Mordialloc Bypass
Air Quality Assessment

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Pertinent Experience of Ian Wallis

- Environmental Engineer – BE, MEngSc, PhD (Monash University)
- Worked in fluid mechanics, dispersion of contaminants in air and water
- Many years working with air quality models and water quality models
- Worked at Universities - Monash, Southampton, London
- Resources for the Future (Washington DC)
- Involved in assessment of air quality for many road projects in VIC, NSW and SA including: Ararat Bypass, Beaufort Bypass,, Eastern Freeway, Monash Freeway Upgrade, Tullamarine, Northern Expressway (SA), Craigieburn, Pakenham Bypass, Southern Expressway (SA), Geelong Bypass, Albury Bypass (NSW), Pacific Highway (NSW), Eastern Freeway, Western Ring Road

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Principal Issues

1. Dust during construction
2. Vehicle Emissions during operations
3. Odour from landfill

Issues screened out in preliminary risk assessment were:

- Contamination by dust of roof rainwater catchments
- Effect of dust on crops or native vegetation
- Effect of dust on avifauna.

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Principal Findings

1. Localised dust impacts during construction
   - For a period of months only at any one site along the route
   - Mostly close to roadways – within 100 m or so
   - Control measures recommended to limit effects of dust

2. Vehicle Emissions during operations
   - Mostly minor increase at receptors in relation to background concentrations
   - Highest concentrations on and adjacent to roadways
   - Effects most apparent within 75 m of roadways
   - Peak levels meet EPA SEPP(AQM) design limits and SEPP(AAQ) objectives.

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Submissions on EES

Issue	Submission Numbers
Concern about dust during construction	47, 53, 69, 81, 88, 112
Concern about contaminated dust and odour	81, 83
Concern about odour from landfill	53, 81, 83
Concern about nitrogen dioxide levels	40
General concern about reduction in air quality	25, 30, 32, 54, 56, 58, 59, 67, 68, 69, 84, 86, 88, 92, 101, 102, 103, 104, 108, 110, 111
Concern about health effects of people	26, 27, 28, 60, 62, 69, 71, 72, 75, 81, 82, 87, 98, 106
Concern about effects of pollution on wildlife	90

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Methodology for Dust Assessment

- Establish the volume of excavation and fill for each route
- Establish the construction period (2 years)
- Estimate type, number and characteristics of construction equipment
- Estimate the dust emissions by equipment type
- Model the transport and dispersion of dust as total dust (TSP) and as PM_{10} using the *Ausroads* model
- Plot the peak TSP and PM_{10} concentrations during construction
- Compare predicted levels to SEPP design criteria and assess impacts.

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Substantial excavation and fill in construction

Earthworks	Unit	Northern Section	Centre Dand. Rd	Lower Dand. Rd	Governor Rd	Southern Section
Remove soil	m^3	4,000	12,000	17,000	20,000	15,000
Excavation	m^3	0	13,000	0	0	3,000
Total Fill	m^3	21,000	253,000	317,000	381,000	258,000

Total excavation = 68,000 m^3 = 3,400 trucks

Total fill = 1,230,000 m^3 = 62,000 trucks

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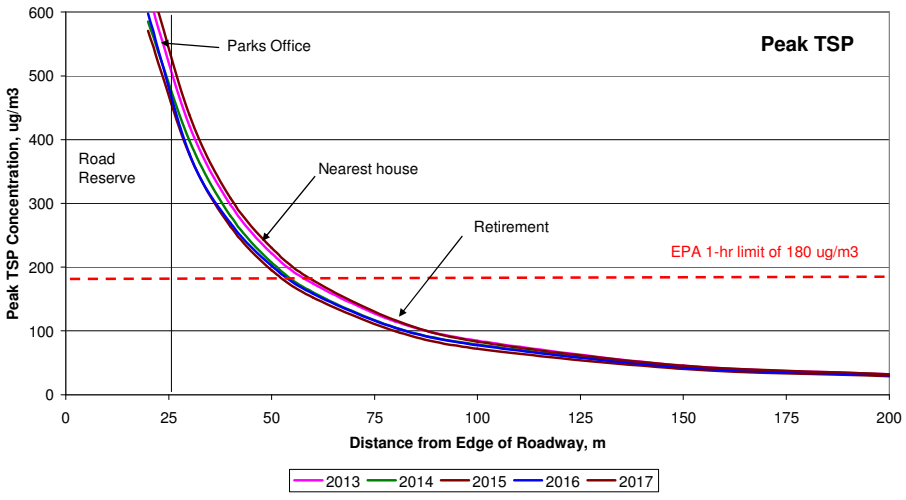
Dust Predictions – Peak 2 Days

TSP = total suspended particulates



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Dust Assessment

- On hot days, with high dust generation and transport, elevated TSP levels (over 180 µg/m^3) will extend to approximately 65 m east or west of the construction area, unless extra measures are taken to control dust.
- Residences beyond 65 m distance from the roadway will experience elevated dust and dustfall for a few days during construction
- Impacts in one retirement village should be less; Chelsea village next to large overpass.
- Parks office in Braeside Park is predicted to experience high TSP levels; **but**
- A short period of elevated TSP will not have a significant impact on rural land, parks, open space and most commercial properties.
- The amount of dust will depend on the weather and how controls are implemented

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Dust Controls (AQ2 in EPR)

AQ2. *Measures to minimise dust, odour and other air emissions must be implemented in accordance with relevant legislation, policies and guidelines including, but not limited to:*

- *EPA Victoria Publication 480: Environmental Guidelines for Major Construction Sites;*
- *VicRoads Contract Specification Standard 177, with PM10 monitoring undertaken for both residential and commercial receptors.*

Install portable PM10 monitors between the work site and residential and commercial receptors, as per the VicRoads specification. Take action promptly in response to high readings of dust by reducing operations, moving operations or increasing watering).

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Contaminated Dust

- Assessment assumed that all fill will NOT be contaminated
- Cover over landfill should not be contaminated material and minor amount of excavation there
- Recommendation is to cover landfill with coarse gravel
- Also expect CEMP to manage work there.

- Hence contaminated dust not expected to be significant issue

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Odour Assessment

- Aging landfill well beyond high emission period
- Data show only small amount of odorous gas is released now
- Recommended gravel cover on landfill to disperse emitted gas
- Also expect CEMP to manage work there
- No odour-sensitive receptors near the landfill

- Hence odour from landfill not expected to be significant issue

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Methodology for Vehicle Emission Assessment

- Establish the number of vehicles per day and in the peak hour each day
- Establish the type of vehicles (cars, trucks, vans; petrol, diesel, LPG, etc)
- Estimate vehicle emissions using EPA data
- Check against emissions from Burnley tunnel
- Model transport and dispersion of these contaminants
- Plot concentration on cross-sections of the road, to 200 m east and west
- Compare the predicted levels to the EPA design criteria and objectives
- Assess the zone of potential impact.

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EPA Design Criteria and Objectives

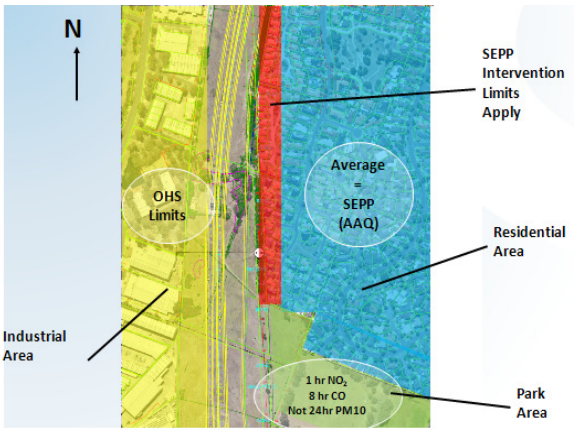
SEPP(AQM)

- Design Criteria (Schedule A)
- Intervention Levels (Schedule B)

SEPP(AAQ)

- Envir Quality Objectives (Sch B, reflect NEPC Air Objectives)
- Future $PM_{2.5}$ Objectives (VIC)

- OHS – workers for 8-hr/day
  (but not the public in these areas)



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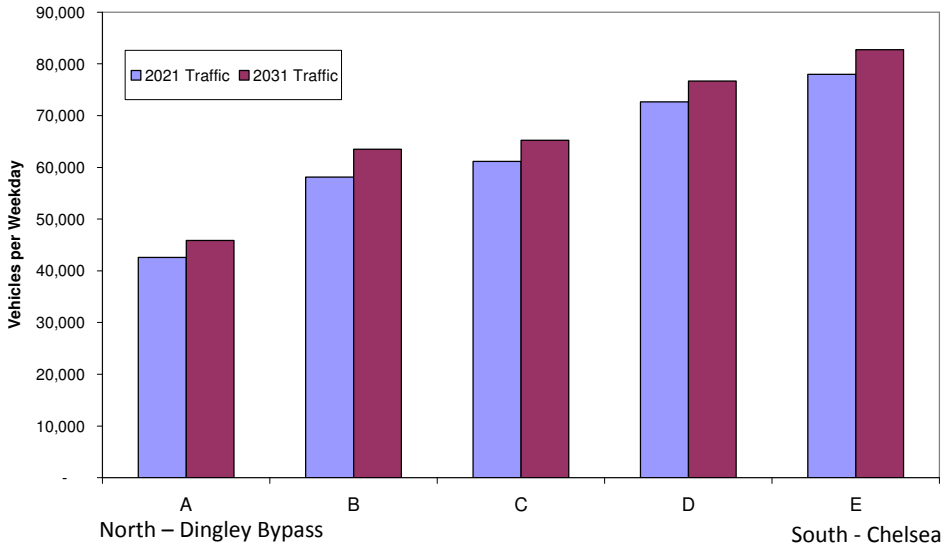
Traffic Predictions Used in Air Quality Assessment



7 % increase in traffic from 2021 to 2031

10 % decrease in vehicle emissions from 2021 to 2031

So contaminant levels higher in 2021 than in 2031

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Vehicle Emission Assessment

- Contaminants assessed are CO, NO_2, PM_{10} and $PM_{2.5}$
- Graphs in Report and Appendix show peak (99.9 %) concentrations
- Highest concentrations will be on and next to the roadways
- Concentrations decrease with distance from the roadways

- There will be a decline in local air quality on and near the Bypass
- There may be an improvement in local air quality on other roads

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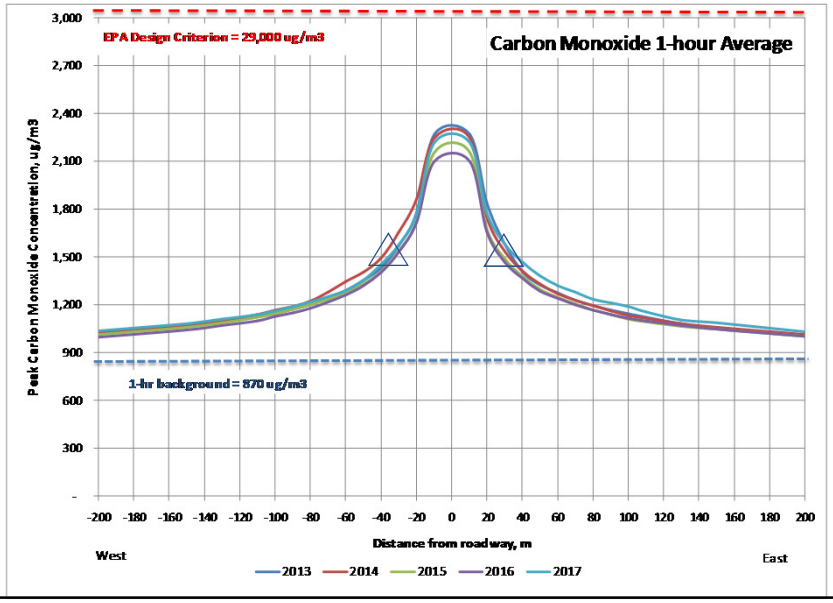
Vehicle Emission Assessment – CO



Triangles at 35 m east and west of roadway – which is the closest residence on each side

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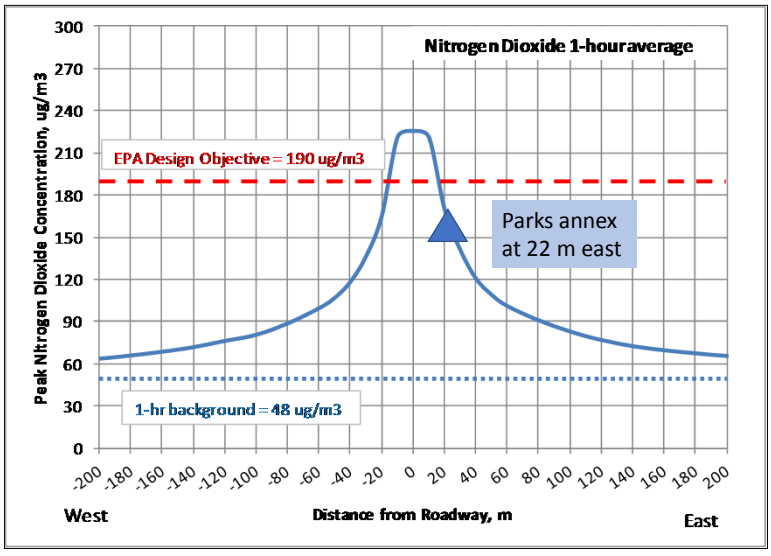
Vehicle Emission Assessment – NO_2



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Mitigation Options for Parks Annex

1. Move annex to east (no move required for Parks main building)

   OR

2. Install 4 m high wall beside roadway, with trees either side, to increase travel path and dispersion.

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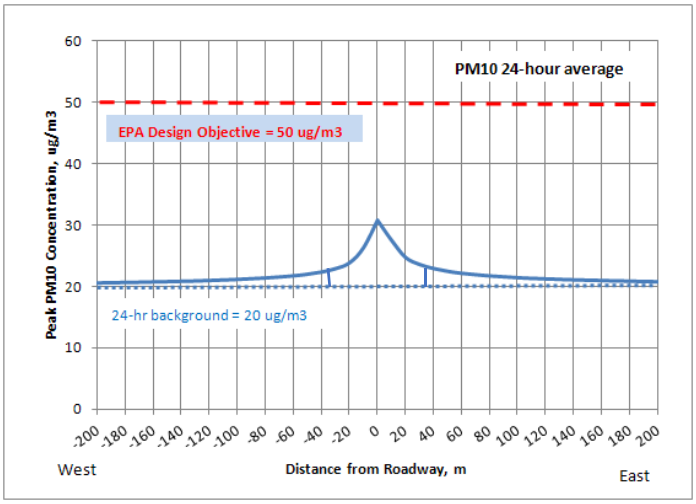
Vehicle Emission Assessment – PM_{10}



24-hour average – as per SEPP(AAQ)

Highest day of the year (99.9 %)

All concentrations well within objective

Background is major part of total

Vehicles are 27 % of background

Other components are smoke, soot, salt, soil and dust, ozone-related particles

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PM_{10} Levels are Similar over Melbourne

24-hour average PM_{10} Concentration in ug/m^3					
VIC-2017	99 %	95 %	90 %	70 %	50 %
Alphington	33	27	24	20	16
Dandenong	35	30	28	23	17
Footscray	40	31	28	23	17
Geelong	44	32	30	23	17
Mooroolbark	36	25	22	19	14
Traralgon	32	25	22	18	15
24-hr Average - VIC	37	28	26	21	16
Brighton 2012	32	28	25	20	16
Brighton-2013	33	28	25	20	15
Brighton-2014	38	30	26	20	16
Brighton-2015	38	28	24	21	17
24-hr Average Brighton	35	29	25	20	16

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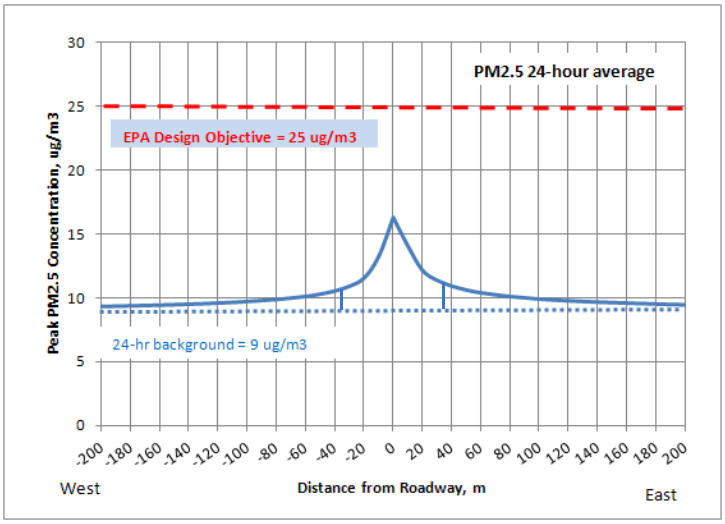
$PM_{2.5}$ – Predicted 24-hour Concentration



24-hour average – as per SEPP(AAQ)

Concentrations at all receptors within current SEPP(AAQ) objective

Background is major part of total

Vehicles are 31 % of background

Other components are smoke, soot, salt, dust, ozone-related particles

Elevated background a few days per year – due to bushfires, wood heaters, dust storms

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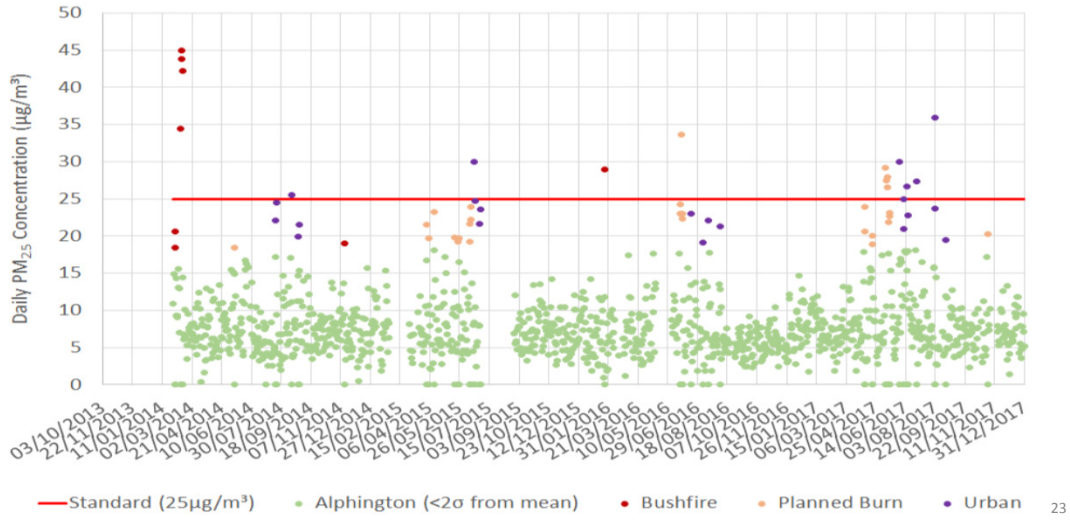
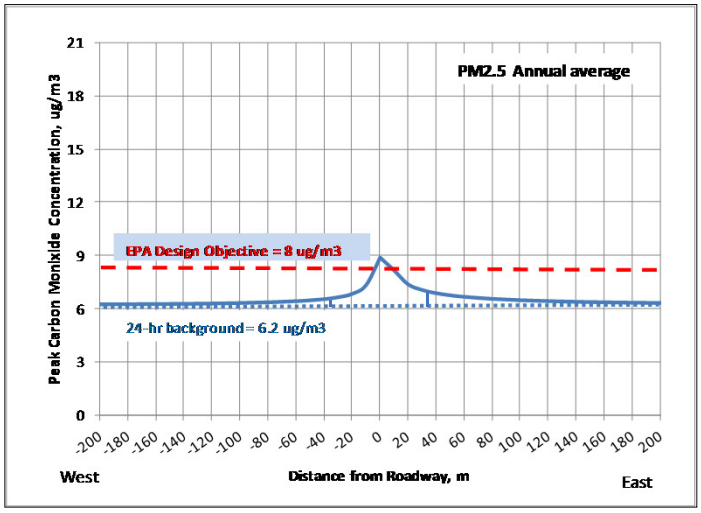
Alphington – A few peaks in $PM_{2.5}$ each year (due to bushfires, planned burns, wood heaters)



$PM_{2.5}$ – Predicted Annual Concentration



Annual average – as per SEPP(AAQ)

Concentrations at all receptors within current SEPP(AAQ) objective

Background is major part of total

Vehicles are 31 % of background

Other components are smoke, soot, salt, dust, ozone-related particles

Elevated background a few days per year – due to bushfires, wood heaters, dust storms

Health Impacts – of $PM_{2.5}$

- Well understood that reactive fine particles are not good for health
- US studies typically based on annual $PM_{2.5}$ of about 18 to 20 ug/m^3
- In comparison, Melbourne has annual average $PM_{2.5}$ of 6 to 7 ug/m^3
- Research papers quote effects on health of 10 ug/m^3 increase in $PM_{2.5}$. This is a massive (150 per cent) increase in $PM_{2.5}$ from 6 ug/m^3
- Risk small (but not zero) for 1 ug/m^3 increase

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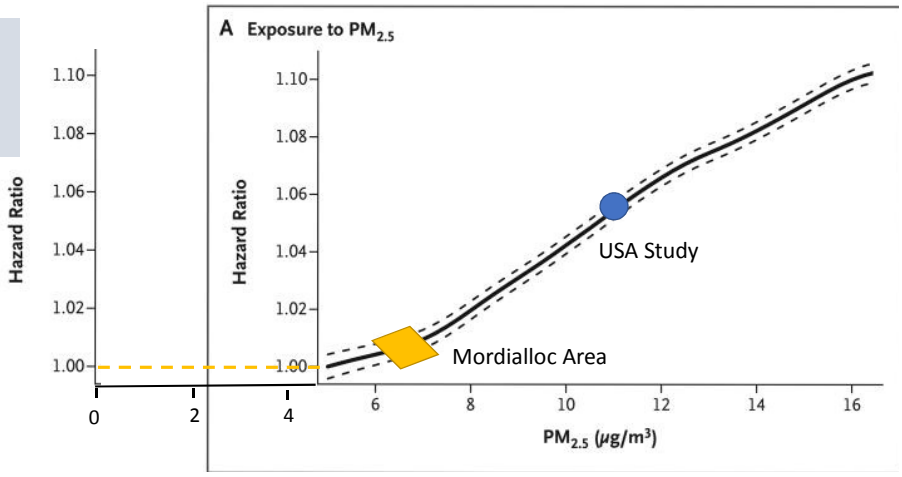
Air Pollution and Mortality in the Medicare Population
Qian Di, Yan Wang, Antonella Zanobetti, Yun Wang, Petros Koutrakis, Christine Choirat, Francesca Dominici and Joel D. Schwartz,

Health Impacts – Annual $PM_{2.5}$

Health risk in US studies based on annual $PM_{2.5}$ not 1-hour peak $PM_{2.5}$



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Vehicle Controls (AQ1 in EPR)

AQ1. Air quality (operation)
The project must be designed and constructed to minimise air quality impacts during operation and to ensure the requirements of relevant legislation, policies and guidelines are met, including but not limited to:
• State Environment Protection Policy (Air Quality Management)
• State Environment Protection Policy (Ambient Air Quality).

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Conclusion of Air Quality Assessment

- The Report has presented an assessment of all the potential impacts
- The impacts have been described so they can be assessed by the readers
- Vehicle impacts can be managed in accordance with the EPR AQ1 (and noting there are continuous improvements in vehicle emission controls)
- Dust impacts can be managed in accordance with the updated EPR AQ2

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