



BARNAWARTHA SOLAR FARM

SITE SELECTION ANALYSIS

RenewableAge 

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1. Introduction

This report summarises the analyses that were carried out to identify the site at 1377 Plunkett Road, Barnawartha as a possible location for a 5MW small-format solar farm project.

2. Why Barnawartha?

Renewable Age and partners believe the Barnawartha area is highly prospective for 5MW small-format solar farm development because:

- There is excellent community support for renewable energy in the Barnawartha/Wodonga area and the Hume region¹,
- There is an AusNet Services substation in Barnawartha that we believe has capacity for new generation connections at 22kV,
- There are 22kV feeders in Barnawartha that have sufficient capacity for 5MW AC export generators,
- There is vacant land of suitable zoning that is outside of residential growth corridors,
- The marginal loss factors² in Barnawartha are currently suitable for renewable energy investment,
- Barnawartha is outside of the declared irrigation districts for Victoria,
- Barnawartha has very good solar resources for Victoria.

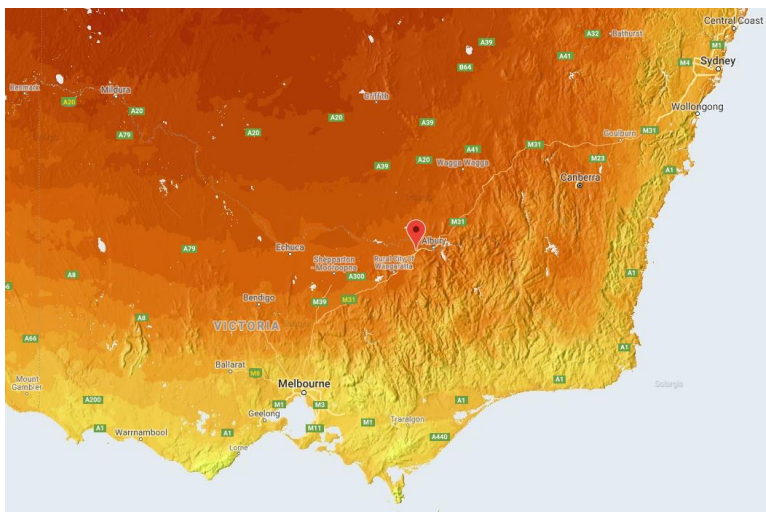


Figure 1 – Solar radiation map showing very good solar resources in Victoria for Barnawartha (from SolarGIS)

¹ “Hume Region Renewable Energy Roadmap”, Goulburn and Ovens Murray Regional Partnerships, DELWP, www.energy.vic.gov.au/renewable-energy/victorias-renewable-energy-roadmap/hume-renewable-energy-roadmap

² “Marginal loss factors (MLFs) reflect the impact of electricity losses along the network and are applied to market settlements in the National Electricity Market (NEM), and so affect generator revenues. They represent electricity losses along the transmission network between a connection point and the regional reference node (RNN), which is used to represent the regional centre of the transmission network.”, AEMC “Fact sheet - Marginal loss factors”, <https://www.aemc.gov.au/sites/default/files/2019-03/Fact%20sheet%20marginal%20loss%20factors.pdf>

2.1 Solar Resource Comparison with Melbourne

Northern Victoria has much better solar resources than southern Victoria, Melbourne for example. The annual mean daily global solar exposure (AMDGSE) for 2019, for comparison of Barnawartha against Melbourne, is shown in the table below.

Location	AMDGSE (in MJ/m ²) ³	Improvement over Melbourne
Melbourne	15.0	N/A
Barnawartha	16.7	11.3%

2.2 Environmental Benefit Analysis

The Carbon Dioxide Equivalent Intensity Index (CDEII) is measured in t CO₂-e/MWh and published by AEMO (Australian Energy Market Operator) on a regular basis.

The average CDEII for the VIC1 region on the NEM in 2019 was 0.92127⁴ (total emissions for VIC1 in 2019 / total energy sent out for VIC1 in 2019).

The Barnawartha Solar farm will generate approximately 12,429 MWh of renewable energy per annum, in the first year of operation, and this will result in avoided greenhouse gas emissions of:

$$11,000 \times 0.92127 = 11,450 \text{ tonnes of CO}_2 \text{ equivalent per annum.}$$

3. Site Selection

Suitable small-format solar farm sites in Victoria require the following characteristics:

- Vacant, cleared, flat land of up to 12 hectares in area,
- Suitable soil characteristics for the proposed mounting system,
- Industrial or Farming zone,
- Non-irrigated land with low agricultural value,
- Minimal visual impact to local residents and passing traffic,
- Avoidance of flood and protected vegetation overlays,
- Minimal or no native vegetation that would need to be removed,
- Adjacent to 22kV three-phase powerlines with sufficient capacity for the proposed generation,
- Must be within a minimum distance from the local zone substation.

The selected site is suitable for a solar farm renewable energy facility because it meets all of the above criteria, namely, it is cleared and in a farming zone (zoned FZ – Farming), it is outside of the residential growth area for Barnawartha, it is outside of any declared irrigation districts, it has low visual impact, it is close to suitable 22kV powerlines and approximately 3.5km from the Barnawartha zone substation, and the site has low agricultural value with a slight north-facing slope.

³ Data taken from Bureau of Meteorology, Climate Data Online, <http://www.bom.gov.au/climate/data/>

⁴ Data taken from AEMO, <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Settlements-and-payments/Settlements/Carbon-Dioxide-Equivalent-Intensity-Index>

3.1 Barnawartha Residents

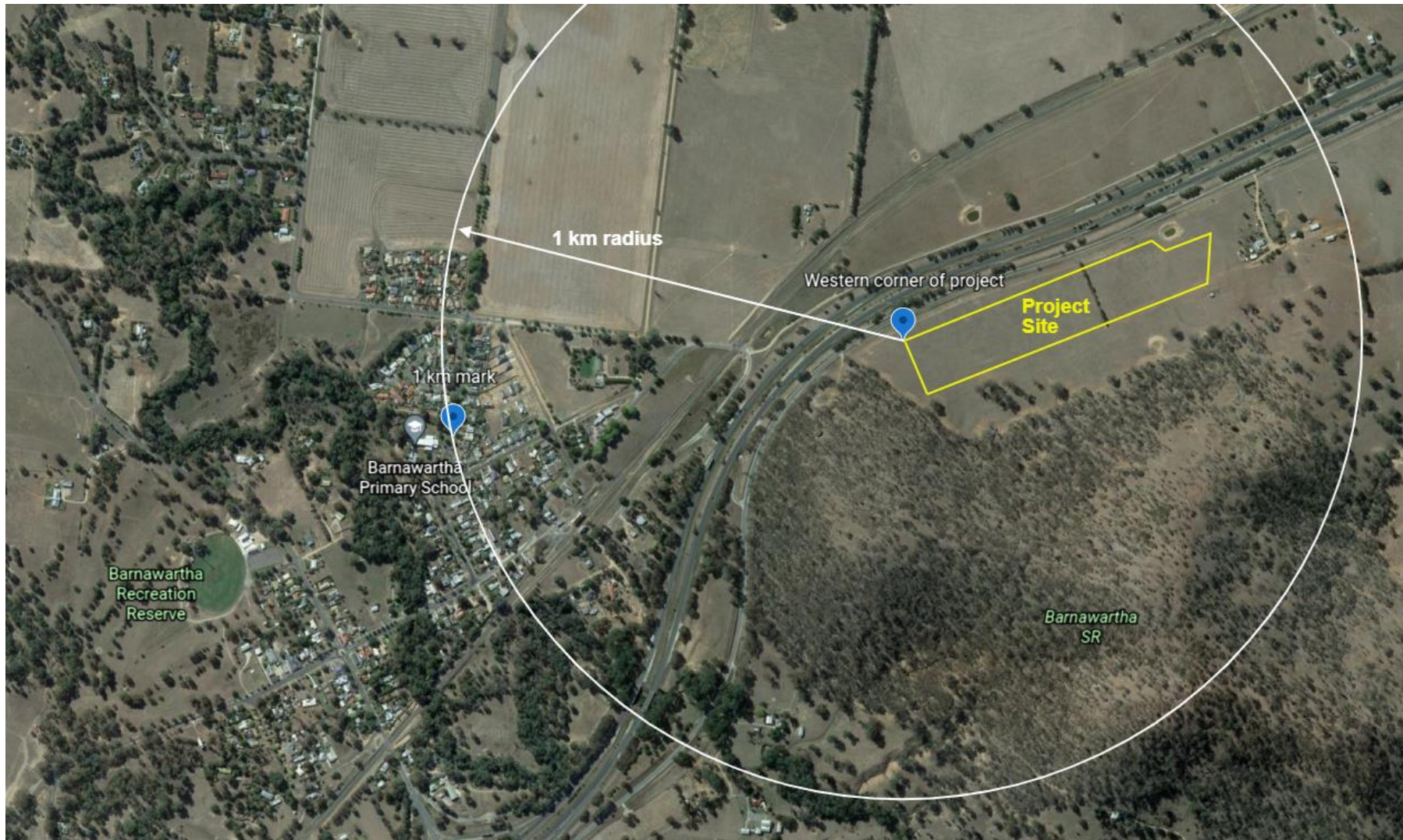


Figure 1 – Barnawartha residents within 1km of the western corner of the project site

3.2 Local Residents

Aside from residents of the township of Barnawartha, that typically have an obscured view, or no view at all, there are two local residents that live within 1 km of the project site, on the other of the Hume Freeway. The nearest resident on Plunkett Rd is 1.4km away to the east. These neighbours have all been advised in advance of the project, either directly or through their landlords.

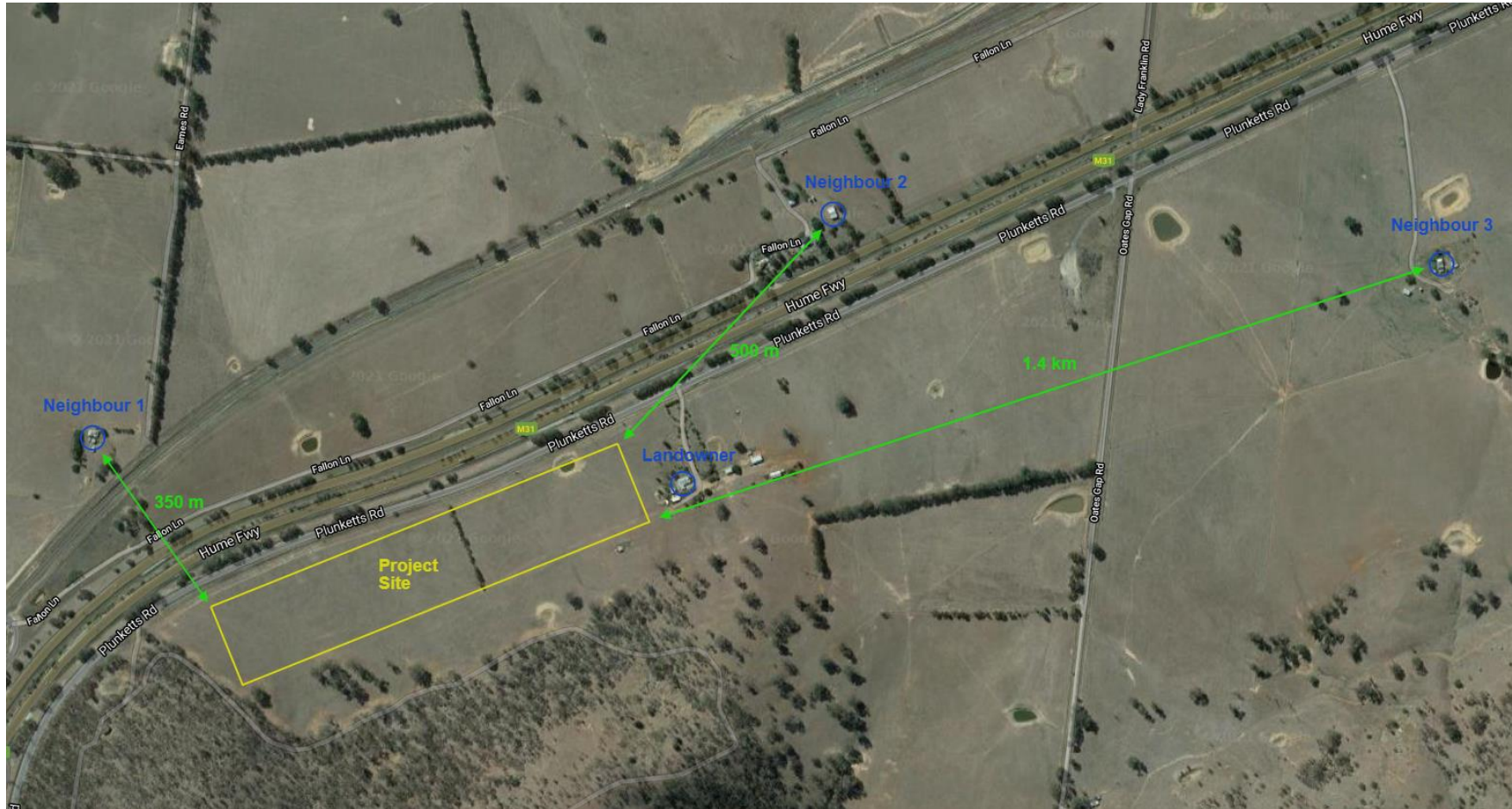


Figure 2 – Proximity of local residents

3.3 Local Land Use Characteristics

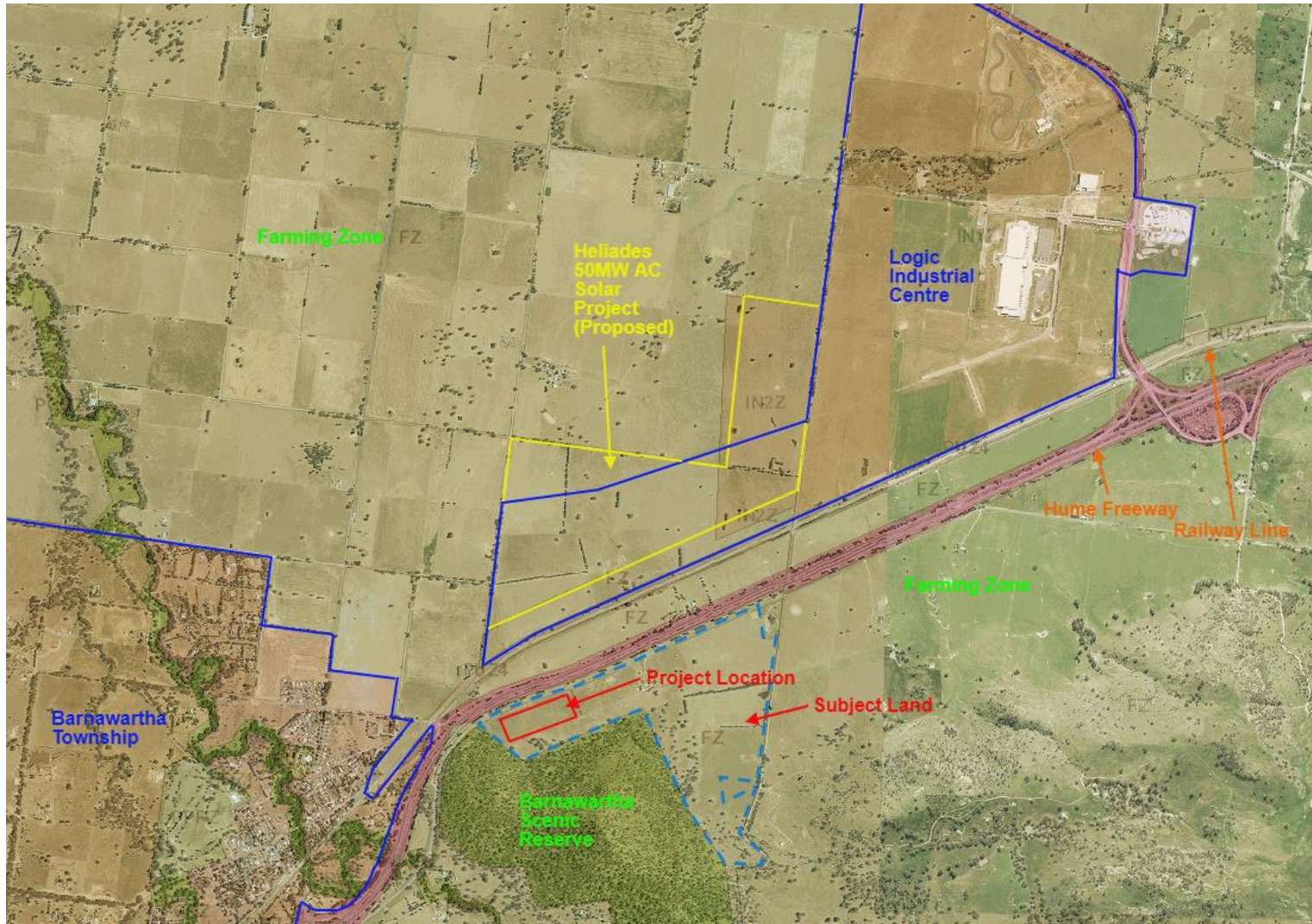


Figure 3 – Local land use characteristics

3.4 Electrical Network

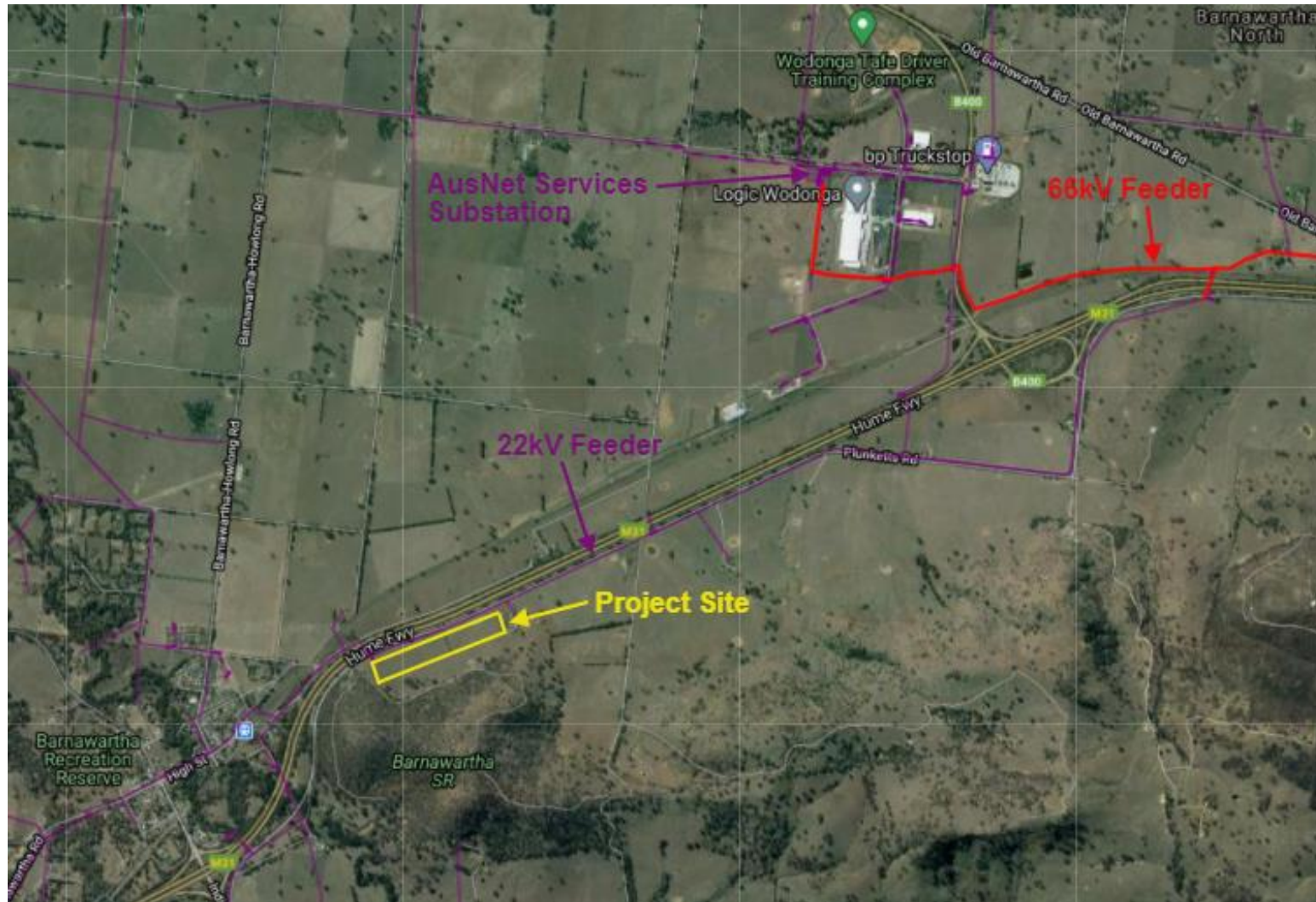


Figure 4 – Barnawartha Solar Farm site showing the Barnawartha AusNet Services substation and the 22kV and 66kV feeders

3.5 Alternate Sites Considered

Two other sites close by were considered. Alternate Site 1 was rejected because it wasn't close enough to the three-phase section of the 22kV feeder and would have required augmentation. Alternate Site 2 was rejected because it would have restricted access to the dam for stock watering.

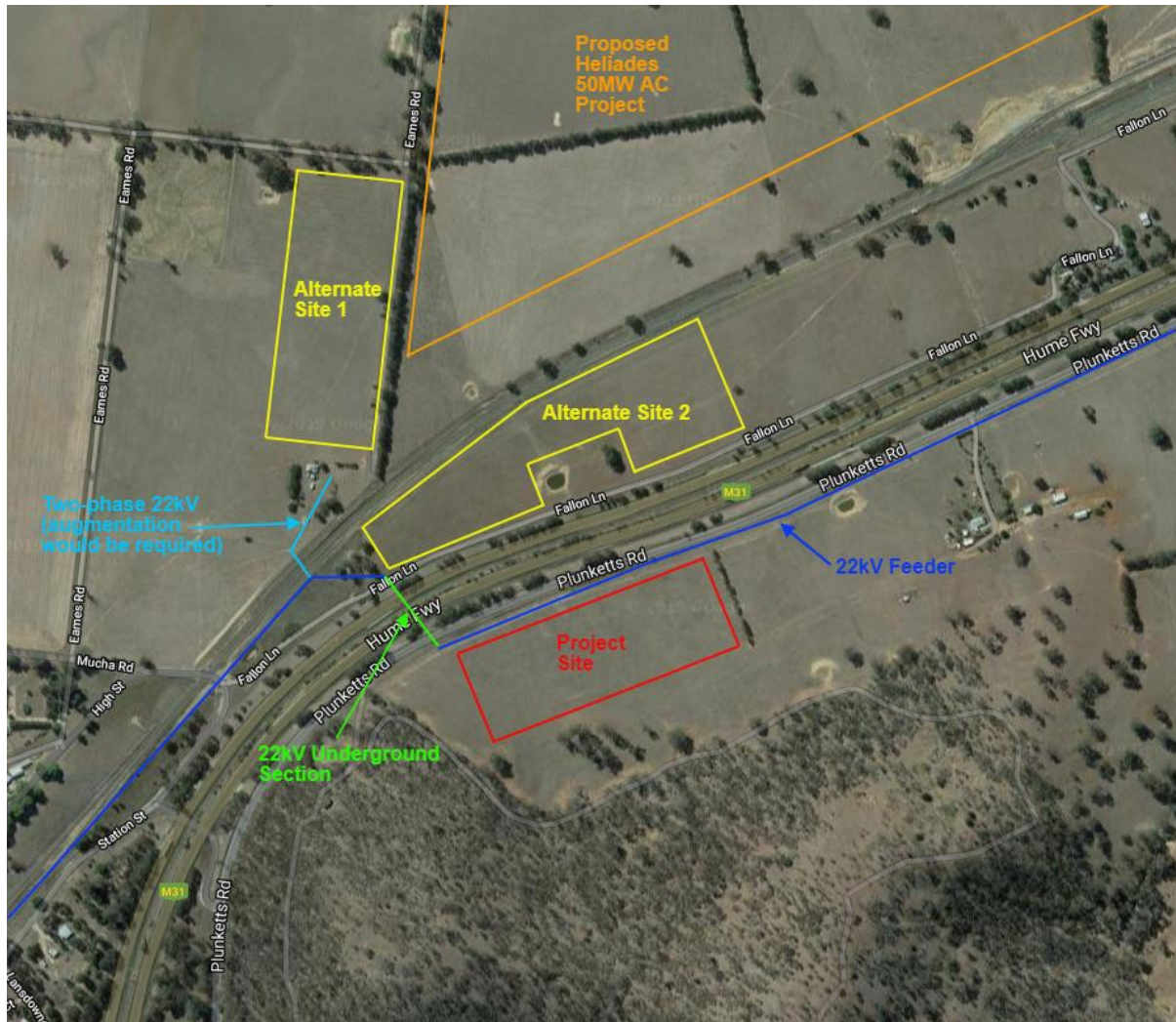


Figure 5 – Alternate sites considered

3.6 Location Within the Property

This particular location was chosen within the property boundary because:

- The landowner advises it is the least productive land on the property.
- It is sloped with a northerly facing aspect, sub-optimal for agriculture, but a slight positive for solar energy generation.
- By being adjacent to the Barnawartha Scenic Reserve it maintains the unbroken line of hillside pasture that can be seen from Plunkett Road, and, in some locations, from the Hume Freeway, stretching east from Barnawartha to the outskirts of Wodonga.
- The landowner will still be able to graze sheep and cattle around the outside of the perimeter fence, and possibly sheep within the perimeter in order to help keep grass and other vegetation at safe levels.

4. Feasibility and Grid Analysis

Small-format solar farms must be built within a few hundred metres or less of 22kV powerlines to be financially viable. There is a 22kV feeder running along Plunkett Road. An onsite inspection of the network and a preliminary discussion with AusNet Services indicated that there was likely to be sufficient capacity for a 5MW AC export small-format solar farm on the 22kV feeder. The site is 3.5km from the Barnawartha zone substation, which is within the maximum distance for a feasible connection at 22kV. SSE Australia, the planning application proponent, is currently engaged in the grid connection process with AusNet Services.

5. Local Resident Engagement

Renewable Age sought to contact the following local residents, prior to submission of the development application to DELWP:

- The landlord for tenants Neighbour 1 and Neighbour 2 on the map, advised that he will notify his tenants about the project.
- The landlord for Neighbour 3 advised that he will notify his tenant, who resides at 1243 Plunkett Road.
- The resident at 68 Neil Street (out of visual line of sight, on the other side of the Barnawartha Scenic Reserve, requested a hardcopy of the plans to be mailed to her, which was done on 17/12/2019.

6. Agricultural Value

Barnawartha is outside of Victoria's declared irrigation districts and hence no agricultural land in the area is irrigated. The landowner of the site has advised that this section of his property has marginal agricultural value. It is currently used for non-intensive sheep and cattle grazing.

7. Contact Details

Please do not hesitate to make contact for any questions or clarification.

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