

# Consulting Design and Inspection Engineers

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## FLOOD AND DRAINAGE ANALYSIS REPORT

FOR 4 MW SOLAR FARM  
AT  
LOT 8 FIVE MILE CREEK ROAD,  
GUNDAGAI NSW 2722

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## INTRODUCTION

A Development Application proposing a 4 MW Solar Farm development for the subject site at Five Mile Creek Road, Gundagai NSW is to be lodged with Cootamundra-Gundagai Regional Council. The site is off Hume Highway at Dog on the Tucker Box near Gundagai in the Cootamundra state electorate in NSW.

A Planning Application is being prepared for the construction of a ground-mounted solar array on land at this site. Since the proposed area is within or close to natural creek and the development is greater than one hectare in area, a Flood Risk Assessment (FRA) is required in accordance with the National Planning Policy Framework (NPPF).

The proposed solar farm comprises approximately 8.0 hectares of land that currently supports dry land cropping.

Several photographic and geospatial sources were used to assess the surrounding catchment and flow regimes. An accurate survey of the lot was provided to further assess the stormwater runoff and this report has been revised accordingly to correspond with that.

- Farm layout prepared by HQEC, reference No: 20018\_E001.1, issue A and dated on 18.04.20

As per Six Maps in Figure 1, this site is close to Five Mile Creek and may be considered as flood affected by the existing creek system and flow path. The task involves analysing the flood planning level required to establish a development.

## SITE LOCATION



Figure 1: The proposed development site location

## Hydrology

Quantitative hydraulic analysis has not been carried out for this catchment. The characteristics of the hydrology of the site and its environs are derived from Survey data and the Google Earth.

### Watercourses

The site lies within the catchment of the Five Mile Creek. This creek water rises during heavy storms. The watercourse then spreads and flows around this site and the vicinity.

### **Drainage system**

The application area tends to be dry and free-draining. Ground levels at the site and across the surrounding land decline to the downstream, hence any run-off will occur in that direction.

### **Flood risk classification**

The Application Area is located entirely within Five Mile Creek zone. Since catchment flood analysis has not been carried out for this catchment, only localised flooding is considered.

### **Finishing levels**

Since no exact freeboard values are available, NSW Councils in general recommend freeboard is adopted above natural ground level. The required freeboard values are shown below.

For habitable areas:

500mm freeboard over 1 in 100 flood level (but here above natural ground)

For non-habitable areas:

100mm freeboard over 1 in 100 flood level (but here above natural ground)

Ground conditions

The soil type of the area is characterised by the gravel soils. These soils typically absorb water and drain to groundwater.

## **FLOOD RISK TO THE SURROUNDING AREA**

The proposed development will cause only minor changes to the run-off characteristics of the site. The solar panels will intercept rainfall and shed it along their lower edges onto the ground. Gaps between panels will prevent run-off from flowing from the upper to lower panels. Based on our interpretation of the existing survey information of the area, the catchment area flowing to the existing gully is approximately 15 ha.

The slope of the land surface is gentle and will therefore disperse drainage of run-off down slope as at present.

A drainage strategy, which is intended to ensure increased run-off from the site does not occur, is provided. Therefore, the development will not increase the downstream risk of flooding.

On the base of general requirements for flood controlling measures for a low flood risk precinct, Section 10.7(2) of Environmental Planning and Assessment Act (1979), the schedule 4 of this Act and Council DCP requirements are applicable for future development on flood controlling zone.

## **DRAINAGE STRATEGY**

### **Introduction**

The drainage strategy is based on previous experience of similar sites and developments. The key principles of the drainage strategy are:

- To ensure no increase in off-site flood risk
- To mitigate against potential impacts of predicted climate change
- To prevent contamination of the water environment

### **During construction**

All access tracks and the compound area will be constructed using permeable granular materials. Vehicular movements will be restricted to the access tracks and designated areas where possible to avoid or limit soil compaction, which could have a detrimental impact on infiltration rates.

The ground conditions are gravelly hence the use of vehicles onsite is unlikely to create muddy conditions, which may in turn increase suspended solid levels in surface water runoff. All runoff is likely to dissipate naturally into the ground, hence further mitigation is not considered necessary.

### **Post-construction**

The following design features will reduce the risks from surface water run-off from solar panels by promoting dispersion and infiltration:

- The gap between panels will be sufficient (typically 40 mm) to allow drainage to the ground rather than onto adjacent panels.
- The ground surface around and between the frames will be maintained as grass to ensure that bare soil areas are minimised.
- Groundcover vegetation will be maintained in good condition in those areas receiving runoff from solar panels.
- The surface gradient is generally less than 10% across the site and therefore run-off is expected to remain dispersed and unlikely to form channels. Broad grass strips around the edge of the array will also act to impede drainage of surface water to field margins.

The proposed transformers will be sufficiently small so that measures to attenuate surface water will not be required. The roof runoff will shed onto the surrounding ground where it will naturally disperse.

Post-development, the land will become managed pasture without seasonal ploughing. Runoff will therefore contain lower silt loads compared to present conditions and perimeter grass strips around fields will reduce runoff to adjacent lots. Managed grassland will offer equivalent or better run-off management than the current seasonal arable crop cover. The access track and temporary compound area will be constructed with permeable granular material. Over the long term, runoff from the area occupied by the solar array is likely to be an improvement on present conditions.

### **Proposed Construction of Dam**

A 0.55ML dam is proposed at the existing gully to minimise the overflow to low level properties as instructed by the Water Regulation Advisory Services, Water NSW. The dam spillway is widened and the spillway path at downstream is filled with rock which will prevent erosion at downstream. The overflow spreads over the rock embankment and forms a sheet flow downstream and under the elevated solar panels. The upstream catchment area is grassland and has been undisturbed.

### **CONCLUSIONS**

An assessment has been undertaken of flood risk in and around the proposed solar farm at Five Mile Creek Road, Gundagai in the Cootamundra-Gundagai Regional Council.

The proposed development covers an area of approximately 8 ha, with all development located in close proximity to Five Mile Creek.

The risk of flooding to and from the site for all flood mechanisms is 'very low'. The area of the solar array, the site topography and underlying geology is such that it is unlikely to be affected by surface water flooding. The construction of a dam will further reduce the overland flow.

All electrical equipment, excluding buried cables, essential equipments and emergency requirements will be located above ground and the whole site is classified to be at 'very low' risk from river or surface water flooding.

Runoff rates for surface water are unlikely to increase after development. Hence, any impact on the surrounding area is not expected. During installation of the solar array, there

may be potential for the soil to become compacted by machinery which could reduce infiltration and increase run-off. However, the gravelly nature of the soil renders this possibility unlikely. If necessary, vehicle movement areas will be covered with blue metal prior to construction.

Post-installation, the development will comprise managed grassland, which will mitigate the potential for increased runoff caused by potential compaction. After installation, the site will be managed grassland without seasonal ploughing. In the future, runoff will contain lower silt loads than from the current arable crops. The perimeter grass strips around fields will reduce runoff to surrounding land.

Over the long term, runoff from the fields occupied by the solar array is likely to provide improvement on present conditions. Therefore, the proposed development will not increase flood risk either to the site itself or the surrounding area.

A handwritten signature in black ink, appearing to read 'Prabu Yoganathan', with a stylized flourish at the end.

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