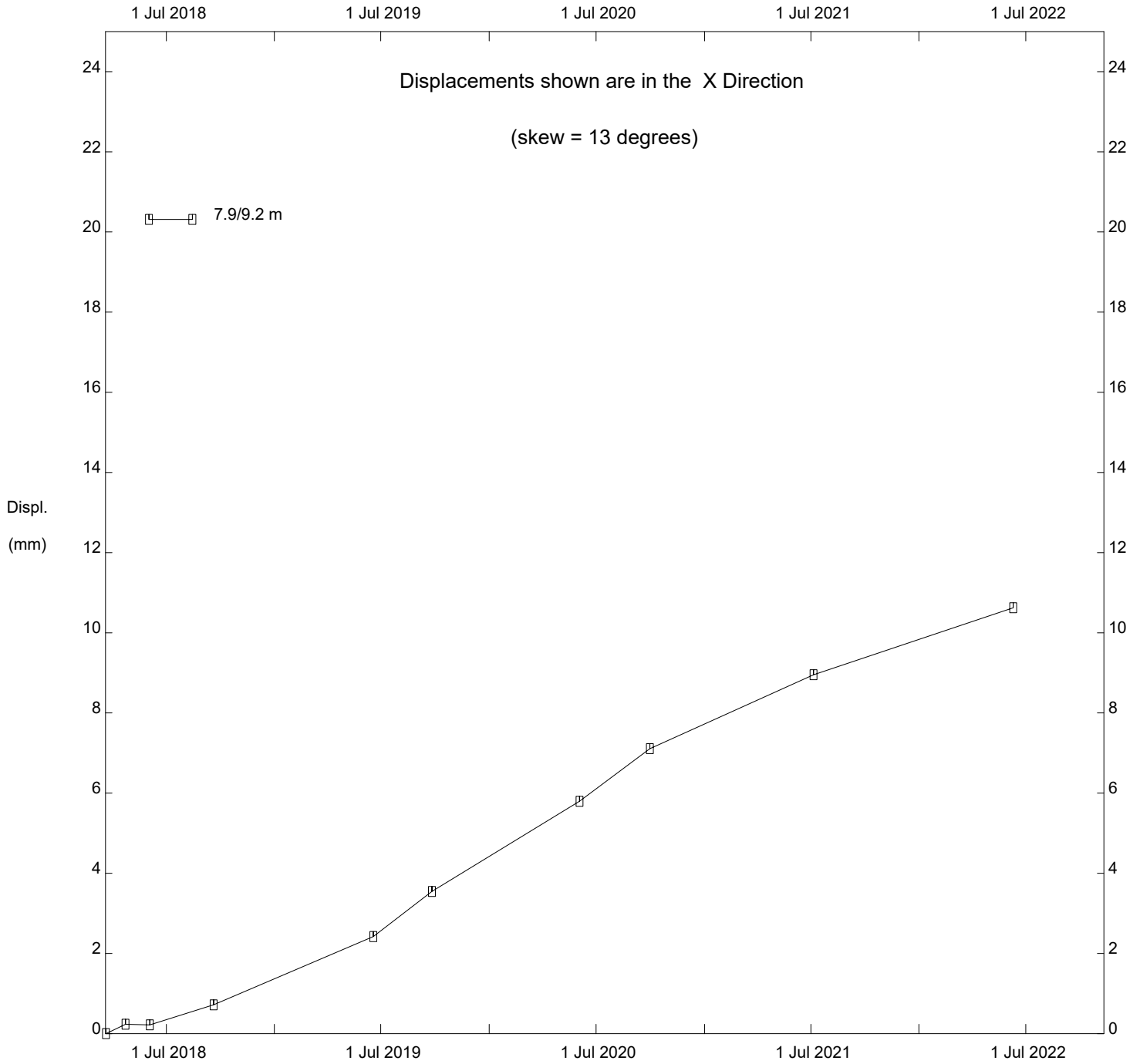


SH001 Retaining Wall, Inclinometer SI18-5

Alberta Transportation

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

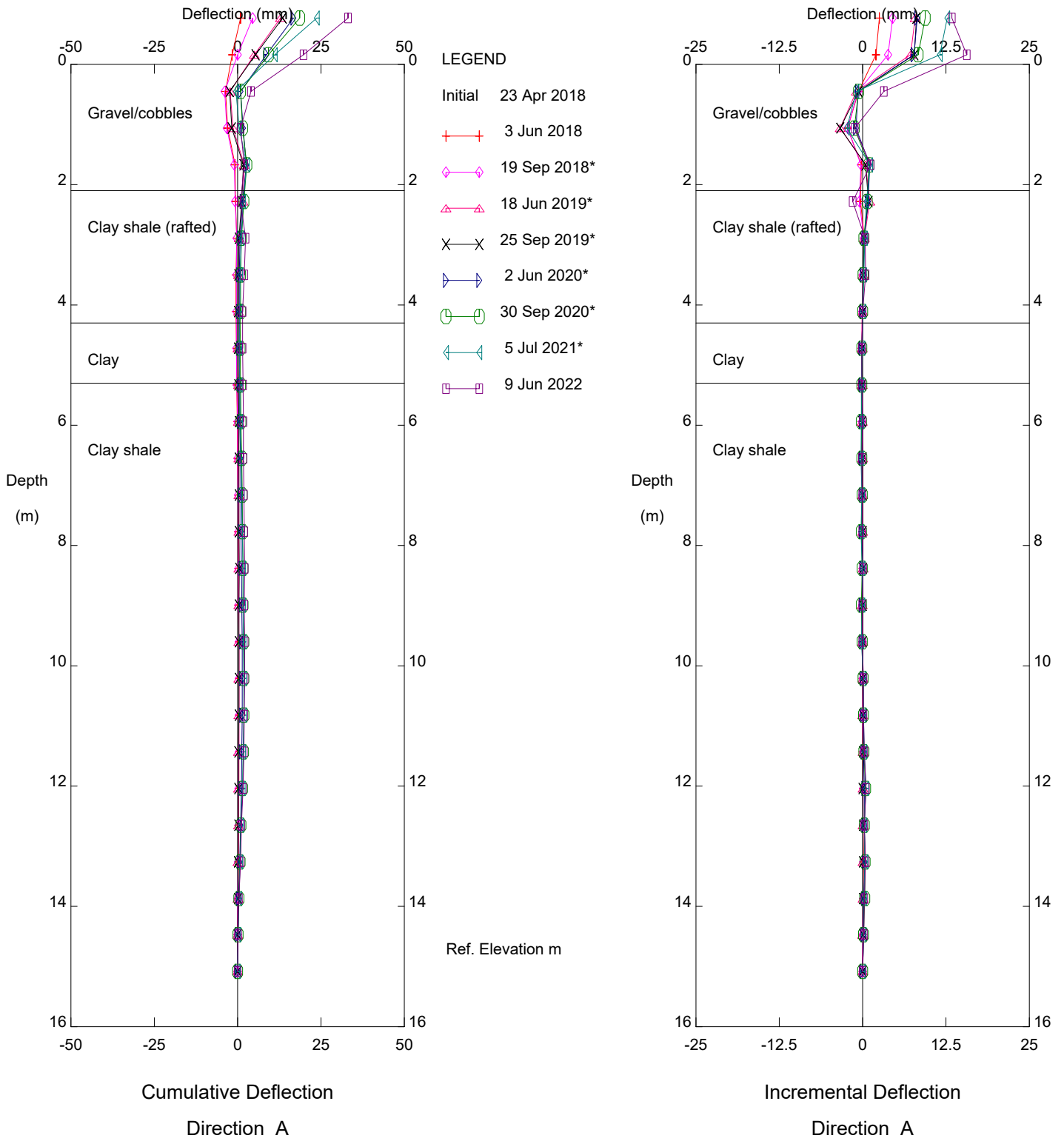
Thurber Engineering Ltd



SH001 Retaining Wall, Inclinator SI18-5

Alberta Transportation

Thurber Engineering Ltd

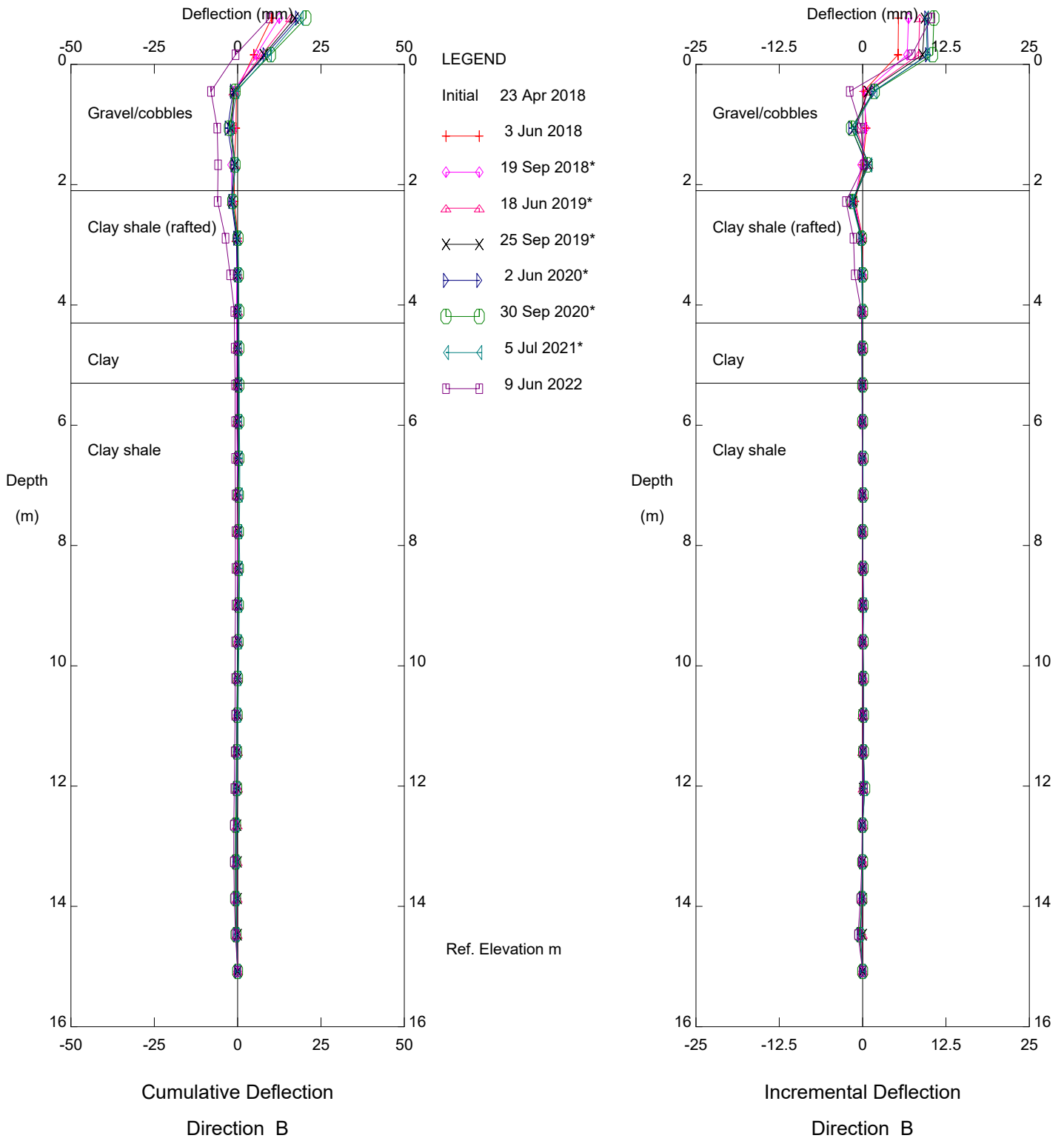


SH001 Retaining Wall, Inclinometer SI18-6

Alberta Transportation

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

Thurber Engineering Ltd

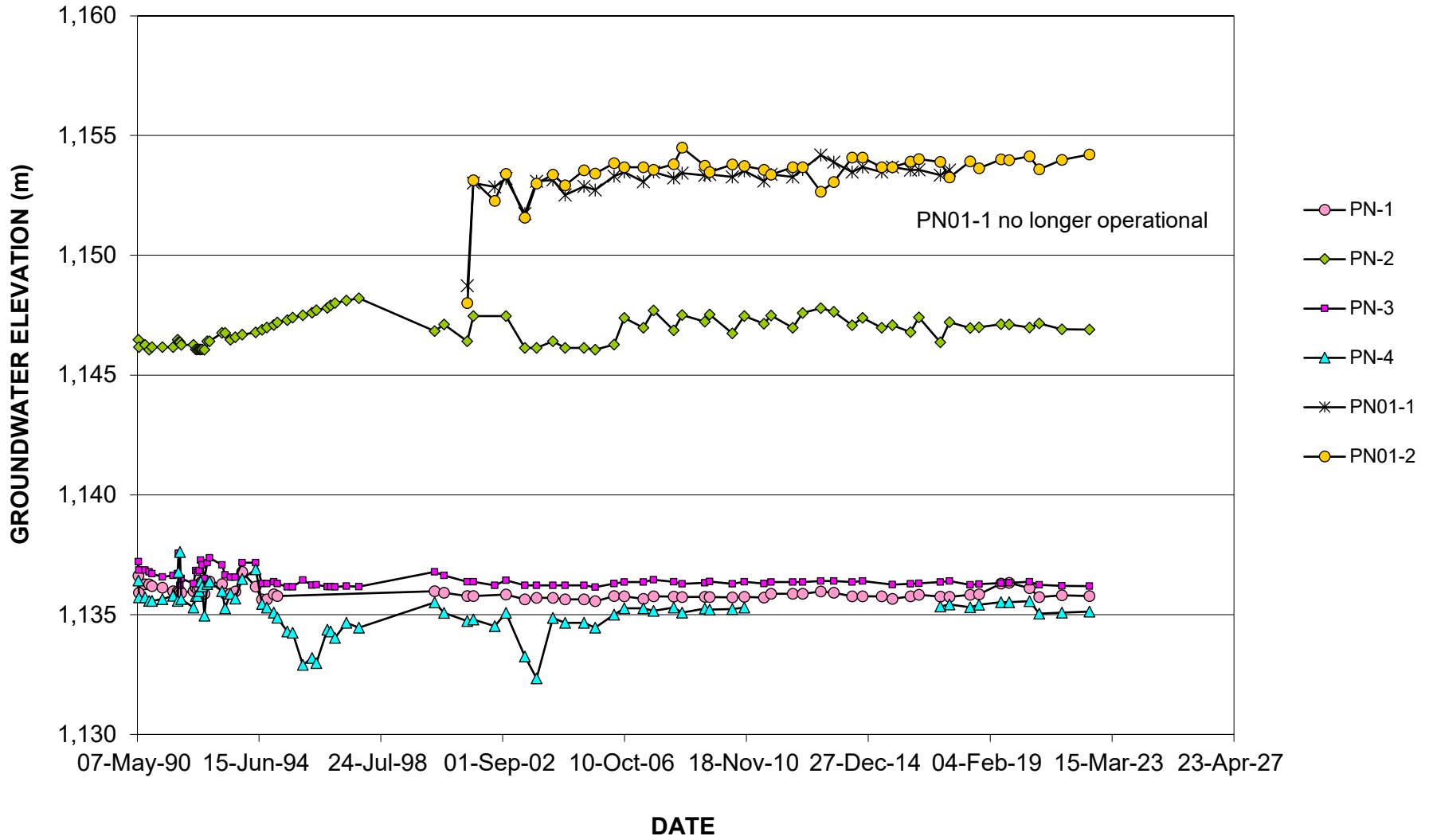


SH001 Retaining Wall, Inclinometer SI18-6

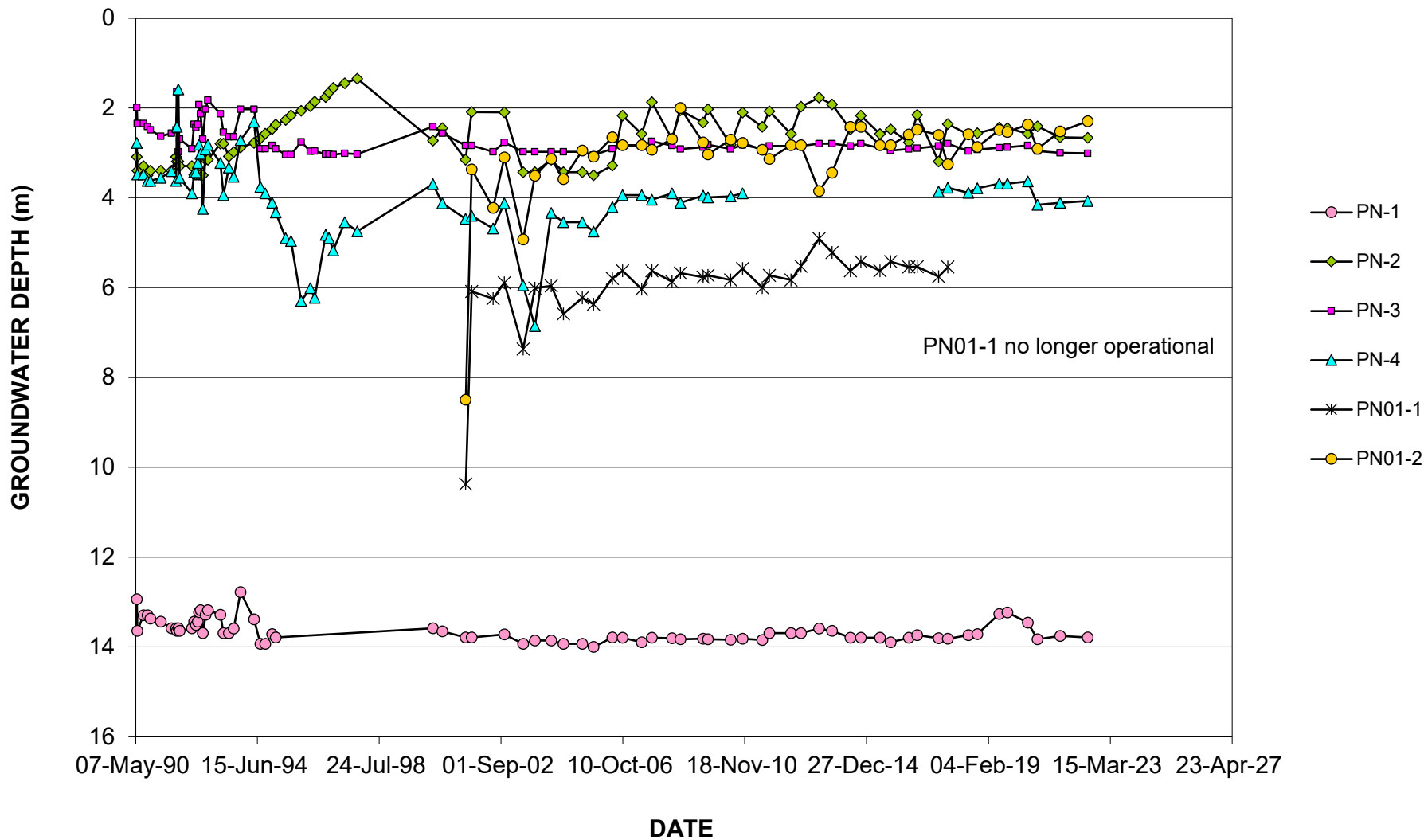
Alberta Transportation

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

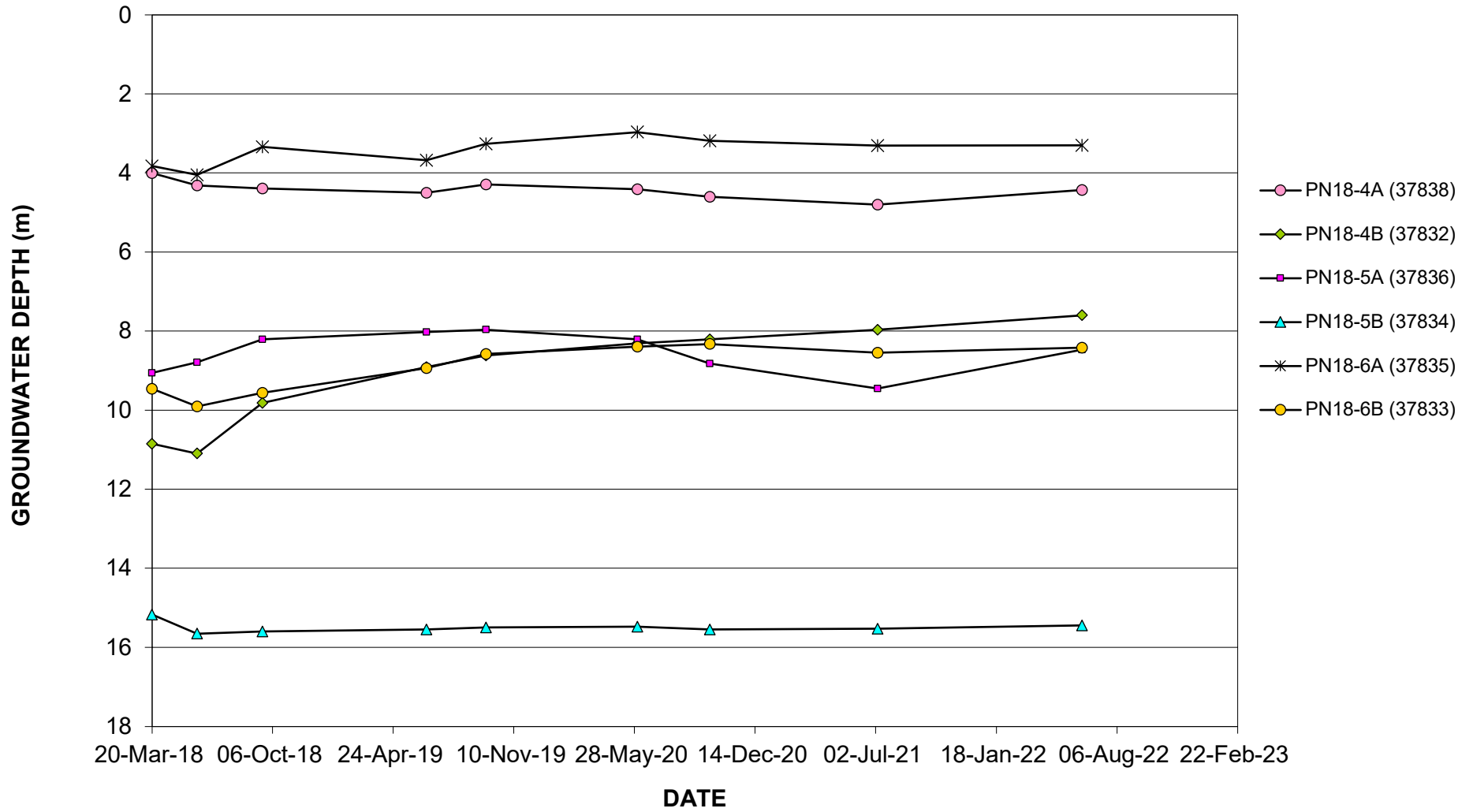
**FIGURE SH001-1
PNEUMATIC PIEZOMETER ELEVATIONS FOR
HWY 33:12 (SWAN HILLS RETAINING WALL - PRE-2018 INSTRUMENTS)**



**FIGURE SH001-2
PNEUMATIC PIEZOMETER DEPTHS FOR
HWY 33:12 (SWAN HILLS RETAINING WALL - PRE-2018 INSTRUMENTS)**



**FIGURE SH001-3
PNEUMATIC PIEZOMETER DEPTHS FOR
HWY 33:12 (SWAN HILLS RETAINING WALL - 2018 INSTRUMENTS)**



**FIGURE SH001-4
PNEUMATIC PIEZOMETER DEPTHS FOR
HWY 33:12 (SWAN HILLS SITE 1A - 2018 INSTRUMENTS)**

