NorthConnex Project (SSI 6136) CoA E11 Modification Request

Amendment of VOC ventilation outlet limit

Submissions report

Roads and Maritime Services | November 2019

NSW GOVERNMENT

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1 Introduction and background

1.1 The modification

The NorthConnex Project Modification 3 proposes to change condition of approval E11 Ventilation Outlets — Limits. Specifically, the Volatile Organic Compounds (VOC) mass pollutant concentration in Table 10 of the condition is proposed to be changed from 1mg/m^3 to 4mg/m^3.

A more detailed description of the modification is found in the modification request prepared by Roads and Maritime Services (Roads and Maritime) on 9 August 2019.

1.2 Statutory context

Section 5.25(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) allows Roads and Maritime, as proponent for the NorthConnex Project, to request the Minister for Planning and Public Places to modify the Minister's approval for State Significant Infrastructure.

Roads and Maritime requested a modification of condition of approval E11 on 9 August 2019.

1.3 Modification exhibition

The Modification was exhibited by the Department of Planning, Industry and Environment (DPIE) for 14 days from Friday 30 August to Thursday 12 September 2019 at www.planningportal.nsw.gov.au/major-projects.

The Modification exhibition was advertised in:

- **Hills Shire Times -** Tuesday 27 August 2019
- **Sydney Morning Herald and Daily Telegraph -** Wednesday 28 August 2019
- **Northern District Times and Parramatta Advertiser -** Wednesday 28 August 2019
- **North Shore Times and Hornsby Advocate -** Thursday 29 August 2019

The Modification was exhibited at:

- Ku-ring-gai Council: 818 Pacific Highway, Gordon
- Turramurra Library: 5 Ray Street, Turramurra
- The Hills Shire Council: 3 Columbia Court, Baulkham Hills
- Baulkham Hills Library: 1 Railway Street, Baulkham Hills
- Hornsby Shire Council: 296 Peats Ferry Road, Hornsby
- Hornsby Shire Library & Information Service: 28-44 George Street, Hornsby
- Pennant Hills Branch Library and Community Centre: Yarrara Road & Ramsay Road, Pennant Hills
- Epping Branch Library: Chambers Court, off Pembroke Street, Epping

As part of the exhibition process, a letter with the exhibition details and a copy of the modification report and accompanying documents was sent to the agencies and councils listed below. The letter invited each agency and council to provide comments on the proposed modification during the exhibition period.

- EPA
- NSW Chief Scientist & Engineer
- Ku-ring-gai Council
- The Hills Shire Council
- Hornsby Shire Council
- NSW Health

1.4 Purpose of the document

During the exhibition of the modification, 199 submissions were made. The Planning Secretary of DPIE provided copies of the submissions to Roads and Maritime and requested Roads and Maritime provide a Response to Submissions that addresses the issues identified in the submissions from members of the public, interest groups and public authorities.

This report identifies the issues raised during exhibition of the modification and provides responses to those issues (Chapter 2).

1.5 Need for the Change

Roads and Maritime sought a Modification to the Conditions of Approval, whereby 1 mg/m^3 instead of 4 mg/m^3 has been written as the VOC limit in the Conditions of Approval E11 for NorthConnex Project (SSI 6136).

There is not an increase in long term exposure of VOC pollutants from the proposed change. The VOC limit change will not change the normal day to day operation of the tunnel ventilation system. The VOC limit change will simply provide a limit to enable management of any unforeseen incidents, such as accidents, in the tunnel. Sydney tunnels approved after NorthConnex (ie WestConnex) adopted a VOC limit of 4mg/m3. In addition, long term, the EPA have introduced changes whereby tunnel ventilation outlets will be required to operate under an Environment Protection Licence, offering another layer of monitoring and reporting.

Roads and Maritime's proposed modification is supported by the AECOM modelling dated 28 September 2015, which highlights a historic error (by virtue of its date of production) but also importantly demonstrates that the VOC emission limit from 1 mg/m3 to 4 mg/m3 does not result in adverse air quality impacts. The modelling results assumed constant pollutant emission of 4 mg/m3, which will not be reached in normal operating conditions. Even in this scenario, the EPA criterion for air pollutants are not met and the predicted results are very much below the criterion. The EPA has reviewed and also concluded that "the increased VOC emission limit from 1mg/m3 to 4mg/m3 does not result in adverse air quality impacts" (letter dated 18 July 2019 attached to the Modification).

Refer section 2.3.1 for more information.

2 Response to issues

2.1 Respondents

The Department of Planning, Industry and Environment received a total of 199 submissions in response to the exhibition of the modification request comprising two government agency submissions and 197 from the community. Of the 199 submissions, five submissions were identified as being from organisations, however were from private individuals. In summary, 93 per cent of submissions objected to the modification, while the remainder commented.

The Environment Protection Authority (EPA) supported the modification, whilst the Office of the NSW Chief Scientist & Engineer provided a positive comment stating "….we do not foresee any issues." The NSW Department of Health did not make a submission.

Public submissions included a petition (46 signatures) and 41 based on form letters. The form letter contents were practically identical, except for personal information.

Refer to Appendix A1 for the List of Respondents (Submission Identification) and Appendix A2 for Report References (Address of Submissions).

2.2 Overview of the issues raised

Each submission has been examined individually to understand the issues being raised. The issues raised in each submission have been extracted and collated, and corresponding responses to the issues have been provided. Where similar issues have been raised in different submissions, only one response has been provided. The issues raised and Roads and Maritime response to these issues forms the basis of this chapter.

The issues raised were mainly about air quality and health. Some raised the assessment process, including display length. Others were concerned about the lack of consultation.

2.3 Issue 1 Air Quality

2.3.1 Sub-issue, VOC Limits

Issue description

In summary, the respondent(s) raised the following issues:

- An objection to the four-fold increase in toxic VOC levels to 4mg/m^3
- 2mg/m^3 VOC limit could be a reasonable compromise
- Restrict the number of incidents to avoid higher level of VOC being emitted continuously. If the new limit is for occasional use, then there should be a restriction on the number of times that VOC emissions are allowed to exceed 1mg/m^3 before triggering condition E13.

Response

A four-fold increase in the limit does not mean a four-fold increase in on-going VOC emissions as the proposed change to 4 mg/m^3 will not affect the day to day operation of NorthConnex.

The tunnel will not be continuously operated with VOC concentrations at 4 mg/m^3. Ventilation outlet concentrations are not constant as they vary over the daily cycle due to changing traffic volumes and speeds, and operation of the ventilation system to maintain in-tunnel air quality in variable traffic conditions. The proposed modification is to correct an error and provide for a limit that will allow appropriate management of infrequent, short term events such as accidents or extreme congestion. All NSW tunnels approved since NorthConnex have a VOC limit of 4 mg/m^3.

The *Dispersion Modelling Results_28Sep15 report* presents the results of modelling at a constant VOC emission concentration of 4 mg/m^3 over three years. This is a highly conservative scenario that is analogous to the tunnel operating under constant worst-case congested traffic and breakdown conditions and would never occur in practice. It provides a "worst-case" prediction of ground-level concentrations to demonstrate compliance with the criteria specified in the *NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005). These "worst case" results are 5% or less than the relevant EPA criteria.

These "worst case" results do not change the health assessment. As noted in the NorthConnex Technical Working Paper: Human Health Risk Assessment, the results of continuous emissions at the proposed emission limits is not relevant for the assessment of exposure and health impacts in the community[1]:

> *This design analysis has been conducted to ensure that regardless of when the peak traffic period occurs or for how long it lasts, the project's ventilation system would be able to meet applicable air quality criteria. This design analysis assumes that the project's ventilation outlets emit the maximum concentration of pollutants based on peak forecast traffic flows on a continuous basis. In reality, emissions concentrations would vary during the day depending on the number and type of vehicles using the tunnels at the time.*
>
> *The design analysis is not representative of emissions that may occur during normal or peak traffic flow conditions and is therefore not relevant for the further assessment of exposure and health impacts in the local community*

The EPA has reviewed the Modification Request and noted that modelling demonstrates the increased VOC emission limit from 1 mg/m^3 to 4 mg/m^3 does not result in adverse air quality impacts.

NSW Health reviewed the proposed modification and deferred to the EPA's assessment that the modelling demonstrates the increased VOC emissions limit does not result in adverse air quality impacts.

There are no plans to increase other limits as specified in the Conditions of Approval. There are strict reporting requirements in the Conditions of Approval for any exceedance of the limits. This includes improvements to the tunnel ventilation system, as opposed to changing any of the limits. Refer to existing Condition of Approval E13.

The VOC values presented in Table 7-101 of the EIS are based on free-flowing, expected traffic volumes. These traffic volumes are significantly lower than the physical capacity of the tunnel. As illustrated in Figure 2-5 of the SPIR, forecast traffic volumes are approximately 50% or less than the physical capacity of the tunnels.

[1] Technical Working Paper: Human Health Risk Assessment – NorthConnex p 49

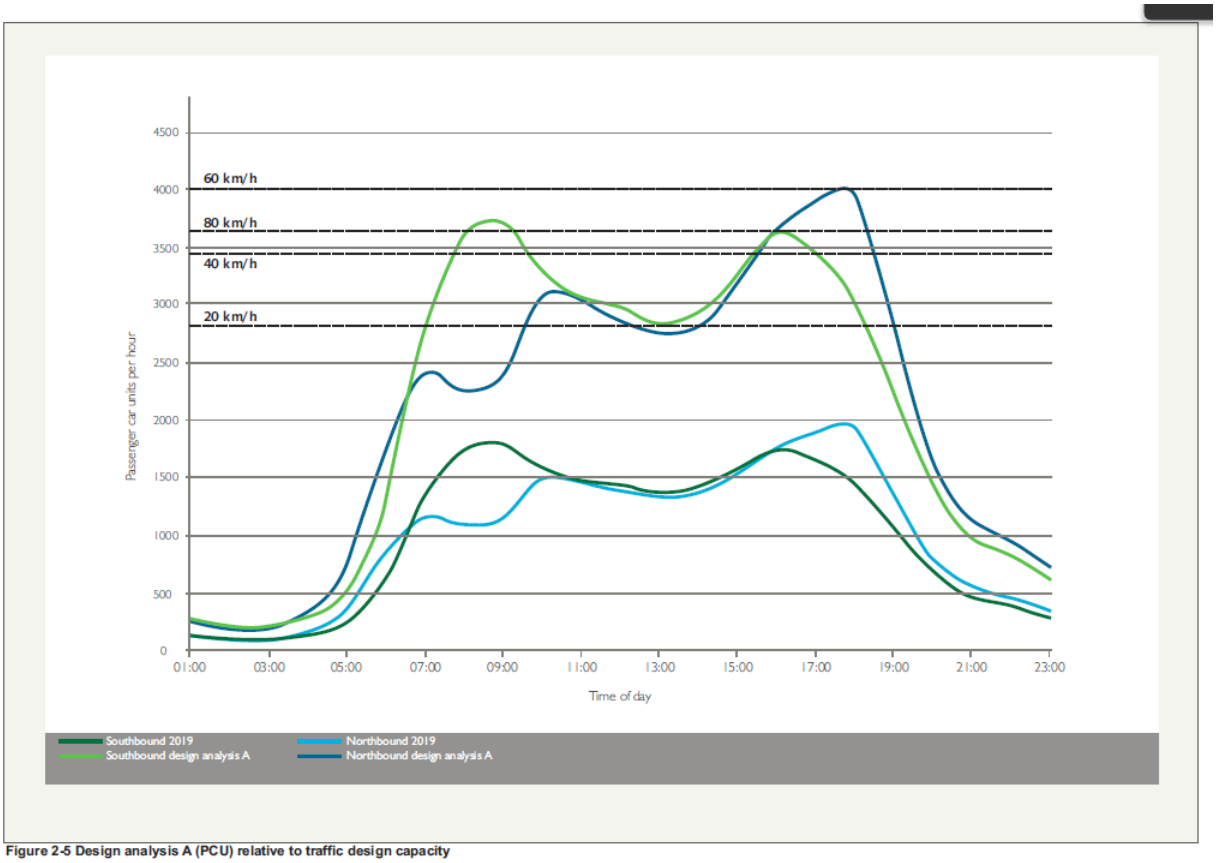

Figure 2-5 Design analysis A (PCU) relative to traffic design capacity

Table 2-3 of the SPIR presents in-tunnel concentrations for CO for the maximum physical capacity of the tunnel.

Table 2-3 Summary of road tunnel design and operational criteria (visibility)

Average traffic speed	Carbon monoxide			Nitrogen dioxide			Visibility (PM_{10})		
	Design criterion (15-minute)	Maximum concentration at tunnel mid point	Maximum concentration at ventilation offtake	Design criterion (15-minute)	Maximum concentration at tunnel mid point	Maximum concentration at ventilation offtake	Design criterion	Maximum concentration at tunnel mid point	Maximum concentration at ventilation offtake
Northbound main alignment tunnel									
80 km/h	**50 ppm (57.3 mg/m^3)**	8.4 ppm (9.6 mg/m^3)	11.8 ppm (13.5 mg/m^3)	**0.5 ppm (0.94 mg/m^3)**	0.40 ppm (0.75 mg/m^3)	0.78 ppm (1.47 mg/m^3)	**<0.005 m^{-1} (1.06 mg/m^3)**	0.0026 m^{-1} (0.55 mg/m^3)	0.0045 m^{-1} (0.96 mg/m^3)
60 km/h	**50 ppm (57.3 mg/m^3)**	8.9 ppm (10.2 mg/m^3)	12.8 ppm (14.7 mg/m^3)	**0.5 ppm (0.94 mg/m^3)**	0.43 ppm (0.81 mg/m^3)	0.84 ppm (1.58 mg/m^3)	**<0.005 m^{-1} (1.06 mg/m^3)**	0.0029 m^{-1} (0.62 mg/m^3)	0.0050 m^{-1} (1.06 mg/m^3)
40 km/h	**60 ppm (68.7 mg/m^3)**	10.1 ppm (11.6 mg/m^3)	13.1 ppm (15.0 mg/m^3)	**0.8 ppm (1.51 mg/m^3)**	0.51 ppm (0.96 mg/m^3)	0.83 ppm (1.56 mg/m^3)	**<0.005 m^{-1} (1.06 mg/m^3)**	0.0034 m^{-1} (0.72 mg/m^3)	0.0050 m^{-1} (1.06 mg/m^3)
Southbound main alignment tunnel									
80 km/h	**50 ppm (57.3 mg/m^3)**	7.2 ppm (8.2 mg/m^3)	10.0 ppm (11.5 mg/m^3)	**0.5 ppm (0.94 mg/m^3)**	0.21 ppm (0.40 mg/m^3)	0.48 ppm (0.90 mg/m^3)	**<0.005 m^{-1} (1.06 mg/m^3)**	0.0021 m^{-1} (0.45 mg/m^3)	0.0039 m^{-1} (0.83 mg/m^3)
60 km/h	**50 ppm (57.3 mg/m^3)**	8.3 ppm (9.5 mg/m^3)	12.0 ppm (13.7 mg/m^3)	**0.5 ppm (0.94 mg/m^3)**	0.27 ppm (0.51 mg/m^3)	0.61 ppm (1.14 mg/m^3)	**<0.005 m^{-1} (1.06 mg/m^3)**	0.0027 m^{-1} (0.57 mg/m^3)	0.0050 m^{-1} (1.06 mg/m^3)
40 km/h	**60 ppm (68.7 mg/m^3)**	10.2 ppm (11.7 mg/m^3)	12.9 ppm (14.8 mg/m^3)	**0.8 ppm (1.51 mg/m^3)**	0.43 ppm (0.80 mg/m^3)	0.69 ppm (1.30 mg/m^3)	**<0.005 m^{-1} (1.06 mg/m^3)**	0.0035 m^{-1} (0.68 mg/m^3)	0.0050 m^{-1} (1.06 mg/m^3)

Note: in-tunnel air quality should be considered and assessed at the tunnel mid point. The maximum concentration at the ventilation offtake is relevant to and has been considered in the assessment of ambient air quality.

The analysis focused on CO, NO_2 and visibility as these were the design criteria for the project. The maximum CO concentration predicted is 15 mg/m^3. VOC emissions are calculated as approximately 10% of CO emissions, so this equates to a maximum VOC concentration on the outlet of approximately 1.5 mg/m^3.

This is the maximum concentration of VOCs if the tunnel is at maximum physical capacity, but does not account for incidents that can result in a short-term increase in VOC emissions that the ventilation system would need to manage.

A compliance limit for VOCs in the outlet should be based on a combination of the physical capacity of the tunnels (ie maximum traffic), and ability to manage short-term incidents.

It is not practical to place a restriction on the number of incidents, as many incidents are beyond the control of the tunnel operator. Placing a restriction on the number of times that

VOC emissions are allowed to exceed 1 mg/m^3 before triggering condition E13 is in effect placing a restriction on the number of incidents. The responsibility of the tunnel operator is to ensure that air quality is appropriately managed during any incident.

It is difficult to quantify potential short-term incidents. However, based on operational experience of the Cross City Tunnel and Lane Cove Tunnel, it is considered that a VOC limit of 4 mg/m^3 provides a reasonable margin for compliance so that the ventilation system can manage the combination of capacity traffic and short-term incidents in compliance with outlet limits. A VOC limit of less than 4 mg/m^3 (e.g. 2 mg/m^3) is therefore not a reasonable margin for compliance.

It should be noted that constant emissions at the proposed outlet limit of 4 mg/m^3 is consistent with all the tunnel projects approved after NorthConnex and has been demonstrated by the supplementary modelling to result in ground-level concentrations of 5% or less than the EPA criteria.

Condition of Approval E12 stipulates that the ventilation outlet limits detailed in Table 10 (ie E11) shall be reviewed on a five-yearly basis and may be lowered (ie made more stringent) subject to a sustainability assessment and there being improvements in vehicle fleet emissions.

2.3.2 Sub-issue, Install Filters

Issue description

In summary, the respondent(s) raised the following issues:

- Common and best practise in developed countries is to install filtration systems in urban tunnels or to place ventilation stacks away from sensitive receptors, such as children.
- Why is RMS ignoring Parliamentary inquiry recommendation to install filtration, which is used internationally?

Response

Filtration does not target VOC emissions. Filtration technologies are targeted at particles, and to a lesser extent nitrogen dioxide.

Experience from motorway tunnels around the world and studies of ambient air quality data demonstrate that emissions from ventilation outlets have a negligible impact on local and regional air quality. This is consistent with air quality modelling for NorthConnex completed at 1 mg/m^3 and 4 mg/m^3.

The independent NSW Chief Scientist and Engineer has released a report in relation to road tunnel air quality. The report found that emissions from well-designed road tunnels cause a negligible change to surrounding air quality, and as such, there is little to no health benefit for surrounding communities in installing filtration and air treatment systems in such tunnels. Further information is available at www.chiefscientist.nsw.gov.au and www.northconex.com.au.

The EIS and the Submissions and Preferred Infrastructure Report (SPIR) present an analysis of the effectiveness of filtration systems. As demonstrated in the EIS and the SPIR, the NorthConnex ventilation system has been designed to result in little, if any change in air quality in the community and there will be air quality monitoring in the community to confirm the EIS predictions. The NorthConnex project has well designed ventilation outlets to effectively disperse emissions high into the atmosphere where they mix with the air with negligible impact on air quality. The NorthConnex tunnel is predicted by the scientists to provide an overall reduction in air pollution in the area. This is achieved because of a number of factors including the design of the tunnel (without a filter system) and because trucks and

cars create their greatest pollution when they stop and start. As NorthConnex will avoid 40 traffic lights on the Pacific Highway to the CBD or bypass up to 21 traffic lights on Pennant Hills Road, some trucks will reduce their emissions substantially, by travelling in a free flowing tunnel, on a straighter, flatter route.

Importantly, the change in traffic caused by the tunnel will take truck and car emissions away from the roads immediately adjacent to schools and homes thereby providing a health benefit. This is particularly relevant along Pennant Hills Road.

These scientific predictions are backed up lawfully in the conditions of consent and scientifically in a peer review of the EIS by two international experts appointed by the independent NSW Chief Scientist and Engineer.

NorthConnex has strict air quality requirements goals to ensure that air pollution levels are appropriately managed inside and outside the tunnels. The in-tunnel limit for NO_2 and the $PM_{2.5}$ ambient air quality goal are amongst the most stringent in the world. Section 3.1 of the November 2014 NorthConnex Submissions and Preferred Infrastructure Report (SPIR) contains an analysis of the availability and effectiveness of international in-tunnel air treatment systems which reached similar conclusions. The link to the report is https://majorprojects.accelo.com/public/8ef811d2782ded23240d424e1f398184/1_Response%20to%20Submissions_PIR%20Volume%201.pdf. Based on the analyses mentioned here, implementation of the recommendation from the parliamentary inquiry to install filtration on ventilation outlets would be ineffective.

NorthConnex tunnel design is consistent with common and best practice in developed countries. Exact comparison can be difficult and complex however the best example is the Stockholm Bypass, which is currently under construction. This will comprise 17 km of longitudinally ventilated tunnels without filtration.

2.3.3 Sub-issue, No explanation of transcription error

Issue description

In summary, the respondent(s) raised the following issues:

- What is the level of confidence in all other technical aspects of the project, given such a fundamental error has only just been identified?
- Possibility original assessment was wrong and with these reports of spikes in current motorway tunnels the Government is now trying to correct its modelling.

Response

After the NorthConnex approval was granted, it was realised that there was an error in the Condition of Approval E11 for the concentration of Volatile Organic Compounds (VOC) for the ventilation outlets, which is currently 1mg/m^3 when it should have been 4mg/m^3. There was never an error with the EIS or SPIR.

This is evidenced by the fact that the methodology adopted in the EIS was that VOC emissions for each vehicle class were calculated by: calculating CO emissions; then calculating the ratio of the National Pollutant Inventory emission factors for VOC and CO; and then multiplying the CO emissions by the ratio calculated. This has resulted in a ratio factor of around 10% (0.1). The calculated VOC levels in the EIS/SPIR are of this ratio to the CO calculated levels. The CO level approved in condition E11 is 40 mg/m^3. In condition E11 the VOC level of 1 mg/m^3 instead of 4 mg/m^3 is clearly not 10% of the CO.

The error has no environmental consequence, however any errors in the approval need to be corrected in a public manner for complete transparency about the project.

2.3.4 Sub-issue, Raising Ventilation Outlet Height

Issue description

In summary, the respondent(s) raised the following issues:

- Raise southern ventilation outlet height

Response

The proposed modification to the VOC limits does not require a change in the southern or northern ventilation outlet heights.

The ventilation outlet heights proposed in the NorthConnex EIS were increased by five metres, as reported in Section 3.2.2 of the November 2014 NorthConnex Submissions and Preferred Infrastructure Report (SPIR). It compared height increases from +2 metres, +5 metres, +10 metres and +15 metres. For the +5 increase there was a marked reduction in ground-level concentrations of various pollutants (link to the analysis is): https://majorprojects.accelo.com/public/8ef811d2782ded23240d424e1f398184/1_Response%20to%20Submissions_PIR%20Volume%201.pdf). A further increase in ventilation outlet height would not significantly decrease levels of motor vehicle emissions in the community.

2.3.5 Sub-issue, Proposed VOC level sets a precedent for future projects.

Issue description

In summary, the respondent(s) raised the following issues:

- The high level sets a precedent for future projects.
- The likelihood of such a 'limit' becoming a constant state of affairs is high.

Response

The proposed VOC level does not set a precedent for future projects.

The requested VOCs outlet limit of 4mg/m^3 is consistent with the VOCs limit specified in the Department of Planning, Industry and Environment planning approval conditions for subsequent major tunnel projects in New South Wales approved after NorthConnex.

2.3.6 Sub-issue, Install more air (pollution) monitoring stations in Wahroonga

Issue description

In summary, the respondent(s) raised the following issues:

- Install more air monitoring stations in Wahroonga area, and near schools to evaluate/demonstrate results. There are no monitoring stations near Wahroonga.
- Provide continuous monitoring system in place to evaluate the air quality, near the ventilation outlet.
- Provision should be made for publication of relevant in-tunnel air quality performance data.
- There should at least warnings sent to local people and schools when temporary exceedances of the air quality occur.
- The tunnel needs at least two more smoke stacks along its length.

Response

Local continuous air quality monitoring will provide the means of detecting any actual changes in local air quality once the tunnel is operational. Near real time data from the six local air

quality monitors for NorthConnex is available to the community at http://airodis.ecotech.com.au/northconnex/

Air quality monitoring will be continued during operation of the project and will be used as a baseline, against which to assess the operational impacts of the project.

The approval requires monitoring data to be collected for at least 12 months prior to, and 2 years after operation. The location of the monitoring stations has been approved by the AQCCC (Air Quality Community Consultative Committee), which includes representatives of local councils and the local community. The AQCCC deliberations were informed by independent expert air quality advice.

Six ambient air quality monitors were installed in late 2018 outside the tunnel in the following locations:

- James Park, Hornsby
- Carden Park, Wahroonga
- Thornleigh Golf Centre, Thornleigh
- Headen Park, Thornleigh
- Ashley Avenue, West pennant Hills
- Larchmont Place, West Pennant Hills.

It should be noted that similar monitoring programs around the Cross City Tunnel, Lane Cove Tunnel and M5 East have detected little, if any, change in air quality as a result of the outlet emissions. Roads and Maritime are confident the same result will be found for NorthConnex.

In addition to the ventilation outlets at each end of the tunnel there are two tunnel support facilities incorporating emergency smoke extraction outlets. The project tunnels would capture vehicle emissions, which would then be released in a controlled and efficient manner via the tunnel ventilation outlets, facilitating effective pollutant dispersion. The tunnel design ensures that two more ventilation outlets are not required.

2.3.7 Sub-issue, Manage congestion and traffic during operation.

Issue description

In summary, the respondent(s) raised the following issues:

- Limit and manage traffic entering the project tunnels in the event of significant congestion conditions that may lead to unacceptable in-tunnel air quality.
- Ensure the project's ventilation system reflects traffic volumes and in-tunnel air quality requirements; contingency measures in the event of elevated, unexpected in-tunnel air quality.

Response

The project's ventilation system has been designed and will be operated to reflect traffic volumes and in-tunnel air quality requirements. The planning approval:

- prescribes stringent air quality limits that must be complied with;
- requires that before the tunnel is operational, a *Tunnel Ventilation, Traffic Incident Response and Traffic Management Systems Integration Protocol* be reviewed by a suitably qualified and experienced independent ventilation specialist to confirm that the limits will be complied with; and
- continuous monitoring to demonstrate compliance with the limits with the monitoring data will be made available on the NorthConnex website.

The EIS has demonstrated that the tunnel can meet in-tunnel limits and outlet limits at capacity traffic. There is therefore no need to limit the traffic volumes entering the NorthConnex project to achieve the required in-tunnel air quality limits.

2.3.8 Sub-issue, Diesel vehicles to be reviewed/ restricted from using NCX

Issue description

In summary, the respondent(s) raised the following issues:

- NorthConnex will emit 500 micrograms per cubic metre of diesel particulates. The normal level across Sydney is between 8 and 25 micrograms.
- Limit the type of vehicles allowed through the tunnel, ie: no diesel fuelled vehicles/trucks.
- Exposure to diesel exhaust "can cause both short-term (acute) and long term (chronic) health effects. Diesel Engine Exhaust (DEE) is linked to both lung and bladder cancer. DEE contains a mixture of gases and soot, which is also called particulate matter.
- Request a review of the performance of smoky vehicle regulation / enforcement and whether additional or amended measures may be required.

Response

The proposed modification will not impact day-to-day operation of the tunnel, and has no bearing on the levels of diesel particulates. It should be noted that levels of particulate in the outlet will typically dilute many hundreds of times before mixing down to ground level where people can breathe them. Levels of particulate were thoroughly assessed in the EIS and it was demonstrated that emissions from the ventilation outlets would result in little, if any, change in air quality. For example, Figure 7-20 from the EIS (reproduced below) shows outlet contribution as the green at the bottom of the figure.

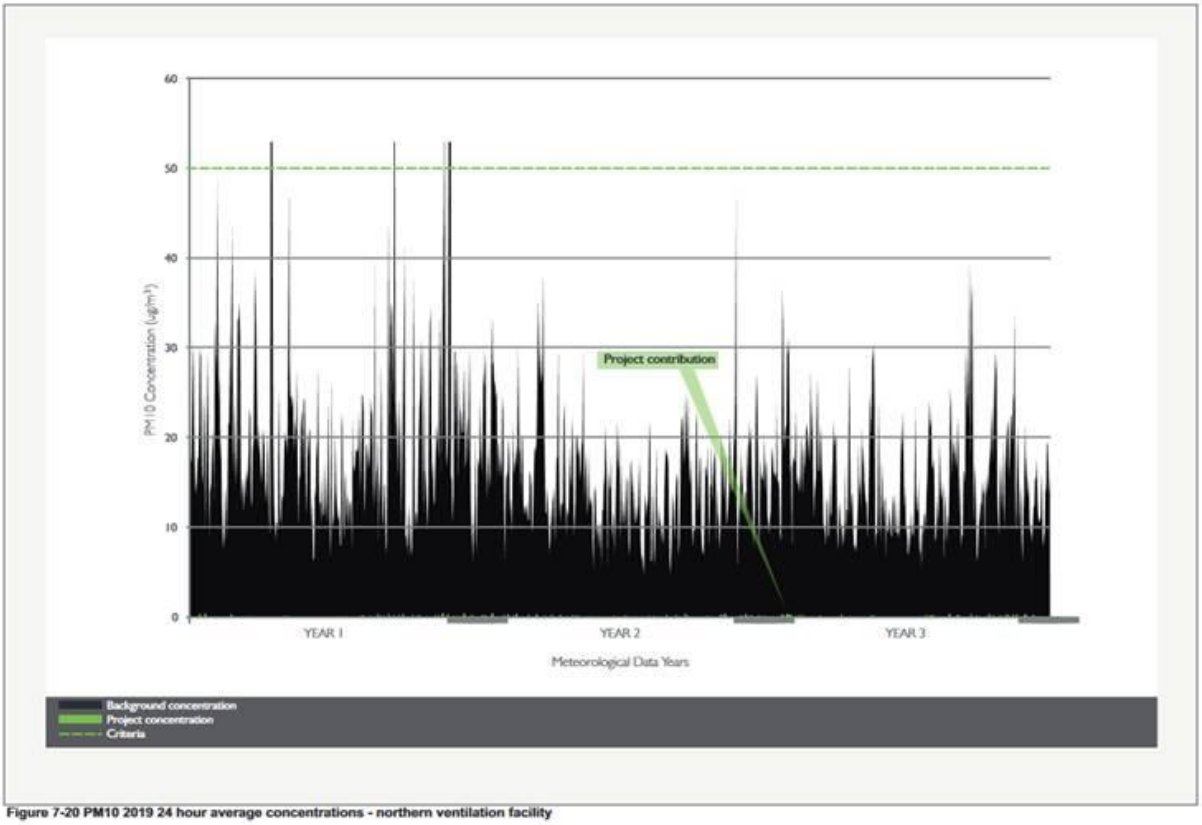

Figure 7-20 PM10 2019 24 hour average concentrations - northern ventilation facility

A review of the performance of smoky vehicle regulation / enforcement is being completed by NorthConnex in consultation with the Environment Protection Authority in accordance with Condition of Approval E16. This review will identify and assess the effectiveness of smoky vehicle enforcement measures in and around the NorthConnex project.

2.3.9 Sub-issue, EPA regulation

Issue description

In summary, the respondent(s) raised the following issues:

- NSW EPA has failed to introduce pollution charges on stack emissions and set those charges at a level reflective of emission control costs.

Response

The *Protection of the Environment Operations Act 1997* (POEO Act) Legislation Amendment (Scheduled Activities Regulation) 2019 commenced on 5 July 2019. The EPA is now the appropriate regulatory authority for emissions from road tunnel ventilation stacks. Details about these changes can be found on the EPA's website.

NSW EPA will be licencing the NorthConnex Project for operational air quality limits. This will include strict conditions and requirements for operators to demonstrate that ventilation stack emissions meet the appropriate air quality standards. This will include existing and new road tunnels including NorthConnex. The changes will provide transparency and greater confidence to the community about how road tunnel ventilation outlets are regulated.

Consistent with other environment protection licenses, tunnel operators will be required to make any monitoring data available on their websites, where that monitoring is required by the licence. They will also be required to provide annual reports to the EPA, details of which will be publicly available on the EPA's website.

2.4 Issue 2 Public Health

2.4.1 Sub-issue, No safe level of exposure

Issue description

In summary, the respondent(s) raised the following issues:

- Detrimental long term health impacts due to the increased level of VOC's from 1 mg/m^3 to 4 mg/m^3 from the northern ventilation outlet in a densely populated residential area in Wahroonga, on children/schoolchildren, (schools, residents, hospitals, the elderly, businesses and homes).
- Re-assess the air quality health issues to surrounding schools and residents in Wahroonga. Provide evidence that there will be no health impacts.
- Substantial short and long term adverse impacts on the surrounding population.

Response

Tunnels in NSW are designed, constructed and operated so that emissions from the ventilation outlets result in little, if any, change in the level of motor vehicle emission in the community. The air quality assessments to demonstrate this at EIS stage are subject to rigorous independent international peer review. The proposed modification will not change the normal operation of the tunnel.

The EIS presented a comprehensive assessment of the potential health impacts of the small increase in VOC levels due to ventilation outlet emissions. This assessment considered both the short term and long term exposure to VOCs. Regarding long term exposure, The Health Assessment concluded:

> Review of the chronic assessment presented in Table 4-7 indicates that during expected operation of the tunnel (in 2019 and 2029) the maximum long-term average (annual average) concentrations of volatile organic compounds and polycyclic aromatic hydrocarbons (assessed as the key individual volatile organic compound and polycyclic aromatic hydrocarbon compounds and as a sum of all the individual volatile organic

> compounds and polycyclic aromatic hydrocarbons) in air surrounding the northern and southern interchanges are well below the relevant long-term (chronic) health based guidelines. These are guidelines that are based on the protection of public health for inhalation exposures all day (24 hours), every day (365 days per year) for a lifetime (at least 70 years). The maximum HI calculated for exposure to the volatile organic compounds and polycyclic aromatic hydrocarbons is 0.011, well below the target HI [Hazard Index] of 1 (around 90 times lower than the target HI).

The supplementary modelling presented in support of the modification was conducted assuming constant emissions at the proposed emission limit for three years. This is a highly conservative scenario that would never occur in reality. This represents theoretical maximum changes in air quality for all potential traffic scenarios and is analogous to the tunnel operating under constant worst-case congested traffic and breakdown conditions.

This modelling demonstrated that even in this very conservative scenario, the small increase in concentrations was 5% or less than the EPA criteria specified in the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.

The EIS showed that emissions from the ventilation outlets will result in a very small change in the levels of air pollution that people breathe. In simple terms – if there is no material change in the level of air pollution, there will be no change in health outcomes.

For complete rigour and transparency, the potential health risks associated with these predicted changes were assessed in the EIS in the Health Impact Assessment. For the NorthConnex project the increased risks for all health indicators assessed were well below the unacceptable level and closer to the negligible level.

2.4.2 Sub-issue, Health Impact and Health Cost

Issue description

In summary, the respondent(s) raised the following issues:

- There is a great deal of published information/large scale research studies/media coverage about the health impacts due to air pollution, and there are grave concerns expressed by health experts.
- VOCs are toxic and carcinogenic causing asthma, bronchitis, reduced lung function, respiratory illnesses, cardio vascular illnesses, learning difficulties in children, dementia and autism. Long term effects are not accurately known.

Response

Tunnels in NSW are designed, constructed and operated so that emissions from the ventilation outlets result in little, if any, change in the level of motor vehicle emission in the community. The air quality assessments to demonstrate this at EIS stage are subject to rigorous independent international review. Stringent approval conditions, including monitoring in the community, require the proponent to confirm the EIS predictions.

The EIS presented a comprehensive assessment of the potential health impacts of the small increase in VOC levels due to ventilation outlet emissions. This assessment considered both the short term and long term exposure to VOCs – including PAHs. Regarding long term exposure, the Health Assessment concluded:

> Review of the chronic assessment presented in Table 4-7 indicates that during expected operation of the tunnel (in 2019 and 2029) the maximum long-term average (annual average) concentrations of volatile organic compounds and polycyclic aromatic hydrocarbons (assessed as the key individual volatile organic compound and polycyclic aromatic hydrocarbon compounds and as a sum of all the individual volatile organic compounds and polycyclic aromatic hydrocarbons) in air surrounding the northern and southern interchanges are well below the relevant long-term (chronic) health based

guidelines. These are guidelines that are based on the protection of public health for inhalation exposures all day (24 hours), every day (365 days per year) for a lifetime (at least 70 years). The maximum HI calculated for exposure to the volatile organic compounds and polycyclic aromatic hydrocarbons is 0.011, well below the target HI of 1 (around 90 times lower than the target HI).

The EIS showed that emissions from the ventilation outlets will result in a very small change in the levels of air pollution that people breathe. In simple terms – if there is no material change in the level of air pollution, there will be no change in health outcomes.

2.4.3 Sub-issue, Above acceptable levels

Issue description

In summary, the respondent(s) raised the following issues:

- The proposed VOC emission level of 4 mg/m^3 is above the acceptable levels in the air we breathe, with 1 to 3 mg/m³ being a high level of concern.

Response

The submission refers to a table referring to ambient levels of VOC, which states that ambient levels above 1 mg/m^3 are high. While it is true that the proposed modification is seeking permissible levels in the outlet to be up to 4 mg/m^3, emissions from the outlet will dilute many hundreds of times before mixing down to ground level where the community can breathe them. This is because the design and approval of the tunnel requires air to be pushed through a 20 metre high outlet at a minimum rate of about 50 km per hour.

Maximum VOC levels in the community are predicted to be below 30 µg/m^3. A µg is a micro gram, and is 1000th of a mg or milligram. The table referred to in the submission states that levels below 0.3mg/m^3 are low. The maximum level in the community is predicted to be below 0.03 mg/m^3, over 100 times less than the level identified as low in the submission.

2.5 Issue 3, Process and Consultation

2.5.1 Sub-issue, Exhibition period and Planning Portal

Issue description

In summary, the respondent(s) raised the following issues:

- The exhibition period was too short and there was not enough time to consider all aspects and to respond.
- The process to make a submission increasingly cumbersome, particularly for those without internet access or who do not receive the local paper.
- The planning portal failed to provide access to submissions process.

Response

The Department of Planning, Industry and Environment (DPIE) publicly exhibited the NorthConnex modification for a period of 14 days. The 14 day display period is typical for these types of modifications. DPIE is in the process of developing an improved planning portal, which will provide a better experience for community members wanting to make submissions on exhibited projects.

2.5.2 Sub-issue, Need for EIS

Issue description

In summary, the respondent(s) raised the following issues:

- There should be a new EIS, as the 1mg level has been approved.

Response

The Division 5.2 process in the *Environmental Planning and Assessment Act 1979* allows for modifications of project approvals. RMS has undertaken an assessment of the proposed change to the VOC limits and this was made publicly available for two weeks. The assessment and all the submissions will be considered by the Minister for Planning, Industry and Environment in deciding whether to approve the proposed modification. Another EIS is not required. Roads and Maritime is following this statutory modification process.

2.5.3 Sub-issue, Consultation

Issue description

In summary, the respondent(s) raised the following issues:

- There has been inadequate consultation by the RMS with the local community, including the parents of children attending local schools, about the potential impact of the proposed modifications.
- There has been inadequate communication and dialogue to the community from Road and Maritime and the Department of Health.
- There has been no consultation and explanation of what these levels mean in relation to air quality and pollution levels in Wahroonga and surrounding suburb.
- The AECOM study was funded by NorthConnex who have a vested interest in seeing the project go through. This seems like a conflict of interest.

Response

The modification report was publicly advertised and made available for viewing at the listed display locations for community comment (Section 1.3). The display resulted in responses from 197 individuals, including parents of children attending local schools.

As part of the preparation of the modification assessment, Roads and Maritime consulted NSW Health and EPA. Their written feedback on the proposed modification was attached to the assessment report that was publicly exhibited. In addition to Roads and Maritime consultation, DPIE also separately wrote to NSW Health, EPA, NSW Chief Scientist & Engineer, Ku-ring-gai Council, The Hills Shire Council, and Hornsby Shire Council inviting comment during the exhibition period.

The NorthConnex Environmental Impact Statement and the proposed modification was prepared by AECOM to meet the environmental assessment requirements specified by the Department of Planning, Industry and Environment. Before being publicly exhibited, the modification assessment was reviewed by the Department of Planning, Industry and Environment, NSW Environment Protection Authority and NSW Health.

2.5.4 Sub-issue, Modelling

Issue description

In summary, the respondent(s) raised the following issues:

- The "Dispersion Modelling Results_28Sep15" report becomes invalid if the parameters are changed.
- The proposal appears to have arisen from an oversight using modelling completed in 2015. The proponent has failed to provide data from either 2018 or 2019 and modelling results based upon such data.
- If the modelling was wrong and the actual impact was not good, how will the issue be fixed?

- The "EPA Letter Response", states that the "EPA also notes the AECOM modelling demonstrates the increased VOC emission limit from 1 mg/m^3 to 4 mg/m^3 does not result in adverse air quality impacts." However, the provided AECOM "Dispersion Modelling Results" makes no such claim. AECOM merely notes that the levels "would result in no exceedances of the speciated VOCs" and in fact, as would be logical, their modelling shows an expected.
- Increase in the level of VOC pollutants emitted into the atmosphere. With regard to the 'exceedances', the levels to be exceeded have not been exhibited in the Project's Modification Request and have thus been kept from scrutiny.
- Original modelling of the dispersal of air pollution used weather patterns from other parts of Sydney, including Terrey Hills, 20 kilometres away, and Sydney Airport. Actual weather patterns in the Wahroonga area are likely to result in less dispersal of air pollution.

Response

The proposed modification will not affect the day-to-day operation of the tunnel. The modification is to correct an error and provide for a limit that will allow appropriate management of infrequent, short term events such as accidents or extreme congestion. All NSW tunnels approved since NorthConnex have a VOC limit of 4 mg/m^3.

Parameters for the *Dispersion Modelling Results_28Sep15 report* will not be altered. The *Dispersion Modelling Results_28Sep15 report* presents results of modelling at a constant VOC emission concentration of 4 mg/m^3 over three years. This is a highly conservative scenario that is analogous to the tunnel operating under constant worst-case congested traffic and breakdown conditions 24-hours a day for three years, and would never occur in practice. It provides a “worst-case” prediction of ground-level concentrations to demonstrate compliance with the criteria specified in the *NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005). These “worst-case” results are 5% or less than the relevant EPA criteria.

Dispersion model scenarios were run with 2009, 2010 and 2011 meteorological data consistent with the EIS. Three years of meteorological data is sufficient to characterise the worst-case conditions that would be experienced in any year. The modelling methodology uses a sophisticated meteorological model (CALMET) to construct a three-dimensional wind and temperature field to predict local weather and dispersions conditions using measured meteorological data, as well as land-use and terrain data. The combination of three-years of meteorological data and the CALMET model ensures that worst-case dispersion conditions in the Wahroonga area are appropriately characterised.

Once NorthConnex is open, there will be 24-hour air quality monitoring inside the tunnel and from ventilation outlets which will be made publicly available.

The approval also requires air quality monitoring in the community to confirm the EIS predictions and detect any impact from the outlet. If this air quality monitoring exceeds the relevant health-based air quality goals there must be an investigation to determine if emissions from the ventilation outlets are a significant contributor to the exceedance. This investigation must be conducted by an independent person approved by the Secretary of the Department of Planning, Industry and Environment. If the investigation identifies the operation of the tunnel to be a significant contributor to the recorded exceedance, improvements to the ventilation system must be identified. NorthConnex must comply with any requirements arising from the Secretary’s review of this investigation report.

3 Proposed amendments to conditions of approval

After consideration of the issues raised in the public submissions, no further changes to the conditions of approval in the NorthConnex Project (SSI 6136) are proposed.

4 References

NorthConnex Environmental Impact Statement (EIS), July 2014

NorthConnex Environmental Impact Statement, Submissions and Preferred Infrastructure Report (SPIR), November 2014

NorthConnex Instrument of Approval SSI 6136, 13 January 2015

Appendix A

A1 – List of Respondents (Submission Identification)

Submission Identification Number	First Name	Last Name	Suburb	State	Postcode
SE-93539	Withheld	Withheld	DUFFYS FOREST	New South Wales	2084
SE-93544	Chan	Nguyen	WAHROONGA	New South Wales	2076
SE-93545	Omar	Afiouni	WAITARA	New South Wales	2077
SE-93550	Withheld	Withheld	WAHROONGA	New South Wales	2076
SE-93682	Reshma	Pandey	WAHROONGA	New South Wales	2076
SE-93686	Withheld	Withheld	EAST LINDFIELD	New South Wales	2070
SE-93689	Dana	Robaei	TURRAMURRA	New South Wales	2074
SE-93724	Kathleen	Chen	-	New South Wales	1
SE-93725	Nicole	van Barneveld	.	New South Wales	1
SE-93727	Matt	Sawdon	.	New South Wales	1
SE-93728	Jay	Harwood	.	New South Wales	1
SE-93729	Jennifer	Corrigan	Northbridge	New South Wales	2063
SE-93730	Jeremy	Gill	.	New South Wales	1
SE-93731	Paul	Baynham	.	New South Wales	1
SE-93732	Tanya	Allison	.	New South Wales	1
SE-93733	Sarah	Bickford	fairlight	New South Wales	2094
SE-93734	Withheld	Withheld	Pennant Hills	New South Wales	1715
SE-93735	leah	Allen	.	New South Wales	1
SE-93736	Anna	Lynch	.	New South Wales	1
SE-93737	julia	nelson	.	New South Wales	0
SE-93738	Angus	Laing	Fairlight	New South Wales	2094
SE-93741	Laura	Lucas	.	New South Wales	1
SE-93742	Karina	Kerr	.	New South Wales	1
SE-93744	Karen	Smith	.	New South Wales	1
SE-93745	Nicole	Antonini	Cammeray	New South	2062

Submission Identification Number	First Name	Last Name	Suburb	State	Postcode
				Wales	
SE-93746	Kate	Juanda	.	New South Wales	1
SE-93747	Hayley	Barban	Roseville	New South Wales	2069
SE-93753	Samantha	Philp	.	New South Wales	1
SE-93769	carlos	Vazquez	Willoughby	New South Wales	2068
SE-93770	Marcela	Gonzalez	.	New South Wales	1
SE-93771	Justin	Shupe	.	New South Wales	1
SE-93772	Kirsty	Cranfield	.	New South Wales	1
SE-93774	Kerry	Heubel	.	New South Wales	1
SE-93785	Withheld	Withheld	WAHROONGA	New South Wales	2076
SE-93790	Rashad	Danoun	Sydney	New South Wales	2000
SE-93799	Withheld	Withheld	WINSTON HILLS	New South Wales	2153
SE-93806	Withheld	Withheld	ASQUITH	New South Wales	2077
SE-93807	Withheld	Withheld	ST IVES	New South Wales	2075
SE-93821	Withheld	Withheld	THORNLEIGH	New South Wales	2120
SE-93825	Geoff	Hiller	WAHROONGA	New South Wales	2076
SE-93826	John	Carolan	WAHROONGA	New South Wales	2076
SE-93828	Withheld	Withheld	HORNSBY	New South Wales	2077
SE-93835	Withheld	Withheld	TURRAMURRA	New South Wales	2074
SE-93836	Withheld	Withheld	MARSFIELD	New South Wales	2122
SE-93837	Withheld	Withheld	MARSFIELD	New South Wales	2122
SE-93838	Brooke	Scott	Wahroonga	New South Wales	2076
SE-93839	Raj	Ratan	Wahroonga	New South Wales	2076
SE-93849	Withheld	Withheld	GALSTON	New South Wales	2159
SE-93852	Troy	Robinson	.	New South Wales	1
SE-93853	Ben	Prag	.	New South Wales	1
SE-93854	Denise	Corrigan	.	New South	1

Submission Identification Number	First Name	Last Name	Suburb	State	Postcode
				Wales	
SE-93855	Emanuel a	Grant	.	New South Wales	1
SE-93856	Brendan	Burrows	.	New South Wales	1
SE-93857	Andy	Munro	.	New South Wales	1
SE-93858	Jimmy	Oliveira	North Sydney	New South Wales	2060
SE-93861	Helen	Nassar	PYMBLE	New South Wales	2073
SE-93868	katherine	gu	FLETCHER	New South Wales	2287
SE-93869	Lei	Gong	WAHROONGA	New South Wales	2076
SE-93871	Withheld	Withheld	DEE WHY	New South Wales	2099
SE-93872	Withheld	Withheld	WAHROONGA	New South Wales	2076
SE-93877	Withheld	Withheld	WEST PENNANT HILLS	New South Wales	2125
SE-93880	Withheld	Withheld	WARRAWEE	New South Wales	2074
SE-93888	Samanth a	Lander	Killara	NSW	2071
SE-93890	sui	chan	ST IVES	New South Wales	2075
SE-93894	Ray	Nassar	PYMBLE	New South Wales	2073
SE-93901	Withheld	Withheld	MERRYLANDS	New South Wales	2160
SE-93905	Withheld	Withheld	WAHROONGA	New South Wales	2076
SE-93909	Withheld	Withheld	CHATSWOOD	New South Wales	2067
SE-93910	Adam	Tym	.	New South Wales	1
SE-93911	Sabae	Lwin	.	New South Wales	1
SE-93912	Cecily	Conroy	.	New South Wales	1
SE-93913	Joseph	Dickson	.	New South Wales	1
SE-93914	Helen	Ward	.	New South Wales	1
SE-93915	Shuchita	Sharma	.	New South Wales	1
SE-93917	Withheld	Withheld	WAITARA	New South Wales	2077
SE-93918	Peter	Gooden	North Sydney	New South Wales	2060
SE-93971	Withheld	Withheld	WAHROONGA	New South	2076

Submission Identification Number	First Name	Last Name	Suburb	State	Postcode
				Wales	
SE-93972	Withheld	Withheld	WAHROONGA	New South Wales	2076
SE-93975	Withheld	Withheld	WAHROONGA	New South Wales	2076
SE-93976	Withheld	Withheld	NORMANHURST	New South Wales	2076
SE-93977	Withheld	Withheld	NORMANHURST	New South Wales	2076
SE-93988	Les	Johnston	BALMAIN	New South Wales	2041
SE-93990	Withheld	Withheld	WAHROONGA	New South Wales	2076
SE-93992	Withheld	Withheld	BEROWRA HEIGHTS	New South Wales	2082
SE-93998	Annika	Wood	PYMBLE	New South Wales	2073
SE-94000	Kathy	Campbell	TURRAMURRA	New South Wales	2074
SE-94002	Evelyn	Ong	Artarmon	New South Wales	1570
SE-94003	Withheld	Withheld	HORNSBY	New South Wales	2077
SE-94004	Withheld	Withheld	WAHROONGA	New South Wales	2076
SE-94005	Withheld	Withheld	WAHROONGA	New South Wales	2076
SE-94007	Kinjal	Dave	WAHROONGA	New South Wales	2076
SE-94101	leona weiyi	Lu	DENISTONE EAST	New South Wales	2112
SE-94103	Withheld	Withheld	THORNLEIGH	New South Wales	2120
SE-94109	Gerard	Lai-Smith	WAHROONGA	New South Wales	2076
SE-94110	Withheld	Withheld	WAHROONGA	New South Wales	2076
SE-94111	Dev	Mookerjee	NORMANHURST	New South Wales	2076
SE-94112	Chan	Nguyen	WAHROONGA	New South Wales	2076
SE-94113	Withheld	Withheld	MOUNT COLAH	New South Wales	2079
SE-94117	Withheld	Withheld	PYMBLE	New South Wales	2073
SE-94123	Manu	Sivaraj	WAHROONGA	New South Wales	2076
SE-94124	Withheld	Withheld	TURRAMURRA	New South Wales	2074
SE-94125	Withheld	Withheld	ST IVES	New South Wales	2075
SE-94126	Suelyn	Lai-Smith	WAHROONGA	New South	2076

Submission Identification Number	First Name	Last Name	Suburb	State	Postcode
				Wales	
SE-94127	Andy	Cheung	TURRAMURRA	New South Wales	2074
SE-94133	Withheld	Withheld	THORNLEIGH	New South Wales	2120
SE-94134	Withheld	Withheld	HORNSBY HEIGHTS	New South Wales	2077
SE-94136	Withheld	Withheld	HORNSBY HEIGHTS	New South Wales	2077
SE-94140	Penelope	Gleen	PYMBLE	New South Wales	2073
SE-94142	Withheld	Withheld	Killara	New South Wales	2071
SE-94144	Gwenda	Charlson	NORTH EPPING	New South Wales	2121
SE-94146	Withheld	Withheld	WEST PYMBLE	New South Wales	2073
SE-94149	Peter	Georgiades	Wahroonga	New South Wales	2076
SE-94151	Withheld	Withheld	KILLARA	New South Wales	2071
SE-94156	Withheld	Withheld	KILLARA	New South Wales	2071
SE-94157	Withheld	Withheld	BEROWRA	New South Wales	2081
SE-94159	Withheld	Withheld	ST IVES CHASE	New South Wales	2075
SE-94160	Withheld	Withheld	BEECROFT	New South Wales	2119
SE-94161	Withheld	Withheld	ST IVES CHASE	New South Wales	2075
SE-94162	Ben	Ewald	THE HILL	New South Wales	2300
SE-94166	Ian	Frame	SOUTH TURRAMURRA	New South Wales	2074
SE-94168	Louise	Greig	WAHROONGA	New South Wales	2076
SE-94170	William	Gill	WAHROONGA	New South Wales	2076
SE-94172	Withheld	Withheld	WAHROONGA	New South Wales	2076
SE-94176	Withheld	Withheld	EAST LINDFIELD	New South Wales	2070
SE-94177	H	H	EAST LINDFIELD	New South Wales	2070
SE-94179	Withheld	Withheld	SYDNEY	New South Wales	2000
SE-94180	Withheld	Withheld	WAHROONGA	New South Wales	2076
SE-94181	Withheld	Withheld	CAMPERDOWN	New South Wales	2050
SE-94183	Withheld	Withheld	CAMPERDOWN	New South	2050

Submission Identification Number	First Name	Last Name	Suburb	State	Postcode
				Wales	
SE-94184	Jane	Georgiades	Wahroonga	New South Wales	2076
SE-94185	Withheld	Withheld	WEST PENNANT HILLS	New South Wales	2125
SE-94187	Vivienne	Cheng	WAHROONGA	New South Wales	2076
SE-94188	David	Altman	NORTHBRIDGE	New South Wales	2063
SE-94189	Withheld	Withheld	BEECROFT	New South Wales	2119
SE-94190	Withheld	Withheld	KILLARA	New South Wales	2071
SE-94192	Mark	Chan	BEECROFT	New South Wales	2119
SE-94193	Hong	Nguyen	WAHROONGA	New South Wales	2076
SE-94195	Josephine	Abbott	TURRAMURRA	New South Wales	2074
SE-94196	Withheld	Withheld	WAITARA	New South Wales	2077
SE-94197	Michelle	Ngan	WEST PYMBLE	New South Wales	2073
SE-94199	Katrina	Chu	Thornleigh	New South Wales	2120
SE-94200	Withheld	Withheld	TURRAMURRA	New South Wales	2074
SE-94204	Withheld	Withheld	NORTHBRIDGE	New South Wales	2063
SE-94205	Withheld	Withheld	PENNANT HILLS	New South Wales	2120
SE-94209	Melissa	Wolf	GLENHAVEN	New South Wales	2156
SE-94210	Vivienne	Hung	LONGUEVILLE	New South Wales	2066
SE-94211	Withheld	Withheld	Turramurra	New South Wales	2074
SE-94212	Maria	Rundell	BEECROFT	New South Wales	2119
SE-94217	JACK	LIU	WAITARA	New South Wales	2077
SE-94219	Deepa	Pillay	WAHROONGA	New South Wales	2076
SE-94220	Lei	Zhang	HORNSBY	New South Wales	2077
SE-94224	Emma	Gow	MOUNT KURING-GAI	New South Wales	2080
SE-94226	Withheld	Withheld	WAHROONGA	New South Wales	2076
SE-94229	Ellie	Yang	ROSEVILLE	New South Wales	2069
SE-94236	Withheld	Withheld	PYMBLE	New South	2073

Submission Identification Number	First Name	Last Name	Suburb	State	Postcode
				Wales	
SE-94238	QINMENG	LI	WAITARA	New South Wales	2077
SE-94240	Eileen	Wang	WAITARA	New South Wales	2077
SE-94241	Jennifer	McLaren	GORDON	New South Wales	2072
SE-94242	Withheld	Withheld	HORNSBY	New South Wales	2077
SE-94243	Donna	Kwok	ROSEVILLE	New South Wales	2069
SE-94244	Stephanie	Pickford	WAHROONGA	New South Wales	2076
SE-94247	Withheld	Withheld	WAITARA	New South Wales	2077
SE-94248	Withheld	Withheld	PENNANT HILLS	New South Wales	2120
SE-94254	Withheld	Withheld	CHATSWOOD	New South Wales	2067
SE-94255	Withheld	Withheld	CHATSWOOD	New South Wales	2067
SE-94256	Maureen	Fong	Pyrmont	New South Wales	2009
SE-94258	Caiyan	Zang	WAITARA	New South Wales	2077
SE-94259	Georgia	Cameron	Beecroft	New South Wales	2119
SE-94260	Withheld	Withheld	PENNANT HILLS	New South Wales	2120
SE-94262	Withheld	Withheld	GORDON	New South Wales	2072
SE-94268	Laura	Soutter	WAHROONGA	New South Wales	2076
SE-94269	Nancy	Wong	BAULKHAM HILLS	New South Wales	2153
SE-94271	teresa	vumbaca	WAHROONGA	New South Wales	2076
SE-94274	Withheld	Withheld	THORNLEIGH	New South Wales	2120
SE-94275	Withheld	Withheld	WARRAWEE	New South Wales	2074
SE-94279	Megan	Soutter	WAHROONGA	New South Wales	2076
SE-94283	Barbara	Davis	CHELTENHAM	New South Wales	2119
SE-94284	Nigel	Pickford	WAHROONGA	New South Wales	2076
SE-94289	Withheld	Withheld	TURRAMURRA	New South Wales	2074
SE-94290	Withheld	Withheld	BEECROFT	New South Wales	2119
SE-94291	Elizabeth	Johnson	WAHROONGA	New South	2076

Submission Identification Number	First Name	Last Name	Suburb	State	Postcode
				Wales	
SE-94292	David	Hartshorn	WAHROONGA	New South Wales	2076
SE-94293	Withheld	Withheld	TURRAMURRA	New South Wales	2074
SE-94296	Withheld	Withheld	WAHROONGA	New South Wales	2076
SE-94312	Marcia	Horvai	Pennant Hills	New South Wales	2120
SE-94313	Rhys	Williams	.	New South Wales	1
SE-94314	Paulina	Hopkins	.	New South Wales	1
SE-94315	Aimee	Brice	Wahroonga	New South Wales	2076
SE-94316	Rebecca	Kiu	Wahroonga	New South Wales	2076
SE-94317	Patricia	Hynes	Waitara	New South Wales	2077
SE-94318	Cecilia	Croaker	Wahroonga	New South Wales	2076
SE-94319	Carrie	Waring	Sydney	New South Wales	2001
SE-94331	Karen	Peaston	.	New South Wales	1
SE-94614	Lisa	Britt	.	New South Wales	1

A2 - Report References (Address of Submissions)

Issues raised in submissions from community groups, individual community members and other stakeholders have been grouped into common issues, which are described in this appendix. Submitters can locate the issues raised in their submissions and the relevant section of the report where these have been addressed. Each submission author has been assigned a submitter identification number based on their submission form number assigned by the NSW Department of Planning, Industry and Environment (DPIE) on receipt of the submission.

Where a submitter has provided additional comments within a form letter, those additional comments are represented by the submitter identification number and cross referenced against the relevant responses in this appendix.

Report Section	Submitter identification numbers	Count
Issue 1 Air quality, Sub issue - Install Filters Report section 2.3.2	SE-93539 SE-93544 SE-93545 SE-93682 SE-93686 SE-93689 SE-93729 SE-93733 SE-93735 SE-93736 SE-93737 SE-93738 SE-93741 SE-93742 SE-93744 SE-93745 SE-93746 SE-93747 SE-93753 SE-93769 SE-93770 SE-93771 SE-93772 SE-93774 SE-93806 SE-93807 SE-93825 SE-93828 SE-93835 SE-93836 SE-93837 SE-93852 SE-93853 SE-93854 SE-93855 SE-93856 SE-93857 SE-93858 SE-93861 SE-93871	134

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	SE-94187 SE-94189 SE-94190 SE-94192 SE-94193 SE-94195 SE-94196 SE-94197 SE-94204 SE-94205 SE-94209 SE-94210 SE-94211 SE-94212 SE-94219 SE-94220 SE-94224 SE-94229 SE-94240 SE-94241 SE-94242 SE-94254 SE-94255 SE-94256 SE-94260 SE-94268 SE-94271 SE-94279 SE-94283 SE-94284 SE-94289 SE-94290 SE-94293 SE-94312 SE-94313 SE-94314 SE-94315 SE-94316 SE-94318 SE-94614	
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	SE-93990 SE-94000 SE-94003 SE-94005 SE-94101 SE-94103 SE-94109 SE-94110 SE-94112 SE-94113 SE-94117 SE-94125 SE-94126 SE-94127 SE-94133 SE-94134 SE-94136 SE-94142 SE-94144 SE-94146 SE-94149 SE-94151 SE-94156 SE-94157 SE-94159 SE-94161 SE-94166 SE-94170 SE-94172 SE-94176 SE-94177 SE-94179 SE-94181 SE-94183 SE-94184 SE-94187 SE-94189 SE-94190 SE-94192 SE-94193 SE-94195 SE-94197 SE-94200 SE-94204 SE-94205 SE-94209 SE-94210 SE-94211 SE-94212 SE-94219 SE-94220 SE-94224 SE-94229 SE-94236	

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