



**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 NC091: HWY 63:02 BACKSLOPE SLUMPS (km 39.35 and 40.37)**

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. FIELD PROGRAM AND INSTRUMENTATION STATUS**

One slope inclinometer (SI18-1) and five pneumatic piezometers (PN18-1, PN18-2A, PN18-2B, PN18-4A, and PN18-4B) were read at the HWY 63:02 Backslope Slumps sites on May 28, 2022 by Mr. Niraj Regmi, G.I.T. and Mr. Jayden Del Cid, both of Thurber Engineering Ltd. PN18-2A showed a fluctuating reading, indicating damage to the piezometer.

Site plans showing the instrument locations are included in Appendix A.

The SI was read using an RST Digital Inclinometer probe with a 2 ft wheelbase and a RST Pocket PC readout. 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 reader.



## **2. DATA PRESENTATION**

### **2.1 General**

SI plots for A and B directions are presented in Appendix A. Where movement has been recorded the resultant plot (X direction, if applicable) and rate of movement have also been provided. Pneumatic piezometer results are also provided in Appendix A. The slope inclinometer and piezometer reading summary tables are provided below. These tables also include instruments deleted from the GRMP program or not read during this monitoring event for future reference.

### **2.2 Zones of Movement**

No zones of new movement were observed in the SI18-1 since the spring of 2021 readings.

Zones of movement are summarized in Table NC091-1 below. Table NC091-1 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 NC091-1  
 SPRING 2022 – HWY 63:02 BACKSLOPE SLUMPS (km 39.35 and 40.37)  
 SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: May 28, 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)
<b>NC091-1 (km 39.35)</b>								
SI18-1	February 20, 2018	10.0 mm over 0.1 to 1.4 m depth in 108° direction	50.0 on March 28, 2018	Operational	June 25, 2021	1.8	2.0	6.1
SI18-2	February 20, 2018	18.2 mm over 1.0 to 2.9 m depth in 289° direction	28.5 on September 10, 2018	Sheared at 3.7 m below top of casing	May 27, 2019	N/A	N/A	N/A
<b>NC091-2 (km 40.37)</b>								
SI18-3	February 20, 2018	11.6 mm over 0.1 to 2.0 m depth in 134° direction	65.8 on March 28, 2018	Damaged	May 27, 2019	N/A	N/A	N/A
SI18-4	February 20, 2018	11.8 mm over 1.0 to 3.5 m depth in 319° direction	28.1 on March 28, 2018	Sheared at 3.4 m below top of casing	May 27, 2019	N/A	N/A	N/A

Figures 32122-NC091-1 and 32122-NC091-2 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.



**TABLE NC091-2  
 SPRING 2022 – HWY 63:02 BACKSLOPE SLUMPS (km 39.35 and 40.37)  
 PNEUMATIC PIEZOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: May 28, 2022

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)
<b>NC091-1 (km 39.35)</b>								
PN18-1 (37784)	February 20, 2018	9.0	Operational	7.37 on May 27, 2019	0.3	8.96	8.97	0.01
PN18-2A (37782)	February 20, 2018	3.9	Damaged	1.09 on May 26, 2018	N/A	N/A	2.47 (June 25, 2021)	N/A
PN18-2B (37781)	February 20, 2018	8.5	Operational	7.91 on September 10, 2018	2.9	8.17	8.17	0.00
<b>NC091-2 (km 40.37)</b>								
PN18-3 (37783)	February 20, 2018	5.5	Damaged	5.07 on September 10, 2018	N/A	N/A	5.35 (May 27, 2019)	N/A
PN18-4A (37785)	February 20, 2018	2.4	Operational	1.28 on May 28, 2022	11.4	1.28	1.69	0.41
PN18-4B (37780)	February 20, 2018	13.0	Operational	12.53 on September 10, 2018	2.8	12.66	12.72	0.06

Figures 32122-NC091-1 and 32122-NC091-2 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.



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

#### **3.1 NC091-1 (km 39.35)**

Slope inclinometer SI18-1 showed a rate of movement of 2.0 mm/yr over 0.1 to 1.4 m depth since the spring of 2021 readings.

The groundwater level increased in PN18-1 by 0.01 m since the spring of 2021 readings. The groundwater level in PN18-2B showed no change since the spring of 2021 readings. Table NC090-2 summarizes the pneumatic piezometer readings. The pneumatic piezometer readings are also plotted on Figure NC091-1 included in Appendix A.

#### **3.2 NC091-2 (km 40.37)**

The groundwater level increased in PN18-4A and PN18-4B by 0.41 m and 0.06 m, respectively, since the spring of 2021 readings. PN18-4A showed the highest groundwater elevation recorded on the instrument since initialization. Table NC090-1-2 summarizes the pneumatic piezometer readings. The pneumatic piezometer readings are also plotted on Figure NC091-1 included in Appendix A.

### **4. RECOMMENDATIONS**

#### **4.1 Future Work**

The instruments at this site should be read again in the spring of 2023. Another attempt will be made to read PN18-2A at that time. If no readings can be obtained, the instrument will be removed from the geohazard readings program.

#### **4.2 Instrumentation Repairs**

SI18-3 and PN18-3 should be repaired in the spring of 2023 so that readings for these instruments can resume. These instruments are damaged below ground surface and require mechanical or hydrovac excavation to complete the repair.



## 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. 32122-NC091-1 and 32122-NC091-2)
  - SI Reading Plots
  - Figure NC091-1 (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.

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 (CON0022163)  
NORTH CENTRAL (ATHABASCA AND FORT McMURRAY DISTRICTS)  
INSTRUMENTATION MONITORING RESULTS**

**SPRING 2022**

**APPENDIX A  
DATA PRESENTATION AND SITE PLANS**

**SITE NC091: HWY 63:02 BACKSLOPE SLUMPS (km 39.35 and 40.37)**



ALBERTA TRANSPORTATION  
 NORTH CENTRAL REGION - ATHABASCA AND FORT McMURRAY DISTRICTS  
 INSTRUMENTATION MONITORING FIELD SUMMARY (NC091)  
 SPRING 2022

<b>Location:</b> HWY 63:02 km 39.35 and km 40.37 Backslope Slumps <b>File Number:</b> 32122 <b>Probe:</b> RST Set 8R <b>Cable:</b> RST Set 8R	<b>Readout:</b> RST PN C108 Unit 4 <b>Casing Diameter:</b> 2.75" <b>Temp (deg C):</b> 18 <b>Read by:</b> NKR/JD
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**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 #	Remarks
	Northing	Easting					A+	A-	B+	B-		
<b>NC091-1</b>												
SI18-1	6112165	405719	28-May-22	0.78	32 to 2	278	-1207	1222	-366	371	8R/8R	
<b>NC091-2</b>												
SI18-3	6113175	405739	28-May-22	0.77	32 to 2	295	216	-196	-602	610	8R/8R	Damaged by tractor lawnmower

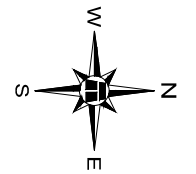
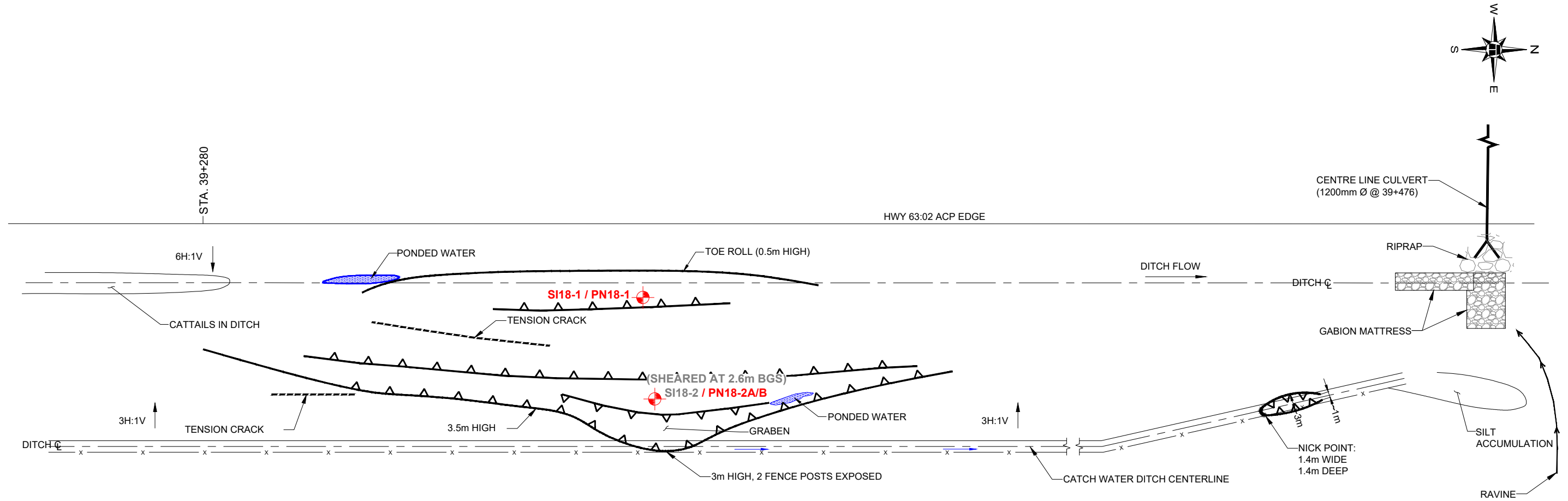
**PNEUMATIC PIEZOMETER (PN) READINGS**

PN #	Serial	GPS Location ( UTM 12)		Location	Date	Reading kPa	Comments
		Northing	Easting				
<b>NC091-1</b>							
PN18-1	37784	6112165	405719	Attached to SI18-1	28-May-22	0.3	
PN18-2A	37782	6112165	405732	Attached to SI18-2	28-May-22	1.3	*
PN18-2B	37781	6112165	405732	Attached to SI18-2	28-May-22	2.9	
<b>NC091-2</b>							
PN18-3	37783	6113175	405739	Attached to SI18-3	28-May-22	-	Damaged by tractor lawnmower
PN18-4A	37785	6113174	405764	Attached to SI18-4	28-May-22	11.4	
PN18-4B	37780	6113174	405764	Attached to SI18-5	28-May-22	2.8	



**INSPECTOR REPORT**

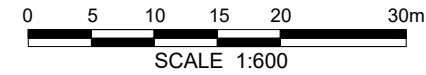
SI18-3 broken at surface at 2ft 9" below ground. Need mechanical excavator or hydrovac to repair. Not repairable by hand.
PN 18-2A, Reading keeps fluctuating when bypass is open. Between 40.0 kpa to 50.0 kpa. When bypass closed reading drops down to 1.3 and keeps climbing up. Possibly damaged.
PN 18-3 buried under slide debris.


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**LEGEND**

-  APPROXIMATE INSTRUMENT LOCATION
- SI SLOPE INCLINOMETER
- PN PNEUMATIC PIEZOMETER
-  SCARP CRACK (APPROXIMATE)






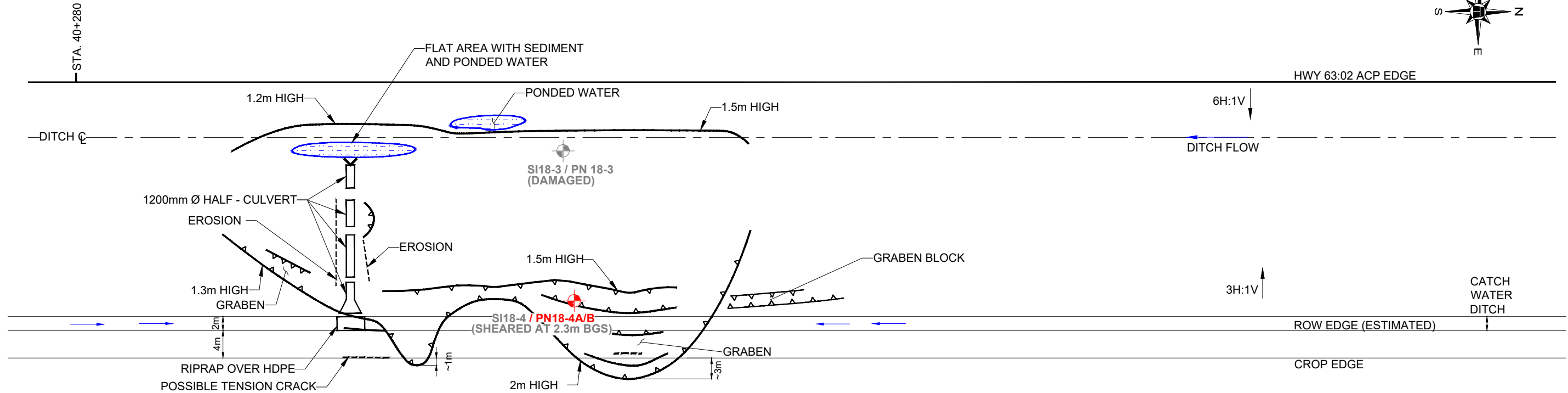
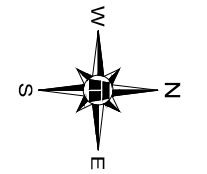
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(ATHABASCA AND FORT MCMURRAY DISTRICTS)  
NC091: HWY 63:02 km 39.35 - BACKSLOPE SLUMP  
SITE PLAN SHOWING APPROXIMATE  
INSTRUMENT LOCATIONS**

**DWG No. 32122-NC091-1**





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DESIGNED BY	BWN
APPROVED BY	TSA
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DATE	JULY 2021
FILE No.	32122

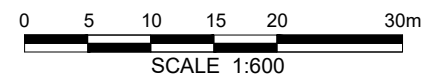


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**LEGEND**

-  APPROXIMATE INSTRUMENT LOCATION
-  SLOPE INCLINOMETER
-  PNEUMATIC PIEZOMETER
-  SCARP CRACK (APPROXIMATE)



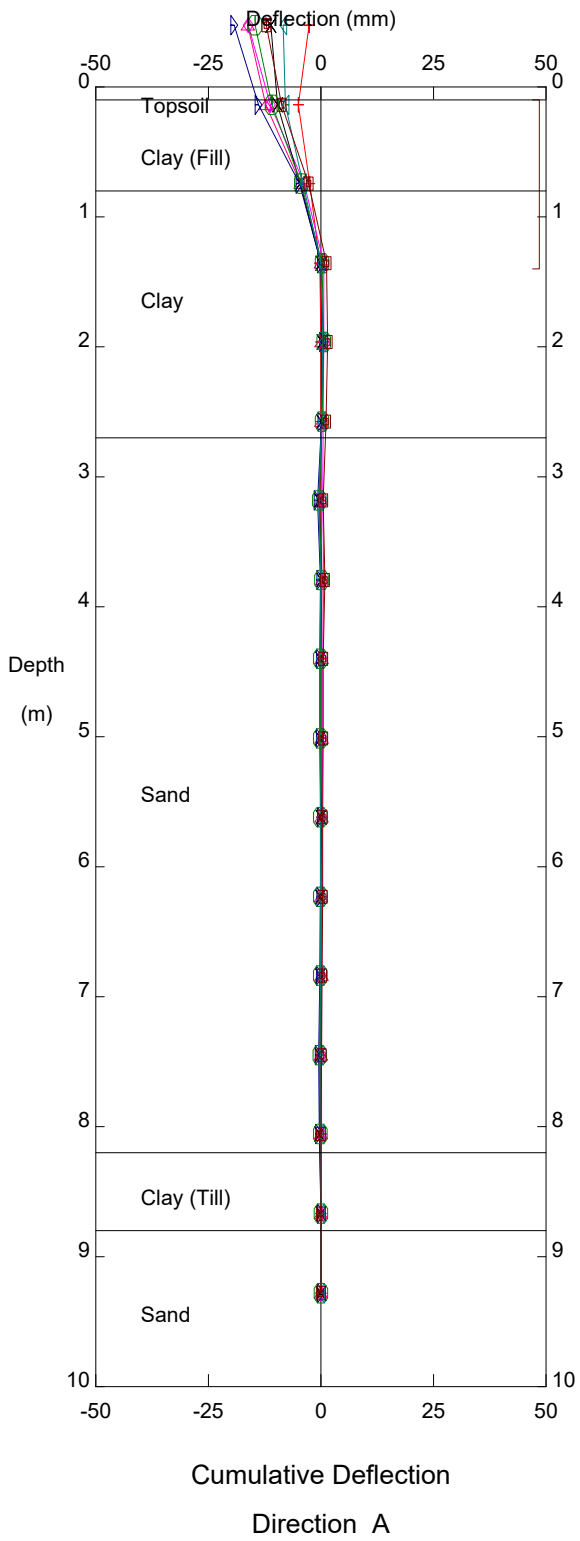
**NORTH CENTRAL  
(ATHABASCA AND FORT MCMURRAY DISTRICTS)  
NC091: HWY 63:02 km 40.37 - BACKSLOPE SLUMP  
SITE PLAN SHOWING APPROXIMATE  
INSTRUMENT LOCATIONS**

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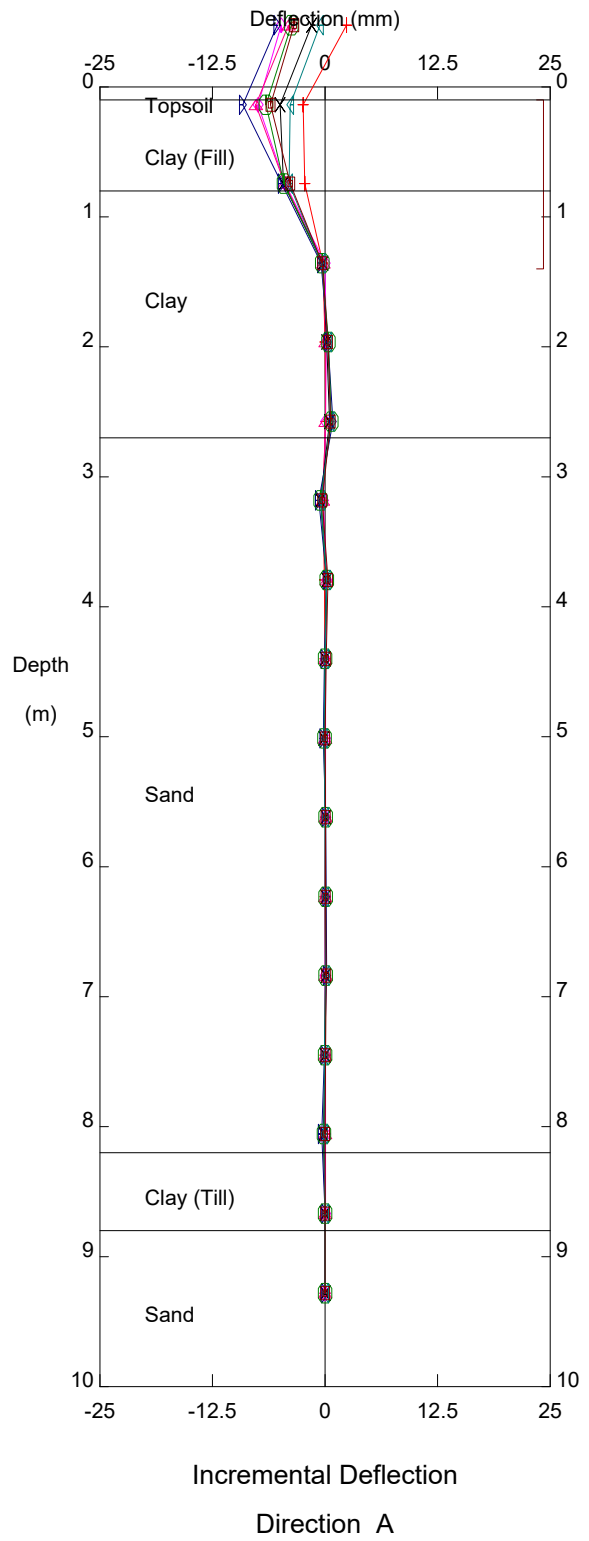
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APPROVED BY	TSA
SCALE	AS SHOWN
DATE	JULY 2021
FILE No.	32122



Thurber Engineering Ltd



- LEGEND
- Initial 20 Feb 2018
  - 28 Mar 2018
  - 26 May 2018
  - 10 Sep 2018
  - 27 May 2019\*
  - 24 May 2020\*
  - 20 Sep 2020\*
  - 25 Jun 2021\*
  - 28 May 2022

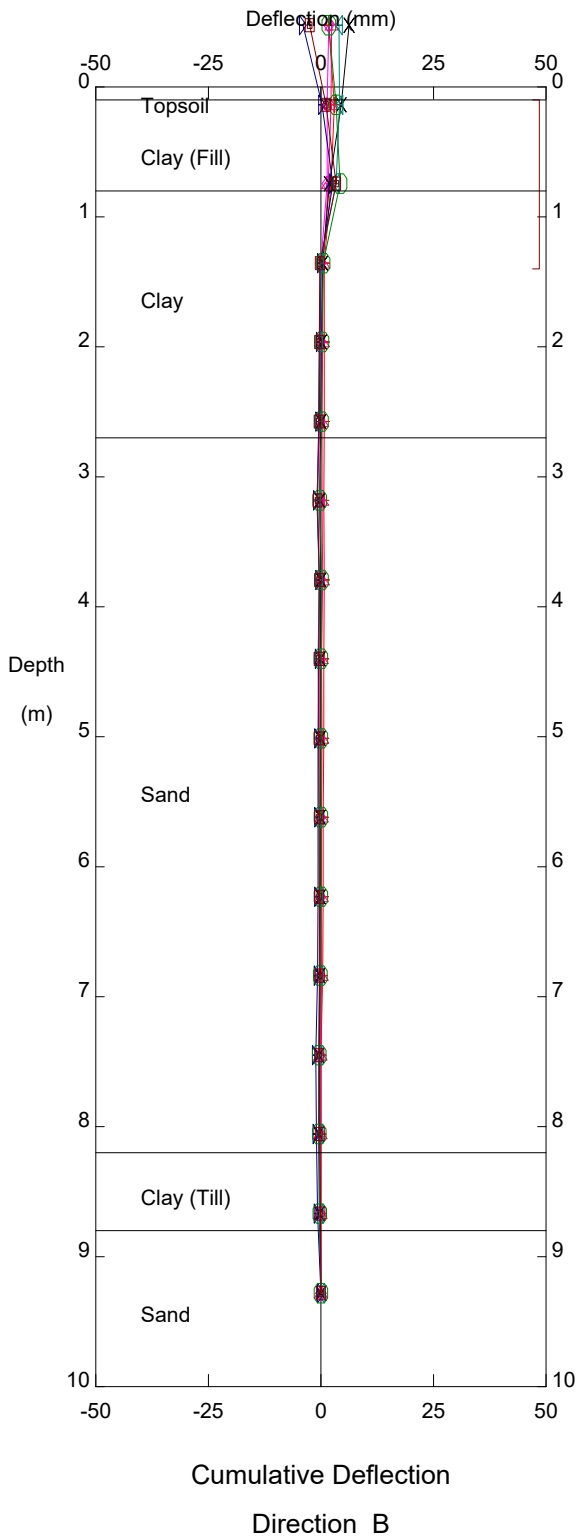


NC091 - km 39.35 Backslope Slump, Inclinometer SI18-1

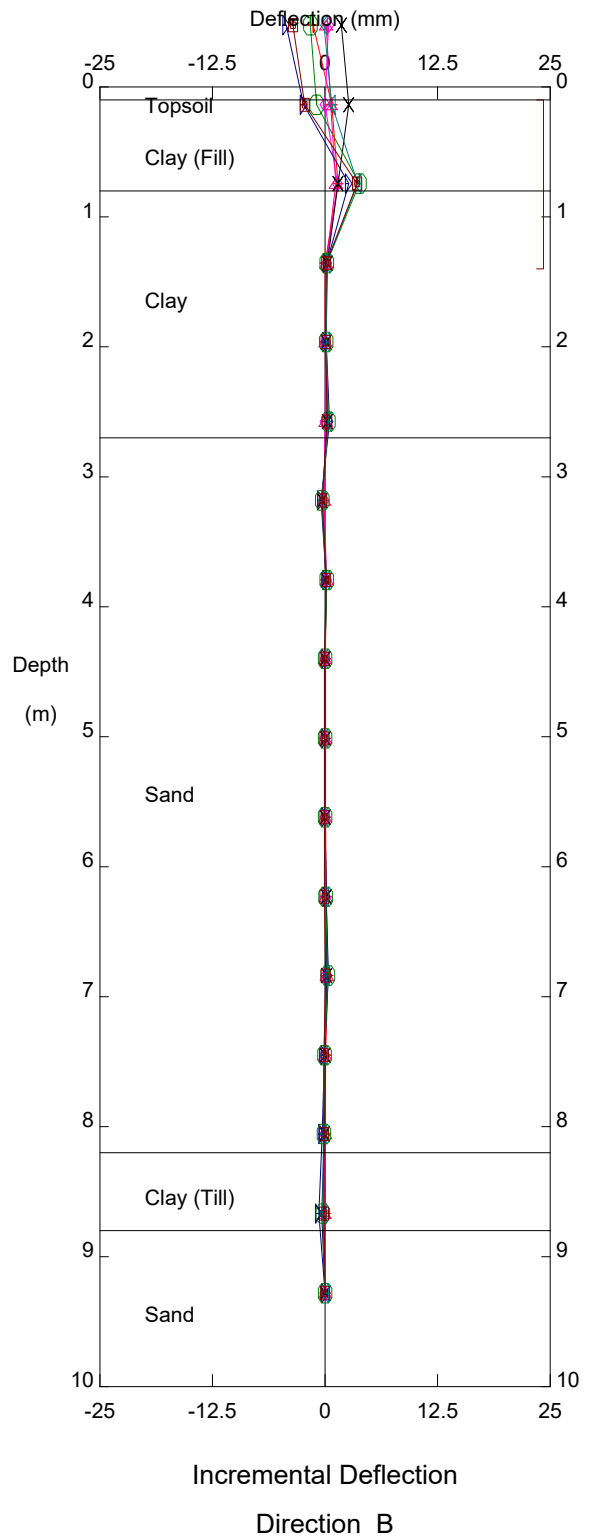
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Sets marked \* include zero shift and/or rotation corrections.

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- LEGEND
- Initial 20 Feb 2018
  - 28 Mar 2018
  - 26 May 2018
  - 10 Sep 2018
  - 27 May 2019\*
  - 24 May 2020\*
  - 20 Sep 2020\*
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  - 28 May 2022

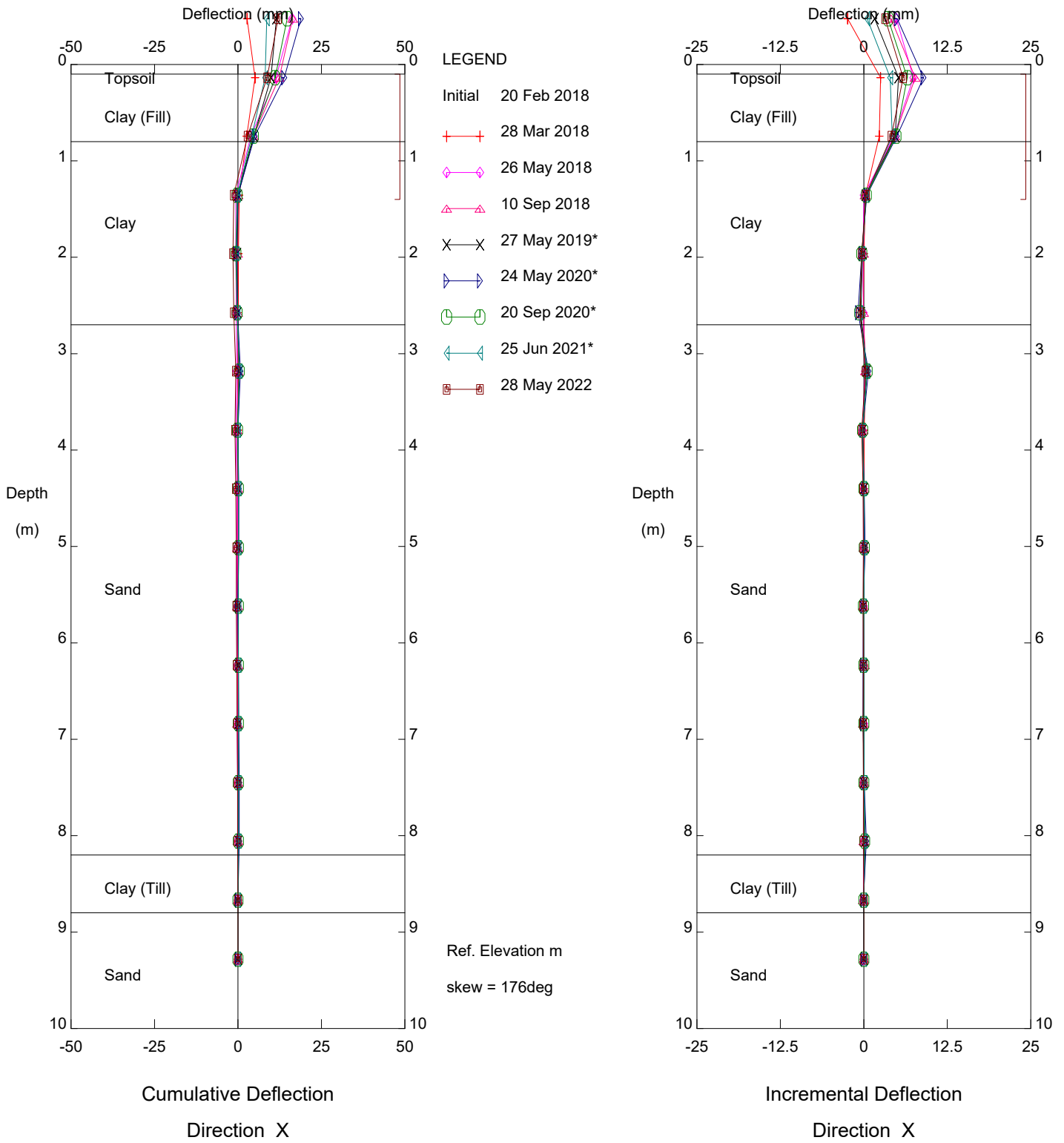


NC091 - km 39.35 Backslope Slump, Inclinometer SI18-1

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

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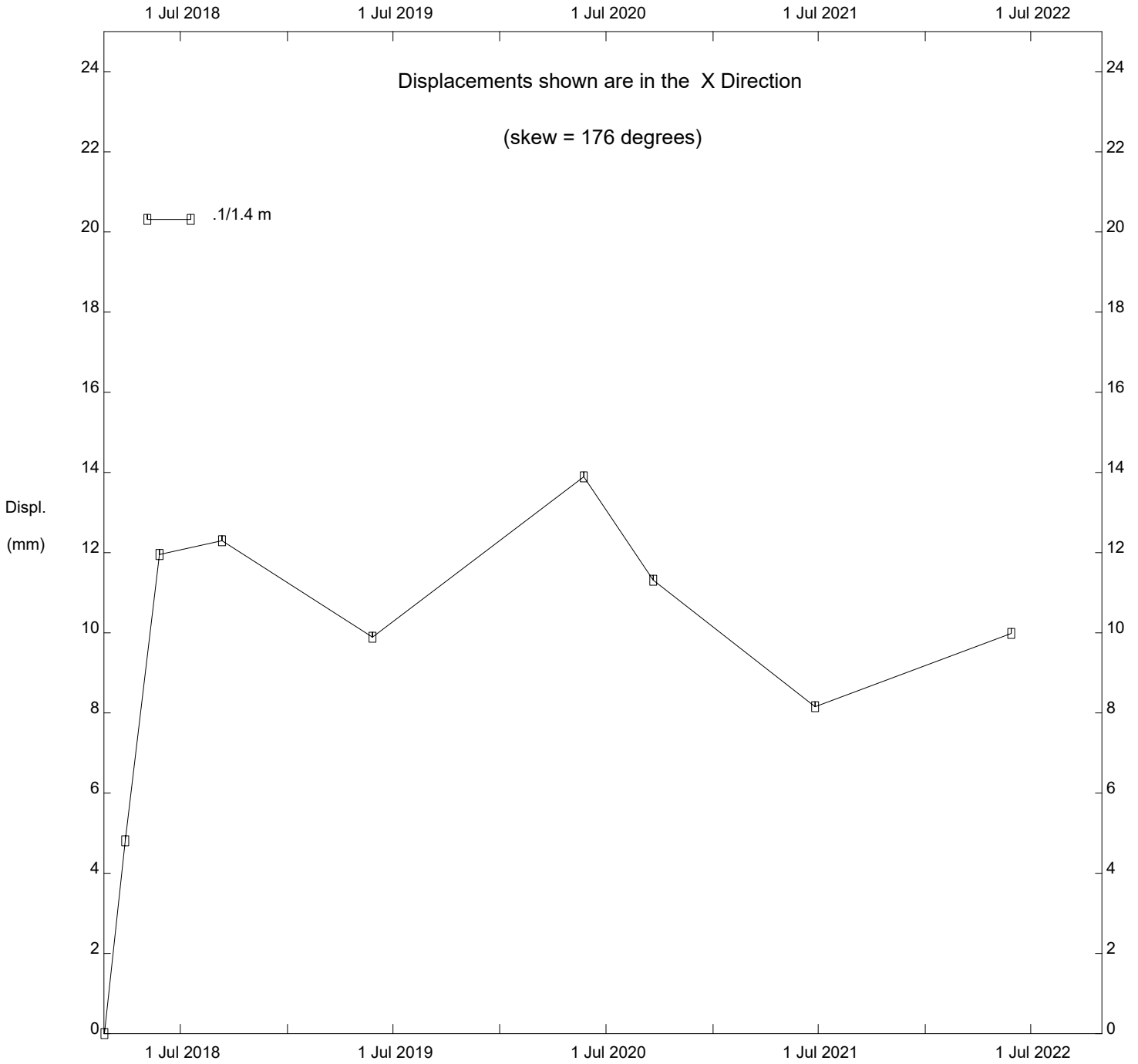


NC091 - km 39.35 Backslope Slump, Inclinometer SI18-1

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

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NC091 - km 39.35 Backslope Slump, Inclinator SI18-1

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**FIGURE NC091-1  
PIEZOMETER DATA FOR HWY 63:02 BACKSLOPE SLUMPS**

