Vales Point Solar Project

Sunset Power International (trading as Delta Electricity)

Environmental Impact Statement

IA155900_01 | Final

31 January 2018

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Statement of Validity

Development Application Details	**Vales Point Solar project**
Applicant name	Sunset Power International Pty Ltd (Trading as Delta Electricity)
Applicant address	Level 7, 287 Elizabeth Street, Sydney, NSW 2000
Land to be developed	Lot DP28898, Lot 4 DP911564, Lot 7497 DP1165634, Lot 150 DP755266, Lot 12 DP1091396, Lot 7077 DP1056107, Lot 102 DP1170291, Lot 1 DP1195160, Lot 22 DP755242, Lot 29A DP755242, Lot 102 DP1196330 and Lot 7 DP915257.
Proposed development	SSD 8533 being the construction, operation and decommissioning of a 55 megawatt capacity solar project in the Local Government Areas of Lake Macquarie and the Central Coast as described in Section 2 of this Environmental Impact Statement.
Prepared by	Jacobs Group (Australia) Pty Ltd
Name	Thomas Muddle
Qualifications	Bachelor of Environmental Science, University of Newcastle and Graduate Diploma of Urban and Regional Planning, University of New England.
Address	Level 2, 710 Hunter Street, Newcastle West NSW 2303
In respect of	State Significant Development - 8533
Certification	I certify that I have prepared the contents of the Environmental Impact Statement in accordance with Schedule 2 of the Environmental Planning and Assessment Regulation 2000 and the Secretary's Environmental Assessment Requirements dated 29 June 2017, and that, to the best of my knowledge the information contained in the Environmental Impact Statement is not false or misleading.
Signature	
Name	Thomas Muddle
Date	31 January 2018

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Glossary and Abbreviations

Acronym	Definition
AADT	Annual Average Daily Traffic
AEP	Annual Exceedance Probability
AGD	Australian Geodetic Datum
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ANCOLD	Australian National Committee on Large Dams
ANL	Acceptable Noise Level
APZ	Asset Protection Zones
ASRIS	Australian Soil Resource Information System
ASS	Acid Sulfate Soil
BATEA	Best Available Technology Economically Achievable
BMP	Best Management Practice
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CARE	Community and Regional Environment
CCC	Central Coast Council
COAG	Council of Australian Governments
CSIRO	The Commonwealth Scientific and Industrial Research Organisation
DECC	Department of Environment and Climate Change now split into the Environment Protection Authority and Office of Environment and Heritage
DIPNR	Former Department of Infrastructure, Planning and Natural Resources
DLALC	Darkinjung Local Aboriginal Land Council
DRG	Department of Planning and Environment – Division of Resources and Geosciences
DPI	The Department of Primary Industries
DSC	New South Wales Dams Safety Committee
EIS	Environmental Impact Statement
EMF	Electric and Magnetic Fields
ENA	Energy Networks Australia
ENM	Excavated Natural material
EPA	Environment Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPL	Environment Protection Licence
ESB	Energy Security Board
FBA	Framework for Biodiversity Assessment
FDR	Fire Danger Rating

Acronym	Definition
FFDI	Forest Fire Danger Index
FTE	Full Time Equivalent
GTLAC	Guringai Tribal Link Aboriginal Corporation
ICNG	Interim Construction Noise Guidelines
ICNIRP	International Commission on Non- Ionizing Radiation Protection
INP	Industrial Noise Policy
ISEEP	State Environmental Planning Policy (Infrastructure (2007)
LGA	Local Government Area
LLEP	Lake Macquarie Local Environment Plan 2014
LMCC	Lake Macquarie City Council
MNES	Matters of National Environmental Significance
MVA	Mega Volt Amp
NBWS	National Bushfire Warning System
NCA	Noise Catchment Area
NEG	National Energy Guarantee
NEM	National Electricity Market
NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999 as revised 2013
NML	Noise management Level
NSW	New South Wales
OEH	Office of Environment and Heritage
OFH	Observed overall fuel hazard
PCS	Power Conversion Station
PEA	Preliminary Environmental Assessment
PMF	Probable maximum Flood
POEO	Protection of the Environment Operations Act 1997
RBL	Rating Background Level (Noise)
RES	Residential
RFS	Rural Fire Service
RMS	Roads and Maritime Authority
RORB	A general runoff and streamflow routing program used to calculate flood hydrographs from rainfall and other channel inputs
SAC	Site Assessment Criteria (contamination)
SAT	Single Axis Tracking
SCADA	Supervisory control and data acquisition
SEARS	Secretary's Environmental Assessment Requirements

Acronym	Definition
SEPP	State Environmental Planning Policy
SRD	State and Regional Development
SSD	State significant development
STS	Sub-transmission substation
TFB	Total fire ban
TSC	Threatened Species Conservation
VENM	Virgin Excavated Natural material
VPAD	Vales Point Ash Dam
WLEP	Wyong Local Environment Plan 2013

Executive Summary

Project Overview

Sunset Power International Pty Ltd trading as Delta Electricity (Delta) are seeking to develop an up to 55 megawatt (MW) solar photovoltaic (PV) generation facility and associated infrastructure in the local government areas (LGA) of Lake Macquarie and the Central Coast (the project). The project would be located within the land holding of the existing Vales Point Power Station and specifically on the rehabilitated area of the Vales Point Ash Dam.

The project is a State significant development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011. As a SSD, an application for the project is required to be submitted under Part 4, Division 4.1 of the NSW Environmental Planning and Assessment Act 1979. The NSW Minister for Planning (or the Minister's delegate) is the consent authority.

The project area covers approximately 80 hectares (Ha) of land. Key components of the project are:

- *Construction and operation of up to 55 MW capacity solar facility delivering an annual output of approximately 110 gigawatt hours (GWh);*
- *Installation of approximately 220,000 solar panel modules supported by either steel piles or concrete ballasted footings;*
- *Installation of ancillary electrical control equipment and switchyard for distribution;*
- *Connection to the National Electricity Market (NEM) via a short 33 kV transmission line (mainly overhead with an option for some underground cabling) to the Vales Point Zone Substation;*
- *Approximately 100 full time equivalent (FTE) jobs during a 12 to 18 month construction program; and*
- *An estimated 30 year design life with ongoing employment for up to five people.*

Project Objectives

The primary objective of the project is to compliment and diversify Delta's electricity generation portfolio. In doing so, Delta is conscious of wider objectives to:

- *Contribute to the achievement of National and State renewable energy targets, and energy security in NSW, in an efficient and cost-effective manner;*
- *Maintain the ongoing function of the VPAD and ash management system associated with the existing Vales Point Power Station;*
- *Implement a productive use of the rehabilitated areas of the VPAD; and*
- *Ensure the current project remains compatible with existing land uses and future development potential of Delta owned and surrounding lands.*

Site Selection

The project site was identified suitable and selected for the solar project on the following basis:

- *The site is currently cleared of significant infrastructure, flat and located within Delta's existing Vales Point Power Station landholding;*
- *The site has previously been extensively disturbed through the disposal of ash from the Vales Point Power Station and rehabilitation activities such that only vegetation regrowth is present with the exception of the short transmission line footprint where a highly disturbed existing power station easement would be used. The site divided into ash deposition landfill cells that have been designated in order of completion and rehabilitation, namely Pond 1, Pond 2 and Pond 3;*

- *The site has suitable insolation levels and site solar access (orientation, configuration and topography) such that energy generation can be maximised for the project;*
- *The site has suitable land area, geology and hydrology, and adequate access and road connections, including options for managing construction traffic;*
- *The site has characteristics that may assist in minimising localised impacts including that it has been previously disturbed and utilised for ash disposal, flat and low-lying topography and existing screening by vegetated buffer lands controlled by Delta;*
- *The project can be readily decommissioned and rehabilitated back to pre-existing or better condition;*
- *The community broadly supports the project as described in Section 4.1;*
- *The project is within close proximity to the electricity network and connection capacity is available at the anticipated connection point; and*
- *The identified site constraints, including unusual biodiversity features described in Section 5.1, proximity to nearest residents as described in Section 5.3, soil and landform as described in Section 5.5 and water management and flooding as described in Section 5.7 would not result in unacceptable environmental impacts.*

Environmental Assessment

Biodiversity

An assessment of the likely biodiversity impacts of the development has been undertaken having regard to the NSW Biodiversity Offsets Policy for Major Projects, and in accordance with the Framework for Biodiversity Assessment. Measures to avoid and minimise impacts focussed on the selection of the artificial Vales Point Ash Dam landform for the solar arrays and use of existing disturbed Vales Point Power Station easements to connect to the electricity transmission and distribution network.

Despite this being a highly disturbed and modified environment, the site does support native vegetation predominantly the result of deliberate rehabilitation efforts but also through the establishment of fresh water wetland and salt marsh plant community types. The fresh water wetland plant community type has formed in locations on Pond 3 and a small area of Pond 2 where surface water pools following rainfall. The salt marsh plant community type is considered likely to be associated with saline influences within the capping material and observed frequent wetting and drying regime. This salt marsh plant community type is limited to the lower lying Pond 2 but is not consistent with the scientific determination of salt marsh Endangered Ecological Communality as it is not tidally influenced being located approximately 9 metres above the maximum tidal range of Mannering Bay.

The siting and planning of the project combined with appropriate mitigation measures and safeguards during construction and operation is expected to be sufficient to ensure that the requirements to avoid and minimise impacts on biodiversity values as set out Framework for Biodiversity Assessment are met. Importantly, the project will not impact on:

- *Endangered Ecological Communities or Critically Endangered Ecological Communities;*
- *Plant community types that contain threatened species habitat;*
- *Critical habitat;*
- *The riparian areas of 4th order or higher streams and rivers, important wetlands or estuaries; or*
- *State significant biodiversity links.*

The selection of the site, on artificially created ash ponds, has avoided the need to impact any high quality plant community types. Further to this, the targeted surveys indicate the absence of threatened

species from the modified ash pond environment selected for the placement of the solar array. Areas of the higher quality freshwater wetland and woodlands have been excluded from the development site to avoid impacts. Despite avoidance and minimisation, removal of native vegetation will be required. The construction footprint would impact on approximately 19.19 hectares of native regrowth vegetation.

There are no impacts that require further consideration by the consent authority in accordance with the Framework for Biodiversity Assessment. The impacts to native vegetation do not require an offset under the FBA as they are not associated with threatened species habitat and are not identified as critically endangered or endangered ecological communities. One vegetation zone provides potential habitat for a number of threatened insectivorous bats species due to the presence of isolated scattered dead trees within the ash dam, some with hollows, and also the presence of insect prey. However, the site value score for this zone is low and therefore an offset is not required. There are expected to be no impacts to species and populations and as such an offset for species and populations is not required.

Heritage

An assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development has been undertaken and included consultation with, and involvement in field assessment by, Guringai Tribal Link Aboriginal Corporation and Darkinjung Local Aboriginal Land Council. The assessment area for the 33 kV transmission line contains no evidence of past Aboriginal occupation having been significantly disturbed by prior roadworks, and the construction of a conveyor belt system and pipelines on the easement.

The Project's construction impacts will avoid all AHIMS registered archaeological sites. It is considered unlikely that Aboriginal objects or artefact deposits will be present within the transmission corridor due to significant ground disturbance from prior road and infrastructure construction.

Land

An assessment of the impact of the development on the integrity of the Vales Point Ash Dam and future rehabilitation management at the Vales Point Power Station, the potential for soil erosion to occur, and the compatibility of the development with the existing and future land uses on the site and adjacent land has been undertaken. The site does not currently support an economically productive use and the location of the project on flat and rehabilitated sections of the VPAD was found to limit the potential for impacts to the ongoing function of the Vales Point Power Station or operational sections of the ash dam. The flat nature of the site along with existing water management systems on site were found to limit the potential for erosion on site or offsite mobilisation of sediments.

Visual

An assessment of the likely visual impacts of the development was undertaken including a site visit to document potential viewpoints for the project. The project is surrounded by an existing vegetated buffer zone controlled by Delta and no direct views to the project from existing receivers are available. Consistent with Department of Resources and Energy guidance that solar farms are not considered to be reflective, the assessment found that in the absence of direct views of the project to motorists the project was unlikely to cause impacts associated with glint or glare.

Noise

An assessment of the construction impacts of the development in accordance with the Interim Construction Noise Guideline and operational noise impacts in accordance with the NSW Industrial Noise Policy has been undertaken. Unmitigated construction impacts were found to exceed noise management levels at four residential receivers on Summerhayes Road. No receivers would be significantly noise affected during construction and Best Management Practice and Best Available Technology Economically Achievable practices are proposed to reduce noise impacts.

Unmitigated operational noise impacts were modelled to exceed criteria at two residential receivers on Summerhayes Road. With the implementation of screening or enclosures of power conversion units these exceedances were found to be avoided.

Traffic

An assessment of the site access route, site access point and likely transport impacts of the development on the capacity and condition of roads has been undertaken. The results indicate that all affected intersection would operate with acceptable levels of service during the construction peak periods. The operational stage will have minimal impact on the road network and therefore no mitigation measures are required to facilitate traffic movement. While not warranted by the project, safety improvements to the site access from Ruttleys Road and the Pacific Highway are proposed with the preliminary designs provided to be agreed with Central Coast Council and Roads and Maritime Services. Alternative measures including construction traffic management are available and would be implemented should the intersection upgrades not be agreed in time for the construction of the project.

Water

An assessment of the likely impacts of the development on surface water and groundwater resources and flooding has been undertaken. The project is proposed to be established within a site that is regulated under the Protection of the Environment Operations (POEO) Act 1997 where surface and groundwater quality is currently monitored in association with the operation of the Vales Point Power Station. The assessment has found that the project would have limited potential to change existing surface and groundwater flows, quality or volume and as such has limited potential for offsite impacts. Surface and groundwater quality would continue to be monitored and managed to comply with the existing Environmental Protection Licence (EPL) 761 and in accordance with the POEO Act. The site is connected to potable water supplies and is licenced to use treated effluent for dust suppression on site under the conditions of EPL 761.

The project is also located in catchments subject to active water level management. The flooding assessment found that the project would not alter existing catchment characteristics and was not at risk of causing changed flood behaviour. The detailed design of the project will further consider flooding potential.

Hazards

An assessment of bushfire risks and electric and magnetic fields (EMF) has been undertaken. The bushfire assessment found that construction activities have the potential to cause bushfire and that the surrounding vegetation buffer means the project would be at risk from bushfires originating offsite. The project site is within the application of a comprehensive bushfire management plan for the power station and surrounding lands which would be updated to consider the additional risks and infrastructure introduced by the project. The recommendations of the Rural Fire Service in relation to provision of defendable space, an all-weather access around the perimeter of the site and onsite water supply for firefighting services would be adopted in the detailed design. The EMF assessment found that on the basis of the 33 kV transmission voltage and limited public access to the project, compliance with the International Commission on Non-Ionizing Radiation Protection guidelines would be achievable.

Social and Economic

An assessment of the likely impacts on the local and regional community has been undertaken. The project has received positive feedback from local residents which is typical of the high level of support among communities for the development of renewable energy throughout NSW. Social impacts of the project include positive contributions through job creation and local spending supporting local businesses and potential negative impacts including demand on local services and amenity and traffic impacts. As the project is located within proximity to major population centres from which the majority

of workers are expected to be sourced, there is limited potential for the project to lead to any increase in demand on public services or the availability of housing.

An initial solar capacity assessment has found that up to 55 MW of solar capacity could be supported on existing capped areas of the VPAD with an expected annual output of 110 GWh. This would provide a positive contribution to energy supplies in the region.

Conclusion and Justification

While there would be some environmental impacts as a consequence of the project such as temporary traffic inconvenience, noise and vibration, ecology impacts, they have been avoided or minimised wherever possible through design and mitigation measures. The beneficial effects of renewable energy generation on land unsuitable for other development is considered to outweigh the mostly temporary adverse impacts and risks associated with the project.

1. Introduction

1.1 Project Overview

Sunset Power International Pty Ltd trading as Delta Electricity (Delta) are seeking to develop a large scale solar photovoltaic generation facility and associated infrastructure in the local government areas (LGA) of Lake Macquarie and the Central Coast (the project) (refer to Figure 1.1). The project would be located within the land holding of the existing Vales Point Power Station and specifically on the rehabilitated area of the Vales Point Ash Dam (VPAD) (refer to Figure 1.2). The project is a State significant development (SSD) under the *State Environmental Planning Policy (State and Regional Development) 2011*. As a SSD, an application for the project is required to be submitted under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979*. The NSW Minister for Planning (or the Minister's delegate) is the consent authority.

The project area covers approximately 80 hectares (Ha) of land. Key components of the project are:

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- Approximately 100 full time equivalent (FTE) jobs during a 12 to 18 month construction program; and
- An estimated 30 year design life with ongoing employment for up to five people.

1.2 Project Objectives

The primary objective of the project is to compliment and diversify Delta's electricity generation portfolio. In doing so, Delta is conscious of wider objectives to:

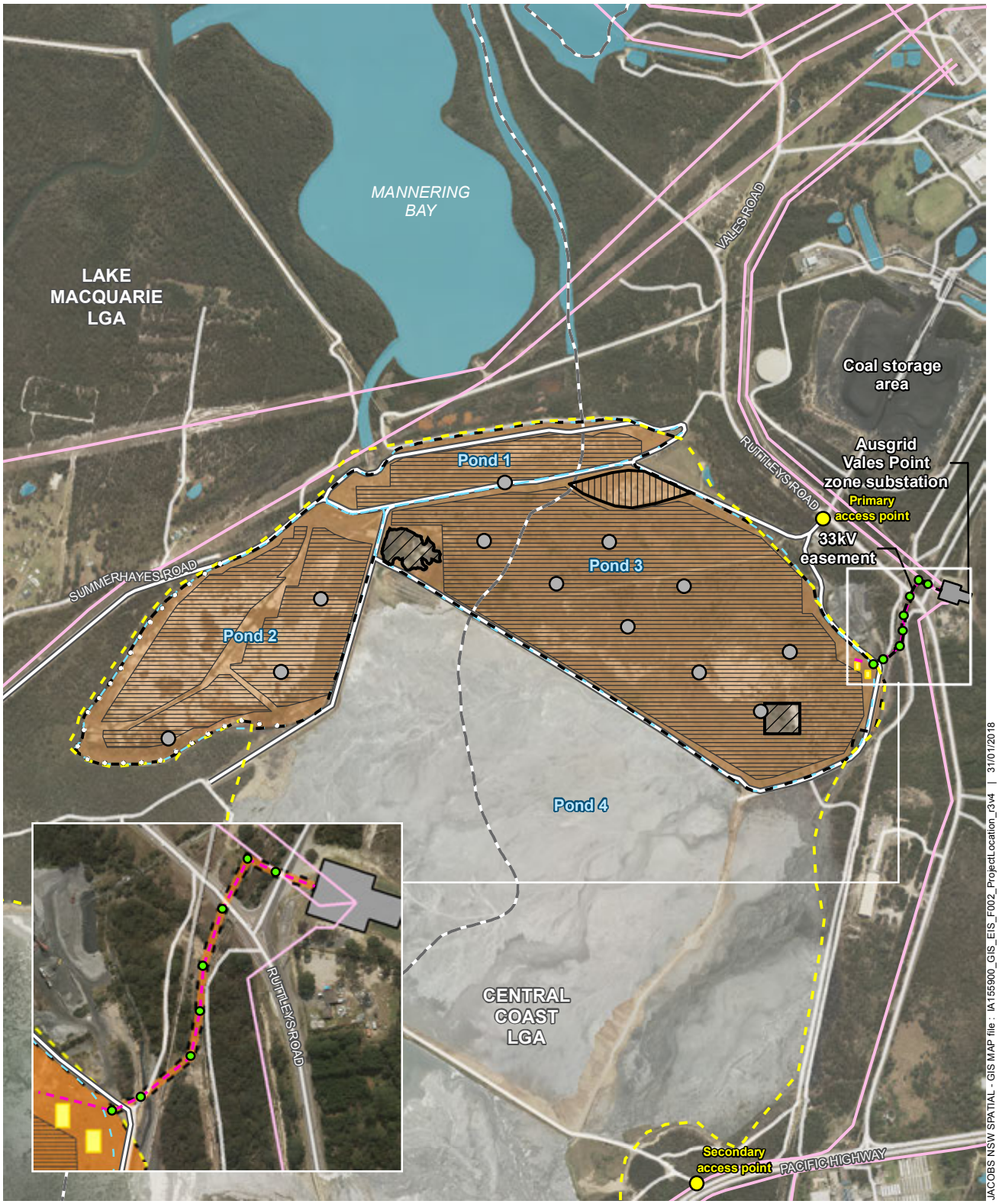
- Contribute to the achievement of National and State renewable energy targets, and energy security in NSW, in an efficient and cost-effective manner;
- Maintain the ongoing function of the VPAD and ash management system associated with the existing Vales Point Power Station;
- Implement a productive use of the rehabilitated areas of the VPAD; and
- Ensure the current project remains compatible with existing land uses and future development potential of Delta owned and surrounding lands.

1.3 Site History

Vales Point Power Station is located on the NSW Central Coast and is owned and operated by Delta, the project proponent. The Vales Point Power Station, including the VPAD, has operated since the 1960's and is managed under the conditions of Environmental Protection Licence (EPL No. 761) regulated by the NSW Environmental Protection Authority (EPA).

Vales Point is a coal fired power station with an installed capacity of 1320 MW. A by-product of the coal combustion process is the generation of ash. This material is composed of unburned mineral matter, often called fly ash, which has pozzalanic properties and can be recycled into cementitious products. Delta promotes the sale of ash products for beneficial use in other industries, with the balance of the ash produced stored in the operating sections of the VPAD to the south of the project.

Figure 1.1 | Site location



Legend

- Indicative power convertion station
- Indicative PV array
- Direct impact area
- Construction compound and laydown area
- Exclusion area
- Ash dam boundary (approx.)
- Pond boundary
- Access point
- Proposed perimeter road
- Existing perimeter road
- Electric pole
- Proposed 33kV cable
- Existing electricity transmission line
- Proposed building
- Existing building
- LGA boundary

0 250 500m
1:15,000 @ A4

Figure 1.2 | Vales Point solar farm

Construction of the VPAD commenced in August 1960 as part of the Ministerial Announcement approving the Vales Point Power Station and was completed in September 1963. The VPAD was originally designed to provide ash storage for the Vales Point A power station for a 30-year period equating to a required storage for an estimated 14 million m^3 of ash. The VPAD was developed through the construction of a 13 metre high, 900 metre long, earthen dam wall across Mannering Creek and the ash ponds were created by progressively filling the area behind the dam wall with ash slurry.

In the late 1970's, with the development of the new Vales Point B power station and the transfer of fly ash from Munmorah Power Station to the VPAD, it was predicted that additional storage capacity would be needed. A review concluded that a proposal to augment the VPAD, with a diversion to Wyee Creek to control flooding, was the preferred and selected option.

The augmentation of the VPAD is described in the 1980 Environmental Impact Statement (EIS) and included:

- The construction of the Wyee Diversion Channel and Wyee Dam (with the dam not constructed until the channel was in service to avoid the risk of flooding upstream in Mannering Creek);
- Blocking and raising of the original spillway, and the construction of a new temporary flood spillway, approximately 60 m wide, with crest level RL11.0 m in the left abutment of the original ash dam wall; and
- Construction of the second stage embankment to raise the dam by 9 metres to approximately RL 18.5 m at the left abutment and RL 21.5 m at the right abutment and eventual closure of the temporary flood spillway.

Since this time, several projects have been completed to optimise ash storage, improve environmental management of the VPAD and commence rehabilitation of completed ash storage areas. Projects include:

- In 1994, the ongoing review and management of the ash storage area identified the need to construct a return water system to control the continuous discharge of ash decant waters to Wyee Creek. These works were substantially completed in late 1995 and commissioned in early 1996;
- The construction of a saddle dam wall in the south east corner of the storage area, adjacent to the Pacific Highway, was completed in 1996;
- Completion and rehabilitation of the area between the original crest of VPAD and the dry ash embankments (designated Pond No.1) in 1996;
- Completion and rehabilitation of Pond No. 2 including capping, revegetation and surface runoff drainage works in 1999;
- Completion and rehabilitation of Pond No. 3 including capping, revegetation and surface runoff drainage works in 2004; and
- Ongoing operational activities, capping, revegetation and surface runoff drainage works for Pond 4 is currently in progress since 2011.

The placement of ash was designed to create a final surface, which once capped and rehabilitated, can drain water away from the active VPAD area. The rehabilitation works have been designed to drain surface water through a series of drainage contours, spillways, rip-rap rock channels and settling ponds, which eventually drain to a clean water outlet and spillway to Mannering Bay.

Presently, the northern portion of the VPAD (Ponds 1 – 3) has been filled to capacity with ash, capped and rehabilitated. The solar project is proposed to be installed on this rehabilitated area of the VPAD. The ongoing operation of the southern section of VPAD, including active capping works in Pond 4 and ongoing ash placement in Ponds 5 and above, is covered by separate approvals to the works which

would be undertaken under this EIS. As such, an assessment of the historic and continuing deposition of ash into the VPAD does not form part of this assessment. Table 1.1 provides a summary of previous approvals and authorisations covering the Vales Point Power Station and VPAD.

Table 1.1 : Summary of Relevant Vales Point Power Station and VPAD Approvals

Development/Activity	Description	Consent / Determining Authority	Date
Original Power station including VPAD	Approved all activities within VPAD as defined prior to augmentation.	Ministerial Announcement	1960
VPAD Augmentation	Approved activities to the extent described in the EIS included the Wyee Creek diversion.	Electricity Commission of NSW	1980
VPAD Embankment Construction to Close Temporary Spillway	Specific to the embankment construction works.	Lake Macquarie Council	1993
Return Water System Review of Environmental Factors	Specific to return water system works.	Delta Electricity	1994
Saddle Dam Wall Construction Review of Environmental Factors	Specific to saddle dam construction works.	Wyong Shire Council	1995
Dam and drainage	Specific to the final rehabilitation of Pond 1 -2.	Wyong Shire Council	1998
Rehabilitation of Pond 3	Specific to the final rehabilitation of Pond 3.	Delta Electricity	2004
Capping and Rehabilitation of VPAD	Includes ongoing operation activities and progressive capping of the VPAD as it is filled to its operational capacity using VENM and ENM materials.	Delta Electricity	2011

1.4 Feasible Alternatives

Assessment of alternatives has included evaluation of a ‘do nothing option’, various alternative land-uses and preliminary consideration of available solar PV panel technologies limited at this stage to fixed-tilt or single-axis tracking and mounting systems. No consideration has been given to alternative locations as a key objective of the project is to utilise the currently unproductive rehabilitated VPAD area and Delta do not have access to other landholdings in close proximity to transmission infrastructure and with similar environmental and landform characteristics.

1.4.1 ‘Do nothing option’

The ‘do nothing option’ would result in the continued unproductive use of this landform. The identified biodiversity values of the project area would be retained noting that the artificial process involved in their creation and atypical flora and fauna assemblage may not continue to survive in the event of ongoing changes to the VPAD water management processes associated with the approved capping of Ponds 4 and beyond. Construction and operational impacts including increased noise and traffic would also be avoided. However, these impacts are considered to be manageable and would not result in a significant environmental impact for the project.

The 'do nothing option' would allow the adoption of alternative uses including contributing to biodiversity corridors and provision of biodiversity offsets or public open space to support future development of the Delta land-holding post power station closure. It is noted that the project is considered a largely reversible land-use, and consideration of alternative uses of the site is not precluded by the project post design life.

The 'do nothing option' does not achieve any of the project objectives. While considered a viable option, based on the identified project benefits and limited negative environmental and social impacts, the 'do nothing option' is not preferred.

1.4.2 Use of site to support biodiversity corridor

The operational areas of the Vales Point Power Station and the VPAD are surrounded by areas identified as Green Corridor and habitat network but are bypassed by the major conservation links identified in the *North Wyong Structure Plan 2012* and more recently in the Central Coast and Hunter Regional Development Plans. The *Hunter Regional Development Plan 2036* identifies this corridor as the Jilliby to Wallarah Peninsula Link and Inter-Regional Landscape Break. This link recognises corridors previously identified in the *Lower Hunter Regional Strategy 2006-2031* and the *North Wyong Shire Structure Plan 2012*. It encompasses major new land release areas that accommodate urban and employment uses in the Hunter and Central Coast regions. The aim of conservation planning in this area is to identify and create habitat corridors and stepping stones to maintain connections between Jilliby State Conservation Area, Wallarah National Park and the Munmorah State Conservation Area. The VPAD is not currently identified as a part of a green corridor or habitat network.

The VPAD is currently fenced for safety and security purposes. Rehabilitation of Ponds 1 and 2 was undertaken with a nominal capping thickness of 100 mm of cover soil and seeding with grasses. Rehabilitation of Pond 3 involved using clean fill material nominally 300 mm thick and topsoil 150 mm thick. These ponds currently support limited shrubs and are unlikely to support deeper rooted tree species. It is considered that while Ponds 1, 2 and 3 may provide foraging habitat, they provide limited value as a corridor due to the absence of cover and due to fencing restricting mobility of ground inhabiting species.

The current methodology for capping Pond 4 involves a nominal depth of approximately 450 mm virgin excavated natural material (VENM) or excavated natural material (ENM). Once compacted, a nominal 150 mm surface layer of topsoil comprising 40 % topsoil, 40 % recycled green waste and 20 % recycled furnace ash will be applied prior to planting with local provenance native species. The VPAD Vegetation Management Plan (Eco Logical Australia, 2011) identifies that the methods to be implemented for capping of Pond 4 and future ponds would be capable of supporting a combination of species from the midstorey and ground layer from the vegetation communities present in the vicinity of the VPAD, notably Coastal Plains Scribbly Gum Woodland and Coastal Plains Smooth Barked Apple Woodland. Ponds 4 and the future ponds are considered to have greater potential to support the biodiversity corridor and the construction of the solar project on Ponds 1, 2 and 3 does not preclude the future consideration of such a use.

1.4.3 Use of site for public open space

Consideration has been given to the potential use of the site to meet future open-space requirements for residential developments in Lake Macquarie and the Central Coast LGA's. Within the Lake Macquarie LGA the site is within the Wyee sub-catchment of the *Morisset Contributions Catchment plan*. For the Central Coast LGA the site is within the *Northern Districts Development Contributions Plan* area.

Central Coast Council's goal for open space is to implement an open space system, which conserves a sustainable natural character for the Shire and provides a variety of settings for recreation to meet identified community needs. Central Coast Council requires that local open space for residential areas

be provided at the standard of 3.0 ha per 1,000 persons. Lake Macquarie Council's goal for open space equates to a community land provision standard for future development of 0.95 hectares per 1,000 persons for sportsgrounds, recreation facilities and parks, with this excluding all open space categorised as natural area.

Ponds 1, 2, 3 and 4 of the VPAD comprise approximately 97 ha of land within the Lake Macquarie LGA (equivalent to open space requirement for 100,000 people) and 152 ha in the Central Coast LGA (equivalent to open space requirement for 50,000 people). Neither the Hunter nor Central Coast Regional Plans, identified by the NSW Government as the 20-year blueprint for the future of the area, identifies a need for this level of residential growth locally.

Discussions with Central Coast Council indicated that the provision of open space and recreation is preferred to be accommodated within the development footprint of residential developments as opposed to being separated from the proposed development where it is less likely to be fully utilised. Similarly, the *Morisset Catchment Plan* includes consideration of locational and other factors that may affect usability. Based on this feedback, and the guidance within the catchment contribution plans, the use of the VPAD for public open space is not expected to be supported by either Council.

Subject to prior agreement with Council, land may be dedicated or transferred in lieu of making a contribution. Both Council's contributions plans identify that Council will only accept land dedication or transfer where that land is of a suitable nature for the purpose for which it is being dedicated or transferred and all land to be dedicated or transferred to Council is to be free of any improvements, structures or other impediments which would restrict or hinder its future use or development for the purposes for which it is being dedicated. The land is also to be dedicated or transferred in an appropriate state, free of any refuse, contamination, or the like, unless otherwise agreed by Council. It is considered unlikely that either Council would accept the dedication of VPAD land due to the prior use of the site.

1.4.4 Use of site for residential, commercial or industrial development

The VPAD is not considered a currently viable opportunity for residential, commercial or industrial development on the basis that neither the Hunter nor Central Coast Regional Plans identify such needs in the area surrounding the VPAD.

1.4.5 Consideration of alternative technologies

Consideration of alternative technologies has included comparison of costs and benefits of fixed-tilt and single- axis tracking mounting systems.

Single-axis tracking technology uses a single row of single photovoltaic (PV) modules laid perpendicular to the long axis of the tracking mechanism. The long axis of the tracking mechanism is aligned north to south and is generally a long drive shaft. The drive shaft has posts at regular intervals to support the modules. This drive shaft rotates from the east to the west following the diurnal range of the sun then backtracks to the east. This rotation is made by a small sun tracking mechanism and incremental motor drive on the drive shaft. The advantage of this technology is that it maximises the energy generated by the panel modules by keeping the modules perpendicular to the sun's angle of incident irradiation. This technology has a higher capital investment and ongoing maintenance requirements but generates more energy per panel.

Figure 1.3 : Single axis tracking system (left) and fixed tilt system (right)

Fixed-tilt technology has a row of modules stacked in portrait or landscape on top of each other, with the main face directed to the north. Generally, the modules are fixed in position and inclined up from horizontal to an angle similar to the latitude of installation. These modules are fixed in position and have no moving parts. This technology has lower capital investment but lower energy yields per module.

Under both systems the method of anchoring to the ground will be dependent on geotechnical considerations. Consideration of alternative technologies is ongoing and would be finalised during the detailed design phase.

1.5 Secretaries Environmental Assessment Requirements

The EIS has been prepared to respond to the Secretaries Environment Assessment Requirements provided below in along with cross reference to the location in the EIS where each requirement has been addressed.

Table 1.2 : Secretaries Environmental Assessment Requirements

Requirement	Location
General Requirements	
The Environmental Impact Statement (EIS) for the development must comply with the requirements in Schedule 2 of the Environmental Planning and Assessment Regulation 2000. In particular, the EIS must include:	This EIS
· a stand-alone executive summary;	Executive Summary
· a full description of the development, including: - details of construction, operation and decommissioning; - a site plan showing all infrastructure and facilities (including any infrastructure that would be required for the development, but the subject of a separate approvals process); - a detailed constraints map identifying the key environmental and other land use constraints that have informed the final design of the development;	Chapter 2 Figure 1.2 Figure 2.1
· a strategic justification of the development focusing on site selection and the suitability of the proposed site;	Chapter 3

Requirement	Location
· an assessment of the likely impacts of the development on the environment, focusing on the specific issues identified below, including: - a description of the existing environment likely to be affected by the development; - an assessment of the likely impacts of all stages of the development (which is commensurate with the level of impact), taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice; - a description of the measures that would be implemented to avoid, mitigate and/or offset the impacts of the development (including draft management plans for specific issues as identified below); and - a description of the measures that would be implemented to monitor and report on the environmental performance of the development;	Chapter 5 and Appendices
· a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS; and	Chapter 6
· the reasons why the development should be approved having regard to: - relevant matters for consideration under the Environmental Planning and Assessment Act 1979, including the objects of the Act and how the principles of ecologically sustainable development have been incorporated in the design, construction and ongoing operations of the development; - the suitability of the site with respect to potential land use conflicts with existing and future surrounding land uses; and - feasible alternatives to the development (and its key components), including the consequences of not carrying out the development.	Chapter 7 Section 5.5.11 Section 1.4
While not exhaustive, Attachment 1 contains a list of some of the environmental planning instruments, guidelines, policies, and plans that may be relevant to the environmental assessment of this development.	Considered in relevant appendices.
In addition to the matters set out in Schedule 1 of the *Environmental Planning and Assessment Regulation 2000*, the development application must be accompanied by: · a signed report from a suitably qualified person that includes an accurate estimate of the capital investment value of the development (as defined in Clause 3 of the Environmental Planning and Assessment Regulation 2000), including details of all the assumptions and components from which the capital investment value calculation is derived; and · the consent in writing of the owner of the land (as required in clause 49(1)(b) of the Environmental Planning and Assessment Regulation 2000).	 Provided separately Provided separately
Specific Issues	
Biodiversity – including an assessment of the likely biodiversity impacts of the development, having regard to the NSW Biodiversity Offsets Policy for Major Projects, and in accordance with the Framework for Biodiversity Assessment, unless otherwise agreed by the Department;	Section 5.1
Heritage – including an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community	Section 5.2

Requirement	Location
Land – including an assessment of the impact of the development on the integrity of the VPAD and future rehabilitation management at the power station, a soil survey to consider the potential for erosion to occur, and paying particular attention to the compatibility of the development with the existing and future land uses on the site and adjacent land (e.g. operating mines, extractive industries, mineral or petroleum resources, exploration activities, urban development, dust generation, and risk of weed and pest infestation) during operation and after decommissioning, with reference to the zoning provisions applying to the land;	Section 5.5
Visual – including an assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain and if required a draft landscaping plan for onsite perimeter planting, with evidence it has been developed in consultation with affected landowners;	Section 5.6
Noise – including an assessment of the construction noise impacts of the development in accordance with the Interim Construction Noise Guideline (ICNG) and operational noise impacts in accordance with the NSW Industrial Noise Policy (INP), and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria;	Section 5.3
Transport – including an assessment of the site access route, site access point and likely transport impacts of the development on the capacity and condition of roads (including on any Crown land), a description of the measures that would be implemented to mitigate any impacts during construction, and a description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required);	Section 5.4
Water – including: · an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including Mannering Bay, wetlands, riparian land, groundwater dependent ecosystems and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts; · details of water supply arrangements; and · a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with Managing Urban Stormwater: Soils & Construction (Landcom 2004);	Section 5.7 Sections 2.3.7 and 2.4.4 Section 5.5.12
Hazards and Electromagnetic Interference – an assessment of potential hazards and risks associated with bushfires and the proposed grid connection infrastructure against the International Commission on Non- Ionizing Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields.	Section 5.8
Socio-Economic – including an assessment of the likely impacts on the local and regional community.	Section 5.9

Requirement	Location
Consultation	
During the preparation of the EIS, you should consult with relevant local, State or Commonwealth Government authorities, infrastructure and service providers, community groups, affected landowners, exploration licence holders, quarry operators and mineral title holders. In particular, you must undertake detailed consultation with affected landowners surrounding the development Lake Macquarie City Council and Central Coast Council. The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.	Chapter 4

2. Project Description

The project includes the construction, operation and decommissioning of a solar photovoltaic (PV) power station of up to 55 megawatt (MW) capacity on capped areas of the VPAD and connection to the National Electricity Market (NEM) as shown in Figure 1.2. The project extends across the LGA boundary of Lake Macquarie and Central Coast. The project site is entirely within the existing property boundary of the Vales Point Power Station and surrounded by vegetated buffer lands owned by Delta. A summary of the project elements is provided in Table 2.1.

Table 2.1 : Project Summary

Project Element	Summary of the Project
Site Description	
Local Government Area	Central Coast and Lake Macquarie City
Project location	Suburbs of Mannering Park (Central Coast LGA) and Wyee (Lake Macquarie)
Formal Identifier	Lot 1/DP28898, Lot 4/DP911564, Lot 7497/DP1165634, Lot 150/DP755266, Lot 12/DP1091396, Lot 7077/DP1056107, Lot 102/DP1170291, Lot 1/DP1195160, Lot 22/DP755242, Lot 29A/DP755242, Lot 102/DP1196330 and Lot 7/DP915257.
Zoning	SP2 Electricity Generation Work under the *Lake Macquarie Local Environment Plan 2014* (LLEP 2014) and predominantly SP2 Electricity Generation Work with a narrow strip zoned W1 Natural Waterways under the *Wyong Local Environmental Plan 2013* (WLEP 2013).
Project footprint	Approximately 80 hectares consisting of the rehabilitated portion of the 524 hectare Vales Point Ash Dam and within the 1,730 hectare Vales Point Power Station landholding.
Access	Primary access from Ruttleys Road, Mannering Park and secondary access from Pacific Highway approximately 500 metres west of the Pacific Highway / Ruttleys Road intersection.
Specification	
Capacity	Approximately 55 MW.
Solar Panels	Approximately 220,000.
Array	Fixed tilt (north facing, two string high configuration in portrait) or single axis tracking (east-west tracking, backtracking, single module in portrait) or combination of both.
Mounting System	Screw/bladed steel pile or concrete ballasted footing.
Trenching for cabling and electrical connection	Approximately 4000 m^3.
Transformers	Approximately 12 Integrated inverters/transformer units comprising twin 2.75 Mega Volt Amp (MVA) 1500V technology inverters in 5.5 MW Power Conversion Station (PCS) block dispersed throughout the solar development footprint. PCS block dimensions of up to 12.2 metres long, 2.5 metres wide and 2.9 metres tall if containerised.

Project Element	Summary of the Project
Grid connection	600 metre, mainly overhead, 33 kV transmission line to the existing 33 kV Vales Point Substation with an option for some underground cabling crossing beneath Ruttleys Road using existing pipeline culvert.
Access, tracks and parking	Use of existing all weather access from Ruttleys Road and establishment of additional on-site access tracks. Off-site parking at Vales Point Power Station may be considered if space or traffic constraints dictate or parking area could be established in non-operational areas of VPAD to be identified during detailed design.
Construction	
Construction Ancillary facilities	Compound including construction office, crib sheds and amenities block, laydown area and parking areas.
Construction Workforce	100 Full Time Equivalent (FTE) (at peak).
Construction Hours	Standard construction hours (Monday-Friday 0700-1800, Saturday 0800-1300 and no Sunday or public holiday work).
Construction timeframe	12-18 months.
Daily traffic volumes	Up to 200 light vehicles movements and 18 heavy vehicles movements.
Plant and Equipment	Diesel generators, mobile crane/telehandler/forklift, pile drilling rig, powered hand-tools, grader, trencher, vibratory roller, front end loader, cement mixer and trucks.
Operations	
Operational life expectancy	30 years
Operational facilities	Permanent infrastructure will include an on-site operation and maintenance facility to house supervisory control and data acquisition (SCADA) system, operations control room and storage facilities for spare parts.
Operational workforce	Up to 5 FTE.
Daily Operation Traffic Movements	10 (light vehicles).
Single-axis tracking panel motors	Up to 1400 (operating for 1 minute per 15 min during daylight). Note, not required if fixed-tilt technology used exclusively.
Inverters - transformers	Up to 12 Inverter/transformer skids would be located evenly throughout the site.
Substation	Not required

For technical and practical reasons, there may be a requirement to reconsider the main elements of the project during the detailed design and construction phase. Potential variations may include total energy capacity due to improvements in solar module technology, alternative inverter configurations and the location of supporting infrastructure. It is desirable that flexibility is provided in the project description, and Delta also seeks flexibility project approval, to allow the final design and specifications for the project to be determined based on selection of preferred technology and optimisation of layout to achieve the most economically, and environmentally and socially feasible development. It is noted that the development footprint remains constant. With reference to the recently released *Draft Large-Scale Solar Energy Guidelines for State Significant Development* (NSW Government, 2017) it is considered that the flexibility sought can be accommodated for the project on the basis that:

- The site has suitable insolation levels and site solar access (orientation, configuration and topography) such that energy generation can be maximised for the project;
- The site has suitable land area, geology and hydrology, and adequate access and road connections, including options for managing construction traffic;
- The site has characteristics that may assist in minimising localised impacts including that it has been previously disturbed and utilised for ash disposal, flat and low-lying topography and existing screening by vegetated buffer lands controlled by Delta;
- The project can be readily decommissioned and rehabilitated back to pre-existing or better condition;
- The community broadly supports the project as described in Section 4.1;
- The project is within close proximity to the electricity network and connection capacity is available at the anticipated connection point; and
- The identified site constraints, including unusual biodiversity features described in Section 5.1, proximity to nearest residents as described in Section 5.3, soil and landform as described in Section 5.5 and water management and flooding as described in Section 5.7 would not result in unacceptable environmental impacts.

The assessment of the project has been based on the identified highest impact scenario of full disturbance of the entire project area and using highest impact technology under consideration and mitigation and monitoring measures are proposed to address the high impact scenario environmental outcomes.

2.1 Site Description

The project would be located within the landholding of the Delta owned Vales Point Power Station and specifically on non-operational rehabilitated sections of the VPAD. The Vales Point Power Station and VPAD are located at the southern end of Lake Macquarie on the NSW Central Coast. The VPAD consists of a series of operational and closed cells referred to as ponds. The closed Ponds 1, 2 and 3, have been capped and rehabilitated with native grasses. The rehabilitated area is relatively flat and provides a substantial area for the construction of a utility scale solar field.

A constraints map identifying the key environmental and other land use constraints that have informed the site selection and project concept design is provided in Figure 2.1.The current landform and vegetation cover typical of each pond is presented in Photographs 1 to 4 below.

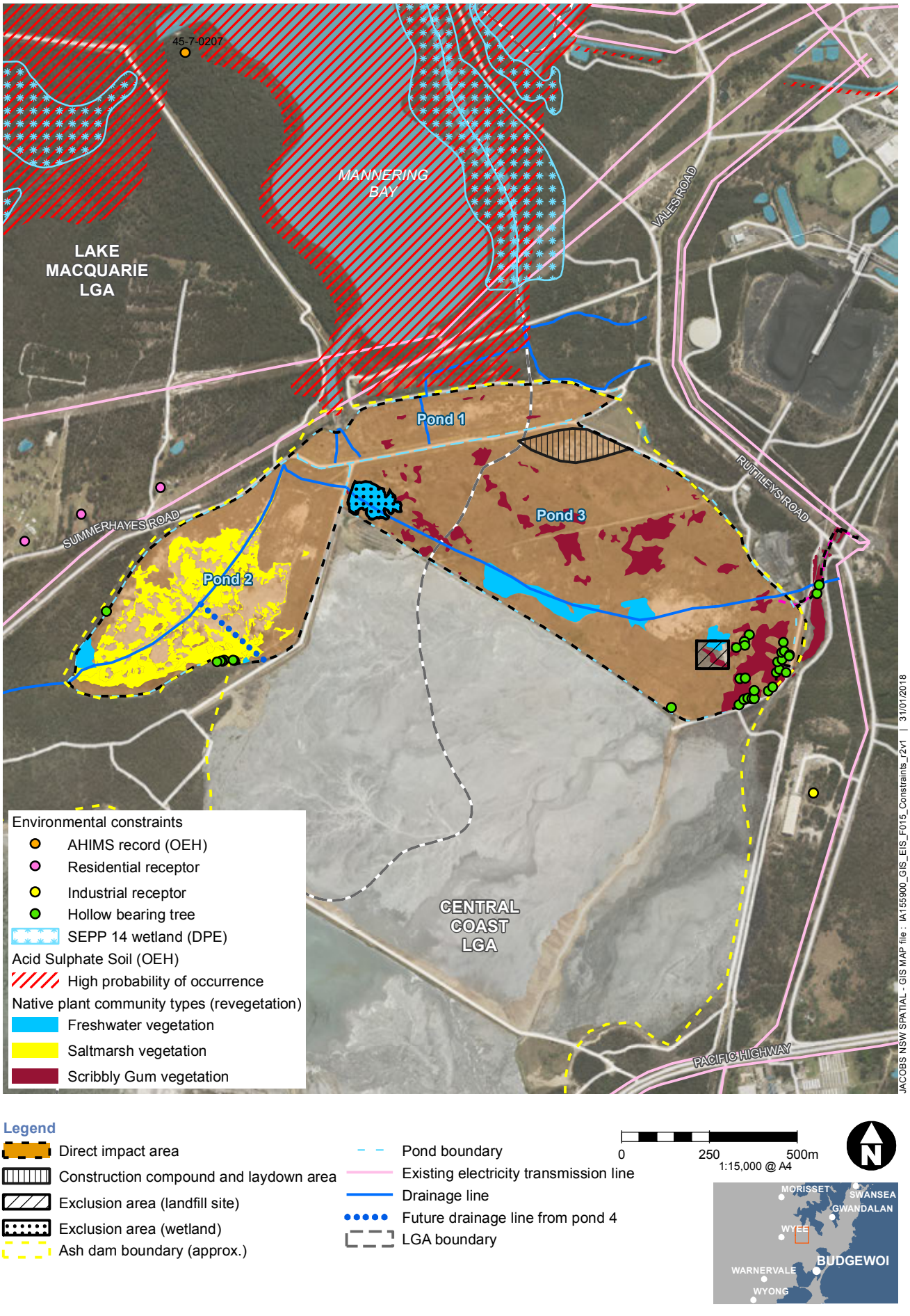


Figure 2.1 | Environmental constraints

Photo 1 : Pond 1 looking north towards Mannering Bay with Vales Point Power Station stacks in the background.

Photo 2 : Pond 2 looking west towards Summerhayes Road

Photo 3 : Pond 3 looking south.

Photo 4 : Pond 3 looking east

The VPAD is located in the southern section of the Vales Point Power Station property with the project to be located approximately 900 metres to the north of the Pacific Highway, 150 metres south-west of Ruttleys Road and 30 metres south of the end of Summerhayes Road.

To the north of the site is Mannering Bay which is a natural water body that flows into Lake Macquarie. To the south of the site are the operational areas of the VPAD, with the pond immediately to the south (Pond 4) currently undergoing capping and rehabilitation works and active ash disposal occurring approximately 600 metres further to the south. To the west is predominantly undeveloped lands interspersed with private rural residences. To the east is Ruttleys Road, the Ausgrid Vales Point Zone Substation, the existing Vales Point Power Station and the operational Mannering Colliery and Chain Valley Bay Colliery underground mines. The VPAD and project site is surrounded by a vegetation buffer consisting of remnant native vegetation with intermittent disturbance by power station infrastructure and transmission lines.

Both the *Lake Macquarie Local Environment Plan 2014* (LLEP 2014) and *Wyong Local Environmental Plan 2013* (WLEP 2013) apply to land within the project site. The site is predominantly zoned SP2 Electricity Generation Works under both Local Environment Plans (LEPs). A narrow strip of land zoned W1 Natural Waterways under the *Wyong Local Environmental Plan 2013* (WLEP 2013) runs along the LGA boundary related to the former alignment of Mannering Creek prior to its damming and filling with power station ash.

The nearest residential areas to the project are located at Mannering Park approximately 1 kilometre to the north, Doyalson North around 1.4 kilometres to the east, Wyee approximately 2.3 kilometres to the west and Doyalson 2.3 kilometres to the south. A number of rural residential receivers are located in closer proximity to the site along Summerhayes Road, with the nearest, approximately 100 metres from the north western site boundary.

The project would connect to the National Electricity Market (NEM) at the existing Ausgrid Vales Point Zone Substation located on the corner of Ruttleys Road and Construction Road to the east of the VPAD as pictured in Photo 5 below. The final design of the connection will be completed in consultation with Ausgrid but is expected to include an overhead 33 kV transmission line from the VPAD to Ruttleys Road using an existing pipeline corridor, crossing Ruttleys Road underground via an existing pipeline culvert and then utilising the existing 33vkV line easement east of Ruttleys Road to connect to the grid at the substation.

Photo 5 : Vales Point Zone Substation

2.2 Project Components

2.2.1 PV Solar Panels

The project will install PV solar modules (or panels) in a series of rows aligned to optimise the collection of solar energy within the project area. The panels will utilise either fixed-tilt (FT) or single-axis tracking (SAT) configurations. The FT system is constructed with beam and structural members to support PV arrays at a fixed tilt angle facing north (in the southern hemisphere) and remain static throughout the year. SAT systems allow the modules to follow the sun in an east to west direction throughout the day to maximise solar energy collection. Tracking systems typically require a greater installation footprint and therefore reduce the capacity of the field in comparison to fixed panels of the same area.

The solar panels will be mounted on support structures consisting of either steel posts or ballasted footings. Ballasted footing mounts, such as concrete or steel, use that weight to secure the solar module in position and do not require ground penetration. The expected height of the mounted panels is approximately two and a half metres.

It is anticipated that approximately 220,000 panels will be installed with the final module design to be determined by a detailed solar resource assessment and optimisation of the solar field layout, detailed geotechnical assessment of the subsurface, and the available grid capacity and network connection requirements.

2.2.2 Electrical Collection System and Switchgear

A system of inverters and medium voltage step up transformers will be located throughout the arrays. The main function of inverters is to convert direct current (DC) power output generated by the PV arrays into alternating current (AC) power required by the grid. A transformer will be located adjacent to each inverter which will step up the system voltage to the medium voltage at 33 kV level. Each medium voltage power station, often referred to as power conversion stations (PCS), will incorporate two inverters, a transformer and switchgear. A series of cable trenches will be required to be constructed for underground electrical conduits and cabling to connect the arrays to the inverters and transformers. The output from each PCS will be marshalled at a new 33 kV switchgear.

2.2.3 Grid Connection

This 33kV switchgear will be connected to the network in the vicinity of the existing Vales Point Zone Substation located on the corner of Ruttleys Road and Construction Road to the east of the VPAD. The 33 kV connection route proposed utilises an existing conveyor and pipeline easement to minimise any vegetation clearing for a series of poles and overhead wires. The transmission line will cross Ruttleys Road underground via an existing pipeline culvert and then utilise the existing 33 kV line easement east of Ruttleys Road to connect to the grid at the substation.

Preliminary discussions have been held with the network operator (Ausgrid) regarding the network connection location. It is proposed that the project will connect to the network via a 33 kV connection to the 743/744 33 kV feeders that supply the Vales Point Zone substation from the Munmorah sub-transmission substation (STS). The 33 kV connection point would likely be located in the vicinity of the Vales Point Zone Substation at either the zone substation or a pole connection directly to either 743/744 33 kV feeder in the vicinity of the substation.

Final design of the network connection infrastructure will be subject to the requirements of the network service provider (Ausgrid), outcomes of the grid connection studies, transmission line route selection and engineering, and any identified environmental and landholder constraints.

2.2.4 Construction Facilities

Temporary site facilities to support peak construction activity and staff numbers will include:

- Material laydown areas;
- Workshop and prefabrication areas;
- A compound providing staff amenities including temporary site offices, meal areas and ablutions facilities; and
- Temporary car parking area for staff, contractors and visitors.

A portion of the site will be used for internal roadways, access tracks and hardstand areas to allow access for construction activities, parking and laydown activities. These areas would be confirmed during the detailed design and by the construction contractor but all will be located within the project area.

2.2.5 Operational Facilities

Permanent infrastructure will include an on-site operation and maintenance facility to house supervisory control and data acquisition (SCADA) system, operations control room and storage facilities for spare parts.

2.2.6 Site Access

The site is proposed to be accessed from the existing all-weather access from Ruttleys Road, with alternative in-bound access to be provided directly from the Pacific Highway.

The Pacific Highway is a state road with a sign posted speed limit of 80 km/h in the vicinity of the site. It is two lanes in each direction on a divided carriageway. The highway carries an Annual Average Daily Traffic (AADT) of approximately 14,000 vehicles per day and it is an approved road for 26 m B-Double vehicles. The site is located west of the highway and has direct access from the highway via a left-in only intersection.

Ruttleys Road is a local collector road with generally one lane in each direction on an undivided carriageway. The road carries an AADT of approximately 6,000 vehicles per day. The sign posted speed limit of Ruttleys Road in the vicinity of the site is 80 km/h. The site has a direct access from Ruttleys Road via a cross intersection. Ruttleys Road between the Pacific Highway and approximately 400m north of the site's access is an approved B-double route for 26 m B-Doubles.

The project includes proposed upgrades to both intersections including a left hand turn lane from the Pacific Highway and a dedicated left-in turn from Ruttleys Road and improvements to the pavement in this location.

The existing all-weather access from Ruttleys Road would be used for access to the operational facilities. The existing perimeter access road is proposed to be extended as shown in Figure 1.2 to permit unobstructed access for emergency services personnel. A network of gravel tracks is also required to provide access throughout the solar array for construction and maintenance activities with the layout of these internal tracks to be confirmed through detailed design.

2.2.7 Drainage Improvements

The project area has a low gradient and works to manage stormwater runoff as part of the project are anticipated to reduce the potential for ponding beneath the solar arrays. These works will seek to minimise ground disturbance and be designed to reflect panel array and access track layout.

2.2.8 Site Security

The VPAD is fully fenced with high security fencing along the site boundaries. Access is limited to operational areas of the VPAD during daylight hours only and security patrols and perimeter inspections are completed regularly. It is not anticipated that additional security fencing will be required to be installed as part of this project.

2.3 Construction Activities

2.3.1 Indicative Construction Program

Project construction is expected to be completed over a 12 to 18-month program with a planned commencement date in late 2018.

2.3.2 Work Methodology

Construction would involve the following activities:

- Establishment of site access improvements and internal access roads;
- Installation of environmental controls;
- Establishment of construction compound, parking and laydown areas;
- Removal of shrubs and slashing of site;
- Establishment of drainage improvements;
- Installation of mounting system and solar panels;
- Installation of underground cabling, invert/transformers and switching station;
- Construction of 33kV network connection including above ground power line, under road cabling and connection infrastructure;
- Commissioning activities; and
- Removal of construction infrastructure and environmental controls.

2.3.3 Construction Hours

Construction would be in accordance with the standard construction hours as defined under the Interim Construction Noise Guideline (DECC 2009) as follows:

- Monday to Friday: 7 am to 6 pm.
- Saturday: 8 am to 1 pm.
- Sundays and public holidays: no work.

Works outside of these hours would only be considered for the safe delivery of materials and equipment and where identified as inaudible at residential receivers.

2.3.4 Plant and Equipment

The following plant and equipment would be used during construction:

- Diesel generators;
- Mobile crane/telehandler/forklift;
- Pile drilling rig;
- Powered hand-tools;

- Grader;
- Trencher;
- Vibratory Roller;
- Front end loader;
- Cement mixers; and
- Trucks.

The use of multiple items within close proximity to each other over extended periods would be avoided where possible.

2.3.5 Ground Disturbance

Ground disturbance would be limited to works associated with ground levelling for structures and compounds, installation of cabling, erecting power poles, establishment of internal access tracks and drainage improvements. All underground cabling would be designed to meet relevant Australian standards. The ground disturbance associated with the installation of the panel array mounting system would be kept to a minimum and, if a screwed pile system is selected, would be minimal.

2.3.6 Construction Employment

The project is expected to employ up to 100 workers during the 18-month construction project. Employment numbers are likely to fluctuate with peak employment limited to the duration of solar panel mounting operations.

2.3.7 Construction Water Supply

Non-potable water use during the construction period is estimated at 70 mega litres (ML) and would mainly be used for roadway dust suppression and other construction works such as concreting. This water would be sourced from the existing treated effluent pond and stormwater retention ponds located on site. It is also noted that some of the roadways are currently watered for dust suppression as part of the normal operation of the ash dam area. A small amount of potable (drinking) water (< 150 kilolitres (kL)) would be utilised for temporary site facilities during the construction period.

Potable water is currently supplied to the VPAD area via a water main located adjacent to the ash reclamation area. A second potable water supply is connected to the existing site facilities utilised by staff managing current ash dam activities. The temporary site facilities will utilise these available water supplies.

Delta currently uses secondary treated effluent waste water for dust suppression on internal roadways on the VPAD under the conditions of the Vales Point Environmental Protection Licence (EPL761). There is sufficient treated water available for dust suppression activities associated with the proposed construction works.

2.3.8 Waste Management

Waste generated by the project would be classified and lawfully disposed at a licenced facility where unable to be reused or recycled. Excavated capping material will be backfilled where appropriate or otherwise re-used as capping material on the neighbouring Pond 4. Excavated ash, where not able to be backfilled, would be deposited in the active VPAD.

The importation of solar panels is likely to involve a substantial volume of cardboard, wooden pallets and plastic wrap. Opportunities to return pallets to the panel provider or use as an alternative fuel source at the Vales Point Power Station under the conditions of Environmental Protection Licence

EPL 761 would be explored or, where untreated they may be considered, along with cardboard for mulching and use in future site rehabilitation activities. Opportunities to recycle plastic wrap would also be investigated. Broken solar panels would be returned to the supplier for reconditioning where the technology selected allows.

2.3.9 Revegetation

Disturbed areas would be rehabilitated progressively as the use of each area is discontinued. Rehabilitation would involve seeding with a cover crop and perennial native species consistent with the existing community with a preference for shade tolerant species.

2.4 Operation

2.4.1 Operational Hours

The project would operate during daylight hours. Maintenance and refurbishment activities would be limited to standard construction hours.

2.4.2 Workforce

Ongoing employment for five staff would be generated by the operation of the project. Cleaning and refurbishment activities may generate short term employment for additional staff on an annual or biannual basis.

2.4.3 Maintenance

Maintenance activities would be limited and include:

- Vegetation management both beneath panels and for maintenance of asset protection zones;
- Periodic maintenance and repairs of tracking system motors;
- Panel cleaning to maintain generation efficiency;
- Maintenance of water management infrastructure to retain capacity; and
- Replacement of panels and collector equipment on an as needs basis.

2.4.4 Operational Water Supply

It is estimated that approximately 5 ML of non-potable water would be used annually for roadway dust suppression. Approximately 200 kL of water would be required for panel cleaning depending on the amount of rainfall received at the solar farm. This water would be sourced from the existing treated effluent pond and stormwater retention basins located on site. Water from the power station water treatment facility can also be utilised if a higher quality of water is required for the panel cleaning. It is also noted that a 20 kL water tank will be installed on site as part of the bushfire mitigation measures which will be supplied by mains water to ensure maximum water supply is constantly maintained. There will be no permanent staff amenities on site during the operational period.

2.5 Reconditioning or Decommissioning

With the ongoing development of solar technology, it is likely that towards the end of the identified 30-year technology operational life a decision will be made as to whether the project can be reconditioned using new technology or decommissioned. Reconditioning would involve the replacement of panels and collector infrastructure with current technology at the time. If replacement of the mounting system were required, it would be considered likely to constitute a new project and any necessary additional approvals would be sought.

Decommissioning would include the removal of all above ground infrastructure with the exception of access tracks and drainage structures. Below-ground cabling would be left in place to avoid ground disturbance. Subject to any identified future use, ballast footings would be left in place. In the event that a future land-use necessitates their removal the concrete would be reused or recycled to the extent possible at the time. Decommissioning and reconditioning activities would involve lower impacts than that associated with construction, but would involve some increased noise and traffic impacts over the existing conditions.

3. Strategic and Statutory Context

3.1 Strategic Context

3.1.1 Commonwealth National Energy Guarantee

In October 2017 the Energy Security Board (ESB) provided the Council of Australian Governments (COAG) Energy Council with advice on changes to the NEM and legislative framework. The proposed national energy guarantee (NEG) aims to support the provision of reliable, secure and affordable electricity with a focus on ensuring:

- The reliability of the system is maintained;
- Electricity sector emissions reductions needed to meet Australia's international commitments are achieved; and
- The above objectives are met at the lowest overall costs.

Limited detail is currently available on how the NEG would function. The NEG aims to encourage new investment in clean and low emissions technologies while allowing the electricity system to continue to operate reliably. The NEG requires retailers to contract with or invest in generators or demand response to meet a minimum level of dispatchable 'on demand' electricity. Retailers must also keep their emissions below an agreed level.

Delta Electricity currently supplies dispatchable electricity into the network via the Vales Point Power Station. The project aims to diversify Delta's generation portfolio and is fully aligned with the attainment of emissions reductions and lowest overall cost components of the NEG.

3.1.2 NSW Renewable Energy Action Plan

In September 2013, the NSW Government released the *NSW Renewable Energy Action Plan* to guide NSW's renewable energy development and to support the former national target of 20% renewable energy by 2020. The NSW Government's vision is for a secure, reliable, affordable and clean energy future for the state. The *NSW Renewable Energy Action Plan* positions the state to increase energy from renewable sources, at least cost to the energy customer and with maximum benefits to NSW.

The *NSW Renewable Energy Action Plan* strategy is to work closely with NSW communities and the renewable energy industry to increase renewable energy generation in NSW. The plan details three goals and 24 actions to most efficiently grow renewable energy generation in NSW:

- Attract renewable energy investment and projects;
- Build community support for renewable energy; and
- Attract and grow expertise in renewable energy technology.

The project would be aligned with the *Renewable Energy Action Plan* in that it involves renewable energy investment. Two significant and variable factors in the cost of solar development are the connection to the transmission network and cost of acquiring or leasing land. Being located in an energy generation area means there are many available connection options in close proximity to the site minimising the cost of transmission line development required. It would also use land that is owned by Delta and not currently supporting other industry or generating income. These two factors contribute to lowering the development costs and, as a result, energy cost to the customer.

The *NSW Government Submission to the Review of the Renewable Energy Target* (NSW Government, 2014) confirmed the NSW Government's commitment to promoting energy security through diversity, particularly through increasing the supply of energy from renewable sources. It

identifies that having a diversity of supply can help to protect energy customers from price sensitivity associated with fuel inputs, such as gas prices.

3.1.3 Regional Plans

The recently released *Hunter Regional Plan 2036* includes an aim to diversify energy supply. Specifically, the *Hunter Regional Plan 2036-Implementation Plan 2016-2018* includes Direction 12 to diversify and grow the energy sector by promoting new opportunities arising from the closure of coal fired power stations that enable long term sustainable economic and employment growth in the region. With the closure of Munmorah Power Station, significant local energy generation has been withdrawn from the area. The development of a solar project on the VPAD would contribute to offsetting this loss.

The *Central Coast Regional Plan 2036* has the vision to create a region with a healthy natural environment, a flourishing economy, and well-connected communities. While not specified in a direction, the development of the project would contribute to the local economy through creation of jobs (particularly during construction) and local supply of renewable and low cost energy to support the goal of expanding local industry.

3.1.4 Local Council Strategy and Plans

Lake Macquarie Council has adopted a 3% per annum Emission Reduction Target and adopted the *Lake Macquarie City Council Energy Resilience Plan* (Kinesis, 2012). This plan identifies a need for significant actions to achieve carbon neutrality and cumulatively save approximately 2,860,000 tonnes of CO_2-equivilent by 2050. These actions include renewable energy generation equivalent to approximately 600,000 MWh, consisting of 138,000 MWh of commercial scale PV, 24,000 MWh of commercial scale wind and the remaining renewable energy sourced from Greenpower outside the LGA. With a portion of the project proposed to be located within the LMCC LGA the energy generated would contribute to meeting this target. Central Coast Council does not currently have a comparable energy strategy or plan.

3.2 Statutory Context

3.2.1 Environmental Planning and Assessment Act 1979

State significant development is assessed in accordance with Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) requiring the preparation of an Environmental Impact Statement (EIS) addressing the Secretary's Environmental Assessment Requirements (SEARs). The Minister of the Department of Planning and Environment, or delegated authority, is the consent authority for State significant development.

The following authorisations are not required for approved State significant development and accordingly the provisions of any Act that prohibit an activity without such an authority do not apply:

- The concurrence under Part 3 of the *Coastal Protection Act 1979* of the Minister administering that Part of that Act;
- A permit under section 201, 205 or 219 of the *Fisheries Management Act 1994*;
- An approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977*;
- An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*;
- An authorisation referred to in section 12 of the *Native Vegetation Act 2003* (or under any Act repealed by that Act) to clear native vegetation or State protected land;
- A bush fire safety authority under section 100B of the *Rural Fires Act 1997*; and

- A water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000*.

The following authorisations cannot be refused if it is necessary for carrying out SSD and are to be substantially consistent with the consent:

- An approval under section 15 of the *Mine Subsidence Compensation Act 1961*;
- An environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (for any of the purposes referred to in section 43 of that Act); and
- A consent under section 138 of the *Roads Act 1993*.

In determining a development application for SSD, the consent authority is to take into consideration such of the matters listed under Section 79c of the EP&A Act as are of relevance to the development.

Table 3.1 : Consideration of S79C of the EP&A Act

Matter for consideration	Consideration
The provisions of any environmental planning instrument.	Environmental planning instruments applicable to the site and project include: · *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP); · *State Environmental Planning Policy (Infrastructure) 2007* (ISEEP); · *State Environmental Planning Policy 55 –Remediation of Land* (SEPP55); · *Wyong Local Environment Plan 2013* (WLEP); and · *Lake Macquarie Local Environment Plan 2014* (LLEP). The relevant provisions of applicable environmental planning instruments are considered in Sections 3.2.9, 3.2.10,3.2.11 and 3.2.12.
The provisions of any proposed instrument.	A small area of Pond 1 is within the Coastal Environment Area, and majority of the site is within the Coastal Use Area as defined in the public consultation draft of *State Environmental Planning Policy (Coastal Management) 2016*. Consideration of the provisions of this proposed instrument is provided in Section 3.2.14.
The provisions of any Development Control Plan.	Under Clause 11 of the SRD SEPP development control plans do not apply to State significant development.
The provisions of any planning agreement that has been entered into under section 93F, or any draft planning agreement that a developer has offered to enter into under section 93F.	No planning agreements affecting the site have been entered into or are proposed.
The provisions of the regulations (to the extent that they prescribe matters for the purposes of this paragraph).	Clause 92 of Environmental Planning and Assessment Regulation 2000 identifies that for the purposes of section 79C (1) (a) (iv) of the Act, the following matters are prescribed as matters to be taken into consideration by a consent authority in determining a development application:

Matter for consideration	Consideration
	(a) in the case of a development application for the carrying out of development: (i) in a local government area referred to in the Table to this clause (includes Wyong and Lake Macquarie, and (ii) on land to which the Government Coastal Policy applies, the provisions of that Policy, (b) in the case of a development application for the demolition of a building, the provisions of AS 2601, (c) in the case of a development application for the carrying out of development on land that is subject to a subdivision order made under Schedule 5 to the Act, the provisions of that order and of any development plan prepared for the land by a relevant authority under that Schedule, (d) in the case of the following development, the *Dark Sky Planning Guideline*: (i) any development on land within the local government area of Coonamble, City of Dubbo, Gilgandra or Warrumbungle Shire, (ii) development of a class or description included in Schedule 4A to the Act, State significant development or designated development on land less than 200 kilometres from the Siding Spring Observatory. Consideration of the Coastal Policy is provided in Section 3.2.13.
The provisions of any coastal zone management plan	The Coastal Zone Management Plan for Wyong Shire deals with the management of the immediate coastal fringe identified as including: · "The first street parallel to the ocean or the extent of the 100 year coastal hazard planning zone (whichever is greater) for urban areas and public reserves; · Fore dunes and hind dunes; and · Unstable coastal areas such as cliffs and bluffs". The propose works are not considered within the immediate coastal fringe and as such the Wyong coastal zone management plan is not considered to apply. The Coastal Zone Management Plan for Lake Macquarie is an extensive document that includes prioritisation of actions across seven themes and divided into three areas. Of most relevance to the consideration of private developments is Theme 2 which includes actions for a healthy coastal zone – protecting biodiversity and ecological resilience as follows: · Maintain or enhance the condition of coastal and estuarine ecological communities in the context of sea level rise; · Maintain or enhance the connectivity of coastal habitats; · Reduce threats from invasive species, pollution and rubbish dumping; · Control catchment inputs to sensitive receiving waters, including stormwater runoff and licensed discharges;

Matter for consideration	Consideration
	· Manage creek bank (riparian) and foreshore vegetation; · Protect sea grass beds; and · Protect wetlands. The Coastal Zone Management Plan notes that these actions are primarily the responsibility of Council. Chapter 5 assesses the potential environmental impacts including potential impacts to the coastal zone. The project is considered able to be undertaken in a manner that avoids impacts to the natural environment and processes of the coastal zone.
The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality	Environmental and socio-economic impacts are assessed in Chapter 5.
The suitability of the site for the development	The site is currently unproductive, relatively flat, appropriately zoned, and largely devoid of sensitive environmental features and provides a substantial area for the construction of a utility scale solar field.
Any submissions made in accordance with this Act or the regulations	To be considered following exhibition in a response to submissions report.
The public interest.	The public interest is considered in Chapter 7.

Section 78A(8) of the EP&A Act requires that a development application for SSD to be accompanied by an EIS prepared by or on behalf of the applicant in the form prescribed by the *Environmental Planning and Assessment Regulations 2000* (EP&A Regulations).

3.2.2 Environmental Planning and Assessment Regulation 2000

Schedule 2 of the EP&A Regulations stipulates the process to obtain Secretaries Environmental Assessment Requirements to be addressed in the preparation of the EIS and the general form and content requirements of the EIS. Table 3.2 identifies how this EIS addresses these form and content requirements. The Secretaries Environmental Assessment Requirements are provided in full in Appendix A.

Table 3.2 : General Form and Content Requirements for the EIS

EIS Requirement	Where addressed
An environmental impact statement must contain the following information:	
(a) the name, address and professional qualifications of the person by whom the statement is prepared	EIS Certification Page
(b) the name and address of the responsible person,	EIS Certification Page
(c) the address of the land: (i) in respect of which the development application is to be made, or	EIS Certification Page

EIS Requirement	Where addressed
(ii) on which the activity or infrastructure to which the statement relates is to be carried out,	
(d) a description of the development, activity or infrastructure to which the statement relates,	Refer to Chapter 2
(e) an assessment by the person by whom the statement is prepared of the environmental impact of the development, activity or infrastructure to which the statement relates, dealing with the matters referred to in this Schedule,	Refer to Chapter 5
(f) a declaration by the person by whom the statement is prepared to the effect that: (i) the statement has been prepared in accordance with this Schedule, and (ii) the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates, and (iii) that the information contained in the statement is neither false nor misleading.	EIS Certification Page
An environmental impact statement must also include each of the following:	
(a) a summary of the environmental impact statement,	Executive Summary
(b) a statement of the objectives of the development, activity or infrastructure,	Section 1.2
(c) an analysis of any feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development, activity or infrastructure,	Section 1.4
(d) an analysis of the development, activity or infrastructure, including:	
(i) a full description of the development, activity or infrastructure, and	Chapter 2
(ii) a general description of the environment likely to be affected by the development, activity or infrastructure, together with a detailed description of those aspects of the environment that are likely to be significantly affected, and	Section 2.1
(iii) the likely impact on the environment of the development, activity or infrastructure, and	Chapter 5
(iv) a full description of the measures proposed to mitigate any adverse effects of the development, activity or infrastructure on the environment, and	Chapter 6
(v) a list of any approvals that must be obtained under any other Act or law before the development, activity or infrastructure may lawfully be carried out,	Section 3.2
(e) a compilation (in a single section of the environmental impact statement) of the measures referred to in item (d) (iv),	Chapter 6
(f) the reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development set out in subclause (4).	Chapter 7

3.2.3 Protection of the Environment Operations Act 1997

The principal legislation governing pollution and waste management in NSW is the *Protection of the Environment Operations Act 1997* (POEO Act). All scheduled activities as listed in Schedule 1 of the POEO Act require an Environmental Protection Licence (EPL) to be obtained prior to commencement of construction of the scheduled development work. While energy generation is generally a scheduled activity, generation of energy by solar is specifically excluded.

Delta Electricity holds a current EPL for the operation of the Vales Point Power Station including the VPAD. The construction and operation of the project would need to be undertaken such that the ability to comply with the EPL is not affected.

3.2.4 Threatened Species Conservation Act 1995 (Repealed)

The *Threatened Species Conservation Act 1995* (TSC Act) establishes mechanisms for:

- The management and protection of listed threatened species of native flora and fauna (excluding fish and marine vegetation);
- The listing of threatened species or key threatening processes;
- The development and implementation of recovery and threat abatement plans;
- The declaration of critical habitat;
- The consideration and assessment of threatened species impacts in development assessment process; and
- The management and regulation of actions that may damage critical or other habitat or otherwise significantly affect threatened species, populations and ecological communities.

The potential to impact threatened species, populations and ecological communities listed under the TSC Act is discussed in Section 6.5 of this report.

3.2.5 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) commenced on 25 August 2017 repealing the TSC Act. Schedule 9 Part 1 of the BC Act identifies that the regulations may contain provisions of a savings or transitional nature consequent on the enactment of this Act. The *Biodiversity Conservation (Savings and Transitional) Regulation 2017* (BC (ST) Regulations) identifies the following as "***pending or interim planning application":***

> *an application for planning approval made within 18 months after the commencement of the BC Act, if an environmental impact statement is to be submitted in connection with the application and the Secretary of the Department of Planning and Environment issued, before the commencement of the new Act, environmental assessment requirements for the preparation of the statement,*

The application is therefore considered a pending or interim planning application.

Under Clause 28 of the BC (ST) Regulations, the former planning provisions continue to apply (and Part 7 of the new Act does not apply) to the determination of a pending or interim planning application, with the former planning provisions defined as the provisions of the EP&A Act that would be in force if that Act had not been amended by the new BC Act and which call-up guidelines established under the TSC Act 1997. However, Part 7 of the new Act applies to the determination of a pending or interim planning application referred to in paragraph (b), (c) or (d) of the definition of pending or interim planning application in clause 27 (1) if the applicant or proponent and the planning approval body for the application agree in writing that Part 7 of the new Act is to apply to the

determination of the application instead of the former planning provisions. No such agreement has been made with the Department of Planning and Environment and as such the project.

3.2.6 Water Management Act 2000

The *Water Management Act 2000* (WM Act) was introduced to provide a comprehensive singular piece of legislation to effectively manage and regulate access, and use of, the State's water resources. Chapter 3, Part 3 of the WM Act requires that approval be granted for works that are classified as "controlled activities" within waterfront land defined as 40 metres from the bank of any river, lake, estuary or coastal waters of the state (Lake includes a wetland, a lagoon, a saltmarsh and any collection of still water, whether perennial or intermittent and whether natural or artificial). The VPAD is created from the application of a coal ash slurry into a man-made ash storage dam and the project would occur on capped and rehabilitated sections of the filled ash-dam. A Controlled Activity Approval is not required for approved SSD.

3.2.7 Mine Subsidence Compensation Act 1961

Section 15 of the *Mine Subsidence Compensation Act 1961* requires approval of the Mine Subsidence Board for the alteration or erection of improvements on land within a gazetted mine subsidence district. The site is within the Swansea North Entrance and West Lake mine subsidence districts.

3.2.8 Roads Act 1993

Under section 138 of the *Roads Act 1993* the consent of the roads authority is required to:

- Erect a structure or carry out a work in, on or over a public road, or
- Dig up or disturb the surface of a public road, or
- Remove or interfere with a structure, work or tree on a public road, or
- Pump water into a public road from any land adjoining the road, or
- Connect a road (whether public or private) to a classified road.

Subject to design and assessment of the project there may be a requirement for some site entry improvements and if so the consent of the road authority will be required.

3.2.9 Local Planning Instruments

The site is within the application area of both the *Lake Macquarie Local Environment Plan 2014* (LLEP 2014) and *Wyong Local Environmental Plan 2013* (WLEP 2013). The site is predominantly zoned SP2 Electricity Generation Works under both Local Environment Plans (LEPs).

The objectives of the SP2 zone are:

- To provide for infrastructure and related uses;
- To prevent development that is not compatible with or that may detract from the provision of infrastructure;
- To recognise existing railway land and to enable future development for railway and associated purposes;
- To recognise major roads and to enable future development and expansion of major road networks and associated purposes; and
- To recognise existing land and to enable future development for utility undertakings and associated purposes.

The only development types permitted within the zone are roads and the purpose shown on the Land Zoning Map (in this case Energy Generation Works) including any development that is ordinarily incidental or ancillary to development for that purpose.

The project meets the definition of Energy Generation Works and as such is permissible with development consent.

A narrow strip of land within the Wyong LGA and along boundary is zoned W1 Natural Waterways. The objectives of this zone are:

- To protect the ecological and scenic values of natural waterways;
- To prevent development that would have an adverse effect on the natural values of waterways in this zone; and
- To provide for sustainable fishing industries and recreational fishing.

Energy generation would be considered a prohibited land use under this zoning. The W1 zoning is unlikely to be considered to remain an appropriate zoning of this land as the natural waterway to which the zone relates has been diverted and subsequently filled with ash in association with separate authorisations.

Under section 89E(3) of the EP&A Act development consent for SSD may be granted despite the development being partially prohibited by an environmental planning instrument. Furthermore, through the workings of Clause 34(7) of *State Environmental Planning Policy (Infrastructure) 2007*, development for the purpose of a solar energy system may be carried out by any person with consent on any land, with the exception of prescribed residential zone.

3.2.10 State Environmental Planning Policy (State and Regional Development) 2011

State Environmental Planning Policy (State and Regional Development) 2011 identifies that development for the purpose of electricity generating works using any energy source that has a capital investment value of more than $30 million as SSD. The project would have a capital investment value of greater than $30 million and as such would be assessed as SSD.

3.2.11 State Environmental Planning Policy (Infrastructure) 2007

Under Clause 34 (7) development for the purpose of a solar energy system may be carried out by any person with consent on any land, except for projects with a capacity to generate more than 100kW in a prescribed residential zone.

Under Clause 101 of *State Environmental Planning Policy (Infrastructure) 2007* the consent authority must not grant consent to development on land that has a frontage to a classified road unless it is satisfied that:

> *"(a) where practicable, vehicular access to the land is provided by a road other than the classified road, and*
>
> *(b) the safety, efficiency and ongoing operation of the classified road will not be adversely affected by the development as a result of:*
>
> *(i) the design of the vehicular access to the land, or*
>
> *(ii) the emission of smoke or dust from the development, or*
>
> *(iii) the nature, volume or frequency of vehicles using the classified road to gain access to the land, and*

(c) the development is of a type that is not sensitive to traffic noise or vehicle emissions, or is appropriately located and designed, or includes measures, to ameliorate potential traffic noise or vehicle emissions within the site of the development arising from the adjacent classified road".

Access to the site will be provided from Ruttleys Road which is not classified. Access to the project via the Pacific Highway (a classified road) may also be available. Consultation with the NSW Roads and Maritime Service is required to identify whether an access arrangement from the Pacific Highway is available for the project that does not adversely affect safety on the classified road. The project is not susceptible to traffic noise or vehicle emissions, does not emit smoke or dust and would not generate a significant increase in traffic volumes using the classified road to access the project.

3.2.12 State Environmental Planning Policy 55

Under *State Environmental Planning Policy 55 -Remediation of Land* (SEPP 55) a consent authority must not consent to the carrying out of any development on land unless:

- It has considered whether the land is contaminated, and
- If the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and
- If the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.

The VPAD has been subject to filling with ash and other forms of power station waste. The portion of the site where the project would be established has been capped and rehabilitated. While the EIS would need to consider contamination status, no additional approvals are required.

3.2.13 NSW Coastal Policy

Section 79C of the EP&A Act requires the consent authority to consider the *NSW Coastal Policy 1997* in determining the application. The policy provides a framework for the balanced and coordinated management of the coast and has nine goals as follows:

- Protecting, rehabilitating and improving the natural environment of the coastal zone;
- Recognising and accommodating the natural processes of the coastal zone;
- Protecting and enhancing the aesthetic qualities of the coastal zone;
- Protecting and conserving the cultural heritage of the coastal zone;
- Providing for ecologically sustainable development and use of resources;
- Providing for ecologically sustainable human settlement in the coastal zone;
- Providing for appropriate public access and use;
- Providing information to enable effective management of the coastal zone; and
- Providing for integrated planning and management of the coastal zone.

The project is located on a highly modified area within the coastal zone and would be designed, constructed and operated to minimise offsite impacts to the more natural surrounding area. Chapter 5 describes the expected impacts and proposed management measures to manage potential impacts to the coastal zone. The project is considered able to be undertaken in a manner that avoids impacts to the natural environment and processes of the coastal zone.

3.2.14 Draft State Environmental Planning Policy (Coastal Management) 2016

An area of Pond 1 is currently mapped as Proximity Area for Coastal Wetlands with all of Pond 1 and parts of Pond 2 mapped as within the Coastal Environment Area and Coastal Use Area Maps as defined in the consultation draft of *State Environmental Planning Policy (Coastal Management) 2016* (CM SEPP), as shown in the Figure 3.1 below.

Development consent must not be granted to development on land wholly or partly identified as "proximity area for coastal wetlands" unless the consent authority is satisfied that the proposed development will not significantly impact on:

(a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or

(b) *the quantity and quality of surface and ground water flows to the adjacent coastal wetland or littoral rainforest if the development is on land within the catchment of the coastal wetland or littoral rainforest.*

Development consent must not be granted to development on land that is wholly or partly within the coastal environment area unless the consent authority is satisfied that the proposed development:

(a) is not likely to cause adverse impacts on the biophysical, hydrological (surface and groundwater) and ecological environment, and

(b) is not likely to significantly impact on geological and geomorphological coastal processes and features or be significantly impacted by those processes and features, and

(c) is not likely to have an adverse impact on the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, having regard to the cumulative impacts of the proposed development on the marine estate including sensitive coastal lakes, and

(d) is not likely to have an adverse impact on native vegetation and fauna and their habitats, undeveloped headlands and rock platforms, and

(e) will not adversely impact Aboriginal cultural heritage and places, and

(f) incorporates water sensitive design, including consideration of effluent and stormwater management, and

(g) will not adversely impact on the use of the surf zone.

Development consent must not be granted to development on land that is wholly or partly within the coastal use area unless the consent authority:

(a) is satisfied that the proposed development:

(i) if near a foreshore, beach, headland or rock platform—maintains or, where practicable, improves existing, safe public access to and along the foreshore, beach, headland or rock platform, and

(ii) minimises overshadowing, wind funnelling and the loss of views from public places to foreshores, and

(iii) will not adversely impact on the visual amenity and scenic qualities of the coast, including coastal headlands, and

(iv) will not adversely impact on Aboriginal cultural heritage and places, and

(v) will not adversely impact on use of the surf zone, and

(b) has taken into account the type and location of the proposed development, and the bulk, scale and size of the proposed development.

While not in force, consideration of the various impacts called-up under the CM SEPP is provided in Chapter 5.

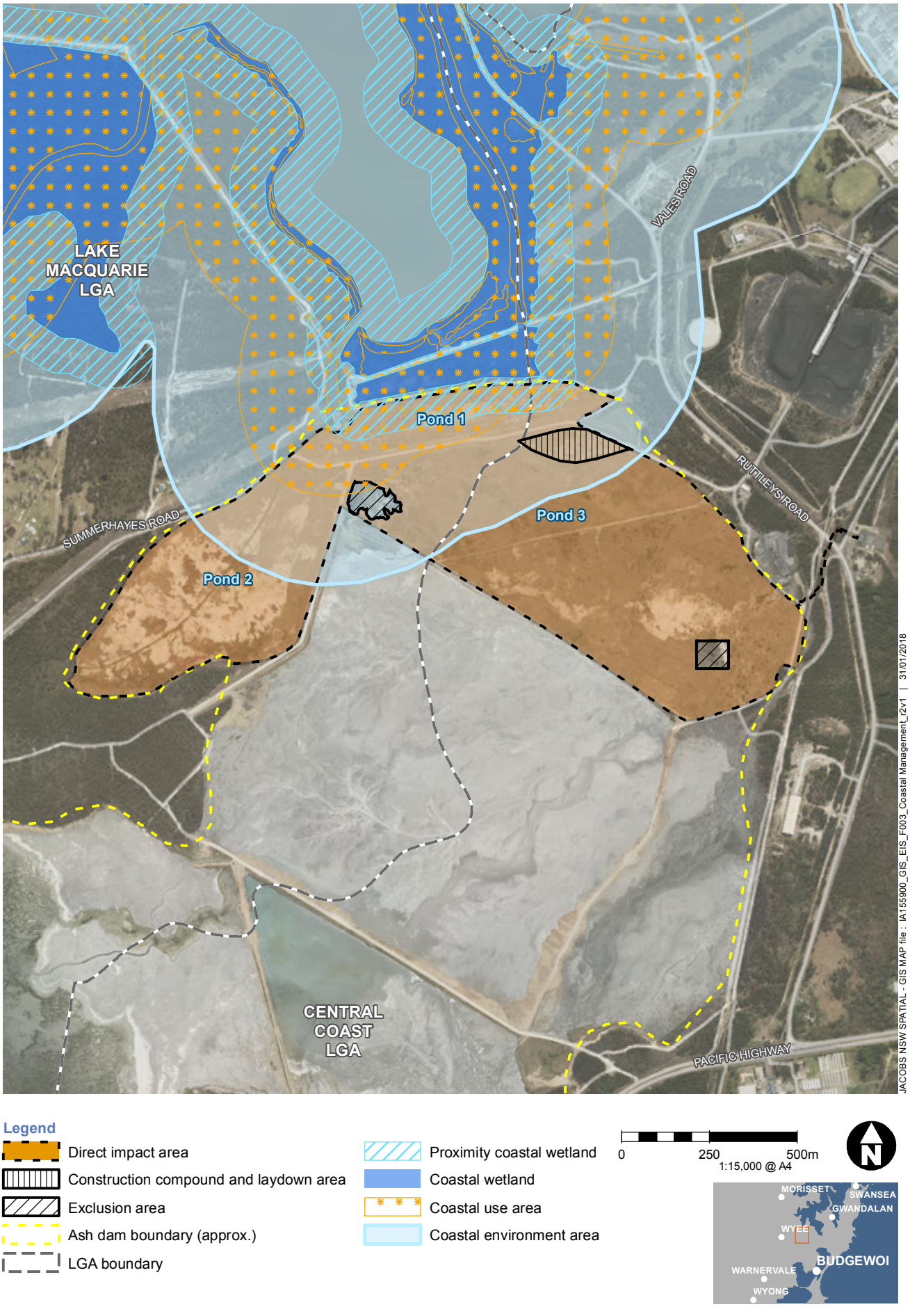


Figure 3.1 | Draft Coastal Management State Environmental Planning Policy Area Map

3.2.15 Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary Commonwealth legislation relating to the environment. Under Part 3 of the EPBC Act, approval from the Australian Minister for the Environment and Energy is required for an action that:

- Has, will have, or is likely to have a significant impact on a matter of national environmental significance;
- Is undertaken on Commonwealth land and has, will have, or is likely to have a significant impact on the environment;
- Is undertaken outside Commonwealth land and has, will have or is likely to have a significant impact on the environment of Commonwealth land; and
- Is undertaken by the Commonwealth and has, will have or is likely to have a significant impact on the environment.

Matters of national environmental significance (MNES) include:

- World heritage properties;
- National heritage places;
- Wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed);
- Nationally threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas;
- The Great Barrier Reef Marine Park;
- Nuclear actions (including uranium mining); and
- A water resource, in relation to coal seam gas development and large coal mining development.

A search of the Australian Government Department of Environment and Energy's EP&BC Act Protected Matters Search Tool was undertaken for the project with a 10 kilometre radius on 3 April 2017. The searches found:

- No World Heritage Properties;
- No National Heritage Places;
- No Wetland of International Importance;
- No Commonwealth Marine Areas;
- Two listed Threatened Ecological Communities (the endangered *Posidonia australis* seagrass meadows of the Manning-Hawkesbury ecoregion and vulnerable Subtropical and Temperate Coastal Saltmarsh);
- 80 listed Threatened Species;
- 70 listed Migratory Species;
- No Commonwealth Listed Heritage places; and
- Three areas of Commonwealth Land (Australian Postal Commission, Australian Telecommunications Commission, Director of War Service Homes).

It is generally the responsibility of the proponent of a proposed development to determine whether the project, or action, has the potential to impact upon a MNES and constitute the need for a referral to the Commonwealth for determination. Further assessment of MNES, particularly threatened species and ecological communities and migratory species has been undertaken in Section 5.1, and has concluded that no significant impact is likely and as such a referral to the Commonwealth Department of Environment and Energy is not required.

4. Engagement

4.1 Community Consultation

Delta has been established within the local community since the main power station was built in the 1960's and has developed strong community relationships during this time. Delta maintains a community reference group known as the *Community and Regional Environment (CARE) Forum* which meets quarterly at Vales Point Power Station. The CARE Forum membership includes representatives from the surrounding community interest groups. Delta also supports a sponsorship program that focuses on local projects and community groups. The Vales Point Solar Project Community and Stakeholder Engagement Plan (CSEP) aims to build on existing community communication pathways and tools to ensure ongoing and meaningful consultation occurs throughout the life of the solar project. A copy of the CSEP is included in Appendix B.

Delta first provided an overview of the project to the CARE Forum at a meeting held 17 November 2016. The project received positive feedback which is typical of the high level of support among communities for the development of renewable energy throughout NSW (OEH, 2015). An update on the development of the project has been presented at each quarterly meeting in 2017 to ensure the group has been well informed and provided with current project information.

A summary of the findings of the environmental assessments was presented to the CARE Forum in November 2017. Delta raised the potential impacts of the construction and operational stages of the project including noise, additional traffic movements and visual amenity as the key areas of interest. Delta also provided an overview of mitigation controls that would be in place during the construction and operation stages of the project to manage any potential impacts. The group did not raise any issues with the environmental assessment or proposed mitigation measures and the high level of support for the project has continued with the consensus indicating that the project is a good initiative to utilise the rehabilitated areas of the ash dam.

Delta has also developed a project information page on the Delta Electricity website (www.de.com.au/sustainability/projects/solar-project). The website is regularly updated, and community members can seek further information via email (info@de.com.au) or the Delta General Enquiries and Complaints (24 hours) phone line.

Delta publishes a regular community newsletter to provide an update to the broader local community on power station operations at Vales Point, new developments and community projects. The newsletter distribution area includes the surrounding suburbs of Wyee, Wyee Point, Mannering Park, Doyalson, Kingfisher Shores and Chain Valley Bay and a copy of the newsletter is published on the Delta website. The November newsletter included an announcement of the solar project and provided details for community members to obtain further information.

Delta undertook a letter box drop and door-knock to residents on the eastern end of Summerhayes Road during November 2017 regarding the project. The main issue of concern to residents contacted on Summerhayes Road is traffic movements along the mostly unsealed road and the resulting dust generation. The residents were informed that the project does not involve the use of Summerhayes Road. This area of Summerhayes Road is characterised by rural properties and the amenity of the area is important to the residents and the broader community. Delta advised the residents that the solar project is expected to be a low impact development that will not affect the visual and aesthetic character of the area. Delta also raised the potential impacts of construction and operational noise during the consultation and the contacted residents demonstrated little concern in relation to this potential impact due to the minor level of predicted impact. The timing of the development application submission and exhibition period was also discussed. Delta will continue to engage with the residents of Summerhayes Road on these issues throughout the construction and operation stages of the project.

Other community consultation activities include printed articles in the local (Newcastle) newspaper which was accompanied with several local radio interviews to announce the project and commencement of planning approvals process in August 2017.

4.2 Aboriginal Community Consultation

Consultation regarding the project was undertaken with the Darkinjung Local Aboriginal Land Council (DLALC) and the Guringai Tribal Link Aboriginal Corporation (GTLAC). A field visit was undertaken in company with representatives from these organisations on 27 July 2017. A draft of the resulting Aboriginal Cultural Heritage Assessment report was circulated to these organisations for comment on 7 August 2017. Comments from DLALC and GTLAC were received and incorporated into the final Aboriginal Heritage Due Diligence Assessment Report and the Aboriginal input is appended to this report in Appendix D.

4.3 Agency Consultation

The Department of Planning and Environment provided copies of the Preliminary Environmental Assessment (PEA) for the project and draft SEARs to various NSW Government Agencies including:

- The Department of Primary Industries (DPI);
- Department of Planning and Environment – Division of Resources and Geosciences (DRG);
- Environment Protection Authority (EPA);
- Office of Environment and Heritage (OEH);
- Roads and Maritime Services (Roads and Maritime);
- NSW Rural Fire Service (RFS);
- Central Coast Council (CCC); and
- Lake Macquarie Council (LMCC).

These agencies provided a written response to the Department of Planning and Environment in relation to the application. In some cases the agencies standard inputs to the preparation of SEARs were provided, which is summarised below. Additional consultation during the preparation of the EIS was also undertaken as required and has also been detailed below. The agency input into the SEARs can be found attached to the SEARs in Appendix A.

4.3.1 Department of Primary Industries

DPI provided input into the SEARs including the views of NSW Department of Industry – Lands. DPI advised that the draft SEARS adequately address matters of regulatory interest to the department.

No further consultation was undertaken with DPI during the preparation of the EIS.

4.3.2 Department of Planning and Environment – Division of Resources and Geosciences

The Division of Resources and Geosciences (DRG) reviewed the PEA and Draft SEARs for the project and did not consider it necessary to provide input in addition to the draft SEARs. The DRE identified that the project is located over disturbed areas currently within the Vales Point Power Station site, which is operated by the proponent of this project, that coal resources in the Great Northern and Fassifern Seams have already been extracted from beneath this site, and no further coal extraction is considered likely in this area. DRG noted that offsite biodiversity offset areas are not likely to be considered or required for this project, and the potential for resource sterilisation is therefore further minimised.

No further consultation was undertaken with DRG during the preparation of the EIS. Should off-site offset sites be considered, the potential for resource sterilisation will be considered in the offsetting process.

4.3.3 EPA

Delta are in ongoing contact with the EPA in relation to the Vales Point Power Station scheduled activity which includes the functioning of the VPAD. The EPA also provided input into the preparation of the SEARs and noted that the proposed solar farm is not a scheduled activity under Schedule 1 of the POEO Act but is within the Vales Point Power Station licensed premises which is regulated under EPL 761. The EPA identified that the maintenance of the established vegetation cover would be important to the management of water and wind erosion and potential exposure of ash. The EPA also noted that potential project impacts would be able to be regulated through the existing EPL. In the event that the detailed design process for the project leads to altered water management practices within the scheduled premises, the EPA would be further consulted in relation to the water monitoring requirements of the scheduled premises.

4.3.4 Office of Environment and Heritage

OEH provided input into the preparation of the SEARs and requested the following be considered for specific inclusion in the SEARS:

- Confirmed that the project would need to be assessed under the Framework for Biodiversity Assessment and that a Biodiversity Assessment Report prepared by an accredited assessor;
- No project specific SEARs were required, but standard OEH input into the SEARs was provided;
- Provided a list of species identified through Atlas of NSW Wildlife as occurring within or near the project requiring assessment; and
- Acknowledged the previously identified Aboriginal cultural heritage values associated with the project area and noted that assessment undertaken prior to 2010 may not meet current OEH Aboriginal cultural heritage guidelines.

Following initial biodiversity fieldwork, OEH was provided with a letter describing preliminary findings and were invited to and attended a site visit 23 August 2017 to discuss assessment requirements for the unexpected plant community types identified. The OEH officer confirmed that the FBA guidelines needed to be followed but that arguments against certain community types being considered endangered ecological communities were to be considered if they could be justified. It was also identified that couch grass observed on project area could be considered non-native.

4.3.5 Roads and Maritime Services

Roads and Maritime Services (RMS) provided input into the preparation of the SEARs identifying that RMS has no proposal that requires any part of the property and describing expectations for the traffic impact assessment. Delta subsequently held a meeting with RMS on 4 October 2017 at which potential options for upgrades to the access to the site off the Pacific Highway were discussed. RMS advised that approved traffic volumes for the Chain Valley Bay Colliery should be considered in cumulative traffic impacts and any loss of service at the intersection of Ruttleys Road and the Pacific Highway addressed. Delta anticipates that further consultation and approvals in the form of a Works Authorisation Deed from RMS would be required should the access to the VPAD be proposed to be upgraded on the Pacific Highway. Preliminary concept drawings for the upgrades to the Pacific Highway and Ruttleys Road access are provided in Section 5.4.

4.3.6 NSW Rural Fire Service

RFS did not provided input into the preparation of the SEARs but did provide their expectations on mitigations measures to be included in the design, construction and operation of the project. These

mitigation measures have been fully adopted in the bushfire impact assessment and mitigation measures provided in Section 5.8.7.

4.3.7 Central Coast Council

Delta met with Senior Central Coast Council (CCC) Planning staff on 17 October 2016 to introduce the solar project and seek CCC input on planning for the development. At this meeting Delta introduced the project, outlined the potential for the site to accommodate a solar development and sought Council feedback on the opportunity and assessment requirements. The Council staff present were generally supportive of the solar project and requested to remain updated as the proposal develops. It was also noted that the Environmental Impact Statement would need to consider noise and traffic as main issues and address site conditions including contamination and mine subsidence to a lesser extent.

Central Coast Council were consulted by the Department of Planning and Environment in the preparation of the SEARs. No input by Central Coast Council was provided to Delta by the Department of Planning and Environment.

Delta met with Central Coast Council on 29 November 2017 to provide an update on the progress and findings of the studies prior to lodgement of the EIS. At this meeting Council advised that based on the described EIS findings at the time, the key interest was that any upgrades to the Ruttleys Road entrance to the ash dam consider all safety implications. Preliminary concept drawings for the upgrades to the Ruttleys Road access are provided in Section 5.4.

4.3.8 Lake Macquarie City Council

A meeting with Lake Macquarie City Council (LMCC), which regulates the western portion of the VPAD, was held 7 November 2016. The meeting was attended by Senior Planning Officials from LMCC and provided a high-level discussion on compatibility of the project with existing and future land uses in the surrounding area. LMCC advised that they were interested in continuing dialogue with Delta during the planning process and they expected to be notified by NSW Department of Planning and Environment during the preparation of SEARs process.

LMCC provided input into the preparation of the SEARs and requested the following be considered for specific inclusion in the SEARS:

- In the biodiversity section, it is requested that biodiversity assessments for the project be undertaken in accordance with the Lake Macquarie Flora and Fauna Survey Guidelines 2012;
- It is recommended that the SEARs include reference to the Draft Coastal Management SEPP;
- Impact on local wildlife (e.g. shore birds);
- Removal of any significant trees to be identified (consultant ecology/arborist report will be required);
- Impact on rehabilitation corridor;
- Asbestos investigation; and
- Acid sulphate soils investigation.

These issues have been considered to the extent required by the SEARs.

Delta met with LMCC on 30 November 2017 to provide an update on the progress and findings of the studies prior to lodgement of the EIS. Council staff present indicated that the project appears to represent a good outcome for the site not withstanding that it could also be considered a lost opportunity to provide additional biodiversity connectivity in the area. Delta reiterated that future rehabilitation works on Pond 4 would continue to consider ability to contribute to biodiversity and green corridor connectivity.

4.4 Continued Engagement

The aim of the CSEP is to ensure broad stakeholder interaction at all stages of the project from the development and assessment process, through construction and operation, and final decommissioning and closure phases of the project.

The CSEP has been developed as part of the early planning and assessment phase of the project. Consultation with key stakeholders will occur throughout the project life cycle as detailed in the CSEP. The CSEP will be reviewed regularly and updated as required to ensure ongoing and meaningful consultation is achieved.

5. Environmental Impact Assessment

5.1 Biodiversity

5.1.1 Methods

The SEARs require an assessment of the impact of the development on biodiversity including:

> *an assessment of the likely biodiversity impacts of the development, having regard to the NSW Biodiversity Offsets Policy for Major Projects, and in accordance with the Framework for Biodiversity Assessment, unless otherwise agreed by the Department.*

This section summarises the Biodiversity Assessment Report (BAR) prepared for the project which has been prepared in accordance with the Framework for Biodiversity Assessment (FBA) and is provided as Appendix C.

The information presented in the BAR assesses the potential biodiversity impacts of the project in accordance with the relevant State and Commonwealth environmental and threatened species legislation and policies and follows the format for a BAR specified by the FBA. The BAR has been prepared by persons accredited in accordance with s142B (1) (c) of the *Threatened Species Conservation Act 1995* (TSC Act). Specifically, the preparation of the BAR has included the following:

- A background review of existing information undertaken to identify the existing environment of the proposed development site and locality;
- Vegetation surveys completed using field survey methods in line with Chapter 5 of the FBA undertaken over three seasons.
- Vegetation within the Development site was identified according to the Plant Community Types (PCTs) classification as described in the NSW Vegetation Information System (VIS) Classification database. PCTs were verified and refined with data from the detailed floristic assessment collected in the field. Each PCT was then further divided into vegetation zones (an area of native vegetation on the development site that is the same PCT and has a similar broad condition state). The condition of PCTs was assessed in accordance with Chapter 5 of the FBA and vegetation zones assigned by comparing the dominant species, the general description of location, soil type and other attributes as described in the VIS classification database;
- The minimum number of transects/plots required per vegetation zone area were completed according to the FBA;
- Site attributes were ranked against benchmark data for the relevant PCT and a site value score for each vegetation zone was determined in accordance with subsection 5.3 of the FBA;
- The candidate threatened species were identified via the BioBanking credit calculator and using database searches; and
- Targeted surveys were conducted to determine the presence or absence of threatened flora and fauna species, this included a detailed habitat assessment and survey for species with a moderate to high likelihood of occurring.

5.1.2 Existing Environment

The development site comprises three artificial ash dams (Ponds 1-3) that were created by the construction of an earthen wall across Mannering Creek and have been progressively filled with ash slurry. The ash ponds are a minimum of nine metres above the mean high tide mark of Mannering Bay and there is no tidal connection to the lake. The development site also includes the area of a disused conveyor and active pipeline easement which will be used for a connection to the National Electricity Market (NEM) via a short 33 kV transmission line (mainly overhead with an option for some underground cabling) to the Vales Point Zone Substation.

Despite this being a highly disturbed and modified environment, the site does support native vegetation predominantly the result of deliberate rehabilitation efforts but also through the establishment of fresh water wetland and salt marsh plant community types. The fresh water wetland plant community type has formed in locations on Pond 3 and a small area of Pond 2 where surface water pools following rainfall. The salt marsh plant community type is considered likely to be associated with saline influences within the capping material and observed frequent wetting and drying regime. This salt marsh plant community type is limited to the lower lying Pond 2 but is not consistent with the scientific determination of salt marsh Endangered Ecological Communality as it is not tidally influenced being located approximately 9 metres above the maximum tidal range of Mannering Bay.

In accordance with Chapter 4 of the FBA, this BAR identifies and assesses the landscape features (such as the IBRA region, IBRA sub-region, Mitchell landscape, rivers and streams, and extent of native vegetation in the area) for the development site. Comprehensive mapping of vegetation and field surveys were completed within the study area in accordance with the requirements of the FBA. The vegetation surveys were completed using field survey methods in line with Chapter 5 of the FBA. The field surveys were undertaken over three seasons. Initial field surveys were undertaken in winter on the 11 July 2017 with further surveys undertaken in spring on the 12 and 13 October 2017. Habitat assessment and targeted surveys for threatened species were undertaken in spring on the 17 September, from 23-26 October 2017, 14 November and in summer on the 1 and 6 December 2017 in accordance with Chapter 6 of the FBA.

While the ash dams are artificial landforms, native vegetation exists within the study area, predominantly as regrowth as well as small disturbed remnant patches. Three Plant Community Types (PCTs) as described by the Vegetation Information System (VIS) were identified within the study area:

- Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast (PCT 1636);
- Saltmarsh Estuarine Complex (PCT 1746); and
- Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (PCT 1071).

The majority of this vegetation has established through deliberate rehabilitation efforts on the ash ponds with the saltmarsh and freshwater wetlands establishing naturally and natural regrowth occurring in the disused conveyor easement. None of these PCTs as they occur within the study area correspond to threatened ecological communities listed under the TSC Act or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The majority of the study area is classed as a highly disturbed area without any native vegetation. The distribution of PCTs within the site is outlined in Figure 5.1.

Figure 5.1 | Native vegetation extent and Plant Community Types

The habitat assessment identified that the habitat components for most threatened species were absent from the development site and/or the habitat was substantially degraded such that most threatened species were unlikely to utilise the development site. Furthermore, targeted surveys for threatened plants, frogs and wading/wetland birds did not locate any threatened species in the development site. The targeted surveys did however confirm the presence of one bird species listed under the marine and migratory status of the EPBC Act. The Pacific Golden Plover (*Pluvialis fulva*) was recorded from 6 of the 8 targeted surveys on Pond 2 using the Saltmarsh Estuarine Complex (PCT 1746) habitat. The development site was determined not to constitute 'important habitat' for this species as defined under the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines*. As such, it is unlikely that the project would significantly affect migratory species.

The site is located within the Wyong subregion of the Sydney Basin Bioregion as defined by the Interim Biogeographic Regionalisation for Australia (IBRA 7) (SA Department of Environment Water and Natural Resources, 2015). The site is situated across two Mitchell Landscapes as mapped by the NSW National Parks and Wildlife Service (2002) and described by the NSW Department of Environment and Climate Change (2008):

- the Sydney – Newcastle Coastal Alluvial Plains; and
- the Gosford – Cooranbong Coastal Slopes.

The site is located in the Lake Macquarie/Tuggerah Lakes catchment and is within close proximity to the Lake Macquarie Wetlands (approximately 200 metres to the edge of Mannering Bay), which are listed on the National Directory of Important Wetlands (NSW189). The Lake Macquarie Wetlands are also an estuarine area as defined under the FBA. The site is also within close proximity (approximately 350 metres) to State Environmental Protection Policy 14 Coastal Wetlands at the edge of Mannering Bay. These wetlands are considered 'important wetlands' under the FBA.

Buffers to important wetlands and estuarine areas are applied to a development site according to Appendix 2 of the FBA. While the development site is located near Mannering Bay it is not within the 50 metres buffer of an important wetland or estuarine area and is not part of the riparian buffer of a third order stream or higher.

The operational areas of the Vales Point Station and the ash dam are surrounded by areas identified as a green corridor and habitat network and are bypassed by the major conservation links identified in the *North Wyong Structure Plan 2012* and more recently in the *Central Coast and Hunter Regional Development Plans*. The *Hunter Regional Development Plan* identifies the corridor as the Jilliby to Wallarah Peninsula Link and Inter-Regional Landscape Break. This link recognises corridors previously identified in the *Lower Hunter Regional Strategy 2006-2031* and the *North Wyong Shire Structure Plan 2012*. The ash dam is not currently identified as a part of any green corridor or habitat network. The proposed development site is not located in a strategic location as defined under the FBA.

5.1.3 Biodiversity Impact Assessment

The biodiversity assessment considered the following impact mechanism associated with construction:

- Direct impacts on biodiversity values including:
  - Removal of native vegetation;
  - Removal of habitat features;
  - Injury and mortality of fauna;
- Indirect impacts on biodiversity values including:
  - Sedimentation and run-off;

- Noise, dust or light spill;
- Inadvertent impacts on adjacent habitat or vegetation;
- Feral pest, weed and/or pathogen encroachment; and

· Impacts that are infrequent, cumulative or difficult to measure.

The biodiversity assessment considered the following impact mechanism associated with operational phase of the project:

· Direct impacts on biodiversity values;

· Injury and mortality of fauna;

· Shading by solar array infrastructure; and

· Indirect impacts on biodiversity values.

The identified impacts are summarised in accordance with the FBA guidelines below.

Combined with appropriate mitigation measures and safeguards during construction and operation of the project as described in Section 5.1.4, the siting and planning of the project is expected to be sufficient to ensure that the requirements to avoid and minimise impacts on biodiversity values as set out in Chapter 8 of the FBA are met. Importantly, the project will not impact on:

· Endangered Ecological Communities (EECs) or Critically Endangered Ecological Communities (CEECs);

· PCTs that contain threatened species habitat (for species credit species);

· Critical habitat;

· The riparian areas of 4th order or higher streams and rivers, important wetlands or estuaries; or

· State significant biodiversity links.

The selection of the site, on artificially created ash ponds, has avoided the need to impact any high quality PCTs. Further to this, the targeted surveys indicate the absence of threatened species from the modified ash pond environment selected for the placement of the solar array. Areas of the Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (PCT 1071) and Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast (PCT 1636) have been excluded from the development site to avoid impacts. The ash dams are considered the most appropriate location for site selection to avoid impacts to adjacent areas of known high biodiversity value. When considering alternative locations for the project within the Vales Point Power Station lands, the study area is the most appropriate location for the project from a biodiversity perspective.

Despite avoidance and minimisation, removal of native vegetation will be required. The construction footprint would impact on approximately 19.19 hectares of native regrowth vegetation. While all groundcover vegetation may not be totally removed as the photovoltaic array will be mounted above the ground, portions beneath the array will likely be damaged during construction and will be shaded resulting in altered micro-climatic conditions. The short transmission line connection would occupy an easement of approximately 7 metres wide. Two immature trees would be removed to establish a clear zone within the easement but the bulk of the lower growing shrubs and all groundcover vegetation will be retained. Access tracks would be provided inside and around the perimeter of the site on existing roadways to allow for maintenance and access.

The impacts have been quantified based on a concept design development footprint and take into consideration potential temporary disturbance during construction including compound sites and upgrading of drainage. The impacts in vegetation zones presented is based on a worst case scenario, and a detailed design has not been assessed. The actual disturbance to the saltmarsh PCT

will be less due to the fact that the linear drain across the ash pond will remain to facilitate drainage of surface water and an additional drain line is planned to manage future surface water drainage from the rehabilitated areas of Pond 4. The existing and future drain lines contain a large portion of the saltmarsh vegetation that would remain in-situ. A range of mitigation measures will be put in place to minimise the impacts to biodiversity during construction and operation.

There are no impacts that require further consideration by the consent authority in accordance with Section 9.2 of the FBA. According to the impact thresholds Table 4 in Section 9 of the FBA, the impacts to native vegetation do not require an offset under the FBA as they are not associated with threatened species habitat and are not identified as critically endangered or endangered ecological communities. One vegetation zone provides potential habitat for a number of threatened insectivorous bats species due to the presence of isolated scattered dead trees within the ash dam, some with hollows, and also the presence of insect prey. However, the site value score for this zone is <17 and therefore an offset is not required. There are expected to be no impacts to species and populations. As such, an offset for species and populations is not required. The impacts to highly disturbed areas without any native vegetation do not require assessment according to Section 9.5 of the FBA.

5.1.4 Mitigation Measures

Once all practicable steps to avoid or minimise impacts have been implemented at the design phase, mitigation measures will be implemented to further lessen the potential ecological impacts of the project.

The following mitigation measures are to be undertaken during the construction phase:

- Native vegetation removal would be minimised through detailed design;
- Pre-construction surveys would be undertaken by an experienced ecologist to investigate potential presence of Pacific Golden Plover prior to entering the dam for construction;
- An unexpected threatened species finds procedure will be developed that contains stop work provisions;
- Habitat features to be protected during construction will be marked on ground and on maps and location of all hollow-bearing trees will be confirmed;
- In the area of the powerline easement a method of clearing that avoids damage to retained native vegetation and reduces soil disturbance will be used. For example, removal of native vegetation by chain-saw is preferable as only partial clearing is proposed in this area;
- Re-establishment of vegetation will be considered where practicable in areas disturbed by construction;
- It is proposed to establish a linear drain across Pond 3, to facilitate surface water drainage. This would be planted with macrophyte vegetation and effectively replace the shallow ephemeral depressions on the site in the provision of compensatory habitat for common frogs and birds;
- Minimising direct harm to native fauna during actual construction operations through onsite measures such as undertaking pre-clearing surveys, regular fauna surveys and the presence of a trained ecologist during clearing events. This is particularly relevant to the standing dead trees in Pond 3;
- Allow fauna to leave an area without intervention as much as possible;
- Use a licensed fauna ecologist or wildlife carer with specific animal handling experience to carry out any fauna handling. Contact an animal rescue agency/wildlife care group or vet before works start to ensure they are willing and available to be involved in fauna rescue and assist with injured animals;

- Implementation of erosion and sediment controls as described in Section 5.5.12 to minimise impacts on biodiversity values on land that is adjoining the site, and waterways downstream of the site;
- Undertake construction during daylight hours to avoid impacts from noise and light spill where this may be detrimental to species habitat on adjoining lands;
- Appropriately train project staff and contractors so that they can implement all measures that minimise inadvertent adverse impacts of the project on biodiversity values; and
- Installing temporary fencing around native vegetation adjacent to the power line easement that is to be retained to protect these features. Exclusion zones will be established to mark clearing limits. This would include the two hollow-bearing trees adjacent to the easement.

Mitigation following measures are to be undertaken during the operation phase:

- Retention and rehabilitation of construction water management devises to provide replacement of freshwater wetlands; and
- Use mechanical weed control methods such as slashing or mowing, as well as a range of herbicides to avoid the development of herbicide resistance.

5.2 Heritage

5.2.1 Methods

The SEARs require an assessment of the impact of the development on heritage including:

> *an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community.*

This section summarises the Aboriginal heritage due diligence assessment, which has included review of available heritage information and consultation with Darkinjung Local Aboriginal Land Council (DLALC) and Guringai Tribal Link Aboriginal Corporation (GTLAC). A site survey of the project area was completed involving both DLALC and GTLAC and is included in Appendix D. This section also incorporates a desktop review of potential impacts to non-Aboriginal heritage.

5.2.2 Existing Environment

Historic Heritage

A search of local, state and commonwealth heritage registers was undertaken by Jacobs on 26 July 2017. One non-Aboriginal heritage, the Wyee coal conveyor railway loop located more than 800 metres to the north-west of the study area was identified. The Wyee coal conveyor railway loop was installed in 1980 with the conveyor originally installed to facilitate supply efficiency from the Vales Point captive coal mines. The item is registered on the State Heritage Register (Item No. 1910146) and the Lake Macquarie Local Environment Plan (Item No. 225). The Wyee coal conveyor railway loop comprises a 3 km of railway balloon loop north of Wyee, a coal unloader and 6 km of covered coal conveyor from the Main Line to Vales Point Power Station. A heritage survey of the study area was undertaken on 27 July 2017 and confirmed that no previously unidentified non-Aboriginal heritage items are located within the project area.

Aboriginal Heritage

A search of the Aboriginal Heritage Information Management System (AHIMS) database using the 'extensive search' feature was undertaken on 7 July 2017. A shapefile of the project area, including a 200 metres search buffer (assessment area), was used to identify any registered (known) Aboriginal sites or declared Aboriginal places within or adjacent to the project as shown in Figure 5.2.

It should be noted that the AHIMS database only contains records of Aboriginal sites that have been officially recorded and included on the list, which mainly represents areas of NSW that have been subject to systematic archaeological survey. As such, the AHIMS database may not provide a complete list of all Aboriginal sites within the landscape, and on its own is not an entirely accurate representation of where sites may be found.

The extensive search identified 39 Aboriginal sites within 7.5 kilometres of the assessment area as described in Table 5.1. These findings were further contextualised through a review of historical, archaeological and heritage reports pertaining to the local region. Based on these assessments a predictive model of potential site types and their associated characteristics is proposed.

The local site distribution is considered typical of coastal sites found within the region. The most common site types found in these coastal lowlands are artefact scatters followed by shell middens. A relatively large number of modified trees were also found within the local area. A grinding groove site, ochre quarry and burial site are also recorded for the locality.

One Aboriginal site is listed in the vicinity of the VPAD and is referred to as 'The Hole' (AHIMS 45-7-0207). This site is located 1.4 kilometres north-west from the project and within the site buffer lands. The artefact assemblage at 'The Hole' belongs to the Small Tool Tradition which includes backed blade and microblade manufacture. This tool technology dates to within the last 5000 years (NOARM 1996). The rehabilitated and operational areas of the VPAD are highly disturbed and modified and unlikely to have any remaining cultural heritage significance.

Based on the sites found in prior surveys of the region described within Appendix D, it was expected that the project area had a low to moderate potential to contain archaeological features such as:

- Open camp sites;
- Artefact scatters on sufficiently dry, level terrain;
- Shell middens on palaeochannels and lake shore in protected positions near water; and
- Scarred trees which are likely to occur on old growth trees and in association with other archaeological areas of Aboriginal occupation (e.g. open camp sites).

Given the density of sites within the local area and the proximity to coastal, alluvial and lacustrine resources it is likely that site distribution was centred upon these productive resource zones.

As suggested by previous research in the region described within Appendix D, several characteristics can be predicted for the above site types:

- Sites will be concentrated around the exploitation of coastal resources;
- Middens will contain a range of edible shell species including Anadara, Volegalea, Telescopium and Crassostrea;
- Open camp sites will contain a range of artefact types including, flakes, ground edge axes, scrapers, blades, microblades, cores and flaked pieces typical of the late Holocene archaeological record;
- Stone artefacts will be made from a variety of lithics including chert, quartzite, silcrete and volcanics; and
- In coastal, alluvial and lacustrine contexts there will likely be a significant depth to archaeological deposits in certain circumstances.

Figure 5.2 | Location of AHIMS sites with proximity to study area

Table 5.1 : AHIMS sites within 7.5 kilometres of the project

AHIMS ID	Eastings	Northings	Site type
45-3-3165	359490	6332490	Grinding Groove
45-7-0339	364943	6329478	Isolated artefact
45-7-0131	366820	6332970	Shell
45-7-0138	366820	6332970	Artefact
45-7-0176	367200	6333300	Artefact
45-7-0178	366800	6330400	Artefact
45-7-0179	365150	6331450	Artefact
45-7-0181	366150	6329600	Shell
45-7-0182	366120	6330950	Shell
45-7-0183	368050	6333200	Grinding Groove
45-7-0189	364950	6331450	Modified Tree (Carved or Scarred)
45-7-0207	361820	6329800	Ochre Quarry
45-7-0079	368450	6330750	Artefact
45-7-0001	361550	6332450	Shell
45-7-0003	363738	6331615	Artefact
45-3-1310	357823	6330130	Artefact
45-3-1553	362540	6330400	Shell
45-3-0334	366730	6330420	Shell
14-7-0149	368000	6333300	Shell
45-3-3180	359150	6325075	Artefact
45-7-0227	363680	6333520	Shell
45-7-0228	363720	6333820	Modified Tree (Carved or Scarred)
45-3-3176	359750	6324715	Shell
45-7-0232	360937	6325205	Modified Tree (Carved or Scarred)
45-3-3179	359563	6325450	Shell
45-3-3186	359612	6326462	Shell
45-3-3187	359375	6325050	Shell
45-3-3188	359427	6325219	Shell
45-7-0080	364780	6328890	Artefact
45-7-0244	363560	6333600	Artefact
45-3-3260	360187	6325275	Shell
45-3-3261	359601	6326537	Stone Arrangement
45-7-0249	363200	6325900	Shell
45-7-0250	363175	6325350	Artefact

AHIMS ID	Eastings	Northings	Site type
45-7-0251	361000	6326250	Shell
45-3-3335	357900	6326000	Modified Tree (Carved or Scarred)
45-3-3166	359840	6332530	Artefact
45-7-0290	368088	6329979	Artefact
45-7-0190	362398	6331810	Burial and modified tree

Note - Coordinates in AGD Zone 56

A field survey was undertaken on 27 July 2017 with nominated site officers from Darkinjung Local Aboriginal Land Council (DLALC) and Guringai Tribal Link Aboriginal Corporation (GTLAC). The inspection included a high-level assessment of the rehabilitated areas of the VPAD. The focus of the field survey to assess the easement for the 33 kV connection from the VPAD to the existing energy distribution network east of Ruttleys Road to identify any archaeological objects, or areas with the potential to contain archaeological objects (PADs). On-site consultation with nominated site officers of the DLALC and GTLAC enabled the development of management recommendations. All areas recommended for archaeological field survey were surveyed. One hundred per cent of the proposed grid connection easement was able to be accessed for the survey. The VPAD was visited to confirm level of previous disturbance. The results of the survey are summarised below in Table 5.2.

Table 5.2 : Archaeological survey results summary

Survey area	Total area	Survey coverage hectares	Visibility	Exposure	Estimate of effective coverage in hectares	Field survey results
Easement for 33 kV transmission line	1.5687 (Ha)	1.5687 (100 %)	90%	90%	1.41183 (90 %)	No Aboriginal cultural heritage identified.

5.2.3 Assessment

The survey area for the 33 kV transmission line was found to contain no evidence of past Aboriginal occupation having been substantially disturbed by prior roadworks, and the construction of a conveyor belt and pipeline easement. Similarly, any evidence of past Aboriginal occupation within the VPAD has been substantially disturbed and potentially buried by ash. The project's construction impacts will avoid all AHIMS registered archaeological sites. It is considered unlikely that Aboriginal objects or artefact deposits will be present within the grid connection easement due to substantial ground disturbance from prior road and infrastructure construction. No direct or indirect impacts to Aboriginal heritage are therefore considered likely as a result of the project. No impacts to non-Indigenous heritage are anticipated by the project.

5.2.4 Mitigation Measures

It is recommended that:

- Standard Management Procedures for Unexpected Heritage Items be applied and implemented;
- Heritage induction training for staff and contractors working on the construction phase of the transmission line is unnecessary; and
- Any further impacts proposed beyond those assessed Appendix D or beyond the boundary of the assessed areas must be subject to further assessment and consultation with Aboriginal stakeholders, consistent with the process in this report.

5.3 Noise

5.3.1 Methods

The SEARs require an assessment of the impact of the development on noise including:

> *an assessment of the construction noise impacts of the development in accordance with the Interim Construction Noise Guideline (ICNG) and operational noise impacts in accordance with the NSW Industrial Noise Policy (INP), and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria.*

This section summarises the noise and vibration impact assessment undertaken for the project which is included in Appendix E. The assessment included a baseline survey of existing ambient noise levels in the study area to determine existing levels of background noise, characterisation the noise environment and establishment of construction and operational noise criteria for the project. Predicted impacts were assessed in accordance with the following guidelines:

- Construction Noise – Interim Construction Noise Guideline (DECC 2009); and
- Operational Noise – Industrial Noise Policy (OEH 2000).

Consideration of construction traffic noise impacts was undertaken using the Roads and Maritime Construction Road Traffic Noise Calculator. The assessment found that the project construction activity is unlikely to lead to an increase of road traffic noise by 2dBA and therefore no further traffic noise impact assessment or mitigation is deemed necessary.

Construction vibration has been considered in relation to both the safe working distances for both “cosmetic” damage (refer British Standard BS 7385) and human comfort (refer to British Standard BS 6472) for offsite receptors.

5.3.2 Existing Environment

The Industrial Noise Policy (INP) classifies the noise environment of the project as “Suburban”. The INP describes the “Suburban” noise environment as an area that:

- Has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry;
- Decreasing noise levels in the evening period (1800-2200); and
- Evening ambient noise levels defined by the natural environment and infrequent human activity.

To further understand the existing noise environment, two noise monitoring locations were selected to be representative of the noise environments affecting residential properties near the VPAD. These potential noise affected residential properties were assigned to five Noise Catchment Areas (NCAs) based on location and expected noise catchment characteristics. The two noise monitoring locations and five NCAs are detailed below and shown in Figure 5.3.

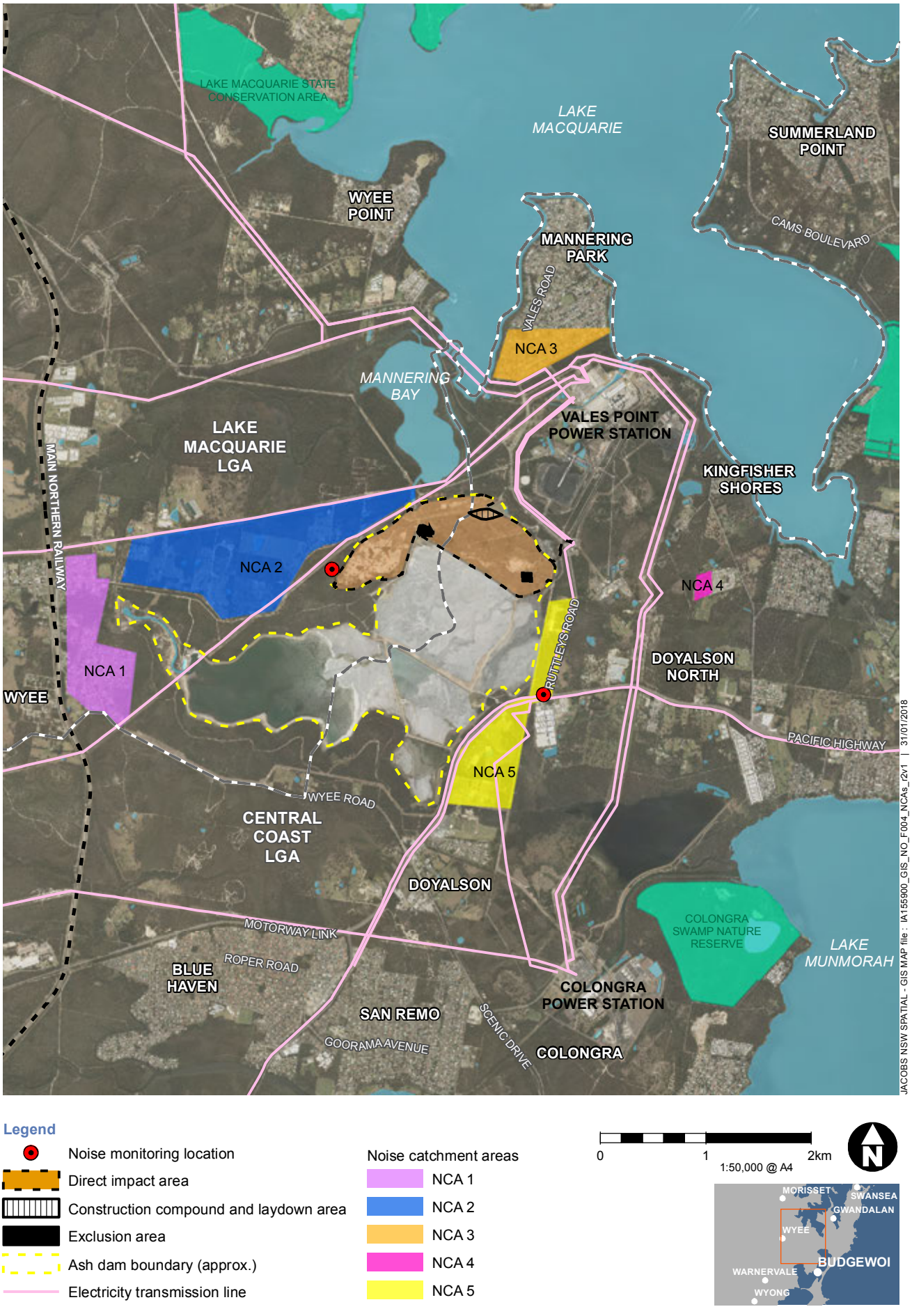


Figure 5.3 | Noise monitoring locations and noise catchment areas

At logger location 1, the measured long term noise levels of 52 dB(A) L_{A90} daytime, 48 dB(A) L_{A90} evening and 32 dB(A) L_{A90} night-time are considered representative of the existing background noise levels at residential properties located along the Pacific Highway assigned as NCAs 4 and 5. Analysis of the audio recording shows that daytime noise levels are dominated by traffic noise, however traffic numbers drop substantially during evening and night time hours, when the noise environment is dominated by distant traffic and the Vales Point Power Station.

At logger location 2, the noise environment is primarily influenced by continuous distant traffic noise and a low constant "humming" noise from the power station. The measured long term noise levels of 33 dB(A) L_{A90} daytime, 32 dB(A) L_{A90} evening and 30 dB(A) L_{A90} night-time show a very quiet suburban location generally unaffected by local noise sources. These background levels were assigned to NCA 1, 2 and 3.

5.3.3 Construction Noise Assessment

The Interim Construction Noise Guideline (ICNG) states that the potential for construction noise impacts can be assessed by comparing the predicted noise at the monitoring locations with the noise management levels provided by the ICNG. Construction is considered to have the potential to cause a noise impact if the predicted noise exceeds the noise management levels.

The project specific noise management levels for construction activities at surrounding receivers are presented in Table 5.3. As construction activities will only be carried out during standard daytime hours the noise management levels specified below are of the ICNG recommended standard hours only.

Table 5.3 : Project specific noise **management** levels

Receiver	ICNG standard hours Noise management level, L_{Aeq} - dB(A)	Highly affected noise management level, L_{Aeq} - dB(A)
Residential receivers north of project NCAs 1, 2 and 3	47[1]	75[2]
Residential receivers south of project NCAs 4 and 5	63[1]	75[2]
Place of worship, classrooms at school and other educational institutions	45 Internal (or 55 external)	n/a
All industrial premises	70	n/a
All offices and retail outlets	65	n/a

Note 1: NCA Rating Background Level (RBL) + 10 dB(A)

Note 2: Highly noise affected.

To assess the potential noise and vibration impacts during construction, a number of scenarios comprising typical plant and equipment were developed based on the indicative staging information and on the basis that all construction works are proposed to be undertaken during standard daytime periods (7.00 am to 6.00 pm Monday to Friday and 8.00 am to 1.00 pm on Saturdays). Prediction of construction noise impacts from the project were undertaken through the use of the SoundPLAN noise propagation modelling software (Version 7.4). The most significant factors in determining the level of noise received from construction activities are the receiver's distance from the project, shielding, ground absorption and source heights. The specific noise modelling parameters used are provided in Appendix E.

Table 5.4 presents the predicted unmitigated noise levels associated with each stage of construction along with a comparison with the relevant construction noise management level. Predicted noise levels have been based on continuous operation of the noise sources identified for each construction stage. Predictions are therefore considered to represent the highest potential noise impacts. The noise levels outlined in Table 5.5 and Table 5.6 would typically be short-term, lasting for the duration of the construction program when works are conducted in the vicinity of each receiver.

Table 5.4 : Predicted construction noise levels at residential receivers (standard hours only)

NCA	Predicted range of noise level L_{Aeq} – dB(A)	Standard hours			"Highly noise affected" L_{Aeq} – dB(A)		
		NML dB(A)	Exceedance dB(A)	Compliance	NML dB(A)	Exceedance dB(A)	Compliance
Stage 1 - Site preparation, clearing & demolition							
NCA 1	27-33	47	-	Yes	75	-	Yes
NCA 2	**30-67**	**47**	**Up to 20**	**No**	75	-	Yes
NCA 3	36-42	47	-	Yes	75	-	Yes
NCA 4	37-38	63	-	Yes	75	-	Yes
NCA 5	37-40	63		Yes	75	-	Yes
Stage 2 - Establish site compound, access roads & delivery of materials							
NCA 1	22-28	47	-	Yes	75	-	Yes
NCA 2	**25-62**	**47**	**Up to 15**	**No**	75	-	Yes
NCA 3	32-37	47	-	Yes	75	-	Yes
NCA 4	32-33	63	-	Yes	75	-	Yes
NCA 5	32-36	63		Yes	75	-	Yes
Stage 3 - Installation of foundation							
NCA 1	23-29	47	-	Yes	75	-	Yes
NCA 2	**26-63**	**47**	**Up to 16**	**No**	75	-	Yes
NCA 3	32-37	47	-	Yes	75	-	Yes
NCA 4	33-34	63	-	Yes	75	-	Yes
NCA 5	33-36	63		Yes	75	-	Yes
Stage 4 - Installation of underground cabling							
NCA 1	18-24	47	-	Yes	75	-	Yes
NCA 2	**22-53**	**47**	**Up to 6**	**No**	75	-	Yes
NCA 3	27-32	47	-	Yes	75	-	Yes
NCA 4	28-29	63	-	Yes	75	-	Yes
NCA 5	28-31	63		Yes	75	-	Yes
Stage 5 - Assembly of panel frames, mounts & transformer units							
NCA 1	21-27	47	-	Yes	75	-	Yes
NCA 2	**23-61**	**47**	**Up to 14**	**No**	75	-	Yes

NCA	Predicted range of noise level L_{Aeq} – dB(A)	Standard hours			"Highly noise affected" L_{Aeq} – dB(A)		
		NML dB(A)	Exceedance dB(A)	Compliance	NML dB(A)	Exceedance dB(A)	Compliance
NCA 3	30-35	47	-	Yes	75	-	Yes
NCA 4	31-32	63	-	Yes	75	-	Yes
NCA 5	31-34	63		Yes	75	-	Yes
Stage 6 - Site rehabilitation / removal of temporary construction facility							
NCA 1	21-27	47	-	Yes	75	-	Yes
NCA 2	**23-61**	**47**	**Up to 14**	**No**	75	-	Yes
NCA 3	30-35	47	-	Yes	75	-	Yes
NCA 4	31-32	63	-	Yes	75	-	Yes
NCA 5	31-34	63		Yes	75	-	Yes

Note 1: A retirement village has been identified in NCA 4 and has been assessed against the residential noise management level

Note 2: Exceedances are highlighted in bold

The results presented in Table 5.4 indicate that construction activities would be unlikely to exceed the construction noise management levels at residential receivers in NCAs 1, 3, 4 and 5, but has the potential to impact on residential receivers in NCA 2. The predicted noise levels indicate that the surrounding residences would not be highly noise affected by construction activities. Appendix C of the Noise and Vibration impact assessment provides a per receptor prediction of noise impacts for properties within the identified NCAs. It is further noted that the exceedances of noise management levels in NCA 2 is limited to four properties on Summerhayes Road as shown in Table 5.5.

Table 5.5 : Detailed prediction of construction noise results (NML exceedances)

Name	Usage	Predicted construction noise impacts – dB(A) (Standard Hours)					
		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
Summerhayes_Rd_263	RES	**48.1**	43.2	43.9	37.8	41.7	41.8
SummerHayes_Rd_285	RES	**54.6**	**49.7**	**50.4**	42.9	**48.2**	**48.3**
Summerhayes_Rd_305	RES	**58.9**	**54**	**54.7**	46.3	**52.5**	**52.6**
Summerhayes_Rd_325	RES	**67.1**	**62.1**	**62.8**	**52.8**	**60.6**	**60.7**

RES = Residential

Exceedances are highlighted in bold

Table 5.6 presents the predicted noise impacts from construction on nearby industrial receivers in NCA 5. The predicted impacts show that the construction activities are well within the noise management levels for industrial receivers.

Table 5.6 : Predicted construction noise levels at industrial receivers (standard hours only).

NCA	Predicted range of construction noise level L_{Aeq} - dB(A)	Standard hours		
		Noise management level dB(A)	Exceedance dB(A)	Compliance
Stage 1 - Site preparation, clearing & demolition				
NCA 5	40-55	70	-	Yes
Stage 2 - Establish site compound, access roads & delivery of materials				
NCA 5	35-50	70	-	Yes
Stage 3 - Installation of foundation				
NCA 5	35-51	70	-	Yes
Stage 4 - Installation of underground cabling				
NCA 5	30-43	70	-	Yes
Stage 5 - Assembly of panel frames, mounts & transformer units				
NCA 5	33-49	70	-	Yes
Stage 6 - Site rehabilitation / removal of temporary construction facility				
NCA 5	33-49	70	-	Yes

The construction noise impacts associated with the construction of the 33 kV grid connection have not been modelled. On the basis that these works would be located over 1.2 km to the nearest residential receiver in NCA 4 and would involve fewer and less noisy equipment than the other construction stages assessed. Noise from this construction stage are therefore unlikely to be audible and are expected to be below the identified noise management levels.

5.3.4 Construction Traffic Impact Assessment

As the project will only be carried out during daytime period, all construction vehicle movements will take place during standard daytime construction hours. For the purposes of this assessment, an estimation of the traffic noise level increases on selected roads from construction traffic has been made. The *Construction Road Traffic Noise Estimator component* of the Roads and Maritime Services *Construction Noise Estimator* was used to assess potential impacts arising from construction traffic. Existing traffic inputs were added with volumes extracted from the NSW Roads and Maritime Service website on the Pacific Highway and Ruttleys Road, and additional traffic generated during construction was estimated based on the anticipated workforce on a per hour basis. Given the existing traffic volumes on the roads proposed to be used during construction and relatively low numbers of additional construction traffic it was found that additional noise arising from construction traffic are unlikely to result in changes of more than 2 dB(A) above existing noise levels and considered a negligible impact.

5.3.5 Construction Vibration Impact Assessment

The major potential sources of vibration from construction activities are during pile driving/boring and the use of a vibratory roller. As a guide, safe working distances for typical items of vibration intensive plant are listed in Table 5.7. The safe working distances are quoted for both “cosmetic” damage (refer British Standard BS 7385) and human comfort (refer to British Standard BS 6472).

Table 5.7 : Recommended safe working distances for vibration intensive plant

Plant item	Rating/description	Safe working distance	
		Cosmetic damage (BS 7385)	Human response (EPA vibration guideline)
Vibratory roller	<50 kN (typically 1-2 t)	5 metres	15 metres to 20 metres
	<100 kN (typically 2-4 t)	6 metres	20 metres
	<200 kN (typically 4-6 t)	12 metres	40 metres
	<300 kN (typically 7-13 t)	15 metres	100 metres
	>300 kN (typically 13-18 t)	20 metres	100 metres
	>300 kN (> 18 t)	25 metres	100 metres
Vibratory pile driver	Sheet piles	2 metres to 20 metres	20 metres
Pile boring	≤ 800 mm	2 metres (nominal)	n/a

Note: Table data reproduced from RMS Construction Noise Guideline

The safe working distances presented in Table 5.7 are indicative only and will vary depending on the particular item of plant and local geotechnical conditions. They apply to typical buildings under typical geotechnical conditions.

The nearest building to the project is identified as the residence at 325 Summerhayes Road. The separation distance between the project and the nearest residential building is approximately 150 m. This separation distance is much larger than the indicated safe working distances for cosmetic damage and human comfort as detailed in Table 5.7. Based on this observation, cosmetic damage or human discomfort is unlikely to occur during vibration intensive activities such as pile driving/boring or the use of a vibratory roller.

The effect of vibration impacts on the integrity of the VPAD has not been assessed as part of this assessment and would be considered in the detailed design process when the construction methodology is being further refined.

5.3.6 Operational Noise Impact Assessment

The unattended noise monitoring results were used to generate project specific noise criteria in accordance with INP principles. The project specific noise levels are the most stringent of the Intrusive and Amenity criteria and are shown in bold in Table 5.8.

Table 5.8 : INP criteria for operational noise emissions to sensitive receivers

Receiver	Time of day	Noise Level dB(A) re 20 µPa				
		ANL[1] (period)	Measured RBL $L_{A90(15min)}$[2]	Measured $L_{Aeq(15min)}$	INP criteria	
					Intrusive Measured RBL + 5 dB(A) $L_{Aeq(15min)}$	Amenity $L_{Aeq(period)}$[3]
Residential receivers north of project - NCAs 1, 2 and 3	Day	55	33	44	**38**	55
	Evening	45	32	38	**37**	45
	Night	40	30	37	**35**	40
Residential receivers south of project - NCAs 4 and 5	Day	55	52	60	57	**55**
	Evening	45	48	57	52	**45**
	Night	40	32	55	**37**	40
Industrial receivers - NCA5	When in use	-	-	-	**-**	**70**

Note 1: ANL Acceptable Noise Level for a suburban area

Note 2: RBL Rating Background Level

Note 3: Assuming existing noise levels unlikely to decrease

The project will be operational for 24 hours , with the majority of activity during daylight hours, 7 days a week. Conservative noise objectives, assessed at the nearest residential receivers have been established as:

- Residential receivers north of the project (NCAs 1, 2 and 3) – **38 dB(A) $L_{Aeq,15min}$** daytime, **37 dB(A) $L_{Aeq,15min}$** evening and **35 dB(A) $L_{Aeq,15min}$** night time.
- Residential receivers south of the project (NCAs 4 and 5) – **55 dB(A) $L_{Aeq,15min}$** daytime, **45 dB(A) $L_{Aeq,15min}$** evening and **37 dB(A) $L_{Aeq,15min}$** night time.

In order to determine the acoustical impact of the project, a computer model incorporating all significant noise sources, the closest potentially affected residential properties, and the intervening terrain was prepared.

The computer model was prepared using the SoundPLAN noise propagation modelling software (Version 7.4) Industrial Module which allows the use of various internationally recognised noise prediction algorithms. The CONCAWE algorithm, which is suitable for the assessment of large industrial plants, has been selected for this assessment because it also enables meteorological influences to be assessed. The equipment sound power levels and modelling parameters used and values adopted in the noise modelling are provided in Appendix E.

Potential noise impacts of both a fixed-tilt (FT) and single-axis tracking (SAT) panel system were assessed with detailed results provided in Appendix E. For the SAT system, noise outputs from a synchronised system (where all panels move simultaneously) and an unsynchronised system (where panel movements occur randomly) were considered. The difference in noise levels from these systems was found to be negligible (<1dB), however the marginally louder unsynchronised system has been used for the tracking system noise model. Noise impacts associated with the fixed panel option were found to comply with all noise criteria.

During the night period the tracker panel motors will not be operating and there will be minimal/zero load on the inverters corresponding to minimal noise impacts. Hence, the operational noise of the

inverters and transformers has only been assessed against the more conservative evening INP noise criteria.

Table 5.9 presents the predicted noise levels associated with the facility's operations along with a comparison with the relevant operational noise criteria (refer Table 5.8).

Table 5.9 : Predicted operational noise levels at residential receivers (Day and Evening)

NCA	Predicted range of noise levels*		Noise criteria $L_{Aeq(period)}$ Day / Evening	Predicted exceedance?	
	FT System	SAT System		FT System	SAT System
1	1 to 19	2 to 21	38 / 37	-	-
2	10 to 37	**12 to 42**	**38 / 37**	-	**Yes**
3	14 to 28	15 to 31	38 / 37	-	-
4	14 to 24	15 to 26	55 / 45	-	-
5	18 to 26	20 to 28	55 / 45	-	-
Industrial	20 to 32	22 to 34	70	-	-

** Includes all meteorological conditions*

These results show that under all meteorological conditions, and in the absence of mitigation, exceedances of the INP noise criteria may occur at properties within NCA 2 where tracking panels are installed, and no exceedances are predicted to result from the fixed-tilt system. Further analysis of noise levels within NCA 2 is presented in Appendix E and identifies that exceedances are limited to the nearest property only during neutral weather conditions and two nearest properties during adverse weather conditions as presented in Table 5.10. Modelled operational noise contours for all meteorological conditions under all scenarios are provided in Appendix E with the worst case (adverse wind) conditions presented in Figure 5.4 and Figure 5.5.

Table 5.10 : Predicted operational noise levels individual receivers within NCA 2

Name	Criteria		Fixed			Tracking		
	Day	Evening	Neutral	Adverse	Invert	Neutral	Adverse	Invert
Summerhayes _Rd_305	38	37	31	35	34	36	**39**	**38**
Summerhayes _Rd_325	38	37	34	37	37	**40**	**42**	**42**

**Bold indicates a potential exceedance of daytime and evening noise criteria*

Without mitigation, noise levels from the power transformer/inverter units, known as power conversion stations (PCS), may result in exceedances at two properties on Summerhayes Road. The results of noise modelling show that where the noise output of these units can be reduced by 5dB(A), compliance at these properties would be expected under all meteorological conditions. A typical acoustic enclosure for this type of equipment is expected to provide a minimum noise reduction in the order of 15 to 20dB(A). Site specific engineering restrictions may reduce the level of attenuation that is possible, however a reduction of 5dB(A) is a very small margin and is expected to be easily achievable during the design development.

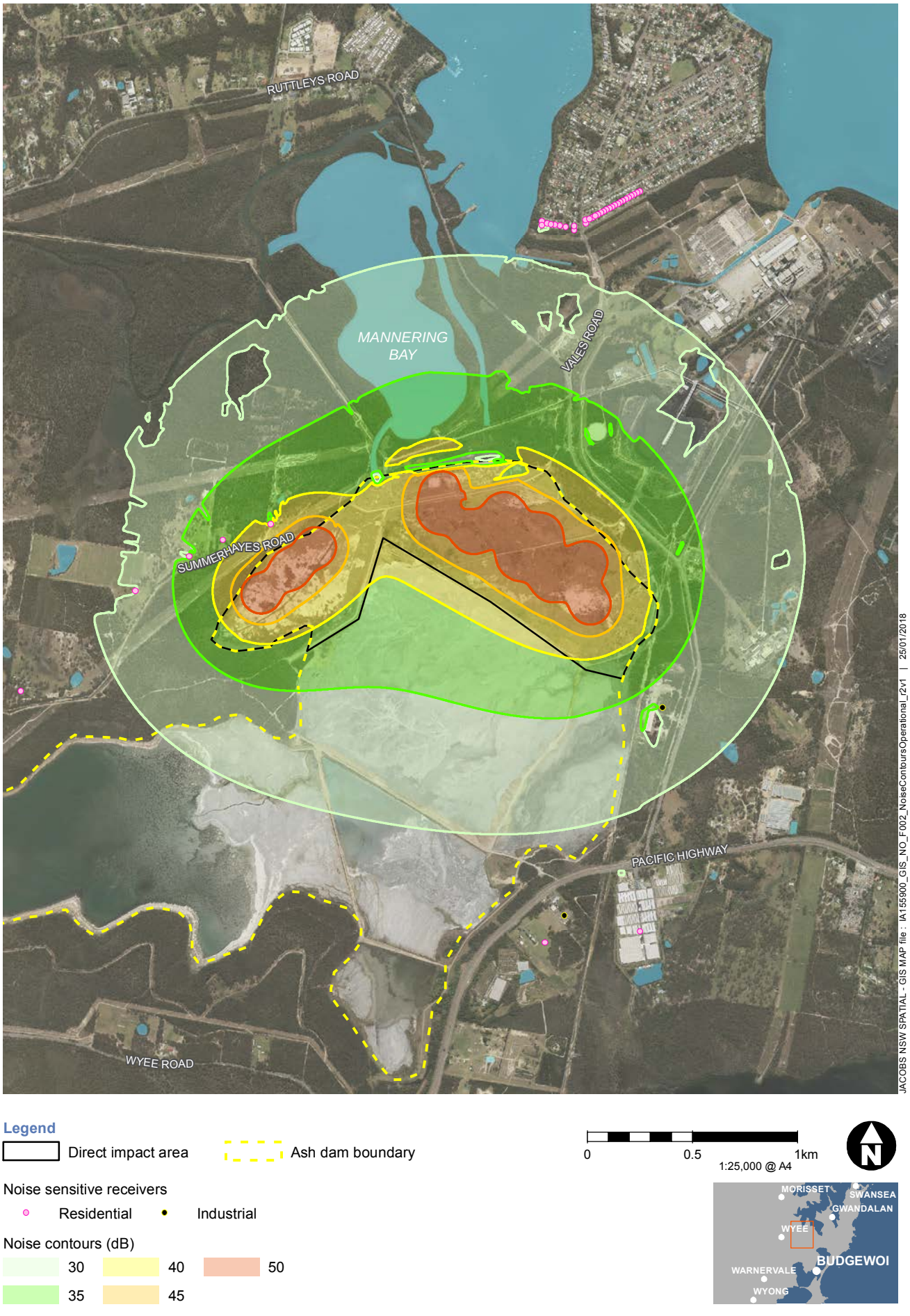


Figure 5.4 | Tracking panels - operational noise impacts during adverse wind condition

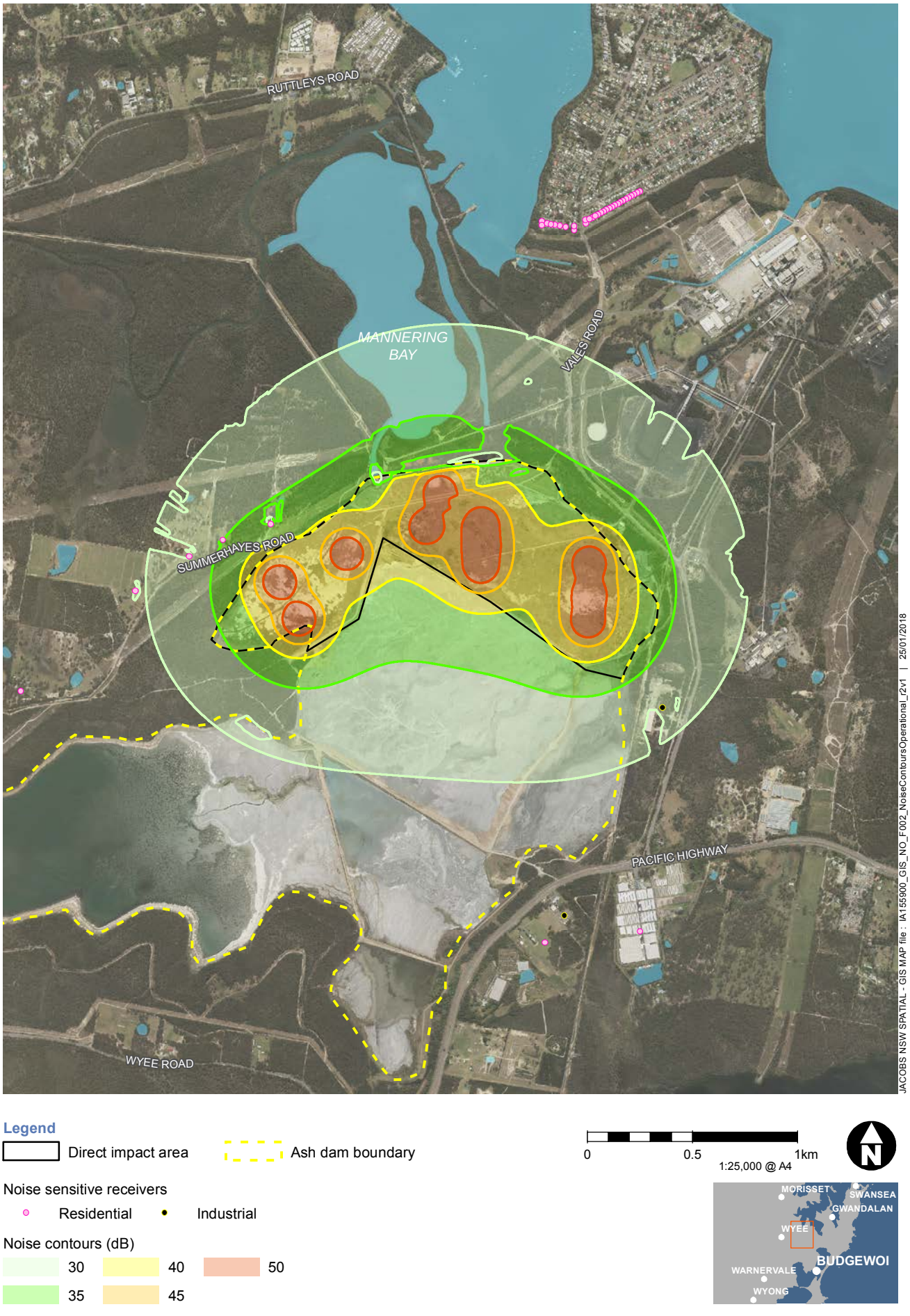


Figure 5.5 | Fixed panels - operational noise impacts during adverse wind condition

5.3.7 Mitigation Measures

The following mitigation measures will be implemented during construction:

- Construction works will only be undertaken in accordance with standard construction hours specified in the ICNG;
- Acoustic screens around stationary high noise generating plant (piling rigs) will be implemented where required;
- No chainsaws and tree mulcher use will occur on Pond 2;
- The predicted noise levels will be considered in establishing work site locations, construction techniques and on-site practices;
- Where possible and in compliance with occupational safety and health standards, reversing beepers on trucks will be replaced with low pitch non-tonal beepers (quackers);
- Construction works will adopt Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) practices as addressed in the ICNG selecting from the recommended measures in Appendix D of the EIS;
- As a minimum all residences within 200 metres radius of the project site will be notified of potential construction works at least 2 weeks prior to the commencement of works;
- Construction noise management practices are to be provided to all staff and contractors and be included during site inductions and daily tool-box talks. The tool-box talks are to include as a minimum, the permitted hours of construction work, work site locations, site ingress/egress and the required noise management measures for each construction phase;
- Monitoring of construction noise will be undertaken to confirm construction noise levels at nearest receivers at the commencement of construction works for the verification of predicted construction noise levels, to confirm requirement for noise management and mitigation measures and in response to justified adverse community response or complaint to construction noise;
- Construction works will be immediately reassessed in the event of any identified exceedances of noise predictions and in response to justified community complaints related to noise;
- Any non-conformances or noise complaints and subsequent corrective actions will be resolved with consideration to the project's Community and Stakeholder Engagement Plan (CSEP); and
- All adopted noise mitigation measures will be updated in work method statements and identified as part of routine tool-box talks to inform staff of current construction noise issues and required mitigation measures.

The following mitigation measures will be implemented during operation:

- Detailed design will consider the ability to located PCS units further away from receptors in Summerhayes Road;
- If a single axis tracking system is to be used, the detailed design will consider installation of tracking motors in locations to minimise noise impacts for potentially affected residents in Summerhayes Road; and
- All PCS units will be housed within an acoustic enclosure or provided with acoustic screening between the unit and receivers on Summerhayes Road which ensures a minimum of 5dB(A) sound reduction.

5.4 Transport

5.4.1 Methods

The SEARs require an assessment of the impact of the development on transport including:

> *an assessment of the site access route, site access point and likely transport impacts of the development on the capacity and condition of roads (including on any Crown land), a description of the measures that would be implemented to mitigate any impacts during construction, and a description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required);*

This section summarises the Traffic and Access impact assessment undertaken for the project which is included in Appendix F. The assessment included:

- Review of existing conditions including existing site uses, road network, access, public transport, road safety assessment and traffic volumes based on traffic counts at the existing Pacific Highway access, Ruttleys Road / Pacific Highway intersection and Ruttleys Road access;
- Calculation of traffic generation for construction and operational stages;
- Estimation of background traffic growth;
- Modelling of intersection performance under construction and operational stages of the project;
- Consideration of potential cumulative impacts;
- Consideration of safety implications and effects on public and active transport networks; and
- Development of mitigation measures including potential for access upgrades to improve safety.

5.4.2 Existing Environment

The VPAD can be accessed from an existing all-weather entrance from Ruttleys Road and an alternative in-bound only access provided from an existing Pacific Highway entry point. There are several other gateway access points to the VPAD including two additional Pacific Highway entrances, four access points along Ruttleys Road and two further access points along Wyee Road. These additional entry points are typically utilised for light vehicle and emergency vehicle entry to internal roadways and fire trails for operational activities.

Ruttleys Road is a local collector road with generally one lane in each direction on an undivided carriageway. The road carries an AADT of approximately 6,000 vehicles per day. The sign posted speed limit of Ruttleys Road in the vicinity of the site is 80km/h. The site has a direct access from Ruttleys Road via a cross intersection. The section between Pacific Highway and approximately 400m north of the site's access on Ruttleys Road is an approved B-double route for 26m B-Doubles.

The Pacific Highway is a state road with a sign posted speed limit of 80 km/h in the vicinity of the site. It is two lanes in each direction on a divided carriageway. The highway carries an Annual Average Daily Traffic (AADT) of approximately 14,000 vehicles per day and it is an approved road for 26m B-Double vehicles. The site is located west of the highway and has direct access from the highway via a left-in only intersection.

The VPAD is an industrial site with light and heavy vehicle movements generated from various operational activities, including ongoing ash dam capping and rehabilitation works, trucks associated with the export of recycled ash products and power station staff generated traffic.

The ash dam capping and rehabilitation works include trucks delivering virgin excavated natural material (VENM) and excavated natural material (ENM) for the purpose of progressively covering the completed ash storage areas. These works are covered by separate approvals to the works which

would be undertaken under this EIS and existing truck movements average 5 trucks per hour with a peak 10 trucks per hour. Trucks enter at either the Ruttleys Road or Pacific Highway entrance, traverse the ash dam in a uniform direction and all vehicles exit the site via Ruttleys Road and return in an easterly direction to the Pacific Highway.

Generally, trucks associated with the export of recycled ash products and light vehicles enter and exit the ash dam via Ruttleys Road to access the ash reclamation area and the ash dam administration building in the northern section of the ash dam. Truck movements for the export of ash products are irregular and typically average five trucks per day, there are also infrequent trucks and light vehicles for ash dam management activities and the staff generated traffic is equivalent to eight full time employees.

It is also noted that the Lake Coal haulage route for the transportation of coal produced at the Chain Valley Bay Mine to the Port Waratah loader at Carrington East, via the M1 motorway, also utilises the section of Ruttleys Road from Construction Road in an easterly direction to the Pacific Highway. Lake Coal has approval for up to 270 trucks per day with loading hours between 5:30am-5:30pm and trucks on the road network until 6:30pm (a 13 hour operational day). This corresponds to an average of 21 trucks per hour with 32 trucks per peak hour (only 16 trucks per hour during peak traffic periods).

Delta has engaged with stakeholders on local traffic matters over many years through the community reference group (CARE Forum). The community have expressed a preference to minimise truck movements along Ruttleys Road where possible. This provides an incentive to maximise truck entry movements from the Pacific Highway although it is acknowledged that it may be more practical for some delivery trucks to enter the site via Ruttleys Road. It is proposed that regardless of the entry point, all trucks continue to exit the site via Ruttleys Road and return in an easterly direction to the Pacific Highway.

5.4.3 Assessment

The focus of the cumulative traffic assessment is to continue to provide safe vehicle access to the VPAD and to ensure additional vehicle movements to not impact the flow of traffic on Ruttleys Road and do not affect the efficiency (level of service - LoS) of the intersection of Ruttleys Road and the Pacific Highway. The assessment found:

- The project would have minimal impact on the existing public transport services and active transport;
- The forecast number of vehicle movements is unlikely to have a significant impact on road safety;
- The construction of the project on its own does not warrant intersection upgrades but that considering the potential for increased rate of capping and existing safety issues means that upgrades could be beneficial; and
- The operational stage will have minimal impact on the road network.

Construction peak traffic models have assessed the cumulative impacts of 13 truck deliveries per hour associated with existing ash dam activities (peak 10 trucks per hour), the proposed deliveries for the solar project (peak 3 trucks per hour) and included the truck movements associated with the Lake Coal haulage route (peak 32 trucks per hour).

The results for the construction period are presented in Table 5.11.

Table 5.11 : Sidra Results for Construction Period

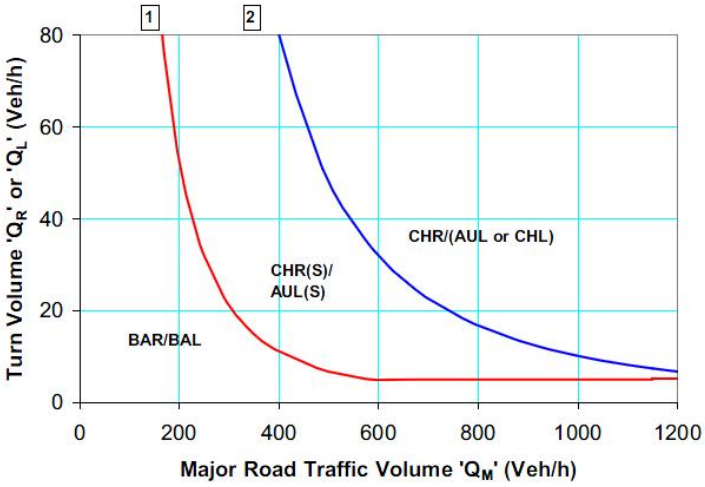
Intersection / Time period	LoS	Average Delay (sec)	Queue Length (m)	Approach
Pacific Highway / Ruttleys Road				
2017 Construction Peak 7:00-8:00am (Base)	A	12	51	West
2017 Construction Peak 8:00-9:00am (Construction Traffic)	A	11	51	West
2017 Construction Peak 3:00-4:00pm (Base)	B	16	109	West
2017 Construction Peak 3:00-4:00pm (Construction Traffic)	B	17	109	West
Pacific Highway / Access Road				
2017 Construction Peak 7:00-8:00am (Base)	A	6	-	-
2017 Construction Peak 7:00-8:00am (Construction Traffic)	A	6	-	-
2017 Construction Peak 3:00-4:00pm (Base)	A	6	-	-
2017 Construction Peak 3:00-4:00pm (Construction Traffic)	A	6	-	-
Ruttleys Road / Access Road				
2017 Construction Peak 7:00-8:00am (Base)	B	27	2	South West
2017 Construction Peak 7:00-8:00am (Construction Traffic)	C	31	2	South West
2017 Construction Peak 3:00-4:00pm (Base)	C	33	3	South West
2017 Construction Peak 3:00-4:00pm (Construction Traffic)	C	37	3	South West

**Level of Service is based on the delay of the worst movement for priority intersections.*

The results indicate that all intersection would operate with acceptable levels of service (LoS) during the construction peak periods. The Ruttleys Road Access has acceptable delay based on the worst movement and through movements on Ruttleys Road have minimal delay as a result of the increase in traffic. The assessment indicates only a minor difference to the delay at the intersection of Ruttleys Road and the Pacific Highway with the Level of Service (LoS) remaining the same.

The need for an auxiliary left turn lane at the Pacific Highway access has been assessed in accordance with the warrants provided in Austroads Guide to Road Design – Part 4A as illustrated in Figure 5.6. The warrant for the left turn lane is based on the following:

- The flow in the through lane adjacent to the left turn is greater than 600 veh/hr in the evening peak – that is 1350 over 2 lanes;
- The proposed maximum number of turning vehicles would be 3 veh/hr; and
- The speed limit of Pacific Highway is 80 km/h (<100 km/h).



(b) Design speed < 100 km/h

Source: Arndt and Troutbeck (2006).

Figure 5.6 : Austroads Guide to Road Design Warrants

During construction, the access from the Pacific Highway with the assumed increase from the proposed development alone would not meet the Austroads warrant for a short left turn lane. However, with cumulative impacts of potential increase in rate of ash dam capping, the volume of heavy vehicles turning left may exceed the warrant for a short left turn lane in the evening peak period.

5.4.4 Mitigation Measures

While the additional traffic associated with the solar project is not expected to have any cumulative impact on local traffic conditions, the project includes proposed upgrades to both existing entrance intersections to improve vehicle access safety. Alternative measures including construction traffic management are available and would be implemented should the intersection upgrades not be agreed in time for the construction of the project. The works and mitigation measures proposed include:

- A construction traffic and access management plan should be developed and implemented for the project and include a driver code of conduct;
- Upgrade access to the site from the Pacific Highway in consultation with Roads and Maritime Services to include a short left turn lane prior to use of this access associated with the project; and
- Upgrade site access from Ruttley Road in consultation with Central Coast Council to improve access and egress efficiency in a manner that does not reduce road safety.

Preliminary design information for both access intersections is provided in Figure 5.7and Figure 5.8.

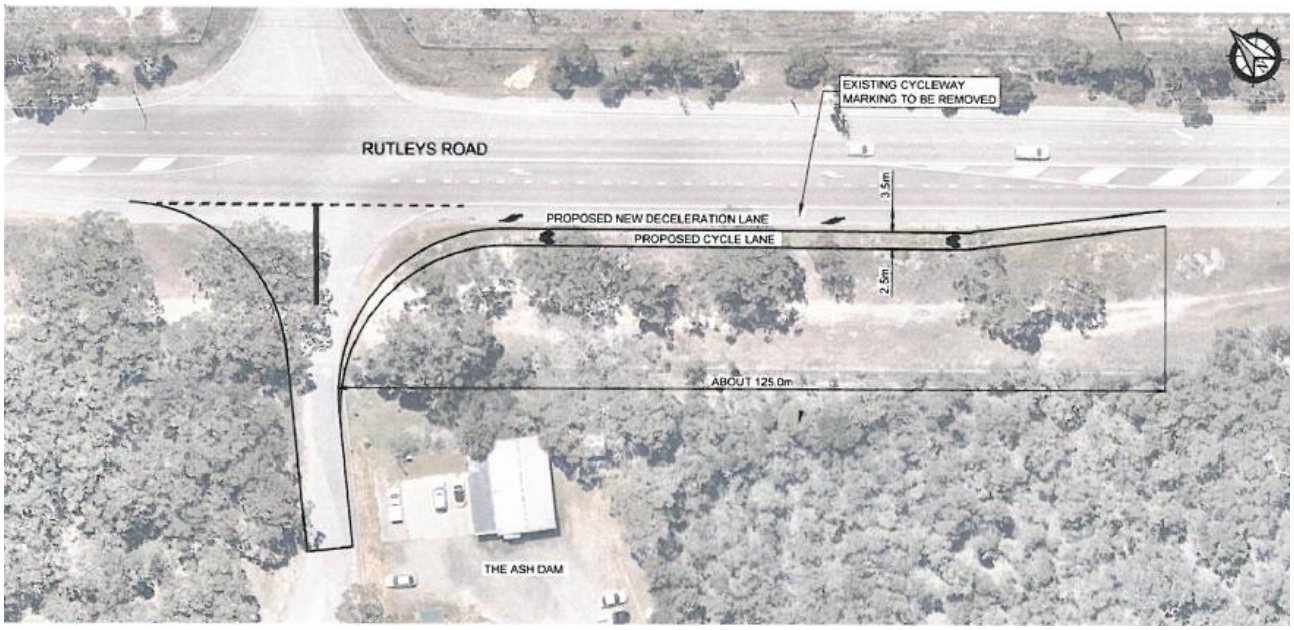


Figure 5.7 : Proposed Ruttleys Road Access Upgrade

Figure 5.8 : Proposed Pacific Highway Access Upgrades

5.5 Land

5.5.1 Methods

The SEARs require an assessment of the impact of the development on the integrity of the VPAD and future rehabilitation management at the Vales Point Power Station, a soil survey to consider the potential for erosion to occur, and paying particular attention to the compatibility of the development with the existing and future land uses on the site and adjacent land (e.g. operating mines, extractive industries, mineral or petroleum resources, exploration activities, urban development, dust generation, and risk of weed and pest infestation) during operation and after decommissioning, with reference to the zoning provisions applying to the land. Addressing the SEARs has involved consideration of the following:

- Desktop consideration of likely consequences on VPAD and power station ongoing operations and rehabilitation activities;
- Investigations of capping material properties and landform to consider erosion risks; and
- Desktop consideration of potential for current and future land-use conflicts.

5.5.2 Existing Environment

The general geology of the area is characterised as quaternary deposits of alluvium, salt, silt, gravel and clay overlaying Triassic formations of claystone, sandstone and shale of the Narrabeen group (Sydney 1:250 000 Geological Series Sheets S1 56-5 in 102219). The A horizon of the natural soil landscape in the area is primarily composed of brown loose loamy sands with yellowish brown clay sands, while the B horizon is characterised yellow brown sandy loams and pedal clay (Matthei, 1995).

The soil landscape units occurring around the disturbed terrain of the VPAD and in the vicinity of the project are predominantly Doyalson with Wyong soil landscapes occurring in the coastal area north of Pond 1.

The Doyalson soil landscape occurs around the majority of the VPAD and in particular in the location of the proposed 33kV network connection. This landscape is characterised by undulating rises with slope gradients less than 10% and broad drainage lines. Where slope gradients steepen, a higher rate of erosion can leave shallow soil. Limitations for this soil include high erodibility, and seasonal waterlogging. The soils tends to be gravelly, acidic, have little organic matter, low water holding capacity and high aluminium toxicity.

Wyong soil landscape is located in areas around Wyee Creek, Mannering Hole and low lying areas to the north of the VPAD. This soil occurs on poorly drained floodplains and alluvial flats. The soil is generally strongly acidic, has low nutrient availability and potential for high aluminium toxicity.

Acid sulfate soils (ASS) are the common name given to naturally occurring sediments and soils containing iron sulfides (principally iron sulfide or iron disulfide or their precursors). The exposure of the sulfide in these soils to oxygen by drainage or excavation leads to the generation of sulfuric acid. Areas of ASS can typically be found in low lying and flat locations which are often swampy or prone to flooding.

The ASS Risk Maps from the CSIRO Australian Soil Resource Information System (ASRIS) database were reviewed to ascertain the probability of ASS being present across the project area. Based on this information, a high probability of ASS occurrence to the north of the site between Pond 1 and Mannering Bay is evident and a low probability to extremely low probability of ASS presence surrounding the remainder of the site. This is consistent with LMCC and CCC Acid Sulphate Soils Mapping that indicates portions of Ponds 1, 2 and 3 as established above land mapped as Class 5, (requiring development consent for works on land below 5 meters Australian height Datum (AHD) likely to lower the water table) with the low lying land between Pond 1 and Mannering Bay as Class 2

(requiring development consent for works below ground surface) and Class 1 (requiring development consent for any works). Twenty six soil sample locations (total 46 sites tested) within the project footprint where found to have pH levels below pH 6.5 indicated capping material is likely to be slightly to moderately acidic in nature. The lowest reported pH in capping materials was pH 4.6 and the maximum reported was pH 8.5. Further details of the soil testing program are included in Section 5.6.8. No suspected ASS was observed in the material excavated during the capping investigation with fill and natural soils not exhibiting characteristics of ASS, as defined in the ASS Management Advisory Committee (1998) as follows:

- Fill and soils did not exhibit a sulphurous smell;
- There was no evidence of shell;
- No jarositic horizons or substantial iron oxide mottling was observed; and
- Fill and soils were not classified as unripe muds (soft, buttery, blue grey or dark greenish grey) or estuarine silty sands or sands (mid to dark grey) or bottom sediments of estuaries or tidal lakes (dark grey to black).

No ground disturbance or alteration to groundwater levels is proposed in identified high ASS risk areas.

The project area is on what appears to have been a Late Holocene lake shore of the Mannering Bay inflow. Lake shore deposits in this location are now buried by overburden from the construction of roads, tracks and power station infrastructure and the deposition of ash.

With the exception of the grid connection infrastructure, the project is wholly contained within the VPAD. The VPAD was developed through the construction of a 13 metre high earthen dam wall across Mannering Creek in the 1960's in accordance with the Ministerial Announcement approving the Vales Point Power Station. Ash was then deposited behind this wall in the vicinity of Pond 1 and Pond 2. The ash ponds were created by progressively filling the area with ash slurry. The VPAD was augmented in the 1980's to include an upstream diversion of Mannering Creek and various other dam walls to enclose the VPAD. Pond 3 was created using a dry ash embankment technique to build on top of previously deposited ash to form the containment wall above Pond 1 and Pond 2.

Once filled to design capacity, the ponds were progressively capped and rehabilitated in accordance with approvals and determinations issued at the time. In relation to the project footprint, capping of Ponds 1 and 2 was undertaken with a nominal capping thickness of 100 mm of cover soil and revegetated. Rehabilitation of Pond 3 involved using clean fill material nominally 300 mm thick and topsoil 150 mm thick. The aim of rehabilitation of the capped areas was to provide a sustainable ground cover that stabilises the area, manages stormwater runoff, reduces erosion, and eliminates dust generation. The current use of the project area is limited to surface water management activities and maintenance of access roads with areas of Pond 3 currently used for third party commercial operations of ash product recovery and recycling. A section of Pond 3 was used for asbestos disposal associated with the power station operations and is fenced and clearly signposted. The asbestos area and commercial operations are excluded from the project footprint.

5.5.3 Existing Land Uses

There are a wide range of buildings and infrastructure which support the generation and transmission of electricity at the Vales Point Power Station in the lands surrounding the project. The core infrastructure comprises the power station itself, the associated administration, service areas and car parks, switch yard, coal stockpile and water storage tanks. Conveyor systems transport coal from the Wyee rail coal unloader to the coal stockpile and then from the stockpile to the power station. The unloader is served by a railway line, which periodically supplies coal from mines within the region.

Transmission lines, which connect the power station to the electricity grid, traverse and extend beyond the landholdings. Distribution lines and associated transformers and switchboards supply electrical power to the conveyor system and other dispersed infrastructure. A pipeline and open

channel drain transfers ash from the power station to the VPAD and water is returned to the power station via a separate pipeline system.

Additional infrastructure (buildings, service facilities, pump stations, power supplies) have been constructed at various locations across the landholdings to support operation of the VPAD, conveyor system and water supply. Several decommissioned and (in some cases) rehabilitated collieries are located on Delta's Vales landholdings. Disused conveyors connecting these mines and the Vales Point coal stockpile are still in place.

The power station landholdings are surrounded by land with a mix of residential, commercial and amenity uses of varying intensities as follows:

- The urban and residential areas of Mannering Park, Wyee and Wyee Point are located to the north and west and Doyalson, Doyalson North and Kingfisher Shores to the south and east;
- There is some broad-scale commercial agriculture in the region. Several intensive agriculture operations are located near the power station landholdings but are not in close proximity to the project. These include greenhouse/horticultural operations and a turkey production operation;
- Apart from the power station, there is only light industrial activity in the vicinity of the project and non-agricultural commercial operations are limited to retail outlets on the Pacific Highway and in the above mentioned urban areas;
- The operational Chain Valley Bay Colliery and Mannering Colliery (currently on care and maintenance although surface infrastructure remains in use) have historic and ongoing workings in the area. DRE has confirmed that coal resources in the Great Northern and Fassifern Seams have already been extracted from beneath this site, and no further coal extraction is considered likely in this area;
- Various recreational and other community facilities are located near the power station. These include the Doyalson fire station, RSL Club and several churches. The power station landholdings also accommodate Tom Barney Oval and park which has public access and the Mannering Park Scout Hall is adjacent to the property;
- The area is well served by road and rail transport infrastructure. The main northern railway line (connecting Sydney with Newcastle and more northern areas) runs along part of the power station landholdings western boundary. The Pacific Highway and several other major roads also provide access to settlements in the area. Residential areas are serviced by a variety of sealed and unsealed local roads;
- A wastewater treatment plant operated by Wyong Council is located adjacent to Delta's land near Kingfisher Shores; and
- There are no conservation or other reserves within or adjacent to the Vales Point Power Station landholdings.

5.5.4 Contamination Potential

A series of waste streams have been approved by NSW EPA for disposal within the VPAD under Environment Protection Licence EPL 761. The following waste streams are approved for disposal with the VPADs:

- Ash from the power station;
- Mill pyrites, residual detergents and oil sheens, sand, concrete products, boiler blowdown, minor chemical spill residues, chemicals for environmental control, VPAD water treatment plant residues, dust returned from the ash recovery plant, marine growth, debris, seaweed, chemical cleaning solutions, oil and chemically impacted soil, de-silting of settling basins, dredge spoil, waste wood, wood chips, dirty water drains, treatment plant discharges, coal handling plant stormwater, neutralised demineralisation effluent, polisher plant effluent, spent ion exchange

resins, chlorine plant storage vessel precipitates, cable tunnel drainage, fabric filter bags, coal chitter and soil capping materials, coal mine dewatering discharges; and

- Any other material approved in writing by the EPA.

Surface water and groundwater quality in the vicinity of the VPAD are currently, and will continue to be, managed in accordance with the monitoring requirements and programs associated with the EPL761 until such time as the scheduled facility is demonstrated to be a safe and sustainable landform and the EPA accepts the surrender of the licence.

5.5.5 Existing Air Quality

In general, background air quality on the Central Coast is good with air quality health standards rarely exceeded with exceedances usually accounted for by bushfires, bushfire hazard reduction burns or localised dust storms. The maximum PM10 24-hour average criteria of 50 µg/m3 were exceeded during 2013 and 2015 at Wyong, where the maximum 24-hour concentration was 70 µg/m³ and 59 µg/m³ respectively. There were no further exceedances recorded during 2013-2017, where the maximum PM10 ranged from 39 µg/m³ (in 2017) to 46 µg/m³ (in 2016). The annual average criteria of 25 µg/m³ was not exceeded during any year.

Air quality monitoring at VPAD is managed in accordance with the requirements and programs associated with EPL761.

5.5.6 Assessment of Consequences to VPAD and Power Station

The majority of the project is located on rehabilitated areas of the VPAD and its use for the project will not restrict the ongoing operation of the Vales Point Power Station or VPAD. The inclusion of the solar project will require consideration in power station land management activities including bushfire management planning (refer to section 5.8.6) and planning for water management as other sections of the VPAD are closed and rehabilitated (refer to Section 5.7).

5.5.7 Assessment of Erosion Potential

A soil survey of capping material properties was undertaken which included the excavation of test pits and soil analysis. Capping materials were found to exhibit sandy-clay or clayey sand properties and further details of the survey are provided in Section 5.5.8. The capped portions of the VPAD do not exhibit signs of erosion despite areas of Pond 2 identified as not having ground cover. All areas of concentrated flow potential which include the former Pond 1 spillway, central drainage line through Pond 2 and the spillway from Pond 3 to Pond 2 are provided with protection including drainage contours, spillways, rip-rap rock channels and settling ponds. Any new drainage systems as part of the project will be established with appropriate protections to prevent erosion and interaction with the underlying ash.

During construction of internal roads, installation of solar panels and electricity transmission lines the capping layer of the ponds may be disturbed. Following construction, shading of vegetation is identified as potentially affecting vegetation cover beneath the panels. This has the potential to generate sediment laden run-off during wet weather. As the ponds have a very shallow gradient it is expected that the stormwater velocities will be slow within the ponds. This will limit the potential for scouring and subsequent transfer of sediments into Mannering Bay. The existing stormwater management infrastructure and available space in which to install management devices would allow standard mitigation measures, as specified in Urban Stormwater: Soils and Construction (Landcom 2004), to be implemented to further mitigate impacts and maintain water quality of discharges to the levels specified in the existing VPAD EPL. All discharges from site will continue to be managed under the conditions of Environment Protection Licence EPL 761.

5.5.8 Assessment of Contamination Risks

The project may have the potential to alter water quality of surface water leaving the VPAD through:

- Excavation for trenching interacting with deposited ash;
- Disturbance through construction and shading by panels reducing ground cover and exposing capping material or ash; and
- Run-off from disturbed areas entering the VPAD's clean water drainage network.

Delta commissioned Jacobs to undertake a soil survey of capping material at selected locations across the VPAD. The scope for the study included test pitting and sample collection within the VPAD capping material across Ponds 1, 2 and 3. A total of 46 test pits were excavated within the VPAD capping material, and analysed for the following parameters:

- Metals and metalloids (arsenic, cadmium, chromium, copper, nickel, lead, mercury and zinc);
- pH and electrical conductivity (EC);
- Total Petroleum Hydrocarbons and Total Recoverable Hydrocarbons;
- Polycyclic Aromatic Hydrocarbons (PAHs), including benzo(a)pyrene;
- Benzene, Toluene, Ethylbenzene and Xylenes (BTEX);
- Polychlorinated Biphenyls (PCBs); and
- Asbestos (absence / presence).

The capping investigation results identified the following:

- The sub-surface material encountered in the test pits (TP01 to TP46) generally consisted of sandy clays and clayey sand fill materials;
- Thicknesses of capping materials ranged from a minimum depth of 0.05 metres below ground surface (m bgl) to a maximum depth of 2.0 m bgl;
- The average thickness of capping material across the three ponds was 0.145 m bgl within Pond 1, 0.227 m bgl in Pond 2 and 0.56 m bgl in Pond 3. These materials were underlain by deposited ash. No natural material was encountered during the investigation;
- Soil samples from test pits were selected for analysis based generally on providing vertical and lateral coverage of potential contaminant extents within the capping material and on visual observations;
- Analytical results were compared to industrial land usage criteria contained under the National Environment Protection Council (NEPC) National Environment Protection (Assessment of Site Contamination) Measure 1999 as revised 2013 (NEPM, 2013);
- All soil samples recorded contaminant concentrations below the adopted Site Assessment Criteria (SAC);
- No asbestos was detected within samples analysed or observed within soil samples or within capping material and was not observed on the surface with the exception of one fragment located near the access road adjacent to Pond 1; and
- Preliminary waste classification of the samples analysed indicated that the capping material sampled during the investigation would be classified as General Solid Waste (non-putrescible) if requiring offsite disposal.

Contamination above the SAC was not identified within Pond 1, 2 and 3 for capping material for the applied analytical regime at the locations tested. Pre-existing or legacy contamination was not present within the pond capping material at the locations tested. Contamination exposure risks associated

with current use for the industrial site and risks to site users in the form of workers and to ecological receptors is considered to be low.

Surface water from rehabilitated Ponds 1, 2 and 3 currently discharges to Mannering Bay via the Pond 1 spillway. As such, alteration of water quality within surface water from the project site has the potential to enter Mannering bay unless appropriately managed. Considering the flat landform on which the project is to be constructed, it is unlikely that high velocity flows would eventuate on site that would lead to the mobilisation of sediment or contaminants off site as a result of the project. Seepage water from the Pond 1 and Pond 2 is currently pumped back to the active portion of the VPAD but can be discharged under the conditions of EPL761. Any water that interacts with ash within excavations would to be returned to the active VPAD. Any excavated ash would also be deposited in the active VPAD. Mitigation measures appropriate for the management of erosion and sediment controls are proposed to minimise these risks during construction and the maintenance of ground cover is proposed to minimise risks during operations.

Groundwater quality in the vicinity of the VPAD is monitored via a network of water bores under the conditions of EPL761. Water quality results are published monthly on the Delta Electricity website and annually through the EPA annual return reporting framework. Historically, levels of groundwater quality analytes assessed in the VPAD bores are not consistently elevated in comparison with background bores and there are no clear trends to indicate that water is leaching from the VPAD such that it is affecting groundwater quality. The installation of solar panel mounting structures that penetrate the capping material will likely come in contact with ash material and the groundwater system but the impact on water quality is considered to be negligible. Ongoing monitoring of the groundwater system will continue under the conditions of EPL761 during construction and operation of the project.

Sampling and analysis of ash properties was not undertaken on the basis that all ash encountered through excavations will be backfilled and capped to reflect the existing situation with excess ash material transferred to the active areas of the VPAD. Given the previous assessment works associated with groundwater and surface water studies at the VPADs, it is considered that appropriate mitigation measures could be designed and implemented to manage potential environmental risks associated with the construction of the solar project.

5.5.9 Assessment of Air Quality Impacts

Currently the fly ash collected from the Vales Point Power Station is deposited in the VPAD. The VPAD has been identified as a potential source of dust emissions under adverse conditions (predominantly strong westerly winds) and therefore the surface of the VPAD is managed to control dust pollution. Current procedures for managing dust would continue to be implemented during the construction and operation period including the use of water trucks for dust suppression on roadways, helicopter water bombing during adverse conditions, low vehicle speed limits and the dust monitoring regime required by EPL 761 would continue.

The project may lead to the temporary disturbance of rehabilitated areas of the ash dam, delivery of aggregate and concrete for access tracks and footings, trenching and ground disturbance for the installation of electrical collection and distribution infrastructure. These works have the potential to lead to dust generation that in the absence of management could lead to offsite impacts particularly where ground disturbance and trenching uncovers ash.

Levels of air borne dust would be expected to be low level and unlikely to cause concern to sensitive receivers provided standard mitigation measures are implemented.

Construction equipment and plant may emit exhaust fumes and would contribute to local air quality. However, in the context of the existing vehicular movements, existing power and industrial operations and operation of the ash dam within the area and given the short duration of the construction period, this is considered to be negligible.

5.5.10 Consideration of Risks to Project

The following risks to the project from the integrity of the VPAD are identified:

- Ash and dam wall stability and settlement;
- Subsidence and settlement impacts to solar generation efficiency; and
- Ash property interactions with mounting system.

The VPAD is currently listed by the NSW Dams Safety Committee (DSC) as a prescribed dam under the NSW *Dams Safety Act 1978*. The DSC is a statutory body whose basic role is to ensure that all prescribed dams are in a condition such as to not endanger downstream residents, property or the environment. It is also responsible for ensuring that coal mining under or adjacent to dams does not result in significant damage to the dams or uncontrolled loss of the storage.

In order to fulfil its role under the *Dam Safety Act 1978*, the DSC has established guidelines for dam owners relating to the design, safety management and surveillance of dams. In particular the guidelines require compliance in the areas of flood capacity, seismic stability, emergency planning, inspection and monitoring activities, safety management, surveillance reporting and hydrological analysis. The requirements vary for each dam and depend largely on the consequence category of the dam, which is the potential for adverse consequences in the event of a dam failure. The condition of the dam and the probability of dam failure are also taken into consideration.

Since the construction of the VPAD, a continual review of the dam's design and operation has been undertaken. In accordance with the reporting requirements of the DSC, a comprehensive inspection is carried out at VPAD on a five-yearly basis with regular and extensive monitoring completed in the interim. The surveillance report provides a detailed examination of the performance of the VPAD embankments, surveillance inspections, monitoring and a review of operation and maintenance and emergency management, and items additional to routine maintenance. The most recent comprehensive inspection report (2013) found the following:

> *This is the seventh report to the NSW Dams Safety Committee (DSC) on the surveillance of Mannering Creek VPAD and Vales Point Ash Dam. The report covers the period from September 2007 to September 2012. The report was prepared by Delta Electricity's dam safety consultant, Aurecon to satisfy the DSC requirements for a Type 2 report.*
>
> *Regular visual inspections, instrument monitoring and general surveillance of Mannering Creek VPAD and its associated embankments has indicated that the embankments and foundations are in good condition, and that the facility is performing satisfactorily, and in accordance with expectations.*
>
> *The installed instrumentation is serviceable and providing valuable monitoring data. There is no indication in the available data of any unsafe or abnormal trends.*
>
> *The inspection and monitoring frequencies at the dam are in accordance with NSW Dams Safety Committee requirements, and all work is being carried out to a satisfactory standard. An Operation and Maintenance Manual has been prepared in accordance with ANCOLD Guidelines. A modified DSEP is included in the Operation and Maintenance Manual.*
>
> *The consequence categories for the dam have been reviewed briefly, based on the requirements of the NSW Dam Safety Committee, set out in its information sheet DSC3A "Consequence Categories for Dams" and DSSC3F "Tailings Dams". The dam is considered to fall into the SIGNIFICANT consequence category for both sunny day and flood conditions.*
>
> *It is assessed that the dam would be able to pass extreme floods in excess of the (*Probable Maximum Flood*) PMF without overtopping of the embankment. This meets the requirements for acceptable flood capacity set down for a dam of this consequence category by the NSW Dams Safety Committee, and hence the flood handling capability of the dam is considered adequate.*

The static stability and earthquake capability of the embankments were assessed empirically and are considered to be acceptable".

The construction of the solar components of the project has limited potential to alter dam safety. The project does not involve the establishment of permanent infrastructure on dam embankments other than access tracks. As such the project does not limit access for safety inspections or the undertaking of maintenance works on the dam walls.

5.5.11 Consideration of Potential Land Use Conflicts

Consideration of the findings of the technical assessments summarised in the EIS, and review of findings of similar scale solar projects indicates that solar developments are considered largely passive and unlikely to present land use conflicts with any existing or likely future land-use in the region. A review of findings in relation to the four recently approved solar projects has been undertaken. Examples of projects of a similar scale, ranging from 20 to 65 MW capacity, that are located on cleared agricultural land with similar buffers to population centres include:

- State Significant Development Assessment - Griffith Solar Farm (SSD 6604);
- State Significant Development Assessment - Parkes Solar Farm (SSD 6784);
- State Significant Development Assessment - Riverina Solar Farm (SSD 7482); and
- State Significant Development Assessment - White Rock Solar Farm (SSD 7487).

The findings of these assessments are summarised below along with discussion of findings of the assessment of the project to describe the potential for land use conflicts to arise from the project.

Noise related land use conflict

All four approved solar projects resulted in similar findings in relation to noise impacts and indicated that:

- The proposed construction activities would largely comply with the noise management levels in the Interim Construction Noise Guideline (ICNG);
- There would be short term exceedances of these management levels at some nearby residents during certain construction and decommissioning activities, however these levels would still be below the highly noise affected levels in the ICNG; and
- There would be negligible noise during operation.

The noise impacts associated with the project have been found to be similar to that identified in the four approved solar projects reviewed (refer to Section 5.3). While some isolated residential receivers are located within 300 metres of the project, reasonable and feasible measures will be implemented to manage any potential construction and operational noise impacts. As with all other solar projects reviewed there is expected to be negligible noise during operation and as such no potential for ongoing land-use conflicts with surrounding current or future land uses based on noise. As Delta control the land surrounding the project, with the exception of the few properties that have been assessed for impacts, there is unlikely to be a change in land-use in the immediate vicinity of the project that would be subject to noise impacts from the project to the extent that any future development would be rendered unfeasible.

Visual related land use conflict

The findings in relation to visual impacts for the four approved solar projects are paraphrased as follows:

- While projects were often visible from residences surrounding the site, including within 1 km of the site no submissions were received from any of the surrounding landowners;
- The proposed solar farm is a relatively low-lying development with panel heights of approximately 2.5 m; and
- Undulating landform and existing trees would provide effective screening, and ensure there would be no significant impacts on surrounding land residences, significant vistas or road users.

The visual impact assessment provided in Section 5.6 identified that the solar components of the project is well screened in close proximity from external views by a large vegetated buffer that surrounds it and by the favourable topography of the site. While the community is likely to be sensitive to any increased visibility of the VPAD there is not considered to be any local or regionally significant scenic or visual values that would be impacted by the solar development.

Hazard related land use conflict

The findings in relation to hazards for the four solar projects are paraphrased as follows:

- The projects would comply with the National Health and Medical Research Council standards for electro-magnetic fields; and
- There are fire risks associated with all large solar farm developments and that these risks can be suitably controlled through the implementation of standard fire management procedures.

Fire risks associated with the project are found to be consistent with the other projects reviewed as described in Section 5.8.6 as the Vales Point land holdings which are actively managed under a Bushfire Management Plan. There is adequate space available within the project area for the provision of asset protection zones and defendable space and as such the development of the solar project would not introduce an unacceptable increased risk of fire to surrounding existing or future land uses.

Traffic related land use conflict

The findings in relation to traffic for the four approved solar projects are paraphrased as follows:

- During the peak construction period there would be 30-50 heavy vehicle movements and 80 -100 light vehicle movements daily;
- There would be negligible vehicle movements during operation; and
- The projects would not result in significant impacts on road network capacity, efficiency or safety.

The traffic and access assessment summarised in Section 5.4 found that the project would not affect the viability of any surrounding future land-use as there would be very limited ongoing increase in traffic movements beyond the construction phase and as such no impact on road capacity or increase in traffic noise.

Future land use conflict

The four approved solar projects reviewed were proposed to be constructed in rural agricultural areas. In relation to land use the projects found that:

- The inherent agricultural capability of the land would not be affected by the projects due to the relatively low scale of the developments;
- The land could be used for grazing during operations and could be returned to agricultural uses after the projects are decommissioned;
- Both the Department of Primary Industries (DPI) – Agriculture and relevant Councils do not consider that operation of the projects would compromise the long-term use of the land for agricultural purposes;
- The proposed solar farms represent an effective and compatible use of the land within the regions in which they operate;
- The proposed solar farms would not fragment or alienate any resource lands during operation as they have generally low impacts and could be easily returned to agricultural land in the future if decommissioned; and
- There would be no increased demand on Council's public amenities or services nor any requirement for developer contributions.

There is no currently proposed future use of the project area beyond a self-sustaining, non-polluting environment. The project area has no inherent agricultural capability.

The VPAD and surrounding area is known to be undermined with mining operations ongoing in the area. The installation of a solar project would not limit any surrounding exploration. Subsidence or settlement has the potential to damage panels or move them off their ideal solar tracking points. Any future underground workings that are not currently approved would need to consider the subsidence effects in the area of the VPAD and manage subsidence consequences particularly in relation to dam safety. The detailed design of the project would account for settlement and subsidence risks but is unlikely to restrict future mining potential.

The project will not affect the current commercial and industrial operations occurring on or in the vicinity of the project. Access arrangements for the project have considered cumulative traffic impacts. As the project area contains no current productive use there will be no loss of income as a result of the project.

5.5.12 Mitigation Measures

The following VPAD integrity mitigation measures would be implemented:

- Detailed design to consider geotechnical properties and safety aspects of the VPAD and limit development on the ash-embankment and dam wall to access tracks unless otherwise demonstrated to be safe; and
- Detailed design to consider the capacity of the existing stormwater network to convey expected stormwater flows from the site and future capped areas of the VPAD.

The following surface water, erosion and sediment control measures would be implemented:

- Any new stormwater infrastructure is to be installed in a manner to prevent surface water interaction with underlying ash;
- A detailed erosion and sediment control plan will be prepared as part of the detailed design process and will address the requirements of the Urban Stormwater: Soils and Construction (Landcom, 2004);

- The existing clean-water system will be treated as a dirty water system for the duration of construction until such time as disturbed areas are rehabilitated to their pre-development level and analysis of water quality within detention basins achieves performance requirements of the EPL761;
- Discharges to Mannering Bay during construction, and until such time as disturbed areas have been rehabilitated will only occur where water quality is demonstrated to be non-polluting and meet the current EPL761 conditions; and
- Ash excavated during construction will be returned to the excavation and capped consistent with the existing situation or be transferred to the active VPAD.

The following air quality management measures would be implemented:

- Any ash excavated or uncovered would be kept wet until it can be replaced below capping or transferred to the operational portions of the ash dam for management;
- Locate stockpiles away from sensitive receivers to the extent possible;
- All work areas and stockpiles will be visually monitored for dust generation, particularly during hot, dry or windy weather;
- In the event of dust generation, appropriate dust suppression measures (e.g. watering, covering stockpiles with tarpaulins or geotextile fabric, appropriate seeding) would be implemented;
- Work practices generating dust would be modified or cease in adverse weather conditions if other measures fail to prevent offsite dust emissions;
- All work vehicles/machinery will be maintained in good working order and in accordance with relevant standards;
- Work vehicles/machinery will not be left running or idling when not in use;
- All loads of waste, excavated material, soil, fill and other erodible matter that are transported to or from the work site will be kept covered at all times during transportation; and
- Air monitoring required under Delta's existing EPL, which includes source monitoring and community monitoring to measure air quality at various locations within and around the power station, would consider the projects contribution to air quality impacts.

The potential for land-use conflict is low and will be managed in accordance with the mitigation measures proposed in relation to noise and vibration, air quality, traffic, bushfire, biodiversity and visual impacts.

5.6 Visual

5.6.1 Methods

The SEARs require an assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain and if required a draft landscaping plan for onsite perimeter planting, with evidence it has been developed in consultation with affected landowners. As the VPAD is surrounded by a vegetated buffer and has favourable topography, the methodology for the visual impact assessment has been limited to:

- Desktop identification of potential viewpoints considering topography and potential breaks in the vegetation screen; and
- Site visit to confirm that no new breaks in the screen have emerged and to capture photos of the VPAD from publicly available locations.

Discussion of potential for glare and impacts to air traffic and road corridors is limited to discussion of solar panel properties in relation to their potential to generate glare and review of prior consideration in relation to other approved solar projects.

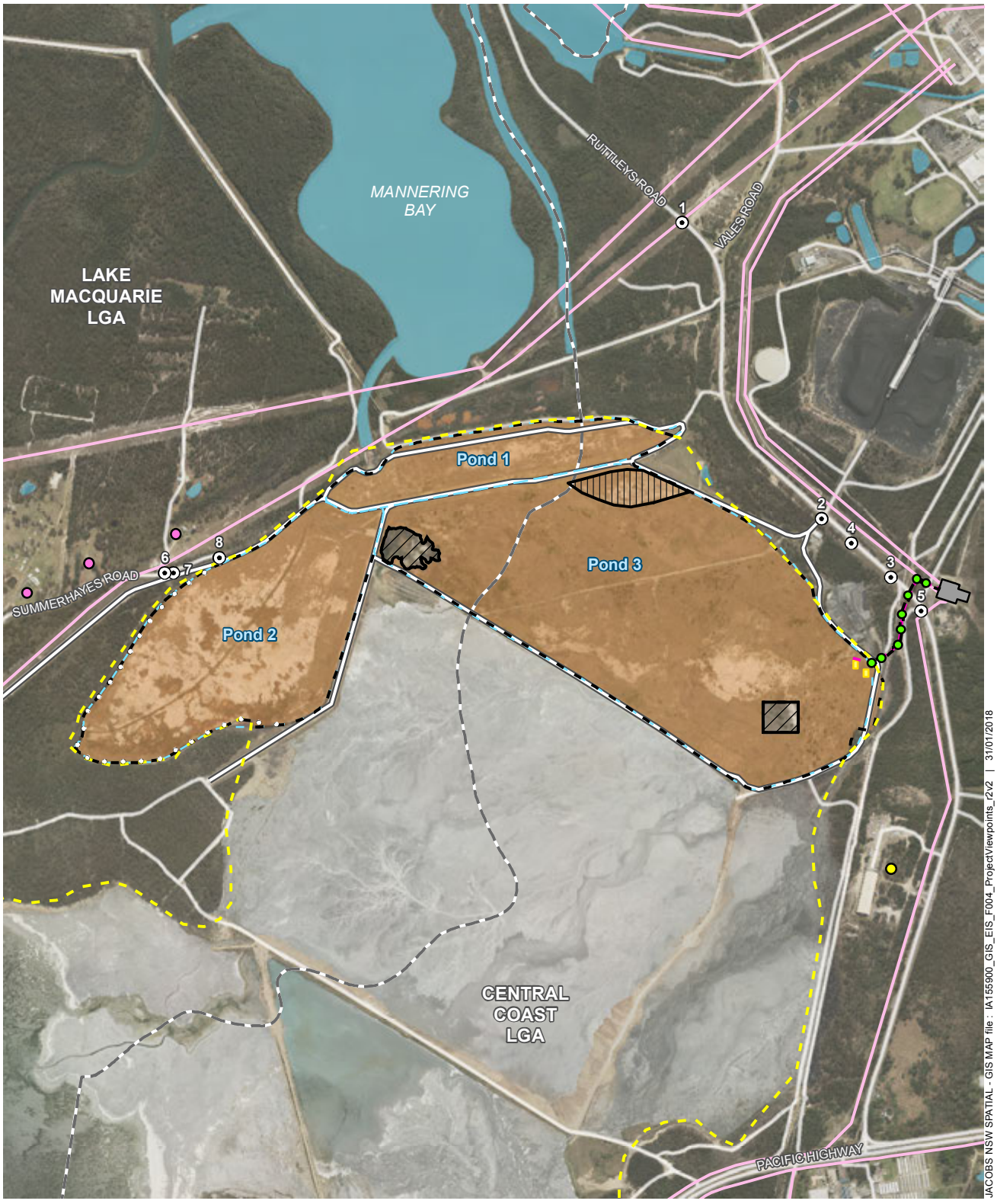
5.6.2 Existing Environment

The VPAD is well screened from external views by a large vegetated buffer that surrounds it and by the favourable topography of the site. No residential properties have views of the project. Publicly accessible areas within the potential view shed of the VPAD are limited to Ruttleys road and Summerhayes Road. There are no public recreation areas or public facilities along Ruttleys Road and no residential or commercial receivers. Summerhayes Road is an unsealed, no-through road with only one private residence located near its end that would attract visitors to the area. While the community is likely to be sensitive to any increased visibility of the project it is not located within any local or regionally significant scenic or visual vistas.

The VPAD currently presents as a flat and largely cleared area with limited vegetation above waist height. From a distance, where visible, the VPAD appears as a light-coloured break within the darker surrounding vegetation.

5.6.2.1 Viewpoints

View shed analysis was considered largely meaningless given the known presence of an almost continuous vegetated buffer controlled by Delta surrounding the VPAD and with no planned developments likely to encroach on this buffer. Existing partial breaks in the vegetation buffer were visited as viewpoints 1 to 8 in Figure 5.9. The available views towards the project are shown in Viewpoint photos 1 to 8.



Legend

- Viewpoint
- Residential receptor
- Industrial receptor
- Direct impact area
- Construction compound and laydown area
- Exclusion area
- Ash dam boundary (approx.)
- Pond boundary
- Proposed perimeter road
- Existing perimeter road
- Electric pole
- Proposed 33kV cable
- Existing electricity transmission line
- Proposed building
- Existing building
- LGA boundary

0 250 500m
1:15,000 @ A4

Figure 5.9 | Viewpoints

Viewpoint 1 : Ruttleys Road North

Viewpoint 1 results from a break in the vegetation buffer related to overhead transmission lines. Public access to the viewpoint is limited to vehicles passing by on Ruttleys Road with no opportunity to stop at this location due to safety barriers on and no pedestrian pathways on both sides of the road. The viewpoint is dominated by overhead transmission lines and the solar components of the project would be visible in the distant background appearing as light-coloured area amongst darker vegetation. The viewpoint is considered to have a very low level of sensitivity due to the limits on access and use by the public beyond momentary glimpse from vehicles passing by and due to the already disturbed nature of the view.

Viewpoint 2 : Ruttleys Road Access

Viewpoint 2 results from the ash-dam access road providing a marginal break in the vegetation buffer. Views of the solar components of the project will be practically non-existent but may increase should the thin strip of trees be removed. The view is dominated by existing gate-house infrastructure and is considered to have a very low level of sensitivity due to the limits on access and use by the public beyond momentary glimpse from vehicles passing by.

Viewpoint 3 : Ash Delivery Pipes

Viewpoint 3 results from the ash delivery pipelines creating a gap in the vegetation buffer. Ash stockpiles related to existing ash mining operations are evident beyond the vegetation. There is limited potential for a change in visibility of the VPAD or solar components of the project at this location which is also considered to have very low sensitivity due to the lack of public activity in the area.

Viewpoint 4 : Network Connection Crossing (looking south east)

Viewpoint 4 is of the location of the network connection infrastructure at its crossing of Ruttleys Road looking south-east. The viewpoint is dominated by existing energy distribution infrastructure and the conveyor gantry and any additional infrastructure in this location would not alter the current character.

Viewpoint 5 : Network Connection Crossing (looking north west)

Viewpoint 5 is of the location of the network connection infrastructure at its crossing of Ruttleys Road looking north-west. The view also is dominated by road and electricity network infrastructure and the conveyor gantry and any additional infrastructure in this location would not alter the current character.

Viewpoint 6 : Summerhayes Road 1

Viewpoint 6 is located approximately 50 metres beyond the driveway to the last private residence on the no-through Summerhayes Road. While publicly accessible, there is very little public activity in the area as it is near the end of a no-through road and is considered unlikely to be used for anything other than access to very few private residences. Views of the VPAD and solar components of the project are available from vehicles on Summerhayes Road as the thin strip of light grasses beyond the trees in the foreground.

Viewpoint 7 : Summerhayes Road 2

Viewpoint 7 is from the fence line approximately 50 metres beyond the driveway to the last private residence on the no-through Summerhayes Road. Partially screened views of solar components of the project are available as illustrated above. This viewpoint is unlikely to be accessed by members of the public unless specifically seeking out views of the proposed solar project.

Viewpoint 8 : Summerhayes Road 3

Viewpoint 8 is at the fence line at the end of Summerhayes Road at. Clear views of solar components of the project are available as illustrated above. This viewpoint is unlikely to be accessed by members of the public unless specifically seeking out views of the proposed solar project. Views of the solar project area are partially obscured by a small grassed embankment.

5.6.3 Visual Impact Assessment

In the absence of elevated viewing locations, solar projects on flat land generally present as low dark/black expanse within a thin band interspersed with inverter/transformer infrastructure. In the absence of readily accessible or used public viewpoints the insertion of dark coloured expanse in place of light coloured grasses is unlikely to be noticeable.

The short transmission line would be expected to be visible to the public regardless of the connection point as it crosses the road network. Given the amount of electricity infrastructure surrounding the VPAD, and particularly at the proposed crossing of Ruttleys Road, a new transmission line is unlikely to change the visual character of the area. The detailed design for the project will also consider the use of existing pipeline culverts to accommodate an under-road option for the transmission line that would further reduce visual impact potential.

As the surrounding buffer lands are owned by Delta, there is limited potential for new viewpoints to be in the process of being established that would impact on private dwellings or public open spaces. The existing private residences on Summerhayes Road are set beyond a small crest and do not have direct views from dwellings or curtilage.

While scenic flights originating from Lake Macquarie airport are expected in the area of the solar project, the change in view from open grassland to dark coloured solar arrays within the context of the

surrounding power station, mining, residential and vegetated features is unlikely to reduce the quality of the scenic experience.

5.6.4 Glare and reflection

The Department of Resources and Energy web site identifies that:

> *"Solar farms are not considered to be reflective. Photovoltaic panels are designed to reflect as little light as possible (generally around 2% of the light received) to maximise their efficiency, absorb sunlight and convert it to electricity. Minimising the light reflected from solar panels is a goal of panel design, manufacture and installation. The glare from panels is significantly less than that from bodies of water".*

In the absence of visibility of the solar arrays from the road network there is negligible potential for any glare or reflection to impact the safety of motorists. Scenic and adventure oriented flights from Lake Macquarie airport may pass the vicinity of the solar project, but as the project is likely to be less reflective than the large expanses of open water of Lake Macquarie the safety of air traffic is unlikely to be compromised

5.6.5 Mitigation Measures

Given the low likelihood of any visual impacts arising from the project, visual impact mitigation measures beyond the maintenance of existing vegetated buffers are considered unnecessary.

5.7 Water

5.7.1 Methods

The SEARs require an assessment of the impact of the development on water including:

- *an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including Mannering Bay, wetlands, riparian land, groundwater dependent ecosystems and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts;*
- *details of water supply arrangements; and*
- *a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with Managing Urban Stormwater: Soils & Construction (Landcom 2004).*

This assessment has included review of available relevant information on stormwater, flooding and topographic data for the existing capped and revegetated areas of Ponds 1, 2 and 3 of the VPAD. In particular, the Vales Point Ash Dam Management Plan 2015-2020 (Aurecon, 2015), which summarises flood capacity assessments for the active portions of the VPAD and stormwater and seepage management for the closed portions of the VPAD, has been reviewed. This report identifies potential stormwater and flooding constraints on, and impacts from, the solar project and identifies management measures to be developed further through the detailed design. The details of water supply arrangements are provided in Section 2.3.7.

5.7.2 Existing Environment

Hydrology

The project is proposed to be located within the land holding of the existing Vales Point Power Station and specifically on capped portions of the VPAD (Pond 1, Pond 2 and Pond 3). The most recently available survey information for the project has been reviewed and shows the hydrology for the project area as illustrated in Figure 5.10 : Catchment Areas of Ponds 1,2, 3 and 4

Pond 4 is currently being capped and revegetated in accordance with separate approvals, and once completed the final landform design is intended to direct surface water flows to Mannering Bay via Pond 2 and then the spillway as shown in Figure 5.5. Until completed, decant water from Pond 4 will continue to be directed to the active portions of the VPAD to the south.

Rainfall runoff generated from Ponds 1, 2 and 3 is designed to flow away from the active portions of the VPAD and discharged via culverts, spillways and weirs to Mannering Bay. Following rehabilitation, run-off from Pond 4 is also intended to discharge into Pond 2. Catchment boundaries and contours for Ponds 1, 2, 3 and 4 are shown in Figure 5.10 and catchment characteristics for Ponds 1,2, 3 and 4 are shown in Table 5.12. Pond 1 has the smallest catchment area and steepest slopes. Catchment areas of Ponds 1, 2 and 3 are considered pervious as they have not been established to achieve set permeability criteria.

Table 5.12 : Catchment Characteristics

Pond	Catchment Area (ha)	Catchment Slope (%)	Elevation (m AHD)
1	26	5.10	26 - 2
2	64	0.30	34 - 12
3	83	0.22	32 - 18
4	185	0.28	36 - 14

Drainage and Flooding

Key drainage features for Ponds 1, 2, 3 and 4 (proposed) include the following:

- A 50m long concrete spillway (crest at RL 10m) in the north-western side Pond 1;
- Surface water from Pond 1 can drain into the northern wetland through stormwater pipes (approximately 200mm diameter) under the road and along the stormwater diversion channel located along the north-eastern side of the pond;
- Three 900mm diameter culverts run directly into the concrete spillway from the north-eastern side of Pond 2;
- A rip-rap rock drainage channel runs through the centre line of Pond 2 from the top of the pond to a sediment pond near the inlet of the three 900mm diameter culverts; and
- Rainfall runoff from Pond 3 discharges into Pond 2 via a 20m long spillway.

Stormwater generated from Pond 4 will be discharged into Pond 2 via a spillway located in the western corner of Pond 4 at the completion of the rehabilitation works and confirmation that the water quality is suitable for discharge.

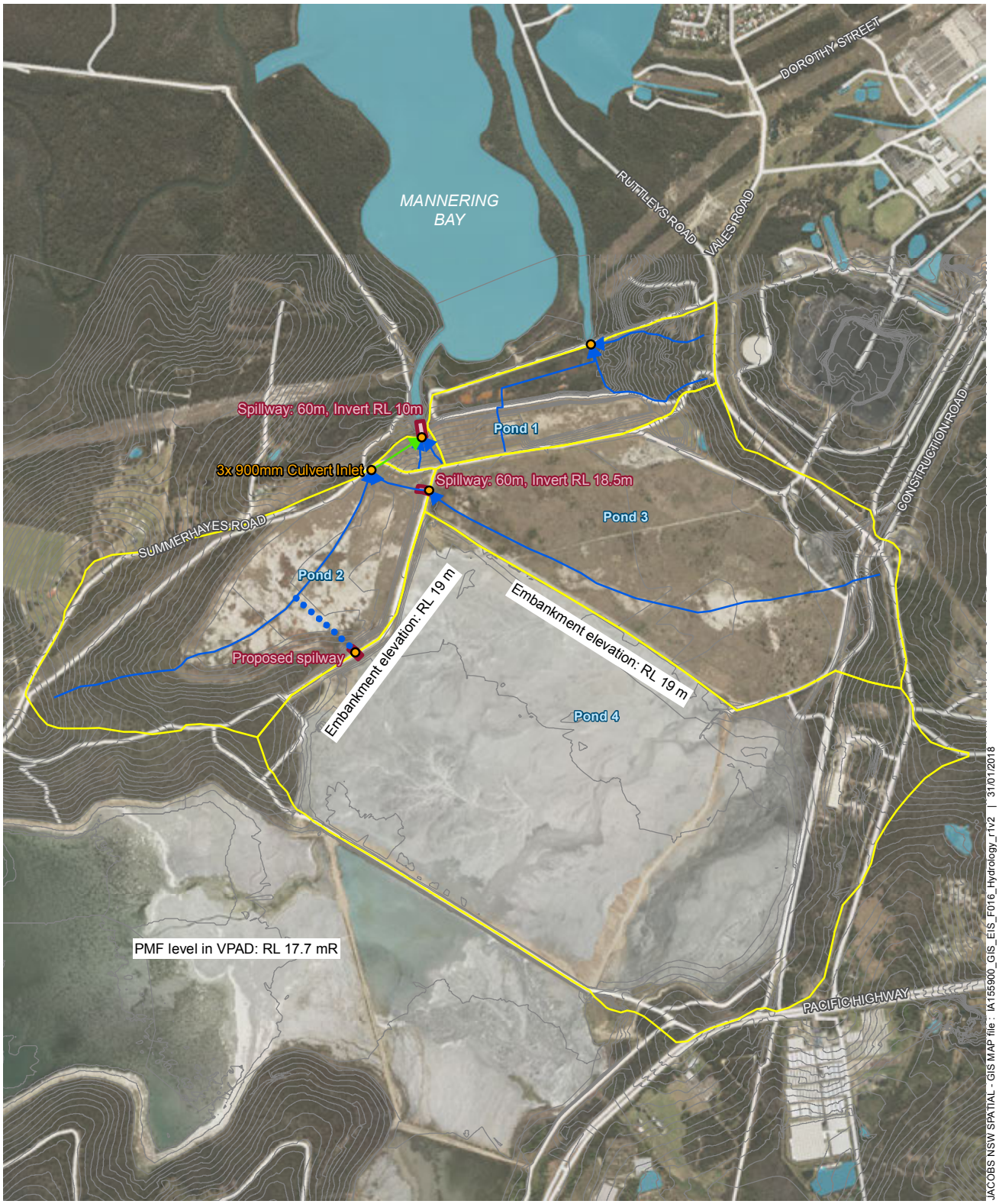


Figure 5.10 | Site hydrology

At present, stormwater from Ponds 1, 2 and 3 is discharged into Mannering Bay, which is connected to Lake Macquarie. The surface water level of Mannering Bay and Lake Macquarie is RL 0 m. Lake Macquarie is connected to the ocean and has a tidal range of approximately 1.2 m with the tadal range in the vicinity of the project less than this. The stormwater outlets are located several metres above the lake levels and hence Ponds 1, 2 and 3 are not impacted by flooding in Mannering Bay or Lake Macquarie and are not tidally influenced.

The crest of the dry ash embankment which divides Pond 4 and the VPAD from Ponds 1, 2 and 3 is located at RL 19.0 m which is approximately 1.3m higher than the probable maximum flood level for the active sections of the VPAD. Hence, Ponds 1, 2 and 3 are not subject to flooding due to extreme flooding in the VPAD. However, due to the flat topography, Ponds 1, 2 and 3 can potentially be subject to shallow inundation with low flow velocities during significant storm events.

Groundwater

A subsoil collection system is installed along Pond 1 and 2 to collect the groundwater seepage. The system diverts seepage via pipe network draining to a large pit in the spillway in Pond 1. Pumps in the pit return the seepage water from the pit to the active portion of the VPAD. The subsoil drainage system is intended to prevent seepages discharging into Mannering Bay and is monitored and maintained in accordance with the conditions of a licenced discharge point in the EPL761.

5.7.3 Potential Impacts

The EPA identified issues relating to surface hydrology as important during development of the SEARs for the project. These SEARs refer to the NSW Government's Floodplain Development Manual, developed to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property (DIPNR 2005), as of relevance to the assessment. An investigation of surface hydrology at the project area was undertaken by Jacobs and is summarised below. Consistent with the Floodplain Development Manual, the report assesses the risk of flooding.

A review of the available relevant information on stormwater, flooding and topographic data as described above was undertaken. As the project is proposed to be sited on an enclosed surface water and actively managed groundwater system, assessments of impacts of surface and groundwater resources were limited to a description of the functioning of the VPAD and the implication of the project on this function. For flooding within the project area, the main modes investigated are over-crest flooding from the active VPAD, over-bank flooding from Mannering Bay, over-land flooding from catchments of the revegetated ponds and due to stormwater system design.

5.7.4 Over-crest Flooding of Solar Project

Over-crest flooding occurs when the depth of water level in a reservoir exceeds the crest level and spills downstream. For the previous hydrology analysis of the VPAD in 1998, a RORB model was developed to assess the peak flows and the depths of flooding in the dam. This RORB model was calibrated and used to calculate the inflow and outflow hydrographs for the storage for a probable maximum flood (PMF) event. The results of this study are presented in Table 5.13.

Table 5.13 : Results of the RORB hydrological modelling

Item	RORB estimate (1998)
PMF Depth	770 mm
PMF Inflow	379 m^3/s
PMF Outflow	171 m^3/s
Critical Duration	6 hours
Max. Flood Level	RL 17.7 m

The crest of the dry ash embankment, which divides the VPAD from the rehabilitated areas (Ponds 1, 2 and 3) is at an approximate elevation of RL 19.0 m. This is considerably higher elevation than the maximum flood level. This means that flooding due to the active portions of the VPAD overtopping to the project area is not considered to be a flooding mechanism for the project. It is noted that this study was completed in 1998 and since then there has been changes in the sites geometry. In particular, the catchment size of the active VPAD has been reduced with the capping of Pond 2 and 3, and will be further reduced with the capping and management of runoff from Pond 4, reducing the maximum flood levels further due to the decreased inflows. Water levels in the VPAD are also now actively managed by a return water system to the power station.

Since this modelling was undertaken there have been changes in the methodology of the calculation of extreme floods. Given the noted elevations and reducing catchment of the active VPAD it is nevertheless considered unlikely that there will be a significant increase in the magnitude of the PMF that would pose a risk of over-crest flooding to the project.

5.7.5 Over-bank Flooding of Solar Project

Surface water from the Pond 1 and 2, and by association Pond 3 and in the future Pond 4, discharge into Mannering Bay, which is connected to Lake Macquarie. The surface water level of Mannering Bay and Lake Macquarie is RL 0 m. Lake Macquarie is connected to the ocean and has a tidal range of approximately 1.2 m. The stormwater discharge points from the ponds have an elevation of approximately RL 10 m. Due to the large elevation difference between Mannering Bay and the ponds discharge points, over-bank flooding is not able to occur into the project area from Mannering Bay.

5.7.6 Over-land Flooding of Solar Project

Overland flooding occurs due to the excess rainfall runoff within a catchment. The depth, volume and velocity of runoff is a function of the size, topography and permeability of the catchment. Using the survey contours provided, the representative catchments of the ponds were delineated. Pond 4 is currently undergoing capping and in the foreseeable future would be removed from the VPAD area and added to the solar project catchment. The results of this catchment delineation are presented in Table 5.14.

Table 5.14 : Results of the catchment delineation

Pond	Area of pond (km^2)	Area of ponds catchment (km^2)
1	0.10	0.26
2	0.30	0.64
3	0.63	0.83
4	1.45	1.85

Catchment for Pond 4 is almost as large as the other ponds combined catchments. How Pond 4 is formed when it is capped will be very important in determining the flooding behaviour within the project area. Runoff is highly influenced by the terrain within the sub-catchments, but given the flat topography and observed ponding on Pond 2 and 3, the project area could potentially be subjected to some level of inundations due to large rainfall events. This would be exacerbated where stormwater networks through the site are constrained or become blocked. It is expected that Pond 2 is the most critical pond where flooding could occur. Blockage of the culvert draining Pond 2 will need to be avoided to prevent larger inundation depths in Pond 2. The detailed design of the project will need to consider drainage and stormwater flows through the project area.

5.7.7 Offsite Flooding Impacts

Using the delineated catchments and a simplified stormwater network, an XP-RAFTS model was developed. This model was used to estimate the peak outlet flows for an annual exceedance probability (AEP) of 1% from the solar project footprint. It was found that the peak flows from Pond 1, which incorporates inflows from Ponds 2, 3 and 4, into Mannering bay was approximately 32 m^3/s.

The changing landform within the VPAD is a function of the final landform design assessed and approved separately. It is important to note that the project does not alter the intended final landform in a manner that redirects flows or substantially increases permeability. The water that discharges from the rehabilitated lands would continue to discharge to Mannering Bay in the absence of the solar project.

Future design decisions for capping of the remaining active portions of the VPAD will need to consider flooding implications to the solar project in addition to implications on the Mannering Creek diversion channel, surrounding lands and downstream areas. Should flows currently anticipated to be directed via the solar project not be able to do so, the Mannering Creek diversion was originally designed to pass the PMF event from discharge from the VPAD including Ponds 3 and 4 along with water from the Mannering Creek catchment above the VPAD. As the diversion also discharges to Mannering Bay there is unlikely to be an increase in flows or changes in flood behaviour in Mannering Bay or Lake Macquarie as a result of the project.

5.7.8 Groundwater Impacts

The drainage control system associated with Ponds 1, 2, 3 and 4 is a subsoil, groundwater collection system that is installed along Pond 1 and Pond 2 to collect the groundwater seepage from the VPAD. The subsoil drainage pipe is approximately 300 mm in diameter. The system diverts captured seepage via a pit and pipe network draining to a large pit in the spillway in Pond 1. Pumps in the pit return the seepage water to the active portions of the VPAD although this is a licenced discharge point under conditions of EPL761.

The key infrastructure components for the development project include installation of approximately 220,000 solar panel modules supported by either steel piles or concrete ballasted footings, electricity transmission lines and new roads within Ponds 1, 2 and 3. These activities are not considered to significantly alter the permeability and functioning of the VPAD capping, which has not been designed or installed to achieve permeability criteria, and as such are considered unlikely to alter seepage volumes or mobility. Groundwater impacts associated with the VPAD will continue to be regulated by the existing EPL 761 and the project is considered unlikely to have any noticeable impact on groundwater quality or availability of groundwater for any potential surrounding users.

5.7.9 Surface Water Impacts

During construction of internal roads, installation of solar panels and electricity transmission lines the capping layer of the ponds may be disturbed. Following construction, shading of vegetation is identified as potentially affecting vegetation cover beneath the panels. This has the potential to generate sediment laden run-off during wet weather. As the ponds have a very shallow gradient it is expected that the stormwater velocities will be slow within the ponds. This will limit the potential for scouring and subsequent transfer of sediments into Mannering Bay. The existing stormwater management infrastructure and available space in which to install management devices would allow standard mitigation measures, as specified in Urban Stormwater: Soils and Construction (Landcom 2004), to be implemented to further mitigate impacts and maintain water quality of discharges to the levels specified in the existing VPAD EPL.

5.7.10 Mitigation Measures

The following management and mitigation measures are recommended:

- Detailed design to consider the capacity of the existing stormwater network to convey expected stormwater flows from the site and future capped areas of the VPAD;
- Any new stormwater infrastructure is to be installed in a manner to prevent surface water interaction with underlying ash;
- A detailed erosion and sediment control plan will be prepared as part of the detailed design process and would address the requirements of the Urban Stormwater: Soils and Construction (Landcom 2004);
- The existing clean-water system on Ponds 1, 2 and 3 will be treated as a dirty water system for the duration of construction and until such time as disturbed areas are rehabilitated to their pre-development level and analysis of water quality achieves performance requirements of EPL 761;
- Discharges to Mannering bay would only occur where water quality is demonstrated to be non-polluting and meet the conditions of EPL 761;
- The detailed design of the solar project will need to consider overland flooding and ponding resulting from rainfall within the solar project catchment and Pond 4 and this may include the need to alter stormwater management designs and structures;
- The detailed design will need to avoid damage to the functioning of existing groundwater management infrastructure;
- The monitoring and management of ground and surface water in association with EPL 761 will continue and is not considered to require changes to accommodate the project; and
- Efforts to minimise ground disturbance and rehabilitate disturbed areas will be included in construction management documentation. Rehabilitation will also include consideration of use of shade tolerant species to support success of rehabilitation below solar panels.

5.8 Hazards and Electromagnetic Interference

5.8.1 Methods

The SEARs require the EIS to address hazards and electromagnetic interference including:

> *"an assessment of potential hazards and risks associated with bushfires and the proposed grid connection infrastructure against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields"*

Bushfire risks have been assessed through a desktop review of the Vales Point Power Station Bushfire Risk Management Plan (Jacobs, 2016). The assessment of exposure to electric and magnetic fields (EMF) was undertaken in accordance with the Energy Networks Australia (ENA) EMF Management Handbook (ENA, 2016) and the exposure levels identified by ICNIRP (2010).

5.8.2 Existing Electric and Magnetic Fields

As stated in ENA (2016), EMF are part of the natural environment and electric fields are present in the atmosphere and static magnetic fields are created by the earth's core. EMF is also produced wherever electricity or electrical equipment is in use. Powerlines, electrical wiring, household appliances and electrical equipment all produce power frequency EMF. The project area is in close proximity to significant energy generation and transmission infrastructure including transmission lines to the north west between the power station and Wyee and next to Ruttleys Road. Much of the electrical components including the majority of the proposed 33 kV transmission line to the network, are contained within non-publically accessible areas. A short section on 33 kV transmission line would cross Ruttleys Road and Construction Road to connect to the existing network at the existing Austgrid substation. While this section is publically accessible there is limited public activity in the area other than drivers in vehicles on Ruttleys Road.

5.8.3 Electric and Magnetic Fields Impact Assessment

Energy Networks Australia EMF Management Handbook (ENA, 2016) states that:

> *"In general, electric and magnetic fields from electricity assets will be well below the Reference Levels in these guidelines* (includes ICNIRP guidelines) *and specific compliance assessments will not be required. Exceptions could include specific occupational activities in close proximity to assets such as very highly loaded conductors, air cored reactors or air cored transformers"*.

As such, ENA (2016) focusses on occupational exposure. A compliance assessment can be used to demonstrate compliance with relevant Australian and international guidelines and, in particular, the Reference Levels or Basic Restrictions. ENA (2016) suggests that where an assessment is required, it could be undertaken in the form of a review of work practices against minimum compliance distances, measurements or simple calculations or modelling to demonstrate compliance against the Reference Levels, or modelling to demonstrate compliance against the Basic Restrictions. For the purposes of this assessment, a desktop assessment was made in accordance with the ENA EMF Management (ENA, 2016) with exposure limits identified by ICNIRP (2010) used as reference.

The exposure 'limits' commonly referred to with regard to exposure to electric and magnetic fields are formally known as Reference Levels. These Reference Levels have been determined so as to provide a practical tool of assessment whilst maintaining adequate safety margins to potential health effects. Following extract from the ENA handbook describes the relationship between the Reference Levels and the Basic Restriction levels determined based on biological effects:

> *"Basic restrictions are the fundamental limits on exposure and are based on the internal electric currents or fields that cause established biological effects. The basic restrictions are given in*

terms of the electric fields and currents induced in the body by the external fields. If Basic Restrictions are not exceeded, there will be protection against the established biological effects.

The Basic Restrictions include safety factors to ensure that, even in extreme circumstances, the thresholds for these health effects are not reached. These safety factors also allow for uncertainties as to where these thresholds actually lie. The physical quantity used to specify the Basic Restrictions is the tissue induced electric field.

The Basic Restrictions in the ICNIRP Guidelines are specified through quantities that are often difficult and, in many cases, impractical to measure. Therefore, Reference Levels of exposure to the external fields, which are simpler to measure, are provided as an alternative means of showing compliance with the Basic Restrictions.

The Reference Levels have been conservatively formulated such that compliance with the Reference Levels will ensure compliance with the Basic Restrictions. If measured exposures are higher than Reference Levels then a more detailed analysis would be necessary to demonstrate compliance with the Basic Restrictions".

ICNIRP identifies two Reference Levels for EMF fields based on whether the exposure is in regard to general public or occupational as identified in Table 5.15. Considering the proposed feeder route it is appropriate to adopt the occupational Reference Levels on the basis that limited public activity in the vicinity of the feeder.

Table 5.15 : ICNIRP Reference Levels – Occupational

EMF field	ICNIRP 2010 (Occupational)
Electric field	10 kV/m
Magnetic field	1,000 µT *
** ICNIRP advises that this level may be exceeded under certain conditions.*	

The source of a magnetic field is the current flowing through a conductor. The magnetic field decreases with the distance from the conductor. In a three phase system the individual phase currents are separated by a phase angle of 120°. This means that in an ideal three-phase system with the three conductors infinitesimally close to each other, the instantaneous sum of the magnetic field arising from the three phase currents is zero. In reality, the physical separation of the phase conductors in a three phase overhead line, and small variations in individual phase currents, yields a resulting magnetic field.

The assessment methodology described in the ENA EMF Management Handbook is based on the British Standard BS EN 50499 – Procedures for the assessment of workers due to electromagnetic fields. This methodology derives a minimum compliance distance for people at which the exposure is equal to the ICNIRP reference level, i.e. if people are further away their exposure is below the Reference Levels as illustrated in Figure 5.11. The methodology is based on the current flowing in a single conductor but may be conservatively applied also to three-phase conductor arrangements.

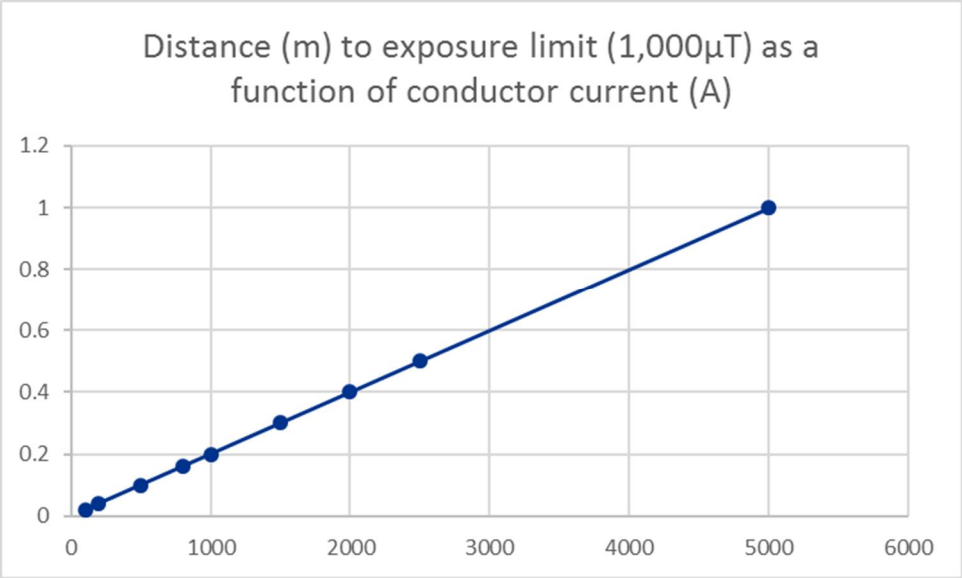


Figure 5.11 : Magnetic Field Minimum Compliance Distances

The solar farm is expected to be operated at near unity power factor, resulting in a maximum export of 55 MVA, or 960A current load at a voltage of 33kV. Based on ENA (2016) the resulting compliance distance will be less than 0.2m for occupational exposure. ENA (2016) identifies 1 metre for public exposure compliance distance. The exposure to any people at ground level will thus be below the ICNIRP reference limit for magnetic fields.

According to the ENA (2016) overhead power lines with voltages above 200kV may under some circumstances result in electrical fields in excess of the reference levels. It is therefore expected that the electrical field arising from the proposed 33kV feeder will not exceed the ICNIRP reference levels.

5.8.4 EMF Mitigation Measures

The following EMF mitigation measures would be implemented as part of the project:

- Design and selection of all electrical equipment is to minimise EMF levels and comply with ICNIRP reference levels; and
- Monitoring of electromagnetic levels is to be undertaken during commissioning activities to confirm exposure levels. If ICNIRP reference levels are exceeded than further mitigation would be considered.

5.8.5 Existing Bushfire Environment

The NSW central coast experiences a mild climate, with warm and relatively moist summers and cooler and somewhat drier conditions through winter. Average annual rainfall based on composite of Norah Heads AWS (BoM station 061366; 1989-2015) and the nearby Norah Heads lighthouse (BoM station 061273; 1969-1988) is approximately 1231 mm and between 1969 and 2014 has ranged between 652 and 2067 mm. Average monthly rainfall is greatest between February and June and least between August and October . Average monthly rainfall totals vary between 67 mm in August and 145 mm in June.

Monthly average temperatures range between 19.9 and 25.6°C in February and 9.7 and 17.8°C in July. Maximum daily temperatures in excess of 35°C have been recorded between October and March and maximum temperatures over 40°C have been recorded in each month between November and March, except February.

Relative humidity on the NSW central coast is relatively high throughout the year. Humidity is typically greater in the morning than in the afternoon and is typically less during the drier months between July and October than at other times of year. Average monthly values range between 63 and 56% in August and 78 and 72% in February (09:00 and 15:00 values, respectively).

Winds are typically light during the morning and freshen through the day. Average wind speeds are greater between about September and December than at other times of year. Wind speeds range between 16 and 19 km/h in July and 20 and 29 km/h in November (09:00 and 15:00 values, respectively). Afternoon winds are predominantly from the south between February and August and from the north-east at other times of year.

The forest fire danger index (FFDI) indicates the likely behaviour of a forest fire should one ignite and the difficulty which may be encountered in fire suppression. It is based on seasonal and shorter-term trends in rainfall and evaporation, as well as daily values of temperature, humidity and wind speed. Bushfires igniting on days on which FFDI exceeds 25 (very high fire danger) may be difficult to control. Those occurring on days with FFDI exceeding 50 (severe fire danger) may exhibit unpredictable behaviour and may be uncontrollable if they are not quickly contained.

Fire danger in the NSW central coast region is moderated by its relatively mild and moist climate. Monthly averages of FFDI are in the low-moderate range (<13) throughout the year as illustrated in Figure 5.12. Days with FFDI values in the very high range (25-50) have been recorded in every month of the year except July, although there are typically less than two such days each year. Days with very high fire danger are most common between September and January. Days with severe fire danger (FFDI >50) are uncommon and occur slightly more than once each decade (on average) and have historically occurred between October and January.

Fire danger in the severe or extreme range (FFDI>50) has been recorded on five occasions since 1969. On two of these occasions, FFDI exceeded 80, which represents extreme fire danger. The most dangerous fire weather conditions are typically experienced on hot days with unusually low humidity (<20%), with afternoon gusty wind changes from the north or north-west towards the south.

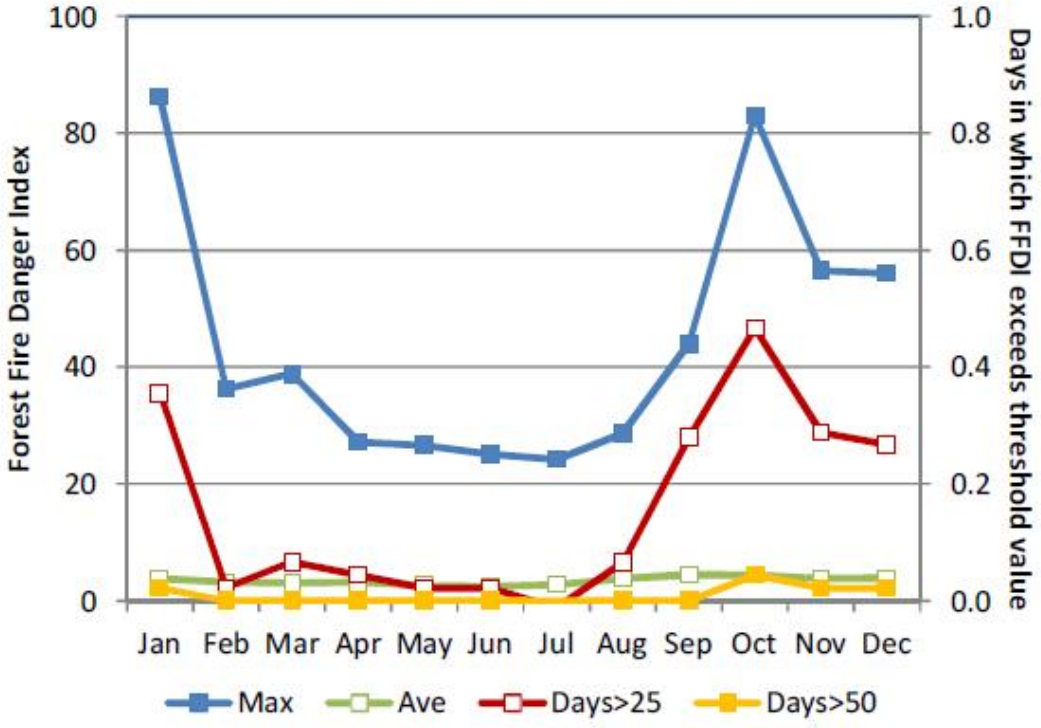


Figure 5.12 : Fire Danger

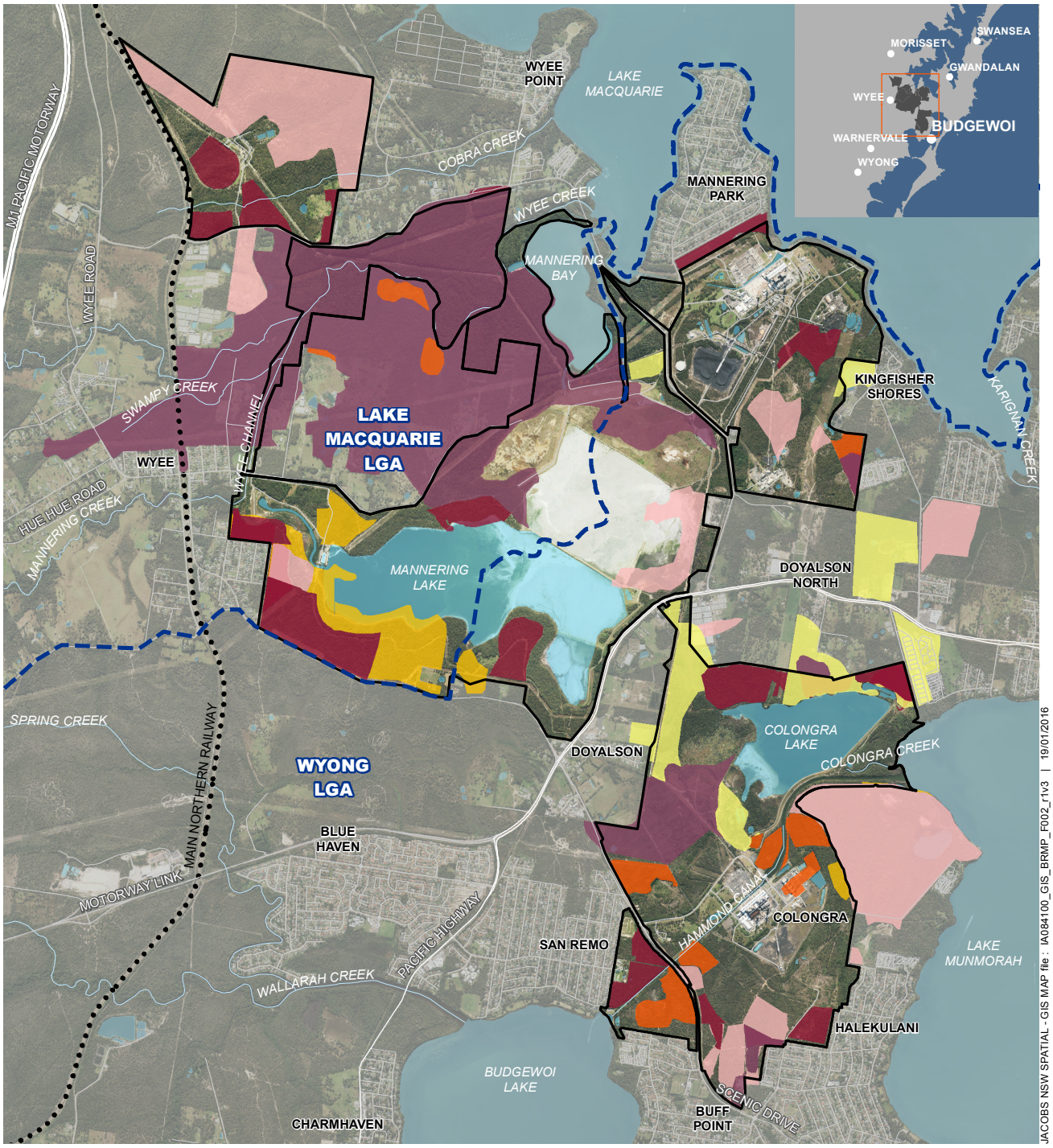
The main bushfire season is considered to extend between August and March in the Lake Macquarie LGA (LMBFMC, 2011) and between October and March in the Wyong LGA (WBFMC, 2011). This is consistent with the times of year when elevated fire weather conditions occur (noting that such conditions occur, on average, about twice each year).

The recorded fire history for Vales Point Power Station landholdings extends back to 1989. Since then, over 1,000 ha of this land have been affected by planned and/or unplanned burning. The area burnt each year has ranged up to 309 ha (2012), with the annual average area burnt being approximately 38 ha.

The month or season of burning within Delta holdings has not been consistently recorded. However, based on the available information, it appears that fires are most common and most extensive between late spring and early autumn (October-March). Of the fires for which the date or season of burning is known, fewer than 20 ha have been burnt outside of this period.

Most fires have resulted from planned burning to manage bushfire fuel hazards. The major exception was a bushfire in 2012, which burnt over 300 ha of land at Vales Point power station and a significant area to its west.

The distribution of fire history across Vales Point power station landholdings is shown in Figure 5.13. Most areas retaining native vegetation have been burnt at least once over the period of record. About one third of the total area burnt has been burnt since 2009.



Legend

Study area

LGA boundary

Fire events in recent years

- 1987 to 1990
- 1991 to 1995
- 1996 to 2000
- 2001 to 2005
- 2006 to 2010
- 2011 to 2015

0 1 2 km

1:55,000 @ A4

N

Data sources

Delta Electricity 2015
Jacobs 2015
Ausimage 2014
LPI 2014

Figure 5.13 | Fire history

Bushfire fuel characteristics are influenced by vegetation type, fire history, climate and management. These, in turn, influence fire intensity and behaviour.

An assessment of Vales Point power station landholdings identified six main types of bushfire fuel. Fuel types are differentiated on the basis of the presence, absence and type of trees and the dominant fuel layer, as follows:

- *Eucalypt forests and woodlands with shrubby understorey:* forest or woodland of mature eucalypts with an understorey comprising a shrub layer of varying density and some grass or forbs cover. Fuel hazard is dominated by the elevated shrubby fuel layer and grassy, near surface fuels and may be reduced to low levels by planned burning. It recovers with time since fire. Observed overall fuel hazard (OFH) (Hines *et al.* 2010) ranges between high and extreme over most examples of this fuel type;
- *Eucalypt forests and woodlands understorey of grass, forbs &/or bracken:* forest or woodland of mature eucalypts with an understorey comprising grass, forbs and/or bracken. Fuel hazard is dominated by those near surface fuels and is moderated by the near absence of an elevated shrubby fuel layer. Observed OFH ranges between medium and very high over most examples of this fuel type, but is reduced to low by planned burning. A small area of pine plantations (~4 ha) within Delta's landholdings has broadly similar fuel hazard characteristics to this fuel type;
- *Swamp oak forest and casuarina regrowth areas:* there are about 43 ha of natural Swamp Oak forest on floodplains and the margins of wetlands and some regrowth areas located around the Vales Point coal stockpile. Fuel hazard is dominated by elevated fuels from young trees, grassy near-surface fuels and, in natural forests, the sometimes thick litter layer. This vegetation type is sensitive to fire. Observed OFH varies with the density of trees and grass cover and is typically high. These areas are not normally subject to planned burning;
- *Heathlands:* these vegetation types occupy about 74 ha of land. Low shrubs dominate the canopy and scattered trees may appear. Fuel hazard is dominated by shrubby elevated fuels, near-surface fuels and/or the often thick surface fuels levels. OFH ranges up to very high, depending on time since fire;
- *Grasslands with low intensity management:* grassland areas which are not intensively managed. These areas include powerline and gas pipeline corridors and capped areas of the VPAD. Grassy near-surface fuels provide the main fuel hazard. OFH between low and moderate; and
- *Intensively managed grassland areas:* grassland areas located around some existing buildings and along some conveyor corridors. Mature trees may be present but do not generally elevate the fuel hazard. This is also the major fuel type in Asset Protection Zones (APZ) which have been developed at the interface between bushland on Delta's landholdings and residential developments. Grassy fuels are managed by slashing or mowing and OFH is kept at low levels throughout the year.

Wetlands are present within the Vales Point Power Station landholdings, but they are not typically fire-prone and have not been included as a bushfire fuel type.

The mild coastal climate experienced by the NSW central coast region means that fire danger is typically in the low-moderate range. Under most typical fire weather and fuel hazard conditions, the chances of successful extended first attack on a fire are high (based on Hines *et al*., 2010). However, extended first attack is unlikely to be successful in forest areas with high fuel hazard on those few days annually with fire danger in the very high range or above. Delta's fuel hazard management program seeks to lower fuel hazards in strategic areas, thereby improving fire authorities' capacity to contain unplanned fires.

The Vales Point Power Station landholdings are generally at low elevation. They rise from sea level on the shores of Mannering Bay to over 50 m in the northern area. Slopes are steepest in the north of the landholdings, but even in these areas, slope is unlikely to contribute to significant changes in fire rates of spread or intensity.

Much of Delta's landholdings may be accessed by internal tracks and/or via locked gates from public roads. Access through the landholdings is more limited by track quality and maintenance history than topography, except where tracks cross low-lying areas which are seasonally wet and non-trafficable.

5.8.6 Bushfire Impact Assessment

The following construction activities introduce ignition risks:

- Hot works;
- Equipment or vehicles being used in long grass;
- Construction workers smoking;
- Build-up of waste at the site; and
- Storage of combustible materials on site.

These additional ignition sources could impact both the project and lead to fires offsite if left unmanaged. With the early works including improving site access and slashing and management of vegetation, the risks of fires starting on-site and migrating off-site is considered low. There is a risk of impacts resulting from a bushfire which originates from offsite due to the presence of bushfire prone land surrounding the site. A detailed bushfire management plan is in place for the surrounding area and is currently implemented to reduce risks of impacts to both infrastructure and residential areas in the locality. This bushfire management plan would be updated to include new bushfire impact scenarios associated with offsite fire risks to the project and onsite ignition risks to offsite infrastructure.

Operation of the project is unlikely to result in any substantial additional bushfire risks. The project would not result in any substantial sources of ignition and all potential risks would be managed through mitigation or the design of the project. Maintenance activities have the potential to result in ignition if hot works are required. These impacts are considered to be unlikely as hot works would be required infrequently and a bushfire management plan would be implemented to minimise potential risks. Maintenance of the site would ensure that groundcover below the solar arrays is appropriately manage to minimise build-up of fuel for bushfires.

5.8.7 Bushfire Mitigation Measures

The following bushfire management measures would be implemented as part of the project:

- Update of the Vales Point Power Station Bushfire Management Plan, or preparation of a standalone bushfire management plan, in consultation with NSW RFS District Fire Control Centre and including:
  - 24/7 contact details including alternative telephone contact;
  - Site infrastructure plan;
  - Fire fighting water supply plan;
  - Site access and internal road plan;
  - Construction of asset protection zones and their continued maintenance;
  - Location of hazards (physical, chemical and electrical) that may impact on fire fighting operations and procedures to manage identified hazards during fire fighting operations;
  - Such additional matters as required by NSW RFS District Office (plan review and update).
- Management of the site as an Asset Protection Zone as outlined in Section 4.1.3 and Appendix 5 of "planning for Bushfire Protection 2006 and the NSW Rural Fire Service's document "Standards for asset protection zones";

- Provision of a 20,000 litre water supply (tank) fitted with a 65mm storz fitting adjoining an internal property access road within the required APZ; and
- Provision of a 10 metre defendable space that permits unobstructed all weather vehicle access around the perimeter of the development site.

Table 5.16 provides operational guidance to prevent bushfire ignitions resulting from works within Delta's landholdings. This guidance is scaled to fire danger rating and identifies suitability of activities and additional equipment requirements to improve the safety of operations. The guidance is applicable to all stages of the project and will be incorporated into the revised or standalone project bushfire management plan.

Table 5.16 : Operational guidance to prevent bushfire ignitions

Fire Danger Rating	Description	Operational guidance for work outside Vales Point power station precinct	Fire equipment requirements
Low-moderate FDI<12	There is some potential for fires and those that occur will normally stop (meteorological conditions allowing) at roads, tracks and watercourses. Fires that occur can generally be extinguished by the use of hand operated water sprays (knapsacks) and fire beaters.	No fires should be left unattended and any fire lit should be extinguished before leaving an areas. No restrictions on slashing or other "hot" work which may generate sparks.	Fire extinguisher or filled knapsack present if using slasher or undertaking hot work in bushland areas or areas with cured grass >5 cm height.
High FDI 12-24	Fires are capable of spreading rapidly, particularly in the absence of preventative measures and may require additional work effort to be extinguished.	As per low-moderate. Hot work which may generate sparks is to be undertaken in cleared areas or areas with green and/or very short grass (< 5 cm). Monitor local ABC emergency radio (1233 AM Newcastle or 702 AM Sydney) for alerts under National Bushfire Warning System (NBWS).	Fire extinguisher or filled knapsack present if using slasher or undertaking hot work.
Very high FDI 25-50	Fires are capable of spreading rapidly, with or without preventative measures. Fire containment may require significant effort and the use of earthmoving equipment and/or back-burning.	No fires of any kind to be lit in the open. Delay hot work or use of slasher if possible. Any hot work or use of slasher which cannot be delayed is to be continuously monitored by an observer and should be completed by midday. Monitor local ABC emergency radio for NBWS alerts.	Fire extinguisher or filled knapsack present if slashing or undertaking hot work.

Fire Danger Rating	Description	Operational guidance for work outside Vales Point power station precinct	Fire equipment requirements
Severe FDI 51-74	Fires are capable of being uncontrollable, unpredictable and extremely fast moving, and will NOT be contained without extensive effort on established fire lines with adequate personnel and equipment (this may include water bombing aircraft).	No use of slasher and no fires of any kind. Hot work to be delayed unless critical and approved by Safety manager. Work to be completed, where possible, by 10.00 am. Any work in bushland areas to be reconsidered and delayed if possible. Monitor local ABC emergency radio for NBWS alerts.	As per very high.
Extreme 75-100	As per severe.	As per severe. Any essential non-hot work in bushland areas to be completed by mid-day. Monitor local ABC emergency radio for NBWS alerts.	As per very high.
Catastrophic FDI>100	Fires are capable of being uncontrollable, unpredictable and extremely fast moving, and will NOT be contained without extensive effort on very large established fire breaks with extensive personnel and equipment (this will include water bombing aircraft).	No work (apart from approved bushfire responses) to be conducted in bushland areas.	No work, not applicable.
Total Fire Ban (TFB)	TFB are declared by RFS to reduce the risk of bushfire ignitions during or (rarely) immediately preceding a period of dangerous fire weather. FDR on days of TFB is typically very high or higher.	Follow applicable bans on equipment use and guidance as per applicable FDR. Hot work and use of slasher not likely to be permitted. Monitor local ABC emergency radio for NBWS alerts.	As per applicable fire danger

Advice of bushfires igniting in the landscape surrounding Delta's landholdings may be subject to National Bushfire Warning System (NBWS) alerts which are broadcast on the local emergency service radio station (ABC local radio: 1233 AM Newcastle or 702 AM Sydney). Recommended actions in response to the three NBWS alert levels are provided in Table 5.17.

Table 5.17 : Responses to National Bushfire Warning System alerts

FDR	Advice	Watch and act	Emergency warning
Low	A fire has been detected, but there is no immediate danger.	A fire is approaching but does not present an immediate danger. Evacuation to a safer location should be considered.	People and assets are in immediate danger and need to take urgent action. Evacuation may not be possible.
Low-Moderate	Continue routine activities.	Continue routine activities, unless smoke and/or flame are visible and current position is under direct attack. If location is unsafe, evacuate to Vales Point inner perimeter or, if unreachable, another safe location or seek shelter on site if travel unsafe. Report to Delta emergency contact.	**Unlikely to be experienced.** Cease activities. Evacuate to Vales Point inner perimeter or, if unreachable, another safe location if current position is unsafe or seek shelter on site. Report to Delta emergency contact.
High	Continue routine activities. Maintain radio watch and watch for smoke. Although this is unlikely, if position is under direct attack and becomes unsafe, evacuate to Vales Point inner perimeter or another safe location. Report situation to Delta Shift Manager on 555.	Maintain radio watch and watch for smoke. Otherwise, respond as per low-moderate.	Maintain radio watch and watch for smoke. Respond as per low-moderate.
Very high	As per high.	Evacuate to Vales Point inner perimeter or another safe location if current position is unsafe. Report to Delta Shift Manager on 555.	As per high.
Severe & Extreme	Avoid working in bushland areas under such conditions. If essential work is undertaken, follow applicable responses as per very high.		
Catastrophic	No work should be undertaken in bushland areas under such conditions.		

5.9 Socio-Economic

5.9.1 Methods

The SEARs require an assessment of the likely impacts on the local and regional community. Given the current unproductive project site and limited surrounding rural or commercial receivers this assessment is limited to a brief summary of population characteristics surrounding the project site and identification of expected social and economic outcomes. The Capital Investment Cost has been estimated and provided separately.

5.9.2 Existing Environment

The project is within the statistical area of Mannering Park in the Central Coast LGA and Wyee in the Lake Macquarie LGA. Table 5.18 provides the population characteristics of these suburbs and LGAs.

Table 5.18 : Population characteristics

Locality	Population and median Age	Unemployment (2011)	Occupation (2011)
Mannering Park	2,472 41 years	7.8%	Of the employed people in Mannering Park (State Suburbs), 4.3% worked in Supermarket and Grocery Stores. Other major industries of employment included Cafes, Restaurants and Takeaway Food Services 4.0%, Hospitals 3.5%, School Education 3.1% and Building Cleaning, Pest Control and Gardening Services 2.7%
Wyee	2,406 46 years	4.4%	Of the employed people in Wyee (State Suburbs), 4.6% worked in Road Freight Transport. Other major industries of employment included Cafes, Restaurants and Takeaway Food Services 3.5%, School Education 3.5%, Residential Care Services 3.3% and Supermarket and Grocery Stores 3.2%.
Central Coast	327,736 42 years	7%	The most common occupations in Central Coast (Significant Urban Areas) included Professionals 17.9%, Technicians and Trades Workers 15.8%, Clerical and Administrative Workers 14.7%, Community and Personal Service Workers 11.6%, and Sales Workers 11.4%.
Lake Macquarie	197,371 42 years	5.3%	The most common occupations in Lake Macquarie (Local Government Areas) included Professionals 19.0%, Technicians and Trades Workers 16.7%, Clerical and Administrative Workers 15.2%, Sales Workers 10.5%, and Community and Personal Service Workers 10.0%.

Note – Based on Australian Bureau of Statistics data

5.9.3 Social Considerations

Based on results of stakeholder engagement to date described in Section 4, the project has received positive feedback which is typical of the high level of support among communities for the development of renewable energy throughout NSW (OEH, 2015). Social impacts of solar projects include positive contributions through job creation and local spending supporting local businesses and potential negative impacts including demand on local services and amenity and traffic impacts. As the project is located within close proximity to major population centres from which the majority of workers are expected to be sourced, there is limited potential for the project to lead to any increase in demand on public services or the availability of housing. Amenity impacts have been described in the proceeding sections of the EIS and mitigation measures are available and proposed to manage these impacts.

5.9.4 Economic Considerations

An initial solar capacity assessment has found that up to 55 MW of solar capacity could be supported on existing capped areas of the VPAD with an expected annual output of 110 GWh. As a coastal location the project is within a medium solar resource area. The quality of the solar resource on its own does not determine the likely yield. Further assessment of project configuration, meteorological information, site horizon line and shading objects, proposed solar panel, inverter and electrical system and loss factors during detailed design would refine the potential yield. The quality of resource and ultimate yield does not determine the projects viability. A lower yield is off-set to some extent by cost savings gained through owning the land and easy access to the distribution network. The detailed design would optimise the project within the project area and a financial decision made with yield being one factor considered.

For ease of development, a solar site is preferred to have a slope less than 5%, be clear land free from rocky outcrops and significant vegetation, free from cultural and heritage features and not flood prone. As described in the sections above the site is largely unconstrained by site features. The detailed design of the project will consider identified site constraints including stormwater management, geotechnical properties and biodiversity values in finalising the project layout and technology selected.

The proximity and availability of an electricity network connection within 600 metres of the project allows for an efficient connection to the network. The short distance to the network has additional benefits in that it minimises transmission losses before the power reaches the grid and end users. The generation of electricity from the largely unproductive VPAD site is considered a good outcome for the network as there is significant local demand for electricity from growing residential and industrial areas and existing mining operations, recent withdrawal of coal fired generation in the area and further potential withdrawal of generation in the medium to long term.

Other main contributors to development cost and therefore solar development viability are logistics, labour and access to utilities (water, power, waste) services to support construction. The development of a solar project does usually require the import and delivery of panels and piles and removal of packaging and other wastes. The site has good transport links to the road network and access to either the Port of Newcastle or Port Botany that would represent substantial road transport cost savings when compared to more remotely located solar projects.

The project construction is also expected to generate approximately 100 jobs during construction. The availability of local labour as well as design, engineering and project management expertise would reduce development labour costs when compared to remote solar project developments. Workers are likely to be drawn from surrounding communities and will not result in any public services being stretched.

5.9.5 Mitigation Measures

Socio economic impacts are not considered to warrant particular mitigation measures beyond those identified for the management of amenity impacts (noise, traffic, visual and air quality) identified in the proceeding sections. The community would be kept informed of project progress through the already established Delta CARE forum which meets on a quarterly basis. The existing community consultation plan would be implemented to manage the concerns and impacts on stakeholders including adjacent property owners. The plan includes following:

- Protocols to keep the community updated about the progress of the project and its benefits;
- Protocols to inform relevant stakeholders of potential impacts; and
- Protocols for allow the community to identify any concerns or issues with the project, particularly during construction and decommissioning.

6. Mitigation Measures

Environmental safeguards and mitigation measures outlined in this document would be incorporated during the detailed design, construction, operation and decommissioning of the project. The safeguards and management measures are summarised in Table 6.1.

Table 6.1 : Summary of Mitigation Measures

Issue	Mitigation measure
Biodiversity	The following mitigation measures are to be undertaken during the construction phase: · Native vegetation removal would be minimised through detailed design; · Pre-construction surveys would be undertaken by an experienced ecologist to investigate potential presence of Pacific Golden Plover prior to entering the dam for construction; · An unexpected threatened species finds procedure will be developed that contains stop work provisions; · Habitat features to be protected during construction will be marked on ground and on maps and location of all hollow-bearing trees will be confirmed; · In the area of the powerline easement a method of clearing that avoids damage to retained native vegetation and reduces soil disturbance will be used. For example, removal of native vegetation by chain-saw is preferable as only partial clearing is proposed in this area; · Re-establishment of vegetation will be considered where practicable in areas disturbed by construction; · It is proposed to establish a linear drain across Pond 3, to facilitate surface water drainage. This would be planted with macrophyte vegetation and effectively replace the shallow ephemeral depressions on the site in the provision of compensatory habitat for common frogs and birds; · Minimising direct harm to native fauna during actual construction operations through onsite measures such as undertaking pre-clearing surveys, regular fauna surveys and the presence of a trained ecologist during clearing events. This is particularly relevant to the standing dead trees in Pond 3; · Allow fauna to leave an area without intervention as much as possible; · Use a licensed fauna ecologist or wildlife carer with specific animal handling experience to carry out any fauna handling. Contact an animal rescue agency/wildlife care group or vet before works start to ensure they are willing and available to be involved in fauna rescue and assist with injured animals; · Implementation of erosion and sediment controls as described in Section 5.5.12 to minimise impacts on biodiversity values on land that is adjoining the site, and waterways downstream of the site; · Undertake construction during daylight hours to avoid impacts from noise and light spill where this may be detrimental to species habitat on adjoining lands; · Appropriately train project staff and contractors so that they can implement all measures that minimise inadvertent adverse impacts of the project on biodiversity values; and · Installing temporary fencing around native vegetation adjacent to the power line easement that is to be retained to protect these features. Exclusion zones will be established to mark clearing limits. This would include the two hollow-bearing trees adjacent to the easement. Mitigation following measures are to be undertaken during the operation phase:

Issue	Mitigation measure
	· Retention and rehabilitation of construction water management devises to provide replacement of freshwater wetlands; and · Use mechanical weed control methods such as slashing or mowing, as well as a range of herbicides to avoid the development of herbicide resistance.
Heritage	The following mitigation measures would be implemented during construction: · Standard Management Procedures for Unexpected Heritage Items be applied and implemented; · Heritage induction training for staff and contractors working on the construction phase of the transmission line is unnecessary; and · Any further impacts proposed beyond those assessed in this report or beyond the boundary of the assessed areas must be subject to further assessment and consultation with Aboriginal stakeholders.
Noise and Vibration	The following mitigation measures will be implemented during construction: · Construction works will only be undertaken in accordance with standard construction hours specified in the ICNG; · Acoustic screens around stationary high noise generating plant (piling rigs) will be implemented where required; · No chainsaws and tree mulcher use will occur on Pond 2; · The predicted noise levels will be considered in establishing work site locations, construction techniques and on-site practices; · Where possible and in compliance with occupational safety and health standards, reversing beepers on trucks will be replaced with low pitch non-tonal beepers (quackers); · Construction works will adopt Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) practices as addressed in the ICNG selecting from the recommended measures in Appendix D of the EIS; · As a minimum all residences within 200 metres radius of the project site will be notified of potential construction works at least 2 weeks prior to the commencement of works; · Construction noise management practices are to be provided to all staff and contractors and be included during site inductions and daily tool-box talks. The tool-box talks are to include as a minimum, the permitted hours of construction work, work site locations, site ingress/egress and the required noise management measures for each construction phase; · Monitoring of construction noise will be undertaken to confirm construction noise levels at nearest receivers at the commencement of construction works for the verification of predicted construction noise levels, to confirm requirement for noise management and mitigation measures and in response to justified adverse community response or complaint to construction noise; · Construction works will be immediately reassessed in the event of any identified exceedances of noise predictions and in response to justified community complaints related to noise; · Any non-conformances or noise complaints and subsequent corrective actions will be resolved with consideration to the project's Community and Stakeholder Engagement Plan (CSEP); and

Issue	Mitigation measure
	· All adopted noise mitigation measures will be updated in work method statements and identified as part of routine tool-box talks to inform staff of current construction noise issues and required mitigation measures. The following mitigation measures will be implemented during operation: · Detailed design will consider the ability to located PCS units further away from receptors in Summerhayes Road; · If a single axis tracking system is to be used, the detailed design will consider installation of tracking motors in locations to minimise noise impacts for potentially affected residents in Summerhayes Road; and · All PCS units will be housed within an acoustic enclosure or provided with acoustic screening between the unit and receivers on Summerhayes Road which ensures a minimum of 5dB(A) sound reduction.
Transport	The project includes proposed upgrades to both existing entrance intersections to improve vehicle access safety. Alternative measures are available and would be implemented should the intersection upgrades not be agreed in time for the construction of the project. The works and mitigation measures proposed include: · A construction traffic and access management plan should be developed and implemented for the project and include a driver code of conduct; · Upgrade access to the site from the Pacific Highway in consultation with Roads and Maritime Services to include a short left turn lane prior to use of this access associated with the project; and · Upgrade site access from Ruttley Road in consultation with Central Coast Council to improve access and egress efficiency in a manner that does not reduce road safety.
Land	The following VPAD integrity mitigation measures would be implemented: · Detailed design to consider geotechnical properties and safety aspects of the VPAD and limit development on the ash-embankment and dam wall to access tracks unless otherwise demonstrated to be safe; and · Detailed design to consider the capacity of the existing stormwater network to convey expected stormwater flows from the site and future capped areas of the VPAD. The following surface water, erosion and sediment control measures would be implemented: · Any new stormwater infrastructure is to be installed in a manner to prevent surface water interaction with underlying ash; · A detailed erosion and sediment control plan will be prepared as part of the detailed design process and will address the requirements of the Urban Stormwater: Soils and Construction (Landcom, 2004); · The existing clean-water system will be treated as a dirty water system for the duration of construction until such time as disturbed areas are rehabilitated to their pre-development level and analysis of water quality within detention basins achieves performance requirements of the EPL761; · Discharges to Mannering Bay during construction, and until such time as disturbed areas have been rehabilitated will only occur where water quality is demonstrated to be non-polluting and meet the current EPL761 conditions; and · Ash excavated during construction will be returned to the excavation and capped consistent with the existing situation or be transferred to the active VPAD.

Issue	Mitigation measure
	The following air quality management measures would be implemented: · Any ash excavated or uncovered would be kept wet until it can be replaced below capping or transferred to the operational portions of the ash dam for management; · Locate stockpiles away from sensitive receivers to the extent possible; · All work areas and stockpiles will be visually monitored for dust generation, particularly during hot, dry or windy weather; · In the event of dust generation, appropriate dust suppression measures (e.g. watering, covering stockpiles with tarpaulins or geotextile fabric, appropriate seeding) would be implemented; · Work practices generating dust would be modified or cease in adverse weather conditions if other measures fail to prevent offsite dust emissions; · All work vehicles/machinery will be maintained in good working order and in accordance with relevant standards; · Work vehicles/machinery will not be left running or idling when not in use; · All loads of waste, excavated material, soil, fill and other erodible matter that are transported to or from the work site will be kept covered at all times during transportation; and · Air monitoring required under Delta's existing EPL, which includes source monitoring and community monitoring to measure air quality at various locations within and around the power station, would consider the projects contribution to air quality impacts. The potential for land-use conflict is low and will be managed in accordance with the mitigation measures proposed in relation to noise and vibration, air quality, traffic, bushfire, biodiversity and visual impacts.
Visual	The existing vegetated buffers would be maintained.
Water	The following management and mitigation measures would be implemented: · Detailed design to consider the capacity of the existing stormwater network to convey expected stormwater flows from the site and future capped areas of the VPAD; · Any new stormwater infrastructure is to be installed in a manner to prevent surface water interaction with underlying ash; · A detailed erosion and sediment control plan will be prepared as part of the detailed design process and would address the requirements of the Urban Stormwater: Soils and Construction (Landcom 2004); · The existing clean-water system on Ponds 1, 2 and 3 will be treated as a dirty water system for the duration of construction and until such time as disturbed areas are rehabilitated to their pre-development level and analysis of water quality achieves performance requirements of EPL 761; · Discharges to Mannering bay would only occur where water quality is demonstrated to be non-polluting and meet the conditions of EPL 761; · The detailed design of the solar project will need to consider overland flooding and ponding resulting from rainfall within the solar project catchment and Pond 4 and this may include the need to alter stormwater management designs and structures; · The detailed design will need to avoid damage to the functioning of existing groundwater management infrastructure;

Issue	Mitigation measure
	· The monitoring and management of ground and surface water in association with EPL 761 will continue and is not considered to require changes to accommodate the project; and · Efforts to minimise ground disturbance and rehabilitate disturbed areas will be included in construction management documentation. Rehabilitation will also include consideration of use of shade tolerant species to support success of rehabilitation below solar panels.
Bushfire	The following bushfire management measures would be implemented as part of the project: · Update of the Vales Point Power Station Bushfire Management Plan, or preparation of a standalone bushfire management plan, in consultation with NSW RFS District Fire Control Centre and including: 24/7 contact details including alternative telephone contact; Site infrastructure plan; Fire fighting water supply plan; Site access and internal road plan; Construction of asset protection zones and their continued maintenance; Location of hazards (physical, chemical and electrical) that may impact on fire fighting operations and procedures to manage identified hazards during fire fighting operations; Such additional matters as required by NSW RFS District Office (plan review and update). · Management of the site as an Asset Protection Zone as outlined in Section 4.1.3 and Appendix 5 of “planning for Bushfire Protection 2006 and the NSW Rural Fire Service’s document “Standards for asset protection zones”; · Provision of a 20,000 litre water supply (tank) fitted with a 65mm storz fitting adjoining an internal property access road within the required APZ; and · Provision of a 10 metre defendable space that permits unobstructed all weather vehicle access around the perimeter of the development site.
Electric and Magnetic Fields	The following EMF mitigation measures would be implemented as part of the project: · Design and selection of all electrical equipment is to minimise EMF levels and comply with ICNIRP reference levels; and · Monitoring of electromagnetic levels is to be undertaken during commissioning activities to confirm exposure levels. If ICNIRP reference levels are exceeded than further mitigation would be considered.

7. Evaluation and Conclusion

This chapter provides the justification for the project taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the project is in the public interest. The project is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

7.1 Justification

While there would be some environmental impacts as a consequence of the project such as temporary traffic inconvenience, noise and vibration, ecology impacts, they have been avoided or minimised wherever possible through design and mitigation measures. The beneficial effects of renewable energy generation on land unsuitable for other development is considered to outweigh the mostly temporary adverse impacts and risks associated with the project.

7.1.1 Social Factors

The project would have some localised social impacts as a result of the disturbance and change that would occur during construction and ongoing low-level noise impacts. Given the project is surrounded by a vegetated buffer zone with few receivers within 500 metres, negative social impacts are limited. Delta has consulted with the most affected residential receivers and is able to manage construction and operation of the project to avoid significant impacts to these receptors.

Positive social impacts include the up to 100 jobs during construction, and five jobs during operation. The long-term effect would be an overall social benefit, through creation of local jobs and spending with local and regional businesses during construction. The generation of renewable energy also contributes to the replacement of energy generation lost as aging coal power stations in NSW reach the end of life and has a role in providing energy security.

7.1.2 Biophysical Factors

The project does not involve the clearing of any endangered ecological communities or impacts to threatened flora species. Despite being a highly disturbed and largely artificial landscape the project area does provide habitat value to some fauna species. Impacts have been avoided where possible and may be further avoided through the detailed design process. The placement of the project on a highly disturbed area is considered preferable to developing a similar project in a more natural setting. Short term risks to water quality in receiving waters is able to be managed through avoidance of direct discharges of impacted water during construction until such time as site disturbance is rehabilitated to its pre-construction level.

7.1.3 Economic Factors

The project as an estimated capital investment value of between $70 million and $115 million depending on final design and installed capacity. While solar panels are likely to be sourced internationally, as they are not manufactured in Australia, where possible local suppliers will be engaged during construction and operation of the project. The project would also demonstrate the ability to construct renewable energy developments on typically underutilised land which may be reproduced on other power station ash dams or similar environments in the future.

7.1.4 Public Interest

The public interest is best served through development that fulfils the needs of the majority. The project represents a cost-efficient private investment in renewable energy that would maximise the long-term social and economic benefits, while minimising the long-term negative impacts on

communities and the environment. Although the project would result in some short-term noise and traffic impacts and ongoing localised changes to amenity these impacts would be outweighed by the long-term benefits once the project is operational.

As a result, the project is considered to be in the public interest. A response to submissions report would be prepared to address any public concern and this along with submissions is required to be considered by the Department of Planning and Environment in determining the project development application.

7.2 Objects of the EP&A Act

The objects of the EP&A Act, and how these are addressed in the project, are presented in Table 7.1.

Table 7.1 : Consideration of Objects of the EP&A Act

Object	Comment
5(a)(i) To encourage 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.	The project design, impact, safeguards and management measures detailed in this EIS allow for the proper management, development and conservation of natural and artificial resources. The project is considered to have long term positive social and economic benefits with limited environmental impacts.
5(a) (ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	A key object of the project is to facilitate the orderly and economic use and development of land with otherwise negligible economic output.
5(a) (iii) To encourage the protection, provision and co-ordination of communication and utility services.	The project generates energy that would be distributed by existing utility services provided locally by Ausgrid. Preliminary discussions with Ausgrid indicate the proposed generation can be accommodated on the local network without jeopardising function. No other utility services are affected by the project.
5(a) (iv) To encourage the provision of land for public purposes.	The project will not affect the provision of land for public purposes.
5(a) (v) To encourage the provision and co-ordination of community services and facilities.	The project is expected to draw the majority of workers from the local community and is not expected to negatively impact the provision of community services.
5(a) (vi) To encourage 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.	The project will be constructed and operate on an artificial land form. Identified biodiversity values have been assessed in accordance with the FBA and where unable to be avoided would be offset. Impact on biodiversity is discussed in Section 5.1 including provision of avoidance, minimisation and offsetting to minimise potential impact to biodiversity.
5(a) (vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in Sections 7.2.1 to 7.2.4 below.
5(a) (viii) To encourage the provision and maintenance of affordable housing.	Not relevant to the project.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	The application has been made in accordance with relevant State and Local environmental planning instruments and has been prepared to respond to the requirements of both State and local Government Authorities.

Object	Comment
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	The project development process involved consultation with relevant stakeholders. Consultation undertaken and proposed is outlined in Chapter 4.

7.2.1 The Precautionary Principle

This principle states: “if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation”.

The project has sought to take a precautionary approach to minimising environmental impact. This has been applied through the development of a range of environmental safeguards to address the impacts identified in Chapter 6. These safeguards would be implemented during construction and operation of the project.

Solar projects are highly reversible following decommissioning with all above ground infrastructure able to be removed and no safeguards have been postponed as a result of lack of scientific certainty. The selected construction contractor would be required to prepare environmental management documentation before commencing construction. Risks to biodiversity have been considered in accordance with the FBA and found to be able to be adequately mitigated or offset.

7.2.2 Intergenerational Equity

The principle states: “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 project would benefit future generations by providing renewable energy over a 30 year design life. Implementation of the safeguards contained in this EIS would ensure that the health, diversity and productivity of the environment is maintained for the benefit of future generations.

Should the project not proceed, generation of electricity would be required via other means or at other locations. In the absence of significant impacts or risks associated with the project, the use of the site for renewable energy generation is considered to be aligned with the intergenerational equity principle.

It is acknowledged that the project may have some adverse impact on the current generation, generally through temporary construction impacts. However, these are not considered to be of a nature or extent that would disadvantage future generations.

7.2.3 Conservation of Biological Diversity and Ecological Integrity

This principle states: “the diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival”.

An assessment of the existing local environment has been carried out to identify and manage any potential impact of the project on biodiversity. The project is located in an area that has previously been modified as a result of the disposal of ash. No vegetation clearing of endangered ecological communities or threatened flora is proposed. While the project area has been assessed in accordance with the FBA guidelines, the artificial nature of the habitat (particularly salt marsh) means the biodiversity of the community is not natural due to the absence of tidal effects or connection to the estuary or ocean. The potential impact of the project on biodiversity will be limited to loss of non-critical habitat for wading birds.

The project will not significantly fragment or isolate any existing large patches of vegetation and will not compromise biological diversity or ecological integrity.

7.2.4 Improved Valuation, Pricing and Incentive Mechanisms

This principle is defined as:

Improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

Environmental and social issues were considered in the strategic planning and establishment of the need for the project, and in consideration of various options. The value placed on environmental resources is evident in the extent of the planning and environmental investigations, and in the design of the proposed mitigation measures and safeguards.

Implementation of these mitigation measures will result in an economic cost to the proponent, which will be included in both the capital and maintenance cost of the project.

7.3 Conclusion

The project is subject to assessment under Part 4, Division 4.1 of the EP&A Act. This EIS has been prepared to address the SEARs and reflects the form and content requirements of the EP&A Regulations. This has included consideration the objectives of the EP&A Act and, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants under the transitional arrangements applicable under the BC Act and TSC Act. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

The project as described in the EIS best meets the project objectives but would still result in some impacts on access, amenity, biodiversity and noise and vibration. Mitigation measures as detailed in this EIS will ameliorate or minimise these expected impacts. The project will deliver renewable energy over a 30 year timeframe from otherwise unproductive land and is in line with its current land-use zoning.

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