Submission to the NSW Department of Environment and Planning in relation to the 'New M5' Environmental Impact Statement on behalf of the RAPS organisation.

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RAPS (Residents Against Polluting Stacks Inc.) was founded in 1997, following and in response to the changes announced to the plans for the M5 East motorway and tunnel which removed the three ventilation stacks located on the hills above the proposed tunnel and replaced them with a single ventilation stack in the valley near Turrella railway station.

Then and now, the objectives of this organization are:

(a) To seek the installation and operation of air pollution treatment systems in the M5 East and other tunnels, and any other effective methods of reducing the impact of air pollution and stacks on the local area

(b) To seek fair and equitable infrastructure planning and pollution assessment processes and regulations.

(c) To support ecological sustainability in all projects affecting the local area.

(d) To share information, and offer advice and assistance to individuals and groups with similar objectives.

(e) To disseminate information to the public on issues related to urban air pollution and planning.

My experience over some 16 years of involvement with tunnel issues includes:

- Membership of the M5East Consultative Committee on Air Quality from mid 1999 until 2007-8
- The 3 parliamentary inquiries into the M5East ventilation system.
- The parliamentary inquiry into the Lane Cove Tunnel
- The parliamentary inquiry 'Health impacts of air pollution in the Sydney basin'.
- Taking part in the 'International Workshop on Tunnel Ventilation 2000"
- Member of the consultative group for the NHMRC report "Systematic Literature Review to Address Air Quality in and Around Traffic Tunnels. 2008"
- Submissions to the Senate inquiry 'Impacts on health of air quality in Australia. 2013'
- Extensive involvement in consultation with the RTA on issues directly relating to the M5East ventilation system, the ill effects experienced by users and the planning of the 'Filtration Trial'.
- Extensive involvement in the health studies carried out into residents' health and the possibility of a cancer cluster around the M5East stack
- In addition, I can claim to be one of the few people in Australia who has actually visited and inspected a modern tunnel filtration system in operation (Madrid. Jan 2008)

A personal note.

I am sometimes asked why, after 15 years of campaigning about tunnels, I am still motivated to continue. The answer is fairly simple. Prior to the M5East stack starting operations, I, always the technological optimist, had assured my neighbours that all would be well and that there would be no impact from the stack.

I have an ineradicable memory of walking around streets in Undercliffe, close to the stack, soon after the tunnel opened, and passing into and out of patches of air which stank of stack emissions.

Almost immediately I started getting reports of people getting ill, of people with controlled asthma reverting to an acute state, of people finding it impossible to tolerate the impacts and putting their houses up for sale.

All this occurred in an area which air quality modelling suggested there would be low but acceptable impacts of less than 0.5µg/m^3 PM10.

Comments and observations on air quality section of the EIS document for the proposed 'WestConnex New M5'

Introduction.

It is probably understandable that the initial reaction of a member of the public when faced with the construction of a new motorway tunnel is concern about the possible harmful impacts of the exhaust pollutants coming from stacks or other exhausts.

Harmful impacts from stack pollution do occur in the vicinity of poorly designed stacks such as the M5East stack in the Turrella valley and they can be severe enough to force people to move away from the area.

However, based on our experience with the M5East and other tunnels, it is RAPS position that, although there can be significant harmful impacts in localised areas outside tunnels from stack and portal emissions, the major impact occurs inside tunnels where the over 400000 daily users can be exposed on a regular basis to harmful levels of pollution.

In relation to the impacts on the greater public, we believe that actions taken to improve in-tunnel conditions, especially those which directly reduce the total quantum of pollution (and especially particulate matter) will also lead to a reduction in the pollution impacts both locally and on a city-wide scale.

We agree with the observation made by the NHMRC in its 2008 report that, in relation to the vehicle pollutants nitrogen dioxide and particulate matter, "the potential for harm appears to lie strongly on the side of particulate matter".

We are concerned that the EIS states the following in section 6.1 - In-tunnel air quality

"The three pollutants assessed in-tunnel are nitrogen dioxide (NO2), carbon monoxide (CO) and particulate matter (PM). For the operating years of the WestConnex project, NO2 will be the pollutant that determines the required airflow and drives the design of ventilation for in-tunnel pollution.

The NSW Department of Planning and Environment issued a report that included discussion on this topic for the NorthConnex project in January 2015. From the Secretary's Environmental Assessment Report2 for the NorthConnex project: "The Department considers that nitrogen dioxide (NO2) is now the key pollutant of concern for in-tunnel air quality. While carbon monoxide has historically been the basis for in-tunnel criteria in NSW and internationally, improvements in modern vehicle technology mean that NorthConnex will comply with existing health based carbon monoxide standards. By contrast, vehicle emissions of NO2 have fallen less quickly, and uptake of diesel vehicles (which produce more NO2 than petrol based vehicles) has risen."

The position of the authors of the report and of the EPA relating to the relative importance of particulate matter and nitrogen dioxide is clearly at variance with the position of the NHMRC in expressed in 2008, which we regard as authoritative and a true representation of the current state of scientific and medical knowledge.

We ask therefore that the position adopted by the EPA be reversed and that a clear statement be made about the extremely harmful nature of the fine particulate matter components of vehicle and especially diesel exhaust and the importance of limiting particulate matter levels inside tunnels be stressed.

We note that it was the high particulate matter levels (disingenuously labelled 'haze'), rather than nitrogen dioxide levels, which caused the problems in the M5East tunnel.

The air-flow in the M5East has been determined by the need to limit particulate matter for most of its operational life and we see little reason why this would be different in the proposed tunnel.

The much-vaunted 'Advisory Committee on Tunnel Air Quality' produced little more than a reaffirmation of the *status quo* in relation to in-tunnel air pollution levels, simply re-stating the existing PIARC norms.

This was in spite of the NHMRC(2008) report which identified the deficiencies of the current regulations and of a specific requests by organisations such as the Asthma Foundation that issues such as a proper mass concentration/exposure standard for particulate matter be resolved.

In the absence of this guidance, the operator appears to believe that there is no compelling reason to maintain particulate matter at demonstrably safe levels, levels which can be directly compared with the levels of pollutants quoted in medical literature.

The current predictions of in-tunnel levels show a number of scenarios where in-tunnel particulate matter concentrations are above 1000µg.m^{-3}, a level noted by the NHMRC to be "clearly dangerous to health".

Although large amounts of NOx (total oxides of nitrogen) are emitted in concentrated form from tunnels it seems unlikely that the impact of this will have a local effect, considering the time it takes for the relatively harmless nitrogen oxide to be converted to Nitrogen dioxide in the atmosphere.

As a group, we are not opposed to tunnels, *per se,* especially if they form part of a well integrated road and public transport plan.

Our issue is that the current standards and norms used for the design and operation of tunnels do not represent a conscientious response to modern medical knowledge nor to they give proper consideration to health, wellbeing and general amenity of ordinary members of the public.

Major Issues.

1. **Accuracy and reliability of the estimation of particulate matter in tunnels and in stack emissions.**

Background.

Motorway and tunnel construction in Sydney has occurred in several phases, with significant pauses between each phase.

Since the first major tunnel was built under Sydney Harbour there have been significant changes in the nature and quantity of vehicle emissions and in the guidelines adopted to limit the exposure of motorists and the general public.

	Opened	Lanes	V/day (aprox)	Length
Sydney Harbour	1992	2 x 2	90,000	2.8 km
Eastern Distributor	1999	2 x 3	130,000	1.7 km
M5 East	2001	2 x 2	110,000	4 km
Cross City	2005	2 x 2	? 35,000	2.1 km
Lane Cove	2007	2 x 2	? 70,000	3.6km

The reduction of carbon monoxide in vehicle exhaust (now about 12% of 1992 levels) has produced a massive decrease in the acute toxicity of tunnel air and the volume of air used to ventilate tunnels has been reduced accordingly.

The fact that other harmful exhaust components have not fallen proportionately has meant that they have actually increased as a proportion of the now reduced volume of vitiated air inside tunnels.

The actual performance of the tunnel ventilation systems in relation to motorist safety and comfort has been variable and in some cases is far from satisfactory.

The relatively short Eastern Distributor is moderately smoky and causes significant localised pollution around Palmer, Bourke and William St.

The M5East tunnel is notorious for its in-tunnel conditions drawing adverse comment from multiple health authorities. It has been noted that *"congested conditions in the west end of the westbound tunnel give rise to significant elevations in PM10 levels (sometimes to over 2000 µg m–3) for short periods."* NHMRC 2008

Both the Cross City and the Lane Cove tunnels have never had their ventilation systems 'stress tested' because their traffic volumes have never approached the design predictions.

The PIARC method for tunnel ventilation design

The ventilation systems of the three most recently completed tunnels were built according to the PIARC (World Road Authority) guidelines for "Road tunnels: Emissions, Ventilation Environment" 1995 (variously updated)

It describes a method for estimating the total emissions of the various gaseous vehicle pollutants under various operating conditions.

Emission rates for 'turbidity' or smoke (which is not regarded as a health risk but as a nuisance limiting clear vision inside the tunnel) are also provided.

This document has been replaced by a further updated version (2012) which uses the same methodologies but updates some of the information including new emission rates for types of vehicles likely to be encountered into the future.

The varying degrees of success of the designs of Sydney's tunnels indicate there are real questions as to the suitability of these guidelines and their ability to reliably produce optimal outcomes.

These questions should lead a prudent person to question whether these guidelines are, in fact, suitable for use as a design guide for these tunnels and into the future.

Of greatest concern is the fact that even the latest document does not treat particulate matter or (more specifically) diesel exhaust as a health issue and does not allow for a determination of the components of particulate matter most implicated as the causes of health impacts such as cancer.

The calculation method is the basis for the estimation of the quantity of pollutants which will be emitted from tunnel stacks and is the crucial input required for all of the various air quality modelling which is carried out to determine likely adverse impacts on both tunnel users and on residents and workers surrounding the tunnel.

This approach does not provide any direct method for estimating particulate matter mass, nor does it allow for the direct estimation of nitrogen dioxide (as opposed to total oxides of nitrogen).

The estimation of nitrogen dioxide depends on assumptions about the rate of conversion of the nitrogen oxide component of total NOx into nitrogen dioxide.

For particulate matter, the guidelines provide a conversion factor to relate particulate matter concentration (as $mg.m^{-1}$ PM2.5) to observed light extinction (K in m^{-1}): *Diluted exhaust gas (tunnel): K = 0.0047μ.*

According to this relationship, the commonly quoted 'limit' to maintain acceptable visibility, $K=0.005m^{-1}$, is equivalent to a PM2.5 concentration of approximately $1000\mu g.m^{-3}$.

This relationship was conclusively shown to be incorrect in the M5East tunnel where, by actual measurement, it was shown that visibility levels of $K=0.005m^{-1}$ were indicative of particulate matter concentrations approximating $2000\mu g.m^{-3}$.

In spite of this EIS document notes the direct usage of this relationship: P 5-128 In-tunnel air quality design criteria.

"For measurements of visibility or in-tunnel haze, an extinction coefficient of 0.005m-1 based on the recommendations of PIARC for free flowing peak traffic travelling speeds of 50 to 100 kilometres per hour. Based on the correlation factor recommended by PIARC, this extinction coefficient is equivalent to an in-tunnel particulate matter concentration of 1.06 milligrams per cubic metre."

If this conversion factor is incorrect, then particulate matter concentrations, such as those in the stack, are underestimated by a factor of 2, hence all of the air quality estimates are necessarily flawed, as are any assumptions or decisions based on them.

Evidence of the unreliability of the PIARC conversion factor

'Those who fail to learn from history are doomed to repeat it' Winston Churchill (and others)

Soon after the M5East tunnel opened, and long before it reached anywhere near its planned capacity, it was obvious that something was severely wrong and that smoke levels in the tunnel were unacceptable to users.

There were frequent reports of motorists suffering distress inside the tunnel and these reports were sufficiently consistent for the NSW Dept of Health to carry out a study of in-tunnel conditions.

It is worth noting that, so far as is known, the notoriously dysfunctional M5East tunnel has always operated well within the PIARC guidelines, including those for visibility.

As the Cross City tunnel was in the planning stage, it was necessary that this apparent anomaly was examined and its cause determined. What happened is best summarised by this transcribed extract from the EIS document for the Cross City Tunnel.

2.7 Extinction coefficient

Experience by RTA indicates that haze in the M5 East tunnel becomes unacceptable when the extinction coefficient, reported by the M5 East tunnel stack opacity monitor exceeds 0.003m^{-1}. Assuming that the particulate in the CCT will have similar properties to the M5 East tunnel, the relationship between extinction coefficient and PM10; concentrations can be applied to calculate an equivalent extinction coefficient in the CCT.

This relationship was derived from data measured in the M5 East tunnel as shown in Figure 3.

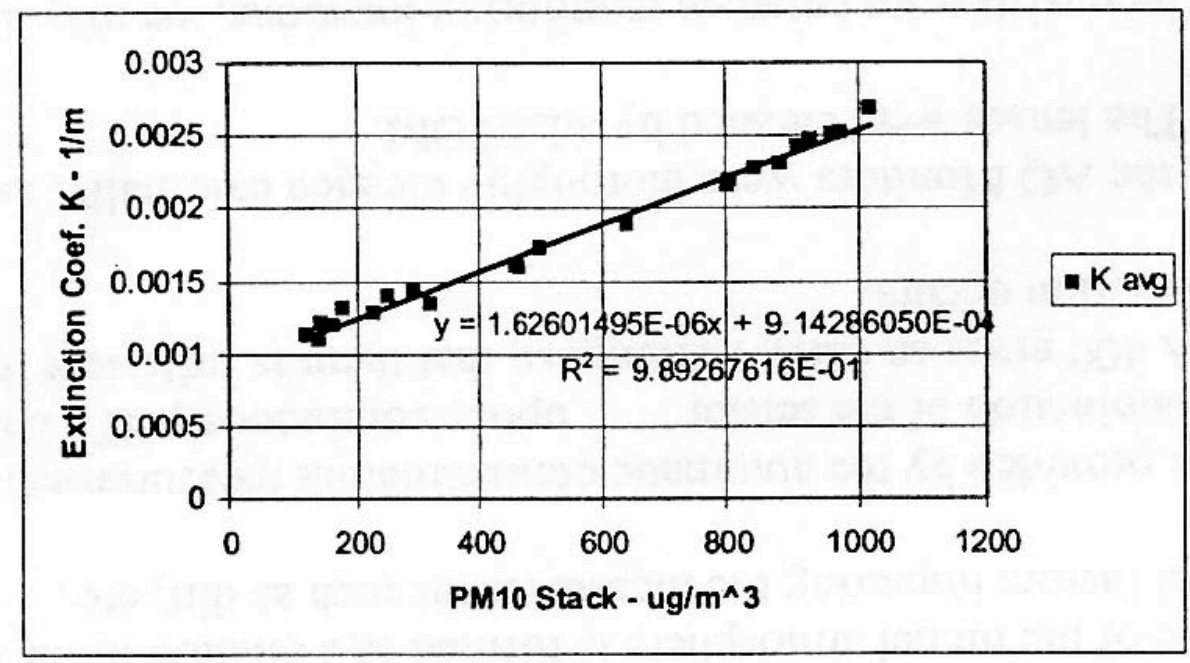

Figure 3. Correlation of extinction coefficient and PM10, concentration obtained from M5 East tunnel discharge stack data.

The relationship shown in Figure 3 differs from that defined by PIARC (1995). PIARC (1995) indicates that an extinction coefficient of 0005m^{-1} corresponds to a PM10, concentration of l000µg/m3. However, the same PM10, concentration in the M5 East tunnel suggests an extinction coefficient of 0.0025m^{-1}, i.e., approximately half that predicted by PIARC (1995). Unless stated otherwise, all extinction coefficients predicted in this report are based on the M5 East relationship shown in Figure 3.

This conclusion was based on an analysis carried out by the environmental engineering firm Synergetics for the NSW RTA.

It is clear that the PIARC relationship between visibility and particulate matter concentration DID NOT HOLD UNDER THE CONDITIONS FOUND IN THE M5 TUNNEL and that the extinction coefficient to be used for the control inside the tunnel needed to be significantly less if acceptable conditions were to be maintained.

Logic would compel us to assume that it is at least possible that these conditions still exist and that a similar set of investigations would produce a similar result.

<u>Estimation of particulate matter emissions in the current EIS.</u>

The actual methods used are summarised in section 9.4 'Particulate matter' contained in the Stacey Agnew 'Appendix L - Ventilation report'.

Although the discussion is both confused and largely circularly argued, it does, however, confirm that the PIARC method and the particulate matter conversion factor 4.7m^2/g is used as the basis for its calculations for particulate matter.

The PIARC method ultimately determines the rate of particulate emissions from the values of visibility reduction ('K' or extinction factor) by summing the contributions of the various numbers and types of vehicles using the tunnel, each vehicle contributing to the total reduction in visibility.

Particulate emissions are calculated from this estimate by use of the conversion factor.

The factor is not an absolute measure like mass or length and there is no 'theoretical' or mathematical relationship between the entities.

Rather it is an empirical value which was determined by actual measurement in tunnels in Europe prior to the publication of the 1995 PIARC document.

There is no actual reason why it should remain constant and not vary over time or location or with changes in the composition of exhaust gases.

It is hardly surprising that it may vary under different conditions, due to variations in engine type and design, emission standards, variation in weather conditions and the various types of non- vehicle sourced particulate matter.

It should be a matter of serious concern that the PIARC conversion factor has been used in spite of the experimental evidence based on local conditions and experience, which demonstrate that it is, in fact, unsuitable and inaccurate.

This problem arises, at least in part, from the resistance by tunnel designers to treat particulate matter as a serious health risk and that this risk is best assessed based on an accurate measure of the gravimetric concentration of PM10 or, more importantly, PM2.5.

It is essential that the approach taken by the designers of the Cross City (and the Lane Cove) tunnel be adopted and that all relationships between visibility and gravimetric concentration be based on a locally determined empirical relationship.

A failure to do this could conceivably lead to significant underestimates of likely pollution quantities and concentrations inside the tunnel, which would have serious consequences in a tunnel design which is already pushing the limits of established norms of tunnel ventilation design.

2. The question of filtration

According the EIS document (p4.5) community and stakeholder feedback identified the following issues as being of paramount concern:

- *In tunnel air quality, including consideration of filtration as part of ventilation systems*
- *Location of ventilation outlets. Feedback from the community suggested positioning ventilation outlets within industrial areas was preferred*

Given this clearly expressed concern, which is not unique to this project, the cursory way in which the proponents have addressed the issue of filtration shows a disregard of the views and desires of the public, especially considering that the company which is to build the tunnel is intending to install a complex filtration system in the tunnel which it is currently constructing in Hong Kong.

The public is at least entitled to expect that the current capabilities of filtration equipment are accurately reported and discussed and that some evidence be given that the potential use of filtration has been considered and not rejected out of hand.

Filtration.

The comments, conclusions and claims made in the executive summary of the technical paper relating to air quality about the possible utility of 'filtration', its cost, usage, operational efficiency and cost cannot go unchallenged.

Many of the claims and assessments made are either incorrect, tendentiously reported or show a misunderstanding of modern usage.

The EIS states at pp xxi - xxii Filtration

"The provision of a tunnel filtration system does not represent a feasible and reasonable mitigation measure and is not being proposed. The reasons for this are as follows:

- *The project's in-tunnel air pollutant levels, which are comparable to best practice and accepted elsewhere in Australia and throughout the world, will be achieved without filtration*

Response

1. In fact the comparison is with the PIARC norms which are not claimed to be "best practice" but rather to an attempt at defining "the minimum air requirement that is required to ensure adequate in-tunnel air quality and visibility thresholds"
2. The in-tunnel air pollution levels are not 'accepted in Australia' by tunnel users. Although the M5East tunnel meets the PIARC criteria, the NHMRC (2008) report notes that *"current levels of PM in some tunnels in Australia (i.e. the M5East) are in excess of 1000 µg m^{-3} which is clearly dangerous to health."*
3. That the current 'allowable' pollution levels, especially for particulate matter in the presence of nitrogen dioxide, are demonstrably inadequate to protect the health and comfort of tunnel users.

- *Emissions from the ventilation outlets of the project tunnel will have a negligible impact on existing ambient pollutant concentrations*

Response

1. This may well be true in the sense that they are not able to be detected by the methods in use supposedly to monitor them but local impacts from stacks such as the M5East stack at Turrella have caused severe distress to sensitive individuals, in spite of the fact that no impact of pollutants could be detected in the immediately adjacent monitoring station, which was specifically located to attempt to detect such impacts
2. The NHMRC 2008 report notes *'No clear evidence exists to show that monitoring such as that carried out to assess compliance with air-quality goals, especially for PM10, can reliably predict the size, nature and course of adverse health impacts.'*

- *Of the systems that have been installed, the majority have subsequently been switched off or are currently being operated infrequently*

Response

1. It is hard to see this comment as other than an attempt to mislead as exactly the same comment could be made about the jet fans in the tunnel. In any sensible system, equipment is not operated when it is not needed. If the systems are operated infrequently then they are presumably operated as they are needed.
   The story of the development and use of electrostatic precipitator equipment is long and complicated and a tendentiously simplistic view of its history is worthless. Electrostatic precipitator equipment has now reached a high degree of efficiency and reliability and techniques for its use continue to develop rapidly. Current experience is necessary if designers are to achieve the full design and economic potential of the technology.

- *Incorporating filtration in the ventilation outlets would require a significant increase in the size of the tunnel facilities to accommodate the equipment. It would result in increased project size, community footprint, and capital cost. The energy usage would be substantial and does not represent a sustainable approach.*

Response

1. This is misleading as it implies that filtration in the ventilation outlets would be the appropriate way to deploy such equipment. The problem likely to occur in this tunnel is excessive particulate matter concentrations inside the tunnel (and high cost relating to increased air volumes required to clear it). The most appropriate way to deal with this is by the use of progressive in-tunnel filtration.
   The size of the installation depends on the way in which the equipment is deployed. Equipment suitable for use in an exceptionally long tunnel such as the proposed M5 duplication could be installed above the carriage-way in an enlarged fan niche

2. The cost of both installation and operation of filtration has been vastly and irresponsibly overstated. The going price, world wide for electrostatic precipitator equipment supplied and installed is around $A2-3 million per 100m^3/sec treated. Energy consumption excluding fans is about 1.5kW per 100m^3/sec treated.

- *If compliance with in-tunnel air quality limits cannot be achieved with the proposed ventilation system, the most effective solution will be the introduction of additional ventilation outlets and additional air supply locations.*

Response

1. The addition of extra ventilation outlets introduces new issues of external impacts and community resistance. Additional air supply does little to alleviate the problem as no pollutant is removed from the tunnel by this alone.

- *This is a proven solution and more sustainable and reliable than tunnel filtration systems.*

Response

1. This assertion is open to question. The proposed tunnel is exceptionally long for an urban, heavy traffic tunnel and is aiming to use a ventilation technique untested on this scale. The countries with most experience with tunnel filtration (Japan and Norway) have shown that progressive in-tunnel filtration can reduce the total cost of ventilation. In addition it has the capacity to reduce the exposure of drivers to pollution. Reliability is not an issue in properly designed and maintained equipment.

Deficiencies of the description of available filtration (electrostatic precipitator) technology

The best demonstration of the fact that the proponents have not conscientiously examined the potential use of filtration in tunnels, the pre-eminent concern expressed in community consultation, is shown by the inaccurate and confused nature of the description given under the section of the EIS entitled “Air Treatment Systems”.

At least 4 different types of technology are here conflated and confused and minor ‘concept designs’ are given more prominence than are fully established and operational systems.

No distinction is drawn between modern installations and equipment which is old and obsolete and the performance and removal efficiency of modern equipment is understated.

Any fair and conscientious examination of the operational performance of modern equipment would have examined, in detail, the massive installation of filtration in the Calle 30 ring route in Madrid.

This project includes electrostatic precipitator equipment from the 4 major suppliers of such equipment in the world Aigner, CTA, Filtrontec and Panasonic.

Although the method of deployment of the equipment (in stacks to reduce local pollution impacts) may not be what is most appropriate for Sydney’s needs, the scale of the project provides a firm basis upon which to draw conclusions about efficiency and reliability.

A summary of operational performance between 2008 and 2013 is given below, based on information which is easily accessible to those interested.

It is based on the report of the company maintaining the systems, which is independent of any of the manufacturers.

It was provided to a delegation from Hong Kong in 2013 and as the company Leightons is involved in both the current Hong Kong tunnel construction and in the M5 project, this information should have been directly accessible to them.

Calle 30 Filters: Performance evaluation.

	Strong Points	Weak Points
Aigner	Good efficiency, Good particle measuring method	Complicated installation, High number of failures (too many elements) High Maintenance costs, Too much automation
CTA	Uncomplicated Installation, Good efficiencies,	Poor particle measuring method (non-continuous)

	Robust, Little automation, Low maintenance cost.	Poor handling from control centre.
Filtrontec	Medium efficiency, robust electrostatic system, Little automation, medium maintenance costs	Poor particle measuring method (non-continuous) Poor efficiency. The equipment did not generate the expected solid waste.
Panasonic	Medium efficiency, robust electrostatic system, Little automation, medium maintenance costs	Poor particle measuring method (non-continuous), High number of failures in waste recycling system, Poor spare parts and after-service.

Particle removal efficiency %	PM1	PM2.5	PM10
Aigner	83.7	90.8	91.3
CTA	85.9	90.8	89.6
Filtrontec	76.6	77.1	76.5
Panasonic	79.8	80.8	81.2

It is evident to us that the equipment supplied by at least one company (CTA) and possibly another (Aigner) is fully capable of providing reliably operating high removal efficiency electrostatic precipitator equipment which is suitable for purpose. The comments about the Filtrontec equipment are entirely consistent with the unsatisfactory performance of this equipment in the M5East filter trial.

Filtration of the current project

The proposed tunnel is exceptionally long and will carry a relatively heavy load of medium and large trucks.

Progressive, in-tunnel filtration of particulate matter has been identified as suitable for this type of tunnel.

The economic advantages of this type of system was first demonstrated in the 11km Kan-Etsu tunnel in Japan where the conversion of the tunnel from 'traditional' ventilation using stacks to the use of progressive filtration demonstrated a 30% reduction in ventilation cost.

Although this is old information, the principle that is possible to reduce ventilation loads by removing pollutants inside the tunnel remains intact.

In addition, the reduction in particulate matter has the potential to reduce the harmful impact of nitrogen dioxide in the tunnel atmosphere.

The intention of the operators to depend on basically passive ventilation systems is of concern as, so far as we are aware this system has not been used on this scale anywhere else.

If, as in the case of the M5East, the particulate levels are higher than expected or if the advance of knowledge or understanding of the health risk from particles dictates limitation of in-tunnel particle exposure, then in-tunnel particle removal by the use of electrostatic precipitators should provide an effective and economical solution.

Space requirements for a filtration system in the new M5 tunnel.

Assuming the proposed tunnel is 3 lanes in width, the extra height required would be about 3 m over a length of 50 m, based on a proposal made by CTA in 2009 to retrofit filtration into the eastern end of the M5East tunnel.

In this proposal the power supplies were to be mounted on the platform which supported the filter modules and fans capable of moving the required volume of air, say 250 -300m^3/sec provided.

These fans to some extent replace existing jet fans.

Two such niches would be required in each tunnel and a total filtration capacity of about 1000-1200 cubic metres per second would be required.

Such a filtration system would have the capacity to significantly reduce both driver exposure and emissions to the atmosphere.

In addition the system should reduce the cost of operating the ventilation system.

The proponent should be required to constructively consult with competent manufacturers of filtration equipment to produce a realistically costed proposal for filtration inside the tunnel.

In Conclusion

It is evident that considerations of cost and operational convenience have dominated the design of this tunnel and there is no evidence to show that any attempt has been made to address well-founded community concern about potential health risks.

The whole design has been predicated on an outmoded and out-dated set of criteria which do not take into account changes in the toxicity of various components of vehicle exhaust, especially that of particulate matter and diesel exhaust, which is treated mainly as a nuisance limiting visibility.

Although lip-service is given to the importance of maintaining healthy conditions inside the tunnel, the changes in the nature of the in-tunnel atmosphere and its increased specific toxicity has not resulted in any change of consequence in the air quality limits used.

Although the EIS occasionally admits that there have been significant changes in particle size and distribution in diesel exhaust and a consequential increase in its specific toxicity, this had not led to any changes in the allowable levels of exposure.

Demonstrably, particulate tunnel exhaust, composed mainly of diesel emissions is much more harmful by any measure than is the particulate matter in the general atmosphere.

Any assessment method which simply adds these components on a basis of weight is necessarily flawed and scientifically invalid

Any safe and competent assessment of potential health risks from vehicle exhaust requires an accurate and robust way of predicting and estimating particulate matter and, especially, the quantity and nature of the various size classes.

The methods used to produce the whole of the air quality assessment lack any reliable way of estimating the actual gravimetric concentration of particle components and consequently the whole analysis is necessarily misleading and scientifically invalid.

The most common concern expressed by the community when it was 'consulted' related to filtration and in-tunnel air quality.

This EIS effectively ignores this concern, simply to assert that the required levels 'will be achieved without filtration.'

It fails to conscientiously examine the potential for the use of filtration as a way of improving conditions inside and out of the tunnel and demonstrates an ignorance of best practice in filtration showing clearly that the use of the technology was not seriously examined.

The community we represent and the tax-payers of the state in general are entitled to a clear and specific response to the issues raised and the apparent failure of the proponents to provide a fair and accurate representation of the likely environmental and human impacts of the proposed project.

We request that you advise the Minister to reject this proposal, and that you publish this submission in accordance with the undertaking on your website and provide a written response to the serious objections and issues raised here.

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