EXPERTS FOR THE SOLAR AGE.

PHOTON ENERGY

Photon Energy Australia Pty Ltd | Level 2 / 55 Grafton Street | Bondi Junction NSW 2022 | Australia

10 December 2018

Dear Alana,

Re: Gunnedah Solar Farm – Question form the Commission

Thank you for your email dated Monday 3 December 2018. We provide the following responses to your questions.

1. **Provide an explanation of how the heavy vehicle route was determined. What was the selection criteria used to determine the route and were other routes considered?**

   The heavy vehicle route outlined below has been determined to be the safest and most appropriate transport route:

   - Kamilaroi Highway to Gunnedah carries B Double trucks and allows for local, regional and national road freight movements
   - Blue Vale Road is well laid out and can safely accommodate the truck movements, providing a high level of control and safety
   - Old Blue Vale Road and the intersections from Blue Vale Road and Kelvin Road have been assessed as providing adequate safety and visibility based on Guidelines
   - Kelvin Road is used for trucks and allows for adequate stopping and turning distances
   - Orange Grove is used as it's the public road giving access to the property

   It is noted that the other access to the site is via the Oxley Highway (through Tamworth), then Rushes Creek Road which ends around Lake Keepit then onto Orange Grove Road. This route includes 30 kms of dirt winding road that is not suitable for semi-trailers.

   More detail can be found in the EIS Appendix I – Traffic Impact Assessment.

2. **Provide a map of the school bus routes through the area.**

   Please refer to Figure 1. The map has been compiled based on discussions with the bus companies listed on the Gunnedah Shire Councils' website. This includes Hope Bus Services, Hawkins Coach lines and Millerd's Bus Service. The school run is generally between 0800 – 0830 and 1530 - 1600 on school days.

3. **Provide a cross-section figure showing the location of VP9 and the solar farm. The cross section should include Reduced Levels (RLs).**

   Please refer to Figure 2 and Figure 3. Figure 2 shows the actual ground levels based on the information in the flood management plans and Figure 3 is using a Figure *3*vertical exaggeration of 1:10.

4. **Provide further details regarding how reflectivity and potential impacts associated with glare would be avoided.**

   Please refer to Table 1 below.

5. **Provide a subdivision plan showing the required allotments as discussed in the briefing 19 November 2018.**

   Please refer to Figure 4.

6. **Provide cost to fence entire site as discussed in the briefing 19 November 2018.**

   The entire estimated length of fencing is 5,500 metres @ $55/m = $302,500 and 4,000 metres at $66/m = $264,000. The total estimated cost being $566,500.

7. **Provide an overview of community consultation undertaken post submission of the Environmental Impact Statement (EIS) including any consultation undertaken throughout the Response to Submissions (RtS) process, following submission of the RtS and any further consultation since that time.**

   Consultation / engagement undertaken post submission of the EIS includes:

   - 23 April 2018 – Sent notification to 19 community members advising that the EIS was about due for public exhibition.
   - 17 May 2018 – communication with Geoff Hood. Spoke with Geoff also on the 23 May, 25 May and 28 May regarding flooding concerns and review of flood modelling data and fencing configuration.
   - 25 May 2018 - Presentation to the Gunnedah Shire Council including the Gunnedah Mayor and Councillors.

   After the RtS was submitted it was understood the Department of Planning and Environment were discussing the proposal with the community. This included a site visit and Department of Planning and Environment holding separate sessions with sensitive receivers.

   - 26 October 2018 – email to Graeme Brown regarding next steps.

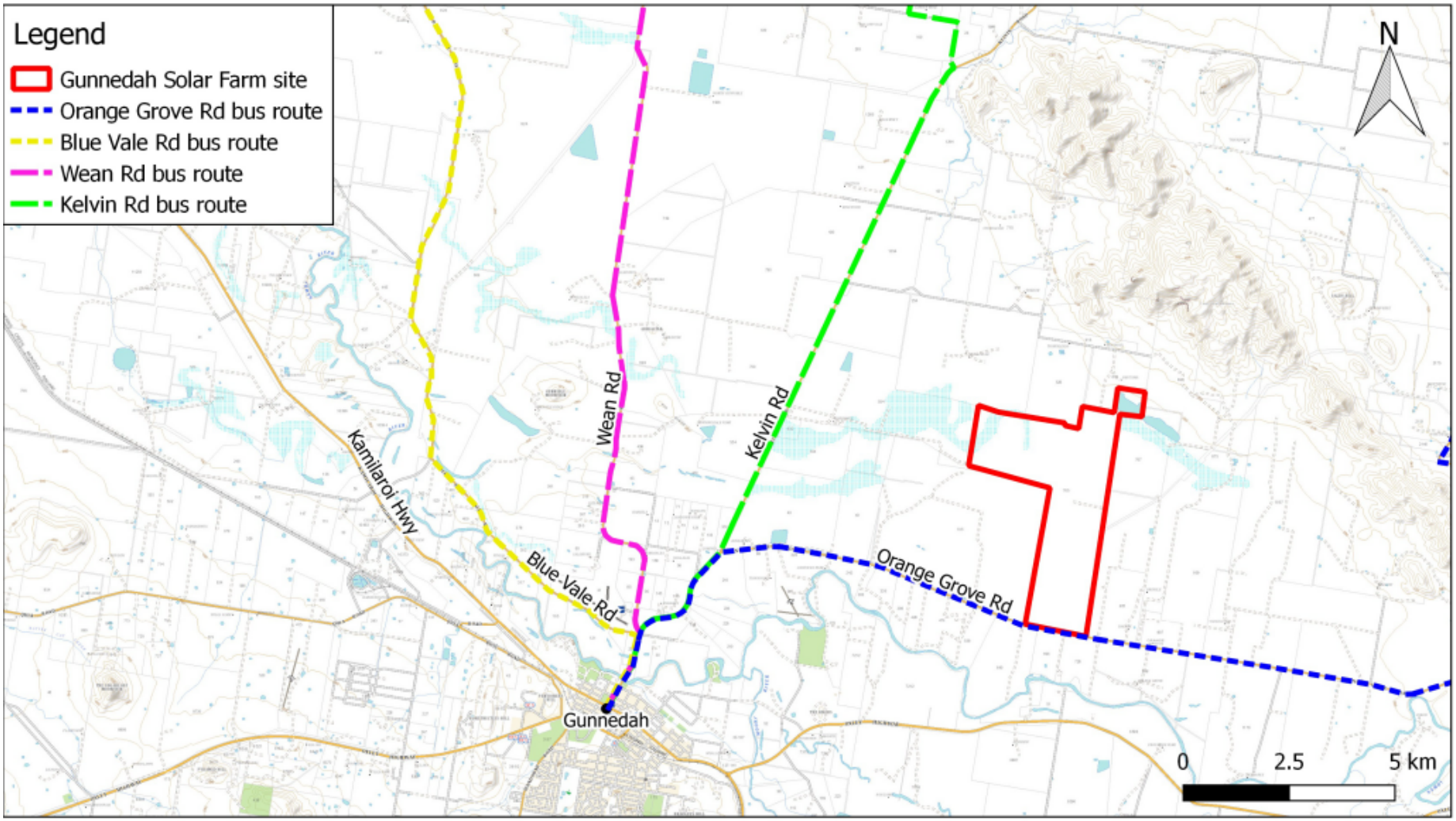
- 30 November 2018 – one on one meetings with Rob Galton regarding the flooding fencing configuration and Chris Avard regarding visual impacts.

There has also been several media requests which have been responded to.

Please do not hesitate to contact me should you require further clarification to the above questions.

Yours sincerely

Nick Guzowski
Project Manager – Gunnedah Solar Farm



School bus routes to Gunnedah around the Gunnedah Solar Farm site

School bus services operate around the site from 8.00 am to 8.30 am and from 3.30 pm to 4.00 pm.

Figure 1 – Gunnedah school bus route

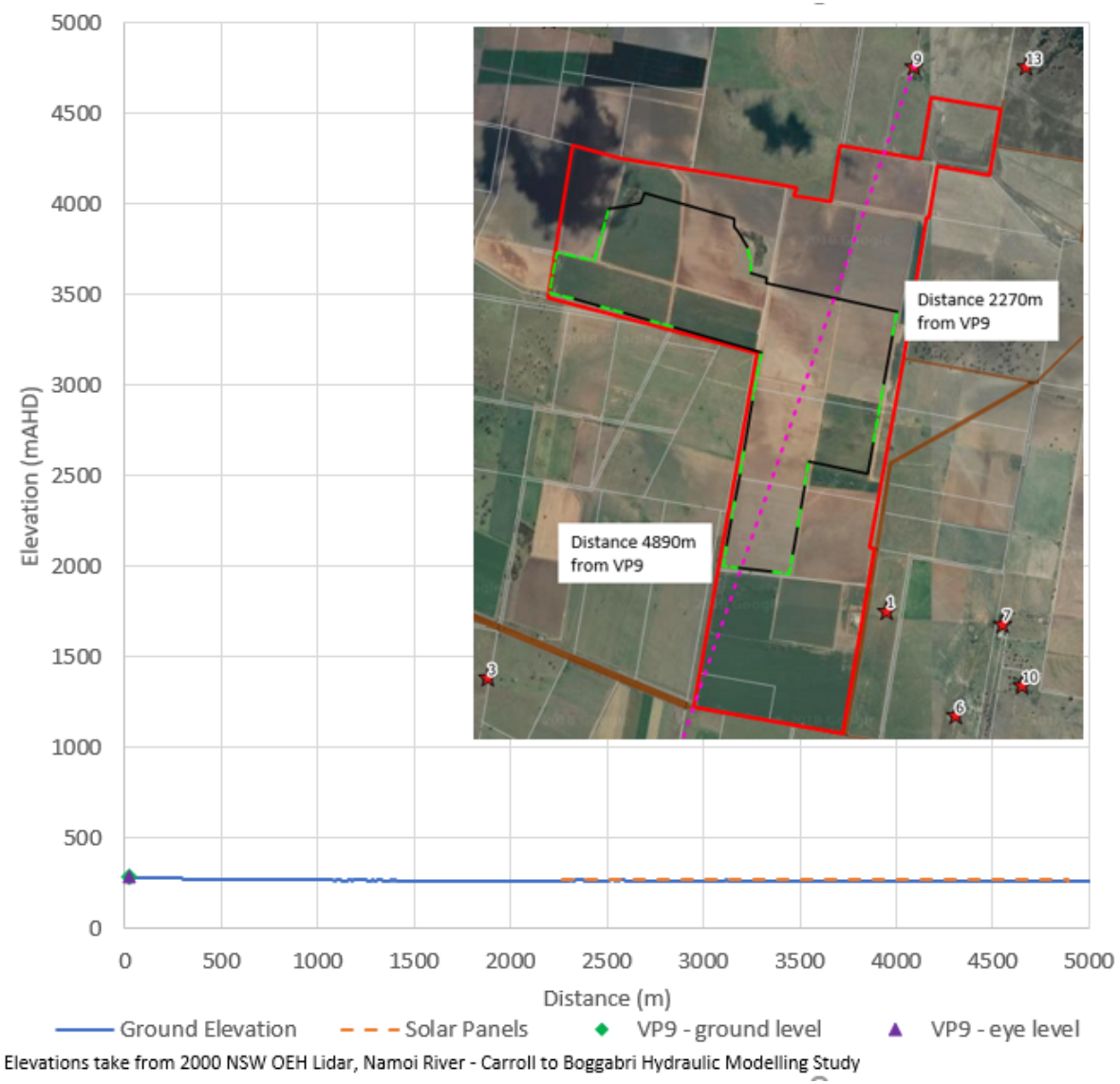


Figure 2 – Cross Section showing the location of VP 9 and the proposed Solar Farm

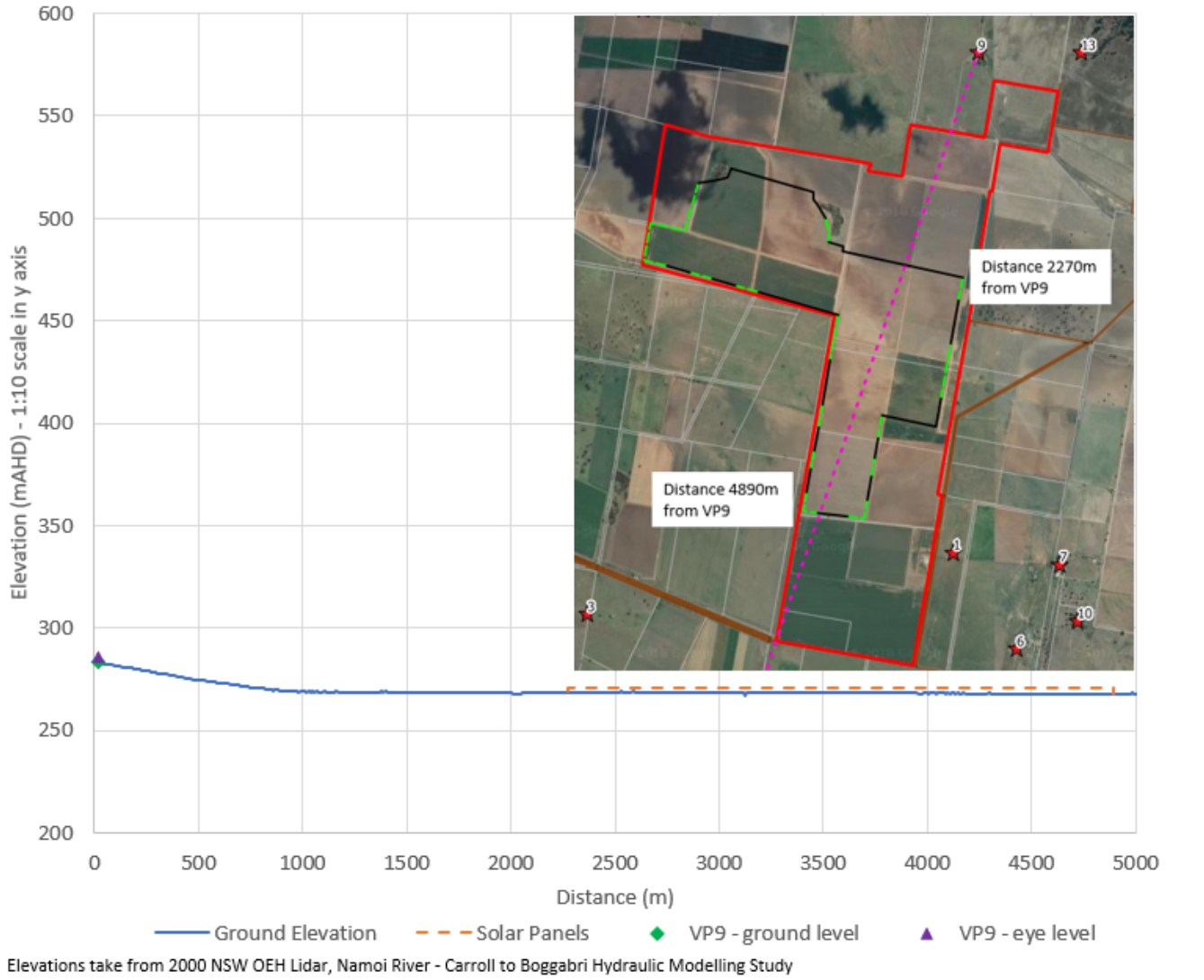


Figure 3- Cross section showing the location of VP 9 and the proposed Solar Farm – vertical exaggeration 1:10

Table 1: Provide further details regarding how reflectivity and potential impacts associated with glare would be avoided.

Potential Impact	Updated Response
Glare	*Overview* The Solar PV modules proposed to be installed at Gunnedah are designed to absorb the light rather than reflect it. This is very different to concentrated thermal solar power which uses mirrors to reflect the sun to one point concentrating the sunlight. In addition it is noted the NSW Government Discussion Paper: Planning for Renewable Energy Generation – Solar Energy (April 2010) states: 'The potential for glare associated with non- concentrating PV systems which do not involve mirrors or lenses are relatively limited'. *Photovoltaic Panel Impacts* Photovoltaic(PV) panels are designed to absorb solar energy (module surface is uneven in design to refract light inwards to maximise efficiency) in order to produce electricity. As a consequence, the reflectance levels from photovoltaic systems are typically lower than the reflectance generated by common reflective surfaces of built environments such as farm sheds. The reflectance from PV panels is also typically lower than features of natural environments, such as bodies of smooth water. Given the trajectory of the sun there will be no glint/glare impacts from the modules to receivers located to the north of the site and the impacts. The trajectory of the sun through the northern horizon means there is theoretical potential impacts to receivers to the south of the project, including the dwellings and the road. These impacts will be mitigated by: • The impacts would be less than that of a body of water as the PV panels are designed to absorb light. • The uneven surface of the modules and the position and setbacks of the receiver's results in reflected light becoming more diffused over distance and the nearest receiver is set back 800 metres to the southeast of the site allowing adequate distance for this phenomena to further mitigate the impacts. • The dynamic nature of the glint/glare impacts occurring due to the change trajectory of the sun, the tracking nature of the modules and the variable static position of a given receiver means any impacts would only occur for a short period before the dynamics change and the impacts are no longer occurring. • Movement of the receiver in a vehicle further reducing the momentary nature of the impact. • Filtering of reflected light by existing trees and structures. • Existing glint and glare received of existing nearby buildings and water bodies.

Potential Impact	Updated Response
	When driving past PV modules in rows perpendicular to the road, the colour of the panels could also change rapidly from black (when viewed from the south) to various shades from blue to white, lightening in appearance as the vehicle passes the facility. The rapid change in viewer position results in abrupt changes in angle and pattern of the panels. This visual change would only be seen if looking directly down the rows when travelling past at speed, and would be momentary. On this basis it is considered that any glint or glare from the PV panels will not have any unreasonable impacts on the nearby potential receivers. *Balance of System Impacts* Beyond the PV panels there will be some instances of glint experienced by nearby receivers, including the road and dwellings, depending on the weather conditions, position of the sun and position of the receptor. This may occur from from the other metal/reflective material that form part of the projects balance of system including the following: • Steel mounting frames • The PV panel frames and "busbar" • Transmission poles • Metal components within the substation, inverters and switching stations As the solar farm is designed to track the sun throughout the day the PV panels will block most of the sunlight from reaching the steel mounting frames. As such there will only be very limited potential for glint or glare off steel mounting frames. The minimal glint or glare that may occur from these mounting frames will typically be a momentary due to the change nature of the sun and tracking nature of the system and further reduced for anyone moving past the project and less likely to be experienced to the north of the site due to the trajectory of the sun. This would be no worse and likely less impactful than the reflected light from a body of water such as a lake or metal farm buildings. As noted above the setbacks of the receivers will also enable any glint or glare to diffuse mitigating its impact. The PV panel frames have a small surface area and spaced out by the PV panels. As such, potential for glint and glare from these frames will very limited and again momentary depending on the position of the sun and the receiver and changing throughout the day and as a result of the tracking nature of the system. The frames are matt steel which also reduces their potential Again mitigation provided by the setbacks of

Potential Impact	Updated Response
	the sensitive receivers and part screening by existing vegetation and buildings. The same characteristics and impacts also apply to the "busbar" (fine silver lines) within the face of the PV panel. The transmission poles and the substation and inverter buildings are considered to be commensurate with existing infrastructure and buildings within this context given the scale, positioning and setbacks. On this basis any glint and glare impacts from these structures will not represent an unreasonable change or increase from existing conditions. Numerous studies of glint and glare produced by solar photovoltaic systems have been performed in the last several years, all concluding that photovoltaic systems represent a low source of glint and glare and a less-than-significant environmental impact (e.g., Power Engineers 2010, AARDVARC Ltd. 2014) and as noted above in the The NSW Government Discussion Paper: Planning for Renewable Energy Generation – Solar Energy (April 2010).
Light refraction from heat	A 'mirage' effect — glittering or shimmering — can be sometimes observed at PV facilities. The effect is similar to the shimmering seen over a bitumen road on a hot day and occurs because the surface of the panels is hotter than the air around it. The 'mirage' effect can make the colour above the panels appear brighter and bluer. The 'mirage' effect is not bright enough to cause discomfort, and is likely to be only observed during certain times of day and from certain viewing positions. The 'mirage effect' may be observed under certain conditions at the Gunnedah Solar Farm but will not have any unreasonable impacts.

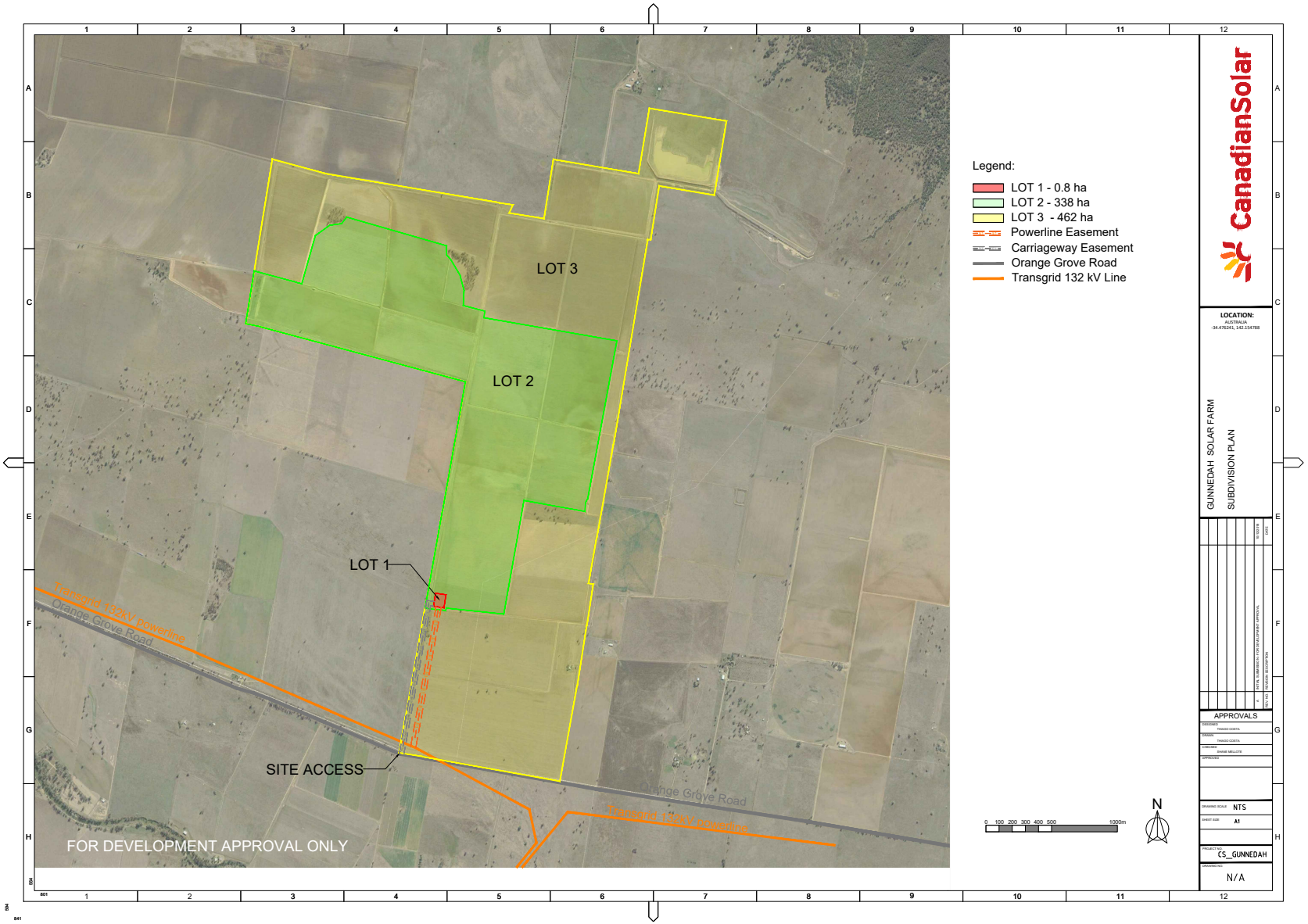


Figure 2: Sub division plan