PARKES
solar farm

neoen
renewing energy

Thursday 17th March 2016

Mr. Mike Young
Department of Planning and Environment - New South Wales
23-33 Bridge Street
Sydney NSW 2000

Dear Mike,

Parkes Solar Farm Development Application

The purpose of this letter is to introduce the lodgement of Neoen's Development Application for the Parkes Solar Farm project, including an Environmental Impact Statement prepared by NGH Environmental.

The Parkes Solar Farm is a 65MWp photovoltaic project including up to 240ha of infrastructure, that will potentially power the equivalent of 19,000 New South Wales (NSW) households.
This project is currently proposed by Neoen under the Large-Scale Solar Competitive Round Funding Program from the Australian Renewable Energy Agency (ARENA). In order to give the project the best chances of securing a grant, and subject to the Department of Planning and Environment assessment constraints, Neoen is seeking to obtain a Development Approval for the project before the ARENA program's full application date on the 15th June 2016.

Following the lodgement of the Development Application on the Department of Planning and Environment website, we will be awaiting the corresponding fee quotation. We would like to note that the Parkes Solar Farm may be eligible for a fee reduction in the context of the NSW Renewable Energy Action Plan.

We remain available to answer any question that would arise from this lodgement and thank you for the support brought by the Department of Planning and Environment to date.

Yours sincerely,

Chris Leonard

Head of Solar Development – Neoen Australia
Tel. 0406 280 568

Environmental Impact Statement

PARKES SOLAR FARM

MARCH 2016

Document Verification

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Certification

I certify that I have prepared the contents of this Environmental Impact Statement in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulations 2000.* To the best of my knowledge, this assessment contains all available information that is relevant to the environmental assessment of the project and that information is neither false nor misleading.

Name:	Jenny Walsh
	On behalf of:
	NGH Environmental Pty Ltd
Qualifications:	B Science
	M Env Plan.
Address	35 Morrisset Street
	Bathurst 2795
Signature:	
Date:	16 March 2016

CONTENTS

TABLES

FIGURES

TERMS AND DEFINITIONS

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACHCRP	Aboriginal Cultural Heritage Consultation Requirements for Proponents
AEMO	Australian Energy Market Operator
AEP	Annual Exceedance Probability
AGO	Australian Greenhouse Office
ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ARENA	Australian Renewable Energy Agency
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
AWS	Automatic weather station
BCC	Biobanking Credit Calculator
BOM	Australian Bureau of Meteorology
BLM	Bureau of Land Management
BREE	Bureau of Resources and Energy Economics
BFRMP	Bush Fire Risk Management Plan
CEMP	Construction environmental management plan
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	Development Application
dB(A)	A measure of A-weighted *(c.f.)* sound levels.
DEC	Department of Environment and Conservation
DECC	Department of Climate Change (now OEH)
DECCW	Department of Climate Change and Water (now OEH)
DOE	Department of the Environment (Commonwealth)
DPE	Department of Planning and Environment
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
EEC	Endangered Ecological Community – as defined under relevant law applying to the proposal
EIS	Environmental Impact Statement
ELF	Extremely low frequency, in relation to Hz *(c.f.)*
EMFs	Electromagnetic fields
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000* (NSW)
EPA	(NSW) Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPL	Environment Protection Licence, issued under the POEO Act *(c.f.)*

ESD	Ecologically sustainable development
GA	Geoscience Australia
GHG	Greenhouse gas
GWh	Gigawatt hours
ha	hectares
Heritage Act	*Heritage Act 1977* (NSW)
Hz	Hertz
ICNG	Interim Construction Noise Guideline
INP	*NSW Industrial Noise Policy*
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007*
km	kilometres
kV	kilovolts
L_{A90} (15 minutes)	The A-weighted sound pressure level that is exceeded for 90% of a 15-minute measurement period, when measured in the absence of the construction works under consideration and excluding extraneous noise. This is considered to represent the background noise.
L_{Aeq}(15 minutes)	The A-weighted equivalent continuous (energy average) sound pressure level of the construction works under consideration over a 15-minute period that excludes other noise sources such as from industry, road, rail and the community.
LALC	Local Aboriginal Land Council
LCA	Life Cycle Assessment
LCU	Landscape Character Unit
LEP	Local Environment Plan
LGA	Local Government Area
LMZ	Landscape Management Zone
LRET	Large scale Renewable Energy Target
m	metres
mm	millimetres
MIA	Murrumbidgee Irrigation Area
MNES	Matters of National Environmental Significance, under the EPBC Act (*c.f.*)
MRET	Mandatory Renewable Energy Target
MVA	Megavolt-ampere
MW	Megawatt
MWh	Megawatt hours
NHMRC	National Health and Medical Research Council
NPW Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
NW Act	*Noxious Weeds Act 1993* (NSW)
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water

PCT	Plant Community Type
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
PMF	Probable Maximum Flood
PV	Photovoltaic
RBL	Rating Background Level - the level of background noise
RDA	Regional Development Australia
RE Act	*Renewable Energy (Electricity) Act 2000* (Commonwealth)
REAP	Renewable Energy Action Plan (NSW)
RFS	NSW Rural Fire Service
RNP	NSW *Road Noise Policy*
Roads Act	*Roads Act 1993* (NSW)
RMS	(NSW) Roads and Maritime Services, formerly Roads and Traffic Authority (RTA)
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy (NSW)
SEPP (Infrastructure)	*State Environmental Planning Policy (Infrastructure) 2007* (NSW)
Sound pressure level	The noise at a given distance from plant or equipment
sp/spp	Species/multiple species
SPRAT	EPBC Act Species Profiles and Threats Database
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011 (NSW)*
SSD	State Significant Development, as defined by section 89C of the EP&A Act *(c.f.)*
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
µT	Microtesla , multiples of a unit of magnetic field
VIA	Visual Impact Assessment
V	Volts
WHO	World Health Organisation
WM Act	*Water Management Act 2000*
WMP	Waste Management Plan
WSP	Water Sharing Plan
ZVI	Zone of Visual Influence

EXECUTIVE SUMMARY

This Environmental Impact Statement (EIS) identifies and assesses the environmental issues associated with the construction, operation and decommissioning of the proposed photovoltaic (PV) 57 megavolt-ampere (MVA) or 65 Megawatt (MW) Parkes Solar Farm ('the proposal'). NGH Environmental has prepared the EIS on behalf of the proponent, Neoen Australia (Neoen).

This EIS has been prepared in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). The structure and content of the EIS address the Secretary's Environmental Assessment Requirements provided by NSW Department of Planning and Environment (DPE) on 9 December 2014.

PROPOSAL DESCRIPTION

The proposal site is located approximately 10 kilometres west of Parkes, within the Parkes Local Government Area. The site is accessed via Henry Parkes Way (locally known as Condobolin Road) and Pat Meredith Drive to the west. The solar farm proposal would connect to the existing Transgrid substation located on Pat Meredith Drive to the north of the site.

The proposal site comprises approximately 240 hectares of freehold land, the majority of which has been cleared and used for grazing or cultivation. There is a small area of native vegetation in the north western area of the site, isolated paddock trees and several rows of planted trees and shrubs across the centre of the site, mostly along fence lines. Four residences are located in the vicinity of the site, the nearest being approximately 400 m from the site boundary.

The proposal comprises the construction, operation and eventual decommissioning of the Parkes Solar Farm. Key infrastructure components would include:

- Solar arrays: approximately 215,000 solar panels supported by approximately 27,000 piles, driven or screwed into the ground in order to support the solar array's mounting system. The panels to be installed would be either:
    - single-axis tracking panels (which would have approximately 2,850 tracker units)
    - north-oriented fixed-tilt panels
    - east-west facing fixed-tilt panels
    - or a combination of these alternatives.
- Approximately 28 PV boxes or PV skids (either containerised or installed on a 'skid' platform), each of them containing an inverter and an 11 kV, 22 kV or 33 kV transformer.
- Onsite cabling and electrical connections between solar arrays and panel inverters.
- One delivery station in a container or on a skid platform.
- Cables and trenches.
- Internal access tracks to allow for site maintenance vehicles, and gravel access road and parking for staff and visitors.
- Staff amenities and offices.
- Perimeter security fencing, approximately 2.3 metres (m) high.
- A vegetation buffer.
- A 66kV overhead or underground power line to connect into the existing Parkes Transgrid substation, approximately 600 m north of the site.

The construction and commissioning phase of the proposal would take approximately nine months. Approximately 40 employees would be required during the first month of construction, rising to approximately 100 employees during the peak construction period. During construction, approximately 0.5 full time equivalent staff would be required on site.

At the end of its operational life, the proposal site would be either reconditioned or decommissioned. Decommissioning would remove all above ground infrastructure, rehabilitating the site to allow for a return to agricultural or other land use for the majority of the site.

PROJECT NEEDS AND BENEFITS

At present, Australia has one of the world's highest greenhouse gas emissions per unit of electricity produced in the world, with the vast majority of its power generated by aging coal-fired power plants. The NSW Renewable Energy Action Plan and the Commonwealth's Large-scale Renewable Energy Target are incentives to support a global reduction in greenhouse gas emissions.

The proposal would generate approximately 125,000 megawatt hours of renewable electricity per year and would have the following benefits:

- Reduced greenhouse emissions, assisting the transition towards cleaner electricity generation.
- Provision of a renewable energy supply that would assist the Commonwealth and NSW Governments to reach Australia's energy and carbon mitigation goals.
- Embed electricity generation supply into the Australian grid, closer to the main consumption centres.

KEY ENVIRONMENTAL ASSESSMENT ISSUES

Prior to detailed environmental investigations, a risk assessment was carried out to identify the key environmental risks of the proposal, to guide the depth of investigation in this EIS. The risk assessment identified four environmental aspects as key risks. Specialist investigations were subsequently undertaken in these areas as part of this EIS:

- Biodiversity.
- Aboriginal heritage.
- Visual amenity.
- Noise.

These issues are discussed in Section 6 of this EIS. Lower risk issues are discussed in Section 7, primarily by desktop assessment.

Summary of higher risk issues

Biodiversity

Biodiversity (flora and fauna) investigations included searches of relevant data bases and a site assessment in line with the *Framework for Biodiversity Assessment - NSW Biodiversity Offsets Policy for Major Projects* (Office of Environment and Heritage 2014). The majority of the solar farm site has been cleared for grazing and cultivation. However the endangered ecological community (EEC) *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions* is present within the proposed overhead transmission line easement, and in patches within the proposal site. Development of the solar farm would require the removal of some EEC for construction of the overhead 66KV powerline. Where removal of the *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions* EEC occurs, this would require offsetting in accordance with the NSW Biodiversity Banking and Offsets *Scheme*. A BioBanking credit assessment was completed for the development of the overhead powerline. This identify that 13 credits are required to offset the EEC that would be impacted.

Aboriginal heritage

Aboriginal heritage investigations included Aboriginal community consultation, background research, a field survey and significance assessment. The survey recorded seven isolated artefacts across the proposal site.

With regard to the proposal site, it is likely that additional artefacts could occur within the proposed development footprint. However, based on the land use history of the proposal area, and an appraisal of the area from the field survey, there is low potential for the presence of intact subsurface deposits.

No additional archaeological investigations are considered to be required. Efforts would be made in the design stage to avoid the artefacts recorded during the survey. If complete avoidance is not possible, the artefacts would be collected and moved to a safe area within the property, as close as possible to their original location, which will not be subject to ground disturbance. The collection and relocation should be undertaken by representatives of the registered Aboriginal parties.

Visual amenity

The results of the community consultation indicate little concern in the local community about the visual impacts of the proposal. Sixteen representative viewpoints were assessed separately, one of which was considered to have high impact significance. Medium impacts are seen for four residences. While existing vegetation will, to some extent screen views to the proposed solar farm site, there are likely to be dominant views of infrastructure from some areas of the residence or yard and screening as a mitigation strategy would be considered for these viewpoints, in consultation with affected landowners to break up views of the 'as built' infrastructure layout.

Noise

Background noise monitoring was undertaken at the nearest residence to the proposal site, located on Henry Parkes Way. This location was used to model construction and operational noise impacts for the proposal.

The assessment predicted no construction noise exceedances for the nearest residences to the proposal site. Operational noise impacts would not exceed noise limits traffic noise levels as a result of the construction works for the solar farm would not adversely contribute to the existing traffic noise levels at the most affected residences along the surrounding roads.

Lower risk issues

Eleven lower risk issues were investigated, primarily using desktop assessment, in Section 7 of this EIS and include.

- Soil.
- Water use and water quality (surface and groundwater) and hydrology.
- Traffic, transport and road safety.
- Climate and air quality.
- Health and safety.
- Land use.
- Socioeconomic and community.
- Resource use and waste generation.
- Fire and bush fire issues.
- Historic heritage.

These impacts were assessed as highly manageable.

MANAGEMENT OF IMPACTS

Impact avoidance and minimisation measures have been incorporated into the design of the proposal. These measures are considered practical and achievable by the proponent. They are set out for each area of investigation in Sections 6 and 7 and summarised in Section 8.2 of this EIS.

All commitments and environmental safeguards would be managed through the implementation of a Project Environmental Management Plan, consisting of a Construction Environmental Management Plan, an Operation Environmental Management Plan and a Decommissioning Environmental Management Plan. These plans would be prepared sequentially and submitted to the DPE, prior to each stage of works.

CONCLUSION

This EIS identifies and assesses the environmental issues associated with the construction, operation and decommissioning of the proposed Parkes Solar Farm, in accordance with Part 4 of the NSW EP&A Act and the Schedule 2 of the EP&A Regulation.

The proposal would comply with relevant Commonwealth, State and local planning requirements. It would:

- Be sympathetic to landscape and potential environmental impacts.
- Contribute to greenhouse gas emission reduction and the move towards cleaner electricity generation.
- Assist to meet Commonwealth and NSW Governments carbon mitigation goals.
- Provide social and economic benefits during construction and operation of the solar plant.

In light of the benefits of the proposal, its low level of expected environmental impacts and their reversibility, the proposal is considered to be ecologically sustainable and justified.

1 INTRODUCTION

1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

This Environmental Impact Statement (EIS) identifies and assesses the environmental issues associated with the construction, operation and decommissioning of the proposed Parkes Solar Farm. The proposed photovoltaic (PV) solar farm would produce up to 57 megavolt-ampere (MVA) or 65 Megawatts (MW) of electricity. NGH Environmental has prepared this EIS on behalf of the proponent, Neoen Australia (Neoen).

This EIS has been prepared in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to support a Development Application (DA) to be lodged with NSW Department of Planning and Environment (DPE).

The objective of this EIS is to fulfil the requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and Section 79C of the EP&A Act. The structure and content of the EIS address the Secretary's Environmental Assessment Requirements (SEARs), provided by NSW DPE on 9 December 2014 (refer Appendix A).

The EIS also addresses the assessment requirements of the *Threatened Species Conservation Act 1995* (TSC Act) and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 PROJECT OVERVIEW

1.2.1 The proponent

Neoen is an Independent Power Producer (IPP) specialized in renewable energy projects. The company is headquartered in Paris (France) and operates across renewable energy technologies, including solar, wind, and biomass, with an experienced staff of around 100 employees.

Neoen develops, finances, constructs, operates and maintains its projects as a fully integrated renewable energy player, with a genuine long-term approach.

Since its founding in 2008, Neoen has expanded beyond its local market in France and currently has branches in Portugal (2010), Australia (2012), Mexico and Egypt (2013) and Salvador (2014). It is also actively developing projects in other African areas, in Central America, in the Pan-Caribbean region, in the Middle East and in the Asia-Pacific region.

Neoen has now reached an industrial maturity with more than 760 MW of assets either in operation or construction. The company is scaling up its portfolio of projects, both inside and outside France, with the goal of reaching a capacity of 2,000 MW by 2020.

In 2015, Neoen Australia initiated the construction of the first stage (100 MW) of the South Australian Hornsdale Wind Farm, and the 10.6 MW solar PV + 6 MW batteries hybrid DeGrussa project in Western Australia.

1.2.2 Site location

The proposal site is located approximately 10 kilometres (km) west of Parkes (refer to Regional Location map in Appendix B) within the Parkes Local Government Area (LGA). The site is accessed via Henry Parkes Way (locally known as Condobolin Road) and Pat Meredith Drive to the west (refer to Proposal Site map in Appendix B). The solar farm proposal would connect to the existing 132/66 kilovolt (kV) Transgrid substation located on Pat Meredith Drive to the north of the site.

1.2.3 Key components of the proposal

The Parkes Solar Farm proposal site covers approximately 240 hectares (ha) of land. Key infrastructure components would include:

- Solar arrays: approximately 215,000 solar panels supported by approximately 27,000 piles, driven or screwed into the ground in order to support the solar array's mounting system. The panels to be installed would be either:
    - single-axis tracking panels (which would have approximately 2,850 tracker units)
    - north-oriented fixed-tilt panels
    - east-west facing fixed-tilt panels
    - or a combination of these alternatives.
- Approximately 28 PV boxes or PV skids (either containerised or installed on a 'skid' platform), each of them containing an inverter and an 11 kV, 22 kV or 33 kV transformer.
- Onsite cabling and electrical connections between solar arrays and panel inverters.
- One delivery station in a container or on a skid platform.
- Cables and trenches.
- Internal access tracks to allow for site maintenance vehicles, and gravel access road and parking for staff and visitors.
- Staff amenities and offices.
- Perimeter security fencing, approximately 2.3 metres (m) high.
- A vegetation buffer.
- A 66kV overhead or underground power line to connect into the existing Parkes Transgrid substation, approximately 600 m north of the site.

The Proposed Infrastructure map in Appendix B illustrates the indicative layout, including the solar array. Detailed design will allow for avoidance of sensitive features on the site (including a planted row of trees which run north-south through the site and groups of trees in south eastern portion of the site which would be retained). The vegetation buffer would be established post-construction, to minimise visual impacts in specific locations.

1.2.4 Capital investment

The proposed Parkes Solar Farm would have a capital investment of approximately $98 million.

2 JUSTIFICATION AND BENEFITS OF THE PROJECT

2.1 PROPOSAL OBJECTIVES

The objectives of the Parkes Solar Farm proposal are to:

- Select and develop a site which is suitable for commercial scale solar electricity generation.
- Assist the NSW and Commonwealth Governments to meet Australia's renewable energy targets and other energy and carbon mitigation goals.
- Develop a project which is acceptable to the local community.
- Provide local and regional employment opportunities and other social benefits during construction and operation.
- Provide a clean and renewable energy source to assist in reducing greenhouse gas (GHG) emissions.
- Construct a project with minimal adverse environmental impacts.
- Provide electricity generation close to a consumption centre.

2.2 PROJECT NEED

2.2.1 Global warming

Human activity is resulting in the release of large amounts of GHGs which trap the sun's heat in our atmosphere and upset the balance of the Earth's climate. This threat is acknowledged by scientists and politicians around the world, as illustrated by the historic global agreement to tackle climate change in November 2015 at the COP21 conference in Paris. At the Paris COP21 conference, Australia committed to reducing its emissions to 26-28% below 2005 levels by 2030.

2.2.2 Renewable energy targets

The Kyoto Protocol is an international agreement created under the United Nations Framework Convention on Climate Change in Kyoto, Japan in 1997. The Australian Prime Minister signed Australia's instrument of ratification of the Kyoto Protocol in 2007, thereby committing Australia to reduce its collective GHG emissions.

There have been a number of government policies in place in Australia influencing the development of renewable energy. In 2001, the Commonwealth Government introduced the Mandatory Renewable Energy Target (MRET) Scheme to increase the amount of renewable energy being used in Australia's electricity supply. The initial MRET was for Australian to provide 9,500 gigawatt hours (GWh) of new renewable energy generation by 2010.

This target was revised and from January 2011 an expanded target of 45,000 GWh of additional renewable energy between 2001 and 2020. The MRET was split into a Small-scale Renewable Energy Scheme and Large-scale Renewable Energy Target (LRET) components to ensure that adequate incentives were provided for large scale grid connected renewable energy. The LRET aims to create a financial incentive for the establishment and growth of renewable energy power stations, such as wind and solar farms, or hydro-electric power stations through the creation of large-scale generation certificates.

In September 2013, the NSW Government released the NSW Renewable Energy Action Plan (REAP) to guide NSW's renewable energy development and to support the former national target of 45,000 GWh of additional renewable energy by 2020. The NSW Government's vision is for a secure, reliable, affordable and clean energy future for the state. The Plan positions the state to increase energy from renewable sources at least cost to the energy customer and with maximum benefits to NSW. The strategy is to work closely with NSW communities and the renewable energy industry to increase renewable energy generation in NSW.

In June 2015, the Australian parliament passed the *Renewable Energy (Electricity) Amendment Bill 2015.* As part of the amendment bill that LRET was reduced from 41,000 GWh to 33,000 GWh in 2020 with interim and post 2020 targets adjusted accordingly. The current projection is that about 23.5% of Australia's electricity generation in 2020 will be from renewable sources.

To meet the LRET of generating 33,000 GWh of renewable electricity annually by 2020, the market situation in early 2016 indicates that this target is unlikely to be reached unless approximately 4,400 MW of projects are committed in 2016, as illustrated in Figure 2-1 (Green Energy Markets 2015).

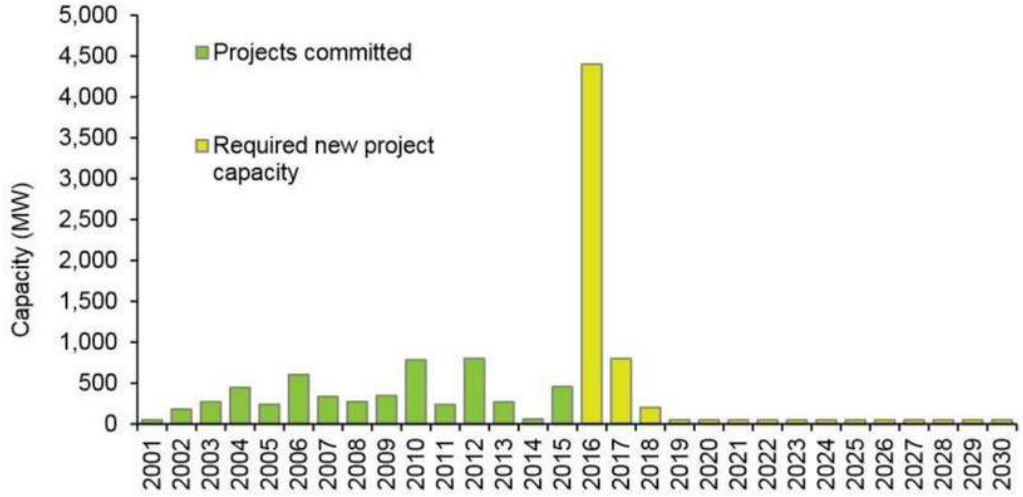

Figure 2-1 Installed capacity required to maintain market liquidity (Green Energy Markets Pty Ltd 2015)

2.2.3 State and Federal support for renewable energy

At present, Australia has one of the world's highest GHG emissions per unit of electricity produced in the world, with the vast majority of its power generated by aging coal-fired power plants. The REAP and LRET incentives are supported at the federal level by grant programs from the Australian Renewable Energy Agency (ARENA), and financing programs from the Clean Energy Finance Corporation. It should be noted that the Parkes Solar Farm is one of 22 projects short-listed by ARENA in January 2016 in the context of its first Large-Scale Solar Competitive Round.

2.3 PROJECT BENEFITS

Key project benefits include:

- The Parkes Solar Farm would generate approximately 125,000 megawatt hours (MWh) of renewable electricity per year.
- Based on an emission factor of 0.87 kg CO_2-e/kWh (for NSW and ACT) (DIICCSRTE 2013) the proposed solar energy facility would displace approximately 110,000 tonnes of carbon dioxide (CO_2) or greenhouse gas emissions per year.
- The proposed solar energy facility could supply enough power each year to service over 19,000 average New South Wales households (ACIL Allen Consulting, 2015).
- A solar energy facility that displaces 110,000 tonnes of CO_2per annum is the equivalent of taking approximately 32,500 cars off the road each year, based on an average car in NSW travelling 14,100 km per year (DIT 2011).

2.3.1 Broad project benefits

Broad project benefits that would be associated with the operation of the Parkes Solar Farm include:

- Reduced GHG emissions, assisting the transition towards cleaner electricity generation.
- Provision of a renewable energy supply that would assist the Commonwealth and NSW Governments to reach Australia's LRET and other energy and carbon mitigation goals.
- Embed electricity generation supply into the Australian grid, closer to the main consumption centres.

2.3.2 Local project benefits

Local social and economic project benefits that would be associated with the construction and operation of the Parkes Solar Farm include:

- Direct and indirect employment opportunities during construction and operation of the solar farm; this includes approximately 100 employees during construction and 0.5 full time equivalent operational staff for the life of the project.
- Direct business volume benefits for local services, materials and contracting businesses.
- Delivery of sufficient solar energy into the national electricity system at Parkes to power the entire LGA.
- Assistance in meeting the future electricity demands for the Parkes LGA.

Furthermore, the proposal would reflect the environmental constraints of the site appropriately. It would be designed to:

- Preserve biodiversity features, through minimising tree removal.
- Minimise impacts to soil and water, through pile driven panel mounts rather than extensive soil disturbance and excavation.
- Minimise visual impacts to neighbours, incorporating vegetation screens located in consultation with neighbours.
- Preserve agricultural production values, being highly reversible at the end of the project's life.

2.4 PROJECT JUSTIFICATION

The Parkes Solar Farm would meet the proposal objectives, principally the development of a commercial scale solar electricity power station and is justified in terms of reducing Australia's GHG emissions, meeting future energy demands, contributing to Australia's renewable energy targets, supporting a global reduction in GHG emissions, being consistent with the REAP and contributing to economic development in the Parkes region.

The proposal has been developed to make use of existing grid connections, on a previously cleared agricultural site that has generally low environmental values.

2.5 ALTERNATIVES CONSIDERED

During the development of the proposal, a number of alternatives were considered and are provided below. These include the 'do nothing option' (not developing the solar farm), developing different renewable technologies or altering the proposed size and the location of the proposal.

2.5.1 The 'do nothing' option

The consequences of not proceeding with the proposal would be to forgo the identified benefits. This would result in the **loss** of:

- Opportunity to reduce GHG emissions and move towards cleaner electricity generation.
- A renewable energy supply that would assist in reaching the LRET.
- Additional electricity generation and supply into the Australian grid.
- Social and economic benefits, created through the provision of direct and indirect employment opportunities during the construction and operation of the solar farm.

Doing nothing would avoid the environmental impacts associated with the development and operation of the proposed solar farm, which include vegetation impacts, construction noise, traffic and dust, visual impacts and a temporary reduction in agricultural production at the site. However, these impacts are considered to be manageable and would not result in a significant impact to the environment. Given the benefits of the proposal, the do nothing option is not considered to be a preferred option. In light of the benefits of the proposal and the low level of environmental impact (assessed within this EIS), the proposal is considered to be ecologically sustainable and justifiable.

2.5.2 Technology alternatives

Renewable energy project alternatives

The LRET and REAP outline the commitment by both Australia and NSW more specifically, to reducing GHG emissions and have set targets for increasing the supply of renewable energy. Other forms of largescale renewable energy accounted for in the LRET include wind, hydro, biomass, and tidal energy. The feasibility of wind, solar, biomass, hydro and tidal projects depend on the availability of energy resources and grid capacity. Neoen has interests in both wind and solar projects. Wind projects were considered to be more suitable to South Australia's world-class wind resources and superior solar resources were identified in New South Wales, providing excellent opportunities for solar projects. This led Neoen to initiate several solar developments in NSW, bearing in mind that this technology can generally be deployed faster than any other type of renewable energy infrastructure.

Available grid capacity at a suitable voltage (66 kV) was instrumental in making Parkes an ideal choice for a renewable energy development, which was confirmed by Transgrid in a presentation at the NSW large-scale solar workshop on the 19 November 2015, where Parkes was identified as one of the "regions of interest" with good connection capacity for renewable energy projects (refer Figure 2-2). The Parkes area is also services by a major transport route.

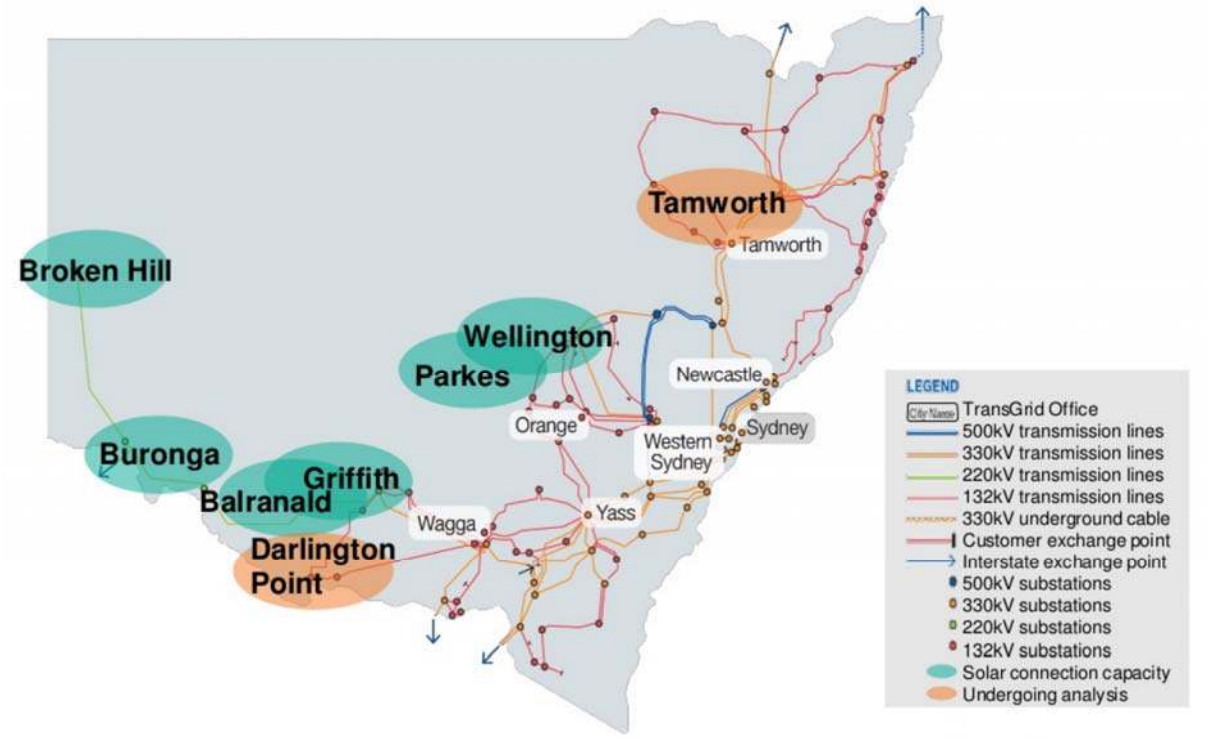

Figure 2-2 Regions of interest for large scale solar in NSW (source Transgrid 2015)

Alternative PV technologies

Neoen is considering several different solar PV mounting technology options for the proposal (see Figures 2-3, 2-4 and 2-5). These include:

- North facing fixed tilt panels.
- East-west facing fixed tilt panels (a lower cost of installation and better density of panels can be achieved).
- Single-axis tracking panels (a lower density but higher energy yield can be achieved).

The final decision may be one or a combination of these technologies.

Figure 2-3 Example of single-axis tracking systems with multicrystalline modules

Figure 2-4 Example of south-facing fixed-tilt mounting system with thin-film technology in Europe (installation in Australia would face the north)

Figure 2-5 Example of east-west facing fixed-tilt mounting system with multicrystalline modules

Each option would have relatively comparable constructed footprints, visual impacts and environmental impacts, as the varying structures would be of similar height with similar support mountings (installed by driving or screwing into the ground, rather than excavations for footings).

In terms of module technology, Neoen is considering both multicrystalline modules, which are the most common technology globally, and thin-film technologies which were used on the recently constructed Nyngan and Broken Hills solar farm projects in NSW.

All of these PV technology options are assessed in this EIS, to provide design flexibility. The final decision would be determined at the detailed design phase.

2.5.3 Alternative site locations

During the site selection process for the Parkes Solar Farm, a number of alternative locations were considered. Minimising environmental and social impacts and maximising efficiency were major considerations in the evaluation of alternatives.

The current site was identified as the preferred location, based on the following features:

- Availability of abundant solar resource.
- Proximity to an electricity substation with good connection capacity.
- Availability of appropriate land with appropriate topography (flat or predominantly north-facing).
- Suitability in terms of environmental constraints (the site has a long disturbance history under agricultural cultivation, minimising potential for biodiversity and heritage constraints).
- Absence of flood risk.

The Parkes site was identified by Neoen as a high-potential location for a solar farm in 2013. An initial feasibility assessment was undertaken which determined the site to be a suitable area to accommodate a solar farm. Subsequent environmental investigations have confirmed its suitability.

2.5.4 Size of proposal

Neoen initially envisaged a 30 MVA capacity solar farm at the Parkes site, at a time when additional connection capacity was uncertain. Further discussions with Transgrid, the network service provider, have confirmed that the nearest substation could accommodate up to 143 MVA. Such a large project could be built at the site with insignificant additional environmental impact with east-west oriented fixed-tilt structures, a mounting technology used by Neoen when building the largest European solar farm in Cestas, close to Bordeaux (France). In this context, Neoen submitted a letter to DPE, requesting the possibility to extend the project maximum capacity to 143 MVA.

Further design studies have since concluded that a 57 MVA solar farm would likely provide the best outcome for the project.

3 PROJECT DESCRIPTION

Neoen proposes the construction, operation and decommissioning of the PV 57 MVA or 65 MW Parkes Solar Farm.

3.1 PROPOSAL SITE

The proposal site comprises approximately 240 ha of freehold land, identified as lot 4, DP854193. Appendix B provides a map of the proposal site, which is located approximately 800 m to the south of Henry Parkes Way. Pat Meredith Drive is located immediately west of the proposal site and the site is accessed by this road (see Appendix B Proposed Infrastructure map). Figures 3-1 and 3-2 illustrate the site from near its north-western corner. Figures 3-3 and 3-4 illustrate the site's central area. The photographs depict the cleared and agricultural nature of the land.

Figure 3-1 View of proposal site from its north-western corner, looking south-east

Figure 3-2 View of proposal site from its north-western corner, looking south

Figure 3-3 View of proposal site from central area, looking north

Figure 3-4 View of proposal site from central area, looking east

The majority of the site has been cleared and cultivated in the past. There is a small area of native vegetation in the north western area of the site, isolated paddock trees and several rows of planted trees and shrubs across the centre of the site, mostly along fence lines. There are five farm dams across the site, the largest one being adjacent to the native vegetation in the north western area of the site.

There is a 132/66 kv power line running north-south through the site located adjacent to the western boundary of the site (see Figure 3-5).

Figure 3-5 View of 132/66 kv power line near western boundary of proposal site and Pat Meredith Drive

The Pat Meredith Drive road reserve to the west of the site, contains mature native vegetation. The vegetation extends into the north-western area of the proposal site. The proposed above-ground grid connection route is adjacent to the existing powerline to the west of Pat Meredith Drive (see Figure 3-6). An alternative underground transmission line route follows the road reserve. The Proposed Infrastructure map in Appendix B illustrates the transmission line route options.

Figure 3-6 View of proposed above ground transmission line route, to the west of Pat Meredith Drive

The proposed transmission line would connect with the existing Transgrid substation, located at the corner of Pat Meredith Drive and Henry Parkes Way (see Appendix B), approximately 800 m north of the site

boundary (see Figure 3-7). Planted and naturally regenerating native vegetation are located around the fenced substation site.

Figure 3-7 View of Transgrid substation on the corner of Pat Meredith Drive and Henry Parkes Way

Dominant land use in the local area are agriculture, with crop production and stock grazing, as well as road and rail infrastructure.

Henry Parkes Way and Pat Meredith Drive are located to the north and west of the proposal site, respectively, with Brolgan Road is approximately 1.5 km to the south of the southern extent of the site. Approximately 600 m further south is the Orange to Broken Hill railway line that connects Parkes and Condobolin. This is used by the Indian Pacific tourist train and freight trains. The Parkes Narromine railway line is located approximately 2 km east of the site and is used mainly for grain haulage.

The nearest water course to the site is Ridgey Creek, approximately 500 m to the west (see Proposal Site map in Appendix B). Ridgey Creek flows to the south-west into Goobang Creek, one of the tributaries of the Lachlan River.

The nearest sensitive receivers to the site are the four residences illustrated the Nearest Receivers map in Appendix B. The non-involved nearest residence is located approximately 400 m north of the boundary of the proposal site.

Henry Parkes Way is a regional transport corridor which connects the towns of Condobolin, Parkes and Manildra. Pat Meredith Drive is a low use road which is gated near the proposal site and becomes an unformed road to the south of the site.

3.2 KEY INFRASTRUCTURE COMPONENTS

Appendix B provides a Proposed Infrastructure map showing the layout of the Parkes Solar Farm proposal, plus drawings of the indicative layout. Key infrastructure of the proposal include:

- Solar arrays: approximately 215,000 solar panels.
- Approximately 2,850 tracker units (for the single-axis tracking technology option).
- Approximately 28 PV boxes or PV skids, each of them containing an inverter and an 11kV, 22kV or 33kV transformer.
- Onsite cabling and electrical connections between solar arrays and panel inverters.
- One containerised or skid-mounted 66kV transformer and delivery station.
- Cables and trenches.
- Internal access tracks to allow for site maintenance vehicles, and gravel access road and parking for staff and visitors.
- Permanent staff amenities and offices.
- Perimeter security fencing, approximately 2.3 m high.
- Vegetation buffer.
- A 66kV overhead or underground power line to connect into the existing Parkes Transgrid substation, approximately 600 m north of the site.

Within the 240 ha proposal site, ground disturbance would be limited to:

- The installation of the piles supporting the solar panels, which would be driven or screwed into the ground.
- Construction of internal access tracks.
- Establishment of PV boxes and delivery station.
- Trenches for the installation of cables.
- Establishment of staff amenities and offices.
- Construction of perimeter security fencing.

As illustrated on the Proposed Infrastructure map in Appendix B, the indicative solar array area covers the majority of the site, however the ground disturbance from pile installation would be disturb only about 0.2% of the total site area. Panels within the solar array area would sit above the ground and ground cover would be maintained under the panels. The area of the site which would be affected by shading from the solar panels would be approximately 70% of the total site area. Additional ground disturbance outside the solar arrays would result from construction of the internal access tracks, trenches for cabling and footings for other equipment.

Ancillary facilities would be located within the site boundary and would include:

- Material laydown areas.
- Temporary construction site offices.
- Temporary car and bus parking areas for construction workers transportation. Once the plant has been commissioned a small car park would remain for the minimal staff required and occasional visitors.
- Staff amenities. Once constructed, the solar farm would be monitored and operated remotely and would therefore require a minimum number of maintenance personnel (0.5 full time equivalent staff) to be onsite.

It is noted that the location of the ancillary facilities is not specified on the Proposed Infrastructure map in Appendix B and will be determined at the detailed design phase. They would be located within the site boundaries.

The annual output of the proposal would be up to 125 Gigawatt hours (GWh), with a capacity factor of approximately 17 to 23 per cent depending on the technology. The construction phase of the project would be approximately 9 months with a capital cost of approximately $98 million. The proposal is expected to have a 25 to 30 year operating life at which point, all above ground infrastructure would be removed from the site.

3.2.1 Solar arrays

The solar arrays would be comprised of approximately 215,000 solar panels, which would be either multicrystalline or thin-film technology.

The panels to be installed would be either single-axis trackers (which would have approximately 2,850 tracker units), north-oriented fixed-tilt, east-west facing fixed-tilt or a combination of these technologies.

Approximately 27,000 piles would be driven or screwed into the ground in order to support the solar array's mounting system and solar panels, with racking systems to allow the installation of solar panels. This minimises ground disturbance.

The panel structures would be 1.5 m to 2.3 m high. The mounting system to be installed on the poles would be dependent on the final project technology. Panel technology options are illustrated in Figures 2-1, 2-2 and 2-3. Figures 3-6, 3-7 and 3-8 illustrate the construction and assembly stages of a solar PV array (for a single-axis tracking system).

Figure 3-8 Example of poles driven into the ground on a Neoen solar project in Western Australia

Figure 3-9 Example of a single-axis mounting system before panel installation

Figure 3-10 Example of a single-axis mounting system after panel installation

The multicrystaline or thin-film solar PV panels installed on the mounting system would be interconnected so as to obtain a number of strings whose overall voltage would be adequate for the operating input voltage range of the inverters. These module interconnections would as short as possible and would shorten the cabling loops thereby minimizing the lightning effects.

3.2.2 PV boxes or PV skids

Approximately 28 PV boxes or PV skids would be installed and spread across the site. Each of them would contain an inverter and a transformer. The PV boxes (containerised) or PV skids (on skid platforms) would measure up to 6.1 m long x 3.4 m high x 2.4 m wide.

The containerised PV boxes would contain inverter and transformer stations in containers, with an example illustrated in Figure 3-9.

Figure 3-11 Example of a containerised PV box

The PV skids would contain an inverter and transformer installed on a platform and would be similar to that illustrated in Figure 3-10.

Figure 3-12 Example of a skid platform PV box

3.2.3 Delivery station

The main transformer and delivery station would have a similar appearance to the PV box or PV skid in described above. The delivery station measurements would be up to container which is 8.2 m long x 3.5 m wide x 3.4m high.

3.2.4 Underground cabling

Underground cabling on site would be designed in accordance with Australian and international standards, taking into account the temperature of the ambient environment in which the cables and ancillaries shall operate, the allowable currents compatible with an acceptable warming-up as stated in the standards and as per manufacturers' recommendations.

Trenches would accommodate and protect the power and would be comprised of the following:

- Power ducts to export the production from the solar arrays to the Array Boxes (AB's).
- Power ducts to export the production from the ABs to the PV boxes or PV skids.
- One 25mm² copper wire for equipotentiality.
- The medium voltage cable for the two antennae from the PV boxes or PV skids to the delivery station.
- A fibre optic connection.
- A low current duct for communication.

Figure 3-11 illustrates an example of a trench design which may be used.

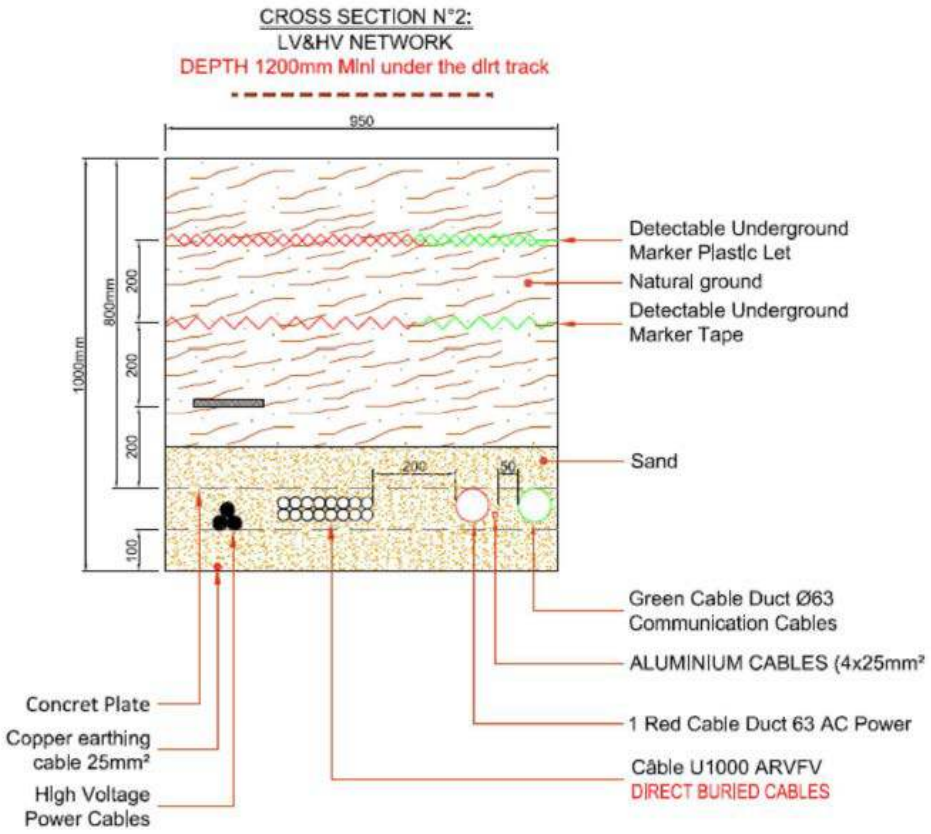

Figure 3-13 Typical trench design

3.2.5 Transmission line

The electrical connection from the site would be via a 66 kV overhead or underground line running to the existing Parkes Transgrid substation, approximately 600 m north of the site. The Proposed Infrastructure map in Appendix B illustrates the route of the overhead and underground powerline options.

The overhead line option would be situated to the west of the existing 132/66 kV facilities owned by Transgrid. The existing Transgrid easement would be increased by approximately 20 m, with the consent of the land owner who is also the owner of the land chosen for the construction of the solar farm. The overhead line option would be situated to the west of the existing 132kV double circuit owned by Transgrid. The existing Transgrid easement would be increased by approximately 20 m, with the consent of the land owner (who is also the owner of the solar farm proposal site). The overhead powerline would be installed on up to 20 m high power poles. The actual route of the overhead powerline, across private property, would be determined at the detailed design phase in consultation with the land owner.

The underground powerline route option would be within the Pat Meredith Road reserve. Construction would involve trenching along the road surface and underboring beneath areas of vegetation.

3.2.6 Internal access tracks

The on-site tracks would be made of a gravel compacted layer. If required, a geotextile would be laid between the soil and the gravel. Figure 3-12 illustrates a typical internal track design.

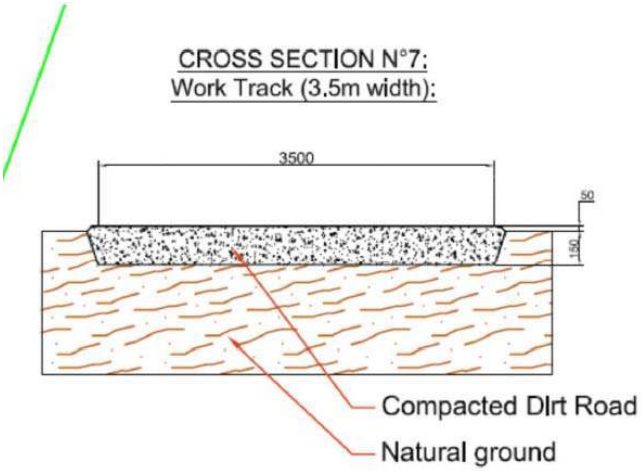

Figure 3-14 Typical internal track design

3.2.7 Ancillary facilities and construction compound

Ancillary facilities would be located within the site boundary and would include:

- Material laydown areas.
- Temporary construction site offices.
- Temporary car and bus parking areas for construction workers transportation. Once the solar farm has been commissioned a small car park would remain for the minimal staff required and occasional visitors.
- Staff amenities. Once constructed, the solar farm would be monitored and operated remotely and would therefore require a minimum number of maintenance personnel (0.5 full time equivalent staff) to be onsite.
- Parking for staff and visitors.

These facilities would be designed in line with the relevant Australian standards.

Staff amenities would be designed to accommodate the number of workers at the peak of the construction period and would include:

- Car park.
- Sanitary modules with septic tank.
- Changing rooms.
- Dining hall.
- Administrative office.
- Undercover storage area.
- Pedestrian road allowing workers to go from the parking to the base camp in security without crossing a vehicular road.
- Muster point in case of emergency.
- Genset for electrical supply.

3.2.8 Perimeter security fencing

The perimeter of the site would be fenced with 2.3 m high security fencing along the site boundaries. It is expected to be cyclone fencing with a strand of barbed wire at the top.

3.2.9 Site access

Access to the site during construction would be from Henry Parkes Way and Pat Meredith Drive. The site access point off Pat Meredith Drive is illustrated on the Proposal Infrastructure map in Appendix B.

3.3 CONSTRUCTION AND COMMISSIONING

3.3.1 Indicative timeline

An indicative timeline for the proposal is outlined in Table 3-1.

Table 3-1 Indicative timeline.

Phase	Approximate commencement	Approximate duration
Construction	January 2017	9 months
Commissioning	September 2017	1 month
Operation	October 2017	25 years
Decommissioning	2042	2 months

Activities specific to each phase of the project are discussed below.

3.3.2 Construction activities

The construction and commissioning phase is expected to last approximately 9 months. The main construction activities would include:

- Site establishment and preparation for construction (vegetation removal, fencing, preliminary civil works and drainage.
- Installation of steel post foundation system for the solar panels.
- Installation of underground cabling (trenching), installation of PV boxes containers and delivery station, connection of communications equipment.
- Construction of the 66 kV transmission line (underground or above ground), switch gear and equipment, and interconnection of the generator to the existing Transgrid Parkes electricity substation.
- Removal of temporary construction facilities and rehabilitation of disturbed areas.

As discussed in Section 3.2, the level of ground disturbance across the site is low. This is primarily because the piles supporting the solar array's mounting system would be driven or screwed into the ground, minimising ground disturbance. Therefore ground disturbance would be minimal, would not involve levelling and would be limited to discrete tracks, piles and other elements described above. Post construction, ground cover would be rehabilitated and maintained beneath solar array areas throughout the operational life of the solar farm.

3.3.3 Hours of operation during construction

Works would be undertaken during standard working hours:

- Monday – Friday 7am to 6pm
- Saturday 8am to 1pm

No night works or work on Sundays or public holidays are proposed. Any construction outside of standard construction hours would only be undertaken in consultation with relevant roads authorities, where required, and in consideration of audible noise impacts to near residents.

3.3.4 Resourcing requirements

Key resourcing requirements for the project would include labour, machinery and equipment, steel, electrical components, water, gravel and landscaping materials.

Labour, machinery and equipment

It is anticipated that approximately 100 construction personnel would be required on site during the peak construction period (approximately five months). Construction supervisors and the construction labour force, made up of construction labourers and technicians, are intended to be hired locally where possible.

It is anticipated that most workers would be accommodated at existing accommodation within the local area. It is proposed that bus transfers would be provided to minimise traffic volumes and transit risks during construction.

Equipment used during construction would include earth-moving equipment for civil works, diesel generators, trucks and cranes with similar noise outputs to farm machinery such as tractors.

Pile driving of the solar panel foundations would be undertaken using a machine which screws or hammers poles into the ground, similar to that used for driving farm fence poles into the ground.

Traffic volumes and requirements

Traffic management would be undertaken during the construction phase to manage haulage traffic. Preliminary plans for the site propose parking for approximately 60 vehicles. The proposed timeline for the project indicates that approximately 40 employees would be required during the first month rising to 100 employees during the peak construction period (approximately five months). Two or three piling or drilling machines would also be present on site during the first months of the works. During construction, up to 20 trucks a day will deliver equipment on site. A special convoy and a 50T mobile crane may be required for the offloading of the PV boxes or PV skids and the delivery station. Traffic volumes and requirements are discussed in detail in Section 7.3.

Materials

In total, approximately 5,000 m^3 of gravel would be required for work and service tracks, while PV boxes or PV skids peripheral backfill and compaction would require around 1,000 m^3 of gravel.

Approximately 550 m^3 of sand would be required for the burying of cables into about 35 km of trenches. Approximately 450 m^3 of sand would likely be required for the installation of the PV boxes or PV skids, subject to further geotechnical studies.

3.3.5 Operation

The operational phase of the proposal is anticipated to commence in October 2017. Once operational, activities would include daily operations and maintenance. This would include:

- Routine visual inspections, general maintenance and cleaning operations of the solar arrays, use of 'drone' technology to enhance maintenance operations.
- Vegetation management. Ground cover vegetation would be maintained beneath panels to resist erosion and weed infestation. A monitoring program would address any bare areas that develop, by seeding or armouring (i.e. jute mesh) to avoid erosion.
- Site security if a security event occurs.
- Replacement of equipment and infrastructure, as required.
- In total, approximately 3,250 man-hours of work per year for preventive maintenance.

During normal operation, it is likely that no vehicles would be present at the site on a permanent basis, with only occasional visits by standard vehicles. Standard work hours would be maintained for standard operational activities. During major outages, 20-30 vehicles may be present at any one time.

Hours of operation during operation

Daily operations and maintenance by site staff would be undertaken during standard working hours:

- Monday – Friday 7am to 6pm
- Saturday 8am to 1pm

Outside of emergencies, night works or work on Sundays or public holidays are not proposed.

During summer months, the solar farm may continue to produce electricity after 6pm and prior to 7am while the days are longer. In the case that the panels installed are single-axis trackers, the tracker units would potentially operate outside standard working hours during summer months.

3.3.6 Decommissioning

During decommissioning, all above ground infrastructure would be removed. Key elements of project decommissioning would include:

- The solar farm's generator would be disconnected from the Transgrid metering point.
- The solar arrays would be removed, including the foundation posts. Materials would be sorted and packaged for removal from the site for recycling or reuse. Much of the solar array panels would be recyclable.
- All site amenities and equipment would be removed and materials recycled or reused, wherever possible.
- Posts and cabling would be removed and recycled (some infrastructure 300 mm below ground may be left in place).
- Fencing would be removed (some fencing may be retained, if it is requested by the landowner).

Traffic required for decommissioning would be similar in type but of shorter duration than that required for the construction phase.

4 STAKEHOLDER CONSULTATION

4.1 AGENCY CONSULTATION

Secretary's environmental assessment requirements

As the proposal is classified as State Significant Development (SSD), a scoping study was prepared and SEARs were requested (for a 30 MVA PV solar farm). These were provided by DPE on 9 December 2014 (refer Appendix A). The SEARs are intended to guide the structure and content of the EIS and reflect the responsibilities and concerns of NSW government agencies in relation to the environmental assessment of the proposal.

In September 2015, Neoen made contact with DPE to advise of changes to the proposal, including an increase in the proposed capacity of the solar farm (from 30 MVA to 143 MVA) and an increase in site coverage (from approximately 55 ha to approximately 240 ha). The revised proposal site remains within the site boundary covered by the original scoping study. Neoen is now applying for a 57 MVA project approval. This EIS is specific to the 57 MVA project.

DPE advised on 16 October 2015, that the SEARs issued on 9 December 2014 remain relevant for the proposed 57 MVA project (refer Appendix C.1).

The following sections provide a summary of the SEARS from the various agencies and cross reference where specific issues are addressed within this EIS. Additional consultation was undertaken with several of the agencies to clarify some of the issues raised in the SEARs or seek further advice. This additional consultation with agencies is also summarised below.

Department of Planning and Environment

Issue summary	Addressed in EIS
The (EIS) must be prepared in accordance with, and meet the minimum requirements of, Part 3 of Schedule 2 of the EP&A Regulation and include the following:	
• Description of the development for the solar farm, as required under clause 6, Part 3 of Schedule 2 of the EP&A Regulation;	Proposal description – Section 3.2.
• Summary of the EIS;	Executive summary provided.
• Statement of objectives of the development, including strategic need, justification, objectives and outcomes and demonstration of greenhouse gas benefits;	Proposal objectives, needs and benefits – Section 2
• Analysis of feasible alternatives;	Proposal alternatives – Section 2.5.
• Analysis of the development, including an assessment, with a particular focus on the requirements of the listed key issues, in accordance with clause 7(1)(d) of the EP&A Regulation (where relevant);	Analysis of the development provided throughout EIS.
• Identification of how relevant planning, land use and development matters (including strategic and statutory matters) have been considered in the impact assessment (direct, indirect and cumulative impacts), including section 79C of the EP&A Act;	Planning context – Section 5.
• Mitigation measures;	Mitigation measures summary - Section 8.2
• Justification of the development taking into consideration the objects of the EP&A Act;	Justification - Section 2.4.
• Incorporation of the principles of ecologically sustainable development (ESD) into proposal design.	ESD - Section 5.5.1

Issue summary	Addressed in EIS
The EIS must address the following specific matters: **Flora and fauna** • Include an assessment of the impacts of all development components on flora and fauna (both terrestrial and aquatic, as relevant) and their habitat. • The assessment must take into account: o the *Threatened Species Assessment Guidelines* (DECC, 2007); o the *Threatened Species Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC, 2004); o Central West Local Land Services Transitional Catchment Action Plan including details on the existing site conditions and likelihood of disturbance (including quantifying the worst case extent of the impact on the basis of vegetation type and total native vegetation disturbed); and o The *Framework for Biodiversity Assessment.* • Specifically consider impacts on threatened species and ecological communities listed under both State and Commonwealth legislation that have the potential to occur on the site and surrounding land, impacts on riparian and/ or instream habitat in the case of disturbance of waterways, and on biodiversity corridors; • Include details of how flora and fauna impacts would be managed during construction and operation including adaptive management and maintenance protocols (including the mitigation and/or management of weeds); and • Any steps taken to mitigate or offset any identified impacts to the environment should also be detailed in the EIS. Current OEH offsets policy should be used in assessing and determining the adequacy of offsets. Note that a draft Biodiversity Offsets Policy for Major Projects is in the process of being finalised**.**	Section 6.2 and Appendix D.
Visual impacts • Provide an assessment of the landscape character and values and any scenic or significant vistas of the area potentially affected by the development. This should describe community and stakeholder values of the local and regional visual amenity and quality, and perceptions of the development based on surveys and consultation; • Include a full assessment of the visual impacts associated with the solar farm, including identification and documentation of all key viewing points and corridors particularly from identified sensitive lands. This should also include the associated transmission line. Alternative pole designs should be presented and assessed and the potential for undergrounding in sensitive locations should also be assessed; • Provide an assessment of the potential for reflectivity from the panels and associated infrastructure, and any safety impacts for motorists or aircraft; • Include photomontages of the development taken from potentially affected residences (including approved but not yet developed dwellings or subdivisions with residential rights), settlements and significant public view points, and provide a clear description of proposed visual amenity mitigation and management measures for the solar farm; and • Provide an assessment of the feasibility, effectiveness and reliability of proposed mitigation measures and any residual impacts after these measures have been implemented.	Landscape character, visual impacts and a feasible and reliable mitigation strategy are provided in Appendix E and Section 6.4. Glare and reflectivity are also addressed as part of the visual assessment. Panoramic photos rather than photomontages are provided in the visual assessment, see below.

Issue summary	Addressed in EIS
Noise Impacts • Include a noise assessment of all phases and components of the development including, but not limited to construction noise (focusing on high noise-generating activities and any works proposed outside of standard construction hours, traffic noise, and vibration generating activities). The assessment must identify noise/vibration sensitive locations (including approved but not yet developed dwellings), baseline conditions based on monitoring results, the levels and character of noise (eg. tonality, impulsiveness etc.) generated by noise sources, noise/vibration criteria, modelling assumptions and worst case and representative noise/vibration impacts; • Include monitoring to ensure that there is adequate background noise data that is representative for all sensitive receptors; • Provide justification for the nominated average background noise level used in the assessment process, considering any significant difference between daytime and night time background noise levels if there are noise generating activities at night; and • Clearly outline the noise mitigation, monitoring and management measures that would be applied to the development. This must include an assessment of the feasibility, effectiveness and reliability of proposed measures and any residual impacts after these measures have been incorporated. • The assessment must take into account the following guidelines (as relevant): o Site Establishment and Construction – *Interim Construction Noise Guidelines* (DECC, 2009); o Traffic Noise – *NSW Road Noise Policy* (DECCW, 2011); o Vibration – *Assessing Vibration: A Technical Guideline* (DECC, 2006; and o Operation – *NSW Industrial Noise Policy* (EPA, 2000).	Appendix F and Section 6.5.
Heritage The EIS must include an assessment of impacts on Aboriginal heritage. The EIS must demonstrate the likely impacts of the development to Aboriginal heritage (including cultural and archaeological significance). Where impacts are identified the assessment shall: • Outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the measures) generally consistent with the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (Department of Environment and Conservation, 2005); • Be undertaken by a suitably qualified heritage consultant(s); • Demonstrate effective consultation with Aboriginal communities in determining and assessing impacts and developing and selecting options and mitigation measures (including the final proposed measures); and • Demonstrate that an appropriate archaeological assessment methodology, including research design (where relevant) has been undertaken, to guide physical archaeological test excavations of areas of potential archaeological deposits. The full spatial extent and significance of any archaeological evidence shall be established and results of excavations included.	Appendix G and Section 6.3. Aboriginal consultation is discussed in Section 4.2.

Issue summary	Addressed in EIS
Traffic and transport The EIS must assess the construction and operational traffic impacts of the development including: • Details of the nature of traffic generated, transport routes, traffic volumes and potential impacts on local and regional roads (including impacts on the structural integrity of the road network), bridges and intersections, including any proposed road upgrades and repairs; • Details of measures to mitigate and/or manage the potential impacts, including measures to control soil erosion and dust generated by traffic volumes and measures to ensure efficiency and safety on the public road network; and • Details of site access roads including how these would connect to the existing road network and any operational maintenance or handover requirements. This must be prepared in accordance with the methodology set out in Section 2 of the RTA's *Guide to Traffic Generating Development's 2002*..	Section 7.3.
Hazards/Risks • The EIS must include an assessment of potential hazards and risks associated with electric and magnetic fields (EMFs) (with reference to Australian Radiation Protection and Nuclear Safety Agency standards) and bushfires. The EIS should demonstrate the application of the Principles of Prudent Avoidance in relation to EMFs. The EIS must also detail measures to contain any hazardous substances to prevent the contamination of pasture and dams.	Section 7.5 and 7.9.
Water Quality, Waterways and Flooding The EIS must include: • An assessment of the likely impacts to the waterways and measures to minimise impacts including details of the design of waterway crossings; • An assessment of soil erosion issues and the potential for clearing to create salinity risks; • Details of water supply demands and an assessment of whether an adequate and secure water supply is available for the project, including statutory (licensing) context of the water supply sources, and assess potential environmental impacts associated with the use of identified sources including impacts on surface and groundwater sources and implications for existing licensed users; • An assessment of any proposed modification to surface water management including modelling of redistribution of waters and an assessment of the impact on neighbouring properties and the associated watercourse and floodplain; • An assessment of the potential for groundwater to be intercepted; • An assessment demonstrating consistency with the relevant Water Sharing Plan(s); and • An appropriate assessment of potential flooding impacts, undertaken generally in accordance with the principles, processes and guidelines as outlined in the NSW Government *Floodplain Development Manual 2005*. The study shall consider a full range of potential flood events up to and including the Probable Maximum Flood (PMF) and any local floodplain risk management planning processes.	Sections 7.2.

Issue summary	Addressed in EIS
General Environmental Risk Analysis Notwithstanding the key assessment requirements, the EIS must include an environmental risk analysis to identify potential environmental impacts associated with the development, proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of the additional key environmental impact(s) must be included in the EIS.	Section 6.1 and mitigation measures within Sections 6 and 7.
Consultation The Proponent must undertake a consultation program as part of the environmental assessment process, including consultation with, but not necessarily limited to, the following parties:	
• Parkes Shire Council.	Parkes Shire Council advised that the SEARs address Council issues. See Appendix A.
• Central West Local Land Services.	See below.
• Office of Environment and Heritage.	See below.
• Environment Protection Authority.	See below.
• Department of Primary Industries (NSW Office of Water).	See below
• NSW Trade and Investment (Crown Lands Division and NSW Mineral Resources).	Crown Lands advised that the proposal has the potential to impact a Travelling Stock Route located north and adjacent to the proposal area and requested consultation with Local Land Services (see below). Mineral resources did not respond via the SEARs, impacts to mineral resources are assessed in Section 7.6.
• NSW Roads and Maritime Service (RMS).	See below.
• NSW Rural Fire Service (RFS).	See below.
• Transgrid.	Neoen has consulted regarding transmission line and connection to grid.
• Local Aboriginal Land Council.	See Section 4.2.

Issue summary	Addressed in EIS
• Relevant mineral stakeholders and the local community and landowners.	Exploration Licence (EL) 7676 is held by Goldfields Australasia Pty Ltd (see Section 7.6). Neoen would consult Goldfields Australasia Pty Ltd regarding development of the proposal on the EL. See Section 4.3 for details of community consultation.
Consultation process to include measures for disseminating information to increase awareness of the development as well as methods for actively engaging stakeholders on issues that would be of interest/concern to them. The EIS must: • Demonstrate effective consultation with stakeholders, and that the level of consultation with each stakeholder is commensurate with their degree of interest/concern or likely impact; • Clearly describe the consultation process undertaken for each stakeholder/group including details of the dates of consultation and copies of any information disseminated as part of the consultation process (subject to confidentiality); and • Describe the issues raised during consultation and how and where these have been addressed in the EIS.	Appendix C2 Community Consultation Plan (methods) and Section 4.3 (results of consultation).

In addition to the SEARS, NGH Environmental contacted DPE to seek further advice regarding the respective scopes of the Visual Impact Assessment (VIA), Aboriginal heritage assessment and flooding assessment. DPE responded on 30 October 2015 (see Appendix C.1) as follows.

Visual Assessment (regarding the NGH Environmental request not to prepare photomontages):

> *Based on the information you provided in your letter, it is difficult for me to determine the necessity of photomontages. Before you dismiss the need to provide photomontages, you should provide some context. Much would depend on the distance of the nearest sensitive receivers, their orientation and impact. It would depend upon how well you present your supporting information demonstrating the impact. In other words once all analysis is proposed you must demonstrate that it would add no additional value.*

The VIA summarised in Section 6.4 provides the context for the proposal and demonstrates the impact of the proposal by way of panoramic photos from representative viewpoints. Indicative photos of infrastructure are provided to demonstrate the likely impacts.

Heritage (regarding the NGH Environmental request that investigations should not necessarily include archaeological sub-surface testing):

> *It is my understanding that there is no automatic requirement for test excavations. Rather it is required that appropriate archaeological methodology must be employed for excavations where relevant for PADs.*

Several artefacts were discovered within the site during the archaeological site survey. The site is very disturbed and the impact to scientific values if the artefacts were to be impacted is considered low. The integrity of the site is already low and any additional disturbance is therefore unlikely to make a meaningful difference to the status of the site. Therefore sub-surface testing was not undertaken.

Flooding (regarding the NGH Environmental request that a flooding impact assessment is not completed as flooding would not be an issue as the site is not traversed by a watercourse or in a flood affected area):

> *It sounds at face value that Parkes does not present a flood risk based on initial hydrology advice. It is a matter for you to demonstrate this in your report.*

Section 7.2 discusses hydrological impacts, specific to the project.

Office of Environment and Heritage

Issue summary	Addressed in this EIS
Biodiversity - impacts related to the proposed Parkes Solar Project are to be assessed and documented in accordance with the *Framework for Biodiversity Assessment*, unless otherwise agreed by OEH, by a person accredited in accordance with s142B(1)(c) of the TSC Act.	Section 6.2 and Appendix D.
Aboriginal cultural heritage The EIS must identify and describe the tangible and intangible Aboriginal cultural heritage values that exist across the whole area that will be affected by the Parkes Solar Project and document these in the EIS. This may include the need for surface survey and test excavation. The identification of cultural heritage values should be guided by the *Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW* (DECCW, 2011) and consultation with OEH regional officers. Where Aboriginal cultural heritage values are identified, consultation with Aboriginal people must be undertaken and documented in accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW). The significance of cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the EIS. Impacts on Aboriginal cultural heritage values are to be assessed and documented in the EIS. The EIS must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the EIS must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment will be documented and notified to OEH.	Appendix G and Section 6.3. Aboriginal consultation is discussed in Section 4.2.
Water and soils • The EIS must map the following features relevant to water and soils. • The EIS must describe background conditions for any water resource likely to be affected by the [development/project]. • The EIS must assess the impacts of the Parkes Solar Project on water quality. • The EIS must assess the impact of the Parkes Solar Project on hydrology. •	Sections 7.1 and 7.2.
Flooding and coastal erosion.	Not relevant to the proposal.

OEH was further consulted regarding the biodiversity assessment requirements for the proposal. A teleconference was held with Liz Mazzer (OEH), David Geering (OEH), Chris Leonard (Neoen), Nick Graham-Higgs (NGH Environmental) and Jenny Walsh (NGH Environmental) on 26 February 2016 to discuss the biodiversity assessment including whether the planted row of vegetation running north-south through the centre of the site should be considered part of an endangered ecological community (EEC) and offsetting requirements.

Further to the teleconference, several emails were exchanged (see Appendix C.1) and OEH advised the following on 26 February 2016:

- *If offsets are required, a suitable offset should be provided within 12 months of the development consent being granted. The offset must be developed in accordance with the NSW Biodiversity Offset Policy for Major Projects.*
- *The most appropriate way to assess the scattered paddock trees on the development site will be to use the BioBanking Paddock Tree Calculator (refer to Appendix 3 in the BioBanking Assessment Methodology and Credit Calculator Operational Manual). This calculator can be used where:*
  - *Native vegetation has an over-storey percent foliage cover <25% of the lower projected foliage cover of the vegetation type and*
  - *There is no native mid-storey*
  - *The groundcover is in low condition.*
- *OEH understands there is some planted vegetation within the footprint of the solar farm. OEH considers this is a matter for the consent authority to consider. OEH understands that visual screening of the solar farm from neighbours will be required and that this should provide opportunity to relocate the planted native vegetation and meet any existing obligation that may exist for its establishment (If any). OEH staff will inspect this at the site visit on the 4th, and may vary this advice at that time.*

Liz Mazzer from OEH visited the proposal site on 4 March 2016 with Chris Leonard from Neoen and advised the following by email on 9 March 2016 (see Appendix C.1):

- *The proposal would result in the clearing of some single Kurrajongs, and the east-west strip of planted trees. There is potential to retain the north-south strip of planted trees. The proponent will investigate the enhancement of the north-south strip of planted trees by planting a row of native trees, including Kurrajongs, on both sides of the existing strip (ie making this three trees wide).*
- *The proposal will also impact on some roadside vegetation (Grey Box EEC) on the western side of the site. Impacts would include pruning and possibly some clearing to allow site access, and some clearing for a transmission line running from the solar array to an adjacent substation.*
- *A car park and site office are proposed to be located in a cleared area in the north-west corner of the site which lies within an area of Grey Box. We suggested enhancement of this Grey Box community, but this will depend on the ultimate location of the car park and site office.*
- *There was discussion about entering the site from the southern end, and putting the carpark and site office at that end rather than in the north-west corner.*
- *The proponent will investigate:*
  - *Whether the site car park and office could be located elsewhere on the site to improve road safety and potentially reduce the need for tree lopping / clearing.*
  - *Whether the transmission line can be put underground along the centre of Pat Meredith Drive, reducing the need to clear for an overhead powerline*
- *As previously mentioned, data (ie flora plot data) is required in the EIS to demonstrate the type and condition of the ground cover on-site*
- *There may be opportunity for the proponent to assist with management of the road reserve.*

- *Offset - It is not possible for OEH to yet to determine if an offset is required as Neon are yet to determine the full clearing required for the project, in particular to the road reserves, entrance to the sub station and in the paddock to the west to accommodate a power line.*
- *With regard to the loss of paddock trees, we have already provided advice on how to quantify the impact. We discussed placing the offset for the loss of these paddock trees within an expanded north south running line of planted vegetation that already exists. The minimum quantity to be determined by the by the method and the type by the type being removed.*
- *With regard to any offset required, the protection of the small remnant and further plantings appear to offer opportunities.*

These issues have been considered in the Biodiversity Assessment Report (BAR) included as Appendix D and Section 6.2.

Environment Protection Agency

Issue summary	Addressed in this EIS
Water quality impacts - identification of appropriate pollution control systems to protect surface and ground water resources such as sediment and erosion controls during construction and operational stages and inclusion of permanent sediment and erosion and stormwater controls where required.	Section 7.2 assesses impacts to water quality. A Soil and Water Management Plan will be developed prior to construction. The Plan will detail specific measures relative to the final design to ensure that surface water drainage infrastructure are designed to minimise impacts.
Noise — identify potential impacts and mitigation strategies to be incorporated during operation to minimise noise and comply with NSW policies and legislation on noise control.	Appendix F and Section 6.5 assess noise impacts.
Dust — identify impacts from dust during the construction and operational periods and identified mitigative measures.	Section 7.4 assesses impacts to air quality.
Storage of chemicals/ fuels - ensure adequate control measures are in place for storages to reduce risk of spills contaminating waterways and land.	A Soil and Water Management Plan will be developed prior to construction. The Plan will detail spill control measures to minimise impacts.
Waste management — options and strategies for waste minimisation, reuse and recycling should be assessed as appropriate.	Section 7.8
Incident management procedures - adequate procedures should to be established including notification requirements to the EPA for incidents that cause material harm to the environment (refer s147-153 Protection of the Environment Operations Act).	Section 7.1.3

Department of Primary Industries

Issue summary	Addressed in this EIS
• Details of water proposed to be taken (including through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan. • Assessment of any volumetric water licensing requirements (including those for ongoing water take following completion of the project). • Identification of an adequate and secure water supply for the life of the project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an assessment of the current market depth where water entitlement is required to be purchased. • Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.	Section 7.2 assesses impacts to water quality. Section 7.1 includes management of soil resources to control erosion and sedimentation. Detailed water balance has not been undertaken. A ground cover management plan would be developed with the aim of maintaining ground cover beneath panels, thereby resisting erosion and weed infestation and run off into aquatic habitat. There are no water licencing requirements relevant to the proposal. Section 5 considers policies and guidelines.

Roads and Maritime Services

Issue summary	Addressed in this EIS
Prepare a traffic impact study in accordance with Section 2 of the RTA's *Guide to Traffic Generating Developments 2002*.	Traffic and transport impacts are assessed in Section 7.3.
Develop a Traffic Management Plan in consultation with Parkes Shire Council and RMS prior to the commencement of haulage and/or construction operations.	Traffic Management Plan to be developed in consultation with Parkes Shire Council and RMS, prior to construction of the proposal, is a commitment of this proposal.

Central West Local Land Services

On 19 January 2016, NGH Environmental contacted Central West Local Land Services requesting environmental assessment requirements for the proposal (Appendix C.1).

Central West Local Land Services has not responded to date.

Rural Fire Service

RFS advised the following by email (dated 18 February 2016):

- The site does not appear to be mapped as bush fire prone land.

If the proposal is considered to be at risk of bushfire, the proposal should address the aims and objectives of *Planning for Bushfire Protection 2006*. This should include a fire management plan to ensure appropriate mitigative measures are developed to reduce the risk of wildfire impacts on the facility, and to address the risk of activities occurring on the site becoming a potential ignition point for fire escaping from the site. Section 7.10 addresses potential bush fire risks.

4.2 ABORIGINAL COMMUNITY CONSULTATION

Local Aboriginal Land Council and Registered Aboriginal Parties

The consultation with Aboriginal stakeholders was undertaken by NGH Environmental (Heritage) in accordance with clause *80C of the National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2010* following the consultation steps outlined in the Aboriginal Cultural Heritage Consultation Requirements for Proponents (ACHCRP) guide provided by OEH. The guide outlines a four stage process of consultation as follows:

- Stage 1 – Notification of project proposal and registration of interest.
- Stage 2 – Presentation of information about the proposed project.
- Stage 3 – Gathering information about cultural significance.
- Stage 4 – Review of draft cultural heritage assessment report.

Stage 1. Letters outlining the development proposal and the need to carry out an Aboriginal Cultural Heritage Assessment (ACHA) were sent to the Peak Hill Local Aboriginal Land Council (Peak Hill LALC), and various statutory authorities including OEH, as identified under the ACHCRP. An advertisement was placed in the local newspapers, the Parkes Champion Post on 23 October 2015 seeking registrations of interest from Aboriginal people and organisations. A further series of letters was sent to other organisations identified by OEH in correspondence to NGH Environmental. In each instance, the closing date for submission was 14 days from receipt of the letter.

As a result of this process, two group contacted the consultant to register their interest in the proposal. The groups who registered interest were:

- Binjang Wellington Wiradjuri Heritage Surveys (Registered by phone); and
- Wiradjuri Council of Elders (Registered by email).

No other party registered their interest, including the entities and individuals recommended by OEH nor the Peak Hill LALC, despite numerous attempts to contact them.

Stage 2. On 23 December 2015 an Assessment Methodology document for the Parkes Solar Farm was sent to all registered parties. This document provided details of the background to the proposal, a summary of previous archaeological surveys and the proposed heritage assessment methodology for the proposal. The document invited comments regarding the proposed methodology and also sought any information regarding known Aboriginal cultural significance values associated with the subject area and/or any Aboriginal objects contained therein. A minimum of 28 days was allowed for a response to the document. No written response was received but Jamie Gray (Binjang Wellington Wiradjuri Heritage Surveys) and Robert Clagg (Wiradjuri Council of Elders) indicated by phone and email respectively that they were satisfied with the methodology and were happy to proceed with the fieldwork.

Stage 3. The *Assessment Methodology* outlined in Stage 2 included a written request to provide any information that may be relevant to the cultural heritage assessment of the study area. It was noted that sensitive information would be treated as confidential. No response regarding cultural information was received.

At this stage, the fieldwork was organised and Jamie Gray of Binjang Wellington Wiradjuri Heritage Surveys and Robert Clegg of the Wiradjuri Council of Elders were asked to participate in the fieldwork.

Stage 4 In March 2016 a draft version of this *Aboriginal Cultural Heritage Assessment Report* for the proposal (this document) was forwarded to the Binjang Wellington Wiradjuri Heritage Surveys and the

Wiradjuri Council of Elders inviting comment on the results, the significance assessment and the recommendations. A minimum of 28 days was allowed for responses to the document.

4.3 COMMUNITY CONSULTATION

Neoen has undertaken consultation with the local community in developing the proposal, in line with DPE's *Guidelines for Major Project Community Consultation* (October 2007) and the Australian Renewable Energy Agency's (ARENA's) *Establishing the social licence to operate large scale solar facilities in Australia: insights from social research for industry* (ARENA n.d.). The following section describes the consultation undertaken. Consultation activities were informed by *Beyond Public Meetings: Connecting community engagement with decision making,* Twyford Consulting (2007).

4.3.1 Community consultation plan

Effective engagement requires an understanding of community stakeholders and prioritisation of potential impacts. It also relies on the community understanding the project and specific issues of interest to them, in order to contribute effectively. The focus of the consultation process for the Parkes Solar Farm has been on providing this understanding and engagement.

A Community Consultation Plan (CCP) was developed for the proposal. It is provided in Appendix C.2.

The aim of the CCP is to identify methods to inform the community about the Parkes Solar Farm and facilitate engagement with the community.

The CCP identifies:

- Community stakeholders for the proposal.
- Issues / risks related to the engagement of each stakeholder group.
- A consultation strategy for each stakeholder group.
- A set of activities against the project development time line to facilitate consultation.

4.3.2 Visual impact assessment requirements

Community consultation specific to the assessment of visual impacts for the proposal was required in order to:

- Understand how the community values existing visual amenity in the study area.
- Document the perceptions of the community to the proposed development.

As part of the community engagement for the proposal, respondents were surveyed on their views regarding solar farm development and local visual amenity. Specific questions relating to visual impacts were included in a feedback form distributed, via:

- The project website.
- At public information session to introduce the proposal, on 15 December 2015.
- Direct meetings and mail outs to near neighbours.

These questions related to:

- Local values, including views.
- Identification of views or landscape characteristics in the region and local area important to respondents.

- Perceptions and concerns about solar farm development.

The feedback form questions are included in the CCP (refer Appendix C.2). The results were used in the identification of viewpoints for the visual impact assessment (refer Appendix E and Section 6.4).

4.3.3 Community consultation activities to date

In line with the CCP, a range of community engagement tools have been used with regards to the proposal. These include:

- Development of a project website to provide information and updates (http://parkessolarfarm.com.au/ website went live in early December 2015 and is updated regularly).
- Establishment of dedicated email address for feedback.
- A media release was issued on 3 December 2015 to advise of the proposal and the date, time and venue of the information sessions for the Parkes Solar Farm on Tuesday 15 December 2015 at Parkes Leagues Club (refer Appendix C.3).
- Direct engagement with neighbours by a letter distributed in early December 2015. The letter advised of the solar farm location and size, identified the land owners, timing for DA lodgement, time and venue of the information sessions for the Parkes Solar Farm and that input from close neighbours to the site was encouraged. Appendix C.3 includes a copy of the letter, which included a Community Feedback Form.
- Direct engagement with neighbours through phone calls, letters and face to face meetings.
- Media release to the local Parkes newspaper, resulting in an article in mid December 2015.
- The proposal was presented a meeting with Parkes Shire Council on 15 December. The Council provided broad support at this meeting. No concerns were raised.
- Public information session held by Neoen in Parkes on 15 December 2015 to provide proposal information and to answer questions (the documentation presented at the community information session is available on the website's "news room" section).

4.3.4 Results of community consultation

Twelve people attended the Parkes Solar Farm information session held in Parkes on 15 December 2015. Five feedback forms were returned; two by respondents less than 2 km from the proposal site and three by respondents more than 5 km from the proposed site.

- Views, community and family ties, work opportunities and recreational opportunities (such as sporting and nature-based activities) were selected equally as holding the most value for the local area (two respondents selected each item).
- All five respondents cited renewable energy generation as what they liked most about solar farms generally. Local economic opportunities (four respondents) and diversification of land use (three respondents) were also cited.
- One respondent cited potential visual impacts as a concern regarding solar farms generally.
- Issues raised with specific reference to the proposed Parkes Solar Farm included:
  - The proposal is a great initiative on local and environmental platforms.
  - Views of cattle grazing land are an important visual characteristic of the local area.
  - Memorial Hill is an important local view; contrasting town and country, particularly when crops are in season (canola and wheat).

While uptake levels of community engagement activities for the proposal have been relatively low, it is considered that this reflects a low level of concern about the proposal. The issued identified through the consultation process have been addressed in the EIA and proposal design.

4.3.5 Continued engagement

Engagement activities will continue throughout the determination period, as set out in the CCP.

The CCP will be reviewed regularly, as well as at key transition phases between different stages of project development (e.g. prior to construction or operation). The Plan will continue to guide engagement activities at all stages of the project, ensuring that engagement is appropriate and in line with good practice.

5 PLANNING CONTEXT

This section sets out the strategic planning framework relevant to the proposal.

5.1 ASSESSMENT CONTEXT

The proposal to construct and operate Parkes Solar Farm requires development consent under Part 4 of the EP&A Act. *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) declares the proposal to be SSD as it is development for the purpose of electricity generating works with a capital cost of greater than $30 million (clause 20, Schedule 1). Section 78A of the EP&A Act requires a DA for SSD to be accompanied by an EIS prepared in accordance with the EP&A Regulation.

This EIS has been prepared in accordance with Part 4 of EP&A Act and Schedule 2 of the EP&A Regulation.

5.2 EVALUATION OF THE DEVELOPMENT

Section 89H of the EP&A Act provides that section 79C applies to the determination of DAs for SSD. Under Section 79C of the EP&A Act, the consent authority is required to consider a number of matters when determining a DA under Part 4. These matters are listed in Table 5-1 and assessed in terms of their relevance to the proposal.

Table 5-1 Matters of consideration

Provision	Relevance to the proposal
Any environmental planning instrument;	Relevant environmental planning instruments (EPIs) are discussed in Section 5.3.
Any proposed instrument that is or has been the subject of public consultation under the EP&A Act and that has been notified to the consent authority;	There are no draft instruments relevant to the proposal.
Any development control plan;	Parkes Shire Council has prepared a number of specific Development Control Plans, however Clause 11 of the SRD SEPP provides that development control plans do not apply to SSD.
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;	There are no planning agreements that have been entered into, nor are any planning agreements proposed, that relate to the proposal.
The regulations (to the extent that they prescribe matters for consideration);	Clause 92 of the EP&A Regulation requires consideration of: • the Government Coastal Policy, for development applications in certain local government areas; and • the provisions of AS 2601 for development applications involving the demolition of structures. Neither of these provisions is relevant to the proposal.
Any coastal zone management plan (within the meaning of the *Coastal Protection Act 1979*), that apply to the land to which the development application relates;	Coastal zone management is not applicable to the proposal.

Provision	Relevance to the proposal
The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality;	The likely impacts of the proposal, including environmental impacts on both the natural and built environments, and the social and economic impacts in the locality, are detailed in Sections 6 and 7 of this EIS. This EIS demonstrates that the environmental impacts of the proposal have been avoided or minimized through careful project design. Overall impacts are considered manageable and justifiable.
The suitability of the site for the development;	The suitability of the site for the development is assessed in Section 2.5.4. Characteristics that make it suitable for development of a solar farm are identified and justified.
Any submissions made in accordance with this Act or the regulations; and	Public submissions would be sought and responded to as part of the EIS determination process. Neoen would consider and respond to any submissions made in relation to the proposal in a Submissions Report or Preferred Project Report, subsequent to the public exhibition period.
The public interest.	A number of public benefits are relevant to the proposal as discussed in Section 2.3. Specifically, these relate to: Reducing fossil fuel emissions that that contribute to climate change. Meeting State and Australian Government policies to increase renewable energy supply. Providing local employment and regional development opportunities.

5.3 NSW LEGISLATION

5.3.1 Environmental Planning and Assessment Act 1979

Development in NSW is subject to the requirements of the EP&A Act and the EP&A Regulation. Environmental planning instruments prepared under the Act set the framework for development approval in NSW.

The proposal would be assessed under Part 4 of the EP&A Act. The relevant objects of the EP&A Act are:

a) to encourage:

i. The proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.

ii. The promotion and coordination of the orderly and economic use and development of land.

iii. The protection, provision and coordination of communication and utility services.

vi. The protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.

vii. Ecologically sustainable development.

The objects of the EP&A Act have been considered throughout this environmental assessment and natural resources and competing land uses have been taken into account. The proposal aims to promote the orderly and economic use of the land through the provision of utility services (power generation). The proposal has been located and designed such that it would avoid protected areas and generally minimise the use of natural and artificial resources while still considering the social and economic welfare of the local community.

The proposal is not in conflict with any of the remaining objects of the EP&A Act. Given the proposal would support a number of the objects of the EP&A Act, and is consistent with the remaining objects of the Act, the proposal is considered appropriate in the context of the EP&A Act.

5.3.2 Environmental Planning and Assessment Regulation 2000

Division 6 of the EP&A Regulation addresses public participation for SSD. Neoen would comply with Division 6 of the EP&A Regulations, including the specific provisions of clauses 84 and 85 regarding placing notices in local newspaper and on the website of the DPE and the form that notice must take (refer Section 4.3 Community Consultation). The Development application and accompanying information (including this EIS) would be placed on public exhibition for a period not less than 30 days.

5.3.3 Parkes Local Environmental Plan 2012

The proposal site is located within the Parkes LGA which is subject to the provisions of *Parkes Local Environmental Plan 2012* (Parkes LEP). The Parkes LEP aims:

(a) to protect, enhance and conserve agricultural land through the proper management, development and conservation of natural and man-made resources,
(b) to encourage a range of housing, employment, recreation and facilities to meet the needs of existing and future residents of Parkes,
(c) to promote the efficient and equitable provision of public services, infrastructure and amenities,
(d) to conserve, protect and enhance the environmental and cultural heritage of Parkes,
(e) to promote the town of Parkes as a major commercial and community service centre,
(f) to encourage the sustainable growth of the villages of Parkes,
(g) to encourage industrial development that is matched by adequate land supply for long-term needs, is linked with key services and infrastructure, provides for a diversity of employment and increases the number of skilled jobs in Parkes,
(h) to raise the profile of Parkes to broaden the economic base, improve its attractiveness as a tourist destination, encourage longer stays and greater local spending and promote a wider understanding of Parkes as a place to live and invest,
(i) to acknowledge the contribution of mining to Parkes and the role of Parkes as a mining centre for the region.

This EIS takes into account the proposal's compatibility with these aims. The proposal is considered compatible with these requirements.

Land zoning

The LEP states that the consent authority must have regard to the development objectives of planning zones identified in the Parkes LEP when determining DAs. The proposal site is located on land zoned RU1 Primary Production under the Parkes LEP.

The objectives of this zone are:

- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- *To minimise the fragmentation and alienation of resource lands.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To encourage eco-tourism enterprises that minimise any adverse effect on primary industry production.*
- *To permit non-agricultural uses that support the primary production purposes of the zone.*
- *To permit small scale rural tourism uses associated with primary production and environmental conservation with minimal impact on primary production and the scenic amenity of the area.*
- *To encourage the provision of tourist accommodation in association with agricultural activities.*
- *To provide opportunities for employment-generating development that adds value to local agricultural production and integrates with tourism.*

For the life of the proposal, the proposal site would harness a natural resource (solar energy). While the activity would impact on land availability for primary production, the land would meet the second and third objects as identified above; it would allow for diversity in land use, appropriate to the area and it would not fragment resource lands. Being fully reversible and involving limited ground disturbance, it would not remove the potential to use the land for primary production at the end of the project's life.

5.3.4 Development Control Plans and Council policies

The following Development Control Plans and Council Policies are also applicable to the proposal:

- Parkes Shire Council Development Control Plan 2013.

The proposal is consistent with the provisions of these plans and polices.

5.3.5 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) was introduced to facilitate the effective delivery of infrastructure across the State by improving regulatory efficiency through a consistent planning regime for infrastructure and services across NSW.

Part 3 Division 4 of ISEPP relates to electricity generating works. Clause 34(1) states that development for the purpose of electricity generating works may be carried out by any person with consent on land in a prescribed rural, Industrial or special use zone. 'Electricity generating works' are defined in Clause 33 as:

'a building or place used for the purpose of making or generating electricity.'

And a 'prescribed rural zone' is defined in Clause 33 as:

any of the following land use zones or a land use zone that is equivalent to any of those zones:

a) Zone RU1 Primary Production,

b) Zone RU2 Rural Landscape,

c) Zone RU3 Forestry,

d) Zone RU4 Rural Small Holdings.

The proposal would generate electricity and is therefore classified as electricity generating works under Clause 34(1) of the ISEPP. Electricity generating works are permitted with consent in the RU1 Primary Production land use zone, under the Parkes LEP.

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

The aims of the SRD SEPP are to identify development that is SSD and to confer functions on joint regional planning panels to determine development applications.

State Significant Development (SDD)

Clause 8 of the SRD SEPP provides that development is declared to be SSD for the purposes of the EP&A Act if:

- *the development is not permissible without consent under Part 4 of the EP&A Act; and*
- *the development is specified in Schedule 1 or 2 of the SRD SEPP.*

Clause 20 of Schedule 1 of the SRD SEPP includes:

"Development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, bio-fuel, distillate and waste and hydro, wave, solar or wind power), being development that:

(a) has a capital investment value of more than $30 million.

The proposed Parkes Solar Farm has an estimated capital investment value of $98 million, therefore the proposal is classified as SSD under Part 4 of the EP&A Act.

SSDs are major projects which require approval from the Minister for Planning and Environment. This EIS has been prepared in accordance with the requirements of the Secretary of the DPE.

5.3.7 State Environmental Planning Policy No. 55 - Remediation of Land

SEPP No. 55 aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment. The SEPP applies to the whole of the State.

Clause 7 of SEPP No. 55 requires that the remediation of land be considered by a consent authority in determining a development application.

A search of the NSW EPA contaminated land public record (NSW Government, 2016a) was undertaken for contaminated sites within the Parkes LGA on 12 February 2016. There were no records returned for the LGA. The online *List of NSW contaminated sites notified to EPA* (NSW Government, 2016b) was also searched on 12 February 2016. There are five sites listed in the Parkes LGA, these are all located within the Parkes township, approximately 10 km from the proposal site.

There is a risk that contamination associated with agricultural activities (e.g., pesticides) could be present on the site however, given no contaminated sites are recorded on or adjacent to the proposal site and no evidence of contamination was observable during the site assessment, this risk is considered very low.

5.3.8 State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

In this Policy, potentially hazardous industry refers to a development which, if the development were to operate without employing any measures to reduce or minimise its impact, would pose a significant risk to human health, life or property or to the biophysical environment.

A potentially offensive industry is a development for the purposes of an industry which, if the development were to operate without employing any measures to reduce or minimise its impact, would emit a polluting discharge in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land.

This EIS investigates risks to human health and the biophysical environment, including risks that may affect existing and future land use. As excavation and soil disturbance activities during construction are limited and as operational infrastructure would not emit any pollutants, these risks are considered low. A series of mitigation measures have been developed to address identified risks. The proposal would be designed, constructed and operated to avoid significant risk to human health, life or property or to the biophysical environment. Therefore it is considered that the proposal does not constitute a hazardous or offensive industry.

5.3.9 State Environmental Planning Policy No. 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) encourages the conservation and management of natural vegetation that provides habitat for Koalas. Koalas are listed under the TSC Act as a vulnerable species. The Parkes LGA is subject to this SEPP and cannot approve development in an area affected by the policy without an investigation of core koala habitat. SEPP 44 aims to identify areas of potential and core Koala Habitat. These are described as follows:

- Potential Koala Habitat: areas of native vegetation where the trees listed in Schedule 2 of SEPP 44 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component; and
- Core Koala Habitat: an area of land with a resident population of Koalas, evidenced by attributes such as breeding females, and recent and historical records of a population.

The BAR (Appendix D) addresses SEPP 44 requirements. The results of this specialist assessment is summarised in Section 6.2.

5.3.10 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is administered by the NSW EPA.

Under section 48 of the POEO Act, premises-based scheduled activities (as defined in Schedule 1 of the POEO Act) require an Environment Protection Licence (EPL). Clause 17 of Schedule 1 of the POEO Act concerns electricity generation works. General electricity works is a scheduled activity and requires an EPL where the activity has the capacity to generate more than 30 MW of electrical power. General electricity generation works is defined as:

> *…the generation of electricity by means of electricity plant that, wherever situated, is based on, or uses, any energy source other than wind power or solar power.*

The works would generate more than net 30 MW of electrical power, however electricity generation would be from solar power which is not considered a scheduled activity. Accordingly, an EPL is not required under the POEO Act for the proposal.

It is noted that pollution events resulting from the proposal would still constitute a breach of the Act under section 120. Under section 148 of the Act, the proponent would be required to notify the EPA of any pollution incidents that occur as a consequence of the construction or operation of the proposed development. While risks for this project are considered to be low, Section 7.1 ensures appropriate mitigation measures are a commitment of the proposal.

5.3.11 Roads Act 1993

The *Roads Act 1993* (Roads Act) provides for the classification of roads and for the declaration of roads authorities for both classified and unclassified roads. It also regulates the carrying out of various activities in, on and over public roads.

Henry Parkes Way and Pat Meredith Drive are public roads. Any works, such as upgrades that interfere with the structure of the road, require consent from the roads authority, which is Parkes Shire Council (for both Henry Parkes Way and Pat Meredith Drive).

5.3.12 Native Vegetation Act 2003

The *Native Vegetation Act 2003* regulates the clearing of native vegetation. Clearing is defined as cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning native vegetation including native grasses and herbage.

An authorisation to clear native vegetation is not required for SSD (section 89J EP&A Act). Impacts to biodiversity as a result of clearing native vegetation are discussed in Section 6.2.

5.3.13 Water Management Act 2000

The *Water Management Act 2000* (WM Act), currently administered by Department of Primary Industries (Office of Water) NOW, is progressively being implemented throughout NSW to manage water resources, superseding the *Water Act 1912.* The aim of the WM Act is to ensure that water resources are conserved and properly managed for sustainable use benefiting both the present and future generations. It is also

intended to provide formal means for the protection and enhancement of the environmental qualities of waterways and their in-stream uses as well as to provide for protection of catchment conditions.

Fresh water sources throughout NSW are managed via WSPs under the WM Act. Key rules within the WSPs specify when licence holders can access water and how water can be traded.

Two WSPs made under Section 50 of the WM Act are relevant to the proposal. The Proposal is located within the area covered by the WSPs for the *Lachlan Unregulated and Alluvial Water Sources* and the *NSW Murray Darling Basin Fractured Rock Groundwater Sources.*

Water Sharing Plans

Lachlan Unregulated and Alluvial Water Sources Water Sharing Plan

The Lachlan Unregulated and Alluvial Water Sources WSP includes the unregulated rivers and alluvial groundwater within the Lachlan River catchment and commenced in September 2012. The WSP covers 22 unregulated surface water sources that are grouped into one extraction management unit and two alluvial groundwater sources.

The Proposal site is within the Goobang and Billabong Creek water source. Table 5-2 presents the water extraction entitlement and active licences for the Lachlan Unregulated and Alluvial Water Sources WSP, identified from a search of the *NSW Water Register* (NOW, 2016).

Table 5-2 Goobang and Billabong Creek Water Sources licence and entitlements information

Water Source	Licence category	Entitlement (ML/year)	Number of licences
Goobang and Billabong Creeks	Domestic and Stock	18	6
	Local Water Utility	1500	1
	Unregulated River	2200	14

The Lachlan Unregulated and Alluvial Water Sources WSP specifies rules for each water source that provide guidance on:

- Limits to the availability of water
- Access rules
- Trading rules
- Rules for managing access licences
- Rules for water supply works

NSW Murray Darling Basin Fractured Rock Groundwater Sources Water Sharing Plan

The proposal site is within the Lachlan Fold Belt MDB water source. Table 5-3 presents the water extraction entitlement and active licences for the NSW Murray Darling Basin Fractured Rock Groundwater Sources WSP, identified from a search of the NSW Water Register (NOW, 2016).

Table 5-3 Lachlan Fold Belt MDB Groundwater Sources licence and entitlements information

Water Source	Licence category	Entitlement (ML/year)	Number of licences
Lachlan Fold Belt MDB	Aquifer	68118.7	1028
	Aquifer (town water supply)	467.35	6
	Local Water Utility	2370.5	35
	Salinity and Water Table Management	236	1

The NSW Murray Darling Basin Fractured Rock Groundwater Sources WSP specifies rules for each groundwater source that provide guidance on:

- Limits to the availability of water.
- Access rules.
- Rules for granting and amending water supply works approvals.
- Trading rules.

Regarding the proposal, there would be no requirement to modify existing entitlements or seek new entitlements under these plans. The proposal does not involve dredging or reclamation as defined by the Act and would not occur within 40 m of water front land.

5.3.14 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) provides for the conservation of threatened species, populations and ecological communities of animals and plants. The TSC Act sets out a number of specific objects relating to the conservation of biological diversity and the promotion of ecologically sustainable development.

The potential to impact threatened species, populations and ecological communities listed under this act has been considered in Appendix D Section 6.2 of this EIS. The format of the assessment is consistent with the newly developed Framework for Biodiversity Assessment, developed for major projects.

5.3.15 National Parks and Wildlife Act 1974

Under the *National Parks and Wildlife Act 1974* (NPW Act), the Director General of OEH is responsible for the care, control and management of all national parks, historic sites, nature reserves, reserves, Aboriginal areas and state game reserves. The Director General of OEH is also responsible under this legislation for the protection and care of native fauna and flora, and Aboriginal places and objects throughout NSW.

The provisions of the NPW Act have been considered for the proposal. The proposal site is not in or in the vicinity of any protected areas as defined in the Act.

An assessment of impacts to Aboriginal Heritage is provided in Section 6-3 of the EIS (and in full in Appendix G). It is noted that an Aboriginal Heritage Impact Permit (AHIP) under section 90 of the NPW Act is not required for SSD (section 89J EP&A Act).

5.3.16 Heritage Act 1977

This Act aims to conserve heritage values. The Act defines ‘environmental heritage’ as those places, buildings, works, relics, moveable objects and precincts listed in the Local or State heritage Significance. A property is a heritage item if it is listed in the heritage schedule of the local Council's Local Environmental Plan or listed on the State Heritage Register, a register of places and items of particular importance to the people of NSW.

The proposal would not impact directly or indirectly on any items of heritage significance (refer to Section 7.10).

5.4 COMMONWEALTH LEGISLATION

5.4.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is administered by the Commonwealth Department of the Environment (DoE). Under the EPBC Act, if the Minister determines that an action is a 'controlled action' which would have or is likely to have a significant impact on a Matter of National Environmental Significance (MNES) or Commonwealth land, then the action may not be undertaken without prior approval of the Minister.

The EPBC Act identifies eight MNES:

- World Heritage properties.
- National heritage places.
- Ramsar wetlands of international significance.
- Threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mining).

When a person proposes to take an action that they believe may be a 'controlled action' under the EPBC Act, they must refer the proposal to the DoE for a decision about whether the proposed action is a 'controlled action'.

A search of the Commonwealth Protected Matters Search Tool on 25 February 2016 indicated that there are no World Heritage Properties or National Heritage Places within the proposal site. Search results listed four Wetlands of International Importance that are either known to occur or have potential to occur in the area, however these are not relevant to the site or proposal. The proposal is not likely to have a significant impact on the environment of Commonwealth land. Section 6.2 discusses the results of searches in relation to threatened species, ecological communities and migratory species. Tables 5-4, 5-5 and 5-6 summarise the results of the searches.

Table 5-4 Summary of Matters of National Environmental Significance (10 km search radius)

Matters of National Environmental Significance	Addressed in this EIS
World Heritage Properties	NA
National Heritage Places	NA
Wetlands of International Significance	NA
Great Barrier Reef Marine Park	NA
Commonwealth Marine Areas	NA
Threatened Ecological Communities	Section 6.2 and Appendix D
Threatened Species	Section 6.2 and Appendix D
Migratory Species	Section 6.2 and Appendix D

Table 5-5 Summary of Other Matters Protected by the EPBC Act (10 km search radius)

Other Matters Protected by the EPBC Act	Addressed in this EIS
Commonwealth Lands	Not applicable to site.
Commonwealth Heritage Places	Not applicable to site.
Listed Marine Species	Not applicable to site.
Whales and Other Cetaceans	Not applicable to site.
Critical Habitats	Not applicable to site.
Commonwealth Reserves	Not applicable to site.

Table 5-6 Summary Extra Information (10 km search radius)

Extra Information	Addressed in this EIS
Place on the RNE	Not applicable to site.
State and Territory Reserves	Not applicable to site.
Regional Forest Agreements	Not applicable to site.
Invasive Species	Section 6.2.
Nationally Important Wetlands	Not applicable to site.

Commonwealth listed threatened ecological communities, threatened species, migratory species and invasive species are discussed in Appendix D and Section 6.2. A significant impact to any of these entities is considered highly unlikely and the proposed activity is considered highly unlikely to be a controlled action.

No other matter of national environmental significance would be affected by the proposed activity.

5.4.2 Native Title Act 1993

The *Native Title Act 1993* provides a legislative framework for the recognition and protection of common law native title rights. Native title is the recognition by Australian law that Indigenous people had a system of law and ownership of their lands before European settlement. Where that traditional connection to land and waters has been maintained and where government acts have not removed it, the law recognises the persistence of native title.

People who hold native title have a right to continue to practise their law and customs over traditional lands and waters while respecting other Australian laws. This could include visiting to protect important places, making decisions about the future use of the land or waters, and hunting, gathering and collecting bush medicines. Further, when a native title claimant application is registered by the National Native Title Tribunal, the people seeking native title recognition gain a right to consult or negotiate with anyone who wants to undertake a project on the area claimed.

Native title may exist in areas such as:

- Vacant Crown land.
- Some national parks, forests and public reserves.
- Some types of pastoral lease.
- Some land held for Aboriginal communities.
- Beaches, oceans, seas, reefs, lakes, rivers, creeks, swamps and other waters that are not privately owned.

The proposal site is located on freehold land and not subject to any native title claims.

5.4.3 Renewable Energy (Electricity) Act 2000

The *Renewable Energy (Electricity) Act 2000* (RE Act) aims:

- To encourage the additional generation of electricity from renewable sources.
- To reduce emissions of GHGs in the electricity sector.
- To ensure that renewable energy sources are ecologically sustainable.

Section 17 of the RE Act defines renewable energy sources eligible under the Commonwealth government's renewable energy target scheme. This includes solar energy.

Certificates for the generation of electricity are issued using eligible renewable energy sources. This requires purchasers (called liable entities) to surrender a specified number of certificates for the electricity that they acquire. In January 2011, renewable energy certificates were reclassified as either large-scale generation certificates or a small-scale technology certificates following changes to the scheme.

The proposal is the subject of application to the Clean Energy Regulator under the RE Act and would receive large scale generation certificates.

5.5 OTHER RELEVANT POLICIES AND MATTERS

5.5.1 Ecologically Sustainable Development (ESD)

Ecologically Sustainable Development (ESD) involves the effective integration of social, economic and environmental considerations in decision-making processes. In 1992, the Commonwealth and all state and territory governments endorsed the *National Strategy for Ecologically Sustainable Development*.

In NSW, the concept has been incorporated in legislation such as the EP&A Act and EP&A Regulation. For the purposes of the EP&A Act and other NSW legislation, the Intergovernmental Agreement on the Environment (1992) and the *Protection of the Environment Administration Act 1991* outline principles which can be used to achieve ESD. These principles are presented below along with a description of how the proposal and this EIS have considered each principle.

a) The precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

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

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

The precautionary principle has been adopted in the assessment of impact. All potential impacts have been considered and mitigated where a risk has been identified. Mitigation is commensurate with risk. Where uncertainty exists, measures have been included to address the uncertainty.

b) Inter-generational equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

The majority of the potential impacts of the proposal are likely to be localised and would not diminish the options regarding land and resource uses and nature conservation available to future generations. Particularly, pollution risks have been addressed and decommissioning would see all above ground infrastructure removed, such that the majority of the site could be returned to primary production or other compatible land use. It is also noted that the proposal would address the need to minimise the risk of climate change to current and future generations by reducing carbon emissions that result for electricity generation. Proposals such as the Parkes Solar Farm are an important part of the transition to a low emission future.

c) Conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.

The impacts of the proposal on biodiversity, including EPBC listed species, have been assessed in detail in Section 6.2. This has included avoidance of higher conservation value areas where possible and management prescriptions to minimise, manage and offset residual impacts. The impacts have been deemed acceptable and justifiable by this assessment.

d) 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.

Attributes of the proposal site such as the existing native vegetation, soil and hydrology have been valued in terms of their broader contribution to the catchment and catchment processes. Pollution risks have been assessed and would place any cost of remediation solely upon the proponent.

The aims, structure and content of this EIS have incorporated these ESD principles. The mitigation measures in Section 8.2 set out an auditable environmental management commitment by the proponent. Based on the social and environmental benefits accruing from the proposal at a local and broader level, and the assessed impacts on the environment and their ability to be managed, it is considered that the development would be ecologically sustainable within the context of ESD and is justifiable.

5.6 SUMMARY OF LICENSES

Table 5-7 lists licenses that have been identified as relevant to the proposal.

Table 5-7 Summary of licenses required

Instrument	Licence or approval requirement
EP&A Act, Part 4	SSD consent - State Significant Developments require approval from the Minister for Planning and Environment. This EIS has been prepared in accordance with the requirements of the Secretary of the DPE.
Roads Act, section 138	Any works to public or classified roads require a permit under this act by the roads authority, which for Henry Parkes Way and Pat Meredith Drive is Parkes Shire Council.

Note, if it is determined that additional licenses or approvals are required, Neoen would obtain these prior to commencement of relevant activities.

6 ENVIRONMENTAL IMPACT ASSESSMENT

6.1 IMPACT ASSESSMENT APPROACH

The environmental impact assessment below addresses all impacts likely to be attributed to the proposal (including the solar farm, access roads and transmission line). This includes consideration of:

- Direct impacts – these include impacts directly attributable to the construction, operational and decommissioning phases such as:
    - Disturbances to native vegetation, soil, water and air quality
    - Potential to impact on cultural features and values
    - Noise generated by equipment and traffic movements
    - Public safety, pollution risks and hazards.
- Indirect impacts – follow-on or cascading impacts such as:
    - Impacts on the local economy
    - Potential to impact existing and future land uses.
- Cumulative impacts - the combined potential effects of different impact types as well as the potential interaction with other proposals. For example:
    - The combined impact of construction noise, traffic and visual impacts for nearby receivers
    - The combined effects of the construction phase coinciding with other large infrastructure works that may be planned in the area.

To guide the level of investigation within the EIS, a risk assessment was undertaken to characterise the likely environmental risks associated with the construction, operation and decommissioning of the proposal. This was based on the Constraints Analysis (NGH Environmental 2014) and Scoping Study (NGH Environmental 2014); provided in the application for the SEARs as well as a site inspection. This exercise has guided the preparation of this EIS.

The risk rating is a factor of the **consequence** and **likelihood** of an impact occurring. Depending on the combination of consequence and likelihood, the overall risk rating could be low to extreme. High to extreme risks (termed 'key risks') have warranted a higher level of investigation. Risks identified as low or highly manageable are discussed in less detail.

Table 6-1 summarises the results of the 'unmitigated' risk assessment. The following four key risks were investigated in detail by way of specialist assessments (refer Section 6):

- Biodiversity.
- Aboriginal heritage.
- Visual amenity.
- Noise.

Lower risk issues were investigated, primarily using desktop assessment, in Section 7 of this EIS.

It is noted that, on the basis of the investigations now documented in this EIS for key and lower risk issues, all risks are considered able to be managed and would have a revised 'mitigated' risk rating of 'low'.

Table 6-1 Risk analysis of environmental issues

Relevant EIS section	Environmental risk	Consequence	Likelihood	Unmitigated risk rating
6.2	Biodiversity	Moderate	Possible	High
6.3	Aboriginal heritage	Moderate	Possible	High
6.4	Visual amenity	Moderate	Possible	High
6.5	Noise and vibration	Minor	Possible	Medium
7.1	Water use, water quality and hydrology	Minor	Possible	Medium
7.2	Soil	Minor	Possible	Medium
7.3	Traffic, transport and road safety	Minor	Possible	Medium
7.4	Climate and air quality	Minor	Possible	Medium
7.5	EMFs	Minor	Possible	Medium
7.6	Land use	Minor	Possible	Medium
7.7	Socioeconomic and community	Minor	Possible	Medium
7.8	Resource use and waste generation	Minor	Possible	Medium
7.9	Fire and bush fire issues	Minor	Possible	Medium
7.10	Historic heritage	Minor	Possible	Medium

6.2 BIODIVERSITY (FLORA AND FAUNA)

6.2.1 Approach

A specialist BAR was prepared by NGH Environmental to investigate and assess the potential impacts of the Parks Solar Farm on biodiversity. The aim of the report was to;

1. Address the requirements of the *Framework for Biodiversity Assessment* (FBA), the NSW biodiversity offsets policy developed for Major Projects (OEH 2014) and the requirements of the SEARs in relation to biodiversity.
2. Assess the proposal in relation to Matters of National Environmental Significance as per the *Environment Protection Biodiversity Conservation* (EPBC Act)

The full report is included in Appendix D and the report is summarised below.

The assessment approach involved literature reviews, database searches, and field surveys conducted in accordance with relevant survey guidelines. The proposed solar farm conforms to the definition of a *site-based development* according to the FBA; a development other than a linear shaped development, or a multiple fragmentation impact development.

The following survey methods were undertaken during the survey on the 7 and 8 of December 2015:

- *Random meander and targeted searches for threatened flora species*:- approximately 4 hours were completed.
- *Biometric vegetation plots*:- a total of 6 biometric plots were completed.
- *Fauna habitat assessment:-* all trees within the study site were inspected for hollows, and the number, size and occupancy of the hollows, as well as the species, diameter at breast height and height of the hollow-bearing trees were all recorded.
- *Targeted and opportunistic fauna surveys*:- were conducted with the aim of identifying occurrence of the following species were completed (see also Appendix D):
  - Grey Falcon (*Falco hypoleucos*)
  - Diamond Firetail (*Stagonopleura guttata*)
  - Glossy Black-cockatoo (*Calyptorhynchus lathami*)
  - Grey-crowned Babbler (*Pomatostomus temporalis* subsp. *temporalis*)
  - Major Mitchells Cockatoo (*Lophochroa leadbeateri*).

A full description of the survey methodology is outlined in Section 4.2 of Appendix D.

The aims of the site surveys were as follows:

1. Determine vegetation communities present within the Project area, their condition and extent.
2. Identify potential EECs within the Project area and determine their condition and extent.
3. Conduct targeted searches for threatened flora and fauna species predicted to occur in the Project area.

To undertake the assessment, two assessment circles (the inner and outer assessment circles) were established and the percent native vegetation cover in the landscape assessed, taking account both cover and condition of vegetation. The area of the inner and outer assessment circles for this assessment are 300 ha and 3,000 ha respectively.

A BioBanking credit assessment was completed for the Parkes Solar Farm. The proposal ID for the assessment is BioBanking Credit Calculator Major Project 205/2015/2370MP Version 1.

6.2.2 Existing environment

Landscape features

The proposal site is located within the New South Wales Western Slopes Bioregion and the Lower Slopes – Central West Subregion (IBRA v.7 2012). Bioregions are large, geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features and plant and animal communities. The geology of the region is Permian to Middle Triassic (240 million years) in age, with landforms described as mountain ranges, dissected plateaus, hills, and undulating plains. The dominant pre-European vegetation type is considered to be Poplar Box Layered Woodland, dominated by *Eucalyptus populnea/ E. melanophloia/Callitris/Acacia spp.* (ASRIS accessed 5/1/16).

The following Mitchell Landscapes occur within the study area:

- Bimbi Plains occurs throughout the majority of the study area. The per cent cleared estimate for this landscape is currently 93% (OEH 2007).
- Goonumbla Hills occurs to the east and west of the study area and crosses a small section of the study area in the southeast. The per cent cleared estimate for this landscape is currently 92% (OEH 2007).

The total area of native vegetation mapped within the outer assessment circle is approximately 85 ha and is shown in Figure 6-1. The majority of land within the development footprint is cleared (non-native vegetation) land which provide very little in terms of fauna habitat.

One creek lies within the study area, being Ridgey Creek. This is an ephemeral creek and was dry during surveys. There are six man made dams occurring within the proposal site. No state or regionally significant biodiversity links, as defined in the FBA (OEH) occur within the study area and within the inner and outer assessment circles.

Native vegetation

Two distinct Plant Community Types (PCTs) were observed in the study area. These include:

1. Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW Western Slopes and Riverina Bioregions.
2. Western Grey Box – Poplar Box – White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion

Both of these PCTs are listed as the EEC *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*.

WESTERN GREY BOX TALL GRASSY WOODLAND ON ALLUVIAL LOAM AND CLAY SOILS IN THE NSW WESTERN SLOPES AND RIVERINA BIOREGIONS (PCT 76)

Within the study area this PCT occurs in the road corridor and adjacent patches along Pat Meredith Drive, in remnant and planted patches within the proposal site and as isolated trees within the proposal site (Refer Figure6-2). This vegetation community is listed as an EEC under the TSC Act, and as an EEC under the EPBC Act – *Grey Box (Eucalyptus macrocarpa) grassy woodland and derived native grasslands of south-eastern Australia*. Only the remnant patch within the road corridor (Pat Meredith Drive) of this community qualifies for the EPBC Act listing of which a small patch is proposed for clearing in the proposed above ground transmission line (Refer Figure 6-2).

While patches within the proposal site have a disturbed understory due to livestock disturbance, the condition of this vegetation is moderate to good within the road corridor, being generally a well-structured

community. This vegetation community provides numerous habitat types for fauna. Canopy trees provide foraging and nesting/resting for birds and arboreal fauna. The mid-storey (if present) provides foraging and nesting for smaller birds, as well as refuge for small-medium sized mammals and reptiles. Ground plants, logs and fallen leaves provide shelter and foraging for terrestrial fauna as well. Where hollow-bearing trees are present, it may provide daytime resting habitat for bats and mammals, and roosting habitat for birds.

WESTERN GREY BOX – POPLAR BOX – WHITE CYPRESS PINE TALL WOODLAND ON RED LOAMS MAINLY OF THE EASTERN COBAR PENEPLAIN BIOREGION (PCT 82)

This PCT occurs at the northern end of the study area in large remnant patches within the Henry Parkes Way corridor (Figure 6-2). This vegetation community is listed as an EEC under the TSC Act and as an EEC under the EPBC Act – *Grey Box (Eucalyptus macrocarpa) grassy woodland and derived native grasslands of south-eastern Australia*. This community only meets the EPBC Act requirements for patches occurring within the proposed above ground transmission line.

This vegetation community which is in moderate to good condition provides numerous habitat types for fauna. Canopy trees provide foraging and nesting/resting for birds and arboreal fauna. The mid-storey (where present) provides foraging and nesting for smaller birds, as well as refuge for small-medium sized mammals and reptiles. Ground plants, logs and fallen leaves provide shelter and foraging for terrestrial fauna as well. Where hollow-bearing trees are present, it may provide daytime resting habitat for bats and mammals, and roosting habitat for birds.

Cleared areas (Non-indigenous vegetation)

This highly disturbed or modified vegetation community occupies the majority of the site and is found where there is a prevalence of exotic or planted non-local flora species that make up groundcover layers and is confined to grazing areas. Non-indigenous vegetation covers the majority of the study area, making it the most abundant community in the study area. The groundlayer is mainly exotic with common grazing species including Oats, Lucerne (*Medicago sativa*) and Perennial Rye Grass (*Lolium perenne*).

Threatened species

The following threatened species were identified from the Biobanking Credit Calculator (BCC) as potentially being present and requiring targeted survey. Table 6-2 below states whether each species was detected during surveys and furthermore, if they are expected to be impacted by the proposal and therefore are required to be offset.

Table 6-2 Threatened species returned from the BCC as requiring survey

Common name	Scientific name	Surveys	Present/presumed present	Affected by the proposal
A spear-grass	*Austrostipa wakoolica*	Not detected.	Presumed to occur on occasion. 4 records nearby.	Unlikely – not recorded within the study area.
Eastern Pygmy-possum	*Cercartetus nanus*	Not detected.	No.	Unlikely – not recorded within the study area, or previously within 10 km or the Parkes Shire LGA. Only marginal habitat present.
Grey Falcon	*Falco hypoleucos*	Not detected.	No.	Unlikely – not recorded within the study area. Only minimal habitat clearing proposed for this large ranging species.
Koala	*Phascolarctos cinereus*	Not detected.	No.	Unlikely – not recorded within the study area and closest record approximately 12 km southeast. No primary feed trees will be impacted.
Pine Donkey Orchid	*Diuris tricolor*	Not detected.	Presumed to occur on occasion. 3 Records occur nearby.	Possible – however not detected during surveys.
Slender Darling Pea	*Swainsona murrayana*	Not detected.	No.	Unlikely – not recorded within the study area.

Figure 6-1 Biodiversity location map showing inner and outer assessment circles of the Project area.

Figure 6-2 PCTs (including condition) within the study area with plot and transect locations and vegetation impact areas

6.2.3 Site surveys

Sixty one flora species and thirty three fauna species were detected during the surveys. Of all the species recorded, no flora or fauna species are listed as threatened species, either under NSW or Commonwealth legislation.

Six threatened species were returned by the BCC assessment as requiring targeted survey (and therefore with potential to generate species credits) were considered to have some potential to occur in the project area. These include the following:

- Pine Donkey Orchid (*Diuris tricolor*), listed as vulnerable under the TSC Act.
- Spear-grass (*Austrostipa wakoolica*), listed as endangered under the TSC Act and EPBC Act.
- Slender Darling Pea (*Swainsona murrayana*), listed as vulnerable under the TSC Act and EPBC Act.
- Eastern Pygmy-possum (*Cercatetus nanus*), is listed as vulnerable under the TSC Act.
- Koala (*Phascolarctos cinereus*), listed as vulnerable under the TSC Act and EPBC Act.
- Grey Falcon (*Falco hypoleucos*), listed as endangered under the TSC Act and EPBC Act.

Based on the survey effort and habitat assessment, combined with the limited level of impact on potential habitat, it was assessed that populations of the threatened species identified would be impacted by the proposal. While it has been assessed that the works would be unlikely to impact on a population of Pine Donkey Orchid the BCC requires that further targeted surveys are necessary to determine if any offsets are required for this species. Targeted surveys are recommended to occur within the next flowering season which will be between August and September 2016.

6.2.4 Potential impacts

Construction

The BAR identified the potential direct and indirect impacts to biodiversity values of the site that would result during the construction phase, see Table 6-3.

Table 6-3 Potential biodiversity impacts as a result of the proposal.

Impact	Frequency	Intensity	Duration	Consequence
Direct				
Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, compound sites, stockpile sites, access tracks)	Regular	High	Construction phase	• Direct loss of native flora and fauna habitat including threatened species and EECs • Potential overclearing of habitat outside of the development footprint. • Injury and mortality to fauna during clearing of fauna habitat and habitat trees. • Disturbance to fallen timber, dead wood and bush rock
Indirect				
Accidental spills and contamination from construction activities (including compound sites)	Rare	Mod-erate	Construction phase	• Pollution of waterways
Earthworks	Regular	Mod-erate	Construction phase	• Erosion and sedimentation of waterways
Noise	Regular	Low	Construction phase	• Construction machinery and activities may disturb local fauna
Dust generation	Regular	Low	Construction phase	• Inhibit the function of plant species and communities, waterways
Light spills during night works	Rare	Low	Construction phase	• Night works may alter fauna activities/movements
General construction activities	Regular	Mod-erate	Construction phase	• Feral pest, weed and/or pathogen encroachment

A range of mitigation measures would be implemented to ensure that impacts on biodiversity during the construction phase are avoided where possible, and minimised where they cannot be avoided. The mitigation measures that would be employed during the construction phase are provided in Section 6.2.5 below. Mitigation measures have considered methods of clearing, clearing operations, timing of construction and other measures that would minimise impacts of the project on biodiversity values.

Operation

The BAR identified the following potential direct and indirect impacts to biodiversity values of the site during the operational phase.

Impact	Frequency	Intensity	Consequence	
Direct				
Existence of new and permanent solar infrastructure	Constant	Moderate	Operational phase	• Collision risks to birds on solar infrastructure • Collision risk to birds and microbats to exterior barbed-wire fencing
Inappropriate landscaping	Constant	Moderate	Operational phase	• Reduction in the quality of habitat for native flora and fauna species
Indirect				
Light spill	Regular	Low	Operational phase	• Alter movements of fauna through the landscape
Weed encroachment	Regular	Moderate	Operational phase	• Ingress of weeds along the boundary of the development
Pest animals	Irregular	Low	Operational phase	• Increase in pest species specialising in edge habitats

Measures to avoid and minimise impacts that may occur during the operational phase would be implemented as part of the project. Where practical, measures to avoid impacts on biodiversity during operation have been identified. Where impacts are unavoidable measures to minimise impacts would be implemented.

Conclusion

The proposal site has been selected to avoid or minimise impacts to biodiversity where possible. Most areas of EEC in the study area have been avoided through the design process with an aim for avoiding offsets. These areas include the patches of Inland Grey Box Woodland (EEC-TSC Act) and Grey Box grassy woodland (EEC-EPBC Act) within the proposed site boundary, as well as planted rows of trees which constitute the same EECs, which will be retained on-site. This, in turn would also avoid impacts to threatened species predicted to occur in the study area through the BCC. The only areas where an intact native vegetation community, and EEC would be impacted are the areas where the 'above ground transmission line' has been proposed to connect the solar arrays to the power station to the north.

The credit report produced by the BCC, based on the development of the above ground transmission line has identified the following credit requirements:

- Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions EEC) (**5 credits required**)
- Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion (Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions EEC) (**8 credits required**)

Offsets are only required in relation to the proposed overhead powerline between the solar array and the substation. Where an option for boring underground, or an alternative overhead route is identified that avoids removal of EECs, then offsetting would not be required.

Two threatened fauna species and one plant, listed as matters of National Environmental Significance (NES) under the EPBC Act were considered with potential to be impacted by the proposal. These species included:

- Koala (*Phascolarctos cinereus*)
- Superb Parrot (*Polytelis swainsonii*)
- Spear-grass (*Austrostipa wakoolica*)

Impact assessments were undertaken for these species, concluding a very low likelihood of significant impact. As a result, an EPBC referral is not required for this project (see Appendix D).

6.2.5 Mitigation measures

Table 6-4 Safeguards and mitigation measures for biodiversity impacts

C: Construction; O: Operation; D: Decommissioning

Environmental Safeguard	Solar farm		
	C	O	D
• Develop a Flora and Fauna Management Plan (FFMP) for incorporation of construction related environmental management safeguards.	**C**		
• EEC areas to be retained would be delineated, and construction activities would be excluded from these areas.	**C**		
• Minimise clearing of EECs, namely 'White Box–Yellow Box–Blakely's Red Gum Woodland'. Clearing and construction contractors should be given inductions that make clear the importance of the sensitive area habitat and its species.	**C**		
• Where trees are to be retained, an adequate tree protection zone (TPZ) will be provided around each tree for the duration of construction from construction activities, including excavation, vehicle parking and stockpiles. Details for calculating TPZs are provided within *Australian Standard 4970-2009 – Protection of trees on development sites*.	**C**		
• Prior to the commencement of work, a physical vegetation clearing boundary at the approved clearing limit is to be clearly demarcated and implemented. This will include environmentally sensitive areas such as EECs. The delineation of such a boundary may include the use of temporary fencing, flagging tape, parawebbing or similar.	**C**		

Environmental Safeguard	Solar farm		
	C	O	D
• A pre-clearing process will be implemented before clearing begins. Pre-clearing surveys will be carried out by an ecologist and will include general fauna surveys, general tree hollow inspections and dam/waterway inspections. Habitat trees will be clearly marked with flagging tape.	**C**		
• When programming the works, consider breeding periods of fauna that may be impacted.	**C**		
• An unexpected threatened species finds procedure will be developed before clearing commences.	**C**		
• A 'Clearing and Grubbing Plan' will be developed to; ➢ include best practice methods for the removal of woody vegetation and non-woody vegetation. ➢ Trees will be removed in such a way as not to cause damage to surrounding vegetation. Root systems of trees and shrubs to be removed will be retained in-ground to ensure surrounding ground layer vegetation is undisturbed and to prevent soil erosion. ➢ Require that where work cannot avoid encroaching into the TPZ, it not impinge on the structural root zones (SRZ) of trees to be retained. Details for calculating the SRZs are provided within *Australian Standard 4970-2009 – Protection of trees on development sites*. ➢ Where possible, trees to be removed will be mulched on-site and re-used to stabilise disturbed areas. ➢ Tree clearing protocol, that includes staged habitat removal, and a requirement for an ecologist being present during tree-felling of all hollow-bearing trees to ensure that any potential impacts on fauna are minimised	**C**		
• Any fallen timber, dead wood and bush rock (if present) encountered on site will be left in situ or relocated to a suitable place nearby. Rock will be removed with suitable machinery so as not to damage the underlying rock or result in excessive soil disturbance.	**C**		
• A Weed Management Plan would be developed for the sites to prevent/minimise the spread of weeds in and between sites. This would include: ➢ Management protocol for declared noxious weeds as stipulated by the *Noxious Weeds Act 1993* during and post construction (e.g. Chilean Needle Grass) ➢ A protocol for weed hygiene in relation to plant, machinery and importation and management of fill ➢ Any occurrences of pathogens such as Myrtle Rust and Phytophthora would be monitored, treated and reported.	**C**		
• use non barbed-wire on exterior fencing		**O**	
• Use of reflective power line marking balls on any overhead transmission lines		**O**	
• Use of 'fauna friendly' lighting		**O**	
• Native vegetation should be re-established in disturbed areas post-construction.		**O**	

6.3 ABORIGINAL HERITAGE

6.3.1 Approach

A specialist Aboriginal Cultural Heritage Assessment Report (ACHAR) was undertaken to provide an assessment of the Aboriginal cultural values associated with the proposal site and to assess the cultural and scientific significance of any Aboriginal heritage sites recorded.

The full report is provided in Appendix G and is summarised below.

The ACHAR was prepared in line with the following:

- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011);
- *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (OEH 2010a), and
- *Aboriginal cultural heritage consultation requirements for proponents 2010* (OEH 2010b).

Consultation with Aboriginal stakeholders was undertaken in accordance with clause *80C of the National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2010,* following the consultation steps outlined in the (ACHCRP) guide provided by OEH.

6.3.2 Background

Parkes is within an area identified as part of the Wiradjuri language group. This is an assemblage of many small clans and bands that speak a number of similar dialects in this area (Howitt 1996, Tindale 1974, MacDonald 1983, Horton 1994).

The Wiradjuri language group was the largest in NSW prior to European settlement. The borders were however, most likely fluid, expanding and contracting over time to the movements of smaller family or clan groups. Boundaries changed through contact with neighbours, the seasons and periods of drought and abundance of food.

It was the small family group that was at the core of Aboriginal society, the basis for their hunting and gathering life. These family groups were part of a larger band comprising of a number of family groups. The immediate family camped, sourced food, made shelter and performed daily rituals together. The archaeological manifestations of these activities are likely to be small campsites, characterised by small artefact scatters and hearths across the landscape. Places that were visited more frequently would develop into larger site complexes with higher numbers of artefacts and possibly more diverse archaeological evidence. Larger groups might come together on special occasions, such as pre-ordained times for ceremonies, rituals or if their paths crossed. The archaeological legacy of these gatherings would be larger sites than small family camps. They may include large hearth or oven complexes, containing a number of grinding implements and a larger range of stone tools and raw materials.

The development site has a recent history of intensive agricultural and pastoral use. The majority of the area has been utilised for grazing and crop production since European settlement in the early 1800's. The location of the proposed solar farm infrastructure is within cleared paddocks that are currently used for grazing cattle. However, the paddocks have also been subject to ploughing and other farming activities for many decades. Overall, the proposal area would be categorised as disturbed through consistent farming practices and land clearing, although not continuous cropping.

Database searches and consultation

An extensive search of the NSW OEH Aboriginal Heritage Information Management System (AHIMS) was undertaken on the 10 November 2015 (AHIMS reference 198658) in an area 25 km (east-west) by 20 km (north-south) centred on the study area. There were 35 Aboriginal heritage sites were recorded within the search area. The search found that there are no recorded sites within the development envelope, but three are located adjacent to the solar farm site.

The results identify that the dominant site types in the region are modified trees and stone artefacts (the latter occurring either as isolated finds or in clusters as artefact scatters).

6.3.3 Site survey

Methodology

The field survey was undertaken on the 28 January 2016, led by archaeologist Matthew Barber. Assistance was provided by two Aboriginal representatives from the Wiradjuri Council of Elders and Binjang Wellington Wiradjuri Heritage Surveys.

The survey strategy followed the standard practice of delineating different survey units within the development envelope, based on topography, soils or other landscape features. One survey unit was delineated for the solar array and one survey unit for the power line.

Survey methodology involved carrying out a series of pedestrian survey transects across the development envelope, ensuring enough coverage to be able to assess and characterise the archaeology. Team members walked in parallel lines across the site at approximately 50 metre intervals. Between the three survey participants, 52.5 km of transects were walked in total.

Overall, it is considered that the surface survey of the solar farm proposal area had modest but effective coverage. The discovery of seven Aboriginal artefacts indicates that the survey technique was effective enough to identify evidence of Aboriginal occupation.

Results and conclusions

A total of seven isolated artefacts were found across the proposal area. Their location is shown in the ACHAR, attached as Appendix G, as well as photographs of the artefacts.

The artefacts recorded include:

Find 1: A broken retouched flake found.
Find 2: A piece of grinding stone in open flat paddock.
Find 3: Broken flake with steep retouch.
Find 4: Piece of grinding stone with some possible flaking on edge.
Find 5: Isolated core.
Find 6: Isolated artefact.
Find 7: Isolated core.

6.3.4 Potential impacts

Construction

The development will result in development of a large proportion of the 240 ha property where infrastructure will be developed, and along the proposed power line easement. The impact is likely to be most extensive in relatively discrete areas where earthworks occur (pile driving, track construction, footings for inverters, site buildings and fencing). This would involve the removal, breakage or displacement of artefacts. This is considered a direct impact on the Aboriginal objects by the development.

The impact to the scientific values if the artefacts were to be impacted by the current proposal is considered low however. The isolated artefacts have little research value apart from what has already been gained from the information obtained during this ACHAR. This information relates more to the presence of the artefacts and in the development of Aboriginal site modelling, which has largely now been realised by the recording.

The assessment has identified that the development can proceed with no additional archaeological investigations. No areas of potential archaeological deposits have been identified and the significance of the Aboriginal heritage objects within the proposal site have been assessed as low.

As the proposed solar farm is classified as State Significant Development under the EP&A Act, a Section 90 permit under the NPW Act is not required, and as such, an AHIP is not required to impact the identified Aboriginal objects. Mitigation of construction impacts would centre on salvage of known sites, in accordance with a Cultural Heritage Management Plan (CHMP) and with involvement from registered stakeholders.

Operation

During operation, it is unlikely the Parkes Solar Farm Project would impact on Aboriginal archaeology. No mitigation is required.

6.3.5 Mitigation measures

The ACHAR identifies that the development proposal can proceed with no additional archaeological investigations. While artefacts were recorded, no areas of Potential Archaeological Deposits (PADs) have been identified and the significance of the Aboriginal heritage objects within the proposal site have been assessed as low. The report identifies a number of safeguards, these are identified below.

Table 6-5 Safeguards and mitigation measures for Aboriginal heritage impacts

C: Construction; O: Operation; D: Decommissioning

Environmental Safeguard	Solar farm		
	C	O	D
Prepare a Cultural Heritage Management Plan (CHMP) in consultation with the registered Aboriginal parties that incorporates the following; • where avoidance of the recorded artefacts within the proposal area is not possible, the artefacts would be collected and moved to a safe area within the property, as close as possible to their original location, but which will not be subject to ground disturbance. The collection and relocation should be undertaken by representatives of the registered Aboriginal parties. A new AHIMS site card will need to be completed identifying the new location of the moved artefacts. • Incorporates an unexpected finds protocol to allow for management of finding additional Aboriginal artefacts during the construction of the solar farm. • Includes a protocol where, in the unlikely event that human remains are discovered during the construction, all work must cease. OEH, the local police and Peak Hill LALC should be notified. Further assessment would be undertaken to determine if the remains were Aboriginal or non-Aboriginal.	**C**		

6.4 VISUAL IMPACT

NGH Environmental completed a Visual Impact Assessment (VIA) of the proposed Parkes Solar Farm (provided in full, Appendix E and summarised below). It provides a full assessment of the visual impacts associated with the proposal, including:

- Landscape character and scenic vistas.
- Stakeholder values regarding visual amenity.
- Potential impacts on representative viewpoints (including glare and reflectivity).

It includes a strategy to address identified impacts, including onsite vegetation screening, general design measures and a process to verify the actual visual impacts of the proposal. This improves the reliability of the measures and provides a trigger to undertake additional mitigation if required.

6.4.1 Approach

The visual impact assessment includes the following components:

- Background investigations, mapping and modelling.
- Field survey including reconnaissance, ground truthing and photography.
- Community consultation.
- Impact assessment.
- Development of a visual impact mitigation strategy.

The impact assessment methodology used in this Visual Impact Assessment is based on the Bureau of Land Management (BLM) Visual Resource Management System, developed by the BLM, US Department of the Interior (n.d). The BLM developed a systematic process to analyse the visual impact of proposed developments. The basic philosophy states that the degree to which a development affects the visual landscape depends on the visual contrast imposed by the project. Mitigation measures are considered for impacts greater than medium visual impact; for a medium impact, the contrast is considered acceptable.

For the purpose of the assessment, a height of 3m was used to model onsite infrastructure to the project boundary extents. This is a realistic approximation of the height of panels and PV containers, which may actually be 2.3m and 3.4m, respectively. It is conservative as panels may not be distributed to the site boundaries and the model does not take into account screening such as vegetation or infrastructure. On this basis is considered a 'worst case' model. The full methodology is provided in Appendix E.

6.4.2 Results

Existing environment

Parkes was founded as a gold discovery settlement. Today, it provides an important contribution to agricultural output (primarily wheat and wool) and mining. Parkes and nearby townships offer a country lifestyle valued by its constituents. It is famous for the Parkes Observatory, and has an important role in the scientific community. In addition to the Parkes Observatory, Bushmans Hill and the War Memorial Lookout, Goobang National Park, and Peak Hill open cut mine are local tourist attractions. The study area is relatively flat, apart for the localised rises north and immediately east of the site and closer to Parkes.

Scenic vistas in the study area include:

- Bushmans Hill Reserve (8.7 km), off the Newell Highway in Parkes, provides 360 degree views of the local area. Views to the proposed solar farm would be screened by topography and due to distance.
- Memorial Hill Lookout (8.7 km), off Bushman Street in Parkes. Views to the proposed solar farm would be screened by topography and due to distance.
- Millers Lookout Road (2.4 km) is a localised rise to the east of the proposed solar farm site. It is likely to provide full views of the proposed solar farm site, from the western side of the landform however, no public access road services the rise.
- Caloma lookout, Goobang National Park (26km) is located to the north east of the site, east of Parkes. While containing recreational areas and scenic lookouts, views to the proposed solar farm would be screened by topography and due to distance.

Values of the local community to the proposal

Twelve people attended the Parkes Solar Farm information session held in Parkes on 15 December 2015. Only five feedback forms were returned; two by respondents less than 2km from the proposed solar farm site and three by respondents more than 5km from the proposed site.

- Views, community and family ties, work opportunities and recreational opportunities (such as sporting and nature-based activities) were selected equally as holding the most value for the local area (two respondents selected each item).
- All five respondents cited renewable energy generation as what they liked most about solar farms generally. Local economic opportunities (four respondents) and diversification of land use (three respondents) were also cited.
- One respondent cited potential visual impacts as a concern regarding solar farms generally.

Issues raised with specific reference to the proposed Parkes Solar Farm included:

- The proposal is a great initiative on local and environmental platforms.
- Views of cattle grazing land are an important visual characteristic of the local area.
- Memorial Hill is an important local view; contrasting town and country, particularly when crops are in season (canola and wheat).

Landscape character units (LCU) and representative viewpoints

LCUs take into account topography, vegetation, land use, and other distinct landscape features. They are a way to summarise differences in the receiving environment that may affect the visual impact of the proposed solar farm at different locations. The three LCUs identified within 16 km of the proposal site are characterised below in terms of their scenic quality (illustrated in Table 6-6) :

- Agricultural - Scenic quality is generally low. These areas are uniform in colour and form, lacking variety. Elements are production related. Existing infrastructure mostly includes powerlines, roads, rail way corridors and houses. This LCU is common in the study area.
- Residential - Scenic quality is considered moderate. These areas have variety in colour and form normal in this character type. Elements include recreational aspects; parks and gardens. This LCU is common in the study area.
- Forests, woodlands, reserves - Scenic quality is considered moderate. This area has variety in colour and is relatively rare in the study area. Elements include natural woodland and forest, although the area is used for production. This LCU is uncommon in the study area.

Table 6-6 Landscape Characteristic Units within 16 km of the proposed Parkes Solar Farm

Landscape Character Unit - Agricultural

Landscape Character Unit - Residential

Landscape Character Unit – Forests, woodlands, reserves

Representative viewpoints within each LCU were identified using ZVI modelling, assuming the proposal could be modelled as a 3 m high rectangular block. This is realistic approximation of the height of panels and PV containers, which may actually be 2.3 m and 3.4 m, respectively. The predicted sensitivity of each viewpoint was then be determined, considering its proximity to the proposed solar farm site and factors such as use, scenic quality and regional significance. Figure 6-3 illustrates the locations of these representative viewpoints with reference to the proposal site and Table 6-7 provides details of representative viewpoints. Criteria for proximity and sensitivity are provided in Appendix E.

Residences were assessed to have moderate sensitivity. Even where they are located in low use areas (off minor local roads) of low scenic quality (agricultural areas). It is noted that community members cited views of rich farming land as an important local value. In agricultural areas, gardens and plantings have often been incorporated into house lots, most likely to provide shade as well as screening from the agricultural lands.

Table 6-7 Representative viewpoints (ID) with reference to the proposed Parkes Solar Farm

Viewing ID	LCU	Scenic quality	Viewpoint	Proximity to proposal site	Sensitivity
1	Agricultural	Low	Road	Middle ground	High
2	Agricultural	Low	Residence	Foreground	Moderate
3 [1]	Agricultural	Low	Residence	Foreground	High
4	Agricultural	Low	Residence	Middle ground	Moderate
5	Agricultural	Low	Residence	Middle ground	Moderate
6	Agricultural	Low	Road	Foreground	Low
7	Agricultural	Low	Road	Middle ground	Moderate
8	Agricultural	Low	Road	Middle ground	Low
9	Agricultural	Low	Road	Middle ground	Low
10	Agricultural	Low	Road	Middle ground	Low
11	Urban	Moderate	Residence	Background	Moderate
12	Urban	Moderate	Park	Background	High
13	Urban	Moderate	Park	Background	High
14	Forestry	Moderate	State Forest	Background	Moderate
15	Agricultural	Low	Road	Background	Low
16	Agricultural	Low	Road	Foreground	Moderate

[1] Involved landowner.

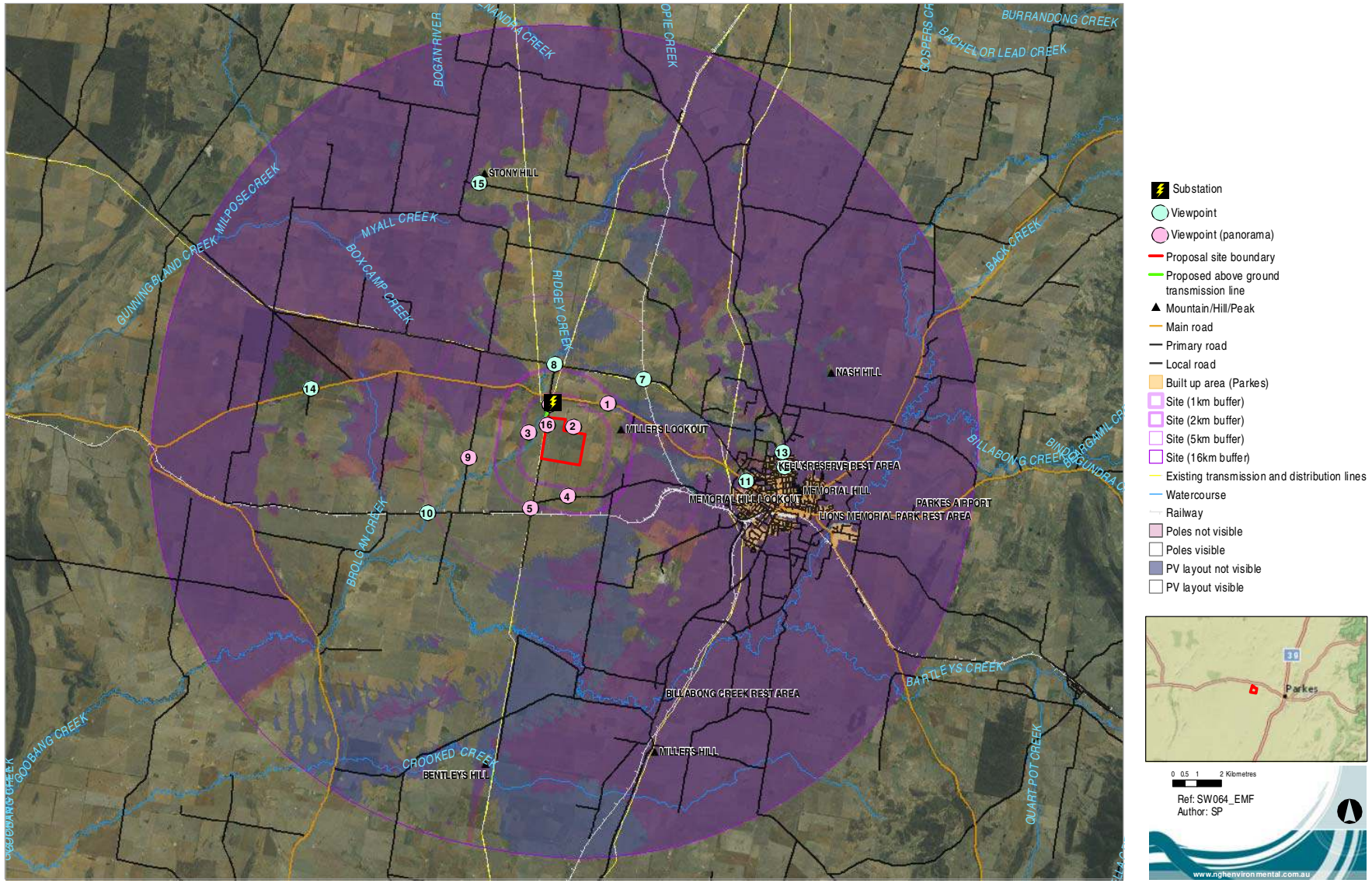

Figure 6-3 Representative viewpoints with reference to the proposed Parkes Solar Farm

6.4.3 Potential impacts

The visual impact assessment was undertaken considering the:

a) Infrastructure components proposed.
b) Their potential impact on landscape character units and representative viewpoints.
c) The degree of contrast the development would have within the identified Visual Landscape Management Zones and if these are considered acceptable.

Visual impact assessment at representative viewpoints

Table 6-8 evaluates the representative viewpoints that rated medium or higher visual impact (all impact ratings are shown in Appendix E). In summary:

- One viewpoints was considered to have a high visual impact.
- Four viewpoints were considered to have a medium visual impact.
- Eleven viewpoints were considered to have a low visual impact.

Figures 6-4 to 6-8 illustrate, where possible, the indicative horizontal extent of the view of solar array infrastructure from the high and medium visual impact viewpoints.

In summary, the highest impacts are seen from one 'non-involved' residence that is in closest proximity to the site. It is represented by Viewpoint 2 (panorama presented in Figure 6-4). While it occurs in a low use area (off a minor road) and existing vegetation will to some extent screen views to the proposed solar farm site from the residence itself, there would be dominant views of infrastructure from many areas of the yard. The form of the infrastructure, low (<3m) and in rectangular arrays, is not incongruous with the existing low lying rectangular forms in this agricultural areas however, screening as a mitigation strategy is recommended for this viewpoint.

Medium impacts are seen for four viewpoints located further from the site, where intervening trees obscure the view such that the low height infrastructure proposed is not likely to be dominant. These are represented by Viewpoints 1, 3, 6 and 16 (panorama presented in Figures 6-5 – 6-8). While impacts are considered acceptable, further minimisation of impacts would be highly feasible, by supplementing existing plantings on Pat Meredith Drive or providing some boundary plantings on the solar farm site. Additionally, general design measures have been recommended that would further lessen the contrast of the infrastructure from these locations.

Low impacts are seen for roads and residences, parks and forestry reserves in the middle and background where views of the solar farm infrastructure would be difficult to perceive or indistinct. No mitigation is required for these locations.

Table 6-8 Visual impact at representative viewpoints with reference to the Parkes Solar Farm

View ID	Viewing opp.	Scenic quality	Proximity	Sensitivity	LMZ	Objective	Contrast	Visual Impact
2	**Residence**	**Low**	**Foreground**	**Moderate**	**B**	**Protect dominant visual features**	**High**	**High impact** Existing vegetation around the house will screen views from the residence itself to some extent. The contrast between the existing landscape and the infrastructure at this distance may be greater than acceptable however, given the 200 degree view potential. Mitigation should be considered for this residence. **Solar site vegetation screening is proposed and could effectivity mitigate this impact.**
3 [2]	Residence	Low	Foreground	High	B	Protect dominant visual features	Medium	Medium impact Existing vegetation between the residence and the proposed solar site will reduce the horizontal extent of the views considerably. The contrast between the existing landscape and the low level infrastructure at this distance is considered to be acceptable. Views could be reduced further by supplementing existing plantings on Pat Meredith Drive.
1	Road	Low	Middleground	High	B	Protect dominant visual features	Low	Medium impact Substantial existing vegetation along the road corridor will largely screen views for motorists. View durations would be short. The contrast is considered to be acceptable.
16	Road	Low	Foreground	Moderate	B	Protect dominant visual features	Medium	Medium impact Existing vegetation along the road corridor will reduce views for motorists. View durations would be short. The contrast is considered to be acceptable. However, views could be reduced further by supplementing existing plantings on Pat Meredith Drive.
6	Road	Low	Foreground	Low	C	Reflect existing forms and colours	Medium	Medium impact Existing vegetation will limit the horizontal extent of the view. View durations would be short for motorists. The contrast is considered to be acceptable. However, views could be reduced further by plantings on the solar farm site.

[2] Involved landowner.

Figure 6-4 Extent of views of infrastructure for highly affected viewpoint: View point 2 HIGH IMPACT (view to south east)

Figure 6-5 Extent of views of infrastructure for medium affected viewpoint: View point 1 MEDIUM IMPACT

Figure 6-6 Extent of views of infrastructure for medium affected viewpoint: View point 3 MEDIUM IMPACT

Figure 6-7 Extent of views of infrastructure for medium affected viewpoint: View point 6 MEDIUM IMPACT

Figure 6-8 Extent of views of infrastructure for medium affected viewpoint: View point 16 MEDIUM IMPACT

Glare and reflectivity of solar panels

The potential for glare associated with non-concentrating photovoltaic systems which do not involve mirrors or lenses is relatively limited. PV solar panels are designed to reflect as little sunlight as possible (generally around 2% of the light received; Spaven Consulting 2011), resulting in negligible glare. The reason for this is that PV panels are designed to absorb as much solar energy as possible in order to generate the maximum amount of electricity or heat. The panels will not generally create noticeable glare compared with an existing roof or building surfaces (NSW Department of Planning 2010).

Other onsite infrastructure that may cause glare or reflections depending on the sun angle, include:

- Steel array mounting - array mounting would be steel or aluminium.
- Temporary site offices, sheds, containerised PV boxes.
- Permanent staff amenities.

6.4.4 Safeguards and mitigation measures

The proposal would be located in an agricultural area of generally low scenic quality. However, the visual characteristics of this farming land are important to members of the local community. The solar farm site is located next to a high use transport corridor (road) and in close proximity to several residences, meaning views of the project would not be overlooked. A high impact was determined for the nearest non-involved neighbour.

A vegetation buffer on the site perimeter is part of the project description. A suggested location for the buffer is provided in Appendix D of the VIA, targeting specific sections of the project perimeter to mitigate high and medium impact receivers. Screening is proposed to break up views of the proposed infrastructure, in consultation with the affected landholders and would be undertaken post-construction to ensure 'as built' impacts are addressed. With the involvement of the affected landowners in the mitigation strategy set out in Table 6-8, the visual impacts of the proposal are considered acceptable and manageable.

Table 6-9 Safeguards and mitigation measures for visual impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
Design measures: • If feasible, underground rather than overhead power lines would be considered. • If feasible, co-location of powerlines would be undertaken to minimise the look of additional power poles. If additional poles are required, these would match existing pole design as much as possible. • The materials and colour of onsite infrastructure will, where practical, be non-reflective and in keeping with the materials and colouring of existing infrastructure or of a colour that will blend with the landscape. Where practical, buildings will non-reflective and in eucalypt green, beige or muted brown. Pole mounts will be non-reflective. Security fencing posts and wire would be non-reflective; green or black rather than grey would reduce the industrial character of the fence.	C		
Screening: • Onsite planting within the solar farm boundaries would be considered for five residences identified with potential for high to medium level impacts; Viewpoints 2, 3, 6 and 16. • Planting requirements are outlined in the VIA and would be detailed fully within an appropriate management plan. • Screens would be maintained for the operational life of the solar farm, including replacing dead plants and weeding, as required to maintain the screen's effectiveness in breaking up views.		O	
A verification process would be implemented within 2 months of the completion of the construction phase. A Visual Verification Report and Landscape Plan would: • Confirm the assumptions of this assessment by ground based assessment and ensure all medium to high impacts are mitigated. • Finalise the location and species for proposed screening, in consultation with nearest affected landholders and roads authority, where relevant. • Detail planting methods and maintenance requirements of the screen planting.		O	

6.5 NOISE IMPACTS

6.5.1 Approach

A Construction and Operational Noise and Vibration Assessment for the proposed Parkes Solar Farm was undertaken by Renzo Tonin and Associates. The full report is provided in Appendix F and is summarised below. It includes consideration of noise and vibration impacts from the construction and operation phases of the project in accordance with relevant Council and EPA requirements and guidelines.

The noise assessment assumed the proposal was larger being 60 MVA / 80 MW, with 265,000 solar panels, 3,500 trackers and 30 PV boxes or skids. As such it assessed a worst case scenario.

6.5.2 Existing environment

The proposal is located in a regional setting, approximately 10 km west of Parkes. The surrounding lnd uses to the proposed solar farm are generally agriculture including cropping and cattle and sheep grazing. Noise sources include traffic along Henry Parkes Way and agricultural activities such as the operation of large harvesters, tractors, haulage tucks, irrigation pumps, quad bikes and 4WD vehicles.

Figure 6-9 illustrates the locations of the nearest receivers to the proposal site, with the nearest non-involved residential dwelling being approximately 400 m north of the proposed solar farm (R1).

6.5.3 Noise monitoring

Criteria for the assessment of construction and operation noise are usually derived from the existing noise environment of an area. The NSW EPA Industrial Noise Policy (INP) outlines methods for determining the background noise level of an area. This assessment of these proposed works has used long-term noise monitoring.

Noise monitoring was undertaken at the closest residence (R1, monitored at M1 on Figure 6-9). Long term (unattended) noise monitoring was carried out at M1 between Friday 6 and Friday 20 November 2015. The existing background and ambient noise levels are presented in (Table 6-10).

Table 6-10 Results of background noise monitoring and noise management levels

Monitoring location	L_{A90} Background Noise Levels			L_{A90} Ambient noise level		
	Day	Evening	Night	Day	Evening	Night
M1 – 893 Condobolin Road	25	23	18	50	52	46

Based on the relevant section of the INP Guidelines, where background noise levels are less than 30dB(A), the minimum applicable background noise level is recommended to be set at **30dB(A)**. Therefore, this minimum background noise level has been adopted for all receiver locations nominated during all assessment periods.

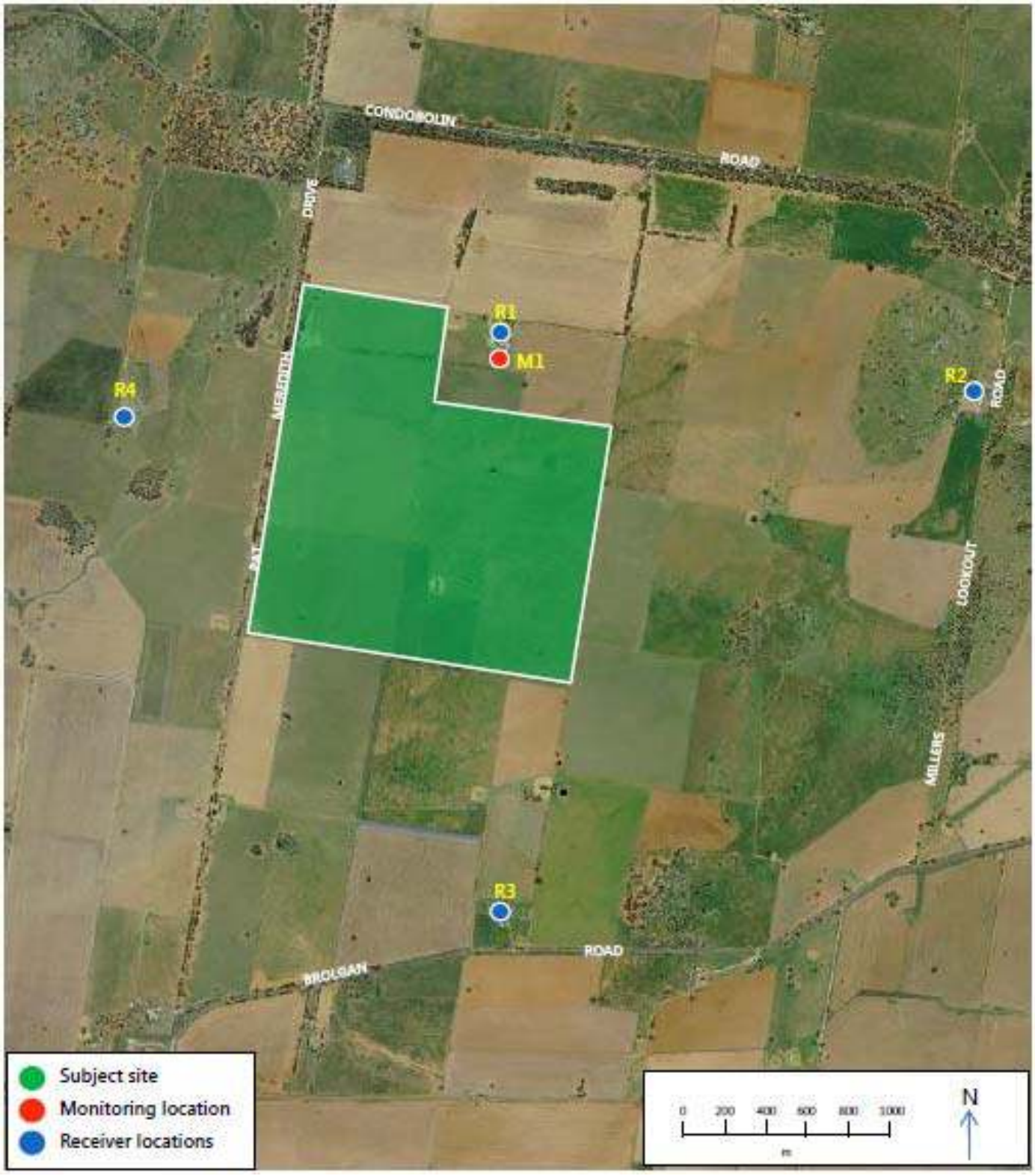

Figure 6-9 Residential receivers and noise monitoring locations adjacent to the proposal site

6.5.4 Construction noise impact assessment

Criteria

The NSW *Interim Construction Noise Guideline* (ICNG; DECC, 2009) deals with managing construction noise impacts. According to the guideline, a quantitative assessment of noise impacts is warranted when works are likely to impact an individual or sensitive land use for more than three weeks in total.

The guideline specifies noise targets, or 'noise management levels', for residences and other noise sensitive receivers (Table 6-11). The Rating Background Level (RBL) is used when determining the management level. The RBL is the overall single-figure background noise level measured in each relevant assessment period. Residential receivers are considered 'noise affected' where construction noise levels are greater than the noise management levels identified below

Table 6-11 Noise Management Levels at residential receivers

Time of day	Management Level
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10dB(A)
	Highly noise affected 75dB(A)
Outside recommended standard hours	Noise affected RBL + 5dB(A)

Noise management levels

Table 6-12Table 6-12 identifies the adopted construction noise management levels (NMLs) for the nearest noise sensitive receivers (refer to Figure 6-9). The NMLs for the receiver locations are derived from the RBLs represented by the background noise levels measured at the monitoring location (Table 6-10) and NSW ICNG (DECC 2009) criteria (Table 6-11). Furthermore, during standard construction hours a highly affected noise objective of 75 dB(A) applies at all receivers.

Table 6-12 Construction Noise Managemnet Levels at Residential Recievers

Location description	Day L_{A90} Background Noise Level (RBL)	Day Noise Management $L_{A90\ (15min)}$
All residential receivers	30[1]	40

Notes: 1. Construction works occur during the daytime period only, hence only the day period assessed.

Construction noise sources

Noise impact predictions, takes into account the typical noise levels of construction equipment likely to be used for the construction phase. The equipment and their sound power levels are in Table 6-12.

Table 6-13 Construction equipment sound power levels

Equipment used	L_{Aeq} Sound power levels (dBA)
Piling Drilling Rig	111
Powered hand tools	110
Mobile crane	110
Truck and dog	108
Delivery van	88

Construction noise assessment

Noise emissions were determined by modelling the noise sources, receiver locations, topographical features of the intervening area and possible noise control treatments surrounding the study area. The modelling calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

The noise prediction models take into account:

- Location of noise sources and receiver locations.
- Height of sources and receivers.
- Separation distances between sources and receivers.
- Ground type between sources and receivers.
- Attenuation from barriers (natural and purpose built).

Table 6-14 presents the noise levels likely to be experienced at the nearby affected receiver locations during the construction works. The present levels are a worst case maximum with all plant and equipment operating concurrently.

Table 6-14 Predicted $L_{Aeq\ 15\ min}$ construction noise levels at receiver locations

Receiver location (refer to Figure 6-9)	Noise management level[1]	Predicted Construction Noise Level, $L_{Aeq\ (15\ min)}$ [2]	Comply? (Yes/No)
R1	40	21-40	Yes
R2		10-21	Yes
R3		12-26	Yes
R4		17-31	Yes

Notes: 1 Noise management for standard day time construction works (i.e Monday to Friday 7am to 6pm and Saturday 8am to 1pm)

2. Based on all construction plant and equipment operating concurrently. Higher level in range occurs when plant and equipment are at closest proximity to receiver and lower level in range occurs when plan and equipment are furthest.

Based on the predicted construction noise levels presented in Table 6-14, predicted noise levels from construction activities at all nearby receivers comply with the construction management levels under the 'worst case scenario', where all plant items are operating concurrently. Therefore, no mitigation measures are considered to be required to reduce construction noise impacts.

Neoen would consult with near neighbours regarding timing of construction noise to reduce noise levels further where possible minimise disruption.

6.5.5 Operational noise assessment

Background noise monitoring

Background noise data collected to assess construction noise were also used to assess operational noise.

Criteria

The *NSW Industrial Noise Policy* (INP) (EPA, 2000) specifies noise criteria relating to intrusive noise impacts and noise level amenity. The assessment criteria under the INP for the Parkes Solar Farm is outlined in Table 6-15.

Table 6-15 NSW Industrial Noise Policy Project Specific criteria

Assessment Criteria	Project Specific Criteria
Intrusive	Rating background level + 5dBA
Amenity	INP based on recommended LAeq noise levels for rural residential properties.

The operational project-specific noise criteria for the solar farm based on the INP criteria and guidelines (Table 6-15) is shown in (Table 6-16).

Table 6-16 Applicable operational noise criteria

Receiver	Intrusiveness criteria		Recommended L_{Aeq} Amenity Noise level		
	Period	L_{Aeq} (15 minute) (dBA)	Time of day	Acceptable	Maximum
All receivers	Day	30 + 5 = 35	Day[1]	50	55
	Evening	30 + 5 = 35	Evening[2]	45	50
	Night	30 + 5 = 35	Night[3]	40	45

Notes: 1. Day is defined as 7.00am to 6.00pm, Monday to Saturday, 8.00am to 6.00pm Sundays and Public holidays

2. Evening is defined as 6.00pm to 10.00pm, Monday to Sunday and Public Holidays.

3. Night is defined as 10.00pm to 7.00am, Monday to Saturday, 10.00pm to 8.00am, Sundays and Public Holidays.

Comparing the amenity and the intrusiveness criteria shows that the intrusiveness criteria are more stringent for day, evening and night periods. As intrusiveness criteria is more stringent, only this is considered further in the assessment.

As the proposal will potentially operate for part of the night time period (prior to 7.00am) during summer months, EPA sleep disturbance criteria apply. Criteria specific to the proposal are outlined in Table 6-17.

Table 6-17 Sleep Disturbance Criteria dB(A)

Receiver	Sleep Disturbance Criteria	Sleep Disturbance Criteria specific to proposal, L_{amax}
All residential receivers	Night Rating background level + 15dBA	30 +15 = 45dBA

Operational noise sources

The potential sources of noise during operation of the solar farm considered for the assessment included:

- Mechanical noise from the tracking system of the solar panels, from up to 3,500 tracking motors to drive up to 265,000 solar panels.
- Operation of 30 inverters with integrated transformers.
- One staff member onsite daily with the use of a light vehicle.

The predicted power levels of these operation activities are outlined in Table 6-18.

Table 6-18 Typical operational plant and equipment and sound power levels for the proposal

Plant description	L_{Aeq} Sound power levels (dBA)
NexTracker Motor (3,500 in total)	78 (each)
Sunny Central 2200 inverter with integrated transformer (24 in total)	94 (each)
Light vehicle	88

Operational noise assessment

In order to determine the noise impacts of the operating solar farm, a computer model incorporating all significant noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments surrounding the study area. The modelling calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

Additionally in accordance with INP noise predictions, three meteorological conditions are considered, including:

- Calm and isothermal conditions (acoustically neutral) – no wind and no temperature inversion.
- Slight to gentle breeze –3m/s wind velocity at 10m from ground level between each noise source and each noise receiver (as per INP default wind conditions). Wind direction was based on wind travelling from the source to the receiver.
- Moderate temperature inversion – applicable for noise predictions during night time periods only.

Table 6-19 presents the predicted noise levels for the 'worst case scenario' based on concurrent operation all plant and equipment shown in Table 6-18.

Table 6-19 Predicted $L_{Aeq\ 15min}$ Operational Noise Levels at Receiver Locations, dB(A)

Receiver location (refer to Figure 6-9)	Intrusiveness criteria	Predicted Operational Noise Levels, L_{Aeq} (15 min)			Comply? (Yes/No)
		Calm and isothermal conditions	Slight to gentle breeze	Moderate temperature inversion[1]	
R1	Day 35 Evening 35 Night 35	30	34	34	Yes
R2		14	21	21	Yes
R3		19	25	45	Yes
R4		23	29	29	Yes

Notes: 1. Applicable for the night time period only.

Based on the predicted operational noise levels presented in Table 6-19, predicted noise levels at all nearby receivers comply with the nominated criteria under all scenarios and meteorological conditions. The predicted operational noise levels will additionally be below the sleep disturbance criteria of 45 dB(A). Mitigation measures to minimise impacts are provided below.

6.5.6 Vibration assessment

Vibration generating activities would occur only during the construction phase. There are no vibration generating activities expected during the operational phase. The nearest identified non-involved receiver is in excess of 300 m from the proposal site and there are no high vibration producing plant items to be used, structural damage due to vibration is not expected. Assessment for vibration impact on human comfort is assessed during the construction phase.

Assessment of potential disturbance from vibration on human occupants of buildings is made in accordance with EPA's *Assessing Vibration: A Technical Guideline* (DECC, 2006). Based on the proposed plant items to be used during construction (Table 6-13), vibration generated by construction plant was estimated and potential vibration impacts are summarised in Table 6-20.

Table 6-20 Potential vibration Impacts for Identified receivers.

Receiver location (refer to Figure 6-9)	Approx. distance to nearest buildings from works	Type of nearest sensitive buildings	Assessment on potential vibration impacts	Vibration monitoring
R1	320m	Residential	Very low risk of adverse comment	Not required
R2	1,810m	Residential	Very low risk of adverse comment	Not required
R3	1,675m	Residential	Very low risk of adverse comment	Not required
R4	700m	Residential	Very low risk of adverse comment	Not required

The potential for adverse comment to vibration impacts was determined to be very low. No vibration mitigation measures are required.

6.5.7 Road traffic noise assessment

As the proposed vehicle access to the subject site is much greater during the construction stage than the operational stage, road traffic noise assessment is only considered for the construction stage to provide a 'worst case' assessment. Vehicle movements during operation of the solar farm would be minimal.

Noise impact from the potential increase in traffic on the surrounding road network due to construction is assessed against the NSW 'Road Noise Policy' (RNP). The RNP sets out criteria to be applied to particular types of road and land uses. Pat Meredith Drive (Condobolin Road) is categorised as an arterial road. Pat Meredith Drive is categorised as a local road. Criteria for these roads are outlined in Table 6-21.

It is assumed 40 truck movements per day will occur along the surrounding road network during the construction stage. It is assumed that 20% of the daily truck movement will occur during the worst one hour period –ie. eight truck movements in the worst one hour period. Truck movements will only occur during the day time period when construction works occur. Results of the road traffic noise predictions against criteria are presented in Table 6-21.

Table 6-21 Predicted road traffic noise contribution levels along public roads, dB(A).

Receiver	Road	Criteria	Truck traffic movements	Speed (km/h)	Distance to Road	Predicted Noise Leve	Comply? (Yes/No)
Residences on Condobolin Road	Arterial	$L_{Aeq(15\ hour)}$ 60 dB(A)	40 per day	100	20m	49 dB(A)	Yes
Residences on Pat Meredith Drive	Local	$L_{Aeq(1\ hour)}$ 55 dB(A)	Eight in worst one hour period	50	690m	30 dB(A)	Yes

From Table 6-21 it can be seen that road traffic noise level contributions from the truck movements associated with the construction works are at least 11dB(A) below the applicable noise criteria. Therefore, traffic noise levels as a result of the construction works for the solar farm would not adversely contribute to the existing traffic noise levels at the most affected residences along the surrounding roads and require no specific mitigation.

6.5.8 Safeguards and mitigation measures

Table 6-22 Safeguards and mitigation measures for noise impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
Plant and equipment to be properly maintained.	C		
Avoid unnecessary noise when carrying out manual operations and when operating plant.	C		
Switch of any equipment not in use for extended periods.	C		
Establish good relations with people living in the vicinity of the site at the beginning of project and maintain. Keep people informed, take complaints seriously, deal with complaints expeditiously. The community liaison member of staff should be adequately experienced.	C		

7 ASSESSMENT OF ADDITIONAL ISSUES

7.1 SOIL

7.1.1 Existing environment

Soils, landforms and geology

The topography of the proposal site is flat, surrounded by flat to gently undulating plains. The *Parkes 1:100,000 Geological Map* Series (Raymond *et al.,* 2000) indicates that the site is underlain by Quaternary alluvium sand plain formation. Soil at the proposal site includes two mapped soil landscapes- Brolgan Plain and Parkes. Information about these soil landscapes is provided in Table 7-1 below.

Table 7-1 Soil landscapes

Soil landscape	Location	Description/Limitations
Brolgan Plain (bp)	Occurs across the majority of the site, except for the far south-eastern corner.	Dominant soils of this landscape are deep (>100cm) imperfectly drained Red Brown Earths and Non-calcic Brown Soils. Soil limitations include sodicity/dispersability, hardsetting surfaces and low fertility. Landscape limitations include flood hazards, foundation hazards and seasonal waterlogging. Topsoils in this soil landscape have a high erodibility while more clay-rich subsoils have a moderate erodibility. Erosion hazard is low to moderate.
Parkes (pa)	Occurs along the edge of the proposal site in the south-eastern corner.	Dominant soil types include moderately deep (>80cm), imperfectly drained Red Brown Earths. Soil limitations include stoniness, sodicity/dispersability, localised salinity, hardsetting surfaces, low permeability, high erodibility and low fertility. Landscape limitations include water erosion hazard and high run-on. Soil erodibility is moderate to high, and erosion hazard is high.

The lithology log for a bore within the proposal site (Bore ID GW054817.1.1) indicates that approximately the top 0.45 metres of the earth is sandy soil. Below this, yellow and grey clays are present to a depth of approximately 14.5 metres, followed by shale at approximately 14.5 to 45 metres.

It is expected that soils in the proposal area are susceptible to erosion due to previous vegetation clearing and agricultural activities. Land capability mapping indicates that the site is subject to moderate- severe land and soil limitations, and is generally not capable of sustaining high impact land uses such as cropping.

Potential contamination

A search of the OEH contaminated land public record (NSW Government, 2016a) was undertaken for contaminated sites within the Parkes LGA on 25 January 2016. The search returned no results for contaminated land within the Parkes LGA. The online *List of NSW contaminated sites notified to the EPA* (NSW Government, 2016b) was also searched on 25 January 2016. The search returned five listings for

Parkes, all of which related to service stations/petroleum stations. None of the sites are near the proposal area.

There is a risk that contamination associated with agricultural activities (e.g., use and storage of pesticides) could be present on the site however, no evidence of contamination was observable during the site assessment and this risk is considered very low.

7.1.2 Potential impacts

Construction and decommissioning

SOIL IMPACTS

Construction activities at the proposal site, such as excavation and earthworks, have the potential to disturb soils, cause soil erosion and subsequent sedimentation. Excavations would be required for the construction of internal roads, compound, lay down and parking areas. Given the relatively flat landforms, large scale bulk earth works would not be required. Trenches excavated for underground cabling would remove vegetation cover and disturb soils, potentially decreasing their stability and increasing susceptibility to erosion.

Erosion and sedimentation impacts associated with soil disturbance from the construction and decommissioning activities can be minimised by undertaking such works in accordance with provisions of the Managing Urban Stormwater: Soils and Construction series, in particular:

- Managing Urban Stormwater: Soils and Construction, Volume 1, 4th edition (Landcom 2004), known as 'the Blue Book'.
- Volume 2A Installation of Services (DECC 2008a).
- Volume 2C Unsealed Roads (DECC 2008b).

Soil compaction would occur as hardstands and internal access roads are created, which would reduce soil permeability thereby increasing run off and the potential for concentrated flows. During excavations mixing of different soil horizons can retard plant growth due to inadequate top soil layer.

Pile driving/screwing of steel posts supporting the arrays as well as installation of power poles and fencing uses light equipment and is unlikely to result in substantive disturbance of soils due to their small and discrete footprint. The areas of disturbance would be sparsely distributed and groundcover would be retained as far as possible prior to, during and rehabilitated post-construction. Dust may be generated as a result of the project site construction and traffic activities. Impacts of dust are discussed in further detail in Section 7.4.

The use of fuels and other chemicals onsite pose a risk of soil contamination in the event of a spill. Chemicals used onsite would include fuels, lubricants and (minimally) herbicides. Spills of these contaminants can alter soil health, affecting its ability to support plant growth. When mobilised, such as in a rain event or flooding, the substances may spread via local drainage lines, affecting much larger areas including aquatic habitat.

Risk of exposing contamination during construction would be managed in accordance with a Construction Environmental Management Plan (CEMP).

Operation

SOIL IMPACTS

Minimal operational impacts to soils would occur. Maintenance activities and vehicles would be largely confined to the formalised access tracks. There would remain a risk of soil contamination in the event of a chemical spill (fuels, lubricants, herbicides), requiring the development of strict emergency protocols (refer to Section 7.2.3).

The potential for wind erosion (dust generation) during regular plant operation would be low given the ability to stabilise soils exposed during after construction. Areas that were temporarily used during construction (e.g. laydown and construction parking areas) would be rehabilitated.

Concentrated runoff from the solar panels could lead to increased soil erosion below the solar array modules during significant rain events and could be influenced by seasonal droughts. Retaining vegetation cover would assist in reducing potential for erosion from rainfall run-off. Monitoring would be required to address any bare areas and erosion that develop, either by vegetation (grass seeding) where possible, or armouring with materials such as jute mesh if vegetation cannot be maintained.

7.1.3 Safeguards and mitigation measures

Activities with potential for adverse soil impacts would be managed through the development and implementation of site specific sediment control plans and spill controls, as detailed below.

Table 7-2 Safeguards and mitigation measures for soil impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
Ground cover would be established and maintained beneath the array area as much as possible prior to and during construction, to minimise areas exposed to erosion.	**C**		
Areas of disturbed soil would be rehabilitated promptly and progressively during construction.	**C**		
A Ground cover management plan would be developed include and monitoring and triggers for action, to address any bare areas and erosion that develop beneath the array.		**O**	
A soil and water management plan, and erosion and sediment control plans, would be prepared, implemented and monitored during the project, in accordance with Landcom (2004), to minimise soil (and water) impacts. These plans would include provisions to: • At the commencement of the works, and progressively during construction, install the required erosion control and sediment capture measures. • Regularly inspect erosion and sediment controls, particularly following rainfall. • Maintain a register of inspection and maintenance of erosion control and sediment capture measures. • Ensure that machinery arrives on site in a clean, washed condition, free of fluid leaks. • Ensure that machinery leaves the site in a clean condition to avoid tracking of sediment onto public	**C**		**D**

Safeguards and mitigation measures	C	O	D
roads which may cause risks to other road users through reduced road stability. • In all excavation activities, separate subsoils and topsoils and ensure that they are replaced in their natural configuration to assist revegetation. • Stockpile topsoil appropriately, so as to minimise weed infestation, maintain soil organic matter, maintain soil structure and microbial activity. • Minimise the area of disturbance from excavation and compaction. • Ensure any discharge of water from the site is managed to ensure ANZECC (2000) water quality criteria are met. • Manage traffic generated soil erosion. • Manage works in consideration of heavy rainfall events; if a heavy rainfall event is predicted, the site should be stabilised and work ceased until the wet period had passed.			
A Spill Response Plan would be developed as part of the overall Risk Management Plan to prevent contaminants affecting adjacent surrounding environments. It would: • Manage the storage of any potential contaminants onsite. • Mitigate the effects of soil contamination by fuels or other chemicals (including emergency response and EPA notification procedures and remediation).	**C**	**O**	**D**
A protocol would be developed in relation to discovering buried contaminants within the proposal site (e.g. pesticide containers). It would include stop work, remediation and disposal requirements.	**C**		**D**
Dust suppression: • A water cart (truck) would be utilised, wetting access roads and exposed dusty surfaces in response to visual cues, as required. This includes stockpiled materials that exhibit significant dust lift. Stockpiles may be covered in preference to wetting. Stabilising techniques and/or environmentally acceptable dust palliatives may be utilised in preference to wetting or covering areas that generate dust.	**C**		**D**
• Any area that was temporarily used during construction (laydown and trailer complex areas) would be restored back to original condition or re-vegetated with native plants. • Areas that may not have been hard packed but have been disturbed in some form would be treated with environmentally acceptable dust palliatives and / or vegetated (e.g. by means of hydro seeding) with a suitable seed mix.		**O**	

7.2 WATER USE AND WATER QUALITY (SURFACE AND GROUNDWATER) AND HYDROLOGY

7.2.1 Existing environment

Surface water

The proposal is located in the Central West Local Land Services area. The site is located within the Lachlan Catchment. The nearest water course to the site is Ridgey Creek, approximately 500m to the west. Ridgey Creek flows to the south west into Goobang Creek, one of the tributaries of the Lachlan River. Goobang Creek is located approximately 7 kilometres south of the proposal site.

There are five farm dams on the site, the largest being adjacent to an area of native vegetation, in the north-western area of the proposal site (refer Figure 7-1).

Figure 7-1 Farm dam near the north western corner of the proposal site

Groundwater

There are two bores within the proposal area (See Figure 7-2). GW054817 and GW054818 are both private bores, originally drilled in 1981 to supply water to stock on the property (NSW Office of Water, 2016). Borewater extraction is unlikely to be proposed for the solar farm.

There is limited groundwater data available in the vicinity of the proposal site.

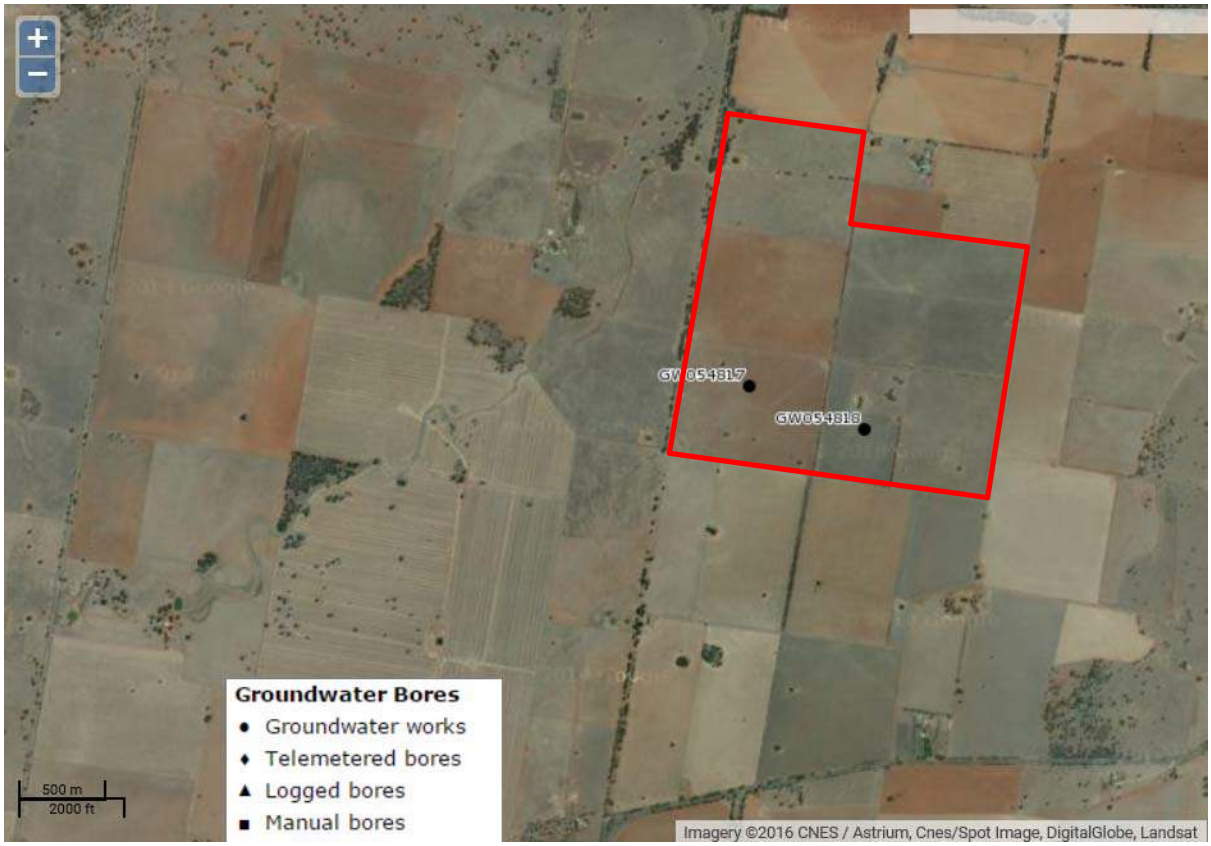

Figure 7-2 Groundwater bores in the area (NSW DPI, 2016) *The proposal site boundary is indicated by the red line.*

Groundwater Dependent Ecosystems (GDEs)

Potential GDEs within the vicinity of the proposal site are mapped in the *Groundwater Dependent Ecosystems Atlas* (BOM, 2016). Potential vegetation GDEs, reliant on subsurface groundwater, within 2 kilometres of the proposal site include:

- Poplar Box Woodland
- Floodplain Complex (Central Lachlan)
- White Box - White Cypress Pine Woodland
- Grey Box – White Cypress Pine – Poplar Box – Smooth-barked Coolabah on red earths
- White Cypress Pine – Poplar Box – Bulloak woodland on footslopes and plains
- Inland Grey Box woodland
- Mugga Ironbark – Box – White Cypress Pine woodland

GDEs in proximity to the proposal site are indicated in Figure 7-3.

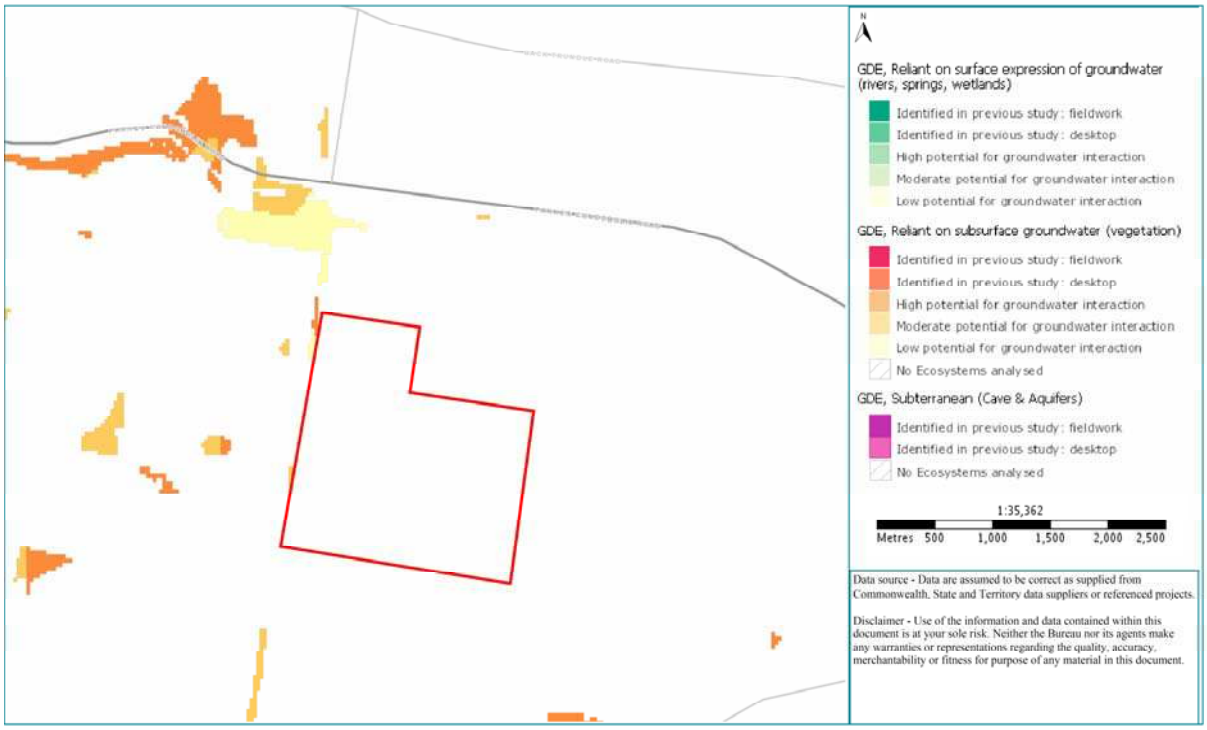

Figure 7-3 GDEs in proximity to the proposal site (BOM, 2016b)

Goobang Creek, located approximately 6 kilometres south west of the proposal site, is listed as a GDEs as it interacts with groundwater. There are no High Priority GDEs as listed on Schedule 4 of the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Source 2012* in close proximity to the proposal site.

There are no High Priority GDEs as listed on Schedule 3 of the *Water Sharing Plan for the NSW Murray Darling Basic Fractured Rock Groundwater Sources 2011* in close proximity to the proposal site.

The closest high priority GDE to the proposal area is a spring, approximately 40 kilometres south-east of the proposal site.

Surface hydrology and flooding

The proposal site is located within the Lachlan River Catchment. The site is flat to gently sloping. Elevation at the site ranges from approximately 267 metres AHD at the south western corner of the site to approximately 278 metres AHD at the north eastern corner of the site.

The site of the proposed solar farm does not occur on a floodplain or within Flood Prone Land. There is no Flood Prone Land mapped in the Parkes LGA (NSW Government 2005).

Water entitlement

The proposal would not involve the extraction of water extraction licenses.

7.2.2 Potential impacts

Construction and decommissioning

WATER USE

Water use during the construction phase would be minimal and mainly for dust suppression on unsealed roads. This water requirement is likely to vary depending on weather conditions such as rainfall and wind and is estimated to be up to 145,000 kL per annum. Potable water requirements for staff would be approximately 40 kL per annum (refer Table 7-3).

Table 7-3 Water requirements during construction

Water quality	Annual construction water requirement (kL)	Potential sources	Availability
Potable (drinking)	30 (for 9 months)	Bottled water	Available as required – commercial supply
Non-potable	108,750 (for 9 months)	Truck delivery	Available as required at most convenient delivery point (to be defined by EPC contractor or subcontractors).

Water is likely to be delivered on site by truck during construction. Water is unlikely to be sourced from new groundwater supplies. In the event onsite supply is insufficient during construction, water access can be secured through commercial arrangements with local water supply authorities.

In the event onsite supply is insufficient during construction, water access can be secured through commercial arrangements with local water supply authorities.

Impacts on water use during the decommissioning would be similar to those during construction. They are considered low risk and would be managed using standard measures.

SURFACE WATER QUALITY

The proposed works would involve a range of activities that would disturb soils and potentially lead to sediment laden runoff, affecting local water ways, during rainfall events. These activities include:

- Excavations for the construction of internal roads, compound, laydown and parking areas.
- Ground preparations associated with the installation of containerised PV boxes.
- Trenching for underground cable installation.

Soil compaction would occur as hardstands and access tracks are created, which would reduce soil permeability thereby increasing run off and the potential for concentrated flows. The use of fuels and other chemicals on site pose a risk of surface water contamination in the event of a spill. Chemicals used onsite would include fuels, lubricants and herbicides.

Erosion and sedimentation impacts associated with soil disturbance from construction activities can be minimised by undertaking works in accordance with provisions of the Managing Urban Stormwater: Soils and Construction series, in particular:

- Managing Urban Stormwater: Soils and Construction, Volume 1, 4th edition (Landcom 2004), known as 'the Blue Book'.
- Volume 2A Installation of Services (DECC 2008a).
- Volume 2C Unsealed Roads (DECC 2008b).

Activities with the potential for adverse water quality impacts would be managed through the development of site specific sediment control plans and spill controls, as detailed in Section 7.1 - Soil. Additionally, impacts to local water quality can be minimised by ensuring erosion and sediment control plans include measures to ensure ANZECC water quality criteria are met prior to discharge of water offsite.

Detention ponds, if required to manage surface water during construction and operation, will be detailed in the design phase, specific to the array layout.

GROUNDWATER DEPENDENT ECOSYSTEMS

No Groundwater Dependent Ecosystems are known to occur within the proposal site. As the Proposal would not alter existing groundwater supplies within the solar farm site, it is considered that impacts to Groundwater Dependent Ecosystems (GDE) are not likely to result from the Proposal. Furthermore, the Proposal is not predicted to have any impact on any High Priority GDEs listed in the relevant WSPs given their distance from the proposal site.

Operation

WATER USE

Water use volumes during operation would be minimal. Water would be required for staff amenities at the control and maintenance building and panel cleaning. Requirements would be extremely minor except for cleaning which is fully dependant on weather. Some solar plants are never cleaned, others require more than two cleanings per year.

Water is likely to be delivered on site by truck during operation. Water is unlikely to be sourced from new groundwater supplies. In the event onsite supply is insufficient during operation, water access can be secured through commercial arrangements with local water supply authorities.

WATER QUALITY

During operation, there is minimal potential for any impacts to surface water quality to occur. Appropriate drainage features would be constructed along internal access roads to minimise the risks of dirty water leaving the site or entering waterways. With the exception of internal roads, parking areas and areas around site offices, the site would be revegetated with grass cover. Risks water quality impacts at the site would therefore be low.

There would be a low risk of contamination in the event of a chemical spill (fuels, lubricants, herbicides etc.) as strict storage and emergency handling protocols would be implemented.

GROUNDWATER

No operational activities would affect groundwater at the proposal site. No groundwater is proposed to be sourced during operation of the solar farm.

There would be no impacts to GDEs during the operation phase.

7.2.3 Safeguards and mitigation measures

Table 7-4 Safeguards and mitigation measures for water quality impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills.	**C**	**O**	**D**
All fuels, chemicals, and liquids would be stored at least 50 m away from any waterways or drainage lines and would be stored in an impervious bunded area.	**C**	**O**	**D**
Adequate incident management procedures will be incorporated into the Construction Environmental Management Plan, including requirement to notify EPA for incidents that cause material harm to the environment (refer s147-153 Protection of the Environment Operations Act).	**C**	**O**	**D**
The refuelling of plant and maintenance of machinery would be undertaken in impervious bunded areas.	**C**	**O**	**D**
Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery. All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills	**C**		**D**

7.3 TRAFFIC, TRANSPORT AND ROAD SAFETY

7.3.1 Existing environment

Regional road network

Parkes is located on the Newell Highway which stretches 1,060 km through NSW between the Victorian border town of Tocumwal and the Queensland border town of Goondiwindi. The highway is managed by the Roads and Maritimes and is part of the National Land Transport Network, a defined network of important road and rail infrastructure links and their intermodal connections, defined under the *National Land Transport Act 2014.*

The Newell Highway is of vital importance to communities living in towns within central NSW. The highway links Parkes to the towns of Dubbo (north) and Forbes (south). The highway is considered to be the economic backbone for freight and livestock transporters, tourism operators, caravanners and holiday makers, emergency services, government, media and business owners (Roads and Maritime 2015).

Generally the highway is two lanes with some formal overtaking opportunities and a speed limit of 100 to 110 km/hour.

Henry Parkes Way runs parallel to the northern boundary of the proposal site (separated by a distance of approximately 900 m). Henry Parkes Way is a regional transport corridor that runs in an east-west alignment and connects the towns of Condobolin, Parkes and Manildra. Henry Parkes Way provides a link to the larger regional town of Orange via The Escort Way. The road is generally a sealed single carriageway road use increases during periods such as grain harvest. It has a speed limit of 100 km/hour.

The Orange – Broken Hill railway line is located approximately 2 km south of the proposal site. The railway line connects Orange to Broken Hill and then extends into South Australia through to Adelaide. It is an important link for east/west rail operations in Australia and is used for the movement of freight, as a weekly passenger train and by the Indian Pacific tourist train.

Local road network

The proposal site is located immediately east of Pat Meredith Drive, a low use road which provides access to the existing Trans Grid substation. The road is sealed to the turnoff of the substation and is then unsealed running south to Brolgan Road (a local road south of the proposal site). There is an unlocked gate across Pat Meredith Drive near the proposal site and a second gate further south. South of the gate, the road is unformed and appears to be used only by the landowner.

Access to the site during construction would be from Henry Parkes Way and along Pat Meredith Drive. A site access point from Pat Meredith Way is shown in Appendix B. The portion of the road between the existing sealed section and the site access point would require upgrading prior to the construction works commencing.

Haulage

While a detailed haulage program has not yet been developed, it is expected that the project's components are most likely to be delivered by road from Sydney and in some instances Melbourne. From Sydney, the route would likely include the Great Western Highway (A32), Mitchell Highway (A32) and Henry Parkes Way. From Melbourne, the route would likely include the Hume Highway (M31), Goulburn Valley Freeway (M39) and the Newell Highway (A39).

These roads of both routes are of sufficient capacity to accommodate the haulage of components required for the construction of the solar farm and transmission line.

Proposal requirements

Access requirements can be separated into the following categories:

- Cars - would be required by project management staff and site workers to access the site. Cars would make up the largest proportion of vehicles accessing the site.
- Buses – would be used to transport workers to and from the site to minimise traffic volumes and transit risks during construction.
- Utility vehicles – would be required to transport equipment and materials around the site and for local pick up of materials.
- Trucks – would also be used to transport equipment and materials around the site and for local pick up of materials. Larger sized deliveries would be undertaken by trucks as opposed to utility vehicles.
- Standard articulate trucks – would be used to transport 12 metre containers from point of origin.
- Oversize and/or overmass vehicles – would deliver components such as the overhead transmission line poles.

Vehicle access to the site would generally be confined to the standard hours of construction. Exceptions would occur as staff arrive and leave the site, before and after shifts. Additionally, the delivery of large components may take place outside normal working hours.

Vehicles would travel around the site via constructed access tracks, which will be required to access the following locations:

- Around the perimeter of the solar farm.
- Site office/compound.
- Construction equipment laydown area.
- Transmission line route.
- Substation.

Internal access tracks would remain unsealed but would be re-sheeted with gravel or crushed and compacted soil, to maintain their condition during the construction phase.

7.3.2 Potential impacts

Construction

The potential traffic, transport and road safety impacts associated with construction of the proposal relate primarily to the increased numbers of large vehicles on the road network which may lead to:

- Increased collision risks (other vehicles, pedestrians, stock and wildlife).
- Damage to road infrastructure.
- Associated noise and dust (particularly where traffic is on unsealed roads) which may adversely affect nearby receivers.
- Disruption to existing services (public transport and school buses).
- Reduction of the level of service on the road network caused by 'platooning' of construction traffic.

Onsite and local traffic

INCREASED VEHICLE NUMBERS

Approximately 40 employees would be required during the first month of construction, rising to 100 employees during the peak construction period (approximately five months duration). Preliminary plans for the site propose parking for approximately 60 vehicles. If the proposed car park was utilised to full capacity, this would result in approximately 100 vehicle movements per day to and from the site.

Approximately 5 - 10 utility vehicles would be used on a daily basis at the site during peak construction, less would be required during non-peak construction periods.

Buses would be used to transport workers to and from the site. Approximately 100 construction personnel would be required on site during the peak construction period. Assuming an up-take rate of 80% and 20 person capacity, up to 10 bus trips would be required per day during peak construction. During non-peak periods, approximately half as many buses are expected to be required.

It is anticipated that up to 20 trucks a day will deliver equipment on site. The number of oversize/overmass vehicles required is expected to be low. A 50T mobile crane may be required for the offloading of the PV boxes or PV skids and the delivery station. Two or three piling or drilling machines would also be present on site during the first months of the works.

Traffic volumes associated with the construction of the proposal are summarised in Table 7-5.

Table 7-5 Summary of the estimated construction traffic volumes during peak and non-peak times

Vehicle type	Trips per day (peak: 5 months)	Trips per day (non-peak: 4 months)
Cars (project management, construction staff etc.	70	40
Utility vehicles	10-20	5-10
Buses	10	4
Delivery trucks (including overmass vehicles)	20	15
Total trips per day:	**110 - 120**	**64 - 69**

INCREASED COLLISION RISK

The increased collision risk relates primarily to traffic entering and exiting Henry Parkes Way from Pat Meredith Drive. This primarily relates to both oncoming traffic and traffic following vehicles that are turning into Pat Meredith Drive. At the Henry Parkes Way / Pat Meredith Drive intersection, sufficient sight distance is available for vehicles entering and exiting Pat Meredith Drive.

DAMAGE TO ROAD INFRASTRUCTURE

The increase in traffic and heavy vehicle movement could impact the condition of roads on the haulage network. Along the Newell Highway and Henry Parkes Way, the impact is expected to be negligible due to the existing capacity of the road network. However, the impact of turning traffic at the Henry Parkes Way/ Pat Meredith Drive intersection would likely require monitoring to ensure that the road is maintained in an adequate condition.

Pat Meredith Drive would remain unsealed, but would require upgrading to accommodate construction traffic. Road upgrade works would meet the requirements of the Parkes Shire Council. The proponent would manage construction impacts on Henry Parkes Way and Pat Meredith Drive by way of a Traffic Management Plan. This may require periodic road improvements and lane closures to preserve traffic flow.

Internal access roads would be constructed or upgraded as required to accommodate the projected volumes and loads of construction traffic. The tracks would be compacted but unsealed.

ASSOCIATED NOISE AND DUST

The proposed works may result in increased noise and dust, particularly on the unsealed portion of Pat Meredith Drive. Impacts from dust generated from the proposed activity, including that associated with increased traffic is considered in Section 7.4. During construction, water would be used to minimise dust generation along the tracks.

The DECCW (2011) *NSW Road Noise Policy* (NSW RNP) been used to evaluate impacts from road traffic noise. This policy outlines a range of measures required to minimise road traffic noise and its impacts, including noise generated by developments that generate additional traffic on existing roads. A noise assessment is included in Appendix F and Section 6.5 of this EIS.

DISRUPTION TO EXISTING SERVICES

Local traffic in Parkes would be minimally affected by increased vehicles from construction staff seeking accommodation and services, and conducting commercial activities relating to the solar farm. This would extend outside construction hours but would be insignificant in the context of existing traffic movements in and around Parkes.

Increased traffic along Henry Parkes Way during construction may cause disruptions to general traffic flows and to public transport services including school bus routes that operate along the road.

SUMMARY OF CONSTRUCTION IMPACTS

Overall, the additional traffic associated with the solar farm would be a small component of the existing traffic loads on the Newell Highway and Henry Parkes Way. No substantive increased collision risks, damage to road infrastructure, noise or dust impacts, disruption to existing services or reduced level of service is expected to accompany construction. This would be ensured by the preparation of a detailed haulage plan, to manage the haulage process and a detailed traffic management plan to manage the traffic impacts at and in proximity to the site.

Operation

Vehicles would use the designated road network to access the site and travel within the site during the operational phase (25 to 30 year period). Two to five cars would be expected during normal operation of the solar farm. Activities undertaken during the operation phase would include travelling to the site office or maintenance building and carrying out maintenance activities on the solar farm infrastructure. Operational staff would be confined to designated parking areas and access roads/tracks within the proposal site.

It is considered unlikely that the low levels of operational traffic would obstruct public or private local access. Additional risks to road safety from operational traffic would be minimal.

Decommissioning

Decommissioning impacts are likely to follow a similar pattern as construction as components are dismantled and removed, over a lesser time period.

7.3.3 Safeguards and mitigation measures

Traffic and haulage impacts would be managed in consultation with the roads authorities covering issues such as, but not limited to, reinstatement of pre-existing road conditions, shuttle bus transport, intersection upgrade, scheduling of deliveries and traffic controls (speed limits, signage etc.), as detailed in Table 7-6.

Table 7-6 Safeguards and mitigation measures for traffic, transport and safety impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
A Haulage Plan would be developed with input from the roads authority, including but not limited to: • Assessment of road routes to minimise impacts on transport infrastructure • Scheduling of deliveries of major components to minimise safety risks (on other local traffic) • Traffic controls (signage and speed restrictions etc.).	C		D
A Traffic Management Plan would be developed as part of the CEMP, with input from the road authorities and Parkes Shire Council. The plan would include, but not be limited to: • Assessment of road condition prior to construction on all local roads that would be utilised. • A program for monitoring road condition, to repair damage exacerbated by the construction and decommissioning traffic. • The designated routes of construction traffic to the site. • Carpooling/shuttle bus arrangements to minimise vehicle numbers during construction. • Scheduling of deliveries. • Community consultation regarding traffic impacts for nearby residents. • Consideration of cumulative impacts. • Traffic controls (speed limits, signage, etc.). • Procedure to monitor traffic impacts and adapt controls (where required) to reduce the impacts. • Providing a contact phone number to enable any issues or concerns to be rapidly identified and addressed through appropriate procedures.	C		D
The proponent would consult with the Parkes Shire Council regarding the proposed upgrading of Pat Meredith Road. The upgrade would be subject to detailed design, and must be designed and constructed to the standards specified by the Parkes Shire Council	C		
The proponent would repair any damage resulting from project traffic (except that resulting from normal wear and tear) as required at the proponent's cost.	C	O	D

7.4 CLIMATE AND AIR QUALITY

Air quality can be affected by dust caused by soil disturbance and emissions from vehicles and machinery. These impacts can be a nuisance to nearby receivers (residences, farm workers, traffic). At worst they can interfere with plant growth, degrade ecosystems, represent human health risks and contribute to GHG emissions and anthropogenic climate change.

7.4.1 Existing environment

Climate

The proposal site is located in the central east of the South Western Slopes Bioregion. The South Western Slopes Bioregion is dominated by a sub-humid climate characterised by hot summers and no dry season (OEH 2011). Rainfall is distributed across the bioregion with high (up to around 1200mm) mean annual rainfall in the east, and lower values (around 400mm) for mean annual rainfall in the west.

The closest Bureau of Meteorology Automatic Weather Station (AWS) to the site is located at Macarthur Street in Parkes (Station ID 065026, now closed 20 December 2012), approximately 9km east of the proposal site. The mean annual minimum temperature is 11.1˚C and the mean annual maximum temperature is 23.3 ˚C. The mean annual rainfall is 584.6mm, with highest rainfalls occurring in January (Weatherzone, 2016). Winds speeds are greatest during spring and summer but generally range between 6 and 12 km/hour.

Local air quality

The air quality at the proposal site is generally expected to be good and typical of that found in a rural setting in NSW. Existing sources of air pollution includes vehicle emissions, dust during dry periods and agricultural activities, particularly stubble burning. During colder months, there may be a minimal increase in air contaminants due to smoke emissions from the operation of solid fuel heating.

A search of the National Pollutant Inventory (Australian Government 2016), identified one facility (the Aero Refuellers at Parkes Airport) that is required to report carbon emissions to the Australian Government. The facility is approximately 15 km from the proposal site.

The closest receiver is approximately 320 m north of the proposal site. A second residence is located 700 m west of the proposal site. Topography of the proposal area is flat. Surrounding the proposal site is minimal native vegetation or screenings.

CRITERIA

The POEO Act requires that no vehicle shall have continuous smoky emissions for more than ten seconds. Limits on dust emission of less than 4mg/m/m2 are also specified.

Climate change

Climate change refers to the warming temperatures and altered climatic conditions associated with the increased concentration of GHGs in the atmosphere. Climate change projections for Australia includes more frequent and hotter hot days and fewer frost days, rainfall declines in southern Australia and more extreme weather events including intense rainfall, severe drought and harsher fires (CSIRO, 2015).

It is now generally accepted that the release of certain gases including, most notably carbon dioxide, contribute to global climate change. These gases are collectively referred to as ‘greenhouse gases’. Construction and maintenance activities where plant and equipment uses diesel, gasoline and other

hydrocarbons, result in GHG emissions and are likely to contribute to climate change. The construction, operation and decommission of the proposed solar farm assessed in this EIS would produce minimal CO_2 emissions when compared to conventional coal and gas fired powered stations; refer to Table 7-7.

Table 7-7 Comparison of CO_2 equivalent emissions produced per kilowatt hour

Generation method	Emissions produced (grams CO2 equivalent per kWh)	Source
PV solar farm	**19-59**	**Wright and Hearps (2010)**
Coal-fired power station	800-1000	Wright and Hearps (2010)
Combined cycle gas turbine	400	Alsema *et al*. (2006)

As discussed in Section 2.3, the operation of the proposal would help reduce GHG emissions and move towards cleaner electricity generation. Based on 125,000MWh, the proposal would offset the equivalent of 110,000 kilotonnes per annum of CO_2 emissions and power the equivalent of 19,000 NSW homes.

7.4.2 Potential impacts

Construction and decommissioning

Dust generation would accompany excavation and other earthworks as well as the movement of trucks and work vehicles along unsealed access roads during construction and decommissioning of the proposed solar farm. Air emissions would also be produced from equipment and vehicle exhaust fumes. Dust and emissions can be a nuisance, interfere with visibility when driving or lead to adverse health impacts where severe or prolonged.

Earthworks associated with construction would be relatively minor and mostly involve trenching for cables and potential underground power line, as well as the forming of access tracks. Poles for solar array would be pile driven. The impact area for the piles would be less than 1% of the site area.

The construction phase is expected to last approximately nine months with a peak period lasting approximately five months. During this time, emissions would be generated from earth-moving equipment, diesel generators, trucks, cranes and pile driving equipment. Vehicles accessing the site would include the construction labour force, largely using shared (bus) transport, (approximately 100 construction personnel during the peak period) and haulage traffic delivering construction components (as detailed in Section 7.3).

The closest residential dwelling is approximately 320m from the proposed solar farm and, in dry and windy conditions, it is likely this dwelling would be affected by dust. However, the proposed works involves minimal earth-moving and mostly piling equipment would be used reducing the amount of dust produced. With the minor earthworks and implementation of mitigation measures, air quality issues for this dwelling would be considered manageable. Due to the distance of other residential dwellings, dust and emissions would be expected to attenuate with very limited distance from the site. Substantive air quality impacts are not anticipated for these dwellings.

Mitigation strategies include a formal community consultation and engagement system, and complaints mechanisms, whereby the sources of complaints are promptly identified and addressed, and appropriate application of a suite of dust and emission reduction measures.

The construction of the proposal is not anticipated to have a significant impact on air quality. Identified impacts are highly manageable.

No air quality impacts in addition to those mentioned for construction are anticipated during the decommissioning phase. Traffic requirements would be similar in type but of shorter duration than that required for the construction phase.

Due to the existing activities surrounding the proposal site and the minimal impacts on air quality during construction and decommissions, the cumulative impact is expected to be not significant. Cumulative impacts are discussed further in Section 7.11.

No climatic impacts are anticipated as a consequence of the construction and decommissioning activities for the solar farm. Haulage traffic and plant and equipment would generate emissions however, the short duration of the work and the scale of the Project suggests this contribution would be negligible in a local or regional context.

Operation

The generation of solar energy during the operation of the proposal would generate negligible air quality impacts and emissions.

Maintenance activities during operation would result in some minor, localised vehicle emissions and potentially some generation of dust from vehicles travelling on the unsealed access roads and tracks. The impacts on local and regional air quality are expected to be negligible during normal operation; during normal operation, it is likely that no vehicles would be present at the site on a permanent basis, with only occasional visits by standard vehicles. During major maintenance operations, this number could increase to 20-30 vehicles at any one time for a limited period.

Limited amounts of fuels would be required for maintenance vehicles during operation of the solar farm and for temporary power generation in the event of an unplanned outage. During operation, the proposal would have a significantly positive impact on global climate by assisting to reduce Australia's reliance on fossil fuels for electricity generation (discussed in Section 2.3).

Due to the existing activities surrounding the site and the minimal impacts on air quality during operation, the cumulative impact is expected to be not significant. Cumulative impacts are discussed further in Section 7.11.

7.4.3 Safeguards and mitigation measures

Air quality impacts would be addressed via the mitigation strategies in Table 7-8.

Table 7-8 Safeguards and mitigation measures for climate and air quality impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
Development of a complaints procedure to promptly identify and respond to issues generating complaints.	C	O	D
Protocols to guide vehicle and construction equipment use, to minimise emissions would be included in construction and operational environmental management plans. This would include but not limited to Australian standards and (POEO Act).	C	O	D
Protocols would be included in construction and decommissioning to minimise and treat dust (water carts or similar in response to visual cues). This may involve installation of barriers such as shade cloth, to protect receivers.	C		D

7.5 ELECTRIC AND MAGNETIC FIELDS

This section addresses potential hazards and risks associated with electric and magnetic fields (EMFs).

EMFs consist of electric and magnetic fields and are produced whenever electricity is used. EMFs also occur naturally in the environment, e.g., from a build-up of electric charge in thunderstorms and Earth's magnetic field (WHO 2012).

Electric fields are produced by voltage. Magnetic fields are produced by current. When electricity flows, EMFs exist close to the lines and wires that carry electricity and close to electrical devices and appliances while operational (WHO 2007). Electric and magnetic field strengths reduce rapidly with distance from the source, and while electric fields are shielded to some extent by building materials, magnetic fields are not.

Fields of different frequencies interact with the body in different ways. In Australia, transmission lines and other electrical devices and infrastructure, including substations, operate at a frequency of 50 Hz. This frequency falls within the Extremely Low Frequency (ELF) range of 0-300 Hz.

Over decades of EMF research, no major public health risks have emerged, but uncertainties remain (WHO undated). While it is accepted that short-term exposure to very high levels of electromagnetic fields can be harmful to health, the International EMF Project has thus far concluded that there are no substantive health consequences from exposure to ELF *electric* fields at the low levels generally encountered by the public (WHO 2007), such as those that would be produced by electricity generation at the proposed solar farm and along the transmission line.

Whether exposure to ELF *magnetic* fields is also harmless is unclear. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA 2015) advises that 'the scientific evidence does not firmly establish that exposure to 50 Hz electric and magnetic fields found near transmission lines is a hazard to human health', and that 'current science would suggest that if any risk exists, it is small'.

Australia does not currently have a standard regulating exposure to extremely low frequency electric or magnetic fields. ARPANSA refers to the limits in the National Health and Medical Research Council's (NHMRC) *Interim guidelines on limits of exposure to 50/60 Hertz electric and magnetic fields* (1989). A summary of these Interim guidelines is provided in Table 7-9.

Table 7-9 Summary of the Interim guidelines on limits of exposure to 50/60 Hz electric and magnetic fields

Exposure characteristics	Electric field strength (volts per metre - V/m)	Magnetic flux density (microteslas - µT)
Occupational		
Whole working day	10,000	500
Short term	30,000	5,000
General public		
Up to 24 hours/day	5,000	100
Few hours/day	10,000	1,000

The proposal includes four main types of infrastructure that could create EMFs:

1. Solar panels and invertors.
2. Underground cables.
3. Overhead or underground 66 kV transmission line.

Typical and maximum EMF levels for these types infrastructure are discussed below. Strength attenuates with distance from the infrastructure, as seen below.

Research into photovoltaic solar arrays in California[3] by Chang and Jennings (1994), indicated that magnetic fields (the EMF type of greatest public concern) was significantly less for solar arrays than for household applications. Chang and Jennings (1994) found magnetic fields from solar arrays were not distinguishable from background levels at the site boundary, suggesting the health risk of EMFs from solar arrays is minimal.

Underground cabling does not produce external electric fields due to the shielding effects of the soil, however magnetic fields still occur. They are expected to be minimal.

It is proposed the 66 kV transmission line would be either an overhead or underground power line. Figure 7-6 displays the maximum and typical magnetic field for a 66 kV overhead powerlines and Figure 7-7 displays the typical magnetic field for a 132KFkV underground power line that would be similar to that of a 66 KV underground power line (EMSF Info 2016). Additionally ARPANSA (2016) provides the typical levels of magnetic fields near overhead transmission lines and substations in Figure 7-8.

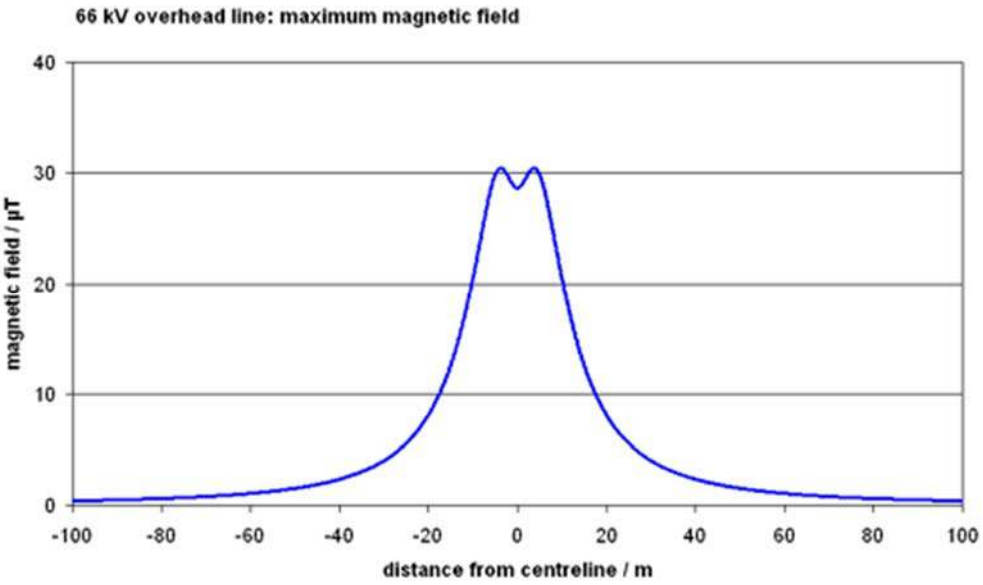

Figure 7-4 Maximum and typical magnetic field from 66kV overhead (EMFS info, 2016)

[3] Converted from mG where 1 mG = 0.1 µT.

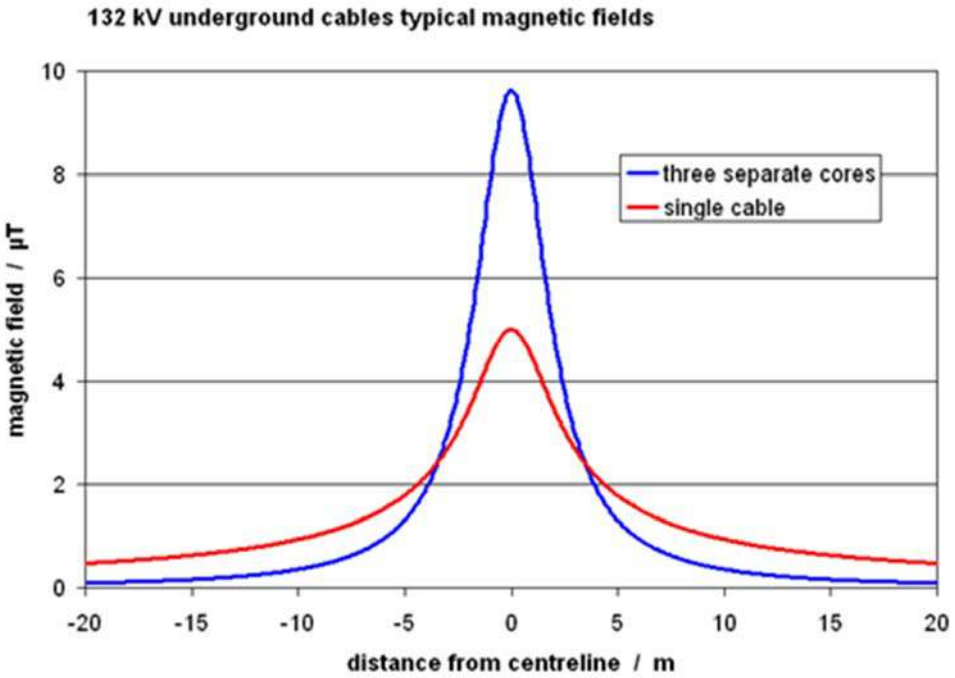

Figure 7-5 Typical magnetic field from 132kV underground powerlines (EMFS info, 2016)

Table 7-10 Typical magnetic field from overhead powerlines

Source	Location of measurement	Range of measurement	
		(mG)	(µT)4
Transmission line	Directly underneath	10 - 200	1 - 20
Transmission line	At edge of easement	2 - 50	0.2 - 5
Substation	At substation fence	1 - 8	0.1 – 0.8

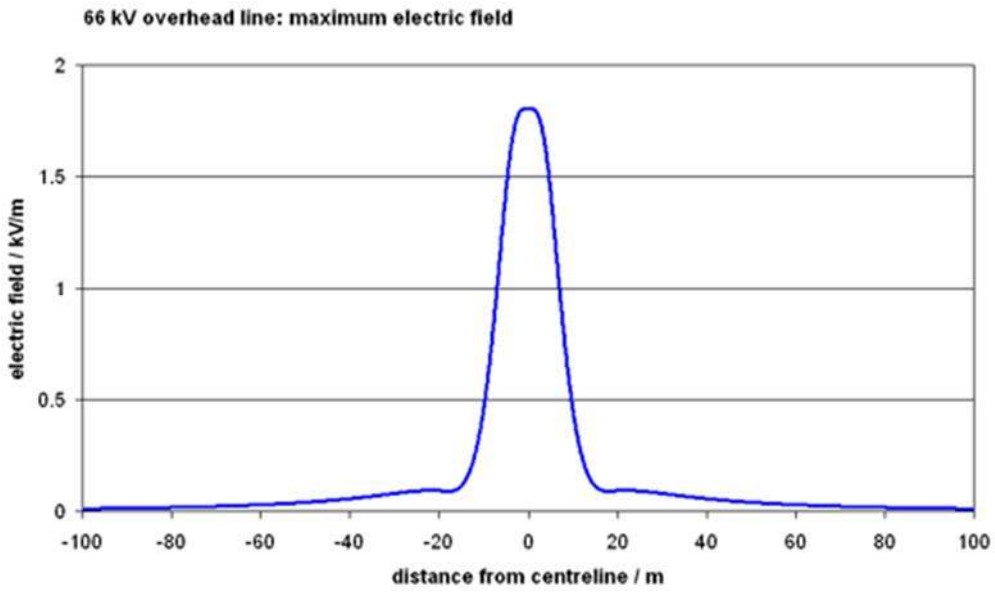

Figure 7-6 Typical electric field from a 66KV overhead powerlines (EMFS info, 2016)

7.5.1 Potential impacts

Construction and decommissioning

There is low potential for EMF impacts during the construction and decommissioning phases of the project. Site staff would be exposed over intermittent periods during works at and around the existing and proposed 132kV and 66kV transmission lines. The maximum magnetic field of the existing transmission lines are well under the 100 µT and 500 µT limits respectively recommended for public and occupational exposure. Given the voltage that workers would be exposed to and the intermittent nature of exposure, the effects are likely to be negligible.

With the exception of the transmission line, the construction site would be fenced to protect the public from construction health and safety risks.

Operation

During operation, EMF sources would include a 66kV transmission line, underground cabling, and the solar array incorporating inverters.

Electric fields can be reduced with distance from operating electrical equipment and by shielding, while magnetic fields are reduced more effectively with distance. Using the Principle of Prudent Avoidance to design and site this infrastructure, the exposure to EMFs can be minimised and potential for adverse health impacts minimised also.

The site is surrounded by agricultural land. Public access would be restricted by site fencing around the site and existing substation during the operational phase. Given the levels associated with the infrastructure components, and the distance to the site perimeter fence, EMFs from the solar farm are likely to be indistinguishable from background levels at the boundary fence. The underground cabling would not produce external electric fields due to shielding from soil, and its magnetic fields are expected to be well within the public and occupational exposure levels recommended by ARPANSA.

The largest potential for public exposure would be associated with the potential overhead 66 kV transmission line alignment, which would cross agricultural land, and Pat Meredith Drive. Public exposure would be intermittent when accessing those areas.

Staff exposure to EMFs from the proposed transmission line would be intermittent during site access and maintenance activities.

Using the Principle of Prudent Avoidance to design and site this infrastructure, exposure to EMFs and potential for adverse health impacts can be further reduced. Adverse health impacts from EMFs are therefore unlikely as a result of the proposal.

7.5.2 Safeguards and mitigation measures

Health and safety impacts are proposed to be addressed via the mitigation measures in Table 7-11.

Table 7-11 Safeguards and mitigation measures for health and safety

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
All design and engineering would be undertaken by qualified a competent persons with the support of specialists as required.	**C**		
Transmission lines would be located as far as practical from residences, farm sheds, and yards in order to reduce the potential for both chronic and acute exposure to EMFs.	**C**		
Design of electrical infrastructure would minimise EMFs.	**C**		

7.6 LAND USE IMPACTS (INCLUDING MINERAL RESOURCES)

The nature of a development determines whether a permanent land use change occurs or whether the development is reversible and existing or alternative land uses can occur alongside the proposal and in future. As well as direct uses of the land, such as agriculture, electricity generation or mining, associated impacts, such as the degree of visual impact and traffic regimes, can affect the compatibility of alternative land uses. These issues as they relate to the proposal are discussed below.

7.6.1 Existing environment

Agriculture

The proposal site and surrounding area is currently used for agriculture, primarily extensive grazing but cropping has been undertaken in the past and occurs in the locality. Agriculture dominates the local economy, including irrigated and dryland agriculture, broadacre cropping, sheep and cattle production. Sheep, beef cattle and grain farming involves approximately 13 per cent of the local population.

Rural residential dwellings occur in the locality. They are at low density. They are often protected by tree plantings, that would assist to mitigate dust and visual impacts of agricultural activities.

Electricity

The proposed 66kV transmission line connecting the solar farm to the existing substation would be located adjacent to or collocated on existing transmission poles along Pat Meredith Drive. The existing substation is an important part of Transgrid's Central West distribution network. The network requires maintenance of vegetation within easements as well as reliable vehicle access to be maintained.

Mining

A current mineral exploration licence is relevant to the proposal site: EL 7676. Exploration leases entitle the holders to carry out exploration and prospecting for minerals within the specified areas. A copper mineral occurrence is mapped in close proximity and west of the site. Other mineral occurrences in the locality include:

- Construction materials sites
- Industrial minerals sites
- Gold (occurrences are concentrated closer to Parkes, to the east).

The current mineral titles and exploration licence applications held in the Parkes region are illustrated Figure 7-7.

Other land uses

The proposal site is located on land zoned RU1 Primary Production under the Parkes LEP. The proposal site is not located on land proposed for residential subdivision development, land managed for forestry or conservation purposes.

7.6.2 Potential impacts

Construction

During construction, agricultural activities would cease in areas required for access and construction of the solar farm. Construction of the transmission line and construction traffic may result in some disruption to local traffic, but Pat Meredith Drive is not a through road and impacts would be minimal. This would be a temporary impact and can be managed in consultation with local landholders.

Connection to the Transgrid substation and installation of transmission lines will be undertaken in consultation with Transgrid so that the substations operation and maintenance requirements are not impacted.

Consultation would be undertaken with extraction licences holders to inform them of the proposed solar farm construction and operational requirements.

No additional land use conflicts are foreseen during construction. The construction impacts would be temporary and mitigation strategies can reduce the level of impact on affected parties.

Operation

During operation, the proposal site would change from agricultural land use to power generation. Grazing may continue as part of a groundcover management strategy around and under the array, but this would be a maintenance activity, primarily to ensure erosion and weed infestation do not occur, and not for agricultural profit.

The development will result in development of a large proportion of the 240 ha property and along the proposed power line easement. The duration of the project would be 25 years. The loss of this amount of agricultural land in the region for this period is not considered a significant loss in the locality. Further, the proposal is highly reversible; at the end of the project all above ground infrastructure would be removed and current agricultural land use activities could resume or other land uses could be considered. The productive capacity of the land would be minimally affected by footings and cabling that would be retained.

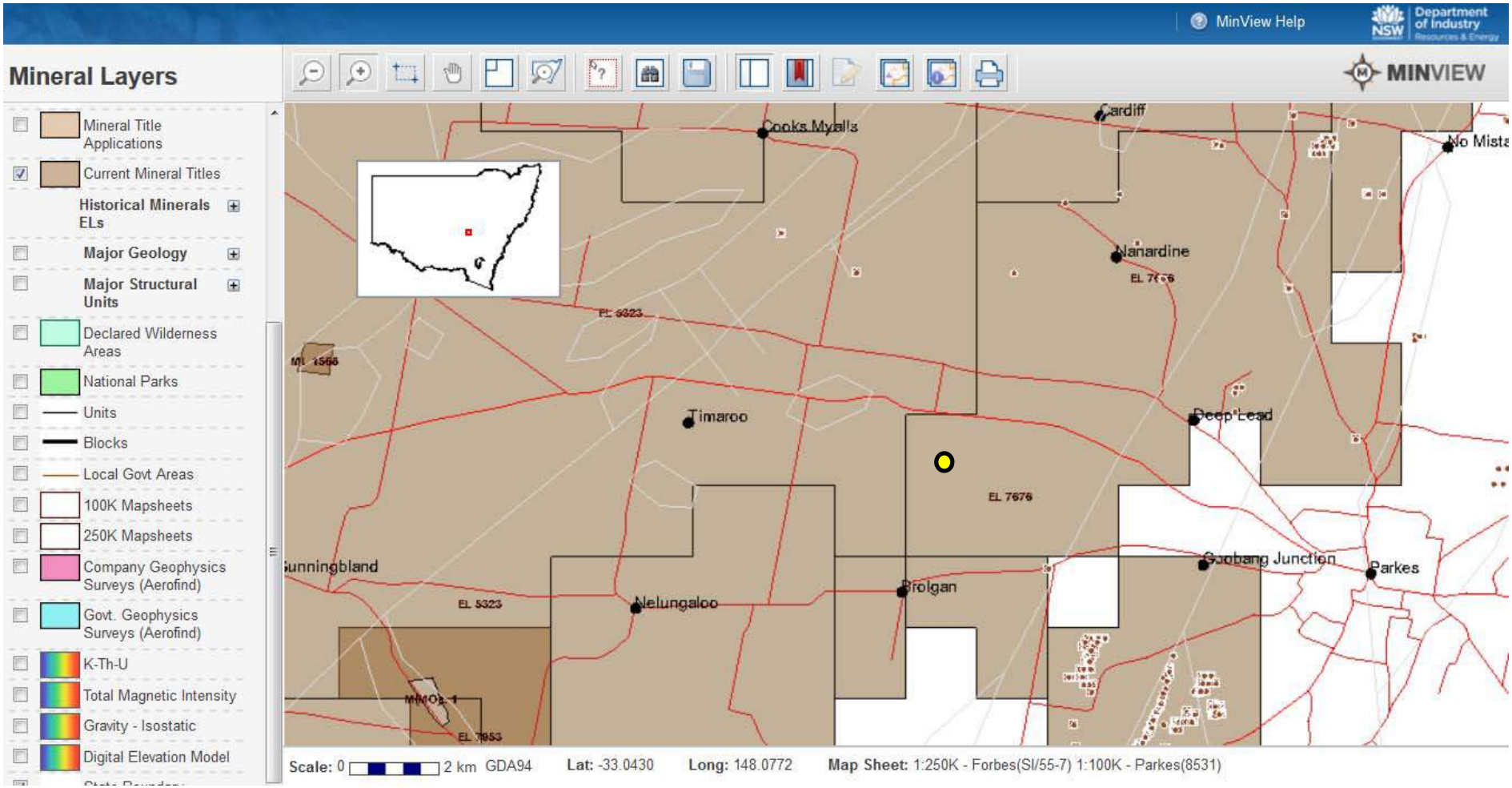

Figure 7-7 Mineral titles and applications within the locality of the proposal site (Department of Trade and Investment, 2016). *The proposal site is indicated by yellow circle*

Once operational, the connection to the Transgrid substation and transmission lines will be handed over to Transgrid to manage. Vegetation buffers proposed around the solar farm site would not be required to be very tall (greater than 8m) to break up views of the solar array (and thereby mitigate visual impacts) and would therefore pose no interference with transmission lines, where they may cross electricity easements.

During the operation of the proposal, future mineral exploration would be limited within the site boundary; 240 ha. Exploration in areas with above ground infrastructure would be precluded. Traffic and additional underground infrastructure such as cabling would make exploration in other areas very difficult and this would not be preferred.

Decommissioning

As the development of the site requires relatively low levels of impact on the soil surface, the proposal is viewed as highly reversible. Some compaction on access roads would have occurred. Following decommissioning the rehabilitated site would have similar opportunities for land use as the site currently possesses. At the end of the project, all above ground infrastructure would be removed and current agricultural or mineral exploration activities or alternative activities including rural residential development or forestry could be undertaken.

7.6.3 Safeguards and mitigation measures

Potential for land use impacts is proposed to be addressed via the mitigation measures in Table 7-12.

Table 7-12 Safeguards and mitigation measures for land use impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
Consultation with local community, to minimise impact of construction of adjacent agricultural activities and access.	C		
Consultation would be undertaken with Transgrid regarding connection to the substation and design of electricity transmission infrastructure.			
Consultation would be undertaken with extraction licences holders to inform them of the proposed solar farm construction and operational requirements.	C		
Removal of all above ground infrastructure and rehabilitation of areas disturbed during the operation of the solar farm, to allow a return to agricultural or alternate use.			D

7.7 SOCIOECONOMIC AND COMMUNITY

Large and new types of developments can produce social and economic impacts on local communities. These can be positive, such as the provision of employment and increased retail trade. They can also produce unintended or adverse impacts, such as creating strains on existing infrastructure (such as public transport or accommodation facilities during construction), including social infrastructure (volunteer services, social ties and networks). This section investigates the socio-economic profile of the region to understand the impact of the proposal on socioeconomics and the community.

7.7.1 Background

Socio-economic profile

The Parkes LGA has a population of 14, 592 people (ABS, 2011). This represents a population increase of around 2 per cent since the 2006 Census (14,281 people). The percentage of people of Indigenous origin (8.3 per cent in 2011) is very high compared to the Australian average (2.5 per cent in 2011). The overseas immigrant population is small; 88 per cent of the population were born in Australia compared to the Australian average of 69.8 per cent (ABS, 2011).

The local economy is based on irrigated and dryland agriculture, including broadacre cropping and sheep and cattle production. Sheep, beef cattle and grain farming involves 12.8 per cent of the population. Other sectors that support the economy include education, metal ore mining, retail, public administration and health care (ABS, 2011; NIEIR, 2015). The unemployment rate for Parkes LGA is 4.9 per cent, which is less than the national rate of 5.6 per cent (ABS, 2011).

Parkes is a service centre for the area and includes:

- 'Crossroads' with the Newell Highway, connecting Brisbane and Melbourne and transcontinental railway linking the eastern seaboard to Perth.
- A regional airport that services a regional population of over 40, 000 people across the LGAs of Parkes, Lachlan, Forbes, Bland and Weddin (Parkes Shire Council. 2015).
- Tourist accommodation including 15 motels, three caravan parks, six hotel and four bed and breakfasts (Parkes Shire Council, 2015).
- Educational facilities within the Parkes Shire including one high school, four primary schools, three pre-schools and one Christian School that is Kindergarten to year 12; additionally a TAFE campus and University Study Centre (Parkes Shire Council, 2015).
- The Forbes District Hospital, providing facilities for accident/emergency, elective surgery, obstetrics, cancer care services and rehabilitation services. The state government has committed to funding for a new hospital. Parkes also has three medical centres, several dentists, physiotherapists and chiropractors an imagery and radiography services, and community health unit. A new aged care facility has recently received development approval (Parkes Shire Council, 2015).
- Recreational and sporting facilities including an olympic swimming pool, 18 hole grass-green golf course, racecourse , as well as facilities for rugby league, rugby union, little athletics, AFL, hockey, cricket, tennis, squash, basketball, netball, bowls, soccer, archery, paintball and shooting ranges (Parkes Shire Council, 2015).
- Tourist attractions within the Forbes LGA including the Parkes radio telescope 'The Dish', the annual Elvis Festival, the annual Tullamore Irish Festival, Trundle Bush tucker Day, ABBA

Festival, Parkes Little Theatre, Parkes Motor Museum, Elvis Exhibit and the Henry Parkes Museum (Parkes Shire Council, 2015).

Community make up and priorities

The Community Strategic Plan 2022 was adopted by the Parkes Shire Council in March 2013. The plan is a 10 year plan identifying the community's main priorities and aspirations for the future. It outlines eight main strategic objectives to help meet these priorities and aspirations, including:

- Developing lifelong learning opportunities: Education is a vital importance for the community that helps create social and civic leadership.
- Improve health and wellbeing: Improving services in health and social impacts.
- Promote, support and grow our communities: Important to maintain essential services, as well as support and assist in the growth of the communities beyond economic benefits.
- Grow diversify the economic base: Embrace emerging and exciting developments in digital and fibre optic technologies. To support a diverse range of economic activities as the economic benefits improve quality of life for the community.
- Develop Parkes as national logistics hub: Assist in growing the economic base, therefore substantial social benefits to the wider community. These are linked through employment and the increase in services that closely follow development these areas.
- Enhance recreation and culture: Social benefits to those living in the Shire are impacted by the recreational and cultural activities available. Continue to resource and support the existing facilities and community groups engaged in this area.
- Care for the environment in a changing climate: Addressing both adaption and mitigation strategies that are required to meet the challenge of a changing climate.
- Maintain and improve the Shire's assets and infrastructure: Prioritise and allocate resources. Transport assets have a particular emphasis as they link all the Shire communities.

These strategic objectives are important in considering the impact on a community of a new development.

Attitudes to renewable energy projects

Research indicates there is widespread support for solar energy as a source of energy for electricity generation in Australia (ARENA n.d); 78% of respondents are in favour of large scale solar energy facilities and 87% are in favour of domestic installations. The large scale solar energy sector is still at a relatively early stage of development in Australia, however. While most members of the community are aware of large scale solar energy, many do not know a great deal about their impacts (ARENA n.d.).

Three approaches to improving community understanding of the visual impacts of large scale installations include:

- Provision of images (from many angles) of large scale solar facilities, particularly in the early stages of a proposal.
- Understanding the similarities between highly supported domestic scale installations and large scale facilities.
- Understanding the current function of the land proposed to hold the facility and the additional value the installation allows for.

(Source: extracted from ARENA n.d).

This EIS addresses some of these issues.

Community feedback on the proposal

Twelve people attended the Parkes Solar Farm information session held in Parkes on 15 December 2015. Only five feedback forms were returned; two by respondents less than 2km from the proposed solar farm site and three by respondents more than 5km from the proposed site.

- Views, community and family ties, work opportunities and recreational opportunities (such as sporting and nature-based activities) were selected equally as holding the most value for the local area (two respondents selected each item).
- All five respondents cited renewable energy generation as what they liked most about solar farms generally. Local economic opportunities (four respondents) and diversification of land use (three respondents) were also cited.
- One respondent cited potential visual impacts as a concern regarding solar farms generally.

Issues raised with specific reference to the proposed Parkes Solar Farm included:

- The proposal is a great initiative on local and environmental platforms.
- Views of cattle grazing land are an important visual characteristic of the local area.
- Memorial Hill is an important local view; contrasting town and country, particularly when crops are in season (canola and wheat).

Additionally, the project was presented at the Parkes Council Meeting of 15 December. The Council provided broad support at this meeting. No concerns were raised.

7.7.2 Potential impacts

Construction

Large scale solar farms can create polarised reactions in communities; some may see it as a large change to existing land use, lifestyles and land character. This feature alone can generate concern in the community. Others may see it as a positive contribution and sign of progress and may derive some direct benefit (such as involved landowners).

The local area has few large scale industries and would be a large change to the character of the site, from extensive agriculture to electricity generation. The site would be somewhat visible to the public during construction, for traffic turning onto Pat Meredith Drive, but would be largely obscured by trees for traffic on Henry Parkes Way.

The proposal would represent a local economic and direct economic benefit to some. The construction of the proposal would utilise up to 90 staff at peak construction. Many of these could be drawn from the local area. Additional workers moving to the area temporarily may stimulate local economic activity. Accommodation and retail services would be stimulated. Conversely, the temporary influx may place pressures on local services such as schools and health services. Additional demands for accommodation and additional traffic may present an adverse effect on local tourism, if coinciding with local festivals for example. Additional traffic may be noticeable. Additional hazards accompany construction traffic (refer to Section 7.3). Mitigation strategies to address these impacts centre on consultation with the community, so that benefits can be maximised and conflicts resolved where possible.

Operation and decommissioning

The development of rural land uses compatible with agricultural activities, such as solar power generation, have potential to provide increased economic security to rural economies through diversification of employment opportunities and income streams. As well, they provide a substitute for carbon emission producing electricity production that is stable and renewable. Consistent with State and National greenhouse emission reduction objectives.

Considering the local economy is dominated by agriculture, it is relevant to note that the soil capabilities at the site limit intensive agriculture (refer to Section 7.1). The installation of solar array modules, that involve little soil disturbance and provide an alternative income stream for large agricultural properties, can be seen as an important local economic benefit. Further, it is noted that projected global warming will increase potential evaporation and water demand, potentially reducing the capacity of the arable land. Pittock (AGO, 2003) observed that a significant proportion of Australian exports are agricultural products sensitive to global warming impacts. Federal Government publications note that failure to adequately mitigate increases in emissions will lead to greater costs for adaptation to consequences of climate change.

Minimal adverse impacts are anticipated during operation and decommissioning. During operation, maintenance staffing and activities would be at low levels. The additional accommodation and traffic impacts of a number of operational staff are not likely to be noticeable.

Decommissioning is likely to require less staff onsite than for construction. It would offer a similar economic benefits to construction in terms of opportunities for local staff and industries. It may also include local recycling of infrastructure components.

7.7.3 Safeguards and mitigation measures

Table 7-13 Safeguards and mitigation measures for socioeconomic and community impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
The Community Consultation Plan would be implemented to manage impacts to community stakeholders, including but not limited to: • Protocols to keep the community updated about the progress of the project and project benefits. • Protocols to inform relevant stakeholders of potential impacts (haulage, noise etc.). • Protocols to respond to any complaints received.	**C**		
Liaison with local industry representatives to maximise the use of local contractors, manufacturing facilities, materials.	**C**		
Liaison with local representatives regarding accommodation options for staff, to minimise adverse impacts on local services.	**C**		**D**
Liaison with local tourism industry representatives to manage potential timing conflicts with local events.	**C**		**D**

7.8 RESOURCE USE AND WASTE GENERATION

7.8.1 Existing environment

Resource use

Key resources and estimated quantities (pending the completion of the detailed project design) required to construct the proposed solar farm include those listed in Table 7-14.

Table 7-14 Resource requirements for the proposed Parkes Solar Farm.

Resource	Quantity
Gravel	6,000 m^3
Sand (back filling trenches)	550 m^3
Sand (footings for PV boxes and skids)	450 m^3
Metal (components for mounting system, PV boxes or PV skids and delivery system containers, fencing, site buildings, transmission line poles)	11,000 tonnes
Glass for panels	3250 tonnes
Silicon for crystalline wafers	550 tonnes
Water during construction	145,000 kL total

During operation and decommissioning, resources used would be associated with maintenance activities and use of machinery and vehicles. Water requirements during operation are estimated to be 3,250 kL / year.

Waste generation

POLICY POSITION

Legal requirements for the management of waste are established under the POEO Act and the *Protection of the Environment Operations (Waste) Regulation 2005*. Unlawful transportation and deposition of waste is an offence under Section 134 of the POEO Act. Littering is an offence under Section 145 of the POEO Act.

The *Waste Avoidance and Resource Recovery Act 2001* includes resource management hierarchy principles to encourage the most efficient use of resources and to reduce environmental harm. The proposal's resource management options would be considered against a hierarchy of the following order:

- Avoidance of unnecessary resource consumption.
- Resource recovery (including reuse, reprocessing, recycling and energy recovery).
- Disposal.

Adopting the above principles would encourage the most efficient use of resources, and reduce costs and environmental harm in accordance with the principles of ecologically sustainable development.

CONSTRUCTION

Solid waste is one of the major pollutants caused by construction. A number of different construction activities would produce solid wastes, such as:

- Packaging materials.
- Excess building materials.
- Scrap metal and cabling materials.
- Plastic and masonry products, including concrete wash.
- Excavation of topsoils and vegetation clearing (expected to be minimal).
- Bio wastes, from onsite septic systems.

In accordance with definitions in the POEO Act and associated waste classification guidelines, most waste generated during the construction and decommissioning phases would be classified as building and demolition waste within the class general solid waste (non putrescibles). Ancillary facilities in the site compound would also produce sanitary wastes classified as general solid waste (putrescibles) in accordance with the POEO Act.

OPERATION

During operation the solid waste streams would be associated with maintenance activities and presence of employees. Some materials such as, fuels and lubricants, metals may require replacement over the operational life of the project.

DECOMMISSIONING

Decommissioning of the site would involve the recycling or reuse of materials including:

- Solar panels and mounting system.
- Metals from posts, cabling, fencing.
- Buildings and equipment such as the inverters, transformers and similar components would be removed for resale or reuse, or for recycling as scrap.

Items that cannot be recycled or reused, such as excess of above, would be disposed of in accordance with applicable regulations and to appropriate facilities. All above ground infrastructure would be removed from the site during decommissioning.

7.8.2 Potential impacts

Construction and decommissioning

While increasing scarcity of resources and environmental impacts are emerging from the use of non-renewable resources, the supply of the materials required for the proposal are not currently limited or restricted. In the volumes required, the proposal is unlikely to place significant pressure on the availability of local or regional resources. The use of the required resources is considered reasonable in light of benefits of offsetting fossil fuel electricity generation.

Water would be required during construction for activities including watering of roads and in the site office and amenities. Water use is considered in Section 7.2

During decommissioning, all infrastructure and materials would be removed from the site and recycled or otherwise disposed of at approved facilities. The proposal is considered highly reversible in its ability to return to the pre-existing land use or alternative land use. The majority of the project components are

recyclable and mitigation measures are in place to maximise reuse and recycling in accordance with resource management hierarchy principles.

Operation

LIFE CYCLE ANALYSIS

Life cycle analysis (LCA) assesses and quantifies the energy and material flows associated with a given process to identify the resource impacts of that process and potential for resource recovery. LCA estimates of energy and emissions based on the total life cycle of materials used for a project, i.e., the total amount of energy consumed in procuring, processing, working up, transporting and disposing of the respective materials (Schleisner, 2000).

A life cycle inventory of multicrystalline PV panels has been undertaken by European and US photovoltaic module manufacturing companies over the 2005/2006 period. Over the panels 30 year lifetime it is expected to produce 28 g of GHG per kWh generated (Fthenakis *et al*, 2011). The 'energy payback time' for multicrystalline PV modules is dependent on the geographical location, it has been estimated at 1.5 years and less for a solar installation in Southern Europe (Fraunhofer ISE, 2015); this is considered roughly comparable to the proposal site.

The purification of the silicon, which is extracted from quartz, accounts for 30% of the primary energy to produce the module. This stage also produces the largest amount of pollutants with the use of electricity and natural gas for heating (Fthenakis *et al*, 2011). The waste produced during production of the modules which can be recycled include graphite crucibles, steel wire and waste slurry (silicon and polyethylene glycol). However, silicon crystals cannot be recycled during this stage (Fthenakis *et al*, 2011). The production of the frames and other system components including cabling would also produce emissions and waste but less than the production of modules.

The ratio of energy produced by, in this case, a solar PV system over its lifetime, to the energy required to make it is referred to as the system's 'energy yield ratio'. PV system energy yield ratio in Northern Europe was estimated to be more than ten, indicating the system would produce more than ten times the amount of energy required to make it (Fraunhofer ISE, 2015). This positive energy yield ratio also means that GHG emissions generated from the production of solar energy systems are more than offset over the systems' life cycle (GA and ABARE 2010).

Solar farms are favourable in a number of aspects when compared to the major electricity generating methods employed in Australia:

- CO_2 emissions generated per kilowatt hour of energy produced.
- Short energy payback time in comparison to the life span of the project.
- Potential to reuse and recycle component parts.

RESOURCES AND WASTE STREAMS

Electricity production using photovoltaics emits no pollution, produces no GHGs, and uses no finite fossil-fuel resources (US Department of Energy, 2004). Only limited amounts of fuels would be required for maintenance vehicles during operation of the solar farm. Operational waste streams would be very low as a result of low maintenance requirements of the solar farm.

Some balance of system electrical components (e.g., inverters, transformers, electrical cabling) would likely need replacement over the proposed life of the solar farm, requiring further use of metal and plastic based products. Repair or replacement of infrastructure components would result in some waste during plant

operations; however, such activities would occur very infrequently and there would be a high potential for recycling or reuse of such waste.

7.8.3 Safeguards and mitigation measures

A Waste Management Plan would be developed to minimise waste and maximise the opportunity for reuse and recycling. Impacts are proposed to be addressed via the mitigation measures in Table 7-15.

Table 7-15 Safeguards and mitigation measures for resource use and waste generation

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
A Waste Management Plan (WMP) would be developed to minimise wastes. It would include but not be limited to: • Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy. • Quantification and classification of all waste streams. • Provision for recycling management onsite. • Provision of toilet facilities for onsite workers and how sullage would be disposed of (i.e., pump out to local sewage treatment plant). • Tracking of all waste leaving the site. • Disposal of waste at facilities permitted to accept the waste. • Requirements for hauling waste (such as covered loads).	C	O	D
Septic system to be installed and operated in accordance with Council's requirements.	C	O	

7.9 FIRE AND BUSH FIRE ISSUES AND IMPACTS

Bush fire presents a threat to human life and assets and can deliver adverse ecological impacts. Bush fire risk can be considered in terms of environmental factors that increase the risk of fire (fuel quantity and type, topography and weather patterns), as well as specific activities (such as hot works) or infrastructure components that exacerbate combustion or ignition risks (such as transmission lines and other electrical components).

7.9.1 Existing environment

The study area is relatively flat, apart for the localised rises north and immediately east of the site and closer to Parkes. Localised native remnants occur in the locality. These are present as linear roadside vegetation but also as patches of open woodland in paddocks. The total area of native vegetation mapped within 1000 ha of the site is 84.85 ha.The majority of the site proposed for development has been cleared and cultivated in the past.

In terms of existing bushfire hazards, there is a small area of native vegetation in the north eastern area of the site, isolated paddock trees and several rows of planted trees and shrubs across the centre of the site, mostly along fence lines. Ground cover is grazed but can also be susceptible to grass fires in hot and windy

conditions. There is a 132/66 kv power line running north-south through the site located adjacent to the western boundary of the site. The existing substation is located approximately 600m north of the site and is surrounded by trees.

The local bush fire danger period occurs between October and March. The harvest period of November to mid December is considered a prime risk period due to machinery in crops and generally high activity in the rural sector. January and February present the highest temperatures, coupled with low humidity and dry crop stubble over extensive areas.

In terms of resources to fight fire, there are five farm dams across the site, the largest one being adjacent to the native vegetation in the north western area of the site. The nearest water course to the site is Ridgey Creek, approximately 500 m to the west. The site is well serviced by wide access tracks dissecting the site and with good access to Pat Meredith Drive.

In terms of receivers and assets at risk from bush fire, two dwellings are located within 1 kilometre of the site. An additional two dwellings are located within 5km of the site. Additionally, farm sheds, watering points, silos and equipment are common in the local area. As stated above, November to mid December represents a period of high activity when many people may be active in harvest and other farm activities onsite and in the local area.

7.9.2 Potential impacts

Construction and decommissioning

Activities associated with construction that may cause or increase the risk of bush fire include:

- Smoking and careless disposal of cigarettes on site.
- Site maintenance activities such as mowing, slashing and using other petrol powered tools.
- Hot works; including welding and soldering activities.
- Operating a petrol, LPG or diesel powered motor vehicle over land containing combustible material.
- Operating plant fitted with power hydraulics on land containing combustible material.

Considering the sparse vegetation cover over the proposed site and other factors discussed above, it is considered unlikely that project would pose a significant bush fire risk. Site access would be formalised at the beginning of the construction stage during civil works, which would increase the ability to access and suppress any fire onsite or on adjoining sites.

The bush fire hazard associated with the activities listed above is considered highly manageable. Risks would be minimised through the implementation of fire and bush fire mitigation measures outlined in Section 7.9.3.

Potential impacts from decommissioning activities would be similar to those for construction. As for construction and operation activities (below), any bush fire risk associated with decommissioning of the project would be highly manageable.

Operation

Repairs and maintenance activities during project operation could increase bush fire risk. All electrical components would be designed to minimise potential for ignition. Asset protection zones would also be maintained around buildings at the site. Ground cover beneath panels would be maintained and not allowed to build up to high fuel levels (access and solar input requirements are in line with this activity). It

is anticipated that Transgrid would maintain the transmission line infrastructure to minimise bush fire ignition risks, once constructed.

Bush fire risks during operation of the solar farm and connection infrastructure is considered highly manageable.

7.9.3 Safeguards and mitigation measures

Table 7-16 Safeguards and mitigation measures for fire and bush fire

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
Develop a Bush Fire Management Plan with input from the RFS to include but not be limited to: • Management of activities with a risk of fire ignition. • Management of fuel loads onsite. • Storage and maintenance of firefighting equipment, including siting and provision of adequate water supplies for bush fire suppression. • The below requirements of *Planning for Bush Fire Protection 2006* - o Identifying asset protection zones o Providing adequate egress/access to the site o Emergency evacuation measures • Operational procedures relating to mitigation and suppression of bush fire relevant to the solar farm.	C	O	D

7.10 HISTORIC HERITAGE

A search of listed items (under the NSW *Heritage Act 1977*, the Australian Heritage Database and those listed by local Councils and Stage Government agencies) was completed for the Parkes LGA on 2 February 2016. None of the items listed are located in the vicinity of the site.

7.10.1 Approach

A desktop study was undertaken to identify any historic heritage (non-indigenous) items or places in proximity to the study area, with a particular focus on the proposal site (solar plant site and surrounding landscape). Heritage databases searched as part of this assessment included:

- The NSW State Heritage Inventory (SHI) (includes items on the State Heritage Register and items listed by state agencies and local government) to identify any items currently listed within or adjacent to the proposal site. The area searched was the Parkes LGA.
- The Australian Heritage Database (includes items on the National and Commonwealth Heritage Lists) to identify any items that are currently listed within or adjacent to the proposal site.
- The heritage schedule of the Parkes LEP (2012) for locally listed heritage items that are within or adjacent to the proposal site.

7.10.2 Results

The results of the heritage searches listed above indicate that no known historic items or places occur on the site. A summary of the results of the heritage searches are illustrated in Table 7-17. Details of listed items are provided below.

Table 7-17 Summary of heritage listings in the Parkes LGA

Name of register	Number of listings
World Heritage List	0
National Heritage List	0
Commonwealth Heritage List	1
NSW State Heritage Register	2
NSW State Agency Heritage Register (section 170)	12
Parkes Local Environment Plan (LEP) 2012	11

State Heritage Register

A search of the NSW State Heritage Register within the Parkes LGA indicated two listings. These included:

- Parkes Post Office, Parkes.
- Parkes Railway Station Group, Parkes.

These items are listed under the *NSW Heritage Act 1977*. Neither item is located within the study area.

NSW State Agency Heritage Register (Section 170)

A search of the NSW State Agency Heritage Register within the Parkes LGA indicated 12 listings. These included:

- Bogan Gate Police Station and Residence, Bogan Gate.
- Eubalong West Railway Station, Eubalong.
- Parkes Police Station Offices, Parkes.
- Parkes Courthouse, Parkes.
- Nvmf 11615 – Coaching Stock – Bogie Guard's Van, Parkes.
- L790 – Freight Stock – Bogie Water Tank.
- Parkes Railway Precinct, Parkes.
- Parkes Fire Station, Parkes.
- Peak Hill District Hospital, Peak Hill.
- Peak Hill Courthouse, Peak Hill.
- Peak Hill Fire Station, Peak Hill.
- Tullamore Police Station, Tullamore.

The above items are listed by State Agencies under s.170 of the *Heritage Act 1977*. None of the above items are located within the study area.

Local Heritage Schedule

A search of the Parkes LEP (2012) resulted in a total of 11 local heritage items being recorded within the LGA. The majority of these items (including one conservation area) are concentrated in the main towns of Parkes and Peak Hill.

No local heritage items are identified as being within or near the study area.

Unlisted heritage items

Although no listed items were identified within the site, it is acknowledged that there may be unlisted items of historic significance on the subject site. No additional potential heritage items were identified within the proposal site during the site inspection.

7.10.3 Potential impacts

A number of heritage items were identified from the desktop study, outlined above. A high percentage of these items are found in Parkes and other towns and villages. None of those items are found within the study area for the solar station proposed site, or adjacent.

The proposal is not considered likely to have a significant impact in accordance with the NSW *Heritage Act 1977*, the EP&A Act, or the EPBC Act, in terms of heritage.

No impacts are considered likely to any heritage items during the construction, operation or decommissioning phases. No heritage approvals are required.

7.10.4 Safeguards and mitigation measures

A protocol for unexpected finds would be developed for the construction phase, as detailed below.

Table 7-18 Safeguards and mitigation measures for historic heritage

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
Should an item of historic heritage be identified, the Heritage Division (OEH) would be contacted prior to further work being carried out in the vicinity.	**C**	**O**	**D**

7.11 CUMULATIVE IMPACTS

Adverse cumulative impacts occur when the infrastructure or activities at the proposal site exacerbate the negative impacts of other infrastructure or activities occurring nearby.

During construction, the additional traffic impact is probably the greatest potential for cumulative visual impacts. The Henry Parkes Way is a high use road corridor carrying a large proportion of heavy vehicles, particularly in harvest periods. The visual impact of increased traffic movements to the site would be predominantly limited to construction (approximately 9 months). During operation, excepting unusual maintenance operations such as inverter or transformer replacement, a small maintenance team using standard vehicles are all that will be required.

The operational view of the solar farm may generate a cumulative impact with the existing substation and powerlines. While the substation is relatively well screened by tree plantings, both facilities would have security fencing and steel dominated infrastructure and be visible from the Henry Parkes Way – Pat Meredith Drive intersection. The additional powerlines would exacerbate an already dominant view of powerlines in some locations. This would not affect any residences due to existing vegetation screening and topography. View durations would be short and considered acceptable, however mitigation strategies have been recommended to reduce impacts where possible.

It is possible another large scale development could be approved within view of the proposed solar farm, however none are known to be proposed at this time.

Generally, adverse cumulative visual impacts are anticipated to be manageable due to the ability to effectively screen infrastructure in this low relief landscape.

8 ENVIRONMENTAL MANAGEMENT

8.1 ENVIRONMENTAL FRAMEWORK

The environmental risks associated with the proposed Parkes Solar Farm would be managed by implementing a project-specific suite of mitigation measures detailed in Sections 6 and 7 and summarised below.

All commitments and environmental safeguards would be managed through the implementation of a Project Environmental Management Plan, consisting of a CEMP, an Operation Environmental Management Plan and a Decommissioning Environmental Management Plan. These plans would be prepared sequentially, prior to each stage of works.

These plans would detail the environmental management responsibilities of specific staff roles, reporting requirements, monitoring requirements, environmental targets and objectives, auditing and review timetables, emergency responses, induction and training, complaint response procedures and adaptive management mechanisms to encourage continuous improvement.

8.2 MITIGATION MEASURES

Where measures are relevant to more than one environmental aspect, they are cited only once under the most relevant aspect, to avoid duplication.

Construction (C), Operation, (O), Decommissioning (D)

Safeguards and mitigation measures	C	O	D
• Develop a Flora and Fauna Management Plan (FFMP) for incorporation of construction related environmental management safeguards.	C		
• EEC areas to be retained would be delineated, and construction activities would be excluded from these areas.	C		
• Minimise clearing of EECs, namely 'White Box–Yellow Box–Blakely's Red Gum Woodland'. Clearing and construction contractors should be given inductions that make clear the importance of the sensitive area habitat and its species.	C		
• Where trees are to be retained, an adequate tree protection zone (TPZ) will be provided around each tree for the duration of construction from construction activities, including excavation, vehicle parking and stockpiles. Details for calculating TPZs are provided within *Australian Standard 4970-2009 – Protection of trees on development sites*.	C		
• Prior to the commencement of work, a physical vegetation clearing boundary at the approved clearing limit is to be clearly demarcated and implemented. This will include environmentally sensitive areas such as EECs. The delineation of such a boundary may include the use of temporary fencing, flagging tape, parawebbing or similar.	C		
• A pre-clearing process will be implemented before clearing begins. Pre-clearing surveys will be carried out by an ecologist and will include general fauna surveys, general tree hollow inspections and dam/waterway inspections. Habitat trees will be clearly marked with flagging tape.	C		
• When programming the works, consider breeding periods of fauna that may be impacted.	C		
• An unexpected threatened species finds procedure will be developed before clearing commences.	C		
• A 'Clearing and Grubbing Plan' will be developed to: ➢ include best practice methods for the removal of woody vegetation and non-woody vegetation. ➢ Trees will be removed in such a way as not to cause damage to surrounding vegetation. Root systems of trees and shrubs to be removed will be retained in-ground to ensure surrounding ground layer vegetation is undisturbed and to prevent soil erosion. ➢ Require that where work cannot avoid encroaching into the TPZ, it not impinge on the structural root zones (SRZ) of trees to be retained. Details for calculating the SRZs are provided within *Australian Standard 4970-2009 – Protection of trees on development sites*. ➢ Where possible, trees to be removed will be mulched on-site and re-used to stabilise disturbed areas. ➢ Tree clearing protocol, that includes staged habitat removal, and a requirement for an ecologist being present during tree-felling of all hollow-bearing trees to ensure that any potential impacts on fauna are minimised	C		
• Any fallen timber, dead wood and bush rock (if present) encountered on site will be left in situ or relocated to a suitable place nearby. Rock will be removed with	C		

Safeguards and mitigation measures	C	O	D
suitable machinery so as not to damage the underlying rock or result in excessive soil disturbance.			
• A Weed Management Plan would be developed for the sites to prevent/minimise the spread of weeds in and between sites. This would include: ➢ Management protocol for declared noxious weeds as stipulated by the *Noxious Weeds Act 1993* during and post construction (e.g. Chilean Needle Grass) ➢ A protocol for weed hygiene in relation to plant, machinery and importation and management of fill ➢ Any occurrences of pathogens such as Myrtle Rust and Phytophthora would be monitored, treated and reported.	C		
• use non barbed-wire on exterior fencing		O	
• Use of reflective power line marking balls on any overhead transmission lines		O	
• Use of 'fauna friendly' lighting		O	
• Native vegetation should be re-established in disturbed areas post-construction.		O	
Prepare a Cultural Heritage Management Plan (CHMP) in consultation with the registered Aboriginal parties that incorporates the following; • where avoidance of the recorded artefacts within the proposal area is not possible, the artefacts would be collected and moved to a safe area within the property, as close as possible to their original location, but which will not be subject to ground disturbance. The collection and relocation should be undertaken by representatives of the registered Aboriginal parties. A new AHIMS site card will need to be completed identifying the new location of the moved artefacts. • Incorporates an unexpected finds protocol to allow for management of finding additional Aboriginal artefacts during the construction of the solar farm. • Includes a protocol where, in the unlikely event that human remains are discovered during the construction, all work must cease. OEH, the local police and Peak Hill LALC should be notified. Further assessment would be undertaken to determine if the remains were Aboriginal or non-Aboriginal.	**C**		
Design measures: • If feasible, underground rather than overhead power lines would be considered. • If feasible, co-location of powerlines would be undertaken to minimise the look of additional power poles. If additional poles are required, these would match existing pole design as much as possible. • The materials and colour of onsite infrastructure will, where practical, be non-reflective and in keeping with the materials and colouring of existing infrastructure or of a colour that will blend with the landscape. Where practical, buildings will non-reflective and in eucalypt green, beige or muted brown. Pole mounts will be non-reflective. Security fencing posts and wire would be non-reflective; green or black rather than grey would reduce the industrial character of the fence.	C		
Screening: • Onsite planting within the solar farm boundaries would be considered for five residences identified with potential for high to medium level impacts; Viewpoints 2, 3, 6 and 16. • Planting requirements are outlined in the VIA and would be detailed fully within an appropriate management plan.		O	

Safeguards and mitigation measures	C	O	D
• Screens would be maintained for the operational life of the solar farm, including replacing dead plants and weeding, as required to maintain the screen's effectiveness in breaking up views.			
A verification process would be implemented within 2 months of the completion of the construction phase. A Visual Verification Report and Landscape Plan would: • Confirm the assumptions of this assessment by ground based assessment and ensure all medium to high impacts are mitigated. • Finalise the location and species for proposed screening, in consultation with nearest affected landholders and roads authority, where relevant. • Detail planting methods and maintenance requirements of the screen planting.		O	
• Plant and equipment to be properly maintained.	C		
• Avoid unnecessary noise when carrying out manual operations and when operating plant.	C		
• Switch of any equipment not in use for extended periods.	C		
• Establish good relations with people living in the vicinity of the site at the beginning of project and maintain. Keep people informed, take complaints seriously, deal with complaints expeditiously. The community liaison member of staff should be adequately experienced.	C		
Ground cover would be established and maintained beneath the array area as much as possible prior to and during construction, to minimise areas exposed to erosion.	**C**		
Areas of disturbed soil would be rehabilitated promptly and progressively during construction.	**C**		
A Ground cover management plan would be developed include and monitoring and triggers for action, to address any bare areas and erosion that develop beneath the array.		**O**	
A soil and water management plan, and erosion and sediment control plans, would be prepared, implemented and monitored during the project, in accordance with Landcom (2004), to minimise soil (and water) impacts. These plans would include provisions to: • At the commencement of the works, and progressively during construction, install the required erosion control and sediment capture measures. • Regularly inspect erosion and sediment controls, particularly following rainfall. • Maintain a register of inspection and maintenance of erosion control and sediment capture measures. • Ensure that machinery arrives on site in a clean, washed condition, free of fluid leaks. • Ensure that machinery leaves the site in a clean condition to avoid tracking of sediment onto public roads which may cause risks to other road users through reduced road stability. • In all excavation activities, separate subsoils and topsoils and ensure that they are replaced in their natural configuration to assist revegetation. • Stockpile topsoil appropriately, so as to minimise weed infestation, maintain soil organic matter, maintain soil structure and microbial activity. • Minimise the area of disturbance from excavation and compaction. • Ensure any discharge of water from the site is managed to ensure ANZECC (2000) water quality criteria are met. • Manage traffic generated soil erosion.	**C**		**D**

Safeguards and mitigation measures	C	O	D
• Manage works in consideration of heavy rainfall events; if a heavy rainfall event is predicted, the site should be stabilised and work ceased until the wet period had passed.			
A Spill Response Plan would be developed as part of the overall Risk Management Plan to prevent contaminants affecting adjacent surrounding environments. It would: • Manage the storage of any potential contaminants onsite. • Mitigate the effects of soil contamination by fuels or other chemicals (including emergency response and EPA notification procedures and remediation).	**C**	**O**	**D**
A protocol would be developed in relation to discovering buried contaminants within the proposal site (e.g. pesticide containers). It would include stop work, remediation and disposal requirements.	**C**		**D**
Dust suppression: • A water cart (truck) would be utilised, wetting access roads and exposed dusty surfaces in response to visual cues, as required. This includes stockpiled materials that exhibit significant dust lift. Stockpiles may be covered in preference to wetting. Stabilising techniques and/or environmentally acceptable dust palliatives may be utilised in preference to wetting or covering areas that generate dust.	**C**		**D**
• Any area that was temporarily used during construction (laydown and trailer complex areas) would be restored back to original condition or re-vegetated with native plants. • Areas that may not have been hard packed but have been disturbed in some form would be treated with environmentally acceptable dust palliatives and / or vegetated (e.g. by means of hydro seeding) with a suitable seed mix.		**O**	
All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills.	**C**	**O**	**D**
All fuels, chemicals, and liquids would be stored at least 50 m away from any waterways or drainage lines and would be stored in an impervious bunded area.	**C**	**O**	**D**
Adequate incident management procedures will be incorporated into the Construction Environmental Management Plan, including requirement to notify EPA for incidents that cause material harm to the environment (refer s147-153 Protection of the Environment Operations Act).	**C**	**O**	**D**
The refuelling of plant and maintenance of machinery would be undertaken in impervious bunded areas.	**C**	**O**	**D**
Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery. All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills	**C**		**D**
A Haulage Plan would be developed with input from the roads authority, including but not limited to: • Assessment of road routes to minimise impacts on transport infrastructure • Scheduling of deliveries of major components to minimise safety risks (on other local traffic) • Traffic controls (signage and speed restrictions etc.).	C		D
A Traffic Management Plan would be developed as part of the CEMP, with input from the road authorities and Parkes Shire Council. The plan would include, but not be limited to: • Assessment of road condition prior to construction on all local roads that would be utilised.	C		D

Safeguards and mitigation measures	C	O	D
• A program for monitoring road condition, to repair damage exacerbated by the construction and decommissioning traffic. • The designated routes of construction traffic to the site. • Carpooling/shuttle bus arrangements to minimise vehicle numbers during construction. • Scheduling of deliveries. • Community consultation regarding traffic impacts for nearby residents. • Consideration of cumulative impacts. • Traffic controls (speed limits, signage, etc.). • Procedure to monitor traffic impacts and adapt controls (where required) to reduce the impacts. • Providing a contact phone number to enable any issues or concerns to be rapidly identified and addressed through appropriate procedures.			
The proponent would consult with the Parkes Shire Council regarding the proposed upgrading of Pat Meredith Road. The upgrade would be subject to detailed design, and must be designed and constructed to the standards specified by the Parkes Shire Council	C		
The proponent would repair any damage resulting from project traffic (except that resulting from normal wear and tear) as required at the proponent's cost.	C	O	D
Development of a complaints procedure to promptly identify and respond to issues generating complaints.	C	O	D
Protocols to guide vehicle and construction equipment use, to minimise emissions would be included in construction and operational environmental management plans. This would include but not limited to Australian standards and (POEO Act).	C	O	D
Protocols would be included in construction and decommissioning to minimise and treat dust (water carts or similar in response to visual cues). This may involve installation of barriers such as shade cloth, to protect receivers.	C		D
All design and engineering would be undertaken by qualified a competent persons with the support of specialists as required.	**C**		
Transmission lines would be located as far as practical from residences, farm sheds, and yards in order to reduce the potential for both chronic and acute exposure to EMFs.	**C**		
Design of electrical infrastructure would minimise EMFs.	**C**		
Consultation with local community, to minimise impact of construction of adjacent agricultural activities and access.	C		
Consultation would be undertaken with Transgrid regarding connection to the substation and design of electricity transmission infrastructure.			
Consultation would be undertaken with extraction licences holders to inform them of the proposed solar farm construction and operational requirements.	C		
Removal of all above ground infrastructure and rehabilitation of areas disturbed during the operation of the solar farm, to allow a return to agricultural or alternate use.			D
The Community Consultation Plan would be implemented to manage impacts to community stakeholders, including but not limited to: • Protocols to keep the community updated about the progress of the project and project benefits. • Protocols to inform relevant stakeholders of potential impacts (haulage, noise etc.).	**C**		

Safeguards and mitigation measures	C	O	D
• Protocols to respond to any complaints received.			
Liaison with local industry representatives to maximise the use of local contractors, manufacturing facilities, materials.	**C**		
Liaison with local representatives regarding accommodation options for staff, to minimise adverse impacts on local services.	**C**		**D**
Liaison with local tourism industry representatives to manage potential timing conflicts with local events.	**C**		**D**
A Waste Management Plan (WMP) would be developed to minimise wastes. It would include but not be limited to: • Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy. • Quantification and classification of all waste streams. • Provision for recycling management onsite. • Provision of toilet facilities for onsite workers and how sullage would be disposed of (i.e., pump out to local sewage treatment plant). • Tracking of all waste leaving the site. • Disposal of waste at facilities permitted to accept the waste. • Requirements for hauling waste (such as covered loads).	C	O	D
Septic system to be installed and operated in accordance with Council's requirements.	C	O	
Develop a Bush Fire Management Plan with input from the RFS to include but not be limited to: • Management of activities with a risk of fire ignition. • Management of fuel loads onsite. • Storage and maintenance of firefighting equipment, including siting and provision of adequate water supplies for bush fire suppression. • The below requirements of *Planning for Bush Fire Protection 2006* - o Identifying asset protection zones o Providing adequate egress/access to the site o Emergency evacuation measures • Operational procedures relating to mitigation and suppression of bush fire relevant to the solar farm.	C	O	D
Should an item of historic heritage be identified, the Heritage Division (OEH) would be contacted prior to further work being carried out in the vicinity.	**C**	**O**	**D**

9 CONCLUSION

The proposed Parkes Solar Farm would be located approximately 10 km west of Parkes. The site is accessed via Henry Parkes Way and Pat Meredith Drive. The proposal would connect to the existing 132/66 kV Transgrid substation located on Pat Meredith Drive to the north of the site.

The proposed PV solar farm would produce up to 57 MVA or 65 MW of electricity. Development of the solar farm would make use of existing electricity infrastructure and contribute to Australia's transition to a low emission energy generation economy. The proposal is considered compatible with existing land uses and highly reversible upon decommissioning, returning the site to its previous agricultural capacity.

The key environmental risks have been investigated through specialist investigations:

- Aboriginal heritage impacts – impacts would be managed under a Cultural Heritage Management Plan.
- Biodiversity impacts – impacts from the removal of Inland Grey Box Woodland EEC for construction of the overhead 66KV powerline would require offsetting in accordance with the NSW Biodiversity Banking and Offsets Scheme.
- Visual impact – the low height infrastructure and onsite screening will minimise the view shed, and therefore visual impact will be low.
- Noise impacts – no exceedances of noise limits are predicted.

Issues raised via community engagement have been addressed in the EIA and proposal design. While uptake levels of community engagement activities for the proposal have been low, this is an indication of a low level of concern about and community support for the proposal.

A suite of management measures have been developed to address environmental impacts and risks to these and other physical, social and environmental impact areas. Key management strategies centre on management plans and protocols to minimise impacts and manage identified risks.

The impacts and risks identified are considered manageable with the effective implementation of the measures stipulated in this EIS. Impacts are considered justifiable and acceptable.

10 REFERENCES

ACIL Allen Consulting (2015) *Electricity Bill Benchmarks for Residential Customers – a Report to the Australian Energy Regulator*, prepared March 2015.

Alsema, E.A. de Wild-Scholten, M.J, Fthenakis, V.M. (2006). *Environmental Impacts of PV Electricity Generation - A Critical Comparison of Energy Supply Option*s. 21st European Photovoltaic Solar Energy Conference, Dresden, Germany, 4-8 September 2006.

Australian Renewable Energy Agency (n.d.) *Establishing the social licence to operate large scale solar facilities in Australia: insights from social research for industry* (ARENA n.d.).

Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). (2015). *Fact Sheet 19: Electricity and health.* Accessed January 2016, from http://www.arpansa.gov.au/pubs/factsheets/019is_electricity.pdf,

Australian Bureau of Statistics (ABS) (2011). *2011 Census QuickStats: Grffith (C) Code LGA 13450 (LGA).* Accessed January 2016, from http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/LGA13450?opendocument&navpos=220

Australian Government (2016) National Pollutant Industry, http://www.npi.gov.au/npidata/action/load/map-search accessed March 2015.

Australian Greenhouse Office (AGO). (2003). *Climate change: An Australian Guide to the Science and Potential Impacts*. Australian Greenhouse Office, edited by B Pittock, 2003.

BLM (n.d.) BLM Visual Resource Management System. Available online from the Bureau of Land Management, US Department of the Interior. (www.blm.gov)

Bureau of Meteorology (2016) Australian Groundwater Explorer, from http://www.bom.gov.au/water/groundwater/explorer/map.shtml

BREE. (2012). *Australian Energy Technology Assessment*. BREE, Canberra.

Chang, G.J. and Jennings, C. (1994). *Magnetic Field Survey at PG&E Photovoltaic Sites*. Accessed January 2016, from http://www.osti.gov/bridge/servlets/purl/82309-WOEtJb/webviewable/82309.pdf,

Commonwealth of Australia. (2006). *Australia State of the Environment 2006*. 'Human Settlements'. Accessed January 2016, from https://www.environment.gov.au/system/files/resources/b0832197-9ef7-4f72-8c0b-2b726d08fa26/files/soe-2006-report.pdf

CSIRO. (2015). *Climate Change in Australia*. Accessed January 2016 from http://www.climatechangeinaustralia.gov.au/en/

Department of Environment and Climate Change (DECC) (2008a). *Managing Urban Stormwater: Soils and Construction Volume 2A –Installation of Services.* DECC, Sydney South.

Department of Environment and Climate Change (DECC) (2008b). *Managing Urban Stormwater: Soils and Construction Volume 2C –Unsealed Roads*, DECC, Sydney South.

Department of Environment and Climate Change. (2009a). *Interim Construction Noise Guideline.* Sydney: Department of Environment and Climate Change.

Department of Environment, Climate Change and Water (DECCW) (2011). *NSW Road Noise Policy*. DECCW, Sydney.

Department of Environment and Conservation. (2006). *Assessing Vibration: a technical guideline*. Sydney: Department of Environment and Conservation.

Department of Environment and Planing (2007) *Guidelines for Major Project Community Consultation*. Sydney, October 2007.

Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education (DIICCSRTE 2013) *AUSTRALIAN NATIONAL GREENHOUSE ACCOUNTS, National Greenhouse Accounts Factors*, prepared 2013.

Department of Infrastructure and Transport (DIT 2011) *Light vehicle CO_2 emissions standards for Australia - Key Issues Discussion Paper*, prepared 2011.

NSW Department of Planning (2010). Discussion Paper On Planning For Renewable Energy Generation - Solar Energy, prepared April, 2010.

Department of Trade and Investment. (2016). *MinView*. Accessed January 2016, from http://minview.minerals.nsw.gov.au/mv2web/mv2

EMFs.info. (2016). *EMFs.info Electric and Magnetic Fields*. Accessed January 2016, from http://www.emfs.info/

EPA. (2000). *NSW Industrial Noise Policy*. Sydney: EPA.

Fraunhofer Institute for Solar Energy Systems (ISE). (2015). *Photovoltaics Report*. Accessed 26 November 2015, from https://www.ise.fraunhofer.de/de/downloads/pdf-files/aktuelles/photovoltaics-report-in-englischer-sprache.pdf

Fthenakis, V., Kim, H.C., Frischknecht, R., Raugei, M., Sinha, P., Stucki, M. (2011). Life Cycle Inventories and Life Cycle Assessment of Photovoltaic Systems, International Energy Agency (IEA) PVPS Task 12, Report T12 - 02:2011.

Geoscience Australia (2015) *Australian Stratigraphic Units Database*. From http://dbforms.ga.gov.au/pls/www/geodx.strat_units.int

Geoscience Australia and ABARE (GA and ABARE) (2010). *Australian Energy Resource Assessment*, Canberra.

Green Energy Markets (2015) *Renewables Report*, prepared December 2015.

Horton, D. (ed.) (1994). *The Encyclopedia of Aboriginal Australia: Aboriginal and Torres Strait Islander History, society and culture*. Aboriginal Studies Press, Canberra.

Howitt, A. W. (1996). *The Native Tribes of South-East Australia*. Aboriginal Studies Press, Canberra.

Ipsos (2015). *Establishing the Social Licence to Operate Large Scale Solar Facilities in Australia: insights from social research for industry.* Australian Renewable Energy Agency.

Landcom (2004). *Managing Urban Stormwater, Soils & Construction* (Volume 1).NSW Government.

MacDonald, G. (1983). *The Concept of Boundaries in Relation to the Wiradjuri People of Inland New South Wales: An assessment of Inter-group Relationships at the Time of European Conquest*. Report prepared for Wiradjuri Land Council.

Murrumbidgee Irrigation Area Bush Fire Management Committee. (2008). Bush Fire Risk Management Plan. Accessed January 2016, from http://www.rfs.nsw.gov.au/__data/assets/pdf_file/0017/2384/Murrumbidgee-Irrigation-Area-BFRMP.pdf

National Health and Medical research Council (NHMRC). (1989). *Interim guidelines on limits of exposure to 50/60 Hz electric and magnetic fields*. Radiation Health Series No. 30. Commonwealth of Australia.

NSW Government (2005) Floodplain Development Manual, the management of flood liable land.

NSW Government (2016a) *NSW OEH contaminated site register*. Accessed 16 January 2016, from http://www.epa.nsw.gov.au/prclmapp/searchregister.aspx

NSW Government. (2016b). *Contaminated sites notified to EPA*. Accessed 16 January 2016, from http://www.epa.nsw.gov.au/clm/publiclist.htm

NSW National Parks and Wildlife Service. (2003). *The bioregions of New South Wales – Their biodiversity, conservation and history*. 'Chapter 9 Cobar Peneplain'. Accessed January 2016, from http://www.environment.nsw.gov.au/bioregions/CobarPeneplainBioregion.htm

NGH Environmental. (2014). *Parkes Solar Farm Scoping Report*. Report Prepared for Neoen Pty Ltd.

NGH Environmental. (2014). *Parkes Solar Farm Constraints Analysis Report*. Report Prepared for Neoen Pty Ltd.

OEH. (2010a). *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales.*

OEH. (2010b). *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010.*

OEH (2016) *eSPADE.* Accessed 16 January 2016, from http://www.environment.nsw.gov.au/eSpadeWebapp/

OEH. (2011). *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW.*

OEH 2014 Framework for Biodiversity Assessment (FBA), the NSW biodiversity offsets policy developed for Major Projects.

NSW Office of Environment and Heritage (2011) South Western Slopes. Webpage http://www.environment.nsw.gov.au/bioregions/NSWSouthWesternSlopesBioregion.htm accessed 10 March 2016.

Parkes Shire Council. (2015). *Parkes Economic and Business Development*. Accessed January 2016, from http://www.parkes.nsw.gov.au/economic-development

Pogson, D.J. (1974). *Narrandera 1:250,000 Geological sheet*. Geological survey of NSW, Sydney.

Roads and Maritime Services (2015), Newell Highway, http://www.rms.nsw.gov.au/projects/western-nsw/newell-highway/index.html accessed 10 March 2016.

Schleisner L. (2000). *Life cycle assessment of a wind farm and related externalities Renewable* Energy, vol. 20, pp. 279-288.

Singh, R.P., Mullen, J .D ., and Jayasuriya , R.T. (2005). *Farming Systems in the Murrumbidgee Irrigation Area in NSW*. Economic Research Report No. 10, NSW Department of Primary Industries, Yanco. http://www.agric.nsw.gov.a/reader/10550

Spaven Consulting (2011). Solar Photovoltaic Energy Facilities: Assessment of potential for impact on aviation. Report prepared January 2011, for RPS Planning and Development.

Tindale, N.B. (1974). Aboriginal *Tribes of Australia*. ANU Press, Canberra.

Twyford Consulting. (2007). *Beyond Public Meetings: Connecting community engagement with decision making*, prepared by Twyford Consulting.

U.S. Department of Energy. (2004). *PV FAQs.* Accessed January 2016 from http://www.nrel.gov/docs/fy04osti/35489.pdf

World Health Organisation (WHO) (2007). *Electromagnetic fields and public health: Exposure to extremely low frequency fields*, Fact sheet N°322. Accessed January 2016, from http://www.who.int/mediacentre/factsheets/fs322/en/index.html

World Health Organisation (WHO). (2012). *Electromagnetic Fields*. Accessed January 2016 from http://www.who.int/peh-emf/about/WhatisEMF/en/

Wright, M. and Hearps, P. (2010). *Australian Sustainable Energy Zero Carbon Australia Stationary Energy Plan*, University of Melbourne Energy Research Institute- Beyond Zero Emissions.