

Appendix N

Flood Impact and Risk Assessment Report

PROJECT BOOST

Penrith HV BESS – Flood Impact and Risk Assessment Report

AUSCONNEX

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Executive Summary

The Penrith High Voltage Battery Energy Storage System (Penrith HV BESS) referred to as the Project, proposed by Ausconnex, aims to develop, construct, operate, and decommission a grid-scale HV BESS with a capacity of up to 100 megawatts (MW) and the ability to store up to 200 megawatt hours (MWh) of energy.

Strategically located adjacent to the existing Penrith Transmission Substation, this project supports the transition towards a decarbonised electricity system in New South Wales (NSW). By providing grid-support services and facilitating greater integration of renewable energy, the Project contributes to the NSW Government's objective of achieving net-zero emissions by 2050.

This Flood Impact and Risk Assessment (FIRA) report forms part of the Environmental Impact Statement for the project. It identifies and evaluates the potential flood impacts associated with the construction, operation, and decommissioning of the project. The assessment addresses the Secretary's Environmental Assessment Requirements (SEARs) and includes flood modelling for both local and mainstream flooding scenarios, considering current conditions and future climate change impacts.

Methodology: The assessment involved detailed flood modelling using hydrological and hydraulic models to simulate flood behaviour under various scenarios. The models considered both local and mainstream flooding, incorporating current conditions and projected climate change impacts. Key steps included:

- Acquisition of latest accepted flood models for Local and Mainstream flooding.
- Modification of existing hydraulic models to update to existing conditions and design conditions
- Simulation of the updated existing and design models to assess flood extents, depths, and velocities and hazard levels.
- Evaluation of flood impacts on the project site and surrounding areas.

Key findings:

- Local Flooding (Cranebrook Overland Flow Flood Study, 2023): The project site is not affected by local flooding up to and including the 1% Annual Exceedance Probability (AEP) event, refer to Appendix A Figure A-4. The project site is affected by events larger than the 1% AEP up to the Probable Maximum Flood (PMF).
- Mainstream Flooding (Hawkesbury-Nepean Flood Study, 2024): The proposed infrastructure is above the 1% AEP flood level (26.4 metres (m) Australian Height Datum (AHD)) ensuring flood immunity for critical infrastructure.
- The Site is partially below the flood planning level (FPL) which is defined by the mainstream flood mechanism. Sensitive infrastructure will be set above the FPL of 26.9m AHD (1% AEP flood level of 26.4m AHD plus 0.5m freeboard).
- Flood Behaviour: The proposed design does not significantly alter flood behaviour in the modelled events, with no adverse impact on peak water levels or hazard levels and negligible changes in velocities or increase flood risk to the community. As such, no flood mitigation is required.
- Emergency Evacuation: Emergency evacuation routes and procedures are adequate, enabling safe evacuation.
 - In the local 1% AEP event, evacuation via Thornton Drive or Museum Drive is possible. In the local PMF, evacuation along these roads would not be possible leaving overland evacuation to the east being the only option.
 - In the mainstream event, early evacuation is possible with sufficient warning time targeted to be 6 to 8 hours.

- Flood Maps have been provided in the Appendixes, presenting flood risk in Appendix A, Flood impacts in Appendix B and climate change flood risk in Appendix C.

Impact outcomes:

The assessment demonstrates that the project will not adversely impact flood behaviour or increase flood risk to the community. The Project, including earth works facilitate the project's resilience to flooding. The report confirms compliance with relevant SEARs requirements.

Overall, the project is well positioned to prevent sensitive infrastructure impacted by mainstream flooding overland flow flooding in compliance with regulatory requirements.

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Glossary

Term	Description
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARI	Annual Recurrence Interval
ARR	Australian Rainfall and Runoff
BESS	Battery Energy Storage Systems
CBD	Central Business District
DEM	Digital Elevation Model
ELVIS	Elevation Information System
FIA	Flood Impact Assessment
FIRA	Flood Impact and Risk Assessment
FPL	Flood Planning Level
GDA	Geocentric Datum of Australia
GIS	Geographic Information System
HPC	Heavily Parallelised Compute
HV	high voltage
km	kilometres
kV	kilovolt
LiDAR	laser imaging, detection, and ranging
m	metres
MGA	Map Grid of Australia
MV	Medium Voltage
MW	megawatts
MWh	megawatt hour
NSW	New South Wales
OEM	Original Equipment Manufacturers
PMF	Probable Maximum Flood
SEARs	Secretary's Environmental Assessment Requirements
SES	State Emergency Service
The Project	The development, construction and operation of a grid-scale HV BESS with a capacity of up to 100MW/200MWh and associated infrastructure in Penrith, NSW.
The Site	The area of land required to support the construction, operation and maintenance of the Penrith HV BESS project. This wholly includes the Indicative development footprint.
TIF	Tagged Image File
TIN	Triangulated Irregular Network

1 Introduction

1.1 Project background

Ausconnex is proposing to develop, construct, operate and decommission a grid-scale high voltage (HV) Battery Energy Storage System (BESS) with a capacity of up to 100 megawatts (MW) and the ability to store up to 200 megawatt hours (MWh) of energy. Known as the Penrith HV BESS Project, it is strategically located adjacent to the existing Penrith Transmission Substation at 2235-2249 Castlereagh Road, Penrith (Lot 5 DP 1017480), within the Penrith City Council local government area, approximately 30 kilometres (km) west of Parramatta central business district (CBD) and 50km west of the Sydney CBD. The site lies within land zoned as E4 General Industrial zone.

The Project directly supports the transition towards a decarbonised electricity system in NSW. By providing grid-support services and facilitating greater integration of renewable energy, the Project contributes materially to the NSW Government's objective of achieving net-zero emissions by 2050 and accelerates the shift away from reliance on traditional coal-fired power generation. As renewable energy penetration increases, projects like this BESS are critical for ensuring a reliable, greener, and cleaner energy future.

The overall project footprint, encompassing both permanent infrastructure and temporary construction facilities, as well as the 33 kilovolt (kV) grid connection route, is approximately 0.9 hectares (ha). While the final configuration will be confirmed during detailed design, BESS containers are typically around 2.8m in height.

1.2 Scope and purpose of this report

The Flood Impact Assessment (FIA) is one of several technical reports forming part of the Environmental Impact Statement for the Project.

The primary objective of this report is to identify and evaluate the potential impacts associated with the construction, operation, and decommissioning of the Project. It directly addresses the Secretary's Environmental Assessment Requirements (SEARs) issued by the Planning Secretary on 19 December 2024.

1.3 Project Secretary's Environmental Assessment Requirements

Table 1-1 presents the relevant SEARs and how they are addressed by the Project for compliance.

Table 1-1: Relevant SEARs requirements

SEARs Requirement	Where and how addressed?
Assessing the impacts of the development, including any changes to flood risk and overland flows on-site or off-site, and detail design solutions and operational procedures to mitigate flood risk where required.	Refer Section 6.3 and Section 6.4. The impact of the development was qualitatively assessed. This approach was adopted as the proposed works are considered minor and would have limited to no impact on flooding. The flood risk was also reviewed based on the adopted flood studies. No changes to the existing flood risk to the project were identified.
Identification of any flood risk on site having regard to adopted flood studies, the potential effects of climate change and any relevant provisions of the NSW Flood Risk Management Manual	Refer Section 6.4 and Section 6.5. Existing on-site flood risk was reviewed based on the latest flood studies available at the time of this assessment. Where available, climate change effects were evaluated using the approach outlined in the FIRA guideline. Other relevant provisions from the manual were also reviewed.

SEARs Requirement	Where and how addressed?
Where the development could alter flood behaviour, affect flood risk to the existing community or expose its users to flood risk, provide a flood impact and risk assessment (FIRA) prepared in accordance with the Flood Impact and Risk Assessment – Flood Risk Management Guide LU01	Refer to Section 6.4 in this report in general. This report presents the flood impact and risk assessment for the project. It is aligned with requirements from the Flood Impact and Risk Assessment – Flood Risk Management Guide LU01.
Detailed design solutions and operational procedures to mitigate flood risk where required.	The development is above the 1% Annual Exceedance Probability (AEP) Flood level as such no design solutions or operational procedures are required for this development.

2 Project description

The Penrith HV BESS project (the Project) involves the development, construction, operation and decommissioning of a grid-scale HV BESS with a capacity to supply up to 100MW of power and the ability to store up to 200MWh of energy adjacent to the existing Penrith Substation to meet the growing demands of the local Penrith community.

The Project includes the following key components:

- Electrical infrastructure including:
 - a 100MW/200MWh BESS comprised of 48 battery containers installed in enclosures (thermal cabinet) and associated ancillary infrastructure. Lithium-ion phosphate is the preferred Lithium-ion battery chemistry for reasons of safety and widespread availability from BESS Original Equipment Manufacturers (OEM). The battery container includes an integrated AC power inverter;
 - step up transformers, auxiliary transformer and ring main units (RMU);
 - 33kV switch room and control room;
 - installation of one (1) x 33kV underground cables and entry point for HV BESS cabling to connect the Project to the Penrith Substation via new and existing conduits; and
 - two harmonic filters.
- Other permanent ancillary infrastructure including:
 - earth grading and levelling works to allow for installation of concrete pads for the BESS containers and associated infrastructure;
 - Operation and Maintenance (O&M) building;
 - car parking;
 - security fencing, lighting, signage and lightning protection;
 - fire detection and suppression equipment;
 - internal access road (about 6m wide) and driveway access off Thornton Drive;
 - formalised underground stormwater network, and provision for water detention (for water quality and fire water purposes);
 - vegetation clearance of non-native vegetation; and
 - noise attenuation walls (7m high).
- Temporary construction facilities including:
 - site office;
 - construction compounds and laydown areas; and
 - stormwater and sediment controls for the project site.

The overall project footprint is about one hectare (ha) of land. This includes the temporary construction facilities as well as the 33kV grid connection.

Typically, BESS containers are 2.8m in height, with a total associated footprint of 50m² in area per container. There are 48 battery containers proposed. The BESS containers typically contain internal heating, ventilation and cooling controls. Harmonic filters can be up to 6m tall while the step-up transformer tank would be up to about 2.5m high.

Figure 2-1 shows the concept design for the Project. The final Project configuration would be confirmed pending detailed design.



Figure 2-1: Proposed Penrith HV BESS Project layout

3 Scope of works

The scope of works for this assessment is listed as follows:

- Data collection and review (refer to Section 4), including:
 - existing flood studies (including reports, maps, models and results);
 - GIS data and other relevant publicly available information;
 - proposed design input data for the development; and
 - relevant policies, manuals and guidelines.
- Flood modelling and Flood Impact and Risk Assessment (refer to Section 6 and Appendices), including:
 - sensibility checks of the original models;
 - model updates for the existing condition in relation to the Site (pre-development condition);
 - model development for the design condition (post-development condition);
 - flood risk mapping for the local and mainstream flooding for flood events impacting the Site (i.e. 1% AEP and Probable Maximum Flood (PMF)), under both the updated existing condition and the design condition;
 - flood impact assessment by comparing the modelling results in the 1% AEP event (flood levels, velocities, and flows) under the design condition to those under the updated existing condition;
 - flood mitigation for adverse flood impacts to adjoining properties;
 - flood risk assessment taking into account flood behaviour, flood hazards, and hydraulic categories;
 - flood modelling and analysis for the climate change scenarios; and
 - flood mapping for the updated existing condition, the design condition and the climate change scenarios.
- Demonstration of design compliance to relevant SEARs requirements (refer to Section 1.3).

4 Available data and information

4.1 Existing studies

4.1.1 Mainstream flooding

At a regional scale, the Site is situated within the Hawkesbury-Nepean catchment. The Site is affected by mainstream flooding from Nepean River and its tributary Peach Tree Creek according to the 2024 Hawkesbury-Nepean River Flood Study (**the '2024 FS'**).

The NSW Government commissioned Rhelm Pty Ltd, in conjunction with Catchment Simulation Solutions Pty Ltd, to prepare the 2024 FS. Components of the work were prepared by WMAwater Pty Ltd and Baird. Local councils within the study area, together with the Hawkesbury-Nepean Valley Flood Risk Management Division within Infrastructure NSW then the NSW Reconstruction Authority, Department of Climate Change, Energy, the Environment and Water, Department of Planning, Housing and Infrastructure, NSW State Emergency Service, and the Bureau of Meteorology were members of a Technical Working Group that met over the development of the project.

The study accounts for flows from the entire 21,400km² Hawkesbury-Nepean catchment, providing detailed flood information for the 190-km length of the Hawkesbury-Nepean River from Bents Basin near Wallacia through to Brooklyn. The study area falls mainly within the Penrith, Hawkesbury, Blacktown and The Hills local government areas as shown in Figure 4-1. Flood level, depth and velocity data at a 15m cell resolution are provided across the river and floodplain.

The 2024 FS reports and maps are publicly available. The model is provided by the NSW Reconstruction Authority on 14 April 2025, which is adopted for this assessment to inform the flood impact and risk of the Project in the regional context (**the regional model**).

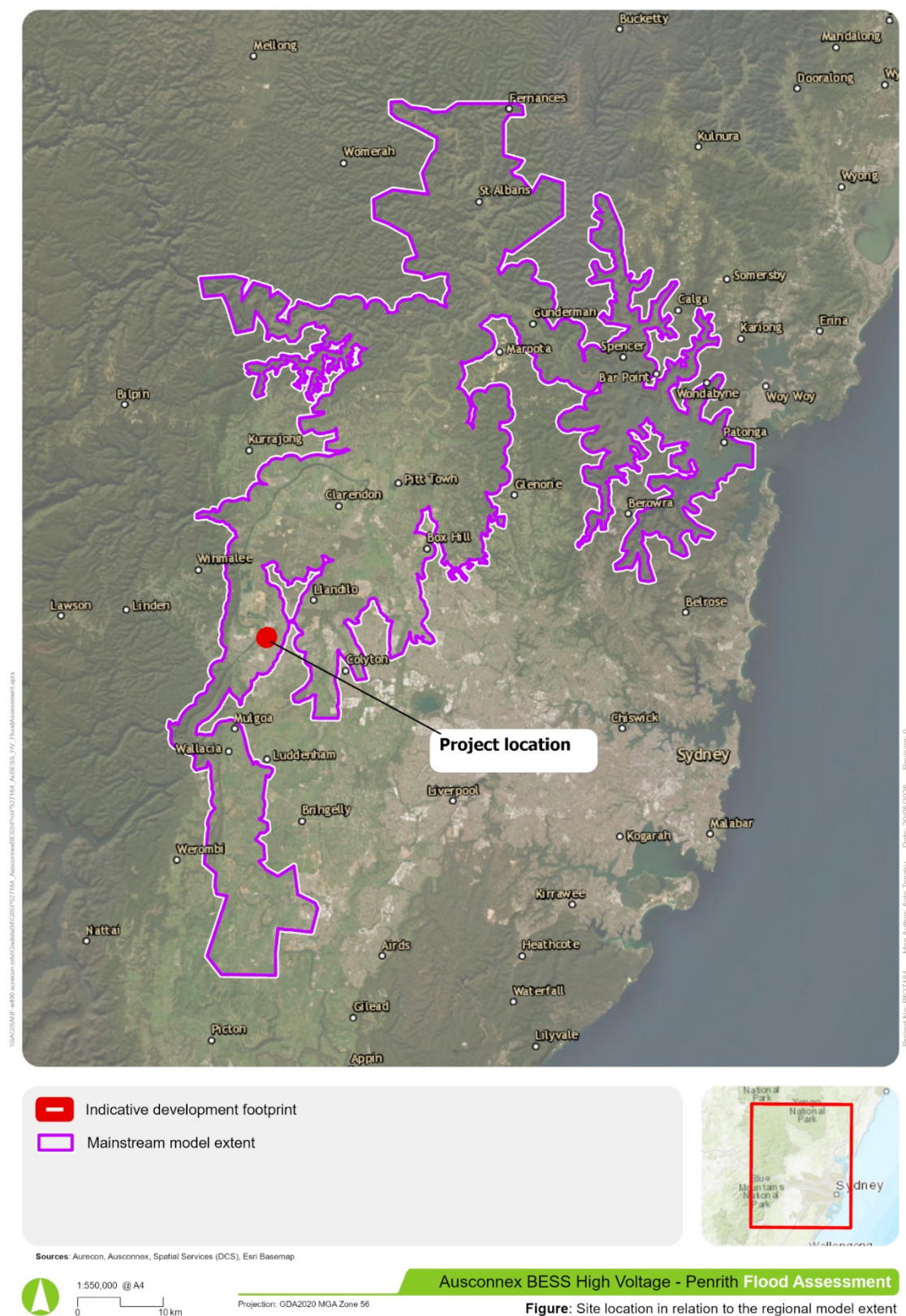


Figure 4-1: Site location in relation to the regional model extent

4.1.2 Local flooding

At a local scale, the Site is within the Boundary Creek catchment and is affected by the overland flooding. The Cranebrook Overland Flow Flood Study (**the '2023 FS'**) that was prepared by Lyall & Associates in 2023 is currently adopted by Council to inform local flood risk to this area.

The 2023 FS covers an area of approximately 13.3km² and comprises the parts of Cranebrook, Penrith and Cambridge Gardens as shown in Figure 4-2. The area is generally bounded by the Nepean River and Penrith Lakes to the west, Cranebrook Road to the north, The Northern Road and Parker Street to the east and the Main Western Railway to the south. Hydrologic modelling was undertaken in the DRAINS software to obtain input hydrographs for the study area and 1D/2D.

Hydraulic modelling was undertaken by TUFLOW to investigate the flood behaviour with a grid resolution of 2m for the full range of design storm events.

The 2023 FS reports and maps are publicly available. The models were provided by the Council, which is adopted for this assessment to inform the flood impact and risk of the Project in the local context (**the local model**).

4.2 GIS data and design inputs

The design inputs for the development, along with the relevant GIS data, were collected, reviewed, and used in the assessment, as summarised in Table 4-1.

Table 4-1: GIS data and design inputs

Data	Date by Source	Description
Detailed site survey of the ground surface in DWG format	14/10/2024 by INFOCUS Surveyors	The drawing includes detail and levels of part of Penrith transmission and zone substations. A 3D Triangular Irregular Network (TIN) of the ground surface is available. The coordinate reference system is GDA2020 MGA56.
Penrith LiDAR terrain data Digital Elevation Model (DEM) in TIF format from ELVIS	Obtained on 28/01/2025 by Aurecon	The data tiles were captured by NSW Government - Spatial Services in 2019 July. The coordinate reference system is GDA94 MGA56. The 1 metre DEM is produced using TIN method of averaging ground heights to formulate a regular grid.
Penrith topographic and cadastral data in SHP format from SIX MAPS		The datasets provide useful GIS information for the development area, including cadastre boundary, road segments and local features in the surroundings.

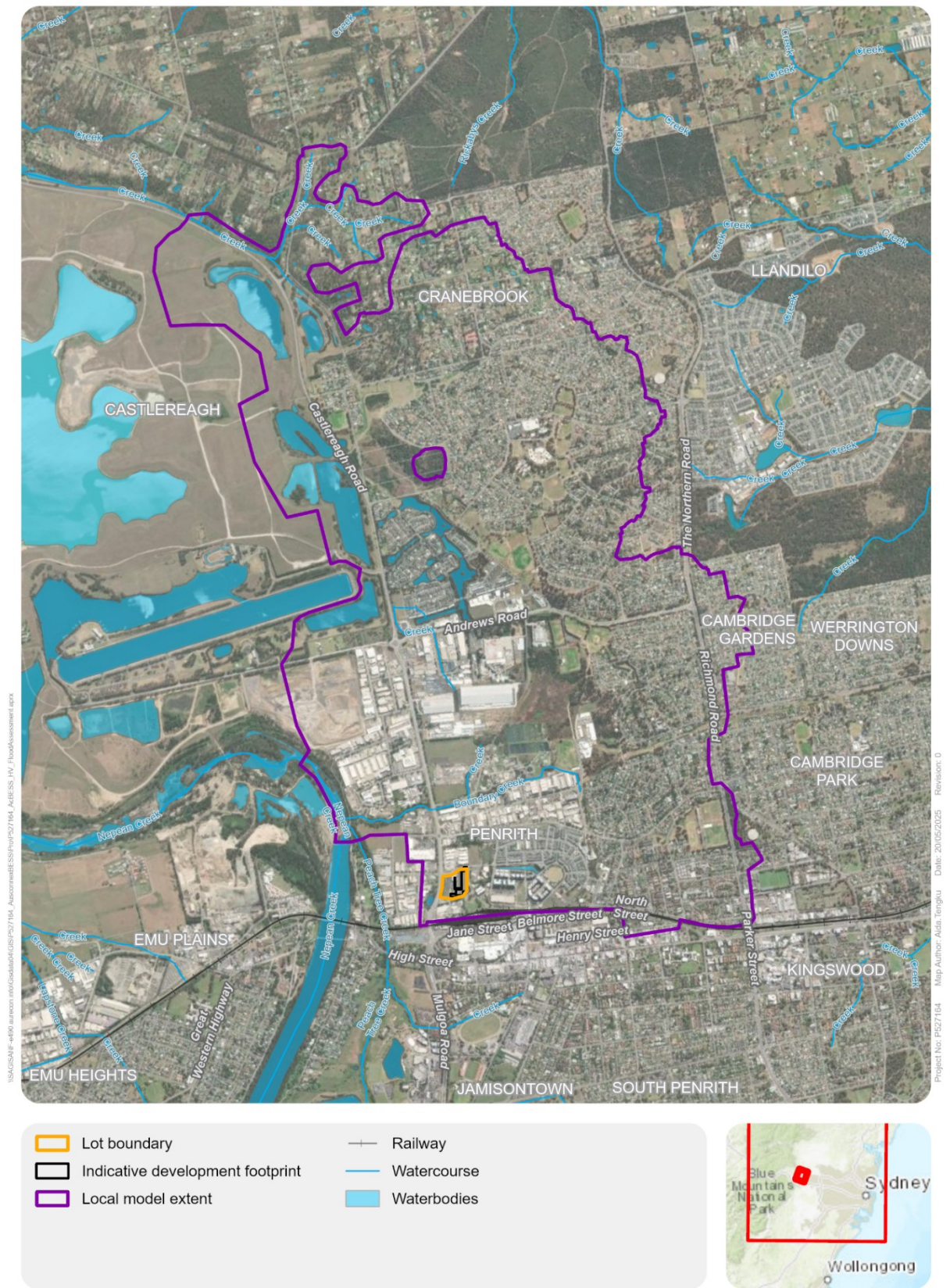


Figure 4-2: Site location in relation to the local model extent

4.3 Relevant policies, manuals and guidelines

The assessment has been undertaken in accordance with the following documents in Table 4-2.

Table 4-2: Relevant policies, manuals and guidelines for the assessment

Documents	Description
TUFLOW Classic/HPC User Manual 2025.0 (BMT, 2025)	This document is the User Manual for the 2025 release of the TUFLOW Classic and TUFLOW HPC hydrodynamic computational engines. Reference is made to the documentation (release notes and manuals) relevant for the previous builds based on the existing TUFLOW models.
<i>Flood Prone Land Policy</i> (NSW Department of Planning and Environment, 2005)	The primary objective is to reduce the impacts of flooding and flood liability on communities and individual owners and occupiers of flood prone property, and to reduce private and public losses resulting from floods, utilising ecologically positive methods wherever possible. In doing so, community resilience to flooding is improved.
Flood Risk Management Manual (NSW Department of Planning and Environment, 2023)	This manual provides for the development and implementation of sustainable strategies for managing human occupation and use of the floodplain. It provides for evaluation of strategies and formulation of plans that achieve effective flood risk management outcomes accounting for social, economic, ecological and cultural factors, together with community aspirations for the use of flood prone land.
Flood Risk Management Guide LU01	This is one of several guides in the Flood Risk Management toolkit. It outlines considerations for assessment of flooding in investigations to support developments.
Construction of buildings in flood hazard areas (Australian Building Codes Board, 2012)	The Standard aims to reduce the risk of death or injury of building occupants as a result of buildings subjected to certain flood events.
Australian Rainfall and Runoff: A Guide to Flood Estimation (ARR19) Version 4.2 (Commonwealth of Australia, 2024)	The guideline is to provide the best available information on design flood estimation in a manner suitable for use by Australian practitioners with varying levels of knowledge about the design flood problem, flood processes, and engineering hydrology.
Australian Disaster Resilience Handbook 7 Collection Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia (Australian Institute for Disaster Resilience, 2017)	The handbook has been developed with consideration of the National Strategy for Disaster Resilience (the Council of Australian Governments, 2011), and the findings of state and national reviews following the multiple flood events of 2010 to 2012 that resulted in widespread flooding. It is intended to provide broad advice and guidance on all important aspects in managing flood risk in Australia.

5 Assumptions, dependencies, and limitations

Assumption, dependencies, and limitations applicable to this assessment are listed in Table 5-1.

Table 5-1: Assumptions, dependencies, and limitations

Assumption or Dependency	Limitation
Local Baseline flood model is adopted based on the Cranebrook Overland Flow Flood Study (2023) for the overland flooding assessment	The study is the best available existing information for local flooding as per Penrith Council's advice. Correspondingly, the assumptions and limitations made for the baseline flood model are embedded in this assessment.
Mainstream Baseline flood model is adopted based on the Hawkesbury-Nepean River Flood Study (2024) for the mainstream flooding assessment	For mainstream flooding, the assumptions and limitations made for the baseline flood model, based on the Nepean River Flood Study, are embedded in this assessment. It should be noted that the adopted methodology and model parameters might be different between the local model and the regional model for the site (i.e. model resolution, topography, drainage structures, etc). However, the models are deemed fit for purpose for the assessment of local and mainstream flooding.
Future climate factors and scenarios are adopted as per the corresponding flood studies.	It is noted that ARR2019 Version 4.2 has updated the climate change scenarios and factors in 2024. This assessment does not update the baseline models in regard to the updated climate change guidance and factors. The Cranebrook Overland Flow Flood Study adopts the proxy approach where the 0.5% and 0.2% AEP events were simulated to represent a 10% and 30% increase in rainfall respectively to represent the likely range of future 1% AEP events. The Hawkesbury-Nepean flood Study (2024) representing the mainstream flooding adopted the following increased rainfall and sea level rise scenarios: ■ 9.5% increase in design rainfall + 0.4m Sea Level Rise ■ 19.7% increase in design rainfall + 0.9m Sea Level Rise
Localised impacts within the BESS site boundary are assessed and existing overland flow paths are maintained.	Given the flood model extent and schematisation, the local rainfall and runoff within the BESS site will exit the site via existing flow paths outside of the site.

6 Flood modelling and results

6.1 Model development

As discussed in Section 4.1, the baseline models from the 2024 Hawkesbury-Nepean River Flood Study and the 2023 Cranebrook Overland Flow Flood Study are adopted for mainstream flooding and for local flooding respectively. The models were further developed to represent the updated existing condition and the design condition for the project. The details of the development are discussed in the following sections.

The modelling methods are consistent with the ARR2019 and the Flood Risk Management Manual. However, it is noted that the Cranebrook Overland Flow Flood Study uses tailwater levels based on ARR1987, which were sourced from the Advisian 2018 study.

For local catchment flooding, the downstream boundary does not influence flood levels across the Site. As a result, no updates to the downstream boundary were required.

6.1.1 Updated existing condition

The existing condition was updated to incorporate the latest survey data within the site for a better representation of the existing ground surface for both models. In addition, the existing drainage networks were incorporated into the local model while they are not applicable in the regional model consistent with the modelling methodology and assumptions in the 2024 FS. Existing model representation is shown in Figure 6-1.

6.1.2 Design condition

Based on the updated existing condition, the design condition was further developed to incorporate the proposed bench, the access roads and the stormwater bioretention basin into the local model (refer Figure 6-2). Due to the limitation of the model resolution, the design was represented using geometry modification features in TUFLOW to account for the limitation, as opposed to reading in the proposed design surface.

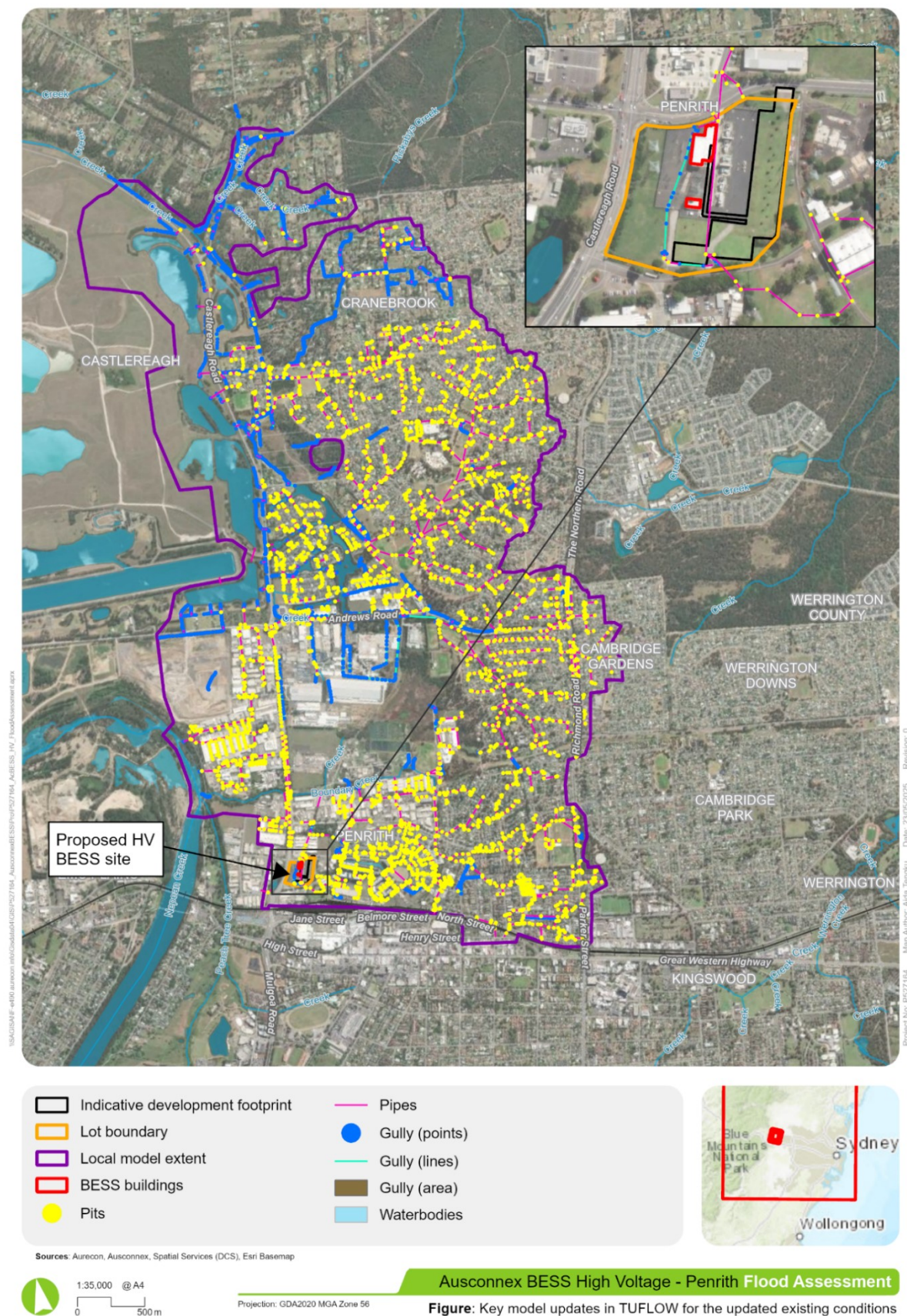


Figure 6-1: Key model updates in TUFLOW for the updated existing conditions

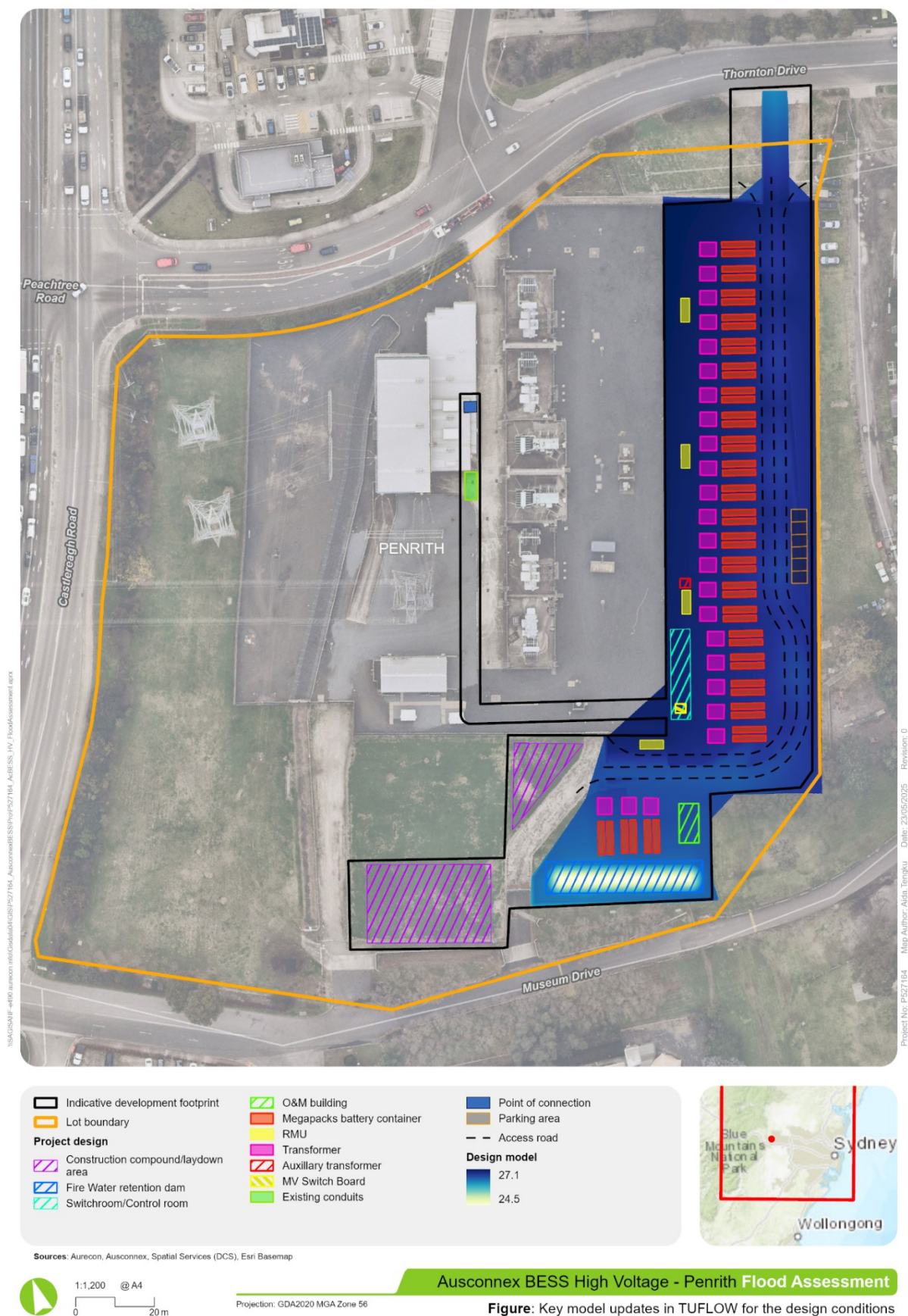


Figure 6-2: Key model updates in TUFLOW for the design conditions

6.2 Model results

The developed local model was simulated for the flood events including 20% AEP, 10% AEP, 5% AEP, 1% AEP and the PMF under the updated existing condition and the design condition.

According to the 2024 FS Map Book Volume A1, the site is outside the flood extent for the events of 20% AEP, 10% AEP and 5% AEP, and gets inundated in the 1% AEP and rarer events.

In the mainstream PMF, the whole site and its vicinity would be inundated with a peak level of approximately 32.26m Australian Height Datum (AHD) (depths of ~7m) under existing conditions where design works are unlikely to make any notable difference to the existing flood behaviour under that deep flood waters.

Hence, the developed regional model was simulated only for the 1% AEP event under the updated existing condition and the design condition. Key model outputs are the peak flood depths, levels, velocities, hazards and peak flows across the flow paths through the site. Details are discussed in the following sections and flood maps are included in Appendix A for illustration.

6.2.1 Updated existing condition

For mainstream flooding, the site is not impacted by flooding until the 1% AEP event. In this event, the western and southern extents of the property are the affected areas. The flood risk is shown in Appendix A, Figure A-8 to Figure A-12. This shows the Site is still under the Flood Planning Level (FPL) of 26.9m AHD (1% AEP flood level + 0.5m freeboard) and thus subject to flood-related development controls. Site levels are shown in Figure 6-2.

For local flooding, the BESS development footprint is not directly affected by the overland flows from the upstream catchments for the flood events from 20% AEP to including the 1% AEP. The site does become inundated in the Local PMF event.

Most of the upstream overland flows are observed in the vegetated area at the southern side of Museum Drive including a sag area. The peak depth within the sag is approximately 0.75m. A section of Museum Drive is inundated in the 1% AEP event with a peak depth of approximately 0.21m. Refer to Appendix A.

The northerly flows across Museum Drive are contained in the swale in front of the project site and then diverted into the swale to the west of the existing substation through culverts.

In the PMF event, since the swales and other drainage features are overwhelmed, the project site is entirely inundated with a maximum peak flood depth of approximately 0.65m towards the western boundary of the site.

6.2.2 Design condition

For mainstream flooding in the 1% AEP event, with the proposed earth grading and levelling works, the Site including the main facilities are now above the 1% AEP flood level. The peak level is approximately 26.33m AHD (26.4m AHD adopted) around the Site.

For local flooding, the indicative development footprint is not at risk from flooding up to and including the 1% AEP. In the PMF event, due to the proposed filling for the BESS bench by up to around 1.5m from natural surface, the BESS and associated infrastructure are not flooded. The peak flood level is approximately 26.06m AHD. The maximum peak depth is approximately 0.73m along the access road inside of the site.

6.3 Flood impact assessment

In accordance with the Flood Risk Management Manual, the flood impacts were assessed in the mainstream and local model for the 1% AEP event. This was done by comparing the flood characteristics under the design condition and the updated existing condition (design minus updated existing). The Site is not at risk of flooding in the 20% AEP, 10% AEP and 5% AEP events, therefore an impact assessment was not undertaken for these events.

Changes in key characteristics are discussed in the following sections and flood maps are included in Appendix B for illustration where impacts have been assessed. Figures B-1 to B3 represent the local flood impacts and Figures B-4 to B-6 represent regional flood impacts.

6.3.1 Change in peak water levels

For mainstream flooding, the Site is flooded in the flood planning event (1% AEP event). In this event, there is no predicted change in peak water levels based on the modelling results. This is due to the minor changes in levels proposed in comparison to the magnitude of flooding and the flood fringe flood function.

For local flooding, there is no predicted change in peak water levels, given the site is not inundated, in the 1% AEP based on the modelling results.

6.3.2 Change in peak velocities

For mainstream flooding, in the 1% AEP events, localised changes are observed in the order of $\pm 0.3\text{m/s}$ within the Site while changes are even smaller at $\pm 0.1\text{m/s}$ outside the Site. The absolute peak velocities are generally less than 1m/s which is relatively slow due to the nature of the backwater flooding under the existing and the design conditions. The downstream velocity of the flood towards the north is not increased by the development.

For local flooding, there is no predicted change in peak velocities, given the site is not inundated based on the modelling results.

6.3.3 Change in peak flows

For mainstream flooding, changes in 1% AEP peak flows around the Site are observed to be approximately ± 0.1 to $0.2\text{m}^3/\text{s}$. This represents a maximum variation of approximately 1.3% relative to existing peak flows of around $15\text{m}^3/\text{s}$, which is considered negligible. Such a small change does not result in any meaningful redistribution of flow downstream.

For local flooding, there is no predicted change in peak flows upstream or downstream of the site based on the modelling results.

6.4 Flood risk assessment

6.4.1 Flood hazards

According to the Australian Emergency Management Institute hydraulic hazard framework, flood hazard is dependent upon a combination of the flood depth and flow velocity. The hazard can be classified under six different categories, from H1 to H6, with H6 being the most hazardous. The Australian Emergency Management Institute flood category curves are identified in Figure 6-3.

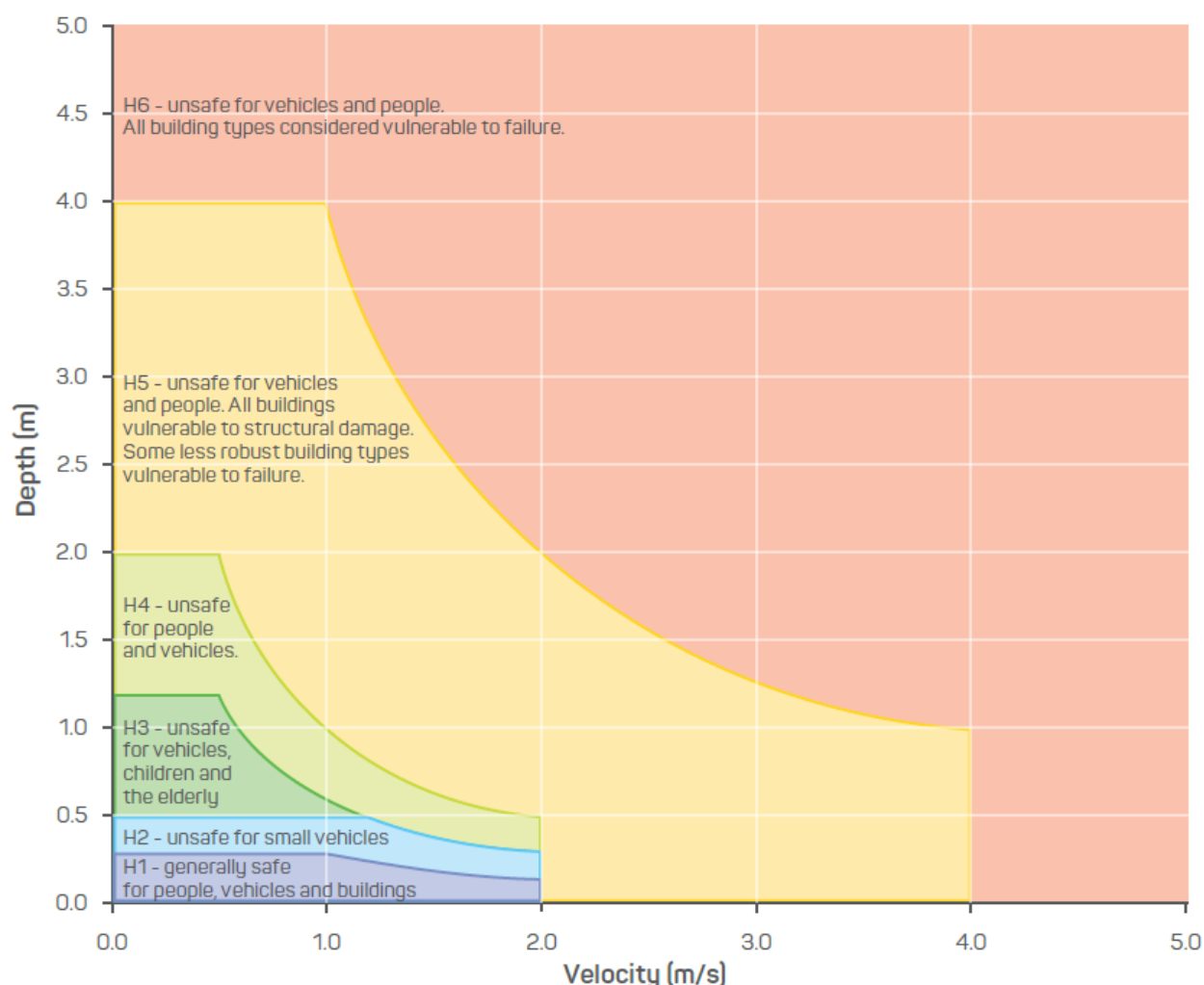


Figure 6-3: Flood hazard vulnerability curves (Book 6 Chapter 7, ARR19)

The flood hazard maps in Appendix A illustrate that the existing flood hazards are not worsened under the design condition.

For mainstream flooding under the design condition, there is no direct hazards within the BESS area for the 1% AEP event. Category H4 is observed along the swales around the development area. Museum Drive is classified as Category H3.

For local flooding under the design condition, there is no direct hazards within the site for all the events. The peak flood hazards are generally Category H1 in vicinity of the site for the events smaller than the 1% AEP events. In the 1% AEP events, while Category H2 and H3 are observed along the swales around the site, Museum Drive is still classified as H1, not subject to flood constraints.

In the PMF event, it is generally classified as H2 - H3 around the site and becomes H4 - H5 towards the downstream of the lot near the existing substation. The low-lying sections of Museum Drive and Thornton Drive are unsafe for vehicles, children and the elderly (Category H3).

6.4.2 Flood function (hydraulic categories)

Based on the flood function classification criteria adopted in the 2024 FS, the site is classified as Flood Fringe under mainstream flooding in the 1% AEP design event. This classification is consistent with the site's flood function under existing conditions. The mainstream flood function in a 1% AEP event is shown in Figure 6-4.

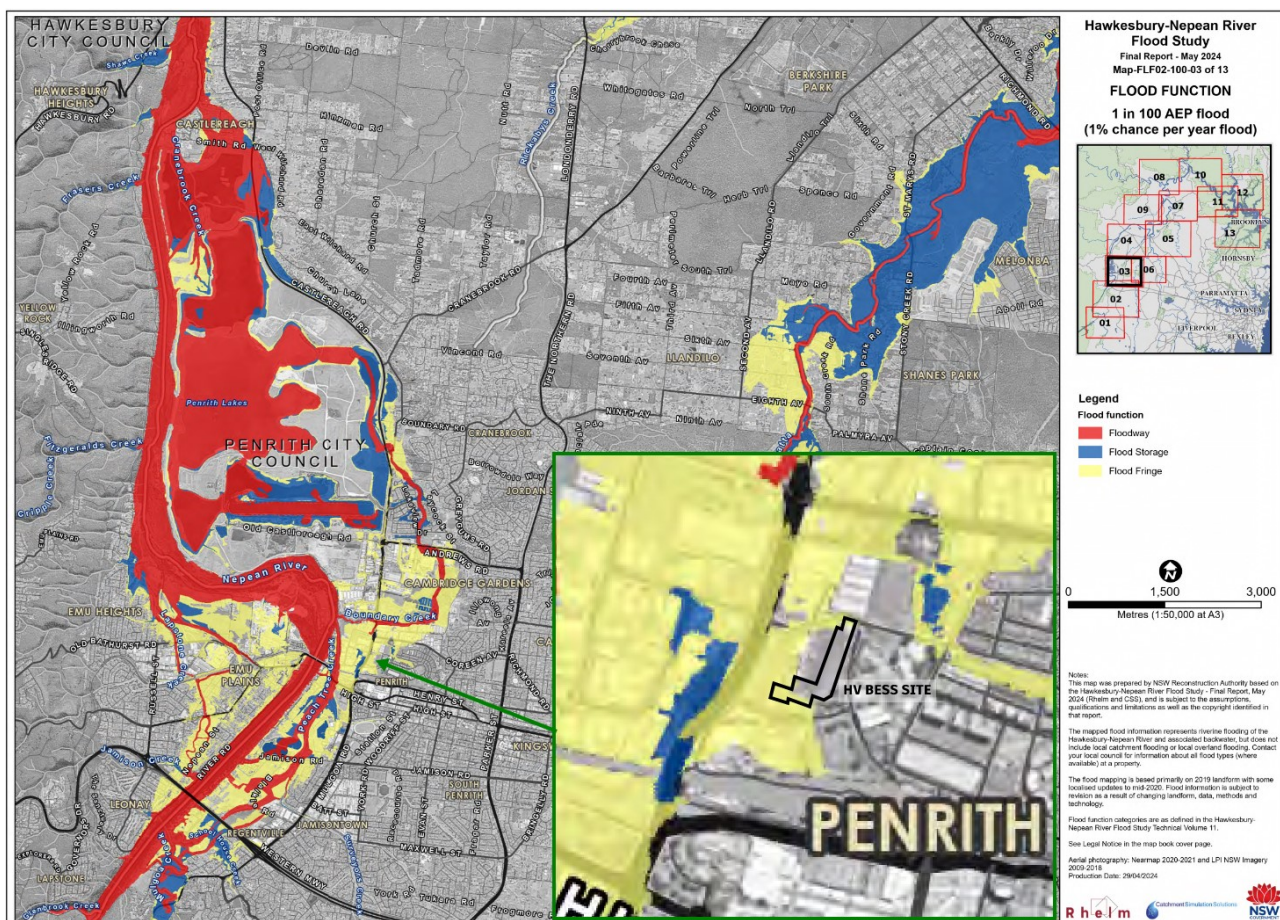


Figure 6-4: Mainstream flood function in a 1% AEP event, extracted from the Hawkesbury-Nepean Flood Study (2024)

For local flooding under the design condition, based on the criteria adopted by the 2023 FS for defining the flood functions, the site has no flood function as it is not subject to flooding. The surrounding area outside of the site generally functions as flood storage for the events up to the 1% AEP event. In the PMF event, the low-lying areas to the west of the site become floodways.

The flood function under the local flooding mechanism is shown in Figure 6-5.

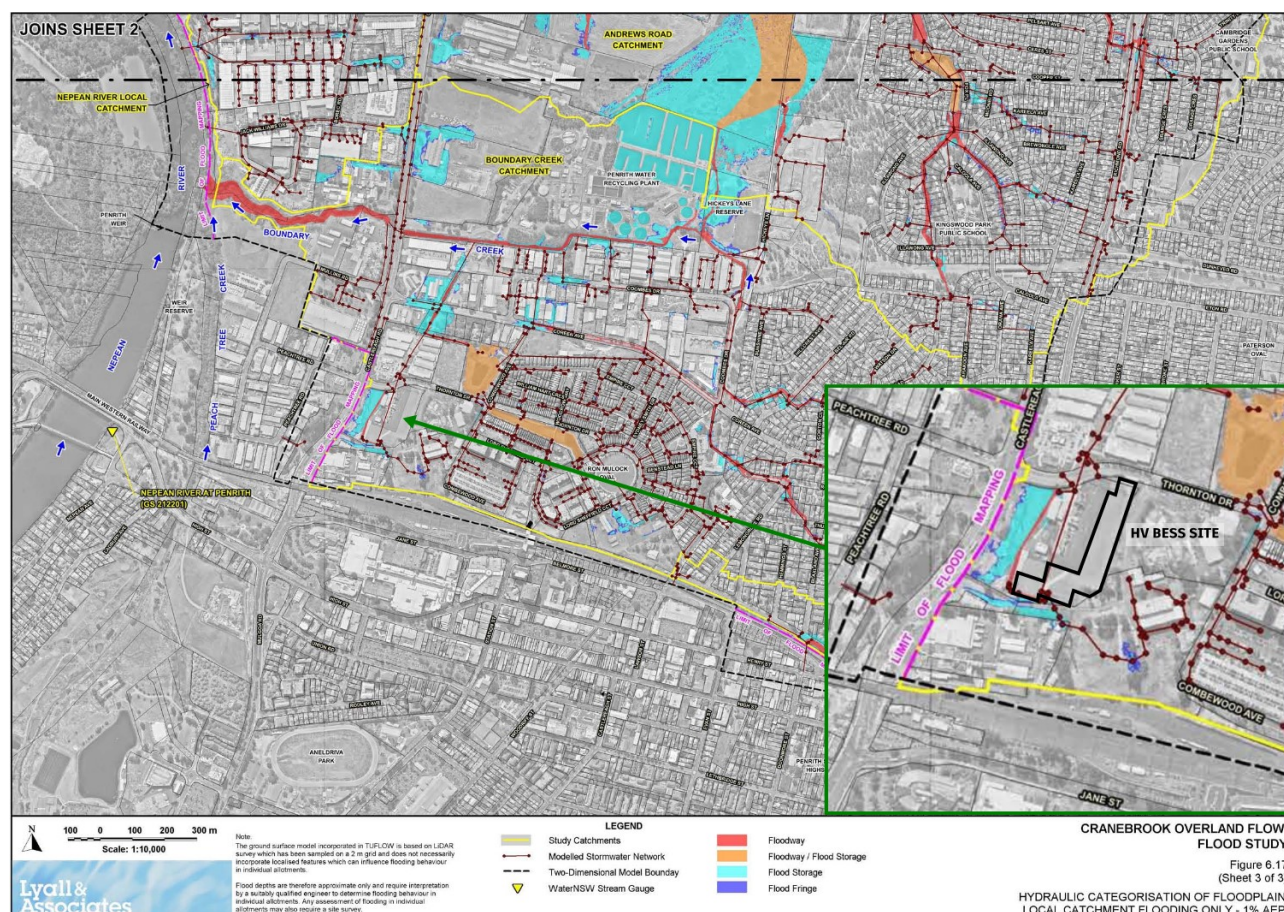


Figure 6-5: Local flooding flood function in a 1% AEP event, extracted from the Cranebrook Overland Flow Flood Study (2023)

6.4.3 Flood immunity

To meet the flood immunity requirements for sensitive infrastructure and equipment, all critical components are proposed to be elevated to a minimum level of 26.9m AHD, corresponding to the peak of the mainstream and local 1% AEP flood level plus 0.5m freeboard (26.33m AHD (rounded to 26.4m AHD) plus 0.5m freeboard). To achieve this, site filling is proposed to establish a graded foundation and elevate the infrastructure to the required level. This is RL 26.4m AHD to achieve Flood Immunity, and RL 26.9m AHD to meet the Flood Planning level.

The site is located outside areas classified as floodways or high hazard zones (refer to Sections 6.4.1 and 6.4.2), and as such, the proposed filling is considered reasonable to facilitate development.

A flood impact assessment of the proposed fill has been undertaken, demonstrating that the filling does not result in adverse flood impacts on adjacent properties (refer to Section 6.3 and Appendix B).

By setting the sensitive infrastructure at or above 26.9m AHD (Flood Planning Level), the Project achieves the required level of flood immunity in accordance with recognised best-practice flood risk management.

The proposed Noise Wall along the eastern side of the site is not affected by Mainstream flooding up to and including the 1% AEP. It will become partially submerged during larger events such as the Mainstream PMF. Local flooding of the low point between the site and the Museum of Fire to the east may result in the base of the wall becoming inundated in the 1% AEP, however the impact to site and operations from this are negligible.

6.4.4 Emergency evacuation

The Project does not impact flooding under mainstream and local flooding, as presented in Section 6.3 and Appendix B. As such, in accordance with Clause 5.21 - Flood Planning of the Local Environment Plan, the development shall not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood.

Flood emergency response categories are assigned to flood affected areas in accordance with the definitions in the Australian Disaster Resilience Handbook Collection Guideline 7-2 (2017). This information will assist NSW State Emergency Service (SES) in emergency management planning during flood events.

Under local flooding for the proposed design scenario, the Site and the adjacent area to its west (proposed MV BESS site) is not flooded by the PMF. However, the other surrounding areas within the cadastral lot, including the access/egress roads, are flooded. Egress to the primary evacuation routes from Museum Drive and Thornton Drive will be cut by floodwater making it not possible to evacuate via road during the flood event.

Since the lot would not be submerged in the PMF, the flood emergency response category is interpreted as Category FIE (Flooded, Isolated, Elevated) in the local PMF flood event based on the modelling results. Despite not being able to evacuate during the flood, the local flood risk is driven by relatively short duration storms (less than 6 hours). Sheltering in place or evacuating overland off road towards Penrith railway station or a safe pickup point may also be an option.

In smaller local flooding events up to the 1% AEP, other parts of the cadastral lot are flooded (i.e. the Site is not flooded but there is flooding across other areas of the cadastral lot which the Site is proposed on), however evacuation routes are safe for vehicles based on the flood hazard results, indicating a low flood hazard classification (i.e. H1). Hence, the lot is determined as FER (Flooded, available Exit, available Rising Road) in these respective events based on the modelling results. Evacuation via Thornton Drive or Museum Drive would be possible (refer to Figure 6-7).

Under mainstream flooding, the site is located within the PMF extent. In a PMF event, flooding is extensive across the entire region, primarily originating from the west (Nepean River), with inundation progressively extending eastward as flood levels rise. This scale of flooding typically dictates regional flood planning and emergency management strategies.

Given the extent of flooding under a mainstream PMF scenario, site evacuation would be the primary emergency management strategy. Although the site is proposed to be operated remotely with no regular workers onsite, it will be accessed periodically by personnel for maintenance and testing. Risk to life from flooding will be managed through the implementation of emergency management procedures, which will align with established flood warning systems and local flood planning frameworks.

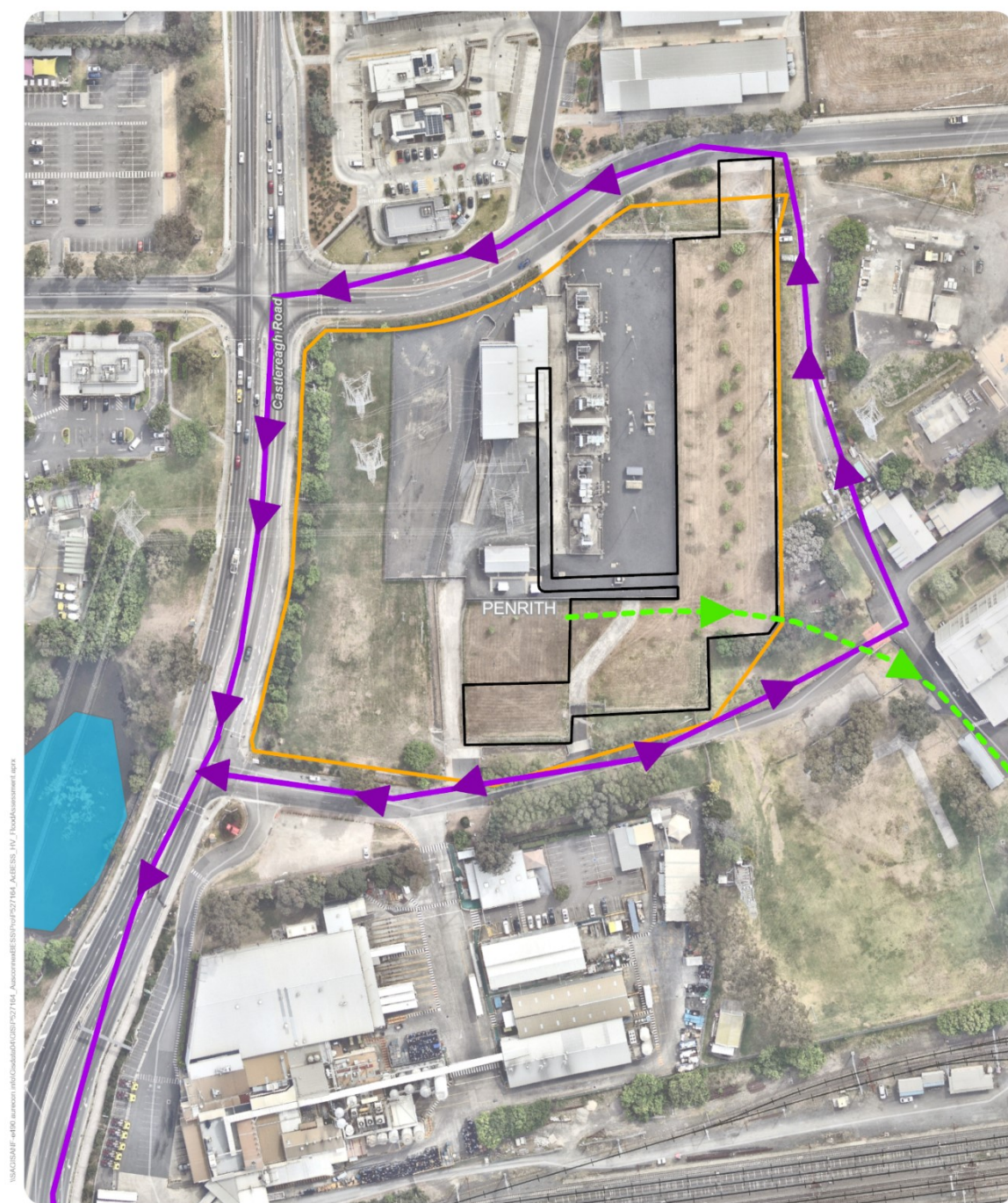
Emergency management procedures for the site will be informed by the Penrith Local Flood Plan and the broader NSW SES Hawkesbury-Nepean Valley Flood Emergency Plan (2020). The plan outlines a 6 to 8 hour target warning lead time for evacuation, triggered at approximate flood levels of 23.0m AHD and 25.4m AHD respectively at the Penrith gauge (Bureau gauge No. 567047). This timeframe is considered sufficient to safely evacuate personnel or to postpone any planned visits to the site during a flood risk period.

In terms of evacuation routes, site evacuation would be directed eastward via connecting local roads to The Northern Road and/or the Great Western Highway (refer to Figure 6-6 and Figure 6-7). Both routes are designated flood evacuation corridors and provide rising road egress, offering a safer and reliable evacuation pathway during flood events.



Figure 6-6: Nearby flood evacuation routes (NSW SES 2024)

As presented in Section 6.3, the proposal is not predicted to impact flood behaviour (flood level, velocity, extent, flow etc.). As such, there would be no impact to the safe occupation or efficient evacuation potential of people outside of the Site.



- Indicative development footprint
- Lot boundary

- ➔ Early evacuation for mainstream flooding or evacuation in local flooding up to a 1% AEP event
- ➔ Overland evacuation during mainstream 1% AEP flood event



Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

Figure: Potential evacuation routes

Figure 6-7: Potential evacuation routes

6.5 Climate change scenarios

The assessment includes consideration of future climate change scenarios, consistent with the methodologies adopted in the relevant local and mainstream flood studies. However, it is noted that these scenarios are based on earlier guidance and do not incorporate the updated climate change recommendations introduced in ARR 2019 Version 4.2.

6.5.1 Local flooding

The climate change scenarios were established as part of the 2023 FS using the DPE guidelines, *Practical Considerations of Climate Change, 2007*. The guidelines recommended until further work is completed in relation to climate change impacts on rainfall intensities, that a sensitivity analysis should be undertaken based on increases in rainfall intensities ranging between 10 and 30%. Under climate conditions at the time the study was undertaken increasing the 1% AEP design Rainfalls intensities by 10% is analogous to a 0.5% AEP event; and increasing those rainfalls by 30% is analogous to a 0.2% AEP event.

The flood study results indicate that although rainfall increases would adversely affect the flooding conditions, the Site would not be flooded under all scenarios. The flood extents are slightly larger under all scenarios.

6.5.2 Mainstream flooding

Flood mapping of climate change is presented in Appendix C. For the mainstream flooding, the 2024 Flood Study (FS) included a climate change assessment that considered both sea level rise and increased rainfall intensity. According to Section 5.1 of Volume 11 of the 2024 FS report, interim climate change factors from the ARR Data Hub were applied to represent Representative Concentration Pathways (RCP) 4.5 and 8.5 for the year 2090. These factors reflect a 9.5% increase in rainfall intensity for RCP4.5 and a 19.7% increase for RCP8.5.

The resulting 1% AEP peak flood levels across the development site under these climate scenarios are approximately 26.89m AHD for RCP4.5 and 27.30m AHD for RCP8.5. The proposed minimum site level is 26.39m AHD, meaning that under RCP4.5, the site would experience inundation during a 1% AEP event, although sensitive equipment located above the FPL of 26.9m AHD would remain protected. Under the more extreme RCP8.5 scenario, the flood level would exceed the FPL, increasing the risk of flood impacts to sensitive infrastructure.

Under these climate change scenarios, flood hazard (refer to Section 6.4.1) across the site also increases. For RCP4.5, flood hazard is predicted to range from H1 to H2, indicating generally low risk conditions generally safe for people. However, under RCP8.5, the hazard rating increases to H3 to H4, reflecting medium hazard conditions with increased risk to life and access. It is important to note that the project has a design life of approximately 20 years, with an expected operational period through to around 2050. As such, the use of 2090 projections represent a conservative approach, and the elevated hazard under the RCP8.5 scenario is not predicted to materialise within the project's lifespan. Should future climate conditions change significantly, the flood risk should be reviewed during the detailed design phase to ensure the infrastructure remains resilient.

7 Conclusion

The Flood Impact and Risk Assessment (FIRA) for the Project has been comprehensively undertaken, addressing all relevant requirements of the Secretary's Environmental Assessment Requirements (SEARs). The assessment confirms that the Project will not adversely impact flood behaviour or increase flood risk to the community.

The assessment includes consideration of future climate change scenarios, consistent with the methodologies adopted in the relevant local and mainstream flood studies. However, it is noted that these scenarios are based on earlier guidance and do not incorporate the updated climate change recommendations introduced in ARR 2019 Version 4.2.

Notwithstanding this, the climate change assessment demonstrates that the project remains resilient under increased rainfall intensities associated with future climate scenarios. Although the site itself lies below the FPL of 26.9m AHD (comprising the 1% AEP level of 26.4m AHD plus 0.5m freeboard), all sensitive equipment and infrastructure are proposed to be located above the FPL. The adopted FPL is above the modelled RCP 4.5 2090 1% AEP flood level of 26.9m AHD, meaning that sensitive infrastructure located above this level would remain protected from flood impact under that scenario.

However, under the more extreme RCP 8.5 2090 1% AEP event, the flood level is predicted to reach 27.3m AHD, which exceeds the current FPL. As a result, critical infrastructure would be at risk of flooding under the RCP 8.5 pathway. It is noted, however, that the project has a design life of approximately 20 years, with an expected end of life around 2050. Therefore, the 2090 climate change projections represent a conservative long-term scenario and the elevated hazard under the RCP8.5 scenario is not predicted to materialise within the project's lifespan. Should future climate need to be considered in the design, a review of flood risk and adaptation measures should be undertaken during the detailed design phase to ensure the project's resilience is maintained.

Emergency management procedures are aligned with established flood warning systems and local flood planning frameworks, ensuring the safety of personnel and visitors during flood events.

Overall, the Project is well-positioned to support the transition to a decarbonised electricity system while maintaining robust flood resilience and compliance with regulatory requirements.

Appendices



Appendix A

Flood Behaviour Maps

Mechanism	Figure name
Local Flooding	Figure A-1: Updated Existing Condition - 1% AEP Local Peak Flood Depths and Flood Level Contours
	Figure A-2: Updated Existing Condition - 1% AEP Local Peak Flood Velocities
	Figure A-3 : Updated Existing Condition - 1% AEP Local Peak Flood Hazards
	Figure A-4: Design Condition - 1% AEP Local Peak Flood Depths and Flood Level Contours
	Figure A-5: Design Condition - 1% AEP Local Peak Flood Velocities
	Figure A-6: Design Condition - 1% AEP Local Peak Flood Hazards
	Figure A-7: Updated Existing Condition - PMF Local Peak Flood Depths and Flood Level Contours
	Figure A-8: Updated Existing Condition - PMF Local Peak Flood Velocities
	Figure A-9: Updated Existing Condition - PMF Local Peak Flood Hazards
	Figure A-10: Design Condition - PMF Local Peak Flood Depths and Flood Level Contours
	Figure A-11: Design Condition - PMF Local Peak Flood Velocities
	Figure A-12: Design Condition - PMF Local Peak Flood Hazards
Mainstream Flooding	Figure A-13: Updated Existing Condition - 1% AEP Mainstream Peak Flood Depths and Flood Level Contours
	Figure A-14: Updated Existing Condition - 1% AEP Mainstream Peak Flood Velocities
	Figure A-15: Updated Existing Condition - 1% AEP Mainstream Peak Flood Hazards
	Figure A-16: Design Condition - 1% AEP Mainstream Peak Flood Depths and Flood Level Contours
	Figure A-17: Design Condition - 1% AEP Mainstream Peak Flood Velocities
	Figure A-18: Design Condition - 1% AEP Mainstream Peak Flood Hazards
	Figure A-19: Updated Existing Condition - PMF Peak Flood Depths and Flood Level Contours
	Figure A-20: Updated Existing Condition - PMF Peak Flood Velocities
	Figure A-21: Updated Existing Condition - PMF Peak Flood Hazards
	Figure A-22: Design Condition - PMF Peak Flood Depths and Flood Level Contours
	Figure A-23: Design Condition - PMF Peak Flood Velocities
	Figure A-24: Design Condition - PMF Peak Flood Hazards

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Lot boundary

Indicative development footprint

Cadastral boundary

Local model extent

Peak Flood Depths (m)

0.00 - 0.05

0.05 - 0.10

0.10 - 0.30

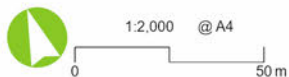
0.30 - 0.50

0.50 - 1.00

> 1.00

Flood Level 1 mAHD Contours

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



1:2,000 @ A4

Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-1: Updated Existing Condition - 1% AEP Local Peak Flood Depths and Flood Level Contours



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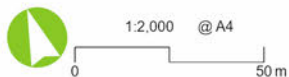


- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Peak Flood Velocities (m/s)

- <0.3000
- 0.3000 - 0.5000
- 0.5000 - 0.7500
- 0.7500 - 1.0000
- >1.0000

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



1:2,000 @ A4

Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-2: Updated Existing Condition - 1% AEP Local Peak Flood Velocities



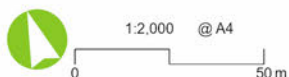


- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Peak Flood Hazard

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

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-3 : Updated Existing Condition - 1% AEP Local Peak Flood Hazards





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Project No: P527164 Map Author: Daniel Robinson Date: 20/05/2025 Revision: 0

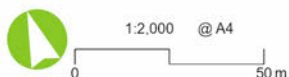
- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Peak Flood Depths (m)

- 0.00 - 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00
- Flood Level 1 mAHD Contours



Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-4: Design Condition - 1% AEP Local Peak Flood Depths and Flood Level Contours

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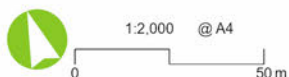


- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Peak Flood Velocities (m/s)

- <0.3000
- 0.3000 - 0.5000
- 0.5000 - 0.7500
- 0.7500 - 1.0000
- >1.0000

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



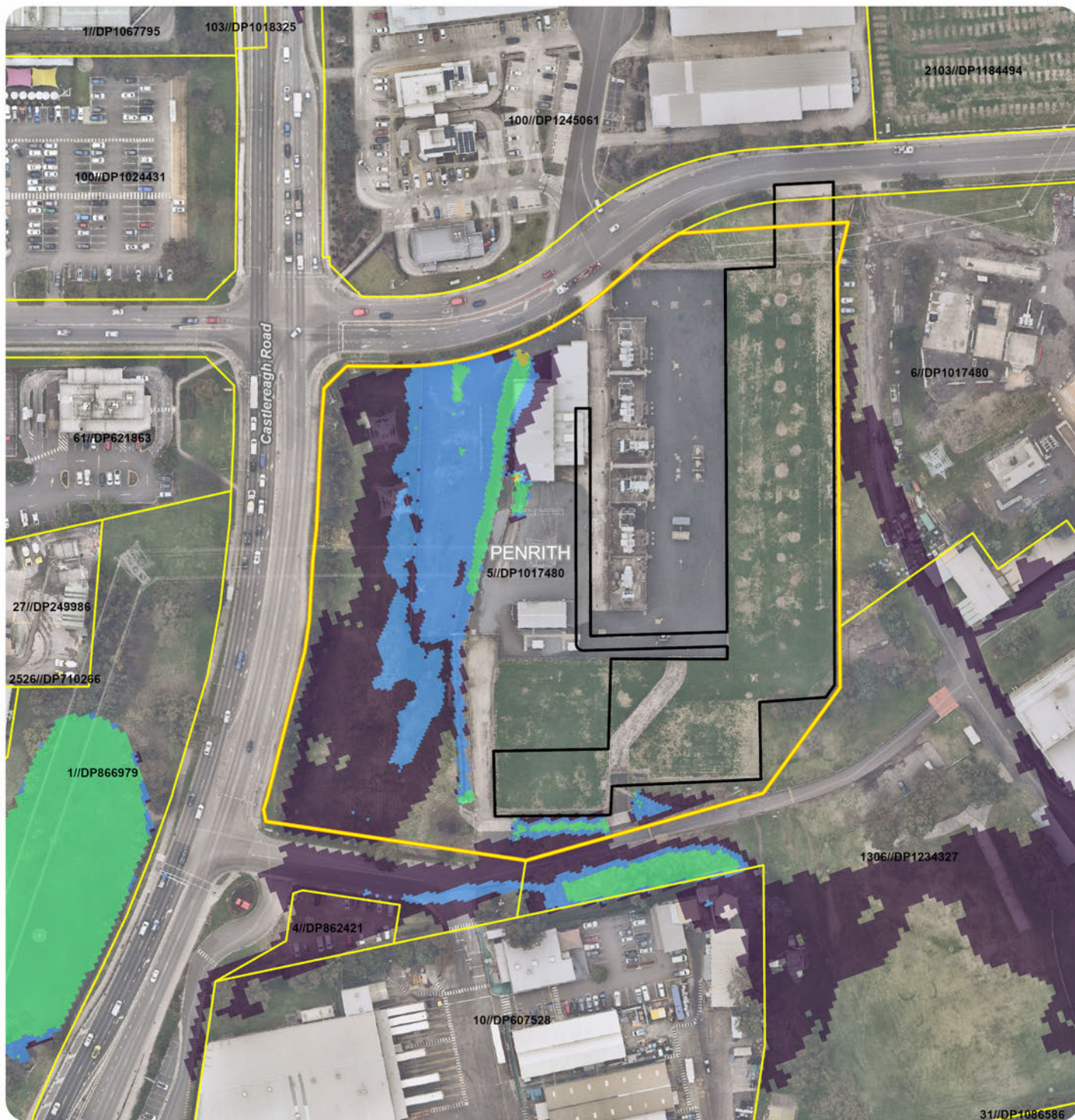
Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-5: Design Condition - 1% AEP Local Peak Flood Velocities



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Lot boundary

Indicative development footprint

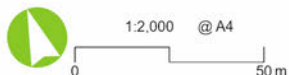
Cadastral boundary

Local model extent

Peak Flood Hazard

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

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



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Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-6: Design Condition - 1% AEP Local Peak Flood Hazards



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Lot boundary

Indicative development footprint

Cadastral boundary

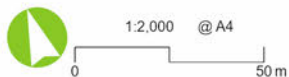
Local model extent

Flood Level 1 mAHD Contours

Peak Flood Depths (m)

0.00 - 0.05
0.05 - 0.10
0.10 - 0.30
0.30 - 0.50
0.50 - 1.00
> 1.00

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



Projection: GDA2020 MGA Zone 56

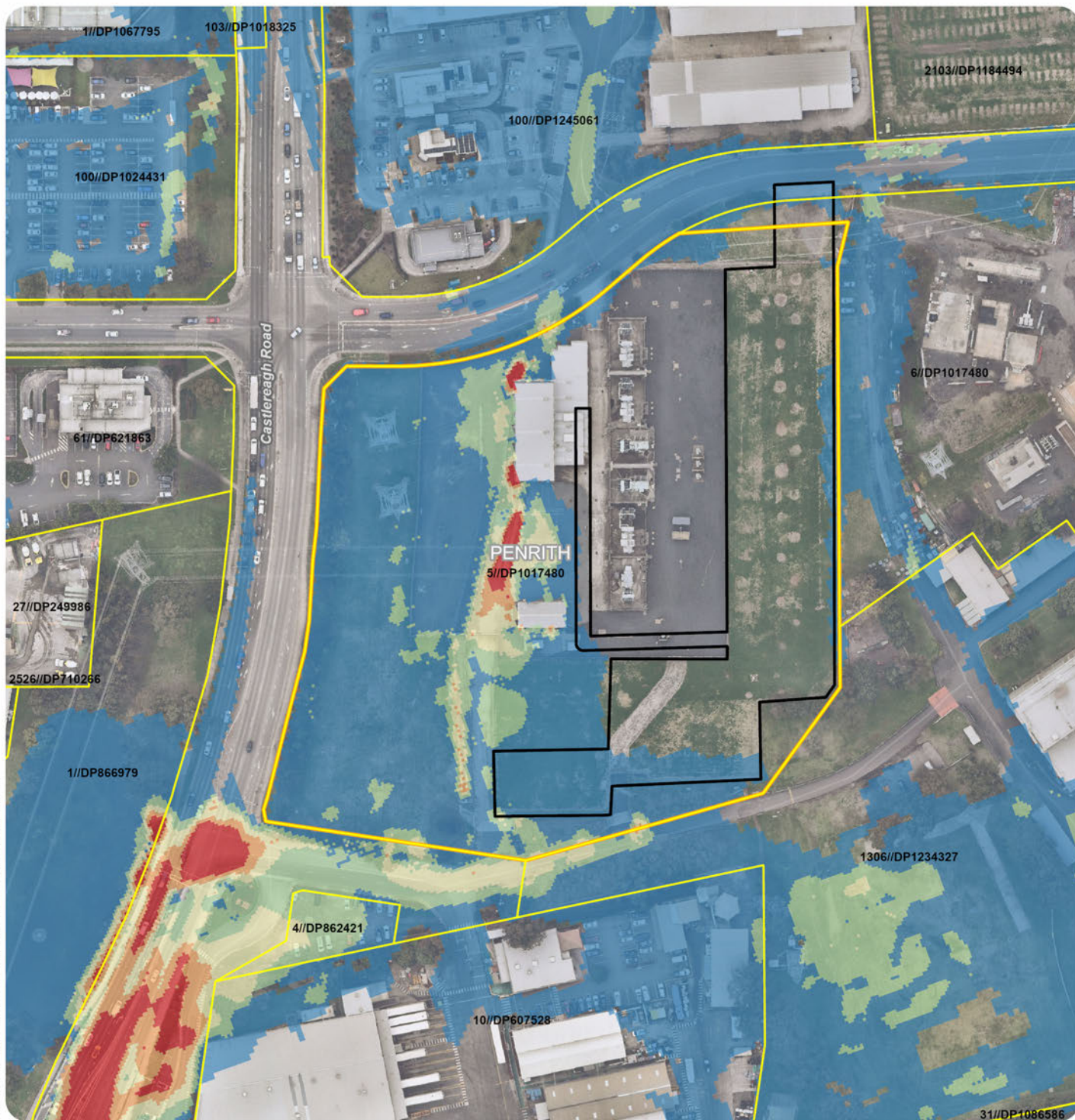
Ausconnex BESS High Voltage - Penrith Flood Assessment

A-7: Updated Existing Condition - PMF Local Peak Flood Depths and Flood Level Contours



Project No: PS27164 Map Author: Daniel Robinson Date: 20/05/2025 Revision: 0

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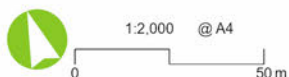


-  Lot boundary
-  Indicative development footprint
-  Cadastral boundary
-  Local model extent

Peak Flood Velocities (m/s)

-  <0.3000
-  0.3000 - 0.5000
-  0.5000 - 0.7500
-  0.7500 - 1.0000
-  >1.0000

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-8: Updated Existing Condition - PMF Local Peak Flood Velocities



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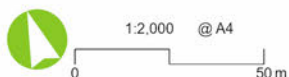


- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Peak Flood Hazard

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

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



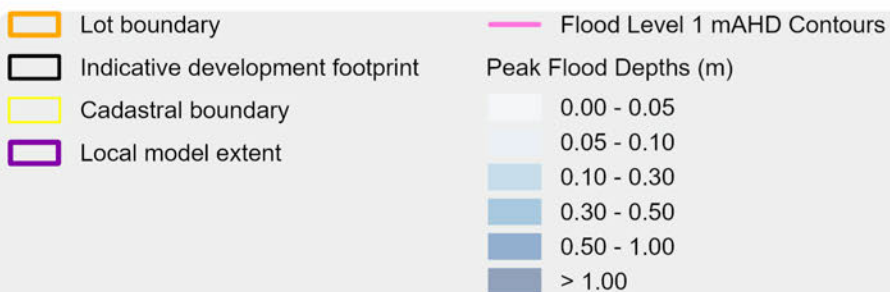
Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

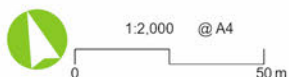
A-9: Updated Existing Condition - PMF Local Peak Flood Hazards



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Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap

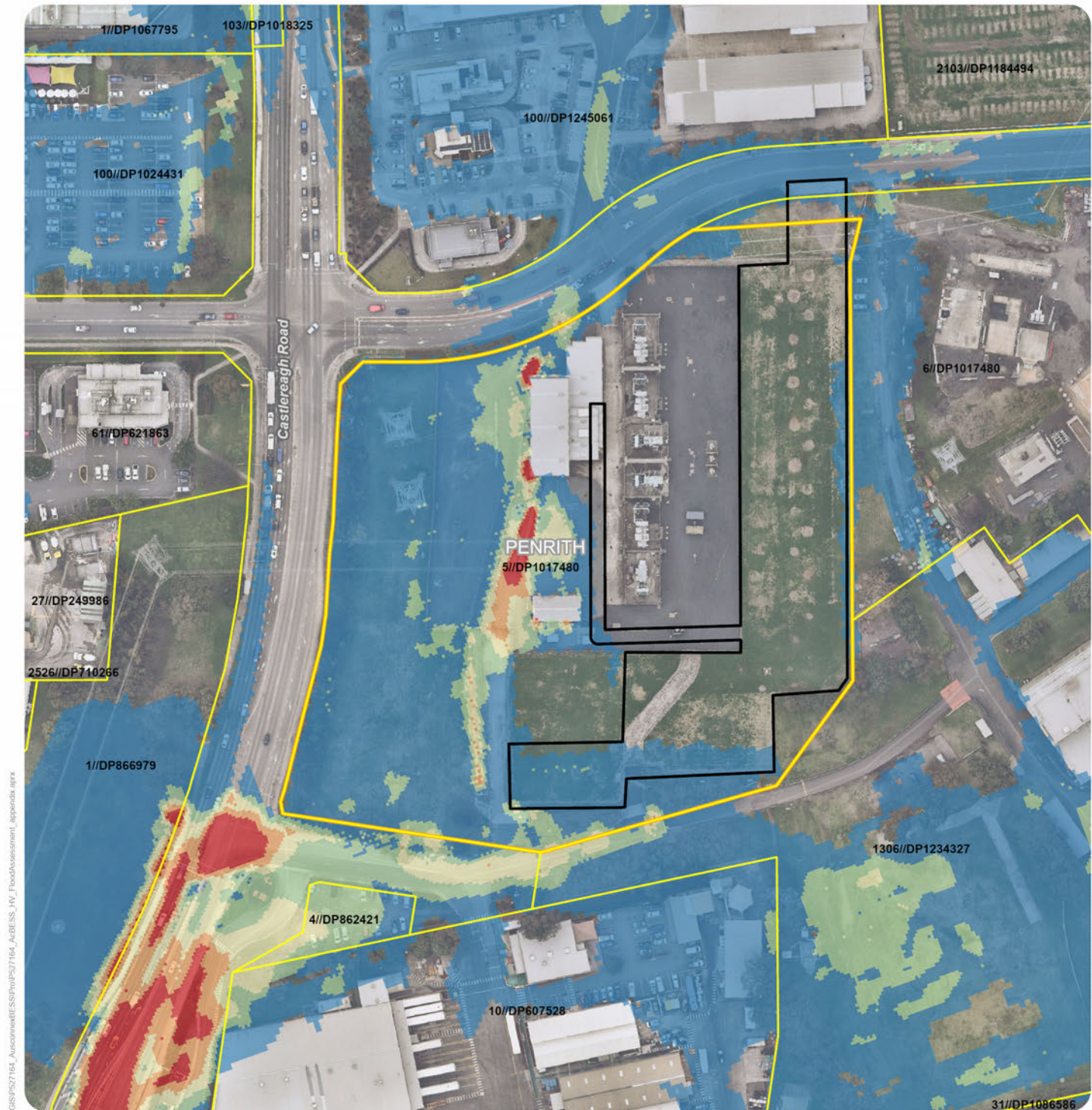


Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-10: Design Condition - PMF Local Peak Flood Depths and Flood Level Contours



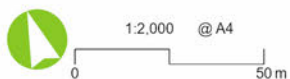


- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Peak Flood Velocities (m/s)

- <0.3000
- 0.3000 - 0.5000
- 0.5000 - 0.7500
- 0.7500 - 1.0000
- >1.0000

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



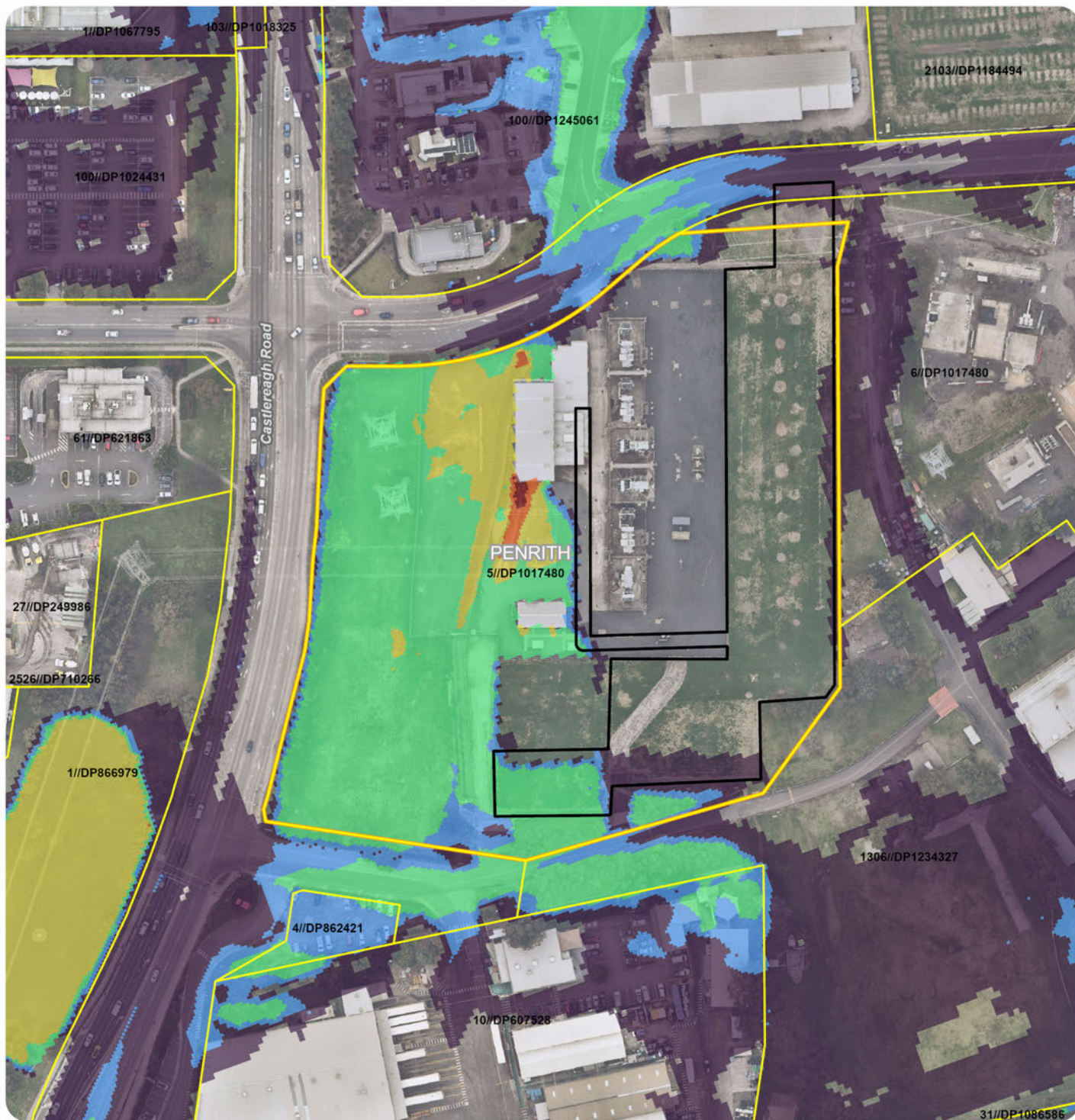
Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-11: Design Condition - PMF Local Peak Flood Velocities



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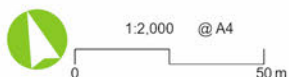
- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Peak Flood Hazard

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



Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-12: Design Condition - PMF Local Peak Flood Hazards

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Lot boundary

Indicative development footprint

Cadastral boundary

Local model extent

Peak Flood Depths (m)

0.00 - 0.05

0.05 - 0.10

0.10 - 0.30

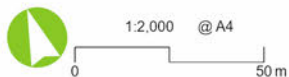
0.30 - 0.50

0.50 - 1.00

> 1.00

Flood Level 1 mAHD Contours

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



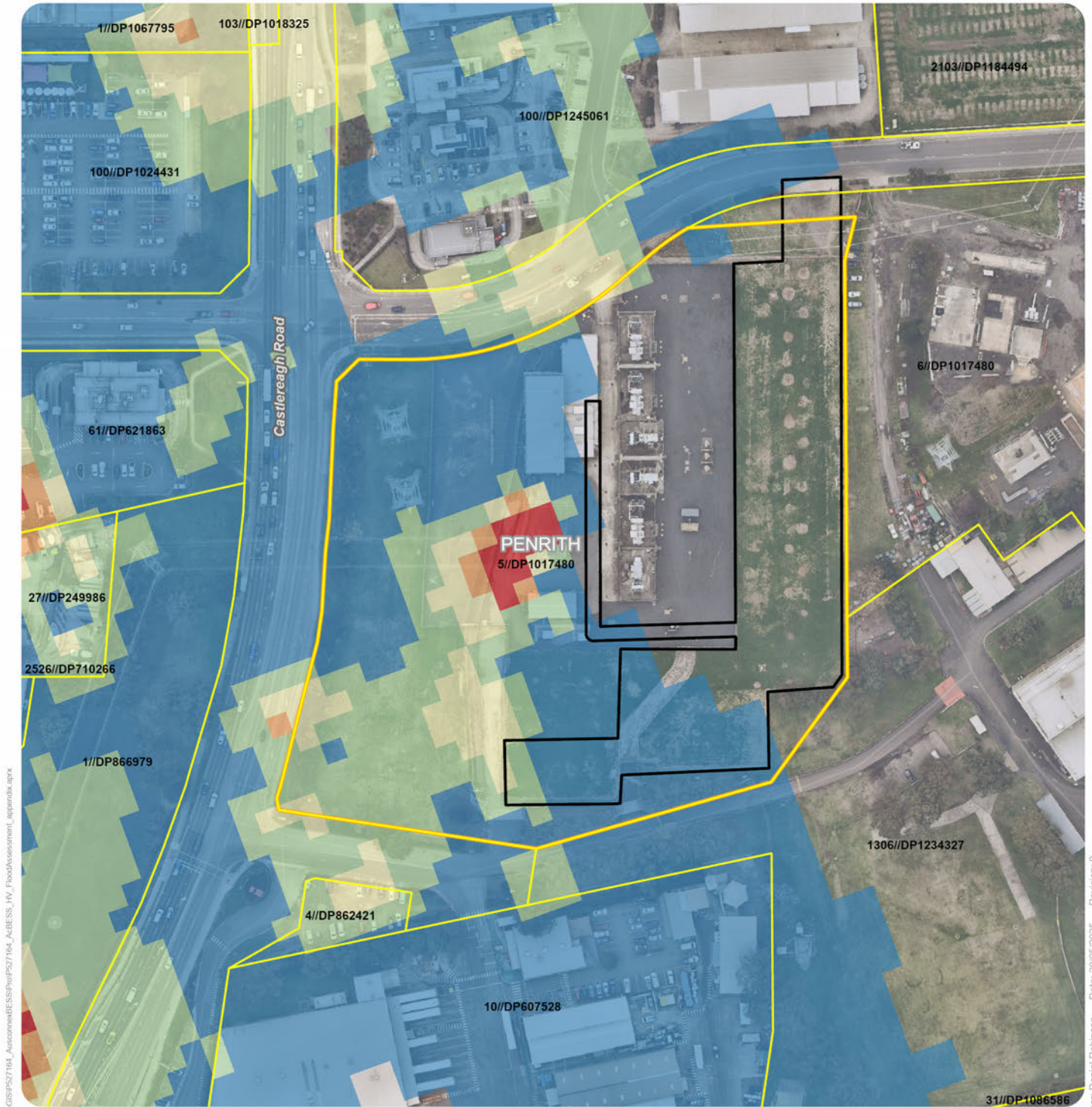
1:2,000 @ A4

Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-13: Updated Existing Condition - 1% AEP Mainstream Peak Flood Depths and Flood Level Contours



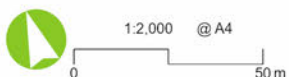


- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Peak Flood Velocities (m/s)

- <0.3000
- 0.3000 - 0.5000
- 0.5000 - 0.7500
- 0.7500 - 1.0000
- >1.0000

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



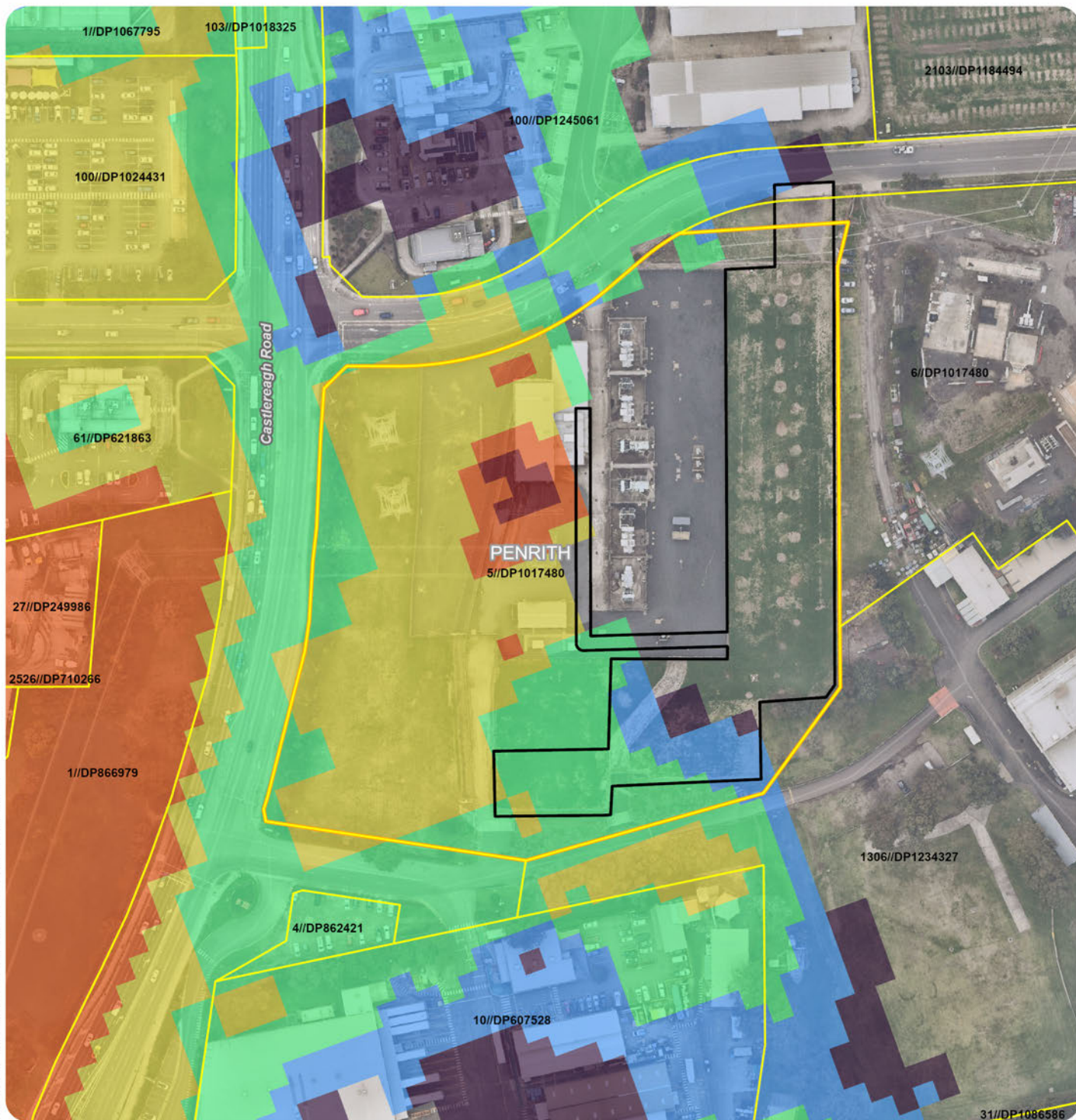
Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-14: Updated Existing Condition - 1% AEP Mainstream Peak Flood Velocities



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Lot boundary

Indicative development footprint

Cadastral boundary

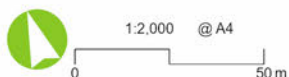
Local model extent

Peak Flood Hazard

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



Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-15: Updated Existing Condition - 1% AEP Mainstream Peak Flood Hazards

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Lot boundary

Indicative development footprint

Cadastral boundary

Local model extent

Peak Flood Depths (m)

0.00 - 0.05

0.05 - 0.10

0.10 - 0.30

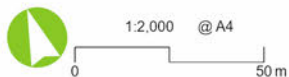
0.30 - 0.50

0.50 - 1.00

> 1.00

Flood Level 1 mAHD Contours

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-16: Design Condition - 1% AEP Mainstream Peak Flood Depths and Flood Level Contours



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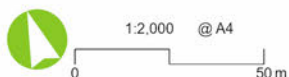


- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Peak Flood Velocities (m/s)

- <0.3000
- 0.3000 - 0.5000
- 0.5000 - 0.7500
- 0.7500 - 1.0000
- >1.0000

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



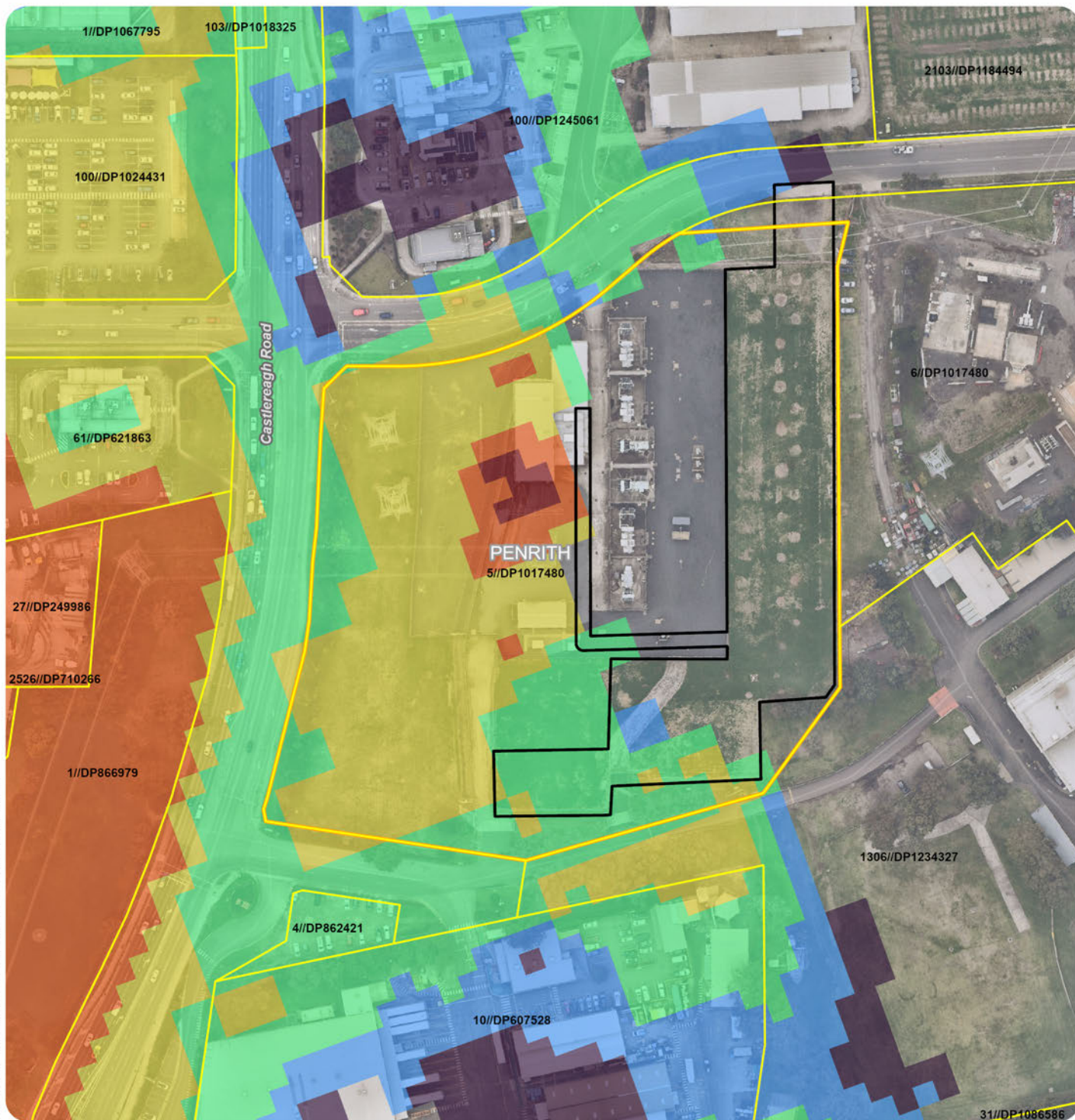
Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-17: Design Condition - 1% AEP Mainstream Peak Flood Velocities



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Lot boundary

Indicative development footprint

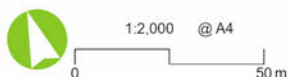
Cadastral boundary

Local model extent

Peak Flood Hazard

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

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-18: Design Condition - 1% AEP Mainstream Peak Flood Hazards



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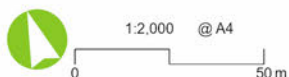


-  Lot boundary
-  Indicative development footprint
-  Cadastral boundary
-  Local model extent

Peak Flood Depths (m)

-  0.00 - 0.05
-  0.05 - 0.10
-  0.10 - 0.30
-  0.30 - 0.50
-  0.50 - 1.00
-  > 1.00

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



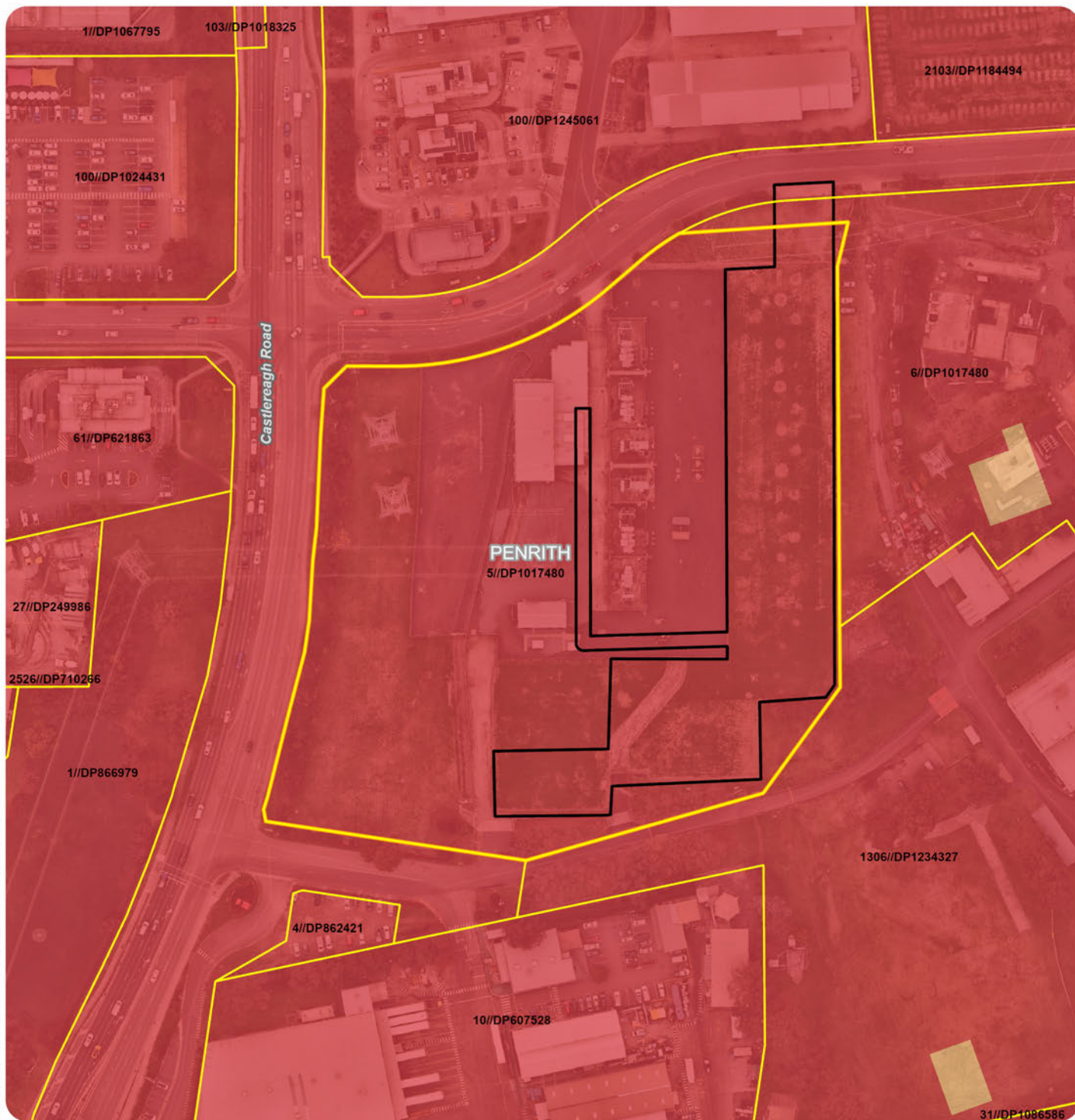
Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-19: Updated Existing Condition - PMF Peak Flood Depths and Flood Level Contours



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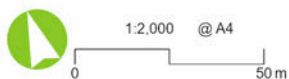


-  Lot boundary
-  Indicative development footprint
-  Cadastral boundary
-  Local model extent

Peak Flood Velocities (m/s)

-  <0.3000
-  0.3000 - 0.5000
-  0.5000 - 0.7500
-  0.7500 - 1.0000
-  >1.0000

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



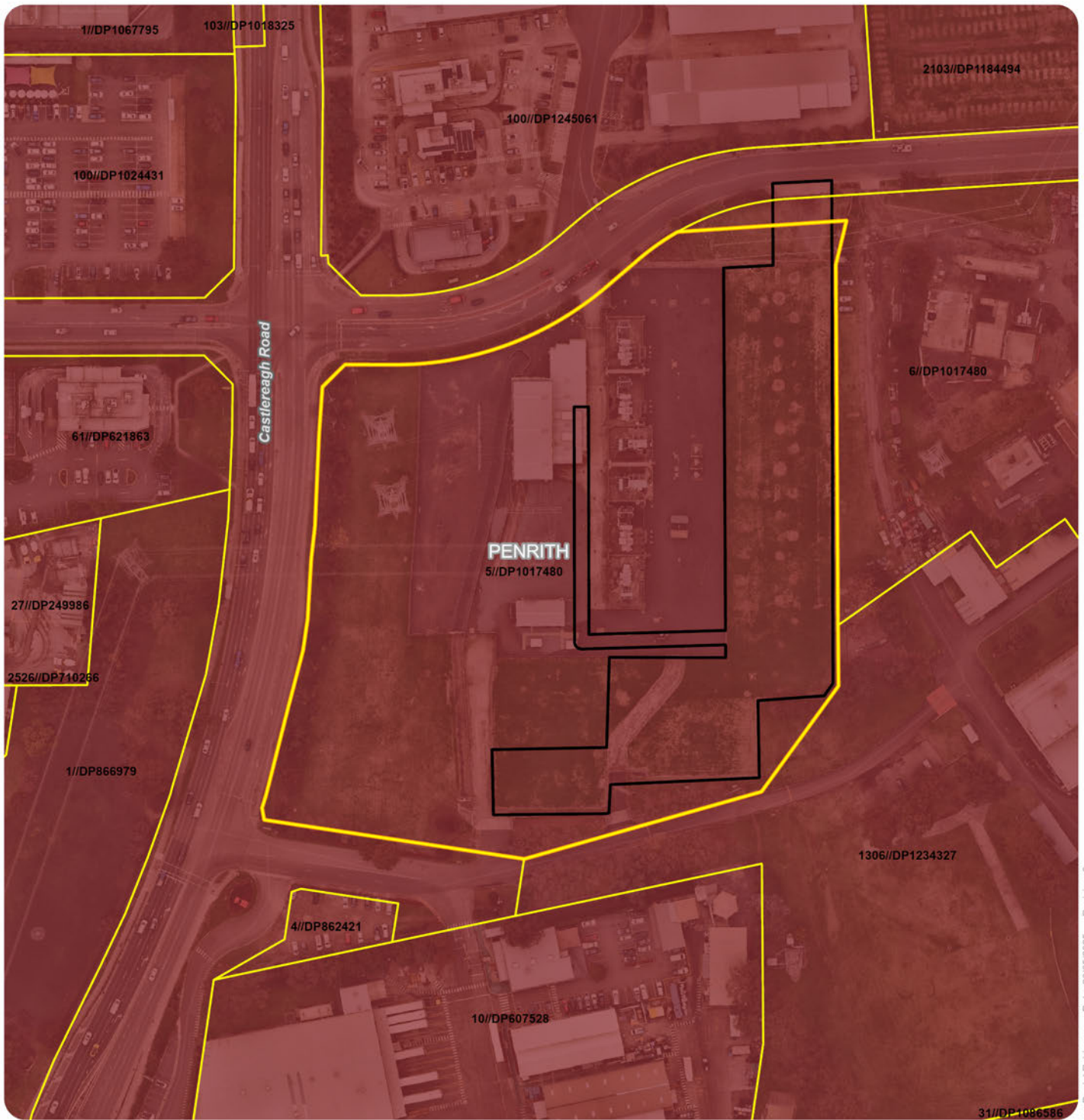
Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-20: Updated Existing Condition - PMF Peak Flood Velocities



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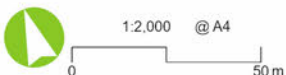
-  Lot boundary
-  Indicative development footprint
-  Cadastral boundary
-  Local model extent

Peak Flood Hazard

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



Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



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Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-21: Updated Existing Condition - PMF Peak Flood Hazards

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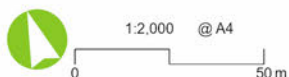


- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Peak Flood Depths (m)

- 0.00 - 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



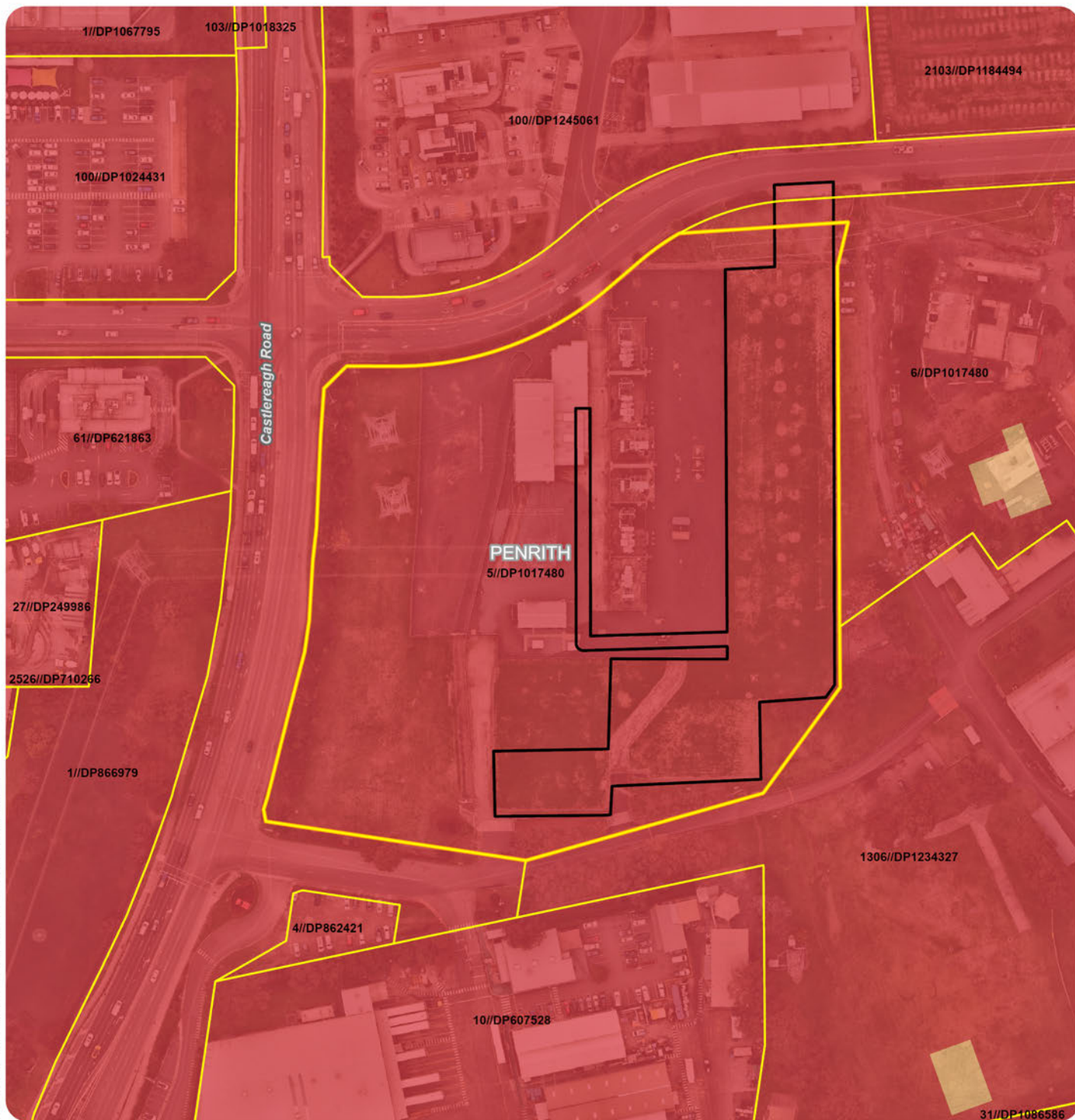
Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-22: Design Condition - PMF Peak Flood Depths and Flood Level Contours



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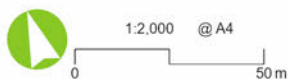


-  Lot boundary
-  Indicative development footprint
-  Cadastral boundary
-  Local model extent

Peak Flood Velocities (m/s)

-  <0.3000
-  0.3000 - 0.5000
-  0.5000 - 0.7500
-  0.7500 - 1.0000
-  >1.0000

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-23: Design Condition - PMF Peak Flood Velocities



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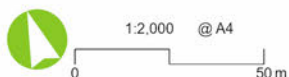


-  Lot boundary
-  Indicative development footprint
-  Cadastral boundary
-  Local model extent

Peak Flood Hazard

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

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

A-24: Design Condition - PMF Peak Flood Hazards



Appendix B

Flood Impact Maps

Mechanism	Figure name
Local Flooding	Figure B-1: Flood Impacts (Design vs Updated Existing Condition) - 1% AEP Local Change in Peak Flood Levels
	Figure B-2: Flood Impacts (Design vs Updated Existing Condition) - 1% AEP Local Change in Peak Flood Velocities
	Figure B-3: Flood Impacts (Design vs Updated Existing Condition) - 1% AEP Local Change in Peak Flood Hazards
	Figure B-4: Flood Impacts (Design vs Updated Existing Condition) - PMF Local Change in Peak Flood Levels
	Figure B-5: Flood Impacts (Design vs Updated Existing Condition) - PMF Local Change in Peak Flood Velocities
	Figure B-6: Flood Impacts (Design vs Updated Existing Condition) - PMF Local Change in Peak Flood Hazards
Mainstream Flooding	Figure B-7: Flood Impacts (Design vs Updated Existing Condition) - 1% AEP Mainstream Change in Peak Flood Levels
	Figure B-8: Flood Impacts (Design vs Updated Existing Condition) - 1% AEP Mainstream Change in Peak Flood Velocities
	Figure B-9: Flood Impacts (Design vs Updated Existing Condition) - 1% AEP Mainstream Change in Peak Flood Hazards
	Figure B-10: Flood Impacts (Design vs Updated Existing Condition) - PMF Mainstream Change in Peak Flood Levels
	Figure B-11: Flood Impacts (Design vs Updated Existing Condition) - PMF Mainstream Change in Peak Flood Velocities
	Figure B-12: Flood Impacts (Design vs Updated Existing Condition) - PMF Mainstream Change in Peak Flood Hazards

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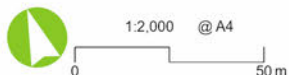


- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Change in Peak Flood Level (m)



Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



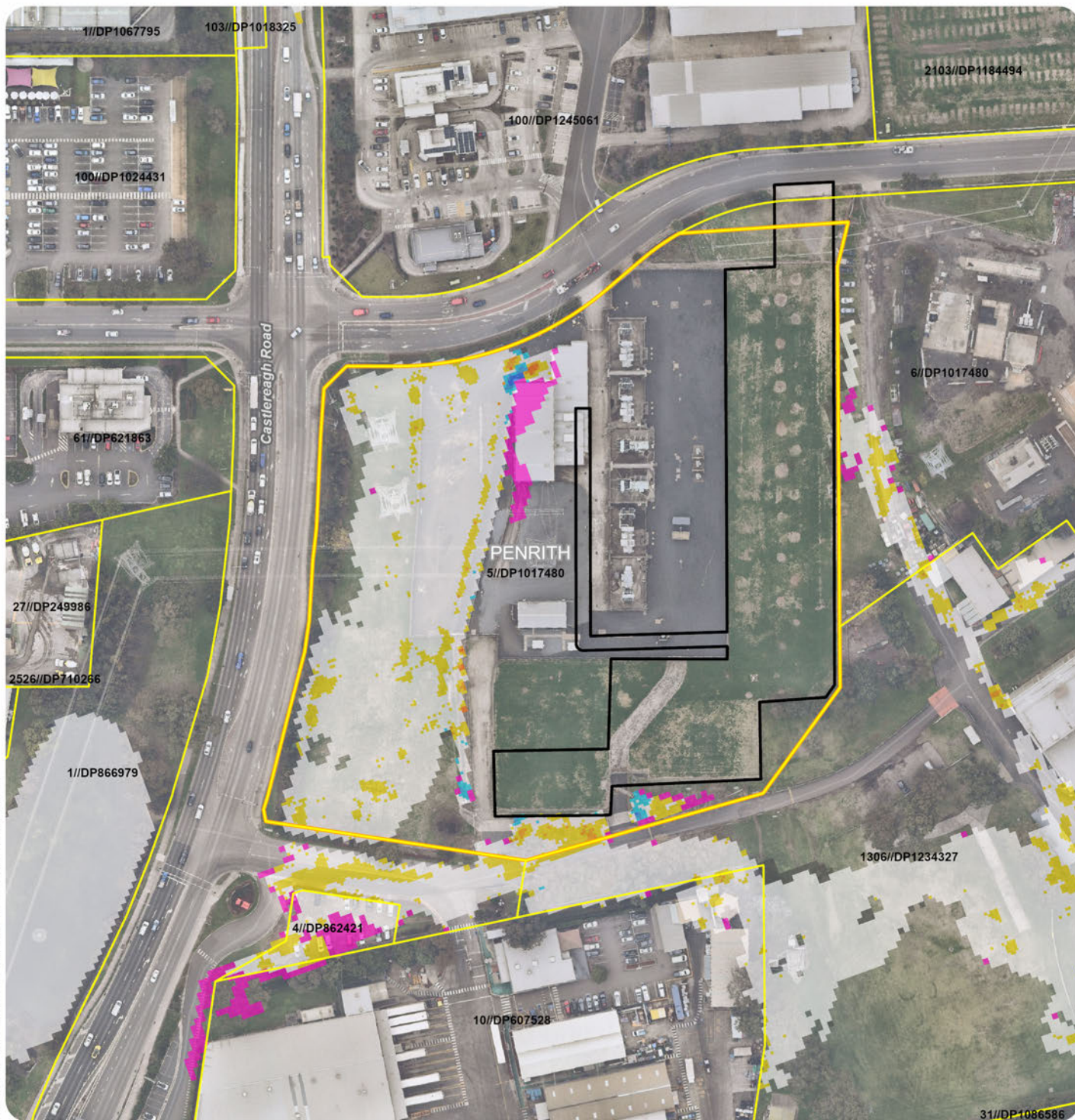
Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

B-1: Flood Impacts (Design vs Updated Existing Condition) - 1% AEP Local Change in Peak Flood Levels



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- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Relative Change in Velocities

- < -0.5
- 0.5 - -0.3
- 0.3 - -0.1
- 0.1 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- > 0.5
- No Longer Flooded
- Newly Flooded

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



1:2,000 @ A4

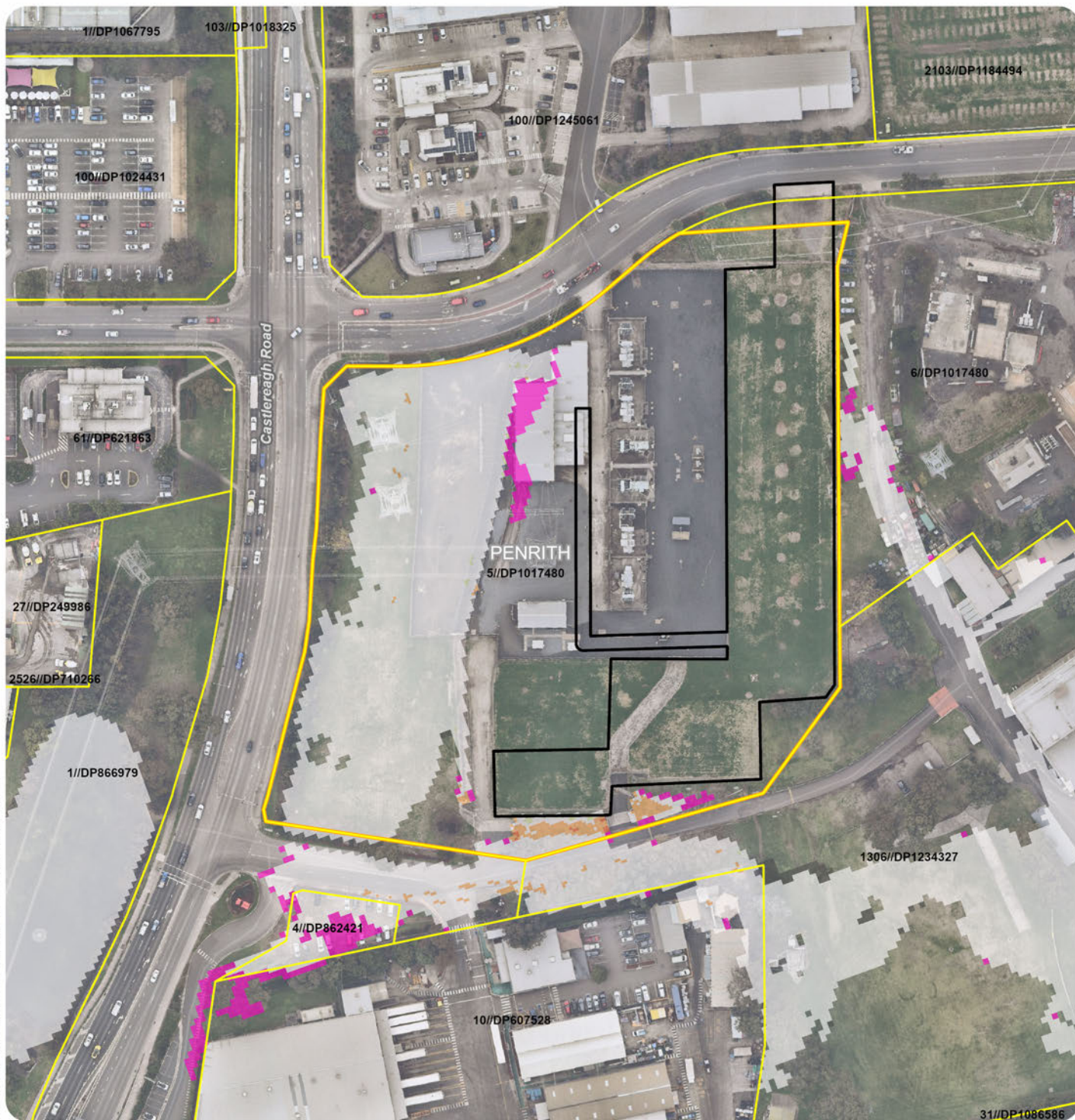
Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment



B-2: Flood Impacts (Design vs Updated Existing Condition) - 1% AEP Local Change in Peak Flood Velocities

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- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Change in Peak Hazards

- 4 Class Lower
- 3 Class Lower
- 2 Class Lower
- 1 Class Lower
- No Change
- 1 Class Higher
- 2 Class Higher
- 3 Class Higher
- No Longer Flooded
- Newly Flooded



Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap

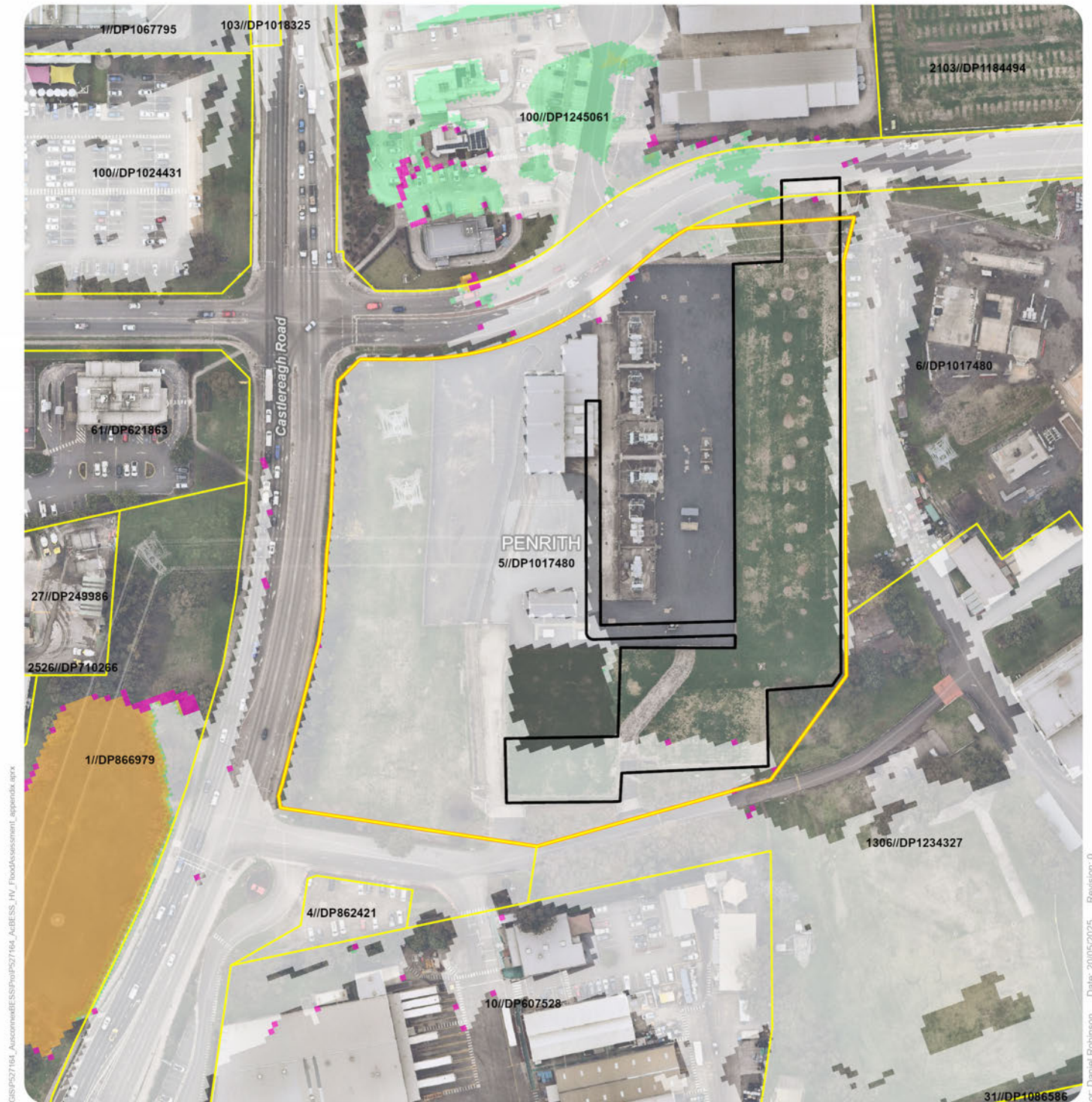


1:2,000 @ A4

Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

B-3: Flood Impacts (Design vs Updated Existing Condition) - 1% AEP Local Change in Peak Flood Hazards



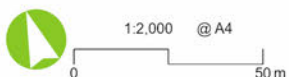
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- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Change in Peak Flood Level (m)



Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



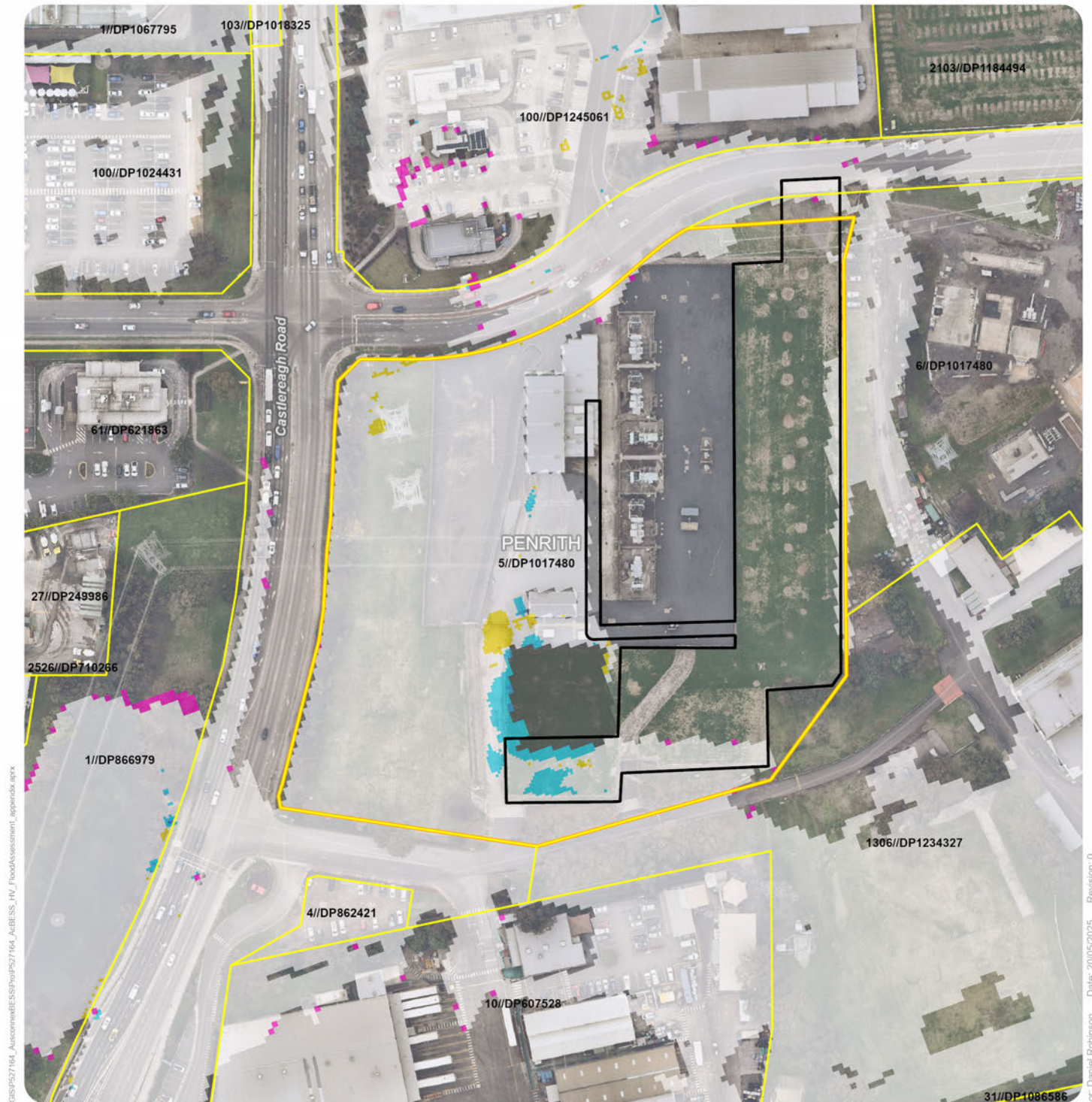
Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

B-4: Flood Impacts (Design vs Updated Existing Condition) - PMF Local Change in Peak Flood Levels



Project No: P527164 Map Author: Daniel Robinson Date: 20/05/2025 Revision: 0



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Project No: P527164 Map Author: Daniel Robinson Date: 20/05/2025 Revision: 0

- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Relative Change in Velocities

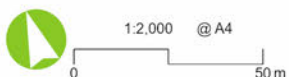
- < -0.5
- 0.5 - -0.3
- 0.3 - -0.1
- 0.1 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- > 0.5

Value

- No Longer Flooded
- Newly Flooded



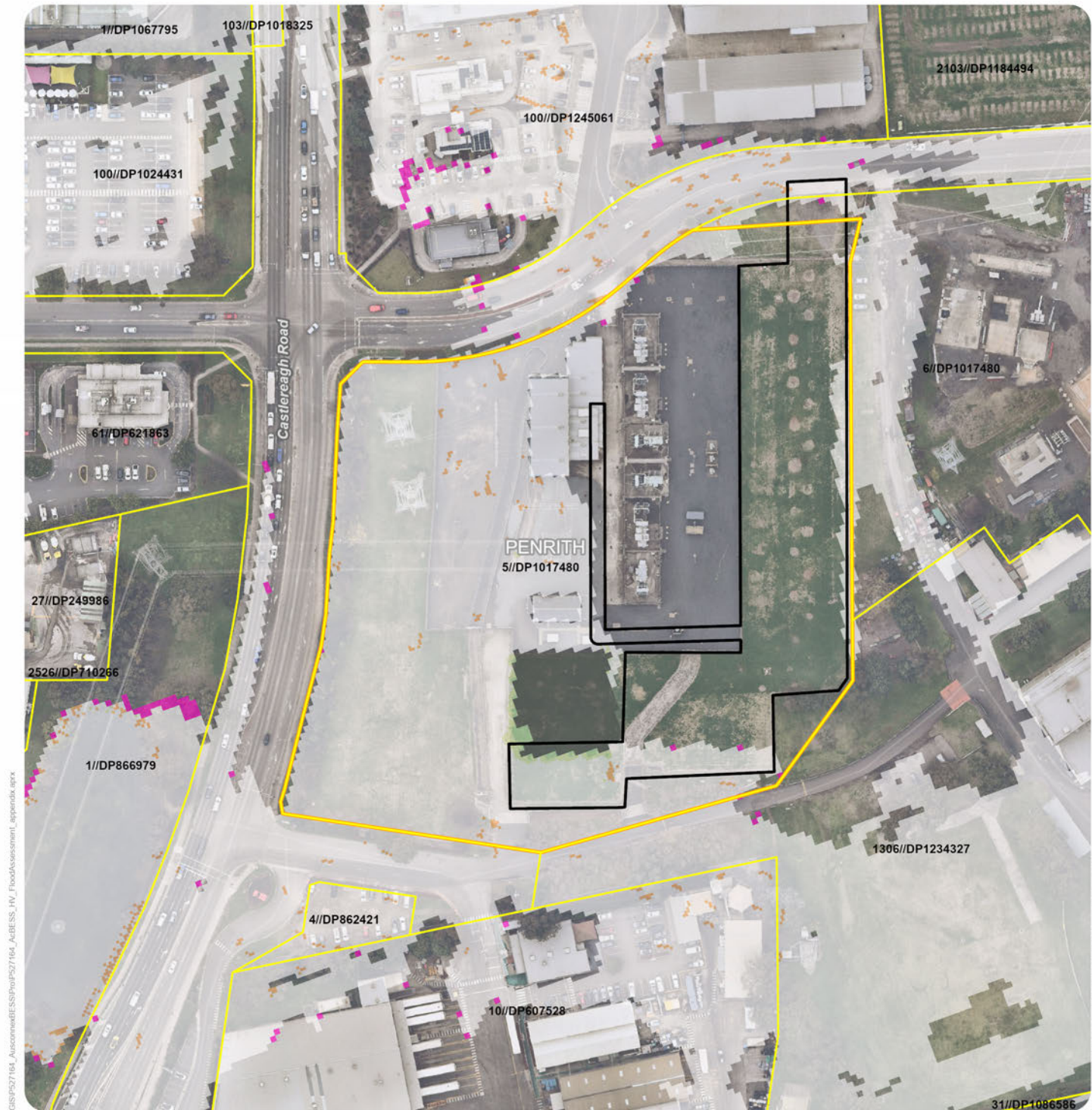
Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

B-5: Flood Impacts (Design vs Updated Existing Condition) - PMF Local Change in Peak Flood Velocities



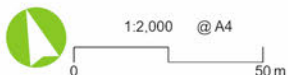
\\SACS\\P\\P\\e490_aurecon\\info\\Gis\\data\\GIS\\P527164_Ausconnex\\BESS\\Penrith\\P527164_AusBESS_HV_FloodAssessment_appendix.aprx

- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Change in Peak Hazards

- 4 Class Lower
- 3 Class Lower
- 2 Class Lower
- 1 Class Lower
- No Change
- 1 Class Higher
- 2 Class Higher
- 3 Class Higher
- No Longer Flooded
- Newly Flooded

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



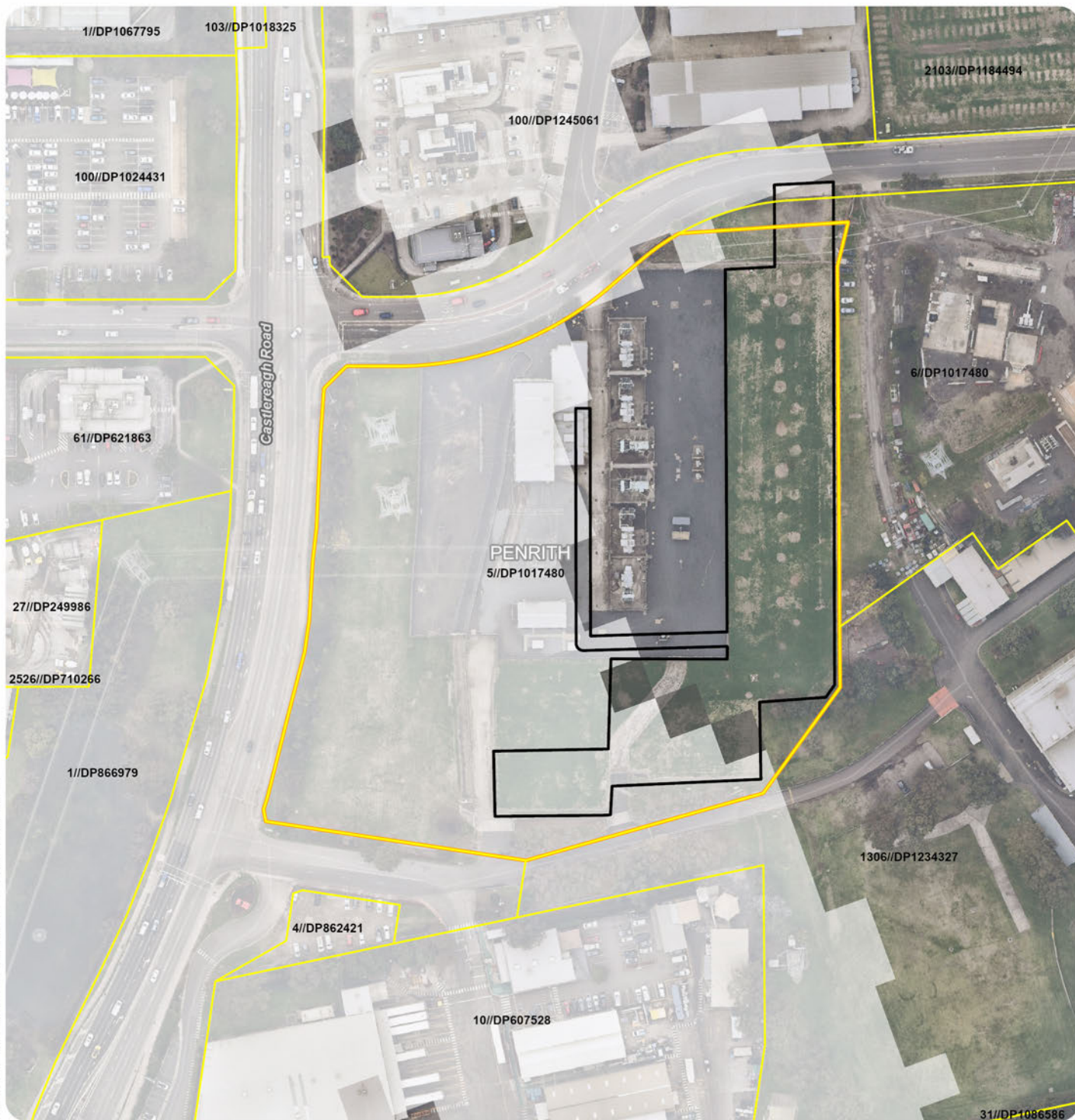
Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

B-6: Flood Impacts (Design vs Updated Existing Condition) - PMF Local Change in Peak Flood Hazards

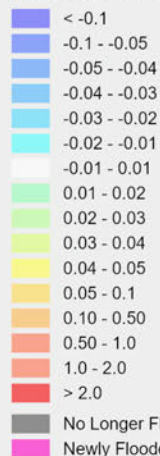


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- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Change in Peak Flood Level (m)



Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



1:2,000 @ A4

Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

B-7: Flood Impacts (Design vs Updated Existing Condition) - 1% AEP Mainstream Change in Peak Flood Levels



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- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Relative Change in Velocities

- < -0.5
- 0.5 - -0.3
- 0.3 - -0.1
- 0.1 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- > 0.5
- No Longer Flooded
- Newly Flooded



Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap

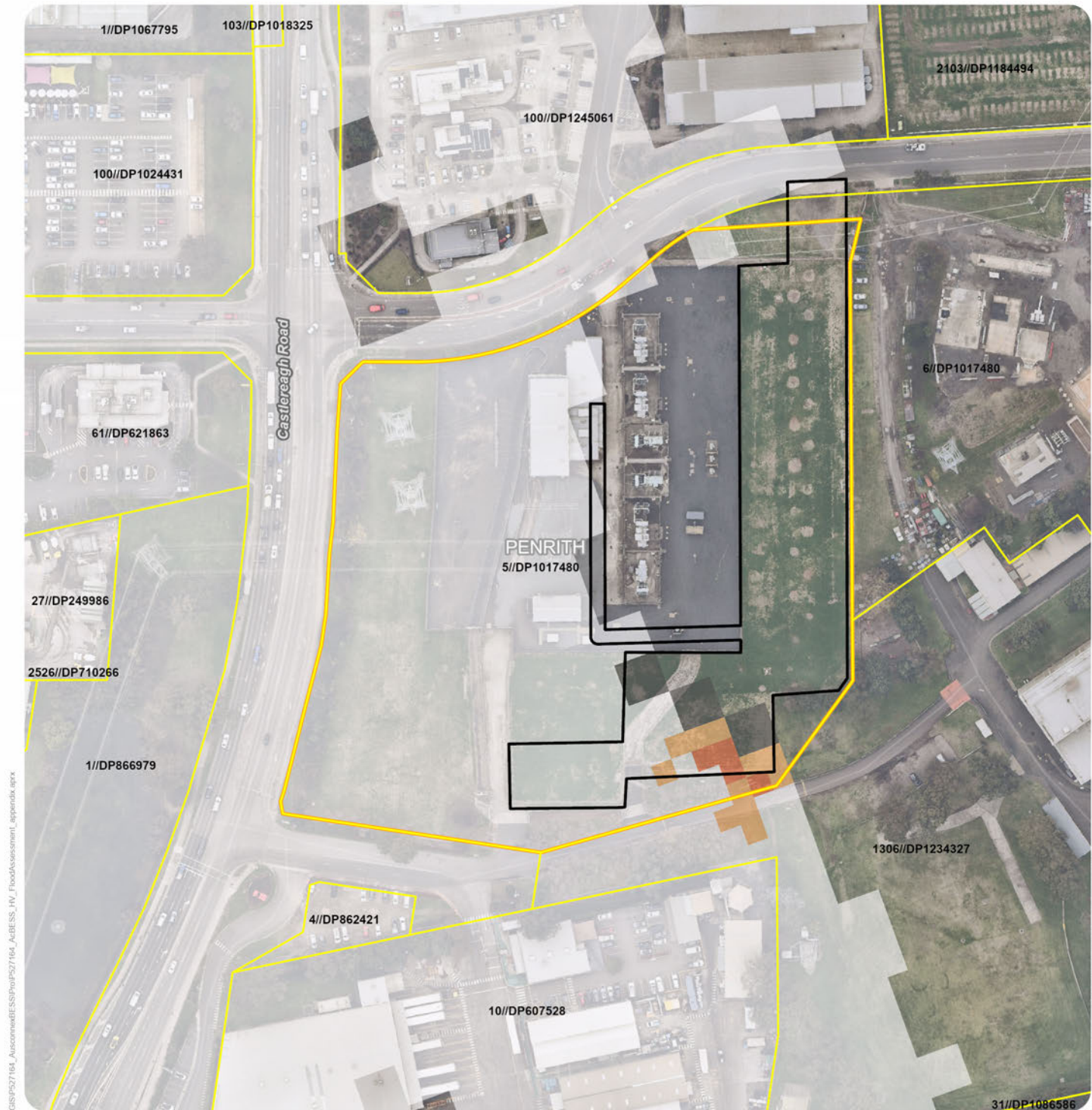


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Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

B-8 Flood Impacts (Design vs Updated Existing Condition) - 1% AEP Mainstream Change in Peak Flood Velocities



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Project No: P527164 Map Author: Daniel Robinson Date: 20/05/2025 Revision: 0

- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Change in Peak Hazards

- 4 Class Lower
- 3 Class Lower
- 2 Class Lower
- 1 Class Lower
- No Change
- 1 Class Higher
- 2 Class Higher
- 3 Class Higher
- No Longer Flooded
- Newly Flooded



Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



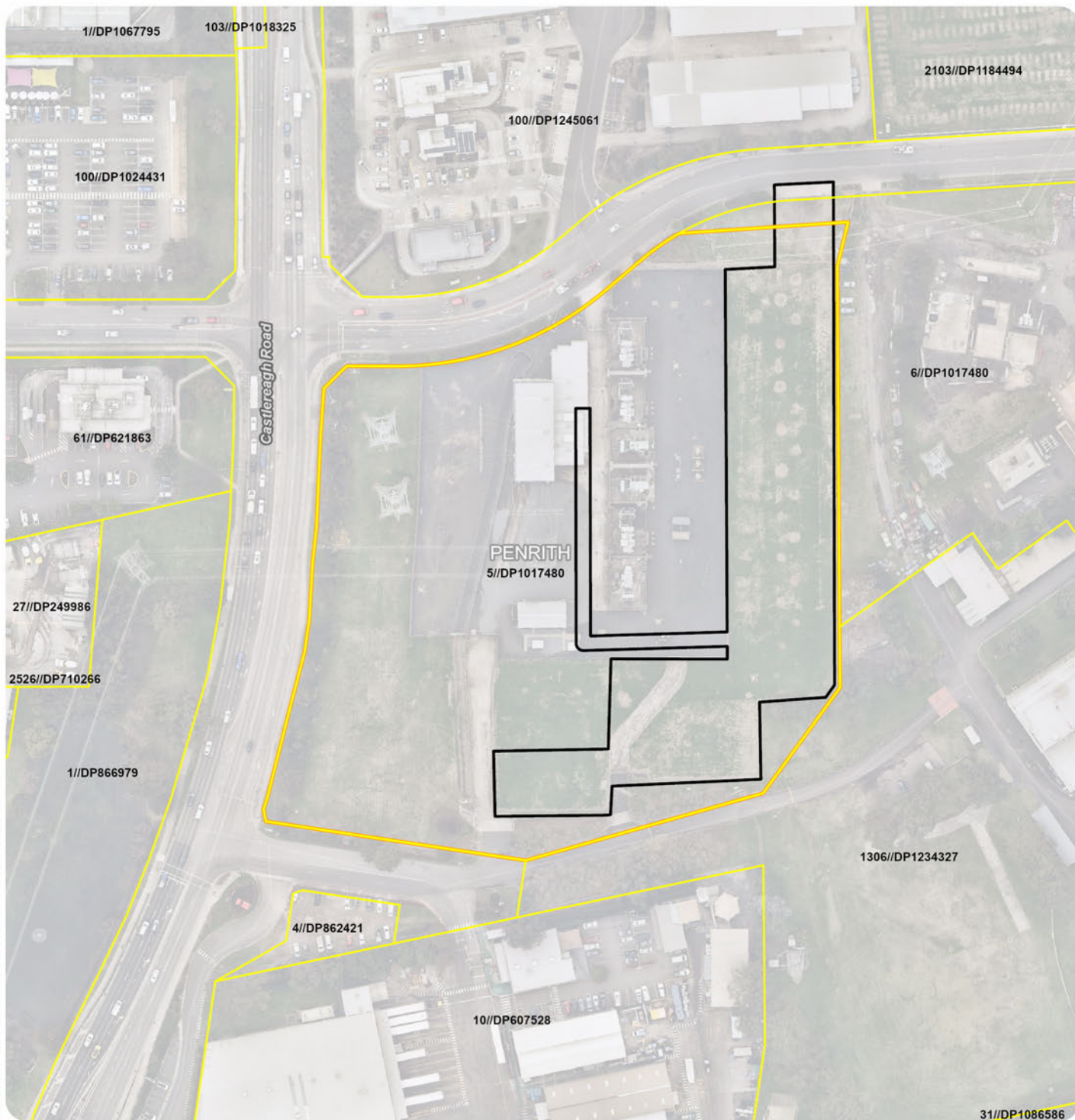
1:2,000 @ A4

Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

B-9: Flood Impacts (Design vs Updated Existing Condition) - 1% AEP Mainstream Change in Peak Flood Hazards

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- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Change in Peak Flood Level (m)



Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



1:2,000 @ A4

Projection: GDA2020 MGA Zone 56

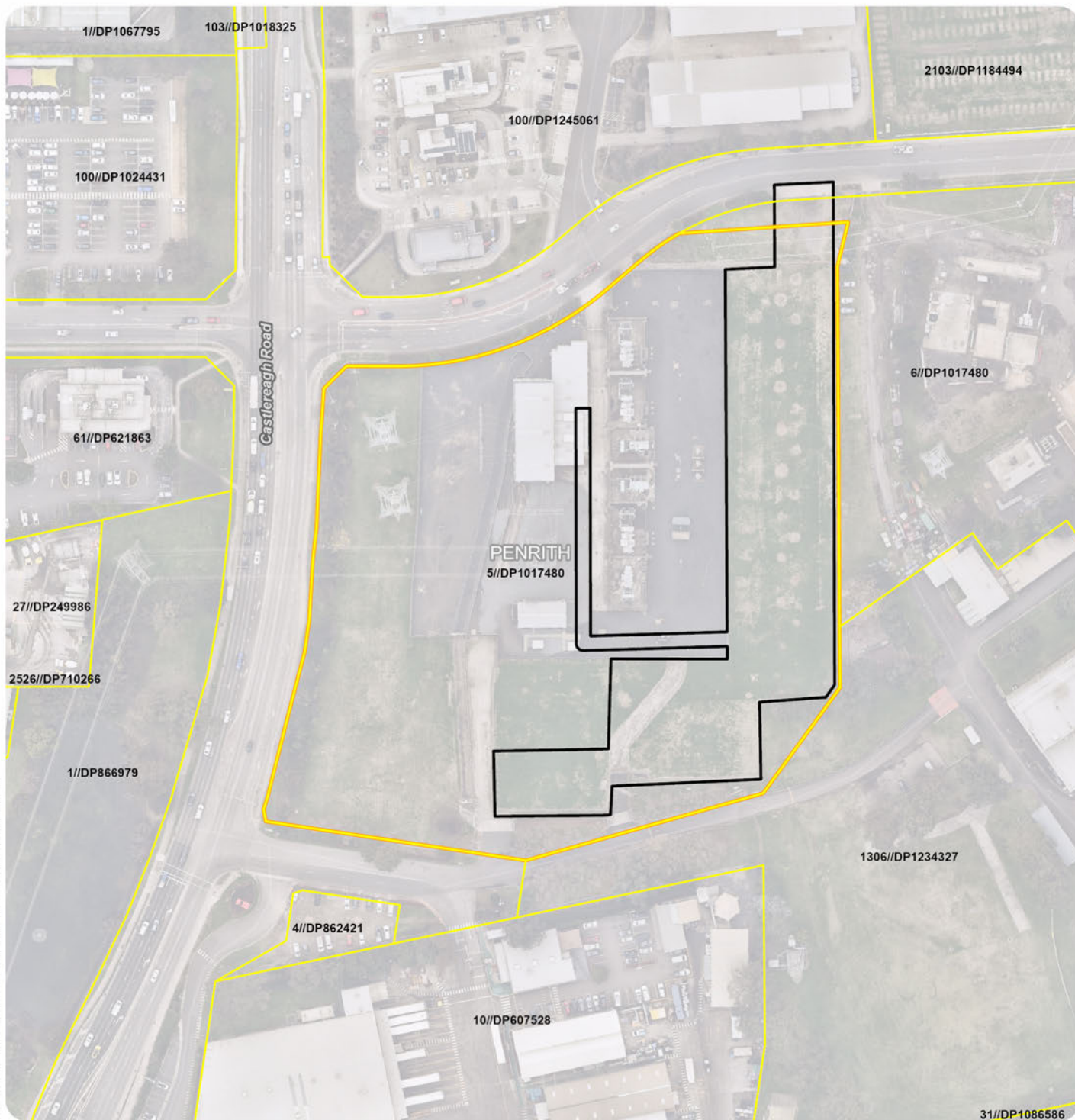
Ausconnex BESS High Voltage - Penrith Flood Assessment

B-10: Flood Impacts (Design vs Updated Existing Condition) - PMF Mainstream Change in Peak Flood Levels

Project No: P527164 Map Author: Daniel Robinson Date: 20/05/2025 Revision: 0



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- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Relative Change in Velocities

- < -0.5
- 0.5 - -0.3
- 0.3 - -0.1
- 0.1 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- > 0.5

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



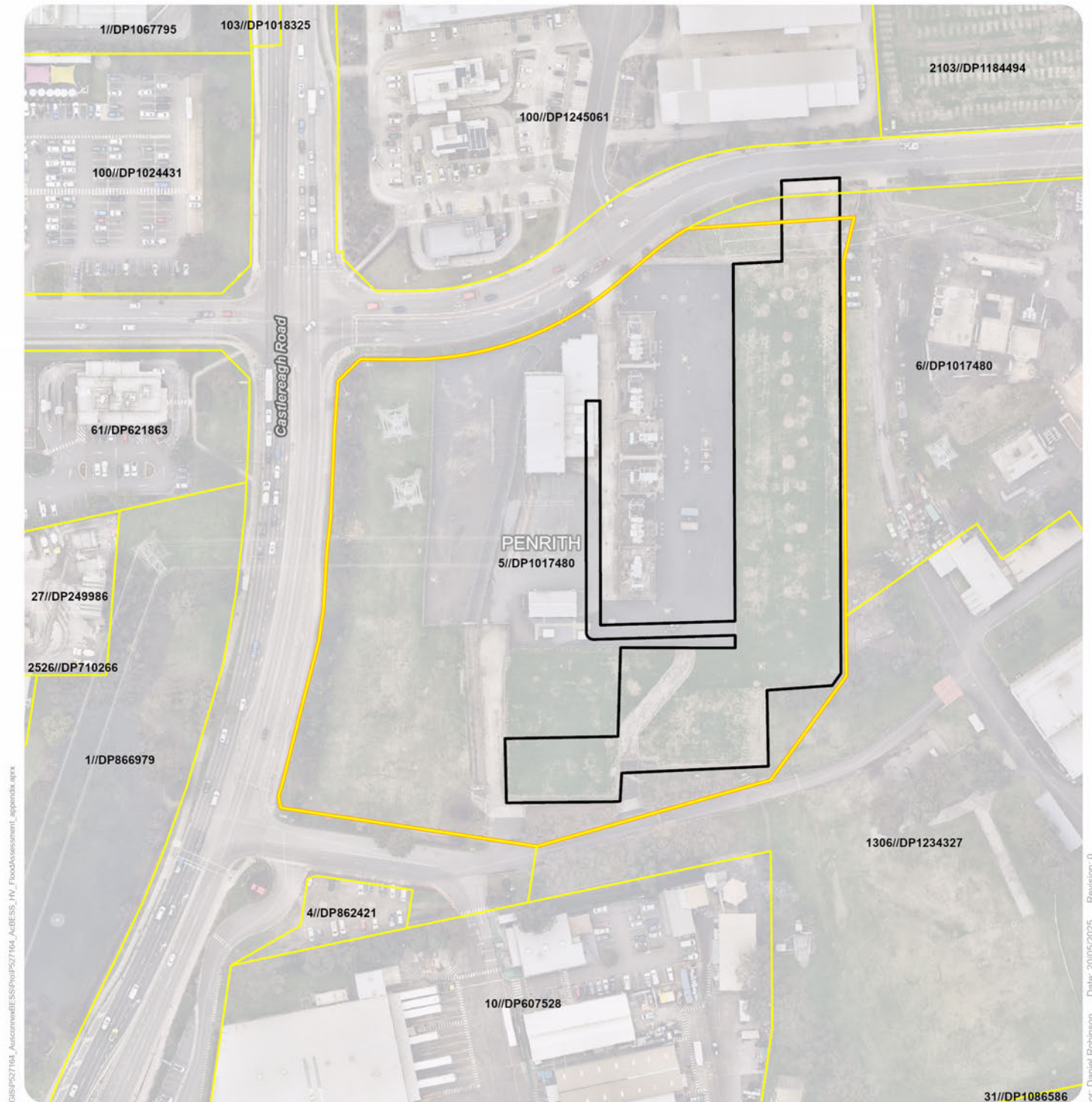
1:2,000 @ A4

Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

B-11: Flood Impacts (Design vs Updated Existing Condition) - PMF Mainstream Change in Peak Flood Velocities





- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Change in Peak Hazards

- 4 Class Lower
- 3 Class Lower
- 2 Class Lower
- 1 Class Lower
- No Change
- 1 Class Higher
- 2 Class Higher
- 3 Class Higher



Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



1:2,000 @ A4

Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

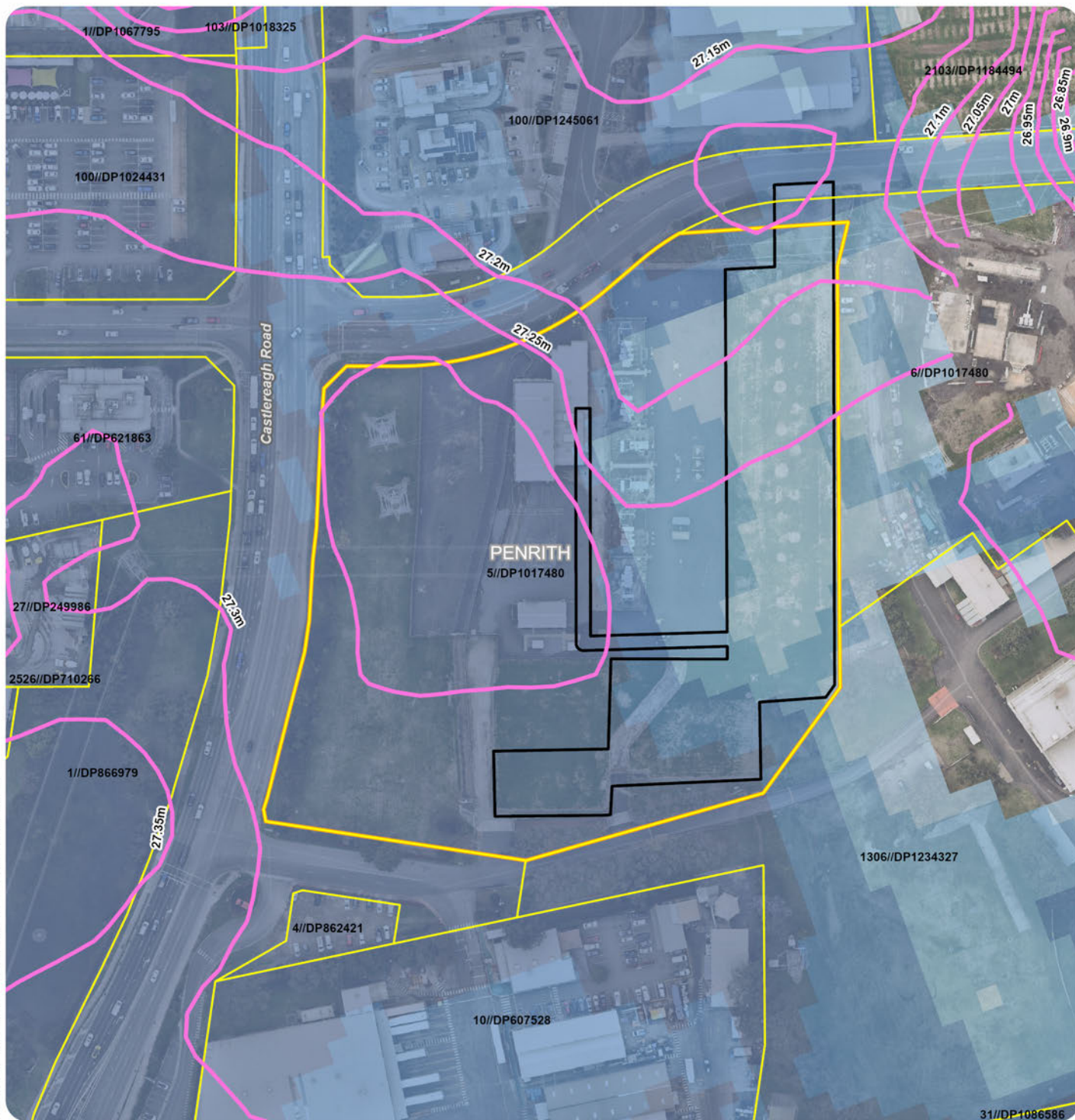
B-12: Flood Impacts (Design vs Updated Existing Condition) - PMF Mainstream Change in Peak Flood Hazards

Appendix C

Climate Change Maps

Mechanism	Figure name
Mainstream Flooding	Figure C-1: Mainstream Climate Change Condition - RCP4.5 2090 - 1% AEP Peak Flood Depths and Flood Levels
	Figure C-2: Mainstream Climate Change Condition - RCP8.5 2090 - 1% AEP Peak Flood Depths and Flood Level
	Figure C-3: Mainstream Climate Change Condition - RCP4.5 2090 - 1% AEP Peak Flood Hazards
	Figure C-4: Mainstream Climate Change Condition - RCP8.5 2090 - 1% AEP Peak Flood Hazards

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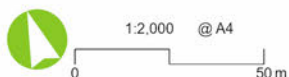


- Lot boundary
- Indicative development footprint
- Cadastral boundary
- Local model extent

Peak Flood Depths (m)

- 0.00 - 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00
- Flood Level 0.5 mAHD Contours

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

C-1: Mainstream Climate Change Condition - RCP4.5 2090 - 1% AEP Peak Flood Depths and Flood Levels

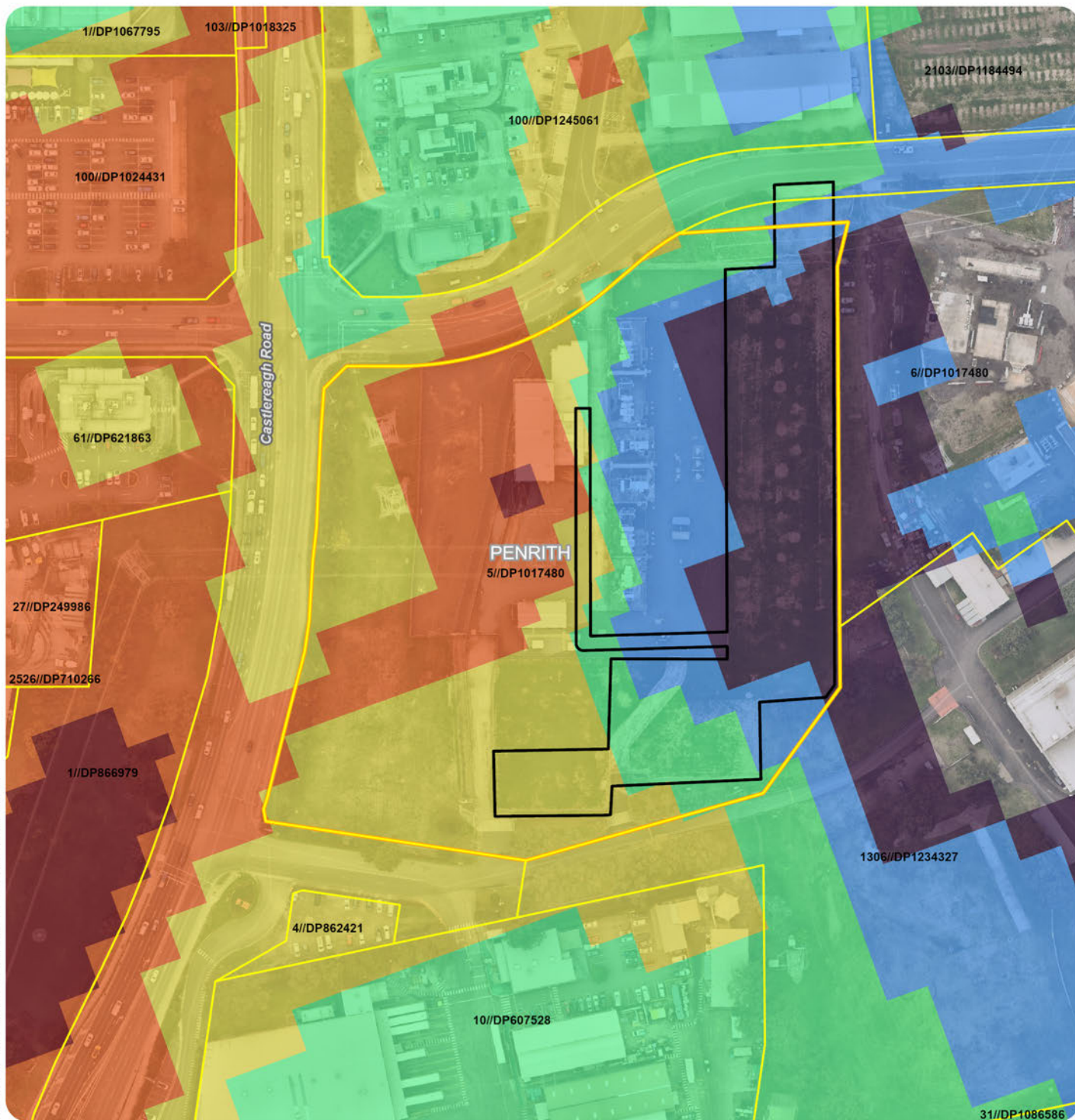




Project No: P527164	Map Author: Daniel Robinson	Date: 20/05/2025	Revision: 0
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Lot boundary

Indicative development footprint

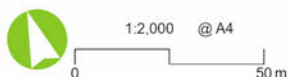
Cadastral boundary

Local model extent

Peak Flood Hazard

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

Sources: Aurecon, Ausconnex, Spatial Services (DCS), Esri Basemap



Projection: GDA2020 MGA Zone 56

Ausconnex BESS High Voltage - Penrith Flood Assessment

C-3: Mainstream Climate Change Condition - RCP4.5 2090 - 1% AEP Peak Flood Hazards



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