Modification Application

WELLINGTON SOLAR FARM SUBSTATION EXPANSION

OCTOBER 2019

Document Verification

Project Title: Wellington Solar Farm substation expansion

Project Number: 19 -453

Project File Name: Modification Application Substation Expansion v1.126092019 bm

Revision	Date	Prepared by (name)	Reviewed by (name)	Approved by (name)
Final v1	13/08/19	Michelle Patrick	Brooke Marshall	Brooke Marshall
Final v 1.1	02/10/19	Michelle Patrick	Brooke Marshall	Brooke Marshall

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CONTENTS

TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

ACHA	Aboriginal Cultural Heritage Assessment
BAR	Biodiversity Assessment Report
BC Act	*Biodiversity Conservation Act 2016*
BOS	Biodiversity Offset Scheme
CEEC	Commonwealth Endangered Ecological Community
Cwth	Commonwealth
DPIE	(NSW) Department of Planning, Industry and Environment
EEC	NSW Endangered Ecological Community
EIS	Environmental impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
ha	hectares
km	kilometres
LGA	Local Government Area
LSBP	Lightsource BP, the proponent
m	Metres
MW	Megawatt
MNES	Matters of National Environmental Significance under the EPBC Act (*c.f.*)
NSW	New South Wales
PV	Photovoltaic
SSD	State Significant Development
VIA	Visual Impact Assessment

1 INTRODUCTION

1.1 THE APPROVED PROJECT

The Wellington Solar Farm is located 2 km north-east of Wellington in the Dubbo Regional Local Government Area (LGA).

The Development Consent was approved by the Executive Director Department of Planning and Environment (DPE) on May 25, 2018 (Application Number: SSD 8573) under Section 4.38 of the *Planning and Environment Act. 1979*. The development application is approved under Schedule 1, subject to the conditions in Schedules 2-4.

The conditions are required to:

- Prevent and/or minimise any adverse environmental impacts of the development
- Set standards and performance measures for acceptable environmental performance
- Provide for the ongoing environmental management of the development.

The existing consent permits the construction, operation and decommissioning of a 174 Megawatt (MW AC) photovoltaic (PV) solar farm and associated infrastructure including:

- A substation within TransGrid's Wellington substation containing one transformer and associated infrastructure
- Battery storage facility
- An overhead transmission line connecting the battery storage facility to the substation
- Access tracks, staff amenities, car parking, laydown area and security fencing.

Refer to Appendix A; Consented layout.

A Modification Application is required to change the overhead transmission line connecting the Project to the Wellington Substation to underground, amend the location of where the transmission line enters the Wellington Substation, extending its length by approximately 110 m, and extend the Wellington substation bench to allow for the substation equipment.

1.2 BACKGROUND

1.2.1 Environmental Impact Statement (EIS)

The Environmental Impact Statement (EIS) was completed by NGH Environmental in 2017. Table 1-1 below includes the environmental risk assessed in the EIS in Sections 7 & 8. The higher risk assessment required specialist input. The lower risk impacts were assessed as part of the EIS. The EIS impact assessments were

considered manageable through appropriate mitigation measures. The EIS public exhibition period was 14 December 2017 until the 28 January 2018.

Table 1-1 Environment risk assessed in the EIS.

Specialist Input – Higher **R**isk	Lower Risk
• Biodiversity • Aboriginal heritage • Visual amenity • Noise • Historic heritage	• Traffic, transport and road safety • Land use impacts (including mineral resources) • Soils • Hydrology (surface and groundwater), water quality and water use • Flooding • Resource use and waste generation • Community and Socio-economic • Air quality and climate • Hazards

1.2.2 Modification Application - overview

This Modification Application is lodged to address required alterations to the approved substation, work to facilitate connection of the Wellington Solar Farm to the existing TransGrid substation. The substation expansion requires underground transmission cables to be installed along and south of the approved alignment for the overhead transmission line, and a small expansion to the substation infrastructure to the south. The entire easement area for the underground transmission cables and substation expansion covers 0.69 hectares (ha). This will impact the following native vegetation plant communities:

- White Box grassy woodland – planted: 0.02 ha
- White Box grassy woodland derived grassland (assessed as moderate to good condition in 2017, now moderate to low due to drought and grazing): 0.36 ha
- White Box grassy woodland derived grassland (low condition): 0.30 ha

Importantly, of the 0.69 ha proposed to be impacted by this modification, 0.32 ha would have been impacted by the approved overhead transmission line alignment, including the 0.02 ha of White Box grassy woodland – planted (refer to Section 2 and Section 6.2).

All works would occur within the originally approved project boundary; refer to Figure 2-2.

This modification application requires specialist input for biodiversity, heritage and noise, as follows:

- A desktop assessment of the Aboriginal Heritage matters (Section 6.1) and preparation of the letter to notify the Registered Aboriginal Stakeholders, completed by NGH (Appendix D.1).
- A standalone Biodiversity Development Assessment Report, including additional field survey, completed by NGH (Appendix D.2).
- An update of the noise and vibration assessment completed by Renzo Tonin (Appendix D.1).

Further assessment of traffic and visual amenity were also required. This is provided in Section 6.

1.3 THE PROPONENT

In March 2019, Lightsource BP ('The Proponent') purchased the Wellington Solar Farm.

Lightsource and BP formed a strategic partnership in 2017 with the aim of combining Lightsource's solar development and management expertise and BP's global scale, relationships and trading capabilities, forming Lightsource BP (LSBP).

LSBP is a global leader in the development, acquisition and long-term management of large-scale solar projects and smart energy solutions. The company is Europe's largest developer and operator of utility-scale solar projects. LSBP has commissioned 1.3 Gigawatt (GW) of solar capacity and manages approximately 2 GW of capacity under long-term operations and maintenance contracts.

1.4 PURPOSE OF THIS DOCUMENT

This report has been prepared to support an application to modify Development Consent SSD 8573. It includes:

- Detailed description of the modifications being sought. Section 2
- Detailed justification for the modification being sought. Section 3
- Details of the consultation undertaken in relation to the proposed modifications. Section 4
- Legislative context for the Modification Application. Section 5
- Assessment of relevant additional impacts. Section 6
- An outline of the amendments sought to the development consent. Section 7

This report has been prepared by NGH Environmental on behalf of the Proponent, LSBP.

2 PROPOSED PROJECT CHANGES

The existing Wellington substation, into which the Wellington Solar Farm will connect, is located south of Goolma Road, approximately 2km from Wellington, NSW (Figure 2-1). The area surrounding the substation was assessed as part of the Environmental Impact Statement (EIS) completed by NGH Environmental (2017).

The consented layout, provided in Appendix A, shows that the overhead transmission line connecting to the substation from the solar farm:

- Follows the Goolma Road corridor east from where it exits the solar farm
- Crosses Goolma Road, heading south
- Veers west halfway down the substation compound, connecting to the western section of the existing substation

TransGrid have advised that there is a need to extend the substation footprint beyond the existing fence line and re-locate the approved point of connection of the transmission line into the substation. The modified layout now allows for an underground transmission cable[1] connection to the substation from the solar farm, which will:

- Exit the solar farm directly north of where it crosses Goolma Road
- Cross Goolma Road, heading south
- Veer west at the southern end of the substation compound, connecting at the south-western corner of the existing substation.

Additionally, an expansion of the existing substation compound is required to house the following equipment:

- Power transformer (132/33kV)
- 132kV bus bar extension
- 132kV current transformer
- 132kV voltage transformer
- 33kV bus for the transformer secondary side (includes the 33kV cable connections)
- 33kV switch room building, including the 33kV switchboard
- Harmonic filters

In total, the modified works require 6,913 m^2 (0.69 ha) of ground disturbance. The substation expansion includes:

- An underground transmission line to be located along the approved alignment of the overhead transmission line to the existing substation under the consented layout (NGH Environmental 2018) 301m x 11 m = 3,260m^2 (0.32 ha).
- Proposed substation bench extension - 110m x 16-36m = 2,563m^2 (0.26 ha).
- Remaining easement for the underground transmission line – 4,350 m^{22} (0.43 ha).

Importantly, of the 0.69 ha of ground disturbance associated with this modification, 0.32 ha would have been impacted by the approved overhead transmission line alignment.

Notes:

- The approved overhead transmission line was 191m in length. The additional proposed underground transmission line is 110m in length resulting in a total of 301m. The approved overhead line is now proposed to be underground and as such, the entire 301m will now be underground.
- The easement width of 11 m is used in this assessment for the underground transmission line trench.
- All works remain within the consented development site boundary.

The proposed substation expansion easement is shown in Figure 2-2 and 2-3.

Subject to approval, the construction works are planned to be begin late October 2019.

[1] This will be a bundle of approximately seven cables. Refer to cross section, Appendix B.

GENERAL LAYOUT OF DEVELOPMENT

Wellington Solar Farm

Approved OAM building (alternative)

Approved OAM building

Approved temporary construction compound and parking

Approved site access with planting

COBBORA ROAD

WUULUMAN CREEK

GOOLMA ROAD

TWELVE MILE ROAD

BELLA VISTA LANE

PINDARI GROVE

- Development exclusion zone (excluding rehabilitation undertaken in accordance with the Biodiversity Management Plan)
- Approved internal road
- Underground transmission line easement
- Approved infrastructure
- Project boundary
- Existing substation
- Local road
- Highway
- Existing transmission lines
- Farm dam / other water body
- Drainage line
- Approved overhead transmission line
- Proposed underground transmission line
- Approved landscaping (5m wide planting)
- Approved landscaping grove
- Approved battery storage facility
- Approved temporary laydown area and parking / turning circle
- Approved substation
- Proposed substation expansion

Constraints

- Aboriginal heritage item (isolated find)
- Aboriginal heritage item (artefact scatter)
- Hearth site
- Potential archaeological deposit (PAD)
- Scarred tree
- Historic heritage site (OAM building)
- Sensitive receiver
- Drainage line (40m)
- Potential rocky outcrops

Vegetation exclusion zones

- Vegetation constraint (CEEC)
- Vegetation constraint (EEC moderate to good condition)

0 100 200 400 m

A3 @ 1:12,500
Ref: SW121 EIS v20190913
Author: TH Date: 3/10/2019

Notes:
- Base map © Esri and its data suppliers.
- Base layers from LPI and Geoscience Aust, 2017

GENERAL LAYOUT OF DEVELOPMENT
Substation expansion

Wellington Solar Farm

- Development exclusion zone (excluding rehabilitation undertaken in accordance with the Biodiversity Management Plan)
- Project boundary
- Existing substation
- Farm dam / other water body
- Approved infrastructure
- Approved overhead transmission line
- Proposed underground transmission line
- Approved internal road
- Approved landscaping (5m wide planting)
- Approved landscaping grove
- Approved substation
- Proposed substation expansion
- Proposed Substation Bench
- Underground transmission line corridor
- Vegetation constraint (CEEC)
- Vegetation constraint (EEC moderate to good condition)

Notes:
- Data collected by ngh 2017-19
- Client data courtesy of Client, received 2011-29
- Base map Copyright © Esri and its data suppliers.

A4 @ 5,000
Ref: SW121 EIS v20190913
Author: T.Hastings 02/10/2019

ngh environmental

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3 JUSTIFICATION

Whilst completing the detailed designs for the approved project, TransGrid advised Lightsource BP there was not sufficient space within the existing substation's footprint to accommodate all the required equipment to facilitate the connection of the Wellington Solar Farm to their substation. As such, the Modification Application is required to extend the Wellington Substation's bench in order to accommodate the switchgear, transformer, oil containment tank and 33 kV GIS building.

4 CONSULTATION

4.1 TRANSGRID

Consultation with TransGrid regarding the modifications has been undertaken as follows:

- Discussion with Lightsource about the development footprint, as above.

4.2 DPIE

The proposed modification application was discussed with the Department of Planning, Industry and Environment (DPIE) in late July – early August 2019.

The Modification Application was submitted to DPIE in August 2019 but in the letter (dated 06/09/2018) from Department of Planning, Industry and Environment (DPIE) a requested completion of a standalone Biodiversity Development Assessment Report (BDAR), pursuant to the new *Biodiversity Conservation Act, 2017 (BC Act)* instead of the updated Framework for Biodiversity Assessment (FBA) Biodiversity Assessment Report submitted. It is understood this relates to a clause introduced into the Biodiversity Conservation (Savings and Transitional) Regulation 2017, on 10 August 2018. Modifications submitted after this date are bound to the new assessment methodology.

4.3 AGENCIES

Lightsource BP discussed the underground cable crossing of Goolma Road with Dubbo Regional Council and the Roads and Maritime Services (RMS) in late July 2019. From this consultation, both agencies have advised there are no outstanding concerns, pending approval of a road opening permit.

NGH spoke with the Biodiversity and Conservation Division (BCD) of DPIE in early September 2019 to determine the requirements of the BDAR. It was determined that the 2017 targeted surveys for flora and fauna completed by NGH at the subject site and for Wellington Solar Farm could be used as appropriate to supplement the 2019 field surveys.

The Biodiversity Conservation Trust (BCT) was contacted about the species credits generated for the Regent Honeyeater to clarify if the impact on the Box Gum Woodland near Goolma Road from the development would result in loss of breeding habitat. At this stage of the development, the removal of 0.02 hectares of Box Gum Woodland for the substation expansion is highly unlikely to impact breeding habitat for the Regent Honeyeater as there are no hollow bearing trees within the development footprint but further clarification is pending from BCT.

4.4 REGISTERED ABORIGINAL STAKEHOLDERS (RAPS)

A letter of notification to RAPs has been prepared as part of this modification application and a copy provided at the time of submission of this Modification Application. It is provided in Appendix D.1.

RAPs provided support for the proposed substation expansion in letter responses dated August 22, 2019.

4.5 NEAR NEIGHBOURS AND BROADER COMMUNITY

The modifications would have negligible impact on near neighbours and the broader community and therefore, no consultation regarding the Modification Application has been undertaken.

5 PERMISSIBILITY

5.1 APPROVAL STATUS

The Development Consent was approved by the Executive Director Department of Planning and Environment (DPE) on May 25, 2018 (Application Number: SSD 8573) under Section 4.38 of the *Planning and Environment Act. 1979*. Project approval permits the construction, operation and decommissioning of a 174 Megawatt (MW) photovoltaic (PV) solar farm and associated infrastructure.

5.2 CONSISTENCY WITH EXISTING APPROVAL

Changes which are consistent with the Development Consent do not require a Modification and can be constructed under the existing approval. A review of the modifications against the consent was undertaken (Appendix C) to determine:

- Whether the changes proposed would be substantive changes to the project's nature or description.
- Whether the changes proposed would have a material change to predicted environmental impacts.
- Whether the changes proposed would impact on the ability to meet any Development Consent.

The review concluded that:

- The changes proposed would not substantively change the project. The project would still involve the construction, operation and decommissioning of a 174MW solar farm.
- Five environmental aspects were identified for closer investigation, to ascertain if material impacts would result:
    - Biodiversity
    - Aboriginal heritage
    - Noise and vibration
    - Visual amenity
    - Traffic and transport
    - Cumulative impacts
- Regarding the ability to meet the Development Consent:

- The changes generally correspond to mapped 'proposed infrastructure', and this is noted as indicative in the EIS.
- The changes now require impacts in an area designated as a 'Development Exclusion Zone' (being NSW listed vegetation in moderate to good condition).
- Obligation to minimise harm to the environment: There is minor additional vegetation removal and soil disturbance that is necessary and can be managed effectively.
- Associated native vegetation impacts will generate an additional offset obligation.

5.3 MODIFICATION APPLICATION

This Modification Application is being lodged under Section 4.55(1A) of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Under Section 4.55 of the EP&A Act, an SSD Development Consent can be modified where the "*development to which the consent as modified relates is substantially the same development as the development for which the consent was originally granted*".

In determining an application for a modification under section 4.55 of the EP&A Act, the consent authority must consider such matters referred to in section 4.40 as are relevant to the development. These matters include the likely impacts of the proposed amendments to the Development Consent, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality.

Modifications are allowed that are 'substantially the same development'. Section 1(A) and Section 2 of Clause 4.55 differ regarding whether the proposed modification is of minimal environmental impact or not.

Environmental Planning and Assessment Act 1979 extract

4.55 Modification of consents—generally

(1A) Modifications involving minimal environmental impact

A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if:

(a) it is satisfied that the proposed modification is of minimal environmental impact, and

(b) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which the consent was originally granted and before that consent as originally granted was modified (if at all), and

(c) it has notified the application in accordance with:

(i) the regulations, if the regulations so require, or

(ii) a development control plan, if the consent authority is a council that has made a development control plan that requires the notification or advertising of applications for modification of a Development Consent, and

(d) it has considered any submissions made concerning the proposed modification within any period prescribed by the regulations or provided by the development control plan, as the case may be.

Subsections (1), (2) and (5) do not apply to such a modification.

(2) Other modifications

A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if:

(a) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all), and

(b) it has consulted with the relevant Minister, public authority or approval body (within the meaning of Division 4.8) in respect of a condition imposed as a requirement of a concurrence to the consent or in accordance with the general terms of an approval proposed to be granted by the approval body and that Minister, authority or body has not, within 21 days after being consulted, objected to the modification of that consent, and

(c) it has notified the application in accordance with:

(i) the regulations, if the regulations so require, or

(ii) a development control plan, if the consent authority is a council that has made a development control plan that requires the notification or advertising of applications for modification of a Development Consent, and

(d) it has considered any submissions made concerning the proposed modification within the period prescribed by the regulations or provided by the development control plan, as the case may be.

Subsections (1) and (1A) do not apply to such a modification.

The proposed changes within this Modification Application would involve minimal environmental impact. As such, this Modification Application is being lodged under Section 4.55(1A) of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Additional impacts that may result from the changes in this Modification Application are assessed, in Section 6, below.

6 IMPACT ASSESSMENT

A review of the proposed modifications against the consented project, provided in Appendix C, identified areas where potential for material changes to predicted environmental impacts could result from the project alterations.

- Aboriginal heritage
- Biodiversity

- Noise and vibration
- Visual amenity
- Traffic, transport and road safety

These areas were investigated in greater detail. Specialist reports are appended, where warranted.

Cumulative impacts are also considered.

6.1 ABORIGINAL HERITAGE

6.1.1 Approach and assessment context

The Wellington Solar Farm EIS (NGH Environmental 2017) included a specialist Aboriginal Cultural Heritage Assessment Report (ACHAR) that included an assessment of the Aboriginal cultural values associated with the proposal site.

Based on the ACHAR report and the proposed footprint for the substation expansion, a desktop study was undertaken. The desktop study aims to assess and identify if the proposed modification layout has been previously subject to assessment and if there are any known Aboriginal sites or objects located within or in proximity to the proposed modification development footprint.

6.1.2 Modification assessment

The Aboriginal Heritage Information Management System (AHIMS) is maintained by the NSW Office of Environment and Heritage (OEH) and provides a database of previously recorded Aboriginal heritage sites. A search provides basic information about any sites previously identified within a search area. The results of the search can be relied upon for 12 months.

An extensive AHIMS search (Client Service Number: 435832) was undertaken on the on the 17th of July 2019 over an area approximately 5 km east-west x 5 km north-south which centred on the proposed modification area at the Wellington substation. A total of 39 registered sites were identified within the search area, but no Aboriginal Places have been declared. Most of the sites recorded in proximity to the proposed modification area were recorded recently during surveys conducted for the Wellington Solar Farm and Wellington North Solar Plant by NGH Environmental archaeologists with Aboriginal community representatives.

None of the AHIMS sites were recorded within the proposed modification development footprint.

The proposed substation expansion would include the realignment of the transmission line and additional infrastructure at the substation. The proposed development footprint is deemed to have been sufficiently assessed and surveyed during the field work previously conducted for the Wellington Solar Farm and Wellington North Solar Plant projects by NGH Environmental archaeologists with Aboriginal community representatives. It should be noted that the Registered Aboriginal Parties for both projects were the same and therefore review of field assessment data from both projects is acceptable in this instance. During the previous surveys conducted in proximity to the substation the landforms in the proposed modification development footprint and generally surrounding the existing substation were deemed to have low archaeological sensitivity and to have been highly disturbed and modified by the construction and maintenance of the existing substation and its associated transmission lines.

The desktop assessment, combined with the review of previous field data and results, have concluded that the proposed modification development footprint has previously been adequately assessed by archaeologist with Aboriginal community representatives and does not require further assessment. No Aboriginal objects/sites or areas of potential archaeological deposit were identified within or adjacent to the proposed modification development footprint

6.1.3 Recommendations

The consented mitigation strategies apply equally to this modification, specifically:

- Proposed works should remain within the assessed areas or be subject to further assessment.
- The Cultural Heritage Management Plan (CHMP) that has been developed for the project must be followed.
- If items suspected of being Aboriginal in origin are discovered during the work the unexpected finds procedure as provided in the CHMP must be followed.

Additionally, however, it is recommended that:

- The Registered Aboriginal Parties must be informed about the proposed modification prior to the lodgement of a modification application.

6.2 BIODIVERSITY

6.2.1 Background

Submissions Report (NGH 2018)

Appendix C of Submissions Report (NGH 2018) updated the vegetation impacts previously calculated in the Environmental Impact Statement, specifically on White Box – Yellow Box – Blakely's Red Gum Woodland, to provide the final approved vegetation clearing amount for the project. A reduction was achieved and approved, totalling 8.48 ha as outlined Table 6-1, when compared to the EIS calculations.

Table 6-1 Comparison of the zones generating offsets presented in the EIS and then updated by the Submissions Report (approved amount)

Zone ID	Vegetation zones	Condition class	Impacted area from EIS (ha)	Revised impact area in Submissions Report (ha)	Net (ha)
2.	PCT #266 BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	Moderate/Good Other (Planted Vegetation)	0.90	0.00	-0.90
4.	PCT #266 BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	Moderate – good	1.81	0.06	-1.75
5.	PCT #266 BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	Derived Grassland – Moderate to Good	5.86	0.03	-5.83
Total			8.57	0.09	-8.48

The updated credit liability for Wellington Solar Farm development was 3 ecosystem credits as outlined in Table 6-2.

Table 6-2. Ecosystem credits for the Wellington Solar Farm

Zone ID	Vegetation zones	Condition class	Credits required in EIS	Revised credit requirement in Submissions Report	Net
2.	PCT #266 BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	Moderate/Good Other (Planted Vegetation)	26	0	-26
4.	PCT #266 BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	Moderate – good	56	2	-54
5.	PCT #266 BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	Derived Grassland – Moderate to Good	121	1	-120
Total			**203**	**3**	**-200**

6.2.2 Approach and assessment context

The credit requirement for the modification application, if approved, will be additional to the above approved credit requirement.

The Biodiversity Development Assessment Report (BDAR) for the Wellington Substation Expansion was prepared by NGH Environmental on behalf of Lightsource BP in September 2019. The BAM credit calculations reflect the substation expansion footprint (Appendix D.2).

A site visit was completed September 17 and 18, 2019 to complete a flora survey and augment targeted surveys from 2017. The outcomes of this BDAR are summarised below.

6.2.3 Modification assessment

The objectives for the BDAR are to:

1. Address the requirements of the *Biodiversity Conservation Act, 2017*, where development may trigger the Biodiversity Offset Scheme (BOS).
2. Assess the proposal in relation to Matters of National Environmental Significance as per the *Environment Protection Biodiversity Conservation* (EPBC Act)

The BDAR uses the site-based Biodiversity Assessment Methodology (BAM).

Vegetation communities identified on site in 2017

One Plant Community Type (PCT) was identified within the substation expansion development site in the 2019 vegetation surveys (See Figure 6-1). This PCT determination was based upon the field surveys completed by NGH in 2017 and 2019. The PCT is White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes (PCT 266). The PCT was categorised on the quality of the vegetation to determine which impacted areas require an offset or a potential EPBC referral.

Changes in offset requirements for the substation expansion

The impacts associated with the modification occur in three homogenous vegetation zones[2]:

- Vegetation Zone 2 - White Box grassy woodland – planted: 0.02 ha
- Vegetation Zone 5 - White Box grassy woodland derived grassland (assessed as moderate to good condition in 2017, now moderate to low due to drought and grazing): 0.36 ha
- Vegetation Zone 6 - White Box grassy woodland derived grassland (low condition): 0.30 ha

Importantly, the 0.02 ha of White Box grassy woodland – planted would have been impacted by the approved overhead transmission line alignment.

The 0.69 ha that would be impacted by the modified project layout includes 0.38 ha within the Development Exclusion Zone, identified because it is a significant NSW EEC in moderate to good condition in the 2017 field survey (NGH 2017). But in 2019, due to heavy grazing and drought, Vegetation Zone 5 was assessed as low to moderate quality.

[2] Condition and structural changes in a PCT necessitate different zones being delineated and represented in the assessment.

Targeted surveys were undertaken for candidate flora species where habitat elements were known to exist onsite. Of the flora species surveyed, none were found during targeted survey.

The majority of fauna candidate species identified in the calculator were excluded from further assessment due to a lack of suitable habitat available onsite. Due to time constraints fauna surveys were not conducted for species that had not been previously assessed such as the Pink-tailed Legless Lizard, Bush Stone-curlew, White-bellied Sea-eagle, Square-tailed Kite and Little Eagle. These were all assumed to be present. Other fauna surveyed in 2017 had sufficient data to exclude them with the exception of the Regent Honeyeater, which was considered to use the site on occasion, however the development is unlikely to impact upon breeding habitat for this species.

No hollow bearing trees will be impacted by this proposal.

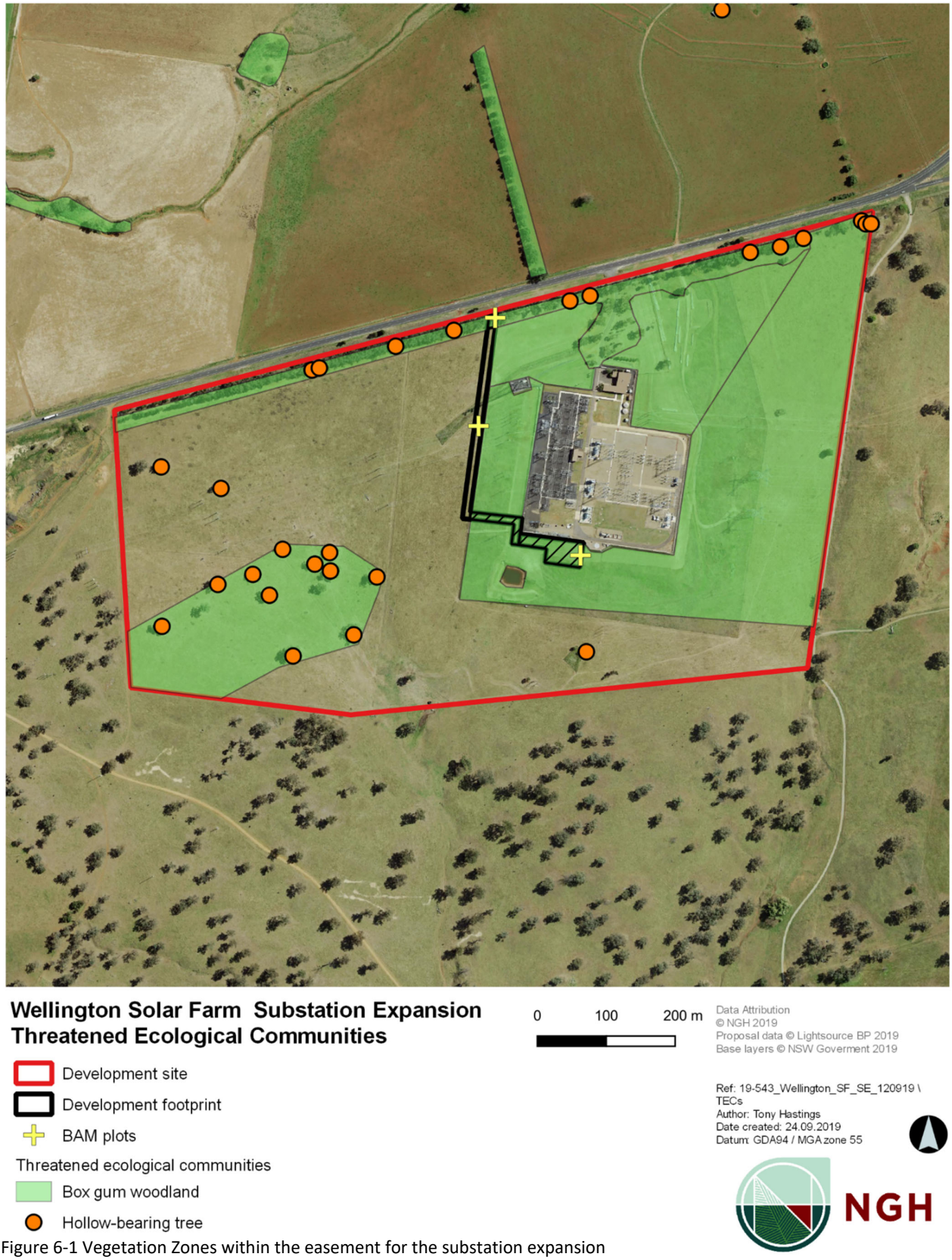

Figure 6-1 Vegetation Zones within the easement for the substation expansion

Table 6-3 Changed impact areas; EIS (2017), Submissions Report (2018) and Modification Application (2019).

Zone ID	Vegetation zones	Condition class	Total impact areas		
			EIS 2017 (ha)	Submissions Report 2018 (ha) (consented)	This Modification application 2019 (ha)
1	PCT #277 BVT CW112 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Low	0.32	0.27	0
2	PCT #266BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	Moderate/Good Other (Planted Vegetation)	0.9	0	0.02
3	BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	Low	1.75	1.98	0
4	PCT #266 BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	Moderate – good	1.81	0.06	0
5	PCT #266BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	Derived Grassland – Moderate to Good	5.86	0.03	0.36
6	PCT #266BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	Derived Grassland - Low	133.59	132.06	0.3
Total Difference (ha)			**144.23**	**134.40**	**0.69**

Ecosystem credits

The vegetation community type, quality and hectare size are entered into the BAM Calculator to determine the project's offset requirements (made up of ecosystem and species credits). The ecosystem credits generated in association with the modification application, are shown below.

Table 6-4-PCTs and vegetation zones that require offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score	Ecosystem credits required
2	266	White-Box Grassy woodland planted – mod-good Consisted of rows of predominantly Yellow Box and White Cypress-pines with very little understorey	0.02	40.4	1

Species credits

An offset is required for the threatened species impacted by the development that require species credits. These species and the species credits required are shown below.

Table 6-5 Species credit species that require offsets

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost	Species credits required
Pink-tailed Legless Lizard	2	0.69	2
Bush Stone-curlew	2	0.02	0
Little Eagle	1.5	0.02	0

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix D.2.

Impacts not requiring an offset

Impacts to PCTs that do not meet the thresholds identified in the BAM do not require offsets. These PCTs and vegetation zones are identified in **Error! Reference source not found.**.

Table 6-6 PCTs and vegetation zones that do not require offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score	Ecosystem credits required
5	266	White-Box Grassy woodland derived grassland – mod-low Consisted of exotic dominated pasture grassland area, impacted by drought and grazing pressures	0.36	8.7	0
6	266	White-Box Grassy Woodland derived grassland – low Consisted of exotic dominated pasture grassland area, heavily impacted by drought and grazing pressures.	0.3	1.4	0

6.2.4 Offset strategy

Mitigation and management measures are proposed to adequately address impacts associated with the proposal, both directly and indirectly. The retirement of these credits is proposed to be carried out in accordance with the NSW Biodiversity Offsets Scheme and will be achieved by either:

a) Retiring credits under the Biodiversity Offsets Scheme, or

b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or

c) Funding a biodiversity action that benefits the threatened entity impacted by the development.

Offsets required under the EPBC Act

Assessment was conducted in relation to the Corben's Long-eared Bat, Pink-tailed Worm Lizard, Striped Legless Lizard and Regent Honeyeater to determine whether a referral to the Commonwealth was necessary. It was considered that no species listed on the EPBC Act have been identified as having the potential to be adversely impacted by the development. As such, the proposal is not considered to require referral in accordance with the EPBC Offsets Policy.

6.3 NOISE AND VIBRATION

6.3.1 Approach and assessment context

A Construction and Operational Noise and Vibration Assessment for the Wellington Solar Farm was undertaken by Renzo Tonin and Associates, as part of the EIS (NGH Environmental 2017). It included consideration of noise and vibration impacts from the construction and operation phases of the proposal.

Noise monitoring was undertaken at the closest residence (R1, monitored at L1 on Figure 6.3). Long term (unattended) noise monitoring was carried out at M1 to determine the existing background and ambient noise levels.

Based on the construction noise levels presented in the noise assessment, the construction management levels at receivers R1 and R7 were assessed as being exceeded when the construction works are conducted

at closest proximity to the receivers. It was noted that there would be minimal construction occurring near R1 and that construction noise levels at all receivers are predicted to be less than the highly noise affected level of 75dB(A).

The assessment of operation noise levels predicted that noise levels at all nearby receivers would comply with the nominated criteria under all scenarios and meteorological conditions. The predicted operational noise levels were additionally assessed as being well below the sleep disturbance criteria of 45 dB(A).

An updated Noise Impact Assessment (Renzo Tonin, 2019) was prepared to investigate whether the proposed modification of the substation layout could result in changes to the predicted environmental impact from noise and vibration. The cumulative impacts of construction and operation of the Wellington North Solar Farm have also been taken into consideration. The updated assessment considering the modified project, is summarised below and provided in full in Appendix D.3.

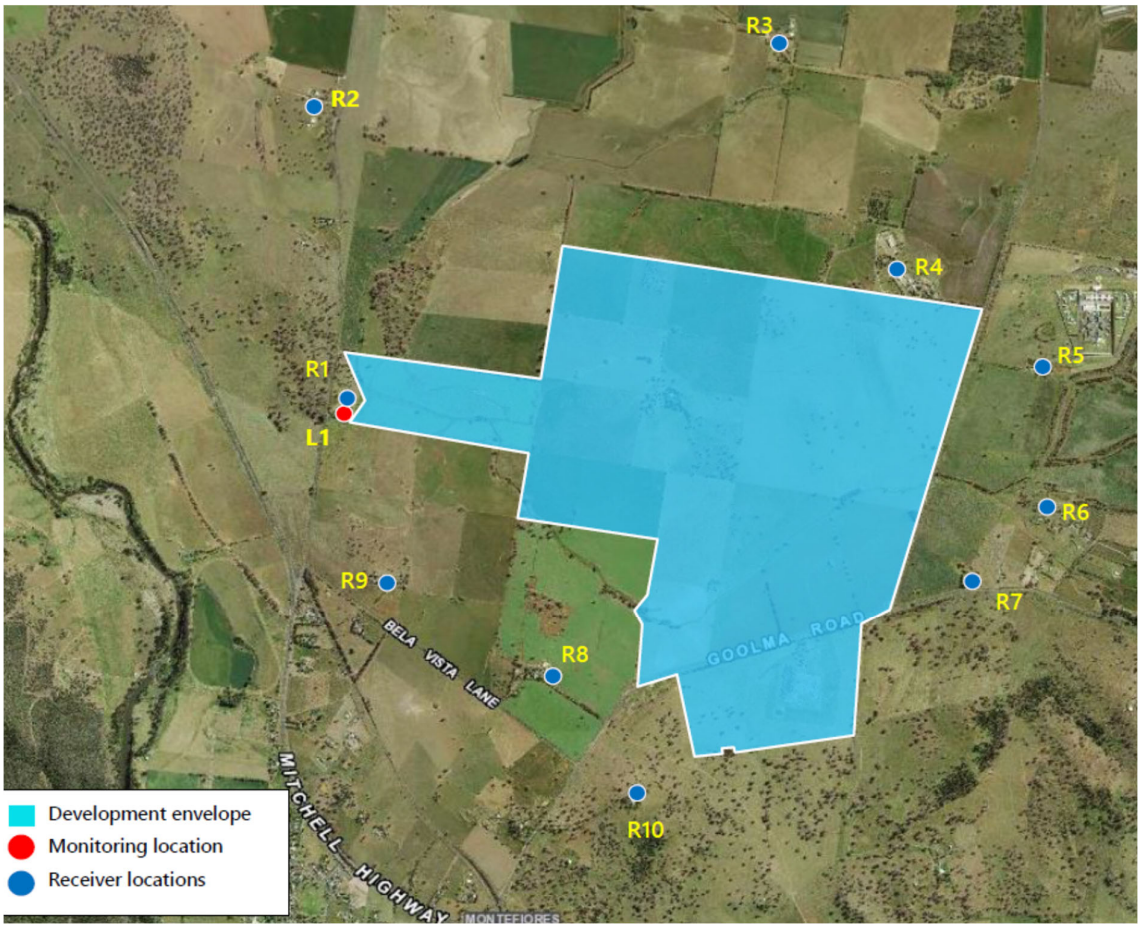

Figure 6-2 Residential receivers and noise monitoring locations (Renzo Tonin, 2017).

6.3.2 Modification assessment

Construction

The updated Noise Impact Assessment did not result in any changes to construction management levels as a result of the proposed modified layout of the substation. The construction noise levels at all receivers are predicted to be less than the highly noise affected level of 75dB(A), as previously assessed in the EIS.

Therefore, no further reasonable and feasible noise mitigation measures are required to reduce operational noise impacts than those stated within the EIS.

CUMULATIVE CONSTRUCTION NOISE ASSESSMENT

Construction activities associated with the adjacent Wellington North Solar Plant may potentially occur at the same time as construction works required for the proposed Wellington Solar Plant. As a result, some of the nominated receivers may be impacted by construction noise from both solar plants concurrently. However, not all receivers identified in Section 2.3 of the updated Noise Impact Assessment (Appendix D.3) have been included in the Wellington North Solar Plant noise and vibration assessment (Renzo Tonin, 2019], as they were not identified as one of the nearest affected receivers and therefore were predicted to comply with the NMLs established within the report.

For a conservative cumulative assessment, for the receivers that have been identified as being the nearest affected receiver for both the Wellington Solar Plant and Wellington North Solar Plant (i.e. Receivers R1, R2 and R4-R10), a cumulative construction noise assessment has been undertaken for the scenario where both solar plants are being constructed at the same time; although, it is highly unlikely the two solar plants will be constructed concurrently due to the different timelines of the projects and the timing of approvals.

The cumulative construction noise assessment was conducted for two different scenarios:

- **Scenario 1 –** Concurrent construction of Wellington Solar Plant and Wellington North Solar Plant.
- **Scenario 2 –** Concurrent construction of Wellington Solar Plant and the proposed Wellington North Solar Plant easement.

The cumulative assessment for Scenario 1 assumes that the same construction plant and equipment are being used at both solar plants concurrently during the construction of the solar plants. Table 4.6 of the updated Noise Impact Assessment (Appendix D.3) presents cumulative construction noise levels likely to be experienced at the nearby affected receivers based on the works conducted in Scenario 1.

The plant and equipment used to construct the solar plant slightly differ to the plant and equipment used for the construction of the easement, demonstrated in the comparison of Table 4.4 and Table 4.5 of the Wellington North Solar Plant report (Renzo Tonin, 2019). Due to the differing equipment a conservative approach has been adopted in Scenario 2, where it is assumed that the three noisiest plant items from each work site are operating concurrently. Table 4.7 of the updated Noise Impact Assessment (Appendix D.3) present the cumulative construction noise levels for Scenario 2.

For the cumulative construction noise levels of the Wellington Solar Plant and Wellington North Solar Plant construction works, the results presented in Table 4.6 Table 4.6 of the updated Noise Impact Assessment (Appendix D.3 indicate possible exceedances above the NML for Receivers R1, R2, R7 and R8. The construction of the Wellington Solar Plant is the main contributor to the exceedance at Receivers R1 and R7, which has been identified in Section 4.3 _of the updated Noise Impact Assessment (Appendix D.3). The exceedance at Receiver R2 is mainly due to the construction of the Wellington North Solar Plant, which was initially identified as exceeding the NML in the Wellington North Solar Plant's noise and vibration assessment. For Receiver R8, the cumulative construction noise introduces a possible 1dB(A) exceedance of the NML, which is negligible as up to a 2dB(A) change in noise level is not discernible or noticeable to the average person.

For the cumulative construction noise levels of the Wellington Solar Plant and Wellington North easement construction works, the results presented in Table 4.7 Table 4.6 of the updated Noise Impact Assessment (Appendix D.3 indicate possible exceedances above the NML for Receivers R1, R6 and R7. The construction of the Wellington Solar Plant is the main contributor to the exceedance at Receiver R1, which has been identified in Section 4.3 of the updated Noise Impact Assessment (Appendix 8D.3). The exceedance at Receiver R7 is mainly due to the construction of the Wellington North easement, which was initially identified as exceeding the NML in the Wellington North Solar Plant's noise and vibration assessment. For Receiver R6, the cumulative construction noise introduces a possible 2dB(A) exceedance of the NML, which is negligible as up to a 2dB(A) change in noise level is not discernible or noticeable to the average person.

Additionally, the cumulative construction noise levels of the Wellington Solar Plant and the Wellington North Solar Plant, and the proposed easement, are predicted to be less than the highly noise affected level of 75dB(A), as shown in Table 4.6 and Table 4.7 of the updated Noise Impact Assessment (Appendix D.3).

The construction and noise mitigation and management outlined in the Noise Impact Assessment undertaken as part of the Wellington Solar Farm EIS are considered sufficient to manage any cumulative impacts.

Operation

The updated Noise Impact Assessment takes into consideration the sound power levels of the additional operational plant and equipment required for the proposed modified layout to the substation (Table 6.3).

Table 6-7 Typical operational plant and equipment and sound power levels for the proposal (plant added as part of this modification indicated in bold text).

Plant description	LAeq Sound power levels (dBA)
Tracker Motor (up to 6,950 in total)	78 (each)
Ingeteam 1640TL B630 Inverters (up to 44 stations of three (3) inverters in total)	88 (each)
Energy Storage Facility PCUs (up to 70 in total)	88 (each)
Energy Storage Facility Air-conditioning Units (up to 70 in total)	75 (each)
Energy Storage Facility Transformers (up to 6 in total)	83 (each)
Light vehicle (3 in total)	88 (each)
Substation Transformers (up to 3 in total)	**83 (each)**
Substation Switch Room	**83 (each)**
Substation Harmonic Filters (up to 120 in total)	**71 (each)**

The additional plant required for the proposed modification to the substation layout did not result in any changes to operational impacts. The predicted operational noise levels at residential receiver locations (R1, R2, R3, R6, R7, R8, R9 and R10) and other sensitive receiver locations (R4 and R5) comply with the noise criteria. Therefore, no further reasonable and feasible noise mitigation measures are required to reduce operational noise impacts.

CUMULATIVE OPERATIONAL NOISE ASSESSMENT

It is likely that the Wellington Solar Plant would be operating concurrently with the Wellington North Solar Plant. Therefore, cumulative noise impacts at the nearest affected receivers due to both solar plants operating have been considered. As highlighted in Section 4.4 of the updated Noise Impact Assessment (Appendix D.3), not all receivers identified in Section 2.3-4.4 of the updated Noise Impact Assessment (Appendix D.3) have been included in the Wellington North Solar Plant noise and vibration assessment (Renzo Tonin, 2019), as they were not identified as one of the nearest affected receivers and therefore were predicted to comply with the project trigger levels established within the report.

An assessment of the cumulative operational noise from the Wellington North Solar Plant with the upgraded substation and the Wellington Solar Plant has been quantified for the receivers that have been identified as being the nearest affected receiver for both the Wellington Solar Plant and Wellington North Solar Plant (i.e. Receivers R1, R2 and R4-R10). The cumulative noise levels are presented in Table 5.7 of the updated Noise Impact Assessment (Appendix D.3) for the applicable meteorological conditions. From this table, the predicted noise levels generally comply at all receiver locations under all scenarios and meteorological conditions. However, under noise enhancing weather conditions, the predicted cumulative noise levels at Receiver R7 exceed the criteria by 2dB(A). The exceedance at R7 is mainly attributed to the noise emissions when both solar farms will be connected to the substation. It is also worth noting this exceedance does not impact this modification application for the substation expansion. A 2dB(A) exceedance is negligible as a 2dB(A) change in noise level is not discernible or noticeable to the average person. Therefore, the predicted noise levels at Receiver R7 are determined to be acceptable and no further reasonable and feasible noise mitigation measures are required.

6.3.3 Recommendations

Noise impacts generated as a result of this modification will be mitigated by implementing the existing strategies in the conditions of consent.

The environmental safeguards proposed as part of the approved project are considered sufficient.

6.4 VISUAL AMENITY

6.4.1 Approach and assessment context

The EIS (NGH Environmental 2017) (Section 7.3) included a Visual Impact Assessment (VIA) for Wellington Solar Farm which included the following visual impact assessment:

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

This visual assessment considered reflectivity, glare, vista impacts in the locality and provided a draft landscaping plan.

The EIS impact assessment methodology used the Visual Impact Assessment from the Bureau of Land Management (BLM) Visual Resource Management System, developed by the BLM, US Department of the Interior (n.d.). As outlined in the EIS (NGH Environmental 2017), the BLM identifies how a development affects the visual landscape is dependent on the visual contrast imposed by the project. Mitigation measures consider 'high impact' receivers, 'medium impact' receivers and 'low impact' receivers.

The EIS VIA was reviewed in the context of the modification, noting any changes to the assumptions and any additional impacts and mitigation strategies that may be relevant.

6.4.2 Modification assessment

The EIS ZVI modelling (provided as Figure 6.5) assumed no discernible infrastructure would be located south of Goolma Road. It modelled the visibility of solar panels, PV containers, the onsite substation and Energy Storage Facility (ESF) are modelled at a height of 4.5m.

As the expansion of the substation footprint will provide an additional discernible visual impact, the closest receivers R1, R2, R3 and R8 (shown on Figure 6.6), were re-assessed to capture any visual impacts on the western side of the substation particularly from elevated areas or residential properties located in this area. The assessment evaluated if the mitigation measures (outlined in the EIS) were sufficient for the substation expansion. Visual impact levels are determined based on the objectives of the visual Landscape Management Zone (LMZs) zone and the contrast the new infrastructure would represent. The visual impact level is consequently defined as:

- High impact: contrast is greater than what is acceptable.
- Medium impact: contrast is acceptable.
- Low impact: visual contrast is little or not perceived and is acceptable.

Receivers R1, R2, R3 and R8 are the closest receivers to the proposed substation expansion works area. They occur within the agricultural landscape character unit. The Landscape Management Zone objective is to protect dominant visual features. Between these receivers and the proposed substation expansion there are three agricultural properties with residential dwellings. The dwellings are located between 1-1.5 km south west of the substation. In between the proposed substation expansion area and these dwellings are open paddocks with scattered trees. These trees soften the view towards the existing substation. The trees will not be impacted by the substation expansion as they are either paddock trees within neighbouring properties or part of the Box Gum Woodland exclusion zone. There is no proposal to remove these trees.

Two of these dwellings are elevated but the area between the dwelling and the substation is broken up by scattered remnant paddock trees. Although a site inspection has not been completed for this visual assessment, based on the solar visual assessment in the EIS (NGH Environmental 2017), it has been determined that the visual impact of the substation expansion is negligible due to the scale development and the distance from the surrounding dwellings.

In consideration of the proposed substation extension of 320m^2, the impact from each of the receivers is considered:

- R1 – won't have a view of the proposed substation expansion area as there is existing vegetation screening the view.

- R2 – may be able to view parts of the Solar Farm and/or the proposed substation expansion area but the distance is over 1 km from the substation sot the view is considered negligible
- R3 – won't have a view of the proposed substation expansion area as there is existing vegetation screening the view.
- R8 is closest to the substation and this location is elevated. There are intervening paddocks trees between this location and the proposed substation. The view is considered negligible.

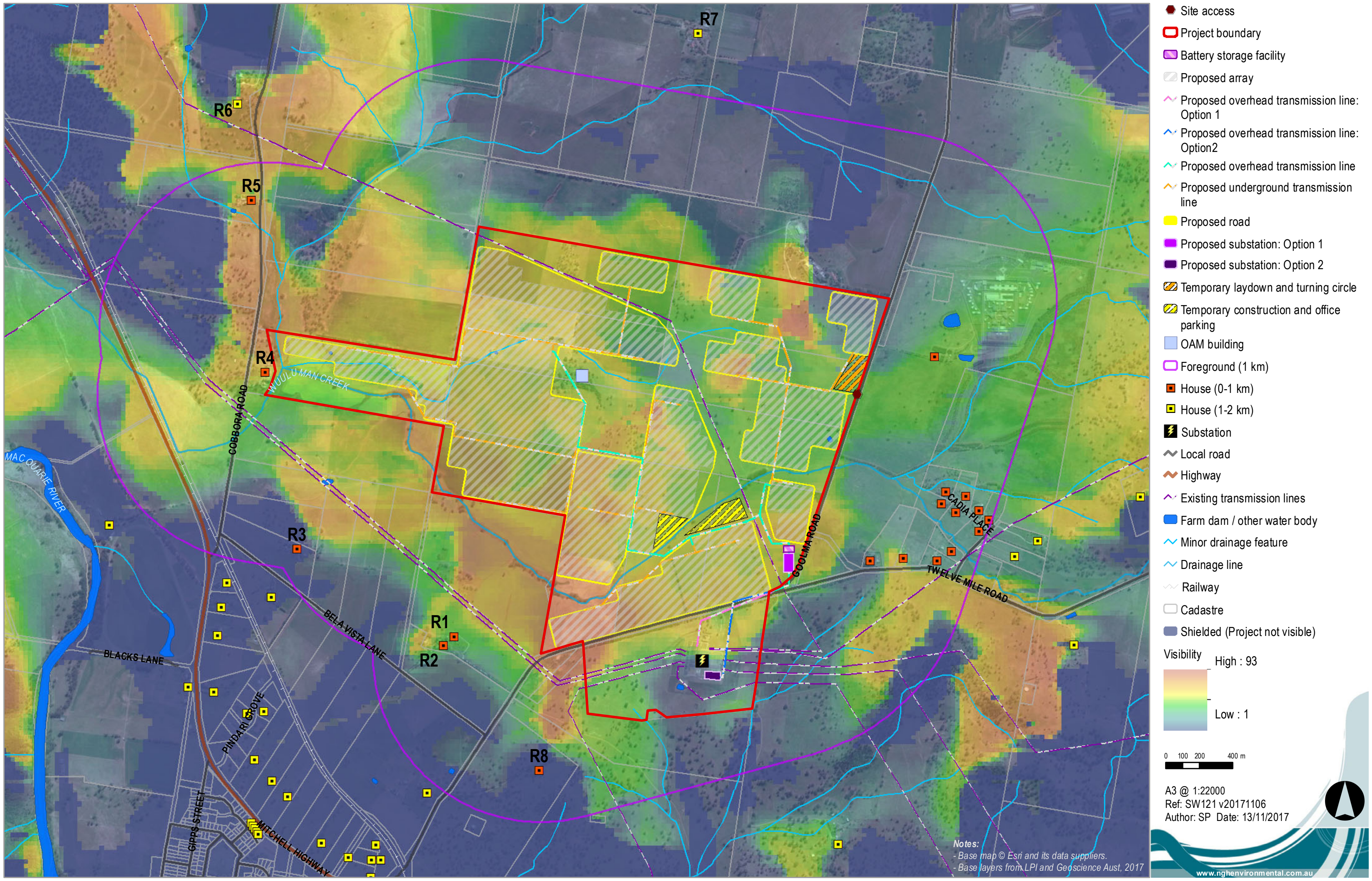

Figure 6-3 Foreground Zone of Visual Influence; ZVI, 1 km (sourced from the EIS 2017, not updated for this modification assessment)

Cumulative impacts with Wellington North Solar Farm

There is no cumulative impact from Wellington North Solar Farm as it is not visible from the south western side of the substation.

Mitigation measures to reduce cumulative impacts from the Wellington Solar Farm includes tree planting in strategic locations to screen the panels from elevated areas to the west. Once construction is complete, the visual impact will be minimal as the transmission lines will be underground cabling.

6.4.3 Recommendations

Existing conditions 7 & 8 for landscaping and vegetation buffers outlined in the Development Consent (DPIE 2018) are considered appropriate for the substation expansion. No additional measures are required.

6.5 TRAFFIC, TRANSPORT AND ROAD SAFETY

6.5.1 Approach and assessment context

The EIS assessment (Section 8.1) (NGH Environmental 2017) identified the following impacts during construction:

- Access near the Correctional Centre from Goolma Road
- 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 (school buses).
- Reduction of the level of service on the road caused by platooning of construction traffic.
- 60-120 vehicle movements. If buses were used, there would be eight bus trips per day.
- 5,350 heavy vehicles would be required during construction over 12 months which averages to 20 heavy vehicles each day.

During the peak construction period there would be the following maximum movements:

- 100 heavy vehicles.
- 300 light vehicles.

Local traffic impacts would largely be confined to standard hours of construction (7am to 6pm Monday to Friday and 8am to 1pm on Saturdays).

The risks identified during the construction period with increased traffic flow includes:

- Increased collision risk - primarily traffic entering and exiting the Solar Farm at the access point on Goolma Road, and traffic entering/exiting Goolma Rd at the Mitchell Highway.
- Damage to road infrastructure
- Noise and dust from construction
- Disruption to existing services

6.5.2 Modification assessment

The following vehicles will be required during the construction of the substation expansion:

- Two over-dimensional vehicles
- Excavator
- Rear actor (backhoe)
- Sheepsfoot roller
- 100 tonne crane
- Semi-trailer with a low loader trailer for the power transformer
- Oil tanker.

Except for the two over-dimensional vehicles required to deliver the transformer and 33 kV GIS building, the other vehicles were accounted for in the EIS assessment.

TransGrid will be completing the construction work. The works will entail:

- Mobilisation of the works
- Civil works associated with the substation bench extension
- Civil works associated with the internal substation access road to the Wellington Solar Farm dedicated assets
- Earth grid extension - potential trenching
- Equipment foundations
- Concrete foundations.

The GE Transformer layout plans have been included in Appendix D.4

Access for the substation expansion will use Goolma Road entrance to the existing TransGrid substation entrance. Delivery of the transformer and 33 kV GIS building will require the use of over-dimensional vehicles (2 vehicle movements) as outlined below. The current access to the substation is adequate to accommodate the over-dimensional vehicles. Goolma Road is an Oversized Overmass Load Carrying Approved Road.

6.5.3 Recommendations

Generally, the provisions for Transport (Schedule 3) in the Development Consent will not change with the substation expansion. However, the addition of two over-dimensional vehicle movements for the delivery of the transformer and 33 kV GIS building will need to be included in Condition 1 of Schedule 3, and the Traffic Management Plan (TMP) will need to be updated .

6.6 CUMULATIVE IMPACTS

6.6.1 Approach and assessment context

The EIS (NGH Environmental 2017) determined the cumulative impact was from the Bodangora Wind Farm, 10km north east of the site but this site was operational from February 2019 so there will be no cumulative impact with Wellington Solar Farm.

Since 2017, there has been a development proposal for Wellington North Solar Farm which is located north of Wellington Solar Farm. If approved, Wellington North Solar Farm will connect to the existing substation and Goolma Road will be the main route for construction vehicles, but this project is currently at the consultation stage so it unlikely any construction activities for these two solar farms will overlap. Therefore, cumulative impacts are considered low to minimal.

Cumulative impact assessment considers the combined impacts of relevant simultaneous activities.

6.6.2 Potential Impacts

There are two Solar Farms in Wellington (Wellington North and Wellington). Both solar farms will connect to the substation. The cumulative impacts include:

- Biodiversity impacts
- Visual impacts
- Noise impacts
- Traffic impacts
- Transmission line relocation which may impact current networks
- Pressures on local facilities, goods and services.

Biodiversity impacts

Cumulative impacts to biodiversity are incremental losses over time. Vegetation clearing contributes to loss of habitat for fauna and flora diversity. Wellington Solar Farm have taken steps to avoid and minimise vegetation loss. Consideration has been given to avoiding and minimising impacts to biodiversity throughout each phase of the proposal to date. Site selection options have been assessed against key environmental, social and economic criteria. Mitigation and management measures will be put in place to adequately address impacts associated with the proposal, both direct and indirect.

From the 2018 Submissions Report the Critically Endangered Ecological Community (CEEC) has been entirely avoided (2.07 ha). The reduction on native vegetation impacts from 2018 is 9.83 ha and in 2019 the reduction is 6.46 ha. The reduction in vegetation impacts includes areas of moderate to good vegetation condition. The impacted areas are considered low quality vegetation condition.

For this Modification Application, there is a small increase for the substation expansion, which includes the White Box – Yellow Box – Blakely's Red Gum Woodland EEC listed under the NSW BC Act. The current easement is worst case scenario and the exact location of the underground transmission cabling has not been determined from Goolma Road to the substation connection. Steps can be taken to avoid and minimise unnecessary loss of vegetation during construction using mitigation measures outlined in the BDAR (Appendix D.2).

The loss of vegetation on site can have a cumulative impact on local biodiversity over time. Through offsetting and improving offset areas for conservation reduces some of these impacts. Offsetting through the BioBanking assessment methodology, aims to address vegetation impacts for these types of projects Offsets are generated through credits for the loss of vegetation from projects to reduce biodiversity impacts.

These same requirements to avoid, minimise and offset apply equally to the Wellington North Solar Farm. No unacceptable cumulative biodiversity impacts are anticipated.

Visual impacts

The existing overhead transmission lines that already connect to the substation grid will remain in-situ after the substation expansion. The proposed substation transmission lines will be underground and therefore will not change any visual aesthetics surrounding the substation. The construction of the solar farm will visually impact the landscape character of the area with the construction of the security fence and the solar panels. To mitigate the visual impacts from the security fence and solar panels, the Development Consent conditions have included a vegetation buffer to reduce the cumulative impact. As the substation expansion transmission lines will now be underground and the substation expansion will be an extension to the existing substation, the cumulative visual impact is considered minimal. The substation is already screened with planted Eucalypts and the White Box Grassy Woodland.

Noise impacts

It is unlikely noise impacts will occur concurrently during construction for Wellington Solar Farms and Wellington North Solar Farm due to the timing of the projects. But an assessment of cumulative construction noise was completed by Renzo Tonin (2019) if construction is occurring concurrently for both solar plants in two scenarios. The first scenario is both solar farm construction occurring simultaneously, and the second scenario is the easement and the Wellington Solar Plant. Both scenarios found the increase noise was 1-2dB(A) which is considered negligible change in noise levels that is not discernible to the average person.

Traffic impacts

Cumulative traffic impacts from heavy vehicles are likely during construction and particularly more noticeable on Goolma Road if construction for both solar farms occur simultaneously to the substation expansion. It is unlikely that approvals for these projects and construction will occur at the same time. The highest impacted area would be the entrance on Goolma Road to Wellington Solar Farm due to the number of heavy vehicles per day and congestion. There may be cumulative impacts at the entrance on Goolma Road for the substation expansion. But this is considered unlikely due to the substation expansion project beginning in late October 2019, and it is a rather small area. Therefore, it is unlikely to have a cumulative impact on Wellington North Solar Farm construction and most likely the work may be completed prior to any construction occurring for Wellington North Solar Farm.

The substation expansion will use existing access off Goolma Road.

Pressures on local facilities, goods and services

It is unlikely there will be a cumulative impact on local facilities, goods and services for the substation expansion due to the scale of the project. Construction may occur concurrently to Wellington Solar Farm, but the impact is likely to be minimal.

6.6.3 Recommendations

No further recommendations are required to address the cumulative impacts identified for the substation expansion.

7 CONCLUSION

Wellington Solar Farm development consent was obtained in May 2018. In the consented layout, approval was granted for overhead transmission lines from Goolma Road to connect to the substation. The proposed substation expansion requires an easement to install underground cabling instead of the overhead transmission lines and a substation bench which has been assessed for this Modification Application.

This Modification Application has considered the key environmental impacts to be:

- Biodiversity
- Aboriginal Heritage
- Noise and Vibration
- Visual amenity
- Traffic, transport and road safety
- Cumulative impacts

The key biodiversity impact is removal of a small patch of vegetation that will be offset in accordance with the Biodiversity Offset Scheme (BOS). The biodiversity impact will be 0.69 ha, including:

- White Box grassy woodland – planted: 0.02 ha
- White Box grassy woodland derived grassland (assessed as moderate to good condition in 2017, now moderate to low due to drought and grazing): 0.36 ha
- White Box grassy woodland derived grassland (low condition): 0.30 ha

Importantly, of the 0.69 ha proposed to be impacted by this modification, 0.32 ha would have been impacted by the approved overhead transmission line alignment, including the 0.02 ha of White Box grassy woodland – planted.

The 0.02 ha is classified as an NSW listed vegetation community in moderate to good condition that generates 1 ecosystem credit.

Additionally, the proposed modification generates 2 species credits.

The Registered Aboriginal Parties support the proposed modification.

The recommendations for noise impacts generated as a result of this modification will be mitigated by implementing the existing strategies in the conditions of consent. The environmental safeguards proposed as part of the approved project are considered sufficient.

An assessment of the visual amenities determined the existing vegetation and the proposed vegetation screen (already committed to by the proponent) would reduce any views towards the substation.

The recommendation in the EIS (NGH Environmental 2017) for traffic, transport and road safety is a Traffic Management Plan.

The Biodiversity Development Assessment Report includes the vegetation impacts for 0.69 hectares for the substation expansion.

No substantive cumulative impacts are anticipated from Wellington North Solar Farm.

The Development Consent conditions will need to be altered to account for the two over-dimensional vehicle movements, the revised ecosystem and species credits and the revised development footprint

associated with the substation expansion. Additionally, the following plans will need to be updated to include the substation expansion footprint. The plans are:

1. The Biodiversity Management Plan will need to be updated to show the modified layout
2. The Cultural Heritage Management Plan will need to be updated to include the modified layout.
3. The Traffic Management Plan will need to be updated to include the modified layout and inclusion of one over-dimensional vehicle for each transformer.

8 REFERENCES

Infigen Energy (2011) Bodangora Wind Farm Traffic and Transport Issues Revision 1.0: ISSUED FOR SUBMISSION November 2011

NGH Environmental, 2017, *Biodiversity Assessment Report, Wellington Solar Farm.* Report prepared for First Solar in November 2017.

NGH Environmental, 2017, *Environmental Impact Statement,* Wellington Solar Farm. Report prepared for First Solar in November 2017.

NGH Environmental, 2018, *Submission Report,* Wellington Solar Farm. Report prepared for First Solar in March 2018.

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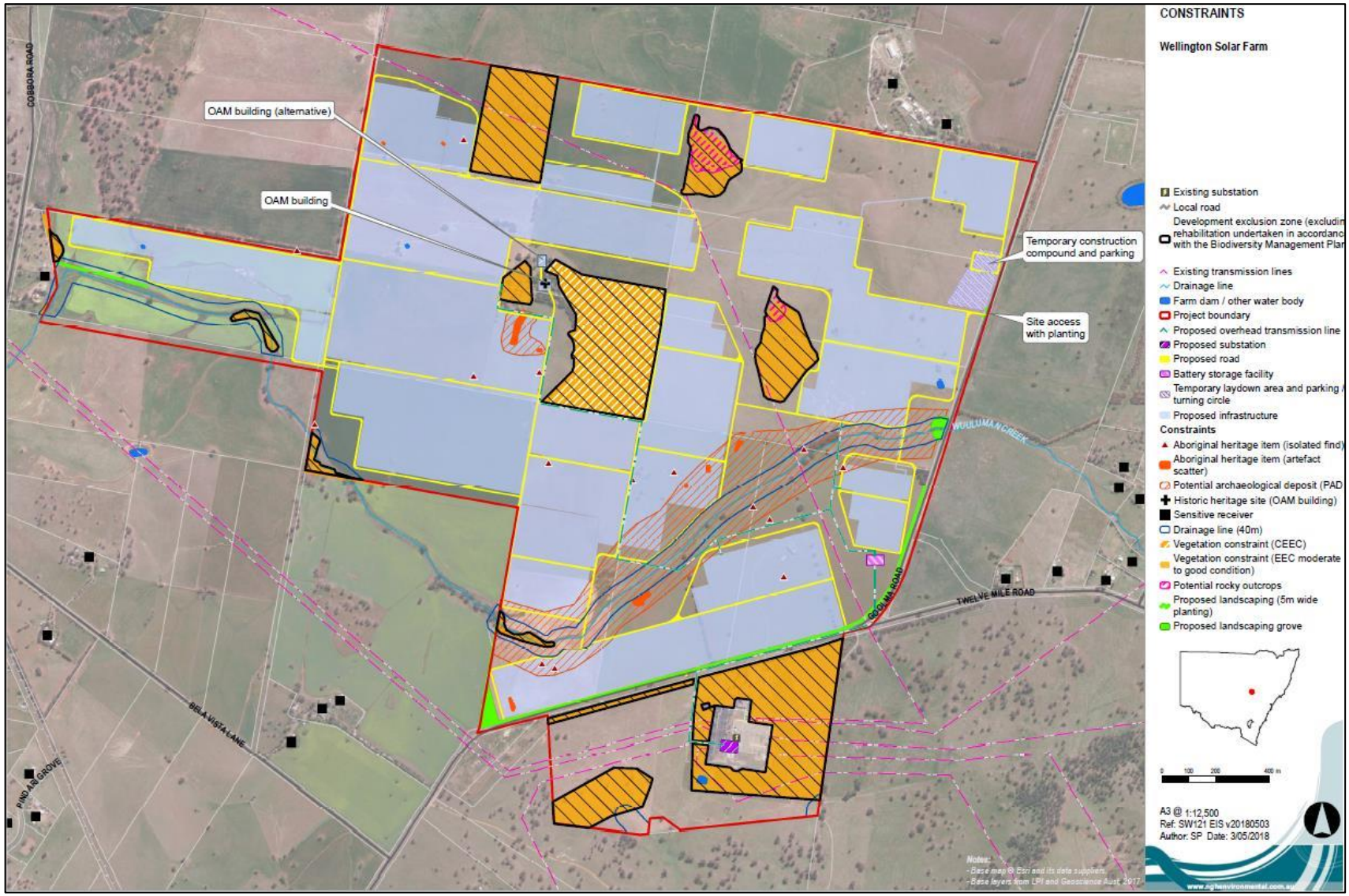
Renzo Tonin and Associates, 2017, *Wellington Solar Farm Construction and Operation Noise and Vibration Assessment*, report prepared for First Solar.

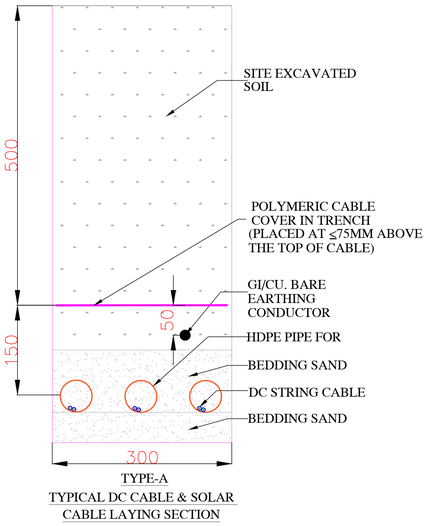
Renzo Tonin and Associates, 2019, *Wellington Solar Farm Construction and Operation Noise and Vibration Assessment*, report prepared for First Solar.

APPENDIX A CONSENTED LAYOUT

APPENDIX 1:
GENERAL LAYOUT OF DEVELOPMENT

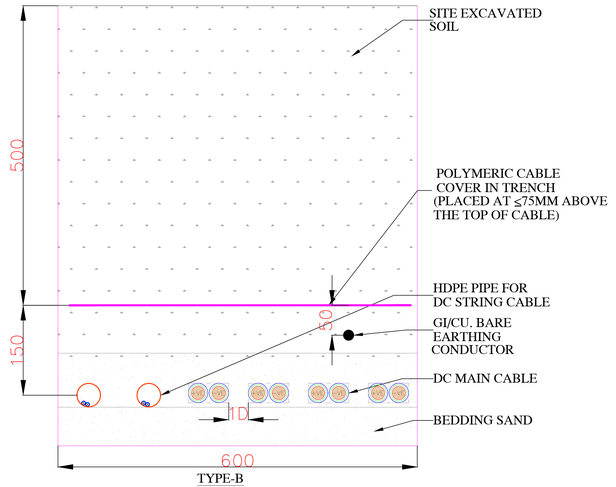


APPENDIX B SUBSTATION EXPANSION DESIGN DRAWINGS



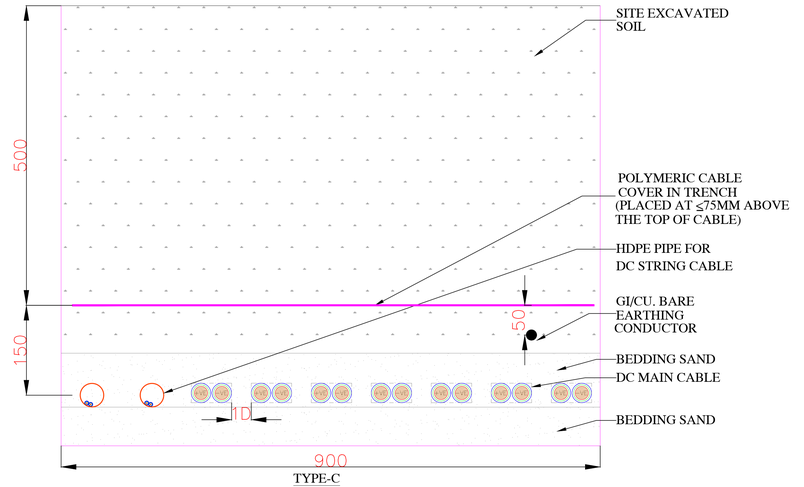
TYPE-A

TYPICAL DC CABLE & SOLAR CABLE LAYING SECTION



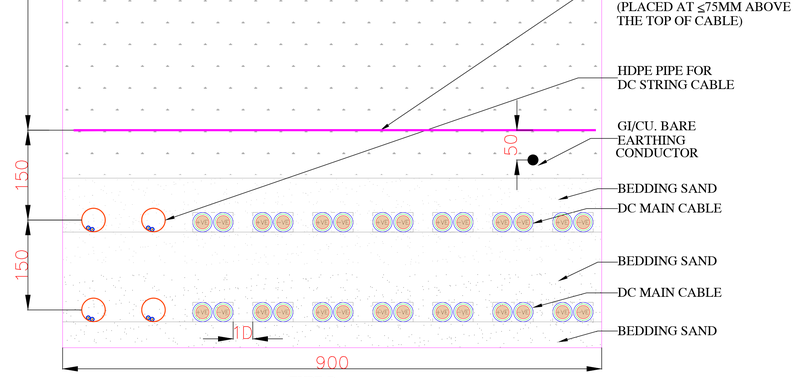
TYPE-B

TYPICAL DC CABLE & SOLAR CABLE LAYING SECTION



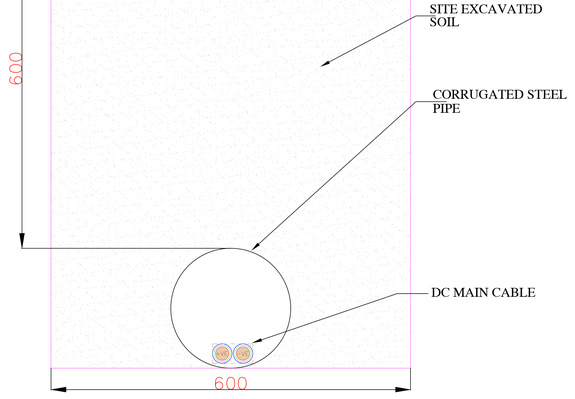
TYPE-C

TYPICAL DC CABLE & SOLAR CABLE LAYING SECTION



TYPE-D

TYPICAL DC CABLE & SOLAR CABLE LAYING SECTION



TYPE-E

TYPICAL DC CABLE LAYING SECTION
ROAD CROSSING

NOTE ; -

1. SOIL THERMAL RESISTIVITY OF AVERAGE 1.5 K.M/W. IS ASSUMED FOR DESIGN.
2. CABLE ROUTE MARKERS SHALL BE PROVIDED AT THE ENTRANCE TO THE INVERTER STATIONS, AT BOTH SIDES OF ROAD CROSSINGS AND AT EACH CHANGE OF DIRECTION.
3. THIS DRAWING IS PRELIMINARY AND SUBJECT TO CHANGE DURING DETAIL ENGINEERING.

CHECK BOX

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☐	☐	☑	☐

No.	DATE	REMARKS	DRN	CHKD
R0	13.07.2019	FOR TENDER PURPOSE ONLY	HST	SDD

REVISIONS

PROJECT TITLE:
170MWac/200MWp SOLAR FARM
AT WELLINGTON, NEW SOUTH WALES, AUSTRALIA

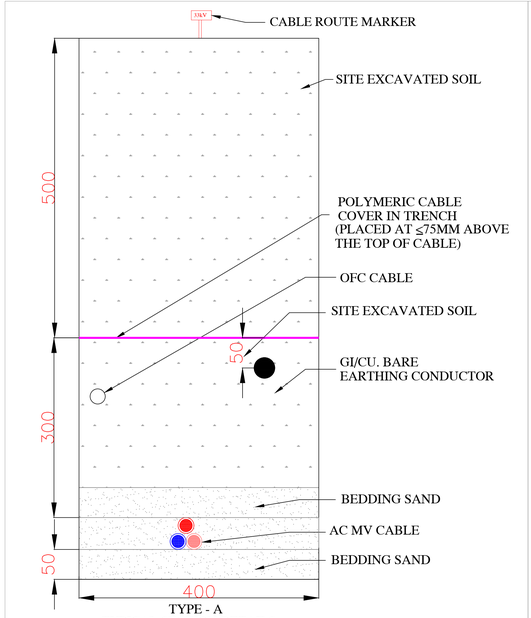
CLIENT:
LIGHTSOURCE DEVELOPMENT SERVICES AUSTRALIA PTY LTD

OWNERS CONSULTANT:

EPC CONTRACTOR:
STERLING & WILSON

DRAWING TITLE:
TYPICAL TRENCH SECTION
(DC TRENCH)

DRAWING NO :		SCALE	NTS
DRAWN	HST	SHEET NO	01 OF 02
CHECKED	SDD	PAPER SIZE	A0
APPROVED	SKK	REV NO.	R0
DATE	13.07.2019		



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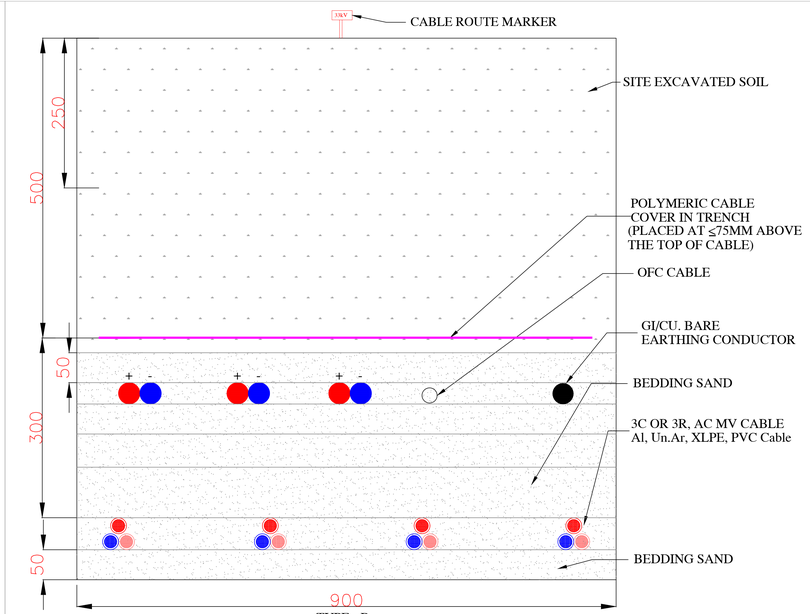
TYPICAL SECTION DETAILS



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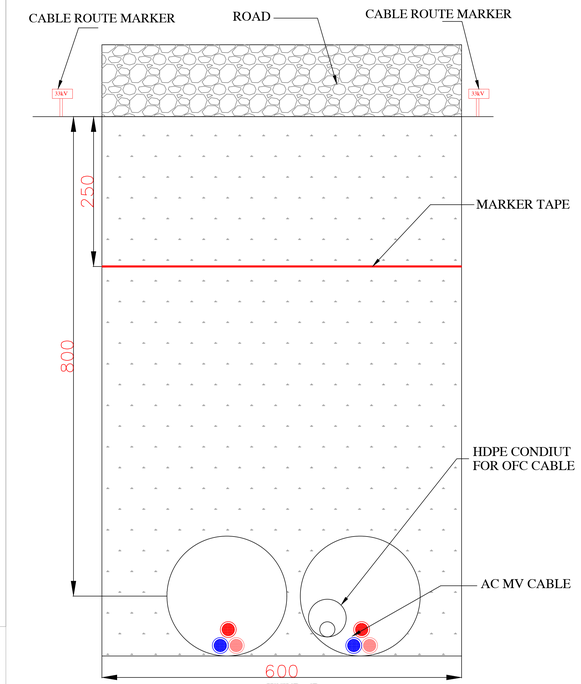
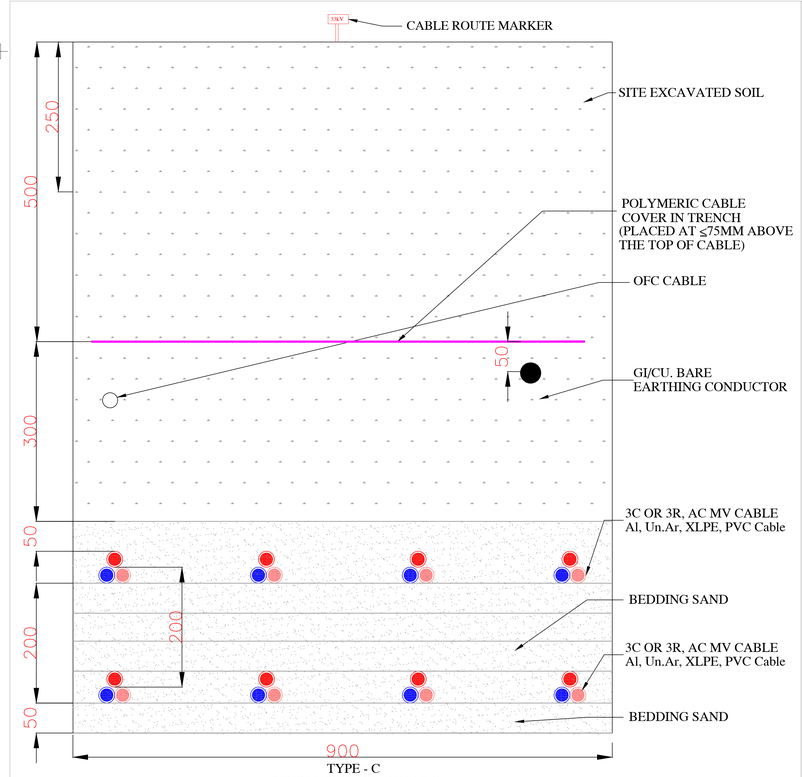
TYPICAL SECTION DETAILS



TYPE - E
TYPICAL SECTION DETAILS (ROAD CROSSING)



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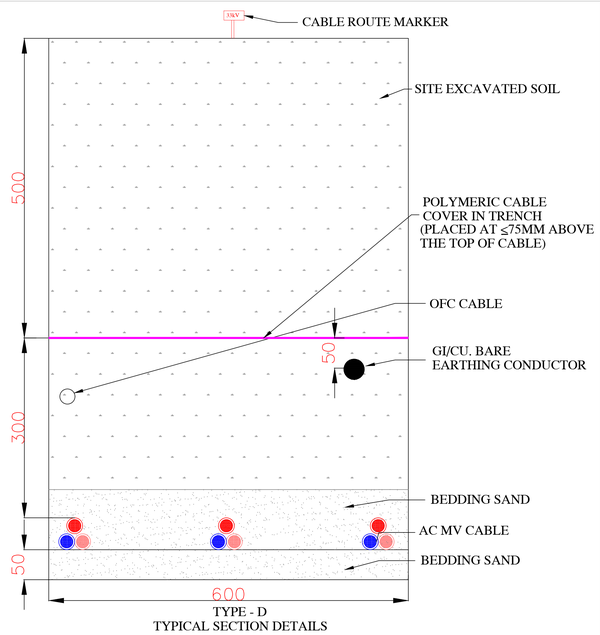
TYPICAL SECTION DETAILS



TYPE - D
TYPICAL SECTION DETAILS

NOTE ; -

1. SOIL THERMAL RESISTIVITY OF AVERAGE 1.5 K.M/W. IS ASSUMED FOR DESIGN.
2. CABLE ROUTE MARKERS SHALL BE PROVIDED AT THE ENTRANCE TO THE INVERTER STATIONS, AT BOTH SIDES OF ROAD CROSSINGS AND AT EACH CHANGE OF DIRECTION.
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CHECK BOX

AS-BUILT	FOR APPROVAL	INFORMATION ONLY	FOR CONSTRUCTION
☐	☐	√	☐

No.	DATE	REMARKS	DRN	CHKD
R0	13.07.2019	FOR TENDER PURPOSE ONLY	HST	SDD

REVISIONS

PROJECT TITLE:
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EPC CONTRACTOR:
STERLING & WILSON

DRAWING TITLE:
TYPICAL TRENCH SECTION
(AC TRENCH)

DRAWING NO :		SCALE	NTS
DRAWN	HST	SHEET NO	02 OF 02
CHECKED	SDD	PAPER SIZE	A0
APPROVED	SKK	REV NO.	R0
DATE	13.07.2019		

APPENDIX C REVIEW OF MODIFICATIONS AGAINST CONSENTED PROJECT

C.1 NATURE OF THE DEVELOPMENT

TransGrid have advised that there is a need to extend the existing Wellington substation footprint beyond the existing fence line and re-locate the approved point of connection of the transmission line into the substation, to facilitate the connection of the Wellington Solar Farm.

The project is considered 'substantially the same development':

> *…the construction, operation, and decommissioning of the proposed Wellington photovoltaic (PV) solar farm.*
>
> *The objectives of the Wellington SF proposal are to:*
>
> - *Select a site which is suitable for commercial scale solar electricity generation, in terms of solar yield, connection to the national electricity grid and environmental (including social) constraints.*
> - *Develop a profitable commercial scale solar electricity generation project and potentially an Energy Storage Facility.*
> - *In producing renewably sourced energy:*
>   - *Assist the NSW and Commonwealth Governments to meet Australia's renewable energy targets and other energy and carbon mitigation goals.*
>   - *Provide a clean and renewable energy source to assist in reducing greenhouse gas (GHG) emissions.*
> - *Obtain a social license to operate from the local community.*
> - *Provide local and regional employment opportunities and other social benefits during construction and operation.*
> - *Identify opportunities to avoid and minimise environmental impacts in the construction and operation of the* project.

C.2 DISTRIBUTION OF IMPACTS

The extension of the substation footprint includes:

- White Box grassy woodland – planted: 0.02 ha
- White Box grassy woodland derived grassland (assessed as moderate to good condition in 2017, now moderate to low due to drought and grazing): 0.36 ha
- White Box grassy woodland derived grassland (low condition): 0.30 ha

These proposed changes include a total 0.69 ha impacted. Importantly, of the 0.69 ha proposed to be impacted by this modification, 0.32 ha would have been impacted by the approved Project.

C.3 CONSIDERATION OF ENVIRONMENTAL IMPACTS

The following risks were investigated within the EIS. Five of these are considered relevant to the modification and are discussed further in this report.

Table B1. EIS impacts

Relevant EIS section	Environmental risk	Relevance to modified layout
7.1	Biodiversity	The changes to the substation expansion will impact 0.69 hectares of White Box Grassy Woodland Derived Grassland (PCT 226), listed as Endangered Ecological Community (EEC). This will affect the consented offset obligation for the project. Refer to summary Section 6.2 and updated BAR in Appendix D.3.
7.2	Aboriginal heritage	The changes to the substation footprint will impact 0.69 hectares of land. Further assessment to identify areas of cultural heritage significance and consideration of consultation obligations is required. Refer to summary Section 6.1 and RAPs notification letter in Appendix D.2.
7.4	Noise and vibration	Additional noise and vibration impacts are likely to occur during construction of the modifications and when in operation. Refer to summary Section 6.3, and updated noise assessment in Appendix D.4.
7.3	Visual amenity	The expanded substation layout will impact the local visual amenity. Refer to assessment in Section 6.4.
7.5	Historic heritage	Three historic homesteads were identified in the EIS. None of these are likely to be impacted from transmission line relocation and connection to the substation. No impact.
8.1	Traffic, transport and road safety	Additional infrastructure would be transported to site, during construction. Refer to assessment in Section 6.5.
8.2	Soils	The changes to the substation footprint will affect a minor additional area ground disturbance. This would be minor, on relative flat land that is not considered a high erosion risk. Standard soil mitigation measures are required, as currently committed to by the consented project. Existing mitigation measures for the project are considered sufficient to address these additional impacts. Key measures will include Soil and Water Management Plan (SWMP) (with erosion and sediment control plans) would be prepared, implemented and monitored during the proposal, in accordance with Landcom (2004), to minimise soil (and water) impacts.
8.3	Water use and water quality (surface and ground water)	Wuuluman Creek is over 700 metres to the north and a tributary of the Macquarie River is located over 350 metres to the south east. No impact to watercourses, water use or water quality is anticipated.

Relevant EIS section	Environmental risk	Relevance to modified layout
8.4	Flooding	The impact areas are not affected by flood or near to waterways. No impacts.
8.5	Land use (including mineral resources)	No impacts.
8.6	Resource use and waste generation	No impacts.
8.7	Socio-economic and community	Visual impacts are addressed above. No other socio-economic or community impacts are anticipated.
8.8	Climate and air quality	The changes to the substation footprint will affect a minor additional area ground disturbance. Standard air quality mitigation measures are required, as currently committed to by the consented project. Existing mitigation measures for the project are considered sufficient to address these additional impacts. Key measures will include: • Dust generation by vehicles accessing the site and earthworks at the site would be suppressed using water applications or other means as required. • Vehicle loads of material which may create dust would be covered while using the public road system. • All vehicles and machinery used at the site would be in good condition, fitted with appropriate emission controls and comply with the requirements of the POEO Act, relevant Australian standards and manufacturer's operating recommendations. Plant would be operated efficiently and turned off when not in use.
8.9	Hazards (including bushfire and EMF)	The changes to the substation configuration may affect the electromagnetic frequencies generated by the plant. EMF compliance requirements as set out in the EIS (Section 8.9) are still appropriate. The changes to the substation configuration are unlikely to affect bushfire risks, which are addressed in Section 8.9 of the EIS. Existing mitigation measures for the project are considered sufficient to address these additional impacts. Key measures will include: **Electromagnetic fields** • All electrical equipment would be designed in accordance with relevant codes and industry best practice standards in Australia. • All design and engineering would be undertaken by qualified and competent person/s with the support of specialists as required. • Design of electrical infrastructure would minimise EMFs. **Fire** Develop a Bush Fire Management Plan which includes all the details and consultation outlined in Section 8.9.4 – Mitigation measures if the EIS.

Relevant EIS section	Environmental risk	Relevance to modified layout
8.10	Cumulative impacts	The key impacts identified are biodiversity, noise, visual, traffic and construction. The combined impacts are not substantive and can be mitigated separately. The Wellington North Solar Farm proposal is located immediately north of the Wellington Solar Farm and will also connect into the Wellington substation.

C.4 CONSIDERATION OF CONSENT CONDITIONS

With reference to the conditions of consent for the project, 25 May 2018, two areas are identified for further consideration.

Table B2. Approval conditions

Consent reference		Can condition be met under the modification
Definitions	The development, as described in the EIS	Is substantially the same.
Definitions	'Development footprint', The area within the project site on which the components of the project will be constructed	Generally, corresponds to mapped 'proposed infrastructure' but this is noted as indicative in the EIS.
Definitions	'Project site', The land defined in the figure in Appendix 1 and the table in Appendix 2 of the Submissions Report (NGH Environmental 2018).	Is located within the project site.
Administrative conditions	Obligation to minimise harm to the environment In meeting the specific environmental performance criteria established under this consent, the applicant must implement all reasonable and feasible measures to prevent and/or minimise any material harm to the environment that may result from the construction, operation, upgrading or decommissioning of the development.	There is minor additional vegetation removal and soil disturbance that is necessary and can be managed effectively.
Administrative conditions	The Applicant must carry out the development: Generally, in accordance with the EIS; and In accordance with the conditions of this consent. *Note: The general layout of the development is shown in Appendix 1.*	The modified layout is small in comparison to area than stated in the EIS. The areas affected are unlikely to result in material additional impacts.

Consent reference		Can condition be met under the modification
Schedule 3	The Applicant must ensure that the development does not generate more than 100 heavy vehicle movements a day during construction, upgrading or decommissioning, and 5 heavy vehicle movements a day during operations; on the public road network; and the length of any heavy vehicles used for the development does not exceed 25 metres, unless the Secretary agrees otherwise.	Two over-dimensional vehicle movements need to be included.
Schedule 3	Landscaping Vegetation buffer The applicant must establish and maintain a mature vegetation buffer (landscape screening) at the locations outlined in the figure in appendix 1 to the satisfaction of the secretary.	No augmentation warranted.
Schedule 3	Biodiversity Retirement of credits Within two years of commencing development under this consent, unless otherwise agreed by the secretary, the applicant must retire biodiversity credits of a number and class specified in table 1 below to the satisfaction of OEH. White box grassy woodland in the upper slopes sub-region of the NSW south western slopes bioregion – 1 ecosystem credit.	The condition needs to be updated to account for the ecosystem and species credits associated with the modification application.
Schedule 3	Protection of Heritage Items Prior to the commencement of construction, the Applicant must salvage and relocate all Aboriginal heritage items located within the approved development footprint to suitable alternative locations on site, in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW, 2010), or its latest version. *Note: The location of the Aboriginal heritage items referred to in this condition are shown in the figure in Appendix 1.*	The development footprint has expanded but this does not affect impacts materially or the mitigation strategy.

Consent reference		Can condition be met under the modification
Schedule 3	Soil & water Water pollution The applicant must ensure that the development does not cause any water pollution, as defined under section 120 of the *protection of the environment operations act 1997*.	The modified layout will not impact any waterways. There will be localised soil disturbance during construction and vegetation removal.
Schedule 3	Fire safety study At least one month prior to the commencement of construction of the development, or unless otherwise agreed by the secretary, the applicant must prepare a fire safety study for the development, in consultation with fire & rescue NSW, and to the satisfaction of the secretary.	No implication.
Schedule 3	Fire Management and Emergency Response Plan Prior to the commencement of operations, the Applicant must prepare a Fire Management and Emergency Response Plan for the development in consultation with the RFS and Fire & Rescue NSW.	No implication.
Schedule 3	Decommissioning and rehabilitation Within 18 months of the cessation of operations, unless the secretary agrees otherwise, the applicant shall rehabilitate the site to the satisfaction of the secretary. This rehabilitation must comply with the objectives in table 2.	Additional areas will require management during operation and decommissioning. No implication in terms of ability to meet this condition.

APPENDIX D SPECIALIST STUDIES

D.1 NOTIFICATION LETTER TO REGISTERED ABORIGINAL PARTIES

ngh environmental

12 August 2019

canberra
unit 8, 27 yallourn st
(po box 62)
fyshwick act 2609
t 02 6280 5053

bega
89-91 auckland st
(po box 470)
bega nsw 2550
t 02 6492 8333

brisbane
suite 4, level 5
87 wickham terrace
spring hill qld 4000
t 07 3129 7633

newcastle
2/54 hudson st
hamilton nsw 2303
t 02 4929 2301

sydney
unit 18, level 3
21 mary st
surry hills nsw 2010
t 02 8202 8333

wagga wagga
suite 1, 39 fitzmaurice st
(po box 5464)
wagga wagga nsw 2650
t 02 6971 9696
f 02 6971 9693

ngh@nghenvironmental.com.au
www.nghenvironmental.com.au

To whom it may concern,

RE – Wellington Solar Farm (SSD-8573) Notice of development footprint modification

As you would be aware, you are a Registered Aboriginal Party (RAP) for the Wellington Solar Farm project that was granted State Significant Development (SSD) planning approval on the 25 May 2018 for the construction and operation of a 174 megawatt (MW) photovoltaic (pv) solar farm and associated infrastructure including access tracks, overhead transmission lines, battery storage facility, substation and transformers. The Wellington Solar Farm will be located about 2 km north-east of Wellington in the Dubbo Regional Local Government Area (LGA).

Recently NGH Environmental was informed that a modification to the development footprint is required to connect the solar farm to the existing adjacent substation. The modification will impact approximately 1.8 hectares as shown in Figure 1 with the proposed transmission line roughly following an existing fence line before connecting to the south-western side of the substation.

A desktop review was undertaken to assess and identify if the proposed modification development footprint had been previously subject to assessment and if there are any known Aboriginal sites or objects located within or in proximity to the proposed modification development footprint.

The result of that assessment is that the proposed development footprint extension has been sufficiently assessed and surveyed during the field work previously conducted for both the Wellington Solar Farm and Wellington North Solar Plant projects by NGH archaeologists with yourselves and other Aboriginal community representatives. It should be noted that the Registered Aboriginal Parties for both projects were the same and therefore we believe review of field assessment data from both projects is considered to be acceptable in this instance. During the previous surveys conducted in proximity to the substation the landforms in the proposed modification development footprint and generally surrounding the existing substation were deemed to have low archaeological sensitivity and to have been highly disturbed and modified by the construction and maintenance of the existing substation and its associated transmission lines.

The desktop assessment, combined with the review of previous field data and results, have concluded that the proposed modification development footprint has previously been adequately assessed by archaeologist with Aboriginal community representatives and does not require further field assessment. No Aboriginal objects/sites or areas of potential archaeological deposit were identified within or adjacent to the proposed modification development footprint.

The desktop review and assessment of the proposed modification concluded that the development footprint will not impact upon previously recorded Aboriginal sites or areas of potential archaeological deposit. The desktop review and assessment noted that the area was deemed during previous investigations of the area to have low archaeological sensitivity and to have been highly disturbed. Therefore, the proposed modification to the development footprint in no way alters or affects the assessment or recommendations in the Wellington Solar Farm Aboriginal Cultural Heritage Assessment Report (NGH 2018) or Cultural Heritage Management Plan (CHMP) that has been developed for the project.

This letter is provided to ensure you are informed about the proposed changes to the development footprint. Please also be advised that we propose to write a small chapter in the modification report detailing the above assessment outcome and this will be submitted to the NSW Department of Planning, Industry and Environment (DPIE) for approval of the modification. Should you have any questions or concerns regarding this update please don't hesitate to contact me.

Yours Sincerely,

Kirsten Bradley
Senior Heritage Consultant
NGH Environmental

Figure 1.Proposed modification over leaf.

GENERAL LAYOUT OF DEVELOPMENT
Substation expansion

Wellington Solar Farm

- Development exclusion zone (excluding rehabilitation undertaken in accordance with the Biodiversity Management Plan)
- Project boundary
- Existing substation
- Farm dam / other water body
- Approved infrastructure
- Approved overhead transmission line
- Proposed underground transmission line
- Approved internal road
- Approved landscaping (5m wide planting)
- Approved landscaping grove
- Approved substation
- Proposed substation expansion
- Proposed Substation Bench
- Underground transmission line corridor
- Vegetation constraint (CEEC)
- Vegetation constraint (EEC moderate to good condition)

Notes:
- Data collected by ngh 2017-19
- Client data courtesy of Client, received 2011-29
- Base map Copyright © Esri and its data suppliers.

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Ref: SW121 EIS v20190913
Author: T.Hastings 02/10/2019

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D.2 BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

WELLINGTON SOLAR FARM SUBSTATION EXPANSION

September 2019

Project Number: 19-453

DOCUMENT VERIFICATION

Project Title:	WELLINGTON SOLAR FARM SUBSTATION EXPANSION
Project Number:	19-453
Project File Name:	BDAR 19-453_Wellington_SE_Final_v1.0

Revision	Date	Prepared by	Reviewed by	Approved by
Final v1.0	26/09/2019	B. Noel (BAAS19015), M. Patrick, T. Hastings	D. Maynard (BAAS17026)	D. Maynard (BAAS17026)

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TABLE OF CONTENTS

FIGURES

TABLE

ACRONYMS AND ABBREVIATIONS

BAM	Biodiversity Assessment Methodology
BC Act	Biodiversity Conservation Act 2016 (NSW)
BDAR	Biodiversity Development Assessment Report
BGW	Box Gum Woodland
BOM	Australian Bureau of Meteorology
CEEC	Critically Endangered Ecological Community (CW listing)
DBH	Diameter at Breast Height
DNG	Derived Native Grassland
DPIE	(NSW) Department of Planning, Industry and Environment
EEC	Endangered Ecological Community (NSW listing)
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
FM Act	*Fisheries Management Act 1994* (NSW)
GHG	Greenhouse Gases
ha	hectares
HBT	Hollow-bearing Tree
km	kilometres
LRET	Large-scale renewable energy target
m	Metres
MNES	Matters of National environmental significance under the EPBC Act (*c.f.*)
NSW	New South Wales
REAP	Regional Environmental Action Plan (NSW)
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water, now Department of Planning, Industry and Environment
PV	Photovoltaic
SSD	State Significant Development
SEARS	Secretary's Environmental Assessment Requirements
SAII	Serious and Irreversible Impact
SEPP	State Environmental Planning Policy (NSW)
sp/spp	Species/multiple species
TEC	Threatened Ecological Community (can refer to either CW or NSW listing)

EXECUTIVE SUMMARY

Wellington Solar Farm's Development Consent was approved by the Executive Director Department of Planning and Environment (DPE) on May 25, 2018 (Application Number: SSD 8573) under Section 4.38 of the *Environmental Planning and Assessment Act 1979*. The development application is approved under Schedule 1, subject to the conditions in Schedules 2-4. The initial Biodiversity Assessment Report (BAR) was prepared by NGH Environmental on behalf of First Solar in November 2017 and was included in Appendix D of the Environmental Impact Statement (EIS) (NGH 2017).

Lightsource BP has approval for Wellington Solar Farm to construct a 174 megawatt solar photovoltaic array with associated infrastructure. The Solar Farm covers approximately 316 ha of the 559.1 ha proposal site and it is location in the Dubbo Regional Local Government Area, NSW, about 2 km north-east of Wellington.

This Biodiversity Development Assessment Report (BDAR) includes a standalone assessment of the biodiversity impacts of the proposed Wellington Solar Farm substation expansion. It uses the Biodiversity Assessment Method (BAM), pursuant to the *Biodiversity Conservation Act, 2017* (BC Act). This BDAR is part of the Modification Application submitted to the Department of Planning, Industry and Environment (DPIE) in August 2019[1].

The substation expansion development requires the removal of 0.69 hectares of vegetation. The development footprint impact on this vegetation community includes:

- Vegetation Zone 2 - White Box grassy woodland – planted - 0.02 ha
- Vegetation Zone 5 - White Box grassy woodland derived grassland (assessed as moderate to good condition in 2017, now moderate to low condition) - 0.36 ha
- Vegetation Zone 6 - White Box grassy woodland derived grassland (low condition) – 0.30 ha

Zone numbering has been made as such as to be consistent with the previous assessment for the broader solar farm BAR. The removal of 0.02 ha of Vegetation Zone 2 resulted in the generation of 1 ecosystem credit. The other two zones (Zone 5 and Zone 6) did not result in the generation of ecosystem credits because of their low condition. Vegetation Zone 5 had deteriorated in condition since previous assessments, most likely due to the drought and pressures from grazing, and Vegetation Zone 6 was also in low condition during the survey.

Targeted surveys were undertaken for candidate flora species where habitat elements were known to exist onsite. Of the flora species surveyed, none were found during targeted survey.

The majority of fauna candidate species identified in the calculator were excluded from further assessment due to a lack of suitable habitat available onsite. Due to time constraints fauna surveys were not conducted for species that had not been previously assessed such as the Pink-tailed Legless Lizard and Bush Stone-curlew. These species were assumed to be present and appropriate credits generated. Other fauna surveyed in 2017 had sufficient data to exclude them with the exception of the Regent Honeyeater, which was considered to use the site on for foraging on occasion, however the development is unlikely to impact upon breeding habitat for this species. Species credits generated include; Pink-tailed Legless Lizard 2 credits, Bush Stone-curlew 0 credits, and Little Eagle 0 credits. Although credits are not generated for the Bush Stone-curlew and Little Eagle, some degree of offset may be required to be determined by the BCT.

[1] Initially, the existing Biodiversity Assessment Report (BAR) (NGH 2010) was updated to address the additional substation expansion impacts, but in the letter (dated 06/09/2018) from DPIE, it was clarified that a BDAR was required.

The retirement of these credits is proposed to be carried out in accordance with the NSW Biodiversity Offsets Scheme and will be achieved by either:

a) Retiring credits under the Biodiversity Offsets Scheme, or

b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or

c) Funding a biodiversity action that benefits the threatened entity impacted by the development.

Mitigation and management measures are proposed to adequately address impacts associated with the proposal, both directly and indirectly.

1. INTRODUCTION

1.1. THE APPROVED PROJECT – WELLINGTON SOLAR FARM

Wellington Solar Farm is located 2 km north-east of Wellington in the Dubbo Regional Local Government Area (LGA). Development Consent was approved by the Executive Director Department of Planning and Environment (DPE) on May 25, 2018 (Application Number: SSD 8573) under Section 4.38 of the *Environmental Planning and Assessment Act 1979*. The development application is approved under Schedule 1, subject to the conditions in Schedules 2-4.

The conditions are required to:

- Prevent and/or minimise any adverse environmental impacts of the development,
- Set standards and performance measures for acceptable environmental performance, and
- Provide for the ongoing environmental management of the development.

The existing consent permits the construction, operation and decommissioning of a 174 Megawatt (MW AC) photovoltaic (PV) solar farm and associated infrastructure including:

- Substation and transformers.
- Underground transmission cable.
- Battery storage facility.
- Access tracks.

The proposed substation expansion is a small addition which, while part of the area assessed in 2017, has not been approved as part of the Development Consent; therefore, a Modification Application is required.

1.2. MODIFICATION APPLICATION

The Modification Application was submitted to DPIE in August 2019, for the alteration to the substation. The substation expansion requires underground cables to be installed in place of and south of the approved overhead transmission line alignment and a small expansion to the substation bench to accommodate the required substation equipment.

1.3. PROPOSAL FOR THE SUBSTATION EXPANSION

The existing Wellington substation, into which the Wellington Solar Farm will connect, is located south of Goolma Road, approximately 2km from Wellington, NSW (Figure 1-1). The area surrounding the substation was assessed as part of the Environmental Impact Statement (EIS) completed by NGH Environmental (2017).

The consented layout (NGH 2018), provided in Appendix A, shows that the overhead transmission line connecting to the substation from the solar farm:

- Crosses Goolma Road, heading south
- Veers west halfway down the substation compound, connecting to the western section of the existing substation

TransGrid have advised that there is a need to extend the substation footprint beyond the existing fence line and re-locate the approved point of connection of the transmission line into the substation. The modified layout

now allows for an underground transmission cable[2] connection to the substation from the solar farm, which will:

- Cross Goolma Road, heading south
- Veer west at the southern end of the substation compound, connecting at the south- western corner of the existing substation.

Additionally, an expansion of the existing substation compound is required to house the following equipment:

- Power transformer (132/33kV)
- 132kV bus bar extension
- 132kV current transformer
- 132kV voltage transformer
- 33kV bus for the transformer secondary side (includes the 33kV cable connections)
- 33kV switch room building, including the 33kV switchboard
- Harmonic filters

In total, the new works require 6,913 m^2 (0.69 ha) of ground disturbance for the proposed substation expansion. The substation expansion includes:

- An underground transmission line to be located along the approved alignment of the overhead transmission line to the existing substation under the consented layout (NGH Environmental 2018) 301m x 11 m = 3,260m^2 (0.32 ha)
- Proposed substation bench extension - 110m x 16-36m = 2,563m^2 (0.26 ha)
- Remaining easement for the underground transmission line – 4,350 m^{22} (0.43 ha)

Notes:

- The approved overhead transmission line was 191m in length. The additional proposed underground transmission line is 110m in length resulting in a total of 301m. The approved overhead line is now proposed to be underground and as such, the entire 301m will now be underground.
- The easement width of 11 m is used in this assessment for the underground transmission line trench.
- All works remain within the consented development site boundary.

The proposed substation expansion easement is shown in Figure 1-1.

The construction works are planned to be begin late October 2019.

[2] This will be a bundle of approximately seven cables. Refer to cross section Appendix B

1.4. THE DEVELOPMENT SITE

1.4.1. Site Location and Description

There is an existing substation south of Goolma Road (opposite the approved Wellington Solar Farm). The extension of the substation covers a small linear strip west of the existing substation and a small area to the south. Most of this area is cleared of trees and shrubs and outside of the fenced substation the area is grazed by cattle. The northern area of the substation adjacent to Goolma Road is planted vegetation with White Box, Yellow Box, White Cypress Pine and Mugga Ironbark (*Eucalyptus sideroxylon*) with a predominately native groundcover.

The substation is located approximately 2km north-east of the town of Wellington within the Dubbo Regional Local Government Area (LGA). The proposal site is within Lot 1, DP1226751, south of Goolma Rd, Wellington. The solar farm is opposite, north of Goolma Rd.

The proposal is a 0.69 ha development, on a 57ha lot of land.

Figure 1-1 and 1-2 show the site location.

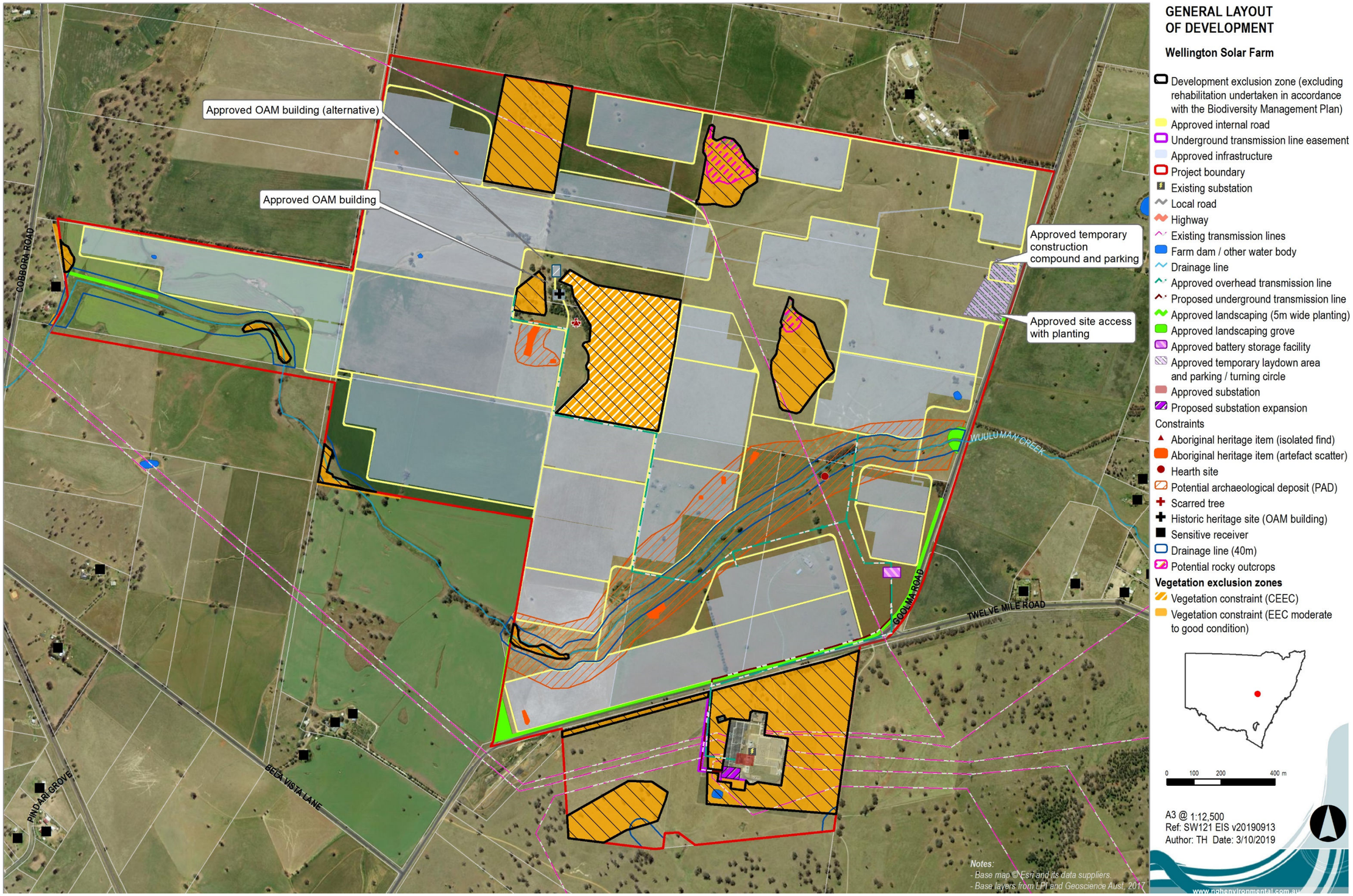

Figure 2-2 Proposed substation expansion easement with substation bench (zoom out)

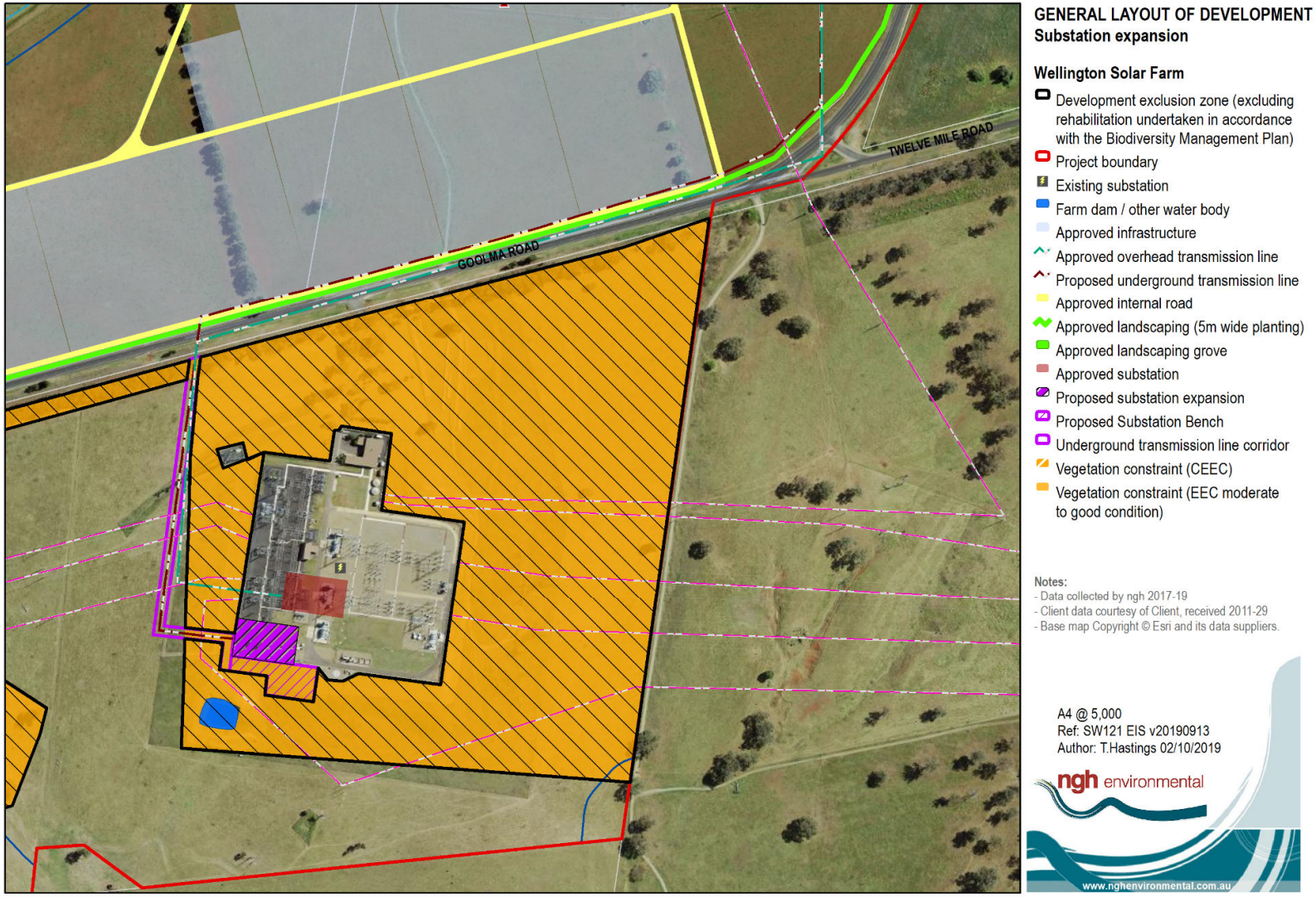

Figure 2-3 Proposed substation expansion easement with substation bench (zoom in)

1.4.2. Construction and infrastructure requirements

The purpose of the proposal is to re-locate the previously approved point of connection of an overhead transmission line into the substation. The substation expansion requires underground transmission cables to be installed along and south of the approved alignment and a small expansion to the substation infrastructure.

The modified layout now allows for an underground transmission cable connection to the substation from the solar farm, which will:

- Cross Goolma Road, heading south
- Veer west at the southern end of the substation compound, connecting at the south- western corner of the existing substation.

Additionally, an expansion of the existing substation compound is required to house the following equipment:

- Power transformer (132/33kV)
- 132kV bus bar extension
- 132kV current transformer
- 132kV voltage transformer
- 33kV bus for the transformer secondary side (includes the 33kV cable connections)
- 33kV switch room building, including the 33kV switchboard
- Harmonic filters

1.5. STUDY AIMS

This BDAR has been prepared by NGH Environmental on behalf of Lightsource BP.

The aim of this BDAR is to assess the native vegetation and habitats in the development site and footprint to determine the impacts and offset requirements under the BC Act.

This BDAR includes an assessment of impacts to protected matters listed under the federal *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). This assessment includes use of the Protected Matters Search Tool to determine potential species and communities occurring within the locality, and targeted surveys across the site to detect the presence of these entities or their habitats. Entities known or considered likely to occur have been included in the impact assessment, and Assessments of Significance have been prepared where there is the potential for impacts to determine the significance of impacts to these entities.

1.6. SOURCES OF INFORMATION USED IN THE ASSESSMENT

The following information sources were used in the preparation of this report:

- Aerial Maps and Proposal layers provided by Lightsource BP.
- Commonwealth Department of Environment and Energy (DoEE) Species Profiles and Threats database (SPRAT) http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 2.
- NSW DPIE's BioNet threatened biodiversity database

  Accessed online via login at http://www.bionet.nsw.gov.au/.
- DPIE Threatened Biodiversity Profiles

  http://www.environment.nsw.gov.au/threatenedSpeciesApp/.

- Office of Environment and Heritage (OEH) (2007). Mitchell Landscapes with per cent cleared estimates.
- OEH BioNet Vegetation Classification Database (OEH 2017)

  Accessed online via login at http://www.environment.nsw.gov.au/research/Visclassification.htm.
- NSW OEH's Threatened Species Profiles
  http://www.environment.nsw.gov.au/threatenedspeciesapp/
- DPI profiles of threatened species, population, and ecological communities
- Commonwealth Department of Environment and Energy Protected Matters Search Tool
  Accessed online at http://environment.gov.au/epbc/protected-matters-search-tool
- Clean Energy Council of Australia website accessed online at
  https://www.cleanenergycouncil.org.au/technologies/geothermal.html
- Wind power Engineering and Development website accessed online at
  https://www.windpowerengineering.com/projects/guidelines-selecting-sites/
- Australia's IBRA Bioregions and sub-bioregions. Accessed
  http://environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 2.
- Lumsden L.F & Micaela J.L (2015). National Recover Plan for Southern Bent-wing Bat. Dept of Land, Water and Planning, Melbourne.
- NSW Government SEED Mapping
- Office of Environment and Heritage (OEH) (2017). Biodiversity Assessment Method.
- NSW OEH's Biodiversity Assessment Method (BAM) calculator
  (http://www.environment.nsw.gov.au/bbccapp/ui/mynews.aspx).
- NSW Biodiversity Values Map

  https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap
- NSW OEH's BioNet threatened biodiversity database

  Accessed online via login at http://www.bionet.nsw.gov.au/.
- NSW OEH Threatened Species Profiles

  http://www.environment.nsw.gov.au/threatenedSpeciesApp/ and

  www.environment.nsw.gov.au/AtlasApp/UI_Modules/
- OEH BioNet Vegetation Classification Database (OEH 2017)

  Accessed online via login at http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx
- OEH VIS Mapping
- Mitchell, P. 2002 Descriptions for NSW Mitchell Landscapes version 2, NSW National Parks and Wildlife Service, Hurstville.
- NSW Planning portal online https://www.planningportal.nsw.gov.au/find-a-property

2. LANDSCAPE FEATURES

2.1. IBRA BIOREGIONS AND SUBREGIONS

The proposal is located within NSW South Western Slopes Bioregion and the Inland Slopes Subregion (IBRA v.7 2012). The geology of the region is Ordovician to Early Carboniferous, with typical landforms a mixture of Mountain Ranges, dissected plateaus, hills and ridges and plains. The dominant pre-European vegetation type is Eucalypt Dry Grassy woodland dominated by Yellow Box (*Eucalyptus melliodora*) and White Box (*Eucalyptus albens*) (ASRIS accessed 15/05/17).

The dominant IBRA subregion affected by the proposal is the Inland Slopes Subregion. This was entered in the BAM Calculator for the proposal.

2.2. NSW LANDSCAPE REGIONS (MITCHELL LANDSCAPES)

The site occurs in the Mitchell Landscape of Mullion Slopes. The Mitchell Landscape description (DECC 2002), is:

> Steep hills and strike ridges on tightly folded Ordovician andesite, conglomerate and tuff, Silurian rhyolite and shale, Devonian quartz sandstones, slate and minor limestone, general elevation 500 to 830m, local relief 200m. Stony uniform sand and loam in extensive rock outcrop along crests, stony red and brown texture-contrast soil on slopes, yellow harsh texture-contrast soil in valleys with some evidence of salinity. Gravel and sand in streambeds. Open forest to woodland of; White Gum (*Eucalyptus rossii*), Brittle Gum (*Eucalyptus mannifera*), Broad-leaved Peppermint (*Eucalyptus dives*), Red Box (*Eucalyptus polyanthemos*), Mountain Grey Gum (*Eucalyptus cypellocarpa*), White Box (*Eucalyptus albens*) with Yellow Box (*Eucalyptus melliodora*) on lower slopes and River Oak (*Casuarina cunninghamiana*) along the streams.

2.3. NATIVE VEGETATION EXTENT

Native vegetation extent within 1500m of the subject land was mapped using aerial imagery and site assessment (NGH 2017). The native vegetation woody cover within the 1500 m buffer area surrounding the development site is 393 ha or 32%. The non-woody vegetation is 195 hectares, or 16% cover based on the vegetation survey in 2017 (NGH 2017).

The pre-European assessment of the native vegetation occurring on the subject site was woodland. Native vegetation mapping used over-storey as a surrogate for native vegetation cover and is considered conservative as this would include non-native vegetation that may still provide some habitat value. The local area's native vegetation is derived from woodland and as such, no natural grasslands are relevant to the study area. The majority of the area is composed of White-box Grassy woodland and derived grasslands with the predominant remnant overstorey species consisting of White Box.

2.4. CLEARED AREAS

Cleared areas in the local area are primarily used for cropping and grazing and provide very little in terms of native fauna habitat. These areas provide suitable foraging habitat for raptors, parrots, cockatoos and macropods, and introduced species such as cats, foxes and rabbits. Approximately 706ha (53%) within the 1500 m buffer area is cleared land.

2.5. RIVERS AND STREAMS

No watercourses run through the development site. Wuuluman Creek, a 3rd order stream, runs to the east of the site (approximately 700 metres away). This watercourse flows into the Macquarie River, approximately 2.5km downstream.

2.6. WETLANDS

No wetlands occur within or adjacent to the development site. The closest Nationally Important Wetland downstream from the development site is the Macquarie Marshes, located over 150km downstream.

2.7. CONNECTIVITY FEATURES

To date, no biodiversity corridor plans have been approved by the Chief Executive of the Environment, Energy and Science Division of DPIE.

No state or regionally significant biodiversity links occur within the development site nor within the inner and outer assessment circles.

2.8. AREAS OF GEOLOGICAL SIGNIFICANCE

The nearest site of geological significance are the Wellington Caves and phosphate mine, approximately 10km south of the subject land.

2.9. AREAS OF OUTSTANDING BIODIVERSITY VALUE

There are no Areas of Outstanding Biodiversity Value or any Biodiversity Values mapped within the development site. The nearest Biodiversity Values areas that are mapped are Wuuluman Creek and Macquarie River. Figure 2-1 shows the surrounding areas of Biodiversity Values September 17, 2019.

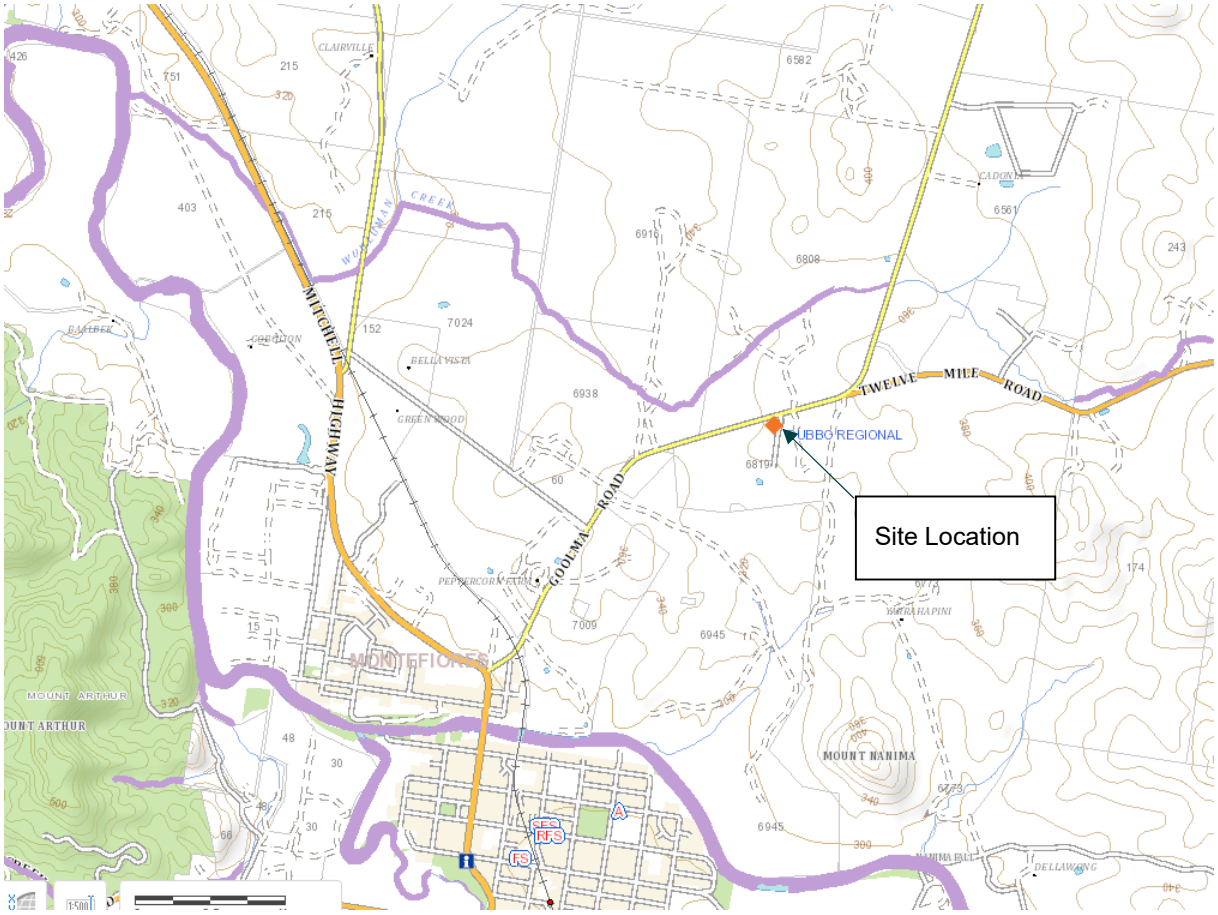

Figure 2-1 Biodiversity Values Map. Source: NSW Government September 2019

2.10. SITE CONTEXT COMPONENTS

2.10.1. Method applied

The proposal conforms to the definition of a *site-based development* under the Biodiversity Assessment Methodology. The site-based development assessment methodology has been used in this BAM assessment.

2.10.2. Percent Native Vegetation Cover

The percentage of Native Vegetation cover within 1500 metres of the development site was calculated by estimating the presence of any native vegetation observed using aerial imagery and on site field surveys (NGH 2017). Due to the previous field surveys, the percentage cover of woody and non-woody vegetation could be calculated. For all other open areas, where aerial imagery shows farming operations, these areas were considered exotic vegetation as these locations and the surrounding landscape could not be verified by site survey.

The total area within the 1500 m buffer from the subject site is 1243 ha. The native vegetation woody cover within the 1500 m buffer area surrounding the development site is 393 ha or 32%. The non-woody vegetation is 195 hectares, or 16% cover based on the vegetation survey in 2017 (NGH 2017). These results were entered into the BAM calculator. The remaining vegetation cover is assumed to be exotic cropping or introduced pastures and covers 706 hectares.

The native vegetation mapped with woody and non-woody vegetation covering approximately 587 hectares or 48% of the buffer area, refer to Figure 2-2.

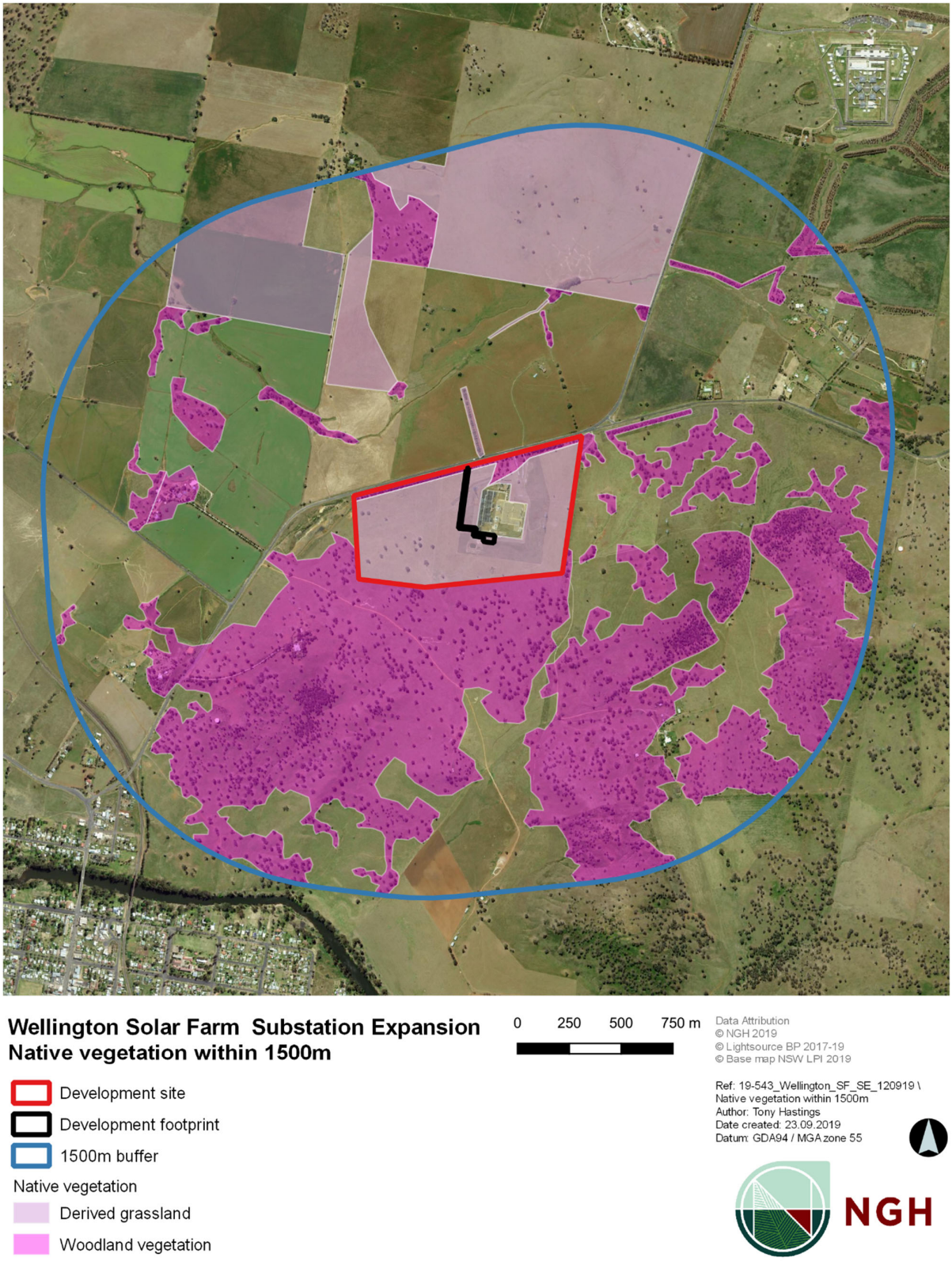

Figure 2-2 Native vegetation within 1500m of the subject land

3. NATIVE VEGETATION

3.1. NATIVE VEGETATION EXTENT

The vegetation in the substation extension and transmission line easement development footprint is considered native and was previously assessed by NGH in 2017 as part of the Biodiversity Assessment Report (NGH 2017) as part of the EIS.

These results along with field surveys have been used to determine the PCTs on site. The development footprint has been re-assessed using the BAM plots in September 2019.

3.2. PLANT COMMUNITY TYPES (PCTS)

3.2.1. Methods used to assess PCTs

Based on the BAR completed by NGH (2017) and the BAM plots completed in September 2019, the PCT on site was White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes (PCT 266).

3.2.2. PCTs identified on the development site

One Plant Community Type (PCT) was identified in the development site; White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes (PCT 266).

Cleared areas that were dominated by non-indigenous vegetation were not considered to provide habitat for threatened species or communities and thus have not been included in the BAM calculations.

White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes (PCT 266)

Within the development site, PCT 266 occurred as three zones:

- Vegetation Zone 2 - White Box grassy woodland – planted (Moderate to good condition) - 0.022 ha
- Vegetation Zone 5 - White Box grassy woodland derived grassland (previously moderate to good condition, now in moderate to low condition due to drought and grazing) 0.364 ha
- Vegetation Zone 6 - White Box grassy woodland derived grassland (low condition) – 0.299 ha

Zone numbering has been made as such as to be consistent with the previous assessment for the broader solar farm BAR.

These zones are shown in Figure 3-1.

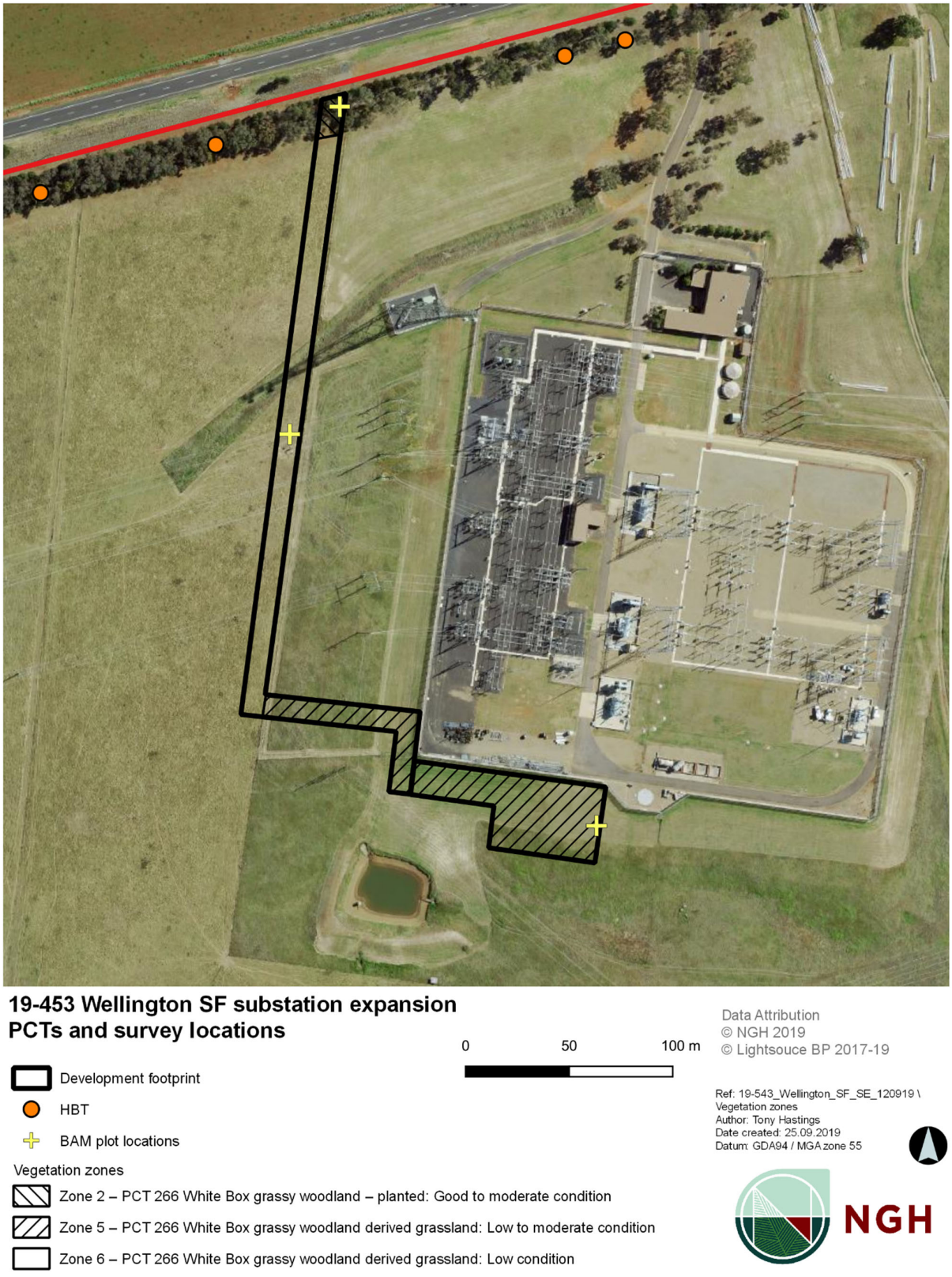

Figure 3-1 Vegetation zones on the subject land

This PCT was determined during the survey based on plot data collected during the solar farm assessment (NGH 2017) within the development envelope and on surveys conducted in adjacent less disturbed vegetation. Within the woodland vegetation the overstorey is characteristically dominated by White Box (*Eucalyptus albens*) with occasional Kurrajong (*Brachychiton populneus subsp. populneus*). Understory vegetation is comprised of native grasses and herbs such as Cotton Panic Grass (*Digitaria brownii*), Red Grass (*Bothriochloa macra*), Windmill Grass (*Chloris truncata*), Twining Glycine (*Glycine clandestina*) and Oxalis (*Oxalis perennans*). Exotic species present include Perennial Rye Grass (**Lolium perenne*), Brome (**Bromus sp.*), Saffron Thistle (**Carthamus lanatus*), Spear Thistle (**Cirsium vulgare*), Variegated Thistle (**Silybum marianum*), White Clover (**Trifolium repens*) and Hop Clover (**Trifolium campestre*).

A planted tree lot occurs alongside Goolma Road near the substation, including the north end of the subject land. This tree lot comprised mature White Box (*Eucalyptus albens*), White Cypress Pine (*Callitris glaucophylla*), Mugga Ironbark (*Eucalyptus sideroxylon*) and Kurrajong (*Brachychiton populneus*) in rows. Understory vegetation is comprised of native grasses such as Spear Grasses (*Austrostipa sp.*), Wallaby Grass (*Rytidosperma caespitosum*), Nineawn Grass (*Enneapogon nigricans*) and exotic annual grasses such as Ryegrass (**Lolium sp.)* and Brome (**Bromus catharticus*). Some native shrubs Creeping Saltbush (*Atriplex semibaccata*), Climbing Saltbush (*Einadia nutans*) and Black Rolypoly (*Sclerolaena muricata*) also occur in the understory. This planted tree lot is included as part of the White Box Grassy Woodland Vegetation community as it contains similar overstorey species, has a native understorey derived from this community and provides similar habitat to the surrounding White Box Grassy Woodland community. During the 2019 survey of a smaller patch of the planted Box Gum Woodland this area was dominated by Yellow Box (*Eucalyptus melliodora),* White Cypress Pine (*Callitris glaucophylla*) and Mugga Ironbark (*Eucalyptus sideroxylon. T*he majority of the groundcover was made up of leaf litter interspersed with Wallaby Grass (Rytidosperma caespitosum), Corkscrew Grass (*Austrostipa setacea),* Fuzzweed (*Vittandinia cuneate),* Burr Medic (**Medicago polymorpha)* and African Boxthorn (**Lycium ferocissimum).*

Within the derived grassland in moderate to good condition, the native groundcover is comprised of species such as Red Grass (*Bothriochloa macra*), Nineawn Grass (*Enneapogon* sp.), Yellow Burr-daisy (*Calotis lappulacea*), Spear Grass (*Austrostipa scabra*), Umbrella Grass (*Digitaria divaricatissima*) and Bluebells (*Wahlenbergia luteola*) in greater than 50% cover. Exotic species are common and include Burr Medic (**Medicago polymorpha*), Hop Clover (**Trifolium campestre*), Clustered Clover (**Trifolium glomeratum*), Saffron Thistle (**Carthamus lanatus*) and St Barnaby's Thistle (**Centaurea solstitialis*). The moderate to good condition derived grassland are now in moderate to low condition which is believed to be attributed to the drought conditions and grazing pressures. The 2019 composition of this derived grassland is a cover of approximately 25% native species composed mostly of Fuzzweed (*Vittadinia cuneata)* with a small amount of Wallaby Grass (*Rytidosperma casespitosum)* and Corkscrew Grass (*Austrostipa setacea).* The exotic cover is composed of predominantly Burr Medic (**Medicago polymorpha)* with a few Dandelion (**Taraxacum officinale)*.

The low condition derived grassland consists of similar native grasses and forbs but with less than 50% native species cover and is dominated by exotic species such as Lucerne (**Medicago sativa*), Hop Clover (**Trifolium* campestre) Capeweed (**Arctotheca calendula*), Brome (**Bromus sp.*) and Heliotrope (**Heliotropium* sp.). In 2019 the low condition grassland consists of approximately 2% native species composed of mostly Wallaby Grass (*Rytidosperma carphoides)* with the majority of cover composed of exotic species Burr Medic (**Medicago polymorpha)* and Vervain (**Salvia verbenaca)*.

Endangered Ecological Communities

PCT 266 forms part of the White Box – Yellow Box – Blakely's Red Gum Woodland EEC listed under the NSW BC Act (See Figure 3.2).

Patches of this vegetation community that meet specific criteria are also listed under the Commonwealth EPBC Act as White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands, a Critically Endangered Ecological community (CEEC). The area of planted Box Gum Woodland

surveyed in September 2019 was not considered to be CEEC under the EPBC Act due to a lack of dominance of native species in the understorey.

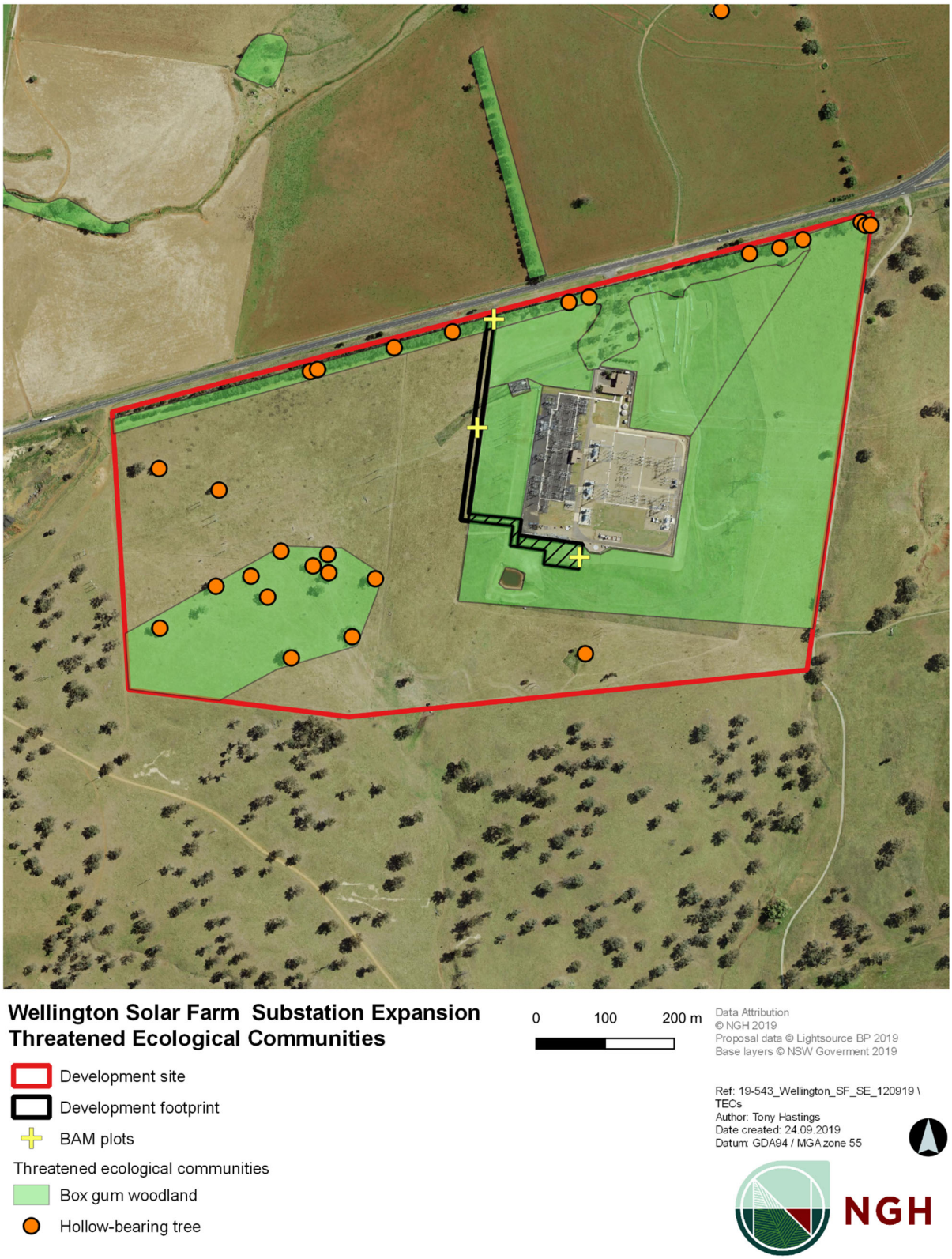

Figure 3-2 Threatened Ecological Communities

3.3. VEGETATION INTEGRITY ASSESSMENT

3.3.1. Vegetation zones and survey effort

Vegetation integrity (VI) plots were used to confirm the PCT and condition within the development footprint (Table 3-1 below). One PCT White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion was confirmed by three VI plots. One VI plot was conducted in each of the three condition states within the development footprint based on previous vegetation stratification conducted for the BAR originally prepared in 2017. See Figure 3-1 for vegetation stratification. Plot 3 in the low condition derived grassland was conducted using a 10m x 100m plot because the area of impact was only 10m wide. The litter plots were also adjusted to occur at 5m, 25m, 45m, 65m and 85m.

Table 3-1 Vegetation Zones and VI Plots

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (# plots)	Patch size (ha)
2	266 Woodland	Planted woodland indicative of Box Gum Woodland species	0.02	1 plot (plot 2, 20x50m)	4
5	266 Derived grassland	Derived grassland in moderate to low condition (previously in moderate to good condition), impacted by drought conditions and intense grazing	0.36	1 plot (plot 4, 20x50m)	3
6	266 Derived grassland	Derived grassland in low condition	0.3	1 plot (plot 3, 10x100m)	24

Note: Zone ID numbers 2, 5 and 6 are the same zone ID numbers for the 2017 BAR assessment (NGH 2017).

3.3.2. Vegetation integrity assessment results

Three vegetation integrity plots were conducted within PCT 266 to reflect the variation in the condition of this community. As such the condition ranged from White Box grassy woodland (planted), to derived grassland in moderate to low condition and derived grassland in low condition. See Table 3-2 for details, field data sheets are provided for each vegetation zone in Appendix A.

Table 3-2 Current vegetation integrity scores for each vegetation zone within the development footprint

Zone ID	PCT ID	Composition score	Structure score	Function Score	Vegetation Integrity Score
2	PCT 266 Plot 2 Woodland – moderate to good	31.4	32.8	64.1	40.4
5	PCT 266 Plot 4 Derived grassland – moderate to low	21.3	10.9	2.8	8.7
6	PCT 266 Plot 3 Derived grassland - low	8.3	0.5	0.7	1.4

4. THREATENED SPECIES

4.1. ECOSYSTEM CREDIT SPECIES

The following ecosystem credit species were returned by the calculator as being associated with the PCTs present within the development footprint:

Table 4-1 Ecosystem credit species from the BAM Calculator

Ecosystem Credit Species	Relevant vegetation zones	NSW listing status	National listing status
Black-chinned Honeyeater	266 Woodland- Mod-Good	Vulnerable	No Listed
Brown Treecreeper (eastern subspecies)	266 Woodland- Mod-Good	Vulnerable	Not listed
Corben's Long-eared Bat	266 Derived grassland Low	Vulnerable	Vulnerable
Diamond Firetail	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed
Dusky Woodswallow	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed
Eastern Bentwing Bat	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed

Ecosystem Credit Species	Relevant vegetation zones	NSW listing status	National listing status
Eastern False Pipistrelle	266 Derived grassland – Mod-Low	Vulnerable	Not listed
Flame Robin	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed
Gang-gang Cockatoo	266 Woodland- Mod-Good	Vulnerable	Not listed
Glossy Black-Cockatoo	266 Woodland- Mod-Good	Vulnerable	Not listed
Grey-crowned Babbler (eastern subspecies)	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Note listed
Grey-headed Flying-fox	266 Woodland- Mod-Good	Vulnerable	Vulnerable
Hooded Robin (south-eastern form)	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed
Koala	266 Woodland- Mod-Good	Vulnerable	Vulnerable

Ecosystem Credit Species	Relevant vegetation zones	NSW listing status	National listing status
Little Eagle	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed
Little Lorikeet	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed
Masked Owl	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed
Painted Honeyeater	266 Woodland- Mod-Good	Vulnerable	Vulnerable
Purple-crowned Lorikeet	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed
Regent Honeyeater	266 Woodland- Mod-Good	Critically Endangered	Critically Endangered

Ecosystem Credit Species	Relevant vegetation zones	NSW listing status	National listing status
Scarlet Robin	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed
Speckled Warbler	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed
Spotted Harrier	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed
Spotted-tailed Quoll	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Endangered
Square-tailed Kite	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed

Ecosystem Credit Species	Relevant vegetation zones	NSW listing status	National listing status
Superb Parrot	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Vulnerable
Swift Parrot	266 Woodland- Mod-Good	Endangered	Critically Endangered
Turquoise Parrot	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed
Varied Sittella	66 Woodland- Mod-Good	Vulnerable	Not listed
White-bellied Sea Eagle	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed
Yellow-bellied Sheathtail-bat	266 Woodland- Mod-Good 266 Derived grassland – Mod-Low 266 Derived grassland Low	Vulnerable	Not listed

4.1.1. Species excluded from the assessment

The following species were excluded from further assessment based on a lack of specific habitat onsite:

Table 4-2 Species excluded from assessment based on lack of habitat

Ecosystem Credit Species	Vegetation Zones Excluded	Reason for exclusion
Black-chinned Honeyeater (eastern subspecies)	266 Derived grassland – Mod-Low 266 Derived grassland Low	Insufficient habitat for foraging within grasslands, devoid of trees and shrubs
Brown Treecreeper	266 Derived grassland – Mod-Low 266 Derived grassland Low	Insufficient habitat for foraging within grasslands, no fallen timber
Corben's Long-eared Bat	266 Derived grassland – Mod-Low 266 Derived grassland Low	Insufficient habitat within grassland, devoid of trees
Eastern False Pipistrelle	266 Derived grassland – Mod-Low 266 Derived grassland Low	Insufficient habitat within grassland, devoid of trees
Gang-gang Cockatoo	266 Derived grassland – Mod-low 266 Derived grassland Low	Insufficient foraging habitat within grassland, devoid of shrubs and trees
Glossy Black-Cockatoo	266 Derived grassland – Mod-low 266 Derived grassland Low	Insufficient foraging habitat within grassland, devoid of shrubs and trees
Grey-headed Flying-fox	266 Derived grassland – Mod-Low 266 Derived grassland Low	Insufficient foraging and roosting habitat within grassland, devoid of trees
Koala	266 Derived grassland – Mod-Low 266 Derived grassland Low	Insufficient foraging habitat within grassland, devoid of trees
Painted Honeyeater	266 Derived grassland – Mod-Low 266 Derived grassland Low	Insufficient foraging habitat within grasslands, devoid of trees and mistletoe

Ecosystem Credit Species	Vegetation Zones Excluded	Reason for exclusion
Swift Parrot	266 Derived grassland – Mod-Low 266 Derived grassland Low	Insufficient foraging habitat within grasslands, devoid of trees
Varied Sittella	266 Derived grassland – Mod-Low 266 Derived grassland Low	Insufficient habitat for foraging within grasslands, no trees

4.2. SPECIES CREDIT SPECIES

4.2.1. Candidate species to be assessed

The BAM Calculator predicted the following species credit species to occur within the development footprint (Table 4-3 below).

Table 4-3 Candidate species credit species requiring assessment.

Species Credit Species	Habitat preferences and geographic distribution	Sensitivity to gain class	NSW listing status	National listing status
Ausfeld's Wattle *Acacia ausfeldii*	Associated with E albens, E blakelyi and Callitiris spp., germination stimulated by fire	High	Vulnerable	Not listed
Yass Daisy *Amobium craspedioides*	Found in moist or dry forest communities, Box Gum Woodland and secondary grassland.	High	Vulnerable	Vulnerable
Regent Honeyeater *Anthochaera phrygia* (Breeding)	Inhabits temperate woodland and open forests. The species inhabits Box-ironbark woodland. Usually inhabit woodlands that have large numbers of mature trees, high canopy cover and abundance of mistletoe	High	Critically Endangered	Critically Endangered
Pink-tailed Legless Lizard *Apraisia parapulchella*	Inhabits sloping, open woodland areas with predominantly native grassy ground layers. Habitat is usually well drained, with rock outcrops or scattered, partially buried rocks. Commonly found beneath small, partially embedded rocks.	High	Vulnerable	Vulnerable

Bush Stone-curlew	Inhabits open forest and woodlands with a sparse grassy ground layer and fallen timber. Nocturnal, feed on insects and small vertebrates.	High	Endangered	Not listed
Gang-gang Cockatoo *Calyptorhynchus lathami* (Breeding)	Generally found in tall mountain forests and woodland in spring and summer. In autumn and winter, they usually move to lower altitudes in drier, more open eucalypt forests and woodland, particularly Box-gum and Box-ironbark woodlands. Favour old growth forest and woodland as nesting hollows are required.	High	Vulnerable	Not Listed
Glossy Black-Cockatoo *Calyptorhynchus lathami* (Breeding)	Inhabits open forest and woodlands where stands of she oak occur. Feeds almost exclusively on She-oak species. Depending on large hollow bearing trees for nesting.	High	Vulnerable	Not Listed
Euphrasia arguta *Euphrasia arguta*	Found in limited area near Nundle. Plants have been reported in eucalypt forest with a mixed grass and shrub understorey. Usually dies off in winter months, most active growth during January to April. It is semi parasitic and attaches to the roots of other associated plants.	High	Critically endangered	Critically endangered
Tumut Grevillea *Grevillea wilkinsonii*	Restricted to the NSW South-west slopes. Can be associated with Blakey's Red Gum, Yellow Box and Kurrajongs. Flowers mid-September to mid-October. Recruits readily where there is some bare ground.	High	Endangered	Endangered
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Terrestrial habitat includes woodland. Breeding habitat consists of mature tall open forest, tall woodland close to foraging habitat.	High	Vulnerable	Not Listed
Little Eagle	Occupies open eucalypt forest, woodland or open woodland.	Moderate	Vulnerable	Not Listed

Hieraaetus morphnoides (Breeding)	Nests in tall living trees within a remnant patch, build stick nests in winter.			
Swift Parrot *Lathamus discolor* (Breeding)	Breeds in Tasmania during spring and summer. In NSW mostly occurs on the coast and south west slopes.	Moderate	Endangered	Critically Endangered
Square-tailed Kite *Lophoictinia isura (Breeding)*	Found in habitats including dry woodlands. Shows preference for watercourses. Has been observed in north west NSW in stony country with a ground cover of chenopods and grasses and low open eucalypt woodland.	Moderate	Vulnerable	Not Listed
Eastern Bentwing Bat *Miniopterus schreibersii oceanensis* *(Breeding)*	Breeding habitat is within caves and manmade tunnels.	Very High	Vulnerable	Not Listed
Squirrel Glider *Pteaurus norfolcensis*	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range. Prefers a mid-storey of shrub or acacia. Requires abundant tree hollows for refuge and nest sites.	High	Vulnerable	Not Listed
Brush-tailed Rock Wallaby *Petrogale penicillata*	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves, and ledges, often facing north. Browse on vegetation adjacent rocky areas including grasses, forbs and foliage and fruits of shrubs and trees.	Very High	Endangered	Vulnerable
Brush-tailed Phascogale *Phascogale tapoatafa*	Inhabits dry sclerophyll open forest with sparse ground cover of herbs, grasses shrubs or leaf litter. Nests and shelter in tree hollows with entrances 2.5-4cm wide, using many hollows over a short time.	High	Vulnerable	Not Listed

Koala *Phascolarctos cinereus*	Inhabit a range of eucalypt forest and woodland communities and will utilise paddock trees. White Box *(Eucalyptus albens)* and Yellow Box (*Eucalyptus melliodora*) are secondary food trees of the Koala in this region.	High	Vulnerable	Vulnerable
Superb Parrot *Polytelis swainsonii*	Inhabit Box Gum and Box-Cypress-pine woodlands. They require hollow bearing trees for nesting.	High	Vulnerable	Vulnerable
Grey-headed Flying-fox *Pteropus poliocephalus*	Roosting camps are generally within 20km of a regular food source, usually found in gullies close to water in vegetation with a dense canopy. Feed on nectar from Eucalyptus, Melaleuca and Banksia species.	High	Vulnerable	Vulnerable
Small Purple-pea *Swainsona recta*	Considered to occur in the understorey of woodlands and open forests dominated by Blakely's Red Gum, Yellow Box, Candle bark Gum and Long-leaf Box. It is considered likely to be extinct.	Moderate	Endangered	Endangered
Silky Swainson-pea *Swainsona sericea*	Found in Box Gum Woodland on South West slopes. Sometimes found in association with Callitris species. Regenerates from seed after fire.	High	Vulnerable	Not Listed
Golden Sun Moth *Synemon plana*	Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands with ground layers dominated by Wallaby grasses (possibly several species), they require bare ground between tussocks. Habitat may have also had Austrostipa species or Kangaroo Grass. They have also been known to use areas containing weeds such as Serrated Tussock.	Moderate	Endangered	Critically Endangered

Masked Owl *Tyto novaehollandiae* (Foraging)	Inhabit dry eucalypt forests and woodlands. Require large hollow bearing trees for nesting.	High	Vulnerable	Not Listed
Zieria obcordata *Zieria obcordata*	Known to occupy an area near Wellington. Grow in eucalypt woodland or shrubland. Also occurs on Eucalyptus and Callitris dominated woodland with an open low shrub understorey, on moderately steep, mainly west to north facing slopes amongst granite boulders. Associated with Box Gum Woodland.	High	Endangered	Endangered

4.2.2. Inclusions and exclusions based on habitat type

The following species credit species have been excluded from further assessment based on the lack of habitat features present within the development footprint (Table 4-4 below).

Table 4-4 Species credit species included and excluded based on habitat features.

Species Credit Species	Relevant habitat inside the development footprint	Included or excluded	Reason for inclusion or exclusion
Ausfeld's Wattle *Acacia ausfeldii*	Associated with E albens, E blakelyi and Callitiris spp.	Included	All associated tree species are present at the site. Some within the development footprint
Yass Daisy *Amobium craspedioides*	Found in moist or dry forest communities, Box Gum Woodland and secondary grassland.	Excluded	Not found north of Cowra
Regent Honeyeater *Anthochaera phrygia* (Breeding)	Inhabits temperate woodland and open forests. The species inhabits Box-ironbark woodland. Usually inhabit woodlands that have large numbers of mature trees, high canopy cover and abundance of mistletoe	Excluded	Some woodland foraging habitat within the development footprint. Unlikely to impact upon breeding habitat.
Pink-tailed Legless Lizard *Apraisia parapulchella*	Inhabits sloping, open woodland areas with predominantly native grassy ground layers. Habitat is usually well drained, with rock outcrops or scattered, partially buried rocks.	Included	Some rocky habitat within the development footprint adjacent woodland area.

	Commonly found beneath small, partially embedded rocks.		
Bush Stone-curlew	Inhabits open forest and woodlands with a sparse grassy ground layer and fallen timber. Nocturnal, feed on insects and small vertebrates. Usually occupies areas of fallen timber.	Included	Open woodland habitat, some fallen timber within development footprint.
Gang-gang Cockatoo *Calyptorhynchus lathami* (Breeding)	Generally found in tall mountain forests and woodland in spring and summer. In autumn and winter, they usually move to lower altitudes in drier, more open eucalypt forests and woodland, particularly Box-gum and Box-ironbark woodlands. Favour old growth forest and woodland as nesting hollows are required.	Excluded	No nesting habitat (HBTs) within the development footprint.
Glossy Black-Cockatoo *Calyptorhynchus lathami* (Breeding)	Inhabits open forest and woodlands where stands of she oak occur. Feeds almost exclusively on She-oak species. Depending on large hollow bearing trees for nesting.	Excluded	No foraging or nesting habitat (HBTs) within the development footprint.
Euphrasia arguta *Euphrasia arguta*	Found in limited area near Nundle. Plants have been reported in eucalypt forest with a mixed grass and shrub understorey. Usually dies off in winter months, most active growth during January to April. It is semi parasitic and attaches to the roots of other associated plants.	Included	Site has the potential to have a mixed grass and shrub understorey in better climatic conditions.
Tumut Grevillea *Grevillea wilkinsonii*	Restricted to the NSW South-west slopes. Can be associated with Blakey's Red Gum, Yellow Box and Kurrajongs. Flowers mid-September to mid-October. Recruits readily where there is some bare ground.	Included	Suitable woodland habitat and eucalypt species available within the development footprint.
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Terrestrial habitat includes woodland. Breeding habitat consists of mature tall open forest, tall woodland close to foraging habitat.	Included	Woodland habitat present within the development footprint.
Little Eagle *Hieraaetus morphnoides* (Breeding)	Occupies open eucalypt forest, woodland or open woodland. Nests in tall living trees within a remnant patch, build stick nests in winter.	Included	Woodland habitat present within the development footprint.

Swift Parrot *Lathamus discolor* (Breeding)	Breeds in Tasmania during spring and summer. In NSW mostly occurs on the coast and south west slopes.	Excluded	Breeding occurs in Tasmania
Square-tailed Kite *Lophoictinia isura (Breeding)*	Found in habitats including dry woodlands. Shows preference for watercourses. Has been observed in north west NSW in stony country with a ground cover of chenopods and grasses and low open eucalypt woodland.	Included	Woodland habitat present within the development footprint. Foraging habitat available adjacent.
Eastern Bentwing Bat *Miniopterus schreibersii oceanensis* *(Breeding)*	Breeding habitat is within caves and man-made tunnels.	Excluded	No caves or other suitable breeding habitat available within or adjacent the development footprint.
Squirrel Glider *Pteaurus norfolcensis*	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range. Prefers a mid-storey of shrub or acacia. Requires abundant tree hollows for refuge and nest sites.	Included	Woodland habitat present within the development footprint.
Brush-tailed Rock Wallaby *Petrogale penicillata*	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves, and ledges, often facing north. Browse on vegetation adjacent rocky areas including grasses, forbs and foliage and fruits of shrubs and trees.	Excluded	No suitable rocky habitat available within the development footprint or within a reasonable distance from the site.
Brush-tailed Phascogale *Phascogale tapoatafa*	Inhabits dry sclerophyll open forest with sparse ground cover of herbs, grasses shrubs or leaf litter. Nests and shelter in tree hollows with entrances 2.5-4cm wide, using many hollows over a short time.	Included	Woodland habitat present within the development footprint.
Koala *Phascolarctos cinereus*	Inhabit a range of eucalypt forest and woodland communities and will utilise paddock trees. White Box *(Eucalyptus albens)* and Yellow Box (*Eucalyptus melliodora*) are secondary food trees of the Koala in this region.	Included	Secondary food trees available within the development footprint.

Superb Parrot *Polytelis swainsonii (*breeding*)*	Inhabit Box Gum and Box-Cypress-pine woodlands. They require hollow bearing trees for nesting.	Excluded	No breeding habitat (HBTs) present within the development footprint.
Grey-headed Flying-fox *Pteropus poliocephalus*	Roosting camps are generally within 20km of a regular food source, usually found in gullies close to water in vegetation with a dense canopy. Feed on nectar from Eucalyptus, Melaleuca and Banksia species.	Included	Possible camp habitat available on site.
Small Purple-pea *Swainsona recta*	Was considered to occur in the understorey of woodlands and open forests dominated by Blakely's Red Gum, Yellow Box, Candlebark Gum and Long-leaf Box. It is considered likely to be extinct.	Included	Woodland habitat present within the development footprint.
Silky Swainson-pea *Swainsona sericea*	Found in Box Gum Woodland on South West slopes. Sometimes found in association with Callitris species. Regenerates from seed after fire.	Included	Woodland habitat present within the development footprint.
Golden Sun Moth *Synemon plana*	Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands with ground layers dominated by Wallaby grasses (possibly several species), they require bare ground between tussocks. Habitat may have *Austrostipa sp*. or Kangaroo Grass. They have also been known to use areas containing weeds such as Serrated Tussock.	Excluded	Not within the geographic limitations for this species.
Masked Owl *Tyto novaehollandiae* (Foraging)	Inhabit dry eucalypt forests and woodlands. Require large hollow bearing trees for nesting.	Excluded	No breeding habitat (HBTs) present within the development footprint.
Zieria obcordata *Zieria obcordata*	Known to occupy an area near Wellington. Grow in eucalypt woodland or shrubland. Also occurs on Eucalyptus and Callitris dominated woodland with an open low shrub understorey, on moderately steep, mainly west to north facing slopes amongst granite boulders. Associated with Box Gum Woodland.	Included	Box Gum Woodland habitat present within the development footprint including eucalyptus and Callitris species.

4.2.3. Candidate species requiring confirmation

The following species were returned by the BAM calculator as requiring survey. Table 4-5 summarises whether each species was detected during surveys and if they are expected to be impacted by the proposal and therefore are required to be offset. Details regarding the targeted surveys undertaken are provided below.

Table 4-5 Threatened species requiring survey

Common name	Scientific name	Surveys	Present/presumed present	Affected by the proposal
Ausfeld's Wattle	*Acacia ausfeldii*	Conspicuous species targeted during all flora surveys 2017 and 2019	Absent	Unlikely – Not detected during targeted surveys
Regent Honeyeater (breeding)	*Anthochaera Phrygia*	Six 20 minute bird surveys conducted over 2 days in 2017	Absent	Unlikely – Not detected during surveys but presumed to occur from time to time, unlikely to impact upon breeding habitat[3]
Pink-tailed Legless Lizard	*Aprasia parapulchella*	No	Assumed present	Possible – Some rock was present including embedded rock within the development footprint.
Bush Stone-curlew	*Burhinus grallarius*	No	Assumed present	Possible – Some fallen timber within the development footprint
Euphrasia arguta	*Euphrasia arguta*	Targeted transect surveys in suitable habitat 2017, botanical assessment 2019	Absent	Unlikely – not detected during surveys
Tumut Grevillea	*Grevillea wilkinsonii*	Botanical assessments conducted 2019	Absent	Unlikely – not detected during surveys
White-belled Sea-eagle (breeding)	*Haliaeetus leucogaster*	No	Absent	Unlikely – not detected during surveys, stick nest observed was too small
Little Eagle	*Hieraaetus morphnoides*	No	Assumed present	Possible – one stick nest observed in the footprint of the site, has previously been detected in the area

[3] There are three known key breeding areas in NSW where the Regent Honeyeater is regularly recorded; the Capertee Valley, Bundarra-Barraba region and the Lower Hunter (OEH 2017). As such, the development footprint is unlikely to provide breeding habitat, particularly considering the small area (0.02 ha) to be removed and contains potential foraging resources for this species only.

Common name	Scientific name	Surveys	Present/presumed present	Affected by the proposal
Square-tailed Kite (breeding)	*Lophoictinia isura*	No	Absent	Unlikely – not detected during surveys, stick nest observed was too small
Squirrel Glider	*Petaurus norfolcensis*	2 nights nocturnal surveys	Absent	Unlikely – Not detected during targeted surveys
Brush-tailed Phascogale	*Phascogale tapoatafa*	2 Nights of Nocturnal Surveys	Absent	Unlikely – No suitable habitat present
Koala	*Phascolarctos cinereus*	2 Nights nocturnal Surveys + Searches around trees for scratches or scats	Absent	Unlikely – Not detected during targeted surveys
Grey-headed Flying-fox (breeding)	*Pteropus poliocephalus*	Search for flying-fox camp within site	Absent	Unlikely – not detected during survey
Small Purple-Pea	*Swainsona recta*	Targeted transect surveys in suitable habitat 2017 and flora assessment 2019	Absent	Unlikely – Not detected during targeted surveys
Silky Swainsona Pea	*Swainsona sericea*	Targeted transect surveys in suitable habitat 2017 and flora assessment 2019	Absent	Unlikely – Not detected during targeted surveys

4.2.4. Species identified in SEARs

From the results in the 2017 BAR (NGH 2017), one threatened fauna species was identified in the Secretary's Environmental Assessment Requirements for the project as requiring additional consideration under section 9.2 of the FBA. This species, the Regent Honeyeater (*Anthochaera phrygia*) was incorporated into the survey design for the Wellington Solar Farm and considered under Section 9.2 of the FBA within the BAR for the broader solar farm development. Due to the proposed removal of 0.02 ha of Box Gum Woodland for the substation expansion in 2019, the Regent Honeyeater has been included as having the potential to be occasionally present at the site. Further consultation has been undertaken with the BCD to seek advice regarding whether the removal of 0.02 ha of Woodland is likely to impact breeding habitat for this species and whether species credits should be generated. However, no response has been received at the time of writing. Therefore, this species has been assessed according to the BAM in this report using the best available information to make informed decisions regarding the potential for this species to be impacted. As discussed above, it has been determined that breeding habitat is unlikely to be impacted for this species and it has not been included as a species credit species. It is acknowledged that the Regent Honeyeater may forage within the woodland to be impacted on occasion and as such the species has been included as an ecosystem credit species.

4.2.5. Previous surveys conducted in the local area

It is unclear whether dedicated biodiversity surveys have been undertaken within the locality, however evidence from the NSW Bionet Search and Atlas of Living Australia indicated that previous occasional

opportunistic surveys have been undertaken. Therefore, most of this assessment will focus on the 2017 survey results (NGH 2017).

4.2.6. Survey results

An incidental bird survey was carried out in September 2019 and 12 birds were recorded. These species have been included in Appendix C.

As part of the broader flora and fauna surveys completed by NGH in 2017, 118 flora and 23 fauna species were recorded throughout the site surveys. There were fauna surveys carried out in development site and these survey locations are illustrated in Figure 4-1.

These results for Wellington Solar Farm can be found in Appendix A of the BAR (NGH 2017).

4.2.7. Targeted survey methodologies

From the field assessments in 2017 (NGH 2017), comprehensive and targeted survey methods and results were undertaken. Flora and fauna field surveys were undertaken from the 8th to 10th May 2017, 4th October 2017 and 17th to 18th September 2019. The 2019 survey included a flora survey for targeted species credit species. During this survey there was one observation of a stick nest within the development footprint.

The aims of the targeted surveys were as follows:

1. Assess the availability and extent of flora and fauna habitat, particularly threatened species habitat, such as hollow-bearing trees.
2. Conduct searches for threatened flora and fauna species predicted to occur in the proposal area.

A combination of flora and fauna survey data from 2017 and 2019 was used to determine the likelihood of presence of a species credit species within the development footprint.

Fauna habitat assessment

An assessment of habitat types available and their quality and suitability as threatened species habitat was conducted within the development footprint. Factors such as arboreal resources, ground-layer resources, vegetation structure, connectivity and disturbance were noted.

None of the trees within the proposed development footprint described within this report contained hollows, however there were several hollow bearing trees occurring within the larger Wellington Solar Farm development. The hollow-bearing tree data can be found in the Biodiversity Assessment Report (NGH 2017).

Waterbodies and ephemeral waterways were assessed for their fauna habitat potential and their likely utilisation by candidate species within the locality.

Incidental sightings of fauna and their traces (e.g. scats, tracks, scratches) made while present on the site were also recorded.

An opportunistic record of fauna species observed, is included in Appendix C.

Diurnal birds including Regent Honeyeater

From the field surveys in 2017, six bird monitoring plots were undertaken within the Wellington Solar Farm development site using the area search method. These consisted of 20 minute searches within a 2ha area in the early morning over two days. Area searches were conducted in areas of remnant woodland. One full day of opportunistic searches also occurred in areas of suitable habitat. These field survey results have been incorporated into this BDAR.

Regent Honeyeater

The Regent Honeyeater was not detected during surveys in 2017. White Box is a key foraging species for the Regent Honeyeater (OEH, 2016), however the White Box was not in flower during the time of the surveys. The regent Honeyeater is nomadic over large distances and unlikely to be detected if food sources are scarce in the area at the time of surveys. There are records of the species in the Wellington area and as such it is assumed to occur on the site from time to time when foraging resources are present.

The BTBD clarifies the Regent Honeyeater is a species credit species only in mapped important areas. Mapped Important areas have been requested from BCT, but as yet have not been received. The BTBD indicates the mapped areas align with breeding habitat. The Regent Honeyeater has three key breeding areas in NSW; the Capertee Valley, Bundarra-Barraba region and the Lower Hunter (OEH 2017). The development site is not near any of the known key breeding areas. It is unlikely that Regent Honeyeater breeding habitat is present onsite as it is not within the mapped areas and the area to be impacted (0.02 ha) is very small, therefore the amount of foraging habitat is also very limited.

Forest Owls

Two nights of nocturnal spotlighting surveys and call playback were completed as part of the 2017 field surveys in woodland areas with numerous hollow bearing trees in the Wellington Solar Farm development area. In 2019, no further surveys were required for the proposed substation development footprint as there were no hollow bearing trees providing breeding habitat.

Masked Owl

A single Masked Owl was recorded during spotlighting surveys within the Wellington Solar Farm development area. Although habitat is present within the area that meets the breeding habitat constraint for this species, there is no breeding habitat within the proposed substation expansion development footprint.

Little Eagle

One threatened bird, the Little Eagle (*Hieraaetus morphnoides*) listed as vulnerable, has been recorded opposite the TransGrid substation on Goolma Road in 2003. This species is predicted to occur in this 2019 assessment as an ecosystem credit species and species credit species. A stick nest was observed that could be utilised by this species within the development footprint which indicates potential habitat present.

Koala

The 2017 survey results determined the dominant overstorey species in the small woodland areas was White Box (*Eucalyptus albens*) and within the Wellington Solar Farm development area, Yellow Box (*Eucalyptus melliodora*) was dominant. White Box and Yellow Box are listed as a secondary food tree species for the Koala in the Central and Southern Tablelands (OEH, 2016). Surveys of the woodland areas were undertaken for the Koala over two nights in 2017 with species observed.

There were no hollow bearing trees in 2019 or presence of the secondary food trees. Koalas are not considered present nor does the area is not considered to currently support a Koala population and it would not comprise *Core Koala Habitat* under SEPP44. No White Box are present in the proposed substation expansion development footprint therefore this area is not defined as *Potential Koala Habitat* under SEPP44. The White Box Woodlands within the proposal area are sparsely vegetated, fragmented and lack connectivity to vegetation within the surrounding landscape. It is considered unlikely that the White Box trees would be utilised by the Koala on a regular basis and the development footprint is not considered to provide habitat for this species.

Squirrel Glider and Brush-tailed Phascogale

Numerous trees containing hollows of a suitable size for nesting were identified within Wellington Solar Farm development area in 2017. Two nights of nocturnal spotlighting surveys and call playback were undertaken within the woodland areas. No record of these species exist within 10km of the Wellington Solar Farm development area. The nearest recorded sighting for the Brush-tailed Phascogale is over 200km away. The proposed substation expansion area does not contain any hollow bearing trees containing breeding habitat, no species were observed during the surveys and there is no flowering shrubs in the understorey. The Box Gum Woodlands within the proposal area are sparsely vegetated, fragmented and lack connectivity to vegetation within the surrounding landscape. It is considered unlikely that the Yellow Box trees within the development footprint would be utilised by these species and the development site is not considered to provide habitat for these species.

Ausfeld's Wattle

Suitable habitat for this species could occur in areas of woodland vegetation. Within the woodland area, mid-storey species were sparse, and any shrubs would have been easily detected. Surveys were undertaken within the appropriate detection period for these species between the 8th and 10th of May 2017, 4 October 2017 and 17th to 18th September 2019. As this shrub is 2-4 m tall, quite conspicuous and very few understory shrubs were detected within the proposed substation development footprint, it is considered unlikely that the species occurs at the site.

Euphrasia arguta

Euphrasia arguta is an erect annual herb up to 35cm tall. This species is semi-parasitic, and it is found in Eucalypt forests with a mixed grass and shrub understory. The nearest known current population of this species is in Nundle, over 300km north-east of the development site. Suitable habitat for this species could occur within the woodland habitat. Surveys for this species was undertaken within the optimal survey time in October 2017 and September 2019. This species was not detected during the targeted surveys and as such is not considered to occur within the development footprint.

Silky Swainson-Pea and Small Purple Pea

Silky Swainson-Pea (*Swainsona sericea*) is a prostrate or erect perennial up to 10cm tall (OEH, 2016). It is found in Box Gum Woodland in the Southern Tablelands and the South West Slopes. Small Purple Pea (*Swainsona recta*) is an erect perennial herb growing to 30cm tall. It occurs in the grassy understory of woodland and open forests (OEH, 2017). Suitable habitat exists for these species within the areas of White Box grassy woodland with a native understory. Surveys for these species were undertaken within the optimal survey time of October 2017 and September 2019. These species were not detected during the targeted surveys and as such are not considered to occur within the development footprint.

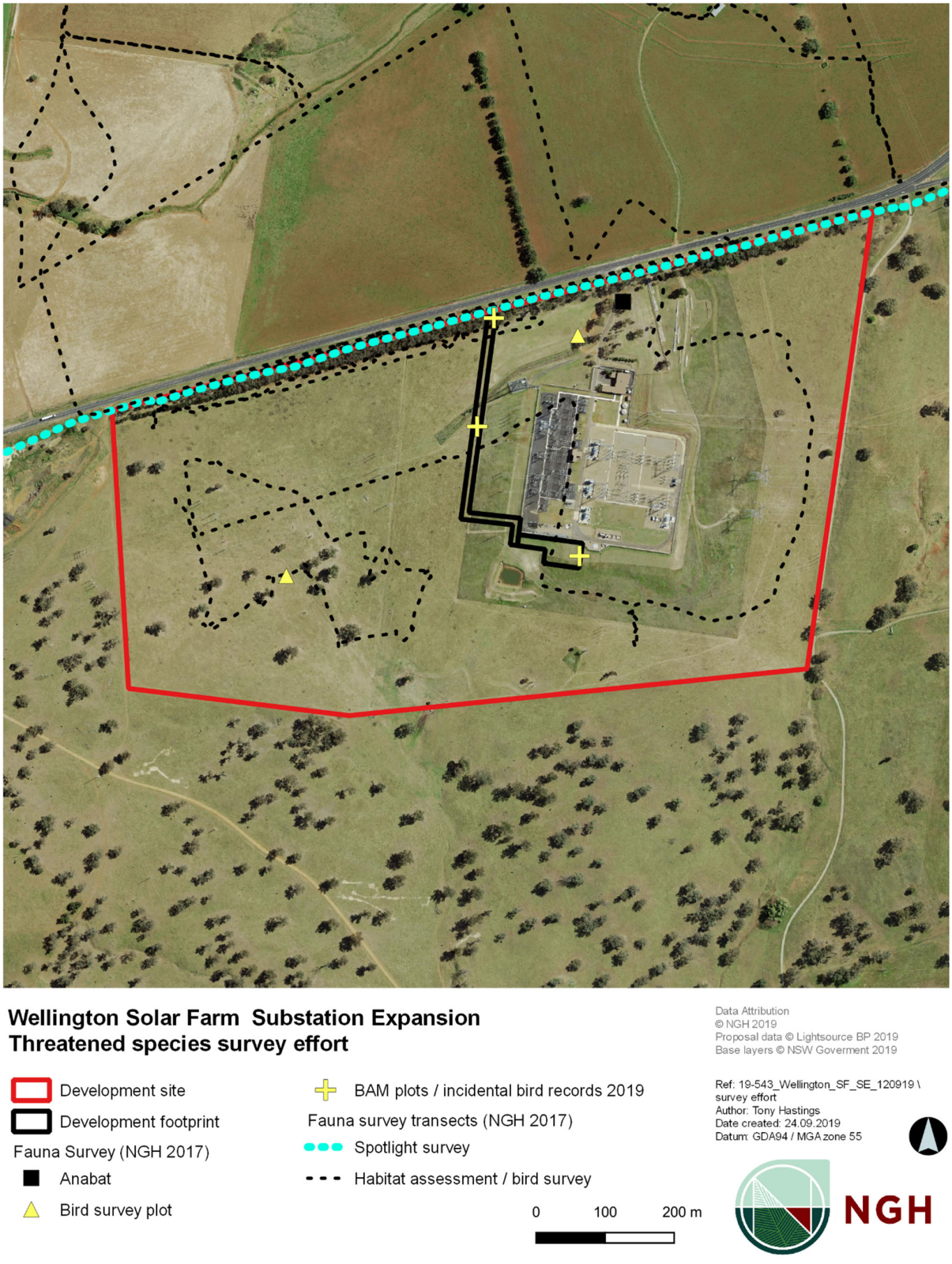

Figure 4-1 Fauna survey effort

4.3. ADDITIONAL HABITAT FEATURES RELEVANT TO PRESCRIPTIONS

4.3.1. Occurrences of karst, caves, crevices, and cliffs

There are no known occurrences of karst, caves, crevices and cliffs at the subject site.

4.3.2. Occurrences of rock

There were minor occurrences of rock recorded at within the development footprint. These consisted of small rocks (less than 15cm) sometimes scattered and sometimes embedded in the ground surface.

4.3.3. Occurrences of human-made structures and non-native vegetation

The human-made structures include the existing substation infrastructure and the transmission lines feeding into the substation. This type of infrastructure includes cyclone fencing around the site. There is planted native vegetation parallel to Goolma Road and degraded derived grasslands surrounding the substation area

4.3.4. Hydrological processes that sustain and interact with the rivers, streams and wetlands

There is one farm to the site of the development footprint for the substation easement which may require mitigation measures during the construction. No other creeks, rivers, streams and wetlands occur within the development area.

5. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC protected matters report was undertaken on September 13th, 2019 (10km buffer of the development site) to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the development site (refer to Appendix E). Relevant to Biodiversity these include:

- Wetlands of International Importance
- Threatened Ecological Communities
- Threatened species
- Migratory species

The potential for these MNES to occur at the site are discussed below.

5.1. WETLANDS OF INTERNATIONAL IMPORTANCE

Four wetlands of international importance were returned from the protected matters report. The nearest of these (within 200km of the development site) is the Macquarie Marshes. All other wetlands returned from the search are over 500km away. The Macquarie Marshes occurs approximately 150km north west of the development site. It is fed by the Macquarie River. There is no apparent connectivity between the development site and the Macquarie River.

5.2. THREATENED ECOLOGICAL COMMUNITIES

Three threatened ecological communities were found in the protected matters report. These were the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia, which is listed Endangered Community, Poplar Box Grassy Woodland on Alluvial Plains listed as an Endangered Community and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland which is a Critically Endangered Community.

None of these three threatened ecological communities were found within the development footprint.

5.3. THREATENED SPECIES

Eight threatened flora, ten threatened birds, seven mammals, two reptiles and four fish were returned from the protected matters report. One additional mammal was returned since the searches conducted for the BAR in 2017; the Greater Glider. Of these 30 species, fourteen species were considered to have the potential to utilise the habitats within the development footprint:

- Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered EPBC Act.
- Swift Parrot (*Lathamus discolor*) – Critically Endangered EPBC Act.
- Superb Parrot (*Polytelis swainsonii*) – Vulnerable EPBC Act.
- Koala (*Phascolarctos cinereus*) – Vulnerable EPBC Act.
- Corben's Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable EPBC Act.
- Large-eared Pied Bat (*Chalinolobus dwyeri)* – Vulnerable EPBC Act.
- Small Purple Pea (*Swainsona recta*) – Endangered EPBC Act.
- Euphrasia arguta (*Euphrasia arguta)* - Endangered EPBC Act.
- Painted Honey-eater (*Grantiella picta)* – Vulnerable EPBC Act.
- Spotted-tailed Quail – Endangered EPBC Act.
- Brush-tailed Rock-wallaby – Vulnerable EPBC Act.
- Grey-headed Flying-fox (*Pteropus poliocephalus)* – Vulnerable EPBC Act.

- Pink-tailed Worm-lizard (*Apraisa parapulchella)* – Vulnerable EPBC Act.
- Striped Legless Lizard (*Delma impar)* – Vulnerable EPBC Act.

Surveys in 2017 and flora surveys and assessment in 2019, (NGH 2017) demonstrate that the Swift Parrot, Superb Parrot, Koala, Euphrasia arguta, Painted Honey-eater, Large-eared Pied Bat, Spotted-tailed Quoll, Brush-tailed Rock-wallaby, Grey-headed Flying-fox and Small Purple-pea are unlikely to occur within the development footprint presented in this report. The remaining species are assessed further in Appendix F.

5.4. MIGRATORY SPECIES

Twelve listed migratory species were returned from the protected matters report. A habitat assessment was conducted for these species (Table 5-1). Two of these species could occur on the site on occasion. – the Fork-tailed Swift, White-throated Needletail. However, as these species are almost exclusively aerial (DoE, 2015) impacts to these species are considered unlikely.

Table 5-1 Habitat assessment for migratory species

Name	Scientific Name	Habitat Present	Impact
Fork-tailed Swift	*Apus pacificus*	Present	Unlikely – almost exclusively aerial species.
White-throated Needletail	*Hirundapus caudacutus*	Present	Unlikely – almost exclusively aerial species
Yellow Wagtail	*Motacilla flava*	Absent – No wetlands, mangroves or dense vegetation within the development site.	Unlikely – No suitable habitat
Satin Flycatcher	*Myiagra cyanoleuca*	Absent – No wet forests within development site	Unlikely – No suitable habitat
Rufous Fantail	*Rhipidura rufifrons*	Absent – No wet forests/mangroves within development site	Unlikely – No suitable habitat
Common Sandpiper	*Actitis hypoleucos*	Absent – No wetlands or mudflats within development site	Unlikely – No suitable habitat
Sharp-tailed Sandpiper	*Calidris acuminate*	Absent -No wetlands or mudflats within development site	Unlikely – No suitable habitat
Pectoral Sandpiper	*Calidris melanotos*	Absent – No mudflats within development site	Unlikely – No suitable habitat
Curlew Sandpiper	*Calidris ferruginea*	Absent – No mudflats within development site	Unlikely – No suitable habitat
Latham's Snipe	*Gallinago hardwickii*	Absent – No wetlands within development site	Unlikely – No suitable habitat
Eastern Curlew	*Numenius madagascariensis*	Absent – No mudflats within development site	Unlikely – No suitable habitat

6. AVOID AND MINIMISE IMPACTS

6.1. AVOIDING AND MINIMISING IMPACTS ON NATIVE VEGETATION AND HABITAT

6.1.1. Site selection – consideration of alternative locations/routes

The site selection for the substation easement is proposed at this location due to the existing substation already present at the site. The proposed substation expansion proposes underground transmission cabling and benching to connect Wellington Solar Farm to the substation. Other locations or routes would not be practical for a new substation due to the possible vegetation impacts, infrastructure or access requirements. Construction vehicles will be already delivering equipment to the approved Wellington Solar Farm using the Goolma Road entrance. Any equipment that will need to be delivered directly to the substation, will use the existing substation entrance to minimise any unnecessary vegetation impacts.

An alteration to the approved substation is required to install underground cables west of the substation and a small bench approved alignment and a small expansion to the substation infrastructure. The entire easement area covers 0.69 ha. This substation expansion will impact the following native vegetation plant communities:

a. White Box grassy woodland – planted (Moderate to good condition) - 0.02 ha (Zone 2)
b. White Box grassy woodland derived grassland (previously moderate to good condition, now moderate to low) - 0.36 ha (Zone 5)
c. White Box grassy woodland derived grassland (low condition) – 0.30 ha (Zone 6)

All works would occur within the approved project boundary; refer to Figure 1-1.

6.1.2. Proposal components – consideration of alternate modes or technologies

No alternatives are practical for the expansion of the substation. All attempts to minimise the impacts have been undertaken including restricting the footprint and potential for directional drilling to install underground cables.

6.1.3. Proposal planning phase – detailed design

TransGrid have advised that there is a need to extend the substation footprint beyond the existing fence line and re-locate the approved point of connection of the transmission line into the substation. The extension of the substation allows for an underground transmission cable[4] connection to the substation from Wellington solar farm. Refer to Section 1.3 for further description of the proposal.

7. IMPACTS UNABLE TO BE AVOIDED

7.1.1. DIRECT IMPACTS

The construction and operational phases of the proposal has the potential to impact biodiversity values at the site that cannot be avoided. This would occur through direct impacts such as habitat clearance and

[4] This will be a bundle of approximately seven cables. Refer to cross section, Appendix B.

installation and existence of infrastructure. In assessing the impacts of the proposal, 100% vegetation removal has been assumed.

Table 7-1 Direct impacts from proposed substation expansion

Impact	Extent	Frequency	Intensity	Duration	Consequence
Direct impacts					
Habitat clearance for permanent and temporary construction facilities (e.g. infrastructure, transmission lines, compound sites, stockpile sites, access tracks)	0.69 ha	Regular	High	Construction phase	• Direct loss of native flora and fauna habitat including semi mature trees • Potential loss of groundcover resulting in unstable ground surfaces • Injury and mortality to fauna during clearing of fauna habitat • Introduction and spread of noxious weeds and pathogens • Disturbance to fallen timber, dead wood and bush rock
Loss of Threatened Ecological Community – White Box Grassy Woodland – planted and derived grassland		Regular	High	Construction phase	• Loss of the vegetation areas that are in low, moderate to low and moderate to good condition estimated to cover 0.69 hectares.
Displacement, injury or death of resident fauna during and after construction		Regular	High	Construction phase	• Displacement of native fauna territories • Decline or relocation of local fauna populations/territories • Direct loss of fauna • Decline in local fauna populations
Accidental spills and contamination from construction activities (including compound sites)		Rare	Moderate	Construction phase	• Pollution of soils and dams
Earthworks		Regular	Moderate	Construction phase	• Erosion and sedimentation and/or pollution of soils, dams and downstream habitats
Noise		Regular	Low	Construction and Operational phase	• Construction machinery and activities may disturb local fauna
Dust generation		Regular	Low	Construction phase	• Inhibit the function of plant species and communities, soils and dams
Mobilisation of sediments		Irregular	Moderate	Operational phase	• Sedimentation of adjacent waterways (Wuuluman Creek)

7.1.2. Changes in vegetation integrity scores

The changes in the vegetation integrity scores are included in Table 7-2 below.

Table 7-2 Changes in vegetation integrity scores

Zone ID	PCT	EEC and/or threatened species habitat?	Area (ha)	Current vegetation Integrity Score	Future vegetation Integrity Score
2	266 Woodland Mod- Good	Yes	0.02	40.4	0
5	266 Derived grassland Mod-Low	Yes	0.36	8.7	0
6	266 Derived grassland Low	Yes	0.3	1.4	0

7.1.3. Loss of species credit species habitat or individuals

The loss of species credit habitat or individuals as a result of clearing is documented in Table 7-3.

Table 7-3 Summary of species credit species loss within the development footprint

Species Credit Species	Biodiversity risk weighting	Area of habitat / count of individuals lost
Pink-tailed Legless Lizard *Apraisia parapulchella*	4	0.02 ha woodland mod-good 0.36 ha derived grassland mod-low 0.3 ha derived grassland low
Bush Stone-curlew *Burhinus grallarius*	0	0.02 ha woodland mod-good
Little Eagle *Hieraaetus morphnoides*	3	0.02 ha woodland mod-good 0.36 ha derived grassland mod-low 0.3 ha derived grassland low

7.1.4. Loss of hollow-bearing trees

No hollow bearing trees will be lost as a result of the development.

7.2. INDIRECT IMPACTS

Indirect impacts could also occur, and include soil and water contamination, creation of barriers to fauna movement, or the generation of excessive dust, light or noise Table 7-4. below details the type, frequency, intensity, duration and consequence of the direct and indirect impacts of the proposal.

Table 7-4 Indirect impact zones of the proposal

Impact	Extent	Intensity	Duration	Consequence
Accidental spills and contamination from construction activities (including compound sites)		Moderate	Construction phase	• Pollution of soils and dams
Existence of permanent infrastructure		Moderate	Operational phase	• Possible collision risk to birds and microbats
Earthworks		Moderate	Construction phase	• Erosion and sedimentation and/or pollution of soils, dams and downstream habitats
Noise		Low	Construction and Operational phase	• Construction machinery and activities may disturb local fauna
Dust generation		Low	Construction phase	• Inhibit the function of plant species and communities, soils and dams
Light spills during night works		Low	Construction phase	• May alter fauna activities and/or movements
Light spill during operation		Low	Operational phase	
Introduction/ encouragement of feral pests, weeds or pathogens		Moderate	Construction phase	• Feral pest, weed and/or pathogen encroachment
Increased Vehicle Traffic		Low	Operational phase	• Increase potential for fauna mortality through vehicle strike
Mobilisation of sediments		Moderate	Operational phase	• Sedimentation of adjacent waterways (Wuuluman Creek)

Table 7-5 Potential indirect impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence to Biodiversity
Indirect impacts (those listed below are included in the BAM)					
Inadvertent impacts on adjacent habitat or vegetation	Unknown	Rare	Construction Phase: Short – term.	0.02 ha woodland mod-good 0.36 ha derived grassland mod-low 0.3 ha derived grassland low	• Direct loss of native flora and fauna habitat
Reduced viability of adjacent habitat due to edge effects	Unknown	Permanent impact	Operational phase: Long-term.	0.02 ha woodland mod-good	• Disturbances caused from increased infrastructure presence.
Reduced viability of adjacent habitat due to increased noise	Unknown	Temporary (construction)	Construction Phase: Short – term.	0.02 ha woodland mod-good 0.36 ha derived grassland mod-low 0.3 ha derived grassland low	• Disturbances to native fauna through excessive dust, noise and light during construction.
Transport of weeds and pathogens from the site to adjacent vegetation	Unknown	Ongoing	Construction and operation: long-term	0.02 ha woodland mod-good 0.36 ha derived grassland mod-low 0.3 ha derived grassland low	• Introduction of new weed outbreaks on surrounding habitat.
Increased risk of starvation, exposure and loss of shade or shelter	Unknown	Permanent impact (operation)	Construction Phase: Short-term.	0.02 ha woodland mod-good	• Loss of woodland habitat.
Rubbish dumping	Unknown	Occasional	Construction Phase: Short-term.	0.02 ha woodland mod-good 0.36 ha derived grassland mod-low 0.3 ha derived grassland low	• Contamination of surrounding habitat with rubbish associated with construction.

7.3. AVOIDING AND MINIMISING PRESCRIBED BIODIVERSITY IMPACTS

The prescribed biodiversity impacts identified in the BC Regulation (Clause 6.1) relevant to the proposal are:

- Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range,
- Impacts of development on movement of threatened species that maintains their lifecycle,
- Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development),
- Impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.

Each of these prescribed impacts to biodiversity has been addressed in the following sections.

7.3.1. Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

The surrounding areas of habitat to development site includes:

- The linear tree line of Goolma Road which contains trees with hollows.
- The Woodland areas and derived grasslands and paddock trees to the south and north of the development.
- Wuuluman Creek to the north within the Wellington Solar Farm.
- A larger patch of vegetation is Mount Arthur, located south of Wellington township.

The closest area of habitat connectivity for threatened species is linear tree line along Goolma Road which is rather isolated. Adjoining patches of planted vegetation or paddock trees are within 50-100 metres with no connection to larger patches of native vegetation. These small linear patches are foraging and refuge areas for birds and bats as these species move through the landscape, but these areas would not be considered adequate habitat connectivity for threatened species.

7.3.2. Impacts of the development on movement of threatened species that maintains their life cycle

Box Gum Woodlands are a listed Endangered Ecological Community (EEC) and is located in the development footprint. As part of the initial surveys completed by NGH for the development footprint, for Wellington Solar Farm, all areas that qualified as an EEC were avoided where possible with 0.09 ha approved to be impacted. In this substation expansion, two small patches will be impacted by this development. The two areas located around the existing substation are planted Box Gum Woodland (Goolma Road) and Box Gum Woodland (south of the substation). The development footprint has been reduced as much as possible to minimise impacts. All impacted areas are included in the BAM calculations and will be offset where required.

There are 26 hollow bearing trees within the survey area around the substation. No hollow bearing trees would be impacted by the proposal.

7.3.3. Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including subsidence or upsidence resulting from underground mining or other development)

There is one water body to the south of the current substation. There is potential for indirect impacts to this small farm dam during construction, but this can be managed by appropriate mitigation measures. It is anticipated there would be no direct or indirect impacts on waterbodies or water quality from the proposal.

7.3.4. Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC

It is possible threatened species that utilise the Box Gum Woodland may be impacted by vehicle strike particularly during construction, but this will be avoided as much as possible through mitigation measures such as reduced speed limits and fauna management.

7.4. IMPACTS TO BIODIVERSITY VALUES THAT ARE UNCERTAIN

Due to the minimal area that this extension is impacting upon and the condition of the habitat to be impacted it is unlikely that there are going to be any impacts to biodiversity that are uncertain.

8. MITIGATING AND MANAGING IMPACTS

8.1. MITIGATION MEASURES

Mitigation measures are required to minimise direct and indirect impacts to threatened communities and species. Mitigation measures have been approved through the Development Consent Conditions and the previous Biodiversity Assessment Report. Table 8-1 proposes the mitigation measure to minimise impacts on native vegetation and habitat.

Table 8-1 Mitigation measures proposed to avoid and minimise impacts on native vegetation and habitat.

Impact	Direct, indirect, cumulative	Consequence	Measures to be implemented	Timing	Outcome
Habitat clearance	• Direct	• Direct loss of native flora and fauna habitat	• Update the Biodiversity Management Plan (BMP) to incorporate protocols for: ○ Protection of native vegetation to be retained ○ Best practice removal and disposal of vegetation ○ Weed management ○ Unexpected threatened species finds ○ Rehabilitation of disturbed areas The BMP would form part of the Wellington Solar Farm Construction Environmental Management Plan (CEMP).	Pre-construction phase Construction phase	Minimise the impacts of habitat removal on native flora and fauna. Offset for the loss of native vegetation
	• Direct	• Potential over clearing and/or damage of habitat outside of the development footprint.	• Stockpiling materials and equipment and parking vehicles will be avoided within the dripline (extent of foliage cover) of any native tree. • Prior to the commencement of work, a physical vegetation clearing boundary at	Construction phase	Prevention of over-clearing.

Impact	Direct, indirect, cumulative	Consequence	Measures to be implemented	Timing	Outcome
			the approved clearing limit is to be clearly demarcated and implemented. The delineation of such a boundary may include the use of temporary fencing, flagging tape, parawebbing or similar.		
Appropriate landscaping	• Indirect	• Increase the quality of habitat for native flora and fauna species.	• Where possible, landscape plantings will be comprised of local indigenous species with the objective of increasing the diversity of the existing vegetation. Planting locations would be designed to improve the connectivity between patches in the landscape where consistent with landscaping outcomes.	Operational phase	Increase/improve native species diversity and connectivity.
Accidental spills and contamination from construction activities (including compound sites)	• Indirect	• Pollution of soils and dams.	• Carry out refuelling of plant and equipment, chemical storage and decanting off site or at least 50m away from farm dams in impervious bunds. • Ensure that dry and wet spill kits are readily available.	Construction phase	Prevent/minimise pollution of ephemeral waterways and dams, and sensitive adjacent habitat.
Earthworks	• Indirect	• Erosion and sedimentation and/or pollution of soils, dams and downstream habitats.	• An Erosion and Sediment Control Plan would be prepared in conjunction with the final design and implemented.	Construction phase	Prevent/minimise erosion and sedimentation of ephemeral waterways and dams, and sensitive adjacent habitat.
Noise	• Indirect	• Construction machinery and activities may disturb local fauna.	• The Construction Environmental Management Plan will include measures to avoid noise encroachment on	Construction phase	Prevent/minimise noise impacts and disturbance to adjacent fauna.

Impact	Direct, indirect, cumulative	Consequence	Measures to be implemented	Timing	Outcome
			adjacent habitats such as avoiding night works as much as possible.		
Dust generation	• Indirect	• Inhibit the function of plant species and communities, soils and dams.	• The Construction Environmental Management Plan will include measures to prevent dust spreading to nearby habitats.	Construction phase	Prevent dust inhibiting the function of plant species and communities, ephemeral waterways and dams.
Light spills during night works	• Indirect	• May alter fauna activities and/or movements.	• Avoid night works. • Direct Lights away from vegetation.	Construction/Operational Phase	Minimise impacts to fauna movements and activity.
Introduction/ encouragement of feral pests, weeds or pathogens	• Indirect	• Feral pest, weed and/or pathogen encroachment.	• Weed, hygiene and pest management protocols will be prepared and implemented as part of the Flora and Fauna Management Plan for the proposal.	Operational Phase	Minimise invasion of pest species.
Increased Vehicle Traffic	• Indirect	• Increase potential for fauna mortality through vehicle strike.	• Awareness training during site inductions regarding enforcing site speed limits. • Site speed limits to be enforced.	Operational Phase	Minimise fauna strikes.
Mobilisation of sediments	• Indirect	• Sedimentation of adjacent waterways (Wuuluman Creek).	• An Erosion and Sediment Control Plan would be prepared in conjunction with the final design and implemented.	Construction Phase	Prevent sedimentation and impacts to adjacent waterways.

8.2. ADAPTIVE MANAGEMENT STRATEGY

The upgrade of the substation expansion is part of the Wellington Solar Farm development. As Wellington Solar Farm is a major project (SSD 8573) approved in 2018, the mitigation measures included in the Biodiversity Management Plan should incorporate any adaptive management measures required for the substation expansion.

As outlined in the Modification Application (NGH 2019), the Biodiversity Management Plan will need to be updated to include the substation expansion development.

9. SERIOUS AND IRREVERSIBLE IMPACTS (SAII)

9.1. POTENTIAL SERIOUS AND IRREVERSIBLE IMPACT ENTITIES

The principles used to determine if a development will have serious and irreversible impacts, include impacts that:

- Will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline, or
- Will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size, or
- Impact on the habitat of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very limited geographic distribution, or
- Impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

9.1.1. Threatened ecological communities

The following relevant TEC has SAII potential:

- White Box Yellow Box Blakely's Red Gum Woodland.

This site is composed of White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion. The woodland does not meet the EPBC listed Box Gum Woodland criteria. This TEC will not be considered any further.

9.1.2. Threatened species

The following species have SAII potential:

- *Anthochaera Phrygia*, Regent Honeyeater [82338], Critically Endangered BC Act and EPBC Act.
- *Euphrasia arguta*, Euphrasia arguta, Critically Endangered BC Act and EPBC Act.
- *Grevillea wilkinsonii*, Tumut Grevillea, Endangered BC Act and EPBC Act.
- *Lathamus discolour*, Swift Parrot, Endangered BC Act and Critically Endangered EPBC Act.
- *Miniopterus schreibersii oceanensis*, Eastern Bent-wing Bat, Vulnerable BC Act, not listed EPBC Act.
- *Petrogale penicillata*, Brush-tailed Rock-wallaby, Endangered BC Act and Vulnerable EPBC Act. *Synemon plana,* Golden Sun Moth, Endangered BC Act and Critically Endangered EPBC Act.
- *Zieria obcordata,* Zieria obcordata, Endangered BC Act and EPBC Act.

As discussed in Appendix F of all of these entities listed above only the Regent Honeyeater has the potential to use the site on occasion for foraging and impacts to breeding are unlikely. All other species listed above are not going to be impacted by the proposed development footprint because they were surveyed for and not present or because their habitat requirements were not met by the development footprint.

No 'important mapped areas' habitat is present for Regent Honeyeater, within the development footprint. From the field work it is clear, the habitat is lacking in sufficient foraging resources to support these species. No Regent Honeyeaters were observed during targeted bird searches or incidentally and will therefore not be considered any further.

10. REQUIREMENT TO OFFSET

10.1. IMPACTS REQUIRING AN OFFSET

10.1.1. Ecosystem credits

An offset is required for all impacts of development on PCTs that are associated with:

a) a vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an endangered or critically endangered ecological community, or
b) a vegetation zone that has a vegetation integrity score of ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or
c) a vegetation zone that has a vegetation integrity score ≥20 where the PCT is not representative of a TEC or associated with threatened species habitat.

The PCTs and vegetation zones requiring offset and the ecosystem credits required are documented in Table 10-1.

Table 10-1 PCTs and vegetation zones that require offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score	Ecosystem credits required
2	266	White-Box Grassy woodland planted – mod-good Consisted of rows of predominantly Yellow Box and White Cypress-pines with very little understorey	0.02	40.4	1

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix G.

10.1.2. Species credits

An offset is required for the threatened species impacted by the development that require species credits. These species and the species credits required are documented in Table 10-2.

Table 10-2 Species credit species that require offsets

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost	Species credits required
Pink-tailed Legless Lizard	2	0.69	2
Bush Stone-curlew	2	0.02	0
Little Eagle	1.5	0.02	0

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix G. It should be noted that although zero credits have been generated for the Bush Stone-Curlew and Little Eagle, this is likely due to the very small area of impact. There is, however, still an impact and this is identified on the BAM

payment report in Appendix G in the final credit pricing column by stating 'contact the BCT for pricing'. A such there may still be a cost associated with offsets for these species however, it would be expected to be less than the value of one credit.

10.1.3. Offsets required under the EPBC Act

Assessment was conducted in relation to the Corben's Long-eared Bat, Pink-tailed Worm Lizard, Striped Legless Lizard and Regent Honeyeater to determine whether a referral to the Commonwealth was necessary. No species listed on the EPBC Act have been identified as having the potential to be significantly impacted by the development. As such, the proposal is not considered to require offsets in accordance with the EPBC Offsets Policy.

10.2. IMPACTS NOT REQUIRING AN OFFSET

Impacts to PCTs that do not meet the thresholds identified in Section 10.1.1 do not require offsets. These PCTs and vegetation zones are identified in Table 10-3 and mapped on Figure 3-1.

Table 10-3 PCTs and vegetation zones that do not require offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score	Ecosystem credits required
5	266	White-Box Grassy woodland derived grassland – mod-low Consisted of exotic dominated pasture grassland area, impacted by drought and grazing pressures	0.36	8.7	0
6	266	White-Box Grassy Woodland derived grassland – low Consisted of exotic dominated pasture grassland area, heavily impacted by drought and grazing pressures.	0.3	1.4	0

10.3. AREAS NOT REQUIRING ASSESSMENT

The proposed substation development footprint consists of native vegetation, therefore no areas were identified and mapped as exotic vegetation.

11. CONCLUSIONS

This BDAR has assessed the biodiversity impacts of the proposal using the Biodiversity Assessment Method as required under the *Biodiversity Conservation Act, 2017*.

The proposal requires underground cables to be installed in place of, and south of, the approved overhead transmission line alignment and a small expansion to the substation bench to accommodate the required substation equipment. The vegetation communities impacted are:

- Vegetation Zone 2 (PCT 266) - White Box grassy woodland – planted (Moderate to good condition) - 0.02 ha
- Vegetation Zone 5 (PCT 266) - White Box grassy woodland derived grassland (previously moderate to good condition, now moderate to low due to drought and grazing) - 0.36 ha
- Vegetation Zone 6 (PCT 266) - White Box grassy woodland derived grassland (low condition) – 0.30 ha

The removal of 0.02 ha of Vegetation Zone 2 resulted in the generation of 1 ecosystem credit. The other two zones (Zone 5 and Zone 6) did not result in the generation of ecosystem credits because of their low condition. Vegetation Zone 5 had deteriorated in condition since previous assessments, most likely due to the drought and pressures from grazing, and Vegetation Zone 6 was also in low condition during the survey, consistent with the previous assessments.

Targeted surveys were undertaken for candidate flora species where habitat elements were known to exist onsite. Of the flora species surveyed, none were found during targeted survey.

The majority of fauna candidate species identified in the calculator were excluded from further assessment due to a lack of suitable habitat available onsite. Due to time constraints fauna surveys were not conducted for species that had not been previously assessed such as the Pink-tailed Legless Lizard and, Bush Stone-curlew. These were assumed to be present and appropriate credits generated. Other fauna surveyed in 2017 had sufficient data to exclude them with the exception of the Regent Honeyeater, which was considered to use the site on occasion, however the development is unlikely to impact upon breeding for this species. Pink-tailed Legless Lizard 2 credits, Bush Stone-curlew 0 credits, and Little Eagle 0 credits. Although credits are not generated for the Bush Stone-curlew and Little Eagle, some degree of offset may be required to be determined by the BCT.

If the modification application is approved, the retirement of these credits will be carried out in accordance with the NSW Biodiversity Offsets Scheme and will be achieved by either:

a) Retiring credits under the Biodiversity Offsets Scheme, or

b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or

c) Funding a biodiversity action that benefits the threatened entity impacted by the development.

Mitigation and management measures are proposed to adequately address impacts associated with the proposal, both directly and indirectly.

12. REFERENCES

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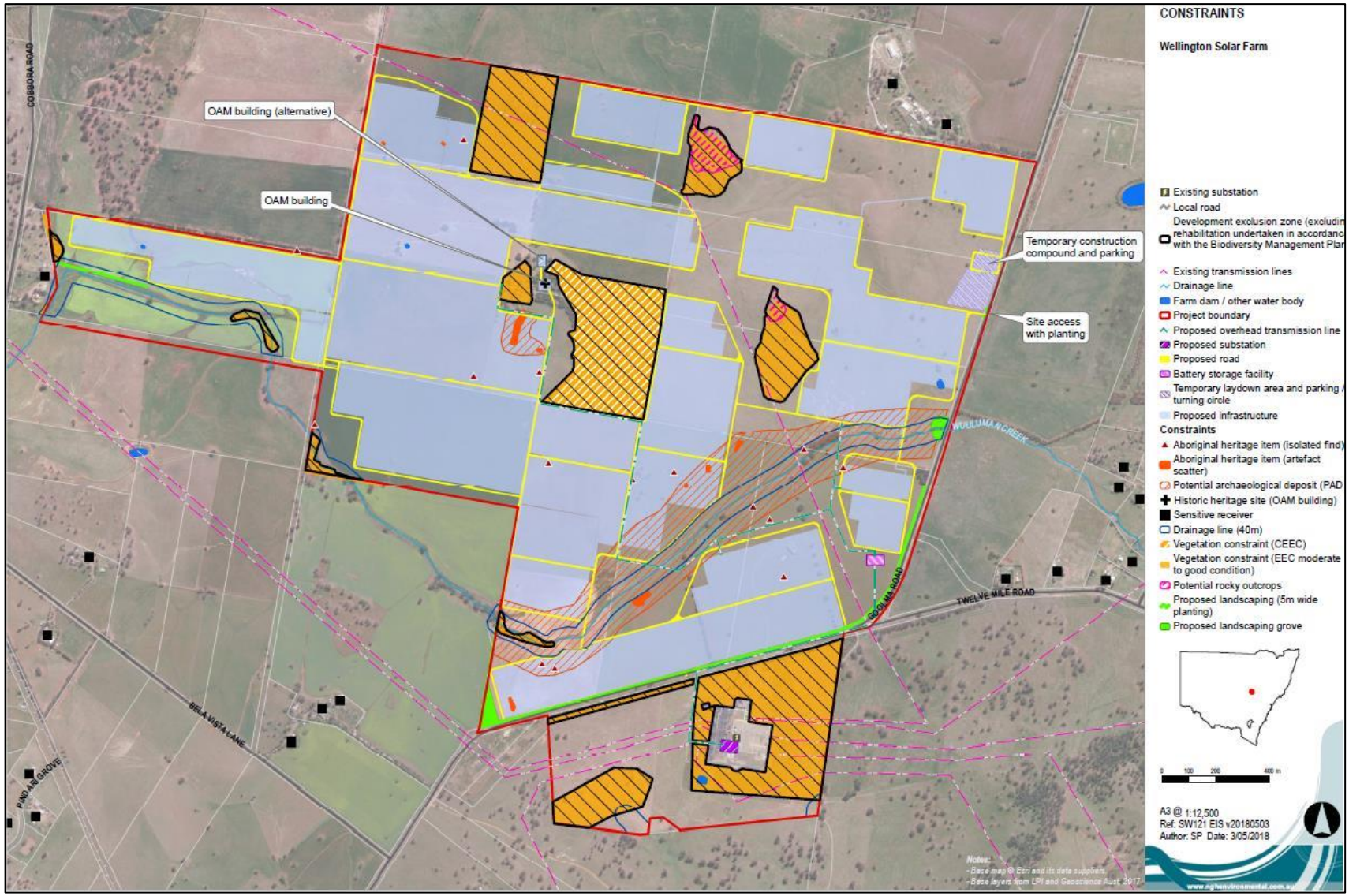
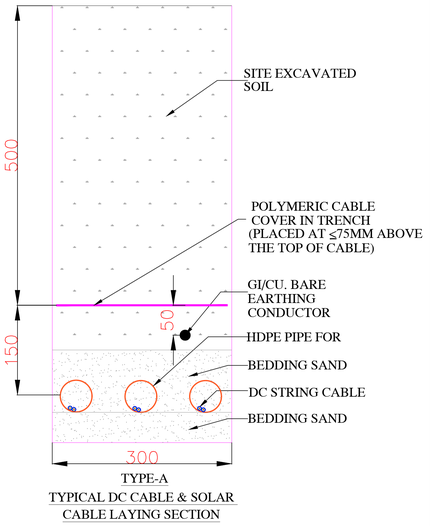
APPENDIX A CONSENTED LAYOUT

APPENDIX 1:
GENERAL LAYOUT OF DEVELOPMENT

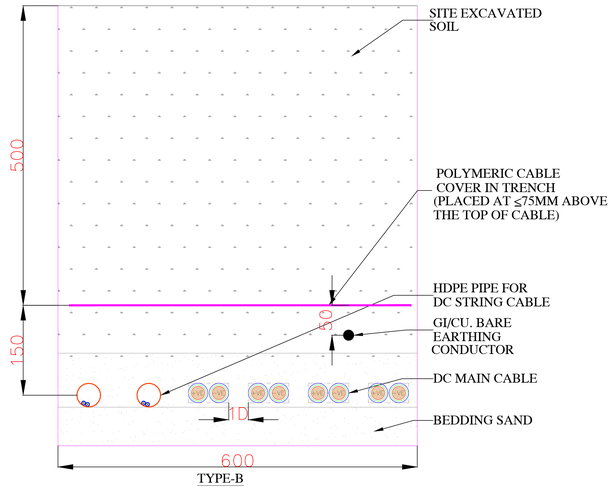


APPENDIX B DETAILED DESIGNS



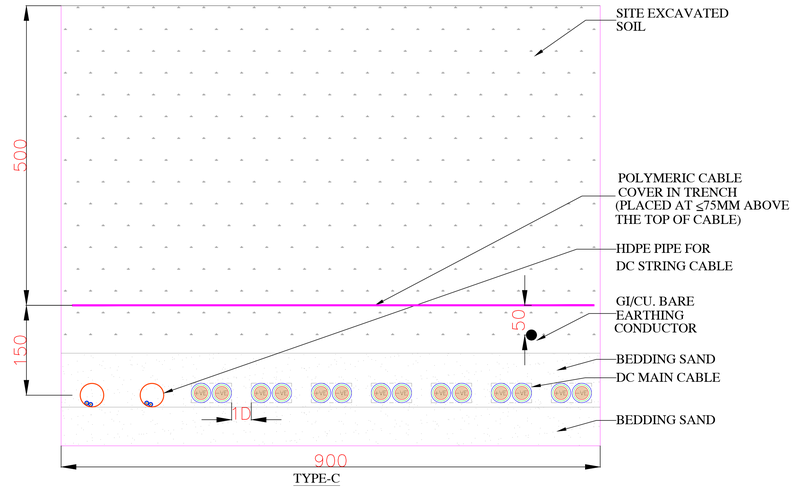
TYPE-A

TYPICAL DC CABLE & SOLAR CABLE LAYING SECTION



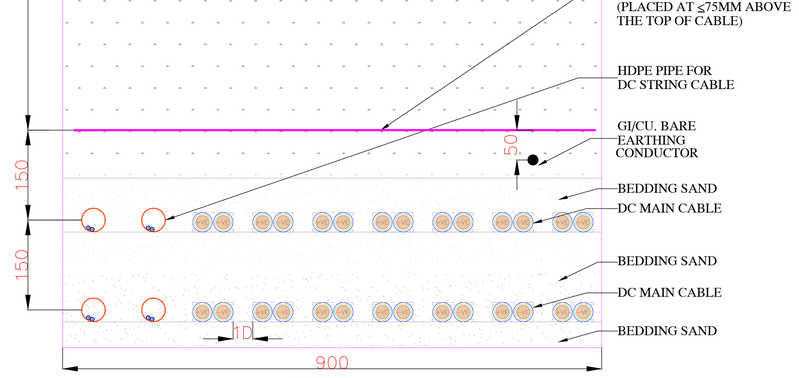
TYPE-B

TYPICAL DC CABLE & SOLAR CABLE LAYING SECTION



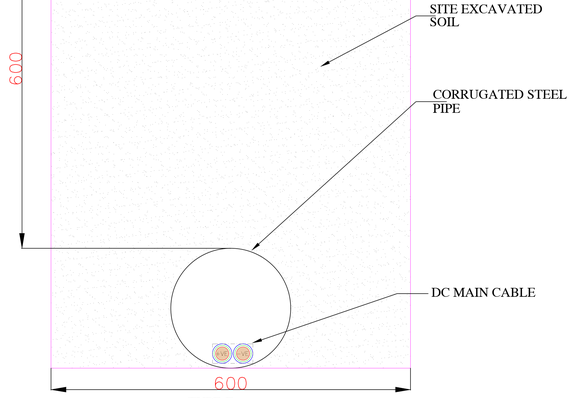
TYPE-C

TYPICAL DC CABLE & SOLAR CABLE LAYING SECTION



TYPE-D

TYPICAL DC CABLE & SOLAR CABLE LAYING SECTION



TYPE-E

TYPICAL DC CABLE LAYING SECTION
ROAD CROSSING

NOTE ; -

1. SOIL THERMAL RESISTIVITY OF AVERAGE 1.5 K.M/W. IS ASSUMED FOR DESIGN.
2. CABLE ROUTE MARKERS SHALL BE PROVIDED AT THE ENTRANCE TO THE INVERTER STATIONS, AT BOTH SIDES OF ROAD CROSSINGS AND AT EACH CHANGE OF DIRECTION.
3. THIS DRAWING IS PRELIMINARY AND SUBJECT TO CHANGE DURING DETAIL ENGINEERING.

CHECK BOX

AS-BUILT	FOR APPROVAL	INFORMATION ONLY	FOR CONSTRUCTION
☐	☐	☑	☐

No.	DATE	REMARKS	DRN	CHKD
R0	13.07.2019	FOR TENDER PURPOSE ONLY	HST	SDD

REVISIONS

PROJECT TITLE:
170MWac/200MWp SOLAR FARM
AT WELLINGTON, NEW SOUTH WALES, AUSTRALIA

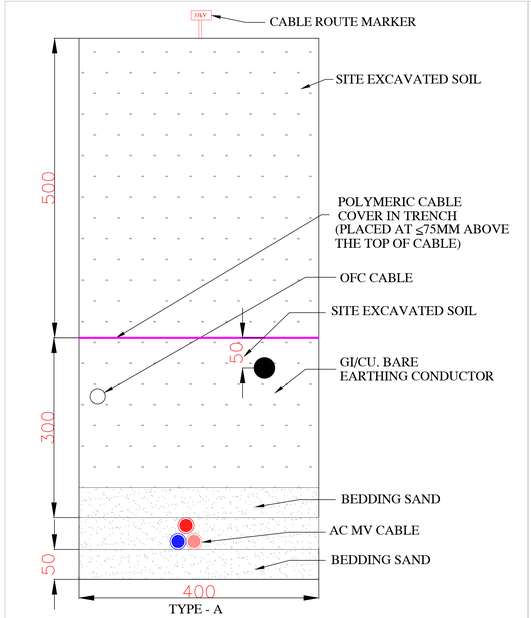
CLIENT:
LIGHTSOURCE DEVELOPMENT SERVICES AUSTRALIA PTY LTD

OWNERS CONSULTANT:

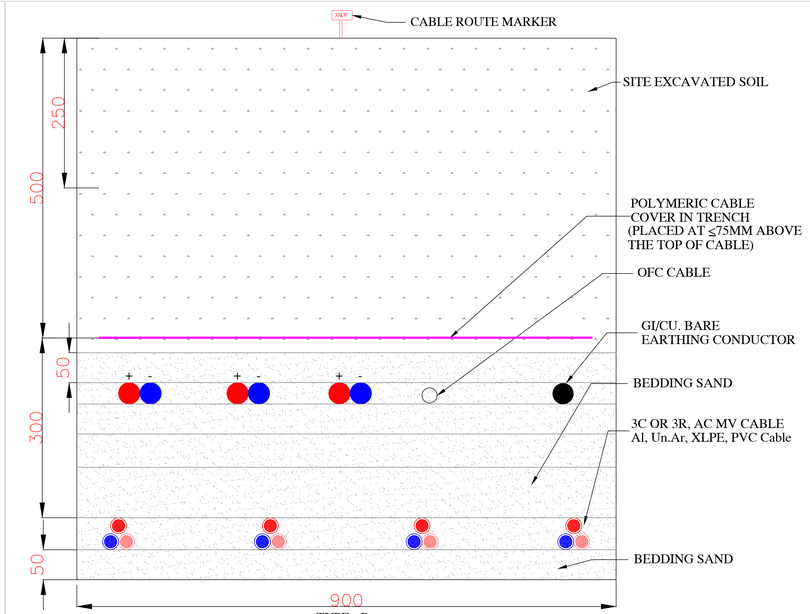
EPC CONTRACTOR:
STERLING & WILSON

DRAWING TITLE:
TYPICAL TRENCH SECTION
(DC TRENCH)

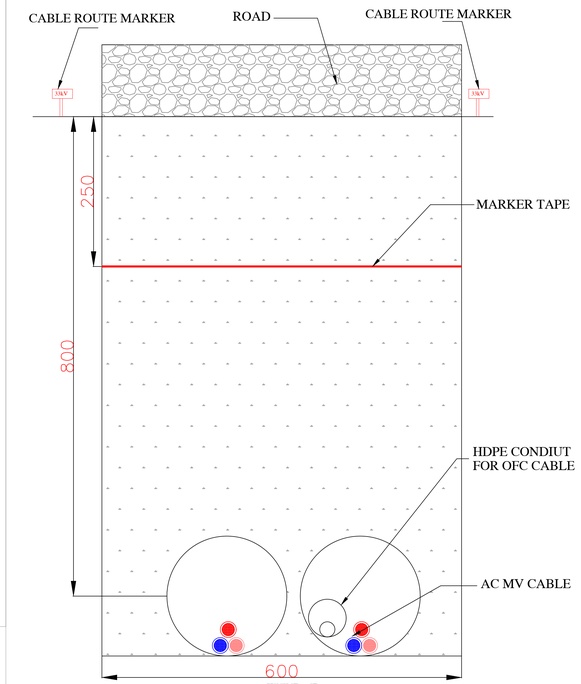
DRAWING NO :		SCALE	NTS
DRAWN	HST	SHEET NO	01 OF 02
CHECKED	SDD	PAPER SIZE	A0
APPROVED	SKK	REV NO.	R0
DATE	13.07.2019		



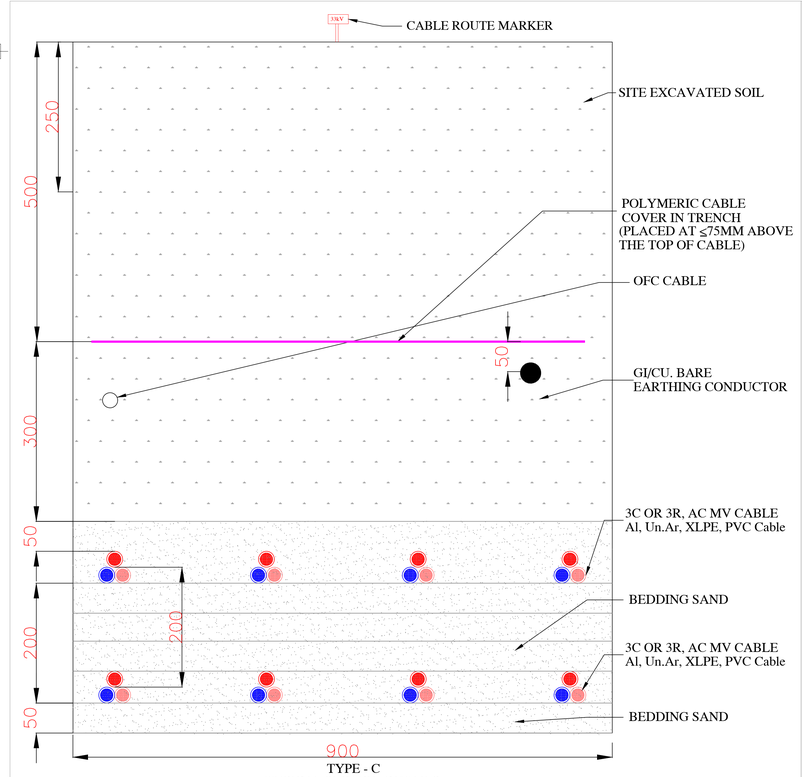
TYPE - A
TYPICAL SECTION DETAILS



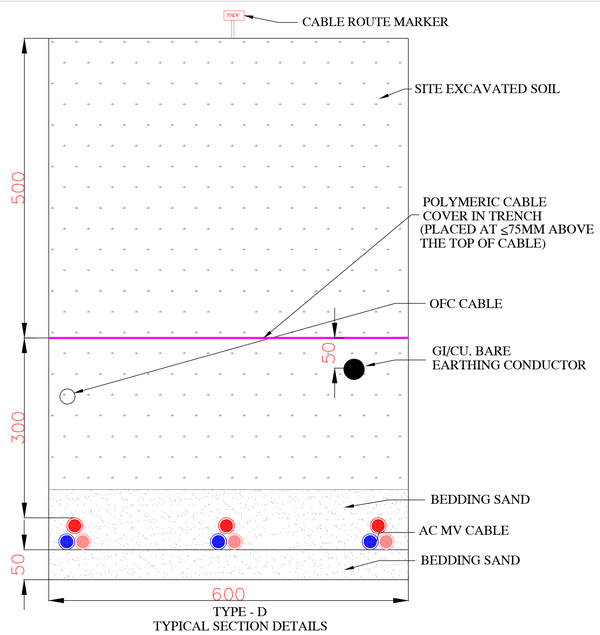
TYPE - B
TYPICAL SECTION DETAILS



TYPE - E
TYPICAL SECTION DETAILS (ROAD CROSSING)



TYPE - C
TYPICAL SECTION DETAILS



TYPE - D
TYPICAL SECTION DETAILS

NOTE ; -

1. SOIL THERMAL RESISTIVITY OF AVERAGE 1.5 K.M/W. IS ASSUMED FOR DESIGN.
2. CABLE ROUTE MARKERS SHALL BE PROVIDED AT THE ENTRANCE TO THE INVERTER STATIONS, AT BOTH SIDES OF ROAD CROSSINGS AND AT EACH CHANGE OF DIRECTION.
3. THIS DRAWING IS PRELIMINARY AND SUBJECT TO CHANGE DURING DETAIL ENGINEERING.

CHECK BOX

AS-BUILT	FOR APPROVAL	INFORMATION ONLY	FOR CONSTRUCTION
☐	☐	√	☐

No.	DATE	REMARKS	DRN	CHKD
R0	13.07.2019	FOR TENDER PURPOSE ONLY	HST	SDD

REVISIONS

PROJECT TITLE:
170MWac/200MWp SOLAR FARM
AT WELLINGTON, NEW SOUTH WALES, AUSTRALIA

CLIENT:
LIGHTSOURCE DEVELOPMENT SERVICES AUSTRALIA PTY LTD

OWNERS CONSULTANT:

EPC CONTRACTOR:
STERLING & WILSON

DRAWING TITLE:
TYPICAL TRENCH SECTION
(AC TRENCH)

DRAWING NO :		SCALE	NTS
DRAWN	HST	SHEET NO	02 OF 02
CHECKED	SDD	PAPER SIZE	A0
APPROVED	SKK	REV NO.	R0
DATE	13.07.2019		

APPENDIX C INCIDENTAL FAUNA LIST

Results of bird survey, 18/09/2019

Species		No. identified
Willy wagtail	Rhipidura leucophrys	4
Australia Magpie	Cracticus tibicen	7
White-Winged Chough	Corcorax melanorhamphos	>2
Sulphur-crested Cockatoo	Cacatua galerita	8
Galah	Eolophus roseicapilla	12
Rosella	Platycercus spp.	>2
Welcome Swallow	Hirundo neoxena	5
Honey eater		2
Common Starling	Sturnus vulgaris	>1
Pied Currawong	Strepera graculina	2
Magpie Lark	Grallina cyanoleuca	4
Miner		2

Survey competed by Beth Noel and Taylor Hume, 18th September 2019

APPENDIX D VEGETATION INTEGRITY PLOT PHOTOS

D.1 REPRESENTATIVE VEGETATION INTEGRITY PLOT PHOTOS

BAM Plot 1

Head of plot

Tail of plot

BAM Plot 2

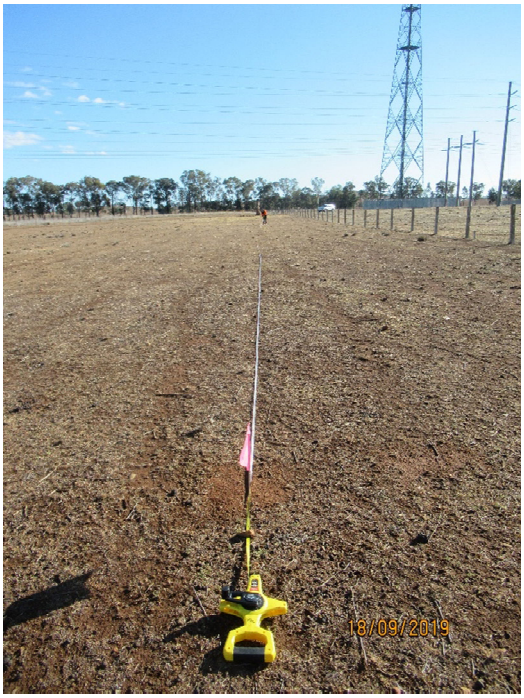
Head of plot

Tail of plot

BAM Plot 3

Head of plot

Tail of plot



D.2 PLOT FIELD DATA RESULTS

BAM Site Field Survey								
Project:	wellington 19-453	**Plot Identifier**	Plot 1	**Pic 20x20**	978	**Pic 20x50**	979	
Survey date:	17/09/2019		**Compass Orientation (head of 20x20 plot**			265		
Recorders	BN Thu		**PCT:**	266				
GPS Easting	684242.301	**GPS Northing**	6399328.63		**Datum**		**Zone**	55
Landform			**Soils**			**Drainage & Slope**		
Morphology			**Soil Texture**			**Slope**		
LandF Element			**Soil Colour**			**Aspect**		
LandF Pattern			**Soil Depth**			**Drainage**		
Microrelief			**Geology**			**Watercourses**		

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing			
Cultivation			
Soil erosion			
Firewood			
Grazing			
Fire Damage			
Storm Damage			
Weediness			
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

Age class of trees (DBH range) , Condition of Vegetation, Hollows

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Grazing, cropping, weeds

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Dominant Species outside Plot	

FUNCTION

Function attributes for	Plot 1

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	5
	Grass & grasslike (GG)	3
	Fern (EG)	0
	Other (OG)	0
	TOTAL	8

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0.6
	Grass & grasslike (GG)	0.3
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	0.9
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			0

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	80%	48.00%	993
	15m	45%		994
	25m	25%		995
	35m	50%		996
	45m	40%		997
Bare ground cover	5m	15%	26%	
	15m	45%		
	25m	25%		
	35m	30%		
	45m	15%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for		Plot 1								
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
ryti caes	*Rytidosperma caespitos*	Ringed Wallaby Grass	Poaceae	0.1	9		Grass & grasslike (GG)	No		
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fal	45	1000	*		No		
tara offi	*Taraxacum officinale*	Dandelion	Asteraceae	0.1	20	*		No		
bras	*Brassica spp.*	Brassica	Brassicaceae	0.1	20	*		No		
aust seta	*Austrostipa setacea*	Corkscrew Grass	Poaceae	0.1	2		Grass & grasslike (GG)	No		
rume brow	*Rumex brownii*	Swamp Dock	Polygonaceae	0.1	1		Forb (FG)	No		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.2	20		Forb (FG)	No		
senn barc	*Senna barclayana*	Smooth Senna	Fabaceae (Ca	0.1	1		Forb (FG)	No		
euch invo	*Euchiton involucratus*	Star Cudweed	Asteraceae	0.1	1		Forb (FG)	No		
both macr	*Bothriochloa macra*	Red Grass	Poaceae	0.1	4		Grass & grasslike (GG)	No		
malv parv	*Malva parviflora*	Small-flowered Mallo	Malvaceae	0.2	4	*		No		
cent sols	*Centaurea solstitialis*	St Barnabys Thistle	Asteraceae	0.1	5	*		No		
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	2		Forb (FG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

BAM Site Field Survey								
Project:	wellington 19-453	**Plot Identifier**	Plot 2	**Pic 20x20**	998	**Pic 20x50**	999	
Survey date:	17/09/2019		**Compass Orientation (head of 20x20 plot**			240		
Recorders	BN Thu		**PCT:**	266				
GPS Easting	684225.744	**GPS Northing**	6399649.69		**Datum**		**Zone**	55
Landform			**Soils**			**Drainage & Slope**		
Morphology			**Soil Texture**			**Slope**		
LandF Element			**Soil Colour**			**Aspect**		
LandF Pattern			**Soil Depth**			**Drainage**		
Microrelief			**Geology**			**Watercourses**		

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing			
Cultivation			
Soil erosion			
Firewood			
Grazing			
Fire Damage			
Storm Damage			
Weediness			
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

Age class of trees (DBH range) , Condition of Vegetation, Hollows

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Grazing, cropping, weeds

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Dominant Species outside Plot

FUNCTION

Function attributes for	Plot 2

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	3
	Shrub (SG)	1
	Forb (FG)	3
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	0
	TOTAL	9

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	40
	Shrub (SG)	0.1
	Forb (FG)	0.4
	Grass & grasslike (GG)	0.3
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	40.8
	TOTAL 'HTE'	0.2

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	0		
50-79	4		
30-49	10		
20-29	7		
10-19	4		
5-9	0		
<5	0		N/A
Length of logs (m)			5

BAM Attributes (1 x 1m Plots)					
	Tape length	% cover	Average %	Photos	
Litter Cover	5m	75%	55.00%		
	15m	50%			4
	25m	85%			
	35m	35%			4
	45m	30%			
Bare ground cover	5m	15%	14%	1016	6
	15m	0%		1017	
	25m	10%		1018	
	35m	5%			
	45m	40%			
Cryptogam cover	5m		0%	1018	
	15m	0%			
	25m	0%			
	35m	0%			
	45m	0%			
Rock Cover	5m	0%	0%		
	15m	0%			
	25m	0%			
	35m	0%			
	45m	0%			

COMPOSITION & STRUCTURE

Species recorded for	Plot 2									
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
ryti caes	*Rytidosperma caespitosu*	Ringed Wallaby Grass	Poaceae	0.1	7		Grass & grasslike (GG)	No		
salv verb	*Salvia verbenaca*	Vervain	Lamiaceae	0.1	4	*		No		
bras	*Brassica spp.*	Brassica	Brassicaceae	0.1	1	*		No		
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fal	0.2	20	*		No		
euca mell	*Eucalyptus melliodora*	Yellow Box	Myrtaceae	25%	7		Tree (TG)	No		
euca side	*Eucalyptus sideroxylon*	Mugga Iron Bark	Myrtaceae	5%	1		Tree (TG)	No		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.2	12		Forb (FG)	No		
oxal	*Oxalis spp.*		Oxalidaceae	0.1	2		Forb (FG)	No		
euch invo	*Euchiton involucratus*	Star Cudweed	Asteraceae	0.1	5		Forb (FG)	No		
trif subt	*Trifolium subterraneum*	Subterranean Clover	Fabaceae (Fal	0.1	1	*		No		
dysp pumi	*Dysphania pumilio*	Small Crumbweed	Chenopodiace	0.1	1			No		
call glau	*Callitris glaucophylla*	White Cypress Pine	Cupressaceae	10%	4		Tree (TG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	0.1	6		Shrub (SG)	No		
tree pic 1011 101	*#N/A*	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
tree	*#N/A*	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
aust seta	*Austrostipa setacea*	Corkscrew Grass	Poaceae	0.2	11		Grass & grasslike (GG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	0.2	1	*		HTE		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

BAM Site Field Survey								
Project:	wellington 19-453	**Plot Identifier**		**pic 10x40**	1023	**pic10x100**	1022	
Survey date:	18/09/2019		**Compass Orientation (head of 10x100 plot)**				175	
Recorders	BN Thu		**PCT:**	266				
GPS Easting	684201.628	**GPS Northing**	6399492.61		**Datum**		**Zone**	
Landform			**Soils**			**Drainage & Slope**		
Morphology			**Soil Texture**			**Slope**		
LandF Element			**Soil Colour**			**Aspect**		
LandF Pattern			**Soil Depth**			**Drainage**		
Microrelief			**Geology**			**Watercourses**		

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing			
Cultivation			
Soil erosion			
Firewood			
Grazing			
Fire Damage			
Storm Damage			
Weediness			
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

Age class of trees (DBH range) , Condition of Vegetation, Hollows

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Grazing, cropping, weeds

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Dominant Species outside Plot

FUNCTION

Function attributes for	0

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	1
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	0
	TOTAL	3

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0.1
	Grass & grasslike (GG)	2.1
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	2.2
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			0

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos	
Litter Cover	5m	5%	8.60%	1032	
	25m	10%		1034	
	45	10%		1036	
	65	10%		1037	4
	85	8%		1038	
Bare ground cover	5m	50%	37%		6
	25m	15%			
	45m	15%			
	65m	35%			
	85m	70%			
Cryptogam cover	5m	0%	0%		
	15m	0%			
	25m	0%			
	35m	0%			
	45m	0%			
Rock Cover	5m	0%	2%		
	25	2%			
	45	1%			
	65	4%			
	85	2%			

COMPOSITION & STRUCTURE

Species recorded for	0									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fal	15	2000	*		No		
ryti carp	*Rytidosperma carphoide*	Short Wallaby Grass	Poaceae	2	500		Grass & grasslike (GG)	No		
bras	*Brassica spp.*	Brassica	Brassicaceae	0.1	10	*		No		
salv verb	*Salvia verbenaca*	Vervain	Lamiaceae	10	1000	*		No		
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	2	400	*		No		
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	0.2	30	*		No		
malv parv	*Malva parviflora*	Small-flowered Mallo	Malvaceae	0.1	4	*		No		
arct cale	*Arctotheca calendula*	Capeweed	Asteraceae	0.1	50	*		No		
senn barc	*Senna barclayana*	Smooth Senna	Fabaceae (Ca	0.1	5		Forb (FG)	No		
tara offi	*Taraxacum officinale*	Dandelion	Asteraceae	0.4	200	*		No		
aust seta	*Austrostipa setacea*	Corkscrew Grass	Poaceae	0.1	10		Grass & grasslike (GG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
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APPENDIX E MNES SEARCH RESULTS

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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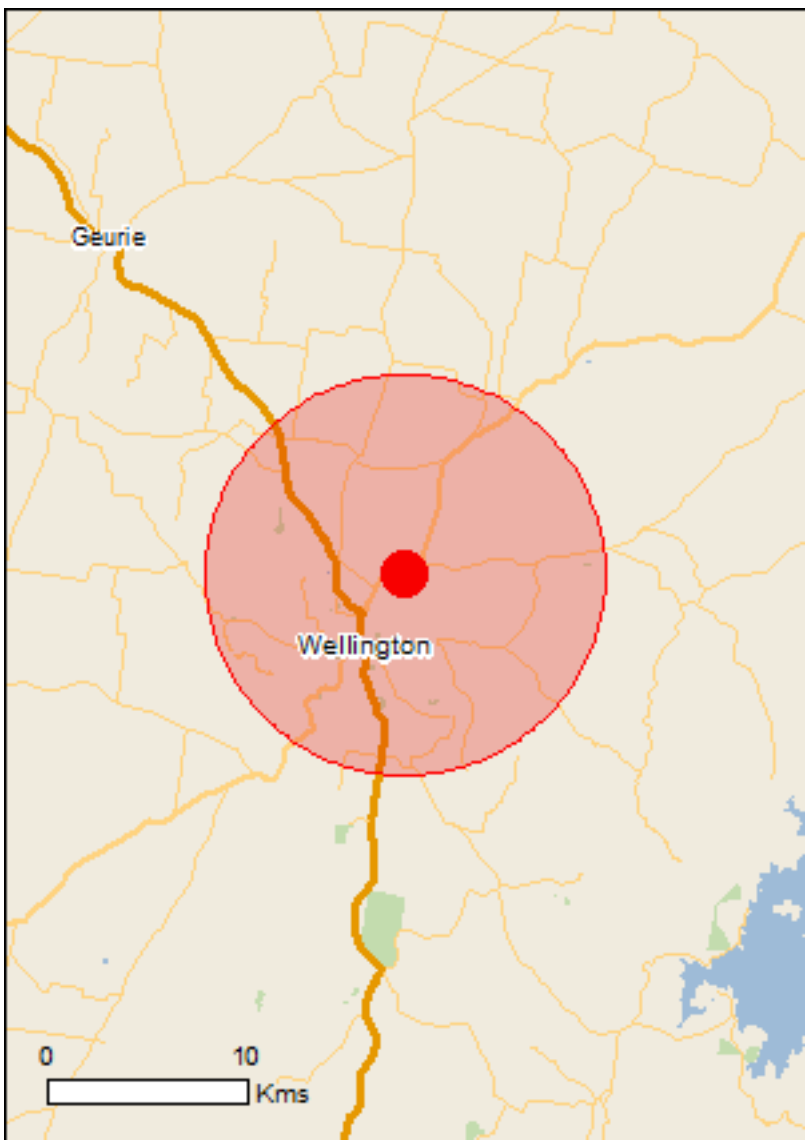

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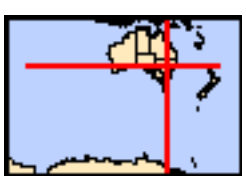

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	31
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	2
Commonwealth Heritage Places:	1
Listed Marine Species:	18
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	29
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	800 - 900km upstream
Riverland	700 - 800km upstream
The coorong, and lakes alexandrina and albert wetland	900 - 1000km upstream
The macquarie marshes	150 - 200km upstream

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia		
Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Grantiella picta		
Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor		
Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
[Polytelis swainsonii](#) Superb Parrot [738]	Vulnerable	Species or species habitat known to occur within area
[Rostratula australis](#) Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
[Galaxias rostratus](#) Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
[Maccullochella macquariensis](#) Trout Cod [26171]	Endangered	Species or species habitat may occur within area
[Maccullochella peelii](#) Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area
[Macquaria australasica](#) Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Mammals		
[Chalinolobus dwyeri](#) Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
[Dasyurus maculatus maculatus (SE mainland population)](#) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
[Nyctophilus corbeni](#) Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
[Petauroides volans](#) Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
[Petrogale penicillata](#) Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
[Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)](#) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
[Pteropus poliocephalus](#) Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
[Androcalva procumbens](#) [87153]	Vulnerable	Species or species habitat likely to occur within area
[Austrostipa wakoolica](#) [66623]	Endangered	Species or species habitat may occur within area
[Euphrasia arguta](#) [4325]	Critically Endangered	Species or species habitat may occur within area
[Prasophyllum petilum](#) Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area
[Prasophyllum sp. Wybong (C.Phelps ORG 5269)](#) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Swainsona recta Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat known to occur within area
Tylophora linearis [55231]	Endangered	Species or species habitat may occur within area
Zieria obcordata [3240]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area
Delma impar Striped Legless Lizard [1649]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within

Name	Threatened	Type of Presence area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Telecommunications Commission

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Wellington Post Office	NSW	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-32.52618 148.96229

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX F EPBC MATTERS

The *Environment Protection and Biodiversity Conservation Act* 1999 specifies factors to be considered in deciding whether a development is likely to significantly affect Endangered Ecological Communities, threatened species and migratory species, listed at the Commonwealth level. The following assessment assesses the significance of the likely impacts associated with the proposed works on:

- White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands. (Critically Endangered Ecological Community)
- Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered EPBC Act.
- Swift Parrot (*Lathamus discolor*) – Critically Endangered EPBC Act.
- Superb Parrot (*Polytelis swainsonii*) – Vulnerable EPBC Act.
- Koala (*Phascolarctos cinereus*) – Vulnerable EPBC Act.
- Corben's Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable EPBC Act.
- Large-eared Pied Bat (*Chalinolobus dwyeri)* – Vulnerable EPBC Act.
- Small Purple Pea (*Swainsona recta*) – Endangered EPBC Act.
- Euphrasia arguta (*Euphrasia arguta)* - Endangered EPBC Act.
- Painted Honey-eater (*Grantiella picta)* – Vulnerable EPBC Act.
- Spotted-tailed Quail – Endangered EPBC Act.
- Brush-tailed Rock-wallaby – Vulnerable EPBC Act.
- Grey-headed Flying-fox (*Pteropus poliocephalus)* – Vulnerable EPBC Act.
- Pink-tailed Worm-lizard (*Apraisa parapulchella)* – Vulnerable EPBC Act.
- Striped Legless Lizard (*Delma impar)* – Vulnerable EPBC Act.

Surveys in 2017 and flora surveys and assessment in 2019, (NGH 2017) demonstrate that the Swift Parrot, Superb Parrot, Koala, Euphrasia arguta, Painted Honey-eater, Large-eared Pied Bat, Spotted-tailed Quoll, Brush-tailed Rock-wallaby, Grey-headed Flying-fox and Small Purple-pea are unlikely to occur within the development footprint presented in this report. Therefore, the following species and communities will be addressed here:

- White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands. (Critically Endangered Ecological Community)
- Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered EPBC Act.
- Corben's Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable EPBC Act.
- Pink-tailed Worm-lizard (*Apraisa parapulchella)* – Vulnerable EPBC Act.
- Striped Legless Lizard (*Delma impar)* – Vulnerable EPBC Act.

Different significant impact criteria apply depending on the level at which a species or community is listed (i.e. vulnerable, endangered, critically endangered etc.). The appropriate criteria have been applied to the entities listed above in the assessment below.

In the context of the assessments below, 'the action' refers to 'the proposal' as described in Section 1 of this report.

WHITE BOX – YELLOW BOX – BLAKELY'S RED GUM GRASSY WOODLAND AND DERIVED NATIVE GRASSLANDS (CRITICALLY ENDANGERED ECOLOGICAL COMMUNITY)

No EPBC listed Box Gum Woodland exists within the current project area. Therefore, there is not going to be an impact upon this TEC due to this development.

REGENT HONEYEATER (CRITICALLY ENDANGERED)

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

lead to a long-term decrease in the size of a population

There are three known key breeding areas in NSW where the Regent Honeyeater is regularly recorded; the Capertee Valley, Bundarra-Barraba region and the Lower Hunter (OEH 2017). As such, the development footprint contains potential foraging resources for this species only. This species relies on flowering eucalypts as feed trees including White Box and would at best be infrequent visitors at the development site. The proposal would impact on 0.02 hectares of overstorey vegetation that could provide foraging resources for these species. Given this minor area, in the context of the extensive patch woodland in the locality and that no breeding resources would be impacted, the proposal is unlikely to lead to a long-term decrease in the size of a population.

reduce the area of occupancy of the species

The broader proposal area will continue to contain suitable areas of foraging habitat and given the mobility of the species would not disrupt movements across the development site. The proposal would not reduce the area of occupancy of these species.

fragment an existing population into two or more populations

The proposal would not affect the ability of these species to move across the development site and would have no impact on breeding habitat. Woodland fragments surrounding the site would also continue to facilitate the movements of this species. The proposal would not fragment existing populations.

adversely affect habitat critical to the survival of a species

Core breeding habitat is considered critical to the survival of these species. As the proposal would not impact on breeding habitat, it would not impact on habitat critical to the survival of this species.

disrupt the breeding cycle of a population

As stated above, the proposal would not impact on breeding habitat and would not reduce the capacity of these species to move to and from breeding habitat. The proposal would not disrupt the breeding cycle of this species.

modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposal will remove approximately 0.02 ha of woodland vegetation containing native canopy species providing potential foraging habitat. This modification and removal of habitat is not considered likely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, as habitat has been avoided and will be retained within the proposal area, ensuring that large areas of suitable habitat remain. The areas being removed and modified would likely only constitute occasional foraging habitat.

result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The proposal is unlikely to result in invasive species such as these that are harmful to the Regent Honeyeater.

The proposal will modify the current land use, potentially creating additional shelter habitat for predatory invasive species such as foxes and cats, which are considered likely to be locally prevalent regardless of the proposal. Management protocols will be prepared and implemented as part of the Biodiversity Management Plan for the proposal which will monitor and manage these species within the development site.

introduce disease that may cause the species to decline, or

The proposal is not considered likely to act as a vector for any disease likely to affect the Regent Honeyeater.

interfere with the recovery of the species

Core breeding areas and surrounding habitat are considered important to the recovery of this species. The development site is not near any known breeding areas for these species. Habitats across the broader proposal area will remain available to the species and given their mobility, the proposal would not restrict the movements of the species across the development site. The proposal is unlikely to interfere with the recovery of the Regent Honeyeater.

CORBEN'S LONG-EARED BAT (VULNERABLE)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

lead to a long-term decrease in the size of an important population of a species

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

The proposal is not considered likely to lead to a long-term decrease in the size of an important population of the species. No known records of this species occur within the locality of the proposal area. A Nyctophilus species was detected through the ANABAT in 2017 however the species could not be identified from calls alone. Suitable habitat for this species occurs within the proposal area. The larger Solar Farm proposal will remove a total of 17 hollow-bearing trees, suitable for roosting for Corben's Long-eared Bat however this proposed substation extension development will not impact any hollow bearing trees. The foraging habitat contained within the development footprint is considered to be sub-optimal, with no shrub or small tree layers present, and would likely only be utilised on occasion.

reduce the area of occupancy of an important population,

The proposed substation extension development footprint will not reduce the area of occupancy of an important population. There will be a reduction of approximately 0.02ha of moderate to good quality woodland vegetation. The species is highly mobile and is considered likely to use several woodland areas surrounding the larger Solar Farm area, including the higher quality habitats within the proposal area, that have been avoided. The proposal area will continue to contain suitable areas of roosting and foraging habitat of a sufficient size and quality to maintain a population of the species within the proposal area and the wider locality.

fragment an existing important population into two or more populations

The vegetation surrounding the substation extension development footprint is already highly fragmented, it is unlikely to fragment an existing population into two or more populations. This species is highly mobile, roosts singly or in pairs and relocates between multiple roost locations over successive nights (TSSC, 2015), the proposal will not impact on its movement within or across the proposal area. The vegetative connectivity within the proposal area will be maintained and improved through planting and avoidance of impacts to vegetation.

adversely affect habitat critical to the survival of a species

No habitat critical to the survival of the species exists within the development site. Suitable foraging and roosting habitats represented within the proposal area have been avoided by the proposal and will be retained, thus ensuring that these habitats are not adversely affected.

disrupt the breeding cycle of an important population

The species is known to roost in large dead stags in NSW (DoE, 2015). No hollow bearing trees are to be removed within the Development Footprint; therefore, breeding will not be disrupted.

modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposal will remove approximately 0.02ha of moderate to good quality woodland vegetation containing native canopy and native understorey species. The vegetation to be removed as a result of the proposal is considered to constitute low quality foraging habitat and no potential roosting and breeding habitat. However, the modification and removal of this habitat is not considered likely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, as higher quality areas of suitable habitat have been avoided and will be retained within the proposal area, ensuring that areas of suitable habitat remain. As such, the impacts to habitat are not considered likely to be such that the species is likely to decline, were it present within the development site.

result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Nyctophilus species are typically impacted by cats due to their slow flight and ground foraging habits. The proposal will modify the current land use, potentially creating additional shelter habitat for predatory invasive species such as foxes and cats, which are considered likely to be locally prevalent regardless of the proposal.

introduce disease that may cause the species to decline

The proposal is not considered likely to introduce any diseases that would impact the species.

interfere substantially with the recovery of the species

Considering the small areas of potential foraging and no roosting habitat to be removed, the mitigation measures in place to avoid impacts to individuals and that substantial habitat will remain within the broader proposal area and locality, the proposal is unlikely to interfere with the recovery of Corben's Long-eared Bat.

Conclusion:

The proposal will remove 0.02 ha of moderate to good quality woodland vegetation. The habitat to be impacted is considered to constitute low-quality foraging habitat and would likely only be utilised on occasion. Roosting is unlikely to occur as there are no hollow bearing trees within the development footprint; however. It is likely that within the larger Solar Farm this species will utilise multiple roost hollows over successive nights, up to 4km apart (TSSC, 2015). As such, it is likely that any individuals utilising the larger Solar Farm site would only do so on occasion. Significant areas of better-quality habitat have been avoided by the proposal and will be retained within the larger Solar Farm area. It is considered likely that, were the species present within the development site, the population would remain viable within the broader proposal area. As such, the proposal is unlikely to significantly impact the species, and a referral under the EPBC Act is not required.

PINK-TAILED WORM LIZARD (VULNERABLE)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

lead to a long-term decrease in the size of an important population of a species

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

No known records of this species occur within the locality of the development footprint or larger Solar Farm area. Some habitat for this species occurs within the development footprint area. The areas of surface rock and embedded rock within the development footprint are considered sub optimal. The species is considered unlikely to occur at the site but if it were present would be unlikely that the proposal would lead to a long-term decrease in the size of an important population of the species.

reduce the area of occupancy of an important population,

It is unlikely that this proposal will reduce the area of an important population. There will be a reduction of approximately 0.67 ha of moderate to low derived grassland vegetation and 0.02 ha moderate to good woodland vegetation. The locality will continue to contain areas of scattered and embedded rock in the surrounding locality.

fragment an existing important population into two or more populations

There is no known occurrence of this species within this locality. It is highly unlikely considering the degraded state of the pasture by slashing, grazing and invasion of non-native species that this proposal will fragment a population into two or more population.

adversely affect habitat critical to the survival of a species

No habitat critical to the survival of the species exists within the development footprint. Suitable habitat represented within the locality is available and will be retained, thus ensuring that habitat is still available for the species.

disrupt the breeding cycle of an important population

The species is known to occupy ant burrows and feeds on the larvae of small black ants. The loss of the small area of the proposed development footprint is not considered likely to disrupt the breeding cycle of any population. No important populations were known to occupy the area.

modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposal will remove approximately 0.65 ha of derived grassland moderate to low condition and 0.02 ha of woodland moderate to good. The vegetation to be removed as a result of the proposal is considered to constitute a low likelihood of providing suitable habitat for this species. However, the modification and removal of this habitat is not considered likely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. As such, the impacts to habitat are not considered likely to be such that the species is likely to decline, were it present within the development site.

result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The proposal is unlikely to modify the current land use, to create additional habitat for predatory invasive species likely to prey upon this species. However, a management plan will be prepared and implemented which will monitor and manage these species within larger Solar Farm and offset area.

introduce disease that may cause the species to decline

The proposal is not considered likely to introduce any diseases that would impact the species.

interfere substantially with the recovery of the species

Considering the small areas of potential habitat to be removed, the mitigation measures in place to avoid impacts to individuals and that substantial habitat will remain within the broader proposal area and locality, the proposal is unlikely to interfere with the recovery of the Pink-tailed Legless Lizard.

Conclusion:

The proposal will remove 0.67 ha of moderate to low quality derived grassland vegetation and 0.02 ha of moderate to good quality woodland. The habitat to be impacted is considered to constitute low-quality habitat and would be unlikely to support a population. It is likely that within the larger Solar Farm the species have suitable habitat available. As such, it is unlikely that any populations potentially utilising the larger Solar Farm site would be without suitable habitat. It is considered likely that, were the species present within the development footprint, the population would remain viable within the broader Solar Farm area. As such, the proposal is unlikely to significantly impact the species, and a referral under the EPBC Act is not required.

STRIPED LEGLESS LIZARD (VULNERABLE)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

lead to a long-term decrease in the size of an important population of a species

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

No known records of this species occur within the locality of the development footprint or larger Solar Farm area. Some habitat for this species occurs within the development footprint area albeit marginal. The areas of tussock forming grass within the development footprint are considered sub optimal due to drought and grazing pressures. The species is considered unlikely to occur at the site but if it were present it would be unlikely that the proposal would lead to a long-term decrease in the size of an important population of the species.

reduce the area of occupancy of an important population,

There will be a reduction of approximately 0.67 ha of moderate to low derived grassland vegetation and 0.02 ha moderate to good woodland vegetation. The locality will continue to contain areas of tussock grassland in the surrounding locality, particularly along the roadside areas. It is unlikely that this proposal will reduce the area of an important population.

fragment an existing important population into two or more populations

There is no known occurrence of this species within this locality. It is highly unlikely considering the degraded state of the pasture by slashing, grazing and invasion of non-native species that this proposal will fragment a population into two or more population.

adversely affect habitat critical to the survival of a species

No habitat critical to the survival of the species is believed to exist within the development site. Suitable habitat represented within the locality is available and will be retained, thus ensuring that habitat is still available for the species.

disrupt the breeding cycle of an important population

The species is known to occupy habitat where grassland is dominated by perennial, tussock forming grasses such as Kangaroo Grass and Spear Grass. The loss of the small area of the proposed development footprint is not considered likely to disrupt the breeding cycle of any population. No important populations were known to occupy the area.

modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposal will remove approximately 0.65 ha of derived grassland moderate to low condition and 0.02 ha of woodland moderate to good. The vegetation to be removed as a result of the proposal is considered to constitute a low likelihood of providing suitable habitat for this species. However, the modification and removal of this habitat is not considered likely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. As such, the impacts to habitat are not considered likely to be such that the species is likely to decline, were it present within the development footprint.

result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The proposal is unlikely to modify the current land use to create additional habitat for predatory invasive species likely to prey upon this species.

introduce disease that may cause the species to decline

The proposal is not considered likely to introduce any diseases that would impact the species.

interfere substantially with the recovery of the species

Considering the small areas of sub optimal potential habitat to be removed, the mitigation measures in place to avoid impacts and that substantial habitat will remain within the broader proposal area and locality, the proposal is unlikely to interfere with the recovery of the Striped Legless Lizard.

Conclusion:

The proposal will remove 0.67 ha of moderate to low quality derived grassland vegetation and 0.02 ha of moderate to good quality woodland. The habitat to be impacted is considered to constitute low-quality habitat and would be unlikely to support a population. It is likely that within the larger Solar Farm the species have suitable habitat available. As such, it is unlikely that any populations potentially utilising the larger Solar Farm site would be without suitable habitat. It is considered likely that, were the species present within the development footprint, the population would remain viable within the broader Solar Farm area. As such, the proposal is unlikely to significantly impact the species, and a referral under the EPBC Act is not required.

APPENDIX G BAM CALCULATOR CREDIT REPORT

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id 00017614/BAAS19015/19/00017615	Proposal Name Wellington Solar Farm substation expansion Modification 2	BAM data last updated * 30/08/2019
Assessor Name	Assessor Number	BAM Data version * 13
Proponent Names	Report Created 26/09/2019	BAM Case Status Open
Assessment Revision 2	Assessment Type Major Projects	Date Finalised To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box Yellow Box Blakely's Red Gum Woodland	Endangered Ecological Community	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

Nil

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	0.7	1.00

266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	**Like-for-like credit retirement options**			
	Name of offset trading group	Trading group	HBT	IBRA region

	White Box Yellow Box Blakely's Red Gum Woodland This includes PCT's: 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698	-	Yes	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Area	Credits
Aprasia parapulchella / Pink-tailed Legless Lizard	0.7	2.00
Burhinus grallarius / Bush Stone-curlew	0.0	0.00

Hieraaetus morphnoides / Little Eagle	0.0	0.00

Aprasia parapulchella/ Pink-tailed Legless Lizard	266_derivedgrasland_low	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Aprasia parapulchella/Pink-tailed Legless Lizard	Any in NSW
	266_derivedgrassMod-Low	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Aprasia parapulchella/Pink-tailed Legless Lizard	Any in NSW
	266_Woodland-Mod-good	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Aprasia parapulchella/Pink-tailed Legless Lizard	Any in NSW

Burhinus grallarius/ Bush Stone-curlew	266_derivedgrasland_low	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Burhinus grallarius/Bush Stone-curlew	Any in NSW
	266_derivedgrassMod-Low	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Burhinus grallarius/Bush Stone-curlew	Any in NSW
	266_Woodland-Mod-good	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Burhinus grallarius/Bush Stone-curlew	Any in NSW
Hieraaetus morphnoides/ Little Eagle	266_derivedgrasland_low	**Like-for-like credit retirement options**	
		Spp	IBRA region

		Hieraaetus morphnoides/Little Eagle	Any in NSW
	266_derivedgrassMod-Low	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Hieraaetus morphnoides/Little Eagle	Any in NSW
	266_Woodland-Mod-good	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Hieraaetus morphnoides/Little Eagle	Any in NSW

D.3 NOISE AND VIBRATION ASSESSMENT

RENZO TONIN & ASSOCIATES
inspired to achieve

Acoustics
Vibration
Structural Dynamics

WELLINGTON SOLAR FARM

Construction & Operational Noise & Vibration Assessment

13 August 2019

NGH Environmental

TJ643-01F01 Report (r7).docx

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Document details

Detail	Reference
Doc reference:	TJ643-01F01 Report (r7).docx
Prepared for:	NGH Environmental
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Attention:	Ms Jane Blomfield

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Authorised
21.07.2017	Generate report	0	1	WC	MCH	MCH
09.10.2017	Update report		2	WC		MCH
11.10.2017	Update report		3	WC		MCH
7.11.2017	Update report		4	WC		MCH
24.11.2017	Add Energy Storage Facility		5	WC		MCH
24.07.2019	Update report		6	WC		MCH
13.08.2019	Update report		7	WC		MCH

Contents

List of tables

List of figures

1 Introduction

Renzo Tonin & Associates was engaged to conduct an environmental noise and vibration assessment of the proposed Wellington Solar Farm located approximately two kilometres northeast of the town of Wellington in New South Wales as part of a Modification Application for the project. Noise and vibration impacts from the construction and operation phases of the project will be addressed in this report in accordance with relevant Council and EPA requirements and guidelines.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Project Description

2.1 Background Information

The Wellington Solar Farm project includes the construction and operation of a solar photovoltaic (PV) plant and associated infrastructure, with a capacity of approximately 174MW. The subject site is located approximately two kilometres northeast of the town of Wellington in New South Wales, within the Dubbo Regional Council Local Government Area (LGA).

2.1.1 Modification Description

TransGrid have advised that there is a need to extend the substation footprint beyond the existing fence line and re-locate the approved point of connection of the transmission line into the substation. The modified layout now allows for an underground transmission cable connection to the substation from the solar farm, which will:

- Cross Goolma Road, heading south
- Veer west at the southern end of the substation compound, connecting at the south- western corner of the existing substation.

Additionally, a 20m x 6m expansion of the existing substation compound is required to house the following equipment:

- Power transformer (132/33kV)
- 132kV bus bar extension
- 132kV current transformer
- 132kV voltage transformer
- 33kV bus for the transformer secondary side (includes the 33kV cable connections)
- 33kV switch room building, including the 33kV switchboard
- Harmonic filters

2.2 Regulatory Requirements

Noise and vibration impacts are assessed in accordance with a number of policies, guidelines and standards, including:

- NSW 'Interim Construction Noise Guideline' (ICNG – Department of the Environment and Climate Change, 2009);
- NSW 'Industrial Noise Policy' (INP – EPA, 2000);

- 'Assessing Vibration: A Technical Guideline' (Department of the Environment and Climate Change, 2006); and
- NSW 'Road Noise Policy' (RNP – Department of Environment, Climate Change and Water, 2011)

2.3 Receiver Locations

The nearest affected receivers were identified through aerial maps as follows:

- **Receiver R1 – 104 Cobbora Road, Maryvale**
  Residential property located approximately 560m west of the project area.
- **Receiver R2 – 215 Cobbora Road, Maryvale**
  Residential property located approximately 1,350m west of the project area.
- **Receiver R3 – 6444 Goolma Road, Bodangora**
  Residential property located approximately 1,250m north of the project area.
- **Receiver R4 – 6582 Goolma Road, Bodangora - NSW Soil Conservation Commission Offices**
  Commercial property located approximately 300m north of the project area.
- **Receiver R5 – Wellington Correction Centre**
  Correction centre located approximately 420m east of the project area.
- **Receiver R6 – 28 Cadia Place, Wuuluman**
  Residential property located approximately 670m east of the project area.
- **Receiver R7 – 59 Twelve Mile Road, Wuuluman**
  Residential property located approximately 400m south-east of the project area.
- **Receiver R8 – 6938 Goolma Road, Wuuluman**
  Residential property located approximately 600m west of the project area. There may be multiple dwellings on this property and assessment is conducted for the worst case nearest dwelling.
- **Receiver R9 – 152 Bela Vista Lane, Montefiores**
  Residential property located approximately 1,040m south-west of the project area.
- **Receiver R10 – 7009 Goolma Road, Montefiores**
  Residential property located approximately 665m south of the project area

Figure 1 provides details of the site, surrounds and receiver locations.

2.4 Hours of Operation

2.4.1 Construction

Construction will occur during the following standard hours of construction:

- Monday to Friday: 7:00am to 6:00pm
- Saturday: 8:00am to 1:00pm
- No work on Sundays or public holidays

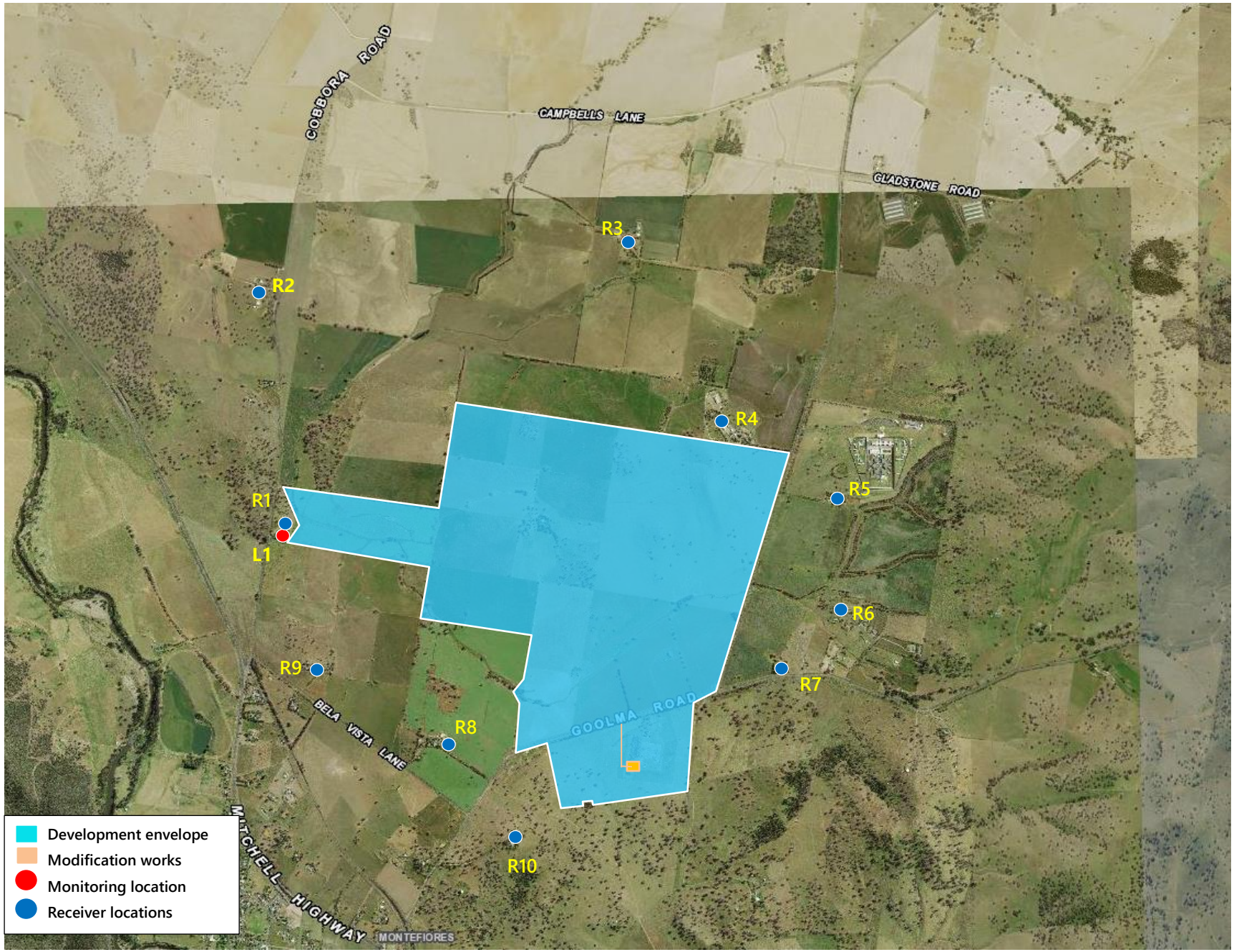
2.4.2 Operation

The solar farm will operate autonomously during times when there is sunlight. This will predominantly be during day and evening periods (7am-6pm and 6pm-10pm, respectively) throughout the year and potentially part of the night time period (prior to 7am) during the summer months.

Furthermore, there will be staff on site during the following standard hours:

- Monday to Friday: 7:00am to 6:00pm
- Saturday: 8:00am to 1:00pm

Figure 1 – Site, Surrounds and Receiver and Noise Monitoring Locations



3 Existing Noise Environment

Background noise varies over the course of any 24 hour period, typically from a minimum at 3am in the morning to a maximum during morning and afternoon traffic peak hours. Therefore, the NSW 'Industrial Noise Policy' (INP – Environment Protection Authority NSW 2000) requires that the level of background and ambient noise be assessed separately for the daytime, evening and night-time periods. The NSW INP defines these periods as follows:

- **Day** is defined as 7:00am to 6:00pm, Monday to Saturday and 8:00am to 6:00pm Sundays & Public Holidays.
- **Evening** is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays.
- **Night** is defined as 10:00pm to 7:00am, Monday to Saturday and 10:00pm to 8:00am Sundays & Public Holidays.

3.1 Noise Monitoring Locations

Noise monitoring is to be undertaken at the nearest or potentially most affected residential locations. In this case the nearest and potentially most affected location where noise monitoring was undertaken was as follows.

- **Location L1 – 104 Cobbora Road, Maryvale**
  Noise monitor was installed in the 'free field' (ie. away from building facades). Noise data represents the background and ambient noise environment for residences surrounding the project area.

To quantify the existing ambient noise environment, long-term (unattended) noise monitoring was conducted at Location L1 between Friday 23rd June and Monday 3rd July 2017.

Appendix A of this report presents a description of noise terms. Appendix B details the noise monitoring methodology and the graphical recorded outputs from long term noise monitoring are included in Appendix C. The graphs in Appendix C were analysed to determine an assessment background level (ABL) for each day, evening and night period in each 24 hour period of noise monitoring, and based on the median of individual ABLs an overall single Rating Background Level (RBL) for the day, evening and night period is determined over the entire monitoring period in accordance with the NSW INP.

3.2 Existing Background & Ambient Noise Levels

Existing background and ambient noise levels are presented in Table 3.1 below. The noise monitor was positioned outdoors in the 'free-field' (ie. away from building facades). Construction and operation noise from the site should be assessed away from the facade at the potentially most affected residential boundaries and therefore, the representative noise levels listed in Table 3.1 are directly applicable.

Table 3.1 – Measured Existing Background (L_{90}) & Ambient (L_{eq}) Noise Levels, dB(A)

Location	L_{90} Background Noise Levels			L_{eq} Ambient Noise Levels		
	Day	Evening	Night	Day	Evening	Night
L1 – 104 Cobbora Road, Maryvale	25	29	13	41	42	37

The identified receivers surrounding the subject site are all classified as rural under INP guidelines. It was found that the background noise levels are representative of residences in a rural environment with daytime and night time background noise levels below 30dB(A).

Based on page 24 of the INP, 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 in Section 2.3 during the daytime and night time assessment periods.

4 Construction Noise Assessment

4.1 Construction Noise Management Levels

The NSW 'Interim Construction Noise Guideline' (ICNG, 2009) provides guidelines for assessing noise generated during the construction phase of developments.

The key components of the guideline that are incorporated into this assessment include:

- *Use of L_{Aeq} as the descriptor for measuring and assessing construction noise*

  NSW noise policies, including the INP, RNP and RING have moved to the primary use of L_{Aeq} over any other descriptor. As an energy average, L_{Aeq} provides ease of use when measuring or calculating noise levels since a full statistical analysis is not required as when using, for example, the L_{A10} descriptor.

- *Application of reasonable and feasible noise mitigation measures*

  As stated in the ICNG, a noise mitigation measure is feasible if it is capable of being put into practice, and is practical to build given the project constraints.

  Selecting reasonable mitigation measures from those that are feasible involves making a judgement to determine whether the overall noise benefit outweighs the overall social, economic and environmental effects.

The ICNG provides two methods for assessment of construction noise, being either a quantitative or a qualitative assessment. A quantitative assessment is recommended for major construction projects of significant duration, and involves the measurement and prediction of noise levels, and assessment against set criteria. A qualitative assessment is recommended for small projects with duration of less than three weeks and focuses on minimising noise disturbance through the implementation of reasonable and feasible work practices, and community notification.

Given the length of the construction works proposed, a quantitative assessment is carried out herein, consistent with the ICNG requirements.

4.1.1 Residential Receivers

Table 4.1 reproduced from the ICNG, sets out the noise management levels and how they are to be applied for residential receivers.

Table 4.1 – Noise Management Levels at Residential Receivers

Time of Day	Management Level $L_{Aeq\ (15\ min)}$	How to Apply
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)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: • times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences) • if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5dB(A)	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the ICNG.

Table 4.2 presents the construction noise management levels established for the nearest noise sensitive residential receivers based upon the noise monitoring results presented in Table 3.1, the proposed construction hours and the above ICNG requirements. The receiver locations are marked in Figure 1.

Table 4.2 – Construction Noise Management Levels at Residential Receivers

Location Description	Day L_{A90} Background Noise Level (RBL)	Day Noise Management Level $L_{Aeq(15min)}$
All residential receivers (Receivers R1 – R3 & R6 – R10)	30[1]	**40**

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

4.1.2 Sensitive Land Uses

Table 4.3 sets out the ICNG noise management levels for other types of noise sensitive receiver locations applicable for this project.

Table 4.3 – Noise Management Levels at Other Noise Sensitive Land Uses

Land Use	Where Objective Applies	Management Level $L_{aeq\ (15\ Min)}$
Receiver R4 – NSW Soil Conservation Commission offices (treated as commercial receiver)	External noise level	70dB(A)
Receiver R5 - Wellington Correctional Centre (treated as commercial receiver)	External noise level	70dB(A)

Notes: 1. Noise Management Levels only apply when premises are in use

4.2 Construction Noise Sources

The following tables lists typical plant and equipment likely to be used by the contractor to carry out the necessary construction works for the project.

Table 4.4 – Typical Construction Equipment & Sound Power Levels

Plant Item	Plant Description	Number of Items	L_{Aeq} Sound Power Levels, dB(A) re. 1pW Single Item
1	Small pile driving rig	6	114
2	Crane	2	110
3	Drum roller	2	109
4	Padfoot roller	2	109
5	Wheeled loader	2	109
6	Dump truck	4	108
7	30t Excavator	8	107
8	Grader	4	107
9	Chain trencher	2	104
10	Water truck	4	104
11	Telehandler	4	98
12	Forklift	4	90

The sound power levels for the majority of activities presented in the above table are provided by the client, based on maximum levels given in Table A1 of Australian Standard 2436 - 2010 'Guide to Noise Control on Construction, Demolition and Maintenance Sites', the ICNG, information from past projects and/or information held in our library files.

4.3 Construction Noise Assessment

Noise emissions were predicted by modelling the noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments using CadnaA (version 2017) noise modelling computer program. The program 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 takes 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 (soft); and
- Attenuation from barriers (natural and purpose built).

Noise levels at any receptors resulting from construction would depend on the above and the type and duration of construction being undertaken. Furthermore, noise levels at receivers would vary substantially over the total construction program due to the transient nature and large range of plant and equipment that could be used.

Table 4.4 presents construction noise levels likely to be experienced at the nearby affected receivers based on the construction activities and plant and equipment associated with the proposed development site. The noise level ranges represent the noise source being located at the furthest to the closest proximity to each receiver location. The construction works associated with the Modification has been included.

Table 4.5 – Predicted $L_{Aeq,15min}$ Construction Noise Levels at Receiver Locations, dB(A)

Plant Item	Plant Description	Predicted $L_{eq(15min)}$ Construction Noise Levels									
		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
Noise Management Level[1]		*40*	*40*	*40*	*70*[1]	*70*[1]	*40*	*40*	*40*	*40*	*40*
1	Small pile driving rig	<20-47	<20-34	<20-29	<20-45	<20-42	<20-36	<20-42	<20-38	<20-31	<20-36
2	Crane	<20-43	<20-30	<20-25	<20-41	<20-38	<20-32	<20-38	<20-34	<20-27	<20-32
3	Drum roller	<20-42	<20-29	<20-24	<20-40	<20-37	<20-31	<20-37	<20-33	<20-26	<20-31
4	Padfoot roller	<20-42	<20-29	<20-24	<20-40	<20-37	<20-31	<20-37	<20-33	<20-26	<20-31
5	Wheeled loader	<20-42	<20-29	<20-24	<20-40	<20-37	<20-31	<20-37	<20-33	<20-26	<20-31
6	Dump truck	<20-41	<20-28	<20-23	<20-39	<20-36	<20-30	<20-36	<20-32	<20-25	<20-30
7	30t Excavator	<20-40	<20-27	<20-22	<20-38	<20-35	<20-29	<20-35	<20-31	<20-24	<20-29
8	Grader	<20-40	<20-27	<20-22	<20-38	<20-35	<20-29	<20-35	<20-31	<20-24	<20-29
9	Chain trencher	<20-37	<20-24	<20	<20-35	<20-32	<20-26	<20-32	<20-28	<20-21	<20-26
10	Water truck	<20-37	<20-24	<20	<20-35	<20-32	<20-26	<20-32	<20-28	<20-21	<20-26
11	Telehandler	<20-31	<20	<20	<20-29	<20-26	<20-20	<20-26	<20-22	<20	<20-20
12	Forklift	<20-23	<20	<20	<20-21	<20	<20	<20	<20	<20	<20
Up to 3 (noisiest) plant operating concurrently		**<20-49**	**<20-36**	**<20-31**	**<20-47**	**<20-44**	**<20-39**	**<20-44**	**<20-40**	**<20-33**	**<20-39**

Notes: 1. Noise Management Levels for day period (ie. standard construction hours)

2. Noise Management Level for commercial type premises

Based on the construction noise levels presented in the table above, the construction management levels at Receivers R1 and R7 may be exceeded when construction works are conducted at closest proximity to the receivers. It is noted that construction noise levels at all receivers are predicted to be less than the highly noise affected level of 75dB(A).

In light of the predicted noise levels above, it is recommended that a feasible and reasonable approach towards noise management measures be applied to reduce noise levels as much as possible to manage the impact from construction noise.

Further details on construction noise mitigation and management measures are provided in Section 4.5 below.

4.4 Cumulative Construction Noise Assessment

Construction activities associated with the adjacent Wellington North Solar Plant may potentially occur at the same time as construction works required for the proposed Wellington Solar Plant. As a result, some of the nominated receivers may be impacted by construction noise from both solar plants concurrently. However, not all receivers identified in Section 2.3 have been included in the Wellington North Solar Plant noise and vibration assessment [ref: TJ917-01F01 Report (r8), dated 18 January 2019], as they were not identified as one of the nearest affected receivers and therefore were predicted to comply with the NMLs established within the report.

For a conservative cumulative assessment, for the receivers that have been identified as being the nearest affected receiver for both the Wellington Solar Plant and Wellington North Solar Plant (ie. Receivers R1, R2 and R4-R10), a cumulative construction noise assessment has been undertaken for the scenario where both solar plants are being constructed at the same time; although, it is highly unlikely the two solar plants will be constructed concurrently due to the different timelines of the projects and the timing of approvals.

The cumulative construction noise assessment was conducted for two different scenarios:

- **Scenario 1 –** Concurrent construction of Wellington Solar Plant and Wellington North Solar Plant.
- **Scenario 2 –** Concurrent construction of Wellington Solar Plant and the proposed Wellington North Solar Plant easement.

The cumulative assessment for Scenario 1 assumes that the same construction plant and equipment are being used at both solar plants concurrently during the construction of the solar plants. Table 4.6 presents cumulative construction noise levels likely to be experienced at the nearby affected receivers based on the works conducted in Scenario 1.

The plant and equipment used to construct the solar plant slightly differ to the plant and equipment used for the construction of the easement, demonstrated in the comparison of Table 4.4 and Table 4.5 of the Wellington North Solar Plant report. Due to the differing equipment a conservative approach has

been adopted in Scenario 2, where it is assumed that the three (3) noisiest plant items from each work site are operating concurrently. Table 4.7 present the cumulative construction noise levels for Scenario 2.

Table 4.6 – Predicted $L_{Aeq,15min}$ Cumulative Plant Construction Noise Levels from Wellington Solar Plant and Wellington North Solar Plant, dB(A)

Plant Item	Plant Description	Predicted $L_{eq(15min)}$ Construction Noise Levels																								
		R1			R2			R4			R5			R6			R7			R8			R9			R10		
Noise Management Level[1]		*40*			*40*			*70*[2]			*70*[2]			*40*			*40*			*40*			*40*			*40*		
	Work Areas	Wellington Solar Plant	Wellington North Solar Plant	Cumul.[3]	Wellington Solar Plant	Wellington North Solar Plant	Cumul.[3]	Wellington Solar Plant	Wellington North Solar Plant	Cumul.[3]	Wellington Solar Plant	Wellington North Solar Plant	Cumul.[3]	Wellington Solar Plant	Wellington North Solar Plant	Cumul.[3]	Wellington Solar Plant	Wellington North Solar Plant	Cumul.[3]	Wellington Solar Plant	Wellington North Solar Plant	Cumul.[3]	Wellington Solar Plant	Wellington North Solar Plant	Cumul.[3]	Wellington Solar Plant	Wellington North Solar Plant	Cumul.[3]
1	Small pile driving rig	23-**47**	<20-39	23-**47**	23-34	<20-**49**	23-**49**	21-45	<20-57	22-57	23-42	<20-40	23-44	23-36	<20-29	23-37	23-**42**	<20-26	23-**42**	23-38	<20-25	23-38	23-31	<20-28	23-33	23-36	<20-20	23-36
2	Crane	<20-**43**	<20-35	<20-**43**	<20-30	<20-**45**	<20-**45**	<20-41	<20-53	<20-53	<20-38	<20-36	<20-40	<20-32	<20-25	<20-33	<20-38	<20-22	<20-38	<20-34	<20-21	<20-34	<20-27	<20-24	<20-29	<20-32	<20-<20	<20-32
3	Drum roller	<20-**42**	<20-34	<20-**42**	<20-29	<20-**44**	<20-**44**	<20-40	<20-52	<20-52	<20-37	<20-35	<20-39	<20-31	<20-24	<20-32	<20-37	<20-21	<20-37	<20-33	<20-20	<20-33	<20-26	<20-23	<20-28	<20-31	<20-<20	<20-31
4	Padfoot roller	<20-**42**	<20-34	<20-**42**	<20-29	<20-**44**	<20-**44**	<20-40	<20-52	<20-52	<20-37	<20-35	<20-39	<20-31	<20-24	<20-32	<20-37	<20-21	<20-37	<20-33	<20-20	<20-33	<20-26	<20-23	<20-28	<20-31	<20-<20	<20-31
5	Wheeled loader	<20-**42**	<20-34	<20-**42**	<20-29	<20-**44**	<20-**44**	<20-40	<20-52	<20-52	<20-37	<20-35	<20-39	<20-31	<20-24	<20-32	<20-37	<20-21	<20-37	<20-33	<20-20	<20-33	<20-26	<20-23	<20-28	<20-31	<20-<20	<20-31
6	Dump truck	<20-**41**	<20-33	<20-**41**	<20-28	<20-**43**	<20-**43**	<20-39	<20-51	<20-51	<20-36	<20-34	<20-38	<20-30	<20-23	<20-31	<20-36	<20-20	<20-36	<20-32	<20-<20	<20-32	<20-25	<20-22	<20-27	<20-30	<20-<20	<20-30
7	30t Excavator	<20-40	<20-32	<20-40	<20-27	<20-**42**	<20-**42**	<20-38	<20-50	<20-50	<20-35	<20-33	<20-37	<20-29	<20-22	<20-30	<20-35	<20-<20	<20-35	<20-31	<20-<20	<20-31	<20-24	<20-21	<20-26	<20-29	<20-<20	<20-29
8	Grader	<20-40	<20-32	<20-40	<20-27	<20-42	<20-**42**	<20-38	<20-50	<20-50	<20-35	<20-33	<20-37	<20-29	<20-22	<20-30	<20-35	<20-<20	<20-35	<20-31	<20-<20	<20-31	<20-24	<20-21	<20-26	<20-29	<20-<20	<20-29
9	Chain trencher	<20-37	<20-29	<20-37	<20-24	<20-39	<20-39	<20-35	<20-47	<20-47	<20-32	<20-30	<20-34	<20-26	<20-<20	<20-27	<20-32	<20-<20	<20-32	<20-28	<20-<20	<20-28	<20-21	<20-<20	<20-23	<20-26	<20-<20	<20-26
10	Water truck	<20-37	<20-29	<20-37	<20-24	<20-39	<20-39	<20-35	<20-47	<20-47	<20-32	<20-30	<20-34	<20-26	<20-<20	<20-27	<20-32	<20-<20	<20-32	<20-28	<20-<20	<20-28	<20-21	<20-<20	<20-23	<20-26	<20-<20	<20-26
11	Telehandler	<20-31	<20-23	<20-31	<20-<20	<20-33	<20-33	<20-29	<20-41	<20-41	<20-26	<20-24	<20-28	<20-20	<20-<20	<20-21	<20-26	<20-<20	<20-26	<20-22	<20-<20	<20-22	<20-<20	<20-<20	<20-<20	<20-20	<20-<20	<20-20
12	Forklift	<20-23	<20-<20	<20-23	<20-<20	<20-25	<20-25	<20-21	<20-33	<20-33	<20-<20	<20-<20	<20-20	<20-<20	<20-<20	<20-<20	<20-<20	<20-<20	<20-<20	<20-<20	<20-<20	<20-<20	<20-<20	<20-<20	<20-<20	<20-<20	<20-<20	<20-<20
Up to 3 (noisiest) plant operating concurrently		25-**49**	<20-41	26-**50**	25-36	<20-**51**	26-**51**	23-47	<20-59	24-60	25-44	<20-42	26-46	25-39	<20-31	26-39	25-**44**	<20-28	26-**44**	25-40	<20-28	26-**41**	25-33	<20-31	26-35	25-39	<20-23	26-39

Notes: 1. Noise Management Levels for day period (ie. standard construction hours)
2. Noise Management Level for commercial type premises
3. Overall noise contribution from construction noise from Wellington Solar Plant and Wellington North Solar Plant
4. **Bold** font represents exceedance of the relevant NML

Table 4.7 – Predicted $L_{Aeq,15min}$ Cumulative Construction Noise Levels from Wellington Solar Plant and Wellington North Solar Plant, dB(A)

Plant Item	Plant Description	Predicted $L_{eq(15min)}$ Construction Noise Levels																								
		R1			R2			R4			R5			R6			R7			R8			R9			R10		
Noise Management Level[1]		*40*			*40*			*70*[2]			*70*[2]			*40*			*40*			*40*			*40*			*40*		
	Work Areas	Welling-ton Solar Plant	Wellington North Easement	Cumul.[3]	Welling-ton Solar Plant	Wellington North Easement	Cumul.[3]	Welling-ton Solar Plant	Wellington North Easement	Cumul.[3]	Welling-ton Solar Plant	Wellington North Easement	Cumul.[3]	Welling-ton Solar Plant	Wellington North Easement	Cumul.[3]	Welling-ton Solar Plant	Wellington North Easement	Cumul.[3]	Welling-ton Solar Plant	Wellington North Easement	Cumul.[3]	Welling-ton Solar Plant	Wellington North Easement	Cumul.[3]	Welling-ton Solar Plant	Wellington North Easement	Cumul.[3]
Up to 3 (noisiest) plant operating concurrently[4]		25-**49**	<20-<20	25-**49**	25-36	<20-<20	25-36	23-47	<20-36	25-47	25-44	<20-43	26-47	25-39	24-38	28-**42**	25-44	20-**63**	27-**63**	25-40	<20-24	25-40	25-33	<20-<20	25-33	25-39	<20-26	25-39

Notes:
1. Noise Management Levels for day period (ie. standard construction hours)
2. Noise Management Level for commercial type premises
3. Overall noise contribution from construction noise from Wellington Solar Plant and proposed Wellington North Solar Plant easement
4. Up to 3 noisiest plant for each work area operating concurrently
5. **Bold** font represents exceedance of the relevant NML

For the cumulative construction noise levels of the Wellington Solar Plant and Wellington North Solar Plant construction works, the results presented in Table 4.6 indicate possible exceedances above the NML for Receivers R1, R2, R7 and R8. The construction of the Wellington Solar Plant is the main contributor to the exceedance at Receivers R1 and R7, which has been identified in Section 4.3. The exceedance at Receiver R2 is mainly due to the construction of the Wellington North Solar Plant, which was initially identified as exceeding the NML in the Wellington North Solar Plant's noise and vibration assessment. For Receiver R8, the cumulative construction noise introduces a possible 1dB(A) exceedance of the NML, which is considered to be negligible as up to a 2dB(A) change in noise level is not discernible or noticeable to the average person.

For the cumulative construction noise levels of the Wellington Solar Plant and Wellington North easement construction works, the results presented in Table 4.7 indicate possible exceedances above the NML for Receivers R1, R6 and R7. The construction of the Wellington Solar Plant is the main contributor to the exceedance at Receiver R1, which has been identified in Section 4.3. The exceedance at Receiver R7 is mainly due to the construction of the Wellington North easement, which was initially identified as exceeding the NML in the Wellington North Solar Plant's noise and vibration assessment. For Receiver R6, the cumulative construction noise introduces a possible 2dB(A) exceedance of the NML, which is considered to be negligible as up to a 2dB(A) change in noise level is not discernible or noticeable to the average person.

Additionally, the cumulative construction noise levels of the Wellington Solar Plant and the Wellington North Solar Plant, and the proposed easement, are predicted to be less than the highly noise affected level of 75dB(A), as shown in Table 4.6 and Table 4.7.

4.5 Construction Noise Mitigation and Management Measures

The following recommendations provide in-principle feasible and reasonable noise control solutions to reduce noise impacts to sensitive receivers. Where actual construction activities differ from those assessed in this report, more detailed design of noise control measures may be required once specific items of plant and construction methods have been chosen and assessed on site.

The advice provided here is in respect of acoustics only. Supplementary professional advice may need to be sought in respect of fire ratings, structural design, buildability, fitness for purpose and the like.

4.5.1 General Engineering Noise Controls

Implementation of noise control measures, such as those suggested in Australian Standard 2436-2010 "Guide to Noise Control on Construction, Demolition and Maintenance Sites", are expected to reduce predicted construction noise levels. Reference to Australian Standard 2436-2010, Appendix C, Table C1 suggests possible remedies and alternatives to reduce noise emission levels from typical construction equipment. Table C2 in Appendix C presents typical examples of noise reductions achievable after treatment of various noise sources. Table C3 in Appendix C presents the relative effectiveness of various forms of noise control treatment.

Table 4.8 below presents noise control methods, practical examples and expected noise reductions according to AS2436 and according to Renzo Tonin & Associates' opinion based on experience with past projects.

Table 4.8 – Relative Effectiveness of Various Forms of Noise Control, dB(A)

Noise Control Method	Practical Examples	Typical Noise Reduction Possible in Practice		Maximum Noise Reduction Possible in Practice	
		AS 2436	Renzo Tonin & Associates	AS 2436	Renzo Tonin & Associates
Distance	Doubling of distance between source and receiver	6	6	6	6
Screening	Acoustic barriers such as earth mounds, temporary or permanent noise barriers	5 to 10	5 to 10	15	15
Acoustic Enclosures	Engine casing lagged with acoustic insulation and plywood	15 to 25	10 to 20	50	30
Engine Silencing	Residential class mufflers	5 to 10	5 to 10	20	20
Substitution by alternative process	Use electric motors in preference to diesel or petrol	-	15 to 25	-	40

The Renzo Tonin & Associates' listed noise reductions are conservatively low and should be referred to in preference to those of AS2436.

Table 4.9 below identifies possible noise control measures, which are applicable on the construction plant likely to be used on site.

Table 4.9 – Noise Control Measures for Likely Construction Plant

Plant Description	Screening	Acoustic Enclosures	Silencing	Alternative Process
Small pile driving rig	✔	✖	✔	✔
Crane	✔	✔	✔	✖
Drum roller	✔	✖	✔	✖
Padfoot roller	✔	✖	✔	✖
Wheeled loader	✔	✖	✔	✖
Dump truck	✔	✖	✔	✖
30t Excavator	✔	✖	✔	✖
Grader	✔	✖	✔	✖
Chain trencher	✔	✖	✔	✔
Water truck	✔	✖	✔	✖
Telehandler	✔	✖	✔	✖
Forklift	✔	✖	✔	✖

4.5.2 Noise Management Measures

In addition to physical noise controls, the following general noise management measures should be followed:

- Use less noisy plant and equipment, where feasible and reasonable.
- Plant and equipment should be properly maintained.
- Provide special attention to the use and maintenance of 'noise control' or 'silencing' kits fitted to machines to ensure they perform as intended.
- Strategically position plant on site to reduce the emission of noise to the surrounding neighbourhood and to site personnel.
- Avoid any unnecessary noise when carrying out manual operations and when operating plant.
- Any equipment not in use for extended periods during construction work should be switched off.
- In addition to the noise mitigation measures outlined above, a management procedure would need to be put in place to deal with noise complaints that may arise from construction activities. Each complaint would need to be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits.
- Good relations with people living and working in the vicinity of a construction site should be established at the beginning of a project and be maintained throughout the project, as this is of paramount importance. Keeping people informed of progress and taking complaints seriously and dealing with them expeditiously is critical. The person selected to liaise with the community should be adequately trained and experienced in such matters.

Where noise level exceedances cannot be avoided, then consideration may be given to implementing time restrictions and/or providing periods of repose for residents, where feasible and reasonable. That is, daily periods of respite from noisy activities may also be scheduled for building occupants during construction hours.

Some items of plant may exceed noise limits even after noise treatment is applied. To reduce the overall noise impact, the use of noisy plant may be restricted to within certain time periods, where feasible and reasonable and to be negotiated with Council and the residents. Allowing the construction activities to proceed, despite the noise exceedance may be the preferred method in order to complete the works expeditiously.

5 Operational Noise Assessment

5.1 Operational Noise Criteria

Noise impact from the general operation of the proposed solar farm is assessed against the NSW Industrial Noise Policy (INP). The assessment procedure in terms of the INP has two components:

- Controlling intrusive noise impacts in the short term for residences
- Maintaining noise level amenity for particular land uses for residences and other land uses.

In accordance with the INP, noise impact should be assessed in terms of both intrusiveness and amenity.

5.1.1 Intrusiveness Criteria

According to the NSW INP, the intrusiveness of a mechanical noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the background noise level measured in the absence of the source by more than 5dB(A). It is noted that this is applicable to residential properties only.

Therefore, the intrusiveness criterion for residential noise receptors as summarised in the INP is as follows:

$$L_{Aeq,\ 15\ minute} \leq \text{Rating Background Level } (L_{A90}) + 5\ dB(A)$$

Based on the monitored background noise levels presented in Section 3.2 and the proposed operating hours of the solar farm, the intrusiveness criteria for the potentially most affected residential receiver locations are presented below.

Table 5.1 – Intrusiveness Noise Criteria, dB(A)

Receiver Location	Intrusiveness Criteria – $L_{Aeq,15min}$		
	Day	Evening	Night
All residential receivers	30 + 5 = **35**	30 + 5 = **35**	30 + 5 = **35**

Notes: 1. Intrusiveness criteria only applicable for residential receivers

5.1.2 Amenity Criteria

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.1 of the NSW INP, the applicable parts of which are reproduced below.

Nearby noise sensitive receivers consist of residential properties situated in a rural area and the correctional centre (Receiver R5), which is considered as a commercial type receiver. Based on the

nature of these receivers, the amenity criteria (L_{Aeq}) for rural residential properties and commercial premises will be applied. The applicable amenity noise criteria are presented in the table below.

Table 5.2 – Applicable Amenity Noise Criteria, dB(A)

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Amenity Noise Level	
			Acceptable	Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
Commercial premises	All	When in use	65	70

Notes: 1. Day is defined as 7:00am to 6:00pm, Monday to Saturday; 8:00am to 6:00pm Sundays & Public Holidays.
2. Evening is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays.
3. Night is defined as 10:00pm to 7:00am, Monday to Saturday; 10:00pm to 8:00am, Sundays & Public Holidays.

Comparing the amenity and the intrusiveness criteria for residential receivers shows that the intrusiveness criteria are more stringent for day, evening and night periods. Compliance with the intrusiveness criteria would result in compliance with the amenity criteria for residential receivers. Therefore, only the intrusiveness criteria would be assessed for from herein for residential receivers.

5.1.3 Sleep Disturbance

Given the proposed operating hours of the project, noise emanating from the solar farm has been assessed for its potential to disturb sleep. The NSW EPA has made the following policy statement with respect to sleep disturbance:

> *"Peak noise level events, such as reversing beepers, noise from heavy items being dropped or other high noise level events, have the potential to cause sleep disturbance. The potential for high noise level events at night and effects on sleep should be addressed in noise assessments for both the construction and operational phases of a development. The INP does not specifically address sleep disturbance from high noise level events.*
>
> *Research on sleep disturbance is reviewed in the NSW Road Noise Policy. This review concluded that the range of results is sufficiently diverse that it was not reasonable to issue new noise criteria for sleep disturbance.*
>
> *From the research, the EPA recognised that the current sleep disturbance criterion of an LA1, (1 minute) not exceeding the LA90, (15 minute) by more than 15 dB(A) is not ideal. Nevertheless, as there is insufficient evidence to determine what should replace it, the EPA will continue to use it as a guide to identify the likelihood of sleep disturbance. This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required.*
>
> *The detailed analysis should cover the maximum noise level or LA1, (1 minute), that is, the extent to which the maximum noise level exceeds the background level and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of*

research results in the NSW Road Noise Policy. Other factors that may be important in assessing the extent of impacts on sleep include:

- *how often high noise events will occur*
- *time of day (normally between 10pm and 7am)*
- *whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).*

The LA1, (1 minute) descriptor is meant to represent a maximum noise level measured under 'fast' time response. The EPA will accept analysis based on either LA1, (1 minute) or LA, (Max).

Source: http://www.epa.nsw.gov.au/noise/applicnotesindustnoise.htm Downloaded: 04.12.2015"

The NSW EPA confirm that a sleep disturbance criterion of $L_{A1(1min)} \leq L_{A90(15min)}$ + 15dB(A), should only be used as a first step guide and where the criteria is not met, more detailed analysis is required as explained in the text above. The L_{Amax} descriptor may be used as an alternative to the $L_{A1(1min)}$ descriptor.

It is noted that the subject site will potentially operate for part of the night time period (prior to 7am) when there is sunlight, during the summer months.

Therefore, the sleep disturbance criterion for the project is presented in Table 5.3.

Table 5.3 – Sleep Disturbance Criterion, dB(A)

Receiver	Sleep Disturbance Criteria, L_{Amax}
All residential receivers	30 + 15 = **45**

5.2 Operational Noise Sources

The proposed solar farm will operate solar panels installed on single-axis trackers in rows aligned in north south arrangement. Tracking systems involve the panels being driven by motors to track the arc of the sun to maximise the solar effect. Therefore, the tracking motors are a potential source of mechanical noise and are included in this assessment. Up to a total of 6,950 tracking motors (NexTracker or equivalent) will be employed to drive the solar panels and are to be evenly distributed across the solar farm area. The tracking motors would turn no more than five (5) degrees every 15 minutes and would operate no more than one (1) minute out of every 15 minute period.

In addition to the trackers, the site will require the operation of up to 44 inverter stations with each containing three (3) inverters (Ingeteam 1640TL B630) which will be evenly distributed across the solar farm area.

An energy storage facility will also be located on the eastern end of the site. Noise generating equipment within the energy storage facility will comprise of 6 transformers, up to 70 Power Conversion Units (PCUs) and up to 70 air-conditioning units.

Noise generating equipment as part of the modification include up to three (3) transformers, switch room and up to 120 harmonic filters.

During operations, it is assumed that three (3) staff members will attend site daily during the day time period to inspect the equipment. It is also assumed that each staff member will travel around the subject site in a light vehicle.

Based on the above, the following table lists associated plant and equipment likely to be used for the operation of the proposed solar farm and their corresponding sound power levels.

Table 5.4 – Typical Operational Plant and Equipment & Sound Power Levels

Plant Item	Plant Description	L_{Aeq} Sound Power Levels, dB(A) re. 1pW
1	Tracker Motor (up to 6,950 in total)	78 (each)
2	Ingeteam 1640TL B630 Inverters (up to 44 stations of three (3) inverters in total)	88 (each)
3	Energy Storage Facility PCUs (up to 70 in total)	88 (each)
4	Energy Storage Facility Air-conditioning Units (up to 70 in total)	75 (each)
5	Energy Storage Facility Transformers (up to 6 in total)	83 (each)
6	Light vehicle (3 in total)	88 (each)
7	Substation Transformers (up to 3 in total)	83 (each)
8	Substation Switch Room	83 (each)
9	Substation Harmonic Filters (up to 120 in total)	71 (each)

The sound power levels for the plant and equipment presented in the above table are provided by the manufacturer, information from past projects and/or information held in our library files.

5.3 'Modifying Factor' Adjustments

Further to the above and in accordance with the INP, where the character of the noise in question is assessed as particularly annoying (ie. if it has an inherently tonal, low frequency, impulsive or intermittent characteristic), then an adjustment of 5dB(A) for each annoyance aspect, up to a total of 10dB(A), is to be added to the predicted value to penalise the noise for its potential increase in annoyance.

Table 4.1 of Chapter 4 of the NSW INP provides definitive procedures for determining whether a penalty or adjustment should be applied from increased annoyance. For the assessment of the solar farm, the noise from the inverters, PCUs and transformers are considered to be tonal in nature. Therefore, a 5dB(A) penalty has been applied to the predicted noise contributions from the inverters, PCUs and transformers.

5.4 Operational Noise Assessment

Noise emissions were predicted by modelling the noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments using CadnaA (version 2017) noise modelling computer program. The program 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 takes 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 (soft); and
- Attenuation from barriers (natural and purpose built).

Furthermore, in accordance with the INP noise predictions were prepared for each of the following meteorological conditions:

1. Calm & isothermal conditions (acoustically neutral) – no wind and no temperature inversion
2. 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.
3. Moderate temperature inversion – applicable for noise predictions during night time periods only

Table 5.5 and Table 5.6 below present the predicted noise levels for the worst case scenario based on concurrent operation of all the plant and equipment shown in Table 5.4. The operational plant associated with the Modification has been included. The tracker motors were time corrected based on their operation of one (1) minute out of a 15 minute period.

Table 5.5 – Predicted $L_{Aeq,15min}$ Operational Noise Levels at Residential Receiver Locations, dB(A)

Receiver Location	Intrusiveness Criteria[1]	Predicted Operational Noise Levels, $L_{Aeq, 15min}$			Comply? (Yes/No)
		Calm & Isothermal Conditions	Slight to Gentle Breeze	Moderate Temperature Inversion[2]	
Receiver R1	*35*	25	30	30	Yes
Receiver R2	*35*	<20	25	25	Yes
Receiver R3	*35*	<20	24	24	Yes
Receiver R6	*35*	27	31	31	Yes
Receiver R7	*35*	31	35	35	Yes
Receiver R8	*35*	25	31	31	Yes
Receiver R9	*35*	22	28	28	Yes

Receiver Location	Intrusiveness Criteria[1]	Predicted Operational Noise Levels, $L_{Aeq, 15min}$			Comply? (Yes/No)
		Calm & Isothermal Conditions	Slight to Gentle Breeze	Moderate Temperature Inversion[2]	
Receiver R10	*35*	22	28	28	Yes

Notes: 1. Criteria for Day, Evening and Night periods
2. Applicable for the Night time period only

Table 5.6 – Predicted $L_{Aeq,15min}$ Operational Noise Levels at Other Sensitive Receiver Locations, dB(A)

Receiver Location	Amenity Criteria[1]	Predicted Operational Noise Levels, $L_{Aeq, period}$			Comply? (Yes/No)
		Calm & Isothermal Conditions	Slight to Gentle Breeze	Moderate Temperature Inversion[2]	
Receiver R4	*65*	28	33	33	Yes
Receiver R5	*65*	26	32	32	Yes

Notes: 1. When in use
2. Applicable for the Night time period only

Based on the predicted operational noise levels presented in the table above, predicted noise levels at the nearest receivers comply with the nominated criteria under all scenarios and meteorological conditions.

Therefore, no further reasonable and feasible noise mitigation measures are required to reduce operational noise impacts.

5.5 Cumulative Operation Noise Assessment

It is likely that the Wellington Solar Plant would be operating concurrently with the Wellington North Solar Plant. Therefore, cumulative noise impacts at the nearest affected receivers due to both solar plants operating have been considered. As highlighted in Section 4.4, not all receivers identified in Section 2.3 have been included in the Wellington North Solar Plant noise and vibration assessment [ref: TJ917-01F01 Report (r8), dated 18 January 2019], as they were not identified as one of the nearest affected receivers and therefore were predicted to comply with the project trigger levels established within the report.

An assessment of the cumulative operational noise from the Wellington North Solar Plant with the upgraded substation and the Wellington Solar Plant has been quantified for the receivers that have been identified as being the nearest affected receiver for both the Wellington Solar Plant and Wellington North Solar Plant (ie. Receivers R1, R2 and R4-R10). The cumulative noise levels are presented in Table 5.7 for the applicable meteorological conditions.

Table 5.7 – Predicted $L_{Aeq,15min}$ Cumulative Operational Noise Levels at Receiver Locations, dB(A)

Receiver Location	Noise Criteria			Predicted Operational Noise Levels, $L_{Aeq, 15min}$												Comply? (Yes/No)
				Calm & Isothermal Conditions				Slight to Gentle Breeze				Moderate Temperature Inversion[1]				
	Day	Evening	Night	Wellington Solar Plant	Wellington North Solar Plant	Wellington North Upgraded Substation	Cumul.[3]	Wellington Solar Plant	Wellington North Solar Plant	Wellington North Upgraded Substation	Cumul.[3]	Wellington Solar Plant	Wellington North Solar Plant	Wellington North Upgraded Substation	Cumul.[3]	
Receiver R1	*35*	*35*	*35*	25	24	<20	28	30	30	22	33	30	30	22	33	Yes
Receiver R2	*35*	*35*	*35*	<20	30	<20	30	25	34	<20	35	25	34	<20	35	Yes
Receiver R4[2]	*65*	*65*	*65*	28	31	<20	33	33	34	25	37	33	35	25	37	Yes
Receiver R5[2]	*65*	*65*	*65*	26	25	<20	29	32	31	24	35	32	31	24	35	Yes
Receiver R6	*35*	*35*	*35*	27	<20	23	29	31	26	29	34	31	26	29	34	Yes
Receiver R7	*35*	*35*	*35*	31	<20	28	33	35	25	33	**37**	35	25	33	**37**	**No**
Receiver R8	*35*	*35*	*35*	25	<20	24	28	31	25	30	34	31	25	30	34	Yes
Receiver R9	*35*	*35*	*35*	22	<20	<20	25	28	26	24	31	28	26	24	31	Yes
Receiver R10	*35*	*35*	*35*	22	<20	27	28	28	22	33	34	28	22	33	34	Yes

Notes:
1. Applicable for the night time period only
2. Commercial receiver assessed only for when in use
3. Overall noise contribution from Wellington North Solar Plant, upgraded substation and Wellington Solar Plant
4. **Bold** font indicates exceedance

From Table 5.7 it can be seen that the predicted noise levels generally comply at all receiver locations under all scenarios and meteorological conditions. However, under noise enhancing weather conditions, the predicted cumulative noise levels at Receiver R7 exceed the criteria by 2dB(A). The exceedance at R7 is mainly attributed to the noise emissions from the Wellington Solar Farm, which predicts noise levels equal to the noise criteria of 35dB(A).

A 2dB(A) exceedance is considered to be negligible as a 2dB(A) change in noise level is not discernible or noticeable to the average person. Therefore, the predicted noise levels at Receiver R7 are determined to be acceptable and no further reasonable and feasible noise mitigation measures are required.

5.6 Sleep Disturbance Assessment

During the night time period, only mechanical plant will be operating, including the tracking motors and inverters with integrated transformers. Noise emissions from these plant items are considered to be continuous with no potential for high peak noise level events. Therefore, the L_{Amax} noise levels experienced at the identified receivers will be similar to the predicted $L_{Aeq,15min}$ noise levels shown in Table 5.5. Therefore, it is expected that the L_{Amax} noise levels experienced at the identified receivers will be well below the nominated sleep disturbance criteria of 45dB(A).

6 Vibration Assessment

Vibration generating activities would occur only during the construction phase of the project. There are no vibration generating activities expected during the operational phase. As the nearest identified receivers are in excess of 100m from the subject site, structural damage due to vibration is not expected. Assessment for vibration impact on human comfort is assessed in accordance with EPA requirements.

6.1 Vibration Criteria

Assessment of potential disturbance from vibration on human occupants of buildings is made in accordance with the EPA's 'Assessing Vibration; a technical guideline' (DECC, 2006). The guideline provides criteria which are based on British Standard BS 6472-1992 'Evaluation of human exposure to vibration in buildings (1-80Hz)'. Sources of vibration are defined as either 'Continuous', 'Impulsive' or 'Intermittent'. Table 6.1 provides definitions and examples of each type of vibration.

Table 6.1 – Types of Vibration

Type of Vibration	Definition	Examples
Continuous vibration	Continues uninterrupted for a defined period (usually throughout the day-time and/or night-time)	Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery).
Impulsive vibration	A rapid build-up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short, typically less than 2 seconds	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.
Intermittent vibration	Can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer, this would be assessed against impulsive vibration criteria.

Source: Assessing Vibration; a technical guideline, Department of Environment & Climate Change, 2006

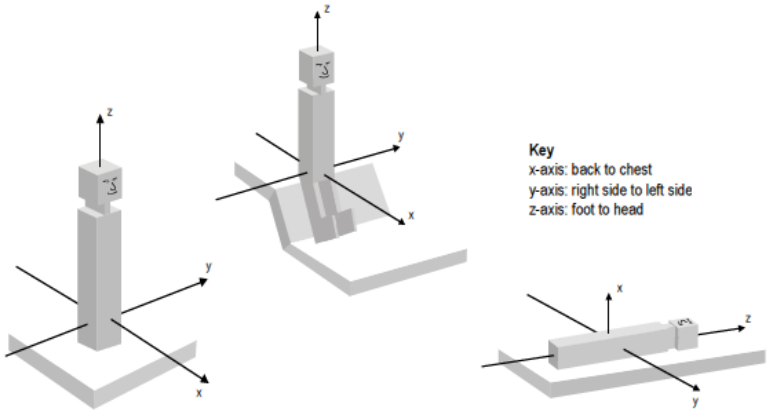
The vibration criteria are defined as a single weighted root mean square (rms) acceleration source level in each orthogonal axis. Section 2.3 of the guideline states:

> *"Evidence from research suggests that there are summation effects for vibrations at different frequencies. Therefore, for evaluation of vibration in relation to annoyance and comfort, overall weighted rms acceleration values of the vibration in each orthogonal axis are preferred (BS 6472)."*

When applying the criteria, it is important to note that the three directional axes are referenced to the human body, i.e. x-axis (back to chest), y-axis (right side to left side) or z-axis (foot to head). Vibration may enter the body along different orthogonal axes and affect it in different ways. Therefore, application of the criteria requires consideration of the position of the people being assessed, as

illustrated in Figure 2. For example, vibration measured in the horizontal plane is compared with x- and y-axis criteria if the concern is for people in an upright position, or with the y- and z- axis criteria if the concern is for people in the lateral position.

Figure 2 – Orthogonal Axes for Human Exposure to Vibration



The preferred and maximum values for continuous and impulsive vibration are defined in Table 2.2 of the guideline and are reproduced in Table 6.2 for the applicable receivers.

Table 6.2 – Preferred and Maximum Levels for Human Comfort

Location	Assessment Period[1]	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Impulsive vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14

Notes: 1. Daytime is 7:00am to 10:00pm and Night-time is 10:00pm to 7:00am

The acceptable vibration dose values (VDV) for intermittent vibration are defined in Table 2.4 of the guideline and are reproduced in Table 6.3 for the applicable receiver type.

Table 6.3 – Acceptable Vibration Dose Values for Intermittent Vibration (m/s$^{1.75}$)

Location	Daytime[1]		Night-time[1]	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Residences	0.20	0.40	0.13	0.26

Notes: 1. Daytime is 7:00am to 10:00pm and Night-time is 10:00pm to 7:00am

6.2 Potential Vibration Impacts

Based on the proposed plant items presented in Table 4.4, vibration generated by construction plant was estimated and potential vibration impacts are summarised in Table 6.4 below. The assessment is relevant to the identified receiver locations.

Table 6.4 – Potential Vibration Impacts for Identified Receivers

Receiver Location	Approx. Distance to Nearest Buildings from Works	Type of Nearest Sensitive Buildings	Assessment on Potential Vibration Impacts	Vibration Monitoring
Receiver R1	560m	Residential	Very low risk of adverse comments	Not required
Receiver R2	1,350m	Residential	Very low risk of adverse comments	Not required
Receiver R3	1,250m	Residential	Very low risk of adverse comments	Not required
Receiver R4	300m	Commercial	Very low risk of adverse comments	Not required
Receiver R5	420m	Commercial	Very low risk of adverse comments	Not required
Receiver R6	670m	Residential	Very low risk of adverse comments	Not required
Receiver R7	400m	Residential	Very low risk of adverse comments	Not required
Receiver R8	600m	Residential	Very low risk of adverse comments	Not required
Receiver R9	1,040m	Residential	Very low risk of adverse comments	Not required
Receiver R10	665m	Residential	Very low risk of adverse comments	Not required

The potential for adverse comments to vibration impacts during the construction works was determined to be very low due to the large distances between the receiver locations and the construction activities. Therefore, additional vibration mitigation measures and vibration monitoring are not required at the identified receiver locations during construction works associated with the project.

7 Road Traffic Noise Assessment

Noise impact from the potential increase in traffic on the surrounding road network due to construction and operational activities 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. These noise criteria are to be applied when assessing noise impact and determining mitigation measures for sensitive receivers that are potentially affected by road traffic noise associated with the construction and operation of the subject site, with the aim of preserving the amenity appropriate to the land use.

Vehicle access to the subject site will be via Goolma Road. Based on information provided by the client, the peak vehicle movements during the construction stage of the project are presented in the following table. Furthermore, vehicle movements will only occur during the day time period when construction works occur.

Table 7.1 – Summary of the Estimated Construction Traffic Volumes During Peak Construction

Vehicle Type	Trips Per Day (peak)
Cars/ light vehicles	300
Trucks/ heavy vehicles	Up to 100

During the operational stage, vehicle access to the site will be maintenance vans and delivery trucks (3 x site staff light vehicle and 5 x miscellaneous courier deliveries per week) which would occur on an irregular basis. Therefore, traffic noise impacts during the operational stage of the project would be minimal and insignificant and will not be assessed further.

7.1 Road Traffic Noise Criteria

Based on functionality, Goolma Road is categorised as a sub-arterial road. For existing residences affected by additional traffic on existing sub-arterial roads generated by land use developments, the following RNP road traffic noise criteria apply.

Table 7.2 – RNP Road Traffic Noise Criteria, dB(A)

Road Category	Type of Project/Land Use	Assessment Criteria, dB(A)	
		Day 7am – 10pm	Night 10pm – 7am
Freeway/arterial/sub-arterial roads	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,(15\ hour)}$ 60 (external)	$L_{Aeq,(9\ hour)}$ 55 (external)

Further to the above, the RNP states the following for land use developments generating additional traffic:

> *"For existing residences and other sensitive land uses affected by **additional traffic on existing roads generated by land use development**, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'."*

7.2 Predicted Road Traffic Noise

Results of the road traffic noise predictions are presented in the table below. It is noted that the predicted noise levels represent the traffic noise contribution from the vehicle movements associated with the construction works and does not take into account existing traffic noise levels due to existing general traffic flows as existing traffic volumes along Goolma Road are unknown.

Table 7.3 – Predicted Road Traffic Noise Contribution Levels Along Public Roads, dB(A) $L_{Aeq(15\ Hour)}$

Receiver	Criteria	Traffic Movements	Speed (km/h)[1]	Distance to Road[2]	Predicted Noise Level	Exceed?
Residences on Goolma Road	$L_{Aeq,\ (15\ hour)}$ 60	As per Table 7.1	100	20m	55	No

Notes: 1. Based on posted speed limit
2. Based on closest distance from facade of dwelling to the road

From the above table, it can be seen that road traffic noise level contributions from the vehicle movements associated with the construction works are at least 5dB(A) below the applicable noise criterion based on dwellings being 20m from the road. Given that residences are located within a rural environment, distances between the road and the dwellings would likely be significantly greater than 20m.

Furthermore, as the predicted levels are 5dB(A) less than the traffic noise criterion, it is not expected that the traffic noise contribution from the construction vehicles would result in an exceedance of the traffic noise criterion and/or increase the existing traffic noise levels by more then 2dB.

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.

8 Conclusion

Renzo Tonin and Associates has completed an environmental noise and vibration assessment of the proposed Wellington Solar Farm. Impacts from the Modification have been included and assessed.

Noise emissions from the construction phase of the project were predicted to exceed the construction noise management levels at the nearest affected receivers. In-principle recommendations are provided in Section 4.5 to limit the potential impact of noise generated by construction activities to acceptable levels.

Noise emissions from the operational phase of the project were predicted to comply with the nominated criteria at the nearest affected receivers.

Given the large separation distance between the nearest affected receivers and the subject site, vibration impacts resulting in structural damage to buildings at the nearest affected receivers are determined to be negligible and there is low risk of adverse comments from occupants of dwellings due to construction vibration.

Road traffic noise impacts on residential properties along the access route were found to comply with the relevant RNP criteria.

APPENDIX A Glossary of Terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 110dB Operating a chainsaw or jackhammer 120dB Deafening
dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.

L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Long-Term Noise Monitoring Methodology

B.1 Noise Monitoring Equipment

A long-term unattended noise monitor consists of a sound level meter housed inside a weather resistant enclosure. Noise levels are monitored continuously with statistical data stored in memory for every 15-minute period.

Long term noise monitoring was conducted using the following instrumentation:

Description	Type	Octave Band Data	Logger Location(s)
RTA04 (CESVA SC310)	Type 1	1/1	L1

Notes: All meters comply with AS IEC 61672.1 2004 "Electroacoustics - Sound Level Meters" and designated either Type 1 or Type 2 as per table, and are suitable for field use.

The equipment was calibrated prior and subsequent to the measurement period using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed.

B.2 Meteorology During Monitoring

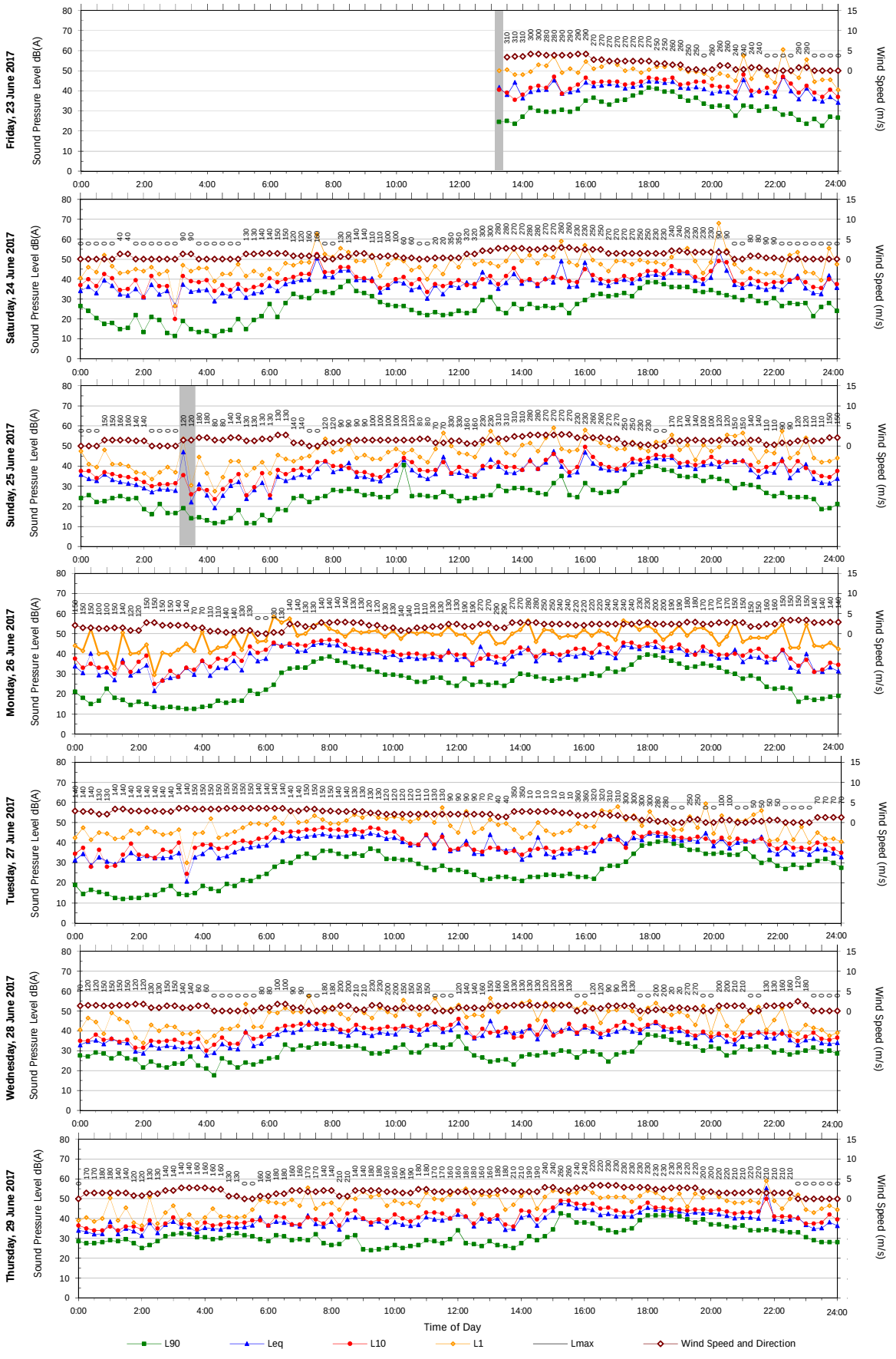
Measurements affected by extraneous noise, wind (greater than 5m/s) or rain were excluded from the recorded data in accordance with the NSW INP. Determination of extraneous meteorological conditions was based on data provided by the Bureau of Meteorology (BOM), for a location considered representative of the noise monitoring location(s). However, the data was adjusted to account for the height difference between the BOM weather station, where wind speed and direction is recorded at a height of 10m above ground level, and the microphone location, which is typically 1.5m above ground level (and less than 3m). The correction factor applied to the data is based on Table C.1 of ISO 4354:2009 '*Wind actions on structures*'.

B.3 Noise vs Time Graphs

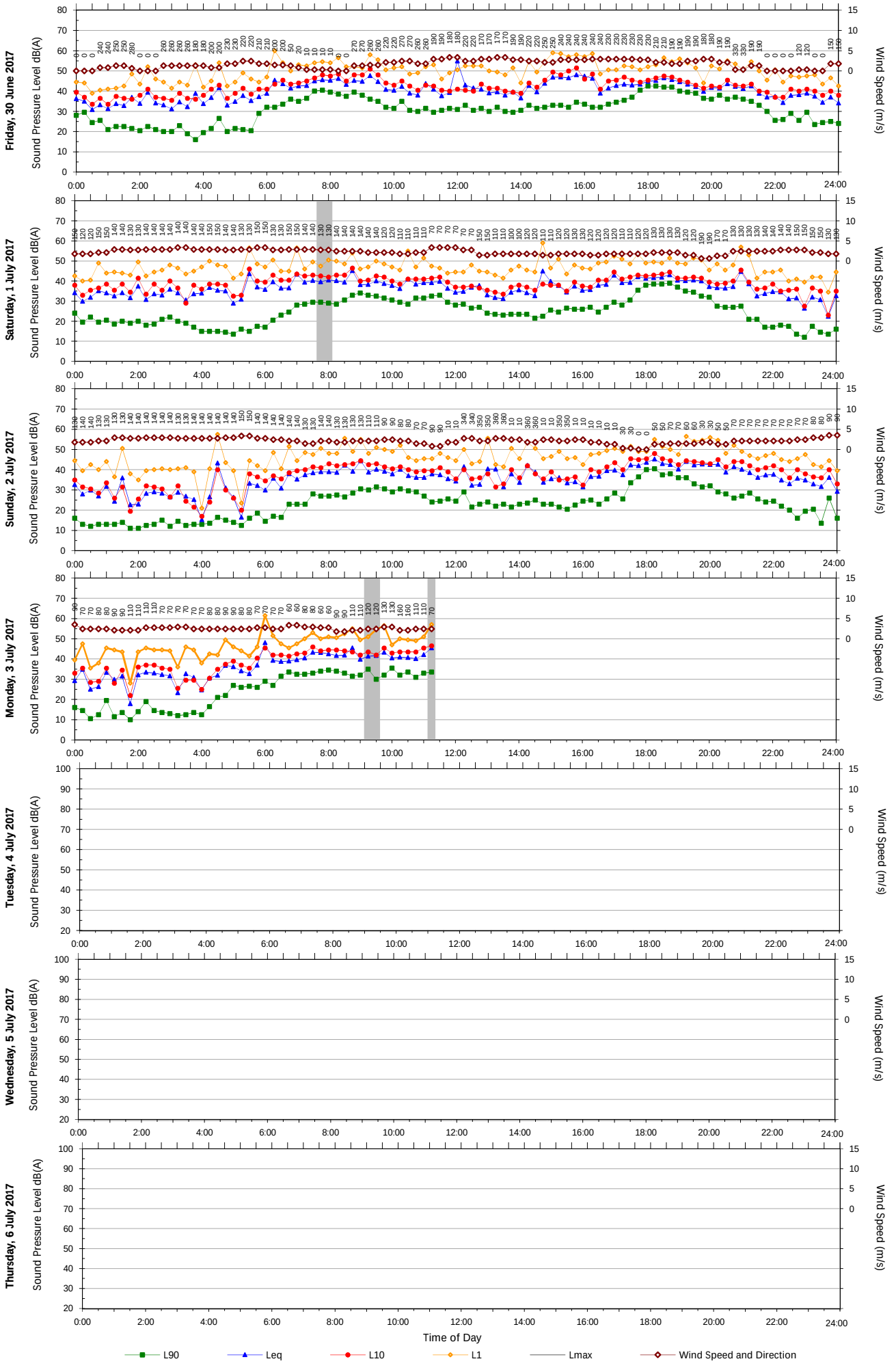
Noise almost always varies with time. Noise environments can be described using various descriptors to show how a noise ranges about a level. In this report, noise values measured or referred to include the L_{10}, L_{90}, and L_{eq} levels. The statistical descriptors L_{10} and L_{90} measure the noise level exceeded for 10% and 90% of the sample measurement time. The L_{eq} level is the equivalent continuous noise level or the level averaged on an equal energy basis. Measurement sample periods are usually ten to fifteen minutes. The Noise -vs- Time graphs representing measured noise levels, as presented in this report, illustrate these concepts for the broadband dB(A) results.

APPENDIX C Long Term Noise Monitoring Results

Unattended Monitoring Results **Location: 104 Cobbora Road, Maryvale**



Unattended Monitoring Results **Location: 104 Cobbora Road, Maryvale**



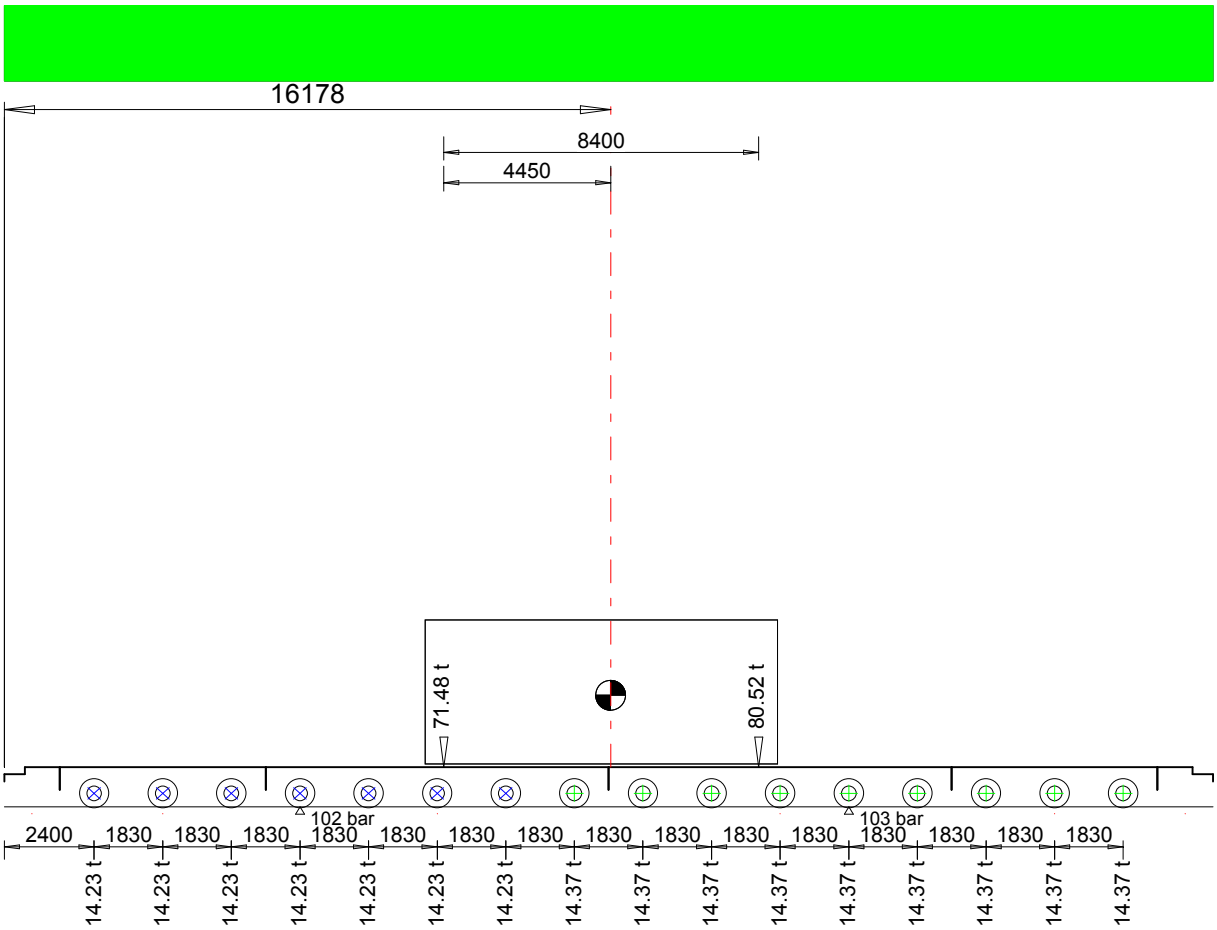
D.4 GE TRANSFORMER LAYOUT PLANS

Load Case

Calculation of fifth-wheel- and axle loads and examination of the steel-structure on even and horizontal road.

GE Grid Solutions - Transgrid 280MVA

Payload = 152.0 t at 60 km/h



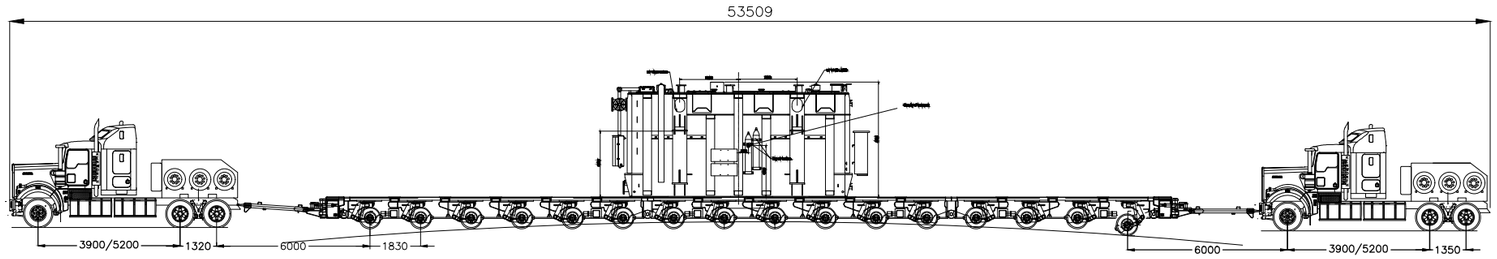
Vehicle composed of: (dead weight approx. 76940 kg)

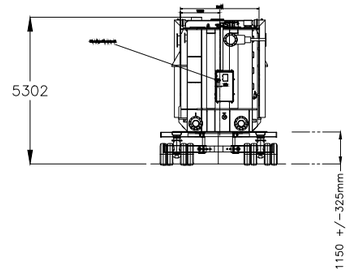
TD 2300 W Inverse (199Y4854) | MW 3 183 - 4200 | MW 5 183 - 4200 | MW 5 183 - 4200 | MW 3 183 - 4200 | TD 2300 W (199Y4856)

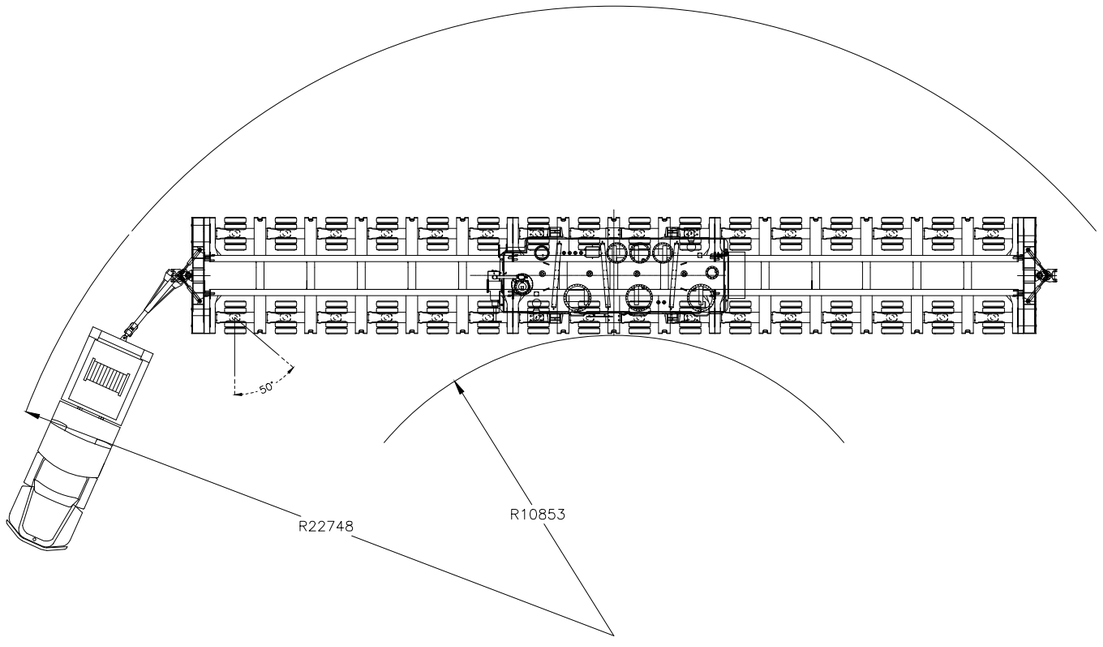
⊗ ⊕ Identical marking of the axles represents hydr. mech. or pneum. connection of the axles in LONGITUDINAL direction

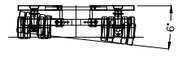
The speed limits are the theoretical allowed maximum speeds only depending on axle loads. For Salsa calculations it is assumed, that the center of gravity of the loading is located on the longitudinal axis of the vehicle. The effects of dynamic and exterior forces, acting on each transport, are not investigated. The operating manual of the vehicle units as well as the currently valid 'information on transport investigations' mandatory have to be observed.

DRG No.	REV
	0









No.	DRG. No.	REFERENCE DRAWINGS	DATE	No.	REVISION	DES BY	DRN BY	CHK BY	APP BY

DATE: 22 OCT 2018

CUSTOMER: ODLS

DRAWN BY: DAVID VERRALL

CHECKED BY:

APPROVED BY: ANTHONY MAY

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Web: www.odliftandshift.com.au

TITLE: GE TRANSFORMER LAYOUT
16 LINE 4.2mW

SIZE	PROJECT	DRG No.	REV
A 4			0

SCALE	SHEET
NTS	1 OF 1