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## Barnawartha Solar Farm

Phase 2 – Preparation of Planning Application and Supporting Assessments

### Surface Water Assessment

Reference: 520618\_Surface Water\_v2  
Revision: 3

7 July 2022



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## Glossary

AHD	Australian Height Datum
ANZECC & ARMCANZ	Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand
ANZG	Australian and New Zealand Guidelines
BoM	Bureau of Meteorology
CEMP	Construction Environmental Management Plan
DEM	Digital Elevation Model
EES	Environment Effects Statement
EP Act	<i>Environment Protection Act 2017</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ELVIS	Elevation Information System
EPA	Environment Protection Agency
FO	Floodway Overlay
LSIO	Land Subject to Inundation Overlay
NWQMS	National Water Quality Management Strategy
PV	Photovoltaic
SEPPs	State Environment Protection Policies
SILO	Scientific Information for Landowners

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## 1 Introduction

### 1.1 Background

Aurecon was commissioned by ARP Australian Solar Pty Ltd to undertake a surface water assessment to inform the development of ~60 MW AC Solar Farm project located four kilometres north of Barnawartha, in northern Victoria.

A planning permit is being sought for a proposed solar energy farm, battery storage and associated connection to the Barnawartha Substation, in Barnawartha, Victoria. The proposal includes:

- installation of a ~64MW (AC) solar energy farm;
- construction of ~64 MW battery storage;
- underground power cables internally to connect the sites to the substation; and
- the construction of overhead lines (OHL) between the proposed facility and the existing Barnawartha Substation to the east.

This report documents the sources of information, methods and findings of the surface water assessment. This assessment report has been prepared to inform the planning application for the project and to determine the implications of the project under relevant Commonwealth and State environmental legislation as well as specific guidelines related to the design and development of Solar Farms.

### 1.2 Scope and purpose of this assessment

The purpose of this report is to provide a technical surface water assessment to support a planning permit application for the Barnawartha Solar Farm and Energy Storage. The specialist surface water technical note in general accordance with Solar Energy Facilities Design and Development Guideline (DELWP, 2019). The scope of the assessments includes the following:

- A review of legislative requirements and guidance documentation relating to surface water.
- A desktop review of existing local surface water conditions.
- Potential impacts associated with surface water including:
  - Drainage.
  - Flood.
  - Sensitive Water Environments / Water Users (Geomorphological, Hydrological and Water Quality).
  - Water Supply.
- High-level mitigation measures to address any identified surface water impacts.
- Conclusions and recommendations for further work.

### 1.3 Site location and layout

This study area is defined by the following:

- The project area, 131.57 hectares of land approximately four kilometres to the north-east of the township of Barnawartha, which comprises two private farmland properties either side of Hermitage Road, shown on **Figure 1-2**.
- Road reserves that adjoined the project area including Hermitage Road, Murray Valley Highway (southern reserve only), Coyles Road, Baxter-Whelan Road and Barnawartha-Howlong Road; and
- The proposed route for the grid connection along the road reserve (both sides) of Baxter-Whelan Road, shown on **Figure 1-3**.

- The substation and building facility layout, shown on **Figure 1-4**.

The study area for the site investigation is represented by the project area on **Figure 1-1**

The desktop study area comprised of local waterways in the surrounding areas including the Murray River to the North, Dry Creek to the South-east and Indigo Creek to the west as well as the land area shown in **Figure 1-1**.

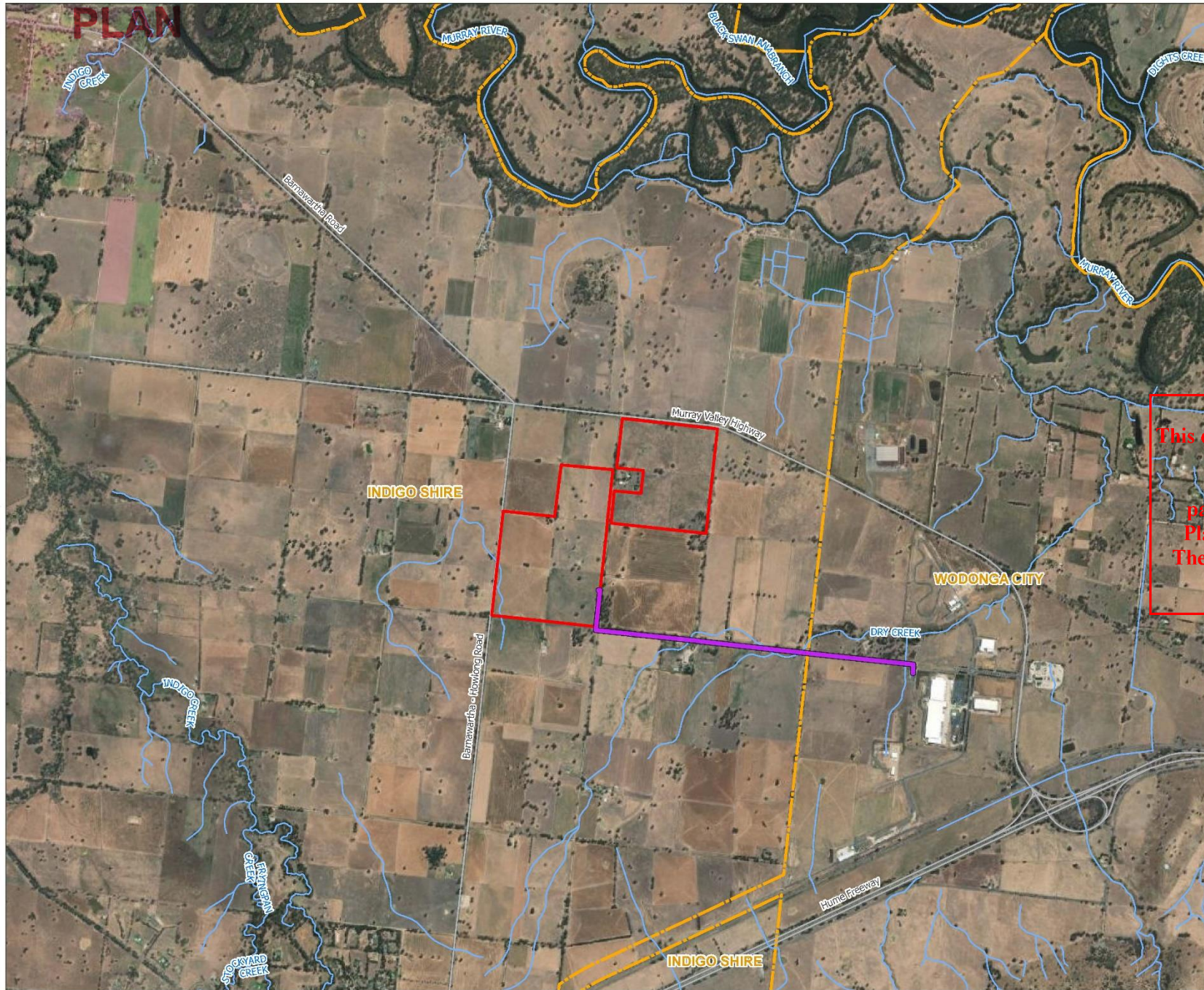
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### Legend

- Project Area
- River
- Road
- LGA outline
- Proposed Cable Route

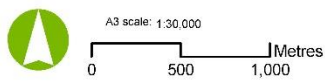


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Source: Esri, Aurecon(2021), Vicmap(2021)

Date: 15/03/2022

Version: 1



Job No: 520618  
Coordinate System: GDA 1994 MGA Zone 55

Path: C:\Users\ada.ian\Aurecon Group\SAVI Spatial - Project Work\0130\_520618\_BarnySolarEcologyCollector\Project\520618\_Barnawartha\_Project\_Surface\Water.aprx

Author: Ada Ian



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- ### General Notes
- BASIC INDICATIVE LAYOUT/DESIGN. FOR PLANNING SUBMISSION ONLY. NOT FOR CONSTRUCTION OR CALCULATION PURPOSES. DESIGN IS NOT FINALISED. SOURCE DRAWING IS BARNSF-GN-LAY-0219.
  - GAS PIPELINE AND COMMS EASEMENT (NOT TO SCALE). ENSURE ADEQUATE STANDOFF OF FENCE AND PERIMETER ROAD. 30M OFFSET FROM PROJECT LANDOWNER PROPERTY BDY TO SOLAR PANELS INC VEGETATION SCREENING.
  - 30M OFFSET FROM SOLAR PANEL TO NEIGHBOURING PROP BDY.
  - 30M OFFSET FROM SOLAR PANEL TO NEIGHBOURING PROP BDY INC VEGETATION SCREENING.
  - RETAINED TREES AREA.
  - APPROX 100 X 50M AREA RESERVED FOR SUBSTATION AND BUILDINGS. REFER TO DWG BARNSF-GN-GAD-0209 FOR INDICATIVE LAYOUT WITHIN.
  - ALT ENTRY TO BE >30M SOUTH OF MURRAY VALLEY HWY COYLES RD INTERSECTION.
  - CONNECTING CABLE TO BE BORED UNDER HERMITAGE RD.
  - EXISTING AUSNET OHL TO AUSNET OHL S OF BAXTER-WHELANS RD. REFER TO SHEET 2.
  - 1 X 45,000L WATER TANK TO BE LOCATED CLOSE TO GATE INSIDE EACH SITE PRIMARY ACCESS POINT. EACH PRIMARY ACCESS POINT TO HAVE BUSINESS IDENTIFICATION SIGN AND CFA WATER TANK DIRECTION SIGN ON OR NEAR GATE FACING OUTWARDS (REF BARNSF-GN-GAD-0228).
  - INTERNAL ROADS 4M. PERIMETER FIRE BREAK 10M INC ROAD.
  - INDICATIVE DESIGN SPECS:
    - LOCATION: BARNAWARTHA, VICTORIA, AUSTRALIA
    - UTM CONVERGENCE: 0.1821 °
    - ALTITUDE: 162.11 M
    - USABLE AREA: 128.93 HA
    - PERIMETER FENCE: 7.37 KM
    - RATED POWER @ POC: 64MW
    - BATTERY CAPACITY: TBC. INDICATIVE 64-192MWH. LOCATION: DISPERSED, NEXT TO PCU.

### LEGEND:

- Project area
- Retained trees area
- Substation, switchroom, building/facility
- Colors indicate solar field connection to each power station
- Mounting structure
- Roads
- Medium voltage trenches
- Fences
- Medium voltage lines
- Existing Ausnet overhead line
- New build overhead line within Wodonga easmt
- Vegetation screen location
- Water tank
- CFA direction to water tank sign
- Business identification sign

1	Original	30 Mar 2022
2	Addressed DELWP RFI's	24 Jun 2022
No.	Revision/Issue	Date

**Firm Name and Address**  
**WIRSOL**  
 YOUR PARTNER IN RENEWABLE ENERGY  
 Wirsol Energy  
 201/39 East Esplanade, Manly, NSW,  
 Australia, 2095  
 ARP Solar

**Project Name and Address**  
**BARNAWARTHA SOLAR FARM**  
 INTERSECTION HERMITAGE RD  
 AND BAXTER-WHELANS RD,  
 BARNAWARTHA, VICTORIA,  
 AUSTRALIA 3688

Drawing number BARNSF-GN-LAY-0226-V2	Sheet 1 of 2
Drawing title Indicative basic overall site layout - Planning submission	
Scale 100m	



- General Notes**
14. EXISTING AUSNET OVERHEAD LINE SOUTH OF BAXTER-WHELANS ROAD TO BE UPGRADED
  15. NEW BUILD OVERHEAD LINE WITHIN WODONGA COUNCIL LAND PARCEL, SOUTH OF ROAD RESERVE TO AVOID VEGETATION CLEARANCE.
  16. AUSNET BARNAWARTHA ZONE SUBSTATION (BWA)
- LEGEND:**
- Project area
  - Retained trees area
  - Substation, switchroom, building/facility
  - Colors indicate solar field connection to each power station
  - Mounting structure
  - Roads
  - Medium voltage trenches
  - Fences
  - Medium voltage lines
  - Existing Ausnet overhead line
  - New build overhead line within Wodonga easmt
  - Vegetation screen location
  - Water tank
  - CFA direction to water tank sign
  - Business identification sign

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No.	Revision/Issue	Date

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 YOUR PARTNER IN RENEWABLE ENERGY  
 Wirsol Energy  
 201/39 East Esplanade, Manly, NSW, Australia, 2095  
 ARP Solar

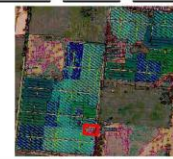
**Project Name and Address**  
 BARNAWARTHA SOLAR FARM  
 INTERSECTION HERMITAGE RD AND BAXTER-WHELANS RD, BARNAWARTHA, VICTORIA, AUSTRALIA 3688

<b>Drawing number</b> BARNSP-GN-LAY-0226-V2	<b>Sheet</b>
<b>Drawing title</b> Indicative basic overall site layout - Planning submission	2 of 2
<b>Scale</b> 1:200m	

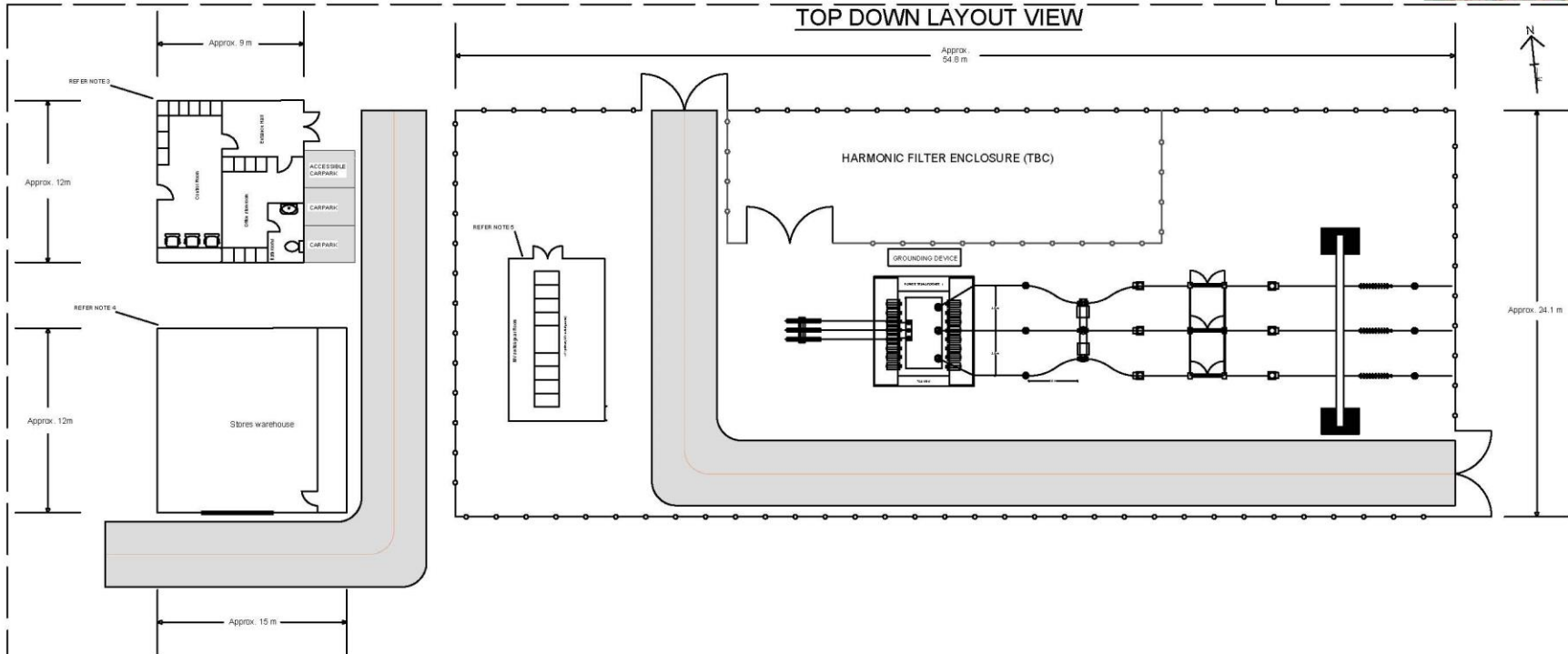
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## LOCATION

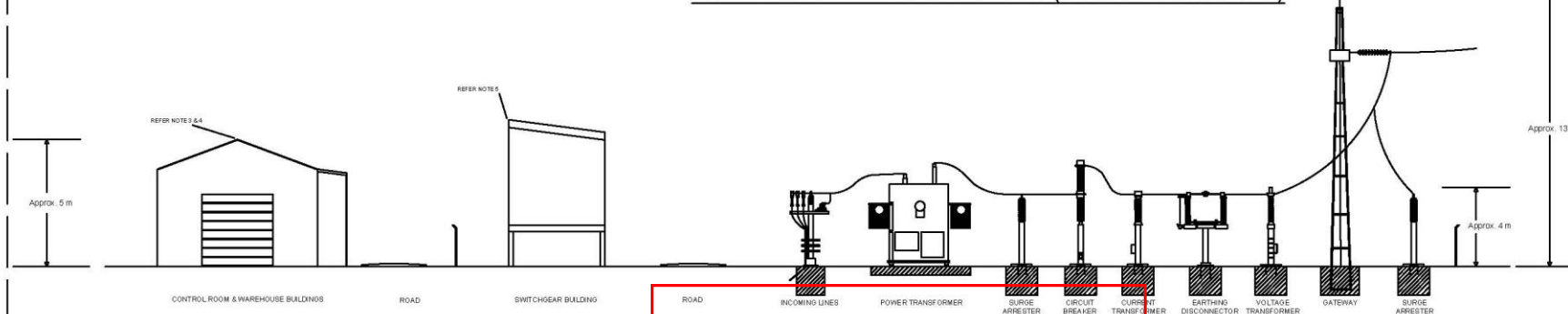
LOCATION OF SUBSTATION AND BUILDINGS WITHIN OVERALL SITE PLAN. REFER BARNSF-GN-LAY-0226.



### TOP DOWN LAYOUT VIEW



### SIDE PROFILE/ELEVATION VIEW (VIEW FROM SOUTH)



#### General Notes

- INDICATIVE DRAWING, LAYOUT AND DIMENSIONS ONLY. DETAILED DESIGN PROCESS AND TENDERING NOT YET COMMENCED. NOT TO BE USED FOR ANY PURPOSE OTHER THAN PLANNING APPROVAL.
- GENERAL CHARACTERISTICS:  
Arrangement: Line to transformer  
High voltage: 66 kV  
Medium voltage: 33 kV  
REFER TO DWG T2Q01143-L-001 & 003 FOR INDICATIVE O&M BLD DESIGN
- REFER TO DWG T2Q01143-L-004 FOR INDICATIVE WAREHOUSE DESIGN
- REFER TO DWG J0456\_L\_001\_SHT\_02\_REV\_0 FOR INDICATIVE SWITCHROOM DESIGN
- OUTDOOR LIGHTING AS REQUIRED
- SUBSTATION AND BUILDINGS AS INDICATIVELY SHOWN IN TOP DOWN VIEW WILL BE POSITIONED WITHIN 100x50M AREA RESERVED IN BARNSF-GN-LAY-0226.

#### LEGEND:

- Surge Arrestor
- Current Transformer
- Circuit Breaker
- Voltage Transformer
- Disconnecter
- Fence
- Gate

1	Original	14 FEB 2022
2	Minor bid design updates	30 MAR 2022
3	Updated layout, carspace	28 MAR 2022

No.	Revision/Issue	Date
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**WIRSQL**  
YOUR PRACTICE IN RESIDENTIAL ENERGY

Wirsol Energy  
201/39 East Esplanade, Manly, NSW, Australia, 2095

ARP Australian Solar

**BARNNAVARTHA SOLAR FARM**

INTERSECTION HERMITAGE RD AND BAXTER-WHELAN RD, BARNNAVARTHA, VICTORIA, AUSTRALIA 3688

Drawing number BARNSF-GN-04D-0226-V3	Sheet 1 of 1
Drawing title Indicative Substation and Buildings Facility layout	
Scale NOT TO SCALE	

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Figure 1-4 Substation and building facility layout

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## 2 Legislation, Policy and Guidelines

This section summarises the current legislative requirements and guidelines for the project relevant to surface water.

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### 2.1 Legislation and policy

#### 2.1.1 Commonwealth guidance

##### ***Environment Protection and Biodiversity Conservation Act 1999***

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is Commonwealth legislation that provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, termed Matters of National Environmental Significance. Under the EPBC Act, an action that has, will have, or is likely to have, a significant impact on a MNES must be referred to the Commonwealth Minister for the Environment. The Minister will then determine whether the proposed action requires formal assessment and approval under the EPBC Act.

##### **National Water Quality Management Strategy**

The National Water Quality Management Strategy (NWQMS) is a joint approach by the Australian and New Zealand governments to improving water quality in waterways. The objective of the NWQMS is to achieve sustainable use of water resources, by protecting and enhancing their quality, while maintaining economic and social development. The NWQMS provides a framework for the development and implementation of management plans for catchment, aquifer, coastal waters and other water bodies, by community and government. The NWQMS includes a number of guidelines covering water quality benchmarks, groundwater management, diffuse and point sources, sewerage systems, effluent management, and water recycling. The guidelines relevant to the Project include:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000; ANZG, 2018).
- Australian Guidelines for Water Quality Monitoring and Reporting.

##### ***Water Act 2007***

The *Water Act 2007* provides the legislative framework for ensuring that Australia's largest water resource – the Murray–Darling Basin – is managed in the national interest. The Water Act aims to:

- Improve water security for all uses of water resources in the Basin.
- Promote the use and management of the Basin's water resources in a way that optimises economic, social and environmental outcomes.
- Ensure the return to environmentally sustainable levels of extraction for water resources that are overallocated or overused.
- Protect, restore and provide for the environment of the Basin.
- Maximise the economic returns to the Australian community from the use and management of the Basin's water resources.
- Implement relevant international agreements to address the threats to the Basin's water resources.
- Ensure that the management of the Basin's water resources takes into account the broader management of natural resources in the Basin.

- Achieve efficient and cost-effective water management and administrative practices in relation to the Basin's water resources.
- To provide for the collection, collation, analysis and dissemination of information about:
  - Australia's water resources.
  - the use and management of water in Australia.

The Water Act includes a number of components to achieve these outcomes.

## Water Regulations 2008

Regulations made to prescribe certain matters as provided for under the *Water Act 2007*. On 19 June 2008 the Federal Executive Council approved the Water Regulations 2008, also referred to as the Principal Regulations. This includes management of Basin water resources (Part 2), water charge rules and water market rules (Part 3), extension of transitional coverage to state and territory water planning arrangements for water information (Part 7) and enforcement (Part 8) and Transitional water resource plans—Victoria (Part 11).

### 2.1.2 State legislation

#### *Environmental Effects Act 1978*

Provides for assessment of proposed projects (works) that are capable of having a significant effect on the environment. The Act does this by enabling the Minister administering the *Environment Effects Act 1978* to decide that an Environment Effects Statement (EES) should be prepared. The Minister might typically require a proponent to prepare an EES when:

- There is a likelihood of regionally or State significant adverse effects on the environment.
- There is a need for integrated assessment of potential environmental effects (including economic and social effects) of a project and relevant alternatives; and
- Normal statutory processes would not provide a sufficiently comprehensive, integrated and transparent assessment.

A final assessment of the effects of a project requiring an EES is provided to relevant decision-makers by the Minister to enable them to make decisions about a project in the knowledge of its environmental effects and the Minister's advice about whether the project provides an acceptable outcome.

The criteria for referral are focused on the potential for a significant effect on the environment. For surface water individual potential environmental effects include:

- Potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'.
- Potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term.
- Potential extensive or major effects on the health, safety or well-being of a human community, due to emissions to air or water or chemical hazards or displacement of residences.

Combination potential environmental effects include:

- Potential extensive or major effects on beneficial uses of waterbodies over the long term due to changes in water quality, streamflows or regional groundwater levels.
- Potential exposure of a human community to severe or chronic health or safety hazards over the short or long term, due to emissions to air or water or noise or chemical hazards or associated transport.

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## **Environment Protection Act 2017**

The primary legislation is the *Environment Protection Act 2017* (EP Act), which supersedes the *Environmental Protection Act 1970*. It creates the legislative framework to protect the environment and came into effect on 1 July 2021. The Environment Protection Authority Victoria (EPA Victoria) has implemented a broad range of new statutory instruments and policies, subordinate legislation and tools under the EP Act. This includes the Environmental Reference Standard, which sets environmental values for water, land and air, and mechanisms for regulation of the discharges to these elements of the environment.

The EP Act aims to prevent pollution and environmental damage by setting environmental objectives and establishing programs to meet them. The EP Act establishes the powers, duties and functions of the EPA Victoria. These include the administration of the EP Act and any regulations and orders made pursuant to it, recommending State Environment Protection Policies (SEPPs), issuing works approvals, licences, permits, pollution abatement notices and implementing National Environment Protection Measures.

## **Planning and Environment Act 1987**

Victoria's statutory land use planning system operates through Planning Schemes, which are subordinate legislation under the *Planning and Environment Act 1987*. Planning Schemes set out policies and provisions for the use, development and protection of land. Planning Schemes include a compulsory, which sets out the state-wide principles, policies and strategies for how land is used and developed. The Planning Policy Framework recognises the impacts of natural hazards, including flood, and sets strategies for development to be located away from flood hazard areas. An assessment of the *Planning and Environment Act 1987* triggers as they relate to water can be found in the Land Use Assessment Report prepared as part of this feasibility stage of investigations.

## **State Environment Protection Policy (Waters)**

The *State Environment Protection Policy (Waters)* (SEPP (Waters)) released in 2018 supersedes previous *State Environment Protection Policy (Waters of Victoria)* and *State Environment Protection Policy (Groundwaters of Victoria)* and all amending orders.

The SEPP (Waters) provides a legislative framework to protect and improve the quality of Victoria's waters under the principles of environment protection outlined in the EP Act. This aim of the policy is to protect and restore the environment, specifically surface water, groundwater and protection of human health. This is achieved by reducing the harmful effects of pollution and waste and improving and / or maintaining the ecological integrity of Victorian surface waters and groundwaters. It provides a structure of how the water environment is to be protected using the waste avoidance, minimisation and resource recovery principles as guidance to inform environmental measures.

## **Water Act 1989**

The *Water Act 1989* provides the legal framework for water management and use across Victoria, including the issuing and allocation of water entitlements and the provision of water services by state-owned water corporations and catchment management authorities.

Under the *Water Act 1989*, the designated waterways, regional drainage and floodplain management authority for the Project area is the West Gippsland Catchment Management Authority (WGCMA).

The WGCMA is one of ten floodplain management authorities which operate across Victoria. They deliver statutory floodplain management functions under the *Water Act 1989*.

The WGCMA's role includes identifying floodplains and preserving their ability to safely convey and store floodwaters, as well as coordinating flood investigations and flood mitigation plans, and monitoring floods when they occur. It has a key role in ensuring that new buildings and works in known floodplain areas do not adversely create additional flood risks.

WGCMA has overseen The West Gippsland Floodplain Management Strategy 2018-2027, a regional floodplain management strategy for the region that provides a blueprint for implementation of flood related programs.

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The role also includes assessment to land-use, development, and planning scheme amendment applications referred by municipal councils. Such referrals are statutory requirements established under the *Planning and Environment Act 1989* and planning schemes.

## Planning Policy Framework

This section responds to the relevant components of the Planning Policy Framework (PPF). The matters within this part of the Planning Scheme set out the key considerations for the state of Victoria generally, in line with state government policy. Each policy includes an objective that sets out the aim of the policy, strategies that outline how the policy is to be achieved and policy guidelines that provide guidance about specific strategies, legislation and other matters to be considered in planning decisions.

The most relevant clauses from the PPF relating to this assessment and this project include the following:

- Clause 12 Environmental and Landscape Values
- Clause 13 Environmental Risks and Amenity
- Clause 14 Natural Resource Management

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## 2.2 Guidelines and strategies

A number of guidelines and strategies are relevant to surface water management for the Project, including:

- Applying the Flood Provisions in Planning Schemes (DELWP, 2015).
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality, (ANZG, 2018; ANZECC & ARMCANZ, 2000).
- Australian Rainfall and Runoff 2019 (Australian Government, 2019).
- Construction – guide to preventing harm to people and the environment (EPA Publication 1820) (EPA, 2021).
- Construction Techniques for Sediment Pollution Control (EPA Publication 275) (EPA, 1991).
- Environmental Guidelines for Major Construction Sites (EPA Publication 480) (EPA, 1996).
- Guidelines for Assessing the Impact of Climate Change on Water Supplies in Victoria (DELWP, 2016).
- Guidelines for Development in Flood Affected Areas (DELWP, 2019).
- Guidelines for Renewable Energy Installations (State of Victoria Country Fire Authority, 2022).
- Indigo Shire Flood Emergency Plan Draft Version 0.6, July 2014 (Indigo Shire Council & Municipal Emergency Management Planning Committee, 2014).
- Maintaining water sensitive urban design elements (EPA Publication 1226) (EPA, 2008).
- Managing soil disturbance (EPA Publication 1894) (EPA, 2020).
- Ministerial guidelines for assessment of environmental effects under the *Environment Effects Act 1978* (Department of Sustainability and the Environment, 2006).
- North East Water Strategy (North East Catchment Management Authority, 2014).
- Section 5 Northern Region. Victorian Environmental Water Holder, Seasonal Watering Plan 2019–20. (Victorian Environmental Water Holder, 2019).
- Solar Energy Facilities Design and Development Guideline (DELWP, 2019).
- Technical Guidelines for Waterway Management, (Department of Sustainability and Environment, 2007).
- Victorian Floodplain Management Strategy (DELWP, 2016).
- Victorian Waterway Management Strategy (DEPI, 2013).

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## 3 Methodology

### 3.1 Desktop study

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#### 3.1.1 Publicly available datasets

Publicly available data was reviewed to support this assessment, the data is related to nearby waterways, flood risk, climate and sensitive receiving environments. **Table 3-1** documents the data available that was reviewed to inform this assessment.

Table 3-1 Available data

Data	Description	Source
Elevation Data	Digital Elevation Model (DEM) for the site were used to create contours for the site.	ELVIS (Intergovernmental Committee on Surveying and Mapping, 2021).
Wetlands	Current Wetlands dataset was reviewed for the identification of sensitive receiving environments.	Layer from Mapshare Vic (DELWP, 2021).
Waterways	Waterways and ISC scores from Mapshare Vic were reviewed.	Layer from Mapshare Vic (DELWP, 2021).
Sensitive Environments	PMST report was exported on the 2 December 2021 to identify any sensitive receiving environments.	PMST Interactive Tool (DAWE, 2021)
Climate Data	Rainfall data from BoM Climatological Station Barnawartha #082000.	BoM Climate Data Online (BoM, 2021).
Flooding Overlay	Defined and Declared floodway from the Victorian Flood Database to determine areas subject to riverine flooding.	Victorian Flood Database (DELWP, 2018).

#### 3.1.2 Consultation with relevant authorities

##### North East Catchment Authority

The North East Catchment Authority was engaged for information relating to flood risk in the area of the project. This consultation is included in **Appendix A**.

##### North East Water

North East Water were engaged in regard to water supply for the area. This information was relevant to inform water balance model to understand how water is to be supplied to the site.

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## 3.2 Site walkover

A site walk-over was conducted on the 21 of October 2021. A safe work method statement (SWMS) and an investigation plan was prepared prior to the investigation. The purpose of the inspection was to ascertain the existence and nature of water storage systems and drainage structures on site. The items inspected as part of the site walkover included:

- Dams.
- Drainage structures.
- Swales.

Information collected of these items included location, size, dimensions and other structure dependant information, and photos were taken of all items. The locations of inspected items are presented in **Figure 4-5** and results are included in **Appendix C** with a discussion of findings in **Section 4**.

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## 3.3 Numerical modelling

A series of numerical modelling was conducted to assist the investigation of existing environment and the impacts of the project, in terms of site runoff volumes and quality as well as site water use.

### 3.3.1 Site water balance

A scenario was conducted using the GoldSim Modelling Package (<https://www.goldsim.com/>) to investigate the capacity requirements for allocated water storage. The deterministic mode was run to determine the required the capacity of the tanks to sustain the solar plant for an amount of time before filling is required. The time ranged from 1 day to 30 days. The water balance model was based on the following assumptions:

#### Construction phase assumptions / demands

- Dust control supply for construction is estimated at 2,712 m<sup>3</sup>/year (based on the assumptions presented in Klise, *et al.*, 2013). This estimate was used based on a lack of suitable local data and as such there are limitations to the accuracy of results.
- It was assumed that water supply needed for planting and establishment of screening vegetation is to be managed and provided by the landscape contractor and has been excluded from model.
- Concrete batching plant water demand has not been included in the calculations as it was assumed ready-mix concrete will be trucked in.
- Water is to be stored in tanks.

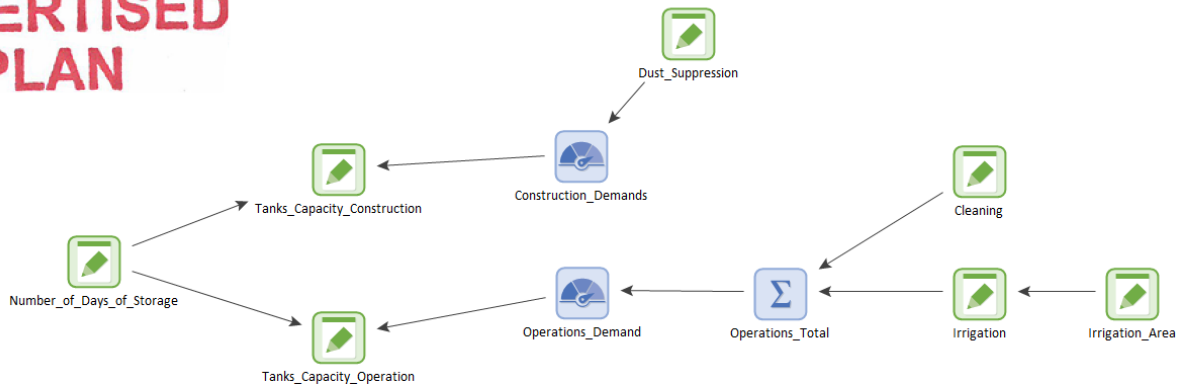
#### Operation phase assumptions / demand

- The site is not connected to the water supply network by North East Water as a result water required to satisfy demand is assumed to be stored on site.
- All water storage will come from the tanks located at the site entrances as per the CFA guidelines / requirements.
- The existing dams (Dam 1, 4, 6, 8 and 9 as presented on **Figure 4-5**) will be filled in and not utilised for storage.
- 345 kL is required for firefighting purposes, therefore the tanks must have a minimum level of 345 kL in it at all times as such, this value is not included in the model and is factored in for the analysis.
- 20 gallons / Megawatt hours for cleaning of the solar panels is estimated as per the estimates presented in Klise, *et al.*, 2013.
- 2 L/m<sup>2</sup>/year is assumed to be required for irrigation with an assumed area of 1,361,843 m<sup>2</sup>.

The model was run in deterministic mode, to investigate the minimum tank capacity required, on top of the 345 kL, for a number of days between refilling.

The model structure is presented in **Figure 3-1** Error! Reference source not found..

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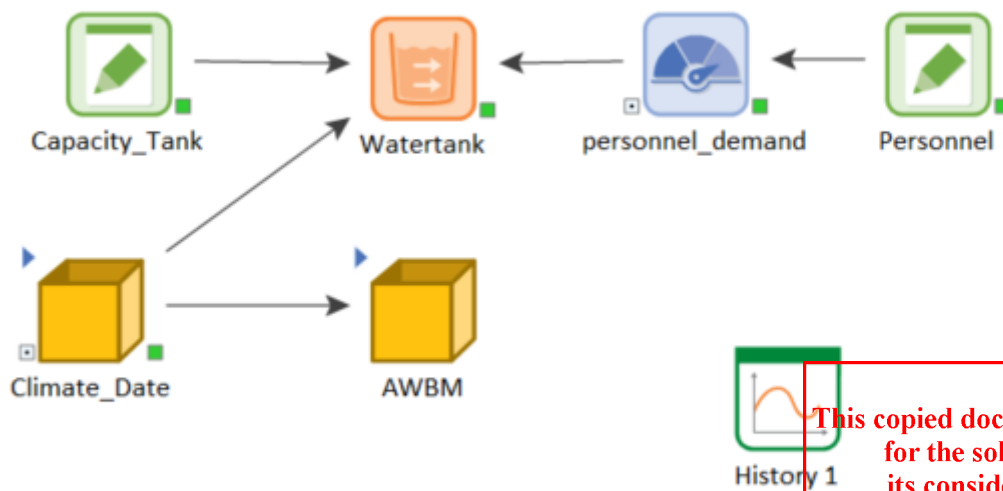


**Figure 3-1 GoldSim Water Balance Model – Site Use**

The results and discussion from the water balance modelling are presented in **Section 5.1**.

### 3.3.2 Personnel water supply water balance

A secondary model conducted using the GoldSim Modelling Package (<https://www.goldsim.com/>) to investigate the requirement for personnel water supply during the operation phase. It is assumed that water supplied to the operations building is collected from the operations building roof with an area of 108 m<sup>2</sup> into a 6 kL tank. The Australian water balance model component with climate data from the Barnawartha BoM Station (#082000) was used. 100 L/day is estimated for water use per individual site personnel (estimation based on DELWP, 2021) and it is assumed that there would be two site personnel present year round so a combined use of 200 L/day (ARP, 2021). The model was run with 100 realisations and the model structure is presented in **Figure 3-2**.



**Figure 3-2 GoldSim Water Balance Model – Personnel Use**

The results and discussion from the water balance modelling are presented in **Section 5.2**.

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## 3.3.3 Site runoff model

A MUSIC model (<https://ewater.org.au/products/music/>) was constructed to understand the existing conditions of the site runoff and the impacts that the project may have on site runoff. The model is based on the preliminary layout supplied by ARP (10 March 2022, **Figure 1-2**). This section discusses the model and its assumptions.

The site has no existing roof, pavement or hardstand areas in the pre-development scenario. Existing external roads will be unchanged by the project and were not included in the modelling as they fall outside the project areas. Access routes (4 m wide following the routes shown on the plans in **Figure 1-2**) are assumed to be unsealed gravel and thus have been included as agricultural land in the post-development stage. The pre-development scenario consists of 137 ha of agricultural land, as defined in the preliminary plans (**Figure 1-2**)

Runoff from the site flows overland as sheet flow and can infiltrate into the topsoil, route to depressions in the topographic surface and flow into farm dams. Excess rainfall and runoff that is not captured in this way on site enters roadside grassed swales that discharge to the north-west via a culvert under Murray Valley Highway or stormwater within the swales undergo evaporation / seepage (**Appendix C**). Sub catchments and overland flow within the site is presented in **Figure 3-3**.



Figure 3-3 Sub-catchments and inferred site runoff directions

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As such, the existing site is considered to have no directly connected areas of imperviousness or is '0% imperviousness'. The existing site was modelled as an agricultural node to reflect its current use for grazing. Default MUSIC pollutant load and soil parameters were adopted, which are presented in **Appendix D**.

Runoff that hits the solar panels for the operation phase would flow onto the ground surface and then become subject to the same storage and pathways as for the existing site (i.e. runoff would flow overland and could become trapped in existing soil storages within topsoil, depressions and farm dams before excess rainfall and runoff enters roadside swales that discharge to the north west via a culvert under Murray Valley Highway). As such, the solar array is considered to have no directly connected areas of imperviousness or is '0% imperviousness'. The solar array area was modelled as an agricultural node to reflect the proposed continued grazing land use (Ag-Challenge Consulting Pty Ltd, 2021).

The site office and amenity block area were modelled as nodes with the roof draining to a 6 kL rainwater tank with a daily demand of 200 L/p/day extracted for non-potable water uses. The storage warehouse was also modelled as a roof node, while the switching station and substation were modelled as sealed road as it is part of a concreted area.

The model was developed using the MUSIC supplied Albury-Wodonga rainfall and potential evapotranspiration files (which is located approximately 17 km east of the project) with the Meteorological statistics shown in **Figure 3-4** which are slightly higher than the meteorological conditions of Barnawartha, presented in **Section 4.2**. This data was used as it was the closest available dataset for 6 minute rainfall.

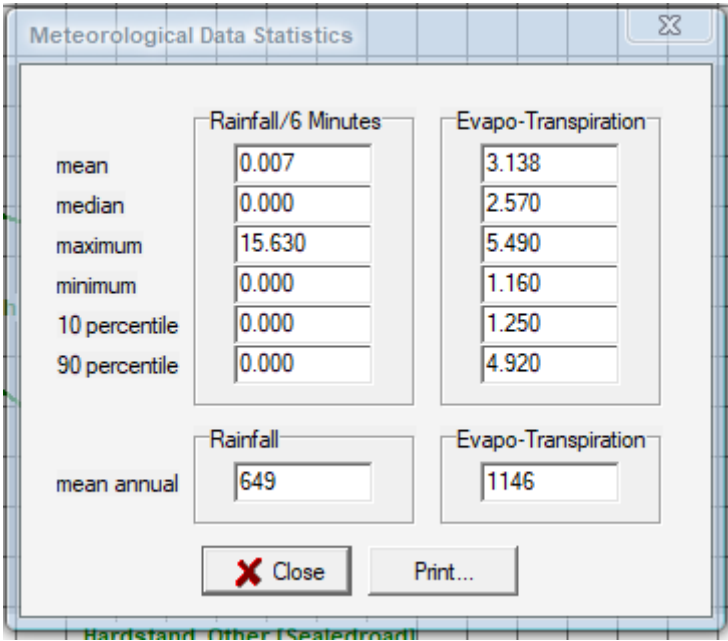


Figure 3-4 Meteorological Statistics for Albury-Wodonga (MUSIC)

A screen shot of the MUSIC model structure can be seen in **Figure 3-5** below.

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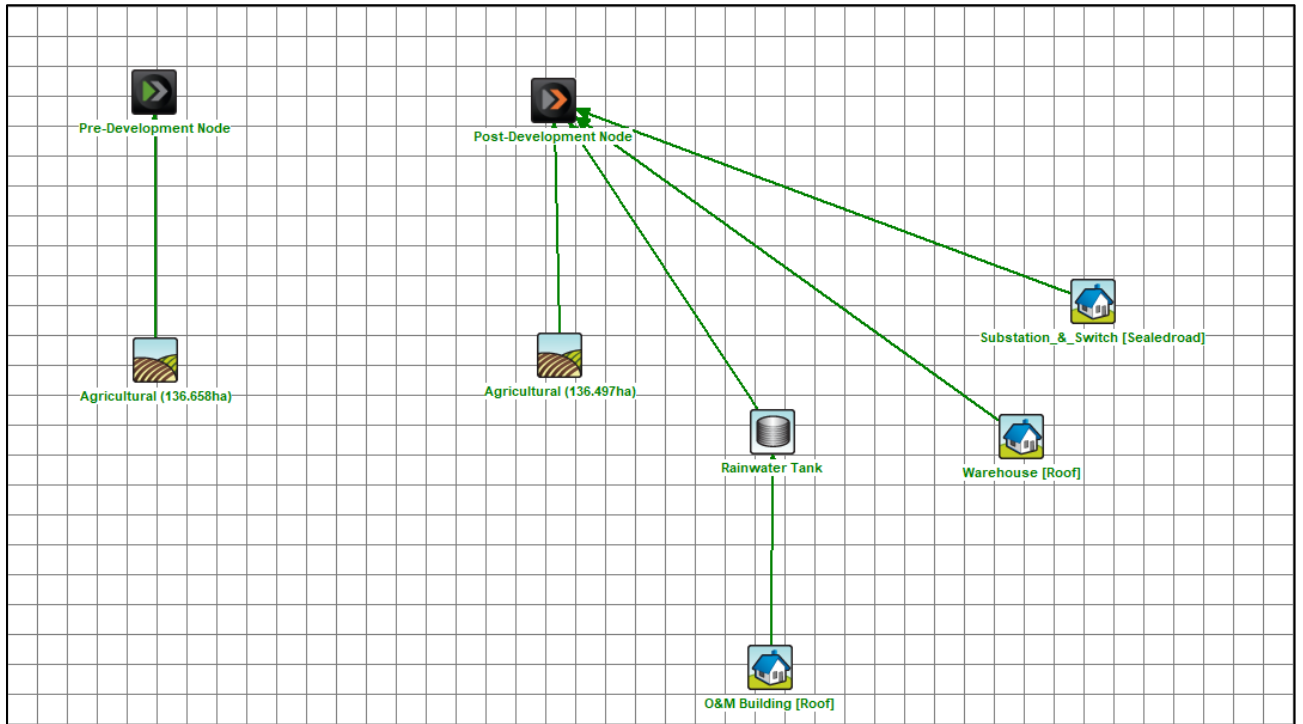


Figure 3-5 MUSIC model structure

Results and discussion for the MUSIC Model are presented in **Section 5.3**.

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## 4 Existing Conditions

### 4.1 Regional physical characteristics

The project lies within the Victorian Riverina Bioregion which is characterised by flat to gently undulating landscape on recent unconsolidated sediments with evidence of former stream channels and wide floodplain areas associated with major river systems and prior streams (DELWP, 2021). Alluvium deposits from the Cainozoic period gave rise to the red brown earths and texture contrast soils (Chromosols and Sodosols) which dominate the Riverine Plain.

The vegetation is dominated by Plains Grassy Woodland, Plains Grassland, Pine Box Woodland / Riverina Plains Grassy Woodland Mosaic, Riverine Grassy Woodland / Riverine Sedgy Forest / Wetland Mosaic, Plains Grassy Woodland / Gilgai Plains Woodland/Wetland Mosaic, Grassy Woodland and Wetland Formation ecosystems.

The Victorian Riverina bioregion is associated with the eight river basin tributaries of the Murray River draining north, west and south west from the Great Dividing Range of eastern Australia. However, some rivers, such as the Avoca, drain internally into a series of terminal lakes and wetlands (DELWP, 2021). The Murray River is located approximately 1.5 km north of the project at its closest point (**Figure 1-1**).

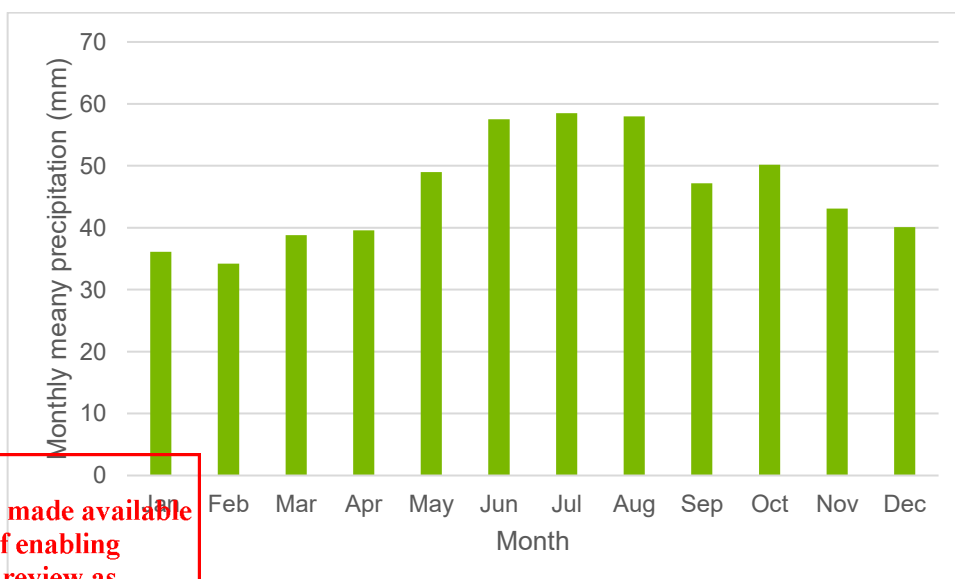
### 4.2 Climate

The Barnawartha area is described by the Bureau of Meteorology’s Australian Climate Classification as being temperate with no dry season and a hot summer (BoM, 2001).

The closest Bureau of Meteorology weather station in operation is located at Barnawartha station, approximately 5 km south of the project. The station has been operational since 1885, noting periodic interruptions to various observation types. It is located at an elevation of 182 m above Australian Height Datum (AHD) approximately 20m AHD higher than the Project area. The climate data presented in the following sections are based on data from the period January 1886 to December 2020 (excluding 1947-1952, 1981-1995, 2001 and 2004).

#### 4.2.1 Precipitation

Average annual precipitation is 551 mm, with a monthly maximum mean (58.5 mm) occurring in July and a monthly minimum mean (34.2 mm) occurring in February (DELWP, 2019) The area experiences rainfall all year round and the distribution of monthly average rainfall shows that temporal variability is not as marked as many tropical areas of Australia (i.e. lack of pronounced dry and wet season) (**Figure 4-1**).



**Figure 4-1 Average monthly rainfall (1984 – 2019)**

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## 4.2.2 Evaporation

Modelled pan evaporation data was available on SILO (Queensland Government, 2021), monthly pan evaporation and rainfall data for the location of North Barnawartha (Barnawartha Station) from January 1889 to December 2020 is presented in **Figure 4-2**. Mean annual pan evaporation for Barnawartha is 100 mm, with a mean monthly pan evaporation maxima of 173 mm (January) and minima of 37 mm (June). In the winter months, rainfall rates are higher than evaporation, potentially leading to excess surface water and saturated soils.

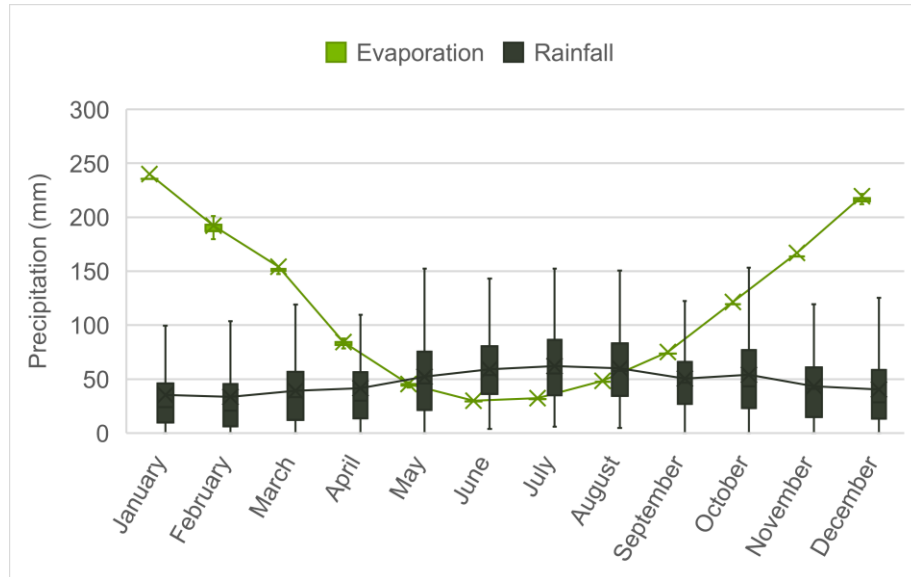


Figure 4-2 SILO monthly evaporation and rainfall (1889 – 2020)

## 4.2.3 Temperature

Monthly average maximum and minimum temperature data for the location of North Barnawartha (Barnawartha Station) from January 1889 to December 2020 is presented in **Figure 4-3** (BoM, 2021). Average monthly maximum temperature of 31.2 °C in January and an average monthly minimum of 2.5 °C in July.

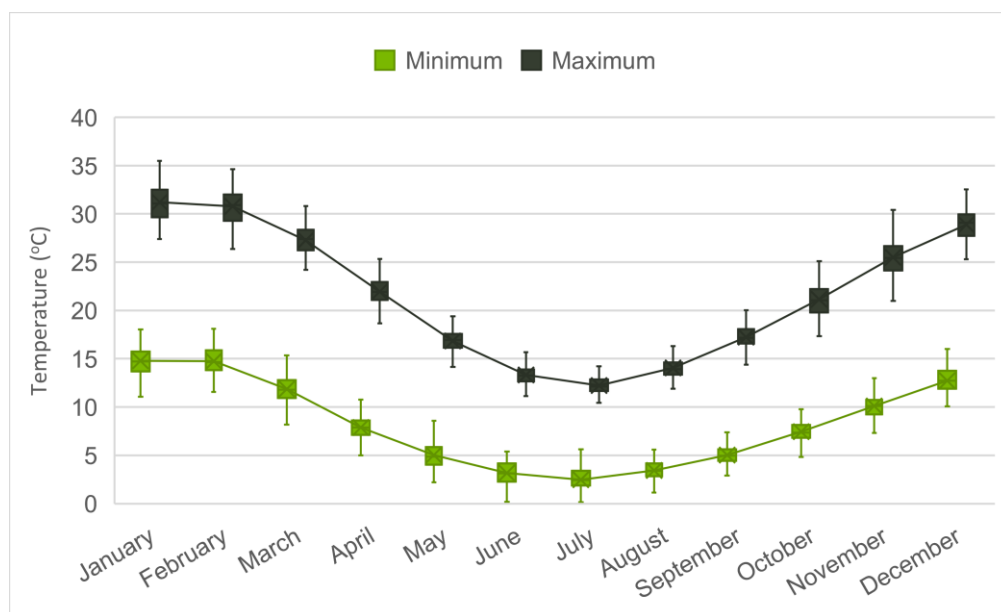


Figure 4-3 Average monthly minimum and maximum temperature (1889 – 2020)

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## 4.2.4 Climate change

Victoria's climate has shown a warming and drying trend over recent decades, and this trend is expected to continue over the longer-term future (GMW, 2021). In comparison to historical conditions, the Project area region is already experiencing:

- Higher temperatures.
- Reductions in rainfall in late autumn and winter and, in some locations, some increases in rainfall during the warmer months; and
- A shift in the streamflow response to rainfall, with less streamflow generated for the same amount of rain.

Some of the rainfall decline in late autumn and winter can be attributed to global warming and changes in the weather systems that deliver rainfall to Victoria. The cause of the reduction in streamflow response to rainfall is not yet fully known and is the subject of continuing research.

## 4.3 Topography and drainage

The project is located within the Black Dog Creek Drainage District defined in the Regional Rural Drainage Management Strategy (Gutteridge Haskins & Davey Pty Ltd, 1999). This area is known to experience waterlogging and impeded drainage (DSE, 2013).

The project area topography is defined as flat to gently undulating, which is characteristic of the Victorian Riverina Bioregion. Topography within the project area ranges from 170 m AHD in the south to 160 m AHD in the north (Figure 4-4). The north-eastern corner of the project area is generally lower than the average elevation (approximately 160 mAHD).

There are grassed swales on all of the sealed roads surrounding the project area and there are two cross-drainage structures that collect runoff from these swales surrounding the project on the south-east side of the intersection of Murray Valley Hwy and Barnawartha-Howlong Road, which is located in the north-west corner of the project. Both structures consist of concrete walled open inlet drains leading to catch-pits and are fed by the grass swales along Barnawartha-Howlong Road and Murray Valley Highway. The drainage structures appear to discharge to a culvert under the Murray Valley Highway. Imagery of the swales and drainage structures are presented in **Appendix C**.

Due to the flat nature of the topography, there are no clear drainage channels within the project area and it is assumed that runoff from storm events travel by overland sheet flow to the closest locally low points where it is subject to seepage into the soil, evaporative losses (during September – April when evaporation exceeds rainfall (**Figure 4-2**) or collection in the dams, discussed further in **Section 4.4**. The swales surrounding the project area store and drain stormwater runoff from the property that is not subject to seepage, evaporation, or collection in dams. Observations of the swales are presented in **Table 4-1** and imagery of the dams and site visit data is presented in **Appendix C**.

**Table 4-1 Swale Observations**

Swale	Approximate Width	Approximate Depth (approx)	Observations
Murray Valley Hwy	1 m	30 cm	Grassed, weedy, overgrown
Barnawartha-Howlong Road	2-3 m	45 cm	Dry, grassed edges
Baxter-Whelan Road	4-5 m	100 cm	Dry, grassed, overgrown, very high (>1m high grass in places)

The MUSIC modelling that has been conducted, described in **Section 3.3.3**, involved a pre-development scenario with an estimated 121 ML/yr of runoff from the project area. It is assumed this runoff existing the site is collected in the surrounding swales and thus the swales are not included in the model.

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**Legend**

- Project Area
- 5m Contour
- River
- Road
- LGA outline

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Source: Esri, Aurecon(2021), Vicmap(2021)

Date: 15/03/2022

Version: 1

**Barnawartha Solar Farm**

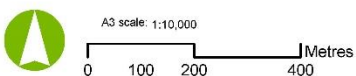
**Figure 4-4 Topography**



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Author: Ada\_Lan



Job No: 520618  
Coordinate System: GDA 1994 MGA Zone 55

## 4.4 Local catchment and surface water environment

The project area is located approximately 1.5 km south of the Murray River (**Figure 4-5**), the longest river in Australia and the principal river and main stream of the Murray-Darling basin (Murray-Darling Basin Authority, 2021). The Murray–Darling Basin is of significant environmental, cultural and economic value to Australia, for the following reasons:

- It provides habitat to 16 internationally significant wetlands, 35 endangered species and 98 different species of waterbirds.
- More than 2.2 million people live in the Basin, including people from 40 different First Nations.
- The Basin attracts visitors from around the world, with tourism earning around \$8 billion each year.
- Around 40% of Australia’s agricultural produce comes from the Basin, including 100% of our rice, 80% of our grapes and 28% of our dairy (Murray-Darling Basin Authority, 2021).

The closest mapped waterways to the project on the Blue Line Drainage Network are Dry Creek, approximately 750 m to the south-east and Indigo Creek, approximately 2.2 km (at the closest point) to the west (**Figure 4-5**). Dry Creek is an 1<sup>st</sup> order ephemeral stream. Indigo Creek flows into the Murray River, 10 km downstream of Barnawartha, and encompasses a catchment area of approximately 187 km<sup>2</sup>. Indigo Creek is an ephemeral stream whose catchment is not hydraulically connected to the Project area, as a result, could not be impacted by the project (Goulburn-Murray Water, n.d.). The theoretical down-gradient catchment based on topography for the Project area, and thus the receptors for hydrological or water quality impacts, consists of:

- Roadside swales linking the Murray Valley Highway and Barnawatha Road.
- Ephemeral drainage ditch sourced at Baxter-Whelans Road that crosses Barnawatha-Howlong Road before flowing due north into a meander cut-off wetland 200 m south of the main Murray River Channel.
- The Murray River near Doolans Bend.

However, there is no evidence that stormwater runoff from the site would ever reach the ultimate receptor (the Murray River), with an absence of permanent and growing channels that would suggest cumulative increases in flows in a down-gradient pattern.

Within the study area there are nine dams present, with two located just outside the project boundary (**Figure 4-5**). These dams are filled by rainfall events and are used for watering livestock. An inspection of seven of these dams on the 21<sup>st</sup> of October 2021 indicated that the water levels were generally full, and the earthen banks were generally gently sloped. The edges of these dams were visibly pugged by livestock and water was brown in colour and turbid. The full results of the inspection are presented in **Appendix C**.

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### Legend

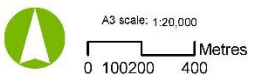
- Project Area
- Dams and Drainage structures
- River
- Road
- Important Wetland
- Current Wetland**
- Coastal saltmarsh
- Forest/woodland
- Moss/heath
- No emergent vegetation
- Sedge/grass/forb
- Shrub
- Unknown

Source: Esri, Aurecon(2021), Vicmap(2021)

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Job No: 520818  
Coordinate System: GDA 1994 MGA Zone 55

## 4.5 Flooding

The project is not in an area impacted by riverine flooding, indicated by the floodway extent presented on **Figure 4-6**, this overlay is categorised by depths in excess of one metre (Melbourne Water, 2017). The floodway is a legally defined area subject to flooding, documented through the municipal planning schemes (State Government of Victoria, 2018). It is advised by the North East Catchment Management Authority, that the project is not within the 1% AEP flood event inundation from the Murray River (**Appendix B**). The declared 1% AEP flood level for the sub-catchment is RL 144 m AHD, significantly lower than the elevation within the Project Area of 160 – 170 m AHD.

The project area, while not impacted by riverine flooding, has a long history of drainage management issues, existing drainage conditions were discussed in **Section 4.3**.

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## 4.6 Local water supply

The Project area is located within the Central Murray catchment and the key water uses are irrigated agriculture, urban water supply, stock, domestic and environmental water. The rural water authority for the area is Goulburn-Murray Water who operate a water trading scheme, Goulburn-Murray Water control the larger water storages and supplies water to North East Water who treat the water at their water treatment plants and distributes to the urban centres in the region (North East Water, 2021).

The closest urban water authority for the area is North East Water. North-East Water supply treated water to 39 towns across the north-east region with Barnawartha Township being the closest networked area to the Project area (North East Water, 2021). Water is sourced from the Murray River System and extracted from Wodonga Creek and is then supplied by pipeline to Baranduda, Barnawartha, Bonegilla, Chiltern, Kiewa, Springhurst, and Tangambalanga. The Murray River system is supplied by the major storages of Hume and Dartmouth the combined volume of these when full is 6,861 gigalitres (Figure 4-7). The storages are fed by the Murray and Mitta Mitta Rivers. Customers on the Murray system use 8 gigalitres in a typical year (North East Water, 2021).

### Murray River System

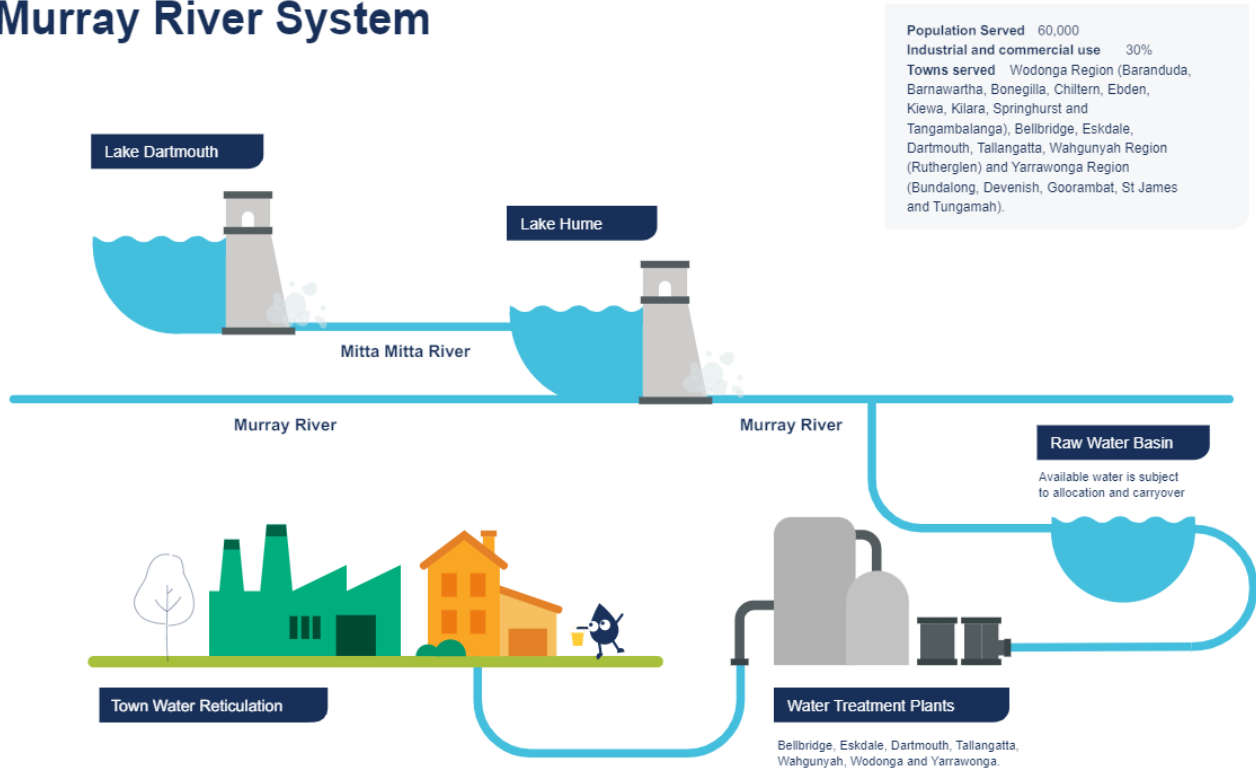


Figure 4-7 The Murray Water Supply system (North East Water, 2021)

The amount of water available is determined by an annual allocation by the Northern Victoria Resource manager. The annual allocation on the Murray is currently 100%.

The project is not located within an Irrigation District (a legal entity declared under the Water Act 1989). These give rural water corporations rights and responsibilities to supply water by channels and pipelines mainly for irrigation purposes. As such, it is understood that no irrigation infrastructure servicing the site has benefited from Commonwealth or State government investment in infrastructure modernisation and the Project area is not integral to the rural water corporation's current and/or future planning for the viability of an irrigation district (DELWP, 2019). The Barnawartha Groundwater Management Unit have access to 100 per cent of their entitlement with seasonal drawdown and recovery likely to remain stable (GMW, 2021).

North East Water were engaged, and they advised that potable water or sewer mains were not present within the Project area. A desktop investigation utilising mapping services indicated that there is a water tank present on-site for the existing farmland suggesting that the property is reliant on rainwater tanks as a

potable water source. A septic tank is used for wastewater and dams for livestock watering and potentially irrigation.

## 4.7 Sensitive environments and water users

An *EPBC Act* Protected Matters Report was created on the 2<sup>nd</sup> December 2021 with a 1 km buffer for the study area (**Appendix E**). There are no Nationally Important Wetlands within the 1 km buffer of the project. There is a grass wetland (of no known conservation status) located 2 km north-west of the project (**Figure 4-5**). Due to the distance and topography of the area and lack of waterways, the project is not hydraulically linked to this wetland. The closest Ramsar wetland is Barmah Forest which is located on the Murray River floodplain in north Victoria, approximately 178 km west from the Project area.

The project is within the Environmental Significance Overlay – Schedule 3 (ESO3) which refers to the area of Black Dog Creek. The North Eastern section of the Ovens River Basin includes a number of smaller water courses which drain directly to the Murray upstream of Lake Mulwala including the Black Dog Creek. The Black Dog Creek Waterway Management District displays a number of significant drainage problems. This overlay is in reference to schedule 3 to clause 42.01 environmental significance overlay of the Indigo Shire Planning Scheme. The project must comply with North East Catchment Management Authority Guidelines for Drainage Approval Within the Black Dog Creek Improvement District. Decision guidelines apply to this project.

The Murray Plains System consists of a number of tributaries that flow into the Murray River from the east of the Ovens River/Murray River junction to Wodonga, including Black Dog Creek, Whim Creek, Diddah Diddah Creek, Indigo Creek and House Creek. The creeks in the system are largely ephemeral channels, flowing only after rain and retreating to small pools during dry summers. The high priority threatened migratory fish, Murray Cod and Golden Perch move from the Murray River into the lower parts of Black Dog Creek as part of their life cycle (North East Catchment Management Authority, 2014). The endangered Macquarie Perch has been recorded in Indigo Creek. The upper reaches of tributaries contain populations of high and medium priority threatened bird species including significant species of egrets, herons, cormorants, bitterns, spoonbills and ducks. Near the Murray River, high priority threatened frogs (Giant Bullfrog and Growling Grass Frog) are associated with the river and surrounding wetlands (North East Catchment Management Authority, 2014). Stands or remnant patches of significant vegetation can be found along most parts of the waterways. The relatively intact River Red Gum canopy associated with the Murray River is considered one of the healthiest in the Murray- Darling Basin.

The majority of lengths of the Murray Plains system are classified as in 'Moderate' condition (approximately 90%) (North East Catchment Management Authority, 2014). Stressors to those areas down-gradient of the Project area include:

- Changed water regimes of floodplains and wetlands.
- Conflicting land and water resource uses and associated management practices.
- Expansion of urban boundaries Murray floodplain around Wodonga.
- Impact of climate changes on stream flows and fire frequency.
- Introduced aquatic fauna.
- Invasive weeds.
- Livestock access to waterways.
- Pressures from recreation and tourism.
- Regulated water regime of the Murray River, Murray River anabranches, floodplain wetlands.

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It is clear from the review that hydrological connectivity of the Project area to these down-gradient sensitive environments does not occur frequently, if at all.

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## 5 Numerical Modelling Results and Discussion

The following sections present and discuss the results for the modelling that was conducted to support this assessment.

### 5.1 Water Balance – Site Use

The GoldSim model was run according to the methodology proposed in **Section 3.3.1** to determine the required capacity for the water tanks to be sustained above the 345 kL threshold for a different amounts of time without refilling. The results for the construction stage and the operation stage are presented in **Table 5-1** and **Table 5-2**, respectively.

Table 5-1 Tank Capacity Requirements during construction

Number of Reserve Storage Days	Capacity (KL)	Number of Reserve Storage Days	Capacity (KL)
1	7	60	445
2.2	16	90	668
3.4	25	120	891
4.6	34	150	1,114
5.8	43	180	1,337
7	52	216	1,605
11.6	86	252	1,872
16.2	120	288	2,140
20.8	155	324	2,407
25.4	189	360	2,675
30	223		

Table 5-2 Tank Capacity Requirements during operation

Number of Days	Capacity (ML) without firefighting requirements	Capacity (ML) with firefighting requirements	Number of Days	Capacity (ML) without firefighting requirements	Capacity (ML) with firefighting requirements
1	2.6	2.8	60	158	158.2
2.2	5.8	6.0	90	237	237.2
3.4	8.9	9.1	120	316	316.2
4.6	12.1	12.3	150	395	395.2
5.8	15.2	15.5	180	474	474.2
7	18.4	18.6	216	568	568.2
11.6	30.5	30.7	252	663	663.2
16.2	42.6	42.9	288	758	758.2
20.8	54.7	55.0	324	853	853.2

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25.4	66.8	67.1	360	948	948.2
30	79	79.2			

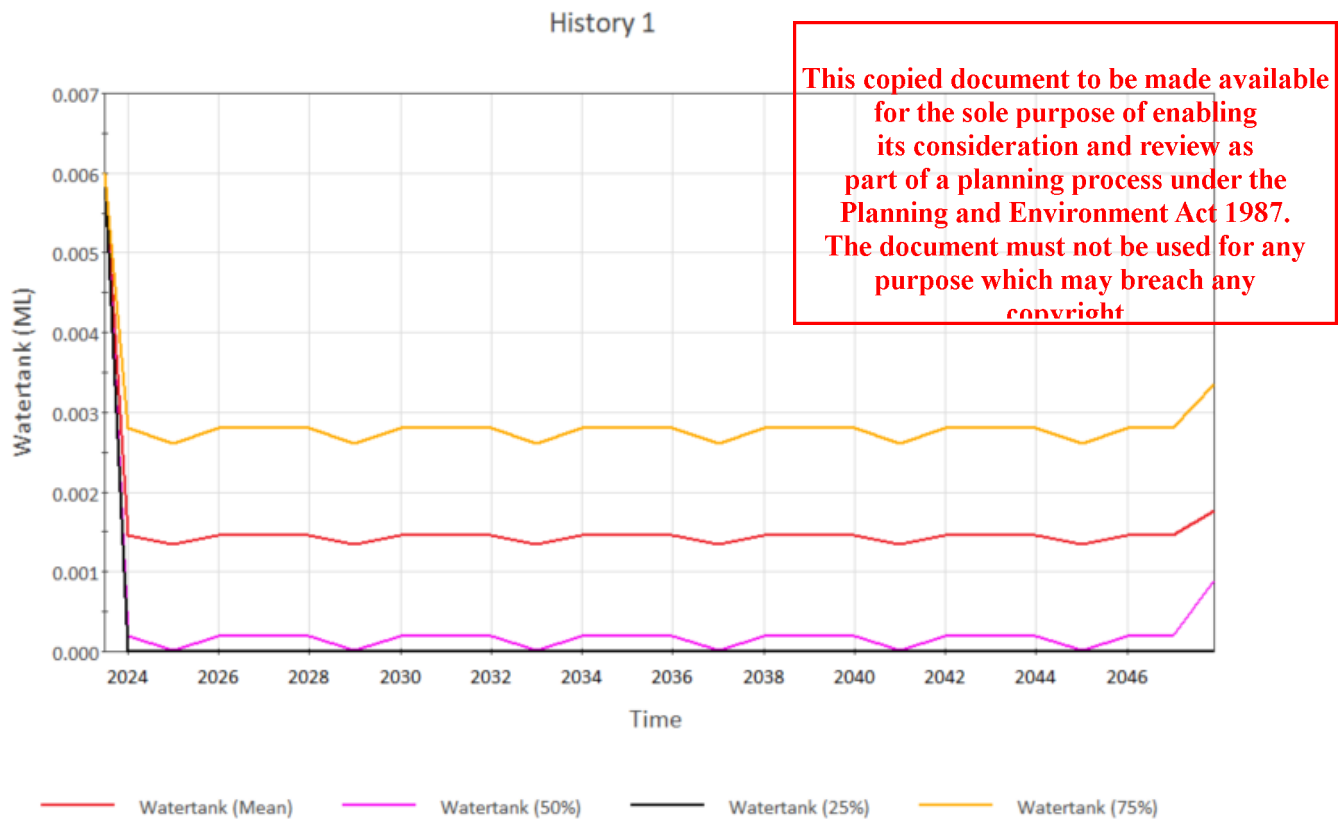
These results indicate the required frequency the tanks will need to be refilled along with the associated minimum capacity for firefighting requirements while utilising the same tanks for other operational purposes such as irrigation and solar panel cleaning. The results can be used to inform the required size of tanks to ensure enough water is in storage at all times.

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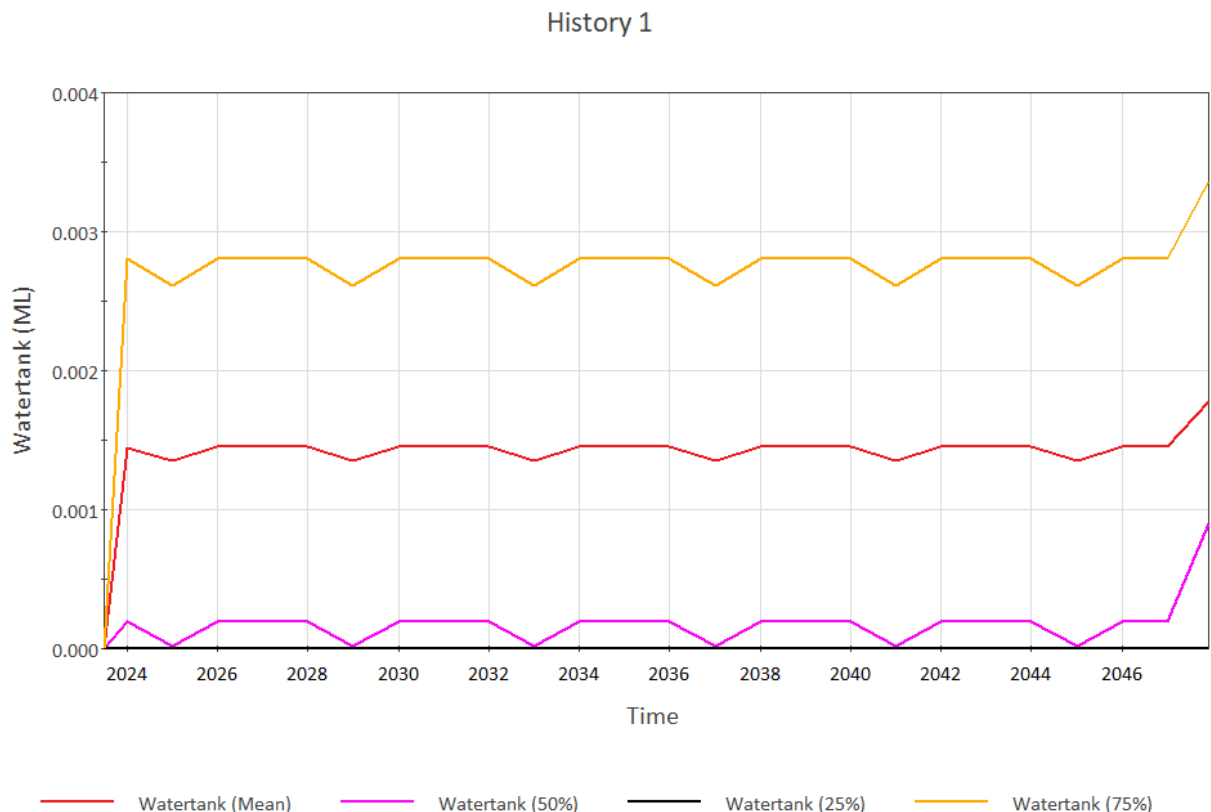
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## 5.2 Water Balance – Personnel Use

The GoldSim model was run according to the methodology proposed in **Section 3.3.2** for the rainwater tank for the personnel use. The results for starting with a full tank and starting with an empty tank are presented in **Figure 5-1** and **Figure 5-2**.



**Figure 5-1** Water tank levels – starting with a full tank



**Figure 5-2** Water tank levels – starting with an empty tank

The results indicate at the 75<sup>th</sup> percentile of both tank scenarios the assumed set-up would be sufficient to supply the personnel with water. The 50<sup>th</sup> percentile for the tank full scenario would be sufficient, however the 50<sup>th</sup> percentile for the tank starting empty, there will be occasions, approximately every 4 years where the tank would be empty. The 25<sup>th</sup> percentile for both scenarios indicates the tank size is insufficient for personnel use.

It is suggested that the tank is full before personnel demand is required and the size of the tank is investigated to be sufficient for personnel demand.

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## 5.3 Site Runoff (MUSIC)

The site runoff model conducted in MUSIC (**Table 5-3**) indicated that the site will overall have no modelled increase of stormwater volume over the overall site in operational phase as a result of the increase of impervious areas of the site from existing condition. Estimates for sediment, phosphorus and nitrogen loads also increased for the operational phase but only in the range from +0.5% to 2.7%. These small increases are within the confidence limits for the modelling accuracy. The impacts of these results are discussed in **Section 6.3**.

**Table 5-3 MUSIC Results**

	Pre-Development	Post Development	Change (%)
Pervious area (ha)	136.658	136.497	-0.1%
Flow (ML/yr)	137	137	No Change
Suspended Solids (kg/yr)	5220	5360	+2.7%
Total Phosphorus (kg/yr)	22.2	23.1	+2.0%
Total Nitrogen (kg/yr)	193	194	+0.5%

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## 6 Impact Assessment

The qualitative impact assessment of the Project has identified the potential impacts listed below on surface waters in terms of drainage (**Section 6.1**), flood (**Section 6.2**), sensitive water environments / water users (**Section 6.3**) and water supply (**Section 0**).

### 6.1 Drainage

Table 6-1 Potential Drainage Impacts

Impact code	Phase	Impact description	Mitigation measures
D01	Construction	Stockpiles would obstruct localised overland flows. Stockpiles are susceptible to mobilisation of sediments which may be transported to drainage lines.	<p>The project is considered to pose a low impact as the requirement for excavation is limited to small areas of construction for the buildings and the connection to the substation. Construction methodology for the PV array has been selected to reduce excavation and concreting requirements. In addition, there are no perennial nor ephemeral watercourses in the immediate vicinity of the Project area.</p> <p>Nevertheless, a Construction Environmental Management Report (CEMP) would be required to mitigate any risk regarding stockpiles. Minimising the number of stockpiles and the area / duration that the stockpiles are exposed would reduce risk. Locating stockpiles away from drainage lines and where they will be least susceptible to wind erosion. Refer to EPA Publication 1895 for further mitigation measures.</p> <p><b>Residual risk rating: Low</b></p>
D02	Construction	Construction material / waste or sedimentation transported to drainage lines, impacting natural or existing drainage regimes by impeding drainage and reduction of environmental values such as visual amenity and aquatic ecosystem health.	<p>Construction waste and material should be properly managed on site, to reduce the risk of such materials ending up in the grassed swales and drainage structures on the North-west corner of the project. A CEMP should be prepared to outline storage of materials and waste. The risk of waste being trapped along perimeter fencing will be specifically addressed in this document. Land cover will be maintained to protect against erosion risk. Refer to EPA Publication 480 for further mitigation measures.</p> <p><b>Residual risk rating: Low</b></p>

Impact code	Phase	Impact description	Mitigation measures
D03	Construction	The construction of the transmission lines to existing substation, will require some excavation. At a minimum, excavations will be required to cross Baxter-Whelans Road, and potentially further to the sub-station (if required, as underground or overground wiring has not been selected at the stage of writing this assessment). This could lead to requirement to discharge waters back into the receiving environment, increasing flow volumes.	Any required excavations and stockpiling as a result of trenching will be managed with a CEMP which will include erosion and sedimentation controls and dewatering management of excavations (including water capture, storage, treatment and discharge protocols, if required). Refer to EPA Publication 1895 for further mitigation measures.  <b>Residual risk rating: Low</b>
D04	Construction / Operation	Changes to the topography as a result of grading or levelling has the potential create changes to local flow paths. It may also cause areas for water to pool and create localised waterlogging issues.	The Solar Energy Facilities Design and Development Guidelines (DELWP, 2019) indicate that the proponent should minimise changes to the topography as a result of construction. As such, this project is using construction technique of piling for PV array to reduce earthworks requirements and thus reduce impacts of required changes of topography. It is proposed that the land will still provide agricultural services, thus the entire site will not be graded or levelled and earthworks will be limited to limited areas such as buildings. Thus, impacts will be managed.  <b>Residual risk rating: Low</b>
D05	Operation	An increase of impervious surface area due to construction of the concrete foundations will increase surface runoff and increase the risk of local flooding / drainage impacts.  <div style="border: 2px solid red; padding: 10px; text-align: center; color: red; font-weight: bold;"> <p>This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright</p> </div>	In accordance with the Solar Energy Facilities Design and Development Guidelines (DELWP, 2019), changes to the land use and topography has been limited due the design chosen for this project, limited areas of hardstand are to be incorporated. The MUSIC model conducted as part of this assessment indicated no change in annual runoff volume is anticipated as a result of this project, as such this impact of the impermeable surfaces compared to existing condition is negligible. Concentrated flow pathways off the impermeable hardstand will be stabilised to prevent erosion. The points of discharge to adjacent roadside swales / cross-drainage have not been altered. Opportunities to intercept and retard peak stormwater flows should be investigated such as beneficial water reuse (vegetation planting / site amenities). A stormwater management plan to mitigate any short-term / localised impacts as a result of increased runoff, will be required to support the planning application ( <b>Appendix A</b> ).  <b>Residual risk rating: Low</b>

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Impact code	Phase	Impact description	Mitigation measures
D06	Operation	PV array on site may increase surface runoff, peak and volume.	<p>In accordance with the Solar Energy Facilities Design and Development Guidelines (DELWP, 2019), changes to the land use and topography has been limited due the design chosen for this project, the PV array are to be tracking panels on a single support, as a result, all rainfall will fall of the panel and onto the ground and undergo similar conditions to pre-development. It is not anticipated that an increase of runoff as a result of the selected panels. Land cover will be maintained in the array to retard peak flows and reduce erosion risks. A stormwater management plan to mitigate any impacts as a result of increased runoff, will be required to support the planning application (<b>Appendix A</b>).</p> <p><b>Residual risk rating: Low</b></p>
D07	Operation	Existing drainage infrastructure may not provide sufficient conveyance capacity for the project infrastructure as well as to account for increase of runoff volume to the existing swales.	<p>The MUSIC model conducted as part of this assessment indicated that no change in annual runoff volume is anticipated as a result of this project, as such this impact is negligible. Infrastructure should be located on higher ground and / or appropriately elevated to account for the impacts of local drainage conditions with critical works elements a minimum of 300 mm above Murray River 1% AEP flood level. This translates to a height of 144.3m AHD which is significantly below the topographic low on the site of 160 m AHD. Opportunities to intercept and retard peak stormwater flows should be investigated such as beneficial water reuse (vegetation planting / site amenities). A stormwater management plan will be required to support the planning application (<b>Appendix A</b>).</p> <p><b>Residual risk rating: Low</b></p>

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## 6.2 Flood

Table 6-2 Potential Flooding Impacts

Impact code	Phase	Impact description	Mitigation measures
F01	Construction	Stripping of topsoil and excavations may increase flood risks downstream of the project by increasing runoff.	<p>The requirement for excavation is limited to small areas of construction for the buildings and the connection to the substation. Construction methodology for the PV array has been selected to reduce excavation and concreting requirements. In addition, there are no perennial nor ephemeral watercourses in the immediate vicinity of the Project area. The points of discharge to adjacent roadside swales / cross-drainage have not been altered. Opportunities to intercept and retard peak stormwater flows should be investigated such as beneficial water reuse (vegetation planting / site amenities).</p> <p>Any local impacts will be mitigated through a CEMP. Refer to EPA Publication 480 for further measures.</p> <p><b>Residual risk rating: Low</b></p>
F02	Operation	Increase of impervious surfaces has the potential to increase runoff to the surrounding area potentially increasing flooding risks. Overland sheet flows on the flat plateau of the Project area can collect and discharge flood waters slowly.	<p>The project causes no change in annual runoff volume due to the limited amount of impervious surfaces increase, and as a result will have a minimal impact on flooding in the area.</p> <p><b>Residual risk rating: Low</b></p>

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Impact code	Phase	Impact description	Mitigation measures
F03	Operation	Effect of flooding of the region on the proposed Infrastructure.	<p>In accordance with the Solar Energy Facilities Design and Development Guidelines (DELWP, 2019), a proponent should avoid siting a solar energy facility within an identified floodplain to a major river system and a mapped wetland area, to avoid unnecessary risk to the facility and its associated infrastructure and the consequential need for flood attenuation measures such as flood levies and barriers. The project is not located within a floodplain or close to any tributaries as a result the site selection has reduced impacts of riverine flooding.</p> <p>Infrastructure should be located on higher ground and/or appropriately elevated to account for the impacts of local drainage conditions, with critical works elements a minimum of 300 mm above 1% AEP flood level. Electrical installations should be designed to withstand the effect of flooding to 1% AEP level + 300 mm, either by raising above flood level or waterproofing any works below flood level as per request from North East Catchment Management Authority (<b>Appendix A</b>). Design adherence to Indigo Planning Scheme schedule 3 to clause 4.2.01 environmental significance overlay, including Specified flood level pursuant to the Building Code of Australia.</p> <p><b>Residual risk rating: Low</b></p>
F04	Construction and Operation	Flood waters present on transportation network leading to lower service levels to the site (e.g. impediment of building materials supply during construction or personnel access to the site).	<p>The main regional access routes for the Project area are the:</p> <ul style="list-style-type: none"> <li>■ Hume Freeway - Havelock Street - Barnawartha High Street - Barnawartha – Howlong Road.</li> <li>■ Hume Freeway - Murray Valley Highway.</li> </ul> <p>None of these routes are flagged as flood-prone (SES, 2014) but care should be taken during heavy rain when transiting through low-lying areas or crossing marked watercourses. A Response Protocol should be considered in the event of a flood affecting access.</p> <p><b>Residual risk rating: Medium</b></p>

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## 6.3 Sensitive Water Environments / Water Users

Table 6-3 Potential Impacts to Sensitive Water Environments/Water Users and Water Quality

Impact code	Phase	Impact description	Mitigation measures
W01	Construction	Mobilisation of sediments into receiving watercourses, deposition of fine sediments impacting aquatic flora and fauna (particulate bound contaminants e.g. metals). Potential for elevated oxygen demand leading to decreased dissolved oxygen.	<p>Any potential impacts are required to adhere to the Environment Protection Act 2017 and associated SEPP (Waters) to reduce surface water pollution. It should be considered to avoid earthworks, if possible, during forecast high rainfall events to reduce the risk for large areas of exposed soil during overland flow events. Erosion and Sedimentation Controls as part of the CEMP should be prepared to reduce soil erosion and mobilisation of sediments from the site during earthworks activities. This will include maintaining ground cover, where possible, and seeking opportunities to reduce peak stormwater flows by interception and beneficial reuse. These controls should be prepared in accordance with the Environment Protection Authority (EPA) Publication 1894 for additional mitigation measures.</p> <p>The project is considered to pose a minimal-low impact to surface water quality due to the distance and lack of tributaries located in the vicinity of the Project area as well as the lack of hydrological connectivity to key watercourses (e.g. Indigo Creek, Murray River).</p> <p><b>Residual risk rating: Low</b></p>
W02	Construction	<p>Potentially harmful chemicals and substances (e.g. oils, grease, petrol etc.) accidentally released during construction spills or as result of maintenance works, refuelling and inappropriate storage or handling. This could lead to soil contamination, leaching of contaminants to groundwater or conveyance of contaminants in runoff to waterways.</p> <p>Cement / concrete has a high oxygen demand and high levels of chromium and aluminium, which are highly toxic to aquatic ecosystems. If these materials are not set prior to rainfall events, there is potential for runoff from the site into watercourses.</p> <p>Leakage from construction worker ablation and toilet facilities or wastewater collection points with subsequent runoff into receiving watercourses.</p>	<p>Earthworks should be avoided, if possible, during forecast high rainfall events to reduce the risk for large areas of exposed soil during overland flow events. Erosion and Sedimentation Controls as part of the CEMP should be prepared to reduce soil erosion and mobilisation of sediments from the site during earthworks activities. Inspection of ablation facilities and wastewater storage systems on a regular basis should be performed. Leakages should be reported immediately and remediated. These controls should be prepared in accordance with the Environment Protection Authority (EPA) Publication 1894 for additional mitigation measures. These impacts are considered low due to the distance to nearby waterways as well as the lack of hydrological connectivity to key watercourses (e.g. Indigo Creek, Murray River).</p> <p><b>Residual risk rating: Low</b></p>

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Impact code	Phase	Impact description	Mitigation measures
W03	Construction	The construction of the transmission lines to existing substation, will require some excavation. At a minimum, excavations will be required to cross Baxter-Whelans Road, and potentially further to the sub-station (if required, as underground or overground wiring has not been selected at the stage of writing this assessment). This could lead to mobilisation of sediments into receiving watercourses, exposure of unknown contaminated land finds which could subsequently impact local water quality and dewatering to remove groundwater from excavated areas and the water is not disposed of properly.	Any required excavations and stockpiling as a result of trenching will be managed with a CEMP which will include erosion and sedimentation controls and dewatering management of excavations (including water capture, storage, treatment and discharge protocols, if required). Investigative trenches should be dug in advance to allow an estimation of likely volumes of water requiring dewatering and disposal. Refer to EPA Publication 1895 for further mitigation measures.  <b>Residual risk rating: Medium</b>
W04	Construction	The construction of the transmission lines to existing substation, may require crossing of ephemeral drainage lines, These ditches may need to be diverted or temporarily blocked. Due to presence of earthworks close to these watercourses, this could lead to transfer of sediments and subsequent deterioration in water quality.	Any required excavations and stockpiling as a result of trenching will be managed with a CEMP which will include erosion and sedimentation controls and dewatering management of excavations (including water capture, storage, treatment and discharge protocols, if required). Earthworks should be avoided, if possible, during forecast high rainfall events to reduce the risk for large areas of exposed soil during overland flow events. Erosion and Sedimentation Controls as part of the CEMP should be prepared to reduce soil erosion and mobilisation of sediments from the site during earthworks activities. Appropriate storage or handling of fuels / oils / other hazardous substances should be followed and a spill kit should be available for trained staff, if required. Refer to EPA Publication 1895 for further mitigation measures.  <b>Residual risk rating: Low</b>
W05	Operational	<p style="text-align: center;"><b>This copied document to be made available for the sole purpose of enabling an evaluation and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright</b></p> <p>There is a very low potential for batteries to leak chemicals which could be collected by the drainage system when overland runoff occurs and transport these chemicals to nearby surface watercourses.</p>	<p>The project is considered to pose a low impact to surface water quality due to the distance and lack of watercourses located in the vicinity of the project area.</p> <p>Design should consider the risk of chemical leakage from batteries and provide appropriate mitigation, if required. Water treatment devices on site could attenuate the off-site export of battery chemicals within the drainage system and provide treatment of particulate-bound contamination in runoff from the battery area.</p> <p><b>Residual risk rating: Low</b></p>

Impact code	Phase	Impact description	Mitigation measures
W06	Operational	If pesticides are used to reduce weeds within the site, runoff could cause the pesticides to be transported to nearby watercourses.	<p>The project is considered to pose a low impact to surface water quality due to the distance and lack of watercourses located in the vicinity of the Project area.</p> <p>Possible mitigation measures may include using pesticides at during dry periods and the use of lower-risk pesticides. Design should include water treatment devices within the drainage system to treat particulate-bound runoff from the Project area. Refer to EPA publication 1226 for WSUD stormwater treatment options.</p> <p><b>Residual risk rating: Low</b></p>
W07	Construction and Operation	Visual impact of a solar energy facility relating to the proximity to environmentally sensitive areas.	<p>The Project area is not close to any permanent watercourses nor low-lying areas. More detail on visual impacts is covered in the Visual Impact Assessment (Aurecon, 2021).</p> <p><b>Residual risk rating: Low</b></p>
W08	Operational	Increased sediment and nutrient load runoff from the site into receiving watercourses causing a deterioration in water quality.	<p>MUSIC modelling has indicated small increases in suspended solids (+2.7%), total phosphorus (+2.0%) and total nitrogen (+0.5%). These increases are within the confidence limits for the modelling and the impact is therefore judged to be negligible.</p> <p>Mitigation to prevent drainage impacts during site operation (as listed in <b>Table 6-1, Section 6.1</b>) will further reduce any impact of increased sediment and nutrient loads.</p> <p><b>Residual risk rating: Low</b></p>

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## 6.4 Water Supply

Table 6-4 Potential Water Supply Impacts

Impact code	Phase	Impact description	Mitigation measures
WS01	Construction	The project does not have a fixed water source, the area is not serviced by the North East Water supply network. Insufficient water for construction demands.	Off-site water is required to be used for any demands during construction. <b>Residual risk rating: Medium</b>
WS02	Construction	The project does not have a fixed water source, the area is not serviced by North East Water. Insufficient water for irrigation for screening vegetation planting and establishment.	The planting regime will be conducted by a contractor. To meet water demands, it is recommended that the contractor supplies their own water for the planting and establishment of screening plants. These will also help to maintain soil structure, leading to lower risk of erosion. <b>Residual risk rating: Medium</b>
WS03	Operation	<p>During Operation, the project will not have a fixed water source as the area is not serviced by North East Water. However, it is assumed that there will be two personnel on site which would require water for the management building.</p> <div style="border: 2px solid red; padding: 10px; text-align: center; margin: 10px 0;"> <p><b>This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright</b></p> </div>	<p>A tank collecting water from the roof of the management building will provide sufficient water for two personnel for toilet and kitchenette uses. It is not recommended that rainwater is used for human consumption purposes unless a full drinking water safety assessment is conducted.</p> <p>Installation of temporary or permanent downpipes will be planned as soon as possible after the installation of roofing and guttering, especially if this is scheduled during periods when rain is expected. If roof water is not re-used because of site excess, it should be discharged away from the active work area and any disturbed soil surface.</p> <p>All roof water drainage and storage will be designed and constructed according to best practice guidelines (Standards Australia, 2008). The anticipated roof water drainage volumes should be established once the final footprint is designed and total roof areas are known in order to correctly size storage. Anti-mosquito measures should be adhered to for water storages, as described in RHAA (2011) including mosquito proof screens (no larger than 1mm aperture mesh) on all outlets, overflows, lids, covers and inlet downpipes must be fitted tightly, water should be inspected at regular intervals and all mosquito screening should be checked to ensure no signs of wear and tear.</p> <p><b>Residual risk rating: Low</b></p>

Impact code	Phase	Impact description	Mitigation measures
WS04	Operation	Insufficient water available in the event of either a structural or bushfire for suppression purposes. Water not accessible to fire trucks to ensure that fire suppression activities are not hindered in any way.	<p>There is a requirement for 345 KL of water supply for firefighting activities at all times (<i>pers comms</i> CFA, 2021). A tank or a series of tanks will be installed next to the sub-station and switching station. This will be filled with water from offsite.</p> <p>The static water storage tank shall be of not less than 345,000 litres effective capacity (<i>pers comms</i> CFA, 2021). The static water storage tank(s) must be an above-ground water tank constructed of concrete or steel. The location and number of tanks should be determined as part of the site's risk management process and in consultation with a CFA delegated officer.</p> <p>The static storage tanks shall be capable of being completely refilled automatically or manually within 24 hours (<i>pers comms</i> CFA, 2021). An external water level indicator is to be provided to the tank and be visible from the hardstand area.</p> <p><b>Residual risk rating: Medium</b></p>
WS05	Operation	The project does not have a fixed water source, the area is not serviced by North East Water. Insufficient water for irrigation for screening vegetation and maintenance of ground cover.	<p>The GoldSim model indicates the sizes of tanks required and the corresponding frequency of refilling if water is to be stored on site for all operational uses. Off-site water could be used to supplement any shortfalls.</p> <p><b>Residual risk rating: Medium</b></p>
WS06	Operation	The project does not have a fixed wastewater disposal network, the area is not serviced by North East Water as such there is no wastewater infrastructure servicing the site.	<p>A septic tank will be installed next to the management building to cover the requirements of wastewater. This will be inspected at regular intervals for signs of leaking and remaining storage capacity.</p> <p><b>Residual risk rating: Low</b></p>
WS07	Operation	Climate Change may impact reliability of water supply in the future of the 25- year lifecycle.	<p>Climate change impacts should be accounted for when deciding on water supply for the project.</p> <p><b>Residual risk rating: Low</b></p>

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## 7 Conclusions and Recommendations for Further Work

The results of this surface water assessment will inform the project team with the low risks that can be managed on site with typical good practice processes and the residual risks that cannot be easily mitigated (**Section 7.1**). It also identified knowledge gaps in relation to surface water and subsequent recommendations are made in **Section 7.2** on any further investigations that would be required to support the planning approval.

### 7.1 Conclusions

A summary of the main findings from the surface water baseline and impact assessment are as follows:

- The baseline environment review has provided an understanding of the site and its immediate surface water landscape including the relationship to natural features.
- North East Catchment Authority were consulted regarding flood-risk obtained from Murray River declaration maps (2004) to the Project area. The Authority advised that in the 1% AEP flood event the Project area would not be subject to inundation from the Murray River.
- It is understood that due to the project's location within ESO3. The application must comply with the North East Catchment Management Authority Guidelines for Drainage Approval Within the Black Dog Creek Improvement District and as such referral to the North East Catchment Management Authority may occur. This report has not identified any preliminary issues.
- There are no Ramsar nor Nationally Protected Wetlands within or immediately down-gradient of the Project area. The closest down-gradient land declared a Ramsar wetland, as defined under section 17 of the *Environment Protection and Biodiversity Conservation Act 1999*, was Barmah Forest approximately 178 km west of the Project area.
- All seven (7) drainage risks and all eight (8) sensitive environment risks received a 'low' classification and can be mitigated easily by implementation of typical good practice mitigation measures.
- Three (3) flood risks and three (3) water supply risks received a 'low' classification and can be mitigated easily by implementation of typical good practice mitigation measures.
- One (1) flood risk (code F04) was classified as 'medium' associated with the flood waters present on transportation network. This was because the consequence of impeded supply networks during construction, restricted personnel access to the site during construction or operation and risk of injury / life of crossing floodwaters was deemed to be 'high' despite likelihood being 'low'. In addition, management of this risk would be beyond the control of the proponents.
- Four (4) water supply risks were classified as 'medium' including insufficient water for construction demands (code WS01), insufficient water for vegetation irrigation during construction and operation (code WS02 and WS05, respectively) and insufficient water available in the event of either a structural or bushfire for suppression purposes (WS03). Mitigation measures are available.
- There were no 'high' risks for the Project regarding surface water issues.

### 7.2 Recommendations for further work

The following recommendations are made to address gaps in knowledge identified in this review (all sections) and manage the identified risks (**Section 6**):

- Confirm all assumptions made in modelling approach, the completion of other studies including the landscaping management plan may assist in understanding water demands, including:
  - Construction demands.



- Operation demands.
- Potential water supply.
- Water storages and capacities.
- Confirm likelihood, frequency and duration of hydrological connectivity between the Project area and down-gradient sensitive habitats.
- Establish sufficient water supply for all site needs during both construction and operational phases.
- Establish ultimate receptor location and type (i.e. soil seepage, groundwater infiltration, drainage swales bordering roadsides, wetlands adjacent to the Murray River) for typical stormwater discharges from the site.
- Estimate dewatering requirements (if underground transmission lines are adopted) for trenching works.
- Stormwater and Drainage Sub-Plan at Detailed Design Phase to support Environment Management Plan.

Evaluation of the need for numerical modelling by review of the qualitative impact assessment findings and feedback from the North East Catchment Management Authority. Flood response protocol to be drafted including persons responsible, agency contacts, emergency event update processes, communications and operational guidance.

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## 8 Bibliography

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- Ag-Challenge Consulting Pty Ltd. (2021). *Agriculture impact Study*.
- ANZECC & ARMCANZ. (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Canberra.
- ANZG. (2018). *Australian & New Zealand Guidelines for fresh and marine water quality*. Canberra.
- ARP. (2021). *Project Initial Information*.
- Aurecon. (2020). *Desktop Hydrology and Flood Risk Assessment - Phase 2. Latrobe Valley Battery Energy Storage System (BESS)*.
- Aurecon. (2021). *Barnawartha Solar Farm Visual Impact Assessment*.
- Aurecon. (2021). *Groundwater Study*.
- Australian Bureau of Statistics. (2016). *2016 Census QuickStats*. Retrieved from Australian Bureau of Statistics:  
[https://quickstats.censusdata.abs.gov.au/census\\_services/getproduct/census/2016/quickstat/SSC21757](https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC21757)
- Australian Government. (2019). *ARR Guidelines*.
- BoM. (2001). *Map of Climate Zones of Australia*. Retrieved from BoM:  
<http://www.bom.gov.au/climate/how/newproducts/images/zones.shtml>
- BoM. (2021). *Climate Data Online*. Retrieved from BoM: <http://www.bom.gov.au/climate/data/>
- BoM. (2021). *Groundwater Dependent Ecosystems Atlas*.
- CFA. (2021). Advice from CFA on Firefight water supply requirements.
- DAWE. (2019). *Ramsar wetlands*. Retrieved from Australian Wetlands Database:  
<http://environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=21>
- DAWE. (2021). *Protected Matters Search Tool*. Retrieved from Department of Agriculture, Water and Environment: <https://www.environment.gov.au/epbc/protected-matters-search-tool>
- DELWP. (2015). *Applying the Flood Provisions in Planning Schemes*.
- DELWP. (2016). *Guidelines for Assessing the Impact of Climate Change on Water Availability in Victoria*.
- DELWP. (2016). *Victoria Floodplain Management Strategy*.
- DELWP. (2018). *Victorian Flood Database*.
- DELWP. (2019). *Guidelines for Development in Flood Affected Areas*.
- DELWP. (2019). *Solar Energy Facilities Design and Development Guidelines*.
- DELWP. (2020). *Biodiversity*. Retrieved from Bioregions and EVC benchmarks:  
<https://www.environment.vic.gov.au/biodiversity/bioregions-and-evc-benchmarks>
- DELWP. (2021). *Bioregions and EVC benchmarks*.
- DELWP. (2021). *MapShareVic*. Retrieved from <https://mapshare.vic.gov.au/mapsharevic/>
- DELWP. (2021). *Target 155*. Retrieved from DELWP: <https://www.water.vic.gov.au/liveable-cities-and-towns/using-water-wisely/target-155-target-your-water-use>
- DELWP. (2021). *Water Measurement Information System*. Retrieved from <https://data.water.vic.gov.au/>
- Department of Sustainability and Environment. (2007). *Technical guidelines for waterway management*.
- Department of Sustainability and the Environment. (2006). *Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978*.
- DEPI. (2013). *Victorian Waterway Management Strategy*.
- DEWLP. (2021). *VicPlan*. Retrieved from <https://mapshare.vic.gov.au/vicplan/>
- DSE. (2013). *Submission to Environment and Natural Resources Committee, Inquiry into Rural Drainage within Victoria*.
- EPA. (1991). *Construction techniques for sediment pollution control*.
- EPA. (1996). *Environmental guidelines for major construction sites*.
- EPA. (2008). *Maintaining water sensitive urban design elements*.
- EPA. (2018). *Caring for Waterhole Creek Citizen Science Project*. Retrieved from <https://www.epa.vic.gov.au/-/media/epa/files/publications/1697.pdf>
- EPA. (2019, February 15). *Fish consumption advice for Morwell's Kernot Lake*. Retrieved from Environment Protection Authority Victoria: <https://www.epa.vic.gov.au/about-epa/news-media-and-updates/news-and-updates/fish-consumption-advice-for-morwells-kernot-lake>
- EPA. (2020). *Managing soil disturbance*.
- EPA. (2021). *Construction - guide to preventing harm to people and the environment*.
- Genco. (2020). *300MW gas-fired generation in Morwell, Victoria Pre-FEED Technical and Land Report*.
- GMW. (2021). *Annual Water Outlook*. Goulburn Murray Water.
- Goulburn-Murray Water. (2021). *Unregulated Streams Local Management Rules*. Retrieved from Goulburn-Murray Water: <https://www.g-mwater.com.au/water-resources/surface-water/unregulated-local-management-rules>
- Goulburn-Murray Water. (n.d.). *Indigo Creek Catchment Local Management Rules*.
- Gutteridge Haskins & Davey Pty Ltd. (1999). *Regional Rural Drainage Management Strategy*.
- Indigo Shire Council & Municipal Emergency Management Planning Committee. (2014). *Indigo Shire Flood Emergency Plan*.

- Intergovernmental Committee on Surveying and Mapping. (2021). *ELVIS*. Retrieved from <https://elevation.fsd.org.au/>
- Klise, G. T., Tidwell, V. C., Reno, M. D., Moreland, B. D., Zemlick, K. M., & Macknick, J. (2013). *Water Use and Supply Concerns for Utility-Scale Solar Projects in the Southwestern United States*. California: Sandia National Laboratories.
- Latrobe City Council. (2020). *Flood Response Guidelines for the Community*.
- Local Government Infrastructure Design Association. (2020). *infrastructure design manual*. Retrieved from [https://www.designmanual.com.au/assets/files/documents/IDM/IDM\\_Version\\_5.30\\_.pdf](https://www.designmanual.com.au/assets/files/documents/IDM/IDM_Version_5.30_.pdf)
- Melbourne Water. (2017). *Overlays Explained*. Retrieved from Melbourne Water: <https://www.melbournewater.com.au/building-and-works/flooding-information-and-advice/overlays-explained>
- Murray-Darling Basin Authority. (2021). Retrieved from Murray-Darling Basin Authority: <https://www.mdba.gov.au/importance-murray-darling-basin>
- North East Catchment Management Authority. (2014). *North East Water Strategy*.
- North East Water. (2021). *Water Supply*. Retrieved from North East Water: <https://www.newater.com.au/supply>
- Queensland Government. (2021). *SILO - Australian climate data from 1889 to yesterday*.
- RHAA. (2011). *Mosquito Proofing Your Tank*.
- SES. (2013). *Latrobe City Flood Emergency Plan for Latrobe city and VICSES Unit(s) Moe & Morwell*.
- SES. (2014). *Indigo Shire Flood Emergency Plan. A Sub-Plan of the Municipal Emergency Management Plan*.
- SES. (2021). *Latrobe Flood History*. Retrieved from Victorian State Emergency Services: <https://www.ses.vic.gov.au/plan-and-stay-safe/flood-guides/latrobe-city-council>
- Standards Australia. (2008). *Rainwater Tank Design and Installation Handbook*.
- State Government of Victoria. (2018). *Metadata*. Retrieved from Data.vic.gov.au: <http://services.land.vic.gov.au/catalogue/metadata?anzlicId=ANZVI0803004311&publicId=guest&extensionProviderId=1>
- State of Victoria Country Fire Authority. (2022). *Guidelines for Renewable Energy Installations*.
- VFA. (2021). *La Trobe - Angling Waters*. Retrieved from VFA.
- Victorian Environmental Water Holder. (2019). *Section 5 Northern Region | Victorian Environmental Water Holder, Seasonal Watering Plan 2019-20*.
- Victorian Government. (2017). *Environment Protection Act 2017*.
- Water Technology. (2007). *Waterhole Creek Flood Study*.
- Waterwatch. (2021). *Waterwatch Portal*. Retrieved from [http://www.vic.waterwatch.org.au/cb\\_pages/view\\_waterwatch\\_data.php](http://www.vic.waterwatch.org.au/cb_pages/view_waterwatch_data.php)
- Wetlands Wonder. (2016, 03 13). *Latrobe Valley Express*.
- WGCMA. (2012). *Regional Catchment Strategy*.
- WGCMA. (2013). *Waterhole Creek Waterway Management Plan*.
- WGCMA. (2017). *West Gippsland Floodplain management Strategy*.
- WGCMA. (2020). *Guidelines for Development in Flood Prone Areas*. Retrieved from <https://www.wgcma.vic.gov.au/wp-content/uploads/2020/01/WGCMA-FloodGuidelines-Jan2020-final-web.pdf>

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# Appendix A Request for Information

Request for Information from AR Partners relevant to the Surface Water Assessment is presented below in **Table A-1**.

**Table A-1 Initial Request for Information**

<b>Information Requested</b>	<b>Supplier</b>
Existing data and information on meteorology, water quality and local hydrology and flooding conditions, including water quality monitoring records, reports of any flooding or water quality assessments, inundation maps, local records and anecdotes of historical flood events	ARP
Site occupancy numbers during all stages of construction and operations	ARP
Site water demand profiles for both construction and operation phases. If these have not been calculated at this stage, estimates from similar solar farm developments will be sufficient	ARP
Topographic plan of the site and surrounds	ARP
Water quality data from watercourses down-gradient from the design footprint	ARP
Confirm method of construction (need to identify permeability of the site)	ARP

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# Appendix B Flood Advice

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# Floodplain Advice and Flood Information

## Application Form

Advice provided pursuant to powers under Division 4 of Part 10 of the Water Act 1989

North East CMA attempts to respond to requests for information within 14 days from receipt of the request.

This document is intended to be printed and filled in by hand.

### PLEASE COMPLETE ALL DETAILS AND RETURN:

Via mail: Floodplain Advice, North East CMA, PO Box 616 Wodonga, VIC 3689  
Via email: [planning@necma.vic.gov.au](mailto:planning@necma.vic.gov.au) with 'Floodplain Advice' as the subject

Applicant's Name	ARP Australian Solar Pty. Ltd.	Landholder's Name (if not applicant)	Bill Chambers & Kevin Fisher
Telephone	0405 646 940	Telephone	0417 287 205 & 0427 200 572
Email	info@arpaustraliansolar.com.au	Email	wchambers1@bigpond.com kevincathyfisher@bigpond.com
Postal Address	C/-Shelton, Governor Phillip Tower Level 36, 1 Farrer Place, SYDNEY NSW	Postal Address	49 Hermitage Road, Barnawartha
Post Code	2000	Post Code	3688

If applicant is not the landholder, has the landholder been notified of this enquiry?  Yes  No

### Sufficient information must be provided to accurately locate the property to which the enquiry relates.

Property Address 49 Hermitage Road, Barnawartha VIC 3688

Your application must include one of the following (usually available on council rates notices)

Crown Allotment and Parish Details  
eg CA 45 section 9, Parish of Wangaratta Allot. 1 Sec. 24 PARISH OF BARNAWARTHA NORTH

Lot and Plan Number  
eg Lot 4 of PS 1443333, Parish of Edi Standard Parcel Identifier (SPI): 1~24\PP2076

- What is the purpose of this application?
- Pre-Purchase
  - Insurance
  - New dwelling
  - Replacement dwelling
  - Dwelling extension
  - Subdivision
  - 1% AEP Flood Level
  - 1%AEP Flood Extent
  - Earthworks

Other  
(Please specify) Planning Permit application for development of a solar farm

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If you require site specific information in relation to flood impact on a proposed development, please provide information to define the location and nature of proposed works. In the absence of sufficient information provided by the applicant the Authority will provide only general advice on the impact of flooding on the entirety of the property.

**Sketch of proposed works** (this should accurately show the location of any proposed works on the property)

See attachment titled "ARP AUS BARN-003RevG\_(Barnawatha Revised Site Layout) A0 1-2500 Scale"

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**Locality Plan** (This should accurately show the location of the property and existing boundaries)

See attachment titled "ARP AUS BARN-003RevG\_(Barnawatha Revised Site Layout) A0 1-2500 Scale"

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Additional pages may be attached if more space is required.

**The following additional information may also be required, where applicable:**

- Existing and proposed use of the site and subdivision boundaries if proposed.
- The number of people expected to be on the property during normal operations
- An accurate locality plan of the property including:
  - Existing natural surface levels, including levels at the proposed building site and along the access-way to the property boundary
  - Existing and proposed buildings, including floor levels
  - Existing and proposed earthworks, including finished surface levels, embankment alignments and crest levels
  - Existing and proposed fencing
  - Existing and proposed road or access-way alignments and crest levels
  - Existing and proposed drainage systems, including waterways, pipelines, drains, culverts and bridges
  - Other important physical features upstream and downstream of the property that may affect flows, such as levee banks, fences and retaining walls

By signing below I declare that the information I have given is true and correct

Name **Amir Hedjripour**

Signature



Date **4 Nov 2021**

North East CMA is committed to protecting your privacy and to the responsible handling of your personal information. The CMA will only use the personal information provided by you for the purposes for which it was collected and any other authorised use. Information the CMA collects may also be used for our own planning and research purposes to improve the services to the community. Information collected may be disclosed to third parties where functions are being outsourced or if disclosure is required or authorised by law.

# Floodplain Advice and Flood Information

The following additional information may also be required, where applicable:

1. Existing and proposed use of the site and subdivision boundaries if proposed
  - Existing use of the site is for agricultural purposes.
  - Proposed use for the site is a solar farm and battery storage.
  - No subdivision of the land will occur under the application.
2. The number of people expected to be on the property during normal operations
  - The construction phase is expected to last for 12-18 months and would provide an estimated 100 new employment
  - The ongoing operational phase of the Solar Energy Facility would be for at least the manufacturer's warranty period of 25- years for the solar PV panels. The operational phase would provide ongoing employment opportunities for 2 site staff and also additional local technicians as needed.
3. An accurate locality plan of the property including:
  - a. Existing natural surface levels, including levels at the proposed building site and along the access-way to the property boundary

See document titled "ARP Aus BARN-100\_Contours for site and surrounds"
  - b. Existing and proposed buildings, including floor levels

See document titled "ARP AUS BARN-003RevG (Barnawatha Revised Site Layout) A0 1-2500 Scale"
  - c. Existing and proposed earthworks, including finished surface levels, embankment alignments and crest levels

See document titled "ARP AUS BARN-003RevG (Barnawatha Revised Site Layout) A0 1-2500 Scale"
  - d. Existing and proposed fencing

Existing fencing is agricultural in nature.

Proposed fencing is shown in document titled "ARP Aus BARN-005\_210729\_(Barnawatha Security Fence)".
  - e. Existing and proposed road or access-way alignments and crest levels

See document titled "ARP AUS BARN-003RevG (Barnawatha Revised Site Layout) A0 1-2500 Scale"
  - f. Existing and proposed drainage systems, including waterways, pipelines, drains, culverts and bridges

See document titled "ARP AUS BARN-003RevG (Barnawatha Revised Site Layout) A0 1-2500 Scale"
  - g. Other important physical features upstream and downstream of the property that may affect flows, such as levee banks, fences and retaining walls

A number of storages, swales and drainage structures are present in vicinity of the proposed sites. These are shown in Figure 1 and listed in Table 1 and Table 3.

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Figure 1 Location of the proposed site and surrounding storages and drainage structures

**Table 1 List of storages in vicinity of the site.**

Dam	Co-ordinates	Approx dimensions	Area	Bank fall	Water level	Water quality	Fill mechanism
1	Lat: 36° 3'31.15"S Long: 146°41'12.23"E	Approx 23m x 23m	0.0478 ha	gentle	full	brown; turbid; algae present; no fringing vegetation	rain
2	Lat: 36° 3'37.84"S Long: 146°41'35.73"E	Approx 57m x 36m	0.1587 ha	gentle	full	brown; turbid; muddy; edges pugged by cattle	rain
3	No details available						
4	Lat: 36° 3'56.59"S Long: 146°41'18.40"E	Approx 37m x 40m	0.0973 ha	gentle	full	brown; turbid; muddy; edges pugged by cattle	rain
5	No details available						
6	Lat: 36° 4'7.81"S Long: 146°41'23.70"E	Approx 26m x 32m	0.0662 ha	gentle	full	brown; turbid; muddy; edges pugged by cattle; east side vegetated (roadside)	rain
7	Lat: 36° 4'10.04"S Long: 146°40'59.85"E	Approx 20m x 15m	0.0211 ha	moderate	low	brown; muddy; surrounded by wheat crop	rain
8 (additional)	Lat: 36° 3'41.67"S Long: 146°41'20.28"E	Approx 26m x 24m	0.0519 ha	gentle	full	brown; turbid; muddy	rain
9 (additional)	Lat: 36° 3'28.61"S Long: 146°41'38.48"E	Approx 24m x 10m	0.0313 ha	flat	moderate	brown; turbid; muddy; edges pugged by cattle; slabs of concrete dumped in dam!	rain

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**Table 2 List of swales in vicinity of the site.**

Swale	Width (approx)	Depth (approx)	Observations
Murray Valley Hwy	1m	30cm	grassed, weedy, overgrown
Barnawartha-Howlong Road	2-3m	45cm	dry, grassed edges
Baxter-Whelan Road	4-5m	1m	dry, grassed, overgrown, very high (>1m high grass in places)

**Table 3 List of drainage structures in vicinity of the site.**

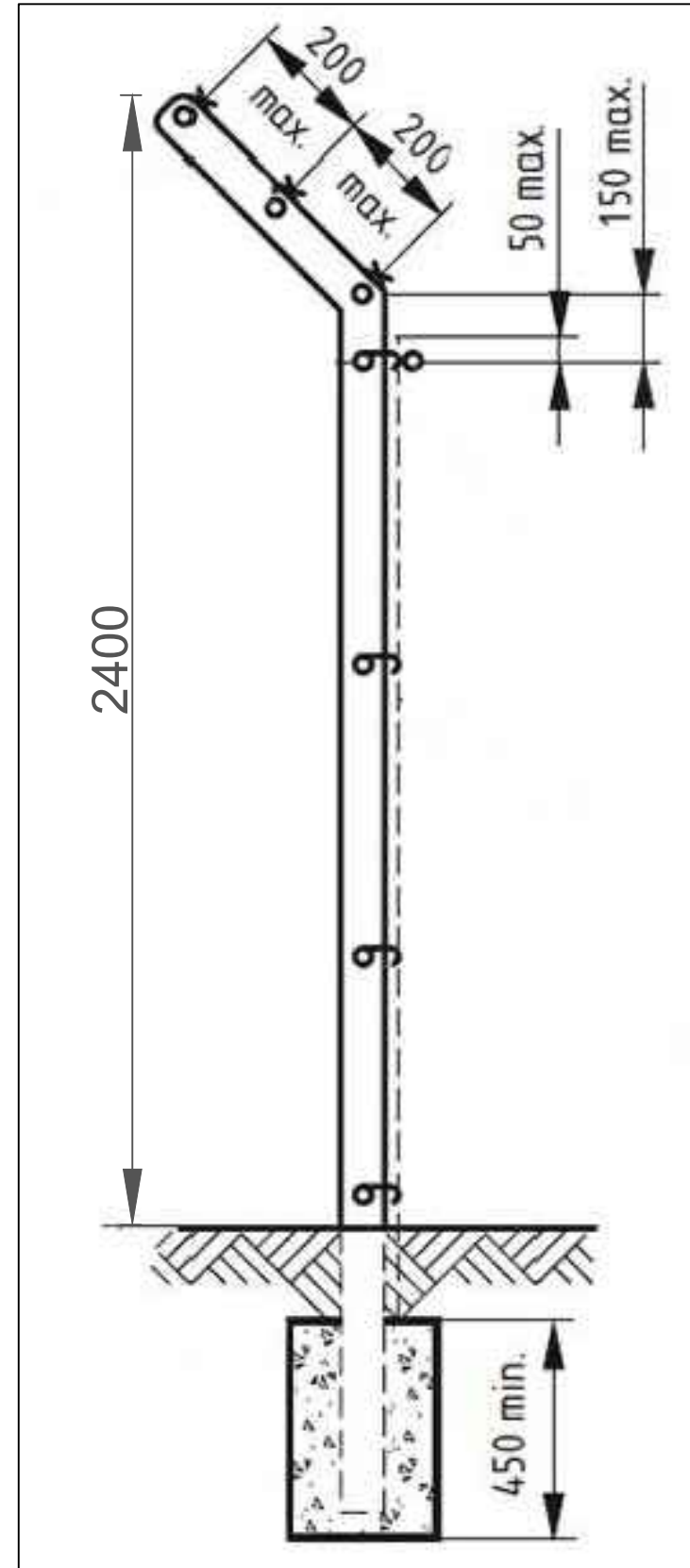
Drainage structure	co-ordinates	Location	Observations	Measurements
Murray Valley Hwy	Lat: 36° 3'17.52"S Long: 146°40'59.50"E	See map	Weed grass either side; concrete structure with steel rungs, concrete cover; structure	<b>Approx</b> 3m long; 50cm deep; 40cm wide; cover (lid) approx
Barnawartha-Howlong Road	Lat: 36° 3'18.40"S Long: 146°40'58.60"E	See map	Weed grass either side; concrete structure with steel rungs, concrete cover; structure	<b>Measured with tape</b> 3.7m long; 60cm deep; 50cm wide; cover

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Rev	Description	Date	Initial	Checked



**ARP Australian Solar Pty. Ltd**

**Tel:** +61(0)473210006  
**Email:** Harry@arpaustraliansolar.com.au  
**Website:** www.ARPAustraliansolar.com.au

**PROJECT** ARP AUSTRALIAN  
SOLAR DOCUMENTS

**TITLE** TYPICAL SECURITY FENCING

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NTS  
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DRAFT  
Drawn By  
LHZ

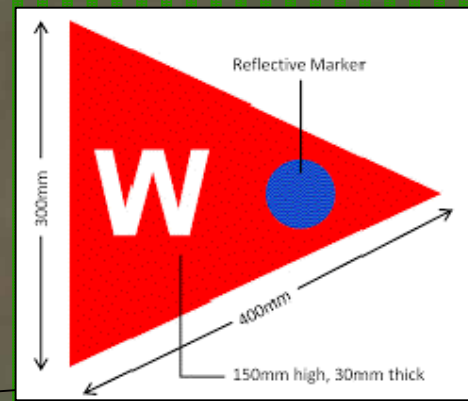
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ARP-AUS-BARN-005

Rev  
-  
Date Created  
JULY-2021

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CFA Water Tank Sign

New identification signs into solar boundary together with direction to water tank

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 Email: Harry@arpaustraliansolar.com.au  
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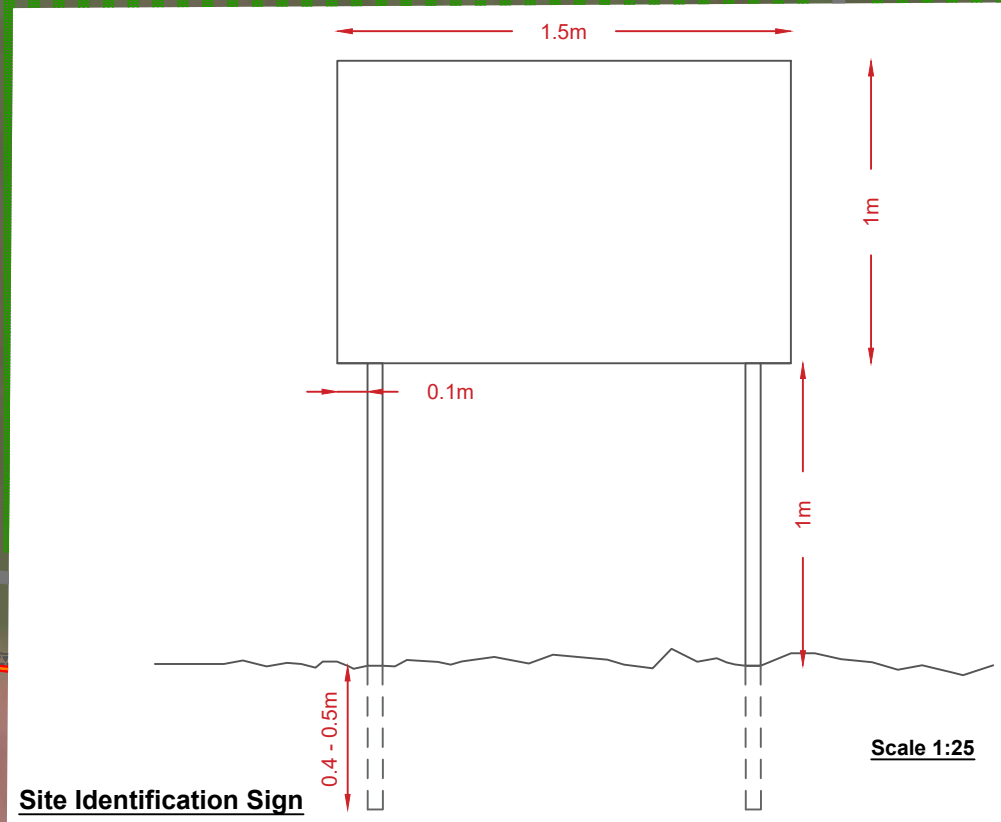
**PROJECT** BARNAWATHA SOLAR PV

**TITLE** PROPOSED NORTHERN SITE ENTRANCE SIGNAGE

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 STATUS  
 Drawn By  
 LHZ

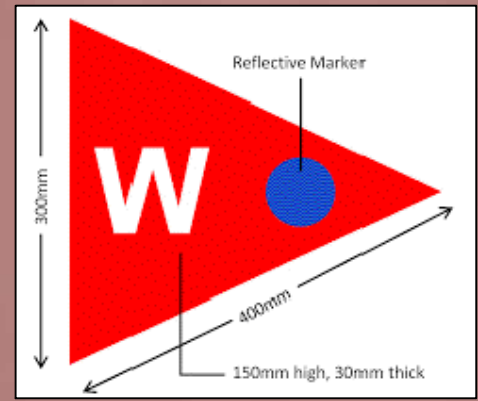
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 ARP AUS BARN-006i

Rev - Date Created JULY-2021



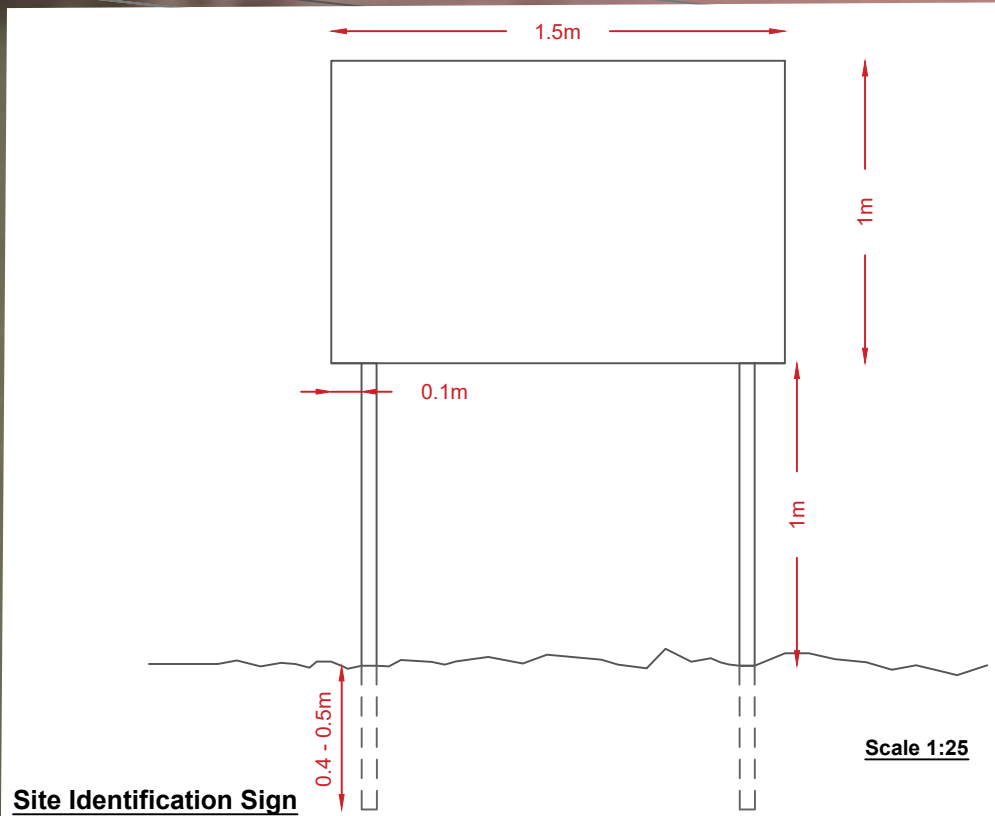
Site Identification Sign

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CFA Water Tank Sign

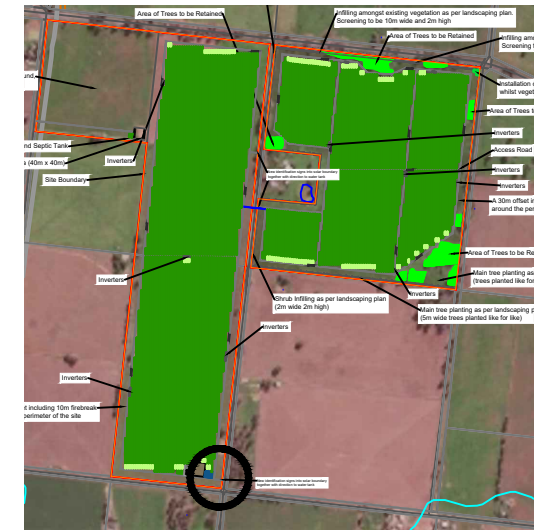
New identification signs into solar boundary together with direction to water tank



Site Identification Sign



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**PROJECT** BARNAWATHA SOLAR PV

**TITLE** PROPOSED SOUTHERN SITE ENTRANCE SIGNAGE

Scale @ A3  
 1:2500  
 Drawing Status  
 STATUS  
 Drawn By  
 LHZ

Drawing Number  
 ARP AUS BARN-006ii

Rev	Date Created
-	JULY-2021

**Note:**  
It is the recipients responsibility to print to correct scale. Only written dimensions should be used.



COLOUR - OLIVE GREEN

EXAMPLE HOUSING FOR INVERTER HOUSING, ELECTRICAL SWITCH GEAR & NSP EQUIPMENT AND SUBSTATION - COLOUR OLIVE GREEN

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**ADVERTISED PLAN**

Rev	Description	Date	Initial	Checked



**ARP Australian Solar Pty. Ltd**

Tel: +61(0)473210006  
Email: Harry@arpaustraliansolar.com.au  
Website: www.ARPaustraliansolar.com.au

**PROJECT** ARP AUSTRALIAN SOLAR DOCUMENTS

**TITLE** TYPICAL INVERTER, MWSF AND NSP SUBSTATION CONTAINERS

Scale @ A3  
NTS  
Drawing Status  
DRAFT  
Drawn By  
LHZ

Drawing Number  
ARP-AUS-BARN-007

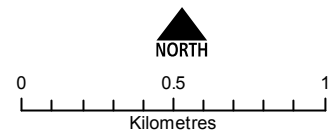
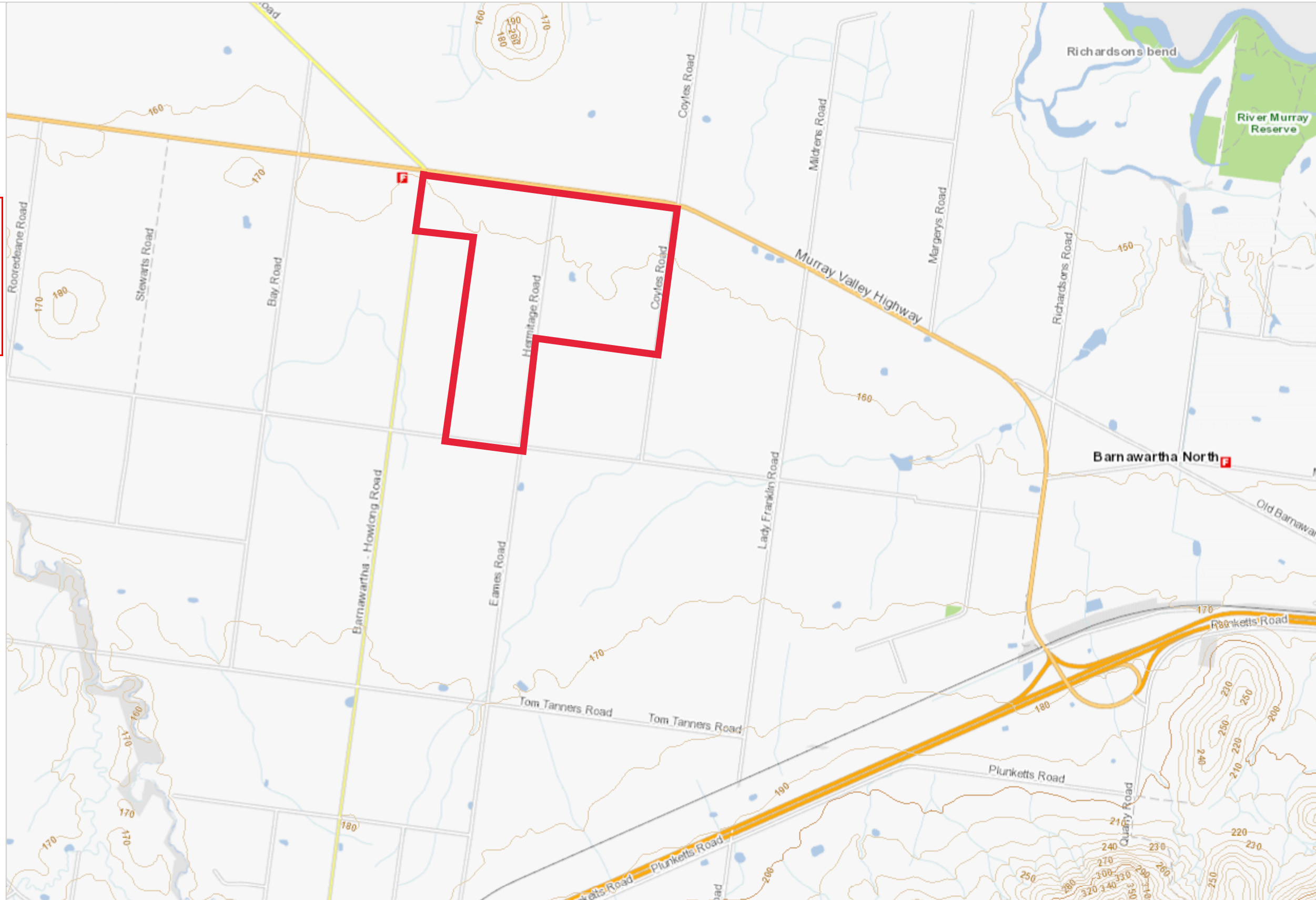
Rev  
- Date Created  
JULY-2021

# Planning Map

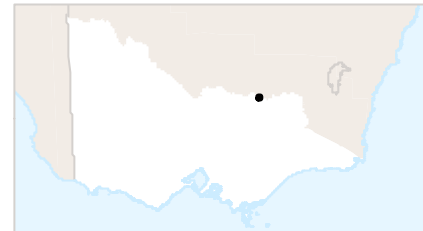
- 10m
- 100m
- Project boundary

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**ADVERTISED PLAN**



Map Projection: GDA 1994 VICGRID94  
Print Date: 11/3/2021



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Red Line Site Boundary - 120.75 hectares  
Approx 231,744 panels. (each panel 1.5m x 1m)



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Rev	Description	Date
H	Reverted back to original red line on east side	02/10/21
G	Mirror alterations	14/09/21
F	Addition of dimensions	14/09/21
E	Addition of working bays	03/09/21
D	Red line amendments and colour change	24/08/21
C	Red line amendments and layout updating	23/08/21
B	Updated labelling	02/08/21
A	Located red line boundary	23/07/21



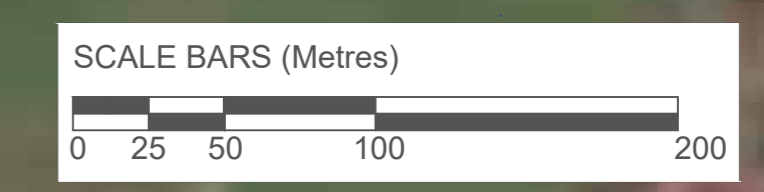
ARP Australian Solar Pty. Ltd  
Tel: +61(0)473210006  
Email: [henry@arnaustralian.com.au](mailto:henry@arnaustralian.com.au)  
Website: [www.ASPAustralianSolar.com.au](http://www.ASPAustralianSolar.com.au)

PROJECT BARNAWATHA SOLAR FARM  
TITLE SITE LAYOUT DESIGN

Scale @ A0  
1:2500  
Drawing Status  
DRAFT  
Drawn By  
LHZ

Drawing Number  
ARP AUS BARN-003

Rev H Date Created JAN-2021





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**LEGEND**

- █ Site Boundary
- █ Underground Cable within a Trench 300mm wide and 1000mm depth. Access Pits approx 350m apart. (All depths and dimensions subject to VicRds approval)

Rev	Description	Date	Initial	Checked
A	Updated Site Boundary	29/07/21	LHZ	GH



**ARP Australian Solar Pty. Ltd**

Tel: +61(0)473210006  
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**PROJECT** BARNAWARTHA PV

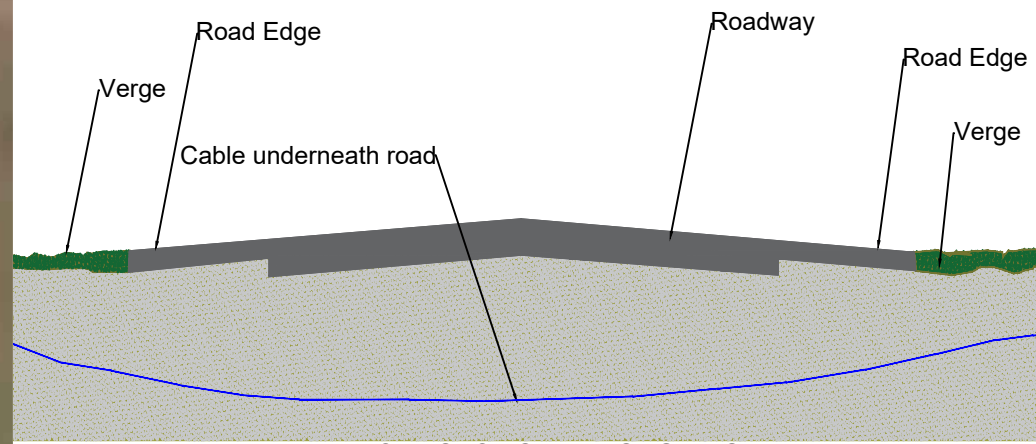
**TITLE** CABLE ROUTES

Scale @ A3  
1:10,000  
Drawing Status  
PLANNING  
Drawn By  
LHZ

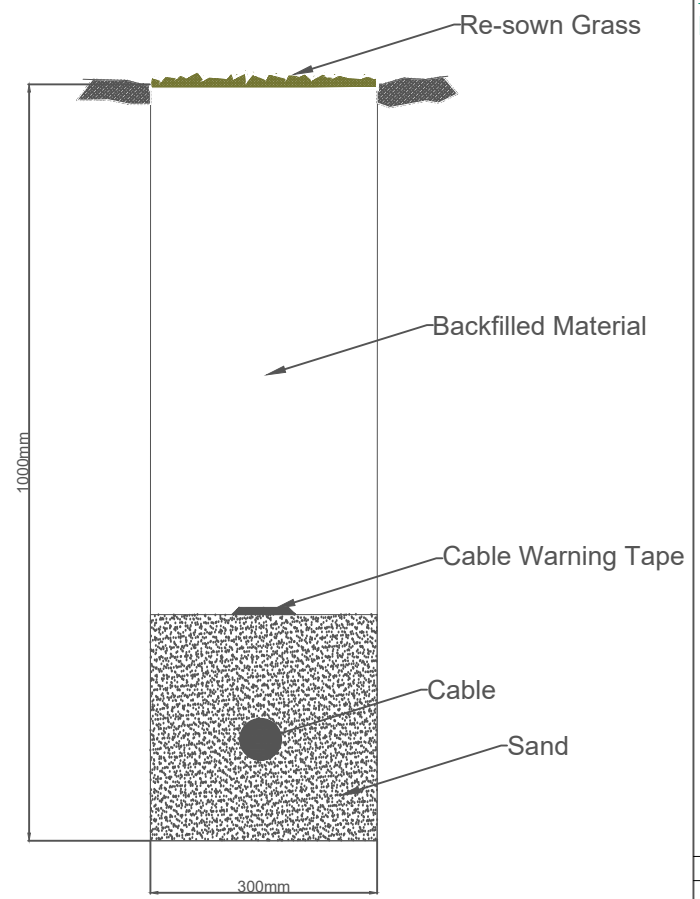
Drawing Number  
ARP-AUS-BARN-04i

Rev	Date Created
A	MARCH-2021





**TYPICAL SECTION THROUGH ROAD**  
Location, depths and dimensions subject to VicRds approval



**TYPICAL CABLE TRENCH CROSS SECTION**  
(All depths and dimensions subject to VicRds approval)  
Scale 1:10

**Note:**  
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**LEGEND**  
█ Site Boundary  
█ Underground Cable within a Trench 300mm wide and 1000mm depth. Access Pits approx 350m apart. (All depths and dimensions subject to VicRds approval)

Rev	Description	Date	Initial	Checked
A	Updated Site Boundary	29/07/21	LHZ	GH

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Cable location along road verge

**Approximate location of trench (cable route)**  
Not to scale and subject to VicRds approval



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 Website: www.ARPAustralianSolar.com.au

**PROJECT** BARNAWARTHA PV

**TITLE** CABLE ROUTE ROAD CROSSING

Scale @ A3  
1:2500  
 Drawing Status  
PLANNING  
 Drawn By  
LHZ

Drawing Number  
ARP-AUS-BARN-019ii

Rev	Date Created
A	MARCH-2021

North East CMA Ref No. : NECMA-F-2021-00428  
Applicant Ref. : Enquiry 4 Nov 2021

Date : 23 November 2021

Amir Hedjripour  
ARP Australian Solar Pty Ltd.  
1 Farrer Place  
Sydney NSW 2000  
Via email: [info@arpaustraliansolar.com.au](mailto:info@arpaustraliansolar.com.au)

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**NORTH EAST  
CATCHMENT  
MANAGEMENT  
AUTHORITY**

Level 1, 104 Hovell Street  
Wodonga VIC 3690  
P.O Box 616  
Wodonga VIC 3689  
Ph: 1300 216 513  
Fax: 02 6043 7601  
Website: [www.necma.vic.gov.au](http://www.necma.vic.gov.au)  
Email: [necma@necma.vic.gov.au](mailto:necma@necma.vic.gov.au)  
ABN 53 229 361 440

Dear Amir

### Flood enquiry location

**Street : 49 Hermitage Road Barnawartha Vic 3688**  
**Cadastral : Allotment 1, Section 24 and Allotments 2 and 3, Section 22, Parish Of Barnawartha North**

Thank you for your enquiry of 4 November 2021, received at the North East Catchment Management Authority (the Authority) on 4 November 2021.

Below is the Authority's understanding of the enquiry:

The applicant(s), ARP Australian Solar Pty Ltd.  
representing landowner Bill Chambers & Kevin Fisher

Enquires in relation to;

**Enquiry type: Flood Information Request – Development of a solar farm**  
on the abovementioned site location.

The Authority's assessment of the above information has determined that the site is covered by the following Zones and Overlays in the Indigo Planning Scheme:

**Zone(s): Farming Zone**  
**Overlay(s): Environmental Significance Overlay – Schedule 3**

Under section 56(3) the North East CMA gives the following comments on the application:

In Victoria, proposals for development on floodplains are generally assessed against the flood magnitude that has a 1% chance of occurring in any given year, known as the 1% Annual Exceedance Probability (AEP) flood. The 1% AEP flood is the minimum standard for planning in Victoria but is not the largest flood that could occur. There is always a possibility that a flood larger in height and extent than the 1% AEP flood may occur in the future.

Flood levels for the 1% AEP flood event along the Murray River adjacent the site have been declared under the *Water Act 1989*. The declared 1% AEP flood level for the location described above is RL 144.0 m AHD. Relevant flood level information for the property is obtained from Murray River declaration maps (2004).

Consequently the Authority advises that in the 1% AEP flood event the site would not be subject to inundation from the Murray River.

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The site is located within the Black Dog Creek Drainage district, an area known to experience water logging and impeded drainage. Allotment 1, Section 24 is noted to contain a broad area of low ground. The Authority holds no drainage information specific to the site.

The Authority's flood information is limited to that provided above. The Authority holds no information on the potential for flooding from local drainage paths and stormwater infrastructure. Such flooding may necessitate a higher level of protection (e.g. higher floor level) than is stipulated in the conditions provided below. Indigo Shire may be able to provide more information in relation to flooding from local drainage paths and stormwater infrastructure.

The Authority notes that this enquiry relates to proposed development of a solar farm and battery storage. The Authority is unlikely to object to development subject to conditions including but not limited to:

- Any application should be supported by a Stormwater Management Plan to assess local drainage conditions arising from accumulation and ponding of local stormwater runoff and demonstrate the measures proposed to:
  - Avoid impact on flood level or flow distribution to adjacent properties as a result of the works (inclusive of any proposed alteration of surface levels arising from construction of access tracks).
  - Ensure that the point of discharge to adjacent properties is not altered.
  - Provide for retardation of flows from the site to ensure that the rate of runoff to adjacent properties is not altered relative to existing conditions.
- Infrastructure should be located on higher ground and/or appropriately elevated to account for the impacts of local drainage conditions, with critical works elements a minimum of 300 mm above 1% AEP flood level. Electrical installations should be designed to withstand the effect of flooding to 1% AEP level + 300 mm, either by raising above flood level or waterproofing any works below flood level.
- Construction management practices should minimise the area of disturbance and site compaction, protect existing groundcover vegetation and minimise alteration in site levels and avoid diversion of surface runoff.
- Perimeter fencing may be prone to trapping debris and impacting flood levels and distribution of flows. Appropriate details will be required to mitigate this risk and avoid off-site impact.

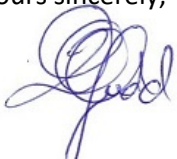
Please note, this document contains flood level advice only and does not constitute approval or otherwise of any development at this location.

The Authority has provided this advice as preliminary information only and has been on the information you have provided. Any flood level advice provided is based on the most accurate information currently available and may change if new information becomes available.

The Authority can provide further information regarding any proposed development of the property in response to a planning permit application referred by the Indigo Shire in accordance with the *Planning and Environment Act 1987*.

Should you have any queries, please do not hesitate to contact Tim Loffler on 1300 216 513. To assist the Authority in handling any enquiries please quote **NECMA-F-2021-00428** in your correspondence with us.

Yours sincerely,



**Dean Judd**  
Manager Waterways and Floodplain Planning

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## **Definitions and Disclaimers**

1. The area referred to in this letter as the 'proposed development location' is the land parcel(s) that, according to the Authority's assessment, most closely represent(s) the location identified by the applicant. The identification of the 'proposed development location' on the Authority's GIS has been done in good faith and in accordance with the information given to the Authority by the applicant(s) and/or the Local Government Authority.
2. While every endeavour has been made by the Authority to identify the proposed development location on its GIS using VicMap Parcel and Address data, the Authority accepts no responsibility for or makes no warranty with regard to the accuracy or naming of this proposed development location according to its official land title description.
3. **AEP** – Annual Exceedance Probability – is the likelihood of occurrence of a flood of given size or larger occurring in any one year. AEP is expressed as a percentage (%) risk and may be expressed as the reciprocal of ARI (Average Recurrence Interval).  

Please note that the 1% probability flood is not the probable maximum flood (PMF). There is always a possibility that a flood larger in height and extent than the 1% probability flood may occur in the future.
4. **ARI** – Average Recurrence Interval – is the likelihood of occurrence, expressed in terms of the long-term average number of years, between flood events as large as or larger than the design flood event. For example, floods with a discharge as large as, or larger than the 100 year ARI flood will occur on average once every 100 years.
5. **AHD** – Australian Height Datum – is the adopted national height datum that generally relates to height above mean sea level. Elevation is in metres.
6. **NFPL** – Nominal Flood Protection Level – is the minimum height required to protect a building or its contents, which includes a freeboard (a minimum of 0.3 m unless otherwise detailed) above the 1% AEP flood level. Freeboard refers to a height above the defined flood level and is typically used to provide a factor of safety in the setting of floor levels for developments, to compensate for effects such as wave action and to provide protection from flooding which is marginally above the defined flood level.
7. No warranty is made as to the accuracy or liability of any studies, estimates, calculations, opinions, conclusions, recommendations (which may change without notice) or other information contained in this letter and, to the maximum extent permitted by law, the Authority disclaims all liability and responsibility for any direct or indirect loss or damage which may be suffered by any recipient or other person through relying on anything contained in or omitted from this letter.
8. This letter has been prepared for the sole use by the party to whom it is addressed and no responsibility is accepted by the Authority with regard to any third party use of the whole or of any part of its contents. Neither the whole nor any part of this letter or any reference thereto may be included in any document, circular or statement without the Authority's written approval of the form and context in which it would appear.
9. The flood information provided represents the best estimates based on currently available information. This information is subject to change as new information becomes available and as further studies are carried out.

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# Appendix C Site Visit

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# 1 Site Walkover

A site walk-over was conducted on the 21<sup>st</sup> of October 2021 by Environmental Consultants from Aurecon. The items inspected as part of the site walkover include dams, drainage structures and swales, the collected information from the site walkover are presented below.

## 1.1 Dams

Observations of the dams are presented in Table 1-1 and images are presented in Figure 4.5 in the main report.

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Table 1-1 Dam Observations

Dam	Co-ordinates	Approx dimensions	Area (ha)	Bank fall	Water level	Water quality	Fill mechanism	Photo (taken from SE corner of dam)
1	Lat: 36° 3'31.15"S Long: 146°41'12.23"E	Approx 23m x 23m	0.0478 ha	gentle	full	brown; turbid; algae present; no fringing vegetation	rain	Yes
2	Lat: 36° 3'37.84"S Long: 146°41'35.73"E	Approx 57m x 36m	0.1587 ha	gentle	full	brown; turbid; muddy; edges pugged by cattle	rain	Yes
3	No photos or details provided as dam outside study area (on land in different ownership)							
4	Lat: 36° 3'56.59"S Long: 146°41'18.40"E	Approx 37m x 40m	0.0973 ha	gentle	full	brown; turbid; muddy; edges pugged by cattle	rain	Yes
5	No photos or details provided as dam outside study area (on land in different ownership)							
6	Lat: 36° 4'7.81"S Long: 146°41'23.70"E	Approx 26m x 32m	0.0662 ha	gentle	full	brown; turbid; muddy; edges pugged by cattle; east side vegetated (roadside)	rain	Yes
7	Lat: 36° 4'10.04"S Long: 146°40'59.85"E	Approx 20m x 15m	0.0211 ha	moderate	low	brown; muddy; surrounded by wheat crop	rain	Yes
8	Lat: 36° 3'41.67"S Long: 146°41'20.28"E	Approx 26m x 24m	0.0519 ha	gentle	full	brown; turbid; muddy	rain	Yes
9	Lat: 36° 3'28.61"S Long: 146°41'38.48"E	Approx 24m x 10m	0.0313 ha	flat	moderate	brown; turbid; muddy; edges pugged by cattle; slabs of concrete dumped in dam!	rain	Yes

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Dam 1 – Wide angle



Dam 1 - Bank

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Dam 2 – Wide angle



Dam 2 – Bank

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Dam 4 – Wide angle



Dam 4 – Bank

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Dam 6 – Wide angle



Dam 6 – Bank

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Dam 7 – Wide angle

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Dam 8 – Wide angle



Dam 8 – Bank

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Dam 9 – Wide angle



Dam 9 – Bank

Figure 1-1 Images of Dams

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## 1.2 Swales and drainage Structures

Observations of the Swales and drainage structures are presented in

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Swale	Width (approx)	Depth (approx)	Observations
Murray Valley Hwy	1m	30cm	grassed, weedy, overgrown
Barnawartha-Howlong Road	2-3m	45cm	dry, grassed edges
Baxter-Whelan Road	4-5m	1m	dry, grassed, overgrown, very high (>1m high grass in places)

Drainage structure	Co-ordinates	Location	Observations	Measurements
Murray Valley Hwy	Lat: 36° 3'17.52"S Long: 146°40'59.50"E	See map	Weed grass either side; concrete structure with steel rungs, concrete cover; structure allows water to pass under road.	<b>Approx</b> 3m long; 50cm deep; 40cm wide; cover (lid) approx 70x70 cm
Barnawartha-Howlong Road	Lat: 36° 3'18.40"S Long: 146°40'58.60"E	See map	Weed grass either side; concrete structure with steel rungs, concrete cover; structure allows water to pass under road.	<b>Measured with tape</b> 3.7m long; 60cm deep; 50cm wide; cover (lid) 1m x 90cm

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Grassed swale along Baxter-Whelan Road facing east (corner of Barnawarthat-Howlong Road)

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Grassed Swale along Barnawartha Road facing north (corner of Murray Valley Hwy)



Grassed Swale along Barnawartha Road facing south (corner of Murray Valley Hwy)

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Culvert along Barnawartha Road facing north (corner of Murray Valley Hwy)

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Culvert along Murray Valley Highway facing east (corner of Barnawartha -Howlong road)

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Grassed swale along Murray Valley Highway facing west (corner of Hermitage Rd)



Grassed swale along Murray Valley Highway facing east (corner of Hermitage Rd)

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Grassed swale along Murray Valley Highway facing west (corner of Coyle)

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# Appendix D MUSIC Model Parameters

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Properties of Agricultural (120.8ha) - Page 2 of 5

### Rainfall-Runoff Parameters

Impervious Area Properties

Rainfall Threshold (mm/day)

Pervious Area Properties

Soil Storage Capacity (mm)

Initial Storage (% of Capacity)

Field Capacity (mm)

Infiltration Capacity Coefficient - a

Infiltration Capacity Exponent - b

Groundwater Properties

Initial Depth (mm)

Daily Recharge Rate (%)

Daily Baseflow Rate (%)

Daily Deep Seepage Rate (%)

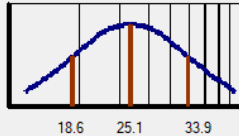
Properties of Agricultural (120.8ha) - Page 3 of 5

### Total Suspended Solids

Base Flow Concentration Parameters

Mean (log mg/L)

Std Dev (log mg/L)



Estimation Method

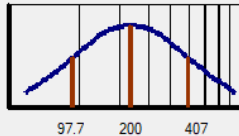
Mean  Stochastically generated

Serial Correlation (R squared)

Storm Flow Concentration Parameters

Mean (log mg/L)

Std Dev (log mg/L)



Estimation Method

Mean  Stochastically generated

Serial Correlation (R squared)

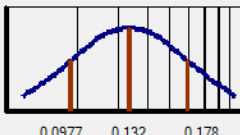
Properties of Agricultural (120.8ha) - Page 4 of 5

### Total Phosphorus

Base Flow Concentration Parameters

Mean (log mg/L)

Std Dev (log mg/L)



Estimation Method

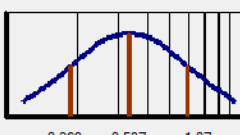
Mean  Stochastically generated

Serial Correlation (R squared)

Storm Flow Concentration Parameters

Mean (log mg/L)

Std Dev (log mg/L)



Estimation Method

Mean  Stochastically generated

Serial Correlation (R squared)

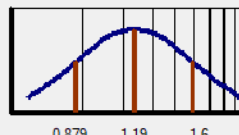
Properties of Agricultural (120.8ha) - Page 5 of 5

### Total Nitrogen

Base Flow Concentration Parameters

Mean (log mg/L)

Std Dev (log mg/L)



Estimation Method

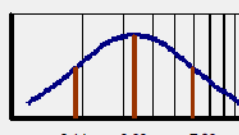
Mean  Stochastically generated

Serial Correlation (R squared)

Storm Flow Concentration Parameters

Mean (log mg/L)

Std Dev (log mg/L)



Estimation Method

Mean  Stochastically generated

Serial Correlation (R squared)

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Properties of OM Building - Page 2 of 5

**Rainfall-Runoff Parameters**

Impervious Area Properties

Rainfall Threshold (mm/day)

Pervious Area Properties

Soil Storage Capacity (mm)

Initial Storage (% of Capacity)

Field Capacity (mm)

Infiltration Capacity Coefficient - a

Infiltration Capacity Exponent - b

Groundwater Properties

Initial Depth (mm)

Daily Recharge Rate (%)

Daily Baseflow Rate (%)

Daily Deep Seepage Rate (%)

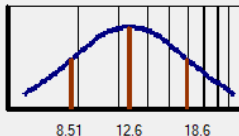
Properties of OM Building - Page 3 of 5

**Total Suspended Solids**

Base Flow Concentration Parameters

Mean (log mg/L)

Std Dev (log mg/L)



Estimation Method

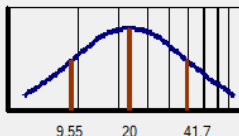
Mean  Stochastically generated

Serial Correlation (R squared)

Storm Flow Concentration Parameters

Mean (log mg/L)

Std Dev (log mg/L)



Estimation Method

Mean  Stochastically generated

Serial Correlation (R squared)

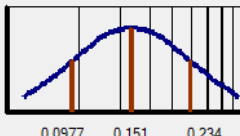
Properties of OM Building - Page 4 of 5

**Total Phosphorus**

Base Flow Concentration Parameters

Mean (log mg/L)

Std Dev (log mg/L)



Estimation Method

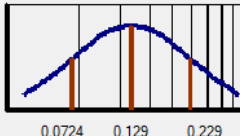
Mean  Stochastically generated

Serial Correlation (R squared)

Storm Flow Concentration Parameters

Mean (log mg/L)

Std Dev (log mg/L)



Estimation Method

Mean  Stochastically generated

Serial Correlation (R squared)

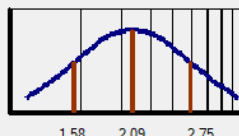
Properties of OM Building - Page 5 of 5

**Total Nitrogen**

Base Flow Concentration Parameters

Mean (log mg/L)

Std Dev (log mg/L)



Estimation Method

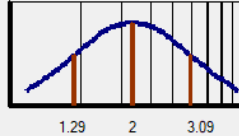
Mean  Stochastically generated

Serial Correlation (R squared)

Storm Flow Concentration Parameters

Mean (log mg/L)

Std Dev (log mg/L)



Estimation Method

Mean  Stochastically generated

Serial Correlation (R squared)

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Properties of Hardstand\_Other - Page 2 of 5

**Rainfall-Runoff Parameters**

Impervious Area Properties

Rainfall Threshold (mm/day)

Pervious Area Properties

Soil Storage Capacity (mm)

Initial Storage (% of Capacity)

Field Capacity (mm)

Infiltration Capacity Coefficient - a

Infiltration Capacity Exponent - b

Groundwater Properties

Initial Depth (mm)

Daily Recharge Rate (%)

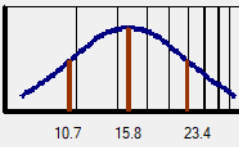
Daily Baseflow Rate (%)

Daily Deep Seepage Rate (%)

Properties of Hardstand\_Other - Page 3 of 5

**Total Suspended Solids**

Base Flow Concentration Parameters

Mean (log mg/L)  

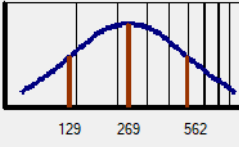
Std Dev (log mg/L)

Estimation Method

Mean  Stochastically generated

Serial Correlation (R squared)

Storm Flow Concentration Parameters

Mean (log mg/L)  

Std Dev (log mg/L)

Estimation Method

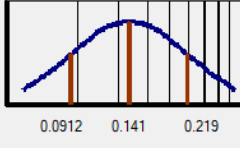
Mean  Stochastically generated

Serial Correlation (R squared)

Properties of Hardstand\_Other - Page 4 of 5

**Total Phosphorus**

Base Flow Concentration Parameters

Mean (log mg/L)  

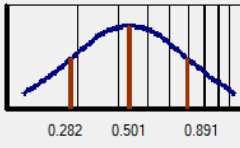
Std Dev (log mg/L)

Estimation Method

Mean  Stochastically generated

Serial Correlation (R squared)

Storm Flow Concentration Parameters

Mean (log mg/L)  

Std Dev (log mg/L)

Estimation Method

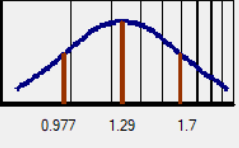
Mean  Stochastically generated

Serial Correlation (R squared)

Properties of Hardstand\_Other - Page 5 of 5

**Total Nitrogen**

Base Flow Concentration Parameters

Mean (log mg/L)  

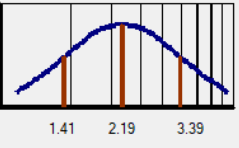
Std Dev (log mg/L)

Estimation Method

Mean  Stochastically generated

Serial Correlation (R squared)

Storm Flow Concentration Parameters

Mean (log mg/L)  

Std Dev (log mg/L)

Estimation Method

Mean  Stochastically generated

Serial Correlation (R squared)

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# Appendix E PMST Report

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# 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. Please see the caveat for interpretation of information provided here.

Report created: 02-Dec-2021

[Summary](#)

[Details](#)

[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

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# Summary

## Matters of National Environment 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](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance (Ramsar)</a>	7
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	5
<a href="#">Listed Threatened Species:</a>	29
<a href="#">Listed Migratory Species:</a>	11

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## 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

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.

<a href="#">Commonwealth Lands:</a>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	18
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None
<a href="#">Habitat Critical to the Survival of Marine Turtles:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	1
<a href="#">Regional Forest Agreements:</a>	1
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">EPBC Act Referrals:</a>	4
<a href="#">Key Ecological Features (Marine):</a>	None
<a href="#">Biologically Important Areas:</a>	None
<a href="#">Bioregional Assessments:</a>	None
<a href="#">Geological and Bioregional Assessments:</a>	None

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# Details

## Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands)		[ Resource Information ]
Ramsar Site Name	Proximity	Buffer Status
<a href="#">Banrock station wetland complex</a>	600 - 700km upstream from Ramsar site	In feature area
<a href="#">Barmah forest</a>	100 - 150km upstream from Ramsar site	In feature area
<a href="#">Gunbower forest</a>	150 - 200km upstream from Ramsar site	In feature area
<a href="#">Hattah-kulkyne lakes</a>	400 - 500km upstream from Ramsar site	In feature area
<a href="#">Nsw central murray state forests</a>	100 - 150km upstream from Ramsar site	In feature area
<a href="#">Riverland</a>	500 - 600km upstream from Ramsar site	In feature area
<a href="#">The coorong, and lakes alexandrina and albert wetland</a>	600 - 700km upstream from Ramsar site	In feature area

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## Listed Threatened Ecological Communities [ Resource Information ]

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

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions</a>	Endangered	Community may occur within area	In feature area
<a href="#">Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia</a>	Endangered	Community likely to occur within area	In feature area
<a href="#">Natural Grasslands of the Murray Valley Plains</a>	Critically Endangered	Community may occur within area	In feature area

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Community Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Weeping Myall Woodlands</a>	Endangered	Community may occur within area	In buffer area only
<a href="#">White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland</a>	Critically Endangered	Community likely to occur within area	In feature area

## Listed Threatened Species [ [Resource Information](#) ]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.  
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
-----------------	---------------------	---------------	---------------

### BIRD

<a href="#">Anthochaera phrygia</a> Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Falco hypoleucos</a> Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Grantiella picta</a> Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Pedionomus torquatus</a> Plains-wanderer [906]	Critically Endangered	Species or species habitat likely to occur within area	In feature area

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Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Polytelis swainsonii</a> Superb Parrot [738]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
<b>FISH</b>			
<a href="#">Galaxias rostratus</a> Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Maccullochella macquariensis</a> Trout Cod [26171]	Endangered	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Maccullochella peelii</a> Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
<a href="#">Macquaria australasica</a> Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In feature area
<b>FROG</b>			
<a href="#">Crinia sloanei</a> Sloane's Froglet [59151]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Litoria raniformis</a> Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<b>INSECT</b>			
<a href="#">Synemon plana</a> Golden Sun Moth [25234]	Critically Endangered	Species or species habitat may occur within area	In feature area
<b>MAMMAL</b>			
<a href="#">Dasyurus maculatus maculatus (SE mainland population)</a> Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area	In feature area

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Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Nyctophilus corbeni</a> Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)</a> Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only

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<a href="#">Pteropus poliocephalus</a> Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
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PLANT			
<a href="#">Amphibromus fluitans</a> River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat likely to occur within area	In feature area

<a href="#">Lepidium monoplocoides</a> Winged Pepper-cress [9190]	Endangered	Species or species habitat may occur within area	In feature area
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<a href="#">Prasophyllum validum</a> Sturdy Leek-orchid, Mount Remarkable Leek-orchid [10268]	Vulnerable	Species or species habitat may occur within area	In feature area
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<a href="#">Senecio macrocarpus</a> Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat may occur within area	In feature area
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<a href="#">Swainsona recta</a> Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat may occur within area	In feature area
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## REPTILE

<a href="#">Aprasia parapulchella</a> Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area	In feature area
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<a href="#">Delma impar</a> Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat may occur within area	In feature area
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## Listed Migratory Species

[\[ Resource Information \]](#)

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
<b>Migratory Terrestrial Species</b>			
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat may occur within area	In buffer area only
<b>Migratory Wetlands Species</b>			
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area	In feature area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area

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## Other Matters Protected by the EPBC Act

Listed Marine Species			[ Resource Information ]	
Scientific Name	Threatened Category	Presence Text	Buffer Status	
<b>Bird</b>				
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area	
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area	
<a href="#">Bubulcus ibis as Ardea ibis</a> Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area	
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area	
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area	
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area	
<a href="#">Chalcites osculans as Chrysococcyx osculans</a> Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area	
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area	In feature area	
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area	

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Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In buffer area only
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Neophema chrysostoma</a> Blue-winged Parrot [726]		Species or species habitat likely to occur within area overfly marine area	In feature area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat may occur within area overfly marine area	In buffer area only
<a href="#">Rostratula australis as Rostratula benghalensis (sensu lato)</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area

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## Extra Information

### State and Territory Reserves [ [Resource Information](#) ]

Protected Area Name	Reserve Type	State	Buffer Status
River Murray Reserve	Natural Features Reserve	VIC	In buffer area only

### Regional Forest Agreements [ [Resource Information](#) ]

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
<a href="#">North East Victoria RFA</a>	Victoria	In feature area

### EPBC Act Referrals [ [Resource Information](#) ]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
<b>Controlled action</b>				
<a href="#">The Modified Operation of the Goulburn Murray Irrigation District</a>	2009/5123	Controlled Action	Post-Approval	In feature area
<b>Not controlled action</b>				
<a href="#">Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia</a>	2015/7522	Not Controlled Action	Completed	In feature area
<a href="#">INDIGO Central Submarine Telecommunications Cable</a>	2017/8127	Not Controlled Action	Completed	In feature area
<b>Not controlled action (particular manner)</b>				
<a href="#">INDIGO Marine Cable Route Survey (INDIGO)</a>	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

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# Caveat

## 1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

## 2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

## 3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

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

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions

## 4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

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- [-Office of Environment and Heritage, New South Wales](#)
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- [-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](#)
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- Other groups and individuals

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

Please feel free to provide feedback via the [Contact Us](#) page.

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