

Modification Application

WELLINGTON SOLAR FARM SUBSTATION EXPANSION



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ACRONYMS AND ABBREVIATIONS

ACHA	Aboriginal Cultural Heritage Assessment
BAR	Biodiversity Assessment Report
BC Act	<i>Biodiversity Conservation Act 2016</i>
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	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwth)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (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 (<i>c.f.</i>)
NSW	New South Wales
OEH	(NSW) Office of Environment and Heritage
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:

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

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

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 Risk	Lower Risk
<ul style="list-style-type: none">• Biodiversity• Aboriginal heritage• Visual amenity• Noise• Historic heritage	<ul style="list-style-type: none">• 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 requires an alteration to the approved substation works. The substation expansion requires underground cables to be installed west of the approved alignment and a small expansion to the substation infrastructure. The entire easement area covers 1.70 hectares. This substation expansion will impact the following native vegetation plant communities:

- a) 0.053 hectares of planted White Box grassy woodland in moderate to good condition (Zone 2);
- b) 0.65 White Box grassy woodland derived grassland in moderate to good condition (Zone 5)
- c) 1.00 hectares of White Box grassy woodland derived grassland in low condition (Zone 6).

All works would occur within the 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 RAPS(Appendix 8D.1).
- Updating the Biodiversity Assessment Report (NGH Environmental 2017) to include the native vegetation impacted by the substation expansion which was not approved as part of the development consent in May 2018. This BAR update was completed by NGH Environmental in 2019 (Appendix D.2).
- An update of the noise and vibration assessment Renzo Tonin (2019) (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:

- 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 cable¹ 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

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

- 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 8,590 m² (0.85 ha) of ground disturbance. The proposed substation expansion easement covers 17,073m² (1.70 ha). The substation expansion includes:

- Approved alignment of the overhead transmission line to the existing substation under the consented layout (NGH Environmental 2018) 230m x 25 m = 5,720m² (0.57 ha)
- Proposed substation bench - 110m x 25m = 2,750m² (0.27 ha)
- Remaining easement – 8,483 m² (0.84 ha)

Notes:

- The new transmission line length is 340m in total but 230m of the old overhead transmission line will now not be required hence, the additional impact is 110m in length.
- The easement width of 25 metres is used in this assessment as a worst-case scenario, as the location of the cable trench has not been determined at this point.
- All works remain within the consented project boundary.

The proposed substation expansion easement in Figure 2.2.

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

Once operational, additional noise may result from the equipment listed above. No other operational impacts are anticipated.

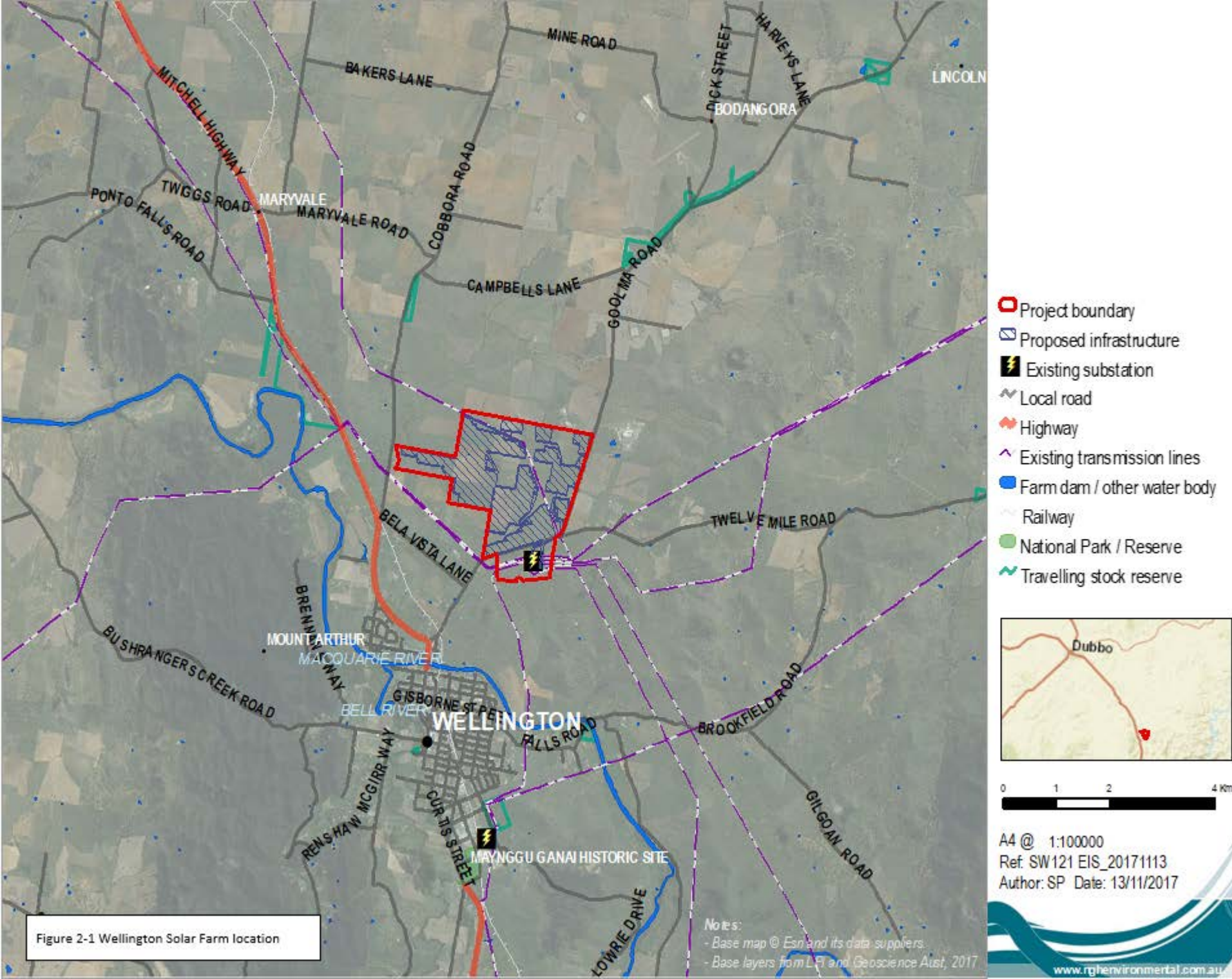
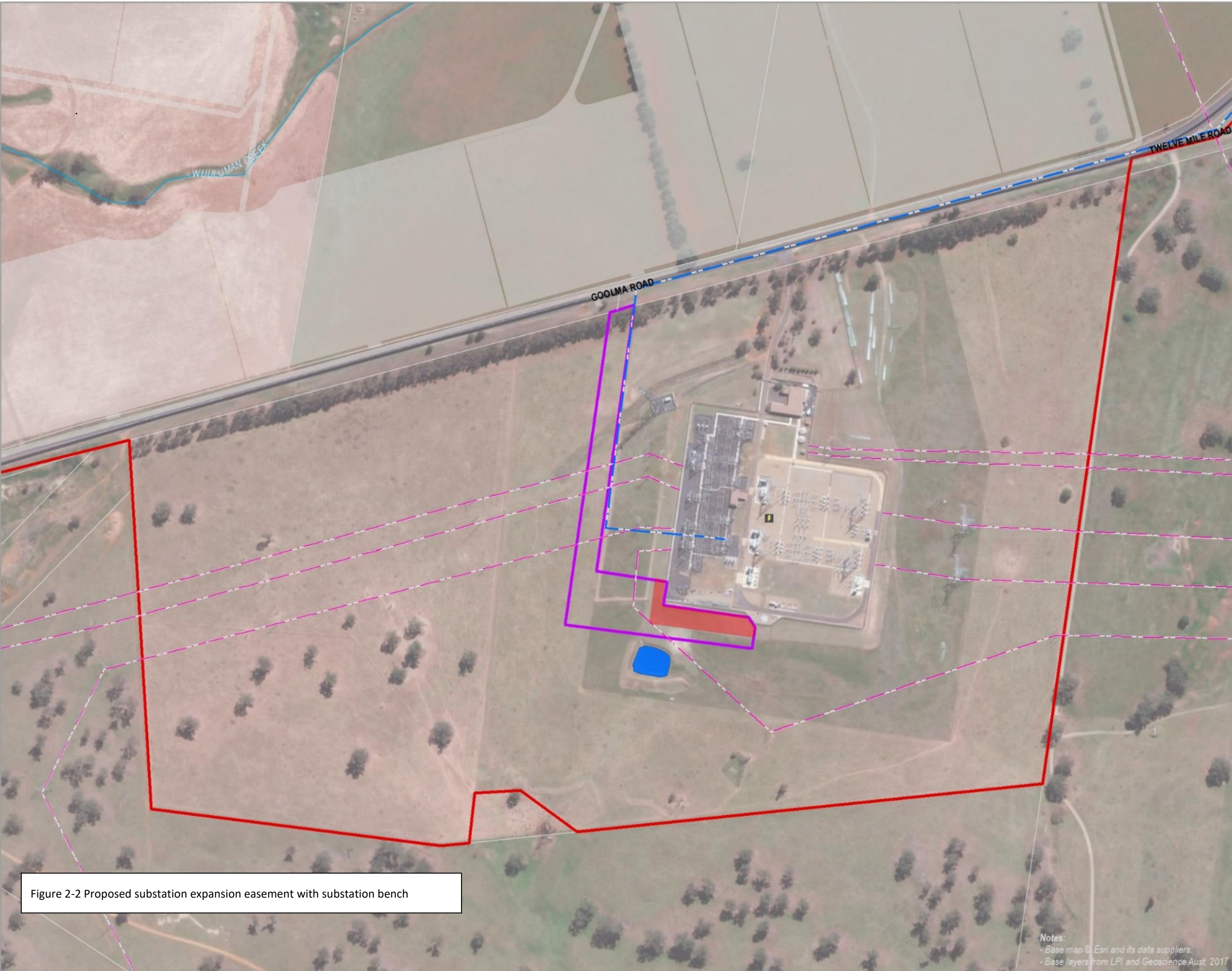


Figure 2-1 Wellington Solar Farm location



- Project boundary
- Existing substation
- Local road
- Existing transmission lines
- Farm dam / other water body
- Drainage line
- Approved infrastructure
- Approved transmission line
- Proposed substation expansion easement
- Proposed substation bench



0 25 50 100 m

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Author: SP Date: 1/08/2019



Figure 2-2 Proposed substation expansion easement with substation bench

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

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.

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 submitted the Biobanking calculation for this modification application to Office of Environment and Heritage (OEH) August 9, 2019.

4.4 REGISTERED ABORIGINAL STAKEHOLDERS (RAPs)

A letter of notification to RAPs has been prepared as part of this modification application and will be submitted prior to this Modification Application. It is provided in Appendix D.1.

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.
 - Additional 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 Approach and assessment context

The Biodiversity Assessment Report (BAR) for the Wellington Solar Farm was prepared by NGH Environmental on behalf of First Solar in November 2017 and submitted with the EIS. The credit calculations were updated in the Submissions Report (NGH Environmental 2018) to reflect minor changes to the layout however, no update to the BAR was undertaken at that time.

An updated (BAR) (NGH Environmental 2019) is now included in Appendix D.2 of this modification application, to ensure that all additional impacts of the modification are properly considered. As all areas impacted by the modification had been surveyed for the BAR previously, no additional site investigations were required. The updated BAR is summarised below. This updated BAR now provides the project's updated offset requirements, in consideration of the modified layout.

6.2.2 Modification assessment

The objectives from the biodiversity assessment undertaken in 2017 remain applicable to this modification application for Wellington Solar Farm. The objectives for the 2017 BAR were:

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

The updated BAR follows the BAR format required by the FBA. Specifically, the assessment used the site-based landscape assessment methodology, in accordance with Appendix D.2 of the FBA for major projects.

Vegetation communities identified on site in 2017

Two Plant Community Types (PCT) were identified within the development in the 2017 vegetation surveys. These vegetation communities were:

1. White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes (PCT 266).
2. Blakely's Red Gum – Yellow Box grassy tall woodland (PCT 277).

These PCTs are 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 changes proposed in this Modification Application impact the following vegetation zones and PCTs:

- 0.05 hectares of planted White Box grassy woodland in moderate to good condition (Zone 2; PCT 266),
- 0.65 White Box grassy woodland derived grassland in moderate to good condition (Zone 5; PCT 266)
- 1.00 hectares of White Box grassy woodland derived grassland in low condition (Zone 6; PCT 266).

This includes 0.70 ha within the Development Exclusion zone, identified because it is a significant NSW Threatened Ecological Community in moderate to good condition.

The EPBC listed threatened ecological community found on site was White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland. This derived grassland is located in the centre of the solar farm development and would not be impacted by the consented layout or this modification; none of the vegetation zones within the substation expansion qualify as a listed EPBC ecological community.

No hollow bearing trees or mature trees would be impacted. No habitat would be affected for any candidate species. No additional ongoing operational impacts are anticipated.

Given this is the third update to the offset calculations for this project, Table 6.1 clearly sets out the impacted areas (in hectares) as follows:

- The first BAR included in the EIS in 2017:
- The Submissions Report (2018)
- The Modification Application in 2019
- The final column shows the net difference between 2018 and 2019 which is the used for the Biodiversity Credit Calculator (BCC) in 2019.

Table 6.1 Changed impact areas; EIS (2017), Submissions Report (2018) and Modification Application (2019).

Zone ID	Vegetation zones	Condition class	Total impact areas			Net difference between consented and modified layout
			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	0.27
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	0.05	0.05
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	1.88
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	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	0.65	0.67
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	1.00	126.75
Total Difference (ha)			144.23	134.40	1.70	129.63

Considering the changes to the vegetation impacts, it is noted that:

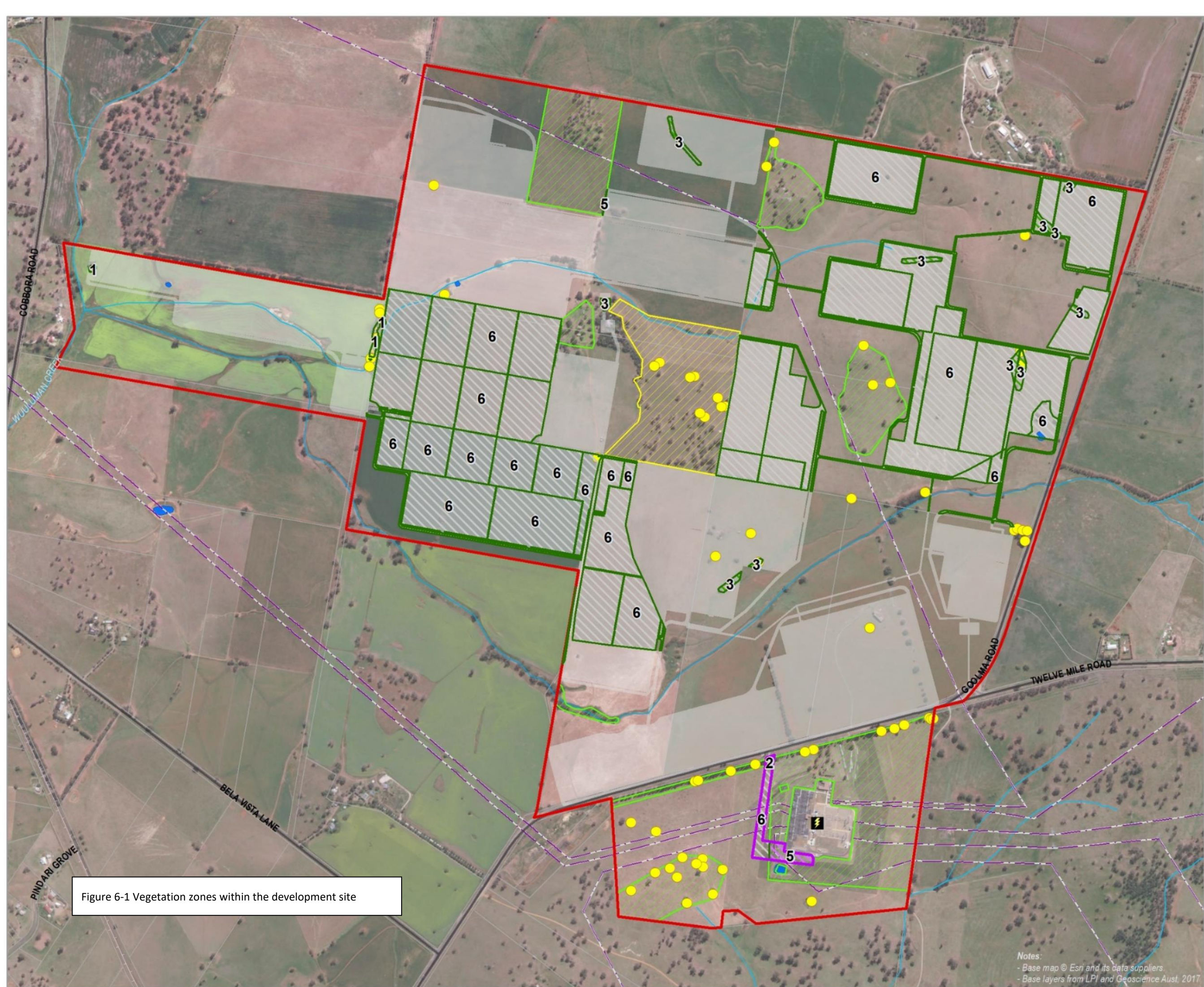
- From the 2018 Submissions Report - a reduction in the vegetation impact zones to avoid a Critically Endangered Ecological Community (CEEC). The overall reduction on this community (which is now entirely avoided) is 2.07 ha. The reduction on native vegetation impacts from the updated footprint was 9.83 ha.
- A reduction of 6.46 hectares in the vegetation impact zones since the EIS (NGH Environmental 2017) where the development footprint was outside of the project boundary. This error is corrected in the 2019 update.
- An increase of 1.70 hectares in 2019 for the vegetation impact zones to expand the substation.

Ecosystem credits

The vegetation community type, quality and hectare size are entered in to the BioBanking Credit Calculator (BCC) to determine the project's offset requirements (made up of ecosystem and species credits). The ecosystem credits now generated for the project, in consideration of modifications, are shown below.

Table 6.2 Ecosystem Credits Wellington Solar Farm.

Plant Community type	Area (ha)	Ecosystem credits generated
Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	0.27	0.00
White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	129.36	16.60
Total	129.63	17



- Project boundary
- Hollow bearing tree
- Substation
- Local road
- Existing transmission lines
- Farm dam / other water body
- Minor drainage feature
- Drainage line
- Railway
- Cadastre
- Box Gum Woodland CEEC - EPBC
- Box Gum Woodland EEC - NSW TSC Act
- Proposed vegetation**
 - Zone 1: PCT 277 (Low)
 - Zone 2: PCT 266 (Moderate to good condition)
 - Zone 3: PCT 266 (Low)
 - Zone 5: PCT 266 (Moderate to good condition)
 - Zone 6: PCT 266 (Low)
- Approved infrastructure
- Proposed substation expansion easement

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Author: SP Date: 1/08/2019

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

Figure 6-1 Vegetation zones within the development site

- Project boundary
- Hollow bearing tree
- Existing substation
- Local road
- Existing transmission lines
- Farm dam / other water body
- Drainage line
- Box Gum Woodland EEC - NSW TSC
- Proposed native vegetation impacts**
 - Zone 2: PCT 266 (Moderate to good condition)
 - Zone 5: PCT 266 (Moderate to good)
 - Zone 6: PCT 266 (Low condition)
- Approved infrastructure
- Approved transmission line
- Proposed substation expansion easement
- Proposed substation bench



0 25 50 100 m

A3 @ 1:4,000
Ref: SW121 EIS v20190801
Author: SP Date: 1/08/2019

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

Figure 6-2 Vegetation Zones within the easement for the substation expansion

Species credits

Targeted flora and fauna field surveys were undertaken in May and October (Spring) 2017. Targeted Flora surveys were conducted for (Ausfeld's Wattle, Scant Pomaderris, Silky Swainson-Pea, Small Purple Pea, *Tylophora linearis*, *Euphrasia arguta*, *Prasophyllum* sp. Wybong). The survey results found Blue Grass, Ausfeld's Wattle, *Euphrasia arguta*, *Narrow Goodenia Goodenia macbarronii*, *Prasophyllum* sp. Wybong, Scant Pomaderris, Silky Swainson-Pea, Small Purple Pea and *Tylophora linearis* were all absent.

Fauna surveys included diurnal bird surveys, nocturnal bird survey, koala searches, anabat surveys and nocturnal spotlighting for mammals. The fauna surveys also included assessing potential habitat such as hollow bearing trees, waterbodies, vegetation structure, incidental sightings or any other habitat types. The fauna survey found the following species were absent Booroolong frog *Litoria booroolongensis*, Brush-tailed Phascogale *Phascogale tapoatafa*, Eastern Pygmy Possum *Cercartetus nanus*, Koala *Phascolarctos cinereus* and Squirrel Glider *Petaurus norfolcensis*. The Regent Honeyeater *Anthochaera Phrygia* was presumed present but did not generate an offset requirement.

As with the 2017 and 2018 updates to the project's offset requirements, no species credits were generated.

EPBC Matters of National Environmental Significance (MNES)

The MNES search shows there was eight threatened flora and nine threatened birds, six mammals, two reptiles and four fish were returned from the protected matters report. Of these 30 species, six species were considered to have the potential to utilise the habitats within the development site:

- 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
- Small Purple Pea (*Swainsona recta*) – Endangered EPBC Act.

The only change in the MNES search between 2017 and 2019 was the addition of the Greater Glider; no habitat for this species is present in the additional impact areas.

The threatened ecological community found on site was White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland. This derived grassland covers 9ha and occurs on the hill slope in the centre of the development. With more than 12 native forb species and important species are present in the understory, this patch meets the condition threshold for listing under the EPBC Act.

6.2.3 Recommendations

All mitigation measures and safeguards mentioned in the Submissions Report (NGH Environmental 2018) and the Biodiversity Management Plan (NGH Environmental 2019) are considered sufficient.

The 17 ecosystem credits generated in the 2019 updated Biodiversity Assessment Report include the solar farm development footprint and the substation expansion. The substation footprint of 1.70 ha extends into the Development Exclusion Zone. This change has been assessed as non-significant and will be offset, in accordance with the Biodiversity Offset Scheme (BOS).

The biodiversity mitigation measure that will be updated is:

- **If the credit profile of the final infrastructure layout cannot be reduced to zero; retirement of the biodiversity credits from the biodiversity register established under Part 7A of the TSC Act would need to be undertaken.**

Retiring these biodiversity credits does not change Condition 10 of the Development Consent.

The consented mitigation strategies for Wellington Solar Farm do need updating for the proposed substation expansion but rather applied equally. The only change required for these measures is updating the Consented Layout to include the proposed substation expansion. The following mitigation measures are considered relevant to the proposed substation expansion. The key measures include:

- The Biodiversity Management Plan (BMP) that would 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

Other considerations for protection of vegetation to be retained are:

- Avoid stockpiling materials and equipment and parking vehicles within the dripline (extent of foliage cover) of any native tree.
- Prior to the commencement of work, a physical vegetation clearing boundary at 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.
- Weed, hygiene and pest management protocols will be prepared and implemented as part of the Flora and Fauna Management Plan for the proposal.

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.

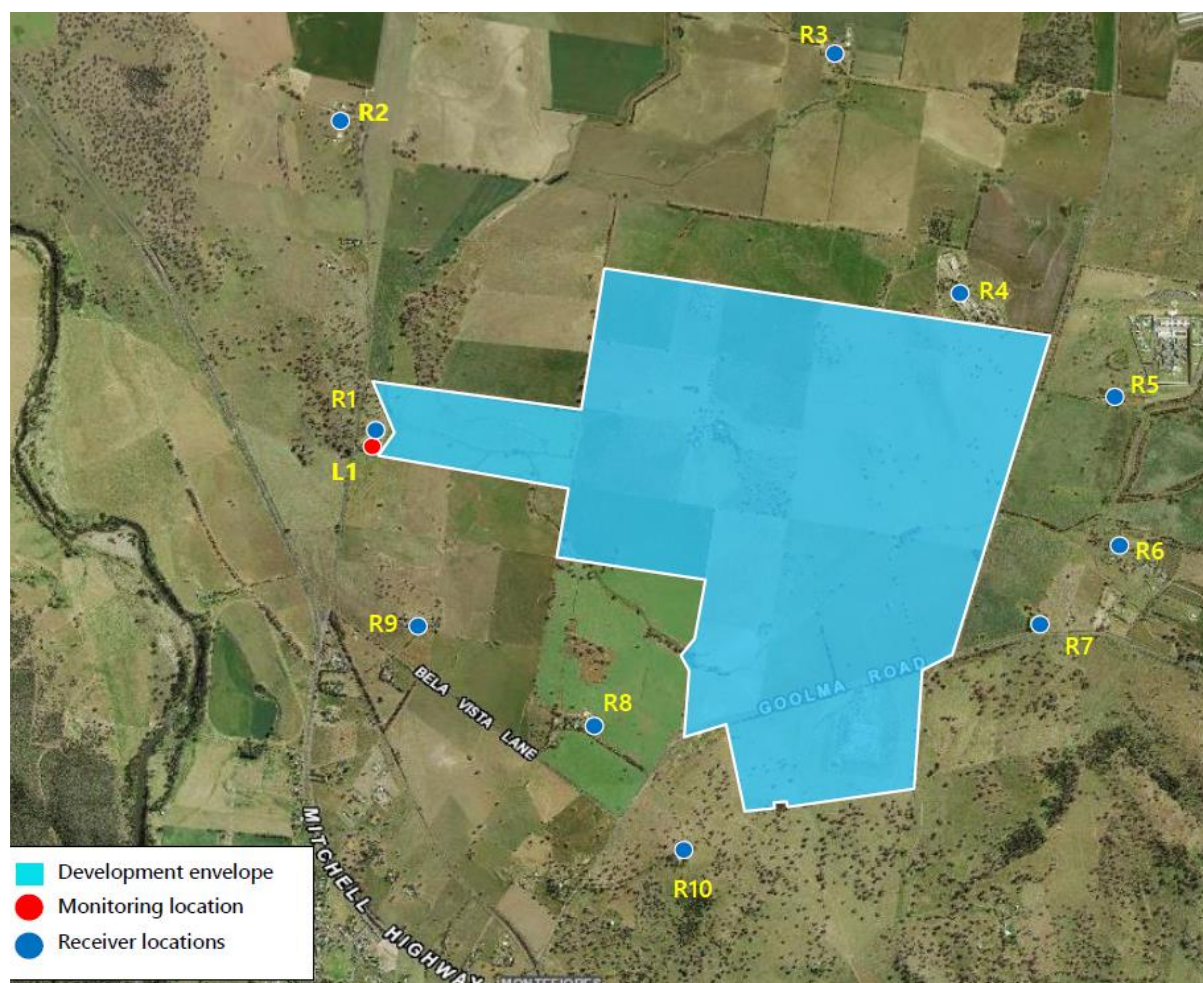


Figure 6-3 Residential receivers and noise monitoring locations (Renzo Tonin, 2017).

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 6.1 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 320m², 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 so 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.

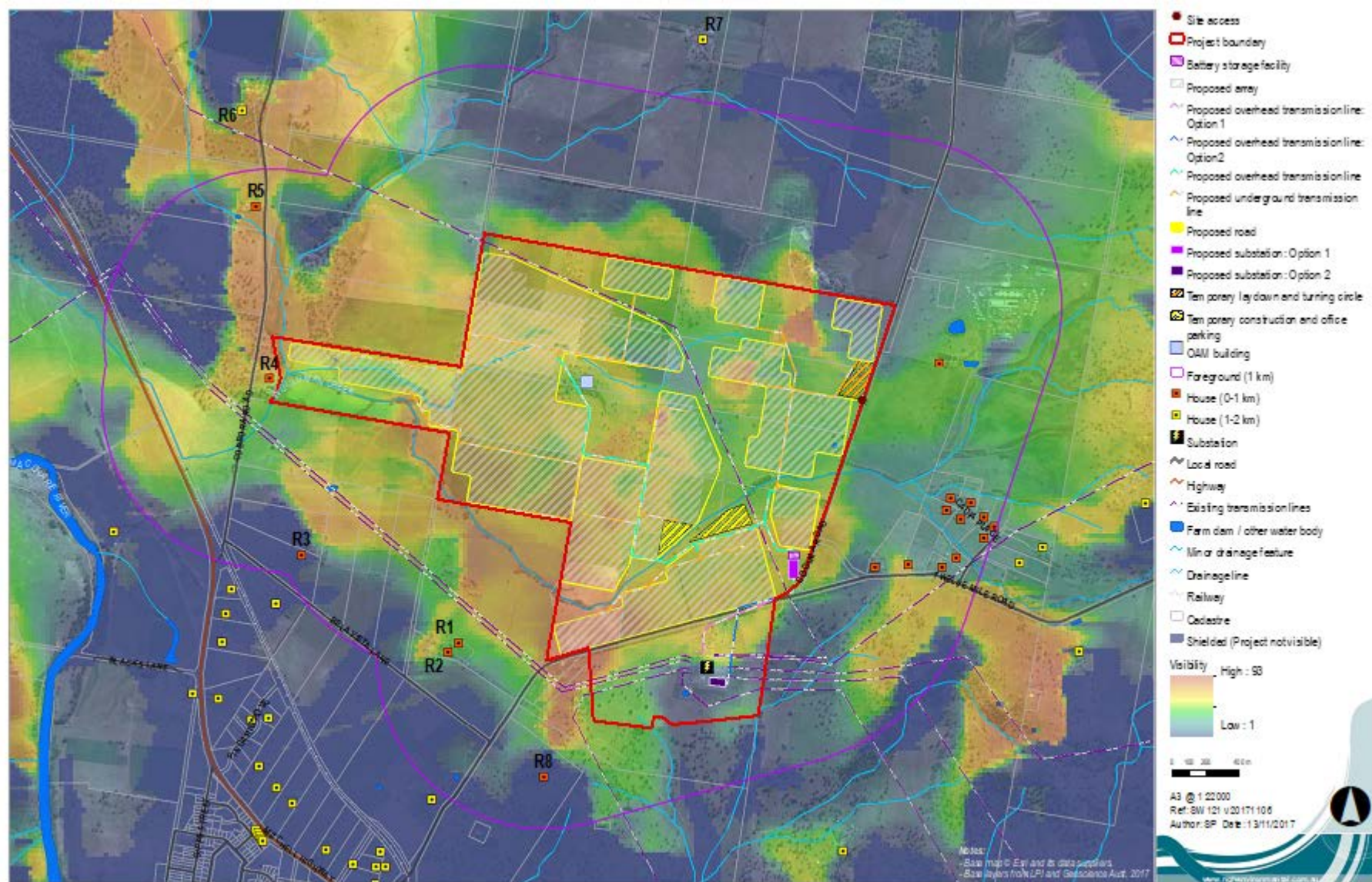


Figure 6-4 Foreground Zone of Visual Influence (ZVI; 1 km)

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.
- One over-dimensional vehicle movement for each transformer

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 substation expansion for this modification will increase the number of vehicles entering the site when delivering equipment for construction. The following heavy vehicles will be required during the construction:

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

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.

Generally, the provisions for Transport (Schedule 3) in the Development Consent will not change with the substation expansion. The addition of over-dimensional vehicles for the delivery of transformers will need to be included in an updated Traffic Management Plan (TMP).

Access for the substation expansion will use the approved Goolma Road entrance. The only exception will be the delivery of a transformer for the substation expansion. Delivery of this transformer requires the use of an over-dimensional vehicle. The current access to the substation is adequate to accommodate the over-dimensional vehicle but this addition has not been included in the current Traffic Management Plan (TMP). The TMP will need to be updated to include this addition. Transformers will be delivered using over-dimensional vehicles for the Solar Farm. These vehicles will use the approved Goolma Road access.

6.5.3 Recommendations

The traffic management plan will need to be updated to include over-dimensional vehicles for the substation and the Solar Farm.

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 is 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 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 BAR (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 be underground cabling 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. The Woodland is in moderate to good condition.

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 August 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 powerlines from Goolma Road to connect to the substation. The proposed substation expansion requires an easement to install underground cabling 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 change for the biodiversity is removal of a small patch of vegetation that has been assessed as non-significant and will be offset, in accordance with the Biodiversity Offset Scheme (BOS). The biodiversity impact will be

1. 0.05 hectares of planted White Box grassy woodland in moderate to good condition
2. 0.65 White Box grassy woodland derived grassland in moderate to good condition
3. 1.00 hectares of White Box grassy woodland derived grassland in low condition.

From the impacted area above, 0.70 hectares in the development exclusion zone is a NSW listed vegetation community in moderate to good condition.

The ecosystem credits for the Solar Farm development footprint and the proposed substation expansion is 17.

The additional aboriginal heritage recommendation includes notifying the Registered Aboriginal Parties about the proposed modification prior to the lodgement of this modification application.

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 Assessment Report was submitted to on August 9, 2019. The updated assessment includes the vegetation impacts from the solar farm development footprint and the 1.70 hectares of vegetation required for removal for the substation expansion.

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

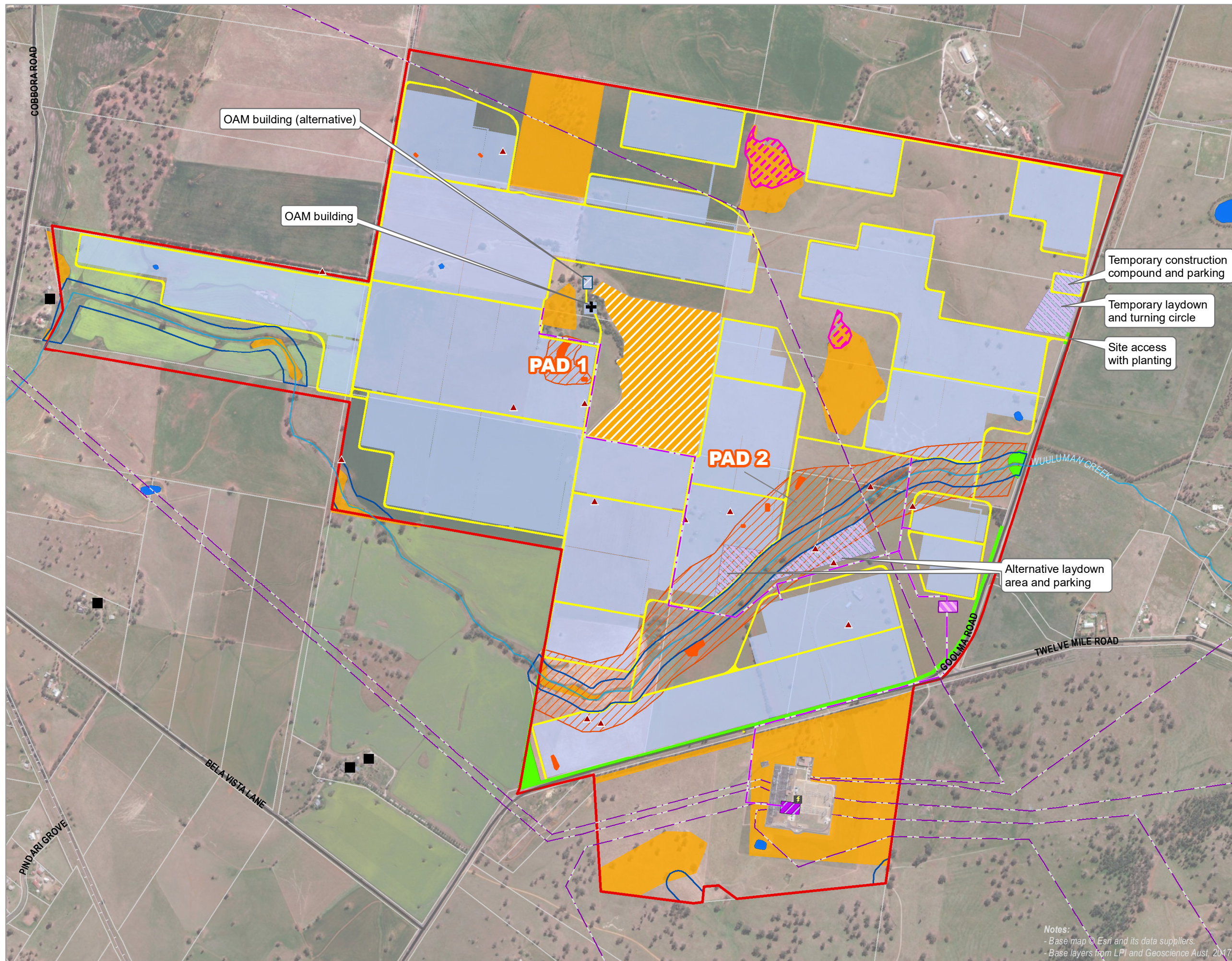
The Development Consent conditions will not need to be altered but following plans will need to be updated to include the substation expansion footprint. The plans are:

1. Appendix 1 of the Development Consent will need to be updated to show the modified layout
2. The Biodiversity Management Plan will need to be updated to show the modified layout
3. The Cultural Heritage Management Plan will need to be updated to include the modified layout.
4. 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

- 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.
- NGH Environmental, 2019, *Biodiversity Management Plan, Wellington Solar Farm*. Report prepared for Lightsource BP in April 2019.
- NGH Environmental, 2019, *Modification Application, Wellington Solar Farm*. Report prepared for Lightsource BP in April 2019.
- 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



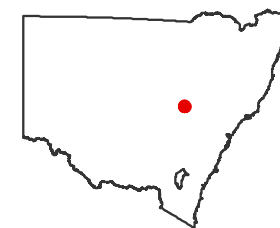
CONSTRAINTS

Wellington Solar Farm

- Existing substation
- Local road
- Existing transmission lines
- Drainage line
- Farm dam / other water body
- Project boundary
- Proposed overhead transmission line
- Proposed substation
- Proposed road
- Battery storage facility
- Proposed infrastructure

Constraints

- Aboriginal heritage item (isolated find)
- Aboriginal heritage item (artefact scatter)
- Potential archaeological deposit (PAD)
- Sensitive receiver
- Historic heritage site (OAM building)
- Drainage line (40m)
- Proposed landscaping (5m wide planting)
- Proposed landscaping grove
- Potential rocky outcrops
- Vegetation constraint (CEEC)
- Vegetation constraint (EEC moderate to good condition)



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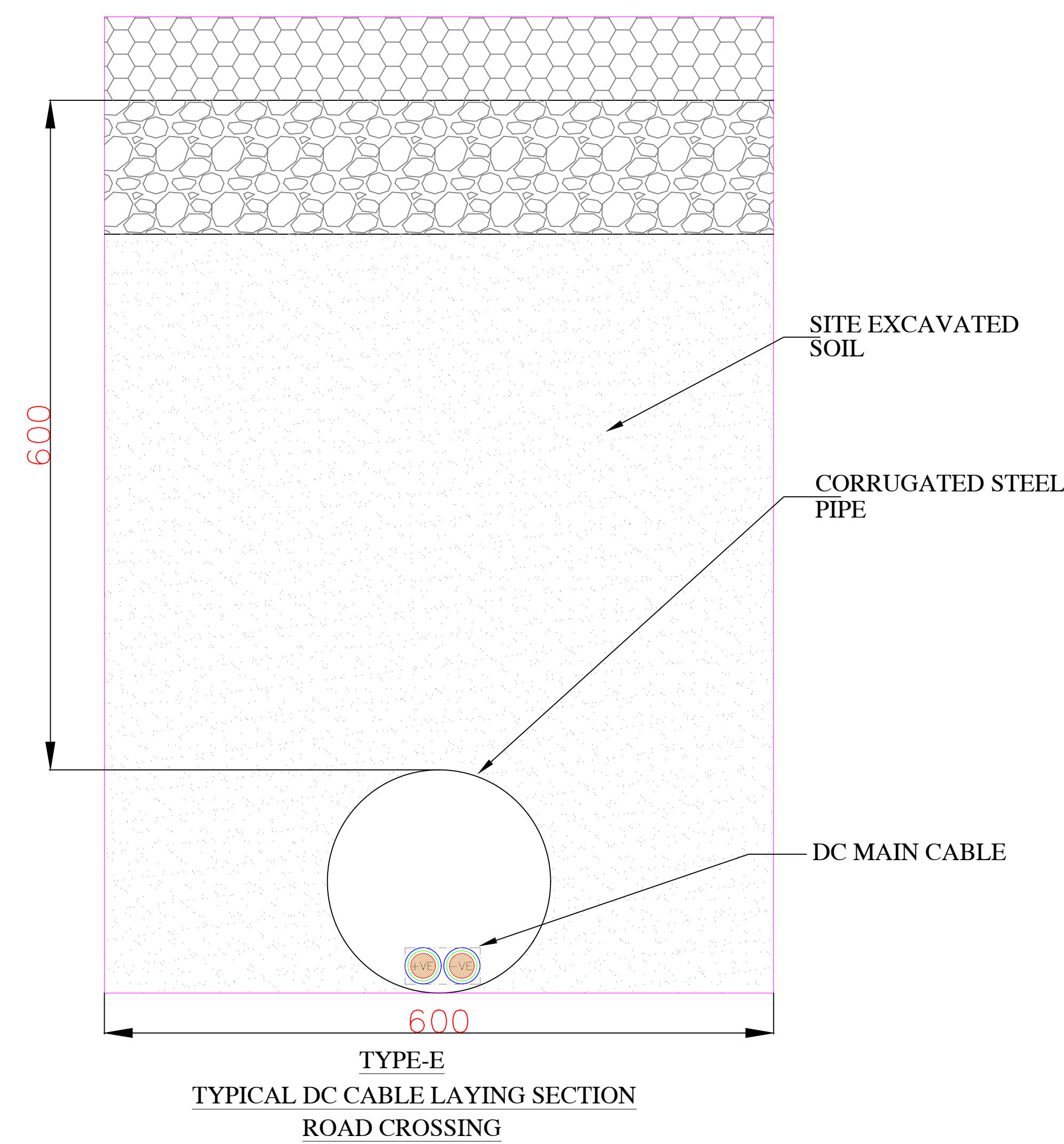
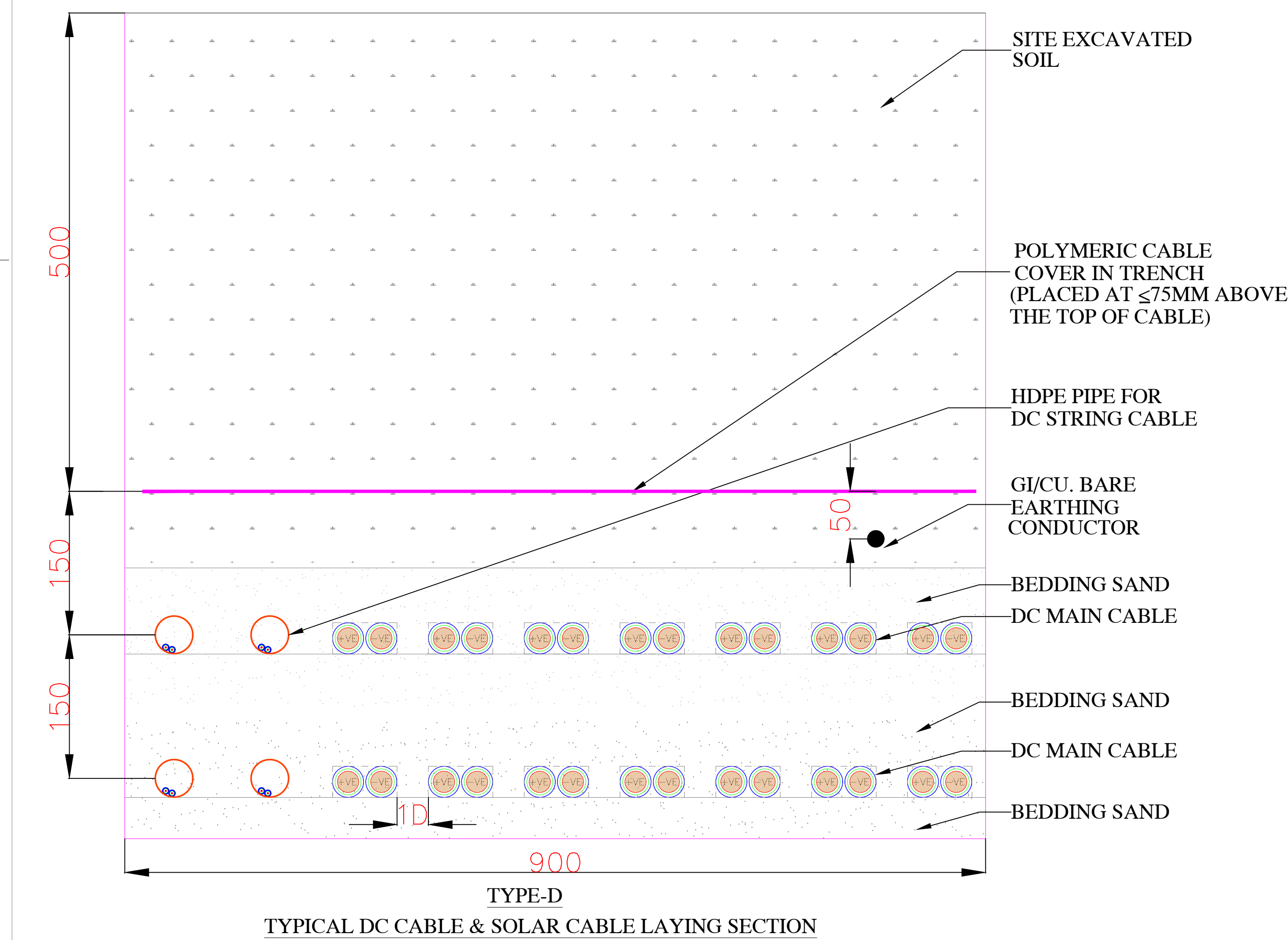
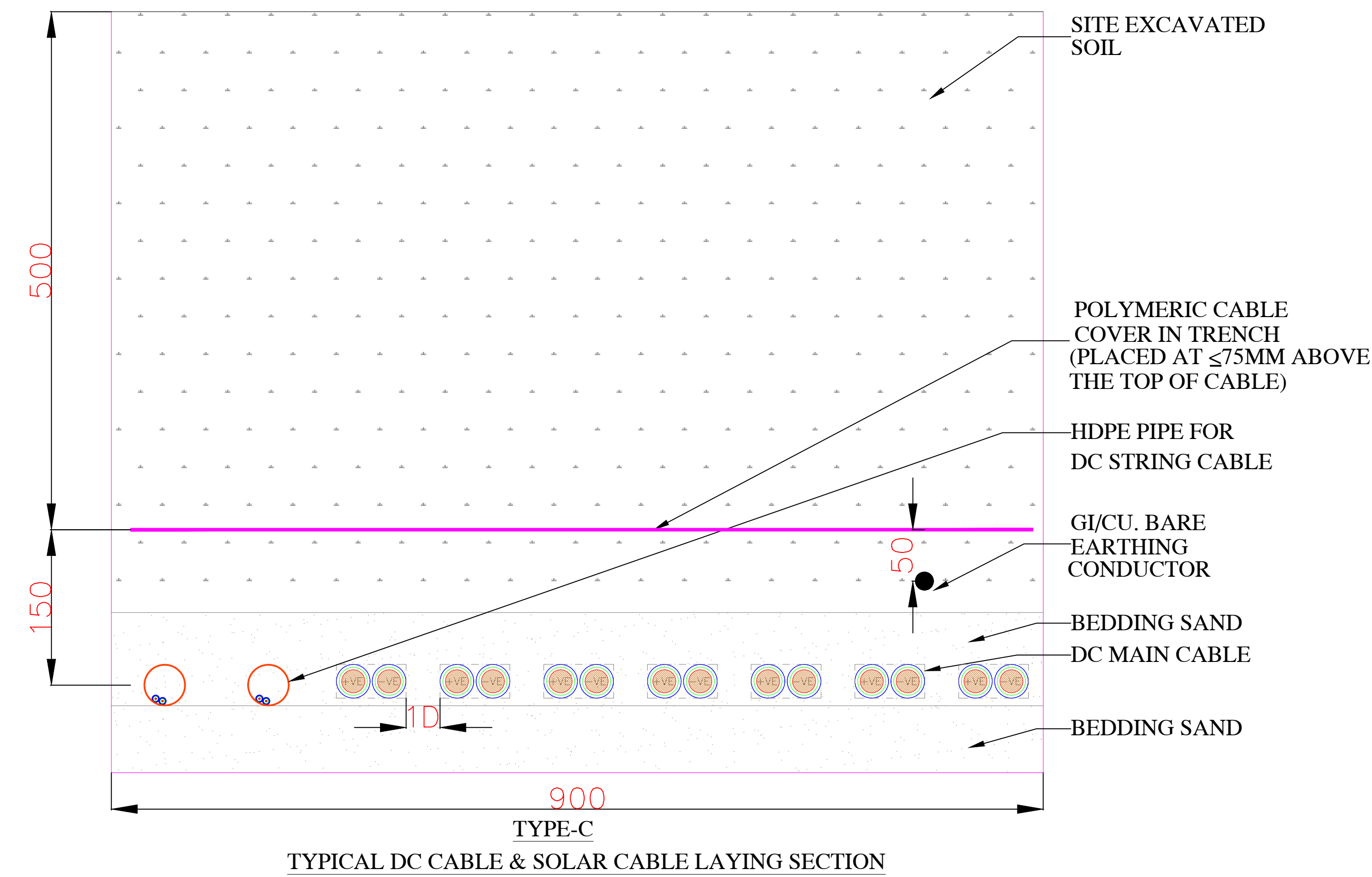
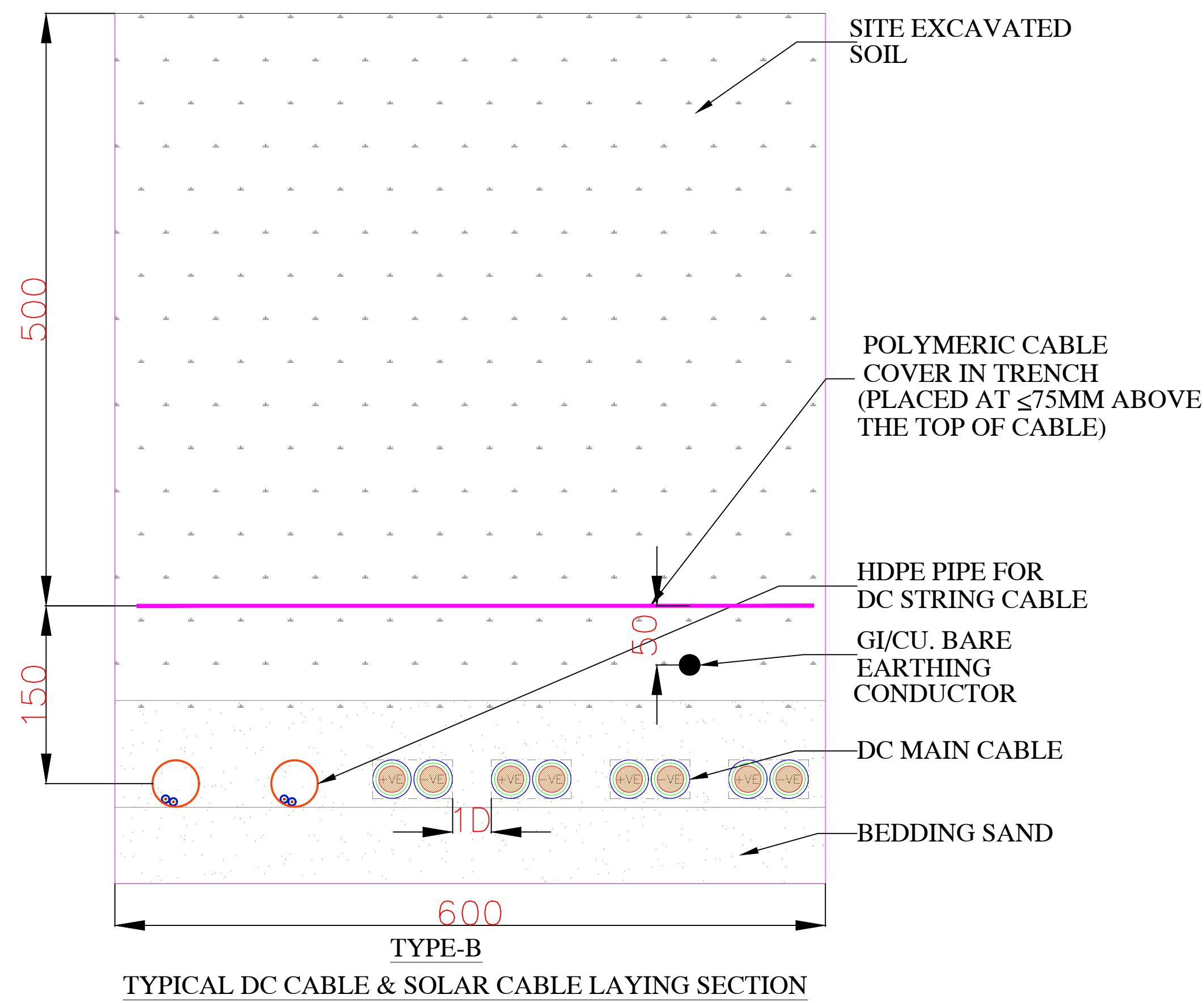
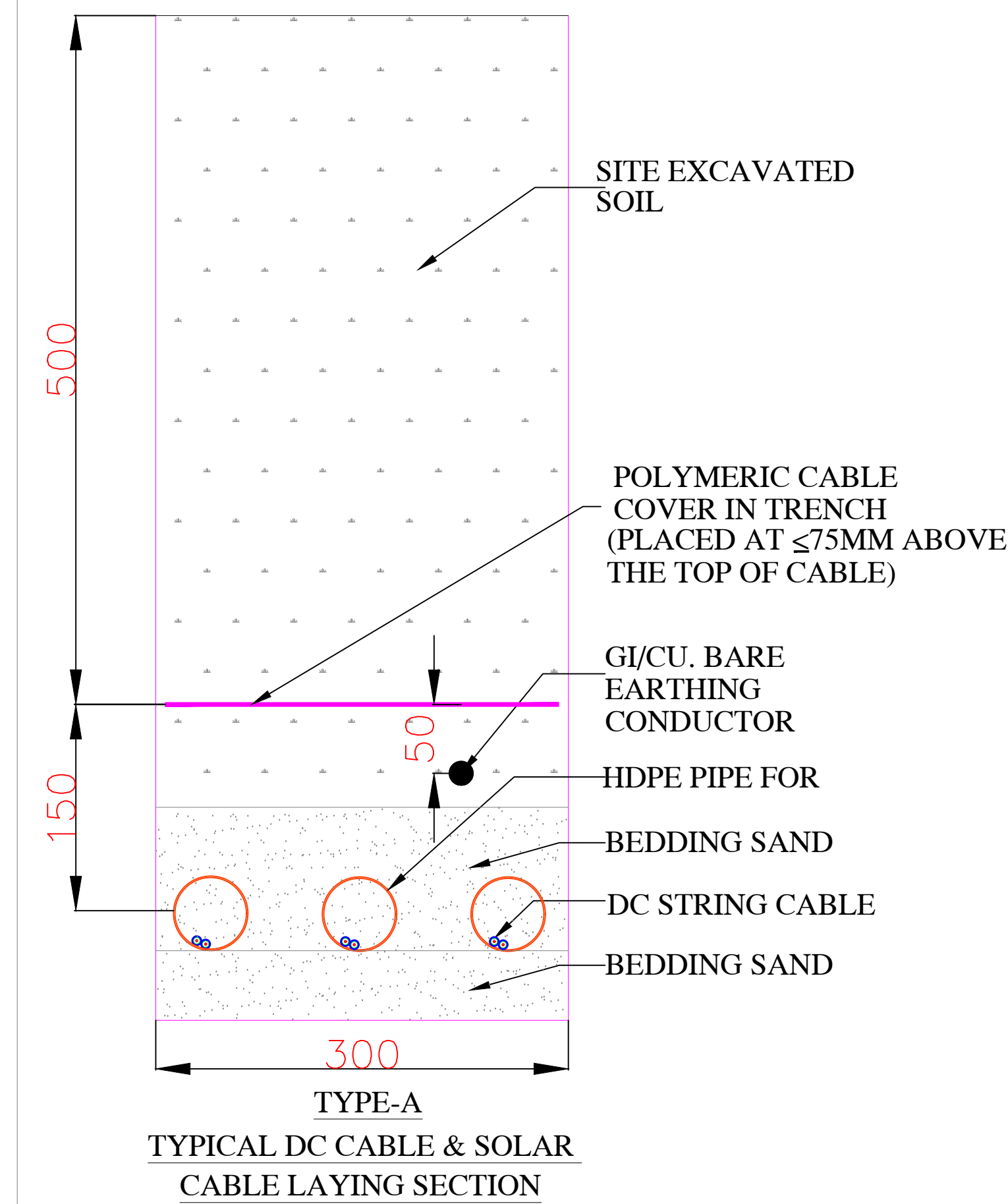
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Ref: SW121 EIS v20180329A3
Author: SP Date: 3/04/2018

Notes:
- Base map © Esri and its data suppliers.
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APPENDIX B SUBSTATION EXPANSION DESIGN DRAWINGS

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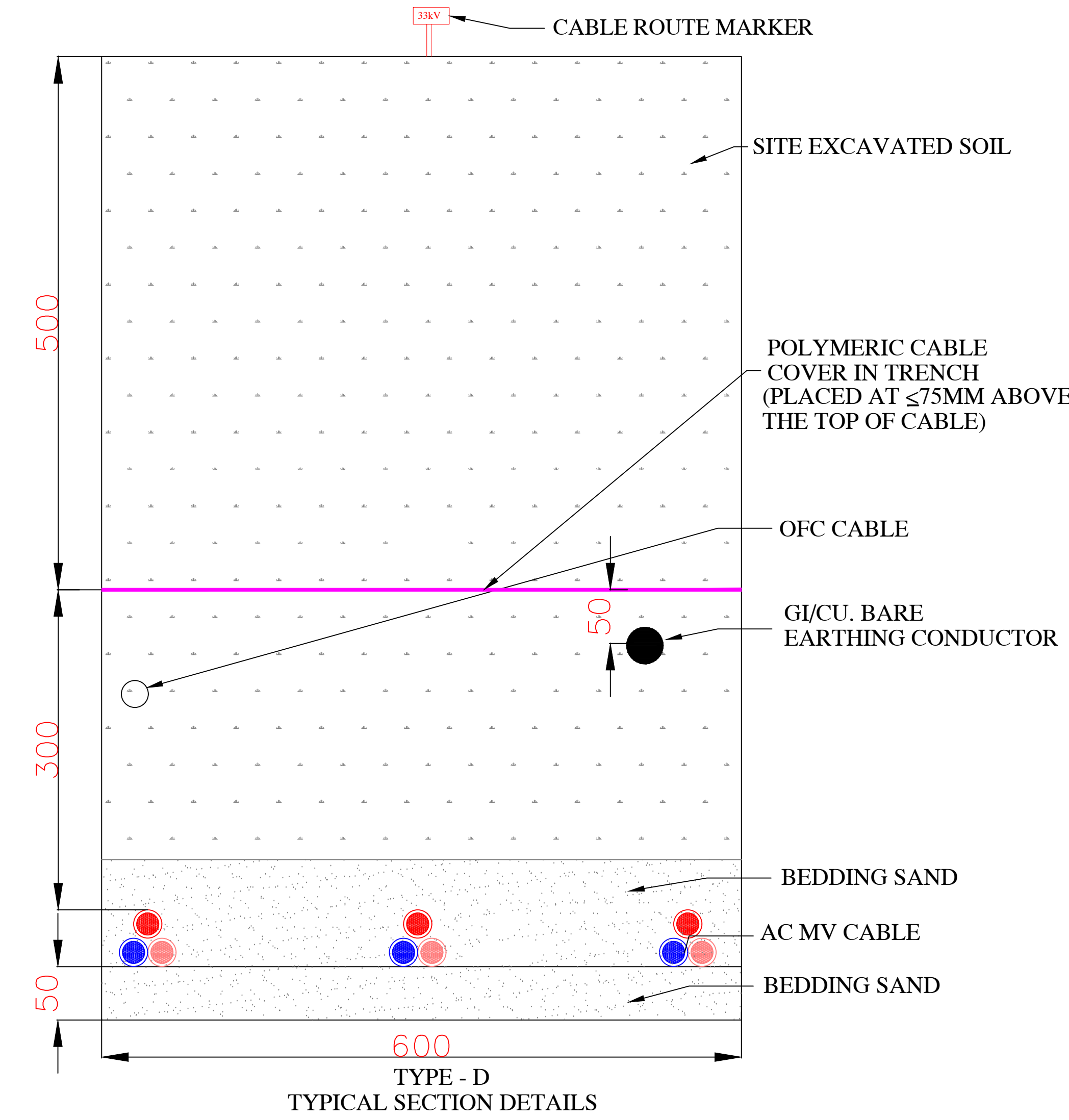
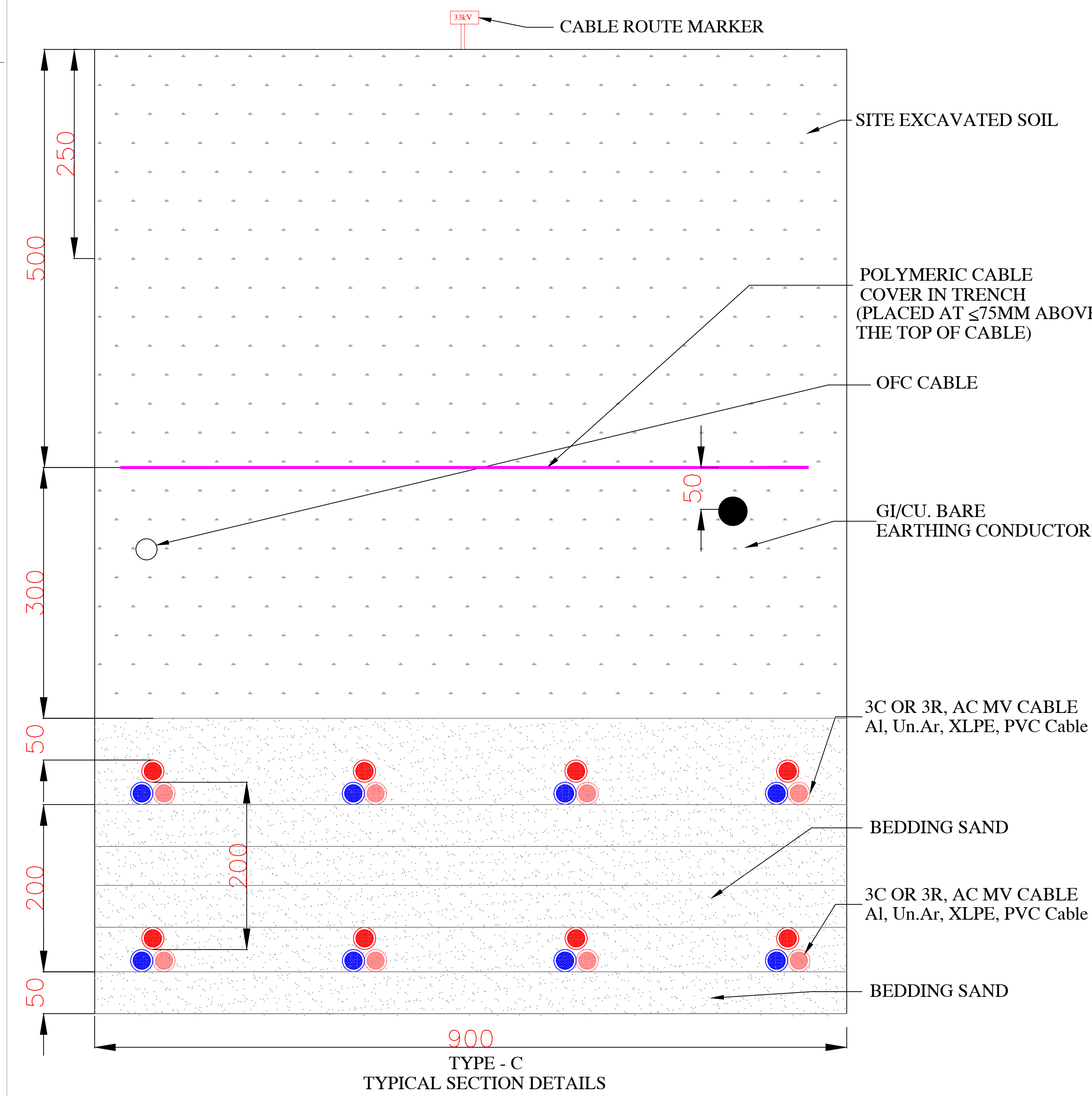
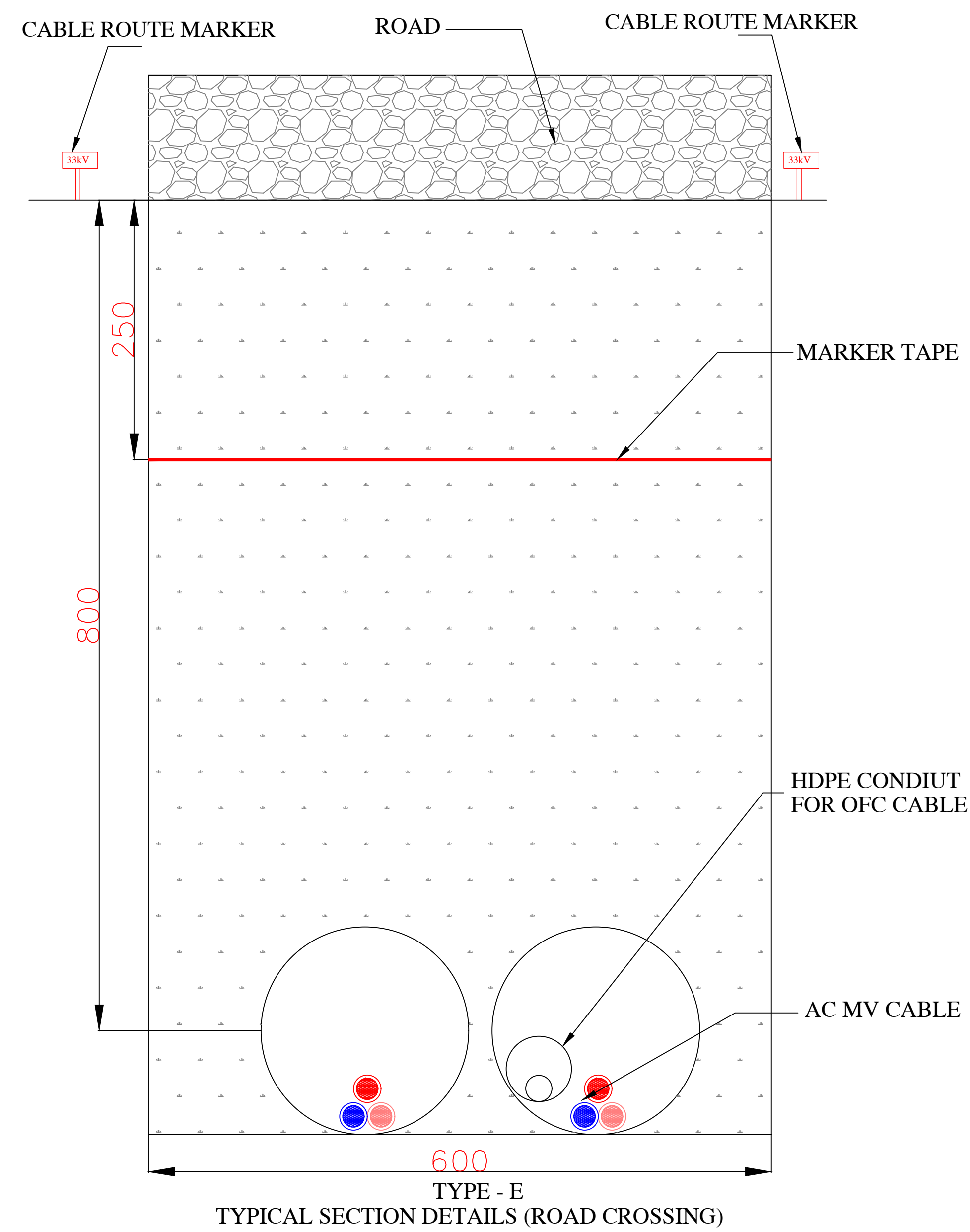
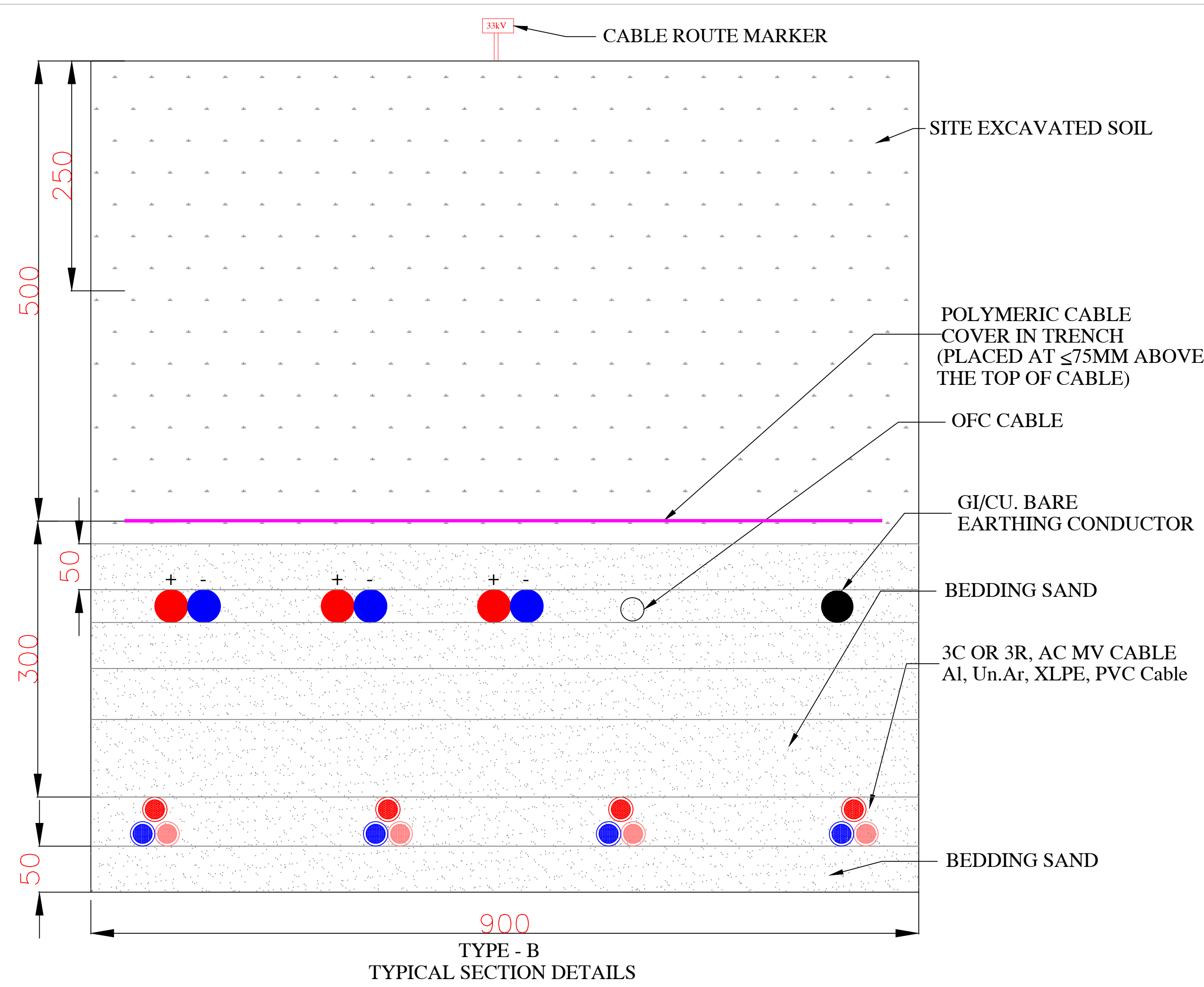
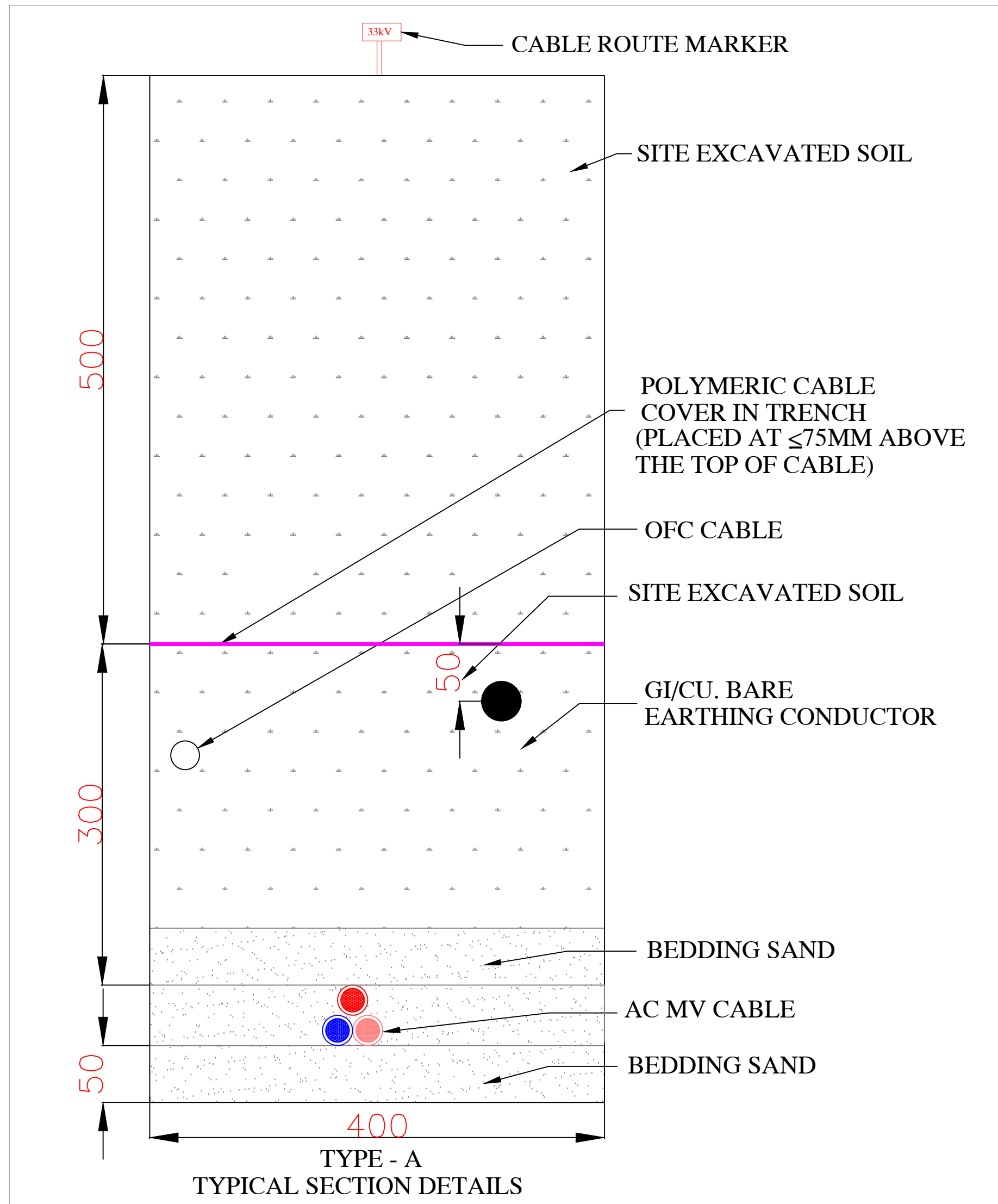
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RD	13.07.2019	FOR TENDER PURPOSE ONLY	HST	SDO
No.	DATE	REMARKS	DRN	CHKD
REVISIONS				
PROJECT TITLE:				
170MWac/200MWp SOLAR FARM AT WELLINGTON, NEW SOUTH WALES, AUSTRALIA				
CLIENT:				
LIGHTSOURCE DEVELOPMENT SERVICES AUSTRALIA PTY LTD				
OWNERS CONSULTANT:				
EPC CONTRACTOR:				
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DATE					

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:

- 0.0531 ha of planted White Box grassy woodland in moderate to good condition
- 1.0007 ha of White Box grassy woodland derived grassland in low condition
- 0.6535 ha of White Box grassy woodland derived grassland in moderate to good condition

These proposed changes include a total 1.7073 ha impacted.

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	<p>The changes to the substation expansion will impact an additional 1.70 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.</p> <p>Refer to summary Section 6.2 and updated BAR in Appendix D.3.</p>
7.2	Aboriginal heritage	<p>The changes to the substation footprint will impact an additional 1.70 hectares of land. Further assessment to identify areas of cultural heritage significance and consideration of consultation obligations is required.</p> <p>Refer to summary Section 6.1 and RAPs notification letter in Appendix D.2.</p>
7.4	Noise and vibration	<p>Additional noise and vibration impacts are likely to occur during construction of the modifications and when in operation.</p> <p>Refer to summary Section 6.3, and updated noise assessment in Appendix D.4.</p>
7.3	Visual amenity	<p>The expanded substation layout will impact the local visual amenity.</p> <p>Refer to assessment in Section 6.4.</p>
7.5	Historic heritage	<p>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.</p>
8.1	Traffic, transport and road safety	<p>Additional infrastructure would be transported to site, during construction.</p> <p>Refer to assessment in Section 6.5.</p>
8.2	Soils	<p>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.</p> <p>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.</p>
8.3	Water use and water quality (surface and ground water)	<p>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.</p>
8.4	Flooding	<p>The impact areas are not affected by flood or near to waterways. No impacts.</p>

Relevant EIS section	Environmental risk	Relevance to modified layout
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	<p>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.</p> <p>Existing mitigation measures for the project are considered sufficient to address these additional impacts. Key measures will include:</p> <ul style="list-style-type: none"> • 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)	<p>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.</p> <p>The changes to the substation configuration are unlikely to affect bushfire risks, which are addressed in Section 8.9 of the EIS.</p> <p>Existing mitigation measures for the project are considered sufficient to address these additional impacts. Key measures will include:</p> <p>Electromagnetic fields</p> <ul style="list-style-type: none"> • 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. <p>Fire</p> <p>Develop a Bush Fire Management Plan which includes all the details and consultation outlined in Section 8.9.4 – Mitigation measures if the EIS.</p>

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

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	<p>Obligation to minimise harm to the environment</p> <p>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.</p>	There is minor additional vegetation removal and soil disturbance that is necessary and can be managed effectively.
Administrative conditions	<p>The Applicant must carry out the development:</p> <p>Generally, in accordance with the EIS; and</p> <p>In accordance with the conditions of this consent.</p> <p><i>Note: The general layout of the development is shown in Appendix 1.</i></p>	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	<p>Landscaping</p> <p>Vegetation buffer</p> <p>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.</p>	No augmentation warranted.
Schedule 3	<p>Biodiversity</p> <p>Retirement of credits</p> <p>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.</p> <p>White box grassy woodland in the upper slopes sub-region of the NSW south western slopes bioregion – 3 credits</p>	1.7073 hectares of White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes (PCT 266). Further offsets will be calculated and updated in the BAR report as required.
Schedule 3	<p>Protection of Heritage Items</p> <p>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 <i>Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW</i> (DECCW, 2010), or its latest version.</p> <p><i>Note: The location of the Aboriginal heritage items referred to in this condition are shown in the figure in Appendix 1.</i></p>	The development footprint has expanded but this does not affect impacts materially or the mitigation strategy.
Schedule 3	<p>Soil & water</p> <p>Water pollution</p> <p>The applicant must ensure that the development does not cause any water pollution, as defined under section 120 of the <i>protection of the environment operations act 1997</i>.</p>	The modified layout will not impact any waterways. There will be localised soil disturbance during construction and vegetation removal.

Consent reference		Can condition be met under the modification
Schedule 3	<p>Fire safety study</p> <p>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.</p>	No implication.
Schedule 3	<p>Fire Management and Emergency Response Plan</p> <p>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.</p>	No implication.
Schedule 3	<p>Decommissioning and rehabilitation</p> <p>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.</p>	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

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bega

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brisbane

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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
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wagga wagga nsw 2650
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f 02 6971 9693

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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,

A handwritten signature in black ink, appearing to read 'Kirsten Bradley', with a long horizontal flourish extending to the right.

Kirsten Bradley
Senior Heritage Consultant
NGH Environmental

Figure 1. Proposed modification.

D.2 UPDATED BIODIVERSITY ASSESSMENT REPORT



Biodiversity Assessment Report

WELLINGTON SOLAR FARM



AUGUST 2019



Document Verification



Proposal
Title:

Wellington Solar Farm

Proposal Number: 19-453

Proposal File Name: Wellington Solar Farm BA Final V3

Revision	Date	Prepared by (name)	Reviewed by (name)	Approved by (name)
Draft v1.0	25/10/17	Julie Gooding Dave Maynard	Dave Maynard Zoe Quaas	Brooke Marshall
Final v1	2/11/17	Julie Gooding	Brooke Marshall	Brooke Marshall
Final v2	2/08/19	Michelle Patrick	Julie Gooding	Brooke Marshall

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Bathurst - Central West and Orana
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ACRONYMS AND ABBREVIATIONS

BBAM	BioBanking Assessment Methodology
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
BCC	BioBanking Credit Calculator
BOS	Biodiversity Offset Strategy
BTBD	BioNet Threatened Biodiversity Database
CEEC	Critically Endangered Ecological Community
CMA	Catchment Management Authority
DECC	NSW Department of Environment and Climate Change (now OEH)
DoEE	Commonwealth Department of Environment and Energy
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cwth)</i>
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
FBA	Framework for Biodiversity Assessment
ha	Hectares
km	Kilometres
m	Metres
NSW	New South Wales
OEH	(NSW) Office of Environment and Heritage (formerly DECC, DECCW)
PCTs	Plant Community Types
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy (NSW)
SSD	State Significant Development
sp/spp	Species/multiple species

EXECUTIVE SUMMARY

Lightsource BP proposes to develop approximately 316 ha of the 559.1 ha proposal site for a 174 megawatt solar photovoltaic array and associated infrastructure within the Dubbo Local Government Area, NSW. 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). Consent for this project was obtained in May 2018.

The purpose of updating the BAR at this time is to address the following changes:

1. The project footprint presented in the Submissions Report in 2018 was reduced to avoid impacts on a Critically Endangered Ecological Community (CEEC). The reduction on this community was 2.0751 ha, while a reduction in native vegetation clearing in the overall development footprint was 9.83 ha. The updated credit calculations were provided in the Submissions Report; however, the BAR was not updated at that time. This BAR update now reflects the changes made in the Submissions Report.
2. The Modification Application (NGH Environmental 2019) being submitted to allow for substation expansion proposes to remove 1.70 hectares of vegetation for the easement and southern expansion of the substation. The vegetation communities that would be impacted include:
 - a. White Box grassy woodland – planted (Moderate to good condition) - 0.05 ha
 - b. White Box grassy woodland derived grassland (moderate to good condition)
0.65 ha
 - c. White Box grassy woodland derived grassland (low condition) - 1.00 ha

This BAR update now reflects the changes made in the Modification Application.

The Biodiversity Assessment Report in 2017 generated 203 ecosystem credits for the clearing of 144.22 ha. From the 2018 submissions report, the retirement of 3 ecosystem credits was required. In 2019, the offset calculation requires retiring 17 ecosystem credits. The updated credit report has been included in Appendix E and this BAR forms part of the Modification Application for the Wellington Solar Farm substation expansion report.

The aim of this BAR is to address the biodiversity matters raised in the Secretary's Environmental Assessment Requirements (SEARs) and to address the requirements of the Framework for Biodiversity Assessment (FBA), developed for Major Projects as part of the Biodiversity Offsets Policy for Major Projects. The FBA has now been superseded by the Biodiversity Assessment Methodology. This is the current assessment methodology for SSD under the NSW Biodiversity Offsets Scheme prescribed by the NSW *Biodiversity Conservation Act 2016*. However, as the previous BAR was completed and approved under the transitional arrangements under the *Biodiversity Conservation (Savings and Transitional) Regulation 2017*, the FBA is considered suitable for this minor change to the project.

This report follows the BAR format required by the FBA. Specifically, this assessment uses the *site-based* landscape assessment methodology, in accordance with Appendix 4 of the FBA for major proposals.

Comprehensive mapping and field surveys were completed in accordance with the requirements of the FBA. The clearing of a total of approximately 129.64ha of White Box Grassy tall woodland and derived grasslands in the Upper Slopes sub region of the NSW South Western Slopes and 0.27ha of Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion resulted in the generation of 15 Ecosystem Credits. A further 165 ha of vegetation within the development site had site value scores of <17 or was not native vegetation and as such, did not generate ecosystem credits.

One species credit species, the Masked Owl was observed within the development site during the site surveys. This species generates species credits based on the presence of breeding habitat. The development site does not provide breeding habitat for this species and as such, no species credits have been generated.

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.

A request to convert these 17 credits calculated via the Biobanking Scheme (in accordance with the FBA, under the TSC Act), using the Reasonable Equivalency Proforma, must be undertaken so the credits can be retired under the new *Biodiversity Conservation Act 2016*.

1 INTRODUCTION

The Wellington Solar Farm proposal is classified as State Significant Development (SSD) under the State and Regional Development State Environmental Planning Policy (SEPP) and therefore a 'major project'. This Biodiversity Assessment Report (BAR) assesses the impacts of the Wellington Solar Farm according to the NSW Framework for Biodiversity Assessment (FBA) as required by the Secretary's Environmental Assessment Requirements (SEARs) for the proposal. The FBA has now been superseded by the Biodiversity Assessment Methodology. This is the current assessment methodology for SSD under the NSW Biodiversity Offsets Scheme prescribed by the NSW *Biodiversity Conservation Act 2016*. However, as this proposal was approved under the transitional arrangement under the *Biodiversity Conservation (Savings and Transitional) Regulation 2017*, the FBA is still applicable.

As stipulated in Section 1.3 of the FBA, proponents must identify and assess the impacts of the proposal on all nationally listed threatened species and threatened ecological communities that may be on the development site. This is addressed in Section 5. The following sections present the detail required to adequately assess the impacts on biodiversity for the Wellington Solar Farm proposal according to the FBA.

1.1 WELLINGTON SOLAR FARM DEVELOPMENT FOOTPRINT

1.1.1 Site location

The Wellington Solar Farm proposal site is located approximately 2km north east of the town of Wellington within the Dubbo Local Government Area (LGA). The power to be generated at the solar farm would be fed into the national grid via an existing substation on the southern side of Goolma Rd (Figure 1-1 Site Map).

1.1.2 Site description

The Wellington Solar Farm proposal site consists of 12 Lots. Lot 89 – 92 DP 2987; Lot 99 DP 2987; Lot 102 - 104 DP 2987; Lot 1 DP34690; Lot 1 DP520396; Lot 2 DP807187, Lot1 DP1226751 and Lot 1 DP1226751. The site is approximately 559.1 ha, the majority of which has been cleared of native vegetation and is cultivated.

Goolma Road runs through the centre of the site. Access to the Wellington Solar Farm proposal site would be off Goolma Road.

North of Goolma Road, the site is currently grazed and cropped. Hillslopes consist of scattered White Box (*Eucalyptus albens*), Kurrajong (*Brachychiton populneus*) and White Cypress Pine (*Callitris glaucophylla*) trees with the understory a mix of native and exotic grasses and forbs. Flats are grazed or cropped with Lucerne (*Medicago sativa*) comprising a largely exotic groundcover but some native grasses remain. Scattered trees are mostly White Box and Yellow Box (*E. melliodora*) in the west. Planted tree lots consisting of mostly exotic or native non-indigenous mature trees occur throughout the site in various locations.

South of Goolma Road, a derived native grassland surrounds the TransGrid substation. To the west of the substation the site is grazed, and understory condition is exotic dominated. Some scattered White Box occurs through the site. A planted tree lot of mature White Box, Yellow Box, White Cypress Pine and Mugga Ironbark (*Eucalyptus sideroxylon*) with a predominately native groundcover runs alongside Goolma Road.

Two watercourses run through the proposal site. One creek, Wuuluman Creek, runs through the centre of the site. An overland flow path, traverses east to west in the northern and central areas of the site and joins up with Wuuluman Creek on the western side of the proposal site. This overland flow path is man-made and has been managed for stock water supply. It was predominantly dry during the site inspection.

1.1.3 Construction and infrastructure requirements

Wellington Solar Farm would comprise of the installation of a solar plant with an upper capacity up to 174MW that would supply electricity to the national electricity grid. Lightsource BP Pty Ltd proposes to develop around 316ha of the 559.1 ha proposal site, retaining where possible, existing patches of viable native vegetation that occur on the array site. An indicative development area is illustrated in Figure 1-1 Site Map.

The key infrastructure for the proposal would include:

- PV modules (solar panels).
- Single Axis horizontal tracking (likely) or fixed mounting frames.
- 30-50 inverter stations with an associated transformer.
- An onsite substation or substation within the existing TransGrid substation containing one transformer and associated switchgear.
- A 33kV or 132kV or 330kV transmission line to the adjacent existing Wellington Substation (100m).
- Underground or aboveground electrical conduits and cabling to connect the inverters to the onsite substation or substation within the existing TransGrid substation.
- An access track off Goolma Road, approximately 4.6km north east of Mitchell Highway junction.
- Permanent site office and maintenance building with associated vehicle parking.
- Internal access tracks to allow for site maintenance.
- Perimeter security fencing up to 2.3m high.
- An Energy storage facility.
- Native vegetation screening, where required to break up views of infrastructure to specific receivers, will be planted prior to the commencement of operations.

During the construction period, some additional temporary facilities would be located within the site boundary and may include:

- Material laydown areas.
- Temporary construction site offices.
- Temporary car and bus parking areas for construction worker's transportation. Once the plant has been commissioned, a small car park would remain for the minimal staff required and occasional visitors during operation.

The construction and commissioning phases are expected to last approximately 12 months. The main construction activities would include:

- Site establishment and preparation for construction (fencing, ground preparation, preliminary civil works and drainage).
- Installation of steel post and rail foundation system for the solar panels.
- Installation of underground cabling (trenching) and installation of inverter stations.
- Construction of the 132kV or 330kV overhead transmission line, onsite substation and equipment, and interconnection to the existing Wellington substation.

Removal of temporary construction facilities and rehabilitation of disturbed areas.

It is anticipated that approximately 200 construction personnel would be required on site during the peak construction period. Construction supervisors and the construction labour force made up of construction labourers and technicians are intended to be hired locally, where possible.

The construction phase is anticipated to commence in August/September 2019. Operation would not be until the fourth quarter of 2020.

1.1.4 Vegetation impact changes since EIS Exhibition

The Wellington Solar Farm (WSF) remains generally as per the detailed description provided in Section 3 of the EIS (NGH Environmental 2017). The following additional layout refinements have been undertaken in since the previous BAR was submitted:

1. The project footprint presented in the Submissions Report (NGH Environmental 2018) was reduced to avoid impacts on a Critically Endangered Ecological Community (CEEC). The overall reduction on this community was 2.0751 ha. While the updated credit calculations were provided in the Submissions Report, the BAR was not updated at that time. This BAR update now reflects the changes made in the Submissions Report.
2. The Modification Application (NGH Environmental 2019) being submitted to allow for substation expansion proposes to remove 1.707 hectares of vegetation for the easement and southern expansion of the substation to achieve compliance. The additional vegetation communities that would be impacted include:
 - a. White Box grassy woodland – planted (Moderate to good condition) - 0.05 ha
 - b. White Box grassy woodland derived grassland (Moderate to good condition)
0.65 ha
 - c. White Box grassy woodland derived grassland (Low condition) - 1.00 ha

This BAR update now reflects the changes made in the Modification Application.

The consented layout (2018) reduced vegetation impacts by 9.83 ha. In 2019, the development footprint for the modified layout is reduced by 6.46 ha as well as a small increase of 1.70ha for the proposed substation expansion.

It is noted that the 33kV feeders from the solar farm will run underground under Goolma Road and into the substation, reducing overhead transmission line visual impacts.

A summary of the changes to each vegetation zone is shown in the following Table 1-1 Vegetation impact changes from 2017-2019.

Table 1-1 Vegetation impact changes from 2017-2019

Zone ID	Vegetation zones	Condition class	Total impact areas			Net difference between consented and modified layout
			EIS 2017 (ha)	Submissions Report 2018 (ha) (consented)	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	0.27
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	0.05	0.05
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	1.88
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	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	0.65	0.67
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	1.00	126.75
Total Difference (ha)			144.23	134.40	1.70	129.63

Considering the changes to the vegetation impacts, it is noted that:

- From the 2018 Submissions Report - a reduction in the vegetation impact zones to avoid a Critically Endangered Ecological Community (CEEC). The overall reduction on this community (which is now entirely avoided) is 2.07 ha. The reduction on native vegetation impacts from the updated footprint was 9.83 ha.
- A reduction of 6.46 hectares in the vegetation impact zones since the EIS (NGH 2017) where the development footprint was outside of the project boundary. This error is corrected in the 2019 update.
- An increase of 1.70 hectares in 2019 for the vegetation impact zones to expand the substation.

1.2 STUDY AIMS

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

The aim of this BAR is to address the requirements of the FBA, developed for Major Proposals, as required in the Secretary's Environmental Assessment Requirements (SEARs) and summarised below.

Secretary's Environmental Assessment Requirement	Where addressed
The EIS must address the following specific issues: <ul style="list-style-type: none">• Biodiversity – including an assessment of the likely biodiversity impacts of the development having regard to the <i>NSW Biodiversity Offsets Policy Major Proposals</i>, and in accordance with the <i>Framework for Biodiversity Assessment</i>, unless otherwise agreed by the Department.	Sections 3 -8.

The NSW Office of Environment and Heritage (OEH) provided input on the preparation of SEARs to the NSW Department of Planning and Environment on the 14th July 2017. This input identified one species, the Regent Honeyeater (*Anthochaera phrygia*) that required further consideration in accordance with Section 9.2 of the Framework for Biodiversity Assessment (FBA). Two threatened entities were specifically excluded from requiring further consideration. These were the Swift Parrot (*Lathamus discolor*) and White Box Yellow Box Blackely's Red Gum Woodland Endangered Ecological Community (EEC). However, assessment of impacts and offset requirement are still included in this BAR.

The NSW DPI also provided input on the preparation of the SEARS to the NSW Department of Primary Industries on the 13th July 2017. This input requested an aquatic ecological assessment on the aquatic ecology of Wuuluman Creek.

This BAR 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 to determine the significance of impacts to these entities.

1.3 REPORT STRUCTURE

This BAR follows the reporting requirements of Sections 1, 2 & 3 of the FBA, including the following:

Section 1

- Identification of biodiversity values subject to the proposed major development (The Proposal) – Chapter 2 (Landscape Features), Chapter 3 (Native Vegetation), Chapter 4 (Threatened Species).

Section 2

- Impacts of the proposal on biodiversity as part of an application for approval to undertake a major proposal under the NSW planning legislation - Chapter 6 (Avoid and Minimise Impacts), Chapter 7 (Impact Summary).

1.4 DEFINITIONS

Wellington Solar Farm ('the proposal')

This refers to all infrastructure and activities required to construct, operate and decommission the proposed solar farm.

The proposal is contained within the Dubbo Regional Council LGA. The broader area within which development would occur such as lot boundaries, road reserves, fence lines etc.

The development site ('development site')

This refers to the area within which infrastructure would be located. This includes the solar array, temporary construction facilities, the access track and cabling and the easement for the transmission line, south of the main site.

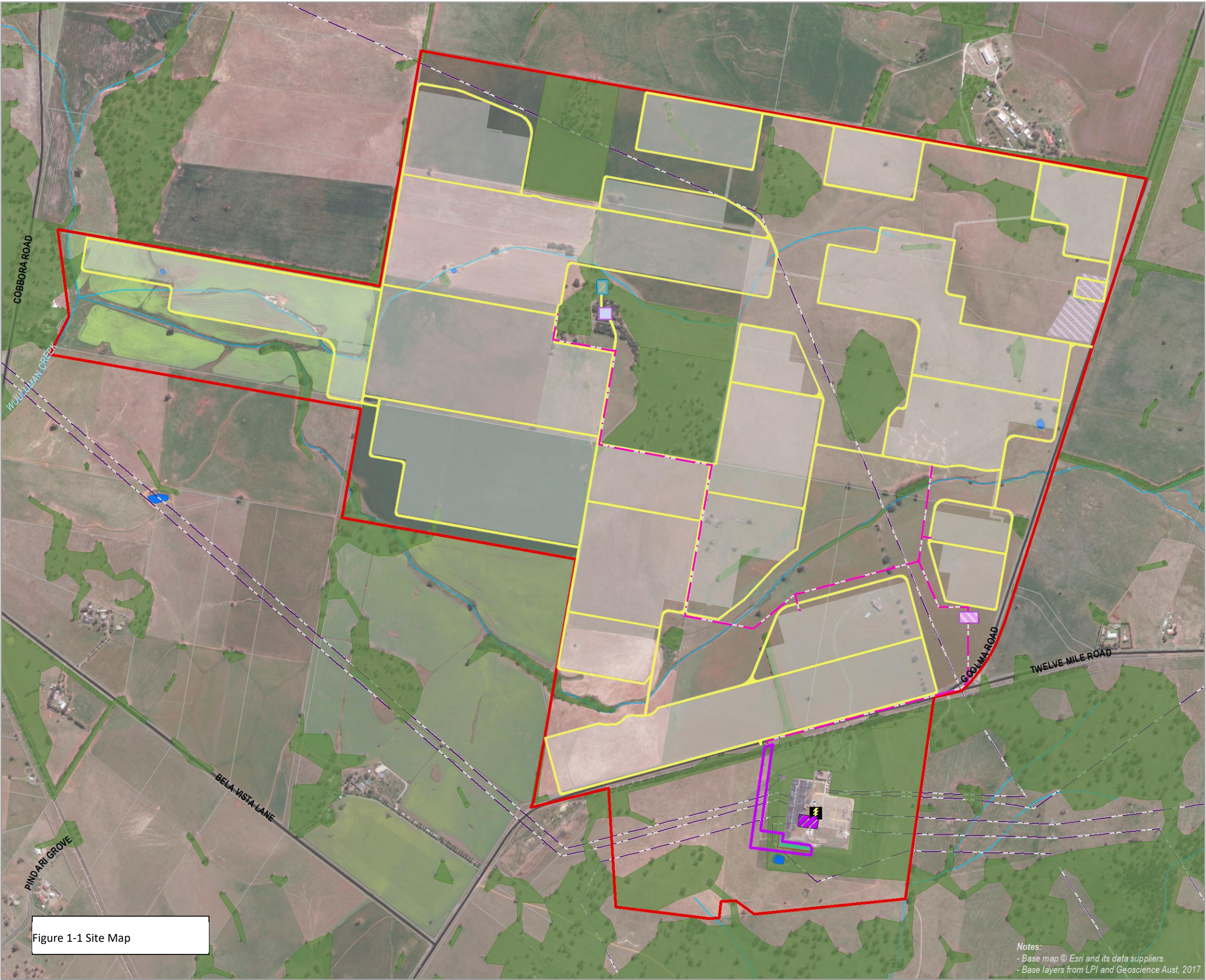
The development site is the area assessed in this BAR. The development site is approximately 316 ha.

Databases & Sources of Information Used

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 OEH's BioBanking credit calculator (<http://www.environment.nsw.gov.au/bbccapp/ui/mynews.aspx>).
- NSW OEH's BioNet threatened biodiversity database
Accessed online via login at <http://www.bionet.nsw.gov.au/>.
- OEH 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>.
- Office of Environment and Heritage (OEH) (2014). Framework for Biodiversity Assessment: NSW Biodiversity Offsets Policy for Major Proposals. Published by Office of Environment and Heritage for the NSW Government.

WELLINGTON SOLAR FARM



- Project boundary
- Substation
- Local road
- Existing transmission lines
- Farm dam / other water body
- Minor drainage feature
- Drainage line
- Railway
- Cadastral
- Native vegetation extent
- Approved underground
- Approved array
- Approved OAM building
- Approved OAM building
- Proposed substation
- Approved internal road
- Approved battery storage facility
- Approved temporary laydown area and parking / turning circle
- Proposed substation expansion easement
- Proposed substation

LGA: Dubbo Regional Council
CMA: Central West
IBRA bioregion: NSW South Western Slopes
IBRA subregion: Inland Slopes (NSS01)



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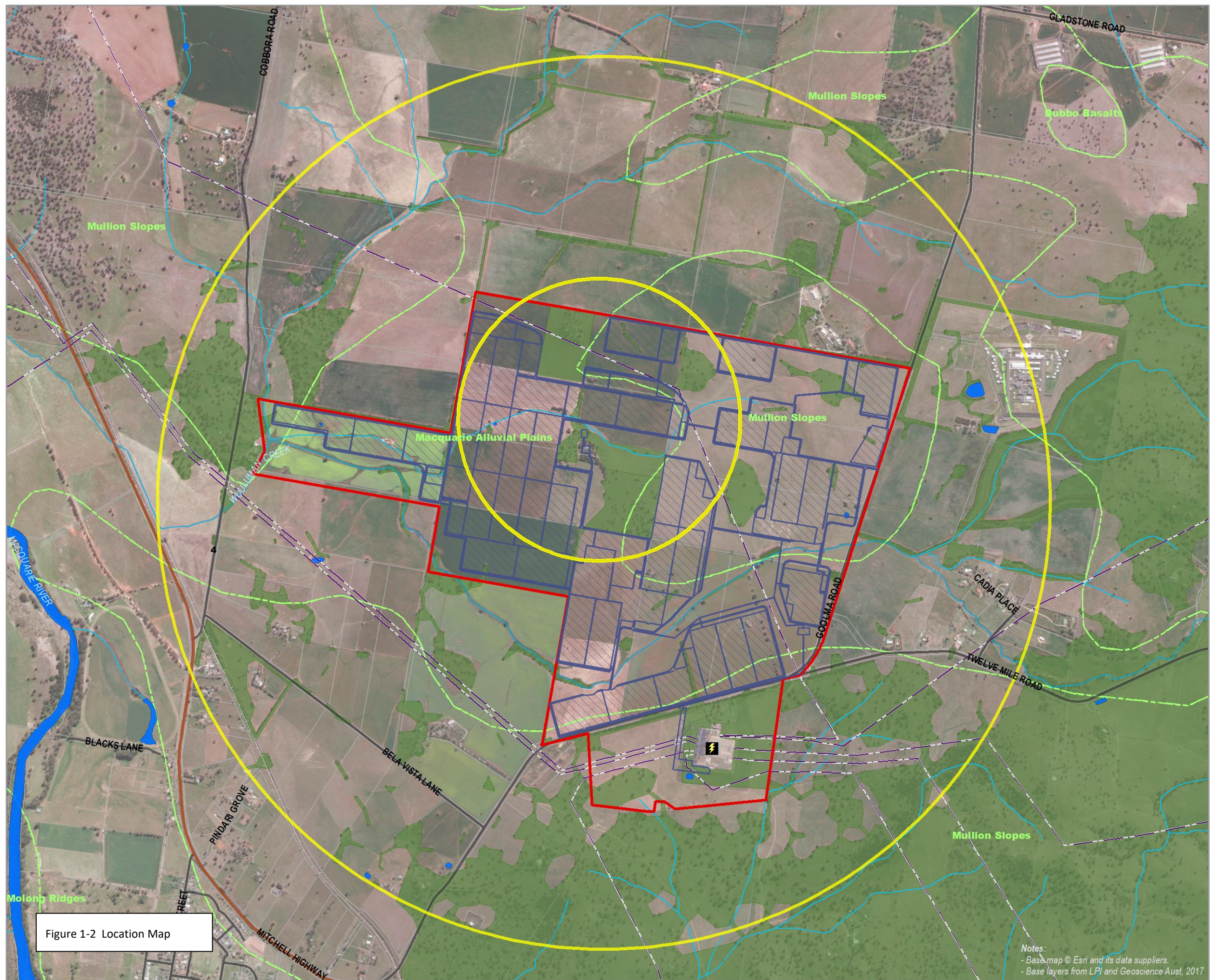
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Author: SP Date: 1/08/2019



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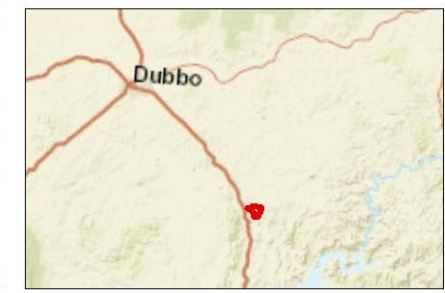
Figure 1-1 Site Map

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



- Native vegetation extent
- Inner assessment circle (200 ha)
- Outer assessment circle (2000 ha)
- Proposed infrastructure
- Project boundary
- Substation
- Local road
- Highway
- Existing transmission lines
- Farm dam / other water body
- Minor drainage feature
- Drainage line
- Railway
- Mitchell Landscapes
- Cadastre

LGA: Dubbo Regional Council
 CMA: Central West
 IBRA bioregion: NSW South Western Slopes
 IBRA subregion: Inland Slopes (NSS01)



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 Author: SP Date: 19/07/2019

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

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Figure 1-2 Location Map

2 LANDSCAPE FEATURES

2.1 IBRA BIOREGIONS AND SUBREGIONS

Bioregions are large, geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features and plant and animal communities. The 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 BioBanking Credit Calculator (BCC) for the proposal.

2.2 NSW LANDSCAPE REGIONS (MITCHELL LANDSCAPES)

Two Mitchell Landscapes occur within the development site; Mullion Slopes and Macquarie Alluvial Plains (Table 2-1).

- Macquarie Alluvial Plains occurs surrounding Wuuluman Creek through the centre of the development site.
- Mullion Slopes occurs on the rest of the development site, 200m north and south of Wuuluman Creek.

The Mitchell Landscape descriptions (DECC 2002), percentage cleared within the Central West CMA (OEH 2016) and the area of each within the development site are provided in Table 2-1 below.

Table 2-1 Description of the Mitchell Landscape relevant to the proposal (DECC 2002)

Mitchell Landscape (DECC 2002)	Percent cleared in the CMA	Area within development site (ha)
Mullion Slopes		
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 (<i>Eucalyptus rossii</i>), Brittle Gum (<i>Eucalyptus mannifera</i>), Broad-leaved Peppermint (<i>Eucalyptus dives</i>), Red Box (<i>Eucalyptus polyanthemos</i>), Mountain Grey Gum (<i>Eucalyptus cypellocarpa</i>), White Box (<i>Eucalyptus albens</i>) with Yellow Box (<i>Eucalyptus melliodora</i>) on lower slopes and River Oak (<i>Casuarina cunninghamiana</i>) along the streams.	92%	370ha
Macquarie Alluvial Plains		
Holocene fluvial sediments of backplain facies of the Marra Creek Formation associated with the Macquarie River main alluvial fan and distributary stream system, relief 1 to 3m. Dark yellow-brown silty clay with patches of sand and carbonate nodules deposited from suspended sediments in floodwater, often with gilgai. Slightly elevated areas with red-brown texture-contrast soils. Open grasslands with scattered Coolibah (<i>Eucalyptus microtheca</i>), Black Box (<i>Eucalyptus largiflorens</i>), River Cooba (<i>Acacia stenophylla</i>), Bimble Box (<i>Eucalyptus populnea</i>), Belah (<i>Casuarina cristata</i>), Lignum (<i>Muehlenbeckia cunninghamii</i>) and Myall (<i>Acacia pendula</i>).	78%	120ha

The dominant Mitchell Landscape affected by the proposal is Mullion Slopes and this was entered in the BCC for the proposal.

2.3 NATIVE VEGETATION EXTENT

Using GIS, an inner and outer assessment circle with the ratio of 1:10 was established. A 200ha inner assessment circle and 2,000ha outer assessment circle was established over the proposal site and centred over the area of native vegetation that is impacted most by the proposal.

As the natural vegetation that would have occurred at the 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 total area of native vegetation mapped within the outer assessment circle is 401.38ha. Refer to Figure 1-2 Location Map.

2.4 CLEARED AREAS

Cleared areas in the development site 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 250ha (47%) within the site boundary is cleared (non-native vegetation) land.

2.5 RIVERS AND STREAMS

Two watercourses run through the development site. Wuuluman Creek, a 3rd order stream, runs through the centre of the development site (Figure 2-1). In the east of the development site Wuuluman Creek is a slow flowing shallow creek with steep banks. Streamside vegetation is degraded consisting mostly of exotic grasses grazed by stock and some scattered Boxthorn (*Lycium ferocissimum*). As the creek flows towards the west, riverbanks become shallow and the water deeper. The stream banks are well vegetated and consist of plants such as Couch (*Cynodon dactylon*) and Bulrush (*Typha* sp.). Some scattered White Box (*Eucalyptus albens*) occurs along the length of the stream. Under the DPI's Policy and Guidelines for Fish Habitat Conservation and Management, Wuuluman Creek comprises both Class 2 and Class 3 Key Fish Habitat. In the east of the development site, Wuuluman Creek would be classed as Type 3, Minimal Sensitive Key Fish Habitat, with no native aquatic vegetation present. Towards the west of the site, with native aquatic vegetation becoming established the Creek would be classed as Type 2, Moderately Sensitive Key Fish Habitat. The waterway class is defined as Class 3 Minimal Key Fish Habitat, having intermittent flow and semi-permanent pools within the waterway.

An Overland Flow Path traverses east to west in the northern and central areas of the site and joins up with Wuuluman Creek on the western edge of the site. This overland flow path has been man made for stock water supply. This flow path is a dry gully, flowing only after rain events (Figure 2-2). Vegetation in these gullies is degraded and dominated by exotic grasses that have been grazed by stock.

These watercourses flow into the Macquarie River, approximately 2.5km downstream.



Figure 2-1 Wuuluman Creek in the a) East of the Development Site and b) Centre of the Development Site



Figure 2-2 Overland Flow Path on the a) East of the development site and b) West of the development site

2.6 WETLANDS WITHIN, ADJACENT TO AND DOWNSTREAM OF THE DEVELOPMENT SITE

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 STATE OR REGIONALLY SIGNIFICANT BIODIVERSITY LINKS

State significant biodiversity links, regionally significant biodiversity links, very large area biodiversity links, large area biodiversity links or local area biodiversity links are defined in the FBA. To date, no biodiversity corridor plans have been approved by the Chief Executive of the OEH.

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

2.8 OTHER LANDSCAPE FEATURES REQUIRED BY THE SEARS

No other landscape features were identified within the SEARS as requiring inclusion.

2.9 LANDSCAPE VALUE SCORE COMPONENTS

A BioBanking Credit Calculator (BCC) assessment was completed for this proposal. The proposal ID for the assessment is 144/2017/4350MP Version 4 and the assessment type was selected as 'major project'. This section summarises the values entered in the Landscape values section of the BCC assessment.

2.9.1 Method applied

The proposal conforms to the definition of a *site-based development* according to the FBA; a development other than a linear-shaped development, or a multiple fragmentation impact development. As a result, the site-based landscape assessment methodology has been used in the assessment, in accordance with Appendix 4 of the FBA for major projects. Key information entered in the BCC is detailed below.

2.9.2 Percent native vegetation cover in the landscape

Table 2-2 below details the percent native vegetation cover within the inner and outer assessment circles before and after development, as calculated in a GIS.

Table 2-2 Percent native vegetation cover before and after development

Assessment circle	Percent cover before development	Percent cover after development
Outer (2,000ha)	20.07%	19.47%
Inner (200ha)	17.32%	13.93%

2.9.3 Connectivity value

A connecting link is when native vegetation on the site adjoins native vegetation surrounding the site and the native vegetation:

- is in moderate to good condition, and
- has a patch size > 1 ha
- is separated by a distance of <100m (or <30m for non-woody ecosystems), and
- is not separated by a large water body, dual carriageway, wider highway or similar hostile link.

The moderate to good vegetation on the site is not connected to adjacent vegetation. No connecting links occur at the development site.

State or regional biodiversity links may also occur as defined in the criteria from Table 10 of the FBA. There are no state or regional significant biodiversity links within the outer assessment circle and as such, none would be impacted by the proposal.

The development would not impact on any connecting links or state or regional biodiversity links. A connectivity value class width of 30-100m was entered in the BCC for both before and after development. A projected foliage cover >25% of the lower benchmark was entered for overstorey condition and >50% of the lower benchmark for mid-storey/groundcover condition.

2.9.4 Patch size

The moderate to good vegetation at the site is not connected to adjacent vegetation. As such, the patch sizes entered for each vegetation zone were equal to the areas of each zone. A maximum patch size of 12 was entered in the BCC landscape assessment.

2.9.5 Area to perimeter ratio

As the proposal is a site-based development and not a linear-shaped development or a multiple fragmentation development, the area to perimeter ratio for the proposal is not required to be assessed.

2.9.6 Landscape value score

Entering the data documented above into the BCC returned a landscape value score of 12.80.

3 NATIVE VEGETATION

3.1 PLANT COMMUNITY TYPES

3.1.1 Vegetation communities

Two Plant Community Types (PCT) were identified in the development site;

- White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes (PCT 266).
- Blakely's Red Gum – Yellow Box grassy tall woodland (PCT 277).

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 BCC 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:

- 1.81ha of woodland vegetation in moderate to good condition.
- 0.90ha of woodland vegetation in moderate to good condition comprised from a previous tree planting.
- 1.75ha of woodland vegetation in low condition.
- 5.86ha of derived grassland in moderate to good condition.
- 133.59ha of derived grassland in low condition.

The distribution of this vegetation type at the development site is shown on Figure 3-1 and a summary of the key details provided in Table 3-1.

This PCT was determined during the survey based on plot data collected 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*). Understorey 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 occurred alongside Goolma Road near the substation. This tree lot comprised mature White Box (*Eucalyptus albens*), White Cypress Pine (*Callitris glaucophylla*), Mugga Ironbark (*Eucalyptus sideroxylon*) and Kurrajong (*Brachychiton populneus*) in rows. Understorey 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 understorey. 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.

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 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 (**T. campestre*) Capeweed (**Arctotheca calendula*), Brome (**Bromus* sp.) and Heliotrope (**Heliotropium* sp.)

A range of other native shrub, grass and forb species were also recorded during the plot surveys. All species recorded, percentage cover and estimated numbers of individuals within each plot is included in Appendix A.

Table 3-1 Summary of White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

White Box Grassy Woodland in the Uppers slopes sub-region of the NSW South Western Slopes Bioregion		
Vegetation formation	Grassy Woodlands	
Vegetation class	Western Slopes Grassy Woodland	
Vegetation type	Plant Community Type (PCT) ID	266
	Biometric Vegetation Type ID	CW216
	Common Community Name	White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion
Approximate extent within the development site	186ha (Figure 3-1).	
Condition	Grassy Woodland in Moderate to Good Condition Grassy Woodland in Low Condition Derived Grassland in Moderate to Good Condition Derived Grassland in Low Condition	
Survey Effort	4 BioBanking plots in Grassy Woodland 8 BioBanking plots in Derived Grassland as mapped on Figure 3-9 PCTs and survey locations within the development site.	
Conservation Status	This PCT is listed as an EEC under the NSW <i>Biodiversity Conservation Act 2016</i> (BC Act) and the EPBC Act.	
Estimate of percent cleared	95%	

White Box Grassy Woodland in the Uppers slopes sub-region of the NSW South Western Slopes Bioregion

Threatened plant species habitat

Within the development site, this community provides potential habitat for the Small purple pea (*Swainsona recta*), Silky Swainson-Pea (*S. sericea*) and Bluegrass (*Dichanthium setosum*).

Fauna Habitat

This vegetation community provides numerous habitat types for fauna. Canopy trees provide foraging and nesting/resting habitat for birds and arboreal fauna. Ground cover plants, logs and fallen leaves also provide shelter and foraging habitat for terrestrial fauna. Where hollow-bearing trees are present, they may provide daytime resting habitat for bats and mammals, roosting habitat for birds and potential breeding resources.

Examples



Figure 3-1 Example of moderate to good condition White Box Grassy woodland in the development site.



Figure 3-2 Example of low condition White Box grassy woodland in the development site.



Figure 3-3 Example of White Box grassy woodland planted vegetation within the development site.

White Box Grassy Woodland in the Uppers slopes sub-region of the NSW South Western Slopes Bioregion



Figure 3-4 Example of moderate to good condition White Box grassy woodland derived grassland in the development site.



Figure 3-5 Example of low condition White Box grassy woodland derived grassland in the development site.

Blakely's Red Gum – Yellow Box grassy tall woodland (PCT 277)

Within the development site, PCT 277 occurred as two small patches (totalling 0.32ha) of low condition woodland vegetation.

The distribution of this vegetation type at the development site is shown on Figure 3-6 and a summary of the key details provided in Table 3-2.

This PCT was determined during the survey based on plot data collected within the development site. The overstorey was dominated by Yellow Box (*Eucalyptus melliodora*) with some Fuzzy Box (*Eucalyptus conica*). The groundcover was heavily disturbed having been heavily impacted on by stock. Exotic species such as Soft Brome (**Bromus hordeaceus*), Lucerne (**Medicago sativa*), Rye Grass (**Lolium perenne*) and small flowered Mallow (**Malva parviflora*) dominated the groundcover. Only one native species, Hogweed (*Zaleya galericulata*) was recorded during plot surveys.

All species recorded, percentage cover and estimated numbers of individuals within each plot is included in Appendix A.

Table 3-2 Summary of Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion in the development site.

Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion		
Vegetation formation	Grassy Woodlands	
Vegetation class	Western Slopes Grassy Woodland	
Vegetation type	Plant Community Type (PCT) ID	277
	Biometric Vegetation Type ID	CW112
	Common Community Name	Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
Approximate extent within the development site	0.32ha	
Condition	Low Condition	
Survey Effort	1 BioBanking plot as mapped on Figure 3-9 PCTs and survey locations within the development site.	
Conservation Status	This PCT is listed as an EEC under the NSW BC Act and the EPBC Act.	
Estimate of percent cleared	94%	
Threatened plant species habitat	Within the development site, this community does not provide any threatened flora habitat due to the high levels of disturbance and degradation.	
Fauna Habitat	This vegetation community provides numerous habitat types for fauna. Canopy trees provide foraging and nesting/resting habitat for birds and arboreal fauna. Ground cover	

Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

plants, logs and fallen leaves also provide shelter and foraging habitat for terrestrial fauna. Where hollow-bearing trees are present, they may provide daytime resting habitat for bats and mammals, roosting habitat for birds and potential breeding resources. A Masked Owl (listed as Vulnerable under the BC Act) was observed in a hollow-bearing tree in this vegetation zone.

Examples



Figure 3-6 Example of low condition Blakely's Red Gum – Yellow Box grassy tall woodland in the development site.

Cleared areas (exotic dominated and cropped land)

Disturbed and modified vegetation occupies approximately 250ha of the development site with a prevalence of exotic or planted exotic flora species that make up the groundcover (Figure 3-7). Within the proposed array area, the groundcover is mainly comprised of the crop species Lucerne (**Medicago sativa*) with various other common agricultural weeds. As this vegetation was either cleared or had virtually no native component in any strata, then in accordance with the FBA, this vegetation is not considered to be native vegetation and as such, does not need to be assessed further.

Scattered planted tree lots were also present within the development area. These tree lots were mostly comprised of non-endemic species such as Chinaberry tree (*Melia azedarach*) or Shining Gum (*Eucalyptus nitens*) (Figure 3-8). These planted areas had no other native components in the mid-storey or groundcover and were not representative of any naturally occurring PCT. As these trees also did not provided threatened species habitat they were not assessed further in the BAR.



Figure 3-7 An example of exotic-dominated (cropped) vegetation within the development site.



Figure 3-8 Planted non-indigenous vegetation within the development site.

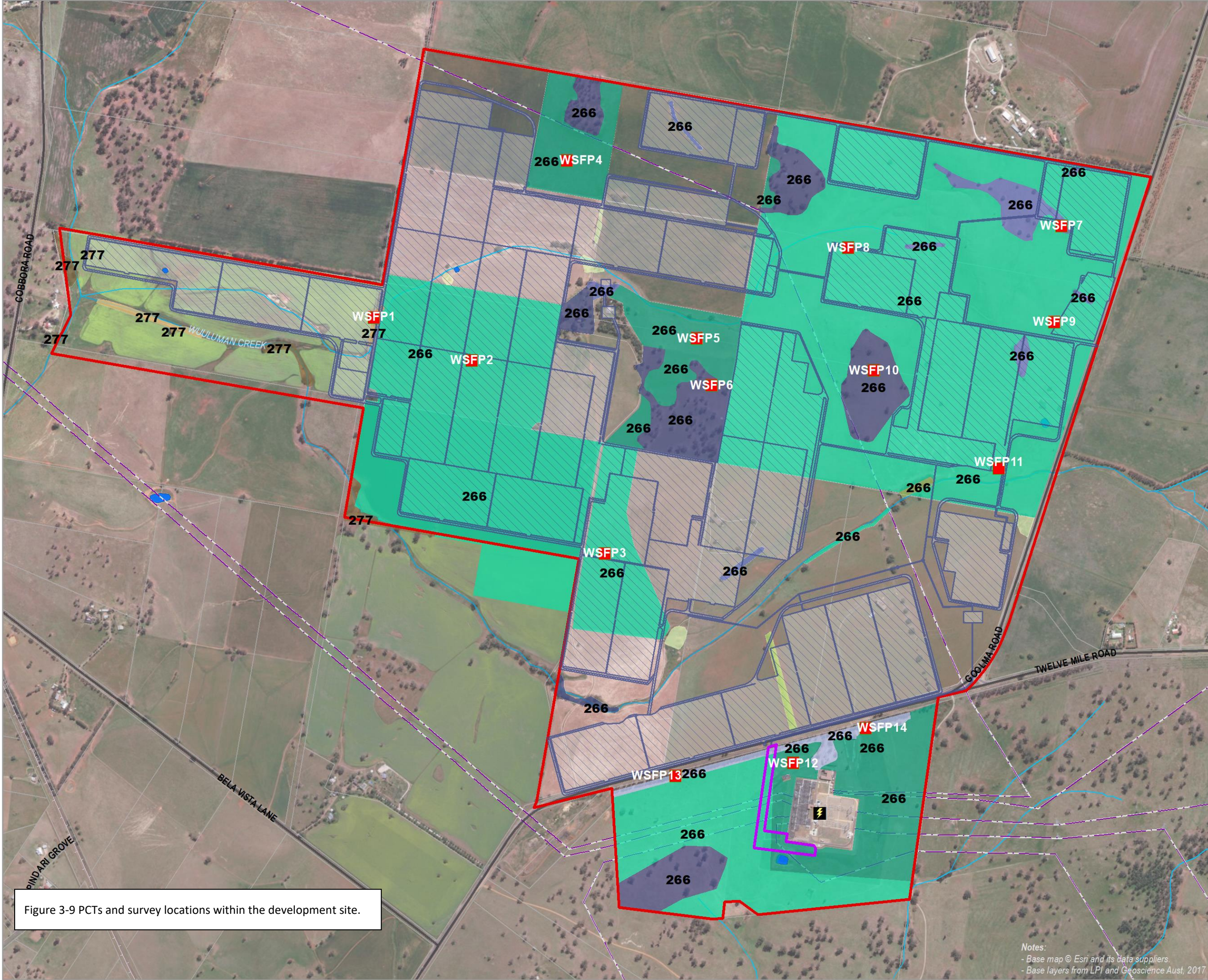
3.1.2 *Endangered Ecological Communities*

Both PCTs occurring within the development site form part of the **White Box – Yellow Box – Blakely’s Red Gum Woodland EEC** listed under the NSW BC Act.

This vegetation community is 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). One patch of White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion meets the condition threshold for the EPBC listed community. This patch occurs on the hillslope at Biometric Plot WSFP6 (Figure 3-9). This patch had a predominantly native understory with more than 12 native understory species (excluding grasses) and contains important species. Most of this patch has been avoided by the development.

The remaining patches of White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion and Blakely’s Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion within the development site do not meet the criteria for the EPBC listed community due to less than 12 native understory species (excluding grasses) occurring in the ground layer and less than 20 mature trees per hectare with no natural regeneration.

WELLINGTON SOLAR FARM



- Project boundary
- Substation
- Local road
- Existing transmission lines
- Farm dam / other water body
- Minor drainage
- Drainage line
- Railway
- Cadastre
- Biometric plot
- Vegetation, PCT,
 - Exotic vegetation
 - Planted local native vegetation, Low
 - Planted non-local native vegetation, Moderate to good
 - Planted local native vegetation, Moderate to good
 - Planted Yellow Box woodland, 266, Moderate to good
 - Blakely's Red Gum - Yellow Box grassy tall woodland derived grassland, 277, Low
 - Blakely's Red Gum - Yellow Box grassy tall woodland, 277, Low
 - Blakely's Red Gum - Yellow Box grassy tall woodland, 277, Moderate to good
 - White Box grassy woodland derived grassland, 266, Low
 - White Box grassy woodland derived grassland, 266, Moderate to good
 - White Box grassy woodland - planted, 266, Moderate to good
 - White Box grassy woodland, 266, Low
 - White Box grassy woodland, 266, Moderate to good
- Proposed substation expansion easement
- Approved

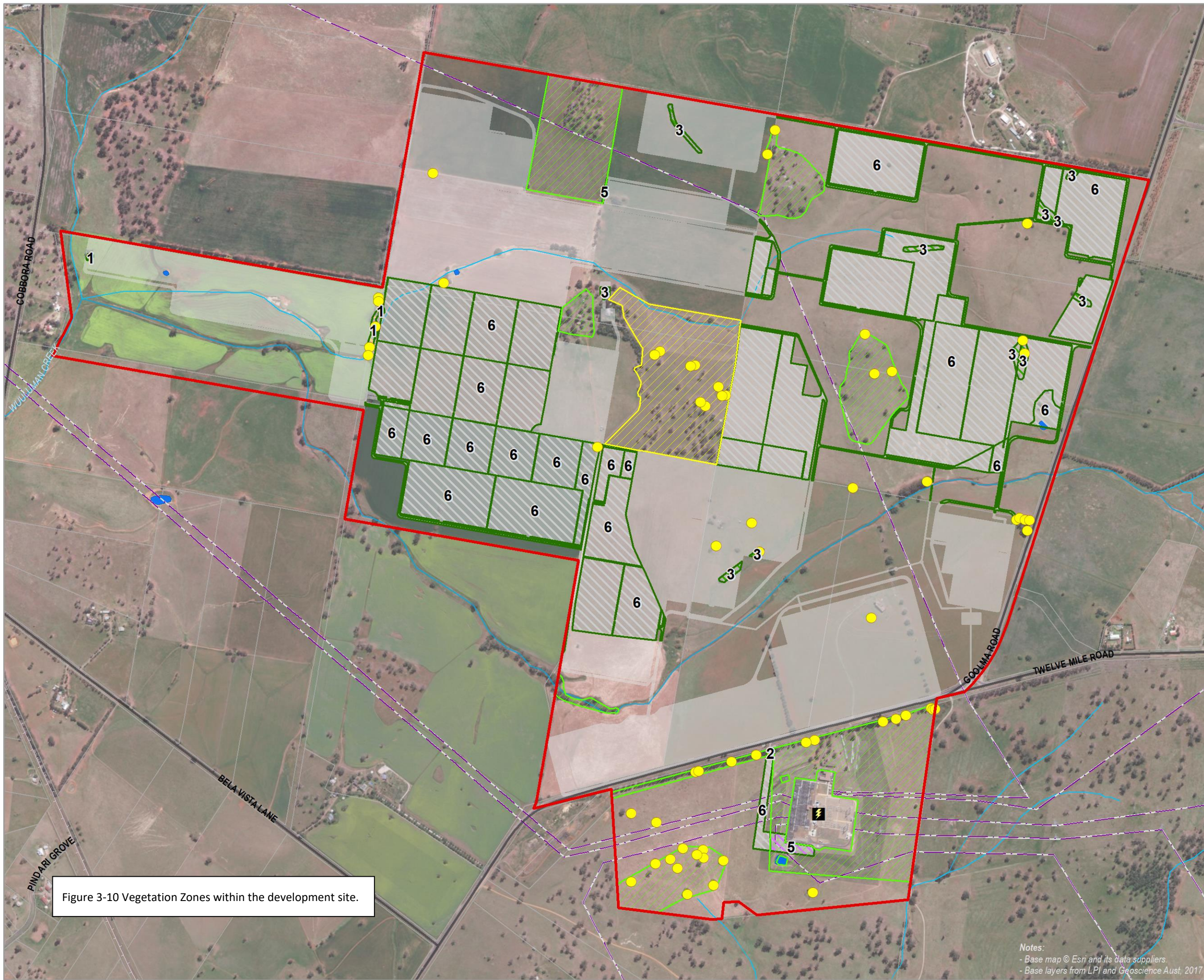
0 100 200 400 m

A3 @ 1:12000
Ref: SW121 v20190801 P
Author: SP Date: 1/08/2019

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

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Figure 3-9 PCTs and survey locations within the development site.



- ▬ Project boundary
- Hollow bearing tree
- Box Gum Woodland CEEC - EPBC Act
- Box Gum Woodland EEC - NSW TSC Act
- Proposed vegetation impacts**
- Zone 1: PCT 277 (Low condition)
- Zone 2: PCT 266 (Moderate to good condition)
- Zone 3: PCT 266 (Low condition)
- Zone 5: PCT 266 (Moderate to good)
- Zone 6: PCT 266 (Low condition)
- ⚡ Substation
- Local road
- Existing transmission lines
- Farm dam / other water body
- Minor drainage feature
- Drainage line
- Railway
- Proposed infrastructure footprint
- Cadastre

0 100 200 400 m

A3 @ 1:12000
 Ref: SW121 v20180719 Z
 Author: SP Date: 19/07/2019



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

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Figure 3-10 Vegetation Zones within the development site.

3.1.3 Vegetation zones in the BCC

The vegetation zones that would be impacted by the proposal, as entered into the BCC, their condition class, number of BioBanking plots undertaken within them and their current site value score, as determined by the BCC, are listed in Table 3-3 below.

Table 3-3 Vegetation zones for the development site

Zone ID	Vegetation zones	Condition class	Area (ha) within development site	Survey effort (number of plots)	Site value score (current)
1.	PCT #277 BVT CW112 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Low	0.27	1	14.00
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)	0.05	2	32.67
3.	PCT #266 BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	Low	1.88	1	8.67
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	0.67	3	26.00
6.	PCT #266 BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	¹ Derived Grassland – Low	126.76	5	10.67
Total			129.64	12	

¹ As the BCC cannot have two zones of the same PCT in the same condition, this zone had to be entered into the calculator as 'moderate to good – poor'. Being moderate to good, the area of this zone required 6 plots where only 5 should have been required for a low condition zone. An additional plot was entered into the BCC which was the average of the 5 actual plots to overcome this limitation.

3.1.4 Site values (plot data entered in the BCC)

The following plot data was collected in May 2017 for vegetation zones 1- 6 (Table 3-4).

Table 3-4 Plot data for all zone (collected May 2017)

Zone 1: PCT #277 - BVT CW112 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
WSF1	3	7	0	0	0	6	88	2	0	3	682869	6401109	55

Zone 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)

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
WSF13	17	33	0	22	0	0	64	1	0	15	683893	6399554	55
WSF14	20	21	0	36	2	14	28	0	0	2	684531	6399722	55

Zone 3: PCT #266-BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion. Low Condition

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
WSF7	3	0	0	2	0	2	80	0	0	0	685195	6401412	55

Zone 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 Condition

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
WSF4	17	0	0	30	0	6	62	0	0	0	683514	6401632	55

WSF5	11	0	0	70	0	0	30	0	0	0	683976	6401037	55
WSF12	21	6	0	50	0	2	44	0	0	0	684287	6399601	55

Zone 6: PCT #266-BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion. Derived Grassland Low Condition

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
WSF2	11	0	0	30	0	0	70	0	0	0	683203	6400966	55
WSF3	14	0	0	8	0	10	82	0	0	0	683647	6400306	55
WSF8	5	0	0	34	0	0	68	0	0	0	684465	6401345	55
WSF9	4	0	0	18	0	6	76	0	0	0	685169	6401086	55
WSF11	7	0	0	16	0	6	78	0	0	0	684983	6400595	55

4 THREATENED SPECIES

4.1 GEOGRAPHIC/HABITAT FEATURES

Five geographic/habitat features for species credit species were generated by the BCC. These features and whether they would be impacted by the proposal are shown in Table 4-1 below.

Table 4-1 Geographic / habitat features.

Impact	Common name	Scientific name	Feature
No	Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	Land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels
No	Brush-tailed Rock Wallaby	<i>Petrogale penicillata</i>	Land within 1km of rock outcrops or cliff lines
Yes	Small Purple Pea	<i>Swainsona recta</i>	Land containing a forb-rich grassy ground layer
Yes	Booroolong Frog	<i>Litoria booroolongensis</i>	Land within 100m of stream or creek banks
No	Pink-tailed Legless Lizard	<i>Aprasia parapulchella</i>	Land containing surface rocks (embedded or loose)
No	Zieria obcordata	<i>Zieria obcordata</i>	Land containing granite boulders on rocky outcrops

4.2 ECOSYSTEM CREDIT SPECIES

The following species are all species predicted by the BCC to occur, based on the data entered for the landscape assessment and vegetation zones in the assessment. These constitute all species which will generate ecosystem credits in the credit calculations.

Table 4-2 Ecosystem credit species predicted to occur.

Common name	Scientific name	TS offset multiplier
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis subsp. gularis</i>	1.3
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus subsp. victoriae</i>	2.0
Bush Stone-curlew	<i>Burhinus grallarius</i>	2.6
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	2.1
Diamond Firetail	<i>Stagonopleura guttata</i>	1.3
Flame Robin	<i>Petroica phoenicea</i>	1.3
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	2.0
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	1.8
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis subsp. temporalis</i>	1.3

Common name	Scientific name	TS offset multiplier
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata subsp. cucullata</i>	1.7
Little Eagle	<i>Hieraaetus morphnoides</i>	1.4
Little Lorikeet	<i>Glossopsitta pusilla</i>	1.8
Masked Owl	<i>Tyto novaehollandiae</i>	3.0
Painted Honeyeater	<i>Grantiella picta</i>	1.3
Powerful Owl	<i>Ninox strenua</i>	3.0
Scarlet Robin	<i>Petroica boodang</i>	1.3
Speckled Warbler	<i>Chthonicola sagittata</i>	2.6
Spotted Harrier	<i>Circus assimilis</i>	1.4
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	2.6
Square-tailed Kite	<i>Lophoictinia isura</i>	1.4
Swift Parrot	<i>Lathamus discolor</i>	1.3
Turquoise Parrot	<i>Neophema pulchella</i>	1.8
Varied Sittella	<i>Daphoenositta chrysoptera</i>	1.3
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	2.2

4.3 SPECIES CREDIT SPECIES PRESENT

4.3.1 Candidate species

The following species were returned by the BCC as requiring survey. Table 4-3 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 4-3 Threatened species requiring survey

Common name	Scientific name	Surveys	Present/presumed present	Affected by the proposal
Ausfeld's Wattle	<i>Acacia ausfeldii</i>	Conspicuous species targeted during all flora surveys	Absent	Unlikely – Not detected during targeted surveys
Booroolong frog	<i>Litoria booroolongensis</i>	No	Absent	Unlikely – No suitable habitat present
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	2 Nights of Nocturnal Surveys	Absent	Unlikely – No suitable habitat present
Eastern Pygmy Possum	<i>Cercartetus nanus</i>	2 Nights of Nocturnal Surveys	Absent	Unlikely – No suitable habitat present and not detected during surveys

Common name	Scientific name	Surveys	Present/presumed present	Affected by the proposal
Euphrasia arguta	<i>Euphrasia arguta</i>	Targeted transect surveys in suitable habitat	Absent	Unlikely – No suitable habitat present
Koala	<i>Phascolarctos cinereus</i>	2 Nights nocturnal Surveys + Searches around trees for scratches or scats	Absent	Unlikely - Not detected during targeted surveys
Narrow Goodenia	<i>Goodenia macbarronii</i>	No longer a threatened species	Absent	Unlikely – Not detected during surveys
Prasophyllum sp Wybong	<i>Prasophyllum sp. wybong</i>	No – Survey timing not appropriate	Absent	Unlikely – No suitable habitat present
Regent Honeyeater	<i>Anthochaera phrygia</i>	Six 20minute bird surveys conducted over 2 days	Presumed present	Yes – Not detected during surveys but presumed to occur from time to time, impacts to foraging habitat only
Silky Swainsona Pea	<i>Swainsona sericea</i>	Targeted transect surveys in suitable habitat	Absent	Unlikely – Not detected during targeted surveys
Small Purple-Pea	<i>Swainsona recta</i>	Targeted transect surveys in suitable habitat	Absent	Unlikely – Not detected during targeted surveys
Squirrel Glider	<i>Petaurus norfolcensis</i>	2 nights nocturnal surveys	Absent	Unlikely – Not detected during targeted surveys

4.3.2 Species identified in SEARs

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 proposal and is assessed further in Chapter 10 of this report.

4.3.3 Targeted survey methodologies

Comprehensive and targeted survey methods and results are included below. The following section sets out the surveys undertaken that underpin the knowledge of the development site. This information is used in the BCC assessment and particularly, to support the decisions regarding candidate species that would be affected by the proposal. Section 6.2.2 also addresses this issue.

Flora and fauna field surveys were undertaken from the 8th to 10th May 2017. Further targeted surveys were undertaken on the 4th October 2017.

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.

Fauna habitat assessment

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

Several trees occurring within the development site were considered to be potentially hollow-bearing. An assessment was undertaken of all accessible trees within the development site to record the species, presence of hollows, tree height, diameter and the number, size and location of hollows. Photographs were taken of each tree surveyed. The hollow-bearing tree data is presented in Appendix B.

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.

Approximately 20 hours were spent assessing fauna habitat within the development site.

An opportunistic record of fauna species observed during the fauna assessments was taken (Appendix A).

Diurnal birds including Regent Honeyeater

Six bird monitoring plots were undertaken within the 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.

Nocturnal birds

Numerous trees containing hollows of a suitable size for nesting were identified within the project area. Two nights of nocturnal spotlighting surveys and call playback were undertaken within woodland areas and areas containing hollow-bearing trees (refer to Figure 4-1).

Koala

The dominant overstorey species in the small woodland areas is White Box (*Eucalyptus albens*). White Box is 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 by actively searching each of the trees for scratchings and scats. Two nights of nocturnal spotlighting surveys were also undertaken within the woodland areas containing hollow bearing trees (refer Figure 3-10). One Bionet record for the Koala occurred within 10km of the project in the town of Wellington.

Squirrel Glider, Brush-tailed Phascogale and Eastern Pygmy Possum

Numerous trees containing hollows of a suitable size for nesting were identified within the project area. Two nights of nocturnal spotlighting surveys and call playback were undertaken within the woodland areas (refer Figure 3-10). No records of these species exist within 10km of the development site. The nearest recorded sighting for the Brush-tailed Phascogale is over 200km away.

Threatened Bats

Two ANABAT recorders were placed in woodland areas as shown in Figure 3-10 over a period of two nights.

Ausfeld's Wattle, Scant Pomaderris

Suitable habitat for these species could occur in areas of woodland vegetation. Surveys were undertaken for these species in woodland areas. 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 and 4 October 2017.

Bluegrass

Surveys were undertaken for these species within areas of native grassland, roadsides and woodland areas. Surveys for this species was undertaken within an appropriate detection period between the 8th and 10th of May 2017.

Silky Swainson-Pea, Small Purple Pea, *Tylophora linearis*, *Euphrasia arguta*, *Prasophyllum* sp. Wybong

Targeted surveys were undertaken for these species on the 4th October 2016 by an ecologist from NGH environmental. This is within the optimal detection period for these species as recommended by the OEH Biobanking calculator. Areas of suitable habitat were surveyed using the parallel field traverse survey technique in accordance with the NSW Guide to Surveying Threatened Plants (OEH, 2016). Parallel field traverses were 10 metres apart in areas of open woodland and derived native grassland. Approximately 4 hours were spent surveying for these species.

4.3.4 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.

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 assessment as an ecosystem credit species (refer Table 4-2).

4.3.5 Survey results

118 flora and 23 fauna species were recorded throughout the site surveys. The results of these surveys are provided in Appendix A.

A total of 60 hollow-bearing trees were identified during surveys of the proposal area. 17 of these trees occur within the development site and would be impacted on by the proposal. The main species detected were White Box (*Eucalyptus albens*) with some Blakely's Red Gum (*Eucalyptus blakelyi*), Mugga Ironbark (*Eucalyptus sideroxylon*) and Yellow Box (*Eucalyptus melliodora*). The majority of these contain small and medium hollows located on limbs and on the trunk.

One threatened species, a Masked Owl (*Tyto novaehollandiae*) was observed during spotlighting surveys on a branch of a large Yellow Box (*E. melliodora*) tree. This tree contained two large hollows (greater than 20cm) in the trunk of the tree. The Masked Owl is listed as vulnerable under the NSW BC Act. It is a dual credit species being an ecosystem credit species predicted to occur in this assessment and a species credit

species where breeding habitat is impacted. Breeding habitat is defined in the OEH BioNet Threatened Biodiversity Database (BTBD) as; *Living or dead trees with hollows greater than 20cm diameter*. As such this species has been included as a candidate species and is included in the discussion of targeted survey results below.

A *Nyctophilus* species was detected through the ANABAT recordings on the 9th of May 2017 however the calls for *Nyctophilus* cannot be distinguished between species. One threatened Bat – Corben's Long Eared Bat (*Nyctophilus corbeni*) could potentially occur within the proposal site. This species is highly mobile and may move over distances of 10km or more.

Masked Owl

As stated above, a single Masked Owl was recorded during spotlighting surveys. Although habitat is present on site that meets the breeding habitat constraint for this species, it is considered unlikely that the Masked Owl would use these habitat features given the context in which these habitat features occur.

The Masked Owl is a large forest owl, it prefers uncleared or lightly cleared areas with high densities of old hollow-bearing trees (DEC 2006). Studies of woodland fragments on privately-owned and unprotected lands in south-eastern New South Wales showed that virtually all records of the Masked Owl were associated with extensively forested areas or occurred within one kilometre of the boundary of these areas (Kavanagh and Stanton, 2002). The development site is highly cleared and fragmented with the nearest densely forested area over two kilometres to the south-west. As such, the development site is unlikely to be preferred habitat for this species. Further, breeding usually occurs near foraging areas. Common Ringtail Possum, Greater Glider and the Sugar Glider are important prey species for large forest owls (Kavanagh and Stanton, 2002), none of which were recorded at the development site during nocturnal surveys. The development site is therefore unlikely to provide foraging habitat for the Masked Owl. The NSW Recovery Plan for large forest owls (DEC 2006) states that the Masked Owl requires old hollow eucalypts with hollows greater than 40cm wide and greater than 100cm deep for nesting. None of the hollows within the development site are greater than 40cm wide and none are likely to be 100cm deep. Based on the above it is considered unlikely that the Masked Owl would utilise the hollows within the development site for nesting. It is likely that the individual observed was resting within the development site while travelling through. As such, no breeding resources would be impacted by the proposal and species credits are not considered to be generated for this species.

Regent Honeyeater

The Regent Honeyeater was not detected during surveys. White Box is a key foraging species for the Regent Honey Eater (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 OEH, 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 therefore assumed that the development site is unlikely to be a mapped important area and that species credits are not generated for this species.

Koala

No Koala's or signs of Koala's were detected during the targeted surveys of the small woodland areas within the development site. As such, the area is not considered to currently support a Koala population and it would not comprise *Core Koala Habitat* under SEPP44. As White Box is a feed species under Schedule 2 of SEPP44 and it comprises more than 15% of the total number of trees in the tree component, the area is 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 site is not considered to provide habitat for this species.

Squirrel Glider, Brush-tailed Phascogale and Eastern Pygmy Possum

The Squirrel Glider, Brush-tailed Phascogale and Eastern Pygmy Possum were not detected during nocturnal surveys. No records of these species occur within 10km of the development site. The woodland vegetation within the proposal area supports hollow-bearing trees that could provide breeding habitat for these species. However, there are no flowering shrubs in the understory that would provide a food source for these species. 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 these species and the development site is not considered to provide habitat for these species.

Booroolong Frog

The Booroolong Frog inhabits rocky permanent streams with some fringing vegetation cover and requires exposed rocks and rock crevices for breeding near and within shallow pools. No rocky permanent streams occurred within the development site and there is little to no fringing vegetation. Wuuluman Creek which runs through the development site is degraded from grazing and has no rocks or crevices present within the stream that would provide breeding habitat for this species. As no suitable habitat is present within the proposal area, it is not considered to occur within the development site.

Ausfeld's Wattle

Ausfeld's Wattle (*Acacia ausfeldii*) was not detected during the surveys. It is a conspicuous shrub 2-4m tall. Very few understory shrubs were detected within the development site. It is considered unlikely that the species would have been overlooked if present and as such it is not considered to occur at the development site.

Bluegrass

Bluegrass (*Dichanthium setosum*) is an upright grass up to 1m tall. Appropriate survey timing was not specified in the BCC. This species flowers mostly in summer (OEH 2017) which is generally the optimal survey timing for this species however, the OEH BioNet Threatened Biodiversity Database specifies a survey period of December through May. Further, a known population 20km from the development site was observed flowering at the time of the May 2017 surveys. This species was not detected within the development site during the targeted surveys. A similar but common species, Queensland Bluegrass (*Dichanthium sericeum*) was detected surrounding the TransGrid substation.

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. This species was not detected during the targeted surveys and as such is not considered to occur within the development site.

***Prasophyllum* sp. Wybong.**

Prasophyllum sp. Wybong is a terrestrial perennial orchid up to 30cm tall. It occurs in open eucalypt woodlands and grasslands. This species is semi-parasitic, and it is found in Eucalypt forests with a mixed grass and shrub understory. Suitable habitat for this species could occur within the woodland habitat. The nearest known population of this species is near Denman, approximately 170km east of the development site. Surveys for this species was undertaken within the optimal survey time in October. This species was not detected during the targeted surveys and as such is not considered to occur within the development site.

Scant Pomaderris

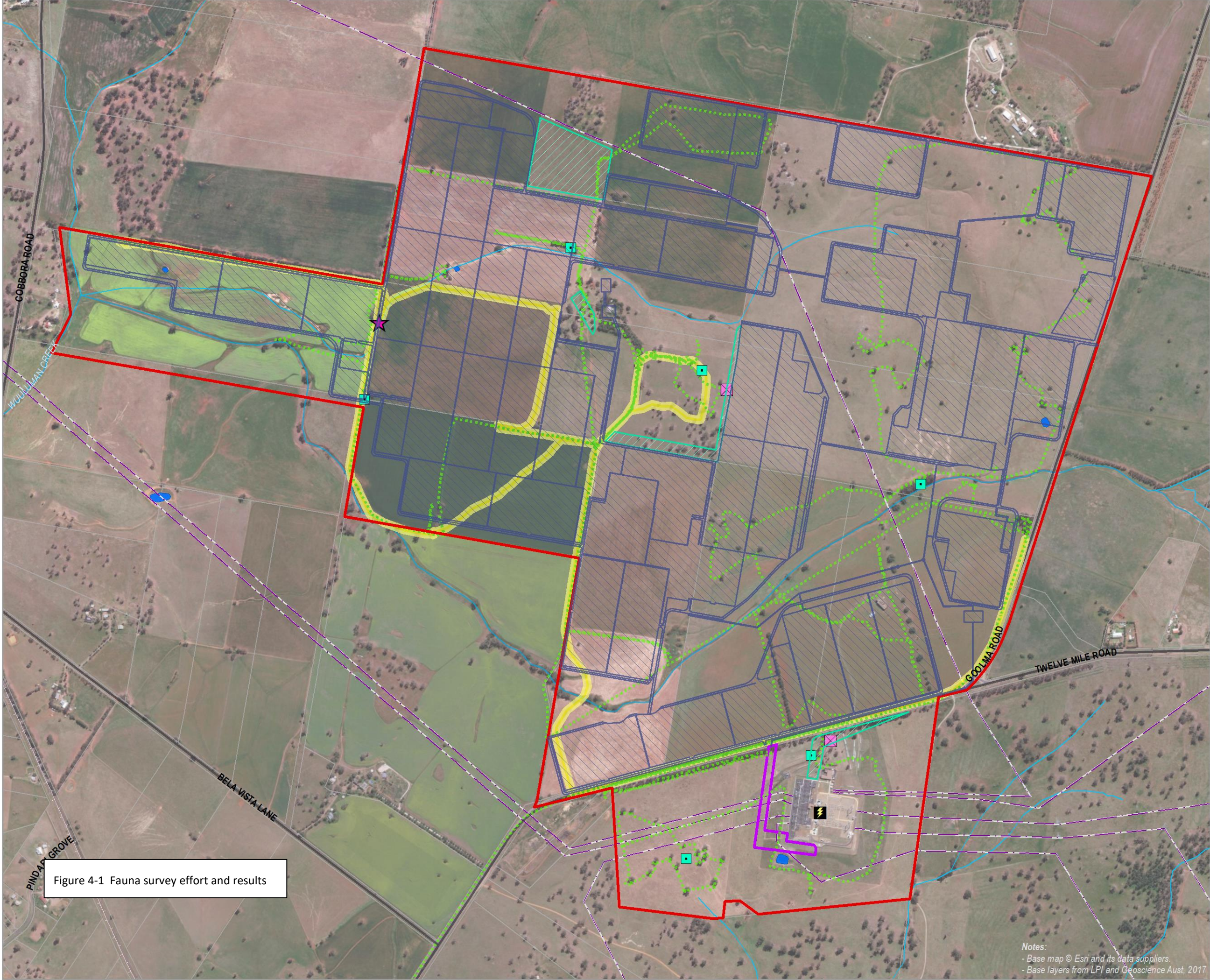
Scant Pomaderris (*Pomaderris queenslandica*) is a medium shrub 2-3 metres tall, found in moist eucalypt forests or sheltered woodlands with a shrubby understory (OEH, 2017). Woodlands within the development were open with very few shrubs in the understory. No moist eucalypt forests or sheltered woodland were present within the study area. It is considered unlikely that the species would have been overlooked if present and as such it is not considered to occur at the development site

Silky Swainson-Pea and Small Purple Pea

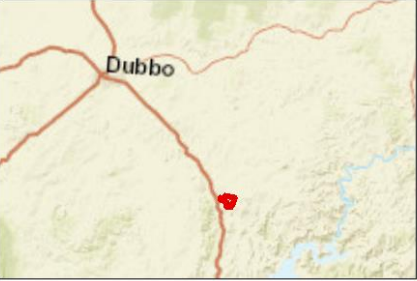
Silky Swainson-Pea (*Swainsona sericea*) is a prostrate or erect perennial up to 10cm tall (OEH, 2016). It is found in Box Gum Woodland in the Southern Tablelands and the South West Slopes. Small Purple Pea (*Swainsona recta*) is an erect perennial herb growing to 30cm tall. It occurs in the grassy understory 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. These species were not detected during the targeted surveys and as such are not considered to occur within the development site.

Tylophora linearis

Tylophora linearis is a small twiner that flowers between September and May (OEH, 2017). It grows in dry woodlands. Appropriate survey timing was not specified in the BCC. This species flowers mostly in spring (OEH 2017) which is generally the optimal survey timing for this species however, the OEH BioNet Threatened Biodiversity Database specifies all months as being appropriate for survey. This species was not detected during the targeted spring surveys of White Box grassy woodland with a native understory and as such, it is not considered to occur at the development site.



- Project boundary
- Substation
- Local road
- Existing transmission lines
- Farm dam / other water body
- Minor drainage feature
- Drainage line
- Railway
- Cadastre
- Flora and fauna surveys**
- Targeted flora survey
- Masked Owl recorded
- Anabat (bat)
- Bird survey plot
- Habitat assessment / Bird survey
- Spotlight transect
- Approved infrastructure
- Proposed substation expansion easement



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Author: SP Date: 1/08/2019



Figure 4-1 Fauna survey effort and results

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

Weather conditions during the field surveys

Weather conditions during the surveys were fine with mild night-time and warm daytime temperatures. There was no rain. Table 4-4 lists the weather conditions as recorded at Wellington over the survey period.

Table 4-4 Weather conditions during the field surveys, recorded at Wellington.

Date	Temperature min (°C)	Temperature max (°C)	Rain (mm)	Wind speed @ 9am (km/h)
08/05/17	0.6	19.6	0.6	Not available
09/05/17	4.2	22.1	0	Not available
10/05/17	4.4	21.1	0	Not available
04/10/17	Not available	Not available	Not available	Not available

4.3.6 Summary of species credit species

In summary, applying the above information to the BCC assessment, the following data was entered in the BCC.

Table 4-5 Summary of species credits

Common name	Scientific name	Impacted by development?	ID method	Loss (ha)	Survey date
Ausfeld's Wattle	<i>Acacia ausfeldii</i>	No	Survey	0.00	08/05/17
Blue Grass	<i>Dichanthium setosum</i>	No	Survey	0.00	08/05/17
Booroolong Frog	<i>Litoria booroolongensis</i>	No		0.00	
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	No	Survey	0.00	08/05/17
Eastern Pygmy Possum	<i>Cercartetus nanus</i>	No	Survey	0.00	08/05/17
Euphrasia arguta	<i>Euphrasia arguta</i>	No		0.00	
Koala	<i>Phascolarctos cinereus</i>	No	Survey	0.00	08/05/17
Narrow Goodenia	<i>Goodenia macbarronii</i>	No		0.00	
Prasophyllum sp. Wybong	<i>Prasophyllum</i> sp. Wybong	No		0.00	
Regent Honeyeater	<i>Anthochaera Phrygia</i>	No		0.00	
Scant Pomaderris	<i>Pomaderris queenslandica</i>	No	Survey	0.00	08/05/17

Common name	Scientific name	Impacted by development?	ID method	Loss (ha)	Survey date
Silky Swainson-Pea	<i>Swainsona sericea</i>	No	Survey	50.00	04/10/17
Small Purple Pea	<i>Swainsona recta</i>	No	Survey	50.00	04/10/17
Squirrel Glider	<i>Petaurus norfolcensis</i>	No	Survey	0.00	08/05/17
<i>Tylophora linearis</i>	<i>Tylophora linearis</i>	No	Survey	0.00	08/05/17

5 EPBC MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC protected matters report was undertaken on the 6th April 2017 and July 25th 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 C). 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

Two threatened ecological communities were returned from the protected matters report. One of these, the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland occurs on the development site. One 9ha patch of this community occurs on the hill slope in the centre of the development site where more than 12 native forb species and important species are present in the understory. This patch meets the condition threshold for listing under the EPBC Act. Most of this patch has been avoided by the proposal.

5.3 THREATENED SPECIES

There was eight threatened flora and nine threatened birds, seven mammals, two reptiles and four fish were returned from the protected matters report. The additional mammal since 2017, is the Greater Glider. Of these 30 species, six species were considered to have the potential to utilise the habitats within the development site:

- 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
- Small Purple Pea (*Swainsona recta*) – Endangered EPBC Act.

Surveys have demonstrated that the Koala and Small Purple-pea are unlikely to occur at the development site. The remaining species are assessed further in section 10.1.4

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

6 SUMMARY OF BIODIVERSITY VALUES

6.1 AREAS NOT REQUIRING ASSESSMENT

Areas without native vegetation or aquatic features do not need to be assessed further. Within the development site, these include treeless paddock areas with an understory of exotic agricultural crop species or previously disturbed sites that have been colonised by exotic species with little to no native component. The total area of land within the development site not requiring further assessment is approximately 250ha.

6.2 AREAS NOT REQUIRING AN OFFSET

6.2.1 Impacts on native vegetation

Offsets are not required where the proposal would impact on PCTs that:

- a) Have a site value score of <17; or
- b) Are not identified as a Critically Endangered Ecological Community (CEEC) or EEC

Impacts are also not required for PCTs that are not associated with threatened species habitat and are not identified as CEECs/EECs.

Three zones had site value scores of less than 17. These were:

- PCT277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes bioregion in Low condition (Site value score 14.00)
- PCT266 White Box Grassy Woodland in the upper slopes sub-region of the NSW South Western Slopes Low Condition Derived Grassland (Site value score 10.67)
- PCT266 White Box Grassy Woodland in the upper slopes sub-region of the NSW South Western Slopes in low condition. (Site value score 8.67)

As such, these three zones do not require offsetting.

6.2.2 Impacts on species and populations

Offsets are not required where the proposal:

- a) Impacts on non-threatened species and populations that do not form part of a CEEC or EEC
- b) Impacts on threatened species habitat associated with a PCT within a vegetation zone with a site value score of <17

As for native vegetation, the habitat provided by the zones listed in Section 6.2.1 do not require an offset as the site value scores are <17.

Species credit species

As discussed in Section 4.3.5, the following species credit species are considered unlikely to occur within the habitats within the development site:

- Ausfeld's Wattle
- Bluegrass

- Booroolong Frog
- Brush-tailed Phascogale
- Eastern Pygmy Possum
- Euphrasia arguta
- Koala
- Narrow Goodenia
- Prasophyllum sp. Wybong
- Scant Pomaderris
- Squirrel Glider
- Silky Swainson-Pea
- Small Purple Pea
- Tylophora linearis

Impacts to these species are unlikely and offsets are not required.

Hollow-bearing trees

Seventeen hollow-bearing trees would be removed within the development site (Figure 3-10). Hollows potentially provide roosting habitat for some species of microbats, parrots, owls and arboreal mammals. Hollow-dependant fauna species are likely to be impacted due to the proposal. However, most of the hollow-bearing trees will remain on site and still provide fauna habitat. Mitigation measures have been recommended to address the clearing risks to resident species (Section 5).

The number of hollows to be impacted is assessed within the BCC, via the plot data collected for each vegetation zone. This data adds to the value of the habitat to be removed, thereby requiring a greater number of credits to be retired. No specific requirement to offset hollows has been identified.

6.3 AREAS REQUIRING FURTHER IMPACT ASSESSMENT

Further assessment is required where the proposal would impact on any native vegetation that:

- a) is identified as a CEEC that is specifically nominated in the SEARs for the major project as a CEEC for which an impact does not require further consideration;
- b) is identified as an EEC that has a site value score ≥ 17 , unless it is an EEC that is specifically nominated in the SEARs for the proposal as an EEC for which an impact requires further consideration; or
- c) is associated with threatened species habitat and in a vegetation zone that has a site value score ≥ 17 .

Further assessment is also required where the proposal would impact on:

- a) Any critically endangered species;
- b) A threatened species or population that was not specifically nominated in the SEARs as a species or population for which an impact requires further consideration; or
- c) Threatened species habitat associated with a PCT in a vegetation zone with a site value score of ≥ 17 .

These impact areas are shown in Figure 6-1 and are assessed further in the sections below

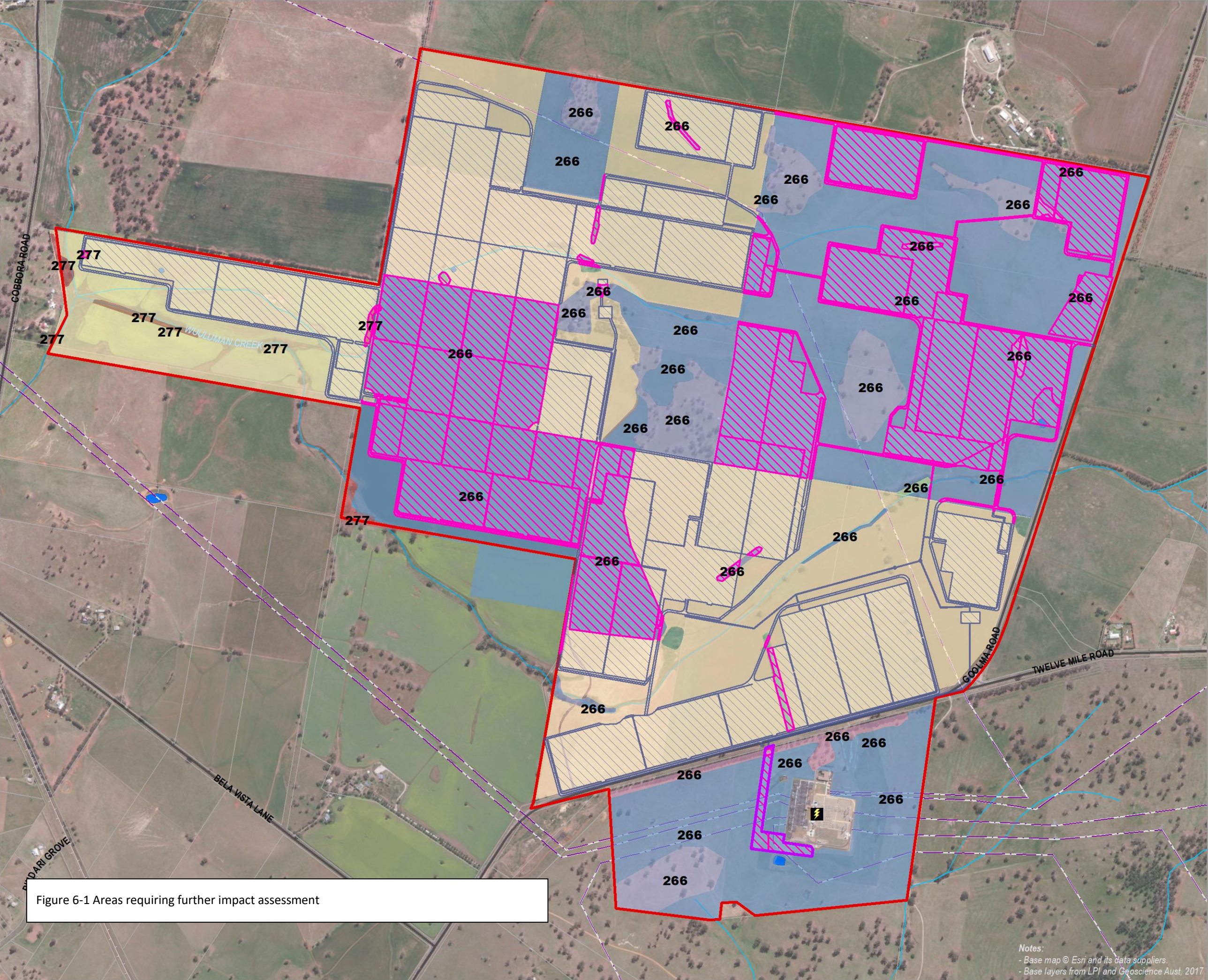


Figure 6-1 Areas requiring further impact assessment

- Project boundary
- Substation
- Local road
- Existing transmission lines
- Farm dam / other water body
- Minor drainage
- Drainage line
- Railway
- Cadastre
- Exotic vegetation
- Planted Yellow Box
- Planted local native
- Planted non-local native
- Blakely's Red Gum - Yellow Box grassy tall woodland (PCT 277)
- Blakely's Red Gum - Yellow Box grassy tall woodland derived grassland (PCT 277)
- White Box grassy woodland - planted (PCT 266)
- White Box grassy woodland (PCT 266)
- White Box grassy woodland derived grassland (PCT 266)
- Approved infrastructure
- Proposed substation expansion easement
- Impacted native

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Author: SP Date: 1/08/2019

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

7 IMPACT ASSESSMENT

7.1 AVOIDANCE OF IMPACTS

7.1.1 Site selection and planning phase

A preliminary constraints analysis was conducted by NGH Environmental (2017) which informed the site layout design. Vegetation constituting the highest ecological constraints such as forming components of EECs and providing threatened flora and fauna habitat were avoided as far as practical. Key changes to the proposal design included the avoidance of areas of White Box grassy woodland in moderate to good condition, streams and rocky outcrops.

7.2 DIRECT AND INDIRECT IMPACTS UNABLE TO BE AVOIDED

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 installation and existence of infrastructure. In assessing the impacts of the proposal, it is noted that the solar array panels will modify not remove vegetation through shading, however for the purpose of this assessment, 100% vegetation removal within the solar arrays has been assumed.

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 7-1 below details the type, frequency, intensity, duration and consequence of the direct and indirect impacts of the proposal.

Table 7-1 Potential impacts to biodiversity during the construction and operational phases

Impact	Frequency	Intensity	Duration	Consequence
Direct impacts				
Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks)	Regular	High	Construction phase	<ul style="list-style-type: none"> Direct loss of native flora and fauna habitat including hollow-bearing trees 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
Impacts to Wuuluman Creek and Riparian Vegetation.	Rare	Moderate	Construction Phase	<ul style="list-style-type: none"> Loss of Riparian Vegetation Bed and Bank Erosion
Shading by solar array infrastructure	Constant	Moderate	Operational phase	<ul style="list-style-type: none"> Potential loss of groundcover resulting in unstable ground surfaces and sedimentation of adjacent waterways
Existence of permanent solar infrastructure	Constant	Moderate	Operational phase	<ul style="list-style-type: none"> Collision risk to birds and microbats (fencing, array infrastructure)

Impact	Frequency	Intensity	Duration	Consequence
Indirect impacts				
Accidental spills and contamination from construction activities (including compound sites)	Rare	Moderate	Construction phase	<ul style="list-style-type: none"> Pollution of soils and dams
Earthworks	Regular	Moderate	Construction phase	<ul style="list-style-type: none"> Erosion and sedimentation and/or pollution of soils, dams and downstream habitats
Noise	Regular	Low	Construction phase	<ul style="list-style-type: none"> Construction machinery and activities may disturb local fauna
Dust generation	Regular	Low	Construction phase	<ul style="list-style-type: none"> Inhibit the function of plant species and communities, soils and dams
Light spills during night works	Rare	Low	Construction phase	<ul style="list-style-type: none"> May alter fauna activities and/or movements
Light spill during operation	Regular	Low	Operational phase	
Introduction/encouragement of feral pests, weeds or pathogens	Regular	Moderate	Construction phase	<ul style="list-style-type: none"> Feral pest, weed and/or pathogen encroachment
Increased Vehicle Traffic	Regular	Low	Operational phase	<ul style="list-style-type: none"> Increase potential for fauna mortality through vehicle strike
Mobilisation of sediments	Irregular	Moderate	Operational phase	<ul style="list-style-type: none"> Sedimentation of adjacent waterways (Wuuluman Creek)

7.3 CUMULATIVE IMPACTS

The clearing of native vegetation, which is a key threatening process at both State and Commonwealth level, is considered a major factor in the loss of biological diversity. At least 61 per cent of the native vegetation in NSW has been cleared or highly modified since European settlement (NSW Scientific Committee 2001), and the removal of native vegetation for this proposal is contributing to this process.

Cumulative impacts are considered best addressed by avoiding and minimising. The proposal largely avoids impacts to native vegetation and threatened species habitat and the cumulative contribution of the proposal to biodiversity impacts is low.

8 MITIGATION MEASURES PROPOSED

8.1.1 Construction phase

A range of mitigation measures will be implemented to ensure that impacts on biodiversity during the construction phase are avoided where possible, and minimised where they cannot be avoided. The mitigation measures that would be employed during the construction phase are provided in Table 8-1. Mitigation measures have considered methods of clearing, clearing operations, timing of construction and other measures that would minimise impacts of the proposal on biodiversity values.

8.1.2 Operational phase

Maintaining vegetation beneath the panels will be important to arrest erosion that would occur if bare areas develop. It is a commitment of the proposal to prepare a ground cover management plan.

Visual screening is part of the project description and is understood that some sections of the site's periphery would be planted with small trees or shrubs. This represents an opportunity to provide additional habitat as part of the project, if suitable native species are selected.

Where practical, measures to avoid other impacts on biodiversity during operation have been identified, including potential enhancement of habitat. These mitigation measures are provided in Table 8-1.

Table 8-1 Mitigation measures proposed to avoid and minimise direct and indirect impacts of the proposal

Impact	Direct, indirect, cumulative	Consequence	Measures to be implemented	Timing	Outcome
Removal or degradation of threatened and/or migratory species habitat	<ul style="list-style-type: none"> Direct 	<ul style="list-style-type: none"> Impacts to hollow dependant fauna 	<ul style="list-style-type: none"> Hollow-bearing trees within the development site would not be cleared between June and January, to avoid the breeding season of Superb Parrot and Corben's Long-eared Bat and the core hibernation period for Corben's Long-eared Bat. If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure these species do not occur. 	Construction phase	Impacts to threatened hollow dependent species are minimised
Habitat clearance	<ul style="list-style-type: none"> Direct 	<ul style="list-style-type: none"> Direct loss of native flora and fauna habitat 	<ul style="list-style-type: none"> Preparation of a Flora and Fauna Management Plan (FFMP) that would incorporate protocols for: <ul style="list-style-type: none"> Protection of native vegetation to be retained Best practice removal and disposal of vegetation Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist Weed management Unexpected threatened species finds Rehabilitation of disturbed areas <p>The FFMP would form part of the Wellington Solar Farm Construction Environmental Management Plan (CEMP).</p>	Pre-construction phase Construction phase	Minimise the impacts of habitat removal on native flora and fauna

Impact	Direct, indirect, cumulative	Consequence	Measures to be implemented	Timing	Outcome
	<ul style="list-style-type: none"> Direct 	<ul style="list-style-type: none"> Potential over clearing and/or damage of habitat outside of the development site. 	<ul style="list-style-type: none"> 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 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. 	Construction phase	Prevention of over-clearing.
	<ul style="list-style-type: none"> Direct 	<ul style="list-style-type: none"> Potential over clearing of Wuuluman Creek and Riparian Vegetation. 	<ul style="list-style-type: none"> A riparian buffer zone of 10-50m along Wuuluman Creek should be clearly delineated prior to works commencing. Works should be avoided within the riparian buffer zone. Existing native riparian vegetation is retained to the greatest extent possible in an undamaged and unaltered condition. Works occurring around the Wuuluman Creek should be in accordance with the DPI Fisheries Policy and Guideline document <i>Policies and Guidelines for Fish Habitat Conservation and Management</i>. 	Construction Phase	Prevention of loss of Riparian Vegetation.
Shading by solar array infrastructure	<ul style="list-style-type: none"> Direct 	<ul style="list-style-type: none"> Potential loss of groundcover resulting in unstable ground surfaces and sedimentation of adjacent waterways. 	<ul style="list-style-type: none"> A groundcover management plan would be developed and implemented to ensure an appropriate perennial ground cover is established and maintained beneath the arrays during operation of the solar farm. This will require consideration of existing 	Construction phase	Prevent/minimise erosion and sedimentation of waterways and sensitive adjacent habitat.

Impact	Direct, indirect, cumulative	Consequence	Measures to be implemented	Timing	Outcome
			groundcover and may require expert input and trials to achieve the objective.		
Appropriate landscaping	<ul style="list-style-type: none"> Direct 	<ul style="list-style-type: none"> Increase the quality of habitat for native flora and fauna species. 	<ul style="list-style-type: none"> 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)	<ul style="list-style-type: none"> Indirect 	<ul style="list-style-type: none"> Pollution of soils and dams. 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Indirect 	<ul style="list-style-type: none"> Erosion and sedimentation and/or pollution of soils, dams and downstream habitats. 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Indirect 	<ul style="list-style-type: none"> Construction machinery and activities may disturb local fauna. 	<ul style="list-style-type: none"> The Construction Environmental Management Plan will include measures to avoid noise encroachment on adjacent habitats such as avoiding night works as much as possible. 	Construction phase	Prevent/minimise noise impacts and disturbance to adjacent fauna.

Impact	Direct, indirect, cumulative	Consequence	Measures to be implemented	Timing	Outcome
Dust generation	<ul style="list-style-type: none"> Indirect 	<ul style="list-style-type: none"> Inhibit the function of plant species and communities, soils and dams. 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Indirect 	<ul style="list-style-type: none"> May alter fauna activities and/or movements. 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Indirect 	<ul style="list-style-type: none"> Feral pest, weed and/or pathogen encroachment. 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Indirect 	<ul style="list-style-type: none"> Increase potential for fauna mortality through vehicle strike. 	<ul style="list-style-type: none"> Awareness training during site inductions regarding enforcing site speed limits. Site speed limits to be enforced. 	Operational Phase	Minimise fauna strikes.
Mobilisation of sediments	<ul style="list-style-type: none"> Indirect 	<ul style="list-style-type: none"> Sedimentation of adjacent waterways (Wuuluman Creek). 	<ul style="list-style-type: none"> 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.

9 REQUIREMENT TO OFFSET

9.1 PCTS AND SPECIES POLYGONS REQUIRING AN OFFSET

9.1.1 Impacts on native vegetation

Offsets are required where the proposal would impact on any native vegetation that:

- a) is identified as a CEEC that is specifically nominated in the SEARs for the Major Project as a CEEC for which an impact does not require further consideration;
- b) is identified as an EEC that has a site value score ≥ 17 , unless it is an EEC that is specifically nominated in the SEARs for the proposal as an EEC for which an impact requires further consideration; or
- c) is associated with threatened species habitat and in a vegetation zone that has a site value score ≥ 17 .

The proposal would have a direct impact on four vegetation zones that are identified as an EEC with a site value >17 . These vegetation zones area summarised is Table 9-1

Table 9-1 Extent of vegetation communities within the development site and their impact areas

Zone ID	Vegetation zones	Condition class	Area (ha) within development site	EEC (Y/N)
1.	PCT #277 BVT CW112 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Low	0.27	Yes
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)	0.05	Yes
3.	PCT #266 BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	Low	1.88	Yes
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	0.67	Yes
6.	PCT #266 BVT CW216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion	² Derived Grassland - Low	126.76	No

² As the BCC cannot have two zones of the same PCT in the same condition, this zone had to be entered into the calculator as 'moderate to good – poor'.

Zone ID	Vegetation zones	Condition class	Area (ha) within development site	EEC (Y/N)
Total			129.64	

9.1.2 Ecosystem Credits generated

The ecosystem credits required are listed in table 9-2 below.

Table 9-2 Ecosystem credits required

Plant Community type	Area (ha)	Credits created
Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	0.27	0.00
White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	129.36	16.60
Total	129.63	17

9.1.3 Impacts on species and populations

Offsets are required where the proposal would impact on:

- d) Any critically endangered species;
- e) A threatened species or population that was not specifically nominated in the SEARs as a species or population for which an impact requires further consideration; or
- f) Threatened species habitat associated with a PCT in a vegetation zone with a site value score of ≥ 17 .

Ecosystem credit species

The BCC found that 24 threatened ecosystem credit fauna species were predicted to occur within the White Box grassy woodland PCT and thus require offsets, including:

Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis subsp. Gularis</i>
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus subsp. victoriae</i>
Bush Stone-curlew	<i>Burhinus grallarius</i>
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>
Diamond Firetail	<i>Stagonopleura guttata</i>
Flame Robin	<i>Petroica phoenicea</i>
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis subsp. temporalis</i>

Hooded Robin (south-eastern form)	<i>Melanodryas cucullata subsp. cucullata</i>
Little Eagle	<i>Hieraaetus morphnoides</i>
Little Lorikeet	<i>Glossopsitta pusilla</i>
Masked Owl	<i>Tyto novaehollandiae</i>
Painted Honeyeater	<i>Grantiella picta</i>
Powerful Owl	<i>Ninox strenua</i>
Scarlet Robin	<i>Petroica boodang</i>
Speckled Warbler	<i>Chthonicola sagittate</i>
Spotted Harrier	<i>Circus assimilis</i>
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>
Square-tailed Kite	<i>Lophoictinia isura</i>
Swift Parrot	<i>Lathamus discolor</i>
Turquoise Parrot	<i>Neophema pulchella</i>
Varied Sittella	<i>Daphoenositta chrysoptera</i>
Yellow-bellied Sheathtail-bat	<i>Saccolaimus flaviventris</i>

The offsets for these species are incorporated in the ecosystem credits for White Box Grassy Woodland (PCT 266).

Species credit species

No species credit species would be impacted by the proposal and as such no species credit species require offsets.

10 IMPACTS REQUIRING FURTHER CONSIDERATION

10.1.1 Impacts on landscape features

Impacts reducing width of riparian buffer of important rivers, streams and estuaries

Further consideration is required where the proposal would impact on areas of native vegetation within:

- a) 20 m either side of a 4th and 5th order stream;
- b) 50 m either side of a 6th order stream;
- c) 50 m around an estuarine area.

No 4th, 5th or 6th order streams, or estuarine areas will be impacted by the proposal. Impacts on important wetlands

Further consideration is required where the proposal would impact on an important wetland and/or its buffer distance of 50m. Important wetlands are those identified as SEPP 14 Coastal wetlands or those listed in the Directory of Important Wetlands of Australia (DIWA). The Macquarie Marshes occurs approximately 150km north west of the development site. It is fed by the Macquarie River of which Wuuluman Creek is a tributary. Given the distance from the development site, the potential for the proposal to indirectly impact on this wetland is low. Further, mitigation measures have been recommended in Section 6 to ensure that the potential for the mobilisation of sediments and pollutants is minimised.

The proposal would not impact on any important wetlands, nor on the buffer area of any important wetland, therefore further consideration is not required.

Impacts on species movements along corridors

No state significant biodiversity links as defined by the FBA are known to occur within the development site, therefore the proposal does not trigger the requirement for further consideration to impacts on species movement along corridors.

10.1.2 Impacts on native vegetation

Further consideration is required where there will be impacts to native vegetation that are likely to cause the extinction of an EEC/CEEC from an IBRA subregion or significantly reduce its viability unless the EEC is specifically excluded by the SEARs. White Box Yellow Box Blakely's Red Gum Grassy Woodland was identified in the SEARS as being specifically excluded from requiring further consideration.

10.1.3 Impacts on threatened species

Further consideration is required where the proposal would impact:

- a) Any critically endangered species;
- b) A threatened species or population that is specifically nominated in the SEARS as a species or population that is likely to become extinct or have its viability significantly reduced in the IBRA subregion if it is impacted on by the development; or
- c) A threatened species that has not previously been recorded in the IBRA subregion according to records in the NSW Wildlife Atlas.

One critically endangered species the Regent Honeyeater was nominated for further consideration by the SEARs. In accordance with section 9.2.5.2 the following information is provided to assess the nature of impacts to this species.

Size of the local Population

The Regent Honeyeater is highly mobile and comprises a single population across South East Australia. The total population size is estimated at 350-400 mature individuals. (Commonwealth of Australia, 2016). No sightings of this species have been recorded within the study area. The nearest recorded sighting of the Regent Honeyeater occurs approximately 10km south of the development site from 1996 (OEH Atlas Data, 2017). A further 14 records have been identified near Lake Burrendong, 20km south of the development site from the 1970's to late 1990s indicating a population may have frequented this area in the past. The nearest currently listed critical breeding habitat for the Regent Honeyeater occurs in the Mudgee district approximately 56km west of the development site.

The likely impact that the development will have on the local population

The Regent Honeyeater inhabits Box-Ironbark Eucalypt Woodlands and Dry Sclerophyll Forest (Commonwealth of Australia, 2016). It is a canopy bird, reliant on large flowering mature eucalypts and mistletoes as a food source. The majority of the 316ha development site is cleared of trees but some patches of remnant woodland remain. These are comprised of mature White Box (*Eucalyptus albens*) and the occasional Yellow Box (*Eucalyptus melliodora*). It is proposed 17 mature hollow-bearing trees would be removed in the development site. Most of these trees are scattered paddock trees that would provide minimal foraging habitat for the Regent Honeyeater. Larger patches of remnant White Box Woodland have been avoided by the development and these woodlands could still be utilised by the Regent Honeyeater for foraging when flowering.

The likely impact on the ecology of the local 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). The Regent Honeyeater nests in the canopy of mature trees with rough bark. The development site is not within a known breeding area and as such, the proposal would be unlikely to impact on the breeding cycle of the Regent Honeyeater.

The Regent Honeyeater forages on flowering eucalypts and mistletoes and moves to areas with large abundance of nectar. White Box (*Eucalyptus albens*), Yellow Box (*Eucalyptus melliodora*) and Mugga Ironbark (*Eucalyptus sideroxylon*) are some of the key foraging species for the Regent Honeyeater and these Eucalypt species are found within the development site. Some of these mature eucalypts would be removed through the proposal, however these trees are highly fragmented and do not provide an abundant food source. Larger remnant woodland patches have been largely avoided and would still provide a foraging source for the Regent Honeyeater should this species occur in the area.

The Regent Honeyeater roosts communally in small groups in mature trees with dense foliage (Commonwealth of Australia, 2016). Habitat fragmentation has reduced the areas that Regent Honeyeater will roost or forage in due to the colonisation of aggressive honeyeaters such as the Noisy Miner. Noisy Miners and other honeyeaters were present within the development site. The trees that are to be removed are highly fragmented from previous clearing and mostly scattered paddock trees. These areas are unlikely to provide suitable roosting habitat for the Regent Honeyeater.

The Regent Honeyeater moves across the landscape to areas with high nectar resources. Some paddock trees would be removed that would reduce the nectar source although this reduction is relatively small.

Small areas of remnant eucalypt woodland would remain that would still provide a resource for the Regent Honeyeater should it occur in the area.

The extent to which the local populations will become fragmented or isolated as a result of the proposed development

The Regent Honeyeater is nomadic and can undertake large scale movements of up to hundreds of kilometres (OEH, 2016). Due to their highly mobile nature the proposed development would unlikely fragment the population. The development site is a mainly cleared agricultural environment and it is unlikely to be providing a corridor for fauna movement. More connected woodland occurs south of the proposal site which would allow for fauna movement in an east west direction across the landscape.

The relationship of the local population to other populations of the species

The Regent Honeyeater is highly mobile and comprises a single population within South East Australia with exchange of individuals between regularly used areas. The proposal would not fragment the population or create a barrier to movement across its population extent. Thus, the proposal would be unlikely to impact on breeding, dispersal and genetic viability of the local population.

The extent to which the proposed development will lead to an increase in threats and indirect impacts that may in turn lead to a decrease in the viability of the local population.

Threats that impact on the survival of the Regent Honeyeater have been defined in the National Recovery Plan for the Regent Honeyeater (Commonwealth of Australia, 2016). These are listed as; a small population size, habitat loss and fragmentation, habitat degradation and increased competition from other nectivorous birds. The proposal would have a minor contribution to habitat loss and fragmentation considering the existing highly cleared and fragmented landscape.

The measures proposed to contribute to the recovery of the species in the IBRA subregion

The National Recovery Plan for the Regent Honeyeater proposes four strategies to contribute to the recovery of the Regent Honeyeater. These are to:

- Improve the extent and quality of Regent Honeyeater habitat
- Bolster the wild population with captive-bred birds until the wild population becomes self-sustaining
- Increase understanding of the size, structure, trajectory and viability of the wild population
- Maintain and increase community awareness, understanding and involvement in the recovery program

Offsets that are required for the proposal would contribute to improving the extent and quality of Regent Honeyeater habitat.

10.1.4 Impacts to EPBC Listed Species

Koala

Although not recorded during targeted surveys, the EPBC Referral Guidelines for the Koala (DoE 2014) documents the 'Koala habitat assessment tool' to assist proponents in determining if a proposal may impact on habitat critical to the survival of the Koala. The tool is provided as Table 10-1 below as it applies to the proposal. Impact areas that score five or more using the habitat assessment tool contain habitat critical to the survival of the Koala. The assessment in Table 10-1 resulted in a score of 3 and as such habitat

within the study area is not considered to be critical to the survival of the Koala. An assessment of significant impact or EPBC referral is not considered necessary for this species.

Table 10-1: Koala habitat assessment tool for inland areas (DoE 2014)

Attribute	Score	Inland	Applicable to the proposal?
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 5 years.	✓ No Koala records within 2km of the development site
	+1 (medium)	Evidence of one or more koalas within 2km of the edge of the impact area within the last 10 years.	
	0 (low)	None of the above.	
Vegetation composition	+2 (high)	Has forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species, OR 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	✓ White Box is a listed food tree and is the only tree present in the upper strata
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known koala food tree present.	
	0 (low)	None of the above.	
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥1000 ha.	
	+1 (medium)	Area is part of a contiguous landscape <1000 ha, but ≥500 ha.	
	0 (low)	None of the above.	✓
Key existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. Areas which score 0 for koala occurrence and have no dog or vehicle threat present	✓
	+1	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack	

Attribute	Score	Inland	Applicable to the proposal?
	(medium)	at present in areas that score 1 or 2 for koala occurrence, OR Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.	
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, OR Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.	
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	✓ Study area is not considered a habitat refuge, nor does it provide important connectivity to large areas surrounding a habitat refuge
Total	3	Decision: The impact area does not contain habitat critical to the survival of the Koala. An assessment of significant impact is not required.	

Regent Honeyeater, Swift Parrot, Superb parrot and Corben's Long-eared Bat

Other EPBC Act listed entities with the potential to occur at the site are the Critically Endangered Regent Honeyeater (*Anthochaera phrygia*), Critically Endangered Swift Parrot (*Lathamus discolor*), Vulnerable Superb Parrot (*Polytelis swainsonii*) and Vulnerable Corben's Long-eared Bat (*Nyctophilus corbeni*). An Assessment of significant impact was completed for these species (Appendix D) and concluded that a significant impact was unlikely on the basis that the proposal would not:

- lead to a long-term decrease in the size of a population of a species
- reduce the area of occupancy of a population,
- fragment an existing important population into two or more populations
- adversely affect habitat critical to the survival of a species

- disrupt the breeding cycle of a population
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a species becoming established in the species' habitat
- introduce disease that may cause the species to decline, or
- interfere substantially with the recovery of the species.

White box – Yellow box – Blakely's Red Gum grassy woodland and derived native grasslands CEEC

In the BAR lodged with the EIS (NGH Environmental 2017) the proposal was to remove 17% of the patch of the Box Gum grassy woodland CEEC within the proposal area. After the EIS consultation process, and as presented in the Submissions Report (NGH Environmental 2018), the CEEC patches were avoided by the development and no impacts would occur to this community. In this third update of the project's credit requirement, impacts on CEEC are still avoided.

A referral under the EPBC Act is not recommended for the White box – Yellow box – Blakely's Red Gum grassy woodland and derived native grasslands CEEC.

EPBC Offset requirement

There are no significant impacts identified for the White box – Yellow box – Blakely's Red Gum grassy woodland and derived native grasslands CEEC. No offsets are required in accordance with the EPBC Environmental Offsets Policy.

10.1.5 Impacts on aquatic ecology of Wuuluman Creek

The proposed infrastructure for the Wellington Solar Farm would not impact on the aquatic habitat of Wuuluman Creek. On the Eastern side of the proposal area where aquatic habitat is minimal and the creek is highly disturbed from grazing, a minimum 10 metre buffer would be in place between the solar infrastructure and creek bank. This is in accordance with the minimum buffer zones for a Type 3, Class 3 Water Way under the DPI Fisheries Policy and Guidelines for Fish Habitat Conservation and Management. In the west of the site, where Wuuluman Creek is a Type 2 Class 3 waterway, a minimum 50 metre buffer would be in place between the solar infrastructure and creek bank.

An overhead powerline would cross over Wuuluman Creek in the south east of the proposal area. This is shown in Figure 6-1. No trees or shrubs are present on the riverbanks at this location and no aquatic habitat or riparian vegetation would need to be removed for the construction of the overhead powerline.

11 OFFSET SUMMARY

11.1 FBA ECOSYSTEMS AND SPECIES CREDITS

A total of 17 ecosystem credits have been generated for the development site (BCC Major Project 144/2017/4350MP Version 4). No species credits have been generated. The BCC full credit report is provided in Appendix E.

Ecosystem credits

Ecosystem credits are required for the following PCTs:

- PCT 266 - White Box Grassy Woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – 15 ecosystem credits

Species credits

No species credits are required. Further detail is provided in Table 11-1 below.

If the credit profile of the final infrastructure layout cannot be reduced to zero, retirement of the biodiversity credits in accordance with the new Biodiversity Conservation Act 2016 must be undertaken.

A request to convert these 17 credits calculated via the Biobanking Scheme (in accordance with the FBA, under the TSC Act), using the Reasonable Equivalency Proforma, must be undertaken so the credits can be retired under the new Biodiversity Conservation Act 2016.

Table 11-1 Credit requirements (the consented layout and modified layout are included in this calculation)

Ecosystem credits

PCT type code	Plant community type name	Management zone area (ha)	Loss in Landscape Value	Loss in site value score	EEC Offset Multiplier	Credits req for TS	TS with highest credit req	TS offset multiplier	Ecosystem credits required
CW112	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	0.27	12.80	14.00	3.0	0		0.0	0
CW216	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	1.88	12.80	8.67	3.0	0		0.0	0
CW216	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	0.67	12.80	26.00	3.0	13	Speckled Warbler	2.6	15
CW216	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	126.76	12.80	10.67	1.0	1420	Masked Owl	3.0	0
CW216	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	0.05	12.80	32.67	3.0	1	Masked Owl	3.0	1

12 BIODIVERSITY CREDIT REPORT

The final credit report for the development is provided as Appendix E. The credit extract report produced by the BCC is provided overleaf. The report includes the requirement for 17 ecosystem credits.

BioBanking Credit Calculator

Ecosystem credits



Proposal ID : 144/2017/4350MP
 Proposal name : Wellington Solar Farm
 Assessor name : Brooke Marshall
 Assessor accreditation number : 0035
 Tool version : v4.0
 Report created : 02/08/2019 16:54

Assessment circle name	Landsc ape score	Vegetation zone name	Vegetation type name	Condition	Red flag status	Management zone name	Management zone area	Current site value	Future site value	Loss in site value	Credit required for biodiversity	Credit required for TS	TS with highest credit requirement	Average species loss	Species TG Value	Final credit requirement for management zone
Circle 1	12,80	CW112_Low	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Low	No	1	0,27	14,00	0,00	14,00	4	0		0,00	0,00	0
Circle 1	12,80	CW216_Low	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Low	No	3	1,88	8,67	0,00	8,67	18	0		0,00	0,00	0
Circle 1	12,80	CW216_Moderate/Good_Derived grassland	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate/Good_Derived grassland	No	5	0,67	26,00	0,00	26,00	15	13	Speckled Warbler	38,89	2,60	15
Circle 1	12,80	CW216_Moderate/Good_Poor	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate/Good_Poor	No	6	126,76	10,67	0,00	10,67	0	1,420	Masked Owl	33,33	3,00	0
Circle 1	12,80	CW216_Moderate/Good_Other	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate/Good_Other	Yes	1	0,05	32,67	0,00	32,67	1	1	Masked Owl	61,11	3,00	1

BioBanking Credit Calculator

Species credits



Proposal ID :

Proposal name :

Assessor name :

Assessor accreditation number :

Tool version : v4.0

Report created : 02/08/2019 16:54

Scientific name	Common name	Species TG value	Identified population?	Can Id. popn. be offset?	Area / number of loss	Negligible loss	Red flag status	Number of credits
No								

13 CONCLUSION

NGH Environmental has updated this BAR on behalf of Lightsource BP for the Wellington Solar Farm in Wellington, NSW. The purpose of updating this BAR, originally submitted with the Wellington Solar Farm EIS (NGH Environmental 2017) is to address the following changes:

3. The project footprint presented in the Submissions Report in 2018 was reduced to avoid impacts on a Critically Endangered Ecological Community (CEEC). The overall reduction on this community was 2.0751 ha. While the updated credit calculations were provided in the Submissions Report, the BAR was not updated at that time. This update now reflects the changes made in the Submissions Report.
4. The Modification Application (NGH Environmental 2019) being submitted to allow for substation expansion proposes to remove 1.707 hectares of vegetation for the easement and southern expansion of the substation to achieve compliance. The additional vegetation communities that would be impacted include:
 - a. White Box grassy woodland – planted (Moderate to good condition) - 0.05 ha
 - b. White Box grassy woodland derived grassland (Moderate to good condition) 0.65 ha
 - c. White Box grassy woodland derived grassland (Low condition) - 1.00 ha

This BAR update now reflects the changes made in the Modification Application.

The difference between the consented project and this update is 16.29 ha.

In this BAR, biodiversity impacts have been assessed through:

- Comprehensive mapping and assessment completed in accordance with the requirements in Appendix 4 of the FBA
- The identification of one threatened species, the Masked Owl within the development site, the impacts to which have been adequately assessed
- Mitigation measures which have been outlined in Table 8-1 to reduce the impacts to biodiversity
- The generation of 17 ecosystem credits within the development site which will need to be offset
- Consideration of MNES and offset requirements under the EPBC Act Environmental Offsets Policy

In assessing the impacts of the proposal, it is noted that the solar array panels will modify not remove vegetation through shading, however for the purpose of this assessment, 100% vegetation removal within the solar arrays has been assumed.

The project site is derived from Box Gum Woodland EEC vegetation. Areas of better quality EEC have been avoided through successive layout revisions. Mitigation measures outlined in Section 6, will assist to further to reduce the impacts to biodiversity. Residual impacts of the proposal include the generation of 15 ecosystem credits. No species credits have been generated.

14 REFERENCES

- Commonwealth of Australia (2016) *National Recovery Plan for the Regent Honeyeater (Anthochaera phrygia)*.
- Cropper, S.C. (1993). *Management of Endangered Plants*. CSIRO, East Melbourne, Victoria.
- DEC (2006) NSW Recovery Plan for the Large Forest Owls: Powerful Owl (*Ninox strenua*), Sooty Owl (*Tyto tenebricosa*) and Masked Owl (*Tyto novaehollandiae*) Department of Environment and Conservation (NSW), Sydney.
- DECC (2002) Descriptions for NSW (Mitchell) Landscapes Version 2. NSW Department of Environment and Climate Change.
- DoE (2017). Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: <http://www.environment.gov.au/sprat>.
- DoE (2014) EPBC Act Referral Guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory), Commonwealth Department of Environment, 2014.
- DoE (2015) Referral Guidelines for 14 Birds listed as migratory species under the EPBC Act, Commonwealth of Australia
- DoE (2015) Conservation Advice - *Nyctophilus corbeni* South-eastern Long-eared Bat, Threatened Species Scientific Committee.
- DPI (2013) *Fisheries Policy and Guidelines for Fish Habitat Conservation and Management*. Department of Primary Industries
- Environment Australia (2001) A Directory of Important Wetlands in Australia. 3rd Edition. Environment Australia, Canberra.
- Kavanagh R. P. and Stanton M. A. (2002) Response to habitat fragmentation by the Powerful Owl (*Ninox strenua*), Sooty Owl (*Tyto tenebricosa*), Masked Owl (*Tyto novaehollandiae*) and other nocturnal fauna in South-eastern Australia. In Ecology and Conservation of Owls, Kavanagh R. P. [Ed].
- NGH Environmental, 2017, *Biodiversity Assessment Report*, Wellington Solar Farm. Report prepared for Lightsource BP in April 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.
- NGH Environmental, 2019, *Biodiversity Management Plan*, Wellington Solar Farm. Report prepared for Lightsource BP in April 2019.
- NSW Scientific Committee (2001). Clearing of native vegetation – key threatening process listing.
- OEH (2016) NSW Vegetation Information System Classification Database. Accessed online via secure login at: <http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx>.

OEH (2014). Framework for Biodiversity Assessment: NSW Biodiversity Offsets Policy for Major Proposals. Published by Office of Environment and Heritage for the NSW Government.

OEH (2017). Threatened species profiles. [Online]. Available from:
<http://www.environment.nsw.gov.au/threatenedSpeciesApp>.

APPENDIX A SPECIES LISTS

Flora species list

Scientific name	Com6mon name	Family	WSF1		WSF2		WSF3		WSF4		WSF5		WSF6		WSF7		WSF8		WSF9		WSF10		WSF11		WSF12		WSF13		WSF14		WSF15	
			% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.
Trees																																
Brachychiton populneus	Kurrajong	Malvaceae													40	2													5	1		
Callitris glaucophylla	White Cypress Pine	Cupressaceae																								20	5					
Eucalyptus albens	White Box	Myrtaceae																			30	1							5	1	30	1
Eucalyptus conica	Fuzzy Box	Myrtaceae	20	1																												
Eucalyptus melliodora	Yellow Box	Myrtaceae	20	1																												
Eucalyptus sideroxylon	Mugga Ironbark	Myrtaceae																									50	8	10	2		
Shrubs																																
*Lycium ferocissimum	African Boxthorn	Solanaceae	1	1																	1	1					1	2				
Atriplex semibaccata	Creeping Saltbush	Chenopodiaceae																									1	10	1	10		
Einadia nutans	Climbing Saltbush	Chenopodiaceae								1	1													2	20	2	50	2	20			
Maireana microcarpa		Chenopodiaceae																											1	2		
Sclerolaena muricata	Black Rolypoly	Chenopodiaceae																											1	10		
Forbs																																
*Acetosella vulgaris	Sheep Sorrel	Polygonaceae					1														1	2										
*Alternanthera pungens	Khaki Weed	Amaranthaceae																			1	1					1	10	1	2		
*Arctotheca calendula	Capeweed	Asteraceae			10	50			2	10																						
*Brassica sp	Wild Mustard	Brassicaceae													1	1											2	10	2	50		
*Capsella bursa-pastoris	Shepard's Purse	Brassicaceae			1	10					1	20																				
*Carthamus lanatus	Saffron Thistle	Asteraceae							1	50	10	10			10	20	2	20	2	10	5	10	5	50	2	50	1	10	2	50	5	50
*Centaurea calcitrapa	Star Thistle	Asteraceae															1	2	2	10			10	10								
*Centaurea solstitialis	St Barnaby's Thistle	Asteraceae			1	5			5	10	15	20	1	3			40	50			1	5			1	10						
*Cerastium vulgare	Mouse-ear Chickweed	Caryophyllaceae					1												5	50	1	50										
*Chenopodium multifidum	Scented Goosefoot																												1	1		
*Chondrilla juncea	Skeleton Weed	Asteraceae	1	1					1	20			1	1			2	20	1	10			1	2								
*Cirsium vulgare	Spear Thistle	Asteraceae									1	2							1	5							1	2	1	20	5	50

Scientific name	Com6mon name	Family	WSF1		WSF2		WSF3		WSF4		WSF5		WSF6		WSF7		WSF8		WSF9		WSF10		WSF11		WSF12		WSF13		WSF14		WSF15	
			% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.
<i>*Conyza sp.</i>	Fleabane	Asteraceae			1	1					2	50																				
<i>*Cucumis myriocarpus</i>	Paddy Melon	Cucurbitaceae	1	5			1																									
<i>*Erodium spp.</i>	Crowfoot	Geraniaceae			1	50							1	1																		
<i>*Heliotropium spp.</i>	A Heliotrope	Boraginaceae					5																									
<i>*Hypochaeris radicata</i>	Catsear	Asteraceae					1		1	10			1	5					2	50	2	100	5	200	1	10	1	20			1	10
<i>*Lepidium bonariense</i>	Argentine Peppercross	Brassicaceae	1	5	1	10					2	50					1	3			1	10										
<i>*Lepidium sp.</i>	A Peppercross	Brassicaceae											1	50													2	200	2	500		
<i>*Malva parviflora</i>	Small-flowered Mallow	Malvaceae	10	500			1		1	5			5	20					1	50			1	50			1	20	1	10	2	50
<i>*Malva sp.</i>	Mallow	Malvaceae											5	10																		
<i>*Marrubium vulgare</i>	Horehound	Lamiaceae											2	20							1	1					1	5	5	50	2	50
<i>*Medicago polymorpha</i>	Burr Medic	Fabaceae (Faboideae)																						20	500	5	100			2	100	
<i>*Medicago sativa</i>	Lucerne	Fabaceae	5	50	50	500					2	50																				
<i>*Petrorhagia nanteuillii</i>	Proliferous Pink	Caryophyllaceae																	2	100										1	50	
<i>*Plantago lanceolata</i>	Lamb's Tongues	Plantaginaceae													5	100	2	10	2	100	2	50	1	50	1	20			1	20	1	5
<i>*Polygonum aviculare</i>	Wireweed	Polygonaceae			2	100			2	50	2	100													2	50	2	50	1	10		
<i>*Salvia verbenaca</i>	Vervain	Lamiaceae					1								2	100					1	10	10	100	2	100			2	10		
<i>*Sida rhombifolia</i>	Paddy's Lucerne	Malvaceae																											1	50		
<i>*Silybum marianum</i>	Variegated Thistle	Asteraceae	1	50			1				1	10			10	200			1	20	2	50							1	10	2	50
<i>*Sonchus oleraceus</i>	Common Sowthistle	Asteraceae							1	2					5	100			2	50												
<i>*Spergularia rubra</i>	Sandspurry	Caryophyllaceae					1																									
<i>*Stellaria media</i>	Common Chickweed	Caryophyllaceae					1																									
<i>*Taraxacum officinale</i>	Dandelion	Asteraceae																							1	10						
<i>*Tolpis barbata</i>	Yellow Hawkweed	Asteraceae							1	1									1	1												
<i>*Tribulus terrestris</i>	Cat-head	Zygophyllaceae							1	10			1	20																		
<i>*Trifolium arvense</i>	Haresfoot clover	Fabaceae																														
<i>*Trifolium campestre</i>	Hop Clover	Fabaceae (Faboideae)	1	50	5	50			20	500	10	200			1	20	10	500			10	100								1	50	
<i>*Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Faboideae)							15	200	5	100							1	20												

Scientific name	Com6mon name	Family	WSF1		WSF2		WSF3		WSF4		WSF5		WSF6		WSF7		WSF8		WSF9		WSF10		WSF11		WSF12		WSF13		WSF14		WSF15	
			% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.
* <i>Trifolium repens</i>	White Clover	Fabaceae (Faboideae)																			10	100										
* <i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Faboideae)					2						2	50	5	200	2	200	10	200							5	200			1	50
* <i>Veronica spp.</i>		Plantaginaceae																									2	100				
* <i>Xanthium spinosum</i>	Bathurst Burr	Asteraceae			1	5	1								2	20					1	2										
<i>Acaena novae-zelandiae</i>	Bidgee-widgee	Rosaceae							2	50																						
<i>Boerhavia dominii</i>	Tarvine	Nyctaginaceae											1	1						1	1			1	5							
<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae			1	20	1		5	100	1	5	1	50																		
<i>Chrysocephalum apiculatum</i>	Common Everlasting	Asteraceae																										1	20			
<i>Convolvulus erubescens</i>	Pink Bindweed	Convolvulaceae									1	1																				
<i>Cotula australis</i>	Common Cotula	Asteraceae																								1	2					
<i>Crassula sieberiana</i>	Australian Stonecrop	Crassulaceae											1	50																		
<i>Cymbonotus lawsonianus</i>	Bear's Ear	Asteraceae																						1	1	1	2					
<i>Daucus glochidiatus</i>	Native Carrot	Apiaceae									1	5															1	20				
<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Faboideae)																												1	1	
<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae			10	500	1																									
<i>Dysphania pumilio</i>	Small Crumbweed	Chenopodiaceae					1																									
<i>Euchiton involucratus</i>	Star Cudweed	Asteraceae											1	1															1	5		
<i>Geranium potentilloides</i>		Geraniaceae																					1	50								
<i>Glycine clandestina</i>	Twining glycine	Fabaceae (Faboideae)																			1	1										
<i>Glycine tabacina</i>	Variable Glycine	Fabaceae (Faboideae)											2	2																		
<i>Haloragis heterophylla</i>	Variable Raspwort	Haloragaceae											1	1																		
<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	Apiaceae					2		2	100			2	100											1	100						
<i>Opercularia hispida</i>	Hairy Stinkweed	Rubiaceae							1	2																						
<i>Oxalis perennans</i>	Oxalis	Oxalidaceae					1		2	100			1	100							1	10	2	100	5	100					2	100
<i>Oxalis radicata</i>		Oxalidaceae							5	100			1	100	5	200	2	100	2	100	2	20					2	100			5	200
<i>Plantago cunninghamii</i>	Sago-weed	Plantaginaceae											1	10																		

Scientific name	Com6mon name	Family	WSF1		WSF2		WSF3		WSF4		WSF5		WSF6		WSF7		WSF8		WSF9		WSF10		WSF11		WSF12		WSF13		WSF14		WSF15															
			% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.														
<i>Rumex brownii</i>	Swamp Dock	Polygonaceae											2	20							1	1							1	5																
<i>Senna barclayana</i>	Smooth Senna	Fabaceae (Caesalpinioideae)					1						1	50									5	4					1	5	1	1														
<i>Sida corrugata</i>	Corrugated Sida	Malvaceae											2	2										2	200			1	20																	
<i>Veronica plebeia</i>	Trailing Speedwell	Plantaginaceae											1	1																																
<i>Vittadinia cuneata</i>	Fuzzweed	Asteraceae			1	5	1				1	20										2	20	2	5	1	2	1	20																	
<i>Wahlenbergia communis</i>	Tufted Bluebell	Campanulaceae			1	1			1	10													2	100																						
<i>Wahlenbergia luteola</i>	Bluebell	Campanulaceae							1	50			1	200										1	20			1	20																	
<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulaceae					1				1	2					1	2								1	5																			
<i>Zaleya galericulata</i>	Hogweed	Aizoaceae	1	3																																										
Grasses																																														
<i>*Bromus catharticus</i>	Praire Grass	Poaceae											10	200											2	100											1	10	20	500	40	500				
<i>*Bromus diandrus</i>	Great Brome	Poaceae			1	2																																								
<i>*Bromus hordeaceus</i>	Soft Brome	Poaceae	20	100									1	20																																
<i>*Bromus sp.</i>	Brome	Poaceae					20													5	100																									
<i>*Digitaria sanguinalis</i>	Crab Grass	Poaceae																					2	50																						
<i>*Echinochloa crus-galli</i>	Barnyard Grass	Poaceae			1	10																																								
<i>*Eragrostis curvula</i>	African Lovegrass	Poaceae																1	4																											
<i>*Festuca spp.</i>		Poaceae																			20	500																								
<i>*Lolium perenne</i>	Perennial Ryegrass	Poaceae	5	100	1	10			2	100					30	500	2	100	10	200	5	100	10	100	2	100	5	200																		
<i>*Phalaris aquatica</i>	Phalaris	Poaceae																	2	50			10	50																						
<i>Aristida behriana</i>	Bunch Wiregrass	Poaceae											1	5																																
<i>Austrostipa aristiglumis</i>	Plains Grass	Poaceae																									1	20																		
<i>Austrostipa setacea</i>	Corkscrew Grass	Poaceae											1	2																					1	50	10	100								
<i>Austrostipa verticillata</i>	Slender Bamboo Grass	Poaceae																																									5	100		
<i>Austrostipa sp.</i>	Spear Grass	Poaceae			1	10	10		2	50			2	50											5	200			10	100																
<i>Bothriochloa macra</i>	Red Grass	Poaceae			1	50	10		5	200	40	500	1	50	1	50	20	500	20	500	5	100	20	200	30	100			2	50																

Scientific name	Com6mon name	Family	WSF1		WSF2		WSF3		WSF4		WSF5		WSF6		WSF7		WSF8		WSF9		WSF10		WSF11		WSF12		WSF13		WSF14		WSF15		
			% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	% cov er	# indi v.	
<i>Chloris truncata</i>	Windmill Grass	Poaceae			1	20	1		1	5			1	10									2	50	2	200			1	10			
<i>Cynodon dactylon</i>	Couch	Poaceae			1	5	5																										
<i>Dichanthium sericeum</i>	Queensland Bluegrass	Poaceae																						2	50	1	10						
<i>Digitaria brownii</i>	Cotton Panic Grass	Poaceae			1	10			1	50	2	75	30	500			2	100	2	100			2	50	5	200							
<i>Digitaria divaricatissima</i>	Umbrella Grass	Poaceae								5	1	10	2	10											5	200							
<i>Elymus scaber</i>	Common Wheatgrass	Poaceae							1																		2	100					
<i>Enneapogon nigricans</i>	Niggerheads	Poaceae											1	20					1	10					5	200	1	50	2	50			
<i>Enneapogon spp.</i>	Nineawn Grass, Bottlewashers	Poaceae							15	200																							
<i>Enteropogon ramosus</i>	Curly Windmill Grass	Poaceae			20	200					2	50	1	50																			
<i>Eragrostis brownii</i>	Brown's Lovegrass	Poaceae			1	20	1		1	10			1	100										2	50								
<i>Eriochloa pseudoacrotricha</i>	Early Spring Grass	Poaceae									5	100																					
<i>Paspalidium constrictum</i>	Knottybutt Grass	Poaceae							1	50																							
<i>Paspalidium distans</i>		Poaceae					1																										
<i>Panicum effusum</i>	Hairy Panic	Poaceae							1	5															1	100							
<i>Rytidosperma caespitosum</i>	Ringed Wallaby Grass	Poaceae																							2	50	1	5	2	10			
<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae															1	5							1	20							
Graminoids																																	
<i>Juncus sp.</i>	Rush	Juncaceae																															
Ferns																																	
<i>Marsilea drummondii</i>	Common Nardoo	Marsileaceae																															

Fauna species list

Class	Scientific Name	Common Name	Status (BC/EPBC)	Number of Sightings
Amphibia				
	<i>Crinia parinsignifera</i>	Beeping froglet		1
	<i>Crinia signifera</i>	Clicking froglet		2
Aves				
	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater		1
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill		2
	<i>Acanthiza nana</i>	Yellow Thornbill		6
	<i>Anthochaera carunculata</i>	Red Wattlebird		1
	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo		4
	<i>Corvus bennetti</i>	Little Crow		3
	<i>Corvus coronoides</i>	Australian Raven		10
	<i>Cracticus tibicen</i>	Australian Magpie		6
	<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater		3
	<i>Eolophus roseicapillus</i>	Galah		20
	<i>Grallina cyanoleuca</i>	Magpie-lark		3
	<i>Hirundo neoxena</i>	Welcome Swallow		2
	<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater		3
	<i>Malurus cyaneus</i>	Superb Fairy-wren		5
	<i>Manorina melanocephala</i>	Noisy Miner		7
	<i>Ocyphaps lophotes</i>	Crested Pigeon		2
	<i>Pachycephala rufiventris</i>	Rufous Whistler		1
	<i>Platycercus eximius</i>	Eastern Rosella		4
	<i>Psephotus haematonotus</i>	Red-rumped Parrot		9
	<i>Rhipidura leucophrys</i>	Willie Wagtail		8
	<i>Sturnus vulgaris</i>	Common Starling		7
	<i>Tyto novaehollandiae</i>	Masked Owl	Vulnerable (BC Act)	1
Microbats				
	<i>Chalinolobus gouldii</i>	Gould's Wattle Bat		
	<i>Vespadelus sp.</i>			
	<i>Mormopterus sp.</i>			
	<i>Nyctophilus sp.</i>			

APPENDIX B HOLLOW-BEARING TREE DATA

Easting	Northing	ID	Species	Height (m)	DBH (cm)	Small Trunk	Medium Trunk	Large Trunk	Small Limb	Medium Limb	Large Limb	Small Fissure	Medium Fissure	Large Fissure
148.963	-32.5249	HBT 1	Stag	12	40							2		
148.9627	-32.525	HBT 2	Stag	8	20	2								
148.9654	-32.5243	HBT 3	<i>Eucalyptus blakelyi</i>	12	50				1				1	
148.9662	-32.5241	HBT 4	Stag	10	30							3		
148.9671	-32.5239	HBT 5	Stag	12	40							2		
148.9672	-32.5239	HBT 6	Stag	6	20							1		
148.9673	-32.5239	HBT 7	<i>Eucalyptus sideroxylon</i>	12	50							1	2	
148.9659	-32.5242	HBT 8	<i>Eucalyptus blakelyi</i>	15	40		2							
148.9564	-32.5293	HBT 9	<i>Eucalyptus albens</i>	14	80		1		2					
148.9573	-32.5288	HBT 10	<i>Eucalyptus albens</i>	14	100					2				
148.9578	-32.5286	HBT 11	<i>Eucalyptus albens</i>	14	70				2	2				
148.9581	-32.5289	HBT 12	<i>Eucalyptus albens</i>	16	90		1			3				
148.9585	-32.5297	HBT 13	<i>Eucalyptus albens</i>	14	80		2							
148.9594	-32.5294	HBT 14	<i>Eucalyptus albens</i>	14	50		2			1				
148.9597	-32.5286	HBT 15	<i>Eucalyptus albens</i>	15	90			1		3				
148.959	-32.5283	HBT 16	<i>Eucalyptus albens</i>	12	90		2		1	2				
148.959	-32.5286	HBT 17	<i>Eucalyptus albens</i>	14	90		1	1		2				
148.9588	-32.5285	HBT 18	<i>Eucalyptus albens</i>	12	100		1			2				
148.9583	-32.5283	HBT 19	<i>Eucalyptus albens</i>	8	70		2							
148.9627	-32.525	HBT 2	Stag	8	20	2								
148.9654	-32.5243	HBT 3	<i>Eucalyptus blakelyi</i>	12	50				1				1	
148.9662	-32.5241	HBT 4	Stag	10	30							3		
148.9671	-32.5239	HBT 5	Stag	12	40							2		

Easting	Northing	ID	Species	Height (m)	DBH (cm)	Small Trunk	Medium Trunk	Large Trunk	Small Limb	Medium Limb	Large Limb	Small Fissure	Medium Fissure	Large Fissure
148.9672	-32.5239	HBT 6	Stag	6	20							1		
148.9673	-32.5239	HBT 7	<i>Eucalyptus sideroxylon</i>	12	50							1	2	
148.9659	-32.5242	HBT 8	<i>Eucalyptus blakelyi</i>	15	40		2							
148.9564	-32.5293	HBT 9	<i>Eucalyptus albens</i>	14	80		1		2					
148.9573	-32.5288	HBT 10	<i>Eucalyptus albens</i>	14	100					2				
148.9578	-32.5286	HBT 11	<i>Eucalyptus albens</i>	14	70				2	2				
148.9581	-32.5289	HBT 12	<i>Eucalyptus albens</i>	16	90		1			3				
148.9585	-32.5297	HBT 13	<i>Eucalyptus albens</i>	14	80		2							
148.9594	-32.5294	HBT 14	<i>Eucalyptus albens</i>	14	50		2			1				
148.9597	-32.5286	HBT 15	<i>Eucalyptus albens</i>	15	90			1		3				
148.959	-32.5283	HBT 16	<i>Eucalyptus albens</i>	12	90		2		1	2				
148.959	-32.5286	HBT 17	<i>Eucalyptus albens</i>	14	90		1	1		2				
148.9588	-32.5285	HBT 18	<i>Eucalyptus albens</i>	12	100		1			2				
148.9583	-32.5283	HBT 19	<i>Eucalyptus albens</i>	8	70		2							
148.9573	-32.5275	HBT 20	<i>Eucalyptus albens</i>	14	80		2							
148.9564	-32.5272	HBT 21	<i>Eucalyptus albens</i>	12	70	2			2					
148.963	-32.5296	HBT 22	Stag	10	70	2	3			2				
148.9587	-32.5259	HBT 23	Stag	10	30	2			1					
148.9609	-32.5254	HBT 24	<i>Eucalyptus blakelyi</i>	14	50		1	1						
148.96	-32.5256	HBT 25	<i>Eucalyptus blakelyi</i>	14	60									

Easting	Northing	ID	Species	Height (m)	DBH (cm)	Small Trunk	Medium Trunk	Large Trunk	Small Limb	Medium Limb	Large Limb	Small Fissure	Medium Fissure	Large Fissure
148.9588	-32.5259	HBT 26	<i>Eucalyptus blakelyi</i>	14	60									
148.9649	-32.5211	HBT 27	Building	0	0									
148.9608	-32.5192	HBT 28	<i>Eucalyptus albens</i>	14	80			1		2				
148.9593	-32.519	HBT 29	Hut	0	0									
148.9606	-32.5183	HBT 30	<i>Schinus molle</i>	12	80		1		1	2				
148.9642	-32.5172	HBT 31	<i>Eucalyptus albens</i>	14	70		2		1	2				
148.9668	-32.5169	HBT 32	Stag	10	40							1	2	
148.9649	-32.5137	HBT 33	<i>Eucalyptus albens</i>	12	70		2		1	2				
148.9655	-32.5136	HBT 34	<i>Eucalyptus albens</i>	12	70	1			2					
148.9645	-32.5125	HBT 35	Stag	6	20	2			1					
148.9703	-32.509	HBT 36	<i>Brachychiton populneus</i>	10	100					2				
148.9702	-32.5126	HBT 37	<i>Brachychiton populneus</i>	8	90							2		
148.9703	-32.513	HBT 38	<i>Eucalyptus albens</i>	14	80		2			2				
148.9701	-32.5181	HBT 39	<i>Eucalyptus sideroxylon</i>	15	70							3	5	
148.9702	-32.518	HBT 40	<i>Eucalyptus sideroxylon</i>	15	50								2	
148.9704	-32.5181	HBT 41	<i>Eucalyptus blakelyi</i>	16	60		1							
148.9706	-32.5181	HBT 42	<i>Eucalyptus blakelyi</i>	14	50		1			2				
148.9705	-32.5184	HBT 43	Stag	14	50							3	1	
148.9549	-32.5161	HBT 44	<i>Eucalyptus albens</i>	10	90			1	2	3				

Easting	Northing	ID	Species	Height (m)	DBH (cm)	Small Trunk	Medium Trunk	Large Trunk	Small Limb	Medium Limb	Large Limb	Small Fissure	Medium Fissure	Large Fissure
148.9584	-32.5135	HBT 45	<i>Eucalyptus albens</i>	14	90		1			1				
148.9582	-32.5135	HBT 46	<i>Eucalyptus albens</i>	8	60		1							
148.9593	-32.5142	HBT 47	<i>Eucalyptus albens</i>	14	70		1		2	3				
148.9595	-32.5144	HBT 48	<i>Eucalyptus albens</i>	14	60		1 (bees)							
148.9594	-32.5144	HBT 49	<i>Eucalyptus albens</i>	12	70					1		1		
148.9588	-32.5148	HBT 50	<i>Eucalyptus albens</i>	14	60					2				
148.9586	-32.5146	HBT 51	<i>Eucalyptus albens</i>	14	70							1		
148.9571	-32.5131	HBT 52	<i>Eucalyptus albens</i>	14	80		2		1					
148.9569	-32.5132	HBT 53	<i>Eucalyptus albens</i>	16	70					2				
148.9611	-32.5063	HBT 54	<i>Eucalyptus albens</i>	14	50					1	1			
148.9609	-32.507	HBT 55	<i>Eucalyptus albens</i>	14	80				1	2				
148.9488	-32.5078	HBT 56	<i>Eucalyptus albens</i>	16	80		2		2	2				
148.9493	-32.5111	HBT 57	Stag	6	30				1			1		
148.9469	-32.5116	HBT 58	Stag	6	70		2	1		3	1			
148.9469	-32.5117	HBT 59	Stag	16	60		3	1	2	3			1	
148.9468	-32.5125	HBT 60	<i>Eucalyptus melliodora</i>	15	90		1	2		2				
148.9466	-32.5132	HBT 61	<i>Eucalyptus albens</i>	14	70					2				
148.9466	-32.5134	HBT 62	Stag	6	70		1		1					

APPENDIX C EPBC PROTECTED MATTERS SEARCH



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.

Report created: 25/07/19 11:42:24

[Summary](#)

[Details](#)

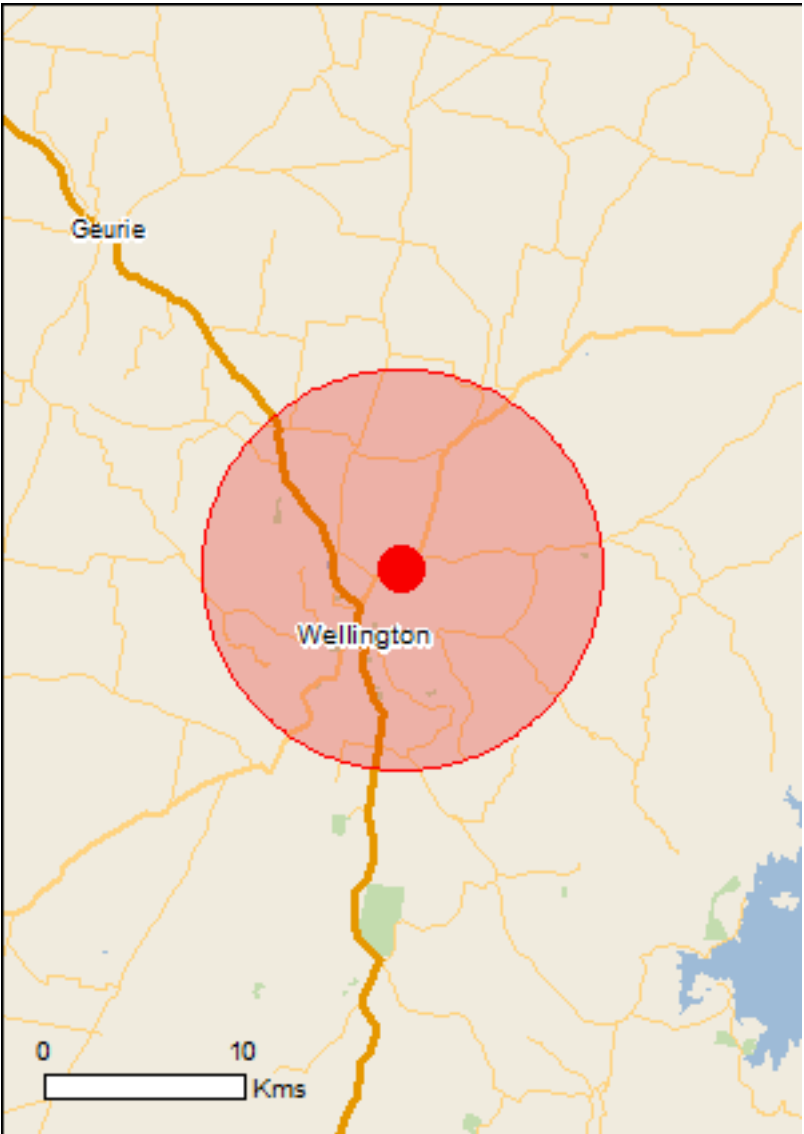
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

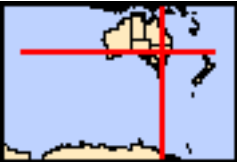
[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 10.0Km



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:	2
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]
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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
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]
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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
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species

Name	Status	Type of Presence
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	habitat known to occur within area Species or species habitat may 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 area

Name	Status	Type of Presence
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
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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 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 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

Name	Threatened	Type of Presence
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 may occur within area

Extra Information

Invasive Species	[Resource Information]
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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 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

Name	Status	Type of Presence
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 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

Name	Status	Type of Presence
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

-32.52773 148.96187

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.

APPENDIX D EPBC ACT ASSESSMENTS OF SIGNIFICANCE

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)
- Regent Honeyeater (Critically Endangered)
- Swift Parrot (Critically Endangered)
- Superb Parrot (Vulnerable)
- Corben’s Long Eared Bat (Vulnerable)

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 context of the assessments below, ‘the action’ refers to ‘the proposal’ as described in Section 1.

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

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

Reduce the extent of an ecological community

One 9ha patch of EPBC listed Box-Gum Woodland Community occurs on the hill slope in the centre of the development site where more than 12 native forb species are present in the understory. In 2017, the proposal was to impact 1.61 ha of this EPBC listed community to construct a transmission line. This was 17 percent of the patch of Box Gum Grassy Woodland. In 2018, the Submissions Report was updated to avoid any impacts in this area to prevent any loss of this CEEC. The proposal would not reduce the extent of the ecological community.

fragment or increase fragmentation of an ecological community,

The 1.61ha of box gum woodland is no longer proposed to be impacted so the woodland patch will not be further fragmented.

adversely affect habitat critical to the survival of an ecological community

Habitat critical to the survival of the Box Gum Woodland includes the moderate to highly fertile slopes of the Western Slopes of NSW. Areas of Box Gum Grassy Woodland that meet the condition criteria for the EPBC listed community should be considered critical to the survival of the ecological community (DECC, 2010). The 9ha patch of Box-Gum Grassy Woodland within the proposal would be considered habitat critical to the survival of the ecological community.

modify or destroy abiotic factor necessary for an ecological community's survival, including reduction of groundwater levels or substantial alteration of surface water drainage patterns.

During construction, the proposal would have a short term gross impact upon soils and possibly surface water flow, within discreet areas. These impacts are manageable with the implementation of erosion and sediment controls and would be unlikely to further degrade the community in the long-term. The actions associated with the proposal are not considered likely to substantially alter hydrological patterns necessary for the community's survival.

cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionality important species, for example through regular burning or flora or fauna harvesting.

The development could cause a change in species composition through soil disturbance for the construction of the transmission line. Once the transmission line is constructed however, there would be no further disturbance to the understory and groundcover species would be able to regenerate from the soil seed bank. Mitigation measures have been recommended to adequately manage risks associated with weed and/or disease introduction and spread. The proposal would be unlikely to cause a substantial change in species composition in remaining areas of the community, including through tree removal and disturbance, harvesting, disease infection, weed invasion or alteration to grazing, burning or flooding regimes.

Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community including but not limited to: assisting invasive species that are harmful to the listed ecological community to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community

The proposal has the potential to introduce or assist the spread of invasive weed species. The invasion of native vegetation by exotic perennial grasses is a particular risk for the community. These risks would be reduced to acceptable levels through weed and hygiene protocols, pre and post works weed control, soil erosion and sedimentation control and effective and timely site rehabilitation. The use of fertilisers is not proposed.

Chemical pollution risks would be reduced using chemical spill kits and site sediment control structures. With these controls in place, the works are not expected to result in impacts from weeds or pollutants

Interfere with the recovery of an ecological community

The objectives for the Box Gum Grassy Woodland Recovery Plan are to minimise the risk of extinction of the ecological community through:

1. Achieving no net loss in extent and condition of the ecological community
2. Increasing protection of sites with high recovery potential
3. Increasing landscape functionality of the ecological community through management and restoration of degraded sites
4. Increasing transitional areas around remnants and linkages between remnants
5. Bringing about enduring changes in participating land manager attitudes and behaviours towards environmental protection and sustainable land management practices to increase extent, integrity and function of Box-gum Grassy Woodland.

The proposal supports the objectives of the recovery plan.

Conclusion

The proposal will no longer remove any of the Box Gum grassy woodland CEEC within the proposal area. The habitat within the patch is considered to be critical to the survival of the community and is the only known habitat meeting the condition criteria for the CEEC in the proposal area. Other areas of CEEC in the locality are likely to be limited based on the current land uses and resulting degradation observed during the site surveys. Although further changes to species composition and indirect impacts to the remaining area of the community are considered manageable, the proposal area is not considered to be potentially significant, as it is not likely to reduce the long-term capacity of the patch to survive. A referral under the EPBC Act is no longer recommended for the White box – Yellow box – Blakely's Red Gum grassy woodland and derived native grasslands CEEC.

REGENT HONEYEATER AND SWIFT PARROT (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). The Swift Parrot breeds in Tasmania (OEH 2017). As such, the development site contains potential foraging resources for these species only. Both species rely 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 3.33 hectares of overstorey vegetation that could provide foraging resources for these species. Given this minor reduction 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 these 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 these 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 these 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 these 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 3.33ha 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 or Swift Parrot.

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 Flora and fauna 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

Beak and Feather Disease has been proven to impact the Swift Parrot (DoE, 2017), however the proposal is not considered likely to act as a vector for the disease.

interfere with the recovery of the species

Core breeding areas and surrounding habitat are considered important to the recovery of these species. Maintaining movements across the landscape between breeding and foraging areas for the Swift Parrot is also considered important for this species recovery. 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 or Swift Parrot.

SUPERB PARROT (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 breeding population of Superb Parrots *Polytelis swainsonii* is approximately 6500. The species is somewhat mobile, and typically utilises foraging habitat within 10km of breeding habitat (SPRAT, 2017). No records of the Superb Parrot occur within the proposal area. No known population of Superb Parrot occurs within the proposal area.

The development site is not part of a core breeding area for the Superb Parrot. Nonetheless, the proposal will remove approximately 1.81ha of woodland vegetation containing native canopy and native understorey species and 1.75ha of low condition woodland with an exotic understorey in addition to the clearing of 17 hollow-bearing trees. Additionally, the potential foraging area for the species would be reduced as cropping would no longer occur within the development site. The proposal is not considered likely to lead to a long-term decrease in the size of the population, as the development would likely constitute only a small portion of the population's foraging and breeding range within the NSW South West Slopes.

reduce the area of occupancy of an important population,

As an important population is not considered to occur within the development site, the proposal is not considered to reduce the area of occupancy of an important population. The broader proposal area will continue to contain suitable areas of breeding and foraging habitat of a sufficient size and quality to maintain individuals of the species within the proposal area and the wider locality.

fragment an existing important population into two or more populations

As the individuals of the species are not considered to form an important population, the proposal is not considered to fragment an existing important population. Vegetative connectivity within the Proposal Area will be maintained and improved through planting and avoidance of impacts to vegetation. As the species is highly mobile, the proposal will not impact on its movement within or across the development site.

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 breeding, 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

No known important population occurs within the proposal area. Three main breeding areas for the superb parrot occur in NSW. The nearest known breeding area to the proposal area occurs in the South West Slopes near Molong, approximately 65km south of Wellington. Within the South West Slopes, the Superb Parrot breeds in hollows in River Red Gum, Blakely's Red Gum, Apple Box, Grey Box, White Box and Red Box species. The nests are usually located near water and the same nest hollows are used in successive years. the individuals of the species are not considered to form an important population, the proposal is not considered likely to disrupt the breeding cycle of an important population. The superb parrot could potentially utilise the development site as a breeding resource, however the use of isolated paddock trees for breeding is considered unlikely. Suitable woodland habitat has been avoided and will be retained throughout the Proposal Area, thus ensuring that individuals could continue to utilise the Proposal Area, and the breeding cycle of the broader population is not 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 1.81ha of moderate to good quality woodland vegetation containing native canopy and native understorey species. Additionally, the potential foraging area for the species would be reduced as cropping would no longer occur within the development site. 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 vulnerable species becoming established in the vulnerable species' habitat

The proposal is not considered likely to result in invasive species becoming established within the Superb Parrot's habitat. Competition with Noisy Miners for breeding and foraging habitat and resources is a major threat to the species and cause for the decline in population numbers. Noisy Miners are already present at the development site. The proposal is unlikely to result in invasive species such as these that are harmful to the habitat of the Superb Parrot.

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 Flora and fauna 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

Beak and Feather Disease has been proven to impact the Superb Parrot (DoE, 2017), however the proposal is not considered likely to act as a vector for the disease.

interfere with the recovery of the species

Core breeding areas and surrounding habitat are considered important to the recovery of the species. The nearest known breeding area to the proposal area occurs in the South West Slopes near Molong, approximately 65km south of Wellington and the species typically utilises foraging habitat within 10km of breeding habitat. Habitats across the broader proposal area will remain available to the species and given its 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 Superb Parrot.

Conclusion:

As the individuals of the species that could potentially utilise the development site are not considered to constitute an important population of the species, the proposal is not considered likely to impact on an important population. Though there will be the removal of 1.81ha of moderate to good quality woodland vegetation, 1.75ha of low condition woodland and 17 paddock trees containing hollows, the extent of vegetation removal is not considered likely to impact the species to the degree that they would no longer utilise the proposal area as habitat. Areas of vegetation where the species was detected have been avoided throughout the project design phase, and areas of higher quality native vegetation will be retained within the proposal area, thus ensuring that suitable habitat continues to occur within the proposal area. As such, impacts to the Superb Parrot are unlikely to be significant, and a referral under the EPBC Act is not required.

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.

No known records of this species occur within the locality of the proposal area. A *Nyctophilus* species was detected through the ANABAT however the species could not be identified from calls alone. Suitable habitat for this species occurs within the proposal area. The proposal will remove a total of 17 hollow-bearing trees, which contain hollows suitable for roosting for Corben's Long-eared Bat. The foraging habitat contained within the development site is considered to be sub-optimal, with no shrub or small tree layers present, and would likely only be utilised on occasion. The species is considered likely, were it to occur within the development site not to be reliant solely on the hollow-bearing trees within the development site as a sole roosting resource. The higher quality remnants of vegetation containing similar densities of hollow-bearing trees and higher-quality understory and foraging habitat have been avoided by the proposal, thus the species is considered likely to remain viable within the proposal area, were it present. The proposal is not considered likely to 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 1.81ha of moderate to good quality woodland vegetation and 1.75ha of low condition woodland. The species is highly mobile and is considered likely to use a number of woodland areas surrounding the proposal area, including the higher quality habitats within the proposal area, that have been avoided were it present. 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

Vegetative connectivity within the proposal area will be maintained and improved through planting and avoidance of impacts to vegetation. As the 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.

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). Specific mitigation measures will be put in place for hollow-bearing tree removal to avoid impacts to the breeding cycle of the species if they are present

within the development site. Suitable breeding habitat will be retained throughout the proposal area, ensuring that individuals could continue to utilise the proposal Area, and the breeding cycle of the broader population is not 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 1.81ha of moderate to good quality woodland vegetation containing native canopy and native understorey species and 1.75ha of low condition woodland, including the clearing of 17 hollow-bearing trees. The vegetation to be removed as a result of the proposal is considered to constitute low quality foraging habitat and small amounts of 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. A management plan will be prepared and implemented which will monitor and manage these species within the proposal area and offset area.

introduce disease that may cause the species to decline

No diseases are known to impact the species. 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 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 1.81 ha of moderate to good quality woodland vegetation, 1.75ha of low condition woodland and 4 hollow-bearing trees. The habitat to be impacted is considered to constitute low-quality foraging habitat and would likely only be utilised on occasion. Roosting may occur on occasion within hollow-bearing trees; however, the species is known to utilise multiple roost hollows over successive nights, up to 4km apart (TSSC, 2015). As such, it is likely that any individuals utilising the 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 broader proposal 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.

APPENDIX E FINAL CREDIT REPORT

Biodiversity credit report



This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 2/08/2019

Time: 4:55:33PM

Calculator version: v4.0

Major Project details

Proposal ID:	144/2017/4350MP
Proposal name:	Wellington Solar Farm
Proposal address:	Goolma Road Wellington NSW 2820
Proponent name:	First Solar (Australia) Pty Ltd
Proponent address:	Level 3 16 Spring Street Sydney NSW 2000
Proponent phone:	02 9002 7710
Assessor name:	Brooke Marshall
Assessor address:	1/216 Carp St Bega NSW 2250
Assessor phone:	64928333
Assessor accreditation:	0035

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	0.27	0.00
White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	129.36	16.60
Total	129.63	17

Credit profiles

1. Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (CW112)

Number of ecosystem credits created

0

IBRA sub-region

Upper Slopes - Central West

Offset options - Plant Community types	Offset options - IBRA sub-regions
<p>Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (CW112)</p> <p>Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (CW138)</p> <p>White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (CW215)</p> <p>White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (CW216)</p> <p>Red Box - White Box +/- Red Stringybark hill woodland in the NSW South Western Slopes Bioregion, (CW280)</p>	<p>Upper Slopes - Central West</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p>

2. White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (CW216)

Number of ecosystem credits created

1

IBRA sub-region

Upper Slopes - Central West

Offset options - Plant Community types	Offset options - IBRA sub-regions
<p>White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (CW216)</p> <p>Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (CW112)</p> <p>Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (CW138)</p> <p>White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (CW215)</p> <p>Red Box - White Box +/- Red Stringybark hill woodland in the NSW South Western Slopes Bioregion, (CW280)</p>	<p>Upper Slopes - Central West</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p>

3. White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (CW216)

Number of ecosystem credits created

15

IBRA sub-region

Upper Slopes - Central West

Offset options - Plant Community types	Offset options - IBRA sub-regions
<p>White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (CW216)</p> <p>Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (CW112)</p> <p>Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (CW138)</p> <p>White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (CW215)</p> <p>Red Box - White Box +/- Red Stringybark hill woodland in the NSW South Western Slopes Bioregion, (CW280)</p>	<p>Upper Slopes - Central West</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p>

Summary of species credits required

D.3 NOISE AND VIBRATION ASSESSMENT

WELLINGTON SOLAR FARM

Construction & Operational Noise & Vibration Assessment

13 August 2019

NGH Environmental

TJ643-01F01 Report (r7).docx

Document details

Detail	Reference
Doc reference:	TJ643-01F01 Report (r7).docx
Prepared for:	NGH Environmental
Address:	Unit 8, 27 Yallourn St Fyshwick ACT 2609
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

Important Disclaimer:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

This document is issued subject to review and authorisation by the Team Leader noted by the initials printed in the last column above. If no initials appear, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

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In preparing this report, we have relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, we have not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

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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

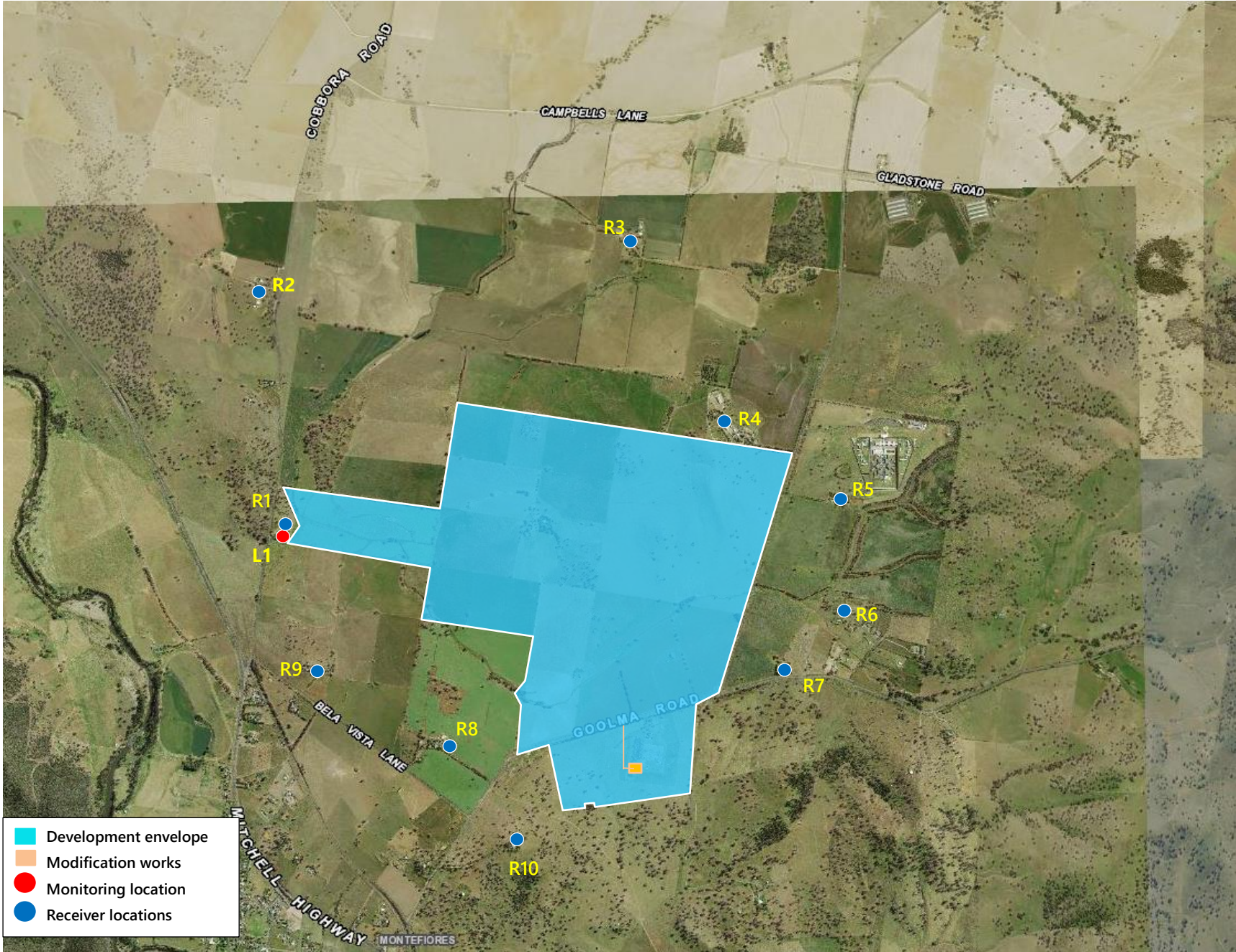
2.4.2 Operation

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 (L₉₀) & 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 L _{Aeq} (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: <ul style="list-style-type: none"> • 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		Wellington Solar Plant	Wellington North Easement	Cumul. ³	Wellington Solar Plant	Wellington North Easement	Cumul. ³	Wellington Solar Plant	Wellington North Easement	Cumul. ³	Wellington Solar Plant	Wellington North Easement	Cumul. ³	Wellington Solar Plant	Wellington North Easement	Cumul. ³	Wellington Solar Plant	Wellington North Easement	Cumul. ³	Wellington Solar Plant	Wellington North Easement	Cumul. ³	Wellington Solar Plant	Wellington North Easement	Cumul. ³	Wellington 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:

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

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)

Noise Criteria				Predicted Operational Noise Levels, L _{Aeq} , 15min												Comply? (Yes/No)
				Calm & Isothermal Conditions				Slight to Gentle Breeze				Moderate Temperature Inversion ¹				
Receiver Location	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

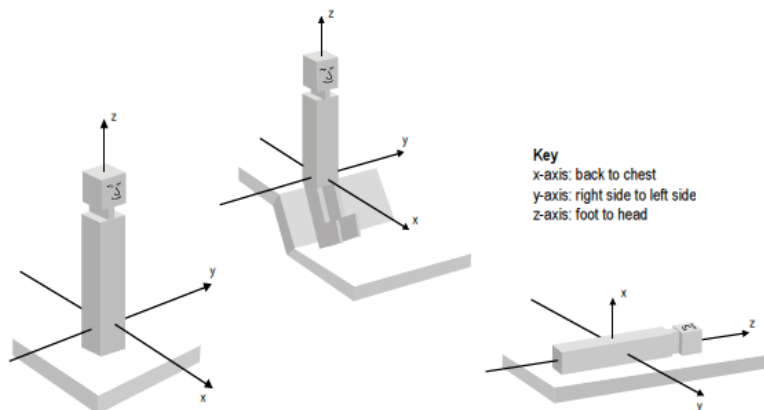
The vibration criteria are defined as a single weighted root mean square (rms) acceleration source level in each orthogonal axis. Section 2.3 of the guideline states:

"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) $L_{Aeq}(15 \text{ Hour})$

Receiver	Criteria	Traffic Movements	Speed (km/h) ¹	Distance to Road ²	Predicted Noise Level	Exceed?
Residences on Goolma Road	$L_{Aeq, (15 \text{ hour})}$ 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 than 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 L _{eq} 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

