The RTA has a plan to improve air quality in the M5 East tunnel including Australia’s first trial of air filtration technology.

On the 16 June 2006, Roads Minister Eric Roozendaal announced a plan by the NSW Government to improve air quality in the M5 East Tunnel. The air quality improvement plan includes video identification of polluting heavy vehicles and sending polluting vehicles to the Clean Fleet Program; increased ventilation flows with an extra 12 jet fans; partial portal emissions and a trial of filtration technology to reduce haze in the tunnel.

This fact sheet describes the latter two proposals.

Proposed changes to the tunnel are designed to bring about a number of benefits. The objectives are to:

- Improve the amenity of tunnel users, by improving in-tunnel air quality and reducing haze levels in the tunnel.
- Ensure the amenity of residents at the tunnel entrances and exits (portals) and around the stack, by meeting air quality goals and improving in-tunnel air quality.
- Improve the availability of the M5 East tunnel by reducing the number of tunnel closures.
- Assess the effectiveness of the latest in-tunnel air filtration systems to improve in-tunnel air quality.

Some of the improvements (or modifications) to the M5 East Tunnel require approval from the Minister for Planning. A Modifications Report has been submitted to the Department of Planning for its consideration.

This fact sheet provides a 12 page overview of the project to modify the tunnel and how it operates. If you need more information, the M5 East tunnel partial portal emissions and a trial of filtration technology environmental assessment report (The Modifications Report) can be found at www.rta.nsw.gov.au.
What is the current problem?

The M5 East Motorway was opened to traffic in December 2001. Since then, traffic in the tunnel has progressively increased to levels exceeding the predictions described in the environmental impact assessment prepared in 1998. The high volume of traffic using the M5 East is an indication of its success as a transport link in the Sydney region. However, current traffic levels and a high percentage of smoky heavy vehicles can result in congestion and ‘haze’ within the tunnels. The main effect of haze in the tunnel is a general reduction in amenity for drivers and the perception amongst users of the environment for drivers and the perception amongst users of a potential health risk – although haze levels are within the relevant guidelines. Importantly, air quality levels in the tunnel and around the stack have remained within the strict goals set by the Minister for Planning.

What is proposed?

Roads Minister Eric Roozendaal requested the RTA to review the causes of haze in the M5 East tunnel and to advise on technology to improve air quality. The video identification of pollution-causing heavy vehicles and the introduction of vehicles into the Clean Fleet Program has commenced. The extra jet fans are being installed to improve airflow within the tunnel. The video system and additional jet fans are considered to be consistent with the existing project. As such, they are not included in the October 2006 Modifications report.

What have the initial investigations shown?

To improve visibility in the tunnel the RTA must introduce more fresh air to dilute the pollutants. Alternatives to introduce more fresh air require:
- A new air intake point or air drawn in through the tunnel portal.
- Additional infrastructure such as an extra ventilation stack or air expelled from the portals.

The investigations predicted that just drawing in additional fresh air through the tunnel entry portals and releasing air from the tunnel exit portals (partial portal emissions) would reduce the haze in the tunnel by up to 41% in some sections, without the need for a new ventilation stack.

With these partial portal emissions, the haze in the western end of the westbound tunnel would only be reduced by a small amount by this strategy. However, by installing a filtration plant in this section of the tunnel to remove some of the pollutants, haze in this western section could be reduced by up to 36% and up to 49% in other parts of the tunnel.

Air in the tunnel passes from the westbound to the eastbound tunnel. The filtration plant would therefore also reduce haze in the eastbound tunnel.

Why is a modification to the approved project needed?

The flow of air currently in the tunnel is shown in the image below to the left. The partial release of air from the tunnel exit portals to reduce haze in the tunnel is not included in the approved operations management plan for the M5 East Tunnel. The trial of filtration technology is not consistent with the previous approval for the M5 East project. These initiatives require a modification to the Minister for Planning’s Conditions of Approval.

The Modifications Report has been submitted to the Department of Planning and is now available on the RTA and Department of Planning websites. The changes to the M5 East would enable the RTA to:
- Install and operate Australia’s first trial of tunnel air filtration technology.
- Develop and implement protocols to partially release air from the tunnel exit portals.

Description of the approvals process

Steps in the current planning process are outlined below.

APPROVALS PROCESS

The RTA prepares a report detailing the changes to the M5 East project and proposed modification to the planning approval.

The modifications report includes an assessment of potential community, environment and economic impacts.

The report is submitted to the Department of Planning.

The Minister for Planning advertises that they have received the report. It goes on the RTA’s and the Department of Planning’s websites. Public comments are received by the Department of Planning.

An independent expert review will be undertaken to assess the modification request.

The Minister for Planning approves or refuses the modification. If approved, a revised set of conditions of approval is issued.

If approved, construction works would begin.
Have previous instances of portal emissions worsened local air quality? Portal emissions have taken place when there have been vehicle breakdowns in the tunnel or tunnel shut downs to undertake maintenance. The RTA has installed air quality monitors near residential areas at each exit portal, to understand the level of air pollutants near residents. An independent specialist examined the data from May 2004 to May 2006, to see if a relationship could be seen between:

- The periods of portal emissions.
- The wind direction and speed.
- The air quality experienced by nearby residents.

The monitoring data showed that the level of emissions taking place from the main portals is having little, if any, impact on air quality at the air quality monitors. Air quality generally remains well below the air quality goals in the M5 East planning approval.

How would the planned portal emissions be managed?

Partial portal emissions would significantly improve haze in the eastbound tunnel and in the eastern section of the westbound tunnel. The strategy for the western end of the westbound tunnel is to install a filtration plant. A document called a portal emissions procedure shows how partial portal emissions to reduce haze would only occur under strict conditions (see flow chart on facing page). As shown below, items to be checked before air can exit the tunnel include:

- The air quality outside the tunnels (called ambient air quality).
- Favourable weather, including wind direction and speed.
- Air flow speed and volume within the tunnels.

The partial portal emissions procedure demonstrates how the RTA would apply ‘trigger’ levels that specify when portal emissions must cease. These would ensure the RTA complies with the conditions of approval and maintains the amenity of residents nearby. These trigger levels are stricter than the air quality goals specified in the current M5 East planning approval, as shown below.

The aim of this procedure is to minimise the air quality impacts outside the portals and at nearby residential areas. The modelling undertaken as part of the Modifications Report predicts minimal increases in pollutant levels outside the portals when portal emissions are carried out.

The stringent air quality goals specified in the conditions of approval would not be exceeded.

Carbon monoxide

The RTA also has a requirement to manage carbon monoxide levels inside the tunnel. Portal emissions are currently used to ensure the safety of tunnel users. This process will continue and is not subject to the controls in the portal emissions procedure for haze reduction.

Background air quality and maximum contribution of particulates from portal emissions to reduce haze

The trigger has been exceeded – therefore no portal emissions would occur

<table>
<thead>
<tr>
<th>Particulate Matter (PM10)</th>
<th>120</th>
<th>100</th>
<th>80</th>
<th>60</th>
<th>40</th>
<th>20</th>
<th>0</th>
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<tbody>
<tr>
<td>PM10 level (μg/m³)</td>
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<tr>
<td>Background air quality</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
<td>0</td>
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<tr>
<td>RTA’s trigger level</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td></td>
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Examples of different types of days

<table>
<thead>
<tr>
<th>Condition</th>
<th>PM10 (μg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme pollution day (e.g. thunderstorm)</td>
<td>100</td>
</tr>
<tr>
<td>High pollution day (PM10 in the air is above 50 μg/m³)</td>
<td>50</td>
</tr>
<tr>
<td>Average day for the region (PM10 in the air is between 16-50 μg/m³)</td>
<td>22</td>
</tr>
<tr>
<td>Low pollution day (PM10 in the air is below 16 μg/m³)</td>
<td>12</td>
</tr>
</tbody>
</table>

RTA’s in-tunnel haze goals: 0.002 μg/m³

Continuous monitoring of the ambient air quality at residences nearest the tunnel portals.

Does in-tunnel haze exceed the RTA’s haze goals of 0.002 μg/m³?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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Are all the controls below the set limits?

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Commence emitting air from the tunnel portals.

Stop emitting air from the tunnel portals.

Reduce volume of portal emissions.

Does in-tunnel haze exceed the RTA’s haze goals?

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Continue or increase the volume of portal emissions.

Provide a brief description of the image. The image contains a flowchart that outlines the process to identify an acceptable volume of air to be emitted from the M5 East Tunnel to manage haze. The flowchart includes decision points and steps to follow based on certain conditions. The flowchart is visually represented with diamonds and arrows, guiding the process from start to finish. The chart is designed to help in understanding the sequence of actions and decisions needed to ensure the safe and controlled emission of air from the tunnel portals.
Australia’s first air filtration trial

Since 2004 the RTA has been researching systems to remove particulate matter and nitrogen dioxide from tunnel air:

Electrostatic precipitators (where particles are attracted to electrically charged plates that are then cleaned) would be trialled to remove fine particles from the tunnel air. A range of systems to remove nitrogen dioxide are available that either absorb the nitrogen dioxide or convert it to harmless gases using a catalyst.

The filtration plant will need to be able to filter and clean:
- 200 cubic metres of air per second to remove at least 80% of particulates of less than 10 microns in diameter;
- 50 cubic metres per second to remove at least 90% of nitrogen dioxide.

The filtration plant would require:
- A building approximately 40 metres long x 20 metres wide x 8 metres high to house the filtration equipment and other facilities. This would be located at the former Bexley Road M5 East construction compound site.
- A ventilation tunnel of approximately 250 to 500 metres long to extract unfiltered tunnel air and return filtered air back into the westbound tunnel.

This building is not a vent stack and no air would be emitted.

Since 2004 the RTA has been researching systems to remove particulate matter and nitrogen dioxide from tunnel air:

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**PROCESS TO IDENTIFY, INSTALL AND OPERATE AN AIR FILTRATION PLANT AND COMMENCE PARTIAL PORTAL EMISSIONS OVER A TRIAL PERIOD**

### Alternatives Identified
- Project objectives defined.
- Broad strategies:
  1. Changing the ventilation system/operation.
  2. Air filtration.
- Alternatives within the strategies identified.

### Preferred Alternative Described
- Preferred alternative identified.
- Design options considered for environmental impacts.
- The Modifications Report is prepared.

### Planning Approval and RTA Commitments Regarding the Management of Potential Impacts
- For both portal emissions and the filtration plant:
  - Statement of commitments to mitigate potential impacts.
  - Management documentation prepared.
  - Planning approval obtained.
  - Modified conditions of approval.

### Detailed Design of Air Filtration Plant
- Design options to be considered.
- Options to have a level of impact not greater than that described in the environmental assessment, e.g., noise related impacts.
- Process such as a value management workshop will compare explicit design options against the project objectives.

### Installation of Air Filtration Plant
- Environmental management.
- Community information.

### Commence Partial Portal Emissions
- In accordance with an approved portal emissions procedure, commence emitting air from the exit portals.

### Trial Period and Reporting for Air Filtration Plant
- Monitor:
  - In-tunnel air quality
  - Availability of the tunnel (number and duration of closures)
  - Reliability
  - Electricity costs
  - Labour costs
  - Operating costs
  - Filter performance

### Trial Period and Reporting for Portal Emissions
- Monitor in and outside tunnel air quality.
- Report on portal emissions to the Department of Planning.

### Review
- Effectiveness
- Whole of life costs
- Annual report to the community regarding tunnel operations.

### What Stages are there in the Process?
The process to identify, install and operate an air filtration plant over a trial period is shown to the left.

The RTA could commence portal emissions immediately should the portal emissions procedure be approved by the Minister for Planning. There are no physical changes to the tunnel infrastructure needed. An improvement in haze to the majority of the tunnel would be achieved immediately.

If approved the design and construction of the filtration plant would commence promptly.

Following Department Planning approval, the next stages in the air quality improvement plant are:

1. To implement portal emissions trial.
2. To start the filtration trial process:
   - Design the filtration plant building and ventilation tunnel.
   - Select the preferred supplier of the filtration system.
   - Construct the air tunnels and building to enable installation of the filtration system.
   - Begin the filtration trial.

### What Impacts would there be for residents during construction?
The construction impacts of building the filtration plant building and tunnel are described in the Modifications Report. Key potential environmental impacts include:

- Construction noise and vibration.
- Potential waste unless excavated soil material is reused.
- Construction traffic impacts.
- Potential visual impacts unless a high-quality design is applied to the building used to house the filtration plant.

The RTA would minimise construction impacts by fulfilling the environmental management commitments described in the Modifications Report and any other requirements of the approval set by the Minister.

Time restrictions would be placed on any noisy activities. Earth works and the removal of excavated soil material (called ‘spoil’) would comply with strict environmental requirements. Construction traffic would use main roads such as Bexley Road and the M5 East wherever possible.

The design of the building to house the filtration plant is important for local residents. The plan should minimise the potential visual impact of the building through good architectural design and landscaping. Some of the features that could be incorporated include:

- Constructing two to four metres of the building below ground to reduce its visible height.
- Integrating the building design, materials, finishes and colours into the surrounding area.
- Planting and landscaping to screen the building from neighbouring houses.

### What Impacts would there be during partial portal emissions?
The community has asked whether there would be any health impacts that would result from emitting air from the tunnel through the exit portals.

### Approach to the Health Studies
The RTA sought data on what the air quality is like around the portals. The RTA also sought meteorological data for every five minutes for the 2005 calendar year. This data includes air temperature, wind direction and wind speed.

State-of-the-art computer modelling was used to estimate the ground level concentration of pollutants as a result of portal emissions. The pollutants modelled included airborne particles from a variety of sources:

- Background particles in the tunnel air including urban smog, bushfire smoke, and local construction activity.
- Vehicle exhausts.
- Tyre wear.
- Brake wear.
- Soil and other particulates from vehicle loads or vehicle surfaces.
- Spores from micro-organisms on tunnel walls.
- Abrasion of the road surface.

The computer modelling also considered volatile organic compounds (or VOCs) that are found in petrol and diesel.

The assessment of potential impact to community health assumed a worst-case scenario of a maximum volume of air exiting from the tunnel running continuously from 5am to 7pm.

The RTA would impose a limit on air volumes to be released of 250m³/sec, below the maximum modelled rate of 380m³/sec. The health risk assessment was based on a continuous exposure for 70 years.
Understanding risk is an important part of the community assessing the impact of the proposal to them. To compare the health risks, there is reportedly a 1 in 1.6 million chance of being killed by lightning strike, a 1 in 1.16 million chance of dying from a venomous bite or sting, a 1 in 32 million risk of mortality for the most exposed individual, and a 1 in 4.7 million risk of a young person with asthma from very small particulates (PM 2.5) are estimated to be:

- 36% in the western end of the westbound tunnel.
- 49% in the western end of the eastbound tunnel.
- 38% in the eastern end of the eastbound tunnel.
- 30% in the eastern end of the westbound tunnel.

A filtration plant designed to remove at least 80% of particulates of less than 10 microns from 200m/sec and at least 90% of nitrogen dioxide from the 50m/sec of the air that passes through the plant.

Improved availability of the tunnel as fewer closures would be required.

Community benefits for residents on adjoining streets that currently have excessive traffic when the M5 East tunnel is closed due to haze or a build up of carbon monoxide.

What are the next steps?

The RTA is committed to improved communication with the community. There are a number of ways that the RTA will keep the community up to date with the project:

- Regular community information sessions would be held so that residents can discuss project data directly with the project team. It is proposed to replace the existing three-monthly air quality consultative committee with the sessions, which would be open to the general public. The sessions would be three-monthly for the first year, then six-monthly after the filtration trial is concluded.
- The RTA would continue to meet with key interest groups such as Residents Against Polluting Stacks.
- The RTA would attend council information sessions to ensure regular exchange of local information.
- Fact sheets such as this one have been prepared and distributed to residents, schools, transport operators and other groups. They are on the RTA website.
- Information would be progressively updated on the RTA website.
- A plain English annual report would be published on developments and activities relating to the M5 East tunnel and distributed widely to the community.
Addendum

Page 9
- The last sentence on page 9, “the health risk assessment was based on a continuous exposure for 70 years” should read:
  The health risk assessment conducted in relation to the risk of developing cancer from VOCS, was based on a continuous exposure for 70 years to the air from the portals. The result was the risk is less than 1 in 1,000,000. The Department of Environment and Conservation state a 1 in 1,000,000 risk of developing cancer is acceptable.

Page 10
- The dot point commencing with “the health risk associated with partial portal emissions” should read:
  The daily health risk associated with partial portal emissions…
  This information relates to the graph on page 4 – *Background air quality and maximum contribution of particulates from portal emissions to reduce haze.*

Page 10
- There is reportedly a 1 in 1.6 million *lifetime* chance of being killed by lightning strike, or a 1 in 1.16 million *lifetime* chance of dying from a venomous bite or *sting.*

How can I get more information?

- 9218 3665
- PO Box K198, Haymarket NSW 1238