

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



| Site Number | Location | Name | Hwy | km |
|---|-------------------|-----------------------------|-------|---------|
| NC088 | km 108 Settlement | HWY 63:06 km 108 Settlement | 63:06 | km 108 |
| Legal Description: 3-30-77-14 W4 | | UTM Co-ordinates | | |
| | | 12U E 426558 | N | 6172648 |

| | | | |
|-----------------------------|--|----------------------------|-------------|
| Current Monitoring: | 16-Sep-2024 | Previous Monitoring | 08-Jun-2024 |
| Instruments Read By: | Mr. Niraj Regmi, G.I.T and Mr. Nixon Mationg, of Thurber | | |

| Instruments Read During This Site Visit | | | |
|---|---|--|---|
| Slope Inclinerometers (SIs): SI18-4 | Pneumatic Piezometers (PN): PN18-3A, PN18-3B, PN18-4A and PN18-4B | Vibration Wire Piezometers (VW): N/A | Standpipe Piezometers (SP): N/A |
| Load Cell (LC): N/A | Strain Gauges: N/A | SAA's: N/A | Others: |

| Readout Equipment Used | | | |
|---|---|------------------------------------|-------------------------------|
| Slope Inclinerometers: RST Digital Inclinerometer probe with a 2 ft. wheelbase and a RST Pocket PC readout | Pneumatic Piezometers: RST C108 pneumatic piezometer reader | Vibration Wire Piezometers: | Standpipe Piezometers: |
| Load Cell: | Strain Gauges: | SAA's: | Others: |
| Notes: | | | |

| Discussion | |
|--|--|
| Zones of New Movement: | None |
| Interpretation of Monitoring Results: | SI18-4 showed a rate of movement of 0.9 mm/yr over 0.3 m to 2.1 m depth since the spring of 2024 readings. This corresponds to a decrease in the rate of movement by 7.7 mm/yr since the spring of 2024 readings. Pneumatic piezometer PN18-3A, PN18-3B PN14-4A, and PN18-4B showed increases in groundwater levels of 0.49 m, 0.46 m, 0.17 m, and 0.14 m, respectively, since the spring of 2024 readings. |
| Future Work: | The instruments should be read again in the spring of 2025. |
| Instrumentation Repairs: | No instrument repairs are required at this time. However, it is recommended to replace SI18-3 to continue monitoring the movement rate of the northbound lanes landslide. |
| Additional Comments: | |

| | |
|---------------------|--|
| Attachments: | <ul style="list-style-type: none">• Table NC088-1 Fall 2024 – HWY 63:06 Km 108 Settlement, Slope Inclinometer Instrumentation Reading Summary• Table NC088-2 Fall 2024 – HWY 63:06 Km 108 Settlement, Pneumatic and Standpipe Piezometer Instrumentation Reading Summary• Statement of Limitations and Conditions• APPENDIX A – NC088-1 FALL 2024<ul style="list-style-type: none">○ Field Inspector's report○ Site Plan Showing Approximate Instrument Locations (Drawing No. 32122-NC088)○ SI Reading Plots○ Figure NC088-1 (Piezometric Depths) |
|---------------------|--|

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

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

Lucas Green, P.Eng.
Geotechnical Engineer

Table NC088-1: Fall 2024 – Hwy 63:06 Km 108 Settlement Slope Inclinometer Instrumentation Reading Summary

Date Monitored: September 16, 2024

| INSTRUMENT # | DATE INITIALIZED | TOTAL CUMULATIVE RESULTANT MOVEMENT AND DEPTH OF MOVEMENT TO DATE (mm) | MAXIMUM RATE OF MOVEMENT (mm/yr.) | CURRENT STATUS OF SI | DATE OF PREVIOUS READING | INCREMENTAL MOVEMENT SINCE PREVIOUS READING (mm) | CURRENT RATE OF MOVEMENT (mm/yr.) | CHANGE IN RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr.) |
|---------------------|---------------------------|---|--|--|---------------------------------|---|--|---|
| <i>SI17-1</i> | <i>September 15, 2017</i> | <i>No discernible movement</i> | <i>N/A</i> | <i>Paved over</i> | <i>September 15, 2017</i> | <i>N/A</i> | <i>N/A</i> | <i>N/A</i> |
| <i>SI17-2</i> | <i>September 15, 2017</i> | <i>218.8 over 0.1 m to 7.4 m depth in 67° direction</i> | <i>295.3 on May 26, 2018</i> | <i>Destroyed during construction</i> | <i>January 13, 2019</i> | <i>N/A</i> | <i>N/A</i> | <i>N/A</i> |
| <i>SI18-3</i> | <i>December 9, 2018</i> | <i>39.7 over 6.5 m to 11.3 m depth in 51° direction</i> | <i>218.1 on January 16, 2019</i> | <i>Sheared off at 11.6 m below top of casing</i> | <i>October 7, 2021</i> | <i>N/A</i> | <i>N/A</i> | <i>N/A</i> |
| <i>SI18-4</i> | <i>December 9, 2018</i> | <i>36.4 over 0.3 to 2.1 m depth in 272° direction</i> | <i>729.4 on December 10, 2018</i> | <i>Operational</i> | <i>June 8, 2024</i> | <i>0.3</i> | <i>0.9</i> | <i>-7.7</i> |

Drawing 32122-NC088 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

Table NC088-2: Fall 2024 – Hwy 63:06 Km 108 Settlement Pneumatic and Standpipe Piezometer Instrumentation Reading Summary

Date Monitored: September 16, 2024

| INSTRUMENT # | DATE INITIALIZED | TIP DEPTH (m) | CURRENT STATUS | HIGHEST MEASURED GROUNDWATER DEPTH (m) | MEASURED PORE PRESSURE (kPa) | CURRENT GROUNDWATER DEPTH (m) | PREVIOUS GROUNDWATER DEPTH (m) | CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m) |
|-----------------|--------------------|---------------|-----------------------------|--|------------------------------|-------------------------------|--------------------------------|--|
| PN17-1A (37669) | September 15, 2017 | 11.00 | Paved Over | 4.29 on September 15, 2017 | N/A | N/A | N/A | N/A |
| PN17-1B (37663) | September 15, 2017 | 16.00 | Paved Over | 4.91 on September 15, 2017 | N/A | N/A | N/A | N/A |
| PN17-2A (37668) | September 15, 2017 | 5.60 | Damaged during construction | 2.86 on September 15, 2017 | N/A | N/A | 4.11 (Jan. 13, 2019) | N/A |
| PN17-2B (37662) | September 15, 2017 | 7.50 | Damaged during construction | 4.51 on May 26, 2018 | N/A | N/A | 4.74 (Jan. 13, 2019) | N/A |
| PN18-3A (38153) | December 9, 2018 | 7.62 | Operational | 2.12 on May 27, 2019 | 29.4 | 4.63 | 5.12 | 0.49 |
| PN18-3B (38150) | December 9, 2018 | 12.19 | Operational | 4.53 on December 10, 2018 | 50.4 | 7.06 | 7.52 | 0.46 |
| PN18-4A (38152) | December 9, 2018 | 6.10 | Operational | 3.57 on December 15, 2018 | 3.3 | 5.76 | 5.93 | 0.17 |
| PN18-4B (28151) | December 9, 2018 | 12.19 | Operational | 4.32 on December 17, 2018 | 66.5 | 5.42 | 5.56 | 0.14 |
| SP17-3 | August 24, 2017 | 15.19 | Could not be located | 4.13 on October 18, 2017 | N/A | N/A | 4.13 (October 18, 2017) | N/A |

Figure 32122-NC088 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.



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.



THURBER ENGINEERING LTD.

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

FALL 2024

**APPENDIX A
DATA PRESENTATION AND SITE PLANS**

SITE NC088: HWY 63:06 km 108 SETTLEMENT

**ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
 NORTH CENTRAL REGION - ATHABASCA AND FORT McMURRAY DISTRICTS
 INSTRUMENTATION MONITORING FIELD SUMMARY (NC088)
 FALL 2024**

| | |
|---|---|
| Location: HWY 63:06 (R1 11.570) - km 108 Settlement File Number: 32122 Probe: RST Set 8R Cable: RST Set 8R | Readout: RST PN C108 Unit 1 Casing Diameter: 2.75" Temp (deg C): 11 Read by: NKR/NRM |
|---|---|

SLOPE INCLINOMETER (SI) READINGS

| SI# | GPS Location (UTM 12) | | Date | Stickup (m) | Readings Depth from top of casing (ft) | Azimuth of A+ Groove degree | Current Bottom Depth Readings | | | | Probe/ Reel # | Size (") | Remarks |
|--------|---------------------------|---------|-----------|----------------|---|-----------------------------------|----------------------------------|------|-----|----|---------------------|----------|-----------|
| | Northing | Easting | | | | | A+ | A- | B+ | B- | | | |
| SI18-4 | 6172648 | 426558 | 16-Sep-24 | 0.66 | 58 to 2 | 270 | 726 | -713 | -45 | 50 | 8R/8R | 2.75 | West Side |

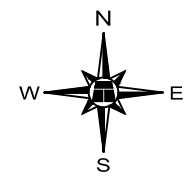
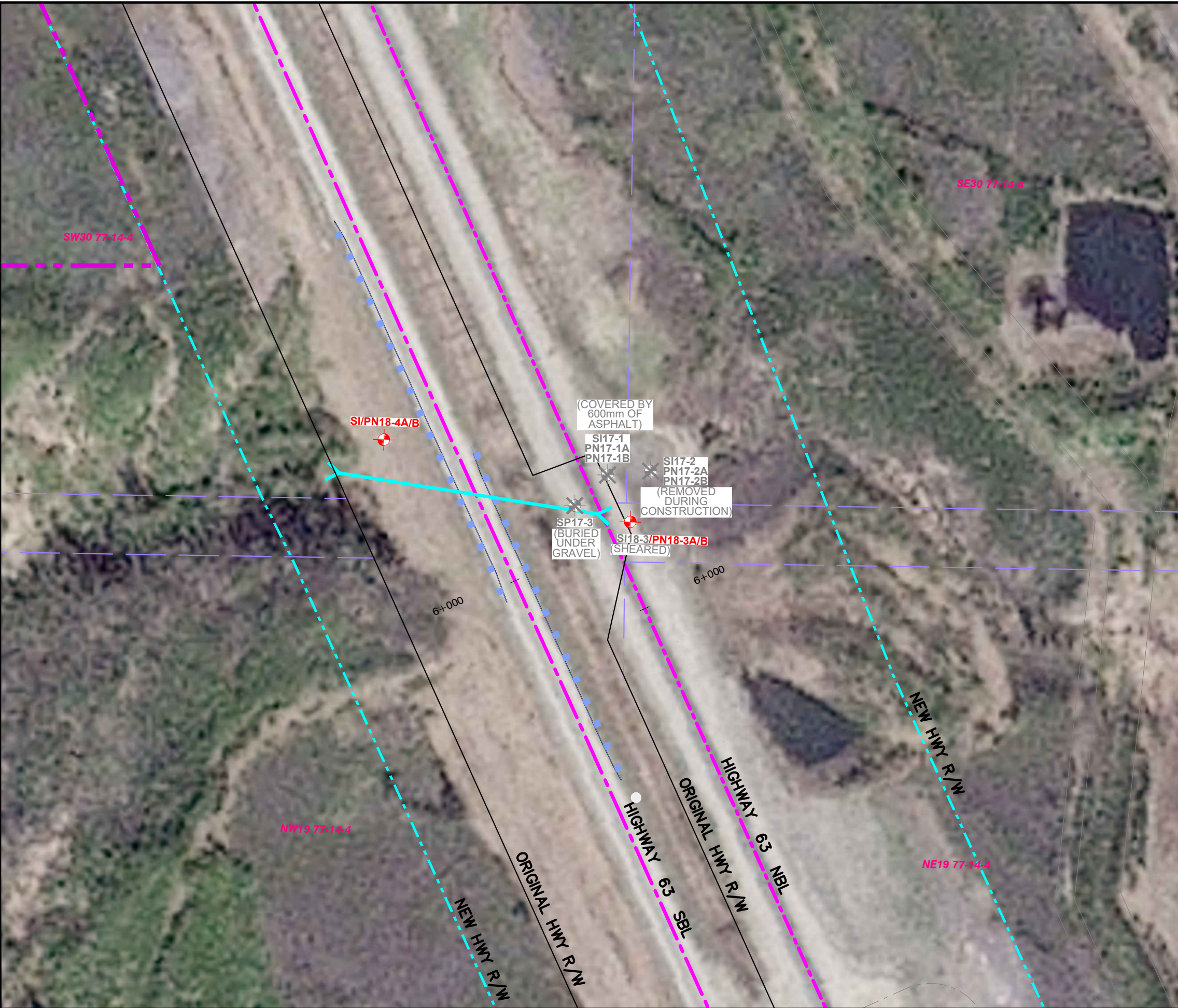
PNEUMATIC PIEZOMETER (PN) READINGS

| PN # | Serial | GPS Location (UTM 12) | | Location | Date | Reading (kPa) | Comments |
|---------|--------|---------------------------|---------|--------------------|-----------|----------------------|-----------|
| | | Northing | Easting | | | | |
| PN18-3A | 38153 | 6172605 | 426683 | Attached to SI18-3 | 16-Sep-24 | 29.4 | East Side |
| PN18-3B | 38150 | 6172605 | 426683 | Attached to SI18-3 | 16-Sep-24 | 50.4 | East Side |
| PN18-4A | 38152 | 6172648 | 426558 | Attached to SI18-4 | 16-Sep-24 | 3.3 | West Side |
| PN18-4B | 38151 | 6172648 | 426558 | Attached to SI18-4 | 16-Sep-24 | 66.5 | West Side |







INSPECTOR REPORT

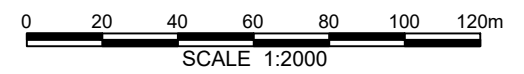
| |
|--|
| |
| Site is at 108 Km marker on Hwy 63 Northbound lane - SI 18-3 |
| Site is at 108 Km marker on Hwy 63 Southbound lane - SI 18-4 |
| |
| |
| |

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\CAD\32122 INSTRUMENT 2022\32122-NC088.dwg - 1N - Jun. 17, 2022



LEGEND

-  APPROXIMATE THURBER TEST HOLE LOCATION
-  SLOPE INCLINOMETER
-  PNEUMATIC PIEZOMETER
-  STANDPIPE PIEZOMETER
-  ORIGINAL 1200mm Ø CULVERT
-  NON-OPERATIONAL INSTRUMENT



BASE PLAN PROVIDED BY ALBERTA TRANSPORTATION; AIR PHOTO PROVIDED BY VALTUS

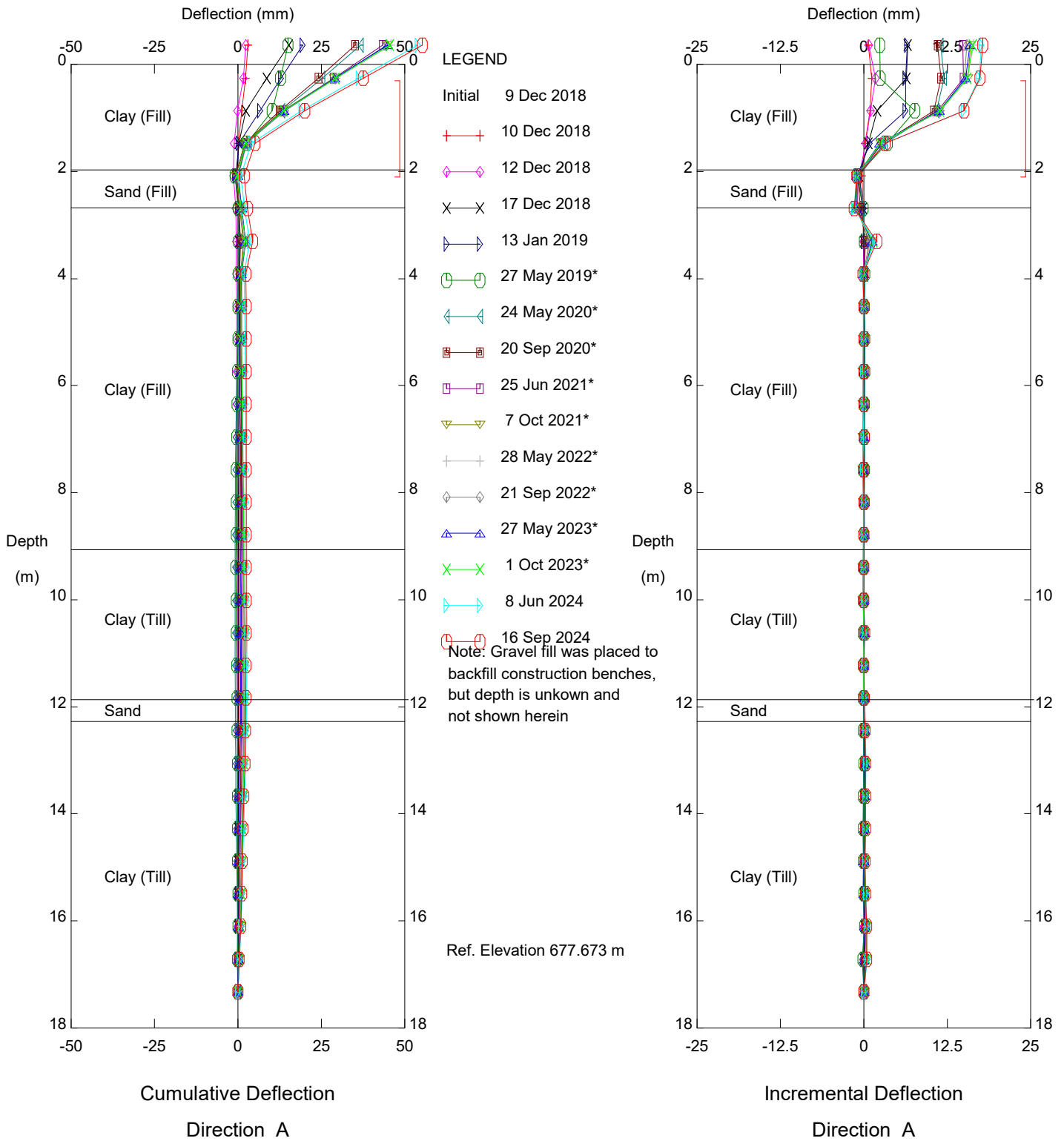


**NORTH CENTRAL
(ATHABASCA AND FORT McMURRAY DISTRICTS)
NC088: HWY 63:06 EAST AND WEST
EMBANKMENT FAILURES (km 4.9)
SITE PLAN SHOWING APPROXIMATE
INSTRUMENT LOCATIONS
DWG No. 32122-NC088**

| | |
|-------------|-----------|
| DRAWN BY | ML |
| DESIGNED BY | BWN |
| APPROVED BY | TSA |
| SCALE | 1:2000 |
| DATE | JUNE 2022 |
| FILE No. | 32122 |



Thurber Engineering Ltd.

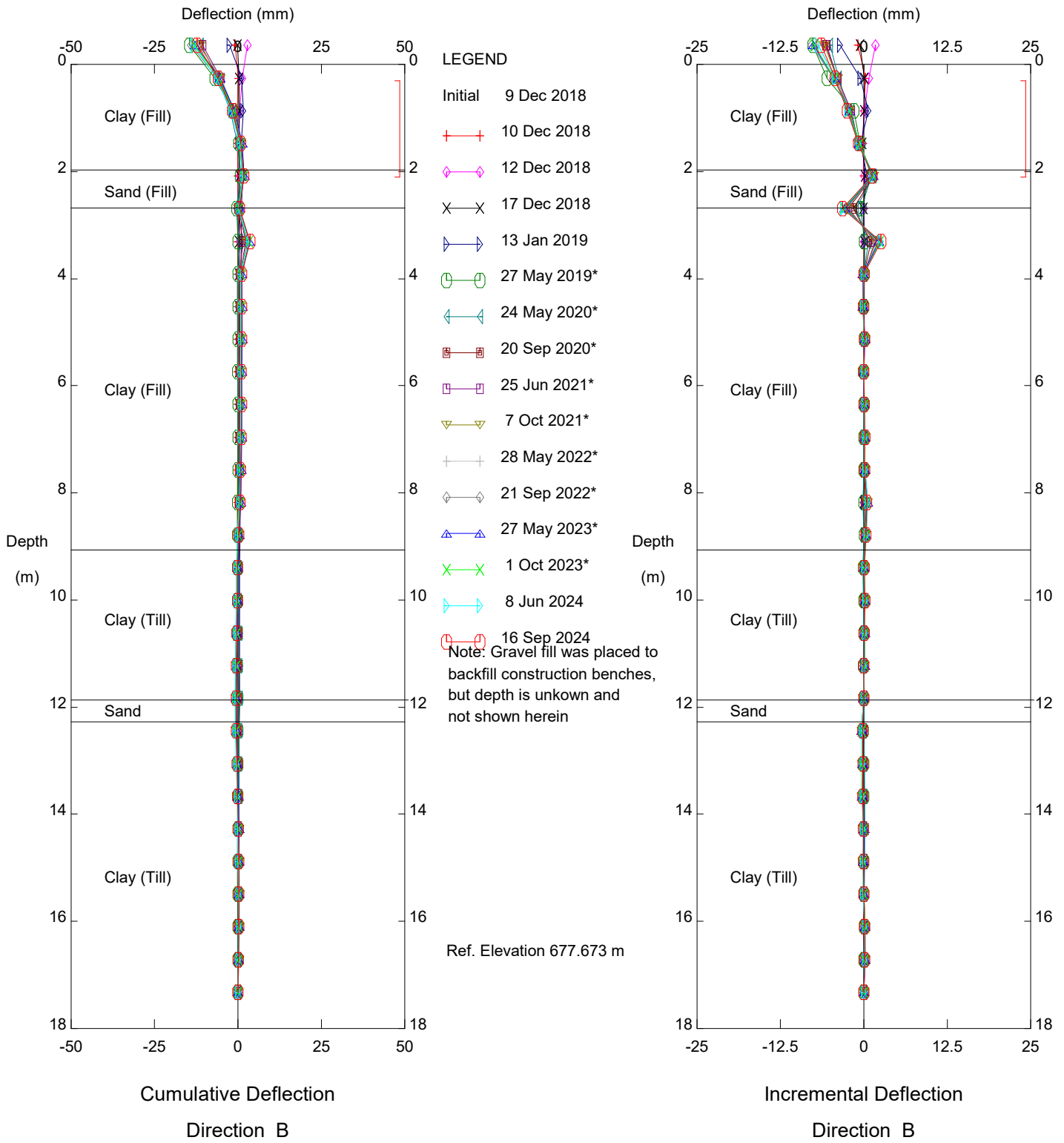


NC088 - West Embankment, Inclinometer SI18-4

Alberta Transportation

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

Thurber Engineering Ltd.

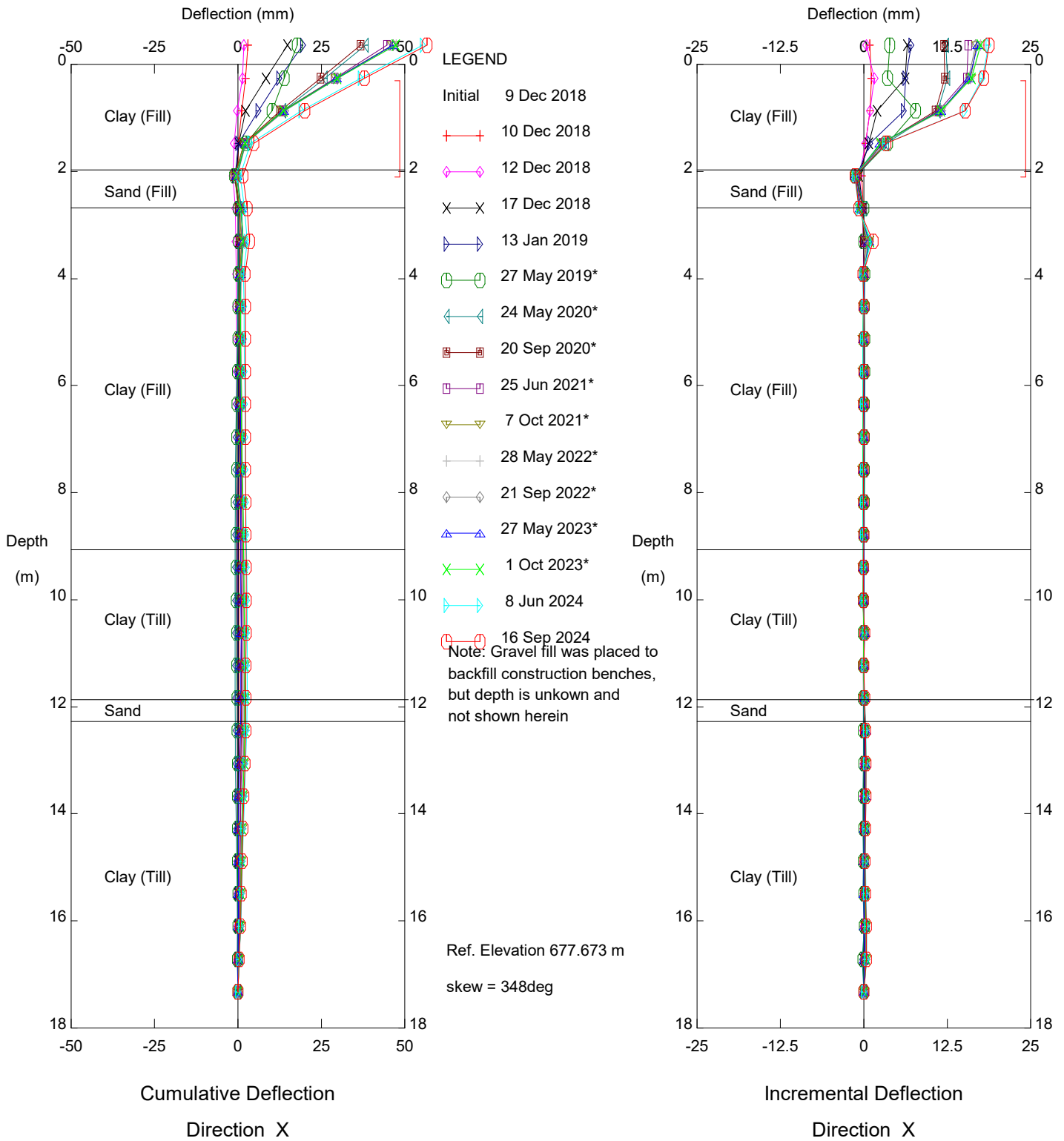


NC088 - West Embankment, Inclinometer SI18-4

Alberta Transportation

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

Thurber Engineering Ltd.

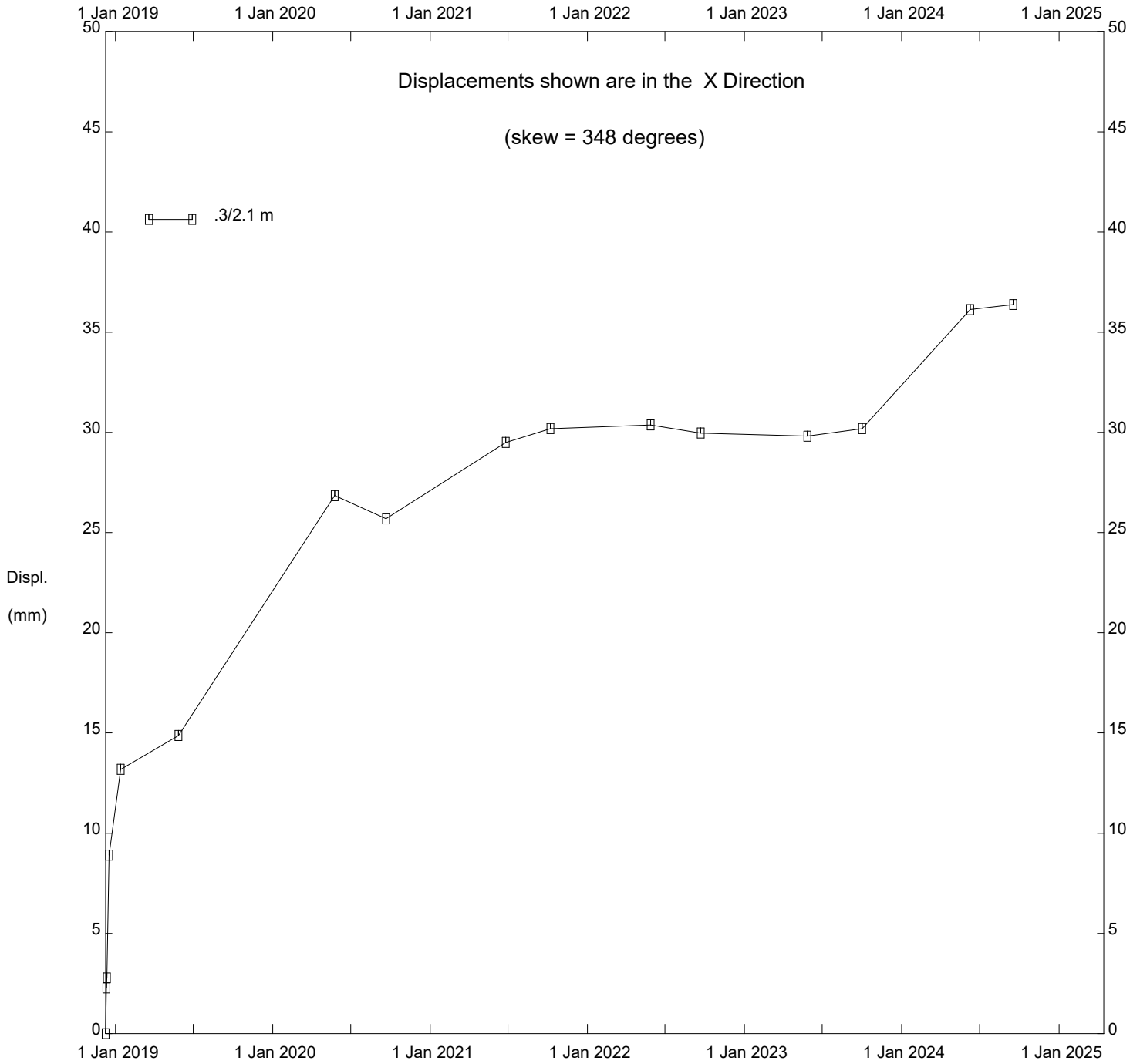


NC088 - West Embankment, Inclinometer SI18-4

Alberta Transportation

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

Thurber Engineering Ltd.



NC088 - West Embankment, Inclinator SI18-4

Alberta Transportation

**FIGURE NC088-1
PIEZOMETER DATA FOR HWY 63:06 EAST AND WEST EMBANKMENT
FAILURES (km 4.90)**

