COSTIN ROE CONSULTING

FLOOD IMPACT RISK ASSESSMENT

SSD-58978472

20 KELSO CRESCENT

MOOREBANK

Prepared for:

Mapletree SR Australia Management Pty Ltd
Level 9, Suite 9.01, 580 George Street
Sydney, NSW, 2000

Prepared by:

Costin Roe Consulting Pty Ltd
Level 4, 8 Windmill Street
Millers Point, NSW, 2000

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	Name	Title
Prepared by	Tim Wang	Design Engineer – Civil
Checked by	Xavier Cure	Senior Associate Director - Civil

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EXECUTIVE SUMMARY

Mapletree SR Australia Management Pty Ltd (the Applicant) are seeking to construct an industrial warehouse at 20 Kelso Crescent, Moorebank (the Proposal). The Proposal is considered State Significant Development (SSD) and accordingly, an Environmental Impact Statement (EIS) has been prepared to support the SSD Application for the Proposal. This Flood Impact Risk Assessment (FIRA) has been prepared by Costin Roe Consulting to support the preparation of the EIS and assess the Proposal's impact on the surrounding environment in relation to flooding and flood management.

Proposal Overview

The proposed development is for the construction and operation of a multi-storey warehouse and distribution centre over a 3.52 Ha parcel of land.

Works will include site preparation works, bulk earthworks, provision of services, building construction, and stormwater management. It is noted that demolition of existing buildings and structures has been completed.

Access to the development would be made via Kelso Crescent and Seton Road.

Purpose of this Assessment

This FIRA has been prepared to address the requirements of Liverpool City Council DCP.

The criteria as adopted in the assessment to confirm that the development is in line with Table 3 of Part 1 Section 9.5 of the DCP as confirmed in **Section 9** of this FIRA.

Assessment overview

The assessment of the proposed development has been completed using a two-dimensional TUFLOW computer modelling engine to assess the pre and post development overland flow conditions for a range of storm events.

The assessment focuses on the Georges River and Anzac Creek. Anzac Creek is approximately 30m east of the development site and is subject to backwater flooding from the Georges River.

Our assessment has been completed for a range of probabilistic flood events and has compared the predevelopment flood conditions to the post development. Scenario testing has been completed within the bounds and requirements of the specific criteria set out in the *Liverpool City Council DCP, NSW Floodplain Risk Management Manual 2023*.

The flood strategy will be confirmed with Endeavour Energy during detailed design.

Comparison between Original Scheme and Revised Scheme

This revised civil design submission is a direct response to the feedback received from DPHI, Council and other government agencies to result in a better outcome. This includes the following key improvements:

- Breakdown of large bulky building and facade
- Efficient warehouse configuration
- Reduced noise impacts
- Increased setback to Kelso Crescent
- Improved visual impact
- Improved pedestrian safety
- Simplified vehicle circulation
- Increased retention of existing trees – 7
- Improved flood storage and stormwater management

- Increased sustainability and environmental outcome

We believe this design represents a significant advancement from the original scheme — a solution that more effectively utilises the site better, responds to DPHI's expectations, and enhances flexibility to meet evolving occupier demands.

Generally, the engineering strategy will remain consistent between the original and revised scheme. A comparison of the differences and similarities between the design, engineering strategy and impacts of the development are as follows.

Site Plan

The original scheme proposes construction and operation of a single block multi-storey warehouse with an approximate building footprint of 1.78Ha and associated ancillary structures, carparks, perimeter truck circulation roads and hardstand areas.

The revised scheme comprises of two multi-storey buildings adjoined by a central hardstand with associated ancillary structures, carparks, perimeter truck circulation road, hardstand areas and an end of trip facility.

Site Works

The original scheme has a proposed basement at FFL R.L 6.00 and warehouse FFL R.L 10.00. Site works included provision of erosion and sediment control, bulk earthworks, services, building constructions and stormwater quantity and quality management in accordance with Liverpool City Council DCP 2021 requirements.

The revised scheme proposes to remove the basement under the original scheme and the revised warehouse FFL is at FFL R.L 12.00. It is noted that the proposed site works remain consistent with the original scheme. I

Refer to **Section 2.3** of this report for the revised scheme plan.

Flood Storage

The original scheme proposed two storage areas to be excavated to ensue that there is no net loss of floodplain storage. The first area is along the original emergency vehicle driveway and the second is under the suspended slab and excavated down to R.L 6.00 to achieve a total volume of 3366m^3.

The revised scheme proposes to incorporate the flood storage volume into the design rather than excavation. The proposed parking and hardstand in the southern portion of the site will be under the 1% AEP level and will provide 3999m^3, complying with Liverpool City Council's requirement to not decrease flood storage within the development.

Conclusion

We confirm that the provided report and modelling outputs address all the criteria items as listed above, as included in **Section 9.**

TABLE OF CONTENTS

1 INTRODUCTION

Costin Roe Consulting Pty Ltd (CRC) has been engaged by Mapletree SR Australia Management Pty Ltd to prepare this Flood Impact Assessment in support of a development application for development of the site as a warehouse type industrial facility at 20 Kelso Crescent, Moorebank, NSW.

The Study Area has been identified by Liverpool City Council as being affected by overland flow from Anzac Creek. The site is included in the Georges River Flood Study (2020) produced by BMT WBM Pty Ltd on behalf of Liverpool City Council. These reports will be referred to as the G Flood Study from hereon.

The scope and primary objectives of the overland flow assessment, as agreed with Council, are as follows:

- Determine the design flows generated by the contributing external catchments for a range of storms (5% AEP, 1% AEP, 0.5% AEP, 0.2% AEP and PMF storms). Hydrology would be based on the flows completed in the Georges River Flood Study;
- Assess the pre-development overland flow path through the development site for the 1% AEP event;
- Assess the post-development overland flow through the development site for a range of storm events so that potential impacts on the development can be assessed and mitigated; and
- Confirm the flood planning level for the development and the hazard category in accordance with the adopted policy of the consent authority; and
- Confirmation of the Probable Maximum Flood (PMF) storm event (post construction) and discussion on flood evacuation from the development during a PMF event.

The modelling was to be undertaken in two stages, broadly speaking, as follows:

Stage 1 – Model Build and Validation

Build of a 2D hydrodynamic flood model of the overland flow path from Anzac Creek in the vicinity of the proposed development area for the existing/ pre-developed scenario;

- Modelling will be performed using the TUFLOW modelling engine with the main watercourse channel and overbank areas being modelled in 2D;
- Modelling of the 5% AEP, 1% AEP, 0.5% AEP, 0.2% AEP and PMF storms for the existing site with validation being completed against the modelling produced in the Council Flood Study;
- The Digital Terrain Model (DTM) used in the pre-developed modelling is based detail survey within the site boundary and lidar surface where detail survey is not available. As noted, detail survey local to the development site was integrated into the lidar DTM to provide better representation of ground levels around the site;
- Reporting and modelling of the pre-developed scenario to be utilised in the post developed Scenario Testing described below.

Stage 2 – Scenario Testing

- Scenario testing of post construction configurations utilising the model build as defined in the pre-developed Stage 1 and incorporating developed conditions including the subject property and the proposed development;
- Scenario testing has been undertaken for the range of AEP events defined in pre-developed assessment;
- Scenario testing is to include differences in flood levels, velocity and general hydraulics;
- The scenario testing will be undertaken for the development of The Site;

This report presents the *Stage 1* and *Stage 2* components of the modelling and assessment. The report provides a summary of the modelling methodology, model parameters and model results for the existing and post development conditions. The *Stage 1* model is compiled to enable scenario testing to confirm the effect of development on the land within the study area. The *Stage 1* TUFLOW model has been completed and validated to be suitable for use in scenario testing of the effect of development on flooding.

The information provided in this Report is intended to inform the relevant stakeholders including the landowner, surrounding property owners, council officers, planners and the property developer of the opportunities and constraints associated with the development in relation to overland flow and flooding for the local overland flow path. The report will form part of a development application submission to be considered by the Liverpool City Council.

The consent authority is Liverpool City Council. The requirements of Liverpool City Council (LCC) local government area, the engineering and policy requirements of LCC have also been considered in the design.

1.1 Response to Submissions

We provide this section in response to items raised by Conservations Programs, Heritage and Regulation (CPHR) Group in their letter "*CPHR Advice – Response to submissions for Proposed Multi-level Warehouse, Kelso Crescent, Moorebank (SSD-58978472) (Liverpool*" dated 12 February 2025 and Liverpool City Council in their letter "*Request advice on the RTS for SSD-58978472 – Kelso Crescent Multi-level Warehouse, Moorebank*" dated 31 January 2025. These items were raised for the original scheme and the comments have been taken into account for the revised scheme.

This section is provided specifically in relation to the Flood Risk Management and Flooding items. We provide the following responses to the items raised in the noted letters.

Item	Response
Flood Risk	
The FERP has acknowledged the Emergency Management (EM) issues raised by CPHR in previous advice. The FERP indicates that: *Due to the significant and prolonged impact of flooding in and around the site during a PMF event, the preferred response strategy for this project is to close the site well in advance of flooding (pre-emptively) and relocate people to safe area away from the hazard.* The FERP outlines the evacuation constraints from the development site based on the results from the Georges River Evacuation Modelling Study (Molino Stewart, 2022) and indicates that evacuation from the proposed development would be possible under existing and infill growth conditions in the Liverpool CBD and its adjoining areas. However, it would not be possible to evacuate from the site under major flooding events, including the PMF Event, when considering the cumulative impacts of infill growth and rezoning proposed across the Liverpool CBD region. For these reasons, CPHR supports the preferred evacuation strategy to pre-emptively evacuate the site.	Noted.
Inadequate detail has been provided on how the pre-emptive evacuation strategy, which requires the closure of the site based on anticipated flooding events, will be implemented, maintained and updated across the construction and operational phase of development. Once the proposed development is operational, the site will have multiple owners. Further details are required to ensure that the future owners of the site have procedures in place to evacuate the site in accordance with the EM protocols.	The evacuation strategy is addressed in **Section 8** of this report. Details about the procedures in place for future owners of the lot in accordance with EM protocols are provided.
Section 3.3 of the FERP outlines the preferred evacuation routes from the site following issuance of evacuation warnings (see page 17). This contradicts the pre-emptive evacuation strategy prior to	The evacuation strategy is addressed in **Section 8** of this report. Details about the procedures in place for future owners of the lot in

evacuation warnings. Evacuation from the site following warnings from the NSW SES would pose considerable risks to workers and visitors of the site. The adjacent road networks would likely be heavily used by evacuating vehicles from flood impacted sites. The existing capacities of road networks are a bottleneck to facilitate safe evacuation from flood impacted sites under major flooding events. The FERP should be updated to clearly state the preferred evacuation route following issuance of flood warnings is a backup EM option that may only be applicable to some workers and visitors unable to evacuate from the site prior to issuance of evacuation warning. The FERP should be updated to avoid any confusion in implementing the EM strategy	accordance with EM protocols are provided.

Item	Response
Flood Risk	
The TTW response lacks necessary details of the proposed flood compensatory excavation works. A separate sheet for the flood compensatory excavation must be included in the engineering drawing set, showing the length, width and depth of the excavation.	The revised scheme will not need excavation works for the flood compensation area and the extent of the flood storage has been shown on the Civil Engineering Report **(REF:14972.02-03.rpt)**
Adequate drainage provisions must be implemented to ensure the flood compensatory excavation area is effectively drained as the floodwater recedes. The engineering drawings must include the necessary details of the drainage arrangement for the flood compensatory excavation area.	The revised scheme will not need excavation works for the flood compensation area and the site will drain via gravity through the overland flow paths as shown in the Civil Engineering Report **(REF:14972.02-03.rpt)**
A flood storage volume of 414 cubic meters has ben shown within the driveway approaching Seton Road. Only the excavation below the level of 8.45m will provide flood storage volume below the 1% AEP flood. Additionally, the driveway cannot be lower than the Seton Road level. Therefore, the flood storage volume in the driveway should be further reviewed, and calculation details should be included in the report.	The revised scheme has redesigned the driveway area approaching Seton Road. The flood storage volume is shown on the Civil Engineering Report **(REF:14972.02-03.rpt)** and the details have been included in **Section 3** of this report.

Civil Engineering drawings, including Drawing Nos. 231204-TTW-00-DR-CV-00031 and 231204-TTW-00-DR-CV-00041, must be corrected to include the proposed compensatory excavation amendments (Reference: 231204 CAAA, Civil Engineering Report – Project Marvel, Revision 3, dated 11/09/2023)	The Civil Engineering drawings for the revised scheme show the full extent of the flood storage area. **(REF:14972.02-03.rpt)**

1.2 SEAR SSD-58978472 Requirements

We provide this section in response to the SEAR's items included in NSW Department of Planning, Housing and Infrastructure (DPHI) in their SEAR letter SSD-58978472 dated 8 June 2023

Tables 1.1 provide responses to the relevant FIRA items raised by DPHI.

Table 1.1 – SEAR SSD-58978472 Requirements

No.	Item	Response
Flood Risk		
1	Identify any flood risk on-site having regard to adopted flood studies, the potential effects of climate change, and any relevant provisions of the *NSW Floodplain Development Manual*	This FIRA has been undertaken using two-dimensional TUFLOW modelling engine. The assessment includes pre and post development modelling of the 5% AEP, 1% AEP, 0.5% AEP, 0.2% AEP and the PMF events. Impact assessments have been included for the 1% AEP, and the 0.5% AEP and 0,2% AEP events assessed as proxies for climate change. The assessment shows acceptable outcomes which meet the objectives of the NSW Floodplain Development Manual and Liverpool City Council DCP. Refer to **Section 4** for an assessment of relevant flood studies and data.
2	Assess the impacts of the development, including any changes to flood risk on-site and off-site, and detail design solutions and operational procedures to mitigate flood risk where required	Refer to item 1.

2 DEVELOPMENT SITE

2.1 Location

The property, 20 Kelso Crescent Moorebank, is located within the Liverpool City Council (LCC) local government area (LGA) and locality map of the site location is as shown in **Figure 2.1**.

Figure 2.1 - Locality Map

2.2 Existing Site Description

The proposal applies to land 20 Kelso Crescent, Moorebank, being Lot 1 DP1296586 (subject site). The subject site is currently vacant, and demolition of the existing buildings and infrastructure has been completed.

The subject site is within E4 General Industrial zone and CA Complex Area pursuant to the Liverpool Local Environmental Plan 2008.

The subject site is located on the south of Kelso Crescent and on the north of Seton Road. The subject site is bounded by adjoining industrial developments to the south, east and west. There is an existing electrical transmission and distribution facility

adjoining the subject site to the north-west known as the Moorebank Zone Substation operated by Endeavour Energy.

The site generally grades down from the north towards the south. The highest level is approximately RL12.0m AHD towards the north-west corner of the site. The lowest level on the site is approximately RL7.5m AHD towards the south-east corner of the site. Kelso Crescent, which the site fronts, falls from west (RL12m AHD) to east (RL10.5m AHD). Seton Road, which the site rears, falls from east (RL7.0m AHD) to west (RL6.5m AHD).

The subject site is within the existing Moorebank industrial precinct, predominantly characterised by established industrial development of similar scale. Vehicular access to the subject site is currently facilitated via existing access points on Kelso Crescent and Seton Road.

Figure 2.2 – Existing Site Aerial View (Source: Nearmap 11 July 2025)

2.3 Proposed Development

The proposed SSD Application seeks approval for the construction and operation of a warehouse and distribution centre, including:

- Site preparation works, including the removal of 31 trees
- Earthworks to achieve proposed site levels
- Provision of infrastructure comprising civil works and utilities servicing
- Construction of eight (8) warehouse tenancies, split over two (2) storeys with ramp-up access, comprising:
    - Warehouse 1a, 1b, 2a and 2c at ground level
    - Warehouse 3a, 3b, 4a and 4b at first level
    - Total Warehousing – approximately 33,700 m²
- Ancillary office accommodation totalling 1,700 m²
- On grade car parking around the Site and undercover car parking off Kelso Road, and loading docks across the two (2) storeys of warehousing
- Onsite cycle parking and end of trip facility
- Complementary landscaping and offset planting, providing 11% coverage
- Signage, including entry, business identification and wayfinding signage
- Diversion of overhead electricity transmission lines at the western and southern boundaries to new subterranean channels
- Allowance for operations up to 24 hours per day, seven (7) days per week

The indicative site layout prepared by Pace Architects has been included in **Figure 2.2**. A 3-Dimensional schematic of the proposed development is also shown in **Figure 2.3.**

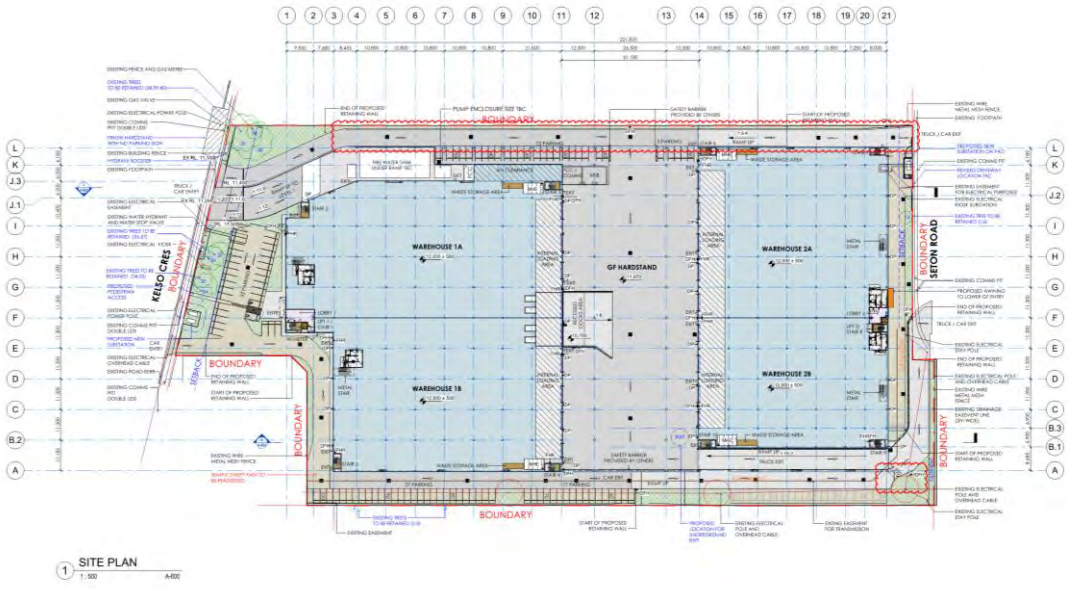

Figure 2.3 - Proposed Development – Site Plan (Source: Pace Architects)

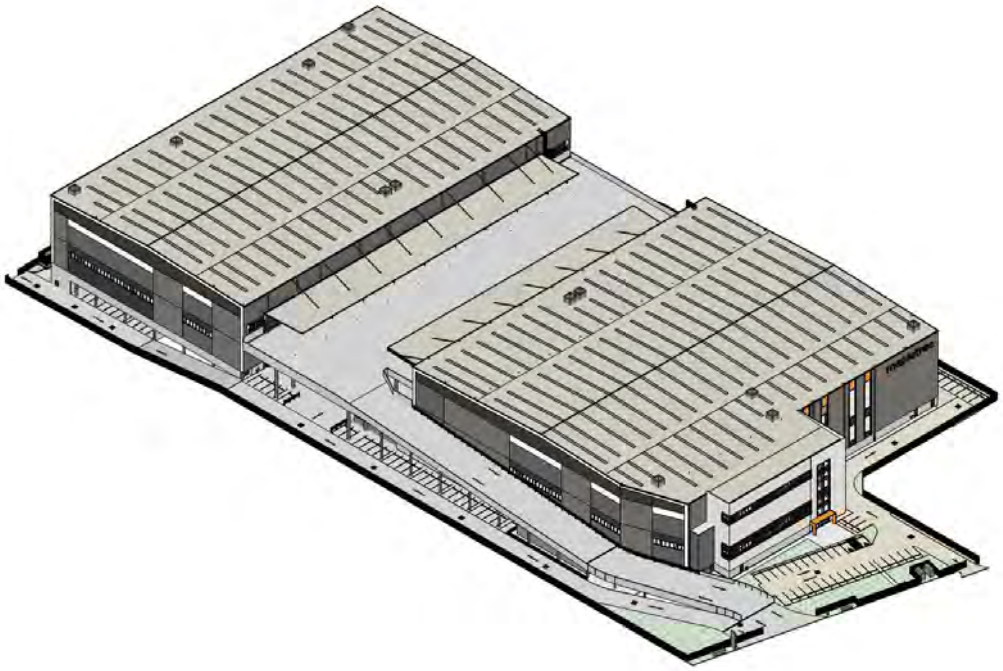

Figure 2.4 - Proposed Development – Artists Impression Only (Source: Pace Architects)

3 STUDY METHODOLOGY & PLANNING OBJECTIVES

3.1 Study Methodology

The objectives of the Flood Study are to:

- Identify relevant flood-related data by searching all relevant data sources;
- Determine the likely extent and nature of flooding and identify potential hydraulic controls by carrying out detailed site visits of the study area;
- Define existing catchment condition flood behaviours for mainstream flooding in the catchment
- Define design flood levels, velocities and flow distributions for the catchment.
- Define the extent of flooding for the 5%, 1%, 0.5% and 0.2% AEP floods and PMF for the catchment;
- Define differences in flood regime as it relates to the proposed development and upstream and downstream properties;
- Define Flood Planning Levels for the flood-affected areas; and
- Confirm flood planning requires for the development.

A numerical modelling tool was developed to convert runoff hydrographs into water levels and velocities throughout the study area. The model simulates the hydraulic behaviour of the water within the study area by accounting for flow in the major channels as well as the potential for overland flow paths, which develop when the capacity of the channel is exceeded. It relies on boundary conditions which include the runoff hydrographs and appropriate downstream boundary level.

The Georges River Flood Study completed by BMT WBM on the January 2020 on behalf of Liverpool City Council identifies the site within a "Medium Flood Risk Precinct."

Section 4 of the report discusses the content and source of relevant data which has been utilised in the study. This section describes relevant flood studies and available historical information and also provides details of the survey used to establish the DTM used in the analysis.

Section 5 discusses the catchment characteristics the hydrological information used in the study.

Section 6 discusses the development of the hydraulic model including establishment of the DTM, boundary conditions, validation, sensitivity analysis and subsequent use for design rainfall events and development scenarios.

Section 7 provides the results of the design flood estimation for the catchment for the pre-developed and post developed conditions.

Section 8 discusses flood safety and evacuation.

Section 9 provides a summary and validation of the post development scenario in and around the specific requirements of the Liverpool City Council Development Control Plan 2024. Review of the 1% AEP event has been made.

Section 10 provides concluding remarks to the overall study.

A number of figures are included to illustrate the study results.

3.2 Floodplain Management Considerations

3.2.1 Flood Planning Level

The introduction of a Flood Planning Level (FPL) is an important flood risk management measure. FPLs are derived from a combination of a designated flood event, which can either be a historic flood or a design flood of a certain recurrence interval, plus a nominated freeboard depth.

The NSW Floodplain Development Manual, 2023 recommends that the FPL generally be based on the 100-year ARI/ 1% Annual Exceedance Probability (AEP) event. It suggests that, whilst this event can be varied, it should only be done in exceptional circumstances. It is considered appropriate to adopt the 1% AEP event for the proposed industrial development.

The freeboard component of an FPL is the difference between the flood level that the level is based upon and the FPL itself. Freeboard is designed to provide reasonable certainty that the reduced risk exposure provided by the chosen FPL is warranted, taking into account factors such as:

- Uncertainties in the estimate of flood levels;
- Differences in water levels across the floodplain;
- Wave action resulting from wind and vehicular/marine traffic during the flood event;
- Changes in rainfall patterns due to climate change;
- The cumulative effect of subsequent infill development on existing zoned land.

The *Floodplain Risk Management Manual* recommends a freeboard of 0.5m for most new industrial developments and it is considered appropriate that this recommended freeboard be for adopted for the proposed development.

3.2.2 Hydraulic and Hazard Categorisation

Floodwaters can vary significantly, both in time and place across the floodplain. They can flow fast and deep at some locations and slow and shallow at other locations. This can result in large variations to the personal danger and physical property damage resulting from the flood.

The Floodplain Development Manual recognises three hydraulic categories of flood prone land, these being floodway, flood storage and flood fringe. These are then further separated into two hazard categories, high hazard and low hazard.

Floodways

Floodways are those areas where a significant volume of water flows during floods and are often aligned with natural channels. They are areas that, even if only partially blocked, would cause a significant redistribution of flood flow, which could adversely affect other areas. They can also be areas with deeper and higher velocity flow.

Flood Storage

Flood storage areas are the parts of the floodplain that provide temporary storage for floodwaters during the passage of a flood. If a reduction in the flood storage area is experienced due to the filling of land or construction of a levee bank, it can result in adverse effects on the flood levels and peak flow rates in other areas.

Liverpool City Council has a requirement for no loss in flood storage so that flood effects are not increased elsewhere. The existing site has 3421m^3 of flood storage and the proposed development will have 3999m^3 of flood storage, complying with council requirements.

Flood Fringe

Flood fringe areas are the remaining area of land affected by flooding. The development of flood fringe land does not generally have any major impact on the pattern of flood flows and/or levels.

The preparation of a flood study is almost always required in the determination of hydraulic categories. This is so that peak depths, velocities and the extent of flooding can be determined across the catchment.

Hazard Categories

Flood hazard categories are broken down into high and low hazard for each hydraulic category. High hazard areas are defined as those where there is a possible danger to personal safety and the potential for significant structural damage. Able-bodied adults would have difficulty in wading to safety. With low hazard areas, should it be necessary, a truck could evacuate people and their possessions, and able-bodied adults would have little difficulty in wading to safety.

Flood hazard criteria and mapping has been completed for the 1% AEP and PMF post development conditions as per criteria set out in the *Australian Rainfall and Runoff (2019), A Guide to Flood Estimation – Book 6 – Flood Hydraulics* and *Figure 6.7.9* as included as **Figure 3.1** below. Refer **Section 10.5** and **Appendix A** for hazard mapping.

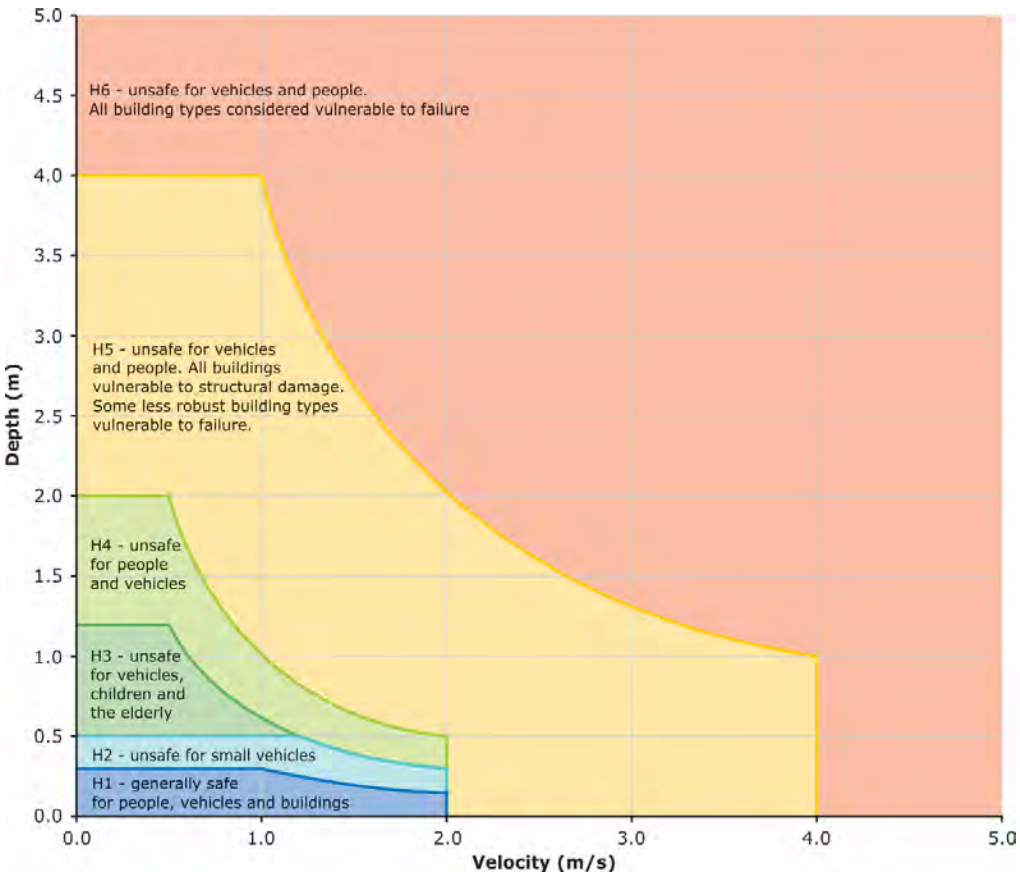

Figure 6.7.9. Combined Flood Hazard Curves (Smith et al., 2014)

Table 6.7.3. Combined Hazard Curves - Vulnerability Thresholds (Smith et al., 2014)

Hazard Vulnerability Classification	Description
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 buildings vulnerable to structural damage. Some less robust buildings subject to failure.
H6	Unsafe for vehicles and people. All building types considered vulnerable to failure.

Table 6.7.4. Combined Hazard Curves - Vulnerability Thresholds Classification Limits (Smith et al., 2014)

Hazard Vulnerability Classification	Classification Limit (D and V in combination)	Limiting Still Water Depth (D)	Limiting Velocity (V)
H1	D*V ≤ 0.3	0.3	2.0
H2	D*V ≤ 0.6	0.5	2.0
H3	D*V ≤ 0.6	1.2	2.0
H4	D*V ≤ 1.0	2.0	2.0
H5	D*V ≤ 4.0	4.0	4.0
H6	D*V > 4.0	-	-

Figure 3.1. Adopted Hazard Criteria and Provisional Flood Hazard Chart (Australian Rainfall and Runoff 2019)

3.2.3 Flood Damages

Damage caused by floods is generally categorised as either tangible or intangible. Tangible damages are financial in nature and can be readily measured in monetary terms. They include direct damages such as damage or loss caused by floodwaters wetting goods and property, and indirect damages such as lost wages incurred during cleanup periods after the flood event. Intangible damage includes emotional stress and even mental and physical illness caused by the flood. It is difficult, if not impossible to quantify intangible damages in financial terms.

From a flood planning perspective, it is important to consider the following direct damage categories:

- Contents Damage – refers to damage to the contents of buildings, including carpets and furniture etc.;
- Structural Damage – refers to damage to the structural fabric of buildings, such as foundations, walls floors, windows, and built-in fittings; and
- External Damage – includes damage to all items external to buildings, including cars, landscaping etc.

As there is no way to prevent a flood from occurring, and it is unrealistic to exclude all development within flood-prone areas, the intent of establishing a FPL is to minimise the risk of direct damage when a flood occurs. By minimising the direct damage, there is a carry-on effect, whereby other associated indirect tangible damages and intangible damages are also minimised.

3.2.4 Emergency Response Planning

Flood planning refers to the preparation of a formal community-based plan of action to deal with the threat, onset and aftermath of flooding. It involves planning for an event equal to, or greater than the event used to derive the FPL.

The plan of action should include an on-site response plan that addresses what measures should be undertaken once the threat of a flood is determined to be imminent. A flood evacuation strategy should also be included so that all persons within the precinct are familiar with the processes required if a flood occurs.

4 REVIEW OF AVAILABLE DATA

Data has been obtained from a number of sources and includes information required for input to the numerical models, together with information required for validation of model results and the adequate representation and presentation of those results.

4.1 Survey

Survey is required to define the physical attributes of the floodplain topography including the creek cross sections and the associated floodplain levels.

The predevelopment scenario survey has been compiled based on information received from Boxall Surveyors. The on-ground survey information was completed in and around the site and study area to properly define the existing overland flow path cross section and features.

The predeveloped survey was built upon with addition of the proposed site levels as designed by CRC to create the post developed scenario survey.

These surveys were used as the basis for the digital terrain model (DTM) used in the hydraulic modelling of the pre and post development scenario respectively.

4.2 Georges River Flood Study

The Georges River Flood Study by BMT WBM Pty Ltd, January 2020 was obtained from council for use in the study. Council has also made available a digital version of the model results including GIS output of the DTM used in their modelling.

The Georges River Flood Study is a local study commissioned by Liverpool City Council. The study includes the area bounded by Heathcote Road, Newbridge Road and Anzac Creek, defining flood level and depths and hydraulic hazard zones throughout the zone.

The Georges River Flood Study includes hydrology and modelling of the 1% AEP event. The study shows the site is subject to flooding during the 1% AEP event from the Anzac Creek overtopping its banks due to backwater flooding from the Georges River.

The Georges River Flood Study was utilised to validate results produced by Costin Roe Consulting for the pre-developed condition. It can be seen when comparing the results of the BMT WBM and Costin Roe Consulting TUFLOW models that the results are generally consistent.

Figure 4.1 shows the 1 in 100 year and PMF flood extents, and flood risk zones as defined by LCC, based on the results of the 2020 BMT WBM flood assessment. It can be seen that the site is affected by the 1 in 100 year event, and to a larger extent by the PMF storm.

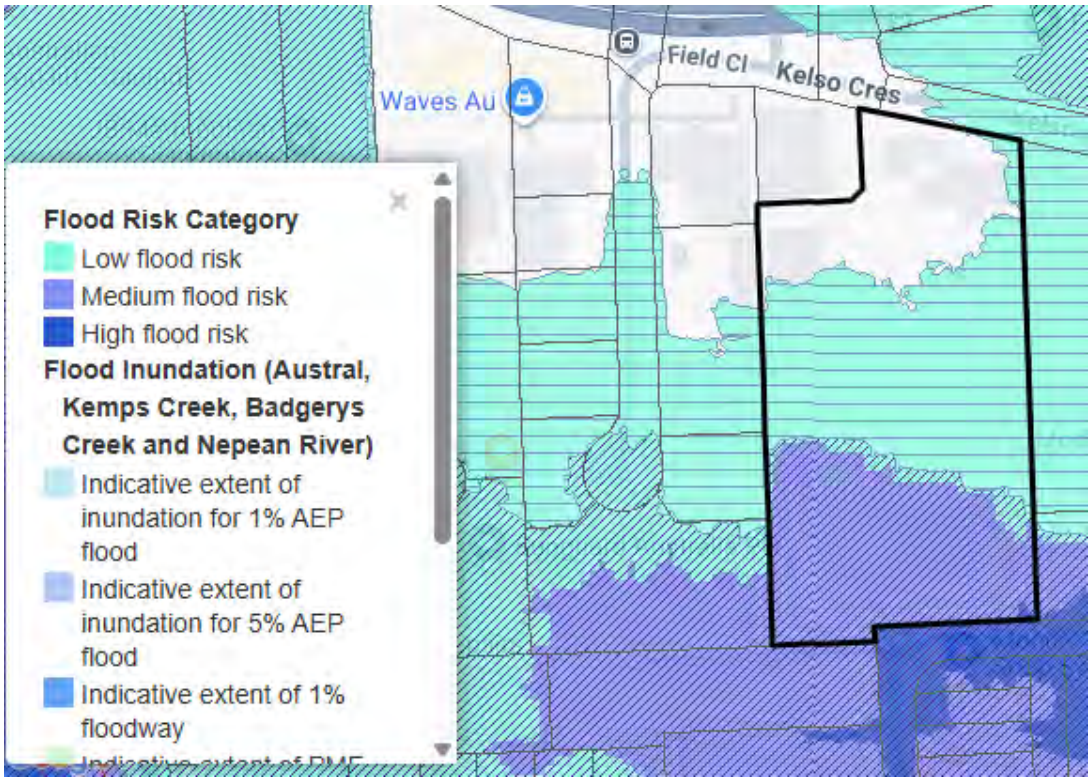

Figure 4.1 – Liverpool City Council Online Flood Planning Map (Source: LCC ePlanning)

The area is impacted by the 1 in 100 year event in **Figure 4.1** coincides with the flow path mentioned in earlier sections. Review of **Figure 4.1** confirms the site to be within the low and medium flood risk categories.

4.3 TTW Flood Risk Assessment

TTW performed a flood risk assessment for the development site on 13 September 2023 (**Ref:231204 CAAA, Flood Report – Project Marvel**). The initial assessment used the Anzac Creek Flood Study but was later adjusted to use the Georges River Flood Study per subsequent feedback from the Biodiversity, Conservation and Science (BCS) Group of the NSW Department of Climate Change, Energy, the Environment and Water (DCEEW), now the Conservation Programs, Heritage and Regulation (CPHR) Group.

5 CATCHMENT INVESTIGATION & HYDROLOGY

5.1 Hydrological Assessment of Existing Catchment

The extent of the Georges River Flood study has been used for the analysis, consisting of a catchment of approximately 960 km^2. The 1% Annual Exceedance Probability (AEP) design flow, provided by Liverpool City Council in their Georges River Flood Study has been adopted by Costin Roe Consulting for use in this analysis.

In order to undertake the TUFLOW modelling, the flood hydrograph for the 1% AEP flood event was required to be confirmed. Utilising the peak flow defined in The Georges River Flood Study, an inflow hydrograph was determined utilising interpolation with an assumption made that a base flow of 1m3/s is present through the creek before and after the storm event. The hydrographs were determined for use in the TUFLOW model. Rainfall intensities and temporal patterns were derived from the Bureau of Meteorology online IFD tool and Australian Rainfall and Runoff (1987).

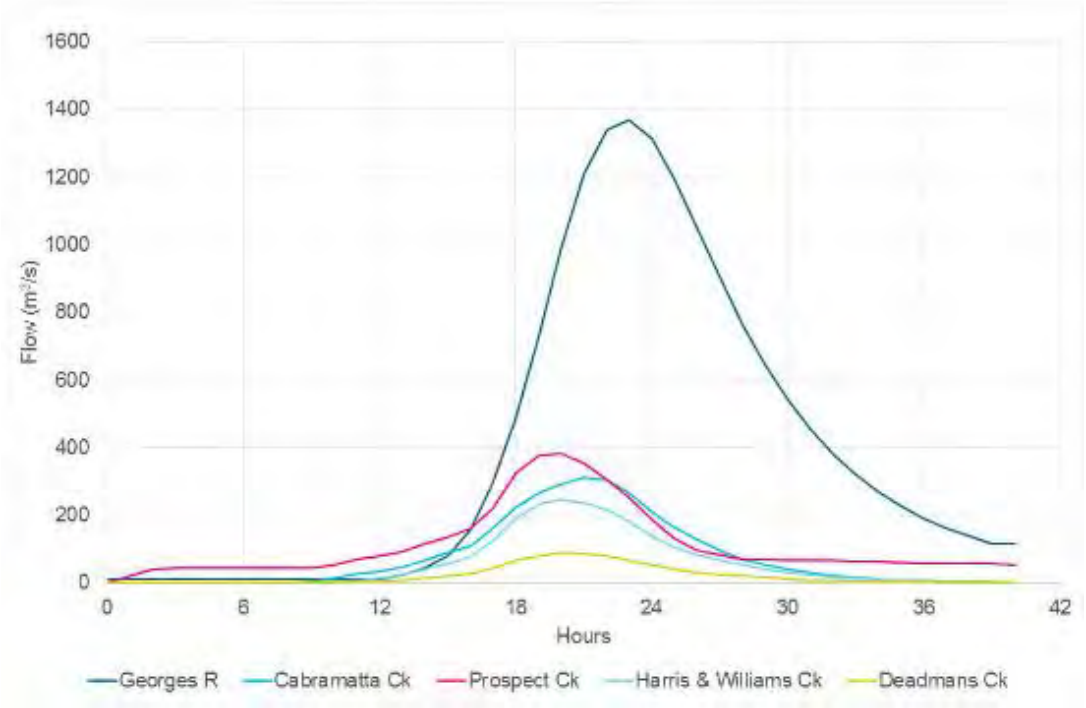

Figure 5.1 – Inflow Hydrograph

6 HYDRODYNAMIC MODEL DEVELOPMENT

6.1 Extent and Topography

The Georges River Flood Study has been used with a catchment area covering approximately 960 km^2, ranging from the East Hills Railway Line in Casula to downstream of the Salt Pan Creek confluence at Lugarno. **Figure 6.1** below shows the extent of the modelling area.

Hydraulic modelling for this study was undertaken using the TUFLOW engine. The modelled system is based on a 2D approach for the existing cases. The DTM was developed based on the survey information provided by Boxall Surveyors & the proposed site design levels as discussed in **Section 4** of this report.

The water levels and flows are resolved on a rectangular grid covering the area of interest. The TUFLOW model was set up with a 10m grid cell size through the area of interest.

Design inflow hydrographs for the model have been included at key locations to simulate overland flow paths caused by the contributing catchments. The upstream boundaries are located sufficiently upstream of the development to ensure the extent of predicted impacts from the development would be covered and any modelling iterations would be resolved clear of the development affectation.

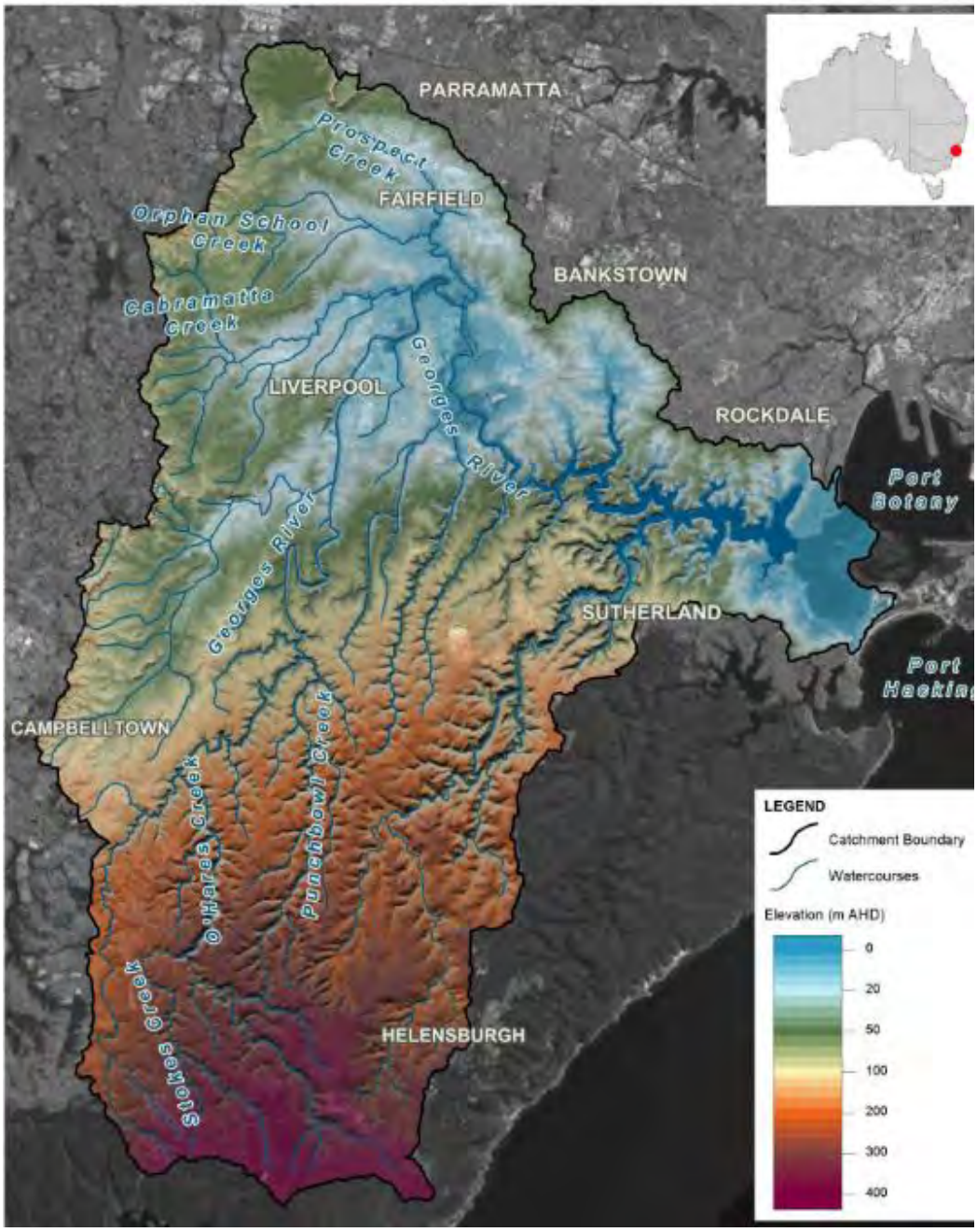

Figure 6.1 – Flood Modelling Extent

6.2 Channel and Floodplain Roughness

Roughness values adopted in the model are contained in **Table 6.1** below.

Table 6.1 - Adopted TUFLOW Element Roughness Values

Model Element	Description	Roughness Parameter Value (Georges River Flood Study)
1	Default	0.1
2	High Density Vegetation	0.15
3	Water Body Upper Catchment	0.05
4	Vegetation	0.08
5	Rural Residential	0.075
6	Water Body lower Catchment	0.03
7	Water Body DS Liverpool Weir	0.035
8	Water Body Salt Pan Creek	0.015
9	Sand	0.03
10	Industrial	0.05
11	Cleared Parkland	0.04
12	Steep Reaches Channel	0.02
13	Steep Reaches Vegetation	0.05

7 FLOOD MODELLING RESULTS

7.1 Pre-Development Scenario Results

The predicted peak flood levels, depth and velocities were extracted from the hydrodynamic modelling and were used to generate water surface profiles, depth profiles and velocity profiles for the design events.

The water surface profile for the 1% AEP event has been presented below in **Figure 7.1** Flow velocities for the 1% AEP event has been presented in **Figure 7.2**. Reference to **Appendix A** should be made for water surface profiles, flood depth estimates and velocity output for the 5% AEP, 1% AEP, 0.5% AEP, 0.2% AEP and PMF storm events.

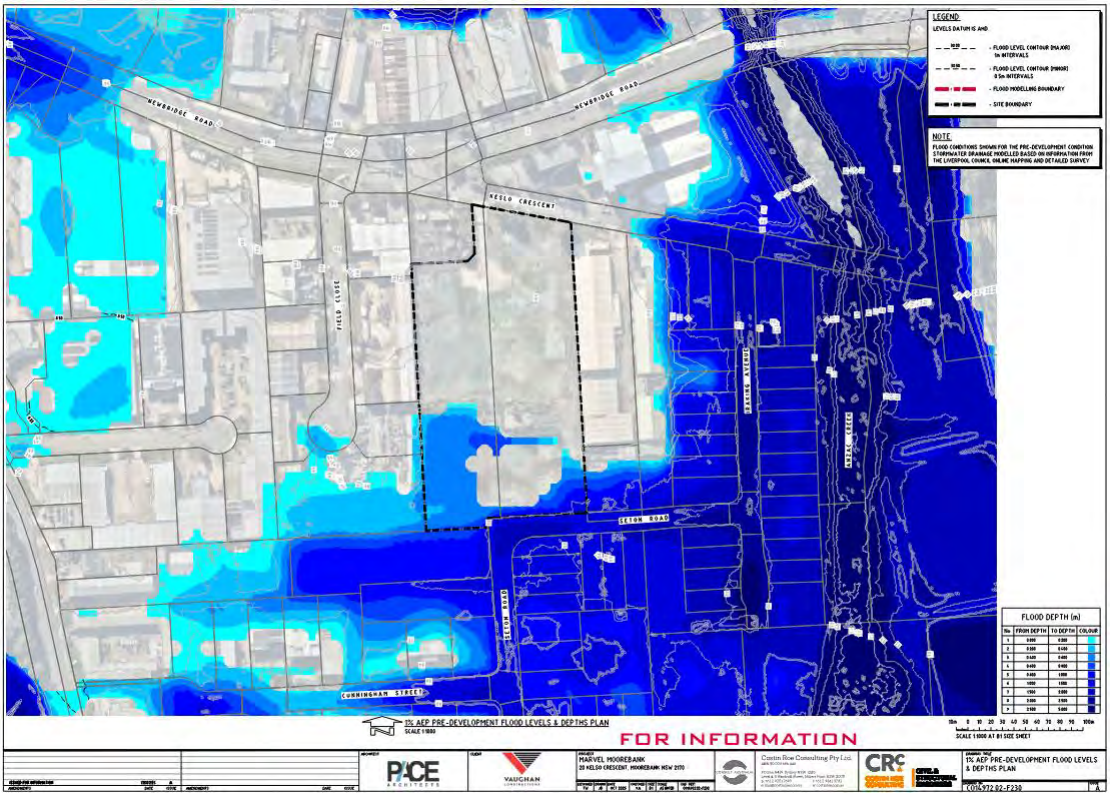

Figure 7.1 - 1% AEP Pre-developed Level and Depth Output

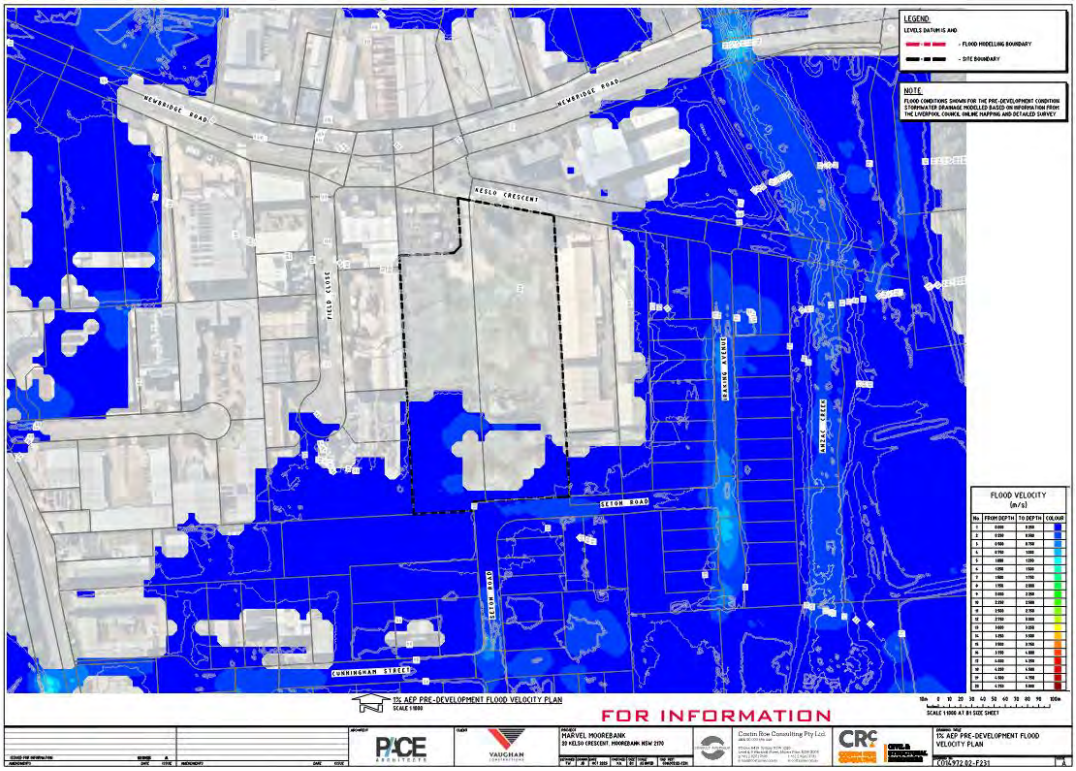

Figure 7.2 - 1% AEP Pre-developed Velocity

The predicted extent of overland flood inundation can be seen to be localised to Anzac Creek. The flood extent within The Site can be seen to be generally shallow and low velocity.

7.2 Post Development Scenario Results

The Post Developed Scenario is based on filling of the proposed site, and flood compensation works within the proposed development. The proposed works will convey the 1% AEP flow from Anzac Creek and ensure that the flood level will not be increased, as to affect the flood liability of adjacent properties.

This scenario produced the following results for the 1% AEP storm event:

- The change in flood surface levels between the existing and developed scenario were seen to be less than 10mm offsite. There are localised flood level increases within the proposed development site.
- The post development scenario has been concluded to be acceptable in terms of the criteria for filling within flood affected land defined in the Liverpool Council Development Control Plan and the proposed works will not cause any adverse effects to surrounding properties.

Reference to **Figure 7.3** shows the post-developed 1% AEP output for depth and levels. **Figure 7.4** shows flood velocity. Reference to **Figure 7.5** shows the 1% AEP flood level afflux and **Figure 8.4** shows the 1% AEP flood velocity afflux. Further results and output can be found in **Appendix A**.

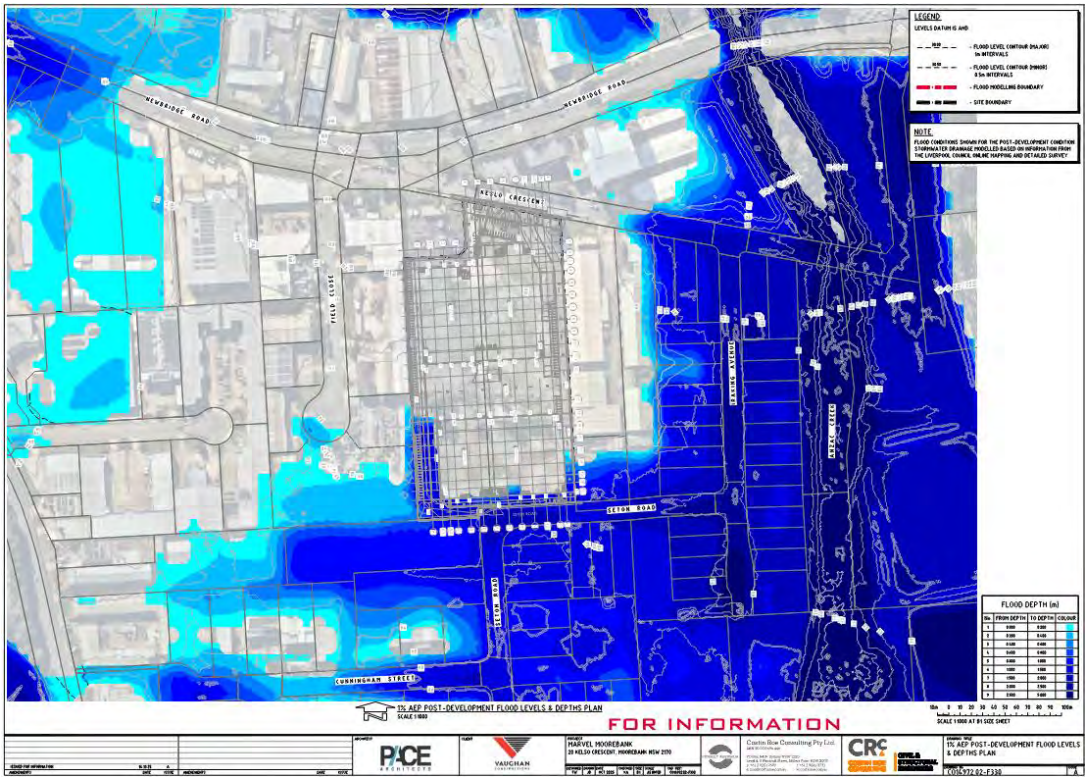

Figure 7.3 - 1% AEP Post Developed Level and Depth Output

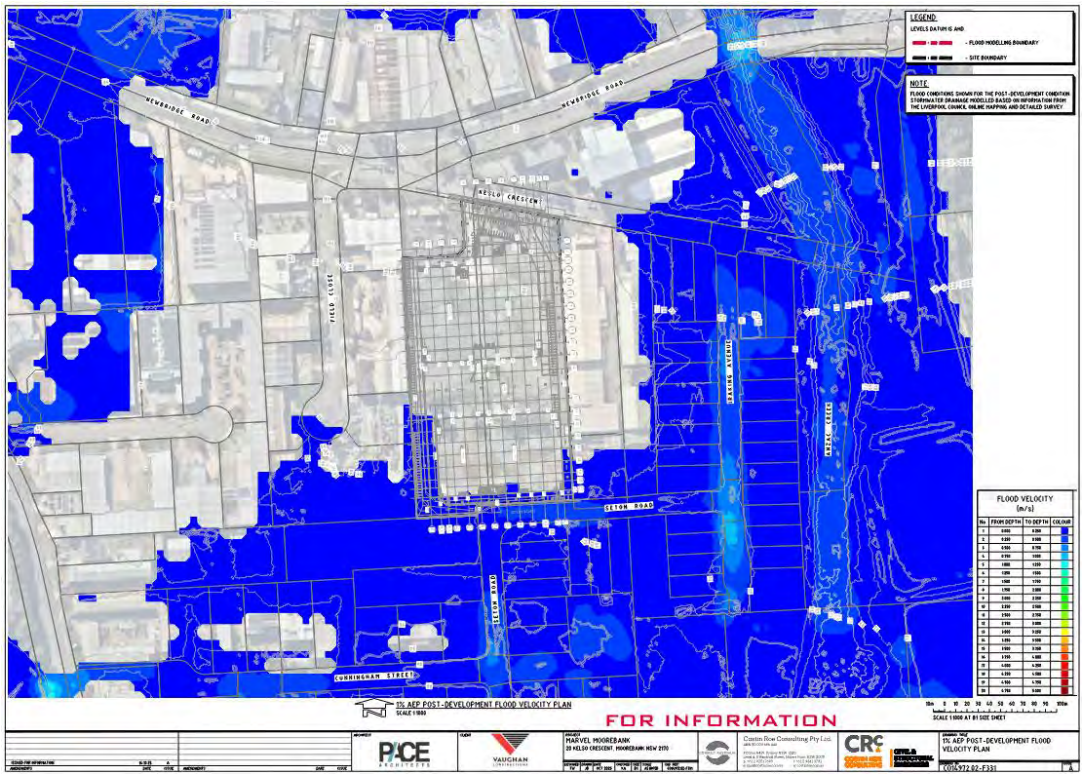

Figure 7.4 - 1% AEP Post Developed Velocity

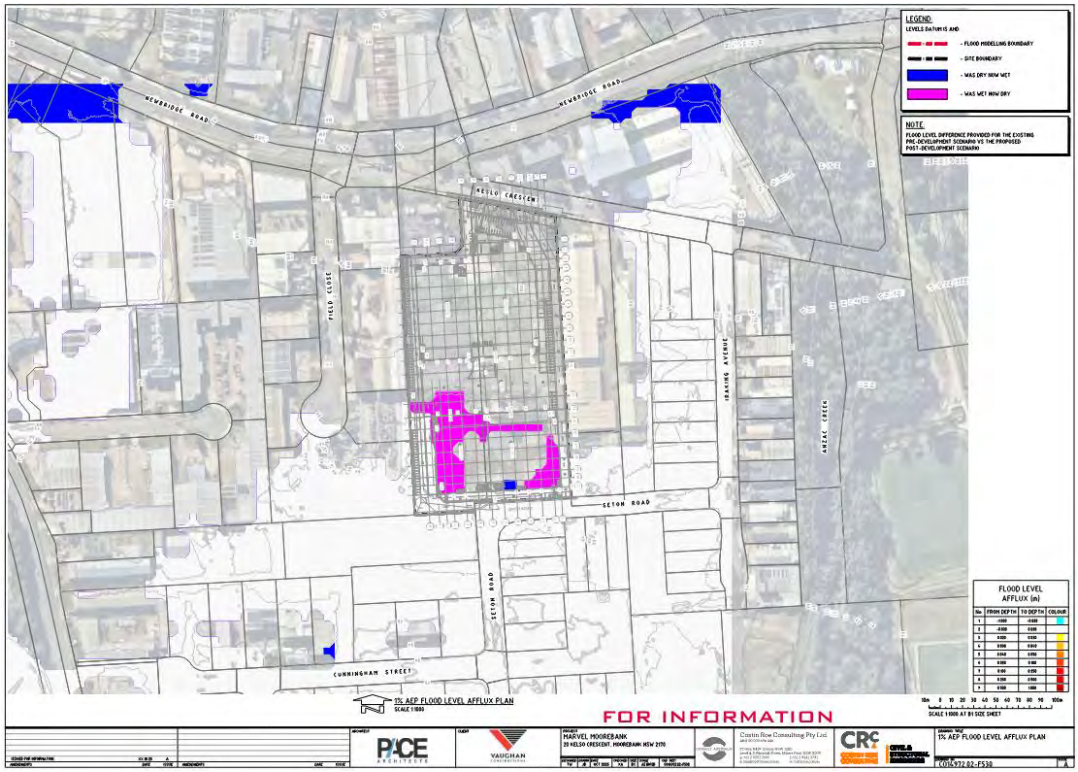

Figure 7.5 - 1% AEP Post Developed Level Afflux

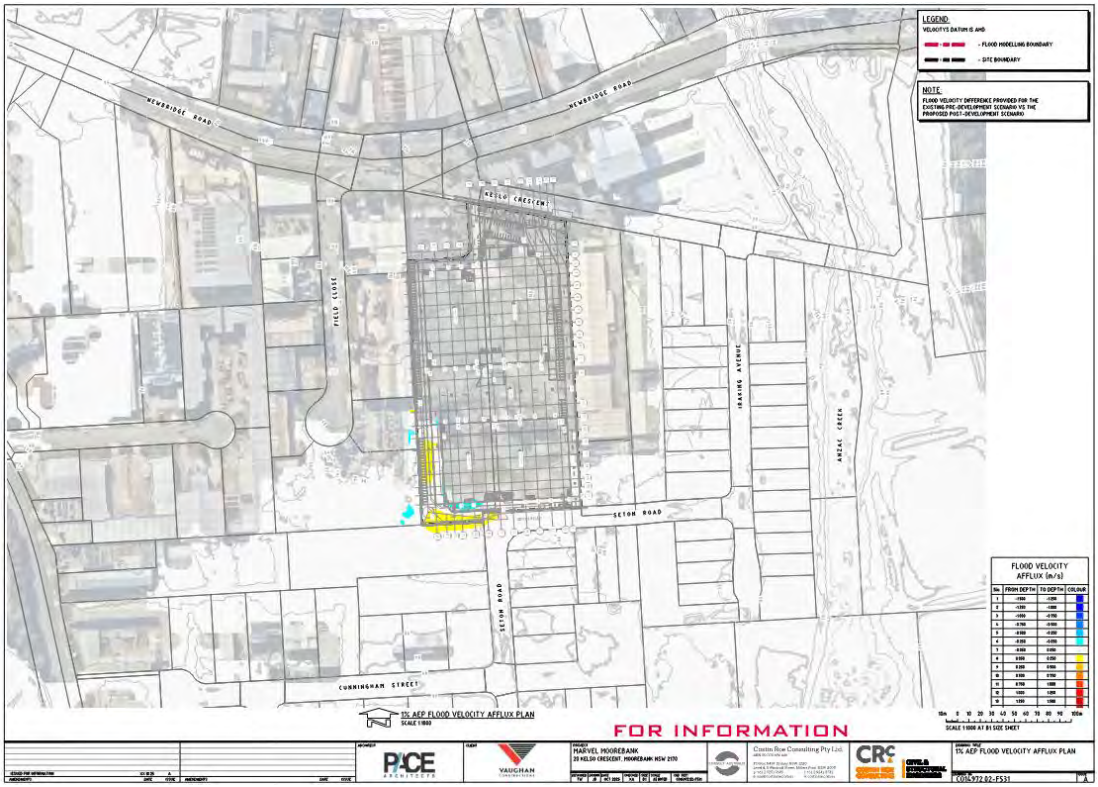

Figure 7.6 - 1% AEP Post Developed Velocity Afflux

8 FLOOD SAFETY AND EVACUATION

8.1 Introduction

This section of the report presents the relevant information in relation to egress and evacuation during the approach of a significant flood event. The information in this report can be used as a framework for the overall precinct and for future more detailed emergency response plans for individual facilities.

This framework has been completed with consideration to the State Emergency and Rescue Management Act 1989 (NSW), the State Emergency Service Act 1989 (NSW), and the Liverpool City Flood Emergency Sub Plan 2023 (refer **Appendix D**).

Based on typical light industrial population rates of 1 employee per 200m^2 GFA, it is expected that approximately 150 people will occupy the building following completion of the development. These people would be distributed proportionately between 3 warehouse/office facilities and will require safe passage during possible flood events.

8.2 Flood Extent and Timing

The flood levels and extent during various storm events are included in earlier sections of this report, and the PMF event for the Developed Scenario is shown below in **Figure 8.1. Figure 8.1** shows that the developed site will be inundated under the PMF storm except for a small island towards the north of the site. The PMF storm event is the most extreme flood event and is extremely unlikely to occur.

Further information on the PMF event can be found in drawing **CO14972.02-F250** in **Appendix A**.

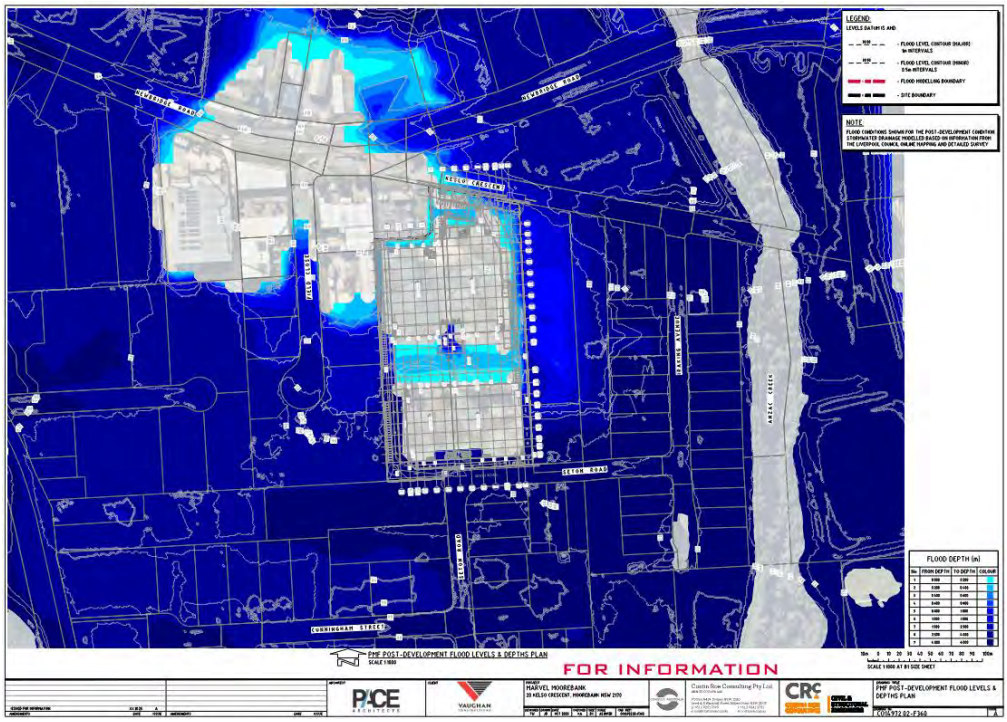

Figure 8.1 - Post-development PMF Flood Extent and Levels

8.3 Preparedness

8.3.1 Education, awareness, and preparedness program

The flood management plan provides the opportunity to develop engagement and education materials to support flood awareness activities. These activities should also be part of any major flood management measures that alters flood behaviour, flood warning or how the community needs to respond to the flood threat. Management (construction & operational stages) need to be responsible for ongoing awareness and education including informing the community on how to prepare for, and how and when to act in response a flood threat.

Education should seek to provide information to raise awareness of flooding so as to enable individuals to understand how to manage themselves and their property in response to flood warnings.

It is recommended that flooding emergency plans is regularly exercised. Should the exercise drills highlight particulars that need to be updated in the flood emergency plan, it is recommended that the plan is updated and circulated to all parties affected.

8.3.2 Development of Warning Systems

Each tenant should have a tenant specific plan which sets out flood warden, evacuation zones and responsible persons. This flood plan should:

- Provide an overview / summary of the flood risk on site;
- Explain and demonstrate emergency evacuation procedures;
- Outline that the site should not be evacuated by foot or vehicle once Iraking Avenue nis flooded.

This flood awareness program should be incorporated into the induction process for new and existing staff members of tenants on the development site and is to be repeated annually as part of any "refresher" training. The program is to be reviewed when new tenants move into the building. Management should consider installing signage in around the site which outlines the flood evacuation procedure.

Visitors are to be briefed on the basics of the flood evacuation procedure upon arrival to the site. This training may include identification of the Flood Warden on site during the duration of their stay and showing visitors the designated refuge areas and evacuation pathways.

As noted, the advice in this report can be used as a framework for these site-specific plans, in conjunction with Liverpool City Council and SES sub plans as required. During construction, the warehouse site should have a responsible person (EM or site manager) who understands the flood behaviour of this area, is familiar with this report and flood management responses set out in the FERP.

The Bureau of Meteorology (BoM) will issue flood alerts as part of their responsibility for the issue of warnings of weather conditions likely to give rise to Floods and for the provision of forecasting and warning services for Extreme Weather and Hazard Impact Events. Severe Weather Warnings, Severe Thunderstorm Warnings & Flood warnings are issued by the Bureau of Meteorology to alert communities to the threat of severe weather at (http://www.bom.gov.au/nsw/warnings/ & http://www.bom.gov.au/nsw/flood/sydney.shtml).

Development Owners and Management should appoint personnel (person or committee) involved with the implementation of this plan. As part of an early warning system, the appointed person or committee should be aware of the weekly weather forecast to identify heavy forecasted rainfall to prepare according. It is recommended that, if possible, the committee/Flood warden, bookmark the BoM warning pages for quick access.

The appointed person or committee should, during periods of heavy or forecast heavy rainfall, diligently observe the Severe Weather Warnings, rainfalls and road closures from the BoM.

As described in **Section 8.3.3** below, the BoM warning system is based on predicted rainfall and gauges in the Sydney region. This includes identification of potential flooding areas, estimated impacts of flooding at different heights and action time.

The BOM warning system will provide good initial guidance for triggering of flood measures. A suitable response/trigger methodology has been outlined in **Section 8.3.3** which can be utilised to inform users of the site to prepare their own site-specific flood management response plans.

Flood warning and emergency response for the development site will be based on the rainfall within the adjoining catchments.

Real-time data (updated at 15-minute intervals) for these sites can be accessed through the BoM website via the following hyperlink: http://www.bom.gov.au/nsw/flood/sydney.shtml (refer **Figure 8.2** for an indication of the relevant site-specific station):

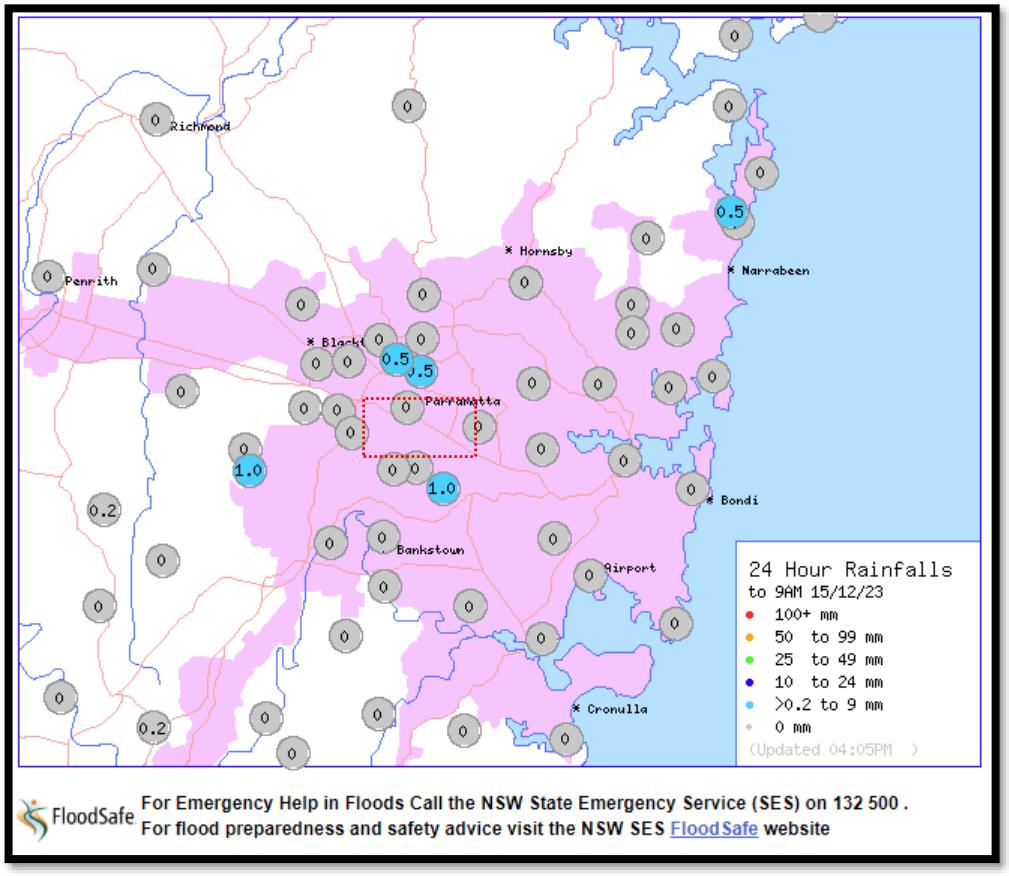

Figure 8.2 – Site specific station (http://www.bom.gov.au/nsw/flood/sydney.shtml)

As described in **Section 8.4** below, the SES Warning System is based on predicted rainfall and gauges on the Georges River. The BOM/ SES system will provide good initial guidance, however in addition to the SES flood warning system, it is recommended that monitoring of real time gauges within Anzac Creek and Georges River, and potentially an in-house warning system also be employed to supplement the BOM gauges. Such a warning system could consist of a series of flood depth markers or responders placed on the east of the site within the Anzac Creek flood plain. A suitable response/ trigger methodology has been outlined in **Section 8.4** which can be utilised to inform users of the site to prepare their own site-specific flood management response plans.

8.3.3 Preparation Steps

It is the responsibility of the occupants of each facility to understand the risks and dangers of flooding across the precinct, and the need to evacuate in such an event.

It is recommended that the users of each facility are registered to be able to receive flood warning messages via SMS from the NSW SES.

Lastly, the evacuation framework, including the evacuation route, contained in this report must be understood and adapted to each specific facility. It is recommended that a copy or copies of this route and plan are kept at several locations on site such as the maintenance manager, and office administrator. A thorough understanding of *Councils Local Flood Plan* as included in **Appendix D** of this report should also be made.

It is noted that significant lead warning time would be required to enable effective flood response plans to be initiated for this site. The freeboard set at 0.5m above the 1% AEP means that the proposed building is at a level higher than the 1% AEP flood level, however the majority of the site and site entry/exit points are below the 1% AEP and PMF level and is flood affected during, meaning that evacuation routes would be compromised. Safe refuge in major flood events associated with Anzac Creek, or local watercourses is available on site.

8.4 Flood Response

8.4.1 Flood Response Introduction

The following sub-sections of the report provide information on potential flood triggers that could be utilised by site management (during construction and operation) to be able to prepare their own flood response plans.

The site management (during construction and operation) may visually gauges conditions (flow depth and velocity) within the Anzac Creek as an early warning system during heavy rainfall.

8.4.2 Response Triggers & Site-Specific Measures

Trigger 1 - A flood alert/watch/advice is issued by the BOM.

The BOM alert will be issued if flood producing rain is predicted. This provides an early warning that flooding may occur, however is not confirmation that flooding will occur. If this alert is issued then the Flood Warden should be on alert for further BOM, SES or site-specific Triggers.

Trigger 2 – General flood alert issued by the BOM.

A generalised flood warning would be issued when flooding is expected to occur in a given area. These would generally be provided by the BOM with three hours warning time is expected from issue of warning to peak flood level as per the "*Service Level Specification for Flood Forecasting and Warning Services for New South Wales – Version 2.0*" (Bureau of Meteorology, 2013).

Maintenance workers, or other persons, who might need to access the landscaped area west of the site hardstand along the Anzac Creek boundary should be notified prior to entering the lower areas on the embankment of the potentially flood affected areas.

It is noted that Trigger 3 may occur prior to Trigger 2 and the Flood Warden is required to consider this eventuality.

Trigger 3 – Guage flood levels within Anzac Creek channel - flood depth of 0.5m below top of bank.

Flood Warden at this point should put Warehouse occupants on alert to evacuate the site. Flood warden to contact SES for additional updates, if required.

Trigger 4 - Guage flood levels within Anzac Creek channel - flood depth at top of bank.

Flood warden should advise the immediate evacuation of the development site to Newbridge Road. No evacuation should be made in any other direction unless otherwise noted by management on the day, with actual information and conditions available.

Flood warden should advise occupants or remaining occupants (those opting to seek refuge on site) to move to higher ground (upper levels), for example within the Office.

End of Response Operations

Once the flood levels recede below the trigger level and the danger posed by flooding has passed, the NSW SES Liverpool Local Incident Controller will issue an "all clear" message which will be conveyed in the same format as the warning message, via SMS. The site occupiers can then leave the industrial precinct if on site refuge was undertaken or return to the precinct if evacuated.

8.5 Hazard Mapping

Flood hazard criteria and mapping has been completed for the 1% AEP and PMF post development conditions.

The assessment and hazard categorisation has been completed based on criteria set out in the *Australian Rainfall and Runoff (2019), A Guide to Flood Estimation – Book 6 – Flood Hydraulics* and *Figure 6.7.9*. The hazard categories are included as **Figure 3.1** in **Section 3.3.2.**

The assessment shows that there is minor change to hazard categories adjacent to the site, and no change to hazard categories offsite. As noted above, the proposed building will be flood affected during the PMF flood event from Anzac Creek however is considered to occur over a short duration.

Refer also **Appendix A** for hazard mapping.

8.6 Confirmation of NSW Flood Risk Management Manual Emergency Management Principles

Consideration of flooding issues has been undertaken in accordance with the requirements of the NSW Government's Flood Prone Land Policy as set out in the *Flood Risk Management Manual 2023* and supporting guidelines, including the *Support for Emergency Management Planning*. The Principles of Emergency Management as per Section A2.7 of the *Support for Emergency Management Planning* has been confirmed in **Table 8.1**.

Table 8.1. Emergency Management Principles – Floodplain Risk Management Manual

Emergency Management Principles	Proposed Development Confirmation
Principle 1 Any proposed Emergency Management strategy should be compatible with any existing community Emergency Management strategy. Any proposed Emergency Management (EM) strategy for an area should be compatible with the evacuation strategies identified in the relevant local or state flood plan or by the NSW SES.	NSW SES's primary strategy for managing populations at risk of flooding is evacuation, which is possible from the development site (Refer to *Section 5.8* of NSW SES's Liverpool City Flood Emergency Sub Plan – April 2023.). The document referenced "Liverpool City Flood Emergency Sub Plan" dated April 2023, which is a sub plan of the Local Emergency Management Plan (EMPLAN) was reviewed and we note the following: The development of warning systems discussed in Section 4.4 mentions that "(d) The State Government, in partnership with Local Government, is responsible for developing and maintaining flash flood warning systems for local catchments where required.".

Emergency Management Principles	Proposed Development Confirmation
	Section 4.6.2 actions NSW SES to work together with individuals, communities, businesses and government agencies to build flood resilience. *Section 5.6*, road and traffic control would be an important risk management factor to consider and could impact the evacuation strategy from the proposed development site. A 'Shelter in place' strategy is not proposed as the primary emergency response but noted as a feasible option.
Principle 2 Decisions should be informed by understanding the full range of risks to the community. Decisions relating to future development should be risk-based and ensure Emergency Management risks to the community of the full range of floods are effectively understood and managed.	A detailed 1D/2D flood modelling suite has been prepared for a range of flooding events. This has been included in this FIRA report by Costin Roe Consulting and included within the application documentation. The range of flooding events have been interrogated and it has been concluded that the site has safe access and egress in all flood events.
Principle 3 Development of the floodplain does not impact on the ability of the existing community to safely and effectively respond to a flood. The ability of the existing community to effectively respond (including self-evacuating) within the available timeframe on available infrastructure is to be maintained. It is not to be impacted on by the cumulative impact of new development.	It should be noted that development across the majority of this site is within the floodplain, including the PMF extent. The development is expected to have limited impact on the ability of the existing community to be able to respond to flooding or flood affectation.

Emergency Management Principles	Proposed Development Confirmation
	In regard to impacts, impact assessments have been included in the reporting and confirmed to have offsite water level changes in the DFE/1% AEP as less than 10mm as required of Council, DPEEHG and other relevant bodies as recommended.
<u>Principle 4 Decisions on redevelopment within the floodplain does not increase risk to life from flooding.</u> The preferred EM approach is evacuation, where evacuation capacity and capability has been demonstrated as the most effective strategy to manage EM risks (i.e. a strategy that enables the users of development to self-evacuate to an area outside the floodplain that has adequate services to sustain the community in an orderly planned outcome). This includes consideration of flood warning and evacuation demand on existing and future access/egress routes considering potential impacts of localised flooding. Where this is not possible any decision involving redevelopment, and in particular increasing population at risk, needs to consider the safety of the community. This may include provisions such as effective flood warning, a practical safe refuge for the full range and behaviour of flooding (i.e. above the PMF and designed to withstand the associated forces of flooding), and provisions to be able to safely self-sustain for short duration flooding. Managing these risks requires careful consideration of development type, likely users, and their ability respond to	The site has been confirmed, through impact assessments and modelling, to be able to be developed without undue risk to occupants of the precinct, and the surrounding areas. Site evacuation is available.

Emergency Management Principles	Proposed Development Confirmation
minimise their risks. This includes consideration of: Isolation – There is no known safe period of isolation in a flood, the longer the period of isolation the greater the risk to occupants who are isolated. Secondary risks – This includes fire and medical emergencies that can impact on the safety of people isolated by floodwater. The potential risk to occupants needs to be considered and managed in decision-making. Consideration of human behaviour – The behaviour of individuals such as choosing not to remain isolated from their family or social network in a building on a floor above the PMF for an extended flood duration, or attempting to return to a building during a flood, needs to be considered when adopting any EM strategy.	
<u>Principle 5 Risks faced by the itinerant population need to be managed.</u> Any EM strategy needs to consider people visiting the area or using a development. This may be relevant for the transient population visiting for shopping, during holiday periods or utilising an area for an entertainment or tourism event.	Refer Principle 1 responses.
<u>Principle 6 Recognise the need for effective flood warning and associated limitations.</u> An effective flood warning strategy with clear and concise messaging understood by the community is key to providing the community an opportunity to respond to a flood threat in an appropriate and timely manner.	We understand that with no formal flood warning system available for the proposed area, that flood planning and evacuation for emergency services would be challenging. With a medium-risk evacuation option from the site (to the south of the development site) available for Self-Managed Evacuation/Relocation is

Emergency Management Principles	Proposed Development Confirmation
	deemed to be available for most storm events up to the PMF. Local road management, such as road-blocks, would need to be considered in accordance with the local flood emergency subplan. The development of warning systems discussed in *Section 4.4.1* of the NSW SES's Liverpool City Flood Emergency Sub Plan, which mentions that "*(d) The State Government, in partnership with Local Government, is responsible for developing and maintaining flash flood warning systems for local catchments where required*.".
Principle 7 Ongoing community awareness of flooding is critical to assist effective emergency response. Councils and government play an important role in ensuring communities have and retain an awareness of flooding and the strategies that will help them respond appropriately to a flood threat.	The flood risk for the precinct is generally medium, noting the majority of development is proposed within the floodplain including the PMF. Education programs and flood awareness is to be implemented to occupants of the proposed development.

9 VALIDATION OF POST DEVELOPED SCENARIO

9.1 Introduction

The Post Development Scenario has been assessed as meeting the requirements *of Liverpool Council Development Control Plan Part 1, Section 9,* for filling within flood affected land. Table 8.1 confirms that Liverpool Councils criteria for filling within flood affected land have been met.

9.2 Post Development Scenario

With reference to **Section 7** and modelling results contained in **Appendix A**, we provide confirmation in **Table 9.1** that each of the criteria set out in the *Liverpool Council Development Control Plan Part 1, Section 9,* for filling within flood affected land.

The site has been identified as being located within the Anzac Creek catchment area and hence is subject to the criteria outlined in **Table 3** of **Part 1 Section 9.5** of the DCP. The site is identified as being an industrial development within a medium flood risk zone. Further to the DCP requirements, we confirm that the criteria shown in **Table 9.1** are met.

Table 9.1 - Post Developed Scenario - Confirmation of Liverpool Council DCP Criteria

Criteria	Scenario Confirmation
Floor Level All floor levels to be no lower than the 1% AEP plus 500mm freeboard. Freeboard may be reduced if justified by site specific assessment. A restriction is to be placed on the title of the land, pursuant to S.88B of the *Conveyancing Act*, where the lowest habitable floor area is elevated more than 1.5m above finished ground level, confirming that the undercroft area is not to be enclosed.	The proposed building floor levels is to be set at minimum 500mm above the 1% AEP flood level.
Building Components All structures to have flood compatible building components below the 1% AEP flood level plus 500mm freeboard or a PMF if required to satisfy evacuation criteria (see below).	Structures within the flood affected areas are to be comprised of flood compatible materials to be confirmed by a structural engineer during the detailed design stage.

Structural Soundness Applicant to demonstrate that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 1% AEP flood plus 500mm freeboard or a PMF if required to satisfy evacuation criteria (see below). An engineer's report may be required.	Structures within the flood affected areas are to be comprised of flood compatible materials to be confirmed by a structural engineer during the detailed design stage.
Flood Effects The flood impact of the development to be considered to ensure that the development will not increase flood effects elsewhere, having regard to: (i) loss of flood storage; (ii) changes in flood levels and velocities caused by alterations to the flood conveyance; and (iii) the cumulative impact of multiple potential developments in the floodplain. An engineer's report may be required. A floodway or boundary of significant flow may have been identified in this catchment. This area is the major conveyance area for floodwaters through the floodplain and any structures placed within it are likely to have a significant impact on flood behaviour. Within this area no structures other than concessional development, open type structures or small non habitable structures (not more than 30sqm) to support agricultural uses will normally be permitted. Development outside the Boundary of Significant flow may still increase flood effects elsewhere and therefore be unacceptable. Any filling within the 1% AEP flood will normally be considered unacceptable unless compensatory excavation is provided to ensure that there is no net loss of floodplain storage volume below the 1% AEP flood.	1% AEP flood surface afflux mapping shows that the change in flood surface levels between pre and post development is consistent with the pre-developed scenario. These afflux plans show that there is no increase in flood level that will impact surrounding properties.
Car Parking and Driveway Access The minimum surface level of a car parking space, which is not enclosed (e.g. open car parking space or carport) shall be as high as practical, but no lower than the 5% AEP flood level or the level of the crest of the road at the highest point were the site can be accessed. In the case of garages, the minimum surface level shall be as high as practical, but no lower than the 5% AEP flood. Garages capable of accommodating more than 3 vehicles on land zoned for urban purposes, or	The proposed northern carpark is to be set above the 1% AEP flood level as per the requirements for the Liverpool City Council DCP. Car parking on existing pavements on the southern side of the proposed building is to remain at existing levels below the 5% AEP flood level as to not displace flood waters.

basement car parking, must be protected from inundation by floods equal to or greater than the 1% AEP flood plus 0.1m freeboard. The level of the driveway providing access between the road and car parking space shall be no lower than 0.3mbelow the 1% AEP flood or such that depth of inundation during a 1% AEP flood is not greater than either the depth at the road or the depth at the car parking space. A lesser standard may be accepted for single detached dwelling houses where it can be demonstrated that risk to human life would not be compromised. Basement car parking or car parking areas accommodating more than 3 vehicles (other than on Rural zoned land) with a floor level below the 5% AEP flood or more than 0.8m below the 1% AEP flood level; shall have adequate warning systems, signage and exits. Barriers to be provided to prevent floating vehicles leaving a site during a 1% AEP flood.	Garages and basement car parking is not proposed as part of development.
<u>Evacuation</u> Reliable access for pedestrians or vehicles required during a 1% AEP flood to a publicly accessible location above the PMF. The development is to be consistent with any relevant flood evacuation strategy or similar plan.	On-site refuge is available to areas above the PMF flood level within the elevated warehouse levels. A flood evacuation strategy has been proposed to avoid a shelter-in-place strategy but we do note that it is feasible if it is required.
<u>Management and Design</u> Site Emergency Response Flood Plan required where floor levels are below the design flood level, (except for single dwelling-houses). Applicant to demonstrate that area is available to store goods above the 1% AEP flood level plus 500mm freeboard. No storage of materials below the design flood level which may cause pollution or be potentially hazardous during any flood.	The proposed building floor levels is min 500mm above the 1% AEP flood level. This includes warehouse areas for goods storage. A management plan is to be put in pace to ensure hazardous material are not stored below the design flood level.
<u>Fencing</u>	All fencing is proposed as to not impede floodwaters

Fencing within a High Flood Risk area, Boundary of Significant Flow or floodway will not be permitted except for permeable open type fences. Fencing is to be constructed in a manner that does not obstruct the flow of floodwaters so as to have an adverse impact on flooding. Fencing shall be constructed to withstand the forces of floodwaters of collapse in a controlled manner so as not to obstruct the flow of water, become unsafe during times of flood or become moving debris.	and to be of open permeable structure such as Chain Link or Palisade fence.

10 CONCLUSION

This Flood Impact Risk Assessment has been prepared in support of the development a new warehouse facility for Mapletree SR Australia Management Pty Ltd Group at 20 Kelso Crescent, Moorebank, NSW.

The Site has been identified by Liverpool City Council as being affected by flooding associated with overland flow from Anzac Creek and the upstream catchment from the development site. Modelling has been undertaken to confirm that council's development control criteria has been met relating to the development of the land and the effect on the flooding as a result of the development.

A TUFLOW hydrodynamic flood model of the overland flow path was produced for the area surrounding the development for the purpose of scenario testing. The report provides a summary of the model build and results for the existing, pre-developed, and the proposed, post-developed condition over the land.

The pre-development flooding produced in the TUFLOW model completed by Costin Roe Consulting shows consistency with that produced in the Council/ BMT WBM Georges River Flood Study.

Pre and post development flood elevation, velocity and flow rate plans have been produced to confirm the effect of the development on flooding. Comparison of the pre- and post-development modelling (shown in the afflux plans) confirms that the development of the land can be made without adversely affecting upstream, downstream or adjacent properties. Criteria relating to development of flood, and/ or overland flow, affected land, set out in the Liverpool City Council Development Control Plan Part 1, have also been shown to be met.

Overall, the pre and post development flood scenario assessment provides favourable results which confirm there will be no effect on downstream or adjacent properties and compliance with the criteria as specified by Liverpool City Council.

11 APPENDICES

COSTIN ROE CONSULTING

APPENDIX A
COSTIN ROE CONSULTING DRAWINGS

MARVEL MOOREBANK

20 KELSO CRESCENT, MOOREBANK, NSW 2170

FLOOD IMPACT RISK ASSESSMENT (FIRA)

DRAWING LIST:

DRAWING NO.	DRAWING TITLE
C014972.02-F100	DRAWING LIST & LOCALITY PLAN
C014972.02-F220	5% AEP PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
C014972.02-F221	5% AEP PRE-DEVELOPMENT FLOOD VELOCITY PLAN
C014972.02-F222	5% AEP PRE-DEVELOPMENT FLOOD HAZARD PLAN
C014972.02-F230	1% AEP PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
C014972.02-F231	1% AEP PRE-DEVELOPMENT FLOOD VELOCITY PLAN
C014972.02-F232	1% AEP PRE-DEVELOPMENT FLOOD HAZARD PLAN
C014972.02-F240	0.5% AEP PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
C014972.02-F241	0.5% AEP PRE-DEVELOPMENT FLOOD VELOCITY PLAN
C014972.02-F242	0.5% AEP PRE-DEVELOPMENT FLOOD HAZARD PLAN
C014972.02-F250	0.2% AEP PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
C014972.02-F251	0.2% AEP PRE-DEVELOPMENT FLOOD VELOCITY PLAN
C014972.02-F252	0.2% AEP PRE-DEVELOPMENT FLOOD HAZARD PLAN
C014972.02-F260	PMF PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
C014972.02-F261	PMF PRE-DEVELOPMENT FLOOD VELOCITY PLAN
C014972.02-F262	PMF PRE-DEVELOPMENT FLOOD HAZARD PLAN
C014972.02-F 320	5% AEP POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
C014972.02-F 321	5% AEP POST-DEVELOPMENT FLOOD VELOCITY PLAN
C014972.02-F 322	5% AEP POST-DEVELOPMENT FLOOD HAZARD PLAN
C014972.02-F 330	1% AEP POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
C014972.02-F 331	1% AEP POST-DEVELOPMENT FLOOD VELOCITY PLAN
C014972.02-F 332	1% AEP POST-DEVELOPMENT FLOOD HAZARD PLAN
C014972.02-F 340	0.5% AEP POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
C014972.02-F 341	0.5% AEP POST-DEVELOPMENT FLOOD VELOCITY PLAN
C014972.02-F 342	0.5% AEP POST-DEVELOPMENT FLOOD HAZARD PLAN
C014972.02-F 350	0.2% AEP POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
C014972.02-F 351	0.2% AEP POST-DEVELOPMENT FLOOD VELOCITY PLAN
C014972.02-F 352	0.2% AEP POST-DEVELOPMENT FLOOD HAZARD PLAN
C014972.02-F 360	PMF POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
C014972.02-F 361	PMF POST-DEVELOPMENT FLOOD VELOCITY PLAN
C014972.02-F 362	PMF POST-DEVELOPMENT FLOOD HAZARD PLAN

DRAWING LIST:

DRAWING NO.	DRAWING TITLE
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C014972.02-F 521	5% AEP FLOOD VELOCITY AFFLUX PLAN
C014972.02-F 530	1% AEP FLOOD LEVEL AFFLUX PLAN
C014972.02-F 531	1% AEP FLOOD VELOCITY AFFLUX PLAN
C014972.02-F 540	0.5% AEP FLOOD LEVEL AFFLUX PLAN
C014972.02-F 541	0.5% AEP FLOOD VELOCITY AFFLUX PLAN
C014972.02-F 550	0.2% AEP FLOOD LEVEL AFFLUX PLAN
C014972.02-F 551	0.2% AEP FLOOD VELOCITY AFFLUX PLAN
C014972.02-F 560	PMF FLOOD LEVEL AFFLUX PLAN
C014972.02-F 561	PMF FLOOD VELOCITY AFFLUX PLAN

LOCAILITY PLAN
SCALE 1:2000

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT: MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F100

CONSULT AUSTRALIA

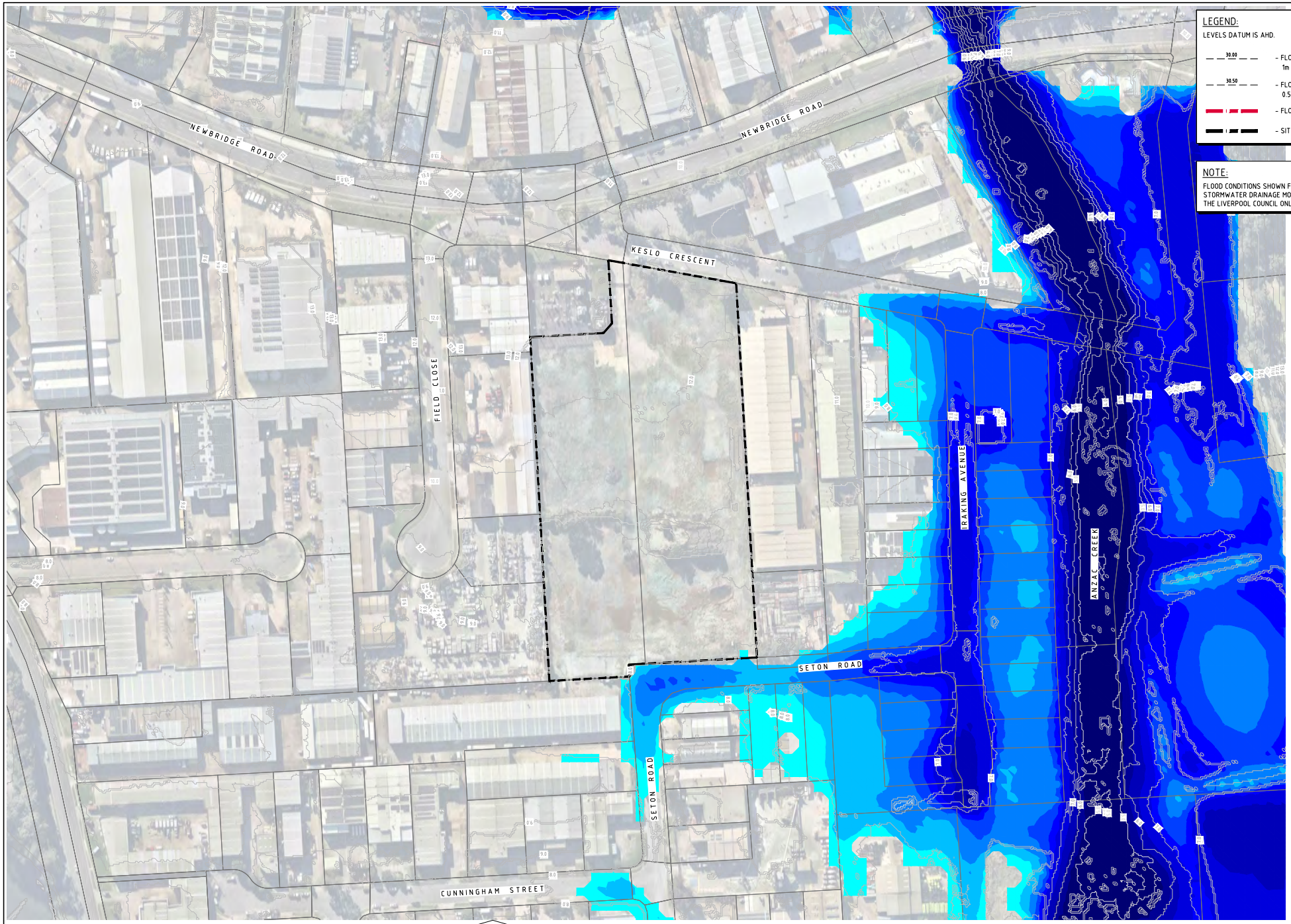
Costin Roe Consulting Pty Ltd.
ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

CRC COSTIN ROE CONSULTING — CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE: DRAWING LIST AND LOCALITY PLAN

DRAWING No: C014972.02-F100

ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- 30.00 – FLOOD LEVEL CONTOUR (MAJOR) 1m INTERVALS
- 30.50 – FLOOD LEVEL CONTOUR (MINOR) 0.5m INTERVALS
- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE PRE-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD DEPTH (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.200	
2	0.200	0.400	
3	0.400	0.600	
4	0.600	0.800	
5	0.800	1.000	
6	1.000	1.500	
7	1.500	2.000	
8	2.000	2.500	
9	2.500	5.000	

5% AEP PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
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DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F220

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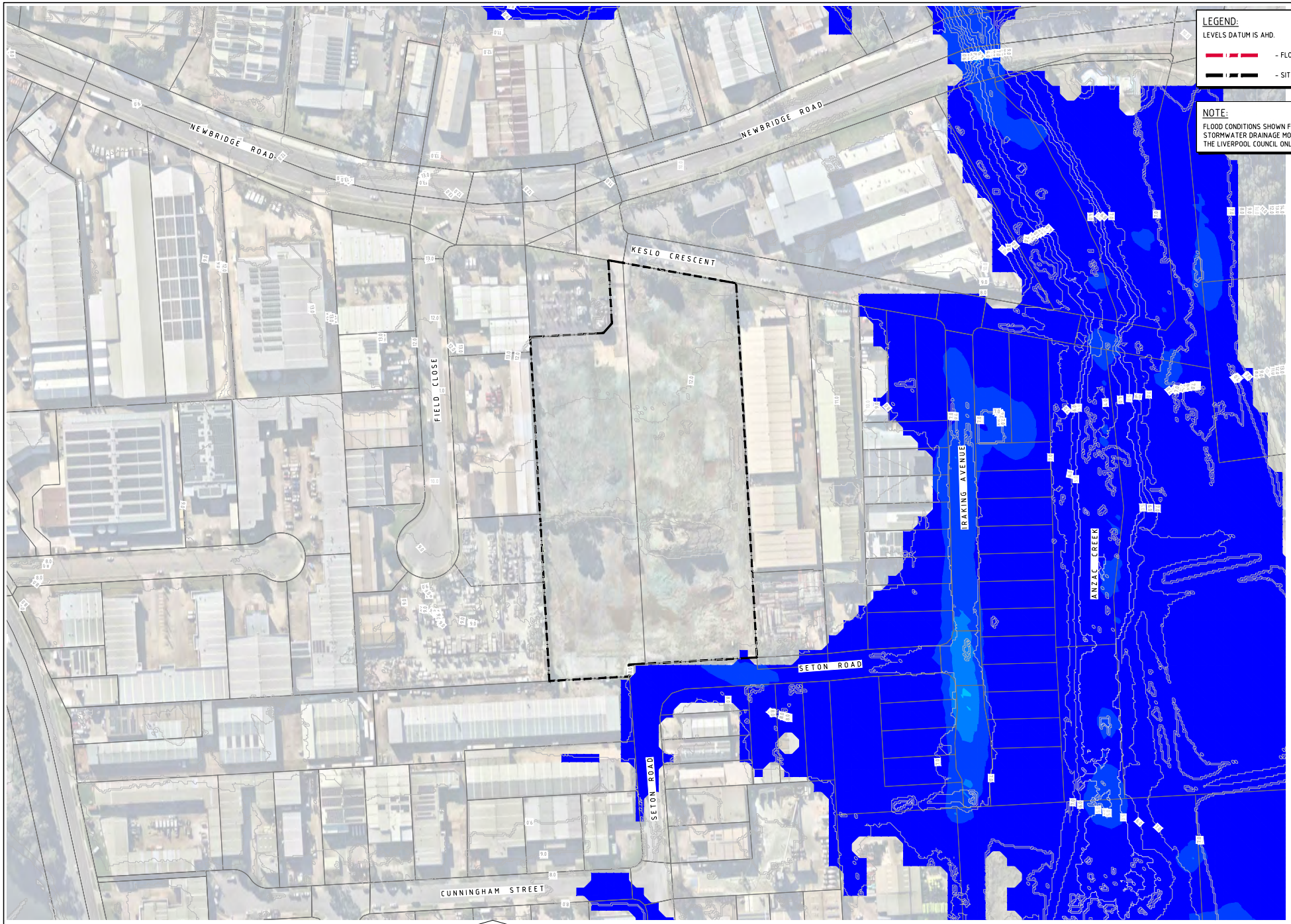
ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au
CRC COSTIN ROE CONSULTING
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
5% AEP PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN

DRAWING No: C014972.02-F220
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE PRE-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD VELOCITY (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.250	
2	0.250	0.500	
3	0.500	0.750	
4	0.750	1.000	
5	1.000	1.250	
6	1.250	1.500	
7	1.500	1.750	
8	1.750	2.000	
9	2.000	2.250	
10	2.250	2.500	
11	2.500	2.750	
12	2.750	3.000	
13	3.000	3.250	
14	3.250	3.500	
15	3.500	3.750	
16	3.750	4.000	
17	4.000	4.250	
18	4.250	4.500	
19	4.500	4.750	
20	4.750	5.000	

5% AEP PRE-DEVELOPMENT FLOOD VELOCITY PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014-972.02-F221

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Costin Roe Consulting Pty Ltd.
ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au
CRC COSTIN ROE CONSULTING
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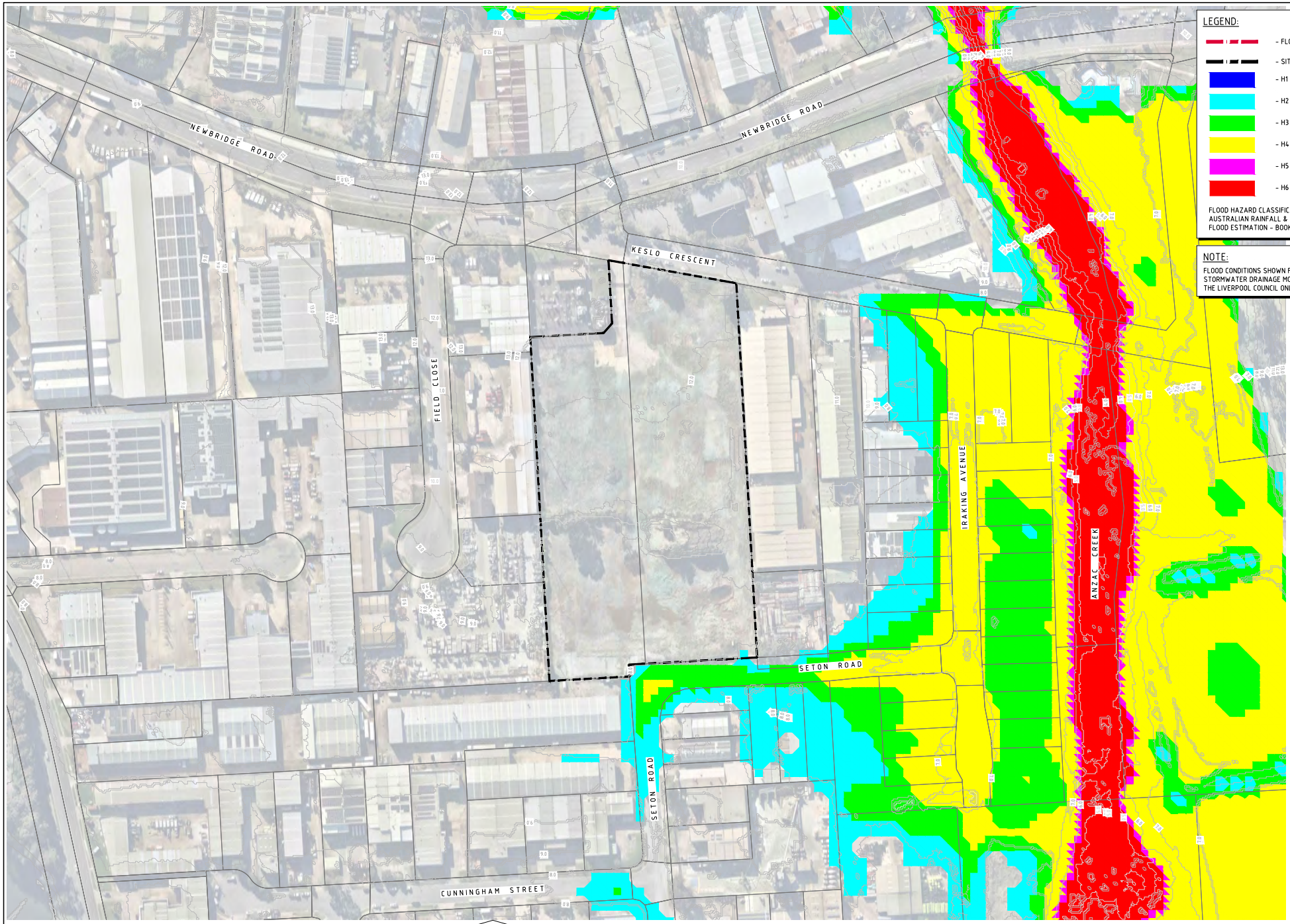
DRAWING TITLE
5% AEP PRE-DEVELOPMENT FLOOD VELOCITY PLAN

DRAWING No: C014-972.02-F221

ISSUE: A



LEGEND:

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY
- H1
- H2
- H3
- H4
- H5
- H6

FLOOD HAZARD CLASSIFICATION AS PER AUSTRALIAN RAINFALL & RUNOFF 2019, A GUIDE TO FLOOD ESTIMATION – BOOK 6 – FLOOD HYDRAULICS

NOTE:

FLOOD CONDITIONS SHOWN FOR THE PRE-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

5% AEP PRE-DEVELOPMENT FLOOD HAZARD PLAN
SCALE 1:1000

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SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F222

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 t: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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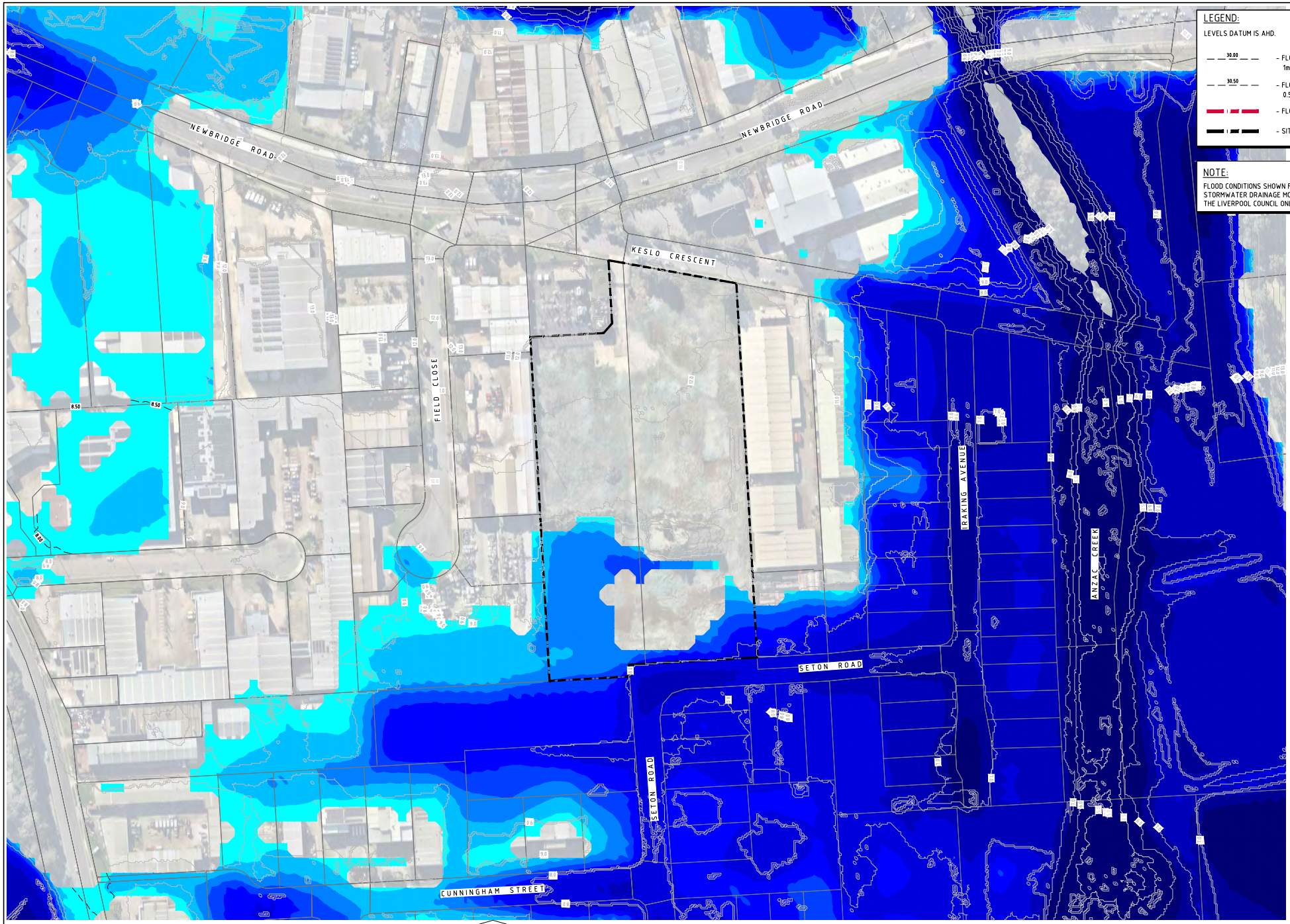
DRAWING TITLE
5% AEP PRE-DEVELOPMENT FLOOD HAZARD PLAN

DRAWING No: C014972.02-F222

ISSUE: A



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LEVELS DATUM IS AHD.

- 30.00 – FLOOD LEVEL CONTOUR (MAJOR) 1m INTERVALS
- 30.50 – FLOOD LEVEL CONTOUR (MINOR) 0.5m INTERVALS
- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE PRE-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD DEPTH (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.200	
2	0.200	0.400	
3	0.400	0.600	
4	0.600	0.800	
5	0.800	1.000	
6	1.000	1.500	
7	1.500	2.000	
8	2.000	2.500	
9	2.500	5.000	

1% AEP PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	17.10.25	B
ISSUED FOR INFORMATION	14.10.25	A

ARCHITECT: PACE ARCHITECTS
CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F230

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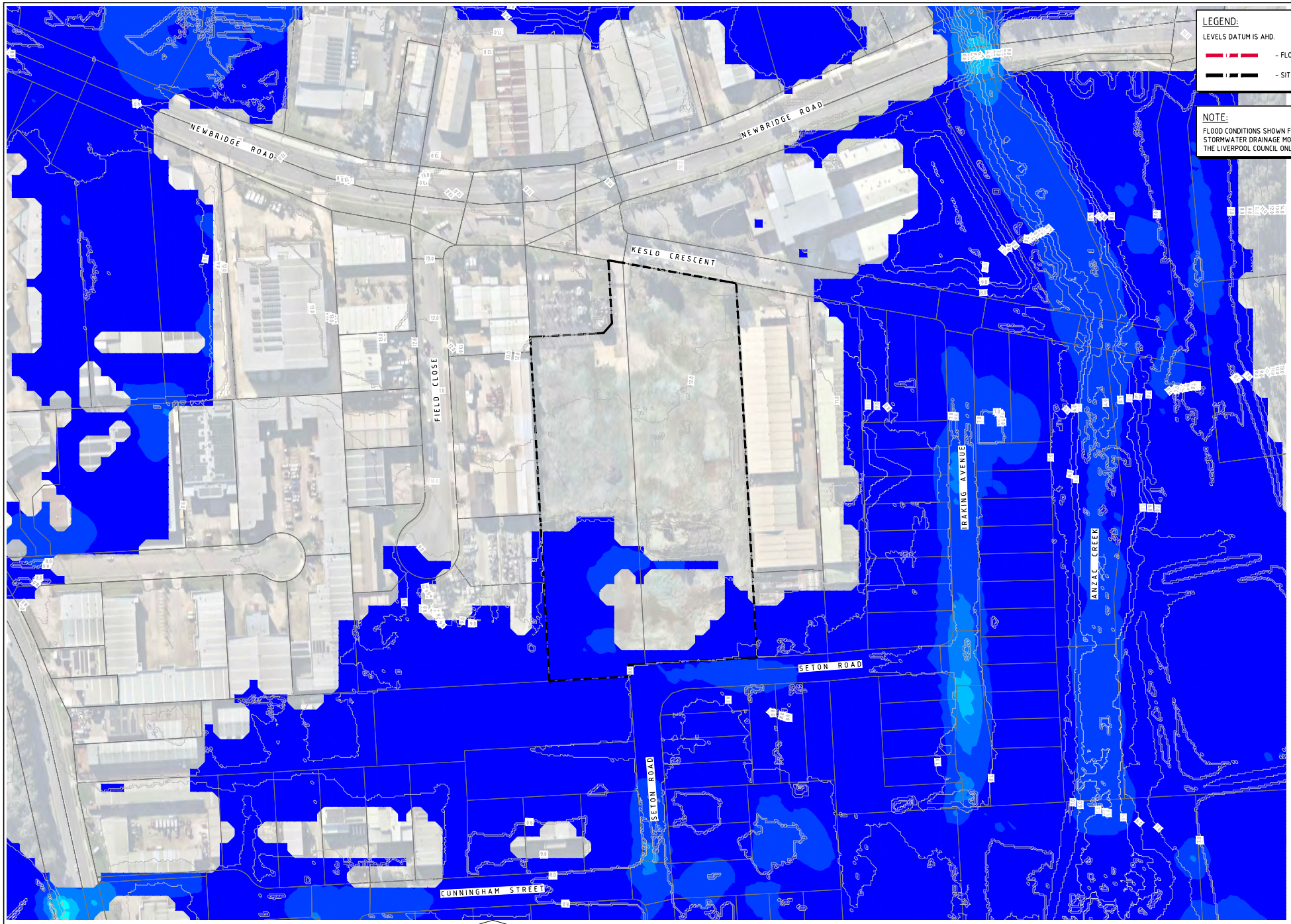
ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9253 7699 f: +61 2 9241 3733
e: mail@costinroe.com.au w: costinroe.com.au
CRC COSTIN ROE CONSULTING
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
1% AEP PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN

DRAWING No: C014972.02-F230
ISSUE: B



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE PRE-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD VELOCITY (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.250	
2	0.250	0.500	
3	0.500	0.750	
4	0.750	1.000	
5	1.000	1.250	
6	1.250	1.500	
7	1.500	1.750	
8	1.750	2.000	
9	2.000	2.250	
10	2.250	2.500	
11	2.500	2.750	
12	2.750	3.000	
13	3.000	3.250	
14	3.250	3.500	
15	3.500	3.750	
16	3.750	4.000	
17	4.000	4.250	
18	4.250	4.500	
19	4.500	4.750	
20	4.750	5.000	

1% AEP PRE-DEVELOPMENT FLOOD VELOCITY PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	17.10.25	B
ISSUED FOR INFORMATION	14.10.25	A

ARCHITECT: PACE ARCHITECTS
CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F231

CONSULT AUSTRALIA

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3733
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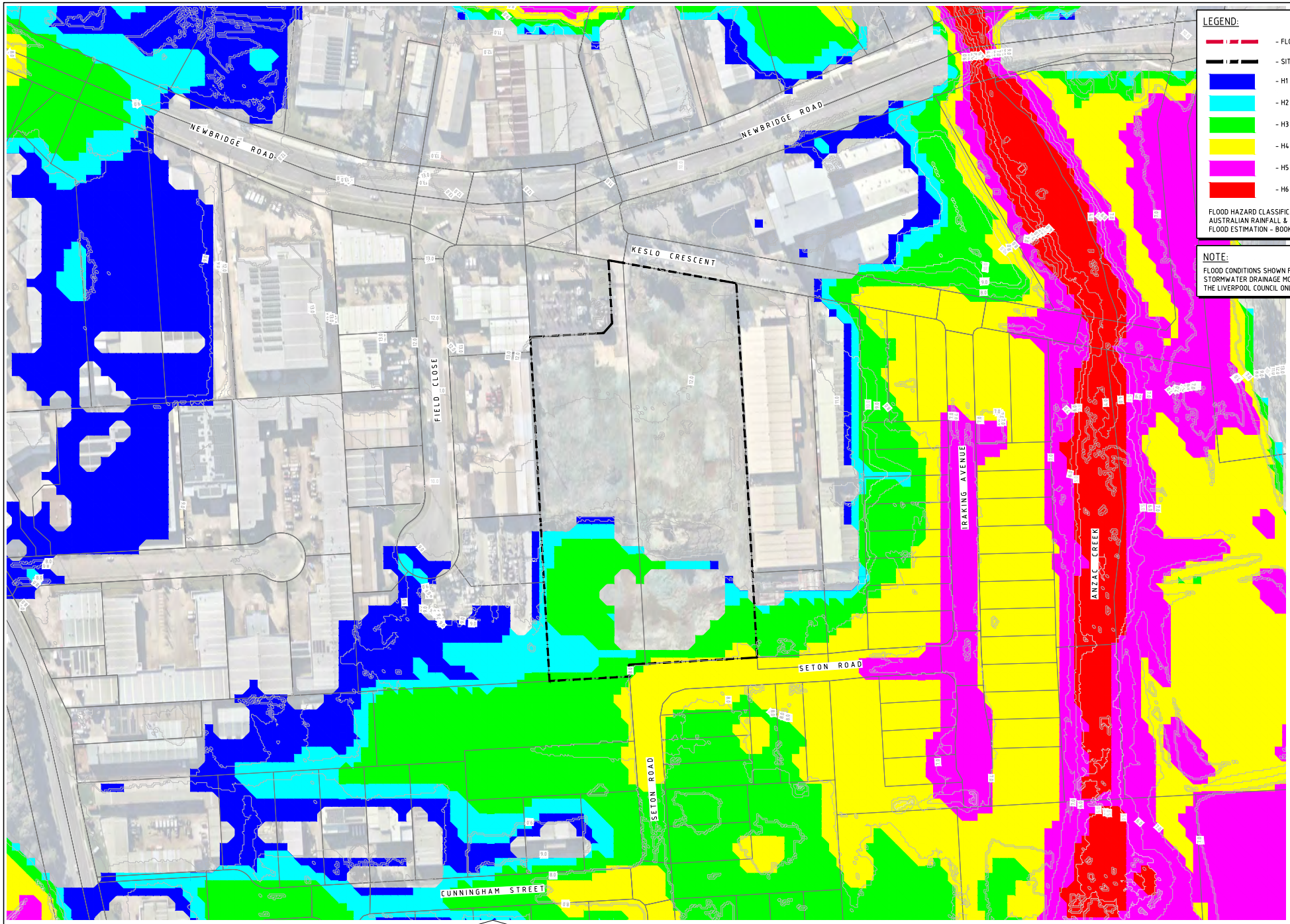
CRC COSTIN ROE CONSULTING
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
1% AEP PRE-DEVELOPMENT FLOOD VELOCITY PLAN

DRAWING No: C014972.02-F231
ISSUE: B



LEGEND:

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY
- H1
- H2
- H3
- H4
- H5
- H6

FLOOD HAZARD CLASSIFICATION AS PER AUSTRALIAN RAINFALL & RUNOFF 2019, A GUIDE TO FLOOD ESTIMATION – BOOK 6 – FLOOD HYDRAULICS

NOTE:

FLOOD CONDITIONS SHOWN FOR THE PRE-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

1% AEP PRE-DEVELOPMENT FLOOD HAZARD PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	17.10.25	B
ISSUED FOR INFORMATION	14.10.25	A

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F232

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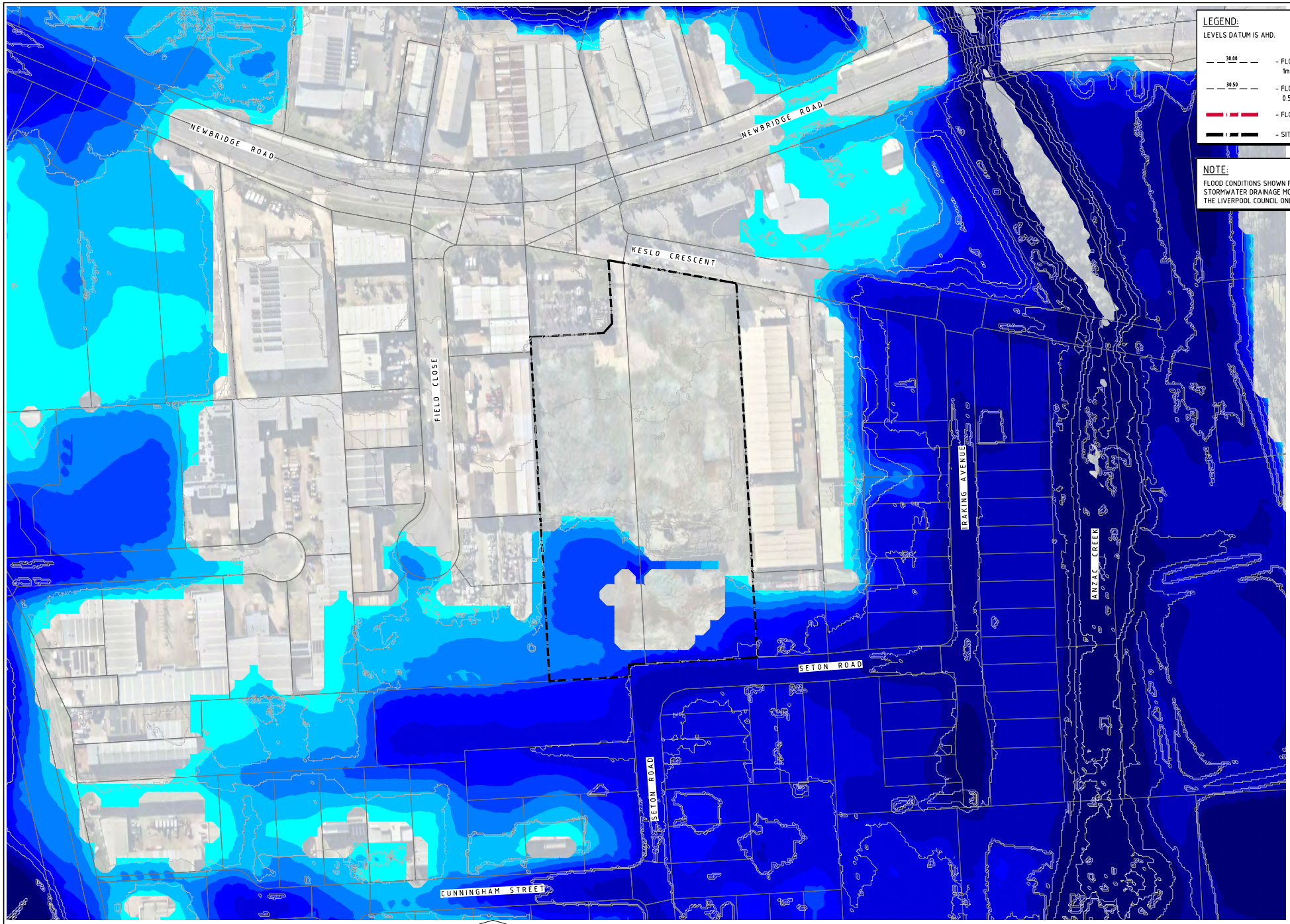
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
1% AEP PRE-DEVELOPMENT FLOOD HAZARD PLAN

DRAWING No: C014972.02-F232
ISSUE: B



LEGEND:

LEVELS DATUM IS AHD.

- 30.00 – FLOOD LEVEL CONTOUR (MAJOR) 1m INTERVALS
- 30.50 – FLOOD LEVEL CONTOUR (MINOR) 0.5m INTERVALS
- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE PRE-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD DEPTH (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.200	
2	0.200	0.400	
3	0.400	0.600	
4	0.600	0.800	
5	0.800	1.000	
6	1.000	1.500	
7	1.500	2.000	
8	2.000	2.500	
9	2.500	5.000	

0.5% AEP PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

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PROJECT
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DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F240

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Level 4, 8 Windmill Street, Millers Point NSW 2000
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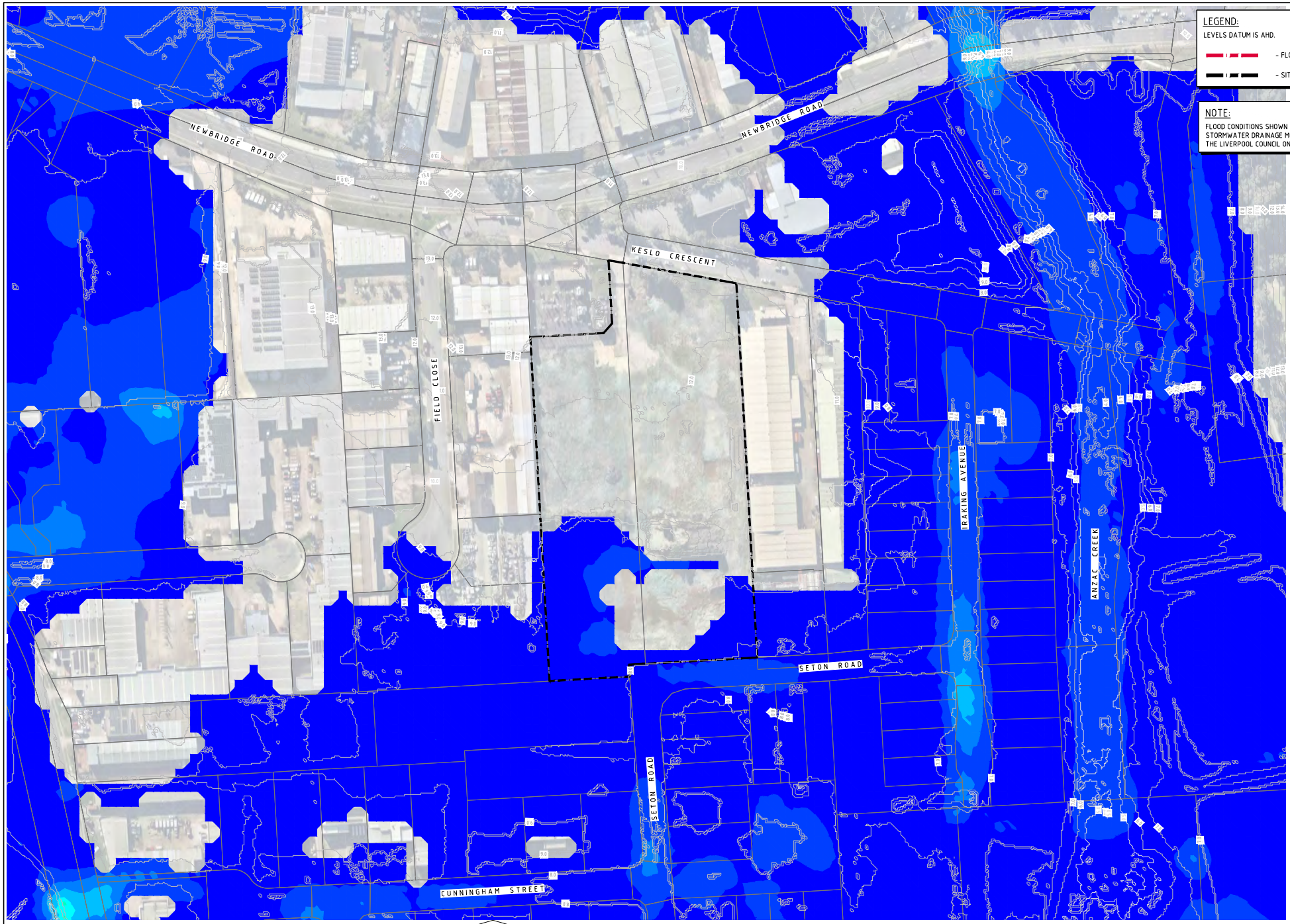
CRC COSTIN ROE CONSULTING
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
0.5% AEP PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN

DRAWING No: C014972.02-F240
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE PRE-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD VELOCITY (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.250	
2	0.250	0.500	
3	0.500	0.750	
4	0.750	1.000	
5	1.000	1.250	
6	1.250	1.500	
7	1.500	1.750	
8	1.750	2.000	
9	2.000	2.250	
10	2.250	2.500	
11	2.500	2.750	
12	2.750	3.000	
13	3.000	3.250	
14	3.250	3.500	
15	3.500	3.750	
16	3.750	4.000	
17	4.000	4.250	
18	4.250	4.500	
19	4.500	4.750	
20	4.750	5.000	

0.5% AEP PRE-DEVELOPMENT FLOOD VELOCITY PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F241

CONSULT AUSTRALIA

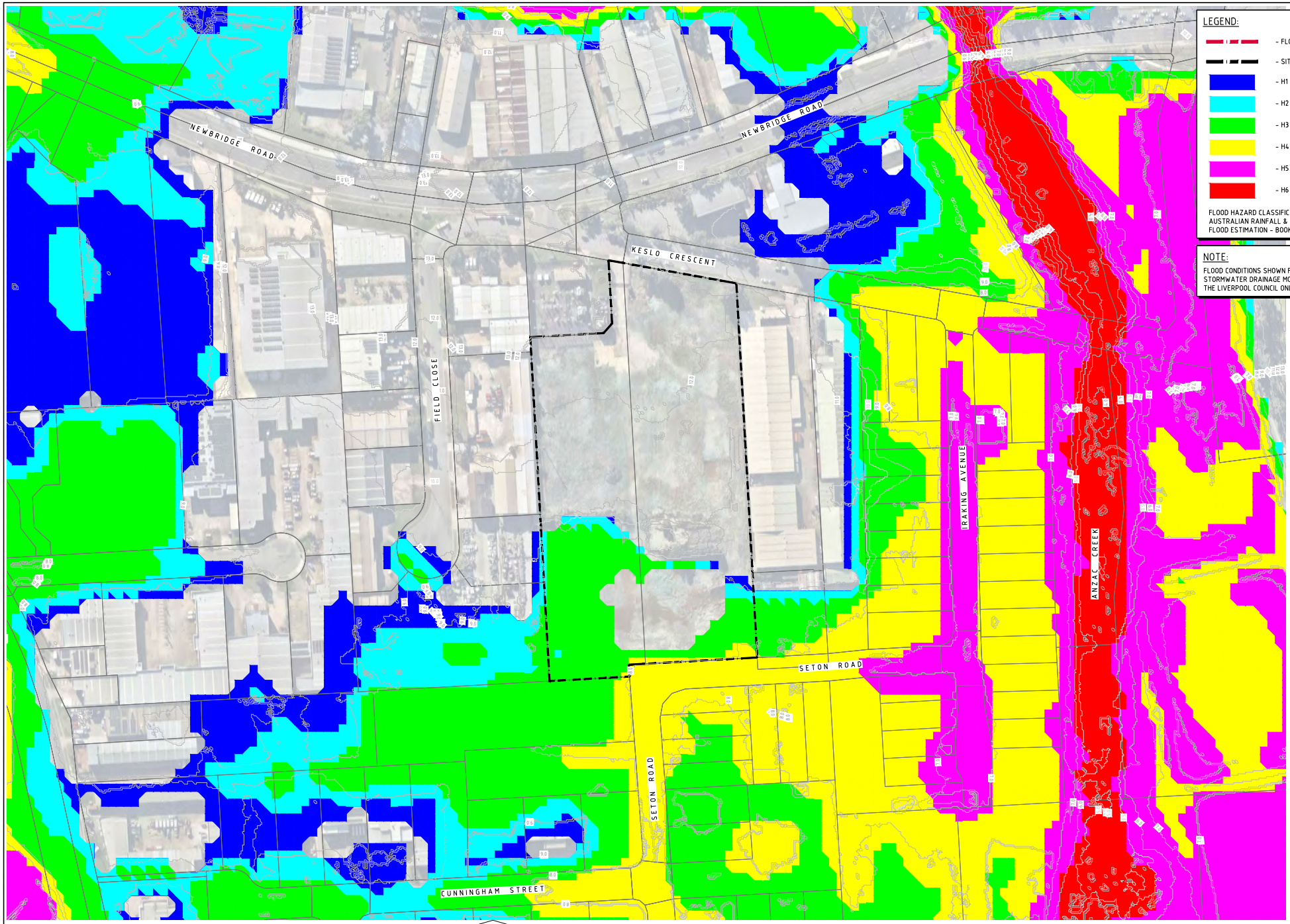
Costin Roe Consulting Pty Ltd.
ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

CRC COSTIN ROE CONSULTING — CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
0.5% AEP PRE-DEVELOPMENT FLOOD VELOCITY PLAN

DRAWING No: C014972.02-F241

ISSUE: A



LEGEND:

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY
- H1
- H2
- H3
- H4
- H5
- H6

FLOOD HAZARD CLASSIFICATION AS PER AUSTRALIAN RAINFALL & RUNOFF 2019, A GUIDE TO FLOOD ESTIMATION – BOOK 6 – FLOOD HYDRAULICS

NOTE:

FLOOD CONDITIONS SHOWN FOR THE PRE-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

0.5% AEP PRE-DEVELOPMENT FLOOD HAZARD PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A			
AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F242

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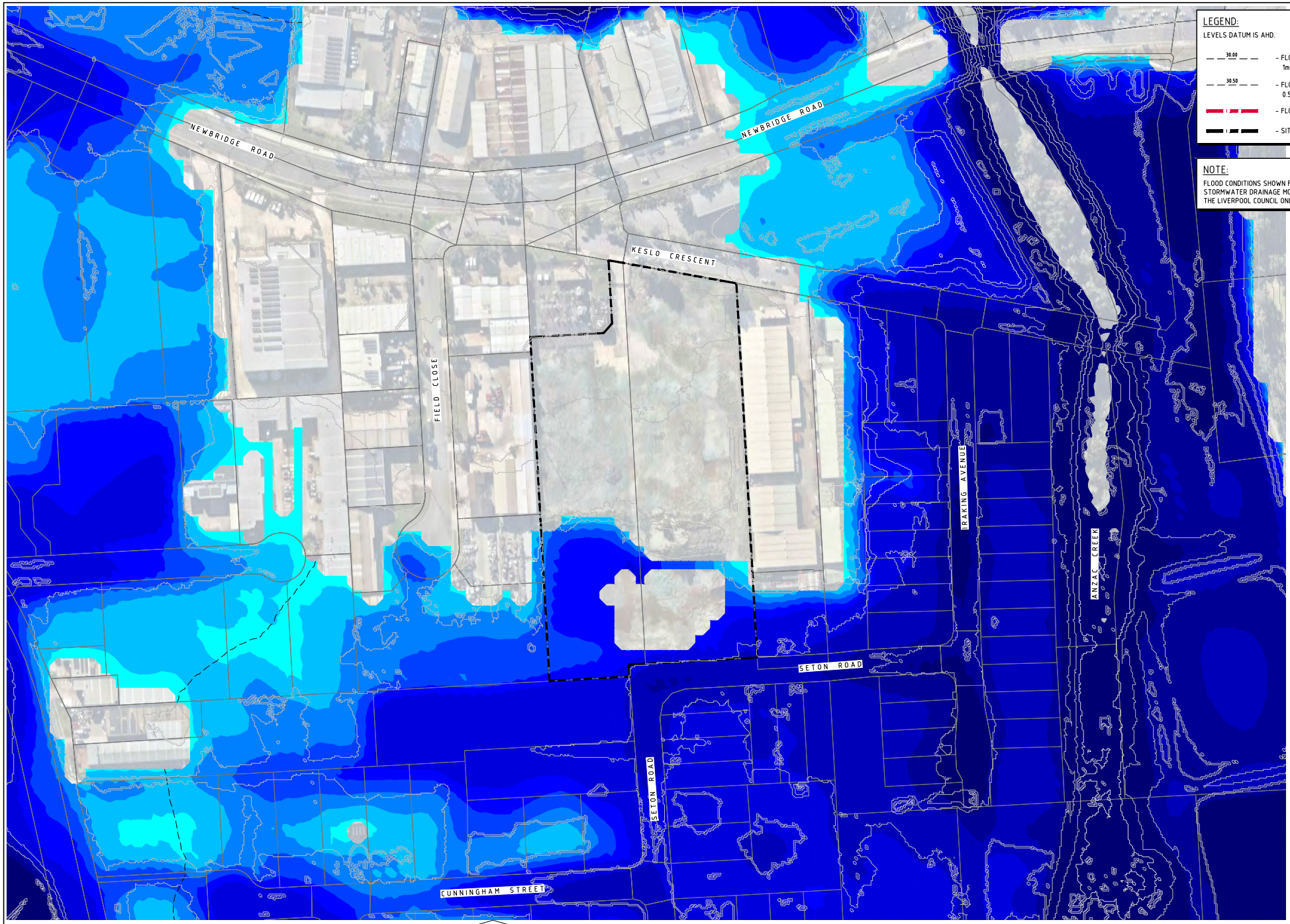
CRC COSTIN ROE CONSULTING — CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
0.5% AEP PRE-DEVELOPMENT FLOOD HAZARD PLAN

DRAWING No: C014972.02-F242
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- 30.00 – FLOOD LEVEL CONTOUR (MAJOR) 1m INTERVALS
- 30.50 – FLOOD LEVEL CONTOUR (MINOR) 0.5m INTERVALS
- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE PRE-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD DEPTH (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.200	
2	0.200	0.400	
3	0.400	0.600	
4	0.600	0.800	
5	0.800	1.000	
6	1.000	1.500	
7	1.500	2.000	
8	2.000	2.500	
9	2.500	5.000	

0.2% AEP PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS
CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F250

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au
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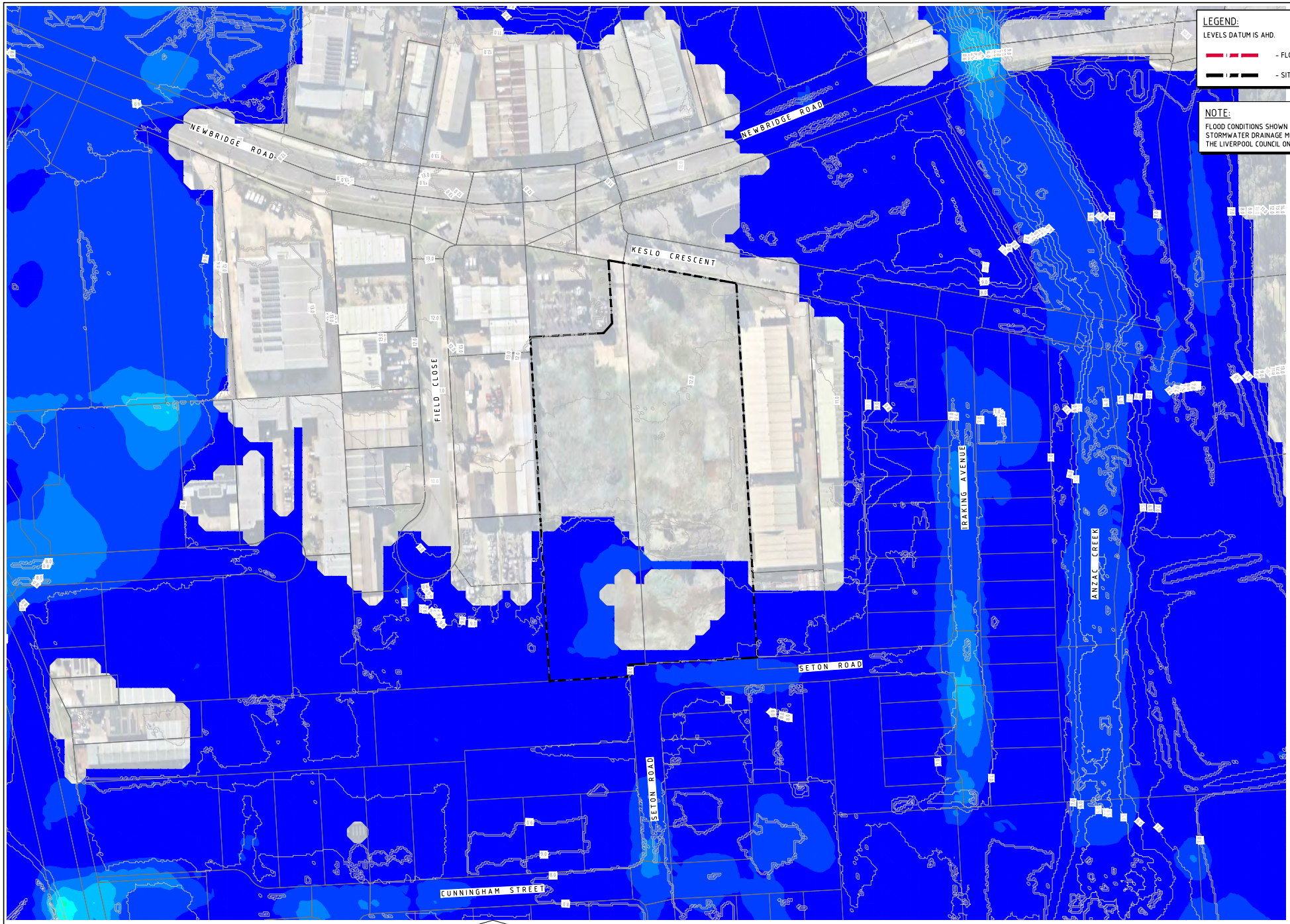
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
0.2% AEP PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN

DRAWING No: C014972.02-F250
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE PRE-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD VELOCITY (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.250	
2	0.250	0.500	
3	0.500	0.750	
4	0.750	1.000	
5	1.000	1.250	
6	1.250	1.500	
7	1.500	1.750	
8	1.750	2.000	
9	2.000	2.250	
10	2.250	2.500	
11	2.500	2.750	
12	2.750	3.000	
13	3.000	3.250	
14	3.250	3.500	
15	3.500	3.750	
16	3.750	4.000	
17	4.000	4.250	
18	4.250	4.500	
19	4.500	4.750	
20	4.750	5.000	

0.2% AEP PRE-DEVELOPMENT FLOOD VELOCITY PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F251

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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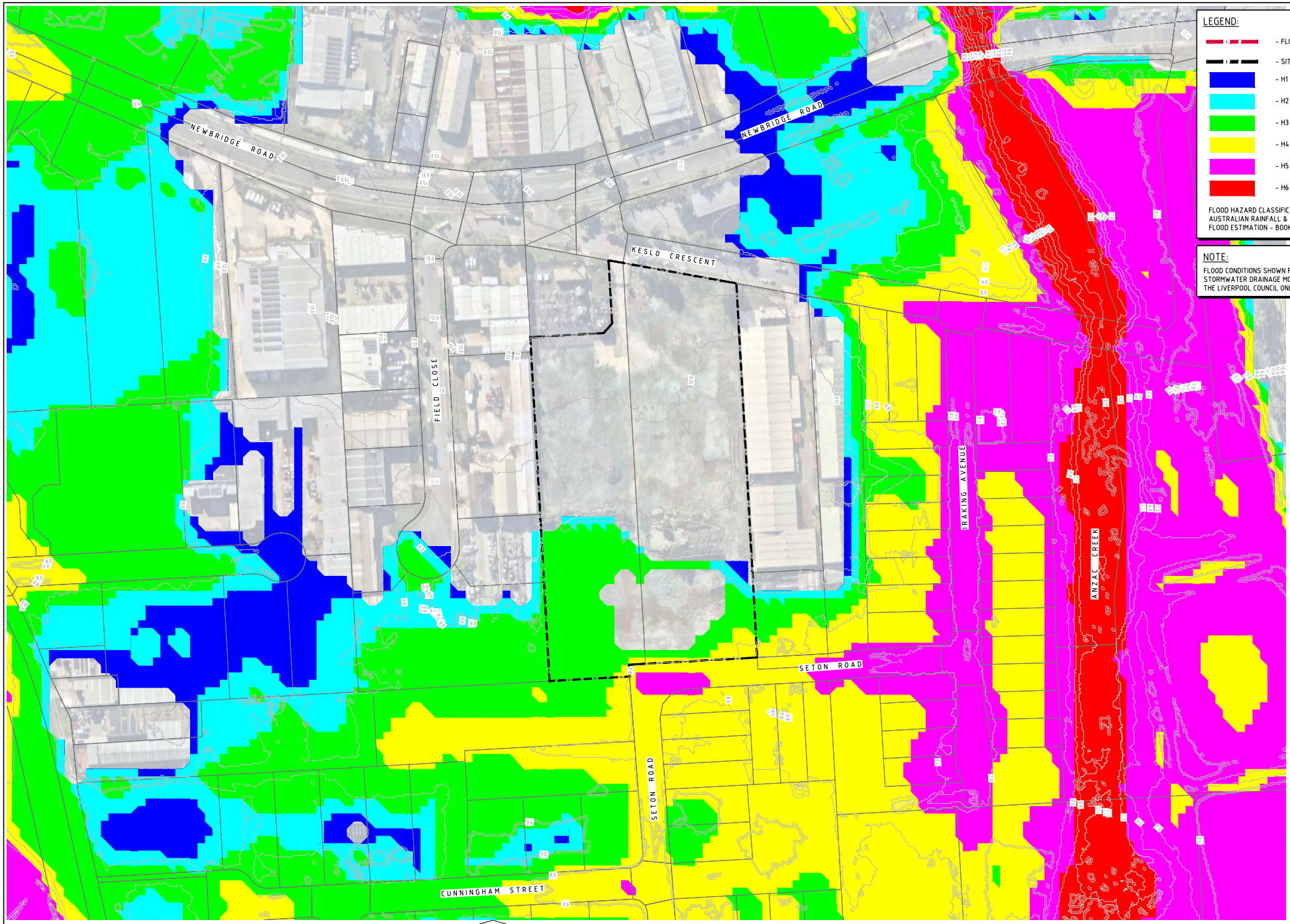
DRAWING TITLE
0.2% AEP PRE-DEVELOPMENT FLOOD VELOCITY PLAN

DRAWING No: C014972.02-F251

ISSUE: A



LEGEND:

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY
- H1
- H2
- H3
- H4
- H5
- H6

FLOOD HAZARD CLASSIFICATION AS PER AUSTRALIAN RAINFALL & RUNOFF 2019, A GUIDE TO FLOOD ESTIMATION – BOOK 6 – FLOOD HYDRAULICS

NOTE:

FLOOD CONDITIONS SHOWN FOR THE PRE-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

0.2% AEP PRE-DEVELOPMENT FLOOD HAZARD PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F252

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9253 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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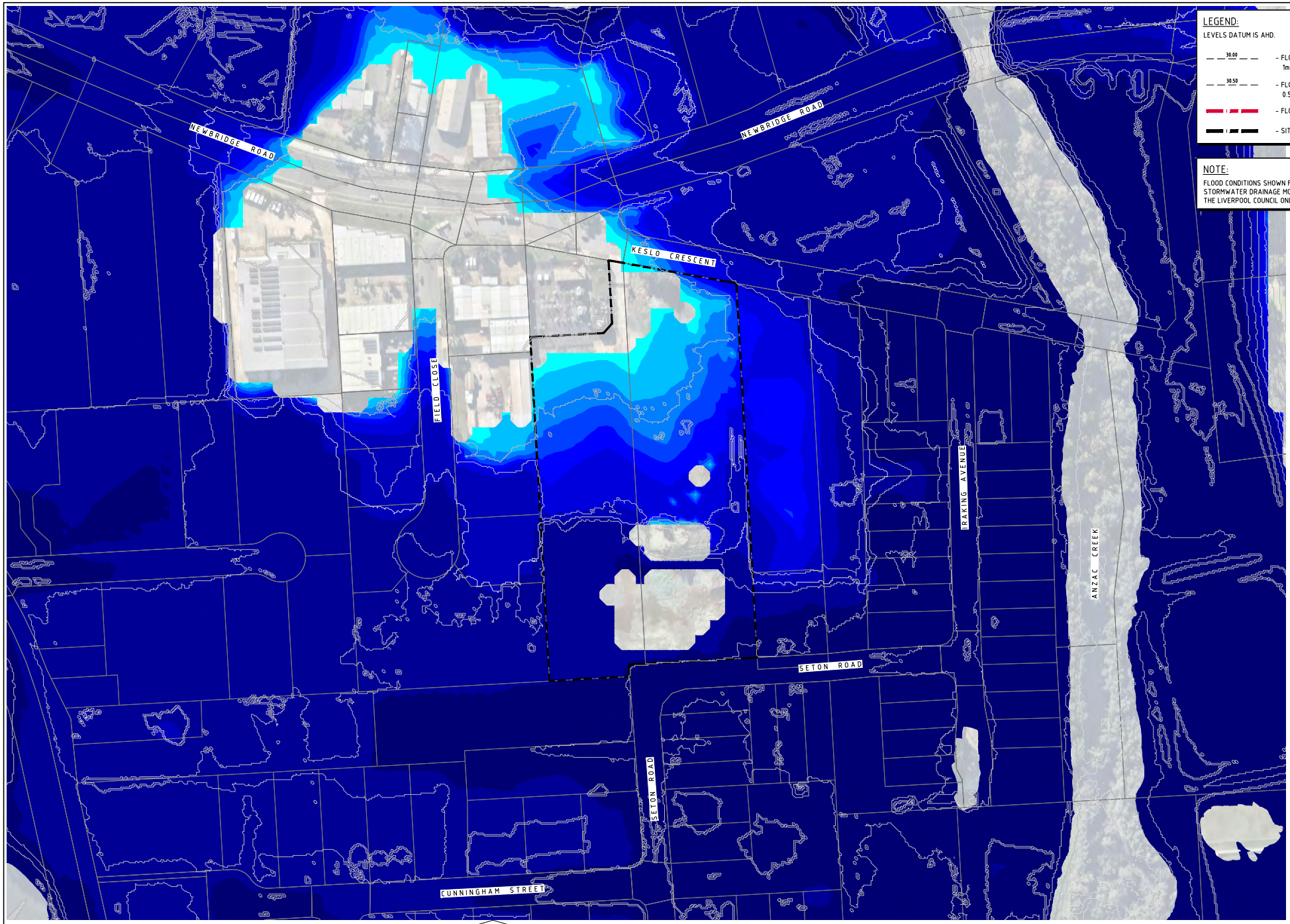
DRAWING TITLE
0.2% AEP PRE-DEVELOPMENT FLOOD HAZARD PLAN

DRAWING No: C014972.02-F252

ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- 30.00 – FLOOD LEVEL CONTOUR (MAJOR) 1m INTERVALS
- 30.50 – FLOOD LEVEL CONTOUR (MINOR) 0.5m INTERVALS
- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE PRE-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD DEPTH (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.200	
2	0.200	0.400	
3	0.400	0.600	
4	0.600	0.800	
5	0.800	1.000	
6	1.000	1.500	
7	1.500	2.500	
8	2.500	4.000	
9	4.000	6.000	

PMF PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F260

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au
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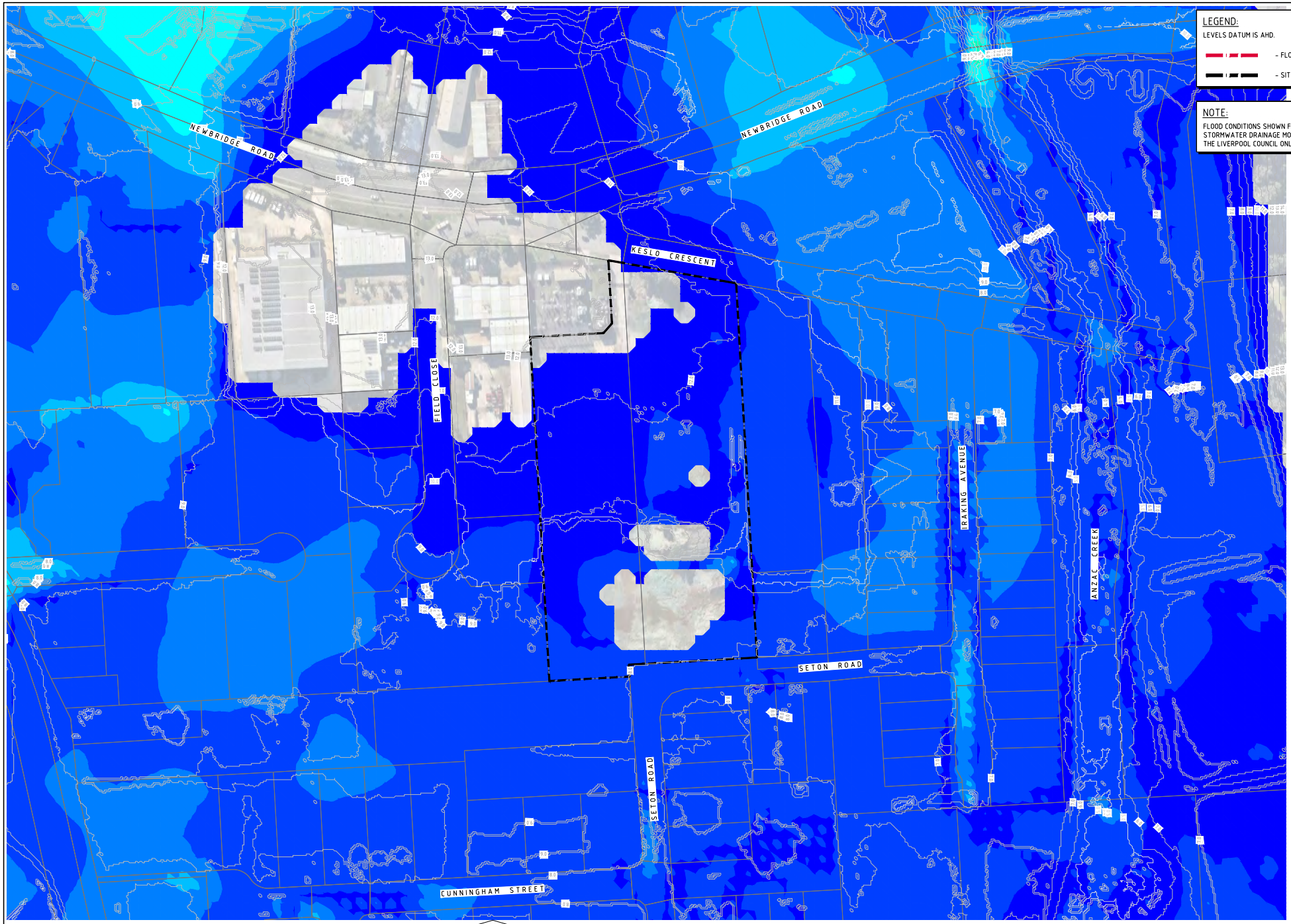
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
PMF PRE-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN

DRAWING No: C014972.02-F260
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE PRE-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD VELOCITY (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.250	
2	0.250	0.500	
3	0.500	0.750	
4	0.750	1.000	
5	1.000	1.250	
6	1.250	1.500	
7	1.500	1.750	
8	1.750	2.000	
9	2.000	2.250	
10	2.250	2.500	
11	2.500	2.750	
12	2.750	3.000	
13	3.000	3.250	
14	3.250	3.500	
15	3.500	3.750	
16	3.750	4.000	
17	4.000	4.250	
18	4.250	4.500	
19	4.500	4.750	
20	4.750	5.000	

PMF PRE-DEVELOPMENT FLOOD VELOCITY PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F261

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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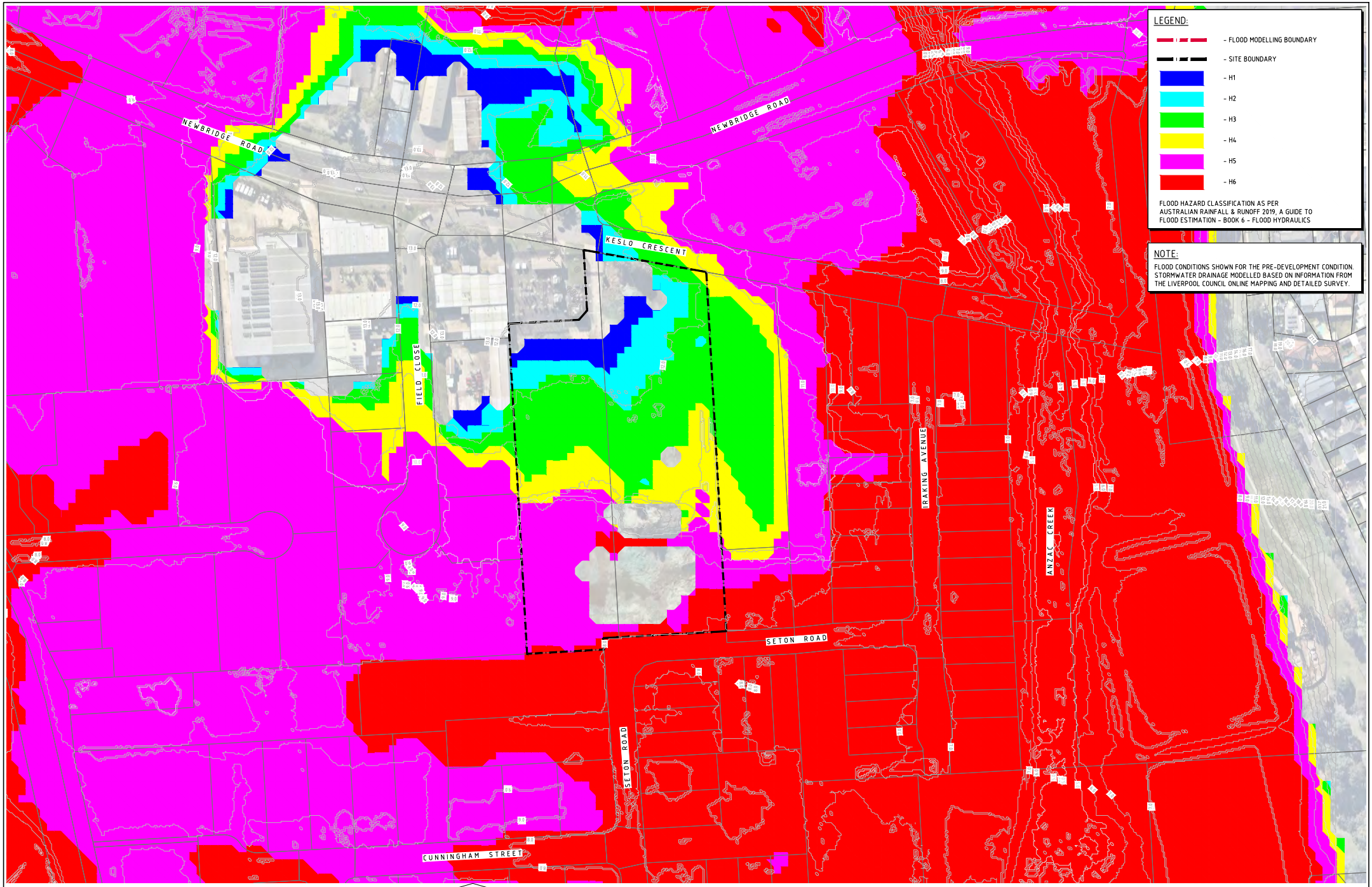
DRAWING TITLE
PMF PRE-DEVELOPMENT FLOOD VELOCITY PLAN

DRAWING No: C014972.02-F261
ISSUE: A



PMF PRE-DEVELOPMENT FLOOD HAZARD PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT
PACE ARCHITECTS

CLIENT
VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F262

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
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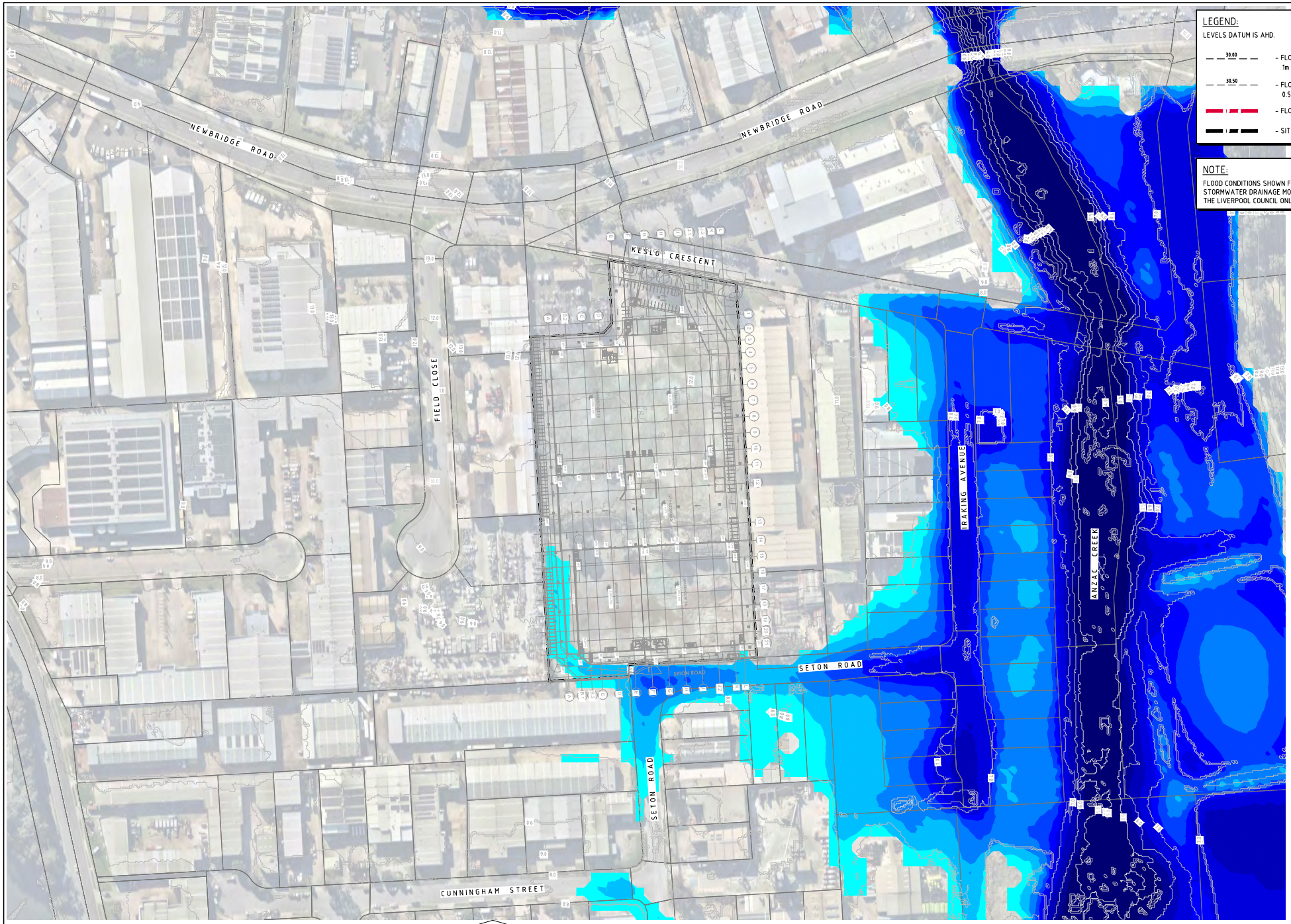
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
PMF PRE-DEVELOPMENT FLOOD HAZARD PLAN

DRAWING No: C014972.02-F262
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- 30.00 – FLOOD LEVEL CONTOUR (MAJOR) 1m INTERVALS
- 30.50 – FLOOD LEVEL CONTOUR (MINOR) 0.5m INTERVALS
- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD DEPTH (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.200	
2	0.200	0.400	
3	0.400	0.600	
4	0.600	0.800	
5	0.800	1.000	
6	1.000	1.500	
7	1.500	2.000	
8	2.000	2.500	
9	2.500	5.000	

5% AEP POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F320

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 t: +61 2 9241 3733
e: mail@costinroe.com.au w: costinroe.com.au

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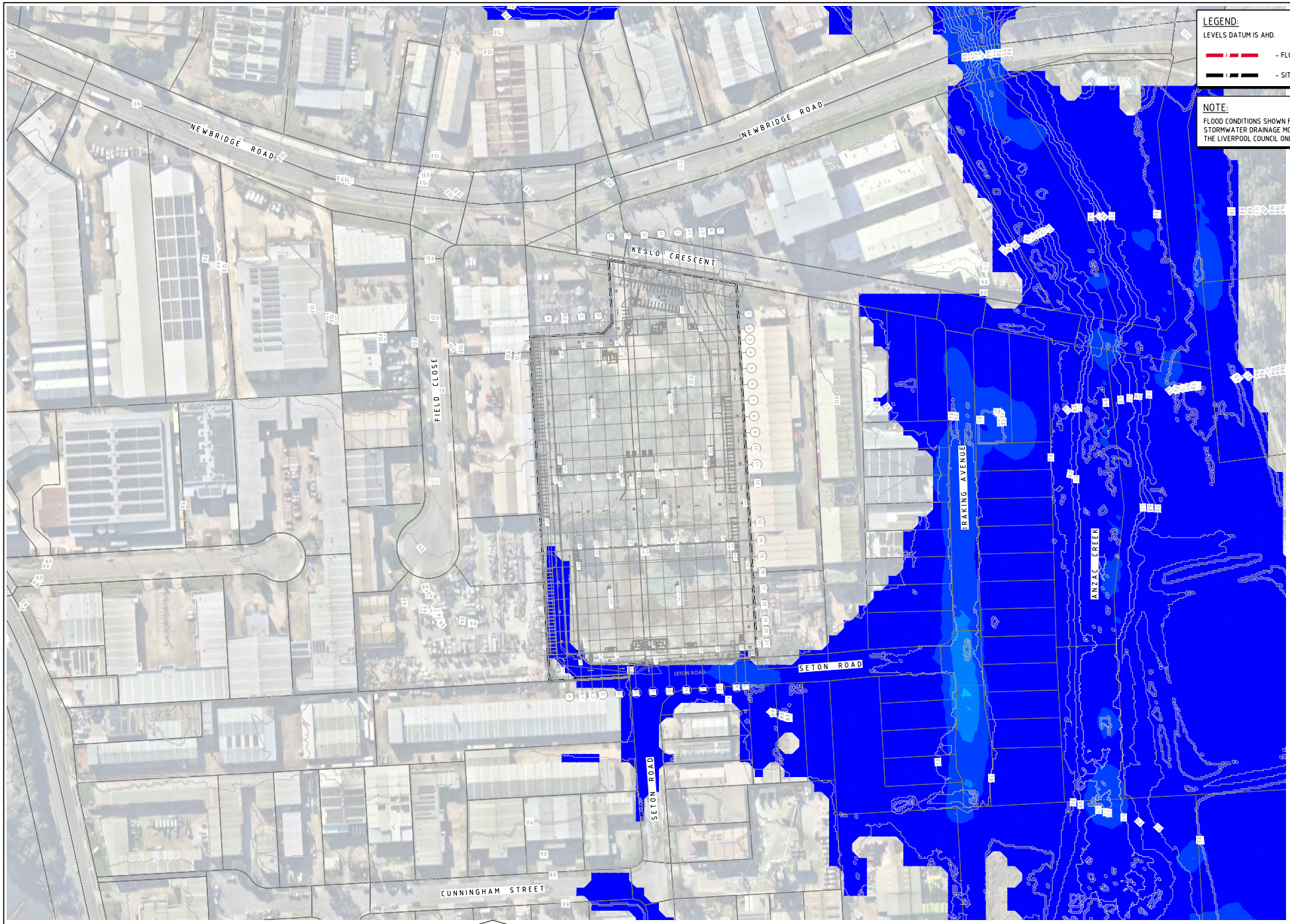
DRAWING TITLE
5% AEP POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN

DRAWING No: C014972.02-F320
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD VELOCITY (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.250	
2	0.250	0.500	
3	0.500	0.750	
4	0.750	1.000	
5	1.000	1.250	
6	1.250	1.500	
7	1.500	1.750	
8	1.750	2.000	
9	2.000	2.250	
10	2.250	2.500	
11	2.500	2.750	
12	2.750	3.000	
13	3.000	3.250	
14	3.250	3.500	
15	3.500	3.750	
16	3.750	4.000	
17	4.000	4.250	
18	4.250	4.500	
19	4.500	4.750	
20	4.750	5.000	

5% AEP POST-DEVELOPMENT FLOOD VELOCITY PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014-972.02-F321

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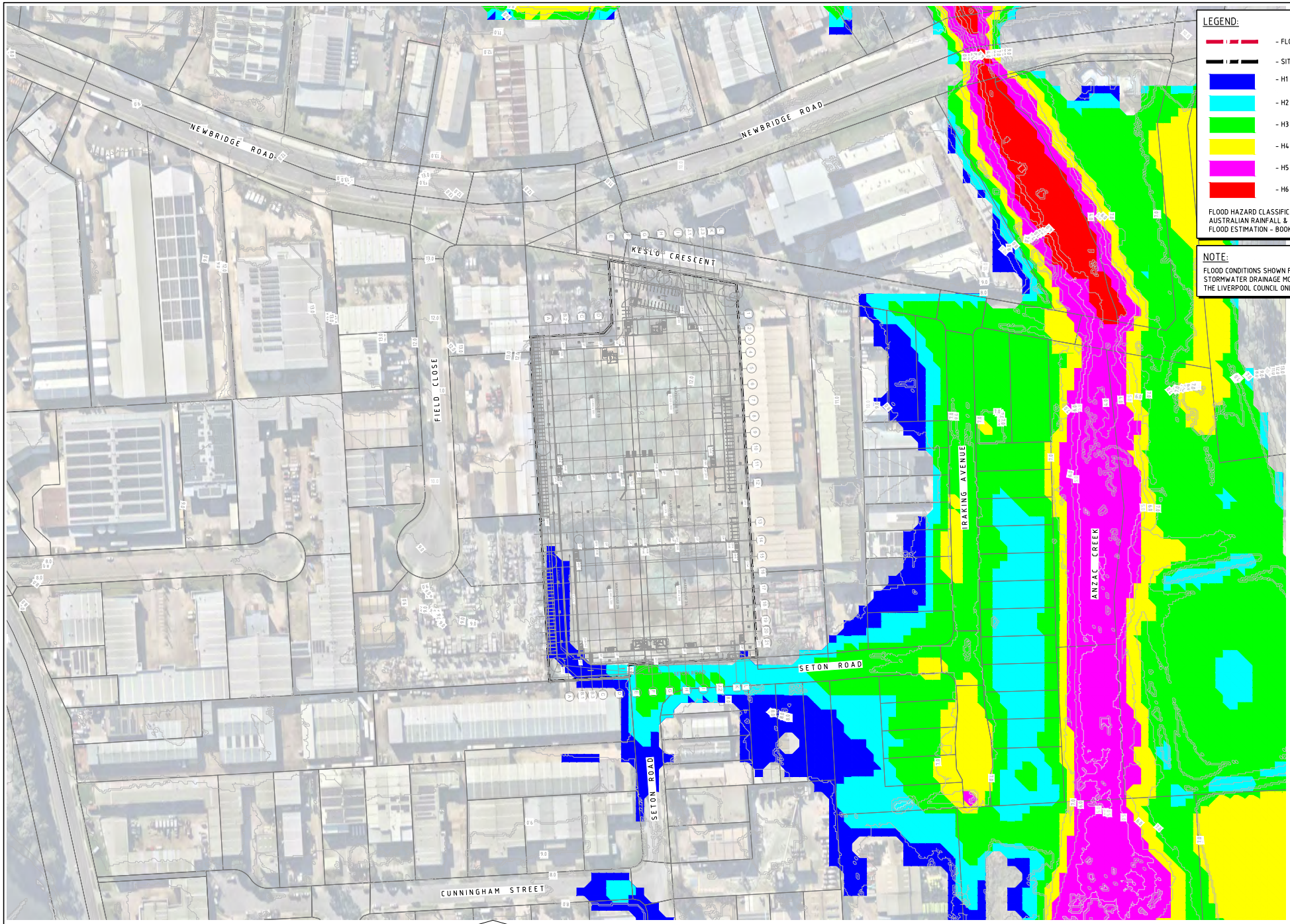
ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

CRC COSTIN ROE CONSULTING | CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
5% AEP POST-DEVELOPMENT FLOOD VELOCITY PLAN

DRAWING No: C014-972.02-F321

ISSUE: A



LEGEND:

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY
- H1
- H2
- H3
- H4
- H5
- H6

FLOOD HAZARD CLASSIFICATION AS PER AUSTRALIAN RAINFALL & RUNOFF 2019, A GUIDE TO FLOOD ESTIMATION – BOOK 6 – FLOOD HYDRAULICS

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

5% AEP POST-DEVELOPMENT FLOOD HAZARD PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F322

CONSULT AUSTRALIA

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Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
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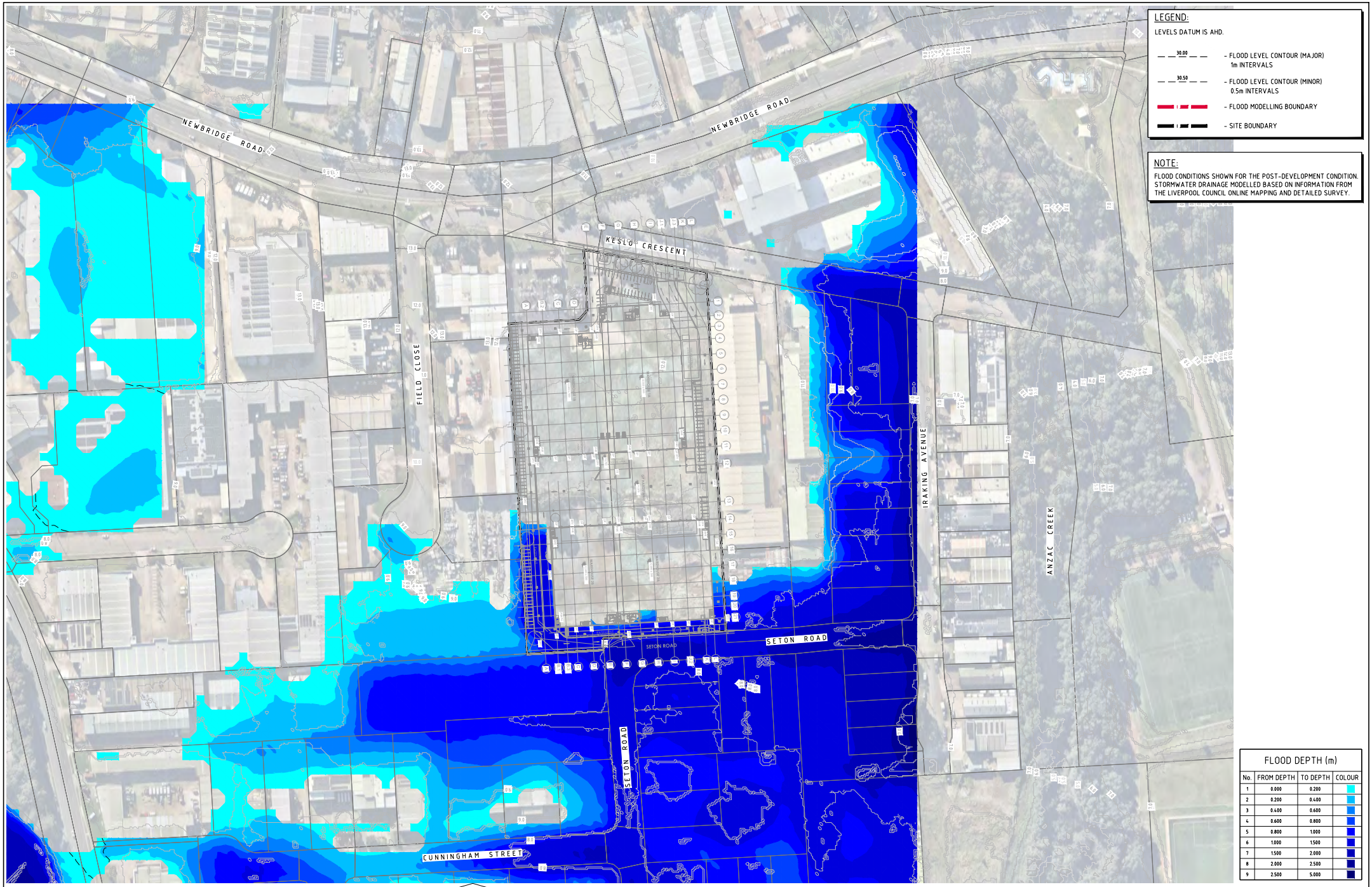
CRC COSTIN ROE CONSULTING — CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
5% AEP POST-DEVELOPMENT FLOOD HAZARD PLAN

DRAWING No: C014972.02-F322
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- 30.00 – FLOOD LEVEL CONTOUR (MAJOR) 1m INTERVALS
- 30.50 – FLOOD LEVEL CONTOUR (MINOR) 0.5m INTERVALS
- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD DEPTH (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.200	
2	0.200	0.400	
3	0.400	0.600	
4	0.600	0.800	
5	0.800	1.000	
6	1.000	1.500	
7	1.500	2.000	
8	2.000	2.500	
9	2.500	5.000	

1% AEP POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	17.10.25	B
ISSUED FOR INFORMATION	14.10.25	A

ARCHITECT: PACE ARCHITECTS
CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F330

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Costin Roe Consulting Pty Ltd.
ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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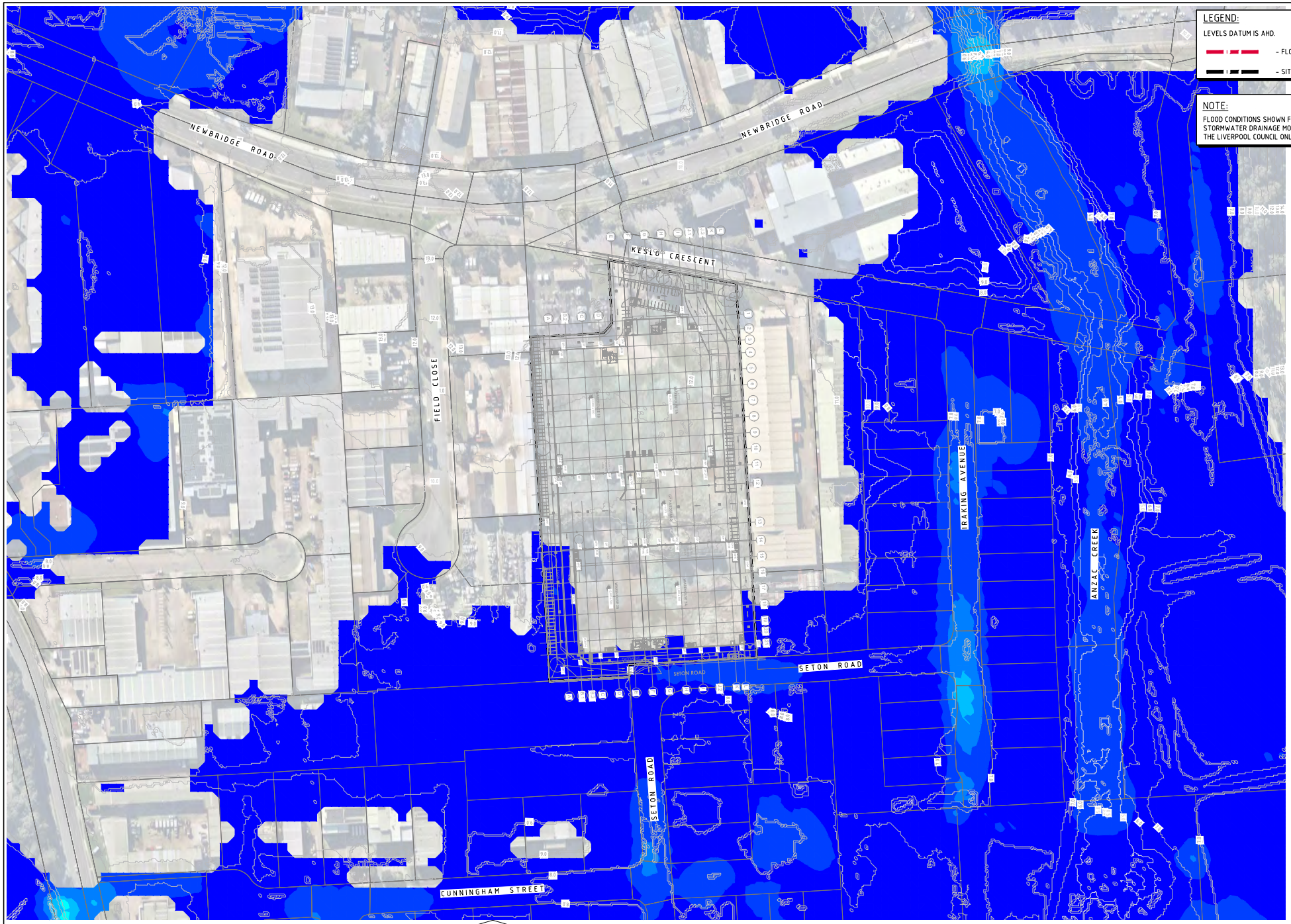
DRAWING TITLE
1% AEP POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN

DRAWING No: C014972.02-F330
ISSUE: B



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD VELOCITY (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.250	
2	0.250	0.500	
3	0.500	0.750	
4	0.750	1.000	
5	1.000	1.250	
6	1.250	1.500	
7	1.500	1.750	
8	1.750	2.000	
9	2.000	2.250	
10	2.250	2.500	
11	2.500	2.750	
12	2.750	3.000	
13	3.000	3.250	
14	3.250	3.500	
15	3.500	3.750	
16	3.750	4.000	
17	4.000	4.250	
18	4.250	4.500	
19	4.500	4.750	
20	4.750	5.000	

1% AEP POST-DEVELOPMENT FLOOD VELOCITY PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	17.10.25	B
ISSUED FOR INFORMATION	14.10.25	A

ARCHITECT: PACE ARCHITECTS
CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F331

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3733
e: mail@costinroe.com.au w: costinroe.com.au
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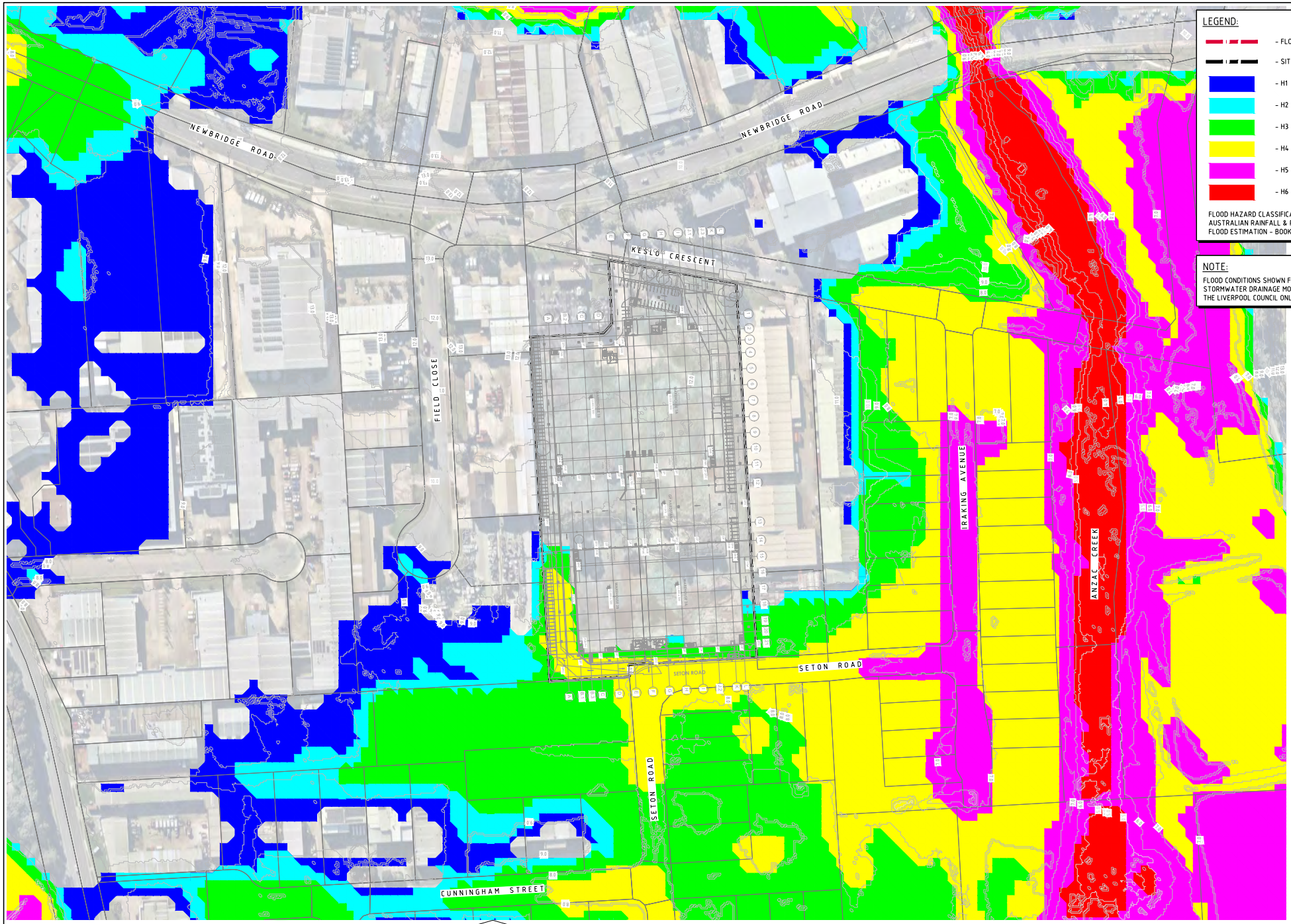
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
1% AEP POST-DEVELOPMENT FLOOD VELOCITY PLAN

DRAWING No: C014972.02-F331
ISSUE: B



LEGEND:

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY
- H1
- H2
- H3
- H4
- H5
- H6

FLOOD HAZARD CLASSIFICATION AS PER AUSTRALIAN RAINFALL & RUNOFF 2019, A GUIDE TO FLOOD ESTIMATION – BOOK 6 – FLOOD HYDRAULICS

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

1% AEP POST-DEVELOPMENT FLOOD HAZARD PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	17.10.25	B
ISSUED FOR INFORMATION	14.10.25	A

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F332

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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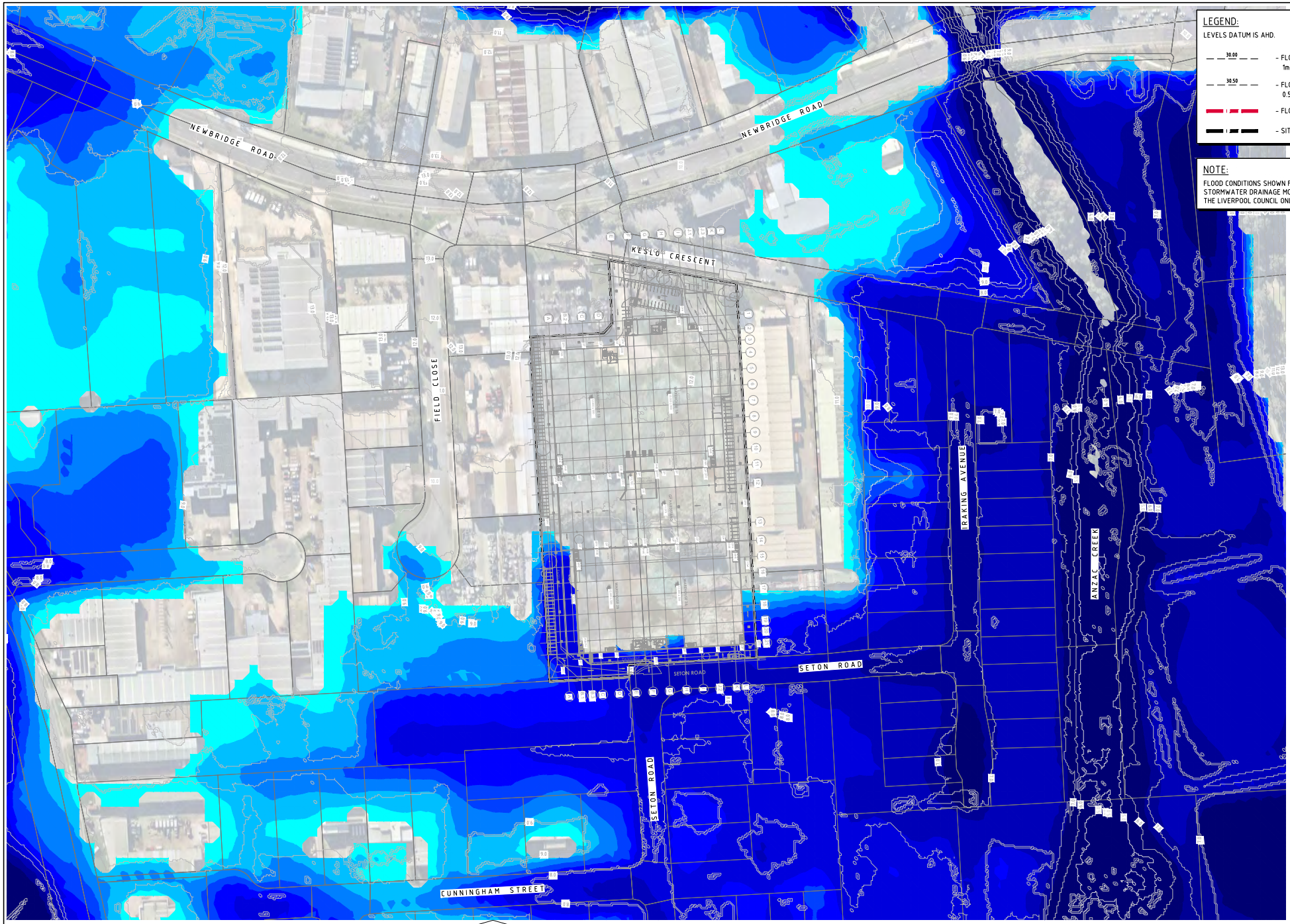
DRAWING TITLE
1% AEP POST-DEVELOPMENT FLOOD HAZARD PLAN

DRAWING No: C014972.02-F332
ISSUE: B



LEGEND:

LEVELS DATUM IS AHD.

- 30.00 – FLOOD LEVEL CONTOUR (MAJOR) 1m INTERVALS
- 30.50 – FLOOD LEVEL CONTOUR (MINOR) 0.5m INTERVALS
- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD DEPTH (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.200	
2	0.200	0.400	
3	0.400	0.600	
4	0.600	0.800	
5	0.800	1.000	
6	1.000	1.500	
7	1.500	2.000	
8	2.000	2.500	
9	2.500	5.000	

0.5% AEP POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS
CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F340

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au
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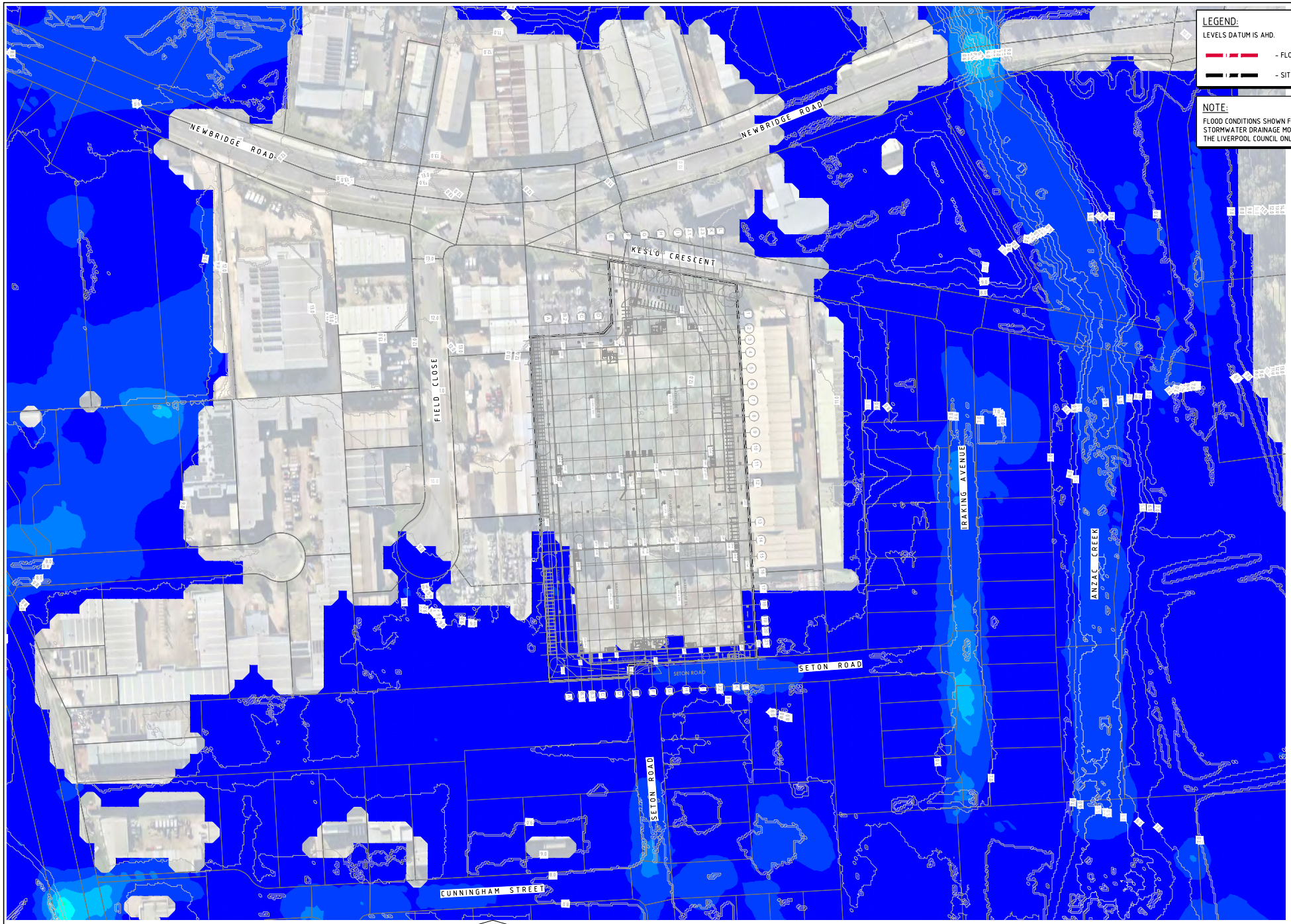
DRAWING TITLE
0.5% AEP POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN

DRAWING No: C014972.02-F340
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD VELOCITY (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.250	
2	0.250	0.500	
3	0.500	0.750	
4	0.750	1.000	
5	1.000	1.250	
6	1.250	1.500	
7	1.500	1.750	
8	1.750	2.000	
9	2.000	2.250	
10	2.250	2.500	
11	2.500	2.750	
12	2.750	3.000	
13	3.000	3.250	
14	3.250	3.500	
15	3.500	3.750	
16	3.750	4.000	
17	4.000	4.250	
18	4.250	4.500	
19	4.500	4.750	
20	4.750	5.000	

0.5% AEP POST-DEVELOPMENT FLOOD VELOCITY PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F341

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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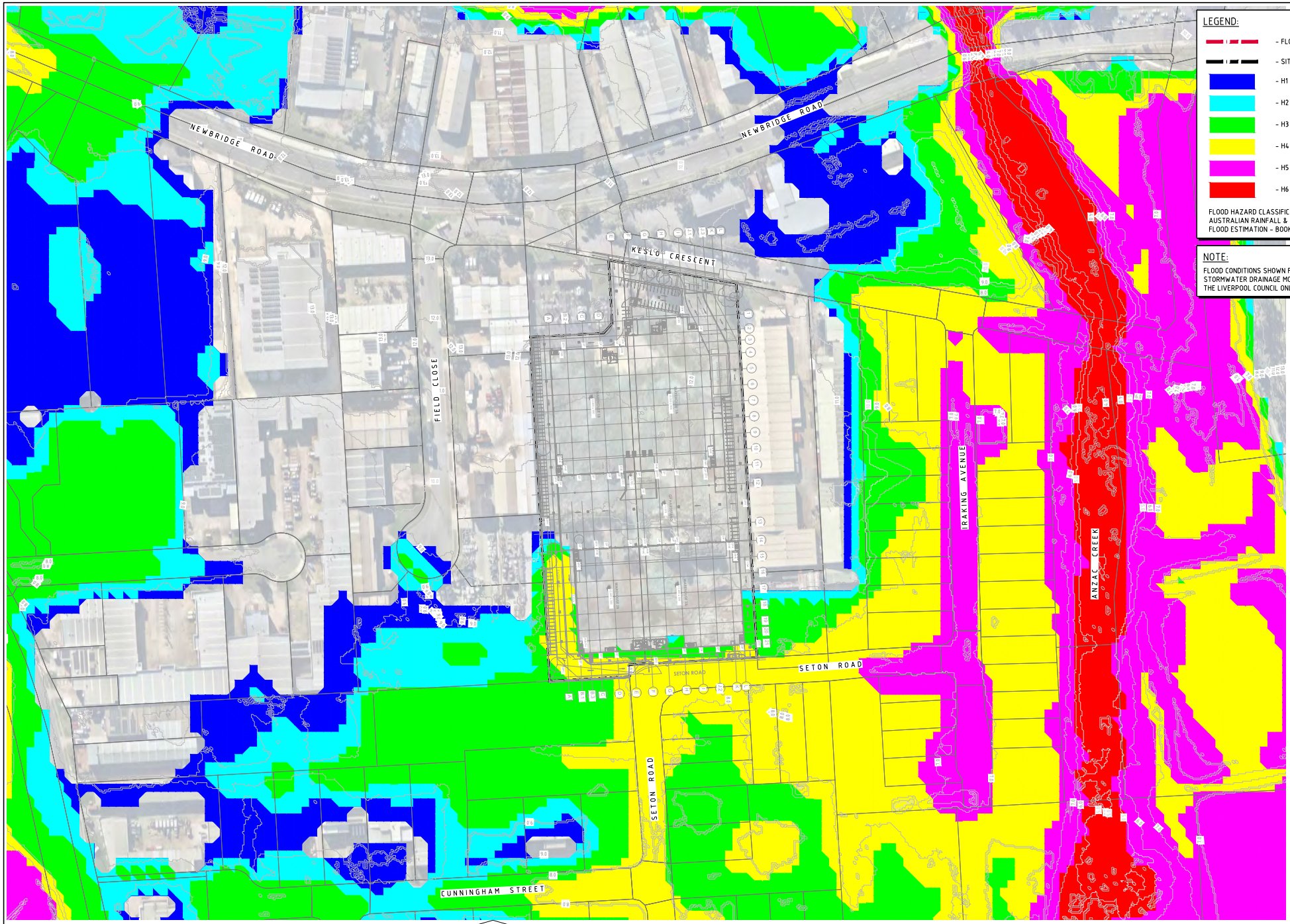
DRAWING TITLE
0.5% AEP POST-DEVELOPMENT FLOOD VELOCITY PLAN

DRAWING No: C014972.02-F341

ISSUE: A



LEGEND:

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY
- H1
- H2
- H3
- H4
- H5
- H6

FLOOD HAZARD CLASSIFICATION AS PER AUSTRALIAN RAINFALL & RUNOFF 2019, A GUIDE TO FLOOD ESTIMATION – BOOK 6 – FLOOD HYDRAULICS

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

0.5% AEP POST-DEVELOPMENT FLOOD HAZARD PLAN
SCALE ######

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F342

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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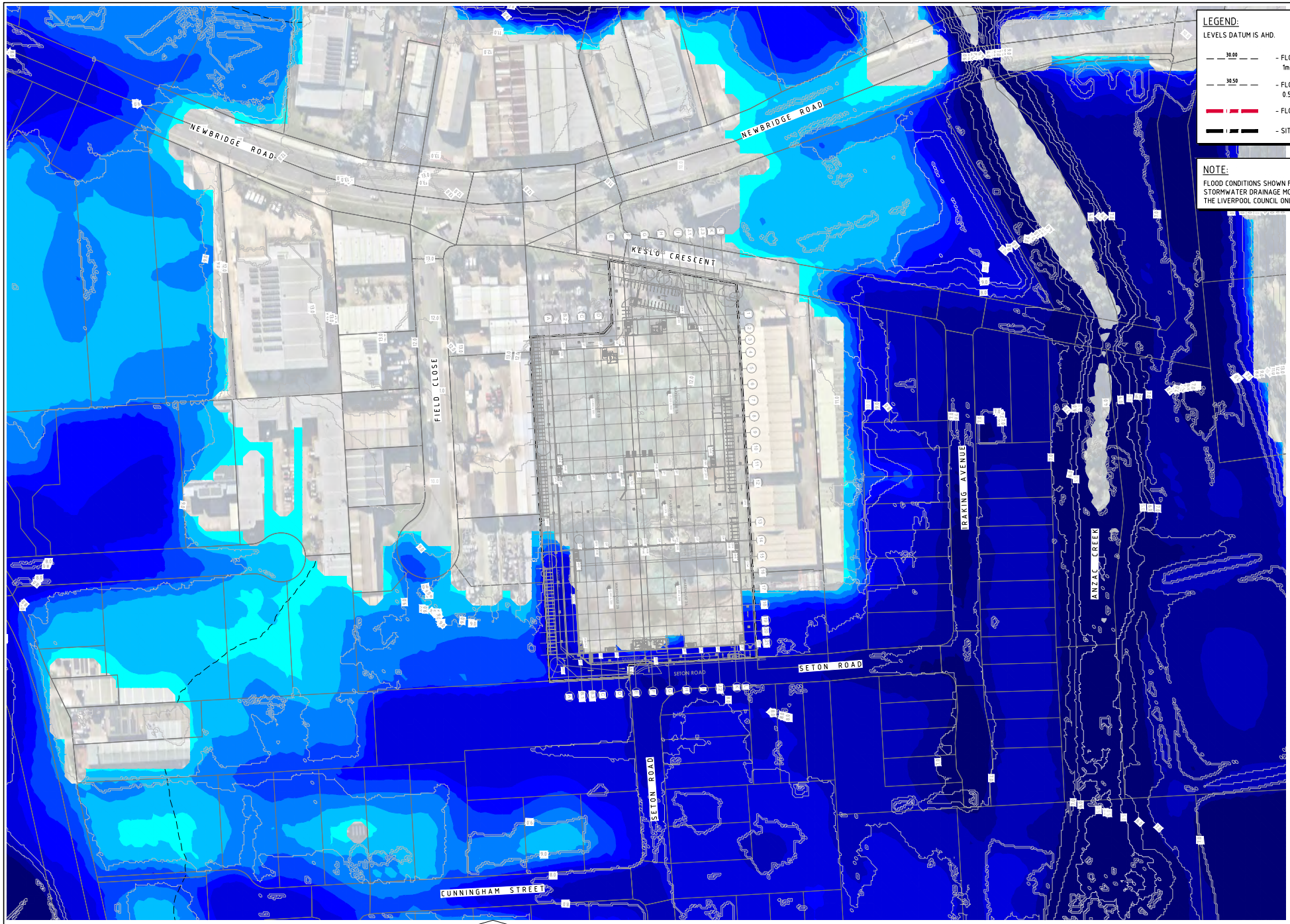
DRAWING TITLE
0.5% AEP POST-DEVELOPMENT FLOOD HAZARD PLAN

DRAWING No: C014972.02-F342
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- 30.00 – FLOOD LEVEL CONTOUR (MAJOR) 1m INTERVALS
- 30.50 – FLOOD LEVEL CONTOUR (MINOR) 0.5m INTERVALS
- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD DEPTH (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.200	
2	0.200	0.400	
3	0.400	0.600	
4	0.600	0.800	
5	0.800	1.000	
6	1.000	1.500	
7	1.500	2.000	
8	2.000	2.500	
9	2.500	5.000	

0.2% AEP POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS
CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F350

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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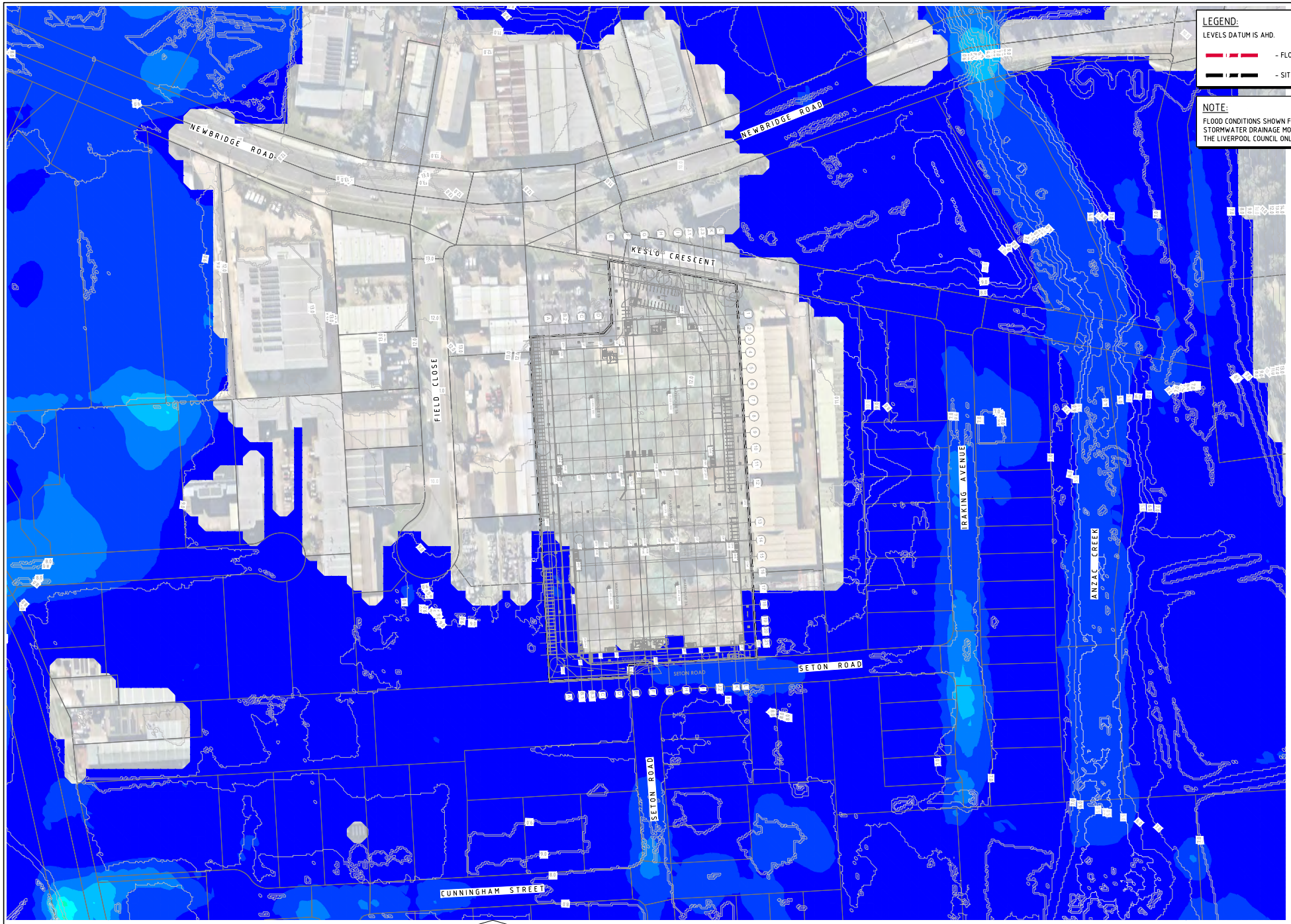
DRAWING TITLE
0.2% AEP POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN

DRAWING No: C014972.02-F350
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD VELOCITY (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.250	
2	0.250	0.500	
3	0.500	0.750	
4	0.750	1.000	
5	1.000	1.250	
6	1.250	1.500	
7	1.500	1.750	
8	1.750	2.000	
9	2.000	2.250	
10	2.250	2.500	
11	2.500	2.750	
12	2.750	3.000	
13	3.000	3.250	
14	3.250	3.500	
15	3.500	3.750	
16	3.750	4.000	
17	4.000	4.250	
18	4.250	4.500	
19	4.500	4.750	
20	4.750	5.000	

0.2% AEP POST-DEVELOPMENT FLOOD VELOCITY PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014-972.02-F351

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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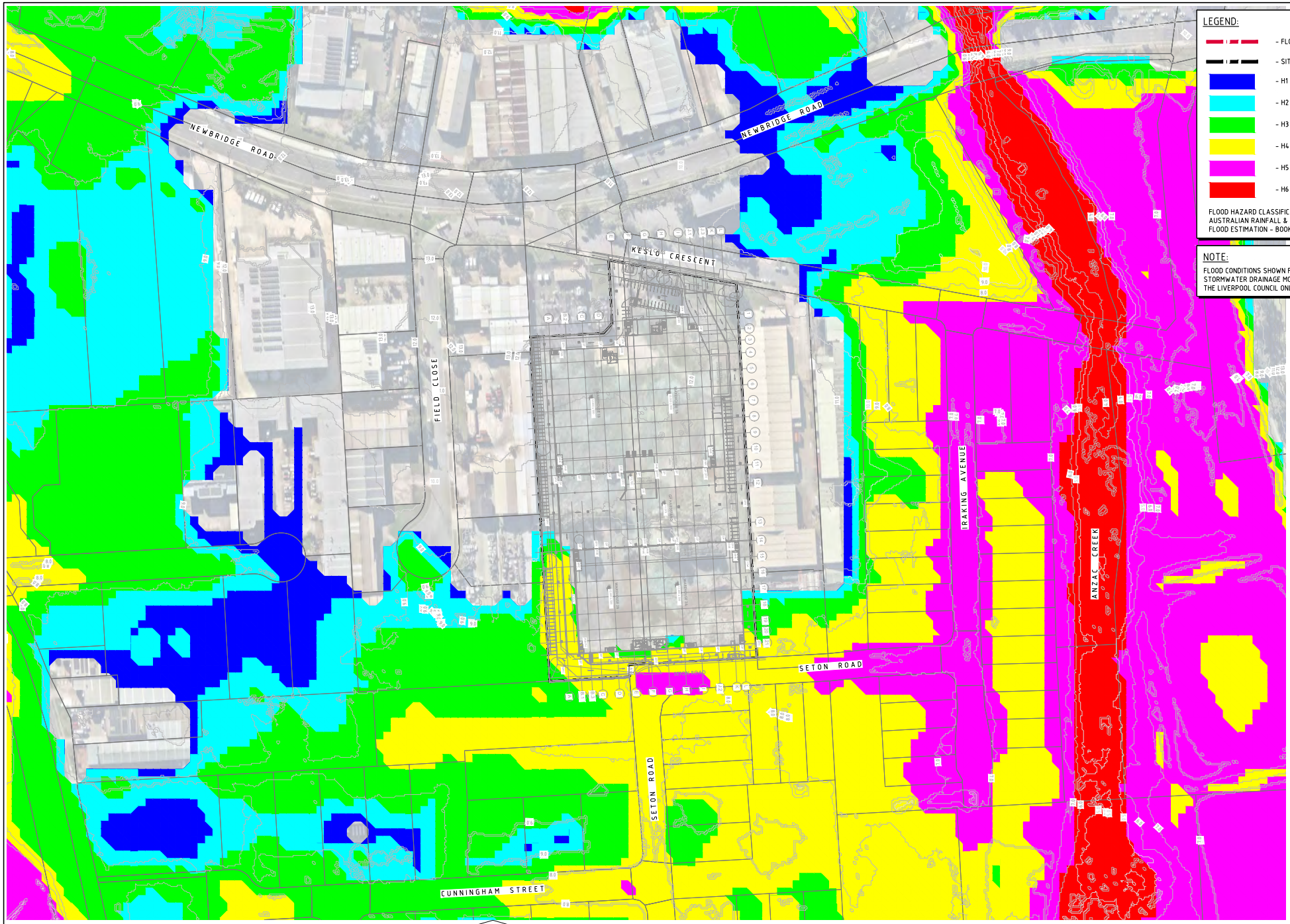
DRAWING TITLE
0.2% AEP POST-DEVELOPMENT FLOOD VELOCITY PLAN

DRAWING No: C014-972.02-F351
ISSUE: A



LEGEND:

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY
- H1
- H2
- H3
- H4
- H5
- H6

FLOOD HAZARD CLASSIFICATION AS PER AUSTRALIAN RAINFALL & RUNOFF 2019, A GUIDE TO FLOOD ESTIMATION – BOOK 6 – FLOOD HYDRAULICS

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

0.2% AEP POST-DEVELOPMENT FLOOD HAZARD PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	DATE 17.10.25	ISSUE A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F352

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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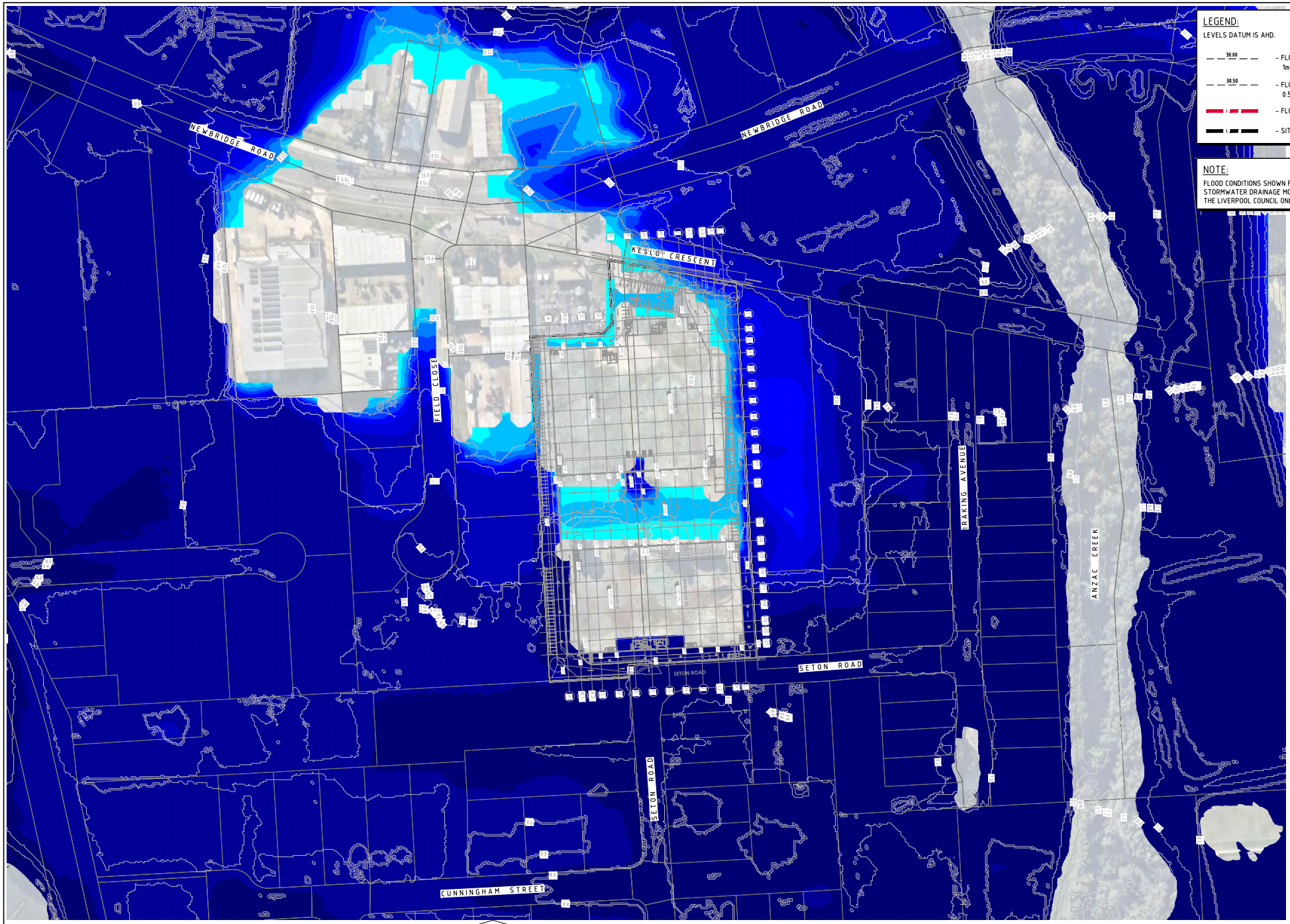
DRAWING TITLE
0.2% AEP POST-DEVELOPMENT FLOOD HAZARD PLAN

DRAWING No: C014972.02-F352
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- 30.00 – FLOOD LEVEL CONTOUR (MAJOR) 1m INTERVALS
- 30.50 – FLOOD LEVEL CONTOUR (MINOR) 0.5m INTERVALS
- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD DEPTH (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.200	
2	0.200	0.400	
3	0.400	0.600	
4	0.600	0.800	
5	0.800	1.000	
6	1.000	1.500	
7	1.500	2.500	
8	2.500	4.000	
9	4.000	6.000	

PMF POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F360

CONSULT AUSTRALIA

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Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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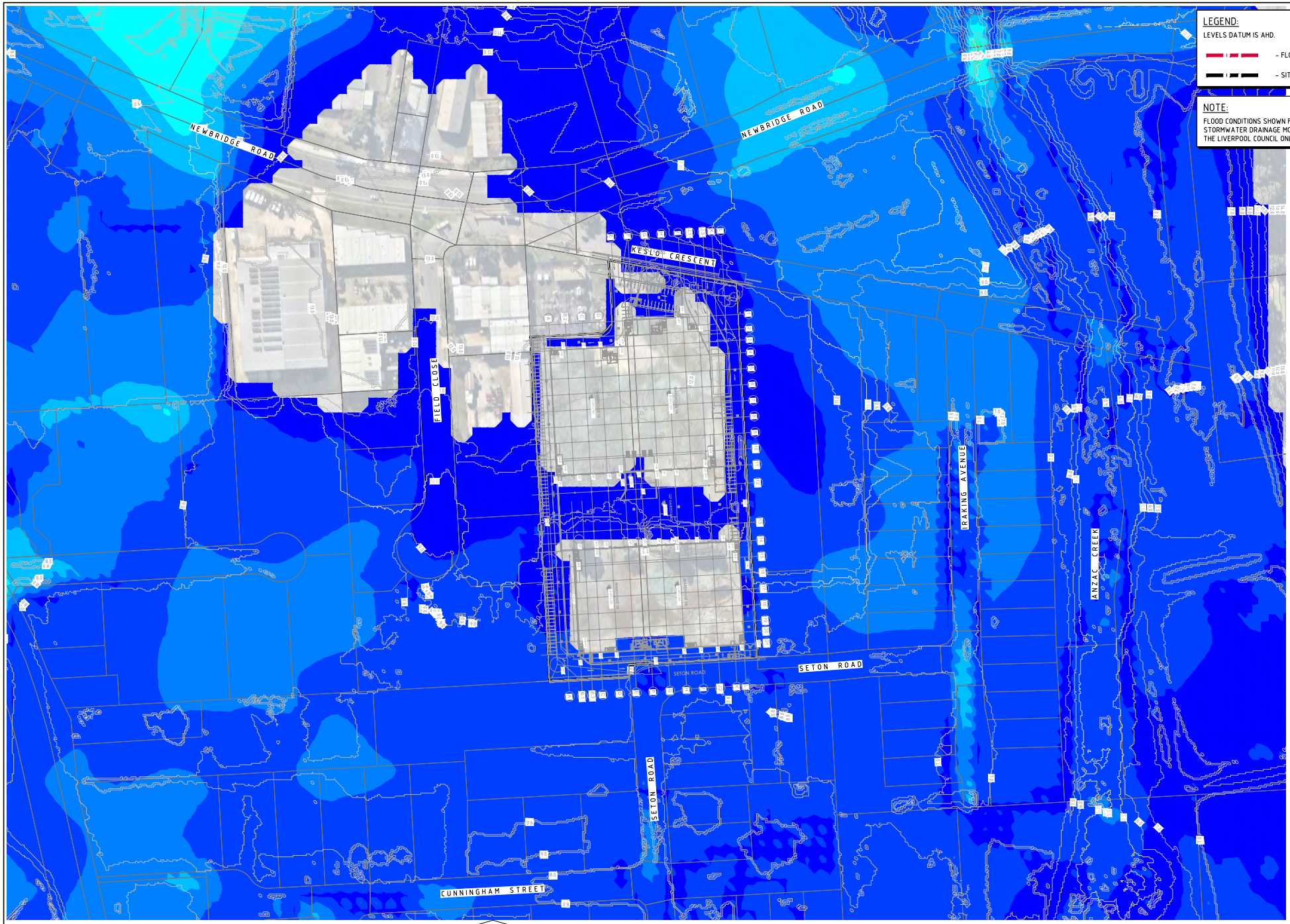
DRAWING TITLE
PMF POST-DEVELOPMENT FLOOD LEVELS & DEPTHS PLAN

DRAWING No: C014972.02-F360
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

FLOOD VELOCITY (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.250	
2	0.250	0.500	
3	0.500	0.750	
4	0.750	1.000	
5	1.000	1.250	
6	1.250	1.500	
7	1.500	1.750	
8	1.750	2.000	
9	2.000	2.250	
10	2.250	2.500	
11	2.500	2.750	
12	2.750	3.000	
13	3.000	3.250	
14	3.250	3.500	
15	3.500	3.750	
16	3.750	4.000	
17	4.000	4.250	
18	4.250	4.500	
19	4.500	4.750	
20	4.750	5.000	

PMF POST-DEVELOPMENT FLOOD VELOCITY PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

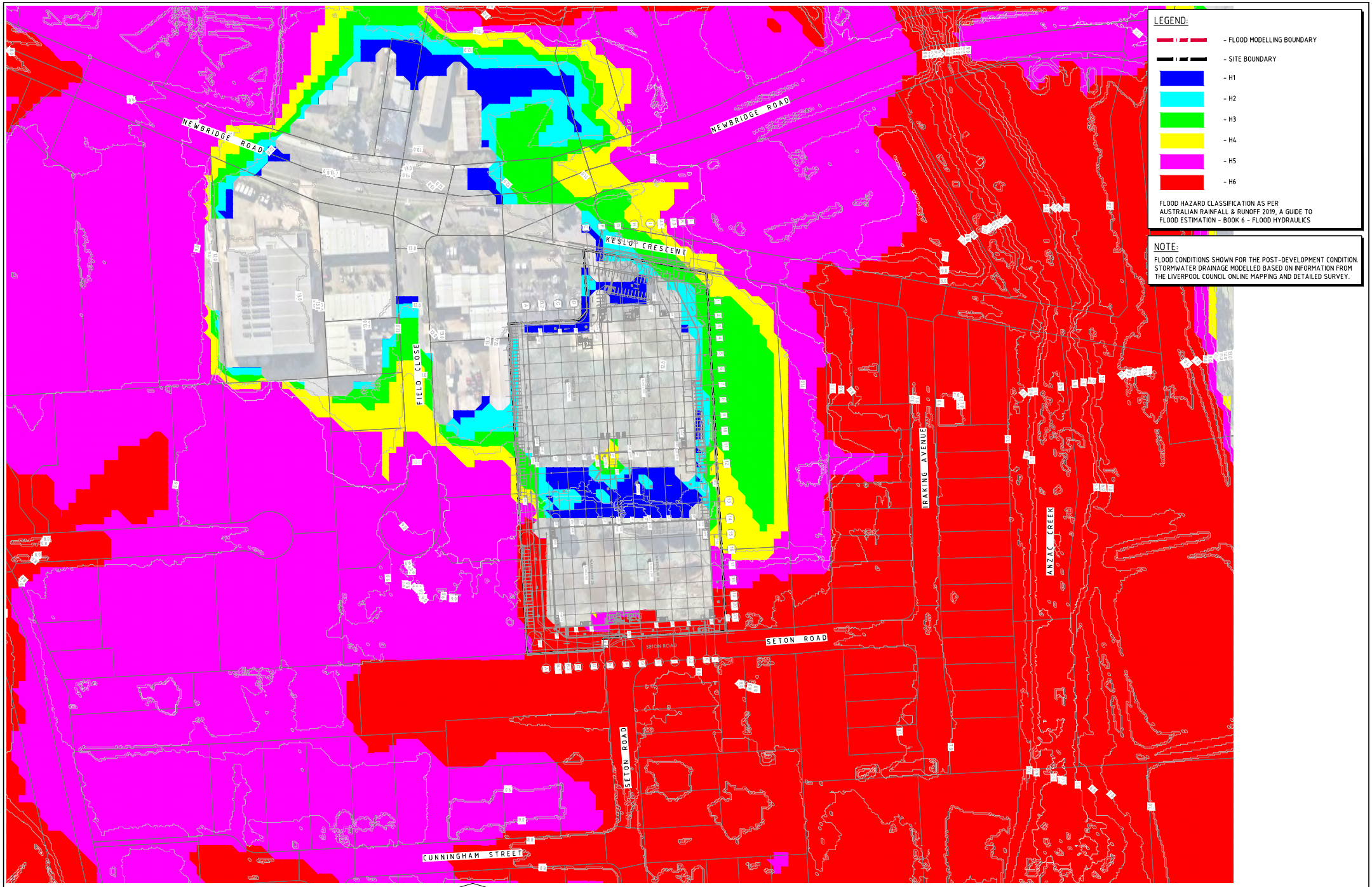
DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F361

CONSULT AUSTRALIA

Costin Roe Consulting Pty Ltd.
ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9251 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au
CRC COSTIN ROE CONSULTING
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
PMF POST-DEVELOPMENT FLOOD VELOCITY PLAN

DRAWING No: C014972.02-F361
ISSUE: A



LEGEND:

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY
- H1
- H2
- H3
- H4
- H5
- H6

FLOOD HAZARD CLASSIFICATION AS PER AUSTRALIAN RAINFALL & RUNOFF 2019, A GUIDE TO FLOOD ESTIMATION – BOOK 6 – FLOOD HYDRAULICS

NOTE:

FLOOD CONDITIONS SHOWN FOR THE POST-DEVELOPMENT CONDITION. STORMWATER DRAINAGE MODELLED BASED ON INFORMATION FROM THE LIVERPOOL COUNCIL ONLINE MAPPING AND DETAILED SURVEY.

PMF POST-DEVELOPMENT FLOOD HAZARD PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F362

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Level 4, 8 Windmill Street, Millers Point NSW 2000
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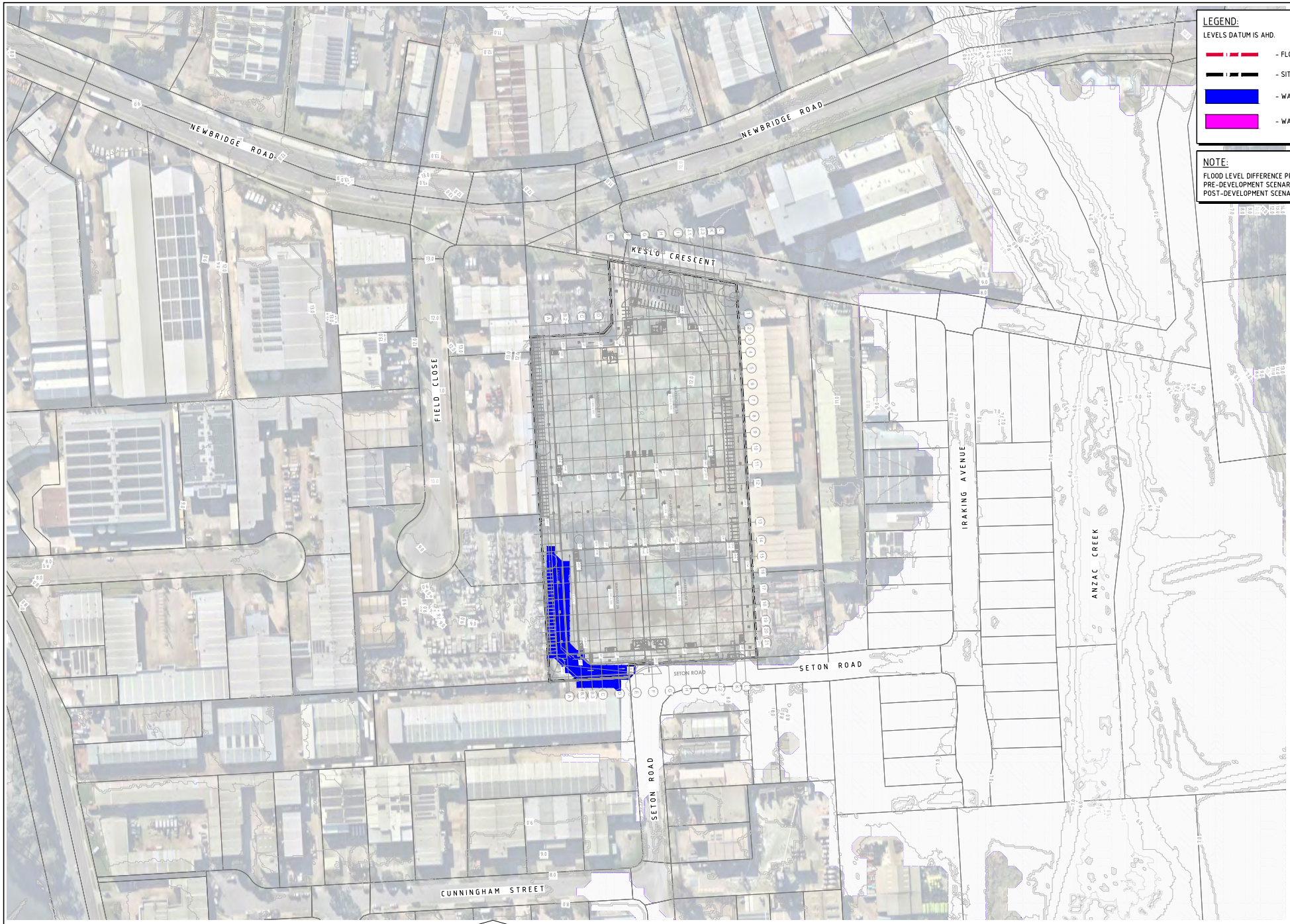
DRAWING TITLE
PMF POST-DEVELOPMENT FLOOD HAZARD PLAN

DRAWING No: C014972.02-F362
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY
- WAS DRY NOW WET
- WAS WET NOW DRY

NOTE:

FLOOD LEVEL DIFFERENCE PROVIDED FOR THE EXISTING PRE-DEVELOPMENT SCENARIO VS THE PROPOSED POST-DEVELOPMENT SCENARIO

FLOOD LEVEL AFFLUX (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	-1.000	-0.020	
2	-0.020	0.020	
3	0.020	0.030	
4	0.030	0.040	
5	0.040	0.050	
6	0.050	0.100	
7	0.100	0.250	
8	0.250	0.500	
9	0.500	1.000	

5% AEP FLOOD LEVEL AFFLUX PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

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PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F520

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DRAWING TITLE
5% AEP FLOOD LEVEL AFFLUX PLAN

DRAWING No: C014972.02-F520
ISSUE: A

LEGEND:

VELOCITYS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD LEVEL DIFFERENCE PROVIDED FOR THE EXISTING PRE-DEVELOPMENT SCENARIO VS THE PROPOSED POST-DEVELOPMENT SCENARIO

FLOOD VELOCITY AFFLUX (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	-1.500	-1.250	
2	-1.250	-1.000	
3	-1.000	-0.750	
4	-0.750	-0.500	
5	-0.500	-0.250	
6	-0.250	-0.050	
7	-0.050	0.050	
8	0.050	0.250	
9	0.250	0.500	
10	0.500	0.750	
11	0.750	1.000	
12	1.000	1.250	
13	1.250	1.500	

10m 0 10 20 30 40 50 60 70 80 90 100m

SCALE 1:1000 AT B1 SIZE SHEET

5% AEP FLOOD VELOCITY AFFLUX PLAN
SCALE 1:1000

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F521

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Level 4, 8 Windmill Street, Millers Point NSW 2000
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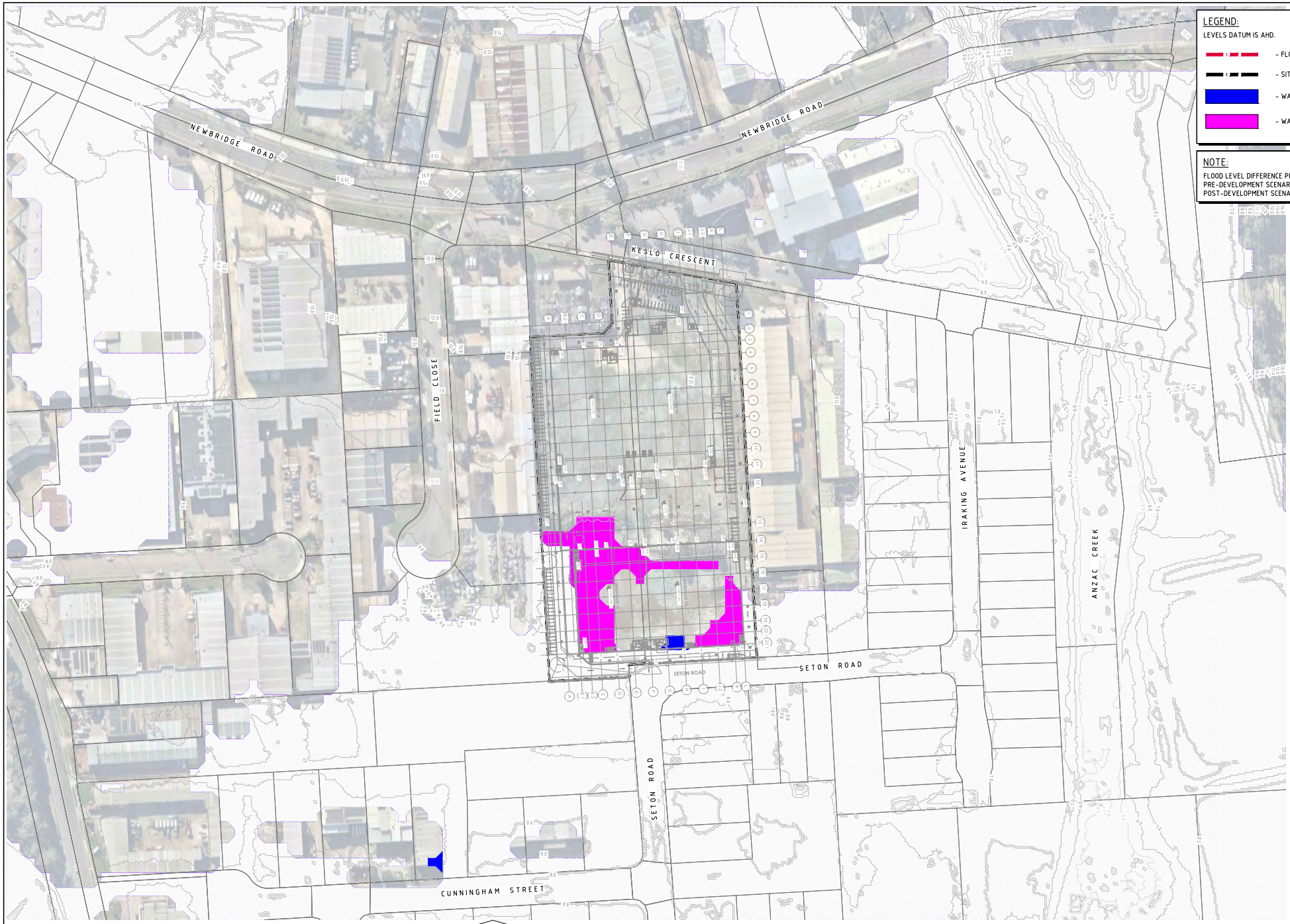
DRAWING TITLE
5% AEP FLOOD VELOCITY AFFLUX PLAN

DRAWING No: C014972.02-F521

ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY
- WAS DRY NOW WET
- WAS WET NOW DRY

NOTE:

FLOOD LEVEL DIFFERENCE PROVIDED FOR THE EXISTING PRE-DEVELOPMENT SCENARIO VS THE PROPOSED POST-DEVELOPMENT SCENARIO

FLOOD LEVEL AFFLUX (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	-1.000	-0.020	
2	-0.020	0.020	
3	0.020	0.030	
4	0.030	0.040	
5	0.040	0.050	
6	0.050	0.100	
7	0.100	0.250	
8	0.250	0.500	
9	0.500	1.000	

1% AEP FLOOD LEVEL AFFLUX PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F530

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9253 7699 f: +61 2 9241 3733
e: mail@costinroe.com.au w: costinroe.com.au

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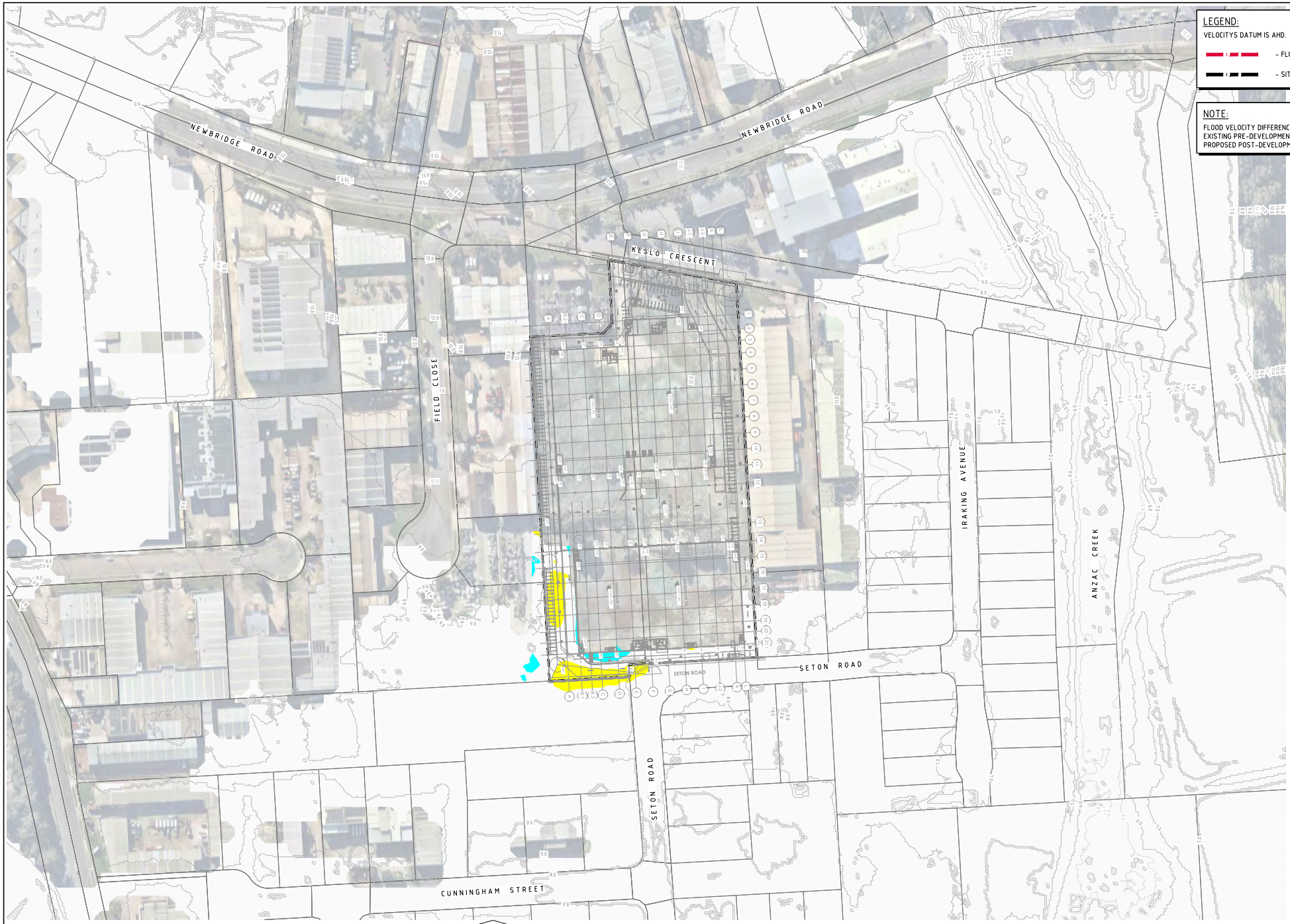
DRAWING TITLE
1% AEP FLOOD LEVEL AFFLUX PLAN

DRAWING No: C014972.02-F530
ISSUE: A



LEGEND:

VELOCITYS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD VELOCITY DIFFERENCE PROVIDED FOR THE EXISTING PRE-DEVELOPMENT SCENARIO VS THE PROPOSED POST-DEVELOPMENT SCENARIO

FLOOD VELOCITY AFFLUX (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	-1.500	-1.250	
2	-1.250	-1.000	
3	-1.000	-0.750	
4	-0.750	-0.500	
5	-0.500	-0.250	
6	-0.250	-0.050	
7	-0.050	0.050	
8	0.050	0.250	
9	0.250	0.500	
10	0.500	0.750	
11	0.750	1.000	
12	1.000	1.250	
13	1.250	1.500	

1% AEP FLOOD VELOCITY AFFLUX PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F531

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9253 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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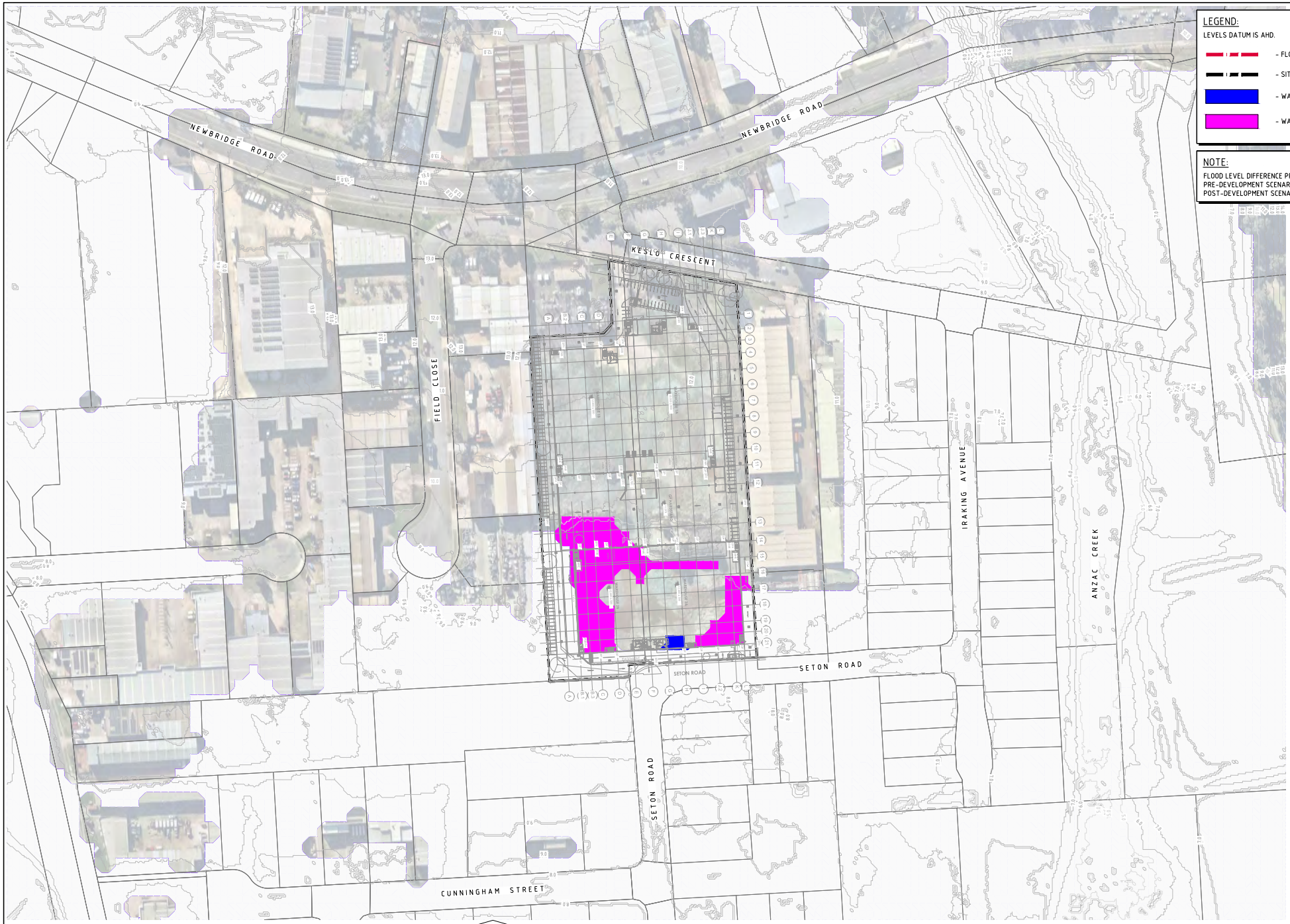
DRAWING TITLE
1% AEP FLOOD VELOCITY AFFLUX PLAN

DRAWING No: C014972.02-F531
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY
- WAS DRY NOW WET
- WAS WET NOW DRY

NOTE:

FLOOD LEVEL DIFFERENCE PROVIDED FOR THE EXISTING PRE-DEVELOPMENT SCENARIO VS THE PROPOSED POST-DEVELOPMENT SCENARIO

FLOOD LEVEL AFFLUX (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	-1.000	-0.020	
2	-0.020	0.020	
3	0.020	0.030	
4	0.030	0.040	
5	0.040	0.050	
6	0.050	0.100	
7	0.100	0.250	
8	0.250	0.500	
9	0.500	1.000	

0.5% AEP FLOOD LEVEL AFFLUX PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F540

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9253 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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DRAWING TITLE
0.5% AEP FLOOD LEVEL AFFLUX PLAN

DRAWING No: C014972.02-F540
ISSUE: A

LEGEND:

VELOCITYS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD VELOCITY DIFFERENCE PROVIDED FOR THE EXISTING PRE-DEVELOPMENT SCENARIO VS THE PROPOSED POST-DEVELOPMENT SCENARIO

FLOOD VELOCITY AFFLUX (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	-1.500	-1.250	
2	-1.250	-1.000	
3	-1.000	-0.750	
4	-0.750	-0.500	
5	-0.500	-0.250	
6	-0.250	-0.050	
7	-0.050	0.050	
8	0.050	0.250	
9	0.250	0.500	
10	0.500	0.750	
11	0.750	1.000	
12	1.000	1.250	
13	1.250	1.500	

0.5% AEP FLOOD VELOCITY AFFLUX PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F541

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ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9253 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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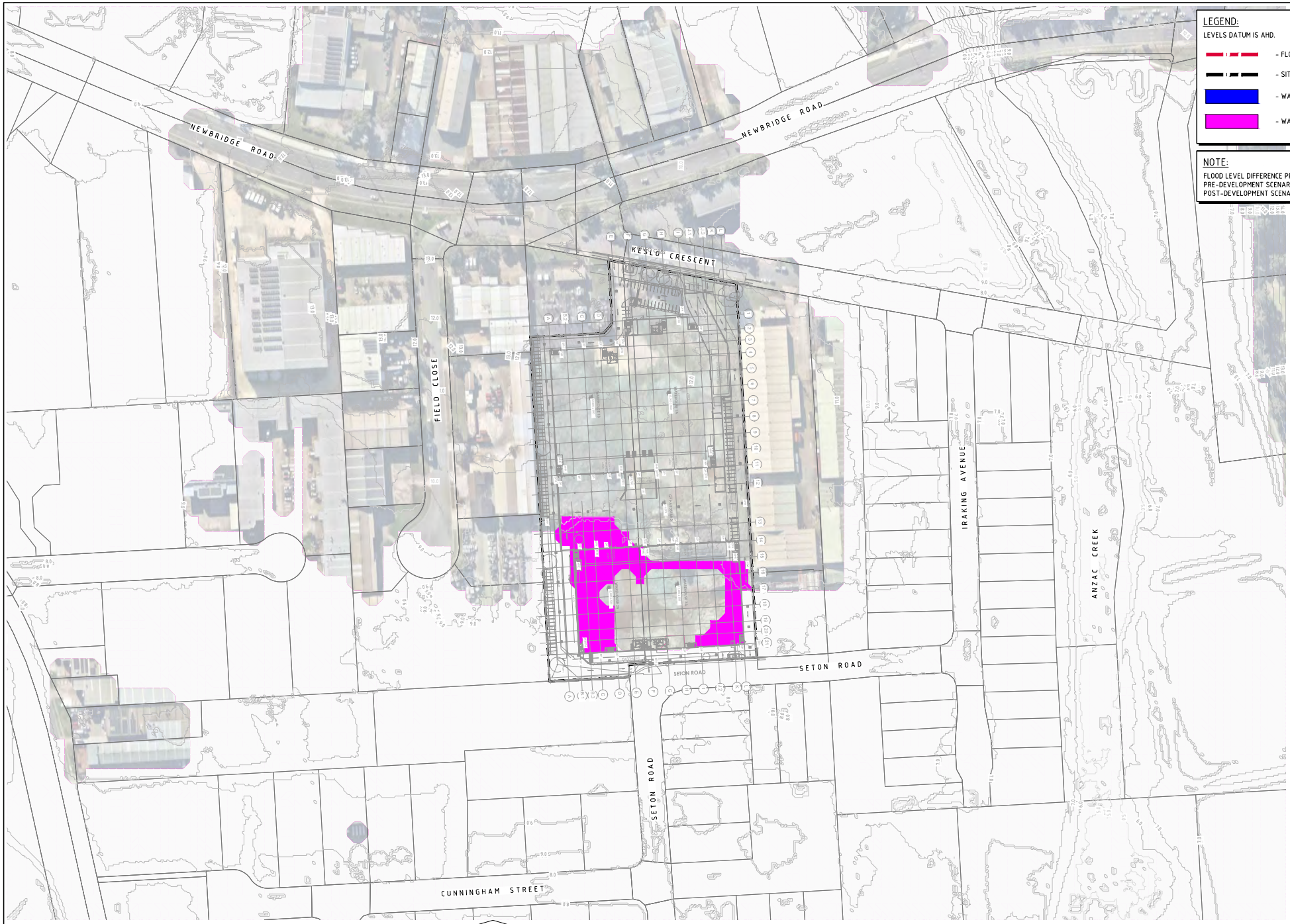
DRAWING TITLE
0.5% AEP FLOOD VELOCITY AFFLUX PLAN

DRAWING No: C014972.02-F541
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY
- WAS DRY NOW WET
- WAS WET NOW DRY

NOTE:

FLOOD LEVEL DIFFERENCE PROVIDED FOR THE EXISTING PRE-DEVELOPMENT SCENARIO VS THE PROPOSED POST-DEVELOPMENT SCENARIO

FLOOD LEVEL AFFLUX (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	-1.000	-0.020	
2	-0.020	0.020	
3	0.020	0.030	
4	0.030	0.040	
5	0.040	0.050	
6	0.050	0.100	
7	0.100	0.250	
8	0.250	0.500	
9	0.500	1.000	

0.2% AEP FLOOD LEVEL AFFLUX PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F550

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p: +61 2 9253 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

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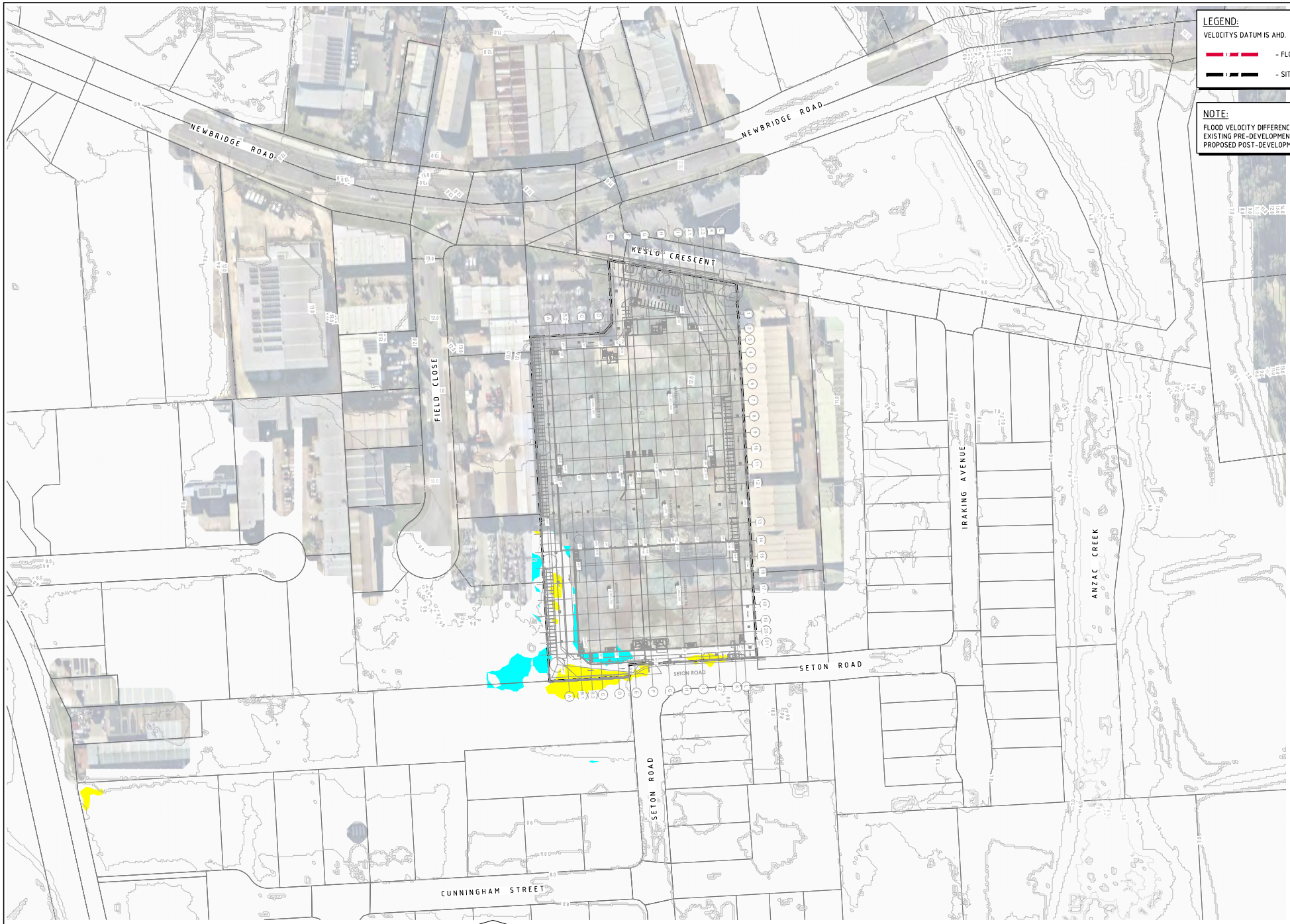
DRAWING TITLE
0.2% AEP FLOOD LEVEL AFFLUX PLAN

DRAWING No: C014972.02-F550
ISSUE: A



LEGEND:

VELOCITYS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD VELOCITY DIFFERENCE PROVIDED FOR THE EXISTING PRE-DEVELOPMENT SCENARIO VS THE PROPOSED POST-DEVELOPMENT SCENARIO

FLOOD VELOCITY AFFLUX (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	-1.500	-1.250	
2	-1.250	-1.000	
3	-1.000	-0.750	
4	-0.750	-0.500	
5	-0.500	-0.250	
6	-0.250	-0.050	
7	-0.050	0.050	
8	0.050	0.250	
9	0.250	0.500	
10	0.500	0.750	
11	0.750	1.000	
12	1.000	1.250	
13	1.250	1.500	

0.2% AEP FLOOD VELOCITY AFFLUX PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

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PROJECT
MARVEL MOOREBANK
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DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F551

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e: mail@costinroe.com.au w: costinroe.com.au

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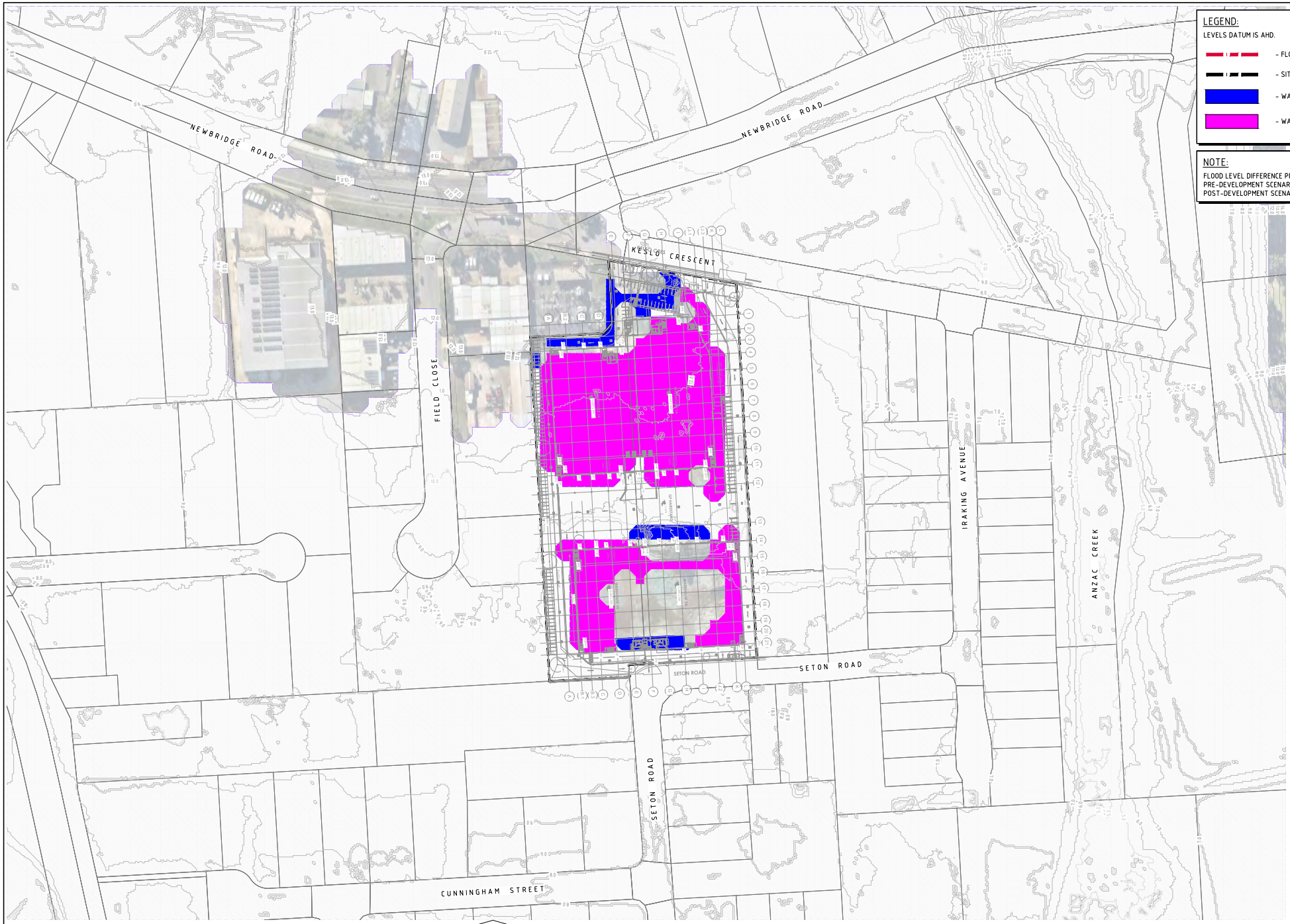
DRAWING TITLE
0.2% AEP FLOOD VELOCITY AFFLUX PLAN

DRAWING No: C014972.02-F551
ISSUE: A



LEGEND:

LEVELS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY
- WAS DRY NOW WET
- WAS WET NOW DRY

NOTE:

FLOOD LEVEL DIFFERENCE PROVIDED FOR THE EXISTING PRE-DEVELOPMENT SCENARIO VS THE PROPOSED POST-DEVELOPMENT SCENARIO

FLOOD LEVEL AFFLUX (m)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	-1.000	-0.020	
2	-0.020	0.020	
3	0.020	0.030	
4	0.030	0.040	
5	0.040	0.050	
6	0.050	0.100	
7	0.100	0.250	
8	0.250	0.500	
9	0.500	1.000	

PMF FLOOD LEVEL AFFLUX PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F560

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Level 4, 8 Windmill Street, Millers Point NSW 2000
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e: mail@costinroe.com.au w: costinroe.com.au
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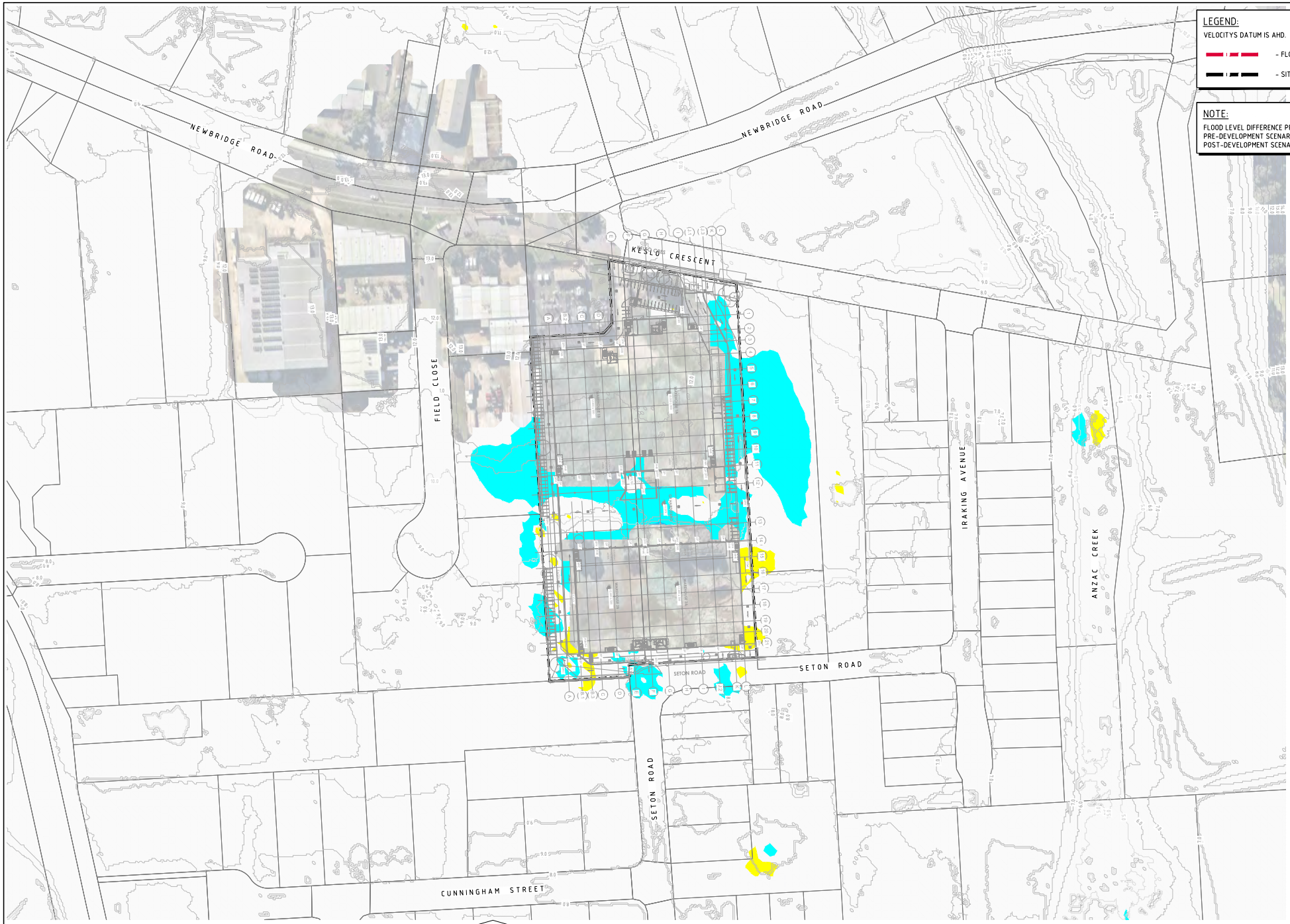
DRAWING TITLE
PMF FLOOD LEVEL AFFLUX PLAN

DRAWING No: C014972.02-F560
ISSUE: A



LEGEND:

VELOCITYS DATUM IS AHD.

- FLOOD MODELLING BOUNDARY
- SITE BOUNDARY

NOTE:

FLOOD LEVEL DIFFERENCE PROVIDED FOR THE EXISTING PRE-DEVELOPMENT SCENARIO VS THE PROPOSED POST-DEVELOPMENT SCENARIO

FLOOD VELOCITY AFFLUX (m/s)

No.	FROM DEPTH	TO DEPTH	COLOUR
1	-1.500	-1.250	
2	-1.250	-1.000	
3	-1.000	-0.750	
4	-0.750	-0.500	
5	-0.500	-0.250	
6	-0.250	-0.050	
7	-0.050	0.050	
8	0.050	0.250	
9	0.250	0.500	
10	0.500	0.750	
11	0.750	1.000	
12	1.000	1.250	
13	1.250	1.500	

PMF FLOOD VELOCITY AFFLUX PLAN
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT B1 SIZE SHEET

FOR INFORMATION

ISSUED FOR INFORMATION	17.10.25	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

ARCHITECT: PACE ARCHITECTS

CLIENT: VAUGHAN CONSTRUCTIONS

PROJECT
MARVEL MOOREBANK
20 KELSO CRESCENT, MOOREBANK NSW 2170

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
TW	JB	OCT 2025	XA	B1	AS NOTED	C014972.02-F561

CONSULT AUSTRALIA

Costin Roe Consulting Pty Ltd.
ABN 50 003 696 446
PO Box N419 Sydney NSW 1220
Level 4, 8 Windmill Street, Millers Point NSW 2000
p: +61 2 9253 7699 f: +61 2 9241 3731
e: mail@costinroe.com.au w: costinroe.com.au

CRC COSTIN ROE CONSULTING — CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
PMF FLOOD VELOCITY AFFLUX PLAN

DRAWING No: C014972.02-F561

ISSUE: A

COSTIN ROE CONSULTING

APPENDIX B

REQUEST ADVICE ON THE RTS FOR SSD-58978472

LIVERPOOL CITY COUNCIL

Ref No.: SSD1-5/2024
Contact: Tony Hadchiti
Ph: 8711 7643
Date: 31 January 2025

David Auster
Department of Planning, Housing and Infrastructure
Locked Bag 5022
Parramatta NSW 2124

Sent via portal

Re: Request advice on the RTS for SSD-58978472 – Kelso Crescent Multi-Level Warehouse, Moorebank

Dear David,

Liverpool City Council was invited to provide advice on the RTS for the above application.

Attachment A of this letter provides detailed comments.

Should you require further information or clarification, please feel free to be in contact.

Yours sincerely,

Tony Hadchiti
Austral Delivery Manager

Attachment A – Detailed comments

1. **Community Planning**

Reviewed documents:

- Appendix D1-RTS Response Matrix
- Response to Submissions Report (Willowtree Planning, 13 December 2024)
- Council Response 20 Kelso Crescent Moorebank (1 July, 2024)

Review & Comments:

- **Community benefits:** As we mentioned before, the proposal is compatible with local context. The site is located within the Moorebank industrial area (E4) and predominantly surrounded by large warehouse and distribution centres. There are no sensitive developments nearby.

  The site is bit far-off from the residential developments. The closest homes would be on Jack O'Sullivan Road, which is a fair distance, across a large park and on much higher ground than this unit. The proposal would unlikely create added community concerns.

  Rather, the proposal has a potential to increase socio-economic benefits by adding local employment opportunities close to home and improved livelihood.

- **Operating hours:** We raised concern on the proposed 24/7 operation of the business. As we mentioned before, there is a Fernwood Gym in that area opposite to the site, which is women only and has 24/7 access. There may be some concerns regarding safety for women coming in and out of the gym at later hours, particularly in those hours where the gym is unstaffed, including traffic and personal safety concerns. We don't know how heavily frequented the gym is in the later hours, but they should be considered as a stakeholder.

  The SIA states, '*the presence of crime hotspots in the vicinity of the site has been noted, and though some are located nearby the site, the actual crime count was low.*

  The proposed development will have secure vehicle entrances but, notwithstanding this, it is recommended that the design incorporates Crime Prevention Through Environmental Design (CPTED) principle' (p 39).

  Council response had included our concern in the previous submission (01/07/24). As it stated, '***A blanket 24-hour operation is not considered suitable for this development. At this stage, it is unclear what the end uses for the warehouses will be, and allowance for 24-hour operation does not take into the consideration the potential impacts of each use. Therefore, Council is of the opinion that approval for 24-hour operation should be removed from the application. If a land use within this development requires 24-hour operation, a separate Development Application***

should be lodged with Council as part of the end use, so the impacts can be appropriately assessed (p2).'

The response Matrix has addressed this concern. It states, '*It is proposed that an appropriately worded condition of any Development Consent prescribe that the 24-hour operation is permitted for a 12-month trial period from the date of issue of the first Occupation Certificate. Any complaints received during this period would necessitate the preparation and submission of evidence Page 10 of 17 demonstrating successful mitigation pursuant to the condition of the Development Consent'* (p9).

We recommend reviewing the operating hours of other businesses of the premises and justification of a new 24/7 business in that set-up. The business should consider all aspects of sustainability and CPTED in the design and management process. Roof top solar panel, adequate lighting, after hour security and access controls, maximize the scope of active and passive surveillance are some examples.

Concluding remarks

Community Planning **does not have any objection** to the proposed state significant development if it complies with the statutory requirements and protects public interests.

2. Heritage

No objections, no additional requirements.

3. Public Art

- A Public Art Strategy or Plan is to be developed for the site, it is recommended further consultation is undertaken with Council's public arts officer prior to undertaking the document.
- Narratives and themes are to be endemic, meaningful, and relevant to the site.
- Public art delivered across the site is to be undertaken by/or in collaboration with local Liverpool artist/s.
- Public art is to be durable and permanent (lifespan of 25 years+).
- Public artwork is to be incorporated into a minimum of 30% of the area of the northern façade to break up the built form when viewed from Newbridge Road.
- Public artwork incorporated into a minimum of 30% of the area of the southern façade or across 70% of the associated glazing, to break up the built form when viewed from Seton Road to the South.

It is recommended that public art is employed to address bulk facades visible from the public domain.

Prior to the issue of a Construction Certificate

- A Preliminary Public Art Plan, including appropriate planning controls; initial proposed locations, scale to bulk, identified current and/or future audiences, role, benefit, and

benchmarking, is to be submitted to Liverpool City Council Public Arts Officer for approval and endorsement.

Prior to Works Commencing

- Prior to Works Commencing the Public Art Plan is to be updated, commissioned artist/s, concept designs, artwork dimensions, materials and submitted to Liverpool City Council Public Art Plan for approval and endorsement.
- Prior to Works Commencing updated architectural and landscape plans are to be submitted identifying the endorsed public art concept designs.

During Construction

- During Construction notification provided to Liverpool City Council Public Arts Officer on commencement of artwork fabrication, delivery, and/or installation.
- During Construction, the Public Art Plan is to be finalised, including artist/s and artwork statement, maintenance, ownership and final design, and submitted to Liverpool City Council Public Arts Officer for approval and endorsement.

Prior to Occupation Certificate

- Prior to Occupation Certificate high resolution images of completed artworks and associated landscaping submitted to Liverpool City Council Public Arts Officer for approval and endorsement.
- Prior to Occupation Certificate the final Public Art Plan is to be submitted to Liverpool City Council Public Arts Officer for approval and endorsement.

4. Transport Planning

The proposed development is anticipated to generate approximately 179 vehicles during the AM peak hour and 193 vehicles during the PM peak hour. Overall, it is expected to generate a total of 1,584 vehicle movements per day, with 23% of these being heavy vehicles.

According to the Traffic Assessment Addendum, by the year 2033, the intersection of Newbridge Road and Kelso Crescent is projected to experience significant delays for traffic entering and exiting Kelso Crescent. At a sign-controlled intersection, prolonged delays can lead to driver impatience, resulting in unsafe turns due to insufficient gaps in the traffic stream, thereby increasing the risk of crashes.

As previously recommended, a road safety audit is required to identify and implement safe treatments for this intersection. Should this review not be carried out, Council recommends that an Operational Traffic Management Plan (OPTM) should be prepared by an accredited practitioner and submitted to and endorsed by Council's Transport Management Section prior to the OC being issued to the subject site. The OPTM is to include haulage routes to/from the subject site, pedestrian/cyclist travel routes, traffic and parking management associated with the operation. The OPTM is to include right turn movements restrictions from Kelso Cresent to Newbridge Road for the vehicles to/from the subject site, particularly heavy vehicles during AM and PM peak hours.

Please find other traffic related conditions to be incorporated into the consent conditions:

1. The layout of the proposed car parking areas associated with the subject development (including, driveways, grades, turn paths, sight distance requirements in relation to landscaping and/or fencing, aisle widths, aisle lengths, and parking bay dimensions) shall be in accordance with AS 2890.1-2004, AS2890.6-2009 and AS 2890.2-2018 for heavy vehicle usage. Parking Restrictions may be required to maintain the required sight distances at the driveway. The driveway and car parking design is to be approved by the Certifier.

2. The applicant shall submit a Section 138 Roads Act application to Council for any proposed new driveway and road work in, on or over a public road including the payment of application and inspection fees.

   Prior to the issue of the construction certificate for any roadwork, the Applicant must submit the design plans to the satisfaction of Council and provide a copy of the approved documents to the Certifier for information.

3. A Construction Traffic Management Plan (CTMP) detailing updated construction vehicle routes, number of trucks, hours of operation, access arrangements and traffic control should be prepared for future developments and submitted to and endorsed by Council's Transport Management Section prior to the issue of a Construction Certificate.

   The CTMP is to outline the need for a Road Occupancy Permit issued by Council or Road Occupancy Permit issued by the Transport Management Centre.

   Works within the road reserve shall not commence until the construction traffic management plan has been endorsed.

During construction

4. All works within the road reserve shall be constructed by the applicant, at no cost to Council, and all signage is to be in accordance with the TfNSW Traffic Control at Worksites Manual and the TfNSW Delineation Guideline.

5. If a works zone is required, an application must be made to Council's Transport Management Section. The application is to indicate the exact location required and the applicable fee is to be included. If parking restrictions are in place, an application to have the restrictions moved, will need to be made.

6. Notice must be given to Council's Transport Management Section of any interruption to pedestrian or vehicular traffic within the road reserve, caused by the construction of this development. A Traffic Control Plan, prepared by a suitably accredited practitioner must be submitted to and approved by Council's Transport Management Section, at least 7 days prior to implementation. This includes temporary closures for delivery of materials, concrete pours etc.

7. Applications must be submitted to and approved by Council's Transport Management Section for any road closures. The applicant is to include a Traffic Control Plan, prepared by a suitably

qualified person, which is to include the date and times of closures and any other relevant information.

8. All the construction vehicles shall enter and exit the site in a forward direction.

9. Parking for all construction workers should be accommodated within the development site.

Prior to Occupation

10. An Operational Traffic Management Plan (OPTM) should be prepared by an accredited practitioner and submitted to and endorsed by Council's Transport Management Section prior to the OC being issued to the subject site. The OPTM is to include measures to identify haulage routes to/from the subject site, pedestrian/cyclist travel routes, traffic and parking management associated with the operation. The OPTM is to include right turn movements from Kelso Cresent to Newbridge Road are restricted for the vehicles to/from the subject site, particularly heavy vehicles during AM and PM peak hours.

11. Prior to the issue of an Occupation Certificate, the Principal Certifying Authority shall ensure that all works associated with a S138 Roads Act approval or S68 Local Government Act approval have been inspected and signed off by Liverpool City Council.

12. All the approved roadworks, traffic control devices, pedestrian crossings, signposting, line marking and street lighting are to be completed to Liverpool Council requirements, at no expense to Liverpool Council or Transport for NSW.

13. Council's on-street assets such as footpath shall be protected at all times. Any damages shall be rectified by the applicant, at no cost to Council, and to Council's satisfaction.

Post Occupation

14. The Operational Traffic Management Plan (OTMP) must be in place and implemented at all times.

15. All loading and unloading must take place on the subject site. Goods and/or waste or extraneous material must not be stored in the vehicular manoeuvrings and parking areas. Those areas must be kept clear at all times for the free movement of vehicles.

5. Development Engineering

General

1. All roadworks, drainage works and dedications, required to affect the consented development shall be undertaken at no cost to Liverpool City Council

Prior to the issue of a Construction Certificate

2. Prior to the issue of a Construction Certificate a S138 Roads Act application/s, including payment of fees shall be lodged with Liverpool City Council, as the Roads Authority for any works required in a public road. These works may include but are not limited to the following:

   - Vehicular crossings (including kerb reinstatement of redundant vehicular crossings)
   - Road opening for utilities and stormwater (including stormwater connection to Council infrastructure)
   - Road occupancy or road closures

   All works shall be carried out in accordance with the Roads Act approval, the development consent including the stamped approved plans, and Liverpool City Council's

   Note:. Approvals may also be required from the Transport for NSW (TfNSW) for classified roads.

3. All retaining walls shall be of masonry construction and must be wholly within the property boundary, including footings and agricultural drainage lines. Construction of retaining walls or associated drainage works along common boundaries shall not compromise the structural integrity of any existing structures.

   Where a retaining wall exceeds 600mm in height, the wall shall be designed by a practicing structural engineer and a construction certificate must be obtained prior to commencement of works on the retaining wall.

4. A stormwater drainage system (including OSD) shall be provided generally in accordance with the concept plan/s lodged for development approval, prepared by TTW Consulting Engineers, reference number 231204-TTW-11-DR-CV-00041 revision P7, 00051 revision P3, dated 15.09.23.

   a) The proposed development and stormwater drainage system shall be designed to ensure that stormwater runoff from upstream properties is conveyed through the site without adverse impact on the development or adjoining properties.

   b) Engineering plans and supporting calculations for the stormwater drainage system are to be prepared by a suitably qualified engineer and shall accompany the application for a Construction Certificate. The plan shall indicate the method of disposal of all stormwater and must include rainwater tanks, existing ground levels, finish surface levels and sizes of all pipes.

Prior to the issue of a Construction Certificate the Certifying Authority shall ensure that the stormwater drainage system has been designed in accordance with Liverpool City Council's Design Guidelines and Construction Specification for Civil Works.

5. Prior to the issue of a Construction Certificate the Certifying Authority shall ensure that details of a stormwater pre-treatment system have been provided on the stormwater plans and that the design meets pollutant retention criteria in accordance Council's Development Control Plan.

   The Construction Certificate must be supported by:
   - Specification & installation details of the stormwater pre-treatment system
   - The approval of an operation and maintenance manual/schedule for the stormwater pre-treatment system

   A copy of the approved operation and maintenance manual/ schedule shall be submitted to Liverpool City Council with notification of the Construction Certificate issue.

6. Prior to the issue of a Construction Certificate the Certifying Authority shall ensure that the stormwater drainage system for the basement car park has been designed in accordance with the requirements for pumped systems in AS3500.3:2003 and Council's Stormwater Drainage Design Specifications for pump out systems for basement carparks.

7. Prior to the issue of a Construction Certificate the Certifying Authority shall ensure that vehicular access, circulation, manoeuvring, pedestrian and parking areas associated with the subject development are in accordance with AS 2890.1, AS2890.2, AS2890.6 and Liverpool City Council's Development Control Plan.

8. Prior to the Commencement of Works a dilapidation report of all infrastructure fronting the development in Kelso Crescent & Seton Road is to be submitted to Liverpool City Council. The report is to include, but not limited to, the road pavement, kerb and gutter, footpath, services and street trees and is to extend 20m either side of the development.

9. A full dilapidation survey and report on the visible and structural condition of all neighbouring structures within the 'zone of influence' of the required excavations must be submitted to the Certifying Authority for approval prior to the issue of any Construction Certificate. The zone of influence is to be defined as the horizontal distance from the edge of the excavation face to twice the excavation depth.

   The dilapidation report and survey is to be prepared by a consulting structural/geotechnical engineer agreed to by both the applicant and the owner of any affected adjoining property.

   All costs incurred in achieving compliance with this condition shall be borne by the person entitled to act on this Consent.

   In the event that access for undertaking the dilapidation survey is denied by an adjoining owner, the applicant MUST DEMONSTRATE, in writing, to the satisfaction of Council that all reasonable steps have been taken to obtain access and advise the affected property owner of the reason for the survey and that these steps have failed. Written concurrence must be obtained from Council in such circumstances.

10. Note: This documentation is for record keeping purposes only, and may be used by the developer or affected property owner to assist in any action required to resolve any dispute

over damage to adjoining properties arising from the works. It is in the applicant's and adjoining owner's interest for it to be as full and detailed as possible

Prior to Commencement of Works

11. Prior to commencement of works sediment and erosion control measures shall be installed in accordance with the approved Construction Certificate and to ensure compliance with the Protection of the Environment Operations Act 1997 and Landcom's publication "Managing Urban Stormwater – Soils and Construction (2004)" – also known as "The Blue Book".

    The erosion and sediment control measures shall remain in place and be maintained until all disturbed areas have been rehabilitated and stabilised.

12. Prior to commencement of works a Traffic Control Plan including details for pedestrian management, shall be prepared in accordance with AS1742.3 "Traffic Control Devices for Works on Roads" and the Roads and Traffic Authority's publication "Traffic Control at Worksites" and certified by an appropriately accredited Roads and Traffic Authority Traffic Controller.

    Traffic control measures shall be implemented during the construction phase of the development in accordance with the certified plan. A copy of the plan shall be available on site at all times

    Note: A copy of the Traffic Control Plan shall accompany the Notice of Commencement to Liverpool City Council

Requirements during Construction

13. Erosion and sediment control measures shall remain in place and be maintained until all disturbed areas have been rehabilitated and stabilised.

14. Prior to the connection of private drainage to Council's drainage system, an inspection is to be carried out by Liverpool City Council's Development Engineering Unit. A fee will be charged in accordance with Council's adopted Fees and Charges, and is to be paid prior to the inspection.

15. All earthworks shall be undertaken in accordance with AS 3798 and Liverpool City Council's Design Guidelines and Construction Specification for Civil Works.

    The level of testing shall be determined by the Geotechnical Testing Authority/ Superintendent in consultation with the Principal Certifying Authority.

Prior to the issue of an Occupation Certificate

16. Prior to the issue of an Occupation Certificate, the Principal Certifying Authority shall ensure that all works associated with a S138 Roads Act approval or S68 Local Government Act approval have been inspected and signed off by Liverpool City Council.

17. Prior to the issue of an Occupation Certificate the Principal Certifying Authority shall ensure that the:

a) On-site detention system/s
b) Stormwater pre-treatment system/s
c) Basement Carpark pump-out system

- Have been satisfactorily completed in accordance with the approved Construction Certificate and the requirements of this consent.
- Have met the design intent regarding any construction variations to the approved design.
- Any remedial works required to been undertaken have been satisfactorily completed.

Details of the approved and constructed system/s shall be provided as part of the Works-As-Executed drawings

18. Prior to the issue of an Occupation Certificate a restriction as to user and positive covenant relating to the:

    a) On-site detention system/s
    b) Stormwater pre-treatment system/s
    c) Basement Carpark pump-out system

    Shall be registered on the title of the property. The restriction as to user and positive covenant shall be in Liverpool City Council's standard wording as detailed in Liverpool City Council's Design and Construction Guidelines and Construction Specification for Civil Works.

19. Prior to the issue of an Occupation Certificate, any damage to Council infrastructure not identified in the dilapidation report, because of the development shall be rectified at no cost to Liverpool City Council.

    Any rectification works within Kelso Crescent & Seton Road will require a Roads Act application. The application is to be submitted and approved by Liverpool City Council prior to such works commencing.

    Any rectification works required by Council regarding the condition of Council infrastructure shall be undertaken, at full cost to the developer.

Advisory

20. Before any excavation work starts, contractors and others should phone "Dial Before You Dig" service to access plans/information for underground pipes and cables. www.1100.com.au

21. The Liverpool City Council Local Government Area soils and ground water may be subject to varying levels of Salinity. Whilst Council may require applicants to obtain Salinity Reports relating to some developments, no assessment may be made by Council in that regard. Soil and ground water salinity levels can change over time due to varying factors. It is recommended that all applicants make their own independent enquiries as to the appropriate protection against the current and future potential effect of salinity to ensure the ongoing structural integrity of any work undertaken. Liverpool City Council will not accept any liability for damage occurring to any construction of any type affected by soil and ground water salinity.

22. The cost of any necessary adjustments to utility mains and services shall be borne by the applicant.

23. Care shall be taken by the applicant and the applicant's agents to prevent any damage to adjoining properties. The applicant or applicant's agents may be liable to pay compensation to any adjoining owner if, due to construction works, damage is caused to such an adjoining property.

6. Flooding

Taylor Thomson Whitting (TTW) Pty Ltd conducted a flood impact assessment (Reference: 231204 CAAA, Flood Report - Project Marvel, Version 1, dated 08/09/2023) and a stormwater design (Reference: 231204 CAAA, Civil Engineering Report - Project Marvel, Revision 3, dated 11/09/2023). TTW subsequently provided responses to flooding submissions, including a flood emergency response plan (Reference: 231204, Flood Response to Submissions - Project Marvel, dated 21 November 2024).

TTW's response does not adequately demonstrate how the flood compensatory excavation will be implemented. Additionally, the information in the civil engineering report and drawings does not align with the flood compensatory works shown in the TTW response. Therefore, the applicant is requested to submit additional information addressing the following issues:

- The TTW response lacks necessary details of the proposed flood compensatory excavation works. A separate sheet for the flood compensatory excavation must be included in the engineering drawing set, showing the length, width, and depth of the excavation.
- Adequate drainage provisions must be implemented to ensure the flood compensatory excavation area is effectively drained as the floodwater recedes. The engineering drawings must include the necessary details of the drainage arrangement for the flood compensatory excavation area.
- A flood storage volume of 414 cubic meters has been shown within the driveway approaching Seton Road. Only the excavation below the level of 8.45m will provide flood storage volume below the 1% AEP flood. Additionally, the driveway cannot be lower than the Seton Road level. Therefore, the flood storage volume in the driveway should be further reviewed, and calculation details should be included in the report.
- Civil engineering drawings, including Drawing Nos. 231204-TTW-00-DR-CV-00031 and 231204-TTW-00-DR-CV-00041, must be corrected to include the proposed compensatory excavation amendments (Reference: 231204 CAAA, Civil Engineering Report - Project Marvel, Revision 3, dated 11/09/2023).

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APPENDIX C

CPHR ADVICE – RESPONSE TO SUBMISSIONS FOR PROPOSED MULTI-LEVEL WAREHOUSE

Department of Climate Change, Energy, the Environment and Water

Your ref: SSD-58978472
Our ref: DOC25/13120

Mr Dave Auster
Senior Environmental Assessment Officer
Department of Planning, Housing and Infrastructure
4 Parramatta Square, 12 Darcy Street
PARRAMATTA NSW 2050

12 February 2025

Subject: CPHR Advice - Response to Submissions for Proposed Multi-Level Warehouse, Kelso Crescent, Moorebank (SSD-58978472) (Liverpool)

Dear Mr Auster,

Thank you for your e-mail received on 20 December 2024 requesting advice on the Response to Submissions for the above project from the Biodiversity, Conservation and Science (BCS) Group of the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW). Please note from the 20 January 2025 BCS has become the Conservation Programs, Heritage and Regulation (CPHR) Group.

CPHR has reviewed the *Submissions Report* (Willowtree Planning, 13 December 2024)*, Flood Response to Submissions* (Appendix D6) (TTW, 21 November 2024) and the *Flood Emergency Response Plan (*Appendix D7) (TTW, 21 November 2024) supporting the State significant development proposal and provides comments in relation to the flood risk assessment and flood emergency management at **Attachment A**.

CPHR acknowledges that the flood assessment has been updated to use the *Georges River Flood Study and Model* (2020) to evaluate flooding risks associated with the Georges River in response to feedback from Liverpool City Council and the Department of Climate Change, Energy, the Environment, and Water (DCCEEW). In addition, a Flood Emergency Response Plan (FERP) has been prepared to address CPHR's advice regarding evacuation constraints and emergency management and the *Flood Risk Management (FRM) Manual 2023 Support for Emergency Management Planning Guideline* (EM01).

As the combat agency for flood, it is recommended the NSW State Emergency Services be consulted on the adequacy of the evacuation strategy FERP.

I request that CPHR not be given a role in any conditions of consent unless CPHR agrees to the role and the condition.

If you have any further questions about this issue, please contact Liz Peterson, Senior Conservation Planning Officer at elizabeth.peterson@environment.nsw.gov.au.

Sincerely

Louisa Clark
Director, Greater Sydney Branch

Regional Delivery
Conservation Programs, Heritage and Regulation

CPHR has review the following documents

- *Submissions Report* (Willowtree Planning, 13 December 2024)
- *Flood Response to Submissions* (Appendix D6) (TTW, 21 November 2024) (FRSA)
- *Flood Emergency Response Plan* (Appendix D7) (TTW, 21 November 2024) (FERP).

Georges River Flooding

It is noted the flood assessment has been updated to use the *Georges River Flood Study and Model* (2020) to evaluate flooding risks associated with the Georges River in response to feedback from Liverpool City Council and the Department of Climate Change, Energy, the Environment, and Water.

The updated flood modelling results show that:

- Newbridge Road, which is the main access to the site, would be inundated to the east and to the west of the development site under a 1% AEP Event.
- In the 1% AEP event, the site becomes inundated within 25 hours of the onset of the storm. Seton Road is affected by H3 and H4 flows (unsafe for people and vehicles) after 22.5 hours.
- During a Probable Maximum Flood (PMF) event, the site is affected by flooding within 7.5 hours of the onset of the critical-duration storm, and key roads connecting to the site become inundated as quickly as 5 to 5.5 hours.
- The site is almost fully flooded after 9 hours of onset of the storm and only a small area of the northern part of the site is not impacted during the PMF event.
- All surrounding roads including Seton Road, Kelso Crescent and Iraking Avenue are impacted by H5 hazard after 20 hours of the onset of the PMF storm.
- The site is isolated for an extended period due to flooding from the Georges River under the PMF event.

Evacuation Constraints

The FERP has acknowledged the Emergency Management (EM) issues raised by CPHR in previous advice. The FERP indicates that:

> *Due to the significant and prolonged impact of flooding in and around the site during a PMF event, the preferred response strategy for this project is to close the site well in advance of flooding (pre-emptively) and relocate people to a safe area away from the hazard.*

The FERP outlines the evacuation constraints from the development site based on the results from the *Georges River Evacuation Modelling Study* (Molino Stewart, 2022) and indicates that evacuation from the proposed development would be possible under existing and infill growth conditions in the Liverpool CBD and its adjoining areas. However, it would not be possible to evacuate from the site under major flooding events, including the PMF Event, when considering the cumulative impacts of infill growth and rezoning proposed across the Liverpool CBD region. For these reasons, CPHR supports the preferred evacuation strategy to pre-emptively evacuate the site.

Evacuation Strategy Implementation

Inadequate detail has been provided on how the pre-emptive evacuation strategy, which requires the closure of the site based on anticipated flooding events, will be implemented, maintained and updated across the construction and operational phases of development. Once the proposed development is operational, the site will have multiple owners. Further details are required to ensure that the future owners of the site have procedures in place to evacuate the site in accordance with the EM protocols.

Evacuation Strategy Clarification

Section 3.3 of the FERP outlines the preferred evacuation routes from the site following issuance of evacuation warnings (see page 17). This contradicts the pre-emptive evacuation strategy prior to evacuation warnings. Evacuation from the site following warnings from the NSW SES would pose considerable risks to workers and visitors of the site. The adjacent road networks would likely be heavily used by evacuating vehicles from flood impacted sites. The existing capacities of road networks are a bottleneck to facilitate safe evacuation from flood impacted sites under major flooding events.

The FERP should be updated to clearly state that the preferred evacuation route following issuance of flood warnings is a backup EM option that may only be applicable for some workers and visitors unable to evacuate from the site prior to issuance of evacuation warning. The FERP should be updated to avoid any confusion in implementing the EM strategy.

Earthworks (cut and fill)

The FRSA outlines that the loss of flood storage due to proposed redevelopment works at the southern portion of the site will be compensated by providing additional flood storage within the development site to comply with the requirements from Liverpool Council. CPHR's is satisfied the comments previously raised on this matter have been adequately addressed.

Evacuation route – incorrect figure reference

Figure 11 of the FERP shows the 'Extent of Georges River Flooding'. Figure 11 is incorrectly referenced on page 17 of the FERP as '*showing the proposed evacuation routes of the site'*.

It is recommended the evacuation routes shown on Figures 12 and 13 be updated to reference the correct figures to avoid any confusion in the implementation of the evacuation of the site.

End of Submission

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APPENDIX D

LIVERPOOL CITY FLOOD EMERGENCY SUB PLAN

LIVERPOOL CITY FLOOD EMERGENCY SUB PLAN

A Sub Plan of the Local Emergency Management Plan (EMPLAN)

Volume 1 of the Liverpool Local Flood Plan

Endorsed by the Local Emergency Management Committee

April 2023

AUTHORISATION

The Liverpool City Council Flood Emergency Sub Plan is a sub plan of the Liverpool City Council Local Emergency Management Plan (EMPLAN). It has been prepared in accordance with the provisions of the ***State Emergency Service Act 1989*** **(NSW)** and is endorsed by the Local Emergency Management Committee in accordance with the provisions of the ***State Emergency and Rescue Management Act 1989*** **(NSW)**.

Authorised

NSW SES Liverpool Unit Commander

Date: 18/4/2023

Endorsed

Chair, Local Emergency Management Committee

Date: 19 May 2023

DISTRIBUTION LIST

Available for general use and distribution on the NSW State Emergency Service website www.ses.nsw.gov.au

VERSION HISTORY

Version	Title	Date
0	Liverpool City Flood Emergency Sub Plan	11.01.2015
1	Liverpool City Flood Emergency Sub Plan: LFP Volume 1	21.10.2021
1.1	Liverpool City Flood Emergency Sub Plan: LFP Volume 1	31.03.2023

AMENDMENT LIST

Suggestions for amendments to this plan should be forwarded to:

Community Planning and Engagement
NSW State Emergency Service
PO Box 6126, Wollongong NSW 2500
nswses.communityplanning@ses.nsw.gov.au

Amendments in the list below have been entered in this plan.

Amendment Number	Description	Updated by	Date
01	Update of wording to section 5.4.1, 5.12 and 5.13 relating to flood warnings, to reflect the change to the Australian Warning System	Donna McKeon	22.11.2022
02	Update of wording from 'BoM' to 'Bureau'	Donna McKeon	22.11.2022
03	Update to section 1.8.1b to include commitment of exercising plan every five years and within two years of the plan being reviewed	Donna McKeon	22.11.2022
04	Update of wording from 'DPIE' to 'DPE' Update of wording from Department of Planning, Industry and Environment to Department of Planning and Environment (5.14.2 under Action)	Donna McKeon	22.11.2022
05	Update to section 5.10.1.b, c, d, from State Rescue Board Land Rescue Policy to State Rescue Board NSW State Rescue Policy	Donna McKeon	22.11.2022
06	Deleted My Road Info from section 5.4.1.h	Donna McKeon	22.11.2022
07	References changed from Resilience NSW to NSW Reconstruction Authority	Savitha Balu	28.02.2023
08	Update of Section 2.1 to reflect latest advice on declared dams, dam break flooding and DSEPs	Savitha Balu	27.03.2023
09	Updated Appendix B, Agriculture and Animal Services Functional Area to insert reference to (NSW Department of Primary Industries, supported by Local Land Services) and change "Coordinate response to animal welfare including pets and livestock" to remove reference to "wildlife"	Savitha Balu	27.03.2023
10	Corrected version numbers to reflect endorsement so latest (with only amendments) is Version 1.1	Savitha Balu	27.03.2023

Table of Contents

1 OUTLINE AND SCOPE

1.1 PURPOSE

1.1.1 The purpose of this plan is to set out the multi-agency arrangements for the emergency management of flooding in the Liverpool City Council Local Government Area (LGA).

1.2 AUTHORITY

1.2.1 This plan is written and issued under the authority of the *State Emergency and Rescue Management Act 1989* (NSW) ('SERM Act'), the *State Emergency Service Act 1989* (NSW) ('SES Act') and the NSW State Emergency Management Plan (EMPLAN).

1.2.2 This plan is a sub plan to the Liverpool City Council Local Emergency Management Plan (EMPLAN) and is endorsed by the Local Emergency Management Committee (LEMC).

1.3 ACTIVATION

1.3.1 This plan does not require activation. The arrangements set out in this plan are always active.

1.3.2 The Liverpool City Council Emergency Management Plan (EMPLAN) is active at all times in anticipation of the need to coordinate support and resources requested by combat agencies, including the NSW State Emergency Service (NSW SES).

1.4 SCOPE

1.4.1 The area covered by this plan is the Liverpool City Council LGA. The Liverpool City Council LGA and its principal towns, villages, rivers and creeks are shown in Appendix A.

1.4.2 The Council area is in the NSW SES Metro Zone and for emergency management purposes, is part of the South West Metro Emergency Management Region.

1.4.3 This plan sets out the emergency management arrangements for prevention, preparation, response and initial recovery for flooding in the Liverpool City Council LGA. Hazard and Risk information can be found in Volume 2, and NSW SES Response Arrangements can be found in Volume 3.

1.4.4 In this plan a flood is defined as a relatively high-water level which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves (including tsunami) overtopping coastline defences.

1.4.5 This plan outlines the local level arrangements for the management of downstream consequences of flooding due to dam failure, however it does not cover the management of flooding of an underground mine by inrush or other cause, which should be covered by the Mine Sub Plan for the respective mine.

1.5 GOALS

1.5.1 The primary goals for flood emergency management in NSW are:

a. Protection and preservation of life

b. Establishment and operation of flood warning systems

c. Issuing of community information and community warnings

d. Coordination of evacuation and welfare of affected communities

e. Protection of critical infrastructure and community assets essential to community survival during an emergency incident

f. Protection of residential property

g. Protection of assets and infrastructure that support individual and community financial sustainability and aid assisting a community to recover from an incident; and

h. Protection of the environment and conservation values considering the cultural, biodiversity and social values of the environment

1.6 KEY PRINCIPLES

1.6.1 The protection and preservation of human life (including the lives of responders and the community) is the highest priority.

1.6.2 Evacuation is the primary response strategy for people impacted by flooding.

1.7 ROLES AND RESPONSIBILITIES

1.7.1 General responsibilities of emergency service organisations and functional areas are set out in the NSW State EMPLAN and NSW State Flood Plan.

1.7.2 Specific roles and responsibilities for agencies, functional areas and organisations in relation to flooding within Liverpool City Council are detailed within this plan, Appendix B and Appendix C.

1.7.3 Any agency with agreed responsibilities in this plan that are temporarily, or no longer able to fulfil their responsibilities must as soon as possible notify the:

a. NSW SES Incident Controller (for local or zone level responsibilities during response operations).

b. NSW SES Zone Duty Commander (for regional level responsibilities outside of response operations).

1.8 PLAN MAINTENANCE AND REVIEW

1.8.1 The NSW SES will maintain the currency of this plan by:

a. Ensuring that all supporting emergency services and functional areas, organisations and officers mentioned in it are aware of their roles and responsibilities.

b. Conduct a minimum of one exercise every five years or within two years of the plan being reviewed.

c. Reviewing the contents of the plan:

- When there are changes which alter agreed plan arrangements
- When changes to land use strategic plans and policies increase the population at risk
- After a flood including from after action reviews, reports, or inquiries; and
- As determined by the NSW SES Commissioner

d. The plan is to be reviewed no less frequently than every five years or after a significant flood event.

1.9 SUPPLEMENTARY DOCUMENTS

1.9.1 Supplementary material published in previous versions of the Local Flood Plan is now maintained on the NSW SES website at: https://www.ses.nsw.gov.au/about-us/flood-storm-and-tsunami-plans/ including:

a. Flood Plan Glossary

b. NSW SES Dam Failure Notification Flowchart

c. NSW SES Resupply Flowchart

2 OVERVIEW OF NSW FLOOD HAZARD AND RISK

2.1 THE FLOOD THREAT

2.1.1 The NSW SES maintains information on the nature of flooding and effects of flooding on the community in the Liverpool Local Government Area. This is outlined in Volume 2 of the Local Flood Plan – Hazard and Risk in Liverpool City.

2.1.2 Declared dams in the Liverpool Local Government Area and any in adjacent LGAs that have the potential to impact local communities are listed below.

a. The local detention basins are addressed in Volume 2 of the Local Flood Plan.

Dam Name	Owner	Location
Amalfi Park Detention Basin	Liverpool City Council	Lurnea
Banks Road Retarding Basin	Liverpool City Council	Hinchinbrook
Cecil Park Basin 3A	Liverpool City Council	Cecil Park
Cecil Park Basin 3B	Liverpool City Council	Cecil Hills
Cecil Hills Basin 100	Liverpool City Council	Cecil Hills
Daruk Park Detention Basin	Liverpool City Council	Casula
Greenway Drive Retarding Basin	Liverpool City Council	West Hoxton
Horningsea Park Detention Basin	Liverpool City Council	Horningsea Park
Hoxton Park Basin 6	Liverpool City Council	Elizabeth Hills
Whitford Road Retarding Basin	Liverpool City Council	Green Valley
Abbotsbury Park Pond 2	Western Sydney Parklands Trust	Fairfield

b. The larger water storage dams, that have potential to impact on communities in Liverpool LGA amongst multiple Local Government Areas, are addressed in the broader Regional Flood Plans.

Dam Name	Owner	LGA
Cataract Dam	Water NSW	Wollondilly
Cordeaux Dam	Water NSW	Wollongong
Avon Dam	Water NSW	Wingecarribee
Nepean Dam	Water NSW	Wingecarribee
Warragamba Dam	Water NSW	Wollondilly
Prospect Dam	Water NSW	Blacktown
Woronora Dam	Water NSW	Sutherland

2.1.3 Each Dam has a Dam Safety Emergency Plan which should include direct input from NSW SES to ensure that alert levels adopted provide adequate time to disseminate Emergency Warnings to local communities at risk from dam break flooding.

3 PREVENTION/ MITIGATION

3.1 INTRODUCTION

3.1.1 The Floodplain Development Manual outlines the NSW Government's Flood Prone Lands Policy which details the framework for managing flood prone land in New South Wales. Incorporation of floodplain risk management into land use planning is one of the key means to limit the exposure to flood risks to our communities and help build long term resilience to future flood events.

3.2 LAND USE PLANNING

3.2.1 **Strategy:** Work with land use planning and consent authorities to advocate that the risks arising from floods are considered so as to prevent the creation of intolerable impacts of these hazards on the community.

Actions:

a. NSW SES will provide strategic input about land use planning matters which have or will create significant flood risk.

b. NSW SES will provide responses to land use planning proposal referrals that have or will create significant flood risk.

3.3 FLOODPLAIN RISK MANAGEMENT

3.3.1 **Strategy**: NSW SES advocates for the recognition of emergency management considerations through participation in the floodplain risk management program.

Actions:

a. NSW SES will provide coordinated and consistent emergency management advice to councils and other agencies in relation to the management of land that is subject to flooding or coastal inundation; and

b. NSW SES will provide advice, support and technical resources for NSW SES representatives to contribute effectively to local Floodplain Management Committees.

4 PREPARATION

4.1 INTRODUCTION

4.1.1 Preparation includes arrangements or plans to deal with an emergency or the effects of an emergency.

4.2 FLOOD EMERGENCY PLANNING

4.2.1 **Strategy**: NSW SES develop, review and maintain Flood Emergency Sub Plans

Actions:

a. Develop and review this NSW SES Local Flood Plan as required. Local Flood Plans outline the specific arrangements for management of flood events within an LGA, and may include cross boundary arrangements; and

b. Review plans as per Section 1.8.

4.2.2 Local EMPLAN Consequence Management Guides (CMG) for flood are not required for communities covered by NSW SES Local Flood Plans.

4.3 FLOOD INTELLIGENCE SYSTEMS

4.3.1 **Strategy**: NSW SES develop and maintain a flood intelligence system to identify flood behaviour, its impact on the community and required response actions.

Actions:

a. Gather and assess flood information for the full range of flood types and severities.

b. Collect, collate, and assess information on the characteristics of communities at risk and the potential effects of flooding on communities at risk; and

c. Share flood intelligence information with supporting agencies.

4.4 DEVELOPMENT OF WARNING SYSTEMS

4.4.1 **Strategy**: Develop, maintain and prepare systems for the provision of flood warnings and associated warning services.

Actions:

a. All levels of government work in partnership to develop and maintain flood warning infrastructure.

b. NSW SES maintains a list of the requirements for flood warnings for flood gauges in NSW (including flood classifications, warning times required and key

statistics) and can be found in the supplementary document to the NSW State Flood Plan (see Section 1.9). Gauges of relevance within the Liverpool City Council LGA will be listed in Volume 3.

c. The NSW SES will recommend new warning services and changes to warning alert levels for gauges to the NSW Flood Warning Consultative Committee.

d. The State Government, in partnership with Local Government, is responsible for developing and maintaining flash flood warning systems for local catchments where required. Liverpool Council currently do not have flash flood warning systems. Council is seeking funding assistance from State Government to undertake this project. State Government is also investigating appropriate warning systems for this. Currently undertaking a pilot project for Hawkesbury region.

e. Dam Owners will provide Dam Failure Warning Systems (where required) and consult NSW SES on alert levels and messaging. Alert level definitions are listed in Dam Emergency Plans.

f. NSW SES maintains a dedicated dam failure hotline via the NSW SES State Operations Centre on 1300 737 326 and procedures to ensure priority dissemination of dam failure warnings.

g. NSW SES develops and maintains warning and flood information products by:

- Utilising flood intelligence data
- Developing pre-written warning and flood information products
- Continuously reviewing warning and flood information products; and
- Consulting with affected communities, key stakeholders, Dam Safety NSW and the NSW Flood Warning Consultative Committee; and maintain Operational Readiness

4.5 BRIEFING, TRAINING AND EXERCISING

4.5.1 **Strategy**: Ensure NSW SES, supporting agencies, functional areas and the community are prepared and familiar with the strategies and arrangements within the Flood Sub Plan and supporting documents.

Actions:

a. NSW SES will consult stakeholders throughout the development of plans.

b. NSW SES will inform stakeholders of content changes after revisions.

c. NSW SES will ensure their facilities and resources are maintained and operationally ready.

d. NSW SES will train personnel for their expected flood operation roles; and

e. NSW SES will regularly brief stakeholders on the exercise arrangements contained in the NSW Flood Emergency Sub Plan.

4.6 COMMUNITY RESILIENCE TO FLOODING

4.6.1 **Strategy**: NSW SES provides and maintains a flexible volunteer workforce to support community resilience.

Actions:

a. Ensure ongoing recruitment and training of a diverse range of volunteers.

b. Ensure pre-planning to facilitate the management of spontaneous volunteers and community members during a flood.

4.6.2 **Strategy**: NSW SES works with individuals, communities, businesses and government agencies to build flood resilience.

Actions:

a. Work with communities to understand and manage the risks associated with floods, including providing business continuity guidance (NSW SES Business FloodSafe), family preparedness (NSW SES Home FloodSafe) and other engagement strategies.

b. NSW SES will collate, assess and disseminate flood information to the community.

c. Collaborate with individuals, businesses, government agencies and communities when developing flood intelligence, preparedness and response information.

d. Plan for floods collaboratively with communities through community and stakeholder participation and engagement.

5 RESPONSE

5.1 INTRODUCTION

5.1.1 Flood response operations will begin:

a. On receipt of a Bureau of Meteorology (Bureau) Severe Weather Warning or Thunderstorm Warning that includes heavy rain or storm surge; or

b. On the receipt of a Bureau Flood Watch or Flood Warning; or

c. On receipt warnings for flash flood; or

d. On receipt of a dam failure alert; or

e. When other evidence leads to an expectation of flooding

5.2 INCIDENT MANAGEMENT ARRANGEMENTS

5.2.1 **Strategy**: Maintain effective control of flood operations across New South Wales.

Actions:

a. The NSW SES uses the Australasian Inter-service Incident Management System (AIIMS) to manage the flood response.

b. Control of flood response will be at the lowest effective level and may be scaled to suit the incident.

c. The NSW SES State Duty Commander will appoint Incident Controllers and establish Incident Control Centres (see NSW SES facilities on map in Appendix A).

d. The Incident Controller, in consultation with participating supporting emergency services and Functional Areas will determine the appropriate breakdown of an incident area into Divisions and/or Sectors in accordance with the principles of AIIMS as well as the predefined Divisions and Sectors outlined within the NSW SES Intelligence System

5.2.2 **Strategy**: Maintain Incident Control Centre(s).

Actions:

a. NSW SES will operate Incident Control Centre(s) as required.

b. The NSW SES Incident Control Centre(s) will:

- Control resources from NSW SES and coordinate resources of supporting emergency services and functional areas.
- Manage Request for Assistance (RFA) tasking and ensure they are actioned in a timely manner.
- Undertake response planning and determine future resourcing requirements; and
- Coordinate information flow, including warnings, public information and social media.

5.2.3 **Strategy**: Provide effective liaison between the NSW SES and supporting agencies or functional areas in accordance with Local EMPLAN.

Actions:

a. Supporting emergency services and Functional Areas should provide Liaison Officers to NSW SES Incident Control Centre(s) and/or Emergency Operation Centres as required; and

b. NSW SES will provide Liaison Officer(s) to Emergency Operations Centres as required.

5.2.4 **Strategy**: Coordinate resources and logistics support to ensure operational effectiveness.

Actions:

a. The NSW SES Incident Controller will notify agencies of potential access issues between locations, for the consideration of pre-deploying of resources.

b. The NSW SES may request resources and logistics support directly from a supporting emergency service or Functional Area.

c. Wherever possible, supporting organisations are to provide their own logistic support in consultation with NSW SES where appropriate.

d. The NSW SES Incident Controller will control air support operations and may utilise supporting agencies in the management of aircraft.

5.3 USE OF INFORMATION AND COLLECTION OF INTELLIGENCE

5.3.1 **Strategy**: Ensure flood information is effectively communicated and collected during a flood.

Actions:

a. Information relating to the consequences of flooding, response strategies, situational awareness and operational updates will be distributed by NSW SES to supporting emergency services and Functional Areas listed under this Plan.

b. All supporting emergency services and Functional Areas will accurately record and report information relevant to their activities and any real time flood information (including road closure information) to the NSW SES Incident Controller. This may be in the form of a combined Emergency Operations Centre (EOC) report, or direct from agencies where an EOC has not been established.

c. The NSW SES may establish and operate a Joint Intelligence Unit to coordinate the collection, collation, interpretation, mapping, actioning and dissemination of information; and

d. Reconnaissance, mapping, damage assessments, intelligence validation and post flood evaluation will be coordinated by NSW SES. This may occur post impact and continue into the recovery phase.

5.3.2 **Strategy**: Ensure flood intelligence is incorporated into operational decision-making.

Action: The NSW SES will use flood intelligence and official forecasts and warnings, to undertake an assessment of the predicted impact of a flood and to inform operational decision-making.

5.4 PROVISION OF INFORMATION AND WARNINGS TO THE COMMUNITY

5.4.1 **Strategy**: Timely and effective warnings are distributed to the community.

Actions:

a. The Bureau issues public weather and flood warning products before and during a flood. These may include:

- Severe Thunderstorm Warnings with reference to heavy rainfall
- Regional Severe Thunderstorm Warnings with reference to heavy rainfall
- Detailed Severe Thunderstorm Warnings (for Sydney/Newcastle/ Wollongong) with reference to heavy rainfall
- Severe Weather Warnings with reference to heavy rainfall and/or storm surge
- Flood Watches, and
- Flood Warnings

b. Dam Owners will utilise Dam Failure Warning Systems to provide warnings and information to NSW SES and communities (where appropriate).

c. NSW SES Incident Controllers will issue the following NSW SES Flood Warnings aligning to the Australian Warning System:

- Advice;
- Watch and Act; and
- Emergency Warning.

d. NSW SES liaises with the Bureau of Meteorology to discuss the development of flood warnings as required.

e. NSW SES provides alerts and deliver flood information to affected communities using a combination of the following methods:

- Mobile and fixed public address systems
- Two-way radio
- Emergency Alert (SMS and voice message alerting system)
- Telecommunications (including Auto dial systems)
- Facsimile
- Standard Emergency Warning Signal
- Doorknocking
- Mobile and fixed sirens
- Variable message signs
- Community notices in identified hubs
- Distribution through established community liaison networks, partnerships and relationships; and
- NSW SES social media and website

f. NSW SES may request supporting agencies redistribute NSW SES alerts and information, including through the provision of doorknocking teams.

g. Road closure information will be provided to the community through the following agencies/methods:

- Local Government Council websites; and
- Transport for NSW 'Live Traffic' website: www.livetraffic.com or 'Transport InfoLine' 131 500. VMS messaging on roadways may also be used to advise motorists.

h. The Public Information and Inquiry Centre will be established by the NSW Police Force where required to provide information regarding evacuees and emergency information. Contact details will be broadcast once the centre is established.

i. The Disaster Welfare Assistance Line will be established by Disaster Welfare Services where required to provide information on welfare services and assistance. Assistance line contact details will be broadcast once Disaster Welfare Services commence.

5.5 PROTECTION OF PROPERTY

5.5.1 **Strategy**: Coordinate the protection of property from destruction or damage arising from floods.

Action: NSW SES, supporting agencies, and community volunteers will assist the community (where resources are available, feasible and safe to do so) in:

a. The protection of properties through flood protection systems (e.g. sandbagging) to minimise entry of water into buildings; and

b. The raising or moving of household furniture and commercial stock and equipment.

5.6 ROAD AND TRAFFIC CONTROL

5.6.1 **Strategy**: Coordinate the closing and re-opening of flood affected roads.

Actions:

a. Liverpool City Council will coordinate the closure and reopening of council managed roads once inspections have been carried out by the relevant authority.

b. The Transport Management Centre (TMC) in coordination with Transport for NSW will coordinate the closure and reopening of the state road network.

c. The NSW Police Force may close and re-open roads but will normally only do so (if the Liverpool City Council or Transport for NSW have not already acted and if public safety requires such action).

d. NSW SES will assist with erecting road closure signs and barriers when time and resources permit.

5.6.2 **Strategy**: Coordinate traffic control measures in flood affected areas.

a. The NSW SES Incident Controller may direct the imposition of traffic control measures into flood affected areas in accordance with the provisions of the *State Emergency Service Act, 1989* and the *State Emergency Rescue Management Act, 1989.*

b. The NSW SES Incident Controller may request the Local Emergency Operations Controller provide suitable personnel to assist with traffic coordination.

5.7 PROTECTION OF ESSENTIAL SERVICES

5.7.1 Arrangements for the protection of local assets are outlined in Volume 3 of this NSW SES local Flood Plan. In addition, Local and Region EMPLAN's contain infrastructure inventories.

5.7.2 **Strategy**: Minimise disruption to the community by ensuring protection of infrastructure and supply of essential energy and utility services.

Actions:

a. Transport Services Functional Area will keep the NSW SES informed of the status of transport network infrastructure.

b. The Energy and Utility Services Functional Area is to coordinate the assessment and restoration of essential energy and utility services (not including telecommunications).

c. The Telecommunications Services Functional Area is to coordinate the assessment and restoration of telecommunications and the Government Radio Network.

d. The Engineering Services Functional Area is to coordinate the assessment and restoration of critical public buildings for example hospitals; and

e. Functional Areas will keep the NSW SES informed of the status of utilities and infrastructure.

5.8 EVACUATION

5.8.1 Evacuation is the NSW SES's primary response strategy for managing the population at risk of flooding.

5.8.2 Community specific evacuation arrangements are located in Volume 3 of this Plan.

5.8.3 **Strategy**: Conduct planning to ensure all evacuation constraints are considered.

Actions:

a. Evacuations will take place when there is a risk to public safety. Circumstances may include:

- Evacuation of people when their homes or businesses are likely to flood.
- Evacuation of people who are unsuited to living in isolated circumstances, due to flood water closing access; and
- Evacuation of people where essential energy and/or utility services are likely to fail or where buildings have been or may be made uninhabitable; and

b. The NSW SES will consider the following in evacuation decisions:

- Duration of evacuation
- Characteristics of the community
- Numbers requiring evacuation
- Availability of evacuation routes and transport
- Time available for evacuation
- Evacuee management requirements; and
- Resources and delivery of evacuation information

c. NSW SES Incident Controllers, and flood planners will carefully consider the risks involved in conducting evacuations.

d. All evacuation decisions will be made as per the current NSW SES policies and procedures, and consistent with the NSW Evacuation Management Guidelines.

e. Potential Evacuation Centres are located in Local EMPLAN; and

f. The NSW Police Force will coordinate the provision of overall security for evacuated areas.

5.8.4 **Strategy**: Evacuate people pre-emptively from dangerous or potentially dangerous places and or locations created by the flood hazard to safe locations away from the hazard.

a. NSW SES will control and coordinate the evacuation of affected communities.

b. The NSW SES Incident Controller will warn communities to prepare for a possible evacuation, where circumstances allow such lead time.

c. The NSW SES Incident Controller will order any necessary evacuations and provide information to the community about when and how to evacuate.

d. Support to evacuation operations may be requested from other emergency services and supporting agencies using arrangements in the local EMPLAN and supporting plans.

e. Health Services Functional Area will coordinate the evacuation of hospitals, health centres and services. If an Aged care facility require evacuation this will be in conjunction with the aged care organisation as per specific aged care evacuation plans. in consultation with the NSW SES and Welfare Services.

f. School administration offices (Government and Private) will coordinate the evacuation of schools in consultation with the NSW SES and Welfare Services, if not already closed.

g. Caravan Park proprietors will inform the NSW SES Incident Controller when caravan park evacuations have been completed.

h. People who are reluctant or refuse to comply with any Emergency Warning will be referred to the NSW Police Force.

5.9 EVACUEE MANAGEMENT AND WELFARE

5.9.1 Research and experience in flood operations shows that most evacuees go to family, friends and commercial accommodation outside the impact area.

5.9.2 **Strategy**: Maintain the welfare of communities and individuals affected by the impact of a flood.

Actions:

a. NSW SES will provide initial welfare for evacuees where required but will hand the responsibility over to the Welfare Services Functional Area as soon as possible. In these cases, the NSW SES will brief the Welfare Services Functional Area at the earliest opportunity regarding the level of assistance required.

b. Welfare Services Functional Area will manage evacuation centres for affected residents and travellers in accordance with the Welfare Services Functional Area Supporting Plan.

c. Schools Administration (Government and Private) will manage the safety of students directly affected by flooding and will work with the NSW SES in the temporary closure of schools and will coordinate with Transport for NSW and Welfare Services in the management of school evacuees.

d. Disaster Victim Registration will be controlled and coordinated by the NSW Police Force with the assistance of NSW SES and Welfare Services Functional Area.

e. NSW SES will provide details of all residents assisted in evacuations to the Welfare Services Functional Area as early as possible.

f. Where the expected remaining number of evacuees and the duration of evacuation is assessed to be beyond the capability and capacity of the established evacuation centre arrangements the SEOCON may establish Major Evacuation Centres or Mass Care facilities; and

g. The decision to establish Major Evacuation Centres or Mass Care Facilities will be made by the NSW SES and SEOCON in consultation with members of the State Emergency Management Committee.

5.9.3 **Strategy**: Coordinate available and accessible health services for flood affected communities.

Action: The provision of environmental health advice, assessment of public health risks and coordination of immediate mental health support will be provided by the Health Services Functional Area Coordinator (HSFAC).

5.9.4 **Strategy**: Coordinate maintenance of food supplies for flood affected communities.

Actions: All matters relating to the primary production, manufacturing, processing and handling of all food from primary industries to retail, inclusive of all restaurants, food services and catering businesses should be referred to the NSW Food Authority through the Agriculture and Animal Services Functional Area.

5.9.5 **Strategy**: Maintain the welfare of animals impacted by a flood.

Actions:

a. Agriculture and Animal Services Functional Area will coordinate the welfare of livestock, pets, companion animals and wildlife including support to primary producers, animal holding establishments and community members; and

b. Agriculture and Animal Services Functional Area role will assist with evacuation, emergency care of animals and assessment, humane destruction and disposal of affected animals, and supply of emergency fodder, water and aerial support where necessary.

5.10 FLOOD RESCUE

5.10.1 **Strategy**: Control and coordinate flood rescue of people and domestic animals.

Actions:

a. NSW SES will perform flood rescue, where training and equipment is suitable and where a risk assessment has indicated that the risk to rescuers is acceptable.

b. Flood rescue operations will be conducted in accordance with the State Rescue Board NSW State Rescue Policy which sets out the framework, governance, responsibilities and requirements for the management and conduct of flood rescue in NSW.

c. NSW SES may request other supporting emergency services to undertake flood rescues on behalf of the NSW SES. Agencies must be authorised/accredited to undertake flood rescue operations in accordance with State Rescue Board requirements, as prescribed by NSW SES. Supporting emergency services must supply information regarding rescues performed to the NSW SES. Notification arrangements with NSW Police Force are outlined in the State Rescue Board NSW State Rescue Policy; and

d. Rescue agencies will conduct rescue of domestic small and large animals as per the State Rescue Board NSW State Rescue Policy (and may include Large Animal Rescue of family horses and cows at a residence or property). The rescue of livestock (which includes commercial animals found on farming and breeding enterprises) will be coordinated through Animal and Agriculture Services Functional Area.

5.11 RESUPPLY

5.11.1 **Strategy**: Coordinate resupply to towns and villages isolated by flooding to minimise disruption to the community.

Actions:

a. NSW SES will advise communities and businesses if flood predictions indicate that areas are likely to become isolated, and indicative timeframes where possible.

b. Retailers should be advised to ensure sufficient stock is available for the duration of the flood.

c. When isolation occurs, NSW SES will establish loading points where retailers can instruct suppliers to deliver goods.

d. NSW SES will endeavour to deliver mail to isolated communities but may not be able to do so according to normal Australia Post timetables.

e. NSW SES will assist hospitals with resupply of linen and other consumables where able.

f. NSW SES may request resupply assistance from supporting agencies.

5.11.2 **Strategy**: Coordinate resupply to rural properties isolated by flooding.

Actions:

a. When requested, NSW SES will establish a resupply schedule and coordinate the resupply for isolated rural properties.

b. NSW SES will provide local suppliers with designated loading points. Resupply items are to be packaged by the supplier; and

c. Isolated households unable to afford resupply items will be referred to Welfare Services Functional Area for assistance.

5.12 RETURN

5.12.1 **Strategy**: Coordinate the safe return of communities to flood affected areas when the immediate danger to life and property has passed.

Actions:

a. NSW SES Incident Controller will determine when it is safe to progressively return in consultation with the relevant Emergency Operations Controller and supporting agencies, considering the impact on the following:

- Access and egress
- Communications
- Power supply
- Gas supply
- Infrastructure damage
- Hazardous materials; and
- Public health risks (including sewerage)

b. NSW SES Incident Controller will specify the level of access to affected communities as the following:

- Not suitable for access
- Limited access by emergency services and response agencies
- Limited access by residents and/or business operators; or
- Full access

c. NSW SES Incident Controller will issue an Advice Warning advising 'Reduced Threat: Return with Caution' message when the immediate danger to life and property has passed for areas assessed as safe; and

d. The NSW SES will facilitate the return of evacuees to their homes

5.13 END OF RESPONSE OPERATIONS

5.13.1 **Strategy**: Conclude response operations.

Actions:

a. Response operations will conclude when:

- The physical impact of the flood has ceased
- All requests for assistance related to the flood have been completed
- The need for warning and evacuation no longer exists

- There is no further likelihood of rescuing people
- Resupply is no longer required (resupply operations may occur concurrently with the recovery phase)
- Response to fire and hazardous material incidents have concluded (not including subsequent clean-up of contaminated sites); and
- All affected areas have had a 'Reduced Threat: Return with Caution' issued.

5.14 POST IMPACT ACTIONS

5.14.1 **Strategy**: Learnings from the event are used to inform recovery and future events.

Actions:

a. NSW SES will continue to engage with communities after significant floods through convening one or more community forums, workshops or other opportunities to provide communities a chance to provide feedback, address any concerns and provide input into the recovery process. These will typically include other agencies such as the Bureau of Meteorology, Welfare Services and Liverpool City Council representatives.

b. NSW SES will ensure that damage assessment information is provided to the relevant Emergency Operations Controller to inform the recovery impact assessment.

c. NSW SES will conduct After Action Reviews, wherever possible, within three weeks of the end of response operations, which will involve all stakeholders. Findings will be shared and incorporated into improved disaster resilience planning.

d. NSW SES will undertake/coordinate a comprehensive review of intelligence and plans following significant flood events.

5.14.2 **Strategy:** Participate in post flood data collection analysis.

Actions: NSW SES will work with the NSW Department of Planning and Environment (DPE) and Liverpool City Council on post flood data collection analysis, including review of flood intelligence where necessary.

6 RECOVERY OPERATIONS

6.1 INTRODUCTION

6.1.1 Recovery is the process of returning an affected community to its proper level of functioning after an emergency. It will generally commence simultaneously with the Response phase.

6.1.2 Recovery operations will be initiated and conducted as outlined in the NSW State EMPLAN and as further detailed in the NSW Recovery Supporting Plan.

6.2 NSW SES RECOVERY ROLE

6.2.1 **Strategy**: NSW SES will support recovery operations and established Recovery Committees.

6.2.2 **Actions**:

a. NSW SES will provide representation to Recovery Committees as required and may have an ongoing role in the Recovery phase.

b. NSW SES roles on Recovery Committees may include providing information about any continuing response, guidance on mitigation strategies and general advice and assistance to the committee as a subject matter specialist and or expert.

c. NSW SES will provide information to NSW Reconstruction Authority to support applications to Treasury for Natural Disaster Relief and Recovery Arrangements.

d. The NSW SES, in conjunction with a Recovery Committee, will provide a service to support the information needs of a community immediately following a flood; and

e. NSW SES and where required supporting agencies will assist with clean-up operations after floods, where possible when resources and personnel permit.

7 ABBREVIATIONS

For a full list of abbreviations refer to the NSW State Flood Plan - Abbreviations

8 GLOSSARY

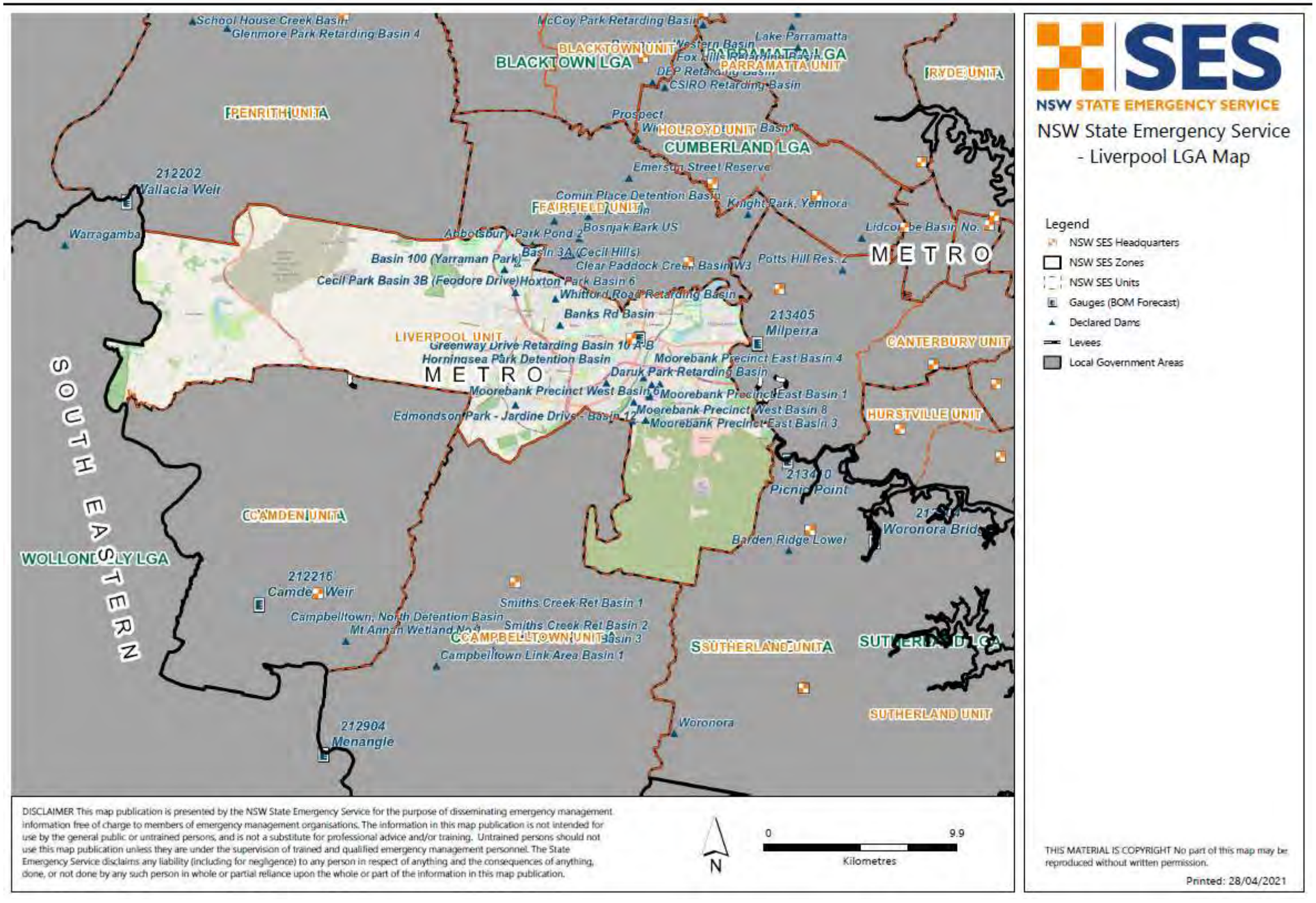
Common emergency service terminology can be found within the Australian Disaster Resilience Glossary.

Readers should refer to EMPLAN Annex 9 – Definitions.

Refer to the NSW State Flood Plan for a complete glossary of terminology used throughout this plan and within NSW SES Flood Plans.

For a full list of definitions refer to the Supporting Document - State Flood Plan Glossary https://www.ses.nsw.gov.au/media/2650/glossary.pdf

Appendix A – Map of Liverpool City Council Area



Appendix B – Roles and Responsibilities

AGENCY	RESPONSIBILITIES
NSW State Emergency Service	The NSW SES is the designated Combat Agency for floods, storms and tsunami and controls response operations. NSW SES roles and responsibilities in relation to floods are detailed within the New South Wales State Flood Plan.

AGENCY	RESPONSIBILITIES
Agriculture and Animal Services Functional Area (NSW Department of Primary Industries, supported by Local Land Services)	The roles and responsibilities for Agriculture and Animal Services are outlined in the Agriculture and Animal Services Supporting Plan Roles and responsibilities in addition to the Supporting Plan are: • Disseminate briefing information to participating agriculture and animal services and related stakeholders. • When activated the Agriculture and Animal Services will coordinate the provision of required services which may include: – Coordinate response for animal welfare including pets and livestock – Supply and delivery of emergency fodder. – Emergency water replacement in certain circumstances; and – Financial, welfare and damage assessment assistance to flood affected primary producers. • Support recovery arrangements including: – Administer transport subsidies to primary producers.
Australian Government Bureau of Meteorology	The roles and responsibilities of the Australian Government Bureau of Meteorology are outlined in the NSW State Flood Plan.
Liverpool City Council	**Preparedness** • Establish and maintain Environmental Advisory Committee (formerly known as floodplain and coastal risk management committees) and ensure that key agencies are represented. • Develop and implement floodplain risk management plans in accordance with the NSW Government's Flood Prone Land Policy and the Floodplain Development Manual. • Provide levee studies, flood studies and floodplain management studies to the NSW SES. • Maintain Dam Safety Emergency Plans for the [Liverpool City Council] dams and provide copies to the NSW SES.

AGENCY	RESPONSIBILITIES
	• Provide information on the consequences of dam failure to the NSW SES for incorporation into planning and flood intelligence. • Maintain council-owned flood warning networks and flood mitigation works. • Participate in NSW SES-led flood emergency planning meetings, to assist in the preparation of Flood Sub-Plans. • Maintain a plant and equipment resource list for the council area. • Contribute to community engagement activities. **Response** • Subject to the availability of council resources, assist the NSW SES with flood operations including: – Traffic management on council managed roads – Provision of assistance to the NSW SES (plant, equipment and personnel where able and requested) – Property protection tasks including sandbagging – Assist with the removal of caravans from caravan parks – Warning and/or evacuation of residents and other people in flood liable areas. – Provision of back-up radio communications – Resupply of isolated properties; and – Technical advice on the impacts of flooding – Close and reopen council roads (and other roads nominated by agreement with Transport for NSW) and advise the NSW SES, the NSW Police Force and people who contact the council for road information. – Assist the NSW SES to provide filled sandbags and filling facilities to residents and business in areas which flooding is expected. • Assist with making facilities available for domestic pets and companion animals of evacuees during evacuations. • Operate flood mitigation works including critical structures such as detention basins and levees and advise the NSW SES regarding their operation. • Manage and protect council-owned infrastructure facilities during floods. • Provide advice to the NSW SES and the Health Services Functional Area Coordinator (HSFAC) during floods about key council managed infrastructure.

AGENCY	RESPONSIBILITIES
	• Advise the Environmental Protection Agency of any sewerage overflow caused by flooding. • Work with the NSW SES and DPE to collect flood related data during and after flood events. **Recovery** • Provide for the management of health hazards associated with flooding including removing debris and waste. • Ensure premises are fit and safe for reoccupation and assess any need for demolition. • Provide services, assistance and advice to State Government in accordance with the State Recovery Plan.
Childcare Centres and Preschools	• When notified of possible flooding or isolation, childcare centres and preschools should. – Liaise with the NSW SES and arrange for the early release of children whose travel arrangements are likely to be disrupted by flooding and/or road closures; and – Assist with coordinating the evacuation of preschools and childcare centres.
Dams Safety NSW	The roles and responsibilities of the Dams Safety NSW (formerly NSW Dam Safety Committee) are outlined in the NSW State Flood Plan.
Department of Defence	Arrangements for Defence Assistance to the Civil Community are detailed within the State EMPLAN (section 448).
Department of Industry	The roles and responsibilities for the Department of Industry (Crown Lands and Water Division) are outlined in the NSW State Flood Plan.
Energy and Utilities Services Functional Area	The roles and responsibilities for Energy and Utilities Services are outlined in the Energy and Utility Services Supporting Plan (EUSPLAN). Roles and responsibilities in addition to the Supporting Plan are: • Assist NSW SES with identification of infrastructure at risk of flood damage where resources are available. • Facilitate local utility service distribution providers (electricity, gas, water, wastewater) to: – Provide advice to the NSW SES of any need to disconnect power/gas/water/wastewater supplies or of any timetable for reconnection. – Advise the NSW SES of any hazards from utility services during flooding and coastal erosion/inundation.

AGENCY	RESPONSIBILITIES
	– Advise the public with regard to electrical hazards during flooding and coastal erosion/inundation, and to the availability or otherwise of the electricity supply. – Clear or make safe any hazard caused by power lines or electricity distribution equipment. – Reconnect customers' electrical/gas/water/wastewater installations, when certified safe to do so and as conditions allow. – Assist the NSW SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.
Engineering Services Functional Area	The roles and responsibilities for Engineering Services are outlined in the Engineering Services Supporting Plan.
Environmental Services Functional Area	The roles and responsibilities for Environmental Services are outlined in the Environmental Services (ENVIROPLAN) Supporting Plan.
Floodplain Management Australia	The roles and responsibilities of Floodplain Management Australia are outlined in the New South Wales State Flood Plan.
Fire and Rescue NSW (as per NSW State Flood Plan)	**Preparedness** • Identify and notify the NSW SES of any locations at risk of fire (within Fire Districts (13) or hazardous materials that pose a significant threat to surrounding populations due to the impact of a flood for incorporation into NSW SES flood intelligence and planning; and **Response** • Meet the agreed arrangements described in the NSW SES and Fire and Rescue NSW Mutual Aid Agreement. • Provide Incident Management personnel and Liaison Officers to the NSW SES where required. • When requested by NSW SES, provide support to the NSW SES in response to flood emergencies across the State. • Assist the NSW SES with the warning and/or evacuation of at-risk communities. • Assist the NSW SES with the monitoring/reconnaissance of flood prone areas. • Provision of Land Based and In Water Flood Rescue Operators as required. • Provision of appropriately trained personnel to perform Down the Wire (DTW) functions as required. • Conduct Hazmat operations including asbestos risks, rising from flood emergencies in coordination with the SES Incident Controller.

AGENCY	RESPONSIBILITIES
	• Decontamination of Flood Rescue Operators as required. • Assist the NSW SES with the resupply of isolated communities and/or properties. • Assist the NSW SES with property protection tasks including sandbagging. • Provide resources for pumping flood water out of buildings and from low-lying areas. • Assist with clean-up operations, including the hosing out of flood affected properties. • Provide trained staff to support a joint intelligence unit, if established by NSW SES, including Remotely Piloted Aircraft System (RPAS) pilots to assist with field observations. • Assist the NSW SES to undertake damage assessment including structural collapse risks. • Coordinate the pre-deployment of fire resources to communities within NSW Fire Districts if access is expected to be lost, in consultation with the NSW SES; and • Coordinate the deployment of the FRNSW High trans Pump to locations in consultation with NSW SES. **Recovery** • Participate in After Action Reviews as required.
Forestry Corporation of NSW	**Response** • Close and reopen Forestry Corporation of NSW roads when affected by flood waters and advise the NSW SES of its status. • Manage traffic on Forestry Corporation of NSW roads. • Facilitate the safe reliable access of emergency resources on Forestry Corporation managed roads. • Assist the NSW SES with identification of road infrastructure at risk of flooding. • Assist the NSW SES with the communication of warnings and information provision to the public through variable message signs and other appropriate means; and • Close and relocate people from camping grounds at risk of flooding in State Forest managed areas.

AGENCY	RESPONSIBILITIES
Health Services Functional Area Coordinator (HSFAC)	The roles and responsibilities for Health Services Functional Area Coordinator are outlined in the Health Services (HEALTHPLAN) Supporting Plan. Roles and responsibilities in addition to the Supporting Plan are: • Ensure that appropriate business continuity plans are developed for essential health infrastructure and are activated during floods.
Hospital Incident Controllers	The roles and responsibilities for Hospital Incident Controller are outlined in the Health Services (HEALTHPLAN) Supporting Plan. Roles and responsibilities in addition to the Supporting Plan are: Ensure that appropriate business continuity plans are developed for essential health infrastructure and are activated during floods.
Local Emergency Operations Controller (LEOCON)	• Monitor flood operations • If requested, coordinate support for the NSW SES Incident Controller
Local Emergency Management Officer (LEMO)	• If requested by the NSW SES Incident Controller, advise appropriate agencies and officers of the start of response operations.
Manly Hydraulics Laboratory (MHL)	The roles and responsibilities of Manly Hydraulic Laboratory are outlined in the NSW State Flood Plan.
Marine Rescue NSW (as per NSW State Flood Plan)	**Response** • When requested by NSW SES, assist in flood operations when training and equipment are available and suitable including assistance with: – Warning and/or evacuation of at-risk communities. – Providing communications personnel. – Property protection tasks including sandbagging; and – Flood rescue operations.
NSW Ambulance	The roles and responsibilities for NSW Ambulance are outlined in the Health Services (HEALTHPLAN) Supporting Plan.
NSW Department of Education	**Preparedness** • Liaise with the NSW SES and arrange for the early release of students whose travel arrangements are likely to be disrupted by flooding and/or road closures (or where required, for students to be moved to a suitable location until normal school closing time). • Ensure that evacuation plans for flood liable schools have arrangements for flooding; and • Assist NSW SES with community engagement and capacity building programs.

AGENCY	RESPONSIBILITIES
	Response • Assist with the coordination of the evacuation of schools and the immediate welfare of students until returned to the appropriate carer. • Pass information to school bus drivers/companies and/or school principals on expected or actual impacts of flooding; and • Provide space in schools for evacuation centres where necessary.
NSW Department of Industry, Planning and Environment (as per NSW State Flood Plan)	**Prevention** • Oversee the delivery of the NSW Flood Prone Land Policy including financial support through the Floodplain Management Program. Provide technical advice to councils and state agencies including assistance with the identification of risks, the preparation and implementation of Floodplain Risk Management Plans and associated mitigation and management actions and understanding flood mitigation schemes including levees. • Work with the NSW SES on the Flood Data Access Program to improve the provision of flood information through the NSW Flood Data Portal. • Assist the Department of Industry-Water in the preparation of rural floodplain management plans under the *Water Management Act 2000* (NSW); and • Provision of strategic technical advice to support floodplain risk management and environmental water management in rural areas of the Murray Darling Basin. **Preparedness** • Assist the NSW SES in the exercising of Flood Sub Plans. • Management of the state government's water level gauges for the flood warning network in tidal areas in NSW (Manly Hydraulic Laboratory operates this system as a service provider on behalf of DPE.). • Advise NSW SES about conditions which may lead to coastal inundation or retarded river drainage near the coast. **Response** • Provide related advice on flood risks to the NSW SES on request; and • Work with the relevant local council and NSW SES to collect flood related data during and after flood events. **Recovery** Support recovery committees as required.
NSW Food Authority	The roles and responsibilities for NSW Food Authority are outlined in the Food Industry Emergency Sub Plan.

AGENCY	RESPONSIBILITIES
NSW National Parks and Wildlife Services (as per NSW State Flood Plan)	**Preparedness** • Assist the NSW SES with identification of road infrastructure in National Parks at risk of flooding. **Response** • Close and reopen National Parks and Wildlife Service roads when affected by flood waters and advise the NSW SES of its status. • Facilitate the safe reliable access by emergency resources on National Parks and Wildlife Service managed roads. • Assist the NSW SES with the communication of warnings and information provision to the public through variable message signs and other appropriate means; and Close and direct people to leave camping grounds at risk of flooding in National Parks and Wildlife Service managed areas.
NSW Police Force (as per NSW State Flood Plan)	**Preparedness** • Participate in NSW SES briefings, training and exercises as required. **Response** • Provide a Liaison Officer to the NSW SES Operation Centre if required. • When requested by NSW SES, in flood operations when training and equipment are available and suitable. – Assist with warning and/or evacuation of at-risk communities. – Assist with monitoring / reconnaissance of flood prone areas. – Assist with flood rescue operations. • Conduct road and traffic control operations in conjunction with council and/or Transport for NSW. • Coordinate searches for missing people within flood affected areas. • Coordinate security of supply lines evacuated and damaged areas. • Manage Disaster Victim Registration; and • Operate the Public Information and Inquiry Centre, if requested or otherwise needed during flood events. **Recovery** • Participate in After Action Reviews as required.
NSW Rural Fire Service (as per NSW State Flood Plan)	**Preparedness** • Participate in NSW SES briefings, training and exercises as required; and

AGENCY	RESPONSIBILITIES
	• Meet the agreed arrangements described in the NSW SES/NSW RFS Memorandum of Understanding. **Response** • Provide a Liaison Officer to the NSW SES Operation Centre or Emergency Operations Centre as required. • Provide Incident Management Personnel when requested. • Provide trained staff to support a joint intelligence unit, if established by NSW SES. • Provide aviation support, management and advice as requested through the State Air Desk. • Provide speciality aircraft and appropriately trained personnel to perform Down the Wire (DTW) functions as required. • Assist with Damage Assessments; and • Provide Strike Teams during flood operations when requested by NSW SES. This may include assistance with: – Warning and/or evacuation of at-risk communities – Monitoring / reconnaissance of flood prone areas – Property protection tasks including sandbagging – Pumping flood water out of buildings and from low-lying areas – Back-up radio communications – Clean-up operations, including the hosing out of flood affected properties – Deploying resources to communities within Rural Fire Districts where access is expected to be lost in consultation with the NSW SES – The resupply of isolated communities and/or properties; and – Decontamination of NSW SES Flood Rescue Operators as required **Recovery** • Participate in After Action Reviews as required.
NSW Volunteer Rescue Association (as per NSW State Flood Plan)	**Response** • Where requested by the NSW SES, assist in flood operations when training and equipment are available and suitable, including assistance with: – The warning and/or evacuation of at-risk communities – Flood rescue operations – Monitoring / reconnaissance of flood prone areas – Resupply of isolated communities and/or properties; and

AGENCY	RESPONSIBILITIES
	– Property protection tasks including sandbagging
Owners of Declared Dams within or upstream of the LGA (as per NSW State Flood Plan)	**Preparedness** • Assist the NSW SES with community engagement programs. • Provide NSW SES with information necessary for response planning and warning distribution. • Assist the NSW SES identify correlations between water level and/or discharges at the dam for use in flood response operations (warning and evacuation); and • Consult with the NSW SES State Headquarters in the development of Dam Emergency Plans, including the development of dam failure alerts, in accordance with the Dam Safety Committee Guidelines. **Response** • Where water level monitoring or other instrumentation allows, provide NSW SES with flood advices as per pre-agreed thresholds for use in downstream flood response operations (warnings). • Notify NSW SES of potential or actual dam failures in accordance with the Dam Emergency Plan and Dam Safety NSW Guidelines. • Close at-risk camping grounds/recreational areas within their managed areas. • In the case of declared dams whose risks are intolerable, assist the NSW SES in planning to warn and evacuate people at risk of dam failure and maintain and operate any special Dam Failure Warning Systems and/or automatic telemetered monitoring devices to assist with early detection of incidents which are installed until such time that the risks have been lowered to an acceptable level; and Owners of gated dams: • Provide all available information to the Bureau and the NSW SES on storage levels and actual and prospective water releases and their likely impacts on downstream river levels. • Advise the downstream community of prospective and actual water releases, except in those circumstances where the Bureau would issue flood warnings; and • Where possible actively work with NSW SES and the Bureau to reduce the impacts of flooding on communities through management of water releases within identified safe parameters and within statutory licencing provisions under the *Water Management Act 2000* and *Water NSW Act 2014*.

AGENCY	RESPONSIBILITIES
Public Information Services Functional Area	The roles and responsibilities for Public Information Services are outlined in the Public Information Services Supporting Plan. Roles and responsibilities in addition to the Supporting Plan are: • On receipt of advice from NSW SES of any weather event likely to result in significant multi agency operational activity, the Public Information Functional Area Coordinator PIFAC determines if a daily multi-agency teleconference is required to ensure that the information needs of each agency are being met and to address any issues. These teleconferences continue through the response phase into the recovery phase.
NSW Reconstruction Authority	• The roles and responsibilities of NSW Reconstruction Authority are outlined in the NSW State Flood Plan.
SEOCON/SEOC	The roles and responsibilities of the SEOCON/SEOC are outlined in the New South Wales State Flood Plan.
Surf Life Saving NSW (as per NSW State Flood Plan)	**Preparedness** • Contribute to NSW SES reviews into plans, policies and procedures as required; and • Participate in NSW SES briefings, training and exercises as required. **Response** • Assist the NSW SES with the warning and/or evacuation of at-risk communities. • Provide accommodation in Surf Life Saving facilities for evacuation centres where required; and • Assist the NSW SES with flood rescue operations, where training and equipment are suitable.
Telecommunications Services Functional Area	The roles and responsibilities for Telecommunications Services are outlined in the Telecommunications Services (TELCOPLAN) Supporting Plan.
Transport for NSW	• Transport for NSW coordinates information on road conditions for emergency services access. • Transport for NSW coordinates the management of the road network across all modes of transport. • Transport for NSW in conjunction will assist the NSW SES with the evacuation of at-risk communities by maintaining access and egress routes. • TMC will assist the NSW SES with the communication of flood warnings and information provision to the public through Live Traffic and Social Media according to the VMS protocols and procedures.

AGENCY	RESPONSIBILITIES
	• Assist the NSW SES with identification of road infrastructure at risk of flooding.
Transport Services Functional Area	The roles and responsibilities for Transport Services are outlined in the Transport Services Supporting Plan. Roles and responsibilities in addition to the Supporting Plan are: • Participate in risk management studies. • Assist the NSW SES to identify transport infrastructure at risk of flood damage for incorporation into planning and intelligence; and • Coordinate the provision of traffic and transport operations as consistent with the roles of Transport organisations.
Water NSW	The roles and responsibilities for Water NSW are outlined in the New South Wales State Flood Plan.
Welfare Services Functional Area	The roles and responsibilities for Welfare Services are outlined in the Welfare Services Functional Area Supporting Plan.

Appendix C – Community Specific Roles and Responsibilities

Aboriginal Organisations and Groups:	– **Cabrogal Clan** – **Darug Nation** – **Local Lands Council** – **Gandangara Local Aboriginal Land Council** – **Deerubin Local Aboriginal Land Council** – **Tharawal Local Aboriginal Land Council** • Act as the point of contact between the NSW SES and the [Aboriginal] community. • Inform the NSW SES Liverpool Unit Commander about flood conditions and response needs. • Disseminate flood information, including flood and evacuation warnings, to the [Aboriginal] community.
Community Members	**Preparedness** • Understand the potential risk and impact of flooding • Prepare homes and property to reduce the impact of flooding • Understand warnings and other triggers for action and the safest actions to take in a flood • Households, institutions and businesses develop plans to manage flood risks, sharing and practicing this with family, friends, employees and neighbours • Have an emergency kit; and • Be involved in local emergency planning processes **Recovery** • Assist with community clean-up if required and able to do so. • Participate in After Action Reviews if required.


COSTIN ROE
CONSULTING