



OUR REF: 803400.140429  
YOUR REF: Email 191216/JH-RP

9 January 2020

Justin Hazelbrook  
Community and Conditions Coordinator  
PO Box 6008  
Silverwater, NSW 2128

**RE: Report on Ambient Air Quality Above-Limit Reading**

Dear Justin,

SNC-Lavalin Australia have been appointed by Fulton Hogan EGIS OM (FHEOM) Joint Venture to perform the Independent Air quality specialist roles and were approved by the NSW Department of Environment and Planning (DPE) on 14 May 2019.

The SNC-L Environment team have prepared and reviewed the report on the Ambient Air Quality Above-Goal Reading Notification dated 14 December 2019 to address the requirements under the Minister's Condition of Approval (MCoA) E12.

Condition E12 states:

*"Within 20 working days of any Notification of Above-Goal Reading, the Proponent must prepare and submit to the Secretary a Report on Above-Goal Reading that details the cause and major contributor of the exceedance and the options available to prevent recurrence.*

*Where the operation of the tunnel is identified to be a significant contributor to the recorded above-goal reading, the Report on Above-Goal Reading 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 Ambient Air Quality Above-Goal Reading Report has been prepared following the notification provided by the Proponent of the Above-Goal Reading that was recorded at Powells Creek monitoring station for  $PM_{2.5}$ .

The SNC-L Environment team have prepared the report based on the information provided by FHEOM who confirmed that during the period when the exceedance occurred, the tunnel was operating normally. Publicly available information and monitoring data was also reviewed when determining the likely cause and major contributor of the Above-Goal Reading which included long and short term monitoring trends for ambient, in-tunnel and ventilation outlet air quality for the M4 East tunnel, air quality data from the NSW Government Environment, Energy and Science Group monitoring stations as well as alerts issued by the NSW Rural Fire Service. The review noted that



all in tunnel and ventilation outlet monitoring data complied with the relevant criteria during the period.

The review concluded that multiple exceptional events including fires occurring in the Wollemi , Blue Mountains, Tallaganda and Yengo National Parks most likely impacted air quality causing the monitoring station to record  $PM_{2.5}$  values above goal levels. It is therefore highly unlikely that the operation of the tunnel was the cause or major contributor to the Above-Goal Reading and no actions are recommended. The cause and major contributor of the exceedance is the exceptional events as noted above.

Should you have any queries regarding our comment, please do not hesitate to contact me by telephone on 0429 227 775 or email at [Richard.Peterson@snclavalin.com](mailto:Richard.Peterson@snclavalin.com).

Yours sincerely,

**SNC-LAVALIN AUSTRALIA PTY LTD**



**Richard Peterson**

Director

*Environment & Geoscience*  
**Infrastructure**



Ambient Monitoring Reporting

<b>Report on Above-Goal Reading</b> WestConnex M4 East To be submitted to DPIE within 20 days of the Report of Above-Goal Reading	
<b>Details of the Above-Goal Reading</b> Attach relevant Notification of Above-Goal Reading	<p>This report has been prepared to address the requirements under MCoA E12: “Within 20 working days of any Notification of Above-Goal Reading, the Proponent must prepare and submit to the Secretary a Report on Above-Goal Reading that details the cause and major contributor of the exceedance and the options available to prevent recurrence.</p> <p>Where the operation of the tunnel is identified to be a significant contributor to the recorded above-goal reading, the Report on Above-Goal Reading 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.</p> <p>The Proponent must comply with any requirements arising from the Secretary’s review of the Report on Above-Goal Reading.”</p> <p>The following parameter, PM<sub>2.5</sub> – 24 hour average reading with a goal limit of 25 µg/m<sup>3</sup>, was reported with Above-Goal Reading on 14 December at the following monitoring station:</p> <ul style="list-style-type: none"> <li>• <b>Powells Creek:</b> PM<sub>2.5</sub> – 24 hour rolling average of 27.1 µg/m<sup>3</sup></li> </ul> <p>The immediate notification of the ambient air quality above-goal reading has been issued to Secretary, EPA and NSW Health. (refer to Section 1 of this report)</p>
<b>Was the data valid?</b> If invalid, include any details or justifications for the invalidity	<p>The data has not yet been validated.</p>
<b>Comparison with long term monitoring trends and background air quality data</b> This is not required to be completed, however if available and	<p>Long term trends for PM<sub>2.5</sub> show that levels are consistently 5-20 µg/m<sup>3</sup> all six stations since monitoring began in December 2018. No increase in PM<sub>2.5</sub> is evident once operation of the tunnel began in July 2019 with pre-operational levels (based on recorded data).</p> <p>The diagrams in Section 2 demonstrates that the Above-Goal Readings for 14 December 2019 were significantly greater than the average daily readings since operation of the tunnel began to October 2019.</p>
<b>Cause or major contributor of the Above-Goal Reading</b> 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.)	<p>It may be concluded that the Above-Goal Reading recorded at the Powells Creek monitoring station was likely to be attributed to multiple exceptional events including the Gospers Mountain Fire in the Wollemi National that was burning on the day of the recorded Above-Goal Reading. Multiple additional fires were also occurring in the Blue Mountains and Tallaganda National Parks. These fires were the most likely cause of the poor air quality in Sydney on 14 December 2019.</p> <p>In addition, the diagrams in Section 2.4 demonstrate that all ventilation outlet and in-tunnel monitoring results for the same period were below the specified goals. Therefore, it is unlikely that events or emissions associated with the operation of the M4 East Tunnel were a cause or major contributor of the recorded exceedances.</p> <p>Additional data collected from the NSW Government Environment, Energy and Science (EES) Group air quality monitoring stations located around the Sydney Basin and alerts issued by NSW Rural Fire Service confirm that the fire events were exceptional and likely to be the cause or major contributor of the Above-Goal Readings.</p>
<b>Options to prevent recurrence</b> This is to 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	

It has been identified that the most likely cause of the Above-Goal Reading was the fires occurring in the Blue Mountains, Wollemi and Tallaganda National Parks. Therefore, the operation of the tunnel has not been identified as a significant contributor of the exceedance and as such, no further action is required as specified in the Minister's Condition of Approval E12.

<b>Person responsible for report</b>	Name	Peter Redwin
	Position	Head of Operations and Maintenance
	Organisation	WestConnex Transurban
	Date	

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# 1. Ambient Above-Goal Reading Notifications

## 1.1 14 December 2019

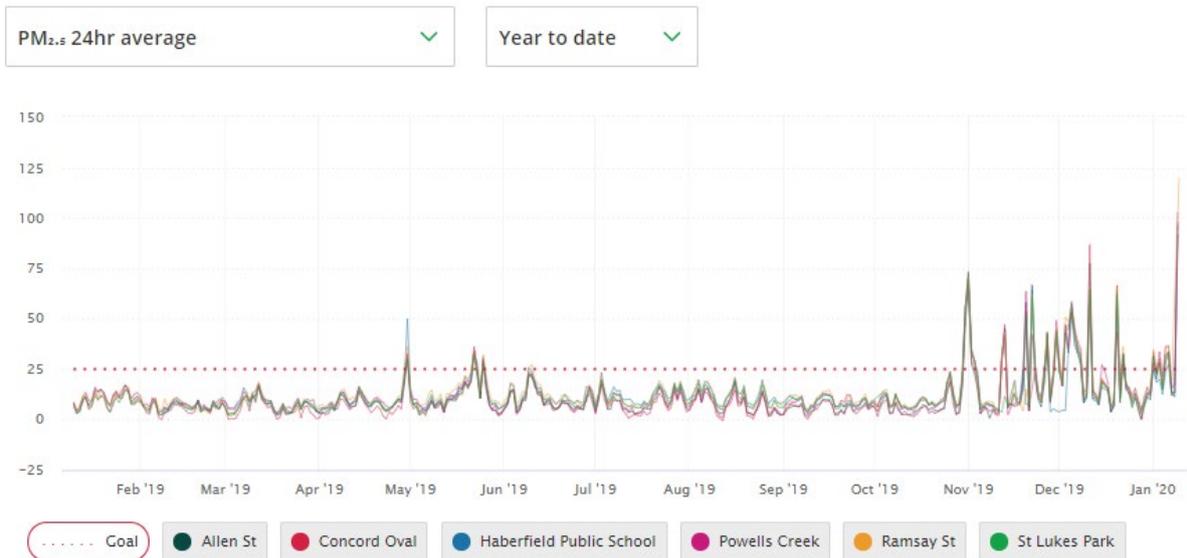
<b>Notification of Ambient above-goal reading</b> WestConnex M4 East	
To be notified immediately to Project Company and RMS. Project Company is to notify DPE, EPA and NSW Health within 24 hours.	
<b>Date</b>	14 December 2019
<b>Time (start and finish)</b>	0000hrs to 0000hrs
<b>Relevant location</b>	<input type="checkbox"/> Allen Street <input checked="" type="checkbox"/> Powells Creek
	<input type="checkbox"/> St Lukes Park <input type="checkbox"/> Concord Oval
	<input type="checkbox"/> Haberfield Public School <input type="checkbox"/> Ramsay Street
<b>Relevant goal</b>	<input type="checkbox"/> CO – 8 hour rolling average of 9.0 ppm
	<input type="checkbox"/> NO <sub>2</sub> – One hour average of 0.12 ppm (245 µg/m <sup>3</sup> )
	<input type="checkbox"/> PM <sub>10</sub> – 24 hour average of 50 µg/m <sup>3</sup>
	<input checked="" type="checkbox"/> PM <sub>2.5</sub> – 24 hour average of 25 µg/m <sup>3</sup>
	<input type="checkbox"/> PM <sub>10</sub> – Annual average of 25 µg/m <sup>3</sup>
<input type="checkbox"/> PM <sub>2.5</sub> – Annual average of 8 µg/m <sup>3</sup>	
<b>Above-goal reading</b> Detail the above-goal reading that was received	<b>PM<sub>2.5</sub></b> Powells Creek: 27.1 µg/m <sup>3</sup>
<b>Duration</b> Detail the duration of the above-goal reading or event	24hrs
<b>Nature of event</b> Detail nature of the event that contributed to the above-goal reading	NSW RFS have indicated that fires burning in the Blue Mountains National Park, Wollemi National Park and Tallaganda National Park are currently being controlled, affecting greater Sydney's air quality. DPIE, Sydney-east air quality was rated fair to poor.
<b>Was the data valid?</b> If unknown at this stage, please indicate. Refer section 5.2.1 of this Protocol.	Data is yet to be validated
<b>Was there an emergency?</b> Refer section 3.1 of this Protocol. If this is unknown at this stage, please indicate.	No
<b>Measures employed</b> Detail measures employed to minimise the concentration levels	All ventilation outlet and in-tunnel monitoring results for the 14/12/19 were below the limits and goals specified.
<b>Commitment to prepare and submit a Report on Above-Goal Reading</b> A Report on Above-Goal Reading will be prepared for this notification. Please note that a Report is not required in the event of an emergency.	
<b>Person responsible for notification</b>	Name: Peter Redwin
	Position: Head of Operations and Maintenance
	Organisation: WestConnex Transurban

## 2. Air Quality Monitoring Results

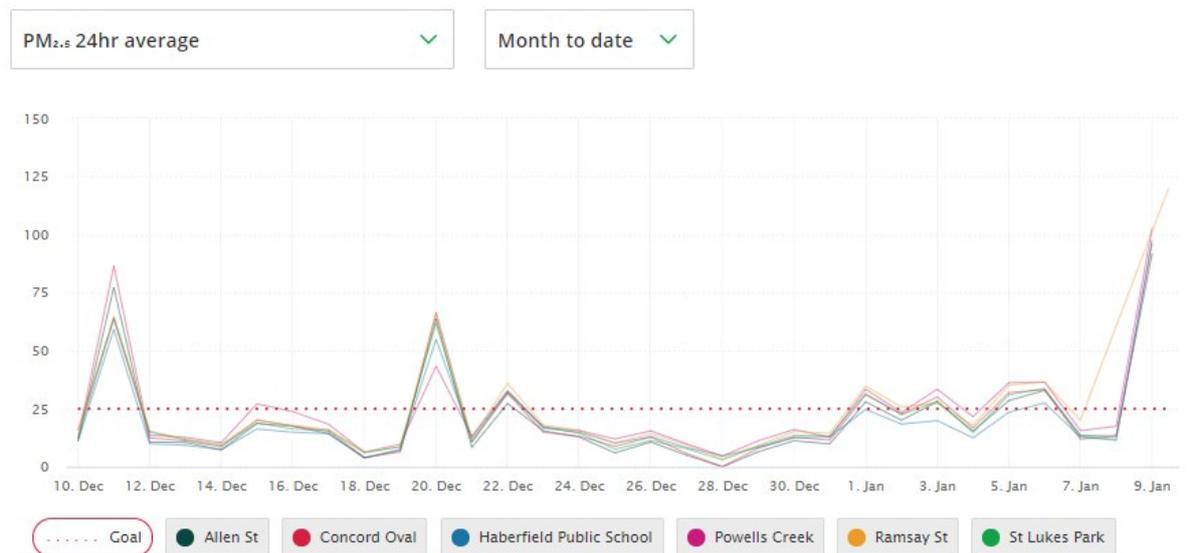
The following diagrams were captured from the official website for the Air Monitoring on M4E.

(<https://www.linkt.com.au/sydney/using-toll-roads/about-sydney-toll-roads/westconnex-m4/tunnel-air-quality>)

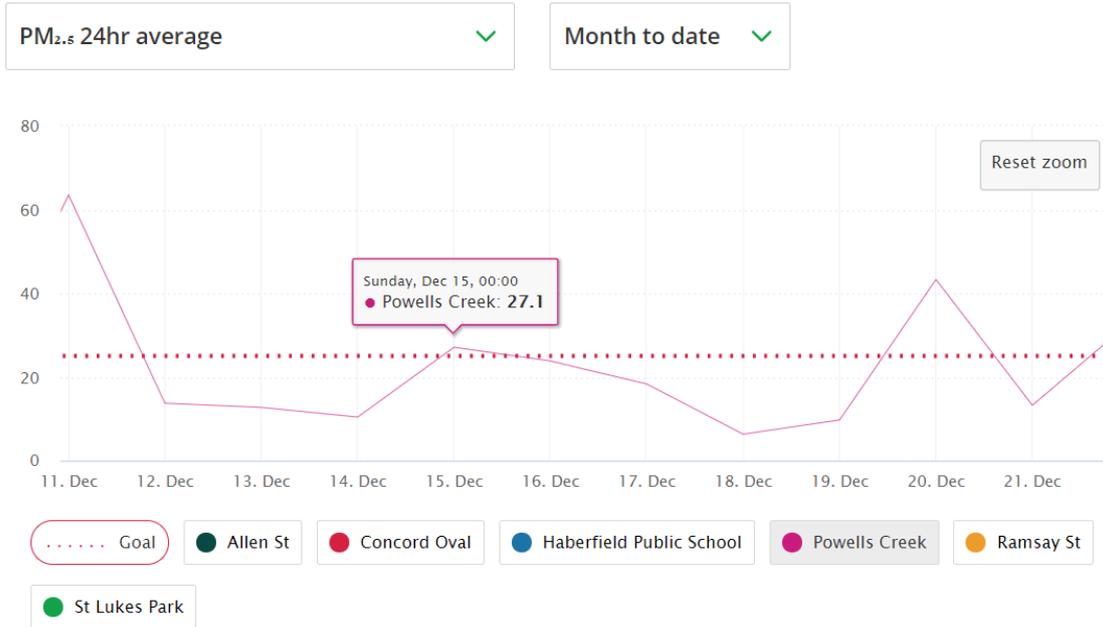
### 2.1 Ambient Air Quality Data from Dec 2018 – Dec 2019



### 2.2 Ambient Air Quality Data for Previous Month



## 2.3 14 December PM<sub>2.5</sub> - 24 Hour Average Data at All Monitoring Stations



## 2.4 Solid Particles – 1 Hour Average Data Values from Ventilation Outlet Monitoring Equipment



### 3. Background

#### 3.1 Monitoring Stations

The Westconnex - M4 East Project features various ventilation, plant and equipment, and air quality monitors to ensure pollutants do not exceed the targets and limits set by the Minster's Conditions of Approval. M4 East air quality is monitored by hundreds of sensors which measure various pollutants across three mains areas, one of which includes ambient air quality stations in the areas around the M4 tunnels.

These stations include six external ambient air quality monitoring stations located at Allen Street, Powells Creek, St Lukes Park, Haberfield public school, Ramsay Street and Haberfield Public School. The locations of these monitoring stations are illustrated in Figure 1 below.

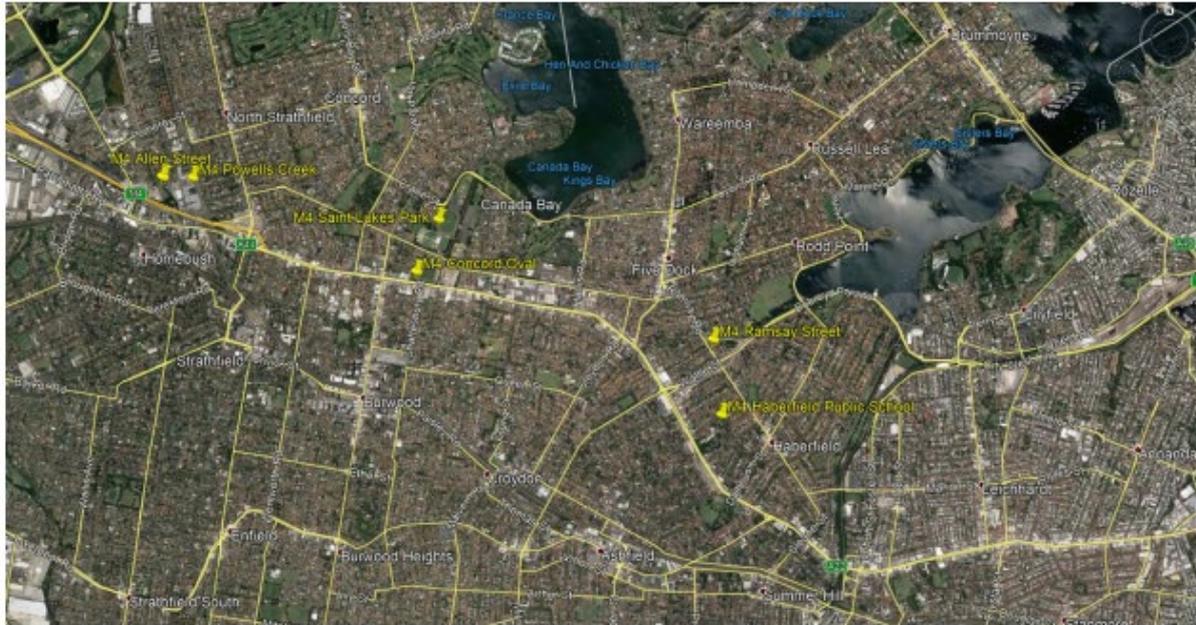


Figure 1 Location of Ambient Air Quality Monitoring Stations

#### 3.2 Ambient Air Quality Goals

Figure 2 below outlines the ambient air quality goals for each recorded parameter.

Parameter	Time Period	Goal Level	Units
CO	8 hours (rolling, based on 1-hour averages)	9.0	ppm
NO <sub>2</sub>	1 hour	0.12	ppm
PM <sub>10</sub>	1 day	50	µg/m <sup>3</sup>
	1 year	25	µg/m <sup>3</sup>
PM <sub>2.5</sub>	1 day	25	µg/m <sup>3</sup>
	1 year	8	µg/m <sup>3</sup>

Figure 2 Ambient Air Quality Goals

### 3.3 Validation of Data

The Ecotech ERS department performs daily data checks to ensure maximum data capture rates are maintained. Any equipment failures are communicated to the responsible field engineers for rectification.

The validated database is created by duplicating the non-validated database and then flagging data affected by instrument faults, calibrations and other maintenance activities. The data validation software requires the analyst to supply a valid reason in the database for flagging any data as invalid. Examples of valid reasons for invalid flagging include demonstrating consistency with maintenance notes and calibration sheets.

### 3.4 Exceptional Events

Exceptional events such as a fire or dust occurrence that adversely affects air quality at a particular location and causes an exceedance of 1-day average standards in excess of normal historical fluctuations and background levels are excluded from this standard, as per the Ambient Air Quality National Environmental Protection Measure (NEPM).

## 4. Events Report

### 4.1 Investigation of Event

In order to determine the cause of the Above-Goal Readings and whether these can be attributed to external phenomena or events or emissions from the M4 East Motorway tunnel outlets, a review of information has been undertaken in line with the WestConnex Ambient Air Quality Goal Protocol that was prepared under Condition E10.

The Above-Limit Reading Notification indicates that the data has not been quality validated, however as no known instrumentation fault or data error has occurred the investigation has proceeded on the basis that the data is valid. As the Notification in Section 1 outlines, no emergencies occurred at the time of the Above-Goal Reading as advised by the Proponent.

Data has been obtained from other ambient air quality monitoring stations in the Sydney Basin to confirm whether the Above-Goal Readings received at the monitoring stations near the WestConnex M4 East Tunnel were similar to other results for concurrent monitoring periods.

The NSW Government Environment, Energy and Science (EES) Group operates air quality monitoring networks that continuously measure particles ( $PM_{10}$ ,  $PM_{2.5}$ ), sulfur dioxide ( $SO_2$ ), carbon monoxide (CO), ozone ( $O_3$ ), nitrogen dioxide ( $NO_2$ ) and visibility. In addition to these, the stations also monitor wind speed and direction, air temperature and humidity.

The monitoring plan prepared for the NEPM for Ambient Air Quality outlines that these stations, along with permanent upper bound stations, ensure that all major pollutant events are captured and reported.

## 4.2 Additional Data

### 4.2.1 Environment, Energy and Science Group

The following data has been obtained from the EES monitoring database for the period concurrent with the Above-Goal Reading obtained from the M4 East monitoring station on 14 December 2019.

Saturday  
14 December 2019  
11 pm - 12 am (AEST)  
[Previous](#) | [Next](#) | [Select](#)  
[Show index values](#)

Scale: 0 to 250

		VERY GOOD sc	GOOD sc	FAIR sc	POOR sc	VERY POOR sc	HAZARDOUS sc		
Pollutants		Ozone O3	Ozone O3	Nitrogen dioxide NO2	Visibility NEPH	Carbon monoxide CO	Sulfur dioxide SO2	Particles PM10	Particles PM2.5
Averaging Periods		1-hour average	rolling 4-hour average	1-hour average	1-hour average	rolling 8-hour average	1-hour average	rolling 24-hour average	rolling 24-hour average
Bushfire Emergency - Port Macquarie	Port Macquarie	1.7	2.4	0.6	0.65	0.2	0.0	16.2	9.6
Bushfire Emergency - Coffs Harbour	Coffs Harbour	2.5	2.7	0.2	1.10	0.4		10.5	6.6
Bushfire Emergency - Lismore	Lismore							26.7	14.5
Sydney East	Cook And Phillip	2.2	2.2	0.2	0.58	0.2	0.0	23.6	14.0
	Randwick	2.7	2.9	-0.1	0.63		0.0	25.1	11.5
	Rozelle	2.9	2.8	0.0	0.73	0.2	0.0	27.7	14.2
	Chullora	2.6	2.6	0.0	0.69	0.0	0.0	43.2	27.3
	Earlwood	2.4	2.6	0.3	0.66			30.0	17.0
	Macquarie Park	2.6	2.5	0.1	0.79	0.3	0.0	37.0	25.7
Sydney North-west	Parramatta North	2.8	2.9	0.3	0.77	0.3	0.1	50.8	29.6
	Richmond	2.7	2.9	0.2	0.79		0.0	68.5	43.4
	St Marys	2.5	2.8		0.79			61.7	38.1
	Prospect	2.9	2.9	0.1	0.75	0.1	0.0	60.8	37.2
	Rouse Hill	2.3	2.6	0.5	0.85	0.3	0.0	59.7	38.5
Sydney South-west	Bargo	2.7	2.9	0.1	0.75		0.0	98.5	73.7
	Bringelly	2.3	2.8	0.1	0.70		0.0	56.1	36.3
	Camden	2.7	3.0	0.2	0.78	0.2		60.0	41.8
	Campbelltown West	2.7	3.0	0.1	0.76	0.3	0.0	48.6	29.3
	Liverpool	2.5	2.5	0.3	0.75	0.2	0.0	48.3	28.7
	Oakdale	2.3	2.8	0.1	1.27			106.3	74.9
Illawarra	Wollongong	1.9	2.4	0.3	0.66	0.2	0.0	25.1	10.4
	Kembla Grange	2.0	2.4	0.1	0.71			35.4	14.2
	Albion Park Sth	2.2	2.5	0.1	0.57		0.0	29.2	17.0
Lower Hunter	Wallsend	2.0	2.0	0.2	0.49		0.1	24.9	14.8
	Newcastle	2.4	2.3	0.2	0.47	0.2	0.0	25.4	10.5
	Beresfield	1.5	1.4	0.7	0.44		0.0	27.8	11.3
Central Coast	Wyong	2.0	2.3	0.1	0.53	0.2	0.0	23.9	12.1
Central Tablelands	Bathurst							49.1	23.0
	Orange				0.14			18.8	2.6
Northern Tablelands	Armidale				1.44			23.9	18.2
North-west Slopes	Gunnedah	2.6	2.7	0.0				23.9	14.0
	Narrabri							21.9	9.3
	Tamworth							29.7	17.7
Southern Tablelands	Goulburn	2.8	3.4	0.2	1.33			45.6	28.1
South-west Slopes	Albury							13.3	2.6
	Wagga Wagga Nth							27.8	3.2
Upper Hunter - Muswellbrook	Muswellbrook			1.2			0.8	60.8	28.5
Upper Hunter - Singleton	Singleton			0.6			0.5	61.9	41.8

Figure 3 EES Air Quality Monitoring Data for 14 December 2019 (Data Readings) (source: <https://www.dpie.nsw.gov.au/air-quality/air-quality-concentration-data-updated-hourly>)

### 4.2.2 NSW Rural Fire Service

The following data has been obtained from the New South Wales Rural Fire Service (NSW RFS) who are the lead agency for the coordination of bush firefighting and prevention throughout the state. The NSW RFS have launched an application that shows every fire in NSW along with its size, severity and warnings. On 14 December 2019, NSW RFS provided notifications through this database that multiple bush fires were occurring in the areas surrounding Sydney specifically including the Gospers Mountain Fire in the Wollemi National Park that was burning on the days of the recorded Above-Goal Reading. Multiple additional fires were also occurring in the Blue Mountains and Yengo National Parks. NSW RFS confirmed that on 14 December 2019, 106 fires were burning in NSW and 57 were not yet contained.



Figure 4 RFS twitter post showing satellite image of smoke across NSW on 14 December 2019 (source: [https://twitter.com/NSWRFS?ref\\_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor](https://twitter.com/NSWRFS?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor))



Figure 5 NSW RFS Twitter post issuing an Emergency Warning for the Gospers Mountain Fire on 14 December 2019 (source: [https://twitter.com/NSWRFS?ref\\_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor](https://twitter.com/NSWRFS?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor))



**NSW RFS** @NSWRFS · 14 Dec 2019

At 8:30am there are 106 bush and grass fires continuing to burn across NSW, with 57 not yet contained. With many areas of the state under a Very High fire danger today, discuss with your family what you would do if fire threatens. How fire proof is your plan? #NSWRFS

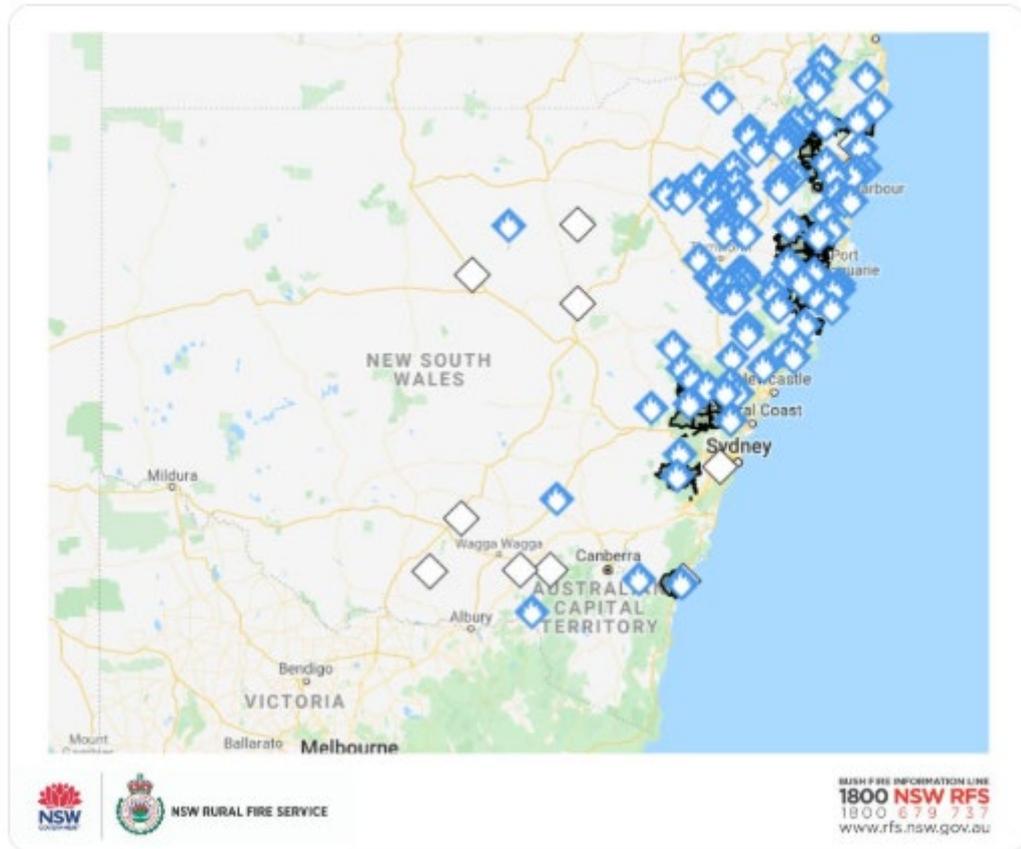


Figure 6 NSW RFS 'Fire Near Me' data of fires Occurring on 14 December 2019 NB: Red = out of control Yellow = being controlled Blue = under control. (source: [https://twitter.com/NSWRFS?ref\\_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwtgr%5Eauthor](https://twitter.com/NSWRFS?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwtgr%5Eauthor))

## 5. Findings

The EES data in Section 4.2.1 outlines that air quality was reduced across the Sydney's north-west and south-west on the day concurrent with that of the notification on 14 December. Figure 3 also shows that the Chullora monitoring station, located 8km from the Powell's Creek monitoring Station, in Sydney's east recorded reduced air quality readings with  $PM_{2.5}$  exceeding goal limits for  $PM_{2.5}$  on 14 December and air quality was rated as poor. Similar to the results from the M4 East monitoring stations, the EES Group data shows that no other station recorded an Above-Goal Reading on 14 December.

On the same day, an emergency warning was issued by NSW RFS for the Gospers Mountain fire and the satellite image shown in Figure 5 outlines smoke affecting eastern NSW on 14 December.

The data indicates that there was an ongoing external event that most likely affected air quality and caused  $PM_{2.5}$  to exceed goal levels. In addition to the data, the alerts and warnings from NSW RFS outlines that multiple fires were occurring on 14 December specifically including the Gospers Mountain Fire in the Wollemi National. Multiple additional fires were also occurring in the Blue Mountains, Tallaganda and Yengo National Parks. These fires along with a range of other fires, are the most probable cause of the event in Sydney, making it unlikely that the use of the tunnel was a significant contributor to the Above-Goal Readings.

The diagrams in Section 2 of this report correlate with the data provided by the EES Group and NSW RFS supporting the possibility that a significant external event was occurring in areas surrounding Sydney on the date of recorded exceedance, that most likely caused the Powells Creek monitoring station to record Above-Goal Readings. In addition, the diagrams in Section 2.1 indicate that apart from the recent bushfires in October, November and December that caused exceedances in ambient air quality, almost all readings at all monitoring stations for the past year have remained under the specified limits and no changes in air quality are evident since operation of the tunnel began. In addition, all ventilation outlet monitoring results for the same period were below the limits and goals specified as exhibited in the diagram in Section 2.4

## 6. Conclusion

The investigation into the cause of the exceedance has identified that the Above-Goal Reading recorded at the Powells Creek monitoring station on 14 December was most likely the result of NSW bushfires that caused  $PM_{2.5}$  values to be recorded above  $25 \mu\text{g}/\text{m}^3$ .

The additional data collected from the EES air quality monitoring stations across Sydney is consistent with the readings from the ambient air quality monitoring stations located near the tunnel. Furthermore, the fire updates from NSW RFS for the concurrent period of the notification date confirm that multiple fires were occurring in areas surrounding Sydney. The fire specifically included the Gospers Mountain Fire in the Wollemi National that was burning at emergency level on the days of the recorded Above-Goal Reading. The satellite images of the smoke above eastern NSW demonstrates that wind is also likely to be a significant contributor to the smoke from these fires affecting the air quality in Sydney.

Therefore, it has been concluded that as no emergencies were occurring within the tunnel at the time, as reported by the Proponent, this external natural occurrence was most likely the cause or major contributor of the exceedances and it is unlikely to be attributable to emissions from the M4 East motorway tunnel outlets.

As the notifications of the Ambient Above-Goal Readings have been provided to the relevant agencies, an external event is most likely the cause of the Above-Goal Readings and the operation of the tunnel has not been identified as a significant contributor of the exceedance, no further action is required as specified in the Minister's Condition of Approval E12.