Premise

ENERPARC AUSTRALIA

DUNEDOO SOLAR FARM

HYDROLOGIC AND HYDRAULIC ASSESSMENT

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Prepared By		**Reviewed By**		**Authorised By**	
H. Samadib.	Samadi	J. Cox	[signature]	Mark Raikhman	[signature]

CONTENTS

FIGURES

TABLES

APPENDICES

ABBREVIATIONS

Abbreviation	Definition
Annual Exceedance Probability (AEP)	The probability of a flood event occurring in any year expressed as a percentage
Australian Rainfall and Runoff (ARR)	National guideline document, data and software suite for the estimation of design flood characteristics in Australia
Digital Terrain Model (DTM)	Digital Terrain or Elevation Model
Light Detection and Ranging (LiDAR)	Remote light sensing to measure ranges
Metres, Australian Height Datum (m AHD)	Elevation from the Australian Height Datum reference
Regional Flood Frequency Estimation (RFFE)	Model for transferring flood characteristics information from a group of gauged catchments to a particular location of interest
Two-Dimensional Unsteady Flow Model (TUFLOW)	A suite of advanced 1D/2D/3D computer simulation software for flooding, urban drainage, coastal hydraulics, sediment transport, and water quality
Hydrologic Engineering Center's Hydraulic Modeling System (HEC-HMS)	A numerical model to simulate the precipitation-runoff processes of dendritic watershed systems.
The QLD Department of Environment and Resource Management (DERM)	A public department who conserves, protects, and manages the state's environment and natural resources for today and for future generations.

Abbreviation	Definition
the Adopted Mean Thread Distance (AMTD)	AMTD reflects the distance from the river mouth as measured along the course of the river.
Queensland Department of Environment and Science (DES)	A department of the Queensland Government, which is responsible for protecting the state's natural environment, developing the government's science strategy, and driving the government's policy and program direction for young people in Queensland.
SILO Rainfall Data	SILO is a database of Australian climate data hosted by DES.
Australian Emergency Management Institute (AEMI)	A Centre of Excellence for education research and training in the emergency management sector.

Executive Summary

Premise Australia Pty Ltd (hereafter referred to as "Premise") has been engaged by Enerparc Australia to undertake a Hydraulic and Hydrologic Assessment for a proposed 5 Megawatt (MW) solar farm at 126 Lawson Park Road, Dunedoo (Lot 78 DP754309). The hydrologic modelling was conducted using the RORB model and the hydraulic modelling was conducted using TUFLOW software package applying rainfall on grid hydrology. The modelling was undertaken in accordance with ARR2019.

This hydrologic and hydraulic report summarises the processes and procedures followed, and assumptions taken while conducting the hydrological and hydraulic assessment during the following scenarios:

- Existing catchments in a pre-development condition; and
- Post the construction of the access road connecting the project site with internal roads and panel block layout provided during the preliminary design development stage.

A catchment area of approximately 345.6 hectares drains through the proposed solar farm site area, which will cover an area of approximately 35 hectares.

The hydrologic model showed that the critical duration storm and median temporal pattern number for an AEP of 1% are obtained at 4.5 hr and TP25, respectively. The hydraulic model results showed that the flood hazard category for post development scenario will be at H1 class (i.e.no restrictions). The hydraulic model results also showed that the outflow peak discharge from downstream boundary of the domain will decrease by 2.2% after conducting the proposed development which has no significant difference. Therefore, there are no flood impacts external to the site and no mitigation measures (such as a detention basin) are required.

1. INTRODUCTION

Premise Australia Pty Ltd (hereafter referred to as "Premise") has been commissioned by Enerparc Australia to undertake a Hydraulic Assessment for the proposed 5 Megawatt (MW) solar farm at 126 Lawson Park Road, Dunedoo (Lot 78 DP754309).

This hydraulic assessment includes an analysis of pre-development site conditions to establish the base runoff characteristics and quantify the potential impacts of the proposed development. The development site is on a small ridge region with an upstream catchment area of 345.6 hectares. All surface rainstorm water is drained downstream river to the Talbragar River via first, second, and third-order streams.

2. SITE CHARACTERISTICS

2.1 Site Location

The subject site is located on Lot 78 in DP754309 at 126 Lawson Park Road, Dunedoo, in the Warrumbungle Shire Council local government area. The subject site has Lawson Park Road to the south. The total area of the site is approximately 183 hectares, of which the proposed solar farm occupies approximately 35 hectares as shown in **Figure 1**.

3. PROPOSED DEVELOPMENT

The Proposal involves the installation of a solar energy facility with a capacity of 5 MW. The concept layout of the proposed solar farm is provided at **Appendix A**. Details of the Proposal that are of particular relevance to the flood risk assessment are the following components:

- Photovoltaic panels and supporting infrastructure (Array Areas);
- Inverter stations;
- Substation and Battery storage facility;
- Operation Buildings Area - site office, maintenance buildings, storage buildings, and workshop;
- Access roads, internal access tracks and firebreaks; and
- Security fencing and vegetation screening.

4. DATA COLLECTION

Data in the preparation of this report, information about the site was gathered from the following sources:

- Detailed Survey prepared by Premise dated 11/01/2021.
- 1m and 5m Aerial LiDAR sourced from Geosciences Australia (Elvis Elevation and Depth Data);
- Aerial Imagery by NSW Spatial Services' Six Maps.
- 2016 IFD data from the Bureau of Meteorology website
- 2016 Ensemble temporal pattern data for the Bureau of Meteorology website
- Rainfall and Catchment loss parameters obtained from ARR Datahub website

Figure 1 - Aerial Image of Site Location (Source: NSW Six Maps)

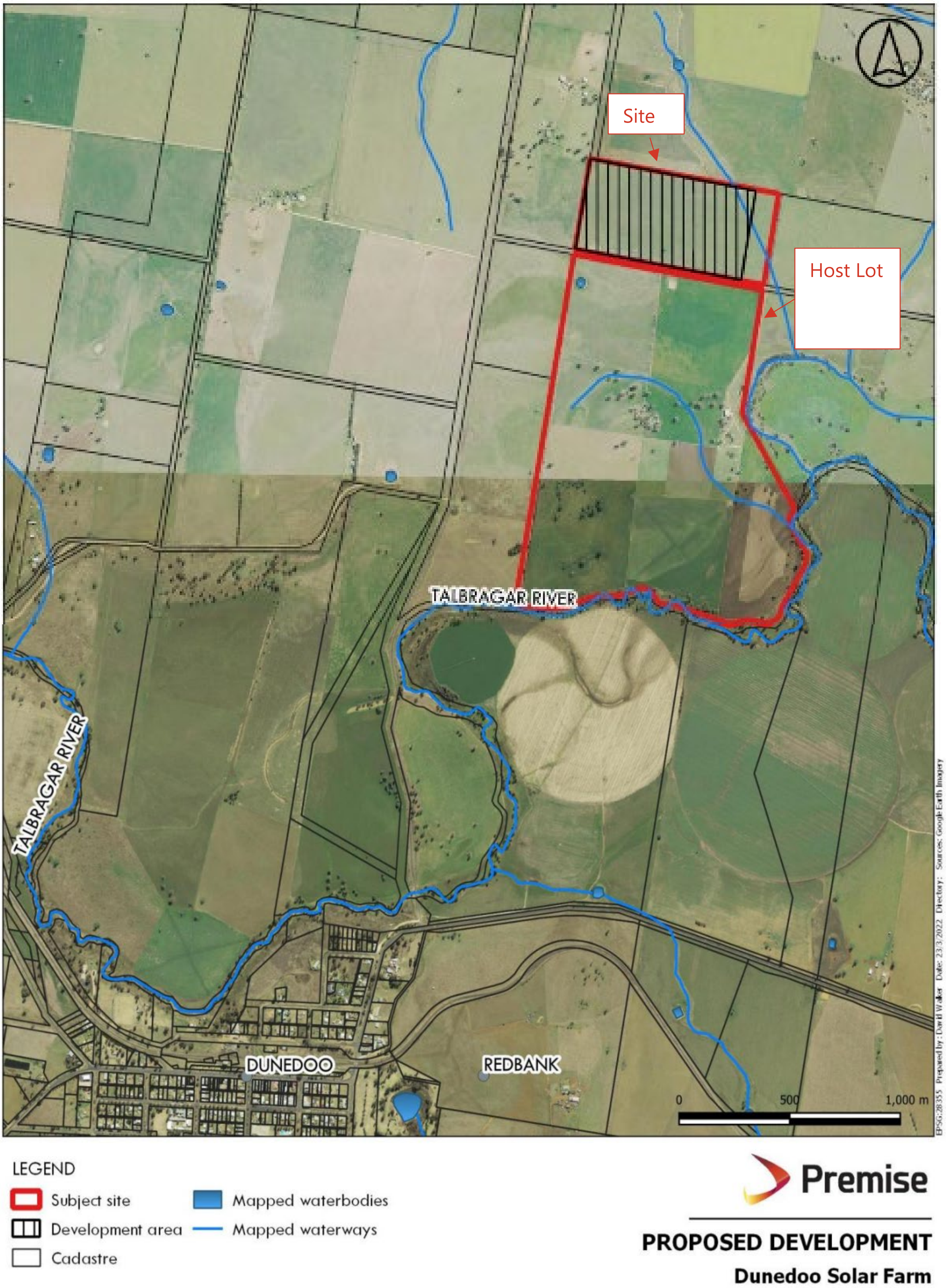
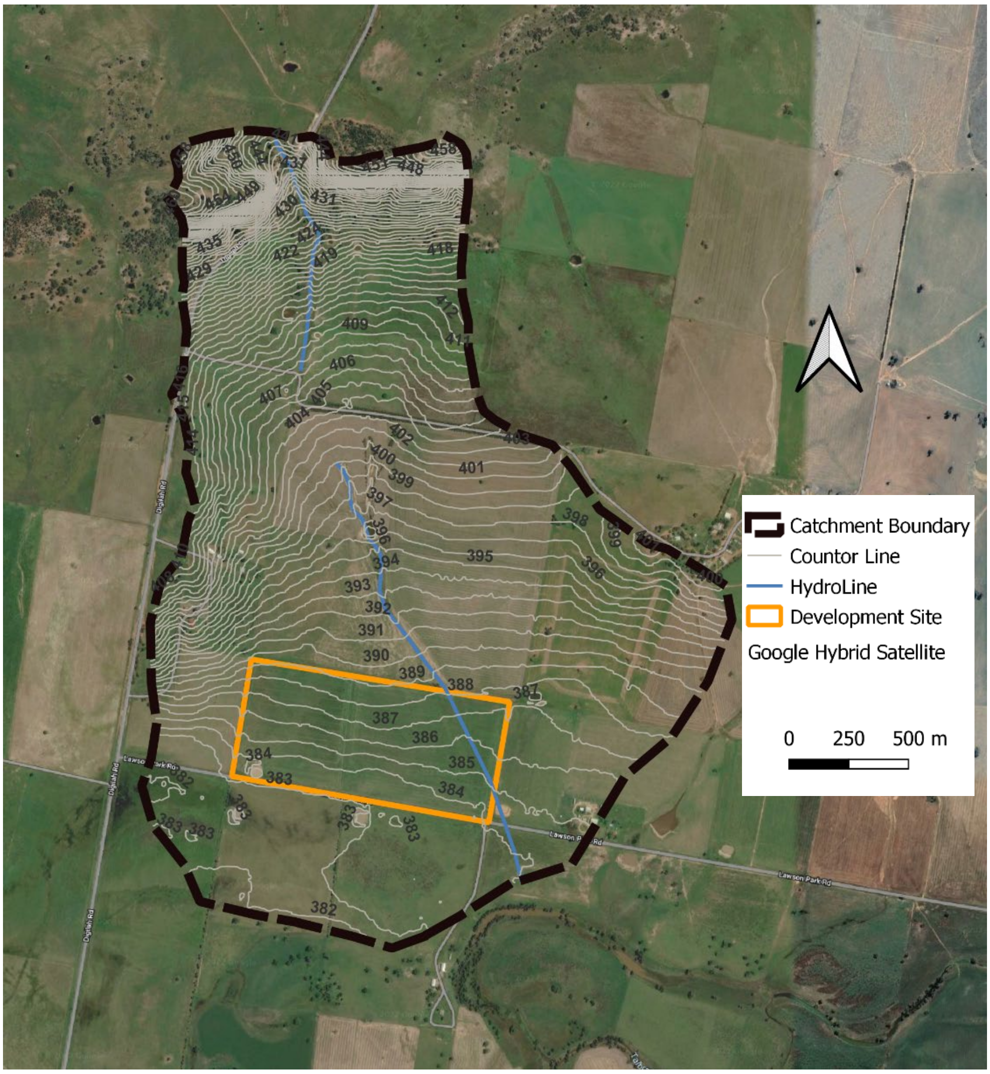


Figure 2 – Studied catchment boundary and drainage paths



4.1 Topography

Based on the topography, drainage of the subject site is generally as follows:

- Topography ranges from 465.15m AHD to 383.12m AHD;
- The site has an average slope of 1.6% and maximum value of 16.9% with a southerly aspect.
- The proposed solar farm location is on a small ridge.
- The site generally drains in a south direction to Talbragar River.

4.2 Catchments and drainage

The project site is intersected by local watercourses and overland flow paths that drain approximately 3.456 km^2 of contributing catchment area, including the upstream catchment and the development site, as shown in Figure 2. This figure shows the contributing catchment area draining toward and through the Site. Physical properties of the catchment are illustrated **Table 1**. The catchment comprises different land use areas including 89% by farms, 5.1% by forest land, 5% by pasture, 0.4% by roads and buildings, and 0.6% by water features (ponds and waterways).

Table 1 – Physical properties of the studied catchment

Parameter	Value
Area (km^2)	3.456
Perimeter (km)	8.032
Shape Factor (L^2/A)	2.11
Watershed Length, L (m)	2700
Length of Main Stream (m)	3228
Height _max (m AHD)	465.1
Height _min (m AHD)	381.3
Average Catchment Slope	3.33 %
Average Main Stream Slope	2.60 %
Time of Concentration (min)	40

4.3 Rainfall Data

The ARR approach has been applied for hydrological and hydraulic assessment. All required rainfall data has been downloaded or sourced from the ARR Data Hub and 2016 IFD data was obtained from the Bureau of Meteorology website. The IFD curves are shown in Figure 3 and the IFD tabular data is provided in **Appendix B**.

For long term projects, the effect of climate change on the prevalence and severity of rainfall extremes must be considered in flood planning. The CSIRO and Bureau of Meteorology (2015) have developed a Climate Futures web tool that facilitates informed selection of a sub-set of climate model results for use in impact assessments. Projected changes from the latest global climate models (GCMs) can be explored for future years (e.g., 2030, 2040, …, 2090); and the four representative concentration pathways (RCPs) for greenhouse gas and aerosol concentrations that were used to drive the GCMs, including RCP 2.6, RCP 4.5, RCP 6, and RCP 8.5.

In this report the RCP 4.5 is considered for the project flood study which translates an increase in rainfall of 9.3% obtained from the ARR data hub, which will cover the climate change effect on rainfall for year 2070.

4.4 Loss Parameters

Initial and continuing loss parameters were selected in accordance with the approaches prescribed in ARR 2019. Literature review has not identified a study conducted in the catchment that determined calibrated initial loss in the locality of the catchment. Therefore, a hierarchical approach is used to determine preferred loss parameter. The catchment fits in hierarchy number five where it is preferred to utilise probability neutral initial loss figures provided in ARR Datahub (**Table 2** and **Table 3**), and continuous loss is multiplied by the factor of 0.4.

Figure 3 – IFD Depth and Intensity data (BOM website)

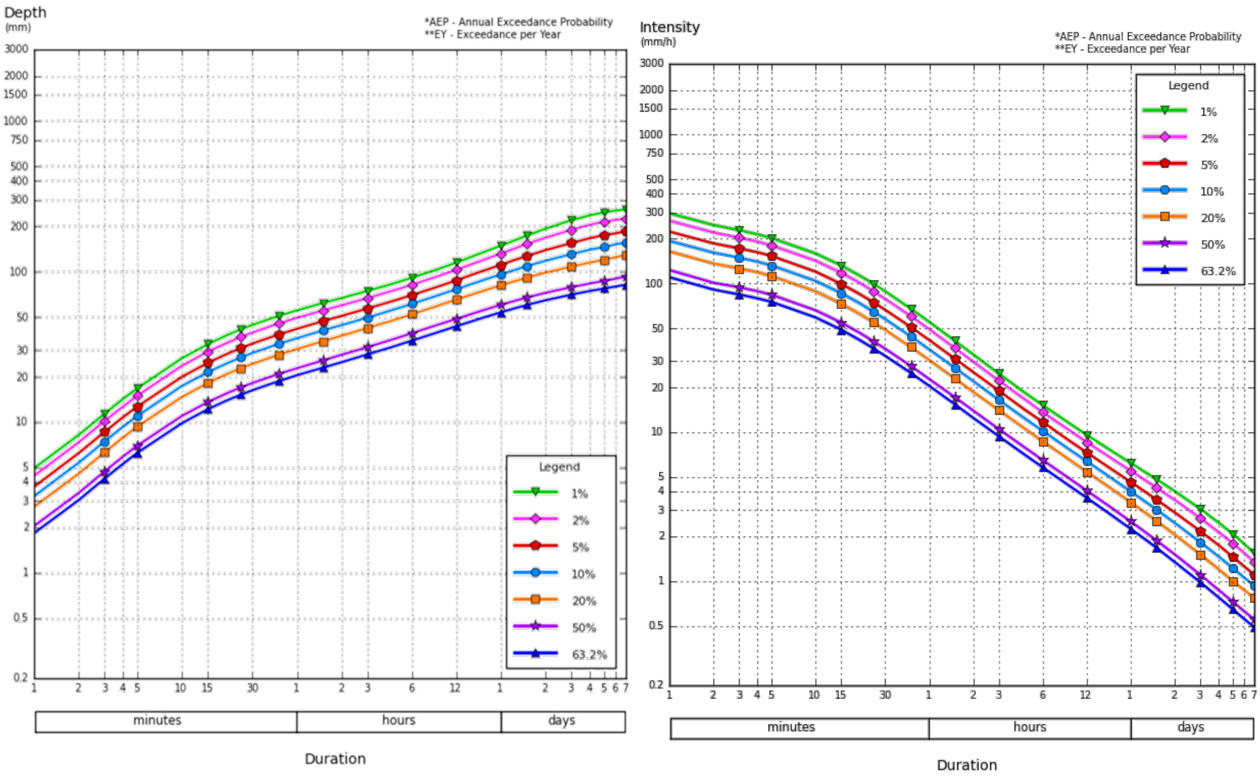


Table 2 – Site initial and continuing loss figures (Obtained from ARR Data hub)

Parameter	ARR HUB (ID 21983)
Storm Initial Losses (mm)	34.0
Storm Continuing Losses (mm/h)	1.6

Table 3 – Median Pre-burst Depths (Obtained from ARR Data Hub)

Duration (min)	60	90	120	180	360	720
Median Pre-burst Depths for AEP of 1% (mm)	0.6	0.2	0.6	2.4	4.6	9.2

5. HYDROLOGICAL AND HYDRAULIC MODELLING

5.1 Hydrological modelling

The development site is located on a small ridge region whose upstream catchment area is 3.456 km^2 and all surface rainstorm water is drained to the Talbragar river via first, second, and third-order streams. Talbragar River is a part of the Macquarie catchment within the Murray–Darling Basin which reaches its confluence with the Macquarie River near Dubbo. Based on a flood study for the Talbragar River completed in 1997 by PPK for Dubbo City Council, the largest floods of 1870, 1920,1926 and 1950 only backed up into the low spots along the river, filling old meander arms and covering the floodplain adjacent to the river, causing little damage. Based on this study, the current hydrologic study has been expanded to 460 m downstream from the project site.

A Direct Rainfall on grid hydrology approach was utilised for this project to determine flow behaviour across the project site. For this purpose, RORB and TUFLOW models were applied. The hydrological model development process involved collecting rainfall depth and temporal pattern data from the Bureau of Meteorology website and collecting loss parameters from ARR Datahub. The temporal patterns that resulted in maximum intensity following initial losses were selected to be routed through the hydrological model.

5.1.1 CRITICAL STORM DURATION AND TEMPORAL PATTEREN SELECTION

The design rainfall data provided in the ARR covers the range of rainfall burst durations from 1 minute to 7 days. The 'critical rainfall duration', which produces the highest flood discharge, must be determined for the studied area. Referring to the ARR procedure, 10 different temporal patterns were tested for each duration and each magnitude storm. The maximum of the means of each of the 10 temporal patterns (referred to as an ensemble) was considered the critical duration storm for the studied catchment. In this regard, the RORB model was used for different storm events with rainfall durations between 30 min and 12 hr and 10 rare temporal patterns (TP21 to TP30). In this model, the Parameters kc and m were considered 2.09 and 0.8, respectively, obtained from Eastern NSW (Kleemola) equation. Ks was checked with the hydraulic catchment routing results using the TUFLOW 2D-Rain Grid model.

Figure 4 shows the RORB model results for 1% AEP storm event peak flow and each ensemble of temporal patterns. From this figure, the critical duration storm and median temporal pattern number, as directed by ARR, are obtained at 4.5 hr and TP25, respectively. The median Temporal Patterns and initial loss for different storm durations and 1% of AEP are illustrated in **Table 4**.

Figure 4 – 1% AEP storm event peak discharge ranges for each ensemble of temporal patterns

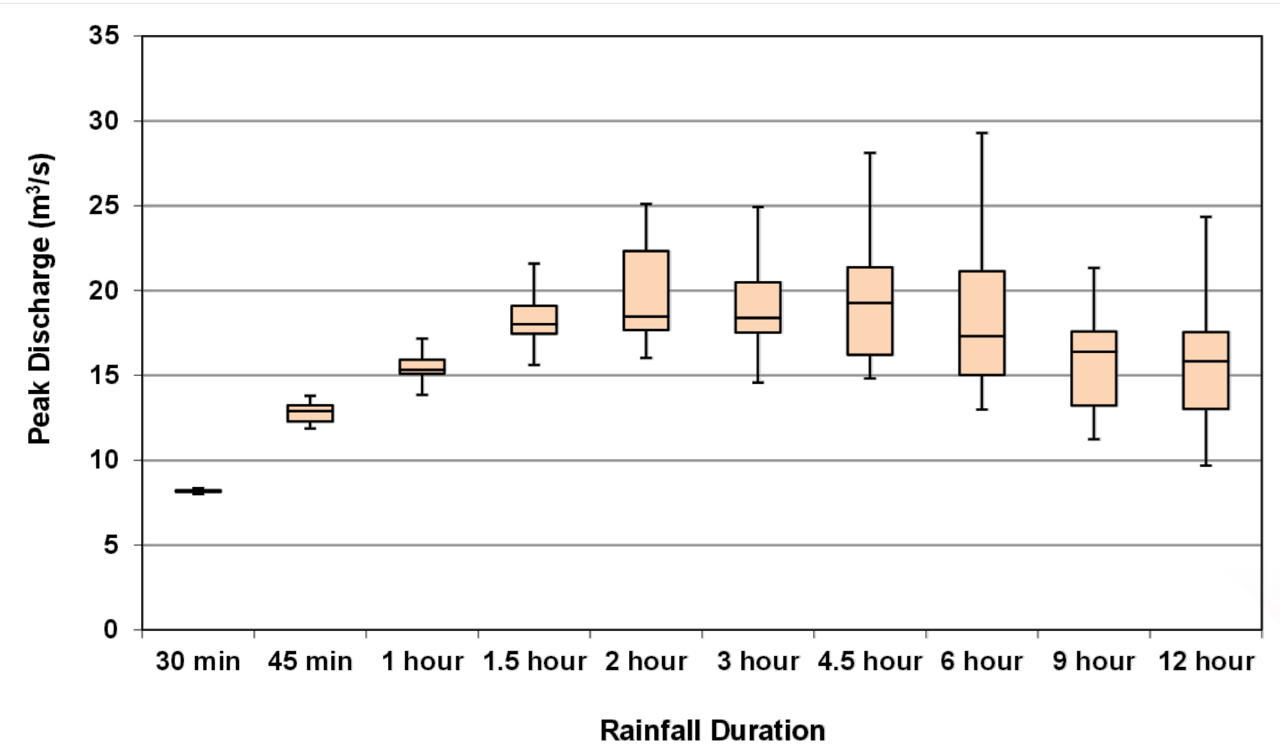


Table 4 –Median Temporal Patterns and initial loss for different storm durations and 1% of AEP

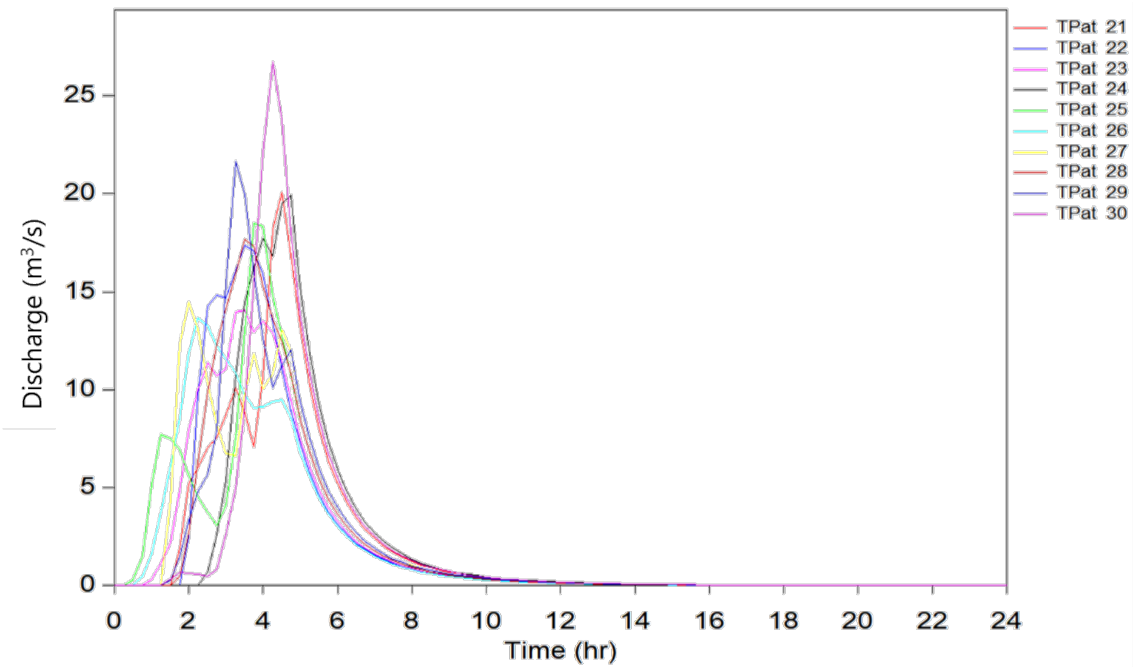
Storm Duration	Median Temporal Pattern	Initial Loss (mm)
1 hour	TP29	33.4
1.5 hour	TP28	33.8
2 hour	TP28	33.4
3 hour	TP26	31.6
4.5 hour*	TP25	30.5
6 hour	TP23	29.4
9 hour	TP26	24.8

* Obtained from interpolation method.

5.1.2 DESIGN FLOOD HYDROGRAPH

The design flood hydrograph was obtained using RORB model for different rainfall durations and temporal pattens. For a 1% AEP storm event and storm duration of 4.5 hr the flood hydrographs are shown in Figure 5. Direct inflow hydrographs were not used directly in the hydraulic model. Instead, the hydrologic model has been used only to determine the critical storm event.

Figure 5 – Calculated hydrograph for 1% AEP storm event and storm duration of 4.5 hr



5.2 Hydraulic modelling

In response to the scope of work, a two-dimensional (2D) hydraulic model was applied to determine the flood characteristics of the Site and surrounds under existing and developed case conditions. This model was developed based on industry best practice and guidance such as the principals outlined in the ARR (2019). The methodology, assumptions, and findings of this assessment are outlined below.

5.2.1 MODEL SETUP

As no existing flood model covers the project site, a new hydraulic 2D model was developed for the purposes of this assessment. The flood model covers the full upstream catchment and extends beyond the Site to approximately 460 m downstream of the south boundary of the site, which is a part of Lawson Park Road. The 2D hydraulic model was developed using the TUFLOW flood modelling software package. The rain-on-grid feature was used to explicitly replicate the rainfall-runoff process within the model. A summary of the key model inputs and parameters are outlined as follows:

- Modelling undertaken on the double precision version of TUFLOW (2020-10-AD)
- The model extent covered the full catchment upstream and extended to 460 m downstream of the project site with a total area of 3.46 km2.
- The model was built on a 5-metre regular grid and the ground topography was based on available digital elevation data included 5 metre Digital Elevation Model (DEM) produced using TIN (Triangular Irregular Network) method of averaging ground heights to formulate a regular grid. This data set contains ground surface model in ascii grid format derived from Leica-Geosystems Airborne Digital Sensor.
- No culverts or other drainage structures are present on the solution domain.
- Manning's 'n' roughness layers were determined based on aerial photography of the catchment. These were applied as follows:
  - Roads = 0.022,
  - Farms = 0.045,
  - Forest area = 0.07,
  - Pasture = 0.06,
  - Maintained open drains = 0.040;
- Rainfall was applied directly to every grid cell within the model with the initial and continuous losses obtained from ARR Hub with AEP of 1%, the critical duration storm of 4.5 hr, and temporal pattern number of TP25.
- Downstream boundary condition was set at the solution boundary located downstream of Lawson Park Road with an average water surface slope of 0.003 m/m at the catchment downstream boundary.
- A solution time step of 1 second was applied.
- Initial water level in dams assumes they are full at the start of the 1% AEP event.

To check the model sensitivity on the downstream boundary condition, for the base case (pre-development situation) three energy slope of 3%, 1% and 0.3% at downstream boundary were applied. The results showed that changing the energy slope affects only 33 m upstream from the boundary. This result shows a low sensitivity of the model to energy slope at downstream boundary. Therefore, the selected distance between the project site and the model downstream boundary (i.e. 460 m) is sufficient.

5.2.2 MODEL VALIDATION

To validate a hydraulic model, stream gauge or historic information is required. Due to this type of data being unavailable, Regional Flood Frequency Estimation (RFFE) can be utilised in accordance with the ARR2019 recommendations. The results obtained from the RFFE calculation are provided in **Table 5**. This result has been obtained based on 15 proximal gauging station data with a catchment area between 13 and 1036 km^2. The unit peak discharge of these gauging stations for the flood with 1% AEP is between 0.5 and 5.1 m^3/s/km^2. By applying these unit rates, the peak discharge for the studied catchment is calculated between 1.73 and 17.65 m^3/s. The peak discharge obtained from the hydraulic model is 17.8 m^3/s which is higher than the maximum value obtained from the unit peak discharge. This result indicates that the result obtained from TUFLOW model is on the conservative side compared with the proximity gauging stations data. Therefore, no more adjustment will be required on the hydraulic model assumption. It should be noted the model setup has been done by reducing continuous loss by the reduction factor of 0.4, pre-burst reduction on initial loss, and considering climate change effects (an increase of 9.3% in rainfall).

After validating the model setup, the hydraulic model was used for the following scenarios:

- **Pre-development scenario** – assumes the catchment and site are in an existing condition.
- **Post-development scenario** – includes the proposed solar arrays and related facilities.

Table 5 – Comparing RFFE results for the studied catchment with the TUFLOW model

AEP (%)	Discharge (m3/s)	Lower Confidence Limit (5%) (m3/s)	Upper Confidence Limit (95%) (m3/s)
50	4.30	1.77	10.3
20	10.1	4.36	23.2
10	15.9	6.92	36.4
5	23.2	10.1	53.2
2	35.6	15.3	83.1
1	47.6	20.3	112

5.2.3 PRE-DEVELOPMENT SCENARIO TUFLOW MODEL RESULTS

A pre-development or existing scenario TUFLOW model run was conducted to determine extent of flooding, depth of flow, flow velocity and flooding hazard across the project site for a 1% AEP storm event. Flood peak discharge was also extracted at the downstream boundary of the project site to assess the development impact on flooding. The depth, velocity, and hazard maps obtained from the hydraulic model are illustrated in **Appendix C**.

5.2.3.1 Flood Depth

The topography is such that flow discharge from the site occurs at the southern boundary with flow to the downstream Talbragar River. The TUFLOW model results, as shown in **Figure 10**, indicate that shallow sheet flow occurs across 39.2% of the Project site area with depth of less than 0.015 m. Across the eastern side of the project site, much deeper flow occurs with a maximum flow depth of 0.26 m. The average flood depth was obtained at 0.061 m. It is also significantly lower than the indicative allowable flooding depth threshold that the supplier uses for ATI tracking structures which is 0.5 m.

5.2.3.2 Velocity

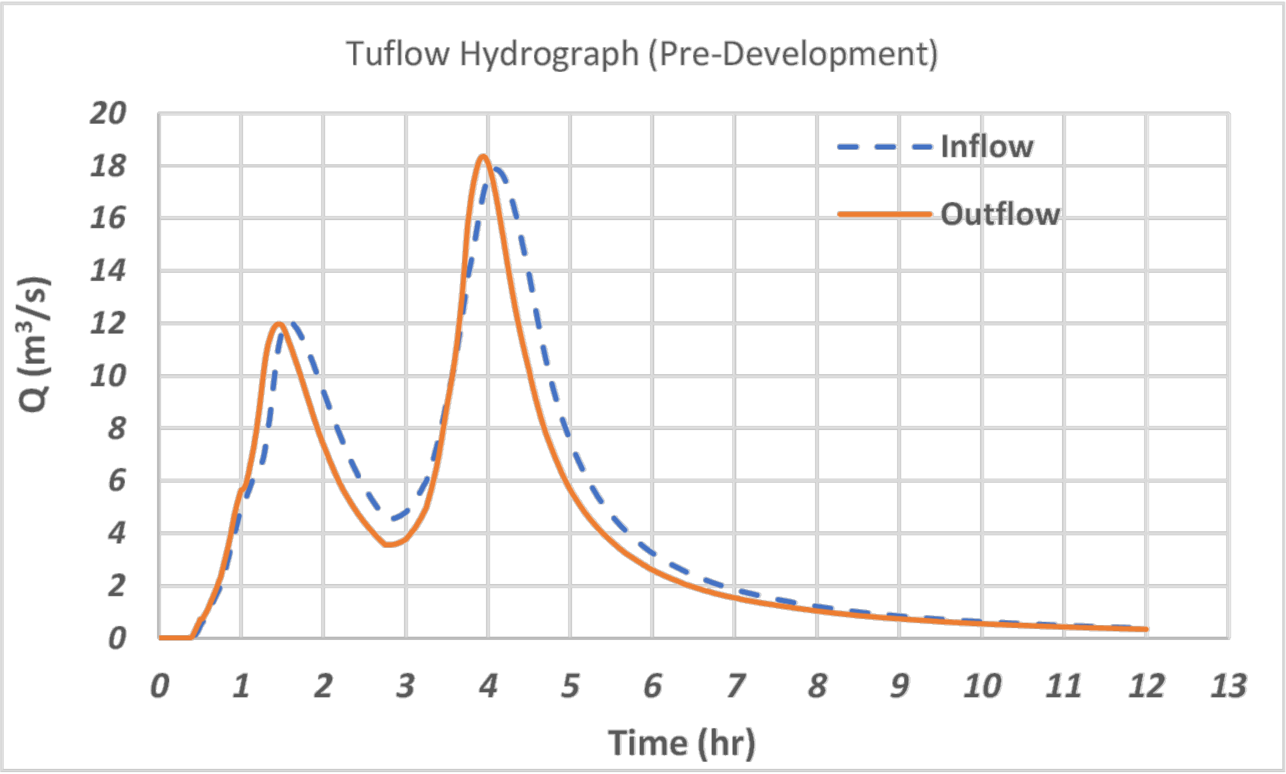
Figure 11 shows maximum flow velocity across the project site based on the TUFLOW model results. The velocity mapping shows that maximum velocity across the site is 0.77 m/s and average velocity within the project site area is obtained at 0.37 m/s. It is also significantly lower than the indicative allowable flood velocity threshold that the supplier uses for ATI tracking structures which is 1.5 m/s.

5.2.3.3 Flood Hydrograph

Figure 6 shows the flood hydrographs at inflow and outflow boundaries of the project site. The results show that the flood peak discharge at inflow and outflow sections is obtained at 18.35 and 17.87 m3/s, respectively.

This slight increase in peak discharge (i.e. 2.6%) may occur because of surface routing effect and runoff production within the project site due to applying the Direct Rainfall Grid approach.

Figure 6 – The Pre-Development flood hydrographs at inflow and outflow boundaries of the project site



5.2.3.4 Hazard

Depth of flow, velocity of flow or product of velocity and depth of flow could provide flooding hazard across a floodplain. Flood hazard category as outlined by Australian Emergency Management Institute (2014) are utilised to generate hazard category at the project site. The combined flood hazard curves and thresholds are presented in **Table 6** and **Figure 9** (AIDR, 2017). The combined curves are divided into six hazard classifications that shows how vulnerable is the project site. Based on the TUFLOW model results, as shown in **Figure 12**, one can see that almost entire area of the project site is covered under category H1. Based on the model results, the maximum and average hazard values (depth×Velocity) across the project site area is obtained 0.14 and 0.02 m^2/s, respectively. It is significantly less than the threshold value for the category H1.

Table 6 – Combined hazard curves – vulnerability thresholds

Hazard Vulnerability Classification	Classification limit (z) m2/s	Limiting still water depth (d) m	Limiting velocity (V) m/s
H1	d×V ≤ 0.3	0.3	2
H2	0.3< d×V ≤ 0.6	0.5	2
H3	d×V ≤ 0.6	1.2	2
H4	d×V ≤ 1.0	2	2
H5	d×V ≤ 4.0	4	4

Hazard Vulnerability Classification	Classification limit (z) m2/s	Limiting still water depth (d) m	Limiting velocity (V) m/s
H6	d×V > 4.0	>4	>4

5.2.4 POST-DEVELOPMENT SCENARIO TUFLOW MODEL RESULTS

- Post-development scenario TUFLOW model run was conducted to determine extent of flooding, depth of flow, flow velocity and flooding hazard across the project site for a 1% AEP storm event. For this purpose, all developed component areas including buildings, roads, impervious open space, and solar panel poles were introduced to the model with the corresponded initial loss, continuous loss and Manning's coefficient.

Flood peak discharge was also extracted at the downstream boundary of the project site to assess the development impact on flooding. The depth, velocity, and hazard maps obtained from the hydraulic model for the post-development scenario are illustrated in **Appendix D**.

5.2.4.1 Flood Depth

Figure 13 indicates maximum flood depth across the project site area based on the TUFLOW model results. This map shows that shallow sheet flow with depth of less than 0.015 m occurs across 25.5% of the Project site area which is 35% less than that of pre-development scenario's values. It means the development will increase flood inundation within the project site by 35%. The maximum and average depth of flood across the project site area is estimated to be 0.45 and 0.07 m, respectively, which are 77% and 12.3% more than that of pre-development's values.

5.2.4.2 Flood Level Change (Afflux)

Flood level impacts were provided across the project site and downstream road. The afflux mapping provided by the hydraulic model for 1% of AEP shows flood level change within the project site with an average water level change of 0.0026 m and a maximum value of 0.167 m. Across the downstream road (Lawson Park Road), the average and maximum value of flood level change were obtained 0.0006 and 0.011 m.

5.2.4.3 Velocity

Figure 14 shows maximum flow velocity across the project site area based on the TUFLOW model results. The map of flow velocity indicates that the maximum and average flow velocity across project site area will be 0.62 and 0.28m/s, respectively, which are 18.8% and 25.7% less than that of pre-development's values, respectively. This is likely because of installing more than 2,000 pole across the project site area which results in an increase in the Manning's number.

5.2.4.4 Flood Hydrograph

Figure 7 shows the flood hydrographs at inflow and outflow boundaries of the project site. The results show that the flood peak discharge at inflow and outflow sections is obtained at 17.95 and 17.31 m^3/s, respectively. This slight increase in peak discharge (i.e. 3.6%) may be as a result of the surface routing effect and runoff production within the project site area due to applying the Direct Rainfall Grid approach. The outflow peak discharge in comparison with pre-development scenario shows a 3.1% decrease which it may refer to changing the velocity and depth pattern within the project site area because of installing more than 2,000 solar poles. Nevertheless, the results show a very slight change in flood hydrograph due to the development impacts.

Finally, the outflow hydrography at the domain downstream boundary was graphed as shown in **Figure 8**. The result shows that the flood peak discharge for pre- and post-development scenarios is obtained at 17.75 and

17.38 m^3/s, respectively, which shows a 2.11% decreasing in peak discharge. This is likely because of increasing flood depth within the project site area due to the installation of more than 2,000 solar poles across the area which plays a detention role and therefore decreasing the downstream flood peak after development.

5.2.4.5 Hazard

Figure 15 shows the floodplain hazard classification map based on AEMI classification obtained from TUFLOW Model results for post-development scenario. From the combined flood hazard curves and thresholds, as illustrated in Table 6, the entire project site is covered under category H1, as shown in Figure 9. This result shows the maximum and average hazard values (depth ×Velocity) determined across the project site area are 0.135, and 0.021 m2/s, respectively. It is significantly less than the threshold value for the category H1. Therefore, the development activity will not change the flood hazard category as obtained from pre-development flood model.

Figure 7 – The Post-Development flood hydrographs at inflow and outflow boundaries of the project site

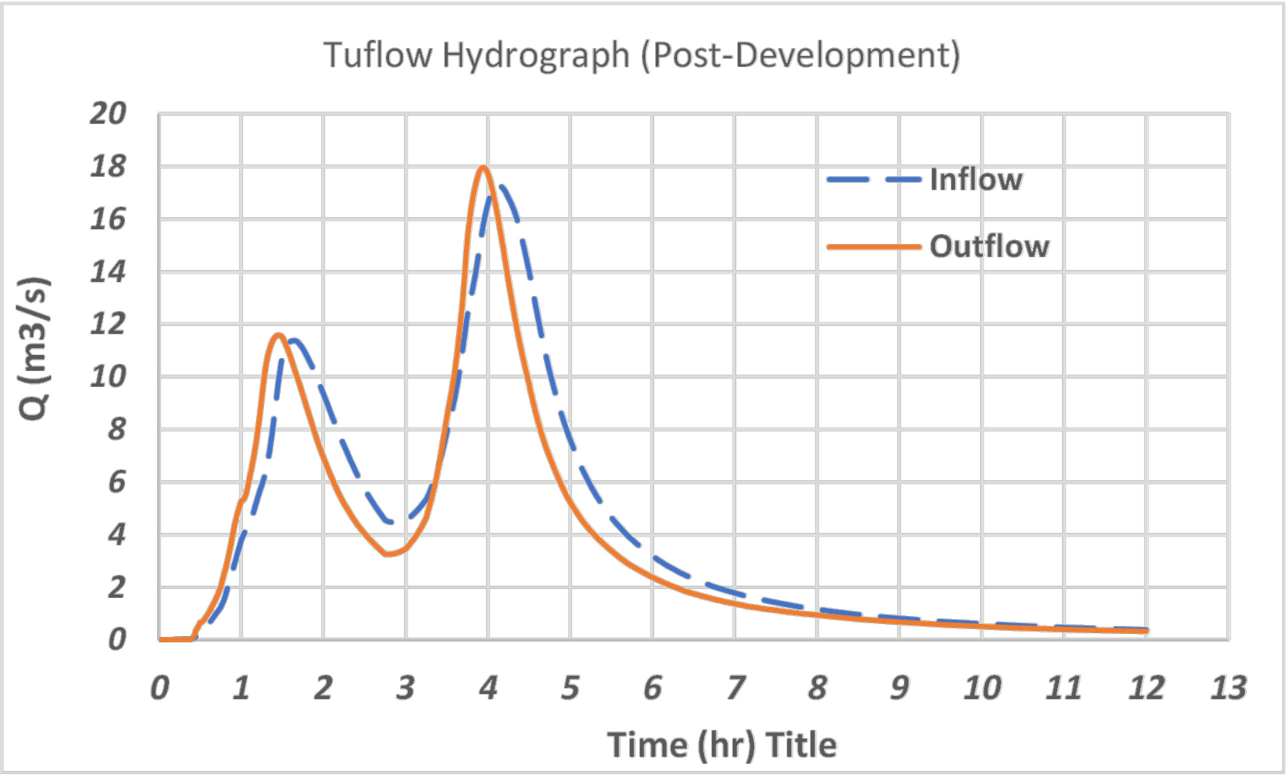


Figure 8 – The post and pre--development flood hydrographs at the domain downstream boundary

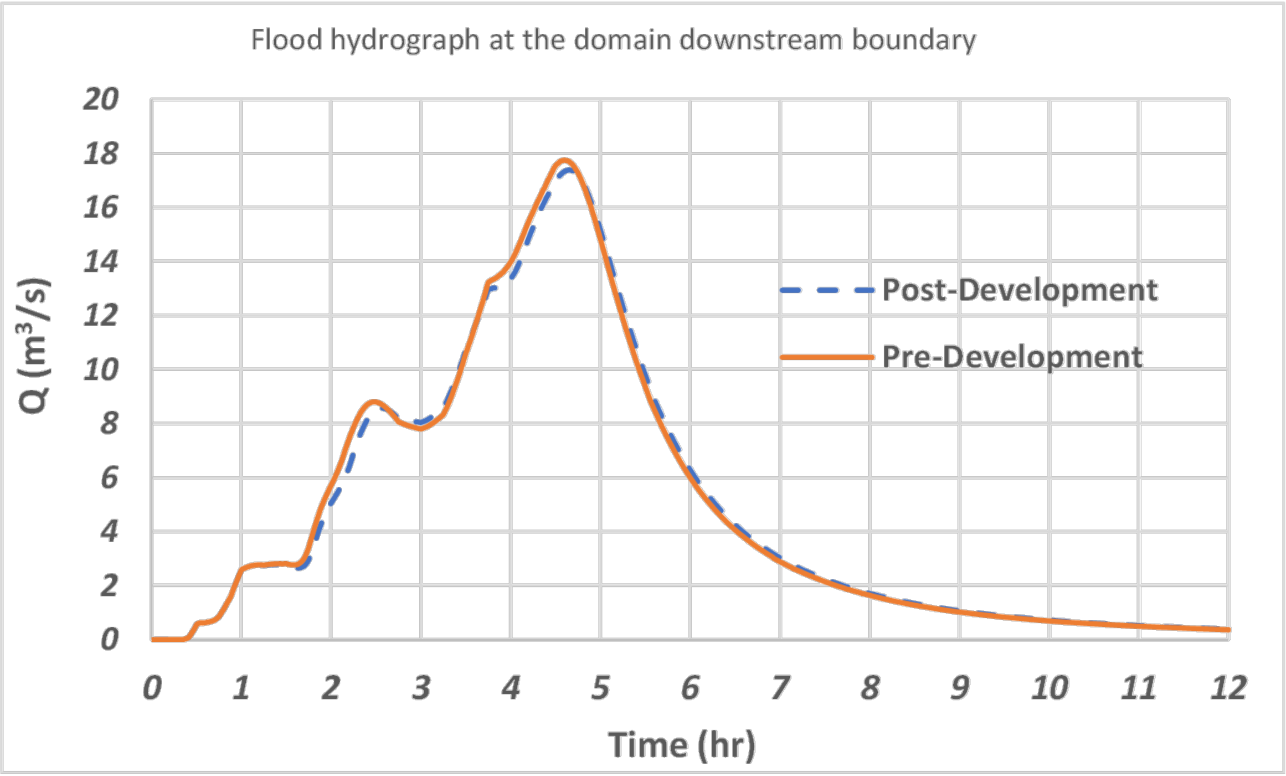
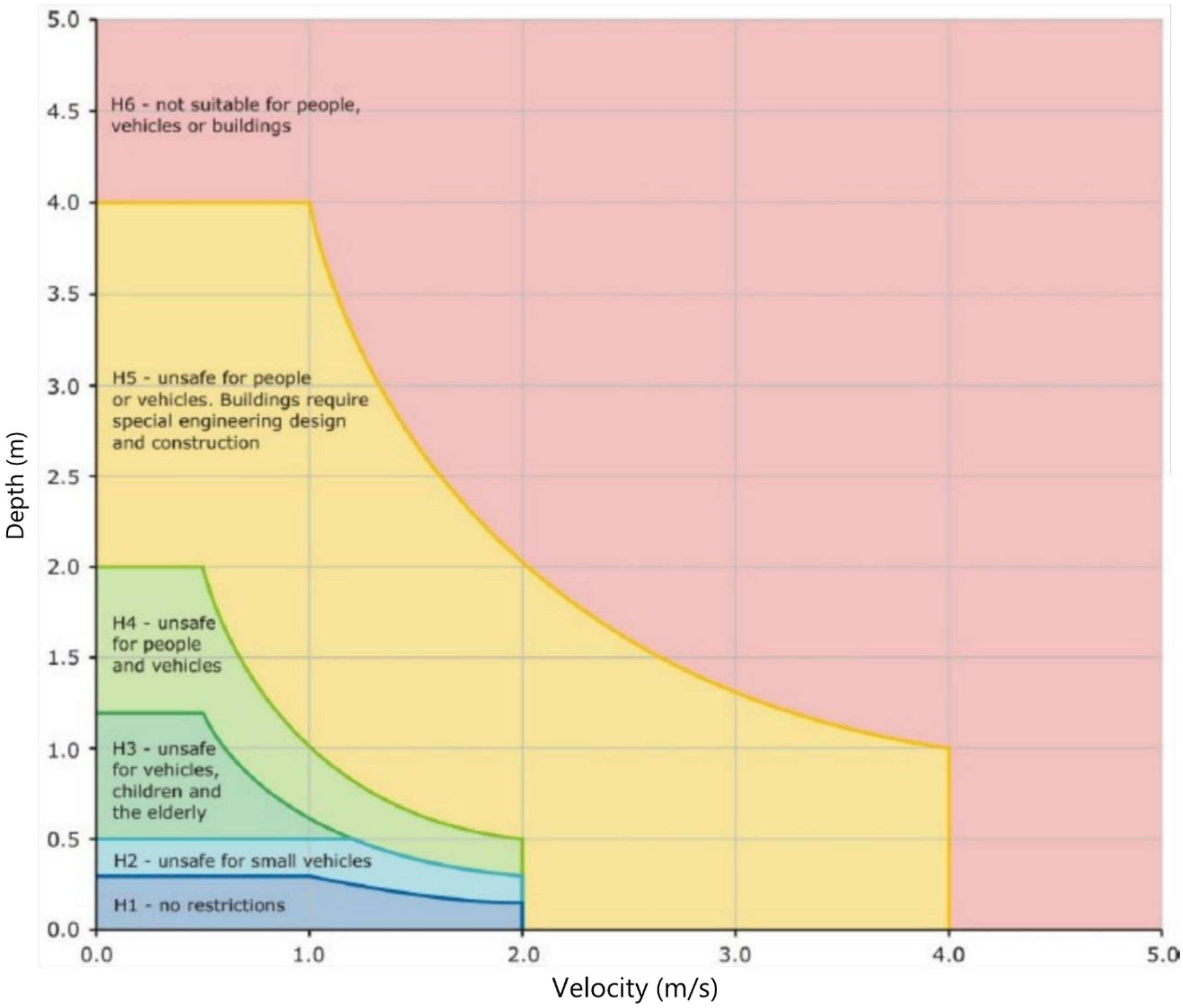


Figure 9 – AEMI flood hazard classification



6. CONCLUSION

This report has been provided to study the impact of the proposed Dunedoo Solar Farm, Dunedoo, New South Wales on flood levels, velocities, and discharge. The assessment included hydrologic assessment based on the ARR guideline (ARR, 2019) to determine critical rainfall duration and inflows to the hydraulic model.

The hydrologic model showed that the critical duration storm and median temporal pattern number for an AEP of 1% are obtained at 4.5 hr and TP25, respectively.

To assess the flood levels, velocities, and discharge across the project site area, 2D TUFLOW hydraulic model (Direct-Rainfall on Grid module) was setup for the full upstream catchment and extends beyond the site to approximately 460 m downstream of the south boundary of the site. The results obtained from the post-development hydraulic modelling indicated that the maximum and average depth of flood across the project site area is estimated to be 0.45 and 0.07 m, respectively, and the maximum and average flow velocity across project site area will be 0.62 and 0.28 m/s, respectively, which places the proposed development on the flood hazard category of H1 (i.e. no restrictions). Comparing flood depth and flow velocity maps obtained from the hydraulic model showed that there is no significant difference between pre-development and post-development flood peak discharges. Furthermore, the indicative allowable flood depth and velocity threshold that the supplier uses for ATI tracking structures are is 0.5 m and 1.5 m/s, respectively.

Also, the hydraulic modelling results showed that the outflow peak discharge from downstream boundary of the domain will decrease by 2.2% after conducting the proposed development which has no significant difference. Therefore, it can be concluded that there are no flood impacts external to the site and no mitigation measures (such as a detention basin) are required.

7. QUALIFICATIONS

Our analysis and overall approach have been specifically catered for the requirements of Enerparc Australia and may not be applicable beyond this scope. For this reason, any other third parties are not authorised to utilise this report without further input and advice from Premise.

Premise has relied on the information as outlined in the Data Section of this Report.

While Premise's report accurately assesses peak flows from design storms in accordance with current industry standards and guidelines and the use of regional flood gauge, future observed flows may vary from that predicted. For these reasons appropriate freeboards should be adopted.

8. REFERENCES

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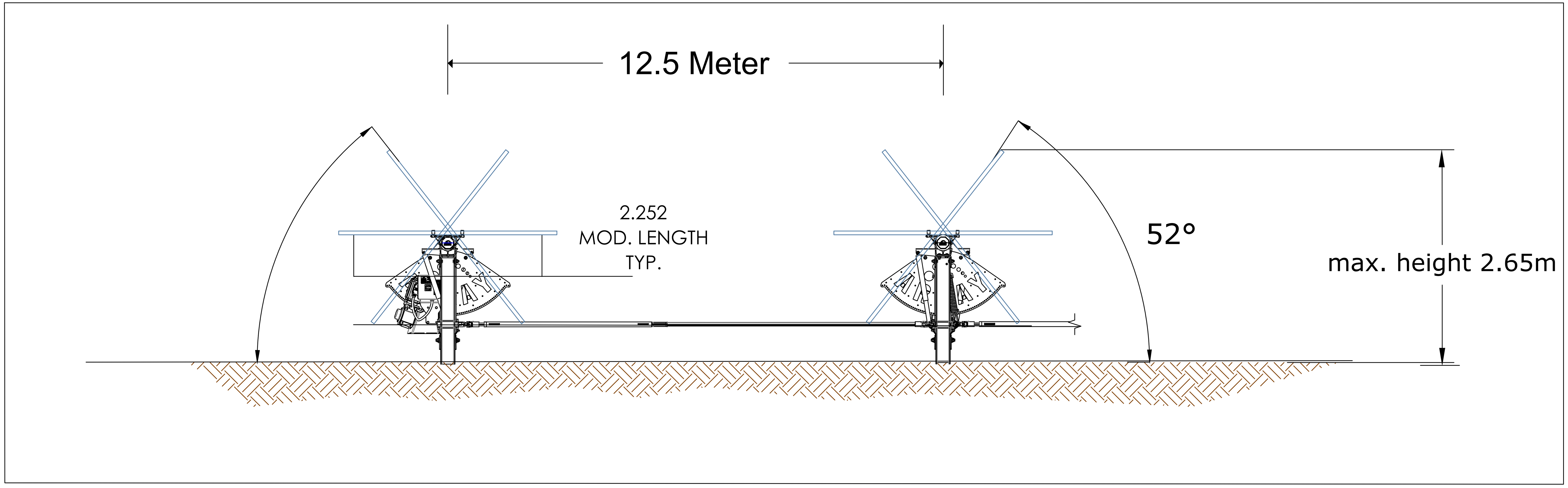
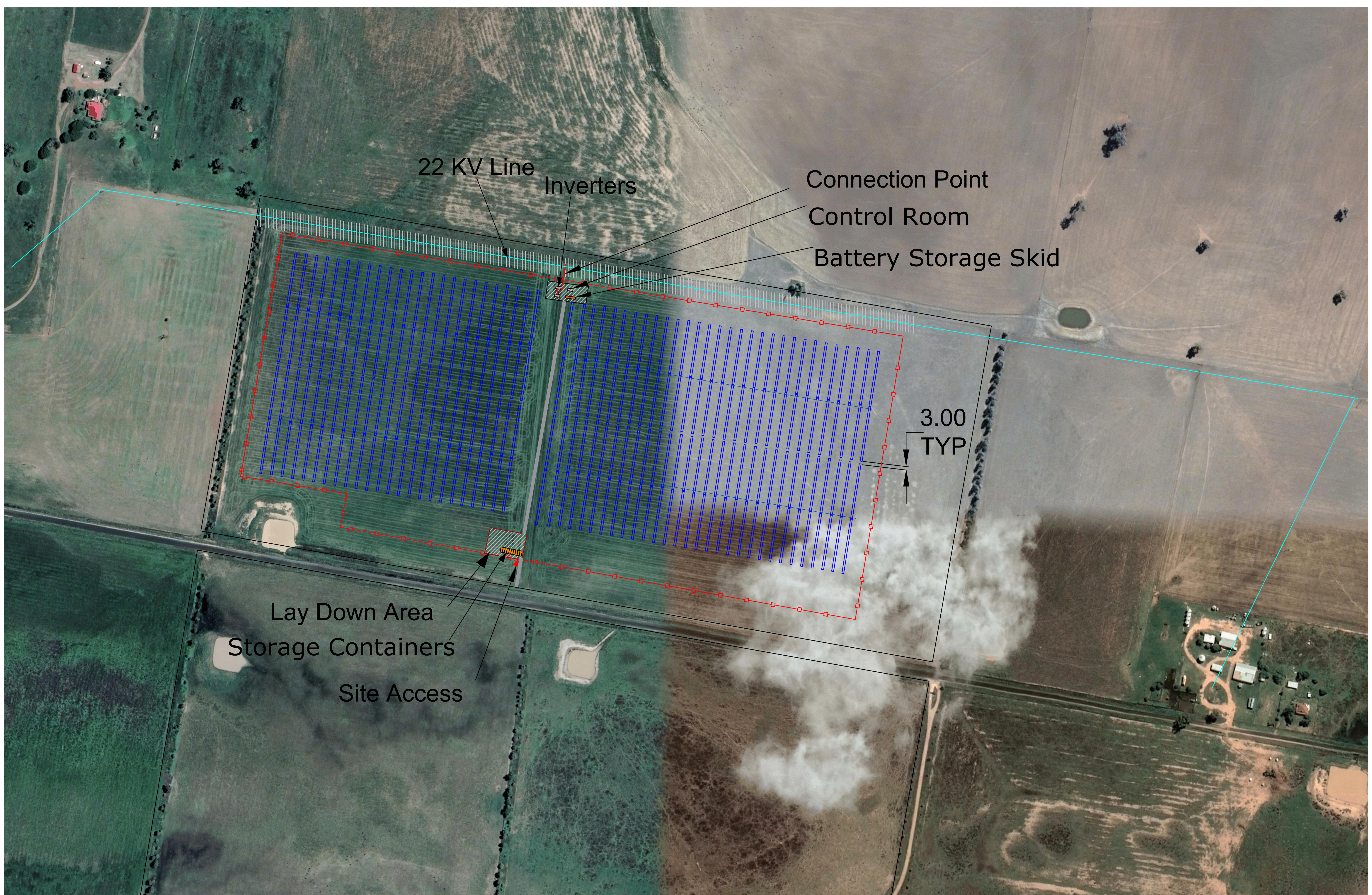
APPENDIX A

PROPOSED SITE PLAN





N

Tracker Table ATI 112 Modules = 108 pieces

Inverter Skid SMA 2930 UP

Control Room

Gate 6 m, 1 piece

Pedestrian gate , 1 piece

Fence (h=2m) 2,092 Meter

Entry

Compound area = 244,832 m²

Service Roads 4 Meter width = 1,219 m²

Module

Type:	CSI BiHiKu6 CSW-545 MB AG
Power:	545 - 550 Wp
Quantity:	12.292 pieces
Power DC:	6.699,14 kWp
Power AC:	4.990,00 kVA Limitation

Inverter

Type	SMA SC- 2930 UP
Quantity:	2 pieces

Structure

Type:	Tracker ATI
Tilt :	0-52°
Azimuth:	9°

Builder:		Date:	Name:
BUILDER ENERPARC AUSTRALIA	Editor	4/8/22	-
	Check	-	-
	Allowed	-	-
	Norm	-	-
IN_H	MODIFICATION_H	DATE_H	NAME_H
IN_G	MODIFICATION_G	DATE_G	NAME_G
IN_F	MODIFICATION_F	DATE_F	NAME_F
IN_E	MODIFICATION_E	DATE_E	NAME_E
IN_D	MODIFICATION_D	DATE_D	NAME_D
IN_C	MODIFICATION_C	DATE_C	NAME_C
IN_B	MODIFICATION_B	DATE_B	NAME_B
IN_A	MODIFICATION_A	DATE_A	NAME_A

General contractor: ENERPARC

Address: DARLINGHURST NSW

Telephone: -

Fax: -

Project: DUNEDOO

Scale:

Drawing-No.

Path: PATH

APPENDIX B

IFD DESIGN RAINFALL DEPTH (MM)

Duration	Annual Exceedance Probability (AEP)						
	63.20%	50%	20%	10%	5%	2%	1%
30 min	16.3	18.2	24.4	28.8	33.3	39.4	44.3
45 min	18.7	20.9	28	33.1	38.2	45.2	50.8
1 hour	20.5	22.8	30.6	36.1	41.7	49.3	55.3
1.5 hour	23	25.7	34.5	40.7	46.9	55.3	61.9
2 hour	25	28	37.5	44.1	50.8	59.7	66.8
3 hour	28.2	31.5	42.2	49.5	56.9	66.7	74.4
4.5 hour	31.8	35.6	47.6	55.9	64	75	83.5
6 hour	34.8	39	52.1	61.1	69.9	81.8	91.1
9 hour	39.6	44.4	59.4	69.6	79.6	93.3	104
12 hour	43.4	48.6	65.2	76.5	87.6	103	115
18 hour	49.3	55.2	74.3	87.5	101	119	134
24 hour	53.7	60.2	81.2	96	111	132	149
30 hour	57.2	64.1	86.7	103	120	143	162
36 hour	60.1	67.3	91.3	109	127	153	174
48 hour	64.5	72.3	98.5	118	139	168	193
72 hour	70.4	78.9	108	131	155	190	220
96 hour	74.4	83.4	115	140	167	205	237
120 hour	77.3	86.9	120	146	175	215	248
144 hour	79.8	89.9	125	152	180	221	255
168 hour	82	92.7	129	156	185	226	259

APPENDIX C

PRE-DEVELOPMENT 1% AEP FLOOD MAPS

Figure 10 – Maximum depth of flood with AEP 1% using TUFLOW model for pre-development scenario

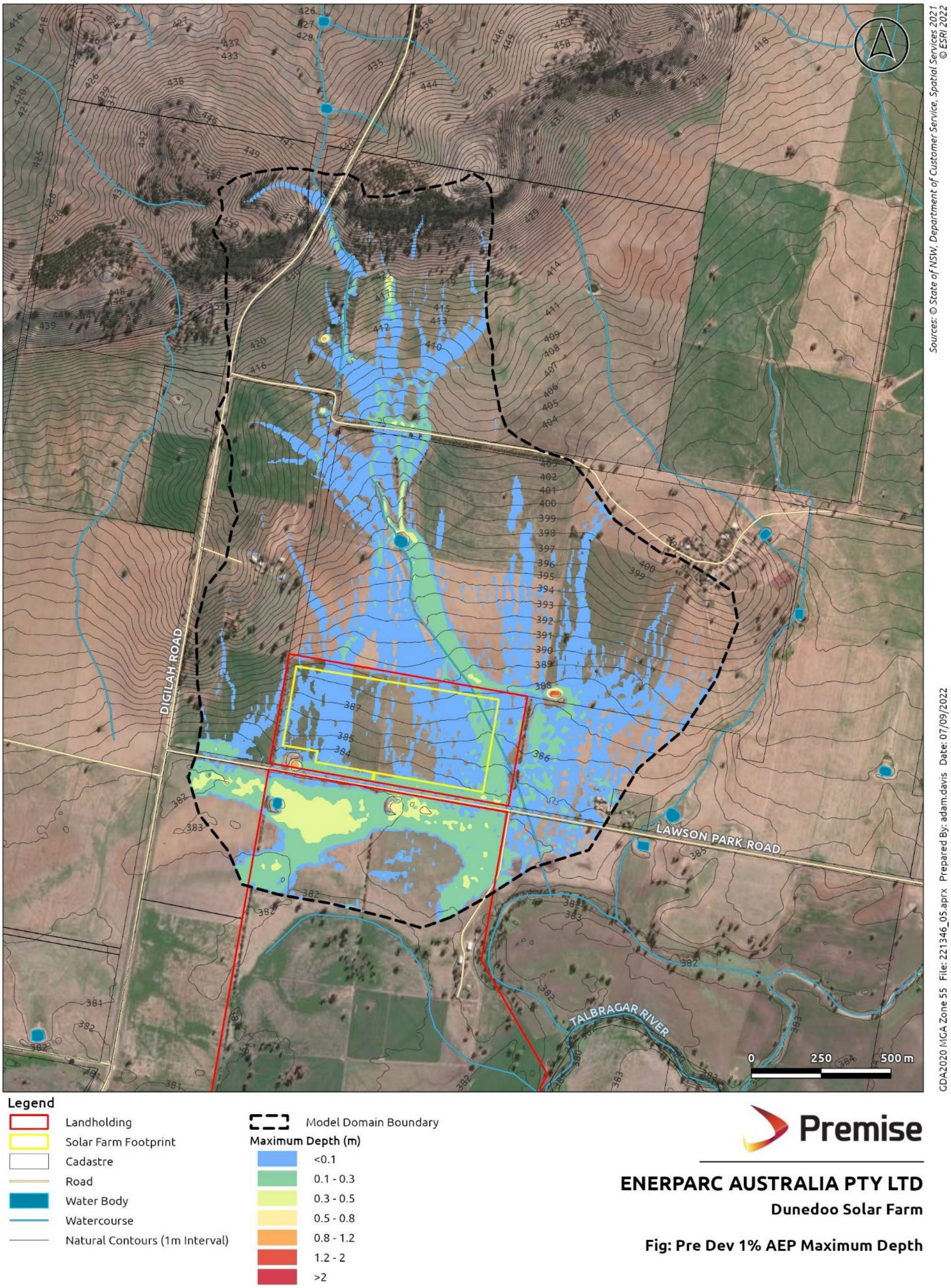


Figure 11 – Maximum flow velocity of flood with AEP 1% using TUFLOW model for pre-development scenario

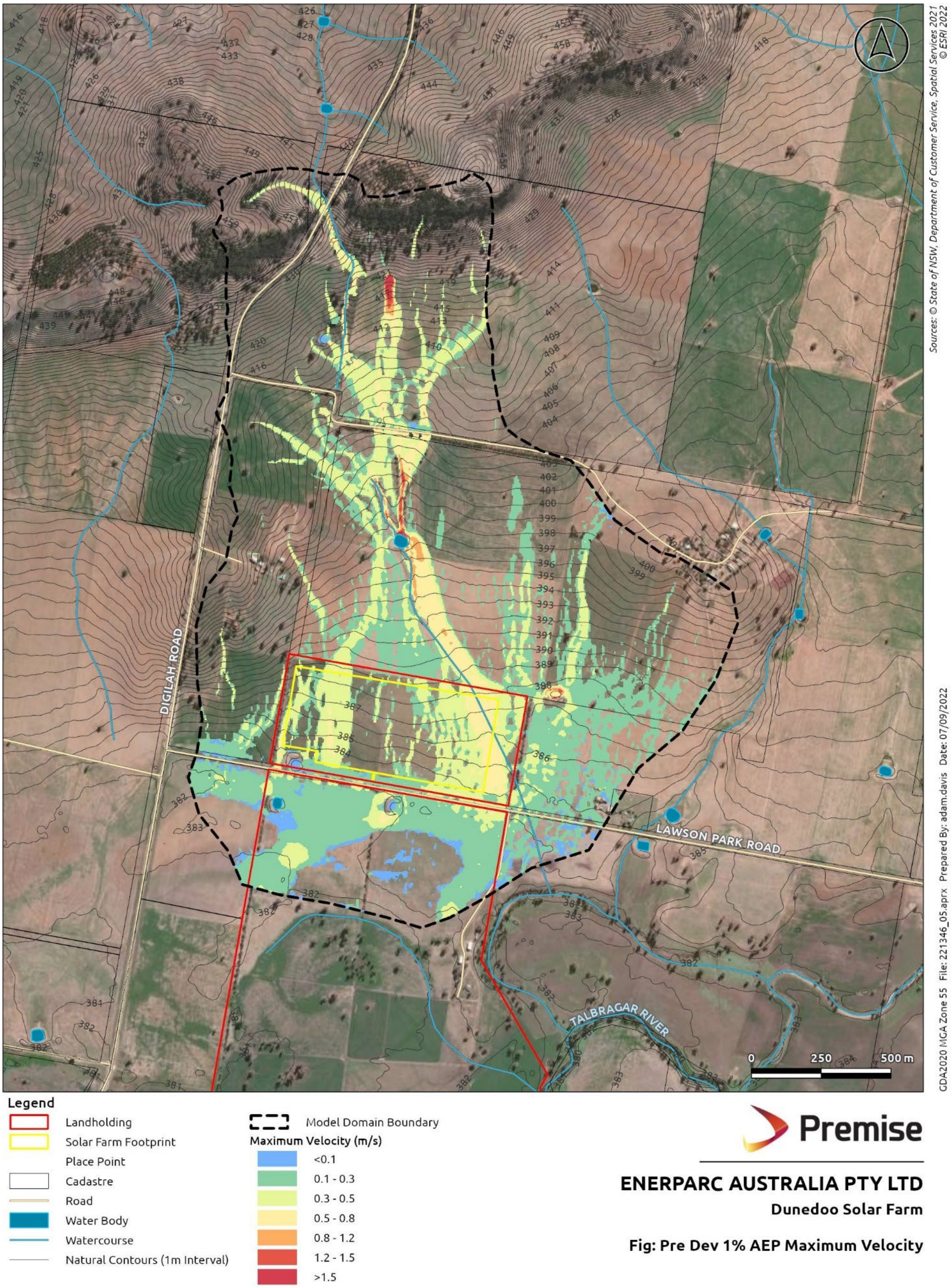
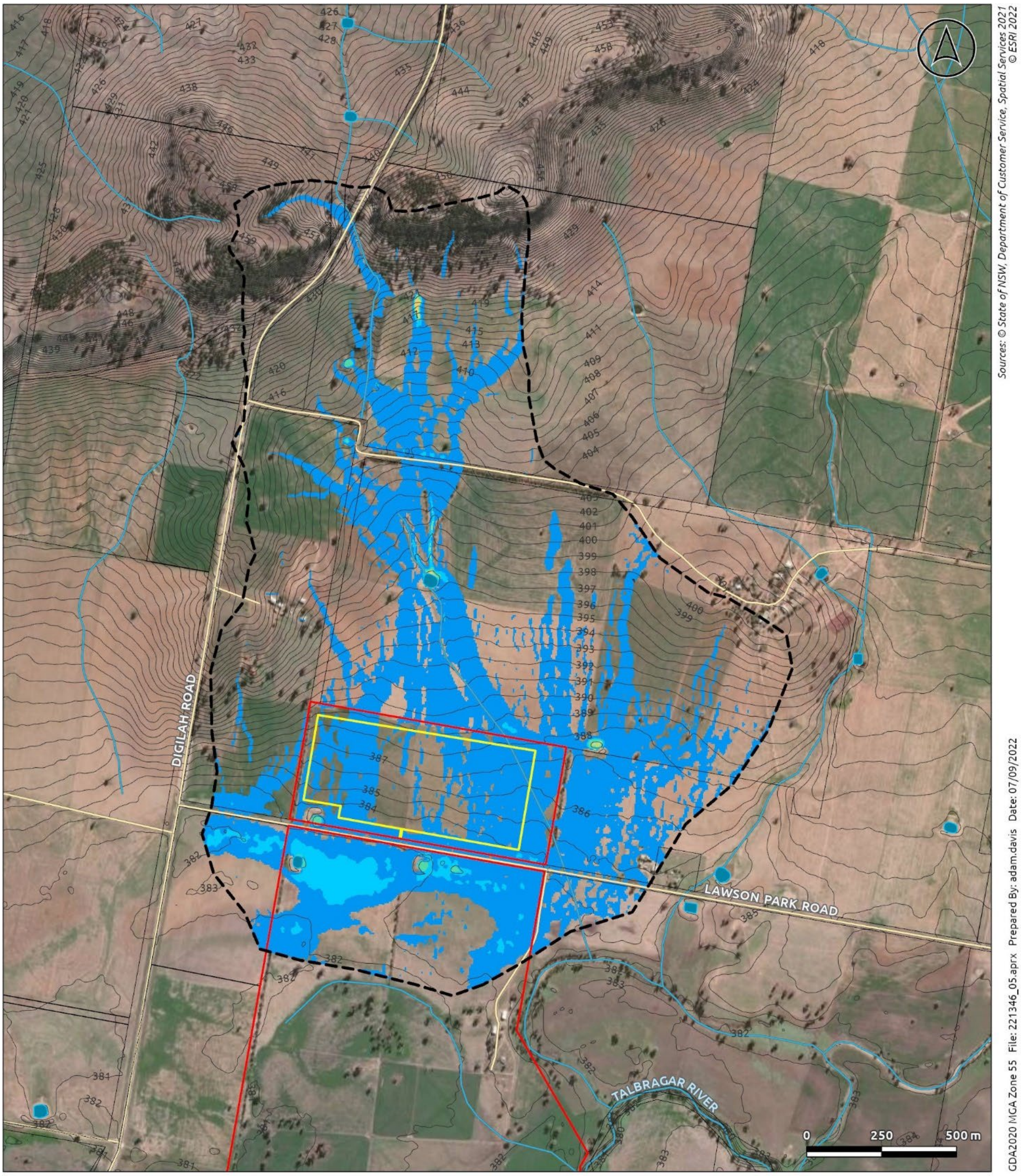


Figure 12 – Floodplain hazard classification map using TUFLOW Model results for pre-development scenario



Legend

- Landholding
- Solar Farm Footprint
- Cadastre
- Road
- Water Body
- Watercourse
- Natural Contours (1m Interval)
- Model Domain Boundary

Flood Hazard Classification

- H1
- H2
- H3
- H4
- H5

Premise

ENERPARC AUSTRALIA PTY LTD

Dunedoo Solar Farm

Fig: Pre Dev 1% AEP Flood Hazard

APPENDIX D

POST-DEVELOPMENT 1% AEP FLOOD MAPS

Figure 13 – Maximum depth of flood with AEP 1% using TUFLOW model for post-development scenario

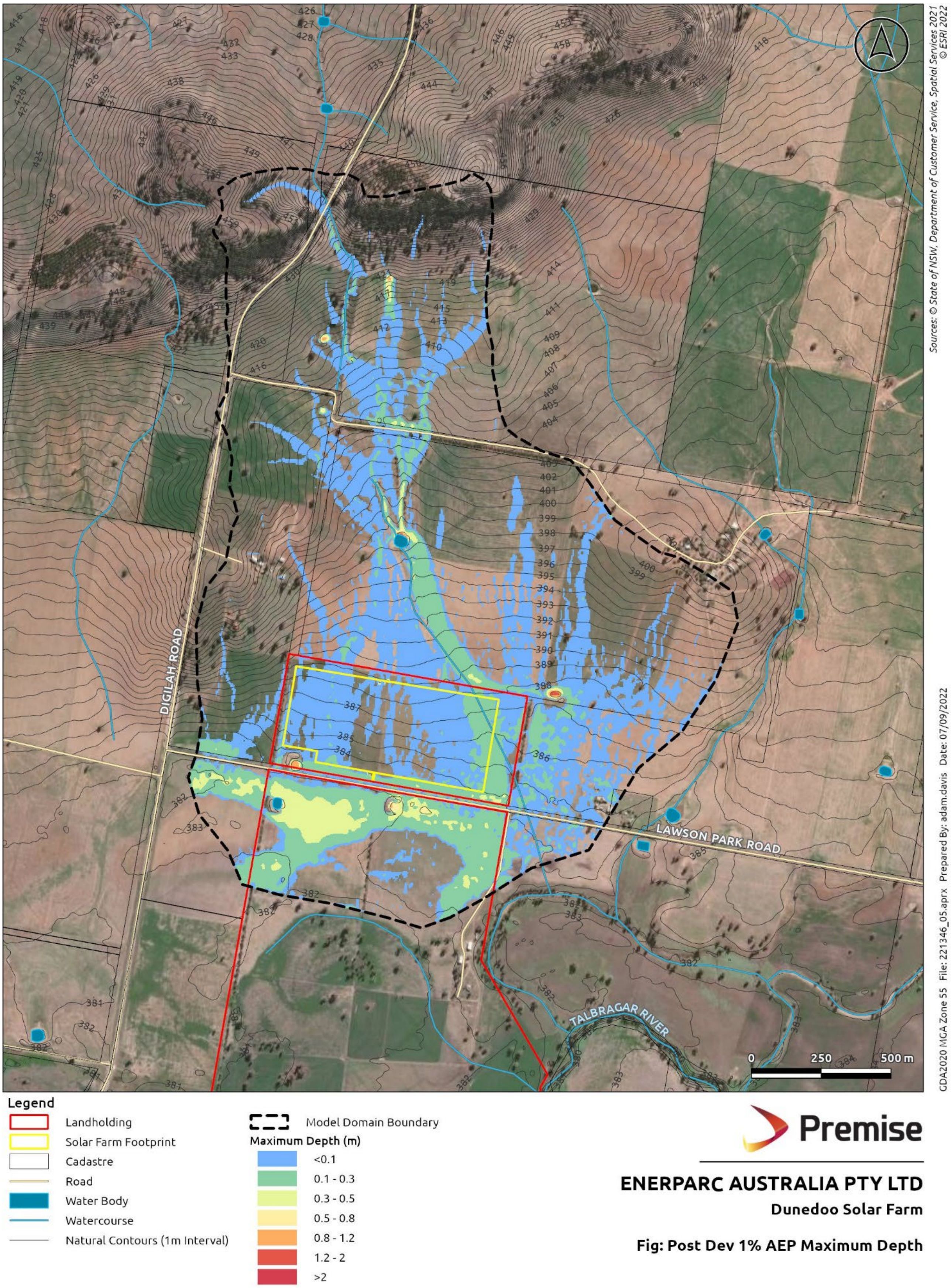


Figure 14 – Maximum flow velocity of flood with AEP 1% using TUFLOW model for post-development scenario

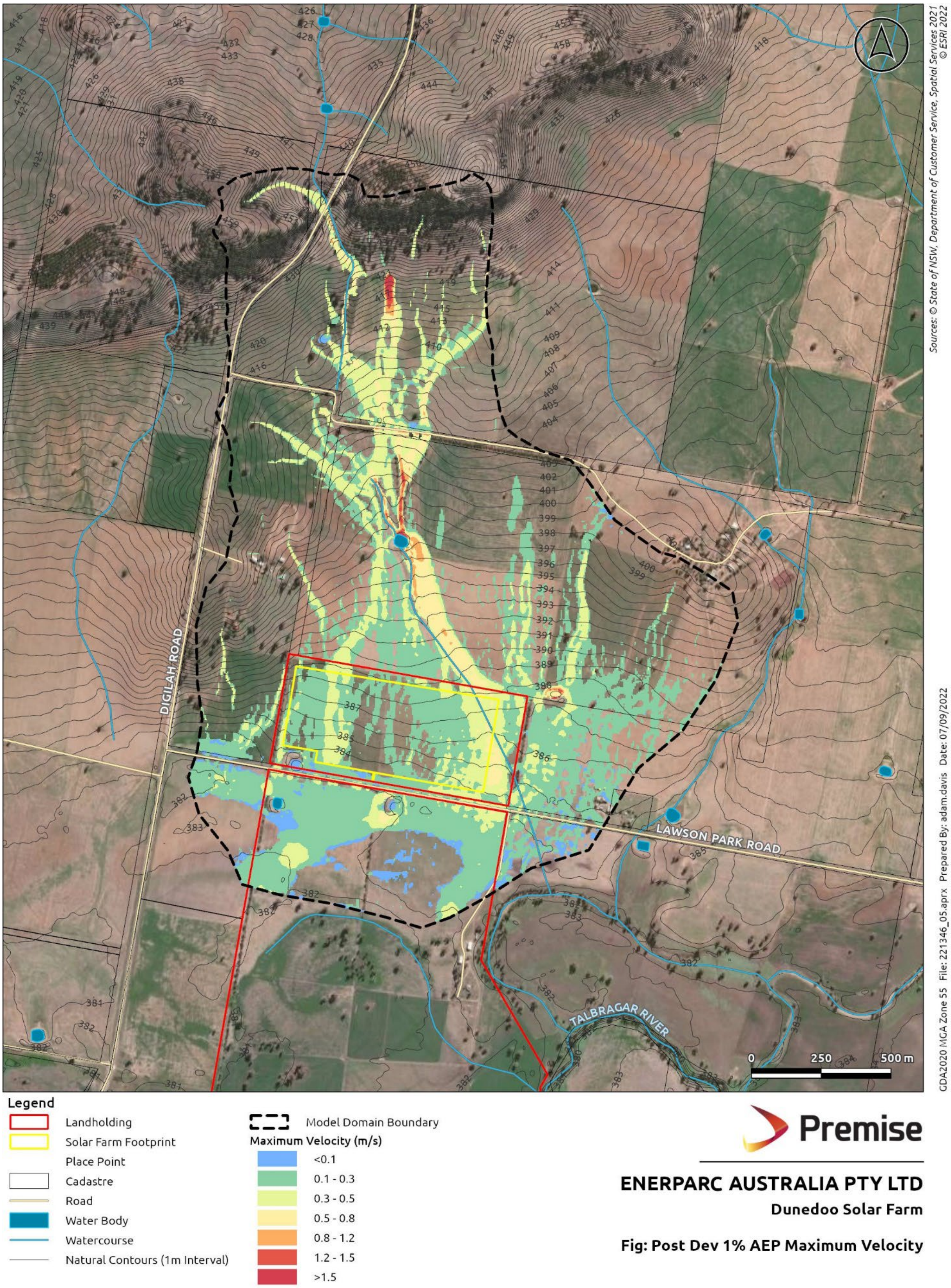


Figure 15 – Floodplain hazard classification map using TUFLOW Model results for post-development scenario