AMENDMENT REPORT

Culcairn Solar Farm

June 2020

Project Number: 18-441

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BEGA - ACT & SOUTH EAST NSW
Suite 11, 89-91 Auckland Street (PO Box 470) Bega NSW 2550 **T.** (02) 6492 8333

BRISBANE
Suite 4, Level 5, 87 Wickham Terrace Spring Hill QLD 4000 **T.** (07) 3129 7633

CANBERRA - NSW SE & ACT
8/27 Yallourn Street (PO Box 62) Fyshwick ACT 2609 **T.** (02) 6280 5053

GOLD COAST
PO Box 466 Tugun QLD 4224 **T.** (07) 3129 7633

E. ngh@nghconsulting.com.au

NEWCASTLE - HUNTER & NORTH COAST
Unit 2, 54 Hudson Street Hamilton NSW 2303 **T.** (02) 4929 2301

SYDNEY REGION
Unit 18, Level 3, 21 Mary Street Surry Hills NSW 2010 **T.** (02) 8202 8333

WAGGA WAGGA - RIVERINA & WESTERN NSW
Suite 1, 39 Fitzmaurice Street (PO Box 5464) Wagga Wagga NSW 2650 **T.** (02) 6971 9696

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An approximately 350 Megawatt (MW) Alternating Current (AC) photovoltaic (PV) solar farm is proposed near Culcairn, southern NSW (equivalent to up to 402.5 MW Direct Current; DC). The 1351 hectare (ha) Subject Land (1084 ha Development Footprint) is freehold rural land approximately 4 kilometres (km) south-west of the township of Culcairn.

The Environmental Impact Statement (EIS) was prepared in accordance with Part 4 of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act) placed on public exhibition between 30 January and 27 February 2020. The Proposal is classified as State Significant Development (SSD).

Culcairn Solar Farm (CSF) reviewed submissions from the public and government stakeholders in May 2020. The proponent's response to submissions has been prepared and is being lodged concurrent with this Amendment Report.

As part of the consideration of submissions, several areas where the proposed Culcairn Solar Farm Project can be improved were identified. CSF have held meetings / conversations with a number of residents near the project site and with government agencies and other stakeholders. Additional specialist investigations were undertaken.

Changes to the design, layout and infrastructure have been proposed as a result of these community and agency submissions, additional consultation and investigation. Changes have also been made to strengthen the environment safeguards that form a commitment of the proposal. These changes have been made to improve community benefits, further reduce possible and perceived impacts and to clarify information contained in the EIS.

This Amendment Report has been prepared to set out the rationale for, and details of, the specific areas of change, in comparison to the proposal exhibited in the EIS. It includes:

- A summary of the investigations informing the changes presented in Section 1 and appendices.
- A summary of the proposed changes in comparison to the exhibited EIS in Section 2. This relates to both community benefits and infrastructure changes.
- The updated environment safeguards relevant to the proposed changes that form a commitment of the proposal are provided in Section 3.

1. INFRASTRUCTURE AND DEVELOPMENT CHANGES

Key changes to the proposal as a result of community and agency consultation include:

- Reduction of panels in the north-eastern corner of the proposal.
- Panel infrastructure further setback from Receivers 24 and 29.
- Additional 5m vegetative screening buffer in the vicinity of Receiver 24.
- Additional on and off-site riparian screening proposed in the vicinity of Receivers 17 and 19.
- Incorporate more efficient solar panels with a higher output to justify the removal of panels in the north-eastern corner.
- Additional plantings to increase habitat connectivity across the site.
- Reduction of development footprint by 42 ha.
- Reduction of clearing of paddock trees from 99 to 77.
- Reduction of clearing of vegetation from 0.61 ha to 0.37 ha.
- Increased proposed width of Weeamera Road to 7m.
- Construction Disruption Payments.

Key changes are further described below and detailed within Figure 1-1.

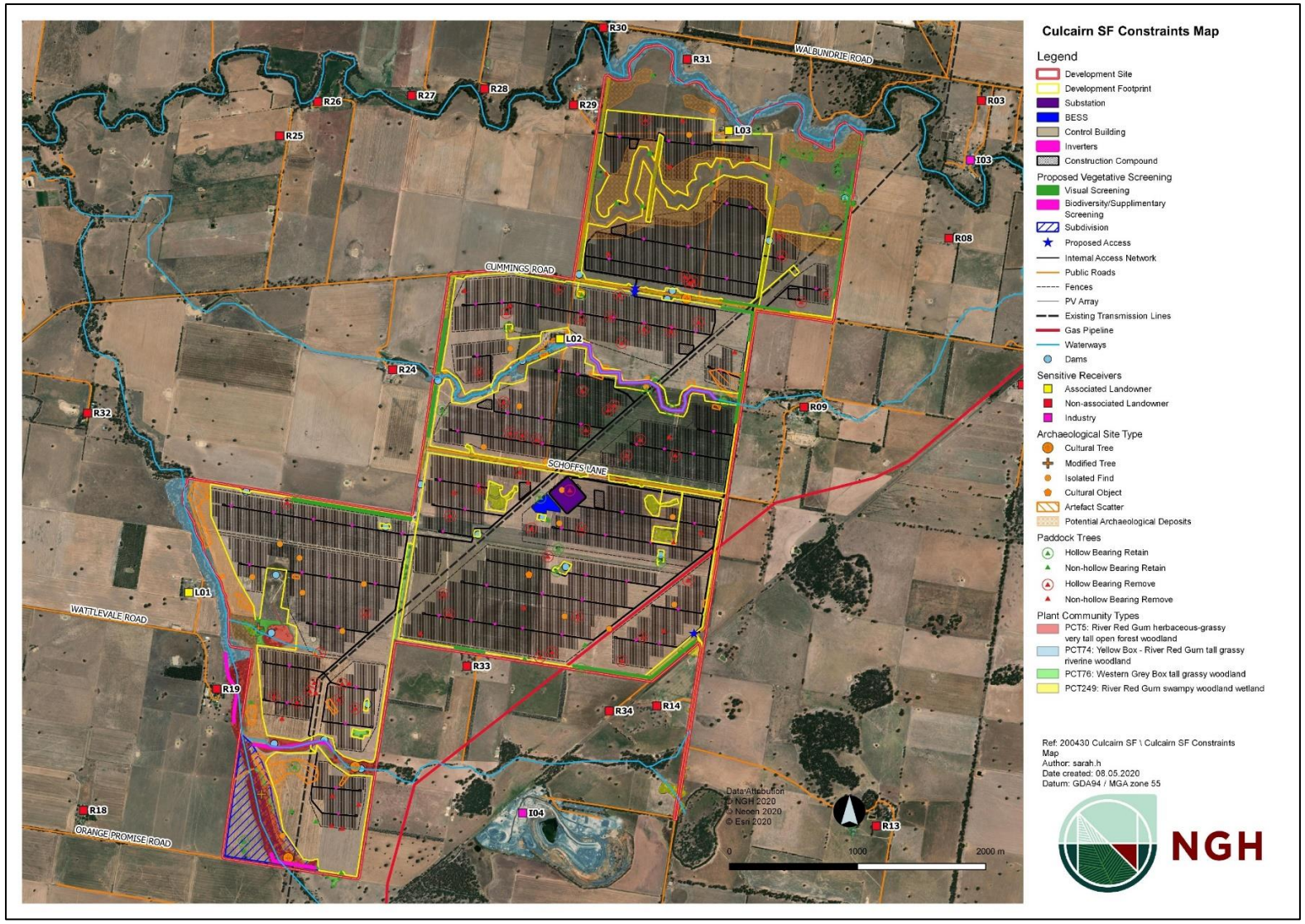

Figure 1-1 Updated constraints and layout map.

1.1. REFINED PV LAYOUT

The Greater Hume Shire Council (see Section 4.2.1 of the RTS) and a number of public submissions (Section 4.1.4 of the RTS) raised objection to the Proposal due to proximity to Billabong Creek, visual and noise concerns.

This was also apparent through the community consultation process, both before and after submission of the EIS. As such, the Proponent has considered all consultation and submissions to refine the proposed layout of the solar farm.

The original design for the Proposal included arrays of panels in the north-eastern corner of the proposal, near Billabong Creek. This panel array has since been removed, creating an approximate 980 m setback from Receiver R8 to solar infrastructure.

Adjustments have also been made to the western side of the development, to increase the setback of solar infrastructure from Receiver 24 by an additional 80 m (with the closest panel infrastructure located approximately 520 m from the residence) This additional setback of solar infrastructure is also supported by an additional 5m of additional vegetation screening to Receiver 24. The setback of solar infrastructure from Receiver 29 has also been increased by 70 m (with the closest panel infrastructure located approximately 350m from the residence).

The purpose for this change was to reduce the visibility of project infrastructure to neighbours, reduce impact to the native pasture and habitat corridor along Billabong creek, reduce noise impacts and allow additional space for landscape plantings.

The amendment of the project layout due to reduced number of PV modules required has also reduced the overall size of the development footprint, from 1126 ha to 1084 ha. This represents a saving of 42 ha and reduces the clearing of paddock trees from 99 to 77 trees.

1.2. ADDITIONAL VEGETATION SCREENING

Additional vegetation screening has been proposed in two locations. An additional 5 m of vegetation screening for Receiver 24, and additional screening in the south-western to supplement existing vegetation screening in Back Creek, to reduce overall views corner for Receiver 17 and 19 (Figure 1-2 and Appendix E).

Species selection and layout has been best informed by a qualified Landscape Architect, who has local knowledge of species availability from nurseries and growth requirements to ensure best outcomes, with a letter of recommendation provided by Jayfields Nursery Walla Walla. This includes the selection of fast growing, fast dispersing mid-stratum species, which are expected to reach a suitable height and form an effective screen before the upper-stratum eucalypt species (or pioneer species). A plan of succession for species will be included in the proposed Landscape Plan. In addition to additional screening, other landscaping improvements are proposed with clarified commitments in terms of ensuring the establishment and long-term success of the screening. These include:

VA1 - Screening would be required on-site, generally in accordance with the Landscaping Plan developed in consultation with neighbouring landholders.

- Barrier plantings would be and where practical, planted on specific sections of the outside of the perimeter fence to break up views of infrastructure including the fencing.
- The proposed plant species to be used in the screen are native, fast growing, with spreading habitat and mixed mature heights of 2-4 m, 3-5 m and 5-10 m. Proposed plants derived from the naturally occurring vegetation community in this area.
- Plants were selected in consultation with affected near neighbours and a botanist or landscape architect, and/or local Landcare groups.
- The timing is recommended to be within 2 months of completion of construction so that actual views of infrastructure can be more certain. The timing of planting should also be chosen to ensure the best chance of survival.

- The screen would be maintained for the operational life of the solar farm. Dead plants would be replaced. Pruning and weeding would be undertaken as required to maintain the screen's visual amenity and effectiveness in breaking up views.
- Proposed screening will be effective within three years of completion of construction.

Vegetation screening is also very effective in reducing the perceived heat island impacts, in that:

- Trees that have a high leaf area density and a high rate of transpiration are the most effective at cooling the environment.
- The cooling effect of parks and vegetated areas is determined by species group, canopy cover, size and shape of the vegetated area.
- Temperatures decrease with every percentage increase in tree canopy cover.

Despite this, Neoen have implemented sufficient setbacks to mitigate any heat island effect as per the recommendations of the Barron-Gafford (2016) Statement of Evidence to the Victorian Planning Panel.

1.3. PV MODULE TECHNOLOGY

Recent developments in PV technology have allowed the Proponent's design team to consider a PV module with a higher watt rating (430 Wp) than was originally anticipated (380 Wp) during the preliminary design stages of the project.

The latest generation of PV modules considered by the Proponent's procurement market appraisal are bifacial, whereby the solar panel equips solar cells on both the top and the rear of the panel. This design provides the ability to transform sunlight into electrical energy on both its top and bottom sides to deliver increased module and design efficiency. This reduces the quantity of panels installed from approximately 1,049,000 to 930,000 modules, representing a reduction of approximately 12%. The reduction justifies the removal and setback of panels in the north-eastern array near Billabong Creek.

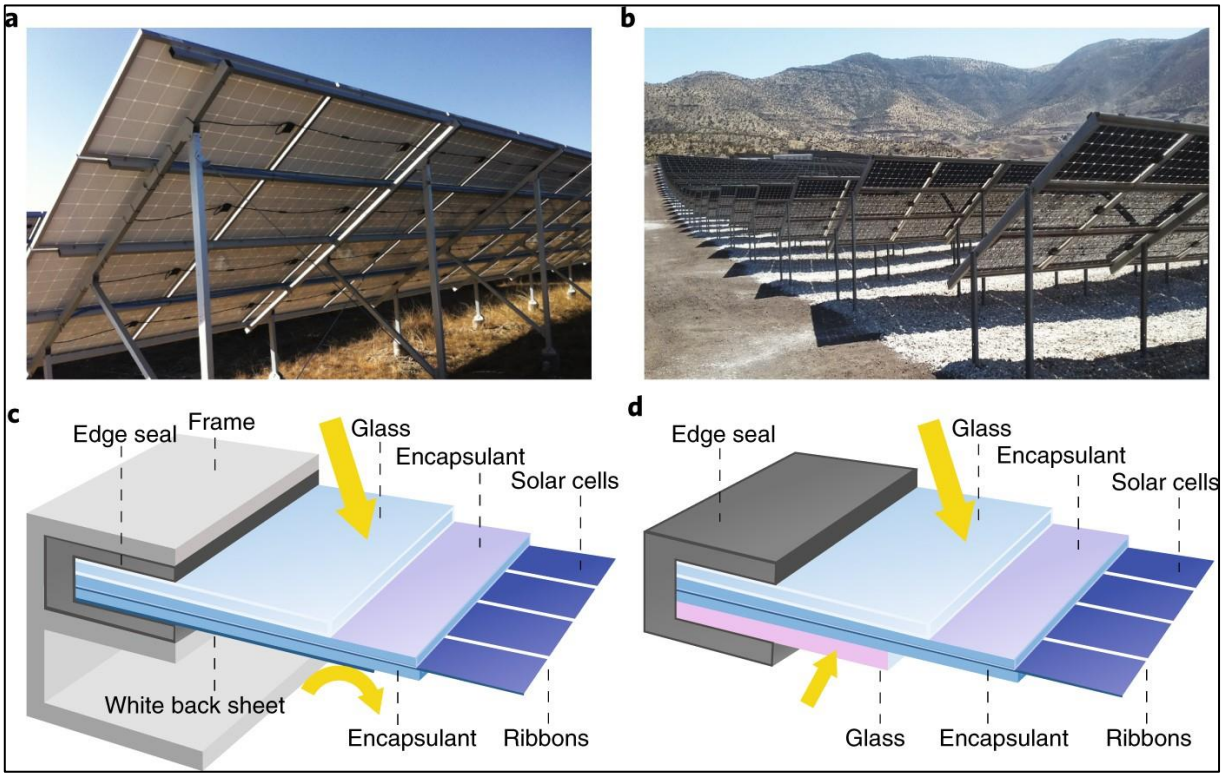

Figure 1-1 Bifacial vs monofacial module design (© Kopecek and Libal 2018)

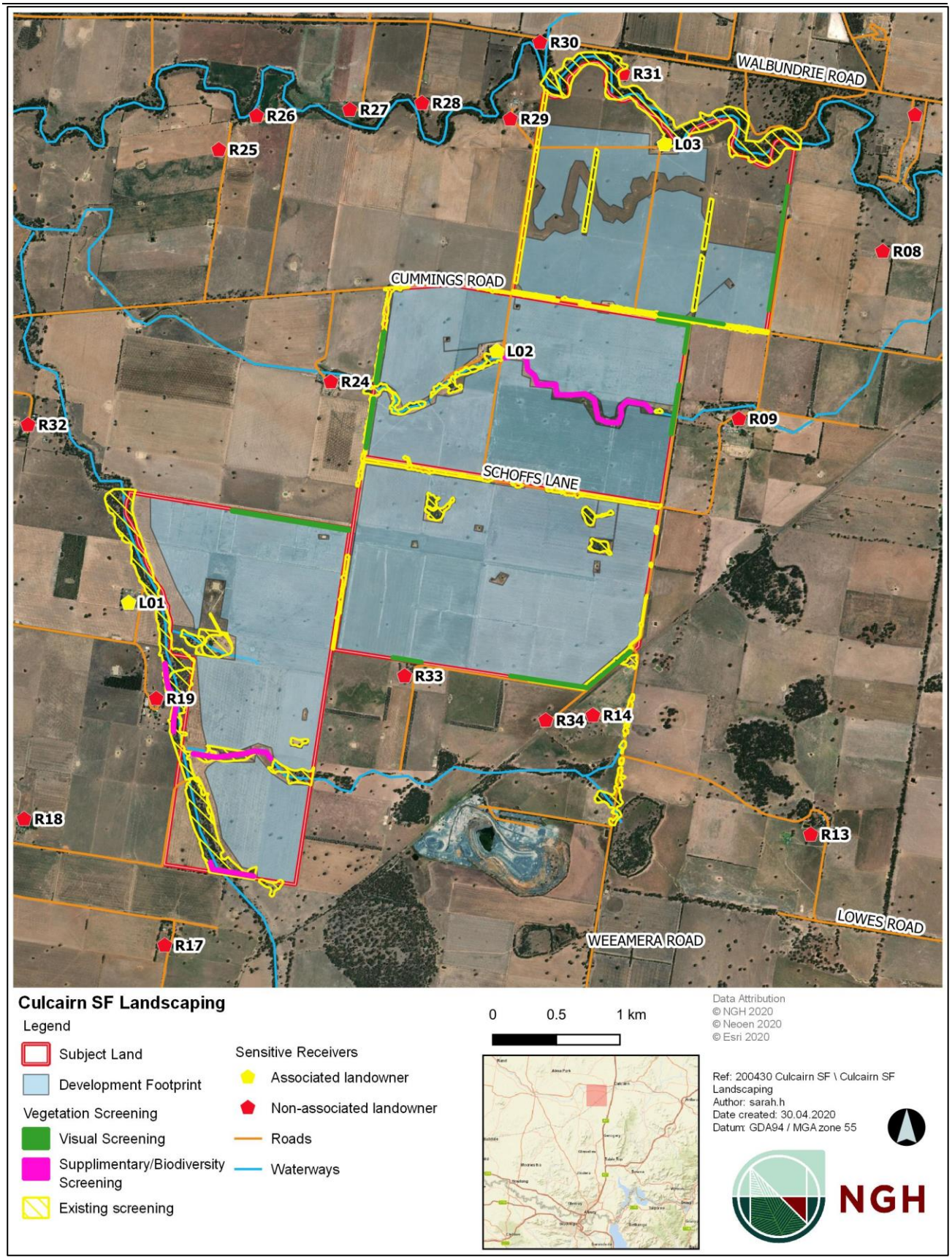

Figure 1-2 Proposed landscaping

1.4. SUPPLEMENTARY PLANTINGS FOR HABITAT CONNECTIVITY

In addition to acting as a visual screen to Receivers R17 and 19, supplementary plantings have been proposed within the Back Creek riparian corridor to increase habitat connectivity and quality (Figure 1-2).

The existing vegetation along Back Creek consists mostly of upper-stratum species, with little in the mid and lower storeys to assist in screening. As such, it is proposed to plant appropriate mid to lower-stratum species to decrease visual impact. This will also enhance the quality of vegetation along the Back Creek riparian zone.

Supplementary planting is also proposed within the drainage lines that runs east-west through the north and south of the Proposal. The supplementary plantings will be designed to decreased habitat fragmentation and isolation, creating connectivity and a wildlife corridor through the proposal (Figure 1-2).

An additional mitigation measure to commit to this action is as follows:

BD16 - Appropriate supplementary plantings (as indicated in the final constraints map and layout) to enhance connectivity and mitigate loss of paddock trees across the development site:

- Landscape plantings will be comprised of local indigenous species.
- Plantings will be a minimum of 20 m wide.

To ensure the success of the supplementary plantings to increase habitat connectivity, the Proponent has also committed to using plain wire fencing where practicable and near woodland areas:

BD15 - Plain wire is to be used on security fencing where practicable and where it meets safety and security requirements of the Proposal. Use plain wire perimeter fencing where this intersects woodland to avoid potential entrapment of fauna on fence.

1.5. AMENDMENT TO WEEAMERA ROAD UPGRADE

Greater Hume Shire Council note in their submission:

Council's engineers provide the following recommend conditions in the event of the approval of this application:

- *At the full cost of the proponent Weeamera Road to the property access be constructed to Council's 'Standard Road Design Typical Cross Section' specification – 7 m paved seal and 9 m road formation.*
- *Prepare a traffic management plan.*
- *For assessment by Council additional design plans are required for the access points from Cummings Road and Weemera Road.*
- *Under section 138 of the Roads Act 1993 any works occurring within the road reserve require the consent of Council as the road authority.*

In response, the Proponent suggested a compromise with advice from Amber Organisation (traffic engineer) to widen the road to 7.0 m and provide a light seal for the following reasons:

- A 7.0 m wide road allows two larger vehicles to comfortably pass one another, which is wider than the specified width in the Australian Standard AS2890.2:2002 for the expected level of traffic.
- A light spray will reduce dust and provide a safe trafficable surface.
- A Traffic management Plan will be prepared, with requirements for monitoring and maintaining road quality.
- A 9.0m wide road formation is considered to be an overdesign for the proposed operational level of traffic (25-30 vehicle movements per day).
- There will be less impact to the threatened Plant Community Type 277 – Blakely's Red Gum – Yellow Box Grassy Tall Woodland.

Greater Hume Shire Council accepted the compromise, conditioning the following:

- 7.0 m seal over gravel pavement, with minimal shoulders appropriately designed to sustain construction traffic.
- Bitumen seal is to be minimum 14/7mm seal.
- Drainage must be suitably formed.
- Construction access must be suitably signed.

An additional mitigation measure to commit to this action is as follows:

TT4 - The Road upgrade would be subject to detailed design and would be designed and constructed to the relevant Australian road design standards.

- Weeamera Road north of the Boral quarry would be widened to a 7m seal over gravel pavement, with a minimum seal of 14/7mm. This would allow two-way movement of heavy vehicles and reduce the impacts of dust on nearby dwellings.
- All works associated with the development shall be at no cost to Transport for NSW or council.

1.6. LOCAL PARTICIPATION PLAN

Greater Hume Shire note in their submission:

- *It is felt that benefits from construction employment will not be able to be capitalised upon by Walla Walla and Culcairn community as there is limited temporary accommodation available.*

In response to Greater Hume Shire Council's concerns, and to other community submissions in regards to employment, the Proponent have committed to a Local Participation Plan (Appendix F).

The Plan identifies the local content procurement approach and objectives for the proposal, developed in accordance with the principles and best practice engagement with special interest groups outlined in the *NSW Large-scale Solar Energy Guidelines* and with reference to the NSW Government Action Plan *Ten Point Commitment to the Construction Sector* in terms of fostering partnerships, increasing local supply side capacity, and ensuring greater inclusion and diversity.

The Proponent is committed to maximising the long term economic and employment opportunities and benefits for the local community that the Proposal affords, and seek to develop and nurture local procurement initiatives, partnerships and innovation.

For the purpose of this plan, local refers to the immediate local (being Culcairn and surrounding area) while participation refers to employment, suppliers and apprenticeships and training.

During the feasibility & planning/approvals phases expressions of interest from local jobseekers and suppliers were invited and received through adverts, information days and the project website. A register of interest was created, maintained and updated to enable timely communication with interested suppliers during the pre-construction and construction phases.

During the post DA period leading into pre-construction the supplier mapping extends to more in-depth research through local, regional and state-wide networking to ensure Neoen has a comprehensive up-to-date listing of relevant suppliers who may not yet have heard about the project.

The Proponent also reached out to local business, training and development networks, such as Greater Hume Shire Council, NSW TAFE (Albury Campus), Riverina Eastern Regional Organisation of Councils, and Regional Development NSW.

An additional mitigation measure to commit to this action is as follows:

SE1 - A Neoen Community Relations Plan and Local Participation Plan would be implemented during construction to manage impacts to community stakeholders, including but not limited to:

- Protocols to keep the community updated about the progress of the project and project benefits.
- Protocols to inform relevant stakeholders of potential impacts (haulage, noise etc.). Protocols to respond to any complaints received.
- Foster participation and maximise community involvement and employment.
- Maintain the Culcairn Solar Farm Business Directory.

1.7. CONSTRUCTION DISRUPTION PAYMENTS

The Construction Disruption Payment was developed by the Proponent in response to community concerns relating to the impact of dust, noise and traffic during the construction period. It was also proposed as a result of lessons learnt from previous projects, and feedback from neighbours living adjacent to the site & the construction traffic route. While this offer was made before the EIS submission to most adjacent neighbours, the offer was recently reiterated to adjacent neighbours and extended to private landowners along the access route.

The one-off payment of $15,000 will be made at the start of construction to enable the residents to mitigate and address these construction-related impacts in whatever way they feel appropriate to their circumstances– for example through house cleaning or additional glazing.

This is a new initiative, and Neoen understands it to be a first in the solar industry. It will be monitored and reviewed to understand whether it is effective in addressing these concerns and mitigating construction related impacts for adjacent neighbours.

2. KEY AREAS OF ADDITIONAL INVESTIGATION

Specific additional investigations were undertaken as in response to the feedback received from the public and government stakeholders, after the EIS public exhibition. The outcomes of these studies have been used to respond to specific issues raised and have assisted to inform the changes to the proposal, as detailed below. These investigations are provided in full in Appendix A in the Response to Submissions. The included:

- Detailed analysis of the potential impacts of the project on agricultural production and agricultural land
- Category 1 Land Assessment.
- Updated biodiversity and noise assessments, reflecting the infrastructure changes and updating assumptions made in the EIS.

2.1. AGRICULTURAL IMPACT STATEMENT

A number of submissions were received from the public in relation to the use of agricultural land, as well as government agencies such as Greater Hume Shire Council and NSW Department of Primary Industries (DPI).

DPI note in their submission:

- *In assessing this proposal, we ask that DPIE Planning and Assessments consider the impacts to the cropping industries vertical supply chain. Secondary industries have not been addressed in detail in the economic impact report and impacts on critical mass can result in a complete failure of that industry in region.*

Greater Hume Shire Council note in their submission:

- *Council notes that the development site and adjacent land is likely high-quality agricultural land. Due to its impending status as important agricultural land under the Riverina Murray Draft Important Agricultural Land Mapping project, Council believes the site should be considered constrained.*
- *Whilst the EIS indicates that soil will be benefitted by being rested, Council believes that the land may not benefit from being beneath highly efficient PV cells and may deteriorate if the vegetation is not able to be supported in this environment.*

An Agricultural Impact Statement (AIS) was prepared by Principal Consultants of Riverina Agriconsultants and Progressive Agriculture, informed by a site inspection of the subject land (Appendix A below). The purpose of the report was to address the requirement of Greater Hume Shire Council, DPI and community submissions by independently assessing the economic impact on local agricultural production of the proposed Culcairn Solar Farm.

Key points from the AIS include:

- The AIS noted that the broadscale landscape mapping does not serve as a basis when quantifying the agricultural impact on the site. As such, the AIS assessment is based on actual agricultural production capabilities of the land before and after development, not outdated or proposed landscape mapping.
- The development does not represent a total loss of production. Both the Proponent and current landowners are committed to the continuation of sheep grazing. The AIS indicates approximately 10% of the development site would be removed from production whilst the solar farm is in place (due to roads, buildings, hardstands etc.), not the entire site, with overall agriculturally productive capability reduced by a conservative estimate of 25%. Pasture will be maintained for sheep feed, as well as additional benefits such as dust and erosion control.

- The estimated agricultural impact on the economy post-development included a reduction in annual gross revenue from agricultural production of $280,000 (farm gate) and annual reduction from agricultural production of $610,000 in related economic activity pre and post-farm gate) assuming the adoption of agrisolar and a 25% reduction in pasture productivity. The estimated reduction on local annual direct agricultural expenditure is also expected to be $450,000.
- The impact outlined in the report will be mitigated by the rental payments received from the Proponent, with a portion expected to be reinvested in the farm business with related economic activity benefits.
- In the transition from agricultural production to solar farming, some service industries will benefit. For instance, fencing and civil contractors are likely to experience higher demand for service at that site than would otherwise have been the case, while agronomic and spray and seeding contractors may only experience a marginal downturn, if at all. Businesses relating to grain production will however be negatively impacted.
- While all current and potential cropping activities on the land will cease post-development, the AIS states changes in land use are typical of what is typical across the broader farming region with cropping land being converted to livestock production and vice vera with seasons, market and other driving forces. As such, no deleterious impacts are expected from converting current cropping practices to grazing.
- Neoen have a strong and proven ability to commit to the continuation and co-location of sheep within solar developments, as is evident through current commercial operations at the Dubbo, Parkes and Numurkah Solar Farms. Neoen continue to refine the design of their enterprises to suit these systems, to ensure best outcomes for landowners and the surrounding communities.
- The current agricultural enterprise provides employment for two full time equivalent (FTE) employees, plus some casual employees at peak times. The proposed sheep grazing enterprise is estimated to require 1.5 FTE employees throughout the operational period of the Proposal.
- The Economic Assessment (Appendix O of the EIS) notes there would be 7 FTE direct and 20 FTE indirect jobs created throughout the operational period of the Proposal. 4 of these indirect jobs are expected to be generated by the proposal within the Greater Hume Shire.
- As such, it can be expected that the current employment requirements in the area will increase from 2 FTE jobs, to 8.5 FTE direct jobs during the operational phase of the Proposal, with additional flow on benefits to the community.

2.2. UPDATED BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT (BDAR)

The BCD noted in their Submission:

- *The number of vegetation integrity plots is under-representative. The result is that the sample is too small to be representative of site variability and may have underestimated the vegetation integrity and habitat suitability of the zones. This may have reduced the integrity of assessments later in the Biodiversity Assessment Methodology (BAM). Eight vegetation zones require an enhanced survey effort to ensure the vegetation integrity scores are representative of each zone.*
- *The assessment of prescribed impacts and indirect impacts on scattered paddock trees is not adequate. A comprehensive assessment of indirect impacts is required, including the impacts prescribed by cl.6.1 of the Biodiversity Conservation Regulation 2017, especially 6.1.1(b), (c) and (f), specifically assessing the impact of loss of scattered paddock trees and hollows across the development site.*

- *The potential for serious and irreversible impacts (SAII) on the Box-Gum Woodland Threatened Ecological Community (TEC) (PCT 277) is not clear. The likelihood of SAII on Box-Gum Woodland Threatened Ecological Community (PCT 277) should be assessed in further detail, including a more holistic assessment of indirect and prescribed impacts across the development site including 79 scattered paddock trees associated with the TEC and especially the 58 trees with hollows.*
- *The assessment requirements of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) are limited to that provided in the BDAR, but the EIS does not address the EPBC Matters of Environmental Significance. We concur that the BDAR provides sufficient evidence that the vegetation integrity of the total area of PCT 277 to be cleared may not form part of the EPBC listing, but note that a paucity of integrity plots is not a good basis for this conclusion. As the EIS relies on the BDAR to assess Matters of National Environmental Significance, and because the BDAR does not fully address the Matters of National Environmental Significance, we recommend that the applicant refer the proposal to the Australian Government Department of Environment for its consideration.*

NGH completed an updated BDAR (Appendix B) in May 2020. The updated report documents the assessment undertaken to address prescribed and indirect impacts, the potential for SAII, as well as the additional plots and surveys to meet the integrity of the BAM and rule out impacts under the EPBC Act.

The BDAR has been modified to include a holistic assessment of prescribed and indirect impacts including the removal of paddock trees. The development footprint has been further refined to avoid removal of an additional 22 paddock trees and reduced the clearing of vegetation from 0.61ha to 0.37ha.

An update to the calculator was completed to include 2020 plot data. Changes to the integrity of zones has been reflected in Section 3.4 of the updated BDAR.

An updated credit and impact summary is provided within Sections 7 to 11 of the updated BDAR. Changes to the credit requirements are provided below:

Table 2-1 Credit summary for the BDAR

Ecosystem credits	Previous offset requirements	Updated offset requirements
PCT 277 derived grassland	1	1
PCT 277 exotic understory	10	3
PCT 277 native understory	1	4
PCT 277 paddock trees	92	73
PCT 5	0	1
TOTAL	**104**	**82**
Species credits	**Previous offset requirements**	**Updated offset requirements**
Small Scurf-pea	10	4
Small Purple-pea	10	4
Silky Swainson-pea	10	4
TOTAL	**30**	**12**

In addition to the offsets produced from the BAM, additional Mitigation Measures have been introduced to further mitigate the loss of hollow bearing paddock trees including:

- **BD16** Appropriate Connectivity plantings to enhance connectivity and mitigate loss of paddock trees across the development site

- **BD17** Install hollows of felled trees onto younger trees or on ground in retained vegetation patches.
- **BD18** A Rehabilitation Plan would be completed to enhance the condition of retained vegetation within the development site.

Additional surveys and assessment were completed for potential EPBC listed communities within the development site.

Two EPBC plots were completed in areas of 277 with a high native understory in the appropriate season. No areas in the development footprint or development site meet the criteria for Box Gum Woodland to be EPBC listed. A detailed assessment has been provided in section 5 of the updated BDAR.

A land categorisation assessment was completed in Appendix G of the updated BDAR (See Section 1.3 and Appendix C of this report). The extent of Category 1 land across the development site demonstrates overall condition of Box Gum Woodland within the development footprint.

One area of PCT 76 within the development site was unable to be surveyed. This community was assumed to meet the criteria for EPBC listed Inland Grey Box Woodland. This community would be avoided by the development. Indirect impacts were assessed through a Test of Significance. With the implementation of mitigation measures a significant impact is considered unlikely.

2.3. CATEGORY 1 LAND ASSESSMENT

As detailed above, the BCD notes in their submission:

- *The assessment requirements of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) are limited to that provided in the BDAR, but the EIS does not address the EPBC Matters of Environmental Significance. We concur that the BDAR provides sufficient evidence that the vegetation integrity of the total area of PCT 277 to be cleared may not form part of the EPBC listing, but note that a paucity of integrity plots is not a good basis for this conclusion.*

As such, a Category 1 Land Assessment was undertaken (Appendix C), in conjunction with additional survey and BAM plots on the proposed Subject Land.

As detailed within the Assessment, Section 6.8(3) of the *Biodiversity Conservation Act 2016* determines that the BAM is to exclude the assessment of the impacts of clearing of native vegetation on Category 1-exempt land (within the meaning of Part 5A of the *Local Land Services Act 2013* (LLS Act)) with exception to any impacts prescribed by the regulations under section 6.3 .Category 1-exempt land is defined under the LLS act as;

- Land cleared of native vegetation as at 1 January 1990 or lawfully cleared after 1 January 2019.
- Low Conservation Grasslands (following commencement of the new framework on 25th August 2017.
- Land (not being grasslands) containing only low conservation groundcover (following commencement of the new framework on 25th August 2017).
- Native vegetation identified as regrowth in a Property Vegetation Plan under the repealed Native Vegetation Act 2003.
- Land biodiversity certified under the Biodiversity Conservation Act 2016.

The analysis identified in conjunction with aerial imagery that areas of land within the proposed Subject Land have been used continuously for cropping and grazing prior to and post 1990. Although smaller areas of past cropping are clearly evident, the vast majority of the proposal area is identified as having modified pastures in the relevant land use layers, however, conclusive evidence within the supporting historical imagery could not determine the significance of groundcover modification and

therefore a precautionary approach was applied. The only exception to this is recent areas of cropping evident during the field surveys (for example most of the open paddocks have been used for cropping, hay production or grazing).

2.4. UPDATED OPERATIONAL NOISE ASSESSMENT

An update to the Operational Noise Assessment (Appendix D) was completed by NGH for the changes to the proposed solar farm layout and updated substation requirements. The results of the assessment of the amended solar farm layout and substation indicate the project operational noise trigger levels (PNTLs) at all receptors is lower than previously assessed. This is due to the increased setback of solar panels as a result of the amended layout.

During normal operations, there is not expected to be any exceedances of PNTLs during daylight or evening hours.

It is important to note that the solar farm would not normally be in operation during the evening and not in the night hours. The exception being summer with extended day lengths. This coincides with daylight savings (NSW daylight savings is from the first Sunday in October to the first Sunday in April), where the inverter stations, tracking motors and on-site substation would be operating until sunset.

During operation, the Battery Energy Storage System (BESS) would not operate continuously. The noise modelling is based on the BESS operating at full output. However, the level of output would be intermittent. As such, these noise levels should be considered as a peak in operation of the BESS rather than the ongoing operational noise levels.

However, if the BESS is operational at ‘worst-case scenario’ for periods during night-time hours, the BESS would be slightly audible at receivers R14, R24, R33 and R34. Noting that the residence at R33 and 34 is currently unoccupied. The PNTL for operation is 40 dB LAeq, 15 min for evening hours and 35 dB LAeq, 15 min. There is an exceedance of 2 dB at R24, exceedance of 1 dB at R14 and R34 and an exceedance of 5 dB at R33 during night-time hours.

3. UPDATED SAFEGUARDS AND MITIGATION MEASURES

Table 3-1 below details all the updated mitigation measures as presented within Section 5 of the RTS, related to the key areas of additional investigation (Section 1) and the infrastructure and development changes (Section 2).

Table 3-1 Updated mitigation measures

No.	Safeguard and mitigation measures	Location in Amendment Report
VA1	Screening would be required on-site, generally in accordance with the Landscaping Plan developed in consultation with neighbouring landholders. • Barrier plantings would be and where practical, planted on specific sections of the outside of the perimeter fence to break up views of infrastructure including the fencing. • The proposed plant species to be used in the screen are native, fast growing, with spreading habitat and mixed mature heights of 2-4 m, 3-5 m and 5-10 m. Proposed plants derived from the naturally occurring vegetation community in this area. • Plants were selected in consultation with affected near neighbours and a botanist or landscape architect, and/or local Landcare groups. • The timing is recommended to be before or on commencement of construction, to ensure an effective screen within three years of completion of construction. The timing of planting should also be chosen to ensure the best chance of survival. • The screen would be maintained for the operational life of the solar farm. Dead plants would be replaced. Pruning and weeding would be undertaken as required to maintain the screen's visual amenity and effectiveness in breaking up views. • Proposed screening will be effective within three years of completion of construction.	
SE1	A Neoen Community Relations Plan and Local Participation Plan would be implemented during construction to manage impacts to community stakeholders, including but not limited to: • Protocols to keep the community updated about the progress of the project and project benefits. • Protocols to inform relevant stakeholders of potential impacts (haulage, noise etc.). Protocols to respond to any complaints received. • Foster participation and maximise community involvement and employment. • Maintain the Culcairn Solar Farm Business Directory	

TT4	The upgrade would be subject to detailed design and would be designed and constructed to the relevant Australian road design standards. Weeamera Road north of the Boral quarry would be widened to a 7m seal over gravel pavement, with a minimum seal of 14/7mm. This would allow two-way movement of heavy vehicles and reduce the impacts of dust on nearby dwellings. All works associated with the development shall be at no cost to Transport for NSW or council.	
BD15	Plain wire is to be used on security fencing where practicable and where it meets safety and security requirements of the Proposal. Use plain wire perimeter fencing where this intersects woodland to avoid potential entrapment of fauna on fence.	
BD16	Appropriate supplementary plantings (as indicated in the final constraints map and layout) to enhance connectivity and mitigate loss of paddock trees across the development site: • Landscape plantings will be comprised of local indigenous species. • Plantings will be a minimum of 20 m wide.	
BD17	Install hollows of felled trees onto younger trees or on ground in retained vegetation patches: • Hollow tree limbs would be made into nest boxes and placed in retained vegetation patches • Hollows removed during clearing would be salvaged where possible and remounted to allow continued use by hollow dependant fauna within or adjacent to the project site. A one to one (hollows removed to hollows or nest boxes mounted) would be achieved. • The construction and placement of felled hollows/nest boxes would be managed by a suitably qualified ecologist.	

4. JUSTIFICATION AND EVALUATION OF MERIT

As detailed within the Amendment Report, a suite of infrastructure and development changes have been proposed, as well as a number of additional assessments undertaken.

Key changes to the proposal which reduce overall impact and risk include:

- Relocation of PV layout allowing for further setback from residential sensitive receivers.
- Additional vegetation screening for receivers R24, R29, R17 and R19.
- Reduction in the size of the development footprint, from 1126 ha to 1084 ha.
- Reduction in the clearing of paddock trees, from 99 to 77 trees.
- Additional supplementary plantings to increase habitat connectivity.
- Improved PV module technology which has reduced the number of PV modules required by 12%.
- Road upgrades as per the Greater Hume Shire Council requirements.
- Local Participation Plan.

These key changes will have the following benefits to the community and Greater Hume Shire:

- Very little impact to agricultural production is expected. Farming practices will continue onsite, co-locating sheep with the solar infrastructure. The proposed agrisolar system of sheep grazing is highly achievable, and the best solution given the context of the landscape.
- An additional 8.5 FTE jobs are expected within the region throughout the operational period.
- The Greater Hume Shire, in particular the Culcairn Area, will benefit from the additional economic boost through Community Benefits Scheme, employment, contracting, retail, rental etc.
- Additional screening will reduce overall visual impacts for both residents and motorists (specifically for residences R24, R29, R17 and R19).
- Vegetation screening will also have the additional benefit of helping to help alleviate any concerns of the perceived heat island effect and increase habitat connectivity.
- Relocating and refining the PV layout has the benefit of reducing overall operational noise impacts across the site.
- Construction Disruption Payments.

The changes presented above show an overall net benefit to the community and the Greater Hume Shire.

On balance, given the changes to the proposal, additional management measures and commitments, and consultation undertaken by CSF, the amended project is one that is more able to be supported by the local community. Impacts are considered justifiable and acceptable in the context of the proposal's benefits.

5. REFERENCES

Kopecek, R. Libal, J. (2018). *Towards large-scale development of bifacial photovoltaics.* Nature Energy. Accessed online May 2020 from https://www.nature.com/articles/s41560-018-0178-0

Appendix A AGRICULTURAL IMPACT STATEMENT

Appendix B BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Appendix C CATEGORY 1 LAND ASSESSMENT

Appendix D UPDATED OPERATIONAL NOISE ASSESSMENT

D.1 OPERATIONAL NOISE ASSESSMENT

D1.1 Assessment criteria

The Rural Background Noise Levels (RBLs) have been adopted from Table 2.3 of the *Noise Policy for Industry* (NPI). Background noise levels were adopted from the NPI due to the rural location of the proposal. The adopted levels are considered to be conservative due to the proximity of activity adjacent to the site including agricultural activity, rural and regional road traffic and quarrying. The RBLs for the site have been used to calculate the construction noise management levels (Table 5-1) and the operational intrusive noise levels.

Construction activities would be limited to standard working hours, the relevant Noise Management Levels (NML) (RBL + 10 dBA) for standard hours and (RBL + 5 dBA) out of hours work are summarised in Table 5-1.

Table 5-1 Construction noise management levels.

Location	Time of day	RBL, dB(A)	NML dB $L_{Aeq,\ 15\ min}$
All Residences	Day	40	50
	Evening	35	40
	Night	30	35
	Highly Noise Affected (Day)	-N/A	75

Operational project intrusive noise levels (PINLs) for the proposal were determined based on the RBLs + 5 dB(A) (Table 5-2).

Table 5-2 Project intrusive noise levels.

Location	Time of day	Adopted RBL dB(A)	PINL dB $L_{Aeq,\ 15min}$
All Residences	Day	40	45
	Evening	35	40
	Night	30	35

Operational project amenity noise levels (PANLs) for the proposal were determined based on the recommended amenity noise level for rural area minus 5dB(A) (Table 5-3).

Table 5-3 Project amenity noise levels

Receiver type	Noise amenity area	Time of day	PANLs dB(A)
Residence	Rural	Day	45
		Evening	40
		Night	35

The project operational noise trigger levels (PNTLs) are the lower of either the PINLs or the PANLs. In this situation the figures are the same.

Table 5-4 Project noise trigger levels

Catchment	Time of day	Intrusive Noise Level dB $L_{Aeq, 15\ min}$	PANL dB $L_{Aeq, 15\ min}$	PNTL dB $L_{Aeq, 15\ min}$
Rural Receptors	Day	45	45	45
	Evening	40	40	40
	Night	35	35	35

D1.2 Operational noise sources

Noise from the operation of the solar farm would be generated by:

1. The onsite substation.
2. Maintenance activities such as visual inspections of panels and structures, general maintenance (e.g. replacing fuses, replacing panels), cleaning of panels and emergency repairs (e.g. replacing tracking motors).
3. Tracking motors and movement of the solar panels.
4. Inverter stations.
5. Centralised Battery Energy Storage System (BESS) including Heating, Ventilating and Air Conditioning (HVAC) systems.

The proposed activities above use readily available equipment. As such, noise levels associated with that equipment (Table 5-5) and activity is well understood and able to be modelled. The 'null effect distance' was modelled for each piece of equipment for operation of the proposed solar farm and the BESS (Table 5-5 and Table 5-6). This represents the distance at which each individual piece of equipment no longer exceeds the PNTLs criteria.

Table 5-5 Operational equipment sound levels.

Equipment	No. of units	Sound power level (dB (A)) at 7 m	Sound pressure level (dB) at 7 m	Null effect (≤45 dB(A)) distance (m)
Internal substation - transformers	2	85	74	280
Light vehicle	1	78	67	160
Tractor – slashing grass	1	92	81	570
Tractor – washing panels	1	92	81	570
Truck	1	83	72	240
Telehandler	1	81	70	200
Tracking motor	10	60	49	35
Invertor station	1	73.9	62.9	120

The proposed centralised BESS would include up to 50 battery container units. On either side of these battery units is a heating, ventilation and air conditioning (HVAC) unit. In addition, the BESS

would require the operation of up to 100 power conversion units, two step-up transformer units and one control room.

During operation, approximately one staff member would attend to the BESS daily during the daytime period to monitor the equipment. This staff member would travel around the site in a light vehicle.

Table 5-6 Operational sound levels for BESS plant and equipment.

Equipment		Sound Pressure Levels, L_{Aeq} dB(A) (@ 7 m)	Number of units	Combined sound pressure level dB(A)	Null effect distance (m)
BESS	HVAC equipment (fans, pumps etc)	67	200	92.3	370
	Power Conversion Units (inverter stations)	80.5	50	97.5	710
	Step up transformers (33kV)	59	2	95	700
	Light Vehicles	79	1	78	160

D1.3 Operational noise assessment

Noise levels have been calculated for two operational scenarios using equipment sound power levels:

- Operation of tracking motors, internal substation, the inverter stations and BESS during standard work hours.
- BESS operation out of standard work hours.

These scenarios are deemed to have the highest noise impact, that is all of the plant would be operating simultaneously. The activities selected provide a worst-case scenario for noise generated from the site.

The operational noise predictions are based on noise attenuation with distance from source. They do not take into account any obstacles between the source or weather conditions which can influence the level of noise perceived.

Table 5-7 Predicted noise level and impact key

Predicted Noise Level dB (A)	Description
Green = no exceedance	Clearly audible = < 10 dB (A) above PNTL
Yellow = Minor exceedance	Moderately intrusive = > 10 dB (A) above PNTL
Orange = Substantial exceedance	Highly intrusive = > 75 dB (A) above NML
Red = highly noise affected	

Scenario 1 – Operation of trackers, onsite substation, inverter stations and BESS

During operation, the internal substation, invertor stations and BESS would generate continuous noise. The tracking motors rotating the panels would generate intermittent noise during the day, operating every 15 minutes for about 0.5 minutes. This scenario considers the continuous operation of the internal substation, invertor substation and tracking motors. It predicts the typical noise levels that may be experienced during the operation of the solar farm infrastructure only with no maintenance activities occurring (Table 5-8).

The internal substation would contain 1 or 2 transformers to transform 33 kV from the solar farm to 132 kV for transmission to the external substation. Australian Standard AS 60076 Part 10 2009 “Power Transformers – Determination of Sound Power Levels” specifies applicable sound power limits for all transformers based on the transformer rating (in MVA). Whilst the MVA rating of the internal substation is not yet available, a conservative assumption is provided below based on two 150 MVA units. The specification for the 150 MVA transformers indicates that the sound power output from 2 transformers would be about 85dB (A) at 7 m.

During operation, there would be 67 inverter stations of two inverter units distributed throughout the development site. Due to their distribution across the site, for any one receiver, it is expected that only one invertor station would be close enough to affect the noise environment. Accordingly, only one inverter station has been used in the noise model below. There would be one tracking motor for 25 rows of 90 solar panels. This would equate to a maximum of 600 tracking motors distributed across the site. It is expected only 10 would be close enough to affect the noise environment at any one sensitive receiver.

Table 5-8 Operational equipment for Scenario 1.

Equipment	Quantity	Sound power level (dB (A)) at 7 m (per item)
Internal substation - transformers	2	85
Tracking motor	10	60
Invertor station	1	74
BESS	(refer to Table 5-6)	

Table 5-9 Predicted noise levels for receivers during scenario 1 (during standard hours).

Receiver	Distance from tracking motor/arrays (m)	Distance from Invertor station (m)	Distance from internal substation (m)	Distance from BESS (m)	Predicted Noise Level dB (A)	Description
R30	670	855	3518	3661	20	Not noticeable
R31	461	651	3391	3560	25	Not noticeable
R29	349	432	2905	3039	30	Not noticeable
R28	1012	1114	3099	3195	17	Not noticeable
R24	498	665	1560	1525	37	Not noticeable
R32	1144	1330	3661	3540	15	Not noticeable
R19	363	556	3017	2835	27	Not noticeable
R17	1157	1308	4253	4107	15	Not noticeable
R33	165	358	1429	1315	40	Not noticeable
R34	385	589	1580	1595	36	Not noticeable
R14	308	485	1661	1686	36	Not noticeable
R09	585	703	1846	2059	24	Not noticeable
R08	979	1106	3482	3692	17	Not noticeable
R03	1768	1951	4363	4569	12	Not noticeable

Table 5-10 Predicted noise levels for receivers during Scenario 1 (during evening hours).

Receiver	Distance from tracking motor/arrays (m)	Distance from Invertor station (m)	Distance from internal substation (m)	Distance from BESS (m)	Predicted Noise Level dB (A)	Description
R30	670	855	3518	3661	20	Not noticeable
R31	461	651	3391	3560	25	Not noticeable
R29	349	432	2905	3039	30	Not noticeable
R28	1012	1114	3099	3195	17	Not noticeable
R24	498	665	1560	1525	37	Not noticeable
R32	1144	1330	3661	3540	15	Not noticeable
R19	363	556	3017	2835	27	Not noticeable
R17	1157	1308	4253	4107	15	Not noticeable
R33	165	358	1429	1315	40	Not noticeable
R34	385	589	1580	1595	36	Not noticeable
R14	308	485	1661	1686	36	Not noticeable
R09	585	703	1846	2059	24	Not noticeable
R08	979	1106	3482	3692	17	Not noticeable
R03	1768	1951	4363	4569	12	Not noticeable

The sensitive receivers within 1 km of the solar farm infrastructure are **not** predicted to experience any noise exceedances above the daytime PNTL.

The solar farm would not normally be in operation during the evening and not in the night hours. The exception being summer with extended day lengths (Table 5-11). This coincides with daylight savings (NSW daylight savings is from the first Sunday in October to the first Sunday in April), where the inverter stations, tracking motors and on-site substation would be operating until sunset.

Table 5-11 Daylight hours at Albury (Willyweather.com.au)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Rise (am)	6.13	6.44	7.12	6.46	7.02	7.21	7.19	6.53	6.11	6.22	5.57	5.51
Set (pm)	8.30	8.08	7.30	5.56	5.16	5.05	5.17	5.40	6.04	7.23	7.58	8.25

Scenario 2 – Operation of the BESS out of standard work hours

During operation, the BESS would not operate continuously. The noise modelling is based on the BESS operating at full output. However, the level of output would be intermittent. As such, these noise levels should be considered as a peak in operation of the BESS rather than the ongoing operational noise levels.

The project amenity noise level for evening is 40 dB(A) and night is 35 dB(A). The figures in Table 5-6 were calculated using a web-based calculator (http://www.sengpielaudio.com/calculator-distance.htm). The maximum noise output from the BESS at 7 m with all components operating at full power is predicted to be 99.9 dB(A). This scenario predicts the 'worst case scenario' and assumes that all plant and machinery are operating continuously and concurrently.

Based on the predicted operational noise levels presented in Table 5-6, noise levels at all sensitive receivers would comply with the evening criteria outside standard working hours. The calculations predict there would be audible noise of an acceptable level at each of the sensitive receivers (Table 5-12). This assessment does not include any effect that the landscape may have on noise transmission.

However, if the BESS is operational at 'worst-case scenario' for periods during night-time hours, the BESS would be audible at receivers R14, R24, R33 and 34. Noting that the residence at R33 and 34 is currently unoccupied. The PNTL for operation is 40 dB LAeq, 15 min for evening hours and R35 dB LAeq, 15 min. There is an exceedance of 2 dB at R24, exceedance of 1 dB at R14 and R34 during night-time hours and an exceedance of 5 dB at R33.

Table 5-12 Predicted noise levels for receivers for Scenario 2 during evening hours.

Receiver	Distance from BESS (m)	Predicted Noise Level dB (A)	Description
R30	3661	20	Not noticeable
R31	3560	25	Not noticeable
R29	3039	30	Not noticeable

Receiver	Distance from BESS (m)	Predicted Noise Level dB (A)	Description
R28	3195	17	Not noticeable
R24	1525	37*	Audible during night-time hours
R32	3540	15	Not noticeable
R19	2835	27	Not noticeable
R17	4107	15	Not noticeable
R33	1315	40	Audible during night-time hours
R34	1595	36*	Audible during night-time hours
R14	1686	36*	Audible during night-time hours
R09	2059	24	Not noticeable
R08	3692	17	Not noticeable
R03	4569	12	Not noticeable

Note: * Exceedances of ≤2 dB(A) are not perceptible.

D1.4 Sleep disturbance

The NPI states:

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

Where the subject development/premises night-time noise levels at a residential location exceed:

- *LAeq,15min 40 dB (A) or the prevailing RBL plus 5 dB, whichever is the greater; and/or*
- *LAFmax 52 dB (A) or the prevailing RBL plus 15 dB, whichever is the greater.*

a detailed maximum noise level event assessment should be undertaken.

During the night-time period, mechanical plant associated with the solar panel infrastructure would not be operating due to the lack of sunlight. During daylight saving period over summer some tracker noise emissions may occur between 6 am and 7 am. When the sun is not shining the invertor stations will not be operating. It is expected that noise levels at the closest receivers would be well below the sleep disturbance criteria.

However, the BESS would be operating intermittently during the night-time to recharge battery energy and discharge battery energy to the electricity network. Based on the predicted operational noise levels presented in Table 5-6, calculations predict there would be audible noise of an acceptable level at each of the sensitive receivers (Table 5-12). An exceedance of 5 dB (A) above the evening NML may occur for R33.

Transmission line

Noise emissions from operational transmission lines can include aeolian and corona discharge noise. In the context of this proposal, aeolian noise could be generated when wind passes over transmission poles or lines. This type of noise is generally infrequent and is dependent on wind direction and velocity. Wind must be steady and perpendicular to the line to cause aeolian vibration. Given the distance to the closest sensitive receiver from the overhead power line and the TransGrid substation 660 m (R33) and 1440 m (R33) respectively, aeolian noise impacts are expected to be negligible.

SLR Consulting have previously measured corona noise (reference GEHA Report 045-109/2 dated 9 November 2004, pers. comm. I. Fricker December 2012) at a site near Officer in outer Melbourne, Victoria. SLR found it possible to measure corona noise at close distances, at high frequencies only, as other noise sources, namely traffic and birds, caused some interference at times. A 500-kV line was measured during damp foggy conditions.

At a distance of 30 m along the ground from the line, a Leq noise level of about 44 dB (A) was measured. At a distance of 660 m the corona noise was calculated to below a detectable level. The night-time intrusive criteria determined is 35 dB (A).

Appendix E UPDATED CONCEPT LANDSCAPE PLAN

Appendix F LOCAL PARTICIPATON PLAN