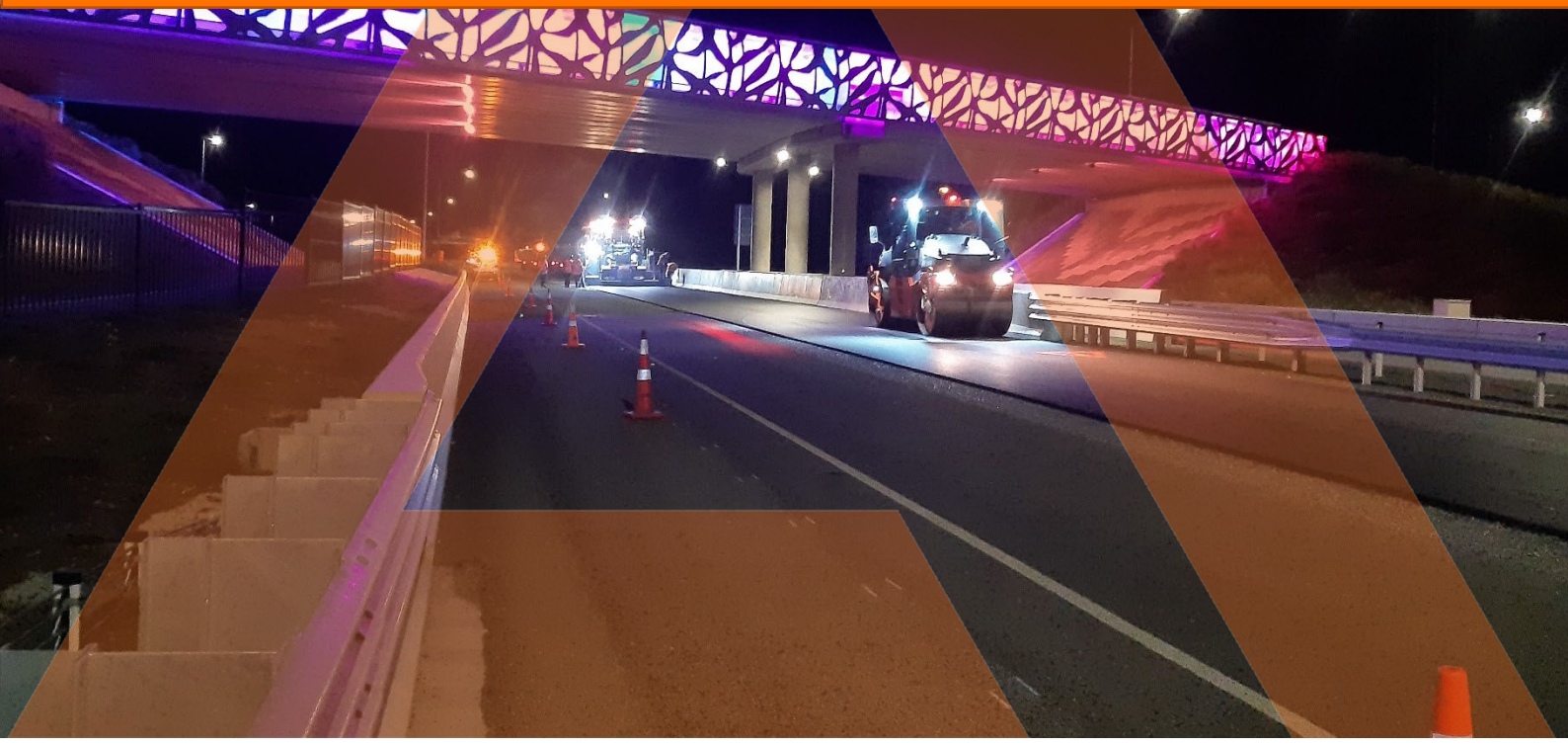


Christchurch Northern Corridor

2022 Trial Site Preliminary
Investigations

Client: Waka Kotahi / NZ Transport Agency
Date: 30 July 2022
Ref: 21-104/R02/C



Prepared for (the Client)

Waka Kotahi / NZ Transport Agency

Prepared by the Consultant)

Altissimo Consulting Ltd

Project Christchurch Northern Corridor
Report 2022 Trial Site Preliminary Investigations
Reference CPX22-02

Prepared by

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Version history:

Version	Date	Comment
A	26/07/2022	Preliminary results for review
B	08/08/2022	Report for issue
C	21/08/2022	Fix surfaces

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1 Introduction

Four porous asphalt trial sites were installed within the Christchurch Northern Corridor (CNC) project. The purpose of these trial sites is to investigate the impact asphalt porosity has on road surface noise generation. Two additional surface types were also installed within the CNC project as part of the surface specification. The details of the surfaces are presented in Table 1 below.

Table 1 CNC surfaces

Surface type	Road ID	Chainage	Notes
EPA7 (50mm)	3844	4710-7005	Installed as low noise treatment on southern extent
	3843	4535-6820	
PA7 (30mm)	3844	20-945	Standard surface for project
		1050-1260	
		1360-1950	
		2410-4200	
	3843	20-750	
		850-1060	
		1155-1765	
		2360-4030	
PA7 HS (30mm)	3844	2040-2390	
PA7 LV (30mm)	3844	4220-4610	Difficulties noted during installation - asphalt was not flowing in clumps out of paver.
SMA7 (30mm)	3843	1855-2340	Awaiting results of laboratory testing - potentially higher void content than specified
PA10 (30mm)	3843	4050-4430	Installed to confirm chip-size relationship



2 Paving measurements

The temperature of the pavement as it was being laid was measured using a FLIR thermal imaging camera installed on the paving machine. The location of the paver and first roller were logged using a GPS system. This instrumentation is shown in Figure 1 below.



Figure 1: GPS logger and FLIR thermal imaging camera installed on paver

The temperature across the pavement as it was installed was measured in 6 boxes, each box spanning 1/6th of the paving width. The minimum, average, and maximum temperature of these boxes were logged for the paving shifts. These boxes are shown below:



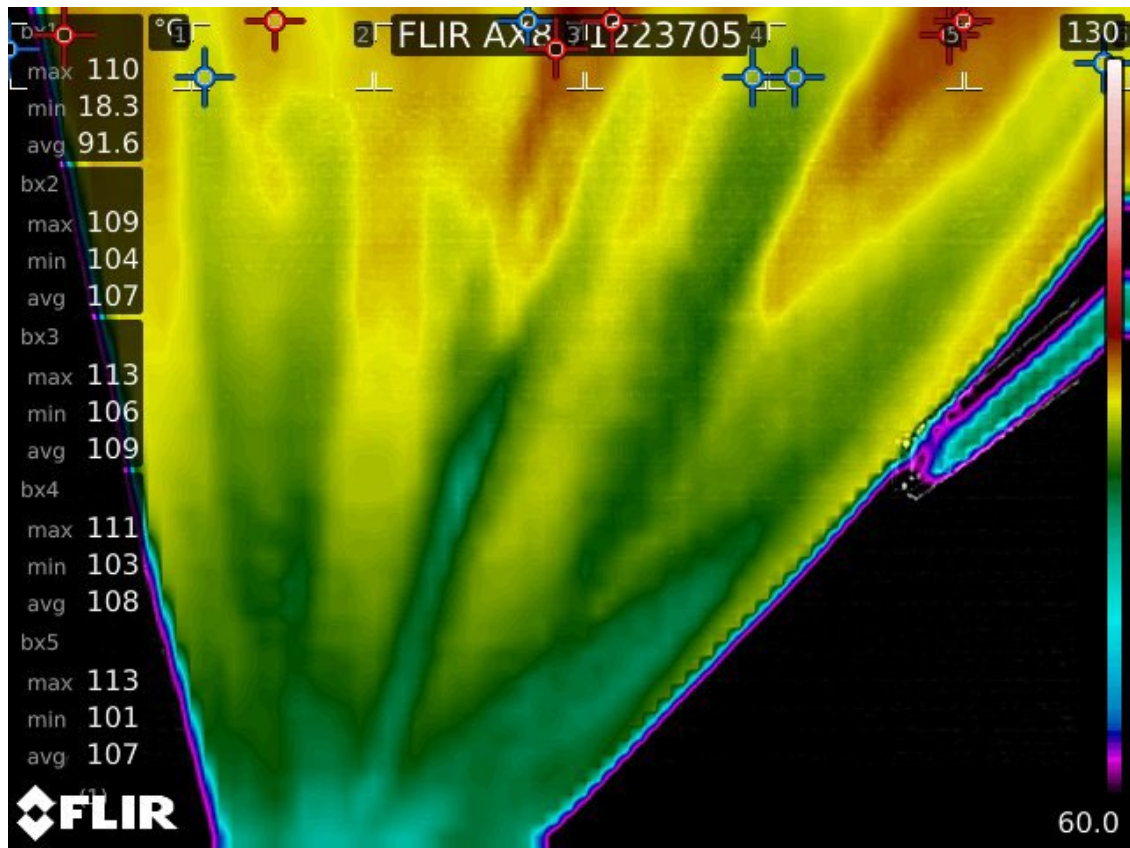


Figure 2: FLIR camera boxes (image is inverted in setup)

The location and temperature data are presented in the following sections.



2.1 2022 02 24 - Position data

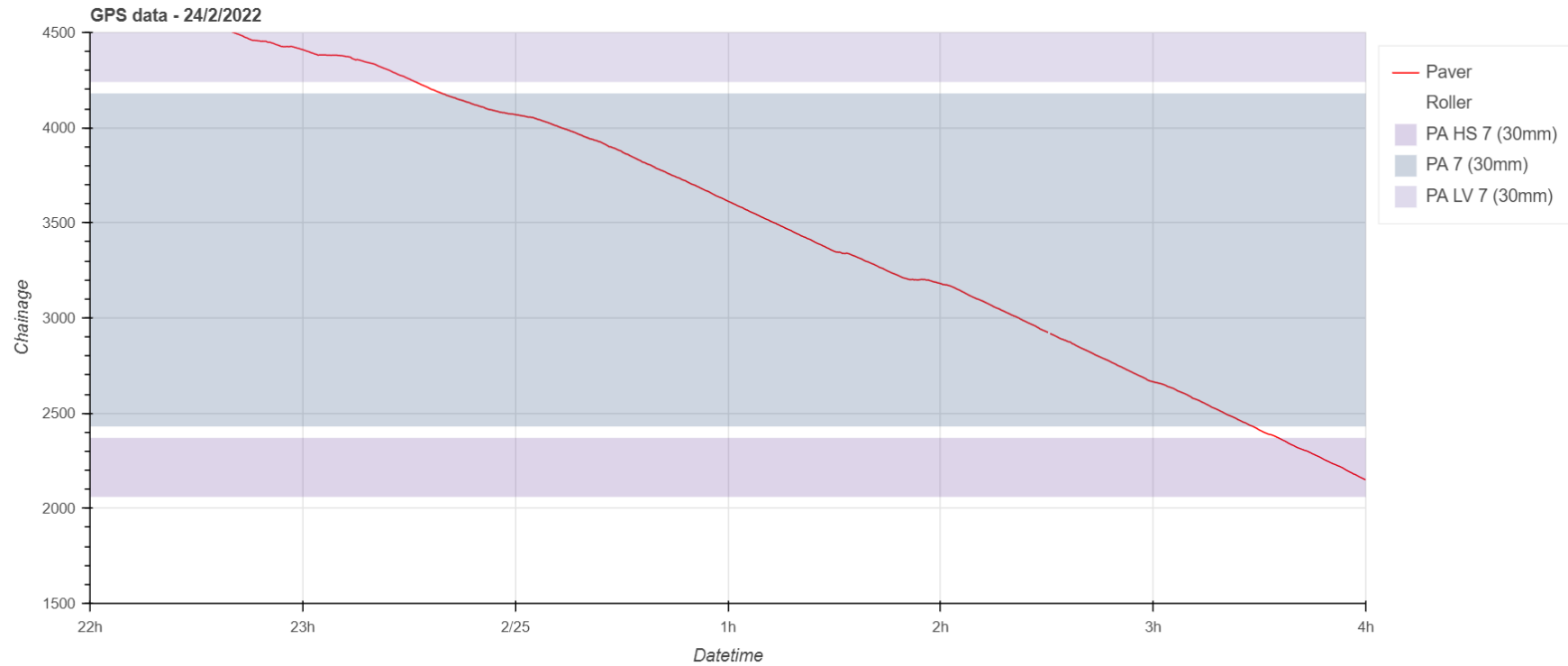


Figure 3: Paver location data - 2022/02/24

2.2 2022 02 25 - Position data

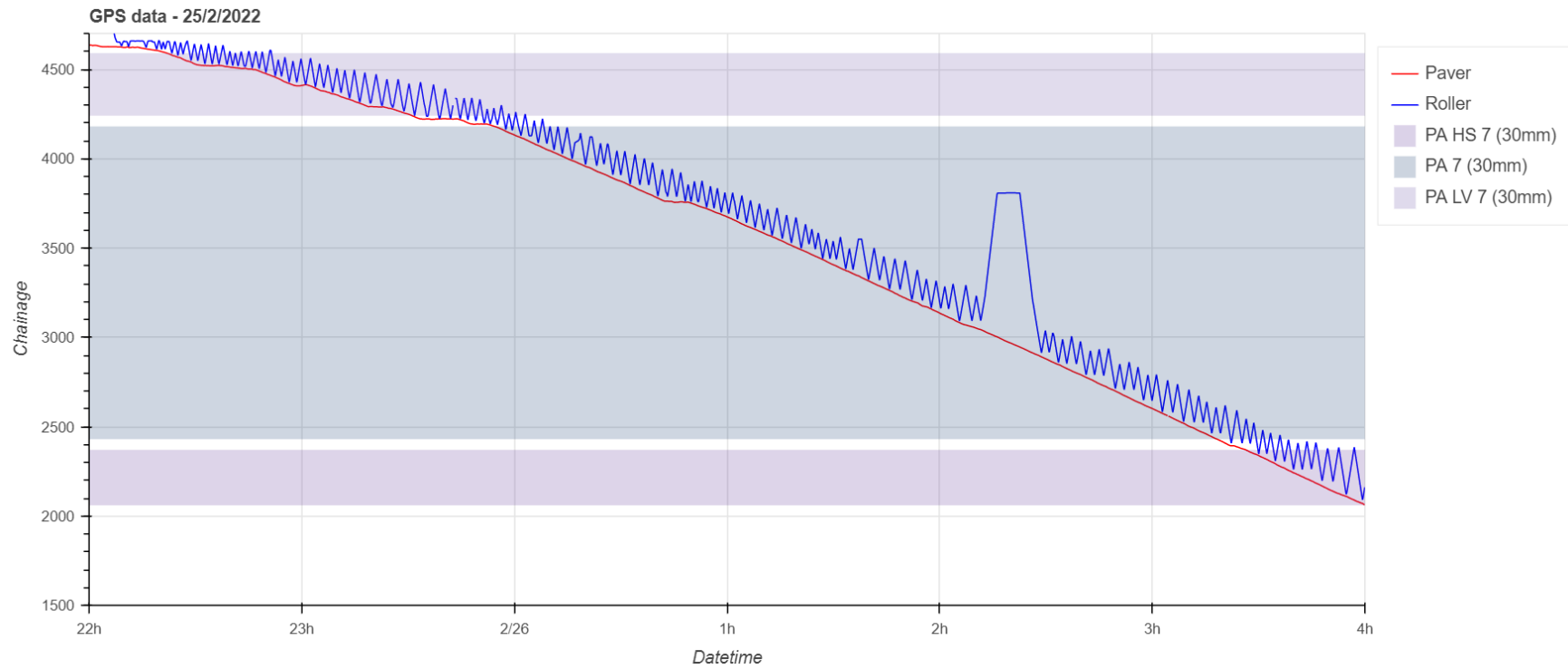


Figure 4: Paver and roller location data - 2022/02/25

2.3 2022 02 25 - Temperature data

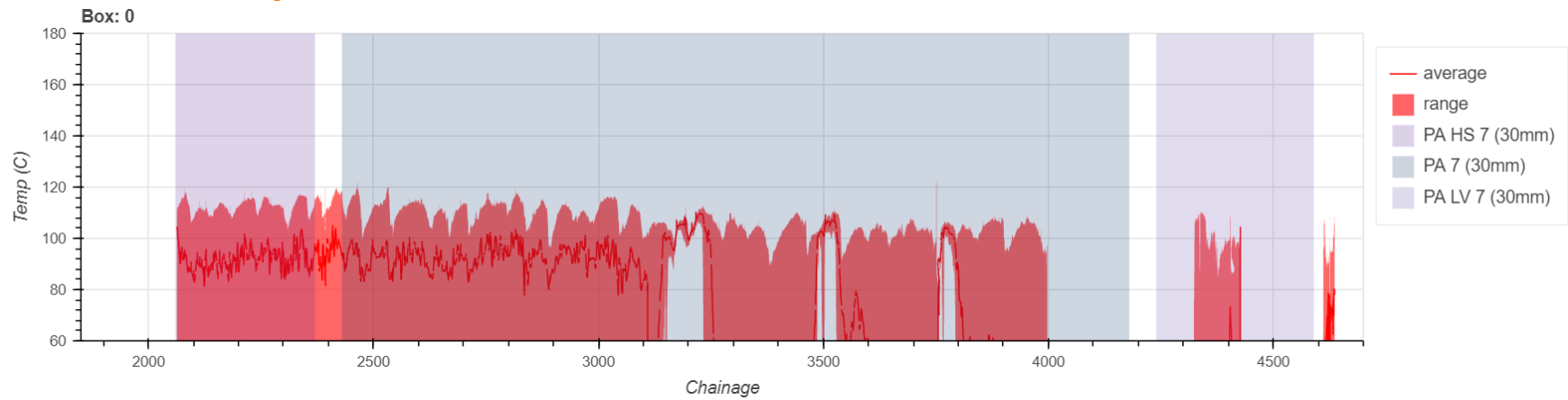


Figure 5: Pavement temperature - box 0 - 2022/02/25

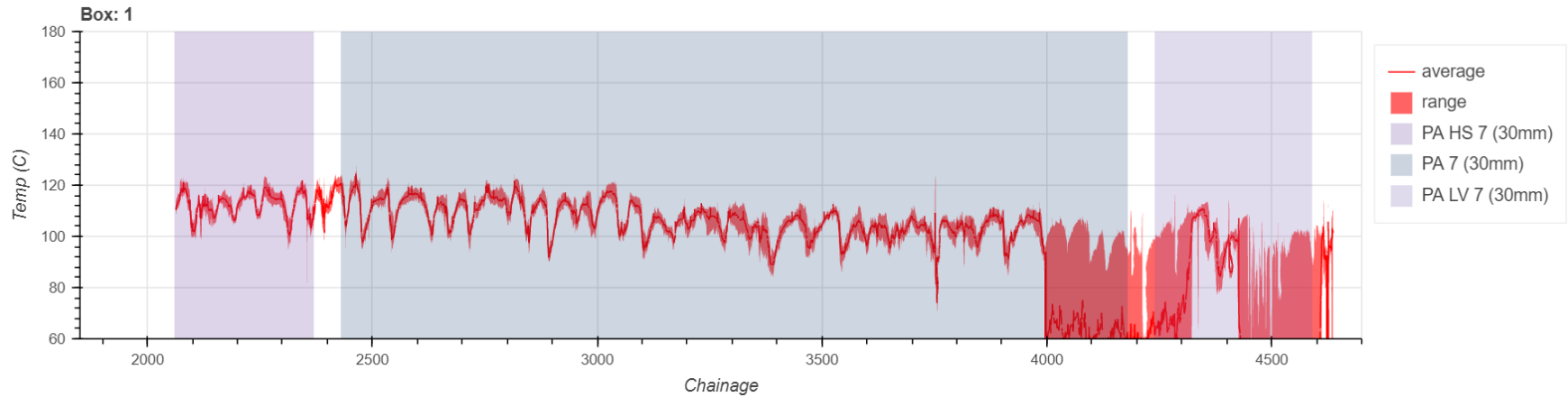


Figure 6: Pavement temperature - box 1 - 2022/02/25

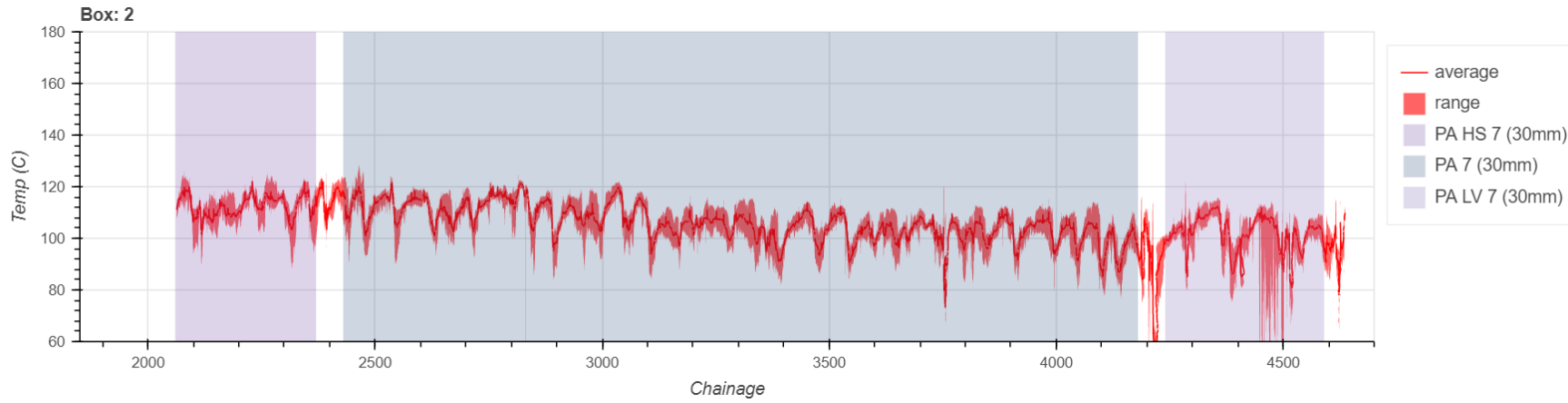


Figure 7: Pavement temperature - box 2 - 2022/02/25

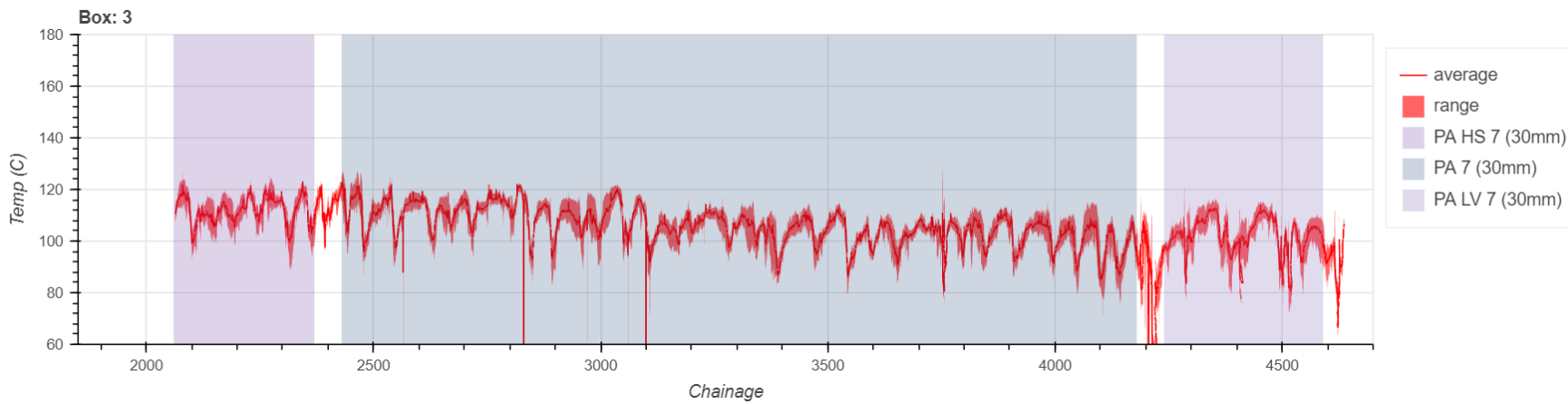


Figure 8: Pavement temperature - box 3 - 2022/02/25

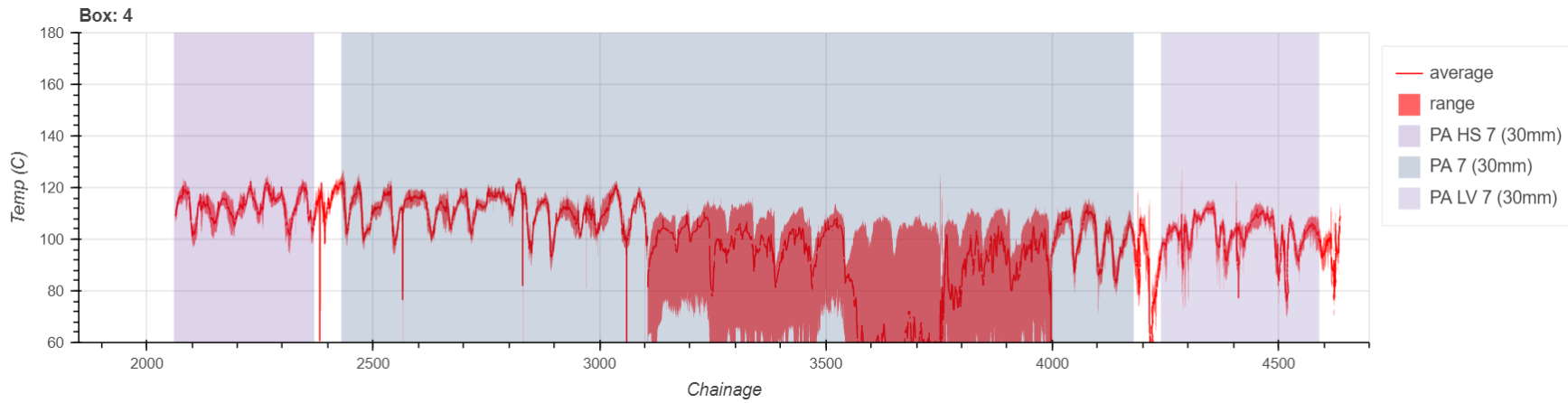


Figure 9: Pavement temperature - box 4 - 2022/02/25

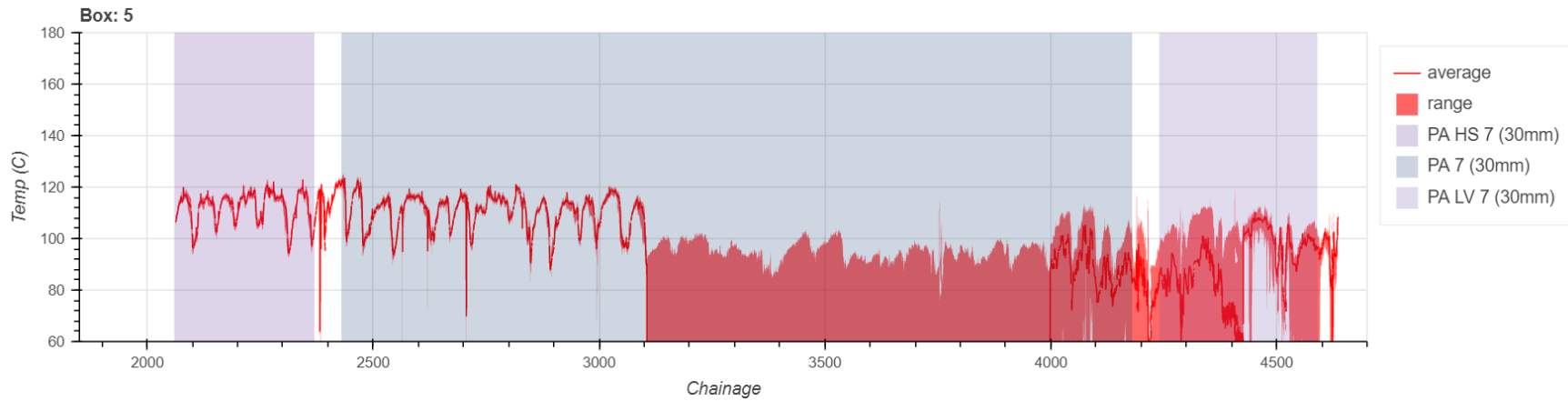


Figure 10: Pavement temperature - box 5 - 2022/02/25

2.4 2022 02 27 - Position data

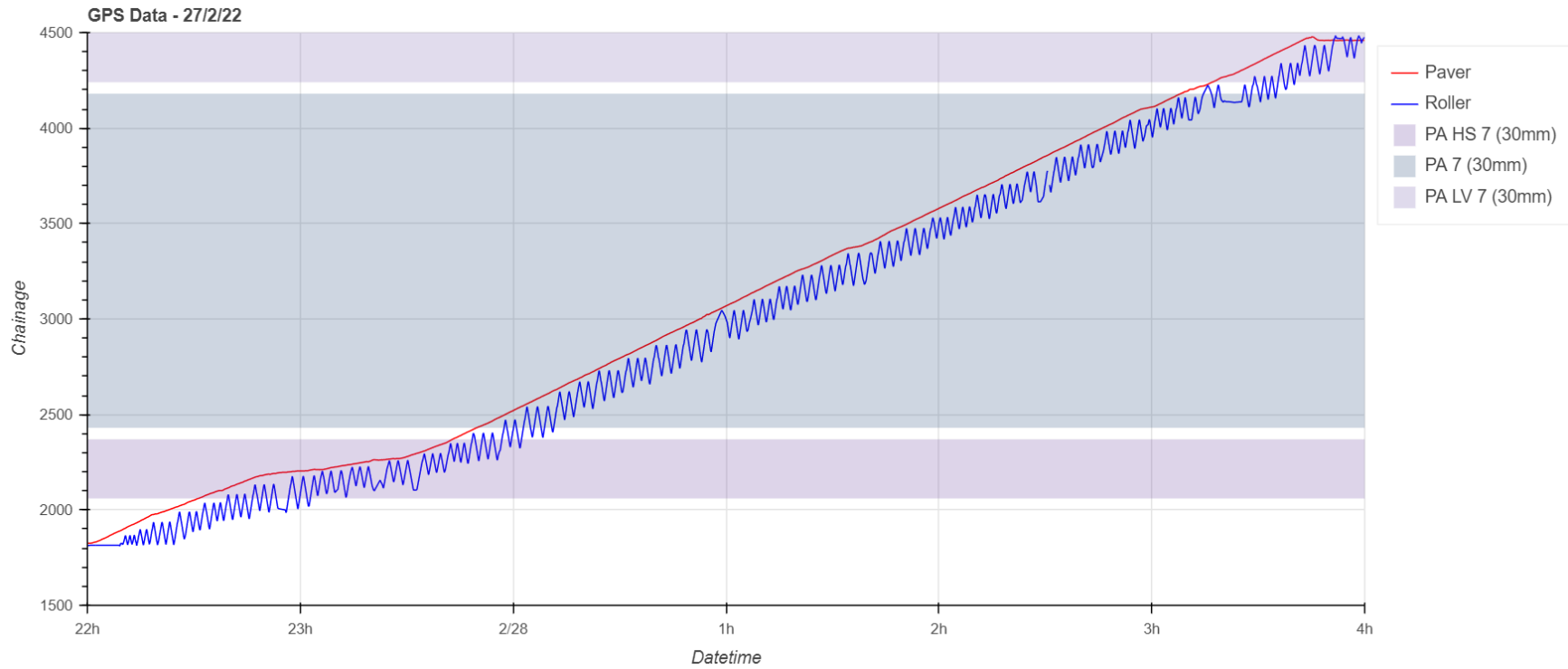


Figure 11: Paver and roller location data - 2022/02/27

2.5 2022 02 28 - Position data

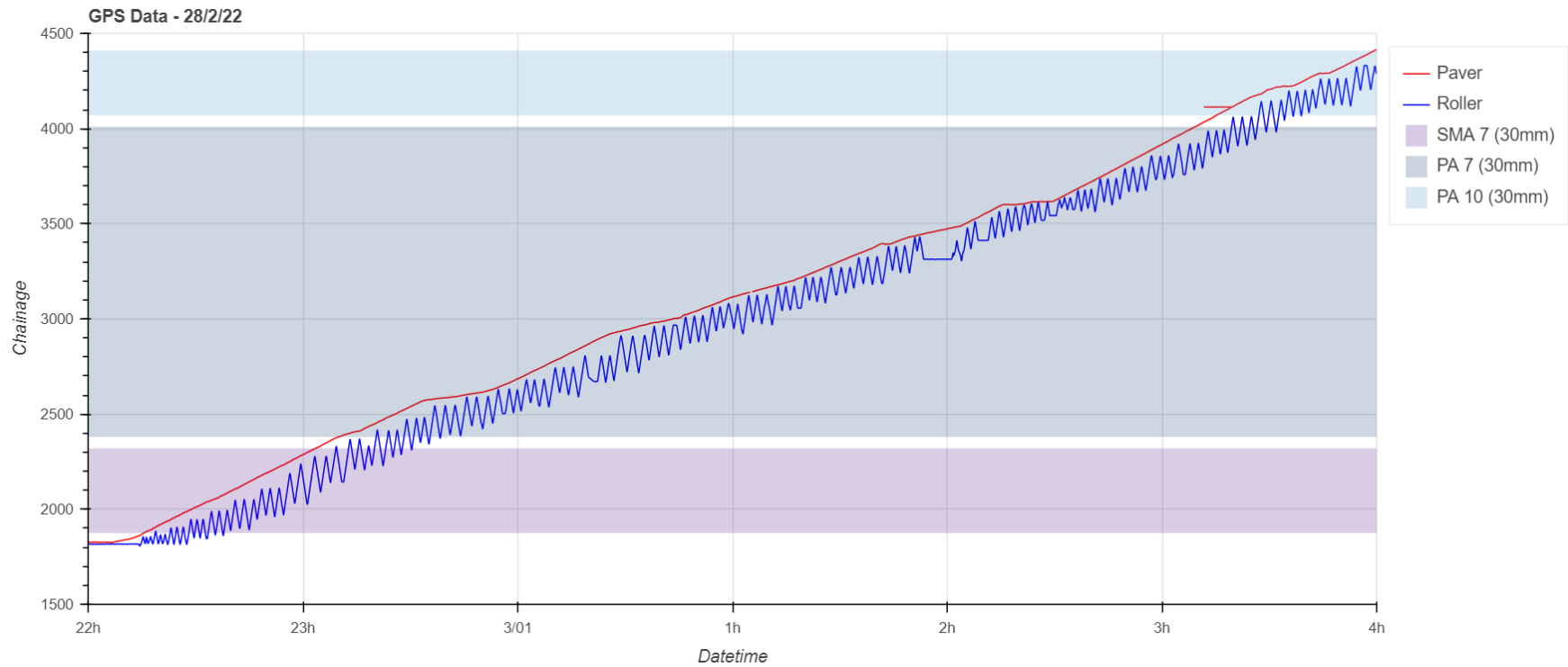


Figure 12: Paver and roller location data - 2022/02/28

2.6 2022 02 28 - Temperature data

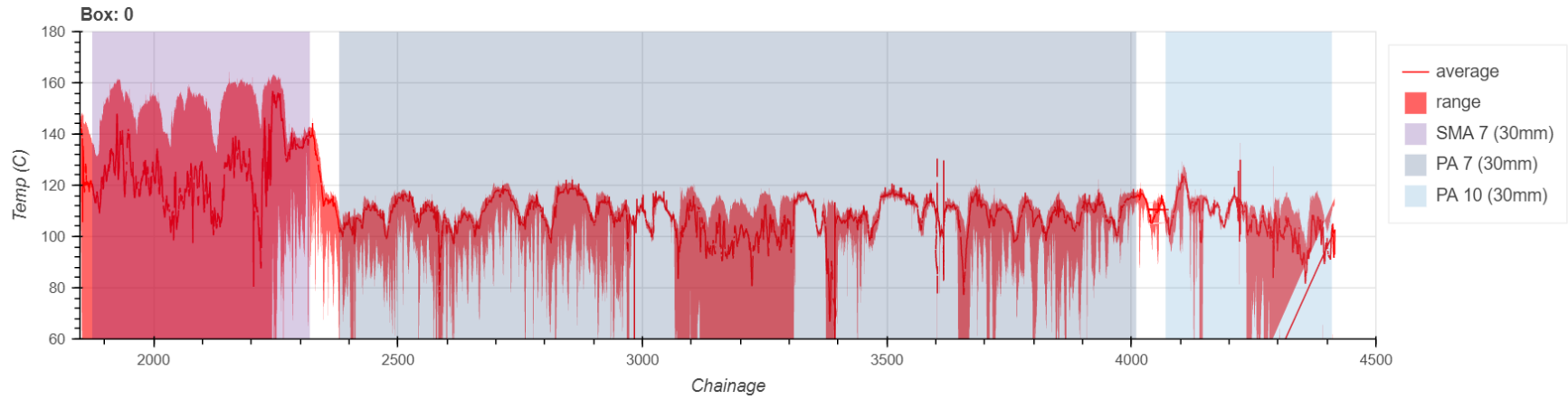


Figure 13: Pavement temperature - box 0 - 2022/02/28

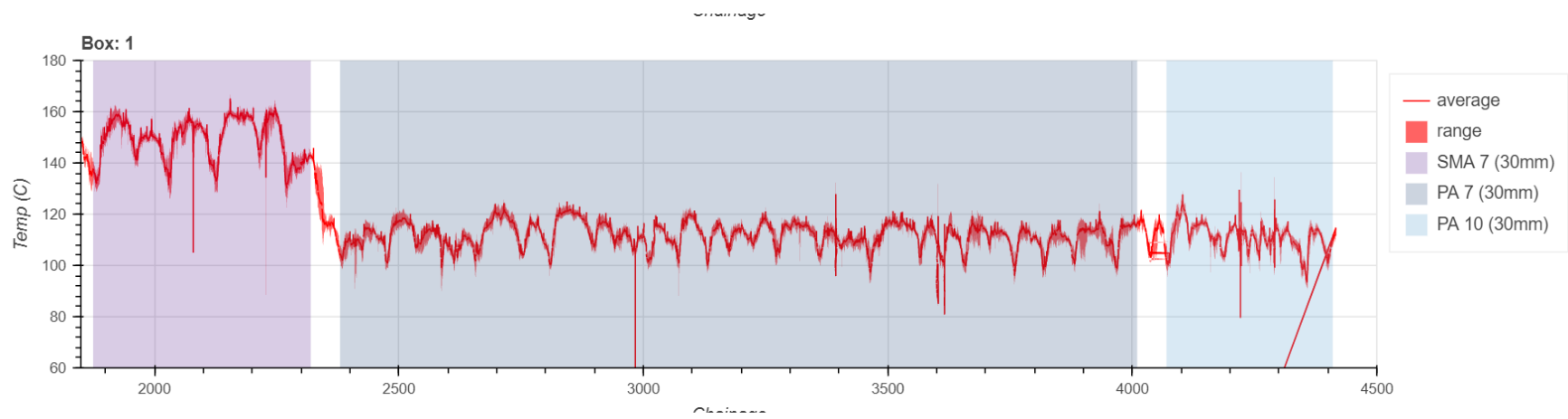


Figure 14: Pavement temperature - box 1 - 2022/02/28

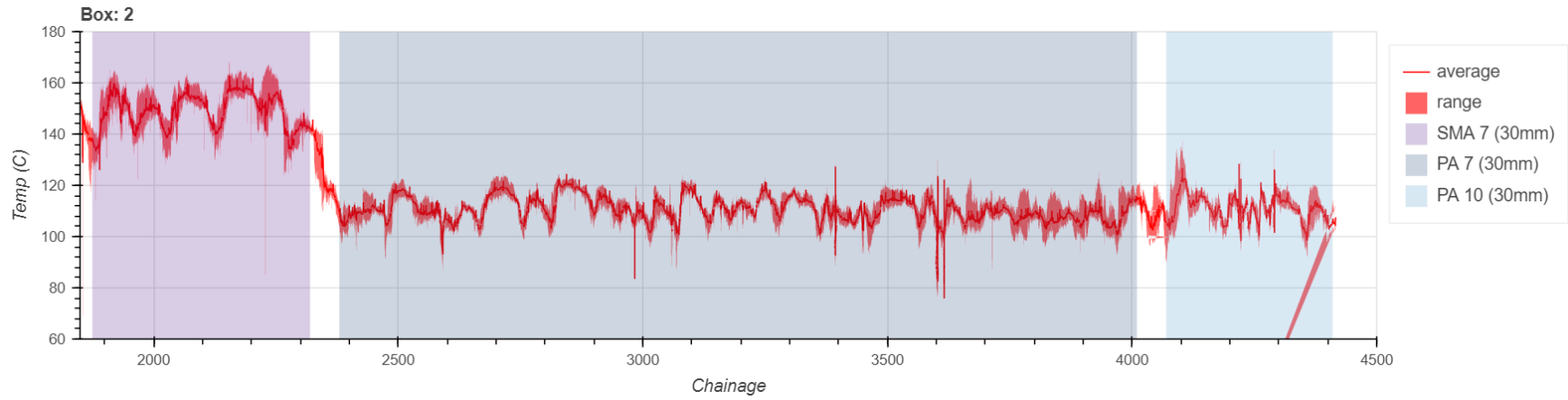


Figure 15: Pavement temperature - box 2 - 2022/02/28

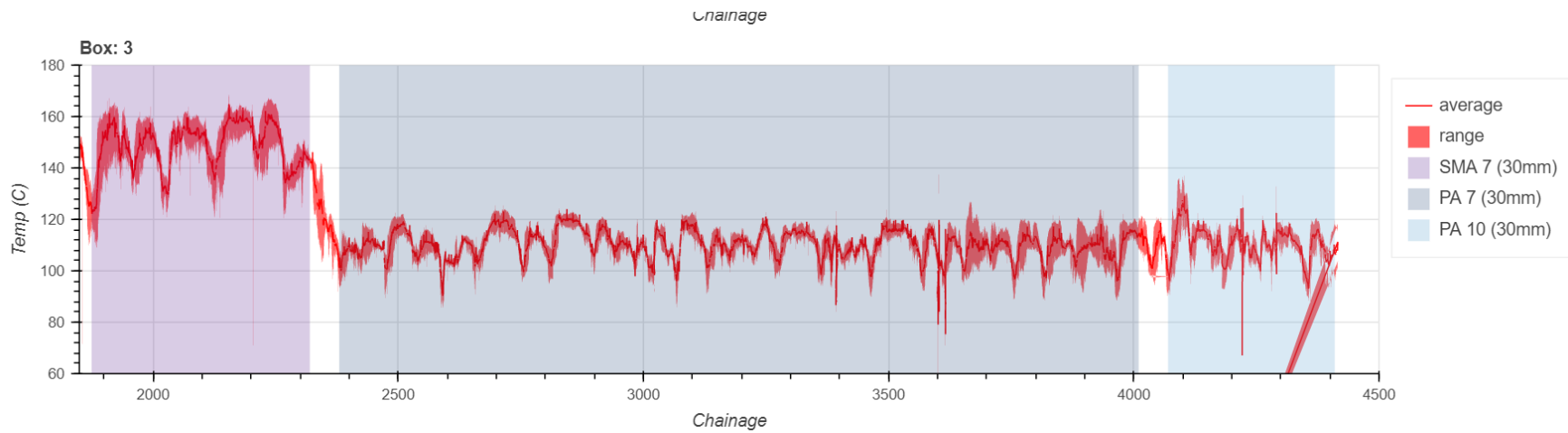


Figure 16: Pavement temperature - box 3 - 2022/02/28

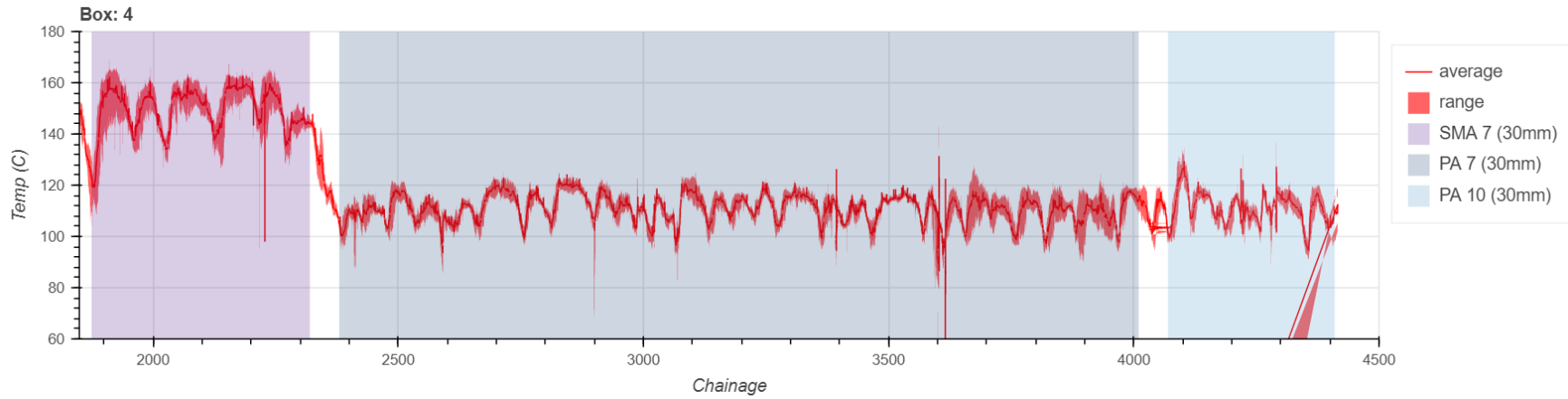


Figure 17: Pavement temperature - box 4 - 2022/02/28

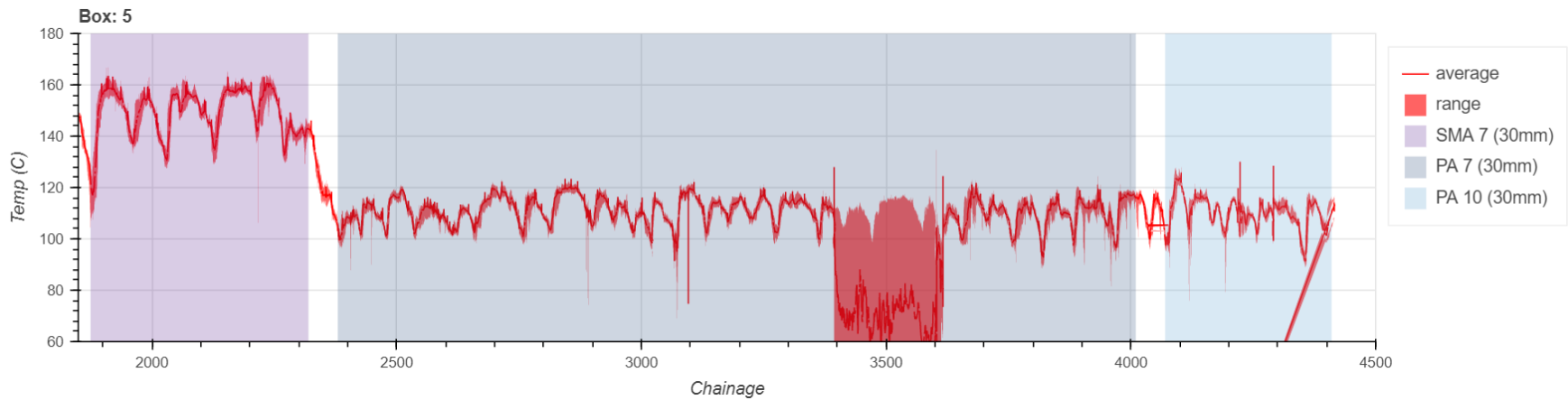


Figure 18: Pavement temperature - box 5 - 2022/02/28

2.7 Example images from FLIR camera

The camera captured thermal video throughout the paving shifts, several screen captures are presented below. The video files have been time-stamped during recording, allowing paving events to be identified in the video stream.

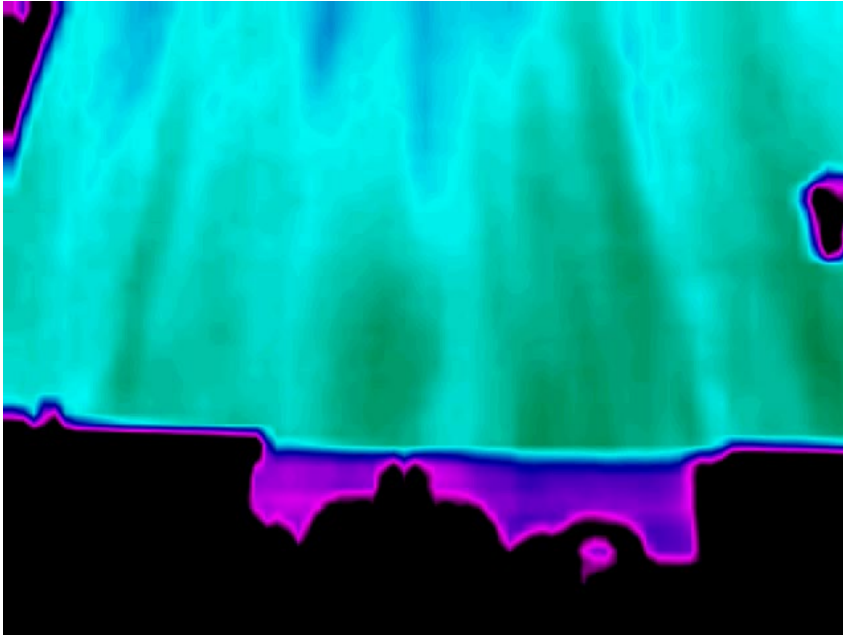


Figure 19: FLIR camera image during paving

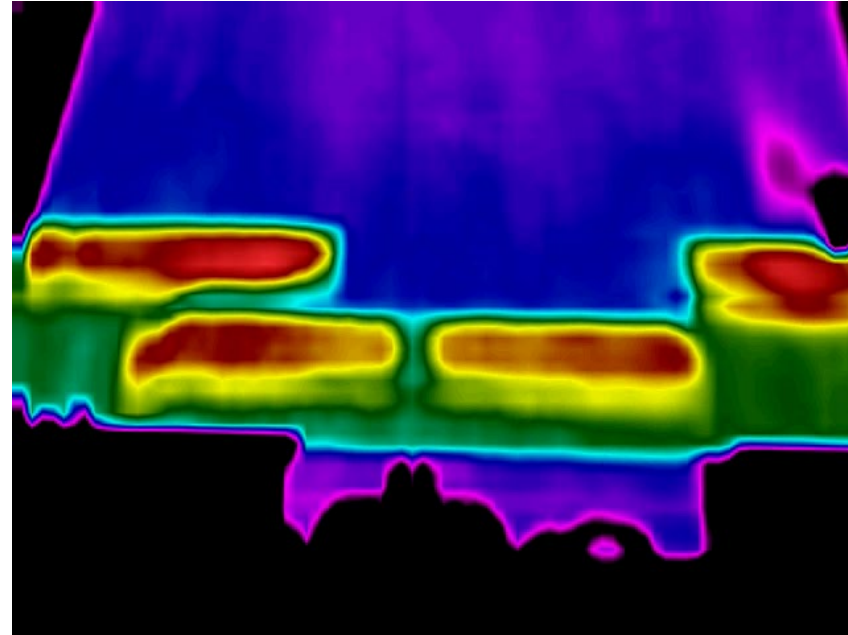


Figure 20: FLIR camera image following paving stop

3 Thickness measurements

The thickness of the pavement was measured via magnetic tomography using a MitScan T3 scanner. This system requires 70mm aluminium disks be installed below the asphalt layer, these were glued onto the underlying chipseal using an epoxy-based anchor-fixing glue (Figure 12).



Figure 21: Aluminium disk glued to chipseal (below bitumen pre-spray)

These disks were installed in the locations listed in Table 2 below:

Table 2 CNC surfaces

Surface type	Disk spacing	Road ID: Chainage range
EPA7 (50mm)	20m in left lane, left wheel path	3843: 4600m - 5800m
PA7 (30mm)	40m in left lane, left wheel path	3844: 3200m - 4220m
	40m in left lane, left wheel path	3844: 2390m - 2990m
	20m in left lane, left wheel path	3843: 2340m - 2800m
PA7 HS (30mm)	40m in right lane, left wheel path	
	20m in left lane, left wheel path	3844: 2040m - 2390m
PA7 LV (30mm)	40m in right lane, left wheel path	
	20m in left lane, left wheel path	3844: 4220m - 4610m
SMA7 (30mm)	40m in right lane, left wheel path	
	20m in left lane, left wheel path	3843: 1855m - 2340m
PA10 (30mm)	40m in right lane, left wheel path	
	20m in left lane, left wheel path	3843: 4050m - 4430m

The thickness was measured following paving and a summary of the thickness results are presented below:



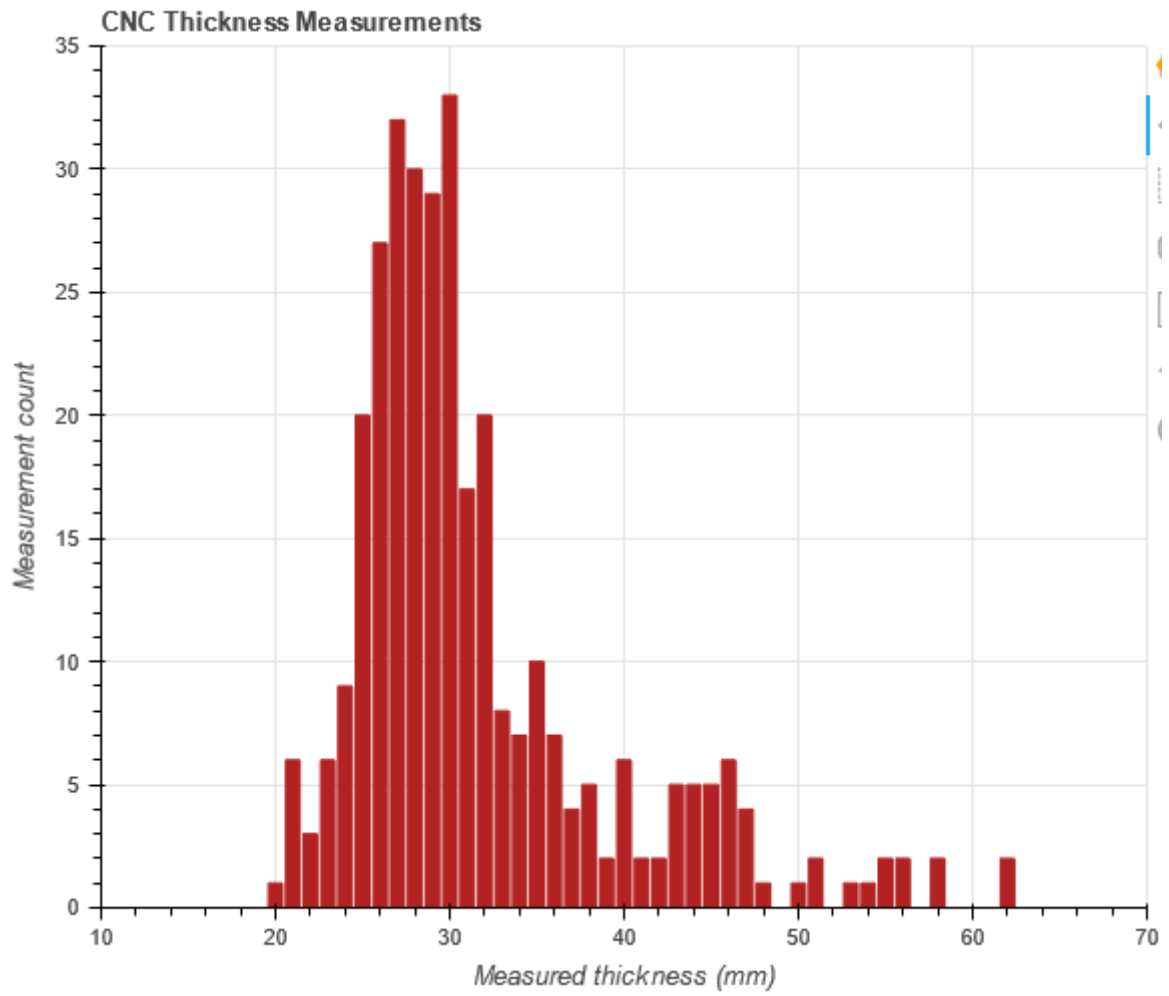


Figure 22: Measured thickness

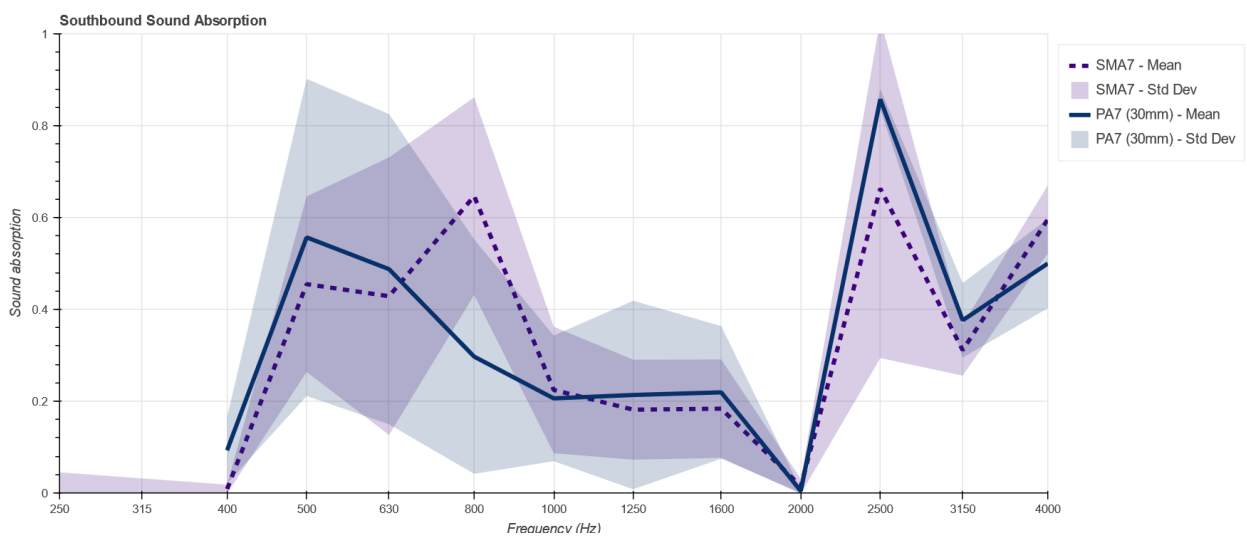


4 Texture measurements

Texture measurements were performed at each of the thickness measurement locations. Texture was measured using CAPTIFs Stationary Laser Profilometer (SLP). Initial measurements were performed within 1 week of installation. These results have not been processed at the time of writing.

5 Surface absorption measurements

The surface sound absorption coefficient was measured using a test rig based on ISO 13472-1. These measurements were performed at each of the thickness measurement locations. The results of the southbound measurements are presented below:

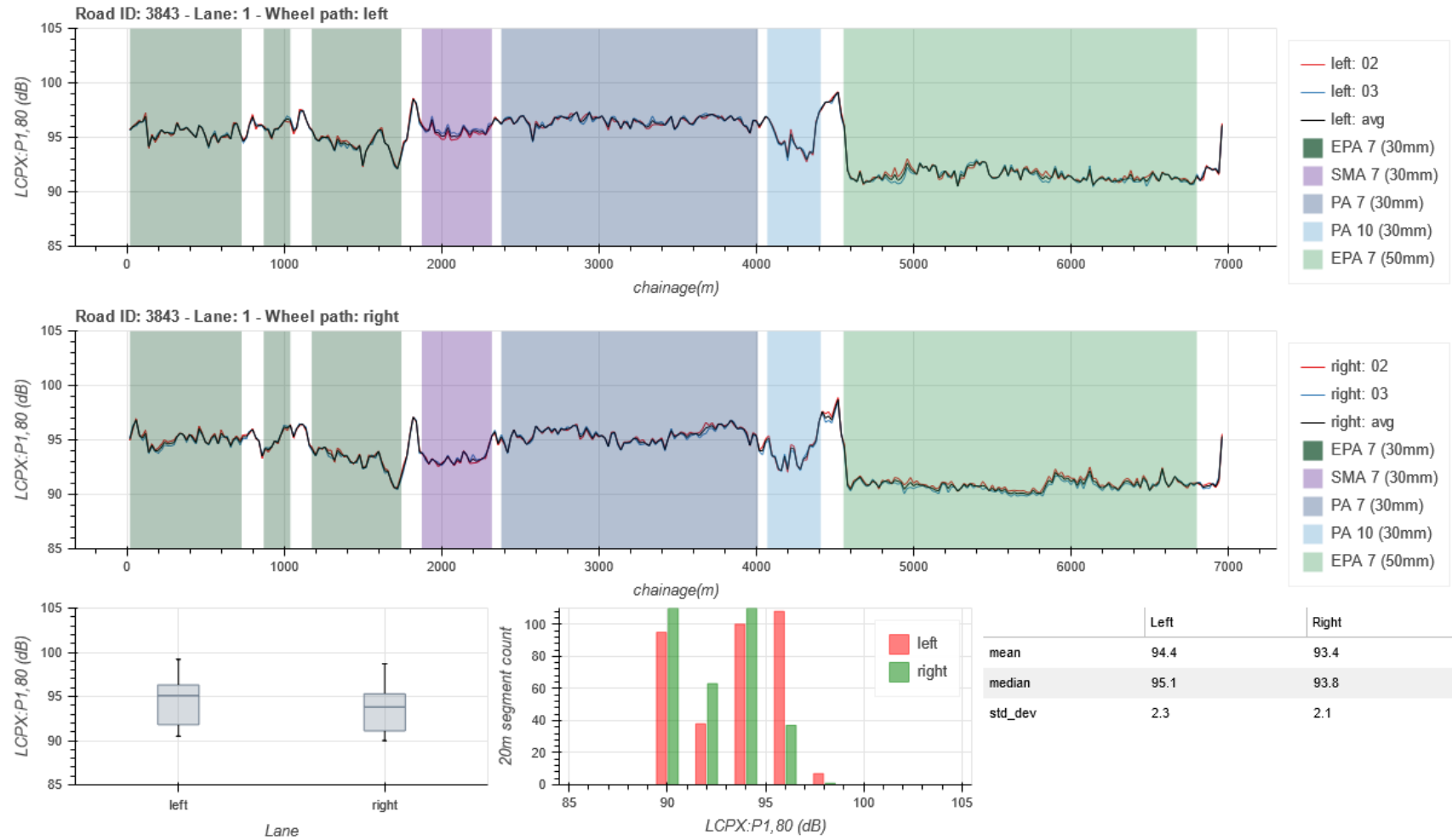


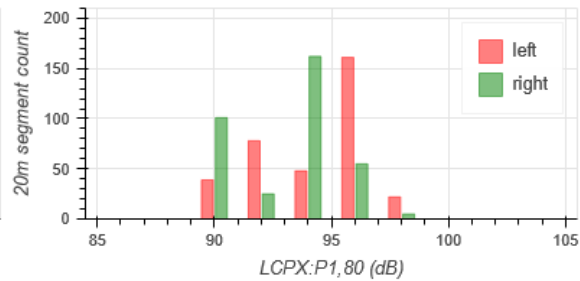
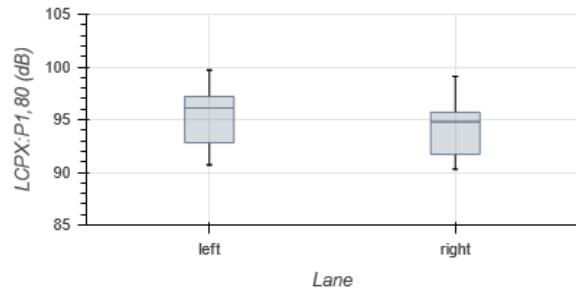
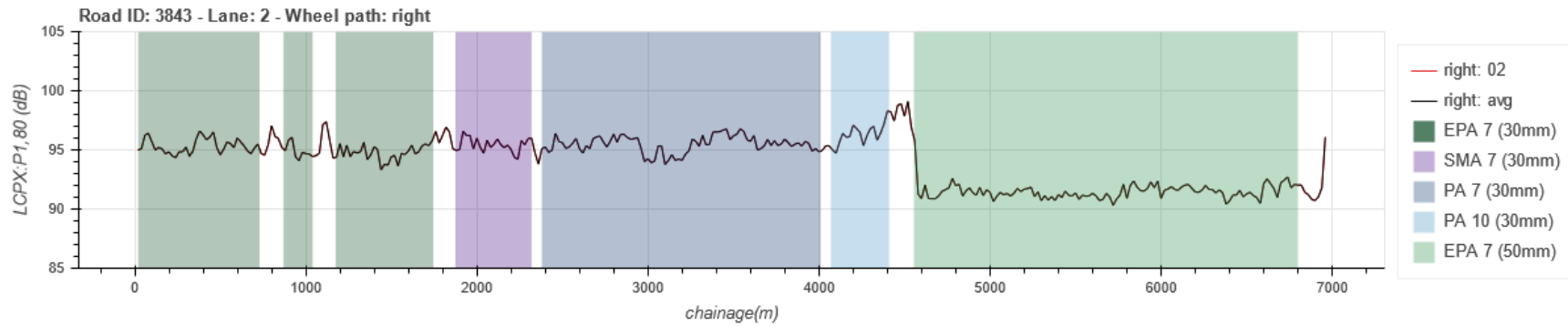
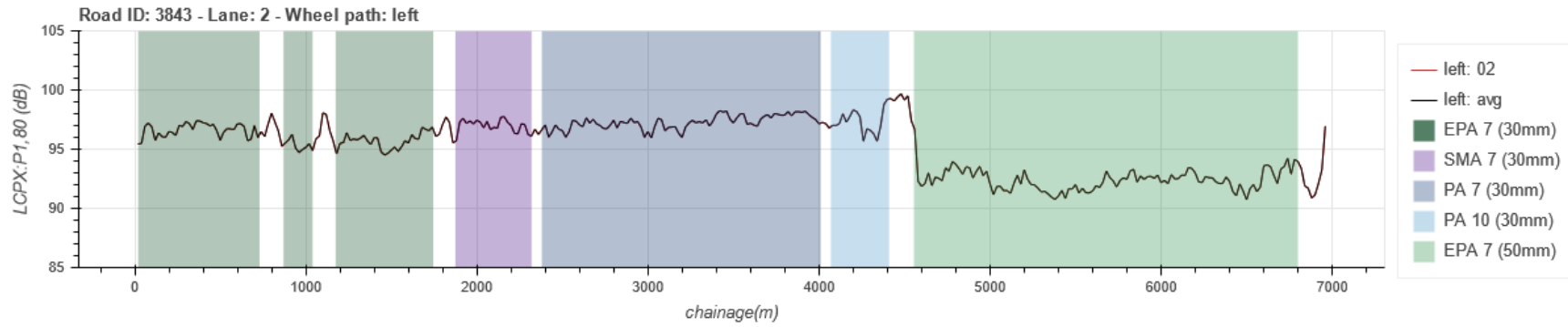
The measurements in the northbound lanes were invalid due to a poor connection in the measurement system.



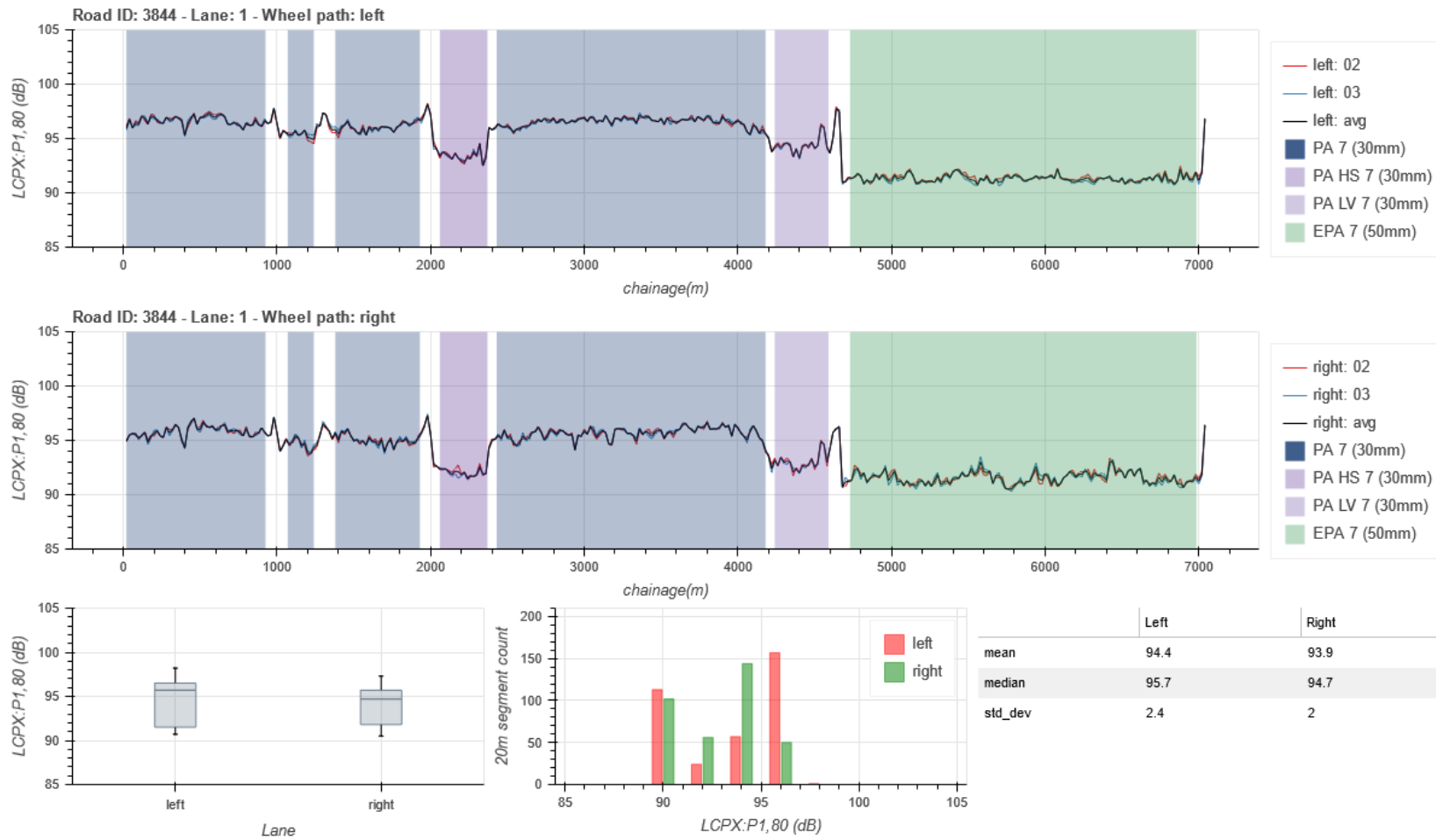
6 CPX Measurements

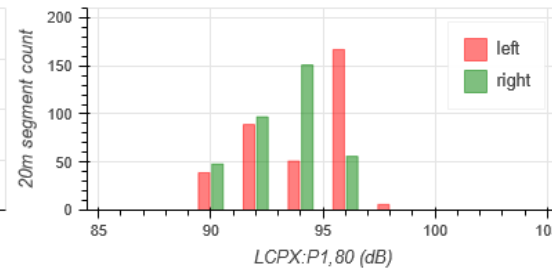
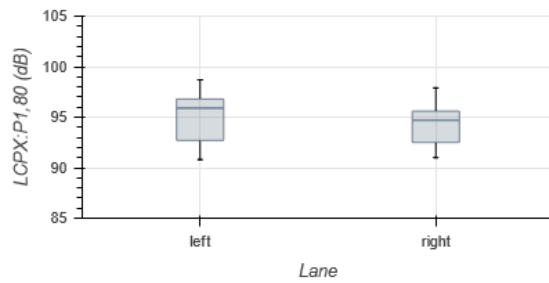
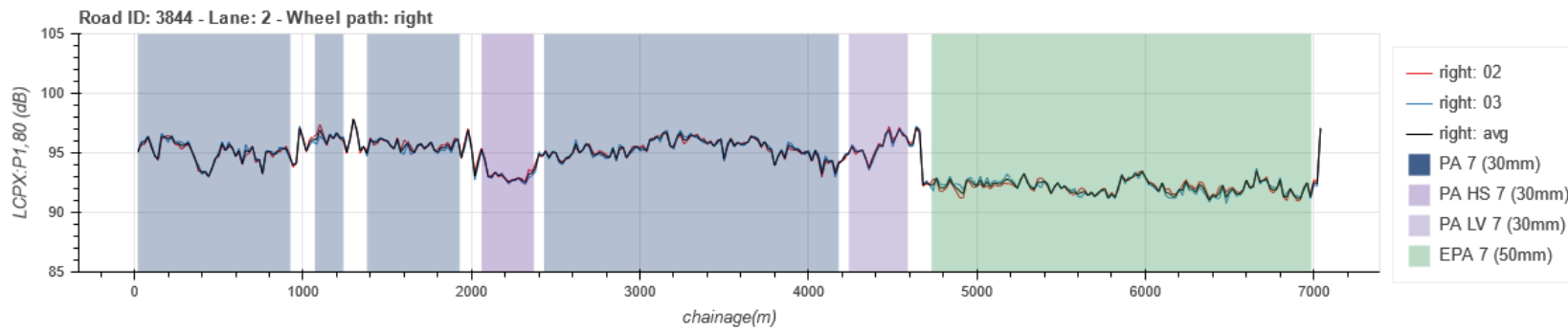
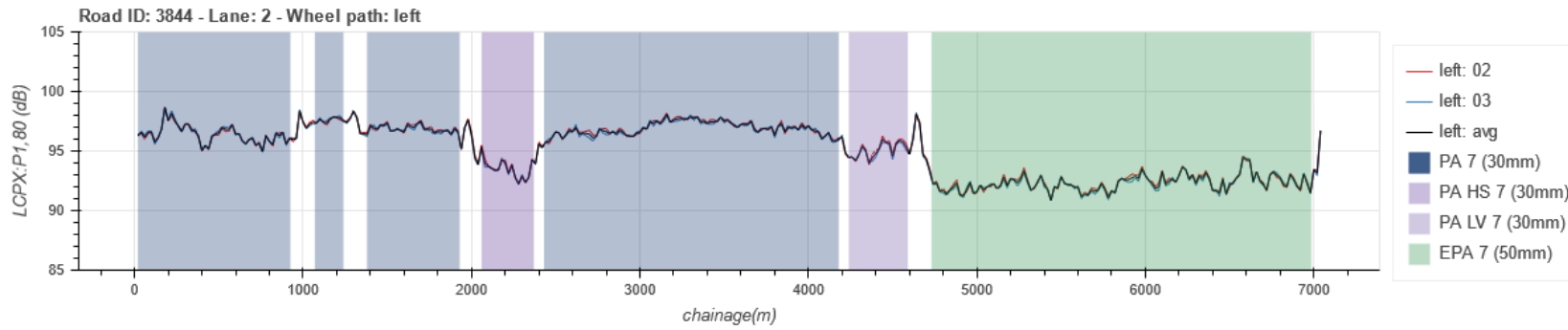
Close proximity (CPX) noise measurements were performed 1 month after installation of the pavement using Waka Kotahi's CPX trailer.





	Left	Right
mean	95.3	94.1
median	96.1	94.8
std_dev	2.3	2.1





	Left	Right
mean	95	94.2
median	95.9	94.7
std_dev	2.2	1.7

