



THURBER ENGINEERING LTD.

November 15, 2023

File No.: 32121

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

Attention: Mr. Max Shannon

**ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP (CON0022164)
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING RESULTS – FALL 2023**

SECTION C

SITE SH037: HWY 747:02, NICHOLLS CREEK SLIDE

Dear Mr. Shannon:

This report provides the results of the bi-annual geotechnical instrumentation monitoring for the above-mentioned site as part of Alberta Transportation and Economic Corridors' 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

One slope inclinometer (SI23-1), one vibrating wire piezometer (VW23-1), and one standpipe piezometer (SP23-2) were installed as part of a preliminary geotechnical assessment in January 2023.

One standpipe piezometer (SP23-2) was read at the Hwy 747:02 Nicholls Creek Slide site on October 8, 2023 by Mr. Niraj Regmi, G.I.T. and Mr. Nixon Mationg, both of Thurber Engineering Ltd. Slope inclinometer SI23-1 was damaged at 1.2 m below ground and could not be read. VW23-1 did not show any data (B unit or temperature) during the reading and is likely damaged at 1.2 m below ground.

The standpipe was read using a Heron 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. SI and piezometer readings summary tables are presented below.

2.2 Zones of Movement

Slope inclinometer SI23-1 has been damaged since the previous reading on June 11, 2023.

Zones of movement are summarized in Table SH037-1 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 SH037-1: Fall 2023 – Hwy 747:02 Nicholls Creek Slide Slope Inclinometer Instrumentation Reading Summary

Date Monitored: October 8, 2023

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)
SI23-1	January 13, 2023	9.7 mm over 3.0 m to 4.8 m depth in 241° direction	32.6 mm/yr in June 2023	Damaged	June 11, 2023	N/A	N/A	N/A

Drawing 32121-SH037-1 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

Table SH037-2: Fall 2023 – Hwy 747:02 Nicholls Creek Slide Vibrating Wire Piezometer Instrumentation Reading Summary

Date Monitored: October 8, 2023

INSTRUMENT #	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER ELEVATION (m)	MEASURED PORE PRESSURE (kPa)	CURRENT WATER ELEVATION (m)	PREVIOUS WATER ELEVATION (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
<i>VW23-1 (160227)</i>	<i>January 13, 2023</i>	<i>586.99</i>	<i>593.69</i>	<i>Damaged</i>	<i>588.90 on January 14, 2023</i>	<i>N/A</i>	<i>N/A</i>	<i>588.49 on June 11, 2023</i>	<i>N/A</i>

Drawing 32121-SH037-1 in Appendix A provides a sketch of the approximate locations of the monitoring instrumentation for this site.

Notes:

VW – vibrating wire piezometer.

BGS - below ground surface.

Table SH037-3: Fall 2023 – Hwy 747:02 Nicholls Creek Slide Standpipe Piezometer Instrumentation Reading Summary

Date Monitored: October 8, 2023

INSTRUMENT #	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER ELEVATION (m)	MEASURED WATER ELEVATION (m)	PREVIOUS WATER ELEVATION (June 11, 2023) (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
SP23-2	January 10, 2023	582.40	593.42	Operational	586.54 on October 8, 2023	586.54	586.40	0.14

Drawing 32121-SH037-1 in Appendix A provides a sketch of the approximate locations of the monitoring instrumentation for this site.

Notes:

SP – standpipe piezometer.

BGS - below ground surface.

3. INTERPRETATION OF MONITORING RESULTS

Slope inclinometer SI23-1 has been damaged since the previous reading on June 11, 2023.

Vibrating wire piezometer VW23-1 has been damaged since the previous reading on June 11, 2023. Standpipe piezometer SP23-2 showed an increase in groundwater level of 0.14 m compared to the previous reading on June 11, 2023. Table SH037-2 summarizes the vibrating wire piezometer readings. Table SH037-3 summarizes the standpipe piezometer readings. Piezometer readings are also plotted in Figures SH037-1 (by depth) and SH037-2 (by elevation) in Appendix A.

4. RECOMMENDATIONS

4.1 Future Work

The instruments should be read again in the spring of 2024, if an attempt to repair the SI and VWP is made.

4.2 Instrumentation Repairs

An attempt could be made to repair the slope inclinometer and vibrating wire piezometer, however a backhoe will be needed to complete the repairs.



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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.
Don Proudfoot, M.Eng., P. Eng.
Partner | Senior Geotechnical Engineer

Niels Rasmussen, P.Geo.
Geologist
/ak

Attachments:

- Statement of Limitations and Conditions
- Appendix A
 - Field Inspector's report
 - Site Plan Showing Approximate Instrument Locations (Drawing No.32121-SH037)
 - SI Reading Plots
 - Figure SH037-1 (Piezometric Depths)
 - Figure SH037-2 (Piezometric Elevations)



STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

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

2. COMPLETE REPORT

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

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

3. BASIS OF REPORT

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

4. USE OF THE REPORT

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

5. INTERPRETATION OF THE REPORT

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

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

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

7. INDEPENDENT JUDGEMENTS OF CLIENT

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



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

FALL 2023

**APPENDIX A
DATA PRESENTATION**

SITE SH037: HWY 747:02, NICHOLLS CREEK SLIDE

**ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING FIELD SUMMARY (SH037)
FALL 2023**

Location: Nicholls Creek Slide (HWY 747:02 C1 35.2) File Number: 32121 Probe: RST Set 5R Cable: RST Set 5R	Readout: DGSI Dipmeter Extension: 2.75" Temp: 21C Read by: NKR/NRM
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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-		
<i>SI23-1*</i>	<i>508123</i>	<i>6094128</i>	<i>08-Oct-23</i>	<i>1</i>	<i>62 to 2</i>	<i>241</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>5R</i>	

VIBRATING WIRE PIEZOMETER (VW) READINGS

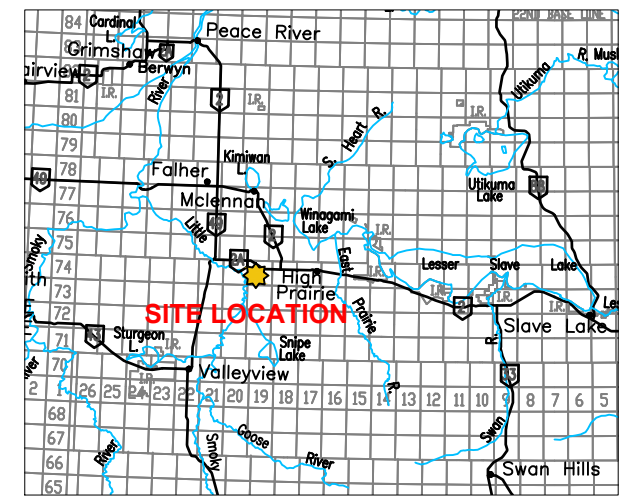
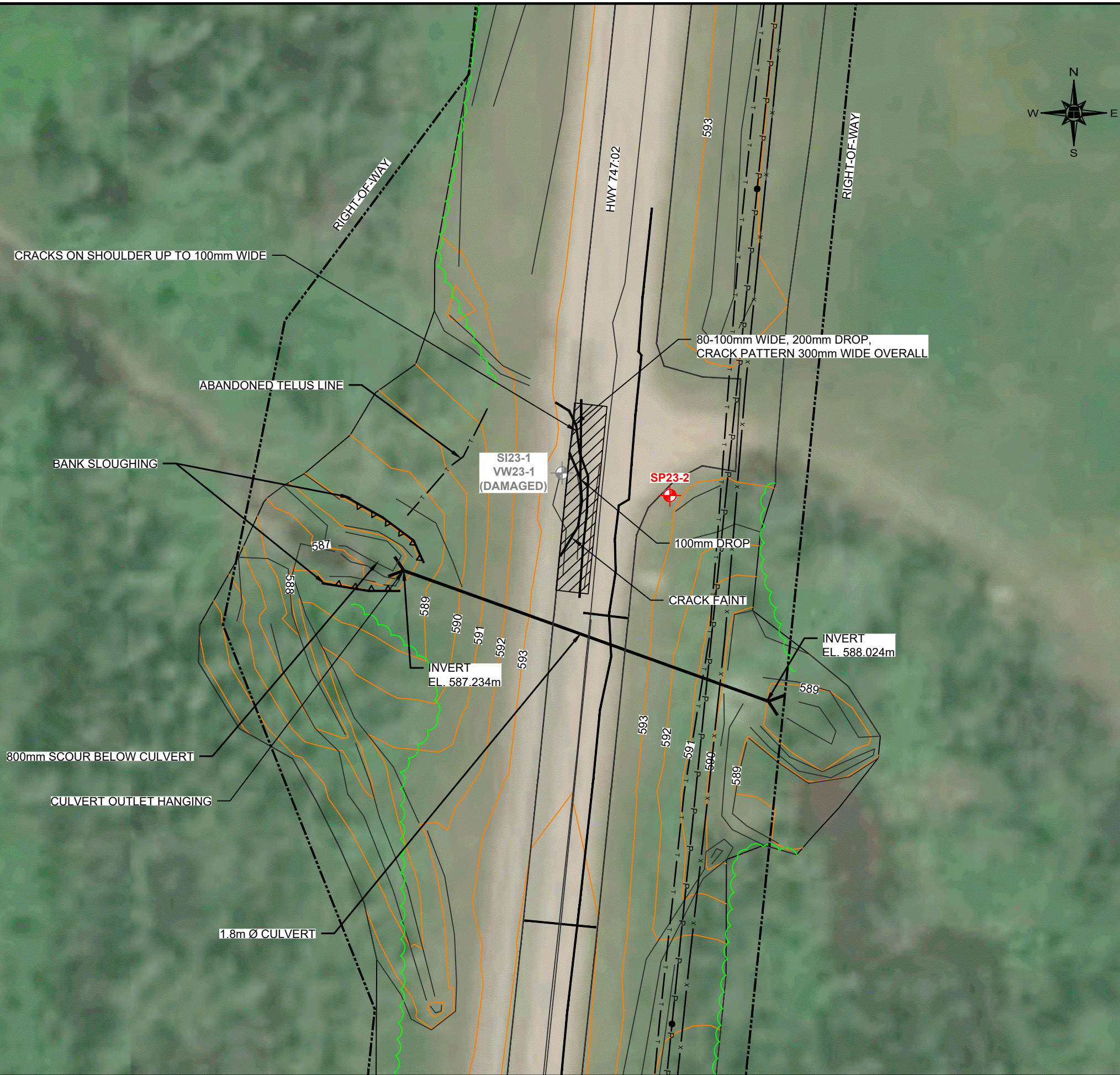
VW#	GPS Location (UTM 12)		Date	Reading (B)	Temp (°C)	Identification Number
	Easting	Northing				
<i>VW23-1**</i>	<i>508123</i>	<i>6094128</i>	<i>08-Oct-23</i>	<i>-</i>	<i>-</i>	<i>160227</i>

STANDPIPE PIEZOMETER (SP) READINGS

SP#	GPS Location (UTM 11)		Date	Stick-up (m)	Reading below top of pipe (m)	Bottom Pipe Depth (below ground (m))
	Easting	Northing				
SP23-2	508137	6138634	08-Oct-23	1.08	7.98	11.07

DAILY INSPECTOR REPORT

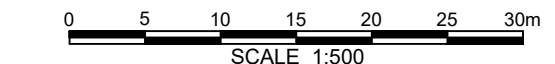
<i>*SI23-1, bent at 4.0 ft , probe will not go down, , damaged during paving and guardrail install. If repair needed, mechanical excavation required, to deep to dig by hand.</i>
<i>**Attached to SI23-1, VW23-1 showed no reading from instrument. Probably cutoff at 4 ft.</i>



KEY MAP
SCALE 1:3 000 000

- LEGEND**
- CRACK (APPROXIMATE)
 - SCARP CRACK (APPROXIMATE)
 - PROPOSED TEST HOLE LOCATION
 - SLOPE INCLINOMETER
 - VIBRATING WIRE PIEZOMETER
 - STANDPIPE PIEZOMETER
 - GROUND SURFACE CONTOUR (CONTOUR INTERVAL = 1m)
 - FIBRE LINE
 - FENCE LINE
 - POWER LINE
 - POWER POST
 - TREE LINE

- NOTES**
1. FEATURE LOCATIONS ARE APPROXIMATE.



2023-01-09 SURVEY FROM MCINTOSH PERRY
SATELLITE IMAGE FROM ESRI WORLD IMAGERY (DOWNLOADED 2022-08-22)



PEACE REGION (PEACE RIVER DISTRICT)

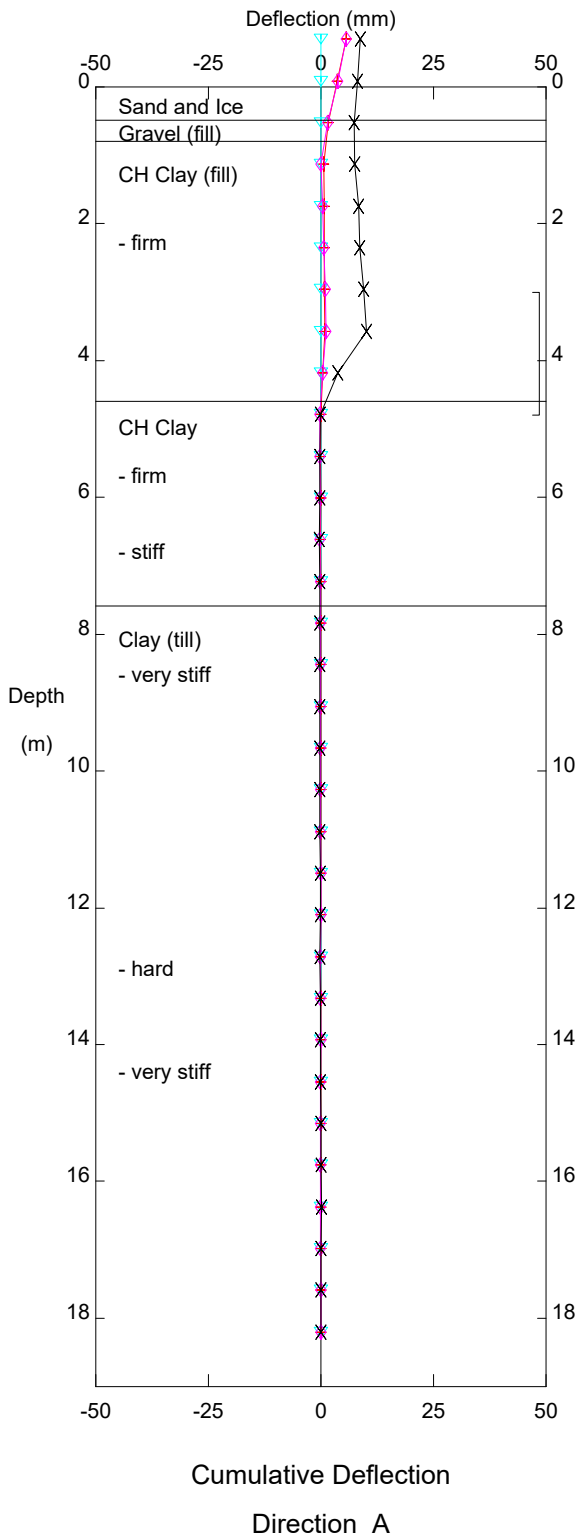
**SH037: HWY 747:02 km 35.2 NICHOLLS CREEK
SITE PLAN SHOWING APPROXIMATE
INSTRUMENT LOCATIONS**

DWG NO. 32121-SH037-1

DRAWN BY	ML
DESIGNED BY	NFR
APPROVED BY	DWP
SCALE	1:500
DATE	NOVEMBER 2023
FILE No.	32121

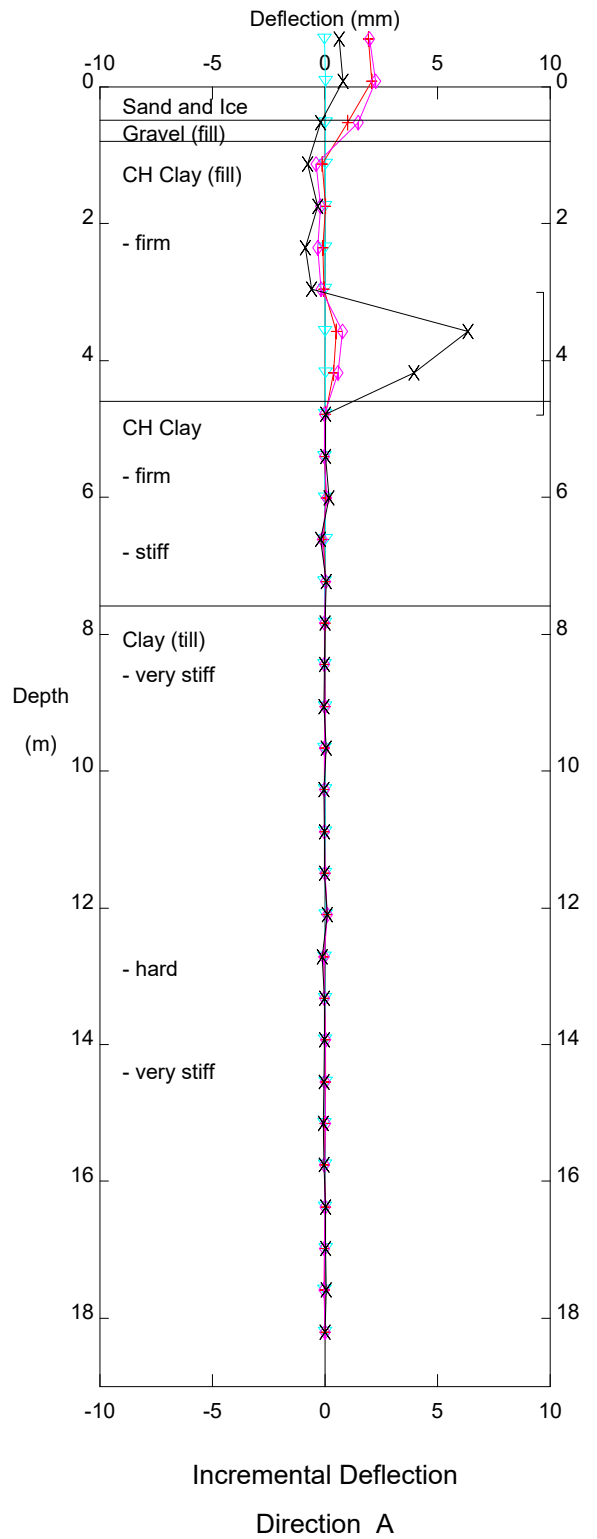


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LEGEND

- Initial 13 Jan 2023
- 14 Jan 2023
- 7 Feb 2023*
- 8 Mar 2023
- 11 Jun 2023*



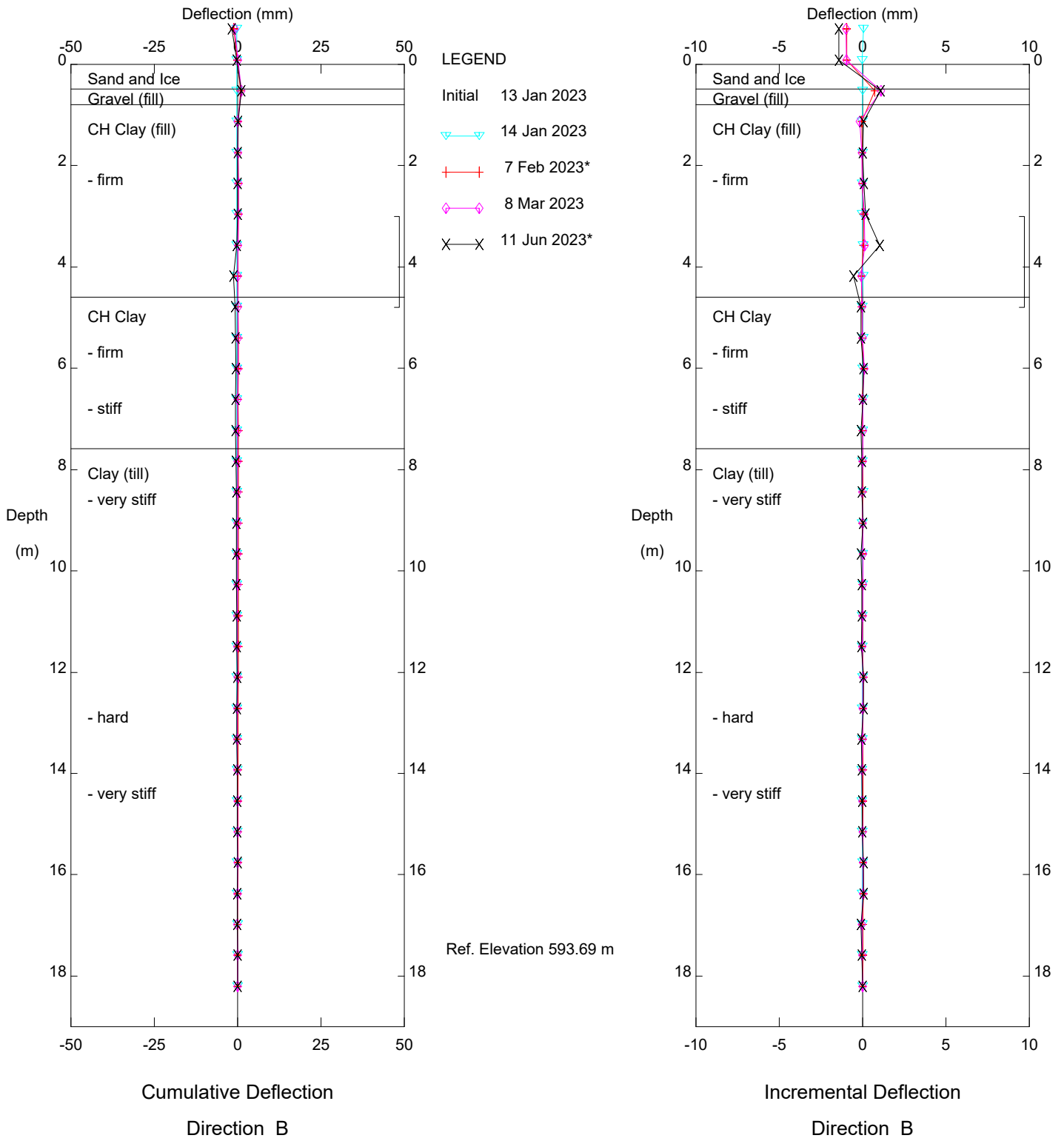
Ref. Elevation 593.69 m

Hwy 747:02 km 35.2 Nicholls Creek, Inclinometer SI23-1

TEC

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

Thurber Engineering Ltd.



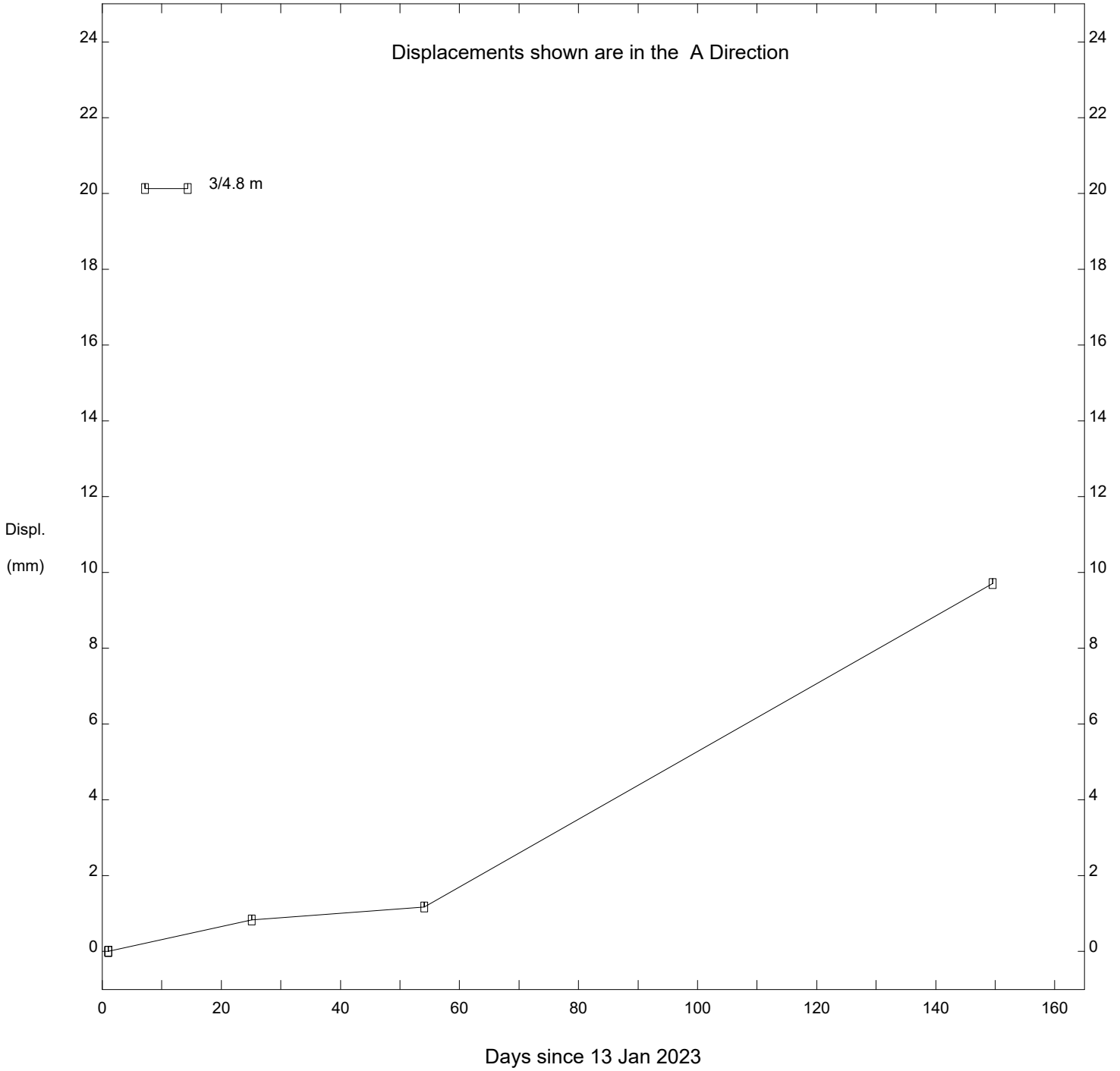
Hwy 747:02 km 35.2 Nicholls Creek, Inclinometer SI23-1

TEC

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

Thurber Engineering Ltd.

13 Jan 2023 2 Feb 2023 22 Feb 2023 14 Mar 2023 3 Apr 2023 23 Apr 2023 13 May 2023 2 Jun 2023 22 Jun 2023



Hwy 747:02 km 35.2 Nicholls Creek, Inclinator SI23-1

TEC

**FIGURE SH037-1
PIEZOMETRIC DEPTHS FOR HWY 747:02 NICHOLLS CREEK SLIDE**

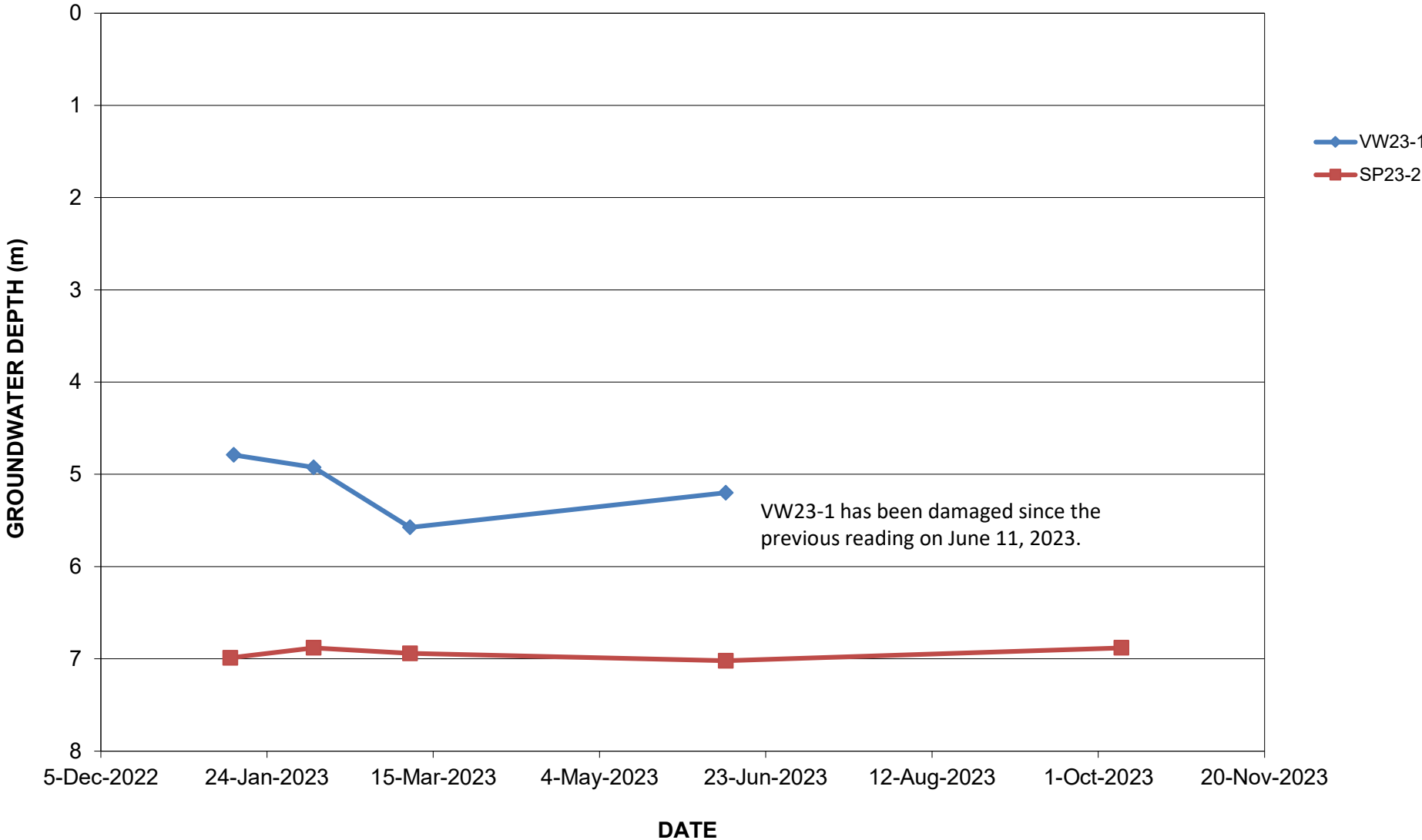


FIGURE SH037-2
PIEZOMETRIC DEPTHS FOR HWY 747:02 NICHOLLS CREEK SLIDE

