Western Power
Collie Power Consortium
Griffin Energy

Proposed Expansion of Coal-Fired Power Generating Capacity in Collie

HEALTH IMPACT STATEMENT

- Final Rev 0
- April 2005

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Contents

List of Plates

List of Figures

List of Tables

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1. Introduction

1.1 Background

This document forms a Health Impact Statement (HIS) commissioned by Western Power Corporation, Griffin Energy and Collie Power Consortium (a partnership between Wesfarmers and J-Power). This report is to allow information to be incorporated into the environmental approval process for two proposals considering the expansion of coal-fired generating capacity at the Collie Power Station, Western Australia.

The report outlines the methodology involved in conducting the Health Impact Assessment (HIA), the results of technical assessments and community input, and draws conclusions to provide a statement of the overall potential health impacts.

1.1.1 South West Interconnected System Power Procurement Process

Western Power Corporation (Western Power) is the principal generator, transmitter, distributor and retailer of electricity in Western Australia. To continue to reliably meet the electricity requirements of its business and residential customers within the South West Interconnected System (SWIS), Western Power requires access to additional generating capacity.

The *Electricity Corporation Act 1994* requires Western Power to procure any substantial new generating capacity through a non-discriminatory and open procurement process. This process allows suitably qualified companies to compete for the opportunity to supply electricity to Western Power and is known as the SWIS Power Procurement Process (PPP). A key principle of this process is the requirement of the *Electricity Corporation Act 1994* to seek to minimise the total delivered cost of electricity while maintaining safety and reliability.

The two stages of the PPP comprise the following:

- **Stage 1** - Up to 260MW of peaking capacity to be in service by 2005/06. Transfield Services Limited will build, own and operate two Siemens V94.2 open cycle gas turbines located in Kemerton Industrial Estate; and
- **Stage 2** - 300MW to 330MW of base-load capacity. The new power station is to be operational by December 2008.

To accelerate the process and ensure the availability of suitable sites for the bidding processes, Western Power sought and received strategic environmental advice and ‘in principle’ approval under Section 16(e) of the *Environmental Protection Act 1986* for a number of potential power station sites, including an expansion of the existing Collie Power Station (Environmental Protection Authority (EPA) Bulletin 1067). The objective of the Strategic Environmental Review (SER) process was to obtain advice and ‘in principle’ approval prior to submission of final tenders,

enabling full specification of environmental performance for the facilities in the PPP tender process. Furthermore, the approach was designed to ensure final approval for the facilities is attainable to meet required commissioning dates.

Western Power has shortlisted three bidders for the provision of the capacity required for Stage 2 of PPP. Two of these, Griffin Energy Pty Ltd (Griffin) and the Collie Power Consortium (Wesfarmers Energy Ltd and J-Power), have presented proposals based on coal-fired power generation and both have a proposal for the expansion of the existing Collie Power Station. Griffin Energy has also proposed the alternative option of Bluewaters II, an additional 200MW adjacent to Bluewaters I (200MW) power station. Public Environmental Review (PER) documents for all three proposals have been released for public comment by the coal bidders.

The essence of the SER process has continued and studies jointly funded by Griffin and the Collie Power Consortium have been facilitated through Western Power to streamline the tendering process for the proposals to expand the Collie Power Station.

This document outlines the culmination of many of these joint studies pertaining to an expansion of Collie Power Station, presented in the form of a Health Impact Statement. It should also be noted that he results of the studies also appear in the following PER documents released by the Griffin and the Collie Power Consortium:

- *Public Environmental Review. Collie Power Station Expansion: Wesfarmers Energy – J-Power Proposal.* (Strategen, January 2005)
- *Collie B Power Station. Public Environmental Review.* (Griffin Energy Pty Ltd, January 2005)

1.1.2 Summary of Investigations and Studies

This Health Impact Statement draws upon previous and existing information and investigations undertaken for the PPP and Health Impact Assessment and includes:

- *Collie Power Station Expansion. Strategic Environmental Review.* (Western Power, June 2002a)
- *Collie Health Impact Assessment. Social Profile.* (Coakes Consulting, November 2004a)
- *Collie Basin Health Impact Assessment Survey.* (Coakes Consulting, November 2004b)
- *Environmental Noise Assessment of the Combined Noise Emissions from the Proposed Expanded Collie Power Station and the Proposed Bluewaters Power Station.* (SVT Engineering Consultants, December 2004)
- *Review of Noise Measurements and Predictions.* (Langford Acoustical Services, December 2004)

- *Air Quality Modelling and Screening Air Quality Health Risk Assessment.* (Sinclair Knight Merz, January 2005a)
- *Public Environmental Review. Collie Power Station Expansion: Wesfarmers Energy – J-Power Proposal.* (Strategen, January 2005)
- *Collie B Power Station. Public Environmental Review.* (Griffin Energy Pty Ltd, January 2005)
- *Collie Health Impact Assessment Community Workshop 23 February 2005– Minutes*. (Sinclair Knight Merz, March 2005b)

1.2 Health Impact Assessment

1.2.1 Scope and Objectives

This Health Impact Statement pertains only to the proposal to develop up to 330MW of coal-fired power generating capacity (refer to **Section 2.1**) and associated infrastructure in the Collie Basin. The assessment of impacts has generally been limited to those that may affect the Shire of Collie.

Technical assessments have included the cumulative assessment of existing sources of emissions and future point source emissions. This document does not assess impacts related to future coal mining or the construction of flyash disposal ponds. Aside from the Bluewaters Power Station, potential industries in the proposed Coolangatta Industrial Estate have not been incorporated into this study.

The specific objectives of the HIS are to:

- determine the characteristics of the Collie community;
- identify the potential health and social impacts on the local community associated with the proposal;
- assess the significance and risk associated with these impacts;
- propose possible management strategies to mitigate these impacts to a level within recognised guidelines and/or that is reasonable and practicable; and
- assess the overall health impact associated with the proposal, taking into account appropriate management strategies.

1.2.2 Purposes and Principles of a Health Impact Assessment

A Health Impact Assessment (HIA) seeks to predict the health impact of a policy, program or project early in the planning stage. HIA is a systematic process to assess the actual or potential, and direct or indirect, effects on the health of individuals or groups arising from environmental conditions or changes in policy, programs or activities. The results of the HIA are then brought together, assessed and documented in a HIS. Like all impact assessment processes, the aim of a

HIA is to reduce negative impacts and enhance positive impacts, particularly in regard to human health.

The World Health Organisation (WHO) defines health as:

> *"a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity".* [1]

This definition is very broad. Whilst it helps to identify what might be encompassed by the term 'health', it is less helpful in setting boundaries around what should be considered and what may be ignored. A more specific approach is to examine the key determinants of health and consider which are susceptible to change and by what means.

A very broad range of factors influences health and there are many determinants of health including lifestyle and behaviour, environment, access to services, and social and economic surroundings. Determinants also include fixed attributes such as genetic make-up, gender and age. Anything that alters a determinant of health may, as a consequence, have an impact on health. Sensitivity of individuals to these impacts is likely to be affected by age, sex, nutritional and pregnancy status, or a combination of these factors.

HIA focuses mainly on the environment (natural and built) in attempting to improve and maintain health. Nevertheless, HIA also needs to address other issues, including economic and social factors which may be readily impacted upon by developmental change.

Impacts can frequently and perhaps automatically be thought of as being negative. However, in HIA, a more balanced approach is practised where it is important that the likely positive health impacts of developments, such as from increased employment or revenue, are properly recognised and captured, as well as the negative impacts.

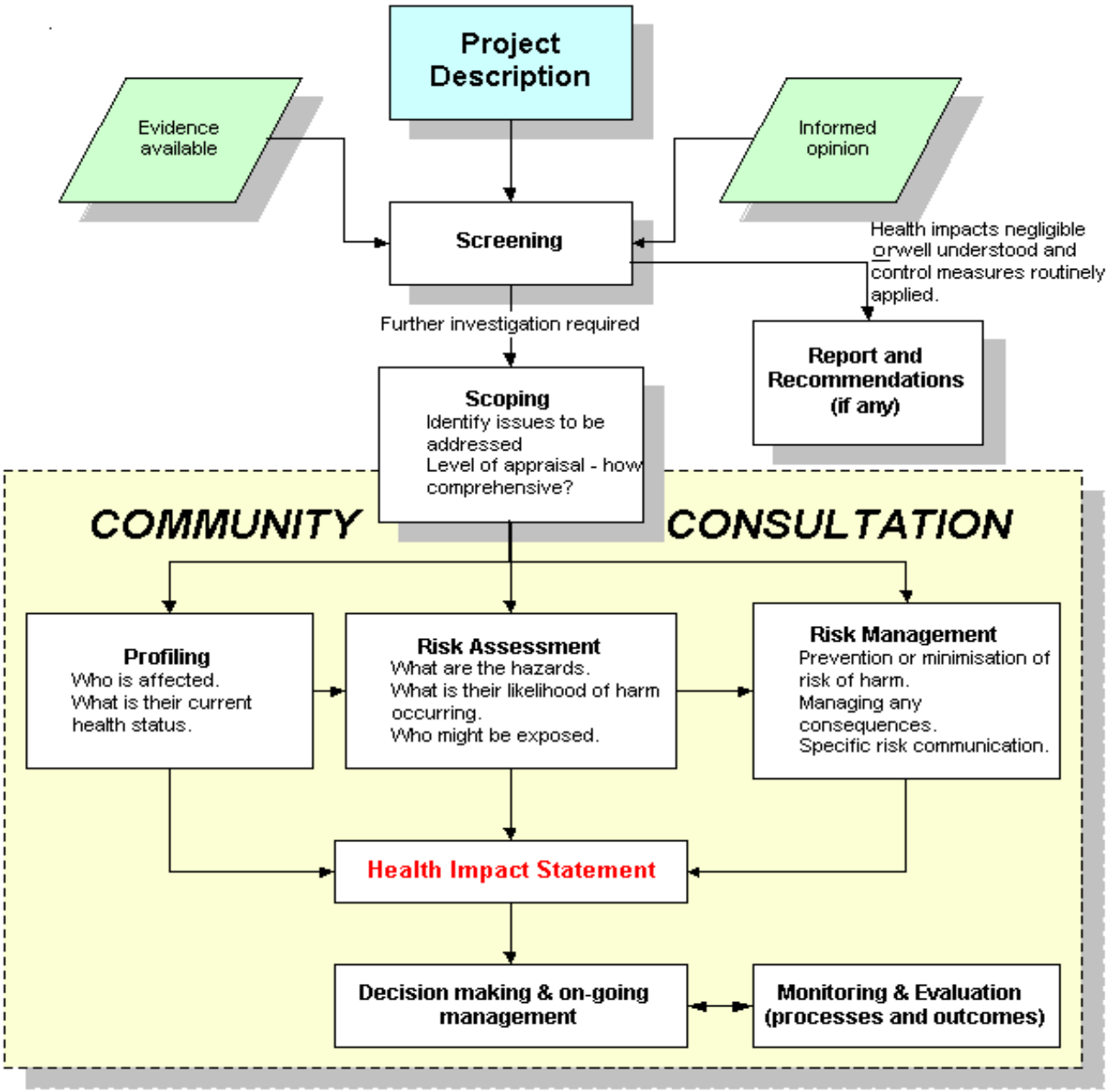
The principles of HIA have been established by the WHO (World Health Organisation, 1987) and are adapted in an Australian context in enHealth (2001a).

1.2.3 HIA Methodology and Process

The methodology for the HIA undertaken for this proposal followed the enHealth Council's HIA guidelines (2001a). The enHealth Council is a subcommittee of the National Public Health Partnership and consists of Federal and State/Territory environmental health officials,

[1] Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.

representatives from the Australian Institute of Environmental Health, the environment and public health sectors and the indigenous and wider community. The HIA process is depicted as a flowchart in **Figure 1**.



- **Figure 1 Flow Chart of the Health Impact Assessment Process (Based on enHealth, 2001a).**

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2. Project Description- an Overview

2.1 Project Overview

The existing Collie Power Station is located approximately 10km east north east of Collie (see **Figure 2**), Western Australia. The construction of a 600MW power station at Collie was approved in 1990. The existing power generating facility was commissioned in 1999 and comprises a 330MW power generating unit, on-site coal facilities, wastewater management and disposal system, cooling water system, ash disposal facilities, substation, water treatment plant and workshops/offices.

The expansion of the Collie Power Station would result in the addition of a new power generating unit, comprising a boiler and turbo-generator of approximately 300MW capacity, and some additional supporting infrastructure. **Plate 1** shows an aerial view of the existing power station.

- **Plate 1 Aerial View of the Existing Collie Power Station.**

Key project characteristics proposed by the two bidders for the Collie Power Station expansion is summarised in **Table 1**, **(**characteristic taken from the Public Environmental Review documents released by Griffin Energy and Collie Power Consortium).

Table 1 Key Project Characteristics

Element	Description	
	Griffin Energy	**Collie Power Consortium**
General		
Project Life	30 years	30 years
Construction Period	30 months to commercial operation	Commences mid 2006 to December 2008
Power Generating Capacity	Up to 360 MW nominal	330 MW Gross Output, 304 MW Sent Out Capacity
Plant Thermal Efficiency	HHV 38% - LHV 41.7% (super-critical)	Design expected 38% HHV at full load
Facility Footprint	200m x 100m; 1.7ha	30,000m^2; 3ha
Plant Facilities		
Stack	one (shared with Collie A); 170m	Existing 170m stack
Cooling tower	one set	one set
Boiler	Balanced draft pulverised coal steam generator matched to steam turbine capacity	Supercritical pulverised coal fired steam generator
Utilities		
Water Supply	Dependant on water quality; 3.6 to 7.4 GL/yr	Estimated normal usage up to 5.1 GL/yr
Coal Supply	Nominal 1.4 million tpa (dependent on coal quality)	Estimated normal usage 1.1 million tpa of standard Collie coal
Emissions (estimated)		
Particulate	340 tpa	400 - 600 tpa
Nitrogen Oxides	4,570 tpa	5,200 tpa
Sulphur Oxides	11,200 tpa	15,300 tpa
Carbon Monoxide	3,500 tpa	3,500 tpa
Greenhouse Gases	2 million tpa CO_2 e	1.9 million tpa CO_2 e
Dioxin/ Furan	Less than 0.5 grams per annum	0.9 grams per annum
Waste		
Ash	Approx. 270,000 tpa to be returned to adjacent mines	Up to 112,000 tpa in existing licensed on-site disposal
Saline Water	Estimated discharge volume of 20L/s; maximum design rate 36 L/s (dependent on water quality supply).	Estimated normal operations up to 1.46 GL/yr
Workforce		
Construction	Approx. 400 personnel at peak	Approx. 600 at peak
Operation	Up to 25 full time operations and maintenance personnel	Up to 50 full time personnel

Source: Strategen, 2005 and Griffin Energy, 2005a.

Abbreviations: tpa – tonnes per annum; MW – Megawatt; CO_2 e – carbon dioxide equivalents; GL/yr – gigalitres per year; m – metre; ha – hectares; HHV – High Heating Value; LHV – Low Heating Value.

2.2 Project Setting

2.2.1 Locality Details

The Collie townsite is situated in the south west agricultural region, 200km south east of Perth in Western Australia and 52km inland from Bunbury (**Figure 2**). The Shire of Collie consists of 170,000ha, of which 79% is designated as State Forest.

The Collie Power Station site is appropriate for additional coal-fired power generating capacity for the following reasons:

- Collie coal has one of the highest specific energy contents of the Western Australian reserves;
- the Collie Basin has sufficient proven coal reserves to meet anticipated requirements; and
- the Collie Power Station site has already been developed with much of the required infrastructure already installed to accommodate an increase in capacity in the order of 300MW.

Access to the site would be through existing roads.

2.2.2 Land Tenure and Zoning

The Collie Power Station site is owned by Western Power and is currently zoned for industrial use. Western Power purchased the Coolangatta Farm, which comprised approximately 1900ha of land used predominantly for grazing.

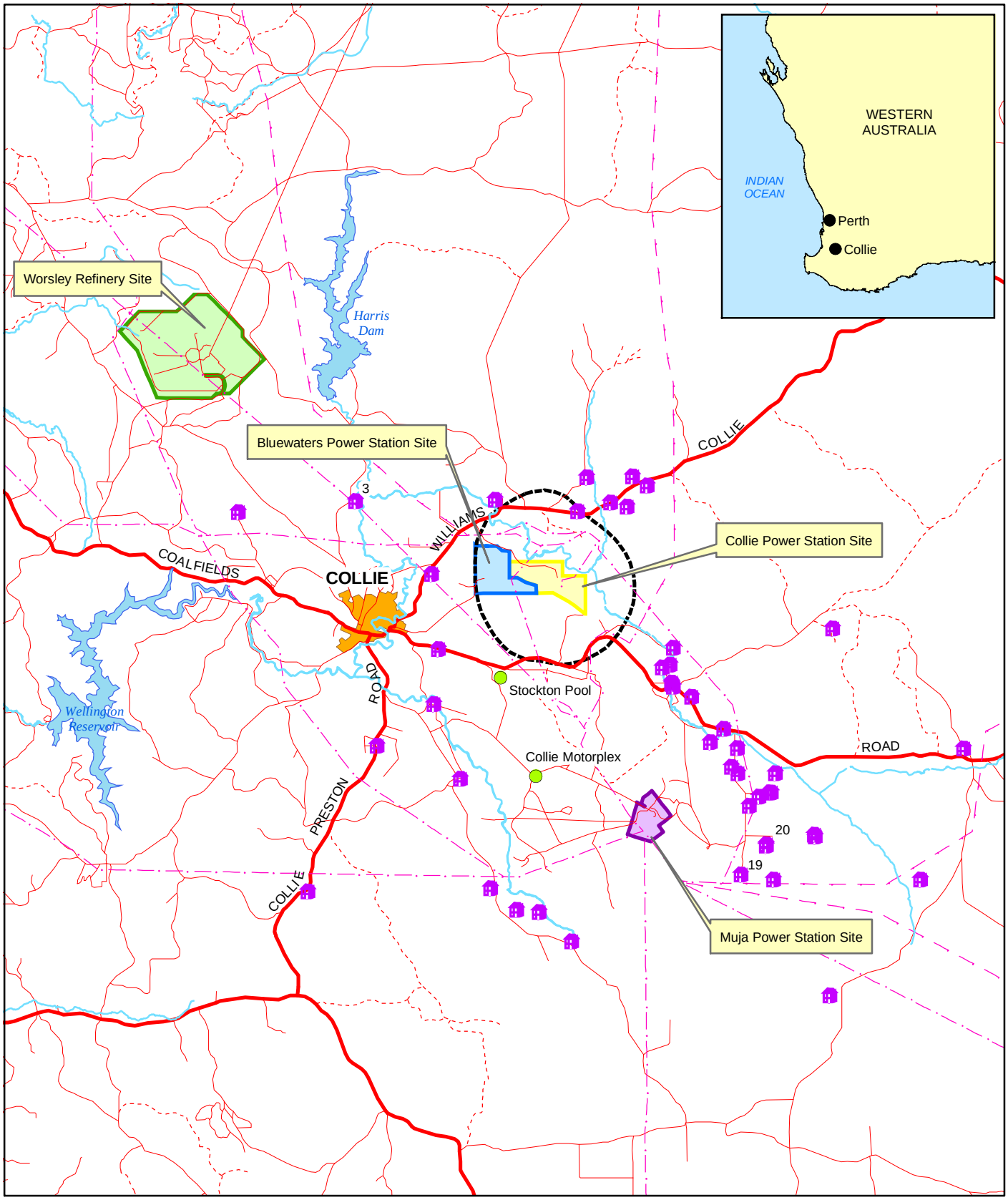
The existing Collie Power Station site is approximately 500ha in size and is situated on land previously used for grazing, hence minimal native vegetation was removed in the construction of the plant. Approximately 60ha of remnant jarrah and marri forest lies on the southern part of the site and approximately 13ha of seasonally inundated wetlands lie to the east and west of the plant equipment.

The Collie Power Station is surrounded by a buffer as described in the Shire of Collie Town Planning Scheme No.4. This buffer is zoned as a Special Control Area where the only land uses permitted are rural and industrial uses. No habitable buildings associated with such rural or industrial uses are permitted unless approved by the DoE. A field visit by Sinclair Knight Merz (17 November 2004) indicated that one residence exists in this buffer area (**Figure 2**). This residence is located approximately 2.7km to the north east of the power station boundary, lying 150m within the buffer zone. Approximately four other residences associated with rural activities are scattered within 2km of the power station buffer. The centre of the Collie townsite lies approximately 10km to the west south west of the power station boundary.

The remaining 1400ha of Western Power owned land forms part of the buffer surrounding the power station. Western Power has planted approximately 800ha of bluegum plantation, most of which is within the buffer area, with some located on the power station site.

Forestry, grazing, agriculture and mining dominate the land-use in the vicinity of the Collie Power Station site. There are four main categories of land use:

- State Forest administered by the Department of Conservation and Land Management;
- privately owned rural land;
- townsites and urban areas; and
- other reserves.



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Legend

- Location of Receptors
- House
- Powerline
- Major Road
- Minor Road
- Track
- Rivers
- Built-up Area
- Collie Buffer Zone
- Bluewaters Power Station Site
- Worsley Refinery Site
- Muja Power Station Site
- Collie Power Station Site

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COLLIE POWER STATION EXPANSION

Collie Power Station Location Map

Figure 2

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3. Scoping

3.1 Background

The scoping phase of the HIA involves identifying the particular issues that should be addressed in the assessment process. As such, the scoping process sets the framework for the assessment. Specifically, scoping includes:

- setting temporal, spatial and demographic boundaries;
- identifying the potential health issues of the proposal;
- selecting which of these potential issues require further detailed assessment;
- identification of key stakeholders; and
- reaching agreement on details of the risk assessment process between the proponent(s), Department of Health (DoH), and other key stakeholders (eg. the Department of Environment (DoE) and EPA).

The scoping process undertaken for the HIA of the proposed expansion of the Collie Power Station is outlined in the following sections.

3.2 General Approach

The need to perform a Health Risk Assessment (HRA) was documented in *the Collie Power Station Expansion – Environmental Scoping Document* (Western Power Corporation, 2004):

> *"With respect to air emissions, a Health Risk Assessment will be performed for those emissions deemed to be significant. Expert advice will be obtained on:*
>
> - *the scope of the health risk assessment; and*
> - *the certainty the assessment will provide."*

Further discussions with the EPA and DoE indicated that the scope of work should be determined through discussion with the DoH. The EPA further requested that a review panel be developed to assess the validity of the approach and findings of the HRA.

The DoH provided guidance throughout the process. The DoH requested a HIA be performed in line with the *Health Impact Assessment Guidelines* produced by the enHealth Council (2001a).

The DoH specified the inclusion of the following elements in the assessment:

- identifying the locations of communities and individuals that may be impacted upon;
- undertaking a social profile of the community and their views of current amenity, health impacts and future developments;

- performing a broad perspective impact assessment with respect to social and economic impacts issue (eg. noise and employment);
- performing a screening HRA for air quality, incorporating all inputs to the regional airshed (with reference to *Environmental Health Risk Assessment – Guidelines for assessing human health risks from environmental hazards* (enHealth, 2001b); and
- implementing a process for exchanging information with the interested local community.

Additional key requirements of the DoH included:

- baseline monitoring data be reviewed and incorporated into the studies;
- a health risk professional be included in the study team; and
- the community of interest be restricted to the local community that would be directly affected by the power station development.

3.3 Setting the Boundaries

A key task associated with the scoping phase of a HIA involves delineating temporal, spatial and demographic boundaries associated with the assessment. These boundaries are influenced by the health impact being assessed. For instance, air emissions involve a broader geographic area of impact than would noise emissions. Similarly, the impact of vegetation clearing would be considered long-term, whereas impacts on water quality may extend throughout the entire basin, but recover to pre-impact conditions in the short-term.

For the proposed additional coal-fired power generating capacity in the Collie Basin, the Shire of Collie (rather than only the Collie township) was selected as the geographical boundary. However, certain impacts result in a varying area of impact and the appropriate boundary is apparent within the discussion for each type of impact.

The typical project life of a coal-fired power station is 25-30 years. Consequently, this was selected as the temporal boundary associated with the project. However, future development proposals may be implemented which could have an influence on the modelling, predictions and assessment of health impact outlined in this document.

Demographic boundaries refer to “populations of special concern” as stated in enHealth (2001a). These include sectors of the community that would be at higher risk than the general population, including pregnant women, the elderly and children. A social profile of the Collie community has been established as part of the HIA and is described in **Section 4**.

3.3.1 Regional activities and development

Current and proposed industrial, mining and domestic activities were considered to determine, where possible, the cumulative impacts of these developments in addition to the proposed power

stationexpansion.. In performing cumulative assessments, existing operations were included where their impact could be estimated. Where relevant, assessments of impacts for the following activities were incorporated:

- Collie Power Station (Collie A)
- Muja Power Station
- Worsley Refinery
- Mining activities
- Ambient dust sources such as domestic wood heaters

This assessment considered the following future changes where relevant to the factor being assessed:

- Worsley Refinery and Upgrades
- Bluewaters Power Station
- Closure of Muja Power Station units A & B

The proposed development of Coolangatta Estate was not assessed here as, aside from the Bluewaters Power Station proposal, there are no firm proposals to assess. Similarly, while existing mining operations were considered in the air quality assessment, assessment of the Ewington II mine expansion was not performed through the air quality modelling, as information was not available to allow a valuable assessment.

The assessment of Bluewaters Power Station included in this report and relevant attachments was based on the site and emissions detailed in the *Bluewaters Power Station Public Environmental Review* (Griffin Energy Pty Ltd, 2004). The Bluewaters Power Station location and noise emissions being proposed have since been modified with the revised location depicted in *Bluewaters Power Station Phase II. Public Environmental Review* (Griffin Energy Pty Ltd, 2005b). **Figure 3** shows the change in location. The representation of Bluewaters Power Station in this assessment is therefore out of date. The significance of this change on the assessment results for noise and air quality are discussed in the relevant section.

3.4 Collie Community Profile

In 2004, two studies were commissioned to identify the key characteristics and social profile of the Collie community. The Social Profile (Coakes Consulting, 2004a) and results from the Collie Community Survey (Coakes Consulting, 2004b) are summarised in **Section 4** of this Health Impact Statement, with technical document attached in **Appendices A** and **B**.

3.5 Key Stakeholders

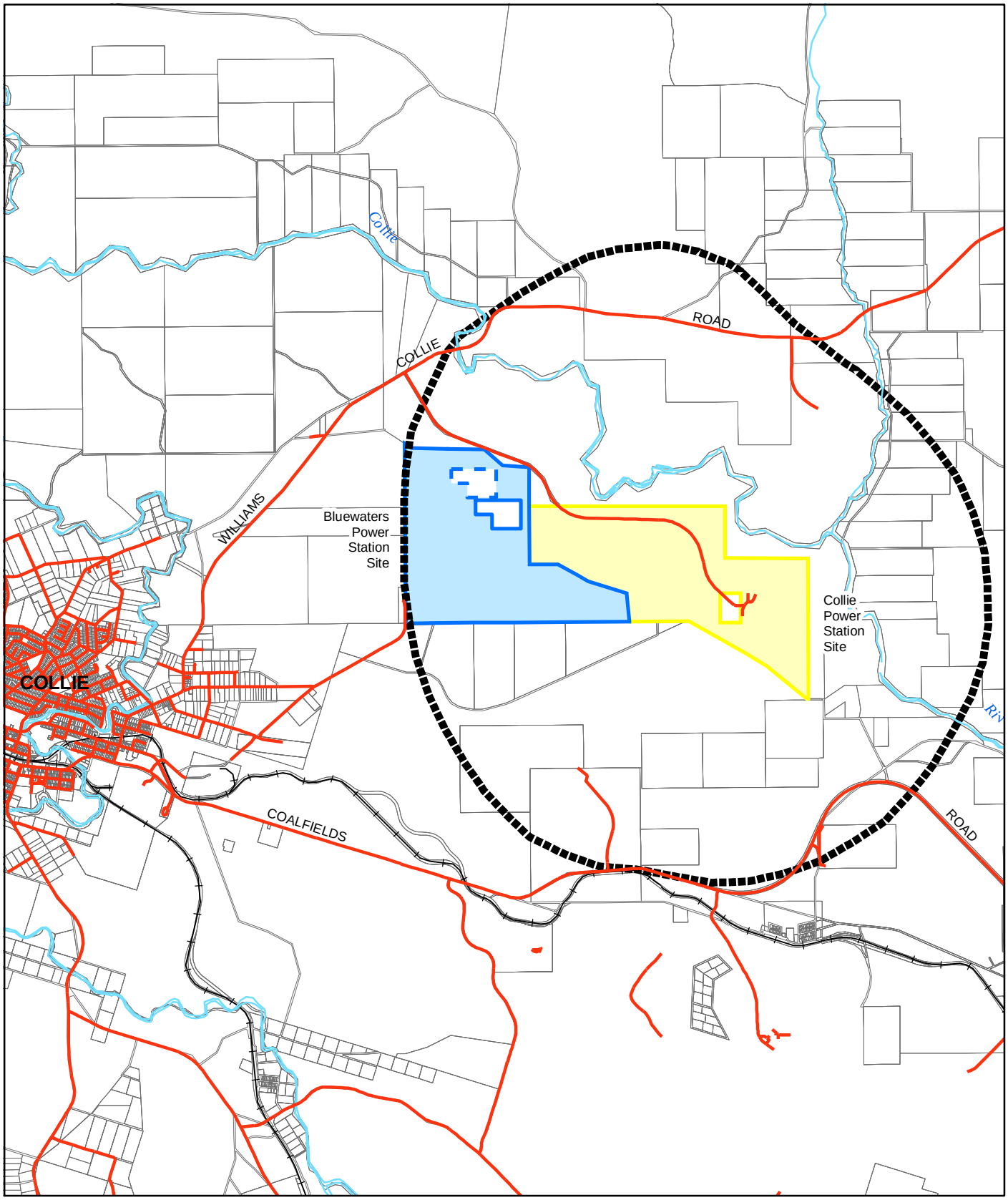
Communication with key stakeholders and the wider community is a critical element of successful impact assessments and aids in the decision making process. A consultation process was conducted during the development of the SER in 2002. Additional consultation was initiated by Collie Power Consortium and Griffin Energy during the development of their PER's, and will continue through the Public Review period (and beyond if one of the bids is successful).

The following list of stakeholders was determined for the purpose of this HIA:

- Government departments
- Industry Groups
- Related Industry
- Nearby Industry
- Aged Care
- Senior Citizens
- Adult Day Care
- Schools
- Youth
- Medical Practices
- Hospital
- Community Groups
- Local Community
- Near Neighbours

3.6 Health Impacts Associated with the Proposal

Potential health impacts were first assessed in detail during development of SER (Western Power Corporation, 2002a) and through literature review. The DoH indicated that a screening air quality HRA was required as a critical component of the health assessment. This has been performed to provide a quantitative assessment of the incremental additional risk to public health caused by the proposed additional sources of air emissions in the Collie airshed. The DoH indicated that the HIA should include a qualitative assessment of the broad environmental health impacts, and social and economic impacts that the proposal is likely to have on the community, as outlined in **Section 3.2** above.



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Map Grid: MGA94 Zone 50

Legend

- Sealed Road
- Bluewaters Power Station Site (Old)
- Bluewaters Power Station Site (New)
- Collie Main Power Station
- Rivers
- Rail
- Collie Buffer Zone
- Bluewaters Power Station Site
- Collie Power Station Site
- Cadastre

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COLLIE POWER STATION EXPANSION

Change in Location of Bluewaters Power Station

Figure 3

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Numerous key factors can influence a person's health such as social and economic factors, certain lifestyle and behaviour factors, availability of services and environmental factors. Key factors determined relevant to this assessment have been highlighted in **Table 2**. In addition to these factors, visual impacts have also been reviewed.

- **Table 2 Key Factors Determining Health**

Fixed	Social and Economic	Lifestyle & Behaviours	Access to services	Environment
Genes	Poverty	Diet	Education	Air quality
Sex	Employment	Physical activity	Health services	Noise
Ageing	Social exclusion	Smoking	Social services	Housing
	Community structure and infrastructure	Alcohol	Transport	Water quality
		Sexual behaviour	Leisure	Social environment
		Drugs		Risk injury
		Coping Skills		Sun exposure
				Disease vectors eg. mosquitoes

Source: enHealth, September 2001.

3.6.1 Environmental Health Impacts

enHealth (2001) define environmental health as:

> *" a subset of public health which focuses on environmental conditions and hazards which affect, or have the potential to affect, human health, either directly or indirectly. It includes the protection of good health, the promotion of aesthetic, social and economic values and amenity, and the prevention of illness and injury by promoting positive environmental factors and reducing potential hazards – physical, biological, chemical and radiological."*

Environmental health factors that have been identified for the proposed expansion of the Collie Power Station include:

- air quality;
- noise;
- solid qaste;
- fly ash;
- liquid waste;
- hydrocarbons and hazardous materials; and
- water supply and quality.

Of the above list, it was determined that specific quantitative assessments were required for atmospheric emissions and noise emissions. **Section 5** provides a detailed description of the environmental health factors relevant to the proposed expansion of the Collie Power Station, including management strategies to minimise or avoid impacts.

3.6.2 Social and Economic Impacts

Social and economic impact assessment is important to HIA in that the health and social and economic impacts are inextricably linked (enHealth, 2001a). While these overlap substantially, health impact and social/economic impacts require different analysis and must be assessed separately. It is important to note that only economic impacts that also have ramifications for the state of health of the region should be considered. The strict economic assessment of a proposal is not part of the HIA process.

Social and economic impacts identified that could affect individual and community health and wellbeing, and that have been determined relevant to the expansion of the Collie Power Station include:

- employment changes;
- social exclusion;
- changes to community structure (including population size) or infrastructure;
- changes to government revenues;
- promotion of synergies and prospects with other industry;
- lifestyle and behavioural changes (alcohol, smoking, diet, physical activity, sexual behaviour, drugs);
- changes to the mental and emotional wellbeing of the community (stress, anxiety, nuisance, discomfort);
- altered opportunities for recreation or socialisation; and
- access to services.

Section 6 provides a detailed description of the social and economic health factors relevant to the proposed expansion of the Collie Power Station.

3.7 Risk Assessment Process

The scopes of work and risk assessment process for this assessment were developed in line with the *'Environmental Health Risk Assessment – Guidelines for assessing human health risks from environmental hazards'* (enHealth, 2001b) and *'Health Impact Assessment Guidelines'* (enHealth, 2001a).

These documents indicate that the risk assessment process should identify the negative health effects, resulting from exposure to a hazard, and positive health effects such as improved recreational or employment opportunities. This 'double-sided' assessment is frequently overlooked by the typical assessment and therefore does not fully consider human health, and is one reason to include a broader view of health in the impact assessment process.

Assessment of risk may be against health-based guidelines, quantitative assessment, or by using qualitative techniques, or a mix of these approaches. The risk assessment process for each potential health impact can vary substantially and, as such, the individual processes are outlined in each relevant section.

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4. Collie Community Profile and Attitude Survey

In 2004, two studies were commissioned to identify the key characteristics and social profile of the Collie community. The information in this section draws heavily on the content of the Social Profile (Coakes Consulting, 2004a) and results from the Collie Community Survey (Coakes Consulting, 2004b).

4.1 Social Profile

Social profiling is the first step of the health impact appraisal and influences the risk assessment and resulting risk management and communication strategies (enHealth, 2001a). Coakes Consulting was commissioned to develop a community profile for the town of Collie. A summary of the community profile is provided in the following Sections and the full technical report is provided in **Appendix D**.

4.1.1 Demographic Data

Collie's social demographics were established from census data collected in 1991,1996 and 2001. The latest census indicates that in 2001 the population within the Shire of Collie was 8,400 persons with approximately 83% residing within the urban centre of Collie. There has been an overall gradual decrease (approximately 7.3% decline) of the population in the Shire since 1991. The population is ageing as shown by an increase in the number of elderly and a decline in the number of young people.

In 2001, the age dependency ratio for the Shire and the urban centre of Collie was lower than the Western Australian (WA) state average, suggesting relatively fewer young and elderly people dependent upon the working population.

The largest proportion of the population is aged between 25 and 39 (young/middle families) (20% in 2001) and is consistent with the State average of 22.2%. The number of people in families with children has declined by 13%, while the number of people in families without children and single parent families has increased by 7% and 6 %, respectively.

The population in the Shire of Collie is predominantly Australian born (82%) which is higher than the State average of 67%.

The number of private dwellings in Collie has been increasing whilst the population has declined. This has led to the fall in household occupancy rate. A large proportion of these dwellings are fully owned (44%). Rental households have fallen significantly over a 10 year period from 1991 (27%) to 2001 (20%).

4.1.2 Health Data

Information derived from the Department of Health is based on geocoded hospital admissions for community members living in the Collie Shire. Rates of hospitalisation for respiratory diseases were compared to other similar rural areas and the state as a whole.

For Collie residents, 2003/04 hospitalisation rates for asthma and acute upper respiratory tract diseases were similar to those expected based on the State average, and were also similar to those observed for residents in similar rural areas of Donnybrook, Manjimup and Bridgetown.

Additional information from the Department of Health indicates the following:

- Death rates are typical to rural areas with cancer mortality between 1999 to 2003 being consistent with the State average. Death from injury and poisoning is higher in males and lower in females in comparison to the State average. Heart disease in males is higher than in females.
- Respiratory diseases results in approximately three deaths per year for males, which is considered within the normal range. There is less than one death per year on average for females which is approximately 50% less than the State average.

4.1.3 Employment and Education

In 2001, the unemployment rate for the Shire of Collie was 11.1% and for the urban centre of Collie was 11.5%. This has reduced to 10.2% in the June 2003 quarter (Strategen, 2005). These rates are significantly higher than the State average of 7.5%. There has been a decline in the number of persons employed full-time between 1991 (70%) and 2001 (59%), falling below the State average of 63%. Approximately 18% of employed persons are involved in the mining industry. Approximately 6% of employed persons are involved in the electricity, gas and water supply industries.

The Shire of Collie offers primary, secondary and tertiary education facilities including five primary schools, a single High School and a regional TAFE Centre.

4.1.4 Special Populations and Sensitive Receptors

Nearby sensitive receptors to the project area were determined by SKM (January, 2005) in accordance to the following criteria:

- locations where people meet, or gather including recreation areas;
- residences; and
- schools and hospitals.

The specific locations of the receptors were identified from aerial photography and discussions with representatives of the Collie Shire and confirmed by site inspections. The total number of potential sensitive receptors is listed in **Table 3**.

Table 3 Potential Sensitive Receptors

Type	Description
Residences	46 at various locations outside of Collie Township
Schools	Wilson Park Primary School
	Collie High School
	Amaroo Primary School
	Koolbardi Glenlee Pre-Primary School
	Pre-Primary School
	Fairview Primary School
Active Recreation	Football Club/Oval
	Speedway
	Collie Motorplex
	Barbara Smith Playground
Passive Recreation	Roche Park
	Stockton Pool
	Harris River Dam
	Glen Mervyn dam
	The Quarry Kiosk (Wellington Dam)
	Potter George (Wellington Dam)
Townships	Collie
	Shotts
	Cardiff
	Allanson
Medical	Collie District Hospital

4.2 Community Survey

A Health Impact Assessment Survey was undertaken by Coakes Consulting in November 2004. The study was a telephone survey of 350 households in the Collie Shire with the objective of examining community attitudes and beliefs in relation to the establishment of a new coal-fired power station in the Collie area. A summary of the conclusions is described below. The technical report is provided in **Appendix B.**

The survey included questions that identified:

- community awareness and knowledge of the proposal to establish a coal fired power station;

- Attitudes and beliefs about current air quality and the impacts of existing power stations on family, community and environment;
- Attitudes and beliefs about the impacts of any new coal fired power station on air quality and impacts to family, community and environment; and
- The social and demographic characteristics of respondents.

An analysis of the social and demographic characteristics of respondents indicated relatively strong attachment to community and place, with 50% of respondents living at their current address for over 30 years and 40% living most of their life in the Collie Shire. There were also strong work associations with the coal and power industries in the area, with 72% of respondents and family members of respondents having worked or currently working in the coal and power industry.

4.2.1 Awareness and Knowledge of the Proposals

Awareness of proposals to establish a coal fired power station in the Collie area was high, with 93% of respondents aware of the proposal. However, while awareness of the proposal was high, only 10% of all survey respondents indicated they had any specific knowledge of the proposal. Amongst those who indicated they had some knowledge of the proposal, the most common knowledge reported was in relation to the generating capacity of the proposed power station (300MW), that multiple companies were involved in the proposals and the geographic location of the proposed power station.

4.2.2 Beliefs about Air Quality

Eighty-one percent (81%) of respondents indicated that they did not experience the effects of air pollutants at their current address, with only 7% of respondents indicating the current health risk of air pollutants to be high or moderate. The most frequent type of air pollutants identified were dust, smoke and flyash. Open cut coal mines, Muja Power Station and the Worsley Alumina Refinery were believed by many respondents to be the primary source of these air pollutants.

Seventy percent of respondents believed that with the establishment of a new coal fired power station the health risks from air pollutants would remain the same. Twelve percent indicated the risks would increase and 8% indicated the health risks would decrease.

4.2.3 Impacts of Power Stations

Several questions in the survey focussed on identifying impacts associated with existing power stations in the Collie area. When respondents were asked to freely identify any impacts from existing power stations, no significant impacts were identified. In addition, when provided with a list of nine potential impacts of existing power stations in the area, the majority of respondents indicated they were ‘not concerned’ about these impacts. A number of respondents indicated they were currently ‘very concerned’ or ‘somewhat concerned’ about greenhouse gas emissions (24%),

the contamination of groundwater (19%), the contamination or rivers and wetlands (18%) and the discharge of water to the ocean (18%).

Community beliefs about future impacts associated with any new power station in the area, focussed on the regional benefits associated with a new power station, with the two most frequently reported impacts being that it would provide employment (90%) and that it would support local businesses and the local economy of the region (74%).

Over 80% of respondents could not identify any new impacts to their family, community or environment from the operation of a new coal fired power station in the Collie area. Where impacts were identified these were frequently positive impacts associated with employment opportunities and local economic growth.

4.2.4 Beliefs about Health Risks

The majority of respondents (58%) indicated there were no health risks to themselves or their family from existing power stations in the area; 35% indicate there were minor or slight health risks and 7% indicated a high or moderate health risk.

A similar pattern emerged in relation to beliefs about the future health risks of a new power station in the Collie area, with 63% indicating no health risks; 32% indicating there was a minor or slight health risk and 4% indicating a high or moderate health risk.

Beliefs about current and future health risks from power stations were found to be highest amongst the younger people in the population and amongst those families with children.

In addition, those in the community who believed they had little control over environmental health issues were also more likely to report higher current and future health risks associated with power stations in the Collie area.

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5. Environmental Health Impacts and Management

5.1 Summary of Relevant Environmental Health Factors

Environmental health factors that have been identified for the proposed expansion of the Collie Power Station include:

- air quality;
- noise;
- solid waste;
- fly ash;
- liquid waste;
- hydrocarbons and hazardous materials; and
- water supply and quality.

Each of these is addressed below in terms of management objectives, potential impacts, management strategies, monitoring and outcome. These factors have been assessed in previous investigations and are referenced here to determine the implications to public health.

5.2 Air Quality

5.2.1 Management Objectives

- *Ensure that gaseous emissions from this proposal in isolation and in combination with emissions from existing neighbouring sources and background concentrations meet acceptable criteria for ambient ground level concentrations;*
- *Ensure that all reasonable and practicable measures are take to minimise operations emissions, including airborne dust; and*
- *Ensure that dust generated during construction does not cause any environmental or human health problems or significantly impact on amenity.*

5.2.2 Background

Preliminary assessment of atmospheric emissions from the proposed expansion of the Collie Power Station was undertaken in the SER (Western Power Corporation, 2002a) and utilised emission modelling estimated by the State Energy Commission of Western Australia (1990). This assessment determined that emissions of significance would be nitrogen, sulphur dioxide and particulate matter from the main stack. Increased coal and fly ash throughput was also recognised to potentially create additional dust.

Sinclair Knight Merz (SKM) has previously conducted an air quality assessment (SKM, 2002), as required during the development of Western Power's Response to Submissions (Western Power Corporation, 2002b) associated with gaining strategic environmental approval under Section 16(e) of the *Environmental Protection Act 1986*.

The need to undertake further air quality modelling, specifically a regional air quality assessment and Health Risk Assessment, was recognised during a scoping exercise for the Collie Power Station Expansion (Western Power Corporation, 2004). The scope of work and assessment methodology was developed in consultation with the EPA, DoE and DoH. A summary of the assessment is provided in the following sections. SKM's report entitled. *Air Quality Modelling and Screening Air Quality Health Risk Assessment* (SKM, 2005a) provides the complete technical report for this assessment.

5.2.3 Ambient Air Quality Criteria

Air quality impacts can be assessed by comparing model predictions against appropriate ambient air criteria. The criteria used in this study have been adopted from the following sources:

- National Environmental Protection Council's National Environment Protection (Ambient Air Quality) Measure (1998);
- World Health Organisation (WHO, 2000) air quality guidelines;
- National Health and Medical Research Council (NHMRC);
- Texas Commission on Environmental Effects Screening Levels (TCEQ ESL);
- The Victorian Design Criteria for Class 2 and Class 3 indicators; and
- The Ontario Ministry for the Environment Ambient Air Quality Criteria.

The adopted criteria for this assessment are listed in the right-most column of **Table 4.** Where available, these are based on National Environment Protection Measure (NEPM) standards or a National Australian guideline such as the NHMRC. Where a NEPM standard or NHRMC guideline is not available, the most conservative of the criteria discussed above has been used, which essentially limits the criteria to the WHO guideline values or the Texas Commission on Environmental Effects Screening Levels (TCEQ ESL).

Table 4 Relevant Ambient Air Quality Criteria

Pollutants ($\mu g/m^3$)	Averaging Period	NEPM ($\mu g/m^3$)	NHMRC ($\mu g/m^3$)	WHO ($\mu g/m^3$)	ESL ($\mu g/m^3$)	Vic DC ($\mu g/m^3$)	Ontario AAQC ($\mu g/m^3$)	Adopted Criteria ($\mu g/m^3$)
SO_2	10-minute		700	500				700
SO_2	1-hour	570	570				690	570
SO_2	24-hour	228		125			275	228
SO_2	Annual	57	60	50			275	57
CO	8-hours	11,240	10,000	10,000			15,700	11,240
NO_2	1-hour	246	320	200			400	246
NO_2	Annual	62						62
PM_{10}	24-hour	50						50
$PM_{2.5}$	24-hour	25						25
$PM_{2.5}$	Annual	8						8
Pb	Annual	0.5	1.5 (3-month)	0.5		3 (1-hour)	2 (24-hr)	0.5
Ozone	1-hour	214	210				165	214
Ozone	4-hour	171	170					171
HCl	1-hour				75		20 (24-hour)	75
HF	1-hour				5	53 (3-min)		5
As	Annual				0.5	0.17 (3-min)	0.3 (24-hr)	0.5
B	Annual				10		120 (24-hr)	10
Be	Annual				0.002	0.007 (3-min)	0.01 (24-hr)	0.002
Cd	Annual			0.005	0.01	0.033 (3-min)	2 (24-hr)	0.005
Cr(III)	Annual				0.1		1.5 (24-hr)	0.1
Cr(VI)	Annual				0.01	0.17 (3-min)	1.5 (24-hr)	0.01
Cu	Annual				0.1	6.7 (3-min)	1.5 (24-hr)	0.1
Hg	Annual			1	1	3.3 (3-min)	2 (24-hr)	1
Ni	Annual				0.015			0.015
Zn	Annual				5		120 (24-hr)	5
Dioxins	Annual			0.3 pg/m^3		3.7pg/m^3 (3-min)		0.3pg/m^3
PAH <10% BaP PAH (as BaP)	1-hour				0.5 0.03	- 0.73 (3-min)		0.5
PAH <10% BaP PAH (as BaP)	Annual				0.05 0.003		- 0.0003	0.05

5.2.3.1 Pollutants and Potential Human Health Effects

Pollutants affecting or having the potential to affect human health are described as either "threshold" or "non-threshold" pollutants. The NEPM uses six "criteria pollutants" as indicators of air quality, and has established for each a maximum concentration above which adverse effects on human health may occur. The six criteria pollutants are:

- carbon monoxide;
- nitrogen dioxide;
- photochemical oxidants (as ozone);
- sulphur dioxide;
- lead; and
- particles as PM_{10}.

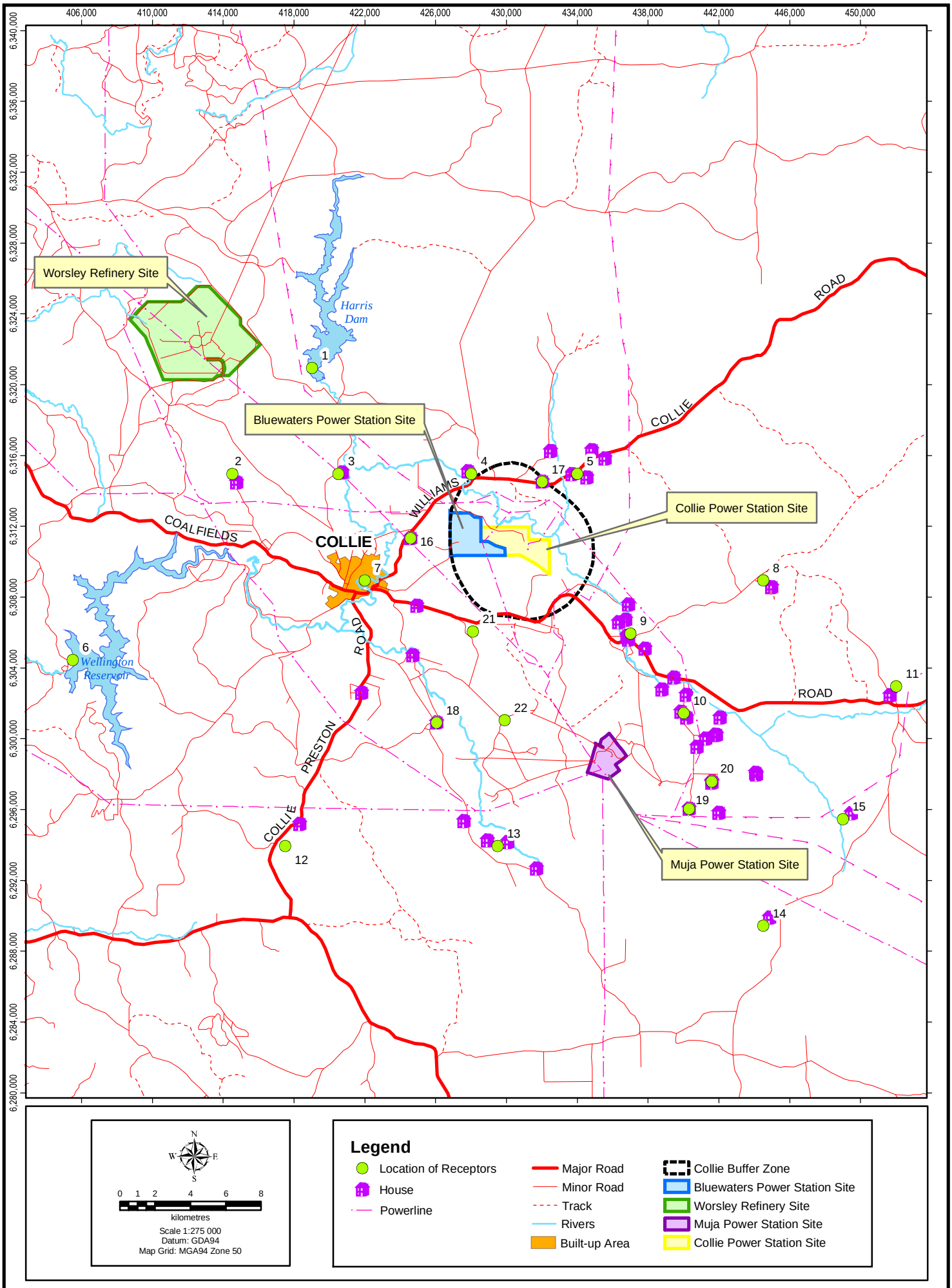
The maximum concentrations for each of the above pollutants are considered threshold concentrations and have been used to set ambient air quality standards.

Similarly, other the hazardous pollutants are commonly assessed against threshold concentrations, below which health effects are widely considered to be very unlikely. However a number of pollutants have insufficient information to determine a threshold concentration. As such no safe exposure threshold has been determined. These pollutants are regarded as "non-threshold" pollutants, and they are typically contaminants with carcinogenic potential. The health effects of non-threshold pollutants are assessed by considering the risks.

The lifetime cancer risk is calculated by multiplying the average lifetime exposure to a pollutant by an estimation of the carcinogenic potency of the pollutant. For air borne carcinogens the measurement used is generally $1\mu g/m^3$, that is, the risk of developing cancer after a life time of exposure to $1\mu g/m^3$ of a pollutant. The target acceptable risk adopted in this assessment is 1 in 1,000,000.

5.2.4 Receptor Locations

For the purpose of the air quality assessment the total number of sensitive receptors was reduced to 22 locations that were considered to have the highest concentrations and/or were generally representative of a specific area. The location of the receptors used in modelling is illustrated in **Figure 4**.



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COLLIE POWER STATION EXPANSION

Location of Sensitive Receptors

Figure 4

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Drawn by: TML

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5.2.5 Air Quality Modelling and Screening Health Risk Assessment

5.2.5.1 Overview of Methodology

The Health Risk Assessment was undertaken with specific regard to the following air pollutant species:

- particulate matter < 10 μm (PM_{10});
- particulate matter < 2.5 μm ($PM_{2.5}$);
- ozone;
- oxides of nitrogen (NO_X);
- sulphur dioxide (SO_2);
- hydrogen fluoride (HF);
- hydrogen chloride (HCl);
- carbon monoxide (CO);
- polycyclic aromatic hydrocarbons (PAHs);
- dioxins and furans (D/Fs); and
- metals including:
  - lead; zinc; mercury; cadmium; chromium; chromium III, chromium IV, arsenic; beryllium, copper, nickel, boron.

The HRA process comprises four main tasks as outlined below:

- **Step 1 Hazard Identification.** For air toxic sources, hazard identification involves determining the potential health effects that may be associated with emitted pollutants. This identifies quantitatively whether a pollutant is a potential human carcinogen or is associated with other types of adverse health effects.
- **Step 2 Exposure Assessment.** This estimates the extent of multi-pathway public exposure to each substance for which the cancer risk is to be quantified or non-cancer effects evaluated.
- **Step 3 Dose Response or Toxicity Assessment.** This is the process of characterising the relationship between the exposure to an agent and the incidence of an adverse health effect in exposed populations.
- **Step 4 Risk Characterisation.** This enables the determination of the relationship between the extent of public exposure and the health effects which may result from that exposure.

The screening air quality HRA consists predominantly of Steps 1 and 2 (as above). It is recognised that relevant health related air quality criteria take into account dose response, toxicity and risks. The approach is considered appropriate to this screening level assessment and was acknowledged as appropriate by the DoH.

To assess the cumulative impacts, emissions from industrial point sources (existing and proposed) and other areal/fugitive sources have been included. Point sources modelled and the proposed scenarios are summarised in **Table 5**.

- **Table 5 Air Quality Modelling Scenarios**

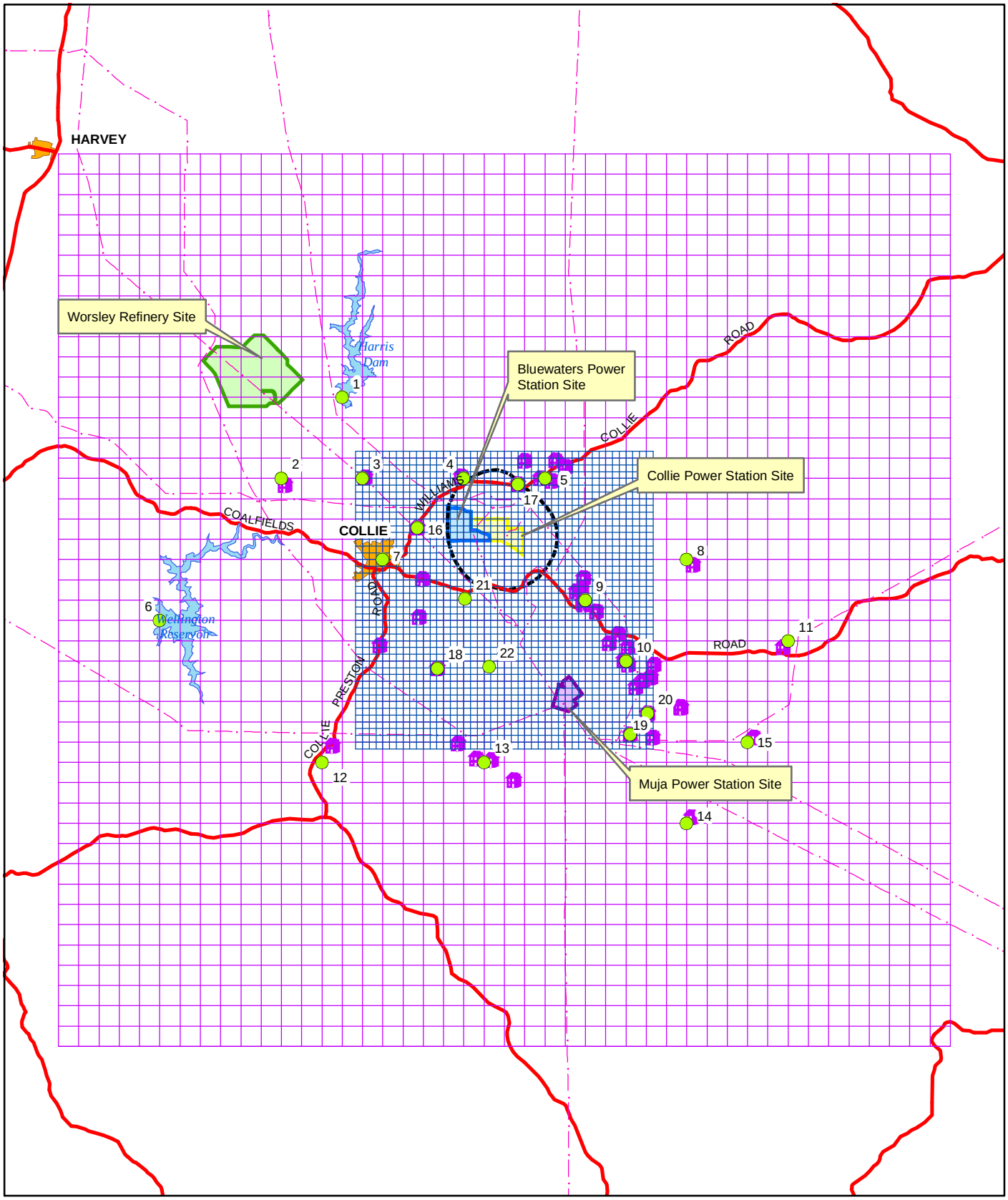
Scenario	Base	Collie B meets PPP requirements				
	1	2	3	4	5	5A
Muja A and B	X					X
Muja C and D	X		X	X	X	X
Worsley (existing)	X		X	X		
Worsley (upgraded)					X	X
Collie A	X		X	X	X	X
Collie B		X	X	X	X	X
Bluewaters 1				X	X	X

The scenarios above can be described as:

- **Scenario 1**: Existing point source emissions in the Collie Basin;
- **Scenario 2**: Proposed Collie B power station in isolation;
- **Scenario 3**: Proposed Collie B power station with existing point source emissions in the Collie Basin and the retirements of the Muja A and B units. Western Power has made a commitment to the closure of Muja A and B by April 2007.
- **Scenario 4**: As for Scenario 3, with the addition of emission from the proposed Bluewaters 1 Power Station.
- **Scenario 5**: As for Scenario 4, with the addition of the Worsley Alumina Refinery modelled as operating in accordance with the proposed upgrade. The Worsley upgrade incorporates the expansion of processing capability, emission reduction initiatives and an additional boiler.
- **Scenario 5A**: accounts for the unlikely possibility that Muja A and B are not retired prior to commissioning of Collie B. Results of this scenario are provided in **Appendix A** of *Air Quality Modelling and Screening Air Quality Health Risk Assessment* (SKM, 2005a).

Fugitive sources of dust are incorporated using dust monitoring data collected by Western Power.

TAPM (The Air Pollution Model, v2.6) and the CALPUFF (Californian Puff model, v5.714) models were utilised to predict ground level concentrations. TAPM was used at the specific request of the Air Quality Management Branch of the DoE and was used primarily to be comparable to the other assessment conducted for Bluewaters Power Station (Physick and Edwards, 2004) and to consider dispersion of gaseous pollutants. TAPM output can be either to a third or fourth grid level. The difference between the resolution of these grid levels is illustrated in **Figure 5**.



N
W E
S

0 2.5 5 10

kilometres

Scale 1:425 000
Datum: GDA94
Map Grid: MGA94 Zone 50

Legend

- Grid 3
- Grid 4
- Location of Receptors
- House
- Powerline
- Major Road
- Built-up Area
- Collie Buffer Zone
- Bluewaters Power Station Site
- Worsley Refinery Site
- Muja Power Station Site
- Collie Power Station Site

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COLLIE POWER STATION EXPANSION

TAPM Grids

Figure 5

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Drawn by: TML

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CALPUFF was used for predicting total suspended particulate as it can model a greater range of particulate size than TAPM, which is currently limited to an upper aerodynamic size of 30µm. This was considered important for Muja Power Station emissions, primarily from stages A and B, where 44% of the particulate is greater than an aerodynamic size of 30µm.

Further detail on the TAPM and CALPUFF air dispersion models is provided in *Air Quality Modelling and Screening Air Quality Health Risk Assessment* (SKM, 2005a).

5.2.5.2 Summary of Results

The predicted ground level concentrations from TAPM are generally from the 4th (0.5km) model grid. Predictions for the region outside of the 4th grid are covered by the 3rd (1.5km) grid. The exceptions to this are for ozone, where the 3rd grid was used (refer to **Figure 5**). Discrete receptor concentrations are then taken as the grid cell in which that receptor occurs. For substances which were closest to their respective criteria (SO_2, NO_2 and PM_{10}), the results from the 3rd pollution grid are also presented to enable a comparison, as the 4th grid results are considered to over predict concentrations. Predictions from CALPUFF are for discrete receptors of interest.

The predictions presented in this section are considered to be generally conservative due to:

- Use of models which are shown to be conservative, especially TAPM v2.6 for 1-hour concentrations using the finer 500m 4th grid. It is considered that more realistic maximum 1-hour concentrations will be provided by the 3rd highest concentration from this grid or the use of results from the third grid;
- Use of generally conservative emission parameters, such as for SO_2, the fraction of NO_2 in NO_X at emissions, generally high elemental concentrations in the coal; and
- Under-prediction in exit velocities at Muja Power Station as now indicated by recent data in Environ (2003).

The following tables list the results from dispersion modelling:

- **Table 6** - Predicted maximum ground level concentrations at any discrete receptor;
- **Table 7** - Results compared to ambient air quality criteria displayed as a percentage of the relevant criteria;
- **Table 8** - Maximum ground level concentrations predicted for each scenario stated above;
- **Table 9** - Maximum ground level concentration predicted for discrete receptor 7 located in Collie; and
- **Table 10** - Results at discrete receptor 7 compared to ambient air quality displayed as a percentage of the relevant criteria.

Table 6 Predicted Maximum Ground Level Concentrations at any Discrete Receptor.

Pollutant	Avg Period	Criteria ($\mu g/m^3$)	Predicted Concentrations ($\mu g/m^3$) for Each Scenario					
			1	2	3	4	5	5A
SO_2	10-minute	700	1149 (671)	321	984	984	984 (663)	1149 (671)
SO_2	1-hour	570	676 (395)	189	579	579	579 (390)	676 (395)
SO_2	24-hour	228	96 (56)	29	59	61	62 (68)	96 (80)
SO_2	Annual	57	7.5 (4.8)	1.8	4.4	8.5	8.9 (8.9)	9.5 (9.5)
CO	8-hour	11240	20	3.6	33	33	33	33
NOx	1-hour	NA	421	48	337	337	337	421
NO_2	1-hour	246	[111] 137	46	116	116	116	116
NO_2	Annual	62	2.9	0.4	2.0	2.2	2.3	3.2
PM_{10}	24-hour	50	84 (50)	0.3	1.2	1.3	1.3	84
$PM_{2.5}$	24-hour	25	25	0.1	0.55	0.55	0.55	25.5
$PM_{2.5}$	Annual	8	0.85	0.005	0.04	0.05	0.05	0.86
PM_{10} (with bckgnd)	24-hour	50	100 (66)	16.3	17.2	17.3	17.3	100
$PM_{2.5}$ (with bckgnd)	24-hour	25	36	11.1	11.55	11.55	11.55	36.5
$PM_{2.5}$ (with bckgnd)	Annual	8	11.25	10.405	10.45	10.45	10.45	11.26
Ozone	1-hour	214	118					
Ozone	4-hour	171	105					
HCl	1-hour	75	39	1.9	33	33	33	39
HF	1-hour	5	4.8	0.5	4.1	4.1	4.1	4.8
Pb	Annual	0.5	1.11E-03				4.21E-05	1.12E-03
As	Annual	0.5	3.63E-04				1.06E-05	3.63E-04
B	Annual	10	2.43E-03				2.45E-03	2.57E-03
Be	Annual	0.002	7.66E-04				6.04E-06	7.66E-04
Cd	Annual	0.005	6.59E-05				1.03E-05	8.96E-05
Cr(III)	Annual	0.1	2.93E-04				3.25E-05	2.93E-04
Cr(VI)	Annual	0.01	1.54E-05				1.71E-6	1.54E-05
Cu	Annual	0.1	3.92E-03				3.06E-05	3.92E-03
Hg	Annual	1	5.18E-05				2.59E-05	5.19E-05
Ni	Annual	0.015	3.10E-04				1.62E-04	3.11E-04
Zn	Annual	5	5.15E-04				9.02E-05	5.16E-04
Dioxins and Furans (TEQ)	Annual	0.3 pg/m^3	0.00014 pg/m^3	-	-	-	0.00010 pg/m^3	0.00014 pg/m^3
PAH <10% BaP	1-hour	0.5	4.76E-04				4.2E-04	4.76E-04
PAH<10% BaP	Annual	0.05	6.76E-06				4.99E-06	6.83E-06
VOC	24-hour	NA	0.18	4.11E-05	0.11	0.11	0.11	0.18
VOC	Annual	NA	0.0077	2.5E-06	0.0057	0.0057	0.0057	0.0077

Notes:

1) Predictions of SO_2, NO_2, CO, HF, HCl, PM_{10} and $PM_{2.5}$ from TAPM with results from use of 4th (0.5km) grid, with selected results from 3rd grid only given in brackets. Ozone from TAPM 3rd grid. All other results from CALPUFF.

2) NO_2 value in square brackets from the TAPM photochemistry run. Other values from tracer run with NO_2 estimated using the NO_X to NO_2 relationship derived from the photochemistry run.

3) Background 24-hour PM_{10} taken as $16\mu g/m^3$ except with background 24-hour and annual average $PM_{2.5}$ concentrations of 11 and 10.4 $\mu g/m^3$ respectively.

4) Metals, PAHs and dioxin and furans concentrations only provided for scenarios with highest concentrations.

5) All annual concentrations provided for receptors which are residences. Receptors which are not residential (eg. 21 and 22) have been excluded as these are not residences and people are only there for a short period of the time.

6) As ozone is a regional pollutant, the highest concentration in the area shown in the figures has been presented.

- **Table 7 Predicted Maximum Concentration at any Receptor as a Percentage of the Relevant Criteria.**

Pollutants	Averaging period	Criteria	Percentage of Relevant Ambient Criteria (%) at any Receptor for Each Scenario					
			1	2	3	4	5	5A
SO_2	10-minute	700	164 (96)	46	141	141	141 (95)	164 (96)
SO_2	1-hour	570	119 (69.3)	33	102	102	102 (68.4)	119 (69.3)
SO_2	24-hour	228	42 (24.6)	12.9	25.9	26.7	27.2 (29.8)	42 (24.6)
SO_2	Annual	57	13.1(8.4)	3.1	7.7	14.9	15.6(15.6)	16.7 (16.7)
CO	8-hour	11240	0.18	0.03	0.3	0.3	0.3	0.3
NO_2	1-hour	246	[45] 55.7	18.7	47.2	47.2	47.2	55.7
NO_2	Annual	62	4.7	0.7	3.2	3.5	3.7	5.2
PM_{10}	24-hour	50	168 (100)	0.6	2	2.6	2.6	168
$PM_{2.5}$	24-hour	25	100	0.4	2.2	2.2	2.2	102
$PM_{2.5}$	Annual	8	11	0.06	0.5	0.6	0.6	10.8
PM_{10} (with bckgnd)	24-hour	50	200 (132)	32.6	34.4	34.6	34.6	200
$PM_{2.5}$ (with bckgnd)	24-hour	25	144	44.3	46.0	46.2	46.2	146
$PM_{2.5}$ (with bckgnd)	Annual	8	141	130	131	131	131	141
Ozone	1-hour	214	65					
Ozone	4-hour	171	61					
HCl	1-hour	75	52	2.5	44	44	44	52
HF	1-hour	5	96	9.1	82	82	82	96
Pb	Annual	0.5	0.22				0.0084	0.22
As	Annual	0.5	0.073				0.0021	0.073
B	Annual	10	0.024				0.0245	0.026
Be	Annual	0.002	38.3				0.30	38.3
Cd	Annual	0.0	1.32				0.21	1.79
Cr(III)	Annual	0.1	0.29				0.033	0.29
Cr(VI)	Annual	0.01	0.15				0.017	0.15
Cu	Annual	0.1	0.039				0.0003	0.039
Hg	Annual	1	0.0052				0.0026	0.0052
Ni	Annual	0.015	2.07				1.08	2.07
Zn	Annual	5	0.01				0.0018	0.01
Dioxins and Furans (TEQ)	Annual	0.3 pg/m^3	0.047				0.033	0.047
PAH <10% BaP	1-hour	0.5	0.095				0.084	0.095
PAH<10% BaP	Annual	0.05	0.0135				0.01	0.0137

Notes:

1) Predictions of SO_2, NO_2, CO, HF, HCl, PM_{10} and $PM_{2.5}$ from TAPM with results from use of 4th (0.5km) grid, with selected results from 3rd grid only given in brackets. Ozone from TAPM 3rd grid. All other results from CALPUFF.

2) NO_2 value in square brackets from the TAPM photochemistry run. Other values from tracer run with NO_2 estimated using the NO_X to NO_2 relationship derived from the photochemistry run.

3) Background 24-hour PM_{10} taken as 16µg/m^3 except with background 24-hour and annual average $PM_{2.5}$ concentrations of 11 and 10.4 µg/m^3 respectively.
4) Metals, PAHs and dioxin and furans concentrations only provided for scenarios with highest concentrations.
5) All annual concentrations provided for receptors which are residences. Receptors which are not residential (eg. 21 and 22) have been excluded as these are not residences and people only are there for a short period of the time.
6) As ozone is a regional pollutant the highest concentration in the area shown in the figures has been presented.

- **Table 8 Summary of Maximum Predicted Ground Level Concentrations of Selected Pollutants Anywhere on the Model Grids.**

Pollutant	Predicted Maximum Concentration (µg/m^3) for Each Scenario		
	1	5	5A
SO_2 – 1-hour	1050 (620)	660 (520)	1050 (620)
SO_2 – 24-hour	230 (130)	145	
SO_2 – Annual	65	41	
NO_2 – 1-hour	125		
PM_{10} – 24-hour	210 (111)	2.5	210
$PM_{2.5}$ – 24 hour	64	1.25	64
Ozone - 1 hour	118		
Ozone - 4 hour	105		
HCl 1-hour	57	42	-
HF 1-hour	7	5	-

Notes:

1) All results from use of inner 4th grid and 3rd grid results with selected results from 3rd grid only given in brackets.

- **Table 9 Predicted Maximum Ground Level Concentrations at Collie.**

Pollutant	Avg Period	Criteria (µg/m^3)	Maximum Predicted Concentrations (µg/m^3) at Collie for Each Scenario					
			1	2	3	4	5	5A
SO_2	10-minute	700	464 (335)	231	587	590	592 (340)	593
SO_2	1-hour	570	273 (197)	136	345	347	348 (200)	349
SO_2	24-hour	228	44 (40)	21	36	37	38 (36)	44
SO_2	Annual	57	3.5	0.64	3.2	3.5	3.9	4.8
CO	8-hour	11240	11.1	1.3	19.8	20.3	20.4	20.4
NOx	1-hour	NA	183	35	112	112	112	183
NO_2	1-hour	246	78.6	35	61.4	61.4	61.4	78.6
NO_2	Annual	62	2.0	0.16	1.38	1.5	1.68	2.5
PM_{10}	24-hour	50	29.5 (30)	0.23	0.71	0.76	0.76	29.5
$PM_{2.5}$	24-hour	25	8.9	0.06	0.36	0.37	0.37	8.9
$PM_{2.5}$	Annual	8	0.65	0.002	0.038	0.040	0.041	0.66
PM_{10} (with bckgnd)	24-hour	50	49.2 (49.7)	19.93	20.41	20.46	20.66	49.2
$PM_{2.5}$ (with bckgnd)	24-hour	25	19.9	11.06	11.36	11.37	11.37	19.9
$PM_{2.5}$ (with bckgnd)	Annual	8	11.05	10.42	10.44	10.44	10.44	11.06
Ozone	1-hour	214	106					
Ozone	4-hour	171	101					

Pollutant	Avg Period	Criteria ($\mu g/m^3$)	Maximum Predicted Concentrations ($\mu g/m^3$) at Collie for Each Scenario					
			1	2	3	4	5	5A
HCl	1-hour	75	15.6	1.3	11	11	11	15.6
HF	1-hour	5	1.95	0.34	1.37	1.37	1.37	1.95
Pb	Annual	0.5	3.65E-04				1.91E-05	3.68E-04
As	Annual	0.5	1.19E-04				4.86E-06	1.19E-04
B	Annual	10	1.04E-03				8.53E-04	1.10E-03
Be	Annual	0.002	2.49E-04				2.75E-06	2.5E-04
Cd	Annual	0.005	2.21E-05				4.38E-06	3.0E-05
Cr(III)	Annual	0.1	9.72E-05				1.46E-05	9.90E-05
Cr(VI)	Annual	0.01	5.12E-06				7.69E-07	5.21E-06
Cu	Annual	0.1	1.28E-03				1.39E-05	1.28E-03
Hg	Annual	1	1.81E-05				1.04E-05	1.89E-05
Ni	Annual	0.015	1.27E-04				5.13E-05	1.3E-04
Zn	Annual	5	1.74E-04				4.07E-05	1.79E-04
Dioxins and Furans (TEQ)	Annual	0.3 pg/m^3	5.2E-05 pg/m^3				4.5E-05 pg/m^3	5.7E-05 pg/m^3
PAH <10% BaP	1-hour	0.5	1.68E-04				1.33E-04	1.68E-04
PAH<10% BaP	Annual	0.05	2.56E-06				2.26E-06	2.81E-06

Notes:

1) Predictions of SO_2, NO_2, CO, HF, HCl, PM_{10} and $PM_{2.5}$ from TAPM with results from use of 4th (0.5km) grid, with selected results from 3rd grid only given in brackets. Ozone from TAPM 3rd grid. All other results from CALPUFF.
2) NO_2 value in square brackets from the TAPM photochemistry run. Other values from tracer run with NO_2 estimated using the NO_X to NO_2 relationship derived from the photochemistry run.
3) Background 24-hour PM_{10} taken as 19.7$\mu g/m^3$ for Collie, with background 24-hour and annual average $PM_{2.5}$ concentrations of 11 and 10.4 $\mu g/m^3$ respectively.
4) Metals, PAHs and dioxin and furans concentrations only provided for scenarios with highest concentrations.
5) All annual concentrations provided for receptors which are residences. Receptors which are not residential (eg. 21 and 22) have been excluded as thse are not residences and people only are there for a short period of the time.

- **Table 10 Predicted Maximum Concentration at Collie as a Percentage of the Relevant Criteria.**

Pollutants	Averaging period	Criteria	Maximum Percentage of Relevant Ambient Criteria (%) at Collie for Each Scenario					
			1	2	3	4	5	5A
SO_2	10-minute	700	66 (47.8)	33	83.9	84.3	84.6 (48.6)	84.8
SO_2	1-hour	570	48 (35)	24	60.5	60.9	61.1 (35.1)	61.2
SO_2	24-hour	228	19.3 (17.5)	9.2	15.8	16.2	16.7 (15.8)	19.3
SO_2	Annual	57	6.1	1.1	5.6	6.1	6.8	8.4
CO	8-hour	11240	0.10	0.012	0.18	0.18	0.18	0.18
NO_2	1-hour	246	32.0	14.2	25.0	25.0	25.0	32.0
NO_2	Annual	62	3.2	0.26	2.2	2.4	1.6	4.0
PM_{10}	24-hour	50	59 (60)	0.46	1.4	1.5	1.5	59
$PM_{2.5}$	24-hour	25	36	0.24	1.4	1.5	1.5	36
$PM_{2.5}$	Annual	8						

PM_{10} (with bckgnd)	24-hour	50	98.4 (99.4)	40.0	40.8	40.9	41.3	41.3
$PM_{2.5}$ (with bckgnd)	24-hour	25	40.0	44.2	45.4	45.5	45.5	45.5
$PM_{2.5}$ (with bckgnd)	Annual	8	138	130	131	131	131	138
Ozone	1-hour	214	50					
Ozone	4-hour	171	59					
HCl	1-hour	75	20.8	1.7	14.7	14.7	14.7	20.8
HF	1-hour	5	39	6.8	27.4	27.4	27.4	39
Pb	Annual	0.5	0.073				0.0038	0.074
As	Annual	0.5	0.024				0.00097	0.024
B	Annual	10	0.010				0.0085	0.011
Be	Annual	0.002	12.4				0.14	12.5
Cd	Annual	0.005	0.44				0.088	0.60
Cr(III)	Annual	0.1	0.097				0.015	0.099
Cr(VI)	Annual	0.01	0.051				0.0077	0.052
Cu	Annual	0.1	1.28				0.014	1.28
Hg	Annual	1	0.0018				0.0010	0.0019
Ni	Annual	0.015	0.85				0.34	0.87
Zn	Annual	5	0.0035				0.0008	0.0036
Dioxins and Furans (TEQ)	Annual	0.3 pg/m^3	0.017				0.015	0.019
PAH <10% BaP	1-hour	0.5	0.034				0.027	0.034
PAH<10% BaP	Annual	0.05	0.0051				0.0045	0.0056

Notes:

1) Predictions of SO_2, NO_2, CO, HF, HCl, PM_{10} and $PM_{2.5}$ from TAPM with results from use of 4th (0.5km) grid, with selected results from 3rd grid only given in brackets. Ozone from TAPM 3rd grid. All other results from CALPUFF.
2) NO_2 value in square brackets from the TAPM photochemistry run. Other values from tracer run with NO_2 estimated using the NO_X to NO_2 relationship derived from the photochemistry run.
3) Background 24-hour PM_{10} taken as 16μg/m^3 except with background 24-hour and annual average $PM_{2.5}$ concentrations of 11 and 10.4 μg/m^3 respectively.
4) Metals, PAHs and dioxin and furans concentrations only provided for scenarios with highest concentrations.

Refer to Section 8 of *Air Quality Modelling and Screening Air Quality Health Risk Assessment* (Sinclair Knight Merz, 2005a) for figures displaying the modelling results.

Individual Species

The standards/guideline levels which are used to assess the impact on health of the proposed scenarios, are based on the potential health effect of the particular contaminant. The health effects of the criteria pollutants are well established and available in the epidemiological literature. A summary of health impacts is provided in **Appendix C**. For other pollutants present in low concentrations, the determination of the exposure assessment for these air pollutants is the most problematic area in the risk assessment process and is the source of most of the uncertainty in the final risk assessment. Some of the major difficulties in assessing exposure are due to the spatial and time variations of the air pollutant concentrations.

For the six criteria pollutants (SO_2, NO_x, CO, O_3, PM_{10}, and Pb) for which maximum ambient levels have been defined in the NEPM Standard, there were no exceedences at any of the sensitive receptors for Scenario 5[2]. Of these, it is noted that hourly SO_2 concentrations were predicted to slightly exceed the NEPM standard when using the 4th grid of TAPM, but these are considered to significantly over-predict concentrations, with concentrations from the more realistic 3rd grid indicating concentrations being only 68% (390µg/m^3) of the standard. For Scenario 5A, which includes the unlikely situation of Muja A and B continuing to operate, maximum 1-hour SO_2 concentrations are predicted to remain similar (395µg/m^3). For longer averaging periods, the SO_2 concentrations are relatively lower and are at most 35% and 16.7% of the 24-hour and annual average NEPM standards respectively.

Using the 1-hour results from the 4th grid of TAPM and a 10-minute to 1-hour ratio of 1.7, maximum 10-minute concentration of 1149µg/m^3 is predicted at the worst affected receptor. This is 164% of the NHMRC 10-minute goal for SO_2. This concentration is considered to be an overestimate with a concentration closer to 671µg/m^3 predicted based on the 3rd grid result from TAPM, which is 96% of the NHMRC goal. A comparison to the more conservative WHO guideline indicates that this concentration is 134% of the guideline. These maximum concentrations occur for the receptors near Muja Power Station. For Scenario 5, the predicted concentration using the 3rd grid is 663µg/m^3 which is slightly less at 95% of the NHMRC goal and 143% of the WHO guideline.

At Collie maximum 10-minute concentrations from the 3rd grid (considered to be more realistic) is predicted to be 335µg/m^3 for the existing case, increasing slightly to 340µg/m^3 for scenario 5. These are well within the NHRMC goal (47.8% and 48.6% respectively) and are 67% and 68% of the more conservative WHO guideline.

For other pollutants, comparison to other adopted criteria such as WHO guidelines and TCEQ ESL values indicate that the concentrations will be well below these values for the sensitive receptor sites.

For the existing case (Scenario 1), the only pollutant with exceedances was PM_{10}. The predicted maximum 24-hour concentration at a residential receptor (receptor 20) for this scenario was 42µg/m^3, and when considering typical conservative (70th percentile) background concentrations, a cumulative 24-hour maximum concentration of 58µg/m^3 was achieved. This is 16% higher than the standard of 50µg/m^3 which has a goal of no more than five exceedances per year. It is considered

[2] Although ozone (O_3) was not specifically modelled for Scenario 5, results from Scenario 1 show that ozone levels are well below NEPM standards.

that approximately one to three exceedances may occur per year at the various receptors, which is within the NEPM standard. For the more likely Scenario 5, it is predicted that the highest 24-hour PM_{10} concentration at any receptor would reduce substantially to 1.3µg/m^3 at receptor 4 and would still remain within the NEPM standard considering background concentrations of 16µg/m^3.

Of the remaining species considered in this assessment, including NO_2, ozone, HCl and HF were closest to the respective criteria adopted.

The maximum 1-hour NO_2 concentration for Scenario 5 at any receptor was predicted to be 116µg/m^3, which is 47.2% of the NEPM standard.

Modelling for ozone was not completed for all five scenarios due to time constraints. Scenario 1 was modelled and predicted maximum ground level concentrations of ozone at 118µg/m^3 which is 55% of the NEPM standard.

The concentrations predicted for NO_2 and ozone indicate that they pose no health risk in isolation.

Predicted levels for scenario 5 of HCl and HF are also relatively high with predicted 1-hour concentrations of 33µg/m^3 and 4.1µg/m^3 respectively. These are 44% and 96% of the adopted Texas Effects Levels. It is considered that both these concentrations are over-predicted by possibly a factor of 10 and 2.9 respectively, due to the conservative nature of the emissions used (generally the maximum elemental concentrations in the coal were used), with no retention in the flyash or bottom ash assumed.

Health Effects from Combined Exposure

A "hazard quotient" can be calculated to assess the cumulative risk of non-cancer compounds. This sums the ratio of predicted concentration and effect-thresholds for individual pollutants and assumes that the toxicological effect of the pollutant is additive. There are limitations to this type of calculation as different pollutants affect different parts of the body, and it can double count risks if the threshold is based on studies that involve exposure to mixtures.

As a general rule for interpreting a hazard quotient, values less than one present no cause of concern, and values greater than one generally do not represent cause for concern due to the inherent conservatism of a preliminary risk assessment. However, it is usual for values greater than 1 to undergo further investigation. Hazard quotients around 10 do present some concern and required further detailed investigation.

The model predictions indicate that the cumulative risks from heavy metals are very low, with a hazard quotient of 0.425 (Scenario 1) with the largest contribution from beryllium. For Scenario 5, the hazard quotient is predicted to decrease significantly to 0.017 due to the closure of Muja A and B.

The combined exposure of acidic pollutants is more significant but still unlikely to cause concern. Hydrogen fluoride, hydrogen chloride, sulphur dioxide and nitrogen dioxide have broadly similar health effects. They cause respiratory irritation and sensitivity in asthmatics. For Scenario 5, the cumulative hazard quotient for these pollutants is 1.27 based on the highest 1-hour average modelled results at the discrete receptors.

Total Carcinogenic Risks

The carcinogenic risk associated with the modelled ground level concentrations for the Collie region is detailed for the individual pollutants. The carcinogenic risk due to each individual pollutant is less than the nominated acceptable risk level. The target acceptable risk adopted in this assessment is 1 in 1,000,000 which is the risk level used by the Australian NHMRC for establishing drinking water guidelines for genotoxic carcinogens. This criteria has been used elsewhere in Australia for conservative screening assessments of air quality impacts, although there is no officially adopted level of acceptable risk. Acceptable levels of risk adopted in other countries generally range from 1 in 10^{-4} to 1 in 10^{-6}. For example, the USEPA indicates that a risk less than 1 in 10^{-6} meets "ample margin of safety" with a more refined assessment necessary for levels above this, and a risk of 1 in 10^{-4} may be acceptable depending on the level of confidence in the assessment, population size, presence of sensitive sub-populations and other factors.

Since many of the genotoxic carcinogens modelled in this assessment target the respiratory system as sites for cancer formation, it is legitimate to sum the carcinogenic risk of the individual pollutants.

The summed carcinogenic risk from the carcinogenic metal compounds (arsenic, cadmium, chromium (VI) and nickel) for the existing scenario (Scenario 1) is 1 in 716,000 occurring at receptor 10. This is higher than the acceptable risk level adopted in this assessment (1 in 1,000,000) and is due primarily to arsenic and chromium VI. With Scenario 5 and closure of Muja A and B, this cumulative carcinogenic risk reduces significantly to 1 in 6,000,000 which is well below the acceptable risk level.

Effect of Change in Bluewaters Power Station Site

With the change in location of Griffin Power Station, such that it is slightly closer (560m out of a total distance of approx 3.2km to Collie A) it is considered that there will be the possibility that the plumes from these two station may tend to overlap more.

Increase in cumulative concentrations from the Collie and Bluewaters Power Station may be several percent, up to around 5% in some areas, such as in the northern parts of Collie.

At receptors to the north of Collie, it is considered that the maximum 1-hour concentrations will remain unchanged as there would be little chance of the plumes overlapping for this direction and distance.

All the maximum impacts due to Muja Power Station, such as at the motorplex site, east of Muja and those at Collie will be unaffected as the Collie and Griffin Power Station have negligible contribution to the Muja plumes at these locations.

5.2.6 Management Strategies

The proposed expansion will be undertaken to include Best Practicable Measures to minimise atmospheric emissions. Both the Collie Power Consortium and Griffin Energy will incorporate:

- low NOx burners to minimise the emissions of nitrogen oxides; and
- dust emission controls including the options of electrostatic precipitators or a baghouse in exhaust systems.

Emission reduction technology will be further investigated and selected during the final design stages. Further details of management strategies are discussed in the companies' Public Environmental Review documents.

5.2.7 Health Outcome

Prediction of ground level concentrations of pollutants on an individual basis and cumulative basis, and evaluation of concentrations against ambient air quality criteria (NEPM, WHO guidelines and TCEQ Effects Screening Levels) indicate that health impacts are unlikely and that a general improvement in air quality will result with the closure of Muja A and B. Particularly considering the conservative nature of the model predictions, and the low emissions of substances such as HCl and HF.

5.3 Noise

5.3.1 Management Objective

- *Ensure that noise emissions emanating from the proposed plant comply with statutory requirements specified in the Environmental Protection (Noise) Regulations 1997.*

5.3.2 Background

Noise emissions have the potential to affect public amenity. To ensure that potential impacts are minimised the *Environmental Protection (Noise) Regulations* provide criteria that to which emitters must adhered. SVT Engineering Consultants (SVT) were engaged by SKM to investigate the potential impact of the combine environmental noise emissions from the proposed expansion of the Collie Power Station and the Bluewaters Power Station Stages 1 and 2. A summary of the noise

assessment is provided in the following subsections, with *Environmental Noise Assessment of the Combined Noise Emissions from the Proposed Expanded Collie Power Station and the Proposed Bluewaters Power Station* (SVT Engineering Consultants, 2004) providing the full technical results

5.3.3 Assigned Noise Criteria

The *Environmental Protection (Noise) Regulations* set assigned noise levels have been set for noise sensitive premises, commercial premises, and industrial premises. For noise sensitive premises, eg residences, an "influencing factor" is incorporated into the assigned noise levels. The influencing factor depends on land use zonings within circles of 100m and 450m radius from the noise receiver, including:

- the proportion of industrial land use zonings;
- the proportion of commercial zonings; and
- the presence of major roads.

For noise sensitive residences, the time of day also affects the assigned levels.

The regulations define three types of assigned noise level:

- L_{Amax} assigned noise level means a noise level which is not to be exceeded at any time;
- L_{A1} assigned noise level which is not to be exceeded for more than 1% of the time;
- L_{A10} assigned noise level which is not to be exceeded for more than 10% of the time.

The time period over which the noise is assessed must be between 15 minutes and four hours and must allow for a representative assessment of the noise emission.

Noise levels at the receiver are subject to penalty corrections if the noise exhibits intrusive or dominant characteristics, ie if the noise is impulsive, tonal, or modulated. That is, the measured or predicted noise levels are adjusted and the adjusted noise levels must comply with the assigned noise levels. Regulation 9 (*Environmental Protection (Noise) Regulations*) sets out objective tests to assess whether the noise is taken to be free of these characteristics.

Table 11 and **Table 12** present the assigned noise levels and the penalties incurred for noise which exhibits intrusive or dominant characteristics.

- **Table 11 Assigned Noise Levels**

		Assigned Level dB(A)		
Type of premises receiving noise	**Time of day**	**$L_{A\ 10}$**	**$L_{A\ 1}$**	**$L_{A\ max}$**
Noise sensitive premises at locations within 15 metres of a building directly associated with a noise sensitive use	0700 to 1900 hours Monday to Saturday	45+ influencing factor	55+ influencing factor	65+ influencing factor
	0900 to 1900 hours Sundays and public holidays	40+ influencing factor	50+ influencing factor	65+ influencing factor
	1900 to 2200 hours all days	40+ influencing factor	50+ influencing factor	55+ influencing factor
	22 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35+ influencing factor	45+ influencing factor	55+ influencing factor
Noise sensitive premises at locations further than 15 metres from a building directly associated with a noise sensitive use	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and utility premises	All hours	65	80	90

- **Table 12 Assigned penalties for intrusive and dominant noise characteristics**

Where tonality is present	Where modulation is present	Where impulsiveness is present
+5 dB	+5 dB	+10 dB

Note: Adjustment where noise emission is not music. These adjustments are cumulative to a maximum of 15dB.

On the basis that both power stations will operate on a 24 hour basis for the duration of the year, the most stringent noise criteria will apply to night-time noise levels. The noise assessment assumed that both power stations will be free of tonality, modulation or impulsiveness, therefore no penalties will apply. Hence, to comply with the *Environmental Protection (Noise) Regulations*, noise emissions from both power stations on a cumulative basis must be:

- 35dB(A) or less at any neighbouring residences;
- 60dB(A) at rural boundaries; and
- 65dB(A) at the property boundary of the power station adjacent to the proposed Coolangatta Estate.

5.3.4 Receptor Locations

The nearest sensitive receptors are residences located 3.8km (within the existing power station buffer) and 5km to the north-east of the power station (**Figure 4**).

5.3.5 Noise Modelling

5.3.5.1 Overview of Methodology

To investigate the potential noise impact of combined noise emissions the following modelling scenarios were adopted:

- **Table 13 Noise Modelling Scenarios**

Scenario	A	B	C	D
Collie A	X	X	X	X
Collie B			X	X
Bluewaters Stage 1	X	X	X	X
Bluewater Stage 2		X		X

Scenario D is considered to represent the worst case situation with specific regard to noise emissions.

The Environmental Noise Model was used to undertake noise modelling and requires input data such as source sound power levels, ground topographical data, meteorological data and receiver locations. The overall sound power levels adopted for the existing and proposed power stations are provided in **Table 14**.

Worst case meteorological conditions were also adopted in accordance with the requirements of the EPA's *Draft Guidance for Assessment of Environmental Factors No.8 – Environmental Noise*. The worst case meteorological conditions for night time noise emissions are:

- Temperature of 15°C;
- Relative humidity of 50%;
- Temperature inversion lapse rate of 2°C/100m; and
- Wind speed of 3m/s.

- **Table 14 Adopted Sound Power Levels for the Collie Power Station and Bluewaters Power Station**

Power Station	Component	Overall Sound Power Level dB(A)
Existing Collie Power Station (Collie A)	Central Plant	116
	Cooling Towers	108
Proposed Expansion Collie Power Station (Collie A & B)	Central Plant	119
	Cooling Towers	111
Bluewaters Power Station Stage 1	Central Plant (10m agl)	115
	Stack (50m agl)	115
Bluewaters Power Station Stage 2	Central Plant (10m agl)	118
	Stack (50m agl)	118

Notes: agl – above ground level

Noise contours were produced for winds from each of the 1/8th cardinal directions and also for calm conditions and available in with *Environmental Noise Assessment of the Combined Noise Emissions from the Proposed Expanded Collie Power Station and the Proposed Bluewaters Power Station* (SVT Engineering Consultants, 2004).

5.3.5.2 Summary of Results

This section provides details of the worst case noise scenario (Scenario D) determined from SVT's noise assessment.

Modelling of Scenario D predicts that proposed noise emissions from the expansion of the Collie Power Station will be:

- below the assigned noise level for rural boundaries of 60dB(A) around the power station site boundary, except along the southern boundary where there are some small excursion ;
- below the assigned noise level for industrial boundaries of 65dB(A) around the power station property boundary.

The operation and cumulative affects of the Bluewaters Power Station and the Collie Power Station were reviewed with particular regard to the existing buffer zone (**Figure 2**) that has been established as Special Control Area permitting only rural and industrial land uses.

There are some excursions around the buffer zone local to Bluewaters Power Station. Noise levels to the east, north and south of the Collie Power Station are less than 35dB(A) outside the buffer zone for most wind directions, except for the south westerly, westerly and north westerly, where the 35dB(A) noise emission contour can extend outside the buffer zone by some 500m. For all wind directions the 40dB(A) noise contour is within the buffer zone, except around the Bluewaters Power Station site.

At the nearest sensitive receptors, proposed noise emissions are within 35dB(A) and therefore comply with the *Regulations*.

Relocation of the proposed Bluewaters Power Station east and closer to the Collie Power Station will not require alteration to the eastern portion of the existing buffer zone provide through the Town of Collie Master Plan.

5.3.6 Management Strategies

Environmental management plans will be prepared to minimise the potential effects of noise emissions on nearby sensitive receptors from the 24 hour operation of the power station. Noise monitoring will also be undertaken to demonstrate compliance to the assigned noise levels in accordance with the *Environmental Protection (Noise) Regulations 1997*. Further information regarding management strategies that will be adopted by the Collie Power Consortium and Griffin Energy is detailed in their respective PER documents.

5.3.7 Health Outcome

Predicted noise emissions from the proposed expansion of the Collie Power Station will meet the requirements of the *Environmental Protection (Noise) Regulations* and will be free of tonality, modulation and impulsiveness. Therefore, on this basis, it is likely that no significant impacts will occur on public amenity and nearby receptors will not be impacted by nuisance noise emissions as a result of the expansion of Collie Power Station. The potential noise impact and management strategies for Bluewaters Power Station are documented in the PER for the proposal.

5.4 Solid and Liquid Waste Disposal

This section discusses the management of solid and liquid waste. The management of flyash and hydrocarbon and hazardous materials are discussed separately in **Sections 5.5** and **5.6,** respectively.

5.4.1 Management Objectives

- *Ensure that the generation of solid and liquid wastes are minimised;*
- *Solid and liquid wastes are handled and disposed of in a manner that minimises the impact on receiving environment;*
- *Ensure that saline water is managed to minimise the potential for impact on the local natural environment; and*
- *Ensure compliance with all relevant Health and Environmental regulations.*

5.4.2 Background

All general and putrescible waste generated at the Collie Power Station is collected and disposed by a licensed contractor in the Collie town site landfill facility in accordance with the requirements of the Shire of Collie.

Domestic wastewater is treated on site, with treated effluent used for irrigating an on-site plantation of trees and sludge is periodically removed off-site by a licensed liquid waste contractor.

Saline wastewater, or brine, is treated to remove heavy metals and then piped from the power station for disposal via an ocean outfall off Buffalo Road, north of the Leschenault Estuary. The pipeline is equipped with a leak detection system comprising flow meters, control valves and automatic shutdown.

5.4.3 Potential Impacts

Solid wastes that are typically produced for the operation of a power station include normal and commercial waste (paper, cans, plastic, food scraps) and miscellaneous solid waste generated during maintenance activities (oily rags, packaging materials, inert materials). Minor quantities of solid waste will be produced of up to 10tpa.

The existing wastewater system at the Collie Power station was designed to manage the requirements of a construction workforce and would therefore be capable of managing the operational workforce for the proposed Collie B unit. It is estimated that approximately 15kL/day of domestic wastewater during construction and up to 0.3kL/day during operation will be produced.

Wastewater produced from the cooling towers will be disposed of either on-site evaporation ponds or piped to an ocean outfall.

Solid and liquid wastes have the potential to affect public health and amenity if waste is exposed, uncontained or inappropriately disposed. Bacteria, vermin, airborne pathogens etc that may generate or occur in uncontained waste has the potential to result in adverse occupational and public health conditions.

5.4.4 Management Strategies

The most effective method of managing solid and liquid wastes to protect public health is maintaining a standard of hygiene across the site. Waste management can be addressed by eliminating the source, managing and sorting the waste on-site and ensuring that waste is disposed to an approved facility, recycled or returned to the vendor.

A recognised hierarchy of managing waste is listed below:

- AVOID the use of certain materials (if possible) if they are difficult to manage;
- REDUCE the amount of waste produced;
- REPLACE the use of difficult to dispose of materials, with less toxic or more environmentally acceptable ones;
- SEGREGATE waste for easier management;

- RECOVER/REUSE waste where feasible;
- RECYCLE waste by reprocessing where feasible; and
- DISPOSE of waste in a safe and environmentally responsible manner.

Regular inspections will be undertaken for litter and general waste. Waste storage and disposal facilities will also be regularly inspected to ensure that they are functioning sufficiently with the types and quantities of waste.

Waste and Saline Water Management Plans will be prepared to provide procedures for the ongoing management of solid and liquid waste and saline water.

5.4.5 Health Outcome

Solid and liquid wastes that will be produced are considered typical to heavy industry and there are well-accepted management strategies across industry for managing such wastes. Provided that these management strategies are implemented successfully, it is unlikely that solid and liquid wastes will affect public health.

5.5 Fly Ash

5.5.1 Management Objective

- *Ensure that the generation of fly ash is minimised; and*
- *Fly ash is handled and disposed in a manner that minimises impact on the environment and social surroundings.*

5.5.2 Background

Ash is disposed of via a dense phase technique, which uses a minimum amount of water to form a slurry. The ash slurry is deposited within bunded storage dams that are lined with a well compacted clay later. Currently there are two ash storage dams, one of which is operational and the other has been partly constructed ready for future use. Land provision has been made for ash disposal for a four unit plant (ie 1200MW).

High dust levels have been experienced and this has initiated the division of the disposal dam into cells to ensure the working area is minimised. Further strategies have been implemented to reduce dust levels and include:

- maintaining the working cell in a damp state using a combination of cooling tower blowdown water and ash recycle water;
- spraying the full cells with molasses to bind the top ash surface; and
- establishing concrete pads at ash handling areas to facilitate the removal of accumulated dust.

Groundwater monitoring bores have been installed around the dam to determine leachate levels from the dam and the permeability of the clay liner in the dam. The groundwater quality and water levels of the monitoring bores are monitored on a quarterly basis.

5.5.3 Potential Impacts

The Collie Power Consortium and Griffin Energy propose to produce fly ash of approximately 112,000tpa and 270,000tpa respectively. Griffin Energy proposes to dispose of fly ash to adjacent mine voids, whilst the Collie Power Consortium proposes to dispose of fly ash to the existing licensed ash storage dams.

Fly ash has the potential to affect public health by two means:

- dust emissions affecting the public's respiratory functions; and
- generation of leachate, containing dissolved elements, having the potential to affect groundwater quality that may be used by neighbouring properties.

5.5.4 Management Strategies

Groundwater quality monitoring from bores surrounding the fly ash dams will continue in accordance with the current DoE licensing requirements. The existing practices of ensuring that working cells are kept damp and the surface of remaining cells are stabilised, will also continue to minimise dust emissions.

5.5.5 Health Outcome

With continued monitoring and appropriate contingency plans in place to take relevant actions should leachate be detected or nuisance dust emissions be generated, the health of nearby sensitive receptors and groundwater resource users can be adequately managed and any affects minimised.

5.6 Hydrocarbons and Hazardous Materials

5.6.1 Management Objective

- *Ensure hydrocarbons and hazardous materials are handled and stored in a manner that minimises the potential for impact on public health and safety, and the environment through leaks, spills and emergency situations.*

5.6.2 Background

Diesel and minor amounts of hydrocarbon products such as lubricating oils and greases and other hazardous materials such as biocides and cleaning fluids are currently used and stored on site. These are managed in accordance with environmental protection and dangerous goods licences.

5.6.3 Potential Impacts

The proposed expansion is likely to result in increased transportation, storage and handling of hydrocarbon products and hazardous materials. The potential health impacts associated with the activities include:

- release to the environment affecting groundwater, surface water, soil or air quality with the potential to impact on near neighbours dependent upon these environmental resources;
- creation of acute and/or chronic toxic hazards; and
- creation of flammable or explosive hazards.

5.6.4 Management Strategies

The storage, handling and transportation of hazardous material will be equivalent to the existing Collie Power Station approved procedures and practices which in turn comply with all relevant local and State regulations, including:

- *Mine Safety and Inspection Regulations 1995;*
- *Dangerous Goods Regulations 1992;*
- *Australian Standard for the Storage and Handling of Flammable and Combustible Liquids (AS1940-1993);*
- *Environmental Protection (Liquid Waste) Regulations 1996; and*
- *Environmental Protection (Controlled Waste) Regulations 2001*.

A Hydrocarbon Management Plan will be prepared with the objectives to:

- reduce the volume of hydrocarbon waste materials produced;
- segregate hydrocarbons from stormwater to reduce the volume of waste materials;
- ensure appropriate transport, storage and handling procedures, in accordance with all relevant legislative requirements;
- ensure appropriate clean-up procedures for spills; and
- define environmentally acceptable methods for the disposal of waste.

Material Safety Data Sheets (MSDS) will be made readily available on-site and regular inspections will be made of storage as part of ongoing operations. Any incidents will be recorded and managed in accordance with the Hydrocarbon Management Plan.

5.6.5 Health Outcome

Relevant health and safety standards will be adopted on site in addition to the implementation of the Hydrocarbon Management Plan. Hydrocarbons and hazardous materials that will be utilised for

the operation of Collie B will be in accordance with MSDS and approved procedures, therefore the materials are unlikely to affect public or occupational health.

5.7 Water Supply

5.7.1 Management Objective

- *Minimise the impact on natural water resources by minimising water consumption and reusing wastewater where feasible.*
- *Minimise the potential to impact the quality of local surface and groundwater.*

5.7.2 Background

The Collie Basin contains large resources of fresh groundwater. Groundwater is mainly contained with the sandstone of the Muja Coal Measures, Premier Coal Measures, Allanson Sandstone, Ewington Coal Measures and Westralia Sandstone of the Collie Group; within the sand and sandstone of the Nakina Formation; and the surficial sediments. Some groundwater may also occur in the sandstone of the Shotts Formation. Groundwater provides the major source of water to the coal mines, power stations, domestic and stock watering, and maintains the river pools and associated environment. All the mines extend below the water table and dewatering of the aquifers has taken place since 1988.

Groundwater currently serves as a water supply to power stations in the Collie region, both from mine dewatering operations and water supply borefields. Muja Power Station is able to draw on Muja open pit, Ewington II, Premier Pit I and the future Premier Pit 4. Collie Power Station, however, can only draw on Ewington II. Additional water can also be obtained from Western W2, Western WD6 and ACIRL borefields which intersect old underground mines. Water supply borefields include Cardiff South and Shotts borefields. The Stockton borefield, although drilled, is still to be equipped.

Western Power is the process of developing a Water Management Strategy for its activities in the Collie Basin. This strategy is based on the *Collie Basin Water Resource Management Strategy* (Collie Water Advisory Group, 1999). The DoE allocation policy currently adhers to this strategy which has the following main directives:

- maximum use should be made of surface water from Wellington and Harris reservoirs;
- mine dewatering should serve as the primary groundwater supply;
- the use of groundwater resources should be restricted as much as possible; and
- groundwater should only be abstracted in the vicinity of the South branch of the Collie River in an emergency situation.

5.7.3 Potential Impacts

A number of varying options are being considered by the Collie Power Consortium and Griffin Energy to determine the optimal water supply strategy that will comply with the current groundwater resource management strategies. Specific details of their proposals are provided in their respective Public Environmental Review documents.

The expansion of the Collie Power Station has the potential to add further stress on existing groundwater resources and the potential to affect the community who are dependent on these resources.

5.7.4 Management Strategies

Both companies have indicated the possibility of utilising dewatering water from nearby mines. Further discussions are to be held with the DoE to development and confirm an appropriate Water Management Strategy for the proposed expansion.

5.7.5 Health Outcome

The DoE and the *Collie Basin Water Resource Management Strategy* will continue to provide guidance for the future use of groundwater resources in the region. These mechanisms are expected to support the interests of existing nearby groundwater users that may be potentially affected by further abstraction of groundwater.

Following the directives of the DoE's allocation policy, which adheres to the above Strategy, it is likely that there will be minimal impact on nearby groundwater users.

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6. Social and Economic Impacts and Management

6.1 Background

The following sections address the critical social factors including management strategies that will be required to ensure that:

- the potential economical employment benefits of the project are maximised;
- potential impacts on community and recreational values of the surrounding area are maintained;
- potential impacts on visual amenity are minimised;
- public safety is maintained in terms of risk and traffic management; and
- potential impacts on sites of cultural significance to Aboriginal heritage are minimised and appropriate management of significant sites is undertaken.

6.2 Socio-Economic Issues

6.2.1 Management Objectives

- *Ensure that any potential negative impacts from the development on the nearby community are minimised; and*
- *Ensure that where possible the local community experiences the benefit of increased employment opportunities.*

A semi-quantitative investigation of the social and economic issues associated with the expansion of coal-fired power generating capacity in the Collie Basin has been conducted. The following provides an indication of the key issues to be addressed.

6.2.2 Potential Impacts

Western Australia and the South West region will receive significant economic and social benefits to the local, regional, state and national economies, during both construction and operation phases, in the following ways:

- capital investment of $450 million in the South West;
- direct employment of construction workforces (peaking at 600 persons), plus associated indirect employment during the construction phase;
- direct employment of between 25 to 50 full-time permanent positions during operation of the expanded power station, plus associated indirect employment in service and commercial industries;

- additional employment of at least 30 full-time permanent positions in the coal mining industry;
- flow on effects resulting in increased local and regional business activity in the form of maintenance, supply and similar services;
- contributions to local training and employment programs for personnel, where practicable;
- maintenance of Collie as an economic and viable sustainable town;
- avoid future shortfalls in existing consumer electricity supply and provide additional electricity to new future industries.

The Collie Power Station expansion would be expected to draw on the existing and future labour forces from the residential areas within the South West region.

Although there is an overall socio-economic benefit to the expansion of the Collie Power Station, there are a number of socio-economic issues that have the potential to negatively affect the community:

- temporary population increase during the construction phase;
- shortage of accommodation and services during the construction phase. As a result, there is potential for temporary cost increases in some services, particularly accommodation;
- social pressures from a transient workforce;
- increased demand and pressure on local and regional health and welfare services, emergency response facilities, education and transport; and
- cumulative effect of Bluewaters Power Station proposal and Collie B construction phases proceeding at the same time or workforces potentially peaking at similar times.

6.2.3 Management Strategies

To minimise the impact on existing services and the amount of transient personnel, the project will utilise the local workforce and services where possible. This would maximise the local employment opportunities associated with the expansion and decrease the pressure placed on the local social environment by an influx of people associated with the development into the region.

Where appropriate, workforce training will be provided to employees to develop additional skills and qualifications to further maximise local employment opportunities.

Social strategies will be implemented by the Preferred Bidder as part of the Construction Environmental Management Plan. These management strategies will be prepared in consultation with the Shire of Collie and other key stakeholders and will address:

- keeping local residents and industries informed of construction and operational activities;

- giving advance notice to affected parties of any disruption to services during the construction phase;
- housing of the construction workforce, which is expected to reach up to 400 personnel and extend over a period of up to 30–48 months;
- capacity of existing health and education facilities to cope with an influx of personnel during the construction phase; and
- other issues associated with transient workforces.

6.2.4 Health Outcome

An overall positive socio-economic benefit will result from the proposed expansion of the Collie Power Station.

6.3 Recreational Areas and Tourism

6.3.1 Management Objective

- *Ensure that recreational use of the areas surrounding the power station is not compromised.*

6.3.2 Background

There a number of recreational areas and tourist attractions in the Collie area, some of which revolve around industrial heritage associated with mining, as listed below.

Industrial Heritage

- **Coal Arch and Skip Throssell Street**: This is the only surviving example of a mine entrance at the Collie coal fields and was relocated from Western Collieries Western No.1 underground mine;
- **Tourist Coal Mine Throssell Street**: This replica mine offers an insight into the way of life of underground miners and their working conditions;
- **Muja Power Station**: Tours of the Muja Power Station, located 20km east of Collie, are undertaken daily; and
- **Open Cut Coal Mines**: Wesfarmers Premier Coal and Griffin Coal Mining Company operate open cut mines to the east of the Collie townsite for which tours can be undertaken.

Wellington Dam and Wellington National Park

The Wellington Dam and Wellington National Park are located 18km west of Collie in jarrah forest, and offer camping, bush walking, picnicking, swimming, canoeing and white water rafting.

Wellington National Park was opened as a National Park in June 2000 and now forms part of the Wellington Forest, covering approximately 4000ha.

6.3.3 Potential Impacts

The location of the Collie Power Station does not infringe directly on any tourist or recreation sites. Consequently, during the construction and operational phase of the proposed expansion, there are not expected to be any significant impacts on tourism or recreational areas.

6.3.4 Management Strategies

No specific management strategies required.

6.3.5 Health Outcome

It is unlikely that the proposed expansion of the Collie Power Station will impact on or indirectly effect recreation areas and tourism.

6.4 Visual Amenity

6.4.1 Management Objective

- *Ensure that the visual amenity of the plant and associated infrastructure from adjacent public areas is minimised.*

6.4.2 Background

The closest public viewpoint to the existing Collie Power Station is the Williams-Collie Road, which travels in a south west to north east direction, approximately 3.5km from the site. The Coalfields Road also runs to the south of the site.

The existing power station is impossible to screen from every angle due to the scale of the structures, particularly the stacks. Illustrations are provided on the following pages. These illustrations indicate that the power station stack is visible from various locations along public roads that surround the project site.

The view of Collie Power Station from the main power plant access road is displayed in **Plate 2**. The power plant stack is clearly visible in the distance. Gates restrict public entry into the power station area.

- **Plate 2 View of Collie Power Station from the access road at the entry gates.**

The main road between Collie and Darkan (Coalfields Road) currently offers numerous views of the power station to the public. **Plate 3** displays the view from a site on Coalfields Road approximately 5km east of Collie. This photograph looks north east, showing the power station stack in the distance. In addition, the edge of the Griffin Coal mine site is evident in the foreground to the east of the power plant.

- **Plate 3 View of Collie Power Station from Coalfields Road, east of Collie townsite**

Plate 4 shows another view from Coalfields Road, at a site located further from Collie. This photograph displays the north east view at the intersection of Coalfields Road and the rail line. The power station is visible in the distance beyond the Griffin Coal mine site.

- **Plate 4 View of Collie Power Station from the intersection of Coalfields Road and the rail line.**

Some nearby residences are able to see the Collie Power Station while others do not, due to a screen of vegetation (pers comm. Received during the Community Workshop (see **Section 7**).

6.4.3 Potential Impacts

As demonstrated in the above photographs, the tallest plant structure at the existing Collie Power Station is the main exhaust stack. As the existing exhaust stack has been sized for 600MW, no additional stacks would be required for the proposed expansion. As a result, the visual appearance of the power station will not be altered significantly and the view from public viewpoints would remain predominantly unchanged.

The visual impact due to the proposed expansion of the power station will therefore be minimal. However, during cool days, when the plume from the main exhaust is visible, the plume may be larger than present due to the larger flow of exhaust gases.

6.4.4 Management Strategies

To improve the visual amenity of the proposed power station expansion, the following management strategies will be undertaken where appropriate:

- buildings to be coloured to blend into the surrounding terrain;
- building graphics/signage would be restricted to assigned areas;
- all temporary disturbances would be rehabilitated and revegetated with local species;
- planting of screening vegetation where appropriate; and

- a high standard of housekeeping would be maintained at all times.

6.4.5 Health Outcome

The expansion of the existing coal-fired power station will be have minimal impact on the visual amenity of the Collie region.

6.5 Traffic

6.5.1 Management Objectives

- *Ensure that roads are maintained and road traffic managed to meet an adequate standard of level of service and safety; and*
- *Ensure the requirements of Main Roads of Western Australia are met.*

6.5.2 Background

The South West region has an extensive road network. Main road links to the north are via South Western Highway and Old Coast Road. Coalfields Road is another significant transport link, which extends east from South Western Highway at Roelands through Collie and intersects with Albany Highway at West Arthur.

The Collie Power Station is accessed via Williams-Collie Road, which meets Coalfields Road at the eastern edge of the Collie townsite.

6.5.3 Potential Impacts

The construction phases would result in increased traffic on access roads to the power station. This increased traffic would result from:

- workforce commuting; and
- construction related deliveries of material and equipment.

The workforce traffic would occur mostly between 6.30am and 7.30am, and between approximately 5.30pm and 6.30pm. Construction related deliveries would most likely occur during normal construction hours (7am to 6pm, Monday to Friday). Traffic associated with the construction phase would increase as the peak construction period is reached and then decrease as the plant nears the commissioning phase.

Given that the construction workforce is likely to peak at about 600 personnel, midway through the period, a worst case maximum of approximately 1,200 vehicle movements a day could be expected for this workforce, assuming that no car pooling arrangements are in place. Additional movements related to delivery of construction material would also occur. All traffic would access the power station site through the existing access roads.

This increase in traffic movements has the potential to result in traffic delays and congestion particularly at the start and completion of working shifts and during the movement of oversized loads. There is the potential for an increase in road accidents.

6.5.4 Management Strategies

Traffic Management Plans will be prepared to ensure that impacts on traffic and roads are minimised and will include the following elements or equivalent:

- co-ordination of all proposed traffic delays during the construction phase with Main Roads WA and the relevant local council;
- scheduling the movement of construction items that could obstruct regular traffic flow to minimise delays and road closure;
- installation of appropriate signage;
- monitoring the movement of oversize vehicles to and from site; and
- notifying the community of any planned evening transport to site.

6.5.5 Health Outcome

The changes to traffic conditions during the construction and operation phases are predicted to be readily manageable by the implementation of a Traffic Management Plan and will not compromise the performance of the road network or road safety (Strategen, 2005).

6.6 Culture and Heritage

6.6.1 Management Objectives

- *Ensure that the proposal complies with the requirements of the Aboriginal Heritage Act 1972; and*
- *Ensure that changes to the biological and physical environment resulting from the project do not adversely affect cultural associations with the area.*

6.6.2 Background

No Aboriginal or European archaeological or ethnographic sites have been recorded within the Collie Power Station site. However, one Aboriginal mythological and two ethnographic sites were identified during ethnographic and archaeological surveys undertaken for the Collie Power Station environmental approvals (State Energy Commission of Western Australia, 1990), the nearest of which was 1km from the power station site.

Aboriginal heritage sites in the Collie area are generally small stone artefact scatters, quarries and stone arrangements and stratified archaeological deposits, the latter of which provides evidence of intensive use of the jarrah forest in the area (McDonald Hales and Associates, 1991). Most sites

occur near to, or are closely associated with water sources, and are small scale and low significance (Harris, 2001; Green Iguana, 2001; McDonald Hales and Associates, 1991).

6.6.3 Potential Impacts

There is very limited potential for impacts to occur on aboriginal or European heritage. If any deep excavations are proposed for the construction phase, there is potential for burial sites to be discovered.

6.6.4 Management Strategies

Cultural and heritage sites will not be disturbed without prior approval under Section 18 of the *Aboriginal Heritage Act*. Appropriate surveys of the area to be disturbed and monitoring during the construction phase will be undertaken.

6.6.5 Health Outcome

It is not expected that Aboriginal or European archaeological or ethnographic sites will be encountered in the project area. Therefore, potential impacts on significant cultural and heritage sites are unlikely.

6.7 Hazards and Public Safety

Any industrial development that involves the storage, transportation or processing of hazardous substances could pose risk to employees, the public and the environment. The following section identifies potential hazardous events, assesses the outcomes and related risks, and develops management strategies to minimise risk.

6.7.1 Management Objectives

- *Ensure that the risk to the public is as low as reasonably practicable; and*
- *Ensure that risk is managed to meet the EPA's criteria for off-site individual fatality risk and that the Department of Industry and Resources requirements in respect to public safety are met.*

6.7.2 Background

The existing Collie Power Station includes a buffer zone, which has been developed to protect the community from potential impacts of industry, including the risk of industrial accidents. The buffer zone is sufficient to contain any public risk associated with the onsite operations of the power station.

Under the National Occupational Health and Safety Commission's Council of Major Hazard Facilities document (National Occupational Health and Safety Commission, 1996), the proposed power is not considered a major hazard facility.

6.7.3 Risk Criteria

The EPA has developed risk criteria that should be taken into account when assessing a proposed hazardous industry. Offsite individual risk is the risk of a certain outcome to an individual at a specific location.

Criteria relevant to the development of the proposed Collie Power Station Expansion are summarised in the EPA publication 'Guidance for Risk Assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant' (EPA, 2000b). This document specifies the offsite individual risk criteria for fatalities from a hazardous industrial plant as:

- *"Risk levels from industrial facilities should not exceed a target of 50 in-a-million per year ($50x10^{-6}$) at the site boundary for individual industry, and the cumulative risk imposed upon an industry should not exceed a target of 100 in-a-million per year ($100x10^{-6}$).*
- *A risk level for non-industrial activity located in buffer zones between industrial facilities and residential zones of ten-in-a-million ($10x10^{-6}$) or lower is so small as to be acceptable to the EPA.*
- *A risk level in residential zones of 1 in-a-million per year ($1x10^{-6}$) or less is so small as to be acceptable to the EPA.*
- *A risk level in "sensitive developments", such as hospitals, child care facilities and aged care housing developments of between one half and one-in-a-million per year (0.5 to 1x10-6) is so small as to be acceptable to the EPA*

In addition, risk minimisation must be demonstrated in all new proposals".

On-site risks to employees are managed under the *Occupational Safety and Health Act 1994* and the *Mines Safety and Inspection Act 1994* and Regulations.

6.7.4 Potential Risk Impacts

A preliminary review was performed by Western Power (2002) to identify hazardous materials and processes that may be used in the operation of a 600MW coal-fired power station. The offsite risk during construction of the plant would be minimal compared to those during operation. It has been assumed that the power station would be predominantly fired on coal and that liquid fuel inventories would be minor (maximum 800kL). The outcomes of this review are summarised below:

- the proposed power station would not be considered a major hazard facility;
- the buffer zone would be sufficient to contain any public risk associated with the on site operations of the power station;
- the transport of hazardous goods to the power station is in minor volumes only and this imposes no greater risk than existing material cartage to the power station; and

- the transport of hydrocarbon products to the power station poses a low risk, but has the potential to cause severe impacts on wetlands and rivers if spills occur within the vicinity of these water bodies or tributaries to them.

6.7.5 Management Strategies

Sound engineering practice to ensure all legal requirements and guidelines for the storage, handling and transport of hazardous materials will be adhered to as described in **Section 5.6.4**.

6.7.6 Health Outcome

Any potential off-site risk to the public will be adequately contained within the existing buffer zone. Risk to public safety is therefore considered manageable and low.

7. Community Workshop

7.1 Overview of Community Consultation

A community workshop was held at Roche Park Recreation Centre, Collie on 23 February 2005 to present information to the Collie community and to record their feedback and concerns. A key exercise of the workshop was to engage the community in ranking the relevant issues in order of importance or significance. The workshop included the following community members and stakeholders:

- Bunbury Wellington Economic Alliance;
- Chamber of Commerce and Industry (South West);
- Collie Conservation Group;
- Collie Day Care Centre;
- Department of Environment (Collie);
- Department of Health;
- Department of Industry and Resources;
- Griffin Energy;
- Land Owners;
- Premier Coal;
- Riverview Residence;
- Shire of Collie;
- Wesfarmers Energy;
- Western Power; and
- Worsley Alumina.

The following stakeholder groups were also invited but were unable to attend:

- Department of Environment
- South West Development Commission
- WaterCorp
- Department of Planning and Infrastructure
- Department of Conservation and Land Management
- Department of Industry and Resources
- Chamber of Commerce and Industry
- MLA Collie – Mr M Murray

- Collie Senior Citizens
- Collie Senior High School
- Amaroo Primary School
- Collie Police and Citizens Youth Club
- Collie River Valley Medical Centre
- Collie Medical Group
- Collie District Hospital
- Community Member
- Riverview Residence
- Collie Senior High School
- Amaroo Primary School
- Collie Police and Citizens Youth Club
- Collie River Valley Medical Centre
- Collie Medical Group
- Collie District Hospital

The workshop minutes are provided in **Appendix C.**

7.2 Presentation and Queries

SKM presented summaries and the key conclusions of investigations that have been undertaken to date. During this presentation, the community was invited to provide comment and any queries. A list of queries and responses that were discussed during the workshop is provided in **Table 15**.

The majority of the queries were raised by nearby landowners.

Table 15 Collie Community Workshop – Queries and Responses

No.	Query	Response
Overview		
1	Does Griffin propose to establish a super-critical or sub-critical power station?	Decision has not been made yet. It is expected that the emissions profile from both options will be similar.
2	Does the potential change of Government affect the information presented today?	There will be no change in the results of the studies that have been undertaken. SKM's investigations have been based on a doubling of Collie A.
3	The end date of the public review and lodgement of submissions has been extended from the 21 March to the 28 March on the grounds that the community are assessing numerous large public documents (three PERs and a Structure Plan). EPA letter sighted at workshop.	Proponents are not aware of any extension provided. Review of EPA letter suggests that extension is only provided to the addressee of the letter.
4	Light spill – has this issue been addressed by the Proponents. "Collie lights up at night and is like a Christmas tree".	Light spill listed as an issue for further discussion in the workshop.
5	Has any consideration been given to the Ewington 1 mine proposal? The mine is a large issue and needs to be included as part of a cumulative assessment.	Emissions from mining operations have been reviewed and addressed in the air quality assessment. This will be discussed in the air quality presentation.
6	Has both the current expansion of the Worsley refinery as well as the future proposed expansion been included as part of the cumulative assessment.	Both expansions have been included and addressed and will be discussed in the air quality presentation.
7	Bluewaters has been included in the assessment, why hasn't the Industrial Estate been included? The community needs to understand cumulative impact. Modelling has been undertaken for industries such as a pulp mill etc. Griffin Energy has included additional emission sources predicted in the Structure Plan.	The Structure Plan is assessed differently to individual proposals and requires some estimation of "likely" industries. These industries are not yet proposed.
8	A buffer zone should be established for the Ewington mine. The existing 3km buffer should also apply to the Bluewaters site.	SKM can not comment on the EPA's criteria for defining the buffer zone boundary.
9	Griffin Energy has specifically stated that SKM's information that is being presented is incorrect.	The SVT modelling presented by SKM for Bluewaters was based on the site and noise emissions detailed in the Bluewaters 1 PER. The Bluewaters Power Station proposal has been modified since this PER, hence our representation of Bluewaters is out of date. We believe the modelling assumptions for Collie A & B are correct.

No.	Query	Response
Social Profile and Survey		
10	The unemployment figures presented are dated. Why from 2001? Why not get weekly/monthly updates released by the ABS?	Information from the Census is utilised as it has provided the most information for the range of parameters being investigated for the social profile. It also enables comparison with previous census figures to show trends and allows comparison with the average unemployment figures for Western Australia.
11	For the telephone survey, what was the timing of phone calls? Was it during the day or night?	Phone surveys were undertaken during the morning, afternoon and evening. Some answering machines were encountered, however three attempts were made for each telephone number before going onto the next number. The methodology that was used is described in the survey report.
12	Define the rating of minor/ slight/ moderate risk perception used for community concerns.	The risk perception rating is based on a continuum of 5 points ranging from high, moderate, minor, slight to no risk ", based on the respondant's perceived level of concern about the health risk.
Air Quality		
13	When was a measuring meter be established at the receptor location number 16?	This is a theoretical point where concentrations were determined through modelling. No actual monitoring is undertaken at this location. Ambient monitoring of air quality is undertaken at other locations.
14	Where are ambient monitoring sites located?	The locations of ambient monitoring sites are pointed out on the presentation slide in relation to receptor locations. These are detailed in SKM's report.
15	Why over-estimate or under-estimate emission exit velocities at Muja?	An over-prediction of emissions occurs from under-estimating exit velocities. A lower exit velocity results in less dispersion and mixing, therefore pollutants are more concentrated nearer to the source of the emission. A higher exit velocity results in better dispersion and mixing where pollutant concentrations less concentrated as they are spread over a greater area due to better dispersion. In both scenarios, pollutants will reach Collie, however at low exit velocities the pollutant concentrations will be worse.

No.	Query	Response
16	Why is the 3rd grid and not 4th grid preferred for air quality?	The theoretical estimations determined on the 3rd grid corresponds better to actual monitoring data collected from the ambient monitoring sites. The 4th grid over predicts and provides predictions for every 500m. The 3rd grid provides predictions for every 1.5km.
17	What will happen if Muja A & B are still operating in the future?	This scenario has been modelled and is included in the appendix of SKM's air quality report. In this scenario, Collie B emissions are generally overshadowed by the emissions from the Muja Power Station.
18	What are the SOx, NOx, PM health impact and potential effects on employees at the power station?	SKM is not able to comment on the workplace scenario as different criteria apply. It is based on occupational health and safety. Employees will have a higher exposure, as they will be closer to the source. Adopting a conservative estimate (4th grid), SO_2 concentrations are predicted to exceed the World Health Organisation guideline for 1 to 2 hours every year. This exceedance may cause effects to asthmatics, for example some minor effects on asthma.
Noise and Other Factors		
19	For noise emissions, isn't the NE wind scenario indicate the worst case for Collie?	The worst case scenario is based upon the highest predicted noise level at the nearest residence. The nearest residence is located to the NE of the power station. The township of Collie is not affected by the Collie Power Station expansion as noise emissions reach background levels in the Collie area.
20	Presentations are not consistent with latest data as documented in Bluewaters cumulative assessment. Who is correct?	SKM is not able to comment on Griffin's Bluewaters assessment. The SVT modelling presented by SKM for Bluewaters was based on the site and noise emissions detailed in the Bluewaters 1 PER. The Bluewaters Power Station proposal has been modified since this PER, hence our representation of Bluewaters is out of date. We believe the modelling assumptions for Collie A & B are correct.
21	Why do the contours stop before the town of Collie	The contours show the extent over which the noise model was created. The extent was chosen as that which would show the distance over which the impact of the Collie Power Station would have am impact and to include the closest residences.
22	Will there be environmental licenses for offsite pollution.	Yes, licenses will specify requirements for groundwater monitoring.
23	Has the use of industrial water from Wellington Weir been considered.	A number of potential options are being investigated. No decision has been made. This remains as an option.

No.	Query	Response
24	How much water does Collie B require?	5.1GL/year cooling H_2O.
25	What is the point of assessing impacts on recreational areas and tourism? Why not consider other factors such as schools?	Recreational areas were considered a factor that required investigation to determine if any impacts would occur. Although it was found not to be significant, any potential impacts need to be identified.
26	Visual amenity – lighting. What is the view from the other side of the power station? The bluegum plantation that provides some screening is currently being harvested.	Issue noted.
27	Has the night-time visual amenity been considered?	Issue noted.
28	What are the current traffic movements in Collie related to the power station?	About 300 traffic movements/day.
29	The predicted traffic movements proposed by the project, what are they based on?	Rough estimate, peak construction workforce of 600 with two trips per day per person. Noted that 2004 traffic count for Collie is 470/day.
30	Has any consideration been given to transport routes, particularly routes travelling adjacent to river? Materials such as H_2 SO_4 could spill into the river.	Issue noted.
31	Flyash technology not emitted from stack.	Technology is based on opportunities for reuse. Flyash removal from stack is undertaken by well proven technology.

7.3 Ranking of Issues

A ranking exercise was undertaken by dividing community members and stakeholders into two groups. Proponents and other selected stakeholders (e.g. Perth based) were held as observers during this exercise. The two groups were then requested to prioritise what they considered to be significant issues/ concerns by allocating ten votes against the issues they considered most important. Specifically they were asked to *"Distribute your 10 dots between the issues you believe will be most significant in future"*.

The following is a summary of the results that were obtained. Results from the two individual groups are provided in **Appendix C**.

- **Table 16 Ranking of Significant Community Issues**

Description	Number of Dots (votes)
Increased employment opportunities	**18**
Increased water use	**14**
An increase in noise	**11**
An increase in the contamination of groundwater (bores, aquifers)	**10**
An increase in gaseous emissions (sulphur dioxide and oxides of nitrogen)	**9**
An increase in road traffic	**9**
An increase in greenhouse gas emissions	**9**
Positive impacts on the town's growth and development	8
Changes in how the area looks (ie visual impact)	8
Contamination of rivers and wetlands (surface water)	6
Increased demand for services such as education and health	6
An increase in dust, fly ash and smoke (concern is from Muja)	5
An increase in respiratory conditions (e.g. asthma)	5
Presence of hazardous materials	4
Light shed (during the night-time)	4
Impacts on Aboriginal sites and artefacts	2
Increase in population	1
Disposal of solid waste products	1
Impacts on recreational areas	-

In order of priority, the following five significant issues were determined to be of most concern:

1) increased employment of opportunities;
2) increased water use;
3) an increase in noise;
4) an increase in the contamination of groundwater; and

5) an increase in road traffic, greenhouse emissions and gaseous emissions.

Other issues that were raised by the community whilst undertaking the workshop included:

- accommodation for construction workforce;
- traffic management and safety; and
- cumulative impacts from all proposals for the Collie region.

7.4 Summary of Workshop Outcomes and Key Concerns

Although the community favoured the potential increase in employment opportunities as the most significant issue, other issues such as water use, noise, groundwater contamination, traffic and gaseous emissions were determined as key concerns. Many of these concerns were based upon potential cumulative impacts from other various proposals that are currently being assessed for the Collie region.

The difficulty experienced by the community in assessing cumulative impacts for the several proposals released for public review was the most significant issue raised during the workshop.

No specific concerns were raised for Collie B in isolation. Its performance and emissions were considered generally acceptable to the community, however the community did express confusion in assessing the cumulative impacts of the project in relation to the several other proposals currently released for public review, including the Bluewaters Power Station, the Coolangatta Industrial Estate and the Ewington II mine expansion.

8. Summary and Conclusions of Health Impacts

8.1 Overview of Assessment

When determining potential health impacts a consideration of the person's or community's physical, mental and social well-being must be made. Numerous key factors can influence a person's health such as social and economic factors, certain lifestyle and behaviour factors, availability of services and environmental factors.

The Collie Social Profile provides a social context for the proposed expansion of coal-fired power generation facilities in the Collie Basin. It has reviewed local history, social demographics, contemporary issues and developments and has outlined previous community consultation undertaken by the Griffin Group and relevant consultants. These activities have suggested several key findings regarding the attitudes of Collie community members towards the proposed developments. These include:

- *Favourable attitude towards proposed development*: The community appear generally in favour of the proposed development projects and tend to respond favourably to growth in the region. This is likely to be influenced by the possibility of employment generation associated with the development and eventual operation of the proposed projects.
- *Concern for environmental impacts*: Issues in the community appear to reflect concern for environmental conservation. Apprehension regarding development tends to be grounded in fears associated with possible environmental impacts.
- *Current concerns to be considered*: Current issues associated with dust, noise and blasting associated with pre existing mines were raised as concerns. The potential impact of such issues related specifically to the proposed Ewington 1 Mine Development, however such impacts need to be considered cumulatively.

A telephone survey was undertaken of 350 households in the Shire of Collie, which examined community attitudes and beliefs in relation to the establishment of a new coal fired power station in the Collie area.

Several investigations have been undertaken to determine the potential issues/impacts of relevant social, economic and environmental factors. The conclusions of these investigations for relevant issues are summarised in **Table 17**.

Table 17 Summary of Assessment Outcomes for Relevant Issues

Issue	HIA Outcome	Section in HIS
Air Quality	Prediction of ground level concentrations of pollutants on an individual basis and cumulative basis, and evaluation of concentrations against ambient air quality criteria (NEPM, WHO guidelines and TCEQ Effects Screening Levels) indicate that there is no cause for concern. Particularly considering the conservative nature of the model predictions, and the low emissions of substances such as HCl and HF. Modelling of the future scenario indicates an improvement in the ambient air quality for the region, with predicted concentrations of pollutants below the adopted air quality criteria. Predicted hazard quotients for acidic gases do not represent cause for concern at Collie.	5.2
Noise	Predicted noise emissions from the proposed expansion of the Collie Power Station will meet the requirements of the Environmental Protection (Noise) Regulations and will be free of tonality, modulation and impulsiveness. Therefore on this basis it is likely that no significant impacts will occur on public amenity and nearby receptors will not be impacted by nuisance noise emissions.	5.3
Solid and Liquid Waste	Solid and liquid wastes that will be produced are considered typical to heavy industry and there are well-accepted management strategies across industry for managing such wastes. Provided that these management strategies are implemented successfully, it is unlikely that solid and liquid wastes will affect public health.	5.4
Fly Ash	With continued monitoring and appropriate contingency plans in place to take relevant actions should leachate be detected or nuisance dust emissions be generated, the health of nearby sensitive receptors and groundwater resource users can be adequately managed and any affects minimised.	5.5
Hydrocarbons and Hazardous Materials	Relevant health and safety standards will be adopted on site in addition to the implementation of the Hydrocarbon Management Plan. Hydrocarbons and hazardous materials that will be utilised for the operation of Collie B will be in accordance with MSDS and approved procedures, therefore the materials are unlikely to affect public or occupational health.	5.6
Water supply	The DoE and the *Collie Basin Water Resource Management Strategy* will provide guidance for the future use of groundwater resources in the region. These mechanisms are expected to support the interests of existing nearby groundwater users that may be potentially affected by further abstraction of groundwater. Following the directives of the DoE's allocation policy, which adheres to the above Strategy, it is likely that there will be minimal impact on nearby groundwater users.	5.7
Socio-economic Issues	An overall positive socio-economic benefit will result from the proposed expansion of the Collie Power Station.	6.2
Recreational Areas and Tourism	It is unlikely that the proposed expansion of the Collie Power station will impact on or indirectly effect recreation areas and tourism.	6.3
Visual Amenity	The expansion of the existing coal-fired power station will be have minimal impact on the visual amenity of the Collie region.	6.4
Traffic	The changes to traffic conditions during the construction and operation phases are predicted to be readily manageable by the implementation of a Traffic Management Plan and will not compromise the performance of the road network or road safety (Strategen, 2005).	6.5
Culture and Heritage	It is not expected that Aboriginal or European archaeological or ethnographic sites will be encountered in the project area. Therefore, potential impacts on significant cultural and heritage sites are unlikely.	6.6
Hazards and Public Safety	Any potential off-site risk to the public will be adequately contained within the existing buffer zone. Risk to public safety is therefore considered manageable and low.	6.7

8.2 Important Issues for the Community

A community workshop with Collie community member and key stakeholders was held to determine the issues that were considered significant by the Collie community. A ranking exercise was undertaken with the following issues being ranked in the top five in order of priority:

1) increased employment of opportunities;
2) increased water use;
3) an increase in noise;
4) an increase in the contamination of groundwater; and
5) an increase in road traffic, greenhouse emissions and gaseous emissions.

The performance and emissions of Collie B were considered generally acceptable to the community, however the community did express confusion in assessing the cumulative impacts of the project in relation to the several other proposals currently released for public review, including the Bluewaters Project and the Collie Structure Plan.

The difficulty experienced by the community in assessing cumulative impacts for the several proposals currently released for public review was the most significant issue raised during the workshop.

8.3 Conclusions

The Health Impact Assessment that has been undertaken for the expansion of the existing Collie Power Station predicts that potential adverse health impacts on the community will not be significant. It is predicted that overall benefits to the well-being of the community will result from increased employment opportunities and relevant flow-on effects.

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9. Acknowledgements

This Health Impact Statement has been primarily based on the enHealth Council Publication 'Health Impact Assessment Guidelines'. Much of the background material and HIA specific content has been sourced from this publication.

Sinclair Knight Merz acknowledges the assistance and information obtained from the Department of Health, the Collie community, proponents and Western Power.

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Appendix A Collie Health Impact Assessment Social Profile

Collie Health Impact Assessment

Social Profile

Prepared for Western Power, Griffin Energy and Collie Power Consortium

Project Managed by Sinclair Knight Merz (SKM)

November 2004

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Contents

1 Introduction

This Social Profile has been prepared for the Collie Basin Health Impact Assessment to obtain a more comprehensive understanding of the social context in which the proposed expansion of coal-fired power generation facilities in Collie would occur. This expansion is, in turn, part of the South West Interconnected System (SWIS) Power Procurement Process (PPP) for Western Power, the principal energy provider in Western Australia (WA).

This PPP consists of two phases and the decisions relating to Phase 1 have already been made. Phase 2 involves the provision of an additional 300MW to 330MW of base load capacity. To accelerate this process, Western Power received 'in principle' environmental approval for a number of potential coal or gas power station sites through the Strategic Environmental Review (SER) process. The potential coal site was an expansion of the existing Collie Power Station, located about 10km east north east of Collie.

The bidders involved in the process were also able to identify their own sites and be responsible for necessary approvals. These include:

- the Griffin Energy Bluewaters site located adjacent to the Collie Power Station; and,
- the Collie Power Consortium (Wesfarmers/J-Power) site at the Worsley Alumina Refinery.

One of these sites may be selected as the location for Stage 2 of the PPP. Prior to the commissioning of any new power station, the oldest two units of the Muja Power station will be decommissioned.

The Social Profile forms part of Task 2 in the Collie Basin Health Impact Assessment Scope of Works dated 25 August 2004 prepared by Sinclair Knight Merz. In addition to the Social Profile, Task 2 includes:

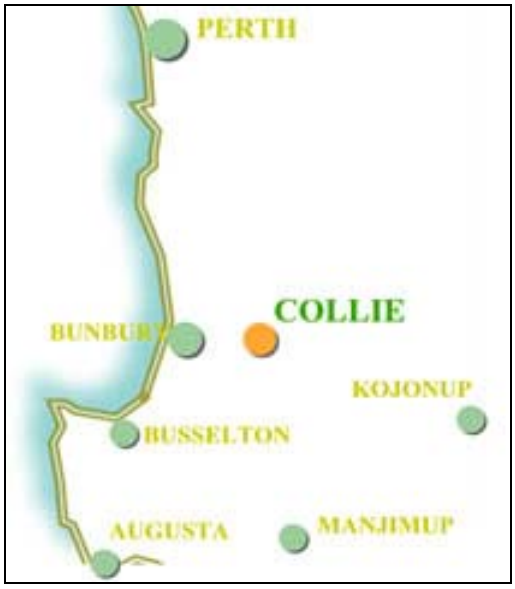
- **Random Community Survey** - To enable the identification of community attitudes and issues associated with the projects.
- **Community Information Sheet and Information Session** - Once the Social Profile and Community Survey are complete, the information will be presented to key stakeholders and interested community members through an information session.

This report presents information gained from an analysis of secondary information and provides a social context for the township and Shire of Collie. This Social Profile is structured as follows:

- Geographic Location
- Local History
- Socio-demographic Statistics
- Historical and Contemporary Development Issues
- The Proposal (Collie B)

2 Geographic Location

Collie is located approximately 200km south of Perth, and 60km west of the Port of Bunbury.



Map 1: Location of Collie *(Source: http://www.collierivervalley.org.au/about.htm)*

The climate of Collie is temperate. The annual daily maximum temperature is 22.5 °C with an average daily minimum of 8.4°C. The majority of days have temperatures less than 30°C. Average annual rainfall is 948 mm.

3 Local History

The Collie Region was originally used as pasture land and for timber production. The discovery of coal in 1883 shifted the focus of Collie's industry to coal mining and Collie was declared a townsite in 1896. Collie residents remain proud of their timber and coal mining heritage.

Underground mining ceased in 1994 and now open cut methods have been adopted within the area. The first coal fired power station was established in 1931. The Muja Power Station (A, B, C, D), was established in 1969, and the Collie Power Station (Collie A) in 1999. These power stations are still in operation within the region with the coal provided by Griffin Coal and Wesfarmers Premier Coal.

3.1 Shire of Collie

The Shire of Collie covers 1,685km², with 78% of the Shire's area consisting of state forests. Wellington Dam is also within the Shire boundaries.

The Shire President is Cr Bruce Roberts; and the current vision for the Shire is to make *"Collie a community where people want to live, visit and invest*". Their mission is to "*meet the community's expectations within the Shire of Collie by providing appropriate services and infrastructure both safely and economically. This will be accomplished through team effort and sound practice.*" The council is of a relatively

medium size for WA and has an operating revenue of $85.8 million. Full council meetings are held twice a month, specifically the second and fourth Tuesdays.

The Shire of Collie has committed to encouraging the growth and development of the region. This is pursued in their Invest Program, as part of their 2002-2007 Strategic Plan. The intent of this program is to "*support existing and assist in developing new industry*" within the area.

The Shire emphasises the regions capacity for major industrial development, and recognises that it has the only coal field located in WA. In addition, Collie is located only 60km from the Port of Bunbury and has significant access to natural water resources. The Shire's commitment to the development of the region and their significant coal resources have led to the Shire Council's support of the proposed expansion of coal-fired power generation facilities in Collie. They have formed a Power Station Task Force which is discussed in more detail in 3.1.2 below.

The tourism industry in Collie is an increasingly important part of Collie's local economy. The majority of the Shire consists of National Forest, State Forest or Conservation Parks and eco-tourism is a focus in the area. As a result, environmental conservation is particularly salient to local communities.

The Collie Western Entrance Tourism Precinct Development is a program currently aimed at recognising the natural beauty of the region, with particular interest in promoting the western entrance into the town.

Collie also boasts three "Discover Collie" tours. These were developed to showcase the attractions of Collie, particularly the natural beauty of the region.

3.1.2 Power Station Task Force

The Power Station Task Force was formed in February 2004 by the Collie Shire Council *"to unite the communities of the South West to promote the use of coal for a coal-fired base-load power station in Collie by recognising the benefits (reliability) of coal to the State as an energy fuel source".*

The Task Force is chaired by the Collie Shire Council and has the following members: South West Development Commission; Bunbury-Wellington Economic Alliance; The Griffin Coal Mining Co Pty Ltd; Wesfarmers Premier Coal Ltd; Collie Chamber of Commerce and Industry Inc; South West Chambers of Commerce and Industry Inc; Collie Miners' Union; Collie Conservation Group as well as Collie community representatives.

The Task Force has produced a document entitled "*Coal - Essential for the next base-load power station"* and has made presentations to a number of organizations.

4 Socio-demographic Statistics

This section presents an analysis of Collie's social demographics from census data collected in 1991, 1996 and 2001. Collie refers to the urban centre of Collie which consists of the Collie Township and its surrounds. To provide a State-wide perspective, the census data is compared to the 2001 data collected for the State of WA.

4.1 Key Issues

The analysis of demographic data indicates some key issues and trends in Collie. These include:

- A decline in population size since 1991;
- A high percentage of home ownership suggesting high levels of place and community attachment;
- A relatively low number of young people and the elderly compared to the number of people of working age, in comparison to the State average;
- A decline, since 1991, in the number of young people and an increase in the number of elderly in the population;
- Lower levels of schooling completed when compared to the State average;
- A high percentage of one-parent families and families without children in the population when compared to the State average; and,
- An unemployment rate of 11% in 2001 which was above the WA State average of 8%.

The following key issues are discussed in more detail:

- Population and Dwellings;
- Community Age Structures;
- Schooling Levels;
- Birthplace by Region;
- Family Composition;
- Household Income;
- Industry of Employment; and,
- Labour force Characteristics.

4.2 Population and Dwellings

The 2001 census reported that there were 8,400 persons within the Shire of Collie of which 6,995 lived in the urban centre of Collie (Collie Township). This is shown in Table 1.

Between the 1991 and 2001 census, the population of the Shire of Collie declined from 9,058 to 8,400 persons (7.3% decline in population). Aboriginal and Torres Strait Islanders comprised 2.9% of the population in 2001, which was below the State average figure of 3.2%.

There has been an increase in the number of dwellings between 1991 and 2001, which has occurred at the same time as the population has declined. This has led to a fall in the household occupancy rate from 2.9 to 2.5 people per household.

In 2001, thirty-five percent of the population in the Shire of Collie over five years of age indicated that they had lived at a different address 5 years ago and 16% indicated they lived at a different address one year ago.

Table 1. Population and Dwellings: Shire of Collie (1991–2001) and Collie (2001)

	Shire of Collie			Collie
	1991	1996	2001	2001
POPULATION				
Total persons counted	9,058	8,636	8,400	6,955
Persons in private dwellings	8,912	8,398	8,248	6,826
% in private dwellings	98.4	97.2	98.2	98.1
Total Indigenous persons	216	233	245	242
% indigenous persons	2.4	2.7	2.9	3.5
PRIVATE DWELLINGS				
Occupied	3,105	3,153	3,242	3,019
Unoccupied	326	380	351	302
Total	3,431	3,533	3,593	3,321
PERSONS PER PRIVATE DWELLING	2.9	2.7	2.5	2.3
Different address 1 year ago		na	1,238	1,115
Percent different address 1 year ago[1]		na	15.9	17.3
Different address 5 years ago		3,000	2,755	2,363
Percent different address 5 years ago[1]		37.8	35.3	36.7

Note: *Census data for Collie is for the urban centre of Collie*
'na' indicates the information is not available in the 1996 census
[1]Aged over 5 years

Source: *ABS (2001)* *Prepared by:* *EBC (2004)*

4.2.1 Housing Tenure

Table 2 indicates that both the Shire of Collie (44%) and the urban centre of Collie (42%) have a greater percentage of dwellings that are fully owned than the State average of 36%.

In the Shire of Collie, the percentage of rental households has fallen significantly between 1991 and 2001 from 27% to 20%. In 2001, both the Shire of Collie (18%) and the urban centre of Collie (20%) had fewer rental households than the 2001 WA State average of 24.9%.

Table 2. Housing Tenure, 1991 - 2001

	Shire of Collie			Collie	WA
	1991	1996	2001	(2001)	State
Fully owned	1,301	1,434	1,420	1150	249,649
	41.9	*45.5*	*43.8*	*42.4*	*35.9*
Being purchased	834	815	965	793	220,516
	26.9	*25.8*	*29.8*	*29.3*	*31.7*
Rental	839	738	586	551	172,888
	27.0	*23.4*	*18.1*	*20.3*	*24.9*
Other tenure	129	167	272	73	21,512
	4.2	*5.3*	*8.4*	*2.7*	*3.1*
Not stated				144	31,084
				5.3	*4.5*
Total occupied dwellings	**3,103**	**3,154**	**3,243**	**2,711**	**695,649**
	100.0	***100.0***	***100.0***	***100.0***	***100.0***

Source: ABS (2001) Prepared by: EBC (2004).

4.3 Community Age Structures

In the Shire of Collie between the 1996 and 2001 census, the elderly dependency ratio has increased while the child dependency ratio has fallen (Table 3). This indicates that relative to the percentage of people of working age (15-64 years), there has been an increase in the number of dependent elderly people and a decrease in the number of dependent young people (Table 3).

In 2001, the age dependency ratio for the Shire of Collie and the urban centre of Collie was lower than that for the WA State Average, suggesting relatively fewer young and elderly people dependent upon the working population.

Table 3. Community Age Structures, 1996 - 2001

	Shire of Collie			Collie	WA
	1991	1996	2001	(2001)	State
0-4 Pre-School	760	707	603	519	122,707
	8.4	*8.2*	*7.2*	*7.5*	*6.7*
5-12 Primary School	1,393	1,184	1,151	925	215,151
	15.4	*13.7*	*13.7*	*13.3*	*11.7*
13-17 High School	771	761	703	566	137,857
	8.5	*8.8*	*8.4*	*8.1*	*7.5*
18-24 Young Singles/Couples	912	706	587	509	177,231
	10.1	*8.2*	*7.0*	*7.3*	*9.7*
25-39 Young/Middle Families	2,285	1,979	1,674	1,375	407,124
	25.2	*22.9*	*20.0*	*19.8*	*22.2*
40-49 Mature Families	1,183	1,396	1,358	1,096	276,257
	13.1	*16.2*	*16.2*	*15.8*	*15.1*
50-64 Pre-Retirement	914	988	1,307	1,063	291,003
	10.1	*11.5*	*15.6*	*15.3*	*15.9*
65+ Elderly	836	904	1,003	895	204,676
	9.2	*10.5*	*12.0*	*12.9*	*11.2*
Total	**9,054**	**8,625**	**8,386**	**6,948**	**1,832,006**
	100.0	***100.0***	***100.0***	***100.0***	***100.0***
Age Dependency Ratio	45.0	42.7	41.2	41.3	46.4
Elderly Dependency Ratio	11.3	12.4	13.6	14.4	16.4
Child Dependency Ratio	33.7	30.3	27.5	26.8	30.0

Note: *The age dependency ratio is the proportion of the population (below 14 years and above 65 years) that is economically dependent for every 100 persons of working age (15-64 years).*
The elderly dependency ration is the proportion of elderly persons (above 65 years) for every 100 persons of working age (15-64 years).

The child dependency ratio is the proportion of young persons (below 14 years) for every 100 persons of working age (15-64 years).

Source: *ABS (2001)* *Prepared by:* *EBC (2004).*

4.4 Highest Level of Schooling

Table 4 shows that approximately 36% of all persons above 15 years of age in the Shire of Collie and the urban centre of Collie had completed their education at Year 10. This is a significantly more than the 27% WA State average.

Table 4 indicates that in comparison to the State average the population of the Shire of Collie and the urban centre of Collie completed much lower levels of schooling, suggesting a less educated population when compared to the State.

Table 4. Highest Level of Schooling Completed (2001 Census: Persons over 15 years)

	Shire of Collie (2001)	Collie (2001)	WA State
Year 8 or below	639	559	101,621
	10.1	*10.6*	*7.1*
Year 9 or equivalent	614	533	93,120
	9.7	*10.1*	*6.5*
Year 10 or equivalent	2,320	1,904	386,797
	36.5	*36.0*	*26.9*
Year 11 or equivalent	870	737	149,523
	13.7	*13.9*	*10.4*
Year 12 or equivalent	1,136	885	551,043
	17.9	*16.7*	*38.3*
Still at school	197	164	43,684
	3.1	*3.1*	*3.0*
Did not go to school	29	29	11,270
	0.5	*0.5*	*0.8*
Not stated	551	475	102,274
	8.7	*9.0*	*7.1*
Total	**6,356**	**5,286**	**1,439,332**
	100.0	***100.0***	***100.0***

Note: *This information not provided in the basic community profile for the 1991 and 1996 census*

Source: *ABS (2001)* *Prepared by:* *EBC (2004).*

4.5 Birthplace by Region

Table 5 indicates that 82% of all persons in the Shire of Collie and the urban centre of Collie were born within Australia. This compares to 67% for the WA State average.

Table 5. Birthplace by Region (2001 Census)

	Shire of Collie (2001)	Collie (2001)	WA State
Australia	6,905	5,701	1,241,786
	82.2	*81.9*	*67.1*
Asia	77	65	93,871
	0.9	*0.9*	*5.1*
North-West Europe	565	448	239,533
	6.7	*6.4*	*12.9*
Southern and Eastern Europe	169	155	60,454
	2.0	*2.2*	*3.3*
Oceania (excluding Australia)	124	106	47,364
	1.5	*1.5*	*2.6*
Africa and Middle East	36	26	37,644
	0.4	*0.4*	*2.0*
Americas	13	16	14,708
	0.2	*0.2*	*0.8*
Other Locations	0	3	1,670
	0.0	*0.0*	*0.1*
Not stated	496	433	94,982
	5.9	*6.2*	*5.1*
Overseas visitors	0	9	19,244
	0.0	*0.1*	*1.0*
Total	**8,399**	**6,962**	**1,851,256**
	100.0	***100.0***	***100.0***

Note: *Only 2001 census data is shown as different regional classifications were used in the 1991 and 1996 census*

Source: *ABS (2001)* *Prepared by:* *EBC (2004).*

4.6 Family Composition

In 2001, the family composition profiles of residents in the Shire of Collie and the urban centre of Collie were similar to those found in the WA State (Table 6). Since 1991 in the Shire of Collie, the number of people in families with children has declined by 13%, while the number of people in families without children has increased by 7%, as has the number of people in one parent families (6%).

Table 6. Family Composition (Persons in one family households)

	Shire of Collie			Collie	WA
	1991	1996	2001	(2001)	State
Family couples with children	5,621	4,865	4,303	3,447	869,337
	73.3	*67.7*	*62.6*	*60.6*	*61.8*
Family couples without children	1,275	1,460	1,593	1,322	334,786
	16.6	*20.3*	*23.2*	*23.2*	*23.8*
One parent families	711	793	930	875	185,449
	9.3	*11.0*	*13.5*	*15.4*	*13.2*
Other family types	65	73	49	43	18,103
	0.8	*1.0*	*0.7*	*0.8*	*1.3*
Total 1 family households	7,672	7,191	6,875	5,687	1,407,675
	100.0	*100.0*	*100.0*	*100.0*	*100.0*

Source: *ABS (2001)* *Prepared by:* *EBC (2004).*

4.7 Weekly Household Income

In the 2001 census, the Shire of Collie and the urban centre of Collie had slightly more households on low and middle household incomes when compared to the State average and slightly fewer households on high incomes when compared to the State average (Table 7).

Table 7. Weekly Household Income 2001 (Families in occupied private dwellings)

	Shire of Collie (2001)	Collie (2001)	WA State
Negative/Nil income	13	10	5,744
	0.4	0.4	0.9
$1 - $199	204	185	27,792
	6.6	7.1	4.2
Low Weekly Incomes	**217**	**195**	**33,536**
	7.0	**7.5**	**5.1**
$200-$399	667	601	104,044
	21.4	23.0	15.8
$400-$599	384	324	85,556
	12.3	12.4	13.0
$600 - $799	280	238	73,943
	9.0	9.1	11.2
$800 - $999	228	188	65,013
	7.3	7.2	9.9
Middle Weekly Incomes	**1,559**	**1,351**	**328,556**
	50.1	**51.8**	**49.8**
$1,000-$1,499	526	417	110,157
	16.9	16.0	16.7
$1,500 or more	422	329	111,425
	13.6	12.6	16.9
High Weekly Incomes	**948**	**746**	**221,582**
	30.5	**28.6**	**33.6**
Income not stated	388	318	75,990
	12.5	12.2	11.5
Total	**3,112**	**2,610**	**659,664**
	100.0	**100.0**	**100.0**

Note: There is no comparable 1996 census data from the basic community profile.
Source: ABS (2001) Prepared by: EBC (2004).

4.8 Industry of Employment

Eighteen percent (18%) of employed persons in the Shire of Collie and the urban centre of Collie were employed in mining, which is approximately five times that found in the State (4%) (Table 8).

The number of people who were employed in the provision of electricity, gas and water supply has declined since 1991. Nevertheless, in 2001, this industry maintained 6% of employed persons, which was significantly higher than the WA average of 0.3%.

Table 8. Industry of Employment (Employed Persons)

	Shire of Collie			Collie	WA
	1991	1996	2001	(2001)	State
Agriculture, Forestry and Fishing	71	79	114	69	36,674
	2.0	*2.3*	*3.6*	*2.7*	*4.4*
Mining	629	384	555	454	28,771
	17.6	*11.0*	*17.6*	*17.9*	*3.5*
Manufacturing	129	345	321	250	84,281
	3.6	*9.9*	*10.2*	*9.9*	*10.2*
Electricity, Gas and Water Supply	438	357	197	159	6,878
	12.2	*10.3*	*6.3*	*6.3*	*0.8*
Construction	86	287	180	152	61,961
	2.4	*8.2*	*5.7*	*6.0*	*7.5*
Wholesale Trade	52	58	75	64	42,305
	1.5	*1.7*	*2.4*	*2.5*	*5.1*
Retail Trade	377	398	437	363	123,049
	10.5	*11.4*	*13.9*	*14.3*	*14.8*
Accommodation, Cafes & Restaurants	115	140	132	118	38,321
	3.2	*4.0*	*4.2*	*4.7*	*4.6*
Transport and Storage	85	66	82	63	32,630
	2.4	*1.9*	*2.6*	*2.5*	*3.9*
Communication Services	11	18	23	15	12,115
	0.3	*0.5*	*0.7*	*0.6*	*1.5*
Finance and Insurance	54	50	36	34	24,121
	1.5	*1.4*	*1.1*	*1.3*	*2.9*
Property and Business Services	626	472	181	143	90,141
	17.5	*13.6*	*5.7*	*5.6*	*10.9*
Government Admin. and Defence	89	59	104	89	36,088
	2.5	*1.7*	*3.3*	*3.5*	*4.4*
Education	216	244	209	160	60,318
	6.0	*7.0*	*6.6*	*6.3*	*7.3*
Health and Community Services	237	274	260	202	79,276
	6.6	*7.9*	*8.3*	*8.0*	*9.6*
Cultural and Recreational Services	34	58	39	31	18,220
	0.9	*1.7*	*1.2*	*1.2*	*2.2*
Personal and Other Services	80	84	104	83	33,104
	2.2	*2.4*	*3.3*	*3.3*	*4.0*
Non-classifiable economic units	5	26	30	29	7,093
	0.1	*0.7*	*1.0*	*1.1*	*0.9*
Not stated	245	80	70	58	13,435
	6.8	*2.3*	*2.2*	*2.3*	*1.6*
Total	**3,579**	**3,479**	**3,149**	**2536**	**828,781**
	100.0	***100.0***	***100.0***	***100.0***	***100.0***

Source: ABS (2001) Prepared by: EBC (2004).

4.9 Labour Force Characteristics

The percentage of persons employed full-time has fallen between 1991 (70%) and 2001 (59%) and is now below the State average of 63% (as indicated in Table 9). In 2001 the unemployment rate for the Shire of Collie was 11.1% and for the urban centre of Collie was 11.5%. In 2001, these unemployment rates were both significantly higher than the WA State average of 7.5%.

Table 9. Labour Force Characteristics (Persons aged 15 years and over)

	Shire of Collie			Collie	WA
	1991	1996	2001	(2001)	State
Full-time	2,487	2,353	1,852	1,487	520,491
	69.5	*67.6*	*58.9*	*58.9*	*62.8*
Part-time	871	1,041	1,190	950	285,302
	24.3	*29.9*	*37.8*	*37.6*	*34.4*
Not stated	222	86	104	87	22,988
	6.2	*2.5*	*3.3*	*3.4*	*2.8*
Total	**3,580**	**3,480**	**3,146**	**2,524**	**828,781**
	100.0	***100.0***	***100.0***	***100.0***	***100.0***
Unemployed	412	360	394	329	67,485
Total labour force	3,992	3,839	3,543	2,850	896,266
Not in the labour force	2,468	2,447	2,548	2,205	486,740
Unemployment rate (%)	10.3	9.4	11.1	11.5	7.5

Source: ABS (2001) Prepared by: EBC (2004).

5 Services and Facilities

5.1 Education Facilities

Collie has five primary schools, namely Allanson Primary, Amaroo Primary, Fairview Primary, Collie Catholic - St Brigids Campus and Wilson Park Primary. In addition, Collie Senior High School offers classes to Year 12. The region also provides post-compulsory education facilities within the Collie TAFE Centre.

5.2 Health Services

Collie offers considerable health services including Collie Hospital (83 beds), two medical centres and two dentists. Additionally, there are Aged Care Facilities and a Child Health Centre.

5.3 Shopping Facilities

Collie has many shopping facilities including, Coles, Newmart, Target Country, approximately 60 specialty stores and four banks.

5.4 Sporting Facilities

The range of sporting options is comprehensive and valued by the Collie Community. Additionally, sporting associations address the needs of junior, senior and disabled players. Some of the sports available include, soccer, basketball, Australian Rules, shooting, motor sports, bocce and cycling.

5.5 Other Facilities

There are a number of other facilities available in Collie such as the Recreation Centre, Swimming Pool, Police and Citizens Youth Club, the Italian Club, Senior Citizens Centre, the Mine Workers Institute, and the Collie Visitors Centre.

6 Contemporary Community Issues

The Collie Mail is the Shire's community newspaper. An analysis of the 'Community Comment' section of the paper and other relevant articles has been conducted to consider what the community perceives as contemporary issues. Several themes have emerged and are presented in a Media Timeline (Table. 10). These include issues around:

- The Environment;
- The Coal Industry and the Collie Community; and,
- General Social Issues.

6.1 Environmental Issues

Environmental protection is highly valued by the Collie community. Concern for the Collie River ("Full Review Needed", August 2003; "Environmental Protection thoughts Supported", August 2003), the presence of the water weed Nardoo, and prevention of the logging of the Acadia Forest ("Know your Enemy" August 2004; Support for Bid", August 2004) have all been salient issues in the area in recent years.

6.1.2 Collie River

Concerns surrounding the sustainability of the Collie River have also been raised in the media, with word that the Ewington Weir will be removed in association with the annual release of the Harris Dam. Removal of the weir is argued to ultimately reduce the impact of water erosion. However, community concern lies in the possible safety threat it poses. There is no knowledge of the potential outcome of its removal and a full study of the river was suggested.

6.1.3 Nardoo Water Weed

Nardoo, a water weed, has been a concern for the threat it poses to native flora and fauna. The introduction of the plant into the river system has been debated due to its rapid growth potentially impacting on other plant and animal life (crustaceans, fish, animals, and reptiles) but also safety, recreation and tourism.

6.1.4 Protection of the Acadia Forest

Conservation of the Acadia Forest relates to the recent desire to convert the area into a National Forest Reserve. It is argued this will also enhance tourism in the area. The Collie Conservation Group and the Preston Environmental Group have expressed particular interest in this issue.

6.2 The Coal Industry and the Collie Community

Several matters have been raised that relate to the impact of the coal industry on the Collie community.

6.2.1 Dust and Noise

Concerns of community members surrounding the observed increase in Griffin coal dust emissions from their Ewington mine site have been raised ("Call for Action on Dust" August, 2004). Residents of Palmer Road and Wallsend Street have particular concerns regarding the increase in emissions and additional noise from the development. These implications have prompted one family to consider relocation. Despite this concern, it was noted that emissions have not exceeded regulatory levels. Griffin Coal notes that they have accomplished 70% of the Five–point–plan strategy implemented in 2002, aimed at addressing such matters.

6.3 Social Issues

The issue of shopping facilities in Collie appears quite pressing ("Bleak Appearance", July 2003). There tends to be criticism of the type and appearance of shops in Collie. Additionally, goods are perceived to be expensive and the cost of travelling to Bunbury for cheaper goods was noted ("Shopping in Bunbury" September 2003).

6.4 Media Time Line

Table 10. Media Time Line

Date of Publication	Article Title	Presenting Issue
11 July 2003	"Nardoo Problem"	*Environmental* Nardoo Weed
11 July 2003	"Prices too High"	*Social* Shopping facilities at Collie
11 July 2003	"Bleak Appearance"	*Social* Shopping facilities at Collie
11July 2003	"Shoppers view on Service"	*Social* Shopping facilities at Collie
19 August 2003	"Full Review Needed"	*Environmental* Community concern regarding the state of the Collie River
4 September 2003	"Shopping In Bunbury"	*Social* Shopping facilities at Collie
23 January 2004	"Dust Control"	*Environmental/Social* Concerns over dust emissions
12 August 2004	"Know your Enemy"	*Environmental* Protection of Acadia
16 August 2004	"Environmental protection thoughts supported"	*Environmental* Protection of Acadia
26 August 2004	"Support for Bid"	*Environmental* Protection of Acadia
9 September 2004	"Wood fire Ban Support"	*Environmental* Responsible use of wood fires
16 September 2004	"Anne's Not Alone on Smoke"	*Environmental* Responsible use of wood fires
16 September 2004	"More Jobs Needed in Collie"	*Social* Limited employment opportunities for young people

Source – local media

7 Current and Proposed Development within the Community

There is great emphasis in promoting growth in the Collie region. Some of the development projects that have been adopted or are currently being considered by the Shire include:

- Industrial Developments
- Property Investment
- Western Lakes Development
- Collie Motorplex
- Griffin Energy Proposal

7.1 Industrial Developments

In accordance with the Shire's Strategic Planning process, there has been a desire within the region to enhance its industrial potential. The Shire is being assisted by the South West Development Commission in considering the feasibility of the Collie Shotts location, a potential major industrial site.

Additionally, the development of Collie's Light Industrial Area (2km from the Collie Township) is currently being considered. This is in partnership with the Collie Chamber of Commerce.

Both projects aim to encourage investment in Collie. In addition, Griffin Energy propose to develop the Coolangatta Industrial Estate, located near the Collie township (Section 7.5).

7.2 Property Investment

Increased activity in the housing market in Collie has been noted and is seen to be associated with affordable prices of land and residency in the area. This has been encouraged by the Shire who is eager to increase the number of new community members to the region.

7.3 Western Lakes Development

The Western Lakes Development is an initiative aimed at converting a disused mining void into a water recreation ground. The proposal has been made by Wesfarmers Premier Coal and the South West Development Commission.

7.4 Collie Motorplex

The Collie Motorplex, currently in development, aims to provide the best motor sport facilities in regional WA. Conservation and Motoring South West have been involved in the project, particularly in regard to funding for the improvements.

7.5 Griffin Proposals

The Griffin Group is currently in the final stages of formal approval associated with the development of three interconnected projects, namely:

- Ewington 1 Mine Development, as proposed by the Griffin Coal Mining Company Pty Ltd;
- Bluewaters Power Station (Griffin Energy); and
- Coolangatta Industrial Estate (Griffin Energy).

The Bluewaters Power Station, to be fuelled by coal from the Ewington 1 Mine site and situated in the proposed Coolangatta Industrial Estate, is intended to supplement the current power supply infrastructure. The location of the coal source is favourable due to its close proximity to the proposed power station site.

8 Community Attitudes to Coal Fired Power Generation

A range of mechanisms were previously undertaken to involve the communities of Collie, Perth and Bunbury in the Griffin Energy proposals. These mechanisms included press releases, information brochures, presentations to local Collie community groups and several community workshops in Collie and Bunbury, which were poorly attended. In addition, the following initiatives were undertaken and have been summarised below:

- A telephone survey to ascertain Community Attitudes to Coal Fired Power Generation;
- Community Consultation regarding the Bluewaters Power Station proposed for Coolangatta Industrial Estate and potential health issues associated with these developments; and,
- A Social and Economic Impact Assessment

8.1 Telephone Survey

A telephone survey was conducted by the Australian Research Group from June 24-29 2004. The survey consisted of 400 randomly selected interviews including 200 from the Perth population and 200 from Bunbury and Collie.

The survey focussed on the following relevant issues:

- Community perceptions of coal as an energy source;
- Attitudes regarding power shortages; and
- Awareness of the proposed Bluewater Power Station.

These will be discussed in turn.

8.1.1 Community Perception of Coal as an Energy Source

The survey found differences in the perception of coal between Collie and Perth. The perceptions of coal as an energy source were more positive in Collie than in Perth. Collie residents viewed coal as providing more employment for WA. However, there was a general preference for gas energy generation in Perth. Respondents in Perth also conveyed environmental concerns associated with the generation of greenhouse gas emissions from coal burning.

An earlier survey was undertaken in 2002, and this enabled certain trends to be observed. Questions were asked about the preference for coal or gas for electricity

generation in the 2002 and 2004 surveys. There has been a strong increase in the preference for coal for electricity generation, from 32% in 2002 to 45% in 2004 in the Bunbury/Collie region. The preference for coal in Bunbury and Collie tends to reflect employment opportunity generated by coal mining for energy production.

The survey also found that the community perceptions of coal as an energy source were poor, and that the majority of respondents felt that natural gas provided cheaper electricity. Such perceptions were consistent with consultation in 2002. Despite this observation the majority of individuals interviewed thought that there should be a reduction in gas usage, with 95% arguing that there should be an incorporation of both coal and gas for energy generation.

8.1.2 Attitudes regarding Power Shortages

The power shortages of February 2004 prompted questions about people's attitudes towards power shortages. These included:

- *Power shortage as a community issue*
- *Major community concerns regarding power shortages*
- *Attitudes towards the acceptability of power shortages*

The survey found that the power shortages of February 2004 were gradually becoming less of a community issue. Ninety four percent (94%) of respondents were aware of the shortages that occurred, but were unable to identify the specific date that the shortages occurred (18 February 2004). When asked about the possible causes of the shortages, a wide range of suggestions were made.

There was overwhelming concern for the impact of power shortages on more vulnerable groups in society. Business was deemed the most affected by shortages. This was followed by the impact on the elderly, residents, hospitals, schools, babies and young children.

Seventy-five percent of respondents deemed power shortages as unacceptable. Fifty percent stated that they expected that another shortage would occur. Only a third of those interviewed were aware that the government were taking action to address the matter. Furthermore, only 8% knew of the proposal for the new power station.

8.2 Community Consultation regarding the Bluewaters Power Station

The Collie and Bunbury communities were consulted to scope their perception of the proposed development of the Bluewaters Power Station, the Coolangatta Industrial Estate and associated attitudes towards health issues.

8.2.1 Attitudes towards the development of Bluewaters Power Station

Workshops in June 2004 were conducted in Bunbury and in Collie to consider community attitudes regarding the proposed development. Findings from the consultation suggested that community members have environmental concerns regarding the possible environmental impact of the Power Station. Issues of water management took precedence, with concerns regarding the impact on the Collie River, wetlands and the future impact on the Collie Basin. Additionally, Griffin's strategy for addressing Greenhouse gas emissions was queried in regard to the measures to be adopted.

Generally, there was positive feedback regarding the proposed development, with particular interest in the possibility of employment opportunities in the region.

8.2.2 Coolangatta Industrial Estate

The Griffin Group has expressed interest in the development of an energy intensive industrial estate to be located on 420 hectares of cleared Griffin-owned land in Collie. Griffin Energy has adopted several strategies to raise awareness in the community regarding the parks development. These strategies included pamphlet deliveries to households and key stakeholders, press releases, information posted on the company website, a display hosted at the Royal Show 2003, personal interviews with stakeholders and two community workshops.

8.2.2.1 Consultation Findings

Eighty five percent (85%) of the 53 responses supported the industrial estate. Favourable aspects included the generation of employment in Collie, the rezoning of land in the area, the need for industry in Collie and the South West, and assistance in the long term viability of Collie.

Some community members expressed concerns over the proposed development. For instance, social concerns related to the proximity of industry to residential areas, associated health implications with new industry, and the impact of increased traffic flow. Environmental concerns focussed on water issues. The water source for industry, and water purification and management were considered critical aspects. Pollution, disposal of waste and land clearing were also raised. Economic concerns related to the impact of the estate on associated land values.

8.2.3 Industrial Development and Health Issues

A workshop was conducted in December 2003 to consider health issues regarding the proposed developments. Outcomes of the consultation indicated that community members had no major health concerns related to the development of the Power Station.

8.2.4 Ewington Mine Consultation

Consultation with community members regarding the Ewington mine site is an ongoing but relatively unstructured initiative by the Griffin Group that has occurred since August 1991. Consultation regarding the proposed development of Ewington 1 commenced in July 2001 when a public meeting was held to convey information regarding potential impacts associated with the new development.

Most recent consultation was conducted on 9 June 2004. Issues that arose from this meeting are:

8.2.4.1 Social Issues

The issue of dust was of particular concern, particularly during the summer months. Monitoring of dust and noise impacts was queried, and questions regarding the public availability of monitoring results were raised. Blasting was also noted as an impact on the community, with particular residents reporting blasting impacts as regular occurrences. The impact on property value was also raised.

8.2.4.2 Industry-related Concerns

Some community members raised questions regarding the nature of the mine itself. Specifically there was interest as to why open cut was favoured over underground mining options. Additionally, the life of the mine was questioned. Community members requested information regarding reporting of complaints and it was also noted that the exact location of the buffer zone appears ambiguous.

8.2.4.3 Environmental Issues

Environmental matters related to land clearing associated with the development. Some residents provided suggestion of possible pre existing transport routes that could be adopted that may lessen the environmental and social impact of increased industrial traffic.

8.3 Social and Economic Impact Assessment for Coal-fired Power Stations

In 2002, Griffin commissioned ACIL Tasman to conduct a Social and Economic Impact Assessment on the potential impact of a 400MW coal fired power station. This was updated to account for the potential construction and operational impact of the Bluewaters Power Station. Stakeholders from Local and State Governments, Industry and various associations were interviewed. Findings of the consultation suggested that the proposed Power Station would aid in securing the long term sustainability of Collie by generating training, development and employment opportunities, while encouraging an increased use of social infrastructure.

9. Conclusion

This Social Profile provides a social context for the proposed expansion of coal-fired power generation facilities in the Collie Basin. It has reviewed local history, social demographics, contemporary issues and developments and has outlined previous community consultation undertaken by the Griffin Group. These activities have suggested several key findings regarding the attitudes of Collie community members towards the proposed developments. These include:

- *Favourable attitude towards proposed development*: The community appear generally in favour of the proposed development projects and tend to respond favourably to growth in the region. This is likely to be influenced by the possibility of employment generation associated with the development and eventual operation of the proposed projects.
- *Concern for environmental impacts*: Issues in the community appear to reflect concern for environmental conservation. Apprehension regarding development tends to be grounded in fears associated with possible environmental impacts.
- *Current concerns to be considered*: Current issues associated with dust, noise and blasting associated with pre existing mines were raised as concerns. The potential impact of such issues related specifically to the proposed Ewington 1 mine development, however such impacts need to be considered cumulatively.

In addition, this analysis has provided several recommendations for more efficient community engagement in the future.

- *Clear strategy and framework*: To date, consultation has been conducted sporadically and by various groups. A clear strategy should be developed to ensure future consultation is consistent, structured and responsive to the community and its issues.
- *Identification and involvement of Key Stakeholders:* Key stakeholders need to be identified and involved in the process. Particular attention needs to be made to address community groups, as previous consultation appears to have focussed primarily on government and industry.

- *Low level of community interest:* Despite previous consultation efforts, the community appears relatively apathetic to participating in consultation processes, as indicated by poor response rates. This must be taken into account when interpreting the findings from consultative efforts. In light of this, it appears that a strategy should be developed to consider what methods of consultation are most effective within the community. It appears that telephone surveying was the most successful method (400 respondents interviewed in 5 days) and outlined a range of general community attitudes to coal fired power generation.

Appendix B Collie Community Attitude Survey

Collie Basin Health Impact Assessment Survey

Prepared for Western Power, Griffin Energy and Collie Power Consortium

Project Managed by Sinclair Knight Merz (SKM)

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EXECUTIVE SUMMARY

A telephone survey was undertaken of 350 households in the Shire of Collie, which examined community attitudes and beliefs in relation to the establishment of a new coal fired power station in the Collie area.

The survey included questions which identified (a) community awareness and knowledge of the proposal to establish a coal fired power station, (b) attitudes and beliefs about current air quality and the impacts of existing power stations on family, community and environment, (c) attitudes and beliefs about the impacts of any new coal fired power station on air quality and impacts to family, community and environment and (d) the social and demographic characteristics of respondents.

An analysis of the social and demographic characteristics of respondents indicated relatively strong attachment to community and place, with 50% of respondents living at their current address for over 30 years and 40% living most of their life in the Collie Shire. There were also strong work associations with the coal and power industries in the area, with 72% of respondents and family members of respondents having worked or currently working in the coal and power industry.

Awareness and Knowledge of the Proposals
Awareness of proposals to establish a coal fired power station in the Collie area was high, with 93% of respondents aware of the proposal. However, while awareness of the proposal was high, only 10% of all survey respondents indicated they had any specific knowledge of the proposal. Amongst those who indicated they had some knowledge of the proposal, the most common knowledge reported was in relation to the generating capacity of the proposed power station (300MW), that multiple companies were involved in the proposals and the geographic location of the proposed power station.

Beliefs about Air Quality
Eighty-one percent of respondents indicated they did not experience the effects of air pollutants at their current address, with only 7% of respondents indicating the current health risk of air pollutants to be high or moderate. The most frequent type of air pollutants identified were dust, smoke and flyash. Open cut coal mines, Muja Power station and the Worsley Alumina Refinery were believed by many respondents to be the primary source of these air pollutants.

Seventy percent of respondents believed that with the establishment of a new coal fired power station the health risks from air pollutants would remain the same. Twelve percent indicated the risks would increase and 8% indicated the health risks would decrease.

Impacts of Power Stations
Several questions in the survey focussed on identifying impacts associated with existing power stations in the Collie area. When respondents were asked to freely identify any impacts from existing power stations no significant impacts were identified. In addition, when provided with a list of nine potential impacts of existing power stations in the area, the majority of respondents indicated they were ‘not concerned’ about these impacts. A number of respondents indicated they were currently ‘very concerned’ or ‘somewhat concerned’ about greenhouse gas emissions (24%), the contamination of groundwater (19%), the contamination or rivers and wetlands (18%) and the discharge of water to the ocean (18%).

Community beliefs about future impacts associated with any new power station in the area focussed on the regional benefits associated with a new power station, with the two most frequently reported impacts being that it would provide employment (90%) and that it would support local businesses and the local economy of the region (74%).

Over 80% of respondents could not identify any new impacts to their family, community or environment from the operation of a new coal fired power station in the Collie area. Where impacts were identified these were frequently positive impacts associated with employment opportunities and local economic growth.

Beliefs about Health Risks

The majority of respondents (58%) indicated there were no health risks to themselves or their family from existing power stations in the area; 35% indicate there were minor or slight health risks and 7% indicated a high or moderate health risk.

A similar pattern emerged in relation to beliefs about the future health risks of a new power station in the Collie area, with 63% indicating no health risks; 32% indicating there was a minor or slight health risk and 4% indicating a high or moderate health risk.

Beliefs about current and future health risks from power stations were found to be highest amongst the younger people in the population and amongst those families with children.

In addition those in the community who believed they had little control over environmental health issues were also more likely to report higher current and future health risks associated with power stations in the Collie area.

Community Consultation

Respondents were provided with a list of procedures that could be used in informing the community about new power stations that might be developed in the area and were asked to identify which procedures they would prefer to be used. Respondents indicated their first preference was to inform the local community through ‘information in the local newspaper’ (45%) and their second preference was for a ‘letterbox drop of information’ (30%).

1. INTRODUCTION

This report describes the findings of a survey of community attitudes towards the establishment of additional coal fired power stations in the Collie area. The report identifies and assesses current community beliefs about air quality and the impacts of existing power stations on family, community and environment. Similarly, beliefs about the potential impacts of new power stations that may be developed in the Collie area are also assessed.

2. SURVEY METHODOLOGY

A household telephone survey was undertaken between Saturday the 6th of November and Sunday the 14th of November 2004. Surveys were undertaken during the day, on weekends and after 6.00 p.m. in the evenings during weekdays.

Using the digital White Pages directory (May 2004), all listed household telephone numbers from postcode 6225, which approximates the Shire of Collie, were identified. All telephone numbers were sorted into a random order and five interviewers worked sequentially throughout the list of all phone numbers in contacting households and obtaining 350 completed questionnaires.

Table 1 shows the survey response rate and call profiles. Of the 1,241 telephone numbers that were called 350 (28%) interviews were completed. The effective response rate indicates that of those households who were able to be contacted, 83% completed interviews. Sixty-six percent of phone numbers were unanswered after three attempts or the phone number was unconnected or had an answering machine attached.

Table 1. Survey Response and Call Profile

Response	Count	Percent
Completed questionnaires	350	28.2
Effective response rate		*83.1*
Refusal	71	5.8
Non-English speaking person	0	0.0
No answer, no connection or answering machine	820	66.1
Total Telephone Call Attempts	**1,241**	**100.0**

Note: Reasons for refusals include 'uninterested', 'live too far away', 'no time', 'shift worker' and 'no issues'.
No answer includes no answer after three call attempts
No connection includes phone engaged, facsimile connection, no connection or a business phone number.
Source: EBC - Coakes Consulting (2004).

Interviewers were instructed to complete only those interviews where the respondent was over 15 years of age. Where there was no answer on the first telephone call interviewers were instructed to call the household again on two separate occasions in an attempt to interview respondents at the household.

A survey of 350 households is of sufficient size that there is minimal sampling error in making generalisations from the sample to the population of interest. For example, when a 'yes' or 'no' response is required to a specific question and assuming 50% of respondents within a sample of 350 responded 'yes' and the remaining 50% responded 'no', this would yield a standard error of 0.026. In other words, if 50% of the

sample responded 'yes' to a specific question, we would be 95% confident that the true value in the population from which the sample was drawn would be between 44.8% and 55.2%.

Proportions that are higher or lower than 0.50 yield correspondingly lower standard errors. For instance, if 80% of respondents within a sample of 350 responded 'yes' to a specific question, we would be 95% confident the true value in the population from which the sample was drawn would be between 75.8% and 84.2%.

2. QUESTIONNAIRE

The questionnaire included questions which identified (a) community awareness and knowledge of the proposals, (b) attitudes and beliefs about current air quality and impacts to family, community and environment, (c) attitudes and beliefs about the impacts of the proposals on air quality, family, community and environment and (d) questions related to the social and demographic characteristics of respondents.

The questionnaire was introduced to potential survey respondents by stating:

> "Hello, my name is..... We are undertaking a survey of the local community on behalf of Wesfarmers and Griffin, who are separately seeking approval to possibly construct additional coal-fired power stations in the Collie area. Each company will have their individual proposals but have joined together in undertaking a survey of residents to better understand people's attitudes towards additional coal-fired plants in the Collie area. The survey is required as part of the approval process for the possible developments".

The first part of the telephone interview focussed on identifying and assessing community beliefs about the impacts from existing power stations. The second part of the interview focussed on addressing community beliefs about the impacts from any new coal fired power station established in the Collie area. Immediately prior to commencing the second part of the questionnaire, a description of the proposals for an additional power station in the Collie area was provided. This stated:

> "A coal fired power station of about 300 megawatts may be developed in the Collie region. This may be as an expansion of the existing Collie Power Station, located about 10km east north east of Collie or be constructed at other sites proposed by Griffin, such as Bluewaters located adjacent to the Collie Power Station and that proposed by Wesfarmers at the Worsley Alumina Refinery. Prior to any new power station being developed, the oldest units of the Muja Power station will be decommissioned."

4. RESPONDENT CHARACTERISTICS[1]

The ages of survey respondents are presented in Table 2. The age range was from 15 to 90 years. Percentages associated with each of the age categories are also shown for the 2001 census. Compared to the 2001 census, the 15-19 year age group within the sample has been undercounted and the 60-64 year age group has been over counted. In all other instances survey percentages for each of the age categories are within plus or minus 5% of the 2001 census age categories.

Table 2. Age of Respondents

Response	Sample Frequency	Percent	ABS (2001) Census	Survey-Census Difference
15-19	10	2.9	9.6	-6.7
20-24	6	1.7	6.3	-4.6
25-29	9	2.6	7.7	-5.1
30-34	25	7.2	9.2	-3.0
35-39	34	9.8	9.5	+0.3
40-44	36	10.3	10.8	+0.5
45-49	40	11.5	10.5	+1.0
50-54	32	9.2	9.4	-0.2
55-59	39	11.2	6.4	+4.8
60-64	40	11.5	4.7	+6.8
65-69	27	7.8	4.5	+3.3
70-74	20	5.7	3.7	+2.0
75-79	9	2.6	3.7	-1.1
80+	21	6.0	3.9	+2.1
Total Respondents	**348**	**100.0**	**100.0**	

Note: ABS Census data based on the Shire of Collie.
The mean age was 51.9 years and the standard deviation 16.2.
Two individuals did not provide their age.
Source: EBC (2004).

Table 3 indicates that 43% of the sample consisted of males and 57% were females. A comparison with Australian Bureau of Statistics census data for 2001 indicates gender profiles for the sample to be within 8% of population counts.

Table 3. Sex of Respondents

Response	Sample Frequency	Percent	ABS (2001) Census	Survey-Census Difference
Male	149	42.6	50.6	-7.7
Female	201	57.4	49.4	+7.7
Total Respondents	**350**	**100.0**	**100.0**	

Note: ABS Census data based on the Shire of Collie.
Source: EBC (2004).

[1] *Table percentages may not always ad to 350 due to some respondents no wishing to respond to the question or indicating they are unwilling to answer the question*

Table 4 shows that although 14% of sample had been resident at their current address for less than five years, approximately 50% of the sample had been resident at their current address for more than 30 years, suggesting relatively long term attachment to community and place.

Table 4. "How long have you lived at your current address?"

Response (Years)	Frequency	Percent	Cumulative Percent
1-5	47	13.6	13.6
6-10	29	8.4	22.0
11-15	23	6.7	28.7
16-20	26	7.5	36.2
21-25	18	5.2	41.4
26-30	32	9.3	50.7
31-35	23	6.7	57.4
36-40	21	6.1	63.5
41-45	17	4.9	68.4
46-50	28	8.1	76.5
51-55	26	7.5	84.0
56-60	23	6.7	90.7
61+	32	9.3	100.0
Total Respondents	**345**	**100.0**	

Source: EBC (2004).

Further evidence of long term association with community and place is also shown in Table 5, where 40% of the sample were found to have been resident at their current address for most of their life.

Table 5. Age and Length of Residence

Length of Residence in the Shire		Frequency	Percent
Life	(within 5 years of birth)	138	40.2
Childhood	(6-15 years of age)	27	7.9
Adult	(16 years of age and over)	178	51.9
Total Respondents		**343**	**100.0**

Source: EBC (2004).

Table 6 also shows high levels of home ownership amongst residents. With long term residence in the area (Tables 4 and 5), this further emphasises the relatively strong sense of attachment and association to the local community and place.

Table 6. "Do you rent or own your home?"

Age (Years)	Frequency	Percent
Own (inc. mortgage)	310	89.6
Rent	36	10.4
Total Respondents	**346**	**100.0**

Source: EBC (2004).

Eighty-three percent of respondents indicated they were not currently working in the coal industry or at a power station (Table 7). Table 7 also shows 6% of respondents were currently working at a power station and 10% identified themselves as currently working in the coal industry.

Table 7. "Do you currently work at a power station or for the coal industry?"

Locality	Count	Percent
No	290	83.3
Power station	22	6.3
Coal industry	36	10.3
Total Respondents	**348**	**100.0**

Source: EBC - Coakes Consulting (2004).

In relation to both current and past employment in the coal or power industries, Table 8 shows that a third of all respondents (35%) indicated they were either currently working in either of these two industries or had worked in these industries in the past.

Table 8. "Have you worked in the past at a power station or for the coal industry?"
(Includes current and past employment)

Locality	Count	Percent
No	218	62.6
Power station	54	15.5
Coal industry	66	19.0
Both coal and power industry	10	2.9
Total Respondents	**348**	**100.0**

Source: EBC - Coakes Consulting (2004).

Further evidence of family level associations with the coal and power industries is also shown in Table 9 where 72% of all respondents indicated that they or family members living with them had worked in the power or coal industries.

Table 9. "Have you or any family members living with you worked at a power station or in the coal industry?"

Locality	Count	Percent
Yes	252	72.0
No	98	28.0
Total Respondents	**348**	**100.0**

Source: EBC - Coakes Consulting (2004).

5. AWARENESS AND KNOWLEDGE

Table 10 shows that 93% of all respondents were aware of proposals to develop an additional coal fired power station in the Collie area.

Table 10. "Were you aware that there were proposals to develop an additional coal fired power station in the Collie area?"

Response	Count	Percent
Yes	326	93.4
No	23	6.6
Total Respondents	**349**	**100.0**

Source: EBC - Coakes Consulting (2004).

Those respondents who indicated they were aware of the proposals (Table 10) were also asked if they knew anything specific about the proposals. Table 11 indicates that only 10% of these respondents indicated they knew anything specific about the proposals.

Table 11. "Do you know anything specifically about these proposals?"

Response	Count	Percent
Yes	31	9.5
No	294	90.5
Total Respondents	**325**	**100.0**

Note: Based on only those respondents who were aware of the proposal (Table 10)
Those respondents who reported it was 'coal fired' were excluded as this information was provided in the question (see Table 10)
Source: EBC - Coakes Consulting (2004).

Amongst those respondents who indicated they knew specific information about the proposals, Table 12 shows respondent knowledge focussed on it being a 300MW power station and that there were multiple companies involved in the development process. In addition much of the specific information reported about the proposals also focussed on potential locations for the power station.

Table 12. "What do you know about these proposals?"

Response	Count	Percent
300MW power station	6	21.4
Multiple companies involved	6	21.4
At old Bluewater's site	4	14.3
Waiting for approval	3	10.7
At existing Collie power station site	2	7.1
Out by other power station	2	7.1
Will provide employment	2	7.1
Better technology	1	3.6
Choosing coal over gas	1	3.6
Conforms to environmental standards	1	3.6
Joining forces and making it bigger	1	3.6
More efficient	1	3.6
Same size as power station already built	1	3.6
Tenders for electricity	1	3.6
Total Respondents	**28**	**100.0**

Note: Based on only those respondents who indicated they knew something specific about the proposals (Table 11)
Source: EBC - Coakes Consulting (2004).

All respondents were asked to score their knowledge of coal fired power stations on a scale of one (1) to ten (10), with one indicating no knowledge and ten indicating all possible knowledge a person could have. Table 13 shows the distribution of scores on this scale.

Forty-six percent of respondents self assessed their knowledge of coal fired power stations by giving themselves a score of six or higher, indicated they believed themselves to be reasonably knowledgeable about these power stations.

Table 13. "If you were to give yourself a score from one to ten in relation to how much knowledge you have of coal fired power stations, what score would you give yourself?"

Response	Count	Percent
1 (Low knowledge)	22	6.3
2	15	4.3
3	27	7.7
4	38	10.9
5	87	24.9
6	33	9.4
7	35	10.0
8	44	12.6
9	34	9.7
10 (High knowledge)	15	4.3
Mean	5.6	
Standard Deviation	2.4	
Total Respondents	**350**	**100.0**

Source: EBC - Coakes Consulting (2004).

There was no relationship between self assessed knowledge and age, however males were found to have a higher self assessed knowledge score (mean=6.8) when compared to females (mean=4.8)[2].

In addition, Table 14 and Figure 1 show a significant difference in self assessed knowledge scores between those who currently or had previously worked in the power and coal industries and those who had not worked in these industries.

Table 14. Self Assessed Knowledge of Coal Fired Power Stations and Current or Previous Employment in the Power or Coal Industry

	No Previous Employment In the Industry		Pervious Employment in the Industry	
Response	Count	Percent	Count	Percent
1 (Low knowledge)	20	9.2	2	1.5
2	14	6.4	1	0.8
3	23	10.6	4	3.1
4	30	13.8	7	5.4
5	67	30.7	19	14.6
6	18	8.3	15	11.5
7	21	9.6	14	10.8
8	15	6.9	29	22.3
9	8	3.7	26	20.0
10 (High knowledge)	2	0.9	13	10.0
Mean	4.8		7.1	
Standard Deviation	2.1		2.1	
Total Respondents	**218**	**100.0**	**130**	**100.0**

Note: There is a significant difference in the mean scores, F(1,346)=100.0,p<.001
Source: EBC - Coakes Consulting (2004).

[2] *A statistical test of significance between the mean shows males and females differed significantly in knowledge scores, F(1,348)=76.6, p<.001.*

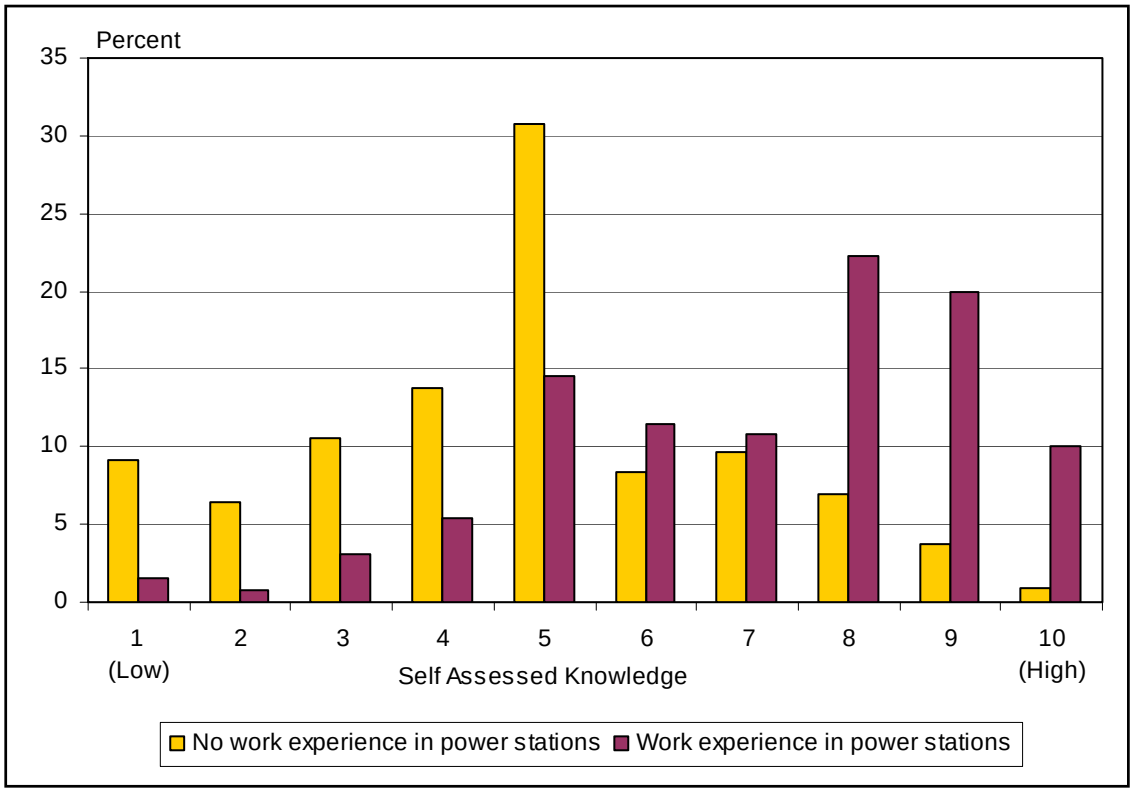

Figure 1. Self assessed knowledge and work experience in the coal industry and power stations

6. COMMUNITY BELEIFS ABOUT AIR QUALITY

Community beliefs about air quality were assessed in relation to what the respondents currently experienced and what they believed may be experienced given the development of a proposed power station in the Collie area.

6.1 Current Beliefs about Air Quality

Table 15 shows that 19% of all respondents reported having experienced the effects of air pollutants at their current address.

Table 15. "Have you or your family ever experienced the effects of air pollutants at your current address?"

Response	Count	Percent
Yes	66	18.9
No	284	81.1
Total Respondents	**350**	**100.0**

Source: EBC - Coakes Consulting (2004).

Amongst all respondents, only 7% judged the health risk from air pollutants to themselves or their family as either high or very high (Table 16). The majority (81%), also indicated in Table 15, reported that they did not currently experience air pollutants at their current address.

Table 16. "How would you rate the health risks from air pollutants in the area to yourself and your family?"

Response	Count	Percent
High	6	1.7
Moderate	17	4.9
Minor	9	2.6
Slight	24	6.9
No risk	10	2.9
No experience of air pollutants	284	81.1
Total Respondents	**350**	**100.0**

Source: EBC - Coakes Consulting (2004).

Amongst those who indicated they experienced the effects of air pollutants, 61 respondents indicated they could identify the type of air pollutants they had experienced. As shown in Table 17, the most common type of air pollutant reported was dust, followed by smoke and flyash.

Table 17. Type of air pollutants experienced and level of concern

	Level of Concern								No Experience of Pollutants	
	Very Concerned		Somewhat Concerned		Minor Concern		Not Concerned			
	Count	%	Count	%	Count	%	Count	%	Count	%
Dust	9	2.6	9	2.6	11	3.1	3	0.9	318	90.9
Smoke	4	1.1	0	0.0	7	2.0	1	0.3	338	96.6
Flyash	2	0.6	1	0.3	5	1.4	0	0.0	342	97.7
Carbon Monoxide	0	0.0	1	0.3	3	0.9	1	0.3	345	98.6
Sulphur dioxide	0	0.0	1	0.3	3	0.9	1	0.3	345	98.6
Oxides of Nitrogen	0	0.0	1	0.3	0	0.0	1	0.3	346	98.9
Wood smoke	0	0.0	1	0.3	0	0.0	1	0.0	348	99.4
Acid	1	0.3	0	0.0	0	0.0	0	0.0	349	99.7
Alumina	1	0.0	0	0.0	0	0.0	0	0.0	349	99.7
Car/Truck exhaust fumes	0	0.0	1	0.0	0	0.0	0	0.0	349	99.7
Coal dust and soot	0	0.0	1	0.3	0	0.0	0	0.0	349	99.7
Insecticides	1	0.3	0	0.0	0	0.0	0	0.0	349	99.7

Note: The responses to this question were obtained through free recall.
Source: EBC - Coakes Consulting (2004).

Table 18 shows that respondents believed the three most common sources of air pollutants to be the 'open cut mines in the area', Muja power station and Worsley alumina refinery.

Table 18. "What do you think are the main sources of these air pollutants in the local area?"

Response	Count	Percent of all Respondents Experiencing Air Pollutants	Percent of all Respondents
Open cut mines in the area	20	32.8	5.7
Muja power station	18	29.5	5.1
Worsley alumina refinery	16	26.2	4.6
Bushfires	14	22.9	4.0
Wood heaters in houses	9	14.8	2.6
Collie power station	8	13.1	2.3
Other sources	7	11.5	2.0
Total Respondents	**61**	**100.0**	**100.0**

Note: Other sources included with a frequency with one and included 'dust from trucks', char plant, crop spraying, car and truck exhausts and prescribed burns.
The responses to this question were obtained through free recall.
This is a multiple response table, where all rows of the table are independent.
Source: EBC - Coakes Consulting (2004).

6.2 Future Perception of Air Quality

After having described the proposal for a new power station in the Collie area (see Section 3), all respondents were asked what changes they believed might occur in the health risk from air pollutants. Table 19 shows that 70% of respondents believed that with the development of a new power station in the area the health risks would 'remain the same'. Only 12% of respondents believed the health risks from any future power station would increase.

Table 19. "With a new coal fired power station in the area, would you say the risks to you or your family from air pollutants would increase, decrease or remain the same?"

Response	Count	Percent
Increase	42	12.0
Remain the same	244	69.7
Decrease	27	7.7
Don't know	37	10.6
Total Respondents	**350**	**100.0**

Source: EBC - Coakes Consulting (2004).

Of the 42 (12%) respondents who believed there would be an increase in the risk from air pollutants, only 16 (38%) respondents in a free recall[3] format could identify the type of pollutants which they believed would create an increase in risk to themselves and their family. As shown in Table 20 the most common form of air pollutant reported was 'dust'.

Table 20. "What type of pollutants would they be?"

Response	Count	Percent
Dust	10	62.5
Carbon monoxide	4	25.0
Oxides of nitrogen	2	12.5
Sulphur dioxide	2	12.5
Coal dust/soot	2	12.5
Flyash	1	6.3
Greenhouse gas emissions	1	6.3
Emissions	1	6.3
Impurities in the air	1	6.3
Total Respondents	**16**	**100.0**

Note: The responses to this question were obtained through free recall.
This is a multiple response table, where all rows of the table are independent.
Source: EBC - Coakes Consulting (2004).

[3] *A 'free recall' format is one in where the response categories are not provided and the question is left open-ended.*

7. IMPACTS FROM EXISTING AND FUTURE POWER STATIONS

Survey respondents were asked to identify and assess impacts in relation to existing power stations in the Collie area and in relation to any future power station developed in the area.

7.1 Beliefs about Current Impacts

When asked in a free recall format to identify any impacts from the operation of power stations which were experienced by themselves or their families, only one respondent indicated they currently experienced impacts from the operation of power stations in the area (the impact was reported as coal dust).

In addition to providing an opportunity for respondents to identify potential impacts in a free recall format, nine potential impacts were described to each respondent and they were asked to identify the level of concern they had about each impact on the local community and environment.

Table 21 again indicates that the majority of respondents were either 'not concerned' about these impacts or had only a 'minor concern' in relation to the impacts. As identified in Table 21 and Figure 2 most concern was expressed in relation to environmental impacts, including those associated with the impact of greenhouse gases and the contamination or rivers, wetlands and groundwater.

Table 21. "In relation to existing power stations in the area, how concerned would you say you are about the following potential impacts in relation to their impact on the local community and environment…?"

	Very Concerned		Somewhat Concerned		Minor Concern		Not Concerned	
Impact Statement	Count	%	Count	%	Count	%	Count	%
Greenhouse gas emissions	37	10.6	46	13.1	76	21.7	181	51.7
The contamination of rivers and wetlands	36	10.3	28	8.0	77	22.0	202	57.7
The contamination of groundwater	36	10.3	32	9.1	69	19.7	207	59.1
The discharge of waste water to the ocean	28	8.0	33	9.6	58	16.6	225	64.3
The discharge of emissions in the air	14	4.1	14	4.1	83	24.1	233	67.7
Hazardous materials stored at the power station	20	5.7	26	7.4	53	15.1	241	68.9
The visual appearance of the environment	11	3.1	16	4.6	34	9.7	280	80.0
Noise from the operation of the power station	3	0.9	7	2.0	29	8.3	309	88.3
Noise from the transport of materials to and from the power station	9	2.6	7	2.0	22	6.4	307	89.0
Use of water by the power station[1]	3	0.9	2	0.6	0	0.0	345	98.6

Note: [1]*This impact statement was obtained in a free recall format.*
Source: *EBC - Coakes Consulting (2004).*

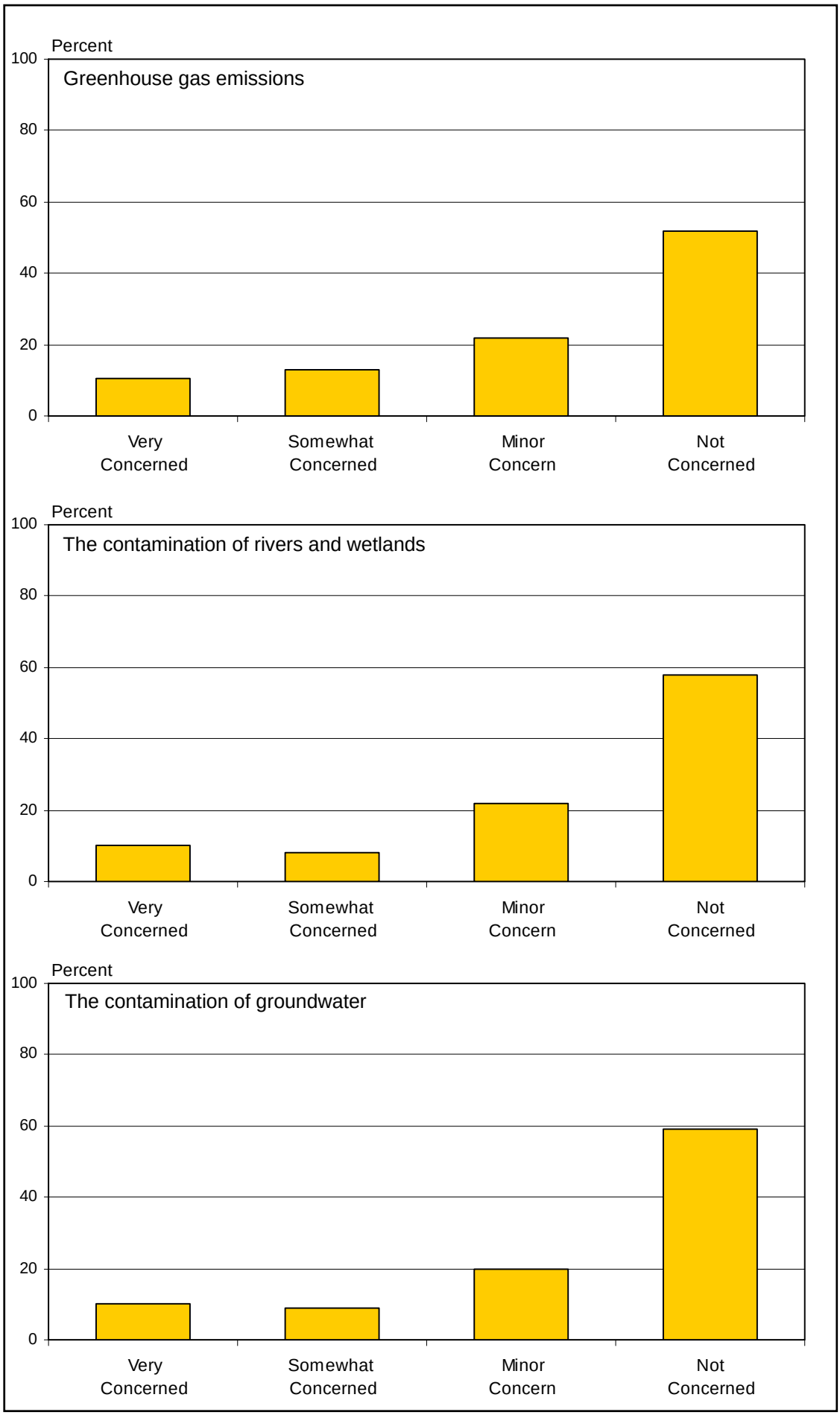

Figure 2. Beliefs about impacts from existing power stations

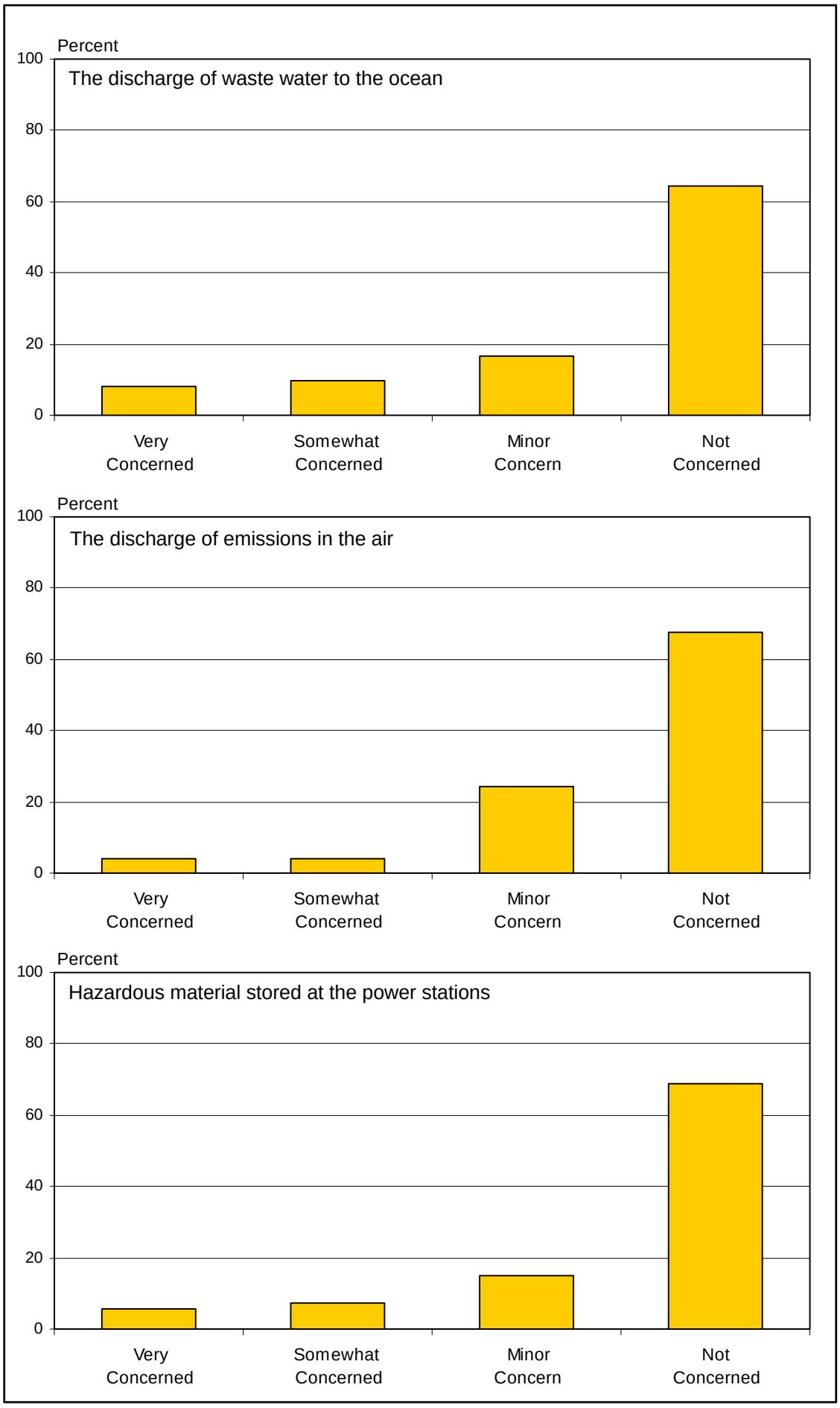

Figure 2 (continued). Beliefs about impacts from existing power stations

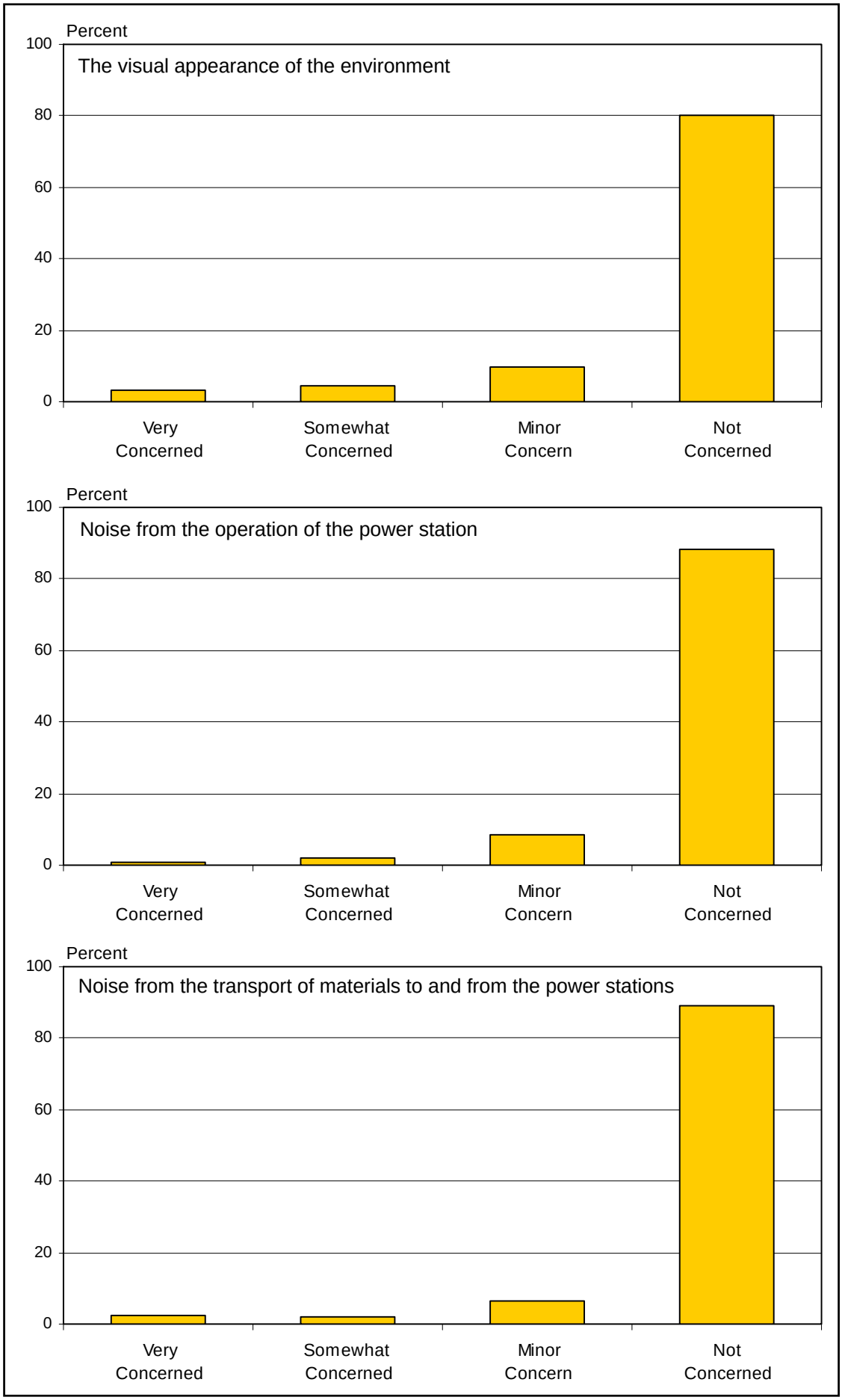

Figure 2 (continued). Beliefs about impacts from existing power stations

7.2 Beliefs about Future Impacts

After presenting respondents with a description of the proposal, as described in Section 3, all respondents were asked in a free recall format to identify the benefits of a new coal fired power station to the local community and region.

Table 22 indicates that 98% of respondents identified community and regional benefits associated with a new power station, with the two most frequently reported benefits being that it would provide employment (90%) and that it would support local businesses and the local economy of the region (74%).

Table 22. "What do you think the benefits of the new coal fired power station would be to the local community and the region?"

Response	Count	Percent
Don't Know	6	1.7
No benefits	2	0.6
Provides employment	314	90.2
Supports local businesses (economy)	257	73.9
Increase population in the area	179	51.4
Provide electricity to homes and businesses	147	42.2
Property values would increase	129	37.1
Other impacts	63	18.1
Total Respondents	**348**	**100.0**

Note: *This is a multiple response table where all rows are independent and where a single respondent was able to provide multiple responses and be included in more than one row of the Table.*
The responses to this question were obtained through free recall.
Source: *EBC - Coakes Consulting (2004).*

Respondents were also asked, in a free-recall format, whether they believed there would be any *new* impacts on their family from a new coal fired power station in the Collie area. As shown in Table 23, 87% of respondents could not identify any new impacts. Where impacts were reported, they were most commonly positive impacts associated with employment and the growth and development of the town.

Table 23. "Do you think you or our family would experience any new impacts from the operation of a new power station in the Collie area?"

Response	Count	Percent
No new impacts	305	87.1
Positive Impacts		
Increase in employment	15	4.3
Positive impacts on town's growth and development	14	4.0
Improve the local economy (more businesses)	3	0.9
Real estate prices will increase	1	0.3
Negative Impacts		
Increase in traffic	5	1.4
Increase in pollution	3	0.9
Increase in use of water	1	0.3
Use of open carriages to deliver to power station	1	0.3
Land rates will rise	1	0.3
Impacts on the environment	1	0.3
Total Respondents	**350**	**100.0**

Note: *This is a multiple response table where all rows are independent and where a single respondent was able to provide multiple responses and be included in more than one row of the Table.*
Source: *EBC - Coakes Consulting (2004).*

In addition to identifying new impacts on themselves and their family, respondents were also asked whether they believed there would be any new impacts on the community and environment from a new coal fired power station. Seventy-nine percent of respondents, in a free recall format, could not identify any new impacts on community and environment. Where new impacts were identified, most frequently the impacts reported were positive, emphasising again that that respondents believed any new power station would contribute to employment opportunities and local economic growth.

Table 24. "Do you think there would be any new impacts to the local community and environment from the operation of a new power station in the Collie area?"

Response	Count	Percent
No new impacts	277	79.1
Positive Impacts		
Positive impacts on town's growth and development	27	7.7
Increase in employment	17	4.9
Improve the local economy (more businesses)	9	2.6
Contribute to community and schools	1	0.3
Improve the environment	1	0.3
Real estate process will increase	1	0.3
Removal of old technology	1	0.3
Negative Impacts		
Increase in pollution	4	1.1
Increase in use of water	4	1.1
Impacts on the environment	1	0.3
Increase in noise	1	0.3
Increase in rental housing prices	1	0.3
Increase in traffic	1	0.3
Land clearing on farms will increase	1	0.3
Power lines on property	1	0.3
Total Respondents	**350**	**100.0**

Note: This is a multiple response table where all rows are independent and where a single respondent was able to provide multiple responses and be included in more than one row of the Table.
The responses to this question were obtained through free recall
Source: EBC - Coakes Consulting (2004).

In addition to questions which allowed respondents to identify any potential new impacts to their family, community or environment, the nine potential impacts identified in relation to the existing power stations (Table 21) were again presented to respondents. After each potential impact was described, respondents were asked whether they believed a new power station in the area would result in the impact increasing, remaining the same or decreasing.

Table 25 and Figure 3 shows that the majority of respondents believed all nine potential impacts would remain the same. Although a significant percentage of respondents indicated they did not know what effect a new power station would have in relation to each of the nine impacts, a significant percentage of respondents also indicated there may be either increases or decreases in greenhouse gas emissions, the discharge of emissions from the air, noise from the transport of materials to and from the power station and the contamination of wetlands and rivers.

Table 25. "With a new power station in the area, do you think the impact to the local community and environment from the following potential impacts would increase, decrease or remain the same?"

	Increase		Remain the same		Decrease		Don't Know	
Impact Statement	Count	%	Count	%	Count	%	Count	%
Greenhouse gas emissions	56	17.2	175	53.8	41	12.6	53	16.3
The discharge of emissions in the air	49	15.0	182	55.8	42	12.9	53	15.1
Noise from the transport of materials to and from the power station	44	12.6	232	70.9	6	1.8	45	13.8
The contamination of rivers and wetlands	37	11.4	191	58.8	36	11.1	61	18.8
The contamination of groundwater	32	9.8	199	61.0	34	10.4	61	18.7
The discharge of waste water to the ocean	32	9.9	193	59.9	28	8.7	69	21.4
Hazardous materials stored at the power station	31	9.5	196	59.9	17	5.2	83	25.4
Noise from the operation of the power station	23	7.0	238	72.8	12	3.7	54	16.5
The visual appearance of the environment	13	4.1	202	64.3	10	3.2	89	28.3

Note: Summing the counts across the columns for each impact will give the sum of responses on which the percentage is based.
Source: EBC - Coakes Consulting (2004).

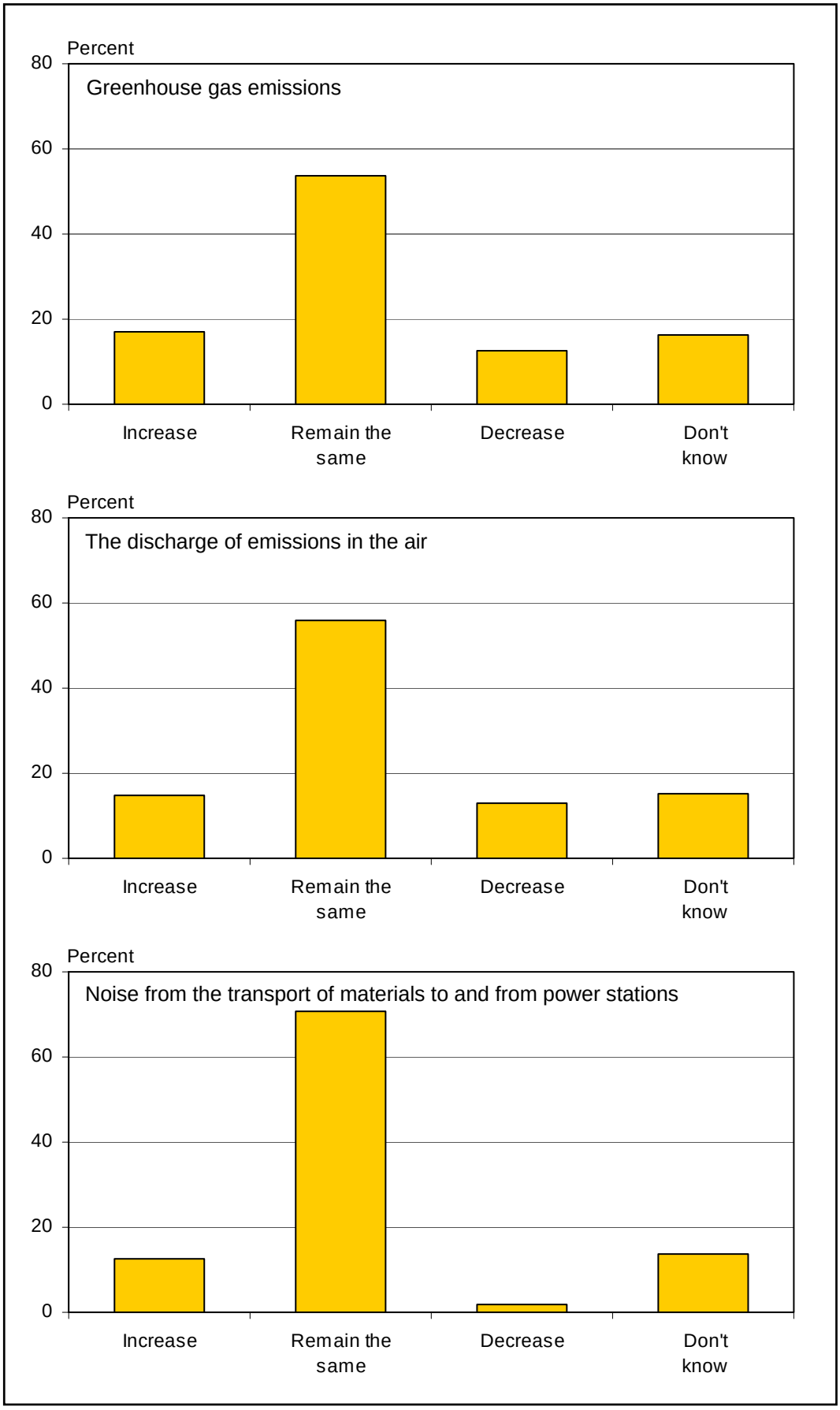

Figure 3. Beliefs about impacts from future power stations

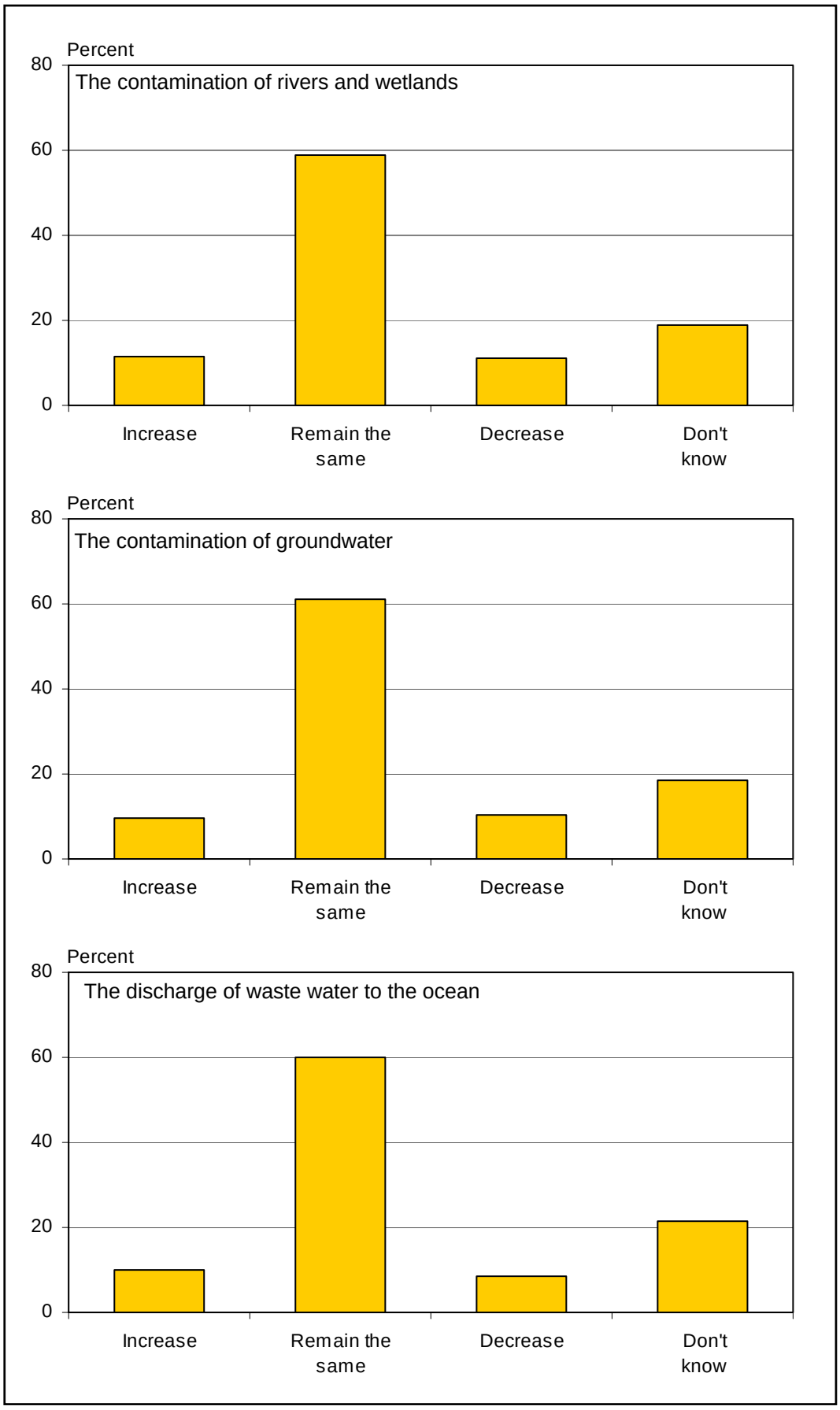

Figure 3 (continued). Beliefs about impacts from future power stations

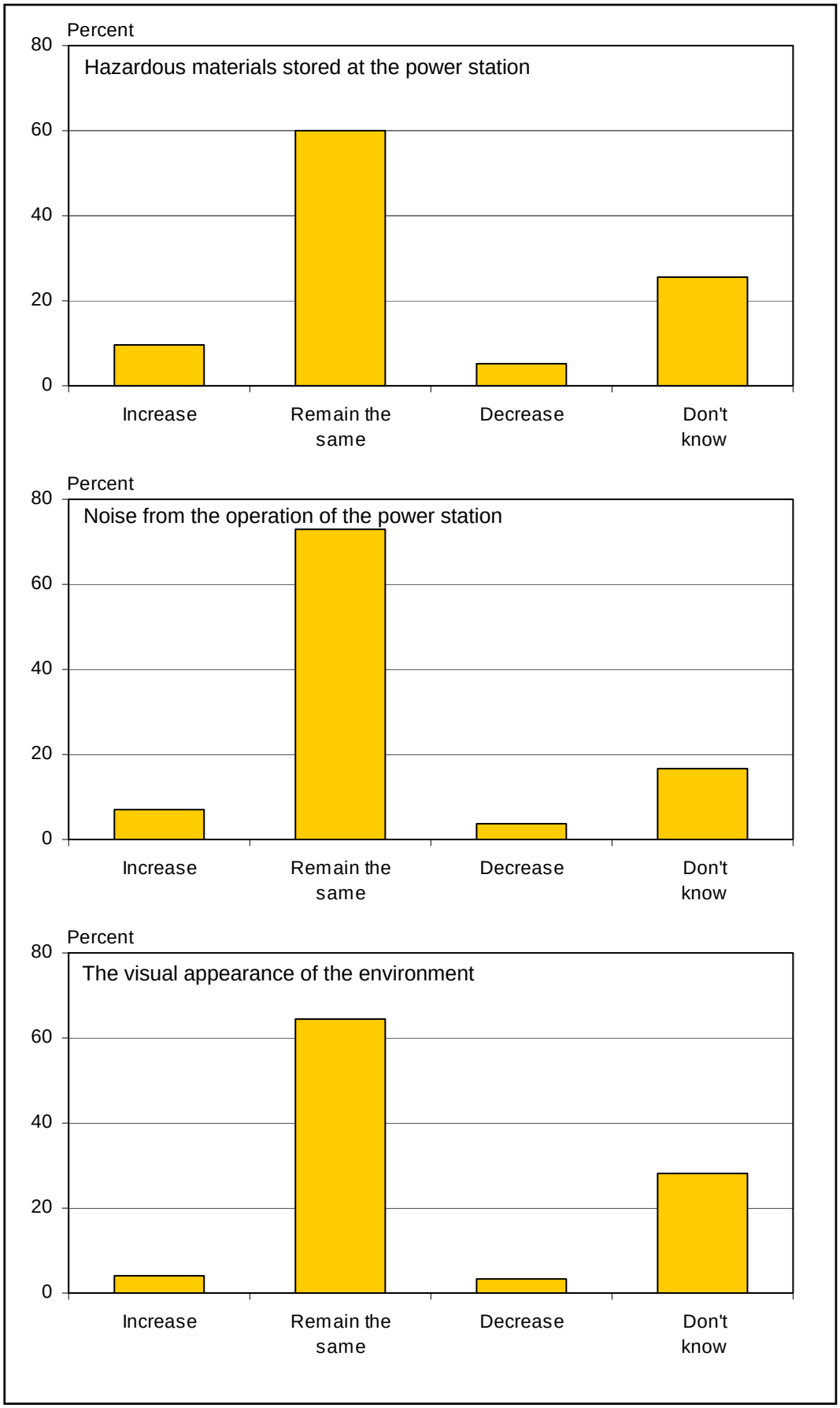

Figure 3 (continued). Beliefs about impacts from future power stations

8. BELIEFS ABOUT HEALTH RISKS

The perception of health risks was examined in relation to existing power stations and the proposal to establish in the future a new coal fired power station in the Collie area. Survey respondents made judgements about existing and future health risks on a five point scale, which had the scale anchors of high risk (1) and no risk (5). Judgments were made in relation to the health risks to themselves and their family.

8.1 Beliefs about Existing Health Risks

All respondents were asked to judge the health risks to themselves and their family from existing power stations in the area. Table 26 and Figure 4 shows that 58% of respondents believed there were no health risks to themselves or their family from existing power stations in the area.

Table 26. "How would you rate the health risks to yourself and your family from existing power stations in the area?"

Response	Count	Percent
High	3	0.9
Moderate	20	5.8
Minor	43	12.4
Slight	79	22.8
No risk	202	58.2
Total Respondents	**347**	**100.0**

Source: EBC - Coakes Consulting (2004).

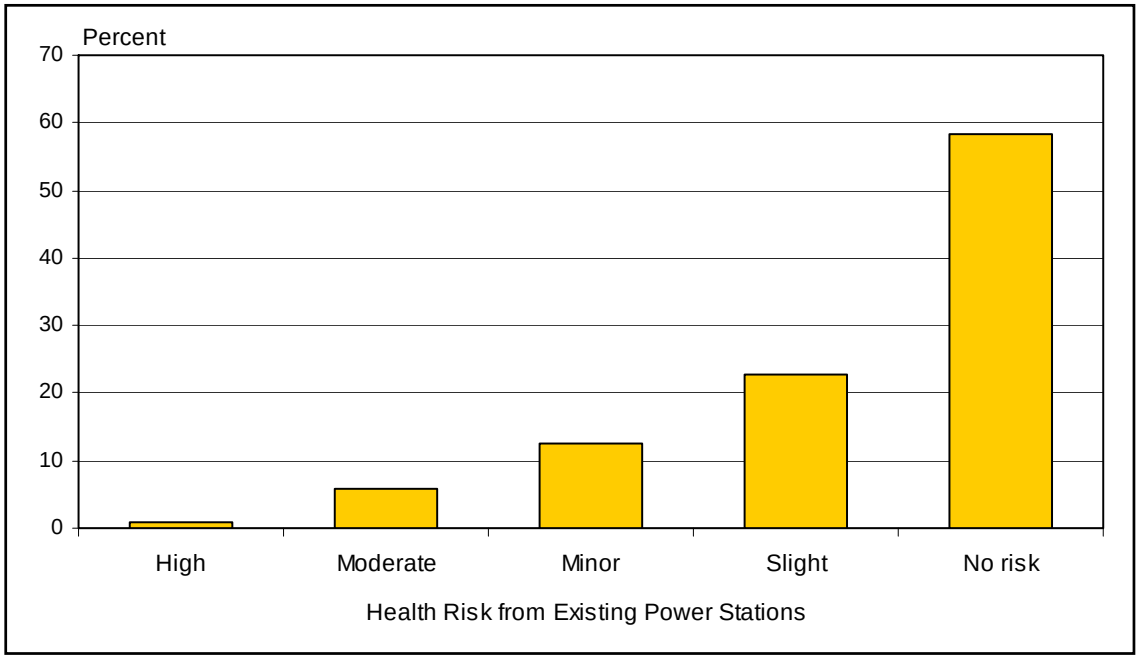

Figure 4. Beliefs about health risks from existing power stations

Using information on the respondents demographic and social profiles a number of comparisons were made in relation to existing health risk judgements. No significant differences were found in judgments of existing health risk between males and females; between respondents who owned and rented their own home and between respondents who had and had not worked in the coal or power industries.

In addition there were no significant correlations between existing health risk judgements and the level of self assessed knowledge of coal fired power stations and length of residence at their current address.

However a significant relationship was found between the age of the respondent and judgments of existing health risk. As shown in Table 27 and Figure 5, respondents over 47 years of age show a decline in existing health risk judgments with age. In comparison existing health risk judgements increase with age between 15 and 47 and peak amongst the 38 to 47 year age group.

Table 27. Beliefs about Existing Health Risks by Age

Age (years)	Mean	Standard Error
15 - 37	4.22	0.11
38 - 47	4.14	0.12
48 - 57	4.18	0.14
58 - 66	4.35	0.10
67 - 90	4.67	0.09
Total Respondents	**4.31**	**0.05**

Note: *The mean score is derived from the risk scale where the scale anchor of high risk is assigned a score of one and scale anchor of no risk is assigned a score of five.*
There is a significant difference in scores between the three groups under the Kruskal-Wallis test, x2(2)=15.6, p <.01
Source: *EBC - Coakes Consulting (2004).*

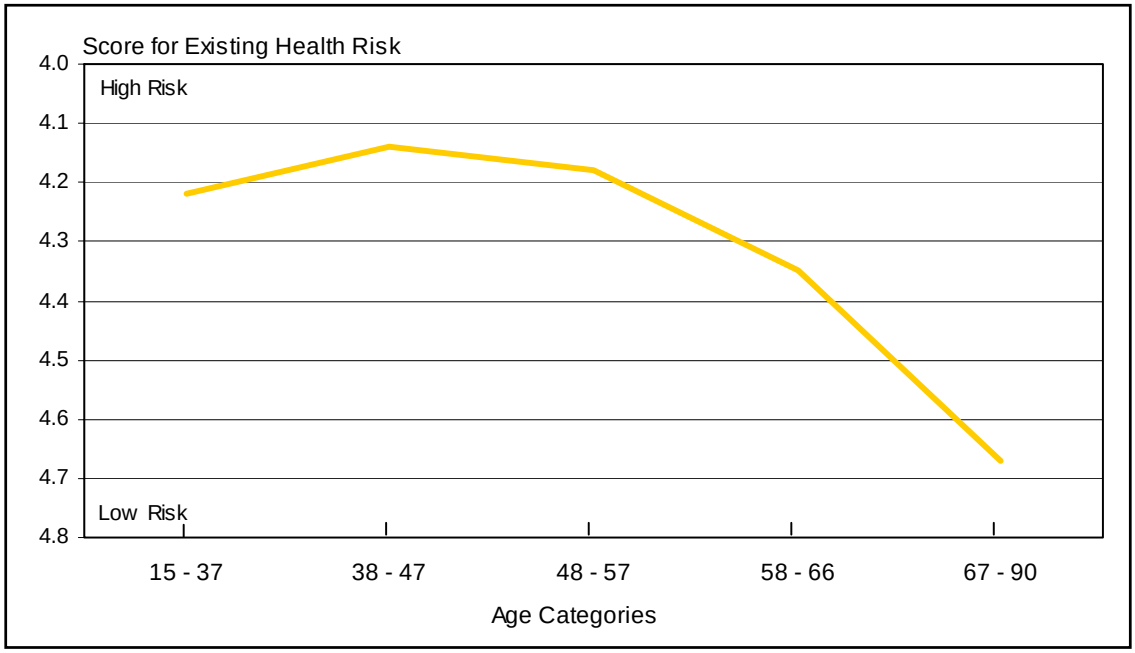

Figure 5. Age of respondents and health risk from existing power stations

Table 28 also shows that respondents in families with children report significantly higher health risks from existing power stations than those respondents in families with no children. This is particularly the case, as shown in Table 28 amongst those respondents in families with children below five years of age.

Table 28. Beliefs about Existing Health Risks by Family Type

Family Type	Mean	Standard Error
With children under five years	3.89	0.20
With children between 6 and 15 years	4.15	0.11
No children in family	4.39	0.06
Total Respondents	**4.32**	**0.05**

Note: *The mean score is derived from the risk scale where the scale anchor of high risk is assigned a score of one and scale anchor of no risk is assigned a score of five.*
There is a significant difference in scores between the three groups under the Kruskal-Wallis test, x2(2)=9.9,p <.01
Source: *EBC - Coakes Consulting (2004).*

8.2 Beliefs about Future Health Risks

All respondents were also asked to judge the health risks to themselves and their family from a new coal fired power station in the area. As shown in Table 29 and Figure 6, 63% of respondents indicated there would be no health risk from a new coal fired power station in the area. Only 4% of respondents indicated there would be a high or moderate health risk from a new coal fired power station.

Table 29. "How would you rate the health risks to yourself and your family from existing power stations in the area?"

Response	Count	Percent
High	2	0.6
Moderate	12	3.5
Minor	34	9.8
Slight	79	22.8
No risk	219	63.3
Total Respondents	**346**	**100.0**

Source: *EBC - Coakes Consulting (2004).*

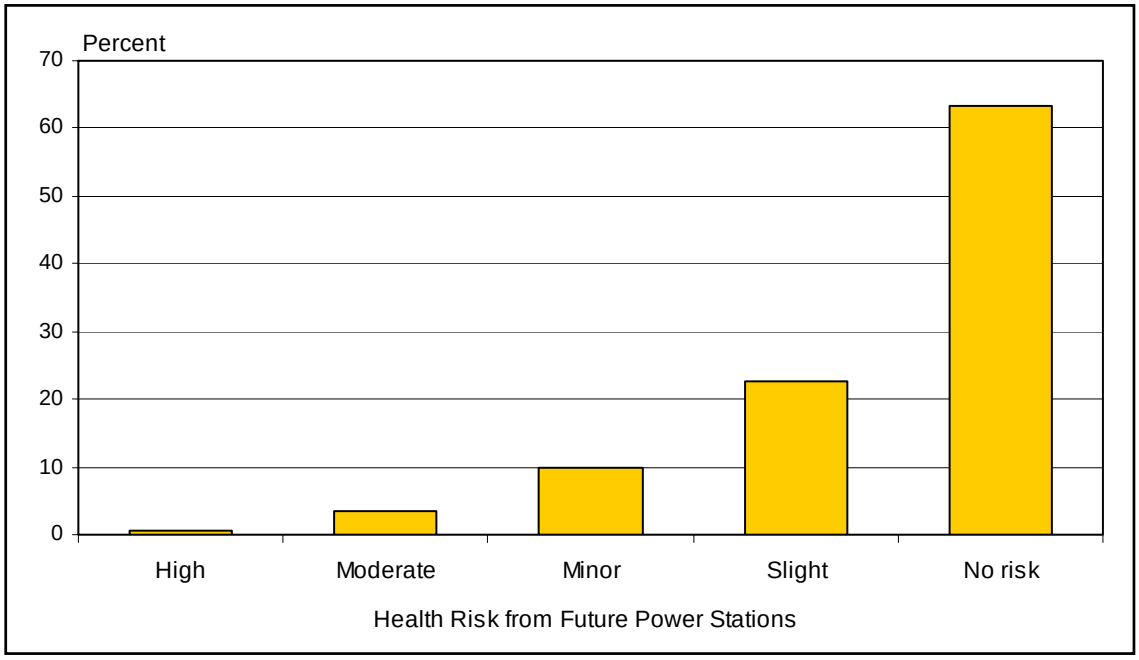

Figure 6. Beliefs about health risks from future power stations

A high correlation was found between judgments of existing (Table 26) and future (Table 29) risk[4]; indicating that those respondents who believed there were existing health risks were also likely to believe there were health risk from a new power station.

As shown in Figure 7, the high percentage of respondents who indicate no existing health risks from power stations also indicated their would be no future health risks from new power stations in the area.

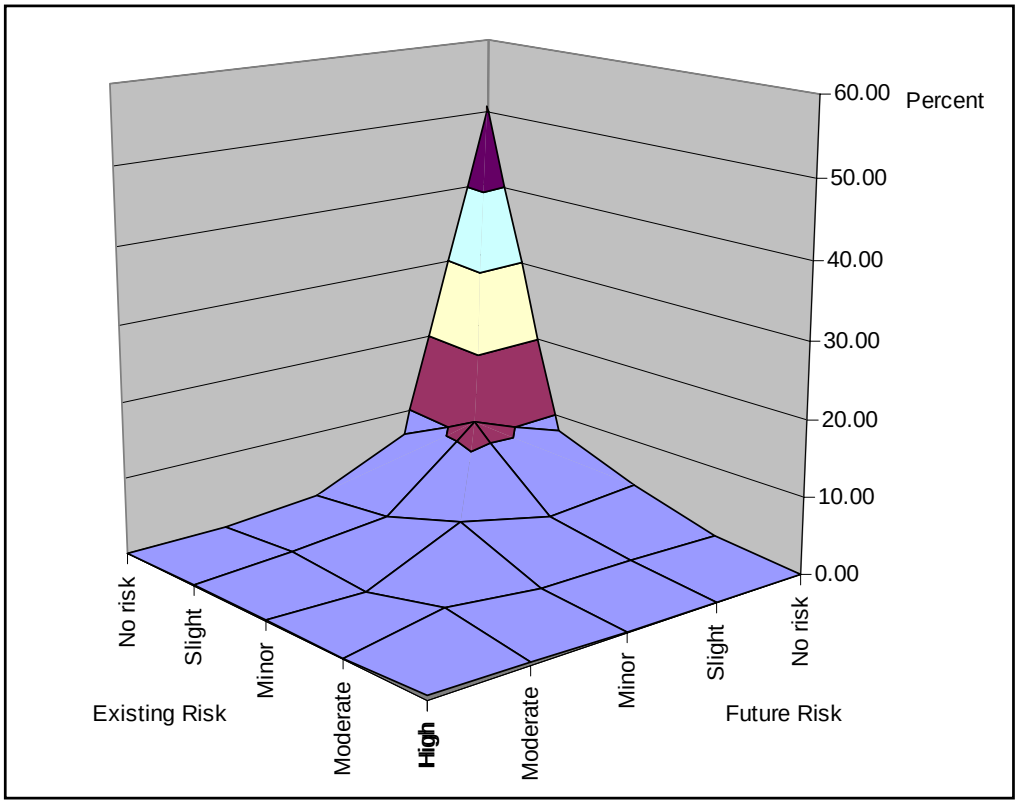

Figure 7. Relationship between judgements of existing and future health risks

Using information on the respondents demographic and social profiles a number of comparisons were made in health risk judgements. No significant differences were found in judgments of future risk between males and females, between respondents who owned and rented their own home and between respondents who had and had not worked in the coal or power industries

In addition there were no significant correlations between future risk judgements and the level of self assessed knowledge of coal fired power stations and length of residence at their current address.

As was the case in the assessment of existing health risks (Section 8.1), a significant relationship was found between the age of the respondent and judgments of future health risks. As shown in Table 30 and Figure 8 respondents over 47 years of age show a decline in future health risk judgments with age. In comparison future health risk judgements increase with age between 15 and 47 and peak amongst the 38 to 47 year age group.

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[4] *Pearson's correlation co-efficient indicates a significant correlation between existing and future health risks, r=0.66, p<.001*

Table 30. Beliefs about Future Health Risks by Age

Age (years)	Mean	Standard Error
15 - 37	4.32	0.11
38 - 47	4.28	0.11
48 - 57	4.44	0.11
58 - 66	4.48	0.09
67 - 90	4.72	0.08
Sample	**4.45**	**0.05**

Note: *The mean score is derived from the risk scale where the scale anchor of high risk is assigned a score of one and scale anchor of no risk is assigned a score of five.*
There is a significant difference in scores between the three groups under the Kruskal-Wallis test, x2(2)=14.6, p <.01
Source: *EBC - Coakes Consulting (2004).*

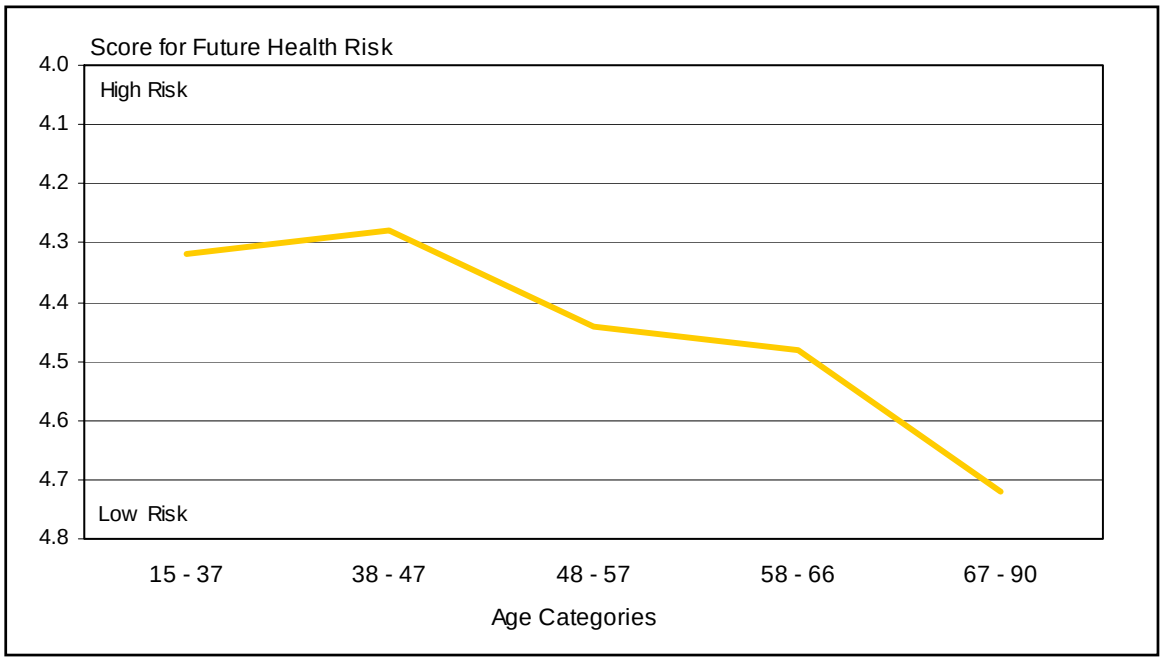

Figure 8. Age of respondents and health risk from future power stations

Furthermore, and again as identified in the assessment of existing health risks (Section 8.1), Table 31 shows that respondents in families with children report significantly higher health risks from future power stations than those respondents in families with no children. Again, this is particularly the case amongst those respondents in families with children below five years of age.

Table 31. Beliefs about Future Health Risks by Family Type

Family Type	Mean	Standard Error
With children under five years	4.22	0.36
With children between 6 and 15 years	4.26	0.10
No children in family	4.52	0.05
Sample	**4.45**	**0.05**

Note: *The mean score is derived from the risk scale where the scale anchor of high risk is assigned a score of one and scale anchor of no risk is assigned a score of five.*
There is a significant difference in scores between the three groups under the Kruskal-Wallis test, x2(2)=7.9,p <.01
Source: *EBC - Coakes Consulting (2004).*

8.3 Attitudes towards Environmental Health Issues

Nine attitude statements (Table 32) were used to understand more broadly community attitudes towards environmental health issues in the area. The question wording is drawn directly from the work of Starr, Langley and Taylor (2000)[5] from the South Australian Department of Human Services, who have used the same questions in an Australia wide population survey.

Cluster analysis was used to identify any clearly identifiable clustering of the nine attitude statements. The results of a hierarchical cluster analysis, as shown in Figure 9, identified three clusters of attitude statements, which were identified as (i) risk centrality, (ii) risk control and (iii) risk awareness.

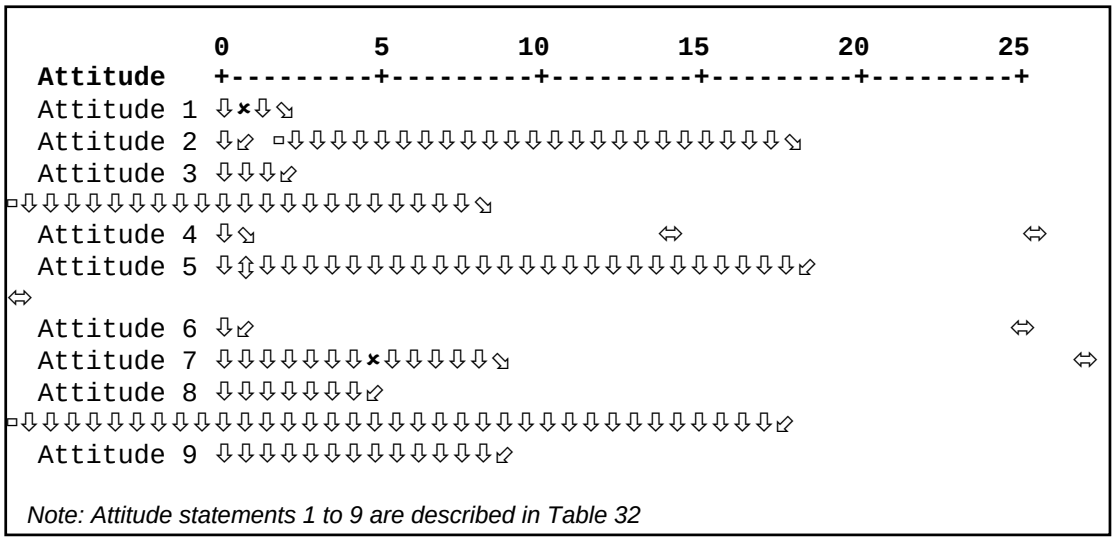

Figure 9. Cluster Analysis of Attitude Statements

Risk Centrality included three attitude statements which emphasised that environmental risks were not a core issue of importance to the respondent, that many environmental risks were overstated and that if there was a specific environmental health problem the Government would alert the community to the issue. A high score (1) on this dimension indicate that environmental health issues are not a central issue of concern to the respondent. As shown in Table 32 there is little difference between the Collie and national samples in relation to risk centrality. In the Collie sample between 30 and 40 percent of respondents have high scores on risk centrality, believing that environmental risks are not a central issue of concern to them.

Risk Control included three attitude statements which emphasise that environmental risks are becoming an issue in the local area with the individual having limited control over the occurrence of environmental risks. In relation to the attitude statements in this cluster the Collie sample tends to score lower than the national sample, suggesting that the Collie sample in comparison to the national sample may believe they have greater control over risks that are occurring in their community. Between 20 and 30 percent of respondents in the Collie sample score high (1) on risk control, believing that they have little control over the environmental risks that are occurring in their area.

[5] Starr, G., Langley, A & Taylor, A. (2000). *Environmental health risk perception in Australia*. Centre for Population Studies in Epidemiology. SA Department of Human Services.

Risk Awareness again includes three attitude statements and emphasises the awareness of environmental health risks in the local community and those risks associated with greenhouse effect and commercial products. In comparison to the Collie sample, the national sample appears to score higher (1) on risk awareness, indicating greater awareness of environmental risks. However there are relatively high levels of risk awareness in both samples, with 60 to 65 percent of respondents in the Collie sample having a high score on risk awareness.

Figure 10 shows the distribution of scores on each of the environmental health attitude statements for the Collie sample and the national sample.

Table 32. Attitudes towards Environmental Health Issues

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know
Scores Assigned	**1**	**2**	**3**	**4**	
RISK CENTRALITY					
1. Until the government alerts me about a specific environmental health problem, I really don't have to worry	6	131	176	24	13
	1.7	*37.4*	*50.3*	*6.9*	*3.7*
National Sample	***1.6***	***18.6***	***56.6***	***21.4***	***1.8***
2. People in Australia are becoming too concerned about small health risks	12	138	162	21	17
	3.4	39.4	46.3	6.0	4.9
National Sample	***5.9***	***34.6***	***50.8***	***6.6***	***2.1***
3. Australians should be prepared to accept some risk to their health in order to benefit the economy	5	105	187	32	21
	1.4	*30.0*	*53.4*	*9.1*	*6.0*
National Sample	***4.8***	***33.5***	***42.8***	***16.1***	***2.8***
Total Collie Sample Mean	***2.66***				
Total National Sample Mean	***2.77***				
RISK CONTROL					
4. The land air and water around us are in general more contaminated now than ever before	12	78	207	30	23
	3.4	*22.3*	*59.1*	*8.6*	*6.6*
National Sample	***26.4***	***49.8***	***18.5***	***1.1***	***4.3***
5. I feel that I have very little control over risks to my health	10	101	195	30	14
	2.9	*28.9*	*55.7*	*8.6*	*4.0*
National Sample	***6.9***	***30.6***	***48.7***	***11.9***	***1.9***
6. There are numerous environmental health problems where I live	3	35	253	49	10
	0.9	*10.0*	*72.3*	*14.0*	*2.9*
National Sample	***5.0***	***20.1***	***64.0***	***9.2***	***1.8***
Total Collie Sample Mean	***2.85***				
Total National Sample Mean	***2.47***				
RISK AWARENESS					
7. The greenhouse effect is a serious problem which could lead to harmful changes in the environment and peoples health	19	204	86	19	22
	5.4	*58.3*	*24.6*	*5.4*	*6.3*
National Sample	***32.3***	***51.6***	***10.0***	***1.7***	***4.4***
8. I believe my community is becoming a healthier place in which to live	15	220	70	6	39
	4.3	*62.9*	*20.0*	*1.7*	*11.1*
National Sample	***5.3***	***52.3***	***33.4***	***5.4***	***3.6***
9. I pay close attention to warning labels on products that I use	58	262	23	1	6
	16.6	*74.9*	*6.6*	*0.3*	*1.7*
National Sample	***30.3***	***56.0***	***11.5***	***1.5***	***0.8***
Total Collie Sample Mean	***2.14***				
Total National Sample Mean	***2.02***				

Note: *Summing the counts across the columns for each impact will give the sum of responses on which the percentage is based.*
Means are obtained by deriving a scale with a score of one being strongly agree and a score 4 being strongly disagree.
Tests of significance between the sample and national means are not possible as raw data for the national ample is not available.

Source: *EBC - Coakes Consulting (2004).*

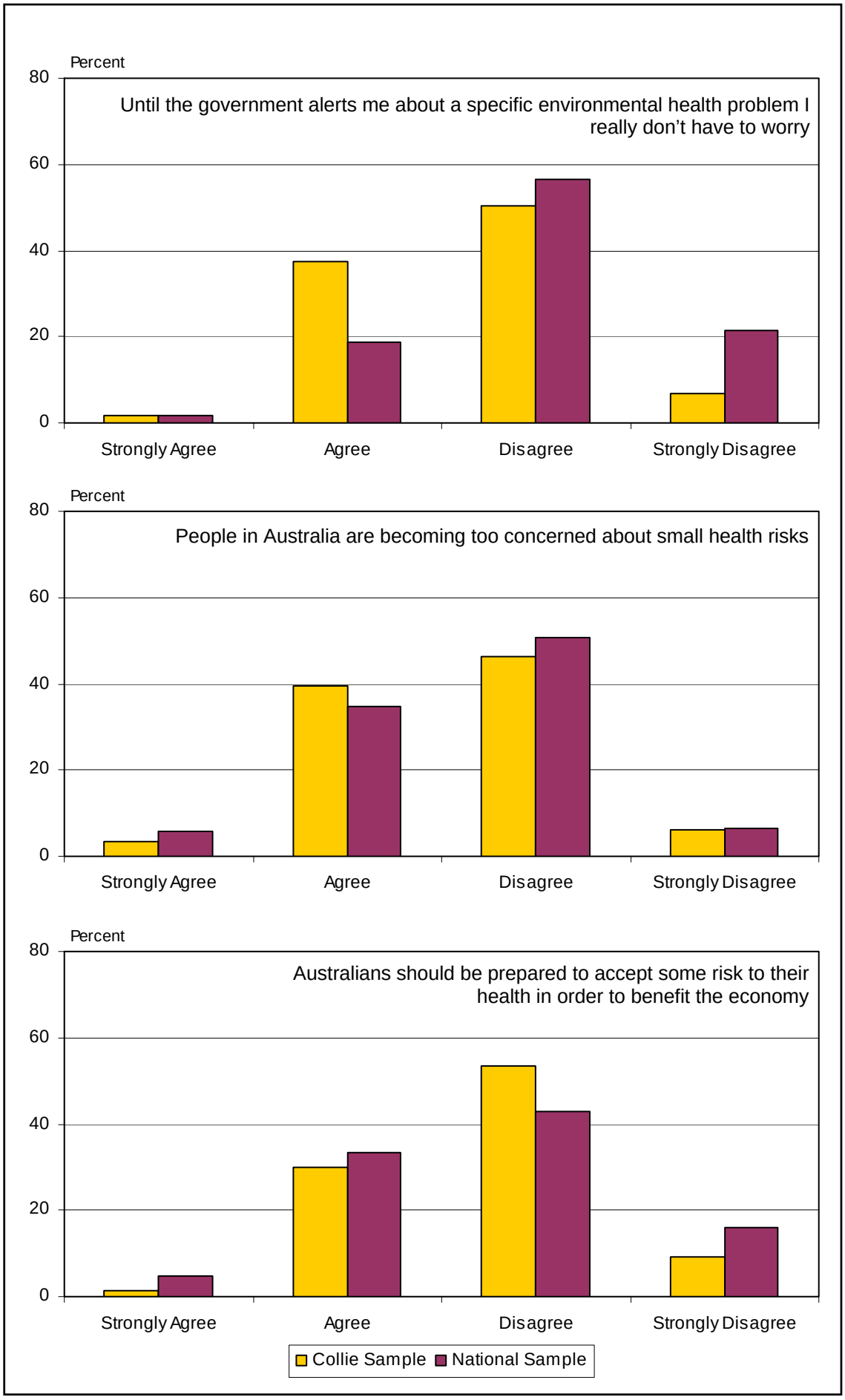

Figure 10. Attitudes towards environmental health issues

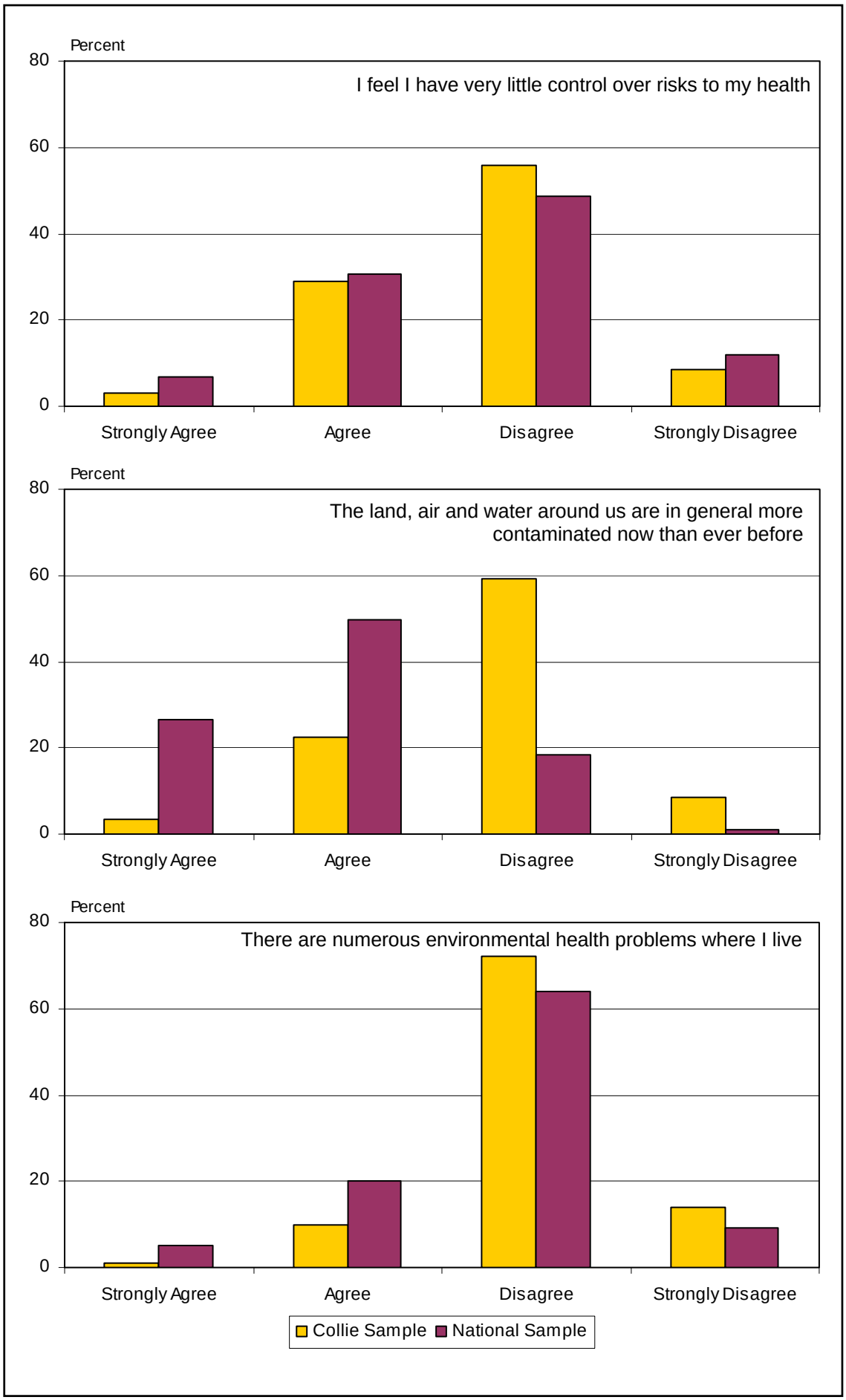

Figure 10 (continued). Attitudes towards environmental health issues

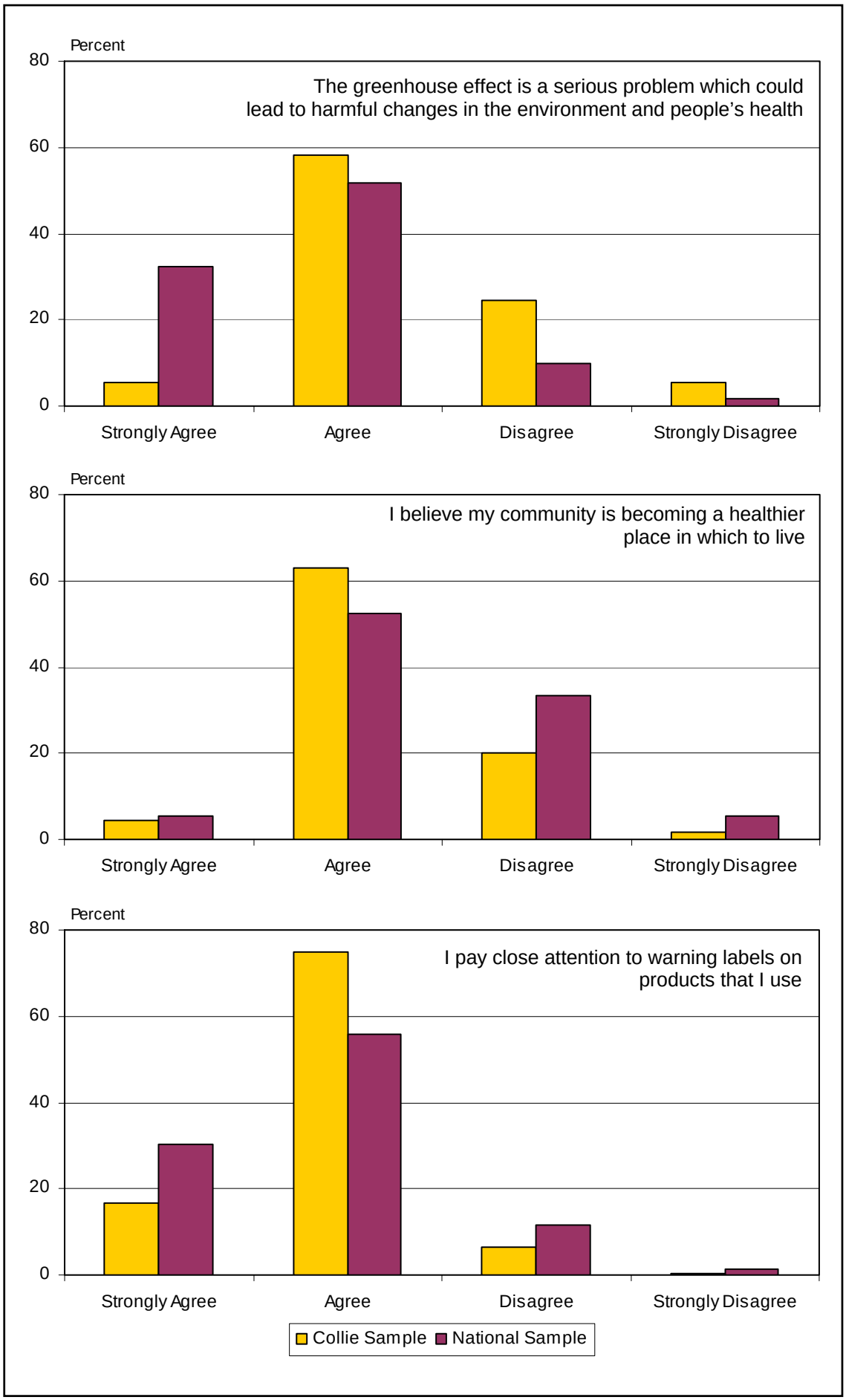

Figure 10 (continued). Attitudes towards environmental health issues

Perception of existing and future health risks from power stations were also compared with respondents scores on each of the attitude clusters of risk centrality, risk control and risk awareness. No relationship was found between existing and future health risk scores and the attitude clusters of risk centrality and awareness, however a significant relationship was found between existing and future health risks from power stations and risk control.

As shown in Figure 11, individuals who believe that they have little control over environmental risks also tend to believe there are higher existing and future health risks from power stations in the area. In contrast individuals who believe they have some ability or capacity to control environmental risks are less likely to believe there are existing and future health risks associated with power stations in the area.

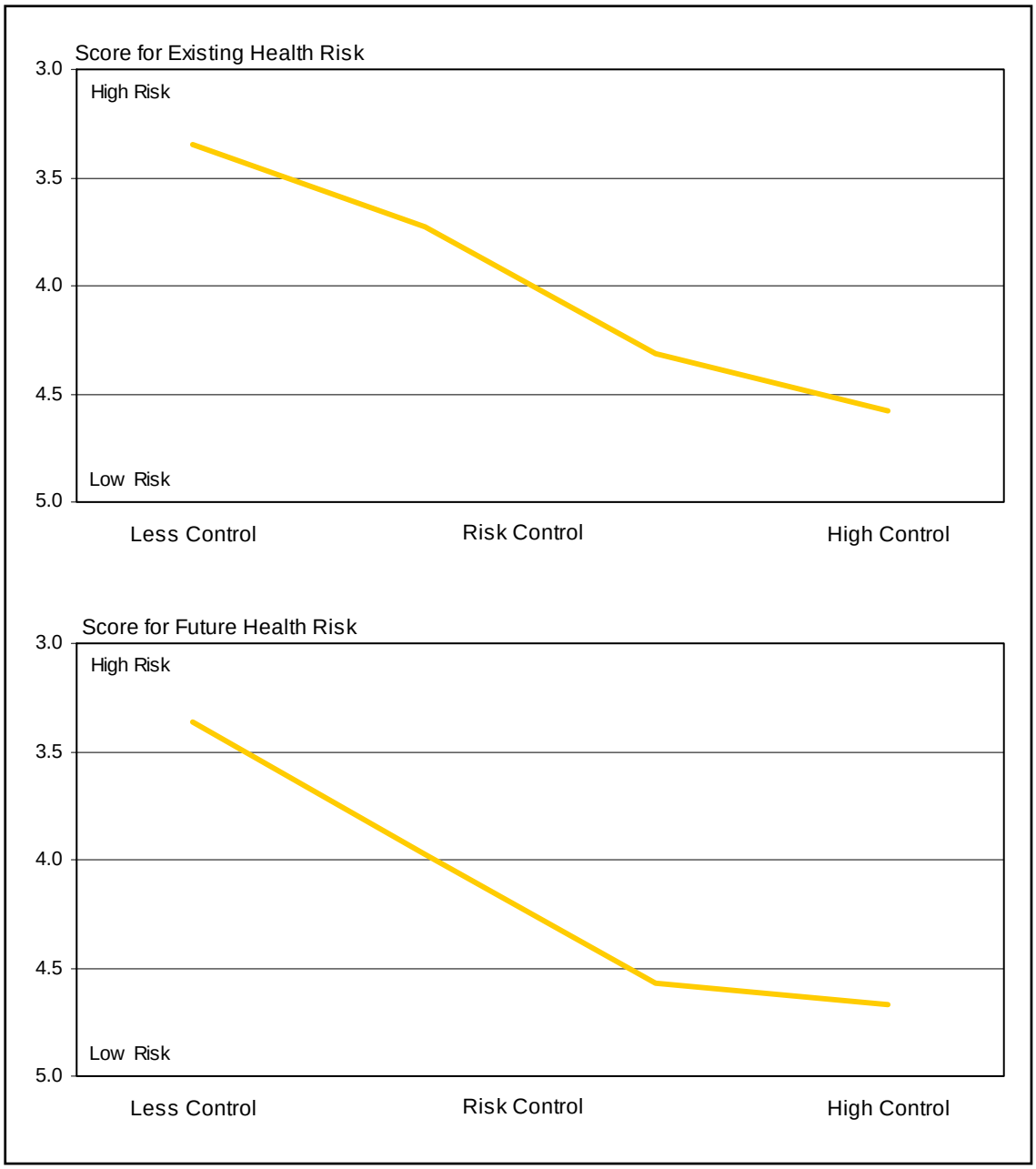

Figure 11. Existing and Future Health Risks from Power Stations and Risk Control

9. COMMUNITY CONSULTATION

Respondents were provided with a list of procedures that could be used in informing the community about new power stations that might be developed in the area and were asked to identify which procedure would be their first and second preference.

Table 33 shows that the majority of respondents indicated their first preference was to inform the local community through 'information in the local newspaper' (45%) and their second preference was for a 'letterbox drop of information' (30%). These two procedures were the most preferred by respondents and as shown in Table 33, there was limited preference for any of the remaining procedures.

Table 33. "When informing the community about any new power station to be developed in the area, which of the following procedures would you prefer to be used?"
(only first two preferences recorded)

	1st Preference		2nd Preference	
Response	Count	Percent	Count	Percent
Public meeting	54	15.4	31	9.0
Display in the town	31	8.9	30	8.7
Visit you personally	5	1.4	1	0.3
Letterbox drop of information	79	22.6	104	30.3
Information in the local newspaper	157	44.9	103	30.0
Information on the radio	15	4.3	62	18.1
Internet website	3	0.9	3	0.8
Small group meetings	7	2.0	9	2.6
Total Respondents	**350**	**100.0**	**343**	**100.0**

Note: This is a multiple response table where all rows are independent and where a single respondent was able to provide multiple responses and be included in more than one row of the Table.
Source: EBC - Coakes Consulting (2004).

Appendix C Criteria Pollutant Health Effects

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Sulphur Dioxide (SO2)

Sulphur dioxide (SO_2) is a potent respiratory irritant when inhaled. Asthmatics are particularly susceptible. SO_2 acts directly on the upper airways (nose, throat, trachea and major bronchi), producing rapid responses within minutes. It achieves maximum effect in 10 to 15 minutes, particularly in individuals with significant airway reactivity, such as asthmatics and those suffering similar bronchospastic conditions.

The symptoms of SO_2 inhalation may include wheezing, chest tightness, shortness of breath or coughing, which are related to reductions in ventilatory capacity (for example, reduction in forced expiratory volume in one second, or FEV_1), and increased specific airway resistance. If exposure occurs during exercise, the observed response may be accentuated because of an increased breathing rate associated with exercise. A wide range of sensitivity is evident in both healthy individuals and more susceptible people, such as asthmatics, the latter being the most sensitive to irritant.

Epidemiological studies have shown significant associations between daily average SO_2 levels and mortality from respiratory and cardiovascular causes. Increases in hospital admissions and emergency room visits for asthma, COPD and respiratory disease have also been associated with ambient SO_2 levels. These associations were observed with up to a two-day lag period. Long-term exposure to SO_2 and fine particle sulphates (SO_4^{2-}) has been associated with an increase in mortality from lung cancer and development of asthma and cardio-pulmonary obstructive disease. Increases in respiratory symptoms have also been associated with SO_2 levels.

Nitrogen Oxides (NOx)

The inhalation of nitrogen dioxide (NO_2) has been shown to cause reversible effects on airway responsiveness and lung function. Exposure may also cause an increase in the sensitivity to natural allergens. Inhalation by children will increase the risk of respiratory infection and may lead to poor lung function in later life. Association between ambient NO_2 exposure and increases in daily mortality and hospital admissions for respiratory disease, has been shown in recent epidemiological studies. NO_2 has also been shown to increase the effects of exposure to other known irritants, such as ozone and respirable particles.

There is some evidence that acute exposure to NO_2 may cause an increase in airway responsiveness in asthmatic individuals. This response has been observed only at relatively low NO_2 concentrations, mostly in the range of 400–600 $\mu g/m^3$. However, the findings of both clinical and epidemiological studies do not provide any clear quantitative conclusions about the health effects of short-term exposures to NO_2. The adverse health effects at low levels of NO_2 remain uncertain, with conflicting patterns of results obtained in both controlled exposure studies and in

epidemiological studies. The contribution of NO_2 as one of a mixture of pollutants in the ambient environment has yet to be clearly defined.

Particulate Matter < 10μm (PM10)

The major health effects from airborne particles are:

- increased mortality;
- aggravation of existing respiratory and cardiovascular disease;
- hospital admissions and emergency department visits;
- school absences;
- lost work days; and
- restricted activity days.

People most susceptible to the effects of particles include: the elderly; those with existing respiratory disease such as asthma, chronic obstructive pulmonary disease and bronchitis; those with cardiovascular disease; those with infections such as pneumonia; and children. The results of epidemiological studies have provided no evidence for the existence of a threshold value below which no adverse health effects are observed.

Carbon Monoxide (CO)

The health effects of carbon monoxide are well understood. When inhaled, CO combines with haemoglobin (Hb), the blood's oxygen-carrying protein, to form COHb. In this state the Hb is unable to carry oxygen (O_2). It takes about 4 to 12 hours for CO concentrations in the blood to reach equilibrium with the CO concentration in air, so any fluctuations in the ambient CO concentrations are only slowly reflected in the COHb levels in humans.

High exposures to CO can cause acute poisoning, with coma and collapse occurring at COHb levels of over 40%. Ambient exposures to CO are several orders of magnitude lower than those associated with acute poisoning. However, some exposures in urban settings have been shown to adversely affect the heart, brain and central nervous system.

Adverse cardiovascular effects of CO inhalation include decreased O_2 uptake and decreased work capacity. Those with angina may suffer decreased exercise capacity at onset of angina, and increased duration of angina. Adverse neurobehavioural effects of CO include a decrease in vigilance, visual perception, manual dexterity, ability to learn and perform complex sensorimotor tasks in healthy individuals, and reduced birth weight in non-smoking mothers.

Ozone (O3)

Epidemiological evidence indicates that a wide variety of health outcomes are possible from exposure to O_3, including short-term effects on mortality, hospital admissions and emergency room attendances, respiratory symptoms and lung function. Experimental evidence has demonstrated short-term physiological and pathological changes in the respiratory system of humans. Although potentially more important, there is little evidence of long-term effects. Recently, ozone has been found to cause asthma, particularly in young children exercising in areas with higher ozone levels.

The health effects associated with exposure to ozone can be summarised as follows:

- increase in daily mortality, respiratory and cardiovascular disease;
- increase in hospital admissions and emergency room visits;
- increase in respiratory and cardiovascular disease;
- decrease in lung function;
- increase in symptoms of respiratory illness such as cough, phlegm and wheeze; and
- increase in bronchodilator usage.

These effects are observed in sensitive sub-populations, although effects on lung function have also been observed in the healthy normal population.

Lead (Pb)

The health effects of lead are related to the level of lead in human blood. Although there are some differences in the bio-availability of different lead compounds, the health effects caused by increased blood lead levels are the same, regardless of the lead compounds causing the exposure.

One of the most widely recognised effects of lead exposure is a decrease in intelligence and general academic performance in children, especially when exposed to lead within the first two to three years of life. The sub-groups most vulnerable to lead are young children and developing foetuses. There is now clear epidemiological evidence of a close causal relationship between prenatal exposure to lead and early mental development indices, and it has not been possible to identify a clear threshold for its effects.

Where there is the likelihood of ingestion from deposited lead, this must be taken into account in conjunction with inhalation exposure when considering the total body burden. This is especially so when assessing potential health effects on children living in an area where lead may be inhaled and/or ingested.

Mercury (Hg)

The effects of chronic exposure to elemental mercury (Hg) include central nervous system (CNS) effects (such as erethism, irritability, insomnia), severe salivation, gingivitis and tremor, kidney

effects (including proteinuria), and acrodynia in children. The primary effect of chronic exposure to methyl mercury is CNS damage, while chronic exposure to inorganic mercury induces kidney damage (US EPA, 1998). Acute inhalation exposure to high levels of elemental mercury in humans results in CNS effects such as hallucinations, delirium and suicidal tendencies; gastrointestinal effects; and respiratory effects such as chest pains, dyspnoea, cough, pulmonary function impairment, and interstitial pneumonitis. Acute exposure to high levels of methyl mercury also results in CNS effects, including blindness, deafness, impaired level of consciousness and death.

Studies of the effects on human reproduction and development from exposure to inorganic mercury are ambivalent. There is no information on reproductive and developmental effects on humans, but animal studies have reported effects including testicular changes and developmental abnormalities. Studies on the carcinogenic effects of elemental mercury on humans are inconclusive. No studies are available on the carcinogenic effects of methyl mercury on humans.

The US EPA has classified inorganic and methyl mercury as Group C carcinogens, and elemental mercury as Group D (unclassifiable). IARC has classified methyl mercury compounds as a Group 2B carcinogen, and mercury and inorganic compounds as Group 3 (unclassifiable) (IARC, 1998).

No unit risk factors are available for mercury and mercury compounds. Their status as carcinogens is ambivalent. WHO recommends a guideline for inorganic mercury of 1 µg/m^3 as an annual average. This is based on a lowest observable adverse effects level for renal tubular effects on humans of 20 µg/m^3 and an uncertainty factor of 20.

The US EPA RfC for elemental mercury is 0.3 µg/m^3, and the reference dose (RfD) for methyl mercury is 0.3 µg/kg/day (US EPA, 1993). The California Air Resources Board (CARB) RELs are as follows:

- elemental mercury 0.3 µg/m^3 (chronic REL);
- inorganic mercury and mercury compounds 30 µg/m^3 (acute REL); and
- methyl mercury 1 µg/m^3 (chronic REL).

The acute REL for inorganic mercury is under review, and a draft value of 1.8 µg/m^3 is to be reviewed by the Scientific Review Panel on Toxic Air Contaminants.

Appendix D Community Workshop – Minutes

Community Workshop – Minutes/ Notes

Date	23 February 2005
Project No	WV02681.210
Subject	**Collie B - Community Workshop: Health Risk Assessment**

A Community Workshop was held at Roche Park Recreation Centre on 23 February 2005 to present information to the Collie community and to record their feedback and concerns. The presentation included the discussion of the following topics:

- Overview of the Health Impact Assessment, purpose, scope and approach;
- Social profile and survey;
- Air quality;
- Noise and other factors;
- Ranking issues;
- Where to from here?;
- Queries and closure.

The information presented at the workshop is attached.

The following provides a summary of the attendee's (**Table 1**), apologies (**Table 2**) and the queries/ responses that were raised during the workshop (**Table 3**). The invitee list was intended to capture the interests of a broad range of the community, including those involved with care of the young and old, health professionals, representatives from schools and near neighbours.

- **Table 1 Attendee's List**

Name	Company/Organisation
Rebecca Gamble	Sinclair Knight Merz
Philip Millichamp	Sinclair Knight Merz
Jenny Yan	Sinclair Knight Merz
Andrea Jardine-Orr	Coakes Consulting
Mark Feldwick	Department of Health. Mark.feldwick@health.wa.gov.au
Nathan Major	Department of Health. Nathan.major@health.wa.gov.au
Allan McDougall	Western Power
Campbell Hawks	Western Power
Michael Waite	Western Power
Cath Dowdell	Collie Adult Day Care Centre
Norma Wallis	Collie Adult Day Care Centre
Ian Wallace	Collie Conservation Group Inc.
John Cook	Wesfarmers. Jcook@wesenergy.com.au
Cameron Schulster	Wesfarmers. Cschulster@wesenergy.com.au

Name	Company/Organisation
Steve Woodward	Wesfarmers. Swoodward@wesenergy.com.au
Bruce Roberts	Shire of Collie. Roberts@starday.com.au
Gary Evans	Land Owner
Michael Britten	Land Owner. Michael.britten@westernpower.com.au
Glyn Yates	Land Owner
Margaret Tonkin	Land Owner. Colintonkin@netfactory.com.au
Colin Tonkin	Land Owner. Colintonkin@netfactory.com.au
Peter Christian	Western Power. Peter.christian@westernpower.com.au
Peter Capon	Department of Industry and Resources. Peter.capon@dior.wa.gov.au
Ian Miffling	Shire of Collie. Ian.miffling@colling.wa.gov.au
Stephen Davies	Review Residence. Donnadcollie@hotmail.com
Tansy Stowe	Griffin. Tansy.stowe@thegriffingroup.com.au
Graeme Baesjou	Bunbury Wellington Economic Alliance. Ceo@bwea.com.au
Harry Goff	Griffin. Harry.goff@thegriffingroup.com.au
Rolf Stene	South West Chambers of Commerce and Industry
Gerry Rayner	Wosley Alumina. Gerry.rayner@wapl.com
Peter di Marco	Griffin. Pdimarco@bigpond.net.au
Peter Ashton	Premier Coal. Peter.ashton@premiercoal.com.au
David Biggs	Department of Environment (SW Division). David.bills@environment.wa.gov.au

- **Table 2 Apologies List**

Name	Company/Organisation
Wayne Tingey	Dept. of Environment (SW Regional Mgr)
Paul van Buynder	Dept. of Health
Don Punch	SW Development Commission
Chris Elliot	Water Corporation
John Yorath	Water Corporation
Larry Guise	Dept. of Planning and Infrastructure
Drew Griffiths	Dept. of Conservation and Land Management
Jim Weighell	Chamber of Commerce and Industry – Collie
Vin Rose	Dept. of Industry and Resources
Luke Botica	Collie Shire Council
Jake Davidson	Collie Shire Council
Colin Wheadon	Collie Shire Council
Mick Murray	MLA Collie
Wendy Hoskins	Collie Senior Citizens
John Tuffin	Collie Senior High School
Charlie Serravite	Amaroo Primary School
Rob Smithson	Collie Police and Citizens Youth Club

Name	Company/Organisation
Keith Meadows	Collie River Valley Medical Centre
Basudeb Saheray	Collie Medical Group
District Manager	Collie District Hospital
Roseanne Pimm	Community Member
Bernadette Durrell	Riverview Residence

During the presentations, the attendees raised various queries. A record of the queries that were raised and the responses that were given are summarised in the table below.

No.	Query	Response
Overview		
1	Does Griffin propose to establish a super-critical or sub-critical power station?	Decision has not been made yet. It is expected that the emissions profile from both options will be similar.
2	Does the potential change of Government affect the information presented today?	There will be no change in the results of the studies that have been undertaken. SKM's investigations have been based on a doubling of Collie A.
3	The end date of the public review and lodgement of submissions has been extended from the 21 March to the 28 March on the grounds that the community are assessing numerous large public documents (three PERs and a Structure Plan). EPA letter sighted at workshop.	Proponents are not aware of any extension provided. Review of EPA letter suggests that extension is only provided to the addressee of the letter.
4	Light spill – has this issue been addressed by the Proponents. "Collie lights up at night and is like a Christmas tree".	Light spill listed as an issue for further discussion in the workshop.
5	Has any consideration been given to the Ewington 1 mine proposal? The mine is a large issue and needs to be included as part of a cumulative assessment, specifically with reference to noise.	Emissions from mining operations have been reviewed and addressed in the air quality assessment. This will be discussed in the air quality presentation. Noise emissions from Ewington have not been considered in the noise assessment.
6	Has both the current expansion of the Worsley refinery as well as the future proposed expansion been included as part of the cumulative assessment.	Both expansions have been included and addressed and will be discussed in the air quality presentation.
7	Bluewaters has been included in the assessment, why hasn't the Industrial Estate been included? The community needs to understand cumulative impact. Modelling has been undertaken for industries such as a pulp mill etc. Griffin Energy has included additional emission sources predicted in the Structure Plan.	The Structure Plan is assessed differently to individual proposals and requires some estimation of "likely" industries. These industries are not yet proposed.

No.	Query	Response
8	A buffer zone should be established for the Ewington mine and Bluewaters. Bluewaters should have a similar buffer to that existing for Collie A, which the DoE set based on air quality.	SKM can not comment on the EPA's criteria for defining the buffer zone boundary.
9	Griffin Energy has specifically stated that SKM's information that is being presented is incorrect.	The SVT modelling presented by SKM for Bluewaters was based on the site and noise emissions detailed in the Bluewaters 1 PER. The Bluewaters Power Station proposal has been modified since this PER, hence our representation of Bluewaters is out of date. We believe the modelling assumptions for Collie A & B are correct.
Social Profile and Survey		
10	The unemployment figures presented are dated. Why from 2001? Why not get weekly/monthly updates released by the ABS?	Information from the Census is utilised as it has provided the most information for the range of parameters being investigated for the social profile. It also enables comparison with previous census figures to show trends and allows comparison with the average unemployment figures for Western Australia.
11	For the telephone survey, what was the timing of phone calls? Was it during the day or night?	Phone surveys were undertaken during the morning, afternoon and evening. Some answering machines were encountered, however three attempts were made for each telephone number before going onto the next number. The methodology that was used is described in the survey report.
12	Define the rating of minor/ slight/ moderate risk perception used for community concerns.	The risk perception rating is based on a continuum of 5 points ranging from high, moderate, minor, slight to no risk ", based on the respondant's perceived level of concern about the health risk.
Air Quality		
13	When was a measuring meter be established at the receptor location number 16?	This is a theoretical point where concentrations were determined through modelling. No actual monitoring is undertaken at this location. Ambient monitoring of air quality is undertaken at other locations.
14	Where are ambient monitoring sites located?	The locations of ambient monitoring sites are pointed out on the presentation slide in relation to receptor locations. These are detailed in SKM's report.
15	Why over-estimate or under-estimate emission exit velocities at Muja?	An over-prediction of emissions occurs from under-estimating exit velocities. A lower exit velocity results in less dispersion and mixing, therefore pollutants are more concentrated nearer to the source of the emission. A higher exit velocity results in better dispersion and mixing where pollutant concentrations less concentrated as they are spread over a greater area due to better dispersion. In both scenarios, pollutants will reach Collie, however at low exit velocities the pollutant concentrations will be worse.

No.	Query	Response
16	Why is the 3rd grid and not 4th grid preferred for air quality?	The theoretical estimations determined on the 3rd grid corresponds better to actual monitoring data collected from the ambient monitoring sites. The 4th grid over predicts and provides predictions for every 500m. The 3rd grid provides predictions for every 1.5km.
17	What will happen if Muja A & B are still operating in the future?	This scenario has been modelled and is included in the Appendix of SKM's report. In this scenario, Collie B emissions are generally overshadowed by the emissions from the Muja Power Station.
18	What are the SOx, NOx, PM health impact and potential effects on employees at the power station?	SKM is not able to comment on the workplace scenario as different criteria apply. It is based on occupational health and safety. Employees will have a higher exposure, as they will be closer to the source. Adopting a conservative estimate (4th grid), SO_2 concentrations are predicted to exceed the World Health Organisation guideline for 1 to 2 hours every year. This exceedance may cause effects to asthmatics, for example some minor effects on asthma.
Noise and Other Factors		
19	For noise emissions, isn't the NE wind scenario indicate the worst case for Collie?	The worst case scenario is based upon the highest predicted noise level at the nearest residence. The nearest residence is located to the NE of the power station. The township of Collie is not affected by the Collie Power Station expansion as noise emissions reach background levels in the Collie area.
20	Presentations are not consistent with latest data as documented in Bluewaters cumulative assessment. Who is correct?	SKM is not able to comment on Griffin's Bluewaters assessment. The SVT modelling presented by SKM for Bluewaters was based on the site and noise emissions detailed in the Bluewaters 1 PER. The Bluewaters Power Station proposal has been modified since this PER, hence our representation of Bluewaters is out of date. We believe the modelling assumptions for Collie A & B are correct.
21	Why do the contours stop before the town of Collie	The contours show the extent over which the noise model was created. The extent was chosen as that which would show the distance over which the impact of the Collie Power Station would have am impact and to include the closest residences.
22	Will there be environmental licenses for offsite pollution.	Yes, licenses will specify requirements for groundwater monitoring.
23	Has the use of industrial water from Wellington Weir been considered.	A number of potential options are being investigated. No decision has been made. This remains as an option.
24	How much water does Collie B require?	5.1GL/year cooling H_2O.
25	What is the point of assessing impacts on recreational areas and tourism? Why not consider other factors such as schools?	Recreational areas were considered a factor that required investigation to determine if any impacts would occur. Although it was found not to be significant, any potential impacts need to be identified.

No.	Query	Response
26	Visual amenity – lighting. What is the view from the other side of the power station? The bluegum plantation that provides some screening is currently being harvested.	Issue noted.
27	Has the night-time visual amenity been considered?	Issue noted.
28	What are the current traffic movements in Collie related to the power station?	About 300 traffic movements.
29	The predicted traffic movements proposed by the project, what are they based on?	Rough estimate, peak construction workforce of 600 with two trips per day per person. Noted that 2004 traffic count for Collie is 470.
30	Has any consideration been given to transport routes, particularly routes travelling adjacent to river? Materials such as $H_2 SO_4$ could spill into the river.	Issue noted.
31	Flyash technology not emitted from stack.	Technology is based on opportunities for reuse. Flyash removal from stack is undertaken from well proven technology.

Following the presentation, community members and stakeholders were divided into two groups and asked to prioritise what they considered to be significant issues/ concerns: *"Distribute your 10 dots between the issues you believe will be most significant in future"*.

The following is a summary of the results that were obtained.

- **Table 3 Ranking of Significant Issues: Group 1 Results**

Description	No. of Dots
An increase in dust, fly ash and smoke (concern is from Muja)	-
An increase in gaseous emissions (sulphur dioxide and oxides of nitrogen)	5
An increase in respiratory conditions (e.g. asthma)	3
An increase in greenhouse gas emissions	4
An increase in the contamination of groundwater (bores, aquifers)	2
Contamination of rivers and wetlands (surface water)	2
Positive impacts on the town's growth and development	**8**
Increased employment opportunities	**10**
An increase in road traffic	5
Increased demand for services such as education and health	**6**
Increased water use	**7**
Increase in population	1
An increase in noise	4
Presence of hazardous materials	2
Impacts on recreational areas	-

Description	No. of Dots
Disposal of solid waste products	-
Changes in how the area looks (ie visual impact)	**8**
Impacts on aboriginal sites and artefacts	2
Light shed (during the night-time)	2

- **Table 4 Ranking of Significant Issues – Group 2 Results**

Description	No. of Dots
An increase in dust, fly ash and smoke (concern is from Muja)	5
An increase in gaseous emissions (sulphur dioxide and oxides of nitrogen)	4
An increase in respiratory conditions (e.g. asthma)	2
An increase in greenhouse gas emissions	5
An increase in the contamination of groundwater (bores, aquifers)	**8**
Contamination of rivers and wetlands (surface water)	4
Positive impacts on the town's growth and development	-
Increased employment opportunities	**8**
An increase in road traffic	4
Increased demand for services such as education and health	-
Increased water use	**7**
Increase in population	-
An increase in noise	**7**
Presence of hazardous materials	2
Impacts on recreational areas	-
Disposal of solid waste products	1
Changes in how the area looks (ie visual impact)	1
Impacts on aboriginal sites and artefacts	-
Light shed (during the night-time)	2

- **Table 5 Ranking of Significant Issues - Overall**

Description	No. of Dots
An increase in dust, fly ash and smoke (concern is from Muja)	5
An increase in gaseous emissions (sulphur dioxide and oxides of nitrogen)	**9**
An increase in respiratory conditions (e.g. asthma)	5
An increase in greenhouse gas emissions	**9**
An increase in the contamination of groundwater (bores, aquifers)	**10**
Contamination of rivers and wetlands (surface water)	6
Positive impacts on the town's growth and development	8
Increased employment opportunities	**18**
An increase in road traffic	**9**

Description	No. of Dots
Increased demand for services such as education and health	6
Increased water use	**14**
Increase in population	1
An increase in noise	**11**
Presence of hazardous materials	4
Impacts on recreational areas	-
Disposal of solid waste products	1
Changes in how the area looks (ie visual impact)	8
Impacts on aboriginal sites and artefacts	2
Light shed (during the night-time)	4

In order of priority, the following significant issues were determined to be of concern:

1) Increased employment of opportunities;
2) Increased water use;
3) An increase in noise;
4) An increase in the contamination of groundwater; and
5) An increase in road traffic, greenhouse emissions and gaseous emissions.

A significant issue raised by the community that could not be fully addressed by the Workshop as it was beyond the scope of the Collie B proposal was cumulative impacts:

- **Cumulative Impacts** from ALL proposals was a significant issue raised by the community including noise, dust, light shed and air quality.
  a) Department of Health recommended that the EPA be requested to investigate the cumulative impacts of ALL proposals currently in the public arena on behalf of the community.
  b) The Department of Health advised that the EPA is considering the establishment of a Collie Industry Council to address cumulative impacts and common community issues.
  c) Kim Taylor is the relevant representative in the EPA to contact for further assistance.
  d) Community is frustrated that projects are considered in isolation.
  e) The community request that ALL projects be presented in one effort to provide a clear message of the potential cumulative impacts.
- **Submissions** - Community advised to lodge a submission advising that they are not equipped or have capacity to review all these documents. Request EPA to assist the community.

Other issues that were raised by the community whilst undertaking the workshop included:

- **Accommodation** for construction workforce, for example the ability of existing facilities to cater for accommodation needs. Availability of camp/rental properties, type workforce (families or single persons), land availability for housing etc.
- **Traffic Management** – reduce traffic movements by bussing workforce to site.
- **Traffic Safety** along Williams Rd where several school age children live, provision of signage, speed controls, policing and enforcement.

End.