THURBER ENGINEERING LTD.

November 10, 2022 File No.: 32122

Alberta Transportation
Twin Atria Building
4999 – 98 Avenue
Edmonton, Alberta
T6B 2X3

Attention: Ms. Amy Driessen, P.Eng.

ALBERTA TRANSPORTATION GRMP (CON0022163)
NORTH CENTRAL (ATHABASCA AND FORT McMURRAY DISTRICTS)
INSTRUMENTATION MONITORING RESULTS – FALL 2022

SECTION C

SITE NC106: HWY 63:08 km 27.9 PAVEMENT DISTRESS

Dear Ms. Driessen:

This report provides the results of the bi-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

In 2021, a remediation project was completed to address ongoing pavement settlement and distress in the southbound lanes of Hwy 63:08, km 27.9. The distress was triggered due the excessive settlement of the thick peat and organic soil deposits below the highway.

The 2021 remediation included a sub-excavation of the affected portion of the highway and the placement of a 500 mm thick layer of Cematrix Lightweight Cellular Concrete (LCC), followed by a 400 mm thick layer of clay cap below the reconstructed pavement structure. The underlying peat was not disturbed during the excavation, and the vertical profile of the highway was lowered to further reduce the embankment weight on the top of the peat layer.

In order to monitor the performance of the LCC repair section, new geotechnical instrumentation was installed just prior to paving the remediated highway section. The instrumentation within the LCC repair section included two extensometer strings (EXT21-1 and EXT21-2) , installed in two separate test holes, to monitor the settlement of the remediated section and assess the effectiveness of reducing the embankment loading . Two thermistor arrays (THERM21-2 and THERM21-3) were also installed within the same test holes as the extensometers to monitor changes in temperature at various depths. Two additional control thermistor arrays were also

installed within the project limits. The first thermistor array was installed within the highway embankment south of the Cematrix repair section to compare the temperature changes to a non-remediated portion of the highway embankment (THERM21-1, Pavement Control). The second thermistor array was installed in the grassed highway ditch (THERM 21-4, Grassed Control). The intent of the thermistors was to understand how the Cematrix layer, which acts as an insulator, changed the thermal properties of the pavement structure and underlying soils, particularly as it pertains to the potential for pavement icing due to a reduction in stored thermal energy. The instruments were connected to a Campbell Scientific CR6 datalogger that was programmed to take readings every hour. A weather station was also installed at the site to record relevant weather data such as air temperature, wind speed, precipitation, and barometric pressure. The weather station was also connected to the CR6 datalogger.

The data from the datalogger was downloaded on September 21, 2022, by Mr. Niraj Regmi, G.I.T. and Mr. Kyle Crooymans, both of Thurber Engineering Ltd. The extensometer, thermistor and weather station data were downloaded to a field laptop using Campbell Scientific Loggernet software.

Selected drawings showing approximate instrumentation locations are included in Appendix A.

2. DATA PRESENTATION

2.1 General

The data for the extensometers, thermistor arrays and weather station are summarized below and are plotted in Appendix A. Plots comparing the shallow thermistor array nodes to the ambient temperature are presented in Appendix A, including the hourly and cumulative precipitation plot (Figure NC106-9).

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TABLE NC106-1
FALL 2022 – HWY 63:08 km 27.9 PAVEMENT DISTRESS
EXTENSOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: September 21, 2022 (Monitoring period from May 28, 2022 to September 21, 2022)

SETTLEMENT ZONE [1]	DATE INITIALIZED	CURRENT STATUS	CURRENT SETTLEMENT (mm)	PREVIOUS SETTLEMENT (mm) [2]	CHANGE IN SETTLEMENT (mm) [3]
EXT21-1					
Total Settlement (0 m to 5.83 m depth)	May 18, 2021	Operational	2.7	2.5	0.2
Settlement in Clay Till (4.83 m to 5.83 m depth)			0.5	0.3	0.2
Settlement in Peat (1.33 m to 4.83 m depth)			1.1	1.2	-0.1
Settlement in Cematrix, Clay Cap and GBC (0 m to 1.33 m depth)			1.1	1.0	0.1
EXT21-2					
Total Settlement (0 m to 5.76 m depth)	May 18, 2021	Operational	13.6	11.2	2.4
Settlement in Clay Till (4.76 m to 5.76 m depth)			0.9	0.8	0.1
Settlement in Peat (1.26 m to 4.76 m depth)			9.8	7.7	2.1
Settlement in Cematrix, Clay Cap and GBC (0 to 1.26 m depth)			2.9	2.7	0.2

Drawings 32122-NC106-1 through 32122-NC106-3 in Appendix A provide sketches of the approximate locations of the monitoring instrumentation for this site.

Notes: (1) Depth measured from top of granular base coarse (GBC)
(2) Previous settlement measured on May 28, 2022
(3) Negative (-) change in settlement indicates upward movement (heave) and positive (+) change in settlement indicates downward movement (settlement)

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TABLE NC106-2
FALL 2022 – HWY 63:08 km 27.9 PAVEMENT DISTRESS
THERMISTOR ARRAY INSTRUMENTATION READING SUMMARY

Date Monitored: September 21, 2022 (Monitoring period from May 28, 2022 to September 21, 2022)

NODE DEPTH [(1)] (m)	DATE INITIALIZED	CURRENT STATUS	CURRENT TEMPERATURE (°C)	MAX TEMPERATURE OVER MONITORING PERIOD (°C)	MIN TEMPERATURE OVER MONITORING PERIOD (°C)	MEAN TEMPERATURE SINCE PREVIOUS READING (°C)
THERM21-1 (Pavement Control)						
0.1	June 6, 2021	Operational	12.2	25.3 (July 19, 2022)	11.4 (May 30, 2022)	19.3
1.1			15.1	20.2 (Aug. 28, 2022)	7.6 (May 28, 2022)	15.9
2.1			13.2	14.2 (Sep. 6, 2022)	1.5 (May 28, 2022)	10.2
3.1			11.3	11.4 (Sep. 13, 2022)	0.5 (May 28, 2022)	7.1
4.1			9.3	9.3 (Sep. 18, 2022)	1.3 (May 28, 2022)	5.4
5.1			7.7	7.7 (Sep. 20, 2022)	2.1 (May 28, 2022)	4.6
THERM21-2 (Cematrix section)						
0.1	June 6, 2021	Operational	13.0	26.4 (July 20, 2022)	13.0 (Sep 21, 2022)	20.7
0.4			14.6	26.2 (July 20, 2022)	14.2 (May 30, 2022)	21.1
0.8			13.7	22.0 (Aug. 27, 2022)	11.7 (May 28, 2022)	17.9
1.3			10.6	11.3 (Sep. 7, 2022)	3.9 (May 28, 2022)	8.6
2.3			9.6	9.6 (Sep. 12, 2022)	2.8 (May 28, 2022)	6.8
3.3			8.0	8.0 (Sep. 18, 2022)	2.5 (May 28, 2022)	5.4

Drawings 32122-NC106-1 through 32122-NC106-3 in Appendix A provide sketches of the approximate locations of the monitoring instrumentation for this site.

Notes: (1) Depth measured from top of granular base coarse (GBC)

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TABLE NC106-2 – CONTINUED…
FALL 2022 – HWY 63:08 km 27.9 PAVEMENT DISTRESS
THERMISTOR ARRAY INSTRUMENTATION READING SUMMARY

Date Monitored: September 21, 2022 (Monitoring period from May 28, 2022 to September 21, 2022)

NODE DEPTH [(1)] (m)	DATE INITIALIZED	CURRENT STATUS	CURRENT TEMPERATURE (°C)	MAX TEMPERATURE OVER MONITORING PERIOD (°C)	MIN TEMPERATURE OVER MONITORING PERIOD (°C)	MEAN TEMPERATURE SINCE PREVIOUS READING (°C)
THERM21-3 (Cematrix Section)						
0.3	June 6, 2021	Operational	13.3	26.0 (July 19, 2022)	12.6 (May 31, 2022)	20.5
1.3			11.6	12.3 (Sep. 7, 2022)	2.4 (May 30, 2022)	9.0
2.3			10.7	10.9 (Sep. 15, 2022)	1.3 (May 30, 2022)	7.2
3.3			6.7	6.7 (Sep. 20, 2022)	1.6 (May 29, 2022)	4.3
4.3			5.1	5.1 (Sep. 21, 2022)	3.7 (May 31, 2022)	4.2
5.3			4.3	4.3 (Sep. 21, 2022)	3.8 (July 10, 2022)	4.0
THERM21-4 (Grassed Control)						
0.3	June 6, 2021	Operational	12.1	15.6 (Aug. 28, 2022)	5.2 (May 28, 2022)	12.7
1.3			9.4	9.4 (Sep. 16, 2022)	2.0 (May 28, 2022)	6.3
2.3			6.3	6.3 (Sep 21, 2022)	3.5 (June 14, 2022)	4.5
3.3			4.9	4.9 (Sep. 21, 2022)	4.3 (July 16, 2022)	4.4
4.3			4.8	5.0 (May 28, 2022)	4.7 (Aug. 14, 2022)	4.7
5.3			4.6	5.0 (May 28, 2022)	4.6 (Sep. 20, 2022)	4.8

Drawings 32122-NC106-1 through 32122-NC106-3 in Appendix A provide sketches of the approximate locations of the monitoring instrumentation for this site.

Notes: (1) Depth measured from top of granular base coarse (GBC)

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TABLE NC106-3
FALL 2022 – HWY 63:08 km 27.9 PAVEMENT DISTRESS
WEATHER STATION INSTRUMENTATION READING SUMMARY

Date Monitored: September 21, 2022 (Monitoring period from May 28, 2022 to September 21, 2022)

MONITORING PERIOD	MAX TEMPERATURE (°C)	MIN TEMPERATURE (°C)	MEAN TEMPERATURE (°C)	TOTAL PRECIPITATION (mm)	MAX HOURLY WIND SPEED (m/s)	MEAN HOURLY WIND SPEED (m/s)	MEAN BAROMETRIC PRESSURE (mbar)	MEAN RELATIVE HUMIDITY (%)
May 28, 2022 to Sep. 21, 2022	32.4 on Sep. 3, 2022	2.0 on May 30, 2022	15.8	118.2*	15.7 on June 15, 2022	3.1	935.9	69.8

Drawings 32122-NC106-1 through 32122-NC106-3 in Appendix A provide sketches of the approximate locations of the monitoring instrumentation for this site
*From May 28, 2022 to September 21, 2022

3. INTERPRETATION OF MONITORING RESULTS

The extensometer data is summarized in Table NC106-1 above and is plotted in Figures NC106-1 and NC106-2 in Appendix A.

Extensometer EXT21-1, installed towards the southern end of the Cematrix repair section, shows a current total settlement of 2.7 mm, and is showing equal amounts of settlement between the peat layer and the Cematrix, clay cap and GBC layer. EXT21-1 had shown a total settlement of 2.5 mm on May 28, 2022. EXT21-2, installed towards the northern end of the Cematrix repair section, shows a current total settlement of 13.6 mm, which corresponds to an overall increase in settlement of 2.5 mm since it was previously read on May 28, 2022. As shown on Drawing 32122-NC106-2, the peat layer is thicker at EXT21-2 location, and this explains the higher amount of the overall settlement observed in EXT21-2.

Both EXT21-1 and EXT21-2 previously showed a pattern of heave over the winter months between December 2021 and April 2022, followed by a pattern of increased settlement after spring thaw. The heave was primarily observed in the clay cap, GBC and Cematrix layer closest to the ground surface, and corresponds to the freezing temperatures observed in the uppermost nodes of their respective thermistor string during those months. The next reading in the spring of 2023 will determine if a similar heave pattern is observed this coming winter.

The thermistor data is summarized in Table NC106-2 above. The temperature data for the individual thermistor arrays are plotted in Figures NC106-3 through NC106-6 and combined for selected depths in Figures NC106-7 and -8 in Appendix A.

Thermistor array THERM 21-1 (Figure NC106-3), installed south of the Cematrix repair zone, shows highly variable temperature readings within its shallowest thermistor node (0.1 m depth) reflecting changes in air temperature, which was somewhat muted in the next thermistor node at 1.1 m depth. The thermistor nodes at 2.1 m and 3.1 m depth have been showing a trend of steadily increasing temperatures since the spring. The lowest nodes at 4.1 m and 5.1 m show a trend of slowly decreasing temperatures until the beginning of the summer, after which they have showed a trend of gradually increasing temperatures.

The data for THERM21-1 indicates that the maximum frost penetration for this instrument was between 2.1 m and 3.1 m during the winter of 2021-2022.

In THERM21-2 and THERM21-3 (Figures NC106-4 and -5, respectively), installed within the Cematrix repair section, the thermistor nodes within the combined Cematrix, clay cap and GBC layer (thermistors installed within the upper 1 m) show a similar trend to those observed in the shallow thermistors in THERM21-1, where the temperatures follow a pattern of highly variable temperatures corresponding to increasing ambient temperatures. The temperature trend of the thermistor nodes between 1 m and 3.3 m depth shows a more muted response of slowly increasing temperatures since approximately late May 2022. The deeper thermistor nodes in THERM21-3 at 4.3 m and 5.3 m depth show an overall pattern of stable to slowly increasing temperatures over the monitoring period. It should be noted that there was significant noise in the

signals from THERM21-3 and erroneous readings have been removed, resulting in the gaps in the data., particularly during the coldest portion of the winter from December 2021 to January 2022.

The data from THERM21-2 indicates that the maximum frost penetration at this location was between 1.3 m and 2.3 m during the previous winter, which when compared to the pavement control section, demonstrates that the Cematrix had an insulating effect for the instrument at this location. The data from THERM21-3 shows that the maximum frost penetration was between 2.3 m and 3.3 m depth, which is similar to what was observed in the pavement control section.

THERM21-4 (Figure NC106-6) was installed in the grass-covered highway ditch west of the southbound highway lanes. Compared to the other thermistor arrays installed within the pavement, the shallow thermistor node at 0.3 m shows a much more muted response to changes in temperature, presumably due to the vegetative, rather than asphalt surface. The shallow node at this instrument showed a much slower trend of decreasing temperature starting in November 2021 before a sharp increase in temperature starting in May 2022. The behavior of this instrument can likely be attributed due to the insulating effect of the snow cover at its location. The thermistor nodes at 1.3 m and 2.3 m depth shows a trend of slowly increasing temperatures since the previous monitoring period, while the deepest two notes at 4.3 m and 5.3 m depth show an overall stable temperature trend during this time.

The near-surface temperature nodes from each thermistor array, compared to the ambient temperature are plotted in Figure NC106-7 in Appendix A. From this figure, it can be seen that the near-surface temperature nodes in the highway closely follow the ambient air temperatures, while the shallow thermistor in THERM21-4 remains much more stable.

To compare the influence of the Cematrix on temperatures at depth, the 1.1 m – 1.3 m thermistor readings from all four locations are plotted in Figure NC106-8. From this figure, it can be observed that the thermistors in the Cematrix section were less affected by the changes in temperature compared to the pavement control section, which demonstrates the insulating properties of the Cematrix.

4. RECOMMENDATIONS

4.1 Future Work

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

During the spring of 2022 site visit, it was confirmed that THERM 21-3 is wired properly, and the erratic data is due to a malfunction of the instrument itself. For future readings, the data will need to be filtered to remove the erratic readings from this instrument.

4.2 Instrumentation Repairs

No instrument repairs are required at this time.

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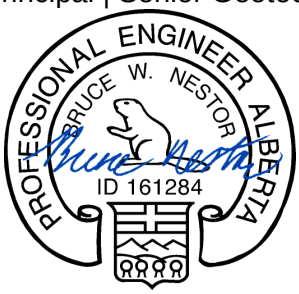
5. CLOSURE

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.
Tarek Abdelaziz, Ph.D., P.Eng.
Principal | Senior Geotechnical Engineer



November 10, 2022

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
RM SIGNATURE:
RM APEGA ID #: 91085
DATE: November 10, 2022
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Bruce Nestor, P.Eng.
Geotechnical Engineer
/jf

Attachments:

- Statement of Limitations and Conditions
- Appendix A
  - Field Inspector's report
  - Site Plan and Cross Sections Showing Approximate Instrument Locations (Drawings No. 32122-NC106-1, 32122-NC106-2, and 32122-NC106-3)
  - Figures NC106-1 and NC106-2 (Extensometer Data Plots)
  - Figures NC106-3 through NC106-6 (Individual Thermistor Array Plots)
  - Figure NC106-7 (Composite Plot of Shallow Thermistor Array Nodes Compared to Ambient Temperature)
  - Figure NC106-8 (Composite plot of 1.1 – 1.3 m depth Thermistor Nodes)
  - Figure NC106-9 (Hourly and Cumulative Precipitation)

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

FALL 2022

APPENDIX A
DATA PRESENTATION AND DRAWINGS

SITE NC106: HWY 63:08 km 27.9 PAVEMENT DISTRESS

ALBERTA TRANSPORTATION
NORTH CENTRAL REGION - ATHABASCA AND FORT McMURRAY DISTRICTS
INSTRUMENTATION MONITORING FIELD SUMMARY (NC106)
FALL 2022

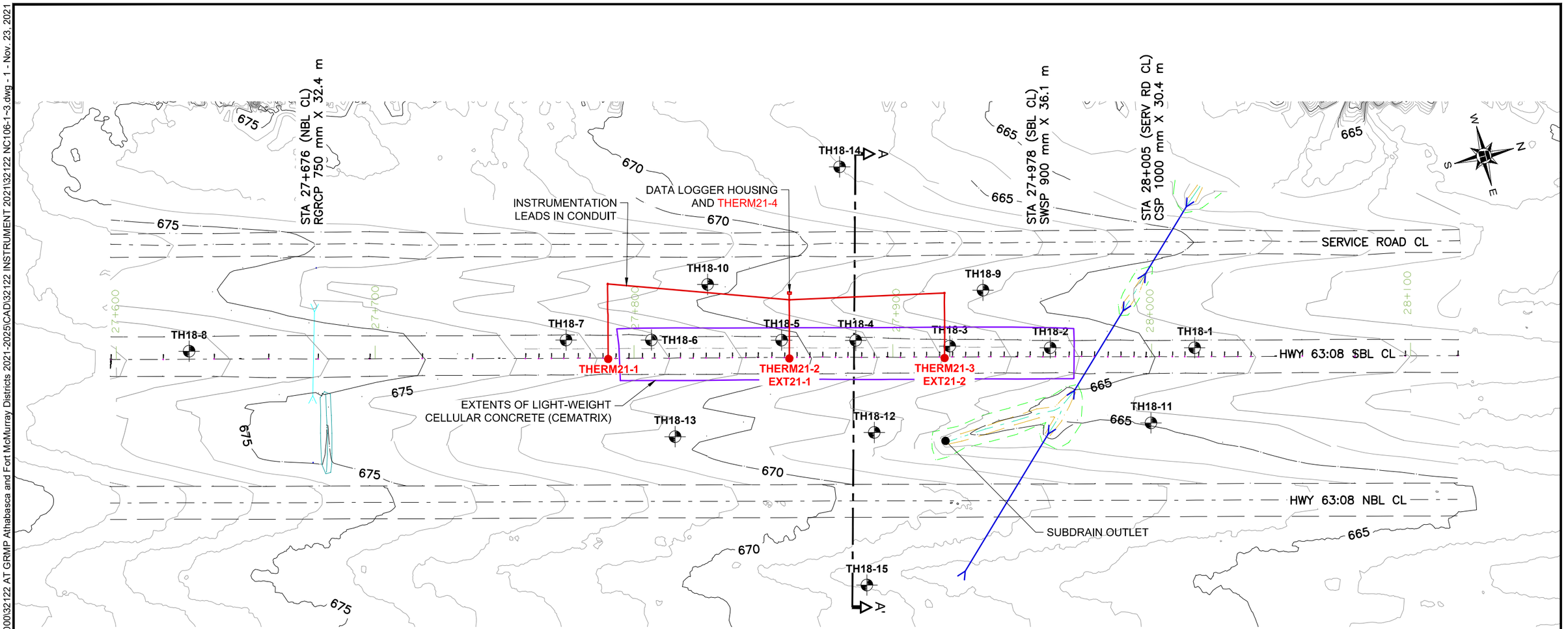
Location: Hwy 63:08 km 27.9 Pavement Distress	**Temp (deg C):**
File Number: 32122	**Read by:** NKR/KTC

DATALOGGER STATION READINGS

Instruments	GPS Location (UTM 11)		Datalogger Serial #	Date	Remarks
	Easting (m)	Northing (m)			
Extensiometers, thermistors and weather station	455134.00	6227955.00	CR6 15875	21-Sep-22	Data downloaded

Download data from CR6 logger - need unique key to unloack logger enclosure
Site is between km marker 174 and 176 on southbound lane of Hwy 63

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\CAD\32122 INSTRUMENT 2021\32122 NC106-1-3.dwg - 1 - Nov. 23, 2021



BASE PLAN PROVIDED BY ARA ENGINEERING, SURVEYED JUNE 2021;
LIDAR PROVIDED BY ALBERTA TRANSPORTATION

LEGEND

- APPROXIMATE TEST HOLE LOCATION
- PATCH
- THERM THERMISTOR STRING
- EXT EXTENSOMETER

0 20 40 60 80 m

SCALE 1:1500

Alberta

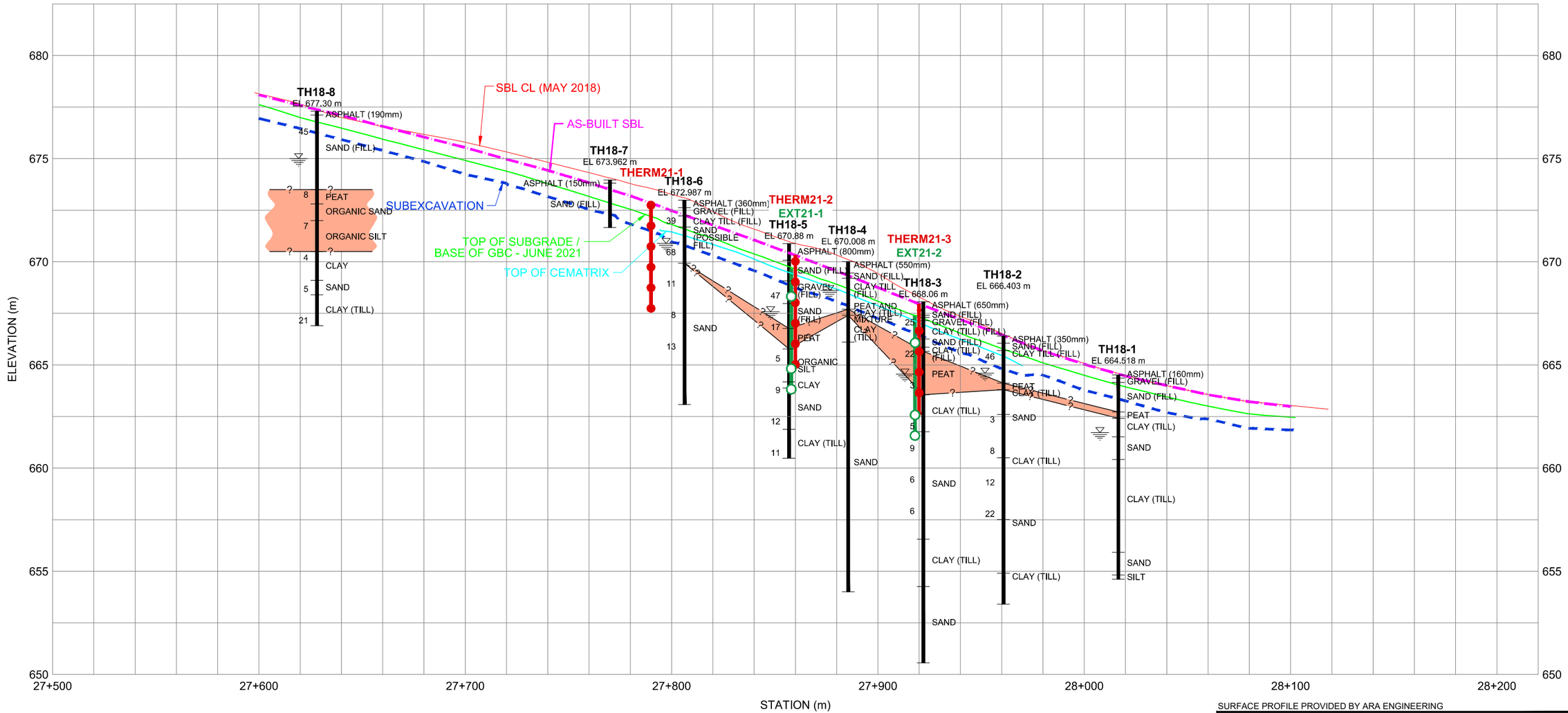
NC106: HIGHWAY 63:08 km 27.9 PAVEMENT DISTRESS NEAR WANDERING RIVER, ALBERTA

AS-BUILT SITE PLAN SHOWING LOCATIONS OF INSTRUMENTATION AND REPAIR

DWG No. 32122-NC106-1

DRAWN BY	KLW
DESIGNED BY	KEF
APPROVED BY	RVC
SCALE	1:1500
DATE	NOVEMBER 2021
FILE No.	32122

THURBER ENGINEERING LTD.



SURFACE PROFILE PROVIDED BY ARA ENGINEERING

LEGEND

- SPT N VALUE
- WATER LEVEL IN HOLE AT END OF DRILLING
- THERMISTOR (THERM) NODE
- EXTENSOMETER (EXT) ANCHORS

NOTE

DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT THE TEST HOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN TEST HOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.

Alberta

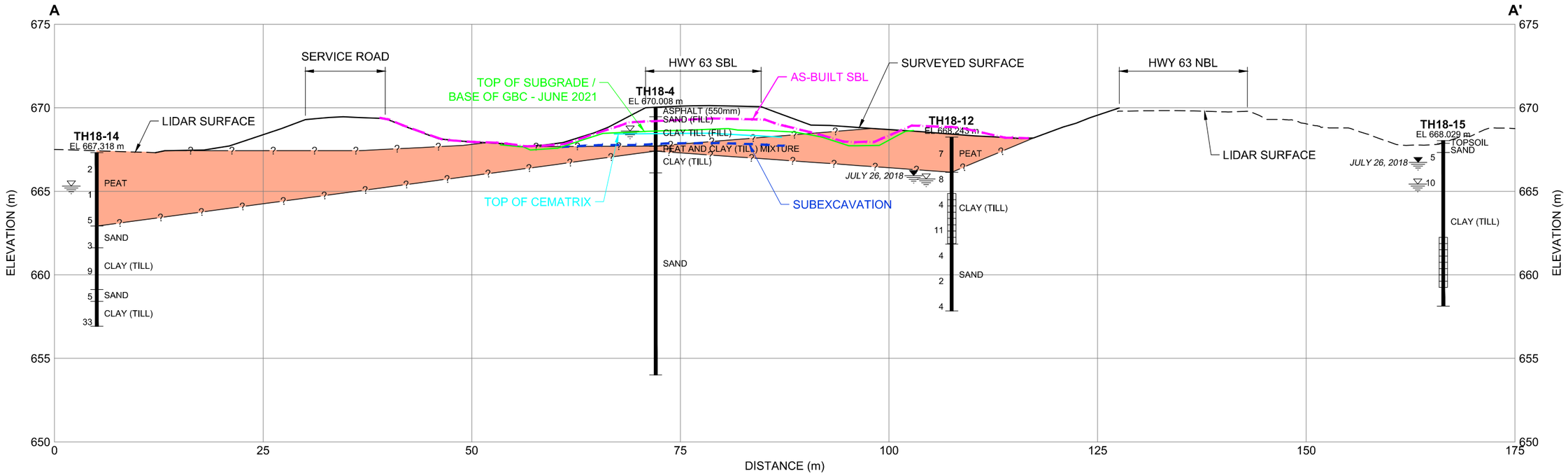
NC106: HIGHWAY 63:08 km 27.9 PAVEMENT DISTRESS NEAR WANDERING RIVER, ALBERTA

AS-BUILT PROFILE ALONG ROAD

DWG No. 32122-NC106-2

DRAWN BY	KLW
DESIGNED BY	KEF
APPROVED BY	RVC
SCALE	H 1:2000 V 1:200
DATE	NOVEMBER 2021
FILE No.	32122

THURBER ENGINEERING LTD.



LEGEND

- SPT N VALUE
- WATER LEVEL IN HOLE AT END OF DRILLING
- WATER LEVEL IN PIEZOMETER
- STANDPIPE PIEZOMETER SCREENED INTERVAL

NOTES

1. INSTRUMENTATION NOT SHOWN FOR CLARITY
2. DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT THE TEST HOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN TEST HOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.

BASE PLAN PROVIDED BY ARA ENGINEERING

Alberta

NC106: HIGHWAY 63:08 km 27.9 PAVEMENT DISTRESS NEAR WANDERING RIVER, ALBERTA

AS-BUILT CROSS-SECTION A-A'

DWG No. 32122-NC106-3

DRAWN BY	KLW
DESIGNED BY	KEF
APPROVED BY	RVC
SCALE	H 1:500 V 1:250
DATE	NOVEMBER 2021
FILE No.	32122

THURBER ENGINEERING LTD.

Figure NC106-1
Highway 63:08 km 27.9 Pavement Distress Near Wandering River, Alberta
EXT21-1 - Displacement

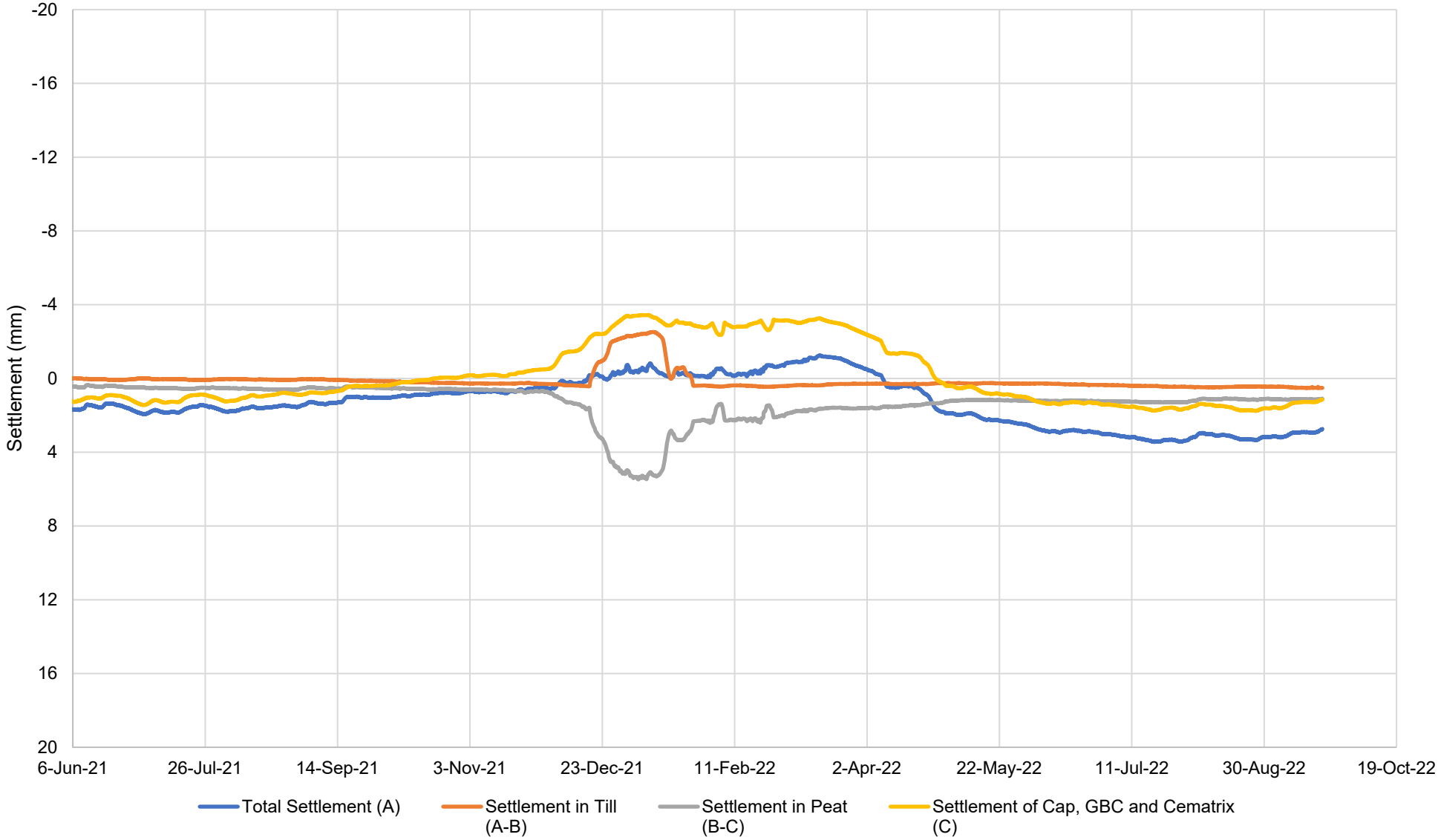


Figure NC106-2
Highway 63:08 km 27.9 Pavement Distress Near Wandering River, Alberta
EXT21-2 - Displacement

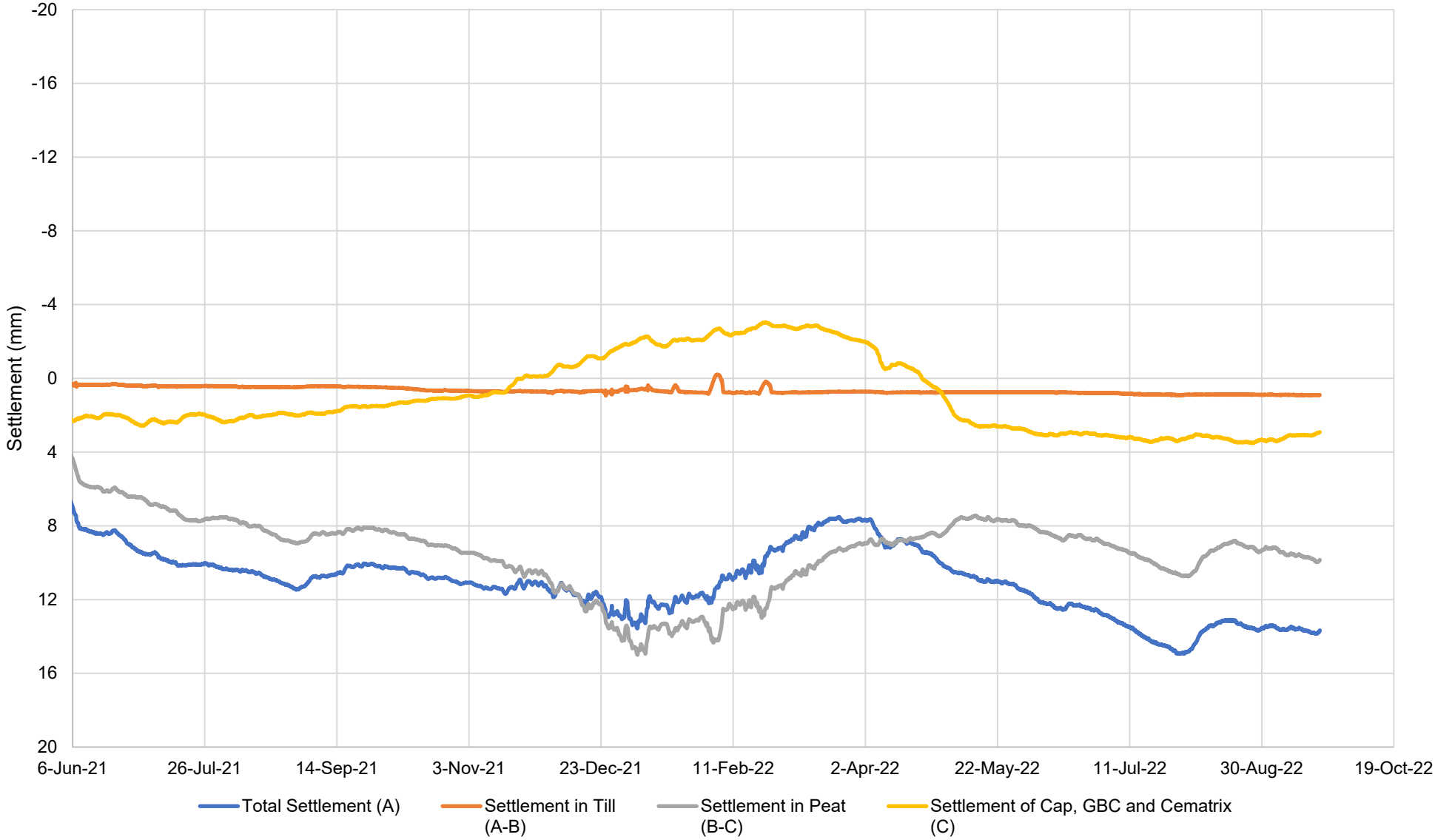


Figure NC106-3
Highway 63:08 km 27.9 Pavement Distress Near Wandering River, Alberta
THERM21-1 (Pavement Control)

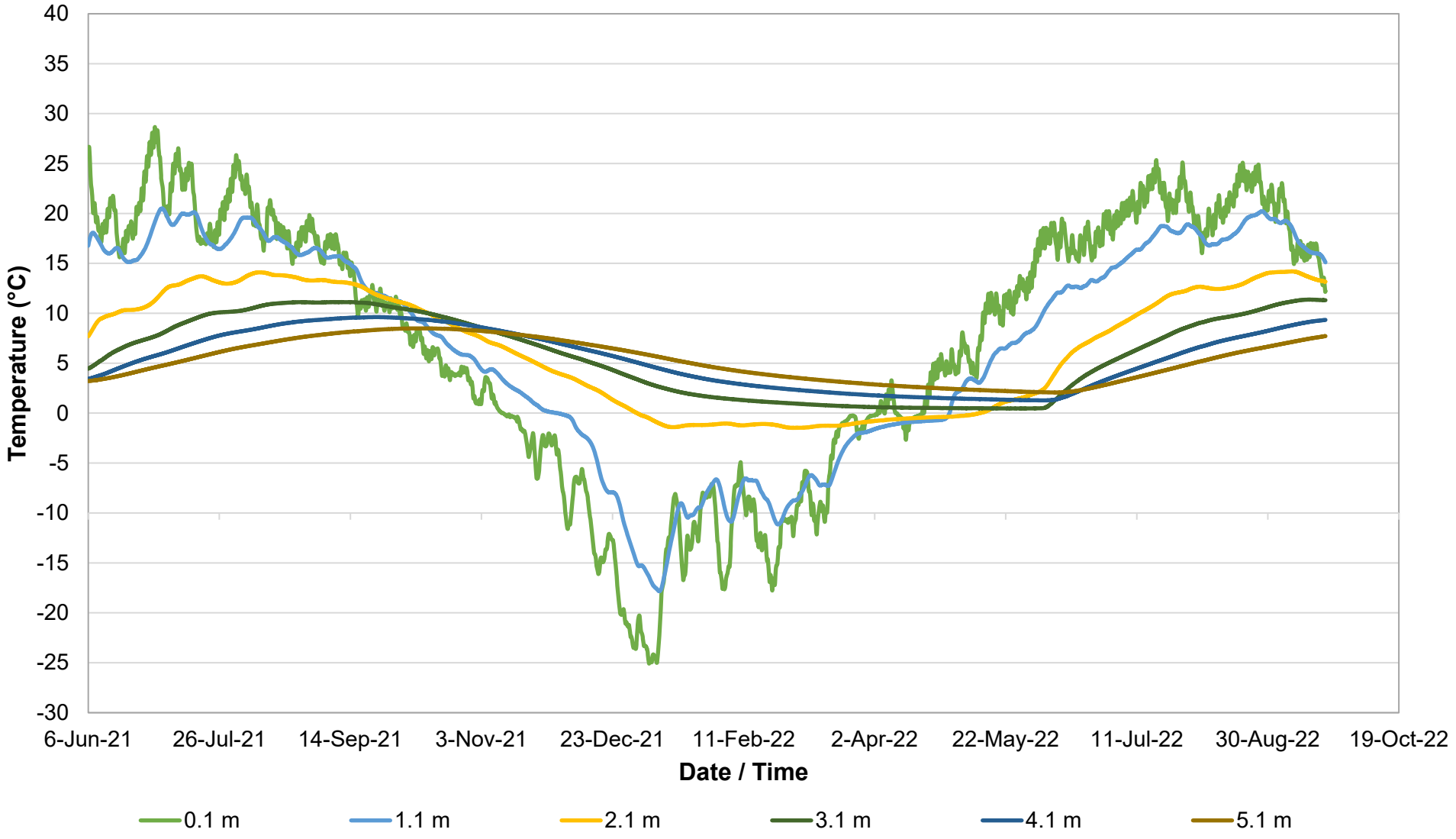


Figure NC106-4
Highway 63:08 km 27.9 Pavement Distress Near Wandering River, Alberta
THERM21-2 (Pavement Test)

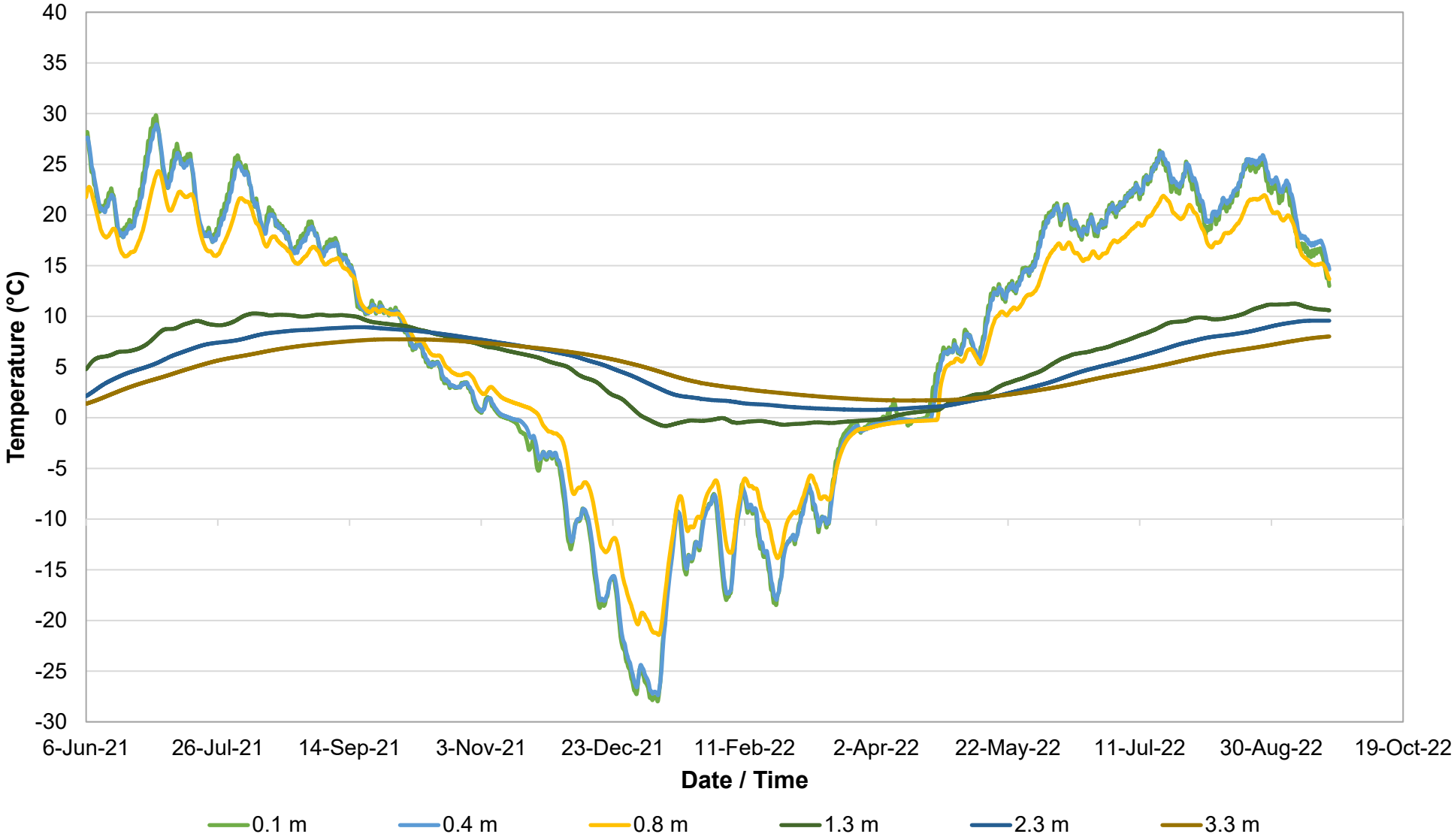


Figure NC106-5
Highway 63:08 km 27.9 Pavement Distress Near Wandering River, Alberta
THERM21-3 (Pavement Test)

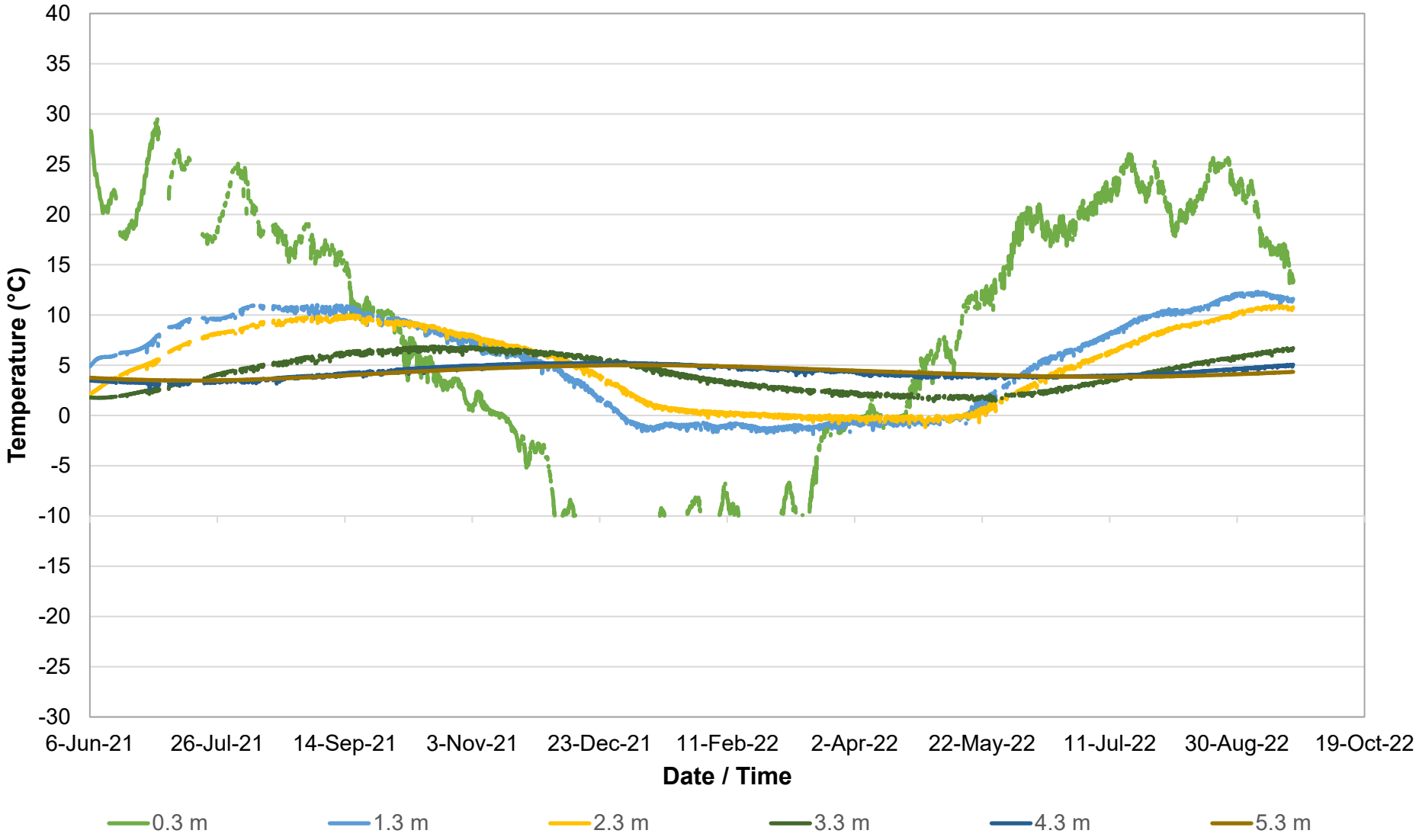


Figure NC106-6
Highway 63:08 km 27.9 Pavement Distress Near Wandering River, Alberta
THERM21-4 (Control Grassed)

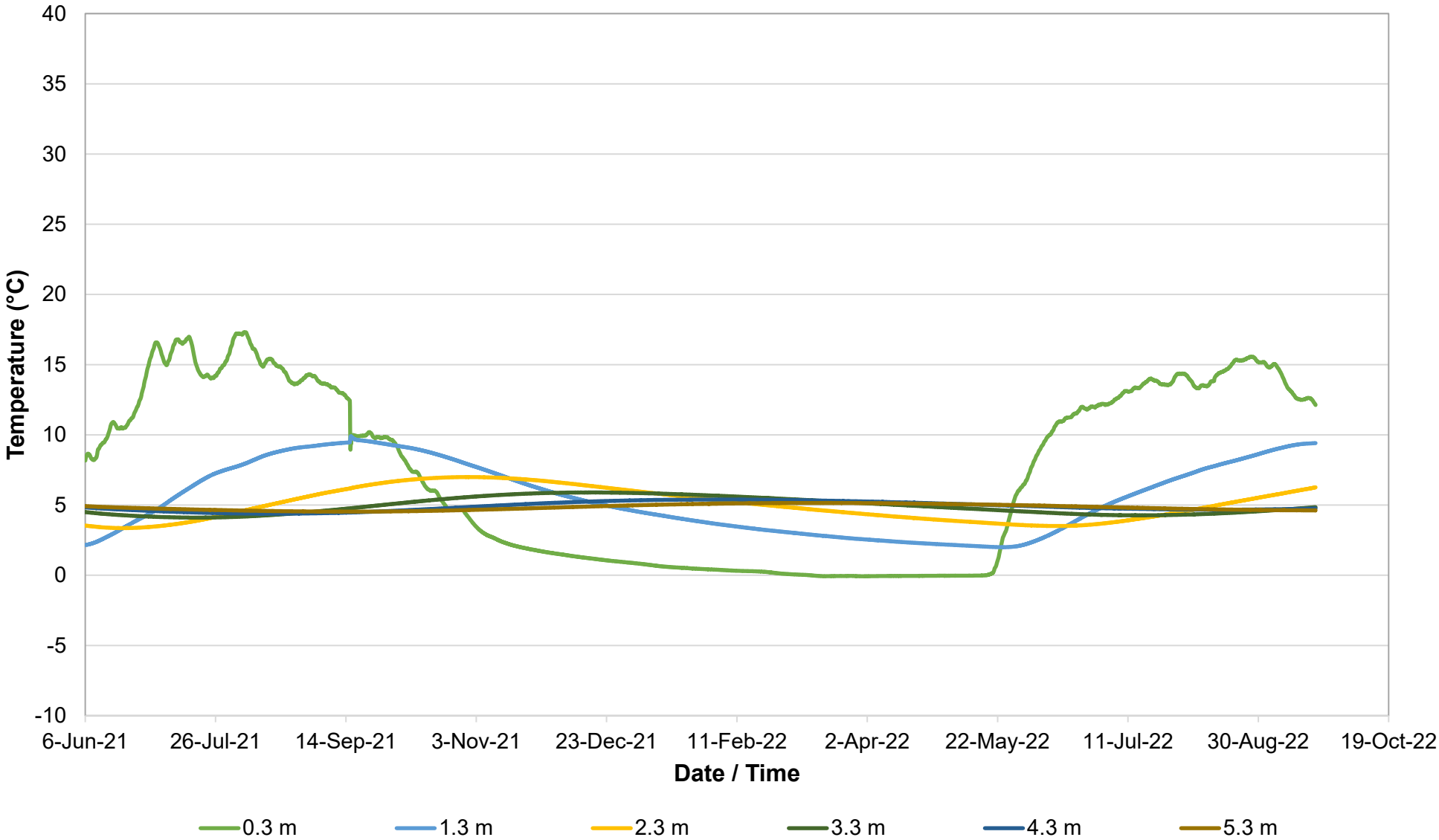


Figure NC106-7
Highway 63:08 km 27.9 Pavement Distress Near Wandering River, Alberta
Surface Thermistors and Weather Data

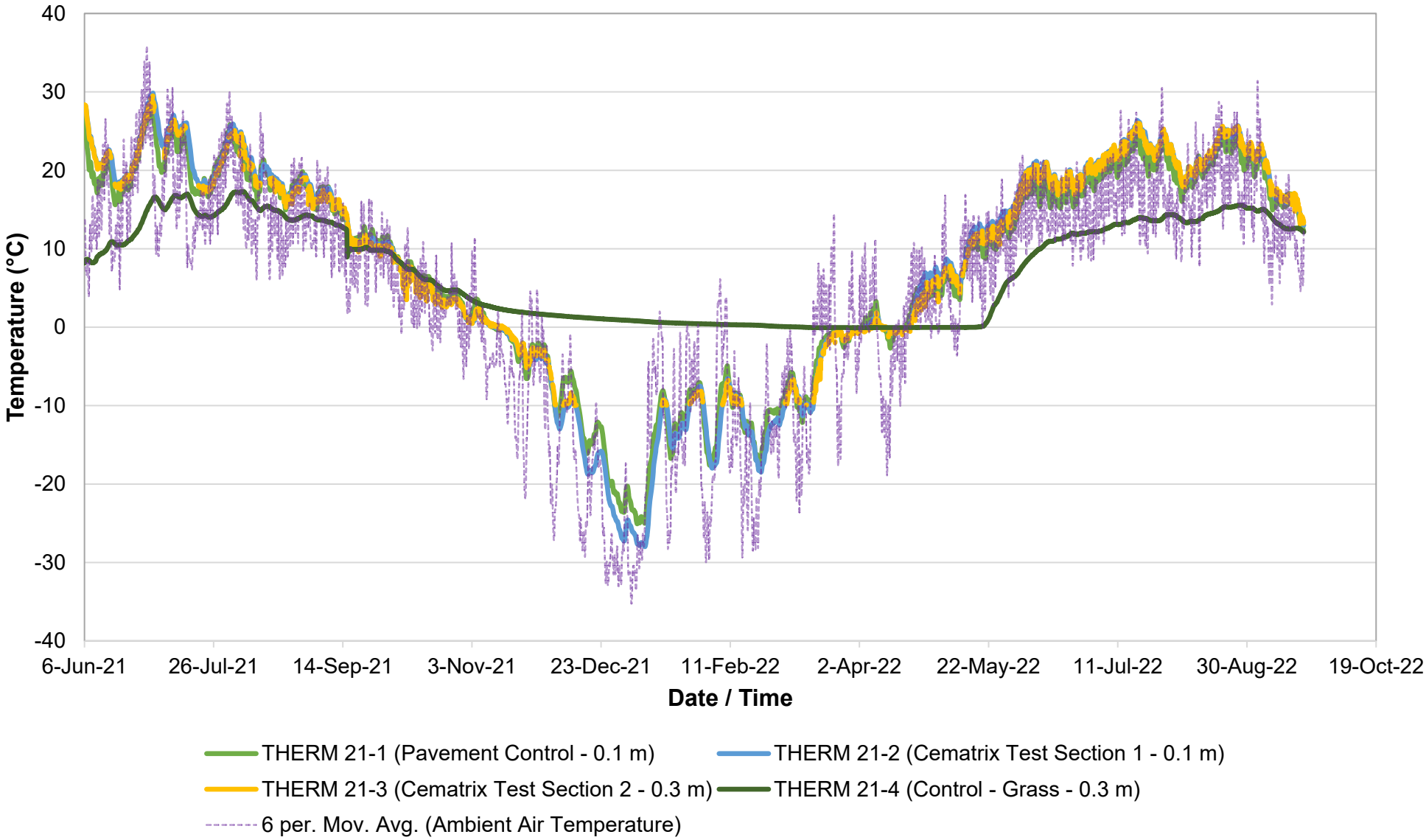


Figure NC106-8
Highway 63:08 km 27.9 Pavement Distress Near Wandering River, Alberta
1.1 m - 1.3 m Depth Thermistors and Weather Data

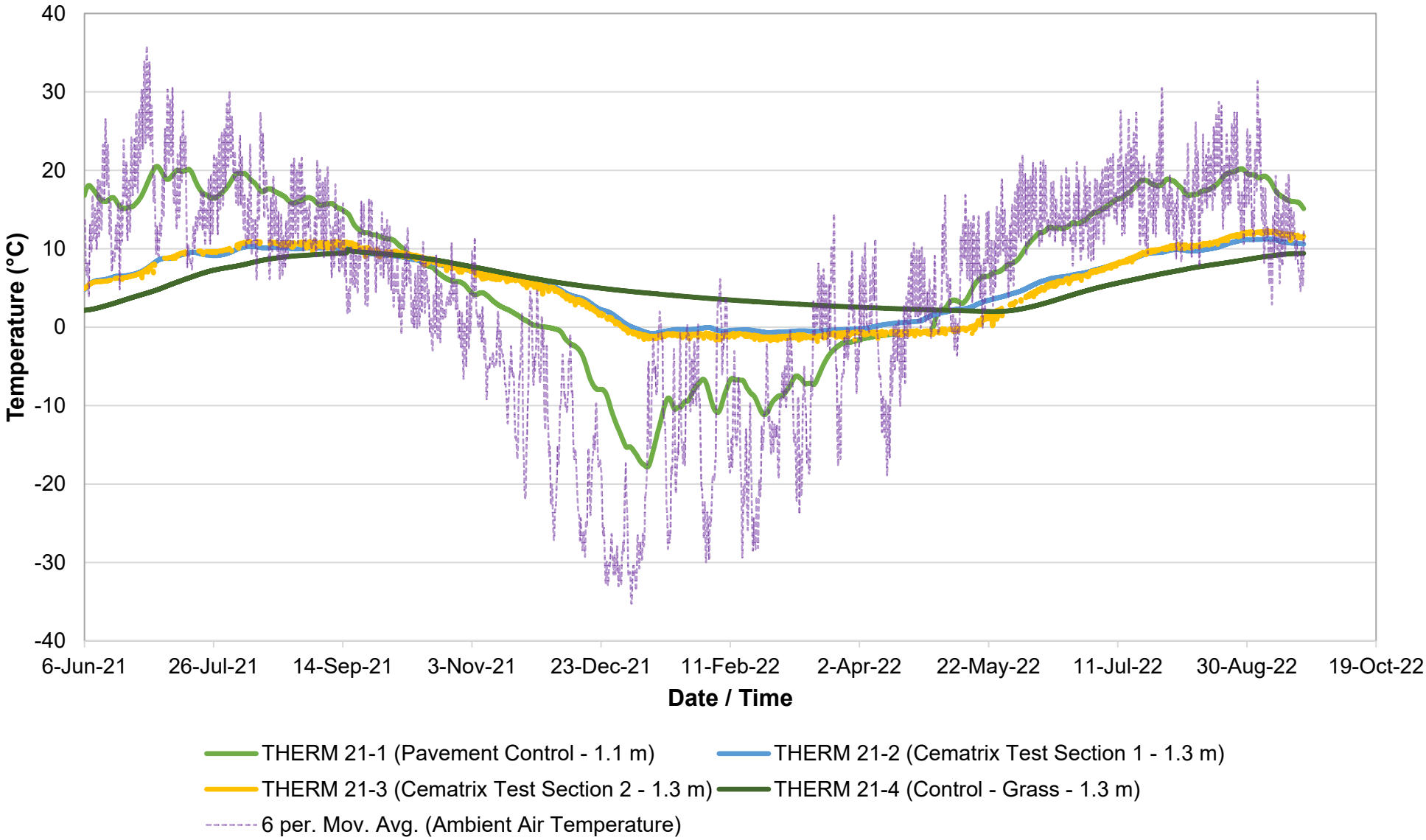


Figure NC106-9
Highway 63:08 km 27.9 Pavement Distress Near Wandering River, Alberta
Hourly and Cumulative Precipitation