



**THURBER** ENGINEERING LTD.

August 4, 2022

File No.: 32123

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

Attention: Mr. Ed Szmata

**ALBERTA TRANSPORTATION GRMP (CON0022165)  
PEACE REGION (GRANDE PRAIRIE DISTRICT – NORTH)  
INSTRUMENTATION MONITORING RESULTS – SPRING 2022**

**SECTION C**

**SITE GP024: HWY 725:02, HAMELIN CREEK**

Dear Mr. Szmata:

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 Peace Region Grande Prairie District – North (CON0022165).

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**

Two slope inclinometers (HC04-3 and SI06-08), five pneumatic piezometers (PN06-02, PN06-04, PN06-05, PN06-08 and PN03-6A) and two standpipe piezometers (SP06-03 and SP06-06) were read at the Hwy 725:02 Hamelin Creek site on June 21, 2022 by Mr. Niraj Regmi, G.I.T. and Mr. Jayden Del Cid, both of Thurber Engineering Ltd. Pneumatic piezometer PN03-6A was found to be functioning for the first time since the fall of 2018 readings during the current readings.

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 a RST C108 pneumatic piezometer readout. The standpipes were read using a DGS1 dipmeter.



## **2. DATA PRESENTATION**

### **2.1 General**

SI plots for A and B directions are presented in Appendix A and are summarized below. Where movement has been recorded, the resultant plot (X direction, if applicable) and rate of movement have also been provided. The pneumatic and standpipe piezometer readings are also summarized below and are plotted in Appendix A. The SI and piezometer summary tables also include instruments deleted from the GRMP program, for future reference.

### **2.2 Zones of Movement**

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

Zones of movement are summarized in Table GP024-1 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.



**TABLE GP024-1  
 SPRING 2022 – HWY 725:02 HAMELIN CREEK  
 SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: June 21, 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) | RATE OF MOVEMENT (mm/yr) | CHANGE IN RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr) |
|--------------|-------------------------------|---|----------------------------------|-------------------|--------------------------|--|--------------------------|---|
| HC03-6A      | October 11, 2003              | 244.3 over 8.8 m to 16.2 m depth in 1° direction                              | 1444.0 in October 2003           | Destroyed         | May 29, 2012             | N/A  | N/A                      | N/A   |
| HC04-1       | April 22, 2004                | 72.6 over 14.0 to 18.3 m depth in 2° direction                                | 54.0 in May 2004                 | Sheared at 15.8 m | May 30, 2013             | N/A  | N/A                      | N/A   |
| HC04-3       | April 22, 2004                | 121.3 over 5.7 m to 13.0 m depth in 27° direction                             | 111.4 in May 2004                | Operational       | July 17, 2021            | 2.3  | 2.4                      | <0.1  |
|              |                               | 37.0 over 19.7 m to 24.0 m depth in 27° direction                             | 23.4 in May 2004                 |                   |                          | 3.2  | 3.5                      | 3.1   |
| SI06-01      | July 22, 2006                 | 34.2 over 12.7 m to 15.8 m depth in 201° direction                            | 9.5 in March 2007                | Sheared at 15.2 m | August 28, 2012          | N/A  | N/A                      | N/A   |
|              | June 10, 2016 (reinitialized) | 1.9 over 12.8 m to 15.9 m in 312° direction                                   | 6.2 in October 2017              |                   | October 5, 2017          | N/A  | N/A                      | N/A   |

Drawing 32123-GP024 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.



**TABLE GP024-1 – CONTINUED...  
 SPRING 2022 – HWY 725:02 HAMELIN CREEK  
 SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: June 21, 2022

| <b>INSTRUMENT #</b> | <b>DATE INITIALIZED</b> | <b>TOTAL CUMULATIVE RESULTANT MOVEMENT AT NOTED DEPTH SINCE INITIAL READING (mm)</b> | <b>MAXIMUM RATE OF MOVEMENT (mm/yr)</b> | <b>CURRENT STATUS</b>                 | <b>DATE OF PREVIOUS READING</b> | <b>INCREMENTAL MOVEMENT SINCE PREVIOUS READING (mm)</b> | <b>RATE OF MOVEMENT (mm/yr)</b> | <b>CHANGE IN RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr)</b> |
|---------------------|-------------------------|--|---|---------------------------------------|---------------------------------|---|---------------------------------|--|
| SI06-02             | July 25, 2006           | 41.3 over 14.0 m to 16.4 m depth in 249° direction                                   | 8.5 in March 2007                       | Sheared at 16.2 m below top of casing | October 22, 2020                | N/A   | N/A                             | N/A  |
| SI06-04             | July 23, 2006           | 40.9 over 16.1 m to 18.6 m depth in 224° direction                                   | 11.9 in May 2007                        | Sheared at 18.3 m below top of casing | October 22, 2020                | N/A   | N/A                             | N/A  |
| SI06-05             | July 27, 2006           | 46.2 over 15.6 m to 18.6 m depth in 255° direction                                   | 18.0 in September 2011                  | Sheared at 17.7 m below top of casing | October 5, 2018                 | N/A   | N/A                             | N/A  |
| SI06-08             | July 26, 2006           | 37.9 over 2.8 m to 5.2 m depth in 38° direction                                      | 7.2 in May 2007                         | Operational                           | July 17, 2021                   | 0.7   | 0.7                             | 0.9  |

Drawing 32123-GP024 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.



**TABLE GP024-2  
 SPRING 2022 – HWY 725:02 HAMELIN CREEK  
 PNEUMATIC PIEZOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: June 21, 2022

| <b>INSTRUMENT #</b> | <b>DATE INITIALIZED</b> | <b>TIP ELEV. (m)</b> | <b>GROUND ELEV. (m)</b> | <b>CURRENT STATUS</b> | <b>HIGHEST MEASURED WATER ELEVATION (m)</b> | <b>MEASURED PORE PRESSURE (kPa)</b> | <b>CURRENT WATER ELEVATION (m)</b> | <b>PREVIOUS WATER ELEVATION (m)</b> | <b>CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)</b> |
|---------------------|-------------------------|----------------------|-------------------------|-----------------------|---|-------------------------------------|------------------------------------|-------------------------------------|---|
| PN03-06A            | October 17, 2006        | 605.40               | 618.10                  | Operational           | 607.04 in June 2022                         | 16.1                                | 607.04                             | 606.88 (Oct 15, 2018)               | 0.16  |
| PN06-02             | October 17, 2006        | 591.30               | 618.30                  | Operational           | 606.63 in January 2007                      | 149.0                               | 606.49                             | 606.35                              | 0.14  |
| PN06-04             | October 17, 2006        | 595.52               | 619.24                  | Operational           | 607.36 in October 2019                      | 114.5                               | 607.20                             | 607.10                              | 0.10  |
| PN06-05             | October 17, 2006        | 602.84               | 618.31                  | Operational           | 608.61 in May 2013                          | 38.7                                | 606.79                             | 606.22                              | 0.57  |
| PN06-08             | October 17, 2006        | 591.09               | 614.73                  | Operational           | 606.21 in January 2007                      | 147.0                               | 606.08                             | 606.00                              | 0.08  |

Drawing 32123-GP024 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.



**TABLE GP024-3  
 SPRING 2022 – HWY 725:02 HAMELIN CREEK  
 STANDPIPE PIEZOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: June 21, 2022

| <b>INSTRUMENT #</b> | <b>DATE INITIALIZED</b> | <b>TIP ELEV. (m)</b> | <b>GROUND ELEV. (m)</b> | <b>CURRENT STATUS</b>                         | <b>MAXIMUM WATER ELEVATION (m)</b> | <b>CURRENT WATER ELEVATION (m)</b> | <b>PREVIOUS WATER ELEVATION (m)</b> | <b>CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)</b> |
|---------------------|-------------------------|----------------------|-------------------------|---|------------------------------------|------------------------------------|-------------------------------------|---|
| SP06-01             | October 17, 2006        | 594.76               | 625.26                  | <i>Blocked at 1.72 m below ground surface</i> | <i>612.25 in June 2016</i>         | *                                  | 612.25                              | N/A   |
| SP06-03             | October 17, 2006        | 591.52               | 613.82                  | Operational                                   | 607.41 in June 2022                | 607.41                             | 606.94                              | 0.47  |
| SP06-06             | October 17, 2006        | 596.01               | 621.71                  | Operational                                   | 621.29 in June 2022                | 621.29                             | 619.69                              | 1.60  |

Drawing 32123-GP024 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

\*SP06-01 was destroyed by a mower after the spring of 2016 readings.



### **3. INTERPRETATION OF MONITORING RESULTS**

Slope inclinometer HC04-3 showed rates of movement of 2.4 mm/yr and 3.5 mm/yr over 5.7 m to 13.0 m depth and 19.7 m to 24.0 m depth, respectively, since the spring of 2021 readings. SI06-08 showed a rate of movement of 0.7 mm/yr over 2.8 m to 5.2 m depth since the spring of 2021 readings.

All of the pneumatic piezometers showed increases in measured groundwater levels since the spring of 2021 readings, ranging from an increase of 0.08 m in PN06-08 to an increase of 0.57 m in PN06-05. PN03-06A showed an increase in groundwater level of 0.16 m since the previous reading of this instrument in the fall of 2018, and the current groundwater level is the highest ever measured for this instrument. Pneumatic piezometer results are summarized in Table GP024-2 above and are plotted in Figures GP024-1 (by elevation) and GP024-2 (by depth) in Appendix A.

Standpipe piezometers SP06-03 and SP06-06 showed increases in groundwater levels of 0.47 m and 1.60 m, respectively, since the spring of 2021 readings. The current groundwater levels in the standpipes are the highest measured in the instruments since they were initialized. Standpipe piezometer results are summarized in Table GP024-3 above and are plotted in Figures GP024-1 (by elevation) and GP024-2 (by depth) in Appendix A.

### **4. RECOMMENDATIONS**

#### **4.1 Future Work**

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

#### **4.2 Instrumentation Repairs**

SP06-01 has been damaged since the fall of 2016. A repair was attempted in the spring of 2017 but the instrument was found to be blocked at 1.72 m below ground surface. In order to repair SP06-01, a backhoe or excavator will be required to dig down below the level of the blockage. Since there are other operational piezometers at this site that can provide groundwater information, it may not be necessary to repair SP06-01; however, this is up to AT to make a final decision. No other 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.  
Renato Clementino, Ph.D., P.Eng.  
Principal | Senior Geotechnical Engineer

Bruce Nestor, P.Eng.  
Geotechnical Engineer  
*/if*

### Attachments:

- Statement of Limitations and Conditions
- Appendix A
  - Field Inspector's report
  - Site Plan Showing Approximate Instrument Locations (Drawing No. 32123-GP024)
  - SI Reading Plots
  - Figure GP024-1 (Piezometric Elevations)
  - Figure GP024-2 (Piezometric Depths)



## 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.

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### 3. BASIS OF REPORT

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

### 4. USE OF THE REPORT

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### 5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- 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.

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

**SPRING 2022**

**APPENDIX A  
DATA PRESENTATION**

**SITE GP024: HWY 725:02, HAMELIN CREEK**

**ALBERTA TRANSPORTATION  
PEACE REGION (GRANDE PRAIRIE - NORTH DISTRICT)  
INSTRUMENTATION MONITORING FIELD SUMMARY (GP024)  
SPRING 2022**

|  |   |
|--|---|
| <b>Location:</b> Hamelin Creek (HWY 725:02 C1 17.415)<br><b>File Number:</b> 32123<br><b>Probe:</b> RST Set 8R<br><b>Cable:</b> RST Set 8R | <b>Readout:</b> RST PN C108 Unit 2<br><b>Casing Size:</b> 2.75<br><b>Temp:</b> 18<br><b>Read by:</b> NKR/JD |
|--|---|

**SLOPE INCLINOMETER (SI) READINGS**

| SI#     | GPS Location (UTM 11) |              | Date      | Stickup (m) | Depth from top of casing (ft) | Azimuth of A+ Groove | Current Bottom Depth Readings |       |      |       | Probe/ Reel # | Remarks                          |
|---------|-----------------------|--------------|-----------|-------------|-------------------------------|----------------------|-------------------------------|-------|------|-------|---------------|----------------------------------|
|         | Easting (m)           | Northing (m) |           |             |                               |                      | A+                            | A-    | B+   | B-    |               |                                  |
| HC04-3  | 361702.73             | 6207568.73   | 21-Jun-22 | 0.38        | 83 to 3                       | 0                    | 1194                          | -1170 | 298  | -300  | 5R/5R         | Read with 1 ft extension (84 ft) |
| SI06-08 | 361767.45             | 6207099.48   | 21-Jun-22 | 0.88        | 84 to 2                       | 47                   | -83                           | 109   | 1257 | -1254 | 8R/8R         | Read with 1 ft extension (84 ft) |

**STANDPIPE PIEZOMETER READINGS**

| SP#     | GPS Location (UTM 11) |              | Date      | Stick-up (m) | Reading below top of pipe (m) | Bottom Pipe Depth (below ground (m)) |
|---------|-----------------------|--------------|-----------|--------------|-------------------------------|--------------------------------------|
|         | Easting (m)           | Northing (m) |           |              |                               |                                      |
| SP06-03 | 361688.78             | 6207566.09   | 21-Jun-22 | 0.94         | 7.35                          | 22.30                                |
| SP06-06 | 361707.38             | 6207497.42   | 21-Jun-22 | 0.77         | 1.19                          | 25.70                                |

**PNEUMATIC PIEZOMETER (PN) READINGS**

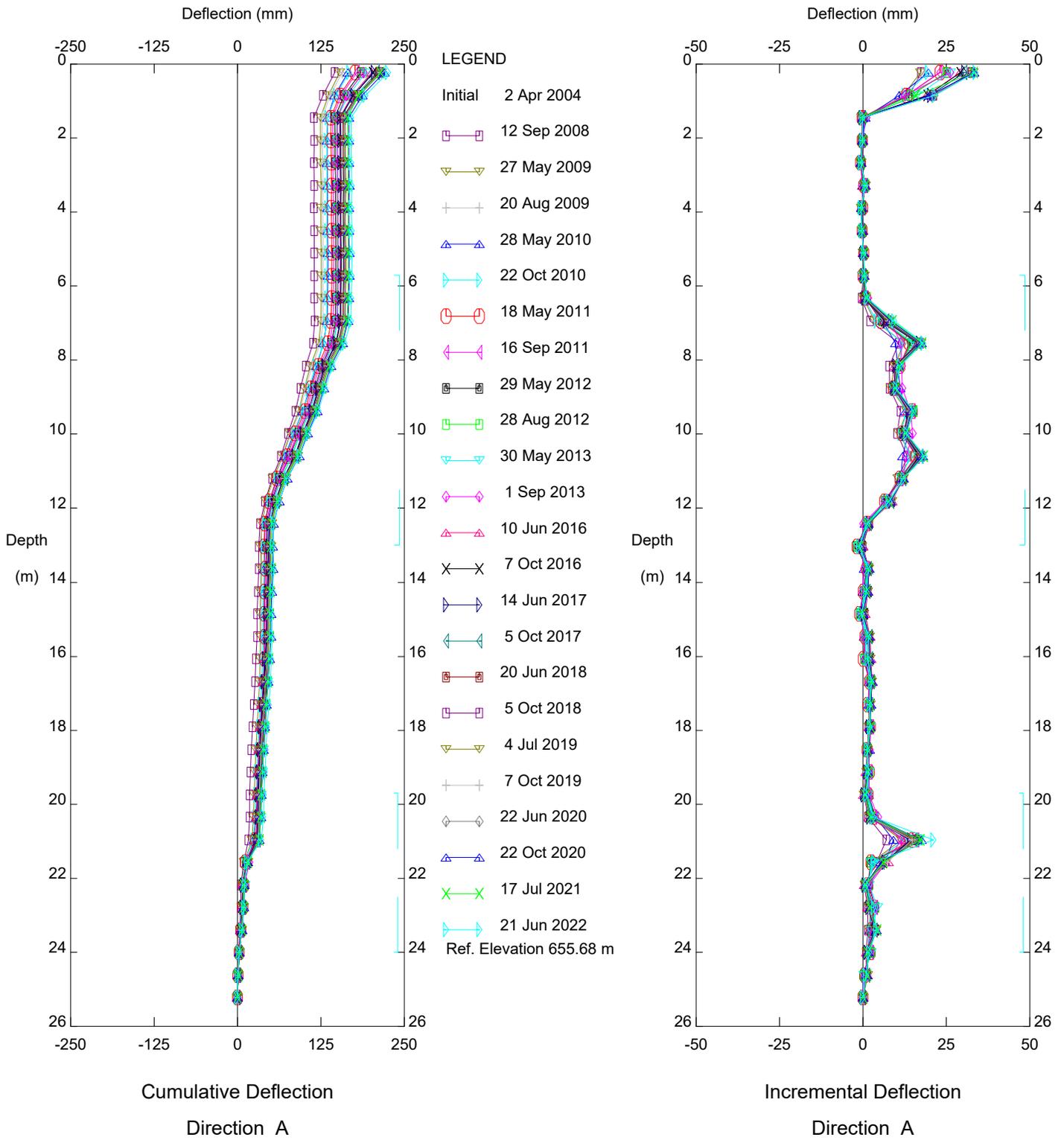
| PN#     | GPS Location (UTM 11) |              | Date      | Reading (kPa) | Identification Number |
|---------|-----------------------|--------------|-----------|---------------|-----------------------|
|         | Easting (m)           | Northing (m) |           |               |                       |
| PN06-02 | 361739.17             | 6207731.54   | 21-Jun-22 | 149           | 30668                 |
| PN06-04 | 361619.85             | 6207741.56   | 21-Jun-22 | 114.5         | 30669                 |
| PN06-05 | 361699.61             | 6207525.52   | 21-Jun-22 | 38.7          | 30672                 |
| PN06-08 | 361767.45             | 6207099.48   | 21-Jun-22 | 147           | 30670                 |
| PN03-6A | 361702.73             | 6207568.7    | 21-Jun-22 | 16.1          | NO ID                 |

**INSPECTOR REPORT**

|                                      |   |
|--------------------------------------|---|
| (1) Do not use extension for SI06-02 | For all Gtilt plot, apply check for depth offset. |
|                                      |   |
|                                      |   |



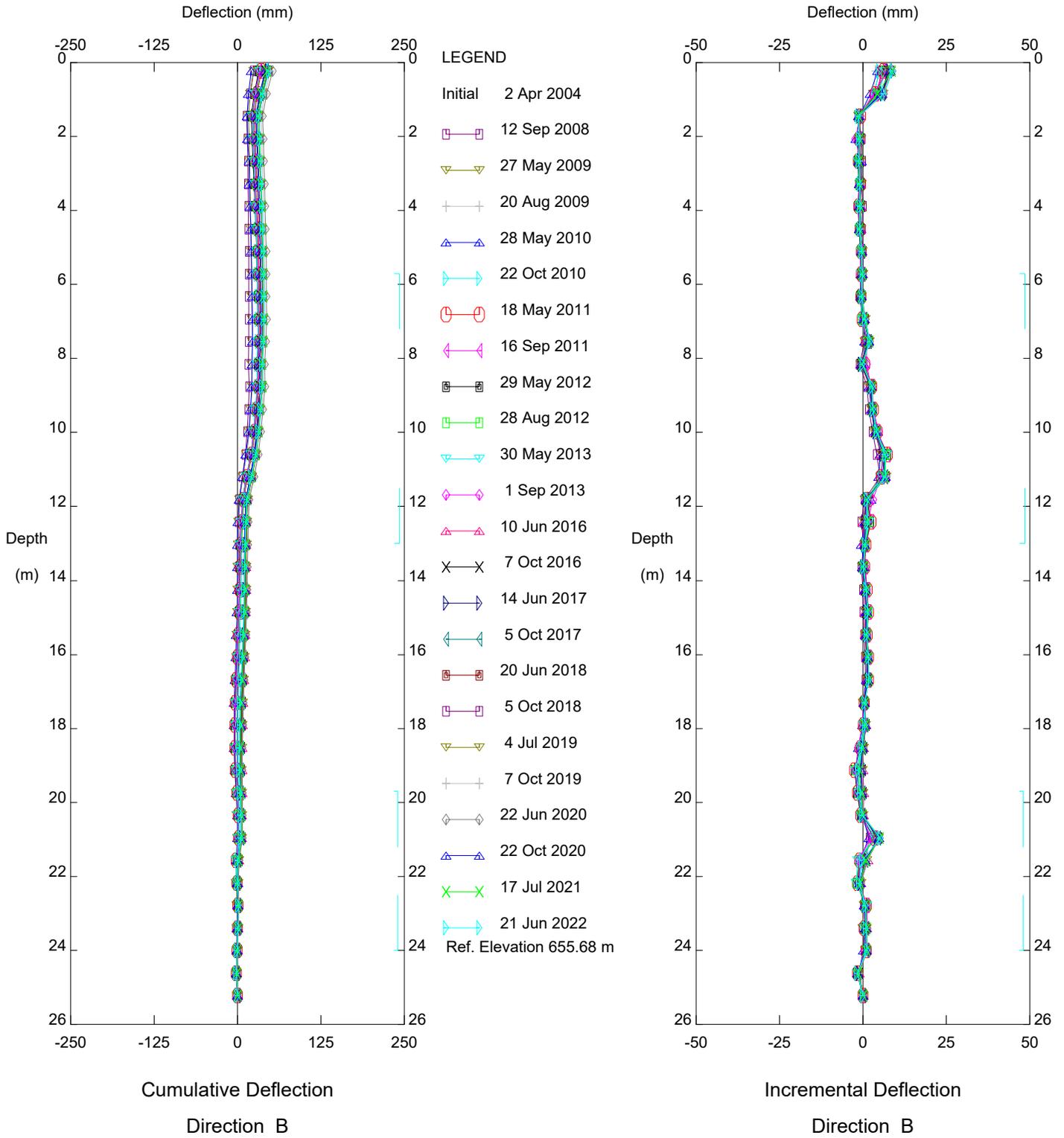
Thurber Engineering Ltd



GP024 Hamelin Creek, Inclinometer HC04-3

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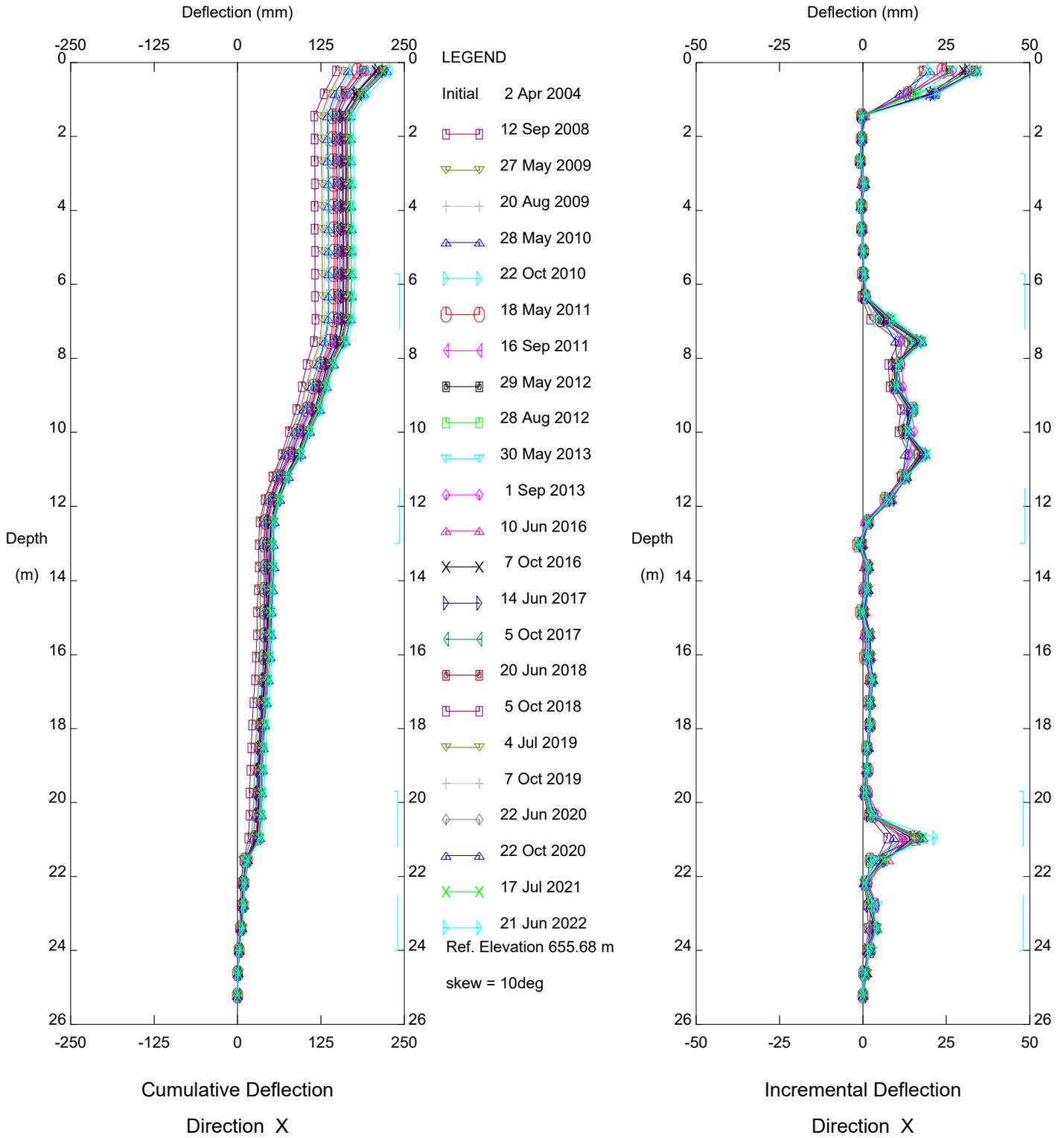
Thurber Engineering Ltd



GP024 Hamelin Creek, Inclinometer HC04-3

Alberta Transportation

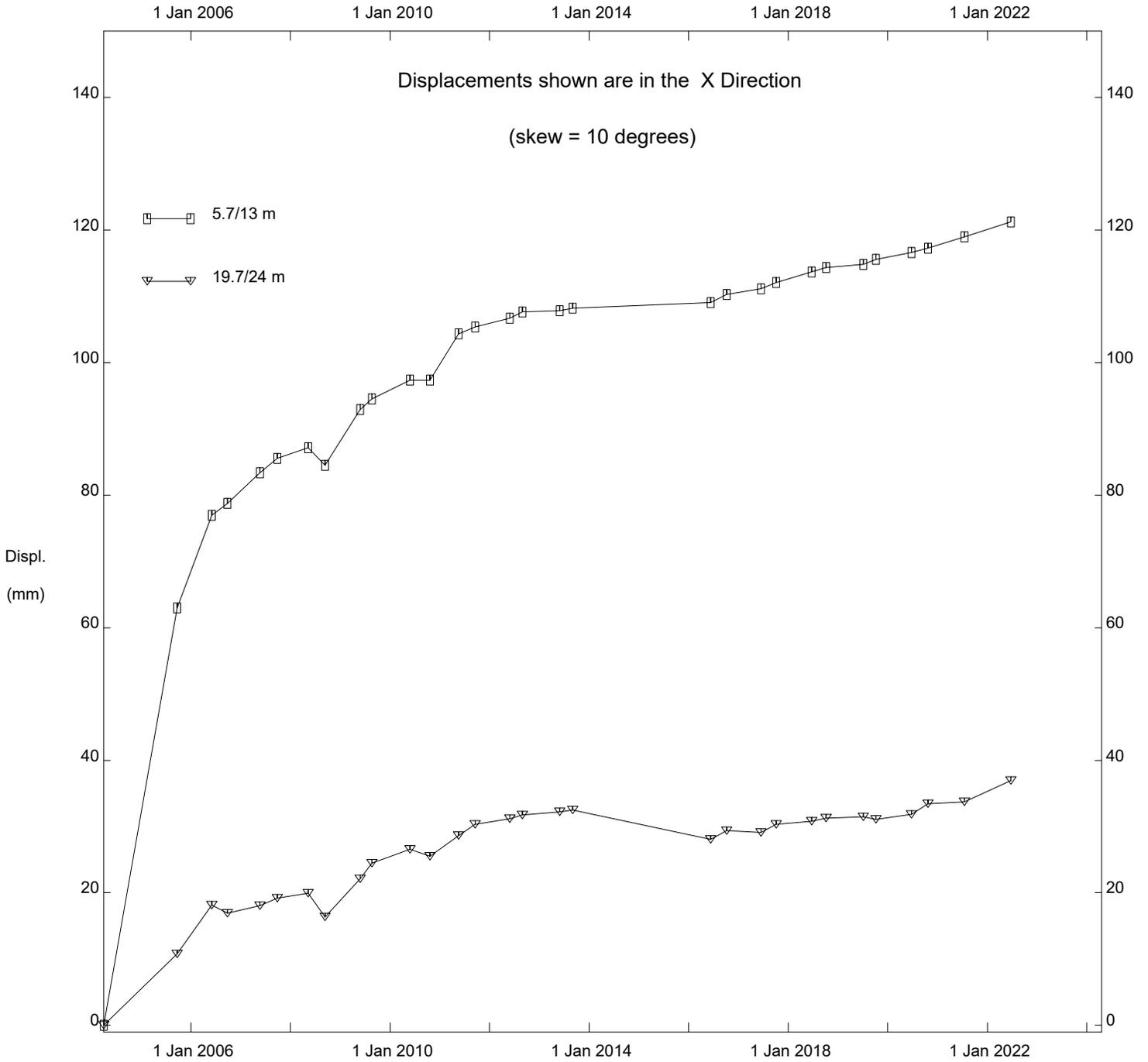
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GP024 Hamelin Creek, Inclinometer HC04-3

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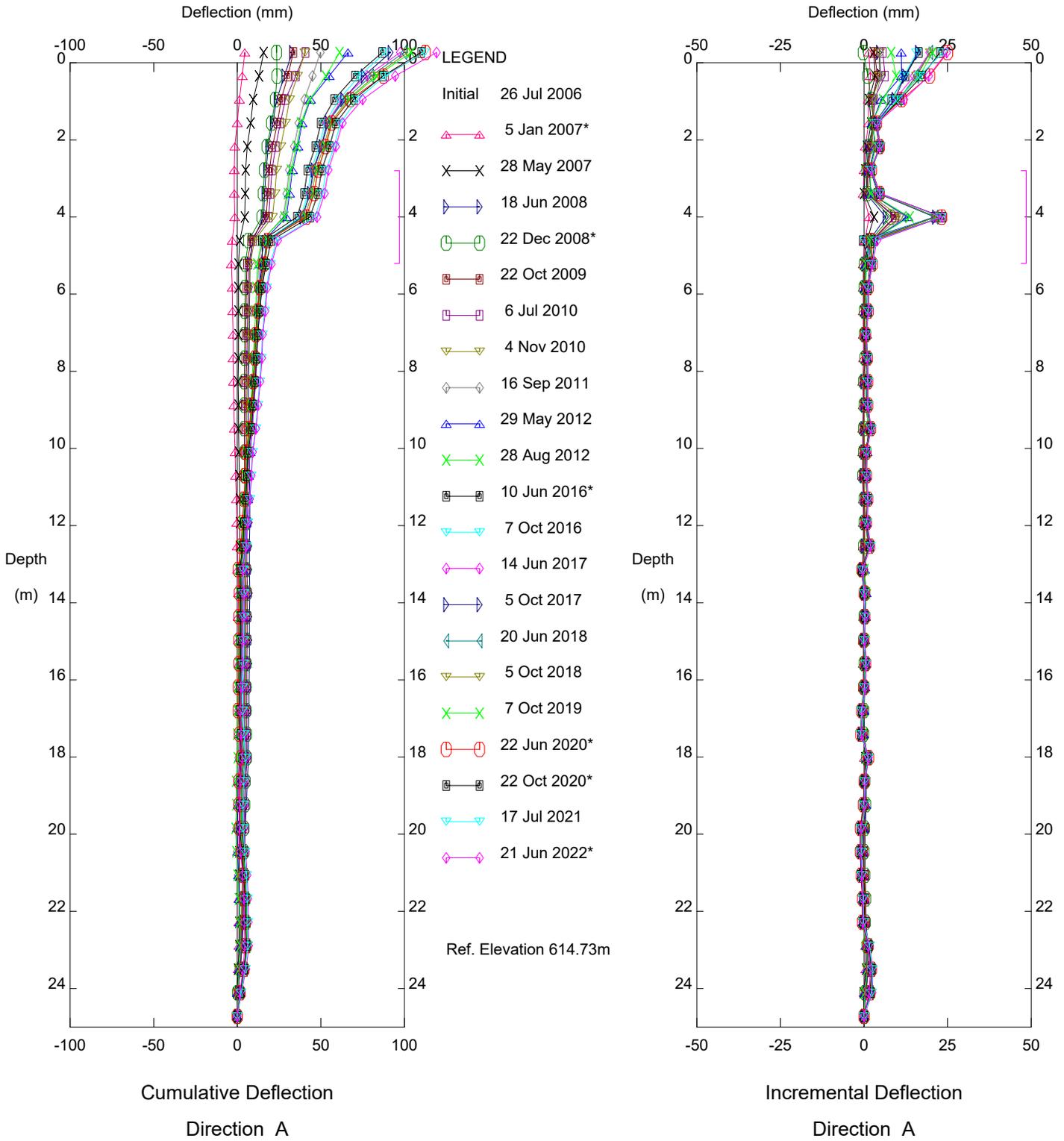
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GP024 Hamelin Creek, Inclinator HC04-3

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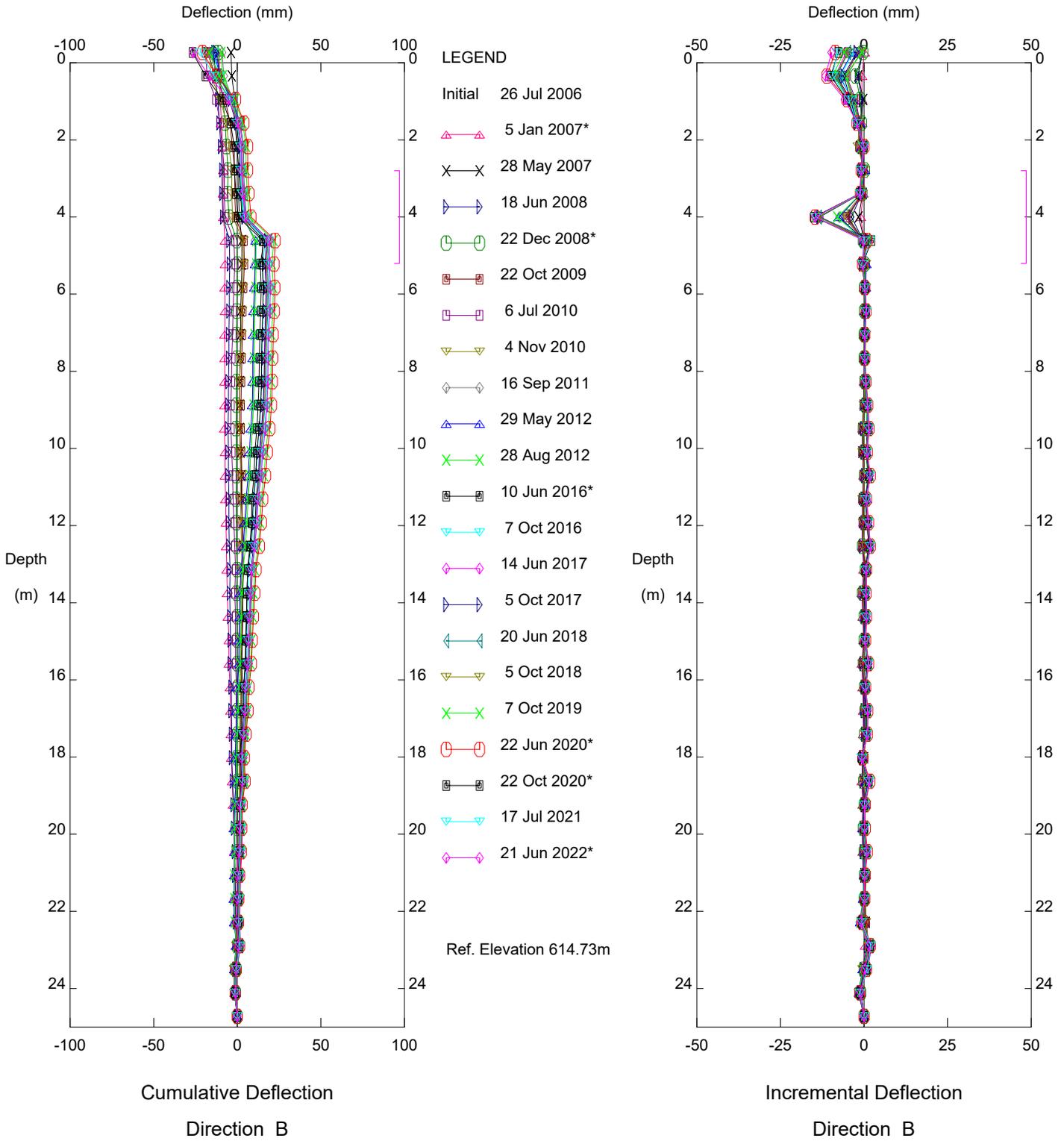


GP024 Hamelin Creek, Inclinator SI06-8

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

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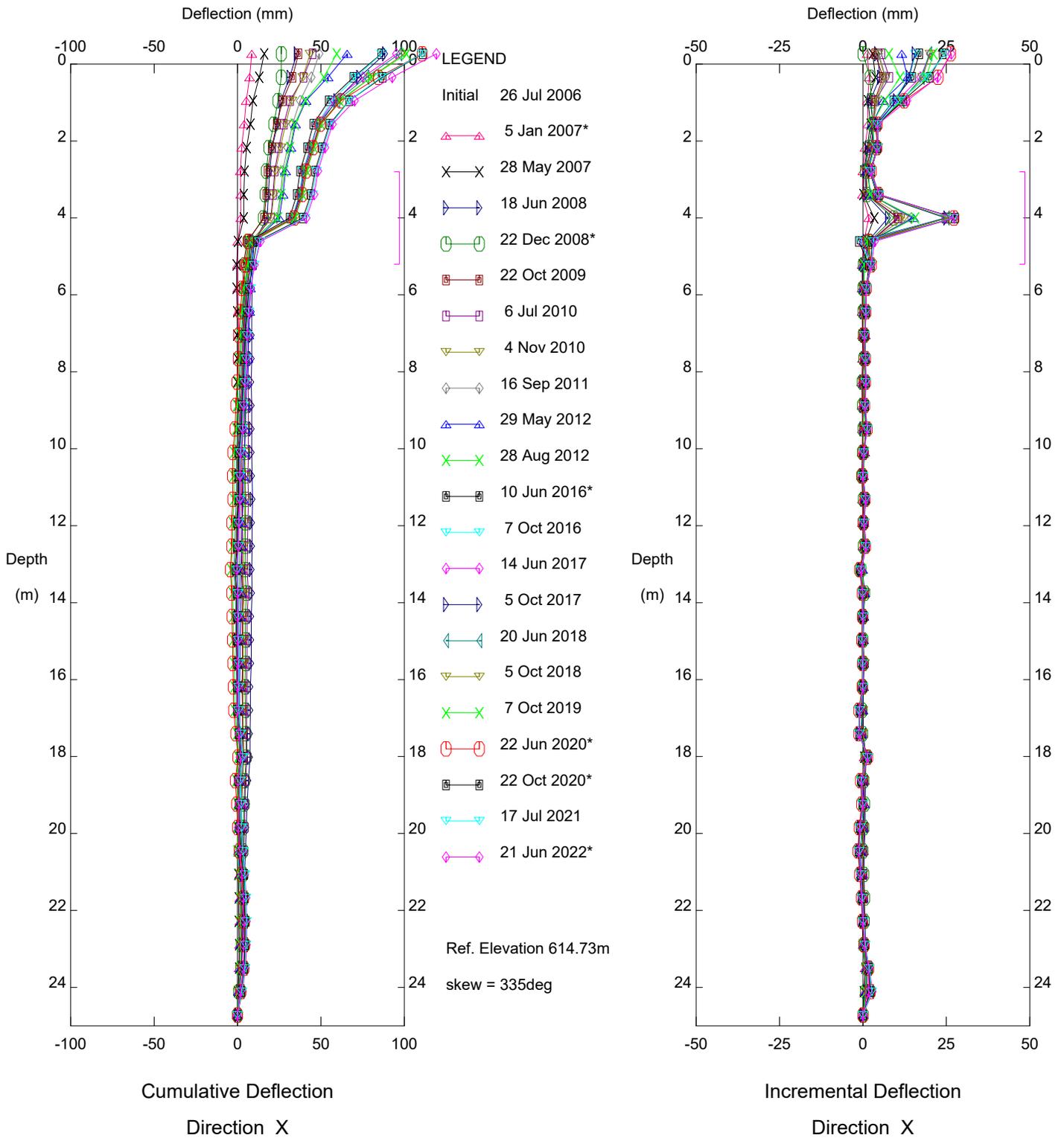


GP024 Hamelin Creek, Inclinometer SI06-8

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

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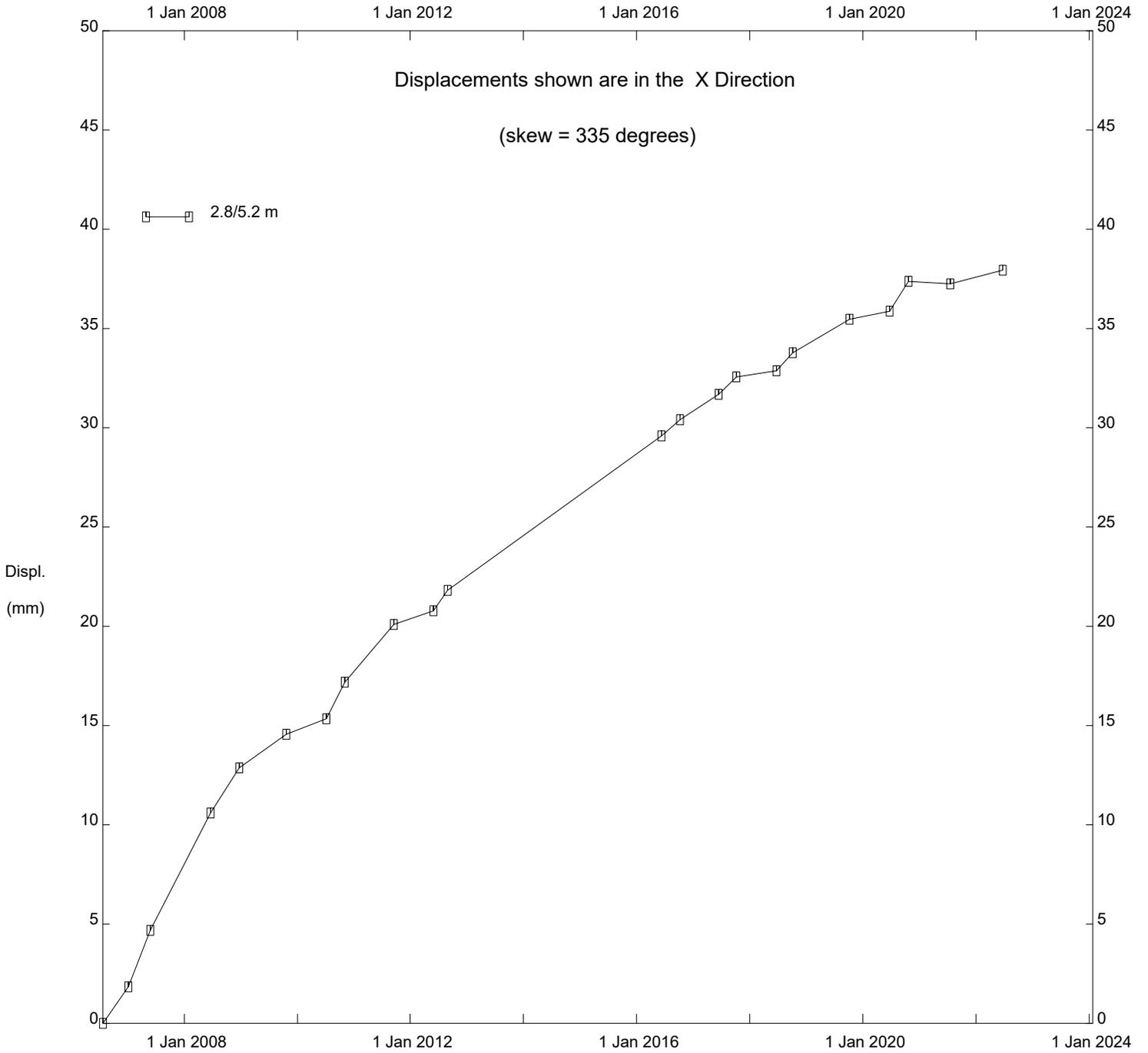


GP024 Hamelin Creek, Inclinator SI06-8

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

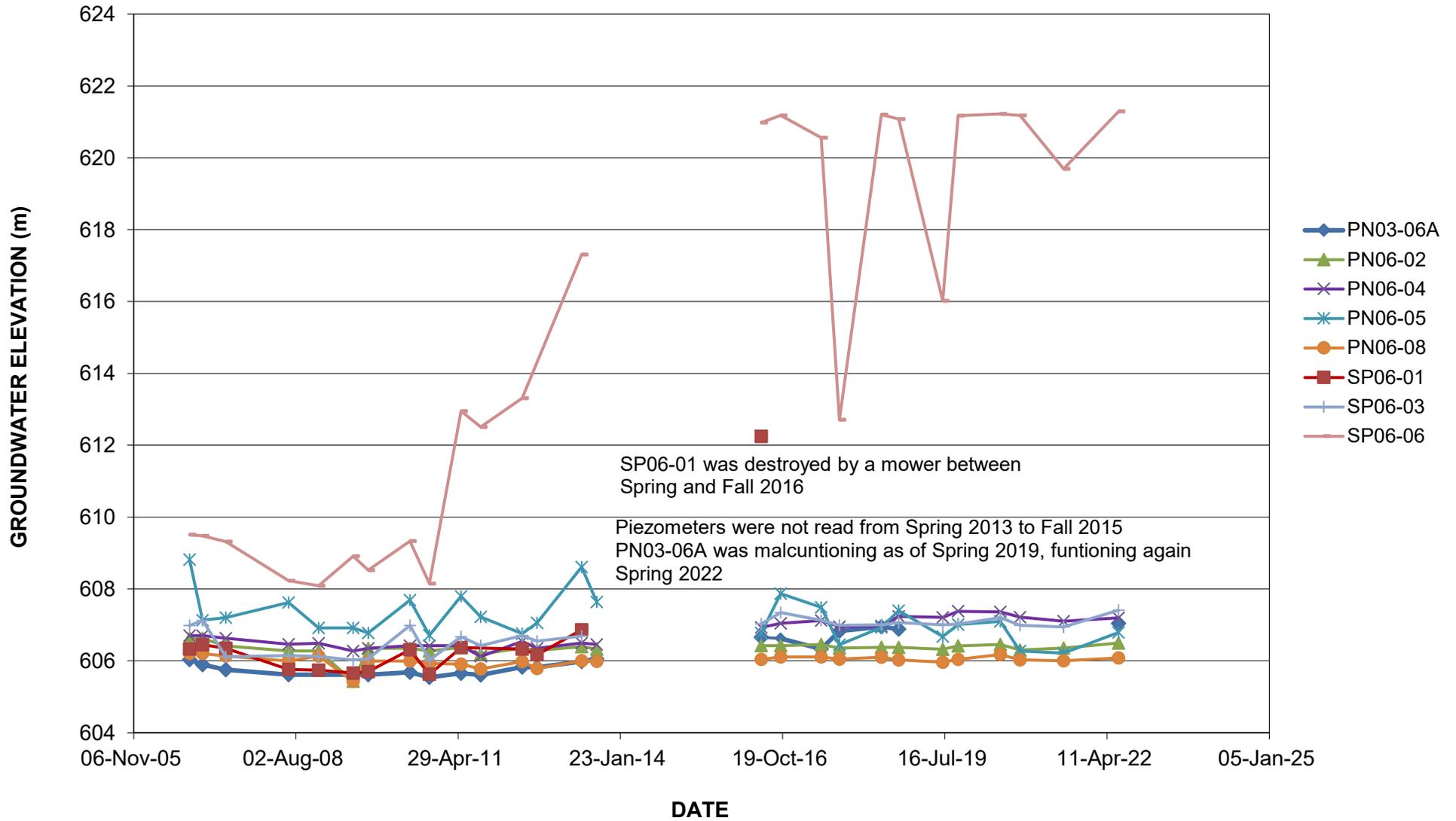
Thurber Engineering Ltd



GP024 Hamelin Creek, Inclinometer SI06-8

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**FIGURE GP024-1**  
**PIEZOMETRIC ELEVATIONS FOR HWY 725:02, HAMELIN CREEK**



**FIGURE GP024-2  
PIEZOMETRIC DEPTHS FOR HWY 725:02, HAMELIN CREEK**

