

Background

The M5 East Motorway is a 10 km long, 4-lane dual carriage motorway, which links central Sydney with Sydney's southwest. It consists of three major sections that include:

- **The western section:** This section covers 4 kilometres of open carriageway from the end of the existing M5 South-West Motorway at King Georges Road to the start of the tunnel section at Bexley Road, Earlwood.
- **The tunnel section:** From Bexley Road, Earlwood to Marsh Street, Arncliffe. The tunnel section consists of twin 2 lane tunnels, 4 kilometres in length. The tunnel is ventilated utilising a closed system (ie to avoid exhausting from portals) with fresh air supplied through an air intake at Duff Street Arncliffe. Jet fans operate against traffic flow at exit portals, and with traffic flow in the Marsh Street entry, to assist the movement of air to an exhaust location. Exhaust air is extracted without filtration through a single stack located approximately 900m north of the tunnel near Turrella railway station.
- **The eastern section:** From Marsh Street, Arncliffe to General Holmes Drive at Sydney Airport that includes the Eve Street viaduct, the Cooks River crossing and the freeway interchange with General Holmes Drive.

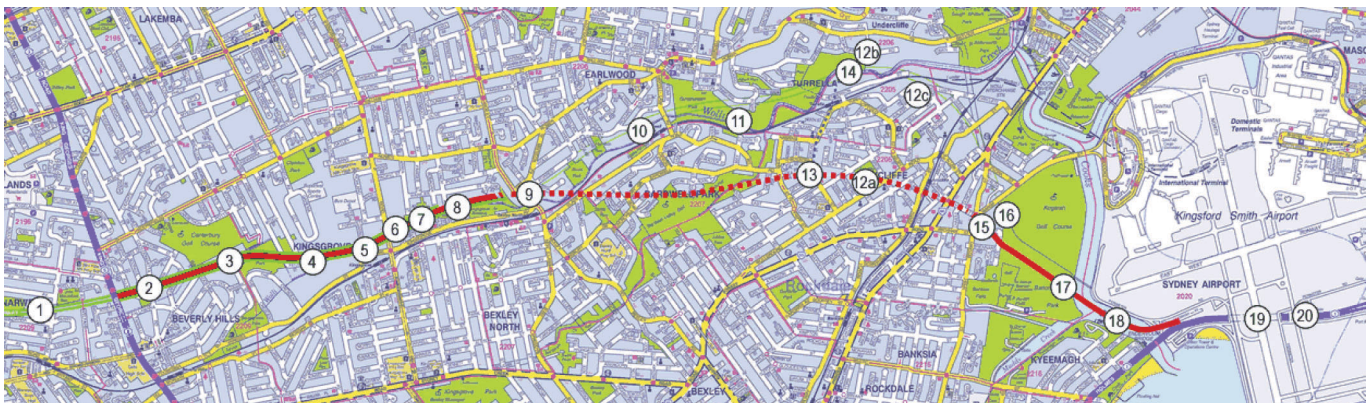
1.1 History

From its inception this development has been a controversial one. This report deals with the specific health concerns from the many local residents around the M5 East exhaust stack.

The concept of developing a motorway linking central Sydney to Sydney's southwest has existed since the late 1940's. However it was not until 1989 that an Environmental Impact Statement (EIS) for a 6-lane motorway between Beverly Hills and Alexandria was exhibited. In 1994 an alternative EIS was released. This 1994 EIS proposed a 4 lane tolled motorway. Following exhibition of the 1994 EIS key modifications were made and in 1996 yet another EIS was exhibited. This 1996 EIS originally proposed a three stack/three intake system of ventilation for the tunnel section of the motorway. However owing to 7951 representations of objection during its exhibition period, on 30 June 1997, the Roads and Traffic Authority (RTA) modified the 1996 EIS to a one stack / four air intake system. The stack was to be located near Henderson Street, Turrella.

On 9 December 1997, the RTA was given approval by the Minister of Urban Affairs and Planning, subject to 150 conditions, to proceed with the single ventilation stack M5 East Motorway development.

Figure 1. Location of M5 East Motorway*



12 a 12b, 12c.-Air Quality monitoring stations

13 – Air intake system

14 – M5 East exhaust stack, Turrella.

All other numbers do not relate to this report but are general features along the M5 East motorway.

* Figure taken from RTA website

On 16 January 1998 the Transport Action Group Against Motorways Inc. commenced proceedings in the Land and Environment Court to stop the current plan for development of the M5 East motorway, challenging the validity of some of the decisions taken by the RTA and the Minister for Urban Affairs and Planning. One key argument was the modification of the 1996 EIS from a three stack / three air intake system to a one stack / four air intake system. They unsuccessfully argued that this was a significant change to the development and as such another EIS and community consultation period should be undertaken. A subsequent appeal was also dismissed.

On 28 October 1999 a Parliamentary Committee was established to investigate the proposed development of the single ventilation stack at Turrella (*General Purpose Standing Committee No.5 (GPSC5)*). The Committee made 12 recommendations, which included:

Recommendation 6 – The need for an epidemiological health study of the community surrounding the ventilation stack.

Owing to the limitations of epidemiological studies in small populations, NSW Health advised resources to be directed to more effective measures such as monitoring pollutants.

Community outrage towards the ventilation stack increased, culminating in a rally and a sit down protest outside Parliament House in May and August 2000. On 12 December 2000 the Construction, Forestry, Mining and Energy Workers Union ('the CFMEU') issued a green ban on the ventilation construction site.

In August 2000, on advice from various government departments, the Department for Urban Affairs and Planning (DUAP) increased the construction height of the ventilation stack from 25 metres to 35 metres.

On 26 March 2001, the Parliamentary Committee (GPSC5) reformed to inquire into new areas of concern and report on the progress of its recommendations. At its conclusion, the Committee made 14 recommendations including:

Recommendation 2 – That Recommendation 6 from the previous Committee meeting be enacted.

Originally planned for opening on 4 June 2002, the Motorway construction was ahead of schedule and the opening was revised to 9 December 2001. This early opening meant some of the conditions of approval for the development of the M5 East Motorway would not be met. Therefore on 6 November 2001 Residents Against Polluting Stacks (RAPS) threatened to seek an injunction in the Land and Environment Court to prevent the opening of the tunnel until all the regulator's conditions had been met or a commitment to install electrostatic filtration equipment had been made. Three days prior to the opening an agreement between RAPS and RTA was reached and the temporary injunction adverted.

On 9 December 2001 the M5 East Motorway opened for traffic.

On 30 April 2002 NSW Health received, as part of a submission from RAPS, a petition with 72 signatures from residents around the Turrella ventilation stack who believed their health was being affected from stack exhaust. The predominant symptoms reported were eye irritation, headache and new or worsening asthma.

As part of the consent for development the RTA had installed air pollutant monitors around the M5 East exhaust stack. Five monitoring stations were installed, three operational since June 2000, with the other two operational since November 2001. These air pollutant monitors showed that air pollutant levels (carbon monoxide, nitrogen dioxide, fine particles and air toxics) did not change significantly once the stack opened. Further, the levels of measured pollutants remained below applicable standards before and after the stack opened, except for occasions of city-wide elevations as is found with bushfires.

Residents also reported significant odours associated with the opening of the stack. In December 2001 the RAPS group distributed odour diaries to residents. Katestone Environmental Consultants conducted preliminary analysis of diaries from 24 households and one workplace covering the period 10/12/01 to 30/6/02. The consultants reported that independent

complaints were often made on the same day, particularly during light winds.

In July 2002 NSW Health attended various committee and community group meetings to elicit more information about the health complaints and to determine the best way of addressing the concerns. The unique situation in this case was that people were reporting symptoms in the absence of any predictions of ill health. The epidemiological difficulties associated with assessing the reported symptoms in this circumstance were:

- The relatively small population affected
- Difficulty in quantifying exposure
- Presence of multiple potential confounders (cigarette smoking, home heating, traffic, annoyance)
- Lack of knowledge of mechanism of symptomatology (eg. which chemicals could be causing symptoms, whether or not symptoms are odour mediated)
- Likelihood of small physiological changes which would require a large study population over time to detect (eg changes in peak flows in asthmatic children)
- Difficulty in assessing cause

NSW Health prepared an internal discussion paper and convened a series of meetings with experts in epidemiology and environmental health inside and outside the Department to discuss possible research strategies to investigate the symptoms. A steering committee was appointed to guide the investigation.

Various strategies were considered, including a prevalence study of symptoms through the NSW Health Survey, a cohort study of children with asthma at nearby schools and a cohort study of adults with asthma at various 'exposure distances' from the stack. These options were limited by their relative insensitivity. Given the relatively small population affected, any form of population study has the potential for Type II errors (missing a true effect).

To refine the study options, NSW Health consulted with experts in immunology and respiratory medicine at Royal Prince Alfred Hospital. After a number of meetings NSW Health determined that the best methodology was to use a multi phase investigation, with the first phase being an exploratory, qualitative

study to better define the nature of the symptoms being experienced. A similar methodology was successfully used in 1996 to explore symptoms reported by people who believed they had been exposed to pesticides in Gunnedah.¹ The initial objectives were to define a group of residents who could be experiencing symptoms attributable to the M5 East stack, and then to monitor symptoms and signs in this population to determine if there was a plausible, temporal relationship between pollutant and/or odourous emissions from the M5 East and clinical effects. If indicated by these first 2 phases, NSW Health planned to conduct a cross sectional household survey of the prevalence of identified symptoms in the community.

On 21 October 2002 the Parliamentary Committee (GPSC5) presided for a third time on the M5 East tunnel and stack. During this Inquiry, on 18 November 2002, the Chief Health Officer, Dr. Greg Stewart advised the committee that NSW Health was committed to investigating the symptoms reported.

In December 2002 community meetings were held to discuss the study protocol with local residents, after which several revisions were made to the study protocol. The protocol for the first phase was submitted to the Ethics Review Committee of the Central Sydney Area Health Service in January 2003. Approval to proceed with the study was granted in March 2003.

1.2 Health effects of traffic emissions

Motor vehicles emit a variety of pollutants, many of which are known to be associated with adverse health effects. The pollutants of concern can generally be classified as particulate or gaseous, and the gaseous pollutants of concern include the commonly measured oxides of nitrogen and carbon monoxide, and air toxics, a diverse group of more complex chemicals including volatile organic compounds and polycyclic aromatic hydrocarbons. These pollutants have been investigated as individual chemicals and as part of the typical urban pollutant mix to assess their effect on human health.

Particulate air pollution has mainly been investigated in ecological studies, where health effects are attributed to the variability in particulate levels over time. Established health effects include increased respiratory and cardiovascular morbidity and mortality, although irritative effects to the mucous membranes are also reported.^{2,3,19}

An oxide of nitrogen, nitrogen dioxide, has been demonstrated in chamber and ecological studies to produce irritative effects on the eye and respiratory tract, as well as associations with increased respiratory morbidity and mortality.^{2,3,4}

The effects of carbon monoxide relate to its preferential binding with haemoglobin to reduce oxygen supply to the tissues

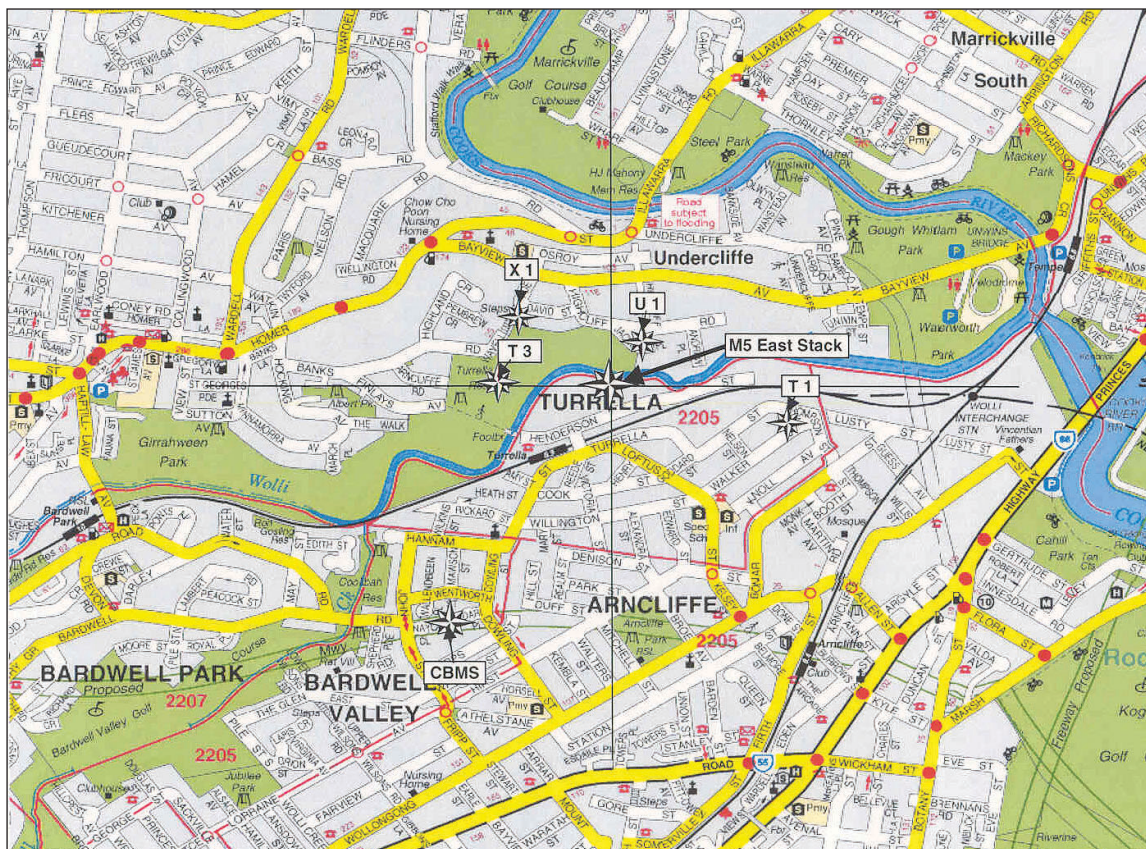
Australia has developed ambient air quality standards for nitrogen dioxide, carbon monoxide and particulate matter as part of the Ambient Air Quality National Environment Protection Measure (Air NEPM). While these standards are based on health effects, the standards do not provide a threshold below which effects do not

occur. Particles especially are recognised as having a dose response effect on health outcomes, even in settings with levels well below the NEPM standard.⁵

The general population is not typically exposed to levels of air toxics associated with immediate adverse health impacts, and there are no applicable population exposure standards for these compounds in Australia. The World Health Organization has established low or no observed effect levels for many, and occupational standards are also available. Air toxics have a range of effects, reflecting the wide range of chemicals in this group, however many cause irritative effects to the mucous membranes and nervous system. Several air toxics are known or probable carcinogens.⁵

The four air monitoring stations around the M5 East stack do not demonstrate that there has been any change in the level of common air pollutants since the tunnel opened. The two monitoring sites for air toxics (T1 and T3 - sixth daily sampling) indicate that those air toxics that are measured (benzene, 1,3 butadiene, acetaldehyde and formaldehyde) are at the typical low levels found in Sydney, and well below levels thought to cause irritative effects.

Figure 2 Location of monitoring stations.



- T1 - Cnr Walker Street and Thompson Street, Turrella.
- U1 - Cnr Jackson Place and Highcliff Road, Undercliffe.
- X1 - Cnr of Wavell Parade and David Street, Earwood.
- CBMS - Gipps Street Lookout, Bardwell Valley.
- T3 - Finlays Avenue, Earwood