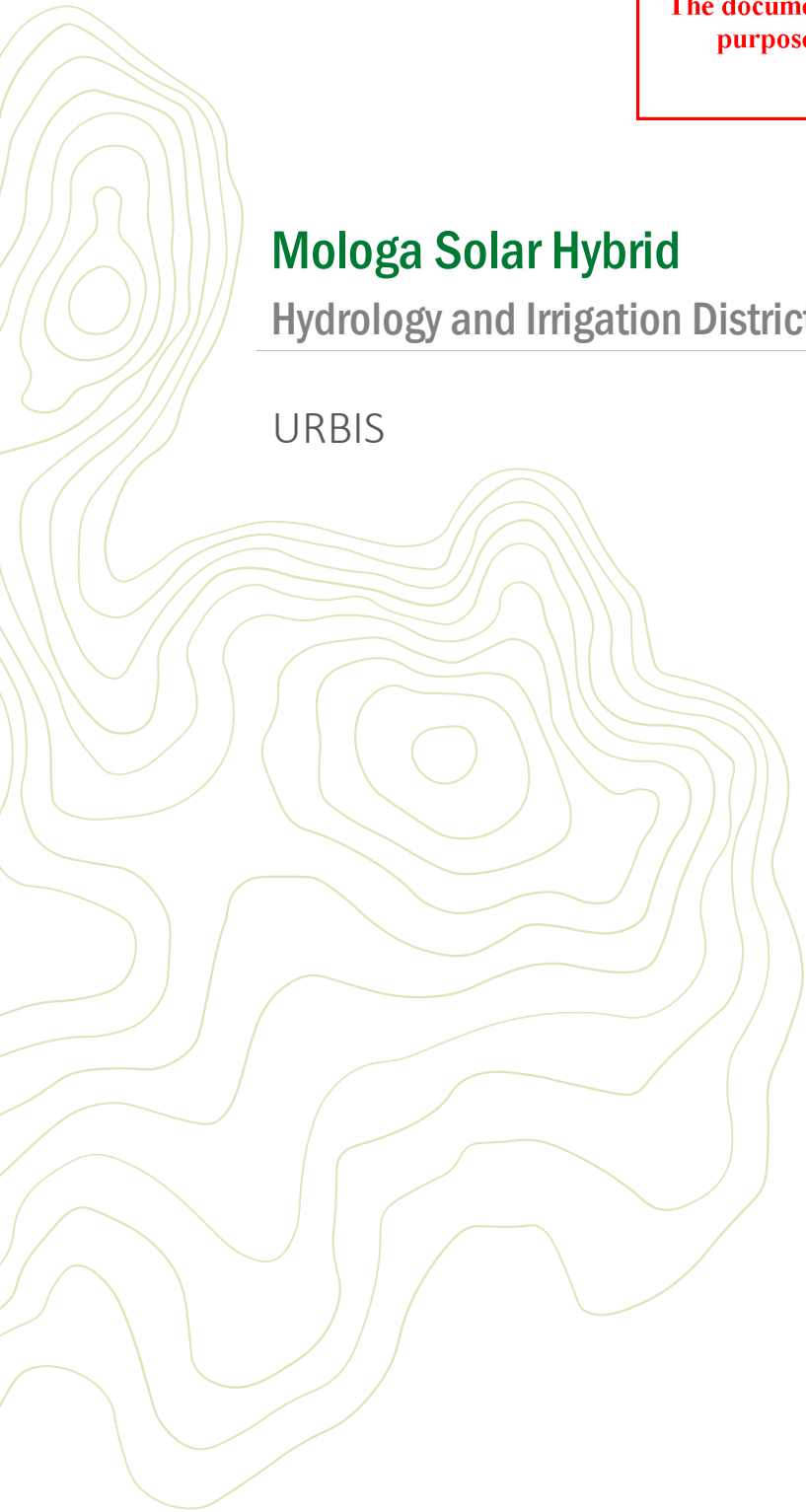


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Mologa Solar Hybrid

Hydrology and Irrigation District Assessment

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Abbreviations

Abbreviation	Description
2D	Two dimensional
AEP	Annual Exceedance Probability
ADR	Australian Disaster Resilience
ARI	Average Recurrence Interval
AR&R	Australian Rainfall and Runoff
ARF	Areal reduction factors
BESS	Battery Energy Storage System
BoM	Bureau of Meteorology
CL	Continuing loss
CMA	Catchment Management Authority
DEM	Digital Elevation Model
ELA	Eco Logical Australia Pty Ltd.
ELVIS	Elevation and Depth – Foundation Spatial Data
ICSM	Intergovernmental Committee on Surveying and Mapping
IFD	Intensity-Frequency-Duration
IL	Initial loss
GMID	Goulburn-Murray Irrigation District
GMW	Goulburn-Murray Water
RFFE	Regional Flood Frequency Estimation
RORB	Rainfall and Runoff Routing
SSP	Shared-Socioeconomic Pathway
TERN	Terrestrial Ecosystem Research Network

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Executive Summary

Eco Logical Australia (ELA) was engaged by Urbis to assess flood hydrology and irrigation impacts for the proposed Mologa Solar Hybrid project near Mitiamo-Kerang Road, Mologa, VIC (the 'Site'). The study characterises baseline hydrology, models 10%, 2% and 1% Annual Exceedance Probability (AEP) flood events under existing and proposed conditions, examines long-term climate scenarios and assesses potential effects on irrigation infrastructure and water quality.

Assessment indicated that baseline surface water flows are shallow and slow moving, with deeper water are confined to Blind Creek, where the modelled maximum flood depth and velocity were recorded, and existing dam features. Shallow inundation was present over much of the Site.

Modelling of the proposed conditions undertaken based on preliminary layout design, provided by Urbis in November 2025, indicated negligible change in peak flows (<1%) relative to baseline existing conditions, with very limited diversion of localised flows within the Site and proposed development area.

Flood risk at the Site was generally assessed as low under the 10%, 2% and 1% AEP events with a flood hazard classification of H1 (generally safe for people, vehicles and buildings) in accordance with the VIC (2019) *Guidelines for Development in Flood Affected Areas*. However, there are isolated areas of deeper water (such as dams and drainage lines) where the flood hazard increased to H4 (unsafe for vehicles and people) under the 1% AEP conditions.

The Site is located within the Goulburn-Murray Irrigation District, a declared irrigation district serviced by Goulburn Murray Water (GMW). While regional irrigation infrastructure is likely to be retained, the land is currently being managed as dryland farming. As hydraulic modelling indicates negligible changes to surface water flows under proposed conditions, the project is considered unlikely to compromise the functionality or connectivity of the irrigation network. Potential risks relate primarily to erosion and sedimentation during construction, which could affect channel conveyance capacity and water quality. Mitigation measures including CFA compliant sediment controls, setbacks from channels, culvert design to GMW standards and licensing for works near assets will ensure a net-zero impact on irrigation infrastructure. The project design also incorporates opportunities for agrivoltaic co-use, supporting policy objectives to balance renewable energy development with agricultural productivity.

Overall, the assessment indicates the proposed development will not substantially increase catchment peak flows but will change local inundation patterns around raised infrastructure. As solar panel installation is planned for areas of Blind creek where the hazard level is expected to be up to H3 (depth between 0.5 m and 1.2 m, velocity <2 m/s, velocity x depth ≤ 0.6), additional management or mitigation measures should be considered such as works to divert or contain floodwaters or increasing the minimum height of the solar panels to 0.6 m above ground level to provide a minimum of 300 mm freeboard above the 1% AEP flood depth. Areas of elevated flood hazard are concentrated along existing channels; these should inform layout, access, and mitigation measures to protect people, vehicles and critical infrastructure and to minimise impacts on irrigation assets. Additional refined hydrologic and hydraulic modelling may be undertaken based on final landform and Project layout design to ensure adequacy of flood impact mitigation measures.

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- Maximum modelled depth

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- Modelled depth afflux

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- Modelled depth climate change scenarios

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1. Introduction

Eco Logical Australia Pty Ltd (ELA) was engaged by URBIS to assess hydrological characteristics associated with the 10%, 2% and 1% Annual Exceedance Probability (AEP) flood events and conduct an Irrigation Assessment under both existing and proposed conditions for the development at Mologa Solar Farm and Battery Energy Storage System (BESS) (Mologa Solar Hybrid project) located east of Bendigo-Pyramid Road and south of Mologa-Durham Ox Road Mologa, VIC 3575 Australia (the 'Site').

The Hydrology and Irrigation District Assessment outlines the below items:

- Methodology
- Hydrological modelling information
- Flood hazard classification
- Information on local overland flow paths
- Flood assessment for 10%, 2% and 1% AEP storm events result for existing and proposed conditions.
- Long term (2081-2100) climate change assessment under the SSP1-2.6 (low GHG emissions), SSP2-4.5 (intermediate GHG emissions) and SSP3-7.0 (high GHG emissions) emission scenarios.
- Assessment of surface water impacts on irrigation infrastructure.

1.1. Background and objectives

Mologa Solar Hybrid project is located approximately 65km north of Bendigo and 51km west of Echuca. The site is located to the east of Bendigo-Pyramid Road and south of Mologa-Durham Ox Road, in Mologa. The site extends across approximately 591 hectares and is currently used predominantly for dryland cropping and some grazing.

The subject site is described by the following Certificates of Title:

- Crown Allotment 6 Section A Parish of Mologa.
 - Volume: 9056 & Folio: 961
- Crown Allotment 7 Section A Parish of Mologa
 - Volume: 2429 & Folio: 740
- Crown Allotment 8 Section A Parish of Mologa
 - Volume: 7628 & Folio: 185
- Crown Allotment 17 Section A Parish of Mologa
 - Volume: 9056 & Folio: 962
- Crown Allotment 17A, 18A, & 18 Section A Parish of Mologa
 - Volume: 10991 & Folio: 175
- Crown Allotment 17B Section A Parish of Mologa
 - Volume: 2667 & Folio: 397
- Crown Allotment 17C Section A Parish of Mologa
 - Volume: 10407 & Folio: 536

The proposed solar hybrid project comprises:

- 250 MW solar farm
- 250 MW 4 hour Battery Energy Storage System (BESS)
- Substation
- Terminal station

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A 220 kV transmission line easement runs north–south through the western side of the site. The proposed BESS and substation will connect directly to this existing line, enabling efficient integration with the grid.

The proponent, Potentia Energy, requires flood and irrigation assessment for the proposed new development at the Site as shown in Figure 1-1. The key objectives of the assessment are to:

- Characterise baseline hydrologic conditions at the Site.
- Identify potential risks to the baseline surface water flows as a result of proposed development.

1.2. Scope of works

The scope of works to achieve the objectives comprised:

- Review and collation of data sourced and applied as part of the assessment (Section 2).
- Hydrologic modelling to determine peak flows for the 10%, 2% and 1% AEP events (Section 3).
- Hydraulic modelling to determine inundation extents, flood depths and velocities for the specified AEP events under existing and proposed conditions (Section 4 and Section 5).
- Irrigation Assessment to identify project activities that may impact irrigation infrastructure or water quality/quantity (Section 6).

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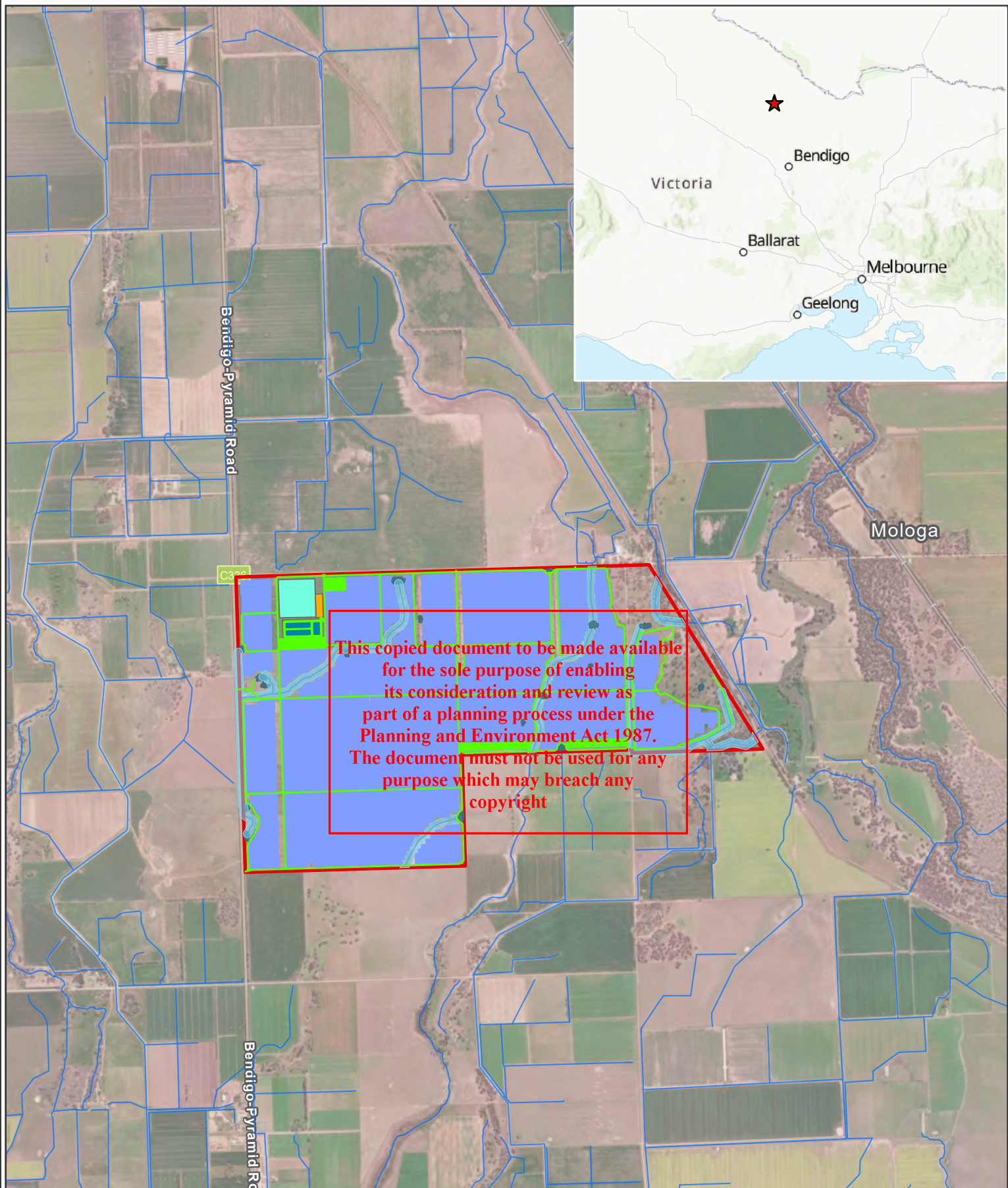


Figure 1-1 Site location and proposed development

- Roads
- Watercourses
- Site boundary
- Mologa Terminal Station
- BESS
- PV arrays
- Retained dam
- Setback from designated waterways
- Building
- Access track

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0 0.25 0.5 1 1.5
Kilometers

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2. Hydrologic site setting and flood characteristics

2.1. Data review

The following datasets were reviewed to define the hydrologic setting and inform the flood risk assessment for the Site:

- Site spatial data and proposed condition information, as provided by Urbis.
- Digital Elevation Models (DEM) encompassing the contributing catchment area that drains the Site and any adjacent waterways.
- Bureau of Meteorology (BoM) observed climate, rainfall and historical streamflow data.
- Intensity Frequency Duration (IFD) data representing the rainfall intensities for design rainfall events for the specified catchment.
- Australian Rainfall and Runoff (AR&R) Data Hub information for rainfall patterns and loss information.
- Regional Flood Frequency Estimation (RFFE) modelling methods to validate the hydrologic model results for design storm events.
- Previous environmental investigation reports including flood studies and inundation mapping.
- Site layout including proposed development features and existing irrigation infrastructure.

2.2. Digital Elevation Model (DEM) and catchment delineation

Regional and Site DEMs were sourced to determine the contributing runoff catchment, waterways and drainage features for the Site. The following DEM and surface terrain datasets were obtained:

- 1 m by 1 m resolution Site survey LIDAR data provided by URBS, September 2025.
- 10 m by 10 m DEM surface was sourced from data for the regional area from the Australian Government's Intergovernmental Committee on Surveying and Mapping Elevation and Depth – Foundation Spatial Data (ELVIS) website.

An average vertical adjustment of -0.12 m was applied to the coarser resolution data (ELVIS) to ensure a smooth transition between the two DEM surfaces.

The DEM datasets obtained were considered representative of existing conditions for the purposes of hydrologic/hydraulic modelling and establishment of baseline surface water runoff characteristics at the Site. The resulting ground surface elevation used in the models is illustrated in Figure 2-1.

2.3. Catchment features and watercourse identification

A review of the DEM indicates the regional catchment area encompassing the Site is approximately 33 km² comprising first to third order streams including primary drainages and tributaries of Blind Creek and a number of irrigation channels as shown in Figure 2-1.

The Site and contributing catchment are located within the Loddon River Catchment managed by the North Central Catchment Management Authority (CMA).

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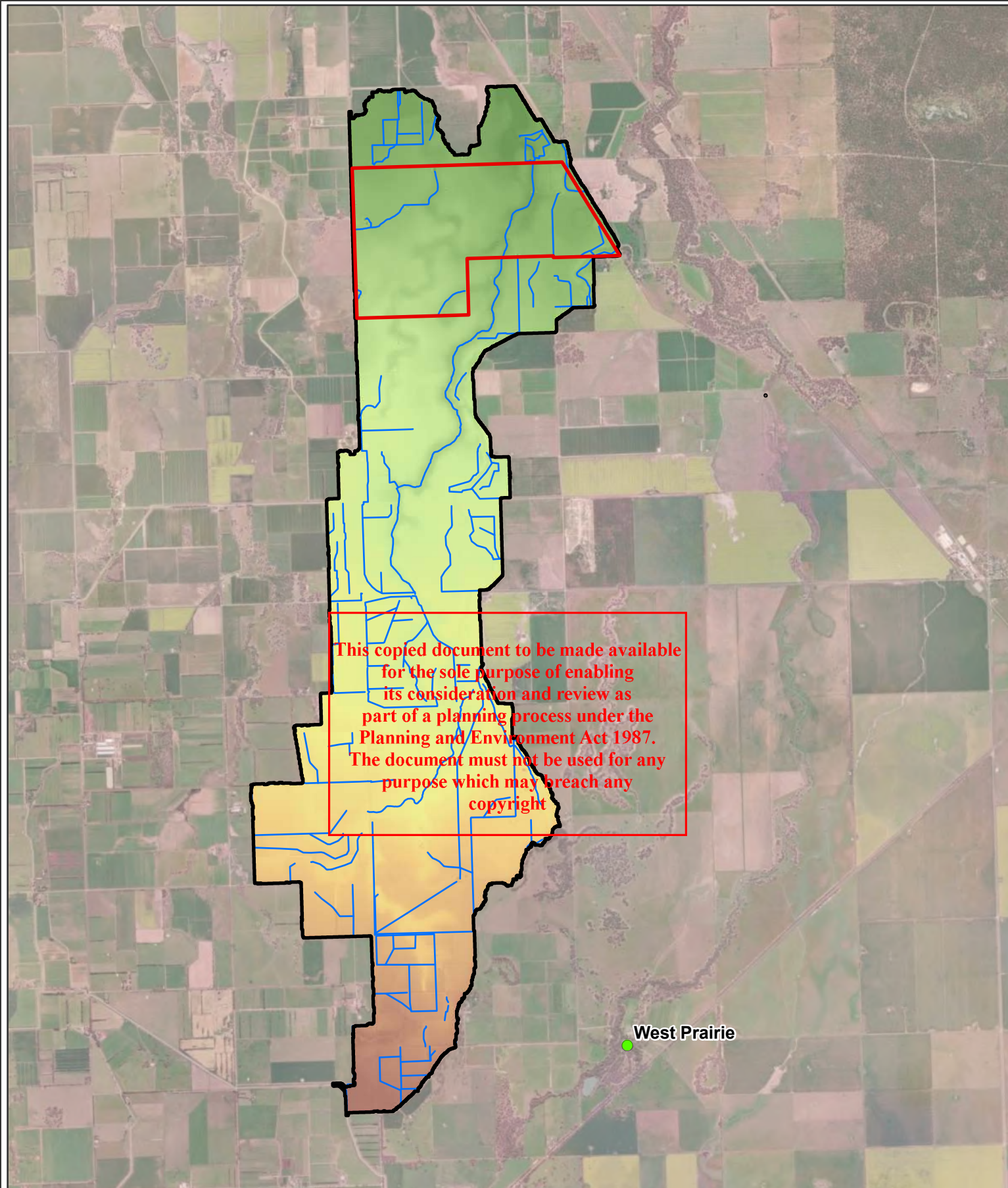
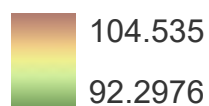


Figure 2-1 Catchment features

- Rain guage sites
- Streams
- Site boundary
- Catchment boundary

Elevation (mAHD)



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2.4. Rainfall and evaporation

The closest observed rainfall information was available at West Prairie (gauge 080130), approximately 10 km south of the Site (-36.27°S, 144.17°E, indicated in Figure 2-1). Daily rainfall data was available for review for a 16-year period from October 2009 to October 2025 and is presented in Figure 2-2 alongside data from Pyramid Hill (gauge 080013) located approximately 11 km north of the project Site (-36.06°S, 144.21°E).

Annual mean rainfall was approximately 406 mm, with average monthly rainfall ranging from approximately 14 mm in February to 42 mm in October, however the average rainfall in October is heavily influenced by an unusually wet October in 2022. The next highest average monthly rainfall is June with 41 mm.

Observed evapotranspiration data sourced from the Australian Terrestrial Ecosystem Research Network (TERN) Landsat online map portal for the catchment area from May 1987 to August 2025 indicates a mean annual evaporation of approximately 353 mm/year, approximately 85% of mean annual rainfall (Australia's Terrestrial Ecosystem Research Network, 2025). Rainfall typically exceeds evaporation from April to August, consistent with expected climatic conditions for the region.

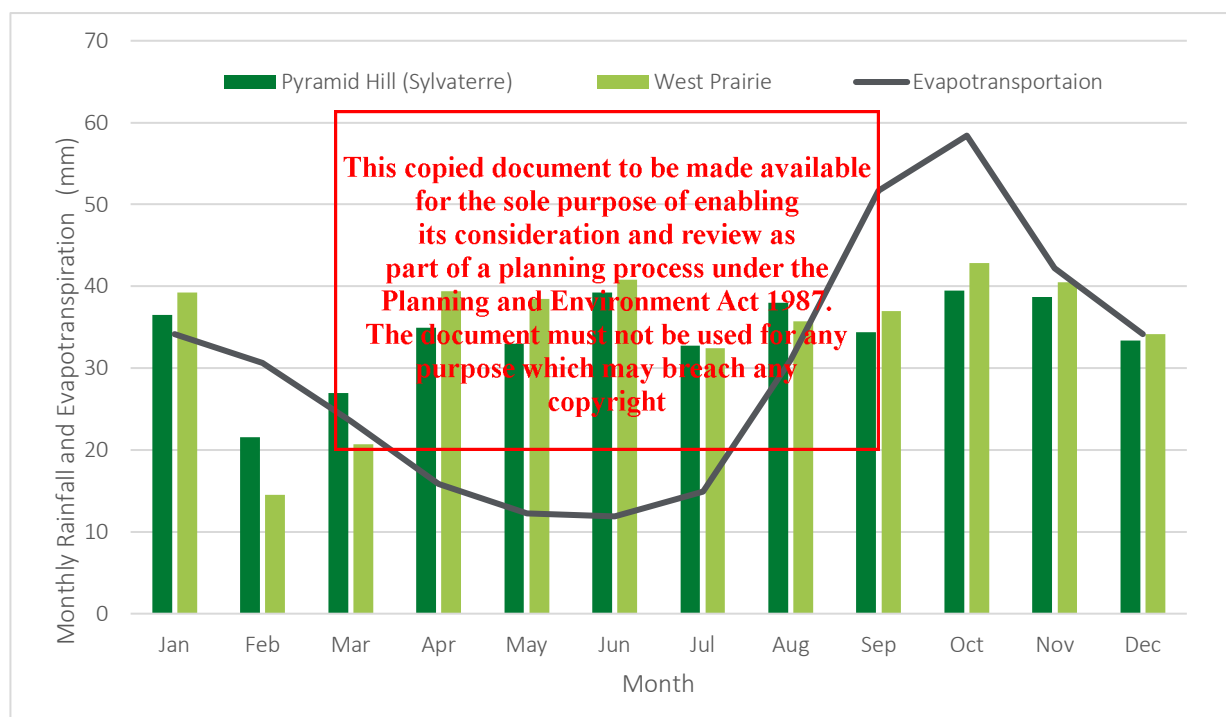


Figure 2-2 Observed monthly climate statistics

2.5. Streamflow

Historical streamflow information was available downstream of the Site at Bullock Creek at Minch West (gauge 407287), located approximately 26 km north of the project Site (-35.92°S, 144.18°E) for the period from March 1990 to October 2025 (current). Although this data cannot be used directly for calibration of the hydrologic or hydraulic model due to the distance from the Site and the significantly larger catchment area, it does provide useful context for the wider catchment.

Based on a review of available historical streamflow data, discharge at the gauge location on Bullock Creek downstream of the Site was generally less than 5 m³/s (mean 0.2 m³/s), with a maximum recorded flow being approximately 37 m³/s during a flood event in 2011, as shown in Figure 2-3.

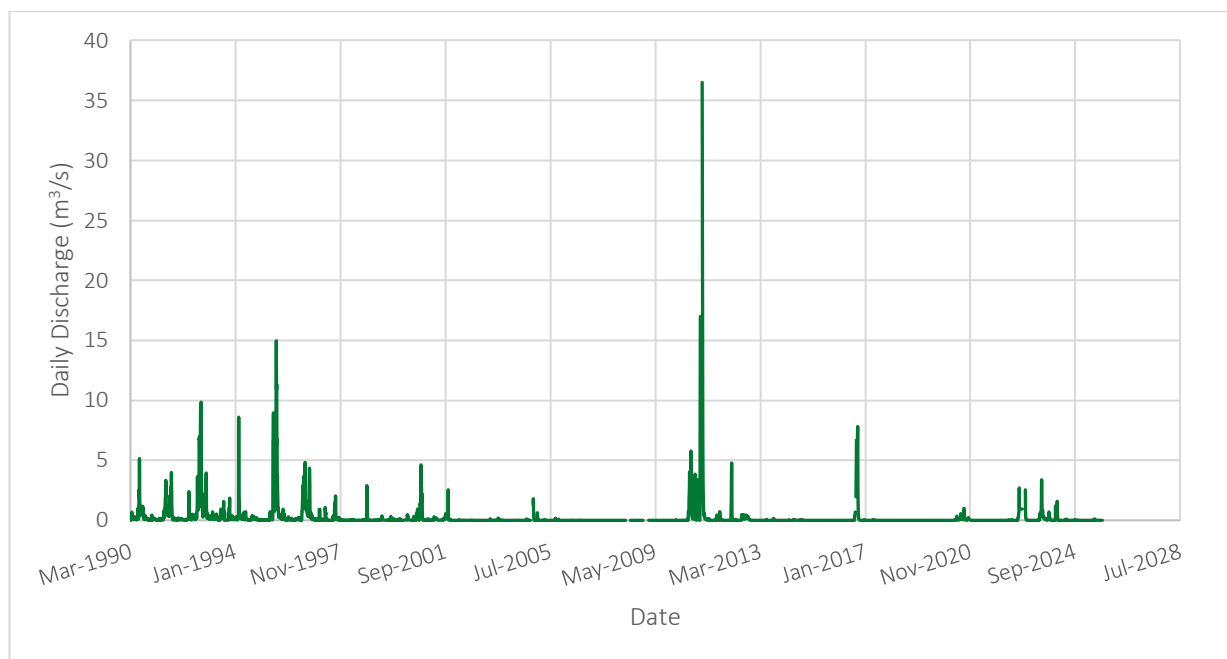


Figure 2-3 Daily streamflow and water levels for Bullock Creek upstream of Box Creek (gauge 407287)

2.6. Australian Rainfall and Runoff (AR&R) Data Hub information

Information required for parameterising surface water models was sourced from the AR&R Data Hub¹ (retrieved 7 October 2025) at the regional catchment centroid (-36.21°S, 144.14°E).

Relevant parameters were sourced from the South East Coast (Victoria) Mitchell-Thomson Rivers sub-region, including recommended areal reduction factors (ARF) and losses.

The IFD information was sourced from the BOM IFD curves (retrieved 16 October 2025) using the centroid coordinates for the delineated catchment. IFD information is required to produce design (e.g. 1% AEP) flow and flood events from the modelling suite.

The relevant parameters and AR&R Data Hub information are included in Appendix A.

2.7. Regional flood frequency estimation

Due to limitations of historical local streamflow gauge data discussed in Section 2.5, the AR&R RFFE model² was run on 16 October 2025 and used to provide design flow comparison and calibration context for hydrologic modelling using the regional catchment domain centroid coordinates. The model uses information from nearby similar catchments to provide an estimation of the peak surface water discharge rates.

The RFFE peak flows are presented in Section 3 alongside calibrated hydrologic modelling results. The RFFE analysis details are provided in Appendix B.

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¹ <http://data.arr-software.org>

² <http://rffe.arr-software.org>

3. Hydrologic modelling

This section outlines the hydrological modelling approach for determining rainfall-runoff relationships at the Site. Hydrologic modelling was undertaken using the RORB (version 6.52) software package to determine peak sub-catchment flows for the delineated contributing catchment area shown in Figure 2-1.

The RORB runoff and routing modelling software package simulates rainfall-runoff processes using the unit hydrograph method to predict the temporal distribution of runoff and associated hydrological response of a catchment resulting from a given rainfall event.

The in-built routing equations allow for adjustment of the following parameters to calibrate the hydrologic model to observed streamflow or RFFE in accordance with AR&R guidelines:

- Rainfall-runoff transformation (m) – the response time between rainfall input and resulting runoff within the specified catchment area. A higher ‘ m ’ value indicates a relatively faster response and shorter duration, while a lower ‘ m ’ value results in a broader peaked unit hydrograph with a more prolonged runoff response.
- Channel routing coefficient (k_c) – the rate at which runoff travels through the defined catchment channels or reaches. A higher ‘ k_c ’ value indicates faster routing through the channel network, while a lower ‘ k_c ’ value indicates slower routing.
- Initial Loss (IL) – the amount of rainfall that is removed from the input hydrograph, due to immediate infiltration, transpiration, and/or evaporation of water which does not contribute to surface runoff within the specified catchment area.
- Continuing Loss (CL) – the amount of rainfall that is lost during a storm event after runoff has started due to infiltration, storage, and/or evaporation.

The resulting peak flows were used as inputs to the subsequent hydraulic (flood depth and velocity) modelling for each modelled design AEP scenario (10%, 2% and 1%).

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3.1. Catchment and drainage

The overall catchment boundary, sub-catchment boundaries and drainages were delineated through the DEM (Figure 2-1) for use in the RORB modelling process. The ArcHydro and ArcRORB plugins were used to create the necessary catchment, sub-catchments and drainage line features (based on the DEM see Section 2.2) including reaches and junction nodes and convert them into the catchment input file for RORB as shown in Figure 3-1.

The modelled catchment relevant to the Site is approximately 33 km² and assumed to be in a predominantly natural condition (i.e. minimal or no lined ditches/channels/drains). Although artificial channels and irrigation ditches exist within the catchment domain, these were not connected to the natural waterways modelled for hydrology assessment purposes. Therefore, all reach types within the catchment file were set to ‘Natural’ and the ‘fraction impervious’ for the model domain was set to zero.

The RORB model reach, node, sub-catchment and catchment file layout details are outlined in Appendix C.

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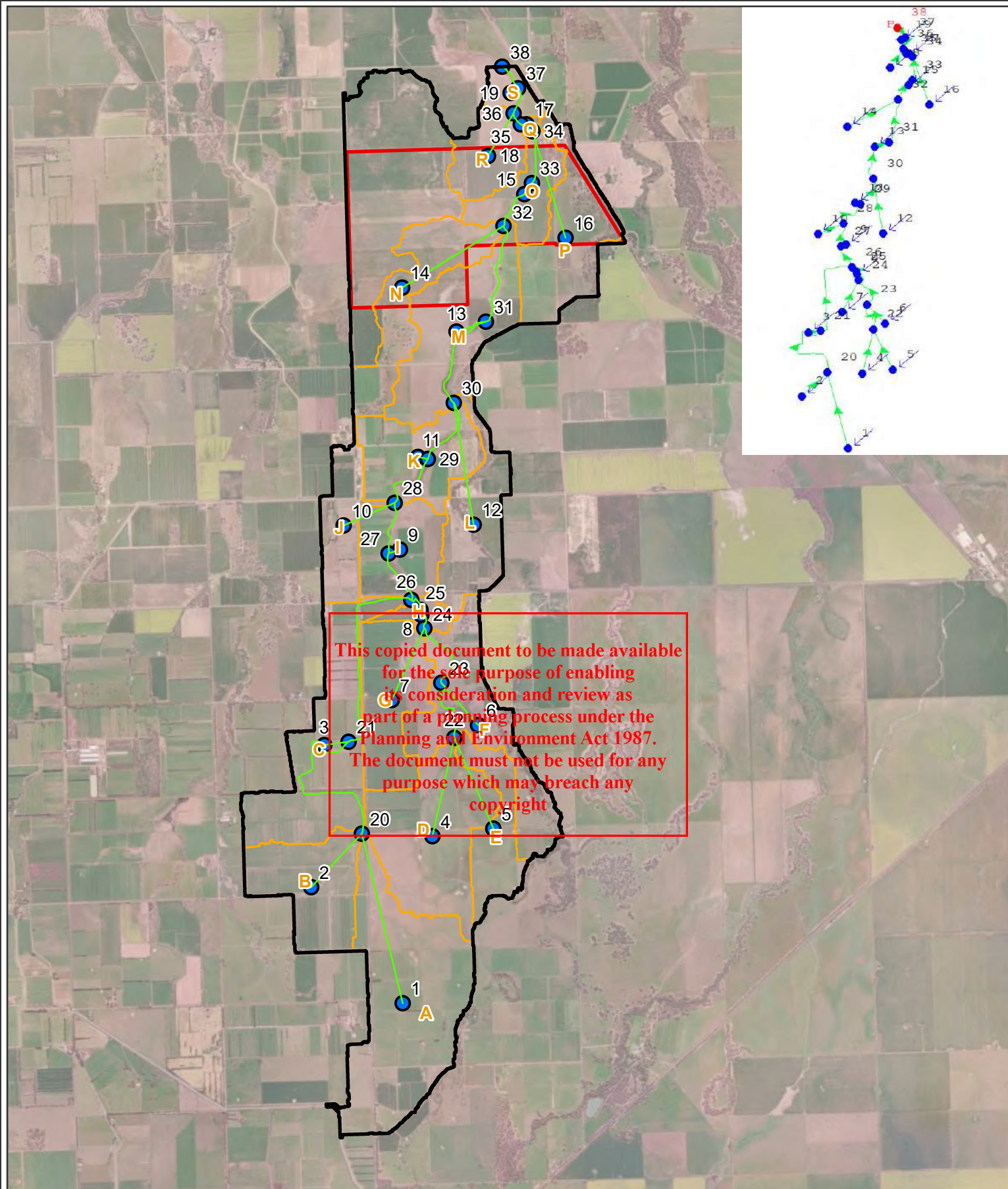


Figure 3-1 RORB model layout

- RORB nodes
- RORB reach
- RORB sub areas
- Catchment boundary
- Site boundary

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3.2. Calibration

Initially the hydrologic model was compared to the RFFE analysis with losses from the AR&R Data Hub (IL = 40 mm, CL = 0 mm/h) however, these losses resulted in a very high peak flow well above the expected RFFE curve. The expected RFFE curve is considered to be high for the size and topography of the catchment; additionally the unusual shape of the catchment renders the RFFE results to be unreliable (see Appendix B). A review of nearby gauged catchments indicated more realistic IL of between 24 mm and 37 mm and CL of 2.3 mm/h to 4.4 mm/h, shown in Table 3-1.

Comparisons of losses and the RORB routing parameters can be seen in Figure 3-2 and Figure 3-3. The range of routing parameters used were based on the Kc equations in RORB for the catchment area, with upper and lower limits calculated based on Pearse et al (2002) methods.

The final adopted routing parameters and losses are presented in Table 3-2. Although the adopted parameters do not result in the best fit to the RFFE expected curve, they are considered to be more appropriate based on the low gradient of the catchment and the resulting curve is within the RFFE confidence limits. Additionally, the unit flow for the calibrated RORB model is well within expected flows when compared to nearby gauged catchments, as shown in Figure 3-4.

Table 3-1 Summary of nearby gauged catchments losses and peak flow

Catchment ID	Comment	IL (mm)	CL (mm)	Mologa Catchment 1 % AEP Peak flow
407236	Nearby (by centroid)	24	2.5	94.42 (3h)
407253	Nearby (by centroid)	26	4.1	86.08 (1.5 h)
406216	Similar size	27	4.4	80.9 (2h)
415257	Same soil type	37	2.3	78.68 (3h)

Table 3-2 Resulting RORB parameters calibrated to RFFE expected peak flow

Parameter	Adopted value	comment
m	0.8	Default m
Kc	20.54	20.54 (average flow distance *2.1 (M. Pearse, 2002)
IL	24	Adjusted relative to ARR Data Hub IL of 41 mm
CL	0.8	Adjusted relative to ARR Data Hub CL of 0 mm/hour.

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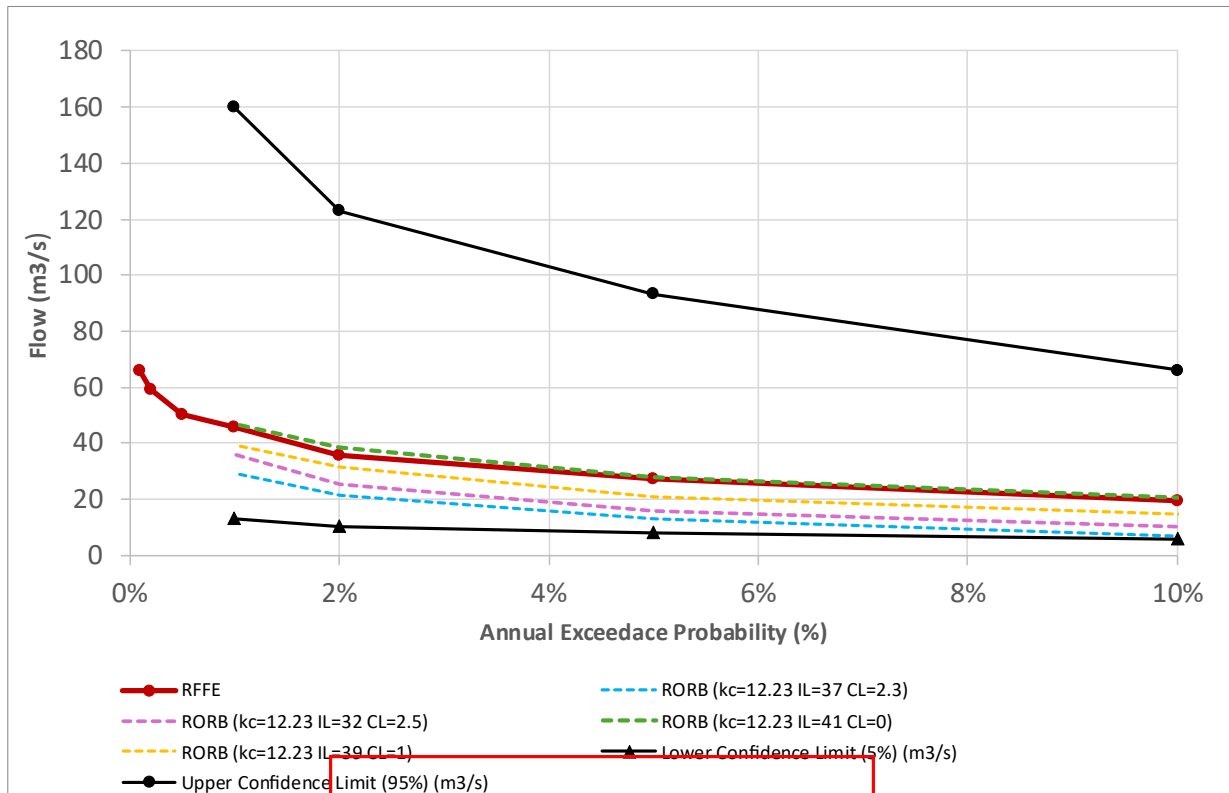


Figure 3-2 RORB loss parameters variability comparison

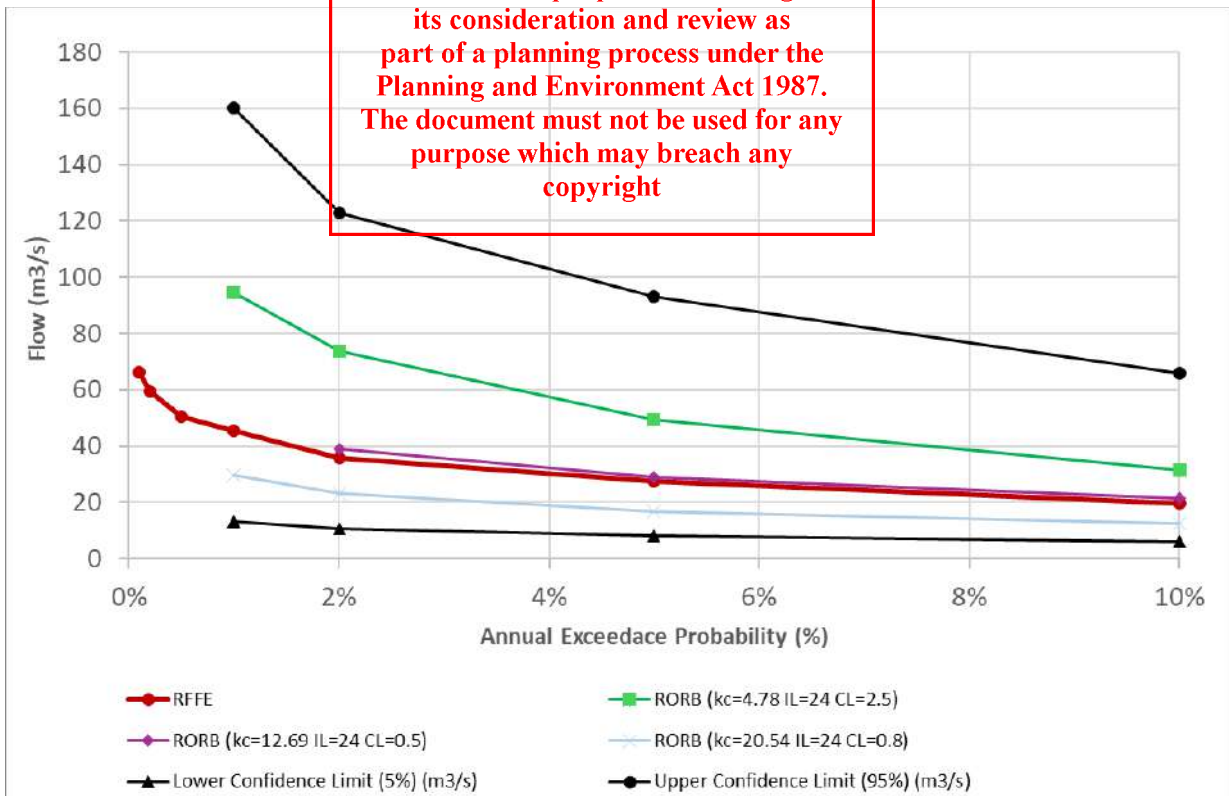


Figure 3-3 RORB routing parameter (kc) variability comparison

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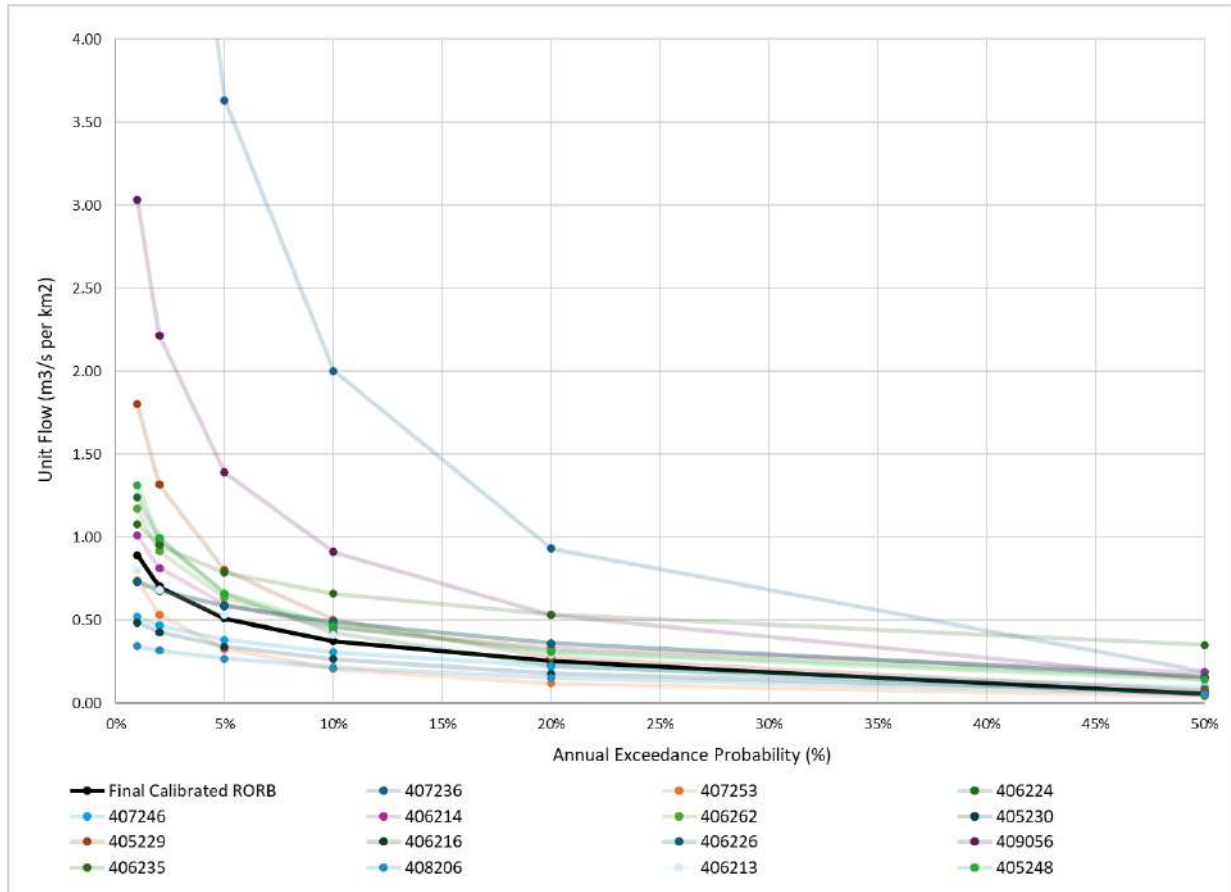


Figure 3-4 Nearby catchment unit peak flow

3.3. Hydrologic model setup summary

To simulate design storms using the RORB model, parameter files were created and are summarised in Table 3-3. The Monte Carlo framework, using repeated random sampling to determine probability of occurrence, was used to examine the impact of different temporal patterns upon peak flow results in accordance with AR&R best practice guidelines.

Note, the areal temporal patterns for the region were applied instead of point temporal patterns due to the contributing catchment size (33 km²) being greater than 1 km² and considering the catchment shape and topography. Areal temporal patterns were available from the AR&R Data Hub for storm durations ranging from 12-hours to 168-hours (see Appendix A).

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Table 3-3 RORB parameter file specifications for design storms

Parameter file section	Detail
Catchment file	• Separate catchment and generated design storm. • RORB catchment file (Figure 3-1). • DESIGN run. • Print at outlet node (Outlet).
Data Hub files	• Data Hub file as discussed in Section 2.6. • Temporal patterns as discussed in Section 2.6. • Use regional losses is unchecked. • Use ARFs from file is checked.
Design Rainfall specification	• Initial-continuing loss model. • A user defined IFD as discussed in Section 2.6. • Monte Carlo simulation from 12- to 168-hour durations (available durations for areal temporal patterns). • Default time increments of 0.5 hours. • Uniform areal pattern. • No pre burst. • Constant losses.
Parameter specification	• Single set of routing parameters. • k_c of 20.54. • Default m of 0.8. • RFFE calibrated IL of 24 mm. • RFFE calibrated CL of 0.8 mm/hr.
Monte Carlo specification	• Number of rainfall divisions: 50 (default). • Number of samples per division: 20 (default). • Temporal patterns as described above. • Monte-Carlo sample initial loss.

3.4. Hydrologic results

The RORB rainfall-runoff hydrologic routing was run to provide verification peak flows or hydraulic modelling.

Although the RORB hydrologic model results were relatively lower than the RFFE expected peak flows, they correspond closely to the TUFLOW peak flows and the expected peak for nearby gauged catchments as shown in Figure 3-4. As RFFE analysis provided expected peak flow quantiles at the modelled catchment outlet, results were used to calculate expected unit flow per km² to allow further comparison between expected quantiles and hydraulic model peak flow results. This shows that both the hydrologic (RORB) and hydraulic (TUFLOW) model peak flows remain within a similar range considering localised hydrologic characteristics of the contributing catchment area.

A summary of the peak flows measured at the modelled catchment outlet is provided in Table 3-4.

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Table 3-4 Hydrologic model peak flow results

AEP	RFFE peak flow (m ³ /s)	Existing		Proposed
		RORB peak flow (m ³ /s)	TUFLOW peak flow (m ³ /s)	TUFLOW peak flow (m ³ /s)
10%	19.7	12.46	10.4	10.5
2%	27.4	16.92	24.0	24.1
1%	45.6	29.68	30.1	31.3

Modelling of proposed conditions indicated a minor change in peak flows (1%-4% across modelled AEP scenarios) relative to existing conditions due to proposed condition terrain modifications causing slight diversion of hydrologic flows.

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4. Hydraulic modelling

This section outlines the hydraulic modelling approach for determining flow characteristics across the Site. Hydraulic modelling was conducted using the TUFLOW modelling software package. TUFLOW models were developed using a two-dimensional (2D) rain-on-grid analysis for the target AEP scenarios (10%, 2% and 1% AEP). The below sections outline the process undertaken to set up the TUFLOW model.

4.1. Model domain and geometry

The hydraulic 2D flow area model domain encompassed the regional catchment covering the Site (Figure 4-1). A computational mesh spacing of 10 m by 10 m was applied across the 2D flow area perimeter. A refined mesh was applied automatically in TUFLOW where 1D features (culverts) are joined to the 2D mesh. The 10 m by 10 m mesh was deemed optimal through initial model run comparison of hydrograph results to model simulation times (i.e. where no additional benefit in resolution of results was gained through reduction of mesh cell size and model run times drastically increased).

As the 2D model domain encompassed the entire contributing catchment area for the Site, the only hydrologic inputs were rain-on-grid, with no external inflow hydrographs.

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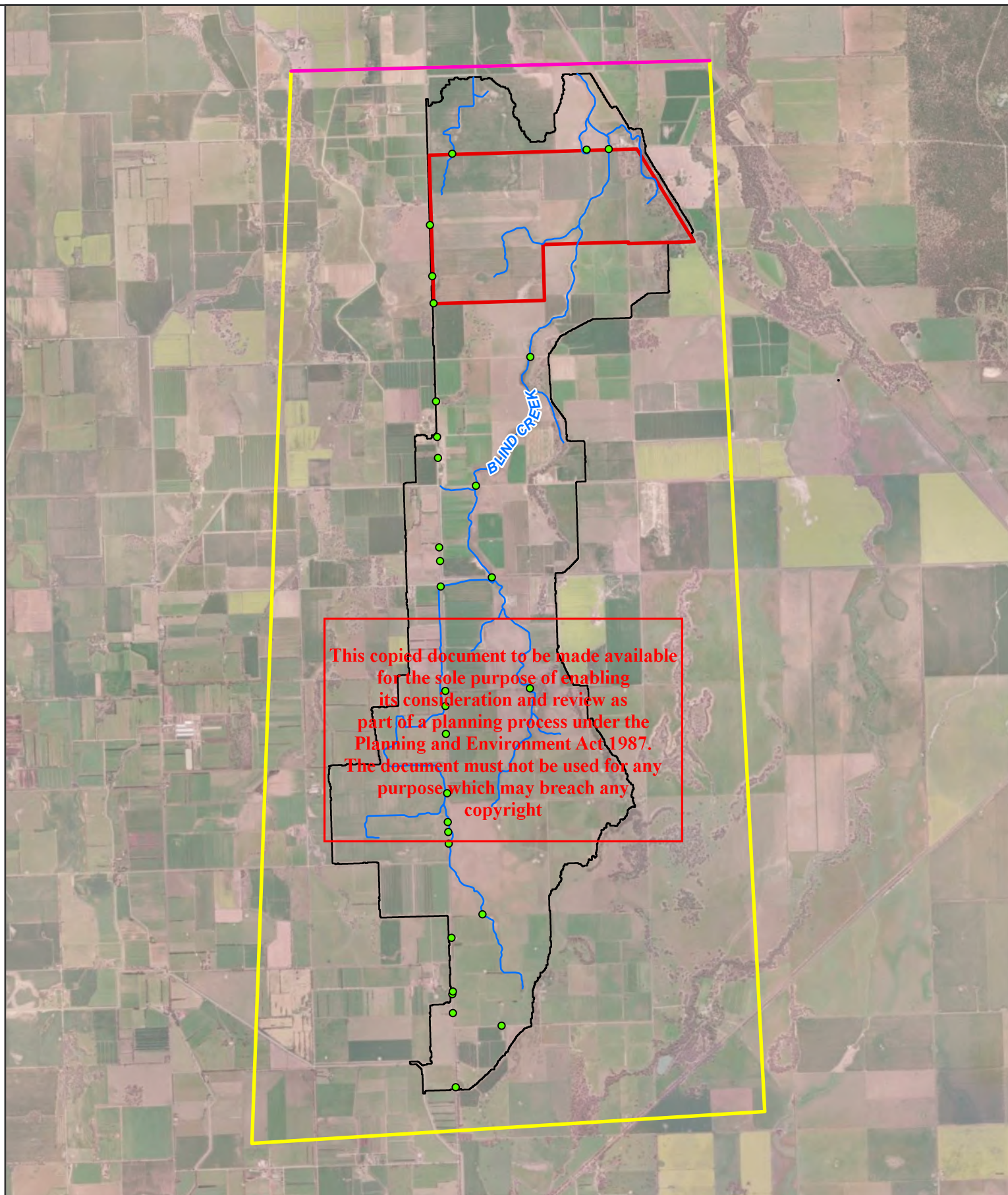
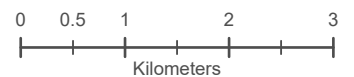


Figure 4-1 Hydraulic model catchment domain

- Culvert location
- Streams
- Model boundary condition
- Site boundary
- Model domain
- Catchment boundary

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4.2. Roughness

Roughness coefficients are used to define the frictional resistance against moving water across the terrain and controls the shape of flow hydrographs resulting from rainfall and upstream flow. These coefficient values are defined from the extent of flow path ranges, i.e. from concrete to floodplain channels. Modelling the whole 2D catchment area, which extends outside of normal channels and their corresponding slopes, requires much larger roughness values than are typically applied to models that just model in channel streamflow.

A catchment-wide Manning's roughness coefficient of 0.035 was applied to the model, reduced from initial roughness of 0.06, to calibrate the model to expected peak flows based on RFFE and RORB results. A roughness coefficient of 0.035 remains within a range representative of rural and undeveloped land use, particularly where vegetation is sparse. This was further refined with a defined channel roughness of 0.03, applied using a shapefile of "Land cover" regions to the model and assigning roughness coefficients to each region independently. The areas defined as channels were identified from flow paths generated from initial model runs. The minimal difference between the "channel" roughness and that of the surrounding land is representative of the lack of definition in the drainages.

4.3. Critical duration and temporal pattern

The critical duration of a rainfall event at any given location within the floodplain is that which produces the highest peak flow for any given AEP. The temporal pattern represents the temporal distribution of total rainfall depth over the duration of the storm. Figure 4-2 shows box plots of the peak flows for ten standard temporal patterns for storm durations from 72-hours to 168-hours for the 1 % AEP event. The design storm selected was the one that produced the maximum peak flow (1% AEP 31.2 m³/s under existing conditions) at the catchment outlet (120-hour temporal pattern 6), this is considered to be a conservative assessment and aligns more closely with the RFE expected flows (1% AEP 46.9 m³/s).

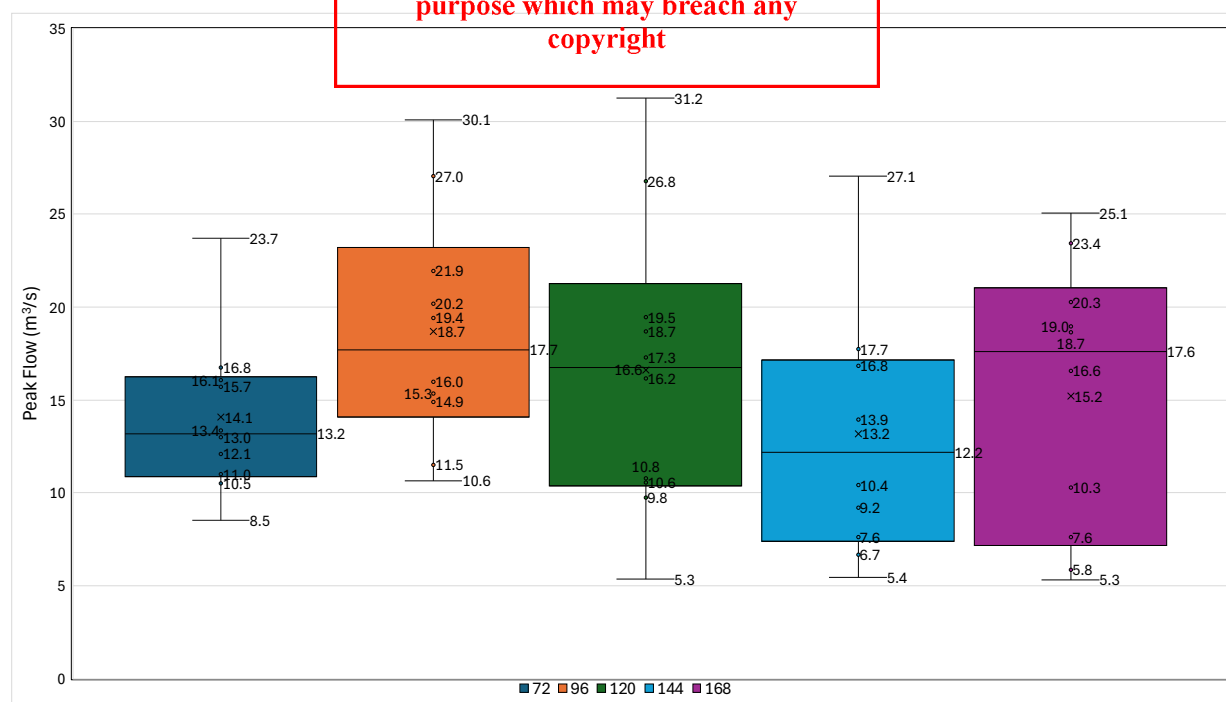


Figure 4-2: 1% AEP Peak flow box plots at catchment outlet

For each flood design scenario, the critical design storm duration was determined based on results from the TUFLOW model domain catchment area. The areal temporal patterns were used without areal reduction factors as the catchment is 33 km², larger than the 1 km² threshold.

When the critical duration for each target AEP was determined, the ten temporal patterns for that duration were compared to choose the pattern that yielded the maximum peak flow; this approach is considered to be conservative compared to the AR&R Guidelines but yields a peak flow closer to RFFE.

The critical durations for the 10%, 2% and 1% AEP design scenarios were 96-hours and 120-hours, as shown in Table 4-1. Cumulative total rainfall depth and temporal distribution is shown in Figure 4-3.

Table 4-1 Final design storm event and temporal pattern summary

AEP (%)	Rain depth (mm)	Event ID	Temporal pattern number	Critical duration (h)
10	90.7	5890	Tp04	4 days (96h)
2	136	5982	Tp06	5 days (120h)
1	156	5982	Tp06	5 days (120h)

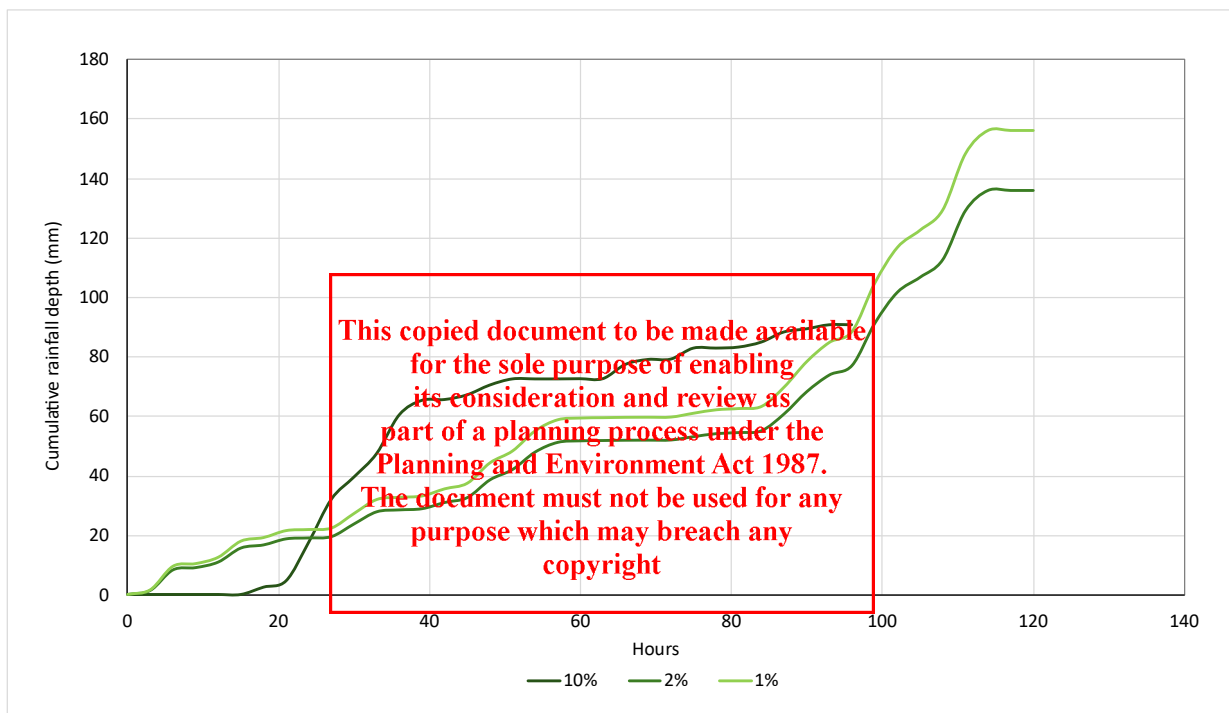


Figure 4-3 Final design storm rainfall depths applied to 2D flow area for the 10%, 2% and 1% AEP design events

4.4. Design storm

The precipitation inputs were derived from the BoM IFD tables sourced on the 2 October 2025 (BoM, 2016), included in Appendix A.

Excess rainfall depths and patterns were calculated for each critical duration and design storm temporal pattern using the losses determined from RORB calibration (IL of 24 mm and CL of 0.8 mm/hour). The resulting excess rainfall hyetograph based on the selected temporal pattern for the 120-hour critical duration under the 1% AEP design rainfall scenario is shown as an example in Figure 4-4.

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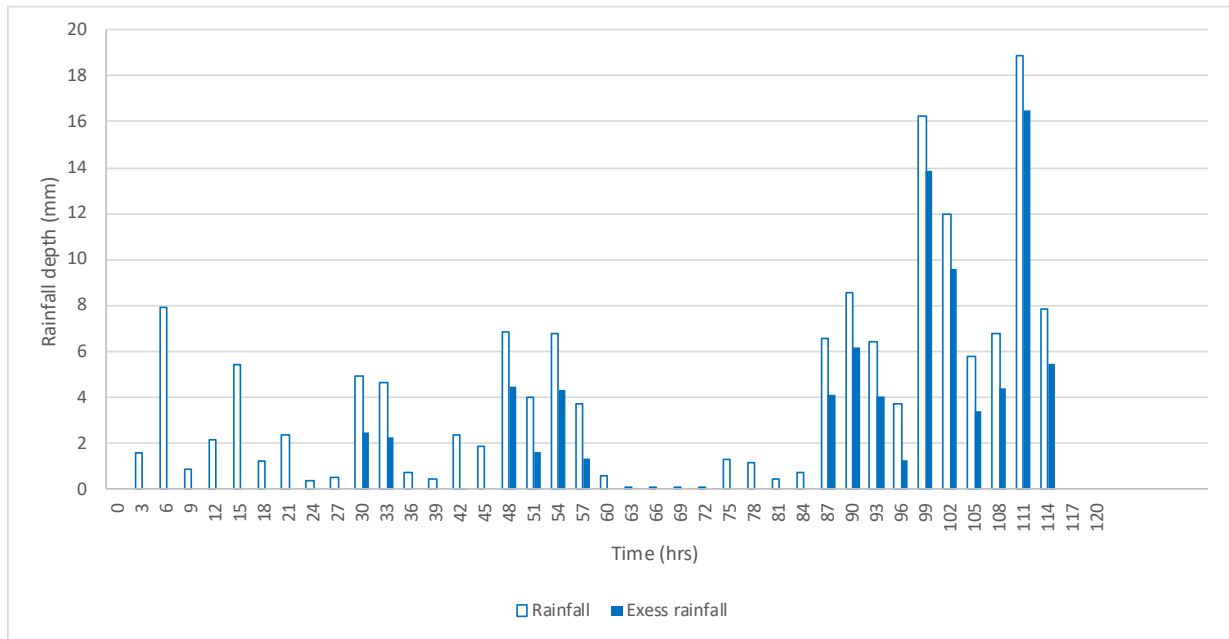


Figure 4-4 1% AEP 120-hour critical duration design storm excess rainfall pattern

Loss sensitivity analysis was undertaken for existing conditions under the 1% AEP design scenario to assess the effect of losses on peak flows, depths and velocities as summarised in Table 4-2. Results are discussed in Section 5.3.

Table 4-2 Adopted design rainfall event losses for sensitivity analysis

Loss scenario	AEP events	IL	CL
Normal (adopted, RORB calibrated ¹)	100%	24	0.8
Upper limit	1%	41	4.4
Lower limit	1%	17	0

4.5. Outflow boundary conditions

Locations where water exits the model domain (outflows) require boundary conditions to be specified. The concentrated flow paths that exit the model domain were set to a normal depth boundary condition, using the uniform bed slope of each flow path as the estimated energy slope, as measured from the available terrain data.

A normal flow slope of 0.003 was applied to the primary drainage outflow downstream of the Mologa Solar Hybrid Site. The slope applied to the model was calculated based on review of underlying terrain within the primary Blind Creek drainage channel at the model outlet and is representative of typical stream gradient for flat terrain such as that within the Site and contributing catchment area.

4.6. Proposed conditions

To assess potential changes to flood characteristics under proposed conditions, the model terrain was altered based on layout information provided by Urbis, superimposed on the underlying terrain surface. They account for changes in the topography of the surface elevations and the roughness of the land surface under proposed conditions. The terrain modifications associated with each component of the proposed layout are summarised in Table 4-3 and shown in Figure 4-5.

Table 4-3 Proposed conditions land cover regions

Landcover regions	Roughness	% impervious	Terrain modification
Office Buildings	0.01	100	+3 m
Mologa Terminal Station/BESS	0.02	30	+0.5 m
Tracks(internal) and Laydown	0.023	70	n/a
Main Roads	0.015	80	n/a

As no detailed design information was available for infrastructure located within the BESS compound (i.e. office buildings, Mologa Terminal Station and BESS), general assumptions about building and platform height were adopted for the purposes of proposed condition modelling:

- For the office buildings, an impervious surface was raised 3 m above existing ground level, representative of the potential height from the ground surface to the building roof.
- For the substation and BESS, a partially impervious surface was raised 0.5 m above existing ground level, representative of the potential infrastructure platform height.

Actual building, platform and/or final surface levels may differ from adopted assumptions however, the proposed condition design flood event model results are unlikely to change unless the layout and location of Site infrastructure is altered from modelled conditions.

An example of the land cover regions for the existing/post-closure and proposed condition scenarios is shown in Figure 4-5.

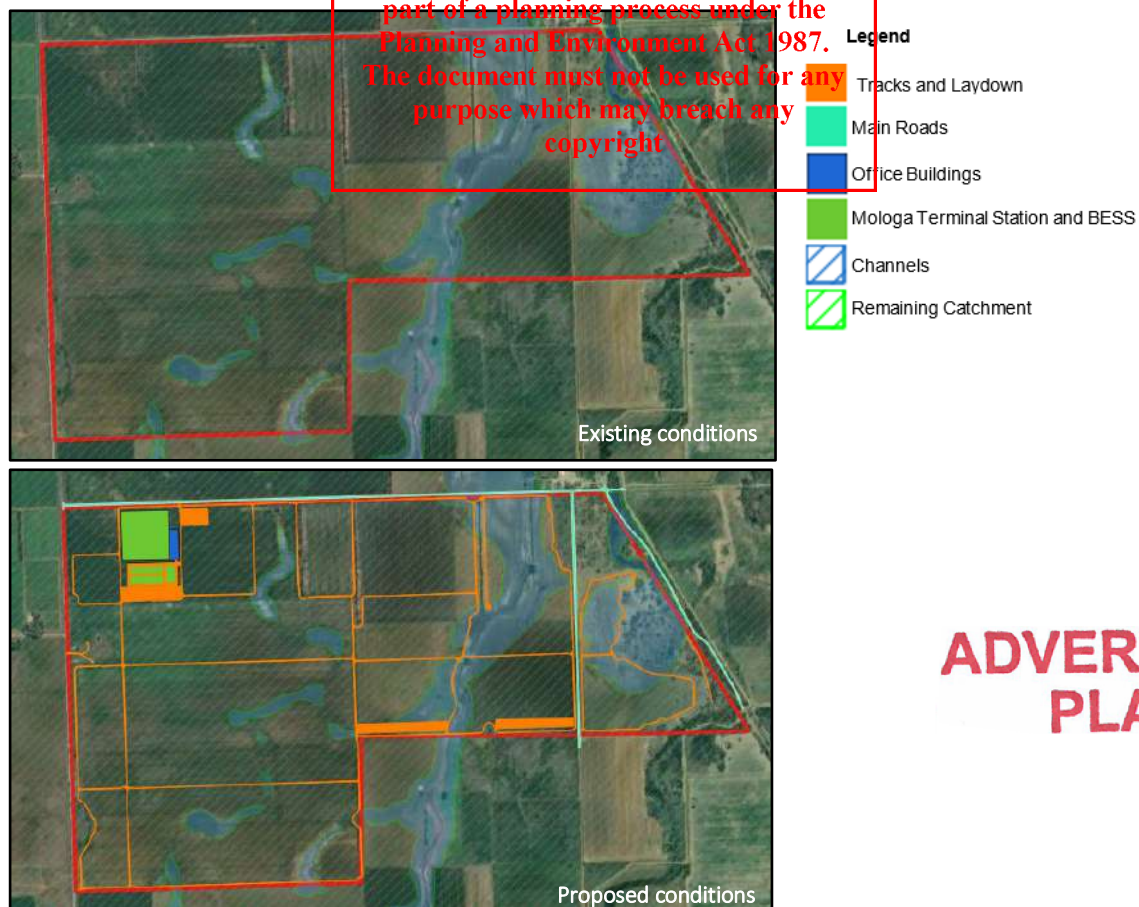


Figure 4-5 Manning's n roughness coefficient and percent impervious land cover regions

5. Hydraulic results

For each modelled AEP event and scenario, maximum flood depths and velocities were extracted for the Site as discussed below. Maximum modelled flood depths and velocities for each scenario are provided in Appendix D.

5.1. Existing conditions

Modelled maximum flood depths showed that, while there is significant area impacted by shallow inundation across the Site, deeper waters are confined to the primary flow paths and natural depressions in existing terrain. The main drainage features within the Mologa assessment area include:

- Blind Creek is the primary drainage line flowing south to north through the eastern portion of the Site. It joins Bullock Creek 6 km downstream of the project boundary.
- Another unnamed drainage line runs roughly parallel to Blind Creek 1 km to the west. Under flood conditions they are joined by a shallow linking stream.
- There is significant ponding present on the eastern section of the Site between Old Church Road and Mitiamo-Kerang Road.

While there is significant ponding on the Site, the velocities are considered to be low, generally less than 0.5 m/s. Isolated areas along Blind Creek have modelled velocities of up to approximately 0.9 m/s. Maximum modelled flood depths and velocities for each modelled AEP event are summarised in Table 5-1.

Table 5-1 Summary of existing conditions overland flow hydraulic results within assessment area

AEP	Maximum modelled depth (m)	Maximum modelled velocity (m/s)
10%	1.85	0.8
2%	1.90	0.9
1%	1.95	0.9

Note: Extracted values are based on hydraulic model results within the Mologa project area inclusive of existing dams and drainage lines.

An overall maximum flood depth of 1.9 m was observed in small, isolated areas of existing dams as shown in Figure 5-1. The maximum modelled depth within Blind Creek was 1.2 m under the 1 % AEP event.

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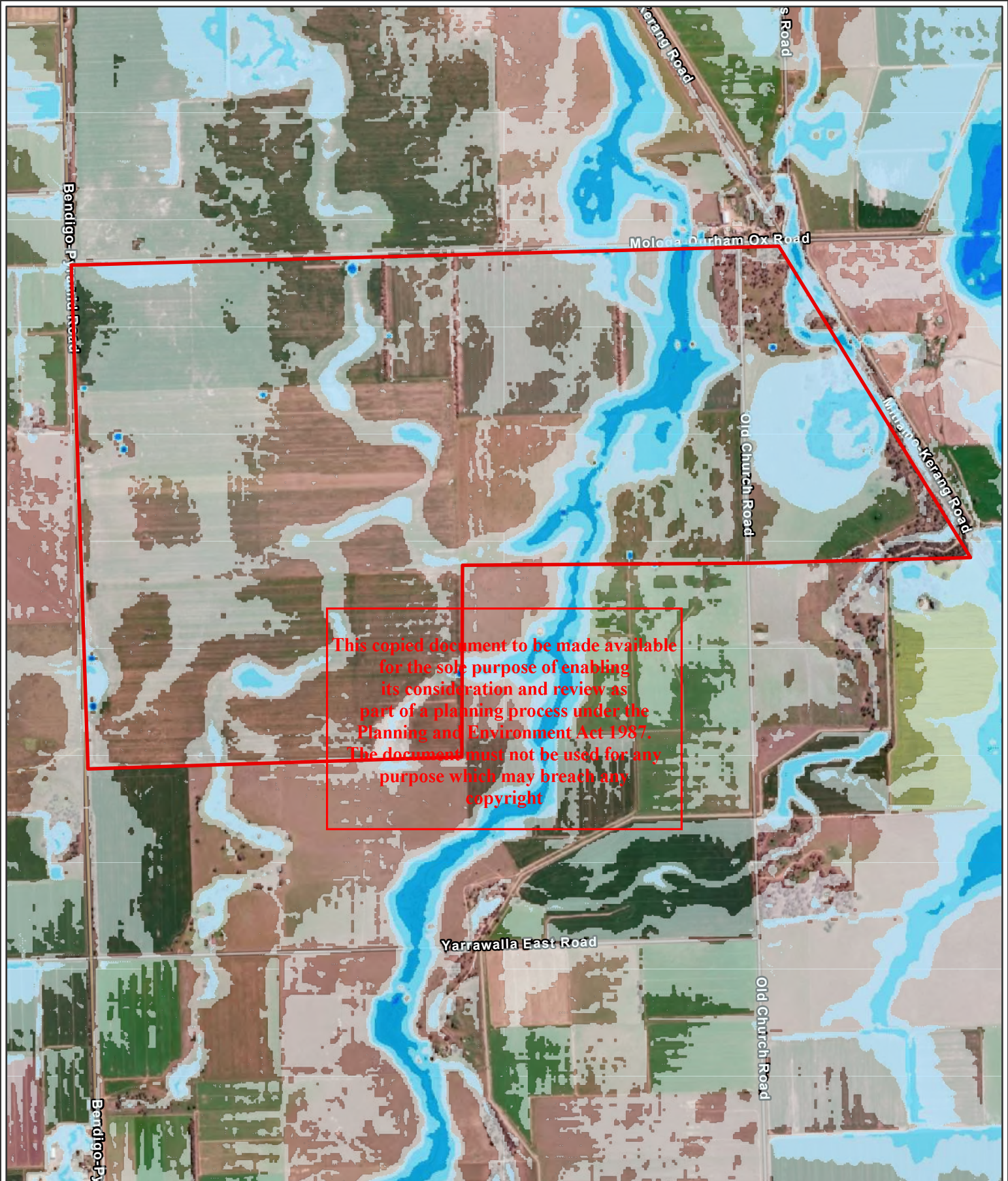


Figure 5-1 1% AEP maximum flood depth - existing conditions

Depth (m)	 0.751 - 1	 Site boundary	 0 0.25 0.5 1 Kilometers
0.003 - 0.01	 1.001 - 1.25		
0.011 - 0.15	 1.251 - 1.5		
0.151 - 0.3	 1.501 - 2		
0.301 - 0.5	 2.001 - 3		
0.501 - 0.75	 3.001 - 4.532		

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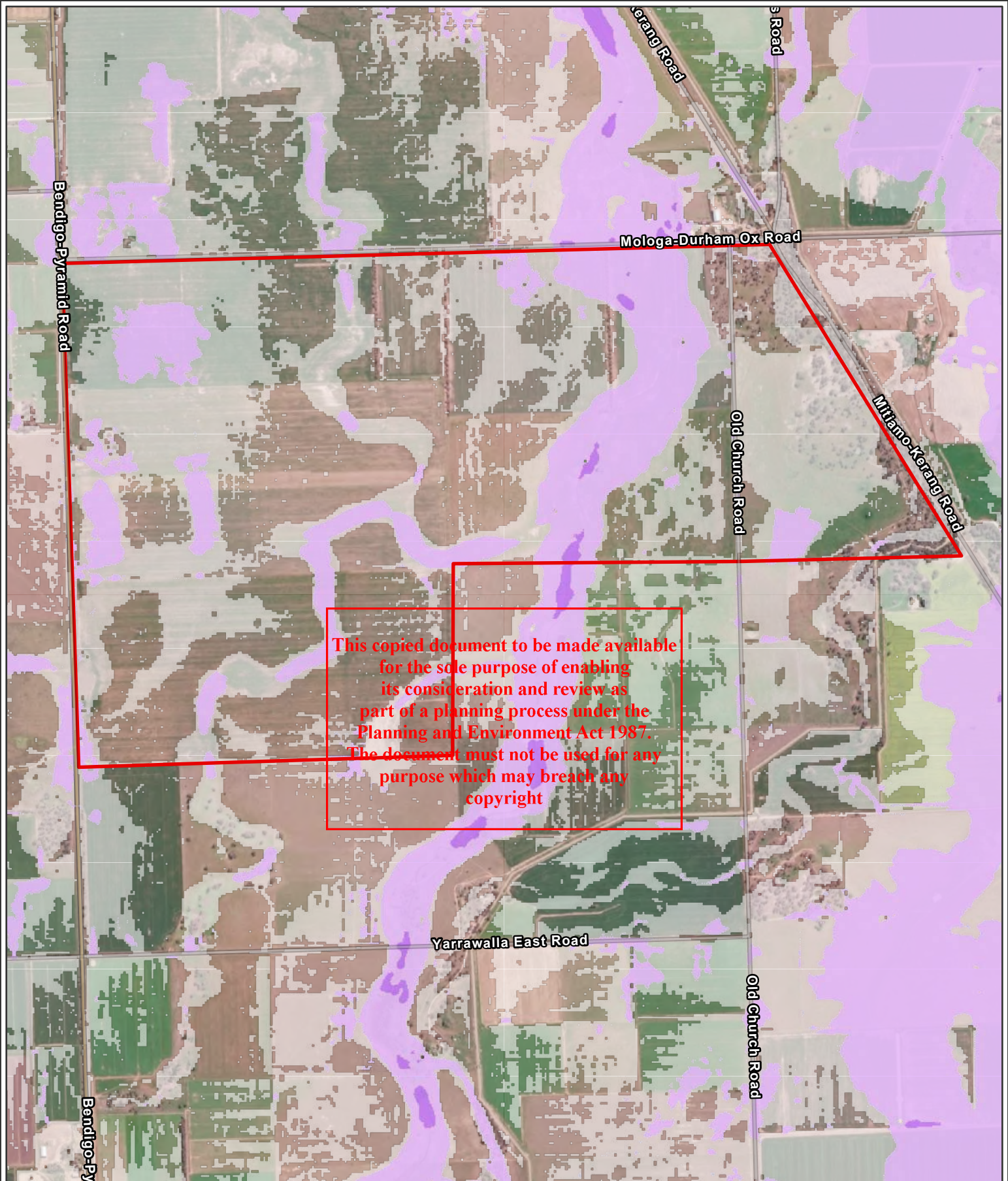



Figure 5-2 1% AEP maximum flood velocity - existing conditions

Velocity (m/s)

0.01 - 0.1

0.1 - 0.5

0.5 - 1

1 - 2

2 - 4

Site boundary

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0 0.25 0.5 1

Kilometers

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5.2. Proposed conditions

The model terrain and roughness were altered to reflect the proposed development as documented in Section 4.6. Modelling of the proposed conditions under the 1% AEP, 2% and 10% AEP scenarios showed minimal change (0 to 1% increase) in peak flow results relative to existing conditions as summarised in Table 5-2 and shown in Figure 5-3.

Changes to the inundation extent and depth are presented in Figure 5-4 (1% AEP proposed flood depth) and Figure 5-5 (1% AEP depth afflux), and show changes to the extent primarily around the BESS and Substation areas and the office building which were locally raised in the model terrain. It should be noted that the preliminary design layout places panels over areas of Blind Creek where flood depths are significant (over 0.75 m in places). This assessment has not considered impacts from earthworks that maybe implemented to limit the extent of inundation under these areas.

Table 5-2 Peak flow at outlet under proposed and existing conditions

AEP (%)	Critical duration (h)	Rain depth (mm)	Event ID	Temporal pattern number	Peak flow (proposed)	Peak flow (existing)	% change
10	4 days (96h)	90.7	5890	Tp04	10.5	10.4	1%
2	5 days (120h)	136	5982	Tp06	24.1	24.0	0.4%
1	5 days (120h)	156	5982	Tp06	31.3	31.2	0.3%

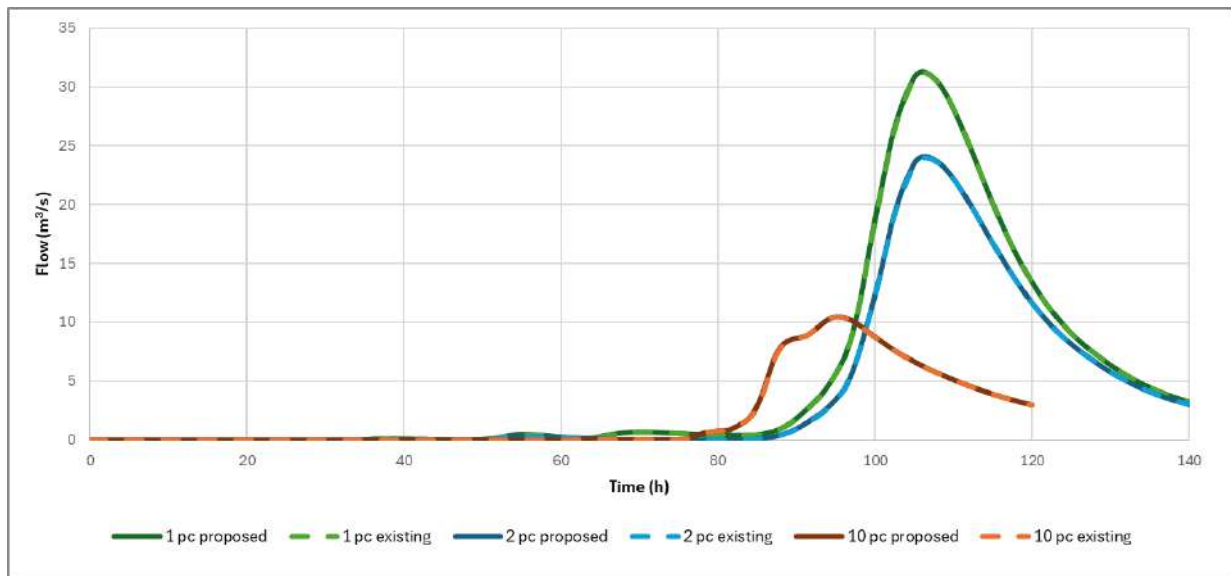


Figure 5-3 Peak flow for existing and proposed conditions

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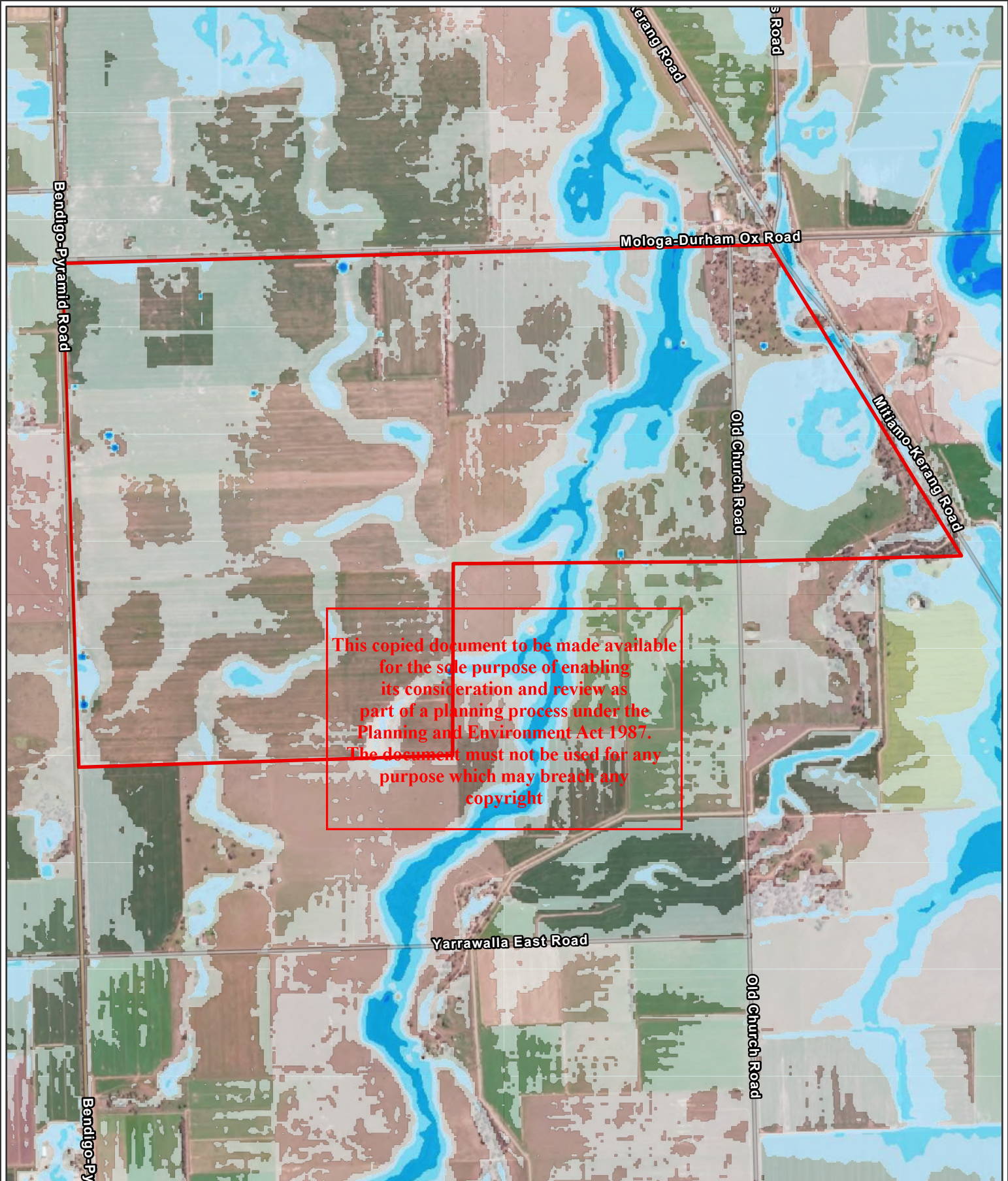


Figure 5-4 1% AEP maximum flood depth - proposed conditions

Depth (m)	0.751 - 1	Site boundary		Datum/Projection: GDA2020 MGA Zone 55 Project: 25ADL11237-EH Date: 4/12/2025
0.003 - 0.01	1.001 - 1.25			
0.011 - 0.15	1.251 - 1.5			
0.151 - 0.3	1.501 - 2			
0.301 - 0.5	2.001 - 3			
0.501 - 0.75	3.001 - 4.532			

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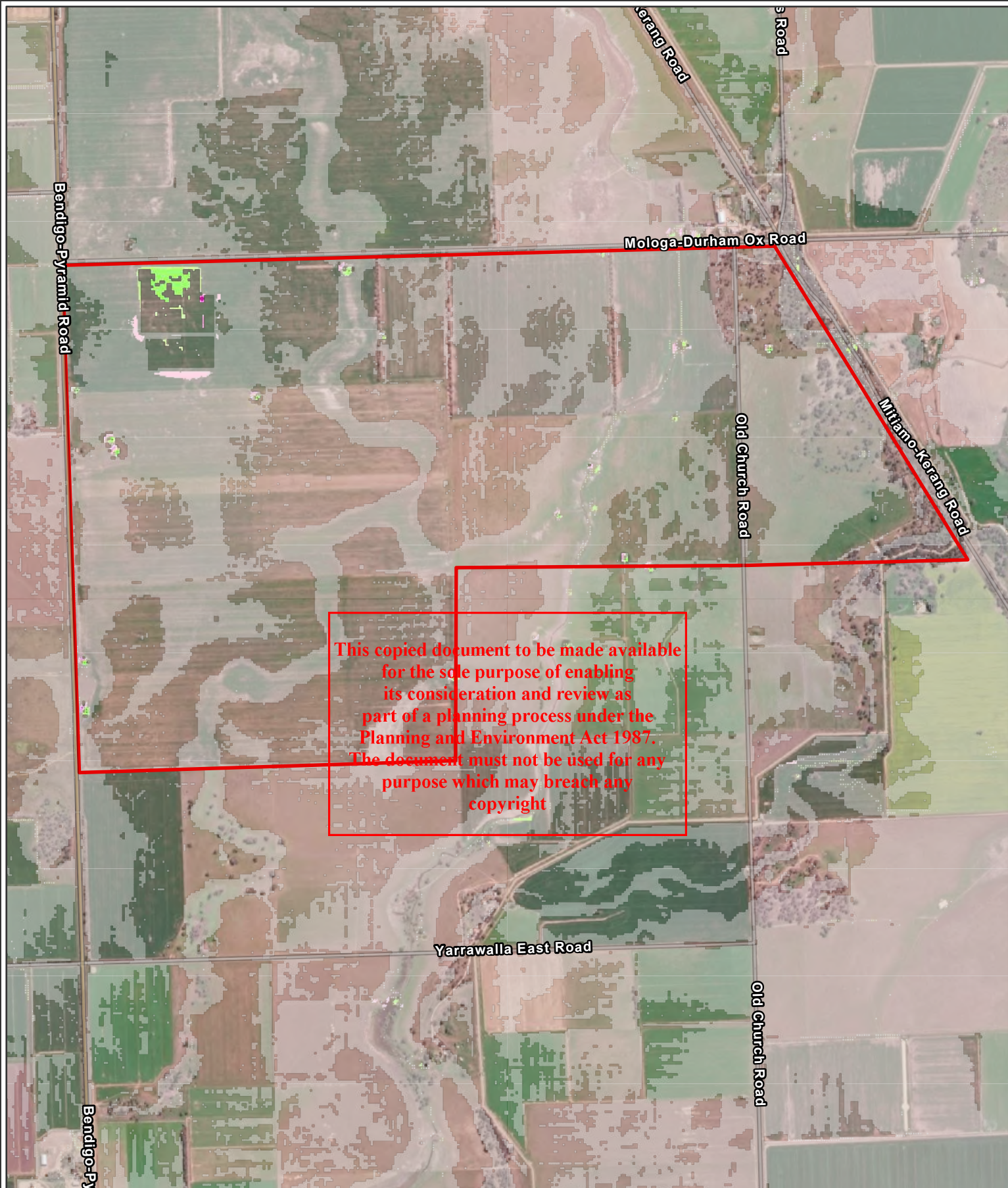
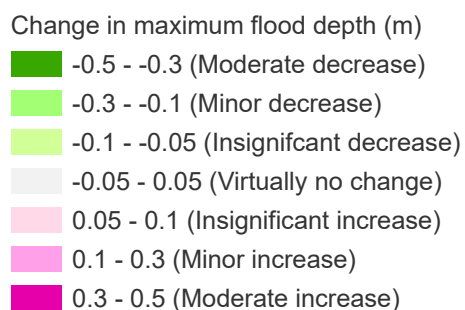
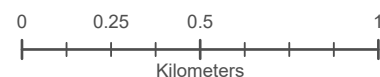


Figure 5-5 1% AEP maximum flood depth - afflux



Site boundary



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5.2.1. Flood hazard classification

The hydraulic flood modelling results (Section 5.2) were used to classify flood hazard and associated risk at the Site in accordance with Victoria State Government/Melbourne Water guidelines (Victoria State Government and Melbourne Water, 2025) which are based on the *Australian Disaster Resilience (ADR) Handbook 7* (Australian Institute for Disaster Resilience, 2017). The guidelines note that flood hazard conditions may exist without flood risk where no human interaction with flooding will occur (i.e. within the main channel of Blind Creek away from roads and infrastructure).

To determine maximum flood hazard classification for each design scenario, flood hazard vulnerability curves have been adopted from ADR Guideline 7-3 as summarised in Table 5-3.

Table 5-3 Flood classification vulnerability thresholds

Hazard vulnerability classification	Description	Limiting velocity (V) (m/s)	Limiting depth (D) (m)	Classification limit (m ² /s)	Resulting hazard level
H1	Generally safe for vehicles, people and buildings	2.0	0.3	$V \times D \leq 0.3$	Low
H2	Unsafe for small vehicles	2.0	0.5	$V \times D \leq 0.6$	Medium
H3	Unsafe for vehicles, children and the elderly	2.0	1.2	$V \times D \leq 0.6$	High
H4	Unsafe for vehicles and people	2.0	2.0	$V \times D \leq 1.0$	High
H5	Unsafe for vehicles and people. All building types vulnerable to structural damage. Some less robust building types vulnerable to failure	4.0	4.0	$V \times D \leq 4.0$	Extreme
H6	Unsafe for vehicles and people. All building types considered vulnerable to failure	-	-	$V \times D > 4.0$	Extreme

The maximum modelled flood depth and velocity for each scenario within the Site was compared to defined thresholds for each respective parameter. The maximum resulting classification for each modelled AEP event is summarised in Table 5-4, noting that maximum depth and velocity did not occur at the same location, therefore the calculated maximum product of velocity and depth is not equal to the product of the individual maximum parameters.

Table 5-4 Summary of flood hazard classification for Site

Scenario	Maximum V (m/s)	Maximum D (m)	Maximum $V \times D$ (m ² /s)	Maximum flood hazard classification	Maximum hazard level
10% AEP	0.73	1.29	0.35	H4	High
2% AEP	1.49	1.30	0.49	H4	High
1% AEP	1.54	1.31	0.54	H4	High

The maximum flood hazard classification under the 1% AEP scenario was determined as H4 (unsafe for vehicles and people) due to maximum depth up to 1.31 m in Blind Creek. However, the H4 classification is confined to small, isolated areas of deeper water within Blind Creek, existing dams and one anomaly near the eastern edge of the Mologa Terminal Station boundary. The majority of the Site has a hazard level of H1 and Blind Creek, H3 as shown in Figure 5-6.

The isolated area of increased flood hazard near the eastern edge of the Mologa Terminal Station is likely to be a result of the increase in velocity due to the terrain modification for the office building. The terrain was lifted by 3 m to simulate the building, inclusive of ground level to roof height, and the velocity has increased as a result of this lift. It is likely that simple stormwater management systems

(e.g. rainwater capture) will be sufficient to adequately reduce the runoff in this area. As solar panel installation is planned for areas of Blind creek where the hazard level is expected to be up to H3 (depth between 0.5 m and 1.2 m, velocity <2 m/s, $V \times D \leq 0.6$), additional management or mitigation measures should be considered such as works to divert or contain floodwaters or increasing the minimum height of the solar panels to 0.6 m above ground level to provide a minimum of 300 mm freeboard above the 1% AEP flood depth. Additional refined hydrologic and hydraulic modelling may be undertaken based on final landform and Project layout design to ensure adequacy of flood impact mitigation measures.

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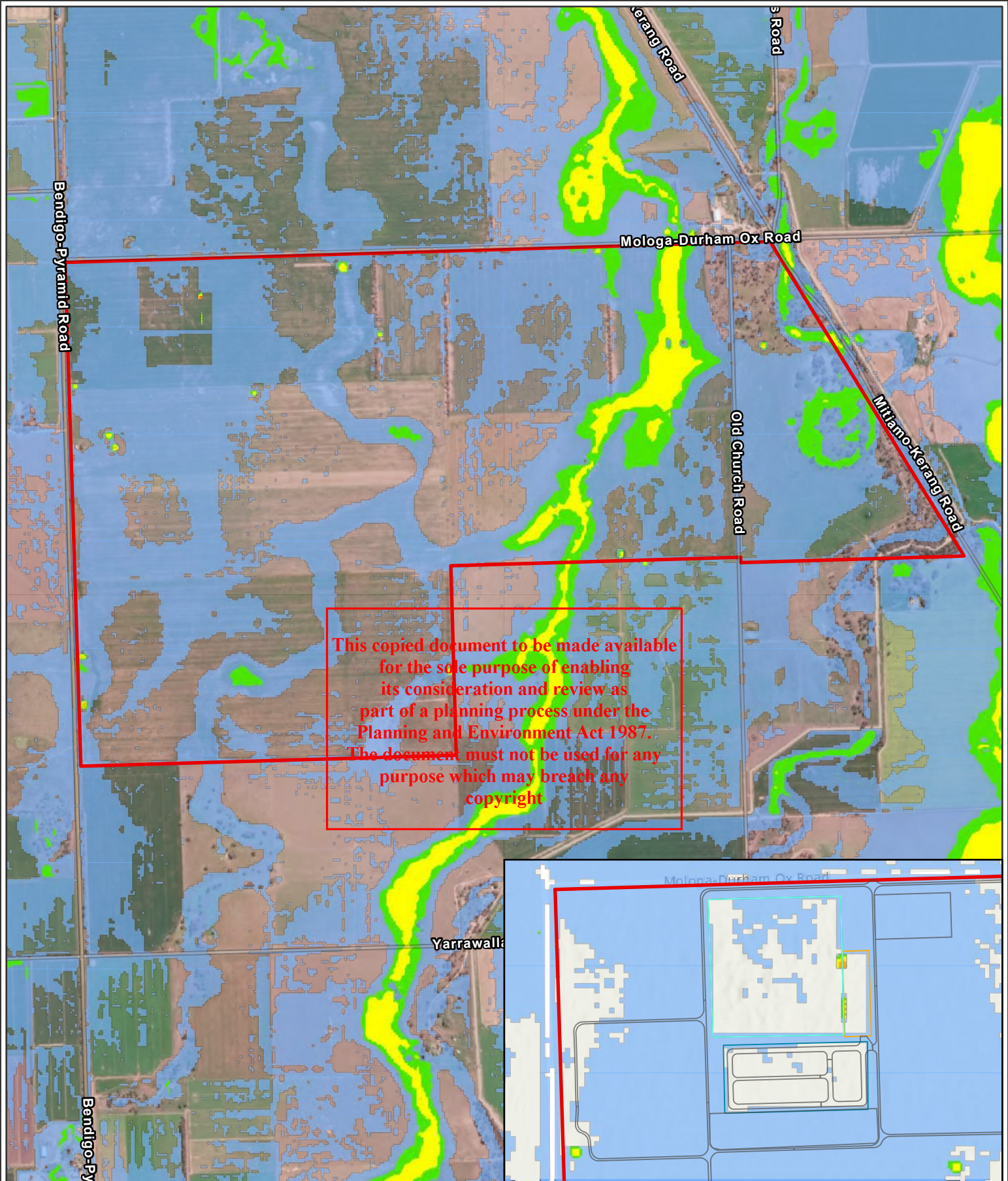


Figure 5-6 1% AEP maximum flood hazard - proposed conditions

Site boundary

 Access track

 Molloga Terminal Station

 BESS

 Building

Flood hazard classification

H1

H2

H3

H4

H5

H6

0 0.25 0.5 1

Kilometers

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5.2.2. Climate change

Three climate change scenarios were modelled based on the 1% AEP under the proposed development conditions with mitigation measures. Temperature changes based on long term (2081-2100) estimates. Despite the evidence that temporal patterns may become more front loaded, there is currently no approved methodology for estimating the change and therefore no changes have been made to the temporal pattern. (DCCEEW, 2023). Table 5-5 presents the changes in climatic parameters based on a range of low to high Shared Socio-economic Pathways (SSPs).

Table 5-5 Climate change predicted temperature changes and rates of change

Parameter	SSP1-2.6 (low)	SSP2-4.5 (medium)	SSP3-7 (high)
Temperature change (long term) °C ¹	1.7	2.7	3.6
Change in initial loss (Murray basin) (%/°C) ²	3.1	3.1	3.1
Change in continuing loss (Murray basin) (%/°C) ²	6.7	6.7	6.7
Change in total rainfall depths 12h (%/°C) ³	9	9	9

Modelled peak flow increased in correlation to the severity of each climate change scenario, with SSP3 experiencing 49% increase in the flow at the sub catchment outlet, as shown in Figure 5-7. The area of inundation, maximum depths and velocities were also slightly increased as expected and shown in Figure 5-8.

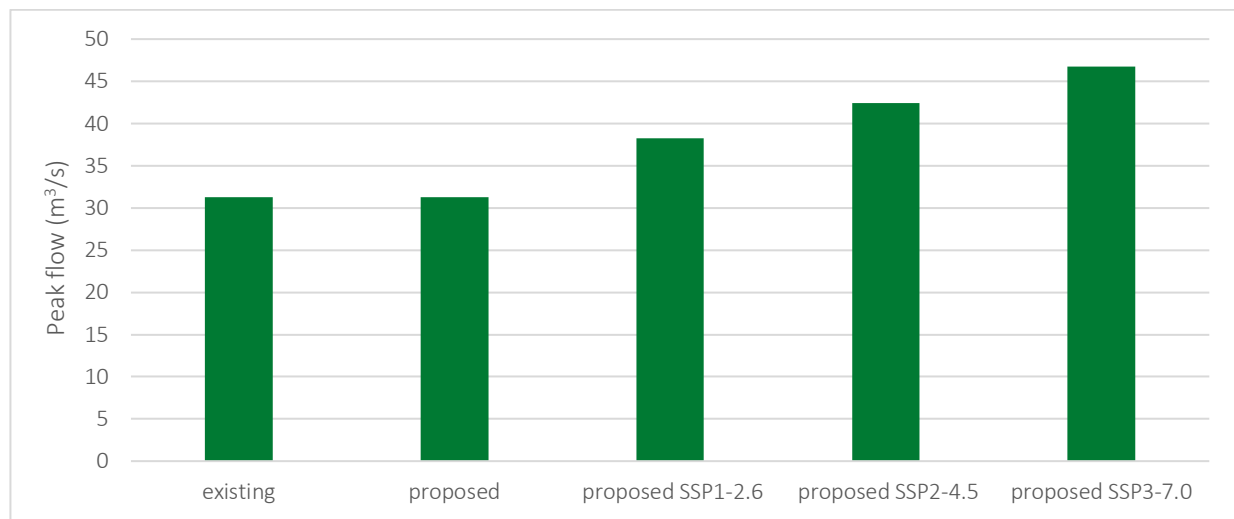


Figure 5-7 Peak flow at sub catchment outlet under climate change scenarios

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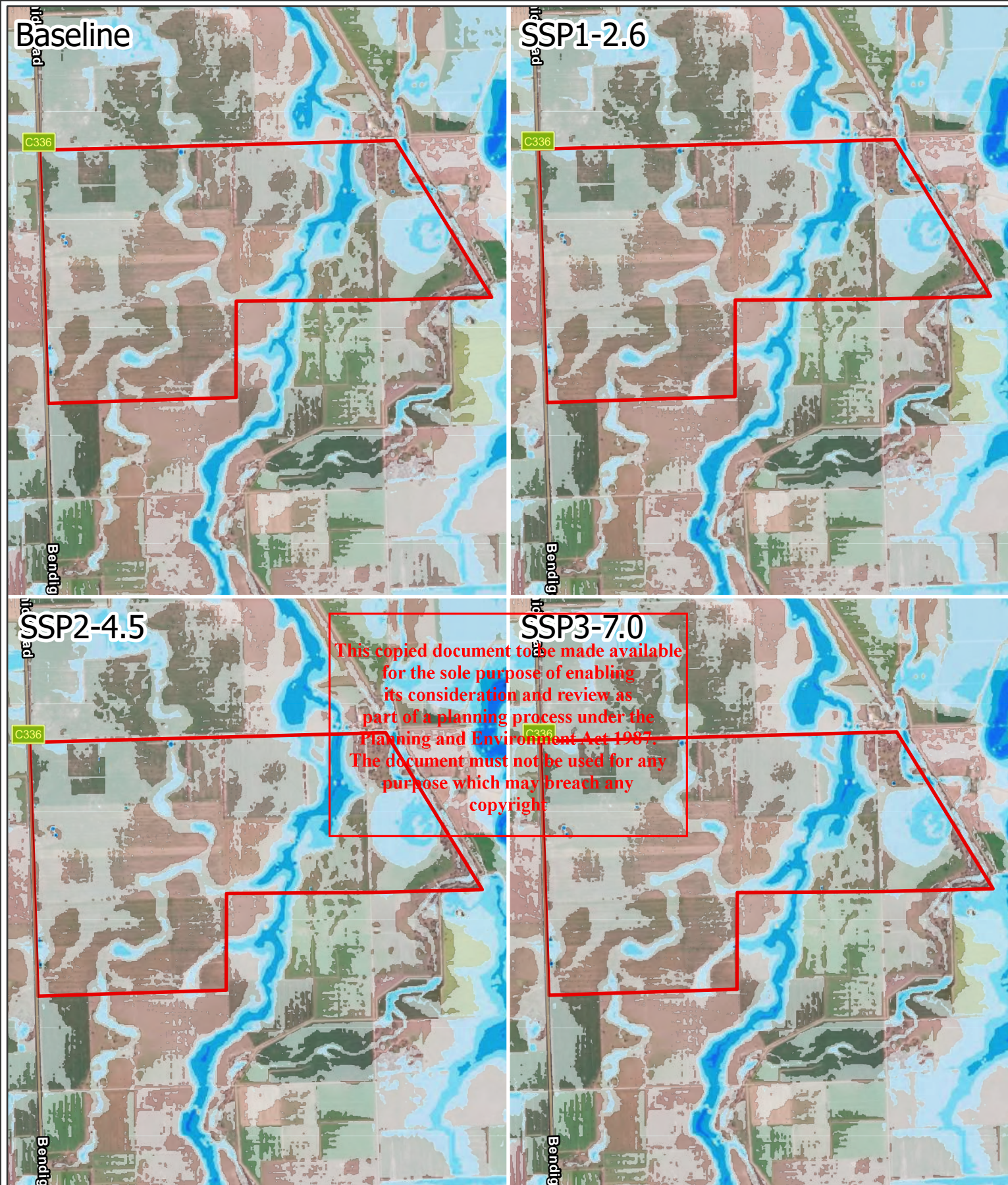


Figure 5-8 1% AEP maximum flood depth - climate sensitivity

Depth (m)	0.751 - 1
0.003 - 0.01	1.001 - 1.25
0.011 - 0.15	1.251 - 1.5
0.151 - 0.3	1.501 - 2
0.301 - 0.5	2.001 - 3
0.501 - 0.75	3.001 - 4.532

Site boundary

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0 412.5 825 1,650
Metres

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5.3. Sensitivity analysis

Sensitivity analysis aims to analyse the impact of variations in key model parameters and assumptions on the results and conclusions of the hydrologic/hydraulic assessment. Sensitivity analysis was therefore undertaken for overland roughness and design storm loss input parameters under existing conditions for the 1% AEP scenario using reasonable lower and upper limits (see Section 3.4).

In addition to land cover modifications for existing and proposed condition modelling, roughness sensitivity analysis was undertaken under existing conditions for the 1% AEP scenario to assess its effect on peak flows.

The adopted upper and lower limit sensitivity parameters are summarised in Table 5-6.

Table 5-6 Adopted roughness for sensitivity analysis

Roughness scenario	AEP events	Roughness coefficients	Losses	
			IL (mm)	CL (mm/hr)
Normal (adopted)	10%, 2%, 1%	0.03, 0.035 for channels	24	0.8
Upper limit	1%	0.07	41	4.44
Lower limit	1%	0.0175	17	0

A comparison of peak flows between varying roughness indicates moderate sensitivity to changes in roughness, with peak flows ranging from 41.37 m³/s under a decreased (lower limit) roughness scenario to 4.03 m³/s under an increased (upper limit) roughness scenario (as compared to baseline of 31.24 m³/s), cumulative flows for upper and lower limits for each temporal pattern are presented in Figure 5-9 and Figure 5-10. Although sensitivity to overland roughness was identified, there is general confidence in the 'normal (adopted)' roughness applied due to selection of Manning's n values representative of land use within the contributing catchment area and comparison against previously calibrated hydrologic modelling undertaken within the region.

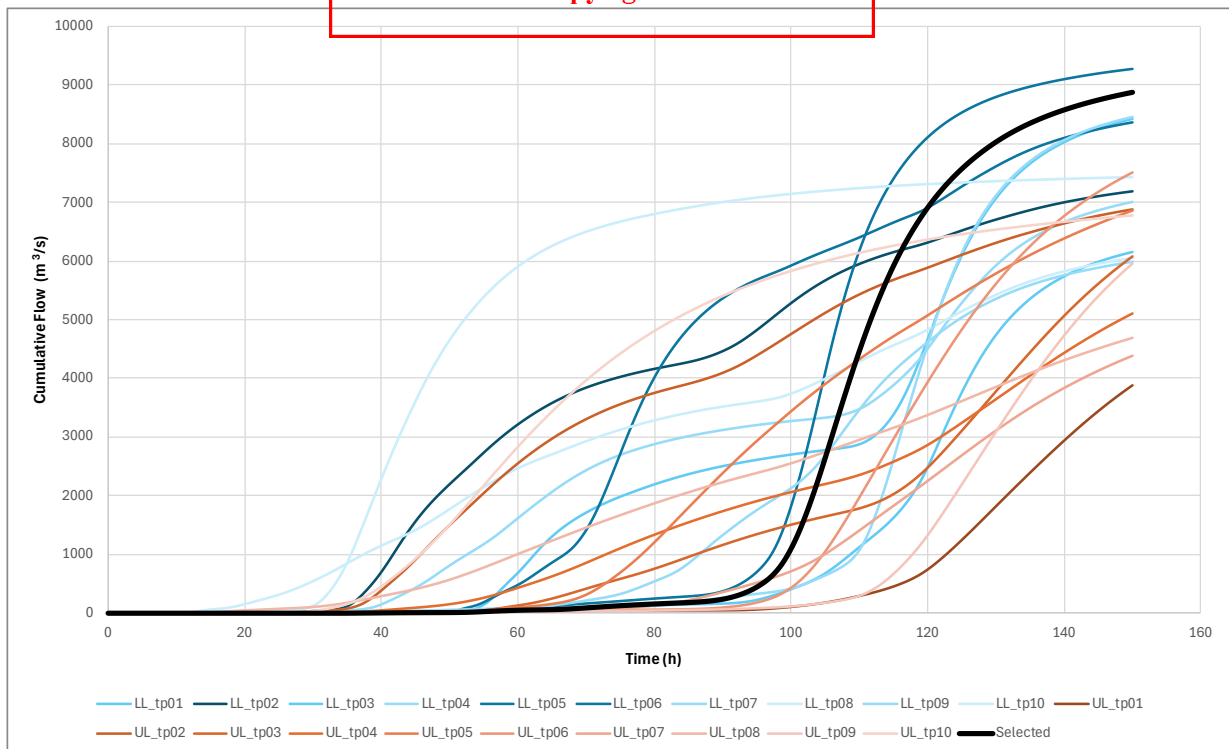


Figure 5-9 Roughness sensitivity results

The adopted design storm loss rates are considered to have a greater level of impact on hydrologic and hydraulic model results, with difference in peak flow under the upper limit and lower limit loss scenarios (up to a maximum of 152 m³/s). The normal (selected) loss scenario is considered appropriate for the purposes of this assessment, as the cumulative flow falls between the flow for upper and lower losses and given validation of unit peak flow results within similar range to other catchments modelled in the region.

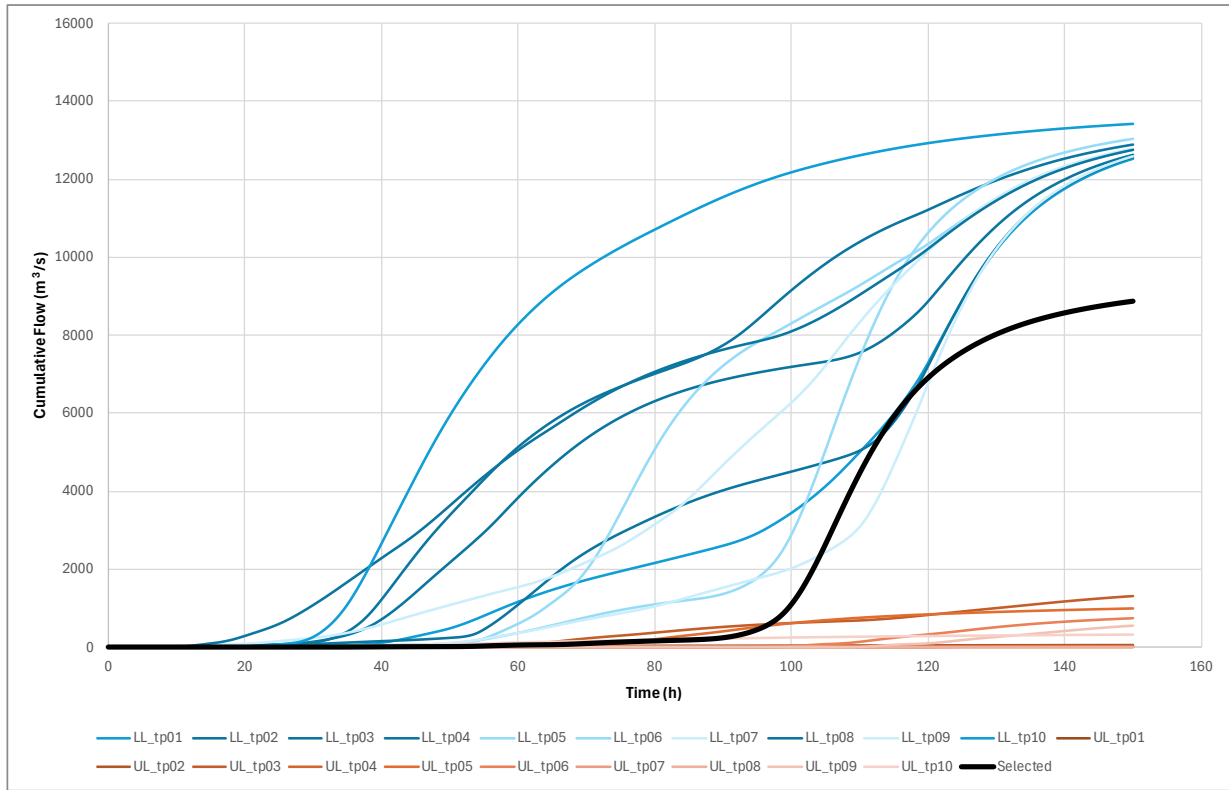


Figure 5-10 Losses sensitivity analysis

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6. Irrigation assessment

The purpose of this section is to conduct a site-specific irrigation analysis in accordance with the state government's *Solar Energy Facilities Design and Development Guideline (DELWP, 2022)*. The proposed development is situated within a declared irrigation district, necessitating an evaluation of its relationship with the region's agricultural and water management framework.

This assessment includes an analysis of the relevant regulatory context, a description of the Site's existing environment and land use history, and an evaluation of its connection to and status within the Goulburn Murray Irrigation District (GMID).

6.1. Irrigation system and water entitlement

6.1.1. Goulburn Murray Water Irrigation District Infrastructure

The project Site is classified as a serviced property located within the GMID. The regional irrigation network infrastructure that supplies the area is maintained by Goulburn Murray Water (GMW).

Preliminary advice from the Department of Energy, Environment and Climate Action (DEECA) indicates that Goulburn Murray Water is likely to maintain the regional irrigation infrastructure network including features within the project Site.

6.1.2. On-site irrigation infrastructure and historical use

In direct contrast to the status of the regional network, the existing and previous landowners made the decision to decommission all on-farm irrigation infrastructure more than two decades ago. This has resulted in a complete and long-standing transition to dryland farming practices across the Site, fundamentally altering the agricultural use.

6.1.3. Water Use licenses and access points

The properties associated with the project hold active water use licenses. Despite the existence of these licenses, the associated water entitlements are not used for broadacre irrigation. The water is currently used for stock and domestic purposes only, consistent with a dryland farming operation.

The access points for associated licenses are PH333 and PH714 and the locations are shown in Figure 6-1. Water access point PH333 and approximate 350m of Irrigation channel is the only infrastructure located within the Site. All other access points and channel infrastructure along the eastern boundary are located along Mitiamo-Kerang Road.

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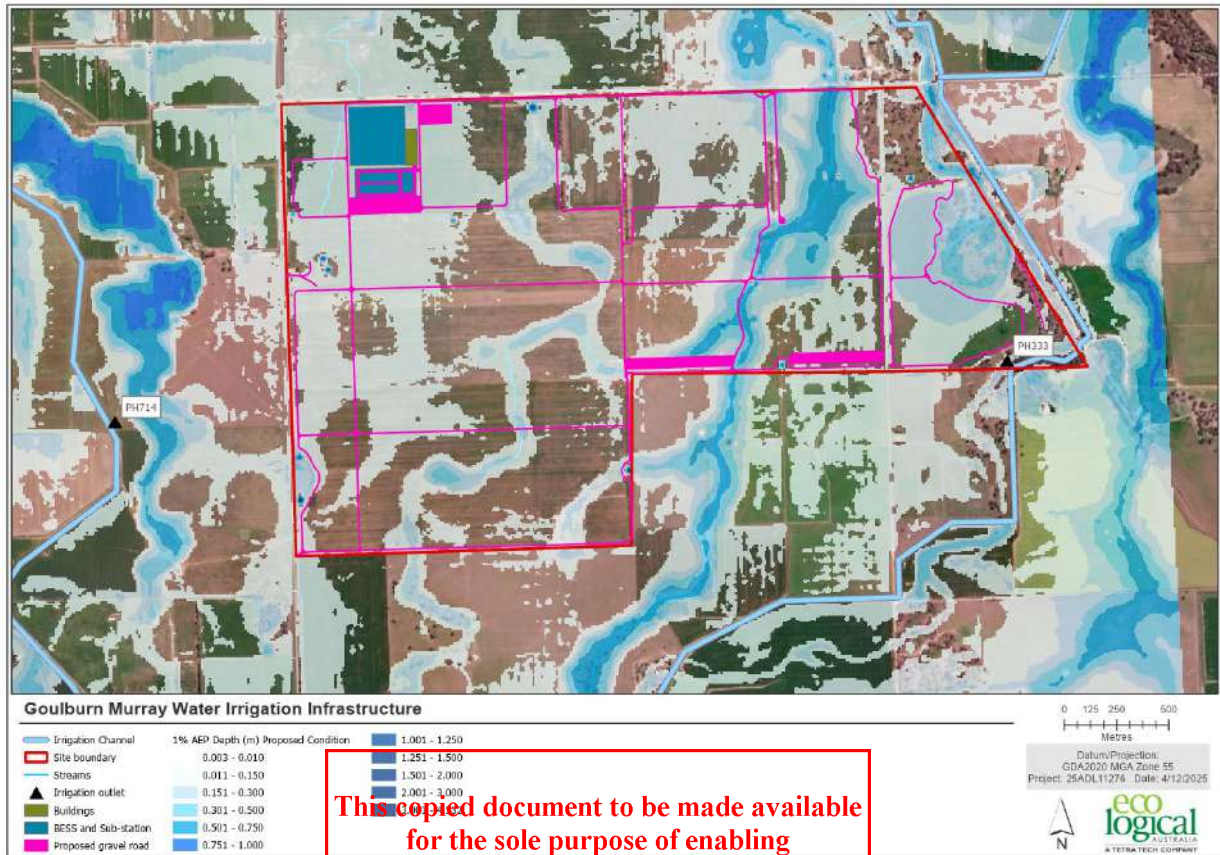


Figure 6-1 Irrigation access points

6.2. Potential impacts on irrigation infrastructure

6.2.1. Surface water interaction with irrigation infrastructure

Hydraulic modelling of the proposed development layout indicates that changes to surface water flows under the 10%, 2%, and 1% AEP flood events are negligible, with peak flow increases of less than 1%. These minor changes are primarily due to localised terrain modifications around raised infrastructure such as the substation, BESS, and office buildings, which slightly divert overland flow paths without significantly altering catchment-scale hydrology.

Implications for Irrigation Infrastructure:

- **Existing channels and access points:** The Site contains limited on-site irrigation infrastructure, with only one active access point (PH333) and approximately 350 m of channel within the project boundary. Regional GMW assets remain active and are planned for retention, requiring careful integration of the solar farm layout with these features.
- **Flow interaction:** Under proposed conditions, inundation patterns shift slightly around elevated structures, but the primary drainage lines (e.g., Blind Creek) and irrigation channels maintain their hydraulic capacity. No significant increase in flood depth or velocity is expected near irrigation assets, reducing the risk of erosion or structural compromise.

Overall, the proposed development does not compromise the functionality or connectivity of the irrigation network. With appropriate design and licensing measures, the interaction between modified surface flows and irrigation infrastructure can be managed to achieve a net-zero impact on the Goulburn Murray Irrigation District.

6.2.2. Potential erosion and sedimentation impacts on irrigation infrastructure

Construction and operation of the proposed solar farm introduce potential erosion and sedimentation risks, particularly during earthworks, installation of access tracks, and modification of surface terrain. While hydraulic modelling indicates negligible changes to peak flows under proposed conditions, localised alterations to flow paths around raised infrastructure (e.g., substation, BESS, office buildings) may concentrate runoff in certain areas, increasing the potential for soil disturbance and sediment transport.

Implications for Irrigation Infrastructure:

- Sediment deposition in downstream channels and drains, reducing conveyance efficiency.
- Increased turbidity in surface water runoff from the Site, potentially affecting stock and domestic water use.

6.3. Mitigation measures

It is essential to identify and manage potential impacts on the surrounding irrigation district during construction and operation. The following Table 6-1 summarised the potential impacts identified in Section 6.2 and the corresponding mitigation measures required to ensure the project integrates responsibly with the existing environment and can have a net zero to positive impact on the irrigation district.

Table 6-1 Potential impacts on irrigation infrastructure

Potential Impact	Proposed Mitigation
Connectivity and functionality of the irrigation supply system	Ensure that the non-agricultural use of the Site does not undermine the physical or operational integrity of the broader Goulburn Murray Water irrigation network. This includes maintaining GMW's access rights and asset protection. Figure 6-1 shows the proposed gravel road access tracks for the Site which has a gravel access track at the Irrigation access point PH333. This solar farm will also: • Maintain setbacks from channels/pipelines/drains; • design crossings to GMW standards; size culverts to match or exceed existing hydraulic capacity; • preserve GMW access tracks/easements; • avoid obstructions in drainage lines; • obtain a GMW Licence to Construct and Use Private Works for any works near assets.
Sediment and erosion during construction and operation	• Implement a Construction Environmental Management Plan (CEMP) with EPA-compliant sediment and erosion controls (e.g., silt fences, sediment basins, staged earthworks); • maintain buffer zones and setbacks from irrigation channels; • design culverts and crossings to minimise scour and stabilise outlets with rock armouring; • schedule works during low rainfall periods; • apply progressive stabilisation (e.g., revegetation, mulching) to disturbed areas; • obtain a GMW Licence to Construct and Use Private Works for any works near irrigation assets.

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7. Conclusion and recommendations

Assessment of hydrologic and hydraulic characteristics associated with existing, proposed and post-closure conditions under the 10%, 2% and 1% AEP flood events was undertaken to identify potential risks to baseline surface water flows and understand the potential risks associated with development at the Mologa Solar Hybrid Site.

The assessment found that on-site surface flows are generally shallow and slow-moving, with the deepest and fastest flows confined to Blind Creek, where the maximum modelled depth and velocity occurred. Extensive shallow inundation was evident across much of the Site and there are areas (particularly in Blind Creek) where the depth of flood waters may impact the design of panels.

Hydraulic modelling based on November 2025 preliminary layout information provided by Urbis indicated negligible change in catchment peak flows (less than 1%) relative to existing conditions, causing only minor, localised diversion of flow within the project footprint.

Overall, flood risk across the Site for the 10%, 2% and 1% AEP events is low, with most areas classified as H1 (generally safe for people, vehicles and buildings) under Victorian guidelines. Localised pockets—principally dams and natural drainage lines—exhibit deeper inundation and elevated hazard, reaching H4 (unsafe for vehicles and people) under the 1% AEP scenario and therefore warrant targeted management and design consideration. Additional management or mitigation measures should be considered such as works to divert or contain floodwaters or increasing the minimum height of the solar panels to 0.6 m above ground level in these areas to provide a minimum of 300 mm freeboard above the 1% AEP flood depth.

Refined surface water modelling and flood hazard modelling may be considered after final landform design to determine the flood risk and inform management strategies.

The proposed Mologa Solar Hybrid project is unlikely to affect the functionality of the GMID. based on modelling resulting showing negligible changes to surface water flows. The main risk to the irrigation network is erosion and sedimentation during construction, which could impact channels and water quality. Mitigation measures, such as EPA-compliant sediment controls, setbacks, culvert design to GMW standards and licensing for works near assets will ensure no adverse impact while supporting renewable energy and agricultural co-use objectives.

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Appendix A AR&R Data Hub information

IFD tables

Table A- 1 BoM IFD rainfall depths for 50% to 0.1% design rainfall events

Duration	Duration in min	63.2%	50.0%	20.0%	10.0%	5.0%	2.0%	1.0%
1 min	1	1.36	1.6	2.45	3.09	3.78	4.79	5.65
2 min	2	2.37	2.78	4.22	5.35	6.59	8.43	10
3 min	3	3.19	3.74	5.68	7.18	8.82	11.2	13.4
4 min	4	3.87	4.55	6.91	8.73	10.7	13.6	16.1
5 min	5	4.46	5.25	7.98	10.1	12.3	15.6	18.5
10 min	10	6.58	7.77	11.9	15	18.3	23.2	27.3
15 min	15	8	9.46	14.5	18.3	22.4	28.4	33.4
20 min	20	9.08	10.7	16.4	20.8	25.4	32.3	38.1
25 min	25	9.96	11.8	18	22.7	27.9	35.4	41.8
30 min	30	10.7	12.6	19.3	24.4	29.9	38	44.8
45 min	45	12.5	14.7	22.2	28.1	34.4	43.7	51.6
1 hour	60	13.8	16.2	24.4	30.7	37.5	47.6	56.2
1.5 hour	90	15.8	18.5	27.5	34.4	41.9	52.9	62.2
2 hour	120	17.4	20.2	29.8	37.1	44.9	56.4	66.2
3 hour	180	19.8	22.8	33.2	41	49.2	61.2	71.2
4.5 hour	270	22.4	25.7	36.8	45.1	53.6	65.9	75.9
6 hour	360	24.4	27.9	39.6	48.1	56.9	69.3	79.3
9 hour	540	27.4	31.3	43.9	52.9	62	74.6	84.6
12 hour	720	29.6	33.8	47.2	56.6	66.1	79	89
18 hour	1080	32.8	37.5	52.2	62.5	72.7	86.3	96.7
24 hour	1440	35.1	40.1	56	67.1	78	92.4	103
30 hour	1800	36.8	42.1	59.1	70.9	82.6	97.9	110
36 hour	2160	38.1	43.7	61.6	74.1	86.5	103	115
48 hour	2880	40.2	46.2	65.6	79.3	93	111	125
72 hour	4320	42.7	49.3	70.9	86.4	102	123	140
96 hour	5760	44.4	51.2	74	90.7	108	131	150
120 hour	7200	45.6	52.6	76	93.2	111	136	156
144 hour	8640	46.5	53.5	77.1	94.5	113	138	159
168 hour	10080	47.4	54.3	77.6	94.9	113	139	159

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Available temporal patterns

Table A- 2 Available point temporal pattern durations from AR&R (highlighted)

Durations				
1 minute	15 minutes	1.5 hours	12 hours	72 hours
2 minutes	20 minutes	2 hours	18 hours	96 hours
3 minutes	25 minutes	3 hours	24 hours	120 hours
4 minutes	30 minutes	4.5 hours	30 hours	144 hours
5 minutes	45 minutes	6 hours	36 hours	168 hours
10 minutes	1 hour	9 hours	48 hours	

Table A- 3 Available areal temporal pattern durations from AR&R (highlighted)

Durations				
1 minute	15 minutes	1.5 hours	12 hours	72 hours
2 minutes	20 minutes	2 hours	18 hours	96 hours
3 minutes	25 minutes	3 hours	24 hours	120 hours
4 minutes	30 minutes	4.5 hours	30 hours	144 hours
5 minutes	45 minutes	6 hours	36 hours	168 hours
10 minutes	1 hour	9 hours	48 hours	

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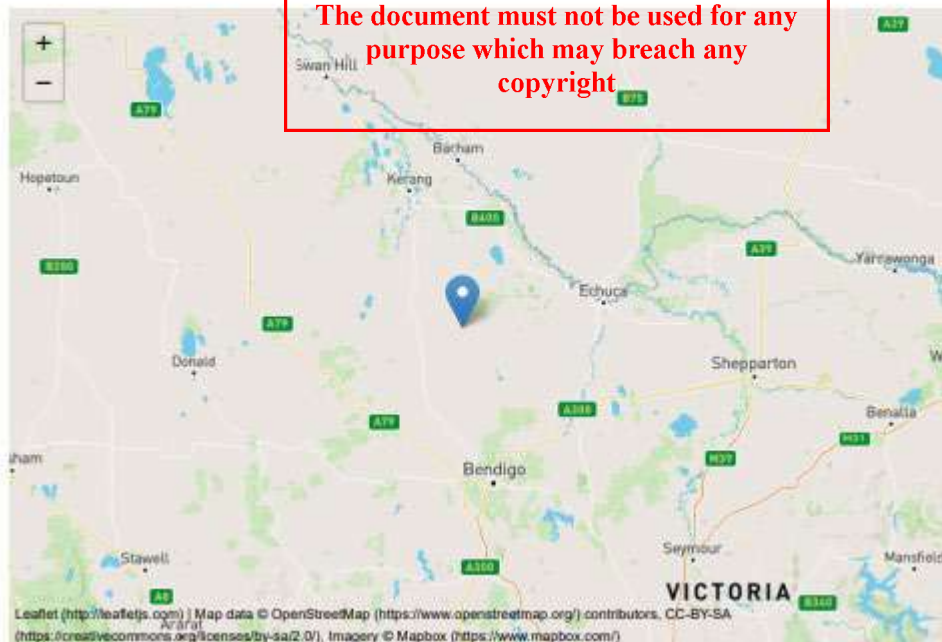
Data Hub results

Australian Rainfall & Runoff Data Hub - Results

Input Data

Longitude	144.142
Latitude	-36.214
Selected Regions (clear)	
River Region	show
ARF Parameters	show
Storm Losses	show
Temporal Patterns	show
Areal Temporal Patterns	show
BOM IFDs	show
Median Preburst Depths and Ratios	show
10% Preburst Depths	show
25% Preburst Depths	show
75% Preburst Depths	show
90% Preburst Depths	show
Climate Change Factors	show

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Data

River Region

Division	Murray-Darling Basin
River Number	7
River Name	Loddon River

Layer Info

Time Accessed	30 October 2025 03:57PM
Version	2016_v1

ARF Parameters

$$ARF = Min \left\{ 1, \left[1 - a \left(Area^b - c \log_{10} Duration \right) Duration^{-d} \right. \right. \\ \left. \left. + e Area^f Duration^g (0.3 + \log_{10} AEP) \right. \right. \\ \left. \left. + h 10^{i \frac{Area}{1000}} (0.3 + \log_{10} AEP) \right] \right\}$$

Zone	a	b	c	d	e	f	g	h	i
Southern Semi-arid	0.254	0.247	0.403	0.351	0.0013	0.302	0.058	0.0	0.0

Short Duration ARF

$$ARF = Min \left[1, 1 - 0.287 \left(Area^{0.265} - 0.439 \log_{10} (Duration) \right) . Duration^{-0.36} \right. \\ \left. + 2.26 \times 10^{-3} \times Area^{0.220} . Duration^{0.125} (0.3 + \log_{10} (AEP)) \right. \\ \left. + 0.0141 \times Area^{0.213} \times 10^{-0.021 \frac{(Duration-100)^2}{1100}} (0.3 + \log_{10} (AEP)) \right]$$

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Version	2016_v1

Storm Losses

Note: Burst Loss = Storm Loss - Preburst

Note: These losses are only for rural use and are **NOT FOR DIRECT USE** in urban areas

Note: As this point is in Victoria the advice provided on losses and pre-burst in the VIC specific tab of the ARR Data Hub should be considered.

ID	28367.0
Storm Initial Losses (mm)	41.0
Storm Continuing Losses (mm/h)	0.0

Layer Info

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Version	2016_v1
Temporal Patterns Download (.zip) (static/temporal_patterns/TP/MB.zip)	
code	MB
Label	Murray Basin
Layer Info	
Time Accessed	30 October 2025 03:57PM
Version	2016_v2
Areal Temporal Patterns Download (.zip) (/static/temporal_patterns/Areal/Areal_MB.zip)	
code	MB
arealabel	Murray Basin
Layer Info	
Time Accessed	30 October 2025 03:57PM
Version	2016_v2
BOM IFDs	
Click here (http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016&coordinate_type=dd&latitude=-36.21398609&longitude=144.1419607&sadmin=true&sdir=true&sdday=true&user_label=) to obtain the IFD depths for catchment centroid from the BoM website	
Layer Info	
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Median Preburst Depths and Ratios

Note: As this point is in Victoria the advice provided on losses and pre-burst in the VIC specific tab of the ARR Data Hub should be considered.

Values are of the format depth (ratio) with depth in mm

min (h)AEP(%)	50	20	10	5	2	1
60 (1.0)	2.8 (0.171)	2.3 (0.095)	2.0 (0.066)	1.8 (0.047)	1.6 (0.033)	1.4 (0.025)
90 (1.5)	2.7 (0.145)	2.1 (0.077)	1.7 (0.050)	1.4 (0.033)	0.8 (0.016)	0.5 (0.007)
120 (2.0)	3.2 (0.156)	3.5 (0.119)	3.8 (0.102)	4.0 (0.090)	2.1 (0.038)	0.7 (0.011)
180 (3.0)	2.4 (0.106)	3.5 (0.106)	4.3 (0.104)	5.0 (0.101)	4.9 (0.079)	4.8 (0.067)
360 (6.0)	0.6 (0.023)	1.4 (0.035)	1.9 (0.039)	2.4 (0.042)	3.8 (0.055)	4.8 (0.061)
720 (12.0)	0.0 (0.000)	0.5 (0.011)	0.9 (0.015)	1.2 (0.018)	1.7 (0.022)	2.2 (0.024)
1080 (18.0)	0.0 (0.000)	0.0 (0.001)	0.1 (0.001)	0.1 (0.001)	0.5 (0.006)	0.8 (0.008)
1440 (24.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.1 (0.001)	0.2 (0.002)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	30 October 2025 03:57PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

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10% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)AEP(%)	50	20	10	5	2	1
60 (1.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
90 (1.5)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
120 (2.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
180 (3.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
360 (6.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
720 (12.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1080 (18.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1440 (24.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

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Note	Prebust interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

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25% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)AEP(%)	50	20	10	5	2	1
60 (1.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
90 (1.5)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
120 (2.0)	0.0 (0.002)	0.0 (0.001)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
180 (3.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
360 (6.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
720 (12.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1080 (18.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1440 (24.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

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Note	Prebust interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

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75% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)IAEP(%)	50	20	10	5	2	1
60 (1.0)	9.7 (0.597)	13.1 (0.536)	15.3 (0.499)	17.5 (0.467)	14.4 (0.302)	12.0 (0.214)
90 (1.5)	13.4 (0.726)	15.9 (0.577)	17.5 (0.508)	19.1 (0.455)	17.2 (0.325)	15.8 (0.253)
120 (2.0)	11.8 (0.582)	14.5 (0.486)	16.3 (0.439)	18.0 (0.401)	18.2 (0.323)	18.3 (0.277)
180 (3.0)	12.7 (0.557)	15.6 (0.470)	17.5 (0.427)	19.3 (0.393)	22.6 (0.369)	25.0 (0.352)
360 (6.0)	3.5 (0.127)	8.8 (0.222)	12.3 (0.255)	15.6 (0.274)	18.6 (0.269)	20.9 (0.264)
720 (12.0)	1.6 (0.047)	6.0 (0.126)	8.9 (0.156)	11.6 (0.176)	14.2 (0.180)	16.2 (0.182)
1080 (18.0)	0.2 (0.006)	2.2 (0.041)	3.4 (0.055)	4.7 (0.064)	10.3 (0.119)	14.5 (0.150)
1440 (24.0)	0.0 (0.000)	1.4 (0.025)	2.4 (0.035)	3.3 (0.042)	4.6 (0.049)	5.5 (0.054)
2160 (36.0)	0.0 (0.000)	0.4 (0.006)	0.6 (0.008)	0.8 (0.010)	0.5 (0.005)	0.3 (0.002)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.4 (0.003)	0.6 (0.005)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	30 October 2025 03:57PM
Version	2018_v1
Note	Prebust interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

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90% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)AEP(%)	50	20	10	5	2	1
60 (1.0)	19.3 (1.191)	24.2 (0.993)	27.5 (0.895)	30.6 (0.816)	30.5 (0.641)	30.4 (0.541)
90 (1.5)	24.8 (1.344)	27.3 (0.992)	28.9 (0.839)	30.5 (0.727)	33.1 (0.627)	35.1 (0.565)
120 (2.0)	26.9 (1.334)	30.3 (1.016)	32.5 (0.876)	34.6 (0.770)	41.1 (0.728)	45.9 (0.693)
180 (3.0)	23.4 (1.024)	27.8 (0.839)	30.8 (0.752)	33.7 (0.684)	44.2 (0.723)	52.1 (0.732)
360 (6.0)	16.3 (0.584)	20.4 (0.513)	23.0 (0.478)	25.6 (0.449)	35.8 (0.516)	43.4 (0.547)
720 (12.0)	12.2 (0.362)	18.6 (0.393)	22.8 (0.402)	26.8 (0.405)	29.1 (0.369)	30.9 (0.347)
1080 (18.0)	4.1 (0.109)	10.5 (0.201)	14.7 (0.236)	18.8 (0.259)	23.2 (0.268)	26.4 (0.273)
1440 (24.0)	2.5 (0.062)	7.2 (0.129)	10.3 (0.154)	13.3 (0.171)	16.3 (0.177)	18.6 (0.180)
2160 (36.0)	0.1 (0.001)	4.6 (0.074)	7.6 (0.102)	10.4 (0.120)	12.3 (0.119)	13.6 (0.118)
2880 (48.0)	0.0 (0.000)	1.0 (0.015)	1.7 (0.021)	2.3 (0.025)	6.4 (0.057)	9.4 (0.075)
4320 (72.0)	0.0 (0.000)	0.5 (0.006)	0.8 (0.009)	1.0 (0.010)	4.7 (0.038)	7.4 (0.053)

Layer Info

Time Accessed	30 October 2025 03:57PM
Version	2018_v1
Note	Prebust interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

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Climate Change Factors

Rainfall Factors

SSP1-2.6

Year	<1 hour	1.5 Hours	2 Hours	3 Hours	4.5 Hours	6 Hours	9 Hours	12 Hours	18 Hours	>24 Hours
2030	1.18	1.17	1.16	1.14	1.13	1.12	1.12	1.11	1.1	1.1
2040	1.21	1.19	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.11
2050	1.22	1.2	1.18	1.17	1.15	1.15	1.14	1.13	1.12	1.11
2060	1.23	1.21	1.2	1.18	1.17	1.16	1.15	1.14	1.13	1.12
2070	1.24	1.22	1.2	1.18	1.17	1.16	1.15	1.14	1.13	1.12
2080	1.23	1.21	1.2	1.18	1.17	1.16	1.15	1.14	1.13	1.12
2090	1.23	1.21	1.2	1.18	1.17	1.16	1.15	1.14	1.13	1.12
2100	1.22	1.2	1.19	1.17	1.16	1.15	1.14	1.13	1.12	1.12

SSP2-4.5

Year	<1 hour	1.5 Hours	2 Hours	3 Hours	4.5 Hours	6 Hours	9 Hours	12 Hours	18 Hours	>24 Hours
2030	1.18	1.17	1.16	1.14	1.13	1.12	1.12	1.11	1.1	1.1
2040	1.22	1.2	1.19	1.17	1.16	1.15	1.14	1.13	1.12	1.12
2050	1.27	1.24	1.23	1.21	1.19	1.18	1.17	1.16	1.15	1.14
2060	1.3	1.27	1.25	1.23	1.21	1.2	1.19	1.18	1.16	1.16
2070	1.33	1.3	1.28	1.26	1.24	1.22	1.21	1.19	1.18	1.17
2080	1.37	1.33	1.31	1.28	1.26	1.24	1.22	1.21	1.2	1.19
2090	1.4	1.36	1.34	1.31	1.28	1.26	1.24	1.23	1.21	1.2
2100	1.41	1.37	1.35	1.32	1.29	1.27	1.25	1.24	1.22	1.21

SSP3-7.0

Year	<1 hour	1.5 Hours	2 Hours	3 Hours	4.5 Hours	6 Hours	9 Hours	12 Hours	18 Hours	>24 Hours
2030	1.18	1.17	1.16	1.14	1.13	1.12	1.12	1.11	1.1	1.1
2040	1.23	1.21	1.2	1.18	1.17	1.16	1.15	1.14	1.13	1.12
2050	1.29	1.26	1.24	1.22	1.2	1.19	1.18	1.17	1.16	1.15
2060	1.35	1.32	1.3	1.27	1.25	1.23	1.22	1.2	1.19	1.18
2070	1.42	1.38	1.35	1.32	1.29	1.28	1.26	1.24	1.22	1.21
2080	1.5	1.45	1.42	1.38	1.35	1.33	1.3	1.28	1.26	1.25
2090	1.59	1.53	1.49	1.44	1.4	1.38	1.35	1.33	1.3	1.29
2100	1.66	1.59	1.55	1.5	1.45	1.42	1.39	1.37	1.34	1.32

SSP5-8.5

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Year	<1 hour	1.5 Hours	2 Hours	3 Hours	4.5 Hours	6 Hours	9 Hours	12 Hours	18 Hours	>24 Hours
2030	1.2	1.18	1.17	1.16	1.14	1.13	1.13	1.12	1.11	1.11
2040	1.26	1.24	1.22	1.2	1.18	1.17	1.16	1.15	1.14	1.14
2050	1.34	1.31	1.29	1.26	1.24	1.23	1.21	1.2	1.18	1.18
2060	1.42	1.38	1.35	1.32	1.29	1.28	1.26	1.24	1.22	1.21
2070	1.52	1.47	1.43	1.4	1.36	1.34	1.31	1.29	1.27	1.26
2080	1.63	1.57	1.52	1.48	1.43	1.4	1.37	1.35	1.33	1.31
2090	1.77	1.69	1.64	1.58	1.52	1.49	1.45	1.42	1.39	1.37
2100	1.86	1.77	1.71	1.64	1.58	1.54	1.5	1.47	1.43	1.41

Loss Factors

Initial Loss (Adjustment Factors)

	Losses SSP1-2.6	Losses SSP2-4.5	Losses SSP3-7.0	Losses SSP5-8.5
2030	1.04	1.04	1.04	1.04
2040	1.04	1.04	1.05	1.05
2050	1.04	1.05	1.06	1.07
2060	1.05	1.06	1.07	1.08
2070	1.05	1.07	1.08	1.1
2080	1.05	1.07	1.09	1.11
2090	1.05	1.07	1.11	1.13
2100	1.04	1.08	1.12	1.15

Continuing Loss (Adjustment Factors)

	Losses SSP1-2.6	Losses SSP2-4.5	Losses SSP3-7.0	Losses SSP5-8.5
2030	1.08	1.08	1.08	1.09
2040	1.09	1.1	1.1	1.11
2050	1.1	1.11	1.13	1.14
2060	1.1	1.13	1.15	1.18
2070	1.1	1.14	1.18	1.21
2080	1.1	1.16	1.21	1.25
2090	1.1	1.17	1.24	1.3
2100	1.1	1.17	1.27	1.33

Temperature Changes (Degrees, Relative to 1961-1990 Baseline)

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Year	SSP1-2.6	SSP2-4.5	SSP3-7.0	SSP5-8.5
2030	1.2	1.2	1.2	1.3
2040	1.3	1.4	1.5	1.6
2050	1.4	1.7	1.8	2.1
2060	1.5	1.9	2.2	2.5
2070	1.5	2.1	2.5	3
2080	1.5	2.2	2.9	3.5
2090	1.5	2.4	3.3	4.1
2100	1.4	2.5	3.6	4.5

Layer Info

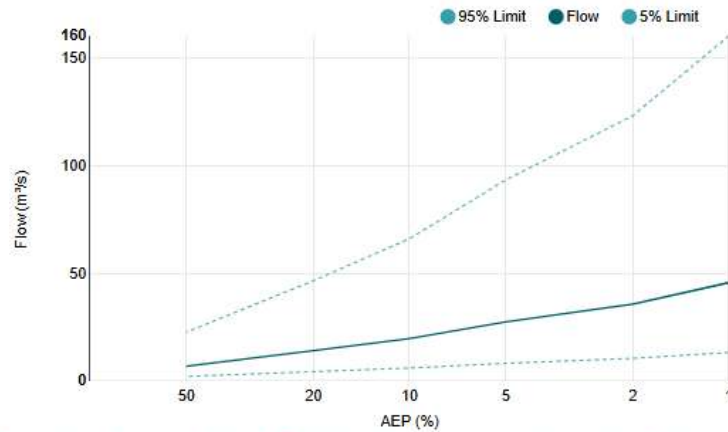
Time Accessed	30 October 2025 03:57PM
Version	2024_v1
Note	Updated climate change factors for IFD Initial loss and continuing loss based on IPCC AR6 temperature increases from the updated Climate Change Considerations (Book 1: Chapter 6) in ARR (Version 4.2). ARR recommends the use of Current and near-term (2030 midpoint), Medium-term (2050 midpoint) and Long-term (2090 midpoint)

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Appendix B Flood frequency estimation

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*The catchment has unusual shape. Results have lower accuracy and may not be directly applicable in practice.

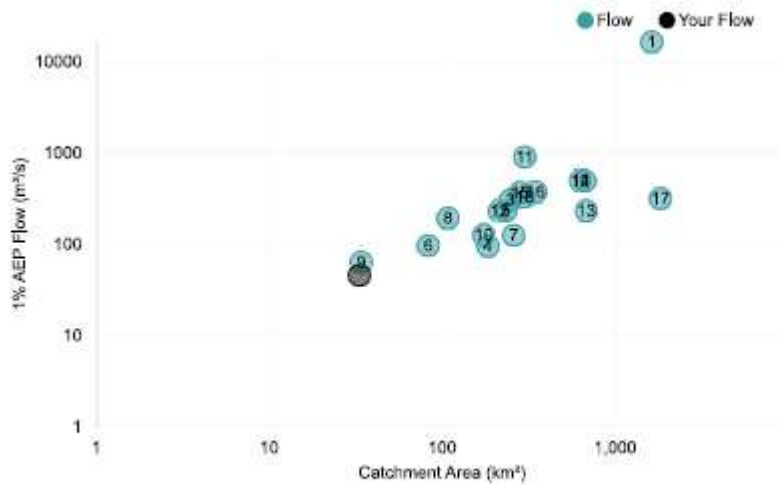
AEP (%)	Discharge (m³/s)	Lower Confidence Limit (5%) (m³/s)	Upper Confidence Limit (95%) (m³/s)
50	6.86	2.10	22.6
20	14.1	4.34	46.5
10	19.7	6.01	66.0
5	27.4	8.20	93.2
2	35.6	10.5	123
1	45.6	13.2	160



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1% AEP Flow vs Catchment Area



Shape Factor vs Catchment Area

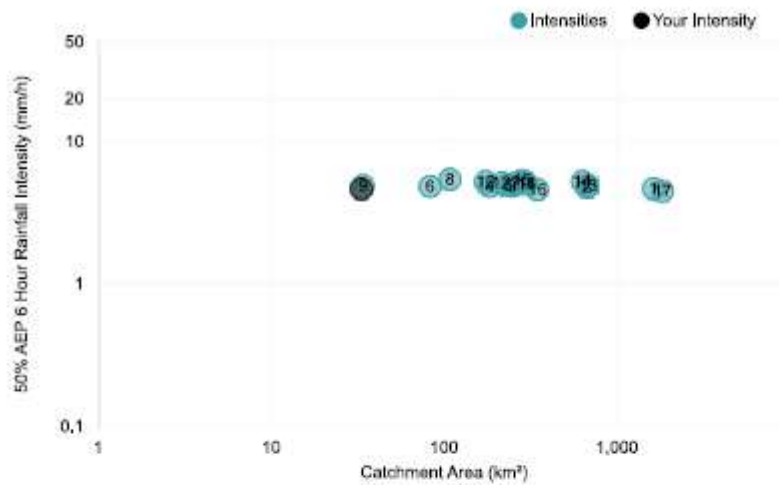
Note: This region does not use shape factors



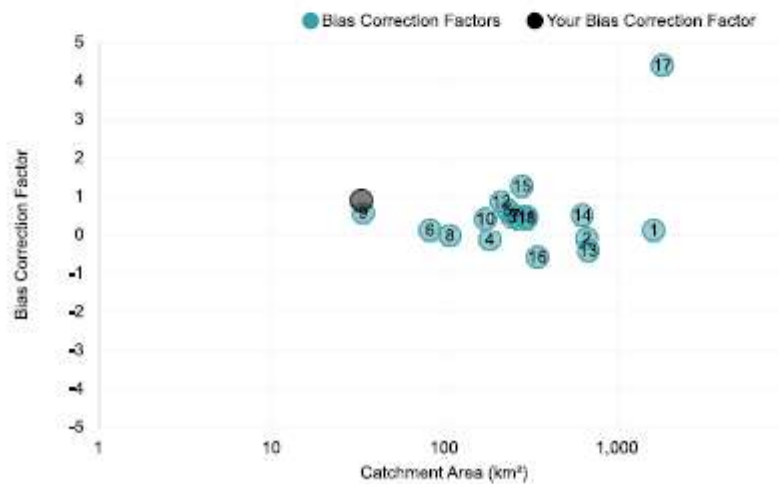
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Intensity vs Catchment Area



Bias Correction Factor vs Catchment Area



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Input Data

Date/Time	2025-10-16 15:41
Catchment Name	Catchment1
Latitude (Outlet)	-36,1454084
Longitude (Outlet)	144,1561159
Latitude (Centroid)	-36,21398609
Longitude (Centroid)	144,1419607
Catchment Area (km ²)	33.25
Distance to Nearest Gauged Catchment (km)	11,92
50% AEP 6 Hour Rainfall Intensity (mm/h)	4,657206
2% AEP 6 Hour Rainfall Intensity (mm/h)	11,556281
Rainfall Intensity Source (User/Auto)	Auto
Region	Fringe - East Coast & Arid and Semi-arid
Region Version	RFFE Model 2016 v1
Region Source (User/Auto)	Auto
Shape Factor	1,34*
Interpolation Method	Natural Neighbour
Bias Correction Value	0,891

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Appendix C RORB details

Table C- 1 RORB reach details

No.	Reach ID	Reach type	Reach length (km)
1	DS MN	Natural	0.757
2	DS M	Natural	1.467
3	DS K	Natural	0.998
4	DS I	Natural	0.771
5	DS AB	Natural	2.818
6	DS H	Natural	0.299
7	DS DE	Natural	1.032
8	DS Q	Natural	0.189
9	DS QR	Natural	0.383
10	SA B	Natural	1.022
11	SA A	Natural	2.418
12	SA C	Natural	0.340
13	SA D	Natural	1.398
14	DS ABC	Natural	2.818
15	SA E	Natural	1.370
16	DS DEF	Natural	1.032
17	SA F	Natural	0.775
18	SA G	Natural	1.093
19	DS FG	Natural	0.299
20	SA H	Natural	0.070
21	DS CH	Natural	0.771
22	SA I	Natural	0.166
23	SA J	Natural	0.774
24	DS IJ	Natural	0.998
25	SA K	Natural	0.139
26	SA L	Natural	1.711
27	DS KL	Natural	1.467
28	SA M	Natural	0.429
29	SA N	Natural	1.645
30	DS O	Natural	0.757
31	SA O	Natural	0.186
32	SA P	Natural	1.548
33	DS OP	Natural	0.189
34	SA Q	Natural	0.079
35	SA R	Natural	0.689
36	DS S	Natural	0.383
37	SA S	Natural	0.121

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Table C- 2 RORB sub-catchment area details

No.	Sub-catchment ID	Sub-catchment area (km ²)	Fraction impervious
1	B	1.867	0
2	C	3.112	0
3	D	2.918	0
4	E	1.206	0
5	G	1.864	0
6	H	0.308	0
7	I	1.450	0
8	J	1.120	0
9	F	2.470	0
10	A	4.439	0
11	K	1.793	0
12	L	1.683	0
13	M	2.631	0
14	N	1.848	0
15	O	1.051	0
16	P	2.023	0
17	Q	0.075	0
18	R	1.005	0
19	S	0.393	0

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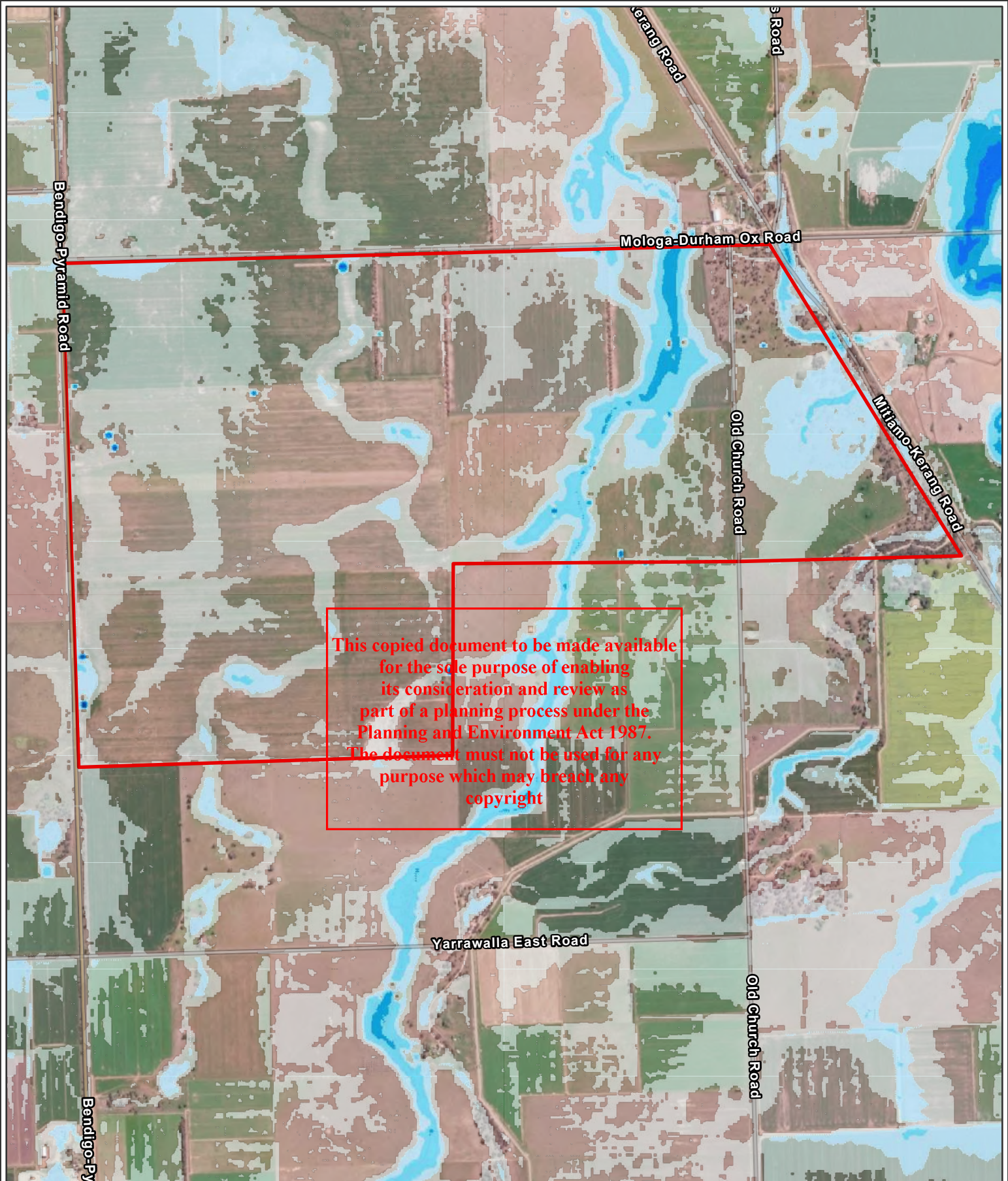
Appendix D Hydraulic results mapping

Maximum modelled depth

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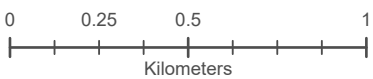


10% AEP maximum flood depth - existing conditions

Depth (m)	0.751 - 1
0.003 - 0.01	1.001 - 1.25
0.011 - 0.15	1.251 - 1.5
0.151 - 0.3	1.501 - 2
0.301 - 0.5	2.001 - 3
0.501 - 0.75	3.001 - 4.532

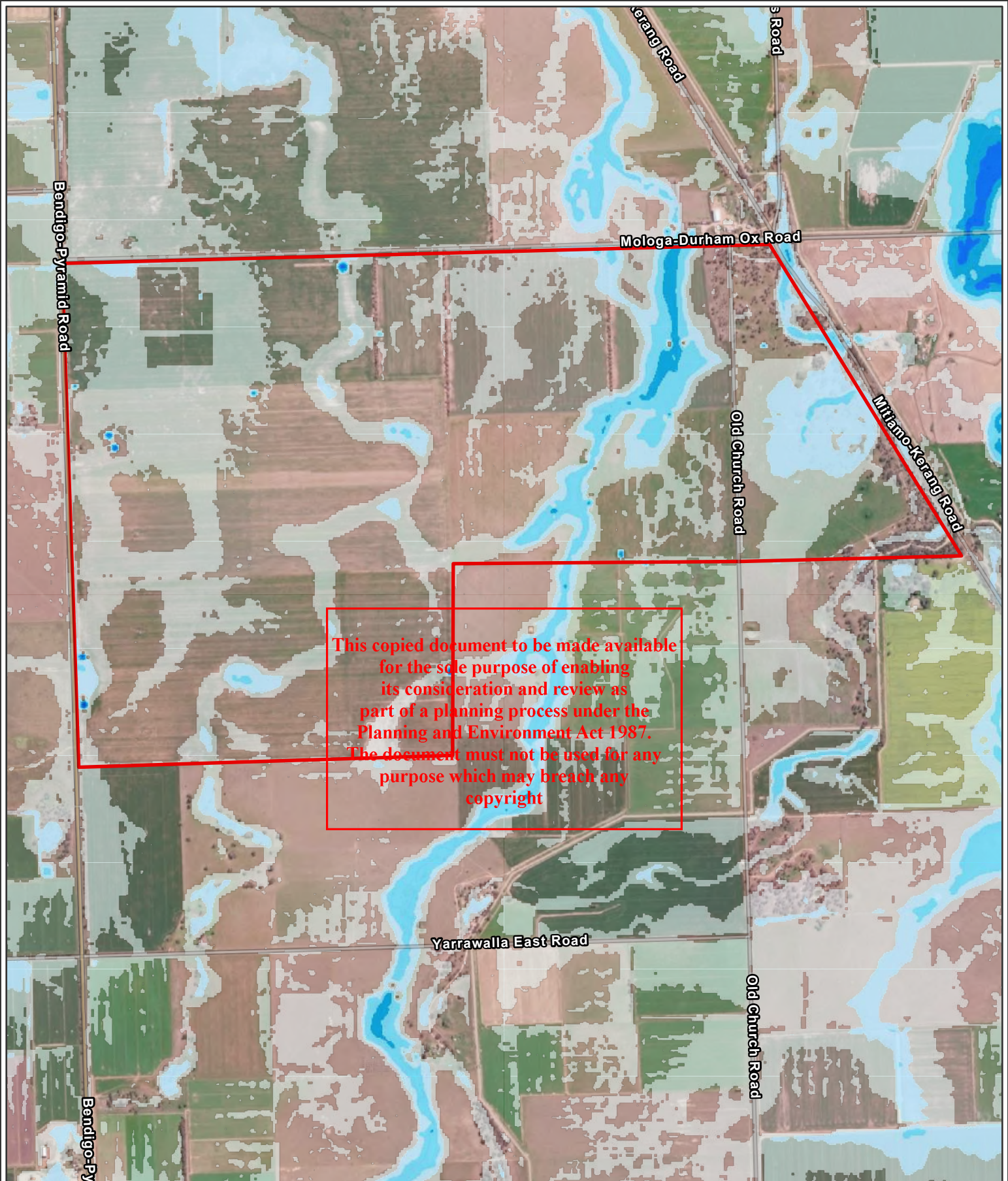
 Site boundary

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Datum/Projection:
GDA2020 MGA Zone 55
Project: 25ADL11237-EH Date: 4/12/2025



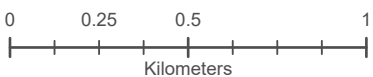


10% AEP maximum flood depth - proposed conditions

Depth (m)	0.751 - 1
0.003 - 0.01	1.001 - 1.25
0.011 - 0.15	1.251 - 1.5
0.151 - 0.3	1.501 - 2
0.301 - 0.5	2.001 - 3
0.501 - 0.75	3.001 - 4.532

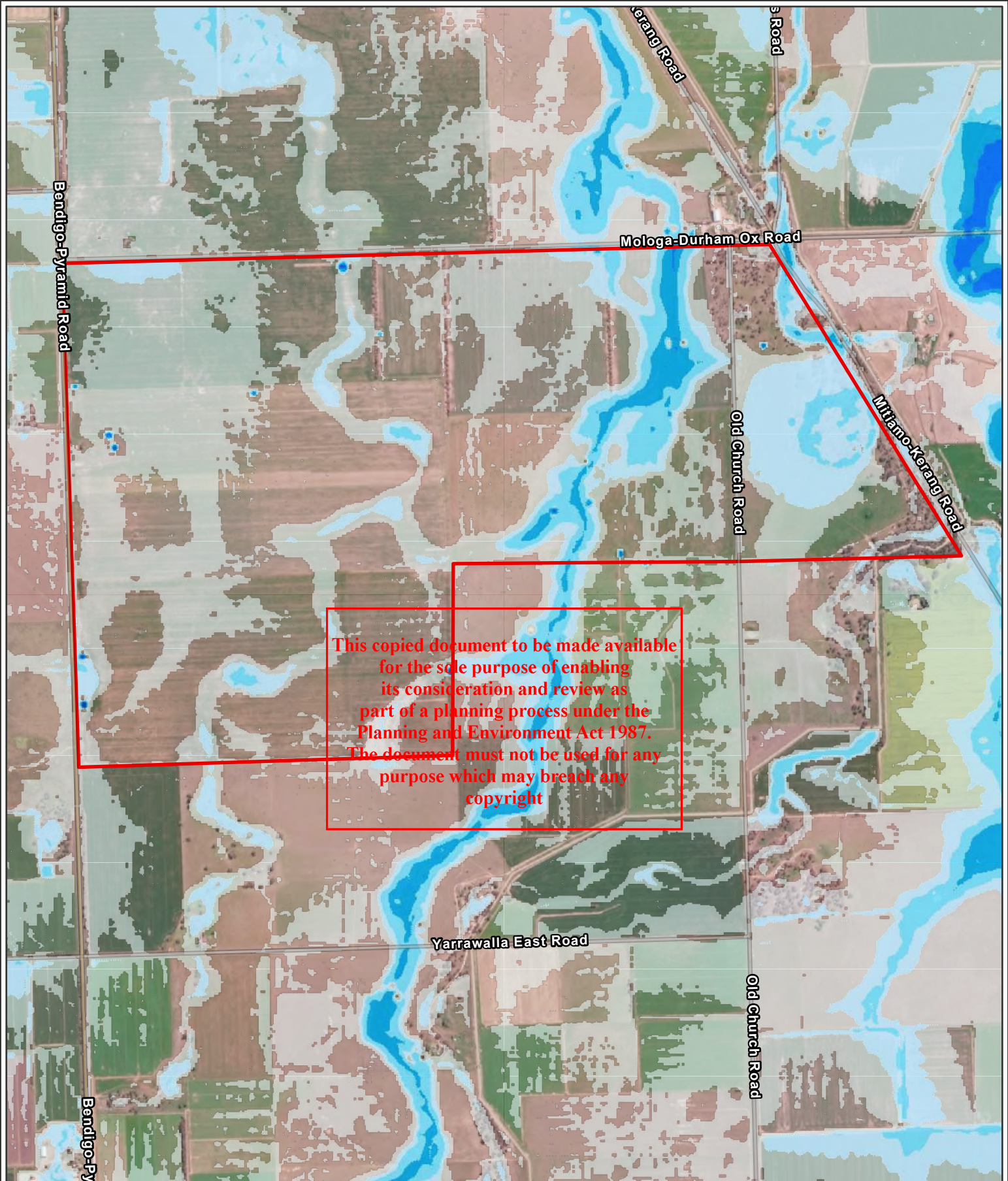
Site boundary

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Datum/Projection:
GDA2020 MGA Zone 55
Project: 25ADL11237-EH Date: 4/12/2025



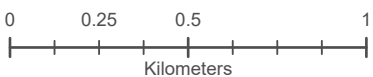


2% AEP maximum flood depth - existing conditions

Depth (m)	
0.003 - 0.01	0.751 - 1
0.011 - 0.15	1.001 - 1.25
0.151 - 0.3	1.251 - 1.5
0.301 - 0.5	1.501 - 2
0.501 - 0.75	2.001 - 3
	3.001 - 4.532

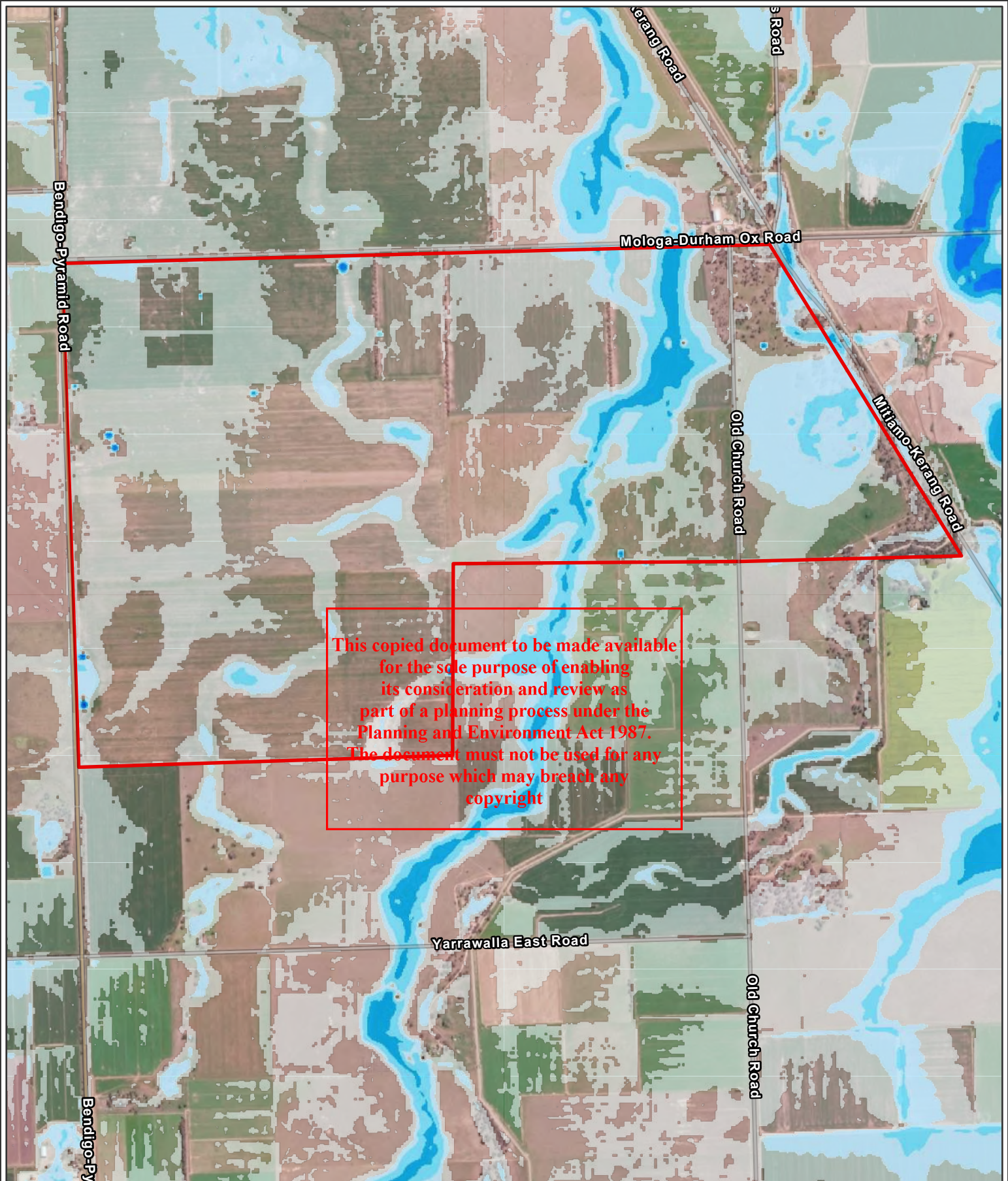
Site boundary

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PLAN



Datum/Projection:
GDA2020 MGA Zone 55
Project: 25ADL11237-EH Date: 4/12/2025





2% AEP maximum flood depth - proposed conditions

Depth (m)	0.751 - 1	Site boundary
0.003 - 0.01	1.001 - 1.25	
0.011 - 0.15	1.251 - 1.5	
0.151 - 0.3	1.501 - 2	
0.301 - 0.5	2.001 - 3	
0.501 - 0.75	3.001 - 4.532	

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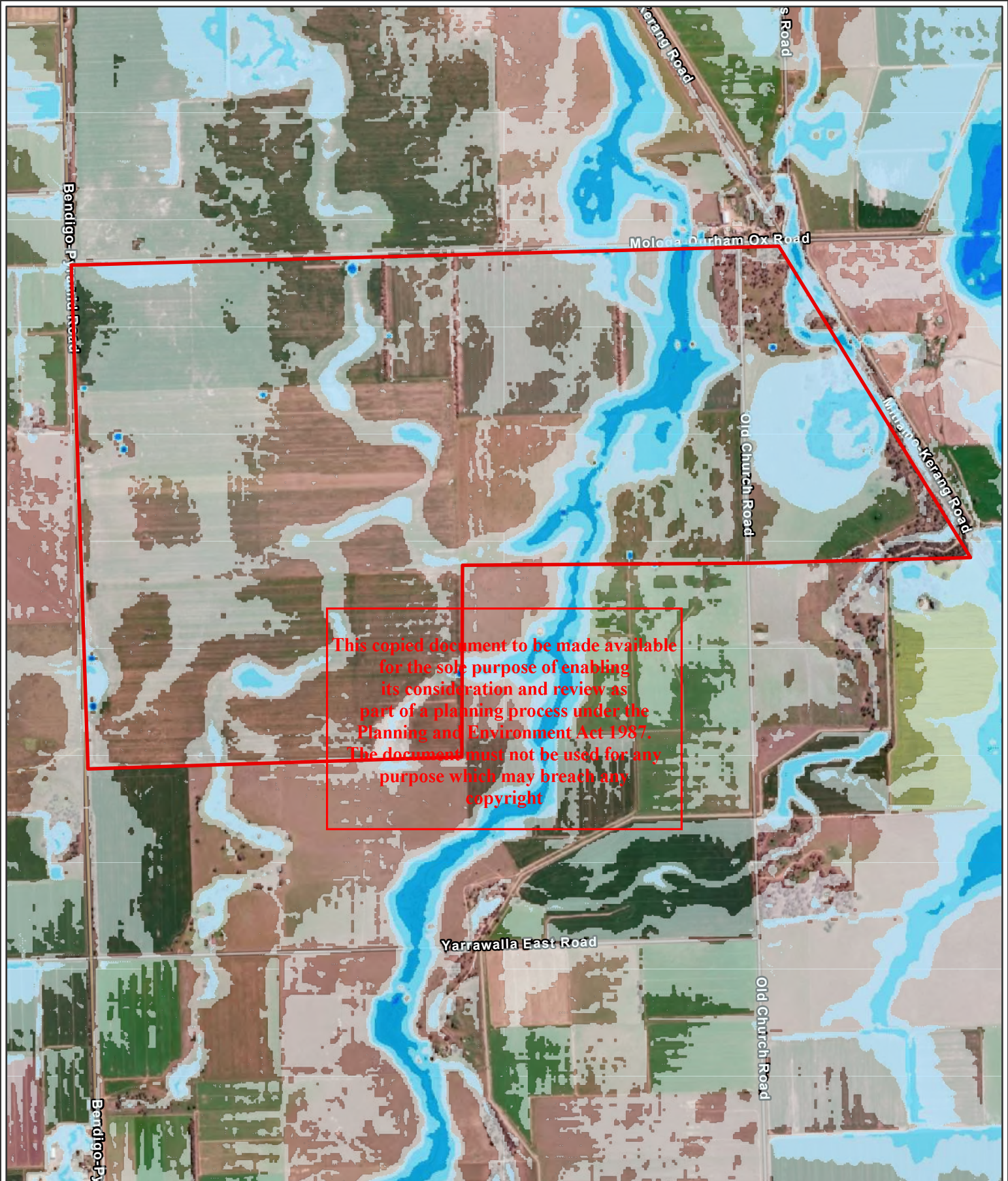
0 0.25 0.5 1
Kilometers

Datum/Projection:
GDA2020 MGA Zone 55

Project: 25ADL11237-EH Date: 4/12/2025

N

ATETRA TECH COMPANY

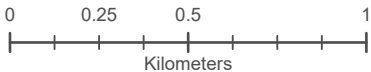


1% AEP maximum flood depth - existing conditions

Depth (m)	
0.003 - 0.01	0.751 - 1
0.011 - 0.15	1.001 - 1.25
0.151 - 0.3	1.251 - 1.5
0.301 - 0.5	1.501 - 2
0.501 - 0.75	2.001 - 3
	3.001 - 4.532

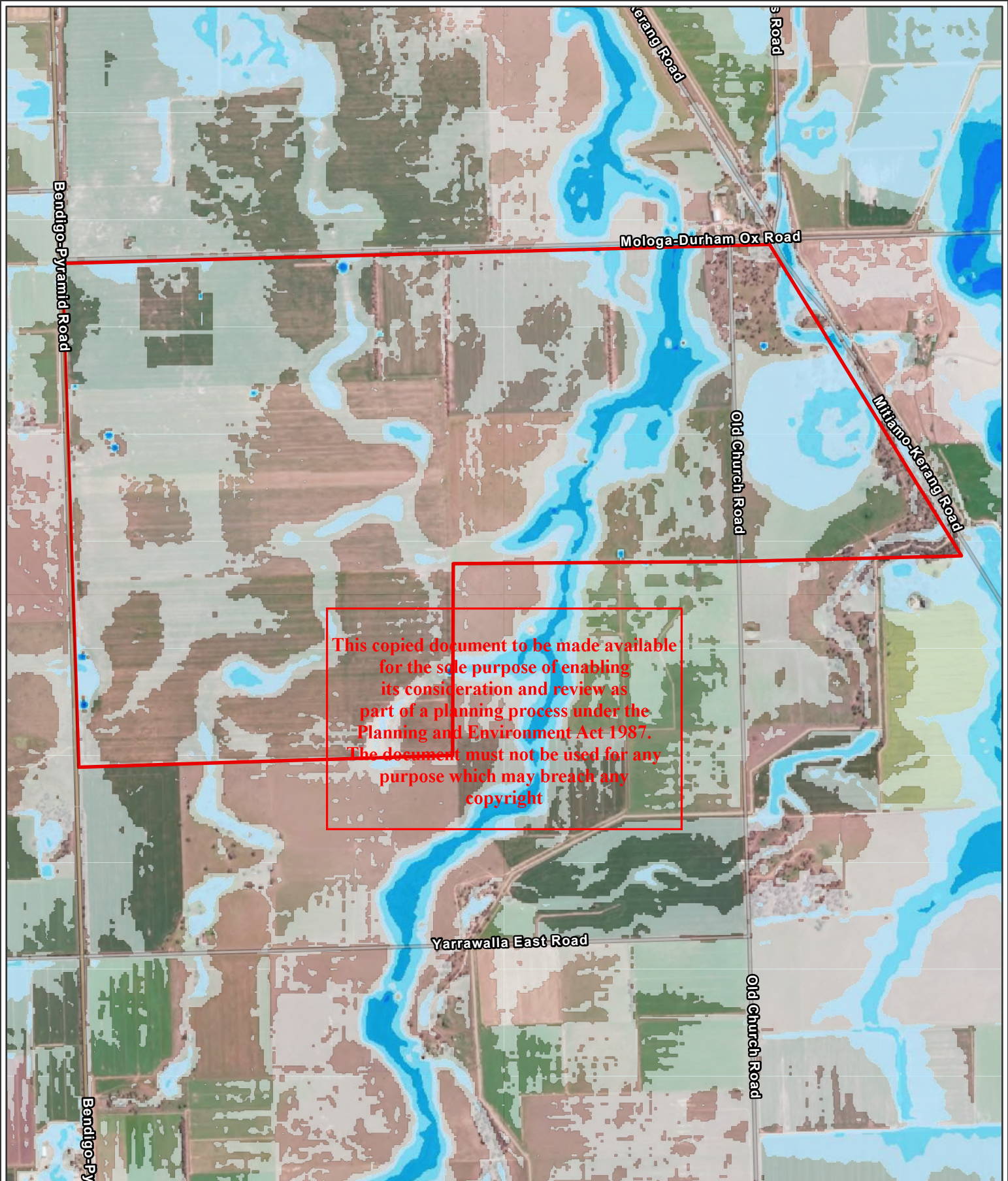
Site boundary

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Datum/Projection:
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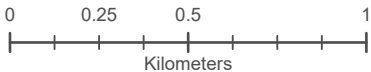


1% AEP maximum flood depth - proposed conditions

Depth (m)	0.751 - 1
0.003 - 0.01	1.001 - 1.25
0.011 - 0.15	1.251 - 1.5
0.151 - 0.3	1.501 - 2
0.301 - 0.5	2.001 - 3
0.501 - 0.75	3.001 - 4.532

Site boundary

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Datum/Projection:
GDA2020 MGA Zone 55
Project: 25ADL11237-EH Date: 4/12/2025

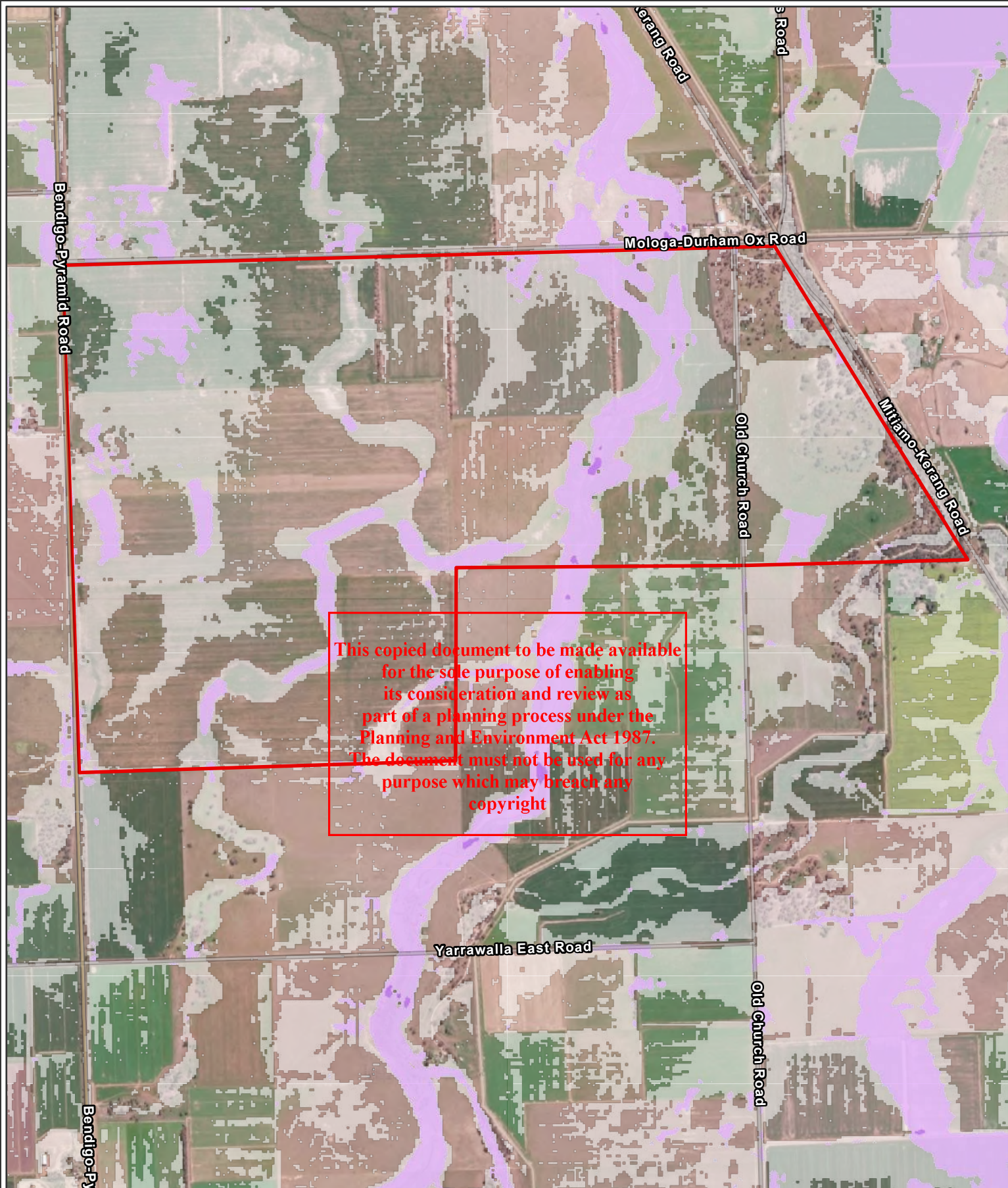


Maximum modelled velocity

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10% AEP maximum flood velocity - existing conditions

Velocity (m/s)

Site boundary

0.01 - 0.1

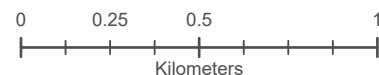
0.1 - 0.5

0.5 - 1

1 - 2

2 - 4

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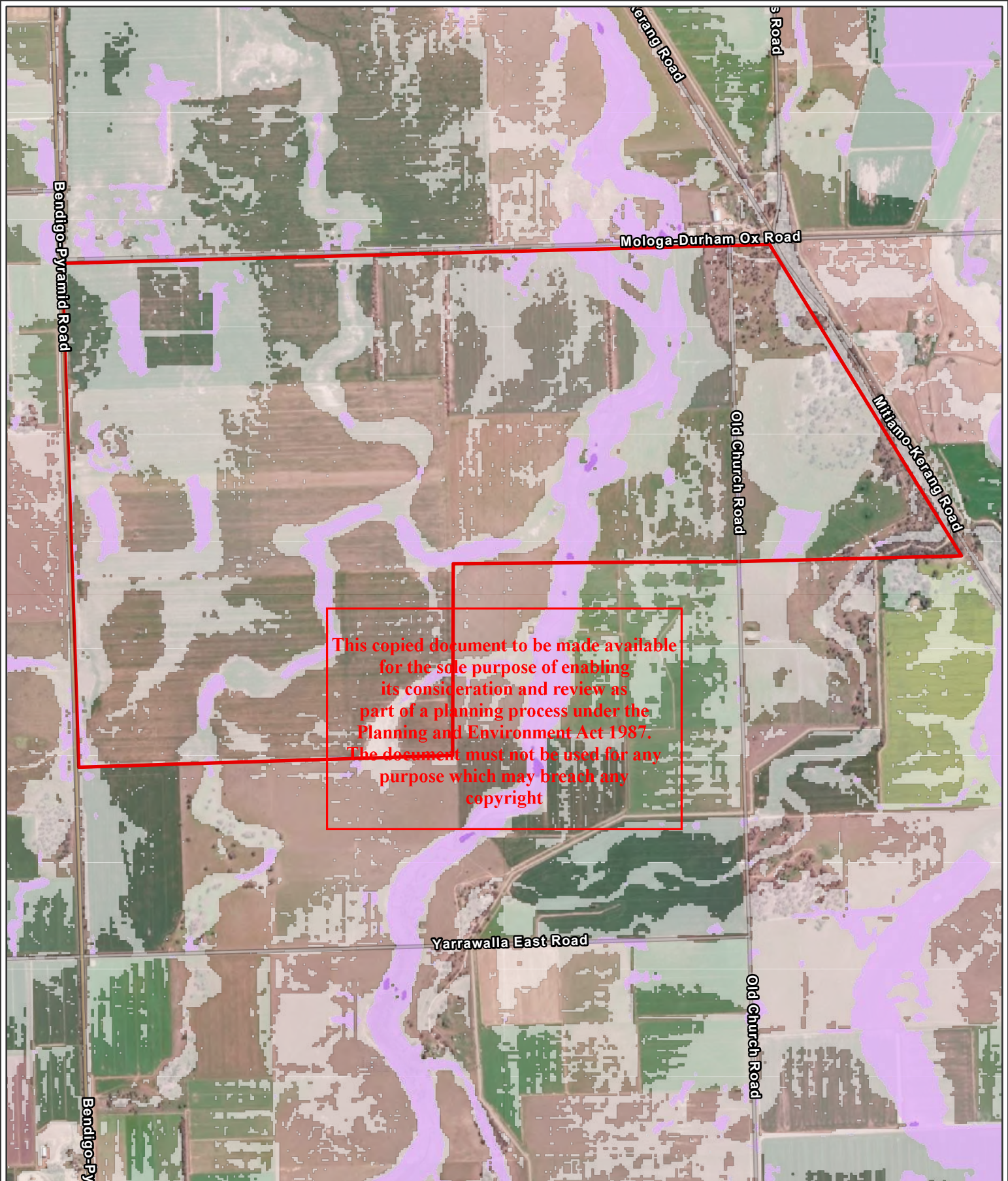


Datum/Projection:
GDA2020 MGA Zone 55

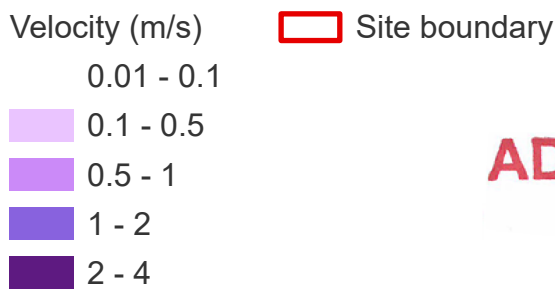
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10% AEP maximum flood velocity - proposed conditions



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Kilometers

Datum/Projection:
GDA2020 MGA Zone 55

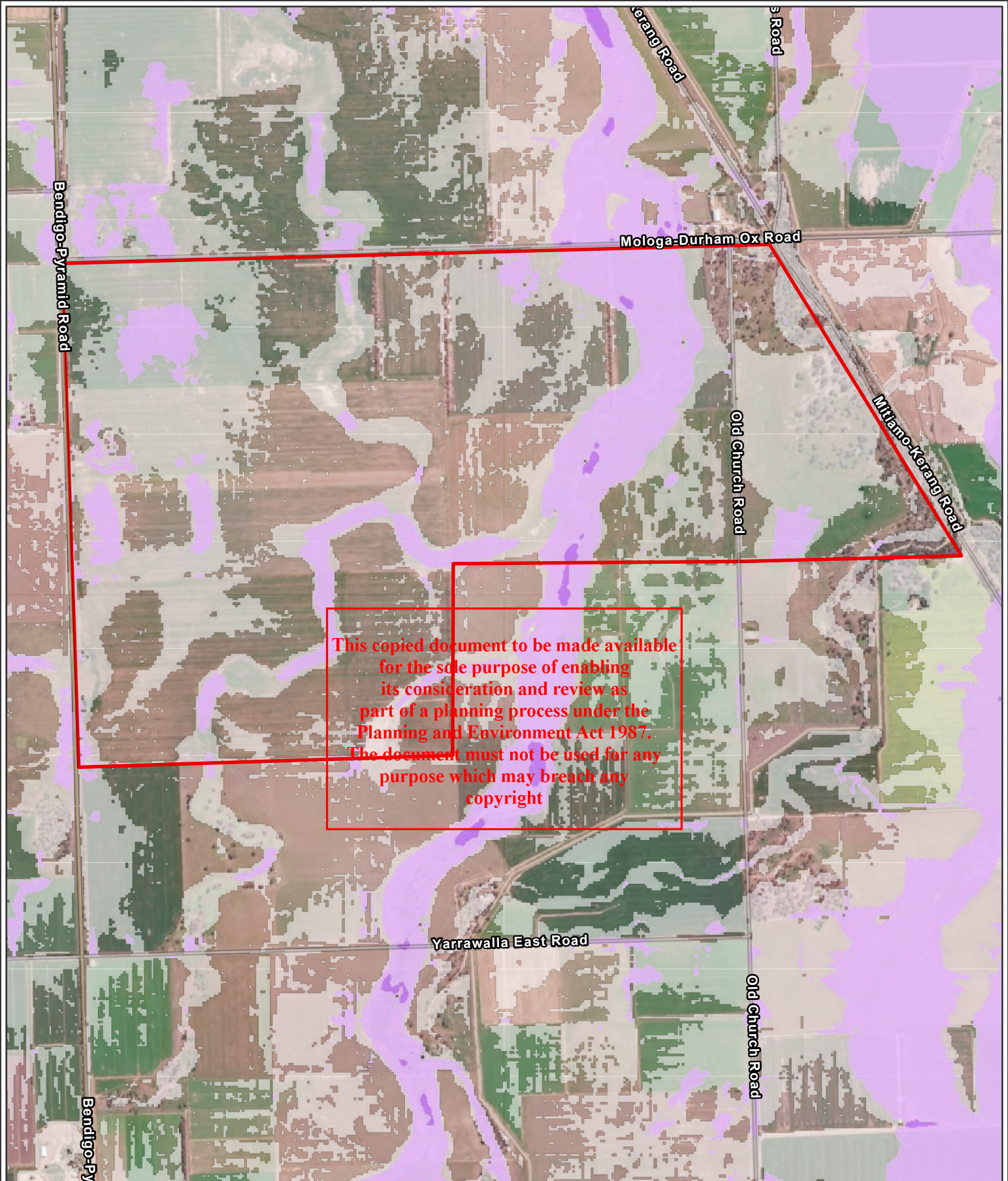
Project: 25ADL11237-EH Date: 4/12/2025



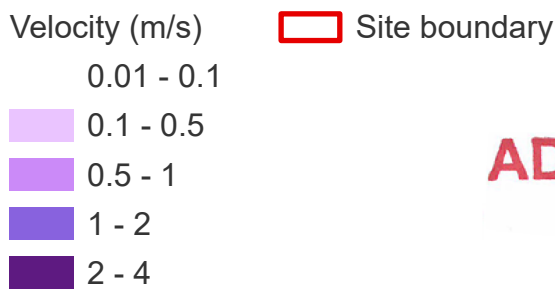
N



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2% AEP maximum flood velocity - existing conditions



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0 0.25 0.5 1

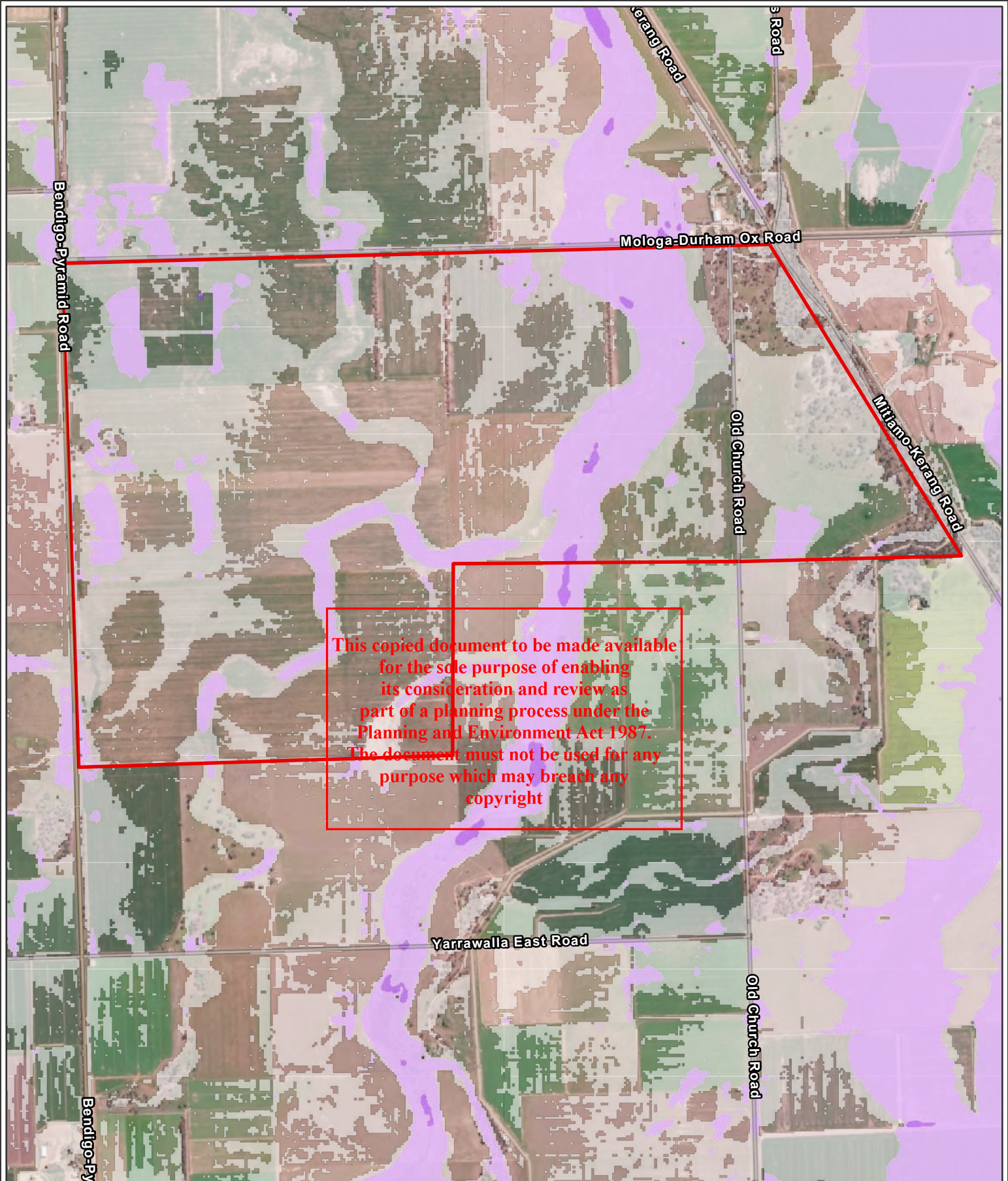
Kilometers

Datum/Projection:
GDA2020 MGA Zone 55

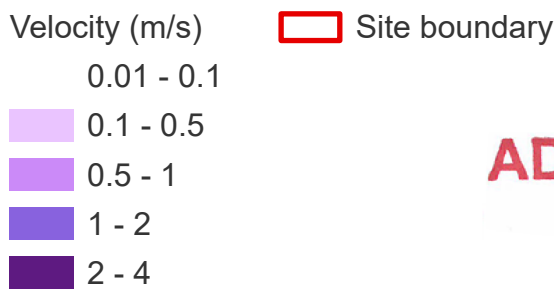
Project: 25ADL11237-EH Date: 4/12/2025

N

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2% AEP maximum flood velocity - proposed conditions



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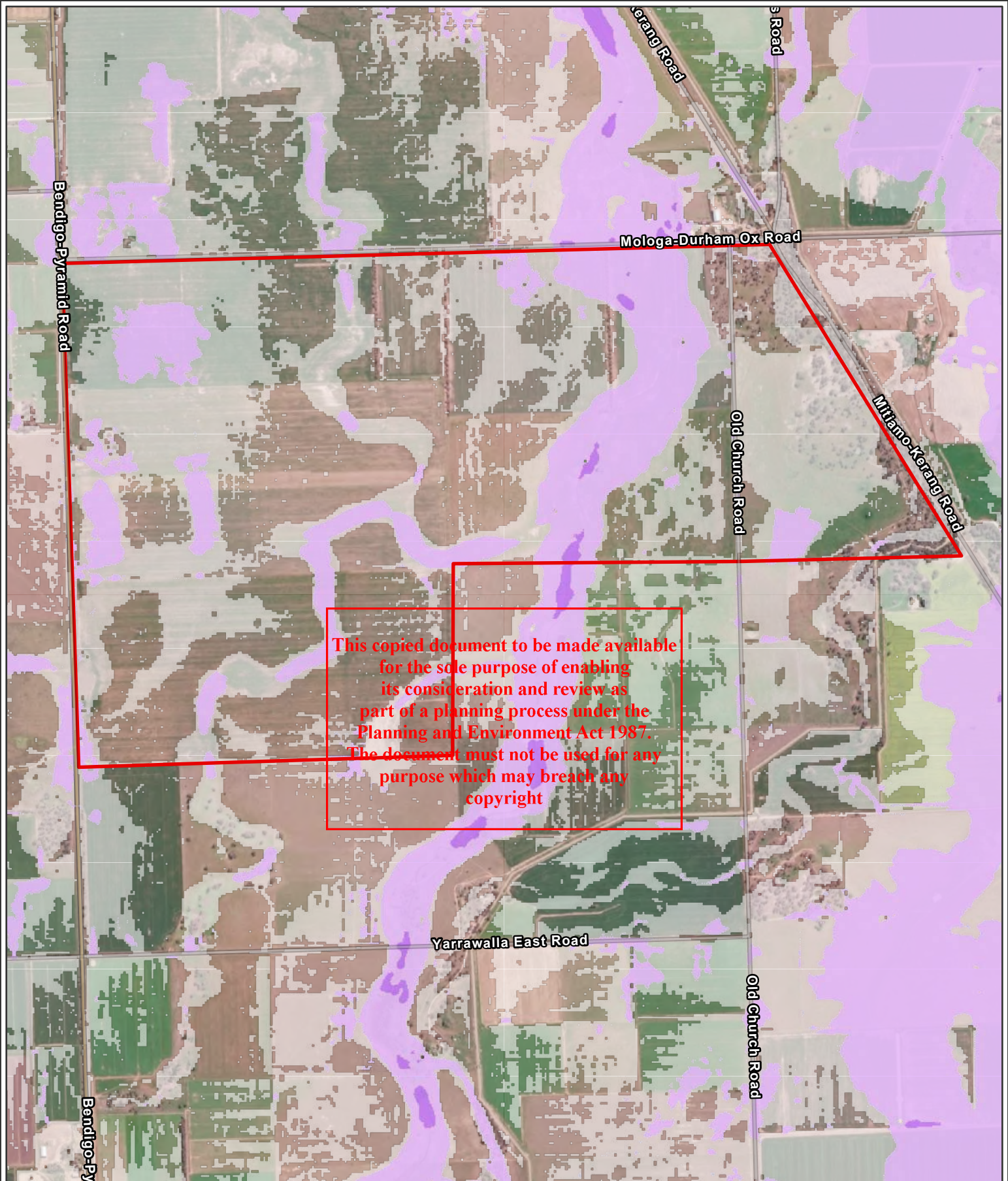
00.250.51

Kilometers

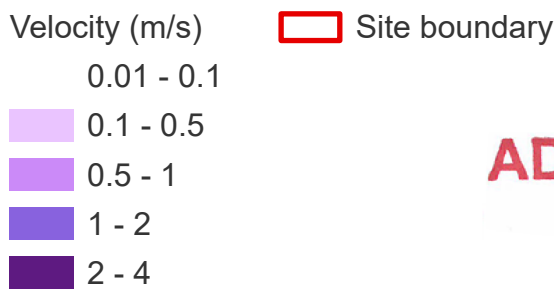
Datum/Projection:
GDA2020 MGA Zone 55

Project: 25ADL11237-EH Date: 4/12/2025

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1% AEP maximum flood velocity - existing conditions



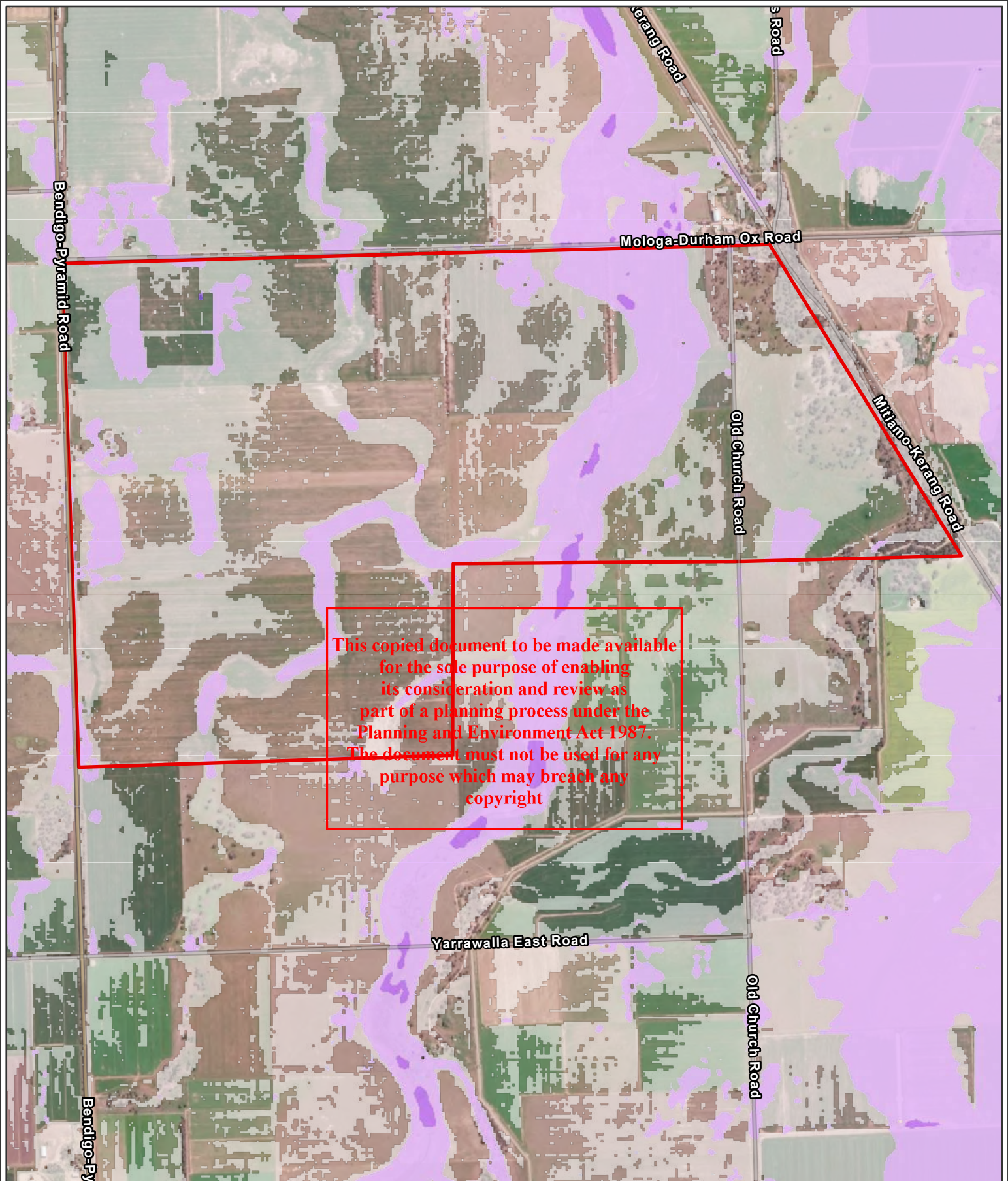
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0 0.25 0.5 1

Kilometers

Datum/Projection:
GDA2020 MGA Zone 55

Project: 25ADL11237-EH Date: 4/12/2025



1% AEP maximum flood velocity - proposed conditions

Velocity (m/s)

0.01 - 0.1

0.1 - 0.5

0.5 - 1

1 - 2

2 - 4

Site boundary

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Kilometers

Datum/Projection:
GDA2020 MGA Zone 55

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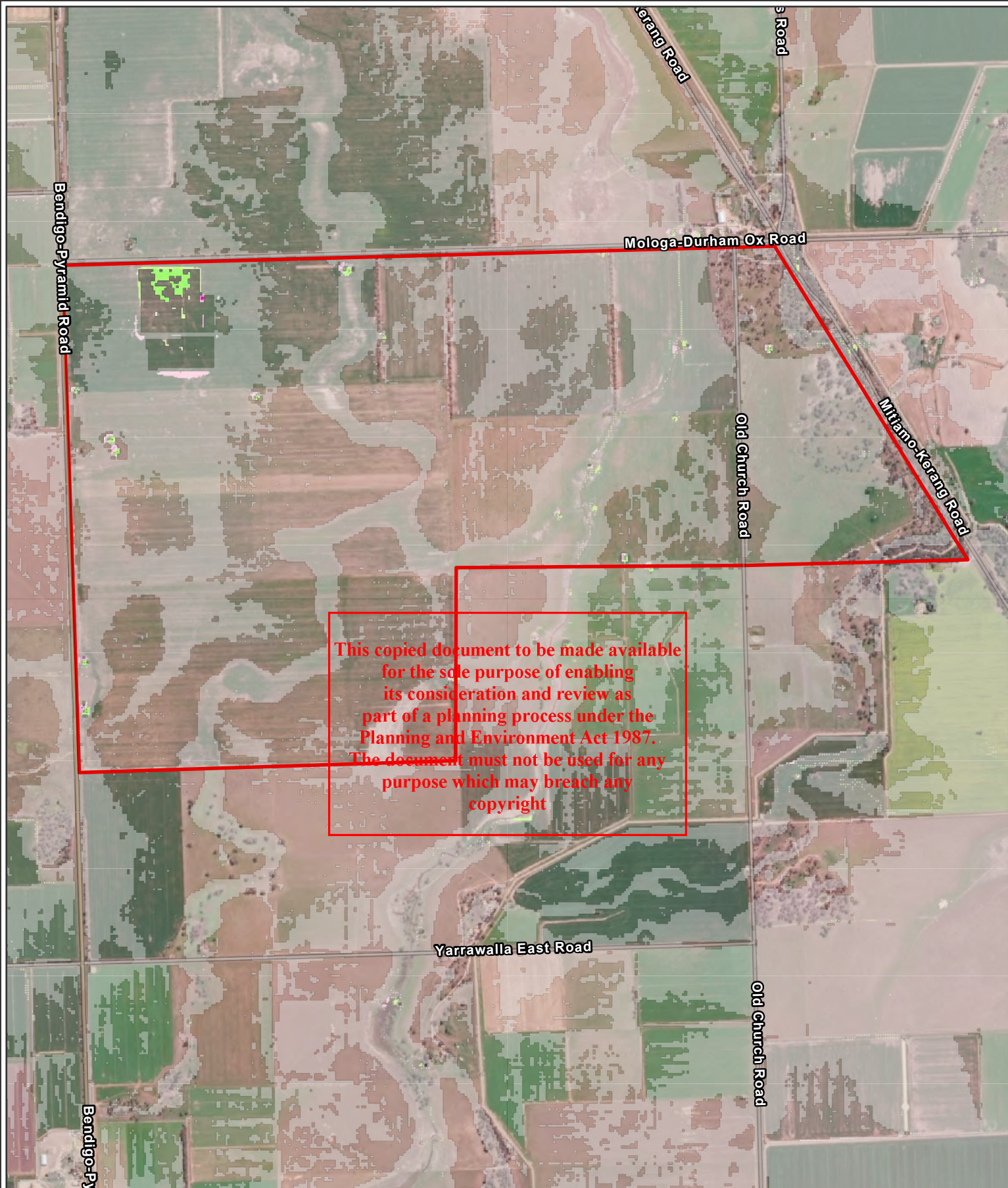


Modelled depth afflux

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10% AEP maximum flood depth - afflux

Change in maximum flood depth (m)

- 0.5 - -0.3 (Moderate decrease)
- 0.3 - -0.1 (Minor decrease)
- 0.1 - -0.05 (Insignificant decrease)
- 0.05 - 0.05 (Virtually no change)
- 0.05 - 0.1 (Insignificant increase)
- 0.1 - 0.3 (Minor increase)
- 0.3 - 0.5 (Moderate increase)

Site boundary

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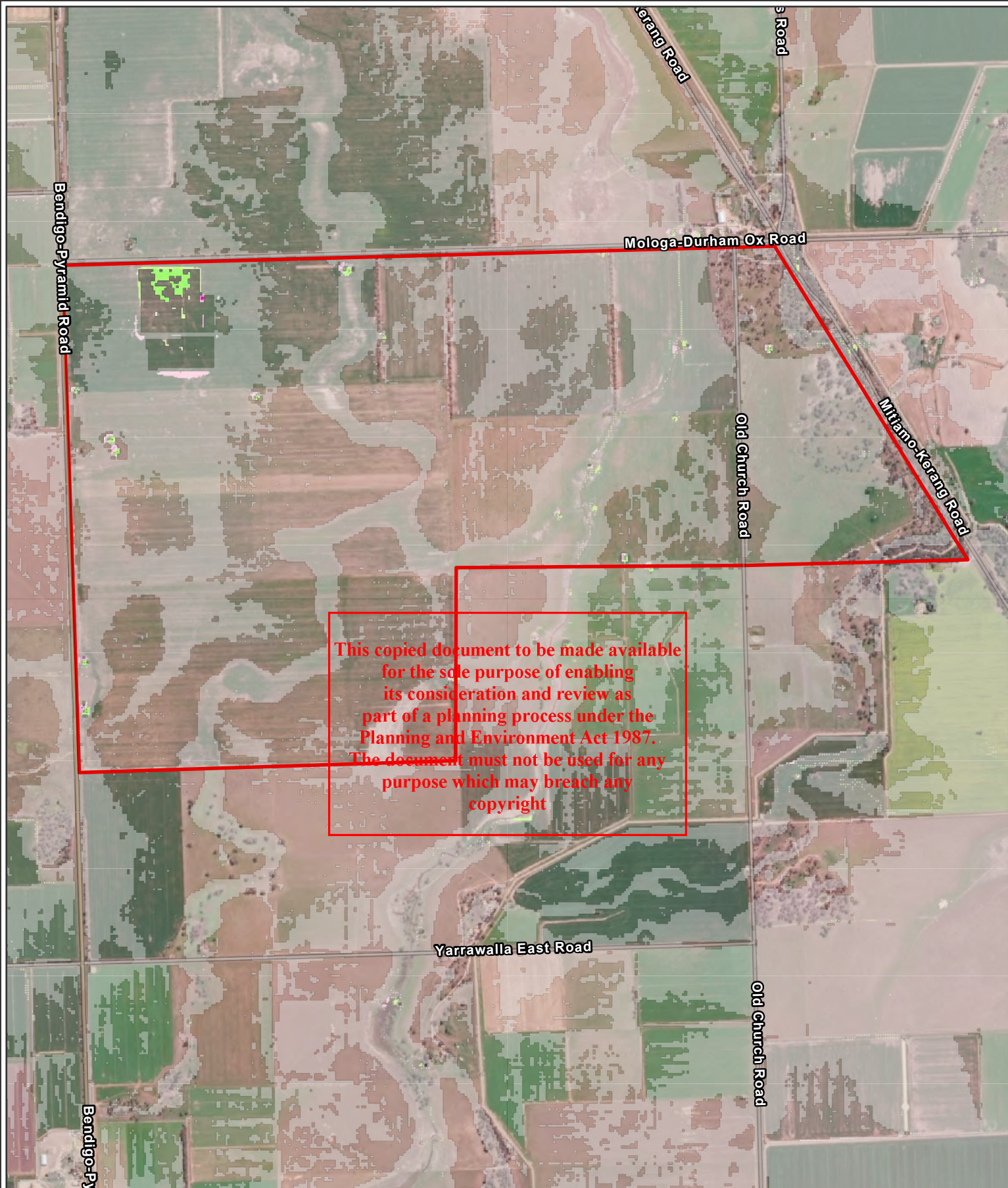
0 0.25 0.5 1
Kilometers

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2% AEP maximum flood depth - afflux

Change in maximum flood depth (m)

- 0.5 - -0.3 (Moderate decrease)
- 0.3 - -0.1 (Minor decrease)
- 0.1 - -0.05 (Insignificant decrease)
- 0.05 - 0.05 (Virtually no change)
- 0.05 - 0.1 (Insignificant increase)
- 0.1 - 0.3 (Minor increase)
- 0.3 - 0.5 (Moderate increase)

Site boundary

0 0.25 0.5 1
Kilometers

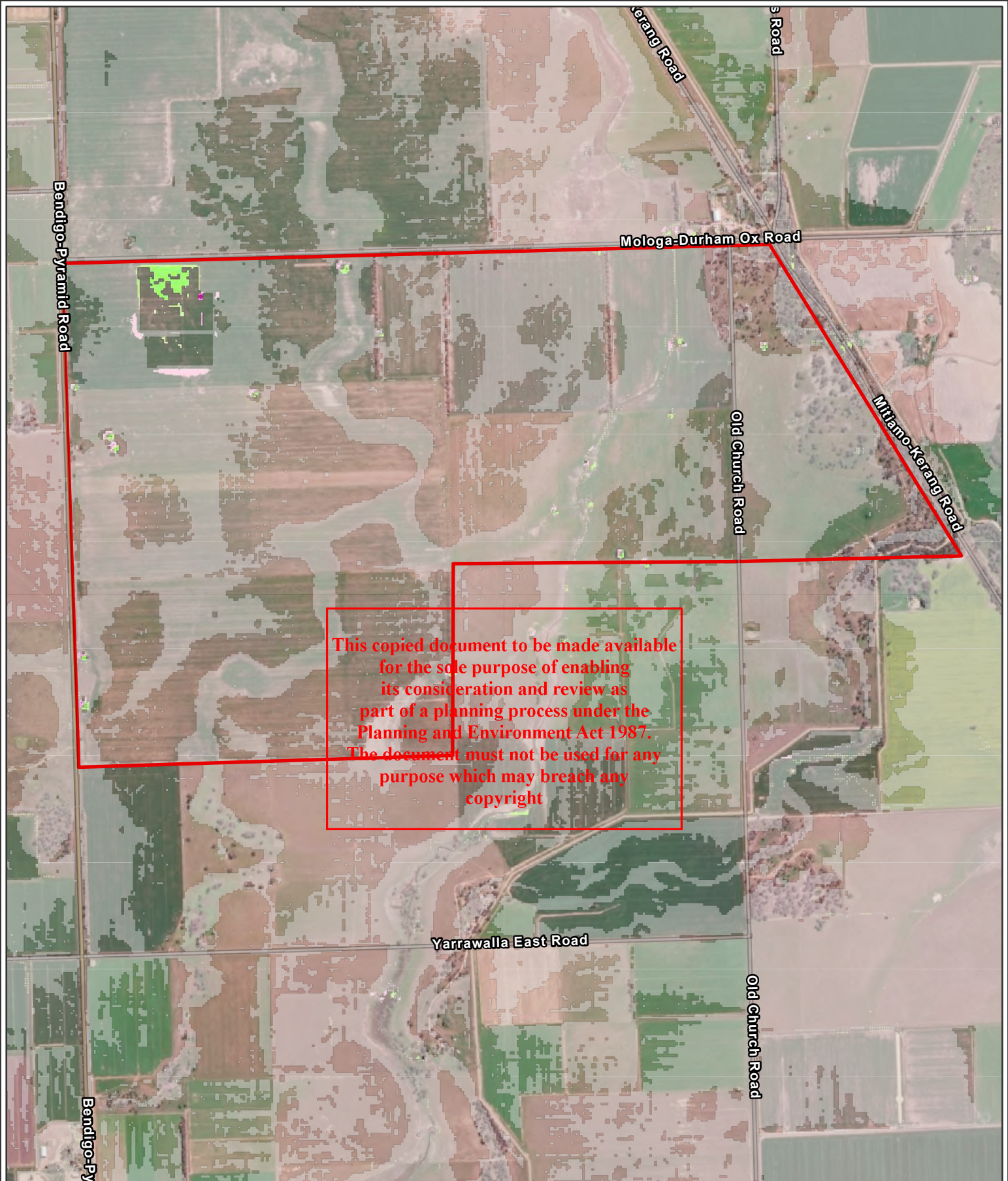
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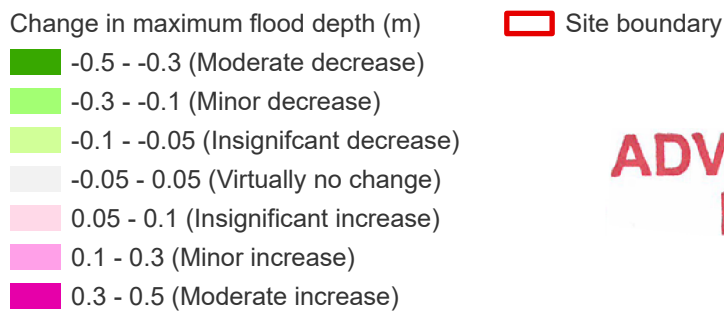


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1% AEP maximum flood depth - afflux



00.250.51

Kilometers

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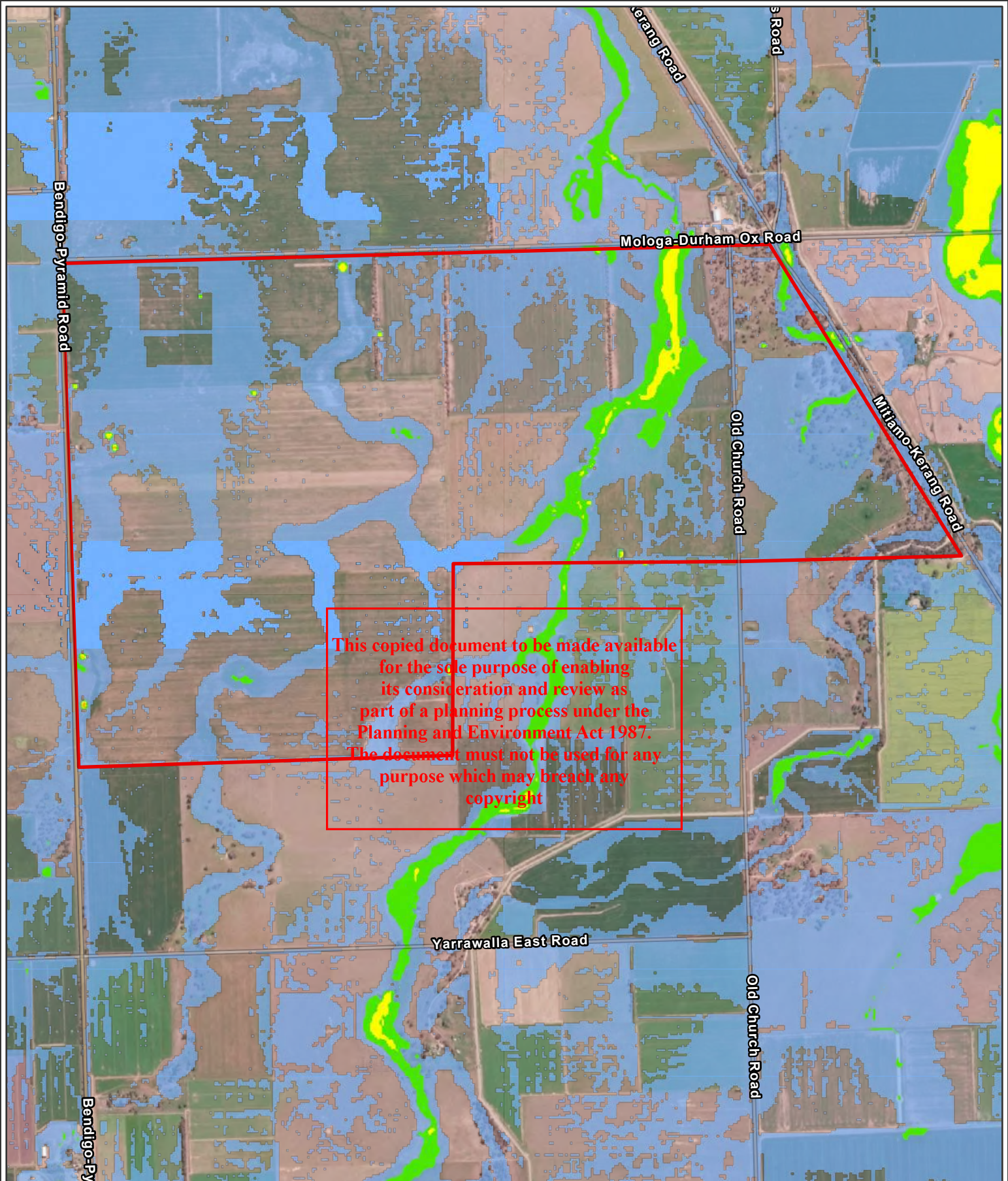
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Modelled flood hazard

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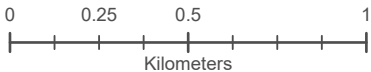


10% AEP maximum flood hazard - proposed conditions

Flood hazard classification Site boundary

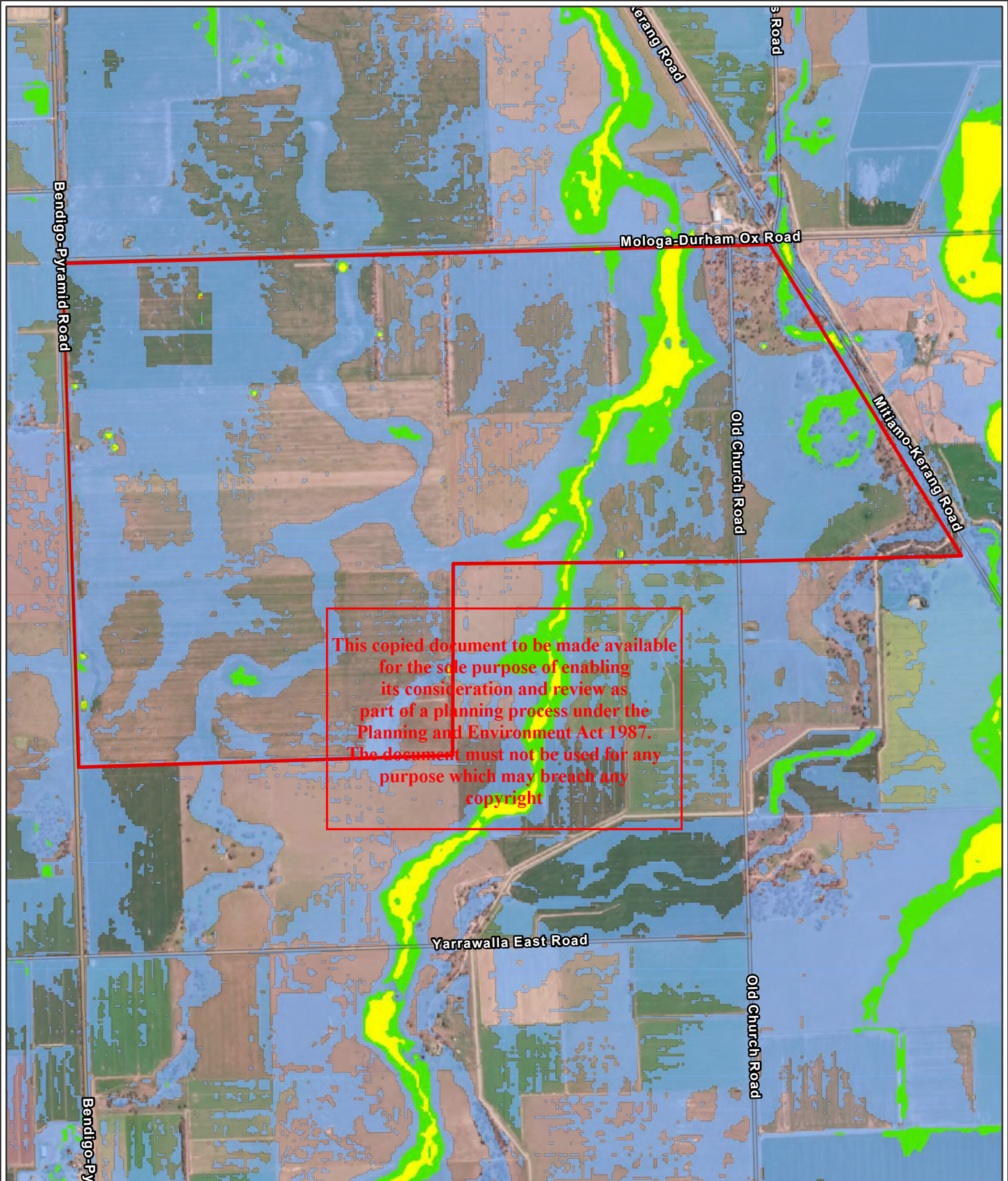
- H1
- H2
- H3
- H4
- H5
- H6

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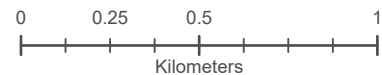


2% AEP maximum flood hazard - proposed conditions

Flood hazard classification Site boundary

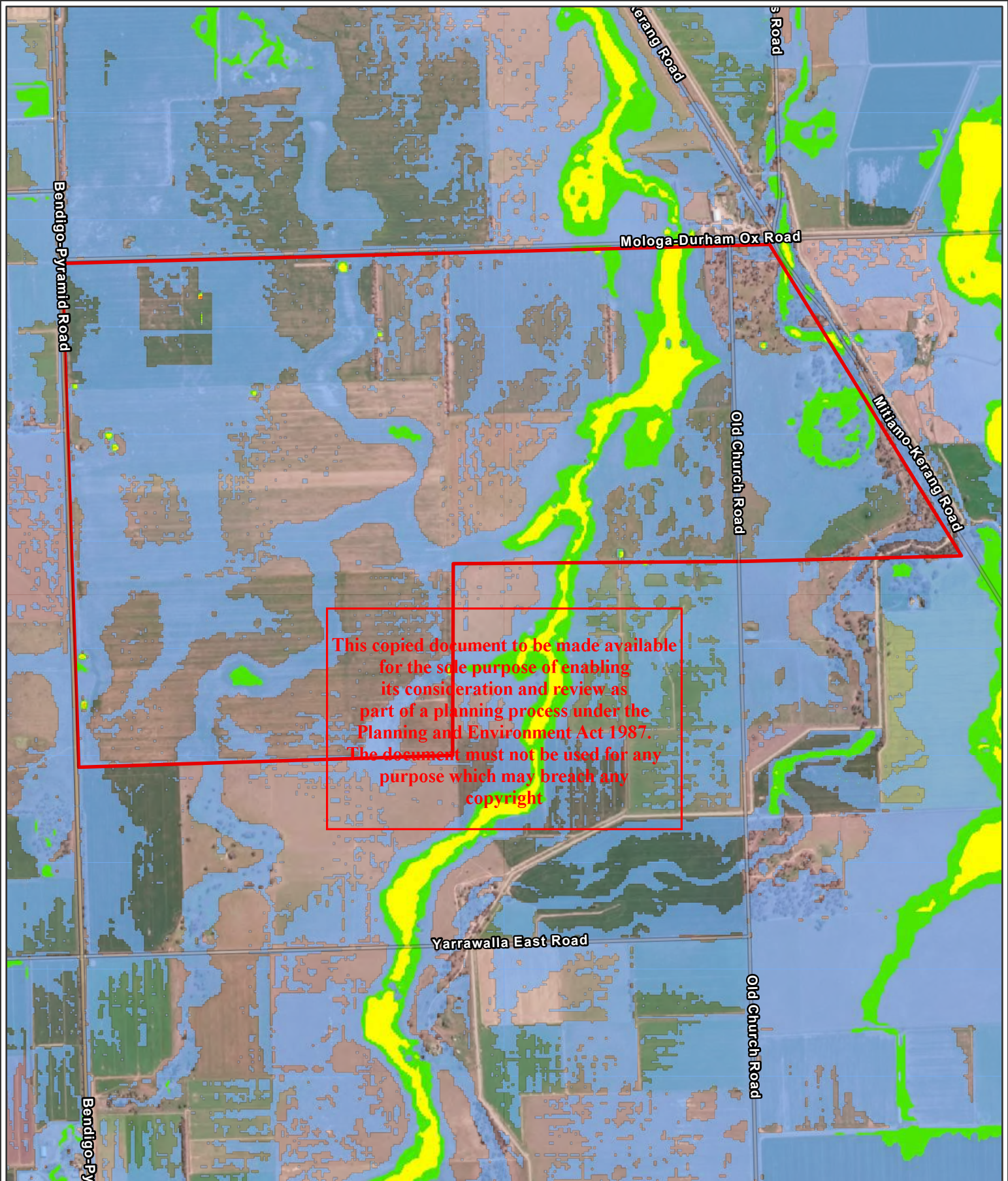
- H1
- H2
- H3
- H4
- H5
- H6

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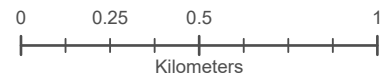


1% AEP maximum flood hazard - proposed conditions

Flood hazard classification Site boundary

- H1
- H2
- H3
- H4
- H5
- H6

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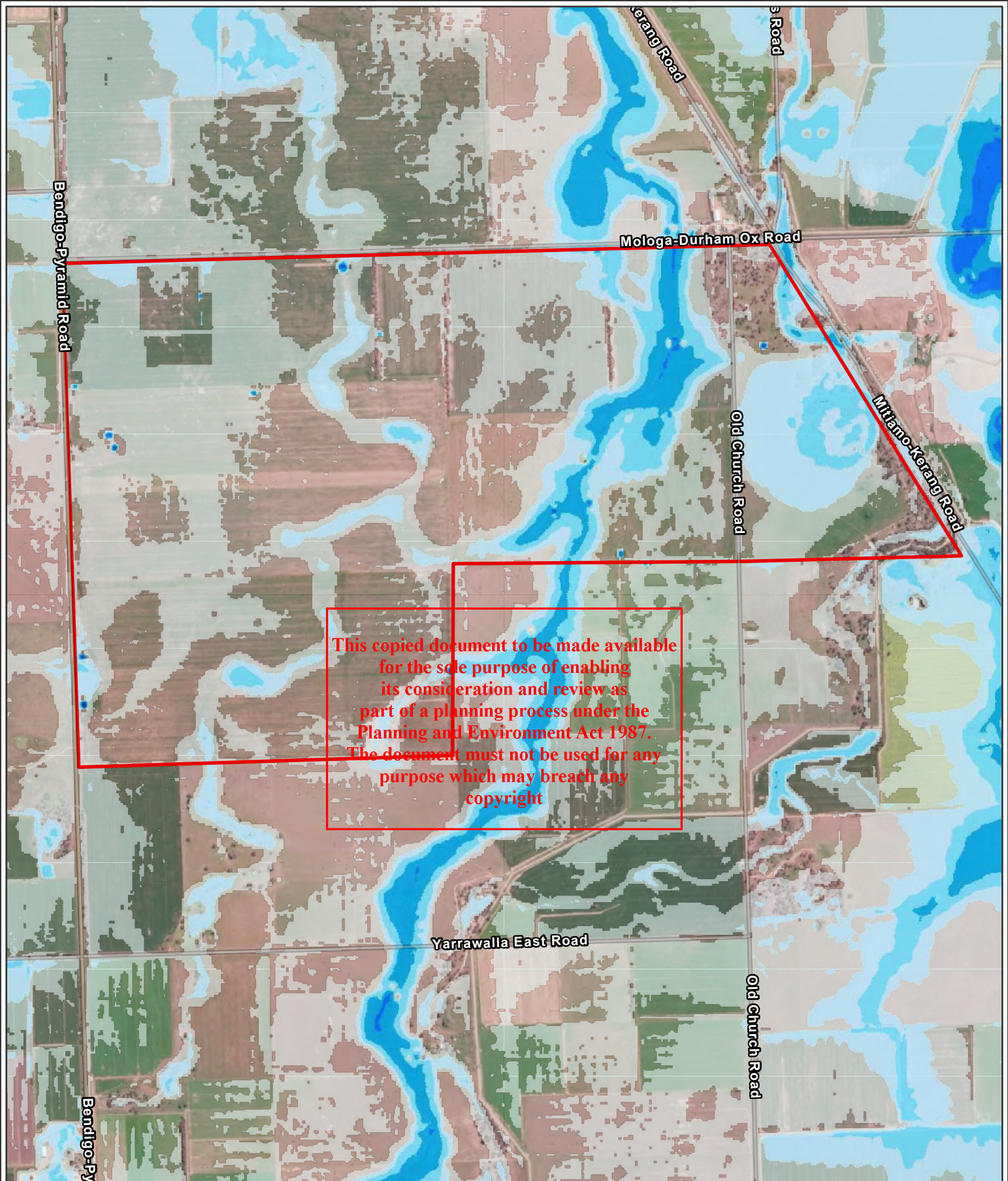
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Modelled depth climate change scenarios

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1% AEP climate scenario SSP1-2.6 maximum flood depth - proposed conditions

Depth (m)	
0.003 - 0.01	0.751 - 1
0.011 - 0.15	1.001 - 1.25
0.151 - 0.3	1.251 - 1.5
0.301 - 0.5	1.501 - 2
0.501 - 0.75	2.001 - 3
	3.001 - 4.532

Site boundary

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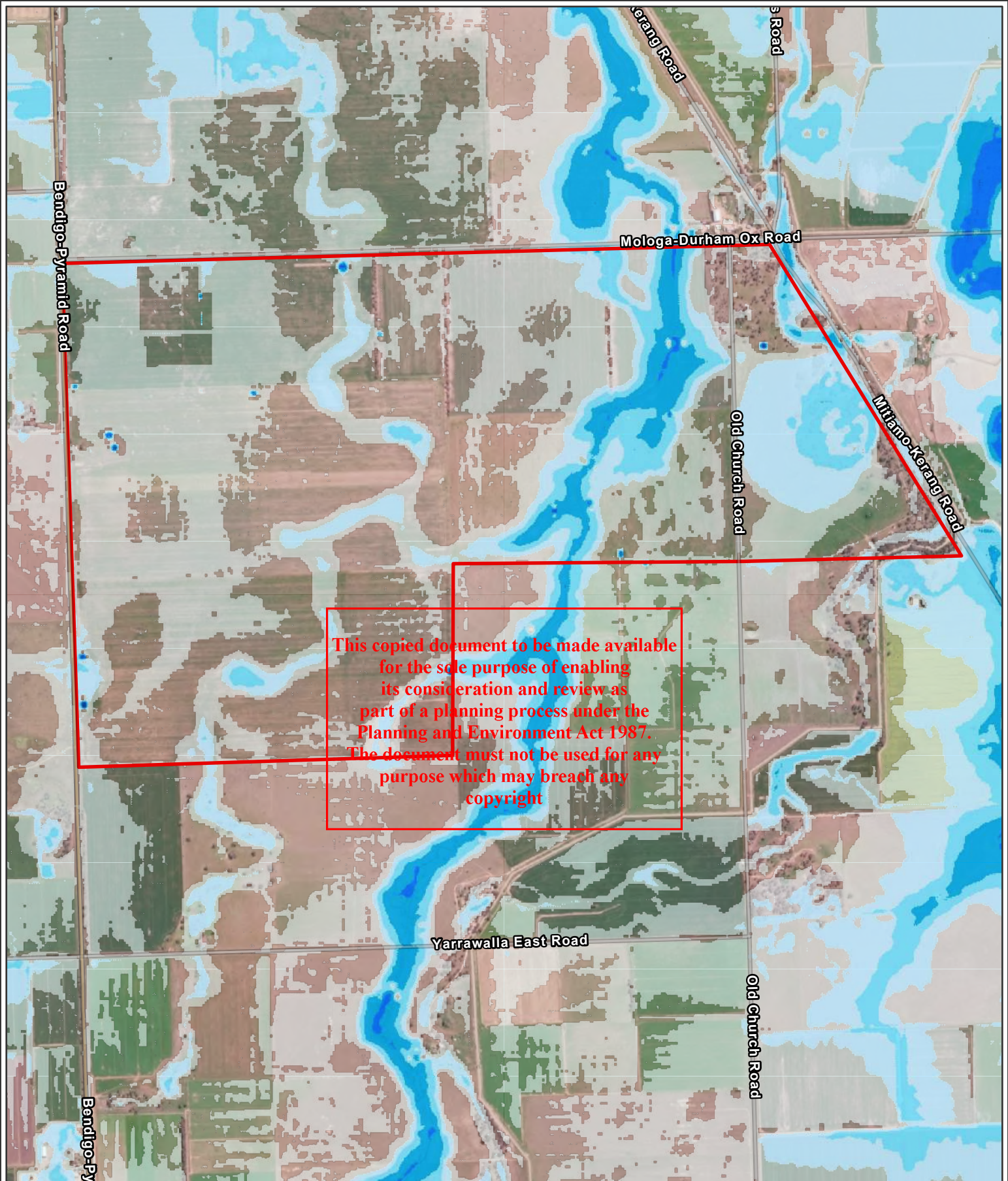
0
0.25
0.5
1

Kilometers

Datum/Projection:
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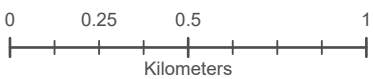


1% AEP climate scenario SSP2-4.5 maximum flood depth - proposed conditions

Depth (m)	
0.003 - 0.01	0.751 - 1
0.011 - 0.15	1.001 - 1.25
0.151 - 0.3	1.251 - 1.5
0.301 - 0.5	1.501 - 2
0.501 - 0.75	2.001 - 3
	3.001 - 4.532

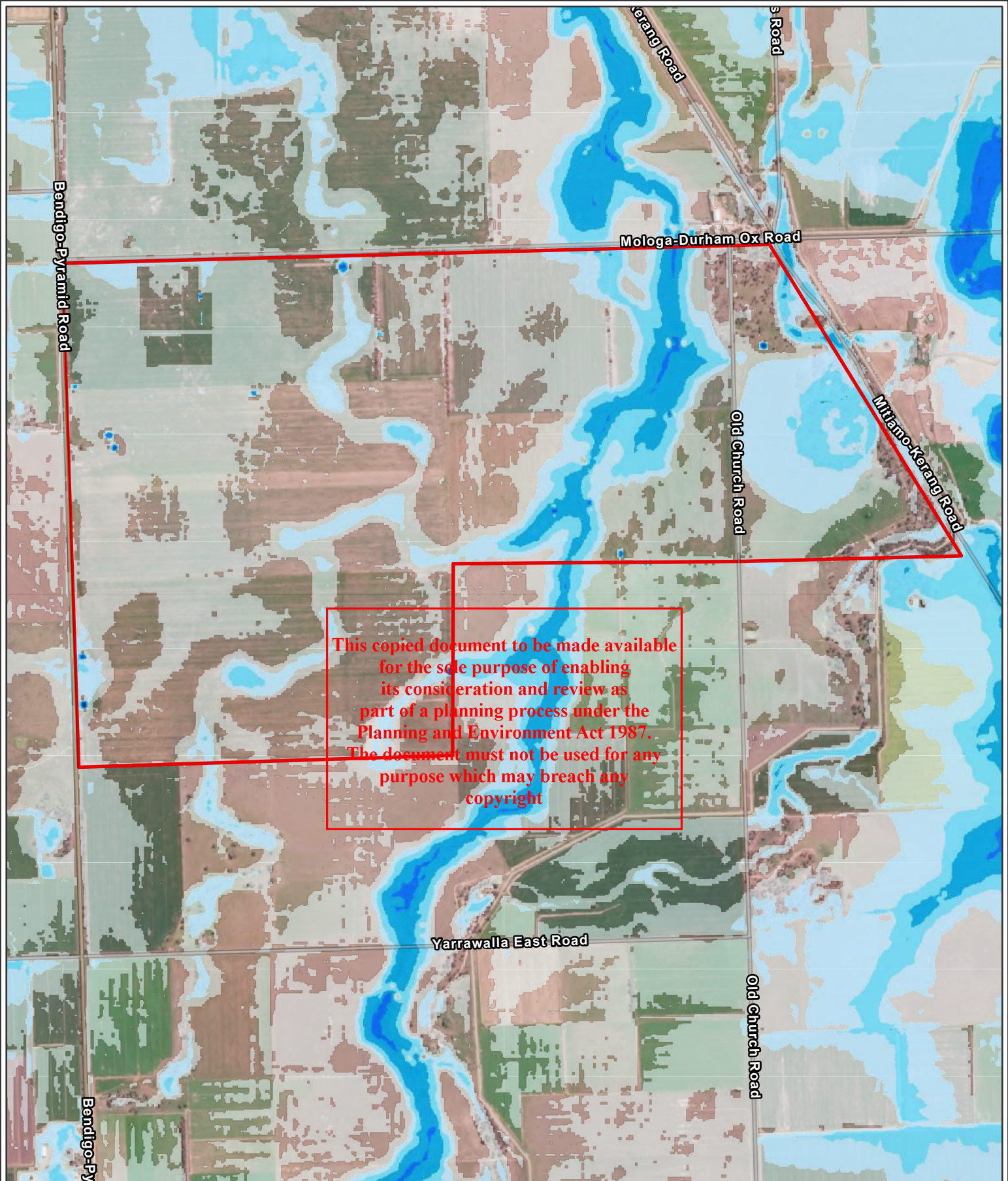
Site boundary

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Project: 25ADL11237-EH Date: 4/12/2025





1% AEP climate scenario SSP3-7.0 maximum flood depth - proposed conditions

Depth (m)

0.003 - 0.01	0.751 - 1
0.011 - 0.15	1.001 - 1.25
0.151 - 0.3	1.251 - 1.5
0.301 - 0.5	1.501 - 2
0.501 - 0.75	2.001 - 3
	3.001 - 4.532

Site boundary

0 0.25 0.5 1

Kilometers

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