



NSW GOVERNMENT

Department of Planning

***MAJOR PROJECT ASSESSMENT:
Bamarang Gas-Fired Power Station
(Stage 2)***

Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

October 2008

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EXECUTIVE SUMMARY

On 27 February 2007, Delta Electricity (the Proponent) received concept plan approval for the staged development of a new gas-fired power station at Bamarang approximately seven kilometres west of Nowra, as well as project approval to develop the first stage of that power station, comprising the construction and operation of a 300 megawatt open-cycle gas turbine facility, including ancillary gas pipeline and transmission line infrastructure. The Minister's concept plan approval detailed further assessment requirements that the Proponent must address in seeking project approval for the second stage of the proposal, the design of which was not sufficiently well advanced to warrant project approval at the time of the concept plan.

The Proponent has now sought project approval to develop Stage 2 of the power station, involving the conversion of the (yet to be constructed) Stage 1 plant to a 400 megawatt combined-cycle facility and the construction and operation of water supply infrastructure to supply both the Stage 1 and Stage 2 facilities. The Stage 2 facility is proposed to operate up to 24 hours a day and 365 days a year as a base load electricity generator providing constant electricity supply to the network. The Stage 2 project would entail significant benefits to the State of New South Wales, by helping to secure base-load electricity supply to cater for existing and future inhabitants of the State.

The Department received a total of 10 public submissions on the Stage 2 project. Of these, four objected to the project, two indicated in principle support, whilst the remainder did not specifically state a position. Six submissions were received from public authorities: the Commonwealth Department of Defence; Commonwealth Civil Aviation Safety Authority; NSW Department of Environment and Climate Change; NSW Department of Water and Energy; NSW Rural Fire Service and Shoalhaven City Council (incorporating Shoalhaven Water). None of the agencies objected to the proposal, however raised issues for the Department's consideration.

The potential for environmental impacts associated with Stage 2 project related to two new design elements which were not considered in detail during the concept plan (water supply infrastructure and the incorporation of air-cooled condenser technology rather than wet-cooled condenser), as well as potential impacts associated with future landuse identified in the Nowra Bombaderry Structure Plan, which was finalised following the approval of the concept plan and Stage 1 project. Submissions on the proposal mainly raised concerns regarding potential noise, air quality, visual and landuse impacts associated with a power station at Bamarang and these issues were considered where relevant to the Stage 2 project, although the impacts of the approved Stage 1 project were not revisited.

The Department assessed the Proponent's Environmental Assessment, Submissions Report and Statement of Commitments on the Stage 2 project and submissions received by public agencies and the community on the project. Based on its assessment, the Department is satisfied that the Proponent has provided a robust and conservative assessment of impacts and that the impacts associated with the Stage 2 are consistent with the approved concept plan for the Bamarang gas-fired power station. They can be managed and mitigated to achieve acceptable environmental standards, so as to not preclude the orderly and economic development of surrounding landuse.

Although some residual noise and visual impacts may result, particularly to the future long-term living areas identified directly to the east of the project site boundary at Bamarang, the Department considers the project to be on balance justified given its benefits to the broader community and because opportunity exists to minimise impacts to future landuse through appropriate development controls should this area be developed as planned (e.g. the location of less noise sensitive landuse such as commercial premises to buffer and shield more sensitive residential landuse and appropriate dwelling siting and landscaping). The Department has drafted a recommended instrument of approval incorporating stringent and comprehensive environmental mitigation and management requirements consistent with the management framework already established for Stage 1 and to serve to enhance commitments made by the Proponent in its Statement of Commitments.

On balance, the Department considers the project to be justified and in the public's interest and should be approved subject to the Department's recommended conditions of approval and the Proponent's Statement of Commitments.

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1. BACKGROUND

On 27 February 2007, the Minister for Planning granted concept plan approval to Delta Electricity (the Proponent) to develop a new gas-fired power station and associated ancillary infrastructure in two stages, at Bamarang, approximately seven kilometres west of Nowra. At the same time, the Minister granted project approval for Stage 1 of the development involving the construction and operation of an approximately 300 megawatt open-cycle (peaking) gas turbine facility, including ancillary transmission line and natural gas pipeline. Construction of Stage 1 has not yet commenced.

Project approval was not granted to Stage 2 of the development, involving the conversion of the Stage 1 facility into an approximately 400 megawatt (base-load) combined-cycle facility, as its design at the time was not considered sufficiently well advanced. In addition, project approval was not granted for the proposed means of water supply to both Stages 1 and 2 as this matter was not finalised at the time of concept plan approval. The Minister's concept plan approval specified further assessment requirements that the Proponent must address in seeking project approval for the Stage 2 combined-cycle facility, including outstanding water supply infrastructure.

The Proponent has now sought project approval for the Stage 2 facility and for water supply infrastructure to cater for both Stages. Should project approval be granted, the Proponent may choose to develop the power station in a staged manner (i.e. construct and operate the approved Stage 1 open-cycle facility and then convert to a combined-cycle facility at a future date) or proceed directly to the Stage 2 combined-cycle facility. In either case the ancillary infrastructure (gas pipeline and transmission line) approved under Stage 1 would be constructed and operated in accordance with the Stage 1 project approval to cater for constructed gas turbine facility.

1.1 Existing Site

The approved Stage 1 facility site and gas pipeline and transmission line corridors are shown in Figure 1. The approved facility site comprises land that was previously developed (but never operated) for the purposes of an abattoir and is now owned by the Proponent. The Stage 1 facility would be situated so as to take advantage of already cleared/ disturbed areas within the site (the abattoir development) and would be accessed via Yawal Road using the existing site access road. The site is located on land zoned 1(d) Rural "D" (General Rural) in the *Shoalhaven Local Environmental Plan 1985*, under which power stations are a permissible landuse.

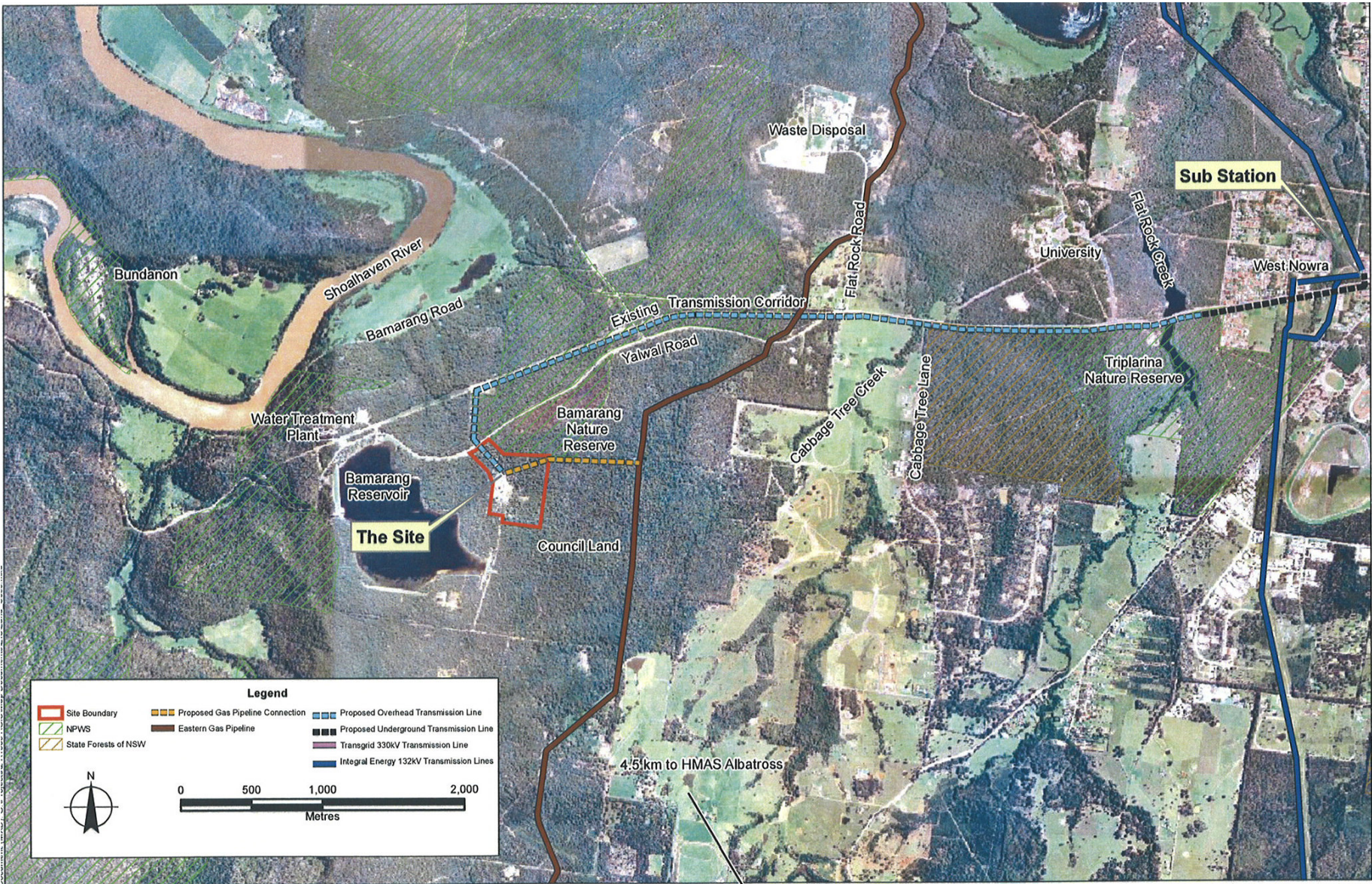
Conversion to a Stage 2 facility (or direct construction of the Stage 2 facility) would marginally increase the approved Stage 1 facility footprint; however, the facility would remain within the confines of the approved site identified in the concept plan. The proposed water supply infrastructure would involve connection to Shoalhaven Council's reticulated water supply system which travels along the western boundary of the site (refer Figure 2). The pipeline would be undergrounded and located almost entirely within the Stage 2 facility footprint and bushfire asset protection zone, and is not expected to require any additional vegetation clearance over and above that required for the facility footprint and associated bushfire clearance zone. The pipeline would extend marginally outside the site into land zoned 7(c) Environment Protection "C" (Water Catchment Areas) to connect with Council's existing pipeline network located on this land.

The Stage 2 facility and water supply infrastructure would not require any changes to the transmission line route and gas pipeline route which were granted project approval under Stage 1 (refer Figure 1).

1.2 Surrounding Land Use

The facility site is generally surrounded by bushland, with Bamarang Nature Reserve and Yawal Road (connecting the site to Nowra) situated to the north. Other land uses within the vicinity of the site include the Bamarang Reservoir located 350 metres to the west of the site, Triplarina Nature Reserve and Shoalhaven State Forest approximately one kilometre to the east, public utilities such as the Eastern Gas Pipeline and 132 and 33 kilovolt transmission lines, rural land, and the HMAS Albatross air base approximately 4.5 kilometres to the south east.

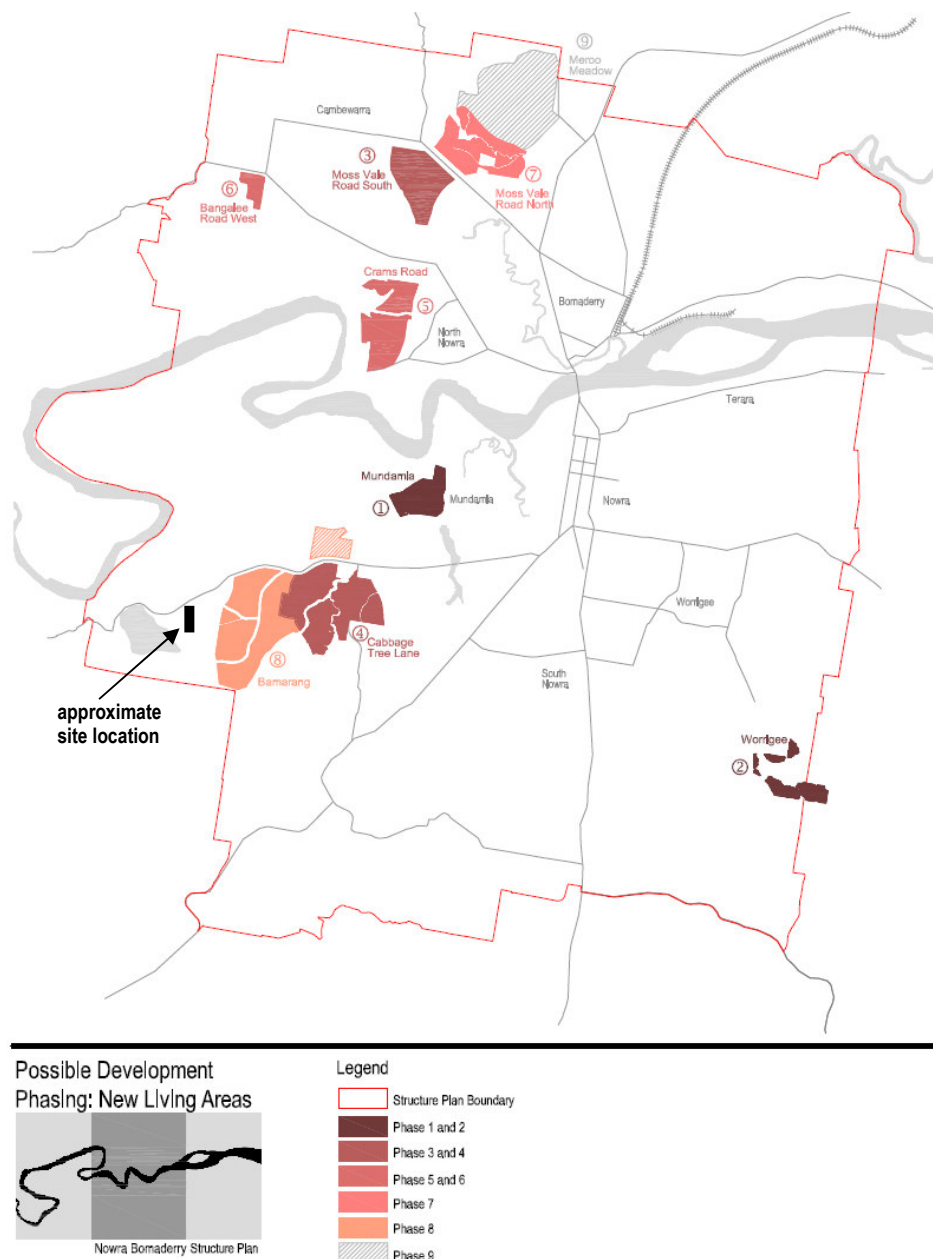
Figure 1 – Approved Stage 1 Project and Surrounding Land Use (GHD, May 2006)



The nearest receivers to the site include a mud-brick manufacturing business 750 metres to the north along Yawal Road, rural-residential dwellings approximately 1.4 kilometres to the north along Bamarang Road and approximately two kilometres to the south-east near Cabbage Tree Lane south. In addition, Shoalhaven Council's *Nowra-Bomaderry Structure Plan* (endorsed by the Department of Planning in February 2008) has identified 'Future Living Areas' approximately 1.25 kilometre to the east of the site at Cabbage Tree Lane North and 'Future Long Term Living Areas' approximately 250 metres to the east of the site boundary (500 metres from the facility itself) at Bamarang (refer Figure 2).

Council's Local Environmental Plan has yet to be amended to take into account the proposed future landuse. Whilst a definitive timing for the development of the new areas has not been identified, the Structure Plan identifies indicative phasing with the 'Future Living Areas' at Cabbage Tree Lane identified as phase four of nine and the 'Future Long Term Living Areas' at Bamarang identified as phase eight of nine. Based on this indicative phasing and growth projections, it is anticipated that development would commence at Cabbage Tree Lane within the next 10-15 years. Development timing at the 'Future Long Term Living Areas' at Bamarang appears less definite and further into the future, with the Structure Plan identifying that the potential for future residential use in this land being "subject to further investigations".

Figure 2 – Proposed New Living Areas in Nowra-Bomaderry Structure Plan (Shoalhaven Council, 2006)



2. PROPOSED DEVELOPMENT

2.1 Project Description

The Proponent has received concept plan approval to develop a new gas-fired power station at Bamarang and project approval to develop Stage 1 of that power station, comprising the construction and operation of a 300 megawatt open-cycle gas turbine facility, including ancillary gas pipeline and transmission line infrastructure. The Proponent has now sought project approval to develop Stage 2 of the power station, involving the conversion of the (yet to be constructed) Stage 1 plant to a 400 megawatt combined-cycle facility and the construction and operation of water supply infrastructure to supply both the Stage 1 and Stage 2 facilities.

The approved Stage 1 (open-cycle) project comprises a peak power generating facility that would operate for up to 440 hours in any given twelve month period. In contrast, the Stage 2 (combined-cycle) facility would operate up to 24 hours a day and 365 days a year as a base load electricity generator providing constant electricity supply to the network. Depending on market demand, the Proponent may proceed directly to the Stage 2 facility rather than first building an open-cycle peaking plant and converting to a base-load facility at a later date. The ancillary infrastructure (gas pipeline and transmission line) approved under the Stage 1 project would serve both the Stage 1 and Stage 2 plants, depending of the staging of the facilities.

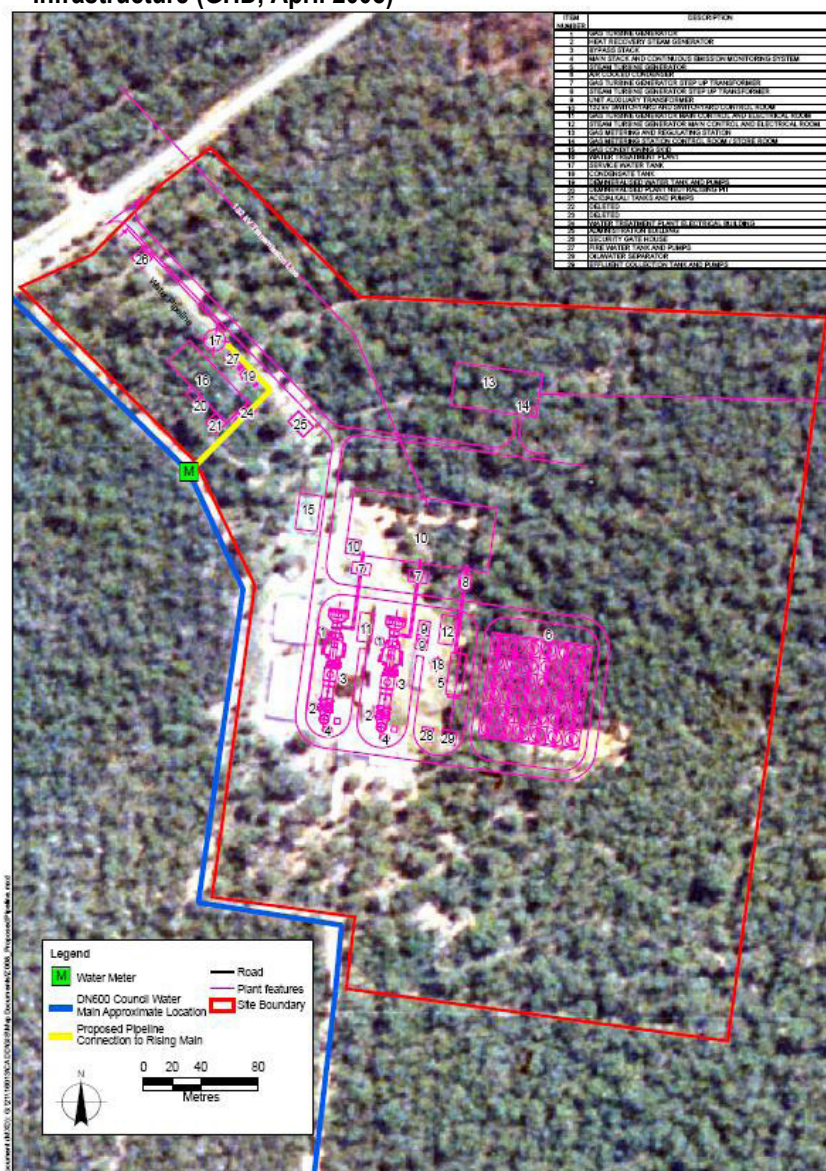
The approved open-cycle configuration comprises two gas turbines each capable of generating approximately 130-150 megawatts of electricity by drawing in cool air through a compressor, where the air would be mixed with natural gas and injected at high pressure into a combustion chamber. The combustion reaction would then produce hot exhaust gases which would be used to drive an electrical generator to produce electricity, with the hot gases being vented to the atmosphere. Stage two would see the addition of two heat recovery steam generators (one to each gas turbine) and a steam turbine to the open-cycle configuration. The combined cycle configuration would take advantage of the waste heat gases produced from the open-cycle process, using the heat and additional water to produce steam to drives a generator to produce electricity. A condenser would then be used to convert the steam back to water for re-use in the combined-cycle process.

The water requirements associated with the combined-cycle process are significantly higher than those of an open-cycle process, largely due to the water requirements of the condenser system. The original concept plan identified that the Stage 2 plant would use a water-cooled condenser system and predicted a total water demand of 8.4 megalitres per day. The Proponent indicated that the required volumes would likely be sourced from industrial effluent sources. However, should the use of industrial effluent not be possible then alternative water sources and/ or the use of (less water intensive) air-cooled condenser process would be progressed. The pipeline route would be dependent on the source of water determined.

Whilst the water supply pipeline was also envisaged to cater for the Stage 1 plant, the much lower water requirements of Stage 1 (two megalitres per annum) compared to Stage 2 meant that the source of water supply (and therefore the pipeline route) would be entirely dependent on achieving the Stage 2 water requirements. Project approval was granted to Stage 1 on the basis that the Proponent would seek further approval for outstanding water supply infrastructure to supply both stages. As part of concept plan approval, the Minister required the Proponent to undertake further detailed assessment of the feasibility of water sources and the design of the water pipeline route.

Following further investigation, the Proponent has determined that the Stage 2 plant should comprise an air-cooled condenser system, which requires significantly less water requirements than the water cooled system; and has proposed to source required water volumes from Shoalhaven Council's potable water network. On this basis an approximately 140 metre long pipeline connection to Council's reticulated water supply pipeline network (which runs along the western boundary of the approved proposal site) is proposed to cater for the water requirements of Stage 1 (approximately 2 megalitres per annum) and Stage 2 (approximately 0.5 megalitres per day). The pipeline would be almost entirely confined to the approved power station site and undergrounded in a shallow trench (approximately 1.2 metres deep) (refer Figure 3).

Figure 3 – Proposed Stage 2 Facility and Water Supply Infrastructure (GHD, April 2008)



Consistent with the approved concept plan, the Stage 2 project would include water treatment plants to produce water of sufficient quality for use in the heat recovery steam generators.

Water received on site from Council's reticulated water system would be fed through a micro-filtration/ reverse osmosis treatment plant and then an ion exchange treatment plant to produce demineralised water to be used in the combined cycle process and other uses such as the inlet air evaporative cooler.

Waste from the treatment plants would be either disposed offsite or recovered via a brine concentrator and dewatering facility.

2.2 Project Need

The NSW Government discussion paper entitled *Energy Directions Green Paper* (2004) identifies the need for new base load generation capacity in 2012/13. The paper acknowledges that managing and meeting this demand will occur through a combination of measures, which includes the construction of gas generation facilities. The development of the Bamarang Stage 2 (combined-cycle) plant would help meet this anticipated demand for base-load electricity generation. Base load generation requires continual operation and therefore high efficiency levels, which a combined-cycle process can deliver. Furthermore, in comparison to the upgrade or building of new coal-fired power stations, base-load generation via combined-cycle technology provides significant greenhouse gas and capital cost advantages.

While renewable energy sources and demand management measures are also identified as key measures for meeting electricity demand in the *Energy Directions Green Paper*, the Green Paper acknowledged that these approaches are more likely to have a role in future generation, as cost efficiencies are improved. In light of this, gas fired power generation is generally viewed to be a suitably efficient approach for meeting immediate electricity generation needs. The Department is satisfied that the Proponent has established the need for the proposal and that the Bamarang Stage 2 (combined-cycle) plant would be able to generate the electricity required to meet future base-load demand for the State in an efficient and cost-effective manner.

3. STATUTORY CONTEXT

3.1 Major Project

The project is declared to be a Major Project under *State Environmental Planning Policy (Major Projects) 2005* because it is development for the purpose of an electricity generation facility for gas fired generation that has a capital investment value of more than \$30 million (clause 24(a)). The project is therefore subject to Part 3A of the *Environmental Planning and Assessment Act 1979* (the Act) and the Minister for Planning is the approval authority.

3.2 Permissibility

The Stage 2 facility and the majority of the water pipeline would be located within the approved Stage 1 facility site, which is zoned 1(d) Rural "D" (General Rural) in the *Shoalhaven Local Environmental Plan 1985*. The Stage 2 facilities and water pipeline is permissible under this zoning. The water pipeline would also extend marginally outside the site into land zoned 7(c) Environment Protection "C" (Water Catchment Areas) to connect with Council's existing pipeline network which is located on this land. The water pipeline is permissible under this zoning.

3.3 Environmental Planning Instruments

There are no environmental planning instruments that substantially govern the carrying out of the proposal.

3.4 Minister's Approval Power

The Proponent submitted an Environmental Assessment with the Director-General in March 2008. Pursuant to Section 75H and 75I(2)(g) of the Act, the Director-General was satisfied that the Environmental Assessment had addressed the environmental assessment requirements specified in condition 2.2 of the Minister's concept plan approval for the Bamarang gas turbine development. A copy of the Environmental Assessment is attached (see Appendix D).

The environmental assessment was placed on public exhibition from 16 April 2008 until 19 May 2008 and submissions invited in accordance with Section 75H of the Act. The Environmental Assessment was also made publicly available on the Department's website.

Following the exhibition period, the Director-General directed the Proponent to respond to the issues raised in submissions. As the project will require an Environment Protection Licence under the *Protection of the Environment Operations Act 1997*, a copy of the submissions were also provided to the Department of Environmental and Climate Change, pursuant to Section 75GH of the Act. The Submissions Report (see Appendix C) prepared by the Proponent was subsequently made publicly available of the Department's website.

The Department has met all its legal obligations so that the Minister can make a determination regarding the project.

3.5 Objects of the *Environmental Planning and Assessment Act 1979*

Section 5 of the *Environmental Planning and Assessment Act 1979* details the objects of the legislation. The objects of the Act are:

- (a) to encourage:
 - (i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment;
 - (ii) the promotion and co-ordination of the orderly and economic use and development of land;
 - (iii) the protection, provision and co-ordination of communication and utility services;
 - (iv) the provision of land for public purposes;
 - (v) the provision and co-ordination of community services and facilities;
 - (vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats;

- (vii) *ecologically sustainable development;*
- (viii) *the provision and maintenance of affordable housing; and*
- (b) *to promote the sharing of the responsibility for environmental planning between the different levels of government in the State; and*
- (c) *to provide increased opportunity for public involvement and participation in environmental planning and assessment.*

Of particular relevance to the environmental impact assessment and eventual determination of the subject project application by the Minister, are those objects stipulated under section 5(a). Relevantly, the objects stipulated under (i), (ii), (iii), (vi) and (vii) are significant factors informing determination of the application (noting that the proposal does not raise significant issues relating to land for public purposes, community services and facilities or affordable housing). With respect to ecologically sustainable development, the EP&A Act adopts the definition in the *Protection of the Environment Administration Act 1991*, including the precautionary principle, the principle of inter-generational equity, the principle of conservation of biological diversity and ecological integrity, and the principle of improved valuation, pricing and incentive mechanisms.

It is important to recognise, that while the EP&A Act requires that the principles of ecologically sustainable development be encouraged, it provides other objects that must equally be included in the decision-making process for the subject proposal. The Department has considered the need to encourage the principles of ecologically sustainable development, in addition to the need for the proper management and conservation of natural resources such as water resources; the orderly development of land considering landuse; and the protection of the environment including threatened species in Section 5 of this report. The agency and community consultation undertaken as part of the assessment process (see Sections 3 and 4 of this report), address objects 5(b) and (c) of the Act.

3.6 Nature of the Recommended Approval

The Minister's concept plan approval for the Bamarang gas-fired power station development identified that the design of the proposed Stage 2 combined-cycle facility and water supply infrastructure was not sufficiently well developed to warrant project approval at the time. The Minister's concept plan approval included detailed further assessment requirements that the Proponent must address is seeking project approval for the outstanding elements, including:

- a water supply feasibility study – that quantitatively demonstrates water availability for the combined cycle gas turbine facility operation;
- an updated air quality and noise impact assessment to take into account any design changes to the Stage 2 plant; and
- a landuse, flora and fauna and heritage impact assessment of the finalised water supply pipeline route.

The Department is satisfied that the additional investigations undertaken by the Proponent have resolved the design of outstanding elements and that the additional assessment undertaken demonstrates that the Stage 2 project (including water supply infrastructure) would remain consistent with the cumulative impact envelop established as part of the concept plan and within acceptable environmental limits. Consequently, the Department recommends project approval for the Stage 2 project (including water supply infrastructure).

An instrument of project approval has been created, establishing stringent environmental standards, mitigation measures, environmental controls and monitoring requirements that the Proponent must meet during the construction and operation of Stage 2.

4. CONSULTATION AND ISSUES RAISED

4.1 Public Submissions

The Department received a total of 10 public submissions on the Stage 2 project. Of these, four objected to the project and two indicated in principle support subject to the issues raised being addressed. The remainder did not specifically state a position although raised issues for consideration in the Department's assessment. The key issues identified in public submissions are summarised in Table 1.

Table 1: Issues Raised by Public Submissions

Issue		Number of submissions
Noise	<ul style="list-style-type: none"> inadequate consideration of local meteorological conditions in noise modelling. concerns that the noise modelling is not representative of all sensitive receivers. adequate noise mitigation measures to ensure that the noise levels generated are as low as they can be. potential vibration impacts. 	10
Landuse	<ul style="list-style-type: none"> cumulative impacts (noise, air quality, visual) would affect rural amenity and lifestyle. affect tourism potential of area be changing from rural to industrial amenity. impacts to future living areas identified in the Nowra to Bomaderry Structure Plan. property values affected by amenity impacts. 	7
Air Quality	<ul style="list-style-type: none"> odour and greenhouse gas impacts. potential health impacts from changes to air quality. modelling should be based on local measurement of background air quality levels. 	3
Visual	Visual impact of proposed facilities	2
Water Supply	Impact of water requirements for the project on town water supplies	2
Electromagnetic radiation	Electromagnetic radiation from transmission lines	2
Flora and Fauna	Flora and fauna impacts of the proposed facilities	1
Bush Fire	Bush fire risk to the facilities	1
Water Quality	Surface and groundwater contamination risk including water quality impacts to Bamarang Reserve	1
Gas Supply	Long term availability of gas supply to the power station	1
Consultation	Inadequate consultation / notification on the project	1

4.2 Submissions from Public Authorities

Six submissions were received from public authorities: the Commonwealth Department of Defence; Commonwealth Civil Aviation Safety Authority; NSW Department of Environment and Climate Change; NSW Department of Water and Energy; NSW Rural Fire Service and Shoalhaven City Council (incorporating Shoalhaven Water). None of the agencies objected to the proposal, however raised issues for the Department's consideration.

Commonwealth Department of Defence (DoD)

- Noted that DoD would need up to one year's notice to revise HMAS Albatross flight path and procedures and to proclaim a danger area to take into account the plume rise impacts from the plant.

- Supported the direct construction of Stage 2 (without building Stage 1 first and converting to the Stage 2 later), as the Stage 2 project would involve less plume rise impacts than Stage 1.

Civil Aviation Safety Authority (CASA)

- Noted that the plume rise assessment indicated that there would be little risk to aviation safety.
- Noted that CASA would need up to six months notice to place the power station (and associated plume rise risk) in aeronautical charts.

Department of Environment and Climate Change (DECC)

- Raised concerns that the stated mitigation measures would not be able to achieve the project specific noise goals and required revised assessment of mitigation options.

Department of Water and Energy (DWE)

- Supported change from wet-cooled condenser technology (as identified in the concept plan) to air-cooled technology due to water savings.
- Queried whether the proposal would impact on any waterways/ or riparian zones.
- Recommended conditions of approval in relation to waterway and riparian zone protection.

NSW Rural Fire Service

- Did not raise any issues of concern.

Shoalhaven City Council (incorporating submission from Shoalhaven Water)

- Raised concerns regarding the potential impacts of the project landuse identified in the Nowra Bombaderry Structure Plan. In particular the "Future Living Area at Cabbage Tree Lane" and "Future Long Term Living Area at Bamarang" identified to the east of the site and the "Conservation and Riparian Area" identified partially within the site.
- Noted that Section 94 contributions should be levied to accommodate any potential increase in demand to public infrastructure and services (such as road infrastructure upgrade and maintenance requirements and connection to Council's water supply infrastructure).
- In relation to traffic and road works, noted that:
 - the design of the transmission line next to road would need to allow for future road widening planned to cater for future residential development in the area;
 - Council approval is required under section 138 of the *Roads Act 1993* for works within any Council roads;
 - appropriate construction traffic arrangements would need to be implemented during construction at or near roads; and
 - a 42.5 tonne weight limit applies to Yawal Road. Road/ bridge upgrade may be required when transporting oversize plant structures to site during construction;
- In relation to water supply:
 - require the Proponent to enter into agreement with Council's water supplier Shoalhaven Water, regarding water supply requirements and to meet Shoalhaven Water's requirements in relation to water infrastructure policy; and
 - recommended ongoing consultation with Shoalhaven Water.
- In relation to water management, required further details on:
 - how water will be recycled on site to minimise potable water requirements;
 - wastewater management and disposal requirements;
 - sewage disposal requirements; and
 - stormwater management measures to minimise impacts to the drinking water catchment.
- Noted that offsets would be required for the biodiversity impacts associated with the project.
- Considered that the air quality impact assessment should be revised to take into account site specific background air quality levels in the modelling.

- Recommended that all building be undertaken in accordance with the Building Code of Australia (BCA) and that an appropriate waste management plan be prepared for construction and operation.

4.3 Submissions Report

Upon review of the submissions received the Department directed the Proponent to prepare a Submission Report, which included a revised noise assessment demonstrating that the proposed mitigation measures can achieve the stated noise goals. The Proponent's response to submission did not lead to any changes to the project, as such a Preferred Project Report was not prepared.

The Submissions Report (including finalised Statement of Commitments) was made publicly available on the Department's website and a copy provided for comment to the Department of Environment and Climate Change (DECC). The DECC confirmed that it was satisfied that the revised noise assessment had addressed its concerns and that DECC was able to grant a licence for the project. The Department has considered the DECC's recommendations in formulating recommended conditions of approval for the project.

4.4 Department's Consideration

The Department's consideration of issues raised in public and agency submissions is summarised in Table 2.

Table 2: Department's consideration of issues raised in Submissions

Issue	Department's Consideration
Water Supply	Section 5.1
Noise and Vibration	Section 5.2
Air Quality/ Plume Rise Risks	Section 5.3
Flora and Fauna including waterway/riparian issues	Section 5.4
Visual	Section 5.5
Landuse	Section 5.6
Consultation	Section 4
Electromagnetic radiation associated with transmission lines	The transmission line was assessed (including consideration of electromagnetic radiation) and approved as part of Stage 1. The approved transmission line will be used for Stage 2, however, no changes are proposed to the approved lines as part of Stage 2. Consequently, this issue is not considered relevant for Stage 2 and is not considered further.
Section 94 contributions	<p>The Proposal has the potential to impact /increase the demand for local infrastructure and services, with respect to the local road network (construction related haulage including movement of oversize plant and operational traffic) and Council's water supply network.</p> <p>The project approval for Stage 1 and the recommended conditions of approval for Stage 2 include requirements for the Proponent to bear the cost of any damage that may result to the local road network from the traffic and transportation impacts of the proposal. Furthermore, as part of Stage 2, the Proponent will be required to enter into an agreement with Council (including appropriate fee arrangements) to enable the use of Council's water supply network and bear the cost for connection to Council's network and ongoing maintenance of the pipeline.</p> <p>The Department is satisfied that these requirements will ensure that the Proponent bears full responsibility for any increase in demand to local infrastructure and services associated with the project, such as to not warrant additional Section 94 contribution levies in this regard.</p>
Greenhouse gas	The Proponent's assessment has demonstrated that the greenhouse gas impacts associated with the revised Stage 2 facility (incorporating air-cooled condenser technology) would remain unchanged to that predicted in the

	concept plan for Stage 2. The Proponent has committed to continued investment in greenhouse gas abatement and sustainable energy generation strategies through participation in the <i>Australian Government's Greenhouse Challenge (Plus) Program</i> and the <i>Generator Efficiency Standards Program</i> , to minimise greenhouse gas generation at an organisation level. The Department is satisfied with this approach.
Odour	The Department is satisfied that these matters have been adequately addressed in the Proponent's Submissions Report and / or Statement of Commitments.
Bushfire risk	
Traffic and road works	
Surface water runoff/ groundwater contamination impacts on Bamarang Reserve	
Onsite water management (including water re-use initiatives, wastewater management and sewage disposal)	
Waste generation and management	
Gas supply	
BCA	

5. ASSESSMENT OF ENVIRONMENTAL IMPACTS

After consideration of the Environmental Assessment, submissions, Submissions Report and Statement of Commitment the Department has identified the following key environmental issues associated with the proposal:

- Water supply;
- Noise;
- Air quality and aviation safety;
- Flora and fauna;
- Visual amenity; and
- Landuse.

All other issues are considered to be adequately addressed by the Proponent's Statement of Commitments.

5.1 Water Supply

Issue

As part of its concept plan, the Proponent identified the water requirements associated with open-cycle (Stage 1) and combined-cycle (Stage 2) operations, being approximately two megalitres per annum and 8.4 megalitres per day, respectively. The Stage 2 water requirements were predicted on the basis that a wet-cooled condenser system would be utilised during combined-cycle operation. A number of water supply options (including industrial effluent sources) were indicated; however, a final delivery option was not identified.

Whilst the final water supply option was also envisaged to cater for the Stage 1 plant, the much lower water requirements of Stage 1 compared to Stage 2 meant that the source of water supply (and therefore associated delivery infrastructure) would be entirely dependent on achieving the Stage 2 water requirements. Project approval was granted to Stage 1 on the basis that the Proponent would seek further approval for outstanding water supply infrastructure to supply both stages.

One of the key concerns raised by agencies during the assessment of the concept plan was the availability of water to meet the requirements of Stage 2 for the life of the project. As part of its concept plan, the Proponent indicated that should water sources prove unviable, consideration would be given to the development of Stage 2 using air-cooled condenser technology, which involves significantly less water demand. To take into account agency concerns, the concept plan was approved on the basis that the Proponent was to undertake further detailed assessment of the feasibility of water sources and associated infrastructure (pipeline) requirements in consultation with the Department of Water and Energy and Shoalhaven Council, when seeking project approval for Stage 2.

The Proponent has now sought approval for the Stage 2 project including water supply infrastructure. Consistent with the approved concept plan, the Proponent has proposed air-cooled technology as part of the Stage 2 plant, due to its much lower water demand (approximately 0.5 megalitres per day compared to 8.4 megalitres per day for wet-cooling) and has proposed to pipe this water from Shoalhaven City Council's reticulated water supply network, operated by Council's water supply arm, Shoalhaven Water. The preferred pipeline route would remain almost entirely within the Proponent-owned proposal site (as approved under the concept plan and Stage 1 project approval) only extending outside the site to connect with Shoalhaven Water's existing pipeline network, which traverses the western boundary of the site. The water would also be used to supply the minor domestic requirements of the Stage 2 project (approximately 0.4 megalitres per annum). One public submission raised concerns that the sourcing of water from Council's reticulated supply would risk residential water supplies in the local government area.

In identifying its preferred water source the Proponent considered several options including reclaimed and industrial effluent, river water, groundwater, site stormwater and wastewater, and desalinated water provided by a site-specific desalination plant constructed on tidal flats. These alternative options were discounted due to:

- the inability to secure required volumes as a result of: the water being allocated elsewhere (reclaimed effluent), existing cap restrictions (river water), variability of existing resource (groundwater), and insufficient water volumes likely to be generated on site (stormwater and wastewater);

- inadequate water quality requiring significant treatment (industrial effluent and saline groundwater);
- significant cost and scale of the required infrastructure (including lengthy pipeline from Nowra and Bomaderry for reclaimed and industrial effluent and a desalination plant on the Shoalhaven River tidal flats to generate desalinated water); and
- potential environmental impacts (including impacts to environmental flows from river and stormwater extraction; impacts to groundwater dependent species/ stream flow from groundwater extraction; disturbance associated with lengthy pipeline and other infrastructure development; and brine disposal associated with desalination plant).

Following consultation with Shoalhaven Water, the Proponent has determined that Council has sufficient water to supply the water requirements of the project in Stages 1 and 2, without posing a risk to existing and future water demand in the local government area. The Proponent's assessment indicates that Shoalhaven Council has secured water entitlements in the order of 23,000 megalitres/ annum to cater for existing demand (approximately 15,000 megalitres/ annum in 2005) and forecast growth in residential and non-residential demand up to 2035 (approximately 21,000 megalitres/ annum). The water entitlements secured by Council from the Shoalhaven catchment are in addition to water allocated for environmental flows in the Shoalhaven River and drought relief storage to supply the greater Sydney region if required.

On this basis, the Proponent has determined that there is adequate capacity in Council's water supply to comfortably accommodate the worst case water requirements of the project (up to 200 megalitres/ annum in Stage 2), without placing strain on existing or future demand or posing a risk to catchment health or other catchment users. In particular, the water requirements of the project would remain well within Council's water allocations for non-residential use, both existing (2070 megalitres/ annum) and in the future (2900 megalitres/ annum). The Proponent has investigated several options for connection into Council's existing reticulated system, with the DN 600 Hobas Rising Main connection preferred due to its close proximity to the site, ensuring that impacts are largely contained within the existing approved site. An alternative option (DN 750 MSCL), which utilises the transmission line easement approved as part of Stage 1 has also been identified should the preferred option prove unsuitable. However, approval is not being sought for the alternative option at this stage.

Consideration

The Department is satisfied that the Proponent has undertaken a robust and comprehensive assessment of water supply options and that the option identified is a viable water source that can sustainably supply the water requirements of the project in the long term. The Department notes that the Proponent has made significant effort to reduce the water requirements of the project (as described in the concept plan) by converting from wet-cooled to air-cooled condenser technology, so as to not pose significant demand on the region's water supply. The Department is satisfied that the Proponent has demonstrated that the reduced water requirements of the revised project can be comfortably accommodated within Council's water supply allocations for the local government area, without posing risks to existing and future demand and the Shoalhaven Catchment. Specifically, the Department is satisfied that the source of water and supply option identified involves the lowest potential environmental risks to the alternatives considered. The Department notes that Shoalhaven Water has not objected to the water requirements of the project being sourced from its reticulated supplies and that the Department of Water and Energy has supported the changes to the project resulting in lower water use.

The Proponent will be required to enter into an agreement with Shoalhaven Water to source water for the project, including agreement on applicable fees and water supply infrastructure requirements. The Department has recommended conditions of approval to ensure that the Proponent enters into agreement Shoalhaven Water and bear the cost of connection and maintenance of the water supply infrastructure as negotiated with Shoalhaven Water.

5.2 Noise

Issue

The concept plan identified that the Stage 2 project can be designed to meet noise levels of 35 dB(A) (i.e. 5 dB(A) above the assumed lowest background noise level in the *NSW Industrial Noise Policy*) at all nearest sensitive receivers. The Stage 2 project was assessed assuming wet-cooled condenser technology. The Proponent has now sought project approval for Stage 2 incorporating air-cooled condenser technology and has undertaken a

revised noise assessment in accordance with the *NSW Industrial Noise Policy*, considering worst case meteorological conditions and plant operations, to determine the impact of the revised Stage 2 project.

All of the public submissions received raised concerns regarding the potential noise impacts of the Stage 2 project including concerns that the modelling undertaken was not representative of local meteorological conditions and of all surrounding sensitive receivers. Shoalhaven Council raised concerns regarding the potential impacts of the Stage 2 project on the new living areas identified in the Nowra Bombaderry Structure Plan (endorsed following the approval of the concept plan and Stage 1). DECC required further clarification of mitigation options to demonstrate that the stated noise goals could be achieved.

Consideration

Noise Impacts to Existing Receivers

The Proponent's noise assessment modelled impacts at the same receivers considered as part of the concept plan/ Stage 1 assessment:

- Lot 2 DP 1040676 Yawal Road (identified as Lot 22 DP 746233 in the concept plan/ Stage 1 assessment), approximately 750 metres north of the site - at the time of concept plan / Stage 1 assessment this property was modelled as a residential receiver as the site was subject to a development application for a commercial enterprise (training centre) and residential dwelling (a manager's residence). The development application was determined in January 2008; however, the construction of a dwelling was withdrawn prior to determination on Council's advice, as the parcel size was less than the minimum required for subdivision for rural residential purposes. Consequently, the current assessment has modelled the site as a commercial receiver, taking into account existing commercial operations on site (mud-brick manufacturing facility).
- 190 Bamarang Road, approximately 1.4 kilometres northwest of the site;
- Gannet Road, approximately 1.65 kilometres southeast of the site.

Furthermore, in response to resident concerns that the modelled receiver locations were not representative of all surrounding receivers, the Proponent also modelled impacts at 145 Bamarang Road (a holiday guest house), approximately 1.2 kilometres to the north of the site, as an additional residential receiver. The Proponent's assessment indicated that with the implementation of mitigation measures, the revised Stage 2 project can achieve noise goals under the *NSW Industrial Noise Policy* at each of the receivers under all operational/ meteorological scenarios (refer Table 3 and Figure 4). The noise mitigation options that could be implemented to achieve these options included: stack exit attenuators, 'low noise' fans, enclosure of the boiler section and enclosure of pumps in up to 2.5 high noise barriers.

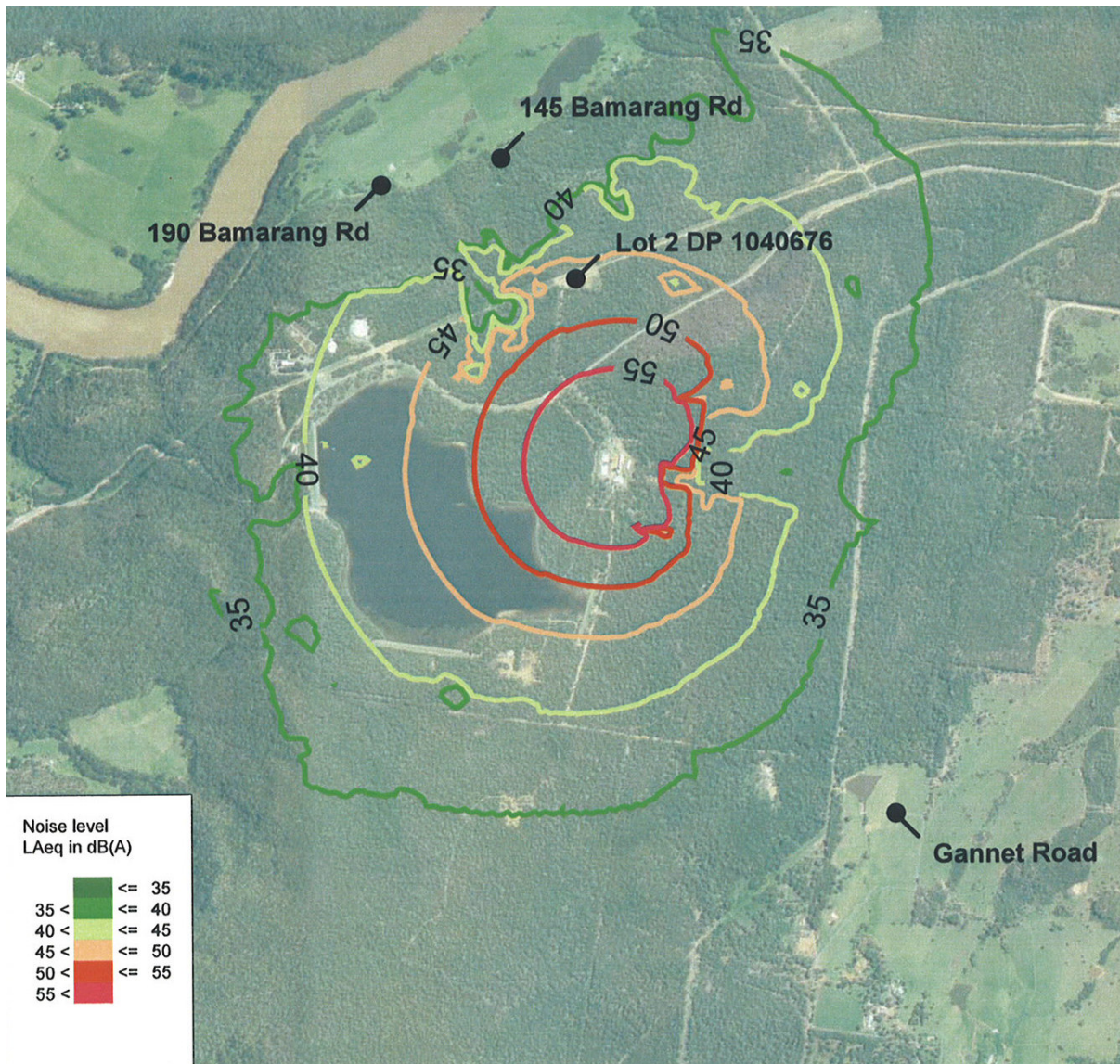
Table 3: Predicted Noise Impacts

Receivers		Project Specific Noise Goals (dB(A))		Predicted Noise Levels (dB(A))		
		Day Time	Night Time	Neutral Weather	Temperature Inversion and SE wind	Temperature Inversion and NW wind
Lot 2 DP 1040676 Yawal Road	Commercial	65	65	43	47	43
Gannet Road	Residential	37	35	28	28	33
145 Bamarang Road		35	35	19	23	19
190 Bamarang Road		35	35	28	32	28

The Department is satisfied that the noise assessment has been undertaken in accordance with the *NSW Industrial Noise Policy*, including consideration of worst case operating scenarios and meteorological conditions and the modelling is representative of noise conditions to nearest sensitive receivers. The Department is further satisfied that the mitigation measures proposed by the Proponent are viable and feasible options that can be implemented as part of the Stage 2 facility to ensure that appropriate noise goals are achieved. Consequently, the Department is satisfied that the revised Stage 2 project (incorporating air-cooled condenser technology), would not result in unacceptable noise impacts to existing sensitive receiver, consistent with the approved concept plan.

To ensure that the project is operated consistent with the predicted environmental outcomes, the Department has recommended comprehensive annual reporting of the environmental performance of the project including how complaints have been addressed and what additional mitigation has been implemented in the case that the performance of the project has not been consistent with predicted outcomes. The DECC confirmed that it was satisfied that the Proponent's noise assessment and that it is able to grant a licence for the project.

Figure 4: Worst Case Noise Predictions (With Mitigation)



Noise Impacts to Future Receivers

With respect to impacts on future landuse, the Proponent has clarified that the noise levels associated with the Stage 2 project (with mitigation) would fall below 35 dB(A) at a distance greater than one kilometre from the site. This means that the Stage 2 project would be able to meet the *NSW Industrial Noise Policy* noise goal of 35 dB(A) (i.e. 5 dB(A) above the assumed lowest background noise level in the INP) at the proposed new living area at Cabbage Tree Lane which is located approximately 1.25 kilometres from the site.

Noise levels of between 45 dB(A) to 55 dB(A) are predicted to occur (with mitigation) at the proposed location of the future long term living area at Bamarang, approximately 250 metres east of the site boundary. Whilst within the maximum recommended amenity noise goals for rural residences in the *Industrial Noise Policy*, the Department acknowledges these noise levels have the potential to impact on the viability and scale of residential development at this location. Notwithstanding, the Department notes that the potential for development in this area is not yet certain and that the Structure Plan has identified that development would be subject to further site

investigations, including consideration of potential conflicts with biodiversity values of existing intact vegetation on site and noise constraints associated with the existing military aircraft flight path (the HMAS Albatross). Based on growth projection and development phasing, the Proponent has suggested that development of this area maybe up to 35 years in the future. Given the uncertainty associated with development of this area, including timing and the ultimate scale of development (considering other environmental constraints), the Department considers that it would be unreasonable to penalise the development of the Stage 2 project on the basis of potential impacts to this future living area, noting that potentially expensive mitigation requirements at this stage may be wasted depending on the scale and siting of development (including if the area develops at all). It is noted that Council's Structure Plan has considered the development potential for the area with knowledge of the proposed power station location (refer Section 7.4 of the Structure Plan).

The Department notes that the noise levels associated with the Stage 2 project would not absolutely preclude development in the identified location, if subject to appropriate development controls. This could include the location of less noise sensitive landuse (e.g. commercial premises) to buffer and shield more sensitive residential landuse and building controls for individual buildings such as insulation measures to provide acoustic shielding (which may also be necessary to mitigate aircraft noise). The Department is satisfied that this would provide an appropriate balance between the orderly and economic development of land and the mitigation obligations of the project with respect to noise, considering future development uncertainty. Whilst the project may result in some residual impacts to future landuse, the Department is satisfied that the project would not result in the absolute sterilisation of future development potential at this location and is on balance justified given its benefits to the broader community with respect to security of energy supply, which is a key factor underpinning the success of future development not only at this location but other areas of the State.

Other Noise and Vibration Concerns

Submissions also raised concerns regarding the potential operational vibration impacts of the Stage 2 project. Based on the distance to nearest receivers (both existing and future) being at least 500 metres from the power station and the type of equipment and building form proposed as part of the power station, The Department is satisfied that (consistent with the approved concept plan) receivers were unlikely to be subject to operational vibration impacts from the Stage 2 project.

The construction noise and vibration impacts of the Stage 2 project remain unchanged from that identified for Stage 2 in the concept plan and are not considered to be significant. The Department has recommended construction environmental management measures consistent with those established for the Stage 1 project to manage the construction noise and vibration impacts of the Stage 2 project.

5.3 Air Quality and Aviation Safety

Issue

As part of the concept plan, the Proponent assessed the impacts of Stage 2 on local air quality in accordance with the *Approved Methods and Guidelines for the Modelling and Assessment of Air Pollutants in New South Wales* (DECC, 2005), considering key pollutants typically associated with gas-fired power stations (i.e. particulates, nitrogen oxides and carbon monoxide). As the project would be located below flight paths for the HMAS Albatross air base (located 4.5 kilometres to the south of the site), the Proponent also assessed the potential impacts of exhaust plumes from the power station on aviation safety. The focus of the plume rise assessment was to determine the percentage of time that the exhaust plumes from the power station would exceed the vertical velocity criterion of 4.3 m/s (at which aircraft would be affected), at the minimum height used by aircraft known as the 'Obstruction Clearance Surface' (OCS). In the case of the project, the OCS was set at 167 metres Australian Height Datum (AHD) or 60 metre above ground level (AGL).

The air quality and plume rise assessment assumed a Stage 2 power station involving two 40 metre high and 6.7 metre diameter exhaust stacks and wet-cooled condenser technology. The concept plan identified that the Stage 2 project would achieve NSW air quality goals at each sensitive receiver modelled and that the plume rise associated with the power station was likely to exceed the vertical velocity criterion at a height above the OCS approximately 30% of the time (refer Tables 4 and 5). The maximum plume rise height for stage 2 was reported to be 308 metres AGL. The approved Stage 1 project was generally recognised as likely to involve higher plume

rise than Stage 2, as the open-cycle plant (Stage 1) would involve venting of gas at higher temperatures than the combined cycle Stage 2 project.

The Proponent has now undertaken a revised air quality and plume rise assessment taking into account the revised Stage 2 project which incorporates an air-cooled condenser system. The air quality assessment considered the same receivers as previously modelled; however, incorporated updated background monitoring data from a DECC air quality monitoring station at Albion Park South and a local monitoring station at the Nowra Water Treatment Plant. The plume rise assessment considered impacts from the 40 metre high exhaust stacks and the 31 metre high air-cooled condenser, separately and jointly. The results of the Proponent's assessments are summarised in Tables 4 and 5 below.

Several public submissions raised concerns regarding the potential air quality impacts of the Stage 2 project, including questioning the accuracy of the modelling undertaken. Shoalhaven Council queried the impacts of the project on the proposed new living areas identified in the Nowra Bombaderry Structure Plan (endorsed following the approval of the concept plan and Stage 1) and considered that the air quality modelling should be undertaken using local background monitoring data. The Civil Aviation Safety Authority (CASA) and the Commonwealth Department of Defence (DoD) did not raise any concerns regarding the Proponent's plume rise assessment during the exhibition of the project.

Table 4: Predicted Air Quality Impacts

PM₁₀ Concentration – Maximum 24 Hour Average (ug/m³)							
Receptor	Goal	Stage 2 (concept plan)			Stage 2 (current)		
		Background (Albion Park 2004)	Increment	Background + Increment	Background (Albion Park South 2006)	Increment	Background + Increment
Bundanon	50	46.8	0.6	47.4	44.1	0.51	44.61
Water Treatment Plant	50	46.8	0.8	47.7	44.1	0.37	44.47
Bamarang Bush Cabins	50	46.8	1.0	48.6	44.1	0.29	44.39
Katalives	50	46.8	1.7	48.4	44.1	0.80	44.90
Mundamia	50	46.8	1.4	48.3	44.1	0.92	45.02
Gannet Road	50	46.8	2.9	50.0	44.1	1.38	45.48
NO₂ Concentration – 1 Hour Average (ppb)							
Receptor	Goal	Stage 2 (concept plan)			Stage 2 (current)		
		Background (Albion Park 2004)	Increment	Background + Increment	Background (Nowra Water Treatment Plant 2006)	Increment	Background + Increment (refer footnote)
Bundanon	120	44	6	50	16	N/A	11.26
Water Treatment Plant	120	44	9	53	16	N/A	11.53
Bamarang Bush Cabins	120	44	15	59	16	N/A	11.28
Katalives	120	44	16	60	16	N/A	11.75
Mundamia	120	44	14	58	16	N/A	11.27
Gannet Road	120	44	27	71	16	N/A	14.65

CO Concentration – 1 Hour Average (ppb)							
Receptor	Goal	Stage 2 (concept plan)			Stage 2 (current)		
		Background (Wollongong 2004)	Increment	Background + Increment	Background (Albion Park South 2006)	Increment	Background + Increment
Bundanon	25	3.2	0.4	3.6	2.7	0.004	2.7
Water Treatment Plant	25	3.2	0.5	3.7	2.7	0.004	2.7
Bamarang Bush Cabins	25	3.2	1.2	4.5	2.7	0.003	2.7
Katalives	25	3.2	1.1	4.3	2.7	0.005	2.7
Mundamia	25	3.2	0.6	3.8	2.7	0.005	2.7
Gannet Road	25	3.2	0.5	5.8	2.7	0.015	2.7
SO ₂ Concentration - 1 Hour, 24 Hour and Annual Average (ppb)							
Receptor	Goal	Stage 2 (concept plan)			Stage 2 (current)		
		Background (Albion Park 2004)	Increment	Background + Increment	Background (Albion Park South 2006)	Increment	Background + Increment
Bundanon	200 (1-hour)	34.1	0.5	34.6	38	0.20	38.20
	80 (24-hour)	1.4	0.1	1.5	9.6	0.03	9.63
	20 (Annual)	0.8	0.0	0.8	0.85	0.002	0.85
Water Treatment Plant	200 (1-hour)	34.1	0.5	34.6	38	0.18	38.18
	80 (24-hour)	1.4	0.1	1.5	9.6	0.025	9.63
	20 (Annual)	0.8	0.0	0.8	0.85	0.001	0.85
Bamarang Bush Cabins	200 (1-hour)	34.1	0.4	34.5	38	0.17	38.17
	80 (24-hour)	1.4	0.1	1.5	9.6	0.02	9.62
	20 (Annual)	0.8	0.0	0.8	0.85	0.001	0.85
Katalives	200 (1-hour)	34.1	0.4	34.5	38	0.23	38.23
	80 (24-hour)	1.4	0.1	1.5	9.6	0.05	9.65
	20 (Annual)	0.8	0.0	0.8	0.85	0.002	0.85
Mundamia	200 (1-hour)	34.1	0.4	34.5	38	0.24	38.24
	80 (24-hour)	1.4	0.1	1.5	9.6	0.06	9.66
	20 (Annual)	0.8	0.0	0.8	0.85	0.003	0.85
Gannet Road	200 (1-hour)	34.1	1.3	35.4	38	0.72	38.72
	80 (24-hour)	1.4	0.1	1.5	9.6	0.09	9.69
	20 (Annual)	0.8	0.0	0.8	0.85	0.003	0.85

Footnote: Due to the meteorological characteristics and chemical transformations simulated within the air shed, the predicted cumulative (background + increment) NO₂ levels at receivers were lower than the measured background levels at the Nowra water treatment site.

Table 4: Predicted Plume Rise Impacts

	Stage 1 (Approved)	Stage 2 (Concept Plan)	Stage 2 (Current)		
			Exhaust Stacks (ES)	Air Cooled Condenser (ACC)	ES + ACC
Maximum Plume Height at which the of Critical Vertical Velocity Criterion is exceeded (metres AGL)	887m	308 m	289 m	156 m	308 m
Frequency of Exceedance of Critical Vertical Velocity Criterion at the OCS (%)	40%	30%	30%	10-20%	60%

Consideration

Air Quality

The Proponents assessment indicates that the revised Stage 2 project would achieve NSW air quality goals at each of the receivers modelled. A number of submissions queried the accuracy of the modelling noting that site-specific background emission data have not been used in the modelling. The Department is satisfied that the use of site specific data would not materially affect the outcome of the air quality assessment, which indicates that the pollutant contributions of the project would be a fraction of the background air quality levels and therefore unlikely to cause significant changes to existing air quality. Specifically, the Department notes that the emission levels predicted for the revised Stage 2 project (incorporating the air cooled condenser) are lower than those identified for Stage 2 in the concept plan. The Department notes that the use of background emission data sourced from more built up areas provides a conservative basis for the assessment as it is likely to overestimate pollutant levels within the local air shed, meaning that air quality levels in the local area (with the project) would be further within NSW air quality criteria that indicated in the assessment. The DECC has not raised any concerns regarding the Proponent's air quality modelling. The Department is satisfied that the Proponent's air quality assessment is robust and has been prepared in accordance with the *Approved Methods and Guidelines for the Modelling and Assessment of Air Pollutants in New South Wales* (DECC, 2005).

Shoalhaven Council has raised concerns about the potential air quality impacts of the Stage 2 project on future receivers identified in the Nowra Bombaderry Structure Plan. The Proponent has indicated that air quality levels modelled at 'Mundamia' would be representative of proposed new living areas at Cabbage Tree Lane as the Mundamia property is located in the north western corner of the proposed new growth area. Based on the modelling undertaken at this receiver, the Department is satisfied that the Stage 2 project would comfortably achieve NSW air quality goals at new residential receivers at this location. Whilst, specific modelling has not been undertaken at the proposed site of the 'Future Long Term Living Area' at Bamarang (approximately 500 metres east of the power station), the Department is satisfied that given the very low emission contributions attributed to the project coupled with expected low background pollutant levels in the local rural air shed, the Stage 2 project is unlikely result in unacceptable air quality impacts at this location such as to sterilise the future use of this land.

The Department has recommended a range of conditions of approval to ensure that the Stage 2 project achieves best practice air quality standards during its operation, including the establishment of strict emission limits at the exhaust stacks; requirements for operational monitoring and performance verification; the preparation and implementation of an operational air quality management plan; and annual performance reporting requirements. The Department is satisfied that with the implementation of these controls the air quality impacts of the Stage 2 project can be managed to meet NSW air quality standards.

The construction dust impacts of the Stage 2 project remain unchanged from that identified for Stage 2 in the concept plan and are not considered to be significant. The Department has recommended construction environmental management measures consistent with those established for the Stage 1 project to manage the construction dust impacts of the Stage 2 project.

Plume Rise Impacts

The Proponent's assessment has predicted that the Stage 2 project as currently proposed (incorporating air cooled condenser technology) has the potential to result in a higher frequency of exceedance of the critical vertical velocity criterion at the OCS than both the approved Stage 1 project and the Stage 2 project as originally described in the concept plan (i.e. 60% compared to 40% and 30% respectively). Notwithstanding, the modelling indicates that the maximum plume height of critical vertical velocity criterion exceedance associated with the project would not change from that predicted for Stage 2 under the concept plan (i.e. 308 metres) and would remain significantly lower than the maximum vertical height predicted for the approved Stage 1 project (i.e. 887 metres), given the lower exit temperature of vented gas. Similarly, the Proponent has indicated that the maximum horizontal extent of the current Stage 2 plume (at the maximum height of critical vertical velocity criterion exceedance) would not exceed the horizontal extent predicted for the approved Stage 1 project (i.e. 132 metres).

The Stage 1 project was approved subject to the Proponent working with the Department of Defence (DoD) and the Civil Aviation Safety Authority (CASA) to proclaim a danger area within the flight path above the power station, which covered the maximum vertical and horizontal plume extents at which the critical vertical velocity criterion would be exceeded. This would ensure that aircraft could avoid the area of plume rise associated with

the power station that has the potential to affect aircraft safety. Whilst the current Stage 2 project is likely to involve a higher frequency of vertical velocity criterion exceedance *within* the maximum plume extent, the maximum plume extent itself at which the criterion would be exceeded would remain within the worst case parameters (887 metres height and 132 metres radius) associated with the approved Stage 1 project. This means that whilst conditions within the plume may be more turbulent, the extent of the plume would be no greater than the area originally predicted for Stage 1. Consequently, the Department is satisfied that the aerial extent of plume rise impacts associated with the current proposed Stage 2 project would no worse than the maximum worst case envelope already approved as part of the Stage 1 project and which is to be subject to a proclaimed danger area in accordance with DoD and CASA requirements (and therefore would have the affect of excluding aircraft from the area).

The higher frequency of vertical velocity criterion exceedance associated with the current Stage 2 project is the result of enhancement effects associated with the air-cooled condenser system, which has been proposed due to its significant water conservation benefits compared to wet cooled technology. The Proponent has indicated that the modelling is based on highly conservative assumptions and that consistent with the Stage 2 project described in the concept plan, the risk of exceedance of the critical criteria dramatically reduces to between 1-2% by the height of 100 metres above ground level (40 metres above the stack). Consequently, consistent with the original Stage 2 project, should aircraft breach the maximum height of the proclaimed danger area (i.e. 308 metres), the risk of safety impacts to aircraft at a height greater than 100 metres above ground level would be minimal (particularly, when considering that the likelihood of worst case air plume impacts occurring at the same time as an aircraft is flying at that exact location would be negligible). The Department notes that the plume rise assessment for the current Stage 2 project has been prepared in consultation with DoD, and that the DoD and CASA have not raised any objection to the Stage 2 impacts as proposed.

Given the above, the Department is satisfied that the current Stage 2 project incorporating air cooled condenser technology would not result in air plume rise impacts significantly different to that associated with the approved Stage 1 project and concept plan and would not preclude the Department from recommending approval to the project. The Department has recommended that similar stringent consultation and liaison requirements with the DoD and CASA as established for Stage 1, be applied to Stage 2 to ensure that appropriate flight safety protocol maybe established prior to the commencement of operation of the power station.

5.4 Flora and Fauna

Issue

The Proponent identified the vegetation clearance associated with Stages 1 and 2 within the facility site in its concept plan. This included areas of vegetation that would be entirely cleared (to site the power station) and areas that would be only partially cleared for hazard reduction to minimise bushfire risk (refer Table 3). The concept plan identified that some of the partial vegetation clearing required would affect vegetation close to two unnamed drainage lines located within the facility site. The vegetation clearance identified in the concept plan for Stage 2 assumed a facility layout associated with wet-cooled condenser technology.

The Proponent has now sought project approval for Stage 2 involving a revised facility layout associated with air-cooled condenser technology. The revised facility would result in additional area of complete clearance; however, less area of partial clearance than originally proposed for Stage 2 in the concept plan (refer Table 3). In addition, whilst remaining generally unchanged in layout adjacent to drainage line one, the revised Stage 2 project is proposed to directly impact on an approximately 80-metre length of drainage line two. The water pipeline is not expected to further increase the clearing associated with Stage 2 as it would be entirely contained within the bush fire clearance zone for Stage 2. The revised Stage 2 facility layout would also result in a minor reduction in the number of hollow bearing trees proposed to be cleared in the concept plan from 15 to 12, including the conservation of 'tree 128' which was identified as a tree of high habitat value due to it supporting a large hollow approximately 50 centimetres in diameter.

One public submission raised concerns about the flora and fauna impacts of the Stage 2 project. The Department of Water and Energy (DWE) queried the impacts of the Stage 2 project on waterways and riparian vegetation on site and Shoalhaven Council raised concerns regarding the impacts of the proposal on land identified as

“Conservation and Riparian” within and surrounding the site in Council's *Nowra Bomaderry Structure Plan*. Council recommended that the biodiversity impacts of the project be appropriately offset.

Table 3: Vegetation Clearance within the Approved Facility Site

Vegetation Clearance within Facility Site	Concept Plan			Current Proposed		
	Stage 1 (approved)	Stage 2	Cumulative (Stages 1 + 2)	Stage 2	Cumulative (Stages 1 and 2)	Change from Concept Plan
Complete Clearance	1.0 hectares	0.5 hectares	1.5 hectares	1.0 hectare	2.0 hectares	+ 0.5 hectares
Partial Clearance	4.4 hectares (including site perimeter)	1.2 hectares	5.6 hectares	0.4 hectares	4.8 hectares	- 0.8 hectares
<i>Total Vegetation Affected</i>	<i>5.4 hectares</i>	<i>1.7 hectares</i>	<i>7.1 hectares</i>	<i>1.4 hectares</i>	<i>6.8 hectares</i>	<i>- 0.3 hectares</i>

Consideration

The concept plan identifies that the vegetation within the facility site does not comprise an endangered ecological community (EEC); however, it is likely to provide potential habitat for several threatened flora and fauna species. Consequently, the minor additional ‘total’ clearing proposed as part of the project has the potential to increase impacts to threatened species. Potential impacts to threatened species’ habitat were identified as a significant issue in the Department’s assessment of the concept plan and Stage 1. Stage 1 was approved on the basis that a comprehensive biodiversity offset package be prepared prior to the commencement of clearing, which offset the impacts of the project on a 2:1 ratio to ensure that there would be no net loss to biodiversity values in the local area.

The biodiversity impacts of Stage 2 remain largely consistent with that originally predicted for Stage 2 under the concept plan. Consequently, the Department is satisfied that the cumulative impacts resulting from Stage 2 (in addition to Stage 1) would not result in an unacceptable biodiversity impact such as would preclude the Department from recommending approval to Stage 2. The Department supports efforts made by the Proponent to minimise the impacts of Stage 2 project as far as possible, including reducing the area of partial clearing required for bushfire hazard reduction (including the number of hollow bearing trees to be removed) through revised facility layout and locating the pipeline within the required bushfire hazard reduction zone to avoid the requirement for additional clearing. The Department is satisfied that subject to the same stringent biodiversity compensatory requirements, the minor additional impacts of the Stage 2 project can be appropriately offset such as to ensure that local biodiversity values are maintained or improved. Consequently, the Department has recommended conditions of approval requiring the Proponent to prepare and implement a biodiversity offset strategy in consultation with DECC prior to the commencement of clearing for Stage 2.

The Proponent has commenced investigation of a number of sites to offset the biodiversity impacts of the Stage 1 project, including one directly opposite the facility site and one bio-banking site and has commenced negotiations with landowners in this regard. It is understood that the sites being investigated contain similar vegetation types (and therefore similar habitat values) to the project site. Once secured the sites will effectively no longer be available for any future development and be secured for conservation in perpetuity thereby offsetting the impacts of the project. Based on the status of the Proponent’s investigations, the Department is satisfied that the viable and suitable land options are available to offset the biodiversity impacts of the project.

The Department of Water and Energy (DWE) raised concerns regarding potential impacts of the Stage 2 project on riparian zones. The Proponent has indicated that the revised facility layout (with the air cooled condenser located close to the gas turbines) is required to minimise steam duct length as well as to take into account wind direction which has a direct impact on the condenser’s thermal performance. The Department is satisfied that the proposed filling in of approximately 80 metres of drainage line on site is unlikely to have significant impacts to aquatic or riparian habitat, noting that the drainage line has been identified as a minor top-of-catchment flow line which would hold flowing water infrequently. The Proponent has proposed erosion and sediment controls to protect the water quality of the drainage line during construction and to separate ‘clean’ and ‘dirty’ water streams

during operation. The Department is satisfied that these measures would be sufficient to protect the drainage line and has recommended conditions of approval to reinforce the Proponent's commitments in this regard.

Since concept plan and Stage 1 approval was granted for the Bamarang power station (including the facility site), Council's Nowra Bomaderry Structure Plan has been endorsed by the Department of Planning. The primary objective of the conservation strategy component of the Nowra Bomaderry Structure Plan is to protect and restore the biodiversity, ecological integrity and natural capital throughout the Nowra Bomaderry district. Specifically, the approved facility site falls within land classified as Blackbutt Forest-Grey Gum in the Plan and is subject to 'Biodiversity Recommendation 7', which recommends the reservation of large areas of this community as it provides habitat for the threatened species Yellow-bellied Glider and Glossy Black Cockatoo and is poorly reserved in the region. Importantly, the Structure Plan does not necessarily preclude all development in the conservation areas but recognises that "if undisturbed habitat is assessed as necessary for development, opportunities to mitigate impacts should be developed concurrently with future planning of these areas".

The Department notes that the approved Stage 1 facility and (if approved) the Stage 2 facility would be subject to comprehensive biodiversity offset requirements which would need to be met prior to the commencement of clearing to ensure no net loss of biodiversity values in the local area. Despite being partially disturbed and the vegetation onsite site not comprising an EEC, a robust offset ratio of 2:1 (two hectares of offset for every one hectare removed) has been set, to take into account the likely significant habitat values of the remnant vegetation site and its surrounds. The offset ratio was determined not only on the basis of potential impacts to Yellow-Bellied Glider and Glossy Black Cockatoo habitat but to the habitat of several other threatened species including the Koala, Long-Nosed Potoroo and Grey-Headed Flying Fox. The Department is satisfied that development subject to these strict controls would result in an acceptable conservation outcome and would be consistent with the objectives of the structure plan.

5.5 Visual Amenity

Issue

The approved concept plan identified that the Stage 2 plant would include two heat recovery steam generators, each with exhaust stacks approximately 40 metres high and water cooled condenser and associated cooling tower approximately 11 metres high. The revised Stage 2 facility would involve an approximately 31 metre air-cooled condenser facility in place of the wet-cooled facility, which has the potential to add to the visual impacts of the Stage 2 project. The Stage 2 plant would also include an approximately 140 metre long pipeline, which would not cause visual intrusion as it will be undergrounded. Two submissions raised concerns regarding the potential visual impacts of the Stage 2 facility on nearby residential receivers and on proposed new living areas under Shoalhaven Council's Nowra Bomaderry Structure Plan.

Consideration

Whilst being taller than the originally proposed condenser structure, the newly proposed air-cooled condenser would be no higher than the tallest elements of the Stage 2 facility as proposed in the original concept plan (i.e. the 40 metre exhaust stacks). Consequently, the Department is satisfied that the Stage 2 facility as currently proposed (incorporating the air-cooled condenser) would remain consistent in scale and scope to the Stage 2 facility envisaged in the concept plan.

Notwithstanding, the Department acknowledges that the Stage 2 project would involve taller and more intrusive elements than the Stage 1 project, which has received project approval (i.e. 40 metre stacks compared to 25 metre stacks for Stage 1). Nevertheless, when considering the large viewing distance to nearest sensitive receivers (>1 kilometre) and significant screening provided by existing bushland, the Department considers that the overall visual impact of converting the Stage 1 facility to a Stage 2 facility would not be significant and would not preclude the Department from recommending approval to Stage 2. The Department considers that the visual impacts of the Stage 2 project can be further minimised if it is subject to the same comprehensive urban design and landscaping requirements as established for Stage 1, which would ensure that the facility is built in a manner that blends in rather than stands out from its surroundings. These include:

- the appropriate treatment of visually intrusive features (including colour sensitive palette and low reflective material);
- the mounting and screening of external lighting so as to not create nuisance impacts; and

- additional landscaping (using species consistent with the surrounding bushland) to further screen the facility from nearby view points.

Submissions raised concerns regarding the potential visual impacts of the Stage 2 project on the proposed new living areas identified in the Nowra Bombaderry Structure Plan. The Department is satisfied that the visual impacts of the Stage 2 project on proposed new living areas at Cabbage Tree Lane would not be significantly different to that associated with existing nearest sensitive receivers, which are located at a similar viewing distance (> one kilometre) as the proposed new growth area and subject to the same level of screening from existing bushland. Furthermore, the Department considers that there would be opportunities during residential development to further minimise exposure of the new receivers to views of the power station through appropriate landscaping and siting of dwellings with respect to other less sensitive landuse (e.g. commercial buildings).

Whilst receivers at the 'Future Long Term Living Areas' would be located much closer to the project site (approximately 500 metres from the facility) and therefore potentially more visually affected by the power station, the Department is satisfied that the urban design and screening requirements of the power plant coupled with appropriate residential planning as described above would ensure that the land is not sterilised for residential use by the visual impacts of the Stage 2 project.

In summary the Department is satisfied that the Stage 2 project would not result in unacceptable visual impacts to existing or future receivers and has recommended conditions of approval requiring comprehensive urban design and landscaping controls be established consistent with the Stage 1 approval.

5.6 Landuse

Issue

The Department's assessment and approval of the concept plan and Stage 1 project included consideration of the suitability of the facility site with respect to surrounding landuse. However, as the water supply infrastructure (and associated route) for the Stage 2 project was yet to be finalised at the time of concept plan approval, the concept plan approval required the Proponent to consider the landuse implications of its proposed water supply infrastructure, as part of the further assessment requirements of the Stage 2 project.

In seeking project approval for the Stage 2 project the Proponent has confirmed that the proposed water supply pipeline would be located almost entirely within the facility site approved under the concept plan and Stage 1 project approval, which is zoned 1(d) Rural "D" (General Rural) in the *Shoalhaven Local Environmental Plan 1985* (LEP). The water pipeline would also extend marginally outside the site into land zoned 7(c) Environment Protection "C" (Water Catchment Areas) to connect with Council's existing main network located on this land. The water pipeline would be undergrounded and is a permissible landuse under both these zonings.

Since approval of the concept plan and Stage 1 project, Shoalhaven Council's Nowra Bombaderry Structure Plan has been endorsed by the Department of Planning. The Structure Plan identifies parts of the approved facility site and its surrounds as a 'Conservation and Riparian Area' and identifies proposed future living areas approximately one kilometre to the east of the site at Cabbage Tree Lane and approximately 250 metres to the east of the site boundary (500 metres from the facility itself) at Bamarang. Council's LEP has yet to be amended to take into account the proposed new landuse.

A number of public submissions raised concerns that the impacts associated with the Stage 2 project (including noise, air quality and visual) would affect the rural amenity and lifestyle of the local area and in turn impact on property values and tourism potential in the area. Furthermore, the impact of the project on future living areas identified in the Nowra to Bomaderry Structure Plan was raised as an issue of concern.

Consideration

As noted above, the site suitability for the Bamarang gas-fired power station was assessed as part of the concept plan (for both Stages) and Stage 1 project and found to be acceptable. Consequently, landuse impacts of the Stage 2 project location are only assessed in so far as they relate to any changes to the Stage 2 project as described in the concept plan (i.e. incorporation of air-cooled technology and finalised water supply infrastructure).

With the exception of the water pipeline, which would extend just outside of the site to connect to Council's existing water supply network located along the site's western boundary, the Stage 2 project as currently proposed will not extend outside of the facility site approved as part of Stage 1. The Department considers the water pipeline to be consistent with landuse already approved on site (i.e. the Stage 1 power station) and with existing landuse outside of the site (i.e. Council's existing water distribution network). Furthermore, the pipeline is a permissible landuse within all affected land, and being undergrounded would not pose an intrusive feature in the landscape. Whilst the Structure Plan identifies parts of the approved site and its surrounds as 'conservation and riparian areas', the Department is satisfied that (subject to appropriate biodiversity offsets), the disturbance impacts of the Stage 2 project and associated water supply infrastructure would not preclude their location as proposed (refer Section 5.4).

In addition to direct landuse impacts, the Department has assessed the environmental impacts of Stage 2 (including on noise, air quality and visual) to determine the project impact on surrounding landuse amenity. Based on its assessment, the Department is satisfied that the Stage 2 project can be constructed and operated to achieve acceptable environmental standards at existing surrounding receivers and is unlikely to result in future landuse sterilisation (subject to appropriate development controls of future landuse). The Department's assessment has specifically considered impacts to future living areas identified in the Nowra Bombaderry Structure Plan. The Department is satisfied that the Stage 2 project is unlikely to preclude future landuse as proposed; however, may necessitate specific development controls to be incorporated into the future residential development, to minimise exposure to the impacts of the power station and maximise development potential. This is likely to be the case for the 'future long term living area' proposed approximately 500 metres to the east of the facility at Bamarang, although it is noted that the potential for development at this location is not certain and is yet to be confirmed by future investigations.

In summary, the Department is satisfied the landuse impacts of the Stage 2 project are consistent with the approved concept plan and would not preclude the orderly and economic development of surrounding land.

6. CONCLUSIONS AND RECOMMENDATIONS

The Department accepts that the second stage of the Bamarang gas-fired power station proposal, which involves the conversion of the approved (but yet to be constructed) open-cycle (Stage 1) plant to a combined cycle plant, would entail significant benefits to the State of New South Wales, by helping to secure base-load electricity supply to cater for existing and future inhabitants of the State.

The potential for environmental impacts associated with Stage 2 project related to two new design elements which were not considered in detail during the concept plan (water supply infrastructure and the incorporation of air-cooled condenser technology rather than wet-cooled condenser), as well as potential impacts associated with future landuse identified in the Nowra Bombaderry Structure Plan, which was finalised following the approval of the concept plan and Stage 1 project. Submissions on the proposal mainly raised concerns regarding potential noise, air quality, visual and landuse impacts associated with a power station at Bamarang and these issues were considered, where relevant, to the Stage 2 project, although the impacts of the approved Stage 1 project were not revisited.

The Department assessed the Proponent's Environmental Assessment, Submissions Report and Statement of Commitments on the Stage 2 project and submissions received by public agencies and the community on the project. Based on its assessment, the Department is satisfied that the Proponent has provided a robust and conservative assessment of impacts and that the impacts associated with the Stage 2 are consistent with the approved concept plan for the Bamarang gas-fired power station and can be managed and mitigated to achieve acceptable environmental standards, so as to not preclude the orderly and economic development of surrounding landuse.

Although some residual impacts may result, particularly to the future long term living areas identified directly to the east of the project site boundary at Bamarang, the Department considers the project to be on balance justified given its benefits to the broader community and because opportunity exists to minimise impacts to future landuse through appropriate development controls, should this area be developed as planned. The Department has drafted a recommended instrument of approval incorporating stringent and comprehensive environmental mitigation and management requirements consistent with the management framework already established for Stage 1 and to serve to enhance commitments made by the Proponent in its Statement of Commitments.

On balance, the Department considers the project to be justified and in the public's interest and should be approved subject to the Department's recommended conditions of approval and the Proponent's Statement of Commitments.

APPENDIX A – RECOMMENDED CONDITIONS OF APPROVAL

APPENDIX B – STATEMENT OF COMMITMENTS

APPENDIX C – RESPONSE TO SUBMISSIONS

APPENDIX D – ENVIRONMENTAL ASSESSMENT
