

Committed to improving air
quality in the Kwinana region



KWINANA
INDUSTRIES
COUNCIL



The Kwinana Industrial Area looking south towards Rockingham.

A Valuable Asset

The Kwinana Industrial Area was established in the early 1950s to accommodate the development of major industries in Western Australia. It covers an area of about 20 square kilometres along an 8 kilometre strip of coast adjacent to Cockburn Sound.

It is a significant State asset in economic, environmental and social terms.

The Kwinana Industries Council (KIC) and its member companies are committed to providing a high level of protection for the regional environment to ensure the health and safety of employees and the general community.

The KIC is committed to sustainable development of the Kwinana region by balancing the economic, environmental and social progress of the area.

The goal of industry is to achieve sustainability through:

- Efficiently processing resources to provide a range of goods and services needed by our society;
- Achieving an acceptable and decreasing level of environmental impact;
- Providing jobs and income for our community; and
- Engaging in cooperative projects that benefit local communities, the State and Australia.

Western Australia's Industrial Hub

In 1953 industrial development adjacent to Cockburn Sound began with the construction of the BP oil refinery in the Kwinana Industrial Area. During the next five decades the number of operations within the Area expanded with the development of industries such as minerals refining/processing, iron and steel manufacturing, cement, chemical, fertiliser and power production, multiple port facilities and a bulk grain terminal.

Many associated service and support companies were also established in the area to supply the major Kwinana industries.

In the early 1970s, at the southern end of the Sound, a causeway was built to connect Garden Island to the mainland to further the development of HMAS Stirling as the main Australian naval base servicing the Indian Ocean.

In the 1990s the Henderson Marine Precinct was also developed at the northern end of Cockburn Sound with a range of dockyard and other facilities for shipbuilding and marine maintenance.

Both marine developments further increased the combined industrial, commercial, naval and recreational use of Cockburn Sound.

Today the Kwinana Industrial Area represents a unique blend of industries, many of which are interdependent in their use of resources and infrastructure. This creates significant synergies through the flow of materials and wastes between industries to create new products.



Revegetating the buffer zone surrounding the Kwinana Industrial Area.



Sodium Cyanide plant, Kwinana.

An Economic Impact Study released in 2002 demonstrated the economic effect of the Kwinana Industrial Area was:

- *\$4.3 billion in direct sales*
- *22 per cent of the WA manufacturing sector's total income*
- *Nearly \$9 billion of direct and indirect economic contribution to Australia*
- *Employee earnings of \$600 million per annum*
- *Nearly 4,000 people directly employed*
- *\$812 million capital expenditure planned over the five years to 2007*



The Kwinana Industrial Area and the monitoring stations of the Kwinana air quality network.

Area A: Heavy industry

Area B: Buffer area surrounding industry

Area C: Rural and residential land uses

SO₂ monitoring locations

- | | |
|---------|---|
| Current | 1. Wattleup (DoE) |
| | 2. Hope Valley (DoE) |
| | 3. North Rockingham (DoE) |
| | 4. Abercrombie Road/Postans (KIC) |
| | 5. Fancote Avenue, Beelihar (KIC) |
| | 6. Miguel Road, Bibra Lake (KIC) |
| Former | 7. Fanstone Avenue, Munster (2002 – 2004) |
| | 8. Hillman Primary School (1993 - 1994) |
| | 9. Rhodes Park, Calista (1994 - 1995) |
| | 10. Henderson Avenue (1995 - 2002) |
| | M KIC meteorological station (1993 -) |

■ DoE monitors

■ KIC monitors

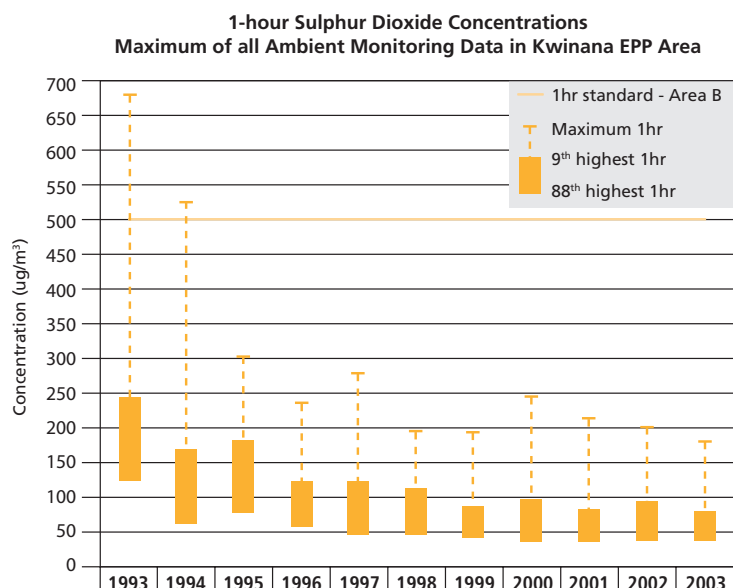
Monitoring Air Quality

The most significant air emissions issue addressed by industry and the State Government during Kwinana's development has been sulphur dioxide (SO₂) levels in the 1980s.

When ambient SO₂ monitoring began in 1979 the 1 hour ambient concentrations occasionally exceeded 1400 micrograms per cubic metre (ug/m³) but are now generally less than 200 ug/m³ (as shown on the table below). The annual average SO₂ concentration at the Wattleup monitoring site in 1979 was 44 ug/m³. Now (as shown on the table below) the annual average concentration has been well below 10 ug/m³ since KIC started its monitoring programme in 1992. This is well below the standards set in the Kwinana Environmental Protection Policy (EPP).

The Kwinana EPP developed in 1992 has the following functions:

- Identifies the area covered;
- Establishes, through associated regulations, the air-quality objectives for SO₂ and particulates (with the opportunity for other contaminants to be added at later dates);
- Enables the Environmental Protection Authority to establish procedures for determining and applying limits on emissions from each industrial source such that the cumulative impact of these emissions does not exceed the air quality objectives; and
- Requires the industries to monitor the ambient sulphur dioxide concentrations at various locations in the environment and also to monitor emissions from the various industrial sources so that the achievement of policy objectives can be verified and enforced. This is in addition to those programs conducted by individual industries.



Air Emissions

Development of industry in Kwinana resulted in regional air quality becoming an issue of public interest from the 1980s onwards.

As the regional population increased a Kwinana air quality buffer zone was created and formalised by the 1992 Kwinana EPP. The buffer assists industry and the State Government to manage industrial emissions so as to maintain a healthy level of air quality for employees and surrounding communities.

With the number of people living in the region continuing to grow, it has become even more important that air quality is of the highest standard.

A National Environment Protection Measure (NEPM), established by the State and Territory Governments in 1998, also proposes uniform standards for assessing air quality throughout Australia. Industries in Kwinana measure or estimate their emissions against these national standards.

Australia also has a National Pollutant Inventory (NPI) that contains emissions data for 3,000 facilities, 32 airsheds and 29 catchments around the nation. This includes the Kwinana Industrial Area as a whole and its individual major operations.

Industry in Kwinana measures or estimates emissions levels for more than 90 compounds and supplies this information to the NPI each year. Information can be found at www.kic.org.au.

Emissions are documented and published annually by the NPI. It also publishes information on other major emissions sources, such as transport and domestic activities. Information on the NPI can be found at www.npi.gov.au.

The KIC is an active participant in regional community forums reviewing air quality issues.

Some of the emissions contained in the NPI that have been of particular interest to people in the Kwinana and Rockingham area in recent years include:

- Sulphur dioxide (SO₂)
- Oxides of Nitrogen (NO_x)
- Volatile organic compounds (VOCs)
- Heavy metals
- Benzene
- Particulates (PM₁₀, PM_{2.5})

It should be noted that in addition to industrial sources, there are even larger non-industrial sources for some of these compounds and materials in the region.



Year	Annual Average SO ₂ Concentration (ug/m ³)
1993	6.7
1994	5.8
1995	5.4
1996	5.5
1997	3.7
1998	2.9
1999	3.1
2000	2.3
2001	2.5
2002	2.9
2003	3.3

Top: Emissions testing at Tiwest Joint Venture.

Middle: Particulate monitoring at Alcoa World Alumina Australia.

Questions on Key Compounds

Q What is SO₂ and how is it produced?

SO₂ is a colourless gas that has a sharp irritating odour at high ambient concentrations. In Kwinana SO₂ concentrations vary according to seasonal conditions and higher ambient levels tend to occur in summer when sea breezes are common.

Historically SO₂ emissions were due to the burning of heavy fuel oil and the processing of crude oil, both of which contained high sulphur. The air quality in the Kwinana Industrial Area improved significantly from 1984 as industries began using low sulphur fuels such as natural gas, introduced tighter emission controls and started processing low sulphur crude oil. Some industries in the area have also reduced their SO₂ emissions through the installation of equipment to recover or remove SO₂.

Q What are the current levels of SO₂ in the Kwinana airshed?

Current monitoring of ambient air in and adjacent to the Kwinana air quality buffer zone demonstrates that SO₂ levels are well within the standards set in the Kwinana EPP and relevant health and environmental guidelines. The levels also comply with the ambient air quality NEPM standards and have done so since their development in 1998.

Concentrations of SO₂ are generally low in Perth, with the maximum concentrations being lower than those experienced in Melbourne and Sydney. SO₂ emissions in Perth have decreased markedly from all industrial sources, not just Kwinana, since the 1980s.

Q What are oxides of nitrogen (NO_x) and how are they produced?

At high temperatures atmospheric nitrogen combines with oxygen to form a mixture of NO and NO₂, known as NO_x (oxides of nitrogen).

The gases are emitted by combustion processes including vehicles, industrial and commercial boilers, power generation, industrial combustion processes and high temperature chemical reactions. In urban areas, vehicle emissions are the major source of NO_x.

Q What are the current levels of NO_x in the Kwinana airshed?

Between 1992 and 1999 monitoring of NO_x by the Department of Environment (DoE) at 12 metropolitan sites found that concentrations at Hope Valley and Rockingham – the nearest points to the Kwinana Industrial Area – were four times lower than concentrations at a Perth CBD¹ site. This is because one of the primary emitters of NO_x are vehicles, which are mainly used in urban areas and concentrate in the CBD, especially during peak hours. NO₂ levels recorded in ambient air in the Kwinana area are below guidelines².

Q What are VOCs and how are they produced?

VOCs (volatile organic compounds) are produced by a range of combustion processes including those in vehicles, industry, bushfires, burning-off and heaters.

Q What are the current levels of VOCs in the Kwinana airshed?

A two year baseline monitoring program recently completed by the DoE found the highest annual average concentrations of volatile organic compounds were in the Perth CBD³. Again this is attributed to the fact that the main production of VOCs in urban areas comes from vehicles.

1. Perth Photochemical Smog Study, Department of Environmental Protection / Western Power 1996
2. Kwinana Gap Emissions Study Stage 1: Significant pollutants in the Kwinana Industrial Airshed, Department of Environment, Draft Report November 2003
3. VOC Monitoring in Perth: Baseline Air Toxics Project, Department of Environmental Protection, January 1998

Q What are heavy metals emissions and how are they produced?

Heavy metals are natural components of the Earth's surface. They are found in substances that are in daily use in all households. The best known example of a heavy metal emission is probably lead from motor vehicle engines before unleaded fuel was introduced. Other heavy metals emitted by combustion processes include copper, zinc, mercury, arsenic and cadmium.

Industry emits traces of heavy metals from most combustion processes. These heavy metal emissions can arise from trace concentrations in fuels that are burnt or from raw materials.

Q What are the current levels of heavy metals in the Kwinana airshed?

Major industries with heavy metals emissions are licensed under the Environmental Protection Act and those in Kwinana are operating within relevant health guidelines. Vehicles are the other major source of heavy metals emissions, but DoE studies show that these are also low in Perth compared with other cities, largely through the use of unleaded petrol and a dispersed population⁴.

Q What is benzene and how is it produced?

Benzene is found in emissions from industrial and domestic combustion processes. Most benzene in urban areas is the result of emissions from motor vehicles and wood heaters/fires.

Q What is the current level of benzene in the Kwinana airshed?

All Kwinana industries are operating within the relevant health guidelines for benzene emissions.

A two year baseline monitoring program recently completed by the DoE found the highest annual average concentrations of volatile organic compounds, which includes benzene, were in the Perth CBD due to the concentrated number of vehicles⁵. Overall, there has been a significant decrease in industrial emissions of benzene.

Q What are particulates?

In the simplest term possible, particulates are dust. In any environment dust particles are around us all the time and most are naturally occurring. However, other particulates can be formed during industrial processes and emitted from stacks or other parts of a production process. Some particulates from industrial sites also come from stockpiles of raw materials or areas which have lost their vegetation.

Q What are the current levels of particulates in the Kwinana airshed?

A considerable amount of research is now being done into particulates in the Kwinana airshed. Current information shows that particulates from industry are not a health problem and that other dust in the local area comes from land clearing and development activity. Dust can be measured as either PM₁₀, PM_{2.5} or as Total Suspended Particulates.

Monitoring for all three measurements is carried out in the Kwinana airshed. Industry and regulators intend moving towards the PM_{2.5} measurement because it monitors the smallest dust particles, which are currently thought to be more important with regards to their potential health impacts.

Q What are the emissions that are visible in the Kwinana Industrial Area?

The main visible emission from Kwinana industries is steam. Steam plumes appear white when they leave the stacks of various industry sites. Under certain climatic conditions, particularly cold winter mornings, the high relative humidity means that the steam plumes persist longer than usual.

4. VOC Monitoring in Perth: Baseline Air Toxics Project, Department of Environmental Protection, January 1998

5. Volatile Organic Compounds Monitoring in Perth - Baseline Air Toxics Project, January 2000, Technical Series 102, Department of Environmental Protection.

KIC initiatives with the State Government

Kwinana industry continues to reduce emissions through new technology, process improvements and fuel and energy changes.

On behalf of its member companies, the KIC is continuing to commit significant funds to air quality monitoring under the current Kwinana EPP.

The KIC has also reviewed the latest information from the NPI, and has developed a computer software program that places the emissions from industry into context with the rest of the Perth metropolitan area.

A DoE study to be completed in 2004 will help identify and review gaps in the monitoring of the Kwinana industrial airshed creating a better understanding of monitoring needs.

Most importantly, the latest information indicates emissions are well within the appropriate health guidelines. The KIC and its member companies will continue working closely with the Department of Environment (DoE) and the Department of Health (DoH) so that industry plays its part in ensuring appropriate health guidelines are met.

The Future

The KIC and its member companies are committed to the continuous improvement of air quality in the Kwinana region and increasing the efficiency of industry emissions.

Effective regional monitoring systems are in place but more studies are underway to ensure that standards are continually improving.

The KIC, the DoH and the DoE are keen to keep the community informed of ongoing improvements in air quality and developments at individual sites.

The KIC will remain an active participant in community forums focussing on issues relating to air quality.

More information on general industry issues, the KIC, or its member companies can be obtained from the Kwinana Industries Council's website www.kic.org.au or by contacting the KIC office at:

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The Kwinana Industries Council Community Information Service allows you to find out the latest information on public safety, environmental and other issues in the Kwinana Industrial Area simply by using your telephone: 1300 304 346

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