Perth air quality management plan report card 2012–13

GOVERNMENT OF WESTERN AUSTRALIA

Air Quality COORDINATING COMMITTEE

Air Quality Coordinating Committee
The Air Quality Coordinating Committee (AQCC) comprises representatives from state and local government, industry, business and the community. Its role is to monitor the implementation of the Perth Air Quality Management Plan and review the progress towards achieving its aims.

Printed by the AQCC 2014

This information is available in alternative formats on request.

Published by the Department of Environment Regulation on behalf of the AQCC.

Cover photo courtesy of DER

Perth air quality management plan report card 2012–13

More information
Executive Officer
Air Quality Coordinating Committee
Locked Bag 33
Cloisters Square Western Australia 6850
Phone: +61 8 9333 7435
www.der.wa.gov.au/airquality
AQCCadmin@der.wa.gov.au

Contents

Foreword

Welcome to the fourth *Perth Air Quality Management Plan Report Card* for 1 July 2012 to 30 June 2013. This report provides a clear and concise overview of *Perth Air Quality Management Plan* (Perth AQMP) activities to inform the community and promote good outcomes in air quality.

There have been a number of highlights and significant developments over the reporting period. For example, the *Halt the Haze* program has been renamed 'BurnWise', with the newly branded program developing a wood heater demonstration trailer over the year and running a number of successful training days with local government environmental health officers. Brochures on correct wood heater use are being developed and should be available in the coming year.

Alternative transport was a growth area during the year, with increased interest in Cycle Instead Bike Week 2013; 23,000 school children participating in Cycle to School Day; and 10,000 people taking part in the HBF Freeway Bike Hike for Asthma.

In the policy area, the Department of Transport and Department of Planning are preparing guidelines relating to parking in major activity centres. These are currently being drafted and a submission will be sent to the Western Australian Planning Commission (WAPC) for endorsement.

Research programs have also made significant progress. As part of the implementation of the recommendations from the five-year review of the Perth AQMP, work has started on re-establishing the Air Pollution and Health Research Network. The Network will report to the Air Quality Coordination Committee (AQCC). Work will be undertaken on Initiative 4 Health Research and Initiative 6 Indoor Air Quality.

The AQCC welcomes feedback from the community on air quality issues and will follow up any issues to help inform the representative departments on where they should focus their efforts within their programs. We also encourage involvement in behaviour change programs as it is only through widespread communication, support and uptake that these programs can be sustained.

Stuart Cowie

AQCC Chairperson

January 2014

NOTE:

As of 1 July 2013, as part of a broader machinery of government announcement, the Department of Environment and Conservation (DEC) separated into two agencies; The Department of Environment Regulation (DER) to carry out environmental regulation and administer the *Environmental Protection Act 1986*, and the Department of Parks and Wildlife (DPaW) to administer the *Conservation and Land Management Act 1984* and the *Wildlife Conservation Act 1950*.

References regarding projects and programs conducted in 2012–13 in this report will refer to DEC.

Photos courtesy of DEC

Introduction

The Perth AQMP, released in December 2000, was developed to improve and maintain clean air throughout the Perth metropolitan region over a 30-year period. It is a whole-of-government initiative developed via a consultative process including key government agencies, with lead roles in implementation, and a range of stakeholders. The Perth AQMP outlines strategies and programs aimed at continually improving air quality and avoiding adverse health and environmental impacts.

The initiatives of the AQMP fall into 10 categories:

1. Community education
2. Vehicle emissions reduction
3. Industrial emissions reduction
4. Health research
5. Modelling and monitoring
6. Indoor air quality
7. Land use and transport planning
8. Haze reduction
9. Small to medium enterprise emissions reduction
10. Smoke management

This ‘report card’ provides a summary of the management actions undertaken, an update of air quality influences, AQCC membership as well as the resources used to implement the actions over the 2012–13 financial year (Table 1 and Table 2).

Further information on the Perth AQMP can be found on the Department of Environment Regulation website http://www.der.wa.gov.au/airquality.

Resource tables

Table 1: Resource use per lead agency 1 July 2012 to 30 June 2013

Agency	Staff (FTE)[1]	Operations ($)
Department of Environment and Conservation (DEC)	7.15	68,500
Department of Transport (DoT)	10.5	780,000
Department of Planning (DoP)	24.5	589,000
Department of Health (DoH)	0.25	25,000
Total	42.4	1,462,500

[1]FTE (full-time equivalent)

Disclaimer: The figures provided are representative of the estimated contributions of each lead agency. These figures may not be exact as actions within the AQMP form part of agency business plan achievements.

Table 2: Resource use per initiative 1 July 2012 to 30 June 2013

Initiative	Staff (FTE)[1]	Operational ($)
Initiative 1	11.9	780,000
Initiative 2	2.45	13,000
Initiative 3	0	0
Initiative 4	0.45	13,000
Initiative 5	0.7	35,000
Initiative 6	0.1	12,000
Initiative 7	24.5	589,000
Initiative 8	2.1	6,000
Initiative 9	0.1	14,500
Initiative 10	0.1	0
Total	42.4	1,462,500

[1]FTE (full-time equivalent)

[2]DoH total contribution was 0.25 FTE for Initiatives 4, 6, 8 and 10. The whole figure was included with Initiative 4 (Health Research)

Disclaimer: The figures provided are representative of the estimated contributions of each agency. These figures may not be exact as actions within the AQMP form part of agencies business plan achievements.

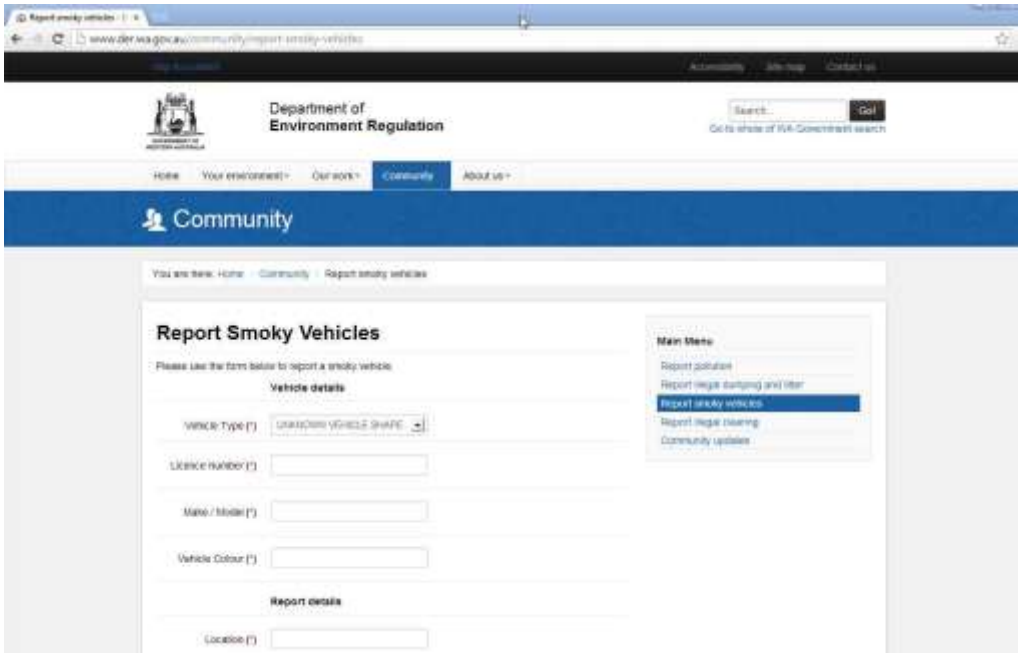
Management actions

Smoky Vehicle Reporting

The number of smoky vehicle reports received for the twelve months from July 2012 to June 2013 had increased from 355 reports the previous year to 381 reports. The results also show that 37 per cent of respondents have had their vehicle repaired since receiving a report of their smoky vehicle. The majority of the respondents (60 per cent) reported their vehicle as diesel.

Online Smoky Vehicle Reporting

DER has recently updated its webpage to include an online smoky vehicle reporting form, which will assist motorists to report smoky vehicles. http://www.der.wa.gov.au/community/report-smoky-vehicles.



Photos courtesy of DEC

RAC Electric Vehicle Trial

During the trial, the Royal Automobile Club of WA (RAC) ran a branded Ford Focus sedan as a patrol vehicle, which had been converted to run purely on electricity. The RAC's Motoring division has purchased a Nissan Leaf EV and a mobile EV charger while the Ford Focus EV continues to operate as a working patrol vehicle. As part of membership of the Sustainable Energy Association there is a second Nissan Leaf electric vehicle in use for one year at the RAC's Head Office in West Perth. The RAC now has public EV charging capability in West Perth and at the RAC Driving Centre.

New projects in 2012–13

- Improved communication materials have been developed for *CleanRun EcoDrive,* including an e-bulletin to increase awareness and inform contacts of upcoming workshops (DEC).
- DEC commenced discussions with a number of organisations to encourage uptake and adoption of *CleanRun EcoDrive*. There have been discussions with Main Roads WA to include *CleanRun EcoDrive* in the Infrastructure Sustainability Rating Framework as part of the Gateway WA Perth Airport and Air Freight project (DEC).
- Advice on the integration of air quality considerations into the plan for the future of metropolitan Perth and Peel has been drafted (DEC).
- A Masters scholarship through Murdoch University has been funded to develop indoor air quality education materials for primary or secondary students. Advertisements for a scholarship student have been circulated (DEC).
- The Community Based Participatory Research Guide for Air Quality Management is being reviewed. There have been a number of developments in the participatory research field since the program was established. The format of the guide has also been realigned to better meet the needs of key stakeholders including government bodies, industry and community groups (DEC).
- Improvements to short-term monitoring of volatile and toxic chemicals are being evaluated during a trial near the Kwinana industrial area. A Fourier Transform Infrared Technology (FTIR) is being deployed with specific sensors that are able to determine short-term concentrations, in air, of these pollutants. This data will be correlated with a field odour assessment. Monitoring will continue in the area for a period of 12 months (DEC).
- Significant limitations have been identified with some existing air dispersion models in certain situations. A brief evaluation of these limitations and a model comparison assessment is being performed. The results will contribute to a more comprehensive model assessment and improvement program being proposed in Western Australia (DEC).

Photos courtesy of DEC

- DEC investigated further amendment options for the Environmental Protection (Petrol) Regulations 1999 (DEC).
- DEC purchased and commenced testing new monitoring equipment to complement the existing eight air monitoring sites that have been established within the bounds of the greater Perth metropolitan area. It is anticipated that it will be used for short term or campaign monitoring (DEC).
- The Government announced the *Perth Central Business District transport plan 2012* in April. Measures already implemented as part of the plan include active travel management using CCTV cameras to provide information to road users; Incident Response Service crews, which remove broken-down vehicles; additional Red CAT buses; and conversion of pedestrian crossing phases to parallel walks (DoT).
- "Your Move, Cockburn" commenced in 2012. The project is a combined active transport and physical activity behaviour-change project delivered primarily in aiming to decrease the number and/or length of car trips by promoting walking, cycling and active connection to public transport. Local schools and workplaces are also engaged in the project through integration of the *TravelSmart Schools* and *TravelSmart Workplace* programs. The project is also supported with minor infrastructure improvements through integration of the connecting schools and connecting stations grants schemes (DoT).
- Planning has been undertaken to re-establish the Air Pollution and Health Research Network. The Network will undertake programs and actions identified in the Perth AQMP as well as inform Initiatives. The first meeting of the Network is scheduled for August 2013 where the terms of reference will be determined (DoH).
- The following DoP initiatives will be informed by the strategic assessment led by the Department of Premier and Cabinet (DPC), in close collaboration with DoP, DPaW, and the Office of the Environmental Protection Authority (OEPA).
    - The Directions 2031 plan for urban consolidation in metropolitan Perth and Peel will be prepared to guide the long-term shape and form of development across the Perth and Peel regions. Stage 1 of this plan is expected to be released in 2013 (DoP).
    - To replace a state planning policy, guidelines have been drafted relating to parking in major activity centres. Further work is required by DoP and DoT to finalise the guidelines for submission to WAPC for endorsement (DoP).

Photos courtesy of DEC

    - Futureplan—A plan for the future of metropolitan Perth and Peel is being prepared to integrate and coordinate strategic planning across the whole of government. This is to be released as a final document once the Directions 2031 plan for urban consolidation for metropolitan Perth and Peel and three outer sub-regional structure plans are finalised in 2014 (DoP).

Annual Program Accomplishments

- Two major cycling promotion campaigns, Cycle Instead in Spring and Bikeweek, were successfully co-ordinated and delivered in 2012–13. Cycle Instead Bikeweek 2013, attracted more than 15,000 adults as part of more than 80 community events throughout WA. Cycle to School Day promoted cycling as a means of transport and physical activity for children. In 2013, more than 23,000 school children from 112 schools took part. Major events during the campaign included the HBF Freeway Bike Hike for Asthma with 10,100 participants (DoT).

- The *TravelSmart Workplace* program engaged and supported 18 organisations to develop travel plans to promote active, sustainable travel by staff, clients and visitors. Three of these organisations (Durack Institute of Technology, Eastern Metropolitan Regional Council, Edith Cowan University) and another three from the previous year (GHD, RAC, WA Local Government Association) adopted and started implementing their plans (DoT/DEC).

- The *TravelSmart Workplace* program assisted nine organisations to run awareness campaigns to promote travel options to their staff. Tools and resources were produced to help workplaces take action including fact sheets, case studies, a workplace access audit tool, an employee travel survey tool, and a video clip. Quarterly forums and other training and networking events were held to build the capacity of workplaces to manage work-related transport. Under the Healthy Workers Initiative, TravelSmart Workplace worked with other providers to promote employee health and wellbeing (DoT/DEC).

- The *TravelSmart to Schools* program was restructured to allow schools to self-select their level of engagement (previously referred to as the 'light model'). As of the end of June 2013, 22 new schools joined the program with nine schools being engaged at a medium or high level and a further 13 at a low level of engagement (DoT).

- During the *Walk Over October* campaign in October 2012, 262 events involved at least 50,000 participants in schools, workplaces and community events. This resulted in:
    - the involvement of 1,848 participants (462 teams) in the online walking challenge
    - 181 schools, 48 community events and 33 workplace events
    - 45 professionals attending the walking seminar
    - 20,000 walking guidebooks being issued
    - 107 public displays (DoT).

- AirWatch continued to run the *Energy Smart for Air* program. Professional development sessions involved 22 new schools, 12 have signed up for the program, and two previous schools revisited the program (DEC).

- New teacher resources, which linked AirWatch to the National Curriculum, were developed and implemented to assist teachers while running the program. Work was undertaken to investigate ways to engage more high schools in the program (DEC).

- Training workshops on wood smoke management were presented to environmental health officers in Albany, Mundaring and Busselton. The workshops have been based on the draft BurnWise Wood Smoke Management Guide and the wood heater demonstration trailer. The BurnWise workshops attracted 33 EHOs from 20 LGAs (DEC).

Completed projects

- The *Halt the Haze* program, rebranded as BurnWise during the year, produced a number of DVDs and brochures about ways to reduce haze (DEC).
- The fit out for the BurnWise wood heater demonstration trailer has been completed (DEC).
- Field monitoring for acid gases in Midland has been completed (DEC).
- The amendments to the Environmental Protection (Diesel and Petrol) Regulations 1999 were gazetted on 9 October 2012. The title of the Regulations has changed to the Environmental Protection (Petrol) Regulations 1999 as they will no longer be regulating diesel fuel (DEC).

Photos courtesy of DEC

- Air Quality Information Sheet (AQIS) Number 6 relating to petrol has been finalised. This AQIS outlines how to calculate Reid Vapour Pressure (RVP) and its management as required by the Regulations. The AQIS has been sent to fuel companies in Western Australia who are managing the RVP of petrol that is being supplied in Perth. This AQIS is now published on the DER website (DEC).
- *EmpowerWA* involved training hundreds of community leaders in a Clean Energy Future for WA and had a number of excellent entries for the Cleaner Tomorrow competition (CCWA).
- A model *TravelSmart to Schools Light* trial was completed and integrated into a restructured ongoing program (DoT).
- *TravelSmart to Schools* messages were integrated into the Nature Play WA passport and website (DoT).
- Evaluation of the data from the *Perth Solar City Living Smart Households* program has been completed. The results can be found at http://www.perthsolarcity.com.au/art/PSC_-_2012_ANNUAL_REPORT.pdf (DoT).
- Training sessions have been held supporting the *Planning and designing for pedestrians guidelines*. A total of 150 professionals attended the training (DoT).
- A report on monitoring levels for smoke impacts and health effects has been completed and is now on the Department of Health's Public Health website (DoH).
- The guidance for air quality index during smoke incidents has been completed (DoH).
- The trial of converted electric vehicles in 11 corporate fleets has been completed. A report on the trial can be accessed here http://therevproject.com/trialreport.pdf (DoT/RAC/DEC).

Ongoing projects and programs

- *CleanRun EcoDrive* undertook a number of activities during the year including workshop planning and delivery. For World Environment Day information was disseminated through Main Roads WA Heavy Vehicles Accreditation System, the West Australian Road Transport Association, and local governments including the Shire of Esperance. Website material was also updated, and information requests were received from interstate (DEC).

Photos courtesy of DEC

- The BurnWise program has provided support and tools to local government environmental health officers who are responsible for responding to domestic smoke nuisance complaints in their jurisdictions and to raise awareness of correct wood heater operation. The BurnWise wood smoke management guide is now at the final draft stage and is currently being prepared for publishing (DEC).
- Community education materials for the BurnWise wood heater demonstration trailer have been developed and are with a graphic designer to prepare for publishing (DEC).
- New and existing materials have been designed to be included in the BurnWise program. They include brochures on buying and selling a wood heater, wood heaters and your health, home heating options, backyard burning/green waste, and troubleshooting your smoky chimney (DEC).
- A report is being compiled for the field monitoring of acid gases in Midland (DEC).
- DEC worked with Curtin University to finalise a report for DEC outlining research findings from the Curtin PhD project, "*Increasing the implementation of cleaner production and industrial symbiosis in small-medium enterprises with specific focus on air pollution*". This report is due in the next year (DEC).

- Community and government departments have been engaged regarding air quality issues from smoke management, regional air quality and air toxics, particularly in the Collie and Bunbury airsheds, and areas targeted for development by natural gas from shale or tight rocks (CCWA).

- Alternative cleaner fuel, active transport and renewable energy have been promoted (CCWA).

- Sub Regional Structure Plans—strategic documents that seek to achieve proper and orderly planning and development of land and infrastructure consistently across their study areas—will be informed by assessment led by DPC, in close collaboration with DoP, DPaW, and OEPA (DoP).

- The *Strategic Assessment of the Perth and Peel region* (SAPPR) is a whole-of-government project. It considers Matters of National Significance (flora and fauna) under the federal *Environmental Protection and Biodiversity Conservation Act 1999* plus environmental factors under section 16 of the state's *Environmental Protection Act 1986*. The SAPPR is a high-level assessment of land use that considers the environmental and biodiversity implications of future land development and infrastructure placement, and ensures the process has involved avoidance, mitigation and the potential offsetting of impacts. Importantly, assessments of this kind are also considered as a strategic review. Therefore, the SAPPR also considers *Directions 2031* policy, the supply and demand for basic raw materials, population projections, and the economic implications for the state under different development scenarios.

  The outputs from the SAPPR are:

  1. A 'Matters of National Significance' plan – which will provide information about the management of species and their population viability.

  2. An impact assessment report – which will consider the measures taken to avoid, mitigate and possibly offset environmental impacts as well as the governance arrangements (DoP).

- On 19 December 2012 the Minister for Planning launched the draft State Planning Strategy for public consultation. Prepared by DoP, under the guidance of the WAPC, this Strategy presents a vision for Western Australia to 2050 and beyond based on a framework of planning principles, strategic goals and state strategic directions. The strategy is the government's proposed response to the opportunities and challenges Western Australia is likely to face in the future. Submissions on the draft closed on 29 March 2013. These are being analysed by DoP and a report will be forwarded to the Minister for Planning in due course (DoP).

- The final *Western Australian Bicycle Network Plan 2012–2021* is expected to be released in 2013–14. *TravelSmart to School* was integrated with the Connecting Schools Infrastracture grants, resulting in participating schools being eligible for $100,000 worth of cycling infrastructure (DoT).

- The randomised control trial assessing the impact of each of the elements of the *Living Smart Households* program was completed in December 2012. The evaluation of the program is on hold due to a change in program focus and budget priorities (DoT).

- The Walkability Audit Tool was developed in 2011 and converted to a digital format in 2012. The tool has been used by various professionals and local government authorities. It is being reviewed for further improvements, which will lead into Phase 2 of the project (DoT).

- The Walking School Bus is progressively being integrated as an activity within *TravelSmart to School*. As there are now more activities and tools for schools to choose from, the number of routes has dropped from 30 to 20 as schools choose activities more appropriate to resources and objectives (DoT).
- "Your Move, Cockburn" will be delivered to 20,000 households in the City of Cockburn over 2013–14 in partnership with the Department of Sport and Recreation and additional third party contributions from Local Government, HBF and RAC (DoT).
- A new reporting framework has been developed and implemented for the TravelSmart Officer network. The first two milestones of the fourth round of TravelSmart Officer funding have been achieved. Monthly TravelSmart Network meetings have been hosted. Meeting topics include promoting implementation of Active Transport programs, strengthening portfolio relationships, fostering improved infrastructure for active modes of transport and increasing the capacity of the network (DoT).
- The document *Dust management for residential and commercial developments* is in the final review stage (DoH/DEC).

Future ideas and initiatives

- Up to four *CleanRun EcoDrive* workshops will be delivered over the next 12 months (DER).
- A revised Community-Based Participatory Research Guide for air quality management will be developed and training will be provided for key stakeholders including government bodies, industry and community groups (DER).

Photo courtesy of DEC

- DER will collaborate with Curtin University to investigate ultrafine particles in relation to small to medium-sized enterprises in Welshpool. This research aims to help address some of the knowledge gaps regarding ultrafine particles in the Perth airshed. The air monitoring will be conducted at a number of sites in the Welshpool light industrial area and the surrounding residential area. At each site, measurements will be taken by a condensation particle counter (CPC) and a NanoMOUDI II cascade impactor. The particle measurements and sampling will occur at one site per week for a period of seven weeks. The particle samples will be analysed for mass concentration, elemental composition and morphology (DER).
- Review and finalise the *Transport Assessment Guidelines for Developments* for a more formal inclusion into the statutory planning process (DoP).
- As part of the *Perth Central Business District Transport Plan 2012–2021*, future works planned include: the introduction of a new Green CAT service to Leederville; additional bus priority lanes; and additional and improved Principal Shared Paths as identified in the WA Bicycle Network Plan (DoT).
- Projects to be developed will:
    - develop indoor air quality (IAQ) awareness information and resources for the community and professionals
    - undertake a literature review on the IAQ policies and implementation of policies
    - communicate data and information on air quality and air pollution issues (DoH).

AQCC membership

Membership at 30 June 2013:

State government

- Stuart Cowie (Department of Environment and Conservation) – Chairperson
- Jim Dodds (Mirella Goetzmann, Proxy) (Department of Health)
- Luke O'Donoghue (Department of Transport)
- Loretta van Gasselt (Department of Planning)
- Kishor Dabasia (Department of Commerce)

Community

- Prof. Philip Jennings (Conservation Council of Western Australia)
- Dr Sue Graham-Taylor (Pollution Action Network)

Business and industry

- Rachel Lewis (Kwinana Industries Council)
- Dr Regina Flugge (Royal Automobile Club of WA)

The AQCC is also supported by the Department of Fire and Emergency Services (DFES—formerly Fire and Emergency Services Authority (FESA)) and the Public Utilities Office.

Three meetings of the AQCC were held during the reporting period, on 25 September 2012, 26 February 2013 and 25 June 2013.

New publications relevant to the AQMP

- Bushfires and other vegetative fires: Protecting community health and well-being from smoke exposure http://www.public.health.wa.gov.au/3/1437/2/bushfire_hazards.pm (DoH).
- AQIS 6: Calculating Reid Vapour Pressure in the Environmental Protection (Petrol) Regulations 1999 (DEC)
- Response to the Western Australian Bicycle Network Plan July 2012 (RAC).
- The economic cycle: A business case for investment in cycling in Western Australia (RAC).
- Public transport report 2013: perceptions of Perth's public transport system from the people that use it (RAC).
- Cycling Guide (RAC).

Contact the AQCC

For more information please contact the Secretariat to the Perth AQMP on 9333 7435, AQCCadmin@der.wa.gov.au or via the website at http://www.der.wa.gov.au/air-quality.

Perth AQMP Progress summary

Some of the programs have been removed from Table 3 as they have been completed since the Perth AQMP has been in place. Other programs may have been marked as completed but may also be seen as ongoing programs, to be updated regularly, rather than being projects with an end point. The remaining programs will be re-numbered.

Table 3: Perth AQMP summary of progress on initiatives, programs and actions.

The table summarises progress undertaken by agencies to complete the initiatives and programs of the Perth AQMP.	**Action**				**Lead agency**
	No progress	In progress	Completed	Future work	
Initiative 1: Community education					
P1: Review existing education and behaviour change programs and establish a strategy and framework for developing and implementing supporting programs in		✔		✔	DoT and DEC
P2: Improve everyone's access to air quality information and programs via the internet.		✔			DEC, DoT and DoH
P3: Influence the community's travel behaviour through implementing TravelSmart, teleworking and other travel alternatives.		✔		✔	DoT and DEC
Initiative 2: Vehicle emissions reduction					
P1: Develop policy and regulations for automotive fuel quality in WA, promote national fuel quality regulation in line with international standards, and co-ordinate fuel quality standards with improved vehicle emission standards.		✔		✔	DEC
P2: Evaluate various emissions-testing options for introduction to Perth and implement the committed outcomes to reduce in-service emissions from motor vehicles.				✔	DEC
P3: On-road enforcement of controls on excessive vehicle emissions		✔		✔	DoT and DEC
P4: Investigate the cost-effectiveness of Stage II vapour recovery, and promote if cost effective.	✔				DEC
P5: Investigate the use of electric, alternative fuel vehicles and ultra-light vehicles.		✔			DoT

The table summarises progress undertaken by agencies to complete the initiatives and programs of the Perth AQMP.	Action				Lead agency
	No progress	Progress	Completed	Future work	
Initiative 3: Industrial emissions reduction					
P1: Assess contribution of industrial NOx and ROC emissions to smog formation in the Perth airshed.	✔				DEC
P2: Assess cost-effective NOx emission reduction options, and implement agreed options to reduce emissions from significant industrial sources.	✔				DEC
P3: Identify and assist the major emitters of ROCs to reduce industrial contributions, and encourage continuous improvement in ROC reduction measures already introduced.	✔				DEC
P4: Promote the awareness of industry achievements in atmospheric emission reduction through 'green industry' awards.	✔				DEC
P5: Ensure proper airshed planning for future industrial development and power generation in the Perth metropolitan region.	✔				DEC
Initiative 4: Health research					
P1: Investigate the public health impacts of air pollution.		✔		✔	DOH
P2: Investigate sources of air pollutants and their impact on residents by determining the potential health impacts of variations in Perth's daily air quality.	✔				DOH
P3: Develop an air pollution and health network.		✔			DOH
Initiative 5: Modelling and monitoring					
P1: Update and consolidate air emissions databases.	✔				DEC
P2: Validate/improve emissions estimates for key emission sources.	✔				DEC
P3: Improve modelling capability and accuracy.		✔			DEC
P4: Establish a monitoring steering committee to review air quality monitoring issues in the Perth metro area.	✔			✔	DEC
P5: Review air quality monitoring practices and procedures in the Perth metropolitan region.				✔	DEC
P6: Develop future monitoring programs.		✔			DEC
P7: Support community information and education programs on air quality monitoring.		✔			DEC

The table summarises progress undertaken by agencies to complete the initiatives and programs of the Perth AQMP.	Action				Lead agency
	No progress	Progress	Completed	Future work	
Initiative 6: Indoor air quality					
P1: Develop an indoor air quality network.		✔			DoH and DEC
P2: Investigate indoor air quality and the contribution of indoor air exposure to personal exposure.		✔			DoH and DEC
P3: Increase community indoor air quality awareness.	✔				DoH and DEC
Initiative 7: Land use and transport planning					
P1: Include regional and local air quality considerations in metropolitan strategic planning.		✔			DoP
P2: Include regional and local air quality considerations in the planning and implementation of development proposals.		✔			DoP
P3: Monitor and review the effectiveness of land use and transport planning decisions in influencing Perth's air quality.		✔			DoP and DEC
P4: Assist local government in influencing the community's travel behaviour to bring about positive change.		✔			DoT and DEC
Initiative 8: Haze reduction					
P1: Increase community awareness of the impacts of domestic wood heaters on air quality.		✔			DEC
P2: Increase awareness among wood suppliers and wood heater installers of the impacts of wood heaters on air quality.		✔			DEC
P3: Domestic smoke nuisance resolution.		✔			DEC and DoH, LGAs
P4: Manage green waste disposal and recycling to reduce local haze creation.				✔	DEC, DLG

The table summarises progress undertaken by agencies to complete the initiatives and programs of the Perth AQMP.	Action				Lead agency
	No progress	Progress	Completed	Future work	
Initiative 9: Small to medium enterprise emissions reduction					
P1: Encourage cleaner production.		✔			DLG,DEC and PUO
Initiative 10: Smoke management					
P1: Establish a smoke management awareness group to facilitate community education and information about smoke impact from planned burns.	✔				DEC
P2: Smoke Management Liaison Group.		✔			BoM, DEC, DFES
P3: Smoke management policy and regulation.	✔				DFES, DEC, DLG
P4: Smoke management research.	✔				DEC, BoM

Photos courtesy of DEC

Air quality influences

Statistics to quantify factors impacting on the Perth AQMP achieving its objectives are in Table 4. These parameters are updated regularly and are accessible through the Australian Bureau of Statistics.

Table 4: Context statistics.

Perth metropolitan area population [1]	1,897,548 (3.6% increase from previous year) (78.08% of WA total population)								
Airshed area[1]	5,386km^2								
Population density [1]	335.36 persons / km^2								
WA Vehicles[2]	1,977,756 (3.4% increase from 2011)								
Fuel type (by number of registered vehicles) [2]	Petrol leaded	Petrol unleaded	Diesel fuel	LPG/Dual/Other					
	77,429	1,441,510	397,876	60,941					
Vehicles per capita (WA) [2]	828 vehicles per 1,000 residents								
Vehicle use[2]	66.6% private vehicles (as the main form of transport on usual trip to work or full- time study)								
Motor vehicles on register [2]		**Passenger vehicles**	**Camp-er vans**	**Light Commer-cial Vehicles**	**Light rigid trucks**	**Heavy rigid trucks**	**Articu-lated trucks**	**Non-freight carry trucks**	**Buses**	**Motor cycles**
	2011	1,394,241	7,941	318,147	13,160	49,089	12,590	4,582	13,597	99,392
	2012	1,432,969	8,127	332,417	14,258	50,483	13,217	4,719	14,371	107,195
Public transport use[3]	11% used public transport as the main form of transport on usual trip to work or full- time study								
Wood heaters in Perth[4]	31,000 (4.7% of dwellings use wood heaters as their main source of space heating)								

<table>
<tr><td>Heavy Industry</td><td colspan="6">The major heavy industrial area is in Kwinana in the south-west of the Perth metropolitan region, between Fremantle and Rockingham.</td></tr>
<tr><td rowspan="4">WA Industrial growth (all sectors)[5]</td><td colspan="2">Employment at end of June</td><td colspan="2">Wages and salaries</td><td colspan="2">Sales and service income</td></tr>
<tr><td>2010-11</td><td>2011-12</td><td>2010-11</td><td>2011-12</td><td>2010-11</td><td>2011-12</td></tr>
<tr><td>'000</td><td>'000</td><td>$m</td><td>$m</td><td>$m</td><td>$m</td></tr>
<tr><td>1,218</td><td>1,293</td><td>59,386</td><td>67,945</td><td>408,837</td><td>454,822</td></tr>
<tr><td>AQ data</td><td colspan="6">Eight monitoring stations monitor Perth’s ambient air quality. They are located at Wattleup, South Lake, Rockingham, Duncraig, Swanbourne, Caversham, Rolling Green and Quinns Rock.</td></tr>
<tr><td>Topography</td><td colspan="6">The Perth metropolitan region is predominantly flat. The gently undulating sand dunes of the Swan Coastal Plain stretch from the coast to the Darling Range, which lies between 30km and 40km to the east. The Darling Range rises up to around 300m above sea level.</td></tr>
<tr><td>Climate and weather</td><td colspan="6">Perth has a Mediterranean climate, with hot and dry summers, and cool and wet winters. During summer months, the major weather influences are the south-westerly sea breeze and the development of a low pressure trough along the west coast. During winter months, cold fronts move rapidly across the Indian Ocean bringing frequent rain and gusty winds to the city. Air quality in Perth is significantly affected by features of the regional meteorology. Temperature inversions on very calm cold nights trap the pollutants near the earth’s surface. Sea breezes can recirculate urban pollutants, blown offshore from Perth during morning hours.</td></tr>
</table>

1. Australian Bureau of Statistics, 3218.0 *Regional Population Growth Australia*, Estimated Resident Population, Statistical Areas Level 2, Western Australia, April 2013

2. Australian Bureau of Statistics, 9309.0 Motor Vehicle Census, 31 January 2012

3. Australian Bureau of Statistics, 4102.0 *Australian Social Trends 2008*

4. Australian Bureau of Statistics, 4602.0.55.001, *Environmental Issues: Energy Use and Conservation*: *Main source of energy for heating,* October 2011

5. Australian Bureau of Statistics, 8155.0 *Australian Industry 2011-12: States, Territories and Australia by industry division* May 2013

Air quality monitoring data

The purpose of this section is to provide an indication of Perth's air quality and, by extension, the success or otherwise of the Perth AQMP. It is important to note there is no single measure of air quality that can provide this as each approach has its limitations and many programs cannot be directly related back to monitoring results. Additionally, for many pollutants there is no safe level below which health is not adversely affected; so even with relatively clean air, measurable adverse health impacts may still occur.

The National Environment Protection (Ambient Air Quality) Measure provides a nationally consistent framework for the monitoring and reporting of six common pollutants (criteria pollutants)—particles (PM_{10}), ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO) and lead (Pb). Additionally there is an advisory reporting standard for particles as $PM_{2.5}$. Table 5 shows the Ambient Air Quality NEPM standards and goals.

Figure 1: map of Perth Metropolitan Region showing the monitoring sites.

2012 National Environment Protection (Ambient Air Quality) Measure results summary

The Ambient Air Quality NEPM standards for CO, NO_2 and SO_2 were not exceeded at any site during 2012. Although there were more exceedences at monitoring sites compared to last year, the NEPM goal for most pollutants was still met, except for O_3 (0.08ppm averaged over four hours at Caversham and Quinns Rocks).

The Ambient Air Quality NEPM advisory standard for particles as $PM_{2.5}$ of 25µg/m^3 averaged over 24 hours was exceeded at Caversham, Duncraig, Quinns Rocks and South Lake. The Ambient Air Quality NEPM advisory standard for particles as $PM_{2.5}$ of 8µg/m^3 averaged over one year was exceeded at Duncraig and South Lake.

Some of these exceedences were attributed to bush fires caused by lightning strikes which resulted in smoke plumes impacting on the Perth metropolitan region. Exceedences are shown in Table 6.

Figure 2: Satellite image of the smoke plumes from the fire at Windy Harbour (14/02/2013, http://firewatch.dli.wa.gov.au/landgate_firewatch_public.asp)

Interpreting graphs

The following graphs show statistical information for the past 10 years' monitoring. Each graph shows the maximum, 99th percentile, 98th percentile, 95th percentile and 90th percentile of daily maximum concentration for all pollutants monitored by DEC.

The nominated percentiles can also be expressed as an nth highest concentration.

Based on 100 per cent data recovery and a normal year (365 days), the following table gives each percentile an equivalent nth highest ordinal value. The bracketed numbers represent the exact (as calculated) value of the ordinal number.

Percentile	nth highest
100	1 (maximum)
99	5 (4.65)
98	8 (8.3)
95	19 (19.25)
90	38 (37.5)

Some graphs also have the NEPM standard included to allow easy comparison.

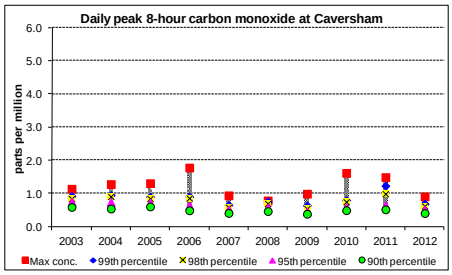
Note: This report card is based on achievements over the 2012/2013 financial year; however, the data from the NEPM report is based on calendar year emissions data to ensure consistency with NEPM reporting.

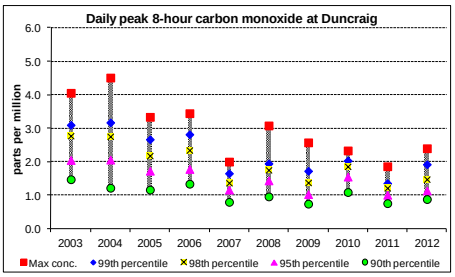
Table 5: National Environment Protection (Ambient Air Quality) Measure standards and goals.

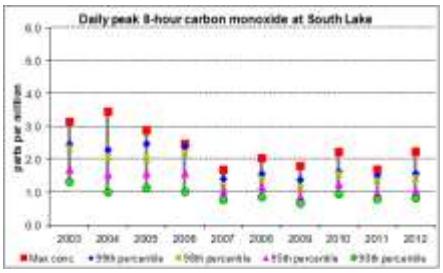
Pollutant	Averaging period	Maximum (ambient) concentration (ppm)	Maximum allowable exceedences by 2008
Carbon monoxide	8 hours	9.0	1 day per year
Nitrogen dioxide	1 hour	0.12	1 day per year
	1 year	0.03	None
Sulfur dioxide	1 hour	0.20	1 day per year
	1 day	0.08	1 day per year
	1 year	0.02	None
Photochemical oxidants (as ozone)	1 hour	0.10	1 day per year
	4 hours	0.08	1 day per year
Particles (as PM_{10})	1 day	50 µg/m^3	5 days per year
Lead	1 year	0.50 µg/m^3	None
Advisory Standards (at June 2013)			
Particles (as $PM_{2.5}$)	1 day	25 µg/m^3	
	1 year	8 µg/m^3	

CO_2

The graphs below show CO trends from 2003 to 2012. In 2012, Ambient Air Quality NEPM standard for carbon monoxide of 9.0ppm averaged over eight hours was not exceeded at any site.

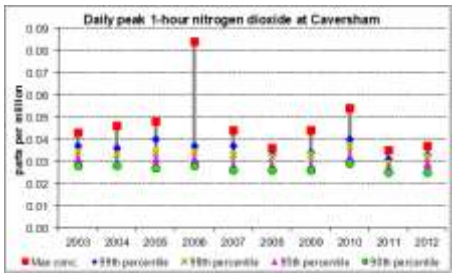


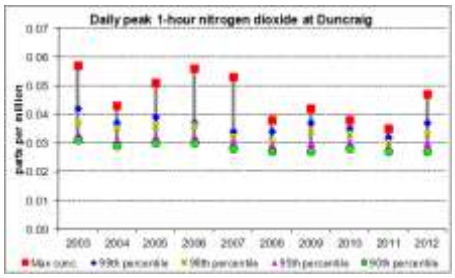


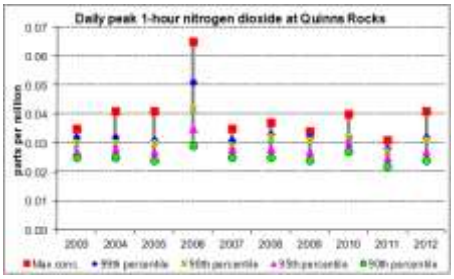


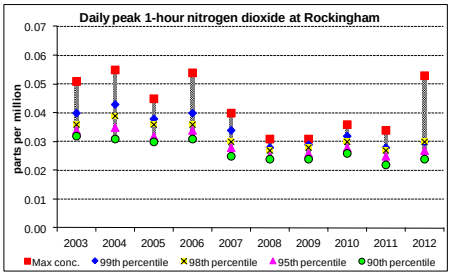
NO_2

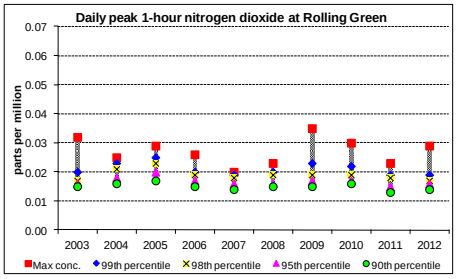
The graphs below show NO_2 trends from 2003 to 2012. In 2012, the Ambient Air Quality NEPM standard for nitrogen dioxide of 0.12ppm averaged over one hour and the 0.03ppm annual average were not exceeded at any site.

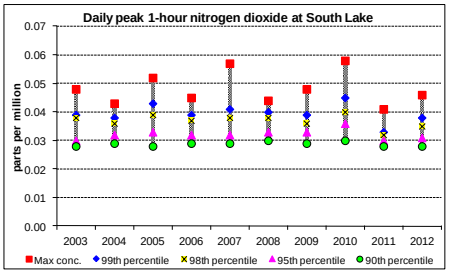


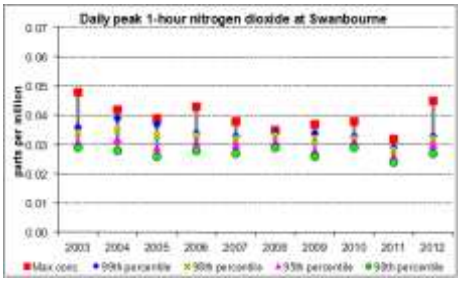








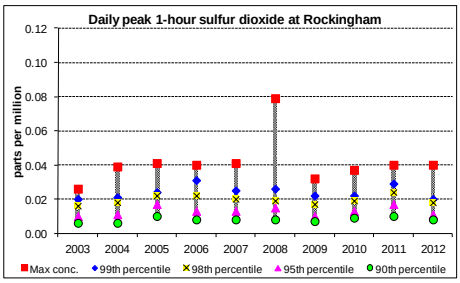


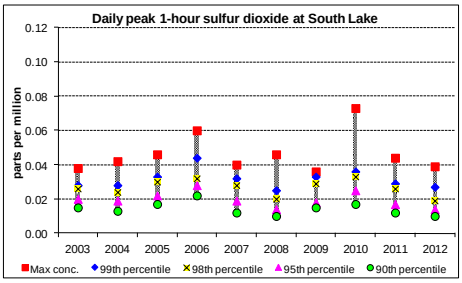


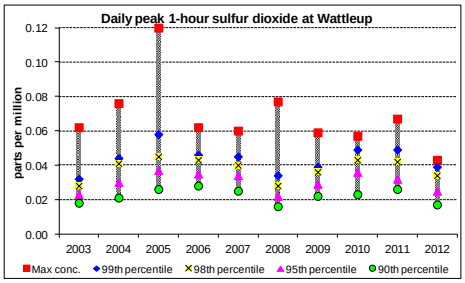
SO_2

The graphs below show SO_2 trends from 2003 to 2012. In 2012, the Ambient Air Quality NEPM standard for sulfur dioxide of 0.20ppm averaged over one hour, the annual standard of 0.02ppm and 0.08ppm averaged over 24 hours were not exceeded at any site.

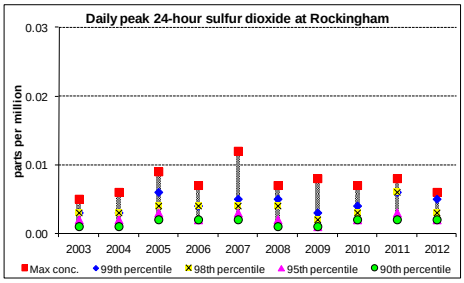
Daily peak 1-hour

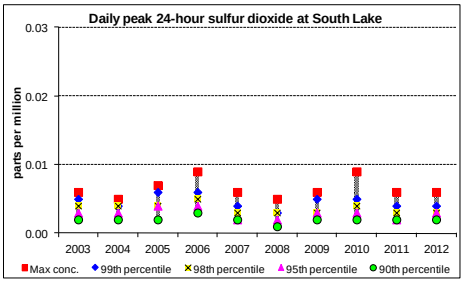


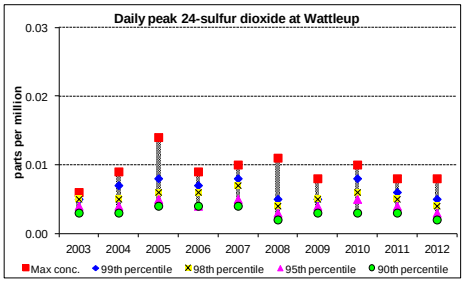




Daily peak 24-hour



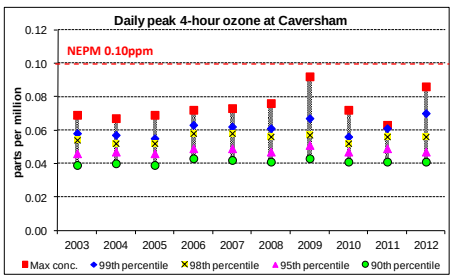


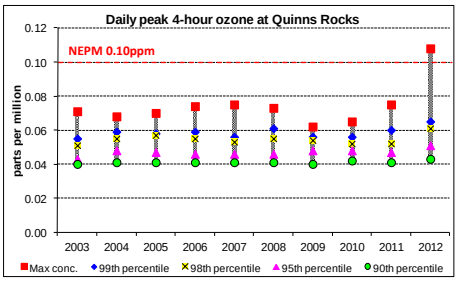


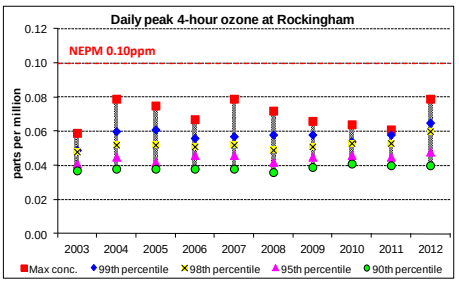
O_3

The graphs below show O_3 trends from 2003 to 2012. In 2012, the standard for ozone of 0.10ppm averaged over one hour was exceeded at Quinns Rocks, Rolling Green and Swanbourne. The standard for ozone of 0.08ppm averaged over four hours was exceeded at Caversham, Quinns Rock, Rolling Green and Swanbourne. The Ambient Air Quality NEPM goal of no more than one exceedence at each site was not met at Caversham and Quinns Rocks, with two exceedences each.

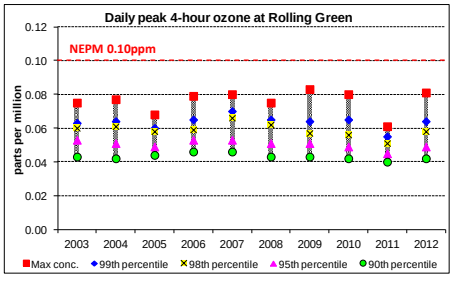
Daily peak 1-hour

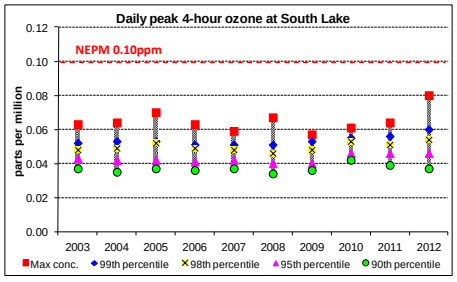


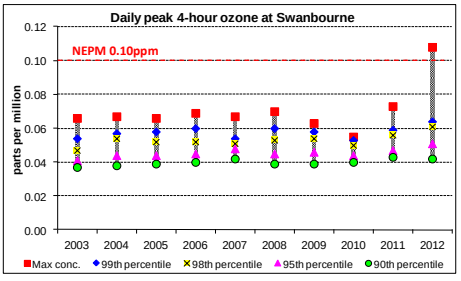




Daily peak 4-hour

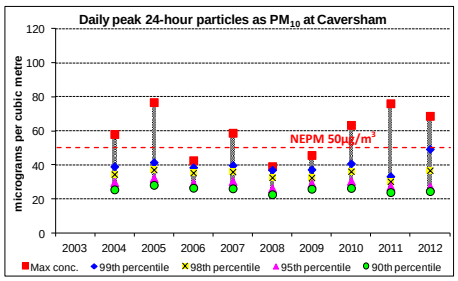


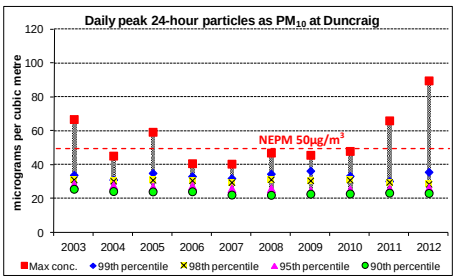


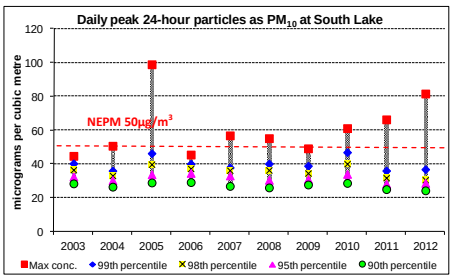


Particles (PM_{10})

The graphs below show PM_{10} trends from 2003 to 2012. In 2012, the Ambient Air Quality NEPM standard for particles as PM_{10} of 50µg/m^3 averaged over 24 hours was exceeded at Duncraig and South Lake twice and four times at Caversham. However, the NEPM goal of no more than five exceedences was met at all sites.



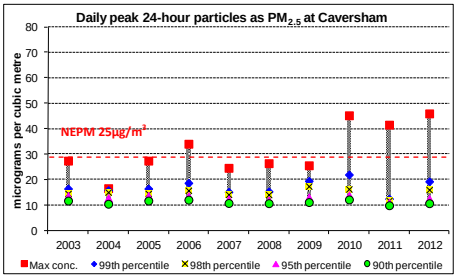


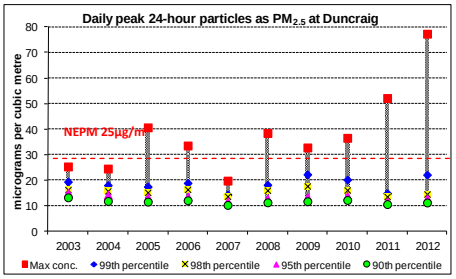


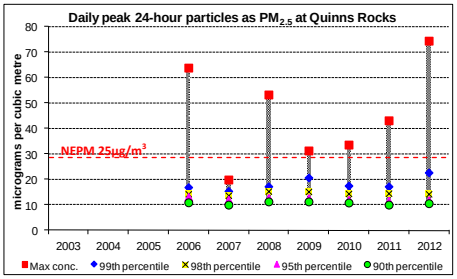
Particles ($PM_{2.5}$)

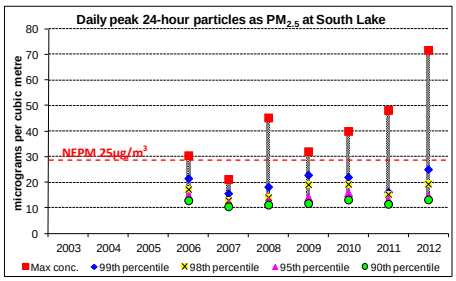
The graphs below show $PM_{2.5}$ trends from 2003 to 2012.

In 2012, the Ambient Air Quality NEPM advisory standard for particles as $PM_{2.5}$ of 25µg/m^3 averaged over 24 hours was exceeded three times at Caversham and Duncraig and four times at Quinns Rocks and South Lake. The Ambient Air Quality NEPM advisory standard for particles as $PM_{2.5}$ of 8µg/m^3 averaged over one year was exceeded at Duncraig and South Lake.









Pb

From 1995, lead levels at Queens Building in the Perth central business district have been below 60 per cent of the 0.5µg/m^3 annual Ambient Air Quality NEPM standard. In 2001, the average lead level in Perth was 0.022µg/m^3, less than five per cent of the Ambient Air Quality NEPM standard. Due to these low levels, the performance monitoring station for lead was decommissioned in 2001.

Table 6: 2012 Exceedences in the Perth airshed.

Site	Pollutant	Concentration	Date	Reason
Caversham	O_3 – 4 hour	0.083 ppm	14/02/2012	Smoke haze
Caversham	PM_{10} – 24 hour	68.7 µg/m^3	14/02/2012	Smoke haze
Caversham	$PM_{2.5}$ – 24 hour	45.9 µg/m^3	14/02/2012	Smoke haze
Caversham	PM_{10} – 24 hour	61.4 µg/m^3	15/02/2012	Smoke haze
Caversham	$PM_{2.5}$ – 24 hour	39.6 µg/m^3	15/02/2012	Smoke haze
Caversham	PM_{10} – 24 hour	58.7 µg/m^3	16/02/2012	Smoke haze
Caversham	$PM_{2.5}$ – 24 hour	39.0 µg/m^3	16/02/2012	Smoke haze
Caversham	O_3 – 4 hour	0.086 ppm	22/02/2012	Smoke induced
Caversham	PM_{10} – 24 hour	65.5 µg/m^3	21/09/2012	Crustal
Duncraig	PM_{10} – 24 hour	89.5 µg/m^3	14/02/2012	Smoke haze
Duncraig	$PM_{2.5}$ – 24 hour	77.3 µg/m^3	14/02/2012	Smoke haze
Duncraig	$PM_{2.5}$ – 24 hour	35.2 µg/m^3	15/02/2012	Smoke haze
Duncraig	PM_{10} – 24 hour	54.8 µg/m^3	16/02/2012	Smoke haze
Duncraig	$PM_{2.5}$ – 24 hour	43.8 µg/m^3	16/02/2012	Smoke haze
Quinns Rocks	O_3 – 1 hour	0.130 ppm	28/01/2012	Coastal event
Quinns Rocks	O_3 – 4 hour	0.108 ppm	28/01/2012	Coastal event
Quinns Rocks	$PM_{2.5}$ – 24 hour	74.5 µg/m^3	14/02/2012	Smoke haze
Quinns Rocks	$PM_{2.5}$ – 24 hour	31.1 µg/m^3	15/02/2012	Smoke haze
Quinns Rocks	$PM_{2.5}$ – 24 hour	45.9 µg/m^3	16/02/2012	Smoke haze
Quinns Rocks	$PM_{2.5}$ – 24 hour	25.2 µg/m^3	22/02/2012	Smoke haze
Quinns Rocks	O_3 – 4 hour	0.086 ppm	31/12/2012	Coastal event
Rolling Green	O_3 – 1 hour	0.103 ppm	15/02/2012	Smoke induced
Rolling Green	O_3 – 4 hour	0.081 ppm	15/02/2012	Smoke induced
South Lake	PM_{10} – 24 hour	81.5 µg/m^3	14/02/2012	Smoke haze
South Lake	$PM_{2.5}$ – 24 hour	71.6 µg/m^3	14/02/2012	Smoke haze
South Lake	$PM_{2.5}$ – 24 hour	36.8 µg/m^3	15/02/2012	Smoke haze
South Lake	PM_{10} – 24 hour	58.8 µg/m^3	16/02/2012	Smoke haze
South Lake	$PM_{2.5}$ – 24 hour	48.0 µg/m^3	16/02/2012	Smoke haze
South Lake	$PM_{2.5}$ – 24 hour	26.4 µg/m^3	22/02/2012	Smoke haze
Swanbourne	O_3 – 1 hour	0.128 ppm	28/01/2012	Coastal event
Swanbourne	O_3 – 4 hour	0.108 ppm	28/01/2012	Coastal event

Key:

Crustal: A small proportion of $PM_{2.5}$ particles within PM_{10}.

Smoke haze: A high proportion of $PM_{2.5}$ particles within PM_{10}.

Coastal event: High concentrations of ozone on the coast due to recirculation of Perth emissions on the sea breeze.

Smoke induced: Elevated ozone due to reactive organic compounds found within wood smoke.

NOTES

DER2013039