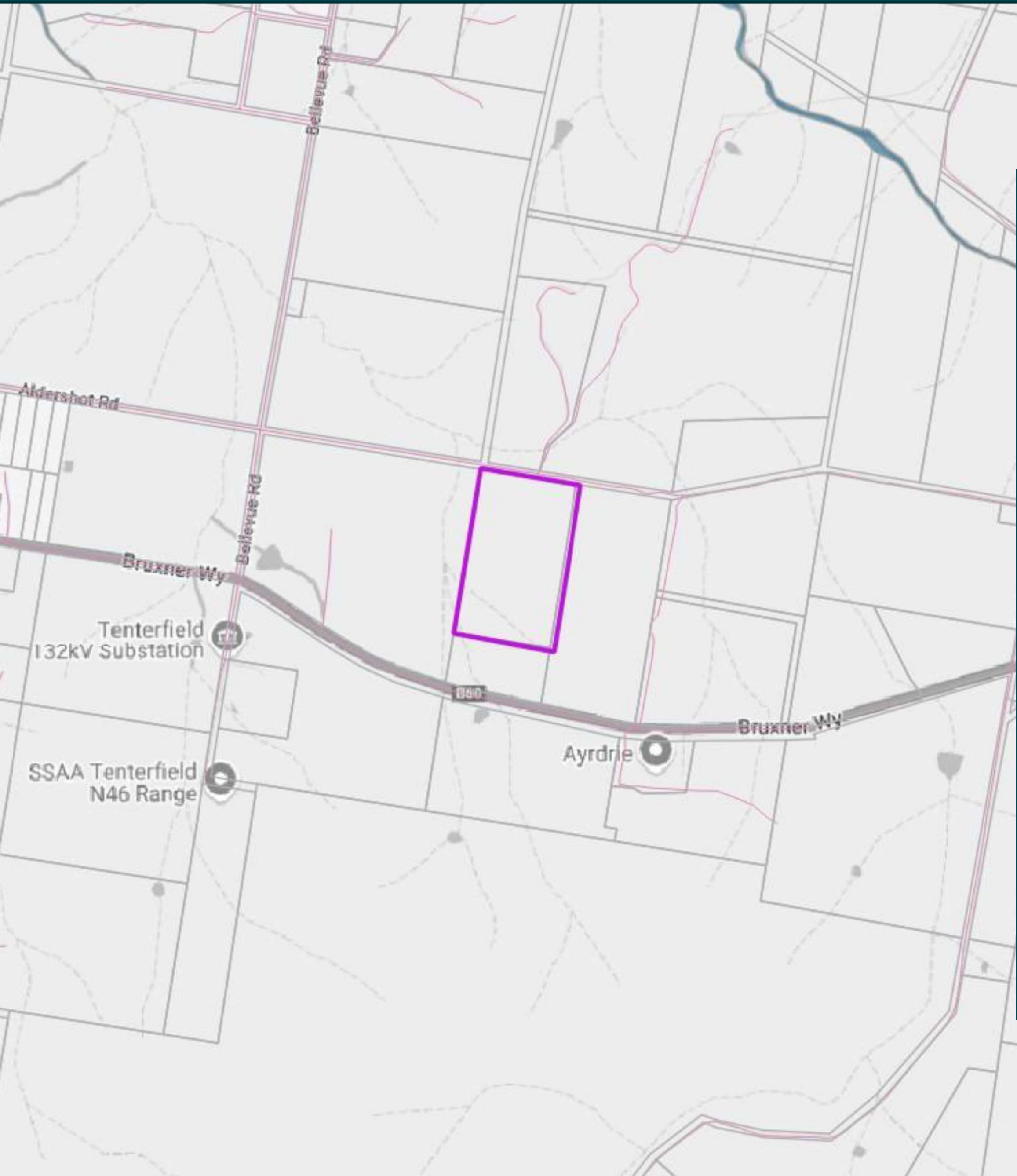

TENTERFIELD DBESS

FLOOD IMPACT ASSESSMENT

REPORT

JULY 2025

Prepared For

ACEnergy

PROJECT DETAILS

Report Details	Tenterfield DBESS – Flood Impact Assessment
Prepared For	ACEnergy
Prepared By	SWM Consulting Pty Ltd
Written By	MM, AS
Document Name	25-1271

Document Control

Version	Author	Reviewer	Description	Report Date
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R01-A	AS	AS	Final	21/07/2025

ACKNOWLEDGEMENT OF COUNTRY

SWM Consulting acknowledges and pays our respect to the Aboriginal and Torres Strait Islander Peoples as the Traditional Custodians of Country throughout Australia. We acknowledge the Traditional Custodians of the land, water and skies upon which this work was conducted. We pay our respects to all First Nations Peoples their Elders past, present and emerging.

We acknowledge the contributions of Indigenous Peoples, and respect the knowledge, skills and lived experiences as we continue to learn from them, and their care for Country. To incorporate reconciliation in our everyday life we recommend:

- Listening to First Nations stories and voices.
- Taking a cultural tour of your area or workplace.
- When you create content, events, or spaces, make sure to think of things from an Indigenous perspective to create a safe environment.
- Following and supporting BLAK businesses, influencers and organisations on social media.
- Planting a native or bush tucker garden and learn about the cultural significance of the plants.
- Engaging with local artists and support their work.
- Learning and memorising the key dates that affect Indigenous peoples.

We encourage you to consider how you might incorporate these actions into your life and remember that its many small things that lead to big change.

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APPENDICES

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LIST OF ABBREVIATIONS

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARR	Australian Rainfall and Runoff
BoM	Bureau of Meteorology
DELWP	Department of Land, Water and Planning
DEM	Digital Elevation Model
FIA	Flood Impact Assessment
GPU	Graphical Processing Unit
HPC	High-Performance-Computing
KM	Kilometres
LiDAR	Light Detection and Ranging
m	metre
m/s	metre/second
QGIS	Quantum Geographic Information System

1 INTRODUCTION

1.1 BACKGROUND

SWM Consulting was engaged by ACEnergy (referred to as 'the client') to undertake a Flood Impact Assessment for the future site of the proposed **Tenterfield DBESS** located at Bruxner Highway Tenterfield 2372 (referred to as 'the site' or 'the subject site'), shown in Figure 1-1.

The proposed development will include:

- BESS container, MVBS including inverter and HV switchgear.
- Internal access roads, and access / egress locations.
- OH line;
- Landscape screening
- Temporary disturbance for construction compound and laydown and work areas;
- Security fencing; and
- Car parking;

The location of the development's components may be further defined in detailed design, once the proponent is satisfied with the supplier's information, and when the development is in accordance with good planning and floodplain management practices.

The site's proposed access is along Old Racecourse Road and Bruxner Highway Tenterfield 2372.

The current proposed indicative layout (provided to SWM Consulting by the client), is shown in Figure 1-2.

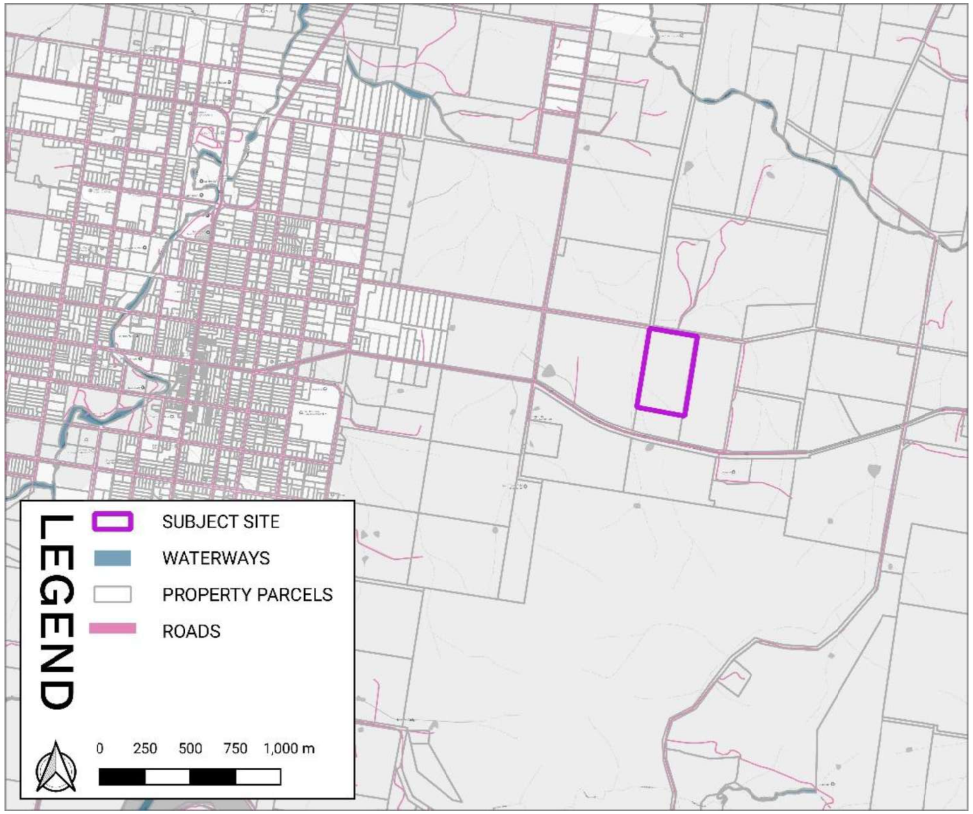

Figure 1-1 Study Area

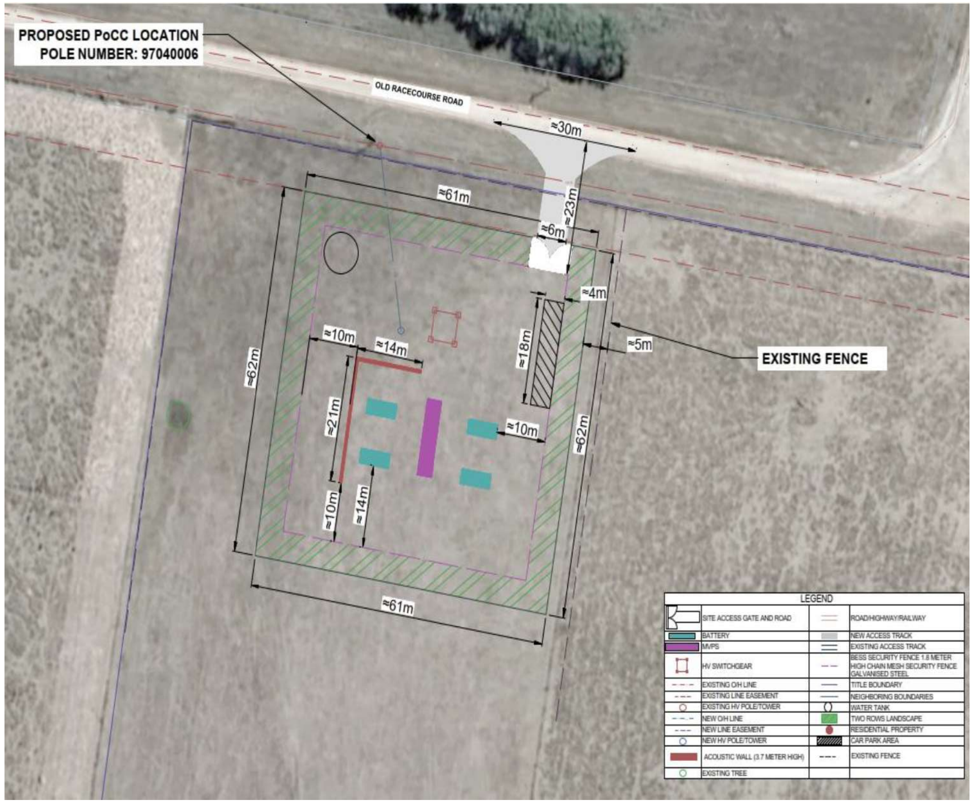

Figure 1-2 Proposed Design

1.2 OBJECTIVES AND SCOPE OF PROJECT

The primary objective of the project is to determine if there are any flooding impacts from the proposed Tenterfield DBESS development, and, to provide advice regarding the flooding and drainage impacts within the projects local area. The scope includes a review of the catchment conditions, the hydrologic and hydraulic modelling and finally an overview of Water Quality requirements. The scope provided the best possible solutions for the client. The key scoping points included:

- Project Management
- Data Review
- Hydrology
- Hydraulic Model Build
- Mitigation Analysis
- Mapping
- Reporting

1.3 STUDY AREA

The site is located east of Tenterfield township within lands, waters and skies of Ngarabal People. The site is zoned Primary Production (RU1) and subject to the following local plans and policies.

- Tenterfield Local Environmental Plan (2013)
- Tenterfield Development Control Plan (2014)
- State Environmental Planning Policy (SEPP) (2023)
    - SEPP (Biodiversity and Conservation) 2021
    - SEPP (Exempt and Complying Development Codes) 2008
    - SEPP (Industry and Employment) 2021
    - SEPP (Planning Systems) 2021
    - SEPP (Resilience and Hazards) 2021
    - SEPP (Resources and Energy) 2021

The subject site is located nearby Barney Downs Creek, the local tributary of Cataract River. There is no flood data readily available for the waterway, likely due to the minor impact to residential properties. There may be overland flow paths across the site which will be investigated as part of the assessment.

1.4 APPROVALS PROCESS

The approvals process for renewable development includes a number of assessments, including, noise, visual, biodiversity, heritage, water, traffic, land use, hazard and risk and cumulative impacts assessments. These assessments determine the design of renewable development throughout Victoria, NSW and QLD. The assessments are reviewed by the NSW Government to ensuring that impacts are identified and appropriately mitigated. The process for state significant development is shown in Figure 1-3.

The key principles for development that must be adhered to are outlined in the NSW's guidelines for development on flood-prone land including:

- Protect human life and health and provide safety from flood hazard.
- Minimise flood damage to property and associate infrastructure.
- Reduce reliance on emergency services during flood events.
- Maintain free passage and temporary storage of floodwaters, and.
- Protect and enhance the environmental features of waterways and floodplains.

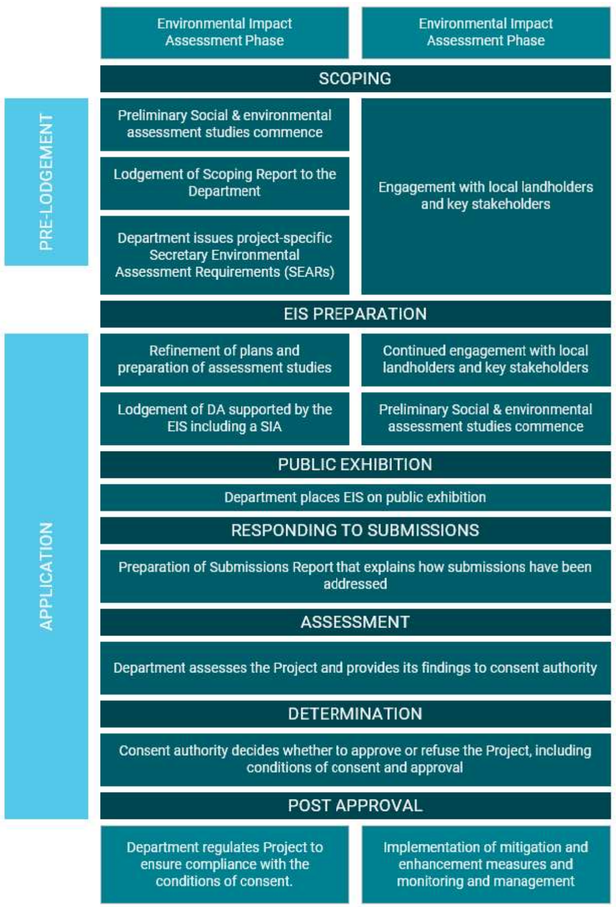

Figure 1-3 Approval Process

1.5 GUIDELINES

There are a number of guidelines relevant to flood impact assessments and specifically for this project, including:

- Australian Rainfall and Runoff – 4.2 (ARR, 2019)
- ARR Data Hub – NSW region specific (ARR, 2019)
- Guidelines for Development in Flood Affected Areas (DELWP, 2019)
- TUFLOW Manual (BMT, 2018)
- RORB Manual (Deakin University,)
- Hydraulic Design of Waterway Structures (AusRoads, 2019)
- Guide to Road Design (AusRoads, 2023)
- Tenterfield Local Environmental Plan 2013
- Tenterfield Shire Council Development Control Plan 2014

1.6 ASSUMPTIONS, INCLUSIONS AND EXCLUSIONS

The following assumptions, inclusions and exclusions were made during the assessment process:

- Roads throughout the catchment were largely blocked by the available LiDAR. No site visit was undertaken as part of this assessment, and due to the no impact to the site, the roads, and associated culverts were modelled as open to allow stormwater flows to pass through the system.
- It is assumed that the available LiDAR dataset extracted from the ELVIS is up-to-date and represents the on-ground topographic characteristics accurately.
- It is assumed the loss values estimated for Clifton Station from the Review of ARR Desing Inputs for NSW report (WMA, 2019) are appropriate for the study.
- A site visit was not undertaken as part of the project.

2 DATA REVIEW

2.1 TOPOGRAPHY

There is one (1) topographic data set extracted for the project, the Tenterfield 2015 LiDAR. The Tenterfield Project has a resolution of 1 metre, a vertical accuracy of ±0.3 metres and a horizontal accuracy of ±0.8 metres. These characteristics deem it to comply with the requirements of hydraulic TUFLOW models.

The catchment headwaters elevation is approximately 954.20 metres Australian Height Datum (m AHD) south of the site along Common Road through to where it converges with Tenterfield Creek north of Tenterfield township at 829.02 m AHD, based on the Tenterfield LiDAR (2015).

Feature survey was undertaken as part of the assessment. The survey indicates the subject site ranges from 868.0 m AHD at the southeast to 858.5 m AHD at the northwest.

The adopted LiDAR is shown in Appendix A.

2.2 KEY HYDRAULIC STRUCTURES

There are several key hydraulic structures for the conveyance and storage of overland flow throughout the catchment in the form of farm dams and road infrastructure. There are a significant number of farm dams acting as storages and road infrastructure limiting flows across the main flow path.

3 HYDROLOGY

3.1 OVERVIEW

The hydrological methodology involves a Rain-on-Grid modelling approach using Australian Rainfall and Runoff (ARR) 4.2 guidelines. The TUFLOW plugin was used to extract rainfall excess hyetographs for the estimated 1% AEP flood event.

The methodology for determining the design flows is summarised below:

- Catchment delineation.
- Design inputs (e.g. rainfall, losses).
- Selection of temporal patterns.
- Determination of design hyetographs using Full Analysis.

Details on each step are given in the following sections

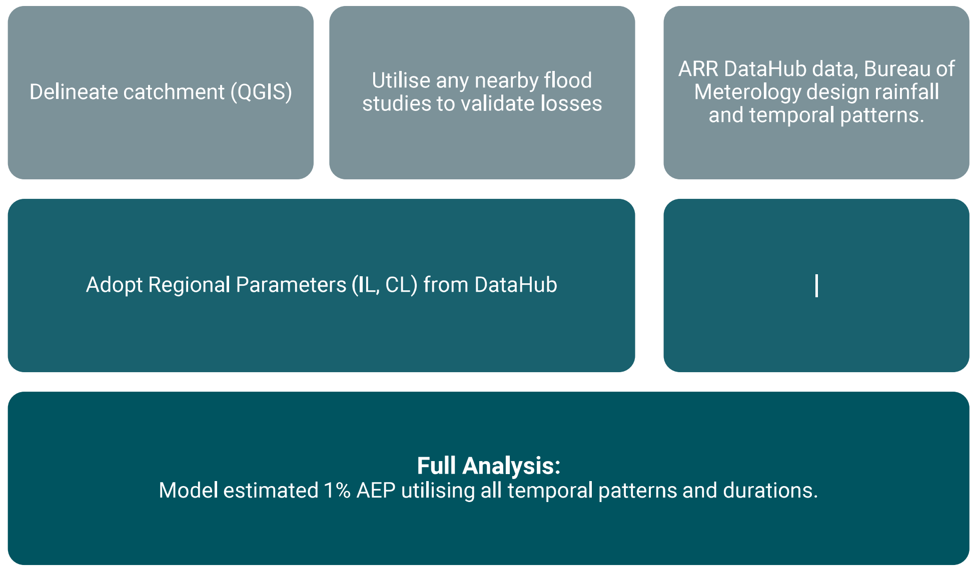

Figure 3-1 Hydrological Analysis Approach

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3.2 CATCHMENT DELINEATION

QGIS was used to delineate the catchment and define the reaches and gullies throughout the region. These were then defined further via aerial imagery, contours and “key areas of interest”.

The local catchment has a total area of approximately 4.71 km^2, which has been delineated into a single catchment.

Figure 3-2 shows the catchment vector.

3.2.1 Fraction Impervious (FI)

The estimated impervious surface within each sub-area were determined using planning zones and then modified based on aerial imagery and development drawings. Adopted FI values were based on MUSIC Guidelines (Melbourne Water, 2018) and similar studies. The specific values are shown in Table 3-1.

Table 3-1 Adopted Fraction Impervious

Land Use	Adopted Fraction Impervious Values
Residential	0.6 – 0.8
Industrial + Commercial	0.9
Rural	0.1 – 0.2
Public Use	0.05 – 0.85
Public Conservation	0.001
Public Park and Recreation	0.10
Roads	0.6 – 0.7
Special Use	0.6

3.3 DESIGN HYDROLOGY

The design hydrology was based on the Full analysis approach consistent with ARR2019 guidelines. The analysis runs 10 temporal patterns and 10 minutes to 12-hour durations for the catchment.

3.3.1 Rainfall Depths

Rainfall depth for the catchment was extracted from ARR Data Hub. Areal reduction factors and temporal patterns were also sourced from ARR Data Hub (-29.06,152.305). The Intensity-Frequency-Duration (IFD) rainfall depths were sourced from the Bureau of Meteorology (BoM) online IFD tool.

3.3.2 Design Temporal Patterns

Design temporal patterns were sourced from the ARR2019 datahub. There are 30 design point temporal patterns relevant to the catchment area. The temporal patterns fall into three categories: frequent (temporal patterns 1 – 10), intermediate (temporal patterns 11 – 20) and rare (temporal patterns 21 – 30).

3.3.3 Rainfall Losses

ARR2019 recommends reviewing the nearest flood studies, in Book 5; Flood Hydrograph Estimation, and adopt losses were relevant. In-lieu of this data ARR2019 recommends adopting ARR Data Hub losses. The catchment is located within a previously assessed catchment mapped with the losses, shown in Table 3-2.

Table 3-2 Loss Parameters

Loss Estimation Option	Initial Loss (mm)	Continuing Loss (mm/hr)
ARR Data Hub	33.0	6.20
ARR Data Hub (CL x 0.4)	33.0	2.48
ARR Maps (Adopted)	**33.0**	**2.60**

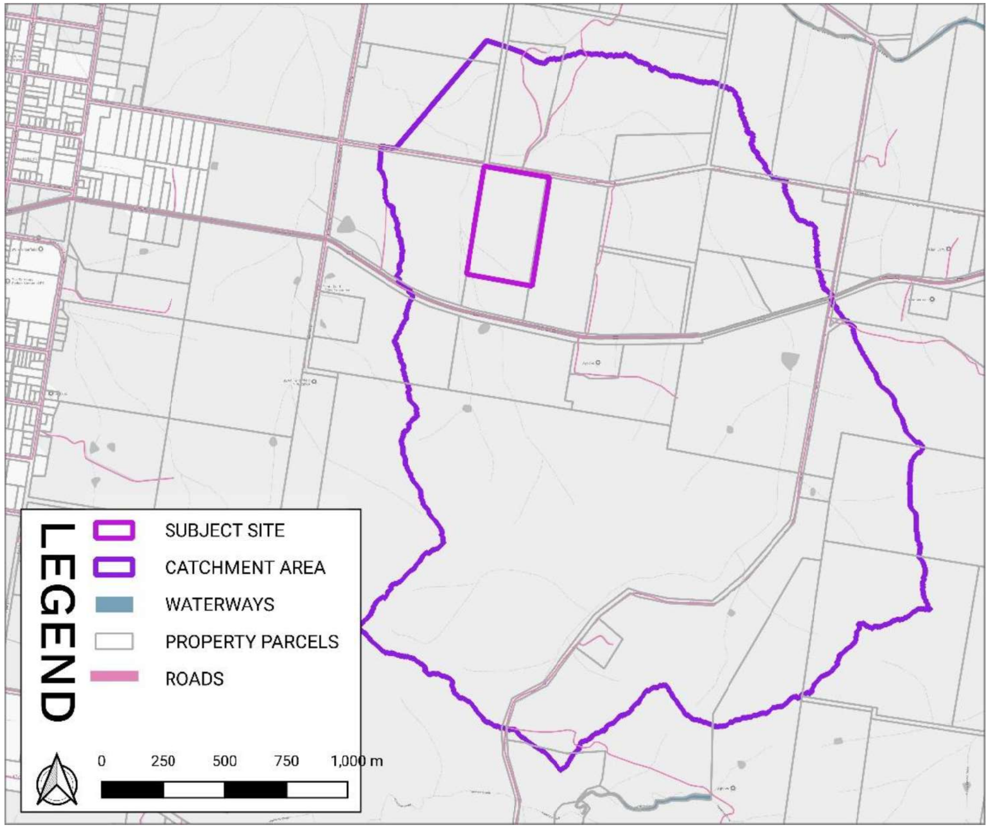

Figure 3-2 Hydrologic catchment

3.4 CLIMATE CHANGE RECOMMENDATION

In 2024, ARR2019 updated its guidance (version 4.2) on Climate Change due to the latest Intergovernmental Panel on Climate Change (IPCC) projections. The previously accepted RCP (Representative Concentration Pathways) projections were superseded by the SSPs (Shared Socio-economic Pathways). This is due to the SSPs ability to account for societal changes rather than solely emission trajectories.

The updated guidance provides the opportunity to run a detailed analysis rather than the previously accepted 'factoring' of IFDs. Instead, both loss and rainfall intensities are adjusted to compensate for the changes in the environment due to climate change.

SWM Consulting has extracted climate data, utlising ARR guidance, from the WMAwater tool, see Figure 3-3. In the year 2090, it is estimated that under a reasonable climate scenario of SSP3 the rainfall intensity increases to approximately 40mm. This is an increase of 26% from existing climate conditions.

SWM Consulting recommends, where possible, increasing finished levels of infrastructure and panels to 600 mm above the estimated 1% AEP flood level, thus providing an additional buffer.

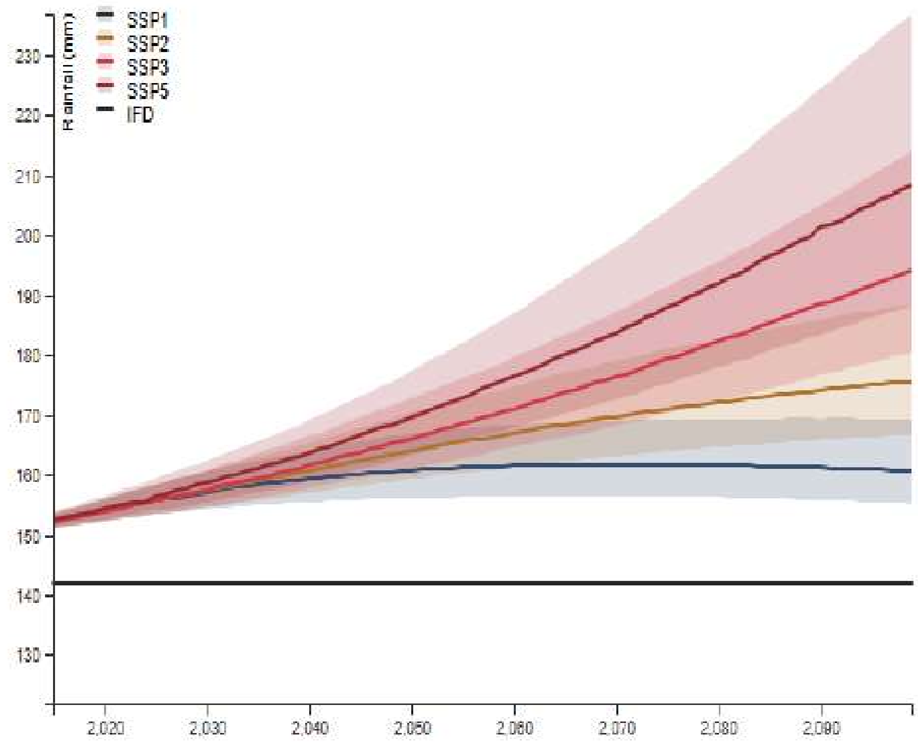

Figure 3-3 Increase in 1% AEP catchment average rainfall

4 HYDRAULIC MODEL BUILD

4.1 OVERVIEW

The hydraulic model was built in TUFLOW, which is the most widely used 2D hydraulic modelling software package in Australia. A detailed 2D model was built 'fit-for-purpose' in accordance with Melbourne Water's "AM STA 6200 Flood Mapping Projects Specification" (August 2021). Table 4.2 below shows the key modelling parameters from the estimated 1% AEP flood event model.

Table 4-1 Key Modelling Parameters

Key Modelling Parameters	
Model Build	
Model Solver	2023-03-AE (Single Precision)
Model Engine	GPU HPC
Projection	GDA94 MGA56
Domains	2D domain used.
Events	Estimated 1% AEP flood event
Scenarios	Existing and developed
Terrain	1-metre LiDAR, see Data Review
Cell Wet/Dry Depth (m)	0.002
Start Time (h)	0.0
End Time (h)	Duration Dependant (See Appendix B)
2D Domain	
Code Boundary	Entire Catchment, No Exclusions (See Appendix B)
Grid Size (m)	2500, 3000
SGS Cell Size (m^2)	0.5
Cell Size (m^2)	5
2D Timestep (s)	0.5
Manning's Values	See Table 4-3
Losses	See Table 4-3
Model Inflows	2d RF – Rainfall Hyetograph
Model Outflows	2d BC – HQ boundary Condition
Z Shapes	Terrain modifiers were used for roads, bunds etc.
Results	
Warnings/Checks prior to simulation	0 / 0
Warnings/Checks during simulation	0 / 0
2D Negative Depths	0
Final Cumulative Mass Error	0.00%

The hydraulic roughness values were based off nearby planning zones, aerial imagery and industry standards, see Table 3-2. The initial and continuing loss values were based on the values estimated for Clifton Station from the Review of ARR Desing Inputs for NSW report (WMA, 2019), see Table 3-2.

Table 4-2 Adopted Roughness, Initial Loss and Continuing Loss Values

Land Use	Roughness Value	Initial Loss (mm)	Continuing Loss (mm/hr)
Residential Rural	0.100	19.932	1.900
Industrial / Commercial	0.500	6.419	1.271
Carpark / Road	0.020	16.368	3.495
Open Pervious Area – Moderate Vegetation	0.060	32.168	2.555
Wetland – Emergent Vegetation	0.045	32.168	2.555

The model was run for all durations between 10 minutes to 1,440 minutes (24 hours) and 10 temporal patterns were run for each duration. Results were processed to select the combination of durations and temporal patterns resulting in the maximum flood depths throughout the catchment and covering the site. The full list of model durations run is available in Appendix B.

5 FLOOD IMPACT ASSESSMENT

The primary guidelines to assess flood impact on development is the Flood impact and risk assessment: Flood risk management guideline from the Department of Planning and Environment (DPE, 2023). The guideline is used to assess development in locations known or suspected to be flood affected. The key principles for development outlined in the guidelines are:

- Protect human life and health and provide safety from flood hazard.
- Minimise flood damage to property and associate infrastructure.
- Reduce reliance on emergency services during flood events.
- Maintain free passage and temporary storage of floodwaters; and,
- Protect and enhance the environmental features of waterways and floodplains.

Requirements for development differ depending on the conditions of the site. Regulatory Authority's will consider the following criteria in assessing the proposed development:

1. **Freeboard:** the height difference between the floor level and the level of the estimated 1% AEP flood event.
2. **Access and site safety:** the difference between safe and hazardous flood conditions.
3. **Flood conveyance:** the development must allow for the free passage of floodwaters.
4. **Flood storage:** cannot fill the site to the detriment of nearby properties.

These guidelines have been used to assess the impacts and therefore suitability of the proposed development.

Two key scenarios were modelled and compared:

Existing: pre-development conditions.

Developed: proposed post-development conditions.

6 FLOOD MODELLING RESULTS

6.1 OVERVIEW

The flood assessment was modelled to reflect the existing site, and local areas, on-ground flooding characteristics derived from the available LiDAR data and information supplied by the client. The scenario was adopted following a comprehensive review, and validation analysis of the modelling inputs and outputs. This was cross-checked against SWM Consulting's rigorous quality assurance and control procedures.

For detailed flood modelling mapping, refer to Appendix C.

6.2 FLOOD DEPTHS

<u>The estimated 1% AEP flood depths within the subject site range from 0.00 to 1.01 metres.</u> The largest flood depths are located within the dam located at the eastern property boundary. The flood depths indicate three (3) overland flow paths which enter farm dams within the catchment.

6.3 FLOOD VELOCITIES

<u>The estimated 1% AEP flood velocities within the subject site range from 0.0 to 2.78 metres/second (m/s)</u>. The highest velocities are located at the eastern property boundary as the overland flows discharge from the farm dam. The flood velocities across the trafficable area are below threshold considered safe for cars & buildings i.e. between 2.0 to 3.0 m/s.

6.4 FLOOD WATER SURFACE ELEVATIONS (FLOOD HEIGHTS)

<u>The estimated 1% AEP flood water surface elevations reflect the underlying topography.</u> The flood heights range from 464.3 m AHD at the eastern property boundary to 413.35 m AHD at the western property boundary at Old Racecourse Road.

6.5 EXISTING SCENARIO

6.5.1 Overview

The existing scenario is modelled to reflect the pre-developed site, existing local areas, on-ground flooding characteristics derived from the available LiDAR data. The scenario was adopted following a comprehensive review, and validation analysis of the modelling inputs and outputs. This was cross-checked using SWM Consulting's rigorous quality assurance and control procedures.

The site is impacted by an overland flow path with a catchment area of approximately 1 km^2 originating from the south. The site currently has not existing development or hydraulic control structures. The elevation of the site ranges from 872.2 m AHD at the southeast corner of the property to 858.5 m AHD at the northwest corner along Bruxner Highway.

For detailed flood modelling mapping, refer to Appendix C.

6.5.2 Flood Depths

<u>The estimated 1% AEP flood depths within property parcels are less than 0.5 metres.</u> The flood depths across the site range from 0.00 to 0.35 metres. There is an existing farm dam in the centre of the site which shows depths greater than 1 metre, this is an existing hydraulic feature and not in the main flow path of the site. The largest flood depths are located along the western site boundary where the main flow path of the catchment traverses the site.

6.5.3 Flood Velocities

<u>The estimated 1% AEP flood velocities within the subject site are below 1.60 metres/second (m/s).</u> The velocities across the site range from 0.20 to 1.60 m/s. The highest velocities are located along the western site boundary. The flood velocities across the trafficable area and Bruxner Highway to flood free land are below threshold considered safe for cars & buildings i.e. between 2.0 to 3.0 m/s.

6.5.4 Flood Water Surface Elevations (Flood Heights)

<u>The estimated 1% AEP flood water surface elevations reflect the underlying topography.</u> The flood heights range from 871.8 m AHD at the southeast corner of the property to 858.6 m AHD at the northwest corner along Bruxner Highway.

6.5.5 Flood Extents

The estimated 1% AEP flood extents reflect the underlying topography. There are certain locations where flows breach hydraulic structures causing increased extents and backwater.

6.5.6 Flood Hazard Product

The estimated 1% AEP flood hazard across the trafficable site is less than the acceptable 0.3 – 0.4m^2/s. The flood hazard is the product of flood depth x flood velocity. The highest flood hazard across the site is 0.53 m^2/s, along the western property boundary corresponding with the higher velocity and main flow path of the upstream catchment. Bruxner Highway has hazard product > 0.3 m^2/s for the driveway to the apex of the road along the entire property frontage.

6.5.7 Flood Hazard Classifications

Flood hazard classification across the site ranges from H1 – generally considered safe to H2 – unsafe for small vehicles. The flood hazard classification is based on individual parameters; in this location the flood depth causes the higher hazard classification. There is a small area classified as H3 this corresponds to the existing farm dam and is related to the larger depths associated with the water storage.

6.6 DEVELOPED SCENARIO

6.6.1 Overview

The developed scenario reflects the 'as-constructed' post-developed flooding characteristics based on the available LiDAR, and the proposed plans supplied by the client. The proposed developed scenario did not require any mitigation iterations.

The developed scenario, shown in Figure 6.1, consists of:

- BESS container, MVBS including inverter and HV switchgear.
- Internal access roads, and access / egress locations.
- OH line;
- Landscape screening
- Temporary disturbance for construction compound and laydown and work areas;
- Security fencing; and
- Car parking;

See Appendix C for flood modelling results.

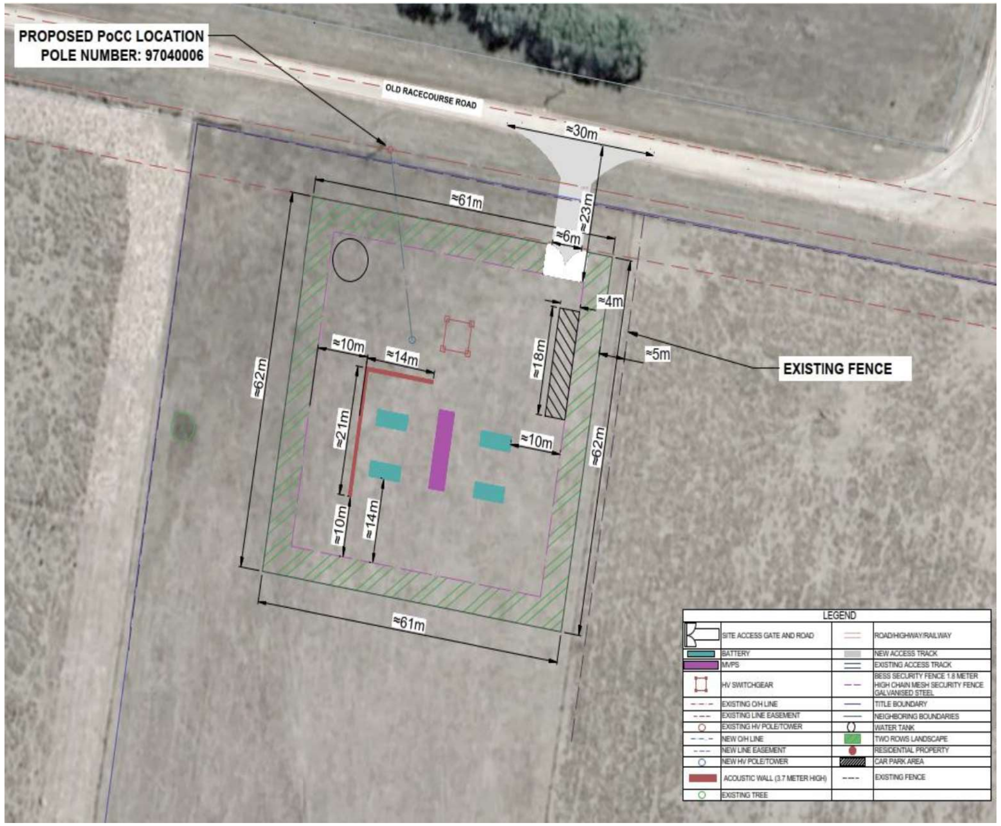

Figure 6-1 Proposed Developed Conditions

6.6.2 Flood Depths

The estimated 1% AEP flood depths within property parcels remain consistent with the existing scenario. The flood depths across the site remain unchanged, reflecting the minor alterations to the site.

6.6.3 Flood Velocities

The estimated 1% AEP flood velocities within the subject remain below 1.60 metres/second (m/s). The velocities remain consistent with the existing scenario. The highest velocities are located along the western property boundary. The flood velocities across the trafficable area are below thresholds considered safe for cars & buildings i.e. 2.0 to 3.0 m/s.

6.6.4 Flood Water Surface Elevations (Flood Heights)

The estimated 1% AEP flood water surface elevations remain consistent the existing scenario. There are some minor changes in flood heights around the batteries and MVPS, with higher flood levels on the upstream side of the proposed infrastructure increasing by up to 0.14m and lower flood levels on the downstream by up to a value of 0.06m.

6.6.5 Flood Extents

The estimated 1% AEP flood extents remain consistent with the existing scenario reflecting the underlying topography.

6.6.6 Flood Hazard Product

The estimated 1% AEP flood hazard across the trafficable site is less than the acceptable 0.3 – 0.4m^2/s. The flood hazard product remains consistent with the existing scenario. The highest flood hazard across the site is along the western property boundary. Bruxner Highway has hazard product > 0.3 m^2/s for the driveway to the apex of the road along the entire property frontage.

6.6.7 Flood Hazard Classifications

Flood hazard classification remains consistent with the existing scenario ranging from H1 – generally considered safe to H2 – unsafe for small vehicles. As with the existing scenario, there is a small area classified as H3 which corresponds to the existing farm dam and is related to the larger depths associated with the water storage.

6.7 DEVELOPED SCENARIO

6.7.1 Overview

To evaluate the developments impact, between the existing and the proposed developed model conditions, the outcomes of the estimated 1% AEP, were analysed and compared. This is done to ascertain the influence of the proposed development on water surface elevations, across the area. This comparison is calculated by subtracting the existing conditions from the developed conditions.

'Developed Conditions – Existing Conditions = Difference comparison results'

Figure 6.2 shows that there is a minor increase on-site around the proposed infrastructure and there are only minor impacts off site.

There is a net positive outcome from the proposed development.

6.7.2 Site Access and Egress

Access and egress to the subject site is largely considered safe based on the flood hazard product less than 0.3 m^2/s.

6.7.3 Finished Levels

It is recommended the proposed structures on site be raised a minimum of 300 above natural surface elevations.

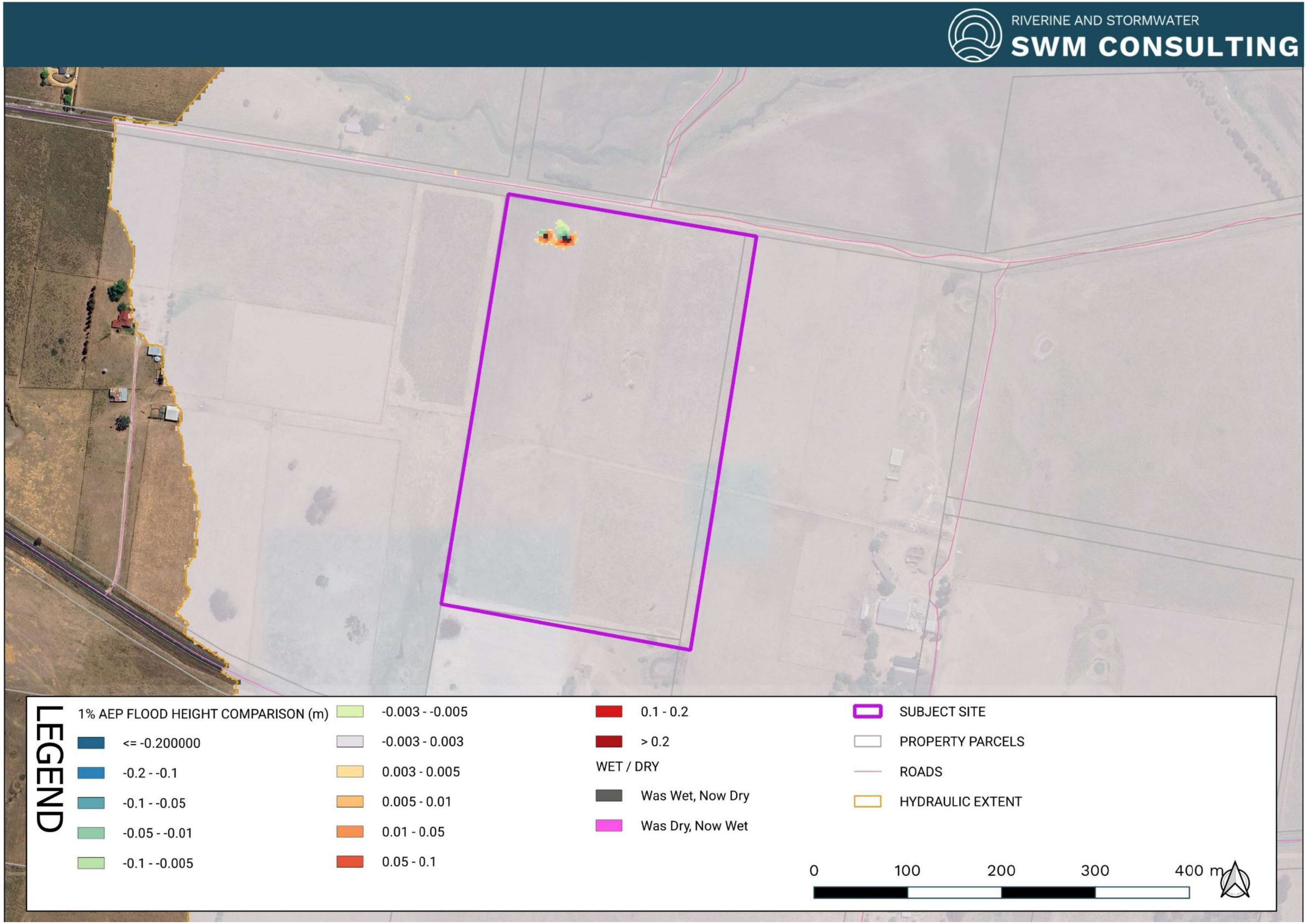

Figure 6-2 Afflux Mapping (Existing vs Developed)

7 STORMWATER QUALITY RECOMMENDATIONS

This section provides information on stormwater quality management. This can be used to inform a Stormwater Water Quality Management Plan (SWMP) during the design phase. Standard renewable developments are required to treat and manage stormwater run-off in line with Best-Practice Environmental Management Guidelines (BPEM). The Project will need to meet the following minimal objectives (during normal operation):

- 80% retention in Total Suspended Solids (TSS).
- 45% retention in Total Phosphorus (TP)
- 45% retention in Total Nitrogen (TN)
- 70% reduction in Litter
- Maintain discharges for the 1 in 1.5-year ARI flow rate at pre-development levels.
- Maintain discharge rate for the 1 in 100-year ARI flow rate at pre-development levels.

These are not significant issues for the site, and are not of concern. It is recommended that a detention or on-site storage be implemented to prevent risk from fire and the use of PFAs, this can be a bund around the structures or on-site tanks. There are several methods that are generally used to meet the required objectives, including a water quality treatment asset and a suitable retarding basin and pit design to control flows to pre-developed rates.

It is important to understand the implications of the development on stormwater quality and assess them against relevant objectives.

8 SUMMARY AND CONCLUSIONS

SWM Consulting was engaged by ACEnergy to undertake a Flood Impact Assessment for the future site of the **Tenterfield DBESS**located at Bruxner Highway Tenterfield 2372.

The proposed development consists of:

- BESS container, MVBS including inverter and HV switchgear.
- Internal access roads, and access / egress locations.
- OH line;
- Landscape screening
- Temporary disturbance for construction compound and laydown and work areas;
- Security fencing; and
- Car parking;

The proposed development is consistent with the objectives of the Tenterfield Local Environment Plan 2013. The proposed development does not create any adverse or cumulative impacts on flood behaviour and the environment.

Please do not hesitate to contact SWM if you require further clarification.

Yours sincerely,

Alex Simmons – Founder | Technical Lead

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APPENDIX A

TOPOGRAPHY

RIVERINE AND STORMWATER
SWM CONSULTING

APPENDIX B

HYDRAULIC MODEL BUILD

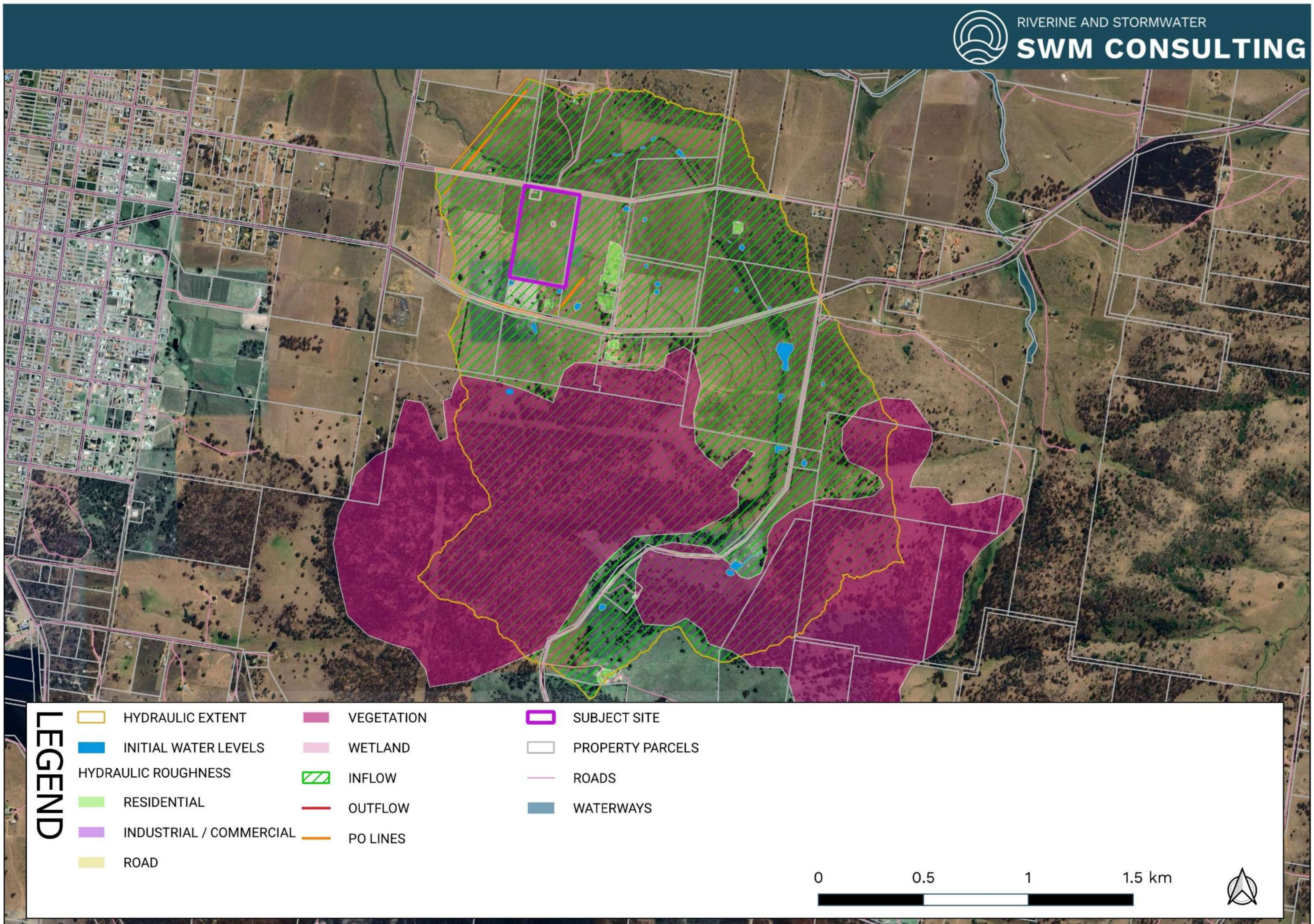

RIVERINE AND STORMWATER
SWM CONSULTING
LEGEND
HYDRAULIC EXTENT
INITIAL WATER LEVELS
HYDRAULIC ROUGHNESS
RESIDENTIAL
INDUSTRIAL / COMMERCIAL
ROAD
VEGETATION
WETLAND
INFLOW
OUTFLOW
PO LINES
SUBJECT SITE
PROPERTY PARCELS
ROADS
WATERWAYS
0
0.5
1
1.5 km

Table B-1- Model Run Times

Duration (mins)	End Time (hrs)
10	3
15	3
20	4
25	4
30	4
45	4
60	4
90	6

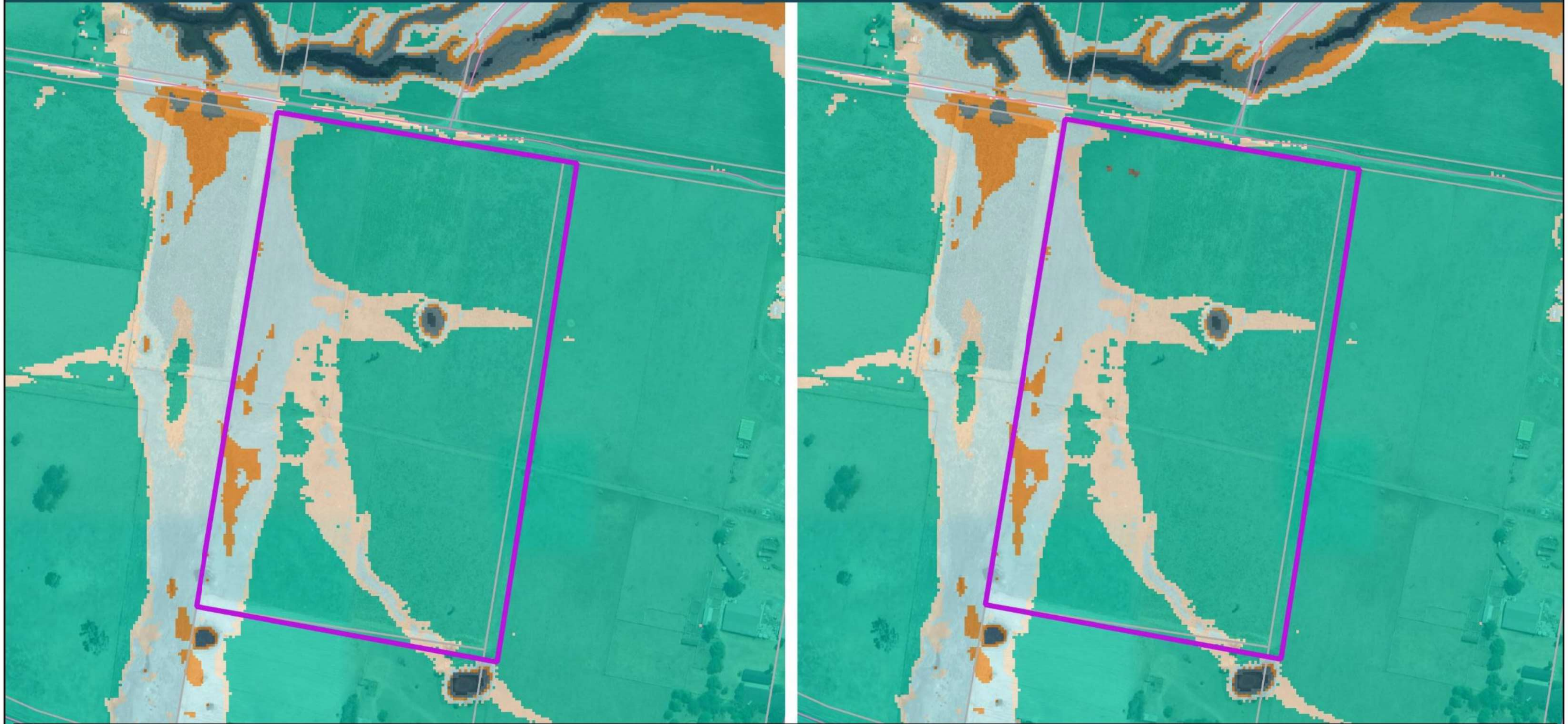
Duration (mins)	End Time (hrs)
120	10
180	12
270	12
360	18
540	18
720	24
1080	30
1440	30

APPENDIX C

ESTIMATED 1% AEP FLOOD MAPPING

Appendix C.1 Estimated 1% AEP Flood Depths (Existing (Left) vs Developed (Right))

RIVERINE AND STORMWATER
SWM CONSULTING



LEGEND

ESTIMATED 1% AEP FLOOD DEPTHS (m)

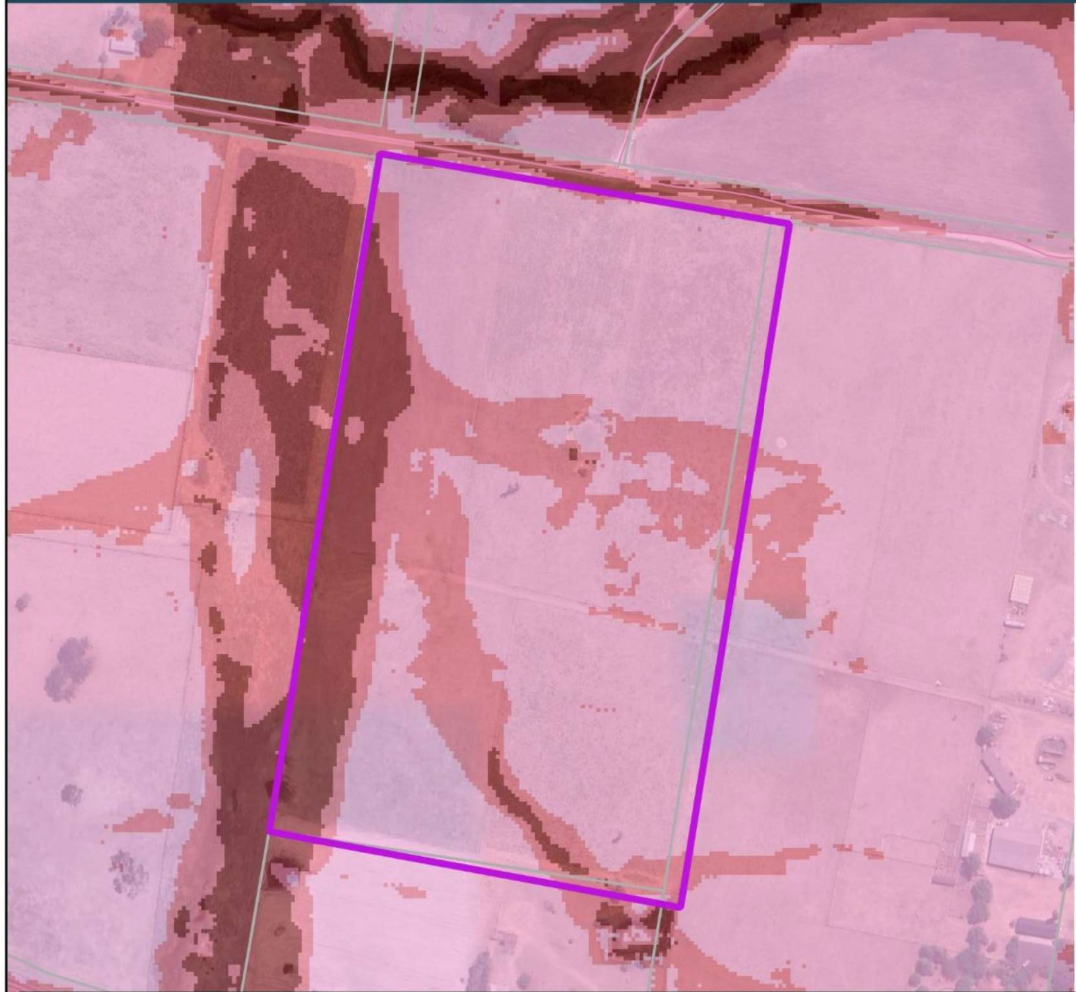
- <= 0.05
- 0.05 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 1.0
- >=1.0

- SUBJECT SITE
- PROPERTY PARCELS
- ROADS
- WATERWAYS
- HYDRAULIC EXTENT

0 50 100 150 200 250 m

Appendix C.2 Estimated 1% AEP Flood Velocities (Existing (Left) vs Developed (Right))

RIVERINE AND STORMWATER
SWM CONSULTING

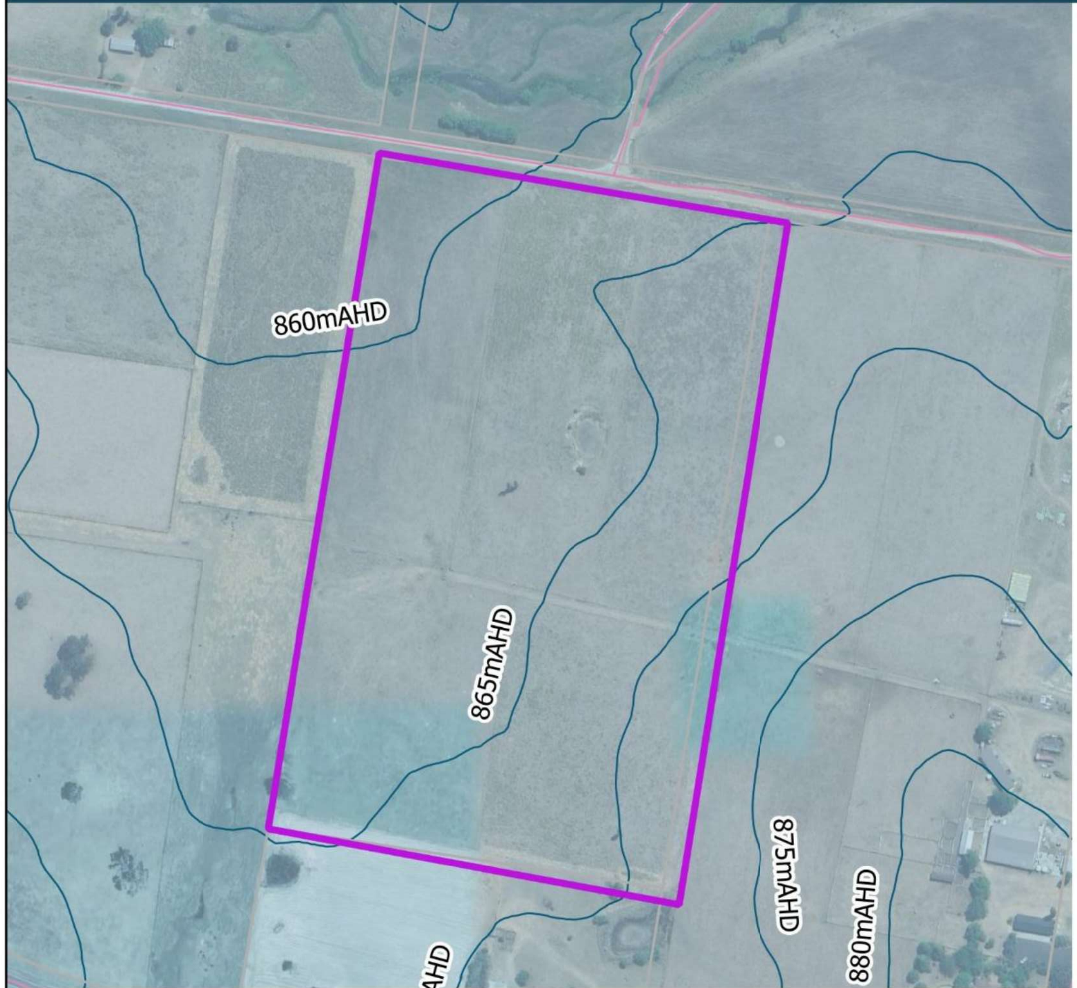


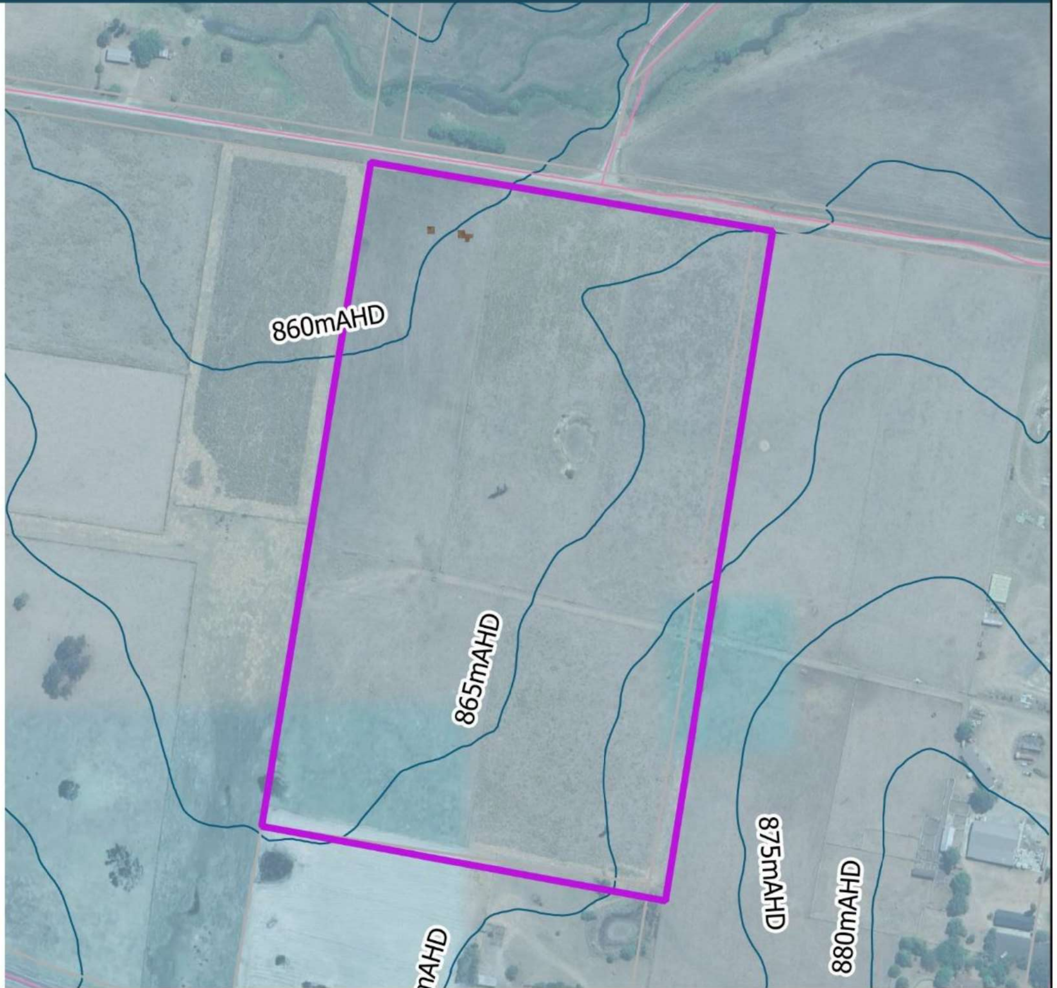
LEGEND

ESTIMATED 1% AEP FLOOD VELOCITIES (m/s)
- <= 0.50
- 0.5 - 1.0
- 1.0 - 2.0
- >=2.0

- SUBJECT SITE
- PROPERTY PARCELS
- ROADS
- WATERWAYS
- HYDRAULIC EXTENT

Appendix C.3 Estimated 1% AEP Flood Extent (Existing (Left) vs Developed (Right))





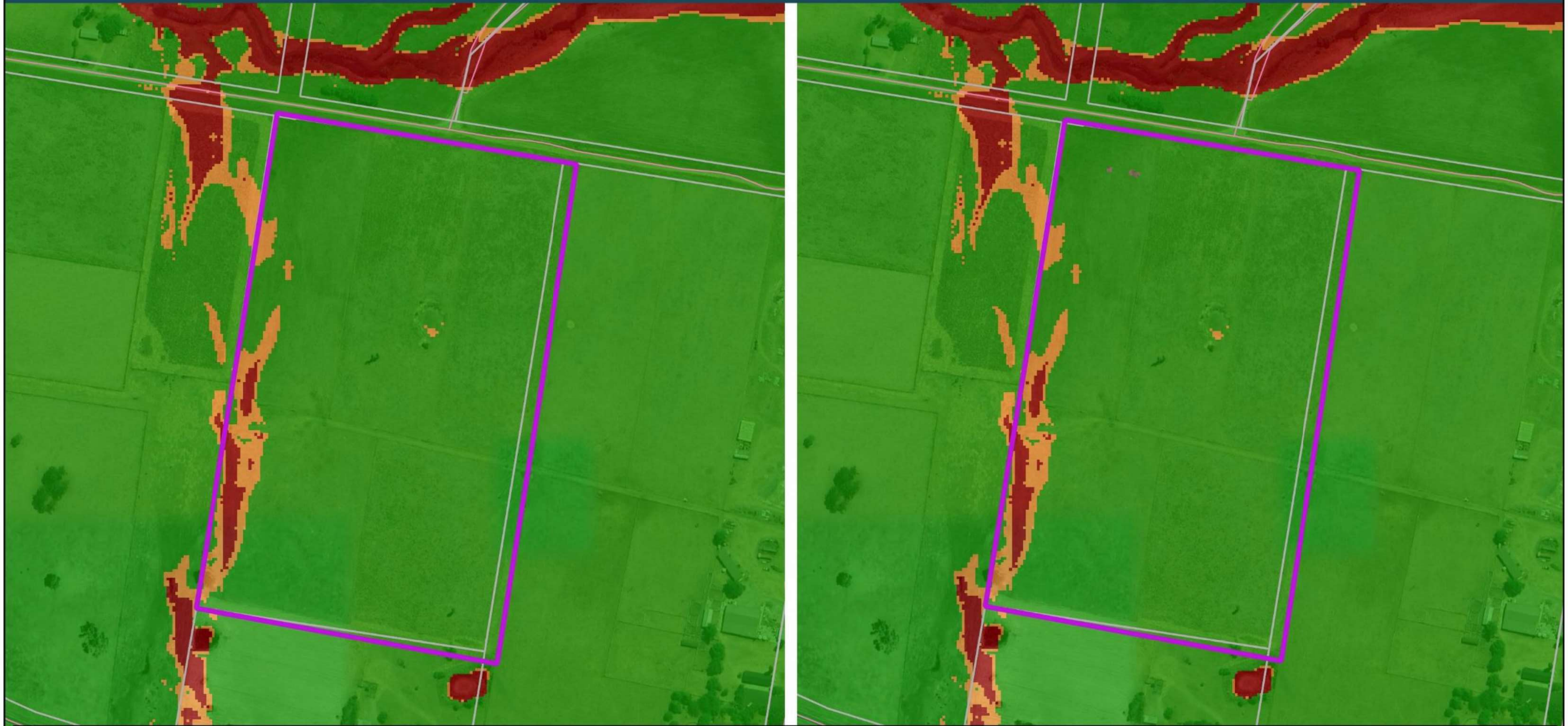
LEGEND

ESTIMATED 1% AEP FLOOD EVENT
- FLOOD EXTENT
- FLOOD CONTOURS
- SUBJECT SITE
- PROPERTY PARCELS
- ROADS
- WATERWAYS
- HYDRAULIC EXTENT

0 50 100 150 200 250 m

Appendix C.4 Estimated 1% AEP Flood Hazard Product (Existing (Left) vs Developed (Right))

RIVERINE AND STORMWATER
SWM CONSULTING



LEGEND

ESTIMATED 1% AEP FLOOD HAZARD (m2/s)

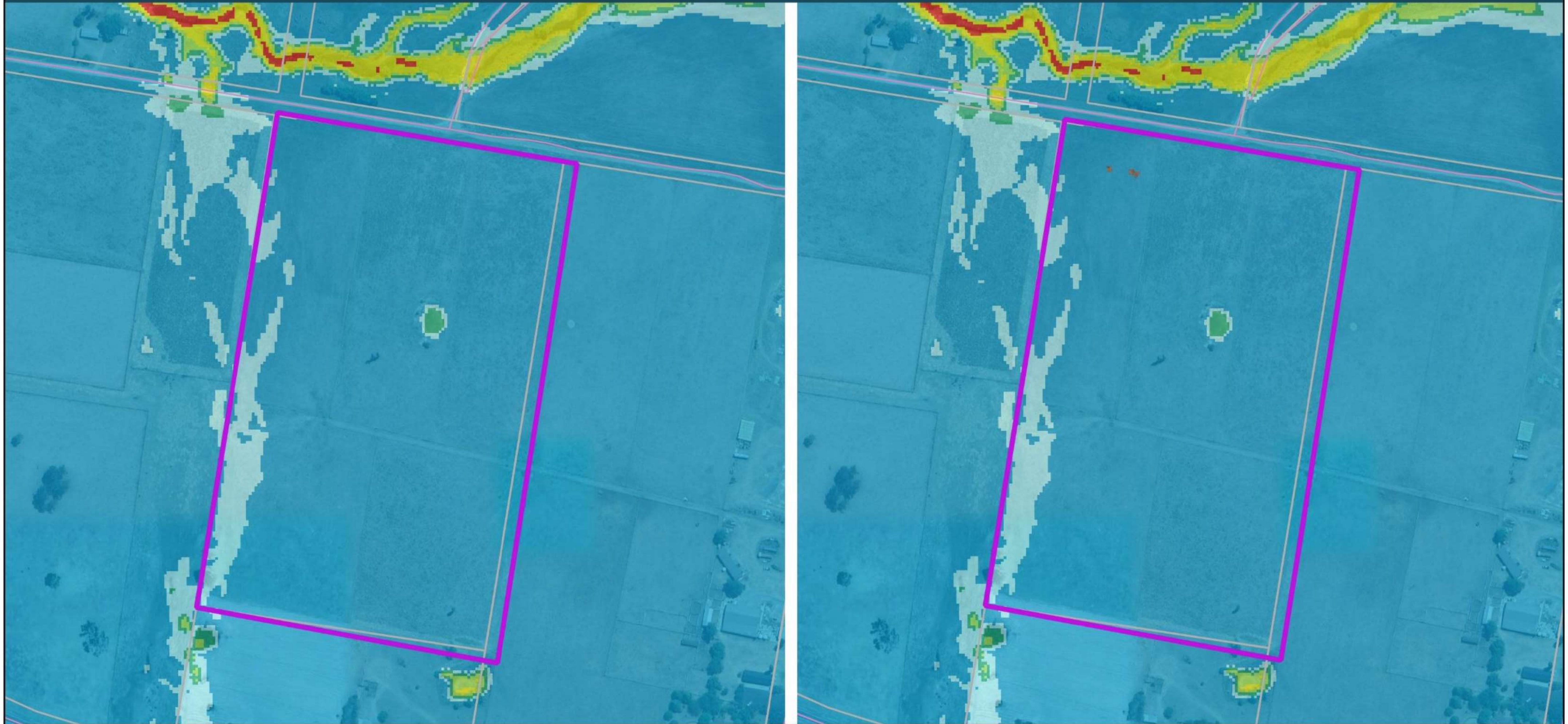
- <=0.3
- 0.3 - 0.4
- >=0.4
- SUBJECT SITE

- PROPERTY PARCELS
- ROADS
- WATERWAYS
- HYDRAULIC EXTENT

0 50 100 150 200 250 m

Appendix C.5 Estimated 1% AEP Flood Hazard Classification (Existing (Left) vs Developed (Right))

RIVERINE AND STORMWATER
SWM CONSULTING



LEGEND

ESTIMATED 1% AEP FLOOD HAZARD CLASSIFICATION

- H1 - Generally safe for vehicles, people and buildings
- H2 - Usafe for small vehicles
- H3 - Unsafe for vehicles, children, and the elderly
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

- SUBJECT SITE
- PROPERTY PARCELS
- ROADS
- WATERWAYS
- HYDRAULIC EXTENT

0 50 100 150 200 250 m