ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP PEACE REGION – (PEACE RIVER DISTRICT) SPRING 2024



Site Number	Location	Name	Hwy	km
PH071	Hwy 986:01 C1 28.474	Daishowa West Hill	986:01	Km 28.5
Legal Descriptio	n: 8-9-85-21 W5	UTM Co-ordinates		
		11U E 485023	N 624	45526

Current Monitoring:	20-May-2024	Previous Monitoring	10-Oct-2023
Instruments Read By:	Mr. Niraj Regmi, G	.I.T and Mr. Nixson Mationg, of Thurb	er

Instruments Read During This Site Visit									
Slope Inclinometers (SIs): Sl16-3	Pneumatic Piezometers (PN): N/A	Vibrating Wire Piezometers (VW): VW16-1A, VW16-1B, VW16-1C, VW16-2A, VW16-2B, VW16-2C, VW16-3A, VW16-3B, VW16-4A, VW16-5A	Standpipe Piezometers (SP):						
Load Cell (LC): VC1917 to VC1925	Strain Gauges: twenty-eight vibrating wire strain gauges	SAAs: SAA-P060, SAA-P097	Others:						

Readout Equipment Used									
Slope Inclinometers: RST Digital Inclinometer probe with a 2 ft wheelbase and a RST Pocket PC readout	Pneumatic Piezometers:	Vibrating Wire Piezometers: Campbell Scientific CR6 datalogger	Standpipe Piezometers:						
Load Cell: Campbell Scientific CR6 datalogger	Strain Gauges: Campbell Scientific CR6 datalogger	SAAs: Campbell Scientific CR6 datalogger	Others:						

	Discussion
Zones of New Movement:	None
	SI16-3 showed rates of movement of 4.8 mm/yr and 0.1 mm/yr over 0.1 m to 3.8 m depth and 14.1 m to 16.0 m depth, respectively, since the fall of 2023 readings. SI16-3 showed no discernible movement over 9.3 m to 11.1 m depth.
Interpretation of Monitoring Results:	SAA-P060 showed a rate of movement of 0.6 mm/yr over 2.5 m to 29.5 m depth, and a rate of movement of 1.2 mm/yr over the full length of the pile and waler since the fall of 2023 readings. SAA P060 has shown a cumulative pile head deflection of 17.9 mm to date in the downslope direction. SAA-P060 has shown an overall relatively steady rate of movement since the end of construction with a total incremental movement of about 5.9 mm in the downslope direction since completion of construction. The Wall movement appears to be approaching an equilibrium level at this location.
	SAA-P097 has shown 0.6 mm of uphill movement since the fall of 2023 readings. SAA-P097 has shown a total pile head deflection of 17.5 mm in the downslope direction to date. SAA-P097 had shown an overall trend of steady

downslope movement since the end of construction, with peaks of higher downhill movement rates during the winter months. However, the more recent readings for SAA P097 seem to indicate that the pile wall is reaching a state of equilibrium at its location.

The strain gauge readings in Pile P066 are summarized in Table PH071-3. Overall, the strain gauges showed relatively small changes in microstrain value compared to the previous readings in the fall of 2023. The greatest change in microstrain was in strain gauge #11 at 0.6 m depth in the upslope face of the pile, which showed an increase in positive (compressive) microstrain of 6.9 microstrain compared to the fall of 2023 readings.

Vibrating wire piezometer VW16-1A was dry during the spring 2024 readings. VW16-1B, and VW16-1C, located upslope of the wall, showed a decrease in groundwater level of 0.60 m and 1.05 m respectively since the fall of 2023 readings. VW16-2C and VW16-2B, also located upslope of the wall, showed decreases in groundwater levels of 0.83 m and 0.26 m, respectively since the fall of 2023 readings. However, the overall trend since end of construction had been a gradual increase in the groundwater table upslope of the wall to what now appears to be a relatively steady level that fluctuates slightly seasonally.

VW16-1A appears to follow an overall cyclical pattern, with groundwater levels registered above the tip elevation each year from late spring to early winter, while for the rest of the year the groundwater level remains below the tip. VW16-2A continued to be dry (this piezometer has only shown a groundwater level above the tip during a period between August 9, 2022, and September 21, 2022).

Of the piezometers located downslope of the wall, VW16-3A and VW16-3B showed increases in groundwater level of 0.18 m and 0.16 m, respectively, since the fall of 2023 readings.

VW16-4A continued to be dry. VW16-5A was dry during the current readings. VW16-4A and VW16-5A tend to remain dry except for brief periods that correspond to either higher than normal rainfall or spring thaw.

The load cells generally showed small changes in measured load compared to the fall of 2023 readings, ranging from a decrease of 3.93 kN in VC1922 (anchor P060B) to an increase of 7.85 kN in VC1924 (anchor P022A). Load cells VC1923 (anchor P022B) and VC1921 (anchor P060C) registered their maximum recorded loads since the instruments were initialized on February 1, 2024.

It should be noted that load cells VC1924 (anchor P022A), VC1923 (anchor P022B), VC1922 (anchor P060B) and VC1918 (anchor P097B) have each lost the function of one vibrating wire channel. The loads that are now reported for these three load cells are based on the average of the two functional channels and projecting a reading for the now malfunctioning channel based on the last reading taken for that channel and the changes observed in the two functional channels since that time.

Since the end of construction, the load cells have generally shown an overall trend of increasing load, with the highest seasonal loads measured towards the end of each winter. The current loads measured in the upper two anchor rows at all three piles, as well as the lower row at P022, are above the design loads. However, the recent readings for P060 and P097 appear to show that the anchor loads in the upper two anchor rows in P060 and P097 are starting to level off.

Future Work:

The instruments should be read again in the fall of 2024. It is recommended to continue monitoring the deflections in the pile wall and the load cell readings to see if there are further increases in deflection or loads compared to the warning threshold values. If the deflections and or load cell readings

	continue to increase, it may become necessary to add additional anchors to the pile wall.
Instrumentation	No instrument repairs are required at this time.
Repairs:	
Additional	
Comments:	

	■ Table PH071-1: Spring 2024 – HWY 986:01, Daishowa West Hill Slope Inclinometer Instrumentation Reading Summary							
	■ Table PH071-2: Spring 2024 – HWY 986:01, Daishowa West Hill Shape Accelerometer Array Instrumentation Reading Summary							
	 Table PH071-3 Spring 2024 – HWY 986:01, Daishowa West Hill Vibrating Wire Strain Gauge Instrumentation Reading Summary 							
	 Table PH071-4: Spring 2024 – HWY 986:01, Daishowa West Hill Vibrating Wire Piezometer Instrumentation Reading Summary 							
	 Table PH071-5: Spring 2024 – HWY 986:01, Daishowa West Hill Load Cell Instrumentation Reading Summary 							
	Statement of Limitations and Conditions							
Attachments:	■ APPENDIX A - PH071 SPRING 2024							
	□ Field Inspector's report							
	 Site Plan Showing Approximate Instrument Locations (Drawings No. 32121 PH071 1 and 32121-PH071-2) 							
	□ SI Reading Plots							
	□ SAA Reading Plots							
	□ Figure PH071-1 (Upslope Piezometer Elevations)							
	□ Figure PH071-2 (Downslope Piezometer Elevations)							
	□ Figure PH071-3 (Load Cell Data Pile P22)							
	□ Figure PH071-4 (Load Cell Data Pile P60)							
	□ Figure PH071-5 (Load Cell Data Pile P97)							

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

Lucas Green, P.Eng. Geotechnical Engineer



Table PH071-1: Spring 2024 – HWY 986:01, Daishowa West Hill Slope Inclinometer Instrumentation Reading Summary

Date Monitored: May 20, 2024 **TOTAL CHANGE IN CUMULATIVE INCREMENTAL** RATE OF **MAXIMUM MOVEMENT** RESULTANT **DATE RATE OF MOVEMENT** DATE OF **INSTRUMENT MOVEMENT AT RATE OF CURRENT** SINCE **MOVEMENT** SINCE # **INITIALIZED NOTED DEPTH MOVEMENT STATUS PREVIOUS PREVIOUS** (mm/yr.) **PREVIOUS** SINCE INITIAL (mm/yr.) READING **READING READING** READING (mm) (mm/yr.) (mm) 32.6 over 0.1 m 9.9 in to 3.8 m depth in 2.9 4.8 -2.5 October 2020 101° direction 4.0 over 9.3 m to December 2. 1.8 in October 10, No discernible SI16-3 11.1 m depth in -0.9 2017 Operational N/A October 2020 2023 movement 136° direction (Re-initialized) 2.8 over 14.1 m 1.2 in to 16.0 m depth in < 0.1 0.1 -0.6 October 2020 101° direction 171.6 on September 6. 9.7 over 10.4 m Sheared at September 30. SI16-4 September N/A N/A N/A 2016 to 12.4 m depth 11.4 m depth 2016 15, 2016 2404.8 on August 30, 64.5 over 8.0 m Sheared at September 9, SI16-5 September 9. N/A N/A N/A 2016 to 9.5 m depth 8.5 m depth 2017 2016

Drawings 32121-PH071-1 and 32121-PH071-2 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site.



Table PH071-2: Spring 2024 – HWY 986:01, Daishowa West Hill Shape Accelerometer Array Instrumentation Reading Summary

Date Monitored: M	ay 20, 2024						
INSTRUMENT #	DATE INITIALIZED	TOTAL CUMULATIVE RESULTANT MOVEMENT AT NOTED DEPTH SINCE INITIAL READING (mm)	CURRENT STATUS	DATE OF PREVIOUS READING	INCREMENTAL MOVEMENT SINCE PREVIOUS READING (mm)	AVERAGE RATE OF MOVEMENT SINCE PREVIOUS READING ⁽¹⁾ (mm/yr.)	CHANGE IN AVERAGE RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr.)
SAA-P022	March 17, 2016	5.1 over 0 m to 29.5 m depth Not		September 9,	N/A	N/A	N/A
3AA-F022	waren 17, 2010	6.7 over 2.5 m to 29.5 m depth	functioning ⁽²⁾	2016	N/A	N/A	N/A
SAA D060	March 17, 2016	17.9 over 2.5 m to 29.5 m depth		October 10,	0.4	0.6	>-0.1
SAA-P060	March 17, 2016	25.3 over 0.0 m to 29.5 m depth	Operational	2023	0.7	1.2	1.6
SAA-P097	March 17, 2016	17.5 over 2.5 m to 29.5 m depth	Operational	October 10, 2023	-0.6	-1.1	-0.2

Drawings: 32121-PH071-1 and 32121-PH071-2 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site.

Notes:

- 1. SAA readings are recorded once per day by the on-site datalogger. Average movement rates are compared to the previous reading event.
- 2. SAA-P022 stopped functioning on September 13, 2016



Table PH071-3: Spring 2024 – HWY 986:01, Daishowa West Hill Vibrating Wire Strain Gauge Instrumentation Reading Summary

Date Monitored: May 20, 2024

DEPTH FROM TOP OF PILE P066 (m)	GAUGE #	TOTAL MICROSTRAIN (MAY 20, 2024) (με)	CHANGE IN MICROSTRAIN SINCE PREVIOUS READING (OCT. 10, 2023) (με)	MEASURED TEMPERATURE (°c)	GAUGE #	TOTAL MICROSTRAIN (MAY 20, 2024) (με)	CHANGE IN MICROSTRAIN SINCE PREVIOUS READING (OCT. 10, 2023) (µE)	MEASURED TEMPERATURE (°c)
		UPSL	OPE PILE FACE			DOWN	SLOPE PILE FACE	
0.575	11	-94.6	6.9	15.1	16	N/A	N/A	N/A
2.575	12	-41.2	6.3	15.5	17	149.6	-2.7	18.7
4.575	13	-52.7	0.2	9.9	18	445.5	-1.9	10.4
6.575	14	-39.4	-0.3	6.2	19	433.5	-4.7	6.2
8.575	15	-33.9	-1.8	-95.8	20	N/A	N/A	N/A
11.075	1	23.6	-2.2	7.1	6	N/A	N/A	N/A
13.075	2	29.5	-0.7	7.4	7	-67.6	-1.3	-162.7
15.075	3	32.9	-0.2	7.5	8	170.9	1.0	7.5
17.075	4	39.1	0.7	5.6	9	166.8	-0.3	7.5
19.075	5	-1.5	0.9	7.5	10	N/A	N/A	N/A
21.075	21	25.3	0.0	-137.2	22	194.9	0.9	7.4
23.075	23	-24.5	0.1	7.3	24	119.2	0.7	7.3
25.075	25	14.3	0.0	7.2	26	N/A	N/A	7.1
27.075	27	N/A	N/A	N/A	28	585.6	0.5	7.0

Drawings 32121-PH071-1 and 32121-PH071-2 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site.

Note: Strain gauges number 6, 10, 16, 20, 26 and 27 are not functioning



Table PH071-4: Spring 2024 – HWY 986:01, Daishowa West Hill Vibrating Wire Piezometer Instrumentation Reading Summary

Date Monitored: May 20, 2024

INSTRUMENT	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST RECORDED GROUNDWATER ELEVATION (m)	CURRENT GROUNDWATER ELEVATION (m)	PREVIOUS GROUNDWATER ELEVATION (m) (OCT. 10, 2023)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
VW16-1A	July 27, 2016	487.04	491.04	Active	488.65 on November 10, 2023	Below Tip Elevation (Dry)	488.44	N/A
VW16-1B	July 27, 2016	482.04	491.04	Active	485.47 on November 10, 2023	484.79	485.39	-0.60
VW16-1C	July 27, 2016	473.04	491.04	Active	482.61 on November 10, 2023	481.40	482.45	-1.05
VW16-2A	April 26, 2017	484.73	487.73	Active	484.82 on September 9, 2022	Below Tip Elevation (Dry)	Below Tip Elevation (Dry)	N/A
VW16-2B	April 26, 2017	478.73	487.73	Active	484.20 on September 9, 2022	483.09	483.92	-0.83
VW16-2C	April 26, 2017	469.73	487.73	Active	482.07 on September 20, 2022	481.59	481.85	-0.26
VW16-3A	September 7, 2016	477.49	482.99	Active	481.81 on May 9, 2021	481.32	481.14	0.18
VW16-3B	September 7, 2016	464.99	482.99	Active	470.25 on September 7, 2016	465.88	465.72	0.16
VW16-4A	August 30, 2016	470.99	481.43	Active	475.30 on June 18, 2020	Below Tip Elevation (Dry)	Below Tip Elevation (Dry)	N/A
VW16-4B	August 30, 2016	457.24	481.43	Not functioning	Below Tip Elevation (Dry) N/A		N/A	N/A
VW16-5A	August 30, 2016	468.02	471.02	Active	470.09 on March 22, 2019	470.09 on March 22, 2019 Below Tip Elevation (Dry)		N/A
VW16-5B	August 30, 2016	452.52	471.02	Not functioning	452.60 on September 12, 2016	N/A	N/A	N/A

Drawings 32121-PH071-1 and 32121-PH071-2 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site.



Table PH071-5: Spring 2024 – HWY 986:01, Daishowa West Hill Load Cell Instrumentation Reading Summary

Date Monitored: May 20, 2024									
LOAD CELL SERIAL #	ANCHOR NUMBER	DESIGN LOAD /LOCK-OFF LOAD (kN)	MAXIMUM RECORDED LOAD (kN)	RECORDED LOAD ⁽¹⁾ (MAY 20, 2024) (kN)	PREVIOUS RECORDED LOAD ⁽¹⁾ (OCT 10, 2023) (kN)	CHANGE IN LOAD SINCE PREVIOUS READING (kN)			
VC1924	P022A	230/184	281.69 ⁽²⁾ on March 14, 2023	263.35 ⁽²⁾	255.50 ⁽²⁾	7.85			
VC1923	P022B	230/184	286.32 ⁽³⁾ on March 23, 2023	274.31 ⁽³⁾	275.26 ⁽³⁾	-0.95			
VC1925	P022C	230/184	239.89 on February 1, 2024	236.06	235.42	0.64			
VC1920	P060A	230/184	288.90 on February 3, 2022	270.71	265.93	4.78			
VC1922	P060B	230/184	301.83 on January 28, 2022	284.11 ⁽⁵⁾	288.04	-3.93			
VC1921	P060C	230/184	236.85 on February 1, 2024	234.09	234.77	-0.68			
VC1917	P097A	230/184	303.66 on March 14, 2022	246.68	244.18	2.50			
VC1918	P097B	230/184	293.16 on March 9, 2022	253.20 ⁽⁴⁾	255.09 ⁽⁴⁾	-1.89			
VC1919	P097C	230/184	227.06 on March 17, 2022	220.22	219.98	0.24			

Drawings 32121-PH071-1 and 32121-PH071-2 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site.

Notes:

- 1) Load cell data is recorded daily with the datalogger on site. Dataloggers are downloaded twice annually during instrumentation readings. See figures PH071-3, PH071-4, and PH071-5 in Appendix A for combined historical instrument readings.
- 2) As of September 16, 2021, only two wire channels are functional on load cell VC1924. The reported loads after this date are based on the average of the two functional channels and a projected reading for the now malfunctional channel.
- 3) As of October 4, 2021, only two wire channels are functional on load cell VC1923. The reported loads after this date are based on the average of the two functional channels and a projected reading for the now malfunctional channel.
- 4) As of May 15, 2022, only two wire channels are functional on load cell VC1918. The reported loads after this date are based on the average of the two functional channels and a projected reading for the now malfunctional channel.
- 5) As of December 5, 2023, only two wire channels are functional on load cell VC1922. The reported loads after this date are based on the average of the two functional channels and a projected reading for the now malfunctional channel.



STATEMENT OF LIMITATIONS AND CONDITIONS

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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.

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- 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.
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- 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.

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

SPRING 2024

APPENDIX A DATA PRESENTATION

SITE PH071: HWY 986:01, DAISHOWA WEST HILL

ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS PEACE REGION (PEACE RIVER DISTRICT) INSTRUMENTATION MONITORING FIELD SUMMARY (PH071) SPRING 2024

Location: Daishowa West Hill (Hwy 986:01 C1 28.474)

Readout:

Probe: RST Set 8R Cable: RST Set 8R

File Number: 32121

Casing: 3.34 Temp: 13 Read by: NRM

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS I	Location	Date	Stickup	Depth from top	Magn. North	Current Bottom			Probe/		Remarks	
	(UT	M 11)		(m)	of Casing (ft)	A+ Groove	Depth Readings			Reel			
	Easting (m)	Northing (m)					A+	A-	B+	B-	#	Size (")	
SI16-3	485023	6245526	20-May-24	0.8	130 to 2	95	187	-173	25	-31	8R/8R	3.34	

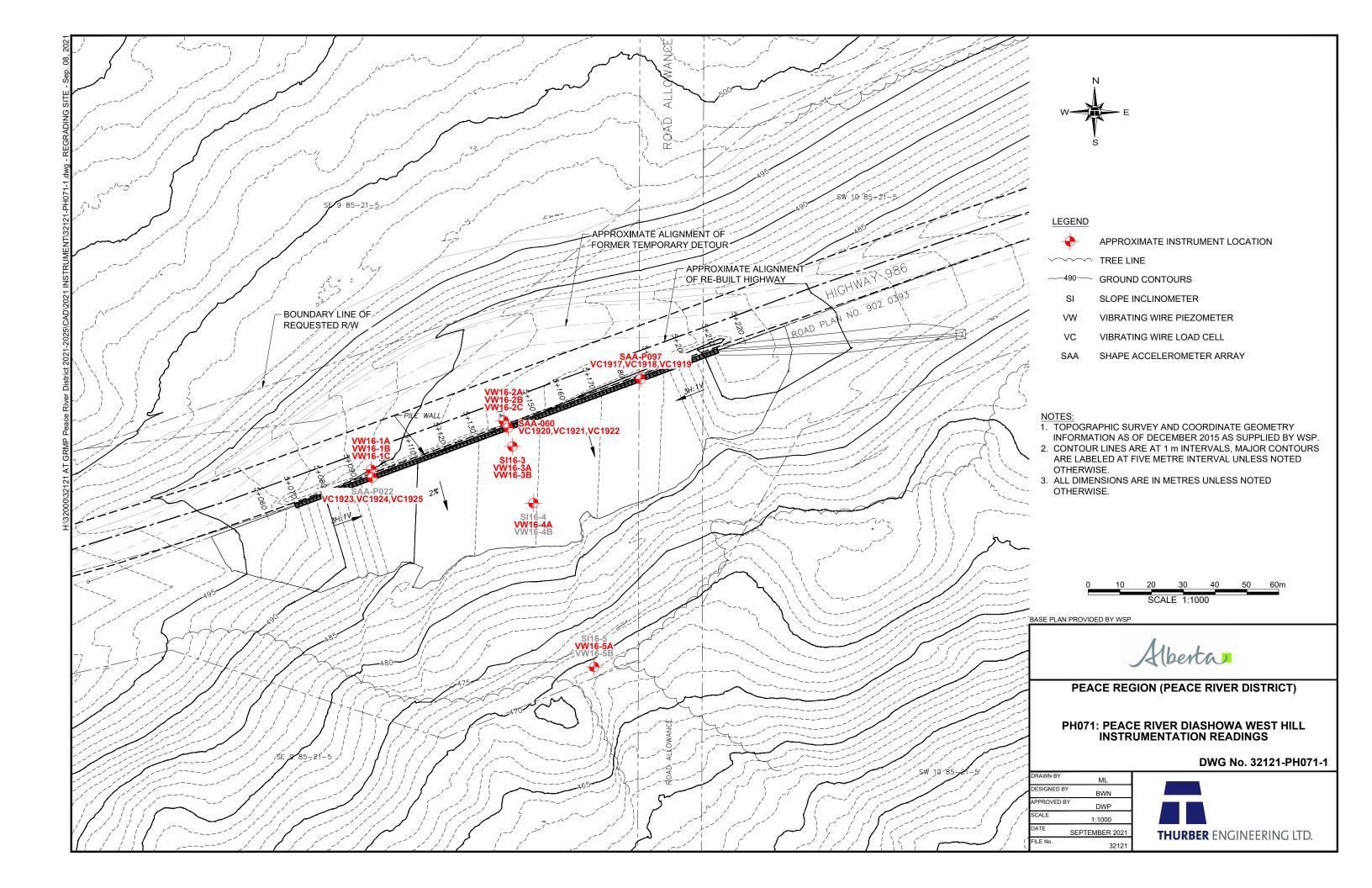
VIBRATING WIRE PIEZOMETER (VW) READINGS

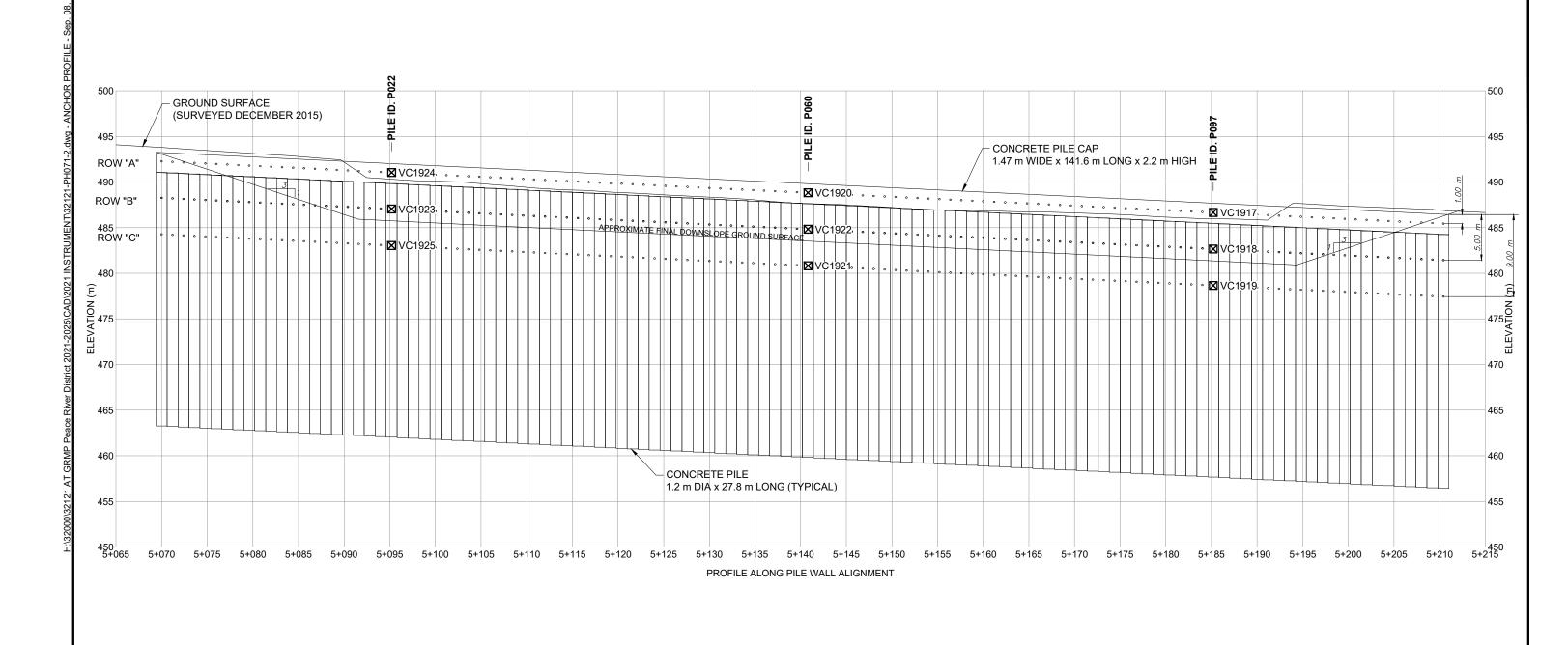
VW#	Serial #	GPS Location (UTM 11)		Datalogger	Date	Comment
		Easting (m)	Northing (m)	Serial #		
VW16-3A	VW36116	485022.21	6245527.86	RST 4885	20-May-24	Downloaded
VW16-3B	VW36119	485022.21	6245527.86	K31 4003	20-May-24	Downloaded
VW16-4A	VW36118	485028.75	6245510.02	RST 4915	20-May-24	Downloaded
VW16-4B	VW36121	485028.75	6245510.02		20-May-24	Not Working
VW16-5A	VW36117	485047.91	6245458.47	RST 4916	20-May-24	Downloaded
VW16-5B	VW36120	485047.91	6245458.47		20-May-24	Not Working

INSPECTOR REPORT

CR6 datalogger is connected to a modem and does not need to be downloaded. CR6 datalogger is uesd to read Shape Accelerometer Array SAA-P060, SAA-P097, Vibrating Wire Piezometers VW16-1A to VW16-2C,
and Load Cells VC1917 to VC1925.

Note: Download data from RST loggers. Do not take manual readings from VW16-4A/B





■ LOAD CELL LOCATION

LEGEND



PEACE REGION (PEACE RIVER DISTRICT)

PH071: PEACE RIVER DIASHOWA WEST HILL INSTRUMENTATION READINGS

DWG No. 32121-PH071-2

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED B	Y DWP
SCALE	1:400
DATE	SEPTEMBER 202
FILE No.	3212



Thurber Engineering Ltd. Deflection (mm) Deflection (mm) -50 0__ -25 -25 0__ -12.5 25 __0 12.5 **LEGEND** Initial 2 Dec 2017 14 Jun 2018 25 Sep 2018 5 5 5 24 Jun 2019 28 Sep 2019 13 Jun 2020 10 10 10 12 Oct 2020 8 Jul 2021 15 Oct 2021 15 12 Jun 2022 15 15 27 Sep 2022 Depth Depth 15 Jun 2023 (m) (m) 10 Oct 2023 20 20 20 20 May 2024 25 25 25 25 30 30 30 30 35 35 35 35 Ref. Elevation m 40 40 40 40

PH071 Daishowa West, Inclinometer SI16-3

Alberta Transportation

-25

-12.5

12.5

25

0

Incremental Deflection

Direction A

25

50

-50

-25

Cumulative Deflection

Direction A

Thurber Engineering Ltd. Deflection (mm) Deflection (mm) -50 0__ -25 25 50 __0 -25 0__ -12.5 12.5 25 __0 **LEGEND** Initial 2 Dec 2017 14 Jun 2018 25 Sep 2018 5 5 5 24 Jun 2019 28 Sep 2019 13 Jun 2020 10 10 10 12 Oct 2020 8 Jul 2021 15 Oct 2021 12 Jun 2022 15 15 15 27 Sep 2022 Depth Depth 15 Jun 2023 (m) (m) 10 Oct 2023 20 20 20 20 May 2024 25 25 25 25 30 30 30 30 35 35 35 35 Ref. Elevation m 40 40 40 40

PH071 Daishowa West, Inclinometer SI16-3

Alberta Transportation

-25

-12.5

12.5

25

0

Incremental Deflection

Direction B

25

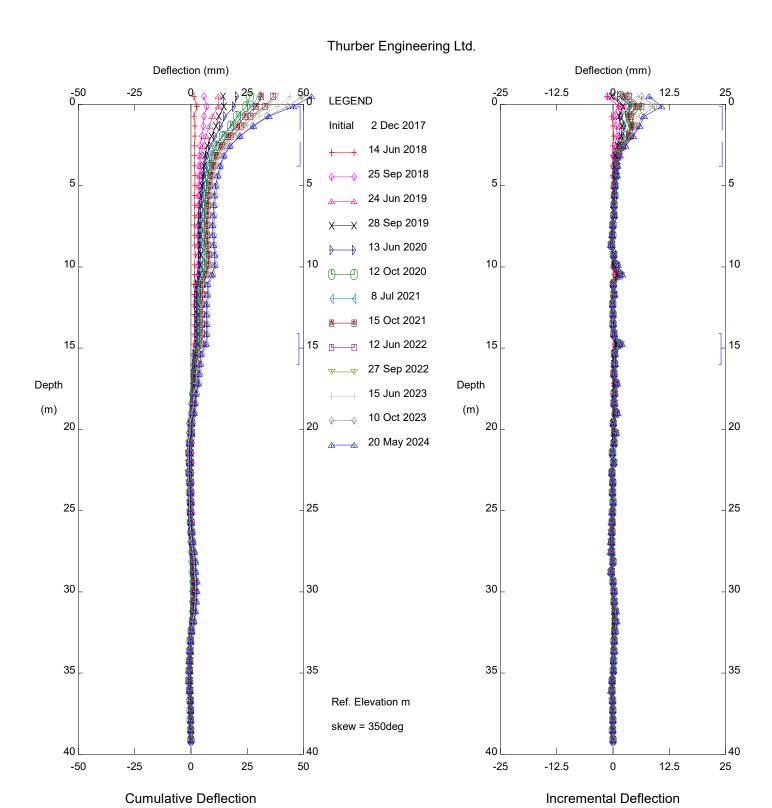
50

-50

-25

Cumulative Deflection

Direction B

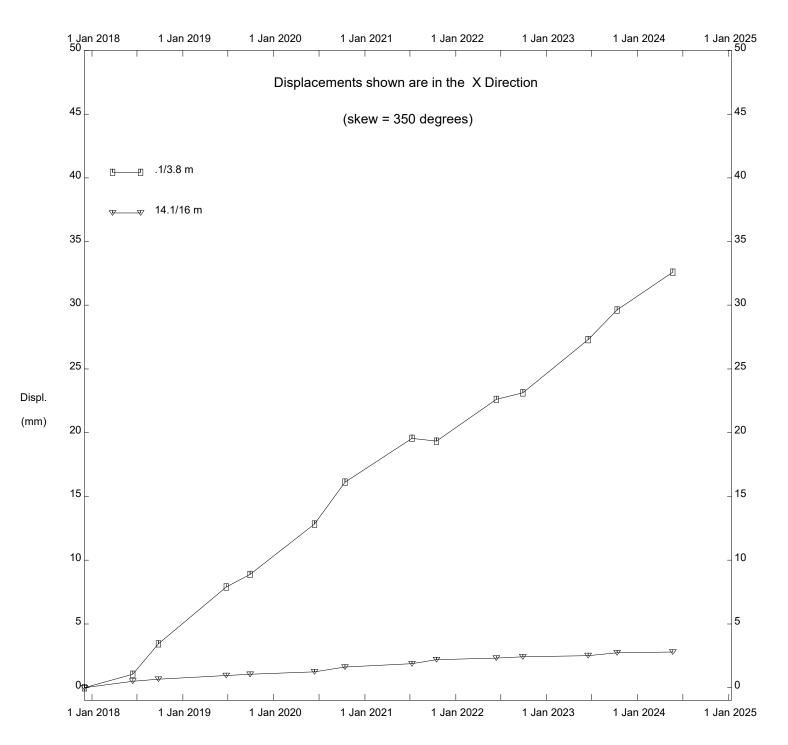


PH071 Daishowa West, Inclinometer SI16-3

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Direction X

Direction X



PH071 Daishowa West, Inclinometer SI16-3

Alberta Transportation

Thurber Engineering Ltd. Deflection (mm) Deflection (mm) -50 0__ -25 -25 0__ -12.5 25 __0 12.5 **LEGEND** Initial 2 Dec 2017 14 Jun 2018 25 Sep 2018 5 5 5 24 Jun 2019 28 Sep 2019 13 Jun 2020 10 10 10 12 Oct 2020 8 Jul 2021 15 Oct 2021 15 12 Jun 2022 15 15 27 Sep 2022 Depth Depth 15 Jun 2023 (m) (m) 10 Oct 2023 20 20 20 20 May 2024 25 25 25 25 30 30 30 30 35 35 35 35 Ref. Elevation m skew = 25deg 40 40 40 40

PH071 Daishowa West, Inclinometer SI16-3

Alberta Transportation

-25

-12.5

12.5

25

0

Incremental Deflection

Direction X

25

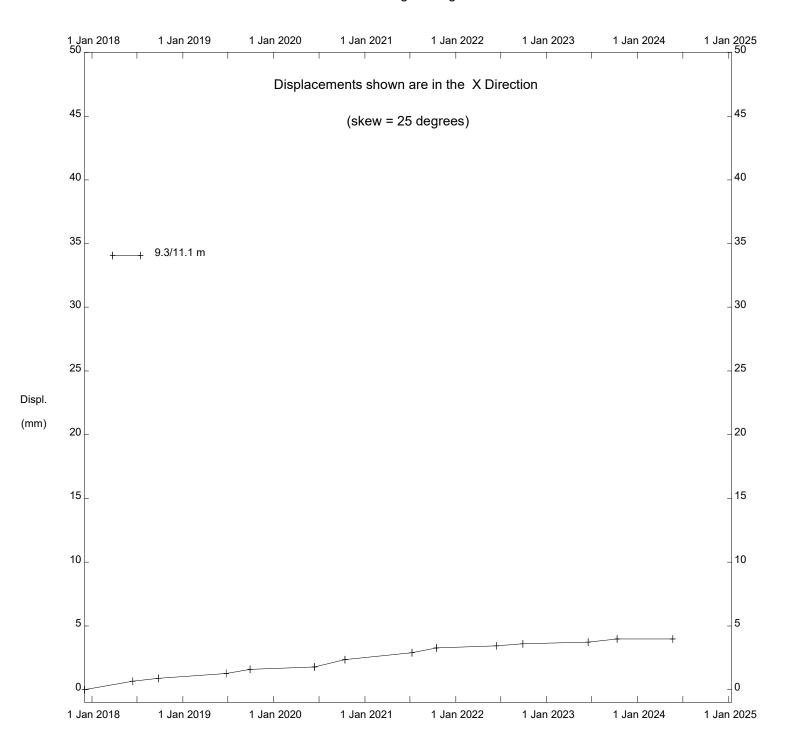
50

-50

-25

Cumulative Deflection

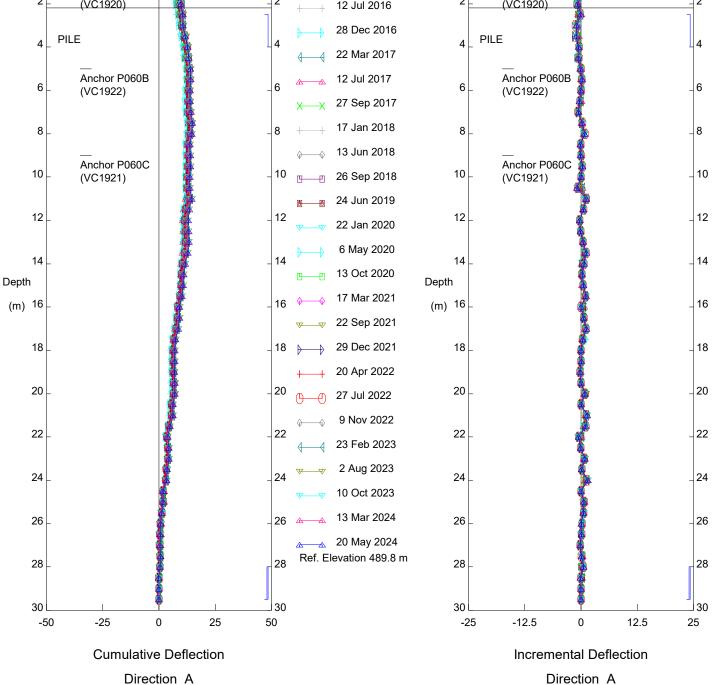
Direction X



PH071 Daishowa West, Inclinometer SI16-3

Alberta Transportation

Thurber Engineering Ltd. Deflection (mm) Deflection (mm) -50 0__ -25 25 -25 0 12.5 25 __0 50 __0 -12.5 0 **LEGEND** WALER WALER Initial 17 Mar 2016 Anchor P060A Anchor P0607 (VC1920) (VC1920) 2 12 Jul 2016 28 Dec 2016 PILE PILE 4 22 Mar 2017 Anchor P060B Anchor P060B 12 Jul 2017 6 6 (VC1922) (VC1922) 27 Sep 2017 17 Jan 2018 8 13 Jun 2018 Anchor P060C Anchor P060C 10 26 Sep 2018 (VC1921) (VC1921) 24 Jun 2019 12 12 22 Jan 2020 6 May 2020 14 13 Oct 2020 Depth 17 Mar 2021 (m) 16 22 Sep 2021 29 Dec 2021 18 20 Apr 2022 20 27 Jul 2022 9 Nov 2022 22 22



Hwy 986:01 Daishowa West, Inclinometer SAA-P060 Alberta Transportation

Thurber Engineering Ltd. Deflection (mm) Deflection (mm) 25 50 __0 -25 0 -12.5 12.5 25 __0 -25 0 0 **LEGEND** WALER WALER Initial 17 Mar 2016 Anchor P060A Anchor P060A (VC1920) (VC1920) 2 12 Jul 2016 28 Dec 2016 PILE PILE 4 22 Mar 2017 Anchor P060B Anchor P060B 12 Jul 2017 6 6 (VC1922) (VC1922) 27 Sep 2017 17 Jan 2018 8 8 13 Jun 2018 Anchor P060C Anchor P060C 10 10 26 Sep 2018 (VC1921) (VC1921) 24 Jun 2019 12 12 12 22 Jan 2020 6 May 2020 14 14 13 Oct 2020 Depth 17 Mar 2021 (m) 16 22 Sep 2021 29 Dec 2021 18 20 Apr 2022 20 27 Jul 2022 9 Nov 2022 22 22

-50 0__

4

6

8

10

12

14

18

20

22

24

26

28

30

-50

-25

Depth

(m) 16

16 18 20 22 23 Feb 2023 2 Aug 2023 24 24 24 10 Oct 2023 13 Mar 2024 26 26 20 May 2024 Ref. Elevation 489.8 m 28 28 30 30 30 25 50 -25 -12.5 12.5 25 **Cumulative Deflection** Incremental Deflection Direction B Direction B Hwy 986:01 Daishowa West, Inclinometer SAA-P060

Alberta Transportation

Thurber Engineering Ltd. Deflection (mm) Deflection (mm) -50 0__ 25 -25 0 -12.5 25 __0 -25 0 50 __0 0 12.5 **LEGEND** WALER WALER Initial 17 Mar 2016 Anchor P060A Anchor P060A (VC1920) (VC1920) 2 12 Jul 2016 28 Dec 2016 PILE PILE 4 4 22 Mar 2017 Anchor P060B Anchor P060B 12 Jul 2017 6 6 6 (VC1922) (VC1922) 27 Sep 2017 17 Jan 2018 8 8 8 13 Jun 2018 Anchor P060C Anchor P060C 10 10 10 26 Sep 2018 (VC1921) (VC1921) 24 Jun 2019 12 12 12 12 22 Jan 2020 6 May 2020 14 14 14 13 Oct 2020 Depth Depth 17 Mar 2021 (m) 16 (m) 16 16 22 Sep 2021 18 29 Dec 2021 18 18 20 Apr 2022 20 20 20 27 Jul 2022 9 Nov 2022 22 22 22 22 23 Feb 2023 2 Aug 2023 24 24 24 24 10 Oct 2023 13 Mar 2024 26 26 26 26 20 May 2024 Ref. Elevation 489.8 m 28 28 28 skew = 50deg 30 30 30 30

Hwy 986:01 Daishowa West, Inclinometer SAA-P060

Alberta Transportation

-25

-12.5

Incremental Deflection

Direction X

12.5

25

-50

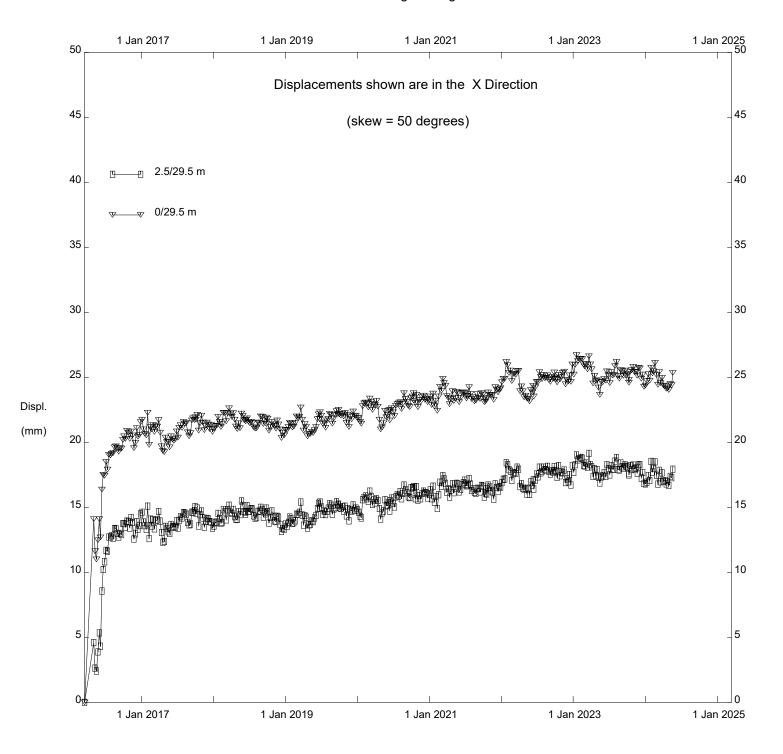
-25

Cumulative Deflection

Direction X

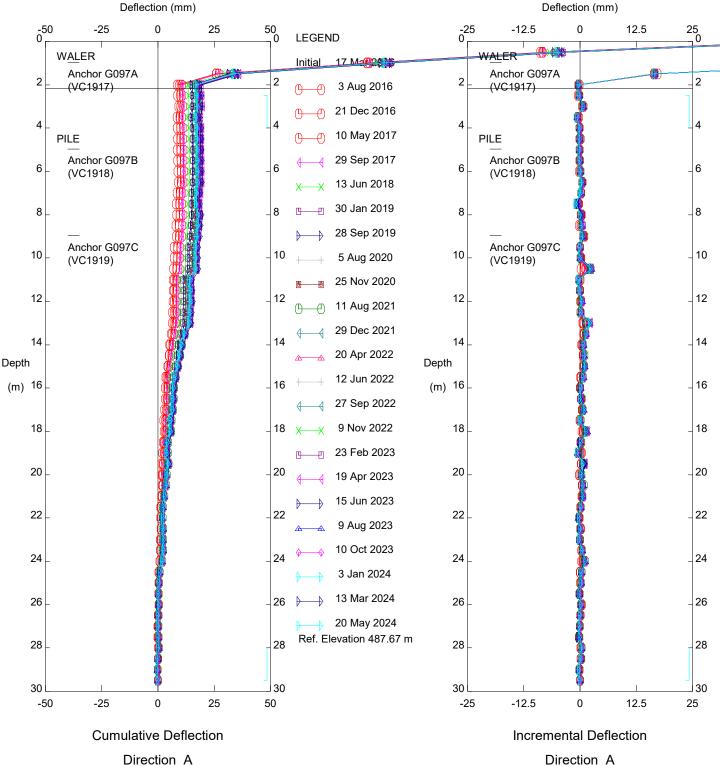
25

50



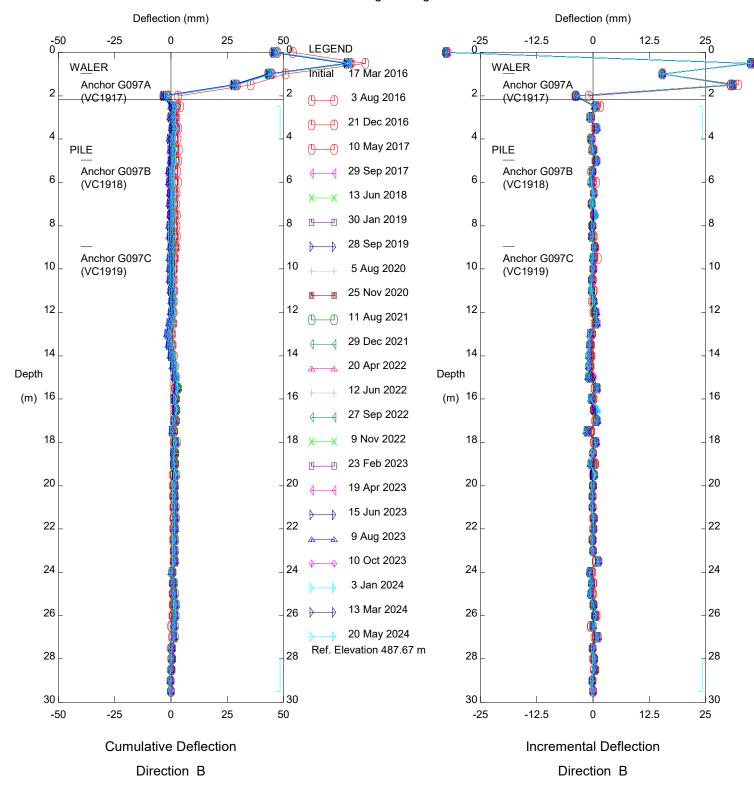
Hwy 986:01 Daishowa West, Inclinometer SAA-P060

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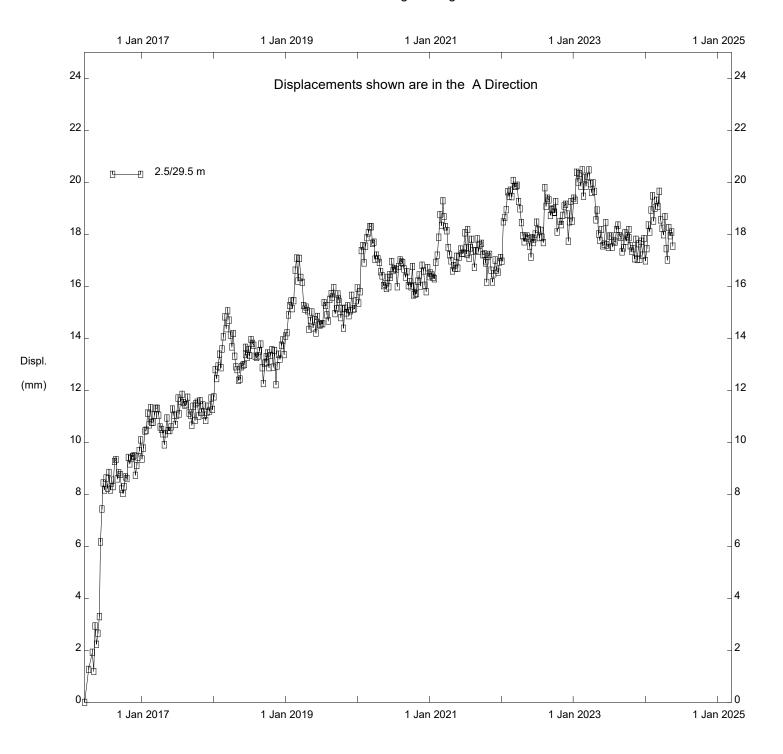
Hwy 986:01 Daishowa West, Inclinometer SAA-P097

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Hwy 986:01 Daishowa West, Inclinometer SAA-P097

Alberta Transportation



Hwy 986:01 Daishowa West, Inclinometer SAA-P097

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FIGURE PH071-1
PIEZOMETRIC ELEVATION FOR HWY 986:01, DAISHOWA WEST HILL
(UPSLOPE PIEZOMETERS)

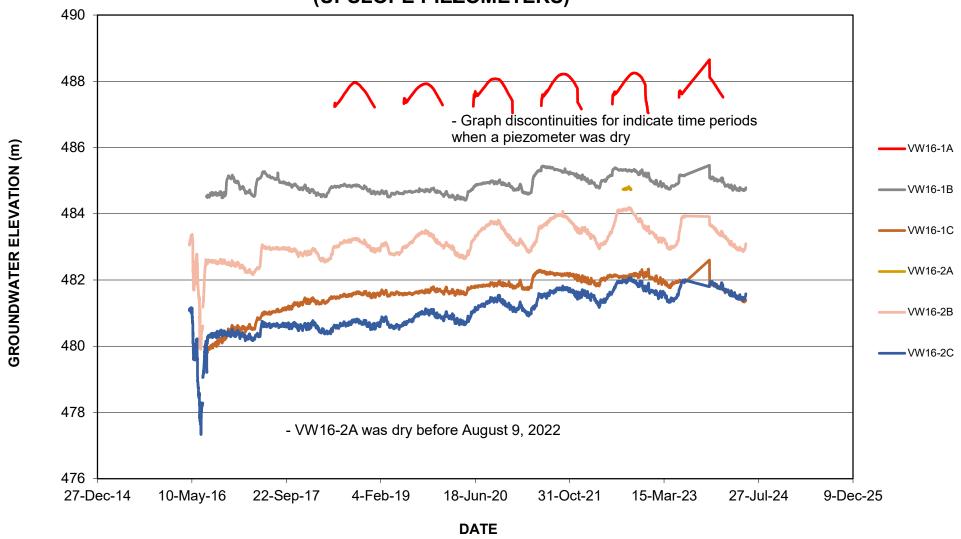
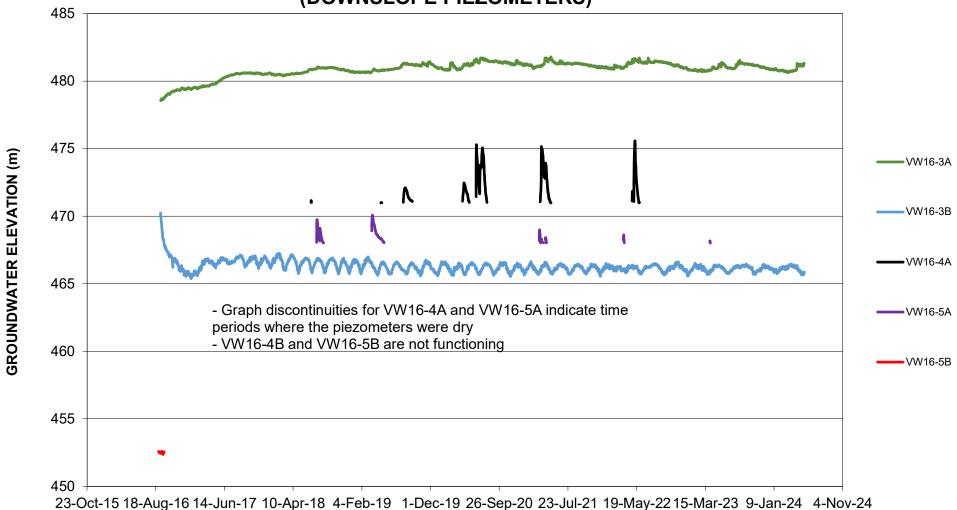


FIGURE PH071-2
PIEZOMETRIC ELEVATIONS FOR HWY 986:01, DAISHOWA WEST HILL
(DOWNSLOPE PIEZOMETERS)



DATE

FIGURE PH071-3 LOAD CELL DATA FOR HWY 986:01, DAISHOWA WEST (PILE P022)

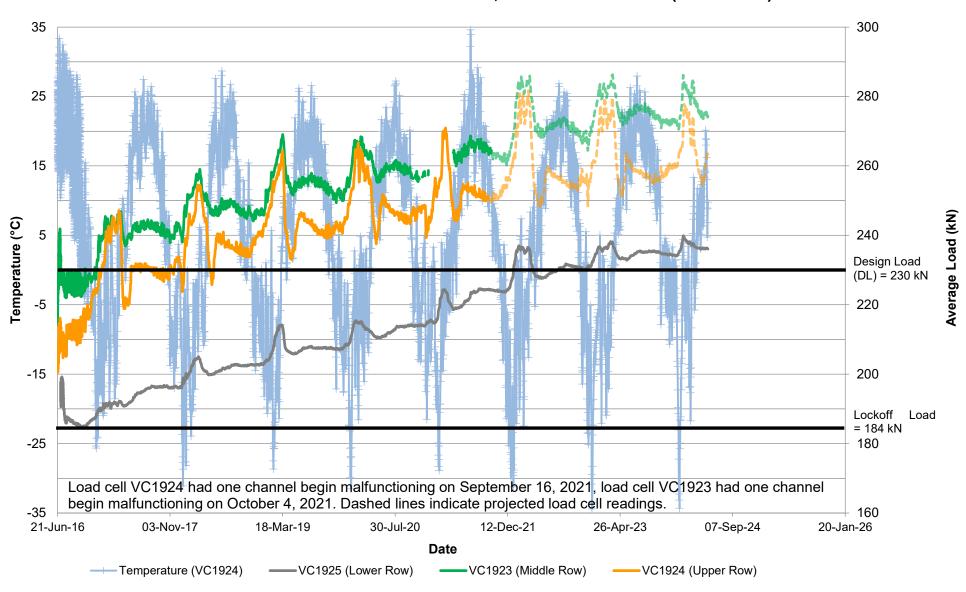


FIGURE PH071-4 LOAD CELL DATA FOR HWY 986:01, DAISHOWA WEST (PILE P060)

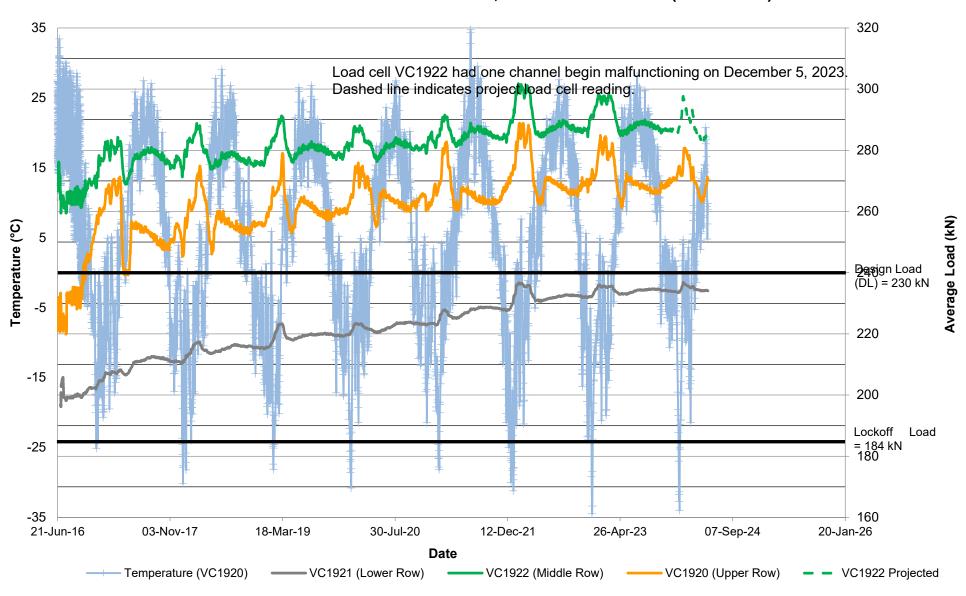


FIGURE PH071-5 LOAD CELL DATA FOR HWY 986:01, DAISHOWA WEST (PILE P097)

