

23 October 2020

Justin Hazelbrook
Community and Conditions Coordinator
Fulton Hogan Egis O&M Pty Ltd
50 Clarence Street
Sydney NSW 2000

Re: M8 Approval Condition E9 - review of in-tunnel above-limit report

Dear Justin,

1 Introduction

The Ministers Condition of Approval (MCoA) E9 for WestConnex M8 (New M5) includes a requirement for in-tunnel monitoring notification and reporting, as follows:

Within 20 working days of any request by the Secretary under condition E8, the Proponent must prepare and submit to the Secretary a Tunnel Air Quality Management Systems Effectiveness Report on the overall system performance and cause and major contributor of any exceedances, including:

(a) the overall performance and concentration levels in the tunnel for the preceding six month period (or since commencement of operation, where the SSI has operated for under six months), including average and maximum levels and time periods;

(b) details of any instances throughout the operation of the SSI where pollutant concentration levels in the tunnel have exceeded the limits specified in conditions E4, E5 and E6; and

(c) consideration of improvements to the tunnel air quality management system.

The Tunnel Air Quality Management Systems Effectiveness Report is to be prepared by the Proponent and reviewed by a suitably qualified and experienced independent specialist(s) whose appointment has been approved by the Secretary.

The Proponent must comply with any requirements arising from the Secretary's review of the Tunnel Air Quality Management Systems Effectiveness Report

The purpose of this report is to document the independent specialist review of the Tunnel Air Quality Management Systems Effectiveness Report (hereafter, the Report), prepared by Fulton Hogan Egis O&M Pty Ltd (FHEOM), dated 20 October 2020.

1.1 Experience of the independent specialist reviewer

Ronan Kellaghan has been appointed and approved to act as the independent specialist reviewer. Ronan has 18 years of professional experience and has been consulting in air quality for the past 15 years. His areas of expertise include dispersion modelling, emission estimation, odour assessment, monitoring, management and greenhouse gas assessment. Ronan has delivered significant consultancy projects for government, and in the private sector has delivered over 100 air quality assessments for industries including transport and infrastructure, energy and energy from waste, mining and extractive, waste and wastewater treatment, food and agriculture. Ronan has prepared and presented evidence for the NSW Land & Environment Court and been involved in legal mediation and Section 34 conferencing. He has presented on air quality issues for a

Senate Enquiry into air quality and health and engaged with the community through community consultation committees for various projects.

2 Review

Section 1 of the Report provides the Notification of In-Tunnel above-limit reading sent to DPIE¹, EPA and NSW Health for a Carbon Monoxide (CO) exceedance on 26 September 2020. The notification reports that a suspected fault or reporting error with one of the instruments resulted in the elevated readings for CO. It is noted that the cover page for the Report is incorrect, as it refers to a previous visibility exceedance on 12 August 2020. This should be updated for the final report.

2.1 Summary of performance and details of exceedances

MCoA E9 requires that the Tunnel Air Quality Management Systems Effectiveness Report includes:

- the overall performance and concentration levels in the tunnel for the preceding six-month period (or since commencement of operation), including average and maximum levels and time periods; and
- details of any instances where pollutant concentration levels in the tunnel have exceeded the limits.

A summary of the in-tunnel monitoring results for the complete monitoring period is provided in Section 4 of the Report. Monitoring results are provided for all parameters (CO, NO₂, NO_x and visibility) and displayed as plots captured from the data reporting website. While averages and maximums are not explicitly shown, continuous data is displayed for the averaging periods relevant to the limits specified in E4, E5 and E6. Maximums can be inferred from these plots. A summary of all instances where pollutant concentration levels in the tunnel have exceeded the limits is presented in Table 6.

Section 5.4 of the report displays the average and maximum CO concentration data for the 26 September 2020, the day of the above limit reading. The exceedance was a result of short-term increase in concentrations between 17:30 and 17:37, peaking at 17:33. The single elevated spike in the timeseries data presented in Figure 5.4.1 is clearly a data outlier, with concentrations returning to low levels within a few minutes.

There was no increase in in-tunnel concentrations of other pollutants (NO₂ and visibility) for the period of the exceedance, further supporting the conclusion that the above-limit reading was caused by invalid data.

Monitoring results for the ventilation outlets are also provided in Section 4.2 of the Report and there were no exceedances of the ventilation outlet limits on the day of the in-tunnel above limit reading. FHOEM also reviewed in-tunnel traffic data and jetfan data. Traffic was found to be free flowing and no faults or issues were identified with the jetfans.

2.2 Improvements to tunnel air quality management

MCoA E9 requires that the Report includes consideration of improvements to the tunnel air quality management system. As the above-limit reading was caused by a data outlier / incorrect instrument reading, no improvements to the tunnel air quality management system are proposed.

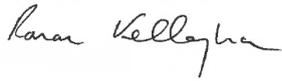
However, the instrument will be inspected at the next planned maintenance site visit or planned tunnel closure. The reporting of data outliers / instrument errors to the website will also be reviewed and improved where needed.

¹ Department of Planning, Industry and Environment

3 Conclusion

My review of the Tunnel Air Quality Management Systems Effectiveness Report for a CO exceedance on 26 September 2020, supports the conclusion that the exceedance was caused by an instrument fault / data reporting.

Yours sincerely



Ronan Kellaghan

Associate - Air Quality

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Tunnel Air Quality Management Systems Effectiveness Report

WestConnex M8

To be submitted to DPIE within 20 days of receiving a request from the Secretary in accordance with E9

Details of the exceedance

Attach relevant Notification of Above-limit Reading

This report has been prepared to address the requirements under MCoA E9: “Within 20 working days of any request by the Secretary a Tunnel Air Quality Management Systems Effectiveness Report on the overall system performance and cause and major contributor of any exceedances, detailing the following:

- a) The overall performance and concentration levels in the tunnel for the preceding six month period (or since commencement of operation, where the SSI has operated for under 6 months), including average and maximum level and time periods
- b) Details of any instances throughout the operation of the SSI where pollutant concentration levels in the tunnel have exceeded the limits specified in conditions E4, E5 and E6; and
- c) Consideration of improvement to the tunnel air quality management systems

The notification of In-tunnel above-limit reading was issued to Secretary, EPA and NSW Health as required under MCoA E6 (refer to Section 1 of this report).

Refer to section 1 for details of the exceedance.

Was the data valid?

If invalid, include any details or justifications for the invalidity

No. The root cause of the exceedance was an issue with the PLC located in the relevant cross passage. This will be investigated in the upcoming maintenance closure.

The overall performance and concentration levels in the tunnel for the preceding six month period, including average and maximum levels and time periods

The in-tunnel concentration levels since commencement of operations can be seen in Section 4.1.

Details of any instances throughout the operation of the SSI where pollutant concentration levels in the tunnel have exceeded the limits specified in conditions E4, E5 and E6

Attach relevant previous Notification of Above-Limit Reading

In-tunnel visibility has exceeded the limit of 0.005 m^{-1} on one instance, on the:

- 12th August 2020
 - Eastbound maximum reading of (0.0645 m^{-1})
 - Westbound maximum reading of (0.0319 m^{-1})

Consideration of improvements to the tunnel air quality management system

This is to include consideration of improvements to the tunnel air quality management system so as to achieve compliance with the In-tunnel limits.

Inspect AQS31804 and PLC at upcoming tunnel closure. Change system information location of AQS31804 from westbound to eastbound.

Person responsible for report

Name	Peter Redwin
Position	Head of Operations and Maintenance
Organisation	WestConnex Transurban
Date	20.10.2020

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1. In Tunnel above-limit Reading Notification

Notification of In-Tunnel above-limit reading WestConnex M8 To be notified immediately to Project Company and TfNSW. Project Company is to notify DPE, EPA and NSW Health within 24 hours.		
Date	26 September 2020	
Time (start and finish)	17:30 – 17:33	
Relevant location within the tunnel	Westbound	
Relevant limit	<input type="checkbox"/> CO – Rolling 15-minute average of 87 ppm	
	<input type="checkbox"/> CO – Rolling 30-minute average of 50 ppm	
	<input checked="" type="checkbox"/> CO – Rolling 3-minute average of 200 ppm (single point)	
	<input type="checkbox"/> NO ₂ – Rolling 15-minute average of 0.5 ppm	
	<input type="checkbox"/> Visibility – Rolling 15-minute average of 0.005 m ⁻¹	
Above-limit reading Detail the above-limit reading that was received	Westbound: A 3-minute average of 299.89 ppm	
Duration Detail the duration of the above- limit reading or event	3 minutes	
Nature of event Detail nature of the event that contributed to the above- limit reading	A suspected fault with AQS31804 have caused elevated readings of Carbon Monoxide to upload to the website. The readings have subsequently returned to normal levels.	
Was the data valid? If unknown at this stage, please indicate.	No.	
Was there an emergency? Refer section 6.5 of this Plan. If this is unknown at this stage, please indicate.	No.	
Measures employed Detail measures employed to minimise the concentration levels	N/A	
Commitment to prepare and submit a Tunnel Air Quality Management Systems Effectiveness Report A Report on Above-limit Reading will be prepared following any request by the Secretary in accordance with E9 for this notification. Please note that a Report is not required in the event of an emergency.		
Person responsible for notification	Name	Peter Redwin
	Position	Head of Operations and Maintenance
	Organisation	WestConnex Transurban

2. Data Acquisition and Processing

2.1 In-tunnel Locations of Air Quality Sensor

The M8 tunnel (SSI 6788) air quality sensors (AQS) provide direct in-situ measurements of NO₂, NO, CO and visibility. These are linked to the Plant Monitoring and Control System (PMCS) for continuous monitoring. A total of 10 air quality monitors have been installed and commissioned for the eastbound tunnel and ramps and 10 for the westbound tunnel and ramps, for a total of 20 air quality sensors. Monitors have been located at portals, junctions and supply/exhaust points (for normal operation) to enable a representative measurement of the nominated pollutants across the length of the tunnel. The location of in-tunnel air quality sensors are identified in Figure 1. Table 1 list the AQS examined for this report.

Figure 1: In-tunnel air quality monitoring locations (source: NM5-EN-PLN-PWD-0047-1-A-OEMP)

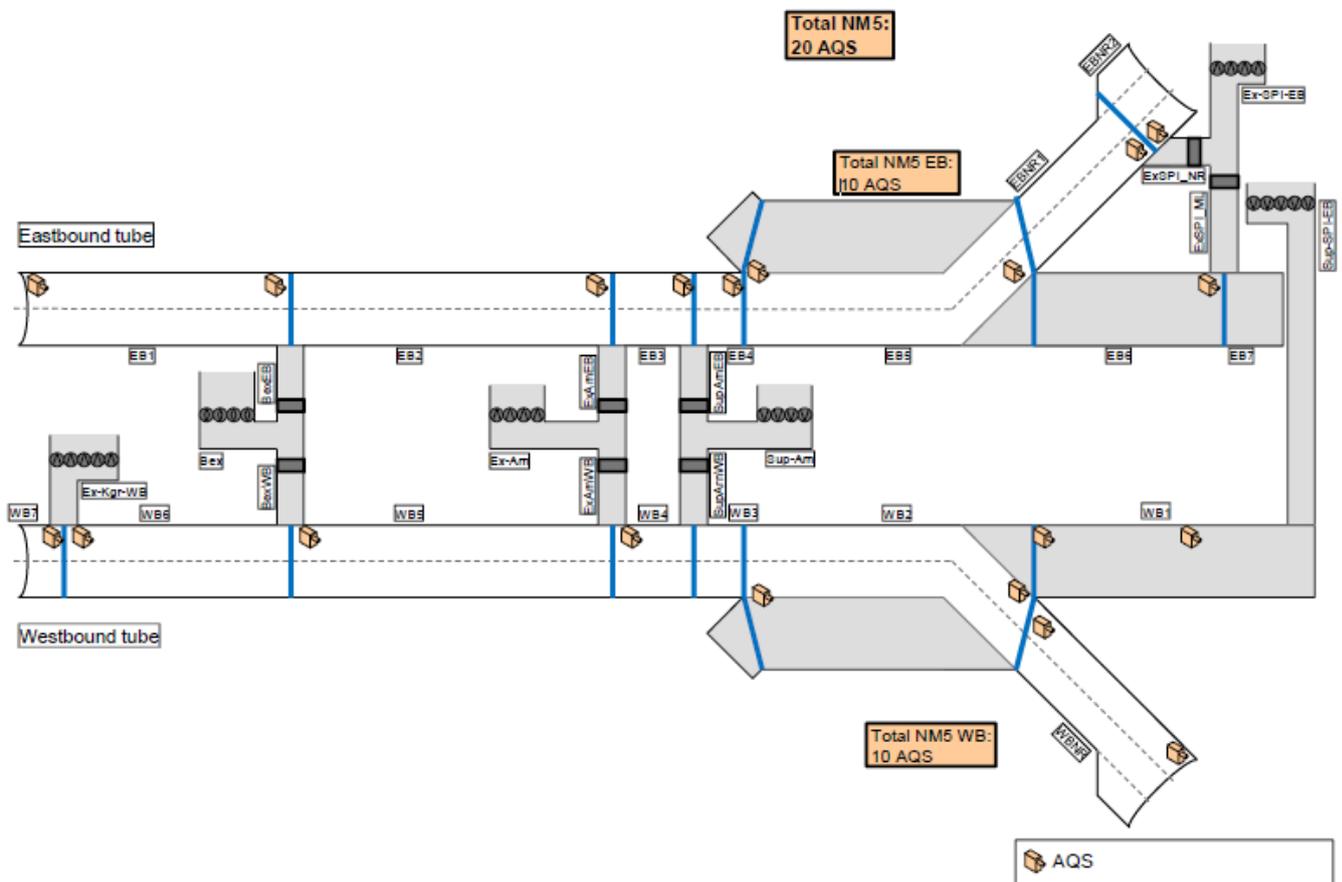


Table 1: Air quality sensors and their locations reviewed for TAQM SER report.

Eastbound	Westbound
AQS31804	AQS31001
AQS31701	AQS31201
AQS31603	AQS31205
AQS31503	AQS31303

2.2 Data monitoring methodology

The pollutants, units, frequency and method required under condition E2 of the infrastructure approval is referenced below in table 2.

Table 2: In-tunnel monitoring methodology (CoA E2) (source: NM5-EN-PLN-PWD-0047-1-A-OEMP)

Pollutant / parameter	Units of measure	Frequency	Method
CO	ppm	Continuous	Special Method 1 ¹ – Infrared spectroscopy technique
NO ₂	ppm	Continuous	Special Method 1 ¹ – Differential absorption
Visibility	m ⁻¹	Continuous	Special Method 1 ¹ – Light transmission opacity technique

Note: 1. Special Method 1 means a method approved by the Secretary in consultation with the EPA.

3. In-tunnel air quality concentration limit tables

Tables 3 to 5 show the concentration limits relevant to this report, as specified under conditions E4, E5 and E6.

Table 3: Condition E4. Concentrations limits of CO and NO₂, calculated along the length of the tunnel, specified for that pollutant.

Pollutant	Concentration Limit	Units of measurement	Average Period
CO	87	ppm	Rolling 15-minute
CO	50	ppm	Rolling 30-minute
NO ₂	0.5	ppm	Rolling 15-minute

Table 4: Condition E5. Concentration limit of CO as measured at any single point in the tunnel, under all conditions (including congested conditions)

Pollutant	Concentration Limit	Units of measurement	Average Period
CO	200	ppm	Rolling 3-minute

Table 5: Condition E6. The tunnel ventilation system must be designed and operated so that the visibility in the tunnel does not exceed the level specified

Pollutant	Concentration Limit	Units of measurement	Average Period
Visibility	0.005	m-1	Rolling 15-minute

(Source: Westconnex Stage 2-New M5 SSI 6788)

4. SSI 6788 In-tunnel monitoring results

The following diagrams were captured from the official website for the Air Quality Monitoring for the M8. (www.linkt.com.au/sydney/using-toll-roads/about-sydney-toll-roads/westconnex-m8/tunnel-air-quality) This is inclusion for all data captured required under the SSI 6788 infrastructure approval.

In-tunnel data for visibility, Figure 4.1.1, shows eastbound (yellow) and westbound (blue) readings are below exceedance limits as specified in condition E6. Figures 4.1.2 shows the CO three-minute maximum readings for both eastbound and westbound since commencement of operation. The maximum data spike occurring on 26th September, is the only above limit reading reported since commencement of operations. Figures 4.1.3 to 4.1.5 show all other in-tunnel pollutant readings since the commencement of operations have not surpassed concentration limits outlined in section 3.

To help evaluate the effectiveness of the tunnel air quality management system, ventilation outlet data captured from the linkt website is displayed in Section 4.2. SSI 6788 ventilation outlet facilities are located at Arncliffe, St Peters and Kingsgrove and monitor air pollutants released from tunnel emissions and is licensed under EPL #21372. Table 6 is a summary of the above limit exceedances reported to date for SSI 6788 and investigation findings for each exceedance.

4.1 In-tunnel Data

Figure 4.1.1 Visibility – 15 min rolling period, eastbound and westbound (3rd July to 5th October 2020). No above-limit readings eastbound or westbound.

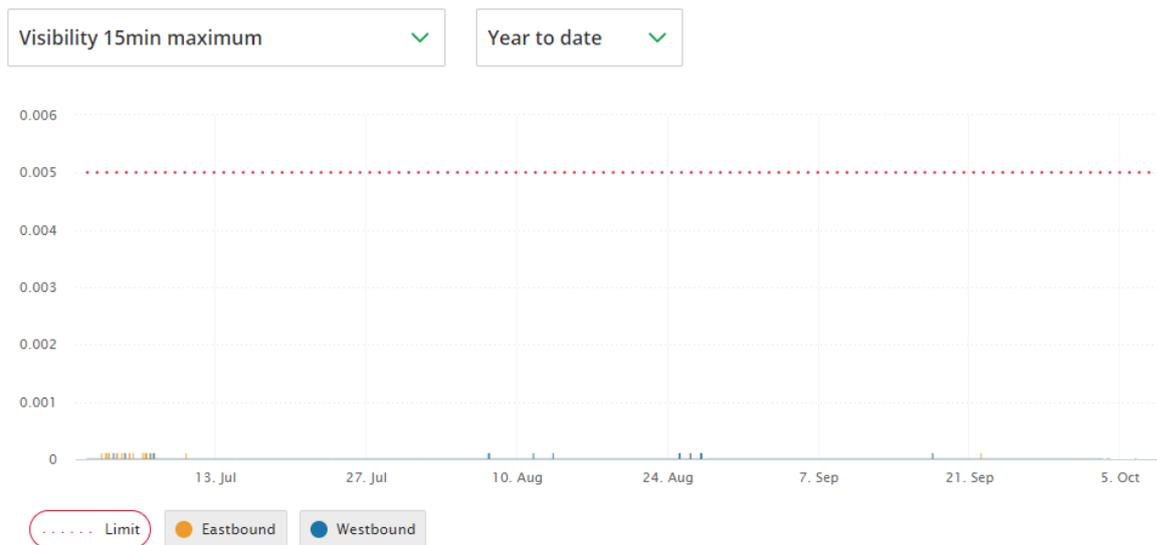


Figure 4.1.2 Carbon Monoxide – 3min maximum-eastbound and westbound (3rd July to 5th October 2020). Above limit reading, 26 September 2020, westbound 299.89 ppm.

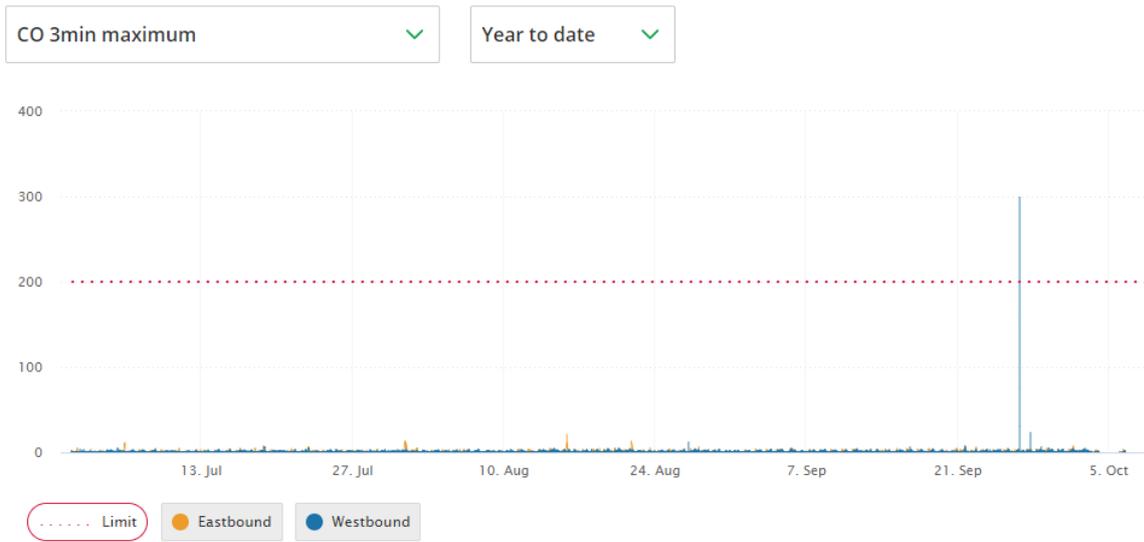


Figure 4.1.3 Carbon monoxide – 15min maximum-eastbound and westbound (3rd July to 5th October 2020). No above limit readings.

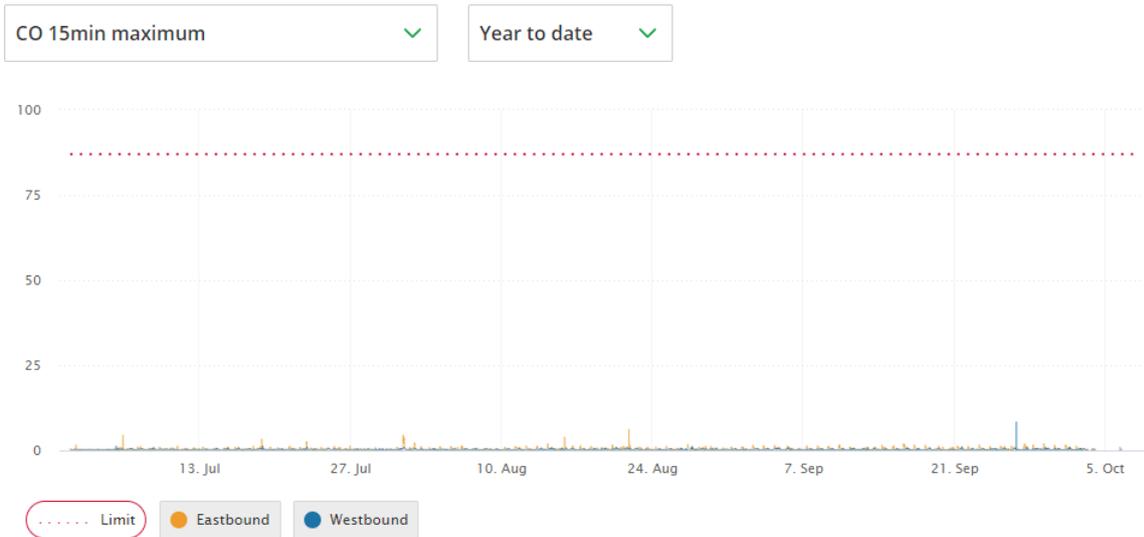


Figure 4.1.4 CO – 30min maximum- eastbound and westbound (3rd July to 5th October 2020). No above limit readings.

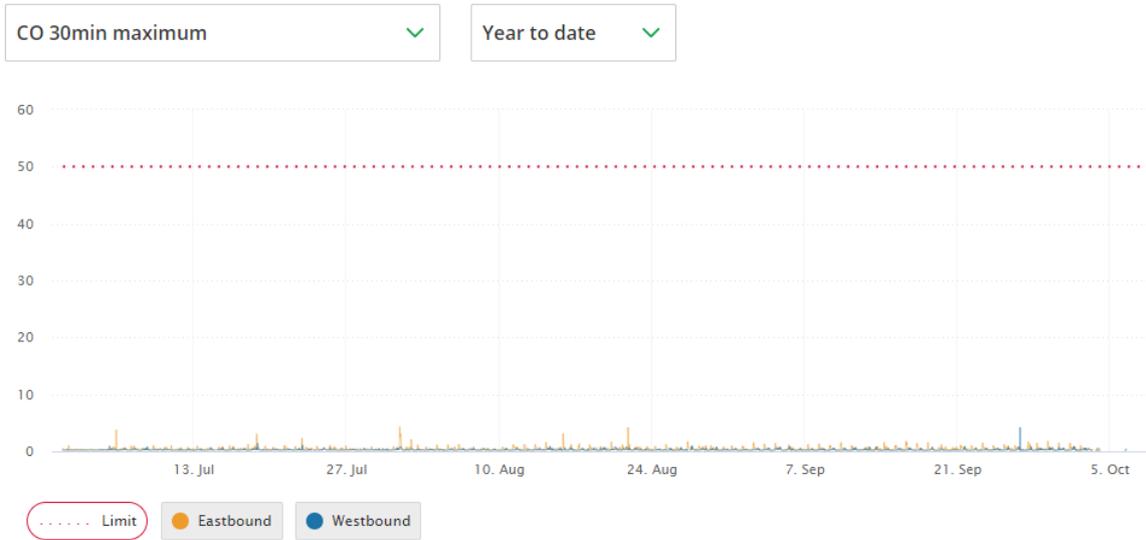
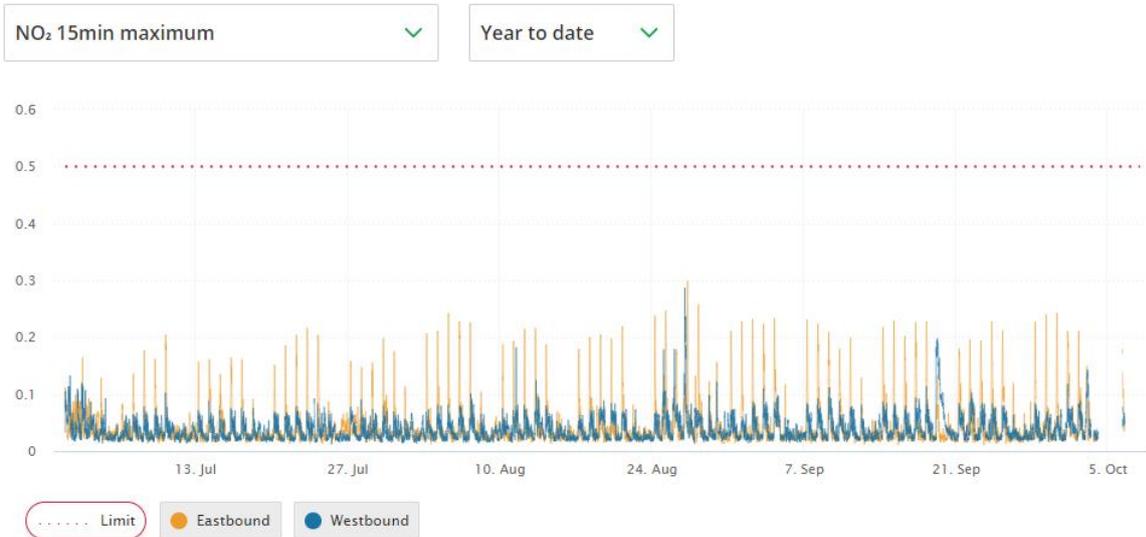


Figure 4.1.5 Nitrogen dioxide – 15min maximum- eastbound and westbound (3rd July to 5th October 2020). No above-limit readings.



4.2 Ventilation outlet data year to date (Arncliffe, Kingsgrove and St Peters ventilation facilities)

Figure 4.2.1 Carbon monoxide- 1 hour average (3rd July to 5th October 2020). No above limit readings.

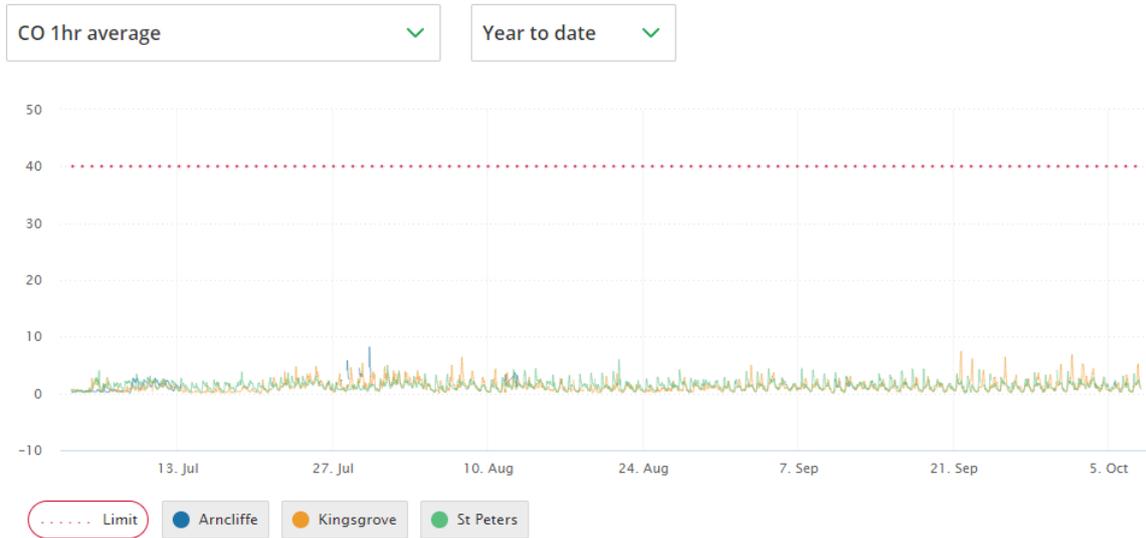


Figure 4.2.2 Nitrogen dioxide - 1 hour average (3rd July to 5th October 2020). No above-limit readings.

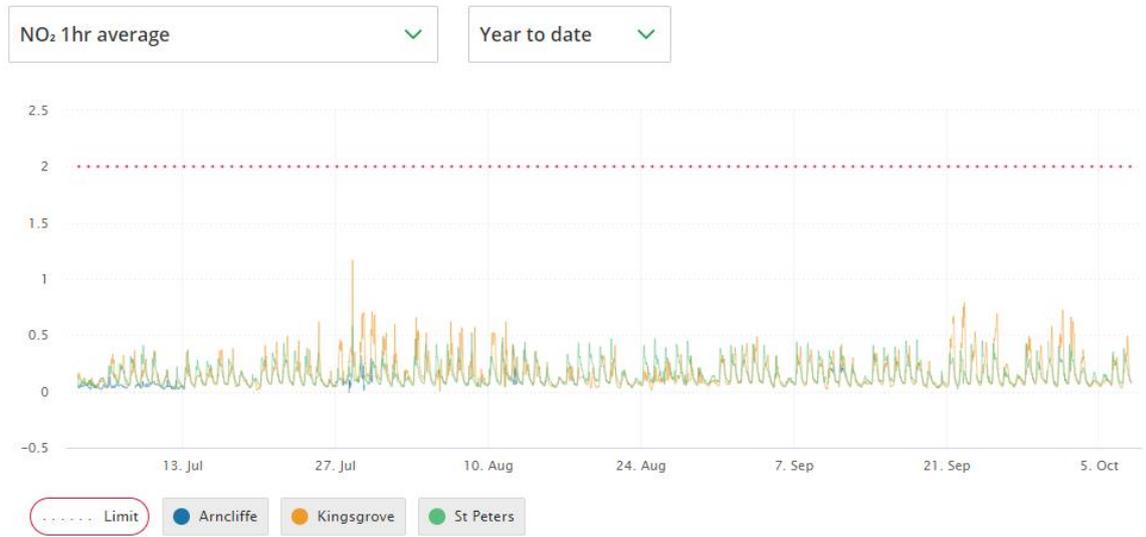


Figure 4.2.3 NO_x 1 hour average (3rd July to 5th October 2020). No above-limit readings.

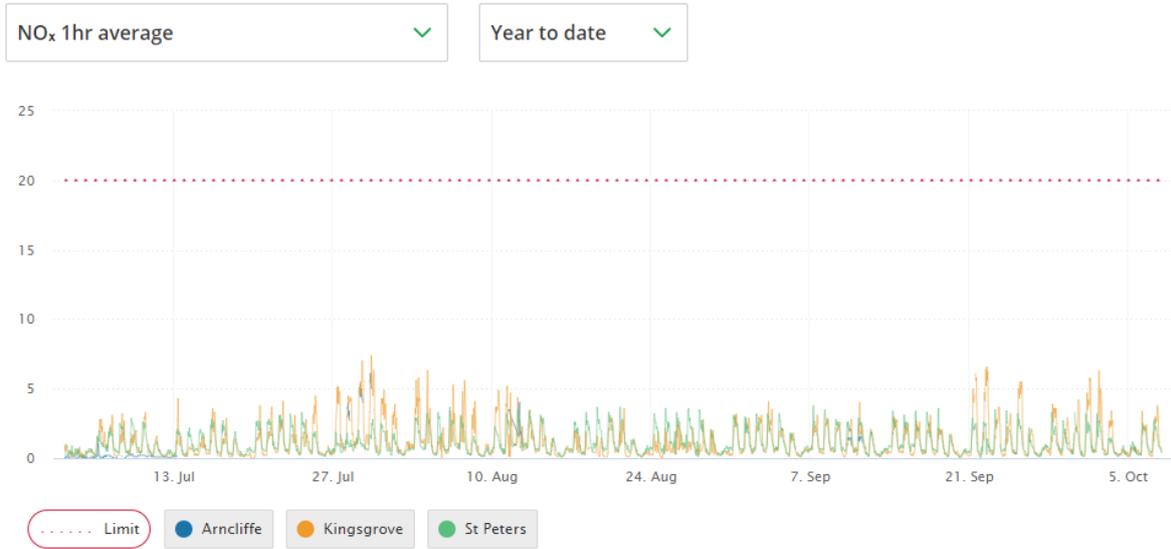


Figure 4.2.4 Solid particles 1 hour average (3rd July to 5th October 2020). Refer Table 6 for above-limit readings.

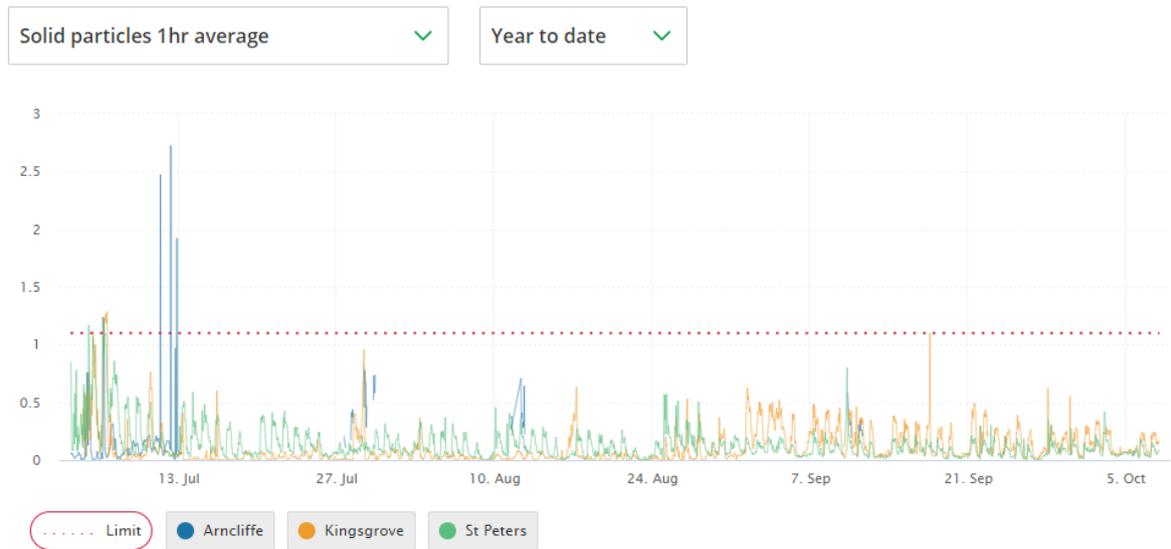


Figure 4.2.5 VOC 1 hour average (3rd July to 5th October 2020). No above-limit readings

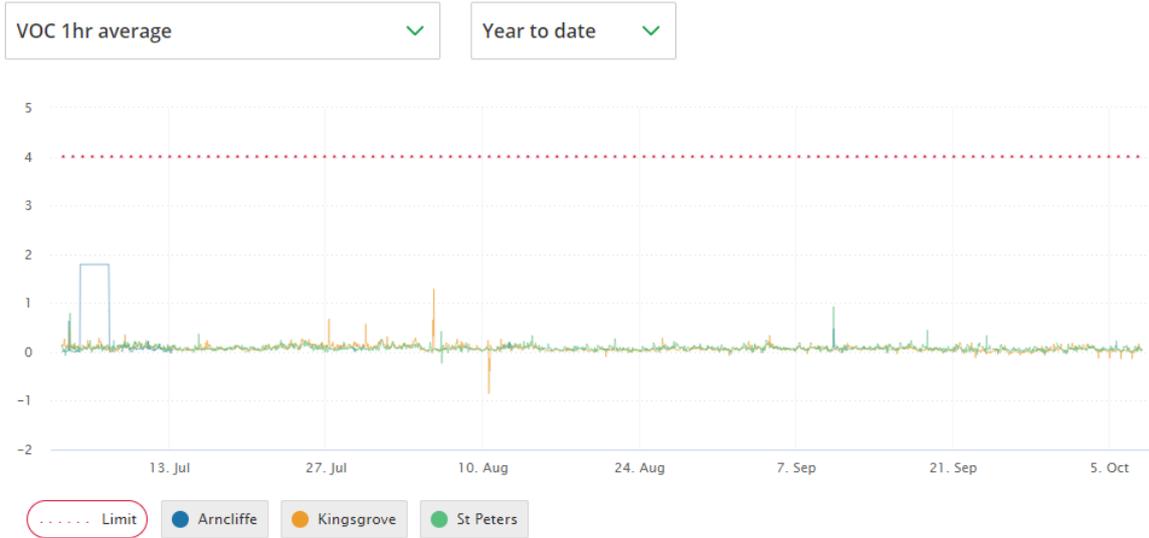


Table 6: Summary of SSI 6678 ventilation outlet exceedances from 3rd July to 5th October 2020.

Date	Site	Pollutant	Measurement	Validity	Report Conclusion	Improvement implemented
5.07.2020	Kingsgrove	Solid Particles	1.115 mg/m ³	Valid	Residual construction dust	Road sweeping
6.07.2020	Kingsgrove	Solid Particles	1.225 mg/m ³	Valid	Residual construction dust	Road sweeping
	Arncliffe	Solid Particles	1.235 mg/m ³	Valid	Residual construction dust	Road sweeping
	St Peters	Solid Particles	1.241 mg/m ³	Valid	Residual construction dust	Road sweeping
11.07.2020	Arncliffe	Solid Particles	2.473 mg/m ³	Invalid	Human error-incorrect conversion factor	Correct conversion factor used
12.07.2020	Arncliffe	Solid Particles	2.723 mg/m ³	Invalid	Human error-incorrect conversion factor	Correct conversion factor used
			1.918 mg/m ³			
17.09.2020	Kingsgrove	Solid Particles	1.101 mg/m ³	Valid	Disturbance of settled particulates in the westbound stub	Review work permits and SWMS of contractors working within stub

5. SSI 6788 Event Reports

5.1 Operations Management Control System (OMCS)

The Operations Management and Control System (OMCS) comprises:

- Traffic Monitoring and Control System (TMCS) – represents the hardware and software systems and equipment that monitor and control all traffic-related devices on the Motorway, in real time. The TMCS enables the operators to control and observe the status of traffic control devices
- Plant Monitoring and Control System (PMCS) – represents the hardware and software systems and equipment that monitor and control Motorway plant, sub-systems and equipment in real time. The PMCS enables the MCC Operator to observe the status and control of tunnel including pumps, lighting, ventilation, drainage and fire protection systems as required to provide effective response to incidents
- Incident Management System (IMS) – provided as part of the PMCS/TMCS control system software. The IMS provides the interface through which operators will manage events. The system will:
 - o Ensure that an operator's actions are consistent with agreed pre-planned ITPs and TCPs
 - o Automate operator tasks
 - o Control sub-systems
 - o Record details of actions and incident information for incident de-briefing

The OMCS controls the road closure as an automated and orderly, integrated process and ensures the sequencing of actions on multiple devices.

5.2 In-tunnel traffic congestion and emergency events data (3rd July to 6th October 2020) from OMCS

Traffic data taken from the OMCS has been reviewed for above limit readings, both eastbound and westbound. The data period reviewed was from operation commencement to 6th October 2020. Traffic flow has been identified as free flowing, with no traffic jams or congestion being recorded and no validated emergency events.

5.3 Jet fan responses to in tunnel events (3rd July to 6th October 2020) from OMCS

Jet fans within the tunnel respond automatically to rises in pollutant concentrations to alleviate visibility issues resulting in potentially dangerous driving conditions. Data taken from the PMCS was reviewed. Jet fans within the tunnel were all functioning normally with ramp up activity correlating with heavier, peak hour, traffic flow volumes. Exhaust fan activity at ventilation facilities also showed no atypical activity, the exception being on the 17th September 2020 where an inadvertent emergency event was activated during planned maintenance work (refer to Table 6).

5.4 Carbon monoxide data from westbound and eastbound AQS from OMCS

Figures 5.4.1 and 5.4.2 respectively show CO data recorded for eastbound and westbound AQS on 26th September. An above-limit reading recorded eastbound at AQS31804 is clearly displayed (5.4.1) but all westbound readings are below limit concentration levels specified in section 3.

Table 7 shows the average and maximum rolling 3 minute average carbon monoxide measurements for individual air quality sensors investigated for this report (section 2.1 Table 1) on the 26th September 2020.

The average CO reading from westbound AQS on 26th September, over a 24 hour time period, was 0.595 ppm, and the maximum value reached was 5.08 ppm from AQS31303 at 15:32 hours. The average AQS eastbound CO reading recorded on 26th September over 24 hours was 1.168 ppm. The maximum CO measurement recorded was 299.94 ppm at 17:33 on 26th September, by AQS31804.

Table 7: Average and maximum rolling 3-minute average carbon monoxide levels recorded on 26th September 2020 from eastbound and westbound AQS.

AQS	Average (ppm)	Maximum (ppm)
AQS31804	3.01	299.94
AQS31701	0.68	3.29
AQS31603	0.87	3.52
AQS31503	0.77	3.72
AQS31303	1.05	5.08
AQS31205	0.96	4.41
AQS31201	0.19	1.47
AQS31001	0.24	1.54

Figure 5.4.1: OMCS data for CO on 26th September 2020, eastbound AQS.

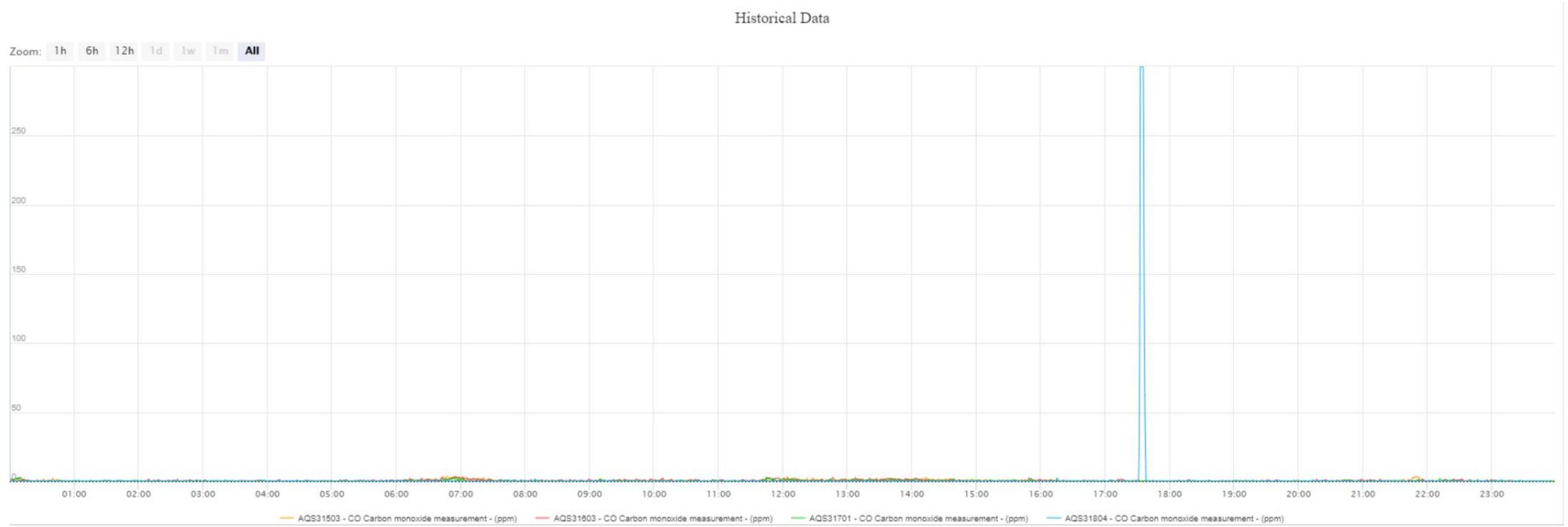
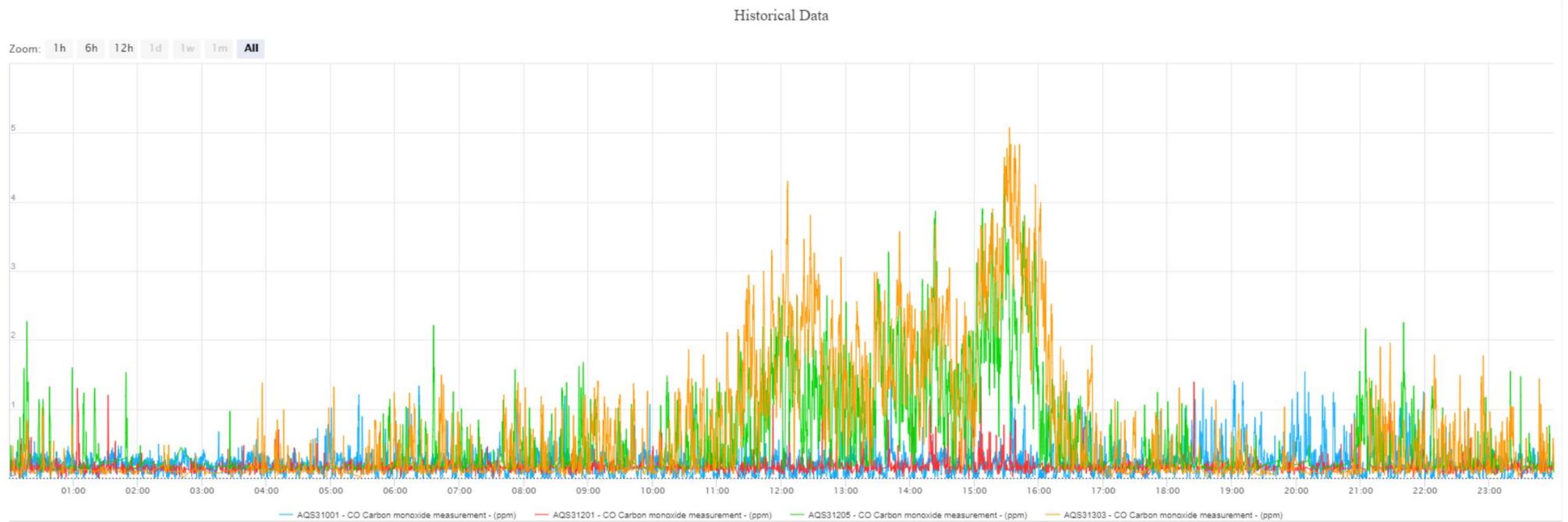


Figure 5.4.2: OMCS data for CO on 26th September 2020, westbound AQS.



6. Root Cause; AQS31804 analysis and recommendations for improvements

Analysis of OMCS data (Section 5.4) revealed AQS31804 recorded the above limit reading on 26th September 2020. Figure 6.1.1 shows the CO measurements recorded from AQS31804 since the commencement of operations and clearly show no other above level limits have occurred from this monitor. Reviewing of OMCS raw data for AQS31804 found at 17:30 hours on 26th September, AQS31804 monitor readings began to increase, peaking at 17:33 hours to 299.94 ppm and subsided by 17:37 hours (raw data not included in this report). No in-tunnel conditions were found to attribute to this increase. Such excessively high levels of CO peaking and falling over a 7 minute time period, with no other monitoring parameters showing a similar trend change, suggests that the root cause was due to instrument error or an error with the related PLC (programable logic controller) being the more likely cause. It is also evident that a system error in the data uploading to the linkt website has occurred. The reported direction of the above-limit reading was westbound, however the instrument that recorded the above-limit reading is in the eastbound tunnel. Figure 6.1.2 is a schematic from the OMCS showing the location of AQS31804.

To improve the reporting of errors being uploaded to the linkt website, the proponent will inspect AQS31804 during an upcoming planned tunnel closure. It is also recommended that the location information of AQS31804 being reported the linkt website be corrected.

Figure 6.1.1 OMCS data for CO from westbound AQS31804 3rd July to 6th October 2020

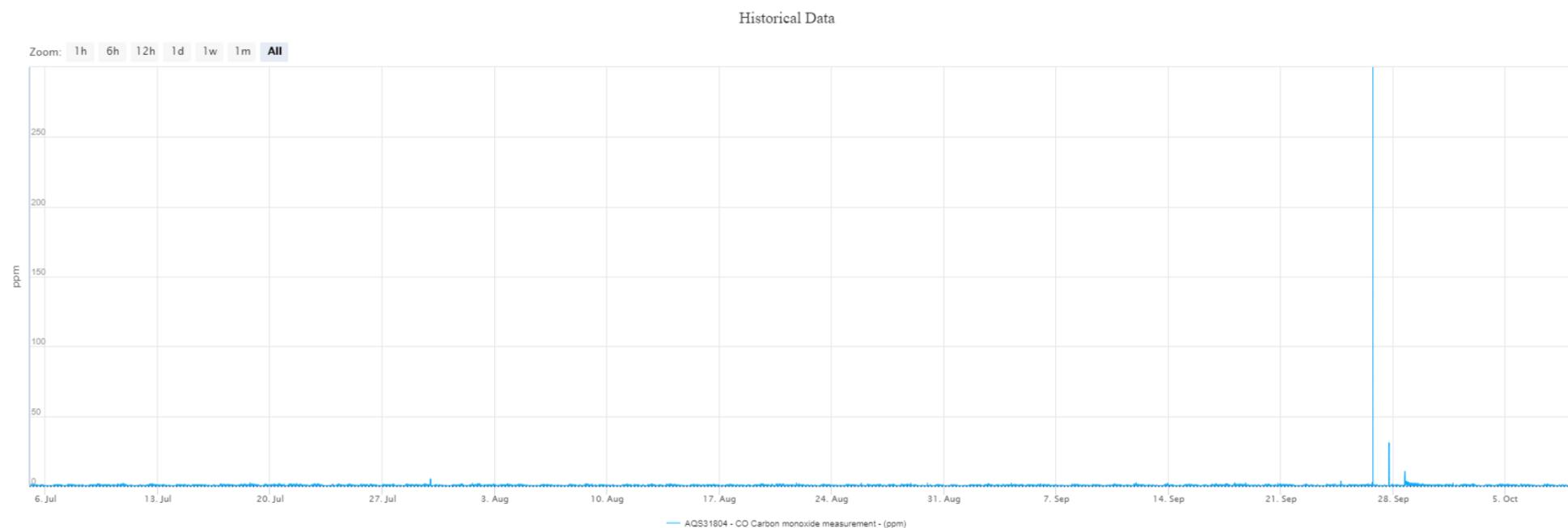
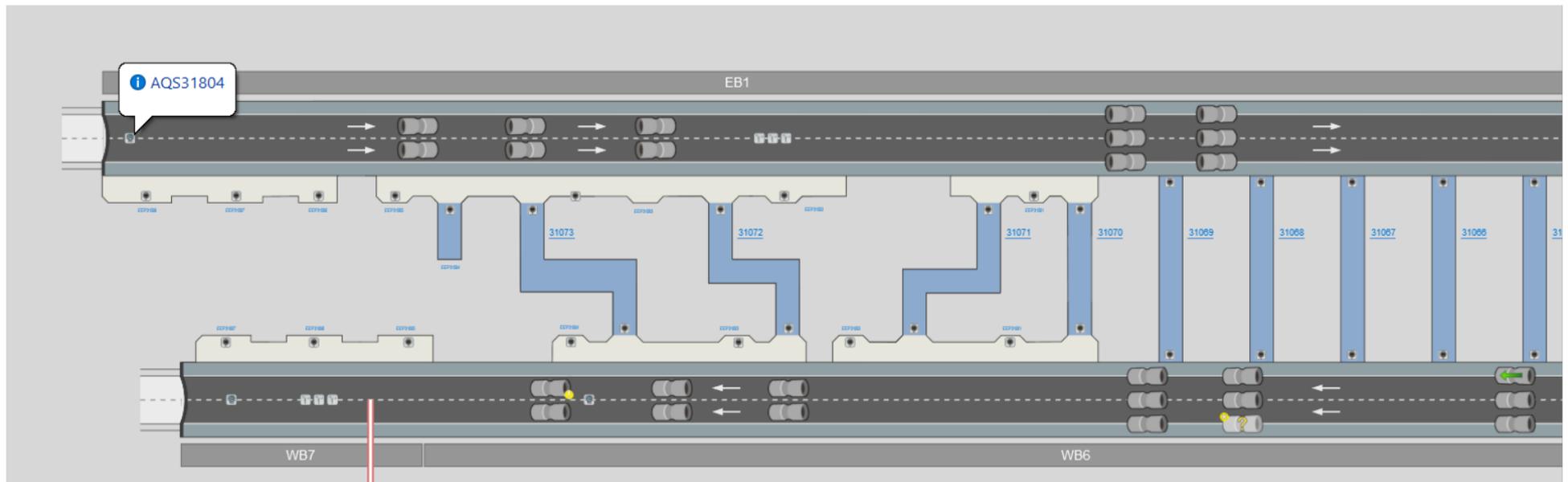


Figure 6.1.2 OMCS schematic diagram showing location of AQS31804 location is in the eastbound tunnel.



7. Conclusion

The M8 (New M5) tunnel, SSI 6788, opened on the 4th of July 2020. Since commencement of operation, air quality sensors have continuously monitored tunnel conditions. Ventilation and ambient monitoring have also occurred as part of the infrastructure approval. Notification of an in-tunnel CO above-limit reading occurred on 26th September 2020, westbound, of 299.89 ppm, at 17:30 -17:33 hours. This report investigated the effectiveness of the tunnel air quality monitoring management system since the commencement of opening, in accordance with condition E9 of SSI 6788 approval.

Examination of in-tunnel linkt air quality data, ventilation outlet data and OMCS air quality monitor data found that instrument, in-particular, system errors, was the root cause of the exceedance. Eastbound* AQS31804 reported a sharp rise and fall in CO over a 7-minute time period, and the maximum reading of 299.84 ppm equates to the PLC maximum scale reading. No in-tunnel events (eg traffic congestion, stopped vehicles, accidents, fires) were found that may have attributed to the above-limit CO reading (Section 5). Ventilation outlet data were also examined and there were no coinciding pollutant exceedances reported on the 26th September 2020.

No immediate corrective action was taken as the instrument readings normalised. Planned inspections of AQS31804 are recommended as well as adjusting system information to reflect the correct location of AQS31804 as an eastbound sensor, not westbound.

In conclusion, the in-tunnel above limit CO readings reported on the 26th September 2020 of 299.84 ppm was invalid data uploading to the linkt website due to instrument faults.

8. Definition and Acronyms

	Description
AQA	Air Quality Analyser
AQS	Air Quality Sensor
IMS	Incident Management System
NOx	The total concentration of all nitrogen oxide gases.
NO2	Nitrogen Dioxide
OMCS	Operation Management Control System
PLC	Programmable Logic Controller
PMCS	Plant Monitoring and Control System
TMCS	Traffic Monitoring and Control System

9. Appendix A: Previous in-tunnel above limit notification

Notification of In-Tunnel above-limit reading WestConnex M8 <small>To be notified immediately to Project Company and TfNSW. Project Company is to notify DPE, EPA and NSW Health within 24 hours.</small>		
Date	12 August 2020	
Time (start and finish)	12:45 - Current	
Relevant location within the tunnel	Eastbound & Westbound	
Relevant limit	<input type="checkbox"/> CO – Rolling 15-minute average of 87 ppm	
	<input type="checkbox"/> CO – Rolling 30-minute average of 50 ppm	
	<input type="checkbox"/> CO – Rolling 3-minute average of 200 ppm (single point)	
	<input type="checkbox"/> NO ₂ – Rolling 15-minute average of 0.5 ppm	
	<input checked="" type="checkbox"/> Visibility – Rolling 15-minute average of 0.005 m ⁻¹	
Above-limit reading Detail the above-limit reading that was received	Eastbound: 0.0645 m ⁻¹ 15-minute rolling average Westbound: 0.0319 m ⁻¹ 15-minute rolling average	
Duration Detail the duration of the above- limit reading or event	5hrs from initial exceedance until time of notification.	
Nature of event Detail nature of the event that contributed to the above- limit reading	Adjustments made to the in-tunnel data management and reporting system has resulted in the implementation of the improper conversion factor. Currently the data is invalid.	
Was the data valid? If unknown at this stage, please indicate.	No.	
Was there an emergency? Refer section 6.5 of this Plan. If this is unknown at this stage, please indicate.	No.	
Measures employed Detail measures employed to minimise the concentration levels	N/A	
Commitment to prepare and submit a Tunnel Air Quality Management Systems Effectiveness Report A Report on Above-limit Reading will be prepared following any request by the Secretary in accordance with E9 for this notification. Please note that a Report is not required in the event of an emergency.		
Person responsible for notification	Name	Peter Redwin
	Position	Head of Operations and Maintenance
	Organisation	WestConnex Transurban