# 13.0 Groundwater Assessment

*Based on a review of existing data a conceptual model of the hydrogeological regime within the Project Site has been developed. This section discusses the conceptualisation and data used to develop the model as well as potential impacts and mitigation measures for the construction and operation of the proposed Bayswater B project*.

## 13.1 Conceptual Hydrogeological Model

### 13.1.1 Geology and Geomorphology

The regional geology comprises two distinct units, namely a Permian sandstone/coal sequence with lesser siltstone, uncomfortably overlain by Quaternary alluvial deposits of sand and gravel with varying clay and silt content along drainage channels.

Regional east-west compression of the strata has resulted in the development of a number of structural features. Most significant in a hydrogeological context is the occurrence of the Muswellbrook anticline, the axis of which lies immediately west of the Project Site. The axis of the anticline is accompanied by a number of graben[2] features and associated north-south trending faults, which have been intruded by igneous material to form dykes and sills.

The stratigraphy of the Project Site comprises a Permian sandstone/coal sequence intruded by a dolerite sill which is exposed at the surface across much of the Project Site. Quaternary alluvial deposits occur along the gullies and creeks and uncomfortably overlie the Permian strata.

The faulting present in the vicinity of the Project Site is likely to have resulted in the development of secondary permeability and localised increases in aquifer hydraulic conductivities.

### 13.1.2 Hydrogeology

The Hunter Region hosts three types of aquifer systems. These comprise:

- Alluvial aquifer associated with major drainage channels such as the Hunter River;
- Shallow bedrock aquifer within the weathered zone or regolith; and
- Deep bedrock aquifer associated with the coal measures.

The following sections describe the characteristics of these aquifer systems.

**Alluvial Aquifer**

Deposits of unconsolidated silts, sands and minor gravels of mixed colluvial and alluvial origin occur in valleys, creeks and gullies in the vicinity of the Project Site. Within the Project Site, alluvial sediments are confined to limited sections of Saltwater Creek. These deposits are thin and of limited aerial extent, and hence do not have significant groundwater storage capacity.

[2] A graben is the result of a block of land being downthrown producing a valley with a distinct scarp on each side.

In contrast, the alluvial deposits of the Hunter River approximately 5 kms to the south of the Project Site, are considered a significant source of groundwater. Previous studies have estimated the Hunter River alluvium is up to 13 m thick and contains a basal gravel unit varying between about 2.5 m and 4 m in thickness. Data provided by the Department of Natural Resources indicate that bores located within the Hunter River alluvials can yield between 1 and 80 L/sec, with the higher yielding bores being closest to the river. The Hunter Valley alluvium yields usable quantities of water for irrigation and stock watering.

The alluvial sediments present within the Project Site are not considered Hunter Valley alluvials.

Due to the shallow and permeable nature of alluvial aquifers, they are highly responsive to rainfall and stream flow. Recharge is predominantly through rainfall infiltration. Groundwater which may occur within the alluvial sediments of the Project Site is likely to drain rapidly into the creeks and gullies, and hence be short lived.

Due to the relatively low order of drainages within the Project Site based upon the degree of stream branching, valley infill deposits of colluvial and alluvial material are limited. As such, valley infill deposits do not constitute a significant aquifer resource.

**Shallow Bedrock Aquifer**

The shallow bedrock aquifer comprises surficial soil and weathered bedrock. It is likely that discontinuous perched aquifers develop at the interface between soil and bedrock and along zones of locally increased permeability's caused by weathering of bedrock.

The depth and permeability of the aquifer is likely to be dependant on several factors including the depth of weathering and the extent and frequency of permeable fracture systems. A hydrogeological assessment carried out at the United Collieries mine located approximately 10 kms to the south of the Project Site indicated that increase in permeability's due to bedrock weathering may extend to a depth of 30 to 40 metres below the surface, however the interface with the underlying deep bedrock aquifer is likely to be gradational and not a distinct horizon. Groundwater within the shallow bedrock aquifer is generally brackish to saline.

Recharge to the shallow bedrock aquifer is primarily through the infiltration of rainfall. Some infiltration would also be expected through exposed strata of the open cut coal mine pits in the vicinity of the Project Site. Some infiltration from the shallow bedrock aquifer to deeper levels is likely to occur through permeable fractures, joints and faults.

**Deep Bedrock Aquifer**

The Permian strata comprises a sequence of low yielding to essentially dry sandstone and siltstones and low to moderately permeable coal seams. The coal seams generally have a low primary or intergranular, porosity and permeability, however bedding planes, joints and fractures impart a secondary permeability to the rock mass. These joints and fractures tend to be laterally and vertically discontinuous which result in poor hydraulic connection and low groundwater yields.

Pumping tests conducted on bores located within the coal seams at the adjacent Drayton Mine recorded yields in the range of 1.0 L/sec to 3.3 L/sec.

Groundwater in the deep bedrock aquifer is of poor quality. Water quality data from bores intersecting the coal seams on nearby mines indicates that groundwater within the coal seams is brackish to saline and not suitable for domestic or irrigation purposes and has marginal use for stock water supplies.

Recharge to the deep bedrock aquifer is generally from infiltration of rainfall from overlying aquifers and water storages, and the flow direction is expected to reflect the local topography and flow from areas of higher ground in the west towards the east.

### 13.1.3 Groundwater Users

A review of the DECCW database identified four registered bores within the land owned by Mac Gen used for industrial use. Three of the four bores are installed to between 92 and 99 m depth in fractured bedrock and coal. The fourth bore is installed to 3 m only in unconsolidated sediments. Groundwater yields of the various aquifers encountered during the installation of these wells ranged from 0.1 L/sec to 4.2 L/sec, however were generally less than 1 L/sec.

There are several bores registered within a 5 km radius of the Project Site. The use of the bores is described as being for:

- Stock watering;
- Irrigation;
- Industrial;
- Monitoring; and
- Town water supply.

The majority of these bores are located along the southern side of the Hunter River, to the south of the Project Site (refer to **Figure 13-1**), and installed into the Hunter Valley alluvial sediments.

### 13.1.4 Previous Investigations

A previous preliminary geotechnical investigation in the vicinity of the proposed Bayswater B project included the drilling of ten boreholes and installation of nine piezometers. The investigation encountered between 0.6 m and 3.0 m of soil cover overlying siltstone and coal seams of the Greta Coal Measures, or the dolerite sill.

Groundwater observations were not made during drilling, however the piezometers installed reported a depth to groundwater (from surface) of between 11.4 m and 38.7 m. The report concluded that groundwater levels roughly image the surface topography, with flow towards the surface drainage features.

The groundwater levels reported during the previous geotechnical investigation were consistent with information provided by the DECCW which indicated a depth to groundwater of 15 m in the vicinity of the Project Site.

## 13.2 Existing Impacts on Groundwater Regime

The presence of numerous underground and open cut mines in the vicinity of the Project Site have already influenced the local groundwater regime. The mining of coal seams and removal of overburden have resulted in drawdown and loss of pressure within the shallow and deep bedrock aquifers.

Lake Liddell and Liddell Ash Dam to the northeast of the Project Site and Plashett Dam to the south are assumed to act as regional water sources and recharge points for the groundwater system. These water sources have been shown by previous studies to effectively establish a constant ‘head’ from which hydraulic gradients are established towards local drainages and mine pits.

## 13.3 Potential Impacts and Mitigation Measures

An assessment of potential impacts to the groundwater regime as a result of the proposed Bayswater B Project was undertaken. Activities with the potential to impact groundwater are considered to include:

- Excavation during construction
- Installation of piles during construction
- Spills and leaks during construction and operation
- The disposal of ash (dependant on the fuel source selected)

The potential impacts these activities may have on the hydrogeological regime are discussed below.

### 13.3.1 Excavation during Construction

Construction of the power station and associated infrastructure would involve the clearing, grading and excavation works which would disturb the surface and shallow subsurface soils.

The maximum depth of excavation would be dependant on the final foundation design, however it is anticipated that excavations of up to 5 m would be required for concrete foundations and the laying of underground pipes and services.

Previous investigations have identified the presence of shallow bedrock across the majority of the Project Site, with localise thicker soil coverage, particularly near gullies. The maximum depth to bedrock encountered was approximately 3 m, indicating the bedrock may be encountered during excavation (refer to **Figure 13-2**).

Drilling records (provided by DECCW and presented in other studies) for boreholes drilled within the Project Site indicate a depth to groundwater of approximately 15 metres within the shallow bedrock aquifer. As such, it is not anticipated that groundwater would be encountered during shallow excavations.

Some seepage of water into excavations may occur following rainfall events. This water should be managed in accordance with the Environmental Management Plan to be prepared for the Site.

### 13.3.2 Installation of Piles

The installation of piles would be required for the support of larger structures associated with the power station. Piles would either be bored or driven into bedrock and sealed with an inert material. The maximum depth of piling is expected to be approximately 30 metres, and as such, is likely to encounter groundwater within the bedrock aquifer (refer to **Figure 13-2**).

The presence of the piles may result in a slight variation in groundwater flow direction around the pile, however this impact is expected to be localised and not result in a measurable impact. Localised changes, should they occur, would likely equilibrate in a relatively short timeframe.

### 13.3.3 Spills and Leaks

The accidental release of fuels, solvents or chemicals used during the construction or operation of the facility has the potential to impact underlying groundwater.

Impacts to groundwater that occur from spills and leaks are usually limited in extent and are not likely to impact off-site users. The potential for impacts can be minimised through the appropriate storage of fuels and hazardous chemicals, the implementation of appropriate work procedures and regular inspections and maintenance of equipment and plant.

The assessment and management of leaks and spills should be handled in accordance with the EMP prepared for the project and remediated as required.

### 13.3.4 Ash Disposal

The disposal of ash would be required for the coal fired option. Disposal of ash to open cut mine voids is currently being considered at a number of locations near the Project Site.

Ash produced as a result of coal combustion is a fine-grained, powdery particulate material that is transported through the boiler by the flue gas and collected from the flue gas by baghouses.

The principal components of the ash are silica, alumina, iron oxide, and calcium, with varying amounts of carbon and trace metals including, but not limited to, arsenic, cadmium, chromium, lead, mercury, molybdenum, nickel, selenium, and zinc. The physical and chemical properties of ash are dependent on the coal's geological origin, combustion conditions, efficiency of particulate removal, and degree of weathering before final disposal.

The disposal of ash has the potential to impact water quality within the hydrogeological system. From a hydrogeological perspective, the issues are primarily the leaching of the ash and the migration and fate of leachate in the subsurface and the effect on water quality. The leaching behaviour of trace elements within the ash is controlled by several variables including the liquid to solid ratio, pH, redox, salinity, ionic composition and groundwater flow properties.

Since the location for Bayswater B ash disposal (and hence the specific hydrogeological characteristics of the site) are not yet known, the potential impacts to groundwater and recommended management measures cannot be fully assessed at this point in time.

As an example however, the following details methods by which fly ash from the existing Bayswater Power Station is disposed of in the Ravensworth Mine void. For Bayswater, the mine rehabilitation method is currently being used, whereby fly ash material is transported to Ravensworth Mine to rehabilitate the completed mining voids. The ash disposal process for the existing Bayswater Power Station has some key differences to that which may be used for Bayswater B. However, it provides a useful illustration of how ash disposal can be managed to minimise impacts to groundwater.

The overall objective of water management at the Ravensworth ash storage area is to avoid the need to discharge surplus water under a wide range of climatic and operational conditions during the operational phase. Should discharges be necessary, management measures ensure that they are of adequate quality. A key difference in ash management for Bayswater B as opposed to the existing Bayswater power station is that the latter uses wet slurry pumping (approximately 30% water) whereas the proposed Bayswater B power station would employ ash conditioning (approximately 15% water). As such, only the applicable measures from Bayswater-Ravensworth have been detailed below.

The likely method for the disposal of fly ash at Bayswater B would include:

- Conveying fly ash to a silo or holding tank
- Conditioning the ash with water to control dust during transport (15% water)
- Conveying the conditioned ash to the mine void for rehabilitation.

The potential for water seepage would be reduced through the minimal water content of the ash.

A number of water handling systems would be potentially applicable to ash disposal from Bayswater B:

- Minimisation of water flow into the void (i.e. stormwater)
- Maximisation of the use of any excess water at the site for dust suppression
- Provision of temporary water storage if required for management of stormwater (i.e. retention for evaporation or for use in dust suppression, avoiding offsite flows).

The following principles may be applied to site drainage around an ash disposal site (mine void) to be protective of groundwater and surface water:

- Minimisation of infiltration into the groundwater system of the void through the establishment of drainage systems which direct surface drainage away from the site and the isolation or rectification of sink holes and soak areas which direct surface water down through the spoil into the voids.
- Construction of sedimentation dams if required.
- Direction of surface run-off from both fully revegetated and bare spoil areas off site wherever possible, through sediment control structures. Drainage from larger areas that have not been rehabilitated directed through sedimentation ponds, while small areas may only require temporary control structures until vegetation is established (2008, MacGen Ravensworth Mine S96(A) Modification to DA 144/93).

Additional methods that may be employed for the minimisation of groundwater interaction if applicable may include mine wall compaction to reduce infiltration potential and additional water separation devices such as sink holes and surface water diversions.

The Ravensworth mine void ash disposal is subject to conditions of its approval and an Environmental Management Plan. The ash disposal point for the Bayswater B site (if the coal fired option is chosen) would be subject to:

- Detailed groundwater assessment as part of the detailed design phase (once the disposal location is identified) and supporting appropriate regulatory assessment and approval
- Inclusion of specific recommendations as part of the detailed groundwater assessment to support engineering controls and management and mitigation measures to be protective of groundwater
- Preparation of an Ash Disposal Plan including all environmental management measures, processes and procedures and monitoring and reporting requirements for the operation of the ash disposal point.

## 13.4 Conclusion

Adverse impacts to the groundwater regime as a result of the construction of the proposed Bayswater B project are not anticipated to be significant due to the limited extent of subsurface work required. Mining operations surrounding the Project Site are likely to have already impacted the groundwater regime and the incremental impacts from the construction of the proposed Bayswater B project are considered minimal.

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AECOM

GROUNDWATER BORE LOCATIONS

Environmental Assessment

Bayswater B Power Station

Figure 13.1

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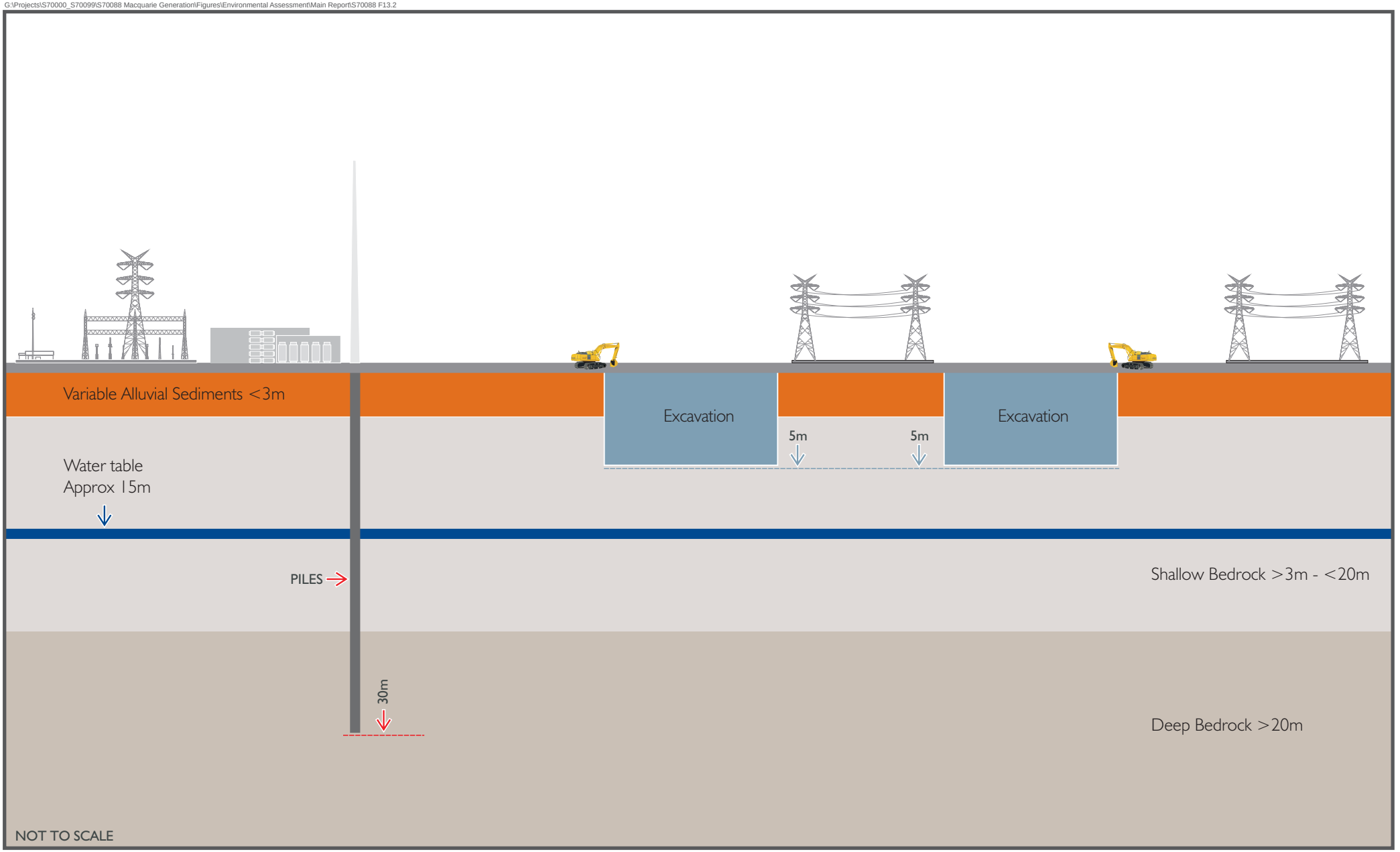


AECOM

CONCEPTUAL SITE MODEL

Environmental Assessment

Bayswater B Power Station

Figure 13.2

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# 14.0 Noise

*This Chapter provides a summary of the results of the Noise and Vibration Assessment undertaken by AECOM. The full Noise and Vibration Assessment is provided in Appendix E, with this chapter providing a summary. This assessment has been undertaken in consultation with DECCW and with recourse to the Director General's Requirements which include:*

***Noise Impacts** - the Environmental Assessment must include a comprehensive operational noise impact assessment for the project, prepared in accordance with NSW Industrial Noise Policy (EPA, 2000) considering worst case operating scenarios and meteorological conditions, representative monitoring and receiver locations, and cumulative impacts from the adjacent Bayswater-Liddell generating complex, surrounding mining operations (as relevant) and the connection/upgrade of the Antiene coal conveyor. The assessment must consider the potential for low frequency noise generation and peak noise events with the potential to cause sleep disturbance. The Environmental Assessment must also consider the potential for:*

*Construction noise impacts consistent with the DECC's "construction noise – existing guidelines" available electronically at http://www.environment.nsw.gov.au/noise/constructionnoise.htm ;*

*Vibration impacts during construction and operation consistent with Assessing Vibration A Technical Guideline (DECC, 2006); and*

*Traffic generated noise during construction and operation consistent with Environmental Criteria for Road Traffic Noise (EPA, 1999).*

*The Environmental Assessment must include a framework for the mitigation, management and monitoring of noise impacts, particularly with respect to sensitive receptors likely to be significantly.*

## 14.1 Existing Environment

The surrounding areas of the proposed development are dominated by agricultural practices, power generation and mining activities (refer to **Chapter 4 Site and Context**). The existing environment in the Upper Hunter Valley in terms of terrain and land use has been summarised in **Section 4.2** (Site and Context), while the local climate, inter-annual climate variability and local meteorology has been described in **Section 9.1** (Air Quality).

The nearest residential locations (noise sensitive) to the proposed Bayswater B Power Station are:

- Residences located approximately 10 km north of the site next to the New England Highway (represented by assessment location R2)
- Residences located approximately 10 km north east of the site next to Hebden Road (represented by assessment location R1)
- Residences located approximately 9 km south of the site next to the Golden Highway (represented by assessment locations R5, R6, R7 and R8)
- Residences located approximately 8.5 km south west of the site next to the Golden Highway (represented by assessment locations R4 and R9)
- Residences located approximately 11 km north west of the site next to Edderton Road (represented by assessment location R3)

- Residences located approximately 13 km north west of the site next to Denman Road (represented by assessment locations R10, R11 and R12)
- The nearest industrial noise receiver has been identified as the existing Bayswater Power Station (represented by assessment location IR1). No residential receivers were identified within 10 km east of the site.

The main roads in the vicinity of the proposed development are the New England Highway to the north east and the Golden Highway to the south west of the site.

## 14.2 Potential Impacts

Noise monitoring and/or assessment was carried out for the above receptor locations, with acoustic impact modelling based on the 'worst case' impact of likely site activities and equipment. The assessment results for both construction and operation of the proposed Bayswater B Power Station are summarised below.

**Construction**

The primary noise sources during construction would include:

- Large civil construction equipment noise sources such as concrete batching plant, pile drivers, backhoes, compactors, concrete mixer trucks, graders, flat bed trucks, dump trucks and compressors during site preparation
- Cranes, heavy haul low loaders, flat bed delivery trucks, man lifts, generators, pneumatic tools, welders and forklifts during the erection of steelwork / plant.

The construction noise impact assessment showed that there is a low potential for noise impacts during the construction of the proposed development. Modelling showed that for both neutral and adverse weather conditions, construction noise levels would be well below established noise criteria at all assessment locations during the daytime, evening and night-time periods. In addition, the noise impact at the closest industrial type receiver (the existing Bayswater Power Station) would also comply with the construction noise criteria for industrial type premises.

Construction activities would take place predominantly during recommended standard working hours (7.00 am – 6.00 pm Monday to Friday and 8.00 am – 1.00 pm Saturday). However, oversized loads and emergency work may need to be conducted outside recommended standard working hours. Heavy vehicle traffic (excluding oversized loads and emergency work) should be restricted to movements during daytime hours.

**Operation**

Potential noise impacts during the operation of the proposed development may include:

- Operation of plant
- Truck movements
- Train movements on the Antiene Rail Loop
- Loading / unloading activities
- Mechanical services associated with site buildings.

All predicted operational noise levels for the both the coal and gas fired options under neutral and adverse weather conditions, worst wind conditions and temperature inversion comply with the site specific operational noise criteria at all nearby residential receivers during the daytime, evening and night-time periods.

In the case that the coal fired option were chosen for the proposed development, additional coal would be required to be brought to the site via the existing Antiene Rail Loop. This could result in up to two additional train movements per day. Potential noise and vibration impacts on nearby residences associated with additional trains utilising the Antiene Rail Loop have previously been assessed and appropriate mitigations recommended (refer to **Appendix E**). It is considered that no significant noise or vibration impacts would arise as a result of the increased use of the Antiene Rail Loop as a result of the Bayswater B project.

## 14.3 Management and Mitigation

### 14.3.1 Construction

Prior to the commencement of the construction of the Bayswater B Power Station, it is recommended that the proponent prepares a Construction Noise Management Plan (CNMP) in accordance with the DECCW "*Draft Construction Noise Guidelines"*. The CNMP would outline noise mitigation measures, noise monitoring and management procedures to be implemented to minimise noise impacts during the construction phase of the project. The CNMP may also include the following work practices to minimise the potential noise impacts at sensitive receivers during construction:

- Community notification and consultation
- Noise monitoring
- Operating plant in a quiet and efficient manner
- Involving workers in minimising noise
- Handling complaints appropriately.

Each of these aspects is detailed in full in **Appendix E**.

### 14.3.2 Operation

It is recommended that the proponent prepares an Operational Noise Management Plan (OEMP) in accordance with the DECCW "Industrial Noise Policy". The OEMP would outline noise mitigation measures, noise monitoring and management procedures to be implemented to minimise noise impacts during the operation phase of the project. The OEMP may also include the following best management practices to minimise potential noise impacts at sensitive receivers during operation:

- Using components that do not emit tonal or low-frequency noise, using trenches, cuttings, tunnels and barriers for transport routes
- Using conveyor systems with low noise output, paying particular attention to rollers
- Maintaining plant and equipment to ensure that the designers' noise-output specifications continue to be met during the operation phase of the projects
- Using 'smart' reversing alarms
- Where low-frequency noise is difficult to isolate, seeking specialist advice about machinery redesign
- Reducing tonal noise through machinery redesign, enclosure; applying engineering noise control
- Within 90 days of the project commencing operation, monitor environmental noise levels at noise sensitive locations to determine compliance with the consent/licence conditions;

- Monitor noise levels as a result of community complaints. This may be done in addition to noise monitoring at various stages of the development described above, or could stand alone as the sole driver for performance monitoring; and
- Establish a complaint hotline to record receiver complaints regarding the development, a system for logging complaints and dealing with them.

## 14.4 Residual Impacts

As indicated above, the noise and vibration impact assessment has shown that all predicted operational noise and vibration levels for the both the coal and gas fired options under neutral and adverse weather conditions comply with the site specific operational noise criteria at all nearby residential receivers during the daytime, evening and night-time periods. There are not anticipated to be residual effects associated with the proposed development provided that the recommended mitigation measures are implemented.

# 15.0 Flora and Fauna

*This Chapter provides a summary of a flora and fauna assessment undertaken by Eco Logical Pty Ltd. This Chapter deals specifically with ecological aspects under the Threatened Species Conservation Act. A separate Chapter (Chapter 16) discusses Matters of national Environmental Significance under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.*

*The full report is provided in* ***Appendix F*** *and addresses the Director General's Requirements which included:*

***Ecological Impacts*** *- the Environmental Assessment must include*

*An assessment of the impacts on native vegetation, threatened species, populations, ecological communities and their habitats (both terrestrial and aquatic as relevant). The Environmental Assessment must include a screening of species, populations, ecological communities and habitats[3] based on ecological significance[4] and the potential for impact as a consequence of the project[5]. For species, populations, ecological communities and habitats with high ecological significance and significant potential for impact, include sufficient information to demonstrate the likely impacts, consistent with Guidelines for Threatened Species Assessment (DEC & DPI, July 2005).*

*The Environmental Assessment must include an assessment of impacts to aquatic and riparian values where waterway crossings are proposed[6]. The assessment must demonstrate a design philosophy of impact avoidance on ecological values, and in particular, ecological values of high significance and include a framework for the further consideration of ecological impacts at the project approval stage, and during detailed design of the project, including options for mitigation and/ or offset consistent with "improve or maintain" principles[7]. Sufficient details must be provided to demonstrate the availability of viable and achievable options to offset the impacts of the project.*

## 15.1 Methodology

The methodology undertaken for the assessment of Flora and Fauna impacts involved:

- A review of Flora and Fauna Database records;
- A review of literature and previous studies and reports relevant to the study site;
- Undertaking of a five day field survey in July 2009 to identify Flora and Fauna characteristics and verify database and literature review findings. It should be noted that not all of the pipeline route could be accessed at the time of survey. Survey extended to the portion of the pipeline on land owned by MacGen. Any un-surveyed areas have been assessed via desk based review and the assessment includes provision for further survey during the detailed design phase of the project;

[3] Refer Chapter 4 and Appendix A of the full Flora and Fauna Assessment in **Appendix F**

[4] Refer Section 4.3 in Appendix F

[5] Refer Chapter 5 in Appendix F

[6] Refer Section 4.2.7 and Chapter 5 in Appendix F

[7] Refer Section 5.4 and 6.1 in Appendix F

- An assessment of vegetation communities and Endangered Ecological Communities (EECs) for habitat value and occurrence on site;
- An assessment of threatened flora and fauna species; and
- An assessment of riparian conditions and habitat.

## 15.2 Site Characteristics

The proposed Bayswater B project site has been subject to human activity for a number of years. Prior to the development of the existing power station, the site would have been subject to agricultural activities, and is currently subject to light grazing over much of the proposal site.

East of the site is the existing Bayswater Power Station and the New England Highway. North and south of the site is relatively cleared land comprising primarily mining and agricultural enterprises.

Stands of native vegetation adjoin the western boundary, and are scattered amongst native and improved pastures to the south and west.

The majority the site comprised disturbed grassland/pasture. Low intensity cattle grazing occurs on the site. Cattle can access most of the site, except for the eastern most parts of the remnant woodland. Rabbits have a localised effect, being abundant in some locations which effects local diversity and biomass. Kangaroos are also abundant in the grassland areas.

## 15.3 Likelihood of Occurrence

### 15.3.1 Endangered Ecological Communities

The Grassland areas were found to be mostly disturbed as a result of cattle grazing and rabbit burrowing.

No threatened species listed in the Threatened Species Conservation (TSC) Act were identified on the study site. However, two communities, both “proposed” to be listed as EECs under the TSC Act were recorded. These were:

- Central Hunter Box – Ironbark Woodland; and
- Central Hunter Ironbark – Spotted Gum – Grey Box Forest.

### 15.3.2 Threatened Flora Species

No threatened flora species were recorded during field investigations.

Two threatened orchid species (*Diuris pedunculata* (Small Snake Orchid) and *Diuris tricolor* (Pine Donkey Orchid) may potentially occur on the site but could not be detected given the survey was conducted outside of their flowering season.

### 15.3.3 Threatened Fauna Species

Four vulnerable woodland bird species were recorded during the site survey; the Diamond Firetail *(Stagonopleura guttata);* Grey-crowned Babbler *(Pomatostomus temporalis temporalis);* Hooded Robin *(Melanodryas cucullata),* and the Speckled Warbler *(Pyrrholaemus sagittatus)*.

The results of the desk top review and site survey are shown in the table below Included is an indication of their likelihood of occurrence (as assessed at the desk based stage) and the potential for impact (as identified on the basis of survey and assessment).

### 15.3.4 Aquatic Ecosystem and Riparian Habitat Assessment

The predominant drainage pattern within the project area is southwards with minor tributaries flowing into Saltwater Creek which empties into Plashett Dam. Waterways comprise both poorly defined and well defined ephemeral creeks higher in the catchment and permanent features towards Plashett Dam. A number of aquatic features have been altered (waterways) or created (dams and channels) to cater for existing power station operations.

The condition of natural drainage features within the project area has been degraded in most areas through clearing of riparian and adjacent vegetation which has resulted in erosion of bed and bank features, deposition of sediment and reduced water quality.

Modified aquatic habitats within the project area provide habitat for aquatic flora and fauna, and are of particular importance to the Green and Golden Bell Frog.

### 15.3.5 Conservation Significance Assessment

Three remnant native vegetation communities occur on the study site:

- Central Hunter Box - Ironbark Woodland;
- Central Hunter Ironbark – Spotted Gum – Grey Box Forest, and;
- Hunter Valley River Oak Forest.

Remnant vegetation on the site has high conservation value as it is the subject of a preliminary determination of an EEC. Within the matrix that contributes to conservation significance, patch size is the lone distinguishing variable that differs across the site and that may direct where impacts should be located.

**Table 15-1: EPBC and TSC Listed Fauna**

| Species Name | TSC Act Status | Likelihood of occurrence within project area (based on desk based review) | Impact (based on survey and assessment) |
|---|---|---|---|
| *Diuris tricolor* | V, E2 | Potential | Potential habitat is present on site. Surveys are required in an appropriate season to determine if the species is present. |
| *Diuris pedunculata* | E | Potential | Potential habitat is present on site. Surveys are required in an appropriate season to determine if the species is present. |
| Brown Treecreeper<br>*Climacteris picumnus victoriae* | V | Potential | Habitat is present in and around the project site, most of which would be retained. Several areas of preferred habitat are located in the surrounding areas.<br>Impact likely to be low or negligible and acceptable |
| Swift Parrot<br>*Lathamus discolor* | E | Potential | Species may transit through the site foraging. No known critical habitat or lifecycle components at the site.<br>Impact likely to be low or negligible and acceptable. |
| Hooded Robin<br>*Melanodryas cucullata cucullata* | V | Yes | Identified at the project site. Woodland habitat may be removed, however only to a small extent. Linear impacts are not likely to restrict their movement across the landscape. Habitat would remain on site and surrounds.<br>Impact likely to be low and acceptable. |

| Species Name | TSC Act Status | Likelihood of occurrence within project area (based on desk based review) | Impact (based on survey and assessment) |
|---|---|---|---|
| Black-chinned Honeyeater (eastern subspecies)<br>*Melithreptus gularis gularis* | V | Potential | Habitat is present in and around the site most of which would be retained. Several areas of preferred habitat are located in the surrounding areas.<br>Impact likely to be low or negligible and acceptable. |
| Grey-crowned Babbler (eastern subspecies)<br>*Pomatostomus temporalis temporalis* | V | Yes | Identified at the project site. Woodland habitat may be removed, however only to a small extent. Linear impacts are not likely to restrict their movement across the landscape. Habitat would remain on site and surrounds.<br>Impact likely to be low and acceptable. |
| Speckled Warbler *Pyrrholaemus sagittatus* | V | Yes | Identified at the project site. Woodland habitat may be removed, however only to a small extent. Linear impacts are not likely to restrict their movement across the landscape. Habitat would remain on site and surrounds.<br>Impact likely to be low and acceptable. |
| Australian Painted Snipe<br>*Rostratula australis* | V | Unlikely | No wetlands are located in the vicinity of the Proposal site.<br>Impact likely to be nil. |
| Diamond Firetail<br>*Stagonopleura guttata* | V | Yes | Identified at the project site. Woodland habitat may be removed, however only to a small extent. Habitat would remain on site and surrounds.<br>Impact likely to be low and acceptable. |
| Regent Honeyeater<br>*Xanthomyza phrygia* | E | Potential | Species may transit through the site. No known critical habitat or lifecycle components at the site.<br>Impact likely to be nil. |
| Barking Owl<br>*Ninox connivens* | V | Likely | Preferred habitat identified at the project site in the form of hollow bearing trees and foraging areas. It is unknown whether the species utilizes these resources on site, but avoidance of hollow bearing trees and a suitable buffer around nest sites would substantially reduce impacts.<br>It is recommended that a hollow bearing tree survey be undertaken along the impact area and 50m either side.<br>The likely level of impact cannot be determined at this stage, but by avoiding hollow bearing trees and buffering accordingly, impact is likely to be low and acceptable. |
| Large-eared Pied Bat<br>*Chalinolobus dwyeri* | V | Potential | Habitat is present in the vicinity of the Proposal site. It is unknown whether the species utilizes hollow bearing trees on site, but avoiding hollow bearing trees would substantially reduce impacts.<br>It is recommended that a hollow bearing tree survey be undertaken along the impact area.<br>By avoiding hollow bearing trees and buffering accordingly, impact is likely to be low and acceptable. |

| Species Name | TSC Act Status | Likelihood of occurrence within project area (based on desk based review) | Impact (based on survey and assessment) |
|---|---|---|---|
| Eastern Bentwing-bat<br>*Miniopterus orianae oceanensis* | V | Potential | Foraging habitat is present in the vicinity of the Proposal site. The proposal is unlikely to affect any potential roosting habitat.<br>The impact of the proposal is considered to be negligible and acceptable. |
| East-coast Freetail-bat<br>*Mormopterus norfolkensis* | V | Potential | Habitat is present in and around the Proposal site. Several areas of preferred habitat are located in the surrounding areas.<br>By avoiding hollow bearing trees and buffering accordingly, impact is likely to be low and acceptable. |
| Large-footed Myotis<br>*Myotis macropus* | V | Potential | Habitat is present in the vicinity of the Proposal site. Foraging and potential roosting habitat is present (waterways and hollow bearing trees). Minor impact to foraging habitat may occur. By avoiding hollow bearing trees and buffering accordingly, impact is likely to be low and acceptable. |
| Eastern Long-eared Bat<br>*Nyctophilus bifax* | V | Unlikely | Preferred habitat is not located in the locality of the Proposal site. |
| Grey-headed Flying-fox<br>*Pteropus poliocephalus* | V | Likely | Preferred foraging habitat identified at the project site.<br>Impact likely to be negligible and acceptable |
| Yellow-bellied Sheathtail-bat<br>*Saccolaimus flaviventris* | V | Potential | Habitat is present in and around the Proposal site. Several areas of preferred habitat are located in the surrounding areas.<br>Impact likely to be negligible and acceptable |
| Greater Broad-nosed Bat<br>*Scoteanax rueppellii* | V | Potential | Habitat is present in and around the Proposal site. Several areas of preferred habitat are located in the surrounding areas.<br>By avoiding hollow bearing trees and buffering accordingly, impact is likely to be low and acceptable. |
| Koala<br>*Phascolarctos cinereus* | V | Unlikely | Characteristic food trees are located on site but a lack of records in recent times indicates that the site is not “core” Koala habitat.<br>Impact of the proposal is likely to be nil. |
| Squirrel Glider<br>*Petaurus norfolcensis* | V | Unlikely | Preferred habitat is not located in the locality of the Proposal site.<br>Impact likely to be negligible and acceptable |
| Brush-tailed Rock-wallaby<br>*Petrogale penicillata* | E | No | Preferred habitat is not located in the locality of the Proposal site.<br>Impact likely to be nil. |

| Species Name | TSC Act Status | Likelihood of occurrence within project area (based on desk based review) | Impact (based on survey and assessment) |
|---|---|---|---|
| Booroolong Frog<br>*Litoria booroolongensis* | E | Unlikely | Preferred habitat is not located in the locality of the Proposal site.<br>Impact likely to be nil. |
| Green and Golden Bell Frog<br>*Litoria aurea* | E | Likely (Suitable habitat recorded within the study site) | Preferred habitat identified at the project site. Further survey is required to better understand, evaluate and manage potential impacts. |

## 15.4 Bushfire

A bushfire assessment was also undertaken (also in **Appendix F**) which identified that currently for the coal and gas fired option, there are a number of assets that are considered to be at a moderate level of risk. A number of key treatment strategies have been identified that if implemented would reduce the residual risk to a low and acceptable level.

## 15.5 Potential impacts

The location of infrastructure at this stage of the project has taken into account the presence of vegetation and flora and fauna in an effort to minimise potential impacts (as detailed in **Chapter 3** of the EA and 6.1 of the full Flora and Fauna Assessment in **Appendix F**). The detailed design phase would take into consideration the results of this assessment and further surveys, to further avoid or minimise potential impacts. Any impacts that cannot be avoided, would be able to be quantified on the basis of the final detailed design which would confirm the locations of infrastructure. Any residual impacts would be subject to an assessment to support offsetting if required.

Based on the current location of the plant and infrastructure, the construction of the coal fired option would result in the removal of:

- Some 7.06 ha (1.2%) of Central Hunter Box – Ironbark Woodland within the project area; and
- Some 0.25 ha (<1%) of Central Hunter Ironbark – Spotted Gum – Grey Box Forest.

This would be mainly for the access road, raw water line and conveyors.

The gas fired option would result in the removal of:

- Some 9.6 ha (1.7%) of Central Hunter Box – Ironbark Woodland
- Some 4.5 ha (1.9%) of Central Hunter Ironbark – Spotted Gum – Grey Box Forest
- Some 0.3 ha (2%) of Hunter Valley River Oak Forest.

This would be mainly for the gas pipeline, access road and raw water line.

These figures are only approximate pending the final design. The majority of the remnant vegetation within the site would be retained.

In addition to direct vegetation removal, both concept options have the potential to impact on water quality, bank stability and aquatic habitats (including Green and Golden Bell Frog habitat) as a result of increased runoff and sedimentation during construction. Increased traffic during this phase of both projects may also negatively impact fauna (including threatened woodland bird species and the vulnerable Green and Golden Bell Frog).

Operational impacts for both scenarios were found to be relatively similar, with potential for ongoing noise disturbance, artificial lighting disturbance and increased traffic to disturb threatened woodland bird species and the Green and Golden Bell Frog. The aquatic environment may also be subject to impacts as a result of stormwater runoff and settlement of dust emissions (coal fired option only).

Assessment against Part 3A of the EP&A Act 'Improve or Maintain Principles' determined that significant impacts to threatened species known or likely to occur in the locality are unlikely, provided the proponent commits to the measures proposed to mitigate unavoidable impacts and offset remaining impacts (if determined to be required following finalisation of the location of infrastructure and determination of the extent of native vegetation lost).

## 15.6 Mitigation and Management

A detailed series of mitigation measures are identified in the full Flora and Fauna report in **Appendix F** including:

- Additional survey around preferred or likely routes for roads, conveyors, pipelines and other disturbance areas for two orchid species (*D. pedunculata* and *D. tricolor*) and the Green and Golden Bell Frog and the Barking Owl in a more appropriate season;
- Measures to be protective of vegetation communities, threatened flora and fauna species including the Green and Golden Bell Frog, woodland birds, Grey-headed Flying Fox, microchiropteran bats and the Barking Owl;
- Measures to be protective of aquatic and riparian habitats;
- Measures to avoid off site or downstream impacts; and
- Offsetting principals should this be determined to be required following finalisation of the detailed project design.

## 15.7 Residual Impacts

The proposed Bayswater B project site has been subject to human activity for a number of years. Prior to the development of the existing power station and associated infrastructure, the site would have been subject to agricultural activities, and is currently subject to light grazing over much of the proposal site. Despite this, remnant vegetation on the site is in moderate and good condition, and the area supports both terrestrial and aquatic habitat.

Assessment against Part 3A of the EP&A Act 'Improve or Maintain Principles' determined that significant impacts to threatened species known or likely to occur in the locality are unlikely, provided the proponent undertaking the action commits to the recommendations and actions proposed to mitigate unavoidable impacts and offset remaining impacts (if required). The offsetting principles are outlined in Section 6.6 of the full Flora and Fauna Assessment in **Appendix F**.

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# 16.0 EPBC Matters

*This Chapter provides a summary of all matters relating to the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*

## 16.1 Introduction

Under the EPBC Act 1999, there are a number of Matters of National Environmental Significance (NES) requiring consideration as part of any development project (or "action"). If an action would, or is likely to have a significant impact on a Matter of NES, approval is required from the Commonwealth Minister for Environment, Heritage and the Arts.

This section draws on the flora and fauna assessment undertaken by Eco Logical Pty Ltd (refer **Chapter 15** and **Appendix F**). This section also draws together an assessment of the potential impacts on each Matter of NES and listed marine species.

This Chapter has been undertaken in consultation with the Department of Environment, Water, Heritage and the Arts (DEWHA). The assessment itself has been undertaken utilising the EPBC Act Policy Statement 1.1: Significant Impact Guidelines, Matters of National Environmental Significance (DEH (now DEWHA), May 2006).

## 16.2 World Heritage Properties

The site is not a World Heritage Property, and is not in close proximity to any such property. The Greater Blue Mountains World Heritage Area (GBMWHA) is the nearest World Heritage Property. The GBMWHA comprises eight national parks including Blue Mountains, Wollemi, Kanangra-Boyd, Nattai, Yengo, Gardens of Stone, Thirlmere Lakes and Jenolan Caves Karst Reserve. Wollemi is the nearest of these national parks, being approximately 11 km south of the site at its nearest point.

## 16.3 National Heritage Places

No adverse impacts are expected to occur on National Heritage Places. There are no National Heritage listed properties within 10 km of the proposed action.

## 16.4 Wetlands of International Importance

The Hunter Estuary Wetlands (RAMSAR) occurs approximately 90 km south east of the site. **Table 16-1** summarises the potential impacts on any wetlands of international importance.

**Table 16-1: Summary Impacts on Wetlands of International Importance**

| Policy Guideline Criteria | Commentary |
|---|---|
| ***Would the action result in:*** | |
| Areas of wetland being destroyed or substantially modified. | The project site is not part of a RAMSAR listed area, and hence there would be no direct impact on any RAMSAR wetlands. The nearest RAMSAR wetlands are approximately 90 km away from the site to the south east (the Hunter Estuary Wetlands). Although the project site falls within the same broad catchment as the Hunter Estuary Wetlands, it is substantially removed from these wetlands. Adverse water quality impacts are not predicted and downstream impacts are unlikely to occur given that the site is designed to manage water within the Bayswater B to Plashett Dam cycle. |
| A substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland. | This project would not require any additional water from the river and as noted above with respect to the Plashett Dam – Bayswater B water management cycle, no water would be discharged back to the river. As such, there would be no effect on the hydrological regime of the wetland as a result of this project. |
| The habitat or lifecycle of native species, including invertebrate fauna and fish species, dependant on the wetland being seriously affected. | As no direct impacts or downstream impacts are anticipated, no serious effects on RAMSAR wetland dependant species are expected or considered likely to occur. |
| A substantial and measurable change in the water quality of the wetland e.g. a substantial change in the level of salinity, pollutants or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health | Given the lack of direct hydrological links between the project site and the RAMSAR wetlands, water quality related impacts are not predicted. |
| An invasive species that is harmful to the ecological character of the wetland being established, or an existing invasive species being spread in the wetland. | The proposal is not expected to the hydrological regime of the Hunter River. It is also unlikely to affect connectivity of aquatic habitats in the Hunter River Estuary and its catchment. The proposal is considered unlikely to contribute to the establishment or spread of invasive species in the Hunter Estuary Wetlands. |

## 16.5 Listed Threatened Species and Ecological Communities

## 16.6 Threatened Fauna Species

A search was undertaken using the EPBC Protected Matters Search Tool (EPBC Protected Matters Search, accessed July 2009). Five of the eight threatened fauna species potentially occurring within the search area (of 10 km) were found to potentially occur at or within the vicinity of the project site. These threatened species are listed in **Table 16-2** along with their EPBC status, habitat and the likelihood of occurring within the project site itself.

**Table 16-2: Likelihood of Threatened Fauna Species at the Site**

| Scientific Name | Common Name | EPBC Act Status | Habitat | Likelihood of Occurrence within the Project Site |
|---|---|---|---|---|
| *Rostratula australis* | Australian Painted Snipe | V | Well vegetated margins of wetlands | Unlikely. No wetlands are located in the vicinity of the project site |
| ***Chalinolobus dwyeri*** | **Large-eared Pied Bat** | **V** | **Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (Hirundo ariel), frequenting low to mid-elevation dry open forest and woodland close to these features.** | **Potentially. Habitat is present in the vicinity of the project site.** |
| ***Pteropus poliocephalus*** | **Grey-headed Flying-fox** | **V** | **Subtropical & temperate rainforests, tall sclerophyll forests & woodlands, heaths & swamps.** | **Likely. Preferred habitat identified at the project site** |
| *Petrogale penicillata* | Brush-tailed Rock-wallaby | V | Rocky escarpments, outcrops, steep slopes or cliffs – especially those with caves, ledges or overhangs & shrub cover. | No. Preferred habitat is not located in the locality of the project site |
| *Litoria booroolongensis* | Booroolong Frog | E | Permanent cobbled streams with overhanging and fringing vegetation. | Unlikely. Preferred habitat is not located in the locality of the project site. |
| ***Litoria aurea*** | **Green and Golden Bell Frog** | **E** | **Marshes, dams & stream-sides particularly those containing *Typha* or *Eleocharis*. Need waterbodies unshaded, free of predatory fish and that have a grassy area nearby.** | **Likely (Highly suitable habitat recorded within the study site)** |

| Scientific Name | Common Name | EPBC Act Status | Habitat | Likelihood of Occurrence within the Project Site |
|---|---|---|---|---|
| ***Xanthomyza phrygia*** | **Regent Honeyeater** | **E, M, JAMBA / CAMBA** | **Dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.** | **Potentially. Species may transit through the site. No known critical habitat or lifecycle components at the site.** |
| ***Lathamus discolor*** | **Swift Parrot** | **E, M** | **Migrates to the Australian south-east mainland between March and October. Areas where eucalypts are flowering profusely or where there are abundant lerp infestations.** | **Potentially. Species may transit through the site. No known critical habitat or lifecycle components at the site.** |

The field investigations and fauna surveys for this EA did not identify any of the above threatened fauna species (see **Chapter 15**). There has been one instance of the Green and Golden Bell Frog (*Litoria aurea*) being identified at the site in the past (in 2000 as part of a previous fauna survey).

No adult or tadpole Green and Golden Bell Frog were recorded during targeted surveys for the species. however suitable aquatic habitat and previous records of their presence suggest that they are likely to inhabit areas of the site.

The larger water bodies within the study site (e.g. 'farm' dams and reservoirs) were not sampled for the species. However these water bodies were observed to contain fish species including eels and *Gambusia sp.* It is therefore unlikely these areas would support Green and Golden Bell Frog.

The ecological assessment performed by ELA also reviewed the site's aquatic ecosystems and riparian habitats. Despite previous disturbance within the catchment, sections of waterways within the project area (particularly those that have been less disturbed) offer important habitat for native flora and fauna and act to protect downstream ecosystems such as Plashett Dam.

Similarly, modified aquatic habitats within the project area provide habitat for aquatic flora and fauna, and are of particular importance to Green and Golden Bell Frog. Eight (8) aquatic habitat features within the project area are of significance to Green and Golden Bell Frog as potential habitat or breeding habitat. These habitat locations can be seen **Figure 9** in **Appendix F**.

**Table 16-3** summarises the predicted impacts on the identified fauna species that may potentially or are likely to occur on the site.

**Table 16-3: Summary of Impacts on Potentially Occurring Fauna Species**

| Vulnerable Species EPBC Assessment Criteria | Large-eared Pied Bat | Grey-headed Flying-fox | Green and Golden Bell Frog | Regent Honeyeater | Swift Parrot |
|---|---|---|---|---|---|
| ***Is there a real chance or possibility that the action would:*** | | | | | |
| Lead to a long term decrease in the size of an important population of a species | Unlikely – due to no planned adverse impacts to preferred habitat locations and species not identified during site survey. | Unlikely – due to limited impact on preferred habitat locations and species not identified during site survey. | Unlikely – due to limited impact on preferred habitat, potential impacts that have been identified could effectively be managed with appropriate mitigation planning.<br>Assume species is in project area despite not being identified during the site survey. | Unlikely – due to limited impact on preferred habitat locations of Box-Ironbark woodland, and riparian forests of River She-oak.<br>No known critical habitat or lifecycle components at the site.<br>Species not identified during site survey. | Unlikely – due to limited woodland vegetation clearing. It is assumed that the species may transit through the site.<br>No known critical habitat or lifecycle components at the site.<br>Species not identified during site survey. |
| Reduce the area of occupancy of an important population | Unlikely | Unlikely | Unlikely with appropriate mitigation measures. | Unlikely | Unlikely |
| Fragment an existing important population into 2 or more populations | Unlikely | Unlikely | Unlikely with appropriate mitigation measures. | Unlikely | Unlikely |
| Adversely affect habitat critical to the survival of a species | No | Unlikely | Unlikely | Unlikely | Unlikely |
| Disrupt the breeding cycle of an important population | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely |
| Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline | No | No | Unlikely | No | No |

| Vulnerable Species EPBC Assessment Criteria | Large-eared Pied Bat | Grey-headed Flying-fox | Green and Golden Bell Frog | Regent Honeyeater | Swift Parrot |
|---|---|---|---|---|---|
| Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat | No | No | Unlikely | No | No |
| Introduce disease that may cause the species to decline | No | No | Unlikely | No | No |
| Interfere substantially with the recovery of the species | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely |

## 16.7 Threatened Flora Species

A search was undertaken using the EPBC Protected Matters Search Tool (EPBC Protected Matters Search, accessed July 2009). Ten (10) threatened flora species were found to potentially occur at or within the vicinity of the project site.

These threatened species are listed in **Table 16-4** along with their EPBC status, habitat and the likelihood of occurring within the project site.

**Table 16-4: Likelihood of Threatened Flora Species at the Site**

| Scientific Name | Common Name | EPBC Act Status | Habitat | Likelihood of Occurrence within the Project Site |
|---|---|---|---|---|
| *Eucalyptus nicholii* | Narrow-leaved Black Peppermint | V | Dry grassy woodlands on shallow infertile soils. | No |
| *Bothriochloa biloba* | n/a | V | Woodlands on poor soils. | Unlikely |
| *Cynanchum elegans* | White-flowered Wax Plant | E | Typically grows on the margin of rainforest amongst vegetation that can include Spotted Gum and Forest Red Gum. | Unlikely |
| *Pomaderris brunnea* | Brown Pomaderris | V | Grows in moist woodland and forest on clay soils. Also grows along creeks on alluvial soils. | No |
| *Wollemia nobilis* | Wollemi Pine | E | Grows in warm temperate rainforest and rainforest margins | No |

| Scientific Name | Common Name | EPBC Act Status | Habitat | Likelihood of Occurrence within the Project Site |
|---|---|---|---|---|
| *Olearia cordata* | n/a | V | Grows in dry open sclerophyll forest and open shrubland, on sandstone ridges. | No |
| *Thesium australe* | Austral Toadflax, Toadflax | V | Found in grassland or grassy woodland, often in damp sites with Kangaroo Grass (*Themeda australis).* Flowers in spring–summer. Widespread but rare. | Unlikely |
| *Digitaria porrecta* | Finger Panic Grass | E | Native grassland, woodlands or open forest with a grassy understorey, on richer soils (DECC 2007). Often found along roadsides and travelling stock routes where there is light grazing and occasional fire (DECC 2007). | Unlikely |
| *Diuris tricolor*<br>*Diuris sheaffiana* | Pine Donkey Orchid<br>Tricolor Diuris | V | Grows in sclerophyll forest among grass, often with *Callitris* spp. It is found in sandy soils, either on flats or small rises. Also recorded from a red earth soil in a Bimble Box community in western NSW. Soils include gritty orange-brown loam on granite, shallow red loamy sand on stony porphyry, skeletal lateritic soil and alluvial grey silty loam. Flowers from September to November or generally spring. | Unlikely |
| *Eucalyptus glaucina* | Slaty Red Gum | V | Associated with grassy woodland on deep, moderately fertile and well-watered soil. | No |

Despite a lack of likelihood, as identified in **Table 16-4**, targeted surveys were undertaken for each of the threatened flora species. None of the species identified in **Table 16-4** were identified during the survey.

It should be noted however that target surveys for *Diuris tricolor* and *Diuris pedunculata* could not be undertaken at the time of the survey. Neither species was flowering during the survey period, and therefore could not be readily detected or identified.

Survey for these species should occur during an appropriate season in areas of suitable habitat affected by the development.

## 16.8 Threatened Ecological Communities

Two nationally listed Critically Endangered Ecological Communities (CEECs) under the *EPBC Act 1999* were identified using the EPBC Protected Matters Search Tool as likely to occur or may occur within 10km of the site (EPBC Protected Matters Search, accessed July 2009). These were:

- *Weeping Myall – Coobah – Scrub Wilga Shrubland of the Hunter Valley*
- *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland*

However, these communities were not found to be present within the site and are not known to occur within the locality.

## 16.9 Listed Migratory Species

A search was undertaken using the EPBC Protected Matters Search Tool (EPBC Protected Matters Search, accessed July 2009). Seven (7) threatened listed migratory species were found to potentially occur at or within the vicinity of the project site.

These migratory species are listed in **Table 16-5** along with their EPBC status, habitat and the likelihood of occurring within the project site.

**Table 16-5: Likelihood of Migratory Species at the Site**

| Scientific Name | Common Name | EPBC Act Status | Habitat | Likelihood of Occurrence within the Project Site |
|---|---|---|---|---|
| *Haliaeetus leucogaster* | White-bellied Sea-Eagle | Mar, CAMBA | Found along the coastline of Australia and also inhabits large river systems and permanent inland water bodies. | Unlikely. The Proposal is not located along the coast or on a large river / inland waterbody that would be considered suitable for the White Bellied Sea Eagle |
| ***Hirundapus caudacutus*** | **White-throated Needletail** | **M, Mar JAMBA / CAMBA / ROKAMBA** | **Arrive in Australia from breeding grounds in the northern hemisphere in about October each year and leave somewhere between May and August. Birds usually feed in rising thermal currents associated with storm fronts and bushfires and they are commonly seen moving with wind fronts. Feeds on flying insects, such as termites, ants beetles and flies.** | **Potential. Species may transit through the site. No known critical habitat or lifecycle components at the site.** |
| ***Merops ornatus*** | **Rainbow Bee-eater** | **M, Mar JAMBA / CAMBA** | **Open forests, woodlands and shrublands, and cleared areas, usually near water. It would be found on farmland with remnant vegetation and in orchards and vineyards. It would use disturbed sites.** | **Likely. Species may transit through the site. No known critical habitat or lifecycle components at the site.** |

| Scientific Name | Common Name | EPBC Act Status | Habitat | Likelihood of Occurrence within the Project Site |
|---|---|---|---|---|
| ***Monarcha melanopsis*** | **Black-faced Monarch** | **M, Mar** | **Rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.** | **Potential. Species may transit through the site. No known critical habitat or lifecycle components at the site.** |
| *Myiagra cyanoleuca* | Satin Flycatcher | M, Mar | Tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests. | Unlikely. Species may transit through the site. No known critical habitat or lifecycle components at the site. |

Note: The Swift Parrot and Regent Honeyeater have been excluded from this table as they are encompassed by Table 16.3 and Table 16.3 above.

The fauna survey, in which 67 bird species were identified, reveals that none of these listed migratory species in **Table 16-5** were identified during the survey.

The key impacts to the habitats for these species would be the removal of Central Hunter Box – Ironbark Woodland. The predicted removal of this habitat type is provided in **Table 16-6**.

**Table 16-6: Summary of Central Hunter Box - Ironbark Woodland**

| Operating Scenario | Area | % Removed |
|---|---|---|
| Ultra Supercritical Pulverised Coal Fired | Approx 7 ha | Approx 1.2% |
| Combined Cycle Gas Turbine | Approx 9 ha | Approx 1.7% |

Not withstanding the predicted removal of the Central Hunter Box - Ironbark Woodland, as identified in **Table 16.6**, the majority of the remnant vegetation within the site would be retained.

With a low amount of direct disturbance to remnant native vegetation and a considerable area in which to implement actions to improve native vegetation condition, it would appear that there is opportunity for the proposal to meet the “maintain or improve” test.

A summary of the potential impacts on the identified migratory species is provided in **Table 16-7**.

**Table 16-7: Summary of Impacts on Potentially Occurring Migratory Species**

| Migratory Species EPBC Assessment Criteria | All species identified |
|---|---|
| ***Is there a real chance or possibility that the action would:*** | |
| Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species | Unlikely |
| Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species | Unlikely |

| Migratory Species EPBC Assessment Criteria | All species identified |
|---|---|
| Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species | Unlikely |

## 16.10 Listed Marine Species

During the site surveys five (5) listed marine species were identified during the site surveys. These species are listed in **Table 16-8** along with their EPBC status and habitat

All EPBC protected marine species are listed under Section 248 of the EPBC Act. Further to this, the complete list of protected marine species can be found on the Department of the Environment, Water, Heritage and the Arts (DEWHA) website (http://www.environment.gov.au/coasts/species/marine-species-list.html).

Under Section 254 of the EPBC Act it is an offence to kill or injure a member of the marine listed species.

**Table 16-8: Likelihood of Marine Species at the Site**

| Scientific Name | Common Name | EPBC Act Status | Habitat | Likelihood of Occurrence within the Project Site |
|---|---|---|---|---|
| *Ardea intermedia* | Intermediate Egret | Marine | Favoured habitats of fresh water lagoons, dams, wetlands and their banks. | Identified |
| *Cacomantis flabelliformis* | Fan-tailed Cuckoo | Marine | Favoured habitat of open temperate forests and woodlands, but also found to inhabit subtropical or tropical mangrove forests and subtropical\tropical montanes moist forest. | Identified |
| *Coracina novaehollandiae* | Black-faced Cuckoo-shrike | Marine | Wooded habitats are favoured, with the exception of rainforests, but also known to inhabit subtropical/tropical lowland moist forest and mangroves, pastureland and artificial (urban) landscapes. | Identified |
| *Falco cenchroides* | Nankeen Kestrel | Marine | Preferred habitats are lightly wooded areas, grasslands and open agricultural regions and tend to be absent from dense forests. | Identified |
| *Himantopus himantopus* | Black-winged Stilt | Marine | Preferred habitats of freshwater and saltwater marshes, mudflats, and the shallow edges of lakes and rivers. | Identified |

Although these five listed marine species were identified during the site surveys, each of the species is known to inhabit and prefer a variety of habitats. The Fan-Tailed Cuckoo, Black-faced Cuckoo-shrike and the Nankeen Kestrel prefer open temperate woodlands of the kind present on the project site. As the proposed project is predicted to only clear a small area of wooded vegetation (about 7.3 ha for the coal fired option and about 14.46 ha for the gas fired option) it is not anticipated that theses marine listed species would be adversely impacted by this proposal.

The Intermediate Egret and the Black-winged Stilt both have preferred habitats including freshwater lagoons, wetlands and lakes, and the Black-winged Stilt also inhabits saltwater marshes, mudflats and wetlands. As this proposal is not expected to modify or impact Plashett Dam or either of the freshwater dams on the site, it is not anticipated that the proposed project would adversely impact either of these marine listed bird species.

Adverse impacts, to these identified marine species are not anticipated as a result of the proposed Bayswater B project.

## 16.11 EPBC Actions

A summary of how the Bayswater B project impacts on the remaining EPBC referral triggers is provided in **Table 16-9.**

**Table 16-9: Summary of other EPBC Actions**

| Action | Comment |
|---|---|
| Nuclear actions | The proposed action is not a nuclear action, nor would it impact on any nuclear actions. |
| Actions taken by the Commonwealth (or Commonwealth agency) | The proposed action is not being undertaken by the Commonwealth or a Commonwealth agency. |
| Actions taken in a Commonwealth marine area | There are no Commonwealth marine areas within the vicinity of the site.<br>The proposed activity on the site would not have a significantly adverse effect on a Commonwealth marine area, or significantly impact on a Commonwealth marine protected species. |
| Actions taken on Commonwealth land | No part of this project would be undertaken on Commonwealth land.<br>There would be no impacts to Commonwealth land. |

## 16.12 Mitigation and Management

A variety of management and mitigation measures have been proposed (as outlined in **Appendix F**). The following refer specifically to EPBC listed matters, the following safeguards are proposed:

- Undertake a survey around preferred or likely routes for roads, conveyors, pipelines and other disturbance areas in likely habitat for the threatened flora species, *Diuris pedunculata* (Small Snake Orchid) and *Diuris tricolour* (Pine Donkey Orchid) that may potentially occur on the site;
- Should either species occur on site, avoiding impact to either species should be the first priority. Alternative designs should be considered, and where avoidance is not possible, offsetting should be considered;

- Retain hollow bearing and rough bark trees and retain large, consolidated areas of remnants;
- Avoid loss of hollow bearing trees, for which few were identified on the site;
- Undertake survey for Green and Golden Bell Frog in an appropriate season (warmer months, ideally mid to late spring) to ascertain their presence or absence and level of activity. Should the species be found then infrastructure should seek to avoid their habitat, introduce water quality controls that specifically consider this species and seek habitat enhancement ;
- Where disturbance of Green and Golden Bell Frog habitat cannot be avoided, the following mitigation measures should be considered:
  - Infrastructure and roads that cross creeks may require works to protect and enhance Green and Golden Bell Frog habitat. Restored or created habitat should include habitat enrichment, supplementation and remediation actions as well as the maintenance of connectivity as indicated in *Best Practice Guidelines Green and Golden Bell Frog Habitat* (DECC, 2008);
  - Prepare a Soil and Water Management Plan to control sediment runoff into potential Green and Golden Bell Frog habitat; and
  - Consider alternative road alignment to avoid creek crossings in areas of habitat. This may require the road to remain on the southern side of the east-west flowing creek along, or close to, the ridge line;
- A Vegetation Management Plan (VMP) would be in accordance with as per the *Guidelines for Controlled Activities – Vegetation Management Plans* (DWE 2008). The VMP would address (but not be limited to) the following:
  - The edge of the vegetation clearing (and edge of permanent maintenance zone) would be clearly marked with flagging tape to deter access beyond this point. Construction personnel would be trained to avoid unnecessary disturbance of these areas and creek banks;
  - Hygiene protocols for riparian vegetation removal activities to minimise weed spread;
  - Progressive slope stabilisation in accordance with the Blue Book and Soil and Water Management Plan;
  - Once stabilised, planting of local native plants would be undertaken to assist in the restoration of the function of the riparian zone;
  - Local regeneration to facilitate enhancement of sites environmental values as part of an integrated offset package; and
  - Pests would be controlled on an as needs basis.
- Preparation of a Soil and Water Management Plan prior to construction which would address (but not be limited to) the following:
  - Temporary sediment control devices would be installed where necessary to control sediment (i.e. upstream of existing drain inlets, down slope of steep slopes) and would be maintained regularly. Care would be taken to ensure sediment control devices are in place during shut down periods and over weekends.

## 16.13 Residual Impacts

The surveys of the orchids and GGBF would confirm the extent of potential impact. With the implementation of the recommended mitigation and management actions, it is believed that no significant impacts would result from the proposed project.

As noted in the previous chapter, provided the recommendations and actions are undertaken, assessment against Part 3A of the EP&A Act 'Improve or Maintain Principles' determined that significant impacts to threatened species known or likely to occur in the locality are unlikely.

## 16.14 Conclusion

On the basis of the assessment, it is not believed that the Bayswater B project would result in significant impacts on matters of NES. Specifically:

- There would be no impacts on World Heritage properties;
- There would be no impacts on National Heritage places;
- There would be no impacts on wetlands of international importance
- There may be some impacts to threatened fauna (the Green and Golden Bell Frog) but these are believed to be minor and manageable. This is due to the fact that GGBF habitat is primarily along the watercourses. The direct impacts to these areas are as a result of the linear infrastructure which does allow opportunities for flexibility in footprint location to avoid impacts and also construction techniques to minimise impacts. Other effects would be secondary (such as water quality and erosion and sediment control) which can be managed. This needs to be confirmed via a more detailed survey during the appropriate season but is not anticipated to constitute a significant impact;
- There are no impacts to threatened flora species;
- There are no impacts to threatened ecological communities; and
- There are no impacts to listed migratory species.

Notwithstanding this, a referral has been prepared and will be submitted to DEWHA.

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# 17.0 Heritage

*This Chapter outlines the results of a full archaeological assessment which is presented in **Appendix G**. This has been prepared in response to the Director General's Requirements which include:*

***Heritage Impacts** - the Environmental Assessment must include:*

*Sufficient information to demonstrate the likely impacts on Aboriginal heritage values/items (archaeological and cultural) and proposed mitigation measures consistent with the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC, 2005).*

*The Environmental Assessment must demonstrate effective consultation with Aboriginal communities has been undertaken in determining and assessing impacts and mitigation measures*

## 17.1 Introduction

The objective of this assessment was to produce a report that identifies the Aboriginal and non Aboriginal archaeological values as well as potential areas of archaeology and constraints associated with construction of the proposed Bayswater B Project.

The archaeological assessment forms the basis of a cultural heritage assessment in consultation with the Aboriginal community, in accordance with DECC (now DECCW) guidelines. Where steps in the cultural heritage assessment have been completed, they are discussed in this chapter (and in the full report in **Appendix G**). However, since the full cultural heritage assessment is yet to be completed, the archaeological assessment (undertaken in consultation with Wanaruah Local Aboriginal Land Council) forms the basis of the constraints analysis for this EA. The full assessment would be completed shortly, and the results updated to reflect the input of the Aboriginal community with respect to cultural heritage values. This approach was discussed with DoP and DECCW as well as the Aboriginal community representatives who registered interest as part of the DEC guideline process.

In order to meet these objectives, the following tasks were carried out:

- Identification of statutory requirements relevant to the project;
- Review of relevant State and Federal heritage registers and listings, including the Department of Environment, Climate Change and Water (DECCW – AHIMS register) and the Heritage Branch (Department of Planning – State Heritage Register);
- Review and collation of relevant existing documents including previous archaeological reports;
- Identification of the relevant Aboriginal stakeholders in accordance with the National Parks & Wildlife Act 1974: Part 6 Approvals – Interim Community Consultation Requirements for Applicants (ICCRs);
- Identification and assessment of Aboriginal and non Aboriginal archaeological and cultural heritage values; and
- field survey to locate extant archaeological sites within the project area

The guiding principles and methodology used for conducting the Aboriginal heritage assessment for this EA are:

- The Director-General's EAR's issued for this project;
- The Aboriginal Cultural Heritage Standards and Guidelines Kit (NPWS 1997);
- The draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC 2005); and
- The Part 3A EP&A Act Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC/DoP 2007).

In order to achieve the objective outlined above, the Aboriginal heritage assessment was divided into three broad tasks:

- Aboriginal consultation in accordance with the EARs, following the 2005 guidelines;
- Understand previously identified Aboriginal heritage values within the project site using desktop survey;
- Undertake archaeological field survey of the project site.

The outcomes and findings of these three tasks are summarised in the following sections.

## 17.2 Aboriginal Community Consultation

Aboriginal Stakeholder Consultation was conducted in accordance with the *National Parks & Wildlife Act 1974: Part 6 Approvals – Interim Community Consultation Requirements for Applicants* and is documented in a consultation log included in the full Heritage report included as **Appendix G** of this EA.

A newspaper advertisement (see **Appendix G**) was placed in the Hunter Valley News on the 13th July 2009 seeking registrations of interest from local community groups who wished to be consulted for the assessment. As a result of the advertisement the following community groups registered interest:

- Wanaruah Local Aboriginal Land Council;
- Aboriginal Native Title Consultants;
- Hunter Valley Culture Consultants;
- Upper Hunter Heritage Consultants;
- Yinarr Cultural Services;
- Wanaruah Custodians Aboriginal Corporation; and
- Ungooroo Aboriginal Corporation.

In addition to placing an advertisement in the local newspaper various government organisations were contacted seeking known local stakeholder groups who may wish to be consulted in the assessment. Stakeholder groups identified by these organisations were sent a letter inviting registration. The following stakeholder groups subsequently registered interest in consultation for the assessment:

- Giwiir Consultants;
- Culturally Aware; and
- Wattaka Wonnarua Cultural Consultancy Services.

Groups registered at this stage of the project were sent a copy of the field methodology by mail for comment.

A stakeholder meeting and site walkover was held on 9 September 2009 at Bayswater Power Station. A powerpoint presentation was discussed including the Aboriginal sites identified, the Potential Archaeological deposit identified, the scientific significance assessment, the proposal for test excavation and salvage excavation, and an explicit request for the community to discuss or communicate Aboriginal heritage values of the land other than the physical evidence of archaeological sites.

Representatives of all the groups listed above attended, with the exception of Wanaruah Custodians and Ungooroo Aboriginal Corporation. In additional to those listed above, representatives of the following groups arrived at, and were and were involved in the meeting:

- Hunter Valley Cultural Surveying (Luke Hickey); and
- Mingga Consultants (Clifford Matthews).

A copy of the draft report was distributed by hand to each of the attendees and mailed to those Aboriginal Stakeholders that did not attend.

No formal consultation responses have yet been received.

### 17.2.1 Aboriginal Heritage Information Management Systems (AHIMS)

A search of the DECCW Aboriginal Heritage Information Management Systems (AHIMS) register was conducted on the 29th of June, 2009 and identified 124 Aboriginal archaeology sites within a 10 x 6 km some of the project site (see Figure F5 & Appendix A of **Appendix G)**.

The results of an AHIMS search and review of past works have resulted in locating a total of 25 Aboriginal sites previously recorded within the immediate vicinity of the project site. The majority of these sites consist of open camp sites containing scatters of stone artefacts and isolated finds.

### 17.2.2 Historic Heritage Database Searches

Search of historic heritage databases were performed on 20 July 2009.

A review of the Australian Heritage Database identified a total of 46 items listed within the Muswellbrook local government area (LGA). Of those, 29 are located within the urban area of Muswellbrook township and four are located in rural areas surrounding Muswellbrook. The remaining 13 items are located in and around Denman, Singleton and Sandy Hollow, or as much larger regional areas. For example, the Blue Mountains are listed as four separate entries. With the exception of the Blue Mountains, which are listed on the RNE, WHL and NHL, all other items are registered on the RNE. A search of a 10 x 10 km search area centred on the project site identified no items listed on the RNE, CHL, NHL or WHL.

A 10 x 10 km search area centred on the project site identified no items listed on the RNE, Commonwealth Heritage List (CHL), NHL or WHL.

A review of the NSW Heritage Branch (DoP) Heritage Database for the Muswellbrook LGA identified a total of 66 historic heritage items. Of those, there are nine items listed on the State heritage Register (SHR), and 57 items listed in other environmental planning instruments. The majority of listed items are located within the urban areas of towns in the region, e.g. Muswellbrook (33), Denman (11) and Kerrabee (2).

There are eight items listed for the rural area surrounding Muswellbrook. One item – Saltwater Creek Underbridge at Liddell – is located in reasonably close proximity to the project site. However, there are no listed items within the project site itself.

## 17.3 Results from the Field Survey and Research

An extensive artefact distribution was found across a total of 47 Aboriginal sites identified within the project site (Appendix C of **Appendix G**). Four sites were previously recorded and were identified through AHIMS records. A total of 43 new Aboriginal sites were identified through field survey for this assessment undertaken on 8th - 10th July and 29th – 31st July.

Aboriginal heritage values identified in the course of this assessment relate to the physical evidence of past Aboriginal occupation. To date no non-tangible Aboriginal heritage values have been identified.

### 17.3.1 Previously Recorded Sites

The AHIMS register suggests that seven open camp sites were previously recorded close to Saltwater Creek in the project site, although there are doubts as to the accuracy of the AHIMS coordinates for three of the sites recorded. Scrutiny of the AHIMS records confirmed that these three sites all occur south and outside of the project area. The incorrect coordinates in the AHIMS register are due to the previous translation of imperial to AMG coordinates by algorithm in the late 1980s by the former National Parks and Wildlife Service.

A total of four previously recorded sites fall within the project site.

A survey of a major eastern tributary to Saltwater Creek had been conducted, resulting in the recording of a series of large open sites in areas where soil erosion works had been proposed. The area surveyed intersects with the route of infrastructure (road and pipelines) heading east from the site of the proposed Bayswater B power station.

Three of the recorded sites were encountered and re-recorded during the present survey along the proposed eastern infrastructure corridor.

### 17.3.2 Sites Recorded During Survey

A total of 43 Aboriginal sites with artefactual evidence were newly recorded in the project site as well as three sites previously recorded as described above. These are roughly equally distributed between artefact scatters (n=23) and isolated finds (n=19). In addition, one PAD (potential archaeological deposit) site was recorded.

All Aboriginal sites located during the survey were open stone artefact sites, or “open camp sites”. Several large open sites were identified in the southern section of the project site, associated with the two main watercourses – Saltwater Creek and western tributary creek. These open sites contain the largest assemblages, which are best able to demonstrate the variety of tool and technological types, as well as raw materials which suggest patterns of procurement of local raw materials.

The survey results include many locations where only one or a few stone artefacts were found, generally in a localised soil exposure. Archaeological research in the Upper Hunter Valley over the past 20 years suggests that the majority of these sites, located along the creek margins, are all part of a consistent distribution of artefacts, generally found within 50 metres of a creek margin.

For the purposes of assessment and subsequent management, these sites have been grouped on the basis of landscape location into distribution areas (see Figure F6 of **Appendix G**).

The open camp sites are presented in detail in Section 6.4 of **Appendix G** with the most complex open sites presented first, then grouped open sites within “distributions” along discrete creek sections, and then isolated sites and/or low density artefact scatters. “Distributions” are presented as amalgamations of individual sites, which are delineated on the basis of either landform context or disturbance context.

Examples of typical stone artefacts in the project site are shown in Plate P5, Plate P6 and Plate P7 of **Appendix H**.

### 17.3.3 Summary of Aboriginal Cultural Heritage Values and Significance

Based on a thorough analysis of the desktop and field surveys, the cultural heritage values and significance were assessed and provided in **Appendix G**.

In summary the heritage values of the project site include:

- pre-contact Aboriginal activity evident in the widespread stone artefact evidence present within the topsoil in close association with creeks and some nearby slopes;
- a pre-contact landscape of high intensity Aboriginal activity associated with Saltwater Creek and its major tributaries and associated flat land distinct from low intensity activity in the upper reaches of creeks where creek margins are more inclined; and
- rare evidence of Aboriginal grinding tools in two sites.

In summary the significance of the Aboriginal heritage sites and potential archaeological deposit identified within the project site include:

- the highly significant Aboriginal sites 37-2-820 (P24) and MGA35 due to the presence of rare grindstones.
- the remaining 45 Aboriginal sites of moderate significance due to their typical content which contributes to an understanding of the archaeological landscape and Aboriginal cultural heritage.
- there are no Aboriginal sites of low significance.
- Aboriginal archaeological deposit of high significance occurs in the southern part of the project site south of MGA32. The potential archaeological deposit in this area has high research potential in relation to the extent and character of archaeological sites close to entrenched major creeks where exposures suggest rich assemblages occur with rare artefact types.
- Aboriginal archaeological deposit of moderate significance occurs north of site MGA32 and is anticipated to be useful to demonstrate known characteristics of Aboriginal sites, but not anticipated to reveal new information or address current research questions.

## 17.4 Potential Impacts to Aboriginal Heritage

### 17.4.1 Power Station and Switching Yard Footprint

The proposed gas or coal fired power station footprints would be located on the flat ground between Saltwater Creek and the western tributary creek. This area includes the potential archaeological deposit described above.

The proposed switching yard would impact the isolated find site MGA30 and would also impinge on the area of significant potential archaeological deposit occurring in the southern part of the project site. Line connections from the switching yard to the current transmission lines would skirt site 37-2-500.

### 17.4.2 Infrastructure Routes

The proposed ash haulage road and conveyor route heading north from the power station skirt the edges of the less significant northern archaeological deposit and would not constitute an impact on Aboriginal heritage.

The proposed gas pipeline connecting the gas fired power station option from the north east passes over site MGA44 and passes through the area of significant archaeological deposit where it crosses Saltwater Creek.

The proposed road and associated infrastructure heading generally east from the power station toward the existing Bayswater Power Station would impact a number of small sites and skirts the highly significant site 37-2-820 (P24) and the site 37-2-818 (P22). Current plans suggest the following sites would be impacted: MGA5, MGA43, MGA42, MGA41 and 37-2-815 (P19). The eastern infrastructure route would impact the area of significant potential archaeological deposit where it crosses Saltwater Creek. The route also crosses potential archaeological deposit along the eastern tributary creek.

### 17.4.3 Lay down area

The temporary lay down area refers to the general area where materials would be temporarily stored during construction. The area is approximately three times the size of the power station footprint and located on adjacent suitable land. Although not precisely defined at this concept stage, this area is likely to include the area of significant potential archaeological deposit between Saltwater Creek and the western tributary creek.

## 17.5 Cumulative Impacts

Impacts would occur on Aboriginal heritage sites and archaeological deposit over a combined area of approximately 50 hectares and along an 800 m stretch of Saltwater Creek. The combined area is calculated by adding the area of the power station connected to the area of the switching yard and all infrastructure between located on or near potential archaeological deposit and recorded Aboriginal sites. The length of affected Saltwater Creek includes the reach crossed by infrastructure.

Present and past Aboriginal heritage investigations have identified Aboriginal sites along most parts of Saltwater Creek, and buried Aboriginal heritage material is predicted along its entire length, with more significant deposit anticipated from the southern part of the project site and continuing to the Hunter River, approximately 9 km downstream.

A length of approximately 5 km was previously impacted by inundation with the construction of Plashett Dam in past decades. An appraisal of air photo imagery in Mapinfo mapping software suggests 3 km of Saltwater Creek remains below Plashett Dam. Approximately 1 km of Saltwater Creek is between the project site and Plashett Dam. Approximately 4 km of Saltwater Creek flows within the project site, which is bounded by the distinctive east-west conveyor line bordering the Drayton mine area.

These figures indicate that of the 13 km of Saltwater Creek counted here, 5 km has been previously impacted by Plashett Dam. Of the 8 km remaining, a length of 800 m or 10 % would be impacted to some degree by the construction of the proposed Bayswater B power station and associated infrastructure crossing the creek. Approximately 7.2 km of Saltwater Creek, with its associated archaeological deposit, would remain undisturbed by the proposed project.

## 17.6 Mitigation and Management

### 17.6.1 Principles

The management of cultural heritage is determined in accordance with the cultural significance of the heritage site, place or heritage resource. This assessment has identified Aboriginal sites and potential archaeological deposit of high significance which would be impacted by the proposed development.

The options for repositioning aspects of the development to avoid impacts are limited (in the case of the power station footprint) or non-existent (in the case of infrastructure crossing Saltwater Creek). The commitments discussed in **Section 17.7.2** take into consideration the significance of the identified Aboriginal heritage and limited capacity to modify development footprint within current landform constraints.

### 17.6.2 Commitments

**Sites to be Fenced and Avoided**

The small island of ground surrounded by creek channels defining the highly significant site 37-2-820 (P24) would be fenced and avoided by the eastern infrastructure corridor.

The soil exposure defining the highly significant site MGA35 would be fenced and avoided by construction of infrastructure crossing Saltwater Creek.

Fencing shall comprise star pickets and high visibility construction fencing (or similar suitable materials) and shall be removed on completion of construction.

**Collection and Set-Aside of Impacted Aboriginal Sites**

The contents of Aboriginal sites impacted by the development shall be collected and relocated to the closest area within the same landform not impacted by the development. This site relocation exercise would be conducted by the Aboriginal community working with an archaeologist who would record the destination locations of artefacts moved and prepare a report to be deposited with relevant DECCW files. The collection and set aside procedure would be undertaken prior to commencement of construction and when the development footprint is finalised. The intention of this measure is to keep Aboriginal artefacts from sites without significant research potential "in-country" rather than in boxes within a keeping place.

**Test Excavation of Significant Potential Archaeological Deposit**

A program of archaeological test excavation followed by archaeological salvage excavation is warranted to accurately clarify the extent of archaeological deposit suggested in this assessment, and to identify appropriate areas of concentrated archaeological material suitable for archaeological salvage excavation.

The extent of potential archaeological deposit should be clarified through archaeological test excavation. The test excavation would entail a systematic sample of test pits dug in at 20 m intervals in multiple transects spanning the area identified in this report as potential archaeological deposit. The use of bulk earth moving methods of archaeological investigation would be avoided during this testing phases (e.g. "grader scrapes"). All soil from test pits would be wet screened through 5 mm and 3 mm sieves for the purpose of identifying all stone tools including fine debitage indicative of knapping floors.

Recovered artefacts would be subject to appropriate forms of analysis and reported in accordance with relevant guidelines.

The test excavations would be conducted by a suitably qualified and experienced archaeological team working with the Aboriginal stakeholders.

**Salvage Excavation**

Salvage excavation would occur in locations of significant deposit or features as identified through test excavations. The salvage methodology may include a number of excavation methods and would be limited to the development impact area. The salvage would include as a minimum:

- at least two large area excavations by hand, with wet sieving to 3 mm screen, of >100 m² or more if significant artefacts, features or artefacts are found during testing or in the course of salvage;
- grader scrapes to be conducted after completion of all hand excavations for the purpose of identifying features such as hearths within the topsoil;

- large scale excavation by machine and course dry-sieve mechanical screen for the purpose of recovering larger rare artefacts such as hatchet heads and grindstones. This method is subject to site access by the appropriate machinery.

The salvage methodology would be detailed in a research design document prepared in consultation with DECCW and the Department of Planning. The research design document would set out the number and placement of various pits, scrapes and open areas. The scale and number of excavations would be justified by reference to current research questions and evidence required to adequately address those research questions.

Recovered artefacts would be subject to appropriate forms of analysis and reported in accordance with relevant guidelines.

The Aboriginal community would be involved in the salvage excavations.

Salvaged Aboriginal heritage material would be stored in a manner that ensures future generations can access and enjoy the material. The material would be stored in an appropriate keeping place within the Hunter Valley or within the Australian Museum until a suitable keeping place is available.

# 18.0 Local Social and Economic Assessment

*A social and economic assessment of the proposed project has been undertaken. This chapter details the demographics of the Singleton and Muswellbrook Shire LGAs in addition to the local and regional economy and workforce trends. Existing and proposed land uses in the areas affected by the proposed project and the relationship of the proposal to these land uses are addressed.*

*Potential impacts of the project upon existing and future surrounding land uses as well as potential social and economic impacts on the local area, the Hunter Region and the state of NSW are assessed. Possible mitigation measures are presented where appropriate.*

## 18.1 Introduction

This assessment of social and economic impacts has focused on the local impacts upon the Singleton and Muswellbrook Shire LGAs, as the project is considered to have the greatest impact in this region due to the concentration of activities on the Project Site. The majority of potential social and economic impacts are related to the construction and operation of the Bayswater B Power Station, whether coal or gas fired, and are discussed in the following section.

Social and economic impacts associated with construction of the proposed gas pipeline spur are likely to be temporary and transient in nature. Following construction, potential impacts of the pipeline would be negligible as there would be minimal activity associated with the pipeline; therefore amenity is considered unlikely to be impacted.

## 18.2 Existing Environment

### 18.2.1 Land Use

**Local Government Areas**

*Singleton*

Singleton is a large LGA with an area of 4,896 km², comprising about 16% of the Hunter Region. Coal mining is the most significant land use and economic activity affecting the Singleton LGA (SC, 2008). The Singleton Military Area comprises an area of about 12,500 ha south of the town. Agriculture is also a significant land use within Singleton LGA and includes beef cattle grazing, dairying, viticulture, horticulture and equine activities. Approximately 2% of the LGA (over 8,500 ha) is identified as Class 1 agricultural suitability, comprised largely of productive alluvial landforms.

The closest residents within the Singleton LGA to the Project site are small rural landholdings and rural communities such as Jerry's Plains.

Important characteristics of the Singleton LGA identified in the *Singleton Land Use Strategy 2008* include:

- The main land uses outside the urban areas are agriculture, national parks, and coal mining;
- the LGA is considered to provide adequate urban water and sewer infrastructure;
- over approximately the last 20 years, new housing development has occurred at a rate of about 160 dwellings per year, with about 40% in residential areas and the balance rural / rural residential;

- Singleton provides location and transport advantages by virtue of its location on the New England Highway and Main Northern Railway Line. The LGA is experiencing increasing traffic flows (mainly New England Highway, Singleton town, and areas south east and east of Singleton), and a high level of commuting by car to work; Accordingly, there are rural road infrastructure improvement and maintenance pressures.
- new infrastructure provision (Hunter Expressway) would affect the Singleton area;
- there is relatively poor public transport accessibility in the LGA;
- there appears to be decline and uncertainty in the agricultural sector;
- there appears to be some uncertainty in relation to industrial land demand and supply;
- there are limits of availability of water supplies at the regional level; and
- a significant area of land in the LGA is subject to natural hazards (flooding and bush fires).

*Muswellbrook*

Muswellbrook Shire covers an area of 3,402 km² and is dominated by the major river systems of the Hunter and Goulburn Rivers. The shire comprises two urban centres: Muswellbrook and Denman. The township of Muswellbrook is the main residential and commercial settlement in the shire and is built on the eastern side of the floodplain of the Hunter River. The Muswellbrook Shire also includes a number of rural communities including Sandy Hollow, Wybong, Baerami, Martindale, McCully's Gap, Widden and Muscle Creek.

National Parks, including Wollemi and Goulburn River National Parks (located in the south west) and the Manobalai Nature Reserve (located in the north west) cover approximately 43% of the Shire.

Of the remaining area, the primary land uses (outside of the municipal areas) are agricultural lands and primary industries. Many areas are agricultural lands which are actually the buffer areas of mining and power generation activities.

Of those agricultural lands, 23 % of the shire is considered prime agricultural land (agricultural land suitability classes 1, 2 and 3). Approximately 3% of the LGA (over 9,200 ha) is identified as Class 1 agricultural suitability and comprises highly productive alluvial landforms used mainly for dairy farming and production of livestock fodder. Other agricultural activities in the shire include viticulture, vegetable and market gardens, horse breeding, beef cattle and sheep grazing.

Overall however, Muswellbrook has an intensity of major projects and developments occurring within its borders that reflects the resources within the area. Coal mining accounts for a high proportion of the projects and facilities in the area as well as power station operations.

Bayswater and Liddell Power Stations are positioned to the south east of the Muswellbrook township, near Muswellbrook's boundary with the Singleton LGA.

Consultation with Muswellbrook Council indicates that some important characteristics and considerations include:

- Pressure on local accommodation within an area already heavily utilised by developments and itinerant support industries (i.e. travelling sales reps etc);
- Positive benefits of an employment boom also requiring detailed management to avoid negative aspects of the rise in cost of living and employment saturation resulting in skills and trades shortages;

- Potential pressure on local/rural road networks;
- Potential pressure on community services and amenities;
- Potential pressure on infrastructure, particularly sewer; and
- Recognition of the weight of projects being undertaken or to be undertaken within Muswellbrook over the coming years and the need for Muswellbrook Council to retain adequate time for strategic planning to support them, and avoid unnecessary pressure on resources within the LGA.

**Project Site**

The Bayswater B site lies on the border of Muswellbrook and Singleton LGAs. The footprint of the development lies within Singleton but the infrastructure traverses into the Muswellbrook LGA. The project is also geographically closer to Muswellbrook which is likely to be the primary resource for the proposed Bayswater B project. The Traffic Assessment in this EA (refer Chapter 21) identified that for current operations, approximately 65% of the operational workforce travel from Muswellbrook and the remaining 35% from Singleton and other areas.

Given the proximity of Muswellbrook, this 65-35% split has been utilised as a basic assumption in the assessment of potential impacts resulting from either construction or operation of the Bayswater B Power Station.

### 18.2.2 Local Economy

Agriculture formed the main economic driver for both Singleton and Muswellbrook around the time of their foundation during the early 1800s. The discovery of coal quickly transformed both Singleton and Muswellbrook LGAs into the largest producers of coal in NSW. Furthermore, the Bayswater and Liddell Power Stations, commissioned in 1973 and in the mid 1980s respectively, have the capacity to produce a large proportion of the NSW electricity demand and currently employ over 570 people.

The Muswellbrook region's economy has undergone an economic resurgence in recent years, with long term prospects in coal mining, power generation and supporting service industries becoming more evident (MSC, 2008a).

The wealth of resources has encouraged growth and contributed to Singleton evolving from a quiet rural town to a vibrant commercial centre, catering for its cosmopolitan workforce and residents. Market gardens, dairy and beef cattle, an emerging mushroom industry and a rapidly growing tourism industry also contribute to diversity in Singleton's local economy.

**Economic Growth**

Economic growth in both the Singleton and Muswellbrook LGAs has traditionally been fuelled by coal mining. Although the mining industry remains active within these LGAs, this may decline in relative importance as the industry moves north west to the Upper Hunter (Advitech, 2008). However, the ongoing intensity of major projects in the area may also affect the ongoing population figures.

Considerable life remains in the resources of both the Singleton and Muswellbrook LGAs with jobs growth and a number of alternative industries and businesses emerging. Agricultural based industries and wine based tourism are emerging as important generators for both LGAs. Other alternative industries are becoming more diverse and less reliant on linkages to the coal and power industry.

One of the most significant projects for the Singleton LGA will be the construction of the Hunter Expressway (also known as the F3 to Branxton link). This project is expected to commence in 2010, with its opening scheduled for 2013 (RTA, 2009). The expressway will provide about 40 km of dual divided carriageway between the F3 Freeway at Seahampton and the New England Highway west of Branxton. The expressway will improve the efficiency of the National Network between Sydney, Newcastle and Brisbane. It will also provide a transport link between Newcastle, Sydney and Singleton and reduce travel time by 20 minutes. Importantly, the extension will mean that Singleton is the first town north-bound motorists on the F3 encounter once leaving Sydney. This may draw more visitors to Singleton who would normally pass through Maitland and is likely to further stimulate the local economy both directly and indirectly.

**Tourism**

The Singleton and Muswellbrook LGAs are often recognised for their historical and cultural sites, vineyards and wineries, beef and dairy cattle, heavy industry, mining operations and power generation. Singleton has an attractive main street and shopping precinct, cafes and fine dining restaurants, Lake St Clair and a host of boutique wineries. In around May each year, Countryfest is held at Singleton Showground and attracts thousands of visitors, boosting tourism and trade for local businesses. Muswellbrook's Agricultural Show is held in April and the Spring Wine Festival in October. The Muswellbrook Cup is held on Melbourne Cup Day in November.

Wineries are a key attraction for tourism in the broader Hunter Valley. The Singleton and Muswellbrook LGAs are home to a number of major vineyards and wineries including Arrowfield Wines, Brokes Promise Vineyard and Olive Grove, Margan Broke-Fordwich Winery, Krinklewood Vineyard, Two Rivers Wines, Cruickshank Callatoota Estate, James Estate Wines, Bell's Lane Wines, Horseshoe Vineyard, Reynolds, Yarraman, Barrington Estate and Inglewood Vineyards. As of 2006, there were 48 businesses in Singleton and 63 businesses in Muswellbrook contributing to tourism by providing accommodation, cafes and restaurants (ABS, 2008). A further 12 businesses in Singleton and 27 businesses in Muswellbrook contribute to tourism through the provision of cultural and recreational services.

Key directions for tourism in the Singleton and Muswellbrook LGAs relate to the provision of accommodation and recreation experiences related to rural, agricultural and environmental land uses.

**Temporary Accommodation**

There are approximately 38 providers of temporary accommodation in the Singleton and Muswellbrook LGAs. This comprises 22 businesses in the Singleton LGA and 16 businesses in the Muswellbrook LGA (Error! Reference source not found.). Particular demand for temporary accommodation is associated with increased tourism and horticultural activity in the spring and summer months. It is expected that contractors represent a consistently high proportion of residents in temporary accommodation facilities in both the Singleton and Muswellbrook LGAs.

Consultation with Muswellbrook Council suggests that pressure on temporary accommodation can be high, given the need to house construction workers for major projects, accommodate equipment suppliers and other support services to the mines and power stations as well as during the peak tourist seasons (Autumn and Spring).

**Table 18-1: Temporary Accommodation in the Singleton and Muswellbrook LGAs**

| LGA | Accommodation Type | | | | | Total |
|---|---|---|---|---|---|---|
| | Hotel | Motel | B&B | Caravan Park | Serviced Apartments / Cottages | |
| Singleton | 7 | 7 | 4 | 3 | 1* | **22** |
| Muswellbrook | 6 | 7 | 0 | 2 | 1 | **16** |

Notes:

* 35 serviced apartments.

Data Source: Yellow Pages / Google Earth interface, 2009.

In 2006, the industry sector comprising accommodation and food services employed 647 people in the Singleton LGA and 473 people in the Muswellbrook LGA (**Section 18.2.5**). The industry sector comprising rental, hiring and real estate services employed 177 and 118 people in the Singleton and Muswellbrook LGAs, respectively.

**Housing**

*Tenure*

The availability of housing has been an issue within the Singleton area for some time (SC, 2006) and it is recognised that rental properties in both the Singleton and Muswellbrook LGAs are somewhat difficult to come by (**Figure 18.1**). The market price of quality residential accommodation is also increasing. When businesses within Singleton attempt to recruit staff for vacant positions within their organisations, quite often the successful candidates need to look further afield than Singleton to satisfy their rental requirements (SC, 2006).

**Cost of Living**

*House Prices*

In recent years the median house price at Singleton has risen above that of the broader Hunter Region and the median house price at Muswellbrook has remained below that of the broader Hunter Region (**Figure 18.2**). The median house price for both Singleton, Muswellbrook and the broader Hunter Region has remained below the median house price for NSW. As of March 2009, the median house price for NSW was very similar to that of March 2005. Contrary to this, the median house price in Singleton and Muswellbrook in March 2009 was 30 % and 41 % respectively above the 2005 median house prices. This suggests that there has been increasing demand for housing around the Singleton and Muswellbrook LGAs.

*Rental Prices*

The median rental price for a three bedroom dwelling in both Singleton and Muswellbrook has increased largely in proportion with the broader Hunter Region and the state of NSW (refer **Figure 18.3**). This increase generally corresponds with an increase in Australian housing interest rates which peaked in 2008, before falling markedly (RBA, 2009). This increase is also likely influenced by the higher demand for housing associated with population growth and competition for available rental properties. Median rental prices in Singleton remain well above the median for the broader Hunter Region, reflecting the particular demand for rental properties in the Singleton LGA.

The census data for 2006 indicates that the most common weekly rental price for Singleton was in the range $180-224 and for Muswellbrook was in the range $140-179. The 2006 census data also indicates a greater spread in rental prices for each LGA when compared to previous census years, with 'lower end' rental prices still evident but 'higher end' rental prices now much more common (**Figure 4** and **Figure 5**).

Although median rental prices have increased, the median household income for both the Singleton and Muswellbrook LGAs has also increased by a similar proportion (refer **Figure 18.6**).

*Income*

The median household income in the Singleton LGA increased by approximately 31% over the period 2001 to 2006, from $958 per week to $1,256 per week (refer **Figure 18.6**). Median house loan repayments increased approximately 41%, from $997 to $1,408 per week; and median rental fees increased approximately 38%, from $130 to $180 per week.

The median household income in the Muswellbrook LGA increased approximately 28% over the period 2001 to 2006, from $827 per week to $1,058 per week (refer **Figure 18.6**). Median house loan repayments increased approximately 50%, from $867 to $1,300 per week; and median rental fees increased approximately 36%, from $110 to 150 per week.

The data indicates that the median house loan repayment in both the Singleton and Muswellbrook LGAs is outside the median household income, suggesting that the purchase of a private dwelling is beyond the reach of most residents. The data does however indicate that rental fees in 2006 were well within the capacity of the median household income for both LGAs.

### 18.2.3 Population Demographics

**Population**

Data collected from the Australian Bureau of Statistics (ABS) Census of Population and Housing 2006 indicates that the Singleton LGA had a population of 23,005 and the Muswellbrook LGA had a population of 15,944 at the time of census. Over the period 2002 to 2006, the Singleton and Muswellbrook LGAs experienced an average population growth of 1.7 % pa and 0.8 % pa respectively. This was above the broader NSW growth rate of 0.7 % pa for this period (ABS, 2008).

Population projections, based on the annual growth observed from 2002 to 2006, are illustrated in **Figure 18.7** and indicate that by the year 2030 the population of Singleton and Muswellbrook may be in the order of 34,000 and 19,000 respectively.

**Age Structure**

Based on the 2006 census data, the majority of persons in the Singleton and Muswellbrook LGAs are of working age, with the number of children higher than the State average while the number of older people is lower (**Figure 18.8**).

Between the 2001 and 2006 census, NSW experienced a decline (-1.1 %) in the number of children (aged under 15) as a proportion of the population, down to 20% of the population in 2006. During the same period Muswellbrook LGA saw a slight increase (1.1%) in the number of children as a proportion of the population while Singleton LGA had a much larger increase (6.4%), resulting in children comprising 24% of the population in both LGAs.

This is not surprising given the intensity of development projects in the area which would suggest a higher level of employment age population, which in turn would suggest a higher level of school age children.

The data suggests a relatively large number of young families in the area which is particularly positive for the sustained growth of both the Singleton and Muswellbrook LGAs.

### 18.2.4 Sensitive Receptors

The Muswellbrook and Singleton LGAs contain many receptors with the potential to be impacted by air quality, noise, traffic and other environmental considerations associated with the project. Particularly sensitive receptors include schools, childcare and pre-schools, hospitals, aged care facilities, churches, parks and other outdoor recreational facilities. Particularly sensitive receptors occurring within the Singleton and Muswellbrook LGAs are presented in **Figure 18.9** and allow an appreciation of the position and distance from the project site.

### 18.2.5 Employment

Employment levels in the broader Hunter Region have trended down since its high in March 2008 (HVRF, June 2009). However, strength and diversity in the Hunter economy means that job losses in sectors most exposed to the effects of the global economic downturn have been largely offset by gains in others.

In both the Singleton and Muswellbrook LGAs, the number of persons employed far outweighs the number of persons not in the labour force for those aged between 15 and 65. Of those employed, the greatest number fall within the 35-39 year age bracket in Singleton (**Figure 18.10**) and within the 40-44 year age bracket in Muswellbrook. For each LGA, the greatest number of unemployed persons (those in the labour force, but not currently employed) fall within the age category 15-19 years.

Data collected from the 2006 census indicates that mining is the major employment industry in both the Singleton and Muswellbrook LGAs (**Figure 18.11** and **Figure 18.12**). This is particularly the case for the Singleton LGA, with the number of people employed in the mining industry more than double that of the next biggest industry employment sector (retail). However, each LGA maintains strong diversity across a number of employment sectors, including many not related to the mining industry. This helps lessen the effects of global economic conditions on the Singleton and Muswellbrook LGAs as a whole.

The mining sector benefits the local economies of Singleton and Muswellbrook by provision of jobs and flow on effects that stimulate local support services. However, there is an inherent risk that the attraction of generally higher paying jobs in the mining industry may impact on skilled labour shortages for domestic, commercial and industrial needs in the townships. Both the Singleton and Muswellbrook Councils recognise these issues and are developing approaches to combat skilled labour shortages through their strategic planning processes (**Section 18.2.10**).

A booming (or saturated) employment market has many flow on effects including:

- Skills shortage in domestic and general domestic and commercial areas (such as carpenters, plumbers etc);
- Reduction in inter-generational skills and trades education; and
- Need to manage employment peak times during large scale construction projects which either temporarily floods the employment market further, or requires skills and trades to be imported from other areas.

### 18.2.6 Services

Community services, such as water, waste, health and sewerage are coordinated by the local councils in the Region. State managed facilities include emergency services such as police and ambulance / hospital facilities.

**Emergency Services**

Just over a quarter of the people in NSW live outside the three major cities of Sydney, Newcastle and Wollongong. There are eight Area Health Services that are responsible for providing health services in a wide range of settings, from primary care posts in the remote outback to metropolitan tertiary health centres. Four of the Area Health Services are classified as comprising rural areas. The relevant service area for the proposed development area is Hunter New England Area Health Service.

There are three State managed hospitals in the locality being located at Muswellbrook, Denman and Singleton. Both Muswellbrook and Singleton are classified as district health services and provide surgical, medical, emergency, obstetric, paediatric, limited care renal dialysis, early childhood, oncology and community nursing to the surrounding areas. Denman is classified as a community hospital and provides general health care services and has limited emergency care facilities. These services also offer emergency and palliative care for the local population, as well as provision of emergency response services such as ambulance.

While the current level of service is considered adequate for the locality and surrounds, it should be noted that there has been a significant decrease in service levels across the State in recent years. This pressure has resulted from increases in population and has increased operational pressures on hospitals.

The existing Bayswater Power Station has its own small health centre for employees, staffed by nurses only, but does not have an ambulance service.

**Local Emergency Services**

Muswellbrook has the only 24 hour police station in the Hunter Valley Local Area Command (LAC). There are other non-24 hour police stations in the surrounding towns. The crime rate in Muswellbrook is already quite low with the trends in recorded crime statistics remaining stable in most areas from 2004 – 2008 and remaining stable across all categories from 2007-2008.

Local emergency services in the region include the State Emergency Service (SES) and Rural Bushfire Services (RFS). These are predominantly volunteer services where communities rally to provide assistance in adverse condition such as flooding and bushfire occurrences.

### 18.2.7 Service Infrastructure

On 24 April 2009, Muswellbrook joined with Singleton and Upper Hunter Councils in an alliance for the ongoing management of sewer and water services in the region over 10 years.

The alliance is currently preparing a plan of action for the Region that seeks to resolve potential shortcomings of the sewer, water and waste services and to accommodate projected future growth.

**Sewer**

Sewer in the region is managed by the respective local government authorities. These sewer treatment facilities are at various stages of their operational lifespan and service the towns of Singleton and Muswellbrook and some adjacent rural areas.

Muswellbrook Sewer Treatment Plant is nearing the end of its predicted working life. As a requirement of the DECCW licence for the sewer plant, Muswellbrook Council is upgrading / expanding to accommodate the predicted influx of additional waste due to the population growth for the LGA. In 2007, *Muswellbrook Sewer Strategy* identified a 10 year plan for the upgrade to accommodate future development loading with this plan being developed to accommodate the predicted growth of the area.

Singleton Council considers its urban water and sewer infrastructure adequate for the maintenance of the existing service area. Within Singleton, sewerage is connected to all dwellings within the town boundaries where economically feasible, and only a small number of properties are not connected. Council operates one sewage treatment plant at Doughboy Hollow south of Singleton.

**Water**

Muswellbrook has three water supply systems, Muswellbrook, Denman and Sandy Hollow. Denman water treatment plant was opened in April 2008 to supply the Denman township. It is noted that Muswellbrook Council has recently embarked on an augmentation program to improve services, as water consumption is increasing at a faster rate than the population. Muswellbrook Council has also embarked on effluent reuse agreements with Mount Arthur Coal, Muswellbrook Golf Course and Denman Golf Course to reduce stress on the system.

The town of Singleton is well placed in relation to existing urban water supply, and potential future demands with a supply from the Glennies Creek Dam via a pipeline. Residential and surrounding rural residential areas currently have an adequate water supply of good quality. A non potable water supply is provided to some properties along the Glennies Creek Dam pipeline route.

The current commitments to supply water, plus an estimate of additional commitments for existing and proposed development areas expanding at current growth rates, indicates that in 10 to 15 years time further water entitlements and alternative sources may be needed.

Augmentation of the Waste Water Treatment Works is scheduled for 2010 to 2012, subject to growth rate assessment and a final demand analysis study.

**Waste**

The Muswellbrook Waste Management Facility with a projected capacity of 8 years remaining and the Denman Waste transfer Station are located in the vicinity of Muswellbrook.

Singleton Council Waste Management Facility is located off Dyrring Road, about 5km from Singleton. The Council's Capital Works Program includes provision for new landfill extensions to at least 2025, together with a range of resource recovery services over a period of several years, to 2015.

### 18.2.8 Community Infrastructure

The proposed development is likely to increase the use and requirements for service infrastructure in the Muswellbrook and Singleton areas as a consequence of an increase in both construction and operational workforces for significant projects in the area.

**Sporting facilities**

The number of sporting clubs and facilities as well as other recreational clubs in the Muswellbrook Shire is considered amongst some of the best in regional and rural Australia. This is a similar situation for Singleton with the locality well catered with sporting facilities. **Figure 18.9** identifies the available sporting facilities and infrastructure within the locality.

**Childcare and Schools**

Muswellbrook, Singleton and the surrounding villages have a range of childcare and educational facilities that cater for a variety of ages with the majority of facilities located in the larger town. The construction and operation of the proposed development has the potential to increase competition for places and increase enrolment numbers in some of these facilities. The potential impacts to these facilities are discussed below in relation to the scholastic grouping (Childcare, Primary, Secondary and Tertiary).

A total of 11 childcare centres are registered in the Muswellbrook / Singleton area. Five Childcare centres are in Muswellbrook, five in Singleton and one in Singleton Heights. An additional mobile pre-school catering for 2-5 year old children is run by Singleton Council at various rural halls in the LGA. There are limited vacancies in both the Singleton and Muswellbrook area, with the least places available for the 2-3 year age groups.

*Primary Schools*

Muswellbrook and Singleton have eight and nine primary schools in their respective LGAs.

The number of facilities available for children on primary school age, (5-12), is considered adequate for the region's existing and projected population growth figures. The proposed development has the potential to increase the number of children of the construction/ operational workforce who are of primary school age in the area, which may increase competition for placements at these schools.

Current figures for this age group show approximately 16% of the population are at Primary School age, marginally higher than the State average (13%). Given the number of existing facilities and the level of service for the Primary School aged population, it is considered that the proposed increase is within the service levels of the existing facilities, however, should the projected population increase of the Region increase significantly based on cumulative developments, additional facilities may be required to accommodate the potential increase in families.

**Secondary Schools**

There are a total of six Secondary Schools in the Muswellbrook and Singleton Region with three schools located in each LGA. These include both public and denominational schools and are currently adequate for the Secondary school age population figures of the region.

The proposed development has the potential to increase the number of children of secondary school age (12-18) and increase competition for school places. Current population figures show this age group as equivalent to the State average. However, as discussed above, there is a noted increase in population of Primary School aged children that will be progressing to Secondary education in the coming years. This would have the potential to increase pressure on the existing facilities based on current population trends.

*Tertiary Education*

Four tertiary education facilities are located in Muswellbrook, (two university campus, one college and one TAFE campus), and one TAFE campus is located in Singleton.

These facilities are considered adequate for the local community and projected future growth of the Region. It is noted that a high proportion of tertiary students relocate to nearby areas such as Newcastle, Armidale and Sydney.

### 18.2.9 Other Major Projects

As at 6 August 2009, the proposed construction and operation of the proposed Bayswater B project, is one of 32 Major Projects for the LGA of Singleton and 18 Major Projects for the LGA of Muswellbrook listed on the NSW Department of Planning website.

**Figure 12** shows the location and **Table 3** provides details of other Major Projects relevant to the Singleton and Muswellbrook LGAs that have been listed as either approved or pending for the 12 month period to 6 August 2009. The Hunter Expressway project (approved in August 2007) has also been added to this list as it is a Major Project affecting Singleton, with construction earmarked to commence in 2010.

The majority of these Major Projects relate to the extraction and processing of coal. Other Major Projects include a gas pipelines, a water pipeline, a highway link, a renewable energy generating facility and a large mixed use urban area to be located adjacent to Branxton and North Rothbury, approximately 50 km (direct line) south east of the proposed Bayswater B site.

These projects are discussed in detail in Chapter 23 (Cumulative Issues).

### 18.2.10 Sustainability / Council Policy

The concept of sustainability is ingrained in the strategic plans for the Singleton and Muswellbrook LGAs. These plans are used to assist council and the community to plan for the future and realise their vision.

**Singleton 2030 Strategic Plan**

The *Singleton 2030 Strategic Plan* was developed for guidance in future planning and was adopted by Singleton Council in November 2006. The Strategic Plan reflects the broad vision for the future of the Council and the community it services; being for a progressive community of excellence and sustainability.

The *Community Action Plan* (CAP) forms a key component of the Strategic Plan. The CAP breaks the broad vision into key visions and provides strategies and performance indicators for each. The key visions of the CAP include:

- *lifestyle – a community which values its lifestyle opportunities in an attractive and healthy environment*
- *economy – a buoyant economy which succeeds on its diversity and entrepreneurialism*
- *tourism – visitation maximised by marketing Singleton's natural and diverse assets*
- *natural environment – by adopting a sustainable approach, ensure that the integrity of the natural environment is maintained and enhanced*
- *built environment / heritage – ensure that the built environment is developed with the principles of sustainability in mind*

- *marketing / image – a community which demonstrates a progressive and "can do" positive attitude*
- *infrastructure – sustainable public works infrastructure that supports the needs of Singleton's community*
- *governance – an organisation that is transparent, accountable and equitable in the way that it responds to the needs of the community and prides itself on its governance protocols.*

**Making Muswellbrook Shire Strategic Plan 2008-2010**

Muswellbrook Shire Council's vision for the future is of: *a community with a strong, diversified, vibrant and expanding economy; a community where people choose to live, work, play and learn; a community that has a strong and sustainable future beyond the exhaustion of the finite resource coal; and a community that works together toward the development of sustainable industry and employment opportunities now and for the future generations.*

The Making Muswellbrook Shire Committee is responsible for the development of initiatives to achieve sustainable economic growth with real benefits to Muswellbrook's residents in terms of employment, improved skills, raised aspirations and achievements and access to jobs. In 2008 the committee established the following goals for the Muswellbrook Shire that have since been adopted by Council:

- *industry and business development – to facilitate growth and sustainability for existing business / industry and entice new and diverse industry*
- *community perception – to enhance the internal and external perception of Muswellbrook as the "ideal place to live, work and play"*
- *population, infrastructure and provision of services – to sustain and increase the region's population in order to maintain and enhance community infrastructure, health facilities and educational provision etc.; and to constantly review and plan upgrading of all public utilities*
- *employment and education – to meet industry needs for current skilled trade shortages, to encourage and support apprenticeships and traineeships, and to sustain and increase future employment opportunities for the local community and schools*
- *tourism and promotion – to promote Muswellbrook Shire as a tourist destination and attract visitors to the region.*

## 18.3 Impacts

As with all large infrastructure projects, the proposed Bayswater B project would have social and economic benefits, and social and economic costs.

### 18.3.1 State and Regional Benefits

The primary benefit of the project would be the provision of additional base load power to support the predicted demand within the next ten years.

In addition, the project has an estimated value in excess of $2 billion and would provide a broad array of social and economic benefits including:

- direct employment for a construction workforce of up to 950 people and operational workforce of up to 160 people;

- indirect employment during the construction phase, resulting from increased demand for goods and services;
- significant capital investment during the construction phase; and
- securing an adequate supply of electricity to residents, businesses and industry of NSW.

### 18.3.2 Local and Regional Impacts

Social and Economic impacts would occur at both the construction and operational phases of the proposed Bayswater B project. The potential impacts (both positive and negative) are summarised in the table below.

**Table 18-2: Summary Potential Impacts**

| Subject Area | Construction | Operation |
|---|---|---|
| Land Use | The project would be undertaken wholly within MacGen owned lands with the exception of the gas pipeline (should gas be the preferred fuel source). The concept route of the gas pipeline is indicative only at this stage but has attempted to utilise road and rail easements where possible to minimise potential impacts to landowners. A process of consultation and negotiation would occur to ensure that the final pipeline alignment does not impinge on or sterilise land uses. | No anticipated effects during operation. |
| Tourism | No potential impacts are anticipated directly on tourist facilities during construction.<br>There are potential impacts from the project (and cumulatively with other development projects) in terms of construction activity and use of amenities and resources in Muswellbrook particularly. This could affect the peak tourist seasons in Autumn and Spring.<br>In particular, the success of wine-based tourism, annual attractions such as Countryfest (May), the Muswellbrook Agricultural Show (April), the Spring Wine Festival (October), the Muswellbrook Cup races (November) and other events may be reliant on the availability of quality local accommodation in order to sustain the attraction of visitors to the area. The development of a construction camp would help alleviate such impacts. | No anticipated effects during operation. |

| Subject Area | Construction | Operation |
|---|---|---|
| Local Economy | Construction represents a potential benefit in that local employment, resources and supplies could be sourced from nearby areas where feasible. In addition, support services (such as accommodation, hotels, cafes etc) would benefit from the additional workforce population.<br>No effects are anticipated that would impact on current businesses with the exception of potential pressure for business needs (as discussed below in relation to accommodation etc). | No negative effects are identified during operation. |
| Accommodation | There are potential impacts from the project (and cumulatively with other development projects) in terms of accommodation needed for construction workers. A construction workers camp for up to 800 people is planned to be built at a location within the vicinity of the Project Site. Some accommodation within the town of Muswellbrook particularly may be needed however which could put pressure on available temporary accommodation. | The source of the operational staff is not yet known however, it may be assumed that permanent housing may be needed to house incoming workers for the facility. It has also been assumed (as with the current location split) that roughly 65% of operational staff would be housed in Muswellbrook. This may place pressure on the housing market, if cumulative issues arise with other development projects. |
| Sensitive Receptors | Potentially, there are impacts to sensitive receptors in Singleton and Muswellbrook from traffic noise and activity that could affect school zones, patient and aged care facilities and use of amenities such as parks and churches. | No anticipated effects to sensitive receptors during operation via traffic (refer Chapter 21) or via emissions from air (refer Chapter 9) or noise (refer Chapter 14) as the facility has been designed and would be managed to meet specified criteria. |
| Employment | Potential positive benefits employment opportunities available during construction.<br>Potential effects of employment saturation – this could represent an impact to the future Proponent (in that there may be issues around availability of workers, particularly given the cumulative intensity of major project development in the area). This could also exacerbate the current skills shortage situation. | No significant issues have been identified during operation as the current situation already suggests a level of saturation and skills shortage. This would continue to be exacerbated potentially within the context of cumulative issues. |

| Subject Area | Construction | Operation |
|---|---|---|
| Emergency Services | There could be potential effects and stress on emergency services if construction workforce management is not planned effectively. While crime statistics indicate stable levels, inappropriate or mis-management of the construction workforce could result in security issues or anit-social behaviour. In addition, construction logistics needs to take into account OH&S planning and potential emergency response planning needs, given the potential for emergency service requirements in the event of an incident during construction. | No anticipated effects during operation. |
| Infrastructure and Utilities | There could be potential effects to infrastructure and utilities during the construction period for Muswellbrook particularly including on the local road network, sewer requirements (either for the construction workers camp or for more permanent or semi-permanent accommodation) and so on.<br>At the current time this is difficult to quantify as the specific transport routes have yet to be identified. This would not occur until the detailed design stage although transport routes are most likely to utilise the arterial road network. Similarly, the specific location of a construction workers camp has not been identified and would be selected based on proximity, constructability and environmental grounds and on the basis of negotiation and consultation with the relevant landowner. | No anticipated effects during operation. However, this would be reviewed when the technology is known (i.e. there would be a difference in operational workforce numbers and therefore potentially a large difference in permanent employees and families moving to the location). If coal is the selected option (which requires a higher number of employees) and taking into account the potential cumulative issues, there may be increased pressure for new accommodation and subsequently potential pressure on infrastructure and utilities. |
| Community Services | Potential effects during construction relate to the construction workforce housed within Singleton and Muswellbrook particularly. This is especially so if construction workers in the towns relocate with families have a family presence requiring child care and school places and potentially general medical. | As above. |
| Sustainability and Future Directions | The project is considered to be consistent with the strategic visions of both LGAs and does not impinge on the development of stated initiative and strategic directions.<br>Consultation with Muswellbrook Council particularly noted the potential to construct the construction workforce camp with a view to a longer term use. | No anticipated effects during operation. |

## 18.4 Mitigation and Management

As shown above, the bulk of potential impacts on the social and economic environment are during the construction period. The construction period would be approximately 3 years if gas fired is the preferred technology and 5 years for coal fired. For either option, a peak construction workforce of approximately 950 is anticipated.

A construction camp would include barracks, mess hall, ablutions, etc. It would be located within the vicinity of the proposed Bayswater B site, subject to site selection and landowner negotiation. The workers would then be transported to site by bus.

Other construction employees would be housed within Muswellbrook and Singleton (with the assumption being that the majority in Muswellbrook given the proximity). Some services within the towns may be used by construction workers whether within the camps or within the towns (e.g. sports facilities etc). Other services may be used only by personnel housed within the towns (e.g. child care places for families). In addition, other goods and services would be sourced from Singleton and Muswellbrook subject to availability. During construction, all plant, equipment and raw materials would need to be transported to site via the New England Highway which traverses directly through Muswellbrook in the north and Singleton in the south.

The flow-on effects of the construction period extend to pressure on local accommodation as well as sporting and community facilities, local infrastructure including potential damage to local/rural roads and service utilities.

All these issues need to be considered in light of the cumulative effect of multiple large scale major developments potentially occurring in the area at the same time.

It is noted however, that some issues cannot be resolved at this stage. For example, MacGen is currently the proponent for the Concept Approval, but may not be the party undertaking the construction and/or operation.

Similarly, the final technology (i.e. coal or gas) is yet to be determined and the choice of technology has implications for the confirmation of potential impacts (i.e. such as the different workforce numbers and construction timeframes).

As such, the following mitigation measures have been included as part of the proposal:

- The detailed design and construction logistics reports would be prepared based on the information provided in this EA in order to plan appropriately to avoid or minimise potential negative effects;
- The construction logistics/planning is to take account of potential construction staging and timeframe that coincides with other major project development as well as coincides with tourism peak times and local festivals;
- The location of the construction workers camp is to be considered with due care and attention in order that workforce requirements are carefully managed, negative impacts to the local community minimised and economic benefits maximised. This includes locating the workers camp site in the vicinity of the local town so that construction workers may utilise amenities and interact with the local community but ensuring configuration and management principles prevent mass migration to the towns on a regular basis (i.e. making the site a “wet site” to avoid large numbers of construction workers travelling to the local town to utilise pubs and hotels;

- Review and update of this social and economic assessment on the basis of the finalised detailed design and construction logistics report to confirm the extent of potential effects. This is particularly in relation to infrastructure (including rural roads) and utilities once the location of the construction camp is known, as well as the transport routes for plant, equipment, raw materials and construction employees;
- Once potential impacts are confirmed, the proponent for the development should consult with Muswellbrook and Singleton Councils. This would allow the basis for management of the potential impacts, longer term support for the Councils to manage effects and to allow Councils to confirm within their long term or strategic planning, additional resources that may be needed over time (e.g. permanent housing etc);
- An assessment should also be undertaken of a long term viable use for the construction workers camp including beneficial re-uses and long term management or sale to identify the feasibility of this approach while retaining a fit-for-purpose utility;
- A Construction Environmental Management Plan is to be prepared that specifically takes into account issues as they relate to social and economic impacts. This includes:
  - Traffic management including management of delivery times, shift times and transport routes to be protective of sensitive receptors and amenity users (such as school zones, quiet areas (such as parks, churches and cemeteries), hospitals and so on);
  - Workforce management plan to ensure ongoing principles are observed, including management structure of the site;
  - Stakeholder engagement plan to ensure ongoing communication with the community regarding progress, and including a complaints handling procedure;
  - Rehabilitation plan that includes the process for making good any damage caused during the construction period.

## 18.5 Residual Impacts

If all mitigation and management measures are undertaken, while there may be short term negative impacts, those effects can be managed. The remaining impacts would be those that are beneficial to the locality, region and State.

Potential negative effects to the locality and the broader region have been assessed and discussed in each of the chapters in this EA, including air quality and greenhouse gas emissions, noise, traffic and water quality. Each of those chapters include a discussion of the mitigation and management measures required to be implemented to ensure that potential effects are avoided or managed to appropriate levels.

As previously, noted, the current location of the construction worker's camp is currently unknown as this would depend on detailed design and consultation with local landowners. The key to the appropriate management of potential effects during construction however, is the review of the Social and Economic Assessment against the detailed design.

Singleton and Muswellbrook in particular are the local communities that would be required to accommodate this project and it is noted that these towns are also required to accommodate many other major projects. The major projects (including both heavy industrial/mining and power stations) require potential impacts on those communities to be managed carefully in order to support the benefits of additional electricity generation that would be available to the broader NSW community.

Muswellbrook Council noted an in-principle support of the project on the basis that social and economic impacts (and the broader environmental impacts) would be managed. The review and management process outlined herein provides the basis for:

- Managing potentially adverse impacts on the local communities;
- Identifying the benefits that can result from this project for the local community; and
- orting the broader need for power generation within the next decade while not disadvantaging the local community.

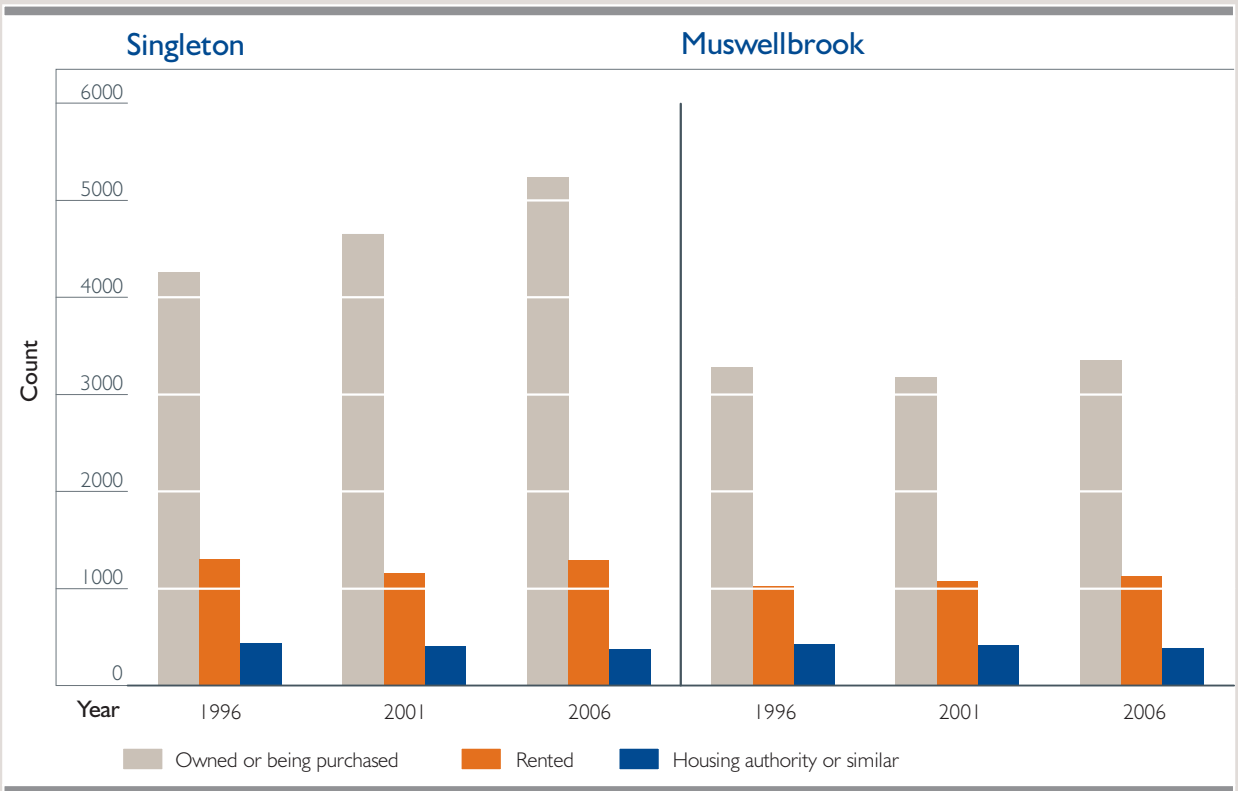


**Figure 18.1**
Dwelling tenure in the Singleton and Muswellbrook LGAs - 1996 to 2006
(Data Source: ABS, 2009)

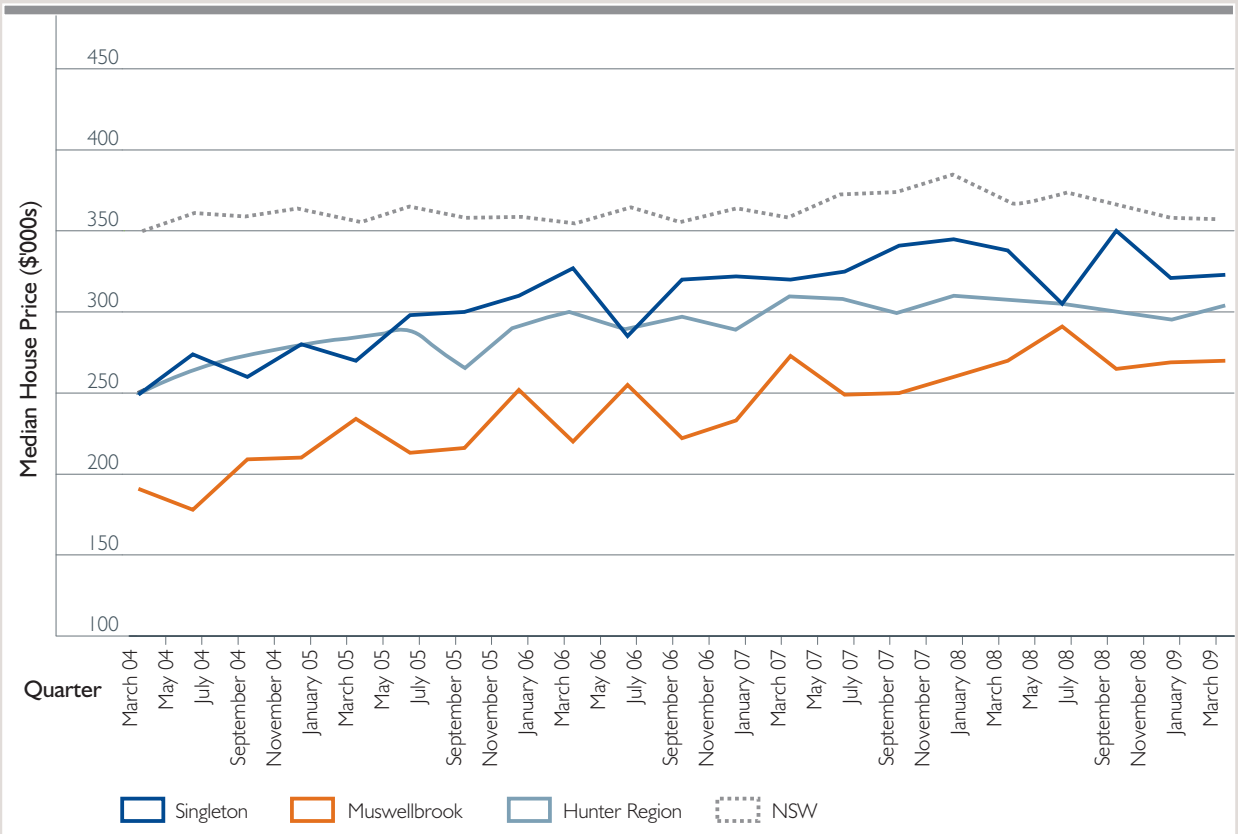


**Figure 18.2**
Median House Prices in the Singleton and Muswellbrook LGAs, Hunter Region and NSW - March 2005 to March 2009
(Data Source: Housing NSW, 2009)

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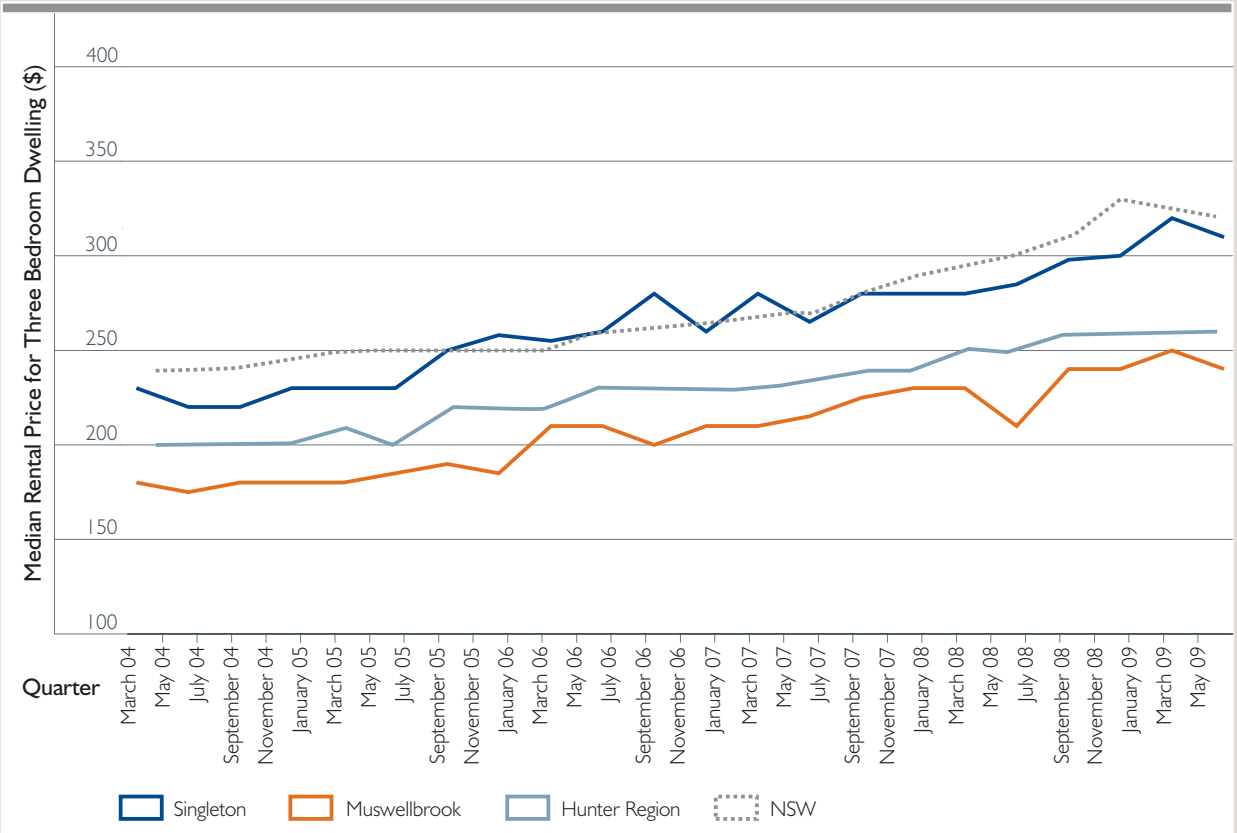


**Figure 18.3**
Median Rental Price for a Three Bedroom Dwelling in the Singleton and Muswellbrook LGAs, Hunter Region and NSW - March 2004 to March 2009
(Data Source: Housing NSW, 2009)

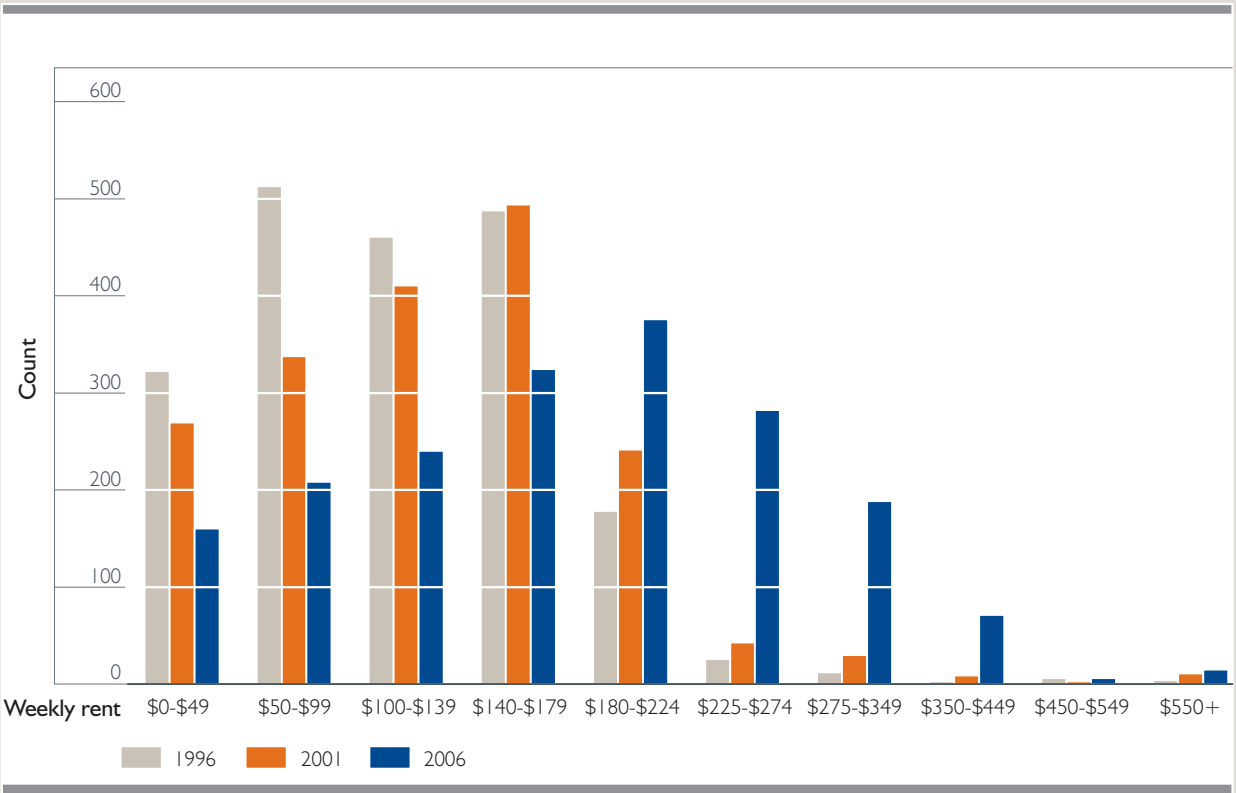


**Figure 18.4**
Weekly rental prices in the Singleton LGA - 1996 to 2006.
Data Source: ABS, 2009.

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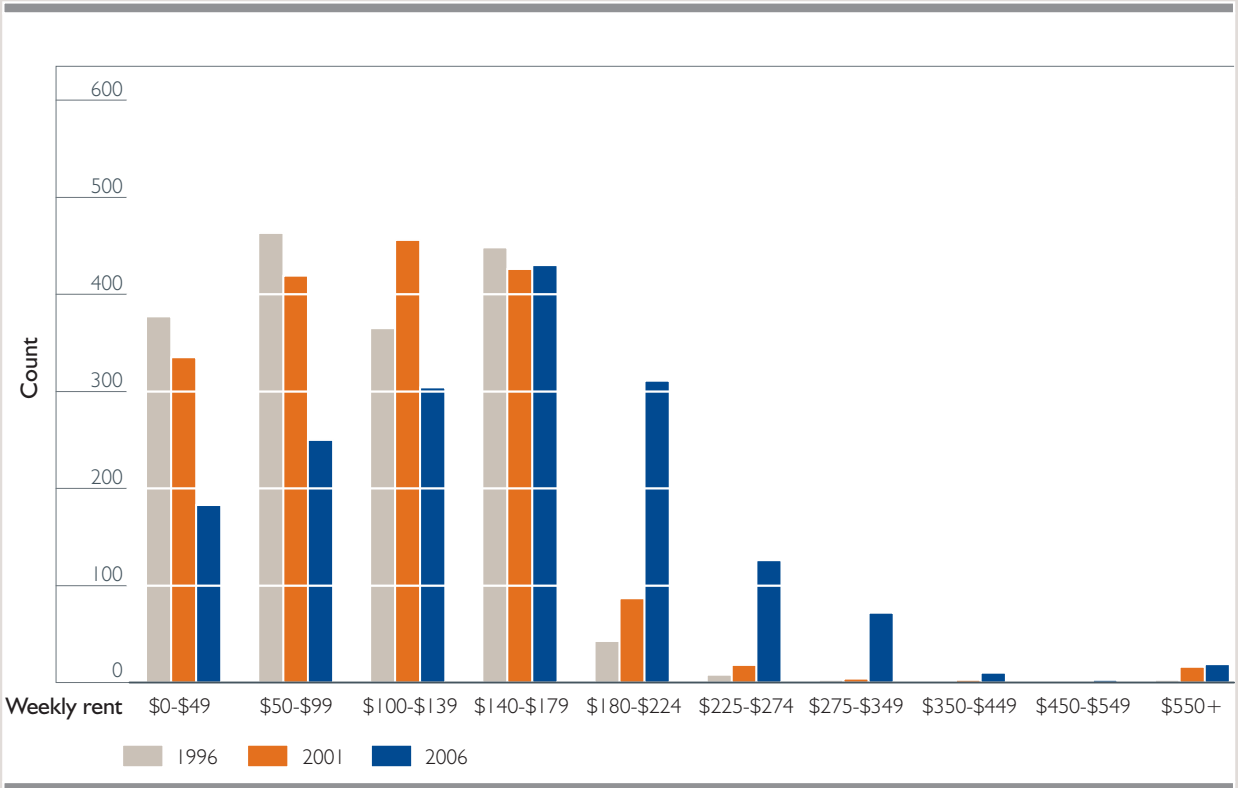


**Figure 18.5**
Weekly rental prices in the Muswellbrook LGA - 1996 to 2006.
Data Source: ABS, 2009.

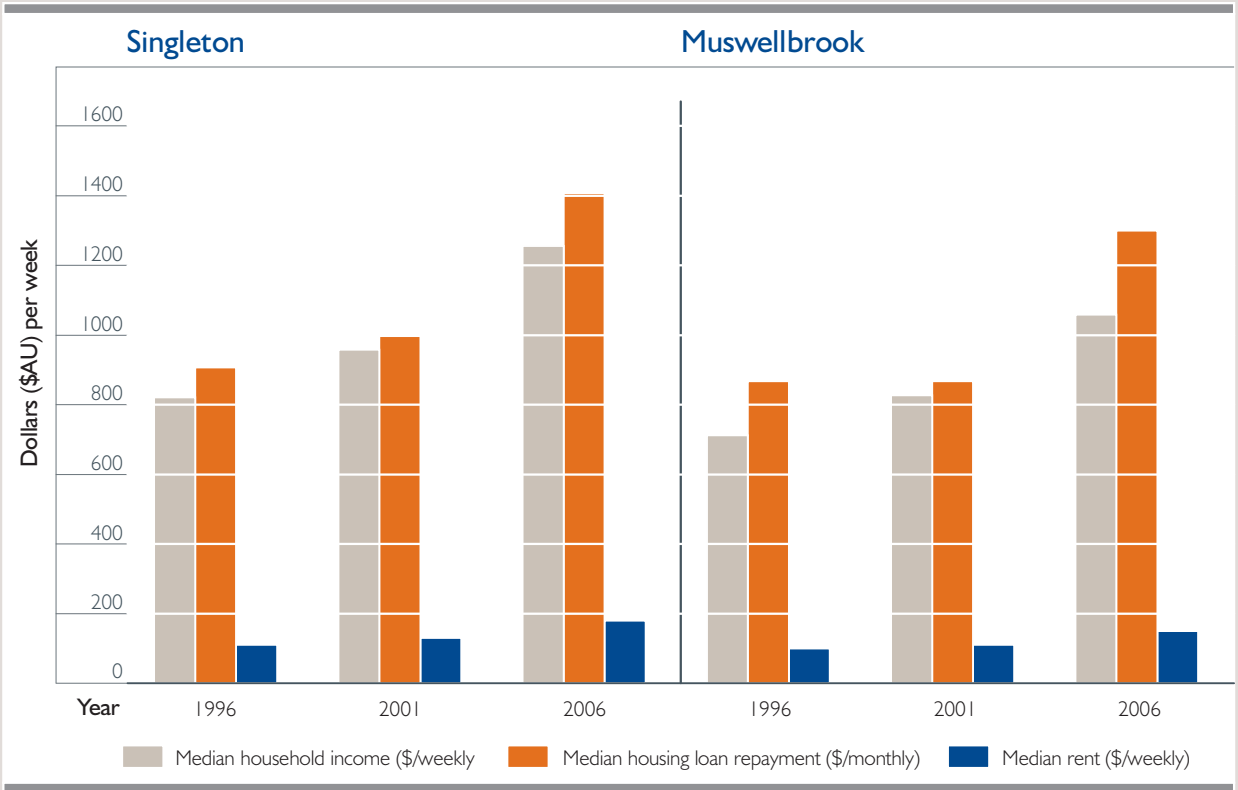


**Figure 18.6**
Gross Household Weekly Income, Housing Loan Repayments and Rent in the Singleton and Muswellbrook LGAs 1996 to 2006.
(Data Source: ABS, 2009)

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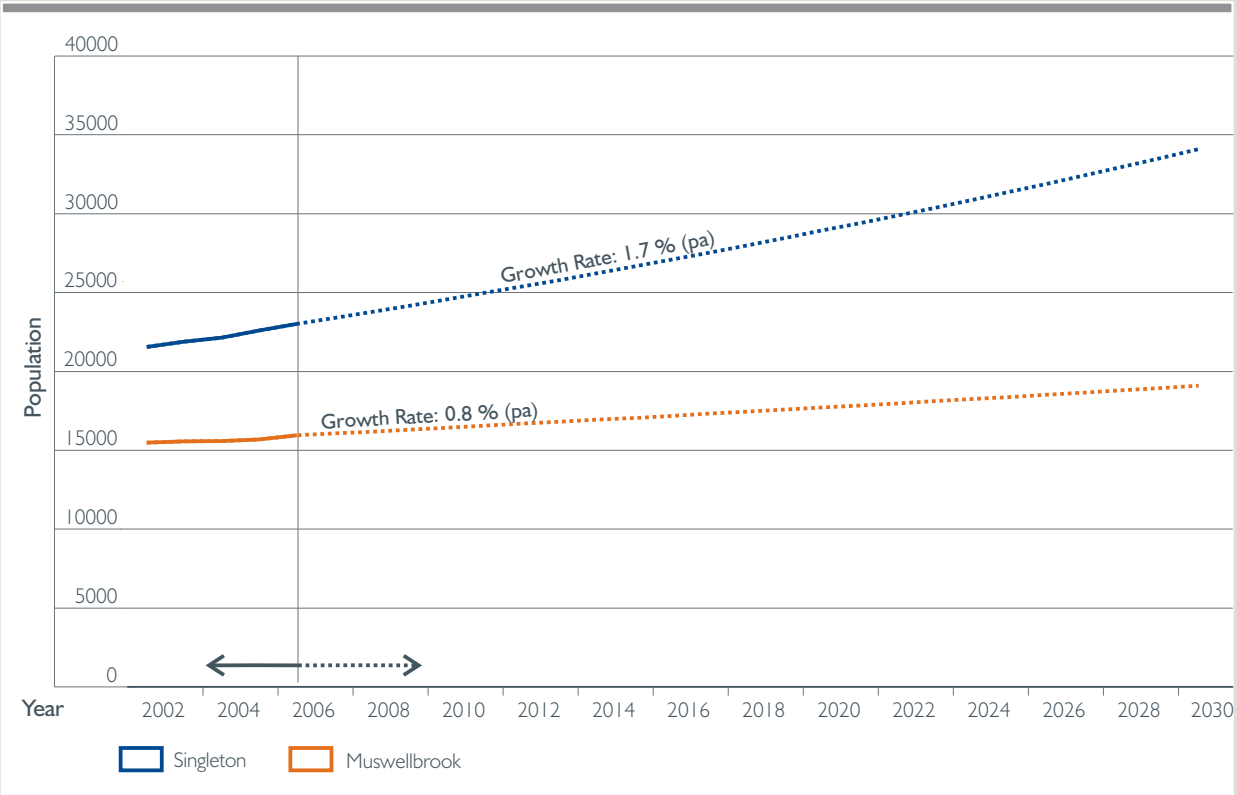


**Figure 18.7**
Population Count and Projections for Singleton and Muswellbrook LGAs.
(Data Source for 2002-2006 Data: ABS 2008)

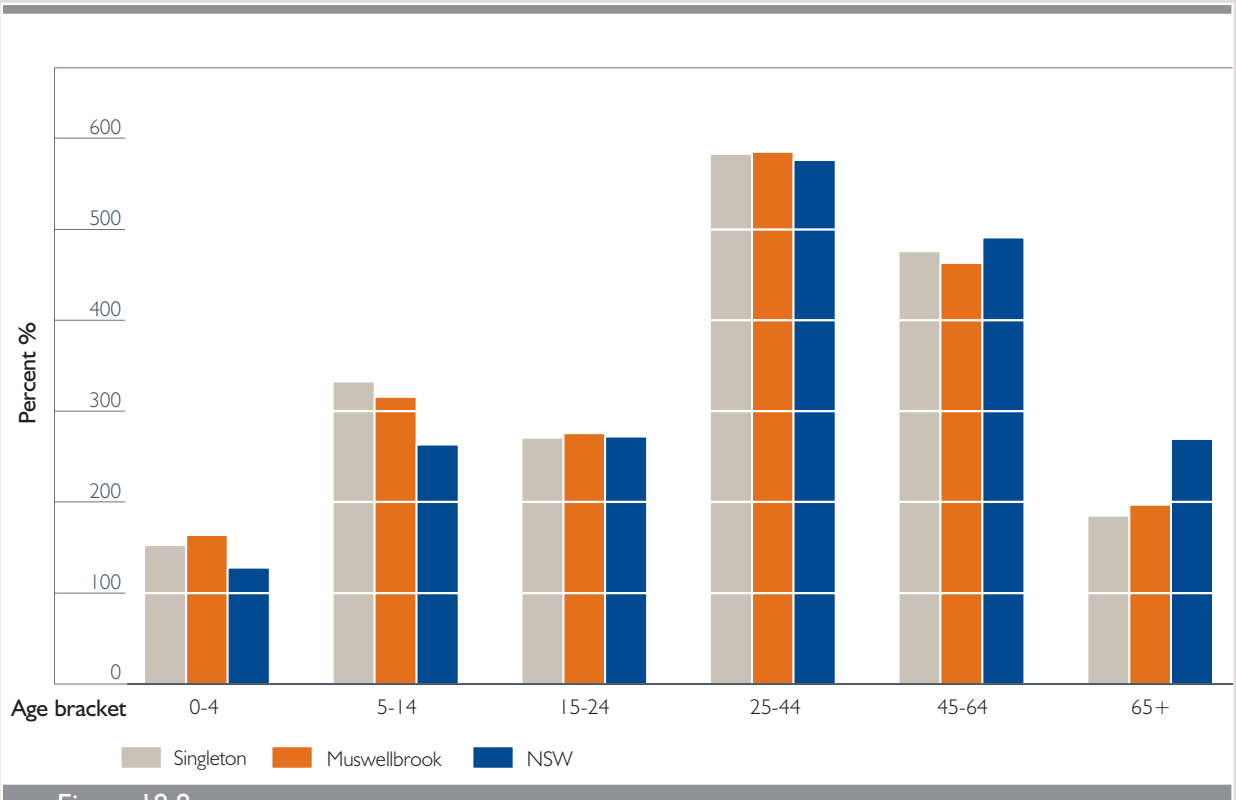


**Figure 18.8**
Population Age Structure of Singleton and Muswellbrook LGAs and Broader NSW
(Data Source: ABS, 2009)

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Figure 18.9
Muswellbrook Sensitive Receptors


Figure 18.10
Singleton Sensitive Receptors

AECOM

Environmental Assessment
Bayswater B Power Station
Figure 18.9 & 18.10

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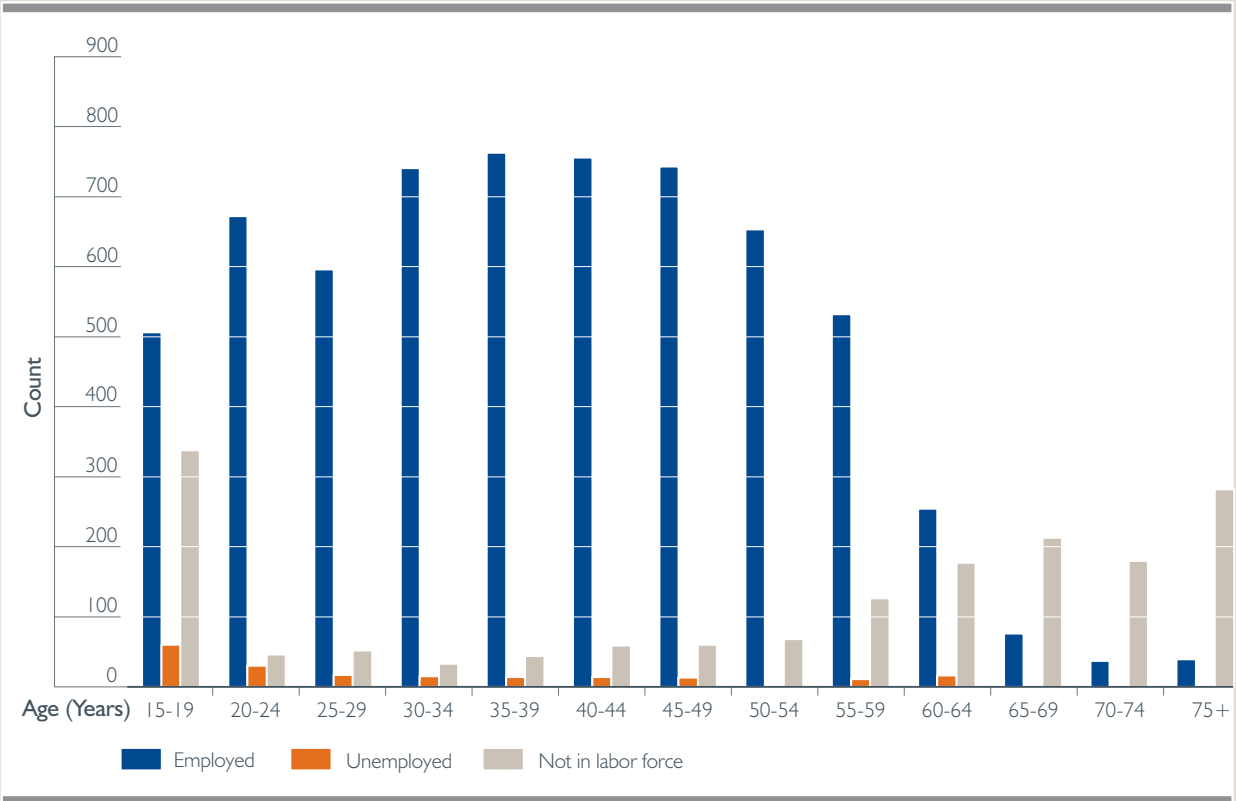


**Figure 18.11**
Labour Force of Singleton LGA - 2006
(Data Source: ABS, 2009).

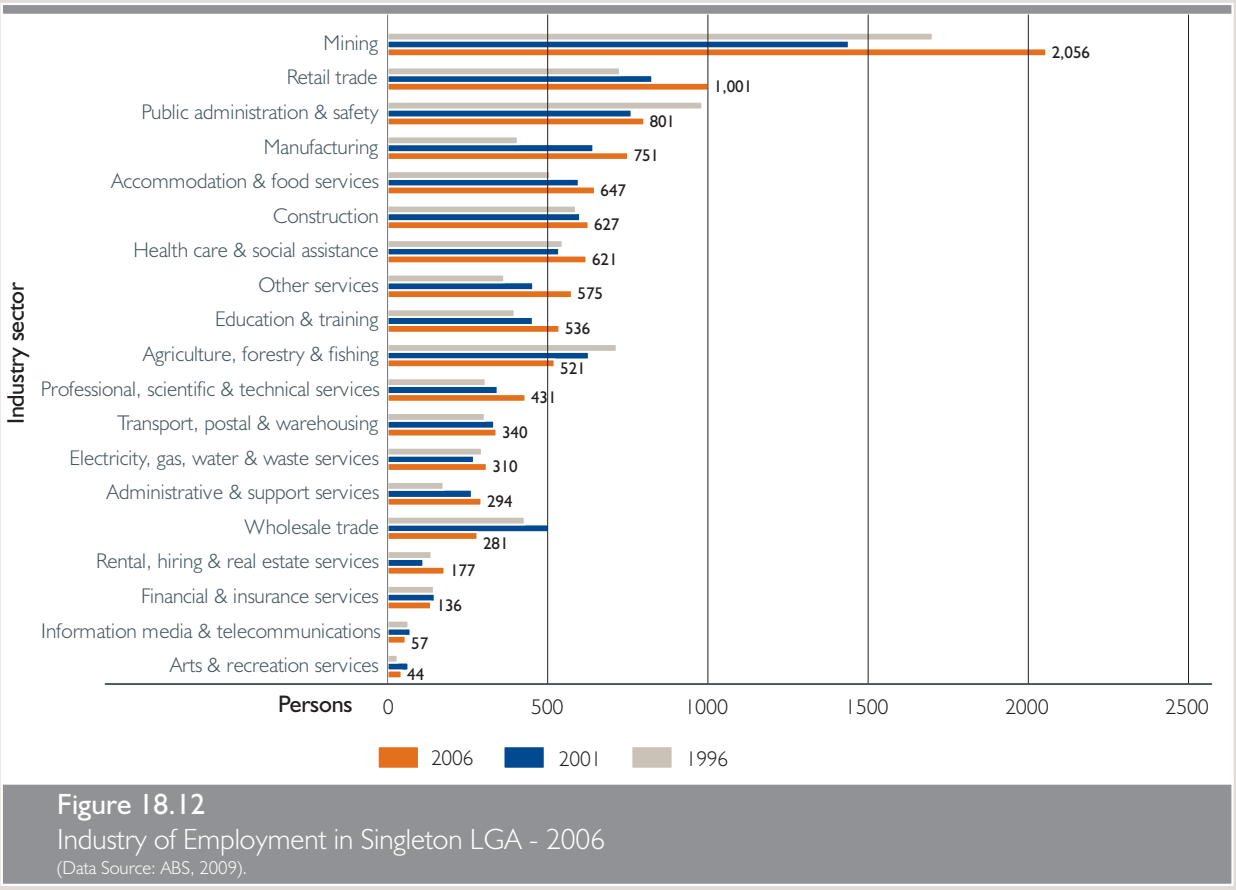


**Figure 18.12**
Industry of Employment in Singleton LGA - 2006
(Data Source: ABS, 2009).

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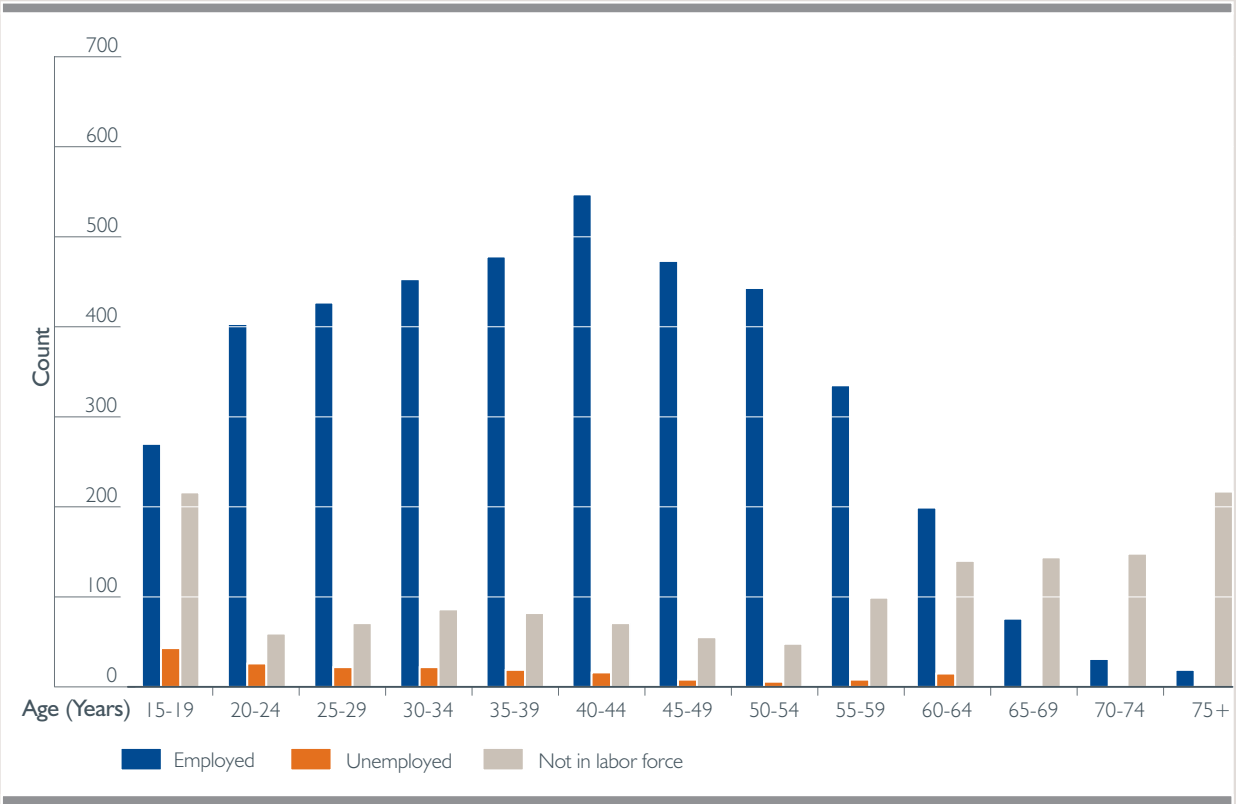


**Figure 18.13**
Labour Force of Muswellbrook LGA - 2006
(Data Source: ABS, 2009).

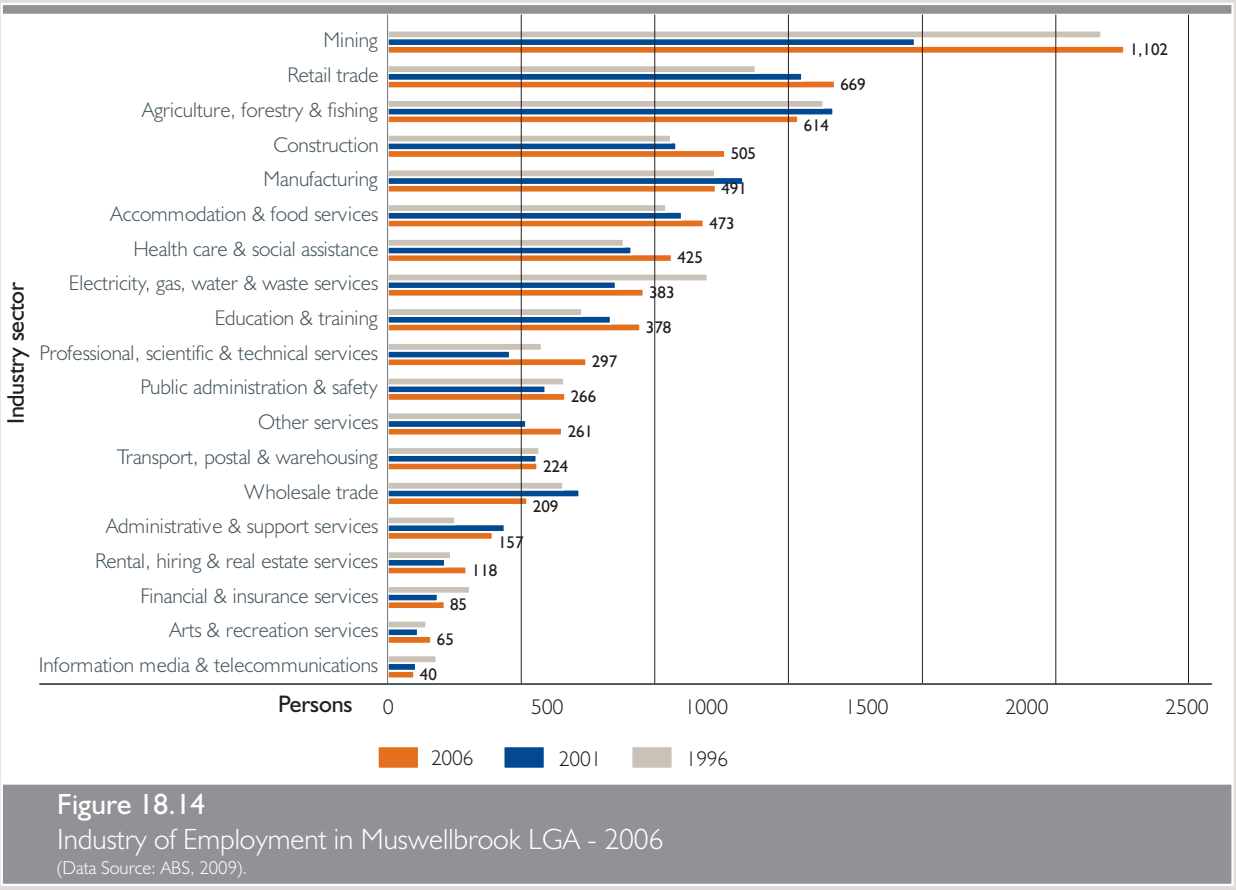


**Figure 18.14**
Industry of Employment in Muswellbrook LGA - 2006
(Data Source: ABS, 2009).

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# 19.0 Visual Assessment

*This chapter outlines the visual assessment in accordance with the EARs which included Visual Impacts: The Environmental Assessment must include:*

*An assessment of the visual impact of the project from representative viewing points including residential receivers, settlements and significant public view points and include a framework for the mitigation and management of visual amenity impacts on affected receivers;*

*An overview of the effectiveness and reliability of the measures and any residual impacts after the implementation of such measures must be included.*

## 19.1 Existing Environment

### 19.1.1 Surrounding Site Context

The Project Site is located wholly within existing MacGen property holdings which extend west of the existing Bayswater Power Station, north of Plashett Dam and in the order of 10 km north of Jerrys Plains which is the closest residential area.

Satellite images and aerial photographs provide confirmation that the proposed site and its surrounds have been substantially modified. The visual landscape is dominated by current and previous coal mining activities and by the Bayswater and Liddell Power Stations. Vast areas of the landscape have been altered topographically and both native and introduced vegetation has been removed in order to establish open cut coal mines including Mount Arthur Operations, Drayton Coal Mine, Cumnock Coal Mine, Hunter Valley Operations, Liddell Coal Mine, Ravensworth-Narama, Ashton, Ravensworth East, Mount Owen, Bengalla and ash dams and manmade lakes associated with electricity generation.

Both power stations and their ancillary infrastructure provide significant visual landscape components, particularly the tallest structures such as cooling towers, stacks and transmission lines.

Where land has not been disturbed by coal mining or power generation or their associated infrastructure, it is rural in nature characterised by gently undulating pastures used for grazing with small dry or intermittently wet creeks and areas of open woodland.

### 19.1.2 Site Description

The Project Site covers approximately 2 $km^2$. The original open-forest vegetation, which once covered most of this landscape, has previously been cleared and replaced with pasture, which is currently used for cattle grazing.

The site is relatively level and low lying compared to the immediate topography and slopes gently south towards Plashett Dam. Immediately west and north of the proposed project footprint the site slopes uphill to a maximum height of 238 (AHD).

The MacGen property holdings provide a significant interface between the two power stations. The Project Site, adjoining landuses and the topography of the area provides further separation given that the proposed Bayswater B project site is located at a lower elevation within a “basin” surrounded by hills and ridgelines.

Outside the immediate footprint of the proposed power station, the infrastructure traverses areas that are steeper. This represents the northern side of the topographical “basin” within which the proposed Bayswater B project sits.

The meandering watercourse known as Saltwater Creek, a deep cut semi-permanent creek, lies within 200m to the east and 500m to the south east of the Project Site.

Other natural features include some remnant areas of Narrabeen Footslopes Slaty Box Woodland located to the west of the Project Site and Hunter Floodplain Red Gum Woodland Complex located to the east south east.

## 19.2 Visual Components

### 19.2.1 Key Visual Components - Coal Plant

For the purposes of this visual assessment only key visual elements in respect of the Bayswater B Project have been considered. These are listed below in **Table 19-1.**

**Table 19-1: Heights of Plant and Structures (Coal)**

| Building Component | Approximate Dimensions |
|---|---|
| Chimney/Stack | 300m H, |
| Boiler (x two) | 95m H x 64m W x 80 L |
| Turbine Bay | 40m H x 40m W x 200m L |
| DA/Bunker Bay | 60m |
| ACC | 38m H x 110m W x 110m L |
| Fabric Filters | 22m H, 50m x W, 42m x L |
| Transformers | 8m |
| Coal Storage level | 20m (above storage level) |
| 700Ltr Coal Bin | 40m (20m above coal storage level) |
| Coal Dry Store | 80M ( 60m above coal storage level) |
| Tanks /buildings | Up to 10m |

Note that H = Height W = Width, L= Length

The most significant visual structures to form part of the coal fired option are: the Chimney/ Stack at 300m, Boilers at 95m, Coal Dry Store at 80m and DA/bunker Store at 60m. In addition to this, a switch yard and 500KVA transmissions lines and 60m high pylons would be used to convey the newly generated electricity to the existing transmission lines 73 and 74, which pass through the MacGen lands to the north of the Project Site.

One combined coal conveyor (or conveyor route) would be employed to transport both raw coal material and the ash. The conveyor would be close to the ground, with increases in height and structure where necessary to navigate over built and natural obstacles.

#### Visual Impact of Emissions

Currently, water vapour is visible from the existing Bayswater Power Station. New technology to be used for cooling as part of the proposed Bayswater B project, whichever power generation option is selected, would generally not give rise to steam except possibly on rare occasions during winter. Generally, there would be no visible water vapour plume associated with the proposed Bayswater B project.

### 19.2.2 Key Visual Components - Gas Plant

Overall the proposed gas fired option would comprise fewer and smaller visual features than the proposed coal plant. Of its building components, these are generally less than 38m in height as shown below. A switch yard and 500KVA transmissions lines and 60m high pylons would also be used to convey the newly generated electricity to the existing transmission lines 73 and 74 to the north of the Project Site.

**Table 19-2: Heights of Plant and Structures (Gas)**

| Building Component | Dimensions |
|---|---|
| GT Air Intake | 28m H |
| Turbine Building | 24m H |
| Heat Recovery Steam Generator (HRSG) | 22m H x 45m W x 14m L |
| ACC | 38m H x 51m W x 51m W |
| Transformers | 6m |
| Tanks/Buildings | Up to 10m |

Note that H = height; W = width; L = length

#### Visual Impact of Emissions

As with the coal fired option, on most days, there would be no visible water vapour plume.

#### Pipeline Corridor

For the gas fired option, the proposed gas pipeline corridor from the proposed Bayswater B Project Site is underground and extends to the north east towards the Antiene Rail Loop, and then continues north north east. Two-thirds of the proposed pipeline route is on MacGen owned land and the pipeline corridor predominantly crosses grazing land. Once constructed, there would be no visual impacts beyond the required marker posts.

## 19.3 Visual Catchment

The analysis of topographical information, aerial photographs and satellite imagery has determined a viewing catchment that is an area from within which parts of the proposed Bayswater B project may be seen.

The viewing catchment can be defined further by selecting those locations which are permanent receptors (residences or public facilities) and those used by transient receptors (transport corridors and places of work).

The viewing catchment comprises a greater number of transient receptors than permanent receptors located at the work sites surrounding the Project Site, including Thomas Mitchell Industrial Estate, Mount Arthur Coal, Anglo Coal Australia, Drayton Coal Mine, Bayswater Power Station, Liddell Power Station, Hunter Valley Energy Coal and Cumnock Coal Mine. In addition transient receptors include users of the Golden Highway, The New England Highway, Denman Road, Edderton Road, Pierce Rd, rail lines and smaller subregional roads within the area.

Permanent receptors include various private landowners and residences all of which are at some distance from the site:

- Pierce Road and the Golden Highway in the south (approximately 8-10 km distance);
- Coolmore Stud and Arrowfield Winery in the south west (some 7-8 km distance);
- Edderton Road Farmhouse in the west (about 10 km distance);

- Residents along Denman Road in the north (around 10km distance) have partially obstructed views as a result of the Mount Arthur Coal Operations which lie between residences and the Project Site;
- Antiene Estate and the lake Liddell Camping Reserve to the north east (some 9-10km distance).

Given the transient nature of the visual catchment from the New England Highway and the visual catchment for residents on the northern side of the New England Highway being largely dominated by existing facilities, the focus of the assessment was on receptors west of the New England Highway. Consultation with Muswellbrook Council also identified that residents to the west of the New England Highway could potentially be affected by the proposed Bayswater B project.

The assessment includes a site line analysis and viewshed for residents and personnel at Lot 4 Antiene Estate, 6 Pierce Road, Arrowfield Winery and Edderton Road Farmhouse. Other locations towards the south and west were evaluated for inclusion in the visual assessment, however the four properties listed above were deemed representative of viewpoints in the area.

## 19.4 Potential Visual Impacts

### 19.4.1 Potential Visual Impact during Construction (Coal or Gas Option)

A construction lay-down area (or series of areas) would comprise generally low level and transient activities. This area would be used for storage of materials, building components and would allow for assembly of plant.

Staged construction would mean that visual disturbances created during this process fluctuate dependent on the nature and extent of site work. Apart from increased site movements, deliveries and general traffic within the site and within MacGen's property, visual impacts would be experienced gradually as the project develops over the construction period. The construction site and building works within the development footprint would not be visible to permanent receptors. Receptors surrounding the site located on Golden Highway, Pierce and Edderton Roads and the New England Highway may be subjected to visual impacts caused by greater traffic movements and deliveries during the construction phase.

### 19.4.2 Potential Visual Intrusion

**Figure 19.1** provides the viewshed from the four chosen representative locations. This shows the view range from the locations in the south, south west, north west and north east.

The viewshed shows that views of the Project Site are largely obstructed by topography and vegetation and the proposed Bayswater B plant would not be visible from most locations. The stack would however, be visible from properties located both north and south of the proposed Bayswater B project including Lot 4 Antiene Estate and 6 Pierce Road..

The line of sight analysis shows that the coal fired option (the top of the stack) would be visible from the Pierce Road location in the south. **Figure 19.2** shows that the existing Bayswater facility is visible from this location (at around 11 km distance) with the stack providing an indication of the visual nature of the proposed site. Unlike the existing facility however (which are also visible from this location – refer **Figure 19.2**), no other elements of the Bayswater B site would be visible. A gas fired option would not be visible from this location.

The viewshed analysis and line of site assessment shows that the proposed Bayswater B project (whether coal or gas) would not be visible from permanent receptors in the north west (ie from the Edderton Road receptor location – refer **Figure 19.3**).

**Figure 19.4** shows that neither the coal nor gas fired option would be visible from the Arrowfield Winery receptor location in the south west.

**Figure 19.5** indicates that the top of the stack (if coal fired option were chosen) would be visible from the Lot 4 Antiene Estate receptor location. This would be from a distance of nearly 8km however. The gas fired option would not be visible from this location.

The site would be visible to transient receptors on the New England Highway at a distance of some 6 km at its closest point but would be viewed within the context of an agglomeration of large scale facilities dominated by the existing Bayswater and Liddell Power Stations.

## 19.5 Mitigation and Management

Given the level of impacts predicted, no specific mitigation and management measures are required.

## 19.6 Residual Impacts

The residual impact would only be present in the event that a coal fired option is chosen. The impact would be the visible top of the stack for the Pierce Road and Lot 4 Antiene Estate locations, which lie at a distance of 8 and 11km distance respectively.

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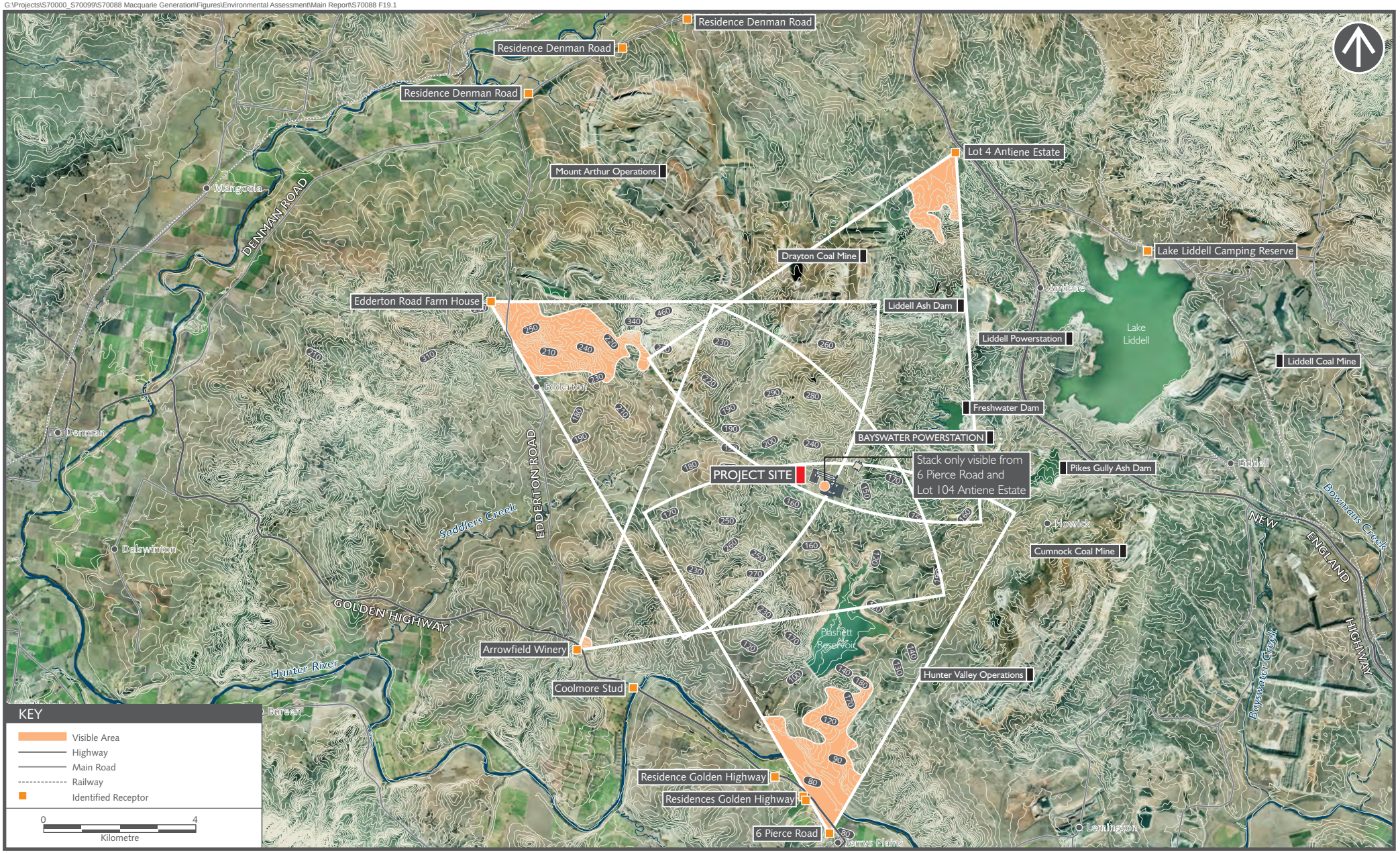


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**Note:** Stack specified is from the proposed Coal Fired Power Station design

VIEWSHED ANALYSIS

Environmental Assessment

Bayswater B Power Station

Figure 19.1

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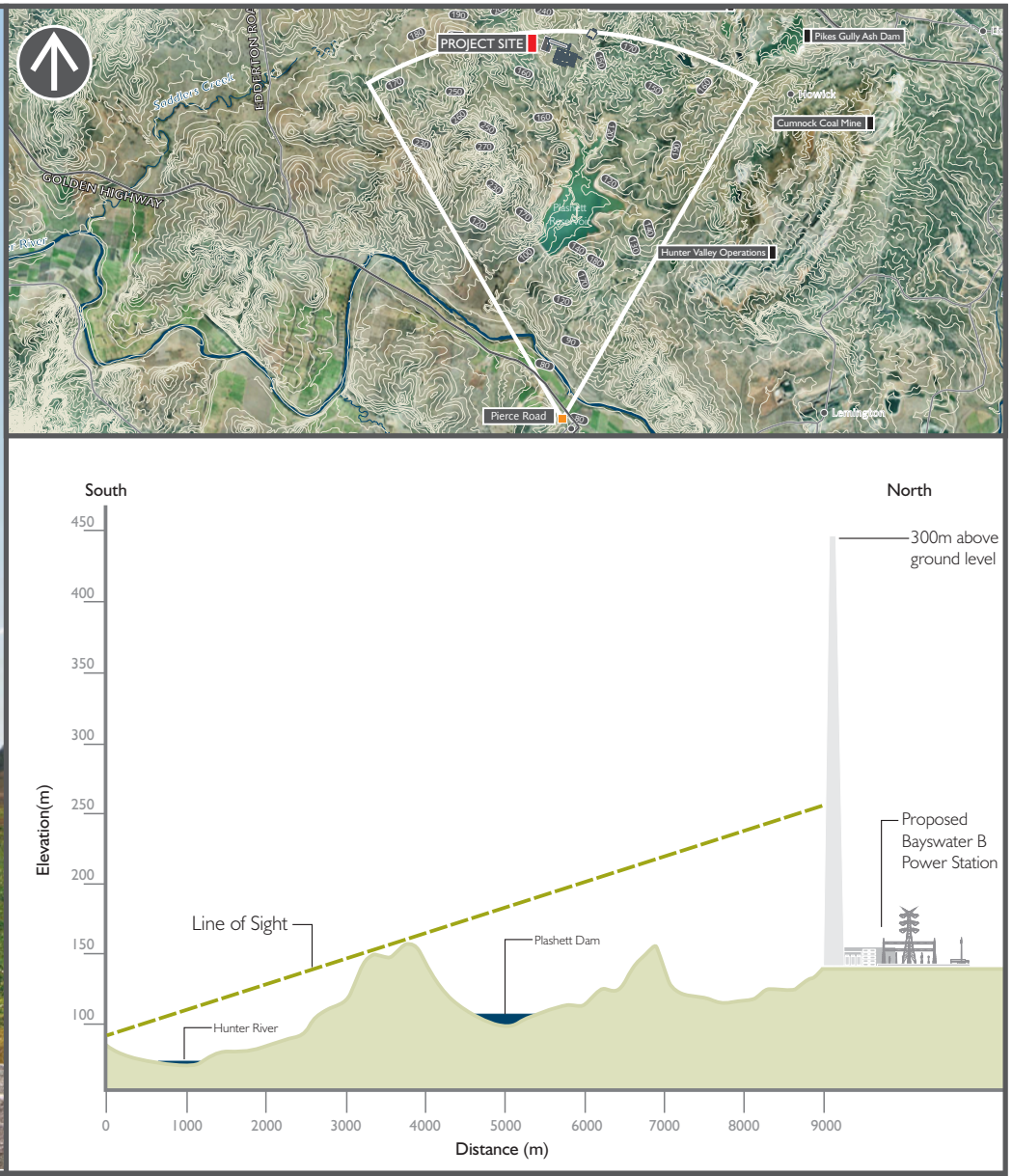
Existing View from Pierce Road Identified Receptor




Line of Sight Analysis from Pierce Road Identified Receptor

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**Note:** Line of Sight Axis' have been exaggerated

LINE OF SIGHT ANALYSIS - SOUTH TO NORTH

Environmental Assessment

Bayswater B Power Station

Figure 19.2

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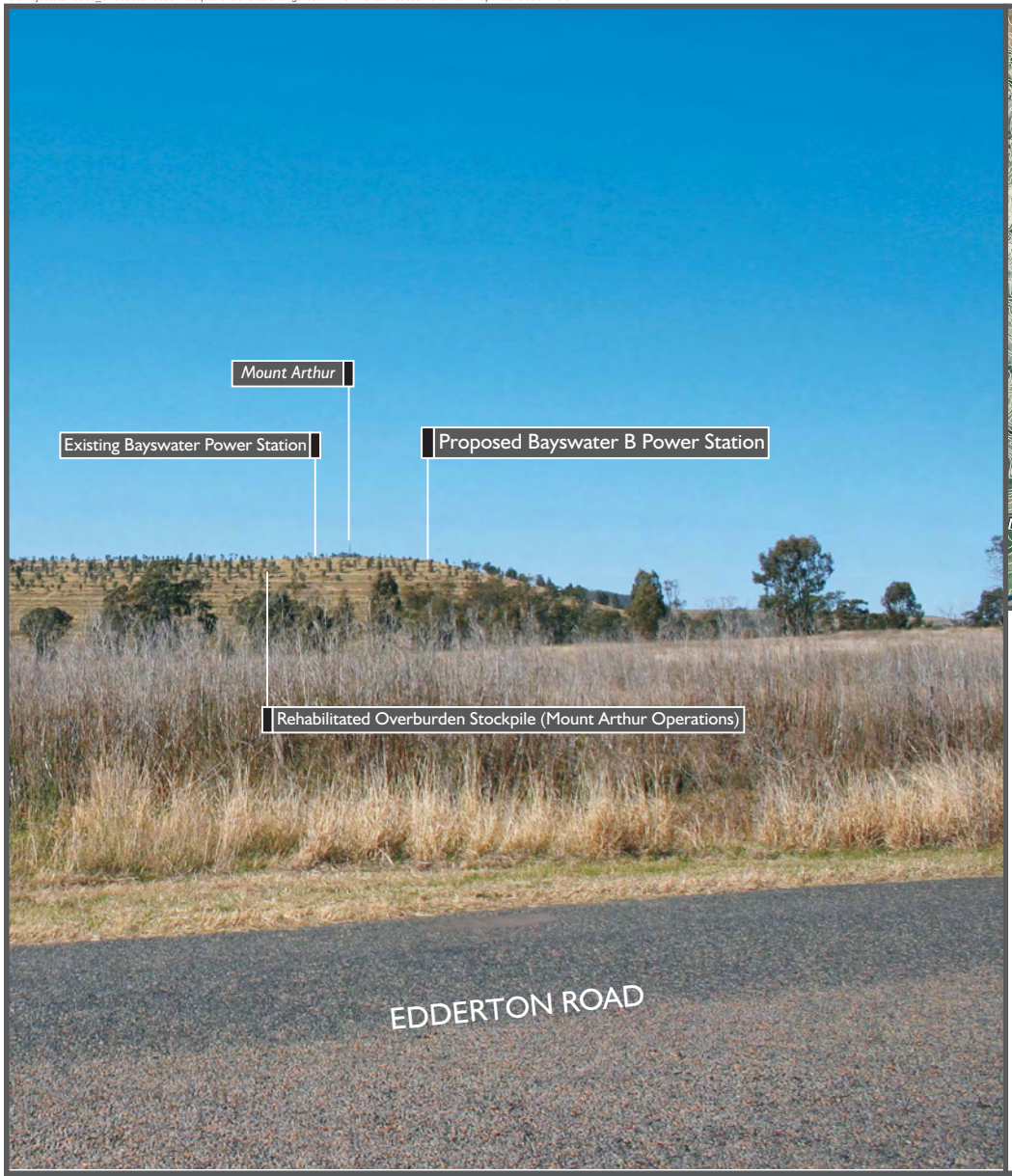
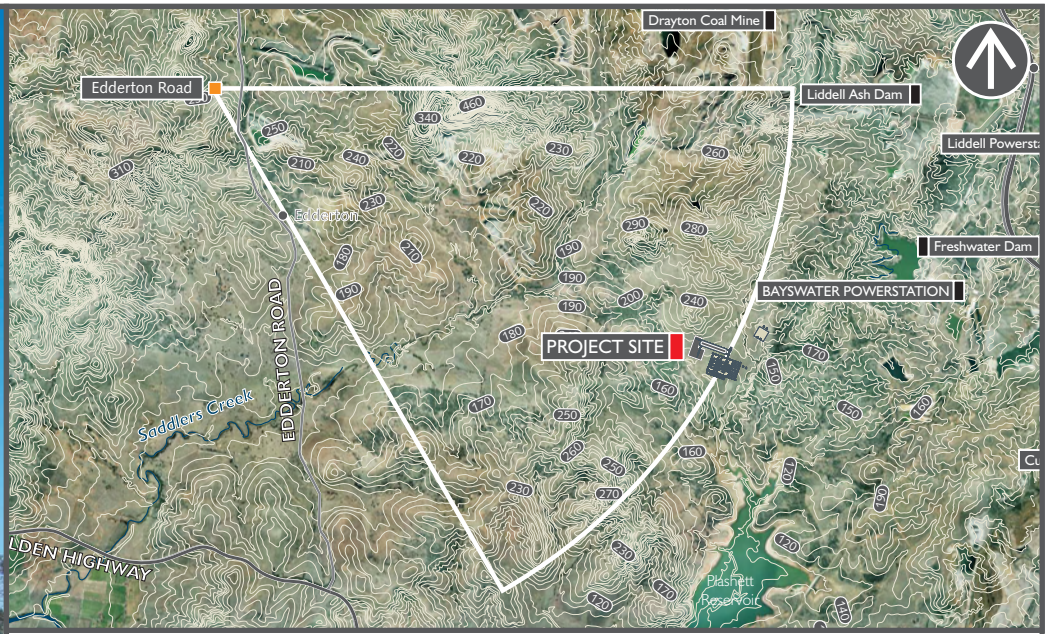
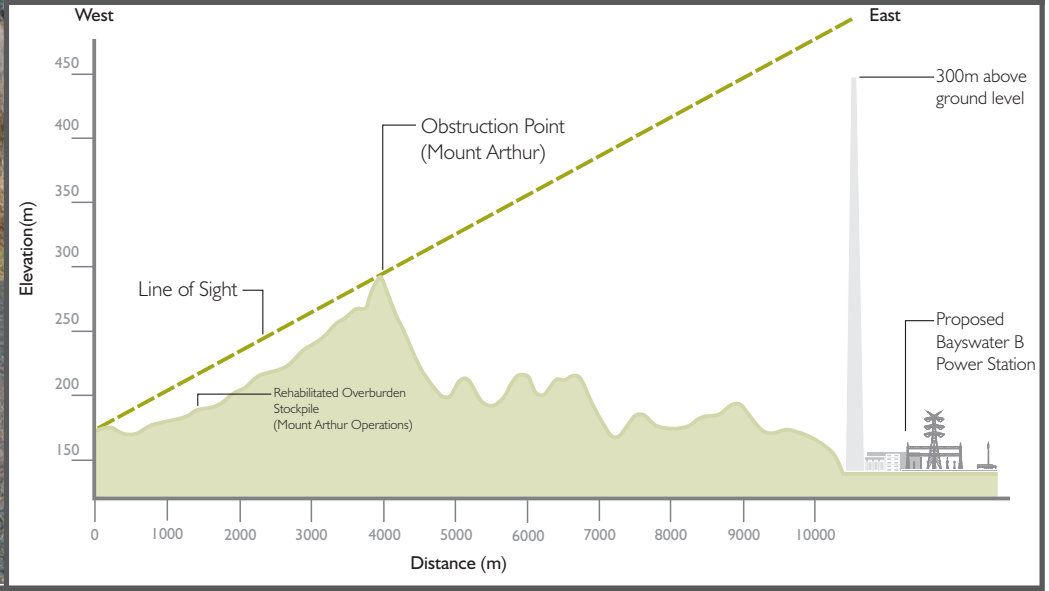



Existing View from Edderton Road Identified Receptor




Line of Sight Analysis from Edderton Road Identified Receptor

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**Note:** Line of Sight Axis' have been exaggerated

LINE OF SIGHT ANALYSIS - WEST TO EAST

Environmental Assessment

Bayswater B Power Station

Figure 19.3

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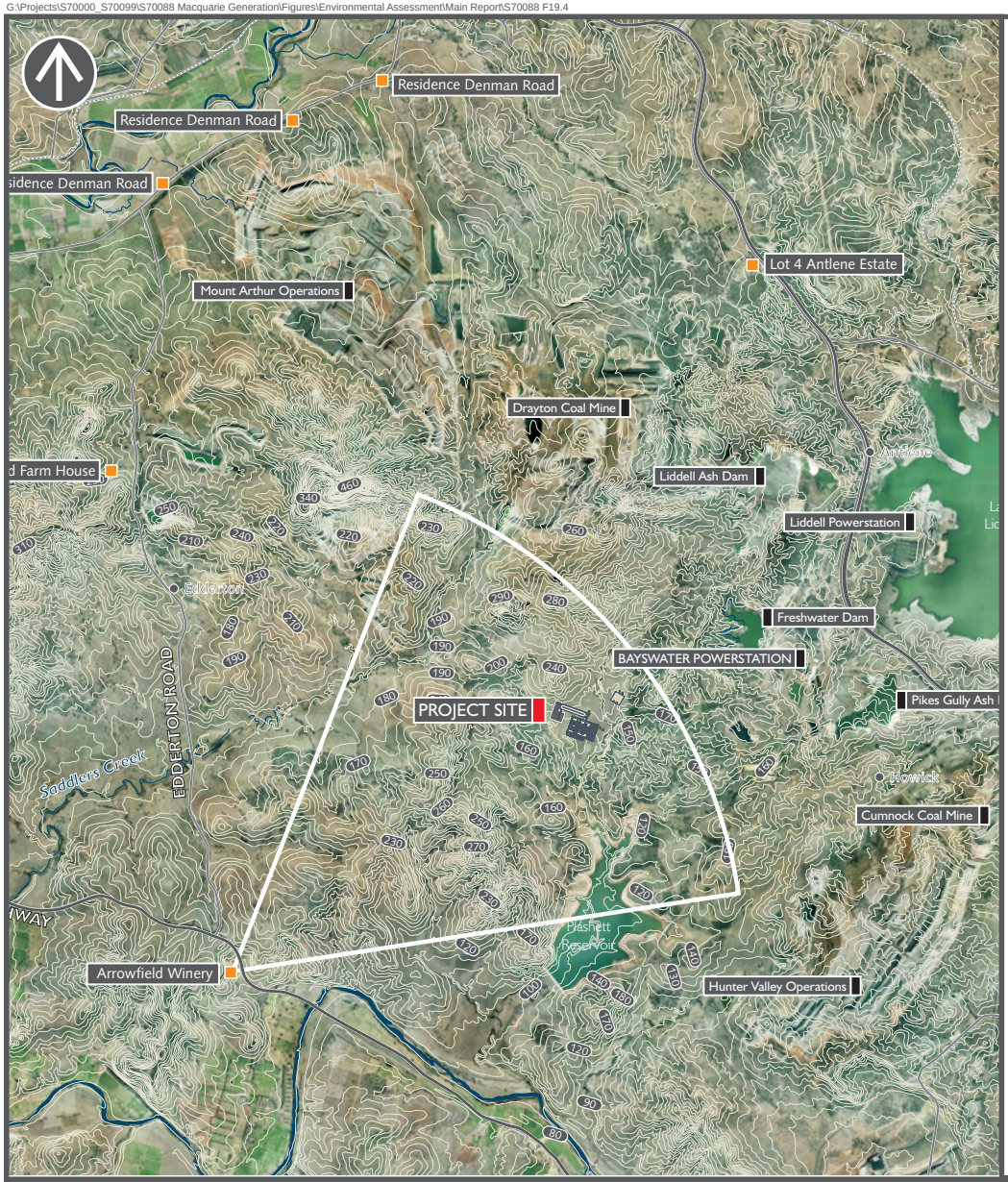
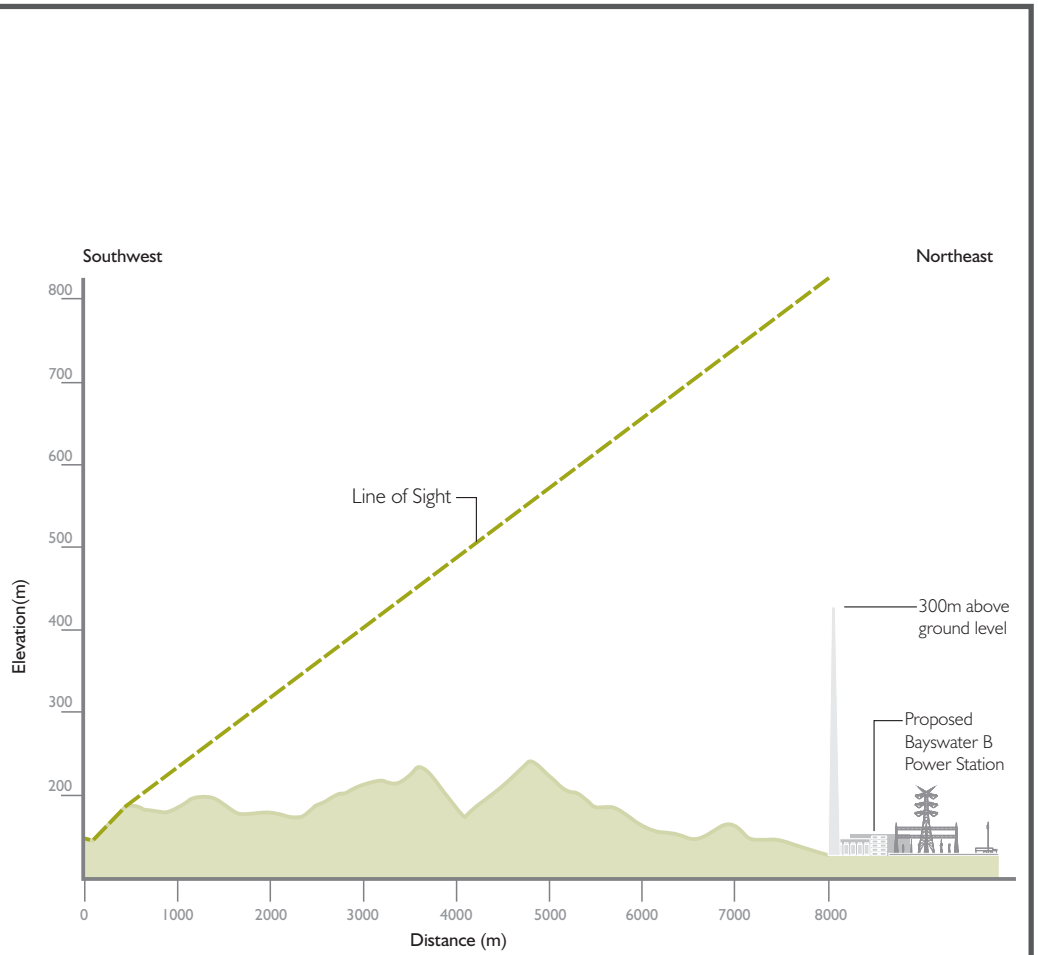



Existing View from Arrowfield Winery Identified Receptor




Line of Sight Analysis from Arrowfield Winery Identified Receptor

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**Note:** Line of Sight Axis' have been exaggerated

LINE OF SIGHT ANALYSIS - SOUTHWEST TO NORTHEAST

Environmental Assessment

Bayswater B Power Station

Figure 19.4

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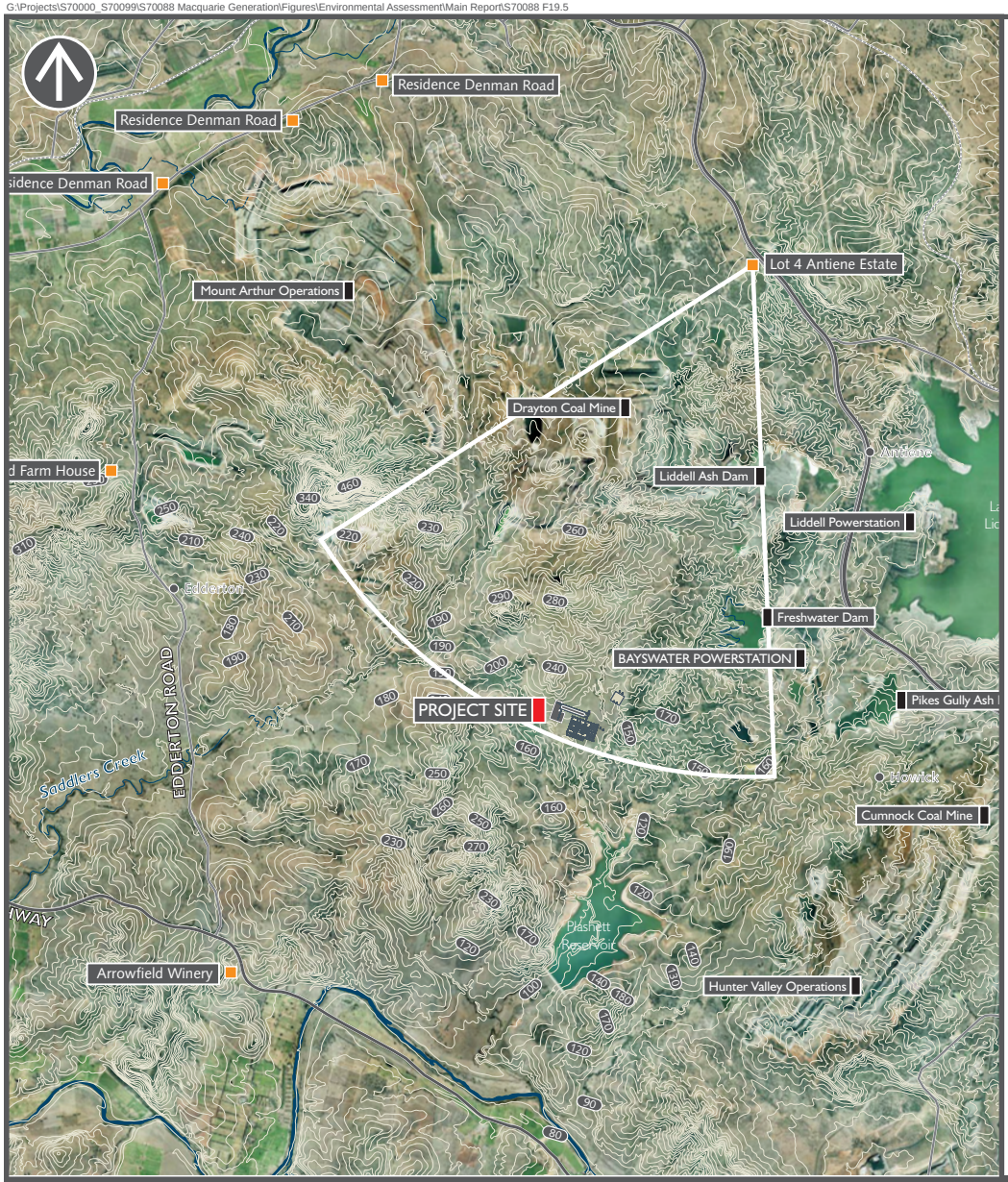
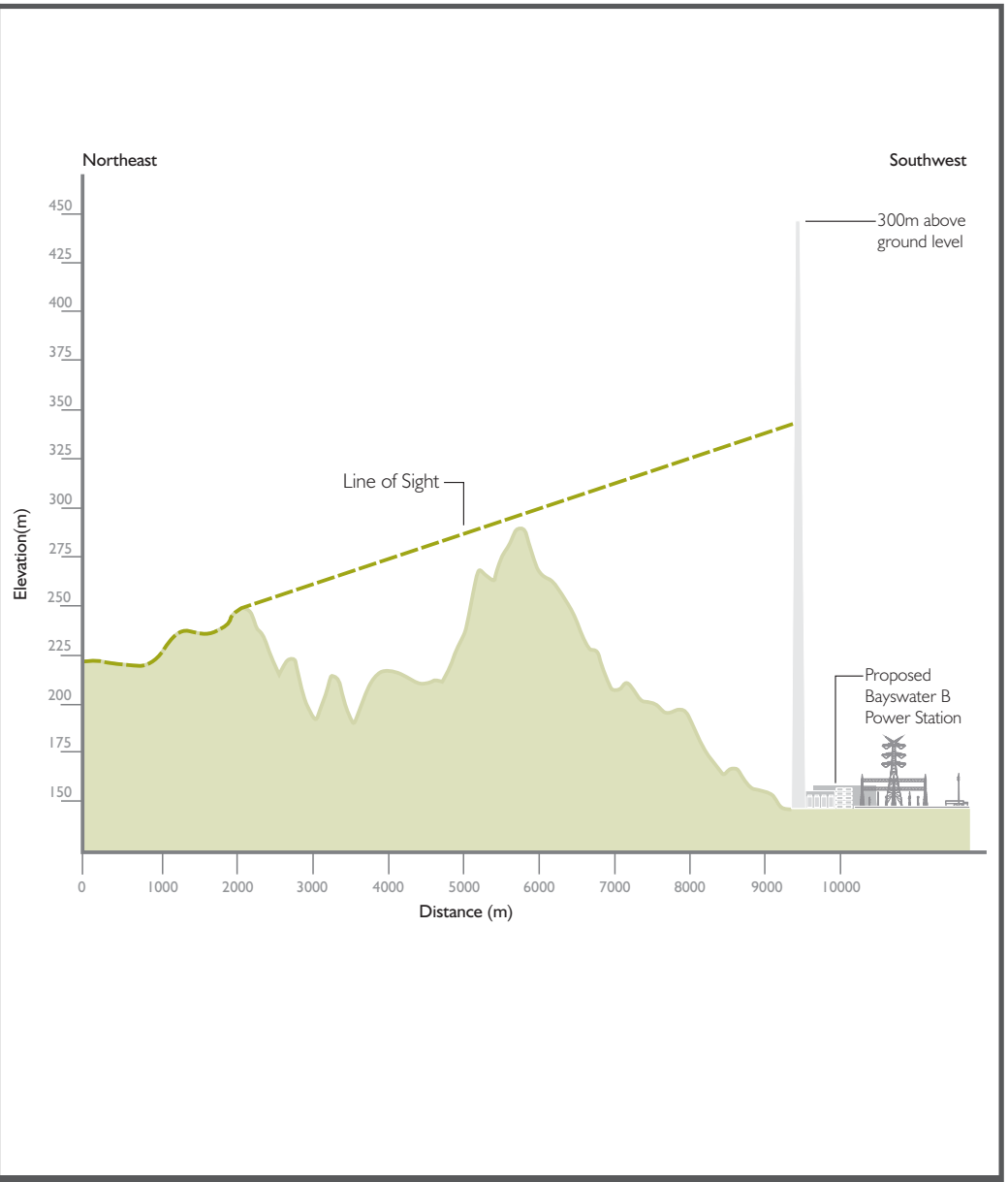



Existing View from Arrowfield Winery Identified Receptor




Line of Sight Analysis from Arrowfield Winery Identified Receptor

AECOM

**Note:** Line of Sight Axis' have been exaggerated

LINE OF SIGHT ANALYSIS - NORTHEAST TO SOUTHWEST

Environmental Assessment

Bayswater B Power Station

Figure 19.5

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# 20.0 Hazard and Risk

*This Chapter provides details of hazard and risk management for the project and addresses the Director-General's Environmental Assessment Requirements as follows:*

***Hazard and Risk Impacts***

- *The EA must include a screening of potential hazards on site to determine the potential for off site impacts and any requirement for a Preliminary Hazard Analysis (PHA).*
- *The EA must also provide a preliminary screening of potential risks to aviation safety associated with the exhaust plumes from the operation of the project with consideration to the Commonwealth Civil Aviation Safety Authority's Advisory Circular Guidelines for Conducting Plume Rise Assessments (June 2004).*

## 20.1 Introduction

A Preliminary Hazard Analysis (PHA) was prepared in respect of the proposed Bayswater B project. The full PHA report is included in **Appendix H**. This chapter provides a summary of the PHA including a description of the study scope and methodology used, identification of hazards, assessment of potential consequences and analyses of frequency and risk for hazards with potential off site impact. The chapter also identifies mitigation and safety measures in respect of hazards that have the potential to impact off site areas, in order to minimise any risks to the environment and adjacent land uses.

A plume rise assessment was conducted by AECOM to assess the potential impact on aviation safety from the coal fired and gas fired options for the proposed Bayswater B Power Station. This assessment is required by the Civil Aviation Safety Authority (CASA) for facilities with exhaust plumes that have an average vertical velocity that exceeds 4.3 m/s at the Obstacle Limitation Surface (OLS) at an aerodrome, or at 110 m above ground level in other areas. The report was prepared in accordance with the Guidelines for Conducting Plume Rise Assessments (June 2004) issued by CASA, and the information is to be used by CASA to undertake a hazard assessment to determine whether the plume should be classified as a 'hazardous object' under Civil Aviation Safety Regulations (CASR) Part 139. A summary of the plume rise assessment is provided in **Section** Error! Reference source not found. and the full report is included in **Appendix H**.

## 20.1 PHA Scope and Methodology

The scope of the PHA study included assessment of hazards and risks to the surrounding land uses from operation of the proposed Project, including both gas fired and coal fired options. Potential hazards were assessed within the power station footprint area, including auxiliary infrastructure such as the proposed gas spur pipeline.

The PHA was prepared in accordance with relevant NSW Department of Planning guidelines including Hazardous Industry Planning Advisory Paper (HIPAP) No. 6 – Guidelines for Hazard Analysis. A summary of the study approach is presented below:

- Hazard Identification – assessment of the hazards associated with the storage and handling of Dangerous Goods at the site including identification of potential hazardous incidents.
- Consequence Analysis – analysis of the consequence severity and impact at adjacent land uses for identified hazardous incidents with potential to impact off site.

- Frequency Analysis – analysis of the frequency of incidents that have the potential to impact off site with severity levels exceeding the criteria published in HIPAP No.4 (Risk Criteria for Land Use Safety Planning).
- Risk Analysis – combination of the consequence and likelihood of identified hazardous incidents to determine the risk.
- Comparison with Risk Criteria – comparison of the assessed risks with those published by the regulatory authorities.
- Risk Reduction and Review – application of risk reduction solutions and review of risks to ensure risks are below criteria.

There are three levels of risk assessment set out in *Multi Level Risk Assessment* (DoP, 2007) that may be appropriate for a PHA, as detailed in Error! Reference source not found. below:

**Table 20-1: Level of Assessment - PHA**

| Level | Type of Analysis | Appropriate if: |
|---|---|---|
| 1 | Qualitative | No major off site consequences and societal risk is negligible |
| 2 | Partially Quantitative | Off site consequences but with low frequency of occurrence |
| 3 | Quantitative | Where level 1 and 2 are exceeded |

This PHA has been undertaken as a Level 2 assessment based on the nature of the stored materials (i.e. corrosives, flammable gases/liquids and toxic gases) and the fact that the adjacent land uses to the site do not contain a sensitive population.

## 20.2 Proposed Hazard Safeguards

The following safeguards would be installed as part of both the gas fired and coal fired power station options:

- Fire main system including fire water tanks, pumps and hydrants; fire extinguishers.
- High pressure steam relief valves.
- Leak prevention safeguards for chlorine, ammonia and corrosive liquids.
- Transformer oil leak avoidance and transformer fire management systems.
- Wastewater containment systems.

Additional safeguards for the gas fired option would include flame and heat detectors, sprinklers and inert gas drench on various components, as well as gas leak detectors and automatic gas isolation for the incoming gas supply.

## 20.3 Hazard Analysis

### 20.3.1 Hazardous and Dangerous Goods

In order to maintain effective system operations at the proposed Bayswater B Project, it would be necessary to store and handle a number of hazardous materials (Hazmat) and Dangerous Goods (DGs). These would be stored in various areas around the proposed power station, but mainly in the chemical storage area adjacent to the water treatment plant. The Hazardous Materials and Dangerous Goods include the following:

- **Flammable & Combustible Liquids** – diesel (underground tank), petrol (underground tank) and acetone/kerosene/turpentine (minor quantities)
- **Flammable Gases** – acetylene, Liquefied Petroleum Gas (LPG) and compressed hydrogen (all in cylinders)
- **Toxic Gases** – anhydrous ammonia (above ground tank) and chlorine (cylinders)
- **Non-Toxic & Non-Flammable Gases** – oxygen, argon and compressed carbon dioxide (all in cylinders)
- **Corrosive Liquids** – Sulphuric Acid, Sodium Hydroxide, Hypochlorite, Ferric Chloride, ammonia solution and formaldehyde solution (in tanks and/or drums)
- **Natural Gas** – delivered to site by high pressure pipeline (gas fired option only).

### 20.3.2 Hazard Identification

Hazard identification was conducted for potential hazards associated with the storage and handling of Hazmat and DGs at the site. The hazard identification commenced with a detailed review of the DGs stored and handled at the site. The nature and properties of each of the following Hazmats/DGs was assessed separately and a number of postulated hazards developed:

- Sulphuric Acid
- Sodium Hydroxide
- Ferric Chloride
- Corrosive Liquids Store
- Transformer Oil
- Petroleum Gas, Liquefied (LPG)
- Compressed Hydrogen
- Flammable and Non-Flammable Gas Cylinder Store
- Acetone/Kerosene/Turpentine – Flammable Liquids Store
- Gasoline
- Diesel Fuel
- Ammonia (anhydrous)
- Chlorine
- Carbon Dioxide

- Oxygen Storage
- Natural Gas Supply (gas fired option only)
- Gas Release in the Gas Turbine Enclosure (gas fired option only)

A hazard identification table was completed, listing potential incidents associated with the storage and handling of Dangerous Goods at the site. Each postulated hazard was then subjected to a hazard analysis to determine whether the proposed plant safeguards were adequate to protect against off site impacts. Where safeguards were not considered qualitatively adequate to contain the postulated hazards, those incidents were carried forward for consequence analysis.

## 20.4 Consequence Analysis

The potential incidents carried forward for consequence analysis were assessed. Each incident may occur as a result of a number of scenarios, the worst case scenario in each area was assessed in detail and the potential for off site impact reviewed. Where the incident was identified to have no off site impact, it was not carried forward for further assessment. Where an incident was identified to have a potential for off site impact it was carried forward for frequency and risk assessment. The consequence analysis identified the following:

- **Transformer fire** – in both coal fired and gas fired options a transformer fire would be contained in the bunded area surrounding the transformer unit. The heat radiation impact at the site boundary from a fire in the transformer bund would not exceed the HIPAP No. 4 criteria.
- **Gasoline or diesel fuel spill during transfer to underground tanks / bund fire** – a gasoline or diesel spill would be contained within the transfer area for both coal fired and gas fired options. The heat radiation impact from a fire resulting from such a spill would be well within the site boundary. Hence there is no potential for impact off site.
- **Ammonia releases** – a gas dispersion analysis was performed for a postulated worst case ammonia release at the proposed ammonia tank. It was identified that any impacts from ammonia release would be well within the site boundary. Hence there is no potential for impact off site.
- **Chlorine releases** – a gas dispersion analysis was performed for a postulated worst case chlorine release at the proposed chlorine storage area. It was identified that there would be potential for off site impact from a chlorine release.
- **Gas pipeline leak / external interference incidents** – (gas fired option only) the majority of the proposed gas spur pipeline would be located on MacGen land, however, sections of the pipeline would traverse open countryside within a 30m pipeline easement. It was identified that a gas release incident from the pipeline could impact beyond the pipeline easement. Hence, there is a potential for off site impact.
- **Gas leak into turbine enclosures / explosion incidents** – (gas fired option only) in the event of a gas release within a turbine enclosure, there is a potential for delayed ignition and explosion. It was identified that the potential impact from an explosion would be well within the site boundary and as such would not exceed the HIPAP No. 4 criteria.

## 20.5 Frequency Analysis

The consequence analysis indicated that three incidents have the potential to impact off site areas with severity levels exceeding the criteria published in HIPAP No.4. Hence, those incidents carried forward for frequency analysis are:

- Chlorine cylinder connection failure leading to chlorine release
- Gas pipeline incident leading to gas leak as a result of external interference (i.e. excavation impact)
- Ammonia release from pipework, flanges or fittings.

These incidents were subjected to a detailed frequency analysis. The analysis included an assessed of the initiating event frequency and the probability of failure of the protection systems installed to maintain safe operations. A summary of the results of the frequency analysis are presented below:

- Chlorine cylinder connection failure leading to chlorine release was assessed to have a likely frequency of $1x10^{-5}$ p.a. (1 in 100,000 p.a.). Note that this is conservative as the analysis has not taken account of the potential for manual isolation of the chlorine cylinders using breathing apparatus to access the leak area.
- Gas pipeline incident leading to a gas leak as a result of external interference (i.e. excavation impact) was assessed to have a likely frequency of $1x10^{-5}$ p.a. per 100m section of pipeline. Note that a 100m section of line was used for frequency estimation as this is the maximum impact distance of a jet fire as a result of pipeline failure and gas release. (A jet fire occurs when flammable gas is ignited after leaking from a pressurised pipe.)
- Ammonia release from storage and transfer systems was assessed for transfer hose, gasket and pipeline failures, with a combined ammonia leak frequency of $7.8x10^{-4}$ leaks p.a. (7.8 in 10,000 p.a.). The frequency of continued releases at the ammonia storage (if protection systems were to fail) was predicted to be $3.9x10^{-7}$ p.a. (0.39 per million p.a.)

All three potential hazard incidents were carried forward for risk analysis.

## 20.6 Risk Analysis

The selected fatality risk criterion for impact to sites adjacent to the proposed Bayswater B Power Station is 50 chances per million per year (pmpy). This equates to the criterion published in HIPAP No.4 for industrial land uses. The selected fatality risk criterion for impact to rural areas around the proposed gas spur pipeline route is 10 pmpy. This is a conservative criterion based on the HIPAP No.4 criterion for active open spaces, in the absence of a specific criterion for rural land.

The risk analysis of gas pipeline incidents identified that the fatality risk at the pipeline easement boundary is equal to the calculated pipeline gas release frequency multiplied by the probability of gas ignition. As such, the risk of fatality adjacent to the pipeline would not exceed 3 chances in a million per year (3 pmpy). A review of the selected criteria for the pipeline route indicates that the estimated fatality risk is below the selected risk criteria (i.e. 10 pmpy). Hence, the pipeline would only be classified as potentially hazardous.

The risk analysis of chlorine release incidents identified that at the site boundary the risk of fatality would not exceed 7.3 pmpy and the risk of injury would also be less than 7.3 pmpy. These estimated risks are also below the selected risk criteria.

The risk analysis of ammonia release incidents identified that the risk of injury resulting from ammonia release would not exceed 0.39 pmpy. This estimated risk is also below the selected risk criteria.

The risk analysis did not incorporate any risk reduction measures that may be employed in order to reduce risks; mitigation measures are discussed in the following section.

## 20.7 Mitigation Measures

A review of the risk analysis results, in comparison to the accepted risk criteria indicates that the assessed risks do not exceed the acceptable criteria. Hence, it is concluded that both the coal fired and gas fired options would only be classified as potentially hazardous and not actually hazardous and therefore would be permitted within the land zoning where the facility is proposed to be located.

Notwithstanding the above conclusion, a number of mitigation measures have been identified, regarding the design and operation of the proposed power station options, to ensure the risks associated with the power station options remain within the As Low As Reasonably Practicable (ALARP) range. These are detailed below.

- The operation of the underground fuel storage tanks requires delivery of fuel to the tanks. An incident involving a fuel spill during delivery, ignition and subsequent fire would impact to a distance of 12m from the fill points. It is recommended that the fill points and road tanker fill area be located no closer than 12m to buildings and structures at the proposed power stations.
- The supply of natural gas from the Queensland to Hunter Gas Pipeline requires the construction of a lateral pipeline to the proposed gas power station. The selected pipeline route includes the traversing of open countryside with the potential for the pipeline to be installed close to rural residences. Although the risk to rural areas is considered low and is within the selected risk criteria, the following safeguards have been identified to ensure that gas pipeline risks are maintained within the ALARP range:
  - The pipeline be located no closer than 100m to any property residence.
  - The depth of cover over the pipeline where the pipeline crosses roads or where property residences are at 100m from the pipeline, be increased in open land areas from the proposed depth of 900mm to 1200mm (the length of the increased depth should be 100m either side of the road and 100m in either direction from the perpendicular to the property residence).
  - Installation of pipeline marker tape 300mm below the ground surface where the pipeline crosses roads (the marker tape should be installed for 50m either side of the road).
  - The distance between the signs located along the pipeline route be decreased such that signs are no more than 50m apart, notwithstanding any clear visibility along a straight flat section of the pipe route.
  - A safety management system element be developed specifically for the pipeline, this element should include regular pipeline route and equipment inspections, line pigging with intelligent pigs on a regular basis (every 5 years), inspection and checking of the impressed current corrosion protection system.

Planned chlorine storage measures to reduce the risk of chlorine release include storage of chlorine cylinders in a depot designed to comply with the requirements of AS2927-2002. The chlorine storage area would be fitted with a number of safeguards including gas detection, alarms and a chlorine shut down system. In order to further reduce the risk of chlorine release, further safeguards should include:

- Pigtails should be replaced regularly (e.g. once every 6 months) to minimise the potential for premature failure
- As per AS2927-2002 chlorine storage and handling components with potential for failure should be inspected regularly to identify wear or potential failure points, with maintenance or replacement as required
- If a chlorine leak is detected and the automatic chlorine shut down system fails to operate, immediate response should be manual isolation of the chlorine cylinders using breathing apparatus to access the leak area. This safeguard is subject to having appropriate PPE, safety procedures and trained staff.

Planned ammonia storage measures to reduce the risk of ammonia release include the following safeguards:

- The ammonia tank filling point would be protected by impact barriers.
- Ammonia hose leak incidents would be limited by the attendance of the driver at the transfer operation, who would activate the emergency shut down of the transfer in the event of a leak (i.e. emergency stop button on the truck)
- To minimise the potential for continuous release of ammonia, the ammonia tank and associated pipework would be fitted with gas detectors and a permanent fire water fog nozzle. In the event of a leak, the gas detection system would identify the release and alarms would initiate emergency response. The fog system would absorb the ammonia, preventing continued release of ammonia from the storage area. In the event the automatic system fails, an operator would initiate the fog system manually.

## 20.8 Plume Rise Assessment and Aviation Safety

A plume rise assessment was undertaken to assess the potential impact on aviation safety from the coal fired and gas fired options for the proposed Bayswater B Power Station as detailed in **Section 20.1** and **Appendix H**.

The assessment was conducted using five continuous years of hourly meteorological data generated by TAPM, as required by the CASA guidelines. The assessment includes analysis of plume rise dynamics and upper level winds and determines:

- The maximum height at which the critical vertical velocity (4.3 m/s) of the plume is reached; and
- The vertical and horizontal limits of the exhaust plume at which the average vertical velocity reduces to a value of 4.3 m/s.

A summary of the plume characteristics for the coal fired and gas fired plants is provided in Error! Reference source not found., which shows the maximum, minimum and average heights below which the plume vertical velocity exceeded 4.3 m/s (critical height). Also shown are the maximum, minimum and average spreads of the plume in the horizontal and vertical directions.

**Table 20-2: Critical Plume Extents**

| Statistic | Critical Height (m) | Horizontal Spread (m) | Vertical Spread (m) |
|---|---|---|---|
| **Coal Fired Option** | | | |
| Maximum | 1127 | 132 | 66 |
| Minimum | 306 | 11 | 6 |
| Average | 355 | 29 | 10 |
| **Gas Fired Option** | | | |
| Maximum | 642 | 90 | 45 |
| Minimum | 65 | 9 | 4 |
| Average | 102 | 20 | 10 |

Results of the plume rise analysis demonstrated that for both proposed options (coal fired and gas fired) stack plumes would exceed the 4.3 m/s above the 110 m criteria applicable to this facility. On the basis of these findings, the proponent would be required to apply to CASA for an "Operational Assessment of a Proposed Plume Rise".

In addition to the application for an Operational Assessment to Proposed Plume Rise, CASA would be notified of the final stack height (depending on whether the coal fired or gas fired option is selected) for inclusion in the RAAF Aeronautical Information Service tall structure database.

## 20.9 Residual Risk

The components of the proposed project, including the power station footprint and gas spur pipeline, carry the risk of certain hazards, largely related to the potential for release and ignition of natural gas and the potential for release of chlorine or ammonia gas. However, the PHA undertaken shows that these risks meet the relevant criteria established by the NSW DoP and can be adequately managed through the implementation of mitigation measures such that residual risks are minimal.

The plume rise assessment provides sufficient information to allow CASA to undertake its Operational Assessment in respect of plume rise effects from the Bayswater B Project.

## 20.10 Conclusion

Potential hazards and risks associated with the proposed project were assessed in the PHA prepared fro this EA. The PHA concludes that the off-site risks posed by the various project components meet the NSW DoP Land-Use Safety risk tolerability criteria and are therefore considered to be acceptable.

Results of the plume rise analysis demonstrated that for both proposed options (coal fired and gas fired) stack plumes would exceed the CASA application trigger threshold of 4.3 m/s above 110 m applicable to this facility. On this basis, the proponent would apply to CASA for an "Operational Assessment of a Proposed Plume Rise". This report provides sufficient information to allow the CASA assessment to be undertaken.

# 21.0 Traffic and Transport

*This chapter presents the findings of a transport review of the Bayswater B power station. Although there are no specific traffic / transport matters nominated in the EARs, the RTA was consulted and recommended that a traffic impact study be undertaken in accordance with the RTA's Guide to Traffic Generating Developments. As such, this transport assessment considers the potential traffic generation during both the construction and operation stages of the Bayswater B Power Station and the capacity of the local road network.*

## 21.1 Existing Environment

### 21.1.1 Local Road Network

The proposed Bayswater B project is to be located adjacent to the existing Bayswater-Liddell power generation complex, located approximately 16km south of Muswellbrook and 29km north of Singleton and separated by the New England Highway.

Currently, the existing land uses surrounding the site include a mixture of extractive operations comprising mines, quarries and dams as well as some agricultural uses. These operations are accessible via the New England Highway.

The New England Highway is a state road under the care and control of the New South Wales Roads and Traffic Authority (RTA) and is a major inland route linking Sydney and Brisbane as well as other major regional centres along the route.

Outside of town centres, the New England Highway is typically a rural highway with limited interruptions and high speeds. However within regional towns, such as Muswellbrook and Singleton, the Highway serves as the main road through the town centre with high vehicle and pedestrian activities.

Access to the Bayswater-Liddell complex is via an interchange located on the New England Highway which includes an overpass over the New England Highway to allow access for all maintenance and operation vehicles to the network of internal roads within the complex.

### 21.1.2 Existing Power Station Operations

Both the Bayswater and Liddell Power Stations are fuelled by coal from surrounding open cut coal mines. Coal is transported by rail from the mines and then distributed via overland conveyors to each power station. As such, traffic generated by operation of the power stations is limited to employee vehicles, deliveries made by heavy vehicles and other service vehicles (i.e. contractors) as required.

#### Employee Traffic

The power stations operate over two shifts, with employee numbers and shift hours summarised in **Table 21-1** below.

**Table 21-1: Summary of Staff Numbers at Bayswater and Liddell**

| | Maintenance Staff | Operation Staff (Total) | | Office Staff |
|---|---|---|---|---|
| | 6.30am - 4.30pm | 7.00am - 7.00pm | 7.00pm-7.00am | 7.30am-4.00pm |
| Bayswater | 93 | 12-16 | 12-16 | 73 |
| Liddell | 106 | 10-12 | 10-12 | 69 |

Source: Macquarie Generation, 2009

As shown in **Table 21-1,** the operations staff are employed on two 12 hour shifts to allow continual operation of the power stations.

Due to the remote location and the limited public transport options available between the adjacent residential towns and the Project Site, employees are generally dependant on private vehicles for their journey to work. However, a high level of car pooling for the day staff is well established at both existing power stations, which reduces vehicle movements.

**Heavy Vehicle Traffic**

The combined average heavy vehicle traffic generated by the Bayswater-Liddell complex is approximately 680 trips (1360 movements) per month.

Heavy vehicles are generated daily to transport beneficiated fly ash and bottom ash off site to third parties for reuse within the building and construction industries. Fuel and chemicals are also delivered on site for the power stations consumption.

At present, some 20 (40 movements) heavy vehicle trips (40 movements) occur per day to transport beneficiated flyash and bottom ash off site to third parties and up to and 4 trips (8 movements) per weekday are used to deliver fuel and chemicals on site respectively.

### 21.1.3 Existing Traffic Conditions

The New England Highway, between Muswellbrook and Singleton, is a two lane, two way rural highway with intermittent passing as well as additional approach and departure lanes provided adjacent to major intersections.

Existing signposts along the New England Highway, adjacent to the Project Site, restrict speed to 100km/hr which is typical of a rural highway with little disruption to the traffic flow and limited road lighting.

Within the urban environs of Muswellbrook and Singleton, the highway expands to four lanes, to allow either an additional travel lane or kerbside parking. The New England Highway, within the town centres, functions as the main street with high levels of pedestrian, and local traffic movement. The signposted speed limit within these areas is currently 60km/hr.

RTA permanent traffic counters 05.244 and 05.037 are located on the New England Highway, south of Muswellbrook, and on Foy Brook Bridge, respectively. Their recorded traffic flows from 1992 to 2004 are shown in **Table 21-2**.

**Table 21-2: New England Highway RTA Permanent Counts (vehicles/day)**

| Counter | 1992 | 1995 | 1998 | 2001 | 2004 |
|---|---|---|---|---|---|
| **05.244** | 10,707 | 10,255 | 10,114 | 12,084 | 10,269 |
| **05.037** | - | 12,643 | 11,468 | 10,611 | 11,472 |

Source: RTA Average Annual Daily Traffic (AADT) Volumes 2004.

The historical traffic counts indicate a fluctuating traffic pattern along the New England Highway during the past years. The patterns are representative of the various construction related traffic movements generated from a range of developments that have occurred in the area including extensions of the surrounding coal mines. As such, a clear background growth rate cannot be established from historical data.

**Figure 21-3** shows that the peak traffic movements occur between the afternoon hours of 3pm and 6pm, with approximately 7.5% of the daily traffic occurring during the peak hour of 3pm to 4pm when maintenance and office staff leave. In comparison, there are no evident peaks during the morning period and traffic flows are considered to be steady.

### 21.1.4 Base Traffic Volumes

The most recent traffic study in the vicinity of the subject area was undertaken as part of the *Mount Arthur Underground Project Traffic and Transport Assessment* (August, 2007). This project was recently approved for additional underground mining at the Bayswater No.3 mine. The mine is located adjacent to the Bayswater Power Station and the road network assessed for the underground mine encompasses the same area as the Project Site.

A concurrent traffic study was also undertaken for the extension of the Drayton Coal Mine which is located adjacent to the power stations and is accessed via the New England Highway.

This traffic assessment has used the base traffic data for the project area derived from the traffic assessments prepared for the Mount Arthur and Drayton Coal Mines.

**Mount Arthur Underground Project**

The traffic assessment for Mount Arthur identified that the expansion of the underground operations would increase the traffic on the New England Highway by an additional 312 trips per day to 10,581. This represents a 3% increase in the traffic volume from that recorded at counter 05.244 in 2004.

In addition to the traffic generated by Mount Arthur underground project, the traffic report also identified that the committed developments at the Mt Pleasant and Anvil Hill (now called Mangoola) mines would also increase traffic flows along New England Highway.

**Drayton Mine Extension**

The traffic assessment undertaken for the Drayton Mine Extension estimated that the daily traffic volumes along the New England Highway would increase by 0.3-0.4% in 2013 with the extension of Drayton Mine and the committed development of adjacent sites. The volumes forecast by the traffic assessment are shown in **Table 21-3**.

**Table 21-3: Estimated 2013 New England Highway Traffic Volumes**

| | Northbound | Southbound | Total |
|---|---|---|---|
| North of Thomas Mitchell Drive | 4,516 | 4,552 | 9,068 |
| South of Thomas Mitchell Drive | 5,076 | 5,081 | 10,157 |

Source: Appendix N, Drayton Mine Extension

**Table 21-3** identifies that the average daily traffic volumes would be between 9,070 and 10,160 by 2013.

### 21.1.5 Road Capacity

The Austroads' *Guide to Traffic Engineering Practices Part 2 Road Capacity*, specifies that a two-way, two-lane rural road on level terrain, such as the New England Highway adjacent to the power stations, with AADT volumes in the range of 9,000 – 13,500 would operate at a Level of Service (LoS) D as indicated in **Table 21-4**.

**Table 21-4: Maximum AADTs for Level of Service on Two-Lane Two Way Rural Roads**

| Level of Service | | | | | |
|---|---|---|---|---|---|
| K Factor[1] | A | B | C | D | E |
| 0.10 | 2,400 | 4,800 | 7,900 | 13,500 | 22,900 |
| 0.11 | 2,200 | 4,400 | 7,200 | 12,200 | 20,800 |
| 0.12 | 2,000 | 4,000 | 6,600 | 11,200 | 19,000 |
| 0.13 | 1,900 | 3,700 | 6,100 | 10,400 | 17,600 |
| 0.14 | 1,700 | 3,400 | 5,700 | 9,600 | 16,300 |
| 0.15 | 1,600 | 3,200 | 5,300 | 9,000 | 15,200 |

Source: Austroads Guide to Traffic Engineering Practices Part 2 Road Capacity

[1] Ratio of design hour volume and the AADT

Based on the criteria shown in **Table 21-4**, the transport assessment for the Drayton Mine Extension suggested that the New England Highway would operate at a LoS D.

To analyse a worst-case scenario, the higher traffic volume of 10,581, forecast as part of the Mount Arthur Underground Project assessment has been assumed as the base traffic case for the assessment of the Bayswater B proposal. Based on assumed flow, the highway would operate at a LoS D.

### 21.1.6 Site Access

An interchange on New England Highway provides access to the Bayswater-Liddell Power Station sites. The interchange separates the major crossing and turning movements to allow maximum traffic flows on all approaches.

An internal road network, including a bridge over the New England Highway allows access to the two power stations from both directions of travel on the New England Highway, via the interchange.

Comparing the traffic flows between the New England Highway and the traffic on the interchange ramps, the capacity constraint of the interchange and traffic generated from the proposed Bayswater B site, would be dependant on through traffic along the New England Highway.

### 21.1.7 Traffic Assignment

The 2006 Transport Data Centre's *Journey-to-Work Data*, found that 65% of all employment based vehicle trips within Muswellbrook Shire Council originate from within the Council boundaries.

For the purpose of this EA it is assumed that all employment trips generated by the operation of the proposed Bayswater B project would be generated from within Muswellbrook or Singleton and therefore all trips would enter/exit the site via the New England Highway interchange.

## 21.2 Proposed Bayswater B Project Construction

The number of staff engaged during the construction stages of the proposal would vary, with a maximum of 950 staff employed during the peak construction period of both the coal and gas options. Demand for temporary accommodation generated by such a large volume of staff is unlikely to be satisfied within the adjacent towns. A temporary accommodation camp is therefore proposed to be built proximate to the site. While the exact location of the camp site is still to be determined it is proposed that bus transfer services would be provided to transport employees between the camp and the work site.

During the construction phase, various heavy vehicle movements would be generated for establishing the site, delivering construction materials and installing the power station units together with associated facilities. The total traffic volumes generated during the construction phase are likely to be greater than the volumes generated during the operational phase.

The traffic generation and the duration of the construction phase would vary dependant on the technology chosen for the plants. The following sections describe the likely traffic generation and the impact of the construction and operation phases of the proposed Bayswater B Project with the two fuel source options.

### 21.2.1 Gas Fired Generation Option

Construction of a gas fired CCGT Bayswater B Project option is proposed to be undertaken over a three year period. During this phase, the transportation of materials and employees would generate significant volumes of daily traffic movements on the adjacent road network.

**Construction Staff – Gas**

The timeframe for the each of the construction stages is uncertain at this stage. However, construction is expected to occur, or be focussed, over 10 hours per day, Monday to Saturday, with the possibility of some extensions during peak construction period to allow staff to work on shifts.

To minimise the impact on the local road network, the starting and finishing hours of the construction teams would be staggered over their relative peak hours and buses would be scheduled to transfer workers between the work site and the camp.

Assuming that 50% of the staff are transported by buses and that each bus has a capacity to transport 50 people, 10 bus trips would be required during each of the AM and PM peak hours (20 movements). Depending on the travel times between the camp and the work site, the number of bus trips may increase if return bus trips occur during the peak hour.

Car-pooling by staff would be encouraged at the work site as well as the camp grounds. It is assumed that with such measures, the average vehicle occupancy rate would be between two to three persons. Based on this, 190 private vehicle trips are estimated to be generated during each of the AM and PM peak hours (in total 380 daily movements).

Given the extensive walking distance between the work site and the New England Highway, it is unlikely that drivers would park their vehicles on the New England Highway and walk to the site and this would in any case be discouraged from a safety perspective. Therefore, to encourage car pooling and bus use, site access and parking controls should be implemented at the work site to limit and manage single occupancy private vehicle access.

**Construction Vehicles – Gas**

A concrete batching plant would be established on site for the duration of the construction phase and fly ash would be transported along the existing internal road network to minimise the impact of the proposed development.

Similarly, bottom ash produced from the existing Bayswater site would be utilised as road base where appropriate to further reduce the reliance on road transportation of raw materials during the construction phase.

Mobilisation of large machines and heavy vehicles, required for site establishment and construction would occur at the onset of construction but remain on site throughout the construction period. As such, the delivery of these pieces of equipments and vehicles would have a brief impact on the road network, which would be managed by scheduling deliveries to inter-peak and off-peak periods.

Throughout the construction stage, building materials would be transported to the construction site on a daily basis. The majority of these would be heavy vehicles delivering segments required for the construction of the gas pipeline.

The gas pipeline is proposed to be installed within a Right-of-Way (normally 25m wide) and laid sequentially. Although this would involve continuous movement of the workforce, construction vehicle access would be limited to the existing New England Highway interchange.

Heavy vehicle movements are likely to vary daily, dependant on the construction stage as well as activities scheduled for each day. However the average rate of traffic generation during the construction would be in the order of 200 movements per day.

### 21.2.2 Coal Fired Generation Option

The construction of the proposed coal fired power station, is likely to be undertaken over that month period. During this phase, significant traffic volumes are expected to be generated to transport materials and staff.

**Table 21-4** provides an initial estimate of construction staff levels during the 54 month period. As shown, the maximum engagement of 950 staff is forecast for a duration of about 11 months, between months 25 to 36. Beyond the 36 month period, staff levels are expected to decrease significantly.

**Construction staff – Coal**

As identified above, 10 bus trips and 190 private vehicle trips are forecast to be generated during each of the AM and PM peak hours. With the construction of a coal fired power station expected to extend over a longer duration than the gas fired option, the traffic generated on the adjacent public road network by staff movements would also extend over a longer period.

**Construction Vehicles – Coal**

Similar to the gas fired power station option, delivery of large machines and heavy vehicles would be mobilised to site at the onset of construction and remain on site throughout the construction phase. Furthermore, construction materials such as those required to construct the conveyor belt to transport coal would need to be transported to the site by heavy vehicles on a daily basis. Similar to the gas option, the average rate of heavy vehicle traffic generation during the construction phase would be approximately 200 movements per day.

## 21.3 Proposed Bayswater B Operation

### 21.3.1 Gas Fired Generation Option

If a gas fired Bayswater B Power Station is constructed, the gas would be supplied via a proposed 15km spur pipeline from the Queensland to Newcastle Gas Pipeline located to the north of the Bayswater B site.

**Operational Staff - Gas**

The number of staff required to operate the gas fired Bayswater B power station is expected to be relatively lower than the coal fuelled option. Similar to adjacent power stations, the proposed Bayswater B Project would operate continually and require operational staff to be employed on a shift basis. It is assumed that the operation staff numbers would be similar to the Bayswater and Liddell Power Stations with approximately 16 staff on site over two shifts. Staff numbers required to operate the gas fired option are shown in **Table 21-5**.

**Table 21-5: Operational Staff at Bayswater B Power Station - Gas**

| Maintenance Staff | Operation Staff | | Office Staff |
|---|---|---|---|
| | Shift 1 | Shift 2 | |
| 35 | 16 | 16 | 35 |

Source: Macquarie Generation, 2009

Based on **Table 21-5**, it is estimated that a gas fuelled power station would generate approximately 200 daily staff vehicle movements over a 24 hour period and with operational staff on two shifts.

**Heavy Vehicles - Gas**

Heavy vehicle volumes generated by the gas fired option are expected to be limited to vehicles transporting fuel and chemicals to the plant. It is estimated that the volumes would be similar to the current heavy vehicle deliveries at Bayswater and Liddell Power Stations. Therefore, it is estimated that the gas fuelled power station would generate approximately 6-8 truck movements per day.

### 21.3.2 Coal Fired Generation Option

If coal is utilised as the fuel source, coal would be transported from the adjacent coal mines to the site by the existing Antiene rail loop and supplied to the Bayswater B Power Station by conveyors.

**Operational Staff - Coal**

The level of employment generated by the proposed power station is expected to be proportionate to the existing operations. **Table 21-6** indicates the forecast employment levels at the Bayswater B Power Station for the coal fired option.

**Table 21-6: Operational Staff at Bayswater B Power Station - Coal**

| | Maintenance Staff | Operation Staff | | Office Staff |
|---|---|---|---|---|
| | | Shift 1 | Shift 2 | |
| Coal Fuelled | 65 | 16 | 16 | 50 |

Source: Macquarie Generation, 2009

As per the gas option discussed in the section above, operation staff would be employed on a shift basis to ensure that Bayswater B operates continuously.

Based on **Table 21-6**, it is estimated that a coal fuelled power station would generate some 300 daily staff vehicle movements.

**Heavy Vehicles - Coal**

The sections above identified that the heavy vehicle generation at the existing Bayswater-Liddell Power Stations averages approximately 48 heavy vehicle movements per day. For the purpose of this assessment, it is assumed that a coal fuelled power station at the Project Site would generate heavy vehicles volumes proportionate to the existing movements at Bayswater and Liddell sites.

It is understood that fly ash produced by the proposed coal fired option would be disposed within the mine voids located adjacent to the Bayswater-Liddell complex, via the existing internal road connections. While the final disposal point for the fly ash is not yet known, preference is given to a mine void within a 10km radius.

The volume of fly ash is anticipated to be 1.35 million tonnes per annum and would be transported in a semi-enclosed conveyor. The furnace (or bottom) ash is anticipated to be 0.34 million tonnes per annum and would be transported in covered trucks via an ash haulage road, adjacent to the ash conveyor.

In summary, the volume of heavy vehicle traffic generated by the coal fired option would be limited to operational material averaging 46 vehicle movements per day, assuming carriage of bottom ash in 40 tonne loads.

**Rail**

The coal fuelled option could burn up to 6.5 million tonnes per annum of coal. The coal would be transported to site via the Antiene Rail Loop and then by conveyor from the rail loop to the Bayswater B site. The rail loop is currently approved to transport 15 million tonnes per annum of coal and so the approval (should coal become the preferred option) would need to be modified (refer to **Chapter 6** Statutory Planning).

The Antiene Rail Loop was approved as part of the coal unloading facility, Antiene Rail Unloader. The Antiene Rail Loop is located at the end of a spur line from the Main Northern Rail Line at Antiene to secure the supply of coal to the existing Bayswater Power Station.

It is forecast that for the maximum transfer capacity, at 15 million tonnes per annum, 5 daily trains could operate on the rail loop per day, over a 24 hour period. This equates to a capacity of 3,650 rail trips per annum.

The forecast projections for rail movements, with the development of the proposed Bayswater B project coal option, are shown in **Table 21-7**.

**Table 21-7: Forecast Increase of Train Movements**

| Year | Antiene Coal Train Movement Increase |
|---|---|
| 2013 | 1,590 |
| 2015 | 1,956 |
| 2016 | 2,320 |

Given the capacity of the rail loop, the increase in train trips would not affect the operation of the rail loop.

### 21.3.3 Summary Operational Traffic

Based on the above assumptions, the forecast daily trip generation for the proposed Bayswater B Project are shown in **Table 21-8**. The values are representative of total trips, e.g. one vehicle trips generates two movements.

**Table 21-8: Predicted Total Daily Vehicle Movements - Proposed Bayswater B Project**

| | Maintenance Staff | Operation Staff (Two Shifts) | Office Staff | Heavy Vehicles | Total Vehicle Movements |
|---|---|---|---|---|---|
| Gas Fuelled | 70 | 64 | 70 | 8 | **212** |
| Coal Fuelled | 130 | 64 | 100 | 46 | **340** |

## 21.4 Potential Construction Traffic Impacts

The assumed traffic generation during the construction phase for both the coal and gas generation options is summarised in **Table 21-9**.

**Table 21-9: Predicted Daily Vehicle Generation – Construction Stage both Options**

| Generated Vehicles | Daily Vehicle Movement Generation |
|---|---|
| Generated Vehicles | Daily Vehicle Movement Generation |
| Buses | 20 |
| Private Vehicles | 380 |
| Heavy Vehicles | 200 |
| **Total** | **600** |

Based on the forecast traffic generation volumes shown in **Table 21-9** and the base flows derived in **Section 21.1.4**, the average traffic flows along New England Highway, during the construction phase, is estimated to increase to 11,181 per day, representing a 5.7% increase. According to *Austroads Guide to Traffic Engineering Practices Part 2, Road Capacity,* the New England Highway would continue to operate at a LoS D with the forecast additional construction traffic movements.

The construction staff camp is proposed to be located at a site in close proximity to the Project site, isolated from the town centres so that the travel route of the workers do not access the local traffic network. Therefore, the transportation of construction staff is expected to have minimal impact on the surrounding road network.

As the Project site is in a rural area served by a limited road network, the heavy vehicle movements, generated by the Project Site, would need to access the New England Highway within the regional town centres. To minimise the impact on the local traffic within Singleton and Muswellbrook, protocols would be put in place as part of the Traffic Management Plan for the site which may include restricting movements during the peak hours and during school bus hours.

If, in a worst-case-scenario, a suitable temporary accommodation camp is not located adjacent to the construction site, it may be assumed that the accommodation for staff would be distributed in the same manner as the existing traffic distribution, i.e. 65% Muswellbrook and 35% Singleton. Given that traffic within these towns is of a local nature generated by the local businesses and schools, shift hours for the workers may need to be scheduled outside of local traffic peak hours, to minimise the impact on the local traffic and safety.

## 21.5 Potential Operational Traffic Impacts

Based on the forecast trip generation volumes shown in **Table 21-8**, the average daily traffic flow along the New England Highway, with a coal fuelled power station is estimated to be 10,923 which equates to an increase of 3.2%. With a gas fuelled station, the average traffic would increase to an average of 10,793, representing a 2.0% increase. These volumes indicate that the New England Highway, adjacent to the Bayswater-Liddell complex would continue operating at a LoS D, as identified in **Section 21.1.4**.

Given this increase in traffic volumes, the impact on the local roads. However, this is expected to be minimal and restricted to residential streets in the areas where employees live.

The marginal increase of heavy vehicles generated by a gas fired option is unlikely to impact on the local traffic sections of the New England Highway.

Furthermore, the staggered starting and finishing times for the different employment types and the transportation of fly ash within the internal road network is likely to minimise the impact on the road network.

There would be no impact on the local road network from transport of coal, as coal would be delivered to the site via the Antiene Rail loop and conveyor.

## 21.6 Mitigation and Management Measures

Given the extent of development scheduled at adjacent sites, a significant volume of traffic is forecast for the New England Highway. It is possible that the construction timeframes for the proposed Bayswater B Project would overlap with some of the adjacent developments. Notwithstanding this, the capacity of the road network would not be compromised as the cumulative traffic assessment carried out as part of this EA is based on previous analysis prepared for the adjacent development, and the cumulative impact with all future developments was used as the baseline to assume a worst case scenario.

Following the determination of the preferred technology for the proposed Bayswater B Project, a Construction Traffic Management Plan would be prepared to identify transport routes to and from the construction work camp, finalise construction staff numbers, quantify raw materials and truck movements, put in place protocols for the timing of deliveries and so on, to minimise the construction traffic impact on Muswellbrook and Singleton as well as other regional town centres.

## 21.7 Residual Impacts

If the mitigation measures are observed, the impact on the adjacent road network is likely to be minimal and safety within the town centres of Muswellbrook and Singleton should not be affected. The traffic generated by the proposed Bayswater B project is unlikely to compromise the function and operation of the New England Highway.

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AECOM

RTA PERMANENT COUNTER LOCATIONS

Environmental Assessment

Bayswater B Power Station

Figure 21.1

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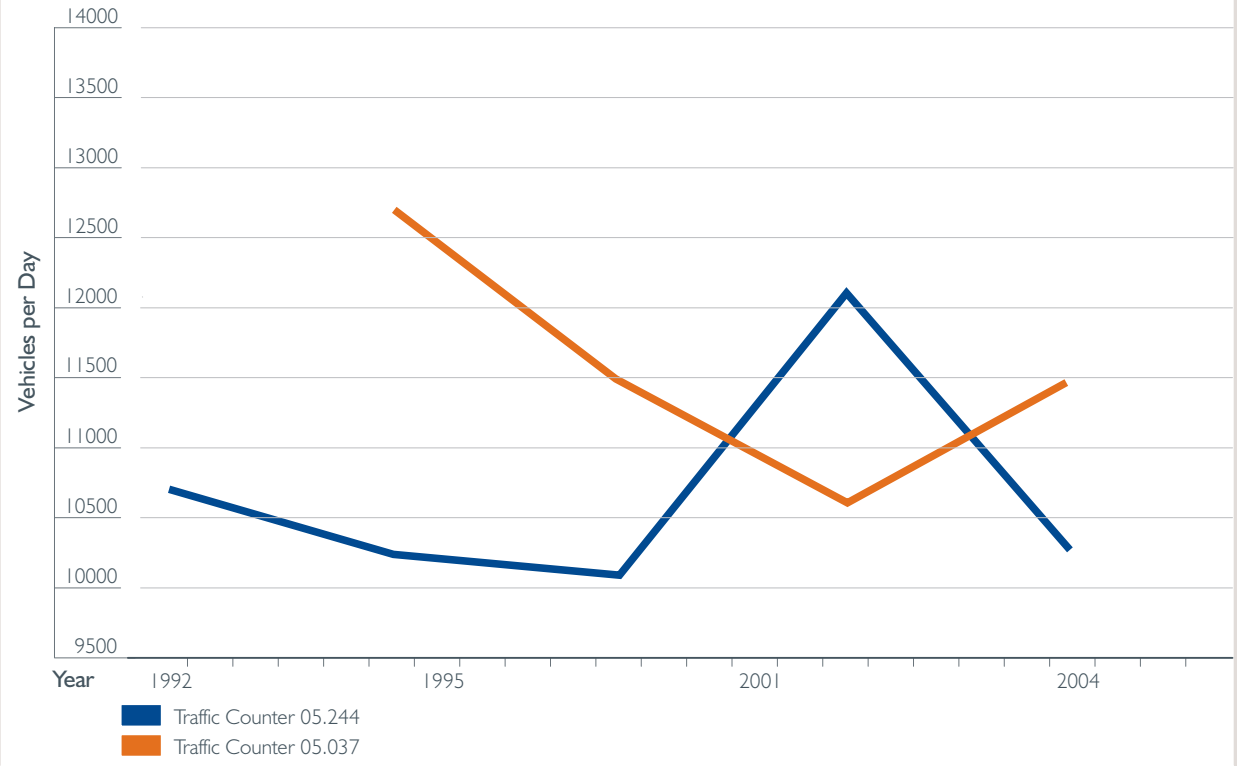


**Figure 21.2**
Daily Traffic Pattern at New England Highway
(Data Source: RTA AADT Volumes 2004).

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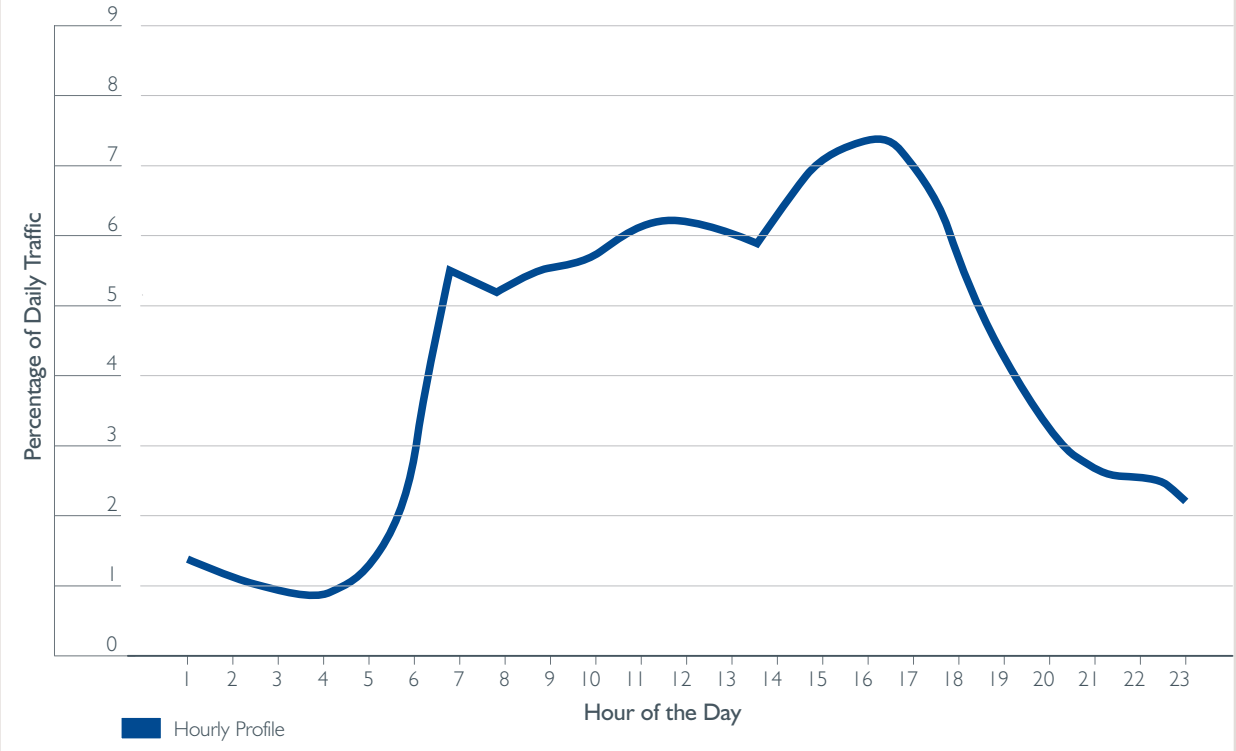


**Figure 21.3**
Hourly Traffic Profile (Station 05.244) of New England Highway
(Data Source: RTA AADT Volumes 2004).

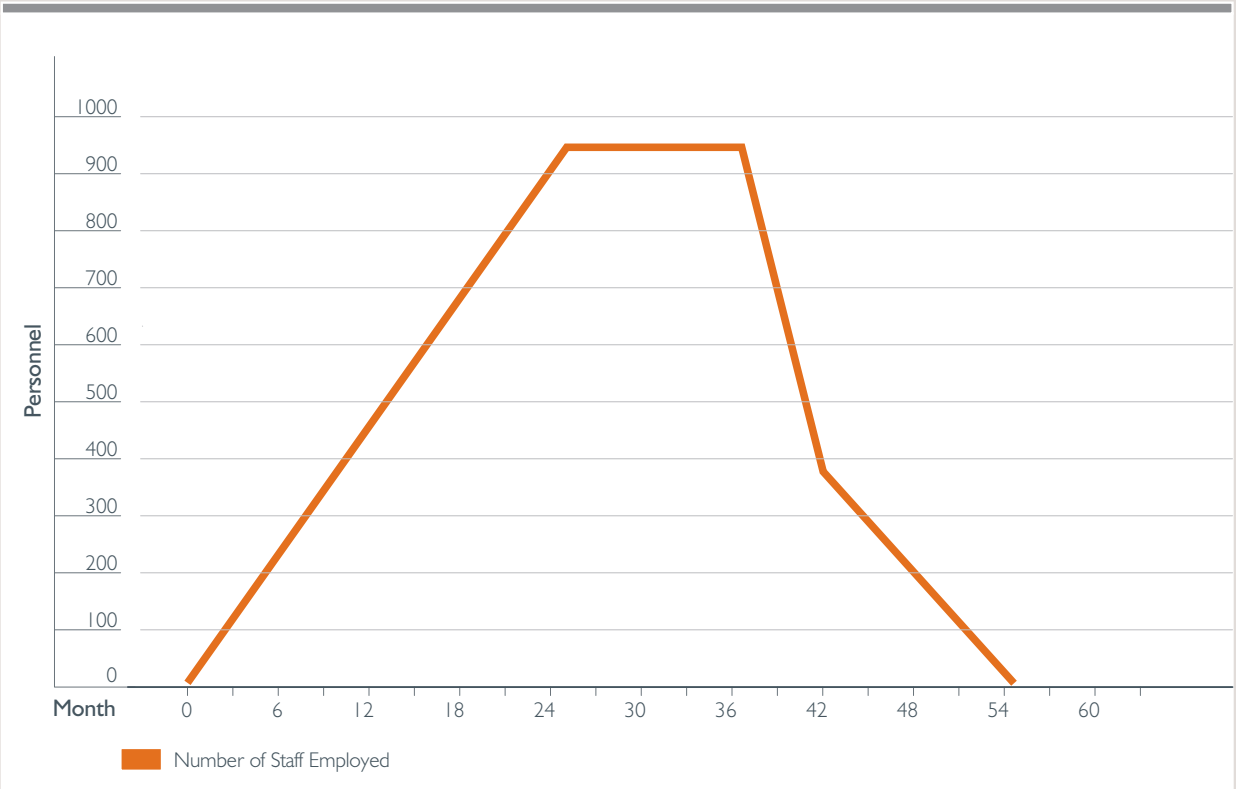


**Figure 21.4**
Number of Staff Engaged During the Construction Phase of Bayswater B Power Station (USC Option)
(Data Source: AECOM, 2009).

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# 22.0 Waste

*This Chapter provides details of waste management for the Project and addresses the requirements of the Director-General's Environmental Assessment Requirements as follows:*

***Waste Management** – the EA must include identification of the major waste streams to be generated by the proposal (including waste from water treatment and coal ash) and measures for its management and disposal including options for recycling and reuse where reasonable and feasible.*

## 22.1 Overview

The relevant legislative requirements, classification of waste types, and anticipated waste streams during construction and operation are described below. The approach for management of wastes generated during Project construction and operation phases are discussed with reference to waste avoidance, reuse, on-site management, transport and disposal.

## 22.2 Legislative Requirements

### 22.2.1 Waste Avoidance and Resource Recovery Act 2001

The *NSW Waste Avoidance and Resource Recovery Act 2001* (WARR Act) promotes waste avoidance and resource recovery. The objects of the Act include ensuring that resource management options are considered against a waste hierarchy, of which the first priority is waste avoidance and reduction, followed by resource recovery, resulting in reduced final disposal of waste.

### 22.2.2 Waste Avoidance and Resource Recovery Strategy 2007

The *NSW Waste Avoidance and Resource Recovery Strategy 2007* (the Waste Strategy) sets out principles regarding adoption of measures which avoid unnecessary resource consumption and promote resource recovery. The Waste Strategy identifies key areas where outcomes must be achieved in order to avoid and manage waste, including preventing waste, increasing the use of renewable and recovered materials, reducing toxicity in products and materials and reducing litter and illegal dumping.

Waste management measures proposed for this Project encourage efficient resource use alternatives, re-use and recycling. Waste that cannot be re-used or recycled would be disposed of appropriately.

## 22.3 Waste Classification

The DECC Waste Classification Guidelines (DECC, July 2009) describe a number of specific classifications of wastes, based on physical and chemical composition and associated environmental impacts. Waste streams require different management, transportation and disposal depending on their classification. The six waste categories are:

- Special waste (e.g. clinical and related, asbestos and tyres)
- Liquid waste (i.e. anything free-flowing / not able to be shovelled)
- Hazardous waste (e.g. coal tar, lead paint waste, dangerous goods containers)
- Restricted solid waste (wastes with a contaminant concentration lower than hazardous waste, but higher than general solid waste; no wastes have yet been pre-classified by the EPA as 'restricted solid waste'.)

- General solid waste (putrescibles) (e.g. food wastes, manure and human excrement, dewatered sewage treatment screenings)
- General solid waste (non-putrescible) (e.g. glass, plastic, garden waste, dewatered stormwater screenings).

Wastes may be further classified within these categories based on waste type or chemical assessment, as per the Waste Classification Guidelines. Potential wastes generated from the construction and operation of the proposed Bayswater B Project and ancillary infrastructure are described below in **Section 22.4.**

## 22.4 Project Waste Streams

The proposed Bayswater B Project would generate wastes during both the construction and operation phases. The following sections detail the main waste streams likely to be generated during each project phase, along with estimated waste quantities where possible. At this concept stage, waste quantity estimates are approximate only.

Waste materials generated from the construction and operation of the Project have been classified according to the Waste Classification Guidelines as shown in Error! Reference source not found. and Error! Reference source not found. respectively.

### 22.4.1 Construction Waste

Waste during the construction phase of works would predominantly be generated from civil works activities associated with the construction and preparation of the power station, transmission infrastructure, roads and water pipeline, as well as the coal conveyor and ash haulage route and/or gas pipeline as applicable. The waste streams likely to be generated during construction are detailed in Error! Reference source not found..

During the construction period it is estimated that there would be waste generation of some 50 tonnes (t) per month on average (600 t /year). This would result in total construction period waste of approximately 2700 t for the coal fired option, or 1900 t for the gas fired option. Modest amounts of waste would be generated in the initial and final stages, whilst there would be more waste generated during the peak construction period. At this concept stage, it is not possible to estimate quantities of individual construction waste streams. Individual and total waste stream quantities are dependent on factors including design of plant, methodology for manufacture and assembly, and transport method of construction supplies.

**Table 22-1: Classification of Wastes Generated from the Project during Construction**

| Waste Streams by Category |
|---|
| **Special waste** |
| Used tyres |
| **Liquid waste** |
| Liquid (non-dewatered) sewage from work site/s and construction camp/s |
| Wastewater e.g. stormwater runoff from construction areas, hydrostatic test water |
| Liquid wastes e.g. waste chemicals, cleaning agents, waste fuels including lubricating oil |
| **Hazardous waste** |
| Lead-acid or nickel-cadmium batteries |

| Waste Streams by Category |
|---|
| Containers having previously contained dangerous goods from which residues have not been removed (including Class 1: Explosives; Class 3: Flammable liquids; Class 4: Flammable Solids, etc; Class 5: Oxidizing Substances & Organic Peroxides; or Class 8: Corrosive Substances; or Division 6.1: Toxic Substances); |
| **Restricted solid waste** |
| N/A |
| **General solid waste (putrescible)** |
| Domestic waste including putrescible organics (e.g. food waste from personnel) |
| **General solid waste (non-putrescible)** |
| Non-recyclable wastes including plastics (e.g. packaging), cured and dried residues of resins, paints and glues, asphalt wastes, concrete wastes, stormwater screenings |
| Containers having previously contained dangerous goods from which residues have been removed |
| Drained oil filters, empty oil containers, rags and oil-absorbent materials that only contain non-volatile petroleum hydrocarbons and do not contain free liquids |
| Recyclable or reusable wastes: construction (e.g. scrap metal, aluminium, timber pallets) and general (including glass, PET bottles, paper and cardboard) |
| Excavated topsoil and/or subsoil from cutting/ grading |
| Cleared exotic and/or native vegetation |
| **TOTAL CONSTRUCTION WASTE QUANTITY** |
| Total Estimated Waste During Construction – Gas Fired Option = 1900 t<br>– Coal Fired Option = 2700 t |

### 22.4.2 Operations Waste

Waste generated during the operations phase of works would predominantly be general solid waste, as well as various wastewater which would for the most part be recycled. If the coal fired option is selected, fly ash and bottom ash would be generated as by-products of the coal combustion process. The waste streams likely to be generated during operations are detailed in **Table 22-2**.

During normal operation of the proposed Power Station, it is assumed that solid waste would be generated at a rate of approximately 50 t per annum, based on an estimated volume of 1 t per week. At this concept stage, it is not possible to estimate quantities of most individual waste streams. Individual and total waste quantities are dependent on factors including design of plant, plant operating procedures, and sources available for site operation supplies. At this stage of project planning, quantities of operations phase waste have been estimated for sewage, chemical drain flows and ash waste (the latter being for the coal fired option only).

The estimated volume of sewage waste during operations is 25m$^3$ (0.025 ML) per day or approximately 10 ML p.a. Chemical drains from sources which may contain chemicals (e.g. chemical storage areas and polisher regeneration plant) have been estimated to have operations phase flows of up to some approximately 0.4 ML per day (146 ML p.a.) for the coal fired option or 0.3 ML per day (110 ML p.a.) for the gas fired option. However, as further discussed in **Section 22.6.3**, depending on whether coal or gas is the selected option, this component of wastewater would be recycled for use in ash conditioning at either the Project site or at the existing Bayswater Power Station.

If the coal fired option is selected, it is expected that around 1.4 to 1.7 million tonnes (Mt) of ash would be generated per annum as a by-product of the combustion process. Based on the concept stage design coal, the quantity of ash has been estimated at 1.6 Mt per annum. Over the 30 year designed life of the plant, this would equate to approximately 48 Mt of ash in total. Note that the actual quantity of ash generated would depend upon coal specification.

**Table 22-2: Classification of Wastes Generated from the Project during Operations**

| Waste Streams by Category | |
|---|---|
| **Special waste** | |
| N/A | |
| **Liquid waste** | |
| Liquid (non-dewatered) sewage (from power station facilities) | |
| Wastewater e.g. dirty drains water, contaminated wastewater, chemical wastewater | |
| Liquid wastes e.g. waste chemicals, cleaning agents, waste fuels including lubricating oil, liquid sludge from filters | |
| **Hazardous waste** | |
| Lead-acid or nickel-cadmium batteries | |
| Containers having previously contained dangerous goods from which residues have not been removed (including classes 1: Explosives; 3: Flammable liquids; 4: Flammable Solids, etc; 5: Oxidizing Substances & Organic Peroxides; or 8: Corrosive Substances; or Division 6.1: Toxic Substances) | |
| **Restricted solid waste** | |
| N/A | |
| **General solid waste (putrescible)** | |
| Domestic waste including putrescible organics (e.g. food waste from personnel) | |
| **General solid waste (non-putrescible)** | |
| Dewatered sludge from filters (e.g. from water treatment plant) | |
| Conditioned fly ash, bottom ash, pulveriser rejects and filter bags (disposed of with bottom ash) | |
| Non-recyclable wastes including plastics (e.g. packaging), cured and dried residues of resins, paints and glues, stormwater screenings | |
| Containers having previously contained dangerous goods from which residues have been removed | |
| Drained oil filters, empty oil containers, rags and oil-absorbent materials that only contain non-volatile petroleum hydrocarbons and do not contain free liquids | |
| Recyclable or reusable wastes: from maintenance (e.g. drums, timber pallets) and general (including glass, PET bottles, paper and cardboard) | |
| **TOTAL OPERATIONS WASTE QUANTITIES (annual average estimates where available)** | |
| Estimated Liquid Sewage Waste | = 10 ML p.a. |
| Estimated Chemical Drains Wastewater | = 110 ML p.a. (gas fired) or 146 ML p.a. (coal fired) |
| Estimated Solid Waste (Excluding Ash) | = 50 tonnes p.a. |
| Estimated Ash Waste (Coal Fired Option Only) | = 1.6 Mt p.a. |

## 22.5 Construction Waste Management and Safeguards

The following section outlines potential waste management measures aimed at minimising the impacts of waste, pollution and contamination during construction of the proposed Bayswater B Project, through appropriate management, handling and disposal of wastes.

A number of environmental safeguards would be implemented during all phases of Project construction to minimise waste and to re-use and/or recycle potential generated wastes. A Construction Environmental Management Plan (CEMP) would be prepared and implemented prior to the commencement of construction activities (refer **Chapter 25**) and would include:

- Procedures to classify wastes in accordance with the Waste Guidelines and NSW legislative requirements
- Measures to be implemented to minimise, reuse and recycle waste
- Details of how waste would be quantified, stored, treated (on site) and disposed of
- Reporting and recording procedures to track wastes in accordance with regulations.

Environmental safeguards and management measures to be implemented during the life of the Project are described below in accordance with the DECC's Waste Classification Guidelines (DECC, 2008) and the *Waste Avoidance and Recovery Act 2001*. More prescriptive waste management measures would be identified in later stages of project planning.

### 22.5.1 Waste Avoidance

The principal aim of waste management during construction would be to minimise waste generation. This would occur via procedures including:

- Responsible purchasing of materials, including consideration of packaging and volume of supplies purchased to avoid packaging waste and excess supplies, as well as purchase of materials that include recycled content where feasible.
- Waste management procedures including efficient use of materials, including supply considerations (e.g. pre-cut lengths of metal components) and operations processes (e.g. batch volumes)
- Staff and contractor awareness, including induction processes that make workers aware of waste minimisation procedures
- Reuse of materials and recycling where feasible, in order to reduce waste to landfill.

### 22.5.2 Resource Recovery, Reuse and Recycling

Following from avoidance of waste, the next step in waste management during construction would be to maximise recycling of materials wherever practicable. Construction workers would be briefed on the requirement and processes on site to separate recyclable and non-recyclable wastes as far as practicable. Management measures would be implemented to maximise the recycling of waste materials.

### 22.5.3 On-Site Management

The following section provides detail on the handling, treatment and processing, storage and containment of construction waste streams, including measures to facilitate recycling and re-use.

As a minimum during construction, waste would be separated into hazardous and non-hazardous materials and disposed of in a responsible manner. The aim would be to undertake further separation of waste into domestic/putrescible waste, recycling, scrap metal and industrial waste streams. Separate areas or skips would be available on site to facilitate this.

During construction a high standard of 'housekeeping' would be maintained with materials managed so that they are not washed or blown away. This would be facilitated by provision of suitable means of disposal (e.g. covered skips) for domestic waste, recyclable waste and industrial/construction waste. Bins would be emptied regularly and the site maintained to avoid litter accumulation

General on-site waste management safeguards throughout construction would be in accordance with the CEMP and would include:

- Induction processes would ensure that staff and contractors are aware of their responsibilities to ensure that waste materials are managed appropriately.
- Appropriate spill, incident management and response procedures would be implemented including measures to avoid spillages of chemicals, liquids and other wastes.
- Resource recovery and reuse strategies would be implemented for each type of waste material where applicable.
- Work sites would be cleaned up and rehabilitated following works.

**Special Wastes**

The only 'special waste' stream likely to be generated during construction is waste tyres. Quantities are expected to be low. Waste tyres would be disposed of separately from general solid waste.

**Liquid Wastes**

Liquid wastes during the construction phase would include liquid sewage, other liquid wastes, stormwater runoff and hydrostatic test water.

During construction, sewage waste generated on the proposed Bayswater B site would either be collected in portable toilets, or alternatively Envirocycle treatment system/s or similar may be installed. Depending on the location of the construction camp, this may be connected to town sewage infrastructure if appropriate (Muswellbrook or Singleton), or alternatively on-site treatment system/s such as Envirocycle may be installed for the camp. If biological treatment of sewage occurs at either the Bayswater B site or construction camp/s, these would be managed to ensure that effluent meets acceptable criteria prior to discharge.

Liquid wastes including waste chemicals and cleaning agents, waste fuels and lubricants would be separated into relevant categories on site before being removed by a licensed contractor. Wastewater components would be dealt with as follows:

- General wastewater (potentially dusty stormwater runoff from the construction site) would be collected in a series of catch drains or similar before being directed to settling ponds. After settling of dust, water would be discharged to Plashett Dam
- Hydrostatic test water would be taken off site by the testing contractor, treated and disposed of at an approved disposal location

**Hazardous Wastes**

Lead-acid or nickel-cadmium batteries and containers having previously contained dangerous goods from which residues have not been removed would be managed via the following hazardous wastes safeguard measures:

- Hazardous substances would be collected separately from general waste.
- Handling, storage, transport and tracking of hazardous materials and waste would be in accordance with the *National Code of Practice* and the relevant material safety data sheet for the product.
- Hazardous wastes would be transported by an authorised contractor and disposed of appropriately according to regulations at a licensed waste facility.

**Restricted Solid Waste**

No 'restricted solid wastes' are likely to be generated during construction of the Project.

**General Solid Waste (Putrescible)**

Domestic waste including putrescible organics (e.g. food waste from personnel) would be contained in dedicated covered rubbish bins to prevent odour, vermin and health issues. Bins / rubbish bags containing putrescibles would be kept away from surface water drains.

**General Solid Waste (Non-Putrescible)**

General non-putrescible non-recyclable wastes (including packaging, residues of resins, paints and glues, asphalt and concrete wastes, stormwater screenings, containers having previously contained dangerous goods from which residues have been removed, and containers/items previously used for oil) would be collected in bins or skips as appropriate, separately from hazardous wastes, soil and waste vegetation. Adequate containment measures would be taken to avoid wind blown rubbish.

Reuse and/or recycling of solid wastes would be maximised wherever practicable. This may be facilitated by installation of skips or containers for general recyclables (including glass, PET bottles, paper and cardboard) and provision of designated stockpile areas for reusable wastes generated from site works (e.g. scrap metal, aluminium, timber pallets, metal drums). Scrap metal would be separated by metal type where feasible and sent for recycling at an appropriate facility

Excavated topsoil and/or subsoil from cuttings and grading would be stockpiled separately and appropriately maintained onsite for reuse during backfill and/or initial rehabilitation of construction areas. It would not be removed from site.

Native and/or exotic vegetation cleared from main site and auxiliary features construction areas would be stockpiled on site and maintained appropriately. If feasible this waste product would be mulched and respread during post-construction rehabilitation to minimise erosion and promote revegetation. If not feasible to reuse (e.g. if weed content is an issue, or if excess organic material is present), the waste vegetation would be removed from the site and disposed of appropriately at a licensed green waste facility.

### 22.5.4 Waste Transport and Disposal

The objective of construction waste transport and disposal is to remove all waste from site, except for waste streams that are able to be treated or reused on site. Wastes which are not suitable for reuse or recycling or on site treatment would be disposed of at an appropriately licensed facility.

Wastes anticipated to be treated and/or disposed of on site during the construction period include sewage (if Envirocycle or similar is used) and stormwater runoff (discharged to Plashett Dam after passing through settling ponds). If portable toilet facilities are used instead of or as well as Envirocycle, these would be maintained by a waste contractor as required, with waste transported and disposed of off-site at an approved facility.

Construction wastes anticipated to be recycled as much as practicable include:

- Excavated soil and cleared vegetation (to be reused on site, if feasible)
- General/domestic recyclables (to be collected and recycled off-site)
- Construction recyclables/reusables (to be collected and recycled or reused off-site)

Hazardous wastes, special wastes and chemical/fuel wastes would be separated into relevant categories and removed by a licensed contractor (where required) before disposal at approved facilities:

- Waste tyres would be disposed of at a licensed waste facility and would need to be tracked if transported interstate. If possible, used tyres may be reused or recycled by an external buyer.
- Chemical/fuel wastes including waste or used oils and greases would be collected separately and removed from site by a licensed contractor to be disposed of at appropriately licensed disposal facilities (e.g. oil recycling facility)
- Hazardous wastes and liquid wastes other than stormwater would be removed from site regularly by an appropriately licensed contractor, using all required safety and environmental procedures, as storage facilities are filled.
- Oil / air filters, oily rags, spill clean-up materials or empty chemical and fuel drums would be either disposed of as prescribed waste or recycles at an appropriately licensed prescribed waste management facility

All remaining general putrescible and non-putrescible solid wastes would be regularly removed from site and disposed of at an approved licensed waste facility (general landfill).

## 22.6 Operations Waste Management and Safeguards

The following section outlines potential waste management measures to minimise the impacts of waste, pollution and contamination during operation of the proposed Power Station, through appropriate management, handling and disposal of wastes.

A number of environmental safeguards would be implemented during operations to minimise waste and to re-use and/or recycle potential generated wastes. An Operation Environmental Management Plan (OEMP) would be prepared prior to the commencement of power station operation activities. The OEMP would include elements similar to the CEMP (refer to **Section 22.5**) but specific to operations waste management.

### 22.6.1 Waste Avoidance

The main aim of waste management during operation would be to minimise waste generation. This should occur via waste avoidance procedures as detailed for construction in **Section 22.5.1**.

### 22.6.2 Resource Recovery, Reuse and Recycling

Following from avoidance of waste, the next step in waste management during operations would be to maximise recycling of materials wherever practicable. Management measures would be implemented to support the recycling of waste materials, including:

- Operational staff and contractors would be briefed regarding recycling procedures during induction and encouraged to separate recyclable and non-recyclable wastes as far as practicable.
- Timber pallets and metal drums in reasonable condition would be reused (after repair or reconditioning, if required) either on site or by external users where this is feasible. Designated collection areas should be provided for these items.
- Florescent tubes, PC boards, VDUs and all types of dry cell rechargeable batteries would be collected separately and sent for treatment and/or recycling by an appropriate operator rather than being disposed to landfill
- Paper, cardboard, glass, aluminium cans and other recyclable containers would be separated and recycled; this would be assisted by installation of designated bins
- If appropriate, consider use of recycled oil for USC coal boiler start-up

In relation to wastewater, the quantity discharged into Plashett Dam by the Project would be minimal due to continuous water treatment and recycling. Refer to **Chapter 11 Water Quality** for further detail.

#### Ash Reuse

Bottom ash from the coal fired option would be used as road base where appropriate. Fly ash and/or bottom ash would also be reused either by the proponent or sold for reuse by other parties wherever there is a need or demand. Potential beneficial re-uses include as a component in cement manufacture, landscaping and road works. Due to the location of the proposed Power Station away from major population centres, as well as ash being a low value commodity, opportunities to sell this waste product are expected to be limited. However, opportunities for ash reuse would be actively monitored and utilised wherever possible, as discussed in **Chapter 3 Alternatives**.

### 22.6.3 On-Site Management

The following section provides detail on the handling, treatment and processing, storage and containment of the different waste streams during operation.

General on-site waste management safeguards throughout operations would be in accordance with the OEMP and similar to those detailed for construction in **Section 22.5.1**.

#### Special Waste

No ‘special wastes’ are likely to be generated during operation of the Project.

### Liquid Wastes

Wastewater streams generated during the operations phase would include liquid sewage, dirty drains water, coal stockpile and ash plant runoff, contaminated wastewater and chemical wastewater. These would be managed as detailed in **Chapter 11 Surface Water.**

Liquid wastes including waste chemicals and cleaning agents, waste or used fuels and lubricants would be collected separately from other wastes, separated into relevant categories and stored with adequate protection and containment (e.g. bunds) to capture any potential spills. These wastes would be disposed of regularly by a licensed contractor. Liquid sludge from wastewater filtration equipment would most likely be used for ash conditioning on the Project site or at Bayswater Power Station.

All cleaned wastewater that is discharged to Plashett Dam would effectively be recycled. At this concept stage, it is estimated that the volume of cleaned water discharged to Plashett Dam would be around 0.22 GL p.a. for the gas fired option or some 0.59 GL p.a. for the coal fired option. Water treatment prior to discharge would be undertaken to ensure that the disposed water meets acceptable criteria. The treatment would involve the removal of other trace elements which may be present in the produced water.

### Hazardous Wastes

Management of hazardous waste during operations would be as per procedures detailed for construction in **Section 22.5.3.**

### Restricted Solid Waste

No 'restricted solid wastes' are likely to be generated during operation of the Project.

### General Solid Waste (Putrescible)

Management of putrescible solid waste during operations would be as per procedures detailed for construction in **Section 22.5.3.**

### General Solid Waste (Non-Putrescible)

Management of general non-putrescible solid waste during operations would be as per procedures detailed for construction in **Section 22.5.3.**

For the coal fired option, and as detailed in **Chapter 5 Project Description**, fly ash, bottom ash and pulveriser rejects would be collected in their respective handling plants before being transferred to the ash conditioning plant. The waste ash would be conditioned in order to improve the manageability and reduce the dust potential of the waste product. An estimated 0.41 GL of water would be required for ash conditioning per annum. As part of wastewater recycling, approximately 22% of this waster requirement would be made up of neutralised chemical wastewater, with another 10% being liquid sludge from wastewater filtration systems. The conditioned ash would then be transferred to the ash disposal plant, as detailed below.

Fabric filter bags from flue gas filtration require periodic replacement. These would be collected separately from general solid waste and transferred to the ash disposal plant along with the bottom ash. Dewatered sludge from filters (e.g. from water treatment plant) would also be transferred to the ash disposal plant.

### 22.6.4 General Waste Transport and Disposal

The objective of operations waste transport and disposal is to remove all waste from site, except for waste that is able to be treated or reused on site. Wastes which are not suitable for reuse or recycling would be disposed of at an appropriately licensed facility and no wastes would be discarded on site.

Wastes anticipated to be treated and/or disposed of on site during operations include sewage (in the proposed on-site sewage treatment plant) and the various streams of wastewater (discharged to Plashett Dam or reused either on site or at Bayswater) as described in **Section 22.6.3** above.

Operations wastes anticipated to be collected and recycled as much as practicable include:

- General/domestic recyclables (to be recycled off-site)
- Operations and maintenance recyclables/reusables (to be recycled or reused off-site)

Management of hazardous wastes, chemical/fuel wastes, and general solid wastes during operations would be as per procedures detailed for construction in **Section 22.5.4.** This excludes ash products and fabric filter bags from the coal fired option, for which transport, disposal and management are discussed in **Section 22.6.5** below.

### 22.6.5 Ash Transport, Disposal and Management

Ash for which no reuse options are available would be transported to one of the mine voids within 10km of the Bayswater B Power Station site. The mine void to be used cannot be specified at this concept stage as it would involve negotiation and agreement with mine owners. In order to dispose of the expected quantity of ash over the Project life (approximately 48 Mt), a mine void of 25 million cubic metres would be required for ash disposal.

Conditioned fly ash from the coal fired option is proposed to be conveyed to the selected mine void via a single conveyor. Conditioned bottom ash and pulveriser rejects (along with used fabric filter bags and dewatered waste sludge) would be transported to the void in trucks via the purpose-constructed ash haulage route. The fly ash conveyor is planned to run alongside the ash haulage route. It is proposed that ash would be conveyed / trucked to the void in shifts, predominantly during daylight hours.

Upon arrival at the mine void, the conditioned fly ash and other waste products are likely to be stockpiled adjacent to the void before being transferred into the void via truck or excavator. Bottom ash and pulveriser rejects may be used as appropriate for road base for any roads or access ramps required to be constructed for access purposes around the void. Ash waste placed in the void would be graded and compacted during daylight hours in the void section currently in use. This process would maximise the utilisation of space in the void as well as consolidating ash waste to prevent dust and erosion.

The primary management strategy to prevent water contamination and ground water contamination from disposed ash would be appropriately designed drainage systems. These would be developed around the ash haulage route, fly ash conveyor and the perimeter of the mine void. Sediment traps and/or diversion of water into settling ponds would be utilised to collect ash contained in runoff. These would be monitored, emptied and managed on an ongoing basis, with collected sediment transferred into the mine void. The purpose of drainage systems would be to achieve the following outcomes:

- To minimise drainage into the mine void, in order to prevent potential leachate issues and/or groundwater contamination that may result from water accumulation in the void (refer to **Chapter 13 Groundwater** for further details)
- To control suspended solids in surface water discharge from the haulage route and the surroundings of the mine void site within regulatory limits, in order to prevent potential surface water contamination.

Conditioned ash would be a moist consistency with a low potential for dust generation and dust nuisance. Ash maximum moisture content would be approximately 25% (depending upon the time of year). This moisture level is purely for dust suppression while avoiding excess water content, in order to balance the need to avoid groundwater contamination.

Potential dust emissions from ash waste that may result from wind erosion, transport and delivery of ash, and placement and grading of ash in the void would be mitigated as far as possible by the application of water to haul roads and worked surfaces if required. Water for dust suppression would be obtained from the ash plant water (service water and recycled wastewater) as required. Another management procedure that would assist in dust control would be progressive filling of the mine void with ash one section at a time in layers, followed by spreading of a soil layer over the ash surface when finished with each section.

The use of a mine void for the disposal of ash would require regulatory adjustments, which would relate to the use of the site as well as its management. The Proponent would gain all the appropriate approvals from the relevant authorities for the deposition of ash into the void, and undertake the necessary rehabilitation, monitoring and reporting requirements as determined by the relevant authorities. This would be undertaken in consultation with the owner of the final disposal point as well as the regulatory agencies and would include all necessary environmental assessments, management plans and rehabilitation plans

## 22.7 Residual Impact

Waste management procedures would be developed as part of the CEMP and OEMP implemented for the Project which would ensure that waste is appropriately handled, stored and reused, recycled or disposed. The majority of waste generation is likely to be predominantly during the construction phase, and therefore is temporary in nature.

Ash disposal for the coal fired option would be managed to minimise potential residual impacts on groundwater, as discussed in detail in the **Chapter 13 Groundwater**. Potential impacts and management measures regarding ash disposal would require further review and investigation during the detailed design phase of the Project. At that stage the mine void to be used for disposal would be identified, allowing site-specific impact assessment and management measures.

## 22.8 Conclusion

The proposed Bayswater B Project would result in the generation of wastes during both the construction and operation phases. Wastes such as excavated topsoil, cleared vegetation, scrap metal and wastewater streams would be managed and reused onsite or recycled where appropriate. Waste requiring offsite disposal would consequently be minimised, and as such no significant residual impacts are anticipated.

The implementation of waste management plans would detail measures and environmental safeguards such as those identified above in order to effectively manage waste generated by the Project. As such, waste generation is not considered to represent a significant constraint to the Project.

# 23.0 Cumulative Impacts

*Cumulative impacts can result from a number of different elements within a project, as well as from other projects in the same locality. The cumulative impact of a project is a combination of each elemental impact of the project and the surrounding projects on the environment. Cumulative impacts can be considered on a project basis, taking into account each element on a locality or regional basis as well as taking into account the interacting impacts of other projects in the immediate locality and the region.*

*This section sets out the potential cumulative effects of the project in accordance with the Director General's EARs including:*

*The Environmental Assessment must assess the worst case as well as representative impact for all key issues considering cumulative impacts, as applicable, from the adjacent Bayswater- Liddell generating complex and surrounding mining development (as relevant) considering both coal fired and gas generation scenarios including associated key ancillary components (as relevant).*

## 23.1 Cumulative Impact of the Project

The cumulative impacts of the proposal have been considered in relation to each of the identified environmental issues in **Chapter 9** to **Chapter 22** of this EA. Cumulative impacts of the proposal, particularly with respect to green house gas, air quality, noise, traffic, socio-economic matters and hazards and risks have been considered in each of the technical studies undertaken in respect of this proposal. The mitigations proposed in each of the chapters have been targeted at amelioration of potential impacts associated with each individual risk and to minimise the overall cumulative impacts of the development.

The potential impacts for each of the environmental factors were considered to be acceptable provided the prescribed mitigation measures and safeguards are implemented. As the identified impacts are able to be adequately controlled through mitigation and best practice management, it is considered that there would be no adverse cumulative impacts expected from the Project.

## 23.2 Cumulative Impact with other Projects

The assessment of the cumulative impacts with other projects has three defining aspects.

- The Cumulative effects with existing developments
  - a) This is dealt with through baseline studies and analysis of the existing ambient conditions in the locality.
- The Cumulative effects within the Project
  - b) This is the combination of individual aspects of the Project and the potential for the combined factors to influence the environmental conditions of the locality.
- The Cumulative effects with other Projects
  - c) The combined effects of potential issues on the locality resultant from simultaneous construction or operation.

In considering the cumulative impacts of the proposal in conjunction with other major projects planned in the local area. It was identified that there were 32 Major Projects for Singleton LGA and 18 Major Projects for the Muswellbrook LGA listed on the NSW DoP Major Project Register. Of these projects, approximately 50% are considered to be 'new' developments while the remaining projects are extensions or ancillary development to existing operations (mainly mining extensions) in the region. **Table 23-1** provides a summary of the projects relevant to the Singleton and Muswellbrook LGAs that have been listed as either approved or pending for the 12 month period to 6 August 2009. The Hunter Expressway project (approved in August 2007) has also been added to this list as it is a Major Project affecting Singleton, with construction earmarked to commence in 2010. While it is acknowledged that there are likely to be other developments occurring in the region concurrently to the proposed development, the Projects identified in **Table 23-1**, are considered to be the largest and of greatest significance to the project in terms of cumulative impacts in the short to medium term.

The majority of the identified projects have the potential to be in construction at the same time as the proposed Bayswater development. This would have the potential to exacerbate construction impacts, such as traffic, dust, noise and biological impacts. It may also result in pressures to the local and regional infrastructure and services of the Muswellbrook and Singleton area. The increased workforce numbers may also result in the requirement for small construction work camps / temporary accommodation in local towns.

The provision of temporary workers camps for the identified major projects in the locality would require construction of accommodation, connection of services and utilities and formation of access that may pressure existing services. Should the workforce be located within existing townships, (mainly Singleton and Muswellbrook), this could impact rental/retail accommodation and housing prices for local residents and may see pressure put on the services and the existing town retail industry. It is noted that this level of temporary growth in population has not been planned for in current planning strategies and infrastructure upgrades. Based on information provided for assessment on the Major Project Register, only the Queensland to Newcastle Gas Pipeline Project has identified a requirement for construction camps. There is a potential for up to 7 more construction camps for other identified projects, however, there is not adequate information available to determine these requirements.

**Table 23-1: Projects proposed within the Muswellbrook and Singleton Region**

| Project | Description | Status | Construction Workforce Numbers | Timing of Construction | Operational Workforce Numbers | Construction Timeframe Overlap | Geographical Location |
|---|---|---|---|---|---|---|---|
| **Singleton** | | | | | | | |
| Maitland to Minimbah Third Track, Hunter Valley | Construction of approximately 32 km of new rail track and ancillary infrastructure associated with the transport of coal | EARs Issued | 500 | Completion Jan 2012 | Not Provided | Potential for Overlap | Closer to Singleton |
| Bulga Mine Modification | Establishment of a ventilation air methane (VAM) abatement system and small gas-fired power plant at the Bulga Coal Mine | EARs Issued | Unknown | Unknown | Unknown | Potential for Overlap | Closer to Singleton |
| Integra Underground (Glennies Creek) Coal Mine | Extension of underground coal mining operation | On Exhibition | NA | Completion early 2014 | Ongoing - 220 People | Potential for Overlap | Closer to Singleton |

| Project | Description | Status | Construction Workforce Numbers | Timing of Construction | Operational Workforce Numbers | Construction Timeframe Overlap | Geographical Location |
|---|---|---|---|---|---|---|---|
| Integra Open Cut (Camberwell) Coal Mine | Extension of the existing open cut coal mining operation and associated infrastructure | On Exhibition | NA | Not provided | Ongoing - 250 People | Potential for Overlap | Closer to Singleton |
| Liddell Power Station North-South Gas Supply Pipeline | Construction and operation of a gas pipeline to supply gas fuel to supplement coal-fired electricity generation at the Liddell Power station | Being Assessed | 3 | 3 month period | 1 | Potential for Overlap | Closer to Muswellbrook |
| Huntlee New Town, Branxton | Draft regional voluntary planning agreement for Stage 1 of the Huntlee New Town development | DoP Preparing Response | Not provided | Completion in 5 years | Not provided | Potential for Overlap | Closer to Singleton |
| | Stage 1B – subdivision associated with the first residential neighbourhood and residential town centre (Village 1) to accommodate up to 800 dwellings and 120 large lots. | Being Assessed | Not provided | Completion in 5 years | Not provided | Potential for Overlap | Closer to Singleton |
| | Stage 1A – subdivision associated with the first residential neighbourhood and residential town centre (Village 1) to accommodate up to 1200 dwellings; employment lands (40 ha); a large lot residential development of 180 lots. | Being Assessed | Not provided | Completion in 5 years | Not provided | Potential for Overlap | Closer to Singleton |
| Wambo Mine: Construction of South Dam | Construction and operation of a new mine water storage dam and installation of supporting infrastructure | Being Assessed | Unknown | Unknown | Unknown | Potential for Overlap | Closer to Singleton |
| Rix's Creek Coal Mine: Cut and Cover Tunnel Project | The construction of a cut and cover tunnel under the existing New England Highway, to allow mine vehicles to have unrestricted access between Pit 1 and Pits 2 and 3 | Being Assessed | Unknown | Unknown | Unknown | Potential for Overlap | Closer to Singleton |
| United Collieries, Warkworth: Longwall 12 | The extraction of coal from an additional longwall panel (LW 12) as well as first workings extraction within the current mining lease area | Proponent preparing response to public submissions | NA | Not provided | Ongoing | Potential for Overlap | Closer to Singleton |

| Project | Description | Status | Construction Workforce Numbers | Timing of Construction | Operational Workforce Numbers | Construction Timeframe Overlap | Geographical Location |
|---|---|---|---|---|---|---|---|
| Narama Coal Mine: Narama Extended Project | Extension of the existing mining operations at Narama Mine to the east of the approved mining area and the development consent by 4 years. Also, ancillary works including the relocation and construction of an erection yard, water management structure and other infrastructure. | Undergoing Adequacy Review | Not provided | Unknown | Not provided | Potential for Overlap | Closer to Singleton |
| Integra Underground (Glennies Creek) Coal Mine: Modification | Amending the current approval to enable a 12 month extension to the latest date for installation of the approved overland conveyor | Being assessed | NA | Unknown | 1 | Potential for Overlap | Closer to Singleton |
| Nardell Coal Mine: Change to Mining Method | Modification to the Ravensworth Underground Mine to enable the change of mining method within an approved longwall extraction area to board and pillar mining and other minor modifications to improve environmental management on site | Approved (July 2009) | Unknown | Unknown | Unknown | Potential for Overlap | Closer to Singleton |
| Cumnock No. 1 Colliery: Wash Plant Pit and Rehabilitation Project | Extraction of coal reserves from underneath the existing coal handling and preparation plant | Approved (June 2009) | NA | Not provided | Ongoing | Potential for Overlap | Closer to Singleton |
| Wambo Coal Mine: Construction of Dam | Construction of an 810ML dam in order to augment the existing water management system at Wambo Coal Mine | Approved (June 2009) | Unknown | Unknown | Unknown | Potential for Overlap | Closer to Singleton |

| Project | Description | Status | Construction Workforce Numbers | Timing of Construction | Operational Workforce Numbers | Construction Timeframe Overlap | Geographical Location |
|---|---|---|---|---|---|---|---|
| Minimbah Bank Third Track | A third track adjacent to the existing "Up" main line including approximately 10.8 km of track and earthworks, three new rail underbridges, grade separation of Range Road level crossing, replacement and realignment of the Golden Highway overbridge, services relocation, signalling works, service tracks and property acquisition | Approved (May 2009) | 150 | Completion by March 2010 | NA | Unlikely | Closer to Singleton |
| Mount Thorley and Warkworth Mines: Extension to Mine Water Dam 9S | Extension of Dam 9S such that it replaces the existing approved dams 6S, 7S and 8S with a single mine water dam with a capacity of up to 2 GL | Approved (May 2009) | Unknown | Unknown | Unknown | Potential for Overlap | Closer to Singleton |
| Hunter Valley Operations Coal Mine – South Coal Project (HVO South), Jerrys Plains | Consolidation of existing consents, infrastructure upgrades, modifications and extension to mining at HVO South. This includes:<br>• consolidation of 25 existing consents to allow production and processing of up to 16 million tonnes of coal<br>• extension of three pits<br>• transport of coal, overburden, tailings and rejects between HVO South and HVO North<br>• transport of coal via haul trucks or conveyor to the Wambo rail spur, or alternatively construction of a new rail spur, and transport of coal to market via rail | Approved (March 2009) | 100 | Not provided | Ongoing – 50 people | Potential for Overlap | Closer to Singleton |

| Project | Description | Status | Construction Workforce Numbers | Timing of Construction | Operational Workforce Numbers | Construction Timeframe Overlap | Geographical Location |
|---|---|---|---|---|---|---|---|
| | • relocation of the Hunter Valley Gliding Club and Camleroi Road<br>• rehabilitation and revegetation of the site | | | | | | |
| Queensland to Newcastle Gas Pipeline – Wallumbilla to Newcastle | Construction and operation of a high pressure gas transmission pipeline from the Wallumbilla Gas Hub in South Central Queensland to the existing Sydney-Newcastle pipeline at Hexham, NSW | Approved (February 2009) | 600 | 8 months duration | Not provided | Potential for Overlap | Closer to Singleton |
| Huntlee New Town – Concept Plan 07 0064 | Proposed mixed use urban area to be located adjacent to Branxton and North Rothbury in the Lower Hunter Valley | Approved (February 2009) | Not provided | 10-15 year period | Potential for 2000 jobs | Potential for Overlap | Closer to Singleton |
| Integra Underground (Glennies Creek) Coal Mine – Open Cut Mining Operation | Construction and operation of an open cut coal mine at the existing Glennies Creek Colliery | Approved (December 2008) | 20 | Ongoing | 45-60 | Potential for Overlap | Closer to Singleton |
| Integra Underground (Glennies Creek) Coal Mine – Forest Road Ventilation Shaft Area Modification | Construction and operation of additional surface infrastructure within the Forest Road Ventilation Shaft Area | Approved (November 2008) | 2.5 | Not provided | NA | Potential for Overlap | Closer to Singleton |
| Narama Coal Mine – Increase in annual coal production | Increased production at Narama Coal Mine | Approved (October 2009) | Unknown | Unknown | Unknown | Potential for Overlap | Closer to Singleton |

| Project | Description | Status | Construction Workforce Numbers | Timing of Construction | Operational Workforce Numbers | Construction Timeframe Overlap | Geographical Location |
|---|---|---|---|---|---|---|---|
| Integra Open Cut (Camberwell) Coal Mine – Increase in ROM Production | Increase in run of mine (ROM) coal production from 3.8 million tonnes per annum (Mtpa) to 4.5 Mtpa; transport of ROM coal to the existing coal handling and preparation plant; and despatch of washed coal by rail using existing facilities | Approved (August 2008) | NA | Unknown | NA | Potential for Overlap | Closer to Singleton |
| RTA Hunter Expressway | Construction of approximately 40 km of dual divided carriageway between the F3 Freeway at Seahampton and the New England Highway west of Branxton, with interchanges at the F3 Freeway, Buchanan, Kurri Kurri, Loxford, Allandale and Branxton | Approved (August 2007) | Unknown | 4 years (commencing 2010) | NA | Potential for Overlap | Closer to Singleton |
| **Muswellbrook** | | | | | | | |
| Mount Arthur Coal Mine – Open Cut Consolidation Project | Increasing run-of-mine production at Mount Arthur Coal Operations to a maximum of 36 million tonnes a year, and consolidating all open cut mining operations on the site under a single project approval | EARs Issued | 240 | Not provided | 720 | Potential for Overlap | Closer to Muswellbrook |
| Liddell Power Station North-South Gas Supply Pipeline – North-South Gas Pipeline | Construction and operation of a gas pipeline to supply gas fuel to supplement coal-fired electricity generation at the Liddell Power Station | EARs Issued | 3 | 3 months | 1 | Potential for Overlap | Closer to Muswellbrook |

| Project | Description | Status | Construction Workforce Numbers | Timing of Construction | Operational Workforce Numbers | Construction Timeframe Overlap | Geographical Location |
|---|---|---|---|---|---|---|---|
| Kyoto Energy Park | Construction and operation of a renewable energy generating facility with a total generating capacity of up to 137 MW and associated infrastructure, including the following components:<br>• 42 wind turbines with a total generating capacity of up to 126 MW<br>• 3-10 MW capacity solar photovoltaic array<br>• 1 MW closed loop hydro plant<br>• maintenance shed, manager residence and Visitor Education Centre<br>• internal access roads<br>• substation, switchyard, control room and internal (33 kV) transmission cabling<br>• two options for connection to the existing overhead transmission network comprising a 13 km 66 kV transmission line to the new Scone sub transmission station or a 42 km 132 kV transmission line to the existing Muswellbrook sub transmission station | DoP Preparing Response | 50 locally | Phased - Not provided | 10-15 | Potential for Overlap | Closer to Muswellbrook |
| Drayton Coal Mine – Extension to approved mining disturbance area | Minor extension (7.5 ha) of the approved Drayton mining disturbance footprint and the addition of 12 ha of land to the Drayton Wildlife Refuge to provide an offset for the extended mining disturbance footprint | Undergoing Adequacy Review | NA | Unknown | 388 | Potential for Overlap | Closer to Muswellbrook |

| Project | Description | Status | Construction Workforce Numbers | Timing of Construction | Operational Workforce Numbers | Construction Timeframe Overlap | Geographical Location |
|---|---|---|---|---|---|---|---|
| Liddell Power Station East-West Gas Supply Pipeline | Construction and operation of a gas pipeline from nearby coal fields to supply gas fuel to supplement coal-fired electricity generation at the Liddell Power station | Approved (July 2009) | 3 | 3 months (fourth quarter 2009) | 1 | Unlikely | Closer to Muswellbrook |
| Mangoola (Anvil Hill) Coal Mine – Hunter River Pipeline Relocation | Relocation of the approved Hunter River water supply pipeline and minor changes to some other infrastructure | Approved June 2009 | Unknown | Unknown | Unknown | Potential for Overlap | Closer to Muswellbrook |
| Queensland Hunter Gas Pipeline – Wallumbilla to Newcastle | Construction and operation of a high pressure gas transmission pipeline from the Wallumbilla Gas Hub in South Central Queensland to the existing Sydney-Newcastle pipeline at Hexham, NSW | Approved (February 2009) | 800 | 8 months | 150 | Potential for Overlap | Closer to Muswellbrook |
| Mount Arthur Coal Mine – P 06 0091 (Underground Project) | Construction and operation of an underground coal mine at the existing Mount Arthur Coal Operations, including ROM production of up to 8 Mtpa for 21 years; increasing the capacity of the existing coal handling and preparation plant and associated facilities from 20 to 30 Mtpa; and transporting this coal to markets via the existing rail coal loading facility at the Mount Arthur North mine | Approved (December 2008) | 500 | 2 year period | 250 | Potential for Overlap | Closer to Muswellbrook |

Geographically, the identified major projects proposed for the region are located in proximity to Singleton (refer to **Figure 23-1 and Table 23-1**). Using Ravensworth as the half way divide between Muswellbrook and Singleton, approximately 75% of the significant projects lie closer to Singleton township with approximately 25% of the significant projects lying south of Singleton. Given the proximity of the significant developments to Singleton, it is anticipated that the greatest influence of the cumulative pressures from new developments in the region may be focused on the Singleton Township. The proposed Bayswater B Project lies mainly within the vicinity of Muswellbrook and it is anticipated, unlike the majority of identified major projects, the greater proportion of the Bayswater B proposal's cumulative pressures are likely to be focussed on the Muswellbrook township.

### 23.2.1 Workforce Impacts Summary

Based on a worst case scenario the following assessment can be made on the potential workforce pressures on the townships of Singleton and Muswellbrook.

A worst case scenario would be that all the identified projects occur at the same time and that all workforce personnel are required to be externally sourced. In reality, not all the projects may be undertaken concurrently and there is a probability that employees would be sourced from the local area as well as from the wider region and beyond.

However, for the purposes of assessing the potential cumulative effects, the worst case scenario serves to illustrate the maximum (from known project sources) potential effect.

**Table 23-2: Summary Potential Workforce Numbers in the LGAs**

| | Construction | Operation |
|---|---|---|
| Singleton | Approximately 1400* | Approximately 2600* personnel |
| | 237 personnel (equal to 25% Bayswater construction workforce) | Approximately 34 personnel (equal to 25% of Bayswater operational workforce) |
| **Total** | **Approximately 1,637*** personnel | **Approximately 2,634*** personnel |
| Muswellbrook | Approximately 1600* personnel | Approximately 1600* personnel |
| | 712 personnel (equal to 75% Bayswater construction workforce) | Approximately 101 personnel if coal fired equal to 75% of the Bayswater operational workforce (which represents worst case of the two generating technologies) |
| **Total** | **Approximately 2,312*** personnel | **Approximately 1,701*** personnel |

Note: Approximately 34 if coal fired equal to 25% of Bayswater operational workforce (which represents worst case of the two generating technologies)

* Table 2 provides estimated numbers of personnel as identified in the Environmental Assessments for each individual project in the locality. Where numbers of personnel were not included these have been excluded from calculations.

## 23.3 Assessment of Cumulative Impacts

### 23.3.1 Environmental Matters

The proposed larger projects in the main involve the construction of pipelines and extensions of mining areas or mining quantities in the region with these projects occurring in both the Singleton and Muswellbrook area. Given the type of developments proposed, it is considered that the greatest impacts of a cumulative nature would be:

- Increase in traffic transporting construction materials to the development sites;
- Increase in traffic removing coal or soil material from the development sites;
- Increased dust generation from extractive industries operational in the locality;
- Increased greenhouse gasses resultant form the development;
- Potential impacts to air quality from increased power generation activities; and
- Increased noise from construction activities and operational extractive industries.

Given the spread of larger projects is distributed between Singleton and Muswellbrook, it is expected that the cumulative impacts from these larger developments would be distributed in both Muswellbrook and Singleton townships. However, it is likely that the cumulative impact of larger projects in the Singleton area, in combination with the higher proportion of major projects in the region also being focused around Singleton, may result in a greater impact to that town. The majority of these issues are addressed through each individual project and would be managed through project specific mitigation measures as identified in the individual Environmental Assessments and/or Conditions of Approval.

### 23.3.2 Social and Economic Environment

The cumulative impacts of the proposed Bayswater B project and the other proposed developments in the locality are targeted at the social aspects of the Singleton and Muswellbrook Townships (refer to **Chapter 18**). These include:

- Increased accommodation pressures;
- Increased construction and operational traffic;
- Increased pressures on services and infrastructure (water, waste, etc);
- Increased green house gas emissions
- Potential to decrease local air quality; and
- Competition for educational and childcare services;

The cumulative impacts of the proposed Bayswater B Project and that of the combined regional developments would be addressed through mitigations in the detailed design stage of the project. This may include measures to ensure adequate accommodation and infrastructure resources are available for the proposal.

A review of the Environmental Assessment during the detailed design stage and an assessment of the construction logistics, in particular socio-economic considerations, traffic and transport and cumulative impacts with other developments, would be undertaken to identify additional constraints and develop detailed mitigation measures for the development. This review would analyse current and proposed project activity with the aim of updating / preparing management plans to support the proposed Bayswater B project construction logistics.

## 23.4 Residual Impacts

The mitigation and detailed planning undertaken for the proposed Bayswater B project is targeted at minimising potential impacts of the development on the locality. While this development has proposed mitigation measures to minimise cumulative impacts to the region, the potential for local and regional cumulative impacts may still be present from other projects that may increase pressure on services and infrastructure. The minimisation of potential impacts is primarily related to the specific mitigation measures developed for each of these individual projects. Where these measures are not adequate, the potential for increased residual impacts may increase.

## 23.5 Conclusion

The cumulative impacts of the proposal have been considered with respect to impacts associated with the proposed development, in addition to impacts associated with other projects in the region. The cumulative impact of the combined developments in the region has the potential to exacerbate the use of infrastructure and service resources within Muswellbrook and Singleton, and may impact on accommodation availability and price in the locality, as well as community service provision and access to childcare services. Mitigation measures to address these potential impacts would be addressed in the detailed design stage of the proposed Bayswater B project and would include consultation with Council, Department of Planning and other relevant Government Authorities to create a coordinated approach to impact management and ensure all issues are resolved.

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AECOM

SIGNIFICANT PROJECTS IN MUSWELLBROOK AND SINGLETON

Environmental Assessment

Bayswater B Power Station

Figure 23.1

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# 24.0 Environmental Management

*The purpose of this chapter is to provide information in relation to the management of environmental impacts during the course of the construction and operation of the project. The chapter outlines the management plans to be prepared in respect of the project responsibilities and monitoring and reporting requirements to ensure that the potential impacts of the project are minimised.*

## 24.1 Introduction

Subject to the granting of Concept Plan Approval, the proposed development would be implemented as described in this EA and in accordance with other approvals and relevant legislative and regulatory requirements and guidelines, conditions of the Concept Plan Approval and/or any subsequent conditions of approval.

A Statement of Commitments (SoC) has been prepared for the project in accordance with the EARs, however a more detailed account of the environmental management measures and monitoring to be undertaken in respect of the project would be incorporated into the Proponent's Construction Environmental Management Plan (CEMP) and the Operating Environmental Management Plan (OEMP).

The CEMP would incorporate the following sub-plans:

- Air Quality Management Plan (AQMP)
- Soil and Water Management Plan (SWMP)
- Noise Management Plan (NMP)
- Vegetation Management Plan (VMP)
- Traffic Management Plan (TMP)
- Waste Management Plan (WMP)
- Emergency Spill Preparedness and Response Plan (ESPRP)
- Rehabilitation Management Plan (RMP).

The OEMP would incorporate the following sub-plans:

- Air Quality Management Plan including an Air Quality Monitoring Program
- Soil and Water Management Plan including a Water Quality Monitoring Program.
- Noise Management Plan
- Vegetation Management Plan (applicable for at least 5 years following construction)
- Ash Disposal Plan (coal fired option only)
- Waste Management Plan
- Emergency Spill Preparedness and Response Plan

Management functions are outlined in **Section 24.4** in respect of the roles and responsibilities for implementing the various components of the CEMP and OEMP. The following sections provide further details of the CEMP and OEMP and their sub-plans.

## 24.2 Construction Environmental Management Plan

The CEMP would detail specific management strategies to be implemented during the construction phase of the proposed development, including strategies and protocols relating to soil and water management, protection of vegetation to be retained, fauna protection, rehabilitation strategies, containment of waste, and an emergency response program for accidental spills and other emergencies. The Proponent would develop an induction program for the CEMP and induct site workers involved in construction activities (whether directly or indirectly) into the CEMP program prior to their commencement of duties.

A number of management sub-plans would form part of the CEMP. The CEMP would be prepared in consideration of the relevant legislation and guidelines. The management sub-plans are outlined below.

### 24.2.1 Air Quality Management Plan

An AQMP would be prepared and implemented outlining activities required to manage and minimise dust and vehicle emissions during the construction of the power station and associated infrastructure. Mitigation measures for construction would include:

- Control of access via sealed roadways
- Vehicle speed limits on site
- Monitoring of wind speed and direction to manage dust-generating activities during undesirable conditions
- Contingency measures in the event of adverse weather conditions
- Minimisation of areas of disturbed soils during construction
- Dust suppression with water sprays or other media during windy periods (as required)
- Stockpiling of soils on site to be kept to a minimum
- Excavation with limited soil free fall
- Management procedures governing the concrete batching plant, including transport and storage of materials and materials handling (including controlled loading to avoid dust plumes)
- Construction equipment idling time minimisation and appropriate engine tuning and servicing to minimise exhaust emissions
- Procedures to address complaints received
- Development of contingency measures.

The AQMP would be specifically tailored for the preferred technology. For example, if gas is the preferred option, the AQMP would be tailored to account for the construction of the gas pipeline and the potential for dust emissions from that activity, whereas if coal is the preferred option, the AQMP would be tailored to account for the construction of conveyors and coal stockpiles.

### 24.2.2 Soil and Water Management Plan

The SWMP would incorporate the relevant identified mitigation measures as described in **Chapter 11** and **12** and would be submitted to the Director-General prior to construction. Components of the Rehabilitation Management Plan (**Section 24.2.4**) would also be relevant to soil and water management. Mitigations in the SWMP would indentify mitigations measures including:

- Assess the soil and water implications at the development planning stage, including those relating to ecologically sustainable development (ESD). Investigate the salinity and the acid sulfate potentials of the soils where their disturbance is likely to expose and/or exacerbate the problem
- Plan for erosion and sediment control concurrently with engineering design and before earthworks begin, ensuring proper assessment of site constraints and integration of the various components.
- Minimising the area of soil disturbed and exposed to erosion, maintaining surface cover where possible and minimising the area of disturbance required at any one time through careful construction staging and progressive rehabilitation of completed areas
- Conserve topsoil for later site rehabilitation/revegetation and avoid mixing subsoil with topsoil and
- Minimising the volumes of water required to be handled by diverting clean water around all disturbed areas, and controlling water flow from the top of, and through the development area
- Rehabilitate disturbed lands quickly including temporary erosion control earthworks and revegetation
- Maintain soil and water management measures appropriately during the construction phase
- Best-practice management and recycling of slurry / wastewater from the concrete batching plant with no offsite discharge of water
- Treating the surface of areas required for construction traffic, parking, storage and amenities to provide adequate drainage and prevent soil loss (i.e. temporary seal or gravel pavement)
- Provision of truck wash facilities to remove soil from vehicle wheels and undercarriage with water directed to an oil-grit trap and subsequently a sediment basin prior to discharge
- Provision of sedimentation basins, traps, and fencing as required to capture and treat runoff from disturbed areas, including a regime for inspection and removal of accumulated sediment
- Storage of potential contaminants (i.e. fuels, oils or chemicals) within bunded, covered and lined areas
- Location of designated bunded areas at least 10m away from watercourses or drains, with repair and maintenance work to plant and vehicles subjected to the same controls
- Work procedures to minimise the risk of accidental release of pollutants and development of spill preparedness and emergency response procedures for accidental spills

- Avoidance where possible of disturbance to watercourses. Where works are necessary, special precautions would be implemented to reduce erosion and sediment impacts, and works would be completed in the shortest timeframe possible and in dry, fine conditions.
- In order to be protective of threatened species, temporary sediment control devices would be installed where necessary to control sediment (i.e. upstream of any existing drain inlets, downslope of steep slopes) and would be maintained regularly. Care would be taken to ensure sediment control devices are in place during shut down periods and over weekends.

### 24.2.3 Noise Management Plan

Prior to the commencement of site preparation works or construction, a Construction Noise Management Plan would be prepared outlining noise mitigation measures, noise monitoring and management procedures to be implemented to minimise noise impacts during the construction phase of the project.

The DECCW "*Draft Construction Noise Guidelines"* recommends that the proponent demonstrates best practicable means and include noise mitigation measures in the CEMP to minimise the noise impact at sensitive receivers. This may include the work practices described below.

- Community notification:
  - Contact potentially noise-affected neighbours at the earliest possible time before any site work begins;
  - Inform potentially noise-affected neighbours about the nature of the construction stages and the noisier activities – for example excavation and rock-breaking;
  - Give clear indication to potentially noise-affected neighbours of how long noisy activities would take;
  - Describe any noise controls, such as walls to be built first that would reduce noise, temporary noise walls, or use of silenced equipment;
  - Keep potentially noise-affected neighbours up to date on progress;
  - Provide contact details on a site board at the front of the site, and keep a complaints register suited to the scale of works;
  - Ask about any concerns that potentially noise-affected neighbours may have and discuss possible solutions;
  - Provide a copy of the noise management plan to potentially noise-affected neighbours.
- Noise monitoring:
  - Initial monitoring to be undertaken within one week following construction activities commencing on site to validate predicted noise and vibration limits, and on at least a monthly basis thereafter for the duration of construction; and
  - Noise monitoring to be undertaken in response to complaints.
- Operate plant in a quiet and efficient manner:
  - Turn off plant that is not being used;
  - Examine, and implement where feasible and reasonable, alternative work practices which generate less noise – for example use hydraulic rock splitters instead of rockbreakers, or electric equipment instead of diesel or petrol powered equipment;

- Examine, and implement where feasible and reasonable, the option of using silenced equipment.
- Ensure plant is regularly maintained;
- Locate noisy plant away from potentially noise-affected neighbours or behind barriers, such as sheds or walls; and
- Where reasonable, provide respite periods for very noisy activities.

- Involve workers in minimising noise:
  - Avoid dropping materials from a height;
  - Talk to workers about noise from the works and how it can be reduced; and
  - Use radios and stereos indoors rather than outdoors.
- Handle complaints:
  - Develop a process for handling and investigating any noise complaints
  - Review, and implement where feasible and reasonable, work practices to minimise noise from construction that are the subject of noise complaints.

### 24.2.4 Vegetation Management Plan

A Vegetation Management Plan (VMP) would be prepared as per the *Guidelines for Controlled Activities – Vegetation Management Plans* (DWE 2008). The VMP would be prepared prior to construction, for use during construction and for a maintenance period of at least 5 years. The VMP would include (but not would not be limited to):

- Measures to control grazing herbivores to protect regenerating vegetation or damage of planted seedlings (if required)
- Weed removal and control protocols, including an initial assessment of weed prevalence in retained vegetation areas
- Details of appropriate plant species and planting densities to be utilised in the revegetation sectors
- Use of seed and vegetative material of local provenance
- Measures to integrate fauna habitat enhancement with vegetation management (diversity of tree species, establishment of corridors, habitat enhancement for threatened species)
- Compliance with legislative and regulatory requirements when collecting native seed
- Identification of seed collection protocols: identification of optimal collection zones, sampling regime and quantities required
- Planting in corridor areas to provide appropriate vegetation structure for native fauna passage and linkage between vegetation patches
- A monitoring program with performance criteria and measures for restitution of damaged or supplementary plantings, if necessary
- The edge of the vegetation clearing (and edge of permanent maintenance zone) would be clearly marked with flagging tape to deter access beyond this point. Construction personnel would be trained to avoid unnecessary disturbance of these areas and creek banks
- Hygiene protocols for riparian vegetation removal activities to minimise weed spread

- Progressive slope stabilisation in accordance with the Managing Urban Stormwater: Soils and Construction (The Blue Book) and SWMP
- Once stabilised, planting of local native plants would be undertaken to assist in the restoration of the function of the riparian zone
- Pests would be controlled on an as needs basis.

The VMP also needs to be protective of threatened species, specifically ensuring that measures include:

- A pre-construction survey in relevant areas for threatened orchid species
- Pre-construction surveys for fauna species as required, particularly for the Green and Golden Bell Frog
- Other measures identified as part of the impact assessment for threatened species

It should be noted that if the pre construction survey identifies habitat and presence of the species and the detailed design confirms the extent to which there may be potential residual impacts, the Proponent may need to prepare a stand alone Green and Golden Bell Frog Management Plan. This would be prepared in consultation with DECCW.

### 24.2.5 Traffic Management Plan

The TMP would outline and manage construction-related traffic including heavy vehicles. The TMP would also address:

- Nomination of transport routes to and from the project site and to and from the proposed construction work camp
- Heavy vehicle access protocols
- Traffic speed control and road safety
- Deliveries and dispatch (management protocols and timing of delivery and dispatch)
- Timeframe limitations
- Traffic direction and control within the construction site
- Heavy vehicle and employee parking
- Employee transport
- Use of truck turnaround areas
- Access to laydown and temporary work areas.

### 24.2.6 Waste Management Plan

A Construction WMP would be prepared and implemented which would include the following waste management safeguards:

- Waste avoidance or minimisation via responsible purchasing of materials, efficient use of materials and staff and contractor awareness
- Measures to ensure that a high standard of ‘housekeeping’ would be maintained on the project site
- Procedures to classify wastes, including at a minimum separation of wastes into hazardous and non-hazardous materials

- Resource recovery, recycling and reuse strategies to be implemented for each type of waste material where applicable
- Management measures governing special waste, liquid waste, hazardous waste and general solid waste, including their transport by licensed contractor/s with disposal at appropriately licensed disposal facilities.
- Details of how waste would be quantified, stored, treated (on site) and disposed of
- Reporting and recording procedures to track wastes in accordance with regulations
- Appropriate spill, incident management and response procedures to be implemented including measures to avoid spillages of chemicals, liquids and other wastes
- Induction processes to ensure that staff and contractors are aware of their responsibilities to ensure that waste materials are managed appropriately
- Work sites to be cleaned up and rehabilitated following works

### 24.2.7 Emergency Spill Preparedness and Response Plan

The Construction ESPRP would detail measures to manage the emergency response to any fuel or chemical spills that could occur on-site, including the following components:

- Spill containment
- Collection and/or neutralisation of spilled material
- Disposal of spilled material and clean-up materials offsite through a licensed facility.

### 24.2.8 Rehabilitation Management Plan

A programme of rehabilitation is proposed as part of the project to ensure disturbed areas are left in an appropriate condition following completion of works. The RMP would include:

- Measures to manage rehabilitation of watercourse crossings:
  - Watercourse banks would be restored to their original profiles following construction
  - Stabilisation techniques such as the placement of rip rap, sand bags or gabion along the banks and bed at watercourse crossings shall be implemented as required to reinstate near original conditions;
  - Fencing to be installed where required to prevent access to restored sites to assist site recovery;
  - Site specific requirements for additional sediment and erosion control measures during and following rehabilitation may include terracing and surface water diversion berms, silt and sediment fences, re-seeding and replanting, application of stabilisation materials such as mulch, jute matting or other geotextile, minimising access, and application of appropriate soil management controls;
  - Topsoil excavated during construction to be stockpiled appropriately on site and reused along banks during rehabilitation to assist in bank stabilisation.

- General rehabilitation measures including:
  - Ground disturbance during rehabilitation to be minimised as far as practicable;
  - Installation and maintenance of sediment and erosion control measures, such as silt fencing surrounding exposed areas and stockpiles;
  - Soil and mulched vegetation to be stockpiled during the construction period where possible to be reused during the initial rehabilitation phase. Topsoil and subsoil would be replaced in an appropriate order;
  - Surfaces to be re-contoured to match the surrounding land and natural drainage lines would be re-instated;
  - Where revegetation is to be undertaken, native endemic species would be utilised.
  - Where the surrounding land use is agricultural, consultation would be undertaken with the land owner to determine appropriate rehabilitation.

## 24.3 Operation Environmental Management Plan

The OEMP would include strategies and protocols relating to soil and water management, protection of retained vegetation and rehabilitation areas, fauna protection, site closure and rehabilitation strategies, containment of waste, an emergency response program for accidental spills and other emergencies, and monitoring / auditing protocols.

Over and above this content, the OEMP would consist of the following management sub-plans:

- Air Quality Management Plan including:
  - An Air Quality Monitoring Program prepared in consultation with DECCW, which would include monitoring at commissioning for solid particles, hydrogen fluoride and acid gases, oxides of nitrogen and (for the coal option only, if applicable) sulphur dioxide and opacity. Post-commissioning, continuous monitoring would be implemented for oxides of nitrogen and (for the coal option only, if applicable) sulphur dioxide and opacity. In addition, quarterly post-commissioning monitoring would be undertaken for solid particles, hydrogen fluoride and acid gases, for either the gas or coal fired option.
  - For the coal fired option, measures to manage potential dust emissions from the coal stockpile including application of a dust suppression veneer to raw material stockpiles, minimisation of drop heights for raw materials, application of water sprays on haul roads and stockpile pads and wind guards on raw material transfer systems and conveyors
  - For the coal fired option, measures to minimise particulate emissions via fabric filter bag performance management, including progressive change-out of bags and an electronic system for tracking bag failure rates if appropriate
  - For the coal fired option, measures to manage potential dust emissions from ash disposal would be detailed in the Ash Disposal Plan (refer below).
- Soil and Water Management Plan including:
  - Measures to ensure that all unsealed areas, drainage and site landscaping would be regularly inspected and maintained to ensure no ongoing erosion is occurring and protect the site soils from degradation and erosion

- A Water Quality Monitoring Program would be established for the site detention basin, settling ponds and first flush pond to confirm they are achieving appropriate water quality treatment prior to discharge to Plashett Dam.

- Noise Management Plan would outline noise mitigation measures, noise monitoring and management procedures to be implemented to minimise noise impacts during the operation phase of the project. This Plan may also include the following methods of standard practice to avoid potential noise impacts:
  - Using components that do not emit tonal or low-frequency noise, using trenches, cuttings, tunnels and barriers for transport routes;
  - Using conveyor systems with low noise output, paying particular attention to rollers;
  - Maintaining plant and equipment to ensure that the designers' noise-output specifications continue to be met during the operation phase of the projects;
  - Using 'smart' reversing alarms;
  - Where low-frequency noise is difficult to isolate, seeking specialist advice about machinery redesign;
  - Reducing tonal noise through machinery redesign, enclosure; applying engineering noise control;
  - Within 90 days of the project commencing operation, monitor environmental noise levels at noise sensitive locations to determine compliance with the consent/licence conditions. Noise monitoring sites should at least include noise sensitive locations where noise levels are likely to be the highest;
  - Monitor noise levels as a result of community complaints. This may be done in addition to noise monitoring at various stages of the development described above, or could stand alone as the sole driver for performance monitoring; and
  - Establish a complaint hotline to record receiver complaints regarding the development, a system for logging complaints and dealing with them.

- Vegetation Management Plan, applicable for a maintenance period of at least five years following construction, including (but not limited to) the following:
  - Measures to control grazing herbivores to protect regenerating vegetation or damage of planted seedlings (if required)
  - Weed removal and control protocols
  - Measures to protect retained vegetation from operational activities where possible, including use of existing access tracks, parking of vehicles and location of equipment and stockpiles in existing cleared areas
  - A monitoring program with performance criteria and measures for restitution of damaged or supplementary plantings, if necessary

- Ash Disposal Plan (if coal fired technology becomes the preferred option) which would include measures based on the detailed design and confirmation of the final disposal point. The Ash Disposal Plan would outline specific management and mitigation measures to avoid, reduce or manage potential impacts to groundwater and surface water run-off from the disposal area and potential dust emissions. This would be controlled through management measures guiding transport of material, disposal and handling and rehabilitation. The Ash Disposal Plan would also include a monitoring plan for dust.

- Waste Management Plan, which for the operations period would include management measures regarding the following:
  - Waste avoidance or minimisation
  - Resource recovery, recycling and reuse strategies to be implemented for each type of waste material where applicable, including reuse of wastewater components. For the coal fired option, re-use of ash would be implemented where possible.
  - Other waste management measures as required
  - For the coal fired option, management procedures for ash disposal, as detailed in the Ash Disposal Plan.
- Emergency Spill Preparedness and Response Plan which would detail measures to manage the emergency response to any fuel or chemical spills that could occur on-site.

## 24.4 Roles and Responsibilities

Internally, the requirements of both the CEMP and OEMP would be monitored by the Proponent, audited and approved in the first instance by the Environmental Manager, and subsequently if required by an independent Environmental Consultant.

The structure of the environmental team and their collective and individual responsibilities would be confirmed in the CEMP and OEMP.

## 24.5 Training and Induction

Construction and operations personnel would be required to attend an induction prior to the commencement of activities for the construction and operation of the Project and its components. The induction would ensure that all personnel are fully aware of their OH&S and environmental responsibilities and gain the necessary knowledge and skills to fulfil their responsibilities. Inductions and/or training required for specific sites would be conducted for personnel prior to the start of work at that site. Induction would address general environmental and OH&S management issues identified in this EA, including any specific issues which would be identified in the appropriate management plans.

It would be the responsibility of all Contractors to prepare and implement an induction and job specific training program appropriate to their methods of work. Approval from the Proponent would be required prior to implementation.

## 24.6 Inspection, Monitoring and Auditing

Inspection, monitoring and auditing would be undertaken to assess and record whether activities are in compliance with regulatory requirements and the objectives outlined in the CEMP and OEMP.

### 24.6.1 Outline of Environmental Reporting

Environmental reporting is an important tool for environmental management as it can facilitate the collection of information regarding environmental impacts and issues thereby facilitating the identification of possible solutions to minimise these potential impacts. Environmental reporting also brings benefits to the performance and efficiency of an operation. During the construction and operational stages of this Project, environmental reporting would be considered a vital component. Reporting information would include:

- Compliance reports;
- Remedial actions undertaken resulting from the reporting of an incident;
- Checklists to address operational compliance;

- Details of any stakeholder consultation and meetings;
- Outcomes of any auditing that is carried out; and
- The findings of any monitoring that is conducted.

The Proponent would ensure that reporting undertaken in relation to environmental and OH&S issues would be in compliance with the relevant licence conditions and regulatory requirements.

### 24.6.2 Outline of Environmental Auditing

Environmental compliance auditing would be undertaken to assist in identifying the environmental impacts associated with the construction and operational phases of the Project.

Inspection of construction and operational activities would be undertaken on a regular basis by a suitably qualified person. On-going monitoring of these activities would be essential to ensure compliance with regulatory requirements and conditions of approval.

The Proponent would ensure that records are kept of auditing that is conducted. Based on results of the audits, the Proponent would ensure modifications and corrective actions are undertaken to rectify identified environmental impacts or concerns of the project.

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# 25.0 Statement of Commitments

*This Chapter provides a summary statement of commitments for the project and addresses the Director-General's Environmental Assessment Requirements as follows:*

***Statement of Commitments***

*The Environmental Assessment must include a draft Statement of Commitments detailing measures for environmental mitigation, management and monitoring for the project.*

## 25.1 Introduction

In accordance with the EARs, the following Statement of Commitments (SoC) is provided. As required by the EARs, the SoC for the project describes measures for environmental mitigation, management and monitoring which would be undertaken as part of the proposed project during detailed design, construction and operational activities, to ensure that the potential impacts identified in this EA are appropriately managed.

## 25.2 Statement of Commitments

The SoC prepared in respect of the proposed construction and operation of the Bayswater B project has been compiled on an issues basis and is informed by the environmental risk analysis and impact assessment undertaken as part of this EA. The SoC has been written in a format which can be incorporated into an approval issued to act as the conditions of that approval.

**Table 25-1: Statement of Commitments**

| Commitment |
|---|
| **General Commitments** |
| 1. The Proponent will undertake the activities, the subject of the Concept Approval in accordance with the general descriptions and details provided in this EA, including the mitigation and management measures identified in this EA. |
| 2. The Proponent will gain all necessary approvals and permits supporting both construction and operation. |
| 3. The Proponent will prepare and implement the following management plans for the project:<br>- A Construction Environmental Management Plan (CEMP) and<br>- An Operations Environmental Management Plan (OEMP). |
| 4. The Proponent will undertake further detailed environmental assessment on a range of issues as identified in this SoC. |
| 5. The Proponent will ensure that the final design footprint of the Bayswater B power station is determined in consideration of relevant environmental constraints with a view to minimising the potential impacts of the Project. |
| 6. The Proponent will ensure that the final design locations of linear infrastructure associated with the Project (roads, conveyors, pipelines) are selected generally in line with the following:<br>- In existing disturbed areas wherever possible<br>- Avoiding vegetation, watercourses and riparian areas<br>- Avoiding Aboriginal heritage places or items<br>- Utilising existing access tracks where practicable |

| Commitment |
|---|
| - Avoiding impacts on existing infrastructure<br>- On relatively flat ground (i.e. less than 10% gradient)<br>- Considering visual effects and opportunistic use of natural screening such as vegetation<br>- Considering land use and landowner preferences. |
| **Air Quality**<br>7. The Air Quality Assessment will be reviewed during the detailed design phase.<br>8. An Air Quality Management Plan will be prepared for inclusion in the CEMP and OEMP<br>9. Air quality management practices will be included within the Ash Disposal Plan to guide operations (if coal fired technology is selected)<br>10. An Air Quality Monitoring Program for the operations phase of the project will be prepared once selection of the preferred technology has been undertaken. |
| **Greenhouse Gas**<br>11. The Proponent will undertake a review at least every two years of the viability of carbon capture, transport and storage technologies, along with opportunities to invest in carbon offset projects. The results of each review would be provided in a report to DoP. |
| **Water Management – Detailed Design Phase**<br>12. The Proponent will undertake the detailed design of the project supported by the considerations outlined in the Water Quality section of this EA in order that the project and its drainage catchment areas can be designed to appropriately divert and treat where necessary, stormwater and wastewater.<br>13. The Proponent will prepare a Soil and Water Management Plan, including a Water Quality Monitoring Program, as part of the OEMP<br>14. The Proponent will prepare an Emergency Spill Preparedness and Response Plan as part of the OEMP |
| **Water Management – Construction Phase**<br>15. The Proponent will prepare a Soil and Water Management Plan as part of the CEMP<br>16. The Proponent will prepare an Emergency Spill Preparedness and Response Plan as part of the CEMP<br>17. Where construction of access roads or pipelines to the proposal and connecting roads/infrastructure involves crossings of, or works near, a watercourse, the Proponent will ensure that a controlled activity approval is obtained under Clause 91 of the *Water Management Act 2000*. |
| **General Soil Management**<br>18. The Proponent should undertake further testing and design modifications for sodic and dispersible soils, salinity, gypsum requirement, structural hazards and acidity prior to construction.<br>19. The Proponent will prepare a Soil and Water Management Plan as part of the CEMP and the OEMP (refer also above). The OEMP will include measure to address long term management of potential issues such as salinity, erosion and acidity. |
| **Rehabilitation – General**<br>20. The Proponent will prepare a Rehabilitation Management Plan as part of the CEMP. |

| Commitment |
|---|
| **Groundwater – General**<br>21. If coal is selected as the preferred technology, the Proponent will prepare an Ash Disposal Plan which will address potential impacts on groundwater.<br>22. The Proponent should ensure that seepage of water into excavations during construction (which may occur following rainfall events) is managed in accordance with the CEMP to be prepared for the Site.<br>23. The CEMP will also include measures for the response to and management of potential spills and leaks |
| **Noise**<br>24. As part of the CEMP the Proponent will prepare a Construction Noise Management Plan in accordance with the DECCW "*Draft Construction Noise Guidelines"*.<br>25. As part of the OEMP the Proponent will prepare a Operational Noise Management Plan in accordance with the DECCW "*Industrial Noise Policy*" |
| **Flora and Fauna Management – General**<br>26. The Proponent will review the Flora and Fauna Assessment on the basis of the detailed design to ensure that the impact assessment is appropriate.<br>27. The Proponent will undertake pre-construction surveys during an appropriate season for *Litoria aurea* (Green and Golden Bell Frog), *Diuris pedunculata* (Small Snake Orchid) and *D. tricolour* (Pine Donkey Orchid).<br>28. The Proponent will prepare a Vegetation Management Plan as part of the CEMP.<br>29. The Proponent will ensure that the VMP, the RMP and the SWMP contain appropriate measures to avoid or reduce secondary/downstream impacts, including the effects and requirements of rehabilitation. |
| **Heritage**<br>30. The Proponent will fence off and avoid highly significant Aboriginal heritage sites.<br>31. The Proponent will ensure that the contents of Aboriginal sites impacted by the development are collected and relocated (set-aside) to the closest area within the same landform not impacted by the development. The site relocation exercise will be conducted by the Aboriginal community working with an archaeologist who will recorded the destination locations of artefacts moved and prepare a report to be deposited with relevant DECCW files.<br>32. The Proponent will ensure that a program of archaeological test excavation is undertaken prior to Project Approval to clarify the extent of potential archaeological deposit on site and to identify appropriate areas of concentrated archaeological material suitable for archaeological salvage excavation as outlined in **Appendix G**.<br>33. The Proponent will ensure that archaeological salvage excavation occurs in locations of significant deposit or features as identified through test excavations. The salvage methodology may include a number of excavation methods and will be limited to the development impact area.<br>34. The Proponent will ensure that the archaeological salvage methodology is detailed in a research design document prepared in consultation with DECCW and DoP.<br>35. The Proponent will ensure that the Aboriginal community is involved in the salvage excavations.<br>36. The Proponent will ensure that salvaged Aboriginal heritage material / recovered artefacts are managed as specified in this EA. |

| Commitment |
|---|
| **Social and Economic Assessment**<br>37. The Proponent will prepare a detailed design and construction logistics reports based on the information provided in this EA in order to plan appropriately to avoid where possible all potential negative effects<br>38. The Proponent will ensure that the construction logistics/planning takes account of potential construction staging and timeframes that coincide with other major project development as well as coincide with tourism peak times and local festivals<br>39. The Proponent will ensure that the location of the construction workers camp is considered with due care and attention in order that workforce requirements are carefully managed<br>40. The Proponent will review and update the Social and Economic Assessment contained in this EA on the basis of the finalised detailed design and construction logistics report to confirm the extent of potential effects and will consult with Muswellbrook and Singleton Councils.<br>41. The Proponent will ensure that the CEMP includes:<br>- Traffic management including management of delivery times, shift times and transport routes to be protective of sensitive receptors and amenity users (such as school zones, quiet areas and hospitals)<br>- Workforce management plan to ensure ongoing principles are observed, including management structure of the site<br>- Stakeholder engagement plan to ensure ongoing communication with the community regarding progress, and including a complaints handling procedure<br>- Rehabilitation plan that includes the process for making good damage caused during the construction period. |
| **Hazard and Risk**<br>42. The Proponent shall ensure that fuel filling points for bunded fuel storage tanks and road tanker fill area be located no closer than 12 m to buildings and structures at the proposed power station.<br>43. The Proponent shall implement the following regarding the gas spur pipeline (if gas fired technology is selected):<br>- Where the pipeline crosses roads or where residences are at 100 m from the pipeline in open land areas, the depth of cover over the pipeline shall be increased to 1200 mm (the length of the increased depth should be 100 m either side of the road and 100 m in either direction from the perpendicular to the property residence).<br>- Pipeline marker tape shall be installed 300 mm below the ground surface where the pipeline crosses roads (marker tape should be installed for 50 m either side of the road).<br>- Pipeline location signs located along the pipeline route shall be no more than 50 m apart, notwithstanding any clear visibility along a straight flat section of the pipe route.<br>- A safety management system shall be developed specifically for the pipeline, which should include regular pipeline route and equipment inspections, line pigging with intelligent pigs every 5 years, inspection and checking of the impressed current corrosion protection system.<br>44. The Proponent will ensure that storage of chlorine cylinders is in a depot designed to comply with the requirements of AS2927-2002. The chlorine storage area will be fitted with safeguards including gas detection, alarms and a chlorine shut down system. The Proponent will also ensure that:<br>- Pigtails should be replaced regularly (e.g. once every 6 months) to minimise the potential for premature failure |

| Commitment |
| --- |
| - As per AS2927-2002 chlorine storage and handling components with potential for failure should be inspected regularly to identify wear or potential failure points, with maintenance or replacement as required<br>45. The Proponent will ensure that ammonia is stored to reduce the risk of accidental release include the following safeguards:<br>- The ammonia tank filling point would be protected by impact barriers.<br>- Ammonia transfer operations would be attended by the delivery driver, who would activate the emergency shut down of the transfer in the event of a leak<br>- The ammonia tank and associated pipework would be fitted with gas detectors and a permanent fire water fog nozzle.<br>46. The proponent will apply to CASA for an “Operational Assessment of a Proposed Plume Rise”.<br>47. The Proponent will notify CASA of the final stack height (depending on whether the gas or coal option is selected) for inclusion in the RAAF Aeronautical Information Service tall structure database. |
| **Traffic**<br>48. The Proponent will ensure that a Traffic Management Plan is prepared as part of the CEMP |
| **Waste**<br>49. The Proponent will ensure that a Waste Management Plan is prepared for inclusion in both the CEMP and OEMP.<br>50. The Proponent will prepare an Ash Disposal Plan (if coal fired technology is selected) |

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# 26.0 Residual Risk Analysis

## 26.1 Approach

The Residual Environmental Risk Analysis for the proposed Project is based on a process adapted from Australian Standard AS 4360:2004 Risk Management. The process is qualitative and is based on the Residual Risk Matrix shown below.

Residual Environmental Risk is assessed on the basis of the significance of environmental effects of the proposed project and the ability to confidently manage those effects to minimise harm to the environment.

The significance of environmental effects is given a numerical value between 1 and 5 based on the receiving environment, the level of understanding of the type and extent of impacts and community response to the environmental consequences of the project. This enables both the actual and perceived impacts to be considered. The manageability of environmental effects is similarly given a numerical value between 1 and 5 based on the complexity of mitigation measures, the known level of performance of the safeguards proposed and the opportunity for adaptive management. The numerical value allocated for each issue is based upon the following considerations.

**Significance of Effects**

| | |
|---|---|
| *5. Extreme* | Undisturbed receiving environment; type or extent of impacts unknown; substantial community concern. |
| *4. High* | Sensitive receiving environment; type or extent of impacts not well understood; high level of community concern. |
| *3. Moderate* | Resilient receiving environment; type and extent of impacts understood; community interest. |
| *2. Minor* | Disturbed receiving environment; type and extent of impacts well understood; some local community interest. |
| *1. Low* | Degraded receiving environment; type and extent of impacts fully understood; uncontroversial project. |

**Manageability of Effects**

| | |
|---|---|
| *5. Complex* | Complicated array of mitigation measures required; safeguards or technology are unproven; adaptive management inappropriate. |
| *4. Substantial* | Significant mix of mitigation measures required; limited evidence of effectiveness of safeguards; adaptive management feasible. |
| *3.Straight forward* | Straightforward range of mitigation measures required; past performance of safeguards is understood; adaptive management easily applied. |
| *2. Standard* | Simple suite of mitigation measures required; substantial track record of effectiveness of safeguards; adaptive management unlikely to be required. |
| *1. Minimal* | Little or no mitigation measures required; safeguards are standard practice; adaptive management not required |

The significance and manageability numbers are added together to provide a result which provides a ranking of potential residual effects of the project when the safeguards identified in this EA are implemented. Refer to **Table 26-1** Residual Risk Matrix.

**Table 26-1: Residual Risk Matrix**

| Significance of Effects | Manageability of Effects | | | | |
|---|---|---|---|---|---|
| | 5 Complex | 4 Substantial | 3 Straightforward | 2 Standard | 1 Minimal |
| 1 Low | 6 (Medium) | 5 (Low/Medium) | 4 (Low/Medium) | 3 (Low) | 2 (Low) |
| 2 Minor | 7 (High/Medium) | 6 (Medium) | 5 (Low/Medium) | 4 (Low/Medium) | 3 (Low) |
| 3 Moderate | 8 (High/Medium) | 7 (High/Medium) | 6 (Medium) | 5 (Low/Medium) | 4 (Low/Medium) |
| 4 High | 9 (High) | 8 (High/Medium) | 7 (High/Medium) | 6 (Medium) | 5 (Low/Medium) |
| 5 Extreme | 10 (High) | 9 (High) | 8 (High/Medium) | 7 (High/Medium) | 6 (Medium) |

## 26.2 Analysis

The analysis of residual environmental risk for issues related to the proposed Bayswater B Project is shown in **Table 26-2**. This analysis indicates the environmental risk profile for the proposed project based on the assessment of environmental effects, the identification of appropriate safeguards, and the SoC included in this EA.

**Table 26-2: Risk Profile**

| Issue | Significance | Manageability | Residual Risk |
|---|---|---|---|
| Air Quality | 3 | 2 | 5 (Low/Medium) |
| Greenhouse Gas Emissions | 3 | 2 | 5 (Low/Medium) |
| Surface Water | 2 | 2 | 4 (Low/Medium) |
| Soils and Land Capability | 2 | 3 | 5 (Low/Medium) |
| Groundwater | 3 | 3 | 6 (Medium) |
| Noise and Vibration | 2 | 2 | 4 (Low/Medium) |
| Flora and Fauna / EPBC | 3 | 2 | 5 (Low/Medium) |
| Heritage | 3 | 2 | 5 (Low/Medium) |
| Socio Economic | 3 | 3 | 6 (Medium) |
| Visual | 1 | 1 | 2 (Low) |
| Hazard and Risk | 2 | 2 | 4 (Low/Medium) |
| Traffic and Transport | 3 | 3 | 6 (Medium) |
| Waste | 2 | 2 | 4 (Low/Medium) |
| Cumulative Impacts | 3 | 3 | 6 (Medium) |

The above residual risk analysis indicates that the proposal presents an overall low to medium risk in relation to each of the identified environmental issues, provided that the recommended mitigation, management and monitoring measures are implemented.

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# 27.0 Project Justification

*This Chapter provides the Project Justification and addresses the requirements of the Director-General as follows:*

**Project Justification** – the Environmental Assessment must include:

*A conclusion justifying the project taking into consideration the environmental, social and economic impacts of the project; the suitability of the site; and the public interest.*

## 27.1 Introduction

Schedule 2 of the EP&A Regulation requires that justification of any proposed project be provided with regard to biophysical, economic and social considerations together with the principles of ESD. The assessment of the proposed Project undertaken in this EA has integrated these considerations and principles.

This chapter provides a justification of the Project in line with the requirements of the EP&A Regulation and the Director General's EARs for the project, based upon the site location and economic, biophysical and social considerations. This chapter also examines Ecologically Sustainable Development (ESD) as it relates to the Project and also the consequences of not proceeding.

The proposed Project has the potential to provide substantial benefits, including stimulus of the local, regional and State economies along with the provision of sufficient electricity supply for NSW. The Project would therefore have resultant benefits for the local and wider community and economy, as well as for present and future generations.

## 27.2 Suitability of Location

The proposed Project site is largely cleared grazing land, on which the proposed project would have minimal environmental impacts. The surrounding area has a long-running history of similar activities to the proposed Project, including power stations and coal mines, indicating that the Project would be consistent with other industrial activities in the area. The site provides opportunities for industrial expansion in the local region while maintaining a sustainable impact on the environmental, social and cultural elements of the environment.

The studies which form part of this EA have enabled the identification of a project footprint which minimises environmental impacts. Compatibility of the Project with the local environment has been considered as part of the EA in order to allow for up front consideration of environmental constraints in the detailed design process.

The Project site is located approximately 5 km from the nearest residential properties, which presents a buffer to minimise conflicting land use impacts. Compatibility of the Project with current and future land uses would be facilitated through consultation with affected landowners and other stakeholders with the regard to the siting of the various project components, particularly the gas pipeline if applicable.

At this concept stage, linear infrastructure routes (access roads, water pipelines and/or the gas pipeline if applicable) are indicative only. Further assessments would be undertaken on these during the detailed design phase to determine the most appropriate location within environmental and land use constraints.

Mitigation measures would be implemented during the construction and operation phases to ensure the Project has minimal adverse impact. The preliminary design of the Project and the assessment of potential impacts presented in this EA show that the Project is able to be constructed and operated in a manner which is compatible with existing and future land uses.

## 27.3 Environmental Considerations

The EA has assessed the biophysical environment and the potential impacts associated with the proposed Project, including the following aspects:

- Air quality and GHG emissions (**Chapters 9** and **10**)
- Surface water and groundwater (**Chapters 11** and **13**)
- Land use and soils (**Chapter 12**)
- Flora and fauna and EPBC matters (**Chapters 15** and **16**)
- Waste (Chapter 22)
- Cumulative impacts (**Chapter 23**).

Each of the abovementioned studies concluded that the implementation of a range of environmental safeguards and measures as recommended throughout this EA would mitigate potential impacts, and that the proposal would not have a significant adverse impact on the biophysical environment. The proposal is therefore justifiable taking into account potential impacts on the biophysical environment.

### 27.3.1 Air Quality and GHG Emissions

The air quality impact assessment (**Chapter 9**) demonstrated that both the gas and coal fired technology options would result in a relatively minor impact on ambient air quality. Any potential impacts would be minimised via on-site management measures.

The GHG assessment (**Chapter 10**) indicated that whilst the Project would have a significant emissions footprint, this would be mitigated by implementation of appropriate technology to minimise GHG emissions as much as practical. Through the course of the Project an ongoing review process would be undertaken by the Proponent to identify the point where CCS would be feasible to implement. This would reduce the Project's total GHG footprint.

### 27.3.2 Surface Water and Groundwater

The surface water assessment (**Chapter 11**) showed that the Project would not impact upon downstream off-site waterways or water users. Implementation of appropriate management measures including a Soil and Water Management Plan (as part of a CEMP during construction) would ensure that any potential impacts would be minimised.

Assessment of potential impacts on groundwater (**Chapter 13**) indicated that adverse impacts to the groundwater as a result of the proposed Bayswater B project are not anticipated to be significant and would be minimised via appropriate management procedures. For the coal fired option, potential impacts from ash disposal would be assessed during the detailed design phase (once coal source, plant design and ash disposal site are confirmed) and would be addressed in an Ash Disposal Plan.

### 27.3.3 Land Capability

Likewise, the assessment of land capability (**Chapter 12**) concluded that appropriate site management including erosion and sedimentation controls would ensure that there would be no residual impacts to soils or land capability.

### 27.3.4 Flora, Fauna and EPBC Matters

The flora and fauna assessment (**Chapter 15**) indicated that construction of the Project would result in the removal of small areas of native vegetation and that construction and operation have the potential to impact on fauna habitat. Significant impacts to threatened species in the locality were deemed to be unlikely, provided mitigation measures are implemented along with offsets for remaining impacts (if required). On the basis of the EPBC matters assessment (**Chapter 16**), the Bayswater B Project is not anticipated to result in significant impacts on Matters of National Environmental Significance.

### 27.3.5 Waste

The waste assessment indicated that no significant residual impacts are anticipated as a result of waste generated by the Project, provided that waste management plans detailing measures to effectively manage waste are implemented (**Chapter 22**).

### 27.3.6 Cumulative Impacts

Cumulative impacts have been considered of the proposed Bayswater B Project in conjunction with other projects in the region (**Chapter 23**). Mitigation measures to address these potential impacts would be addressed in the detailed design stage of the Project and would include consultation with relevant Council/s and State Government department/s to create a coordinated approach to impact management and ensure all issues are resolved.

## 27.4 Economic Considerations

The EA has assessed economic considerations and potential economic impacts associated with the proposed Project. Bayswater B would be a significant contributor to the local, regional and State economies. The economic impacts of the proposal are discussed in **Chapter 18 Social and Economic Assessment**. The Project represents a significant investment in the region and economic contributions would include employment and purchases of goods and services during both the construction and operational phases. The Project would also provide an opportunity to expand the local power industry, which is consistent with other power generation and mining activities in the region.

Bayswater B would provide local direct and indirect employment opportunities. The construction phase is expected to require a workforce peaking at approximately 800 personnel, or around 950 personnel for the coal fired option. The operational phase of the project is expected to provide long term employment for around 110 personnel for the gas fired option or around 150 personnel for the coal fired option. Related to this, the Muswellbrook and Singleton Shires would experience positive impacts associated with demand for local goods and services during both the construction and operation phases of the project.

The importance of securing additional base load power supply is considered vital to the social and economic growth of New South Wales. The Bayswater B Power Station would help to secure an adequate supply of electricity for NSW, which would support continued growth in the local, regional and State economies.

Given the anticipated economic benefits, the proposed Bayswater B Project is considered to be justifiable from an economic perspective.

## 27.5 Social Considerations

The EA has examined the potential social impacts of the proposed Project on the local region, including consideration of:

- Social and economic impacts (**Chapter 18**)
- Noise (**Chapter 14**)
- Aboriginal heritage (**Chapter 17**)
- Visual amenity (**Chapter 19**)
- Hazard and risk (**Chapter 20**)
- Traffic and transport (**Chapter 21**)
- Air quality (**Chapter 9**), land use and soils (**Chapter 12**) and cumulative impacts (**Chapter 23**) (as discussed in **Section 27.5.1**).

The assessments presented in this EA regarding the above matters indicate that provided appropriate mitigation and management measures as outlined in the Statement of Commitments are implemented, the proposed Project would have a minimal and acceptable impact on social and related issues. The proposed Project is therefore justifiable taking into account potential social impacts.

### 27.5.1 Social and Economic Impacts

The social and economic impact assessment (**Chapter 18**) showed that the bulk of Project impacts on the local region would be during construction. Provided that the social and economic assessment is reviewed at the detailed design phase and that a Construction Environmental Management Plan is prepared detailing appropriate mitigation measures, all impacts can be managed. The remaining impacts would be those that are beneficial to the locality, region and State.

### 27.5.2 Noise and Vibration

The noise and vibration assessment (**Chapter 14**) for both construction and operation indicated compliance with relevant acoustic requirements and negligible vibration impacts. Similarly, the visual assessment (**Chapter 19**) has shown that the proposed Project would have a very minor visual impact in the local region and that visual amenity would be consistent with existing facilities in the local area. As such no mitigation measures would be required.

### 27.5.3 Heritage

The heritage assessment (**Chapter 17**) has shown that mitigation and management measures are possible to minimise any impacts on the existing and potential Aboriginal heritage sites within the proposed development footprint.

### 27.5.4 Hazard and Risk

The hazard and risk assessment (**Chapter 20**) showed that potential risks related to the Project would result in a Project classification of ‘potentially hazardous’ and that mitigation measures would ensure that risks remain as low as reasonably practicable. The plume rise assessment reviewed potential impacts on aviation safety resulting from flue exhaust plumes. The results indicate that the Proponent would be required to apply to CASA for an “Operational Assessment of a Proposed Plume Rise” in order to determine whether the plume should be classified as a ‘hazardous object’.

### 27.5.5 Traffic and Transport

The traffic impact assessment (**Chapter 21**) concluded that the Project is likely to result in significant traffic during the construction stage, with minimal impact during the operations stage. A Construction Traffic Management Plan would be prepared to minimise the construction traffic impact on Muswellbrook and Singleton as well as other regional town centres. Observance of mitigation measures would ensure safety within the nearby town centres as well as minimal impact on the adjacent road network.

## 27.6 Ecologically Sustainable Development

Schedule 2 of the EP&A Regulation establishes four interrelated principles of ecologically sustainable development (ESD): the Precautionary Principle; intergenerational equity; biological diversity and ecological integrity; and valuation and pricing of environmental resources. Under the *EPBC Act 1999*, the decision-making processes for the proposed Project also needs to be addressed.

The ESD principles and decision-making processes associated with the proposed development need to be considered as part of determining whether or not the proposed Bayswater B Project would be consistent with the principles of ESD in Australia.

### 27.6.1 Precautionary Principle

The precautionary principle outlines the need to act with caution to prevent environmental degradation whether or not a risk to the environment has been scientifically demonstrated. The identification of potential impacts to the environment as a result of the Project has been assessed through detailed specialist studies undertaken as part of this EA. The results of these investigations have been used to inform the concept design stage and the selection of alternatives for the Project. In addition, appropriate environmental management measures have been proposed for the Project which aim to avoid significant environmental and social impacts and to manage or minimise residual impacts.

With regard to the Concept Approval which is the subject of this EA, further detailed investigations would be undertaken prior to the Project Approval and commencement of works, to ensure that the potential environmental impacts of the proposal are fully understood and that appropriate safeguards are identified to protect the environment. This precautionary approach will enable the proposed Project to proceed while mitigating environmental degradation. As such, the proposed project is consistent with the precautionary principle.

### 27.6.2 Intergenerational Equity

The principle of intergenerational equity places an onus on ensuring that the health, diversity and productivity of the environment are maintained, if not enhanced, for the benefit of current and future generations.

The proposed Project would provide social and economic benefits to the local and regional community through employment opportunities and flow-on effects. Through the implementation of mitigation measures during construction and operation, the Project would have negligible effect on the health of either the environment or community.

The various components of the Project have been designed to minimise environmental impacts and to ensure that the proposed works do not degrade the environment. Mitigation strategies have been developed as part of the Project, recognising the requirement to achieve, where possible, a neutral or beneficial effect on the environment.

The proposed Project would not result in the sterilisation of land or other resources and would return the land to as close as possible to its pre-development state upon initial rehabilitation of the development footprint, following construction. With the implementation of the identified environmental safeguards and mitigation measures, the Project would result in the provision of a valuable addition to NSW's electricity supply without causing significant or irreversible environmental harm.

The proposed project is therefore considered to be consistent with the principle of intergenerational equity.

### 27.6.3 Biological Diversity and Ecological Integrity

This principle requires the conservation of biological diversity and ecological integrity to be a fundamental consideration of all development projects. An assessment of the potential ecological effects of the proposed Project is detailed in **Chapter 15**. The assessment found that the Project would have no significant impact upon threatened species, populations or ecological communities or their habitats as long as the proposed mitigation measures are implemented. Monitoring would be undertaken to ensure that environmental control measures are operating effectively.

The proposed environmental management practices to be implemented during construction and operation of the Project would minimise any adverse effects on biodiversity and ecological integrity. The proposed Project is not expected to present a significant risk to the biodiversity of the locality or region.

As such, the proposed Project is consistent with the principle of biological diversity and ecological integrity.

### 27.6.4 Valuation and Pricing of Environmental Resources

The *Intergovernmental Agreement on the Environment* (IGAE) and *POEO Act 1997* require improved valuation, pricing and incentive mechanisms to be included in policy making and program implementation. In the context of environmental assessment and management, this would translate to environmental factors being considered in the valuation of assets and services.

Integration of environmental and economic goals is a key principle of ESD, which can be measured undertaking a cost-benefit analysis, that is, by measuring the costs of proceeding with a project against the benefits arising from the project. The value of the environment is also managed through the legislative process by imposing financial penalties or requirements to rehabilitate on persons responsible for polluting the environment.

Given the different values placed on the various components of the environment, it is difficult to assign a monetary value against the environmental costs and benefits associated with a project. In this context, the approach adopted for this project is the management of environmental impacts through appropriate safeguards, and to include the cost of implementing recommended safeguards in the total cost of the project.

The Proponent would implement the safeguards and monitoring requirements outlined in this EA to minimise environmental impacts caused by the Project, and to minimise the potential for pollution to occur.

The Project would also capitalise on the use of the existing infrastructure in the locality to generate and supply electricity to NSW. This use of existing infrastructure reduces the cost on the environment by limiting the resources required to integrate a new site to electricity, transport and water supply networks.

### 27.6.5 Decision-making Process

Under the EPBC Act 1999, decision-making processes need to include economic, environmental, social and equitable considerations in the short and long term. This EA has provided an assessment of the proposed Project in terms of these considerations. This would be considered by DoP in determining approval for the proposed Project under Part 3A of the NSW EP&A Act. The concept approval process ensures that decision making and monitoring of the Project would be undertaken in an integrated manner, having regard to relevant issues associated with the Project within its context. Further assessment would be undertaken and approvals sought for the Project in accordance with the requirements of the legislation and the conditions of any concept approval issued.

## 27.7 Consequences of Not Proceeding

The following section demonstrates that the project is justifiable in terms of being in the public interest, with regards to project consequences on base load electricity demand and reliability of electricity supply in NSW, support of electricity demand requirements of economic growth, support of industries that would supply the construction and operation of the project, and support of the local, regional and State economies.

### 27.7.1 Base Load Electricity Demand and Reliability of Supply

The Owen Inquiry (2007) noted that with forecasted growth in electricity demand, there is anticipated to be a shortfall in available energy by 2013-14. The key finding of the Owen Inquiry was that: *"With a risk-averse approach, NSW needs to be in a position where new baseload generation can be operational by 2013-14 if necessary, in order to avoid potential energy shortfalls."*

More recent estimates of NSW economic growth (Gross State Product) and the highly correlated growth of electrical energy use have confirmed that there is likely to be an electricity shortfall by 2015/16. It should also be noted that this does not take into account any potential new major industrial facilities which may increase energy demand earlier.

Given projected energy supply components as discussed in **Chapter 2 Strategic Justification**, by 2015/2016 NSW's existing coal fired power stations would be required to increase and sustain output at 17% above 2008/09 levels. Given that these plants would by then be up to 45 years old and that operating at a higher capacity puts added stress on plant operation, this would have risks for supply reliability. The NSW State Plan (2006, updated 2008) objectives included increasing the reliability of electricity generation in NSW, as *"Electricity supply reliability is considered a basic service and critical to the quality of life of residents and the State's business competitiveness"*. The introduction of additional base load capacity by about 2015/16 would mitigate the base load and reliability risks to NSW supplies.

In order to supply the requirement for additional base load capacity within the next 6 – 10 years, it has been demonstrated that either a coal-fired or gas-fired power station would be required as renewable energy options are not able to provide sufficient scale or reliability of base load electricity within this timeframe. The Bayswater B Power Station would be able to provide the required base load generation capacity within the required timeframe, thereby meeting NSW's projected demand needs.

The consequences of not proceeding with the proposed Project would be that NSW would have a base load electricity shortfall by around 2015/16. It appears unlikely that either interstate generators or existing NSW generators would be able to provide the NSW predicted base load demand requirements. If the Project does not proceed and existing generators were required to increase their output close to maximum capacity, this is likely to result in negative impacts on supply reliability due to added strain on already aging plant.

New renewable energy generators may be able to meet some of the power demand, but not sufficient to meet the full demand prediction. As such, without the development of a new power station in NSW such as Bayswater B, there would be insufficient electricity to provide the demand of industrial, business and domestic energy consumers in NSW. This could result in either ongoing supply fluctuations resulting in 'blackouts' or energy use restrictions being enforced on businesses and/or homes throughout the State.

### 27.7.2 Electricity Demand Growth

The importance of securing sufficient base load electricity supply is considered vital to the social and economic growth of the State. This project seeks to support the NSW government in providing base load electricity in the context of ongoing government initiatives with respect to population and economic growth and future development needs. The population of NSW is steadily growing and this is resulting in demand for infrastructure growth to support development, which in turn requires increased electricity capacity.

If the proposed Project does not proceed, in addition to the potential consequences outlined above regarding not being able to meet projected base load requirements, there may be consequences related to population growth and economic development in NSW. An electricity shortfall within the State would be likely to constrain the development of new and existing industries and businesses due to limitations on energy available for operation. Additionally, the shortfall could impact more directly on the growing population if development of infrastructure and services is constrained.

### 27.7.3 Supply Industries

If Bayswater B proceeds, operation of the power station would require either 112 PJ per year of natural gas or 6.3 million tonnes per year of coal, over an estimated plant lifespan of 30 years. This raw material requirement would provide significant and ongoing support to the mining and extraction sector, including in terms of employment in that sector. Similarly, significant volumes of materials such as steel and concrete would be required during construction, with flow-on effects in those industries. The consequence of the Project not proceeding is that these industries would not gain the benefits of these supply contracts.

### 27.7.4 Local, Regional and State Economies

The proposed Project would provide significant economic and social benefits to the local community and the wider NSW community. Benefits would include direct employment within the Upper Hunter region, particularly during the construction phase, but also ongoing over the life of the project. There would also be indirect employment generated in Muswellbrook and Singleton in various industries, due to the needs of those directly employed by the project, as well as employment in supply industries as discussed above. The generation of direct and indirect employment would stimulate the local, regional and State economies. The consequences of Bayswater B not proceeding would be that these economic and social benefits would not be gained.

## 27.8 Conclusion

Undertaking the Project in the manner proposed is justifiable taking into consideration potential impacts on the biophysical, economic and socio-cultural environments. Additionally, the proposal accords with the principles of ESD and is in the public interest. Consideration of the proposal against a wide range of criteria demonstrates that the project is environmentally sustainable and justifiable.

# 28.0 Conclusion

The proposed construction and operation of the Bayswater B power station involves the following primary components:

- Construction and operation of a gas fired power station or a coal fired power station
- Construction of ancillary infrastructure including access road, switch yard, transmission line tie-in and raw water supply pipeline
- If a gas fired power station, the construction of a gas supply pipeline, tying into the approved Queensland to Hunter Gas Pipeline
- If a coal fired power station, the construction and operation of a coal conveyor, ash conveyor and ash haulage road and use of the Antiene Rail Loop for coal transport.

The proposal is identified as a 'Major Project' under SEPP 2005 (Major Projects) of the *EP&A Act*, therefore the Minister for Planning is the consent authority.

The proposal has been subject to environmental assessment in accordance with Part 3A of the *EP&A Act* and the requirements issued by the Director General. The EA has concludes that whilst the project would have some residual impacts, the mitigation measures identified would effectively reduce these to an acceptable level of environmental risk.

Undertaking the Project in the proposed manner, including the implementation of identified safeguards, is justified taking into consideration potential environmental impacts as detailed in **Chapters 9** to **22** of this EA and further discussed in **Chapters 24** and **25**.

The assessment of the possible effects of the proposal on the environment demonstrates the environmental acceptability of the proposal, provided the recommended safeguards are implemented, and indicates there would be no significant adverse physical, biological, social or cultural impacts. The proposal would have significant environmental, economic and social benefits and is aligned with the principles of ESD.

It is considered that the construction and operation of the proposal is justified on the basis of its environmental acceptability taking into account biophysical, socio-cultural and economic considerations and is in accordance with the principles of sustainability.

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AECOM

# Worldwide Locations

| | |
|---|---|
| Australia | +61-2-8484-8999 |
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| Belgium | +32-3-540-95-86 |
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| China | +86-20-8130-3737 |
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View to existing Bayswater Power Station