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29 May 2021

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

Re: M8/New M5 Approval Condition E21 - review of ventilation outlet above-limit report

Dear Justin,

1 Introduction

The Ministers Condition of Approval (MCoA) E21 for WestConnex M8 (New M5) include a requirement for ventilation outlets notification and reporting, as follows:

> *Should the results of monitoring show that any of the ventilation outlet limits specified in condition E19 have been exceeded, the Proponent must notify the Secretary, EPA and NSW Health within 24 hours of the recorded event. The notification must be followed up with a detailed report within 20 working days, which must be prepared by the Proponent, reviewed by a suitably qualified and experienced independent specialist(s), and submitted to the Secretary, on the cause and major contributor of the exceedance and the options available to prevent recurrence. The Secretary must approve the independent person/organisation prior to the commencement of operation, or at some other time prior to preparation of the report.*
>
> *Where the operation of the tunnel is identified to be a significant contributor to the recorded exceedance, this report must include consideration of improvements to the tunnel air quality management system so as to achieve compliance with the ambient air quality goals, including but not limited to installation of the additional ventilation management facilities allowed for under condition B5, and discussion of whether those improvements are feasible and reasonable.*

The purpose of this report is to document the independent specialist review of the above-limit exceedance report, prepared by Fulton Hogan Egis O&M Pty Ltd (FHEOM), dated 20 May 2021.

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

MCoA E21 requires that the above-limit exceedance report includes the following:

- cause and major contributor of the exceedance;
- options available to prevent exceedances;
- consideration of improvements to the tunnel air quality management system so as to achieve compliance with ambient air quality goals, including but not limited to installation of the additional ventilation management facilities; and
- discussion of whether those improvements are feasible and reasonable.

2.1 Cause and major contributor

A notification was provided for an elevated VOC concentration recorded at the St. Peters Ventilation Facility (MOC4) on 4 May 2021 at 14:00. However, the short-term spike did not result in an exceedance of the 1-hour average VOC limit (4.0 mg/m^3), with the rolling 1-hour average peaking at 3.4 mg/m^3.

Therefore, a notification of exceedance was not required.

Regardless, FHOEM reviewed in-tunnel monitoring data to investigate the short-term spike in VOC concentrations. The review no other monitoring parameter recorded an increase at the same time as the spike in VOC concentrations. No further action was taken.

2.2 Options to prevent exceedances

The investigation found that no VOC exceedance occurred, therefore no preventative measures were recommended.

2.3 Improvements to tunnel air quality management to achieve compliance with ambient air quality goal

The exceedances of the ambient air quality goals on the 4 May 2021 (for $PM_{2.5}$) are not related to the spike in VOC concentrations. Therefore, no further improvements or discussion was required.

3 Conclusion

My review has found that the above-limit exceedance report has adequately addressed the MCoA E21.

Yours sincerely

Ronan Kellaghan
Associate - Air Quality
rkellaghan@emmconsulting.com.au

Ventilation Outlet Above-Limit Report

WestConnex M8 – St Peters Ventilation Facility

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2	

Originated and revised by

Kim Guven – Quality, Safety, Environment Admin

Reviewed and authorised by

Justin Hazelbrook – Environment and Community Manager

1. Contents

Figures

Report on Ventilation Outlet above-limit reading WestConnex M8 To be submitted to DPIE within 20 days of the Report of Above-Limit Reading	
Details of the exceedance Attach relevant Notification of Above-limit Reading	This report has been prepared to address the requirements under MCoA E21: "Should the results of monitoring show that any of the ventilation outlet limits specified in condition E19 have been exceeded, the proponent must immediately notify the Secretary, EPA and NSW Health. The notification must be followed up with a detailed report within 20 working days, which must be prepared by the proponent, reviewed by a suitably qualified and experienced independent specialist(s), and submitted to the Secretary, on the cause and major contributor of the exceedance and the options available to prevent recurrence." The following parameters were reported with suspected above-limit reading on the 4th of May 2021. Each exceedance was reported to the EPA in accordance with EPL# 21372.
Was the data valid? If invalid, include any details or justifications for the invalidity	Yes. This report has been prepared to identify the root cause of the above limit reading and any other possible contributing factors.
Comparison with long term monitoring trends and background air quality data	N/A
Cause or major contributor of the exceedance If the cause or major contributor are not able to be determined, then known facts of what was occurring at the time should be included (e.g. traffic information, ventilation outlet monitoring records etc)	A spike in VOC (as propane) was recorded at St. Peters Ventilation Facility (MOC4) at 14:00 but quickly dropped below the 4.0 mg/m^3 limit. The 1-hour average was not exceeded, the rolling 1-hour average reading was 3.4 mg/m^3. As a result, this notification was falsely reported as the 1-hour rolling average was not exceeded.
Options to prevent recurrence This is to include consideration of improvements to the tunnel air quality management system to achieve compliance with the ambient air quality goals, including but not limited to installation of the additional ventilation management facilities allowed for under condition B5, and discussion of whether those improvements are feasible and reasonable	
As the 1-hour rolling average was not exceeded, no options to prevent recurrence are suggested.	
Person responsible for report	Name: Peter Redwin
	Position: Head of Operations and Maintenance
	Organisation: WestConnex Transurban
	Date: 20/05/2021

2. Ventilation Outlet Notification - Solid Particles

WestConnex

Ventilation Outlet Notification and Report

Ventilation Outlet Monitoring Notification

Notification of Ventilation Outlet above-limit reading WestConnex M8 To be notified immediately to Project Company and TfNSW. Project Company is to notify DPIE, EPA and NSW Health within 24 hours.	
Date	04 May 2021
Time (start and finish)	14:00 – 15:00
Relevant location	☐ Kingsgrove Ventilation Facility
	☐ Arncliffe Ventilation Facility
	☒ St Peters Ventilation Facility
Relevant limit	☐ Solid particles – 1-hour average of 1.1 mg/m^3
	☐ NO_2 or NO or both, as NO_2 equivalent – 1-hour average block of 20 mg/m^3
	☐ NO_2 – 1-hour block average of 2.0 mg/m^3
	☐ CO – 1-hour rolling average of 40 mg/m^3
	☒ VOC – 1-hour rolling average of 4.0 mg/m^3
Above-limit reading Detail the above-limit reading that was received	1-hour average reading of 4.10 mg/m^3
Duration Detail the duration of the above-limit reading or event	1-hour per above-limit reading
Nature of event Detail nature of the event that contributed to the above- limit reading	VOC non-methane levels exceeded the 1-hour limit. Ventilation was increased, and the levels reduced. No maintenance or calibration works were occurring at the time, investigations are ongoing.
Was the data valid? If unknown at this stage, please indicate.	Yes.
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	The ventilation level was increased, the corresponding VOC levels began to trend downwards.
Commitment to prepare and submit a Report on Above-Limit Reading A Report on Above-Limit Reading will be prepared 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

3. Overview of Tunnel Ventilation System

The environmental performance of the WestConnex M8 tunnel (SSI-6788) is monitored by capturing air quality data, as one parameter, used to assess environmental impacts of the tunnel. Tunnel ventilation enables the tunnel to operate with acceptable air quality at all times. The tunnel ventilation system is part of the overall Plant Monitoring and Control System (PMCS) and consists of:

- Exhaust fans
- Supply fans
- Jet fans mounted throughout the tunnel and ramps
- Shutoff and balancing dampers
- Air-flow, pollution and thermal measurement equipment both within the tunnel and at the outlets
- Plant control system
- Kingsgrove Ventilation Facility within the M5 Motorway corridor at MOC1 – the facility serves the westbound traffic within the project tunnel
- Bexley Ventilation Building between Wolli Creek and the M8 Motorway at MOC2 – the building provides supply or exhaust in emergency conditions (refer to Section 8.2 of the OEMP regarding ‘emergency’ conditions and management)
- Arncliffe Ventilation Building at the Kogarah Golf Course at MOC3 – the facility provides supply and/or exhaust in normal and emergency conditions
- St Peters Ventilation Facility within the St Peters interchange at MOC4 – the facility provides supply and/or exhaust from the mainline eastbound tunnel and exhaust from the St Peters interchange (tunnels and off ramps) for normal and emergency operation.

The ventilation control system software module has the ability to control the required level of ventilation to be operated (including corresponding numbers of supply, exhaust and jet fans within the tunnel) depending on in-tunnel air quality results in order to comply with the minimum air-quality limits under normal operation.

In accordance with CoA B4, the tunnel ventilation system will be operated to release emissions from the ventilation outlets only, and to avoid emissions from the portals and/or the emergency smoke extraction facilities at Bexley (MOC2) and Arncliffe (MOC3), except for emergency smoke management purposes and during periodic testing of the system.

4. Air Quality Monitoring

The maps within section 3.1, were taken directly from the Operational Management Control System (OMCS) and show the location air quality monitoring facilities and ambient stations used on the M8 tunnel. The air quality analysers used in ventilation facilities (MOC1 Kingsgrove, MOC3 Arncliffe and MOC4 St Peters) monitor the following pollutants within the tunnel exhaust:

- Solid Particles
- Oxides of Nitrogen - NO_X
- Nitrogen Dioxide – NO_2
- Carbon Monoxide – CO
- Volatile Organic Compounds – VOC's (as propane).

The pollutants and the corresponding limits and units of measure monitored at ventilation outlets are listed in Table 1 below.

Table 1. SSI-6788 Infrastructure Approval (condition E19)

Table 10 — Ventilation Outlet Mass Pollutant Concentrations

Pollutant	100 percentile limit	Units of measurement	Averaging period	Reference conditions
Solid particles	1.1	mg/m^3	1 hour, or the minimum sampling period specified in the relevant test method, whichever is the greater	Dry, 273K, 101.3kPa
NO_2 or NO or both, as NO_2 equivalent	20	mg/m^3	1 hour block	Dry, 273K, 101.3kPa
NO_2	2.0	mg/m^3	1 hour block	Dry, 273K, 101.3kPa
CO	40	mg/m^3	1 hour rolling	Dry, 273K, 101.3kPa
VOC (as propane)	4.0	mg/m^3	1 hour rolling	Dry, 273K, 101.3kPa

4. Operations Management Control Systems

The Operations Management Control System (OMCS) is the overall governing control system that ensures; the motorway operates safely, mitigates the effects of incidents, safeguards from damage and improve situational awareness. The OMCS controls the road closure as an automated and orderly integrated process and ensures the sequencing of actions on multiple devices. The OMCS encompasses the following;

4.1 Plant Management Control System - PMCS

The PMCS represents the hardware and software systems that monitor and control Motorway plant, sub-systems and equipment in real time. The PMCS enables the MCC Operators to observe the status and control of the tunnel, including: pumps, lighting, ventilation, drainage and fire protection systems as required to provide effective response to incidents. Graphs 7 and 8 have been extracted from the PMCS – Ventilation System indicating all ventilation pollutant emission concentrations over the period of the exceedance.

4.2 Traffic Management Control System – TMCS

Traffic Monitoring and Control System (TMCS) – represents the hardware and software systems 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

4.3 Incident Management System – IMS

Incident Management System (IMS) – provides part of the PMCS/TMCS control system software. The IMS provides the interface through which operators will manage events. The system will:

- Ensure that an operator's actions are consistent with agreed pre-planned ITPs and TCPs
- Automate operator tasks
- Control sub-systems
- Record details of actions and incident information for incident de-briefing

5. Investigative Data Captured from WestConnex M8 website.

The following graphs display air quality parameters for the month to date taken from the linkt website (https://www.linkt.com.au/sydney/using-toll-roads/about-sydney-toll-roads/westconnex-m8/tunnel-air-quality).

5.2 Ventilation Facility Data

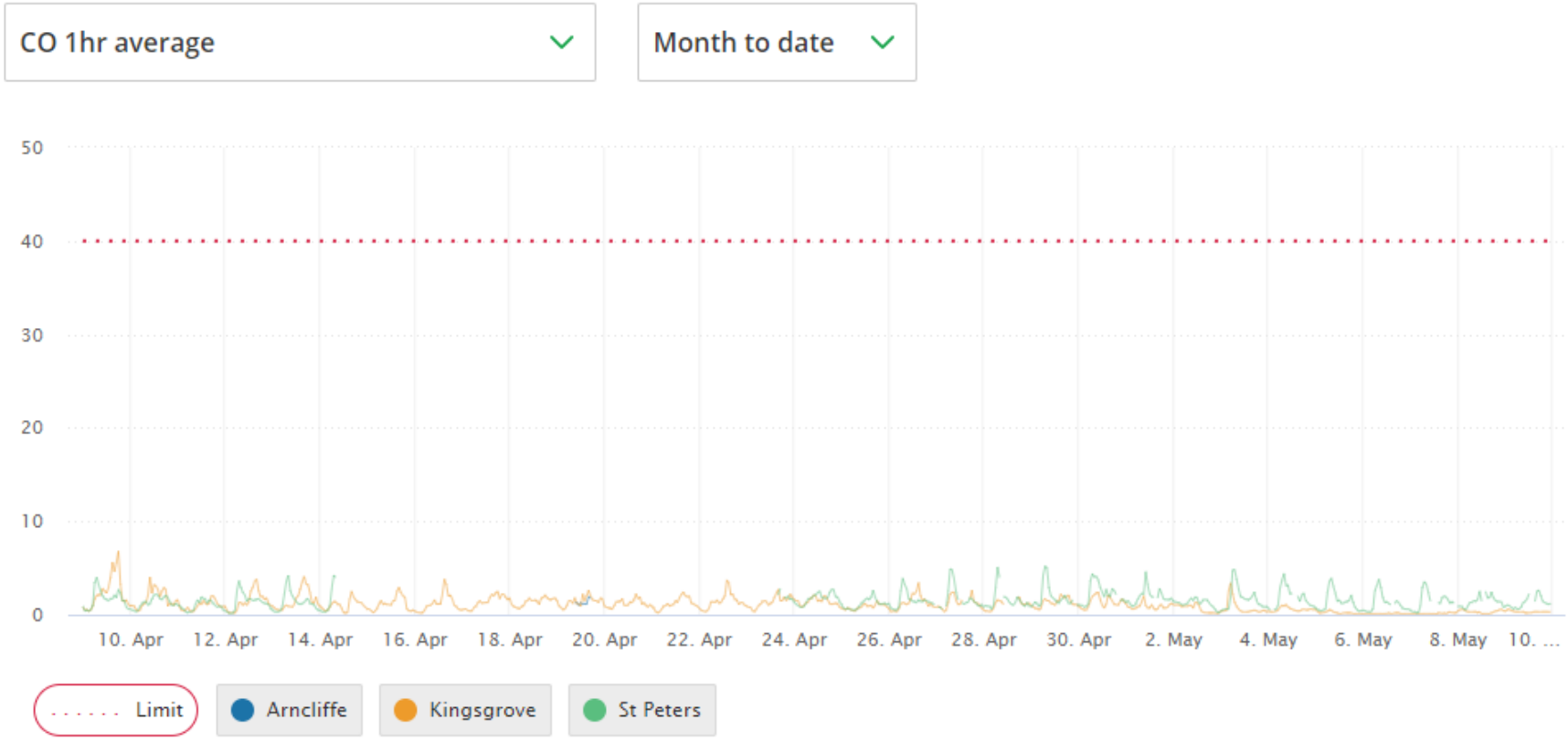


Figure 5.2.1: Carbon monoxide (1hr average), data uploaded to Linkt website showing no exceedances during the month for Arncliffe, Kingsgrove and St Peters ventilation facilities.

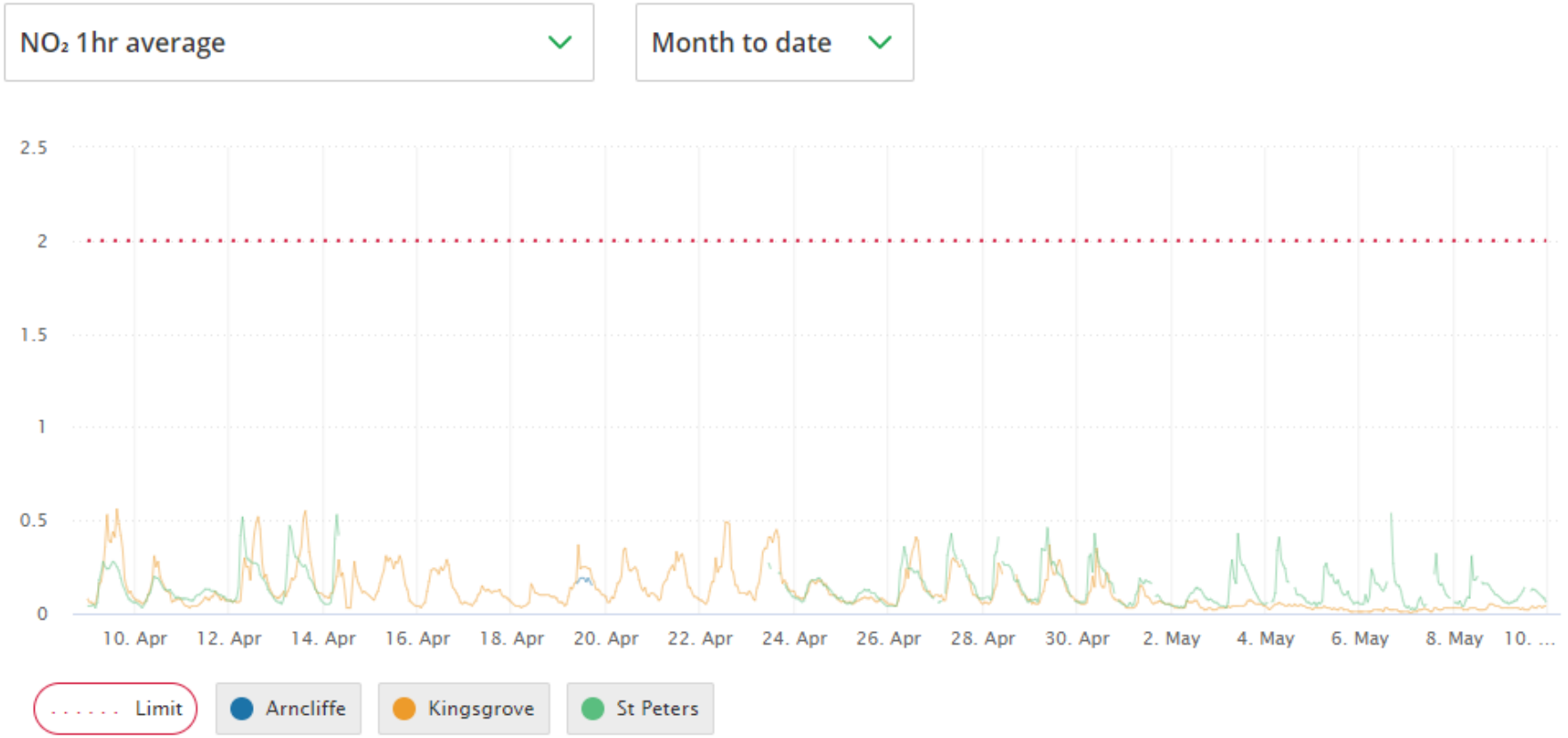


Figure 5.2.2: Nitrogen dioxide (1hr average), data uploaded to Linkt website showing no exceedances during the month for Arncliffe, Kingsgrove and St Peters ventilation facilities.

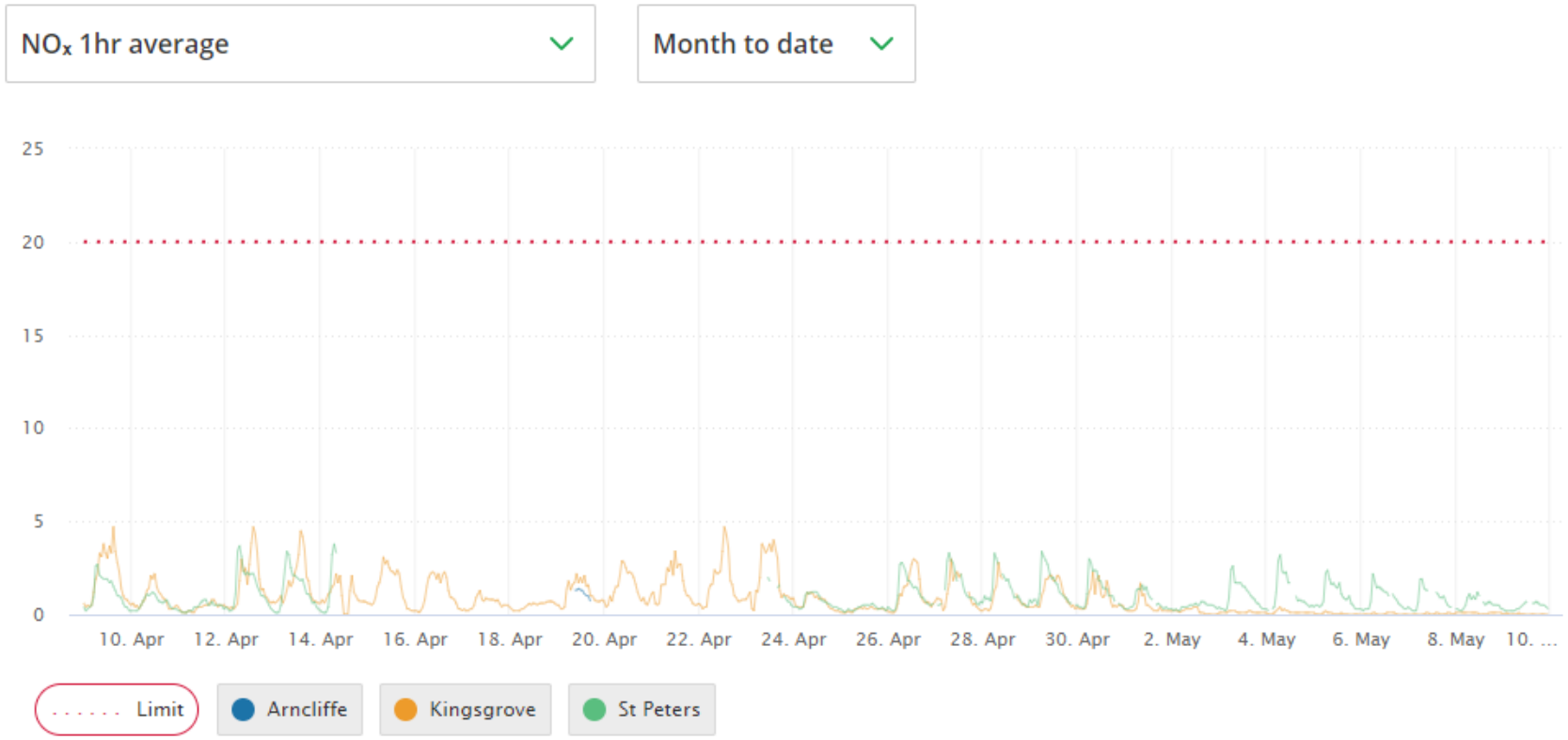


Figure 5.2.3: Nitrogen oxide compounds (1hr average), data uploaded to Linkt website showing no exceedances during the month for Arncliffe, Kingsgrove and St Peters ventilation facilities.

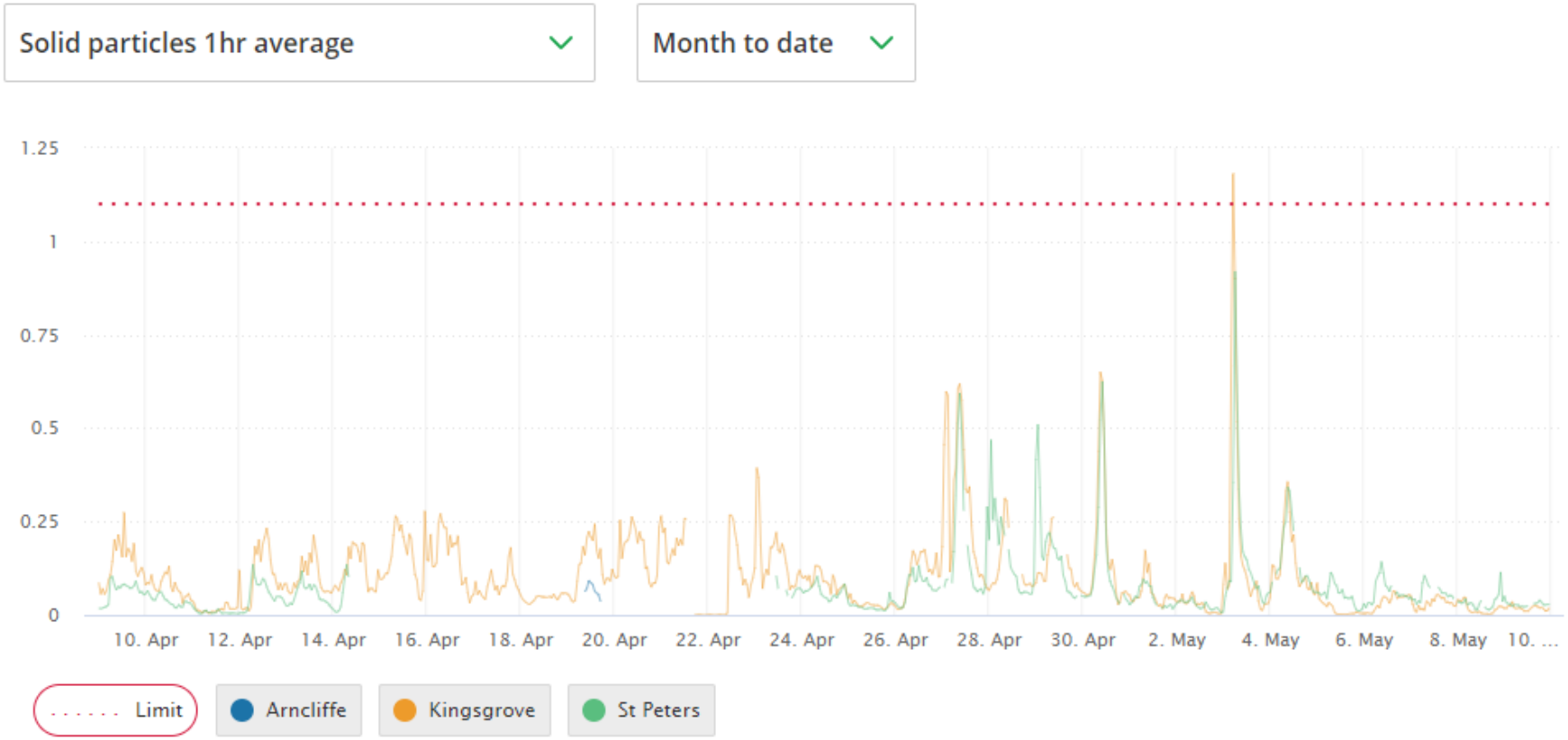


Figure 5.2.4 Solid particles (1hr average), data uploaded to Linkt website showing a reported exceedance on 3rd May 2021 at Kingsgrove ventilation facility (yellow). An increased spike, but with no exceedances, occurred at Arncliffe and St Peters ventilation facilities on 3rd May, 2021.

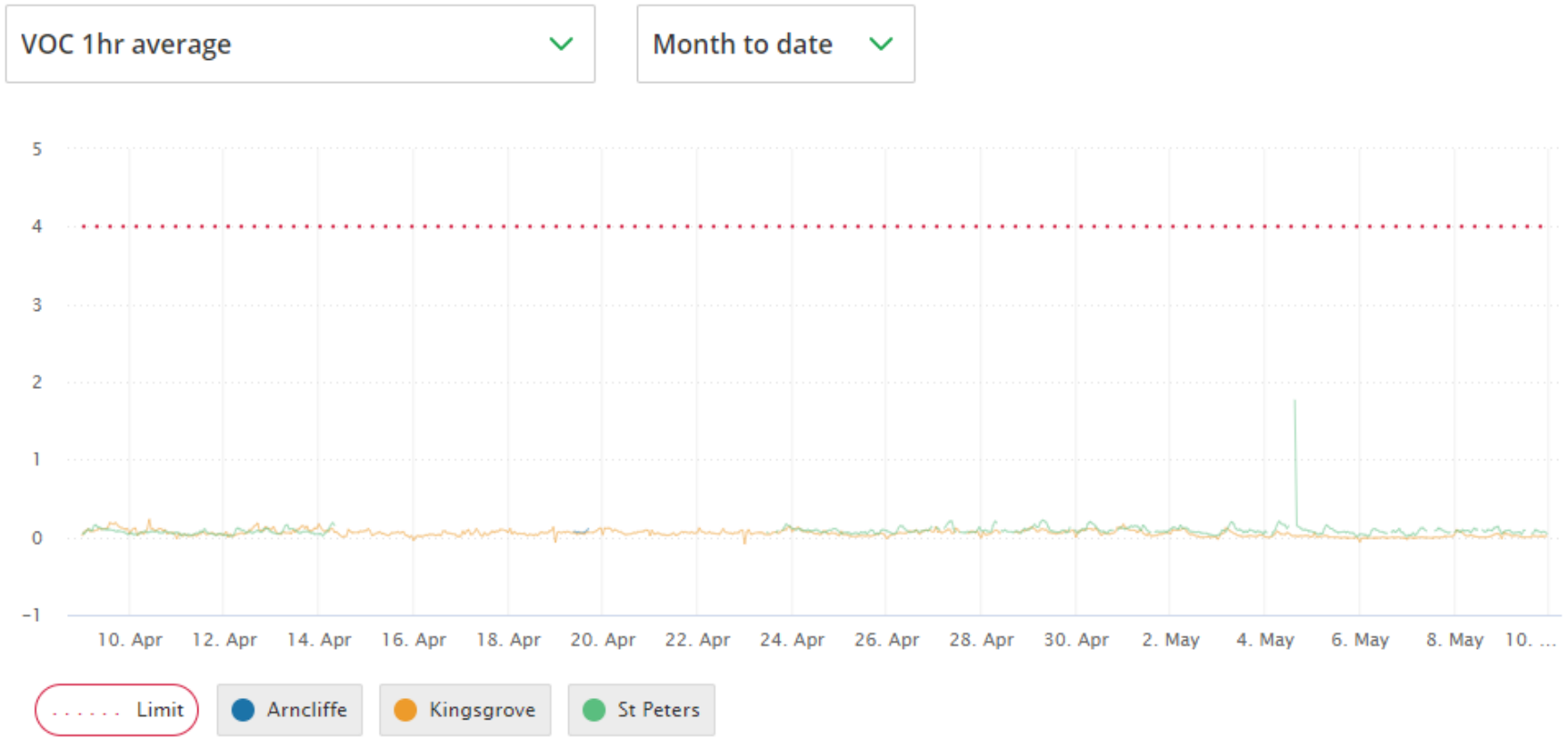


Figure 5.2.5: VOC (1hr average), data uploaded to Linkt website showing no exceedances during the month for Arncliffe, Kingsgrove and St Peters ventilation facilities. An increased peak in VOC activity occurred on 4th May 2021 (green line) but no exceedances occurred.

6. Investigation Data from Specialist Technician (Ecotech)

VOC data from St Peter's ventilation facility was assessed from 29/04/2021 to 5/05/2021 by Ecotech (specialist technicians). A distinctive peak in VOC levels of 3.4 mg/m^3 was observed as shown in Figure 6.1. Whilst this distinct spike was observed, it did not exceed the 1-hour rolling average. Refer to Appendix A for correspondence.

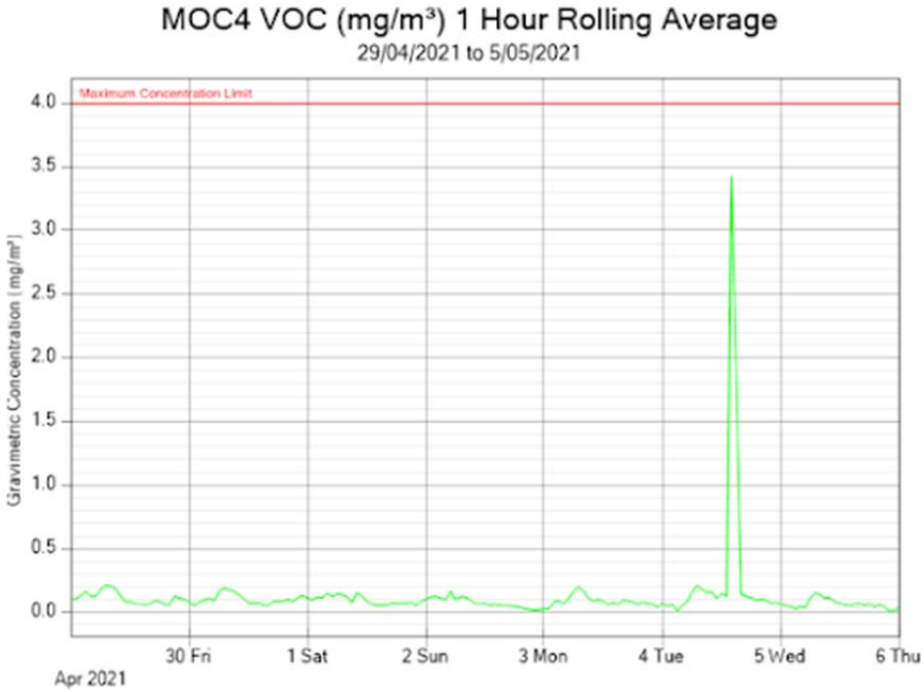


Figure 6.1: VOC 1 hour rolling average 29/04/2021 to 5/05/2021 St Peter's Ventilation Facility

6. Conclusion

On 4th May 2021 at St Peters ventilation facility, an above-limit VOC value of 4.1 mg/m^3 was reported at 14:00 - 15:00 hours. Investigations into the reported exceedance found that no other ventilation outlet monitoring parameter exceedances occurred at Arncliffe, Kingsgrove or St Peters ventilation facilities on the 4th May 2021.

Air quality results extracted from the linkt website and from technical specialists Ecotech (Sections 5 and 6), showed that VOC levels, although a distinct spike in concentration levels occurred, it did not exceed the 1-hour rolling average limit of 4.0 mg/m$^{3.}$

There is no data to support the notified above limit 1-hour rolling VOC reading of 4.1 mg/m^3. It is believed the reading of 4.1 mg/m^3 was the peak concentration recorded in the motorway control centre.No maintenance work or calibration works were occurring at the time. As the 1-hour rolling average limit was not exceeded, no improvements to the air quality monitoring system are suggested.

Appendix A

Justin

From: Chris
Sent: Friday, 7 May 2021 9:19 AM
To: Justin
Subject: Fwd: VOC spike 4/5

Hi Justin

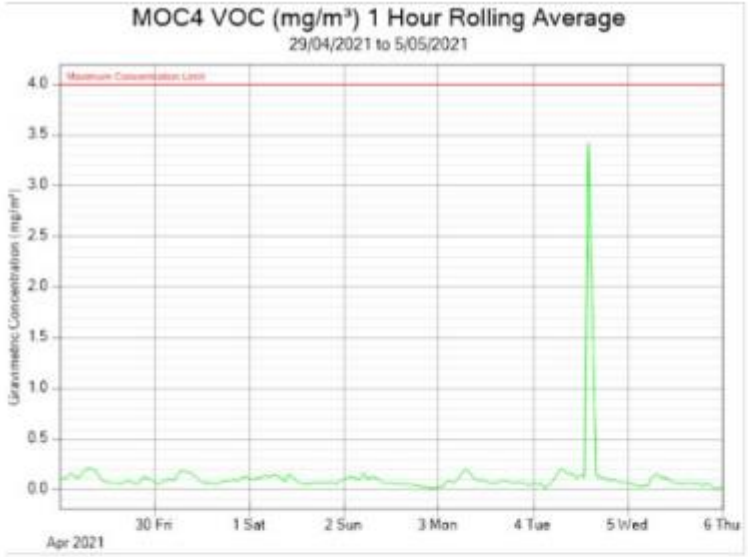
I spoke with Jon about this strange VOC excursion from earlier in the week. Based on our discussions, we were going to have to provide you with an exceedance report to assist with your report to the regulators. We cant find any reason to invalidate the data, but the good news is that it was not an exceedance of the 4mg limit anyway, so hopefully this is all that you need (see below).

Cheers

---------- Forwarded message ---------
From: **Jon**
Date: Thu, May 6, 2021 at 4:22 PM
Subject: VOC spike 4/5
To: Chris

Chris

The VOC spike the other day has been assessed as valid but was actually below the limit so it probably needn't be reported at all. I'm not sure why the website is showing some of this data removed as we have it all still even with exit velocity filtering.



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