Other Issues

12

12. Other Issues

This chapter of the Environmental Assessment describes the other issues identified in Chapter 5 and Table 5.2. These issues include:

- traffic and transport
- flora
- fauna
- heritage
- socio economic impacts
- visual
- soils
- cumulative impacts.

12.1 Traffic and Transport

12.1.1 Introduction

Traffic and transport was investigated as part of the environmental assessment for the Colongra Gas Turbine facility. As the gas turbine facility is located within the Munmorah Power Station locality, much of the information is applicable to this Proposal for the rehabilitation of units 3 and 4.

Site location and access

Munmorah Power Station is accessible from Scenic Drive via a designated road. Scenic Drive links with the Pacific Highway and the F3 Freeway via Mandalong Road at the Morisset Interchange (if southbound) or the Link Road (if northbound).

The new equipment for the Colongra Gas Turbine facility was transported from the Port of Newcastle via the New England Highway and the F3 Sydney-Newcastle Freeway to the west of Munmorah Power Station. The NSW Roads and Traffic Authority identified the New England Highway, F3 Freeway, Pacific Highway and the Link Road between the F3 Freeway and Scenic Drive as possible routes for over height vehicles (up to 4.6 m from a normal maximum of 4.3 m). Scenic Drive was not included as a high vehicle route.

It is expected that a similar route would be followed for any heavy or large items required for the Proposal.

Existing traffic flows

The RTA's *Traffic Volume Data for Hunter and Northern Regions 2004* is the most current available data for traffic flows in the area. Existing traffic flows were described by Parsons Brinckerhoff for the Colongra Gas Turbine Environmental Assessment (2005). These are summarised in Table 12.1.

The Average Annual Daily Traffic counts for roads in the vicinity of Munmorah Power Station are shown in Table 12.2.

12.1.2 Construction traffic

During the rehabilitation works, several activities would generate additional traffic. This would include the delivery of equipment and the increased traffic associated with the transport of construction staff.

The major plant items required for the rehabilitation of Munmorah Power Station are shown in Table 12.3. Several of the plant items are of a significant length and/or width which would mean that they would need to be transported via flat-bed semi-trailers. The exact number of heavy vehicle movements would be influenced by the construction methodology and confirmed at a later date. For example, if the generator stator is rewound, it is expected that this would be done on site, which would result in several smaller loads of windings and bars. This would be confirmed when the rehabilitation program is finalised.

Construction staff travelling to and from the site would occur during peak hours in the early morning and afternoon. The indicative average workforce numbers at any time during the rehabilitation programme would be in the order of 100 employees.

During the proposed decommissioning of the power station, scrap steel and demolition waste would be removed and transported off-site to appropriate waste facilities. It is estimated that truck movements could peak at up to 30 per day but this would be highly conditional on the dismantling and demolition philosophy adopted by the demolition subcontractor (refer Section 3.6.4 for more detail).

A Traffic and Transport Plan was put in place for the construction of the Colongra Gas Turbine Facility. It is expected that this management plan would be consulted, and if necessary updated, to cover the required transport requirements for the Proposal.

Table 12.1 – Traffic flows recorded for Colongra Gas Turbine Environmental Assessment

	Weekdays	Weekends	Traffic flows
Sydney-Newcastle Freeway Southbound traffic volumes	33,000 16,600	26,500 13,100	91% between 6am and 10pm and <1% between midnight and 5am
Pacific Highway at Swansea	15,000	15,000	93% between 6am and 10pm.
New England Highway westbound	25,500 27,000		<1% between midnight and 5am

Source: Parsons Brinckerhoff, 2005

Table 12.2 – Average Annual Daily Traffic counts for roads in the vicinity of Munmorah Power Station

Location of traffic monitoring	Annual Average Daily Traffic (AADT) Traffic flows
F3 - Wyee at Hue Hue Road overpass	38,494
F3 - Freemans Waterhole at Palmers Road Overpass	26,951
Pac Hwy - Doyalson south of Motorway Link MR 675	15,811
Pac Hwy - Swansea 2km south of Lake Macquarie Bridge	15,732
Central Coast Hwy at Budgewoi, west of Budgewoi Creek Bridge	12,023
Central Coast Hwy - Doyalson east of Pac Hwy	13,331
Wyee Road - Morisset south of Dora Street	8,362

Source: RTA's *Traffic Volume Data for Hunter and Northern Regions 2004*

Table 12.3 – Equipment specifications

Plant Item	# of items	Approx weight (tons)	Max width (m)	Max length (m)	Max height (m)
Generator transformers (no oil)	6	130	2	2	4
Generator rotor	2	60	1.4	11	1.4
Turbine rotors	8	45	3.2	6	3.2
Turbine cylinders	8	20	2.5	5.5	2.5

12.1.3 Operational traffic

Traffic associated with the operation of the rehabilitated Munmorah plant would consist of personal vehicles and some light commercial vehicles and is expected to be similar to the current traffic flows experienced. The operational Colongra Gas Turbine facility, which also accesses the site, is expected to be staffed by 5 to 10 staff which may be sourced from existing Munmorah Power Station staff. If additional staff are sourced from elsewhere, the impact is expected to be minimal.

The transport of large equipment for major maintenance activities is part of the normal maintenance program and the potential implications of such activity on the local traffic conditions would be addressed by the Traffic and Transport Management Plan.

It is expected that all coal delivery to Munmorah Power Station would be via the MV conveyor. In the unlikely event that coal needs to be transported to site by truck, any necessary approvals would be requested from the local council at that time.

12.1.4 Mitigation measures

The major impacts associated with traffic and transport would occur during the delivery of the large turbine and generator parts. The current Traffic and Transport Plan in place for the Colongra Gas Turbine Facility would be updated as required. The major mitigation measures as outlined by the Traffic and Transport Plan are as follows:

Construction

- confirmation of the final route and haulage timetable. Modification to local infrastructure was required for the Colongra Gas Turbine facility and this could still be in place for the transport of overmass equipment
- obtain all required permits for transport of overmass equipment
- phasing of delivery schedules to meet rehabilitation requirements
- ensuring that all access roads are suitable for the transport of overmass equipment
- alert other transport users of the transportation activities
- newsletters and letter-box drops would be used to ensure that the community is aware of the designated delivery periods, delivery routes and access points to the site
- access points to and from local roads to meet NSW Roads and Traffic Authority and Council requirements
- designated speed and load limits for heavy vehicle routes and on site
- designated reserves on the site for parking, turning, loading and unloading
- appropriate traffic controls and on-site management measures are in place to ensure that vehicles use designated roads only
- inspect and maintain access routes and site tracks to ensure they are kept in an adequate and safe condition.

Operation

It is expected that that operational traffic would be similar to current operational traffic impacts. Maintenance programs requiring additional vehicles to access the site would be managed via a specific traffic management plan developed for the maintenance activities.

12.1.5 Conclusions

Construction traffic may temporarily impact on normal traffic flow, however based on the construction traffic estimates, potential impacts on the local traffic conditions are likely to be low.

The transport of large plant components has the potential to restrict traffic flow due to their size and slow speed. This may result in some disruption to traffic when passing through metropolitan areas or lead to delays on single lane roads where there are no opportunities for other traffic to pass. The scheduling of these activities during the early periods of the day and the use of appropriate traffic management measures would ensure disruptions to the local road users are minimised.

Transport of the overmass components would require liaison and approval of the NSW Roads and Traffic Authority and Newcastle, Lake Macquarie and Wyong Councils. A Traffic and Transport Management plan is already in place for the construction of the Colongra Gas Turbine Facility. This plan includes detailed planning and provides an appropriate route and mitigation measures and would be updated as relevant for this Proposal.

Traffic generated by site staff during normal operations would be negligible in comparison with existing traffic flows. There may be the occasional requirement for additional vehicles to access the site during maintenance activities. This aspect of the Proposal would be managed via a specific traffic management plan to be developed for the maintenance task.

12.2 Flora and Fauna

This section provides a description of the existing ecological characteristics of the Munmorah Power Station site and locality, including the Tuggerah Lakes Estuary as well as the potential ecological impacts of the Proposal.

12.2.1 Introduction

Munmorah Power Station is located within the Sydney Basin Bioregion. Bioregions are relatively large land areas characterised by broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems. The Sydney Basin Bioregion is one of the most species diverse in Australia.

Although the Munmorah Power Station site is a brownfield site and most of the rehabilitation works

would occur within the existing plant area, the DECCW requested an assessment of the potential impacts on threatened species, endangered ecological communities and their habitats. A review of the available literature was undertaken.

An ecological survey in the vicinity of Munmorah Power Station was undertaken by Robert Payne Ecological Survey and Management (Robert Payne ES&M) in 2002. The assessment included extensive field reconnaissance and data collection. A further fauna and flora survey was conducted by Parsons Brinckerhoff for the Colongra Gas Turbine facility Environmental Assessment in March 2005.

Both assessments were undertaken in accordance with the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act).

12.2.2 Flora and fauna

Terrestrial flora habitats/communities

Robert Payne ES&M (2002) identified 11 habitats, with over 220 plant species. The report indicated that that there was not a significant level of plant diversity, mainly due to the large area of moist and wet habitats. Each of the habitats identified by Payne was assessed for significance.

Parsons Brinckerhoff (2005) identified five vegetation communities, three of which were located within the vicinity of Munmorah power station. Table 12.4 lists the significant communities and Figure 12.1 provides an overview of the vegetation communities.

Figure 12.1 indicates that the area around the Munmorah Power Station buildings is cleared and therefore the vegetation communities of significance would not be impacted by the Proposal.

Table 12.4 – Habitats of significance identified on the Munmorah Power Station site

Survey	Habitat Community	Habitat Significance
Robert Payne ES&M, 2002	Woodland	Sydney Coastal Estuary Swamp Forest
	Swamp Oak Forest	
	Wetland	
	Colongra Wetland (natural)	
	Forest Red Gum Forest	
Parsons Brinckerhoff, 2005	Wyong Paperbark Swamp Forest	Sub unit of EEC [1] Swamp Sclerophyll Forest on Coastal Floodplain under the TSC Act[2]
	Riparian Melaleuca Swamp Forest [3]	

Note: [1] EEC – Endangered Ecological Community
[2] *Threatened Species Conservation Act 1995*
[3] Lower Hunter and Central Coast Regional Environmental Management Strategy 2003b

Flora species

The Robert Payne ES&M (2002) report identified over 220 plant species. Significant species are listed in Table 12.4. A total of 147 flora species were recorded in the Colongra Gas Turbine facility EIA (Parsons Brinckerhoff, 2005).

Fauna species

Robert Payne ES&M (2002) recorded 107 vertebrate species in the Lake Munmorah area, of which 13 species were identified as being threatened under the TSC Act and the EPBC Act. Parsons Brinckerhoff (2005) recorded 52 vertebrate species of animal during the site survey. No threatened species were recorded.

12.2.3 Conservation significance of terrestrial flora and fauna

Threatened plant and animal species are listed on schedules under the TSC Act and the EPBC Act. A search of the Department of the Environment, Water, Heritage and the Arts (DEWHA) *Protected Matters Search Tool* was undertaken in June 2009 to confirm the presence of protected species in the area identified in the previous two surveys.

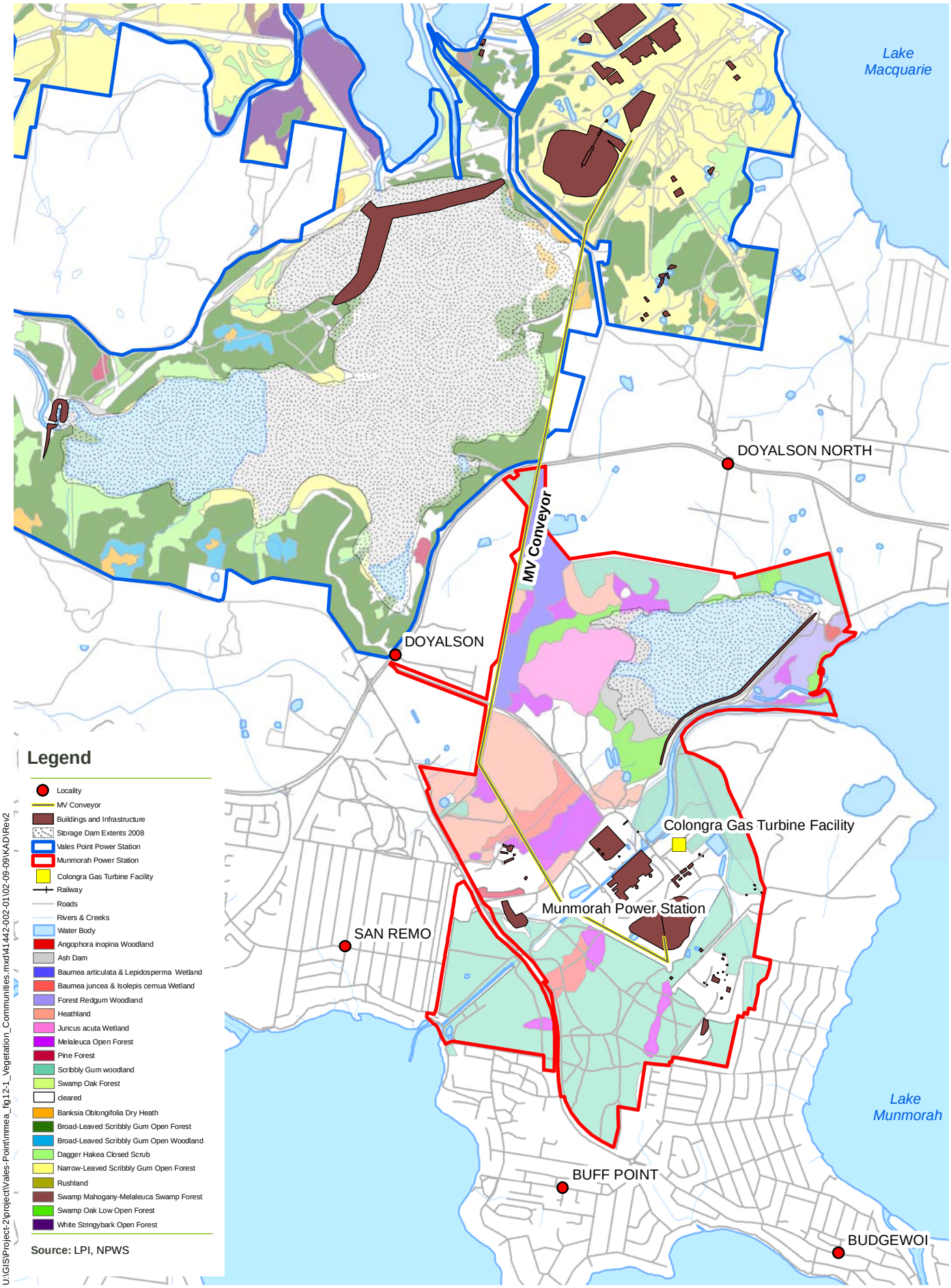

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FIGURE 12.1: Vegetation Communities

Flora species

Of the 147 species identified in the 2005 EIA, only 13 species were listed under the TSC Act and/or the EPBC Act. Five of these species were identified as being likely to occur in the vicinity of the Munmorah Power Station (Table 12.5). Only *Angophora inopina* was recorded on-site (see Figure 12.2). As the proposed rehabilitation would be restricted to existing operational areas of the power station, this species is unlikely to be affected by the Proposal.

Endangered Ecological Communities (EEC)

Endangered ecological communities are listed under the TSC Act (Schedule 1, Part 3) and the EPBC Act. Vegetation Communities No 15 and 16 (Table 12.4) are a sub unit of the Swamp Sclerophyll Forest considered an EEC under the TSC Act. However, as the proposed rehabilitation would be restricted to existing operational areas of the power station, there would be no impact on these endangered communities.

Table 12.5 – Threatened plants in the local area (Parson Brinckerhoff EIA, 2005)

Scientific Name	TSC Act	EPBC Act	Likelihood of occurring
Angophora inopina	V	V	Yes, recorded
Acacia bynoeana	E1	V	Yes, not recorded
Grevillea parviflora ssp. Parviflora	V	V	Yes, not recorded
Cryptostylis hunteriana	V	V	Yes, not recorded
Tetratheca juncea	V	V	Yes, not recorded

NOTES:
TSC Act. V = Vulnerable, E1 = Endangered; E2= Endangered Population, E4 = Extinct (*Threatened Species Conservation Act 1995*);
EPBC Act. V = Vulnerable, E = Endangered, X = Extinct (*Environment Protection and Biodiversity Conservation Act 1999*)

Fauna species

The threatened species (identified in both the 2002 and 2005 surveys) which are likely to occur in the vicinity of Munmorah Power Station are listed in Table 12.6. The full list of threatened vertebrate species and the full list of recorded species can be found in Parsons Brinckerhoff EIA (2005) Technical Paper No. 1. See Figure 12.3 for an overview of the locations of the fauna species.

Migratory species

In addition to threatened species, the EPBC Act allows for the listing of internationally protected migratory species, which includes some common Australian bird species. A number of migratory species were predicted to occur in the area based on DEWHA search results, however none of the migratory species were recorded in the area and as such there is unlikely to be an impact on migratory species.

Endangered populations

Endangered populations are listed under the TSC Act (Schedule 1, Part 2). No endangered populations were identified in or near the Proposal area.

12.2.4 Aquatic ecosystems

The main aquatic plants in the Tuggarah Lakes are seagrasses, which are found to grow on the bottom of the lakes. The dominant species of seagrasses in the lake system include *Zostera capricorni* (eelgrass or ribbonweed), *Halophila ovalis* (paddleweed or breamweed) and *Ruppia megacarpa* (stackweed). These grow below the high tide level in shallow sheltered waters in areas of mud or sand. They are found in the upper 2 m of the lake as they require a certain level of sunlight to survive. Other aquatic plants include emergent species along the lake edge including *Juncus kraussii* (sea rush), *Phragmites australis* (Common reed) and various saltmarsh species.

Algae are a natural part of the lakes ecology and are the lake systems other main primary producer, along with seagrass. The two types of algae are Phytoplankton and Benthic algae. Tuggerah Lakes has not yet had any problems with blooms of phytoplankton. Nuisance algae in Tuggerah Lakes are mostly green algae, baitweed (*Enteromorpha*) and the finer filamentous types *Chaetomorpha* and *Rhizoclonium*. These types of algae attach and grow on the local seagrass before forming large surface

mats. *Gracilaria verrucosa* is also experienced in the lake system however is not considered a nuisance.

The Tuggerah Lakes Estuary is home to *Hippocampus whitei* – White's Seahorse, which is only found in Australian waters and lives in the seagrass beds of the Tuggerah Lakes Estuary. Although this species is not under significant threat, it is a listed species under the NSW *Fisheries Management Act 1994* and the EPBC Act (Wyong Shire website – Environmental Care).

The lake is also home to three species of sponges, with one genus *Suberites* being newly recorded. The sponge occurs in water up to 1.5 m on muddy flats in areas of patchy seagrass.

Table 12.6 – Threatened vertebrate species most likely to occur in the local area (Parsons Brinckerhoff EIA, 2005)

Scientific Name	Common Name	TSC Act	EPBC Act	Likelihood of occurring
		Amphibians		
Crinia tinnula	Wallum Froglet	V		Habitat is present within the Coastal Plains Scribbly Gum Woodland in the northern part of the site
Pseudophryne bibroni	Bibron's toadlet			Special species of concern
		Native Birds		
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		Although this species may occasionally use the Casuarina feed trees for foraging, the rehabilitation works would not impact on foraging or nesting resources
Ninox strenua	Powerful Owl	V		Yes the species may use the habitats as a foraging area
Tyto novaehollandiae	Masked Owl	V		Yes- the species may use the habitats as a foraging area
		Native Mammals		
Miniopterus australis	Little Bent-wing Bat	V		The species may use the habitats in the study area for marginal foraging, however important roosting and nursery sites are not present
Miniopterus schreibersii	Eastern Bent wing Bat	V	C	The species may use the habitats in the study area for foraging and roosting
Mormopterus norfolkensis	Eastern Freetail-bat	V		The species may use the habitats in the study area for foraging and roosting
Myotis adversus	Large-footed Myotis	V		The species may use the habitats in the study area for marginal foraging, however important roosting habitats are not present
Petaurus norfolcensis	Squirrel Glider	V		Habitat within the Coastal Plains Scribbly Gum Woodland
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	The species may use the habitats for marginal foraging, however, there are no camps present
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V		The species may use the habitats in the study area for foraging and roosting
Scoteanax rueppellii	Greater Broad-nosed Bat	V		The species may use the habitats in the study area for foraging and roosting

Notes: (1) TSC Act– V = Vulnerable, E1 = Endangered
(2) EPBC Act– V = Vulnerable, E = Endangered, M = Migratory, C = Conservation Dependent
(3) Actual is taken to be when the species is recorded on site. Likely is when there is a real chance or probability of the species occurring based on the habitat present.

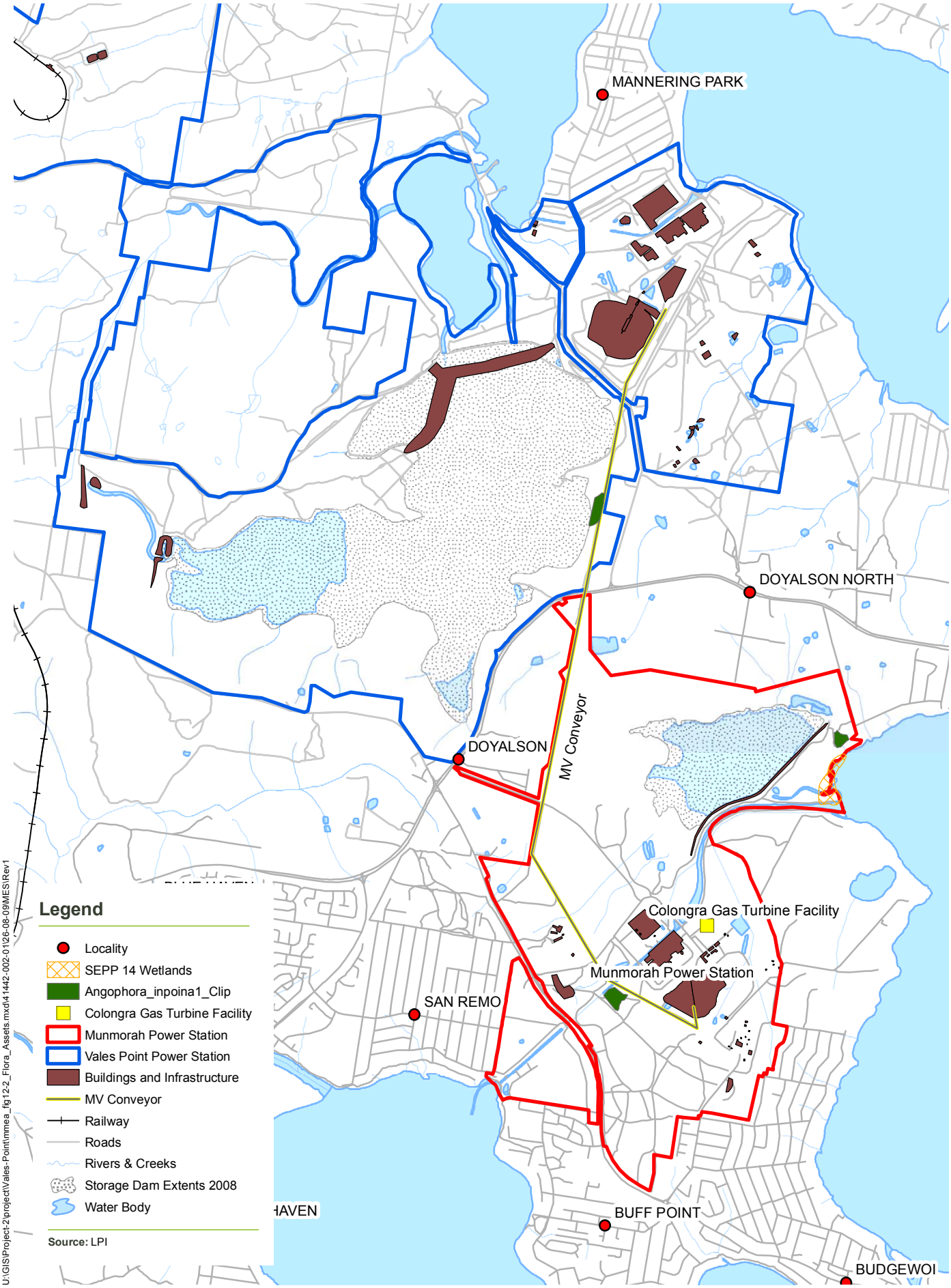

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FIGURE 12.2: Flora Assets

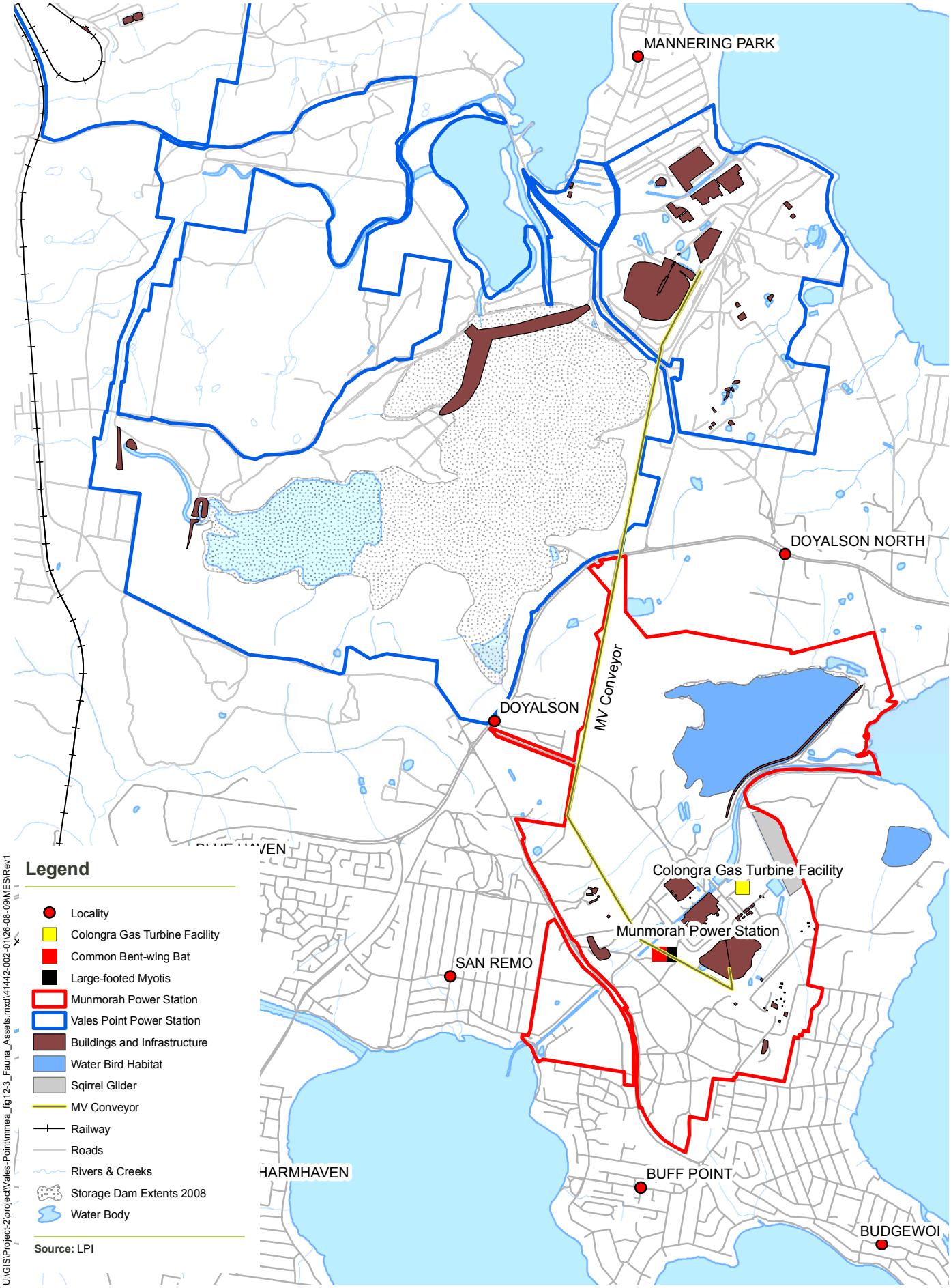

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FIGURE 12.3: Fauna Assets

12.2.5 Impacts of the Proposal on flora and fauna

The proposed rehabilitation works would generally be located within the existing plant area of the power station therefore the impacts on flora and fauna are expected to be minimal. The proposed works to the MV conveyor would occur within the already existing cleared easement.

Construction noise would generally be no greater than what is typical of maintenance operations. Localised increased noise which may occur could cause disturbance to fauna in the local area for a short period of time. Access for maintenance vehicles may also cause intermittent disturbance, however, in both cases the impacts are likely to be minor.

Any fauna that has adapted to the environment of the operating power station would not be expected to be disturbed by the rehabilitation works. Continuity of the existing environment would occur as rehabilitation is proposed to be staged so that one unit would be operational at all times.

Potential roosting locations would not be expected to occur within the busy operations areas of the power station. Roosting locations are more likely to be dark places with low levels of activity.

While it is not inconceivable that some micro bats might roost within the power station, such individuals would have done so because they are adapted to the industrial environment of the operating power station. Potential species that would adapt to living within the operating power station are limited (Ecotone pers comm.). The open structures of the power station would not be expected to impede movements of microbats into and out of the industrial environment of the power station.

With regard to gas pipeline connections, one possible supply scenario is that any new pipeline would be installed within the existing pipeline easements to the site. As existing interconnected pipelines are located between the site and various supply points such an option would be expected to result in minimal additional disturbance of surrounding areas.

Possible impacts of the Proposal on aquatic flora and fauna has been discussed in greater detail in Section 8.7.2.

12.2.6 Mitigation measures and safeguards

To minimise and mitigate impacts on flora, fauna and sites of ecological value, the following mitigation measures and safeguards are proposed:

- access for workers, their equipment and vehicles would be restricted to the designated asphalt roads. Site inductions would include awareness training about the ecological values of areas within the power station site
- the threatened species *Angophora inopina* (see Figure 12.2) is located in the vicinity of the Munmorah Vales Point coal conveyor. Colour tape or ‘parawebbing’ would be used to delineate the maximum work area permitted and ‘no go’ areas adjacent to the work site. This would be implemented prior to any work commencing on site
- parking of vehicles and stockpiling or storing of equipment waiting for disposal off-site, construction equipment and materials would be confined to designated areas.
- In the event that the power station does not operate for a significant period prior to rehabilitation (12 months) a survey to identify if micro bats have occupied areas that would be subject to works would be considered in consultation with a suitable specialist fauna consultant.
- No proposed rehabilitation works have been identified that would likely require disturbance of existing habitat. In the event that the detailed design, eg the MV conveyor upgrade, requires disturbance to vegetation an additional assessment would be required and appropriate level of approval or alternative arrangements devised, prior to works proceeding. The area of possible disturbance the MV conveyor is considered to be of low flora and fauna significance and as such the risk to flora and fauna is considered minimal

12.2.7 Conclusion

Impacts on local flora and fauna are expected to be minimal given that the majority of works are occurring within the existing plant area of the currently operating power station with other works confined to existing operational areas and facilities. In the event that unexpected minor disturbance of potential habitat is proposed due to detailed design issues, these would require an appropriate level of assessment to determine their potential impacts and acceptability, before they are adopted.

12.3 Heritage

12.3.1 Existing environment

Aboriginal heritage

An archaeological survey of the Munmorah perimeter land was carried out by Pacific Power's archaeologist in 1987 (McIntyre, 1987). This report also considered the findings of a broad ranging planning study of Aboriginal resources in Wyong Shire (Dallas *et al* 1987).

Field investigations revealed that certain areas within the perimeter land were archaeologically sensitive and recommendations were made to set aside certain areas to allow for future scientific investigations. Restrictions on land use practices were proposed to ensure the conservation of specific areas. Six isolated stone artefacts were located and recorded.

Although no archaeological site within the power station perimeter land or its immediate vicinity had been recorded on the NPWS register prior to the 1987 study, information gathered during the study suggested that a major ceremonial/meeting place may have been located just outside the perimeter land at Colongra Point (beach ridge area) which, if verified, would suggest significant sites would be located within the Munmorah perimeter land adjoining this area. This potentially sensitive area has since been transferred to NPWS and is now the Colongra Nature Reserve,

Further cultural heritage investigations were undertaken as part of the Environmental Assessment for the Colongra Gas Turbine Facility. Aboriginal Heritage was assessed within areas of the Munmorah Power Station site associated with the proposed gas turbine facility and pipeline and involved a search of the Department of Environment, Climate Change and Water's Aboriginal Heritage Information Management System (AHIMS).

An archaeological field survey undertaken as part of the assessment found that areas in the immediate vicinity of the existing power station were considered to have nil to low archaeological potential (Parsons Brinckerhoff, 2005)

An Addendum REF was undertaken by Parsons Brinckerhoff for the Colongra Gas Pipeline Project due to changes in the location of the pipeline. In November 2006, a detailed archaeological field survey of the pipeline study area together with representatives of the Darkinjung Local Aboriginal Land Council (DLALC) was undertaken. The survey did not find any archaeological deposits along the two route options being considered but identified up to four potential archaeological deposits (PADs) (Parsons Brinckerhoff, 2008). PAD 1 and PAD 2 are located within the Munmorah Power Station perimeter land in the north western portion of the site. (Figure 12.4)

As the rehabilitation work would occur within the existing plant area of the power station, these PADS and other Aboriginal heritage would not be affected by the proposed works.

Non-Aboriginal heritage

A search of non-Aboriginal heritage was conducted in June 2009. No heritage sites were identified in the area.

12.3.2 Mitigation measures and safeguards

To minimise and mitigate impacts on site of heritage value, the following mitigation measures and safeguards are proposed:

- access for workers, their equipment and vehicles would be restricted to the designated asphalt roads. No access would be allowed within bushland areas surrounding the power station site
- parking of vehicles and stockpiling or storing of equipment waiting for disposal off-site, construction equipment and materials would be confined to designated areas
- the area surrounding the MV conveyor is considered to be of low to moderate heritage significance. The conveyor occupies an existing disturbed easement and any upgrade or modifications to the conveyor would be undertaken within this area, as such the risk to heritage is considered minimal

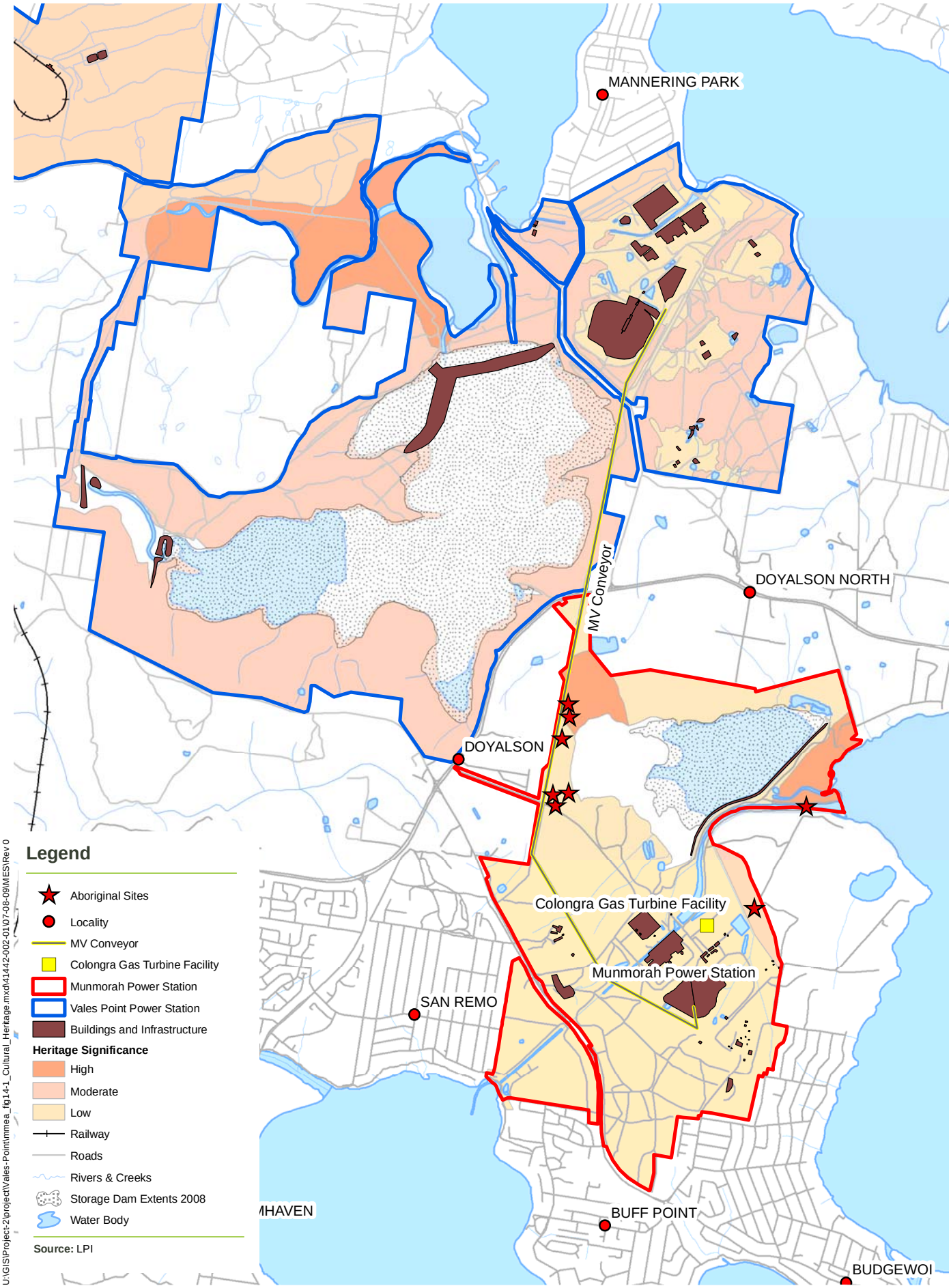

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FIGURE 12.4: Cultural Heritage

- in the event any items of potential heritage value be discovered during construction activities, works would cease immediately and the NPWS would be contacted immediately. No work would resume until the NPWS give clearance to do so.

12.3.3 Conclusion

Impacts on Aboriginal heritage are not expected, due to the majority of works occurring within the existing plant area of the power station. Safeguards would be incorporated in the project environmental management plan to ensure suitable management of any unforseen issues.

12.4 Soils

12.4.1 Existing environment

Munmorah Power Station is located on low-lying, level land. The 1:250,000 Sydney Geological Sheet S 156-5 indicates that the Munmorah site is underlain by Quaternary sediments and rocks of the Gosford Formation belonging to the Narrabeen Group. This formation comprises sandstone claystone and shale.

The soil landscape units appearing within the Central Coast are described in the Soil Landscapes of the Gosford – Lake Macquarie 1:100,000 Sheet (Murphy, 1993). The following terrains are identified and described below:

Doyalson soil landscape

The soils of the Doyalson soil landscape are moderately deep (50-150 cm) yellow earths, yellow podzolic soils and soloths occurring on sandstones and conglomerates; moderately deep yellow podzolic soils, soloths and some red podzolic soils occurring on fine grained siltstones and claystones; and moderately deep to deep (100-150 cm) yellow leached earths, grey earths, soloths and gleyed podzolic soils occurring along drainage lines.

Soils in this landscape are primarily comprised of uniform and texture contrast soils that are found in areas of gentle to moderate relief. The soil landscape is characterised by generally undulating rises with slope gradients less than 10% and broad drainage lines. On steep slopes the high rate of erosion leaves a shallow soil that may contain fragments of parent material. Intensive soil conservation measures may be required to control erosion occurring on these soils.

Wyong soil landscape

The Wyong soil landscape unit occurs on poorly drained deltaic floodplains and alluvial flats. The soils consist of deep yellow podzolic soils, brown podzolic soils, and soloths with some humus podzols around lake edges. The slope gradient is less than 3% and the local relief below 10 m. These soils occur to the north of Munmorah Power Station on the south eastern and north eastern shores of Munmorah Ash Dam. Limitation of Wyong soil includes a severe flooding hazard, seasonal water-logging and localised severe stream bank erosion. Fertility of the soils is low. The soil materials are very strongly acidic, sodic, have low available nutrients and have a high potential for aluminium toxicity. High to severe limitations exist for urban development due to flooding hazards. Rural capabilities have generally low limitations except for waterlogged areas that have high to severe limitations.

Tacoma Swamp soil landscapes

The Tacoma Swamp soil landscape occurs in swampy floodplains and depressions with low gradients. Small areas of this soil group occur within the swamplands and wetlands to the north west of Munmorah Ash Dam. The soils are waterlogged, strongly saline, have low fertility and have high acid sulphate potential, therefore posing severe limitations for urban development, cultivation and grazing.

Gorokan soil landscape

The Gorokan soil landscape is also an erosional soil landscape characterised by undulating low hills and rises on lithic sandstones of the Tuggerah Formation as well as broad crests and ridges, long gently inclined slopes and broad drainage lines. Local relief is less than 30 m while slope gradients are less than 15 %. Soils are moderately deep soloths and yellow podzolic soils on ridges and crests. Soloths, yellow podzolic soils and grey-brown podzolic soils occur on slopes with gleyed podzolic soils occurring along drainage lines (Murphy 1993).

Small areas of this soil unit occur to the north of Rutleys road at the north west extent of Vales Point Power Station. The Gorokan soil landscape has a number of limitations, including very high erosion hazard, localised foundation hazard, seasonal water-logging and hard-setting, strongly acid, low fertility, plastic, impermeable soils (Murphy 1993).

Acid Sulphate Soils

Acid Sulphate Soils (ASS) are a natural part of coastal lowlands. Undisturbed they do not cause any problems, however degradation of lowland environments and estuarine water quality has been found to occur as a result of their disturbance. In recognition of the significance of the problem, Acid Sulphate Soil Risk Maps have been prepared for the NSW coast. These maps have been prepared as a guide to land use planning. Specific sites are only able to be accurately assessed by a detailed soil investigation.

The ASS risk map for the Catherine Hill Bay and Doorolong 1:25,000 map sheets (Murphy, C. 1995) indicates that low lying areas of land generally associated with the Wyong soil landscape on the Central Coast, particularly on the shores of Lake Macquarie, Lake Munmorah and Lake Budgewoi, and in the vicinity of Wyee Creek and to the west of Munmorah Ash Dam, have a high probability of being ASS. These potential acid sulphate soil (PASS) areas are expected to occur at or near the ground surface on most of this land. Where these soils occur, activities such as drainage works, excavation or clearing, are considered to pose a severe environmental risk. Potential ASS occur in the terrain units described as the Wyong and Tacoma Swamp soil landscapes. Investigations associated with the Colongra Gas Pipeline project confirmed the presence of ASS within the Tacoma Soil landscape.

12.4.2 Mitigation measures and safeguards

In the event that earthworks are required for the conveyor upgrade, a Construction Soil and Water Management Plan would be prepared in consultation with relevant agencies. The plan, which would form part of the project CEMP (Construction Environmental Management Plan), would include an erosion and sediment control plan that would be consistent with the 'Blue Book' Managing Urban Stormwater: Soils and Construction – 4th Edition (Landcom 2004).

Measures considered in the erosion and sediment control plan would include:

- installation and regular inspect sediment controls such as sediment fences and bunds
- stockpile materials appropriately away from drainage lines and waterways
- avoid using machinery near drainage lines
- minimise transfer of soils through use of wheel wash facilities
- remove any soils from public roads and other paved areas through the use of dry street sweepers
- revegetate disturbed areas if required
- only reuse topsoil containing exotic seeds on-site, if it is to be buried more than 200 mm below the surface
- ensure that spill kits appropriate to any products used on site are readily available.

12.4.3 Conclusions

There would be no impact on soils for the majority of the rehabilitation works as these would occur within the existing plant area of the power station. If earthworks are required for the MV conveyor upgrade, more detailed investigation would be undertaken before the upgrade or earthworks commence. These works would be carried out in accordance with the Construction Soil and Water Management Plan.

12.5 Socio Economic

12.5.1 Existing environment

The Central Coast, located between 60 and 90 km north of Sydney comprises the two local government areas of Gosford and Wyong. The Wyong Shire comprises the major service centre of Wyong, townships spread around Tuggerah Lake, Lake Budgewoi, Lake Munmorah and the southern shore of Lake Macquarie.

The region is surrounded by extensive bushland reserves, lakes and beaches, creating an attractive natural setting for tourist and urban development.

The importance of Wyong Shire as a destination for families and retirees from areas further south is expected to continue over the forecast period (to 2016). As a result of this there is significant pressure for residential expansion within the Shire from both existing residents and from people moving to the area (Wyong Shire Council Population Forecast, 2006)

The *SEIFA Index of Relative Socio-Economic Disadvantage* for Wyong LGA was examined. This index is derived from attributes such as low income, low educational attainment, high unemployment, jobs in relatively unskilled occupations and variables that reflect disadvantage rather than measure specific aspects of disadvantage (eg Indigenous and Separated/Divorced). Low scores on the Index indicate areas which are more disadvantaged ie areas with more low income families and more people in

unskilled occupations. Wyong LGA has an index of 966.8 and is listed number eight, out of a possible 43 LGAs. The Wyong LGA appears to be relatively disadvantaged in terms of these social indicators such as income, education, occupation, wealth, living conditions and expenditure.

Population

The Central Coast is considered one of the fastest growing areas in Australia. From 1991 to 2001, population growth in the Central Coast was about 23.5%, where the growth in Sydney was 13.1% and growth in NSW was 12%. Much of the growth was attributed to improvements in transport infrastructure, the electrification of the railway and construction of the F3 Freeway from Sydney, the affordability of land and housing, attraction of coastal lifestyle and increasing growth pressures in the Sydney Metropolitan Area (Parsons Brinckerhoff, 2005).

Table 12.7 – Comparison of % of population per age group (ABS Census 2006)

Statistic	Wyong LGA	NSW	Australia
0-14 % of population	**21.3 ***	19.8	19.8
15-24% of population	11.9	13.3	13.6
25-54% of population	37.4	42.0	42.2
> 55 % of population	**29.3 ***	24.8	24.3

* higher than the Australian and NSW averages

Table 12.8 – Comparison of total labour force in % of population (ABS Census 2006)

Statistic	Wyong LGA	NSW	Australia
Employed full time	55.0	60.8	60.7
Employed part time	30.5	27.2	27.9
Unemployed	**8.2** [(2)]	3.3	3.5
Others [(1)]	6.4	8.6	7.8
Not in the labour force	**Approx 32%** [(2)]	Approx 27%	Approx 26%

NOTE: [(1)] hours not stated, employed away from work
[(2)] higher than the Australian and NSW averages

The total population of Wyong LGA in the 2006 census was estimated at 139,801. Table 12.7 shows a breakdown of the population by age group. The Estimated Resident Population (ERP) figures as at 30 June 2008 have put the Wyong Shire population at 146,589, an increase of 1.6% from 2007. The ERP numbers are updated annually by taking into account births, deaths, internal and overseas migration (Wyong Shire Council website, 2009).

Employment

Table 12.8 below shows a breakdown of the employment statistics for Wyong LGA against the Australian and NSW numbers. About 32% of the Wyong population is not in the labour force. This reflects the number of residents that are either retired, in full time education or caring full-time for children. This number has decreased since the ABS Census 2001 figure of 43.7%. The unemployment rate was 8.2%, about 5% higher than the average (3.3% - 3.5%). This number has however decreased from the 10% estimated in ABS Census 2001.

Table 12.9 shows the breakdown of the Wyong LGA in terms of occupation.

Historically the area has had a high proportion of the local population employed in ‘blue collar’ work, with many employed by the existing power stations. About 37.6% of the Wyong Shire’s labour force is employed as technician and trades workers, labourers and machinery operators (ABS 2006). The number of professionals has increased from 5.7% to 13.2% (2001 to 2006 census) and managers from 2.7% to 10.1%.

Table 12.9 – Wyong LGA Occupations (ABS Census 2006)

Occupation	Number employed	Percentage
Technicians and trade workers	9,208	17.1
Clerical and administrative workers	7,696	14.3
Professionals	7,123	13.2
Labourers	6,866	12.7
Sales Workers	6,601	12.3
Community and personal service workers	5,764	10.7
Managers	5,450	10.1
Machine operators and drivers	4,255	7.9
Total Employed	**52,963**	

Table 12.10 – Comparison of Income for individuals and households in $ per week (ABS Census 2006)

Statistic	Wyong LGA	NSW	Australia
Median individual income	**381 (306 in 2001)**	461 (386 in 2001)	466
Median household income	**770**	1,036	1,027
Median family income	**1,013**	1,181	1,171

Income

The median incomes per week for households and individuals, shown in Table 12.10, indicate that these are lower in Wyong LGA than the Australian and NSW averages.

12.5.2 Potential impacts

A total of 123 (including 1 fixed term contractor) staff were employed at Munmorah Power station for the 2007-2008 financial year (2008 Delta Sustainability Report).

Construction

The indicative average workforce numbers at any time during the rehabilitation programme would be in the order of 100 employees, while actual numbers being employed would vary according to design specifications and the staging of the works. This has the potential to increase economic activity in the surrounding townships.

In addition, indirect income would be generated from the purchase of materials, transportation of materials, petrol, diesel, fuel supplies, truck parts, tyres, office supplies, accommodation, and other requirements sourced from local suppliers. Part of the wages of contractors employed for the Proposal would ultimately filter through the local economy by effects attributable to expenditure.

The Proposal is expected to take 24 months. During this time, the potential for adverse impacts are likely to be associated with increases numbers of workers in the area placing increased demands on services within the area, but any such increase is expected to be temporary.

The Proposal would not result in any impacts on the visual amenity of the area, as most of the works would be occurring within the existing plant area and as such the outward appearance of the power station would remain unchanged. On this basis, the Proposal is unlikely to have an adverse effect on the local tourism industry.

Operation

The Proposal is unlikely to significantly increase employment opportunities in the local area due to the general functionality of the power station remaining unchanged. The number of staff currently employed by Delta Electricity is likely to remain unchanged once the rehabilitated plant is recommissioned.

If the proposed rehabilitation of Munmorah Power Station does not proceed the station would probably cease operations around 2014/15. This could have a negative impact on the local population both in terms of loss of future employment opportunities and loss of earnings filtering through to the local economy. This would be a detrimental impact on a region that is already below the Australian and NSW average for income per family and on the unemployment rate which is above both the Australian and NSW rates.

12.5.3 Conclusions

The Proposal would result in little change from the existing situation for the local community. It does offer extension of employment opportunities for the staff of Munmorah Power Station and some Delta Maintenance staff based at Vales Point Power Station. This is regarded as an important contribution to the local economy and one that if removed could cause some disruption to the local community through either unemployment or relocation of existing local residents.

It is anticipated that a portion of the workers required for the rehabilitation would be sourced from the Wyong/Lake Macquarie/Newcastle area. However, due to the specialist nature of many trades required for the rehabilitation, many of the skilled workers would be sourced from outside the local area. During construction the potential for adverse impacts would primarily be associated with increases numbers of workers in the area placing increased demands on services within the area.

As any short term increase in the local population would be minor, it is expected that the area is well suited to provide any services required during construction. There is the potential for construction traffic and activities that generate noise and dust during rehabilitation. These impacts would be managed in accordance with mitigation measures presented in this Environmental Assessment and the Construction Environmental Management Plan (CEMP).

12.6 Visual impacts

12.6.1 Existing environment

Munmorah Power Station is a dominant element within the visual landscape of the area. The large buildings (up to 60 m tall) and two 150 m high chimneys can be seen from most locations surrounding the site. This includes Budgewoi, Toukley, Lake Munmorah and the Pacific Highway near Doyalson.
Other facilities surrounding the central power station area include the coal stockpile, switchyard, transmission and coal delivery infrastructure, a mixture of smaller buildings, car parks and various water treatment and storage ponds. These elements of the facility are generally screened by the bushland buffer zone, due to the surrounding topography, a generally flat to undulating coastal plain.

The expansive buffer zones provide a bushland setting for the site which softens the impact of this industrial facility. The buffer zones provide a transition to the surrounding area, which is characterised by large areas of bushland and wetlands interspersed with settlements surrounding the lakes, which provide the dominant natural feature in the area.

The recent construction of the Colongra Gas Turbine facility has introduced another element in to the visual environment. The assessment of the visual impacts of this facility concluded that the proposed facility which includes four 35 m exhaust stacks was unlikely to have a significant impact on the visual landscape of the area, largely due to the existing surrounding vegetation and its scale against the Munmorah Power Station.

The future development of additional ash storage may have an impact on the landscape. Most options would be located in proximity to current ash storage areas. The extent of any impact would be dependent on the option proposed and would be the subject of a separate approval process. Sensitive design would include consideration of the potential visual impacts.

Land uses outside the power station buffer zone include the residential areas of Charmhaven, Lake Haven, Budgewoi, Halekulani and Lake Munmorah and rural residential areas to the north. A large seniors living complex is located to the north east of the site at Lake Munmorah.

The surrounding area is recognised as a tourist destination due to its natural beauty, coastal location and the recreational opportunities offer by the lakes (Parsons Brinkerhoff 2005)

12.6.2 Potential impacts

Apart from upgrading of the existing MV conveyor, the rehabilitation works would mainly occur within the existing power station site. As a result, the potential of the rehabilitation works to impact the visual environment is minimal. The possible future addition of carbon capture facilities would introduce elements

on a scale similar to the Colongra Gas Turbine Facility and hence would be predicted to be unlikely to have a significant impact on the visual landscape of the area, due to the existing surrounding vegetation and the scale of this plant against the existing Munmorah Power Station.

12.6.3 Conclusions

The Proposal is unlikely to have a significant impact on the visual landscape of the area.

12.7 Cumulative impacts

Cumulative impacts are those resulting from the interaction of the Proposal with existing and future proposed land uses in the vicinity of the area affected by the Proposal.

12.7.1 Construction impacts

The impacts on noise and air for construction are described in detail in Chapter 7 (Air quality) and Chapter 11 (Noise and vibration). These assessments take into account the additional impact of this Colongra Gas Turbine, which was assessed and approved by the Department of Planning in July 2006.

Development of the surrounding land is constrained by protected wetlands and major infrastructure corridors (including road, rail and electricity transmission). If a further pipeline is required for the transport of gas for the proposed co-firing option, this would be subject to a separate Development Application.

It is not anticipated that any other construction works would be undertaken in the vicinity of the Proposal at the same time. Therefore the cumulative impact would be negligible.

Local labour and materials would benefit from the facility construction. Local employment and expenditure would assist the cumulative economic growth of the local area through flow on benefits to retail, entertainment and services.

12.7.2 Operational impacts

Water quality management and possible impacts associated with the Proposal is addressed in detail in Chapter 8. The effects of Munmorah Power Station on the lakes are predicted to be significantly less than the effects of the previously operating four unit power station. Discharge temperatures are also expected to comply with current EPL conditions due to the availability of attemperation and due to the improved turbine efficiency and reduction in condenser temperature rise. The rehabilitation is not expected to add to the effects of the equivalent ‘as built’ two unit power station on water quality, zooplankton, fish and prawn larvae or seagrasses in Lake Budgewoi, lake Munmorah or Lake Tuggerah. Delta Electricity has also made a commitment further reduce the use of domestic water.

Potential cumulative impacts in relation to air quality were assessed through local and regional airshed modelling for the Colongra Gas Turbine facility Environmental Assessment and additional modelling of emissions from Munmorah Power Station. The possible impacts of the rehabilitated plant was assessed and results of the assessment are provided in Chapter 7 and Appendix E.
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The operation impacts on noise are described in more detail in Chapter 11. The proposed rehabilitation would not introduce additional operational noise or vibration sources and therefore no additional operational impact is expected. Increases in efficiency and the replacement of worn and damaged items of equipment are expected to slightly reduce the operational noise emission level of the power station.

Both the noise and air quality assessments take into account the additional impact of this Colongra Gas Turbine, which was assessed and approved by the Department of Planning in July 2006.

12.7.3 Mitigation

A number of water quality mitigation measures have been described in Chapter 8. A fully integrated water management system is in place at Munmorah Power Station and ongoing water quality and ambient water monitoring and compliance with the EPL limits would ensure that no additional cumulative impacts are added to the local environment. Delta Electricity has prepared a water management plan for the site and is committed to investigating and implementing water savings measures at the site.

The mitigation measures set out in Chapters 7 and 11 in relation to air quality and noise would help to mitigate potential cumulative impacts that may result from the operation of the Proposal.

Liaison with Wyong Shire Council would identify any projects with possible overlap of construction periods.

12.7.4 Conclusion

It is unlikely that the proposed rehabilitation of Munmorah Power Station would have an adverse

cumulative impact on the surrounding land uses due to the rehabilitation works occurring within the existing plant area.

No additional impacts on local water quality and seagrass communities are expected. Rather the effects of Munmorah Power Station on the lakes are predicted to be significantly less than the effects of the previously operating four unit power station.

Potential cumulative impacts in relation to air quality have been assessed through assessment of previously reported local and regional air shed modelling. The air quality assessment concluded that the Proposal does not pose an adverse cumulative impact on the current local and regional ambient air quality and would comply with the relevant ambient air quality goals set by the Department of Environment, Climate Change and Water.

Potential cumulative impacts in relation to noise have been assessed based on previous monitoring and available literature. The assessment concluded that based on the assessment results, and with consideration of the proposed mitigation measures to be implemented during the construction and operation of the Proposal, the Proposal is unlikely to result in adverse noise impacts on the nearest sensitive receptors.

Project Justification

13

13. Project Justification

This chapter of the Environmental Assessment provides a review of information that provides the basis for justification of the rehabilitation of Munmorah Power Station Units 3 and 4. The Director General's Requirements issued for this project require justification for the project to be provided, having regard to environmental, social and economic impacts of the project, the suitability of the site and public interest. The project is also required to be consistent with the objects of the EP&A Act, as set out in Section 5 of the Act.

13.1 Project Need

13.1.1 Electricity supply and demand

Chapter 2 addresses the electricity supply and demand requirement of NSW. In summary, a shortfall of electricity is predicted to occur sometime in the middle of the next decade, due to a number of factors including:

- no new major baseload power generating facilities have been constructed since 1993
- more demands placed on existing infrastructure due to population growth
- possible decrease in net contributions from other states (Victoria, Tasmania).

With the introduction of the Federal Governments MRET and the NSW Government's GGAS, the lower emission generation sources (renewables and gas) are increasing their market share. While they are expected to continue to increase their share of total generation capacity, following the introduction of the national CPRS, coal-fired generators are expected to continue to play a crucial role in both the NEM and in NSW for the foreseeable future.

"The National Electricity Market (NEM) provides a wholesale market for the supply of electricity to retailers and end-users in NSW, Victoria, Queensland, South Australia, Tasmania and the Australian Capital Territory. The NSW Government's *Inquiry to Electricity Supply in NSW*, also known as the Owen Inquiry, examined the future of electricity generation in NSW and provided advice to the Government on the actions necessary for a timely investment in new baseload generation. The growth of the electrical energy use in NSW is very dependent on the growth rates forecast for the economy and the continued increase in population. Electrical consumption in NSW has grown by 1,700 GWh per year for the past 30 years. The average growth rate for the next 10 years is expected to be around 1,600 GWh per year, factoring in demand management trends. NSW generators are capable of delivering about 85,000 GWh of energy per year and the Owen Inquiry concluded that NSW needs to be prepared for new baseload generation to avoid energy shortfalls. The Owen Inquiry forecast in 2007 that more than 85,000 GWh of electrical energy would be needed in NSW by 2013/2014 under a medium growth scenario and by 2016/2017 under a low growth one.

The Owen Inquiry highlighted the timeframe requirements for the development of new baseload electricity generation. This included planning approvals, detailed design processes, contracting periods, mobilisation, construction and commissioning. The 6-10 year projected timeframe greatly restricts the types of fuels and technologies that can be considered for this purpose.

Subsequent forecasts published by TransGrid (2009) and the Australian Energy Market Operator[1] (AEMO – 2009) indicate that the growth rate in electricity demand has slowed due largely to the downturn in economic activity in Australia as a consequence of the global financial crisis. On the balance of probabilities, and reflecting improving economic growth in Australia since the analysis for the forecasts was carried out, it is anticipated that new baseload capacity will be needed in service in NSW in five to seven years. This period is about the timeframe estimated to conclude the sale of the site and for the new proponent to contract, design, procure, construct and commission new baseload generation capacity to meet growth in demand and to maintain sufficient levels of reserve capacity."

This project supports the NSW government needs for an increase in base load power generation to be available within a specific timeframe ie:

- The rehabilitation works aim to improve the efficiency and restore the output of Units 3 and 4 to 350 MW. The resulting 700 MW baseload generation that would provide around 4,800 GWh of electricity per annum.
- The rehabilitation works at Munmorah would take approximately 24 months to complete, meaning the plant could be available by 2015/16, which is within the timeframe of need.

This project would not negate any need for renewable energy sources or for government regulation and policy directives. This project would be undertaken within the context of these issues.

[1] AEMO came into being on 1 July 2009 as a result of a merger of NEMMCO, VENCorp and other energy bodies.

13.1.2 Efficiency and greenhouse gas emissions

The NSW Government has instituted a number of schemes and plans aimed at improving sector efficiency and reducing the reducing greenhouse gas emissions associated with the production and use of electricity

The rehabilitation works will improve the generating capability of the two remaining operational units at the site, while reducing the overall carbon emissions per unit of electricity generated, making it environmentally competitive for existing baseload generation. The efficiency improvements that would result from the rehabilitation will mean the combined output of Units 3 and 4 will increase by around 100MW for the same fuel consumption. This is equivalent to providing the electricity needs for around 14,000 standard households. This will be achieved by replacing outmoded and worn components with the commercially best available technology

The installation of appropriate burners allow Munmorah Power Station to generate with coal or natural gas, consistent with the Governments fuel neutral policy, In addition, the rehabilitation would ensure the plant would be suitable for fitting future carbon capture technologies when they are commercially available and practical.

13.2 Site Suitability and Infrastructure availability

Munmorah Power Station is a valuable power generation site for NSW due to its designation as a power generation site and long established use for electricity generation. The existing buffer zone with the surrounding community and existing fuel delivery, transmission and other infrastructure connections significantly reduce the impact when compared to an equivalent greenfield development.

Colongra Gas Turbine power station is one of two parties contracted by the AEMO to provide black restart services for the system in northern NSW. Munmorah and Vales Point Power Stations provide a system restart pathway for Colongra to restore supply to the Central Coast region in the event of a system blackout event. Under these circumstances, Colongra power station would be used to restart Munmorah and/or Vales Point power stations, which in turn would be used to re-power the electricity grid. The close proximity of Munmorah power station provides for a simpler and faster switching process when re-powering from Colongra Gas Turbine, This provides for faster restoration of electricity supply to the grid. Having both Vales Point and Munmorah units available for black restart increases the flexibility, reliability and load capacity of the service to AEMO. A black restart test has been successfully performed using a Munmorah unit to demonstrate the service to AEMO.

The infrastructure required to distribute the electricity generated at the site already exists and is suitable to meet the ongoing generation from the site. Some upgrading of the current coal supply infrastructure may be required within the existing conveyor easement.

The existing ‘once through’ salt water cooling system has adequate capacity for the rehabilitated plant. This system results in greater generation efficiencies when compared with other wet and dry cooling systems as well as providing generation security during times of severe droughts when inland power stations water supplies are threatened.

Munmorah is supplied with domestic water by the Gosford City and Wyong Shire Councils, Central Coast’s water supply system. The councils have developed and integrated water cycle management plan (IWCMP), Water Plan 2050, to ensure sufficient water is available in to the future. The plan sets out the strategy water consumption.

13.3 Strategic Directions

The rehabilitation of Munmorah Power Station will provide additional generation capacity at the lowest cost to minimise the risk of high value stranded assets in the event that more significant greenhouse gas reductions are eventually implemented. This project provides one of the most feasible options for an interim measure to provide baseload electricity to the NEM.

13.4 Acceptability of Environmental Impacts

Comprehensive assessments of the relevant environmental issues have been undertaken. As required under Part 3A of the EP&A Act, environmental mitigation, management and monitoring requirements have been compiled and summarised into the Statement of Commitments, provided in Chapter 14.

The key environmental impacts associated with the proposed project have been assessed in Chapters 5 to 12 of this EA and include examination of the following:

- Greenhouse gas emissions;
- Air quality;
- Water Cycle Management;
- Waste generation
- Hazards and Risk
- Noise and Vibration, along with
- other issues less significantly affected by the project.

13.4.1 Greenhouse gas emissions

The main objective of the rehabilitation works will be to return the units back to the original design rating of 350 MW output and to improve the overall efficiency of operation. The rehabilitation will reduce the consumption of coal per unit of electricity generated thereby achieving a reduction in greenhouse gas emissions per unit of electricity generated. Put another way, at full load about 100MW of additional electricity would be produced with no increase in the amount of fuel consumed.

13.4.2 Air quality aspects

The air quality assessment, discussed in Chapter 7 examined the potential impacts of atmospheric emissions from the project. This included consideration of emissions of SO_x, NO_x, lesser amounts of other gaseous compounds and particulates.

The installation of low NO_x coal burners are proposed as part of the rehabilitation work. The expected NO_x emissions are expected to be substantially lower than the current NO_x emissions, achievable at most operating conditions (low and high loads).

The impacts of Munmorah Power Station on local and regional level have been shown to comply with current standards and goals. Historical air quality monitoring results, which include the effects of current Munmorah Power Station operations, demonstrate that SO_2, NO_x, and other gaseous compounds are well below the NEPM limits.

Fabric filters, consistent with current Best Available Techniques, were installed at Munmorah Power Station in the 1990s and particulate emissions from the currently operation plant are well below the license requirements of 50 mg/Nm^3. These emissions are predicted to remain predominantly unchanged.

Following an analysis of the potential effects of emissions to the atmosphere and in consideration of proposed mitigation measures and safeguards the assessment concludes that the rehabilitation of Munmorah is not expected to substantially affect existing air quality and potential impacts are acceptable.

13.4.3 Water management

Munmorah Power Station is supplied with potable (domestic) water supplies from the Central Coast Water Supply Scheme operated by Gosford and Wyong Shire Councils and has historically consumed up to 500 ML of domestic water. Potable water is supplied in accordance with the Water Sharing Plan for the Central Coast Unregulated Water Sources 2009.

The projected fresh water demand by the rehabilitated power station, in the absence of significant water savings measures is around 380 ML/a. Actual consumption from year to year varies due to a number of internal and external factors as discussed in Chapter 8.

Munmorah's domestic water consumption represents around 2% of the fresh water demand in the Wyong sub area. Delta continues to play an active role in the development of water savings initiatives within the region. The consumption of water and ongoing participation in the development of water savings strategies by Delta Electricity within the framework of the Wyong Integrated Water Cycle Management Sub Plan is consistent with long-term water supply strategy for the Central Coast (Gosford and Wyong Councils, 2007).

Ambient water characteristics have been examined and found to be acceptable and are not expected to be affected by the Proposal.

Investigations of likely impacts on local water quality and the lakes have shown that the effects of the rehabilitated, Munmorah Power Station will be to be significantly less than the effects of the previously operating four unit power station and consistent with the effects of two units operating when the power station was built. Significant improvements, are also identified when compared with recent operating impacts.

An examination of the recreational uses of the lakes and predicted changes following rehabilitation has predicted that there would be no additional impact on the recreational use of the lakes.

The assessment concludes that environmental impacts on the Water Cycle as a result of the Project are acceptable.

13.4.4 Waste generation

Delta Electricity fully complies with the NSW Government WRAPP policies. Replaced components and construction waste removed as a result of the rehabilitation will be disposed of in accordance with the NSW Government Guidelines. No changes to the ultimate demolition requirements for the Power Station at end of life are expected.

The most significant non-hazardous waste generated by the power station is the ash produced by the combustion of coal. For the worst case scenario that the fuel source for the station is 100% coal, it is expected that the rehabilitation of Munmorah Power Station would shorten the expected life of the ash dams by anything between two and eight years depending on the ash content of the coal and sales.

Sales of flyash, furnace ash and cenospheres by Delta Electricity currently occur. While the market demand is currently fully supplied, efforts to develop markets and address regulatory constraints that may provide a path to increase these sales in the future continue. Ash disposal is currently managed through the existing Central Coast ash management plan which is reviewed every five years.

While there is adequate storage for furnace ash, under high ash production, low sales scenarios, the existing ash storage systems will be required to be augmented during the life of the rehabilitated plant.

Taking the storage capacity scenarios of both ash dams in to account, with the proviso that ash storage for Vales Point Power Station is able to store its projected ash production, it is predicted that, in the absence of significant increases in the demand for ash products, flyash could continue to be stored in Vales Point Ash Dam until around 2019/20. Beyond that, alternative ash storage strategies for about 6 Mt of Munmorah fly ash, probably within the boundaries of the existing Central Coast Ash Dams would need to be investigated.

While there is capacity to store fly ash at Munmorah Ash Dam for around a further six years, a detailed investigation of potential impacts and the development of appropriate mitigation measures and safeguards would be required before the current ash storage arrangements could be modified. This may include new water management infrastructure appropriate to changed operations.

Options to expand storage capacities to be considered may include:

- dense/dry phase storage,
- additional height of storage and/or
- pick-up of any remaining Vales Point ash storage after closure
- storage in disused underground mines.

Consideration of the options has demonstrated that, at a conceptual level, viable ash storage solutions would be able to be developed.

The ongoing ash storage beyond 2019/20 is not considered further in this assessment. The timing for detailed planning, gaining of necessary approvals and development of alternative ash storage strategies will be influenced by a number of factors, including ownership, electricity production, ash markets, fuel choice, economics and environmental considerations.

While it is expected that additional storage areas would be located within the boundaries of the existing Central Coast Ash Dams, this would be the subject of a further detailed assessment and additional approval.

This assessment has examined how waste can be effectively managed for the Project.

13.4.5 Noise and vibration

Noise emissions from the proposed rehabilitation of the existing Munmorah Power Station have been assessed and compared to the existing noise sources on site. The proposed rehabilitation works will not introduce additional operational noise or vibration sources and therefore no additional operational impact is expected. Increases in efficiency and the replacement of worn and damaged items of equipment is expected to slightly reduce the operational noise emission level of the power station.

Noise emissions from the proposed rehabilitation of the Munmorah Power Station are specified in the existing Munmorah Power Station Noise Management Plan developed by Parsons Brinkerhoff (September 2008) and the emissions criteria described in Chapter 11.

All feasible and reasonable noise control measures will be implemented during the design stage and commissioning measurements will be conducted to verify the noise modelling.

A construction noise and vibration management plan will be developed to assess in detail the impact of construction noise on the local community and ensure noise criteria are met once a detailed construction schedule is developed.

No additional operational noise and vibration impacts are expected and it is anticipated that that the increases in efficiency and the replacement of worn and damaged items of equipment is expected to slightly reduce the operational noise emission level.

Should unforeseen noise emissions post commissioning be found to be excessive, options for remedial action have been identified and discussed.

The noise investigations have demonstrated that the project design, monitoring and mitigation measures and safeguards should ensure that acceptable noise amenity levels are maintained.

13.4.6 Hazards and Risks

The risk assessment of potentially hazardous materials has been undertaken. All risks identified during the risk assessment with high cumulative, consequence and likelihood scores have been qualitatively assessed and have demonstrated effective technical and management controls to ensure the ongoing safety of the proposed development.

None of the other hazard scenarios identified had the potential of presenting an unacceptable risk to the surrounding land users.

Quantitative calculations of a possible natural gas leak and subsequent fire, carbon dioxide release and ammonia release showed that it would not impact on the neighbouring land users. The risk assessment demonstrated that the Munmorah Power Station rehabilitation project site can operate with an acceptable risk level provided that the documented procedures and controls are applied

13.4.7 Other Issues

Traffic and transport

Construction traffic may temporarily disrupt and impact on normal traffic flow, however based on the construction traffic estimates, potential impacts on the local traffic conditions are likely to be low. The scheduling of transport activities during the early periods of the day and the use of appropriate traffic management measures would ensure disruptions to the local road users are minimised. Traffic and transport issues have been addressed an will be managed to ensure that any impacts are acceptable.

Flora, fauna and heritage

Impacts on local flora, fauna and heritage are expected to be minimal as the majority of works occur within the existing plant area of the operating power station. Options to upgrade the MV Conveyor considered in this proposal are restricted to those options which can be undertaken within the existing conveyor easement in currently engineered areas.

Any minor deviations of the MV conveyor that might be proposed which consider impacts away from the cleared conveyor bench and adjoining access roadway would need to be subject to additional assessment and approval and do not form part of this Proposal.

A preliminary review of existing information confirmed that the majority of areas adjacent to the MV conveyor are unlikely to contain threatened species, endangered ecological communities or significant habitat.

One adjacent area in the vicinity of Vales Point Ash Dam includes the TSC Act listed vulnerable species *Angophora inopina*. Safeguards would be included in the project Environmental Management Plans to ensure that this area is identified and safeguarded during rehabilitation works.

Areas adjacent to the rehabilitation works have been designated as having low archaeological sensitivity. Accordingly no significant impacts on local flora, fauna and heritage are anticipated. Safeguards to protect areas of identified PAD adjacent to the MV conveyor would be included in the project Environmental Management Plans to ensure that they are identified and safeguarded during rehabilitation works.

The need for any further investigation of unforseen non operational areas that may be proposed to be disturbed by the proposed rehabilitation works would be identified at the detailed design stage.

Socio-economic

The proposed rehabilitation will result in little perceivable change for the local community. The rehabilitation would provide ongoing employment

opportunities for the staff of Munmorah Power Station and some Delta Maintenance staff based at Vales Point Power Station. This employment makes an important contribution to the local economy and many of the site staff resides in the local community.

The proposed rehabilitation project should not impact on amenity or social impacts, given the proximity of sensitive receptors, and design and management measures which would be implemented as outlined in the Statement of Commitments (refer Section 13.6).

The proposed project responds to consumer demand and the Government's intent to increase power generation capacity in NSW in line with demand to avoid system capacity exceedances. Rehabilitating Munmorah Power Station existing is a cost effective way of providing generation capacity to meet the growing demand for power, without developing a new power plant.

The proposed rehabilitation project would provide both direct and indirect economic benefits to the local, regional and state economies. The construction phase of the proposal would generate some local employment opportunities and income to local businesses in the Central Coast area. Continuing to operate Munmorah Power Station following rehabilitation would provide direct employment and indirect benefits for the operation and maintenance of the facility.

The proposed project would also provide economic benefits to the State through the improved security and reliability of the State's electricity supply.

Given these benefits, the proposed project is justifiable on social, cultural grounds and economic grounds.

Visual

The rehabilitation of Munmorah Power Station largely occurs within the existing buildings, which are the dominant visual element of the site. The rehabilitation works described in the Proposal are unlikely to have a significant impact on the visual landscape of the area.

Cumulative Impacts

The rehabilitation of Munmorah Power Station largely occurs within the existing buildings, and operational areas of the site. As Munmorah is an operating power station, the rehabilitation is unlikely to result in any significant increase in cumulative impacts in the region.

A consideration of possible future ash storage requirements has demonstrated at a conceptual level that a viable ash storage option should be able to be developed.

13.5 Ecologically Sustainable Development

Ecological Sustainable Development (ESD) has become an internationally recognised principle which was defined by the World Commission on Environment and Development (1987) as '*development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.*

The concept of ESD has subsequently been incorporated into the NSW decision making process through environmental legislation and government policy. The principles of ESD are legally defined in the *Protection of the Environment Administration Act (POEA Act) 1991*, Section 6(2) and include:

a) *the precautionary principle - if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;*

b) *inter-generational equity - the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations*

c) *conservation of biological diversity and ecological integrity; and*

d) *improved valuation, pricing and incentive mechanisms – that is environmental factors should be included in the valuation of assets and services, such as polluter pays, full life cycle costing, and utilising incentive structures/market mechanisms to meet environmental goals..*

The EPBC Act also identifies a fifth principle for consideration in environmental impact, namely:

Decision making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations.

These five principles are interrelated and need to be considered both individually and collectively as part of determining whether or not a project would be consistent with the principles of ESD in Australia.

13.5.1 Precautionary Principle

The 1992 Intergovernmental Agreement on the Environment between State and Commonwealth Governments defined the precautionary principle in the following way:

i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and

ii) an assessment of the risk-weighted consequences of various options.

Delta Electricity has considered the 'precautionary principle' for the proposed rehabilitation of Munmorah, as represented by the investigation of alternative options in respect to site selection and feasible base load alternatives, and the investigations undertaken to determine the characteristics of the environment, and the likely impacts associated with the proposed option.

As discussed in Chapter 2 the proposed rehabilitation of Munmorah Power Station was considered the most appropriate option as it represents the most efficient and effective method of meeting the increasing demand for electricity and achieving an acceptable environmental outcome.

Environmental studies were undertaken to identify potential environmental impacts. This enabled the proposed project to be designed to avoid significant environmental impacts, and allowed measures to be developed to manage or avoid potential environmental impacts.

Environmental monitoring of the power station operations and the environmental management measures would be undertaken for the life of the power station to ensure that the environmental impacts are appropriately managed and adjustments made to ensure environmental strategies and goals are met for the site.

13.5.2 Intergenerational Equity

The principle of 'intergenerational equity' requires that decisions made by the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

The proposed rehabilitation of Munmorah Power Station would have minimal long-term impacts on the environment as a result of detailed planning for the preferred design and management of potential operational impacts to avoid significant impacts on the environment through the implementation of environmental management measures.

Delta Electricity has an accredited Environmental Management System (EMS) which would adopt the safeguards identified in this EA particularly those associated with the operational phase of the project. In addition, incorporation of the identified safeguards in the design of the proposed project would allow environmental impacts at the operational phase to be more effectively managed.

13.5.3 Biological diversity and ecological integrity

The conservation of biological diversity and ecological integrity is a fundamental consideration of ESD. The potential impacts of the proposed project on flora and fauna ecology of the area has been considered in Chapter 12.

There have been several ecological assessments undertaken for the site over the past several years. Based on these cumulative findings it is concluded that the proposed Proposal would not impact threatened species of ecological communities as it involves the continuation of existing operations and the rehabilitation work would mostly occur within the existing power station footprint.

Appropriate environmental safeguards have been recommended to minimise potential impacts to local and regional biodiversity. With the implementation of the recommended safeguards, it is considered that the project meets the principle of biological diversity and ecological integrity.

13.5.4 Valuation and pricing of environmental resources

The Intergovernmental Agreement on the Environment and the POEO Act 1991 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.

Given the different values placed on the environment, and the various components of an environment, it is difficult to assign a monetary value against the environmental costs and benefits associated with the proposed rehabilitation of Munmorah Power Station

When considering the valuation and pricing of environmental resources the cost of implementing and managing the recommended environmental management measures is included. The impact assessment and the alternative baseload options discussed in Chapter 2 are relevant to the consideration of the valuation and pricing of environmental resources for 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.

Delta Electricity would implement the safeguards and monitoring requirements outlined in this EA to minimise environmental impacts caused by the proposed project, and to minimise the potential for pollution to occur.

13.5.5 Consequences of not proceeding

As discussed in Chapter 2, the *NSW State Infrastructure Strategy* (Department of Treasury, 2008), states that the NSW population is projected to grow from about 7 million in 2008 to 7.6 million in 2018. Sydney (including the Central Coast) is expected to account for 70 per cent of this growth. The population growth experienced from 2007 to 2008 was 1.1%, higher that the average increase of 0.9% per annum, measured over the previous five years. The Central Coast is estimated to grow by around 12 per cent between 2008 and 2018, the largest of the State Infrastructure Strategy regions.

The growth scenarios have an impact on the ability to meet electricity demand through the supply options currently facing NSW. This includes a limited range of technologies, a restricted supply from other sources (including interstate transfers) and the constraints placed on current generation facilities.

Priority P2 of the *NSW State Plan* (2006, updated 2008) aims to maintain and invest in infrastructure including roads, railways, power, water supply and ports. The plan states

"*The Government needs to ensure we have the right infrastructure at the right place at the right time."*

The plan commits to maintain an average annual growth rate in Government capital expenditure of 4.6% nominal over the decade to 2015-16. The plan identifies a target of electricity reliability for NSW of 99.98% by 2016. http://www.nsw.gov.au/stateplan/

The NSW Government developed an Energy Reform Strategy (http://www.nsw.gov.au/energy/), includes the option to rehabilitate of Munmorah Power Station Units 3 and 4.

Munmorah Power Station, if rehabilitated, would provide 700MW of the additional generation capacity required in the next decade. Upgrading existing plants is considered to be a cost effective way to provide new generation capacity, and meet growing demand for a limited period of time without developing a new power plant.

Without the proposed project, Munmorah Power Station would cease operating at around 2012. A cost effective option to providing part of NSWs' required additional baseload capacity of 700 MW providing around 4,800 GWh of electricity per annum would also be lost.

Therefore the proposal to rehabilitate Munmorah Power Station is in accordance with consumer demand and the government's intent to increase generation capacity where possible and practical.

13.5.6 Decision making process

The proposed project requires approval under Part 3A of the EP&A Act 1979. As part of this approval, a variation to the existing Environment Protection Licence would be required under the POEO Act.

An assessment of the short, medium and long term impacts of the proposed project, taking into account the principles of ESD is described in this EA. The Statement of Commitments, provided in Chapter 14 forms the environmental mitigation, management and monitoring requirements for the project and its proposed operations.

The project approval process prescribed under Part 3A of the EP&A Act and subsequent environmental management frameworks ensure 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.

13.5.7 Conclusion

The proposed project described in this EA is consistent with the principles of ESD defined in the *Protection of the Environment Administration Act (POEA Act) 1991* and the Intergovernmental Agreement on the Environment.

Statement of Commitments

14

14. Statement of Commitments

This chapter provides a Statement of Commitments by the proponent in relation to environmental impact mitigation, management and monitoring associated with the rehabilitation of Munmorah Power Station.

14.1 Introduction

Delta Electricity proposes to mitigate the impact resulting from the rehabilitation of Munmorah Power Station by undertaking the measures outlined in this Chapter. It is proposed that these mitigation measures, along with any conditions of approval issued by the Minister for Planning, will be incorporated into the detailed design of the project and, where appropriate, the construction Environmental Management Plans (EMP) and an updated EMP for Munmorah Power Station.

Delta Electricity received third party certification to ISO 14001 in June of 2002 for all its power stations. The ISO 14001 standard provides a “best practice” specification for implementation of an Environmental Management System (EMS). This international environmental standard ensures a consistent approach is undertaken to integrate environmental management at all levels of the organisation by:

- identification of significant environmental risks,
- identifying and maintaining awareness of relevant environmental legislation,
- assignment of roles and responsibilities,
- establishment of procedures for internal and external communications,
- establishment of procedures for monitoring and measuring environmental performance,
- setting and reviewing objectives and targets for improving environmental performance,
- monitoring and measuring environmental compliance and community inquiries,
- setting and reviewing management system programs for achieving objectives and targets,
- provision of environmental training aligned to skill requirements, and
- review of EMS performance for continual improvement.

The environmental requirements of the rehabilitation will be managed to be consistent with this system.

The Construction EMP and supporting sub plans will include any statutory and approval requirements, environmental performance requirements, goals and responsibilities, mitigation measures and safeguards. In addition environmental performance monitoring and auditing procedures along with guidelines for emergency response and incident management plans and responsibilities would be included.

14.2 Statement of Commitments

This section states the commitments made by Delta Electricity to ensure that the impacts of implementing the rehabilitation project are acceptable. Subject to the incorporation of the mitigation measures identified in the following table, the rehabilitation of Munmorah Power Station Units 3 and 4 can be implemented with acceptable impacts to the environment.

Table 14.1 – Summary of Commitments

Environmental Issue	Commitment
Greenhouse Gas Emissions	
1	Monitoring and measurement for the purpose of reporting of greenhouse gas emissions from Munmorah Power station in compliance with the requirements of National Greenhouse and Energy Reporting (NGER) Act 2007.
2	The rehabilitation works under all coal/gas firing scenarios will ultimately result in a reduction in the greenhouse intensity factor of the Munmorah Units compared to current operation.
3	Consistent with the International Energy Agency (2007) definition of carbon capture ready, summarised in Section 6.3, the requirements necessary to make the rehabilitated Munmorah Units 3 and 4 "Carbon Capture Ready" will be considered in the detailed design for the rehabilitation.
Air Quality	
4	Delta Electricity shall limit the average sulfur content in coal to 0.7%.
5	Delta Electricity commits to achieving 500 mg/m^3 for NO_2 under normal operating conditions.
6	Delta Electricity shall ensure that mitigation measures are implemented during rehabilitation work to minimise dust generation as much as practicable. They may include: • Ensuring vehicles drive only on designated routes; • Ensuring all loads are covered when hauling material; • Minimising the stockpiling of material that has a high dusting potential; and • Conducting audits of dust-generating sources during typical work activities to ensure visible dust sources are mitigated as quickly as possible.
7	In the event that earthworks are required for the upgrading of the MV conveyor, Delta Electricity shall ensure the following mitigation measures are implemented during construction work to minimise dust generation as much as practicable. They may include: a. Ensuring vehicles drive only on designated haul routes, and the use of water trucks on all haul routes, where possible; b. Ensuring all haul trucks are covered when hauling material; c. Ensuring trucks do not have excessive soil on tyres when leaving the site that may fall off onto road ways generating dust (may be achieved through measures such as rumble strips, wheel washes etc.); d. Minimising the stockpiling of excavated material that has a high dusting potential; e. Use of water sprays on stockpiles that may remain for significant lengths of time and during excavation of material with high dusting potential; and f. Revegetation or sealing of completed areas to minimise wind-blown dust.
8	Continue monitoring and reporting of emissions to air as required by the current DECCW EPL licence for the facility
Water Cycle Management	
9	Continue to operate in accordance with the requirements of the Station's Environmental Protection Licence.
10	Delta Electricity is committed to ensuring the appropriate use of water in its operations at Munmorah Power Station.
11	Delta Electricity will continue to adopt an Integrated Water Supply approach to the management of water at Munmorah Power Station and continue to work with the Central Coast Water Supply Authority (Gosford and Wyong Councils) to examine ways to more effectively use water
12	Delta Electricity will regularly review its water usage by way of routine inspection, metering and reporting.
13	Delta Electricity will survey the distribution of seagrass in the Tuggerah Lakes during the 2009/10 summer.

Environmental Issue	Commitment
14	Delta Electricity will undertake a survey of the distribution of seagrass in the Tuggerah Lakes following the completion of rehabilitation works.
Waste Management	
15	Delta Electricity shall comply with the NSW Government's WRAPP
16	All waste shall be classified and disposed of in accordance with the Waste Classification Guidelines produced by the Department of Environment, Climate Change and Water.
17	Solid waste (except ash) shall be segregated into recyclable and non-recyclable waste products where possible and disposed off-site by licensed waste contractors.
18	Detailed investigation and consideration of alternative ash storage arrangements for ash storage beyond the surplus capacity of Vales Point Ash Dam shall be undertaken.
19	Delta Electricity will continue to promote increased ash sales from the Central Coast Power Stations and encourage development of new markets for these products. It is noted that current ash sales reflect the state of the market for the beneficial use of ash products at present and significant increases may be unlikely without market and regulatory changes.
20	The design of the rehabilitation works will ensure that nothing is done to reduce access suitable for the provision of infrastructure suitable for the recovery of furnace ash products for sale
Hazards and Risk	
21	Appropriate safeguards shall be incorporated into the design and operation of the proposed development as prevention or protection measures for higher-level risks. These measures may include plant design features, organisational safety controls, and emergency and counter disaster procedures. Options will be evaluated on the basis of the extent of risk reduction and the extent of benefits or opportunities they create. In general, the cost of managing risks will be commensurate with the benefits obtained.
Noise and Vibration	
22	Noise levels shall comply with the NSW Industrial Noise Policy amenity criteria – suburban environment
23	The design stage shall aim to ensure that operational noise emissions from the site at receiver achieve the project specific noise goal of 39 dBA.
24	Noise monitoring will be conducted as part of the commissioning stage of the project.
25	Should commissioning noise monitoring show that noise emissions from the Munmorah Power Station at the nearest sensitive receiver exceed 39 dBA, a schedule of possible mitigation measures shall be developed and incorporated into an agreed pollution reduction program to target a reduction in noise impacts to the project specific noise goal of 39 dBA.
26	A Construction Noise Management Plan shall be developed prior to the commencement of construction. The construction noise management plan shall implement methodologies that may include: a. Minimising tonal reversing alarms with the implementation of broadband reversing alarms b. Using a "forward working procedure" minimising reversing trucks, forklifts etc, wherever possible c. Using low noise construction practices, where possible d. Locating noisy machinery as far from nearest sensitive receivers, where possible e. Consideration of noise emissions from heavy vehicle routes delivering equipment to site and removing waste from site to sensitive receivers f. Limiting noise sensitive activities to between 7 am and 6pm Monday to Friday, 7 am to 1 pm on Saturdays;
27	Assessment of noise emissions from the final design option for the upgraded MV conveyor shall be conducted during the design stage of the project to ensure noise emissions from the conveyor comply with the operational noise criteria.
28	Silencers shall be installed to the steam release valves.

Environmental Issue	Commitment
Traffic and Transport	
29	A traffic management plan shall be developed to include the required transport requirements for the rehabilitation works.
30	Traffic and Transport Plan shall make provision for the transport of oversize items and may include: a. Confirmation of the final route and haulage timetable. b. Any requirements for modification to local infrastructure c. Obtaining all required permits for transport of overmass equipment d. Phasing of delivery schedules to meet rehabilitation requirements e. Ensuring that all access roads are suitable for transport of overmass equipment f. Alert other transport users of the transportation activities g. Media, newsletters and letter-box drops shall be used to ensure the community is aware of the designated delivery periods, delivery routes and access points to the site for all h. Access points to and from local roads to meet NSW Roads and Traffic Authority and Council requirements i. Designated speed and load limits for heavy vehicle routes and on site j. Designated reserves on the site for parking, turning, loading and unloading k. Appropriate traffic controls and on-site management measures to ensure that vehicles use designated roads only l. Inspection and maintenance of access routes and site tracks to ensure they are kept in an adequate and safe condition.
Flora and Fauna	
31	Delta Electricity shall undertake appropriate Flora and Fauna investigations in the event that detailed design investigations propose options that would deviate from currently established operational areas. These investigations will fully assess the impacts of proposed works and determine the appropriate mitigation measures and safeguards.
32	Delta Electricity shall include any identified flora and fauna safeguards and mitigation measures associated with the MV conveyor upgrade in the project Construction EMP, prior to upgrade works commencing on the MV conveyor
33	Delta Electricity shall retain existing vegetation on the site and incorporate local endemic native species in any post-construction rehabilitation and landscaping
34	The following mitigation measures and safeguards shall be implemented: a. Access for workers, their equipment and vehicles would be restricted to the designated asphalt roads, where practicable. Site inductions will include awareness training about the ecological values of areas within the power station site. b. Colour tape or 'parawebbing' will be used to delineate the maximum work area permitted and 'no go' areas adjacent to the work site if the threatened species *Angophora inopina* is located in the vicinity of the Munmorah Vales Point coal conveyor upgrade works. This would be implemented prior to any work commencing on site. c. Parking of vehicles and stockpiling or storing of equipment waiting for disposal off site, construction equipment and materials would be confined to designated areas.
Indigenous and Non- Indigenous Heritage	
35	Delta Electricity shall undertake appropriate Heritage impact investigations in the event that detailed design investigations propose options that would deviate from currently established operational areas. These investigations will fully assess the impacts of proposed works and determine the appropriate mitigation measures and safeguards.
36	Delta Electricity and its contractors shall cease construction works immediately if archaeological material is located during construction works, isolate the area from other works and contact the National Parks and Wildlife Services (NPWS) immediately. No work shall resume in the locality of the archaeological material until the NPWS give clearance to do so.

Environmental Issue	Commitment
37	Should Aboriginal objects or sites be located during the rehabilitation works Delta Electricity would engage a professional archaeologist, in conjunction with the relevant Aboriginal communities, to investigate and record and manage the object/site prior to its disturbance.
38	Delta Electricity shall ensure that all contractors are made aware of the project heritage management requirements prior to commencing site works.
Soils	
39	In the event that earthworks are required for the conveyor refurbishment, a Construction Soil and Water Management Plan shall be prepared in consultation with relevant agencies. The plan, which would form part of the project CEMP, This shall include an erosion and sediment control plan that would be consistent with the 'Blue Book' Managing Urban Stormwater: Soils and Construction – 4th Edition (Landcom 2004). Measures considered in the erosion and sediment control plan shall include: a. Installation and regular inspection of sediment controls such as sediment fences and bunds b. Stockpile materials away from drainage lines and waterways c. Avoid using machinery near drainage lines d. Minimise transfer of soils through use of wheel wash facilities e. Remove any soils from public roads and other paved areas through the use of dry street sweepers f. Revegetate disturbed areas if required g. Only reuse topsoil containing exotic seeds on-site, if it is to be buried more than 200 mm below the surface h. Ensure that spill kits appropriate to any products used on site are readily available
40	Delta Electricity shall minimise the erosion and the potential discharge of sediments from the site.
Community	
41	Delta Electricity shall continue to keep the community informed about the rehabilitation works through existing community information activities including the CARE Forum, media and local newsletter drops prior to the commencement of key activities.
42	Delta Electricity shall provide regular updates of progress of rehabilitation works following formal commencement through existing community information activities including media, local newsletter drops and updates on the Delta Electricity web site

14.3 Environmental reporting

Periodic environmental reports will be prepared to report performance and progress against the Construction EMP and Station Operational EMP. Any shortcomings in environmental performance identified will be reported and addressed.

14.4 Emergency response

The Munmorah Power Station emergency response and incident management plan outlines the appropriate emergency response requirements for the site. This includes the equipment, the mandatory training requirements, the emergency response procedures and the responsibilities of site operators for these matters.

The existing Munmorah Power Station emergency response and incident management plan will be updated where necessary to ensure incidents associated with the rehabilitation are handled promptly and safely.

14.6 Conclusions

The environmental assessment undertaken for the project has identified the benefits arising from the Munmorah rehabilitation and considered potential environmental impact arising from project.

Mitigation measures have been incorporated, where appropriate, into this Chapter as commitments for environmental management. These measures will be further developed in the EMPs for the rehabilitation work and ongoing operations at the site. The EMPs provide the procedures by which the impact of the project on the environment will be managed and mitigated.

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